

**Associations and Alliances of  
Great Smoky Mountains National Park  
(inclusive of the Foothills Parkway)**



**U.S. NATIONAL VEGETATION CLASSIFICATION**

**NatureServe**

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NatureServe

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This subset of the U.S. National Classification Standard covers vegetation types attributed to Great Smoky Mountains National Park (inclusive of the Foothills Parkway). This classification has been developed in consultation with many individuals and agencies and incorporates information from a variety of publications and other classifications. Comments regarding the contents of this subset should be directed to Don Faber-Langendoen, Senior Ecologist <don\_faber-langendoen@natureserve.org> or Kristin Snow, Ecology Database Analyst <kristin\_snow@natureserve.org>.

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This report is part of a series of publications on the vegetation of the Great Smoky Mountains National Park, including a key to the vegetation types by White et al. (2020) and a comprehensive map of the park's vegetation by Hop et al. (2021). See:

White, R., M. Pyne, T. Govus, and T. Evans. 2020. Field Key to Vegetation Types of Great Smoky Mountains National Park (inclusive of the Foothills Parkway). U.S. National Vegetation Classification. NatureServe, Arlington, VA.

Hop, K., A. Strassman, S. Sattler, R. White, M. Pyne, T. Govus, and J. Dieck. 2021 (in prep). National Park Service Vegetation Mapping Inventory Program: Great Smoky Mountains National Park vegetation mapping project. Natural Resource Report NPS/GRSM/NRR—2021/XXXX. National Park Service, Fort Collins, Colorado.

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# 1. Forest & Woodland

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## 1.B.1. Warm Temperate Forest & Woodland

### 1.B.1.NA. SOUTHEASTERN NORTH AMERICAN FOREST & WOODLAND

#### M305. Southeastern North American Ruderal Forest

##### G031. SOUTHEASTERN NATIVE RUDERAL FOREST

**Group Summary Description:** This ruderal native forest group occurs in old-field and other human-disturbed sites across the southeastern United States. The vegetation shows evidence of former and heavy human use, such as formerly cleared and/or planted sites, but which has been allowed to succeed more-or-less spontaneously, as determined by the vegetation being dominated (>80% cover) by ruderal native tree species. Understory shrub and herb species may be a mix of exotic species and native generalists. Some typical native ruderal species include conifer *Pinus taeda*, and hardwoods *Catalpa bignonioides*, *Catalpa speciosa*, *Liquidambar styraciflua*, *Liriodendron tulipifera*, *Maclura pomifera*, and *Quercus nigra*. Exotic associates may include *Albizia julibrissin*, *Broussonetia papyrifera*, *Triadica sebifera*, and *Maclura pomifera*. *Maclura pomifera* is a native species in a narrow region of the eastern U.S., but is so widely planted outside of its range that it is effectively exotic. Where both the ground layer and tree layer are native ruderals, the stand may overlap with degraded phases of other native forest types.

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#### A3232 *Liquidambar styraciflua* - *Celtis laevigata* - *Quercus nigra* Ruderal Forest Alliance

Sweetgum - Sugarberry - Water Oak Ruderal Forest Alliance

*Ruderal Sweetgum - Sugarberry - Water Oak Forest*

##### ALLIANCE CONCEPT

**Summary:** This alliance includes a variety of semi-natural disturbance-related upland forests of the southeastern United States dominated by *Liquidambar styraciflua*, *Quercus nigra*, *Celtis laevigata*, and other hardwoods. These forests tend to develop after logging or agricultural cropping. Some associations may have *Carya tomentosa*, *Liriodendron tulipifera*, *Quercus alba*, *Quercus falcata*, *Quercus nigra*, *Quercus phellos*, and *Quercus velutina*. In addition, *Pinus taeda* may be present and abundant. *Celtis laevigata* semi-natural stands occur in highly disturbed soils in coastal areas of Georgia and possibly adjacent states. *Celtis laevigata* is the strong canopy dominant in this community. However, exotic tree species such as *Melia azedarach*, *Triadica sebifera*, and *Morus alba* may be scattered throughout. Ground cover species are variable but may include *Rubus trivialis* and *Nekemias arborea*.

**Classification Comments:** *Quercus laevis* and *Crataegus flava* stands formerly included here have been removed. They are strongly dominated by *Quercus laevis* and are mostly (or possibly entirely) the result of the removal and reproductive failure of *Pinus palustris*. This includes modified and/or fire-suppressed examples of *Pinus palustris* - *Quercus* spp.-dominated vegetation, where *Pinus palustris* has been removed and/or failed to regenerate due to fire suppression or other environmental modifications, including turpentine logging. Canopy closure of fire-suppressed examples may exceed 60%. The relative density and diversity of the shrub and herb layers will vary with degree of fire suppression; the local expression will vary with latitude and the distributions of various shrub and herbaceous components, as well as with soil texture. It may be that these sites are better treated (at least from a conservation or restoration perspective) as lower quality (but often highly restorable) examples of various communities in the former *Pinus palustris* / *Quercus* spp. Woodland Alliance (A.499).

**Diagnostic Characteristics:** Stands are found in the uplands and dominated by *Liquidambar styraciflua*, *Quercus nigra*, *Celtis laevigata* (>50%) or, if >25%, with a mix of other generalist tree species, including other hardwoods, such as *Carya tomentosa*, *Liriodendron tulipifera*, *Quercus alba*, *Quercus falcata*, *Quercus nigra*, *Quercus phellos*, and *Quercus velutina*, or the conifer *Pinus taeda*.

##### ALLIANCE DESCRIPTION

**Environment:** These forests tend to develop after logging or agricultural cropping.

**Vegetation:** This alliance includes a variety of semi-natural disturbance-related upland forests dominated by *Liquidambar styraciflua*, *Quercus nigra*, *Celtis laevigata*, and other hardwoods. Some associations may have *Carya tomentosa* (= *Carya alba*), *Liriodendron tulipifera*, *Quercus alba*, *Quercus falcata*, *Quercus nigra*, *Quercus phellos*, and *Quercus velutina*. In addition, *Pinus taeda* may be present and abundant. *Celtis laevigata* semi-natural stands occur in highly disturbed soils in coastal areas of Georgia and possibly adjacent states. *Celtis laevigata* is the strong canopy dominant in this community. However, exotic tree species such as *Melia azedarach*, *Triadica sebifera*, and *Morus alba* may be scattered throughout. Ground cover species are variable but may include *Rubus trivialis* and *Nekemias arborea* (= *Ampelopsis arborea*).

**Physiognomy and Structure:** Stands are primarily dominated by broad-leaved deciduous hardwood trees.

**Floristics:** This alliance includes a variety of semi-natural disturbance-related upland forests dominated by *Liquidambar styraciflua*, *Quercus nigra*, *Celtis laevigata*, and other hardwoods. Some associations may have *Carya tomentosa* (= *Carya alba*), *Liriodendron tulipifera*, *Quercus alba*, *Quercus falcata*, *Quercus nigra*, *Quercus phellos*, and *Quercus velutina*. In addition, *Pinus taeda* may be present and abundant. *Celtis laevigata* semi-natural stands occur in highly disturbed soils in coastal areas of Georgia and possibly adjacent states. *Celtis laevigata* is the strong canopy dominant in this community. However, exotic tree species such as *Melia azedarach*, *Triadica sebifera*, and *Morus alba* may be scattered throughout. Ground cover species are variable but may include *Rubus trivialis* and *Nekemias arborea* (= *Ampelopsis arborea*).

**Dynamics:** These forests tend to develop after logging or agricultural cropping.

**ALLIANCE DISTRIBUTION**

**Range:** This alliance is distributed throughout the southeastern United States in most physiographic provinces, ranging from Maryland to Florida and west to Arkansas and possibly Texas.

**Nations:** US

**Subnations:** AL, AR, DC?, DE, FL, GA, KY, LA, MD, MS, NC, NJ, OK, SC, TN, TX?, VA

**ALLIANCE SOURCES**

**References:** Faber-Langendoen et al. 2019b

**Author of Concept:** Faber-Langendoen et al. 2019b

**Author of Description:** D. Faber-Langendoen, in Faber-Langendoen et al. (2013)

**[CEGL007216] *Liquidambar styraciflua* Ruderal Forest**

Translated Name: **Sweetgum Ruderal Forest**

Common Name: **Ruderal Sweetgum Forest**

**USNVC CLASSIFICATION**

Division	Southeastern North American Forest & Woodland (1.B.1.Na)
Macrogroup	Southeastern North American Ruderal Forest (M305)
Group	Southeastern Native Ruderal Forest (G031)
Alliance	<i>Liquidambar styraciflua</i> - <i>Celtis laevigata</i> - <i>Quercus nigra</i> Ruderal Forest Alliance (A3232)

**ELEMENT CONCEPT**

**Global Summary:** This early-successional upland forest of the southeastern U.S. occurs on a variety of environmental settings, resulting from succession following human activities such as logging and clearing or agriculture. Stands are dominated by *Liquidambar styraciflua*, sometimes to the exclusion of other species. *Pinus taeda* is a common associate. Other associated species are highly variable and depend on location and stand history.

**ENVIRONMENTAL DESCRIPTION**

**Global Environment:** This association is found in uplands that have been heavily impacted by agriculture or other severe disturbances and are recovering.

**VEGETATION DESCRIPTION**

**Global Vegetation:** Stands are dominated by *Liquidambar styraciflua*, sometimes to the exclusion of other species.

**Global Dynamics:** These communities represent successional stands of upland *Liquidambar styraciflua*. As the stands mature, they begin to assume the characteristics of more natural community types. Over time, *Liquidambar styraciflua* declines and is replaced by oaks, hickories, and/or pines. In addition, small stream bottomland sweetgum stands in the Piedmont may recover quickly from disturbance and begin to approximate the characters of *Liquidambar styraciflua* - *Liriodendron tulipifera* / *Lindera benzoin* / *Arisaema triphyllum* Floodplain Forest (CEGL004418) 50 years or more after a stand-initiating disturbance.

**MOST ABUNDANT SPECIES**

**Global**

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Broad-leaved deciduous tree	<i>Liquidambar styraciflua</i>
Shrub/sapling (tall & short)	Broad-leaved deciduous tree	<i>Liquidambar styraciflua</i>

**CHARACTERISTIC SPECIES**

**Global:**

**OTHER NOTEWORTHY SPECIES**

**Global:**

**CONSERVATION STATUS RANK**

**Global Rank & Reasons:** GNA (ruderal) (19-Aug-2002). This is an upland successional vegetation type composed of native species. Its conservation value is limited, but it may provide buffer for communities of greater conservation value.

**RELATED CONCEPTS****Global Similar Types:**

- *Liquidambar styraciflua* - *Liriodendron tulipifera* / *Lindera benzoin* / *Arisaema triphyllum* Floodplain Forest (CEGL004418) a later-successional bottomland association.
- *Liquidambar styraciflua* - *Quercus (alba, falcata)* Ruderal Forest (CEGL007217) of interior provinces.
- *Liquidambar styraciflua* - *Quercus nigra* - *Pinus taeda* / *Vaccinium elliotii* - *Morella cerifera* Ruderal Forest (CEGL007726) a more diverse successional forest of the Coastal Plain.

**Global Related Concepts:**

- sweet gum successional forest (Collins and Anderson 1994) =

**CLASSIFICATION**

**Status:** Standard

**Classification Confidence:** 3 - Weak

**ELEMENT DISTRIBUTION**

**Global Range:** This association may be found throughout the southeastern United States, in the coastal plains and interior ecoregions. It is also attributed to New Jersey with the merger of CEGL006927. The status in intervening states (e.g., Delaware, Maryland) needs to be assessed.

**Nations:** US

**States/Provinces:** AL, AR, DC?, DE, GA, KY, LA, MD, MS, NC, NJ, OK, SC, TN, VA

**TNC Ecoregions:** 31:P, 32:P, 40:P, 41:C, 42:C, 43:C, 44:C, 50:C, 51:P, 52:C, 53:P, 56:P, 57:C, 58:C, 62:C

**USFS Ecoregions (1994/95):** 221Hc:CCC, 222Ef:CCC, 222Fa:CCP, 222Fb:CCC, 222Fe:CCP, 231Aa:CCP, 231Ab:CCC, 231Bh:CCC, 231Bi:CCC, 232Ab:CCC, 232Ac:CCC, 232Ad:CCC, 232Bd:CCC, 232Cb:CCC, M221Dc:???, M221Dd:???

**USFS Ecoregions (2007):** 221Hc:CCC, 223Ef:CCC, 223Fa:CCP, 223Fb:CCC, 223Fe:CCP, 231Aa:CCP, 231Ab:CCC, 231Ha:CCC, 231Hc:CCC, 231Hi:CCC, 232Ab:CCC, 232Ac:CCP, 232Ad:CCC, 232B:CC, 232Cb:CCP, M221Dc:???, M221Dd:???

**Federal Lands:** NPS (Big South Fork, Chickamauga-Chattanooga?, Colonial, Cowpens, George Washington Birthplace, Great Smoky Mountains, Guilford Courthouse, Horseshoe Bend, Kings Mountain, Mammoth Cave, Moores Creek, Natchez Trace, National Capital-East, Ninety Six, Petersburg, Shiloh, Thomas Stone, Vicksburg); USFS (Cherokee?, Oconee?, St. Francis); USFWS (Cape May, E.B. Forsythe, Patuxent, Prime Hook, Supawna Meadows)

**ELEMENT SOURCES**

**Global Description Author(s):** R. White and M. Pyne

**References:** Collins and Anderson 1994, Coxe 2009, Lea et al. 2012, Lea et al. 2013, McCrain and Church 1985, McManamay et al. 2012a, NatureServe 2009, NatureServe Ecology - Southeastern U.S. unpubl. data, Nordman et al. 2011, Patterson 2008c, Patterson 2008d, Patterson 2008e, Pyne et al. 2010, Schotz pers. comm., Southeastern Ecology Working Group n.d., White 2004, White and Govus 2003, White and Govus 2005, White and Pyne 2003

**1.B.2. Cool Temperate Forest & Woodland****1.B.2.NA. EASTERN NORTH AMERICAN FOREST & WOODLAND****M016. Southern & South-Central Oak - Pine Forest & Woodland****G012. SHORTLEAF PINE - OAK FOREST & WOODLAND**

**Group Summary Description:** This group encompasses forests and woodlands of the interior plateaus, Appalachians, Piedmont, Ozark-Ouachita, and upper coastal plain regions (north of the primary range of *Pinus palustris* in the coastal plains) in which *Pinus echinata* is the canopy dominant (or at least an important component). Examples can occur on a variety of topographic and landscape positions, including ridgetops, upper and midslopes, as well as lower elevations (generally below 700 m [2300 feet]) in the Southern Appalachians such as mountain valleys, as well as on rolling uplands in the Upper East Gulf Coastal Plain. Examples occur on a variety of acidic soils or bedrock types. Stands may be codominated by *Quercus* spp., *Carya* spp., and other hardwoods, with the varying proportion of pine versus hardwood depending on management (both commercial forestry and ecological management), particularly time since fire. Although examples of this group occur throughout this broad area, there is considerable local variation in their extent in the landscape and in their structure and composition. In more open stands (such as ones in naturally drier regions or ones which have experienced more recent/frequent fire), the understory is characterized by *Andropogon gerardii*, *Schizachyrium scoparium*, and other prairie graminoid elements. In the lower elevations of the Southern Appalachians, and under current conditions, stands are dominated by *Pinus echinata* or *Pinus virginiana*. *Pinus rigida* may sometimes be present. Stands found outside of the coastal plains in which *Pinus palustris* is a component are also included here. Hardwoods are sometimes abundant, especially dry-site oaks such as *Quercus falcata*, *Quercus montana*, *Quercus stellata*, and *Quercus coccinea*, but also *Carya glabra* and other hickories. The shrub layer may be well-developed, with *Vaccinium pallidum*, *Gaylussacia baccata*, or other acid-tolerant species being most

characteristic. Herbs are usually sparse but may include *Pityopsis graminifolia* and *Tephrosia virginiana*. There is some regional variation in composition across the range of this group, with examples in the Ozark-Ouachita area and the upper coastal plain lacking *Pinus rigida*, *Pinus virginiana*, and *Quercus montana*. In the upper coastal plains, where fire is more frequent, stands of vegetation affiliated with this group may develop a relatively pure and open canopy of *Pinus echinata* with scattered overstory trees and an herbaceous-dominated understory, but such examples are rare on the modern landscape unless maintained by ecological management. More typical are examples in which *Quercus* spp., *Carya* spp., *Liquidambar styraciflua*, *Liriodendron tulipifera*, *Acer* spp., and *Nyssa sylvatica* have become prominent in the midstory and overstory and in which herbaceous patches are rare.

## **A3269 *Pinus echinata* - *Pinus pungens* - *Quercus montana* Appalachian Woodland Alliance**

Shortleaf Pine - Table Mountain Pine - Chestnut Oak Appalachian Woodland Alliance

*Appalachian Shortleaf Pine - Oak Woodland*

### ALLIANCE CONCEPT

**Summary:** This Appalachian shortleaf pine - oak forest alliance is found in the Southern Blue Ridge and adjacent regions, including the Piedmont, Ridge and Valley, Central Appalachians and the Interior Low Plateau from Alabama and Georgia north and east to Kentucky, Virginia, the Carolinas, and possibly West Virginia. Stands of this alliance are typically dominated by *Pinus echinata* with dry-site oaks and other hardwoods. The typical oaks include *Quercus coccinea*, *Quercus montana*, *Quercus stellata*, and/or *Quercus velutina*. Some stands may contain *Quercus falcata*. Other hardwoods may include *Acer rubrum*, *Carya glabra*, *Carya pallida*, *Cornus florida*, *Ilex opaca* var. *opaca*, *Nyssa sylvatica*, and/or *Oxydendrum arboreum*. The shrub layer is typically dominated by *Vaccinium pallidum*. Other shrubs include *Castanea pumila*, *Gaylussacia baccata*, *Gaylussacia ursina*, *Kalmia latifolia*, *Rhododendron calendulaceum*, *Rhododendron minus*, *Vaccinium arboreum*, and *Vaccinium stamineum*. The most frequent native grasses are *Danthonia spicata*, *Piptochaetium avenaceum*, and *Schizachyrium scoparium*. Typical forbs include *Antennaria plantaginifolia*, *Coreopsis major*, *Helianthus microcephalus*, *Pityopsis graminifolia* var. *latifolia*, *Symphyotrichum concolor*, and *Symphyotrichum patens*. These forests typically occur on exposed, rocky ridges and upper, convex slopes, as well as more protected sites. Species composition varies with bedrock geology, aspect, and degree of exposure.

**Classification Comments:** In the Chattooga Basin, quantitative analysis showed the local manifestation of this alliance concept to apply to a large percentage of the vegetation sampled in this tri-state watershed (S. Simon pers. comm.). It accommodates shortleaf pine - dry-site oak forests of the greater Southern Appalachian region (including the southern Ridge and Valley and Cumberland Plateau).

### Similar Alliances:

- *Pinus echinata* - *Quercus falcata* Upper Coastal Plain Woodland Alliance (A3270)
- *Pinus echinata* - *Quercus stellata* - *Quercus marilandica* Piedmont Woodland Alliance (A3268)
- *Pinus echinata* - *Quercus stellata* - *Quercus velutina* Ozark-Ouachita Woodland Alliance (A3271)

**Similar Alliance Comments:** These similar alliances represent floristically related vegetation in other regions of the southeastern United States.

**Diagnostic Characteristics:** Stands are dominated by *Pinus echinata*, possibly with *Pinus pungens* and/or *Pinus rigida*. One hardwood with some diagnostic value is *Quercus montana*.

### Related Concepts:

- IA6a. Dry Shortleaf Pine - Oak - Hickory Forest (Allard 1990) ><
- Shortleaf Pine - Oak: 76 (Eyre 1980) ><

### ALLIANCE DESCRIPTION

**Environment:** Stands are found at relatively lower elevations where *Pinus echinata* codominates in association with *Quercus* species and other Appalachian flora. This vegetation occurs on exposed, rocky ridges and upper, convex slopes, at elevations at or below 670 m (2200 feet), as well as on ridges and upper slopes, typically with southern to western exposures.

**Vegetation:** Examples of this alliance have canopies which are codominated by *Pinus echinata* and combinations of dry-site oaks that may include *Quercus coccinea*, *Quercus montana* (= *Quercus prinus*), *Quercus stellata*, and/or *Quercus velutina*. Some stands may contain *Quercus falcata*. In addition, *Pinus pungens* and/or *Pinus rigida* may be present. Mid-canopy trees can be scattered or form a well-developed subcanopy. Common subcanopy trees can include *Acer rubrum*, *Carya glabra*, *Carya pallida*, *Cornus florida*, *Ilex opaca* var. *opaca*, *Nyssa sylvatica*, and/or *Oxydendrum arboreum*. The shrub stratum varies in composition and density but is typically dominated by *Vaccinium pallidum*. Other shrubs include *Castanea pumila*, *Gaylussacia baccata*, *Gaylussacia ursina*, *Kalmia latifolia*, *Rhododendron calendulaceum*, *Rhododendron minus*, *Vaccinium stamineum*, and *Vaccinium arboreum*. *Smilax glauca* and *Vitis rotundifolia* are common vines. The most frequent native grasses are *Danthonia spicata*, *Dichanthelium dichotomum*, *Piptochaetium avenaceum*, and *Schizachyrium scoparium*. Typical forbs include *Antennaria plantaginifolia*, *Coreopsis major*, *Goodyera pubescens*, *Helianthus microcephalus*, *Pityopsis graminifolia* var. *latifolia*, *Silphium compositum*, *Symphyotrichum concolor*, and *Symphyotrichum patens*.

**Physiognomy and Structure:** Stands range from relatively open woodland physiognomy to more closed forest-like conditions. On rocky sites, canopies may be slightly stunted.

**Floristics:** Examples of this alliance have canopies which are codominated by *Pinus echinata* and combinations of dry-site oaks that may include *Quercus coccinea*, *Quercus montana* (= *Quercus prinus*), *Quercus stellata*, and/or *Quercus velutina*. Some stands may

contain *Quercus falcata*. In addition, *Pinus pungens* and/or *Pinus rigida* may be present. Mid-canopy trees can be scattered or form a well-developed subcanopy. Common subcanopy trees can include *Acer rubrum*, *Carya glabra*, *Carya pallida*, *Cornus florida*, *Ilex opaca* var. *opaca*, *Nyssa sylvatica*, and/or *Oxydendrum arboreum*. The shrub stratum varies in composition and density but is typically dominated by *Vaccinium pallidum*. Other shrubs include *Castanea pumila*, *Gaylussacia baccata*, *Gaylussacia ursina*, *Kalmia latifolia*, *Rhododendron calendulaceum*, *Rhododendron minus*, *Vaccinium stamineum*, and *Vaccinium arboreum*. *Smilax glauca* and *Vitis rotundifolia* are common vines. The most frequent native grasses are *Danthonia spicata*, *Dichanthelium dichotomum*, *Piptochaetium avenaceum*, and *Schizachyrium scoparium*. Typical forbs include *Antennaria plantaginifolia*, *Coreopsis major*, *Goodyera pubescens*, *Helianthus microcephalus*, *Pityopsis graminifolia* var. *latifolia*, *Silphium compositum*, *Symphotrichum concolor*, and *Symphotrichum patens*.

**Dynamics:** This vegetation is presumably at least somewhat fire-dependent, and fire (prescribed or natural) will stimulate regeneration of *Pinus echinata*. Many occurrences of this community are highly disturbed and contain exotic species such as *Dioscorea oppositifolia*, *Ligustrum japonicum*, and *Lonicera japonica*. In many occurrences, stands of *Pinus echinata* have been attacked by the southern pine bark beetle (*Dendroctonus frontalis*), which will eventually kill the trees. Fire-maintained woodlands dominated by *Pinus echinata* occurred historically in the Appalachian regions of Alabama, north through Georgia, Tennessee, Kentucky, and possibly Virginia, on dry ridges and slopes or rock outcrops. Almost no intact examples are known to persist, although restoration efforts are underway in the Daniel Boone National Forest, Kentucky, the Chattahoochee National Forest, Georgia, and in Great Smoky Mountains National Park, Tennessee.

#### ALLIANCE DISTRIBUTION

**Range:** Vegetation of this alliance is found in the Southern Blue Ridge and adjacent regions, including the Piedmont, Ridge and Valley, Central Appalachians and the Interior Low Plateau from Alabama and Georgia north and east to Kentucky, Virginia, the Carolinas, and possibly West Virginia.

**Nations:** US

**Subnations:** AL, GA, IN, KY, NC, OH, SC, TN, VA, WV

**TNC Ecoregions:** 44:C, 50:C, 51:C, 52:C, 59:C

**Federal Lands:** USFS (Sumter, Sumter (Mountains))

#### ALLIANCE SOURCES

**References:** Allard 1990, Evans et al. 2009, Eyre 1980, Faber-Langendoen et al. 2019b, Schafale and Weakley 1990, Simon pers. comm.

**Author of Concept:** Faber-Langendoen et al. 2019b

**Author of Description:** M. Pyne, in Faber-Langendoen et al. (2013)

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### [CEGL007493] *Pinus echinata* - *Quercus (montana, falcata)* / *Oxydendrum arboreum* / *Vaccinium pallidum* Forest

Translated Name: Shortleaf Pine - (Chestnut Oak, Southern Red Oak) / Sourwood / Blue Ridge Blueberry Forest

Common Name: Southern Blue Ridge Escarpment Shortleaf Pine - Oak Forest

#### USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Southern & South-Central Oak - Pine Forest & Woodland (M016)
Group	Shortleaf Pine - Oak Forest & Woodland (G012)
Alliance	<i>Pinus echinata</i> - <i>Pinus pungens</i> - <i>Quercus montana</i> Appalachian Woodland Alliance (A3269)

#### ELEMENT CONCEPT

**Global Summary:** This association includes crests of low-elevation slopes and ridges on the fringes of the Southern Blue Ridge, extending into the southern Ridge and Valley and Cumberland Plateau, where *Pinus echinata* and dry-site oaks characteristic of lower elevations codominate in association with other Appalachian flora. This forest is known from the southern Blue Ridge Escarpment of North Carolina, South Carolina, and Georgia, particularly in the Blue Ridge/Piedmont transition, where it occurs on exposed, rocky ridges and upper, convex slopes, at elevations at or below 670 m (2200 feet). It also extends into the southern Ridge and Valley and Cumberland Plateau, but more information is needed to characterize the variation in that part of the range. This community may occur in slightly more protected situations in the hotter Piedmont ecoregion. Canopies are codominated by *Pinus echinata* and combinations of dry-site oaks that may include *Quercus falcata*, *Quercus coccinea*, *Quercus montana*, *Quercus stellata*, and *Quercus velutina*. On rocky sites, canopies may be slightly stunted. Mid-canopy trees can be scattered or form a well-developed subcanopy. Common subcanopy trees can include *Oxydendrum arboreum*, *Ilex opaca* var. *opaca*, *Cornus florida*, *Quercus marilandica*, *Quercus stellata*, and *Carya pallida*. The shrub stratum varies in composition and density but is typically dominated by *Vaccinium pallidum*. Other shrubs may include *Vaccinium stamineum*, *Gaylussacia ursina*, *Gaylussacia baccata*, *Rhododendron calendulaceum*, *Rhododendron minus*, *Castanea pumila*, and *Kalmia latifolia*. On some sites *Symplocos tinctoria* can be important. *Vitis rotundifolia* and *Smilax glauca* are common vines. The herb stratum is poorly developed with scattered species such as *Chimaphila maculata*, *Iris verna*, *Pteridium aquilinum* var. *latiusculum*, *Goodyera pubescens*, *Hexastylis arifolia*, *Coreopsis major*, *Tipularia discolor*, *Schizachyrium scoparium*, *Pityopsis graminifolia* var. *latifolia*, *Tephrosia virginiana*, *Silphium compositum*, *Dichanthelium* spp., and *Galax urceolata*.

### ENVIRONMENTAL DESCRIPTION

**Global Environment:** This association includes crests of low-elevation slopes and ridges on the fringes of the Southern Blue Ridge, extending into the southern Ridge and Valley and Cumberland Plateau, where *Pinus echinata* and dry-site oaks characteristic of lower elevations codominate in association with other Appalachian flora. This forest is known from the southern Blue Ridge Escarpment region of North Carolina, South Carolina, and Georgia, particularly in the Blue Ridge/Piedmont transition, where it occurs on exposed, rocky ridges and upper, convex slopes, at elevations at or below 670 m (2200 feet). It also extends into the southern Ridge and Valley and Cumberland Plateau, but more information is needed to characterize the variation in that part of the range.

### VEGETATION DESCRIPTION

**Global Vegetation:** Canopies are codominated by *Pinus echinata* and combinations of dry-site oaks that may include *Quercus falcata*, *Quercus coccinea*, *Quercus montana* (= *Quercus prinus*), *Quercus stellata*, and *Quercus velutina*. On rocky sites, canopies may be slightly stunted. Mid-canopy trees can be scattered or form a well-developed subcanopy. Common subcanopy trees can include *Oxydendrum arboreum*, *Ilex opaca* var. *opaca*, *Cornus florida*, *Quercus marilandica*, *Quercus stellata*, and *Carya pallida*. The shrub stratum varies in composition and density but is typically dominated by *Vaccinium pallidum*. Other shrubs may include *Vaccinium stamineum*, *Gaylussacia ursina*, *Gaylussacia baccata*, *Rhododendron calendulaceum*, *Rhododendron minus*, *Castanea pumila*, and *Kalmia latifolia*. On some sites *Symplocos tinctoria* can be important. *Vitis rotundifolia* and *Smilax glauca* are common vines. The herb stratum is poorly developed with scattered species such as *Chimaphila maculata*, *Iris verna*, *Pteridium aquilinum* var. *latiusculum*, *Goodyera pubescens*, *Hexastylis arifolia*, *Coreopsis major* (= var. *rigida*), *Tipularia discolor*, *Schizachyrium scoparium*, *Pityopsis graminifolia* var. *latifolia*, *Tephrosia virginiana*, *Silphium compositum*, *Dichantheium* spp., and *Galax urceolata*.

### MOST ABUNDANT SPECIES

#### Global

#### Stratum

	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Pinus echinata</i>
Tree canopy	Broad-leaved deciduous tree	<i>Quercus falcata</i> , <i>Quercus montana</i>
Tree subcanopy	Broad-leaved deciduous tree	<i>Oxydendrum arboreum</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Vaccinium pallidum</i>

### CHARACTERISTIC SPECIES

**Global:** *Oxydendrum arboreum*, *Pinus echinata*, *Quercus falcata*, *Quercus montana*, *Vaccinium pallidum*

### OTHER NOTEWORTHY SPECIES

**Global: Vulnerable Plants:** *Gaylussacia brachycera* (G3)

### CONSERVATION STATUS RANK

**Global Rank & Reasons:** G3G4 (12-Jan-2000). This community occurs within a restricted geographic range and is uncommon within this range. Because this community is poorly known and essentially uninventoried throughout its range, there remain questions regarding its taxonomic distinctiveness and geographic extent. Further inventory and more detailed field information may expand the current range and concept of this type.

### RELATED CONCEPTS

#### Global Similar Types:

- *Pinus echinata* - *Quercus alba* - *Quercus stellata* / *Vaccinium pallidum* Woodland (CEGL007096)
- *Pinus echinata* - *Quercus alba* / *Vaccinium pallidum* / *Hexastylis arifolia* - *Chimaphila maculata* Forest (CEGL008427)
- *Pinus echinata* - *Quercus montana* / *Rhododendron minus* / *Vaccinium pallidum* Forest (CEGL007496)
- *Pinus echinata* - *Quercus stellata* - *Quercus marilandica* / *Vaccinium pallidum* Woodland (CEGL003765)
- *Pinus echinata* - *Quercus stellata* - *Quercus montana* / *Danthonia spicata* Forest (CEGL007500) a more open, grassy variant.

#### Global Related Concepts:

- IA7a. Xeric Shortleaf Pine - Oak Forest (Allard 1990) >

### CLASSIFICATION

**Status:** Standard

**Classification Confidence:** 2 - Moderate

**Global Classification Comments:** These communities are distinguished by canopies codominated by *Pinus echinata* and combinations of dry-site oaks that may include *Quercus falcata*, *Quercus coccinea*, *Quercus montana*, *Quercus stellata*, and *Quercus velutina*. These communities are not well known. In North Carolina they are apparently largely confined to Cherokee County. Examples are also known from the southern portion of the Chattooga River Basin watershed in South Carolina and Georgia. This forest is probably fire-dependent to some extent, and fire (prescribed or natural) will stimulate regeneration of *Pinus echinata*. Many occurrences of this community are highly disturbed and contain exotic species such as *Ligustrum japonicum*, *Dioscorea oppositifolia*, and *Lonicera japonica*. *Pinus echinata*, in many occurrences, has been attacked by the Southern Pine Bark Beetle, which will eventually kill the trees. The concepts of the former associations *Pinus echinata* - *Quercus falcata* / *Vaccinium pallidum* Forest (CEGL007494) and *Pinus echinata* - *Quercus montana* / *Oxydendrum arboreum* / *Vaccinium pallidum* Forest (CEGL007495) were merged into this association and should be considered variants of this community. *Pinus echinata* - *Quercus alba* / *Vaccinium*

*pallidum* / *Hexastylis arifolia* - *Chimaphila maculata* Forest (CEGL008427) includes shortleaf pine - mesic oak forests of the non-coastal plain, non-Ozark/Ouachita portion of the *Pinus echinata* range, with an overall more mesophytic species composition than the association described here.

#### ELEMENT DISTRIBUTION

**Global Range:** This association occurs in the southern fringes of the Southern Blue Ridge, extending into the southern Ridge and Valley and Cumberland Plateau. It could possibly range into the upper Piedmont.

**Nations:** US

**States/Provinces:** AL:S2, GA, KY, NC, SC, TN

**TNC Ecoregions:** 50:C, 51:C, 52:?

**USFS Ecoregions (1994/95):** 221Hc:CCC, 231Ae:CCP, 231Ag:CCC, 231Cc:CCC, 231Dc:CCC, M221Cd:CCC, M221Dc:CCC, M221Dd:CCC

**USFS Ecoregions (2007):** 221Hc:CCC, 231Ag:CCC, 231Cc:CCC, 231Dc:CCC, 231Ic:CPP, M221Cd:CCC, M221Dc:CCC, M221Dd:CCC

**Federal Lands:** BIA (Eastern Band of Cherokee); NPS (Big South Fork, Blue Ridge Parkway?, Chickamauga-Chattanooga, Great Smoky Mountains, Kings Mountain, Little River Canyon); USFS (Chattahoochee, Chattahoochee (Piedmont)?, Chattahoochee (Southern Blue Ridge), Cherokee?, Daniel Boone, Nantahala, Sumter, Sumter (Mountains))

#### ELEMENT SOURCES

**Global Description Author(s):** K.D. Patterson

**References:** ALNHP unpubl. data 2018, Allard 1990, Evans et al. 2009, NatureServe Ecology - Southeastern U.S. unpubl. data, Nelson 1986, Peet et al. unpubl. data, Schafale 2012, Schotz et al. 2008, Southeastern Ecology Working Group n.d., White and Govus 2005

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### [CEGL008427] *Pinus echinata* - *Quercus alba* / *Vaccinium pallidum* / *Hexastylis arifolia* - *Chimaphila maculata* Forest

Translated Name: **Shortleaf Pine - White Oak / Blue Ridge Blueberry / Arrowleaf Heartleaf - Striped Prince's-pine Forest**

Common Name: **Appalachian Shortleaf Pine - Mesic Oak Forest**

#### USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Southern & South-Central Oak - Pine Forest & Woodland (M016)
Group	Shortleaf Pine - Oak Forest & Woodland (G012)
Alliance	<i>Pinus echinata</i> - <i>Pinus pungens</i> - <i>Quercus montana</i> Appalachian Woodland Alliance (A3269)

#### ELEMENT CONCEPT

**Global Summary:** This association includes forests dominated by a mixture of *Pinus echinata* and mesophytic and dry-mesophytic oaks (e.g., *Quercus alba*, *Quercus rubra*, *Quercus velutina*) occurring in the Southern Ridge and Valley, Cumberland Plateau, low-elevation Southern Blue Ridge, and upper Piedmont of the southeastern United States. These forests occur on low to middle slope positions, on protected to intermediately exposed sites. The mixed evergreen - deciduous canopy is dominated by *Pinus echinata* and *Quercus alba*, sometimes with high coverage of other *Quercus* spp. (*Quercus velutina*, *Quercus coccinea*, *Quercus falcata*, *Quercus rubra*). Xerophytic *Quercus* spp. such as *Quercus montana*, *Quercus stellata*, as well as other species of pines, may be present but are typically not abundant. A well-developed subcanopy is typical, with species such as *Acer rubrum*, *Nyssa sylvatica*, *Carya glabra*, *Cornus florida*, and *Oxydendrum arboreum*. The shrub stratum is sparse to patchy with low shrubs (*Vaccinium pallidum*, *Vaccinium stamineum*, *Vaccinium arboreum*, *Chimaphila maculata*) and vines (*Vitis rotundifolia*). The herb stratum is patchy to absent. *Hexastylis arifolia* is a typical herb. Stands without fire management may experience invasion by *Acer rubrum*. *Piptochaetium avenaceum* may be an important grass in more open stands.

#### ENVIRONMENTAL DESCRIPTION

**Global Environment:** These forests occur on low to middle slope positions, on protected to intermediately exposed sites.

#### VEGETATION DESCRIPTION

**Global Vegetation:** The mixed evergreen - deciduous canopy of stands is dominated by *Pinus echinata* and *Quercus alba*, sometimes with high coverage by other *Quercus* spp. (*Quercus velutina*, *Quercus coccinea*, *Quercus falcata*, *Quercus rubra*). Xerophytic *Quercus* spp. such as *Quercus montana* (= *Quercus prinus*) and *Quercus stellata*, as well as other species of pines, may be present but are typically not abundant. A well-developed subcanopy is typical, with species such as *Acer rubrum*, *Nyssa sylvatica*, *Carya glabra*, *Cornus florida*, and *Oxydendrum arboreum*. The shrub stratum is sparse to patchy with low shrubs (*Vaccinium pallidum*, *Vaccinium stamineum*, *Vaccinium arboreum*, *Chimaphila maculata*) and vines (*Vitis rotundifolia*). The herb stratum is patchy to absent. *Hexastylis arifolia* is a typical herb. Stands without fire management may experience invasion by *Acer rubrum*. In more open stands, *Piptochaetium avenaceum* may be an important grass. A dense forest from the Talladega National Forest, Talladega Ranger District, included here, is dominated by *Quercus coccinea* and *Pinus echinata*; other canopy components include *Quercus velutina*, *Quercus alba*, *Quercus falcata*, *Liriodendron tulipifera*, *Pinus taeda*, *Carya glabra*, and *Liquidambar styraciflua*. The patchy shrub layer

includes *Vaccinium arboreum*, *Vaccinium pallidum*, *Viburnum acerifolium*, and *Acer rubrum*. The sparse herbaceous layer is characterized by *Piptochaetium avenaceum*, which may be an important grass in more open stands.

**Global Dynamics:** Stands without fire management may experience invasion by *Acer rubrum*. *Piptochaetium avenaceum* may be an important grass in more open stands.

#### MOST ABUNDANT SPECIES

##### Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Pinus echinata</i>
Tree canopy	Broad-leaved deciduous tree	<i>Quercus alba</i> , <i>Quercus coccinea</i> , <i>Quercus falcata</i>
Short shrub/sapling	Shrub	<i>Vaccinium</i> spp.

#### CHARACTERISTIC SPECIES

**Global:** *Pinus echinata*, *Quercus falcata*, *Quercus stellata*, *Vaccinium* spp.

#### OTHER NOTEWORTHY SPECIES

**Global: Vulnerable Plants:** *Gaylussacia brachycera* (G3); **Other Plants:** *Vaccinium hirsutum* (G4)

#### CONSERVATION STATUS RANK

**Global Rank & Reasons:** G3G4 (23-Oct-2002). Although this association has a reasonably wide potential natural range, *Pinus echinata* populations seem to have undergone rangewide declines in vigor and extent. This phenomenon is especially pronounced in the range of this type, primarily due to changes in fire regime and to depredations of the southern pine beetle (*Dendroctonus frontalis*). This community has had little inventory, but the total acreage in viable condition is believed to be quite limited. The more mesic to submesic habitat of this association may never have been common and is likely more vulnerable to successional changes than more xeric stands. Further, stands of this association are threatened by removal of commercially valuable tree species (e.g., *Quercus alba*, *Quercus rubra*, *Pinus echinata*), as well as by conversion to commercial forest plantations, and by the effects of continued fire suppression, which inhibits the reproduction of *Pinus echinata* and causes the grass-dominated herbaceous layer to deteriorate. Following the removal of the commercially valuable species, and in the absence of fire, stands could become populated with successional hardwoods (e.g., *Liriodendron tulipifera*, *Liquidambar styraciflua*) as well as less fire-adapted pines (*Pinus taeda*, *Pinus virginiana*). The range in the rank reflects the need for further inventory and evaluation of this community.

#### RELATED CONCEPTS

##### Global Similar Types:

- *Pinus echinata* - *Quercus (montana, falcata)* / *Oxydendrum arboreum* / *Vaccinium pallidum* Forest (CEGL007493) is codominated by drier-site oaks and generally has a higher coverage of ericads in the shrub layer.
- *Pinus echinata* - *Quercus alba* - *Quercus stellata* / *Vaccinium pallidum* Woodland (CEGL007096)
- *Pinus echinata* - *Quercus alba* / *Viburnum (dentatum, acerifolium)* Forest (CEGL003855)
- *Pinus echinata* - *Quercus stellata* - *Quercus montana* / *Danthonia spicata* Forest (CEGL007500) is a drier, more open, grassy variant (when fire-managed).
- *Quercus alba* - *Quercus falcata* / *Vaccinium (arboreum, hirsutum, pallidum)* Forest (CEGL008567) is a related, primarily deciduous type of the Ridge and Valley and parts of the Southern Blue Ridge adjacent to the Ridge and Valley.
- *Quercus falcata* - *Quercus alba* - *Carya tomentosa* / *Oxydendrum arboreum* / *Vaccinium stamineum* Forest (CEGL007244) is a related, primarily deciduous type with representation in the Piedmont and Ridge and Valley but not in the Blue Ridge.

#### CLASSIFICATION

**Status:** Standard

**Classification Confidence:** 3 - Weak

**Global Classification Comments:** This forest has an overall more mesophytic species composition and occurs on deeper soil or on more protected sites than the more extreme shortleaf pine - oak forest, *Pinus echinata* - *Quercus (montana, falcata)* / *Oxydendrum arboreum* / *Vaccinium pallidum* Forest (CEGL007493). In the Daniel Boone National Forest (Kentucky) this vegetation is important as part of a pine-oak matrix which is significant for restoration of red-cockaded woodpecker (*Picoides borealis*) habitat.

*Piptochaetium avenaceum* may be an important grass in more open stands. Some plots attributed to this type have more *Quercus alba* than *Pinus echinata*. Subdivision of this broad type may be warranted as more data become available.

#### ELEMENT DISTRIBUTION

**Global Range:** This community occurs in the Southern Ridge and Valley, Cumberland Plateau, low-elevation Southern Blue Ridge, and upper Piedmont of the southeastern United States.

**Nations:** US

**States/Provinces:** AL, GA, KY, NC, SC, TN

**TNC Ecoregions:** 50:C, 51:C, 52:C

**USFS Ecoregions (1994/95):** 221Hc:CCC, 221He:CCC, 221J:CP, 222E:PP, 231Ab:CCC, 231Cc:CCC, 231Db:CCC, 231Dc:CCC, M221C:CP, M221Dc:CCC, M221Dd:CCC

**USFS Ecoregions (2007):** 221He:CCC, 221He:CC?, 221J:CP, 223E:PP, 231Ab:CCC, 231Cc:CCC, 231Db:CCC, 231Dc:CCC, M221C:CP, M221Dc:CCC, M221Dd:CCC

**Federal Lands:** BIA (Eastern Band of Cherokee); NPS (Big South Fork, Blue Ridge Parkway?, Carl Sandburg Home, Great Smoky Mountains, Kennesaw Mountain?, Kings Mountain, Little River Canyon, Obed River); USFS (Chattahoochee, Chattahoochee (Piedmont), Chattahoochee (Southern Blue Ridge), Cherokee, Daniel Boone, Oconee?, Sumter, Sumter (Mountains), Talladega, Talladega (Talladega))

#### ELEMENT SOURCES

**Global Description Author(s):** K.D. Patterson, A.S. Weakley, R. White

**References:** NatureServe Ecology - Southeastern U.S. unpubl. data, Nelson 1986, Schotz et al. 2008, Southeastern Ecology Working Group n.d., White 2003, White and Govus 2005

### [CEGL003560] *Pinus echinata* / *Schizachyrium scoparium* Appalachian Woodland

Translated Name: **Shortleaf Pine / Little Bluestem Appalachian Woodland**

Common Name: **Appalachian Shortleaf Pine / Little Bluestem Woodland**

#### USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Southern & South-Central Oak - Pine Forest & Woodland (M016)
Group	Shortleaf Pine - Oak Forest & Woodland (G012)
Alliance	<i>Pinus echinata</i> - <i>Pinus pungens</i> - <i>Quercus montana</i> Appalachian Woodland Alliance (A3269)

#### ELEMENT CONCEPT

**Global Summary:** These fire-maintained, shortleaf pine woodlands occurred historically in the Appalachian regions of Alabama, north through Georgia, Tennessee, and Kentucky on dry ridges and slopes or rock outcrops. Almost no intact examples are known to persist, although restoration efforts are underway in the Daniel Boone National Forest, Kentucky, the Chattahoochee National Forest, Georgia, and in Great Smoky Mountains National Park, Tennessee. Stands of these woodlands are dominated by *Pinus echinata*, with less than 25% cover by *Quercus* spp. They may contain an admixture of *Pinus virginiana* or *Pinus rigida*. The canopy can range from an open forest to woodland structure. The understory is open and dominated by graminoids and forbs. This community historically provided habitat for montane populations of red-cockaded woodpecker (*Picoides borealis*). More information is needed to characterize and distinguish this community.

#### ENVIRONMENTAL DESCRIPTION

**Global Environment:** One stand attributed to this type from the Cherokee National Forest in Monroe County, Tennessee, is a frequently burned woodland occurring on a steep slope underlain by phyllite (NatureServe Ecology unpubl. data).

#### VEGETATION DESCRIPTION

**Global Vegetation:** An example of this community undergoing restoration in the western edge of the Blue Ridge, in Fannin County, Georgia, has a canopy dominated by *Pinus echinata*, but with significant coverage by *Quercus coccinea* and *Quercus alba*. Other woody species in the canopy and subcanopy include *Pinus taeda*, *Pinus strobus*, *Nyssa sylvatica*, *Acer rubrum*, *Quercus montana* (= *Quercus prinus*), and *Oxydendrum arboreum*. The shrub stratum is open, but patchy, dominated by ericaceous shrubs such as *Vaccinium pallidum*, *Vaccinium stamineum*, *Vaccinium hirsutum*, *Vaccinium arboreum*, *Rhododendron alabamense*, *Kalmia latifolia*, and *Lyonia ligustrina*. Other shrubs and vines include *Smilax glauca*, *Hypericum hypericoides* ssp. *multicaule*, and *Diospyros virginiana*. The herbaceous stratum is closed, but has variable local dominance. Visual dominants at this site were *Schizachyrium scoparium*, *Pityopsis graminifolia*, *Pteridium aquilinum*, *Baptisia tinctoria*, and *Epigaea repens*. Other herbaceous species are *Iris cristata*, *Coreopsis major*, *Solidago odora*, *Dichanthelium commutatum*, *Antennaria plantaginifolia*, *Galax urceolata*, *Symphotrichum dumosum* (= *Aster dumosus*), *Tephrosia virginiana*, and *Ageratina aromatica*. A sample from the upper Piedmont of Georgia (Chattahoochee National Forest) which is placed here is dominated by *Pinus echinata* in the canopy. The subcanopy includes *Juniperus virginiana* var. *virginiana*, *Quercus marilandica*, *Quercus stellata*, *Nyssa sylvatica*, and *Liquidambar styraciflua*. Shrubs are *Vaccinium arboreum*, *Chionanthus virginicus*, *Smilax glauca*, and *Crataegus uniflora*. Herbs include *Danthonia sericea*, *Coreopsis major*, *Schizachyrium scoparium*, *Andropogon gyrans*, and *Liatris microcephala*. This example is adjacent to a "glade." An additional sample from the Cherokee National Forest in Monroe County, Tennessee, is a frequently burned woodland occurring on a steep slope underlain by phyllite. The canopy is dominated by *Pinus echinata* (10-25% cover). Other canopy components include *Pinus rigida*, *Pinus virginiana*, and *Quercus alba*. The open subcanopy is characterized by *Quercus marilandica*, *Quercus alba*, and *Quercus stellata*. The open shrub layer includes *Calycanthus floridus* and *Ceanothus americanus*. Some of the more prominent members of the dense and diverse herbaceous layer include *Schizachyrium scoparium*, *Sorghastrum nutans*, *Pityopsis graminifolia*, *Tephrosia virginiana*, *Liatris scariosa*, *Antennaria plantaginifolia*, *Symphotrichum undulatum* (= *Aster undulatus*), *Helianthus divaricatus*, and *Galactia volubilis*.

**Global Dynamics:** Nearby stands on similar topographic positions often have a very different composition and lack the open woodland character. In Georgia, these adjacent stands are often densely dominated by *Pinus virginiana*. Young *Pinus strobus* seedlings are becoming established underneath the canopy and are anticipated to move into the gaps caused by the dying and declining

canopy species. The dense shaded environment of these stands suppresses fine fuels provided by herbaceous species and are consequently difficult to burn.

#### MOST ABUNDANT SPECIES

##### Global

##### Stratum

Tree canopy

Herb (field)

##### Lifeform

Needle-leaved tree

Graminoid

##### Species

*Pinus echinata*

*Schizachyrium scoparium*

#### CHARACTERISTIC SPECIES

**Global:** *Pinus echinata*, *Schizachyrium scoparium*

#### OTHER NOTEWORTHY SPECIES

**Global: Other Plants:** *Vaccinium hirsutum* (G4)

#### CONSERVATION STATUS RANK

**Global Rank & Reasons:** G2 (23-Oct-2002). This community is naturally rare in the Appalachians, where shortleaf pine communities are uncommon. It is a fire-maintained community, and most remaining acreage is fire-suppressed with little compositional similarity to historic vegetation. Shortleaf pine (*Pinus echinata*) populations seem to have undergone rangewide declines in vigor and extent. This phenomenon is primarily due to changes in fire regime and to depredations of the Southern Pine Beetle (*Dendroctonus frontalis*). Stands are threatened by the effects of continued fire suppression, which would inhibit the reproduction of *Pinus echinata*.

#### RELATED CONCEPTS

##### Global Similar Types:

- *Pinus echinata* - *Quercus montana* - *Quercus stellata* / *Vaccinium pallidum* / *Pityopsis graminifolia* var. *latifolia* Woodland (CEGL004445) a mixed woodland.
- *Pinus echinata* - *Quercus stellata* - *Quercus marilandica* / *Vaccinium pallidum* Woodland (CEGL003765) a related mixed woodland.

#### CLASSIFICATION

**Status:** Standard

**Classification Confidence:** 3 - Weak

**Global Classification Comments:** This community occurs outside the range of *Pinus palustris*. In Great Smoky Mountains National Park, this community is being restored through the reintroduction of fire (B. Dellinger pers. comm.). There are no true remnants of this community left in Kentucky; all have *Quercus* spp. understory and shrubs and belong in a *Pinus echinata* - *Quercus* spp. woodland alliance (J. Campbell pers. comm.). On the very western edge of the Blue Ridge province in northern Georgia (the Cohutta Foothills), this community is being restored with the reintroduction of fire (K. Wooster pers. comm.). The current presence of related vegetation in the Cumberlands and/or the Interior Low Plateau of Kentucky and Tennessee is more speculative; in those regions, this type was probably more common historically than it is at present.

#### ELEMENT DISTRIBUTION

**Great Smoky Mountains National Park Range:** This association is unlikely on the Mount Le Conte or Cades Cove quadrangles. However, forests dominated by *Pinus echinata* occur within the park boundary, and efforts are being made to restore this association through reintroduction of fire to the landscape.

**Global Range:** This association occurred historically in the Appalachian regions of Alabama, north through Georgia, Tennessee, and Kentucky. Restoration efforts are underway in Georgia, Tennessee, and Kentucky.

**Nations:** US

**States/Provinces:** AL?, GA, KY, NC, TN

**TNC Ecoregions:** 44:C, 50:C, 51:C, 52:C

**USFS Ecoregions (1994/95):** 221:C, 222Ab:C??, 222Af:C??, 222E:CC, 231Ad:CCC, M221Dc:CCC, M221Dd:CCC

**USFS Ecoregions (2007):** 221:C, 223Ab:C??, 223Af:C??, 223E:CC, 231Ad:CCC, M221Dc:CCC, M221Dd:CCC

**Federal Lands:** NPS (Great Smoky Mountains); USFS (Chattahoochee, Chattahoochee (Piedmont), Chattahoochee (Southern Blue Ridge), Cherokee, Nantahala, Talladega (Talladega)?)

#### ELEMENT SOURCES

**Great Smoky Mountains National Park Description Author(s):** K.D. Patterson

**Global Description Author(s):** Southeastern Ecology Group

**References:** Campbell pers. comm., Dellinger pers. comm., Evans et al. 2009, GNHP unpubl. data 2018, NatureServe Ecology - Southeastern U.S. unpubl. data, Peet et al. unpubl. data, Southeastern Ecology Working Group n.d., TDNH unpubl. data 2018, Wooster pers. comm.

**[CEGL007078] *Pinus echinata* / *Vaccinium (pallidum, stamineum)* - *Kalmia latifolia* Forest**Translated Name: **Shortleaf Pine / (Blue Ridge Blueberry, Deerberry) - Mountain Laurel Forest**Common Name: **Appalachian Shortleaf Pine Forest****USNVC CLASSIFICATION**

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Southern & South-Central Oak - Pine Forest & Woodland (M016)
Group	Shortleaf Pine - Oak Forest & Woodland (G012)
Alliance	<i>Pinus echinata</i> - <i>Pinus pungens</i> - <i>Quercus montana</i> Appalachian Woodland Alliance (A3269)

**ELEMENT CONCEPT**

**Global Summary:** These forests occur in the lower elevations (below 730 m [2400 feet]) of the southern Appalachian Mountains on ridges and upper slopes, typically with southern to western exposures. This association includes forest vegetation with greater than 75% of the canopy cover of *Pinus echinata*, occurring over a shrub stratum dominated by ericaceous species, typically *Vaccinium pallidum*, *Vaccinium stamineum*, and *Kalmia latifolia*. Deciduous species make-up less than 25% of the canopy coverage and may include *Quercus falcata*, *Quercus coccinea*, or, in the southern part of this association's range, *Quercus stellata* and *Quercus marilandica*. This community often has a midstory tree stratum with *Oxydendrum arboreum*, *Carya pallida*, *Cornus florida*, or *Diospyros virginiana*. Other characteristic species include *Smilax glauca*, *Silphium compositum*, *Pteridium aquilinum* var. *latiusculum*, *Scleria oligantha*, *Piptochaetium avenaceum*, and *Tephrosia virginiana*.

**ENVIRONMENTAL DESCRIPTION**

**Great Smoky Mountains National Park Environment:** If this community exists within the park boundary, it exists below 2400 feet elevation.

**Global Environment:** These forests occur in the lower elevations (below 730 m [2400 feet]) of the southern Appalachian Mountains on ridges and upper slopes, typically with southern to western exposures, possibly ranging into the adjacent Piedmont.

**VEGETATION DESCRIPTION**

**Great Smoky Mountains National Park Vegetation:** Same as global description.

**Global Vegetation:** The closed canopy is dominated by *Pinus echinata*. Deciduous species make up less than 25% of the canopy coverage and may include *Quercus falcata*, *Quercus coccinea*, or, in the southern part of this association's range, *Quercus stellata* and *Quercus marilandica*. This community often has a midstory tree stratum with *Oxydendrum arboreum*, *Carya pallida*, *Cornus florida*, or *Diospyros virginiana*. The shrub stratum is dominated by ericaceous species, typically *Vaccinium pallidum*, *Vaccinium stamineum*, and *Kalmia latifolia*. Other characteristic species include *Smilax glauca*, *Silphium compositum*, *Pteridium aquilinum* var. *latiusculum*, *Scleria oligantha*, *Piptochaetium avenaceum*, and *Tephrosia virginiana*. In a sample from the Southern Blue Ridge in Union County, Georgia (Chattahoochee National Forest), *Pinus echinata* occupies 75-95% of the canopy which also occasionally includes *Quercus falcata*, *Quercus coccinea*, and *Pinus strobus*. The subcanopy is codominated by *Acer rubrum*, *Oxydendrum arboreum*, and *Cornus florida*. The open shrub layer is characterized by *Ilex opaca*, *Cornus florida*, *Vaccinium pallidum*, *Diospyros virginiana*, *Prunus serotina*, *Sassafras albidum*, and *Viburnum dentatum*. The sparse herb layer includes *Coreopsis major*, *Chimaphila maculata*, *Maianthemum racemosum*, *Lespedeza violacea* (= *Lespedeza intermedia*), and *Trillium catesbaei*.

**MOST ABUNDANT SPECIES****Global****Stratum**

	<b>Lifeform</b>	<b>Species</b>
Tree canopy	Needle-leaved tree	<i>Pinus echinata</i>
Tree subcanopy	Broad-leaved deciduous tree	<i>Diospyros virginiana</i> , <i>Nyssa sylvatica</i> , <i>Oxydendrum arboreum</i>
Tall shrub/sapling	Broad-leaved evergreen shrub	<i>Kalmia latifolia</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Vaccinium pallidum</i> , <i>Vaccinium stamineum</i>

**CHARACTERISTIC SPECIES**

**Great Smoky Mountains National Park:**

**Global:** *Kalmia latifolia*, *Pinus echinata*, *Vaccinium pallidum*

**OTHER NOTEWORTHY SPECIES**

**Global: Other Plants:** *Cleistes bifaria* (G4?)

**CONSERVATION STATUS RANK**

**Global Rank & Reasons:** G4? (1-Dec-1997).

**RELATED CONCEPTS**

**Global Related Concepts:**

- IA6a. Dry Shortleaf Pine - Oak - Hickory Forest (Allard 1990) >
- Shortleaf pine/heath forest of dry, acidic steep slopes (CAP pers. comm. 1998) ?

## CLASSIFICATION

**Status:** Standard

**Classification Confidence:** 3 - Weak

**Great Smoky Mountains National Park Classification Comments:** This community most likely exists within the park boundaries but was never encountered. However, communities that were transitional between this community and Appalachian Montane Oak - Hickory Forest (Low Elevation Xeric Type), *Quercus alba* - *Quercus coccinea* - *Quercus falcata* / *Kalmia latifolia* - *Vaccinium pallidum* Forest (CEGL007691), were documented from this project. It is likely that the community is a more xeric, more fire-adapted version of CEGL007691.

**Global Classification Comments:** Includes successional forests with a hardwood shrub/sapling stratum.

## ELEMENT DISTRIBUTION

**Great Smoky Mountains National Park Range:** This association was not observed or sampled. However, forests dominated by *Pinus echinata* are thought to occur within the park boundary, especially in the area around Calderwood quadrangle. It should be looked for on dry south-facing fire-prone slopes and will most likely be found near occurrences of Appalachian Montane Oak - Hickory Forest (Low Elevation Xeric Type) (CEGL007691).

**Global Range:** These forests occur in the lower elevations of the southern Appalachian Mountains and possibly the adjacent Piedmont.

**Nations:** US

**States/Provinces:** GA, KY, NC, SC, TN

**TNC Ecoregions:** 51:C, 52:P

**USFS Ecoregions (1994/95):** 222Hc:CCC, M221A:CC, M221Ce:CCC, M221Dc:CCC, M221Dd:CCC

**USFS Ecoregions (2007):** 222Hc:CCC, M221A:CC, M221Ce:CCP, M221Dc:CCC, M221Dd:CCC

**Federal Lands:** BIA (Eastern Band of Cherokee); NPS (Great Smoky Mountains); USFS (Chattahoochee, Chattahoochee (Piedmont)?, Chattahoochee (Southern Blue Ridge), Cherokee?, Nantahala, Pisgah, Sumter, Sumter (Mountains))

## ELEMENT SOURCES

**Great Smoky Mountains National Park Description Author(s):** R. White

**Global Description Author(s):** S. Simon, G. Kauffman, D. Danley

**References:** Allard 1990, CAP pers. comm. 1998, Evans et al. 2009, Harrison 2004, Harrison 2011, NatureServe Ecology - Southeastern U.S. unpubl. data, Nelson 1986, Schafale 2012, Schafale and Weakley 1990, Southeastern Ecology Working Group n.d.

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**[CEGL008500] *Pinus virginiana* - (*Pinus rigida*, *Pinus pungens*) / *Schizachyrium scoparium* Forest**

Translated Name: **Virginia Pine - (Pitch Pine, Table Mountain Pine) / Little Bluestem Forest**

Common Name: **Appalachian Low-Elevation Mixed Pine / Little Bluestem Forest**

## USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Southern & South-Central Oak - Pine Forest & Woodland (M016)
Group	Shortleaf Pine - Oak Forest & Woodland (G012)
Alliance	<i>Pinus echinata</i> - <i>Pinus pungens</i> - <i>Quercus montana</i> Appalachian Woodland Alliance (A3269)

## ELEMENT CONCEPT

**Global Summary:** This community includes primarily *Pinus virginiana*-dominated vegetation of low-elevation ridges and steep slopes, occurring in the transition zone between the Southern Blue Ridge and Piedmont / Cumberland and Southern Ridge and Valley, from eastern Tennessee, western North Carolina, western South Carolina and northern Georgia. It occurs on thin soils over a variety of rocky substrates, including quartzite, sandstone, phyllite, and others. The canopy varies from open to closed and may be solely dominated by *Pinus virginiana* or in some cases *Pinus rigida*, or an admixture of other species, including *Pinus pungens*, *Pinus echinata*, *Pinus rigida*, *Quercus coccinea*, *Quercus montana*, and *Quercus velutina*. An open midstory of often stunted hardwoods, including *Quercus marilandica*, *Quercus falcata*, *Oxydendrum arboreum*, and *Acer rubrum*, may also be present. The open shrub layer typically includes *Vaccinium pallidum* and may include other members of the Ericaceae, including *Vaccinium arboreum*, *Vaccinium stamineum*, *Gaylussacia dumosa*, *Kalmia latifolia*, *Vaccinium hirsutum*, *Gaultheria procumbens*, and *Epigaea repens*. The structure of the herbaceous layer is variable, but may provide up to 75% cover. It is dominated by *Schizachyrium scoparium*. Other characteristic herbaceous components include *Clitoria mariana*, *Coreopsis major*, *Dichanthelium commutatum*, *Eurybia surculosa*, *Sericocarpus asteroides*, *Sericocarpus linifolius*, *Silphium compositum*, *Solidago odora*, *Solidago speciosa*, *Sorghastrum nutans*, and *Tephrosia virginiana*.

## ENVIRONMENTAL DESCRIPTION

**Global Environment:** Stands of this forest occur on low-elevation ridges, steep slopes, and other exposed sites along the transition between the Southern Blue Ridge and Piedmont / Cumberland and Southern Ridge and Valley, from eastern Tennessee, western North Carolina, western South Carolina and northern Georgia. They are found on thin soils over a variety of rocky substrates including quartzite, sandstone, phyllite, and others.

### VEGETATION DESCRIPTION

**Global Vegetation:** The canopy varies from open to closed and may be solely dominated by *Pinus virginiana* or *Pinus rigida* or an admixture of other species, including *Pinus pungens*, *Pinus echinata*, *Pinus rigida*, *Quercus coccinea*, *Quercus montana* (= *Quercus prinus*), and *Quercus velutina*. An open midstory of often stunted hardwoods, including *Quercus marilandica*, *Quercus falcata*, *Oxydendrum arboreum*, and *Acer rubrum*, may also be present. The open shrub layer typically includes *Vaccinium pallidum* and may include other members of the Ericaceae, such as *Vaccinium arboreum*, *Vaccinium stamineum*, *Gaylussacia dumosa*, *Kalmia latifolia*, *Vaccinium hirsutum*, *Gaultheria procumbens*, and *Epigaea repens*. The structure of the herbaceous layer is variable but may provide up to 75% cover. It is dominated by *Schizachyrium scoparium*. Other characteristic herbaceous components include *Clitoria mariana*, *Coreopsis major*, *Dichanthelium commutatum*, *Eurybia surculosa*, *Sericocarpus asteroides*, *Sericocarpus linifolius*, *Silphium compositum*, *Solidago odora*, *Solidago speciosa*, *Sorghastrum nutans*, and *Tephrosia virginiana*.

**Global Dynamics:** The open canopy and diverse understory of this community can be the result of management, edaphic factors, or natural disturbances. While *Pinus virginiana* is a fire-intolerant species, many species found in examples of this community are fire-adapted or thrive in open, sunny habitats.

### MOST ABUNDANT SPECIES

#### Global

##### Stratum

Tree canopy

Shrub/sapling (tall &amp; short)

Herb (field)

##### Lifeform

Needle-leaved tree

Broad-leaved deciduous shrub

Graminoid

##### Species

*Pinus rigida*, *Pinus virginiana**Vaccinium pallidum**Schizachyrium scoparium*

### CHARACTERISTIC SPECIES

#### Global:

### OTHER NOTEWORTHY SPECIES

**Global: Vulnerable Plants:** *Euphorbia purpurea* (G3, Southern Blue Ridge endemic), *Selaginella tortipila* (G3, Southern Appalachian endemic); **Other Plants:** *Vaccinium hirsutum* (G4)

### CONSERVATION STATUS RANK

**Global Rank & Reasons:** G3G4 (3-Sep-2002). This xeric evergreen forest community is restricted to ridges, xeric slopes, and other sites with favorable conditions for pines. It will be maintained on sites where these local soil conditions, topographic extremes, or occasional fire function to retard hardwood invasion. Infestations of southern pine beetle (*Dendroctonus frontalis*) can cause mortality of canopy trees. The grass-dominated herbaceous layer may deteriorate without fire.

### RELATED CONCEPTS

#### Global Similar Types:

- *Pinus virginiana* - *Pinus (rigida, echinata)* - (*Quercus montana*) / *Vaccinium pallidum* Forest (CEGL007119)

### CLASSIFICATION

**Status:** Standard

**Classification Confidence:** 2 - Moderate

**Global Classification Comments:** This community is described from the Chattahoochee and Cherokee national forests and along the Nantahala Gorge in Swain County, North Carolina. It is differentiated from the similar *Pinus virginiana* - *Pinus (rigida, echinata)* - (*Quercus montana*) / *Vaccinium pallidum* Forest (CEGL007119) by the more open canopy and understory and the dense, grass-dominated herbaceous layer. In the Appalachian Trail project (Fleming and Patterson 2009a), these two associations emerged as distinct in ordination and cluster analysis. In the most typical examples of this association (e.g., CHER.17, CHAT.76, and 020-05-0362), over 50% of the total species composition is herbaceous plants.

### ELEMENT DISTRIBUTION

**Global Range:** This community occurs primarily in the transition zone between the Southern Blue Ridge and Piedmont / Cumberlands and Southern Ridge and Valley, from eastern Tennessee, western North Carolina, western South Carolina and northern Georgia.

**Nations:** US

**States/Provinces:** AL?, GA, NC, SC, TN

**TNC Ecoregions:** 50:?, 51:C, 52:C

**USFS Ecoregions (1994/95):** 231Ad:CCC, M221Dc:CCC, M221Dd:CCC

**USFS Ecoregions (2007):** 231Ad:CCC, M221Dc:CCC, M221Dd:CCC

**Federal Lands:** BIA (Eastern Band of Cherokee); NPS (Appalachian Trail [Southern Blue Ridge], Blue Ridge Parkway, Great Smoky Mountains); USFS (Chattahoochee, Chattahoochee (Piedmont), Chattahoochee (Southern Blue Ridge), Cherokee, Nantahala, Sumter, Sumter (Mountains))

### ELEMENT SOURCES

**Great Smoky Mountains National Park Plots:** CVS: 026-01-0062, 026-02-0049.

**Global Description Author(s):** J. Teague, T. Govus and K.D. Patterson

**References:** Fleming and Patterson 2009a, NatureServe Ecology - Southeastern U.S. unpubl. data, Nelson 1986, Schafale 2012, Schafale and Weakley 1990, Southeastern Ecology Working Group n.d.

**[CEGL007119] *Pinus virginiana* - *Pinus (rigida, echinata)* - (*Quercus montana*) / *Vaccinium pallidum* Forest**  
 Translated Name: **Virginia Pine - (Pitch Pine, Shortleaf Pine) - (Chestnut Oak) / Blue Ridge Blueberry Forest**  
 Common Name: **Appalachian Low-Elevation Mixed Pine / Blue Ridge Blueberry Forest**

#### USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Southern & South-Central Oak - Pine Forest & Woodland (M016)
Group	Shortleaf Pine - Oak Forest & Woodland (G012)
Alliance	<i>Pinus echinata</i> - <i>Pinus pungens</i> - <i>Quercus montana</i> Appalachian Woodland Alliance (A3269)

#### ELEMENT CONCEPT

**Global Summary:** This community includes *Pinus virginiana*-dominated forests of low-elevation ridges and steep upper slopes, occurring primarily in the Appalachian provinces of the eastern United States, from southwestern Virginia, south and west to northern Georgia and northern Alabama. This community occurs on narrow ridges, steep slopes, and other topographic positions with high solar exposure, over shallow, infertile soils. This mainly evergreen forest is often of low stature, with a somewhat open to closed canopy, sparse to very dense shrub cover dominated by ericaceous species, and a sparse herb stratum. *Pinus virginiana* is the canopy dominant throughout the range of the type. In some parts of the range, other *Pinus* species may be significant canopy associates, as well as dry-site *Quercus* species (e.g., *Quercus montana*, *Quercus coccinea*). Deciduous species may form a subcanopy or sapling stratum, particularly in areas where fire has been excluded. Common shrub dominants include *Vaccinium pallidum*, *Vaccinium stamineum*, *Gaylussacia baccata*, and *Kalmia latifolia*. Herbs vary with geography but are typical of infertile, xeric habitats. Some typical herbs in this forest are *Baptisia tinctoria*, *Chimaphila maculata*, *Dichantherium commutatum*, *Epigaea repens*, *Euphorbia corollata*, *Galax urceolata*, *Gaultheria procumbens*, *Hypoxis hirsuta*, *Iris verna*, *Pityopsis graminifolia* var. *latifolia*, *Pteridium aquilinum* var. *latiusculum*, and *Schizachyrium scoparium*.

#### ENVIRONMENTAL DESCRIPTION

**Great Smoky Mountains National Park Environment:** This community was found at elevations below 700 m (2300 feet) on gentle to moderately steep slopes and low ridges. Sites supporting this community are exposed, typically with southern and western aspects. This forest is frequently fire-suppressed or affected by southern pine beetle (*Dendroctonus frontalis*) and will have standing dead trees, thick litter layers, and much understory encroachment by hardwood species.

**Global Environment:** Stands of this forest occur on narrow ridges and knobs, steep upper slopes, bluff and cliff tops, and other exposed sites throughout the range of the type. The community is found primarily on south-, southeast- or southwest-facing aspects on excessively drained, shallow soils. In the Blue Ridge Escarpment region, the western margin of the Blue Ridge, and west into the Ridge and Valley and Cumberland Mountains, this xeric forest occurs on convex slopes and ridges below 850 m (2800 feet) elevation, over soils classed as Inceptisols, typically Lithic Dystrachrepts originating from sandstone, shale and other noncalcareous parent material. Occurrences in rugged parts of the western Piedmont are also likely. Its environmental situation in the western Alleghenies is not known. In the Interior Low Plateau of Kentucky, Tennessee, and Indiana, this association occurs in edaphically extreme situations, including bluff tops and narrow ridges in thin soils weathered from relatively acidic caprocks with southern and western aspects, as well as other similar slopes, over cherty limestone, siltstones, sandstones, and shales. In particular, in the Knobstone Escarpment Subsection (a few Indiana counties just north of Louisville, Kentucky), it occurs in gladelike situations on steep slopes with thin soils. Along the edges of cliff tops, there is usually a narrow zone of exposed bedrock pavement and patches of very shallow soil, but soils become progressively deeper back from the cliff edge. At least in West Virginia, portions of the stands along the cliff edge are likely to be edaphic climax communities, but farther back from the edge, they are likely to be successional following fire.

