# Forest-associated G1 and G2 Rank Species of Greatest Conservation Need

**Prepared by:** West Virginia Division of Natural Resources, Wildlife Resources Section, Wildlife Diversity Unit

27 November 2023

# Contents

# Introduction

Using the selection process described in Section 2.5 of the 2015 West Virginia State Wildlife Action Plan (SWAP), 1,143 animal and plant species were identified as Species of Greatest Conservation Need (SGCN). Information on assemblages of species by taxonomic group and habitats is provided in greater detail in the SWAP. Given the number of SGCN's addressed in the SWAP, it is impractical to discuss in detail the ecological requirements, distribution and status of every species.

This document summarizes the presence of G1 and G2 ranked species and communities by ecoregion and forest types as described in the SWAP. Conservation recommendations are provided by forest type.

*Table 1. Ecoregion associations of terrestrial forest groupings used in the West Virginia State Wildlife Action Plan.*

| | |
|---|---|
| **Allegheny Mountains** | Dry Calcareous Forests, Woodlands, and Glades |
| | Dry Oak (-Pine) Forests |
| | Dry-Mesic Oak Forests |
| | Mixed Mesophytic Forests |
| | Montane Red Oak Forests |
| | Northern Hardwood Forests |
| | Pine-Oak Rocky Woodlands |
| | Red Spruce Forests |
| **Ridge and Valley** | Dry Calcareous Forests, Woodlands, and Glades |
| | Dry Oak (-Pine) Forests |
| | Dry-Mesic Oak Forests |
| | Mixed Mesophytic Forests |
| | Montane Red Oak Forests |
| | Northern Hardwood Forests |
| | Pine-Oak Rocky Woodlands |
| | Red Spruce Forests |
| **Western Allegheny Plateau** | Dry Oak (-Pine) Forests |
| | Dry-Mesic Oak Forests |
| | Mixed Mesophytic Forests |
| | Northern Hardwood Forests |
| | Pine-Oak Rocky Woodlands |
| **Cumberland Mountains** | Dry Oak (-Pine) Forests |
| | Dry-Mesic Oak Forests |
| | Mixed Mesophytic Forests |
| | Montane Red Oak Forests |
| | Northern Hardwood Forests |
| | Pine-Oak Rocky Woodlands |
| | Red Spruce Forests |

*Table 2. Key to Species of Greatest Conservation Need G rankings.*

| Rank | Definition |
|---|---|
| G1 | Critically Imperiled — At very high risk of extinction or elimination due to very restricted range, very few populations or occurrences, very steep declines, very severe threats, or other factors. |
| G2 | Imperiled — At high risk of extinction or elimination due to restricted range, few populations or occurrences, steep declines, severe threats, or other factors. |
| G1? | Critically Imperiled, but inexact numeric rank. |
| G1G2 | Range Rank — A numeric range rank used to indicate uncertainty about the exact status of a taxon or ecosystem type. |
| G1G2Q | Critically Imperiled or Imperiled but with questionable taxomony that may reduce conservation priority. |
| G1Q | Critically Imperiled, but questionable taxonomy that may reduce conservation priority. Distinctiveness of this entity as a taxon or ecosystem type at the current level is questionable; resolution of this uncertainty may result in change from a species to a subspecies or hybrid, or inclusion of this taxon or type in another taxon or type, with the resulting taxon having a lower-priority (numerically higher) conservation status rank. The "Q" modifier is only used at a global level and not at a national or subnational level. |
| G2 | Imperiled — At high risk of extinction or elimination due to restricted range, few populations or occurrences, steep declines, severe threats, or other factors. |
| G2? | Imperiled, but inexact numeric rank |

# Red Spruce Forests

## Ecoregions

- Allegheny Mountains
- Ridge and Valley
- Cumberland Mountains
- Western Allegheny Plateau

## Description

Red Spruce forest accounts for 1.1% of all state area. Red Spruce forests are usually found where soils are rocky, highly acidic, and cold. Associated trees may include the evergreen Eastern Hemlock, and deciduous Yellow Birch, Red Maple, American Beech, Mountain Ash, and Black Cherry. Common shrubs include Mountain Holly, Great Rhododendron, Striped Maple, Southern Mountain Cranberry, and Mountain Laurel. The herb layer is characterized by species adapted to short, cool growing seasons, including Intermediate Woodfern, Mountain Woodfern, Mountain Wood Sorrel, Canada Mayflower, and Painted Wakerobin. Mosses and liverworts often have heavy cover over the rocky ground. This upland forest ecosystem may include forest seeps which are too small to map as a separate wetland habitat.

## Plant communities

This forest type supports a number of rare plant communities, as identified in the table below.

| Community Name | G-Rank |
|---|---|
| Balsam Fir - Black Ash Swamp | G1 |
| Barbara's Buttons Ice-Scour Prairie | G1 |
| Bog-Rosemary Peatland | G1 |
| Natural Red Pine Forest | G1 |
| Pitch Pine / Heath Peat Woodland | G1G2 |
| Balsam Fir - Oatgrass Swamp | G2 |
| Balsam Fir - Winterberry Swamp | G2 |
| Cranberry - Beakrush Peatland | G2 |
| High-Elevation Boulderfield Forest | G2 |
| Mountain Laurel - Black Huckleberry Heath Barren | G2 |
| Nodding Sedge - Prickly Bog Sedge Seep | G2 |
| Red Spruce - Southern Mountain Cranberry Swamp | G2 |
| Red Spruce – Yellow Birch Forest | G2 |
| Red Spruce / Heath Rocky Woodland | G2 |
| Red Spruce / Southern Mountain Cranberry Forest | G2 |
| Red Spruce / Three-seeded Sedge Peat Woodland | G2 |
| High Elevation Sandstone Boulderfield | G2? |
| Red Spruce - Hemlock / Rhododendron Swamp | G2? |
| Star Sedge Fen | G2? |