#### VEGETATION DESCRIPTION

**Great Smoky Mountains National Park Vegetation:** Forests with canopies dominated by *Pinus virginiana*, sometimes with lesser amounts of *Pinus rigida* or *Pinus echinata*. *Acer rubrum* often dominates the subcanopy. Other canopy and subcanopy trees increase with fire suppression and include *Quercus prinus*, *Quercus coccinea*, *Quercus alba*, *Quercus marilandica*, *Quercus velutina*, *Pinus strobus*, *Oxydendrum arboreum*, *Nyssa sylvatica*, and *Tsuga canadensis*. The tall-shrub stratum can be open to moderately dense and is typically dominated by *Kalmia latifolia* and/or *Vaccinium stamineum*. The short-shrub stratum is typically dense and dominated by *Vaccinium pallidum* and/or *Gaylussacia ursina*. Fire-suppressed examples often have dense *Pinus strobus* in the shrub stratum. Other shrubs include saplings of canopy and subcanopy species as well as *Ilex opaca*, *Viburnum acerifolium*, *Vaccinium hirsutum*, *Amelanchier laevis*, and *Sassafras albidum*. Common vines are *Smilax glauca* and *Smilax rotundifolia*. Herb cover is sparse, and leaf litter often dominates the ground layer. Typical species in the herb stratum are *Galax urceolata*, *Pteridium aquilinum*, *Schizachyrium scoparium*, *Epigaea repens*, *Chimaphila maculata*, and *Dichantherium commutatum*.

**Global Vegetation:** This community is a needle-leaved evergreen forest with a usually somewhat open (occasionally closed) canopy. The canopy is typically short (<20 m) with tree height and canopy cover decreasing with increasing severity of the microsite. A deciduous subcanopy may be present. The shrub layers can be sparse but are more often dense to very dense and are composed of tall and short shrubs, predominantly ericaceous species. Herb cover is sparse, and leaf litter often dominates the ground layer. *Pinus virginiana* is the canopy dominant throughout the range of the type. In the Southern Appalachians and Southern Ridge and Valley it

may occur with mixes of *Pinus rigida*, *Pinus echinata*, or *Pinus strobus*. Within its range, *Pinus pungens* may be present as a very minor component. Regeneration of *Pinus virginiana* is concentrated along cliff edges and tends to drop off inward from the edge. Small stems of *Quercus montana* (= *Quercus prinus*), *Quercus coccinea*, *Acer rubrum*, *Nyssa sylvatica*, and *Oxydendrum arboreum* are common in the subcanopy and sapling strata and may occur in the canopy as well. In the Southern Blue Ridge/Piedmont and Southern Blue Ridge/Ridge and Valley transition regions, *Quercus marilandica*, *Quercus falcata*, and *Quercus stellata* can be deciduous components. Common shrub dominants include *Vaccinium pallidum*, *Vaccinium stamineum*, *Gaylussacia baccata*, and *Kalmia latifolia*. Other typical shrubs can include *Gaylussacia ursina*, *Kalmia latifolia*, *Sassafras albidum*, and *Vaccinium hirsutum* (southwestern North Carolina and southeastern Tennessee only). *Smilax glauca* and *Smilax rotundifolia* can be common vines. In the sparse herb layer, characteristic species from the Southern Blue Ridge and Southern Ridge and Valley include *Baptisia tinctoria*, *Chimaphila maculata*, *Dichanthelium commutatum*, *Danthonia spicata*, *Epigaea repens*, *Euphorbia corollata*, *Galax urceolata*, *Gaultheria procumbens*, *Hypoxis hirsuta*, *Iris verna*, *Pityopsis graminifolia* var. *latifolia*, *Pteridium aquilinum* var. *latiusculum*, and *Schizachyrium scoparium*. Typical herbs from examples in the western portion of the range (Interior Low Plateau) include *Antennaria plantaginifolia*, *Antennaria solitaria*, *Carex albicans* var. *albicans* (= *Carex artitecta*), *Danthonia spicata*, *Dichanthelium dichotomum*, *Lespedeza violacea* (= *Lespedeza intermedia*), *Hieracium gronovii*, *Hieracium venosum*, *Krigia biflora*, *Solidago erecta*, and *Tephrosia virginiana* (M. Homoya pers. comm. 1999). In some of these examples *Opuntia humifusa*, *Calamagrostis porteri* ssp. *insperata*, and *Solidago squarrosa* may occur locally. Nonvascular plants have not been documented rangewide; West Virginia examples have identified lichen species including *Cladonia caroliniana*, *Cladonia squamosa*, *Cladonia rangiferina*, *Cladonia pyxidata*, *Umbilicaria mammulata*, *Lasallia papulosa*, *Lasallia pennsylvanica*, *Xanthoparmelia plittii*, *Xanthoparmelia conspersa*, and *Flavoparmelia caperata*, and moss species including *Leucobryum glaucum*, *Leucobryum albidum*, *Polytrichum juniperinum*, *Dicranum scoparium*, *Dicranum spurium*, *Dicranum condensatum*, *Hypnum imponens*, and *Thuidium delicatulum*. In Indiana's Knobstone Escarpment, this community provides habitat for that state's only endemic vascular plant, *Penstemon deamii*.

**Global Dynamics:** This xeric, evergreen forest community will be maintained on sites where local soil conditions and topographic extremes function to retard hardwood invasion. Although *Pinus virginiana* can become established by seed following fire, the trees are thin-barked and are easily killed by fire. Repeated burning is likely to select for *Pinus rigida* at the expense of *Pinus virginiana*. Infestations of southern pine beetle (*Dendroctonus frontalis*) can cause mortality of canopy trees. Examples affected by southern pine beetle in the Great Smoky Mountains can have up to 80-90% standing dead pine. This forest is also susceptible to damage by fire and has been found to be particularly sensitive to ozone, which causes foliar damage of *Pinus virginiana* (Burns and Honkala 1990a).

This community may occur as early- to late-successional stands. On sites where local soil conditions or topographic extremes retard succession and maintain pine dominance indefinitely, this community is considered a topo-edaphic climax. Other occurrences may be successional to forests with mixed deciduous-evergreen canopies dominated by mixtures of *Pinus (pungens, rigida, virginiana, echinata)* and *Quercus (coccinea, montana)* species.

Throughout most of its range, this community occurs as linear features along ridgetops and may be adjacent to or grade into xeric forests dominated by *Quercus coccinea* or *Quercus montana* or more mesic forests dominated by *Quercus alba*, *Quercus rubra*, *Quercus velutina*, *Carya glabra*, and *Carya alba*. In the Interior Low Plateau, individual stands can be small in size, occurring in a matrix of *Quercus montana* or *Quercus montana* - *Quercus alba* forest (e.g., *Quercus montana* / *Smilax* spp. Forest (CEGL005022) or *Quercus montana* - *Quercus (alba, coccinea)* / *Viburnum acerifolium* - (*Kalmia latifolia*) Forest (CEGL005023)), but in more edaphically extreme circumstances.

#### MOST ABUNDANT SPECIES

##### Great Smoky Mountains National Park

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Pinus virginiana</i>
Tree subcanopy	Broad-leaved deciduous tree	<i>Acer rubrum</i>
Shrub/sapling (tall & short)	Liana	<i>Smilax rotundifolia</i>
Tall shrub/sapling	Broad-leaved deciduous shrub	<i>Vaccinium stamineum</i>
Tall shrub/sapling	Broad-leaved evergreen shrub	<i>Kalmia latifolia</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Vaccinium pallidum</i>

##### Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Pinus rigida</i> , <i>Pinus virginiana</i>
Tree canopy	Broad-leaved deciduous tree	<i>Quercus coccinea</i> var. <i>coccinea</i> , <i>Quercus montana</i>
Tall shrub/sapling	Broad-leaved evergreen shrub	<i>Kalmia latifolia</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Gaylussacia baccata</i> , <i>Vaccinium pallidum</i> , <i>Vaccinium stamineum</i>

#### CHARACTERISTIC SPECIES

**Great Smoky Mountains National Park:** *Kalmia latifolia*, *Pinus virginiana*, *Pteridium aquilinum*, *Solidago odora*, *Tephrosia virginiana*, *Vaccinium hirsutum*, *Vaccinium pallidum*, *Vaccinium stamineum*

**Global:** *Cladonia caroliniana*, *Comptonia peregrina*, *Epigaea repens*, *Gaultheria procumbens*, *Leucobryum glaucum*, *Oxydendrum arboreum*, *Pinus virginiana*, *Pteridium aquilinum*, *Sassafras albidum*, *Schizachyrium scoparium* var. *scoparium*

**OTHER NOTEWORTHY SPECIES**

**Great Smoky Mountains National Park: Vulnerable Plants:** *Vaccinium hirsutum* (G4, globally vulnerable)  
**Global: Vulnerable Plants:** *Buckleya distichophylla* (G3), *Calamagrostis porteri* ssp. *insperata* (G4T3), *Coreopsis latifolia* (G3), *Coreopsis pulchra* (G2, Cumberland Plateau endemic), *Cuscuta harperi* (G2G3), *Diervilla rivularis* (G3), *Gaylussacia brachycera* (G3), *Helianthus longifolius* (G3, rare Cumberland Plateau endemic), *Penstemon deamii* (G1, IN endemic), *Pemmeranthus mengesii* (G3), *Rudbeckia heliopsisidis* (G2), *Sabatia capitata* (G2, Cumberland Plateau endemic), *Thermopsis villosa* (G3?); **Other Plants:** *Cleistes bifaria* (G4?), *Danthonia spicata* (G5), *Vaccinium hirsutum* (G4)

**CONSERVATION STATUS RANK**

**Global Rank & Reasons:** G3 (20-May-2011). This xeric evergreen forest community will be maintained on sites where local soil conditions, topographic extremes, or occasional fire function to retard hardwood invasion. Although not rare (more than 300 occurrences rangewide are estimated), this vegetation is threatened by infestations of southern pine beetle (*Dendroctonus frontalis*) that can cause mortality of canopy trees. Examples affected by southern pine beetle in the Great Smoky Mountains can have up to 80-90% standing dead pine. Infestations are wide-ranging and include most of the range of this association, and with fire suppression, killed stands convert to different vegetation over time. This vegetation is also threatened by climate change because higher temperatures exacerbate southern pine beetle infestations.

**RELATED CONCEPTS****Global Similar Types:**

- *Pinus (pungens, rigida) - Quercus montana / (Quercus ilicifolia) / Gaylussacia baccata* Woodland (CEGL004996)
- *Pinus echinata - Quercus montana - Quercus (coccinea, velutina)* Forest (CEGL004761)
- *Pinus echinata* Ruderal Forest (CEGL006327)
- *Pinus pungens - Pinus rigida - (Quercus montana) / Kalmia latifolia - Vaccinium pallidum* Woodland (CEGL007097)
- *Pinus virginiana - (Pinus rigida) - Nyssa sylvatica / Xanthorhiza simplicissima / Euphorbia corollata* Forest (CEGL006624)
- *Pinus virginiana - (Pinus rigida, Pinus pungens) / Schizachyrium scoparium* Forest (CEGL008500) has a more open structure with relatively well-developed herbaceous stratum, often graminoid-dominated.
- *Pinus virginiana - Quercus falcata - Carya pallida* Forest (CEGL006354)
- *Pinus virginiana / Quercus marilandica* Serpentine Ruderal Forest (CEGL006266)
- *Pinus virginiana* Ruderal Forest (CEGL002591) is distinguished from this community by differences in land-use history; CEGL002591 exists in flat to moderately sloping land that was heavily plowed in the recent past (10-60 years), whereas this community is generally a product of less disturbed soils and more historic disturbance by fire or logging without plowing.
- *Quercus (montana, coccinea) / Kalmia latifolia / (Galax urceolata, Gaultheria procumbens)* Forest (CEGL006271)
- *Quercus montana - Quercus (alba, coccinea) / Viburnum acerifolium - (Kalmia latifolia)* Forest (CEGL005023)

**Global Related Concepts:**

- *Pinus virginiana - (Quercus spp.) / Nyssa sylvatica / Gaultheria procumbens* forest (Vanderhorst 2002b) =
- *Pinus virginiana - Pinus (rigida, echinata) - (Quercus prinus) / Vaccinium pallidum* Forest (Faber-Langendoen 2001) =
- *Pinus virginiana - Quercus prinus - Nyssa sylvatica* Forest (Walton et al. 1997) ?
- IA7c. Xeric Virginia Pine Ridge Forest (Allard 1990) >
- Oligotrophic Forest (Rawinski 1992) >
- Virginia Pine - Oak: 78 (Eyre 1980) >
- Virginia Pine Type (Schmalzer and DeSelm 1982) >
- Virginia Pine: 79 (Eyre 1980) >
- Virginia pine forest (CAP pers. comm. 1998) ?

**CLASSIFICATION**

**Status:** Standard

**Classification Confidence:** 3 - Weak

**Great Smoky Mountains National Park Other Comments:** This community is often bordered by mixed oak forests.

**Global Classification Comments:** In Indiana examples, the substrate is primarily a matrix of acidic siltstone, shale, and sandstone. Rarely are cliffs formed; instead the setting is mostly very steep slopes with high hills and deep ravines. This association also includes vegetation from the transition between the Cumberland Plateau / Southern Ridge and Valley and the Upper East Gulf Coastal Plain in Alabama. Though located in the Coastal Plain, these occurrences are physiographically and floristically similar to this montane association. Related vegetation in Virginia has been treated as several associations within the Central Appalachian Shale Barren and Mountain / Piedmont Acidic Woodlands ecological groups (Fleming and Patterson 2011a).

Early-successional vegetation associated with old fields, old pastures, clearcuts, and burned or eroded areas and dominated by *Pinus virginiana* is classified as *Pinus virginiana* Ruderal Forest (CEGL002591). Appalachian xeric oak forests with similar floristics, but with a mainly deciduous canopy, are classed in *Quercus (montana, coccinea) / Kalmia latifolia / (Galax urceolata, Gaultheria procumbens)* Forest (CEGL006271). Appalachian shale forests and woodlands with *Pinus virginiana* occur on steep, shaley slopes and have stunted canopies and sparse herb and shrub strata, characterized by species adapted to shaley substrates. These shale communities are classed in *Pinus virginiana - Quercus montana* Acidic Shale Woodland Alliance (A3312). In 13 plots from the Southern Blue Ridge, species with  $\geq 54\%$  constancy and at least 10% mean cover are *Pinus virginiana*, *Vaccinium pallidum*, *Quercus*

*montana*, *Oxydendrum arboreum*, *Acer rubrum*, *Quercus coccinea*, *Nyssa sylvatica*, *Pinus rigida*, *Gaylussacia baccata*, and *Gaylussacia ursina*.

#### ELEMENT DISTRIBUTION

**Great Smoky Mountains National Park Range:** This association was sampled on the Cades Cove quadrangle but not found on the Mount Le Conte quadrangle. On the Cades Cove quadrangle it was sampled or observed on the northern half of the quadrangle, below 2300 feet elevation, on south-facing slopes and low ridges. It was found north of the Cades Cove Loop Road in the vicinity of Copper Road, Rich Mountain Road, Tater Ridge, and the lower slopes around Allnight Ridge. West and south of the Cades Cove Loop Road this association was found on the southwest slopes above Forge Creek Road and on the south slopes and ridges of Boring Ridge. This community is more common elsewhere in the park, especially on the western end of the park. Many historic samples from the western portion of the park (Calderwood quadrangle) represent this community.

**Global Range:** This community occurs primarily in the Appalachian region of the United States, ranging from southwestern Virginia, south and west through the Ridge and Valley, Blue Ridge, and Cumberland Plateau to northern Georgia and Alabama, extending westward to scattered areas in the Interior Low Plateau and eastward into the upper Piedmont. It is recorded from the states of Georgia, North Carolina, South Carolina, Tennessee, Kentucky, Pennsylvania, Indiana, Ohio, Maryland, and West Virginia.

**Nations:** US

**States/Provinces:** AL, GA, IN, KY, NC, OH, SC, TN, WV:S2

**TNC Ecoregions:** 43:C, 44:C, 49:C, 50:C, 51:C, 52:C, 59:C, 61:P

**USFS Ecoregions (1994/95):** 221Ea:CC?, 221Eb:CCC, 221Ec:CCC, 221Ed:CCP, 221Ef:CCC, 221Eg:CCC, 221Ha:CCC, 221Hc:CCC, 221He:CCC, 221Ja:CCC, 221Jb:CCC, 222Da:CCC, 222Dc:CCC, 222Dg:CCC, 222Dj:CCC, 222Eg:CCC, 222Ej:CCC, 222El:CCC, 222En:CCC, 222Eo:CCC, 222Fd:CCC, 222Ff:CCC, 231Aa:CCC, 231Ab:CCC, 231Ae:CCC, 231Bc:CCC, 231Cc:CCC, 231Cd:CCC, 231Da:CCC, 231Dc:CCC, M221Aa:CCP, M221Ab:CCC, M221Ac:CCC, M221Bb:CCC, M221Bd:CCP, M221Be:CCP, M221Ca:CCC, M221Cb:CCC, M221Cd:CCC, M221Dc:CCC, M221Dd:CCC

**USFS Ecoregions (2007):** 221Ea:CC?, 221Eb:CCP, 221Ec:CCC, 221Ed:CCP, 221Ef:CCC, 221Eg:CCC, 221Ej:CCC, 221En:CC?, 221Ha:CCC, 221Hb:CCP, 221Hc:CCC, 221He:CC?, 221Ja:CCC, 221Jb:CCC, 223Bc:CCC, 223Da:CCC, 223Dc:CCC, 223Dg:CCC, 223Dj:CCC, 223Eg:CCC, 223Fd:CCC, 223Ff:CCC, 231Aa:CCP, 231Ab:CCC, 231Bc:CCC, 231Cc:CCC, 231Cd:CCC, 231Da:CCC, 231Dc:CCC, 231Ic:CCC, M221Aa:CCP, M221Ab:CCC, M221Ac:CCC, M221Bb:CCC, M221Bd:CCP, M221Be:CCP, M221Ca:CCC, M221Cb:CCC, M221Cd:CCC, M221Dc:CCC, M221Dd:CCC

**Federal Lands:** BIA (Eastern Band of Cherokee); NPS (Appalachian Trail [Central Appalachians], Appalachian Trail [Southern Blue Ridge], Big South Fork, Blue Ridge Parkway, Chickamauga-Chattanooga, Gauley River, Great Smoky Mountains, Kennesaw Mountain, Kings Mountain?, Little River Canyon, Mammoth Cave, New River Gorge, Obed River); USFS (Bankhead, Chattahoochee, Chattahoochee (Piedmont), Chattahoochee (Southern Blue Ridge), Cherokee, Daniel Boone, Land Between the Lakes?, Nantahala, Pisgah, Sumter, Sumter (Mountains), Talladega, Talladega (Oakmulgee), Talladega (Talladega), Wayne)

#### ELEMENT SOURCES

**Great Smoky Mountains National Park Plots:** GRSM.32, GRSM.38, GRSM.200, GRSM.216.

**Great Smoky Mountains National Park Description Author(s):** K.D. Patterson

**Global Description Author(s):** K.D. Patterson, R. White and S.C. Gawler

**References:** Allard 1990, Barden 1977, Burns and Honkala 1990a, CAP pers. comm. 1998, Cooper 1963, Core 1966, Evans et al. 2009, Eyre 1980, Faber-Langendoen 2001, Faller 1975, Gan 2004, Gettman 1974, Homoya pers. comm., INHDC unpubl. data, Malter 1977, Maxwell 2006, NatureServe Ecology - Southeastern U.S. unpubl. data, Nelson 1986, ONHD unpubl. data, Patterson et al. 1999, Peet et al. unpubl. data, Pyne et al. 2010, Racine 1966, Rawinski 1992, Schafale 2012, Schafale and Weakley 1990, Schafale pers. comm., Schmalzer and DeSelm 1982, Schotz et al. 2008, Southeastern Ecology Working Group n.d., TDNH unpubl. data 2018, Vanderhorst 2002b, Vanderhorst et al. 2007, Vanderhorst et al. 2010, WVNHP unpubl. data, Walton et al. 1997, White and Govus 2005, Whittaker 1956

### G159. SOUTH-CENTRAL INTERIOR OAK FOREST & WOODLAND

**Group Summary Description:** This group represents the dry-mesic hardwood forests that cover much of the landscape in a band of unglaciated terrain, between about 34°N latitude and 38°N latitude, extending west of the Appalachians, including the unglaciated part of the Interior Low Plateau, the Upper East Gulf Coastal Plain and Crowley's Ridge, and extending into the Ozarks and Ouachitas of Arkansas, Missouri and Oklahoma. A number of different *Quercus* species (including *Quercus alba*, *Quercus rubra*, *Quercus falcata*, *Quercus velutina* or *Quercus stellata*, *Quercus marilandica*, and *Quercus coccinea*) may dominate stands of this group, with *Carya* species also prominent, including *Carya tomentosa*, *Carya glabra*, *Carya ovata*, *Carya pallida*, and others. East of the Mississippi River, in some drier examples on more acidic substrates, *Quercus montana* is typical, reflecting relations with similar Appalachian forest groups further to the east. *Quercus alba* may also be present but not necessarily dominant, but will typically exhibit dominance in the submesic to dry-mesic examples, possibly with *Quercus falcata* and/or *Quercus velutina*. In addition, *Quercus coccinea*, *Quercus marilandica*, and/or *Quercus stellata* will also share dominance or be prominent in many of the drier examples. *Quercus muehlenbergii*, *Quercus pagoda*, and/or *Quercus shumardii* may appear in examples with high base status. Under current conditions, the understories are typically shrub- and small tree-dominated, with the typical species varying with aspect, soil, and moisture relations. More open canopies and grass-dominated understories may have been more prevalent prior to the mid-twentieth century, when open grazing and surface fires were more common. In the Interior Low Plateaus, the range of this group is generally consistent

with the "Western Mesophytic" Forest region of Braun (1950), Keever (1971), and Greller (1988). Examples are typically found along ridgetops and slopes of various aspects. The floristic expression of different associations included in this group varies considerably with aspect and soil type. The associations range along a moisture gradient from submesic to dry. The submesic to dry-mesic expressions tend to be found on mid slopes with northerly to easterly aspects, and the dry expressions on southerly to westerly aspects and on narrow ridges. Parent material can range from calcareous to acidic with very shallow, well- to excessively well-drained soils in the dry expressions and moderately well-drained soils in the submesic to dry-mesic ones. The canopy closure of this group ranges from closed to somewhat open in the dry examples. On Crowley's Ridge, the vegetation is very distinctive from that of the adjacent alluvial plain, and the sites occur on distinct slopes that rise above the alluvial plain surface. Occurrences of this group generally comprise dry-mesic forests that occupy west-facing slopes and narrow, "finger" ridgetops in a highly dissected landscape. Historically, these examples may have been more open under conditions of more frequent fire. In the Ozarks and Ouachitas, soils are typically moderately to well-drained and more fertile than those associated with oak woodlands. Wind, drought, lightning, and occasional fires can influence vegetation of this group.

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## A3289 *Quercus montana* - *Quercus falcata* Forest Alliance

Chestnut Oak - Southern Red Oak Forest Alliance

### *Southern Chestnut Oak Forest*

#### ALLIANCE CONCEPT

**Summary:** These are dry-mesic to mesic forests dominated or codominated by *Quercus montana* with other *Quercus* species, found in a broad band from the Chesapeake Bay region, through the southern Piedmont of the Carolinas and Georgia, the Cumberland/Ridge and Valley of Tennessee, Kentucky, and Alabama, and the Interior Low Plateau of Illinois, Indiana, and Ohio, marginally ranging into the adjacent Gulf Coastal Plain. *Quercus montana* is typically the leading dominant in these forests, but other common canopy species can include *Acer rubrum*, *Carya tomentosa*, *Carya glabra*, *Carya ovalis*, *Carya ovata*, *Carya pallida*, *Fagus grandifolia*, *Liriodendron tulipifera*, *Nyssa sylvatica*, *Pinus strobus*, *Quercus alba*, *Quercus coccinea*, *Quercus falcata*, *Quercus rubra*, and *Quercus velutina*. The subcanopy often contains *Cornus florida* and *Oxydendrum arboreum*. The ground flora varies depending on available light, moisture and soil nutrients but can be quite diverse, especially in associations with sparse shrub cover. In the Cumberland Plateau and other areas, forests in this alliance have replaced forests once dominated by *Castanea dentata* and often have chestnut sprouts in the understory. This represents the southern portion of the range of *Quercus montana* exclusive of the Southern Blue Ridge region. Stands found within that region are only known from lower elevations (760-1035 m [2500-3400 feet]), on moderately sheltered low ridges and slopes, flats and valleys. Stands of this alliance are generally known from upper slopes, draws and gorge slopes in the Cumberland Plateau, and from upper to middle, dry-mesic slopes in the Piedmont. Some associations at least apparently occur on mafic or circumneutral substrates.

**Classification Comments:** This alliance accommodates *Quercus montana*-dominated vegetation in the southern portion of its range exclusive of the Southern Blue Ridge region. Stands found within that region are only at the lowest elevations.

**Diagnostic Characteristics:** Stands are distinctive for being dominated or codominated by *Quercus montana*, and being within the range of *Quercus falcata*, which may be present in these stands.

**Rationale for Nominal Species or Physiognomic Features:** *Quercus montana* is a frequent dominant in these forests; *Quercus falcata* is typically at least present, and it serves to designate the generally southern range of the alliance.

#### ALLIANCE DESCRIPTION

**Environment:** Stands of this alliance are generally known from upper slopes, draws and gorge slopes in the Cumberland Plateau, and from upper to middle, dry-mesic slopes in the Piedmont. Some associations at least apparently occur on mafic or circumneutral substrates. In the Southern Blue Ridge region, stands are only known from lower elevations (760-1035 m [2500-3400 feet]), on moderately sheltered low ridges and slopes, flats and valleys.

**Vegetation:** *Quercus montana* (= *Quercus prinus*) is typically the leading dominant in these forests, but other common canopy species can include *Acer rubrum*, *Carya tomentosa* (= *Carya alba*), *Carya glabra*, *Carya ovalis*, *Carya ovata*, *Carya pallida*, *Fagus grandifolia*, *Liriodendron tulipifera*, *Nyssa sylvatica*, *Pinus strobus*, *Quercus alba*, *Quercus coccinea*, *Quercus falcata*, *Quercus rubra*, and *Quercus velutina*. The subcanopy often contains *Cornus florida* and *Oxydendrum arboreum*. The ground flora varies depending on available light, moisture and soil nutrients but can be quite diverse, especially in associations with sparse shrub cover. Vines are common. In the Cumberland Plateau and other areas, forests in this alliance have replaced forests once dominated by *Castanea dentata* and often have chestnut sprouts in the understory.

**Physiognomy and Structure:** These are generally closed to somewhat open-canopied forests with open to sparse shrub and herbaceous strata.

**Floristics:** *Quercus montana* (= *Quercus prinus*) is typically the leading dominant in these forests, but other common canopy species can include *Acer rubrum*, *Carya tomentosa* (= *Carya alba*), *Carya glabra*, *Carya ovalis*, *Carya ovata*, *Carya pallida*, *Fagus grandifolia*, *Liriodendron tulipifera*, *Nyssa sylvatica*, *Pinus strobus*, *Quercus alba*, *Quercus coccinea*, *Quercus falcata*, *Quercus rubra*, and *Quercus velutina*. The subcanopy often contains *Cornus florida* and *Oxydendrum arboreum*. The ground flora varies depending on available light, moisture and soil nutrients but can be quite diverse, especially in associations with sparse shrub cover. Vines are common. In the Cumberland Plateau and other areas, forests in this alliance have replaced forests once dominated by *Castanea dentata* and often have chestnut sprouts in the understory.

## ALLIANCE DISTRIBUTION

**Range:** The members of this alliance are found in a broad band from the Chesapeake Bay region, through the southern Piedmont of the Carolinas and Georgia, the Cumberlands/Ridge and Valley of Tennessee, Kentucky, and Alabama, and the Interior Low Plateau of Illinois, Indiana, and Ohio, marginally ranging into the adjacent Gulf Coastal Plain. This represents the southern portion of the range of *Quercus montana* exclusive of the Southern Blue Ridge region. Stands found within that region are only at the lowest elevations.

**Nations:** US

**Subnations:** AL, GA, IL, IN, KY, MD, MS, NC, OH, SC, TN, VA, WV

**TNC Ecoregions:** 38:C, 43:C, 44:C, 50:C, 51:C, 52:C, 58:C, 59:P

**Federal Lands:** USFS (Sumter, Sumter (Piedmont))

## ALLIANCE SOURCES

**References:** Faber-Langendoen et al. 2019b

**Author of Concept:** Faber-Langendoen et al. 2019b

**Author of Description:** M. Pyne, in Faber-Langendoen et al. (2013)

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[CEGL007720] *Quercus montana* - *Juniperus virginiana* - (*Pinus virginiana*) / *Philadelphus hirsutus* - *Celtis occidentalis* Woodland

Translated Name: Chestnut Oak - Eastern Red-cedar - (Virginia Pine) / Streambank Mock Orange - Common Hackberry Woodland

Common Name: Blue Ridge Calcareous Shale Slope Woodland

## USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Southern & South-Central Oak - Pine Forest & Woodland (M016)
Group	South-Central Interior Oak Forest & Woodland (G159)
Alliance	<i>Quercus montana</i> - <i>Quercus falcata</i> Forest Alliance (A3289)

## ELEMENT CONCEPT

**Global Summary:** These mixed or deciduous, edaphically-maintained woodlands are known from the Southern Blue Ridge of North Carolina, Tennessee, and Virginia, possibly ranging into the adjacent Ridge and Valley and Cumberland Mountains. They occur as small-patch openings on steep slopes, below 915 m (3000 feet) elevation, over outcrops of moderately calcareous shales, siltstones and sandstones. Habitats are extremely steep and rocky, with some parts mantled by thin soil over bedrock, and other parts covered by loose gravel-sized shale fragments. Trees are sparse and stunted, generally 2-10 m tall. Primary species include *Quercus montana*, *Juniperus virginiana* var. *virginiana*, *Pinus virginiana*, and *Acer rubrum*. Some stands have *Carya glabra*, *Carya ovata*, *Carya caroliniae-septentrionalis*, *Fraxinus americana*, *Quercus rubra*, *Ulmus alata*, and *Acer saccharum* as important canopy associates. Shrubs include *Philadelphus hirsutus*, *Ostrya virginiana*, *Cercis canadensis* var. *canadensis*, *Celtis occidentalis*, *Celtis tenuifolia*, *Acer leucoderme*, *Cornus florida*, *Staphylea trifolia*, *Chionanthus virginicus*, *Ulmus rubra*, *Ptelea trifoliata*, *Symphoricarpos orbiculatus*, and *Rhus copallinum* var. *latifolia*. *Toxicodendron radicans* ssp. *radicans* and *Parthenocissus quinquefolia* are common scrambling vines. Herbs include *Sedum ternatum*, *Solidago* spp., *Danthonia sericea*, *Danthonia spicata*, *Andropogon virginicus*, *Carex pensylvanica*, *Paronychia argyrocoma*, *Selaginella rupestris*, *Houstonia longifolia*, *Amsonia tabernaemontana*, *Dichantherium boscii*, *Muhlenbergia tenuifolia*, *Packera obovata*, *Asclepias quadrifolia*, *Erigeron pulchellus*, *Polygala paucifolia*, *Arabis laevigata*, *Campanula divaricata*, and *Aristolochia serpentaria*. Some openings are very grassy and include species such as *Sorghastrum nutans*, *Andropogon gerardii*, *Muhlenbergia capillaris*, *Panicum* sp., *Coreopsis major*, *Baptisia tinctoria*, *Lechea racemulosa*, *Liatris* sp., and *Penstemon* sp. Additional herbs from stands assigned here from the Ocoee River Gorge (Tennessee) include *Chasmanthium latifolium*, *Solidago sphacelata*, *Carex purpurifera*, and *Symphotrichum oblongifolium* (these dominant to frequent), as well as *Asplenium platyneuron*, *Carex laxiflora*, *Carex pensylvanica*, *Cheilanthes lanosa*, *Dichantherium* sp., *Euphorbia corollata*, *Geum* sp., *Heuchera* sp., *Oxalis grandis*, *Rudbeckia triloba*, *Sedum nevii*, *Senna marilandica*, *Tradescantia* sp., *Verbesina occidentalis*, and *Verbesina virginica*.

## ENVIRONMENTAL DESCRIPTION

**Great Smoky Mountains National Park Environment:** Within the park, these communities occur on steep slopes with calcareous outcrops. Since there is very little of this geology in the park, this type is extremely rare and may only occur in one location in the park.

**Global Environment:** This community is associated with steep slopes of the Southern Blue Ridge, below 915 m (3000 feet) elevation, over outcrops of moderately calcareous shales, siltstones and sandstones. Habitats are extremely steep and rocky, with some parts mantled by thin soil over bedrock, and other parts covered by loose gravel-sized shale fragments. Known stands are located on slopes fronting rivers and large streams, where downcutting over geological time has resulted in continual mass-wasting of the relatively soft shales. Quantitative soil chemistry data are not available, but the presence of some obligate nutrient-demanding species (e.g., *Philadelphus hirsutus*, *Acer leucoderme*, *Packera obovata*, *Solidago sphacelata*) and a conspicuous absence of ericaceous shrubs at every site is indicative of at least moderately calcareous soils. At the Virginia site, on a steep, southwest-facing sideslope along Whitetop Laurel Creek, calciphilic species tend to be concentrated on the lower, more erosive soils of the occurrence, and less common on more stable, upper slopes where bases have probably been leached. Bedrock is mapped as the Unicoi Formation, which

here consists of conglomeratic sandstone and phyllite, with minor interbedded basalt. Numerous shaley-appearing outcrops and loose boulders cover about 50% of the slope where this community occurs. About 30% of the remaining surface substrate consists of exposed, dark-colored, clay-loam mineral soil with substantial coverage by mosses and lichens.

#### VEGETATION DESCRIPTION

**Great Smoky Mountains National Park Vegetation:** The vegetation of this community may approach a forest with the influence of adjacent *Quercus prinus* matrix communities. However, examples of this community possess short *Carya glabra*, *Fraxinus americana*, *Ulmus americana*, and *Quercus prinus* over a sparse to moderate shrub layer of *Philadelphus hirsutus*. The herbaceous layer in the example of this community sampled was very diverse, with plants ranging from *Arnoglossum atriplicifolium* (= *Cacalia atriplicifolia*) and *Pilea pumila* that occur in more mesic habitats to *Polystichum acrostichoides* and *Asplenium platyneuron*, plants generally associated with drier and more acidic soils.

**Global Vegetation:** Trees are sparse and stunted, generally 2-10 m tall. Primary species include *Quercus montana* (= *Quercus prinus*), *Juniperus virginiana* var. *virginiana*, *Pinus virginiana*, and *Acer rubrum*. Some stands have *Carya glabra*, *Carya ovata*, *Carya caroliniae-septentrionalis*, *Fraxinus americana*, *Quercus rubra*, *Ulmus alata*, and *Acer saccharum* as important canopy associates. Shrubs include *Philadelphus hirsutus*, *Ostrya virginiana*, *Cercis canadensis* var. *canadensis*, *Celtis occidentalis*, *Celtis tenuifolia*, *Acer leucoderme*, *Cornus florida*, *Staphylea trifolia*, *Chionanthus virginicus*, *Ulmus rubra*, *Ptelea trifoliata*, *Symphoricarpos orbiculatus*, and *Rhus copallinum* var. *latifolia*. *Toxicodendron radicans* ssp. *radicans* and *Parthenocissus quinquefolia* are common. Herbs include *Sedum ternatum*, *Solidago* spp., *Danthonia sericea*, *Danthonia spicata*, *Andropogon virginicus*, *Carex pensylvanica*, *Paronychia argyrocoma*, *Selaginella rupestris*, *Houstonia longifolia* (= var. *compacta*), *Amsonia tabernaemontana*, *Dichanthelium boscii*, *Muhlenbergia tenuifolia*, *Packera obovata* (= *Senecio obovatus*), *Asclepias quadrifolia*, *Erigeron pulchellus*, *Polygala paucifolia*, *Arabis laevigata*, *Campanula divaricata*, and *Aristolochia serpentaria*. Some openings are very grassy, and include species such as *Sorghastrum nutans*, *Andropogon gerardii*, *Muhlenbergia capillaris*, *Panicum* sp., *Coreopsis major*, *Baptisia tinctoria*, *Lechea racemulosa*, *Liatris* sp., and *Penstemon* sp. Additional herbs from stands assigned here from the Ocoee River Gorge (Tennessee) include *Chasmanthium latifolium*, *Solidago sphacelata*, *Carex purpurifera*, and *Symphyotrichum oblongifolium* (= *Aster oblongifolius*) (these dominant to frequent), as well as *Asplenium platyneuron*, *Carex laxiflora*, *Carex pensylvanica*, *Cheilanthes lanosa*, *Dichanthelium* sp., *Euphorbia corollata*, *Geum* sp., *Heuchera* sp., *Oxalis grandis*, *Rudbeckia triloba*, *Sedum nevii*, *Senna marilandica*, *Tradescantia* sp., *Verbesina occidentalis*, and *Verbesina virginica*.

Stands included here from shale slopes above the French Broad River (Cherokee National Forest, Tennessee) are open stands on "sub-calcareous" shales. The vegetation has an open canopy of *Quercus montana* with scattered examples of other woody plants. Other trees include *Ostrya virginiana*, *Ulmus alata*, *Quercus rubra*, *Carya pallida*, and *Pinus virginiana*. These are primarily deciduous stands, but with some pine. The stand in Virginia is a deciduous, apparently edaphically-maintained woodland dominated by stunted (6-10 m tall) *Quercus montana* and *Carya glabra*, with less common associates of *Fraxinus americana*, *Carya ovata*, *Quercus rubra*, and *Acer saccharum*. Shrub cover varies from moderately to very dense and is dominated by patchy thickets of *Philadelphus hirsutus*. Associated small trees and shrubs include *Ostrya virginiana* and *Amelanchier arborea*. The herb layer is sparse on the steeper, more erosive slopes, becoming denser and more grass-dominated on the stabilized upper slope.

**Global Dynamics:** This community appears to be edaphically-maintained, but may also be maintained by periodic fires. The exotic grass *Microstegium vimineum* can be invasive in stands of this association.

#### MOST ABUNDANT SPECIES

##### Great Smoky Mountains National Park

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Broad-leaved deciduous tree	<i>Carya glabra</i> , <i>Fraxinus americana</i> , <i>Ostrya virginiana</i> , <i>Quercus montana</i> , <i>Ulmus americana</i>
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	<i>Philadelphus hirsutus</i>

##### Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Broad-leaved deciduous tree	<i>Carya glabra</i> , <i>Fraxinus americana</i> , <i>Ostrya virginiana</i> , <i>Quercus montana</i>
Tall shrub/sapling	Broad-leaved deciduous shrub	<i>Philadelphus hirsutus</i>

#### CHARACTERISTIC SPECIES

**Great Smoky Mountains National Park:** *Carya glabra*, *Philadelphus hirsutus*, *Ulmus americana*

**Global:** *Acer rubrum*, *Celtis occidentalis*, *Juniperus virginiana*, *Philadelphus hirsutus*, *Pinus virginiana*, *Quercus montana*

#### OTHER NOTEWORTHY SPECIES

**Global: Vulnerable Plants:** *Pycnanthemum curvipes* (G3), *Sedum nevii* (G3), *Thaspium pinnatifidum* (G2G3)

#### CONSERVATION STATUS RANK

**Global Rank & Reasons:** G2 (24-Feb-2010). This Southern Blue Ridge shale woodland community is limited in occurrence to steep river-fronting slopes with moderately calcareous, exposed and eroding shale. This community appears to be edaphically-maintained, but may also be maintained by periodic fires. Fewer than 10 occurrences totaling less than 1000 acres are known. Threats are few, although logging in adjacent areas can cause unnatural disturbance or downslope erosion, along with alteration of light levels.

## RELATED CONCEPTS

**Global Similar Types:**

- *Pinus virginiana* / *Vaccinium pallidum* / *Schizachyrium scoparium* - *Carex pensylvanica* Woodland (CEGL003624)
- *Quercus montana* - *Pinus virginiana* - (*Pinus pungens*) / *Schizachyrium scoparium* - *Dichanthelium depauperatum* Woodland (CEGL008540)

**Global Related Concepts:**

- *Carya glabra* - *Fraxinus americana* - *Quercus prinus* / *Ostrya virginiana* / *Philadelphus hirsutus* Woodland (Fleming and Coulling 2001) =

## CLASSIFICATION

**Status:** Standard

**Classification Confidence:** 2 - Moderate

**Great Smoky Mountains National Park Other Comments:** This community may deserve its own community type, but based on the one location that we have documented within the park boundary we could not find sufficient justification to create the new type yet. We should continue to look for other examples of this community type to document and to use for later elaboration of this type into two.

**Global Classification Comments:** In a regional analysis for the Southern Appalachian portion of the Appalachian Trail (Fleming and Patterson 2009a), a small group of three plots was determined to be conceptually and floristically consistent with this association. All three plots were formerly assigned to the all-deciduous type (former *Carya glabra* - *Fraxinus americana* - *Quercus prinus* / *Ostrya virginiana* / *Philadelphus hirsutus* Woodland (CEGL004995)), and a decision was made to merge that type into this one.

## ELEMENT DISTRIBUTION

**Global Range:** This shale woodland is limited to the Southern Blue Ridge of North Carolina, Tennessee, and Virginia. Known stands are from the Hot Springs Window in North Carolina, the French Broad River and Ocoee River Gorge in Tennessee, and along Whitetop Laurel Creek near Damascus, Virginia.

**Nations:** US

**States/Provinces:** NC, TN, VA:S1

**TNC Ecoregions:** 51:C

**USFS Ecoregions (1994/95):** M221Ce:C??, M221Db:CCC, M221Dc:CCC, M221Dd:CCC

**USFS Ecoregions (2007):** M221Ce:C??, M221Db:CCC, M221Dc:CCC, M221Dd:CCC

**Federal Lands:** NPS (Appalachian Trail [Southern Blue Ridge], Great Smoky Mountains); USFS (Cherokee, Jefferson, Nantahala, Pisgah)

## ELEMENT SOURCES

**Great Smoky Mountains National Park Description Author(s):** R. White

**Global Description Author(s):** A.S. Weakley and G.P. Fleming

**References:** Fleming and Coulling 2001, Fleming and Patterson 2009a, Fleming et al. 2017, NatureServe Ecology - Southeastern U.S. unpubl. data, Peet et al. unpubl. data, Schafale 2012, Southeastern Ecology Working Group n.d.

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## A3291 *Quercus stellata* - *Quercus falcata* - *Quercus alba* Interior Low Plateau Woodland Alliance

Post Oak - Southern Red Oak - White Oak Interior Low Plateau Woodland Alliance

*Interior Low Plateau Mixed Oak Woodland*

## ALLIANCE CONCEPT

**Summary:** These are woodlands and open forests of the Interior Low Plateau and adjacent ecoregions, including the Ridge and Valley, Piedmont, Gulf Coastal Plains, and the lower elevations of the Southern Blue Ridge. Examples are dominated by some combination of *Quercus alba*, *Quercus falcata*, *Quercus marilandica*, and/or *Quercus stellata*, with *Carya tomentosa*, *Carya pallida*, and/or *Juniperus virginiana*. Stands are typically found on dry-mesic terraces and midslopes, as well as lower slope hillsides and terraces. Soils are predominantly thin, well-drained, and gravelly. Canopy closure is incomplete and variable depending on fire history and management. The shrub layer may contain *Aralia spinosa*, *Cornus florida*, *Rhus copallinum*, and *Sassafras albidum*. The herbaceous layer may be dense and dominated by *Schizachyrium scoparium* and a diverse assemblage of grasses and forbs. These characteristic grasses and herbs include *Agrimonia pubescens*, *Coreopsis tripteris*, *Dichanthelium* spp., *Elephantopus carolinianus*, and *Symphytotrichum shortii*. Vines include *Smilax glauca*, which is characteristic of this drier environment, along with *Parthenocissus quinquefolia* and *Toxicodendron radicans*.

**Classification Comments:** Should the Piedmont elements of this alliance be transferred elsewhere?

**Diagnostic Characteristics:** This alliance is at least partly defined on biogeographic criteria. It is by definition primarily found in the Interior Low Plateau (rather than the Ozarks or the Piedmont). Stands are dominated by a combination of wide-ranging hardwood species (*Quercus alba*, *Quercus falcata*, *Quercus stellata*), so these alone are not diagnostic.

**Rationale for Nominal Species or Physiognomic Features:** The nominal species, *Quercus alba*, *Quercus falcata*, and *Quercus stellata*, are wide-ranging, so this alliance is partly differentiated on biogeographic criteria, being found in the Interior Low Plateau (rather than the Ozarks or the Piedmont).

**Related Concepts:**

- IA6c. Dry Post Oak - Blackjack Oak Forest (Allard 1990) ><
- IA6i. Interior Upland Dry-Mesic Oak - Hickory Forest (Allard 1990) ><
- White Oak - Black Oak - Northern Red Oak: 52 (Eyre 1980) ><

**ALLIANCE DESCRIPTION**

**Environment:** Stands are typically found on dry-mesic terraces and midslopes, as well as lower slope hillsides and terraces. Soils are predominantly thin, well-drained, and gravelly. Forests of this alliance may occupy narrow bands of dry-mesic habitat transitional between lower and midslope mesic communities and xeric ridgetops. In parts of the Interior Low Plateaus and adjacent regions, these forests form a common matrix vegetation over acidic sandstone and shales.

**Vegetation:** These woodlands and open forests are dominated by some combination of *Quercus alba*, *Quercus coccinea*, *Quercus falcata*, *Quercus marilandica*, and/or *Quercus stellata*, with *Carya tomentosa* (= *Carya alba*), *Carya carolinae-septentrionalis*, *Carya ovata*, *Carya pallida*, *Fraxinus americana*, and/or *Juniperus virginiana*. Canopy closure is incomplete and variable depending on fire history and management. Common subcanopy and shrub species may include *Aralia spinosa*, *Cornus florida*, *Rhus copallinum*, *Sassafras albidum*, *Symphoricarpos orbiculatus*, *Ulmus alata*, *Vaccinium stamineum*, *Viburnum prunifolium*, and *Viburnum rufidulum*. The herbaceous layer may be dense and dominated by *Schizachyrium scoparium* and a diverse assemblage of grasses and forbs. These characteristic grasses and herbs include *Agrimonia pubescens*, *Chimaphila maculata*, *Coreopsis major*, *Coreopsis tripteris*, *Desmodium* spp., *Dichanthelium* spp., *Elephantopus carolinianus*, *Solidago ulmifolia*, *Symphotrichum shortii* (= *Aster shortii*), and *Tephrosia virginiana*. Vines include *Smilax glauca*, which is characteristic of this drier environment, along with *Parthenocissus quinquefolia* and *Toxicodendron radicans*.

**Physiognomy and Structure:** These are woodlands and open forests. Canopy closure is incomplete and variable depending on fire history and management.

**Floristics:** These woodlands and open forests are dominated by some combination of *Quercus alba*, *Quercus coccinea*, *Quercus falcata*, *Quercus marilandica*, and/or *Quercus stellata*, with *Carya tomentosa* (= *Carya alba*), *Carya carolinae-septentrionalis*, *Carya ovata*, *Carya pallida*, *Fraxinus americana*, and/or *Juniperus virginiana*. Canopy closure is incomplete and variable depending on fire history and management. Common subcanopy and shrub species may include *Aralia spinosa*, *Cornus florida*, *Rhus copallinum*, *Sassafras albidum*, *Symphoricarpos orbiculatus*, *Ulmus alata*, *Vaccinium stamineum*, *Viburnum prunifolium*, and *Viburnum rufidulum*. The herbaceous layer may be dense and dominated by *Schizachyrium scoparium* and a diverse assemblage of grasses and forbs. These characteristic grasses and herbs include *Agrimonia pubescens*, *Chimaphila maculata*, *Coreopsis major*, *Coreopsis tripteris*, *Desmodium* spp., *Dichanthelium* spp., *Elephantopus carolinianus*, *Solidago ulmifolia*, *Symphotrichum shortii* (= *Aster shortii*), and *Tephrosia virginiana*. Vines include *Smilax glauca*, which is characteristic of this drier environment, along with *Parthenocissus quinquefolia* and *Toxicodendron radicans*.

**Dynamics:** Canopy closure is incomplete and variable depending on fire history and management. Fire, climate, native grazing and edaphic factors all likely played a role historically in maintaining an open structure in this vegetation. Loss of these natural processes often results in a shift toward a more closed canopy, an increase in successional woody species such as *Juniperus* spp., and a decrease in native grass cover.

**ALLIANCE DISTRIBUTION**

**Range:** This wide-ranging alliance is found primarily in the Interior Low Plateau of Illinois, Indiana, Kentucky and Tennessee, as well as in the Ridge and Valley from Alabama to Kentucky. Some associations may range into the adjacent Piedmont, Gulf Coastal Plains, or marginally into the lower elevations of the Southern Blue Ridge.

**Nations:** US

**Subnations:** AL, AR?, GA, IL, IN, KY, LA?, MO, MS, NC, SC, TN

**TNC Ecoregions:** 38:P, 42:C, 43:C, 44:C, 50:C, 51:C, 52:C, 53:?

**ALLIANCE SOURCES**

**References:** Allard 1990, Andreu and Tukman 1995, Braun 1950, Evans et al. 2009, Eyre 1980, Faber-Langendoen et al. 2019b, Foti 1994b, Foti et al. 1994, Fralish et al. 1991, Golden 1979, Nelson 1986, Oosting 1942, Peet and Christensen 1980, Robertson and Heikens 1994, Schafale and Weakley 1990, Voigt and Mohlenbrock 1964, Wharton 1945

**Author of Concept:** Faber-Langendoen et al. 2019b

**Author of Description:** M. Pyne, in Faber-Langendoen et al. (2013)

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**[CEGL008567] *Quercus alba* - *Quercus falcata* / *Vaccinium (arboreum, hirsutum, pallidum)* Forest**

Translated Name: **White Oak - Southern Red Oak / (Farkleberry, Hairy Blueberry, Blue Ridge Blueberry) Forest**

Common Name: **Appalachian White Oak - Southern Red Oak Forest**

**USNVC CLASSIFICATION**

Division Eastern North American Forest & Woodland (1.B.2.Na)  
 Macrogroup Southern & South-Central Oak - Pine Forest & Woodland (M016)

Group South-Central Interior Oak Forest & Woodland (G159)  
 Alliance *Quercus stellata* - *Quercus falcata* - *Quercus alba* Interior Low Plateau Woodland Alliance  
 (A3291)

#### ELEMENT CONCEPT

**Global Summary:** This is a dry-mesic, deciduous white oak - southern red oak forest found at lower elevations (200-550 m [700-1800 feet]) in the Ridge and Valley and the adjacent southern part of the Southern Blue Ridge, in Tennessee, North Carolina and possibly adjacent Georgia. This includes the gentle slopes and shallow dry-mesic drains of the more-or-less flat metasedimentary surface of Chilhowee Mountain, Tennessee. The canopy is dominated by *Quercus alba* and *Quercus falcata*, possibly with *Quercus stellata* and *Quercus velutina*, typically with lower cover by *Quercus stellata*, *Quercus coccinea*, and/or *Quercus muehlenbergii*. The hickory species *Carya tomentosa*, *Carya glabra*, and *Carya ovata* may also be present or codominant. Dominance by pines (e.g., *Pinus echinata*, *Pinus strobus*, *Pinus virginiana*) should be less than 25%. The subcanopy typically contains *Oxydendrum arboreum*, *Nyssa sylvatica*, *Acer rubrum*, *Carya glabra*, and *Pinus strobus*. Shrubs and other woody plants that may be present include *Carya pallida*, *Cornus florida*, *Rhododendron calendulaceum*, *Tsuga canadensis*, *Sassafras albidum*, *Ostrya virginiana*, *Amelanchier arborea*, and *Magnolia fraseri*.

#### ENVIRONMENTAL DESCRIPTION

**Global Environment:** These dry-mesic forests are found at lower elevations (200-550 m [700-1800 feet]) in the Ridge and Valley and the adjacent southern part of the Southern Blue Ridge, in Tennessee and possibly adjacent Georgia. This includes the gentle slopes and shallow dry-mesic drains of the more-or-less flat metasedimentary surface of Chilhowee Mountain, Tennessee. Chilhowee Mountain is regarded as being somewhat more like the adjacent Ridge and Valley than like the majority of the Southern Blue Ridge. Classed by Keys et al. (1995) as part of M221Dd but by EPA (2004) as part of a separate Level IV Ecoregion 66e.

#### VEGETATION DESCRIPTION

**Global Vegetation:** The canopy of stands of this type is dominated by *Quercus alba* and *Quercus falcata*, possibly with *Quercus stellata* and *Quercus velutina*, typically with lower cover by *Quercus stellata*, *Quercus coccinea*, and/or *Quercus muehlenbergii*. The hickory species *Carya tomentosa* (= *Carya alba*), *Carya glabra*, and *Carya ovata* may also be present or codominant. Dominance by pines (e.g., *Pinus echinata*, *Pinus strobus*, *Pinus virginiana*) should be less than 25%. The subcanopy typically contains *Oxydendrum arboreum*, *Nyssa sylvatica*, *Acer rubrum*, *Carya glabra*, and *Pinus strobus*. Shrubs and other woody plants that may be present include *Carya pallida*, *Cornus florida*, *Rhododendron calendulaceum*, *Tsuga canadensis*, *Sassafras albidum*, *Ostrya virginiana*, *Amelanchier arborea*, and *Magnolia fraseri*. In the Southern Blue Ridge of southeastern Tennessee (e.g., on Chilhowee Mountain), the low-shrub layer may be dominated by *Vaccinium hirsutum*; outside of the limited range of this species, the shrub strata may contain other ericaceous shrubs such as *Vaccinium arboreum* and *Vaccinium pallidum*. Other shrubs include *Smilax glauca*. Vines include *Vitis rotundifolia*. Herbs include *Mitchella repens*, *Dichantherium* sp., *Eupatorium* sp., *Iris verna*, *Smilax glauca*, *Solidago odora*, *Pleopeltis polypodioides* ssp. *michauxiana*, *Hypericum hypericoides* ssp. *multicaule*, *Chasmanthium sessiliflorum*, *Viola* sp., and *Botrychium virginianum*. Additional herbs include *Coreopsis major*, *Houstonia purpurea*, *Ipomoea pandurata*, *Lobelia puberula*, *Lysimachia quadrifolia*, and *Stenanthium gramineum*.

In a stand in the Cherokee National Forest (John Muir Trail #2), the canopy contains *Quercus alba*, *Quercus falcata*, and *Quercus stellata*. The subcanopy contains *Oxydendrum arboreum*, *Nyssa sylvatica*, *Acer rubrum*, *Carya glabra*, and *Pinus strobus*. Shrubs include *Vaccinium arboreum*, *Tsuga canadensis*, *Vaccinium pallidum*, *Sassafras albidum*, *Ostrya virginiana*, *Amelanchier arborea*, and *Magnolia fraseri*. Vines include *Vitis rotundifolia*. Herbs include *Mitchella repens*, *Dichantherium* sp., *Eupatorium* sp., *Iris verna*, *Smilax glauca*, *Solidago odora*, *Pleopeltis polypodioides* ssp. *michauxiana*, *Hypericum hypericoides* ssp. *multicaule*, *Chasmanthium sessiliflorum*, *Viola* sp., and *Botrychium virginianum*. Plots assigned to this type from Tellico Pilot Project (Ridge and Valley of Tennessee) (Andreu and Tukman 1995) are variably dominated by *Quercus alba*, *Quercus velutina*, and *Quercus falcata*, typically with lower cover by *Quercus stellata*, *Quercus coccinea*, and *Quercus muehlenbergii*. The hickory species *Carya tomentosa*, *Carya glabra*, and *Carya ovata* may also be present or codominant. These stands may also contain *Liriodendron tulipifera*, *Liquidambar styraciflua*, *Pinus virginiana*, *Pinus echinata* in their canopies, and *Oxydendrum arboreum*, *Juniperus virginiana*, *Nyssa sylvatica*, *Cornus florida*, *Cercis canadensis*, and *Fagus grandifolia* in their subcanopies. Data from lower strata were not consistently developed in this study.

#### MOST ABUNDANT SPECIES

<u>Global Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Broad-leaved deciduous tree	<i>Quercus alba</i> , <i>Quercus falcata</i>

#### CHARACTERISTIC SPECIES

**Global:** *Quercus alba*, *Quercus falcata*, *Vaccinium arboreum*, *Vaccinium pallidum*

#### OTHER NOTEWORTHY SPECIES

**Global: Other Plants:** *Vaccinium hirsutum* (G4)

**CONSERVATION STATUS RANK**

**Global Rank & Reasons:** G3G4 (17-May-2002). This is not an inherently rare forest type, but it is somewhat restricted in range (Ridge and Valley and adjacent Southern Blue Ridge in southern Tennessee and probably adjacent Georgia). It is presumed to be relatively common throughout its known range, but this may be limited in extent. Not much data are available on the specific condition of examples of this type. Some limited examples are found in the Cherokee (and possibly) Chattahoochee national forests. Stands are threatened by removal of commercially valuable timber species (e.g., *Quercus alba*, *Quercus falcata*, *Quercus stellata*, *Carya* spp.).

**RELATED CONCEPTS****Global Similar Types:**

- *Pinus echinata* - *Quercus alba* / *Vaccinium pallidum* / *Hexastylis arifolia* - *Chimaphila maculata* Forest (CEGL008427) with *Pinus echinata* codominant.
- *Pinus strobus* - *Quercus alba* - (*Carya tomentosa*) / *Gaylussacia ursina* Forest (CEGL007517) with *Pinus strobus* codominant.
- *Quercus alba* - *Quercus (coccinea, velutina, montana)* / *Gaylussacia baccata* Forest (CEGL008521) generally without *Quercus falcata*; originally described from Virginia, ranging into eastern Tennessee (as of 2005).
- *Quercus falcata* - *Quercus alba* - *Carya tomentosa* / *Oxydendrum arboreum* / *Vaccinium stamineum* Forest (CEGL007244) of the Piedmont, Interior Low Plateau, upper Coastal Plains.

**Global Related Concepts:**

- *Quercus falcata* - *Q. stellata* - *Carya (tomentosa, ovata)* / *Juniperus virginiana* (66) (Andreu and Tukman 1995) ><

**CLASSIFICATION**

**Status:** Standard

**Classification Confidence:** 3 - Weak

**Global Classification Comments:** This type is peripheral in the Southern Blue Ridge, being more typical of the Ridge and Valley and better developed and distributed in the Ridge and Valley. Stands assigned here should be primarily deciduous-dominated; greater than 25% dominance by pines (e.g., *Pinus echinata*, *Pinus strobus*, *Pinus virginiana*) would lead to assignment to a related mixed evergreen-deciduous type (e.g., CEGL007517, CEGL008427). This forest seems to be distinct because no element from this alliance has been previously described from the Ridge and Valley and the southern part of the Southern Blue Ridge; the alliance is better developed in the Coastal Plain and other related ecoregions.

**ELEMENT DISTRIBUTION**

**Global Range:** This association is thought to be mostly restricted to the Ridge and Valley and lower elevations of the southern end of the adjacent Southern Blue Ridge in Tennessee, North Carolina and presumably adjacent Georgia.

**Nations:** US

**States/Provinces:** GA?, NC, TN

**TNC Ecoregions:** 50:C, 51:C

**USFS Ecoregions (1994/95):** 221Jb:CCC, 231De:???, M221Dd:CCC

**USFS Ecoregions (2007):** 221Jb:CCC, 231De:???, M221Dd:CCC

**Federal Lands:** NPS (Chickamauga-Chattanooga?, Great Smoky Mountains); TVA (Tellico); USFS (Chattahoochee (Southern Blue Ridge)?, Chattahoochee?, Cherokee)

**ELEMENT SOURCES**

**Global Description Author(s):** M. Pyne

**References:** Andreu and Tukman 1995, EPA 2004, Keys et al. 1995, NatureServe Ecology - Southeastern U.S. unpubl. data, Southeastern Ecology Working Group n.d.

**M502. Appalachian-Northeastern Oak - Hardwood - Pine Forest & Woodland****G015. SOUTHERN APPALACHIAN OAK / CHESTNUT FOREST**

**Group Summary Description:** This dry acidic Appalachian oak forest group includes mostly closed-canopy deciduous (oak) forests and mixed (oak-pine) forests with a variable mixture of dry-site oak and pine species. It is characterized by the occurrence of *Quercus montana* and/or other oaks, typically *Quercus alba*, *Quercus coccinea*, or *Quercus velutina*, often with sprouts of *Castanea dentata*. *Pinus strobus* or *Pinus virginiana* may be an important associate in some areas. Widespread hardwood associates include *Quercus rubra*, *Betula lenta*, *Carya glabra*, *Nyssa sylvatica*, and *Sassafras albidum*. Additional associated trees in parts of the group's range include *Halesia tetraptera* var. *monticola*, *Liriodendron tulipifera*, *Magnolia acuminata*, and *Oxydendrum arboreum*. Subcanopy, shrub, and herb layers vary, but in many cases a moderately well- to well-developed heath layer is present. Ericaceous shrubs are often common and include *Kalmia latifolia*, *Gaylussacia baccata*, *Gaylussacia frondosa*, *Gaylussacia ursina*, *Vaccinium pallidum*, *Vaccinium angustifolium*, *Vaccinium stamineum*, *Vaccinium arboreum*, *Vaccinium simulatum*, *Menziesia pilosa*, *Rhododendron calendulaceum*, and *Rhododendron prinophyllum*. This group is centered on the ranges of *Castanea dentata* and *Quercus montana*, ranging from central New England south through the Central Appalachian and Western Allegheny regions to the Cumberland Plateau and Southern Appalachians. The substrate is typically dry, acidic, and infertile. Elevation ranges from sea level (in the northern part of the range) to about 1500 m (in the Southern Appalachians).

**A4390 *Quercus alba* - *Quercus rubra* - *Quercus montana* Forest Alliance**White Oak - Northern Red Oak - *Quercus montana* Forest Alliance*Southern Appalachian Dry-Mesic Oak Forest***ALLIANCE DISTRIBUTION****Nations:** US**Subnations:** GA, KY, NC, SC, TN, VA**ALLIANCE SOURCES****Author of Concept:** n.d.**[CEGL007517] *Pinus strobus* - *Quercus alba* - (*Carya tomentosa*) / *Gaylussacia ursina* Forest**Translated Name: **Eastern White Pine - White Oak - (Mockernut Hickory) / Bear Huckleberry Forest**Common Name: **Appalachian White Pine - Mesic Oak Forest****USNVC CLASSIFICATION**

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Northeastern Oak - Hardwood - Pine Forest & Woodland (M502)
Group	Southern Appalachian Oak / Chestnut Forest (G015)
Alliance	<i>Quercus alba</i> - <i>Quercus rubra</i> - <i>Quercus montana</i> Forest Alliance (A4390)

**ELEMENT CONCEPT**

**Global Summary:** This association covers mesic pine-oak-hickory in the Cumberlands and Southern Ridge and Valley, Southern Blue Ridge Escarpment and in the Piedmont transition, found below 885 m (2900 feet) elevation, on protected ridges, mid- to upper slopes, and in disturbed bottoms. Canopies are dominated by variable mixtures of *Pinus strobus*, *Quercus alba*, *Quercus velutina*, *Carya tomentosa*, and *Acer rubrum*. Other canopy species may include *Liriodendron tulipifera*, *Tsuga canadensis*, *Quercus rubra*, *Quercus falcata*, *Quercus montana*, and *Magnolia fraseri*. Subcanopy and saplings include canopy species and *Cornus florida*, *Halesia tetraptera*, *Oxydendrum arboreum*, and *Nyssa sylvatica*. Shrub layers are moderate to dense, with *Gaylussacia ursina* and *Kalmia latifolia* most commonly dominating. Other shrubs include *Rhododendron minus*, *Rhododendron maximum*, *Symplocos tinctoria*, *Arundinaria gigantea*, *Castanea dentata*, *Sassafras albidum*, *Amelanchier arborea*, *Pyrularia pubera*, and *Hydrangea radiata*. The herb stratum is sparse, although ferns (*Thelypteris noveboracensis*, *Dennstaedtia punctilobula* and *Polystichum acrostichoides*) may occasionally dominate. Common herbs include *Chimaphila maculata*, *Viola hastata*, *Goodyera pubescens*, *Maianthemum racemosum*, *Polygonatum biflorum*, *Monotropa uniflora*, *Trillium catesbaei*, *Desmodium nudiflorum*, *Eutrochium purpureum*, *Galium circaezans*, *Galium latifolium*, *Galax urceolata*, *Hexastylis shuttleworthii*, *Medeola virginiana*, *Mitchella repens*, and *Houstonia purpurea*.

**ENVIRONMENTAL DESCRIPTION**

**Global Environment:** Stands of this association are found below 885 m (2900 feet) elevation, on protected ridges, mid- to upper slopes, and in disturbed bottoms in the Cumberlands and Southern Ridge and Valley, Southern Blue Ridge Escarpment and in the Piedmont transition region. The presence of *Pinus strobus* in these forests may be a product of disturbance and subsequent fire suppression. It may have increased its abundance since about 1900.

**VEGETATION DESCRIPTION**

**Global Vegetation:** Canopies are dominated by variable mixtures of *Pinus strobus*, *Quercus alba*, *Carya tomentosa* (= *Carya alba*), and *Acer rubrum*. Other canopy species may include *Liriodendron tulipifera*, *Tsuga canadensis*, *Quercus rubra*, *Quercus montana* (= *Quercus prinus*), and *Magnolia fraseri*. Subcanopy and saplings include canopy species and *Cornus florida*, *Halesia tetraptera*, *Oxydendrum arboreum*, and *Nyssa sylvatica*. Shrub layers are moderate to dense, with *Gaylussacia ursina* and *Kalmia latifolia* most commonly dominating. Other shrubs include *Rhododendron minus*, *Rhododendron maximum*, *Symplocos tinctoria*, *Arundinaria gigantea*, *Castanea dentata*, *Sassafras albidum*, *Amelanchier arborea*, *Pyrularia pubera*, and *Hydrangea radiata*. The herb stratum is sparse, although ferns (*Thelypteris noveboracensis*, *Dennstaedtia punctilobula*, and *Polystichum acrostichoides*) may occasionally dominate. Common herbs include *Chimaphila maculata*, *Viola hastata*, *Goodyera pubescens*, *Maianthemum racemosum*, *Polygonatum biflorum*, *Monotropa uniflora*, *Trillium catesbaei*, *Desmodium nudiflorum*, *Eutrochium purpureum* (= *Eupatorium purpureum*), *Galium circaezans*, *Galium latifolium*, *Galax urceolata*, *Hexastylis shuttleworthii*, *Medeola virginiana*, *Mitchella repens*, and *Houstonia purpurea*.

**MOST ABUNDANT SPECIES****Great Smoky Mountains National Park**

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Pinus strobus</i>
Tree canopy	Broad-leaved deciduous tree	<i>Acer rubrum</i> , <i>Carya tomentosa</i> , <i>Quercus alba</i>
Tree subcanopy	Broad-leaved deciduous tree	<i>Cornus florida</i> , <i>Halesia tetraptera</i> , <i>Nyssa sylvatica</i> , <i>Oxydendrum arboreum</i>
Tall shrub/sapling	Broad-leaved evergreen shrub	<i>Kalmia latifolia</i>

Short shrub/sapling      Broad-leaved deciduous shrub      *Gaylussacia ursina*

**Global**

**Stratum**

Tree canopy

Tree canopy

Tree subcanopy

**Lifeform**

Needle-leaved tree

Broad-leaved deciduous tree

Broad-leaved deciduous tree

Broad-leaved evergreen shrub

Broad-leaved deciduous shrub

**Species**

*Pinus strobus*

*Acer rubrum*, *Carya tomentosa*, *Quercus alba*

*Cornus florida*, *Halesia tetraptera*, *Nyssa sylvatica*, *Oxydendrum arboreum*

*Kalmia latifolia*

*Gaylussacia ursina*

**CHARACTERISTIC SPECIES**

**Global:** *Carya tomentosa*, *Goodyera pubescens*, *Liriodendron tulipifera*, *Magnolia fraseri*, *Medeola virginiana*, *Mitchella repens*, *Pinus strobus*, *Polystichum acrostichoides*, *Quercus alba*, *Thelypteris noveboracensis*

**OTHER NOTEWORTHY SPECIES**

**Global: Vulnerable Plants:** *Ageratina altissima* var. *roanensis* (G5T3T4, Southern Blue Ridge endemic), *Gaylussacia brachycera* (G3), *Hexastylis contracta* (G3)

**CONSERVATION STATUS RANK**

**Global Rank & Reasons:** G3G4 (23-Oct-2003). This community is geographically restricted and uncommon within its range. Rank changed to G3G4 from G2G3 on the recommendation of Gary Kauffman, USDA Forest Service.

**RELATED CONCEPTS**

**Global Similar Types:**

- *Pinus strobus* - *Quercus alba* - *Quercus montana* / *Vaccinium stamineum* Forest (CEGL008539)
- *Quercus alba* - *Quercus falcata* / *Vaccinium (arboreum, hirsutum, pallidum)* Forest (CEGL008567)

**Global Related Concepts:**

- IA6f. Dry White Pine Ridge Forest (Allard 1990) >
- White Pine - White Oak - Chestnut Oak Type (Schmalzer and DeSelm 1982) >

**CLASSIFICATION**

**Status:** Standard

**Classification Confidence:** 2 - Moderate

**Great Smoky Mountains National Park Other Comments:** In some occurrences, *Pinus strobus* may overtop the deciduous canopy component, resulting in a signature similar to other *Pinus strobus*-dominated vegetation (i.e., *Pinus strobus* / *Kalmia latifolia* - (*Vaccinium stamineum*, *Gaylussacia ursina*) Forest (CEGL007100), *Pinus strobus* - *Quercus (coccinea, prinus)* / (*Gaylussacia ursina*, *Vaccinium stamineum*) Forest (CEGL007519), *Pinus strobus* - *Tsuga canadensis* / *Rhododendron maximum* - (*Leucothoe fontanesiana*) Forest (CEGL007102)).

**ELEMENT DISTRIBUTION**

**Great Smoky Mountains National Park Range:** This association was not observed or sampled on the Mount Le Conte or Cades Cove quadrangles but is likely in low-elevation, disturbed areas of the Cades Cove quadrangle and in other parts of the park.

**Global Range:** This community is known from the Cumberlands and Southern Ridge and Valley, Southern Blue Ridge Escarpment and in the Piedmont transition region.

**Nations:** US

**States/Provinces:** GA, KY?, NC, SC, TN

**TNC Ecoregions:** 50:C, 51:C

**USFS Ecoregions (1994/95):** 221Hc:CCC, 221He:CCC, M221Dc:CCC, M221Dd:CCC

**USFS Ecoregions (2007):** 221Hc:CCC, 221He:CC?, M221Dc:CCC, M221Dd:CCC

**Federal Lands:** BIA (Eastern Band of Cherokee); NPS (Appalachian Trail [Southern Blue Ridge], Big South Fork, Great Smoky Mountains, Obed River); USFS (Chattahoochee, Chattahoochee (Southern Blue Ridge), Cherokee, Nantahala, Pisgah, Sumter, Sumter (Mountains))

**ELEMENT SOURCES**

**Great Smoky Mountains National Park Description Author(s):** K.D. Patterson

**Global Description Author(s):** S. Simon and K.D. Patterson

**References:** Allard 1990, Chafin 2011, Fleming and Patterson 2009a, NatureServe Ecology - Southeastern U.S. unpubl. data, Schafale 2012, Schafale and Weakley 1990, Schmalzer and DeSelm 1982, Southeastern Ecology Working Group n.d.

**[CEGL007230] *Quercus alba* - *Quercus (rubra, montana)* / *Rhododendron calendulaceum* - (*Gaylussacia ursina*) Forest**

Translated Name: **White Oak - (Northern Red Oak, Chestnut Oak) / Flame Azalea - (Bear Huckleberry) Forest**

Common Name: **Appalachian Montane Oak - Hickory Forest (Typic Acidic Type)**

## USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Northeastern Oak - Hardwood - Pine Forest & Woodland (M502)
Group	Southern Appalachian Oak / Chestnut Forest (G015)
Alliance	<i>Quercus alba</i> - <i>Quercus rubra</i> - <i>Quercus montana</i> Forest Alliance (A4390)

## ELEMENT CONCEPT

**Global Summary:** These forests occur in a wide elevational range, from 610 to 1372 m (2000-4500 feet), in the Southern Blue Ridge, Blue Ridge/Piedmont transition, and the higher ridges of the Cumberland Mountains and Ridge and Valley in southwestern Virginia. The type occurs generally on deep soils of broad ridgetops, exposed upper slopes and saddles, occurring less frequently on protected lower slopes, bottoms and coves. Stands of this deciduous forest association are dominated or codominated by *Quercus alba*, occurring with other *Quercus* species (*Quercus rubra*, *Quercus montana*, *Quercus coccinea*). Associated species are characteristically montane and typical of acidic forests. This association lacks indicators of circumneutral soils and also lacks low-elevation dry-site species such as *Pinus echinata*, *Quercus falcata*, *Quercus stellata*, and *Quercus marilandica*. Species other than oaks that can be important in the canopy include *Carya tomentosa*, *Carya glabra*, *Carya ovalis*, *Liriodendron tulipifera*, *Acer rubrum*, and *Magnolia fraseri*. Common species in the subcanopy/sapling strata include *Cornus florida*, *Acer rubrum*, *Carya* spp., *Liriodendron tulipifera*, *Magnolia fraseri*, *Nyssa sylvatica*, *Oxydendrum arboreum*, *Pinus strobus*, and *Halesia tetraptera*. Shrub cover is sparse to very dense and is often dominated by deciduous heaths. *Kalmia latifolia* and *Gaylussacia ursina* are usually present, but other shrub species can include *Euonymus americanus*, *Rhododendron calendulaceum*, *Vaccinium stamineum*, *Vaccinium pallidum*, *Viburnum acerifolium*, *Calycanthus floridus*, *Pyrularia pubera*, *Ilex montana*, *Halesia tetraptera*, and *Hamamelis virginiana*. In the northern portion of the range of this association (northwestern North Carolina and southwestern Virginia), *Gaylussacia ursina* is frequently absent from the shrub layer. *Smilax glauca* and *Vitis rotundifolia* are common vines. The herbaceous stratum is sparse to moderate in coverage, but often rich in species, approaching the diversity but not the coverage of rich cove forests. Associated herbaceous species vary with elevation and soil moisture. Often there is a dominant fern stratum, with *Thelypteris noveboracensis* and *Polystichum acrostichoides* most typically dominant.

## ENVIRONMENTAL DESCRIPTION

**Great Smoky Mountains National Park Environment:** This community was sampled at low elevations (1120 to 2600 feet) in draws and on low to middle slopes with south and east aspects. At higher elevations (3800 to 4500 feet) this community occurred on middle to high slopes and summits, with north, west, and south aspects. This forest occurs on sites with well-developed soils.

**Global Environment:** These forests occur in a wide elevational range, from 610 to 1370 m (2000-4500 feet), in the Southern Blue Ridge, the Blue Ridge/Piedmont transition, and the higher ridges of the Cumberland Mountains and Ridge and Valley in southwestern Virginia. The type occurs generally on deep soils of broad ridgetops, exposed upper slopes and saddles, occurring less frequent on protected sites, typically lower slopes, bottoms and coves. Twenty-four plots classified as this type in the Appalachian Trail project have a mean elevation of 1095 m (3592 feet) and occur mostly on convex, southwest-facing upper slopes and crests. Soil samples collected from these plots have a mean pH of 4.4, along with low calcium, magnesium, and total base saturation, and high iron and aluminum.

## VEGETATION DESCRIPTION

**Great Smoky Mountains National Park Vegetation:** The canopy and subcanopy of this forest are dominated by *Quercus alba*, *Carya glabra*, and *Acer rubrum*. At low elevations (below 2600 feet), *Carya alba* shares canopy dominance, and at high elevations (greater than 3800 feet) *Quercus rubra* often codominates. Occasionally *Quercus falcata*, *Liriodendron tulipifera*, and *Halesia tetraptera* var. *monticola* may have high coverage in the canopy and subcanopy. Other typical species in the canopy and subcanopy include *Cornus florida*, *Nyssa sylvatica*, *Oxydendrum arboreum*, *Amelanchier laevis*, *Quercus prinus*, and *Quercus velutina*. The shrub stratum has sparse to moderate coverage often with no clear dominant but can also be sparse. In either case, it is usually more diverse than more acidic oak forests but contains less herbaceous biomass than cove forests that may border this association. Common shrubs include *Acer pensylvanicum*, *Castanea dentata*, *Gaylussacia ursina*, *Ilex opaca*, *Magnolia fraseri*, *Robinia pseudoacacia*, and *Sassafras albidum*. Herbaceous cover can be moderately dense and diverse with no clear dominant. Of the plots sampled *Amphicarpaea bracteata*, *Dennstaedtia punctilobula*, *Desmodium nudiflorum*, *Polystichum acrostichoides* var. *acrostichoides*, and *Thelypteris noveboracensis* most often have the highest coverage. Species with the greatest constancy include *Ageratina altissima* (var. *altissima* and var. *roanensis*), *Eurybia divaricata* (= *Aster divaricatus*), *Carex* spp. (e.g., *Carex laxiflora* var. *laxiflora*, *Carex pensylvanica*, *Carex virescens*), *Chimaphila maculata*, *Collinsonia canadensis*, *Dichanthelium* spp. (e.g., *Dichanthelium boscii*, *Dichanthelium commutatum*, *Dichanthelium dichotomum*), *Dioscorea quaternata*, *Galium* spp. (e.g., *Galium circaezans*, *Galium latifolium*, *Galium triflorum*), *Goodyera pubescens*, *Houstonia purpurea* var. *purpurea*, *Lysimachia quadrifolia*, *Maianthemum racemosum* ssp. *racemosum*, *Potentilla canadensis*, *Prenanthes* spp., *Solidago curtisii* (= *Solidago caesia* var. *curtisii*), *Thalictrum* spp. (e.g., *Thalictrum dioicum*, *Thalictrum thalictroides*), *Trillium* spp. (e.g., *Trillium catesbaei*, *Trillium undulatum*), *Uvularia* spp. (e.g., *Uvularia perfoliata*, *Uvularia puberula*, *Uvularia sessilifolia*), and *Viola* spp. (e.g., *Viola blanda*, *Viola canadensis*, *Viola cucullata*, *Viola hastata*, *Viola rotundifolia*, *Viola sororia*, *Viola tripartita*), although other species may occur. Common vines include *Smilax glauca*, *Smilax rotundifolia*, *Vitis aestivalis*, and *Vitis rotundifolia*.

**Global Vegetation:** The canopies of stands of this association are dominated or codominated by *Quercus alba*, occurring with other *Quercus* species (*Quercus rubra*, *Quercus montana* (= *Quercus prinus*), *Quercus coccinea*). Species other than oaks that can be important in the canopy include *Carya tomentosa* (= *Carya alba*), *Carya glabra*, *Carya ovalis*, *Liriodendron tulipifera*, *Acer rubrum*,

and *Magnolia fraseri*. Stands lack indicators of circumneutral soils and also lack low-elevation dry-site species such as *Pinus echinata*, *Quercus falcata*, *Quercus stellata*, and *Quercus marilandica*. Common species in the subcanopy/sapling strata include *Cornus florida*, *Acer rubrum*, *Carya* spp., *Liriodendron tulipifera*, *Magnolia fraseri*, *Nyssa sylvatica*, *Oxydendrum arboreum*, *Pinus strobus*, and *Halesia tetraptera*. Shrub cover is sparse to very dense, and is often dominated by deciduous heaths, including *Kalmia latifolia* and *Gaylussacia ursina*. Other shrub species can include *Euonymus americanus*, *Rhododendron calendulaceum*, *Vaccinium stamineum*, *Vaccinium pallidum*, *Viburnum acerifolium*, *Calycanthus floridus*, *Pyrolaria pubera*, *Ilex montana*, *Halesia tetraptera*, and *Hamamelis virginiana*. *Smilax glauca* and *Vitis rotundifolia* are common vines. The herbaceous stratum is sparse to moderate in coverage, but often rich in species, approaching that of rich cove forests (but with a different composition). Associated herbaceous species vary with elevation and soil moisture. Some of the more constant species include *Parthenocissus quinquefolia*, *Dioscorea quaternata*, *Dichantherium* spp., *Carex pensylvanica*, *Chimaphila maculata*, *Desmodium nudiflorum*, *Goodyera pubescens*, *Maianthemum racemosum* ssp. *racemosum*, and *Trillium catesbaei*. Other species include *Dichantherium laxiflorum*, *Oclemena acuminata* (= *Aster acuminatus*), *Eurybia divaricata* (= *Aster divaricatus*), *Galax urceolata*, *Galium latifolium*, *Lysimachia quadrifolia*, *Mitchella repens*, *Viola hastata*, *Uvularia puberula*, *Polygonatum biflorum*, *Solidago curtisii*, *Convallaria majuscula*, and *Veratrum parviflorum* (= *Melanthium parviflorum*). Often there is a dominant fern stratum, with *Thelypteris noveboracensis* and *Polystichum acrostichoides* most typically dominant. Other ferns include *Athyrium filix-femina* ssp. *asplenioides*, *Dennstaedtia punctilobula*, and *Dryopteris intermedia*.

**Global Dynamics:** Like many contemporary eastern oak forests, stands of this type in Virginia typically exhibit poor oak recruitment and an understory of *Acer rubrum* and other shade-tolerant mesophytic trees. This condition is generally considered symptomatic of long-term fire exclusion.

#### MOST ABUNDANT SPECIES

##### Great Smoky Mountains National Park

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Broad-leaved deciduous tree	<i>Acer rubrum</i> , <i>Carya glabra</i> , <i>Carya tomentosa</i> , <i>Quercus alba</i> , <i>Quercus rubra</i>
Tree subcanopy	Broad-leaved deciduous tree	<i>Carya tomentosa</i> , <i>Cornus florida</i> , <i>Halesia tetraptera</i> var. <i>monticola</i>
Herb (field)	Liana	<i>Amphicarpaea bracteata</i>
Herb (field)	Flowering forb	<i>Desmodium nudiflorum</i>
Herb (field)	Fern (Spore-bearing forb)	<i>Dennstaedtia punctilobula</i> , <i>Polystichum acrostichoides</i> var. <i>acrostichoides</i> , <i>Thelypteris noveboracensis</i>

##### Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Broad-leaved deciduous tree	<i>Carya glabra</i> , <i>Carya tomentosa</i> , <i>Quercus alba</i> , <i>Quercus coccinea</i> , <i>Quercus montana</i> , <i>Quercus rubra</i>
Tree subcanopy	Broad-leaved deciduous tree	<i>Acer rubrum</i> , <i>Cornus florida</i> , <i>Oxydendrum arboreum</i>
Tall shrub/sapling	Broad-leaved evergreen shrub	<i>Kalmia latifolia</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Gaylussacia ursina</i>
Herb (field)	Fern (Spore-bearing forb)	<i>Polystichum acrostichoides</i> , <i>Thelypteris noveboracensis</i>

#### CHARACTERISTIC SPECIES

**Great Smoky Mountains National Park:** *Carya glabra*, *Carya tomentosa*, *Cornus florida*, *Quercus alba*, *Rhododendron calendulaceum*

**Global:** *Gaylussacia ursina*, *Kalmia latifolia*, *Quercus alba*, *Quercus montana*, *Quercus rubra*, *Rhododendron calendulaceum*

#### OTHER NOTEWORTHY SPECIES

**Global: Vulnerable Plants:** *Ageratina altissima* var. *roanensis* (G5T3T4, Southern Blue Ridge endemic), *Carex lucorum* var. *austrolucorum* (G5T3T4), *Carex manhartii* (G3G4), *Penstemon smallii* (G3), *Robinia hispida* var. *kelseyi* (G4T1), *Sisyrinchium dichotomum* (G2); **Other Plants:** *Canoparmelia caroliniana* (G3G5), *Trillium rugelii* (G4), *Vaccinium hirsutum* (G4)

#### CONSERVATION STATUS RANK

**Global Rank & Reasons:** G4G5 (22-Feb-2010). This is a broad-concept type, and while it may be subdivided in the future if analysis warrants this, it is widely distributed over the Southern Blue Ridge, the Blue Ridge/Piedmont transition, and the higher ridges of the Cumberland Mountains and Ridge and Valley in southwest Virginia, over a broad elevational range. It may form large patches at some sites. It is apparently secure, although fire suppression and insect pathogens represent ongoing stand-altering disturbances. It is not threatened or particularly vulnerable. Mature, high-quality stands are uncommon due to extensive past logging and more recent biotic disturbances.

#### RELATED CONCEPTS

##### Global Similar Types:

- *Acer rubrum* - *Betula lenta* - *Magnolia fraseri* / (*Rhododendron maximum*, *Kalmia latifolia*) Ruderal Forest (CEGL008558)
- *Quercus alba* / *Kalmia latifolia* Forest (CEGL007295)

- *Quercus montana* - (*Quercus rubra*) - *Carya* spp. / *Oxydendrum arboreum* - *Cornus florida* Forest (CEGL007267) is drier and less diverse, and occurs at somewhat lower elevations.
- *Quercus montana* - *Quercus rubra* / *Vaccinium pallidum* - (*Rhododendron periclymenoides*) Forest (CEGL008523) is a dry, Central Appalachian mixed oak forest; usually lacks significant *Quercus alba*.
- *Quercus rubra* - *Acer rubrum* / *Pyrularia pubera* / *Thelypteris noveboracensis* Forest (CEGL006192)
- *Quercus rubra* - *Quercus montana* - *Magnolia (acuminata, fraseri)* / *Acer pensylvanicum* Forest (CEGL004817)

**Global Related Concepts:**

- *Quercus coccinea* - *Carya (alba / glabra)* - *Pinus strobus* / *Cornus florida* Forest (Patterson 1994) =
- IA6h. Montane Oak - Hickory Forest (Allard 1990) >
- Montane Mixed Oak / Oak - Hickory Forest (Fleming and Coulling 2001) >

**CLASSIFICATION****Status:** Standard**Classification Confidence:** 2 - Moderate

**Great Smoky Mountains National Park Other Comments:** The low-elevation (below 2000 feet) *Quercus alba*-dominated forests of the pilot quadrangles have some similarities with forests defined in the *Quercus alba* - *Quercus (falcata, stellata)* Forest Alliance (A.241), but overall are not dry enough to fit the concept of forests in this alliance. It is likely that *Quercus alba*-dominated vegetation in the park represents a subset of the Global concept of *Quercus alba* - *Quercus (rubra, prinus)* / *Rhododendron calendulaceum* - *Kalmia latifolia* - (*Gaylussacia ursina*) Forest (CEGL007230). Samples from the park can be segregated into two distinct groups: *Quercus alba*-dominated forests below 2200 feet, distinguished by high coverage by *Carya alba*, *Cornus florida*, *Liriodendron tulipifera*, and *Polystichum acrostichoides* var. *acrostichoides*; and those over 4000 feet elevation that have greater coverage by *Quercus rubra*, *Amelanchier laevis*, *Magnolia acuminata*, *Ilex montana*, *Rhododendron calendulaceum*, and *Dennstaedtia punctilobula*. These higher elevation examples still have canopies with high coverage by *Quercus alba* and *Carya glabra*, but the overall composition begins to resemble CEGL007300, particularly along the Tennessee / North Carolina stateline on the Cades Cove quadrangle where *Quercus rubra* and *Quercus alba* dominance intergrade and may make delineation of this type difficult.

**Global Classification Comments:** This association is meant to cover the typical acidic, oak-hickory forests of the Southern Blue Ridge Mountains. It has a broad concept, and there is potential for subdividing this type by moisture, elevation, or undergrowth. It can be distinguished from *Quercus montana* - (*Quercus rubra*) - *Carya* spp. / *Oxydendrum arboreum* - *Cornus florida* Forest (CEGL007267) by higher species diversity and the presence of a substantial amount of *Quercus alba*. Twenty-four plots from Georgia, North Carolina, Tennessee, and southwestern Virginia were classified as this association in the Appalachian Trail vegetation mapping project (Fleming and Patterson 2009a). In 12 plots from this dataset, species richness ranges from 29 to 115 species per hectare, and averages 59 species per 1000-m<sup>2</sup> plot.

**ELEMENT DISTRIBUTION**

**Great Smoky Mountains National Park Range:** This community was sampled from the Cades Cove, Mount Le Conte, Gatlinburg, Noland Divide, and Ocanaluftee quadrangles. Historic samples of this community come from low elevations (1120 to 2600 feet) on the Calderwood quadrangle. On low elevations of the Cades Cove quadrangle this community was sampled north of the Cades Cove Loop Road, in the vicinity of Cave Ridge (low east-facing slope, 1791 feet) and west of Paw Paw Ridge at the head of a southwest-facing cove (2230 feet). In the southern portion of the quadrangle, at higher elevations, this community was sampled on the summits and convex high slopes of High Point; the southwest slopes below Gregory Bald; the southeastern high slopes below Moore Spring Camp; the summit ridge of Brier Lick Gap and the upper slopes south of Brier Lick Gap; the southwest middle slopes south of Doe Knob; the upper south slope of Greer Knob; on Twenty Mile Ridge south of Greer Knob; on the convex slopes north of Ekaneetlee Gap; on a south-facing side ridge of Bill Grill Ridge, south of Devils Tater Patch; and the convex west slopes of Mollies Ridge. This community was sampled from the northern portion of the Mount Le Conte quadrangle, on a low slope and low ridge in the vicinity of Copeland Creek (1590 and 1600 feet) and on a low slope above Dudley Creek (1680 feet). Variations of this community were also found just upslope from the Job Corps Center near Cherokee, NC, east of Beaugard Ridge on the Noland Divide Trail, upslope from Abram's Creek, and on the Laurel Fall's Trail. This community may occur in most every quadrangle of the park.

**Global Range:** This community is found in the Southern Blue Ridge, the Blue Ridge/Piedmont transition, and Central Appalachians of the eastern United States.

**Nations:** US**States/Provinces:** GA, NC, SC, TN, VA:S3**TNC Ecoregions:** 50:C, 51:C, 52:P, 59:C**USFS Ecoregions (1994/95):** 231Ag:CCC, M221Aa:CCC, M221Ab:CCC, M221Ce:CCC, M221Db:CCC, M221Dc:CCC, M221Dd:CCC**USFS Ecoregions (2007):** 231Ag:CCC, M221Aa:CCP, M221Ab:CCC, M221Ce:CCP, M221Db:CCC, M221Dc:CCC, M221Dd:CCC**Federal Lands:** BIA (Eastern Band of Cherokee); NPS (Appalachian Trail [Central Appalachians], Appalachian Trail [Southern Blue Ridge], Blue Ridge Parkway, Carl Sandburg Home, Great Smoky Mountains); USFS (Chattahoochee, Chattahoochee (Piedmont)?, Chattahoochee (Southern Blue Ridge), Cherokee, Jefferson, Nantahala, Pisgah, Sumter, Sumter (Mountains))

## ELEMENT SOURCES

**Great Smoky Mountains National Park Plots:** GRSM.37, GRSM.47, GRSM.48, GRSM.52, GRSM.65, GRSM.85, GRSM.88, GRSM.118, GRSM.127, GRSM.257, GRSM.260, GRSM.261, GRSM.308, GRSM.321, GRSM.558.

**Great Smoky Mountains National Park Description Author(s):** K.D. Patterson, mod. R. White

**Global Description Author(s):** K.D. Patterson, T. Govus and G. Fleming

**References:** Allard 1990, Fleming and Coulling 2001, Fleming and Patterson 2009a, Fleming and Patterson 2009b, Fleming et al. 2017, Major et al. 1999, NatureServe Ecology - Southeastern U.S. unpubl. data, Nelson 1986, Patterson 1994, Peet et al. unpubl. data, Schafale 2012, Schafale and Weakley 1990, Southeastern Ecology Working Group n.d., White 2003

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**[CEGL007233] *Quercus alba* - *Quercus rubra* - *Carya ovalis* / *Acer saccharum* / *Polystichum acrostichoides* Forest**

Translated Name: **White Oak - Northern Red Oak - Red Hickory / Sugar Maple / Christmas Fern Forest**

Common Name: **Rich Low-Elevation Appalachian Oak - Hickory Forest**

## USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Northeastern Oak - Hardwood - Pine Forest & Woodland (M502)
Group	Southern Appalachian Oak / Chestnut Forest (G015)
Alliance	<i>Quercus alba</i> - <i>Quercus rubra</i> - <i>Quercus montana</i> Forest Alliance (A4390)

## ELEMENT CONCEPT

**Global Summary:** This is a dry-mesic to mesic, low-montane oak-hickory forest of the Ridge and Valley, Cumberland Mountains, and adjacent Southern Blue Ridge. It has moderately high species diversity, with a variable mixed overstory of *Quercus rubra*, *Quercus alba*, *Carya ovalis*, *Carya ovata*, *Carya tomentosa*, *Liriodendron tulipifera* and, less frequently, *Carya cordiformis*, *Magnolia acuminata*, *Quercus velutina*, and *Quercus montana*. The most characteristic subcanopy species are *Acer rubrum*, *Acer saccharum*, *Fraxinus americana*, *Sassafras albidum*, *Nyssa sylvatica*, *Oxydendrum arboreum*, *Ulmus rubra*, *Cornus florida*, and *Ostrya virginiana*. Shrubs of various heights are commonly present; these may include *Frangula caroliniana*, *Corylus cornuta*, *Corylus americana*, *Vaccinium stamineum*, *Cercis canadensis*, *Asimina triloba*, *Morus rubra*, and *Lindera benzoin*. The herb layer is often diverse; the most constant patch-dominants include *Polystichum acrostichoides*, *Desmodium nudiflorum*, *Amphicarpaea bracteata*, *Dichanthelium boscii*, *Actaea racemosa*, and *Ageratina altissima* var. *altissima*. Some other herbs include *Podophyllum peltatum*, *Maianthemum racemosum* ssp. *racemosum*, *Desmodium pauciflorum*, *Desmodium glutinosum*, *Galium circaezans*, *Uvularia perfoliata*, *Dioscorea quaternata*, *Arisaema triphyllum*, *Conopholis americana*, *Geranium maculatum*, *Solidago curtisii*, *Scutellaria elliptica*, *Brachyelytrum erectum*, *Eutrochium purpureum* var. *purpureum*, *Collinsonia canadensis*, and *Polymnia canadensis*. Many other mesophytic and dry-mesophytic herbs occur at low cover. The canopy is generally closed (>75% cover).

## ENVIRONMENTAL DESCRIPTION

**Global Environment:** Most examples occur between 460 and 850 m (1500-2800 feet) (mean = 615 m [2018 feet]), with a few sites as low as 260 m (850 feet). It occupies a variety of sites, slope positions and aspects, most commonly northwestern to eastern. Most, if not all, sample sites for this type are underlain by sedimentary and metasedimentary rocks, including shale, metashale, siltstone, calcareous sandstone, and interbedded limestone and sandstone. Soil samples collected from plots have moderately high mean high calcium and magnesium, and manganese content.

## VEGETATION DESCRIPTION

**Global Vegetation:** This is a dry-mesic to mesic, low-montane oak-hickory forest with moderately high species diversity. It has a variable mixed overstory of *Quercus rubra*, *Quercus alba*, *Carya ovalis*, *Carya ovata*, *Carya tomentosa* (= *Carya alba*), *Liriodendron tulipifera* and, less frequently, *Carya cordiformis*, *Magnolia acuminata*, *Quercus velutina*, and *Quercus montana* (= *Quercus prinus*). Some stands may also include *Fagus grandifolia*, *Fraxinus americana*, *Pinus virginiana*, *Aesculus flava*, *Nyssa sylvatica*, *Quercus falcata*, *Quercus muehlenbergii*, *Tilia americana* var. *heterophylla*, *Pinus echinata*, *Pinus strobus*, *Prunus serotina*, *Quercus coccinea*, *Ulmus alata*, *Juglans nigra*, *Tsuga canadensis*, and *Ulmus rubra*. The canopy is generally closed (>75% cover). The most characteristic subcanopy species are *Acer rubrum*, *Acer saccharum*, *Fraxinus americana*, *Sassafras albidum*, *Nyssa sylvatica*, *Oxydendrum arboreum*, *Ulmus rubra*, *Cornus florida*, and *Ostrya virginiana*, with *Liquidambar styraciflua*, *Ulmus alata*, and *Prunus serotina* present in some stands. *Acer saccharum* and/or *Acer rubrum* typically strongly dominate the subcanopy. In the Tellico Pilot Project, *Acer saccharum* had a relative frequency value of >90% and an average canopy cover dominance of >25%. It is speculated that this high dominance is due to the mesic site conditions and lack of fire. Scrambling and low-climbing vines of *Toxicodendron radicans* and *Smilax rotundifolia* are frequent. Shrubs of various heights are commonly present; these may include *Frangula caroliniana*, *Corylus cornuta*, *Corylus americana*, *Vaccinium stamineum*, *Cercis canadensis*, *Asimina triloba*, *Morus rubra*, and *Lindera benzoin*. The shrub and herbaceous layers tend to have a percent cover of >25%. The herb layer is often diverse; the most constant patch-dominants include *Polystichum acrostichoides*, *Desmodium nudiflorum*, *Amphicarpaea bracteata*, *Dichanthelium boscii*, *Actaea racemosa*, and *Ageratina altissima* var. *altissima*. Other herbs that can be important in some stands include *Podophyllum peltatum*, *Maianthemum racemosum* ssp. *racemosum*, *Desmodium pauciflorum*, *Desmodium glutinosum*, *Galium circaezans*, *Uvularia perfoliata*, *Dioscorea quaternata*, *Arisaema triphyllum*, *Conopholis americana*, *Geranium maculatum*, *Solidago curtisii*, *Scutellaria elliptica*, *Brachyelytrum erectum*, *Eutrochium purpureum* var. *purpureum* (= *Eupatorium purpureum* var. *purpureum*), *Collinsonia canadensis*, and *Polymnia canadensis*.

A stand on the western edge of the Blue Ridge (Cherokee National Forest, Tennessee, M221Dd418, Dry Branch #1) contains *Quercus alba*, *Carya ovata*, *Fraxinus americana*, *Quercus rubra*, *Aesculus flava*, *Juniperus virginiana* var. *virginiana*, *Juglans nigra*, and *Quercus stellata* in the canopy; *Ostrya virginiana*, *Cercis canadensis*, *Ulmus rubra*, *Fraxinus americana*, *Ulmus alata*, *Quercus montana*, and *Juniperus virginiana* var. *virginiana* in the subcanopy; *Frangula caroliniana* as a tall shrub; *Symphoricarpos orbiculatus* and *Vaccinium stamineum* in the low-shrub stratum; *Parthenocissus quinquefolia* as a woody vine; and *Bromus pubescens*, *Elymus hystrix*, *Carex* sp., *Carex pensylvanica*, *Sedum ternatum*, *Asplenium platyneuron*, *Hybanthus concolor*, *Carex communis*, *Dichanthelium boscii* (= *Panicum boscii*), *Asplenium resiliens*, *Symphotrichum undulatum* (= *Aster undulatus*), *Dioscorea quaternata*, *Solidago caesia*, *Galium circaezans*, *Antennaria plantaginifolia*, *Pellaea atropurpurea*, *Verbesina occidentalis*, *Scutellaria elliptica*, *Arabis* sp., *Agrimonia* sp., *Geum* sp., *Eurybia divaricata* (= *Aster divaricatus*), *Conyza canadensis*, *Hepatica nobilis* var. *obtusata*, *Maianthemum racemosum*, *Monarda fistulosa*, *Sanicula canadensis*, *Solidago erecta* (= *Solidago speciosa* var. *erecta*), *Viola x palmata*, and *Thalictrum* sp. as herbs.

**Global Dynamics:** Disturbances from fires and mudslides were observed in many of the Tellico Pilot Project sites of this type. Mesic site conditions can limit fire disturbance. Without disturbance this community may develop into an *Acer saccharum* or *Acer rubrum* forest type, as the subcanopy is strongly dominated by one or both of those species.

#### MOST ABUNDANT SPECIES

##### Global

##### Stratum

##### Lifeform

##### Species

Tree (canopy & subcanopy)	Broad-leaved deciduous tree	<i>Carya ovata</i> , <i>Carya tomentosa</i>
Tree canopy	Broad-leaved deciduous tree	<i>Carya glabra</i> , <i>Liriodendron tulipifera</i> , <i>Quercus alba</i>
Tree subcanopy	Broad-leaved deciduous tree	<i>Acer saccharum</i> , <i>Fraxinus americana</i>

#### CHARACTERISTIC SPECIES

**Global:** *Acer saccharum*, *Carya ovalis*, *Fagus grandifolia*, *Polystichum acrostichoides*, *Quercus alba*, *Quercus rubra*

#### OTHER NOTEWORTHY SPECIES

**Global: Vulnerable Plants:** *Scutellaria pseudoserrata* (G3)

#### CONSERVATION STATUS RANK

**Global Rank & Reasons:** G4 (14-Jan-2000). This is not an inherently rare forest type. It is presumed to be relatively common throughout its known range. It is at least a moderately widespread type, although its full range is not known. It occurs on a variety of aspects and elevations, and it is not restricted to any highly specific geologic substrates. It is poorly documented through EOs, and not much data are available on the specific condition of examples of this type. Some stands have been impacted by removal of more valuable timber species and loss of herbaceous species diversity from the disturbance effects of logging. In all probability, most examples which are not on public land have been repeatedly logged and their composition altered thereby. Remaining unprotected examples are threatened by timber removal, conversion to other managed forest types, and/or development into residential or commercial real estate. The Rank was formerly G3G5. Changing this to G4 helps to clarify its status.

#### RELATED CONCEPTS

##### Global Similar Types:

- *Acer saccharum* - *Quercus muehlenbergii* / *Cercis canadensis* Forest (CEGL006017) is a drier association found to the North and East.
- *Quercus alba* - *Quercus montana* - *Carya glabra* / *Cornus florida* / *Vaccinium pallidum* Forest (CEGL008515) is a drier, more acidic oak-hickory forest of the Central Appalachian / Ridge and Valley region.
- *Quercus alba* - *Quercus rubra* - *Carya ovata* / *Cercis canadensis* - *Juniperus virginiana* Forest (CEGL007240) is a related drier forest association.
- *Quercus alba* - *Quercus rubra* - *Carya ovata* Midwest Forest (CEGL002068) is an equivalent of glaciated landscapes of the Midwest.
- *Quercus alba* - *Quercus rubra* - *Carya tomentosa* / *Cornus florida* Acidic Forest (CEGL002067)
- *Quercus alba* - *Quercus rubra* - *Quercus montana* / *Collinsonia canadensis* - *Podophyllum peltatum* Forest (CEGL007692) is a more montane oak-hickory forest of the Southern Blue Ridge; occurs at higher elevations and has a pronounced component of mesophytic montane species absent from CEGL007233.
- *Quercus alba* - *Quercus velutina* - *Carya (ovata, tomentosa)* - *Pinus* sp. Forest (CEGL007231)
- *Quercus montana* - *Quercus rubra* - *Carya* spp. - *Fraxinus americana* / *Solidago sphacelata* Forest (CEGL008549)
- *Quercus rubra* - *Acer saccharum* - *Liriodendron tulipifera* Forest (CEGL006125) has a more northeasterly distribution.
- *Quercus rubra* - *Acer saccharum* / *Ostrya virginiana* / *Cardamine concatenata* Forest (CEGL008517) is a very similar forest that has a more northern distribution; could be considered the Central Appalachian analogue of CEGL007233.

##### Global Related Concepts:

- *Quercus alba* - *Carya ovata* - *Carya tomentosa* (sic) Forest (Andreu and Tukman 1995) <
- *Quercus alba* - *Quercus rubra* - *Carya (ovata, glabra)* Forest (Andreu and Tukman 1995) <
- *Quercus alba* - *Quercus rubra* - *Carya ovalis* / *Cercis canadensis* / *Amphicarpaea bracteata* - *Desmodium glutinosum* Forest (Fleming and Patterson 2009a) =

- IA6i. Interior Upland Dry-Mesic Oak - Hickory Forest (Allard 1990) >
- Mesic White Oak Type (Schmalzer and DeSelm 1982) =
- Mesotrophic Forest (Rawinski 1992) >
- White Oak: 53 (Eyre 1980) >

#### CLASSIFICATION

**Status:** Standard

**Classification Confidence:** 2 - Moderate

**Global Classification Comments:** This is primarily a type of the Ridge and Valley and Cumberlands (Alabama to southwestern Virginia), but it also occurs on metasedimentary substrates at low elevations on the western flank of the Blue Ridge, in northern Georgia, Tennessee, and extreme western North Carolina (Hot Springs Window). There is at least one occurrence in the upper Piedmont of Georgia. Occurrences in Kentucky and West Virginia are likely. The range of this association (CEGL007233) barely overlaps that of *Quercus alba* - *Quercus rubra* - *Quercus montana* / *Collinsonia canadensis* - *Podophyllum peltatum* Forest (CEGL007692), and where it does, it is separated from the latter by elevation and soils (G. Fleming pers. comm. 2009, Fleming and Patterson 2009a).

This association was originally described from the Tellico Pilot Project (Ridge and Valley of Tennessee, northeastern Monroe County; 26 stands sampled) as the *Quercus alba* - *Carya ovata* - *Carya tomentosa* Forest, where it was recorded from slopes with northwestern, northern and eastern aspects at elevations from 250 to 300 m (820-1000 feet). The high dominance of *Acer saccharum* in the subcanopy of some stands is thought to be due to the mesic site conditions combined with lack of fire. Twenty-five plots from a wider geographic range were classified as this association in the Appalachian Trail classification project (Fleming and Patterson 2009a). More information is needed on the variability of this community across its range. Described from the Ridge and Valley of Tennessee, the concept is generally applied to forests in the southern Cumberlands and adjacent Southern Blue Ridge.

This is an unglaciated equivalent of a Midwestern element of glaciated landscapes, *Quercus alba* - *Quercus rubra* - *Carya ovata* Glaciated Forest (CEGL002068) of Indiana, Illinois, and Missouri north to Ontario. A related drier forest association is *Quercus alba* - *Quercus rubra* - *Carya ovata* / *Cercis canadensis* - *Juniperus virginiana* Forest (CEGL007240). It may also be similar to some limestone forests in Virginia's Ridge and Valley (*Acer saccharum* var. *saccharum* - *Quercus rubra* - *Carya [glabra, ovata]* / *Ageratina altissima* Forest (Fleming 1999)) (G. Fleming pers. comm.). In addition, the association has been identified in the far western edge of the Great Smoky Mountains National Park at a southerly aspect at about 570 m (1870 feet) in elevation.

#### ELEMENT DISTRIBUTION

**Global Range:** This is primarily a type of the Ridge and Valley and Cumberlands from Alabama to southwestern Virginia, but it also occurs at low elevations on the western flank of the Blue Ridge, in northern Georgia, Tennessee, and extreme western North Carolina (Hot Springs Window). There is at least one occurrence in the upper Piedmont of Georgia. Occurrences in Kentucky and West Virginia are likely.

**Nations:** US

**States/Provinces:** AL, GA, KY, TN, VA:S3?

**TNC Ecoregions:** 44:?, 50:C, 51:C, 52:C, 59:C

**USFS Ecoregions (1994/95):** 221Ha:CCC, 221Hc:CCC, 221He:CCC, 221Ja:CCP, 221Jb:CCC, 222Eb:PPP, 231Ad:CCC, 231Cc:CCC, 231Dc:CCC, M221Aa:CCC, M221Ab:CCC, M221Ce:CCC, M221Dc:CCC, M221Dd:CCC

**USFS Ecoregions (2007):** 221Ha:CCC, 221Hc:CCC, 221He:CC?, 221Ja:CCP, 221Jb:CCC, 223Eb:PPP, 231Ad:CCC, 231Cc:CCC, 231Dc:CCC, M221Aa:CCP, M221Ab:CCC, M221Ce:CCP, M221Dc:CCC, M221Dd:CCC

**Federal Lands:** DOE (Oak Ridge); NPS (Appalachian Trail [Southern Blue Ridge], Chickamauga-Chattanooga, Cumberland Gap, Great Smoky Mountains, Russell Cave); TVA (Tellico); USFS (Chattahoochee, Chattahoochee (Southern Blue Ridge), Cherokee, Daniel Boone, Jefferson, Pisgah)

#### ELEMENT SOURCES

**Global Description Author(s):** M. Andreu, M. Tukman, M. Pyne and G. Fleming

**References:** Allard 1990, Andreu and Tukman 1995, Andreu and Tukman 1995, Eyre 1980, Fleming 1999, Fleming and Patterson 2009a, Fleming et al. 2017, Fleming pers. comm., NatureServe Ecology - Southeastern U.S. unpubl. data, Rawinski 1992, Schmalzer and DeSelm 1982, Schotz et al. 2006, Southeastern Ecology Working Group n.d., White 2006

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**[CEGL007240] *Quercus alba* - *Quercus rubra* - *Carya ovata* / *Cercis canadensis* - *Juniperus virginiana* Forest**

Translated Name: **White Oak - Northern Red Oak - Shagbark Hickory / Eastern Redbud - Eastern Red-cedar Forest**

Common Name: **Ridge and Valley Dry-Mesic White Oak - Hickory Forest**

#### USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Northeastern Oak - Hardwood - Pine Forest & Woodland (M502)
Group	Southern Appalachian Oak / Chestnut Forest (G015)
Alliance	<i>Quercus alba</i> - <i>Quercus rubra</i> - <i>Quercus montana</i> Forest Alliance (A4390)

## ELEMENT CONCEPT

**Global Summary:** This dry-mesic late-successional Appalachian forest occurs on slopes with southerly aspects and well-drained upland soils. The canopy is dominated by *Quercus alba*, *Quercus rubra*, *Carya ovata*, and *Carya tomentosa*. Other *Quercus* species are common in the canopy (*Quercus falcata*, *Quercus stellata*, *Quercus coccinea*, *Quercus muehlenbergii*, and *Quercus velutina*). Other canopy species can include *Pinus virginiana*, *Pinus echinata*, *Juniperus virginiana* var. *virginiana*, *Quercus montana*, *Liriodendron tulipifera*, and *Fraxinus americana*. A mixture of calciphilic and acidophilic trees are present in the subcanopy, including *Juniperus virginiana* var. *virginiana*, *Cercis canadensis* var. *canadensis*, *Acer leucoderme*, *Nyssa sylvatica*, *Cornus florida*, *Acer rubrum*, and *Oxydendrum arboreum*. *Acer saccharum*, *Acer nigrum*, or *Acer leucoderme* are sometimes present in the canopy and are often common in the lower strata (subcanopy, tall-shrub, and low-shrub). Other species in the shrub strata include *Cornus florida*, *Juniperus virginiana* var. *virginiana*, *Ulmus alata*, *Cercis canadensis* var. *canadensis*, *Vaccinium stamineum*, *Vaccinium arboreum*, *Viburnum rufidulum*, *Frangula caroliniana*, and *Ostrya virginiana*. The herbaceous layer can be moderately dense to somewhat sparse. Possible herbaceous species are *Polystichum acrostichoides*, *Hexastylis arifolia* var. *ruthii*, *Dioscorea quaternata*, *Galium circaezans*, *Maianthemum racemosum* ssp. *racemosum*, *Parthenocissus quinquefolia*, *Toxicodendron radicans*, *Zizia aptera*, *Chamaelirium luteum*, *Desmodium nudiflorum*, *Desmodium rotundifolium*, and other *Desmodium* species.

## ENVIRONMENTAL DESCRIPTION

**Great Smoky Mountains National Park Environment:** This dry-mesic association occurs only in areas of the park with very calcium-rich soils, such as the White Oak Sinks area in the Kinzel Springs quadrangle. The sites tend to be drier than adjacent cove and mesic white oak communities, and most examples are rocky.

**Global Environment:** This dry-mesic late-successional Appalachian forest occurs on slopes with southerly or westerly aspects and well-drained upland soils. This association is not (at this time) explicitly restricted to any particular geological substrates or soil types. This would be valuable information, as the flora seems to be at least somewhat oriented to a circumneutral substrate. This forest is most often found on slopes with elevation ranging from 250-305 m (820-1000 feet) with a westerly aspect. Topographical position ranges from low slope to high slope. Slopes range from gentle to very steep (0-40+°). These stands are underlain by soils weathered from calcareous shale and calcareous sandstone of the Middle Ordovician. These soils are slightly to very acidic and well-drained. Soil series of this type are Dandridge (Lithic Ruptic-Alfic Eutrochrepts), Tellico (Typic Rhododults), and Steekee (Ruptic-Ultic Dystrochrepts). These soils are slightly to very acidic and well-drained to very well-drained. Average depth of solum ranges from 43 cm (17 inches) (Dandridge series) to 147 cm (58 inches) (Tellico series). The combination of environmental factors and well-drained soils results in dry-mesic site conditions.

## VEGETATION DESCRIPTION

**Great Smoky Mountains National Park Vegetation:** The canopy of this community is usually dominated by *Quercus alba*, but with a wide variety of codominants including *Quercus stellata*, *Quercus falcata*, *Quercus velutina*, *Carya* spp., *Pinus rigida*, *Pinus virginiana*, and even *Liriodendron tulipifera*. The subcanopy is dominated by *Cercis canadensis* but also contains *Nyssa sylvatica*, *Cornus florida*, *Acer nigrum*, *Ostrya virginiana*, *Juniperus virginiana*, and *Acer saccharum*. The herbaceous layer is moderate to dense and very diverse, especially considering the slightly dry nature of the community. *Solidago sphacelata* seems to be a consistent indicator within examples of this community in the Smokies, but other species include *Zizia aptera*, *Bromus pubescens*, *Symphotrichum undulatum* (= *Aster undulatus*), *Doellingeria umbellata*, *Hepatica nobilis* var. *obtusata* (= *Hepatica americana*), *Packera obovata*, and others.

**Global Vegetation:** The canopy is generally closed (>75% cover) with gaps resulting from natural disturbance (i.e., mudslides, fire) and is dominated by *Quercus alba*, *Quercus rubra*, *Carya ovata*, and *Carya tomentosa* (= *Carya alba*). Other *Quercus* species are common in the canopy (*Quercus falcata*, *Quercus stellata*, *Quercus coccinea*, *Quercus muehlenbergii*, and *Quercus velutina*). Other canopy species can include *Pinus virginiana*, *Pinus echinata*, *Juniperus virginiana* var. *virginiana*, *Quercus montana* (= *Quercus prinus*), *Liriodendron tulipifera*, and *Fraxinus americana*. A mixture of calciphilic and acidophilic trees are present in the subcanopy, including *Juniperus virginiana* var. *virginiana*, *Cercis canadensis* var. *canadensis*, *Acer leucoderme*, *Nyssa sylvatica*, *Cornus florida*, *Acer rubrum*, and *Oxydendrum arboreum*. *Acer saccharum*, *Acer nigrum*, or *Acer leucoderme* are sometimes present in the canopy and are often common in the lower strata (subcanopy, tall-shrub, and low-shrub). Other species in the shrub strata include *Cornus florida*, *Juniperus virginiana* var. *virginiana*, *Ulmus alata*, *Cercis canadensis* var. *canadensis*, *Vaccinium stamineum*, *Vaccinium arboreum*, *Viburnum rufidulum*, *Frangula caroliniana*, and *Ostrya virginiana*. The herbaceous layer can be moderately dense to somewhat sparse. Possible herbaceous species are *Polystichum acrostichoides*, *Hexastylis arifolia* var. *ruthii*, *Dioscorea quaternata*, *Galium circaezans*, *Maianthemum racemosum* ssp. *racemosum*, *Parthenocissus quinquefolia*, *Toxicodendron radicans*, *Zizia aptera*, *Chamaelirium luteum*, *Desmodium nudiflorum*, *Desmodium rotundifolium*, and other *Desmodium* species.

**Global Dynamics:** Infrequent fires due to the dry conditions were the only observed disturbances affecting this community type in the Tellico study area.

## MOST ABUNDANT SPECIES

## Great Smoky Mountains National Park

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Pinus rigida</i>
Tree canopy	Broad-leaved deciduous tree	<i>Carya</i> spp., <i>Quercus alba</i> , <i>Quercus stellata</i>
Tree subcanopy	Broad-leaved deciduous tree	<i>Cercis canadensis</i>

**Global**

<b>Stratum</b>	<b>Lifeform</b>	<b>Species</b>
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	<i>Carya ovata</i>
Tree canopy	Needle-leaved tree	<i>Pinus virginiana</i>
Tree canopy	Broad-leaved deciduous tree	<i>Carya glabra</i> , <i>Quercus alba</i> , <i>Quercus rubra</i>
Tree subcanopy	Needle-leaved tree	<i>Juniperus virginiana</i>
Tree subcanopy	Broad-leaved deciduous tree	<i>Acer saccharum</i> , <i>Fraxinus americana</i>
Shrub/sapling (tall & short)	Broad-leaved deciduous tree	<i>Acer saccharum</i>
Shrub/sapling (tall & short)	Liana	<i>Parthenocissus quinquefolia</i> , <i>Toxicodendron radicans</i>
Tall shrub/sapling	Needle-leaved tree	<i>Juniperus virginiana</i>
Tall shrub/sapling	Broad-leaved deciduous tree	<i>Carya tomentosa</i> , <i>Cornus florida</i> , <i>Ulmus alata</i>
Short shrub/sapling	Broad-leaved deciduous tree	<i>Cercis canadensis</i> , <i>Fraxinus americana</i> , <i>Ostrya virginiana</i>
Short shrub/sapling	Dwarf-shrub	<i>Chimaphila maculata</i>
Herb (field)	Flowering forb	<i>Desmodium</i> spp.

**CHARACTERISTIC SPECIES**

**Great Smoky Mountains National Park:** *Cercis canadensis*, *Solidago sphacelata*

**Global:** *Juniperus virginiana*, *Pinus virginiana*, *Quercus coccinea*, *Quercus falcata*, *Quercus muehlenbergii*, *Quercus stellata*, *Quercus velutina*

**OTHER NOTEWORTHY SPECIES**

**Global: Vulnerable Plants:** *Hexastylis contracta* (G3), *Solidago spithamea* (G2)

**CONSERVATION STATUS RANK**

**Global Rank & Reasons:** G4 (14-Jan-2000). This is not an inherently rare forest type. It is at least moderately widespread, and it is presumed to be relatively common throughout its range, although its full range is not known. It occurs on a variety of aspects and elevations, and it is not restricted to any highly specific geologic substrates. It is poorly documented through EOs, and not much data are available on the specific condition of examples of this type. Some stands have been impacted by removal of more valuable timber species and loss of herbaceous species diversity from the disturbance effects of logging. The Rank was formerly G3G5. Changing this to G4 helps to clarify its status and indicates that it is not a rare type.

**RELATED CONCEPTS****Global Similar Types:**

- *Fagus grandifolia* - *Quercus alba* / *Cornus florida* Forest (CEGL007881)
- *Quercus alba* - (*Liriodendron tulipifera*, *Liquidambar styraciflua*) / *Calycanthus floridus* / *Athyrium filix-femina* Forest (CEGL008428)
- *Quercus alba* - *Quercus rubra* - *Carya ovalis* / *Acer saccharum* / *Polystichum acrostichoides* Forest (CEGL007233)
- *Quercus alba* - *Quercus rubra* - *Quercus muehlenbergii* / *Cercis canadensis* Forest (CEGL002070) is an apparently related type, but with chinquapin oak.
- *Quercus alba* - *Quercus velutina* - *Carya (ovata, tomentosa)* - *Pinus* sp. Forest (CEGL007231)
- *Quercus montana* - *Quercus rubra* - *Carya* spp. - *Fraxinus americana* / *Solidago sphacelata* Forest (CEGL008549)

**Global Related Concepts:**

- *Quercus alba* - *Quercus rubra* - *Carya ovata* / *Juniperus virginiana* Forest (Andreu and Tukman 1995) <
- IA6i. Interior Upland Dry-Mesic Oak - Hickory Forest (Allard 1990) >
- White Oak: 53 (Eyre 1980) >

**CLASSIFICATION**

**Status:** Standard

**Classification Confidence:** 3 - Weak

**Global Classification Comments:** Described from Tellico Pilot Project (Ridge and Valley of Tennessee, northeastern Monroe County; 50 stands sampled) (Andreu and Tukman 1995). *Juniperus virginiana* var. *virginiana* is included in the name to indicate the relative xeric nature of this forest, until more information is available to define understory indicator species. This association is related to *Quercus alba* - *Quercus rubra* - *Carya ovalis* / *Acer saccharum* / *Polystichum acrostichoides* Forest (CEGL007233), a more mesic type described from the Tellico Pilot Project. Related vegetation in Virginia is treated as *Quercus muehlenbergii* - *Quercus (shumardii, stellata)* / *Cercis canadensis* / *Viburnum rufidulum* Forest (CEGL007699).

**ELEMENT DISTRIBUTION**

**Great Smoky Mountains National Park Range:** Due to its restriction to calcium-rich soils only found in a few places within park boundaries, this community is most likely limited to the Kinzel Springs quadrangle of the Smokies. Occurrences exist near the White Oak Sinks area.

**Global Range:** This association is at least a moderately widespread type, probably present throughout the Ridge and Valley from Alabama to Tennessee and possibly to Virginia, as well as adjacent Southern Blue Ridge. A comprehensive review of related types has not been completed.

**Nations:** US**States/Provinces:** AL?, GA, KY, TN, VA?**TNC Ecoregions:** 50:C, 51:C**USFS Ecoregions (1994/95):** 221Hc:CCC, 221Jb:CCC, 222E:??, 231Cc:CCC, 231Da:CCC, 231Dc:CCC, M221Dd:CCC**USFS Ecoregions (2007):** 221Hc:CCC, 221Jb:CCC, 223E:??, 231Cc:CCC, 231Da:CCC, 231Dc:CCC, M221Dd:CCC**Federal Lands:** DOE (Oak Ridge); NPS (Big South Fork, Chickamauga-Chattanooga, Cumberland Gap, Great Smoky Mountains); TVA (Tellico); USFS (Chattahoochee, Chattahoochee (Southern Blue Ridge), Cherokee, Daniel Boone?)**ELEMENT SOURCES****Great Smoky Mountains National Park Plots:** GRSM.312.**Great Smoky Mountains National Park Description Author(s):** R. White**Global Description Author(s):** M. Andreu and M. Tukman**References:** Allard 1990, Andreu and Tukman 1995, Andreu and Tukman 1995, Eyre 1980, Fleming pers. comm., NatureServe Ecology - Southeastern U.S. unpubl. data, Southeastern Ecology Working Group n.d., White 2006**[CEGL007692] *Quercus alba* - *Quercus rubra* - *Quercus montana* / *Collinsonia canadensis* - *Podophyllum peltatum* Forest**Translated Name: **White Oak - Northern Red Oak - Chestnut Oak / Richweed - Mayapple Forest**Common Name: **Appalachian Montane Oak - Hickory Forest (Rich Type)****USNVC CLASSIFICATION**

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Northeastern Oak - Hardwood - Pine Forest & Woodland (M502)
Group	Southern Appalachian Oak / Chestnut Forest (G015)
Alliance	<i>Quercus alba</i> - <i>Quercus rubra</i> - <i>Quercus montana</i> Forest Alliance (A4390)

**ELEMENT CONCEPT**

**Global Summary:** This association includes forests dominated by *Quercus alba*, *Quercus velutina*, *Quercus rubra*, or *Carya glabra*, *Carya tomentosa*, or *Carya ovalis*, occurring over circumneutral soils in the Southern Blue Ridge and adjacent inner Piedmont. These forests can occur across a broad elevation range (530-1375 m [1750-4500 feet]) in exposed topographic settings (upper slopes), as well as on more protected sites (edges of coves). Presumed upper Piedmont examples may be at lower elevations (e.g., below 305 m [1000 feet]). Other species that can be important in the canopy include *Quercus coccinea*, *Quercus montana*, and occasionally *Liriodendron tulipifera* where large gaps in the canopy have allowed for its generation. On some sites, species more typical of "cove forests," such as *Fraxinus americana* or *Magnolia acuminata*, may form a very minor component. *Oxydendrum arboreum* and *Cornus florida* are common in the subcanopy. Heath species (*Rhododendron maximum* or *Kalmia latifolia*) are absent or very minor in the shrub stratum. On very high-base status soils, *Philadelphus hirsutus* or *Lindera benzoin* may be in the shrub stratum. The herbaceous stratum can be quite diverse and is characterized by mesic herbs and species associated with circumneutral soils, such as *Podophyllum peltatum*, *Arisaema triphyllum*, *Amphicarpaea bracteata*, *Adiantum pedatum*, *Collinsonia canadensis*, *Asplenium platyneuron*, *Brachyelytrum erectum*, *Actaea racemosa*, *Caulophyllum thalictroides*, *Sanguinaria canadensis*, *Tradescantia subaspera*, *Euphorbia purpurea*, *Phegopteris hexagonoptera*, *Polystichum acrostichoides*, *Athyrium filix-femina* ssp. *asplenioides*, *Dennstaedtia punctilobula*, and *Dryopteris intermedia*.

**ENVIRONMENTAL DESCRIPTION****Great Smoky Mountains National Park Environment:** Same as global.

**Global Environment:** This association includes forests codominated by *Quercus alba*, occurring over nutrient-rich soils in the Southern Blue Ridge and adjacent Piedmont. These forests can occur across a broad elevational range, from 610 to 1372 m (2000-4500 feet), and can occur in exposed topographic settings (upper slopes and broad ridgetops), as well as on more protected sites (edges of coves). Presumed upper Piedmont examples may be at lower elevations (e.g., below 305 m [1000 feet]). Soils collected from plots of this association are strongly acidic with high organic matter content, but have higher magnesium and calcium levels than most other Southern Appalachian soils (Fleming and Patterson 2009a).

**VEGETATION DESCRIPTION**

**Global Vegetation:** This association includes forests dominated by *Quercus alba*. Other species that can be important in the canopy include *Quercus rubra*, *Quercus coccinea*, *Quercus montana* (= *Quercus prinus*), *Quercus velutina*, *Carya glabra*, and *Carya tomentosa* (= *Carya alba*). On some sites, species more typical of "cove forests," such as *Fraxinus americana* or *Magnolia acuminata*, may form a very minor component. *Oxydendrum arboreum* and *Cornus florida* are common in the subcanopy. Heath species (*Rhododendron maximum* or *Kalmia latifolia*) are absent or very minor in the shrub stratum. On very high-base status soils, *Philadelphus hirsutus* or *Lindera benzoin* may be in the shrub stratum. Other woody species may include *Cercis canadensis*, *Viburnum acerifolium*, and *Ulmus alata*. The herbaceous stratum can be quite diverse and is characterized by mesic herbs and species associated with circumneutral soils, such as *Podophyllum peltatum*, *Arisaema triphyllum*, *Amphicarpaea bracteata*, *Adiantum pedatum*, *Collinsonia canadensis*, *Asplenium platyneuron*, *Actaea racemosa* (= *Cimicifuga racemosa*), *Caulophyllum thalictroides*, *Sanguinaria canadensis*, *Tradescantia subaspera*, *Euphorbia purpurea*, *Phegopteris hexagonoptera*, *Polystichum acrostichoides*,

*Athyrium filix-femina* ssp. *asplenioides*, *Brachyelytrum erectum*, *Dennstaedtia punctilobula*, and *Dryopteris intermedia*. A stand included here from Chilhowee Mountain in the Cherokee National Forest also includes *Ageratina altissima* var. *altissima*, *Arabis canadensis*, *Aristolochia serpentaria*, *Asplenium platyneuron*, *Desmodium nudiflorum*, *Hepatica nobilis* var. *obtusata*, *Monarda fistulosa*, *Sanicula canadensis*, *Scutellaria elliptica*, *Silene stellata*, *Smallanthus uvedalius*, *Solidago lancifolia*, *Solidago simplex* var. *spatulata* (= *Solidago spatulata*), *Spigelia marilandica*, *Tradescantia subaspera*, and *Uvularia perfoliata*.

#### MOST ABUNDANT SPECIES

##### Global

##### Stratum

Tree canopy

Tree subcanopy

Herb (field)

##### Lifeform

Broad-leaved deciduous tree

Broad-leaved deciduous tree

Flowering forb

##### Species

*Carya glabra*, *Carya tomentosa*, *Quercus alba*, *Quercus rubra*

*Cornus florida*, *Oxydendrum arboreum*

*Amphicarpaea bracteata*, *Arisaema triphyllum*, *Podophyllum peltatum*

#### CHARACTERISTIC SPECIES

**Great Smoky Mountains National Park:** *Actaea racemosa*, *Adiantum pedatum*, *Amphicarpaea bracteata*, *Arisaema triphyllum*, *Caulophyllum thalictroides*, *Collinsonia canadensis*, *Podophyllum peltatum*, *Quercus alba*, *Sanguinaria canadensis*

**Global:** *Actaea racemosa*, *Adiantum pedatum*, *Amphicarpaea bracteata*, *Arisaema triphyllum*, *Caulophyllum thalictroides*, *Collinsonia canadensis*, *Podophyllum peltatum*, *Quercus alba*, *Sanguinaria canadensis*

#### OTHER NOTEWORTHY SPECIES

**Great Smoky Mountains National Park: Vulnerable Plants:** *Actaea racemosa* (G3G4)

**Global: Vulnerable Plants:** *Actaea racemosa* (G3G4), *Ageratina altissima* var. *roanensis* (G5T3T4, Southern Blue Ridge endemic), *Berberis canadensis* (G3G4), *Carex manhartii* (G3G4), *Carex radfordii* (G3), *Coreopsis latifolia* (G3), *Euphorbia purpurea* (G3, Southern Blue Ridge endemic), *Helianthus glaucophyllus* (G3G4), *Silene ovata* (G3, Southern Blue Ridge endemic), *Sisyrinchium dichotomum* (G2), *Trillium simile* (G3), *Tsuga caroliniana* (G2G3); **Other Plants:** *Prosartes maculata* (G4), *Trillium rugelii* (G4)

#### CONSERVATION STATUS RANK

**Global Rank & Reasons:** G3 (17-May-2002). This montane oak-hickory forest is naturally limited to richer sites in the Southern Blue Ridge mountains and adjacent inner Piedmont. Later successional, unaltered occurrences are rare. Some stands have been impacted by removal of more valuable timber species (e.g., *Quercus alba*, other *Quercus* species) and the loss of herbaceous species diversity from the disturbance effects of logging.

#### RELATED CONCEPTS

##### Global Similar Types:

- *Liriodendron tulipifera* - *Tilia americana* var. *heterophylla* - *Aesculus flava* - *Acer saccharum* / (*Magnolia tripetala*) Forest (CEGL005222) is a mixed mesophytic forest of rich coves and lower slopes; lacks a significant oak component.
- *Quercus alba* - *Quercus rubra* - *Carya ovalis* / *Acer saccharum* / *Polystichum acrostichoides* Forest (CEGL007233) occurs at lower elevations, primarily in the Cumberlands and Southern Ridge and Valley; contains numerous low-elevation species absent from CEGL007692.
- *Quercus rubra* - *Acer rubrum* / *Pyrularia pubera* / *Thelypteris noveboracensis* Forest (CEGL006192) is a more acidic, montane oak forest.
- *Quercus rubra* - *Carya ovata* - *Fraxinus americana* / *Actaea racemosa* - *Hydrophyllum virginianum* Forest (CEGL008518) is similar but more northern in distribution; could be considered the Central Appalachian analogue of CEGL007692.
- *Quercus rubra* - *Tilia americana* var. *heterophylla* - (*Halesia tetraptera* var. *monticola*) / *Collinsonia canadensis* - *Prosartes lanuginosa* Forest (CEGL007878) is strongly dominated by *Quercus rubra* and is typically associated with middle-slope sites with high surficial rock cover.

##### Global Related Concepts:

- Montane Oak-Hickory Forest (Basic Subtype) (Schafale 2012) =

#### CLASSIFICATION

**Status:** Standard

**Classification Confidence:** 2 - Moderate

**Great Smoky Mountains National Park Other Comments:** Similar vegetation was sampled in the southern portion of the Cades Cove quadrangle, but it was dominated by *Quercus rubra* [see *Quercus rubra* - *Tilia americana* var. *heterophylla* - *Halesia tetraptera* var. *monticola* / *Collinsonia canadensis* - *Tradescantia subaspera* Forest (CEGL007878)].

**Global Classification Comments:** This association was originally defined based on occurrence information in the North Carolina Blue Ridge. More information is needed to better describe and define this association and its geographic distribution. Additional data on apparent occurrences have been collected in the Chattahoochee and Cherokee national forests. In a regional analysis for the Appalachian Trail project and a follow-up comparative analysis with *Quercus rubra* - *Tilia americana* var. *heterophylla* - (*Halesia tetraptera* var. *monticola*) / *Collinsonia canadensis* - *Prosartes lanuginosa* Forest (CEGL007878), 31 plots from Georgia, North Carolina, and Tennessee were classified as this type (Fleming and Patterson 2009a). The most constant and abundant species in these plots are *Quercus alba*, *Quercus rubra*, *Carya glabra*, *Liriodendron tulipifera*, *Acer rubrum*, *Fraxinus americana*, *Betula lenta*,

*Magnolia acuminata*, *Castanea dentata*, *Cornus florida*, *Toxicodendron radicans*, *Smilax rotundifolia*, *Collinsonia canadensis*, *Actaea racemosa*, *Amphicarpaea bracteata*, *Maianthemum racemosum* ssp. *racemosum*, *Solidago curtisii*, *Polystichum acrostichoides*, *Eurybia divaricata*, and *Desmodium nudiflorum*.

#### ELEMENT DISTRIBUTION

**Great Smoky Mountains National Park Range:** This association was not observed or sampled on the Mount Le Conte or Cades Cove quadrangles. It was documented from low elevations on the North Carolina side of the park, on the Smokemont quadrangle

**Global Range:** This community occurs in the Southern Blue Ridge and adjacent inner Piedmont of the Carolinas, Georgia, and Tennessee in the eastern United States.

**Nations:** US

**States/Provinces:** GA, NC, SC, TN

**TNC Ecoregions:** 51:C, 52:C

**USFS Ecoregions (1994/95):** 231Ad:CCC, M221Dc:CCC, M221Dd:CCC

**USFS Ecoregions (2007):** 231Ad:CCC, M221Dc:CCC, M221Dd:CCC

**Federal Lands:** BIA (Eastern Band of Cherokee); NPS (Appalachian Trail [Southern Blue Ridge], Blue Ridge Parkway, Great Smoky Mountains); USFS (Chattahoochee, Chattahoochee (Piedmont), Chattahoochee (Southern Blue Ridge), Cherokee, Nantahala, Pisgah, Sumter, Sumter (Mountains))

#### ELEMENT SOURCES

**Great Smoky Mountains National Park Plots:** GRSM.311, GRSM.550.

**Great Smoky Mountains National Park Description Author(s):** K.D. Patterson

**Global Description Author(s):** M.P. Schafale, T. Govus and R. White

**References:** Fleming and Patterson 2009a, NatureServe Ecology - Southeastern U.S. unpubl. data, Nelson 1986, Peet et al. unpubl. data, Schafale 2012, Schafale 2012, Schafale and Weakley 1990, Schafale pers. comm., Southeastern Ecology Working Group n.d.

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#### [CEGL006192] *Quercus rubra* - *Acer rubrum* / *Pyrularia pubera* / *Thelypteris noveboracensis* Forest

Translated Name: Northern Red Oak - Red Maple / Buffalo-nut / New York Fern Forest

Common Name: Appalachian Montane Oak - Hickory Forest (Red Oak Type)

#### USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Northeastern Oak - Hardwood - Pine Forest & Woodland (M502)
Group	Southern Appalachian Oak / Chestnut Forest (G015)
Alliance	<i>Quercus alba</i> - <i>Quercus rubra</i> - <i>Quercus montana</i> Forest Alliance (A4390)

#### ELEMENT CONCEPT

**Global Summary:** This association includes *Quercus rubra* forests at intermediate elevations (mostly below 1067 m [3500 feet], ranging from 610-1220 m [2000-4000 feet]) occurring in the Southern Blue Ridge Escarpment, the Smoky Mountains and the Southern Blue Ridge. It may possibly range into adjacent areas of the Cumberland Plateau. These forests occur on mostly northern to eastern and southeastern, mid to upper, moderately steep slopes of intermediate exposure over acidic soils. The canopy is dominated by *Quercus rubra*, often with other oaks and *Acer rubrum* and/or *Liriodendron tulipifera* codominating. Other minor canopy species may include *Betula lenta*, *Carya tomentosa*, *Carya glabra*, *Halesia tetraptera*, *Quercus alba*, *Quercus montana*, and *Magnolia fraseri*. In some examples, hickories are sparse or absent. The subcanopy and sapling strata include the canopy species, as well as *Halesia tetraptera*, *Betula lenta*, *Tsuga canadensis*, *Cornus florida*, *Acer pensylvanicum*, and *Oxydendrum arboreum*. The shrub stratum is typically sparse but may have local dominance by *Gaylussacia ursina* or *Rhododendron maximum*. Herbaceous cover is sparse to moderate but can be species-rich. Ferns can be locally dominant, typically *Thelypteris noveboracensis* and *Athyrium filix-femina* ssp. *asplenoides*. This forest is distinguished from High Elevation Red Oak forests [see associations in *Quercus rubra* - *Quercus alba* Montane Forest Alliance (A3116)] by lack of species such as *Betula alleghaniensis*, *Ilex montana*, *Vaccinium simulatum*, and by lacking abundant *Hamamelis virginiana*, as well as its occurrence at generally lower elevations. It is also characterized by having a more mixed oak composition (versus nearly monospecific *Quercus rubra*). In the Southern Blue Ridge Escarpment region, these montane oak-hickory forests seem to occupy environments intermediate between more-protected forests dominated by *Quercus alba* and drier more-exposed *Quercus montana* forests.

#### ENVIRONMENTAL DESCRIPTION

**Great Smoky Mountains National Park Environment:** This forest occurs at intermediate elevations, mostly on northern and western slopes of intermediate to protected exposure. Elevations averaged 2870 feet but ranged from 2170 to 4000 feet.

**Global Environment:** This association includes *Quercus rubra* forests at intermediate elevations (mostly below 1065 m [3500 feet], ranging from 610-1220 m [2000-4000 feet]) in the Southern Blue Ridge Escarpment to the Cumberlands and Southern Ridge and Valley (455-1005 m [1500-3300 feet]), the Smoky Mountains and the Southern Blue Ridge, and may possibly range into adjacent areas of the Cumberland Plateau. These forests occur on mostly northern to eastern and southeastern, mid to upper, moderately steep slopes of intermediate exposure over acidic soils. In the Southern Blue Ridge Escarpment region, these montane oak - hickory forests

seem to occupy environments intermediate between more protected forests dominated by *Quercus alba* and drier, more exposed *Quercus montana* forests.

#### VEGETATION DESCRIPTION

**Great Smoky Mountains National Park Vegetation:** This canopy is strongly dominated by *Quercus rubra* and *Acer rubrum*. Occasionally *Liriodendron tulipifera*, *Quercus prinus*, and *Robinia pseudoacacia* may have high canopy coverage. The subcanopy is dominated by *Acer rubrum*, *Halesia tetraptera* var. *monticola*, and *Oxydendrum arboreum*. Other species that may be present in the canopy and subcanopy, but have minor coverage, include *Carya alba*, *Cornus florida*, *Magnolia fraseri*, *Betula lenta*. Shrub coverage is moderate to high and dominated by deciduous species, most often *Gaylussacia ursina*. Other highly constant species in the shrub stratum include *Acer pensylvanicum*, *Castanea dentata*, *Calycanthus floridus*, *Cornus florida*, *Pyrularia pubera*, *Halesia tetraptera* var. *monticola*, *Magnolia acuminata*, *Magnolia fraseri*, *Nyssa sylvatica*, *Prunus serotina*, *Rhododendron calendulaceum*, *Rhododendron maximum*, *Sassafras albidum*, *Vaccinium corymbosum*, and *Viburnum acerifolium*. *Tsuga canadensis* saplings often have moderate coverage in the shrub stratum. Herbaceous cover is sparse to moderate but species rich. Species with the highest coverage and constancy are *Galax urceolata* and *Thelypteris noveboracensis*. Other species with high constancy include *Eurybia divaricata* (= *Aster divaricatus*), *Carex* spp. (*Carex aestivalis*, *Carex debilis*, *Carex digitalis*, *Carex laxiflora* var. *laxiflora*, *Carex pensylvanica*), *Chimaphila maculata* (= var. *maculata*), *Dioscorea quaternata*, *Galax urceolata*, *Goodyera pubescens*, *Houstonia purpurea* var. *purpurea*, *Lysimachia quadrifolia*, *Medeola virginiana*, *Polygonatum biflorum*, *Polystichum acrostichoides*, *Solidago curtisii* (= *Solidago caesia* var. *curtisii*), *Thelypteris noveboracensis*, and *Uvularia puberula*, but other species may occur. Common vines are *Smilax rotundifolia*, *Smilax glauca*, and *Vitis aestivalis*.

**Global Vegetation:** The canopy is dominated by *Quercus rubra*, often with other oaks and *Acer rubrum* and/or *Liriodendron tulipifera* codominating. Other minor canopy species may include *Betula lenta*, *Carya tomentosa* (= *Carya alba*), *Carya glabra*, *Halesia tetraptera*, *Quercus montana* (= *Quercus prinus*), and *Magnolia fraseri*. In some examples, hickories are sparse or absent. The subcanopy and sapling strata include the canopy species, as well as *Halesia tetraptera*, *Quercus alba*, *Betula lenta*, *Tsuga canadensis*, *Cornus florida*, *Acer pensylvanicum*, and *Oxydendrum arboreum*. The shrub stratum is typically sparse but may have local dominance by *Gaylussacia ursina* or *Rhododendron maximum*. Other typical species in the shrub stratum include *Castanea dentata*, *Calycanthus floridus*, *Pyrularia pubera*, *Rhododendron calendulaceum*, *Vaccinium corymbosum*, and *Viburnum acerifolium*. In the northernmost range of this association (northwestern North Carolina), *Calycanthus floridus* and *Gaylussacia ursina* are usually absent from the shrub layer. Herbaceous cover is sparse to moderate but can be species rich. Ferns can be locally dominant, typically *Thelypteris noveboracensis* and *Athyrium filix-femina* ssp. *asplenioides*. Other typical species include *Eurybia divaricata* (= *Aster divaricatus*), *Carex* spp. (e.g., *Carex aestivalis*, *Carex debilis*, *Carex digitalis*, *Carex laxiflora* var. *laxiflora*, *Carex pensylvanica*), *Chimaphila maculata* (= var. *maculata*), *Desmodium nudiflorum*, *Dioscorea quaternata*, *Eutrochium purpureum* (= *Eupatorium purpureum*), *Galium latifolium*, *Galax urceolata*, *Goodyera pubescens*, *Houstonia purpurea* var. *purpurea*, *Lysimachia quadrifolia*, *Maianthemum racemosum* ssp. *racemosum*, *Medeola virginiana*, *Polygonatum biflorum*, *Polystichum acrostichoides*, *Solidago curtisii* (= *Solidago caesia* var. *curtisii*), and *Uvularia puberula*. Common vines are *Smilax rotundifolia*, *Smilax glauca*, and *Vitis aestivalis*.

#### MOST ABUNDANT SPECIES

##### Great Smoky Mountains National Park

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Broad-leaved deciduous tree	<i>Acer rubrum</i> , <i>Quercus rubra</i>
Tree subcanopy	Broad-leaved deciduous tree	<i>Acer rubrum</i> , <i>Halesia tetraptera</i> var. <i>monticola</i> , <i>Oxydendrum arboreum</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Gaylussacia ursina</i>
Herb (field)	Dwarf-shrub	<i>Galax urceolata</i>
Herb (field)	Fern (Spore-bearing forb)	<i>Thelypteris noveboracensis</i>

##### Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	<i>Acer rubrum</i>
Tree canopy	Broad-leaved deciduous tree	<i>Quercus rubra</i>
Tree subcanopy	Broad-leaved deciduous tree	<i>Halesia tetraptera</i> var. <i>monticola</i> , <i>Oxydendrum arboreum</i>
Tall shrub/sapling	Broad-leaved deciduous shrub	<i>Calycanthus floridus</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Gaylussacia ursina</i>
Herb (field)	Flowering forb	<i>Galax urceolata</i>
Herb (field)	Fern (Spore-bearing forb)	<i>Thelypteris noveboracensis</i>

#### CHARACTERISTIC SPECIES

**Great Smoky Mountains National Park:** *Acer pensylvanicum*, *Calycanthus floridus*, *Pyrularia pubera*, *Quercus rubra*

**Global:** *Calycanthus floridus*, *Pyrularia pubera*, *Quercus rubra*

#### OTHER NOTEWORTHY SPECIES

**Global: Vulnerable Plants:** *Tsuga caroliniana* (G2G3)

**CONSERVATION STATUS RANK**

**Global Rank & Reasons:** G4? (3-Jan-2000). This community is uncommon but secure within its range. It is often overlooked in surveys or not recognized as distinct, thus it is much more common than the number of documented occurrences suggests. Resolution of taxonomic issues that distinguish this community from similar associations may lead to a range extension.