## Species

This forest type supports several Species of Greatest Conservation Need, as identified in the table below.

| Scientific Name | Common Name | G-Rank |
|---|---|---|
| *Calymmaria virginica* | A Hahniid Spider | G1 |
| *Triodopsis rugosa* | Buttressed Threetooth | G1 |
| *Platanthera shriveri* | Shriver's Frilly Orchid | G1 |
| *Plethodon nettingi* | Cheat Mountain Salamander | G1G2 |
| *Stenotrema simile* | Bear Creek Slitmouth | G2 |
| *Myotis sodalis* | Indiana Bat | G2 |
| *Bombus affinis* | Rusty-patched Bumble Bee | G2 |

# Northern Hardwood Forests

## Ecoregions

- Allegheny Mountains
- Ridge and Valley
- Western Allegheny Plateau
- Cumberland Mountains

## Description

Northern hardwood forest accounts for 6.1% of all state area. Northern hardwood forests are upland deciduous and mixed deciduous-evergreen forests at high elevations. Common deciduous tree species in natural forests include Sugar Maple, Red Maple, American Beech, Yellow Birch, Sweet Birch, Black Cherry, Red Oak, Cucumber-tree, and White Ash. Some stands may include or be dominated by Eastern Hemlock. Red Spruce is often present but is not abundant in the tree canopy. Common shrubs include Striped Maple and Mountain Holly. The herb layer is characterized by species adapted to short, cool growing seasons, including Intermediate Woodfern, New York Fern, Mountain Wood Sorrel, and Canada Mayflower. This upland forest ecosystem may include forest seeps which are too small to map as a separate wetland habitat. Semi-natural forests within this map class often have canopy composition similar to natural forests, or may be dominated by a single species such as Black Cherry or Red Maple. The map class may also include plantations of Red Pine, Eastern White Pine, Norway Spruce, and Red Spruce.

## Plant communities

This forest type supports a number of rare plant communities, as identified in the table below.

| Common Name | G-Rank |
|---|---|
| Balsam Fir - Black Ash Swamp | G1 |
| Natural Red Pine Forest | G1 |
| Calcareous Prairie | G1G2 |
| Balsam Fir - Oatgrass Swamp | G2 |
| Balsam Fir - Winterberry Swamp | G2 |
| Calcareous Shale Prairie Woodland | G2 |
| Cranberry - Beakrush Peatland | G2 |
| High-Elevation Boulderfield Forest | G2 |
| Mountain Laurel - Black Huckleberry Heath Barren | G2 |
| Nodding Sedge - Prickly Bog Sedge Seep | G2 |
| Red Maple - Black Gum / Peatmoss Swamp | G2 |
| Red Maple - White Oak Forest Seep | G2 |
| Red Spruce - Southern Mountain Cranberry Swamp | G2 |
| Red Spruce – Yellow Birch Forest | G2 |
| Red Spruce / Heath Rocky Woodland | G2 |
| Red Spruce / Southern Mountain Cranberry Forest | G2 |
| High Elevation Sandstone Boulderfield | G2? |
| Red Spruce - Hemlock / Rhododendron Swamp | G2? |

## Species

This forest type supports several known Species of Greatest Conservation Need, as identified in the table below.

| Scientific Name | Common Name | G-Rank |
|---|---|---|
| *Calymmaria virginica* | A Hahniid Spider | G1 |
| *Triodopsis rugosa* | Buttressed Threetooth | G1 |
| *Triodopsis platysayoides* | Flat-spired Threetooth | G1 |
| *Mesomphix sp. 1* | Pygmy Button | G1 |
| *Platanthera shriveri* | Shriver's Frilly Orchid | G1 |
| *Glyphyalinia sp. 1* | West Virginia Glyph | G1 |
| *Pycnanthemum clinopodioides* | Basil Mountainmint | G1G2 |
| *Plethodon nettingi* | Cheat Mountain Salamander | G1G2 |
| *Pyrgus wyandot* | Appalachian Grizzled Skipper | G1G2Q |
| *Pseudosinella meganporteri* | A Springtail | G2 |
| *Stenotrema simile* | Bear Creek Slitmouth | G2 |
| *Corallorhiza bentleyi* | Bentley's Coralroot | G2 |
| *Ptilimnium nodosum* | Harperella | G2 |
| *Myotis sodalis* | Indiana Bat | G2 |
| *Bombus affinis* | Rusty-patched Bumble Bee | G2 |
| *Arabis serotina* | Shale Barren Rockcress | G2 |
| *Anthrobia coylei* | A Sheetweb Weaver | G2? |
| *Paxistima canbyi* | Canby's Mountain-lover | G2? |

# Mixed Mesophytic Forests

## Ecoregions

- Allegheny Mountains
- Ridge and Valley
- Western Allegheny Plateau
- Cumberland Mountains

## Description

Mixed mesophytic forest accounts for 18.2% of all state area. Mixed mesophytic forests are upland deciduous and mixed deciduous-evergreen forests in moist (mesic) habitats at lower to middle elevations throughout the state. Examples can be found on concave slopes that promote moist conditions, commonly called cove forests. Common deciduous tree species in natural stands include Sugar Maple, American Basswood, American Beech, Red Maple, Tuliptree, Red Oak, Sweet Birch, White Ash, and Yellow Buckeye. Some stands may include or be dominated by Eastern Hemlock. Common shrubs include Great Rhododendron, Spicebush, Witch Hazel, and Striped Maple. The herb layers of deciduous Mixed Mesophytic Forests are often lush and diverse, characterized by a flush of spring ephemerals followed by late season dominance by Wood Nettle and ferns. In contrast, hemlock dominated Mixed Mesophytic Forests typically have low cover and diversity of herbs. Bryophytes may be abundant in all types. Semi-natural forests within this map class may be dominated by Tuliptree, Black Walnut, White Ash, and/or Black Cherry. Semi-natural forests on more acidic sites (with hemlock potential) may be dominated by pines.

## Plant communities

This forest type supports a number of rare plant communities, as identified in the table below.

| Common Name | G-Rank |
|---|---|
| Calcareous Prairie | G1G2 |
| Northern White-cedar Slope Woodland | G1G2 |
| Shenandoah Valley Marl Fen | G1Q |
| Acidic Sandstone Riverscour Shrub-Prairie | G2 |
| High-Elevation Boulderfield Forest | G2 |
| Red Maple - Black Gum / Peatmoss Swamp | G2 |
| Red Spruce – Yellow Birch Forest | G2 |
| Red Spruce - Hemlock / Rhododendron Swamp | G2? |

## Species

This forest type supports a number of known Species of Greatest Conservation Need, as identified in the table below.

| Scientific Name | Common Name | G-Rank |
|---|---|---|
| *Calymmaria virginica* | A Hahniid Spider | G1 |
| *Triodopsis rugosa* | Buttressed Threetooth | G1 |
| *Triodopsis platysayoides* | Flat-spired Threetooth | G1 |
| *Mesomphix luisant* | Glossy Button | G1 |
| *Helicodiscus villosus* | Greenbrier Coil | G1 |
| *Anguispira stihleri* | Greenbrier Tigersnail | G1 |
| *Mesomphix sp. 1* | Pygmy Button | G1 |
| *Platanthera shriveri* | Shriver's Frilly Orchid | G1 |
| *Glyphyalinia sp. 1* | West Virginia Glyph | G1 |
| *Malaxis bayardii* | Adder's Mouth | G1G2 |
| *Pycnanthemum clinopodioides* | Basil Mountainmint | G1G2 |
| *Plethodon nettingi* | Cheat Mountain Salamander | G1G2 |
| *Stachys eplingii* | Epling's Hedge-nettle | G1G2 |
| *Monarda brevis* | Smoke Hole Bergamot | G1G2 |
| *Pyrgus wyandot* | Appalachian Grizzled Skipper | G1G2Q |
| *Pseudosinella meganporteri* | A Springtail | G2 |
| *Stenotrema simile* | Bear Creek Slitmouth | G2 |
| *Corallorhiza bentleyi* | Bentley's Coralroot | G2 |
| *Myotis sodalis* | Indiana Bat | G2 |
| *Allium oxyphilum* | Nodding Onion | G2 |
| *Bombus affinis* | Rusty-patched Bumble Bee | G2 |
| *Arabis serotina* | Shale Barren Rockcress | G2 |
| *Anthrobia coylei* | A Sheetweb Weaver | G2? |
| *Paxistima canbyi* | Canby's Mountain-lover | G2? |
| *Spiraea virginiana* | Virginia Spiraea | G2? |

# Dry-Mesic Oak Forests

## Ecoregions

- Allegheny Mountains
- Ridge and Valley
- Western Allegheny Plateau
- Cumberland Mountains

## Description

Dry-mesic oak forest accounts for 30.5% of all state area. Dry-mesic oak forests are upland, mostly deciduous forests at lower and middle elevations throughout the state. Soils are usually somewhat less acidic and more fertile compared to the Dry Oak (-Pine) Forest but are dryer than the Mixed Mesophytic Forest or Northern Hardwood Forest. Most stands have a large component of oaks, including Red Oak, Chestnut Oak, White Oak, and Black Oak. A subset can be described as oak – hickory forests with a large component of hickory species including Pignut, Mockernut, and Shagbark. Other common trees include Red Maple, Sugar Maple, White Ash, Tuliptree, Black Gum, and American Beech. Common small trees and shrubs include Sourwood, Witch Hazel, Hop Hornbeam, Serviceberry, and Dogwood. Heath shrubs may be present but are not abundant as in the Dry Oak (-Pine) Forest. Common vines include Virginia Creeper and Greenbrier. The herb layer ranges from sparse to moderate and is often quite diverse. Semi-natural forests within this map class may be dominated by Tuliptree, Black Locust, Red Maple, Sweet Birch, or Eastern White Pine. Also includes areas of pine plantations.