**RELATED CONCEPTS****Global Similar Types:**

- *Quercus alba* - *Quercus (rubra, montana)* / *Rhododendron calendulaceum* - (*Gaylussacia ursina*) Forest (CEGL007230) contains more than 50% *Quercus alba* in the canopy.
- *Quercus alba* - *Quercus rubra* - *Quercus montana* / *Collinsonia canadensis* - *Podophyllum peltatum* Forest (CEGL007692) is usually dominated by *Quercus rubra*, *Quercus alba*, *Quercus velutina*, and/or *Carya* spp. but is generally not very high in fern cover and generally more diverse than CEGL006192.
- *Quercus rubra* - *Quercus montana* - *Magnolia (acuminata, fraseri)* / *Acer pensylvanicum* Forest (CEGL004817) occurs in the northern part of the Southern Appalachians and is a mixed red oak - chestnut oak forest; is otherwise similar to CEGL006192 and could be considered a northern analogue of it.
- *Quercus rubra* / (*Vaccinium simulatum*, *Rhododendron calendulaceum*) / (*Dennstaedtia punctilobula*, *Thelypteris noveboracensis*) Forest (CEGL007300) is a high-elevation forest.

**Global Related Concepts:**

- IA6h. Montane Oak - Hickory Forest (Allard 1990) >

**CLASSIFICATION**

**Status:** Standard

**Classification Confidence:** 2 - Moderate

**Global Classification Comments:** This association was originally defined from the Chattooga Basin Project (S. Simon pers. comm.) and later refined with information from the Great Smoky Mountains. Global name and concept may need revision as more information becomes available. This association may be a subset of the more broadly defined *Quercus alba* - *Quercus (rubra, montana)* / *Rhododendron calendulaceum* - (*Gaylussacia ursina*) Forest (CEGL007230) but is distinguished by the dominance of *Quercus rubra*, its generally protected topographic setting, and may represent areas formerly dominated by *Quercus rubra* and *Castanea dentata*.

In a Southern Appalachian regional analysis (1134 plots) for the Appalachian Trail project, only nine North Carolina and Tennessee plots were classified as this type (Fleming and Patterson 2009a). This analysis confirms that this type does not reach Virginia, and suggests that its range is concentrated in the higher, more southern part of the Southern Appalachians (Great Smoky Mountains and Nantahala Mountains), where high rainfall and microclimatic conditions may favor the dispersal of *Quercus rubra* forests to lower elevations than further north. The most constant and abundant species in these plots are *Quercus rubra*, *Acer rubrum*, *Dioscorea quaternata*, *Thelypteris noveboracensis*, *Carya glabra*, *Acer pensylvanicum*, *Oxydendrum arboreum*, *Smilax rotundifolia*, *Gaylussacia ursina*, *Halesia tetraptera* var. *monticola*, *Rhododendron calendulaceum*, and *Castanea dentata*.

**ELEMENT DISTRIBUTION**

**Great Smoky Mountains National Park Range:** This community was sampled on the Cades Cove and Mount Le Conte quadrangles. Historic samples are from the Cades Cove quadrangle and Thunderhead Mountain quadrangles, but the community is likely in other areas of the Park. On the Cades Cove quadrangle, recent and historic samples representing this community come from elevations ranging from 2170 to 3820 feet. In the northern portion of the quadrangle, this community was sampled from the east- and west-facing low slopes and draws of Leadbetter Ridge and on low slopes in the vicinity of Boring Ridge and Rabbit Creek Road. In the central portion of the quadrangle, this community was also sampled on the low slopes north of Doe Ridge; above Forge Knob Branch; above Licklog Branch; and on northeast high slopes and ridges of Gregory Ridge. It was also sampled in the southeastern portion of the quadrangle on a west-facing draw above Eagle Creek. On the Mount Le Conte quadrangle this community was sampled from elevation ranging from 2295 to 3260 feet. In the western portion of the quadrangle it was sampled on the high, northwest slope of Piney Mountain and in the vicinity of the Baskins Creek trail. In the southeast, it was sampled on a low slope north of Porters Mountain, above Porter Creek.

**Global Range:** This association is found in the Southern Blue Ridge Escarpment and Cumberlands/Southern Ridge and Valley, the Smoky Mountains and the Southern Blue Ridge, and may possibly range into adjacent areas of the Cumberland Plateau.

**Nations:** US

**States/Provinces:** GA, KY, NC, SC, TN

**TNC Ecoregions:** 50:C, 51:C

**USFS Ecoregions (1994/95):** M221Cc:CCC, M221Ce:CCC, M221Dc:CCP, M221Dd:CCC

**USFS Ecoregions (2007):** M221Cc:CCC, M221Ce:CCP, M221Dc:CCP, M221Dd:CCC

**Federal Lands:** BIA (Eastern Band of Cherokee); NPS (Appalachian Trail [Southern Blue Ridge], Blue Ridge Parkway, Carl Sandburg Home, Cumberland Gap, Great Smoky Mountains); USFS (Chattahoochee, Chattahoochee (Southern Blue Ridge), Nantahala, Pisgah, Sumter, Sumter (Mountains))

**ELEMENT SOURCES**

**Great Smoky Mountains National Park Plots:** GRSM.4, GRSM.14, GRSM.16, GRSM.31, GRSM.120, GRSM.227, GRSM.263.

**Great Smoky Mountains National Park Description Author(s):** K.D. Patterson

**Global Description Author(s):** K.D. Patterson, T. Govus and R. White

**References:** Allard 1990, Fleming and Patterson 2009a, Nelson 1986, Peet et al. unpubl. data, Schafale 2012, Schafale and Weakley 1990, Simon pers. comm., Southeastern Ecology Working Group n.d., White 2003, White 2006

## A4392 *Quercus montana* - *Quercus coccinea* - *Pinus strobus* Forest Alliance

*Quercus montana* - Scarlet Oak - Eastern White Pine Forest Alliance

*Southern Appalachian Dry Oak - White Pine Forest*

### ALLIANCE DISTRIBUTION

**Nations:** US

### ALLIANCE SOURCES

**Author of Concept:** n.d.

## [CEGL007519] *Pinus strobus* - *Quercus (coccinea, montana)* / (*Gaylussacia ursina*, *Vaccinium stamineum*) Forest

Translated Name: Eastern White Pine - (Scarlet Oak, Chestnut Oak) / (Bear Huckleberry, Deerberry) Forest

Common Name: Appalachian White Pine - Subxeric Oak Forest

### USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (I.B.2.Na)
Macrogroup	Appalachian-Northeastern Oak - Hardwood - Pine Forest & Woodland (M502)
Group	Southern Appalachian Oak / Chestnut Forest (G015)
Alliance	<i>Quercus montana</i> - <i>Quercus coccinea</i> - <i>Pinus strobus</i> Forest Alliance (A4392)

### ELEMENT CONCEPT

**Global Summary:** This community occurs on exposed upper slopes and ridgetops at elevations below 915 m (3000 feet) in the southern Appalachian Mountains. This association represents mixed forests with *Pinus strobus*, *Quercus montana*, and *Quercus coccinea*, occurring singly or in combination, each contributing 25-75% of the total canopy coverage. Open subcanopies are composed of *Oxydendrum arboreum*, *Acer rubrum* var. *rubrum*, *Nyssa sylvatica*, and *Cornus florida*. The shrub stratum is dominated by deciduous heath species, typically *Gaylussacia ursina* or *Vaccinium stamineum*. Other species in the shrub/sapling stratum may include *Vaccinium pallidum*, *Eubotrys recurva*, *Kalmia latifolia*, *Castanea dentata*, or *Acer rubrum* var. *rubrum*. On rocky sites, *Deschampsia flexuosa* may be common.

### ENVIRONMENTAL DESCRIPTION

**Great Smoky Mountains National Park Environment:** This community was found mostly below 2000 feet elevation (ranging from 1560-2400 feet) on convex slopes and low ridges. Many stands showed evidence of past logging, and most examples are in early to middle stages of succession.

**Global Environment:** This community occurs on exposed upper slopes and ridgetops at elevations below 915 m (3000 feet) in the southern Appalachian Mountains. The presence of *Pinus strobus* in these forests may be a product of disturbance and subsequent fire suppression. It may have increased its abundance since about 1900.

### VEGETATION DESCRIPTION

**Great Smoky Mountains National Park Vegetation:** These are forests with a well-developed canopy and subcanopy dominated by *Pinus strobus*, codominating with *Quercus prinus* and *Acer rubrum*. Other species that can have high coverage in the canopy or subcanopy include *Quercus coccinea*, *Pinus rigida*, *Nyssa sylvatica*, *Oxydendrum arboreum*, and *Pinus virginiana*. Other trees that can be present include *Pinus echinata*, *Quercus alba*, *Quercus rubra*, *Amelanchier laevis*, *Carya glabra*, and *Tsuga canadensis*. The tall-shrub stratum can be moderate to very dense and typically is dominated by *Kalmia latifolia*, *Acer rubrum*, or *Rhododendron maximum*. The short-shrub stratum is dense and dominated by *Gaylussacia ursina* or *Vaccinium pallidum*. Other species that can be in the shrub strata include saplings of canopy and subcanopy species and *Vaccinium hirsutum*, *Vaccinium stamineum*, *Calycanthus floridus*, *Castanea dentata*, *Cornus florida*, *Ilex opaca*, *Magnolia fraseri*, *Pyrolaria pubera*, *Robinia pseudoacacia*, and *Sassafras albidum*. The herb stratum is sparse, and the ground is often dominated by leaf litter. Typical herb species include *Chimaphila maculata*, *Dioscorea quaternata*, *Epigaea repens*, *Galax urceolata*, *Gaultheria procumbens*, *Goodyera pubescens*, *Lysimachia quadrifolia*, *Pteridium aquilinum*, *Uvularia puberula*, and *Viola hastata*. *Smilax rotundifolia* and *Smilax glauca* are common vines.

**Global Vegetation:** Stands of this forest association typically contain *Pinus strobus* (contributing 25-75% of the canopy coverage) and *Quercus montana* (= *Quercus prinus*) and/or *Quercus coccinea* (occurring singly or in combination) as 25-75% of the canopy coverage. Open subcanopies are composed of *Oxydendrum arboreum*, *Acer rubrum* var. *rubrum*, *Nyssa sylvatica*, and *Cornus florida*. The shrub stratum is dominated by deciduous heath species, typically *Gaylussacia ursina* or *Vaccinium stamineum*. Other species in the shrub/sapling stratum may include *Vaccinium pallidum*, *Eubotrys recurva* (= *Leucothoe recurva*), *Kalmia latifolia*, *Castanea dentata*, or *Acer rubrum* var. *rubrum*. On rocky sites, *Deschampsia flexuosa* may be common.

### MOST ABUNDANT SPECIES

**Great Smoky Mountains National Park**

**Stratum**

Tree canopy  
 Tree canopy  
 Tree subcanopy  
 Tall shrub/sapling  
 Tall shrub/sapling  
 Short shrub/sapling

**Lifeform**

Needle-leaved tree  
 Broad-leaved deciduous tree  
 Broad-leaved deciduous tree  
 Broad-leaved evergreen tree  
 Broad-leaved evergreen shrub  
 Broad-leaved deciduous shrub

**Species**

*Pinus strobus*  
*Quercus montana*  
*Acer rubrum*  
*Rhododendron maximum*  
*Kalmia latifolia*  
*Gaylussacia ursina*, *Vaccinium pallidum*

**Global**

**Stratum**

Tree canopy  
 Tree canopy  
 Tree subcanopy  
 Short shrub/sapling

**Lifeform**

Needle-leaved tree  
 Broad-leaved deciduous tree  
 Broad-leaved deciduous tree  
 Broad-leaved deciduous shrub

**Species**

*Pinus strobus*  
*Quercus coccinea*, *Quercus montana*  
*Acer rubrum* var. *rubrum*, *Oxydendrum arboreum*  
*Gaylussacia ursina*, *Vaccinium stamineum*

**CHARACTERISTIC SPECIES**

**Great Smoky Mountains National Park:** *Gaylussacia ursina*, *Kalmia latifolia*, *Pinus strobus*, *Quercus coccinea*, *Quercus montana*

**Global:** *Gaylussacia ursina*, *Kalmia latifolia*, *Pinus strobus*, *Quercus coccinea*, *Quercus montana*, *Vaccinium stamineum*

**OTHER NOTEWORTHY SPECIES**

**Great Smoky Mountains National Park: Vulnerable Plants:** *Vaccinium hirsutum* (G4, globally vulnerable)

**Global: Vulnerable Plants:** *Monotropsis odorata* (G3), *Thermopsis fraxinifolia* (G3?), *Thermopsis mollis* (G3G4); **Other Plants:** *Vaccinium hirsutum* (G4)

**CONSERVATION STATUS RANK**

**Global Rank & Reasons:** G4 (23-Oct-2003). This community has a restricted range and is uncommon. It is not threatened or particularly vulnerable. Rank changed to G4 on the recommendation of Gary Kauffman, USDA Forest Service.

**RELATED CONCEPTS**

**Global Similar Types:**

- *Pinus strobus* - *Quercus alba* - *Quercus montana* / *Vaccinium stamineum* Forest (CEGL008539)

**Global Related Concepts:**

- *Pinus strobus* - *Pinus rigida* - *Quercus coccinea* / *Kalmia latifolia* / *Gaylussacia ursina* Forest (Patterson 1994) <
- *Quercus coccinea* - *Pinus strobus* / *Gaylussacia ursina* Forest (Patterson 1994) <
- IA6f. Dry White Pine Ridge Forest (Allard 1990) >
- Pine-Oak Forest, subtype Iii (*Quercus coccinea*-*Pinus strobus*/*Gaylussacia ursina* Forest) (Patterson 1994) =
- White Pine - White Oak - Chestnut Oak Type (Schmalzer and DeSelm 1982) >

**CLASSIFICATION**

**Status:** Standard

**Classification Confidence:** 2 - Moderate

**ELEMENT DISTRIBUTION**

**Great Smoky Mountains National Park Range:** This community was sampled on the Cades Cove quadrangle but was not found on the Mount Le Conte quadrangle. It is likely in other areas of the park. On the Cades Cove quadrangle, it was sampled or observed north of the Cades Cove Loop Road, along the ridgeline of Tater Ridge (2500 feet); on the steep north-facing slopes off Crooked Arm Ridge (2400 feet); and on the north-facing slopes above Laurel Creek (2100 feet). It was also sampled southwest of the Cades Cove Loop Road, on low ridges (2000 feet) north and south of Abrams Creek, and on gentle, southwest slopes, east of Forge Creek Road (2000 feet).

**Global Range:** This community is known from the escarpment region of the Southern Blue Ridge.

**Nations:** US

**States/Provinces:** GA, NC, SC, TN

**TNC Ecoregions:** 50:C, 51:C, 52:C

**USFS Ecoregions (1994/95):** 221He:CCC, 221He:CCC, 222Eo:CCC, M221Cd:CPP, M221Db:CCP, M221Dc:CCC, M221Dd:CCC

**USFS Ecoregions (2007):** 221Hb:CCP, 221He:CCC, 221He:CC?, M221Cd:CPP, M221Db:CCP, M221Dc:CCC, M221Dd:CCC

**Federal Lands:** BIA (Eastern Band of Cherokee); NPS (Appalachian Trail [Southern Blue Ridge], Blue Ridge Parkway, Carl Sandburg Home, Great Smoky Mountains, Obed River); USFS (Chattahoochee, Chattahoochee (Piedmont), Chattahoochee (Southern Blue Ridge), Cherokee, Nantahala, Pisgah, Sumter, Sumter (Mountains))

**ELEMENT SOURCES**

**Great Smoky Mountains National Park Plots:** GRSM.36, GRSM.204, GRSM.206, GRSM.208, GRSM.218.

**Great Smoky Mountains National Park Description Author(s):** K.D. Patterson

**Global Description Author(s):** K.D. Patterson and S. Simon

**References:** Allard 1990, Chafin 2011, Fleming and Patterson 2009a, Patterson 1994, Peet et al. unpubl. data, Schafale 2012, Schafale and Weakley 1990, Schmalzer and DeSelm 1982, Southeastern Ecology Working Group n.d., TDNH unpubl. data 2018, White 2003

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**[CEGL007100] *Pinus strobus* / *Kalmia latifolia* - (*Vaccinium stamineum*, *Gaylussacia ursina*) Forest**

Translated Name: **Eastern White Pine / Mountain Laurel - (Deerberry, Bear Huckleberry) Forest**

Common Name: **Southern Appalachian White Pine Forest**

**USNVC CLASSIFICATION**

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Northeastern Oak - Hardwood - Pine Forest & Woodland (M502)
Group	Southern Appalachian Oak / Chestnut Forest (G015)
Alliance	<i>Quercus montana</i> - <i>Quercus coccinea</i> - <i>Pinus strobus</i> Forest Alliance (A4392)

**ELEMENT CONCEPT**

**Global Summary:** This association includes natural stands of forest vegetation with a canopy dominated by *Pinus strobus*. This community occurs at lower elevations (below 900 m) in the Southern Blue Ridge region of the Southern Appalachians on upper slopes and ridgetops protected by higher landforms. Other minor canopy species may include *Pinus rigida*, *Quercus coccinea*, and *Acer rubrum*. These forests often have open subcanopies composed of *Oxydendrum arboreum*, *Acer rubrum*, *Nyssa sylvatica*, and *Cornus florida*. The shrub stratum is patchy to continuous and dominated by ericaceous species, typically *Gaylussacia ursina*, or *Vaccinium stamineum*, and *Kalmia latifolia*. Other common species in the shrub/sapling stratum may include *Gaylussacia baccata*, *Vaccinium pallidum*, *Acer rubrum*, and *Castanea dentata*. Typical herbaceous species include *Galax urceolata*, *Chimaphila maculata*, *Goodyera pubescens*, *Epigaea repens*, *Medeola virginiana*, *Lysimachia quadrifolia*, *Uvularia puberula*, and *Chamaelirium luteum*.

**ENVIRONMENTAL DESCRIPTION**

**Great Smoky Mountains National Park Environment:** This community occurs below 900 m in the park on drier south-facing slopes.

**Global Environment:** This community occurs at lower elevations (below 900 m) in the Southern Blue Ridge region of the Southern Appalachians on upper slopes and ridgetops protected by higher landforms.

**VEGETATION DESCRIPTION**

**Great Smoky Mountains National Park Vegetation:** Within the park, examples of this association are mostly pure *Pinus strobus* with the occasional *Quercus coccinea* and *Pinus virginiana* in the canopy. In addition, *Acer rubrum* is increasing in abundance in the understory and may eventually overtake the current canopy species in the absence of fire. *Kalmia latifolia* is the dominant shrub. Herbaceous species are uncommon and are characteristic of dry acid environments.

**Global Vegetation:** This association includes natural stands of forest vegetation with a canopy dominated by *Pinus strobus*. Other minor canopy species may include *Pinus rigida*, *Quercus coccinea*, and *Acer rubrum*. These forests often have open subcanopies composed of *Oxydendrum arboreum*, *Acer rubrum*, *Nyssa sylvatica*, and *Cornus florida*. The shrub stratum is patchy to continuous and dominated by ericaceous species, typically *Gaylussacia ursina* or *Vaccinium stamineum*, and *Kalmia latifolia*. Other common species in the shrub/sapling stratum may include *Gaylussacia baccata*, *Vaccinium pallidum*, *Acer rubrum*, and *Castanea dentata*. Typical herbaceous species include *Galax urceolata*, *Chimaphila maculata*, *Goodyera pubescens*, *Epigaea repens*, *Medeola virginiana*, *Lysimachia quadrifolia*, *Uvularia puberula*, and *Chamaelirium luteum*.

**MOST ABUNDANT SPECIES**

**Great Smoky Mountains National Park**

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Pinus strobus</i>
Tree subcanopy	Broad-leaved deciduous tree	<i>Acer rubrum</i> , <i>Oxydendrum arboreum</i>
Tall shrub/sapling	Broad-leaved evergreen shrub	<i>Kalmia latifolia</i>

**Global**

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Pinus strobus</i>
Tree subcanopy	Broad-leaved deciduous tree	<i>Acer rubrum</i> , <i>Oxydendrum arboreum</i>
Tall shrub/sapling	Broad-leaved evergreen shrub	<i>Kalmia latifolia</i>

**CHARACTERISTIC SPECIES**

**Great Smoky Mountains National Park:** *Chimaphila maculata*, *Kalmia latifolia*, *Oxydendrum arboreum*, *Pinus strobus*, *Vaccinium stamineum*

**Global:** *Chimaphila maculata*, *Kalmia latifolia*, *Oxydendrum arboreum*, *Pinus strobus*, *Vaccinium stamineum*

**OTHER NOTEWORTHY SPECIES**

**Global:**

## CONSERVATION STATUS RANK

**Global Rank & Reasons:** G2G3 (4-Jan-2000). This community is geographically restricted and uncommon within its range.

## RELATED CONCEPTS

**Global Related Concepts:**

- Eastern White Pine: 21 (Eyre 1980) ><
- IA6f. Dry White Pine Ridge Forest (Allard 1990) >
- White Pine - Chestnut Oak: 51 (Eyre 1980) ><
- White Pine - Hemlock: 22 (Eyre 1980) ><

## CLASSIFICATION

**Status:** Standard

**Classification Confidence:** 2 - Moderate

**Great Smoky Mountains National Park Other Comments:** This community may have photosignatures of similar to *Pinus strobus* - *Tsuga canadensis* / *Rhododendron maximum* - (*Leucothoe fontanesiana*) Forest (CEGL007102) but is distinguished by occurring on low ridges and upper slopes. This community is compositionally and ecologically similar to *Pinus strobus* - *Quercus coccinea*, *prinus*) / (*Gaylussacia ursina*, *Vaccinium stamineum*) Forest (CEGL007519).

**Global Classification Comments:** One Carolina Vegetation Survey plot (020-007-355) from the Nantahala Gorge region was classified as *Pinus strobus* - *Quercus alba* - (*Carya tomentosa*) / *Gaylussacia ursina* Forest (CEGL007517) in the context of the Appalachian Trail, Southern Blue Ridge dataset, but was later reclassified (by committee) as this association (CEGL007100).

## ELEMENT DISTRIBUTION

**Great Smoky Mountains National Park Range:** This association was observed on the north side of the park in the Deep Creek drainage on an exposed south-facing slope.

**Global Range:** This community is known from the escarpment region of the Southern Blue Ridge and the Great Smoky Mountains of Tennessee.

**Nations:** US

**States/Provinces:** GA, NC, SC, TN

**TNC Ecoregions:** 50:C, 51:C

**USFS Ecoregions (1994/95):** 221Hc:CCC, M221Dc:CCC, M221Dd:CCC

**USFS Ecoregions (2007):** 221Hc:CCC, M221Dc:CCC, M221Dd:CCC

**Federal Lands:** BIA (Eastern Band of Cherokee); NPS (Big South Fork, Blue Ridge Parkway, Great Smoky Mountains); USFS (Chattahoochee, Chattahoochee (Southern Blue Ridge), Nantahala, Pisgah, Sumter, Sumter (Mountains))

## ELEMENT SOURCES

**Great Smoky Mountains National Park Plots:** GRSM.515.

**Great Smoky Mountains National Park Description Author(s):** K.D. Patterson, mod. R. White

**Global Description Author(s):** K.D. Patterson

**References:** Allard 1990, DeYoung 1979, Eyre 1980, Fleming and Patterson 2009a, Govus 1982, NatureServe Ecology - Southeastern U.S. unpubl. data, Patterson 1994, Peet et al. unpubl. data, Schafale 2012, Schafale and Weakley 1990, Southeastern Ecology Working Group n.d., TDNH unpubl. data 2018

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**[CEGL006271] *Quercus (montana, coccinea) / Kalmia latifolia / (Galax urceolata, Gaultheria procumbens) Forest***

Translated Name: (Chestnut Oak, Scarlet Oak) / Mountain Laurel / (Beetleweed, Eastern Teaberry) Forest

Common Name: Chestnut Oak Forest (Subxeric Ridge Type)

## USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Northeastern Oak - Hardwood - Pine Forest & Woodland (M502)
Group	Southern Appalachian Oak / Chestnut Forest (G015)
Alliance	<i>Quercus montana</i> - <i>Quercus coccinea</i> - <i>Pinus strobus</i> Forest Alliance (A4392)

## ELEMENT CONCEPT

**Global Summary:** This community includes subxeric ridgetop and exposed slope forests in the Southern Appalachians, ranging south and east into the upper Piedmont, north into the Central Appalachians, and north and west into the Ridge and Valley. This community occurs over shallow soils, primarily on south- to west-facing slopes and ridgetops where solar exposure is high. Soils are rocky, infertile, dry, acidic sandy loams typically derived from sandstone. The community includes forests with canopies strongly dominated by *Quercus montana* and/or *Quercus coccinea*, with lesser amounts of *Quercus velutina*, *Quercus rubra*, *Quercus falcata*, *Oxydendrum arboreum*, *Nyssa sylvatica*, *Pinus virginiana*, and *Acer rubrum*, occurring over a typically dense shrub stratum dominated by ericaceous species. The shrub layer may vary between evergreen and deciduous dominance. Typical shrub species include *Kalmia latifolia*, *Rhododendron maximum*, *Vaccinium stamineum*, *Vaccinium pallidum*, *Gaylussacia ursina*, *Gaylussacia baccata*, and (in the more southern portions of the range) *Eubotrys recurva*. In addition, *Castanea dentata* may occur abundantly as root sprouts. The herb layer is typically sparse and includes subshrubs such as *Epigaea repens* and *Gaultheria procumbens*. Other

common species include *Chamaelirium luteum*, *Chimaphila maculata*, *Galax urceolata*, *Magnolia fraseri*, *Sassafras albidum*, *Symplocos tinctoria*, *Smilax rotundifolia*, and *Smilax glauca*. This community is distinguished by its overall floristic composition, with a high abundance of acid-loving ericaceous species, which are indicative of this community's extremely infertile, acidic soils.

#### ENVIRONMENTAL DESCRIPTION

**Great Smoky Mountains National Park Environment:** This community was found on middle to upper convex slopes and ridges with mostly southern and western aspects. Soils can be deep and well-drained or shallow and rocky. This community typically occurs below 3500 feet elevation but was sampled as high as 3880 feet on a dry ridgeline that was once dominated by pine. At least some occurrences of this community are the result of hardwood succession following fire suppression or pine mortality from Southern pine beetle (*Dendroctonus frontalis*).

**Global Environment:** This community occurs on upper slopes, ridges and spurs, usually convex, primarily on south- to west-facing slopes and ridgetops where solar exposure is high. This community includes subxeric ridgetop forests in the Southern Blue Ridge, ranging south and east into the upper Piedmont and north into the Central Appalachians, and west into the Ridge and Valley. Soils are rocky, infertile, dry to very dry, acidic sandy loams to clay loams often derived from sandstone. These forests occur on moderate to very steep slopes or on flat to gently sloping interfluves. Sites supporting this association are typically below 1067 m (3500 feet) elevation, but range up to 1280 m (4200 feet). The average elevation of 55 plots classified as this association in the Appalachian Trail project (Fleming and Patterson 2009a) is 845 m (2771 feet), ranging from 262 m (860 feet) to 1305 m (4281 feet).

#### VEGETATION DESCRIPTION

**Great Smoky Mountains National Park Vegetation:** The canopy of this forest is dominated by *Quercus prinus*, *Quercus coccinea*, and *Acer rubrum*, occurring either singly or in various combinations. Other species found in the canopy and subcanopy include *Carya glabra*, *Cornus florida*, *Nyssa sylvatica*, *Oxydendrum arboreum*, *Pinus rigida*, *Quercus rubra*, *Quercus velutina*, *Quercus falcata*, and *Robinia pseudoacacia*. The dense shrub layer is dominated by the evergreen shrub *Kalmia latifolia* and/or the deciduous shrub *Gaylussacia ursina*. Other common shrubs include *Rhododendron maximum*, *Castanea dentata*, *Vaccinium hirsutum*, *Vaccinium pallidum*, and *Vaccinium stamineum*. Stands with a heavy deciduous shrub layer tend to have greater herb density and diversity, but typically herbs are sparse. Common herbs include *Chimaphila maculata*, *Epigaea repens*, *Galax urceolata*, and *Goodyera pubescens*. The vines *Smilax rotundifolia* and *Smilax glauca* are common and abundant.

**Global Vegetation:** Stands of this association are forests with canopies strongly dominated by *Quercus montana* (= *Quercus prinus*) and *Quercus coccinea* alone or in mixture. *Quercus velutina* is an important associate in some stands. Other trees, usually in lesser amounts, include *Quercus rubra*, *Quercus alba*, *Quercus falcata*, *Oxydendrum arboreum*, *Nyssa sylvatica*, *Pinus virginiana*, *Pinus rigida*, *Betula lenta*, and *Acer rubrum*. In addition, *Carya tomentosa* (= *Carya alba*), *Carya glabra*, *Magnolia acuminata*, and *Magnolia fraseri* are present in some areas. The canopy trees grow over a typically dense shrub stratum dominated by ericaceous species, which may display either evergreen or deciduous dominance. Typical shrub species include *Kalmia latifolia*, *Vaccinium stamineum*, *Vaccinium pallidum*, *Gaylussacia ursina*, and *Gaylussacia baccata*. Some areas may feature *Rhododendron maximum*, *Rhododendron calendulaceum*, *Rhododendron catawbiense*, and *Eubotrys recurva* (= *Leucothoe recurva*). In addition, *Castanea dentata* may occur abundantly as root sprouts. The herb layer is typically sparse and includes subshrubs such as *Epigaea repens* and *Gaultheria procumbens*. Other common species include *Carex digitalis* var. *digitalis*, *Chamaelirium luteum*, *Chimaphila maculata*, *Coreopsis major*, *Galax urceolata*, *Danthonia spicata*, *Dichanthelium dichotomum* var. *dichotomum*, *Dioscorea quaternata*, *Hieracium venosum*, *Houstonia longifolia*, *Lysimachia quadrifolia*, *Solidago caesia*, *Symplocos tinctoria*, and *Potentilla simplex*. Mosses include *Dicranum fulvum*, *Dicranum scoparium*, *Thuidium delicatulum*, and *Leucobryum glaucum*. Macrolichens include *Flavoparmelia baltimorensis*, *Cladonia furcata*, *Lasallia papulosa*, and *Umbilicaria mammulata*. This community is distinguished by its overall floristic composition, with a high abundance of acid-loving ericaceous species, which are indicative of this community's extremely infertile, acid soils. In the Great Smoky Mountains *Acer rubrum* is often dominant or codominant in these forests, presumably on former American chestnut (*Castanea dentata*) sites. In the Blue Ridge-Piedmont transition, below 853 m (2800 feet) elevation, where this community is often associated with *Pinus rigida* forests and woodlands, *Quercus falcata* may be a component of the canopy, and the shrub stratum is strongly dominated by *Vaccinium pallidum*.

**Global Dynamics:** There is abundant evidence of past fires in this community, and the vegetation may be fire-adapted, although information on natural fire regimes is lacking. Most sites have a history of logging.

#### MOST ABUNDANT SPECIES

##### Great Smoky Mountains National Park

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Broad-leaved deciduous tree	<i>Acer rubrum</i> , <i>Quercus coccinea</i> , <i>Quercus montana</i>
Tree subcanopy	Broad-leaved deciduous tree	<i>Acer rubrum</i> , <i>Nyssa sylvatica</i> , <i>Oxydendrum arboreum</i>
Shrub/sapling (tall & short)	Liana	<i>Smilax glauca</i> , <i>Smilax rotundifolia</i>
Tall shrub/sapling	Broad-leaved evergreen shrub	<i>Kalmia latifolia</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Gaylussacia ursina</i>
Herb (field)	Dwarf-shrub	<i>Galax urceolata</i>

**Global****Stratum**

Tree canopy

**Lifeform**

Broad-leaved deciduous tree

**Species***Quercus alba*, *Quercus coccinea*, *Quercus montana*, *Quercus velutina*

Tall shrub/sapling

Broad-leaved deciduous shrub

*Vaccinium stamineum*

Tall shrub/sapling

Broad-leaved evergreen shrub

*Kalmia latifolia*

Short shrub/sapling

Dwarf-shrub

*Epigaea repens*, *Gaultheria procumbens*

Herb (field)

Flowering forb

*Galax urceolata***CHARACTERISTIC SPECIES****Great Smoky Mountains National Park:** *Acer rubrum*, *Gaylussacia ursina*, *Kalmia latifolia*, *Quercus coccinea*, *Quercus montana***Global:** *Acer rubrum*, *Carex digitalis* var. *digitalis*, *Castanea dentata*, *Chimaphila maculata*, *Coreopsis major*, *Danthonia spicata*, *Dichanthelium dichotomum* var. *dichotomum*, *Galax urceolata*, *Gaylussacia baccata*, *Hieracium venosum*, *Kalmia latifolia*, *Lysimachia quadrifolia*, *Nyssa sylvatica*, *Oxydendrum arboreum*, *Quercus alba*, *Quercus coccinea*, *Quercus montana*, *Quercus velutina*, *Rhododendron periclymenoides*, *Sassafras albidum*, *Solidago caesia*, *Vaccinium pallidum*, *Vaccinium stamineum***OTHER NOTEWORTHY SPECIES****Great Smoky Mountains National Park: Vulnerable Plants:** *Vaccinium hirsutum* (G4, globally vulnerable)**Global: Vulnerable Plants:** *Buckleya distichophylla* (G3), *Hexastylis contracta* (G3), *Monotropsis odorata* (G3), *Robinia hispida* var. *rosea* (G4T3?), *Stachys clingmanii* (G2), *Thermopsis fraxinifolia* (G3?), *Thermopsis mollis* (G3G4), *Tsuga caroliniana* (G2G3);**Other Plants:** *Canoparmelia caroliniana* (G3G5), *Smilax biltmoreana* (G4), *Vaccinium hirsutum* (G4)**CONSERVATION STATUS RANK****Global Rank & Reasons:** G5 (31-Dec-1997).**RELATED CONCEPTS****Global Similar Types:**

- *Acer rubrum* - *Betula lenta* - *Magnolia fraseri* / (*Rhododendron maximum*, *Kalmia latifolia*) Ruderal Forest (CEGL008558) is an acidic mixed hardwood forest of the Southern Blue Ridge, resulting after severe fire, logging, or loss of chestnut; a modified type originally defined from the Great Smoky Mountains.
- *Pinus virginiana* - *Pinus (rigida, echinata)* - (*Quercus montana*) / *Vaccinium pallidum* Forest (CEGL007119)
- *Quercus alba* - *Quercus (coccinea, velutina, montana)* / *Gaylussacia baccata* Forest (CEGL008521)
- *Quercus montana* - (*Quercus coccinea*) / *Carya pallida* / *Vaccinium arboreum* - *Vaccinium pallidum* Forest (CEGL008431) defined for the southern Cumberland Plateau and western fringe of the Southern Blue Ridge, with more diverse shrubs.
- *Quercus montana* - (*Quercus coccinea, Quercus rubra*) / *Kalmia latifolia* / *Vaccinium pallidum* Forest (CEGL006299) is the Central Appalachian analogue of CEGL006271; compositionally similar but generally lacking Southern Appalachian species such as *Galax*, *Oxydendrum*, and *Eubotrys recurvus*.
- *Quercus montana* - (*Quercus rubra*) - *Carya* spp. / *Oxydendrum arboreum* - *Cornus florida* Forest (CEGL007267)
- *Quercus montana* - *Carya* spp. - *Quercus velutina* / *Vaccinium arboreum* / *Iris verna* var. *smalliana* Forest (CEGL007261) is defined for the lower Piedmont of Alabama and has Coastal Plain affinities.
- *Quercus montana* - *Quercus (alba, coccinea)* / *Viburnum acerifolium* - (*Kalmia latifolia*) Forest (CEGL005023) is a broadly defined type for the Appalachian Plateau and Interior Low Plateau.
- *Quercus montana* - *Quercus (rubra, velutina)* / *Vaccinium (angustifolium, pallidum)* Forest (CEGL006282) is defined for the Northern Piedmont, Central Appalachians; occurs on granite monadnocks.
- *Quercus montana* - *Quercus alba* / *Oxydendrum arboreum* / *Vitis rotundifolia* Forest (CEGL006281)
- *Quercus montana* - *Quercus rubra* / *Rhododendron maximum* / *Galax urceolata* Forest (CEGL006286) is more mesic and has a higher component of *Rhododendron maximum* and relatively little *Kalmia latifolia*.

**Global Related Concepts:**

- *Quercus alba* - *Quercus velutina* - (*Quercus prinus*) / *Vaccinium pallidum* - (*Kalmia latifolia*) forest (Vanderhorst 2001b) =
- *Quercus montana* - *Quercus coccinea* / *Vaccinium pallidum* Forest (Fleming and Moorhead 2000) ?
- *Quercus montana* / *Kalmia latifolia* / *Gaylussacia ursina* Forest (Patterson 1994) =
- *Quercus montana* / *Kalmia latifolia* / *Vaccinium pallidum* Association, *pro parte* (Rawinski et al. 1996) ?
- *Quercus prinus* - *Quercus (velutina, coccinea)* / *Oxydendron arboreum* / *Kalmia latifolia* / (*Galax urceolata*) Forest [Southern Appalachian Oak / Heath Forest] (Vanderhorst 2017d) <
- *Quercus prinus* - *Quercus coccinea* / *Kalmia latifolia* / *Vaccinium pallidum* Forest (Fleming and Coulling 2001) =
- Chestnut Oak - Chestnut Forest (Whittaker 1956) =
- Chestnut Oak Forests (McLeod 1988) ?
- Chestnut Oak type (Golden 1974) ?
- Chestnut Oak: 44 (Eyre 1980) >
- Chestnut oak-scarlet oak/ericad forest: (matrix) xeric, S- & SW-facing slopes (CAP pers. comm. 1998) ?
- IA6d. Chestnut Oak Slope and Ridge Forest (Allard 1990) >

## CLASSIFICATION

**Status:** Standard

**Classification Confidence:** 1 - Strong

**Great Smoky Mountains National Park Other Comments:** Many examples of this community are on sites formerly dominated by *Pinus rigida* and *Pinus pungens* and may have these species remaining in the canopy and shrub layers. Other examples occur on sites not dry or rocky enough to support *Pinus*-dominated forests. The canopy and shrub dominants of this community can vary greatly from site to site. This variation is most likely related to a combination of past disturbance regimes and site and soil factors. Stands strongly dominated by *Quercus coccinea* also tended to contain *Pinus rigida* and a dense *Kalmia latifolia* shrub layer. Stands lacking a dense *Kalmia latifolia* shrub layer but rather with a dense deciduous shrub layer also tended to contain high coverage of *Carya glabra* and more herbaceous cover. This community grades downslope into more mesic vegetation such as *Tsuga canadensis* streamside forests and submesic oak forests dominated by *Quercus prinus* and *Quercus rubra*. It grades upslope to more xeric *Pinus*-dominated communities.

**Global Classification Comments:** Like the other matrix oak/heath forests in Virginia, this type can occur on a wide variety of topographic positions, as long as soil conditions are favorable. A similar association defined for the southern Cumberland Plateau, *Quercus montana* - (*Quercus coccinea*) / *Carya pallida* / *Vaccinium arboreum* - *Vaccinium pallidum* Forest (CEGL008431), occurs over sandstone or other geologies not as acidic as the Blue Ridge type and lacks species indicative of the Blue Ridge association, such as *Kalmia latifolia*, *Gaylussacia ursina*, *Gaylussacia baccata*, and *Gaultheria procumbens*.

In the Great Smoky Mountains, *Acer rubrum* is often dominant or codominant in these forests, presumably on former American chestnut (*Castanea dentata*) sites. In the Blue Ridge-Piedmont transition, below 853 m (2800 feet) elevation, where this community is often associated with *Pinus rigida* forests and woodlands, *Quercus falcata* may be a component of the canopy, and the shrub stratum is strongly dominated by *Vaccinium pallidum*. A similar association defined for the southern Cumberland Plateau, *Quercus montana* - (*Quercus coccinea*) / *Carya pallida* / *Vaccinium arboreum* - *Vaccinium pallidum* Forest (CEGL008431), occurs over sandstone or other geologies not as acid as the Blue Ridge type and lacks species indicative of the Blue Ridge association, such as *Kalmia latifolia*, *Gaylussacia ursina*, *Gaylussacia baccata*, and *Gaultheria procumbens*.

In 55 plots classified as this association (homoteneity = 0.60) in the Appalachian Trail analysis (Fleming and Patterson 2009a), the most constant species, in order of descending constancy are *Acer rubrum*, *Kalmia latifolia*, *Quercus montana*, *Quercus coccinea*, *Nyssa sylvatica*, *Vaccinium pallidum*, *Oxydendrum arboreum*, *Galax urceolata*, *Smilax rotundifolia*, *Castanea dentata*, *Sassafras albidum*, and *Smilax glauca*. Species richness ranges from 13-52 species and averages 30 species per 400-m<sup>2</sup> plot sample. In this same analysis, a group of 11 plots from the Great Smoky and Nantahala mountains segregated as a distinct group in cluster analysis. While the composition of this group fits within the broad concept of this association (CEGL006271), this "southern variant" is distinguished by the dominance of *Gaylussacia ursina* and the greater importance of *Quercus rubra*, *Pyrularia pubera*, *Tsuga canadensis*, and *Magnolia fraseri* than in the "typic" expression of CEGL006271. Further, species that are common in the "typic" expression of CEGL006271, *Quercus coccinea*, *Nyssa sylvatica*, *Vaccinium pallidum*, *Gaylussacia baccata*, and *Eubotrys recurva*, are absent or inconstant in the "southern variant." Based on available plot data, environmental and geographic distinctions could not be made between the two groups, but further study may be warranted.

Thirty-seven plots in southern West Virginia (mostly from New River Gorge National River and Gauley River National Recreation Area) are classified in this association. Floristics are similar to the global description, but some southern species such as *Galax urceolata* and *Eubotrys recurva* are present in only a small percentage of plots and the association is only weakly differentiated from West Virginia examples of CEGL005023 further north in the Western Allegheny Plateau. In West Virginia both CEGL006271 and CEGL005023 have abundant *Oxydendron arboreum*, but CEGL005023 lacks most other southern species, and *Kalmia latifolia* is usually absent or patchy.

## ELEMENT DISTRIBUTION

**Great Smoky Mountains National Park Range:** This community was found on both the Mount Le Conte and Cades Cove quadrangles and is widely distributed elsewhere in the Park. On the Cades Cove quadrangle, recent and historic samples representing this community come from elevations ranging from 2240 to 3940 feet, from all areas of the quadrangle. In the northern portion, this community was sampled on the southern slopes of Arbutus Ridge (2240 and 2280 feet); the eastern slopes (3440 feet) and lower northwestern slopes (2840 feet) of Leadbetter Ridge; and north of Leadbetter Ridge on the north slopes above Anthony Creek. In the central portion of the quadrangle, on the low east and west slopes above Forge Creek, west of Mollies Butt (2657 and 2840 feet); the lower and middle west slopes of Doe Ridge (3000 and 3336 feet); northwest slopes below Powell Ridge, the southern upper slopes and ridges in the vicinity of Mollies Ridge and lower slopes west of Mollies Butt (3200 and 2940 feet); on middle slopes at the northern edge of Gregory's Ridge (2700 feet); and on the middle, southern slopes of Big Grill Ridge (3640 feet). In the southeastern part of Cade Cove quadrangle, this community was sampled from the southwest sideridge of Nuna Ridge (3880 feet) and from the southeast slope of Paw Paw Ridge (2620 feet). On the Mount Le Conte quadrangle, this community was sampled at elevations ranging from 1800 to 3250 feet. In the northern portion of the quadrangle, this community was sampled from low ridges and slopes north and east of Grapeyard Ridge (1800 to 2100 feet). In the western part of the quadrangle, it was sampled on the low west-facing slopes above Cherokee Orchard (2560 to 2720 feet) and the west slopes below Scratch Britches (3250 feet). In the east, this community was sampled on east-facing, low slopes above the Little Pigeon River (1880 feet).

**Global Range:** The center of distribution for this community is the Southern Blue Ridge of southwestern Virginia, western North Carolina, eastern Tennessee, northeastern Georgia, and northwestern South Carolina. It ranges south and east into the upper Piedmont

and north into the Central Appalachians. This type is common in the Southern Ridge and Valley and Cumberland Mountains of southwestern Virginia, West Virginia, and Kentucky.

**Nations:** US

**States/Provinces:** GA, KY, NC, SC, TN, VA:S4S5, WV:S4

**TNC Ecoregions:** 50:C, 51:C, 52:P, 59:C

**USFS Ecoregions (1994/95):** 221Ja:CCC, 231Ag:CCC, M221Aa:CCC, M221Ab:CCC, M221Bd:CCC, M221Be:CCC, M221Ca:CCC, M221Cb:CCC, M221Cc:CCP, M221Ce:CCC, M221Da:CCC, M221Db:CCC, M221Dc:CCC, M221Dd:CCC

**USFS Ecoregions (2007):** 221Ja:CCC, 231Ag:CCC, M221Aa:CCP, M221Ab:CCC, M221Bd:CCC, M221Be:CCC, M221Ca:CCC, M221Cb:CCC, M221Cc:CCP, M221Ce:CCP, M221Da:CCC, M221Db:CCC, M221Dc:CCC, M221Dd:CCC

**Federal Lands:** BIA (Eastern Band of Cherokee); NPS (Appalachian Trail [Central Appalachians], Appalachian Trail [Southern Blue Ridge], Blue Ridge Parkway, Carl Sandburg Home, Cumberland Gap, Gauley River, Great Smoky Mountains, New River Gorge); USFS (Chattahoochee, Chattahoochee (Piedmont)?, Chattahoochee (Southern Blue Ridge), Cherokee, Daniel Boone, Jefferson, Nantahala, Pisgah, Sumter, Sumter (Mountains))

#### ELEMENT SOURCES

**Great Smoky Mountains National Park Plots:** GRSM.9, GRSM.18, GRSM.22, GRSM.35, GRSM.42, GRSM.54, GRSM.80, GRSM.99, GRSM.109, GRSM.111, GRSM.122, GRSM.124, GRSM.126, GRSM.128, GRSM.130, GRSM.212, GRSM.319, GRSM.320, GRSM.415, GRSM.503.

**Great Smoky Mountains National Park Description Author(s):** K.D. Patterson

**Global Description Author(s):** K.D. Patterson, R. White and S.C. Gawler

**References:** Allard 1990, CAP pers. comm. 1998, Evans et al. 2009, Eyre 1980, Fleming and Coulling 2001, Fleming and Moorhead 2000, Fleming and Patterson 2009a, Fleming and Patterson 2009b, Fleming et al. 2017, Golden 1974, Major et al. 1999, McLeod 1988, NatureServe Ecology - Southeastern U.S. unpubl. data, Nelson 1986, Patterson 1994, Peet et al. unpubl. data, Rawinski et al. 1996, Schafale 2012, Schafale and Weakley 1990, Southeastern Ecology Working Group n.d., TDNH unpubl. data 2018, Vanderhorst 2001b, Vanderhorst 2017d, Vanderhorst et al. 2007, Vanderhorst et al. 2010, WVNHP unpubl. data, White 2003, White 2006, Whittaker 1956

#### [CEGL007691] *Quercus alba* - *Quercus coccinea* - *Quercus falcata* / *Kalmia latifolia* - *Vaccinium pallidum* Forest

Translated Name: **White Oak - Scarlet Oak - Southern Red Oak / Mountain Laurel - Blue Ridge Blueberry Forest**

Common Name: **Appalachian Montane Oak - Hickory Forest (Low-Elevation Xeric Type)**

#### USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Northeastern Oak - Hardwood - Pine Forest & Woodland (M502)
Group	Southern Appalachian Oak / Chestnut Forest (G015)
Alliance	<i>Quercus montana</i> - <i>Quercus coccinea</i> - <i>Pinus strobus</i> Forest Alliance (A4392)

#### ELEMENT CONCEPT

**Global Summary:** This mixed oak association includes dry, deciduous forests of low elevations (below 915 m [3000 feet]) in the Southern Blue Ridge, associated with sandy, dry soils derived from granitic gneiss and other related acidic substrates. This association is known as a matrix forest type in the area of Brevard, North Carolina, where it occurs on open slopes and broad ridges, in a landscape of a low, rolling plateau. It appears to extend south into South Carolina. These forests have canopies dominated by *Quercus alba*, *Quercus coccinea*, *Quercus falcata*, *Quercus velutina*, and sometimes *Quercus montana*, although other species can be present, including *Pinus echinata*, *Pinus virginiana*, and *Pinus rigida*. This forest is characterized by having associated species more typical of lower, non-montane areas, such as *Quercus falcata*, *Schizachyrium scoparium*, *Silphium compositum*, *Baptisia tinctoria*, and *Piptochaetium avenaceum*, and by the absence of species more typical in mesic, montane oak forests, including *Medeola virginiana*, *Maianthemum racemosum*, *Thelypteris noveboracensis*, *Athyrium filix-femina ssp. asplenioides*, *Dennstaedtia punctilobula*, and *Dryopteris intermedia*). The shrub stratum can be quite open, with *Rhododendron calendulaceum* typical. *Kalmia latifolia* and *Vaccinium pallidum* are usually present in moderate abundance. *Solidago odora var. odora* and *Pteridium aquilinum var. latiusculum* are typical herb components.

#### ENVIRONMENTAL DESCRIPTION

**Great Smoky Mountains National Park Environment:** Within the park, this community occurs on the North Carolina side on xeric south- and southwest-facing slopes below 2500 feet.

**Global Environment:** This association includes dry, deciduous forests of low elevations (below 915 m [3000 feet]) in the Southern Blue Ridge, associated with sandy, dry soils derived from granitic gneiss and other related acidic geologies. This association is known as a matrix forest type in the area of Brevard, North Carolina, where it occurs on open slopes and broad ridges, in a landscape of a low, rolling plateau.

#### VEGETATION DESCRIPTION

**Great Smoky Mountains National Park Vegetation:** Canopies are often dominated by a combination of *Quercus alba*, *Quercus falcata*, *Quercus rubra*, and *Quercus prinus*, but also sometimes contain high proportions of *Pinus rigida* and *Pinus virginiana* where

they may eventually transition to more pine-dominated xeric associations. The herb layer is similar to the global description though *Pteridium aquilinum* is not always present in examples in the Great Smokies.

**Global Vegetation:** These forests have canopies dominated by *Quercus alba* with other oak species including *Quercus coccinea*, *Quercus falcata*, *Quercus velutina*, and sometimes *Quercus montana* (= *Quercus prinus*). Other species can be present, including *Pinus echinata*, *Pinus virginiana*, and *Pinus rigida*. The subcanopy may contain *Oxydendrum arboreum*. This forest is characterized by having associated species more typical of lower, non-montane areas, such as *Quercus falcata*, *Schizachyrium scoparium*, *Silphium compositum*, *Baptisia tinctoria*, *Piptochaetium avenaceum*, and by the absence of species more typical in mesic, montane oak forests (*Medeola virginiana*, *Maianthemum racemosum*, *Thelypteris noveboracensis*, *Athyrium filix-femina ssp. asplenoides*, *Dennstaedtia punctilobula*, *Dryopteris intermedia*). The shrub stratum can be quite open, with *Rhododendron calendulaceum* typical. *Kalmia latifolia* and *Vaccinium pallidum* are usually present in moderate abundance. *Solidago odora var. odora* and *Pteridium aquilinum var. latiusculum* are typical herb components.

#### MOST ABUNDANT SPECIES

##### Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Broad-leaved deciduous tree	<i>Quercus alba</i>
Tall shrub/sapling	Broad-leaved evergreen shrub	<i>Kalmia latifolia</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Vaccinium pallidum</i>

#### CHARACTERISTIC SPECIES

##### Great Smoky Mountains National Park:

**Global:** *Baptisia tinctoria*, *Kalmia latifolia*, *Piptochaetium avenaceum*, *Quercus alba*, *Quercus coccinea*, *Quercus falcata*, *Schizachyrium scoparium*, *Silphium compositum*, *Vaccinium pallidum*

#### OTHER NOTEWORTHY SPECIES

**Global: Vulnerable Plants:** *Ageratina altissima var. roanensis* (G5T3T4, Southern Blue Ridge endemic)

#### CONSERVATION STATUS RANK

**Global Rank & Reasons:** G2G3 (4-Oct-2004). This association is known as a matrix forest type in the area of Brevard, North Carolina, where it occurs on open slopes and broad ridges in a landscape of a low, rolling plateau. It may extend south into South Carolina and Tennessee. It does occur on public lands, but since it is on lower elevations, it would be easy to access for logging and/or conversion to other uses (i.e., pine plantations and development on private land).

#### RELATED CONCEPTS

##### Global Related Concepts:

- Montane Oak--Hickory Forest (Low Dry Subtype) (Schafale and Weakley 1990) =
- Montane Oak-Hickory Forest (Low Dry Subtype) (Schafale 2012) =

#### CLASSIFICATION

**Status:** Standard

**Classification Confidence:** 2 - Moderate

**Global Classification Comments:** This association was defined based on North Carolina occurrences. More information is needed to better describe this association and define its geographic distribution.

#### ELEMENT DISTRIBUTION

**Great Smoky Mountains National Park Range:** Examples of this community occur on dry south-facing ridges on the North Carolina side of the park. They are especially common in the vicinity of the Goldmine Loop Trail upslope from Lake Fontana.

**Global Range:** This association is known as a matrix forest type in the area of Brevard, North Carolina. It apparently extends south into South Carolina. Its full range is unclear (e.g., the status in Tennessee is not known).

**Nations:** US

**States/Provinces:** GA?, NC, SC, TN?

**TNC Ecoregions:** 51:C

**USFS Ecoregions (1994/95):** M221Dc:CCC, M221Dd:CCC

**USFS Ecoregions (2007):** M221Dc:CCC, M221Dd:CCC

**Federal Lands:** BIA (Eastern Band of Cherokee); NPS (Appalachian Trail [Southern Blue Ridge], Blue Ridge Parkway, Great Smoky Mountains); USFS (Chattahoochee (Southern Blue Ridge)?, Chattahoochee?, Cherokee?, Nantahala, Pisgah, Sumter, Sumter (Mountains))

#### ELEMENT SOURCES

**Great Smoky Mountains National Park Plots:** GRSM.514, GRSM.545, GRSM.549.

**Great Smoky Mountains National Park Description Author(s):** R. White

**Global Description Author(s):** M.P. Schafale and M. Pyne

**References:** NatureServe Ecology - Southeastern U.S. unpubl. data, Nelson 1986, Peet et al. unpubl. data, Schafale 2012, Schafale 2012, Schafale and Weakley 1990, Southeastern Ecology Working Group n.d.

**[CEGL008431] *Quercus montana* - (*Quercus coccinea*) / *Carya pallida* / *Vaccinium arboreum* - *Vaccinium pallidum*****Forest**Translated Name: **Chestnut Oak - (Scarlet Oak) / Sand Hickory / Farkleberry - Blue Ridge Blueberry Forest**Common Name: **Subxeric Ridgetop Chestnut Oak Forest****USNVC CLASSIFICATION**

Division	Eastern North American Forest & Woodland (I.B.2.Na)
Macrogroup	Appalachian-Northeastern Oak - Hardwood - Pine Forest & Woodland (M502)
Group	Southern Appalachian Oak / Chestnut Forest (G015)
Alliance	<i>Quercus montana</i> - <i>Quercus coccinea</i> - <i>Pinus strobus</i> Forest Alliance (A4392)

**ELEMENT CONCEPT**

**Global Summary:** This association includes subxeric chestnut oak forests on high slopes and ridges in the southern Cumberland Plateau, southern Ridge and Valley, Southern Blue Ridge, and occasionally in the Piedmont of North Carolina, South Carolina, and Georgia. This forest occurs over rocky, shallow soils derived from various geologies. These include sandstone, quartzite (in the Piedmont), schist, or weakly metamorphosed, metasedimentary rocks (in the western edge of the Southern Blue Ridge). This is a closed-canopy, deciduous forest with open to sparse shrub layers and a sparse to absent herb layer. The canopy is dominated by *Quercus montana*, sometimes sharing dominance with *Quercus coccinea*. Other oaks in the canopy can include *Quercus velutina*, *Quercus stellata*, and *Quercus alba*, although these oaks are not dominant. Hickories (e.g., *Carya glabra*, *Carya pallida*) may be present in the canopy and/or subcanopy. Some examples may have coverage of pine in the canopy, most commonly *Pinus virginiana* and *Pinus echinata*. The most common subcanopy trees are *Acer rubrum*, *Carya pallida*, *Cornus florida*, *Nyssa sylvatica*, and *Oxydendrum arboreum*. The most constant shrub species are *Chimaphila maculata*, *Vaccinium arboreum*, *Vaccinium pallidum*, *Vaccinium stamineum*, *Diospyros virginiana*, and *Sassafras albidum*. Herb coverage is sparse, with little constancy among examples. Some of the more typical herb species are *Euphorbia corollata*, *Hieracium venosum*, *Carex nigromarginata*, and *Solidago odora*, but many other species may occur.

**ENVIRONMENTAL DESCRIPTION**

**Global Environment:** This forest is found on north- and west-facing high slopes and ridgetops over soils derived from sandstone, in the Cumberland Plateau and Ridge and Valley, or weakly metamorphosed, metasedimentary rocks in the western edge of the Southern Blue Ridge. Examples range from 225 to 732 m (740-2400 feet) elevation, with most examples occurring over 274 m (900 feet) elevation. Examples in the Piedmont are usually over metamorphic rock such as schist or quartzite. In the Blue Ridge, this type does not generally reach elevations above 732 m (2400 feet).

**VEGETATION DESCRIPTION**

**Global Vegetation:** This is a closed-canopy, deciduous forest with open to sparse shrub layers and a sparse to absent herb layer. The canopy is dominated by *Quercus montana* (= *Quercus prinus*) sometimes sharing dominance with *Quercus coccinea* (and in some Piedmont examples, with *Quercus coccinea* as the dominant canopy tree). Other oaks in the canopy can include *Quercus velutina*, *Quercus stellata*, and *Quercus alba*, although these oaks are not dominant. Hickories (e.g., *Carya glabra*, *Carya pallida*) may be present in the canopy and/or subcanopy. Some examples may have coverage of pine in the canopy, most commonly *Pinus virginiana* and *Pinus echinata*. The most common subcanopy trees are *Acer rubrum*, *Carya pallida*, *Cornus florida*, *Nyssa sylvatica*, and *Oxydendrum arboreum*. Other minor species in the canopy and subcanopy can include *Carya glabra*, *Castanea dentata*, and *Magnolia macrophylla*. The most constant shrub species are *Chimaphila maculata*, *Vaccinium arboreum*, *Vaccinium pallidum*, *Vaccinium stamineum*, *Diospyros virginiana*, and *Sassafras albidum*. Other shrubs that can occur in examples of this community are *Lyonia ligustrina*, *Castanea pumila*, *Viburnum acerifolium*, *Rhododendron alabamense*, and *Rhododendron canescens*. Herb coverage is sparse, with little constancy among examples. Some of the more typical herb species are *Euphorbia corollata*, *Hieracium venosum*, *Carex nigromarginata*, and *Solidago odora*, but many other species may occur. In the lower Piedmont of Georgia, some additional herbs may include *Schizachyrium scoparium*, *Dichantheium boscii*, *Piptochaetium avenaceum*, *Tephrosia virginiana*, *Verbesina virginica*, *Hypoxis hirsuta*, *Tragia urticifolia*, *Brickellia eupatorioides*, *Scutellaria elliptica*, *Arnoglossum atriplicifolium*, *Pityopsis aspera*, and *Coreopsis major*.

**MOST ABUNDANT SPECIES****Global****Stratum**

Tree canopy

Tree subcanopy

**Lifeform**

Broad-leaved deciduous tree

Broad-leaved deciduous tree

**Species***Quercus coccinea*, *Quercus montana**Acer rubrum***CHARACTERISTIC SPECIES****Global:** *Acer rubrum*, *Oxydendrum arboreum*, *Quercus coccinea*, *Quercus montana***OTHER NOTEWORTHY SPECIES****Global: Vulnerable Plants:** *Diervilla rivularis* (G3), *Gaylussacia brachycera* (G3)

## CONSERVATION STATUS RANK

**Global Rank & Reasons:** G4G5 (31-Jan-2003). This is a wide-ranging type, found on a variety of substrates in several ecoregions; its threats are limited.

## RELATED CONCEPTS

**Global Similar Types:**

- *Quercus (montana, coccinea) / Kalmia latifolia / (Galax urceolata, Gaultheria procumbens) Forest* (CEGL006271) is defined for the Southern Blue Ridge. Has dense, less diverse, ericaceous shrub layer and more acid-loving, Blue Ridge species.
- *Quercus alba - (Quercus montana) / (Hydrangea quercifolia) - Viburnum acerifolium / Carex picta Forest* (CEGL008430)
- *Quercus alba - Quercus (coccinea, velutina, montana) / Gaylussacia baccata Forest* (CEGL008521)
- *Quercus montana - Carya spp. - Quercus velutina / Vaccinium arboreum / Iris verna var. smalliana Forest* (CEGL007261) is defined for the lower Piedmont of Alabama and has Coastal Plain affinities.
- *Quercus montana - Quercus (alba, coccinea) / Viburnum acerifolium - (Kalmia latifolia) Forest* (CEGL005023)
- *Quercus montana - Quercus alba / Oxydendrum arboreum / Vitis rotundifolia Forest* (CEGL006281) is defined for the Piedmont and occurs on granite monadnocks.
- *Quercus montana - Quercus marilandica Piedmont Woodland* (CEGL003708) can often be found in adjacent ridgetop areas of the Piedmont but has a more open canopy and contains *Quercus marilandica*.
- *Quercus montana - Quercus spp. / Vaccinium arboreum - (Kalmia latifolia, Styrax grandifolius) Forest* (CEGL007700) is a broadly defined type for the Appalachian Plateau and Interior Low Plateau.

**Global Related Concepts:**

- *Quercus prinus - (Quercus coccinea) / Carya pallida / Vaccinium arboreum - Vaccinium pallidum Forest* (Govus 2002) =
- Chestnut Oak Forest (Lipps and DeSelm 1969) ?
- Chestnut Oak Forest (Lipps 1966) ?

## CLASSIFICATION

**Status:** Standard

**Classification Confidence:** 3 - Weak

**Global Classification Comments:** This association was defined from examples found in the southern Ridge and Valley of northwestern Georgia, the Cumberland Plateau of northern Alabama, and the western edge of the Southern Blue Ridge in northern Georgia and southeastern Tennessee, where it represents the driest oak forests of this region. This type may be present in the McCreary and Somerset ranger districts of the Daniel Boone National Forest (Kentucky). Stands of *Quercus montana* along ecoregional transitions may be difficult to classify [see similar associations].

## ELEMENT DISTRIBUTION

**Global Range:** This association occurs in the southern Cumberland Plateau and southern Ridge and Valley of Georgia, Tennessee and Alabama, and ranges into the Southern Blue Ridge and Piedmont regions as well. This or related vegetation is reported from the Daniel Boone National Forest of Kentucky; this needs investigation.

**Nations:** US

**States/Provinces:** AL:S2, GA, KY, SC, TN

**TNC Ecoregions:** 50:C, 51:C, 52:C

**USFS Ecoregions (1994/95):** 221He:CCC, 221He:CCC, 231Aj:CCC, 231Cc:CCC, 231Cd:CCC, 231Dc:CCC, M221Dd:CCC

**USFS Ecoregions (2007):** 221He:CCC, 221He:CC?, 231Aj:CCC, 231Cc:CCC, 231Cd:CCC, 231Dc:CCC, M221Dd:CCC

**Federal Lands:** NPS (Big South Fork, Chattahoochee River, Chickamauga-Chattanooga, Great Smoky Mountains, Kennesaw Mountain, Kings Mountain, Little River Canyon, Obed River, Russell Cave); USFS (Bankhead, Chattahoochee, Chattahoochee (Piedmont), Chattahoochee (Southern Blue Ridge), Cherokee, Daniel Boone?)

## ELEMENT SOURCES

**Global Description Author(s):** K.D. Patterson and R. White

**References:** ALNHP unpubl. data 2018, Chapman 1957, Govus 2002, Lipps 1966, Lipps and DeSelm 1969, McManamay 2015, NatureServe Ecology - Southeastern U.S. unpubl. data, Nelson 1986, Schotz et al. 2006, Schotz et al. 2008, Southeastern Ecology Working Group n.d., White and Govus 2005

**A0250 Quercus montana - Quercus rubra Forest Alliance**

Chestnut Oak - Northern Red Oak Forest Alliance

*Dry-Mesic Acidic Chestnut Oak - Northern Red Oak Forest*

## ALLIANCE CONCEPT

**Summary:** This alliance includes dry-mesic oak forests codominated by *Quercus montana* and *Quercus rubra* at moderate elevations in the Central and Southern Appalachians. Many forests in this alliance occur in areas previously dominated by *Castanea dentata*, and chestnut sprouts are common in the understory. The canopy of forests in this alliance tend to be dominated by *Quercus rubra* and/or *Quercus montana*, although other mesic hardwood species can codominate or be present in the canopy and subcanopy. Typical tree associates include *Acer rubrum*, *Carya glabra*, *Carya ovalis*, *Carya ovata*, *Liriodendron tulipifera*, *Quercus coccinea*, *Quercus*

*velutina*, and *Sassafras albidum*. Typical understory trees include *Acer pensylvanicum*, *Cornus florida*, or *Oxydendrum arboreum*. Shrub layers are often dense and dominated by ericaceous species, including *Gaylussacia* spp., *Kalmia latifolia*, *Rhododendron maximum* (especially on northerly aspects), *Rhododendron minus*, and *Vaccinium* spp. Other shrubs may include *Hamamelis virginiana*. Herbaceous coverage tends to be inversely proportional to the shrub coverage. Typical herbaceous species include *Chimaphila maculata*, *Galax urceolata*, *Gaultheria procumbens*, *Houstonia purpurea*, *Lysimachia quadrifolia*, *Maianthemum racemosum ssp. racemosum*, *Polystichum acrostichoides*, *Thelypteris noveboracensis*, and *Uvularia* spp.

**Similar Alliances:**

- *Pinus strobus* - *Quercus montana* Appalachian Forest Alliance (A2080)
- *Quercus montana* - *Quercus coccinea* Forest Alliance (A0248) occurs in more xeric situations.
- *Quercus rubra* - *Quercus alba* Montane Forest Alliance (A3116)
- *Quercus rubra* - *Quercus montana* Dry Rocky Woodland Alliance (A0624)

**Diagnostic Characteristics:** Dominance by *Quercus montana* and/or *Quercus rubra*. Occurs on dry-mesic settings with one or more species, such as *Hamamelis virginiana*, *Houstonia purpurea*, *Lysimachia quadrifolia*, *Maianthemum racemosum ssp. racemosum*, *Polystichum acrostichoides*, and *Thelypteris noveboracensis*.

**Related Concepts:**

- *Quercus prinus* - *Quercus rubra* / *Acer pensylvanicum* Association (Fleming and Moorhead 1996) ?
- Chestnut Oak: 44 (Eyre 1980) ><
- Chestnut oak - hickory (Johnson and Ware 1982) =
- Red oak - chestnut oak association (Airola and Buchholz 1982) ><

**ALLIANCE DESCRIPTION**

**Environment:** In montane landscapes, these forests occur on intermediate positions of elevation and aspect, on protected, often rocky slopes. Forests in this alliance are also found on sandstone boulderfields and outcrops in Virginia's Ridge and Valley. In the Southern Blue Ridge, these forests occur at moderate elevations, from 790-1220 m (2600-4000 feet), on protected, often rocky slopes. In the central Ridge and Valley of Virginia, these forest occur on submesic to subxeric, often very bouldery slopes from the lowest elevations up to approximately 1100 m (3600 feet).

**Vegetation:** Forests in this alliance have deciduous canopies most often dominated by the oaks *Quercus montana* (= *Quercus prinus*) and *Quercus rubra*, although other mesic hardwood species can be present or even codominate in the canopy and subcanopy. Typical tree associates include *Acer rubrum*, *Carya glabra*, *Carya ovalis*, *Carya ovata*, *Liriodendron tulipifera*, *Quercus coccinea*, *Quercus velutina*, and *Sassafras albidum*. Typical understory trees include *Acer pensylvanicum*, *Cornus florida*, or *Oxydendrum arboreum*. Shrub layers are often dense and dominated by ericaceous species, including *Gaylussacia* spp., *Kalmia latifolia*, *Rhododendron maximum* (especially on northerly aspects), *Rhododendron minus*, and *Vaccinium* spp. Other shrubs may include *Hamamelis virginiana*. Herbaceous coverage tends to be inversely proportional to the shrub coverage. Typical herbaceous species include *Chimaphila maculata*, *Galax urceolata*, *Gaultheria procumbens*, *Houstonia purpurea*, *Lysimachia quadrifolia*, *Maianthemum racemosum ssp. racemosum*, *Polystichum acrostichoides*, *Thelypteris noveboracensis*, and *Uvularia* spp. Other herbs typical of these forests include *Carex pensylvanica*, *Desmodium nudiflorum*, *Dichanthelium* spp. (*Dichanthelium boscii*, *Dichanthelium commutatum*, *Dichanthelium dichotomum*), *Galium latifolium*, *Gentiana decora*, *Prenanthes altissima*, *Sanicula trifoliata*, and *Solidago curtisii*.

**Physiognomy and Structure:** Forests in this alliance are closed-canopy deciduous forests. Some associations may have a well-developed subcanopy. Shrub cover is variable but may be very dense and dominated by ericaceous species, and herbaceous coverage tends to be inversely proportional to the shrub coverage.

**Floristics:** Forests in this alliance have deciduous canopies most often dominated by the oaks *Quercus montana* (= *Quercus prinus*) and *Quercus rubra*, although other mesic hardwood species can be present or even codominate in the canopy and subcanopy. Typical tree associates include *Acer rubrum*, *Carya glabra*, *Carya ovalis*, *Carya ovata*, *Liriodendron tulipifera*, *Quercus coccinea*, *Quercus velutina*, and *Sassafras albidum*. Typical understory trees include *Acer pensylvanicum*, *Cornus florida*, or *Oxydendrum arboreum*. Shrub layers are often dense and dominated by ericaceous species, including *Gaylussacia* spp., *Kalmia latifolia*, *Rhododendron maximum* (especially on northerly aspects), *Rhododendron minus*, and *Vaccinium* spp. Other shrubs may include *Hamamelis virginiana*. Herbaceous coverage tends to be inversely proportional to the shrub coverage. Typical herbaceous species include *Chimaphila maculata*, *Galax urceolata*, *Gaultheria procumbens*, *Houstonia purpurea*, *Lysimachia quadrifolia*, *Maianthemum racemosum ssp. racemosum*, *Polystichum acrostichoides*, *Thelypteris noveboracensis*, and *Uvularia* spp. Other herbs typical of these forests include *Carex pensylvanica*, *Desmodium nudiflorum*, *Dichanthelium* spp. (*Dichanthelium boscii*, *Dichanthelium commutatum*, *Dichanthelium dichotomum*), *Galium latifolium*, *Gentiana decora*, *Prenanthes altissima*, *Sanicula trifoliata*, and *Solidago curtisii*.

**ALLIANCE DISTRIBUTION**

**Range:** This alliance ranges from the Southern Blue Ridge, north through the Ridge and Valley, and High Alleghenies of Virginia, and into some areas of the northern Piedmont. This alliance may possibly range into the upper Piedmont and into the eastern fringes of the Cumberland Mountains and Appalachian Plateau of Kentucky.

**Nations:** US

**Subnations:** AL, DE, GA, KY, MD, NC, NJ, PA, SC, TN, VA, WV

**TNC Ecoregions:** 49:?, 50:C, 51:C, 52:C, 59:C, 61:C

**USFS Ecoregions (1994/95):** 212G:P?, 221Am:CCP, 221Da:CCP, 221Db:CCC, 221Eb:C??, 221F:C?, 221H:C?, 221Ja:CCC, 231Aa:PPP, 231Ag:PP?, M221Aa:CCC, M221Ab:CCC, M221Ac:CCC, M221Ad:CCC, M221Ba:CCC, M221Bb:CCC,

M221Bc:CCC, M221Bd:CCC, M221Bf:CCC, M221Ca:CCC, M221Cb:CCC, M221Cc:CCC, M221Cd:CC?, M221Ce:CCC, M221Da:CCC, M221Db:CCC, M221Dc:CCC, M221Dd:CCC

**USFS Ecoregions (2007):** 211G:??, 221Am:CPP, 221Da:CCP, 221Db:CCC, 221Ea:C??, 221Eb:C??, 221F:C?, 221H:C?, 221Ja:CCC, 231Aa:PPP, 231Ag:PP?, M221Aa:CCP, M221Ab:CCC, M221Ac:CCC, M221Ad:CCC, M221Ba:CCC, M221Bb:CCC, M221Bc:CCC, M221Bd:CCC, M221Ca:CCC, M221Cb:CCC, M221Cc:CCC, M221Cd:CC?, M221Ce:CCP, M221Da:CCC, M221Db:CCC, M221Dc:CCC, M221Dd:CCC

**Federal Lands:** BIA (Eastern Band of Cherokee); NPS (Antietam, Appalachian Trail, Blue Ridge Parkway, C&O Canal, Carl Sandburg Home, Catoctin Mountain, Cumberland Gap, Gauley River, George Washington Parkway, Great Smoky Mountains, Harpers Ferry, Monocacy, Morristown, New River Gorge, Shenandoah); USFS (Chattahoochee, Cherokee, George Washington, Green Mountain, Jefferson, Nantahala, Pisgah, Sumter)

#### ALLIANCE SOURCES

**References:** Airola and Buchholz 1982, Airola and Buchholz 1982, Evans et al. 2009, Eyre 1980, Faber-Langendoen et al. 2019b, Fleming and Moorhead 1996, Golden 1981, Johnson and Ware 1982, Livingston and Mitchell 1976, McLeod 1988, Mowbray 1966, Nelson 1986, Nowacki and Abrams 1992, Rheinhardt 1981, Schafale and Weakley 1990

**Author of Concept:** Airola and Buchholz 1982

**Author of Description:** T.M. Airola and K. Buchholz (1982); G.P. Fleming and W.H. Moorhead (1996)

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### [CEGL007267] *Quercus montana* - (*Quercus rubra*) - *Carya* spp. / *Oxydendrum arboreum* - *Cornus florida* Forest

Translated Name: Chestnut Oak - (Northern Red Oak) - Hickory species / Sourwood - Flowering Dogwood Forest

Common Name: Appalachian Montane Oak - Hickory Forest (Chestnut Oak Type)

#### USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (I.B.2.Na)
Macrogroup	Appalachian-Northeastern Oak - Hardwood - Pine Forest & Woodland (M502)
Group	Southern Appalachian Oak / Chestnut Forest (G015)
Alliance	<i>Quercus montana</i> - <i>Quercus rubra</i> Forest Alliance (A0250)

#### ELEMENT CONCEPT

**Global Summary:** This community is known from low to intermediate elevations of the Southern Blue Ridge escarpment, the Great Smoky Mountains, Piedmont transition areas, into the Southern Ridge and Valley, and in the Cumberlands in southern West Virginia. It occurs on relatively exposed landforms below 1000 m (3280 feet) elevation (220-1000 m [700-3280 feet]), on nearly level to steep, convex, middle to upper slopes, ridges, and plateaus, with mostly northwestern to southeastern aspects. These are forests characterized by canopies dominated by *Quercus* and *Carya* species that do not have a well-developed heath shrub layer. *Acer rubrum* and *Liriodendron tulipifera* may have significant coverage, apparently related to logging history. The predominant oaks and hickories in the canopy are *Quercus montana*, *Carya glabra*, *Carya tomentosa*, *Carya ovata*, *Quercus coccinea*, *Quercus velutina*, *Quercus alba*, and *Quercus rubra*. Additional canopy and subcanopy species can include *Nyssa sylvatica*, *Magnolia fraseri*, *Halesia tetraptera* var. *monticola*, *Fagus grandifolia*, *Ilex opaca*, and *Oxydendrum arboreum*. In addition, *Cornus florida* is characteristic and may be dominant in the subcanopy and tall-shrub layers; other tall-shrub species include *Magnolia fraseri*, *Hamamelis virginiana*, and *Sassafras albidum*. *Kalmia latifolia* or *Rhododendron maximum* may be present but only at very low cover. The short-shrub stratum is sparse (up to 20% cover), with no clear dominant. Some typical shrub species include *Vaccinium pallidum*, *Viburnum acerifolium*, and (in the central and southern portions of the type's range) *Gaylussacia ursina*, *Hydrangea arborescens*, and *Hydrangea radiata*. Common vines are *Smilax rotundifolia*, *Smilax glauca*, *Parthenocissus quinquefolia*, *Toxicodendron radicans*, *Vitis aestivalis*, *Vitis rotundifolia*, and *Vitis vulpina*. Herb cover is sparse to moderate; diversity and species composition vary among occurrences. Some of the more typical herb species include *Eurybia divaricata*, *Dioscorea quaternata*, *Maianthemum racemosum*, *Polystichum acrostichoides*, *Solidago caesia*, *Uvularia perfoliata*, and *Uvularia puberula*.

#### ENVIRONMENTAL DESCRIPTION

**Great Smoky Mountains National Park Environment:** This forest occurs at low elevations, on northern, western, and southwestern, middle to upper slopes. Elevations averaged 2084 feet but ranged from 1650 to 2600 feet.

**Global Environment:** This community is known from plateaus, ridges, and gorge slopes at low to intermediate elevations, on relatively exposed landforms from 220 to 1000 m (700-3250 feet) elevation. Slopes are moderately steep to steep where it occurs on convex, middle to upper slopes, grading to gentle on ridges and plateaus; aspects are mostly northern to southwestern. Unvegetated ground cover is dominated by litter and rock. In Virginia, the type occurs on sites underlain by colluvial and alluvial fan material, sandstone, quartzite, and rocks of the Northern Blue Ridge granitic complex. Farther south, soils are weathered from sandstones and, less commonly, shales and are strongly acidic, relatively nutrient-poor and sandy to loamy in texture. Soils in West Virginia plots are well- to rapidly-drained, dry to somewhat moist sandy loam, sandy clay loam, sandy silt loam, silt loam, and clay loam, and test slightly to extremely acidic (mean pH = 4.59). Soil chemistry data from 25 plot samples from throughout the range indicate that mean conditions are extremely acidic, with low levels of calcium, magnesium, and total base saturation, along with moderately high iron and aluminum (Fleming and Patterson 2009a).

## VEGETATION DESCRIPTION

**Great Smoky Mountains National Park Vegetation:** The canopy is dominated by *Quercus prinus* and *Acer rubrum*. Other species that can have significant canopy coverage include *Carya glabra* and *Liriodendron tulipifera*. The subcanopy is dominated by *Cornus florida*. Additional canopy and subcanopy species can include *Quercus rubra*, *Quercus velutina*, *Carya alba*, *Halesia tetraptera* var. *monticola*, *Nyssa sylvatica*, *Robinia pseudoacacia*, and *Oxydendrum arboreum*. The shrub stratum is sparse with no clear dominant. Some typical shrub species include *Gaylussacia ursina*, *Sassafras albidum*, *Nyssa sylvatica*, *Oxydendrum arboreum*, *Cornus florida*, and *Magnolia fraseri*. *Pinus strobus* and *Tsuga canadensis* saplings are commonly in the shrub stratum. Herbaceous cover is sparse to moderate but species rich. Species with the highest coverage and constancy are *Desmodium nudiflorum*, *Polystichum acrostichoides*, and *Thelypteris noveboracensis*. Other species with high constancy include *Eurybia divaricata* (= *Aster divaricatus*), *Chimaphila maculata*, *Dichanthelium* spp. (e.g., *Dichanthelium commutatum*, *Dichanthelium dichotomum*), *Dioscorea quaternata*, *Maianthemum racemosum* ssp. *racemosum*, *Prenanthes* spp., *Thalictrum thalictroides*, *Uvularia perfoliata*, *Uvularia puberula*, *Uvularia sessilifolia*, and *Viola* spp. (e.g., *Viola blanda*, *Viola hastata*, *Viola X palmata*, *Viola tripartita*), but other species may occur. Common vines are *Smilax rotundifolia*, *Smilax glauca*, *Vitis aestivalis*, and *Vitis vulpina*.

**Global Vegetation:** These are forests dominated by species of *Quercus* and *Carya* and without a well-developed heath shrub layer. *Acer rubrum* and *Liriodendron tulipifera* may have significant coverage, apparently related to logging history. The predominant oaks and hickories in the canopy are *Quercus montana* (= *Quercus prinus*), *Carya glabra*, *Carya tomentosa* (= *Carya alba*), *Carya ovata*, *Quercus coccinea*, *Quercus velutina*, *Quercus alba*, and *Quercus rubra*. Additional canopy and subcanopy species can include *Nyssa sylvatica*, *Magnolia fraseri*, *Halesia tetraptera* var. *monticola*, *Fagus grandifolia*, *Ilex opaca*, and *Oxydendrum arboreum*. In addition, *Cornus florida* is characteristic and may be dominant in the subcanopy and tall-shrub layers; other tall-shrub species include *Magnolia fraseri*, *Hamamelis virginiana*, and *Sassafras albidum*. *Kalmia latifolia* or *Rhododendron maximum* may be present but only at very low cover. The short-shrub stratum is sparse (up to 20% cover), with no clear dominant. Some typical shrub species include *Vaccinium pallidum*, *Viburnum acerifolium*, and (in the central and southern portions of the type's range) *Gaylussacia ursina*, *Hydrangea arborescens*, and *Hydrangea radiata*. Common vines are *Smilax rotundifolia*, *Smilax glauca*, *Parthenocissus quinquefolia*, *Toxicodendron radicans*, *Vitis aestivalis*, *Vitis rotundifolia*, and *Vitis vulpina*. Herb cover is sparse to moderate; diversity and species composition vary among occurrences. Some of the more typical species include *Ageratina altissima*, *Eurybia divaricata* (= *Aster divaricatus*), *Carex communis* var. *communis*, *Carex digitalis* var. *digitalis*, *Chimaphila maculata*, *Desmodium nudiflorum*, *Dichanthelium* spp. (e.g., *Dichanthelium boscii*, *Dichanthelium commutatum*, *Dichanthelium dichotomum*), *Dioscorea quaternata*, *Galium circaezans*, *Galium latifolium*, *Goodyera pubescens*, *Maianthemum racemosum* ssp. *racemosum*, *Medeola virginiana*, *Houstonia purpurea*, *Lysimachia quadrifolia*, *Maianthemum racemosum* ssp. *racemosum*, *Polystichum acrostichoides*, *Prenanthes* spp., *Solidago caesia*, *Thalictrum thalictroides*, *Thelypteris noveboracensis*, *Uvularia perfoliata*, *Uvularia puberula*, *Uvularia sessilifolia*, and *Viola* spp. (e.g., *Viola blanda*, *Viola hastata*, *Viola x palmata*, *Viola tripartita*). Common mosses from West Virginia plots include *Thuidium delicatulum*, *Leucobryum glaucum*, *Hypnum imponens*, *Polytrichum ohioense*, *Leucobryum albidum*, and *Dicranum fulvum*.

**Global Dynamics:** Evidence of past fires is abundant in this type, but its natural fire regime is not known. Most stands have been logged, and in West Virginia, many areas likely formerly covered by this forest type have been strip-mined. Evidence of disturbance recorded in Virginia plots includes fire scars on older trees, charcoal in duff, much rotting *Castanea dentata* wood, damage to *Cornus florida* from dogwood anthracnose (*Discula destructiva*), and minor wind/ice damage to tree crowns. Large areas of this community type were impacted by logging and/or the loss of codominant *Castanea dentata*. Based on the abundance of *Castanea* wood debris and live sprouts, as well as the presence of numerous intact logs in older stands, *Castanea dentata* may have reached near optimal importance on sites of this community type prior to the arrival of the blight. At Peters Mountain in Allegheny County, Virginia, the current canopy dominants in these areas typically range from about 35-69 cm (14-27 inches) dbh, with maximum ages of 90 to 140 years. Some patches of old-growth forest remain at Peters Mountain, especially on the steeper dip slopes and landslide benches (Fleming and Moorhead 2000).

## MOST ABUNDANT SPECIES

## Great Smoky Mountains National Park

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Broad-leaved deciduous tree	<i>Acer rubrum</i> , <i>Carya glabra</i> , <i>Quercus montana</i>
Tree subcanopy	Broad-leaved deciduous tree	<i>Cornus florida</i>
Herb (field)	Flowering forb	<i>Desmodium nudiflorum</i>
Herb (field)	Fern (Spore-bearing forb)	<i>Polystichum acrostichoides</i> , <i>Thelypteris noveboracensis</i>

## Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	<i>Acer rubrum</i> , <i>Carya glabra</i> , <i>Carya ovata</i> , <i>Carya tomentosa</i> , <i>Liriodendron tulipifera</i> , <i>Quercus alba</i> , <i>Quercus velutina</i>
Tree canopy	Broad-leaved deciduous tree	<i>Quercus montana</i> , <i>Quercus rubra</i>
Tree subcanopy	Broad-leaved deciduous tree	<i>Cornus florida</i>

## CHARACTERISTIC SPECIES

**Great Smoky Mountains National Park:** *Acer rubrum*, *Carya glabra*, *Cornus florida*, *Maianthemum racemosum* ssp. *racemosum*, *Quercus montana*, *Quercus velutina*, *Thalictrum thalictroides*

**Global:** *Acer pensylvanicum*, *Acer rubrum*, *Ageratina altissima*, *Carya glabra*, *Carya ovata*, *Carya tomentosa*, *Castanea dentata*, *Cornus florida*, *Dioscorea quaternata*, *Eurybia divaricata*, *Galium circaezans*, *Goodyera pubescens*, *Liriodendron tulipifera*, *Maianthemum racemosum*, *Medeola virginiana*, *Nyssa sylvatica*, *Parthenocissus quinquefolia*, *Polystichum acrostichoides*, *Quercus alba*, *Quercus montana*, *Quercus rubra*, *Quercus velutina*, *Solidago caesia*, *Thelypteris noveboracensis*, *Toxicodendron radicans*, *Uvularia perfoliata*, *Uvularia puberula*

#### OTHER NOTEWORTHY SPECIES

**Global: Vulnerable Plants:** *Ageratina altissima* var. *roanensis* (G5T3T4, Southern Blue Ridge endemic), *Carex lucorum* var. *austrolucorum* (G5T3T4), *Isotria medeoloides* (G2G3), *Monotropsis odorata* (G3), *Solidago glomerata* (G3), *Tsuga caroliniana* (G2G3); **Other Plants:** *Vaccinium hirsutum* (G4)

#### CONSERVATION STATUS RANK

**Global Rank & Reasons:** G4G5 (15-Aug-1997).

#### RELATED CONCEPTS

##### Global Similar Types:

- *Acer rubrum* - *Betula lenta* - *Magnolia fraseri* / (*Rhododendron maximum*, *Kalmia latifolia*) Ruderal Forest (CEGL008558)
- *Quercus (montana, coccinea)* / *Kalmia latifolia* / (*Galax urceolata*, *Gaultheria procumbens*) Forest (CEGL006271) is similar but features a well-developed ericaceous shrub layer.
- *Quercus alba* - *Quercus (rubra, montana)* / *Rhododendron calendulaceum* - (*Gaylussacia ursina*) Forest (CEGL007230) occurs at higher elevations and has a stronger white oak component.
- *Quercus montana* - *Carya ovata* - *Quercus rubra* / *Acer saccharum* Forest (CEGL007268) is similar but characterized by *Acer saccharum* as an important subcanopy (or canopy) tree.
- *Quercus montana* - *Quercus rubra* / *Hamamelis virginiana* Forest (CEGL006057)
- *Quercus montana* - *Quercus rubra* / *Rhododendron maximum* / *Galax urceolata* Forest (CEGL006286)
- *Quercus rubra* - *Quercus montana* - *Magnolia (acuminata, fraseri)* / *Acer pensylvanicum* Forest (CEGL004817)

##### Global Related Concepts:

- *Quercus prinus* - *Carya (alba / glabra)* - *Acer rubrum* / *Cornus florida* Forest (Patterson 1994) =
- *Quercus prinus* - *Quercus rubra* - (*Quercus alba*) - *Liriodendron tulipifera* - *Acer rubrum* / *Parthenocissus quinquefolia* forest (Vanderhorst 2001b) >
- *Quercus velutina* - *Quercus montana* / *Cornus florida* Forest (Fleming and Moorhead 2000) =
- Chestnut Oak: 44 (Eyre 1980) >
- IA6h. Montane Oak - Hickory Forest (Allard 1990) >

#### CLASSIFICATION

**Status:** Standard

**Classification Confidence:** 2 - Moderate

**Global Classification Comments:** This forest lacks the dense ericaceous shrub layer typical of other *Quercus montana*-dominated forests in the Blue Ridge escarpment region and commonly has diverse herbaceous composition. It is distinguished from similar forests in the Ridge and Valley by lacking *Acer saccharum* and from Piedmont forests by the lack of *Quercus falcata* and *Quercus stellata*, and by the presence of species more typical of the Southern Appalachians (*Magnolia fraseri*, *Halesia tetraptera*, and *Castanea dentata*). This association was originally defined from the Chattooga Basin Project (S. Simon pers. comm.) and later refined with information from the Great Smoky Mountains. The North Carolina Piedmont examples of this association are only montane transition areas, such as the Sauratown Mountains and Hanging Rock. In West Virginia, this association is floristically intermediate between *Quercus montana* - *Carya ovata* - *Quercus rubra* / *Acer saccharum* Forest (CEGL007268) and the more xeric *Quercus (montana, coccinea)* / *Kalmia latifolia* / (*Galax urceolata*, *Gaultheria procumbens*) Forest (CEGL006271), and some stands are difficult to distinguish. It lacks the abundance of *Acer saccharum* of the former and the abundance of ericaceous shrubs of the latter and has higher abundance of *Liriodendron tulipifera* than either.

#### ELEMENT DISTRIBUTION

**Great Smoky Mountains National Park Range:** This community was sampled on the Cades Cove, Mount Le Conte, and Noland Divide quadrangles. Historic samples also exist for the Calderwood quadrangle, and the community is likely in other areas of the Park. On the Cades Cove quadrangle, recent and historic samples representing this community come from elevations ranging from 2000 to 2600 feet. In the northwestern portion of the quadrangle, this community was sampled from the southern and western slopes Arbutus Ridge; the northwest slopes of Stony Ridge; a north-facing draw north of Coon Butt; and from a north-facing upper slope of Boring Ridge. It was also sampled from the northwest slopes above Licklog Creek, west of Mollies Butt. This community was sampled from the eastern half of the Mount Le Conte quadrangle, at elevations ranging from 1400 to 2200 feet. Samples representing this community come from the lower east slope of Potato Ridge; north-facing slopes above the lower Little Pigeon River, north of Grapeyard Ridge; and from the southwest-facing sideridge and upper slopes of Copeland Divide.

**Global Range:** This community occurs in the Southern Blue Ridge, the Great Smoky Mountains, and Piedmont transition areas of western North Carolina, eastern Tennessee, northwestern South Carolina, and northeastern Georgia, extending north into the Cumberlands in southern West Virginia and the border area between Virginia, Kentucky, and Tennessee. It also extends north in the Virginia Ridge and Valley and Blue Ridge to Allegheny, Botetourt, and Bedford counties.

**Nations:** US**States/Provinces:** GA, KY, NC, SC, TN, VA:S3S4, WV:S4**TNC Ecoregions:** 50:C, 51:C, 52:C, 59:C**USFS Ecoregions (1994/95):** 231Aa:PPP, M221Aa:CCC, M221Ab:CCC, M221Ca:CCC, M221Cb:CCC, M221Cc:CCC, M221Ce:CCC, M221Da:CCC, M221Db:CCP, M221Dc:CCC, M221Dd:CCC**USFS Ecoregions (2007):** 231Aa:PPP, M221Aa:CCP, M221Ab:CCC, M221Ca:CCC, M221Cb:CCC, M221Cc:CCC, M221Ce:CCP, M221Da:CCC, M221Db:CCP, M221Dc:CCC, M221Dd:CCC**Federal Lands:** BIA (Eastern Band of Cherokee); NPS (Appalachian Trail [Southern Blue Ridge], Blue Ridge Parkway, Carl Sandburg Home, Cumberland Gap, Gauley River, Great Smoky Mountains, New River Gorge); USFS (Chattahoochee, Chattahoochee (Piedmont), Chattahoochee (Southern Blue Ridge), Cherokee, George Washington, Jefferson, Nantahala, Pisgah, Sumter, Sumter (Mountains))**ELEMENT SOURCES****Great Smoky Mountains National Park Plots:** GRSM.21, GRSM.23, GRSM.40, GRSM.41, GRSM.245, GRSM.256.**Great Smoky Mountains National Park Description Author(s):** K.D. Patterson**Global Description Author(s):** K.D. Patterson, T. Govus, R. White, S.C. Gawler, G.P. Fleming**References:** Allard 1990, Eyre 1980, Fleming and Coulling 2001, Fleming and Moorhead 2000, Fleming and Patterson 2009a, Fleming and Patterson 2009b, Fleming et al. 2017, NatureServe Ecology - Southeastern U.S. unpubl. data, Nelson 1986, Patterson 1994, Peet et al. unpubl. data, Schafale 2012, Schafale and Weakley 1990, Simon pers. comm., Southeastern Ecology Working Group n.d., Vanderhorst 2001b, Vanderhorst et al. 2007, Vanderhorst et al. 2010, WVNHP unpubl. data, White 2003, White 2006**[CEGL006286] *Quercus montana* - *Quercus rubra* / *Rhododendron maximum* / *Galax urceolata* Forest**Translated Name: **Chestnut Oak - Northern Red Oak / Great Laurel / Beetleweed Forest**Common Name: **Chestnut Oak Forest (Mesic Slope Heath Type)****USNVC CLASSIFICATION**

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Northeastern Oak - Hardwood - Pine Forest & Woodland (M502)
Group	Southern Appalachian Oak / Chestnut Forest (G015)
Alliance	<i>Quercus montana</i> - <i>Quercus rubra</i> Forest Alliance (A0250)

**ELEMENT CONCEPT**

**Global Summary:** This forest is known from protected, usually steep slopes in the Southern Blue Ridge and ranges into adjacent areas of the upper Piedmont to the east and the Allegheny and Cumberland Mountains and Southern Ridge and Valley to the west and north. In the southern portion of its range (Southern Blue Ridge), it usually occurs on north-facing slopes, while in the northern part of its range (the Allegheny and Cumberland Mountains in West Virginia), most sites have southerly to westerly aspects. This is typically a midslope to lower slope type, but it can be found on upper slopes in a more sheltered position. This forest is found at elevations between 760 and 1220 m (2500-4000 feet) in the Southern Blue Ridge and at somewhat lower elevations (200-760 m) in the Allegheny and Cumberland Mountains in West Virginia. Canopies in these forests are dominated by *Quercus montana*, usually with lesser amounts of *Quercus rubra* and/or *Acer rubrum*, and always occurring over a dense, very tall shrub stratum (2-6 m) of *Rhododendron maximum*. In some examples, this community may also be codominated or dominated by *Quercus velutina*, *Quercus alba*, or *Betula lenta*. Additional trees with lower constancy and cover in the canopy and subcanopy include *Tsuga canadensis*, *Oxydendrum arboreum*, *Fagus grandifolia*, and *Nyssa sylvatica*. On some sites, *Tsuga canadensis* may have dense understory regeneration. In some areas of the Southern Blue Ridge, *Rhododendron minus* may dominate the shrub layer. Other common shrubs can include *Gaylussacia ursina* (in the Southern Blue Ridge), *Kalmia latifolia*, *Smilax rotundifolia*, *Ilex opaca* var. *opaca*, and/or *Hamamelis virginiana*. Herbs are sparse. The ground cover is dominated by leaf litter, but *Galax urceolata* is found in most occurrences except at the northern limit of this type's range in West Virginia. Other herb species that can be typical include *Chimaphila maculata*, *Goodyera pubescens*, *Polystichum acrostichoides*, *Maianthemum racemosum*, *Solidago caesia*, *Mitchella repens*, *Eurybia divaricata*, *Dryopteris marginalis*, and *Dioscorea quaternata*. Some examples may have sparse (woodland-like) canopies and occur in association with rock outcroppings. Vascular plant species richness in seven 400-m<sup>2</sup> West Virginia plots ranges from 12 to 49 taxa (mean = 30.1).

**ENVIRONMENTAL DESCRIPTION**

**Great Smoky Mountains National Park Environment:** This association was sampled on a steep, north-facing slope at 1780 feet elevation. It occurs throughout the park in small patches on steep, upper, north-facing slopes up to the exposed ridgeline areas and may occur up to 3500 feet.

**Global Environment:** This forest is known from protected, usually steep slopes in the Southern Blue Ridge and ranges into adjacent areas of the upper Piedmont to the east and Allegheny and Cumberland Mountains and Southern Ridge and Valley to the west and north. In the southern portion of its range (Southern Blue Ridge), it usually occurs on north-facing slopes, while in the northern part of its range (the Cumberlands in WV), most sites have southerly to westerly aspects. This is typically a midslope to lower slope type, but it can be found on upper slopes in a more sheltered position. This forest is found at elevations between 760 and 1220 m (2500-4000 feet) in the Southern Blue Ridge and at somewhat lower elevations (200-760 m) in the Allegheny and Cumberland mountains in West

Virginia. Soils in WV plots are described as well- to rapidly-drained, dry to somewhat moist sandy loam and sandy clay loam that test very strongly to extremely acidic (mean pH = 4.20). Soils of some sites may be classified as folists, characterized by deep organic horizons (duff) over bouldery colluvium.

#### VEGETATION DESCRIPTION

**Great Smoky Mountains National Park Vegetation:** This forest is dominated by *Quercus prinus*, with lesser amounts of *Acer rubrum*, occurring over a dense, tall-shrub stratum of *Rhododendron maximum*. Ground cover is dominated by leaf litter, and herbs are scattered about. Typical herbs include *Chimaphila maculata*, *Galax urceolata*, *Goodyera pubescens*, and *Polystichum acrostichoides*.

**Global Vegetation:** Canopies in these forests are dominated by *Quercus montana* (= *Quercus prinus*), usually with lesser amounts of *Quercus rubra* and/or *Acer rubrum*, and always occurring over a dense, very tall shrub stratum (2-6 m) of *Rhododendron maximum*. In some examples, this community may also be codominated or dominated by *Quercus velutina*, *Quercus alba*, or *Betula lenta*.

Additional trees with lower constancy and cover in the canopy and subcanopy include *Tsuga canadensis*, *Oxydendrum arboreum*, *Fagus grandifolia*, and *Nyssa sylvatica*. On some sites, *Tsuga canadensis* may have dense understory regeneration. In some areas of the Southern Blue Ridge, *Rhododendron minus* may dominate the shrub layer. Other common shrubs can include *Gaylussacia ursina* (in the Southern Blue Ridge), *Kalmia latifolia*, *Smilax rotundifolia*, *Ilex opaca* var. *opaca*, and/or *Hamamelis virginiana*. Herbs are sparse. The ground cover is dominated by leaf litter, but *Galax urceolata* is found in most occurrences except at the northern limit of this type's range in West Virginia. Other herb species that can be typical include *Chimaphila maculata*, *Goodyera pubescens*, *Polystichum acrostichoides*, *Maianthemum racemosum*, *Solidago caesia*, *Mitchella repens*, *Eurybia divaricata*, *Dryopteris marginalis*, and *Dioscorea quaternata*. Some examples may have sparse (woodland-like) canopies and occur in association with rock outcroppings. Vascular plant species richness in seven 400-m<sup>2</sup> WV plots ranges from 12 to 49 taxa (mean = 30.1).

#### MOST ABUNDANT SPECIES

##### Great Smoky Mountains National Park

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Broad-leaved deciduous tree	<i>Acer rubrum</i> , <i>Quercus montana</i>
Tall shrub/sapling	Broad-leaved evergreen tree	<i>Rhododendron maximum</i>

##### Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Broad-leaved deciduous tree	<i>Quercus montana</i> , <i>Quercus rubra</i>
Tall shrub/sapling	Broad-leaved evergreen tree	<i>Rhododendron maximum</i>

#### CHARACTERISTIC SPECIES

**Great Smoky Mountains National Park:** *Galax urceolata*, *Quercus montana*, *Quercus rubra*, *Rhododendron maximum*

**Global:** *Chimaphila maculata*, *Galax urceolata*, *Polystichum acrostichoides*, *Quercus montana*, *Quercus rubra*, *Quercus velutina*, *Rhododendron maximum*

#### OTHER NOTEWORTHY SPECIES

**Global: Vulnerable Plants:** *Tsuga caroliniana* (G2G3); **Other Plants:** *Quercus alba* (G5), *Trillium rugelii* (G4)

#### CONSERVATION STATUS RANK

**Global Rank & Reasons:** G4 (22-Feb-2010). This community is uncommon, but not rare, throughout most of its range. As currently defined, it is a regional endemic, found only in the Southern Blue Ridge and adjacent regions of the upper Piedmont and Cumberlands and Southern Ridge and Valley. This community is often overlooked or not distinguished separately in inventories; thus, it is more common than the number of documented occurrences suggests.

#### RELATED CONCEPTS

##### Global Similar Types:

- *Acer rubrum* - *Betula lenta* - *Magnolia fraseri* / (*Rhododendron maximum*, *Kalmia latifolia*) Ruderal Forest (CEGL008558)
- *Liriodendron tulipifera* - *Betula lenta* - *Tsuga canadensis* / *Rhododendron maximum* Forest (CEGL007543)
- *Quercus (montana, coccinea)* / *Kalmia latifolia* / (*Galax urceolata*, *Gaultheria procumbens*) Forest (CEGL006271)
- *Quercus montana* - (*Quercus rubra*) - *Carya* spp. / *Oxydendrum arboreum* - *Cornus florida* Forest (CEGL007267)
- *Quercus montana* / *Rhododendron catawbiense* - *Kalmia latifolia* Forest (CEGL008524) is mostly of the Central Appalachians and only peripherally in the northern portion of the Southern Blue Ridge; occupies drier sites and is characterized by a dense *Rhododendron catawbiense* shrub layer.
- *Quercus rubra* / (*Kalmia latifolia*, *Rhododendron catawbiense*, *Rhododendron maximum*) / *Galax urceolata* Forest (CEGL007299)

##### Global Related Concepts:

- *Quercus prinus* - *Quercus rubra* / *Rhododendron maximum* / *Leucobryum glaucum* Forest [Chestnut Oak -Red Oak / Great Laurel Forest] (Vanderhorst 2017d) <
- Chestnut Oak: 44 (Eyre 1980) >
- IA6d. Chestnut Oak Slope and Ridge Forest (Allard 1990) >

#### CLASSIFICATION

**Status:** Standard

**Classification Confidence:** 2 - Moderate

**Great Smoky Mountains National Park Other Comments:** This forest can occur downslope from *Quercus (prinus, coccinea) / Kalmia latifolia / (Galax urceolata, Gaultheria procumbens)* Forest (CEGL006271) and can continue downslope into steep ravines. It is unlikely that the signature of this association can be distinguished from other *Quercus prinus*-dominated forests.

**Global Classification Comments:** This association is more protected and other mesic than *Quercus (montana, coccinea) / Kalmia latifolia / (Galax urceolata, Gaultheria procumbens)* Forest (CEGL006271). It occurs at lower elevations and on more protected topographic positions than *Quercus rubra / (Kalmia latifolia, Rhododendron catawbiense, Rhododendron maximum) / Galax urceolata* Forest (CEGL007299). It is much less diverse than *Quercus montana - (Quercus rubra) - Carya spp. / Oxydendrum arboreum - Cornus florida* Forest (CEGL007267), lacking the diverse herbaceous and woody components found in that association. Stands similar to this association but with significant cover by *Tsuga canadensis* in the canopy layers are classified as *Liriodendron tulipifera - Betula lenta - Tsuga canadensis / Rhododendron maximum* Forest (CEGL007543).

After this association was first described from the Southern Appalachians, it was next attributed to the Gauley River gorge in southern West Virginia (Vanderhorst et al. 2010). More recently, similar vegetation has been sampled by plots on the western flanks of the Allegheny Mountains in northern West Virginia. Similar vegetation has also been observed in western Pennsylvania. More work is needed to determine if West Virginia and Pennsylvania stands should constitute a separate association.

**ELEMENT DISTRIBUTION**

**Great Smoky Mountains National Park Range:** This association is uncommon and was sampled at only a single location in the northern portion of the Mount Le Conte quadrangle, above Hill Creek. It was observed on the Cades Cove quadrangle in the vicinity of Bunting Branch and in the Cataloochee Valley. It is possible at the appropriate exposure and elevation elsewhere in the park.

**Global Range:** This community occurs in the Southern Blue Ridge of northeastern Georgia, northwestern South Carolina, north through eastern Tennessee, western North Carolina, and southwestern Virginia. It extends into the Allegheny and Cumberland mountains and Southern Ridge and Valley of Kentucky, Virginia and West Virginia. Its range also extends into the upper Piedmont of North Carolina.

**Nations:** US

**States/Provinces:** GA, KY, NC, SC, TN, VA:S3?, WV:S3

**TNC Ecoregions:** 50:P, 51:C, 52:C, 59:?

**USFS Ecoregions (1994/95):** M221Ab:CCC, M221B:C?, M221Ca:CCC, M221Cc:CCC, M221Ce:CCC, M221Dc:CCC, M221Dd:CCC

**USFS Ecoregions (2007):** M221Aa:CCC, M221Ab:CCC, M221Bb:CCC, M221Ca:CCC, M221Cc:CCC, M221Ce:CCP, M221Dc:CCC, M221Dd:CCC

**Federal Lands:** BIA (Eastern Band of Cherokee); NPS (Appalachian Trail [Central Appalachians], Appalachian Trail [Southern Blue Ridge], Blue Ridge Parkway, Carl Sandburg Home, Cumberland Gap, Gauley River, Great Smoky Mountains); USFS (Chattahoochee, Chattahoochee (Piedmont), Chattahoochee (Southern Blue Ridge), Cherokee, Jefferson, Monongahela, Nantahala, Pisgah, Sumter, Sumter (Mountains))

**ELEMENT SOURCES**

**Great Smoky Mountains National Park Plots:** GRSM.100, GRSM.237, GRSM.238.

**Great Smoky Mountains National Park Description Author(s):** K.D. Patterson

**Global Description Author(s):** K.D. Patterson, R. White and S.C. Gawler

**References:** Allard 1990, Eyre 1980, Fleming and Patterson 2009a, Fleming et al. 2017, NatureServe Ecology - Southeastern U.S. unpubl. data, Nelson 1986, Peet et al. unpubl. data, Schafale 2012, Schafale and Weakley 1990, Schafale pers. comm., Simon pers. comm., Southeastern Ecology Working Group n.d., TDNH unpubl. data 2018, Vanderhorst 2017d, Vanderhorst et al. 2010, White 2003, White 2006

**[CEGL003890] *Vitis aestivalis* Vine-Scrub**

Translated Name: **Summer Grape Vine-Scrub**

Common Name: **Montane Grape Opening**

**USNVC CLASSIFICATION**

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Northeastern Oak - Hardwood - Pine Forest & Woodland (M502)
Group	Southern Appalachian Oak / Chestnut Forest (G015)
Alliance	<i>Quercus montana - Quercus rubra</i> Forest Alliance (A0250)

**ELEMENT CONCEPT**

**Global Summary:** This community is strongly dominated by the vine *Vitis aestivalis*. In Great Smoky Mountains National Park, examples occur on steep to very steep, northerly, middle to upper slopes at intermediate elevations between 610 and 1070 m (2000-3500 feet). All areas sampled showed evidence of disturbance by wind, ice, or logging. *Vitis aestivalis* vines, extremely thick in patches and covering nearly every tree as well as the ground, have 50-100% coverage. Trees in the canopy and subcanopy have 0-50% coverage and vary from site to site. The shrub layer is sparse. The herb layer is sparse to moderate, decreasing with vine coverage. Herbaceous composition varies from site to site. Beneath the vine canopy, coarse woody debris and tip-up mounds are typical. The

dynamics of this community are poorly understood. It apparently originates from disturbance, such as an ice or wind storm, and can persist for decades. Examples can range in size from less than one to ten hectares.

#### ENVIRONMENTAL DESCRIPTION

**Great Smoky Mountains National Park Environment:** This community occurs on steep to very steep, northerly, middle to upper slopes at intermediate elevations (between 2000 and 3500 feet). All areas sampled showed evidence of disturbance by wind, ice, or logging.

**Global Environment:** In the Great Smoky Mountains National Park, this community occurs on steep to very steep, northerly, middle to upper slopes at intermediate elevations between 610 and 1070 m (2000-3500 feet) (MacKenzie 1993).

#### VEGETATION DESCRIPTION

**Great Smoky Mountains National Park Vegetation:** Communities within the Smokies are also strongly dominated by *Vitis aestivalis* and contain a wide range of canopy tree species. In addition to the usual species such as *Acer rubrum*, *Acer saccharum*, *Halesia tetraptera* var. *monticola*, and *Liriodendron tulipifera*, this community may also contain examples of more calciphilic species such as *Carya cordiformis* and *Juglans cinerea*.

**Global Vegetation:** This community is strongly dominated by the vine *Vitis aestivalis*. These vines, extremely thick in patches and covering nearly every tree as well as the ground, have 50-100% coverage. Trees in the canopy and subcanopy have 0-50% coverage and vary from site to site, but typical species include *Acer rubrum*, *Acer saccharum*, *Halesia tetraptera* var. *monticola*, and *Liriodendron tulipifera*. The shrub layer is sparse. The herb layer is sparse to moderate, decreasing with vine coverage. Herbaceous composition varies from site to site but is typical of mesic forests in the area. Some of the more common species from the sampled areas in Great Smoky Mountains National Park are *Ageratina altissima* var. *altissima*, *Amphicarpaea bracteata*, *Arisaema triphyllum* ssp. *triphyllum*, *Polystichum acrostichoides*, *Sanguinaria canadensis*, and *Viola* spp. Beneath the vine canopy, coarse woody debris and tip-up mounds are typical.

**Global Dynamics:** The dynamics of this community are poorly understood. It apparently originates from disturbance, such as an ice or wind storm; and can persist for decades. This community can range in size from less than a hectare to ten hectares. All areas sampled showed evidence of disturbance by wind, ice, or logging.

#### MOST ABUNDANT SPECIES

##### Great Smoky Mountains National Park

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Shrub/sapling (tall & short)	Liana	<i>Vitis aestivalis</i>

##### Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Shrub/sapling (tall & short)	Liana	<i>Vitis aestivalis</i>

#### CHARACTERISTIC SPECIES

**Great Smoky Mountains National Park:** *Aristolochia macrophylla*, *Vitis aestivalis*

**Global:** *Vitis aestivalis*

#### OTHER NOTEWORTHY SPECIES

**Global:**

#### CONSERVATION STATUS RANK

**Global Rank & Reasons:** G2G3 (9-Sep-2015). This is an uncommon community. It is of limited extent within its range and its occurrence could be limited by specific disturbance regimes.

#### RELATED CONCEPTS

**Global Related Concepts:**

- Grape Hole (MacKenzie 1993) =

#### CLASSIFICATION

**Status:** Standard

**Classification Confidence:** 2 - Moderate

**Great Smoky Mountains National Park Other Comments:** Forests previously occupying sites that support this community are mesic forest types, such as cove forests or mesic forest dominated by chestnut oak and red oak. Forests on steep mesic sites may be more susceptible to treefall and gap formation.

**Global Classification Comments:** This community is important for wildlife, especially bears. In the Great Smoky Mountains, forests previously occupying sites that support this community are mesic forest types, such as cove forests or mesic forest dominated by chestnut oak and red oak. Forests on steep, mesic sites may be more susceptible to treefall and gap formation.

#### ELEMENT DISTRIBUTION

**Great Smoky Mountains National Park Range:** This community was sampled on the Cades Cove, Mount Le Conte, and other quadrangles. It was sampled in the central and eastern portion of the Mount Le Conte quadrangle, on steep slopes north of Potato Ridge and north of Mt. Winnesoka. On the Cades Cove quadrangle it was sampled or observed on the north slopes of Allnight Ridge,

in the northern portion of the quadrangle, and on steep slopes over Rowans Branch and steep slopes south of Pond Knob, in the eastern portion of the quadrangle. A plot also exists upslope from the West Prong. It has been seen but not sampled on the North Carolina side.

**Global Range:** This community is known from the Great Smoky Mountains of North Carolina and Tennessee and the Cumberland Mountains of Tennessee and Kentucky.

**Nations:** US

**States/Provinces:** KY, NC, TN

**TNC Ecoregions:** 50:P, 51:C

**USFS Ecoregions (1994/95):** M221Dd:CCC, M222Ab:PPP

**USFS Ecoregions (2007):** M221Dd:CCC, M223Ab:PPP

**Federal Lands:** BIA (Eastern Band of Cherokee); NPS (Appalachian Trail [Southern Blue Ridge], Blue Ridge Parkway?, Cumberland Gap, Great Smoky Mountains); USFS (Cherokee)

#### ELEMENT SOURCES

**Great Smoky Mountains National Park Plots:** GRSM.131, GRSM.132, GRSM.139, GRSM.220.

**Great Smoky Mountains National Park Description Author(s):** K.D. Patterson, mod. R. White

**Global Description Author(s):** A.S. Weakley and M. Pyne

**References:** MacKenzie 1993, MacKenzie 1993, Peet et al. unpubl. data, Schafale 2012, Southeastern Ecology Working Group n.d., White 2006

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### A3116 *Quercus rubra* - *Quercus alba* Montane Forest Alliance

Northern Red Oak - White Oak Montane Forest Alliance

*Appalachian Montane Oak Forest*

#### ALLIANCE CONCEPT

**Summary:** This alliance includes *Quercus rubra*-dominated forest vegetation of high elevations (over 1070 m [3500 feet]), as well as more restricted vegetation of montane landscapes dominated by *Quercus alba*, in the Central and Southern Appalachians. A closed to very open canopy has trees that are often gnarled and stunted, especially on ridge crests. *Quercus rubra* is often the only canopy tree, but other species may have minor importance, including *Acer rubrum*, *Betula alleghaniensis*, *Betula lenta*, *Crataegus flabellata*, and *Crataegus punctata*. *Quercus alba* is a significant component of forests at high elevations in Virginia's Ridge and Valley and at the lower elevations of associations in the Southern Blue Ridge. Forests in this alliance have variable physiognomies, ranging from open herb-dominated understories to understories dominated by dense ericaceous shrubs. If a subcanopy is present, typical species include canopy species plus *Acer pensylvanicum*, *Amelanchier arborea*, *Halesia tetraptera*, *Hamamelis virginiana*, and *Ilex montana*. The shrub stratum is dominated by *Kalmia latifolia*, occurring as patches or with continuous cover (>25%). In some parts of this forest's range, *Gaylussacia ursina* is dominant in the often dense low-shrub stratum. In forests with little or no shrub cover, herbaceous cover is dense and diverse, composed of sedges, ferns, and tall herbs, with dominance varying within and among occurrences. Where shrub cover is dense, the herbaceous stratum is not diverse and is typically very sparse with scattered forbs. Forests typically occur over well-drained, loamy soils underlain by Precambrian gneisses, schists, and granites. Soils supporting these forests tend to have relatively high base status. Forests occur on most of the major mountain ranges of the Southern Appalachians at elevations of 1070-1525 m (3500-5000 feet) on broad ridges, mid to upper slope positions, and on steep rocky slopes at the heads of coves. Forests are also known from the central (on granitic crests) and Northern Blue Ridge (on middle to upper convex slopes) and in the northern Ridge and Valley. Damage by ice storms is probably the most common form of natural disturbance in these montane forests.

#### Similar Alliances:

- *Quercus montana* - *Quercus rubra* Forest Alliance (A0250) occurs at lower elevations and has straighter trees, and a more closed canopy.
- *Quercus rubra* - *Quercus montana* Dry Rocky Woodland Alliance (A0624) occurs at lower elevations.

**Diagnostic Characteristics:** Forests of montane landscapes in the Southern and Central Appalachians dominated by *Quercus rubra* or *Quercus alba*; trees gnarled and canopy often partially open.

#### Related Concepts:

- *Quercus rubra* - *Betula alleghaniensis* / *Rhododendron catawbiense* / *Angelica triquinata* - *Aster acuminatus* Association (Rawinski et al. 1996) ?
- *Quercus rubra* / *Ilex montana* / *Dennstaedtia punctilobula* - *Melanthium parviflorum* Association (Rawinski et al. 1996) ?
- High Elevation Red Oak Forest (Schafale and Weakley 1990) ?
- IA4g. High Elevation Northern Red Oak Forest (Allard 1990) ?
- IA4h. High Elevation White Oak Forest (Allard 1990) ?
- IB4a. Dwarf White Oak Woodland (Allard 1990) ?
- Montane White Oak Forest (Schafale and Weakley 1990) ><

#### ALLIANCE DESCRIPTION

**Environment:** Forests occur on most of the major mountain ranges of the Southern Appalachians at elevations of 1070-1525 m (3500-5000 feet) on broad ridges, mid to upper slope positions, and on steep rocky slopes at the heads of coves. Forests are also

known from the central (on granitic crests) and Northern Blue Ridge (on middle to upper convex slopes) and in the northern Ridge and Valley. Soils are loamy and underlain by Precambrian gneisses, schists and granites. These soils are classified as Typic, Umbric, or Lithic Dystrochrepts, and Typic Haplumbrepts (Golden 1974). Soils supporting these forests tend to have relatively high base status. *Quercus alba* forests of this alliance occur on dry sandstone ridges and south-facing slopes in the highest portions of the Ouachita Mountains; forests on exposed, rocky ridges and convex upper slopes at middle to high elevations in the Southern Appalachians; and unique *Quercus alba* forests found in association with serpentine geology in the Southern Blue Ridge of western North Carolina.

**Vegetation:** *Quercus rubra* is often the only canopy tree, but other species may have minor importance, including *Acer rubrum*, *Betula alleghaniensis*, *Betula lenta*, *Crataegus flabellata*, and *Crataegus punctata*. *Quercus alba* is a significant component of forests at high elevations in Virginia's Ridge and Valley and at the lower elevations of associations in the Southern Blue Ridge. Forests in this alliance have variable physiognomies, ranging from open herb-dominated understories to understories dominated by dense ericaceous shrubs. If a subcanopy is present, typical species include canopy species *Acer pensylvanicum*, *Amelanchier arborea*, *Halesia tetraptera*, *Hamamelis virginiana*, and *Ilex montana*. In forests with little or no shrub cover, herbaceous cover is dense and diverse, composed of sedges, ferns, and tall herbs, with dominance varying within and among occurrences. Typical herbaceous species include *Ageratina altissima* var. *roanensis*, *Athyrium filix-femina* ssp. *asplenioides*, *Carex pensylvanica*, *Clintonia umbellulata*, *Collinsonia canadensis*, *Conopholis americana*, *Dennstaedtia punctilobula*, *Dioscorea villosa*, *Eurybia chlorolepis* (= *Aster chlorolepis*), *Eurybia divaricata* (= *Aster divaricatus*), *Laportea canadensis*, *Lysimachia quadrifolia*, *Medeola virginiana*, *Monarda fistulosa*, *Oclemena acuminata* (= *Aster acuminatus*), *Potentilla canadensis*, *Prenanthes roanensis*, *Silene stellata*, *Solidago curtisii* (= *Solidago caesia* var. *curtisii*), and *Thelypteris noveboracensis*. Typical evergreen shrub dominants include *Kalmia latifolia*, *Rhododendron catawbiense*, and *Rhododendron maximum*. Deciduous shrubs include *Corylus cornuta*, *Gaylussacia ursina*, *Ilex montana*, *Lyonia ligustrina*, *Rhododendron calendulaceum*, *Rubus canadensis*, *Vaccinium erythrocarpum*, and *Vaccinium simulatum*. Where shrub cover is dense, the herbaceous stratum is not diverse and is typically very sparse with scattered forbs, including *Clintonia umbellulata*, *Conopholis americana*, *Dennstaedtia punctilobula*, *Dioscorea villosa*, *Epigaea repens*, *Eurybia divaricata*, *Galax urceolata*, *Solidago curtisii*, and *Thelypteris noveboracensis*.

**Physiognomy and Structure:** Forests in this alliance have variable physiognomies, ranging from open herb-dominated understories to understories dominated by dense ericaceous shrubs. A closed to very open canopy has trees that are often gnarled and stunted, especially on ridge crests.

**Floristics:** *Quercus rubra* is often the only canopy tree, but other species may have minor importance, including *Acer rubrum*, *Betula alleghaniensis*, *Betula lenta*, *Crataegus flabellata*, and *Crataegus punctata*. *Quercus alba* is a significant component of forests at high elevations in Virginia's Ridge and Valley and at the lower elevations of associations in the Southern Blue Ridge. Forests in this alliance have variable physiognomies, ranging from open herb-dominated understories to understories dominated by dense ericaceous shrubs. If a subcanopy is present, typical species include canopy species *Acer pensylvanicum*, *Amelanchier arborea*, *Halesia tetraptera*, *Hamamelis virginiana*, and *Ilex montana*. In forests with little or no shrub cover, herbaceous cover is dense and diverse, composed of sedges, ferns, and tall herbs, with dominance varying within and among occurrences. Typical herbaceous species include *Ageratina altissima* var. *roanensis*, *Athyrium filix-femina* ssp. *asplenioides*, *Carex pensylvanica*, *Clintonia umbellulata*, *Collinsonia canadensis*, *Conopholis americana*, *Dennstaedtia punctilobula*, *Dioscorea villosa*, *Eurybia chlorolepis* (= *Aster chlorolepis*), *Eurybia divaricata* (= *Aster divaricatus*), *Laportea canadensis*, *Lysimachia quadrifolia*, *Medeola virginiana*, *Monarda fistulosa*, *Oclemena acuminata* (= *Aster acuminatus*), *Potentilla canadensis*, *Prenanthes roanensis*, *Silene stellata*, *Solidago curtisii* (= *Solidago caesia* var. *curtisii*), and *Thelypteris noveboracensis*. Typical evergreen shrub dominants include *Kalmia latifolia*, *Rhododendron catawbiense*, and *Rhododendron maximum*. Deciduous shrubs include *Corylus cornuta*, *Gaylussacia ursina*, *Ilex montana*, *Lyonia ligustrina*, *Rhododendron calendulaceum*, *Rubus canadensis*, *Vaccinium erythrocarpum*, and *Vaccinium simulatum*. Where shrub cover is dense, the herbaceous stratum is not diverse and is typically very sparse with scattered forbs, including *Clintonia umbellulata*, *Conopholis americana*, *Dennstaedtia punctilobula*, *Dioscorea villosa*, *Epigaea repens*, *Eurybia divaricata*, *Galax urceolata*, *Solidago curtisii*, and *Thelypteris noveboracensis*.

**Dynamics:** On exposed sites these forests commonly contain, as inclusions, acidic rock outcrop communities and montane shrublands, and may grade into forests dominated by *Pinus pungens*, *Pinus rigida*, *Quercus montana*, and *Tsuga caroliniana*. At higher elevations these forests often occur adjacent to or grade into forests dominated by *Abies fraseri*, *Picea rubens*, or northern hardwood species (*Aesculus flava*, *Betula alleghaniensis*, *Fagus grandifolia*). In some areas, forests are found adjacent to montane shrublands and grasslands. At low elevations on dry sites, these forests may grade into forests dominated by mixed *Quercus* species. Many *Quercus rubra*-dominated stands of today were, prior to the chestnut blight in the 1930s, dominated or codominated by *Castanea dentata* with scattered *Quercus rubra* and *Acer rubrum* in the canopy. Chestnut blight fungus (*Cryphonectria parasitica*) eliminated *Castanea dentata* in the upper canopy, subsequently releasing the subcanopy *Quercus rubra*, which eventually resulted in a nearly pure upper canopy of large *Quercus rubra*. Major compositional variation within these forests is related to a moisture gradient, which in turn is a function of topographic position and relative amount of solar radiation received (DeLapp 1978).

#### ALLIANCE DISTRIBUTION

**Range:** This alliance occurs from Georgia to West Virginia along the higher peaks of the Central and Southern Appalachians.

**Nations:** US

**Subnations:** GA, KY?, NC, SC, TN, VA, WV

## ALLIANCE SOURCES

**References:** Allard 1990, DeLapp 1978, Faber-Langendoen et al. 2019b, Golden 1974, McLeod 1988, McNab and Browning 1993, Newell and Peet 1995, Patterson 1994, Rawinski et al. 1996, Schafale and Weakley 1990, Schafale and Weakley 1990, Stephenson and Adams 1989, Weakley 1980, Wharton 1978, Whigham 1969, Whittaker 1956

**Author of Concept:** Schafale and Weakley 1990

**Author of Description:** D.J. Allard (1990); M.P. Schafale and A.S. Weakley (1990)

**[CEGL007295] *Quercus alba* / *Kalmia latifolia* Forest**

Translated Name: **White Oak / Mountain Laurel Forest**

Common Name: **Southern Blue Ridge High-Elevation White Oak Forest**

## USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (I.B.2.Na)
Macrogroup	Appalachian-Northeastern Oak - Hardwood - Pine Forest & Woodland (M502)
Group	Southern Appalachian Oak / Chestnut Forest (G015)
Alliance	<i>Quercus rubra</i> - <i>Quercus alba</i> Montane Forest Alliance (A3116)

## ELEMENT CONCEPT

**Global Summary:** This community comprises *Quercus alba*-dominated forests on exposed, rocky ridges and convex upper slopes at high elevations (>915 m [3000 feet]). The shrub stratum is dominated by *Kalmia latifolia*, occurring as patches or with continuous cover (>25%). In some parts of this forest's range, *Gaylussacia ursina* is dominant in the often dense low-shrub stratum. Herbaceous cover is typical of xeric *Quercus*-and-*Carya*-dominated forests in the area, with *Carex pensylvanica*, *Chimaphila maculata*, *Euphorbia corollata*, *Galax urceolata*, *Galium latifolium*, *Goodyera pubescens*, *Hexastylis shuttleworthii*, *Iris verna* var. *smalliana*, *Medeola virginiana* typical. The shrub/sapling stratum often has a high coverage of *Castanea* stump sprouts and also includes *Castanea pumila*, *Sassafras albidum*, *Oxydendrum arboreum*, and *Nyssa sylvatica*.

## ENVIRONMENTAL DESCRIPTION

**Great Smoky Mountains National Park Environment:** This community exists in patches on dry, exposed ridgetops and upper slopes at elevations above 1200 m in the Smokies. The example documented with a plot faced southwest at an elevation of approximately 1500 m.

**Global Environment:** These *Quercus alba*-dominated forests occur on exposed, rocky ridges and convex upper slopes at high elevations (>915 m [3000 feet]).

## VEGETATION DESCRIPTION

**Great Smoky Mountains National Park Vegetation:** Within the park, this community exists as patches within a matrix of high-elevation *Quercus rubra*-dominated forests. It consists of a canopy of at least 50% *Quercus alba* with a solid shrub layer of *Kalmia latifolia*. In areas where the *Kalmia latifolia* is not thick, *Vaccinium pallidum* often covers the ground. Herbs are sparse, but include *Epigaea repens*, *Dennstaedtia punctilobula*, *Stenanthium gramineum*, and *Clintonia umbellulata*. Root sprouts of *Castanea dentata* are still common in this community.

**Global Vegetation:** These forests are dominated by *Quercus alba* in the canopy. The shrub stratum is dominated by *Kalmia latifolia*, occurring as patches or with continuous cover (>25%). In some parts of this forest's range, *Gaylussacia ursina* is dominant in the often dense low-shrub stratum. Herbaceous cover is typical of xeric *Quercus*-and-*Carya*-dominated forests in the area, with *Carex pensylvanica*, *Chimaphila maculata*, *Euphorbia corollata*, *Galax urceolata*, *Galium latifolium*, *Goodyera pubescens*, *Hexastylis shuttleworthii*, *Iris verna* var. *smalliana*, *Medeola virginiana* typical. The shrub/sapling stratum often has a high coverage of *Castanea* stump sprouts and also includes *Castanea pumila*, *Sassafras albidum*, *Oxydendrum arboreum*, and *Nyssa sylvatica*.

## MOST ABUNDANT SPECIES

**Great Smoky Mountains National Park**

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Broad-leaved deciduous tree	<i>Quercus alba</i>
Tree subcanopy	Broad-leaved deciduous tree	<i>Acer rubrum</i>
Shrub/sapling (tall & short)	Broad-leaved evergreen shrub	<i>Kalmia latifolia</i>

**Global**

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Broad-leaved deciduous tree	<i>Quercus alba</i>
Tree subcanopy	Broad-leaved deciduous tree	<i>Acer rubrum</i>
Shrub/sapling (tall & short)	Broad-leaved evergreen shrub	<i>Kalmia latifolia</i>

## CHARACTERISTIC SPECIES

**Great Smoky Mountains National Park:** *Castanea dentata*, *Kalmia latifolia*

**Global:** *Castanea dentata*, *Castanea pumila*, *Kalmia latifolia*, *Quercus alba*

## OTHER NOTEWORTHY SPECIES

## Global:

## CONSERVATION STATUS RANK

**Global Rank & Reasons:** G2Q (29-Dec-1999). This forest is restricted geographically, and if considered distinct, it is naturally rare within its range. It is floristically related to other, more common associations and may be better considered a subassociation of one of these communities.

## RELATED CONCEPTS

## Global Similar Types:

- *Quercus alba* - *Quercus (rubra, montana)* / *Rhododendron calendulaceum* - (*Gaylussacia ursina*) Forest (CEGL007230)
- *Quercus rubra* / (*Kalmia latifolia*, *Rhododendron catawbiense*, *Rhododendron maximum*) / *Galax urceolata* Forest (CEGL007299)
- *Quercus rubra* / (*Vaccinium simulatum*, *Rhododendron calendulaceum*) / (*Dennstaedtia punctilobula*, *Thelypteris noveboracensis*) Forest (CEGL007300)

## Global Related Concepts:

- *Quercus alba* / *Castanea dentata* / *Gaylussacia ursina* Forest (Patterson 1994) =
- IA4h. High Elevation White Oak Forest (Allard 1990) ?
- White Oak: 53 (Eyre 1980) >

## CLASSIFICATION

**Status:** Standard

**Classification Confidence:** 3 - Weak

**Great Smoky Mountains National Park Other Comments:** This community is rare within the park; however, this community type is often seen as a component of both *Quercus alba* - *Quercus (rubra, prinus)* / *Rhododendron calendulaceum* - *Kalmia latifolia* - (*Gaylussacia ursina*) Forest (CEGL007230) or this and *Quercus rubra* / (*Kalmia latifolia*, *Rhododendron maximum*) / *Galax urceolata* Forest (CEGL007299).

**Global Classification Comments:** These forests are related to oak - hickory forests and may be best considered as a variant of them. Similar associations include *Quercus rubra* / (*Kalmia latifolia*, *Rhododendron catawbiense*, *Rhododendron maximum*) / *Galax urceolata* Forest (CEGL007299), *Quercus rubra* / (*Vaccinium simulatum*, *Rhododendron calendulaceum*) / (*Dennstaedtia punctilobula*, *Thelypteris noveboracensis*) Forest (CEGL007300), and *Quercus alba* - *Quercus (rubra, montana)* / *Rhododendron calendulaceum* - (*Gaylussacia ursina*) Forest (CEGL007230). On some sites these forests are transitional to *Quercus rubra*-dominated forests (High Elevation Red Oak Forest).

## ELEMENT DISTRIBUTION

**Great Smoky Mountains National Park Range:** This community was sampled in an area along the Catta-loochee Divide near the Purchase and most likely exists as small scattered patches on exposed slopes throughout high-elevation areas of the park.

**Global Range:** This community occurs in the Southern Blue Ridge of western North Carolina, eastern Tennessee, northwestern South Carolina, and northeastern Georgia.

**Nations:** US

**States/Provinces:** GA, NC, SC, TN

**TNC Ecoregions:** 51:C

**USFS Ecoregions (1994/95):** M221Dc:CCC, M221Dd:CCC

**USFS Ecoregions (2007):** M221Dc:CCC, M221Dd:CCC

**Federal Lands:** BIA (Eastern Band of Cherokee); NPS (Blue Ridge Parkway, Great Smoky Mountains); USFS (Chattahoochee, Chattahoochee (Southern Blue Ridge), Cherokee, Nantahala, Pisgah)

## ELEMENT SOURCES

**Great Smoky Mountains National Park Plots:** GRSM.518.

**Great Smoky Mountains National Park Description Author(s):** K.D. Patterson, mod. R. White

**Global Description Author(s):** K.D. Patterson

**References:** Allard 1990, Eyre 1980, McCormick and Platt 1980, Nelson 1986, Newell and Peet 1995, Patterson 1994, Peet et al. unpubl. data, Schafale 2012, Schafale and Weakley 1990, Southeastern Ecology Working Group n.d.

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**[CEGL007299] *Quercus rubra* / (*Kalmia latifolia*, *Rhododendron catawbiense*, *Rhododendron maximum*) / *Galax urceolata* Forest**

Translated Name: Northern Red Oak / (Mountain Laurel, Catawba Rosebay, Great Laurel) / Beetleweed Forest

Common Name: Southern Appalachian High-Elevation Red Oak Forest (Evergreen Shrub Type)

## USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Northeastern Oak - Hardwood - Pine Forest & Woodland (M502)
Group	Southern Appalachian Oak / Chestnut Forest (G015)
Alliance	<i>Quercus rubra</i> - <i>Quercus alba</i> Montane Forest Alliance (A3116)

## ELEMENT CONCEPT

**Global Summary:** This community occurs on most of the major mountain ranges of the Southern Appalachians at elevations of 1070-1646 m (3500-5400 feet) on ridges and mid to upper slopes, commonly with southern and southeastern exposures. Outliers occur in the southern part of the Central Appalachians, on the highest ridges of the Ridge and Valley and Blue Ridge in southwest Virginia. This montane community includes forest vegetation with *Quercus rubra* making up at least 75% of the tree canopy and with greater than 20% shrub cover, which may be continuous to patchy. More than 50% of the total shrub cover is evergreen, although deciduous shrubs may be present. Typical shrub dominants include *Kalmia latifolia*, *Rhododendron catawbiense*, and *Rhododendron maximum*. The herbaceous stratum is not diverse and is typically very sparse with scattered forbs and woody seedlings, including *Galax urceolata*, *Solidago curtisii*, *Epigaea repens*, *Dennstaedtia punctilobula*, *Conopholis americana*, *Thelypteris noveboracensis*, *Clintonia umbellulata*, *Eurybia divaricata*, and *Dioscorea villosa*. On exposed sites this community commonly contains acidic rock outcrop communities and montane shrublands as inclusions, and may grade into forests dominated by *Tsuga caroliniana*, *Pinus rigida*, *Pinus pungens*, and *Quercus montana*. At higher elevations, this forest often occurs adjacent to, or grades into, forests dominated by *Picea rubens*, *Abies fraseri*, or northern hardwood species (*Aesculus flava*, *Betula alleghaniensis*, *Fagus grandifolia*).

## ENVIRONMENTAL DESCRIPTION

**Great Smoky Mountains National Park Environment:** This community was sampled on a flat summit at 4400 feet elevation. The canopy had damage by insects.

**Global Environment:** This community occurs on most of the major mountain ranges of the Southern Appalachians at elevations of 1070-1646 m (3500-5400 feet) on ridges and mid- to upper-slope positions, commonly with south and southeast exposures. Outliers occur in the southern part of the Central Appalachians, on the highest ridges of the Ridge and Valley and Blue Ridge in southwest Virginia. DeLapp (1978) found that this community type occurs on most slope aspects but was most commonly found on southeast and south exposures. Of the 13 plot samples from the Appalachian Trail classification project, 60% were on crests and interfluvies; the remaining samples had variable slope exposures (Fleming and Patterson 2009a). This community occurs over well-drained soils underlain by Precambrian gneisses, schists and granites. These soils are classified as Typic, Umbric, or Lithic Dystrochrepts, and Typic Haplumbrepts (Golden 1974). Soils supporting this forest with a mainly evergreen shrub understory are slightly more acidic than *Quercus rubra*-dominated forests with deciduous shrub understories (DeLapp 1978).

## VEGETATION DESCRIPTION

**Great Smoky Mountains National Park Vegetation:** This community has a rather open canopy dominated by *Quercus rubra*. Other species with minor canopy/subcanopy coverage include *Acer rubrum*, *Betula alleghaniensis*, *Hamamelis virginiana*, *Ilex montana*, *Oxydendrum arboreum*, and *Prunus serotina*. The tall-shrub stratum is extremely dense and dominated by *Rhododendron maximum* or sometimes *Kalmia latifolia*. Other shrubs include *Rubus canadensis* and *Leucothoe fontanesiana*. Typical species in the sparse herb stratum are *Dryopteris intermedia*, *Galax urceolata*, *Carex pennsylvanica*, and *Dennstaedtia punctilobula*.

**Global Vegetation:** Stands of this montane community of the Southern Appalachians are dominated by *Quercus rubra* which makes up at least 75% of the tree canopy. Stands typically have greater than 20% shrub cover, which may be continuous to patchy. More than 50% of the total shrub cover is evergreen, although deciduous shrubs may be present. Typical shrub dominants include *Kalmia latifolia*, *Rhododendron catawbiense*, and *Rhododendron maximum*. The herbaceous stratum is not diverse and is typically very sparse with scattered forbs and woody seedlings, including *Galax urceolata*, *Solidago curtisii* (= *Solidago caesia* var. *curtisii*), *Epigaea repens*, *Dennstaedtia punctilobula*, *Conopholis americana*, *Thelypteris noveboracensis*, *Clintonia umbellulata*, *Eurybia divaricata* (= *Aster divaricatus*), and *Dioscorea villosa*. Many species in this community are endemic to the Southern Blue Ridge or have the bulk of their worldwide range in that region. Some of these endemic species include *Abies fraseri*, *Aesculus flava*, *Ageratina altissima* var. *roanensis*, *Euphorbia purpurea*, *Eubotrys recurva* (= *Leucothoe recurva*), *Prenanthes roanensis*, *Rhododendron catawbiense*, *Rhododendron vaseyi*, *Silene ovata*, and *Solidago curtisii*.

**Global Dynamics:** The canopy is probably rarely removed completely by natural disturbance; however, small canopy gaps are caused by individual tree death. Occurrences of this community on exposed slopes and south- and west-facing ridges are subject to lightning-caused fires and damage by ice and wind. Damage by icestorms is probably the most common form of natural disturbance. *Quercus rubra* reproduction and survival are optimal in canopy gaps with little regeneration under the forest canopy, hence these forests will eventually succeed to forests with mixed canopy composition of *Quercus rubra*, *Betula alleghaniensis*, *Acer rubrum*, and *Fagus grandifolia*. Many *Quercus rubra*-dominated stands of today were, prior to the chestnut blight in the 1930s, dominated or codominated by *Castanea dentata* with scattered *Quercus rubra* and *Acer rubrum* in the canopy (Golden 1974). The fungus *Endothia parasitica* eliminated *Castanea dentata* in the upper canopy, subsequently releasing the subcanopy *Quercus rubra*, which eventually resulted in a nearly pure upper canopy of large *Quercus rubra*.

## MOST ABUNDANT SPECIES

## Great Smoky Mountains National Park

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Broad-leaved deciduous tree	<i>Quercus rubra</i>
Tree subcanopy	Broad-leaved deciduous tree	<i>Hamamelis virginiana</i> , <i>Ilex montana</i>
Tall shrub/sapling	Broad-leaved evergreen tree	<i>Rhododendron maximum</i>
Herb (field)	Fern (Spore-bearing forb)	<i>Dryopteris intermedia</i>

**Global****Stratum**

Tree canopy

Tree subcanopy

Tall shrub/sapling

Tall shrub/sapling

Herb (field)

**Lifeform**

Broad-leaved deciduous tree

Broad-leaved deciduous tree

Broad-leaved evergreen tree

Broad-leaved evergreen shrub

Flowering forb

**Species***Quercus rubra**Acer rubrum*, *Hamamelis virginiana**Rhododendron catawbiense*, *Rhododendron maximum**Kalmia latifolia**Galax urceolata***CHARACTERISTIC SPECIES****Great Smoky Mountains National Park:** *Galax urceolata*, *Hamamelis virginiana*, *Ilex montana*, *Quercus rubra*, *Rhododendron maximum***Global:** *Acer rubrum*, *Galax urceolata*, *Hamamelis virginiana*, *Ilex montana*, *Kalmia latifolia*, *Quercus rubra*, *Rhododendron catawbiense*, *Rhododendron maximum***OTHER NOTEWORTHY SPECIES****Global: Vulnerable Plants:** *Abies fraseri* (G2, Southern Blue Ridge endemic), *Ageratina altissima* var. *roanensis* (G5T3T4, Southern Blue Ridge endemic), *Calystegia catesbeiana* (G3), *Carex roanensis* (G2G3, Southern Blue Ridge endemic), *Euphorbia purpurea* (G3, Southern Blue Ridge endemic), *Hypericum buckleii* (G3), *Krigia montana* (G3), *Prenanthes roanensis* (G3, Southern Blue Ridge endemic), *Rhododendron vaseyi* (G3, NC/Southern Blue Ridge endemic), *Silene ovata* (G3, Southern Blue Ridge endemic), *Tsuga caroliniana* (G2G3); **Other Plants:** *Aesculus flava* (G5, Southern Blue Ridge endemic), *Botrychium lanceolatum* var. *angustisegmentum* (G5T4), *Calamagrostis porteri* (G4), *Clematis occidentalis* (G5), *Clethra acuminata* (G4, Southern Blue Ridge endemic), *Eubotrys recurva* (G4G5, Southern Blue Ridge endemic), *Helianthemum bicknellii* (G5), *Helianthemum propinquum* (G4), *Lonicera dioica* (G5), *Prunus virginiana* (G5), *Pyrola americana* (G5), *Rhododendron prinophyllum* (G5), *Solidago curtisii* (GNR, Southern Blue Ridge endemic), *Streptopus lanceolatus* var. *roseus* (G5T4), *Vaccinium erythrocarpum* (G5, Southern Blue Ridge endemic), *Vaccinium hirsutum* (G4)**CONSERVATION STATUS RANK****Global Rank & Reasons:** G4 (4-Jan-2000). This community is uncommon but not rare. It is secure within its range.**RELATED CONCEPTS****Global Similar Types:**

- *Quercus alba* / *Kalmia latifolia* Forest (CEGL007295)
- *Quercus montana* - *Quercus rubra* / *Rhododendron maximum* / *Galax urceolata* Forest (CEGL006286)
- *Quercus rubra* / (*Vaccinium simulatum*, *Rhododendron calendulaceum*) / (*Dennstaedtia punctilobula*, *Thelypteris noveboracensis*) Forest (CEGL007300) has greater than 20% shrub cover but with more than 50% of the shrub cover composed of deciduous species.
- *Quercus rubra* / *Carex pensylvanica* - *Ageratina altissima* var. *roanensis* Forest (CEGL007298) has less than 20% shrub cover and a herb stratum dominated by ferns, tall forbs, and sedges.
- *Quercus rubra* / *Rhododendron catawbiense* - *Rhododendron arborescens* Woodland (CEGL004503) occurs at higher elevations, in more extreme environments, sometimes adjacent to CEGL007299.

**Global Related Concepts:**

- *Kalmia latifolia* Phase (DeLapp 1978) ?
- *Quercus rubra* / *Rhododendron catawbiense* Forest (Fleming and Patterson 2009a) =
- *Quercus rubra* / *Rhododendron maximum* Forest (Patterson 1994) =
- *Rhododendron catawbiense* Phase (DeLapp 1978) ?
- *Rhododendron maximum* Phase (DeLapp 1978) ?
- High elevation red oak /mt. laurel-great laurel forest (CAP pers. comm. 1998) ?
- IA4g. High Elevation Northern Red Oak Forest (Allard 1990) >
- Northern Red Oak (55) (USFS 1988) ?
- Northern Red Oak: 55 (Eyre 1980) >
- Red Oak - Chestnut Forest (Whittaker 1956) >

**CLASSIFICATION****Status:** Standard**Classification Confidence:** 1 - Strong**Great Smoky Mountains National Park Other Comments:** This forest occurs adjacent to north slope forests dominated by *Betula alleghaniensis* and *Fagus grandifolia*. It is unlikely that the signature of this community can be distinguished from other forests in this alliance. In addition, many of the occurrences of this community type are mixtures of three community types: *Quercus rubra* / (*Kalmia latifolia*, *Rhododendron maximum*) / *Galax urceolata* Forest (CEGL007299), *Quercus prinus* - *Quercus rubra* / *Rhododendron maximum* / *Galax urceolata* Forest (CEGL006286), and *Quercus (pinus, coccinea)* / *Kalmia latifolia* / (*Galax urceolata*, *Gaultheria procumbens*) Forest (CEGL006271).**Global Classification Comments:** This community includes forest vegetation with *Quercus rubra* making up at least 75% of the tree canopy and with greater than 20% shrub cover. More than 50% of the total shrub cover is evergreen, although deciduous shrubs may

be present. Typical evergreen shrub species in this community include *Kalmia latifolia*, *Rhododendron catawbiense*, and *Rhododendron maximum*. The most constant species (>60%) in 13 plots classified as this association from North Carolina, Tennessee and Virginia, in order of descending constancy, are *Quercus rubra*, *Kalmia latifolia*, *Rhododendron maximum*, *Acer rubrum*, *Ilex montana*, *Galax urceolata*, *Castanea dentata*, *Tsuga canadensis*, *Rhododendron calendulaceum*, and *Prunus serotina* var. *serotina* (Fleming and Patterson 2009a).