## Plant communities

This forest type supports a number of rare plant communities, as identified in the table below.

| Common Name | G-Rank |
|---|---|
| Natural Red Pine Forest | G1 |
| Oak - Muscletree Floodplain Forest | G1 |
| Ridge and Valley Pitch Pine Peat Woodland | G1 |
| Sinkhole Marsh | G1 |
| Calcareous Prairie | G1G2 |
| Northern White-cedar Slope Woodland | G1G2 |
| Acidic Sandstone Riverscour Shrub-Prairie | G2 |
| Calcareous Shale Prairie Woodland | G2 |
| High-Elevation Boulderfield Forest | G2 |
| Nodding Sedge - Prickly Bog Sedge Seep | G2 |
| Red Maple - Black Gum / Peatmoss Swamp | G2 |
| Red Maple - Black Gum / Peatmoss Swamp | G2 |
| Red Maple - White Oak Forest Seep | G2 |
| Red Spruce / Heath Rocky Woodland | G2 |
| Sinkhole Pond Oak Swamp | G2 |

## Species

This forest type supports multiple known Species of Greatest Conservation Need, as identified in the table below.

| Scientific Name | Common Name | G-Rank |
|---|---|---|
| *Arrhopalites sp. 3* | A Collembola | G1 |
| *Calymmaria virginica* | A Hahniid Spider | G1 |
| *Islandiana sp. 1* | A Spider | G1 |
| *Triodopsis rugosa* | Buttressed Threetooth | G1 |
| *Paravitrea bellona* | Club Supercoil | G1 |
| *Triodopsis platysayoides* | Flat-spired Threetooth | G1 |
| *Mesomphix luisant* | Glossy Button | G1 |
| *Helicodiscus villosus* | Greenbrier Coil | G1 |
| *Anguispira stihleri* | Greenbrier Tigersnail | G1 |
| *Triodopsis sp. 1* | Piney Creek Threetooth | G1 |
| *Mesomphix sp. 1* | Pygmy Button | G1 |
| *Mesomphix sp. 1* | Pygmy Button | G1 |
| *Chitrella regina* | Royal Syarinid Pseudoscorpion | G1 |
| *Glyphyalinia sp. 1* | West Virginia Glyph | G1 |
| *Gyrinophilus subterraneus* | West Virginia Spring Salamander | G1 |
| *Malaxis bayardii* | Adder's Mouth | G1G2 |
| *Pycnanthemum clinopodioides* | Basil Mountainmint | G1G2 |
| *Plethodon nettingi* | Cheat Mountain Salamander | G1G2 |
| *Stachys eplingii* | Epling's Hedge-nettle | G1G2 |
| *Monarda brevis* | Smoke Hole Bergamot | G1G2 |
| *Pyrgus wyandot* | Appalachian Grizzled Skipper | G1G2Q |
| *Pseudosinella meganporteri* | A Springtail | G2 |
| *Stenotrema simile* | Bear Creek Slitmouth | G2 |
| *Corallorhiza bentleyi* | Bentley's Coralroot | G2 |
| *Ptilimnium nodosum* | Harperella | G2 |
| *Myotis sodalis* | Indiana Bat | G2 |
| *Allium oxyphilum* | Nodding Onion | G2 |
| *Bombus affinis* | Rusty-patched Bumble Bee | G2 |
| *Arabis serotina* | Shale Barren Rockcress | G2 |
| *Pycnanthemum torrei* | Torrey's Mountainmint | G2 |
| *Anthrobia coylei* | A Sheetweb Weaver | G2? |
| *Paxistima canbyi* | Canby's Mountain-lover | G2? |
| *Spiraea virginiana* | Virginia Spiraea | G2? |

# Dry Oak (-Pine) Forests

## Ecoregions

- Allegheny Mountains
- Ridge and Valley
- Western Allegheny Plateau
- Cumberland Mountains

## Description

Dry oak (-pine) forest accounts for 15.2% of all state area. Dry oak (-pine) forests are upland deciduous and mixed evergreen-deciduous forests on warm, dry topographic positions and soils throughout the state, except at the highest elevations, most extensive in the Ridge and Valley Ecoregion. Soils are typically shallow, dry, and highly acidic, with low to moderate fertility. Dominant trees include Chestnut Oak, Scarlet Oak, Black Oak, White Oak, and Red Maple. Sourwood is a common small tree, except in the Ridge and Valley Ecoregion, where it is absent. In the eastern counties there are large areas where Eastern White Pine is codominant with oaks. Other pines are often found scattered in mostly deciduous stands. Some small patches in the Western Allegheny Plateau and Cumberland Mountains ecoregions are dominated or co-dominated by Virginia Pine or Short Leaf Pine. Understories are usually dominated by heath shrubs, including Mountain Laurel, Black Huckleberry, and blueberries. Herb layers are usually sparse and have low diversity.

## Plant communities

This forest type supports a number of rare plant communities, as identified in the table below.

| Common Name | G-Rank |
|---|---|
| Natural Red Pine Forest | G1 |
| Sinkhole Marsh | G1 |
| Calcareous Prairie | G1G2 |
| Northern White-cedar Slope Woodland | G1G2 |
| Calcareous Shale Prairie Woodland | G2 |
| High-Elevation Boulderfield Forest | G2 |
| Mountain Laurel - Black Huckleberry Heath Barren | G2 |
| Red Maple - Black Gum / Peatmoss Swamp | G2 |
| Red Spruce / Heath Rocky Woodland | G2 |
| Red Spruce / Southern Mountain Cranberry Forest | G2 |
| High Elevation Sandstone Boulderfield | G2? |

## Species

This forest type supports multiple known Species of Greatest Conservation Need, as identified in the table below.