Two varieties of *Quercus rubra* occur within the range of this community, *Quercus rubra* var. *ambigua* and *Quercus rubra* var. *rubra* (Kartesz 1999). Although the two varieties are known to occur together (Rohrer 1983), *Quercus rubra* var. *ambigua* occurs mostly at elevations greater than 1000 m (3300 feet), while *Quercus rubra* var. *rubra* occurs at elevations less than 1000 m (3300 feet) (Weakley 1997). The two varieties are based upon morphological differences in the leaves and acorns (Fernald 1950, Coker and Totten 1945); however, studies of foliar flavonoid composition in different *Quercus rubra* populations suggest that varietal distinction may not be warranted (McDougal and Parks 1984). Even though most studies of *Quercus rubra*-dominated vegetation do not distinguish *Quercus rubra* at the varietal level, it is likely, given the elevation range of this community, that the dominant species in this forest is *Quercus rubra* var. *ambigua*.

Similar *Quercus rubra*-dominated forests occur in the southern Appalachian Mountains. Forests with less than 75% *Quercus rubra* in the canopy are classified in other forest alliances. In Georgia this type occurs on the north side of Rabun Bald, where it grades into *Quercus rubra* / *Rhododendron catawbiense* - *Rhododendron arborescens* Woodland (CEGL004503) in more extreme areas.

#### ELEMENT DISTRIBUTION

**Great Smoky Mountains National Park Range:** This community was sampled in the central portion of the Cades Cove quadrangle, on the northeast summit of McCampbell Knob (4400 feet elevation). In addition, it was sampled in the Dellwood quadrangle in 2002. Occurrences of this type intergrade readily with other high-elevation oak community types.

**Global Range:** This community occurs on most of the major mountain ranges of the Southern Appalachians in North Carolina, Tennessee, Georgia, and Virginia. This community could possibly range into South Carolina.

**Nations:** US

**States/Provinces:** GA, NC, SC?, TN, VA:S2?

**TNC Ecoregions:** 50:C, 51:C, 59:C

**USFS Ecoregions (1994/95):** M221Aa:CCC, M221Ab:CCC, M221Ce:CCC, M221Dc:CCC, M221Dd:CCC

**USFS Ecoregions (2007):** M221Aa:CCP, M221Ab:CCC, M221Ce:CCP, M221Dc:CCC, M221Dd:CCC

**Federal Lands:** BIA (Eastern Band of Cherokee); NPS (Appalachian Trail [Central Appalachians], Appalachian Trail [Southern Blue Ridge], Blue Ridge Parkway, Great Smoky Mountains); USFS (Chattahoochee, Chattahoochee (Southern Blue Ridge), Cherokee, Jefferson, Nantahala, Pisgah)

#### ELEMENT SOURCES

**Great Smoky Mountains National Park Plots:** GRSM.228, GRSM.502, GRSM.506.

**Great Smoky Mountains National Park Description Author(s):** K.D. Patterson, mod. R. White

**Global Description Author(s):** K.D. Patterson

**References:** Allard 1990, CAP pers. comm. 1998, Coker and Totten 1945, DeLapp 1978, Eyre 1980, Fernald 1950, Fleming and Coulling 2001, Fleming and Patterson 2009a, Fleming and Patterson 2009b, Fleming et al. 2017, Fleming pers. comm., GNHP unpubl. data 2018, Golden 1974, Kartesz 1999, McDougal and Parks 1984, McNab and Browning 1993, NatureServe Ecology - Southeastern U.S. unpubl. data, Nelson 1986, Patterson 1994, Peet et al. unpubl. data, Pittillo and Smathers 1979, Rawinski 1992, Schafale 2012, Schafale and Weakley 1990, Southeastern Ecology Working Group n.d., Stephenson and Adams 1989, TDNH unpubl. data 2018, USFS 1988, Weakley 1997, Whigham 1969, Whittaker 1956

### [CEGL007300] *Quercus rubra* / (*Vaccinium simulatum*, *Rhododendron calendulaceum*) / (*Dennstaedtia punctilobula*, *Thelypteris noveboracensis*) Forest

Translated Name: Northern Red Oak / (Upland Highbush Blueberry, Flame Azalea) / (Eastern Hay-scented Fern, New York Fern) Forest

Common Name: Southern Appalachian High-Elevation Red Oak Forest (Deciduous Shrub Type)

#### USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (I.B.2.Na)
Macrogroup	Appalachian-Northeastern Oak - Hardwood - Pine Forest & Woodland (M502)
Group	Southern Appalachian Oak / Chestnut Forest (G015)
Alliance	<i>Quercus rubra</i> - <i>Quercus alba</i> Montane Forest Alliance (A3116)

#### ELEMENT CONCEPT

**Global Summary:** This community includes forest vegetation with *Quercus rubra* making up at least 75% of the tree canopy and with greater than 20% shrub cover, which may be continuous to patchy. More than 50% of the total shrub cover is deciduous, although evergreen shrubs may be present. Typical shrub dominants include *Rhododendron calendulaceum*, *Vaccinium simulatum*, *Vaccinium erythrocarpum*, *Ilex montana*, *Gaylussacia ursina*, *Rubus canadensis*, *Corylus cornuta*, and *Lyonia ligustrina*. The herbaceous stratum is diverse and is predominantly a mix of sedges, ferns, and tall herbs, including *Ageratina altissima* var. *roanensis*, *Athyrium filix-femina* ssp. *asplenioides*, *Clintonia umbellulata*, *Collinsonia canadensis*, *Conopholis americana*, *Dennstaedtia punctilobula*,

*Dioscorea villosa*, *Eurybia divaricata*, *Laportea canadensis*, *Lysimachia quadrifolia*, *Medeola virginiana*, *Monarda fistulosa*, *Oclemena acuminata*, *Potentilla canadensis*, *Prenanthes roanensis*, *Silene stellata*, *Solidago curtisii*, and *Thelypteris noveboracensis*. Herbaceous dominance varies within and between occurrences. This community occurs on most of the major mountain ranges of the Southern Appalachians at elevations of 1070-1525 m (3500-5000 feet) on broad ridges and mid to upper slope positions, commonly with southeastern and southern exposures. At higher elevations this forest often occurs adjacent to or grades into forests dominated by *Picea rubens*, *Abies fraseri*, or northern hardwood species such as *Aesculus flava*, *Betula alleghaniensis*, and *Fagus grandifolia*. In some areas, this community is found adjacent to montane shrublands and grasslands. At low elevations, on dry sites, this community may grade into forests dominated by a mixture of *Quercus* species.

#### ENVIRONMENTAL DESCRIPTION

**Great Smoky Mountains National Park Environment:** This community was sampled at elevations from 3500 to 5000 feet, on high slopes, ridges, and summits with northern to southwestern aspects. Most examples showed evidence of disturbance by wind, ice, and Chestnut Blight.

**Global Environment:** This community occurs at elevations of 1070-1525 m (3500-5000 feet) on broad ridges and mid- to upper-slope positions. DeLapp (1978) found that this community occurs on most slope aspects but was most commonly found on southeast and south exposures. Of the 43 plot samples from the Appalachian Trail classification project, about half are on crests and interfluvies; the remaining samples have variable slope exposures (Fleming and Patterson 2009a). This community occurs over well-drained soils underlain by Precambrian gneisses, schists and granites. These soils are classified as Typic, Umbric, or Lithic Dystrochrepts, and Typic Haplumbrepts (Golden 1974). Soils supporting this forest with a mainly deciduous shrub understory are slightly less acidic than *Quercus rubra*-dominated forests with evergreen shrub understories (DeLapp 1978).

#### VEGETATION DESCRIPTION

**Great Smoky Mountains National Park Vegetation:** The canopy of this forest is strongly dominated by *Quercus rubra*, often gnarled and stunted, particularly on sites affected by wind and ice. Other minor canopy trees include *Quercus alba* and *Acer rubrum*. The subcanopy can be absent or have moderate coverage and commonly includes *Acer rubrum* and *Amelanchier laevis*. The shrub strata are moderate to dense and dominated by deciduous species, commonly *Ilex montana*, *Rhododendron calendulaceum*, *Castanea dentata*, *Rubus canadensis*, *Vaccinium erythrocarpum*, and *Vaccinium corymbosum*. The well-developed herbaceous stratum is quite diverse and can approach 100% coverage. Fern species (*Dennstaedtia punctilobula*, *Thelypteris noveboracensis*) are often dominant, but many other species can occur. Some of the other herbaceous species found in this forest include *Ageratina altissima* var. *roanensis*, *Agrostis perennans*, *Agrostis stolonifera*, *Eurybia divaricata* (= *Aster divaricatus*), *Eurybia macrophylla* (= *Aster macrophyllus*), *Carex pensylvanica*, *Clintonia umbellulata*, *Collinsonia canadensis*, *Dichantherium* spp., *Dioscorea quaternata*, *Eupatorium maculatum*, *Galium latifolium*, *Gentianella quinquefolia* ssp. *quinquefolia*, *Hieracium paniculatum*, *Houstonia purpurea* var. *purpurea*, *Houstonia serpyllifolia*, *Lysimachia quadrifolia*, *Maianthemum racemosum*, *Medeola virginiana*, *Monarda clinopodia*, *Prenanthes* spp., *Silene stellata*, *Smilax herbacea*, *Solidago curtisii* (= *Solidago caesia* var. *curtisii*), and *Stenanthium gramineum*.

**Global Vegetation:** This forest is dominated by *Quercus rubra* with other species making up less than 25% of the canopy cover. Other canopy and subcanopy trees may include *Acer pensylvanicum*, *Acer rubrum*, *Amelanchier laevis*, *Betula alleghaniensis*, *Betula lenta*, *Castanea dentata* (root sprouts), *Fagus grandifolia*, *Halesia tetraptera*, *Hamamelis virginiana*, *Ilex montana*, *Magnolia acuminata*, and, on more exposed sites, *Quercus montana* (= *Quercus prinus*). At higher elevations, this community may contain *Picea rubens*. The shrub layer may be continuous to patchy but has at least 20% cover and more than 50% of the total shrub cover is deciduous, although evergreen shrubs may be present. Typical shrub dominants include *Rhododendron calendulaceum*, *Vaccinium simulatum*, *Vaccinium erythrocarpum*, *Hamamelis virginiana*, *Ilex montana*, *Gaylussacia ursina*, *Rubus canadensis*, *Corylus cornuta*, and *Lyonia ligustrina*. In Virginia examples, *Vaccinium erythrocarpum* often occurs as a very low, clonal shrub, only a few inches tall. Other shrubs occur with lower frequency and may include *Kalmia latifolia*, *Rhododendron catawbiense*, and *Rhododendron maximum*. *Rubus allegheniensis* occurs in disturbed openings and in seeps. The herbaceous stratum is diverse and is predominantly a mix of sedges, ferns and tall herbs. Herbaceous dominance varies within and among occurrences. Typical herbaceous species include *Ageratina altissima* var. *roanensis*, *Athyrium filix-femina* ssp. *asplenioides*, *Clintonia umbellulata*, *Collinsonia canadensis*, *Conopholis americana*, *Dennstaedtia punctilobula*, *Dichantherium latifolium*, *Dioscorea quaternata*, *Eurybia divaricata* (= *Aster divaricatus*), *Houstonia purpurea*, *Laportea canadensis*, *Lysimachia quadrifolia*, *Medeola virginiana*, *Monarda fistulosa*, *Oclemena acuminata* (= *Aster acuminatus*), *Potentilla canadensis*, *Prenanthes roanensis*, *Smilax herbacea*, *Silene stellata*, *Solidago curtisii* (= *Solidago caesia* var. *curtisii*), and *Thelypteris noveboracensis*. Many species in this community are endemic to the Southern Blue Ridge or have the bulk of their worldwide range in that region. Some of these endemics include *Abies fraseri*, *Aesculus flava*, *Ageratina altissima* var. *roanensis*, *Carex roanensis*, *Clethra acuminata*, *Euphorbia purpurea*, *Eubotrys recurva* (= *Leucothoe recurva*), *Prenanthes roanensis*, *Rhododendron catawbiense*, *Rhododendron vaseyi*, *Silene ovata*, *Solidago curtisii*, and *Vaccinium erythrocarpum*.

**Global Dynamics:** The canopy is probably rarely removed completely by natural disturbance however, small canopy gaps are caused by individual tree death. Occurrences of this community on exposed slopes and south- and west-facing ridges are subject to lightning-caused fires and damage by ice and wind. Damage by icestorms is probably the most common form of natural disturbance.

*Quercus rubra* reproduction and survival are optimal in canopy gaps with little regeneration under the forest canopy, hence these forests will eventually succeed to forests with mixed canopy composition of *Quercus rubra*, *Betula alleghaniensis*, *Acer rubrum*, and *Fagus grandifolia*. Many *Quercus rubra*-dominated stands of today were, prior to the chestnut blight in the 1930s, dominated or codominated by *Castanea dentata* with scattered *Quercus rubra* and *Acer rubrum* in the canopy (Golden 1974). The fungus *Endothia*

*parasitica* eliminated *Castanea dentata* in the upper canopy, subsequently releasing the subcanopy *Quercus rubra*, which eventually resulted in a nearly pure upper canopy of large *Quercus rubra*.

#### MOST ABUNDANT SPECIES

##### Great Smoky Mountains National Park

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Broad-leaved deciduous tree	<i>Quercus rubra</i>
Tree subcanopy	Broad-leaved deciduous tree	<i>Acer rubrum</i> , <i>Amelanchier laevis</i>
Tall shrub/sapling	Broad-leaved deciduous tree	<i>Castanea dentata</i> , <i>Ilex montana</i>
Tall shrub/sapling	Broad-leaved deciduous shrub	<i>Rhododendron calendulaceum</i> , <i>Vaccinium corymbosum</i>
Herb (field)	Fern (Spore-bearing forb)	<i>Dennstaedtia punctilobula</i> , <i>Thelypteris noveboracensis</i>

##### Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Broad-leaved deciduous tree	<i>Quercus rubra</i>
Tree subcanopy	Broad-leaved deciduous tree	<i>Acer rubrum</i> , <i>Hamamelis virginiana</i> , <i>Ilex montana</i>
Tall shrub/sapling	Broad-leaved deciduous shrub	<i>Rhododendron calendulaceum</i> , <i>Vaccinium simulatum</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Rubus canadensis</i> , <i>Vaccinium erythrocarpum</i> , <i>Vaccinium pallidum</i>
Herb (field)	Flowering forb	<i>Ageratina altissima</i> var. <i>roanensis</i>
Herb (field)	Graminoid	<i>Carex pensylvanica</i>
Herb (field)	Fern (Spore-bearing forb)	<i>Dennstaedtia punctilobula</i> , <i>Thelypteris noveboracensis</i>

#### CHARACTERISTIC SPECIES

**Great Smoky Mountains National Park:** *Ageratina altissima* var. *roanensis*, *Carex pensylvanica*, *Dennstaedtia punctilobula*, *Hamamelis virginiana*, *Ilex montana*, *Quercus rubra*, *Rhododendron calendulaceum*, *Thelypteris noveboracensis*, *Vaccinium erythrocarpum*

**Global:** *Acer rubrum*, *Ageratina altissima* var. *roanensis*, *Carex pensylvanica*, *Dennstaedtia punctilobula*, *Hamamelis virginiana*, *Ilex montana*, *Quercus rubra*, *Rhododendron calendulaceum*, *Rubus canadensis*, *Thelypteris noveboracensis*, *Vaccinium erythrocarpum*, *Vaccinium pallidum*, *Vaccinium simulatum*

#### OTHER NOTEWORTHY SPECIES

**Great Smoky Mountains National Park: Vulnerable Plants:** *Ageratina altissima* var. *roanensis* (G5T3T4)

**Global: Vulnerable Plants:** *Abies fraseri* (G2, Southern Blue Ridge endemic), *Ageratina altissima* var. *roanensis* (G5T3T4, Southern Blue Ridge endemic), *Calystegia catesbeiana* (G3), *Carex roanensis* (G2G3, Southern Blue Ridge endemic), *Chelone cuthbertii* (G3, Southern Blue Ridge endemic), *Coreopsis latifolia* (G3), *Delphinium exaltatum* (G3), *Euphorbia purpurea* (G3, Southern Blue Ridge endemic), *Gentiana austromontana* (G3), *Helianthus glaucophyllus* (G3G4), *Hypericum mitchellianum* (G3), *Prenanthes roanensis* (G3, Southern Blue Ridge endemic), *Rhododendron vaseyi* (G3, NC/Southern Blue Ridge endemic), *Robinia viscosa* var. *hartwegii* (G3T2), *Silene ovata* (G3, Southern Blue Ridge endemic), *Stachys clingmanii* (G2), *Trillium simile* (G3); **Other Plants:** *Aesculus flava* (G5, Southern Blue Ridge endemic), *Botrychium lanceolatum* var. *angustisegmentum* (G5T4), *Calamagrostis porteri* (G4), *Clematis occidentalis* (G5), *Clethra acuminata* (G4, Southern Blue Ridge endemic), *Eubotrys recurva* (G4G5, Southern Blue Ridge endemic), *Helianthemum bicknellii* (G5), *Helianthemum propinquum* (G4), *Lonicera dioica* (G5), *Prunus virginiana* (G5), *Pyrola americana* (G5), *Rhododendron catawbiense* (G5, Southern Blue Ridge endemic), *Rhododendron prinophyllum* (G5), *Solidago curtisii* (GNR, Southern Blue Ridge endemic), *Streptopus lanceolatus* var. *roseus* (G5T4), *Vaccinium hirsutum* (G4)

#### CONSERVATION STATUS RANK

**Global Rank & Reasons:** G4 (31-Dec-1997). This community is uncommon but not rare. It is secure within its range.

#### RELATED CONCEPTS

##### Global Similar Types:

- *Quercus alba* / *Kalmia latifolia* Forest (CEGL007295)
- *Quercus rubra* - (*Quercus alba*) / *Ilex montana* / *Dennstaedtia punctilobula* - *Lysimachia quadrifolia* Forest (CEGL008506) is a Central Appalachian high-elevation red oak forest.
- *Quercus rubra* - *Acer rubrum* / *Pyrolaria pubera* / *Thelypteris noveboracensis* Forest (CEGL006192)
- *Quercus rubra* / (*Kalmia latifolia*, *Rhododendron catawbiense*, *Rhododendron maximum*) / *Galax urceolata* Forest (CEGL007299) has greater than 20% shrub cover but with more than 50% of the shrub cover composed of evergreen species.
- *Quercus rubra* / *Carex pensylvanica* - *Ageratina altissima* var. *roanensis* Forest (CEGL007298) has less than 20% shrub cover and an herb stratum dominated by ferns, tall forbs, and sedges.

##### Global Related Concepts:

- *Corylus cornuta* Phase (DeLapp 1978) ?
- *Quercus rubra* / *Vaccinium corymbosum* - *Vaccinium erythrocarpum* / *Dennstaedtia punctilobula* Forest [Southern Appalachian High Elevation Red Oak / Heath Forest] (Vanderhorst 2017d) =
- Deciduous Heath Phase (DeLapp 1978) ?
- High elevation red oak/blueberry-flame azalea forest (CAP pers. comm. 1998) ?

- IA4g. High Elevation Northern Red Oak Forest (Allard 1990) >
- Mixed Fern Phase (DeLapp 1978) >
- Northern Red Oak (55) (USFS 1988) ?
- Northern Red Oak: 55 (Eyre 1980) >
- Oligotrophic Forest (Rawinski 1992) >
- Red Oak - Chestnut Forest (Whittaker 1956) >
- Tall Herb Phase (DeLapp 1978) >

#### CLASSIFICATION

**Status:** Standard

**Classification Confidence:** 2 - Moderate

**Great Smoky Mountains National Park Other Comments:** Particularly along the Tennessee / North Carolina stateline on the Cades Cove quadrangle, *Quercus rubra* and *Quercus alba* dominance intergrades and may make delineation of this type difficult. Lower elevation occurrences (below 4500 feet elevation) begin to resemble Typic Acidic Montane Oak - Hickory Forest (*Quercus alba* - *Quercus (rubra, prinus) / Rhododendron calendulaceum* - *Kalmia latifolia* - (*Gaylussacia ursina*) Forest (CEGL007230)) in composition, with an increase in coverage of species such as *Acer rubrum*, *Quercus alba*, *Cornus florida*, *Magnolia fraseri*, *Oxydendrum arboreum*, *Robinia pseudoacacia*, *Carya* spp., *Gaylussacia ursina*, and *Vaccinium hirsutum*, and the presence of herbs more indicative of lower elevation forests. It is unlikely that the signature of this community can be distinguished from other forests in the *Quercus rubra* Montane Forest Alliance (A.272).

**Global Classification Comments:** This community includes forest vegetation with *Quercus rubra* making up at least 75% of the tree canopy and with greater than 20% shrub cover. More than 50% of the total shrub cover is deciduous, although evergreen shrubs may be present. Typical deciduous shrub species in this community include *Rhododendron calendulaceum*, *Vaccinium simulatum*, *Vaccinium erythrocarpum*, *Ilex montana*, *Gaylussacia ursina*, *Rubus canadensis*, *Corylus cornuta*, and *Lyonia ligustrina*. The most constant species ( $\geq 70\%$ ) in 43 plot samples classified as this association from North Carolina, Tennessee, and Virginia, in descending order of constancy, are *Quercus rubra*, *Acer rubrum*, *Castanea dentata*, *Acer pensylvanicum*, *Rhododendron calendulaceum*, *Thelypteris noveboracensis*, *Dioscorea quaternata*, *Medeola virginiana*, *Ilex montana*, and *Dennstaedtia punctilobula* (Fleming and Patterson 2009a).

Two varieties of *Quercus rubra* occur within the range of this community, *Quercus rubra* var. *ambigua* and *Quercus rubra* var. *rubra* (Kartesz 1999). Although the two varieties are known to occur together (Rohrer 1983), *Quercus rubra* var. *ambigua* occurs mostly at elevations greater than 1000 m (3300 feet), while *Quercus rubra* var. *rubra* occurs at elevations less than 1000 m (3300 feet) (Weakley 1997). The two varieties are based upon morphological differences in the leaves and acorns (Fernald 1950, Coker and Totten 1945); however, studies of foliar flavonoid composition in different *Quercus rubra* populations suggest that varietal distinction may not be warranted (McDougal and Parks 1984). Even though most studies of *Quercus rubra*-dominated vegetation do not distinguish *Quercus rubra* at the varietal level, it is likely, given the elevational range of this community, that the dominant species in this forest is *Quercus rubra* var. *ambigua*.

Similar vegetation may occur in the Cumberland Mountains (Black Mountain, Cumberland Mountain, Kentucky); for more information, see Braun (1950) and Black Mountain paper (Braun 1940). Kentucky occurrences lack *Gaylussacia ursina*, *Corylus cornuta*, *Prenanthes roanensis*, and occur at 1067 to 1160 m (3500-3800 feet) elevation (M. Evans pers. comm.).

In southern West Virginia, two plots from high elevations in Monroe County close to the Virginia border are classified to this association. These stands occur near the maximum elevations (1130-1190 m) on Peters and Fork mountains, and there is very little appropriate high-elevation habitat where this association might occur. *Vaccinium corymbosum* was identified in both of these plots, and *Vaccinium erythrocarpum* is unusually common in the vicinity, often occurring as a short shrub, perhaps due to deer herbivory.

#### ELEMENT DISTRIBUTION

**Great Smoky Mountains National Park Range:** This community was sampled on the Cades Cove and Bunches Bald quadrangles. On the Cades Cove quadrangle, recent and historic samples representing this community come from elevations ranging from just over 4000 feet to 5000 feet, in the southern portion of the quadrangle. This community was sampled from the summits and convex high slopes Gregory Ridge; the southwest slopes below Gregory Bald; the southeastern high slopes below Moore Spring Camp; the western summit of Pond Knob; and the convex west slopes of Mollies Ridge. In the Bunches Bald area, this community was sampled along Balsam Mountain Road from 3500 to 5000 feet in elevation.

**Global Range:** This community occurs on most of the major mountain ranges of the Southern Appalachians in North Carolina, Tennessee, Georgia, and Virginia. It occurs in a small area of high-elevation habitat in Monroe County, West Virginia, near the Virginia border. It may possibly range into Kentucky's Cumberland Mountains.

**Nations:** US

**States/Provinces:** GA, KY?, NC, TN, VA:S3, WV:S1

**TNC Ecoregions:** 50:C, 51:C, 59:C

**USFS Ecoregions (1994/95):** M221Aa:CCC, M221Ab:CCC, M221Ce:CCC, M221Dc:CCC, M221Dd:CCC

**USFS Ecoregions (2007):** M221Aa:CCP, M221Ab:CCC, M221Ce:CCP, M221Dc:CCC, M221Dd:CCC

**Federal Lands:** BIA (Eastern Band of Cherokee); NPS (Appalachian Trail [Central Appalachians], Appalachian Trail [Southern Blue Ridge], Blue Ridge Parkway, Great Smoky Mountains); USFS (Chattahoochee, Chattahoochee (Southern Blue Ridge), Cherokee, Jefferson, Nantahala, Pisgah)

## ELEMENT SOURCES

**Great Smoky Mountains National Park Plots:** GRSM.44, GRSM.55, GRSM.249, GRSM.262, GRSM.413, GRSM.414.

**Great Smoky Mountains National Park Description Author(s):** K.D. Patterson

**Global Description Author(s):** K.D. Patterson

**References:** Allard 1990, Braun 1940, Braun 1950, CAP pers. comm. 1998, Coker and Totten 1945, DeLapp 1978, Evans et al. 2009, Evans, M. pers. comm., Eyre 1980, Fernald 1950, Fleming and Coulling 2001, Fleming and Patterson 2009a, Fleming and Patterson 2009b, Fleming et al. 2017, Golden 1974, Kartesz 1999, McDougal and Parks 1984, NatureServe Ecology - Southeastern U.S. unpubl. data, Peet et al. unpubl. data, Rawinski 1992, Rohrer 1983, Schafale 2012, Schafale and Weakley 1990, Southeastern Ecology Working Group n.d., Stephenson and Adams 1989, TDNH unpubl. data 2018, USFS 1988, Vanderhorst 2017d, WVNHP unpubl. data, Weakley 1997, Whigham 1969, Whittaker 1956

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**[CEGL007298] *Quercus rubra* / *Carex pensylvanica* - *Ageratina altissima* var. *roanensis* Forest**

Translated Name: **Northern Red Oak / Pennsylvania Sedge - Appalachian White Snakeroot Forest**

Common Name: **High-Elevation Red Oak Forest (Tall Herb Type)**

## USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Northeastern Oak - Hardwood - Pine Forest & Woodland (M502)
Group	Southern Appalachian Oak / Chestnut Forest (G015)
Alliance	<i>Quercus rubra</i> - <i>Quercus alba</i> Montane Forest Alliance (A3116)

## ELEMENT CONCEPT

**Global Summary:** This community occurs on most of the major mountain ranges of the Southern Appalachians in North Carolina and Tennessee, at elevations over 1400 m (4500 feet) on broad ridges, and on steep rocky slopes at the heads of coves, often with northern or southeastern aspects. It includes forest vegetation with a closed to very open canopy, where *Quercus rubra* makes up at least 75% of the tree canopy and with less than 20% shrub cover. Canopy trees may be gnarled and stunted, especially on ridge crests. Other canopy species may include *Acer rubrum*, *Crataegus punctata*, *Crataegus flabellata*, *Betula alleghaniensis*, *Betula lenta*, and, at high elevations, *Picea rubens*. An open subcanopy contains canopy species plus *Hamamelis virginiana*, *Amelanchier arborea*, *Acer pensylvanicum*, *Halesia tetraptera*, and *Ilex montana*. Herbaceous cover is dense and diverse, composed of sedges, ferns, and tall herbs, with dominance varying within and between occurrences. Typical herbaceous dominants include *Carex pensylvanica*, *Ageratina altissima* var. *roanensis*, *Thelypteris noveboracensis*, *Dennstaedtia punctilobula*, *Eurybia chlorolepis*, *Oclemena acuminata*, and *Laportea canadensis*. This forest often occurs adjacent to or grades into forests dominated by *Picea rubens*, *Abies fraseri*, or northern hardwood species (*Betula alleghaniensis*, *Fagus grandifolia*, *Aesculus flava*). In some areas, this community is found adjacent to montane shrublands and grasslands. This community is often referred to as a "Subalpine Oak Orchard Forest."

## ENVIRONMENTAL DESCRIPTION

**Great Smoky Mountains National Park Environment:** This type was sampled on a steep, south-facing, high slope at an elevation of 4640 feet. The site showed evidence of Chestnut Blight.

**Global Environment:** This community occurs at elevations over 1400 m (4500 feet) on broad ridges and on steep rocky slopes at the heads of coves, often with north or southeast aspects. Occurrences of this community on exposed slopes and south- and west-facing ridges are subject to lightning-caused fires and damage by ice and wind. Damage by ice storms is probably the most common form of natural disturbance. This community occurs over well-drained, loamy soils underlain by Precambrian gneisses, schists, and granites. These soils are classified as Typic, Umbric, or Lithic Dystrochrepts, and Typic Haplumbrepts (Golden 1974). Soils supporting this community tend to have relatively high base status.

## VEGETATION DESCRIPTION

**Great Smoky Mountains National Park Vegetation:** The canopy of this short-statured forest is strongly dominated by *Quercus rubra*. Other trees that may form a minor portion of the canopy and subcanopy include *Acer rubrum*, *Halesia tetraptera* var. *monticola*, and *Prunus serotina*. The shrub stratum is open with scattered shrubs, mostly *Halesia tetraptera* var. *monticola* and *Ilex montana*. Other species in the shrub stratum include *Acer pensylvanicum*, *Acer saccharum*, *Kalmia latifolia*, *Magnolia fraseri*, *Prunus serotina*, *Rubus canadensis*, *Vaccinium corymbosum*, and *Vaccinium erythrocarpum*. The herbaceous stratum is strongly dominated by *Carex pensylvanica*, which forms a dense carpet. Other herbaceous species include *Angelica triquinata*, *Eurybia chlorolepis* (= *Aster chlorolepis*), *Clintonia umbellulata*, *Cuscuta rostrata*, *Dioscorea quaternata*, *Dryopteris intermedia*, *Gentianella quinquefolia* ssp. *quinquefolia*, *Lilium superbum*, *Maianthemum racemosum*, *Medeola virginiana*, *Mitchella repens*, *Prenanthes altissima*, *Smilax herbacea*, *Solidago curtisii* (= *Solidago caesia* var. *curtisii*), and *Thelypteris noveboracensis*.

**Global Vegetation:** This community includes forest vegetation, with a closed to very open canopy, where *Quercus rubra* makes up at least 75% of the tree canopy and with less than 20% shrub cover. Canopy trees may be gnarled and stunted, especially on ridge crests. Other canopy species may include *Acer rubrum*, *Crataegus punctata*, *Crataegus flabellata*, *Betula alleghaniensis*, *Betula lenta*, and, at high elevations, *Picea rubens*. An open subcanopy contains canopy species plus *Hamamelis virginiana*, *Amelanchier arborea*, *Acer pensylvanicum*, *Halesia tetraptera*, and *Ilex montana*. Herbaceous cover is dense and diverse, composed of sedges, ferns, and tall herbs, with dominance varying within and among occurrences. Typical herbaceous dominants include *Carex pensylvanica*, *Ageratina altissima* var. *roanensis*, *Thelypteris noveboracensis*, *Dennstaedtia punctilobula*, *Eurybia chlorolepis* (= *Aster chlorolepis*), *Oclemena*

*acuminata* (= *Aster acuminatus*), and *Laportea canadensis*. Many species in this community are endemic to the Southern Blue Ridge or have the bulk of their worldwide range in that region. Some of these endemics include *Abies fraseri*, *Aesculus flava*, *Ageratina altissima* var. *roanensis*, *Carex roanensis*, *Clethra acuminata*, *Euphorbia purpurea*, *Eubotrys recurva* (= *Leucothoe recurva*), *Prenanthes roanensis*, *Rhododendron catawbiense*, *Rhododendron vaseyi*, *Silene ovata*, *Solidago lancifolia*, and *Vaccinium erythrocarpum*.

**Global Dynamics:** The canopy is probably rarely removed completely by natural disturbance; however, small canopy gaps are caused by individual tree death. Occurrences of this community on exposed slopes and south- and west-facing ridges are subject to lightning-caused fires and damage by ice and wind. Damage by ice storms is probably the most common form of natural disturbance.

*Quercus rubra* reproduction and survival is optimal in canopy gaps with little regeneration under the forest canopy, hence these forests will eventually succeed to forests with mixed canopy composition of *Quercus rubra*, *Betula alleghaniensis*, *Acer rubrum*, and *Fagus grandifolia*. Many *Quercus rubra*-dominated stands of today were, prior to the chestnut blight in the 1930s, dominated or codominated by *Castanea dentata* with scattered *Quercus rubra* and *Acer rubrum* in the canopy (Golden 1974). The fungus *Endothia parasitica* eliminated *Castanea dentata* in the upper canopy, subsequently releasing the subcanopy *Quercus rubra*, which eventually resulted in a nearly pure upper canopy of large *Quercus rubra*.

#### MOST ABUNDANT SPECIES

##### Great Smoky Mountains National Park

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Broad-leaved deciduous tree	<i>Quercus rubra</i>
Tree subcanopy	Broad-leaved deciduous tree	<i>Acer rubrum</i>
Tall shrub/sapling	Broad-leaved deciduous tree	<i>Halesia tetraptera</i> var. <i>monticola</i> , <i>Ilex montana</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Rubus canadensis</i>
Herb (field)	Graminoid	<i>Carex pensylvanica</i>

##### Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Broad-leaved deciduous tree	<i>Quercus rubra</i>
Herb (field)	Flowering forb	<i>Ageratina altissima</i> var. <i>roanensis</i>
Herb (field)	Graminoid	<i>Carex pensylvanica</i>
Herb (field)	Fern (Spore-bearing forb)	<i>Dennstaedtia punctilobula</i> , <i>Thelypteris noveboracensis</i>

#### CHARACTERISTIC SPECIES

**Great Smoky Mountains National Park:** *Ageratina altissima* var. *roanensis*, *Carex pensylvanica*, *Quercus rubra*

**Global:** *Ageratina altissima* var. *roanensis*, *Carex pensylvanica*, *Dennstaedtia punctilobula*, *Quercus rubra*, *Thelypteris noveboracensis*

#### OTHER NOTEWORTHY SPECIES

**Great Smoky Mountains National Park: Vulnerable Plants:** *Ageratina altissima* var. *roanensis* (G5T3T4)

**Global: Vulnerable Plants:** *Abies fraseri* (G2, Southern Blue Ridge endemic), *Ageratina altissima* var. *roanensis* (G5T3T4, Southern Blue Ridge endemic), *Calystegia catesbeiana* (G3), *Carex roanensis* (G2G3, Southern Blue Ridge endemic), *Coreopsis latifolia* (G3), *Euphorbia purpurea* (G3, Southern Blue Ridge endemic), *Gentiana austromontana* (G3), *Prenanthes roanensis* (G3, Southern Blue Ridge endemic), *Rhododendron vaseyi* (G3, NC/Southern Blue Ridge endemic), *Silene ovata* (G3, Southern Blue Ridge endemic);

**Other Plants:** *Aesculus flava* (G5, Southern Blue Ridge endemic), *Botrychium lanceolatum* var. *angustisegmentum* (G5T4), *Calamagrostis porteri* (G4), *Clematis occidentalis* (G5), *Clethra acuminata* (G4, Southern Blue Ridge endemic), *Eubotrys recurva* (G4G5, Southern Blue Ridge endemic), *Helianthemum bicknellii* (G5), *Helianthemum propinquum* (G4), *Lonicera dioica* (G5), *Prunus virginiana* (G5), *Pyrola americana* (G5), *Rhododendron catawbiense* (G5, Southern Blue Ridge endemic), *Rhododendron prinophyllum* (G5), *Solidago curtisii* (GNR, Southern Blue Ridge endemic), *Streptopus lanceolatus* var. *roseus* (G5T4), *Vaccinium erythrocarpum* (G5, Southern Blue Ridge endemic)

#### CONSERVATION STATUS RANK

**Global Rank & Reasons:** G2 (30-Apr-1998). This community is relatively secure within its range, but has a naturally restricted habitat. Red oak decline is affecting occurrences of this community; fire may be needed for stand establishment.

#### RELATED CONCEPTS

##### Global Similar Types:

- *Crataegus punctata* - *Crataegus flabellata* Ruderal Forest (CEGL004184)
- *Quercus rubra* / (*Kalmia latifolia*, *Rhododendron catawbiense*, *Rhododendron maximum*) / *Galax urceolata* Forest (CEGL007299) has greater than 20% shrub cover but with more than 50% of the shrub cover composed of evergreen species.
- *Quercus rubra* / (*Vaccinium simulatum*, *Rhododendron calendulaceum*) / (*Dennstaedtia punctilobula*, *Thelypteris noveboracensis*) Forest (CEGL007300) has greater than 20% shrub cover but with more than 50% of the shrub cover composed of deciduous species.

##### Global Related Concepts:

- High elevation red oak/Pennsylvania sedge forest (CAP pers. comm. 1998) ?

- IA4g. High Elevation Northern Red Oak Forest (Allard 1990) >
- Mixed Fern Phase, Tall Herb Phase (DeLapp 1978) >
- Northern Red Oak (55) (USFS 1988) ?
- Northern Red Oak: 55 (Eyre 1980) >

#### CLASSIFICATION

**Status:** Standard

**Classification Confidence:** 2 - Moderate

**Great Smoky Mountains National Park Other Comments:** While one of the samples of this community seems to represent the assigned association, the vegetation on some of the overall ridgelines may be more appropriately mapped as *Quercus rubra* / (*Vaccinium simulatum*, *Rhododendron calendulaceum*) / (*Dennstaedtia punctilobula*, *Thelypteris noveboracensis*) Forest (CEGL007300) or even as *Quercus rubra* Montane Forest Alliance (A.272), as it is unlikely that the various associations in this alliance will have distinguishable signatures.

**Global Classification Comments:** This community includes forest vegetation with *Quercus rubra* making up at least 75% of the tree canopy and with less than 20% shrub cover. Herbaceous stratum dominance varies within and among occurrences but is composed of sedges, ferns and tall herbs. Typical herbaceous dominants include *Carex pensylvanica*, *Ageratina altissima* var. *roanensis*, *Thelypteris noveboracensis*, *Dennstaedtia punctilobula*, *Eurybia chlorolepis*, *Oclemena acuminata*, and *Laportea canadensis*. In three plots classified as this association in the Appalachian Trail classification project, herbs present in all samples are *Angelica triquinata*, *Carex pensylvanica*, *Clintonia umbellulata*, *Smilax herbacea*, *Solidago curtisii*, and *Thelypteris noveboracensis*. Woody species with 100% constancy are *Acer rubrum*, *Acer pensylvanicum*, *Ilex montana*, *Prunus serotina* var. *serotina*, and *Quercus rubra* (Fleming and Patterson 2009a).

Two varieties of *Quercus rubra* occur within the range of this community, *Quercus rubra* var. *ambigua* and *Quercus rubra* var. *rubra* (Kartesz 1999). Although the two varieties are known to occur together (Rohrer 1983), *Quercus rubra* var. *ambigua* occurs mostly at elevations greater than 1000 m (3300 feet), while *Quercus rubra* var. *rubra* occurs at elevations less than 1000 m (3300 feet) (Weakley 1997). The two varieties are based upon morphological differences in the leaves and acorns (Fernald 1950, Coker and Totten 1945); however, studies of foliar flavonoid composition in different *Quercus rubra* populations suggest that varietal distinction may not be warranted (McDougal and Parks 1984). Even though most studies of *Quercus rubra*-dominated vegetation do not distinguish *Quercus rubra* at the varietal level, it is likely, given the elevational range of this community, that the dominant species in this forest is *Quercus rubra* var. *ambigua*.

#### ELEMENT DISTRIBUTION

**Great Smoky Mountains National Park Range:** This community was sampled from two locations, one in the southwestern portion of the Mount Le Conte quadrangle, on the western ridge of Balsam Point (4640 feet elevation) and the other just off of Balsam Mountain Road on the North Carolina side of the park. The community most likely occurs in other areas of the park at the appropriate elevation range.

**Global Range:** This community occurs on most of the major mountain ranges of the Southern Appalachians in North Carolina and Tennessee.

**Nations:** US

**States/Provinces:** NC, TN

**TNC Ecoregions:** 50:P, 51:C, 59:?

**USFS Ecoregions (1994/95):** M221Dc:CCC, M221Dd:CCC

**USFS Ecoregions (2007):** M221Dc:CCC, M221Dd:CCC

**Federal Lands:** BIA (Eastern Band of Cherokee); NPS (Appalachian Trail [Southern Blue Ridge], Blue Ridge Parkway, Great Smoky Mountains); USFS (Cherokee, Nantahala, Pisgah)

#### ELEMENT SOURCES

**Great Smoky Mountains National Park Plots:** GRSM.137.

**Great Smoky Mountains National Park Description Author(s):** K.D. Patterson

**Global Description Author(s):** K.D. Patterson

**References:** Allard 1990, CAP pers. comm. 1998, Coker and Totten 1945, DeLapp 1978, Eyre 1980, Fernald 1950, Fleming and Patterson 2009a, Golden 1974, Kartesz 1999, McDougal and Parks 1984, NatureServe Ecology - Southeastern U.S. unpubl. data, Peet et al. unpubl. data, Rohrer 1983, Schafale 2012, Schafale and Weakley 1990, Southeastern Ecology Working Group n.d., TDNH unpubl. data 2018, USFS 1988, Weakley 1980, Weakley 1997, Whittaker 1956

### G162. VIRGINIA PINE - TABLE MOUNTAIN PINE WOODLAND & BARRENS

**Group Summary Description:** Vegetation of this group encompasses predominantly evergreen woodlands and forests occupying very exposed, convex, often rocky south- and west-facing slopes, ridge spurs, crests, and clifftops in the Central Appalachians, Southern Ridge and Valley and Southern Blue Ridge, as well as distinctive shale barrens of low to mid elevations in the Central and Southern Appalachians. They typically occur at moderate to upper elevations (450-1200 m [1500-4000 feet]), with the more southerly examples at the higher elevations. In the Southern Blue Ridge, this group is best developed above 700 m (2300 feet) in elevation, but some examples may be found at lower elevations. The underlying rock is acidic and sedimentary or metasedimentary (e.g., quartzites, sandstones and shales). The soils are very infertile, shallow and droughty. A thick, poorly decomposed duff layer, along with dead

wood and highly volatile ericaceous shrubs, creates a strongly fire-prone habitat. Most examples are dominated by *Pinus pungens*, often with *Pinus rigida* and/or *Pinus virginiana*, and occasionally *Tsuga caroliniana*. The canopy is usually patchy to open, but areas of closed canopy may be present, especially where *Tsuga caroliniana* is prominent, or where fire has been absent. The shrub layer may be well-developed, with *Gaylussacia baccata*, *Vaccinium pallidum*, or other acid-tolerant species most characteristic. Herbs are usually sparse but may include *Pityopsis graminifolia* and *Tephrosia virginiana*. Fire is a very important ecological process in this group. Frequent, low-intensity fires coupled with periodic severe fires is one factor that determines the occurrence of this vegetation rather than hardwood forests under natural conditions. The pines may be able to maintain dominance due to edaphic conditions, such as very shallow soil or extreme exposure in some areas, which can produce sustained drought conditions, but most sites appear eventually to succeed to oak dominance in the absence of fire. Fire is also presumably a strong influence on vegetation structure, producing a more open woodland canopy structure and more herbaceous ground cover.

In floristically distinctive shale barrens examples, the exposed aspects, parent material with high levels of toxic metals, and lack of soil create extreme conditions for plant growth. Vegetation is mostly of a woodland physiognomy, but may include large open areas of sparse vegetation. The dominant trees are primarily *Quercus montana* and *Pinus virginiana*. On higher-pH shale barrens, which are less common, the primary trees include *Juniperus virginiana* and *Fraxinus americana*, but these are placed in a different group. Shale barrens endemics are diagnostic in the herb layer. The substrate includes areas of solid rock as well as unstable areas of shale scree, usually steeply sloped. The fully exposed areas are extremely dry. These barrens are high in endemic species.

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## A0677 *Pinus pungens* - *Pinus rigida* - *Quercus montana* Woodland Alliance

Table Mountain Pine - Pitch Pine - Chestnut Oak Woodland Alliance

*Appalachian Table Mountain Pine - Pitch Pine - Chestnut Oak Woodland*

### ALLIANCE CONCEPT

**Summary:** This alliance encompasses woodlands dominated by some combination of *Pinus pungens*, *Pinus rigida*, and *Pinus virginiana*, often with *Quercus montana*. Common canopy and subcanopy associates include *Acer rubrum*, *Castanea dentata*, *Nyssa sylvatica*, *Oxydendrum arboreum*, and *Quercus coccinea*. Typical shrubs include *Fothergilla major*, *Gaylussacia baccata*, *Gaylussacia ursina*, *Kalmia latifolia*, *Leiophyllum buxifolium*, *Eubotrys recurva*, *Quercus ilicifolia*, *Rhododendron catawbiense*, *Rhododendron carolinianum*, *Rhododendron maximum*, *Vaccinium angustifolium*, *Vaccinium corymbosum*, *Vaccinium pallidum*, *Vaccinium simulatum*, and *Vaccinium stamineum*. Understory species composition will vary within the range of this alliance, but commonly found forb and subshrub species in this usually sparse stratum include *Carex pensylvanica*, *Comptonia peregrina*, *Epigaea repens*, *Galax urceolata*, *Gaultheria procumbens*, *Pteridium aquilinum* var. *latiusculum*, and *Xerophyllum asphodeloides*. These woodlands may be found from Pennsylvania, Maryland and West Virginia south and west to Tennessee, Georgia, and South Carolina in the Central and Southern Appalachians, Ridge and Valley, and southern Piedmont. This vegetation tends to occur under extreme conditions, including rock outcrops, summits, and exposed slopes, including steep, shaley slopes that maintain the open structure of the vegetation. Fire plays a role in the maintenance of the structure and composition of this vegetation, and without periodic fire, these woodlands may gradually transition into forests dominated by *Quercus montana* and *Quercus coccinea*, except on the most extreme sites, where this vegetation is more self-perpetuating.

**Classification Comments:** Associations in this alliance generally have a woodland structure (open canopy), although locally vegetation may vary to a denser canopy, particularly in the absence of fire.

### Similar Alliances:

- *Pinus rigida* - *Pinus virginiana* - *Quercus marilandica* Serpentine Woodland Alliance (A3311) occurs on serpentine with *Quercus marilandica*.
- *Pinus virginiana* - *Quercus montana* Acidic Shale Woodland Alliance (A3312) occurs on shale substrates.

**Diagnostic Characteristics:** There are several alliances with *Pinus rigida* as a characteristic tree. This is the most general one, and *Quercus montana* is somewhat diagnostic. It occurs on "ordinary" felsic substrates; stands on serpentinite-derived soils and shaley substrates are accommodated elsewhere.

### Related Concepts:

- Appalachian Sand Barrens (Smith 1991) ><
- IA7b. Xeric Pitch Pine/Table Mountain Pine Ridge Forest (Allard 1990) ><
- Pitch Pine: 45 (Eyre 1980) ><

### ALLIANCE DESCRIPTION

**Environment:** These woodlands typically occur at elevations from 488 to 1555 m (1600-5100 feet), on summits, exposed slopes, xeric ridges and exposed, steep sideslopes over thin, excessively drained, nutrient-poor soils and are often associated with rock outcroppings. Fire plays an important role in maintaining the structure and composition of these woodland communities, but on the most extreme sites, such as steep, shaley slopes, clifftops, and quartzite ledges, these communities are maintained by topo-edaphic conditions.

**Vegetation:** Examples are dominated by some combination of *Pinus pungens*, *Pinus rigida*, and *Pinus virginiana*, often with *Quercus montana* (= *Quercus prinus*) and/or *Quercus rubra*. Common canopy and subcanopy associates include *Acer rubrum*, *Amelanchier arborea*, *Castanea dentata*, *Nyssa sylvatica*, *Oxydendrum arboreum*, *Quercus coccinea*, *Quercus marilandica*, and *Sassafras albidum*. Typical shrubs include *Fothergilla major*, *Gaylussacia baccata*, *Gaylussacia ursina*, *Kalmia latifolia*, *Leiophyllum buxifolium*,

*Eubotrys recurva* (= *Leucothoe recurva*), *Pieris floribunda*, *Quercus ilicifolia*, *Rhododendron catawbiense*, *Rhododendron carolinianum*, *Rhododendron maximum*, *Vaccinium angustifolium*, *Vaccinium corymbosum*, *Vaccinium pallidum*, *Vaccinium simulatum*, and *Vaccinium stamineum*. *Smilax rotundifolia* and *Smilax glauca* may be prominent climbers among the shrubs. Understory species composition will vary within the range of this alliance, but commonly found forb and subshrub species in this usually sparse stratum include *Carex pensylvanica*, *Comptonia peregrina*, *Epigaea repens*, *Galax urceolata*, *Gaultheria procumbens*, *Pteridium aquilinum* var. *latiusculum*, and *Xerophyllum asphodeloides*. In the absence of fire, the canopies of examples may become dominated at first by *Quercus coccinea*, *Quercus montana*, and/or *Quercus rubra*, and ultimately by *Acer rubrum*, *Nyssa sylvatica*, and *Pinus strobus*.

**Floristics:** Examples are dominated by some combination of *Pinus pungens*, *Pinus rigida*, and *Pinus virginiana*, often with *Quercus montana* (= *Quercus prinus*) and/or *Quercus rubra*. Common canopy and subcanopy associates include *Acer rubrum*, *Amelanchier arborea*, *Castanea dentata*, *Nyssa sylvatica*, *Oxydendrum arboreum*, *Quercus coccinea*, *Quercus marilandica*, and *Sassafras albidum*. Typical shrubs include *Fothergilla major*, *Gaylussacia baccata*, *Gaylussacia ursina*, *Kalmia latifolia*, *Leiophyllum buxifolium*, *Eubotrys recurva* (= *Leucothoe recurva*), *Pieris floribunda*, *Quercus ilicifolia*, *Rhododendron catawbiense*, *Rhododendron carolinianum*, *Rhododendron maximum*, *Vaccinium angustifolium*, *Vaccinium corymbosum*, *Vaccinium pallidum*, *Vaccinium simulatum*, and *Vaccinium stamineum*. *Smilax rotundifolia* and *Smilax glauca* may be prominent climbers among the shrubs. Understory species composition will vary within the range of this alliance, but commonly found forb and subshrub species in this usually sparse stratum include *Carex pensylvanica*, *Comptonia peregrina*, *Epigaea repens*, *Galax urceolata*, *Gaultheria procumbens*, *Pteridium aquilinum* var. *latiusculum*, and *Xerophyllum asphodeloides*. In the absence of fire, the canopies of examples may become dominated at first by *Quercus coccinea*, *Quercus montana*, and/or *Quercus rubra*, and ultimately by *Acer rubrum*, *Nyssa sylvatica*, and *Pinus strobus*.

**Dynamics:** Periodic fire is an important ecological process that provides opportunities for the regeneration of both canopy pines and less competitive herbaceous species, while setting back successional encroachment of xeric oaks. On many sites (e.g., steep, shaley slopes, clifftops, quartzite ledges), the vegetation is self-perpetuating due to extreme edaphic conditions. Under circumstances of fire exclusion, canopy closure can approach forest physiognomy in some situations, with stands first becoming dominated by *Quercus coccinea*, *Quercus montana*, and/or *Quercus rubra*, and ultimately by *Acer rubrum*, *Nyssa sylvatica*, and *Pinus strobus*. Much of this vegetation has been devastated in the 1990s by infestations of southern pine beetle (*Dendroctonus frontalis*). These outbreaks have resulted in extensive mortality of the dominant pines and an at least temporary change to a shrubland condition.

#### ALLIANCE DISTRIBUTION

**Range:** This alliance is found from Pennsylvania, Maryland and West Virginia south and west to Tennessee, Georgia, and South Carolina in the Central and Southern Appalachians, Ridge and Valley, and southern Piedmont.

**Nations:** US

**Subnations:** GA, KY, MD, NC, PA, SC, TN, VA, WV

**TNC Ecoregions:** 44:P, 50:C, 51:C, 52:C, 59:C, 61:C

**USFS Ecoregions (1994/95):** 221Jb:PPP, 231Aa:CC?, 231Ak:CCC, 231Al:CCC, M221Aa:CCC, M221Ab:CCC, M221Ba:CCP, M221Bb:CCC, M221Bd:CCC, M221Be:CCC, M221Ce:CCC, M221Da:CCC, M221Db:CCC, M221Dc:CCC, M221Dd:CCC

**USFS Ecoregions (2007):** 221De:CCC, 221Jb:CPP, 231Aa:CC?, 231Ib:CCC, M221Aa:CCP, M221Ab:CCC, M221Ba:CCP, M221Bb:CCC, M221Bd:CCC, M221Be:CCC, M221Ce:CPP, M221Da:CCC, M221Db:CCC, M221Dc:CCC, M221Dd:CCC

**Federal Lands:** NPS (Appalachian Trail, Blue Ridge Parkway, Bluestone, C&O Canal, Catoctin Mountain, Great Smoky Mountains?, Harpers Ferry, Little River Canyon?, Shenandoah); USFS (Cherokee, Daniel Boone?, George Washington, Jefferson, Monongahela, Pisgah)

#### ALLIANCE SOURCES

**References:** Allard 1990, Barden 1977, Eastern Ecology Working Group n.d., Edwards et al. 2013, Eyre 1980, Faber-Langendoen et al. 2019b, Fike 1999, Golden 1981, McLeod 1988, Nelson 1986, Newell and Peet 1995, Pittman pers. comm., Racine 1966, Rawinski et al. 1996, Schafale and Weakley 1990, Smith 1991, Southeastern Ecology Working Group n.d., Sutherland et al. 1993, Thomas 1966, Turrill and Buckner 1995, Wharton 1978, Whittaker 1956, Williams 1991, Williams and Johnson 1990, Williams and Johnson 1992, Williams et al. 1990a, Zimmerman et al. 2012, Zobel 1969

**Author of Concept:** Faber-Langendoen et al. 2019b

**Author of Description:** D.J. Allard and J. Teague, in Faber-Langendoen et al. (2013)

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[CEGL007097] *Pinus pungens* - *Pinus rigida* - (*Quercus montana*) / *Kalmia latifolia* - *Vaccinium pallidum*

#### Woodland

Translated Name: Table Mountain Pine - Pitch Pine - (Chestnut Oak) / Mountain Laurel - Blue Ridge Blueberry

#### Woodland

Common Name: Blue Ridge Table Mountain Pine - Pitch Pine Woodland (Typic Type)

#### USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Northeastern Oak - Hardwood - Pine Forest & Woodland (M502)
Group	Virginia Pine - Table Mountain Pine Woodland & Barrens (G162)

Alliance *Pinus pungens* - *Pinus rigida* - *Quercus montana* Woodland Alliance (A0677)

## ELEMENT CONCEPT

**Global Summary:** This association includes mostly evergreen woodlands dominated by *Pinus pungens* and/or *Pinus rigida*, occurring over a dense ericaceous shrub stratum, on sharp ridges, mostly above 610 m (2000 feet) elevation in the Southern Blue Ridge. This type is also found in limited areas of the inner Piedmont and Cumberland Mountains. This woodland occurs across a wide elevational range (485-1220 m [1600-4000 feet]), on exposed ridges and upper slopes with southerly and westerly exposures, over thin, excessively drained, nutrient-poor soils, and can be associated with rock outcroppings. Canopy coverage can often approach that of a forest, especially in areas where fire has been excluded and deciduous species have significant coverage. Deciduous species that can be important, particularly in the subcanopy, include *Quercus montana*, *Quercus coccinea*, *Quercus stellata*, *Nyssa sylvatica*, *Acer rubrum*, and *Oxydendrum arboreum*. *Pinus virginiana*, *Pinus echinata*, and *Pinus strobus* can have high coverage and even codominate on some sites. The shrub stratum is dominated by ericaceous species, typically *Kalmia latifolia* and *Eubotrys recurva* in the tall-shrub stratum and *Vaccinium pallidum* as a low shrub. Other shrub species vary with location but include *Vaccinium stamineum*, *Vaccinium simulatum*, *Vaccinium pallidum*, *Vaccinium hirsutum*, *Vaccinium corymbosum*, *Rhododendron maximum*, *Rhododendron minus*, *Gaylussacia ursina*, *Gaylussacia baccata*, *Buckleya distichophylla*, *Pyrularia pubera*, and *Fothergilla major*. Species commonly found in the sparse herb stratum include *Chimaphila maculata*, *Galax urceolata*, *Pteridium aquilinum* var. *latiusculum*, *Xerophyllum asphodeloides*, *Chamaelirium luteum*, *Comptonia peregrina*, *Leiophyllum buxifolium*, *Gaultheria procumbens*, *Iris verna*, *Dichantherium* spp., and *Epigaea repens*, although herbaceous species composition will vary within the range of this community. *Smilax glauca* is a common vine. Without periodic fire, this community will gradually succeed into forests dominated by *Acer rubrum* or *Quercus montana* and *Quercus coccinea*, except on the most extreme sites, where this vegetation is self-perpetuating. It is thought that woodlands dominated by *Pinus pungens* are associated with more xeric conditions than woodlands dominated by *Pinus pungens* in combination with other tree species.

## ENVIRONMENTAL DESCRIPTION

**Great Smoky Mountains National Park Environment:** This community is found on the Cades Cove quadrangle at elevations from 2300-3800 feet, on exposed ridgetops and on middle to upper slopes with west to southeast aspects. On the Mount Le Conte quadrangle it is found on similar sites, with south and southwest aspects, but reaches elevations over 4000 feet and as low as 1850 feet. Landforms are steep, flat to convex slopes and ridges. Soils are thin, rocky or sandy, and litter layers are thick. Almost all stands sampled showed evidence of Southern Pine Beetle (*Dendroctonus frontalis*) with dead or dying *Pinus pungens*. It is found in other quadrangles (especially Calderwood), but additional samples were not needed elsewhere.

**Global Environment:** This association is typically found on sharp ridges mostly above 610 m (2000 feet) elevation in the Southern Blue Ridge. This woodland occurs across a wide elevation range from 488 to 1220 m (1600-4000 feet) in the Southern Appalachians, on exposed ridges and upper slopes with southerly and westerly exposures, over thin, excessively drained, nutrient-poor soils, and can be associated with rock outcroppings. It is thought that woodlands dominated by *Pinus pungens* are associated with more xeric conditions than woodlands dominated by *Pinus pungens* in combination with other tree species (Zobel 1969, Barden 1977).

## VEGETATION DESCRIPTION

**Great Smoky Mountains National Park Vegetation:** This community has a woodland to forest canopy dominated by *Pinus pungens* and/or *Pinus rigida*, which often overtop all other trees species. The canopy can include many standing dead and dying *Pinus* species. Some occurrences may have significant canopy coverage by *Quercus prinus* or *Quercus coccinea*. A tree subcanopy may be absent or well-developed, with as much as 80% coverage and composed of small-diameter trees, typically *Acer rubrum*, *Oxydendrum arboreum*, and *Nyssa sylvatica*. Other tree species that can occur in the canopy and subcanopy include *Amelanchier laevis*, *Castanea dentata*, *Magnolia fraseri*, *Pinus virginiana*, *Quercus rubra*, *Robinia pseudoacacia*, *Carya alba*, *Pinus strobus*, and *Tsuga canadensis*. A tall-shrub stratum varies from sparse and patchy to dense and continuous, often dominated by *Kalmia latifolia* and/or *Vaccinium stamineum*. Occurrences at high elevations (over 4000 feet) have *Pteris floribunda* as a dominant shrub. The short-shrub stratum ranges in coverage from 0-80% and is often dominated by *Gaylussacia ursina*. Other shrubs that may dominate this stratum include *Vaccinium hirsutum*, *Vaccinium pallidum*, and *Gaylussacia baccata*. Additional shrub species that are found in this community include species from the canopy and subcanopy, as well as *Acer pensylvanicum*, *Ilex montana*, *Pyrularia pubera*, *Quercus velutina*, *Rhododendron carolinianum*, *Rhododendron calendulaceum*, *Rhododendron maximum*, and *Sassafras albidum*. The herbaceous stratum can be sparse to moderate in coverage and is composed of various sub-shrubs and dry site forbs. *Epigaea repens*, *Galax urceolata*, and *Gaultheria procumbens* typically have the most coverage. Other species in the herbaceous stratum can include *Chimaphila maculata*, *Cleistes divaricata*, *Coreopsis major*, *Cypripedium acaule*, *Dichantherium commutatum*, *Goodyera pubescens*, *Melampyrum lineare*, *Pteridium aquilinum*, *Schizachyrium scoparium*, and *Tephrosia virginiana*. The litter layer is thick and often makes up greater than 50% of the ground cover. *Smilax rotundifolia* is a common vine.

**Global Vegetation:** These mostly evergreen woodlands are characteristically dominated by *Pinus pungens* and/or *Pinus rigida*, occurring over a dense ericaceous shrub stratum. Deciduous species that can be important, particularly in the subcanopy, include *Quercus montana* (= *Quercus prinus*), *Quercus coccinea*, *Quercus stellata* (in lower elevation occurrences), *Nyssa sylvatica*, *Acer rubrum*, and *Oxydendrum arboreum*. *Pinus virginiana*, *Pinus echinata*, and *Pinus strobus* can have high coverage and even codominate on some sites. The shrub stratum is dominated by ericaceous species, typically *Kalmia latifolia* and *Eubotrys recurva* (= *Leucothoe recurva*) in the tall-shrub stratum and *Vaccinium pallidum* as a low shrub. Other shrub species vary with location, but include *Vaccinium stamineum*, *Vaccinium simulatum*, *Vaccinium pallidum*, *Vaccinium hirsutum*, *Vaccinium corymbosum*, *Rhododendron maximum*, *Rhododendron minus*, *Gaylussacia ursina*, *Gaylussacia baccata*, *Buckleya distichophylla*, *Pyrularia*

*pubera*, *Castanea dentata*, *Castanea pumila*, and *Fothergilla major*. Species commonly found in the sparse herb stratum include *Chimaphila maculata*, *Galax urceolata*, *Pteridium aquilinum* var. *latiusculum*, *Xerophyllum asphodeloides*, *Chamaelirium luteum*, *Comptonia peregrina*, *Leiophyllum buxifolium*, *Gaultheria procumbens*, *Iris verna*, *Melampyrum lineare*, *Dichantherium* spp., and *Epigaea repens*, although herbaceous species composition will vary within the range of this community. *Smilax glauca* is a common vine. Species in this community which have the bulk of their worldwide range in the Southern Blue Ridge include *Leiophyllum buxifolium*, *Pieris floribunda*, *Pinus pungens*, and *Xerophyllum asphodeloides*. Other rare species include *Fothergilla major*, *Robinia hispida* var. *fertilis*, *Robinia hispida* var. *rosea*, and *Robinia viscosa* var. *viscosa*.

**Global Dynamics:** Fire contributes to the maintenance of this community by destroying the litter layer, opening the canopy, releasing seed from the serotinous cones, and killing competing vegetation. Red squirrels are known to cut branches to remove the *Pinus pungens* cones. It is thought this "squirrel grazing" may decrease the growth and vigor of trees (Zobel 1969). Canopy removal by icestorms stimulate oak sprouting and release advanced regeneration (Williams and Johnson 1992). Canopy coverage in stands of this association can often approach that of a forest, especially in areas where fire has been excluded and deciduous species have significant coverage. Without periodic fire, this community will gradually succeed into forests dominated by *Quercus montana* and *Quercus coccinea*, except on the most extreme sites, where this vegetation is self-perpetuating (Newell and Peet 1994). However, recent regional pine beetle kills throughout large areas of the Southeast have accelerated the rate of succession in most of these stands. This acceleration of succession may lead to conversion of these forests to hardwoods in the long term (M. Jenkins pers. comm.).

#### MOST ABUNDANT SPECIES

##### Great Smoky Mountains National Park

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Pinus pungens</i> , <i>Pinus rigida</i>
Tree subcanopy	Broad-leaved deciduous tree	<i>Acer rubrum</i> , <i>Nyssa sylvatica</i>
Shrub/sapling (tall & short)	Liana	<i>Smilax rotundifolia</i>
Tall shrub/sapling	Broad-leaved evergreen shrub	<i>Kalmia latifolia</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Gaylussacia ursina</i> , <i>Vaccinium pallidum</i>
Herb (field)	Dwarf-shrub	<i>Epigaea repens</i> , <i>Galax urceolata</i> , <i>Gaultheria procumbens</i>

##### Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Pinus pungens</i> , <i>Pinus rigida</i>
Tree subcanopy	Broad-leaved deciduous tree	<i>Acer rubrum</i> , <i>Nyssa sylvatica</i> , <i>Oxydendrum arboreum</i> , <i>Quercus montana</i>
Tall shrub/sapling	Broad-leaved evergreen shrub	<i>Kalmia latifolia</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Vaccinium pallidum</i>
Herb (field)	Flowering forb	<i>Galax urceolata</i>

#### CHARACTERISTIC SPECIES

**Great Smoky Mountains National Park:** *Epigaea repens*, *Galax urceolata*, *Gaultheria procumbens*, *Gaylussacia ursina*, *Kalmia latifolia*, *Melampyrum lineare*, *Pinus pungens*, *Pinus rigida*, *Pteridium aquilinum*

**Global:** *Comptonia peregrina*, *Epigaea repens*, *Fothergilla major*, *Galax urceolata*, *Gaultheria procumbens*, *Leiophyllum buxifolium*, *Pinus pungens*, *Xerophyllum asphodeloides*

#### OTHER NOTEWORTHY SPECIES

**Great Smoky Mountains National Park: Vulnerable Plants:** *Vaccinium hirsutum* (G4, globally vulnerable)

**Global: Vulnerable Plants:** *Buckleya distichophylla* (G3), *Fothergilla major* (G3, Southern Appalachian endemic), *Robinia hispida* var. *fertilis* (G4T1Q), *Robinia hispida* var. *kelseyi* (G4T1), *Robinia hispida* var. *rosea* (G4T3?), *Robinia viscosa* var. *viscosa* (G3T3), *Tsuga caroliniana* (G2G3); **Other Plants:** *Canoparmelia caroliniana* (G3G5), *Pieris floribunda* (G4, Southern Blue Ridge endemic), *Vaccinium hirsutum* (G4)

#### CONSERVATION STATUS RANK

**Global Rank & Reasons:** G3 (30-Apr-1998). This community is endemic to the southern Appalachian Mountains where it is maintained by periodic fire or extreme site conditions. Recent studies show that acreage of this community has decreased due to fire suppression (Turrill and Buckner 1995) and that many remaining examples have substantial hardwood invasion. Lightning-set and high-intensity controlled burns are necessary to maintain and re-establish this community type. In addition, recent pine beetle outbreaks have killed off large areas of this community type in the past five years (1998-2003) in the Southeast. Due to this, the global rank may soon need to be adjusted to G2.

#### RELATED CONCEPTS

##### Global Similar Types:

- *Pinus (pungens, rigida)* - *Quercus montana* / (*Quercus ilicifolia*) / *Gaylussacia baccata* Woodland (CEGL004996) is more northern and with *Quercus ilicifolia*.
- *Pinus rigida* - (*Pinus pungens*) / *Rhododendron catawbiense* - *Kalmia latifolia* / *Galax urceolata* Woodland (CEGL004985) occurs at higher elevations (1220-1555 m [4000-5100 feet) and usually includes *Rhododendron catawbiense*.

- *Pinus rigida* - *Quercus montana* / *Gaylussacia baccata* / *Carex pensylvanica* Woodland (CEGL004821)
- *Pinus virginiana* - *Pinus (rigida, echinata)* - (*Quercus montana*) / *Vaccinium pallidum* Forest (CEGL007119)

**Global Related Concepts:**

- IA7b. Xeric Pitch Pine/Table Mountain Pine Ridge Forest (Allard 1990) >
- Pine--Oak/Heath (Schafale and Weakley 1990) >
- Pitch Pine: 45 (Eyre 1980) >
- Table Mountain Pine type (Golden 1974) ?
- Xeric Pine Forest (McLeod 1988) ?

**CLASSIFICATION**

**Status:** Standard

**Classification Confidence:** 2 - Moderate

**Great Smoky Mountains National Park Other Comments:** Examples at the lowest elevations (below 2300 feet) on the Mount Le Conte quadrangle lacked *Pinus pungens* and *Pinus virginiana* and were dominated by *Pinus rigida* and *Quercus coccinea*. Many former examples of this community now exist as chestnut oak forests (CEGL006271) due to fire suppression and pine mortality due to Pine Bark Beetle. This community often grades into *Quercus prinus*-dominated forests (CEGL006271) on the ridgelines above. Other adjacent communities can include heath shrublands or oak - hickory forests on less exposed sites.

**Global Classification Comments:** Other communities with *Pinus pungens* occur in central Pennsylvania and in Virginia. These northern types are thought to have a different species composition and geology than the forests described here. Species associated with *Pinus pungens* in the northern part of its range that do not occur in this community include *Quercus ilicifolia*, *Viburnum acerifolium*, and *Vaccinium angustifolium*. [See *Pinus (pungens, rigida)* - *Quercus montana* / (*Quercus ilicifolia*) / *Gaylussacia baccata* Woodland (CEGL004996).] Examples of this association studied on lands of the Eastern Band of the Cherokee Indians in Cherokee County, North Carolina, include a substantial amount of *Pinus echinata* and lack *Pinus pungens*. These stands occur on low ridges (520-670 m [1700-2200 feet]) and otherwise, floristically, are a good match for this forest type. It is believed that they are transitional to low-elevation stands dominated by *Pinus echinata* in the Cumberlands and Southern Ridge and Valley. In the Appalachian Trail classification study, 22 plots from Georgia, North Carolina, Tennessee, and Virginia were classified as this association with a homogeneity of 68% (Fleming and Patterson 2009a). The most constant species ( $\geq 64\%$ ), in order of descending constancy, are *Kalmia latifolia*, *Acer rubrum*, *Quercus montana*, *Quercus coccinea*, *Pinus rigida*, *Pinus pungens*, *Gaylussacia baccata*, *Gaylussacia ursina*, *Oxydendrum arboreum*, *Vaccinium pallidum*, *Nyssa sylvatica*, *Galax urceolata*, and *Gaultheria procumbens*. Less constant species with high mean cover values ( $\geq 5$  cover class) in these plots are *Pinus pungens*, *Pinus rigida*, *Gaylussacia baccata*, *Gaylussacia ursina*, and *Vaccinium hirsutum*.

**ELEMENT DISTRIBUTION**

**Great Smoky Mountains National Park Range:** This community was sampled on both the Cades Cove and Mount Le Conte quadrangles and occurs in other areas of the park. On the Cade Cove quadrangle it was found at elevations from 2300-3800 feet. Areas sampled include Cobb Butt and Cobb Ridge, on south slopes and along the southern ridgeline from 3500-3800 feet elevation; an area north of the Cades Cove Loop Road, north of Tater Ridge, on a southwest sideridge of Cave Ridge at 2840 feet; and just southeast of the Cades Cove Loop Road, on northwest, steep, middle slopes above Anthony Creek at 2400 feet. Historic samples that may represent this community on the Cades Cove quadrangle were taken from the broad ridges and upper, west- to southeast-facing slopes north of Parsons Branch Road, above Rabbit Creek (2460-2500 feet elevation); the upper east slopes of Leadbetter Ridge (2300 feet elevation); the eastern, middle slopes of Gregory Ridge (3040-3440 feet elevation); and the middle and upper south slopes of Mollies Ridge / Butt from 2840-3500 feet elevation. This community seems to be less common on the Mount Le Conte quadrangle and was found at elevations from 1850-4200 feet. It was sampled in the southwestern portion of the quadrangle, on the southeast slopes of Bullhead (4200 feet); in the central portion of the quadrangle on the lower western slopes of Mt. Winnesoka above Roaring Fork (2700 feet); north of Brushy Mountain, on the southeast slopes below Turkey Ridge (3700 feet); on the southern part of Potato Ridge; and on a northeast-running sideridge of Mt. Winnesoka, above Injun Creek (2180 feet). In the northeastern portion of the quadrangle, this community was found north of Copeland Creek, on the southwest high slopes over Copeland Creek (1850 feet).

**Global Range:** This community ranges throughout the Southern Blue Ridge and Cumberland Mountains, from southwestern Virginia and southeastern Kentucky, south through western North Carolina and eastern Tennessee, into northeastern Georgia and northwestern South Carolina.

**Nations:** US

**States/Provinces:** GA, KY, NC, SC, TN:S2S3, VA:S3?

**TNC Ecoregions:** 50:P, 51:C, 52:C, 59:?

**USFS Ecoregions (1994/95):** M221Aa:CCP, M221Ab:CCP, M221Ac:CCC, M221Ce:CCC, M221Da:CCC, M221Dc:CCC, M221Dd:CCC

**USFS Ecoregions (2007):** M221Aa:CCP, M221Ab:CCP, M221Ac:CCC, M221Ce:CCP, M221Da:CCC, M221Dc:CCC, M221Dd:CCC

**Federal Lands:** BIA (Eastern Band of Cherokee); NPS (Appalachian Trail [Southern Blue Ridge], Blue Ridge Parkway, Carl Sandburg Home, Cumberland Gap, Great Smoky Mountains); USFS (Chattahoochee, Chattahoochee (Piedmont), Chattahoochee (Southern Blue Ridge), Cherokee, Nantahala, Pisgah, Sumter, Sumter (Mountains))

## ELEMENT SOURCES

**Great Smoky Mountains National Park Plots:** GRSM.34, GRSM.39, GRSM.77, GRSM.84, GRSM.86, GRSM.532, GRSM.240, GRSM.102, GRSM.103, GRSM.140, GRSM.224.

**Great Smoky Mountains National Park Description Author(s):** K.D. Patterson

**Global Description Author(s):** M.P. Schafale and A.S. Weakley

**References:** Allard 1990, Barden 1977, Eyre 1980, Fleming and Patterson 2009a, Fleming et al. 2017, GNHP unpubl. data 2018, Golden 1974, Golden 1981, Hedlin et al. 1981, McLeod 1988, NatureServe Ecology - Southeastern U.S. unpubl. data, Nelson 1986, Newell and Peet 1995, Peet et al. unpubl. data, Racine 1966, Schafale 2012, Schafale and Weakley 1990, Schafale and Weakley 1990, Southeastern Ecology Working Group n.d., TDNH unpubl. data 2018, Turrill and Buckner 1995, Wharton 1978, White 2003, White 2006, Whittaker 1956, Williams 1991, Williams and Johnson 1990, Williams and Johnson 1992, Williams et al. 1990a, Zobel 1969

**[CEGL004985] *Pinus rigida* - (*Pinus pungens*) / *Rhododendron catawbiense* - *Kalmia latifolia* / *Galax urceolata* Woodland**

Translated Name: **Pitch Pine - (Table Mountain Pine) / Catawba Rosebay - Mountain Laurel / Beetleweed Woodland**

Common Name: **Blue Ridge Table Mountain Pine - Pitch Pine Woodland (High-Elevation Type)**

## USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Northeastern Oak - Hardwood - Pine Forest & Woodland (M502)
Group	Virginia Pine - Table Mountain Pine Woodland & Barrens (G162)
Alliance	<i>Pinus pungens</i> - <i>Pinus rigida</i> - <i>Quercus montana</i> Woodland Alliance (A0677)

## ELEMENT CONCEPT

**Global Summary:** This high-elevation (1220 to 1555 m [4000-5100 feet]) woodland is dominated by *Pinus rigida* with a dense, ericaceous shrub stratum and occurs on narrow ridge crests in the Southern Blue Ridge. Other tree species can include *Quercus rubra*, *Tsuga canadensis*, *Picea rubens* (rarely), and *Populus grandidentata* (rarely). Typical shrubs include *Kalmia latifolia*, *Eubotrys recurva*, *Rhododendron catawbiense*, *Rhododendron calendulaceum*, *Gaylussacia baccata*, and *Vaccinium corymbosum*. *Galax urceolata* is often dominant in the herbaceous stratum, but other species may be present. Characteristic herbs include *Pteridium aquilinum*, *Epigaea repens*, and *Melampyrum lineare*. Fire-suppressed examples tend to have coverage of *Pinus strobus*, *Acer rubrum*, and *Nyssa sylvatica*. This community is distinct from the more typical *Pinus pungens* - *Pinus rigida* - (*Quercus montana*) / *Kalmia latifolia* - *Vaccinium pallidum* Woodland (CEGL007097) because of the presence of high-elevation species such as *Rhododendron catawbiense*.

## ENVIRONMENTAL DESCRIPTION

## VEGETATION DESCRIPTION

**Global Vegetation:** Vegetation is dominated by *Pinus rigida* with a dense, ericaceous shrub stratum and occurs on narrow ridge crests in the Southern Blue Ridge. Other tree species can include *Quercus rubra*, *Tsuga canadensis*, *Picea rubens* (rarely), and *Populus grandidentata* (rarely). Typical shrubs include *Kalmia latifolia*, *Eubotrys recurva* (= *Leucothoe recurva*), *Rhododendron catawbiense*, *Rhododendron calendulaceum*, *Gaylussacia baccata*, and *Vaccinium corymbosum*. *Galax urceolata* is often dominant in the herbaceous stratum, but other species may be present. Characteristic herbs include *Pteridium aquilinum*, *Epigaea repens*, and *Melampyrum lineare*. Fire-suppressed examples tend to have coverage of *Pinus strobus*, *Acer rubrum*, and *Nyssa sylvatica*.

## MOST ABUNDANT SPECIES

## Global

Stratum

Tree canopy

Shrub/sapling (tall &amp; short)

Herb (field)

Lifeform

Needle-leaved tree

Broad-leaved evergreen shrub

Flowering forb

Species*Pinus rigida**Kalmia latifolia*, *Rhododendron catawbiense**Galax urceolata*

## CHARACTERISTIC SPECIES

**Global:** *Galax urceolata*, *Kalmia latifolia*, *Pinus rigida*, *Rhododendron catawbiense*

## OTHER NOTEWORTHY SPECIES

**Global:**

## CONSERVATION STATUS RANK

**Global Rank & Reasons:** G2 (21-Jan-2000). This community is endemic to the Southern Blue Ridge where it occurs on high-elevation ridges (over 1220 m [4000 feet]). It is maintained by periodic fire or extreme site conditions. It is only known from a few occurrences in North Carolina, where many examples are in poor condition due to long-term, widespread fire suppression. In recent years, outbreaks of southern pine beetle (*Dendroctonus frontalis*) have resulted in extensive mortality of the dominant pines and changed physiognomies of some stands to a shrubland condition.

## RELATED CONCEPTS

**Global Similar Types:**

- *Pinus (pungens, rigida) - Quercus montana / (Quercus ilicifolia) / Gaylussacia baccata* Woodland (CEGL004996)
- *Pinus pungens - Pinus rigida - (Quercus montana) / Kalmia latifolia - Vaccinium pallidum* Woodland (CEGL007097)

## CLASSIFICATION

**Status:** Standard

**Classification Confidence:** 3 - Weak

**Global Classification Comments:** This association was developed from North Carolina Vegetation Survey data. Known North Carolina examples include Blackrock Mountain, Piney Knob Fork, Whiteside Mountain, and Fodderstacks.

## ELEMENT DISTRIBUTION

**Global Range:** This community is endemic to the Southern Blue Ridge and is known only from high elevations (over 1220 m [4000 feet]) in North Carolina.

**Nations:** US

**States/Provinces:** NC, TN?

**TNC Ecoregions:** 51:C

**USFS Ecoregions (1994/95):** M221Db:CCP, M221Dc:CCC, M221Dd:CCC

**USFS Ecoregions (2007):** M221Db:CCP, M221Dc:CCC, M221Dd:CCC

**Federal Lands:** NPS (Blue Ridge Parkway, Great Smoky Mountains); USFS (Nantahala, Pisgah)

## ELEMENT SOURCES

**Great Smoky Mountains National Park Plots:** CVS: 026-03-0014.

**Global Description Author(s):**

**References:** Peet et al. unpubl. data, Schafale 2012, Schafale and Weakley 1990, Schafale pers. comm., Southeastern Ecology Working Group n.d.

**A3312 *Pinus virginiana - Quercus montana* Acidic Shale Woodland Alliance**

Virginia Pine - Chestnut Oak Acidic Shale Woodland Alliance

*Appalachian Pine - Oak Acidic Shale Woodland*

## ALLIANCE CONCEPT

**Summary:** These mixed evergreen-deciduous woodlands and sparse woodlands are dominated by some combination of *Juniperus virginiana* var. *virginiana*, *Pinus virginiana*, and *Quercus montana*. Hardwood associates include *Carya glabra*, *Carya ovalis*, *Carya ovata*, *Fraxinus americana*, *Quercus rubra*, *Quercus stellata*, and *Quercus velutina*. The shrub layer includes *Amelanchier arborea*, *Gaylussacia baccata*, *Quercus ilicifolia*, *Vaccinium pallidum*, and *Vaccinium stamineum*. The herbaceous layer is generally sparse; grass and other graminoid species include *Carex pensylvanica*, *Danthonia spicata*, *Deschampsia flexuosa*, *Dichanthelium linearifolium*, and *Schizachyrium scoparium*. Forbs include *Cunila origanoides*, *Heuchera americana*, *Hieracium venosum*, *Penstemon hirsutus*, *Phlox subulata*, *Symphyotrichum cordifolium*, and *Viola pedata*. Lichens such as *Cladonia* spp. are abundant in some areas. These woods are found on acidic shale substrates from Maryland, Pennsylvania, Virginia and West Virginia.

**Similar Alliances:**

- *Pinus pungens - Pinus rigida - Quercus montana* Woodland Alliance (A0677)

**Diagnostic Characteristics:** The combination of dominant species (*Pinus virginiana*, *Quercus montana*, and *Juniperus virginiana* var. *virginiana*) is not by itself distinctive. The acidic shale substrate and the distinctive suite of endemic herbs completes the characterization.

## ALLIANCE DESCRIPTION

**Vegetation:** Stands are dominated by some combination of *Juniperus virginiana* var. *virginiana*, *Pinus virginiana*, and *Quercus montana* (= *Quercus prinus*). Hardwood associates include *Carya glabra*, *Carya ovalis*, *Carya ovata*, *Fraxinus americana*, *Quercus rubra*, *Quercus stellata*, and *Quercus velutina*. The shrub layer includes *Amelanchier arborea*, *Gaylussacia baccata*, *Quercus ilicifolia*, *Vaccinium pallidum*, and *Vaccinium stamineum*. The herbaceous layer is generally sparse; grass and other graminoid species include *Carex pensylvanica*, *Danthonia spicata*, *Deschampsia flexuosa*, *Dichanthelium linearifolium*, and *Schizachyrium scoparium*. Forbs include *Cunila origanoides*, *Heuchera americana*, *Hieracium venosum*, *Penstemon hirsutus*, *Phlox subulata*, *Symphyotrichum cordifolium*, and *Viola pedata*. Lichens such as *Cladonia* spp. are abundant in some areas (Fike 1999, Zimmerman et al. 2012). Distinctive endemic herbs which may be present in some examples include *Eriogonum allenii*, *Hieracium greenii*, *Packeria antennariifolia*, and *Solidago arguta* var. *harrisii*. These distinctive endemic herbs are not as diverse or abundant as in shale woodlands on more circumneutral substrates (Fike 1999, Zimmerman et al. 2012).

**Physiognomy and Structure:** Stands are generally mixed evergreen-deciduous woodlands.

**Floristics:** Stands are dominated by some combination of *Juniperus virginiana* var. *virginiana*, *Pinus virginiana*, and *Quercus montana* (= *Quercus prinus*). Hardwood associates include *Carya glabra*, *Carya ovalis*, *Carya ovata*, *Fraxinus americana*, *Quercus rubra*, *Quercus stellata*, and *Quercus velutina*. The shrub layer includes *Amelanchier arborea*, *Gaylussacia baccata*, *Quercus ilicifolia*, *Vaccinium pallidum*, and *Vaccinium stamineum*. The herbaceous layer is generally sparse; grass and other graminoid species

include *Carex pensylvanica*, *Danthonia spicata*, *Deschampsia flexuosa*, *Dichantherium linearifolium*, and *Schizachyrium scoparium*. Forbs include *Cunila origanoides*, *Heuchera americana*, *Hieracium venosum*, *Penstemon hirsutus*, *Phlox subulata*, *Symphotrichum cordifolium*, and *Viola pedata*. Lichens such as *Cladonia* spp. are abundant in some areas (Fike 1999, Zimmerman et al. 2012). Distinctive endemic herbs which may be present in some examples include *Eriogonum allenii*, *Hieracium greenii*, *Packera antennariifolia*, and *Solidago arguta* var. *harrisii*. These distinctive endemic herbs are not as diverse or abundant as in shale woodlands on more circumneutral substrates (Fike 1999, Zimmerman et al. 2012).

**Dynamics:** The rocky substrates supporting examples of this alliance may effectively limit the normal establishment and development of trees. Although periodic drought stress limits some weeds, the shrub *Symphoricarpos orbiculatus* has become invasive in one occurrence. Ruderal weeds such as *Veronica arvensis*, *Barbarea vulgaris*, and *Verbascum thapsus* can also become problematic, especially in wet years.

#### ALLIANCE DISTRIBUTION

**Range:** This alliance is restricted to the states of Maryland, Pennsylvania, Virginia and West Virginia, primarily in the Central Appalachian region as well as in the adjacent southern Blue Ridge and Ridge and Valley regions. One association is attributed to North Carolina, Tennessee and possibly South Carolina.

**Nations:** US

**Subnations:** GA, MD, NC, PA, SC?, TN, VA, WV

**TNC Ecoregions:** 50:C, 51:C, 58:C, 59:C

#### ALLIANCE SOURCES

**References:** Eastern Ecology Working Group n.d., Faber-Langendoen et al. 2019b, Fike 1999, Zimmerman et al. 2012

**Author of Concept:** Faber-Langendoen et al. 2019b

**Author of Description:** M. Pyne, in Faber-Langendoen et al. (2013)

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### [CEGL003624] *Pinus virginiana* / *Vaccinium pallidum* / *Schizachyrium scoparium* - *Carex pensylvanica* Woodland

Translated Name: **Virginia Pine / Blue Ridge Blueberry / Little Bluestem - Pennsylvania Sedge Woodland**

Common Name: **Blue Ridge Acidic Shale Woodland**

#### USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Northeastern Oak - Hardwood - Pine Forest & Woodland (M502)
Group	Virginia Pine - Table Mountain Pine Woodland & Barrens (G162)
Alliance	<i>Pinus virginiana</i> - <i>Quercus montana</i> Acidic Shale Woodland Alliance (A3312)

#### ELEMENT CONCEPT

**Global Summary:** This community occurs on steep, shaley slopes in the Southern Appalachians and has an open to closed, stunted canopy and sparse herb and shrub strata characterized by species able to grow in loose shale fragments. It is known from the Hot Springs Window, in the Blue Ridge Mountains, and occurs elsewhere in the Southern Appalachians, such as the Chauga Basin, South Carolina, and from Chilhowee Mountain, Tennessee. The canopy (5-25 m tall, 25-75% cover) is dominated by *Pinus virginiana*, with *Quercus montana* and *Quercus rubra* sometimes present in substantial numbers in less extreme habitats. The shrub layer is very sparse, and may include scattered individuals of *Kalmia latifolia*, *Vaccinium stamineum*, and *Vaccinium pallidum*. The herb layer is very sparse to patchy, and is dominated by *Schizachyrium scoparium*, *Carex pensylvanica*, *Danthonia spicata*, *Dichantherium linearifolium*, with scattered individuals of *Coreopsis major*, *Houstonia longifolia*, *Hieracium venosum*, and *Euphorbia corollata*. Lichens are frequent, particularly on in-place outcrops, and include *Cladonia rangiferina* and *Cladonia* spp. Loose shale fragments cover 50-90% of the ground surface. It is apparently a long-lived community, maintained by harsh edaphic conditions of steep slopes and shifting shale substrate. The community can vary quite widely from a very open canopy to one that is almost closed in cases where the slope is less steep and/or the rock underlying the stand is more stable.

#### ENVIRONMENTAL DESCRIPTION

**Global Environment:** This community occurs on steep, shaley slopes in the Southern Appalachians and has a sparse herb and shrub strata characterized by species able to grow in loose shale fragments. Loose shale fragments cover 50-90% of the ground surface. It is apparently a long-lived community, maintained by harsh edaphic conditions of steep slopes and shifting shale substrate. The community can vary quite widely from a very open canopy to one that is almost closed in cases where the slope is less steep and/or the rock underlying the stand is more stable.

#### VEGETATION DESCRIPTION

**Global Vegetation:** The stunted open to closed canopy (5-25 m tall, 25-75% cover) of stands of this type is dominated by *Pinus virginiana*, with *Quercus montana* (= *Quercus prinus*) and *Quercus rubra* sometimes present in substantial numbers in less extreme versions of this habitat. The shrub layer is very sparse, and may include scattered individuals of *Kalmia latifolia*, *Vaccinium stamineum*, and *Vaccinium pallidum*. The herb layer is very sparse to patchy, and is dominated by *Schizachyrium scoparium*, *Carex pensylvanica*, *Danthonia spicata*, *Dichantherium linearifolium*, with scattered individuals of *Coreopsis major*, *Houstonia longifolia* (= *Houstonia tenuifolia*), *Hieracium venosum*, and *Euphorbia corollata*. Lichens are frequent, particularly on in-place outcrops, and include *Cladonia rangiferina* (= *Cladina rangiferina*) and *Cladonia* spp.

**MOST ABUNDANT SPECIES****Global****Stratum**

Tree canopy  
Tree canopy

**Lifeform**

Needle-leaved tree  
Broad-leaved deciduous tree

**Species**

*Pinus virginiana*  
*Quercus montana*, *Quercus rubra*

**CHARACTERISTIC SPECIES**

**Global:** *Carex pensylvanica*, *Pinus virginiana*, *Schizachyrium scoparium*, *Vaccinium pallidum*

**OTHER NOTEWORTHY SPECIES**

**Global: Vulnerable Plants:** *Heuchera caroliniana* (G3); **Other Plants:** *Vaccinium hirsutum* (G4)

**CONSERVATION STATUS RANK**

**Global Rank & Reasons:** G2 (19-Feb-2004). As defined, this community is limited to the rare outcrops of shale in the Blue Ridge and in the transition between the Blue Ridge and Ridge and Valley physiographic provinces in extreme western North Carolina and eastern Tennessee. There is some possibility that this type may be somewhat more widespread in the Ridge and Valley of Tennessee, southwestern Virginia, and northern Alabama, although no new locations have been found to date (Feb 2004). It is distinguished from the various shale barren types of western Virginia, eastern West Virginia, western Maryland, and south-central Pennsylvania by the complete absence of the distinctive endemic flora of that region. Most examples are not highly threatened by development or timber harvesting because of their occurrence on steep slopes and the low value/poor quality timber present. This community type is threatened by the invasive exotic *Paulownia tomentosa*, which can colonize this community type where it is near a seed source. Although the current condition of the examples of this type are good, the fact that there are only three known Element Occurrences requires us to give this a high priority Global Rank.

**RELATED CONCEPTS****Global Similar Types:**

- *Quercus montana* - *Juniperus virginiana* - (*Pinus virginiana*) / *Philadelphus hirsutus* - *Celtis occidentalis* Woodland (CEGL007720) on steep, rocky, riverine bluffs in the Southern Blue Ridge with exposed and eroding shale.
- *Quercus montana* - *Pinus virginiana* - (*Pinus pungens*) / *Schizachyrium scoparium* - *Dichanthelium depauperatum* Woodland (CEGL008540) of Virginia, Maryland and West Virginia, is strictly a woodland of non-shale substrates.
- *Quercus montana* / *Quercus ilicifolia* / *Danthonia spicata* Woodland (CEGL008526) on dry shale slopes of the Central Appalachians.

**Global Related Concepts:**

- IE6a. Southern Appalachian Shale Barren (Allard 1990) >

**CLASSIFICATION**

**Status:** Standard

**Classification Confidence:** 3 - Weak

**Global Classification Comments:** Five plots from the area of Hot Springs, North Carolina, are classified as this association in the Appalachian Trail classification study (Fleming and Patterson 2009a). These plots have 27 species with  $\geq 60\%$  constancy. Species with  $\geq 80\%$  constancy include, in order of descending constancy, *Pinus virginiana*, *Quercus montana*, *Quercus rubra*, *Vaccinium stamineum*, *Campanula divaricata*, *Coreopsis major*, *Andropogon virginicus* var. *virginicus*, *Hieracium venosum*, *Juniperus virginiana* var. *virginiana*, *Danthonia spicata*, and *Acer rubrum*. This type is distinguished from the various shale barren types of western Virginia, eastern West Virginia, western Maryland, and south-central Pennsylvania by the complete absence of the distinctive endemic flora of that region. L.L. Gaddy (pers. comm.) reports this association from the Chauga Basin, South Carolina, and it is known from Chilhowee Mountain, Tennessee.

This association shares many floristic elements with *Quercus montana* - *Pinus virginiana* - (*Pinus pungens*) / *Schizachyrium scoparium* - *Dichanthelium depauperatum* Woodland (CEGL008540), a Central Appalachian acidic woodland of various substrates other than shale, occurring in Virginia, Maryland and West Virginia. The two associations emerged as distinct in cluster analysis (Fleming and Patterson 2009a); however, when comparing the constant species ( $\geq 60\%$ ) of the two groups, only three species, *Andropogon virginicus* var. *virginicus*, *Carya pallida*, and *Ulmus alata*, were present in samples of this association (CEGL003624) (n=5) and not in those of CEGL008540 (n=28). In this comparison, less constant species which are unique to CEGL008540 are *Chionanthus virginicus*, *Cornus florida*, *Gaylussacia baccata*, *Quercus ilicifolia*, and *Quercus stellata*, but with a larger sample of CEGL003624, those differences may not hold.

**ELEMENT DISTRIBUTION**

**Global Range:** This forest is found in the Southern Appalachians of the Carolinas and Tennessee. It is reported from somewhat calcareous shales in the Hot Springs Window, in the Blue Ridge of North Carolina and Tennessee, from the Chauga Basin, South Carolina, and from Chilhowee Mountain, Tennessee.

**Nations:** US

**States/Provinces:** NC, SC?, TN

**TNC Ecoregions:** 50:P, 51:C

**USFS Ecoregions (1994/95):** 221Jb:PPP, M221Dd:CCC

USFS Ecoregions (2007): 221Jb:PPP, M221Dd:CCC

Federal Lands: NPS (Appalachian Trail [Southern Blue Ridge], Great Smoky Mountains); USFS (Cherokee, Pisgah)

## ELEMENT SOURCES

Great Smoky Mountains National Park Plots: GRSM.307.

Great Smoky Mountains National Park Description Author(s): R. White

Global Description Author(s): R. White

References: Allard 1990, Fleming and Patterson 2009a, Nelson 1986, Peet et al. unpubl. data, Schafale 2012, Southeastern Ecology Working Group n.d., TDNH unpubl. data 2018

**M883. Appalachian-Interior-Northeastern Mesic Forest****G020. APPALACHIAN-CENTRAL INTERIOR MESIC FOREST**

**Group Summary Description:** This group is composed of tall, productive and diverse forests primarily dominated by a diverse suite of deciduous broad-leaved trees of the unglaciated Appalachians, Piedmont, and Interior Low Plateau regions of the eastern United States. They range from about 125 m (400 feet) elevation to generally 1375 m (4500 feet), and occasionally to 1525 m (5000 feet) in the Southern Appalachians. They are best developed on lower slopes and in sheltered landforms, typically with northern to eastern exposures. Stands are most extensive, diverse and well-developed in the Central and Southern Appalachians, and in the Cumberland and Allegheny Plateaus. Examples in the Interior Low Plateau are somewhat less diverse in comparison, but are still the most diverse and productive forests in this particular region. The most typical and usually dominant forest tree species include *Liriodendron tulipifera*, *Prunus serotina*, *Acer saccharum*, *Tilia americana* (both var. *americana* and var. *heterophylla*, the latter being especially characteristic), and *Fagus grandifolia*. Other associates can include *Fraxinus americana*, *Juglans nigra*, and *Magnolia* spp. (e.g., *Magnolia acuminata*, *Magnolia tripetala*, *Magnolia macrophylla*). Stands are typically dominated by genera other than *Carya* and *Quercus*, although some species of these genera may be present, including *Carya cordiformis*, *Carya ovalis*, *Carya ovata*, *Quercus alba*, *Quercus muehlenbergii*, *Quercus pagoda*, *Quercus rubra*, and *Quercus shumardii*. A diverse herbaceous layer will contain species such as *Adiantum pedatum*, *Arisaema triphyllum*, *Galium* spp., *Osmorhiza claytonii*, *Podophyllum peltatum*, *Polygonatum biflorum*, *Trillium* spp., and *Viola* spp.

**A0235 *Liriodendron tulipifera* - *Tilia americana* var. *heterophylla* - *Aesculus flava* Forest Alliance**

Tuliptree - Appalachian Basswood - Yellow Buckeye Forest Alliance

*South-Central Appalachian Mixed Mesophytic Forest*

## ALLIANCE CONCEPT

**Summary:** This alliance represents the mixed mesophytic forests of the Southern Blue Ridge, Appalachian Plateau, and adjacent ecoregions, with highly variable and diverse canopies, often with no clear canopy dominant. They are locally referred to as "cove forests." Characteristic canopy species include *Acer saccharum*, *Aesculus flava*, *Liriodendron tulipifera*, and *Tilia americana* var. *heterophylla*. Other species that may occur in the canopy include *Acer nigrum*, *Carya cordiformis*, *Halesia tetraptera* var. *monticola*, *Fraxinus americana*, and *Quercus rubra*. Species composition varies with geology and/or elevation. Shrub strata are open to sparse and can include *Hydrangea arborescens* or *Lindera benzoin*. Herbaceous strata are typically lush and diverse. Species commonly found include *Actaea racemosa*, *Asarum canadense*, *Caulophyllum thalictroides*, *Hydrophyllum canadense*, *Hydrophyllum virginianum*, *Laportea canadensis*, and *Sanguinaria canadensis*. However, the herbaceous layer is usually very diverse and variable. A partial list of other typical species includes *Adiantum pedatum*, *Ageratina altissima* var. *roanensis*, *Arisaema triphyllum*, *Carex plantaginea*, *Cystopteris protrusa*, *Delphinium tricorne*, *Dicentra canadensis*, *Dicentra cucullaria*, *Hepatica nobilis* var. *acuta*, *Impatiens capensis*, *Impatiens pallida*, *Osmorhiza claytonii*, *Polystichum acrostichoides*, *Prosartes lanuginosa*, *Tiarella cordifolia*, *Trillium erectum*, *Trillium grandiflorum*, and *Viola canadensis*. Examples of this alliance mainly occur on sites that are protected, mesic, and at low to moderate elevation (610-1370 m [2000-4500 feet]), primarily broad coves and lower slopes. Forests in this alliance are known from the Southern Blue Ridge of North Carolina, South Carolina, Georgia, Tennessee, Virginia, and the Cumberland Mountains of Kentucky, extending north at least through Virginia on the Northern Blue Ridge, as well as west into the Interior Low Plateau of southern Indiana, southern Ohio, Kentucky, and Tennessee. More information is needed to characterize forests provisionally assigned to this alliance that occur in the Allegheny Plateau of West Virginia and Ohio and in Indiana, as well as in New Jersey and Connecticut.

**Classification Comments:** Four associations placed here (CEGL007698, CEGL007878, CEGL008428, and CEGL00848) have some codominance of oaks (*Quercus* spp.) in their canopies, but based on overall floristics and distribution, this is the best placement for them.

**Similar Alliances:**

- *Acer saccharum* - *Carya cordiformis* - *Fraxinus americana* Ozark-Ouachita Forest Alliance (A3260)
- *Acer saccharum* - *Tilia americana* - *Fraxinus americana* Forest Alliance (A3240)
- *Fagus grandifolia* - *Liriodendron tulipifera* - *Carya cordiformis* Forest Alliance (A2033)

- *Fagus grandifolia* - *Quercus rubra* Piedmont-Ridge and Valley Forest Alliance (A3265)
- *Tsuga canadensis* - *Liriodendron tulipifera* Forest Alliance (A3304)

**Similar Alliance Comments:** This alliance (A0235) is distinguished from the similar alliances by geography and overall floristics.

**Diagnostic Characteristics:** This alliance is characterized by a high diversity of deciduous trees, *Aesculus flava* and *Tilia americana* var. *heterophylla* being the most characteristic, although not necessarily abundant. Other common trees include *Liriodendron tulipifera* and *Acer saccharum*. The herbaceous layer is lush and diverse, and supported by rich mesic soils formed in slight concave depressions and on lower slopes where nutrients and moisture accumulate.

**Rationale for Nominal Species or Physiognomic Features:** *Aesculus flava* and *Tilia americana* var. *heterophylla* are diagnostic of this alliance, and *Liriodendron tulipifera* and *Acer saccharum* are almost always present.

#### ALLIANCE DESCRIPTION

**Environment:** These forests mainly occur on protected, mesic, low- to moderate-elevation (610-1370 m [2000-4500 feet]) sites, primarily broad coves and lower slopes. Species composition varies with geology and/or elevation.

**Vegetation:** These mixed mesophytic forests of the Southern Blue Ridge, Appalachian Plateau, and Interior Low Plateau have highly variable canopies, often with no clear canopy dominant. These forests are locally referred to as "cove forests." Characteristic canopy species include *Acer saccharum*, *Aesculus flava*, *Liriodendron tulipifera*, and *Tilia americana* var. *heterophylla*. Other species that may occur in the canopy include *Acer rubrum*, *Betula alleghaniensis*, *Carya cordiformis*, *Fagus grandifolia*, *Fraxinus americana*, *Halesia tetraptera* var. *monticola*, *Magnolia fraseri*, *Prunus serotina* var. *serotina*, and *Quercus rubra*. Species composition will vary with geology and/or elevation. Shrub strata are open to sparse and can include *Calycanthus floridus*, *Cornus alternifolia*, *Hydrangea arborescens*, and *Lindera benzoin*. Herbaceous strata are typically lush and diverse. A partial list of typical species includes *Actaea racemosa* (= *Cimicifuga racemosa*), *Adiantum pedatum*, *Ageratina altissima* var. *roanensis*, *Arisaema triphyllum*, *Asarum canadense*, *Carex austrocaroliniana*, *Carex manhartii*, *Carex plantaginea*, *Carex platyphylla*, *Caulophyllum thalictroides*, *Clintonia umbellulata*, *Cystopteris protrusa*, *Delphinium tricornis*, *Dicentra canadensis*, *Dicentra cucullaria*, *Dryopteris intermedia*, *Hepatica nobilis* var. *acuta*, *Hydrophyllum canadense*, *Hydrophyllum virginianum*, *Impatiens capensis*, *Impatiens pallida*, *Laportea canadensis*, *Mitella diphylla*, *Osmorhiza claytonii*, *Phacelia bipinnatifida*, *Phacelia fimbriata*, *Polystichum acrostichoides*, *Sedum ternatum*, *Stellaria pubera*, *Tiarella cordifolia*, *Trillium erectum*, *Trillium grandiflorum*, and *Viola canadensis* (Schafale and Weakley 1990).

**Physiognomy and Structure:** These forests are characterized by a diverse, closed tree canopy, with a sparse shrub layer. The herbaceous layer is lush and diverse, with many leafy forbs.

**Floristics:** These mixed mesophytic forests of the Southern Blue Ridge, Appalachian Plateau, and Interior Low Plateau have highly variable canopies, often with no clear canopy dominant. These forests are locally referred to as "cove forests." Characteristic canopy species include *Acer saccharum*, *Aesculus flava*, *Liriodendron tulipifera*, and *Tilia americana* var. *heterophylla*. Other species that may occur in the canopy include *Acer rubrum*, *Betula alleghaniensis*, *Carya cordiformis*, *Fagus grandifolia*, *Fraxinus americana*, *Halesia tetraptera* var. *monticola*, *Magnolia fraseri*, *Prunus serotina* var. *serotina*, and *Quercus rubra*. Species composition will vary with geology and/or elevation. Shrub strata are open to sparse and can include *Calycanthus floridus*, *Cornus alternifolia*, *Hydrangea arborescens*, and *Lindera benzoin*. Herbaceous strata are typically lush and diverse. A partial list of typical species includes *Actaea racemosa* (= *Cimicifuga racemosa*), *Adiantum pedatum*, *Ageratina altissima* var. *roanensis*, *Arisaema triphyllum*, *Asarum canadense*, *Carex austrocaroliniana*, *Carex manhartii*, *Carex plantaginea*, *Carex platyphylla*, *Caulophyllum thalictroides*, *Clintonia umbellulata*, *Cystopteris protrusa*, *Delphinium tricornis*, *Dicentra canadensis*, *Dicentra cucullaria*, *Dryopteris intermedia*, *Hepatica nobilis* var. *acuta*, *Hydrophyllum canadense*, *Hydrophyllum virginianum*, *Impatiens capensis*, *Impatiens pallida*, *Laportea canadensis*, *Mitella diphylla*, *Osmorhiza claytonii*, *Phacelia bipinnatifida*, *Phacelia fimbriata*, *Polystichum acrostichoides*, *Sedum ternatum*, *Stellaria pubera*, *Tiarella cordifolia*, *Trillium erectum*, *Trillium grandiflorum*, and *Viola canadensis* (Schafale and Weakley 1990).

#### ALLIANCE DISTRIBUTION

**Range:** This alliance ranges along the Appalachians and adjacent areas from Connecticut south to Alabama and west into the Interior Low Plateau of southern Indiana, southern Ohio, Kentucky, and Tennessee. These forests are known from the Southern Blue Ridge of North Carolina, South Carolina, Georgia, Tennessee, Virginia, and the Cumberland Mountains of Kentucky. Some associations may marginally range into the adjacent Piedmont or Interior Low Plateau. More information is needed to characterize forests provisionally assigned to this alliance that occur in the Allegheny Plateau of West Virginia and Ohio, as well as Indiana and Connecticut.

**Nations:** US

**Subnations:** AL, CT, GA, IN, KY, MD, NC, NJ, NY, OH, PA, SC, TN, VA, WV

**TNC Ecoregions:** 44:C, 49:C, 50:C, 51:C, 52:C, 59:C, 61:P

**USFS Ecoregions (1994/95):** 221Ea:CCC, 221Eb:CCC, 221Ec:CCC, 221Ed:CCC, 221Ee:CCC, 221Ef:CCC, 221Eg:CCC, 221Ha:CCP, 221Hc:CCP, 221He:CCP, 221Ja:CCC, 222E:CC, 222F:CC, 231Ab:CCC, 231Ad:CCC, M221Aa:CCC, M221Ab:CCC, M221Bb:CCC, M221Bd:CCC, M221Be:CCC, M221Cb:CCC, M221Cc:CC?, M221Cd:CCC, M221Ce:CCC, M221Da:CCC, M221Db:CCC, M221Dc:CCC, M221Dd:CCC

**USFS Ecoregions (2007):** 221Ea:CCP, 221Eb:CCP, 221Ec:CCC, 221Ed:CCC, 221Ee:CCC, 221Ef:CCC, 221Eg:CCC, 221Ha:CPP, 221Hc:CPP, 221He:CP?, 221Ja:CCC, 223E:CC, 223F:CC, 231Ab:CCC, 231Ad:CCC, M221Aa:CCP, M221Ab:CCC, M221Bb:CCC, M221Bd:CCC, M221Be:CCC, M221Cb:CCC, M221Cc:CCC, M221Cd:CCC, M221Ce:CCP, M221Da:CCC, M221Db:CCC, M221Dc:CCC, M221Dd:CCC

**Federal Lands:** BIA (Eastern Band of Cherokee); NPS (Abe Lincoln Birthplace, Appalachian Trail, Blue Ridge Parkway, Bluestone, C&O Canal, Cumberland Gap, Gauley River, Great Smoky Mountains, Harpers Ferry, New River Gorge, Shenandoah); USFS

(Chattahoochee, Cherokee, Daniel Boone, George Washington, Jefferson, Monongahela, Nantahala, Pisgah, Sumter, Sumter Mountains), Wayne)

#### ALLIANCE SOURCES

**References:** Allard 1990, Boufford and Wood 1977, Braun 1950, Chapman 1957, Cooper 1963, Cooper and Hardin 1970, Dellinger 1992, DuMond 1970, Evans et al. 2009, Eyre 1980, Faber-Langendoen et al. 2019b, Fike 1999, Golden 1974, Govus 1982, Greenlee 1974, Malter 1977, McLeod 1988, Newell et al. 1997, Patterson 1994, Rodgers and Shake 1965, Schafale and Weakley 1990, Smith 1991, Thomas 1966, Tobe et al. 1992, Tucker 1973, Weakley et al. 1979, Weakley et al. 1996, Whigham 1969, Whittaker 1956

**Author of Concept:** Faber-Langendoen et al. 2019b

**Author of Description:** M. Pyne, in Faber-Langendoen et al. (2013)

### [CEGL007695] *Aesculus flava* - *Acer saccharum* - (*Tilia americana* var. *heterophylla*) / *Hydrophyllum canadense* - *Solidago flexicaulis* Forest

Translated Name: **Yellow Buckeye - Sugar Maple - (Appalachian Basswood) / Bluntleaf Waterleaf - Zigzag Goldenrod Forest**

Common Name: **Southern Appalachian Rich Cove Forest (Montane Calcareous Type)**

#### USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Interior-Northeastern Mesic Forest (M883)
Group	Appalachian-Central Interior Mesic Forest (G020)
Alliance	<i>Liriodendron tulipifera</i> - <i>Tilia americana</i> var. <i>heterophylla</i> - <i>Aesculus flava</i> Forest Alliance
(A0235)	

#### ELEMENT CONCEPT

**Global Summary:** This association includes forests of protected coves in the southern Appalachian Mountains of eastern Tennessee, western North Carolina, and southwest Virginia. This type extends peripherally into the Cumberland Mountains and Ridge and Valley of southwestern Virginia. These forests are associated with nutrient-rich soils and, often, mafic geologies, and occur on steep, middle to low protected slopes and coves at 610-1400 m (2000-4600 feet) elevation. Examples of this association have deciduous forest canopies dominated by either *Acer saccharum*, *Aesculus flava*, *Fraxinus americana*, *Halesia tetraptera* var. *monticola*, or *Tilia americana* var. *heterophylla*, or by various combinations of these species. Other common canopy species can include *Carya cordiformis* and *Quercus rubra*. A shrub stratum is very sparse or absent, and the herbaceous stratum is dense and luxurious, with high species richness. The defining feature of this association is the lush herbaceous flora with many calciphilic species indicative of high pH or circumneutral soils. Characteristic species include *Asarum canadense*, *Carex plantaginea*, *Cymophyllum fraserianum*, *Cystopteris protrusa*, *Deparia acrostichoides*, *Diplazium pycnocarpon*, *Dryopteris goldieana*, *Hepatica nobilis* var. *acuta*, *Hydrophyllum canadense*, *Osmorhiza claytonii*, *Prosartes lanuginosa*, *Solidago flexicaulis*, and *Viola canadensis*. The herbaceous stratum can have local dominance by *Laportea canadensis*, *Viola canadensis*, *Dryopteris intermedia*, *Actaea podocarpa*, *Actaea racemosa*, and *Caulophyllum thalictroides*. This forest lacks dominance by *Betula alleghaniensis* and *Fagus grandifolia*, and has an herbaceous flora indicative of high-base status soils. This association typically has a much more diverse herbaceous stratum than other deciduous cove forests of the Southern Blue Ridge.

#### ENVIRONMENTAL DESCRIPTION

**Great Smoky Mountains National Park Environment:** This association is found on steep to moderately steep, middle to low protected slopes and coves, on sites with northerly aspects, although it can occur at all aspects. Samples of this community had a mean elevation of 2430 feet, ranging from 2000 to 3960 feet. This community can occur on moist, bouldery situations or over well-developed, but rocky, nutrient-rich soils.

**Global Environment:** In the southern part of its range, this vegetation type occurs on protected, concave landforms, at elevations ranging from 610-1400 m (2000-4600 feet). It is associated with nutrient-rich soils and often with mafic substrates, occurring on steep, middle to lower, protected slopes and in coves. In Virginia, the type is restricted to an elevational range from about 760-1220 m (-2500-4000 feet). Virginia sites supporting this community are on strongly concave, moderately steep (mean = 17°) slopes with north to east aspects. Underlying bedrock includes igneous metamorphic formations in the Blue Ridge, and calcareous shale, calcareous mudstone, and calcareous sandstone in the Ridge and Valley and Cumberland Mountains. Surface cover of bedrock and boulders ranges from 0-35%. Dark, apparently fertile, loamy soils at plot sampling sites are moderately acidic (mean pH = 5.6) but have high levels of calcium, magnesium, manganese, and total base saturation.

#### VEGETATION DESCRIPTION

**Great Smoky Mountains National Park Vegetation:** This forest has a canopy dominated by various combinations of *Acer saccharum*, *Aesculus flava*, *Tilia americana* var. *heterophylla*, *Halesia tetraptera* var. *monticola*, and *Fraxinus americana*. Occasionally *Carya cordiformis* or *Quercus rubra* may have high coverage in the canopy. The subcanopy is dominated by the canopy species, occasionally with high coverage by *Cladrastis kentukea* or *Ostrya virginiana*. The shrub stratum is absent or very sparse, with scattered woody saplings, commonly *Acer saccharum*, *Aesculus flava*, and *Halesia tetraptera* var. *monticola*. The herbaceous stratum is lush and diverse, with dominance varying among occurrences. Herbaceous species that commonly have high coverage include

*Adiantum pedatum*, *Ageratina altissima*, *Asarum canadense*, *Eurybia divaricata* (= *Aster divaricatus*), *Caulophyllum thalictroides*, *Actaea racemosa* (= *Cimicifuga racemosa*), *Cystopteris protrusa*, *Deparia acrostichoides*, *Prosartes lanuginosa* (= *Disporum lanuginosum*), *Dryopteris intermedia*, *Dryopteris marginalis*, *Hydrophyllum canadense*, *Impatiens pallida*, *Laportea canadensis*, *Parthenocissus quinquefolia*, *Polystichum acrostichoides*, *Sedum ternatum*, *Solidago curtisii* (= *Solidago caesia* var. *curtisii*), *Solidago flexicaulis*, *Stellaria pubera*, *Tiarella cordifolia*, and *Viola canadensis*. Additional species with at least 50% constancy include *Arisaema triphyllum* ssp. *triphyllum*, *Galium triflorum*, *Hepatica nobilis* var. *acuta*, *Osmorhiza claytonii*, *Polygonatum pubescens*, *Thalictrum* spp. (e.g., *Thalictrum clavatum*, *Thalictrum dioicum*, *Thalictrum pubescens*, *Thalictrum thalictroides*), *Trillium* spp. (e.g., *Trillium catesbaei*, *Trillium erectum*, *Trillium grandiflorum*, *Trillium rugelii*, *Trillium undulatum*), *Uvularia* spp. (e.g., *Uvularia grandiflora*, *Uvularia perfoliata*), and *Monarda* spp. (e.g., *Monarda clinopodia*, *Monarda didyma*). *Aristolochia macrophylla* is a common vine. Other species found in this association that are indicative of high base-status soils include *Dryopteris goldiana*, *Sanguinaria canadensis*, and *Panax quinquefolius*.

**Global Vegetation:** This association represents forests of medium- to high-elevation protected coves in the southern Appalachian Mountains. Tree canopies are dominated by variable mixtures of *Acer saccharum*, *Aesculus flava*, *Fraxinus americana*, *Halesia tetraptera* var. *monticola*, and *Tilia americana* var. *heterophylla*. In the Great Smoky Mountains of North Carolina and Tennessee, relative dominance of canopy species varies from site to site, with some stands strongly dominated by *Halesia tetraptera* var. *monticola*. Other common canopy species are *Carya cordiformis* and *Quercus rubra*. The shrub layer is very sparse or absent, but the herb layer is dense and luxuriant, with relatively high species richness. A defining feature of this association is the lush herbaceous flora with many calciphilic species indicative of high pH or base-rich soils. Characteristic herbs include *Asarum canadense*, *Carex plantaginea*, *Cymophyllum fraserianus*, *Cystopteris protrusa*, *Deparia acrostichoides*, *Diplazium pycnocarpon*, *Dryopteris goldieana*, *Hepatica nobilis* var. *acuta*, *Hydrophyllum canadense*, *Osmorhiza claytonii*, *Prosartes lanuginosa* (= *Disporum lanuginosum*), *Solidago flexicaulis*, and *Viola canadensis*. The herb layer can also have local dominance by *Laportea canadensis*, *Dryopteris intermedia*, *Actaea podocarpa* (= *Cimicifuga americana*), *Actaea racemosa* (= *Cimicifuga racemosa*), *Ageratina altissima*, and *Caulophyllum thalictroides*. This association typically has a much more diverse herbaceous stratum than other deciduous cove forests of the Southern Blue Ridge. Virginia stands of this association entirely lack *Halesia tetraptera* var. *monticola* and are dominated by *Acer saccharum*, *Tilia americana* var. *heterophylla*, *Fraxinus americana*, and *Aesculus flava*. The most abundant herbs recorded in Virginia plots are *Laportea canadensis*, *Actaea racemosa*, *Caulophyllum thalictroides*, *Impatiens pallida*, *Trillium sulcatum*, *Hydrophyllum canadense*, *Hydrophyllum macrophyllum*, *Viola canadensis*, *Dicentra canadensis*, and *Delphinium tricorne*. Many additional herbs occur at low cover. Species richness in plots south of Virginia ranges from 35-94 taxa (mean = 58) per 1000-m<sup>2</sup> plot (n = 30 plots). Species richness in 13 400-m<sup>2</sup> plots from Virginia ranges from 33-60 taxa (mean = 46).

#### MOST ABUNDANT SPECIES

##### Great Smoky Mountains National Park

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Broad-leaved deciduous tree	<i>Acer saccharum</i> , <i>Aesculus flava</i> , <i>Fraxinus americana</i> , <i>Halesia tetraptera</i> var. <i>monticola</i> , <i>Tilia americana</i> var. <i>heterophylla</i>

##### Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Broad-leaved deciduous tree	<i>Acer saccharum</i> , <i>Aesculus flava</i> , <i>Fraxinus americana</i> , <i>Halesia tetraptera</i> var. <i>monticola</i> , <i>Tilia americana</i> var. <i>heterophylla</i>
Herb (field)	Flowering forb	<i>Asarum canadense</i> , <i>Hydrophyllum canadense</i>
Herb (field)	Fern (Spore-bearing forb)	<i>Asplenium rhizophyllum</i> , <i>Cystopteris</i> sp.

#### CHARACTERISTIC SPECIES

**Great Smoky Mountains National Park:** *Acer saccharum*, *Aesculus flava*, *Aristolochia macrophylla*, *Asarum canadense*, *Carya cordiformis*, *Cladrasia kentukea*, *Cymophyllum fraserianus*, *Deparia acrostichoides*, *Dryopteris goldieana*, *Halesia tetraptera* var. *monticola*, *Hepatica nobilis* var. *acuta*, *Hydrophyllum canadense*, *Laportea canadensis*, *Osmorhiza claytonii*, *Ostrya virginiana*, *Prosartes lanuginosa*, *Solidago flexicaulis*, *Tilia americana* var. *heterophylla*, *Viola canadensis*

**Global:** *Actaea podocarpa*, *Aesculus flava*, *Caulophyllum thalictroides*, *Deparia acrostichoides*, *Diphylleia cymosa*, *Impatiens pallida*, *Phacelia fimbriata*, *Sanicula odorata*, *Stachys cordata*, *Trillium sulcatum*, *Viola pubescens*

#### OTHER NOTEWORTHY SPECIES

**Great Smoky Mountains National Park: Vulnerable Plants:** *Trillium rugelii* (G4, globally vulnerable)

**Global: Vulnerable Plants:** *Aconitum reclinatum* (G3G4), *Ageratina altissima* var. *roanensis* (G5T3T4, Southern Blue Ridge endemic), *Cardamine flagellifera* (G3), *Coreopsis latifolia* (G3), *Phacelia fimbriata* (G4, VA state-rare), *Prenanthes roanensis* (G3, Southern Blue Ridge endemic), *Saxifraga caroliniana* (G3), *Silene ovata* (G3, Southern Blue Ridge endemic), *Trillium simile* (G3); **Other Plants:** *Hepatica nobilis* var. *acuta* (G5T5), *Rudbeckia laciniata* var. *digitata* (G5TNR, (= var. *humilis*)), *Trillium rugelii* (G4)

#### CONSERVATION STATUS RANK

**Global Rank & Reasons:** G3G4 (20-Feb-2010). This community is naturally uncommon within its range due to specific habitat requirements. It only occurs in protected, concave topographic positions over high-base status soils in the Southern Blue Ridge, and adjacent parts of the Ridge and Valley and Cumberland Mountains - all regions with predominantly nutrient-poor (acidic) soils.

Although relatively secure and not highly threatened today, most remaining examples of this community have been affected by past logging, thus much of the remaining acreage is not of high quality.

#### RELATED CONCEPTS

##### Global Similar Types:

- *Acer saccharum* - *Fraxinus americana* - *Tilia americana* - *Liriodendron tulipifera* / *Actaea racemosa* Forest (CEGL006237) is related but a more northern and western type usually dominated strongly by sugar maple; it also occurs at lower elevations and lacks *Aesculus flava*.
- *Aesculus flava* - *Betula alleghaniensis* - *Acer saccharum* / *Caulophyllum thalictroides* - *Actaea podocarpa* Forest (CEGL004973) is a higher-elevation, rich northern hardwood forest that always contains a substantial component of *Betula alleghaniensis* and/or *Fagus grandifolia*.
- *Liriodendron tulipifera* - *Fraxinus americana* - (*Aesculus flava*) / *Actaea racemosa* - *Laportea canadensis* Forest (CEGL007710) is a similar rich cove forest of the same region that occurs at somewhat lower elevations and in less calcareous soils, and has an abundance of *Liriodendron tulipifera* in the overstory.
- *Tilia americana* var. *heterophylla* - *Aesculus flava* - *Acer saccharum* / *Cystopteris bulbifera* - *Asarum canadense* Forest (CEGL006472) is a rich, bouldery forest of low-elevation limestone and dolomite valleys, coves and gorges; contains a substantial component of low-elevation species and obligate calciphiles absent from CEGL007695.

##### Global Related Concepts:

- *Acer saccharum* - *Tilia americana* var. *heterophylla* - *Fraxinus americana* / *Actaea podocarpa* - *Sanicula odorata* - (*Phacelia fimbriata*) Forest (Fleming and Coulling 2001) =
- Mixed Mesophytic Forest (Braun 1950) >
- Open Slope Mesophytic Forest (Rheinhardt and Ware 1984) ?
- Sugar Maple - Basswood: 26 (Eyre 1980) >

#### CLASSIFICATION

**Status:** Standard

**Classification Confidence:** 2 - Moderate

**Great Smoky Mountains National Park Other Comments:** Relative dominance of canopy species varies among examples of this association. Some examples may have canopies strongly dominated by *Halesia tetraptera* var. *monticola*, while others have major canopy dominance by either *Acer saccharum*, *Aesculus flava*, *Tilia americana* var. *heterophylla*, or *Fraxinus americana*. Some examples may have signatures similar to *Aesculus flava* - *Betula alleghaniensis* - *Acer saccharum* / *Acer spicatum* / *Caulophyllum thalictroides* - *Laportea canadensis* Forest (CEGL004973). However, *Aesculus flava* - *Acer saccharum* - (*Fraxinus americana*, *Tilia americana*) / *Hydrophyllum canadense* - *Solidago flexicaulis* Forest (CEGL007695) is distinguished by a characteristic herbaceous flora, by lacking canopy dominance of *Betula alleghaniensis* and *Fagus grandifolia*, and by overall occurring at lower elevations, or on less extreme landforms.

**Global Classification Comments:** This association was originally defined for the richest cove forests in the Great Smoky Mountains and may need revision to apply more generally to similar forests in the Southern Blue Ridge. In the Smokies, relative dominance of canopy species varies among examples of this association. Some examples may have canopies strongly dominated by *Halesia tetraptera* var. *monticola*, while others have major canopy dominance by either *Acer saccharum*, *Aesculus flava*, *Tilia americana* var. *heterophylla*, or *Fraxinus americana*. Deciduous cove forests are perhaps the most complex group of communities to classify in the Southern Blue Ridge, due to a combination of wide environmental range, high species richness, and high biogeographic variability. The recognition of associations based on fertility and elevation is provisional and will likely need further refinement.

In a regional Southern Appalachian classification (1134 plots from Georgia, North Carolina, Tennessee, Virginia) for the Appalachian Trail project (Fleming and Patterson 2009a), 40 plots were classified as this association. Soils collected from these plots are generally strongly or moderately acidic (perhaps influenced by slow organic matter decomposition), but have high calcium and magnesium concentrations consistent with weathering from mafic and other base-rich rocks. The most constant ( $\geq 70\%$ ) species with mean cover  $< 1\%$  in the 40 analyzed plots are *Acer saccharum*, *Polystichum acrostichoides*, *Laportea canadensis*, *Tilia americana* var. *heterophylla*, *Aesculus flava*, *Caulophyllum thalictroides*, *Fraxinus americana*, *Actaea racemosa*, *Prosartes lanuginosa*, *Viola canadensis*, *Osmorhiza claytonii*, *Dryopteris marginalis*, *Dryopteris intermedia*, *Hydrophyllum canadense*, *Impatiens pallida*, and *Carya cordiformis*. The most diagnostic species (relative to similar types) are *Hydrophyllum canadense*, *Caulophyllum thalictroides*, *Laportea canadensis*, *Viola canadensis* var. *canadensis*, *Astilbe biternata*, *Tilia americana* var. *heterophylla*, *Solidago flexicaulis*, and *Aesculus flava*. In both the Appalachian Trail analysis and a subsequent 1300-plot analysis of all Virginia montane upland forest and woodland vegetation (Fleming and Patterson 2009b), this type was clearly distinct from a group representing *Liriodendron tulipifera* - *Fraxinus americana* - (*Aesculus flava*) / *Actaea racemosa* - *Laportea canadensis* Forest (CEGL007710), a somewhat lower-elevation rich cove forest with abundant *Liriodendron tulipifera*. The latter is infrequent and rarely attains significant cover in this association (CEGL007695), which can be generally characterized as a "sugar maple-buckeye-basswood" forest.

#### ELEMENT DISTRIBUTION

**Great Smoky Mountains National Park Range:** This community was sampled on the Mount Le Conte, Cades Cove, and Kinzel Springs quadrangles. Additional historic samples are from the Calderwood quadrangle (2780 feet elevation). On the Cades Cove quadrangle, historic and recent samples of this community ranged from 2880 to 3960 feet elevation. Samples from the southern portion of the Cades Cove quadrangle came from an east-facing cove of lower Gregory Ridge; protected upper slopes of the Gregory

Ridge Trail; lower slopes above Forge Creek; and protected slopes north of Ekaneetlee Gap. In the western portion of the quadrangle, this community was sampled on the north slope of Pine Ridge. In the northern portion of the Cades Cove quadrangle, this community was sampled from a cove above Bunting Branch, north of Coon Butt; from a cove below the north side of Coon Butt; and from upper Fanny Branch. An additional sample of this community was taken from the southern portion of the Kinzel quadrangle, in a cove along Scotts Mountain Trail. Samples from the Mount Le Conte quadrangle ranged from 2508 to 3890 feet elevation. In the central and eastern portion of the Mount Le Conte quadrangle, this community was sampled from a cove below Rocky Spur; from broad, protected slopes below Rainbow Falls; west of Porters Flat on middle cove slopes above Long Branch; and on the west slope above Porters Creek. In the southwestern portion of the Mount Le Conte quadrangle, this community was sampled on a southwest-facing cove above Highway 441 in the vicinity of Fort Harry; on a slope east and south of Balsam Point; from a low cove above the west prong of the Pigeon River; on a cove northwest of Bullhead; and on a low slope/cove above Le Conte Creek, north of Bullhead. Additional examples of this community were found in the western portion of the quadrangle in a cove north of Mt. Winnesoka, and on the north slopes of Piney Mountain, above Cherokee Orchard Road.

**Global Range:** This association occurs in the southern Appalachian Mountains of eastern Tennessee, western North Carolina and southwestern Virginia. It likely ranges into the Blue Ridge of Georgia and extends peripherally into Virginia's Cumberland Mountains and Ridge and Valley.

**Nations:** US

**States/Provinces:** AL:S2, GA, NC, TN, VA:S3

**TNC Ecoregions:** 50:C, 51:C, 59:C

**USFS Ecoregions (1994/95):** 221Ja:CCC, M221Aa:CCC, M221Bd:C??, M221Cc:CC?, M221Ce:CCC, M221Dc:CCC, M221Dd:CCC

**USFS Ecoregions (2007):** 221Ja:CCC, M221Aa:CCP, M221Bd:C??, M221Cc:CC?, M221Ce:CCP, M221Dc:CCC, M221Dd:CCC

**Federal Lands:** BIA (Eastern Band of Cherokee); NPS (Appalachian Trail [Central Appalachians], Appalachian Trail [Southern Blue Ridge], Blue Ridge Parkway, Great Smoky Mountains); USFS (Chattahoochee, Cherokee, Jefferson, Nantahala, Pisgah)

#### ELEMENT SOURCES

**Great Smoky Mountains National Park Plots:** GRSM.2, GRSM.3, GRSM.15, GRSM.19, GRSM.27, GRSM.50, GRSM.83, GRSM.101, GRSM.133, GRSM.134, GRSM.138, GRSM.149, GRSM.207, GRSM.225, GRSM.236, GRSM.246.

**Great Smoky Mountains National Park Description Author(s):** K.D. Patterson

**Global Description Author(s):** G. Fleming and P. Coulling

**References:** ALNHP unpubl. data 2018, Braun 1950, Eyre 1980, Fleming and Coulling 2001, Fleming and Patterson 2009a, Fleming and Patterson 2009b, Fleming et al. 2017, GNHP unpubl. data 2018, NatureServe Ecology - Southeastern U.S. unpubl. data, Patterson et al. 1999, Peet et al. unpubl. data, Rheinhardt and Ware 1984, Schafale 2012, Schafale and Weakley 1990, Southeastern Ecology Working Group n.d.

### [CEGL007710] *Liriodendron tulipifera* - *Fraxinus americana* - (*Aesculus flava*) / *Actaea racemosa* - *Laportea canadensis* Forest

Translated Name: Tuliptree - White Ash - (Yellow Buckeye) / Black Baneberry - Canadian Woodnettle Forest

Common Name: Southern Appalachian Rich Cove Forest (Typic Type)

#### USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Interior-Northeastern Mesic Forest (M883)
Group	Appalachian-Central Interior Mesic Forest (G020)
Alliance	<i>Liriodendron tulipifera</i> - <i>Tilia americana</i> var. <i>heterophylla</i> - <i>Aesculus flava</i> Forest Alliance
(A0235)	

#### ELEMENT CONCEPT

**Global Summary:** This association represents deciduous forests of concave lower slopes and flats at middle elevations (610-1370 m [2000-4500 feet]) in the Southern Blue Ridge and at low to middle elevations (200-915 m [650-3000 feet]) in the Northern Blue Ridge and adjacent Ridge and Valley. The canopy is dominated by some mixture of rich-site mesophytic species such as *Fraxinus americana*, *Tilia americana* var. *heterophylla*, *Aesculus flava*, and *Magnolia acuminata*, occurring with more widely tolerant tree species such as *Liriodendron tulipifera*, *Acer rubrum*, *Tsuga canadensis*, and *Betula lenta*. In stands that have been impacted by the last cycle of industrial logging (70-80 years BP), *Liriodendron tulipifera* may dominate. The herbaceous stratum is diverse and often very lush. Typical herbaceous species include *Actaea racemosa*, *Caulophyllum thalictroides*, *Prosartes lanuginosa*, *Aruncus dioicus*, *Adiantum pedatum*, *Collinsonia canadensis*, *Osmorhiza claytonii*, and *Laportea canadensis*. This association is distinguished by the absence or scarcity of calciphilic species, such as *Diplazium pycnocarpon*, *Asplenium rhizophyllum*, *Dryopteris goldieana*, *Aquilegia canadensis*, *Solidago flexicaulis*, *Deparia acrostichoides*, and *Cystopteris protrusa*, by generally occurring at elevations above 610 m (2000 feet) (200 m at the northern end of the range), and by lacking species typical of lower elevation forests.

#### ENVIRONMENTAL DESCRIPTION

**Great Smoky Mountains National Park Environment:** This forest was found in low, protected topographic positions, often near small streams, on gentle to moderate slopes with northerly aspects. Samples of this community had a mean elevation of 2500 feet,

ranging from 1440 to 3740 feet. Perhaps because of the generally more accessible locations of these forests, many of the sites were logged in the past.

**Global Environment:** This association is characteristic of concave lower slopes and flats at middle elevations (610-1370 m [2000-4500 feet]) in the Southern Blue Ridge and at low to middle elevations (200-915 m [650-3000 feet]) in the Northern Blue Ridge and adjacent Ridge and Valley. At the northern end of the range in Virginia, maximum elevation decreases from about 760 m (2500 feet) in the Southern Blue Ridge to as low as 200 m (650 feet) at the extreme north end of the Blue Ridge in Clarke and Loudoun counties. In Virginia, stands occupy mesic sites underlain by base-rich substrates, including metabasalt (greenstone), pyroxene-bearing granites, amphibolite, calcareous sandstone, siltstone, shale, limestone, and dolomite. These sites are mostly situated on moderately steep (mean slope = 17°), straight or concave slopes with east to northeast aspects. Soils are deep, dark and fertile, with moderately high mean calcium and magnesium levels.

#### VEGETATION DESCRIPTION

**Great Smoky Mountains National Park Vegetation:** The canopy of this forest is dominated by various mixtures of *Liriodendron tulipifera*, *Halesia tetraptera* var. *monticola*, *Tilia americana* var. *heterophylla*, *Acer rubrum*, and *Fraxinus americana*. Other species that occasionally have high canopy coverage include *Acer saccharum*, *Aesculus flava*, *Betula lenta*, and *Tsuga canadensis*. If a subcanopy is present it has species from the canopy and often *Cornus florida*. The shrub stratum is sparse to moderate and is often composed of saplings of canopy species, but composition varies from site to site. Some of the more common shrub species include *Acer pensylvanicum*, *Calycanthus floridus*, and *Rhododendron maximum*. The herbaceous stratum has sparse to moderate coverage but is always diverse and contains a mix of species characteristic of high base-status soils occurring with those more typical of acidic forests. Dominance is variable among occurrences and may relate to varying levels of disturbance. Species that most often have moderate to high coverages include *Adiantum pedatum*, *Ageratina altissima*, *Amphicarpaea bracteata*, *Eurybia divaricata* (= *Aster divaricatus*), *Carex* spp. (e.g., *Carex austrocaroliniana*, *Carex digitalis*, *Carex laxiflora* var. *laxiflora*, *Carex pensylvanica*, *Carex plantaginea*, *Carex virescens*), *Caulophyllum thalictroides*, *Actaea podocarpa* (= *Cimicifuga americana*), *Collinsonia canadensis*, *Dryopteris intermedia*, *Galium triflorum*, *Laportea canadensis*, *Maianthemum racemosum* ssp. *racemosum*, *Mitchella repens*, *Osmorhiza claytonii*, *Polystichum acrostichoides* var. *acrostichoides*, *Solidago curtisii* (= *Solidago caesia* var. *curtisii*), *Stellaria pubera*, *Thelypteris noveboracensis*, *Tiarella cordifolia*, and *Viola* spp. (e.g., *Viola blanda*, *Viola canadensis*, *Viola cucullata*, *Viola hastata*, *Viola pubescens*, *Viola rotundifolia*). Other species commonly found include *Arisaema triphyllum*, *Arisaema triphyllum* ssp. *triphyllum*, *Botrychium virginianum*, *Deparia acrostichoides*, *Dioscorea quaternata*, *Prosartes lanuginosa* (= *Disporum lanuginosum*), *Panax quinquefolius*, *Parthenocissus quinquefolia*, *Phegopteris hexagonoptera*, *Sanguinaria canadensis*, *Sanicula canadensis*, *Thalictrum thalictroides*, and *Uvularia perfoliata*. Common vines include *Aristolochia macrophylla*, *Smilax rotundifolia*, and *Vitis aestivalis*. Particularly on disturbed sites, *Vitis aestivalis* can have high coverage.

**Global Vegetation:** In the heart of its Southern Blue Ridge range, canopies of this community are dominated by variable mixtures of nutrient-demanding mesophytic species such as *Fraxinus americana*, *Tilia americana* var. *heterophylla*, and *Aesculus flava*, in association with more wide-ranging tree species such as *Liriodendron tulipifera*, *Acer rubrum*, *Tsuga canadensis*, and *Betula lenta*. Herb layers are diverse and often very lush. Typical herbaceous species include *Actaea racemosa* (= *Cimicifuga racemosa*), *Caulophyllum thalictroides*, *Arunco dioicus*, *Adiantum pedatum*, *Collinsonia canadensis*, *Laportea canadensis*, *Osmorhiza claytonii*, and *Prosartes lanuginosa* (= *Disporum lanuginosum*). In the Southern Blue Ridge, this association is distinguished by the scarcity of calciphilic species such as *Diplazium pycnocarpon*, *Asplenium rhizophyllum*, *Dryopteris goldieana*, *Aquilegia canadensis*, *Solidago flexicaulis*, *Deparia acrostichoides*, and *Cystopteris protrusa*; by generally occurring at elevations above 610 m (2000 feet); and by lacking species typical of lower elevation forests. Virginia examples are similar but lack *Aesculus flava* in areas north of the James River. *Liriodendron tulipifera*, *Fraxinus americana*, *Tilia americana* (both var. *heterophylla* and var. *americana*), and *Quercus rubra* are the most important canopy species. *Acer saccharum*, *Betula lenta*, *Carya glabra*, and *Carya cordiformis* are minor canopy associates. *Ulmus rubra* is a constant understory tree that occasionally reaches the overstory. Most occurrences have a patchy to moderately dense shrub layer dominated by *Lindera benzoin* (10-25% mean cover in 51 plots). The herbaceous flora is lush and forb-rich, at least early in the growing season. The most characteristic herbs in Virginia plot samples are *Actaea racemosa*, *Arisaema triphyllum*, *Circaea lutetiana* ssp. *canadensis*, *Sanguinaria canadensis*, *Stellaria pubera*, *Osmorhiza claytonii*, *Amphicarpaea bracteata*, *Adiantum pedatum*, *Asarum canadense*, *Galearis spectabilis*, *Ageratina altissima* var. *altissima*, *Laportea canadensis*, and *Trillium grandiflorum*. Species richness of 51 Virginia plots ranges from 29 to 98 taxa per 400 m<sup>2</sup> (mean = 60).

**Global Dynamics:** The contemporary abundance of *Liriodendron tulipifera* in this association no doubt reflects the influence of past logging. However, it is likely that *Liriodendron* has always been a component of this vegetation, capable of maintaining a position in these mixed forests because of its rapid growth and superior ability to colonize light gaps caused by downfalls (Fowells 1965, Busing 1995). An abundance of *Acer saccharum* in the understory of some stands of this type also suggests that their composition is a temporary (though long-lasting) seral phase following extensive disturbances which favored *Liriodendron tulipifera*.

#### MOST ABUNDANT SPECIES

##### Great Smoky Mountains National Park

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Broad-leaved deciduous tree	<i>Acer rubrum</i> , <i>Fraxinus americana</i> , <i>Halesia tetraptera</i> var. <i>monticola</i> , <i>Liriodendron tulipifera</i> , <i>Tilia americana</i> var. <i>heterophylla</i>

**Global****Stratum**Tree canopy  
Tree canopy**Lifeform**Needle-leaved tree  
Broad-leaved deciduous tree  
Broad-leaved deciduous tree  
Broad-leaved deciduous shrub**Species***Tsuga canadensis*  
*Acer rubrum*, *Aesculus flava*, *Betula lenta*, *Fraxinus americana*,  
*Liriodendron tulipifera*, *Tilia americana* var. *heterophylla*  
*Ulmus rubra*  
*Lindera benzoin***CHARACTERISTIC SPECIES****Great Smoky Mountains National Park:** *Actaea racemosa*, *Carya cordiformis*, *Collinsonia canadensis*, *Deparia acrostichoides*, *Fraxinus americana*, *Halesia tetraptera* var. *monticola*, *Hepatica nobilis* var. *acuta*, *Hydrophyllum canadense*, *Laportea canadensis*, *Lindera benzoin*, *Liriodendron tulipifera*, *Osmorhiza claytonii*, *Panax quinquefolius*, *Polystichum acrostichoides*, *Prosartes lanuginosa*, *Thelypteris noveboracensis*, *Tilia americana* var. *heterophylla*, *Viola canadensis***Global:** *Actaea racemosa*, *Adiantum pedatum*, *Ageratina altissima* var. *altissima*, *Amphicarpaea bracteata*, *Arisaema triphyllum*, *Asarum canadense*, *Circaea lutetiana* ssp. *canadensis*, *Fraxinus americana*, *Galearis spectabilis*, *Laportea canadensis*, *Osmorhiza claytonii*, *Sanguinaria canadensis*, *Tilia americana* var. *heterophylla***OTHER NOTEWORTHY SPECIES****Great Smoky Mountains National Park: Vulnerable Plants:** *Actaea racemosa* (G3G4), *Panax quinquefolius* (G3G4)**Global: Vulnerable Plants:** *Aconitum reclinatum* (G3G4), *Actaea racemosa* (G3G4), *Ageratina altissima* var. *roanensis* (G5T3T4, Southern Blue Ridge endemic), *Cardamine flagellifera* (G3), *Carex ruthii* (G3G4), *Euphorbia purpurea* (G3, Southern Blue Ridge endemic), *Panax quinquefolius* (G3G4, under collection pressure), *Stachys clingmanii* (G2), *Tsuga caroliniana* (G2G3); **Other Plants:** *Stellaria pubera* (G5), *Trillium grandiflorum* (G5), *Trillium rugelii* (G4)**CONSERVATION STATUS RANK****Global Rank & Reasons:** G4 (20-Feb-2010). This community is somewhat uncommon due to specialized habitat requirements, but is fairly widespread throughout the Southern Appalachians and southern part of the Central Appalachians. It is secure throughout its range, but susceptible to impacts by logging due to its location in accessible topographic positions.**RELATED CONCEPTS****Global Similar Types:**

- *Acer saccharum* - *Fraxinus americana* - *Tilia americana* - *Liriodendron tulipifera* / *Actaea racemosa* Forest (CEGL006237) is the principal rich cove forest of the Central Appalachians, particularly in the Ridge and Valley and Allegheny Mountains; usually codominated by *Acer saccharum*.
- *Aesculus flava* - *Acer saccharum* - (*Tilia americana* var. *heterophylla*) / *Hydrophyllum canadense* - *Solidago flexicaulis* Forest (CEGL007695) is a similar rich cove forest of the same region that occurs at somewhat higher elevations and in more calcareous soils, and has an abundance of *Acer saccharum* in the overstory.
- *Betula alleghaniensis* - *Tilia americana* var. *heterophylla* / *Acer spicatum* / *Ribes cynosbati* / *Dryopteris marginalis* Forest (CEGL004982) is an obligate boulderfield forest of the Southern Appalachians.
- *Liriodendron tulipifera* - *Quercus rubra* - *Fraxinus americana* / *Asimina triloba* / *Actaea racemosa* Forest (CEGL006186) occurs at lower elevations and lacks many montane species.
- *Liriodendron tulipifera* - *Tilia americana* var. *heterophylla* - *Aesculus flava* - *Acer saccharum* / (*Magnolia tripetala*) Forest (CEGL005222) has a more western distribution.
- *Quercus rubra* - *Tilia americana* var. *heterophylla* - (*Halesia tetraptera* var. *monticola*) / *Collinsonia canadensis* - *Prosartes lanuginosa* Forest (CEGL007878) is strongly dominated by *Quercus rubra*.
- *Tilia americana* var. *heterophylla* - *Aesculus flava* - *Acer saccharum* / *Cystopteris bulbifera* - *Asarum canadense* Forest (CEGL006472) is a rich, bouldery forest of low-elevation limestone and dolomite valleys, coves, and gorges; contains a substantial component of low-elevation species and obligate calciphiles absent from CEGL007695.
- *Tilia americana* var. *heterophylla* - *Fraxinus americana* / *Sanguinaria canadensis* - (*Aquilegia canadensis*, *Asplenium rhizophyllum*) Forest (CEGL007711)

**Global Related Concepts:**

- *Liriodendron tulipifera* - *Fraxinus americana* - *Tilia americana* / *Lindera benzoin* / *Cimicifuga racemosa* - *Laportea canadensis* Forest (Fleming et al. 2007b) =
- *Liriodendron tulipifera* - *Quercus rubra* - *Magnolia acuminata* / *Cornus florida* Forest (Fleming and Coulling 2001) <
- *Liriodendron tulipifera* - *Tilia americana* - *Fraxinus americana* / *Lindera benzoin* / *Trillium grandiflorum* - *Impatiens pallida* Forest (Fleming and Coulling 2001) =
- Rich Cove Forest (Montane Intermediate Subtype) (Schafale 2012) =
- Yellow-Poplar - White Oak - Northern Red Oak: 59 (Eyre 1980) >

**CLASSIFICATION****Status:** Standard**Classification Confidence:** 2 - Moderate

**Great Smoky Mountains National Park Other Comments:** Some examples described from Great Smoky Mountains National Park may be more closely related to the global concept of *Liriodendron tulipifera* - *Tilia americana* var. *heterophylla* - (*Aesculus flava*) / *Actaea racemosa* Forest (CEGL007291), but because of the range in elevation (mostly above 2000 feet) and compositional variation among examples, they were placed in *Liriodendron tulipifera* - *Aesculus flava* - (*Fraxinus americana*, *Tilia americana* var. *heterophylla*) / *Actaea racemosa* - *Laportea canadensis* Forest (CEGL007710), which has a more general concept. Many examples of this community are disturbed and have canopy coverage of early successional species such as *Liriodendron tulipifera*, *Acer rubrum*, and *Robinia pseudoacacia*, which may tend to make a photosignature similar to *Liriodendron tulipifera* - *Acer rubrum* - *Robinia pseudoacacia* Forest (CEGL007219).