| Scientific Name | Common Name | G-Rank |
|---|---|---|
| *Calymmaria virginica* | A Hahniid Spider | G1 |
| *Triodopsis rugosa* | Buttressed Threetooth | G1 |
| *Paravitrea bellona* | Club Supercoil | G1 |
| *Triodopsis platysayoides* | Flat-spired Threetooth | G1 |
| *Mesomphix luisant* | Glossy Button | G1 |
| *Helicodiscus villosus* | Greenbrier Coil | G1 |
| *Anguispira stihleri* | Greenbrier Tigersnail | G1 |
| *Triodopsis sp. 1* | Piney Creek Threetooth | G1 |
| *Mesomphix sp. 1* | Pygmy Button | G1 |
| *Glyphyalinia sp. 1* | West Virginia Glyph | G1 |
| *Gyrinophilus subterraneus* | West Virginia Spring Salamander | G1 |
| *Malaxis bayardii* | Adder's Mouth | G1G2 |
| *Pycnanthemum clinopodioides* | Basil Mountainmint | G1G2 |
| *Plethodon nettingi* | Cheat Mountain Salamander | G1G2 |
| *Stachys eplingii* | Epling's Hedge-nettle | G1G2 |
| *Monarda brevis* | Smoke Hole Bergamot | G1G2 |
| *Pyrgus wyandot* | Appalachian Grizzled Skipper | G1G2Q |
| *Stenotrema simile* | Bear Creek Slitmouth | G2 |
| *Corallorhiza bentleyi* | Bentley's Coralroot | G2 |
| *Ptilimnium nodosum* | Harperella | G2 |
| *Myotis sodalis* | Indiana Bat | G2 |
| *Allium oxyphilum* | Nodding Onion | G2 |
| *Bombus affinis* | Rusty-patched Bumble Bee | G2 |
| *Arabis serotina* | Shale Barren Rockcress | G2 |
| *Pycnanthemum torrei* | Torrey's Mountainmint | G2 |
| *Anthrobia coylei* | A Sheetweb Weaver | G2? |
| *Paxistima canbyi* | Canby's Mountain-lover | G2? |
| *Spiraea virginiana* | Virginia Spiraea | G2? |

# Pine-Oak Rocky Woodlands

## Ecoregions

- Allegheny Mountains
- Ridge and Valley
- Cumberland Mountains

## Description

Pine-oak rocky woodland accounts for 0.5% of all state area. Pine-oak rocky woodlands are upland evergreen and mixed evergreen-deciduous woodlands and forests in hot, very dry topographic positions. Soils are usually shallow, rocky, coarse textured and highly acidic. This habitat type is confined to the eastern counties where a dry climate is produced by the rain shadow on the lee side of the Allegheny Mountains. Stands are often small patches on rocky summits, outcrops, and cliffs. Habitats include edaphic pine stands on extremely dry sites such as cliff tops, and successional pine stands which follow fire on deeper soils. Dominant pines which comprise distinct subtypes include Pitch Pine, Table Mountain Pine, Virginia Pine, and Red Pine. Oaks are sometimes codominant. Trees are often stunted and stand physiognomy is sometimes dwarf forest with canopy less than 16 feet tall. The understories are usually dominated by dense heath shrubs including Mountain Laurel, blueberries, and Black Huckleberry. The herb layer is typically sparse and has low diversity. This habitat type also includes sandstone glades with high exposure of bedrock pavement with scattered, dwarfed trees, including pines and Eastern Red Cedar.

## Plant communities

This forest type supports a number of rare plant communities, as identified in the table below.

| Common Name | G-Rank |
|---|---|
| Natural Red Pine Forest | G1 |
| Calcareous Shale Prairie Woodland | G2 |
| Mountain Laurel - Black Huckleberry Heath Barren | G2 |
| Mountain Laurel - Black Huckleberry Heath Barren | G2 |
| Red Spruce / Heath Rocky Woodland | G2 |
| Red Spruce / Heath Rocky Woodland | G2 |
| High Elevation Sandstone Boulderfield | G2? |
| High Elevation Sandstone Boulderfield | G2? |

## Species

This forest type supports multiple known Species of Greatest Conservation Need, as identified in the table below.

| Scientific Name | Common Name | G-Rank |
|---|---|---|
| *Calymmaria virginica* | A Hahniid Spider | G1 |
| *Triodopsis platysayoides* | Flat-spired Threetooth | G1 |
| *Glyphyalinia sp. 1* | West Virginia Glyph | G1 |
| *Pycnanthemum clinopodioides* | Basil Mountainmint | G1G2 |
| *Plethodon nettingi* | Cheat Mountain Salamander | G1G2 |
| *Stachys eplingii* | Epling's Hedge-nettle | G1G2 |
| *Pyrgus wyandot* | Appalachian Grizzled Skipper | G1G2Q |
| *Allium oxyphilum* | Nodding Onion | G2 |
| *Bombus affinis* | Rusty-patched Bumble Bee | G2 |
| *Arabis serotina* | Shale Barren Rockcress | G2 |
| *Paxistima canbyi* | Canby's Mountain-lover | G2? |

# Dry Calcareous Forests, Woodlands, and Glades

## Ecoregions

- Allegheny Mountains
- Ridge and Valley

## Description

Dry calcareous forests, woodlands, and glades account for 0.4% of all state area. Dry calcareous forests, woodlands, and glades are dry to dry-mesic calcareous forests, woodlands, and glades within the range of Chinquapin Oak at low to middle elevations, most abundant in areas with drier climates in the rain shadow on the lee side of the Allegheny Mountains. They are restricted to areas where soils are influenced by calcareous geology, including limestone and dolomite. Natural vegetation of forests is dominated by oak and hickory species, including Chinquapin Oak, White Oak, Red Oak, Bitternut Hickory, and Shagbark Hickory, with codominance by a variety of other hardwoods, including Black Maple, Sugar Maple, and White Ash. Common shrubs and small trees include Paw Paw, Muscletree, Redbud, Dogwood, Spicebush, Hop Hornbeam, and Black Haw. Herb layers are usually diverse, combining species with affinities for other oak-hickory forests in the region and more strict calciphiles. Open stand structure of woodland and glade habitats is maintained by drought stress to trees and in some cases by avalanches, fire, or grazing. Common woodland trees include Eastern Red Cedar, Chinquapin Oak, Red Oak, and White Ash. Some of the oldest known living trees in the eastern United States are Eastern Red Cedars found in this habitat in West Virginia. The herb layer is usually diverse and includes several globally and state rare species.

## Plant communities

This forest type supports a number of rare plant communities, as identified in the table below.

| Common Name | G-Rank |
|---|---|
| Sinkhole Marsh | G1 |
| Calcareous Prairie | G1G2 |
| Calcareous Prairie | G1G2 |
| Northern White-cedar Slope Woodland | G1G2 |
| Calcareous Shale Prairie Woodland | G2 |

## Species

This forest type supports several known Species of Greatest Conservation Need, as identified in the table below.

| Scientific Name | Common Name | G-Rank |
|---|---|---|
| *Arrhopalites sp. 3* | A Collembola | G1 |
| *Calymmaria virginica* | A Hahniid Spider | G1 |
| *Anthrobia coylei* | A Sheetweb Weaver | G2? |
| *Islandiana sp. 1* | A Spider | G1 |
| *Pseudosinella meganporteri* | A Springtail | G2 |
| *Malaxis bayardii* | Adder's Mouth | G1G2 |
| *Pycnanthemum clinopodioides* | Basil Mountainmint | G1G2 |
| *Paxistima canbyi* | Canby's Mountain-lover | G2? |
| *Mesomphix luisant* | Glossy Button | G1 |
| *Anguispira stihleri* | Greenbrier Tigersnail | G1 |
| *Myotis sodalis* | Indiana Bat | G2 |
| *Allium oxyphilum* | Nodding Onion | G2 |
| *Monarda brevis* | Smoke Hole Bergamot | G1G2 |

# Montane Red Oak Forests

## Ecoregions

- Allegheny Mountains
- Ridge and Valley
- Cumberland Mountains

## Description

Montane red oak forest accounts for 0.1% of all state area. Montane Red Oak forests are forests dominated by Red Oak at high elevations in the Ridge and Valley Ecoregion and along the border with Virginia on Allegheny Mountain in the Allegheny Mountains Ecoregion. Other oaks and hickories are generally excluded and canopy height is stunted due to severe climate. There is usually abundant coarse woody debris and an open canopy structure due to tree damage from wind and ice storms. Associated trees include Red Maple, Sugar Maple, Black Cherry and Sweet Birch. Common subcanopy trees and shrubs include Striped Maple, Witch Hazel, and Mountain Holly. Some stands have shrub layers dominated by heaths. Herb layers are variable, with variants dominated by combinations of grasses, forbes, and ferns.

## Plant communities

This forest type supports a number of rare plant communities, as identified in the table below.

| Common Name | G-Rank |
|---|---|
| Natural Red Pine Forest | G1 |
| High-Elevation Boulderfield Forest | G2 |
| Red Spruce / Heath Rocky Woodland | G2 |
| High Elevation Sandstone Boulderfield | G2? |

## Species

This forest type supports one known Species of Greatest Conservation Need; others may occur but are not known at this time.

| Scientific Name | Common Name | G-Rank |
|---|---|---|
| *Bombus affinis* | Rusty-patched Bumble Bee | G2 |

## Other Forests

Other forest accounts for 9.6% of all state area. Other forests are the remaining forested land that was spectrally derived but did not include the specific types classified as River Floodplains, Small Stream Riparian Habitats, Red Spruce Forests, Northern Hardwood Forests, Mixed Mesophytic Forests, Dry-Mesic Oak Forests, Dry Oak (Pine) Forests, Pine Oak Rock Woodlands, Dry Calcareous Forests, or Montane Red Oak Forests. No species specifically are associated with this forest type.

## Other Communities

Although not specifically identified as habitat categories in the West Virginia State Wildlife Action plan there are a number of additional rare communities that typically occur as unique enclaves or inholdings within the broad habitat categories described above that are formally recognized and assigned G-ranks. These rare communities are listed below, with links to descriptions in the NatureServe system.

- Resources to identify, classify, and protect habitats and Associations:
    - WVDNR (West Virginia Division of Natural Resources). 2022. Vegetation Classification for West Virginia: a list of Associations of the U. S. National Vegetation verified to occur in West Virginia and their conservation status ranks, version 4.22.1 (sortable spreadsheet). Natural Heritage Program. Elkins, WV.
    - http://www.wvdnr.org/Wildlife/Factsheets/
    - http://www.wvdnr.org/publications/PDFFiles/High%20Allegheny%20Wetlands-web.pdf
    - http://www.wvdnr.org/publications/PDFFiles/RedSpruceUplands-web.pdf

| WV Group | Code Link | WV name | WV common name | G rank |
|---|---|---|---|---|
| Acidic Bogs and Poor Fens | CEGL007771 | Acidic Bogs and Poor Fens | Nodding Sedge - Prickly Bog Sedge Seep | G2 |
| Acidic Bogs and Poor Fens | CEGL007856 | Acidic Bogs and Poor Fens | Cranberry - Beakrush Peatland | G2 |
| Bottomland Oak Swamps | CEGL004643 | Acidic Bogs and Poor Fens | Sinkhole Pond Oak Swamp | G2 |
| Acidic Bogs and Poor Fens | CEGL008534 | Acidic Bogs and Poor Fens | Star Sedge Fen | G2? |
| Calcareous Fen and Marsh | CEGL006170 | Bottomland Oak Swamps | Shenandoah Valley Marl Fen | G1Q |
| Calcareous Evergreen Woodlands and Glades | CEGL008376 | Boulderfield Forests | Calcareous Prairie | G1G2 |
| Calcareous Evergreen Woodlands and Glades | CEGL008426 | Calcareous Evergreen Woodlands and Glades | Northern White-cedar Slope Woodland | G1G2 |

| | | | | |
|---|---|---|---|---|
| Cliffs and Rock Outcrops | CEGL004389 | Calcareous Evergreen Woodlands and Glades | High Elevation Sandstone Boulderfield | G2? |
| High elevation conifer peatland | CEGL006590 | Calcareous Fen and Marsh | Red Spruce / Three-seeded Sedge Peat Woodland | G2 |
| Dry Pine Forests and Woodlands | CEGL004761 | Cliffs and Rock Outcrops | Short Leaf Pine - Oak Forest | G2 |
| Dry Pine Forests and Woodlands | CEGL006108 | Dry Pine Forests and Woodlands | Natural Red Pine Forest | G1 |
| Heath Barrens | CEGL003939 | Dry Pine Forests and Woodlands | Mountain Laurel - Black Huckleberry Heath Barren | G2 |
| High Floodplain Forests and Woodlands | CEGL003836 | Floodplain Forests | Giant Cane Woodland | G2? |
| Red Spruce Forests and Woodlands | CEGL008501 | Heath Barrens | Red Spruce – Yellow Birch Forest | G2 |
| High elevation conifer peatland | CEGL006587 | High elevation conifer peatland | Pitch Pine - Red Spruce / Heath Peat Woodland | G1G2 |
| High elevation conifer seepage swamp | CEGL006592 | High elevation conifer peatland | Balsam Fir - Oatgrass Swamp | G2 |
| High elevation conifer seepage swamp | CEGL006003 | High elevation conifer seepage swamp | Balsam Fir - Black Ash Swamp | G1 |
| High elevation conifer seepage swamp | CEGL006591 | High elevation conifer seepage swamp | Balsam Fir - Winterberry Swamp | G2 |
| High elevation conifer seepage swamp | CEGL006593 | High elevation conifer seepage swamp | Red Spruce - Southern Mountain Cranberry Swamp | G2 |
| Low-middle elevation seepage swamp | CEGL007853 | High elevation conifer seepage swamp | Red Maple - White Oak Forest Seep | G2 |
| High elevation conifer seepage swamp | CEGL006277 | High elevation conifer seepage swamp | Red Spruce - Hemlock / Great Laurel Swamp | G2? |
| High Floodplain Forests and Woodlands | CEGL008449 | High Floodplain Forests and Woodlands | Virginia Pine – Eastern Red-cedar Bedrock Terrace Woodland | G1 |
| High Floodplain Forests and Woodlands | CEGL006462 | High Floodplain Forests and Woodlands | Oak - Muscletree Floodplain Forest | G1 |
| Riverscour Prairies | CEGL006623 | High Floodplain Forests and Woodlands | Acidic Sandstone Riverscour Shrub-Prairie | G2 |

| | | | | |
|---|---|---|---|---|
| Low-middle elevation seepage swamp | CEGL007056 | Low-middle elevation seepage swamp | Ridge and Valley Pitch Pine Peat Woodland | G1 |
| Marsh and Wet Meadow | CEGL003746 | Low-middle elevation seepage swamp | Sinkhole Marsh | G1 |
| Red Spruce Forests and Woodlands | CEGL006254 | Red Spruce Forests and Woodlands | Red Spruce / Heath Rocky Woodland | G2 |
| Red Spruce Forests and Woodlands | CEGL007131 | Red Spruce Forests and Woodlands | Red Spruce / Southern Mountain Cranberry Forest | G2 |
| Shale Barrens | CEGL006037 | Red Spruce Forests and Woodlands | Calcareous Shale Prairie Woodland | G2 |
| Riverscour Prairies | CEGL006598 | Riverscour Prairies | Barbara's-buttons Ice-Scour Prairie | G1 |
| Boulderfield Forests | CEGL008504 | Riverscour Prairies | High-Elevation Boulderfield Forest | G2 |
| Acidic Bogs and Poor Fens | CEGL006589 | Shale Barrens | Bog-Rosemary Peatland | G1 |
| Floodplain Forests | CEGL006463 | WV Group | Black Willow Slackwater Woodland | G1? |

## Conservation Recommendations

- Apply West Virginia Division of Forestry Logging Sediment Control Act Best Management Practices
- Apply Beneficial Forest Management Practices for WNS-affected bats
- Wetlands and Floodplains are particularly sensitive to changes in hydrology and water quality. No flows should be diverted into or withdrawn from the water sources to these communities, and discharges of pollutants, nutrients, or sediment should not be allowed into their water sources.
- Non-native invasive species should be controlled in areas disturbed by the project and should be monitored (and carefully controlled) in the adjacent rare community occurrences following the project.
- If water crossings are necessary:
    - Avoid if possible
    - Use already established fords when possible
    - Utilize timber matts and bank protection to reduce sediment
    - Leave riparian trees and vegetation intact as much as possible.
    - Try to minimize the number of crossings
- Reduce changes in microclimate
    - Employ uneven aged timber management when possible, and shelterwood cut/leave standing trees when uneven aged management is not possible
    - Leave woody debris on ground, including logs when possible
    - Leave 150 ft buffer around rock outcroppings and boulder piles
- Retain natural plant community
    - Clear equipment/vehicles of mud/soil/seeds from other locations before bringing to site
    - Remove invasive plants, such as autumn olive, bush honeysuckle, J. stilt grass, barberry, and multiflora rose
    - Replant sites with native plants recommended by the West Virginia Planting Tool
        - Emphasis on wildflower species in log landings, road edges, and clearcuts
- Reduce impacts on caves
    - Don’t dispose of waste, including trash, slash, and rubble, in sinkholes/karst
    - Don’t direct water into sinkholes/karst
    - 300 ft reduced ground disturbance buffer around karst features such as a cave entrance
    - 100 ft wide reduced ground disturbance buffer for corridors upstream to karst features
    - 100 ft wide reduced ground disturbance buffer to the edge of losing streams
    - For sinkholes, the reduced ground disturbance buffer shall extend in all directions to a distance of 100’ or to the sinkhole catchment boundary, whichever is less.
    - Restrict hazardous materials storage, equipment refueling, or parking within 100 feet of karst terrain features.
    - Recommendation of conducting pre- and post-construction tests of water quality and quantity for hydrologically active cave systems within 150 ft of the harvestable area.
- Implement road dust control when gravel or dirt roads are used

## Additional Species-specific Conservation Recommendations

*Anguispira stihleri*

- Limestone outcroppings/bluffs within Greenbrier county should follow timbering guidelines similarly used *for Triodopsis platysoides* since *A. stihleri* is a highly endemic species. This would be a primary buffer of 100ft with no disturbance around rock features, plus a secondary buffer of 50ft where up to 20% (based on basal area) of harvestable timber may be removed. Skid roads may be constructed if necessary. Measure must be taken to minimize disturbance. This entails a total buffer zone of 150ft.
- Exception: If tributary glades along the Greenbrier River are found to have species presence, this should be attributed to all known occupied habitat, in which case the rock features should have a primary buffer of 150 ft, plus secondary buffer of 50ft where up to 20% (based on basal area) of harvestable timber may be removed. Skid roads may be constructed if necessary. Measure must be taken to minimize disturbance. This entails a total buffer zone of 200ft.

*Mesomphix luisant*

- As a highly endemic species, same limestone bluff management guidelines as *A. stihleri*, but in addition to Greenbrier county also extended to limestone bluffs in Logan county.

*Helicodiscus villosus*

- Talus slopes and springs within Greenbrier county should follow timbering guidelines similarly used *for Triodopsis platysoides*. This would be a primary buffer of 100ft with no disturbance around talus rock and spring basin features, plus a secondary buffer of 50ft where up to 20% (based on basal area) of harvestable timber may be removed. Skid roads may be constructed if necessary. Measure must be taken to minimize disturbance. This entails a total buffer zone of 150ft.

*Cambarus smilax*

- As an endemic species to West Virginia, mid to headwater reaches of Greenbrier River basin are recommended to have riparian buffers of 100 ft on both sides of the stream to be preserved or restored, with wider buffers recommended on steep slopes.

*Cambarus nerterius*

This endemic crayfish species typically inhabits caves that are hydrologically connected to surface water and runoff conditions. In consideration of this:

- 300 ft reduced ground disturbance buffer around karst features such as a cave entrance
    - Based on double FERC recommendations for drinking water supplies in consideration of hydrologically connections from surface to subterranean features
- 100 ft wide reduced ground disturbance buffer for corridors upstream to karst features
- 100 ft wide reduced ground disturbance buffer to the edge of losing streams
- For sinkholes, the reduced ground disturbance buffer shall extend in all directions to a distance of 100’ or to the sinkhole catchment boundary, whichever is less.
- Restrict hazardous materials storage, equipment refueling, or parking within 100 feet of karst terrain features.

- Recommendation of conducting pre- and post-construction tests of water quality and quantity for hydrologically active cave systems within 150 ft of the harvestable area.

See pages 48-51 and page 104 of Guidelines for Cave & Karst Protection regarding forestry practices and the need for buffers on forested karst landscapes.

*Pyrgus wyandot*

As a species in extremely steep decline, habitat conservation consideration should be given regardless if occupancy is known. As such in areas of potential/suitable habitat:

- When occupancy is unknown, limited or no use of herbicide treatments in or near open to semi-open shale slopes and barrens that have the food host plant *Potentilla canadensis*.
- When occupancy is known, dust-suppression measures implemented for skid and existing dirt and gravel roads adjacent to open to semi-open shale slopes and barrens.
- Within a harvestable area that has 1) open to semi-open shale slopes and barrens, and 2) also have the food host plant *Potentilla canadensis*, consider setting aside up to 2km of suitable habitat within a known project area (or max of project area if < 2km) that has reduced ground disturbance activities within a 300 ft buffer of the suitable habitat.

*Hansonoperla hokolesqua*

- Small, intermittent streams with stone substrates within harvestable areas of Nicholas, Greenbrier, and Wayne counties within the Gauley and Twelvepole watersheds should follow WVDOP Logging Sediment Control Act guidelines: a minimum stream management zone (SMZ) width or distance between exposed or disturbed soil and an intermittent stream should be no less than 100 feet slope distance on either side of the stream from the top or edge of the channel.