**Global Classification Comments:** Deciduous cove forests are perhaps the most complex group of communities to classify in the Southern Blue Ridge, due to a combination of wide environmental range, high species richness, and high biogeographic variability. The recognition of associations based on fertility and elevation is provisional and will likely need further refinement. This association is distinguished by the absence or scarcity of calciphilic species, such as *Diplazium pycnocarpon*, *Asplenium rhizophyllum*, *Dryopteris goldieana*, *Aquilegia canadensis*, *Solidago flexicaulis*, *Deparia acrostichoides*, and *Cystopteris protrusa*, by generally occurring at elevations above 610 m (2000 feet), and by lacking species typical of lower elevation forests.

In a regional Southern Appalachian analysis (1134 plots from Georgia, North Carolina, Tennessee, and Virginia) for the Appalachian Trail project, 48 plots were classified as this association (Fleming and Patterson 2009a). Compared to the related *Aesculus flava* - *Acer saccharum* - (*Tilia americana* var. *heterophylla*) / *Hydrophyllum canadense* - *Solidago flexicaulis* Forest (CEGL007695), this group has a significantly lower mean elevation (736 m [2415 feet] vs. 994 m [3261 feet] for CEGL007695), and is associated with soils of somewhat lower base status. The most constant (>70%) species with mean cover >1% in the 48 analyzed plots are *Liriodendron tulipifera*, *Fraxinus americana*, *Polystichum acrostichoides*, *Quercus rubra*, *Acer rubrum*, *Actaea racemosa*, *Tilia americana* (both var. *heterophylla* and var. *americana*), and *Amphicarpaea bracteata*. The most diagnostic species (relative to similar types) are *Lindera benzoin*, *Amphicarpaea bracteata*, *Liriodendron tulipifera*, *Actaea racemosa*, *Polystichum acrostichoides*, and *Galearis spectabilis*.

Although lacking *Aesculus flava* north of the James River, this community type is well-represented and seems to have a remarkably consistent composition over nearly the entire length of the Blue Ridge in Virginia. These stands have all recovered from logging in the past, but remain threatened by future timber harvests because of excellent site productivity. Shade-tolerant, invasive exotics, especially *Alliaria petiolata*, pose a serious threat to the integrity of this community's herbaceous flora.

#### ELEMENT DISTRIBUTION

**Great Smoky Mountains National Park Range:** This community is widespread throughout the park in coves. It was sampled on multiple quadrangles throughout the park and most likely exists at least in part on all quadrangles. Historic samples are from the Calderwood (1440-1940 feet elevation) and Thunderhead Mountain (2390-3420 feet elevation) quadrangles. On the Cades Cove quadrangle, historic and recent samples of this community ranged from 1680-3740 feet elevation. Samples from the southern portion of the Cades Cove quadrangle came from the vicinity of Forge Creek in coves along and above the creek, east and north of Gregory Ridge and below Doe Ridge; and from slopes in the lower portion of Gregory Ridge Trail; and on a slope northeast of Birch Springs Gap. In the northeast portion of the quadrangle this community was sampled from a cove at the head of Maynard Creek; a cove above Rowans Creek; a cove along Cork branch, above Rowans Branch; and from a cove below Anthony Ridge. An additional sample of this community was taken from the northwest portion of the Cades Cove quadrangle northeast of Spruce Double on a low slope above Abrams Creek. Only two examples of this community were sampled on the Mount Le Conte quadrangle, and the community is uncommon on this quadrangle. The community was sampled in the central portion of the quadrangle, northwest of Mt. Winnesoka, in a cove near Indian Camp Branch (2935 feet elevation) and in the western portion of the quadrangle, on a steep, low slope above Baskins Creek (1950 feet elevation).

**Global Range:** This association occurs in the southern and central Appalachian Mountains of eastern Tennessee, western North Carolina, South Carolina, northeastern Georgia, and Virginia. It appears to be most frequent on the Blue Ridge proper, with the northernmost occurrence at Harpers Ferry in Loudoun County, Virginia, but ranges into the adjacent Ridge and Valley and extreme northern part of the Cumberland Mountains in Virginia.

**Nations:** US

**States/Provinces:** GA, NC, SC, TN, VA:S4, WV?

**TNC Ecoregions:** 50:C, 51:C, 59:C

**USFS Ecoregions (1994/95):** M221Aa:CCC, M221Ab:CCC, M221Ce:CCC, M221Da:CCC, M221Db:CCC, M221Dc:CCC, M221Dd:CCC

**USFS Ecoregions (2007):** M221Aa:CCP, M221Ab:CCC, M221Ce:CCP, M221Da:CCC, M221Db:CCC, M221Dc:CCC, M221Dd:CCC

**Federal Lands:** BIA (Eastern Band of Cherokee); NPS (Appalachian Trail [Central Appalachians], Appalachian Trail [Southern Blue Ridge], Blue Ridge Parkway, C&O Canal, Great Smoky Mountains, Harpers Ferry, Shenandoah); USFS (Chattahoochee, Chattahoochee (Southern Blue Ridge), Cherokee, George Washington, Jefferson, Nantahala, Pisgah, Sumter, Sumter (Mountains))

#### ELEMENT SOURCES

**Great Smoky Mountains National Park Plots:** GRSM.63, GRSM.87, GRSM.210, GRSM.211, GRSM.221, GRSM.253, GRSM.258, GRSM.259.

**Great Smoky Mountains National Park Description Author(s):** K.D. Patterson

**Global Description Author(s):** G. Fleming, P. Coulling, T. Govus

**References:** Busing 1995, Eyre 1980, Fleming 2002b, Fleming and Coulling 2001, Fleming and Moorhead 2000, Fleming and Patterson 2003, Fleming and Patterson 2009a, Fleming and Patterson 2009b, Fleming and Taverna 2006, Fleming et al. 2007b, Fleming et al. 2017, Fleming pers. comm., Fowells 1965, Major et al. 1999, NatureServe Ecology - Southeastern U.S. unpubl. data, Peet et al. unpubl. data, Schafale 2012, Schafale 2012, Schafale and Weakley 1990, Schafale pers. comm., Southeastern Ecology Working Group n.d., TDNH unpubl. data 2018, WVNHP unpubl. data, Young et al. 2006, Young et al. 2009

**[CEGL007878] *Quercus rubra* - *Tilia americana* var. *heterophylla* - (*Halesia tetraptera* var. *monticola*) / *Collinsonia canadensis* - *Prosartes lanuginosa* Forest**

Translated Name: Northern Red Oak - Appalachian Basswood - (Mountain Silverbell) / Richweed - Yellow Fairybells Forest

Common Name: Southern Appalachian Red Oak Cove Forest

**USNVC CLASSIFICATION**

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Interior-Northeastern Mesic Forest (M883)
Group	Appalachian-Central Interior Mesic Forest (G020)
Alliance	<i>Liriodendron tulipifera</i> - <i>Tilia americana</i> var. <i>heterophylla</i> - <i>Aesculus flava</i> Forest Alliance
(A0235)	

**ELEMENT CONCEPT**

**Global Summary:** This community is a *Quercus rubra*-dominated rich forest of protected steep, rocky slopes at intermediate elevations (mostly 800-1400 m [2600-4600 feet]) in the Southern Appalachians. Its distribution is not completely known, but appears to be concentrated in the southern part of the Southern Blue Ridge, in southwestern North Carolina, eastern Tennessee, and possibly northern Georgia. This forest has a canopy dominated by *Quercus rubra* (25-50% cover) occurring with lesser amounts of *Tilia americana* var. *heterophylla*, *Fraxinus americana*, *Acer saccharum*, *Betula lenta*, and *Carya glabra*. *Halesia tetraptera* var. *monticola* is an important canopy associate over parts of the range, particularly in the Great Smoky Mountains. Other minor canopy and subcanopy trees include *Liriodendron tulipifera*, *Magnolia acuminata*, *Acer pensylvanicum*, *Acer rubrum*, *Aesculus flava*, *Carya cordiformis*, and *Prunus serotina*. The shrub stratum is open, made up of saplings from the canopy and subcanopy, with no clear dominant. Herbs are sparse to moderate in coverage, with relatively high species richness. Herbs with the highest coverages are *Collinsonia canadensis*, *Polystichum acrostichoides*, *Prosartes lanuginosa*, *Actaea racemosa*, *Thelypteris noveboracensis*, and *Impatiens pallida*. Other typical herbs are *Actaea pachypoda*, *Ageratina altissima* var. *roanensis*, *Agrostis* spp., *Arisaema triphyllum*, *Athyrium filix-femina* ssp. *asplenioides*, *Caulophyllum thalictroides*, *Desmodium nudiflorum*, *Dioscorea quaternata*, *Dryopteris marginalis*, *Galium lanceolatum*, *Laportea canadensis*, *Maianthemum racemosum*, *Phegopteris hexagonoptera*, *Polygonatum biflorum*, *Sanguinaria canadensis*, *Smilax herbacea*, *Solidago curtisii*, *Tradescantia subaspera*, and *Viola cucullata*.

**ENVIRONMENTAL DESCRIPTION**

**Great Smoky Mountains National Park Environment:** This community was sampled from protected steep slopes, with most aspects, at elevations ranging from 3250 to 4000 feet. Sites are moist and often rocky.

**Global Environment:** This community is found on protected steep, rocky slopes at intermediate elevations in the Southern Appalachians. The known elevational range is 600-1580 m (2000-5200 feet), but most stands occur between 800 and 1400 m (2600-4600 feet). The type is most commonly associated with middle-slope sites that have moderate to high surficial rock cover, including sideslopes and the upper parts of coves. It is also known from more exposed, rocky, convex upper slopes and ridge spurs. The mean aspect of 35 plots samples is 41° (northeast). Soil samples collected from plots are strongly acidic with notably high organic matter content, but have higher magnesium and calcium levels than most other Southern Appalachian soils. Soil chemistry data suggests that mafic bedrock underlies at least some of the sites occupied by this association.

**VEGETATION DESCRIPTION**

**Great Smoky Mountains National Park Vegetation:** This forest has a canopy dominated by *Quercus rubra* (50-95%) occurring with lesser amounts of *Tilia americana* var. *heterophylla*, *Halesia tetraptera* var. *monticola*, or *Acer saccharum*. Occasionally *Liriodendron tulipifera* will have high canopy coverage. Other minor canopy and subcanopy trees include *Magnolia acuminata*, *Acer pensylvanicum*, *Acer rubrum*, *Aesculus flava*, and *Betula lenta*. The shrub stratum is open, made up of saplings from the canopy and subcanopy, with no clear dominant. Herbs are sparse to moderate in coverage, with relatively high species richness. Herbs with the highest coverages are *Thelypteris noveboracensis* and *Collinsonia canadensis*. Other typical herbs are *Actaea pachypoda*, *Ageratina altissima* var. *roanensis*, *Agrostis* spp., *Arisaema triphyllum*, *Athyrium filix-femina* ssp. *asplenioides*, *Caulophyllum thalictroides*, *Desmodium nudiflorum*, *Dioscorea quaternata*, *Galium lanceolatum*, *Laportea canadensis*, *Maianthemum racemosum*, *Phegopteris hexagonoptera*, *Polygonatum biflorum*, *Polystichum acrostichoides*, *Smilax herbacea*, *Solidago curtisii* (= *Solidago caesia* var. *curtisii*), *Tradescantia subaspera*, and *Viola cucullata*.

**Global Vegetation:** This forest has a canopy dominated by *Quercus rubra* (25-50% cover) occurring with lesser amounts of *Tilia americana* var. *heterophylla*, *Fraxinus americana*, *Acer saccharum*, *Betula lenta*, and *Carya glabra*. *Halesia tetraptera* var. *monticola* is an important canopy associate over parts of the range, particularly in the Great Smoky Mountains. Other minor canopy and subcanopy trees include *Liriodendron tulipifera*, *Magnolia acuminata*, *Acer pensylvanicum*, *Acer rubrum*, *Aesculus flava*, *Carya*

*cordiformis*, and *Prunus serotina*. The shrub stratum is open, made up of saplings from the canopy and subcanopy, with no clear dominant. Herbs are sparse to moderate in cover, with relatively high species richness. Herbs with the highest covers are *Collinsonia canadensis*, *Polystichum acrostichoides*, *Prosartes lanuginosa*, *Actaea racemosa*, *Thelypteris noveboracensis*, and *Impatiens pallida*. Other typical herbs are *Actaea pachypoda*, *Ageratina altissima* var. *roanensis*, *Agrostis* spp., *Arisaema triphyllum*, *Athyrium filix-femina* ssp. *asplenioides*, *Caulophyllum thalictroides*, *Desmodium nudiflorum*, *Dioscorea quaternata*, *Dryopteris marginalis*, *Galium lanceolatum*, *Laportea canadensis*, *Maianthemum racemosum*, *Phegopteris hexagonoptera*, *Polygonatum biflorum*, *Sanguinaria canadensis*, *Smilax herbacea*, *Solidago curtisii* (= *Solidago caesia* var. *curtisii*), *Tradescantia subaspera*, and *Viola cucullata*. Many other herbs occur at low cover and constancy. Mean species richness of 35 plots is 67 taxa per 1000 m<sup>2</sup>.

#### MOST ABUNDANT SPECIES

##### Great Smoky Mountains National Park

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Broad-leaved deciduous tree	<i>Quercus rubra</i> , <i>Tilia americana</i> var. <i>heterophylla</i>
Tree subcanopy	Broad-leaved deciduous tree	<i>Halesia tetraptera</i> var. <i>monticola</i>
Herb (field)	Flowering forb	<i>Collinsonia canadensis</i>
Herb (field)	Fern (Spore-bearing forb)	<i>Thelypteris noveboracensis</i>

##### Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Broad-leaved deciduous tree	<i>Quercus rubra</i>
Herb (field)	Flowering forb	<i>Collinsonia canadensis</i>
Herb (field)	Fern (Spore-bearing forb)	<i>Polystichum acrostichoides</i> , <i>Thelypteris noveboracensis</i>

#### CHARACTERISTIC SPECIES

**Great Smoky Mountains National Park:** *Caulophyllum thalictroides*, *Collinsonia canadensis*, *Halesia tetraptera* var. *monticola*, *Magnolia acuminata*, *Maianthemum racemosum*, *Phegopteris hexagonoptera*, *Prosartes lanuginosa*, *Quercus rubra*, *Sanguinaria canadensis*, *Thelypteris noveboracensis*, *Tilia americana* var. *heterophylla*, *Tradescantia subaspera*

**Global:** *Collinsonia canadensis*, *Prosartes lanuginosa*, *Quercus rubra*, *Tilia americana* var. *heterophylla*

#### OTHER NOTEWORTHY SPECIES

**Global: Vulnerable Plants:** *Stachys clingmanii* (G2); **Other Plants:** *Halesia tetraptera* var. *monticola* (G5T5)

#### CONSERVATION STATUS RANK

**Global Rank & Reasons:** G3? (3-Sep-2002). The conservation status of this community has not yet been fully assessed.

#### RELATED CONCEPTS

##### Global Similar Types:

- *Liriodendron tulipifera* - *Fraxinus americana* - (*Aesculus flava*) / *Actaea racemosa* - *Laportea canadensis* Forest (CEGL007710) is a mesophytic, mixed cove forest with a lush, richer herb layer and lacking a substantial component of *Quercus rubra*.
- *Quercus alba* - *Quercus rubra* - *Quercus montana* / *Collinsonia canadensis* - *Podophyllum peltatum* Forest (CEGL007692) occurs mostly on non-rocky, upper slopes and broad ridgetops and has a substantial component of *Quercus alba*.
- *Quercus rubra* - *Acer saccharum* - *Tilia americana* var. *heterophylla* - *Aesculus flava* - (*Cladrastis kentukea*) Forest (CEGL007698)
- *Quercus rubra* - *Fraxinus americana* - *Acer saccharum* / *Actaea racemosa* - *Caulophyllum thalictroides* Forest (CEGL004256) is a similar Southern Appalachian forest occurring at higher average elevation and only weakly dominated by *Quercus rubra* and with abundant *Acer saccharum*, *Fraxinus americana*, and *Carya* spp.; also contains some higher-elevation species such as *Betula alleghaniensis*, *Ageratina altissima* var. *roanensis*, and *Eurybia chlorolepis*.

##### Global Related Concepts:

- *Quercus rubra* - *Tilia americana* var. *heterophylla* - (*Halesia tetraptera* var. *monticola*) / *Collinsonia canadensis* - *Prosartes lanuginosa* Forest (Fleming and Patterson 2009a) =

#### CLASSIFICATION

**Status:** Standard

**Classification Confidence:** 2 - Moderate

**Great Smoky Mountains National Park Other Comments:** Samples representing this association occur in AIS polygons 29 and 31 on the Cades Cove quadrangle.

**Global Classification Comments:** This association may represent a subset of *Quercus alba* - *Quercus rubra* - *Quercus montana* / *Collinsonia canadensis* - *Podophyllum peltatum* Forest (CEGL007692), Appalachian Montane Oak - Hickory Forest (Rich Type), or may be transitional between it and *Liriodendron tulipifera* - *Fraxinus americana* - (*Aesculus flava*) / *Actaea racemosa* - *Laportea canadensis* Forest (CEGL007710), Southern Appalachian Cove Forest (Typic Montane Type). More regional information is needed to assess the distinctiveness of this type. It is described from a small number of samples from Great Smoky Mountains National Park. In a regional analysis for the Appalachian Trail project and a follow-up comparative analysis with *Quercus alba* - *Quercus rubra* - *Quercus montana* / *Collinsonia canadensis* - *Podophyllum peltatum* Forest (CEGL007692), 35 plots from North Carolina and

Tennessee were classified as this type (Fleming and Patterson 2009a). These analyses demonstrated that this type is distinct from CEG007692 and has a wider distribution on the Southern Blue Ridge than previously documented.

#### ELEMENT DISTRIBUTION

**Great Smoky Mountains National Park Range:** This community was sampled from the Cades Cove and Bunches Bald quadrangles. On the Cades Cove quadrangle, it was sampled from a north-facing slope of Ledbetter Ridge; from a east-facing high slope of Big Abrams Gap; from west-facing upper slopes of Nuna Ridge; a protected draw east of Powell Knob above Ekaneetlah Creek; and a draw southeast of Doe Knob. On the Bunches Bald quadrangle it was sampled just off of the Hyatt Ridge Trail.

**Global Range:** This community is found in the Southern Blue Ridge of Tennessee, North Carolina, and possibly Georgia.

**Nations:** US

**States/Provinces:** GA?, NC, TN

**TNC Ecoregions:** 51:C

**USFS Ecoregions (1994/95):** M221Dc:CCC, M221Dd:CCC

**USFS Ecoregions (2007):** M221Dc:CCC, M221Dd:CCC

**Federal Lands:** BIA (Eastern Band of Cherokee); NPS (Appalachian Trail [Southern Blue Ridge], Blue Ridge Parkway, Great Smoky Mountains); USFS (Nantahala, Pisgah)

#### ELEMENT SOURCES

**Great Smoky Mountains National Park Plots:** GRSM.121, GRSM.252, GRSM.255, GRSM.265, GRSM.266, GRSM.401.

**Great Smoky Mountains National Park Description Author(s):** K.D. Patterson

**Global Description Author(s):** K.D. Patterson and G.P. Fleming

**References:** Fleming and Patterson 2009a, NatureServe Ecology - Southeastern U.S. unpubl. data, Peet et al. unpubl. data, Schafale 2012, Southeastern Ecology Working Group n.d.

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## A3304 *Tsuga canadensis* - *Liriodendron tulipifera* Forest Alliance

Eastern Hemlock - Tuliptree Forest Alliance

*Southern Hemlock - Tuliptree Forest*

#### ALLIANCE CONCEPT

**Summary:** Forests in this alliance are acidic cove forests dominated by *Tsuga canadensis*, occurring with various hardwood species of mesic forests, including *Betula lenta*, *Fagus grandifolia*, *Fraxinus americana*, *Halesia tetraptera*, *Liriodendron tulipifera*, *Magnolia acuminata*, *Quercus rubra*, and *Tilia americana* var. *heterophylla*, and others. Common shrubs are *Kalmia latifolia*, *Leucothoe fontanesiana*, and *Rhododendron maximum*. Herbaceous cover is typically sparse and includes acid-loving species such as *Galax urceolata*, *Goodyera pubescens*, *Hexastylis* sp., *Polystichum acrostichoides*, *Thelypteris noveboracensis*, and *Tiarella cordifolia*. They are found primarily in the Southern Blue Ridge, but also ranging into widely scattered areas of the Interior Low Plateau and Cumberlands, where stands containing *Tsuga canadensis* may be notably disjunct from its main range in the north. These forests occur in deep coves, moist flats, and ravines but are occasionally found along larger stream bottoms, typically at elevations below 1068 m (3500 feet).

**Classification Comments:** Most associations included here are mesic uplands. A few have been placed in "temporarily flooded" but the degree of actual flooding involved here is questionable. This hydrologic or landform variation may be regarded as loosely defining two suballiances. Description is most strongly based on the old alliance *Tsuga canadensis* - *Liriodendron tulipifera* Forest Alliance (A.413).

#### Similar Alliances:

- *Acer saccharum* - *Carya cordiformis* - *Fraxinus americana* Ozark-Ouachita Forest Alliance (A3260)
- *Fagus grandifolia* - *Liriodendron tulipifera* - *Carya cordiformis* Forest Alliance (A2033)
- *Fagus grandifolia* - *Quercus rubra* Piedmont-Ridge and Valley Forest Alliance (A3265)
- *Liriodendron tulipifera* - *Tilia americana* var. *heterophylla* - *Aesculus flava* Forest Alliance (A0235)

**Diagnostic Characteristics:** Codominance by *Tsuga canadensis* is characteristic, within the alliance's range in the Southern Appalachians and adjacent ecoregions to the south.

#### Related Concepts:

- *Pinus* - *Tsuga* (Morey 1936) ?
- beech-hemlock association (Morey 1936) ?

#### ALLIANCE DESCRIPTION

**Environment:** These habitats are generally known as acidic cove forests. Stands are primarily found in deep coves, moist flats, and ravines but are occasionally found along larger stream bottoms, typically at elevations below 1068 m (3500 feet). The moister associations placed here are found along montane streams and terraces in the Southern Appalachians and Cumberland Mountains of the southeastern United States. Soils are generally acidic, nutrient-poor, and usually moderately well-drained such as sandy loams.

**Vegetation:** Forests in this alliance are dominated by *Tsuga canadensis*, occurring with various hardwood species of mesic forests, including *Betula lenta*, *Fagus grandifolia*, *Fraxinus americana*, *Halesia tetraptera*, *Liriodendron tulipifera*, *Magnolia acuminata*, *Quercus rubra*, and *Tilia americana* var. *heterophylla*, and others. Common shrubs are *Kalmia latifolia*, *Leucothoe fontanesiana*, and

*Rhododendron maximum*. Herbaceous cover is typically sparse and includes acid-loving species such as *Chimaphila maculata*, *Galax urceolata*, *Goodyera pubescens*, *Hexastylis* sp., *Mitchella repens*, *Polystichum acrostichoides*, *Thelypteris noveboracensis*, *Tiarella cordifolia*, and *Viola blanda*. Moister examples, found along montane streams and terraces, are dominated by *Tsuga canadensis* or codominated by *Tsuga canadensis* and *Pinus strobus*. These forests often have dense ericaceous shrub layers dominated by *Rhododendron maximum* and/or *Leucothoe fontanesiana*.

**Physiognomy and Structure:** These are closed-canopy acidic cove forests and other related mesic to moist forests with moderately closed shrub layers and sparse herbaceous layers.

**Floristics:** Forests in this alliance are dominated by *Tsuga canadensis*, occurring with various hardwood species of mesic forests, including *Betula lenta*, *Fagus grandifolia*, *Fraxinus americana*, *Halesia tetraptera*, *Liriodendron tulipifera*, *Magnolia acuminata*, *Quercus rubra*, and *Tilia americana* var. *heterophylla*, and others. Common shrubs are *Kalmia latifolia*, *Leucothoe fontanesiana*, and *Rhododendron maximum*. Herbaceous cover is typically sparse and includes acid-loving species such as *Chimaphila maculata*, *Galax urceolata*, *Goodyera pubescens*, *Hexastylis* sp., *Mitchella repens*, *Polystichum acrostichoides*, *Thelypteris noveboracensis*, *Tiarella cordifolia*, and *Viola blanda*. Moister examples, found along montane streams and terraces, are dominated by *Tsuga canadensis* or codominated by *Tsuga canadensis* and *Pinus strobus*. These forests often have dense ericaceous shrub layers dominated by *Rhododendron maximum* and/or *Leucothoe fontanesiana*.

**Dynamics:** *Tsuga canadensis* is currently threatened by the hemlock woolly adelgid (*Adelges tsugae*), a sap-sucking bug accidentally introduced from East Asia to the United States in 1924, and first found in the native range of eastern hemlock in the late 1960s. The adelgid has spread very rapidly in southern parts of the range once becoming established, while its expansion northward is much slower. Attempts to save representative examples on both public and private lands are on-going. Virtually all the hemlocks in the southern Appalachian Mountains have seen infestations of the insect, with thousands of hectares of stands dying within since about 2009. A 2009 study conducted by scientists with the U.S. Forest Service Southern Research Station suggests the hemlock woolly adelgid is killing hemlock trees faster than expected in the Southern Appalachians, and rapidly altering the carbon cycle of these forests. According to *Science Daily*, the pest could kill most of the region's hemlock trees by about 2020.

#### ALLIANCE DISTRIBUTION

**Range:** This alliance is found in the Southern Blue Ridge and adjacent ecoregions, ranging into widely scattered areas of the Interior Low Plateau and Cumberlands of Alabama, Indiana, Kentucky, and Tennessee, and north into Pennsylvania and the New Jersey highlands.

**Nations:** US

**Subnations:** AL, GA, IN, KY, MD, NC, NJ, NY, OH, PA, SC, TN, VA, WV

**TNC Ecoregions:** 44:C, 49:C, 50:C, 51:C, 52:C, 59:C

#### ALLIANCE SOURCES

**References:** Allard 1990, Barnes 1991, Brown et al. 1982b, Cooper and Hardin 1970, Coulling 1999, DeYoung 1979, Eyre 1980, Faber-Langendoen et al. 2019b, Fike 1999, Gettman 1974, Golden 1974, Hinkle 1978, Lea 2004, Malter 1977, McLeod 1988, Morey 1936, Nemeth 1973, Newell and Peet 1995, Newell et al. 1997, Patterson 1994, Prentice et al. 1991, Rawinski et al. 1996, Schafale and Weakley 1990, Thomas 1966, Thomas 1989, Tobe et al. 1992, Winstead and Nicely 1976

**Author of Concept:** Faber-Langendoen et al. 2019b

**Author of Description:** M. Pyne, in Faber-Langendoen et al. (2013)

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**[CEGL008558] *Acer rubrum* - *Betula lenta* - *Magnolia fraseri* / (*Rhododendron maximum*, *Kalmia latifolia*)**

#### Ruderal Forest

Translated Name: **Red Maple - Sweet Birch - Mountain Magnolia / (Great Laurel, Mountain Laurel) Ruderal Forest**

Common Name: **Southern Appalachian Ruderal Acidic Mixed Hardwood Forest**

#### USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Interior-Northeastern Mesic Forest (M883)
Group	Appalachian-Central Interior Mesic Forest (G020)
Alliance	<i>Tsuga canadensis</i> - <i>Liriodendron tulipifera</i> Forest Alliance (A3304)

#### ELEMENT CONCEPT

**Global Summary:** This association includes submesic, potentially fire-exposed or heavily logged, mid and upper slopes in the Southern Appalachians north to the Cumberlands. Canopy dominance may be shared by a number of species, including *Acer rubrum* var. *rubrum*, *Carya glabra*, *Magnolia fraseri*, *Halesia tetraptera* var. *monticola*, *Nyssa sylvatica*, *Betula alleghaniensis* var. *alleghaniensis*, *Betula lenta*, *Oxydendrum arboreum*, and *Tsuga canadensis*, but the community's most distinctive character is the relative lack of dominance by any one species and the lack of oak species in the canopy. This community may occasionally be dominated by *Betula lenta* and/or *Betula alleghaniensis* with an extremely dense understory of *Rhododendron maximum*; it may intergrade with acidic cove forests farther downslope. The understory shrub layer is composed of a combination of *Kalmia latifolia* and *Rhododendron maximum*, though the cover is not consistently 100%. The proportion of *Kalmia* to *Rhododendron* varies widely through this association, with more xeric sites having a higher concentration of *Kalmia latifolia* than *Rhododendron maximum*. In addition, drier versions of this association tend to contain abundant *Sassafras albidum* in the understory, whereas the more mesic

versions have lower densities of *Sassafras albidum*. The herb layer is generally sparse but may sometimes be dominated by a dense cover of ferns such as *Dennstaedtia punctilobula* or *Dryopteris marginalis*.

#### ENVIRONMENTAL DESCRIPTION

**Great Smoky Mountains National Park Environment:** Same as global.

**Global Environment:** This is a submesic forest found on moderate to steep terrain on upper slopes of many different aspects and positions in the Great Smoky Mountains National Park area at 760 to 1440 m (2500-4600 feet) in elevation and extending up the Blue Ridge into southern Virginia at the same altitude. Although tree sizes can be very large, this community is usually a late-successional community that developed in mid-elevation areas that were historically dominated by *Castanea dentata*. As the *Castanea dentata* senesced and logging proceeded in remote sections of the park, the tree species now seen in the canopy began to be released from the understory to the canopy. This may explain why the community is so variable in its slope position, moisture regime, and elevation. The areas were probably historically fire-exposed sites before the suppression of landscape-scale fires. Soils are usually very deep.

#### VEGETATION DESCRIPTION

**Great Smoky Mountains National Park Vegetation:** Same as global.

**Global Vegetation:** The canopy of this association is typically shared by a wide range of species including *Acer rubrum* var. *rubrum*, *Betula alleghaniensis* var. *alleghaniensis*, *Betula lenta*, *Magnolia fraseri*, *Oxydendrum arboreum*, *Nyssa sylvatica*, and *Tsuga canadensis*. The understory includes some subcanopy trees such as *Ilex opaca* var. *opaca* or *Ilex montana*, and shrub species such as *Kalmia latifolia* and *Rhododendron maximum* can be very dense. The proportion of *Kalmia* to *Rhododendron* varies widely through this association, with more xeric sites having a higher concentration of *Kalmia latifolia* than *Rhododendron maximum*. In addition, drier versions of this association tend to contain abundant *Sassafras albidum* in the understory, whereas the more mesic versions have lower densities of *Sassafras albidum*. Although the herb layer is comprised mostly of small shrubs, seedlings, and evergreens, *Trillium undulatum*, *Goodyera pubescens*, and other acid-loving species can occasionally be found in this association.

**Global Dynamics:** It is assumed that these communities may have burned in the past. The lack of oak trees in this association is poorly understood. Some examples of this association occur in virgin forest areas, though there are areas where large chestnut stumps are present; these stands may represent a post-chestnut-blight or post-chestnut-blight logging replacement forest. Other stands occur in areas with a previous logging history, and may reflect stands developing after logging.

#### MOST ABUNDANT SPECIES

##### Great Smoky Mountains National Park

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Tsuga canadensis</i>
Tree canopy	Broad-leaved deciduous tree	<i>Acer rubrum</i> var. <i>rubrum</i> , <i>Betula alleghaniensis</i> var. <i>alleghaniensis</i> , <i>Betula lenta</i> , <i>Magnolia fraseri</i> , <i>Nyssa sylvatica</i> , <i>Oxydendrum arboreum</i>
Shrub/sapling (tall & short)	Broad-leaved evergreen tree	<i>Rhododendron maximum</i>
Shrub/sapling (tall & short)	Broad-leaved evergreen shrub	<i>Kalmia latifolia</i>

##### Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Tsuga canadensis</i>
Tree canopy	Broad-leaved deciduous tree	<i>Acer rubrum</i> var. <i>rubrum</i> , <i>Betula alleghaniensis</i> var. <i>alleghaniensis</i> , <i>Betula lenta</i> , <i>Halesia tetraptera</i> var. <i>monticola</i> , <i>Magnolia fraseri</i> , <i>Nyssa sylvatica</i> , <i>Oxydendrum arboreum</i>
Shrub/sapling (tall & short)	Broad-leaved evergreen tree	<i>Rhododendron maximum</i>
Shrub/sapling (tall & short)	Broad-leaved evergreen shrub	<i>Kalmia latifolia</i>

#### CHARACTERISTIC SPECIES

##### Great Smoky Mountains National Park:

**Global:** *Acer rubrum* var. *rubrum*, *Betula alleghaniensis* var. *alleghaniensis*, *Betula lenta*, *Kalmia latifolia*, *Magnolia fraseri*, *Rhododendron maximum*

#### OTHER NOTEWORTHY SPECIES

**Global:**

#### CONSERVATION STATUS RANK

**Global Rank & Reasons:** GNA (ruderal) (9-Oct-2001). Ranked as modified due to the heavy effects logging had on most of these stands over the past 100 years. Stands of this type appear to have been modified by a combination of logging, chestnut death, and fire suppression. These are mature stands in the Great Smoky Mountains National Park.

#### RELATED CONCEPTS

##### Global Similar Types:

- *Betula alleghaniensis* - (*Tsuga canadensis*) / *Rhododendron maximum* / (*Leucothoe fontanesiana*) Forest (CEGL007861) is a more natural association, with a more reliable species composition, sometimes containing *Tsuga canadensis*.

- *Liriodendron tulipifera* - *Betula lenta* - *Tsuga canadensis* / *Rhododendron maximum* Forest (CEGL007543)
- *Quercus* (*montana*, *coccinea*) / *Kalmia latifolia* / (*Galax urceolata*, *Gaultheria procumbens*) Forest (CEGL006271) oak-dominated.
- *Quercus alba* - *Quercus* (*rubra*, *montana*) / *Rhododendron calendulaceum* - (*Gaylussacia ursina*) Forest (CEGL007230)
- *Quercus montana* - (*Quercus rubra*) - *Carya* spp. / *Oxydendrum arboreum* - *Cornus florida* Forest (CEGL007267) oak-dominated.
- *Quercus montana* - *Quercus rubra* / *Rhododendron maximum* / *Galax urceolata* Forest (CEGL006286)

#### CLASSIFICATION

**Status:** Standard

**Classification Confidence:** 3 - Weak

**Global Classification Comments:** None of the communities listed as similar associations are very close to this association in canopy composition, but the understory of all of these associations is similar. Some examples of this community may resemble and even intergrade with acidic cove forest (CEGL007543) but usually occur high up on south- and even some north-facing slopes far from the concave cove areas. This community may begin to pick up species such as *Picea rubens* and *Prunus pensylvanica* at the highest parts of its elevational range in the Southern Appalachians. In the Cumberlands, it definitely can intergrade with acidic coves, and the line between these communities is often hard to draw.

#### ELEMENT DISTRIBUTION

**Great Smoky Mountains National Park Range:** This community exists throughout the park (possibly every quadrangle with the appropriate elevation ranges) but has yet to be found outside of the park.

**Global Range:** This association is documented only from the Great Smoky Mountains National Park and Cumberland Gap National Historical Park, but it may occur throughout the mid- to higher elevation exposed slopes of eastern Tennessee and western North Carolina, and possibly also into adjacent parts of Virginia and West Virginia.

**Nations:** US

**States/Provinces:** KY, NC, TN, VA?

**TNC Ecoregions:** 51:C

**USFS Ecoregions (1994/95):** M221Cc:CCC, M221Ce:CCC, M221Dc:CC?, M221Dd:CCC

**USFS Ecoregions (2007):** M221Cc:CCC, M221Ce:CCP, M221Dc:CC?, M221Dd:CCC

**Federal Lands:** BIA (Eastern Band of Cherokee); NPS (Appalachian Trail [Southern Blue Ridge], Blue Ridge Parkway, Cumberland Gap, Great Smoky Mountains); USFS (Pisgah)

#### ELEMENT SOURCES

**Great Smoky Mountains National Park Plots:** GRSM.303, GRSM.304, GRSM.313, GRSM.323, GRSM.324, GRSM.505, GRSM.529.

**Great Smoky Mountains National Park Description Author(s):** R. White

**Global Description Author(s):** R. White

**References:** NatureServe Ecology - Southeastern U.S. unpubl. data, Southeastern Ecology Working Group n.d., White 2006

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#### [CEGL007543] *Liriodendron tulipifera* - *Betula lenta* - *Tsuga canadensis* / *Rhododendron maximum* Forest

Translated Name: Tuliptree - Sweet Birch - Eastern Hemlock / Great Laurel Forest

Common Name: Southern Appalachian Acidic Cove Forest (Typic Type)

#### USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Interior-Northeastern Mesic Forest (M883)
Group	Appalachian-Central Interior Mesic Forest (G020)
Alliance	<i>Tsuga canadensis</i> - <i>Liriodendron tulipifera</i> Forest Alliance (A3304)

#### ELEMENT CONCEPT

**Global Summary:** This association includes hemlock-hardwood forests and acidic cove forests of lower to intermediate elevations in the Southern Blue Ridge, upper Piedmont, Cumberlands, and adjacent areas, ranging from southwestern Virginia and southern West Virginia, south and west to northwestern Georgia. The concept for this association is intended to be broad and cover both mixed stands of evergreen and deciduous hardwoods as well as stands dominated exclusively by deciduous trees in mesic, acidic environments. These communities occur at low to middle elevations (200-1060 m [650-3500 feet]), generally in coves, gorges or sheltered slopes, over acidic soils. The canopy is usually dominated by *Liriodendron tulipifera* or *Betula lenta* mixed with *Tsuga canadensis*, but substantial portions may be comprised mainly of *Tsuga canadensis* and the occasional *Acer rubrum*, while other sites may have little or no *Tsuga* in the canopy. Other deciduous species more typical of "rich" coves may occur as scattered individuals, including *Tilia americana* var. *heterophylla*, *Acer saccharum*, *Fraxinus americana*, and *Fagus grandifolia*. Other canopy/subcanopy species often include *Quercus alba*, *Quercus rubra*, *Magnolia fraseri*, and *Pinus strobus*. *Rhododendron maximum* is usually dominant in the shrub stratum, often forming impenetrable thickets. South of Virginia, woody associates may also include *Ilex opaca* var. *opaca*, *Calycanthus floridus*, *Halesia tetraptera* var. *tetraptera*, and *Leucothoe fontanesiana*. Herbaceous cover is sparse but can be diverse and is composed of acid-loving species. Typical herbs include *Polystichum acrostichoides*, *Dryopteris intermedia*,

*Dennstaedtia punctilobula*, *Goodyera pubescens*, *Mitchella repens*, *Thelypteris noveboracensis*, *Galax urceolata*, *Viola rotundifolia*, and *Tiarella cordifolia*.

#### ENVIRONMENTAL DESCRIPTION

**Great Smoky Mountains National Park Environment:** This community was sampled on low slopes and flats, mostly below 3000 feet elevation. This forest is often associated with streams but is not a wetland. This community is best developed at the bottom of well-protected coves in areas with especially acidic soils, but it can range well up the slope in protected mesic situations.

**Global Environment:** This association is typically found at lower to intermediate elevations (200-1060 m [650-3500 feet]) in the Southern Appalachians and adjacent foothills as well as nearby plateau/gorge systems in West Virginia. Habitats are mesic and located on gentle to steep, lower slopes along creeks in ravines, in coves or gorges, and in concave positions on protected slopes with cool aspects and acidic soils. In situations where midslopes are in protected north-facing positions, this community can range very high up straight or even convex slopes. The type often occurs in linear patches along stream bottoms and in steep ravines in complexes with rich cove communities. Although frequently associated with streams, it is not a wetland. Soils collected from plots are extremely acidic (mean pH = 4.0) and infertile, with high iron and aluminum levels and very low total base saturation. Where present, they are usually well-drained sandy loam, silt loam, loam, clay loam, or clay. The degree of soil development is highly variable. Some stands have relatively deep colluvial or residual soils, while others have a substrate of deeply piled boulders with sparse interstitial, organic soils.

#### VEGETATION DESCRIPTION

**Great Smoky Mountains National Park Vegetation:** The canopy of this forests can be dominated by *Tsuga canadensis*, *Liriodendron tulipifera*, *Betula lenta*, *Acer rubrum*, or a combination of them all. Other deciduous species that will occasionally have high coverage in the canopy or subcanopy include *Betula alleghaniensis*, *Tilia americana* var. *heterophylla*, and *Fagus grandifolia*. Other canopy/subcanopy species can include *Magnolia fraseri*, *Ilex opaca*, *Cornus florida*, *Halesia tetraptera*, *Oxydendrum arboreum*, and *Pinus strobus*. *Rhododendron maximum* is scattered to dominant in the shrub stratum and is the most consistent character separating this from other communities. Other typical shrubs include *Euonymus americanus*, *Ilex opaca*, and *Leucothoe fontanesiana*. Herbaceous cover is sparse. Typical herbs include *Mitchella repens* and *Polystichum acrostichoides*.

In some cases at the upper elevations of this community, the example may contain only *Betula alleghaniensis* and *Betula lenta* in the canopy. These cases are distinct enough to warrant mention but probably are not distinct enough to allow for a new association.

**Global Vegetation:** This association encompasses hemlock-hardwood forests and acidic cove forests with canopies dominated by mixtures of *Tsuga canadensis*, *Liriodendron tulipifera*, *Betula lenta*, *Quercus rubra*, and *Acer rubrum*. The concept for this association is intended to be broad and cover both mixed stands of evergreen and deciduous hardwoods as well as stands dominated exclusively by deciduous trees. Presumably because of past logging, *Tsuga canadensis* is absent or confined to the understory in some stands, which have mixed canopies of *Liriodendron tulipifera*, *Betula lenta*, *Acer rubrum*, *Magnolia acuminata*, *Quercus rubra*, and/or *Nyssa sylvatica*. Other deciduous species more typical of fertile coves, including *Tilia americana* var. *heterophylla*, *Acer saccharum*, *Fraxinus americana*, and *Fagus grandifolia*, may occur as scattered individuals. Minor overstory and understory species include *Quercus alba*, *Quercus montana* (= *Quercus prinus*), *Magnolia fraseri*, *Magnolia tripetala*, *Oxydendrum arboreum*, *Prunus serotina*, and *Pinus strobus*. *Rhododendron maximum* is scattered to dominant in the shrub stratum often forming nearly impenetrable colonies. *Kalmia latifolia* is also a typical, but less abundant, shrub. In the southern portion of this type's range, *Calycanthus floridus*, *Halesia tetraptera*, and *Leucothoe fontanesiana* may be common; these are lacking in Virginia and West Virginia occurrences, where *Hamamelis virginiana* and *Acer pensylvanicum* may be minor associates. Herbaceous cover is sparse but can be diverse and is composed of acid-loving species. Frequent low-cover species of this layer include *Arisaema triphyllum*, *Chimaphila maculata*, *Dioscorea quaternata*, *Dryopteris intermedia*, *Dryopteris marginalis*, *Eurybia divaricata* (= *Aster divaricatus*), *Galax urceolata*, *Gaultheria procumbens*, *Goodyera pubescens*, *Hexastylis* spp., *Luzula echinata*, *Monotropa uniflora*, *Medeola virginiana*, *Mitchella repens*, *Polypodium virginianum*, *Polystichum acrostichoides*, *Thelypteris noveboracensis*, *Tiarella cordifolia*, *Viola blanda*, and *Waldsteinia fragarioides*. The spectacular sedge *Cymophyllus fraserianus* is often associated with this forest. Bryophytes identified in West Virginia plots include *Leucobryum glaucum*, *Thuidium delicatulum*, *Hypnum imponens*, *Bazzania trilobata*, *Dicranum scoparium*, *Dicranum fulvum*, *Brotherella recurvans*, and *Polytrichum pallidisetum*.

**Global Dynamics:** In Virginia, the hemlock component of many stands has been devastated by outbreaks of hemlock woolly adelgid, resulting in extensive damage and mortality to the mature overstory trees.

#### MOST ABUNDANT SPECIES

##### Great Smoky Mountains National Park

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Tsuga canadensis</i>
Tree canopy	Broad-leaved deciduous tree	<i>Betula lenta</i> , <i>Liriodendron tulipifera</i>
Tall shrub/sapling	Broad-leaved evergreen tree	<i>Rhododendron maximum</i>

##### Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Tsuga canadensis</i>
Tree canopy	Broad-leaved deciduous tree	<i>Acer rubrum</i> , <i>Betula lenta</i> , <i>Liriodendron tulipifera</i>
Tall shrub/sapling	Broad-leaved evergreen tree	<i>Rhododendron maximum</i>

## CHARACTERISTIC SPECIES

**Great Smoky Mountains National Park:** *Betula lenta*, *Leucothoe fontanesiana*, *Liriodendron tulipifera*, *Tiarella cordifolia*, *Tsuga canadensis*

**Global:** *Acer rubrum*, *Betula lenta*, *Dryopteris intermedia*, *Dryopteris marginalis*, *Galax urceolata*, *Leucothoe fontanesiana*, *Liriodendron tulipifera*, *Luzula echinata*, *Mitchella repens*, *Polystichum acrostichoides*, *Quercus rubra*, *Rhododendron maximum*, *Thelypteris noveboracensis*, *Tiarella cordifolia*, *Tsuga canadensis*, *Waldsteinia fragarioides*

## OTHER NOTEWORTHY SPECIES

**Global: Vulnerable Plants:** *Ageratina altissima* var. *roanensis* (G5T3T4, Southern Blue Ridge endemic), *Betula uber* (G1Q), *Botrychium jenmanii* (G3G4), *Diervilla rivularis* (G3), *Hexastylis contracta* (G3), *Hexastylis naniflora* (G3), *Hexastylis rhombiformis* (G3), *Isotria medeoloides* (G2G3), *Malaxis bayardii* (G1G2), *Monotropsis odorata* (G3), *Prenanthes roanensis* (G3), *Scutellaria saxatilis* (G3G4), *Shortia galacifolia* var. *brevistyla* (G3T2), *Shortia galacifolia* var. *galacifolia* (G3T2T3), *Trillium persistens* (G1), *Trillium pusillum* var. 1 (G3T2Q), *Waldsteinia lobata* (G3); **Other Plants:** *Trillium rugelii* (G4), *Vaccinium hirsutum* (G4)

## CONSERVATION STATUS RANK

**Global Rank & Reasons:** G5 (27-Sep-2004). Within its range, this community type occurs extensively in suitable mesic habitats. Occurrences are subject to compositional modification by outbreaks of hemlock woolly adelgid (*Adelges tsugae*), an exotic insect pest that causes decline and eventual mortality of *Tsuga canadensis*.

## RELATED CONCEPTS

## Global Similar Types:

- *Acer rubrum* - *Betula lenta* - *Magnolia fraseri* / (*Rhododendron maximum*, *Kalmia latifolia*) Ruderal Forest (CEGL008558)
- *Betula alleghaniensis* - (*Tsuga canadensis*) / *Rhododendron maximum* / (*Leucothoe fontanesiana*) Forest (CEGL007861)
- *Liriodendron tulipifera* - *Quercus montana* - (*Tsuga canadensis*) / *Kalmia latifolia* - (*Rhododendron catawbiense*) Forest (CEGL008512)
- *Pinus strobus* - *Tsuga canadensis* / *Rhododendron maximum* - (*Leucothoe fontanesiana*) Forest (CEGL007102)
- *Quercus montana* - *Quercus rubra* / *Rhododendron maximum* / *Galax urceolata* Forest (CEGL006286)
- *Tsuga canadensis* - (*Fagus grandifolia*, *Tilia americana* var. *heterophylla*) / *Magnolia tripetala* Forest (CEGL008407)
- *Tsuga canadensis* - *Fagus grandifolia* - *Acer saccharum* / (*Hamamelis virginiana*, *Kalmia latifolia*) Forest (CEGL005043)
- *Tsuga canadensis* - *Halesia tetraptera* - *Magnolia fraseri* / *Rhododendron maximum* / *Dryopteris intermedia* Forest (CEGL007693)
- *Tsuga canadensis* - *Liriodendron tulipifera* - *Platanus occidentalis* / *Rhododendron maximum* - *Xanthorhiza simplicissima* Wet Forest (CEGL007143)

## Global Related Concepts:

- *Betula lenta* - *Liriodendron tulipifera* - *Acer rubrum* / *Rhododendron maximum* Forest (Vanderhorst et al. 2007) <
- *Liriodendron tulipifera* - *Betula lenta* - *Tsuga canadensis* / *Rhododendron maximum* Forest (Vanderhorst et al. 2007) <
- *Liriodendron tulipifera* - *Betula lenta* - *Tsuga canadensis* / *Rhododendron maximum* Forest (Fleming and Coulling 2001) =
- *Liriodendron tulipifera* - *Quercus montana* - *Tsuga canadensis* / *Rhododendron maximum* / *Galax urceolata* Forest (Fleming and Moorhead 2000) =
- *Pinus strobus* - *Tsuga canadensis* - *Liriodendron tulipifera* Forest (Patterson 1994) =
- *Tsuga canadensis* - *Betula lenta* / *Rhododendron maximum* forest (Vanderhorst 2001b) =
- *Tsuga canadensis* - *Liriodendron tulipifera* - *Betula lenta* / *Rhododendron maximum* Forest [Hemlock - Hardwood / Great Laurel Acidic Cove Forest] (Vanderhorst 2017c) =
- Cove Forest (Patterson et al. 1994) >
- IA5b. Southern Appalachian Hemlock Cove Forest (Allard 1990) >
- Mixed Mesophytic Coves (Gettman 1974) ?
- Sweet Birch - Hemlock Type (Schmalzer and DeSelm 1982) =
- Type 5 (Newell and Peet 1995) ?
- Yellow-Poplar - Eastern Hemlock: 58 (Eyre 1980) >

## CLASSIFICATION

**Status:** Standard

**Classification Confidence:** 2 - Moderate

**Great Smoky Mountains National Park Other Comments:** This community can include areas where *Betula lenta* and *Liriodendron tulipifera* dominate over dense *Rhododendron maximum* without a canopy of *Tsuga canadensis*. This situation was found throughout the park. One example was on the Cades Cove quadrangle at the confluence of Big Tommy Branch and Ekaneetlee Creek. On aerial photography, this community may appear similar to other Hemlock-Hardwood communities (i.e., *Tsuga canadensis* - *Halesia tetraptera* - (*Fagus grandifolia*, *Magnolia fraseri*) / *Rhododendron maximum* / *Dryopteris intermedia* Forest (CEGL007693) and *Betula alleghaniensis* - (*Tsuga canadensis*) / *Rhododendron maximum* / *Leucothoe fontanesiana* Forest (CEGL007861)). Some occurrences, where *Tsuga canadensis* overtops the deciduous trees, may have signatures similar to Hemlock and Hemlock-White Pine Forests (i.e., *Tsuga canadensis* / *Rhododendron maximum* - (*Clethra acuminata*, *Leucothoe fontanesiana*) Forest (CEGL007136) and *Pinus strobus* - *Tsuga canadensis* / *Rhododendron maximum* - (*Leucothoe fontanesiana*) Forest (CEGL007102)).

This community crosses over numerous mapping units. *Betula* spp.-dominated versions of this community may be mapped differently than the typical version with *Tsuga canadensis*. In addition, many communities labeled Montane alluvial may actually be this community. The two types intergrade quite a bit and cannot be distinguished easily from aerial photography.

**Global Classification Comments:** Deciduous trees more typical of "rich" coves, such as *Aesculus flava*, *Tilia americana* var. *heterophylla*, and *Acer saccharum*, are present in this forest only as minor components, if at all. Likewise, rich-site herbs, such as *Actaea racemosa*, *Caulophyllum thalictroides*, *Actaea pachypoda*, and *Adiantum pedatum*, are absent or nearly so. This forest is distinguished from "northern hardwood forests" by the lack of or near absence of *Fagus grandifolia*, *Betula alleghaniensis*, *Aesculus flava*, and the presence of low-elevation species, such as *Betula lenta* and *Liriodendron tulipifera*, and generally by a more depauperate herb layer. There is much variability in species composition in the 43 plots classified as this association from the Appalachian Trail region (Fleming and Patterson 2009a), but constancy of the nominal species was quite high ( $\geq 84\%$ ). The most constant species ( $\geq 64\%$ ), in order of descending constancy, are *Rhododendron maximum*, *Tsuga canadensis*, *Betula lenta*, *Acer rubrum*, *Liriodendron tulipifera*, *Quercus rubra*, *Mitchella repens*, *Polystichum acrostichoides*, and *Hamamelis virginiana*. Species richness in 400-m<sup>2</sup> plots ranges from 11 to 72 species per plot. This variable richness is probably influenced by somewhat variable soil fertility and the variation in cover/density of evergreen *Rhododendron* shrub colonies. An interesting example from the Piedmont/Blue Ridge transition of Georgia (Cedar Creek Canyon, Chattahoochee National Forest) has high coverage of *Rhododendron minus* and other foothills/Piedmont species such as *Liquidambar styraciflua* and *Aesculus sylvatica*.

In the 900- to 1060-m (3000-3500 feet) elevational range, the type becomes transitional to *Betula alleghaniensis* - (*Tsuga canadensis*) / *Rhododendron maximum* / (*Leucothoe fontanesiana*) Forest (CEGL007861), which lacks lower-elevation species such as *Liriodendron tulipifera* and *Galax urceolata*, and contains many species characteristic of higher elevations and northern latitudes.

Similar vegetation has been observed in coves of the Cumberland Mountains of southwestern Virginia (e.g., Clinch Ranger District: Dark Hollow, Roaring Branch, Pick Breeches and Flannery Ridges,) but comprehensive data are needed to determine whether these stands are part of this forest types or transitional to *Tsuga canadensis* - (*Fagus grandifolia*, *Tilia americana* var. *heterophylla*) / *Magnolia tripetala* Forest (CEGL008407). The latter unit apparently has an extensive distribution in the Cumberland Plateau of Kentucky and Tennessee, the Southern Ridge and Valley of Tennessee, and the Central Appalachians of West Virginia and southwestern Pennsylvania.

In West Virginia, 45 plots, mostly from New River Gorge National River and Gauley River National Recreation Area, are classified to this association. Outliers at lower elevations on the western flanks of the Allegheny Mountains are also classified here (with less confidence) based on high cover by *Rhododendron maximum*, which is uncommon in related *Tsuga canadensis* - *Fagus grandifolia* - *Acer saccharum* / (*Hamamelis virginiana*, *Kalmia latifolia*) Forest (CEGL005043) typical of the Western Allegheny Plateau, and lack of high-elevation associates found in *Tsuga canadensis* - *Betula alleghaniensis* - *Prunus serotina* / *Rhododendron maximum* Forest (CEGL006206) of high elevations in the Allegheny Mountains. West Virginia examples of this association (CEGL007543) include stands with mixed hemlock-deciduous canopies and stands with deciduous canopies, often with hemlock in the lower strata. *Fagus grandifolia* is not uncommon in WV stands.

#### ELEMENT DISTRIBUTION

**Great Smoky Mountains National Park Range:** This community was sampled from quadrangles throughout the park. It is one of the most wide-ranging communities in the park, occurring in virtually every drainage of the park as it heads down the mountains into the 1840- to 3020-foot range.

**Global Range:** This community occurs in the Southern Blue Ridge and Cumberlands and peripherally in the upper Piedmont and southern Central Appalachians, ranging from southwestern Virginia and southeastern West Virginia south and west to northwestern Georgia.

**Nations:** US

**States/Provinces:** GA, NC, SC, TN, VA:S4S5, WV:S4

**TNC Ecoregions:** 50:C, 51:C, 52:C, 59:C

**USFS Ecoregions (1994/95):** 221Hc:CCC, 221He:CCC, 231Aa:CCC, 231Ad:CCC, M221Aa:CCC, M221Ab:CCC, M221Be:CCC, M221Ca:CCC, M221Cb:CCC, M221Cc:CCP, M221Cd:CCC, M221Ce:CCC, M221Da:CC?, M221Db:CCC, M221Dc:CCC, M221Dd:CCC

**USFS Ecoregions (2007):** 221Hc:CCC, 221He:CC?, 231Aa:CCP, 231Ad:CCC, M221Aa:CCP, M221Ab:CCC, M221Bb:CCC, M221Be:CCC, M221Ca:CCC, M221Cb:CCC, M221Cc:CCP, M221Cd:CCC, M221Ce:CCP, M221Da:CC?, M221Db:CCC, M221Dc:CCC, M221Dd:CCC

**Federal Lands:** BIA (Eastern Band of Cherokee); NPS (Appalachian Trail [Central Appalachians], Appalachian Trail [Southern Blue Ridge], Blue Ridge Parkway, Bluestone, Carl Sandburg Home, Gauley River, Great Smoky Mountains, New River Gorge, Obed River); USFS (Chattahoochee, Chattahoochee (Piedmont), Chattahoochee (Southern Blue Ridge), Cherokee, Jefferson, Monongahela, Nantahala, Pisgah, Sumter, Sumter (Mountains))

#### ELEMENT SOURCES

**Great Smoky Mountains National Park Plots:** GRSM.201, GRSM.254, GRSM.305, GRSM.405, GRSM.407, GRSM.409.

**Great Smoky Mountains National Park Description Author(s):** K.D. Patterson, mod. R. White

**Global Description Author(s):** K.D. Patterson, G. Fleming, P. Coulling, T. Govus, S.C. Gawler

**References:** Allard 1990, Eyre 1980, Fleming 2002b, Fleming and Coulling 2001, Fleming and Moorhead 2000, Fleming and Patterson 2009a, Fleming and Patterson 2009b, Fleming and Taverna 2006, Fleming et al. 2017, Gettman 1974, NatureServe

Ecology - Southeastern U.S. unpubl. data, Newell and Peet 1995, Patterson 1994, Patterson et al. 1994, Peet et al. unpubl. data, Perez pers. comm., SCWMRD unpubl. data 2018, Schafale 2012, Schafale and Weakley 1990, Schmalzer and DeSelm 1982, Southeastern Ecology Working Group n.d., TDNH unpubl. data 2018, Vanderhorst 2001b, Vanderhorst 2017c, Vanderhorst et al. 2007, Vanderhorst et al. 2008, Vanderhorst et al. 2010, WVNHP unpubl. data, White 2003, Wood 1999

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**[CEGL007102] *Pinus strobus* - *Tsuga canadensis* / *Rhododendron maximum* - (*Leucothoe fontanesiana*) Forest**

Translated Name: **Eastern White Pine - Eastern Hemlock / Great Laurel - (Highland Doghobble) Forest**

Common Name: **Southern Appalachian Eastern Hemlock Forest (White Pine Type)**

**USNVC CLASSIFICATION**

Division	Eastern North American Forest & Woodland (I.B.2.Na)
Macrogroup	Appalachian-Interior-Northeastern Mesic Forest (M883)
Group	Appalachian-Central Interior Mesic Forest (G020)
Alliance	<i>Tsuga canadensis</i> - <i>Liriodendron tulipifera</i> Forest Alliance (A3304)

**ELEMENT CONCEPT**

**Global Summary:** This community occurs on creek and river margins and on lower or protected slopes. This association occurs in the Southern Blue Ridge and extends into adjacent ecoregions, such as the Cumberlands of Kentucky and Tennessee. This forest vegetation has a canopy dominated by *Pinus strobus*, sometimes codominating with *Tsuga canadensis*, occurring over a shrub stratum dominated by *Rhododendron maximum*. This is an evergreen forest, but deciduous trees may form a minor part of the canopy. Other minor canopy species may include *Liriodendron tulipifera*, *Betula lenta*, *Magnolia fraseri* (within its range), *Acer rubrum*, and *Tilia americana* var. *heterophylla*. Other shrub species may include *Kalmia latifolia*, *Leucothoe fontanesiana*, *Lindera benzoin*, and *Ilex opaca* var. *opaca*. Herbaceous cover is typically sparse. The Kentucky examples lack *Leucothoe fontanesiana* and have *Magnolia macrophylla* rather than *Magnolia fraseri*. Large stems of *Smilax rotundifolia* may be present in stands of this vegetation.

**ENVIRONMENTAL DESCRIPTION**

**Great Smoky Mountains National Park Environment:** This community is found at low elevations on low, protected slopes, and flats along streams. Samples of this community had a mean elevation of 1800 feet and ranged from 1400 to 2100 feet in elevation. Samples had southwest, west, northwest, and northeast aspects.

**Global Environment:** This community occurs on creek and river margins and on lower or protected slopes, at elevations below 915 m (3000 feet) in the southern Appalachian Mountains, including the Cumberland Mountains of Kentucky and Tennessee.

**VEGETATION DESCRIPTION**

**Great Smoky Mountains National Park Vegetation:** This forest is dominated by *Pinus strobus* and *Tsuga canadensis*. Other species that may have coverage in the subcanopy include *Acer rubrum*, *Liriodendron tulipifera*, *Magnolia fraseri*, *Oxydendrum arboreum*, and *Quercus alba*. The tall-shrub stratum is dominated by *Rhododendron maximum*. *Leucothoe fontanesiana* sometimes dominates a short-shrub stratum. Other shrubs can include *Calycanthus floridus*, *Clethra acuminata*, *Ilex opaca*, *Kalmia latifolia*, and *Pyrolaria pubera*. Herb coverage is sparse. Typical species include *Chimaphila maculata*, *Galax urceolata*, *Goodyera pubescens*, *Hexastylis arifolia* var. *ruthii*, and *Mitchella repens*.

**Global Vegetation:** This forest vegetation has a canopy dominated by *Pinus strobus*, sometimes codominating with *Tsuga canadensis*, occurring over a shrub stratum dominated by *Rhododendron maximum*. This is an evergreen forest, with evergreen species dominating in all strata, but deciduous trees may form a minor part of the canopy. Other minor canopy or subcanopy species may include *Liriodendron tulipifera*, *Betula lenta*, *Magnolia fraseri* (within its range), *Acer rubrum*, *Quercus alba*, *Oxydendrum arboreum*, and *Tilia americana* var. *heterophylla*. Other shrub species may include *Kalmia latifolia*, *Leucothoe fontanesiana*, *Lindera benzoin*, *Hamamelis virginiana*, and *Ilex opaca* var. *opaca*. Herbaceous cover is typically sparse. Typical herbs include *Thelypteris noveboracensis*, *Chimaphila maculata*, *Mitchella repens*, *Polystichum acrostichoides*, *Medeola virginiana*, *Galax urceolata*, and *Tiarella cordifolia*. Kentucky Cumberland examples lack *Leucothoe fontanesiana* and have *Magnolia macrophylla* rather than *Magnolia fraseri*. Large stems of *Smilax rotundifolia* may be present in stands of this vegetation.

**MOST ABUNDANT SPECIES**

**Great Smoky Mountains National Park**

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Pinus strobus</i> , <i>Tsuga canadensis</i>
Tree subcanopy	Broad-leaved deciduous tree	<i>Acer rubrum</i> , <i>Oxydendrum arboreum</i>
Tall shrub/sapling	Broad-leaved evergreen tree	<i>Rhododendron maximum</i>
Short shrub/sapling	Broad-leaved evergreen shrub	<i>Leucothoe fontanesiana</i>

**Global**

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Pinus strobus</i> , <i>Tsuga canadensis</i>
Tall shrub/sapling	Broad-leaved evergreen tree	<i>Rhododendron maximum</i>
Short shrub/sapling	Broad-leaved evergreen shrub	<i>Leucothoe fontanesiana</i>

#### CHARACTERISTIC SPECIES

**Great Smoky Mountains National Park:** *Pinus strobus*, *Rhododendron maximum*, *Tsuga canadensis*

**Global:** *Leucothoe fontanesiana*, *Pinus strobus*, *Rhododendron maximum*

#### OTHER NOTEWORTHY SPECIES

**Global: Vulnerable Plants:** *Gaylussacia brachycera* (G3)

#### CONSERVATION STATUS RANK

**Global Rank & Reasons:** G4 (1-Dec-1997).

#### RELATED CONCEPTS

##### Global Similar Types:

- *Liriodendron tulipifera* - *Betula lenta* - *Tsuga canadensis* / *Rhododendron maximum* Forest (CEGL007543) is a mixed to deciduous acidic cove forest of the Southern Appalachians.
- *Pinus strobus* - *Tsuga canadensis* / *Acer pensylvanicum* / *Polystichum acrostichoides* Forest (CEGL006019)
- *Tsuga canadensis* - (*Fagus grandifolia*, *Tilia americana* var. *heterophylla*) / *Magnolia tripetala* Forest (CEGL008407) is an evergreen to mixed acidic cove forest of the Cumberland Mountains, Cumberland Plateau, and Southern Ridge and Valley.
- *Tsuga canadensis* - *Liriodendron tulipifera* - *Platanus occidentalis* / *Rhododendron maximum* - *Xanthorhiza simplicissima* Wet Forest (CEGL007143) occurs on broad, regularly inundated floodplains.
- *Tsuga canadensis* / *Rhododendron maximum* - (*Clethra acuminata*, *Leucothoe fontanesiana*) Forest (CEGL007136) is dominated by *Tsuga canadensis*.

##### Global Related Concepts:

- *Tsuga canadensis* - *Pinus strobus* / *Rhododendron maximum* Forest (Patterson 1994) =
- Eastern Hemlock: 23 (Eyre 1980) >
- Hemlock Type (Schmalzer and DeSelm 1982) >
- IA5b. Southern Appalachian Hemlock Cove Forest (Allard 1990) >
- White Pine - Hemlock: 22 (Eyre 1980) >
- White pine-eastern hemlock/great laurel dry forest: southern type (CAP pers. comm. 1998) ?

#### CLASSIFICATION

**Status:** Standard

**Classification Confidence:** 2 - Moderate

**Great Smoky Mountains National Park Other Comments:** It is unclear if there is an environmental factor that distinguishes forests codominated by *Tsuga canadensis* and *Pinus strobus* and those dominated by only *Tsuga canadensis*. It is possible that those codominated by *Pinus strobus* occur on drier, more westerly exposed sites or perhaps on previously disturbed sites. It is unlikely that the signature of this association will be distinguishable from that of *Tsuga canadensis* / *Rhododendron maximum* - (*Clethra acuminata*, *Leucothoe fontanesiana*) Forest (CEGL007136).

**Global Classification Comments:** This association is distinguished by a strong evergreen dominance in all strata and the importance of *Pinus strobus* in the canopy. Forests (included here) in the Cumberlands of Kentucky lack *Leucothoe fontanesiana* and have *Magnolia macrophylla* rather than *Magnolia fraseri*.

#### ELEMENT DISTRIBUTION

**Great Smoky Mountains National Park Range:** This community was sampled on the Cades Cove and Mount Le Conte quadrangles and is likely in other areas of the park. Samples on the Cades Cove quadrangle ranged in elevation from 1600 to 2100 feet, mostly in the northwest portion of the quadrangle. Samples of this community came from slopes above More Licker Branch; from slopes along Abrams Creek, northeast of Spruce Double; from slopes above Arbutus Branch; from a ravine south of Coon Butt; and from low slopes in the vicinity of Wildcat Branch. This community is uncommon on the Mount Le Conte quadrangle and was sampled from a single location in the northeastern portion of the quadrangle, on steep, southwest slopes above the Little Pigeon River (1400 feet). This may be the only location for this community on the Mount Le Conte quadrangle.

**Global Range:** This community occurs in the Southern Blue Ridge, but extends into adjacent Cumberland Plateau or Ridge and Valley.

**Nations:** US

**States/Provinces:** GA, KY, NC, SC, TN, VA?

**TNC Ecoregions:** 50:C, 51:C

**USFS Ecoregions (1994/95):** 221He:CCC, 221He:CCC, 222Eo:CCC, M221Be:CPP, M221Cd:CCC, M221Dc:CCC, M221Dd:CCC

**USFS Ecoregions (2007):** 221Hb:CCP, 221He:CCC, 221He:CC?, 223:C, M221Be:CPP, M221Cd:CCC, M221Dc:CCC, M221Dd:CCC

**Federal Lands:** BIA (Eastern Band of Cherokee); NPS (Appalachian Trail [Southern Blue Ridge], Big South Fork, Blue Ridge Parkway, Great Smoky Mountains, Obed River); USFS (Chattahoochee, Chattahoochee (Southern Blue Ridge), Cherokee, Daniel Boone, Nantahala, Pisgah, Sumter, Sumter (Mountains))

#### ELEMENT SOURCES

**Great Smoky Mountains National Park Plots:** GRSM.33, GRSM.69, GRSM.209, GRSM.217.

**Great Smoky Mountains National Park Description Author(s):** K.D. Patterson

**Global Description Author(s):** K.D. Patterson, C.W. Nordman

**References:** Allard 1990, CAP pers. comm. 1998, Eyre 1980, Fleming and Patterson 2009a, Nelson 1986, Patterson 1994, Peet et al. unpubl. data, Schafale 2012, Schafale and Weakley 1990, Schmalzer and DeSelm 1982, Southeastern Ecology Working Group n.d., TDNH unpubl. data 2018

**[CEGL007693] *Tsuga canadensis* - *Halesia tetraptera* - *Magnolia fraseri* / *Rhododendron maximum* / *Dryopteris intermedia* Forest**

Translated Name: **Eastern Hemlock - Mountain Silverbell - Mountain Magnolia / Great Laurel / Intermediate Woodfern Forest**

Common Name: **Southern Appalachian Acidic Cove Forest (Silverbell Type)**

**USNVC CLASSIFICATION**

Division	Eastern North American Forest & Woodland (I.B.2.Na)
Macrogroup	Appalachian-Interior-Northeastern Mesic Forest (M883)
Group	Appalachian-Central Interior Mesic Forest (G020)
Alliance	<i>Tsuga canadensis</i> - <i>Liriodendron tulipifera</i> Forest Alliance (A3304)

**ELEMENT CONCEPT**

**Global Summary:** This association includes forests dominated by *Tsuga canadensis* and *Halesia tetraptera* var. *monticola*, occurring in restricted montane areas of western North Carolina and eastern Tennessee. This forest is found on protected, lower slopes and coves at elevations of 854 to 1403 m (2800-4600 feet). The most important canopy trees are *Tsuga canadensis* and *Halesia tetraptera* var. *monticola*, although *Magnolia fraseri* or *Fagus grandifolia* can have high canopy coverage in some examples. Some occurrences have dense, tall-shrub strata dominated by *Rhododendron maximum*, while other occurrences have a more open shrub stratum with greater herbaceous cover, often dominated by *Dryopteris intermedia*. Other subcanopy/shrub species may include *Acer pensylvanicum*, *Acer saccharum*, *Acer rubrum*, *Amelanchier laevis*, *Betula alleghaniensis*, *Betula lenta*, and *Prunus pensylvanica*. Other common herbaceous species include *Mitchella repens*, *Medeola virginiana*, *Polystichum acrostichoides*, *Solidago curtisii*, *Viola blanda*, and *Viola hastata*. *Rubus canadensis* is also common. This community is distinguished from *Liriodendron tulipifera* - *Betula lenta* - *Tsuga canadensis* / *Rhododendron maximum* Forest (CEGL007543) by not having *Liriodendron tulipifera* as an important component and by generally occurring at higher elevations (over 915 m [3000 feet]). This community is distinguished from *Betula alleghaniensis* - (*Tsuga canadensis*) / *Rhododendron maximum* / (*Leucothoe fontanesiana*) Forest (CEGL007861) by occurring on more protected sites and having more diverse tree and herb strata.

**ENVIRONMENTAL DESCRIPTION**

**Great Smoky Mountains National Park Environment:** This community is found on moderately steep, protected slopes and coves with western to northeastern aspects. Samples had a mean elevation of 3475 feet, ranging from 2600 to 4600 feet.

**Global Environment:** This association includes forests dominated by *Tsuga canadensis* and *Halesia tetraptera* var. *monticola*, occurring in restricted montane areas of western North Carolina and eastern Tennessee. This forest is found on protected, lower slopes and coves at elevations of 854 to 1403 m (2800-4600 feet).

**VEGETATION DESCRIPTION**

**Great Smoky Mountains National Park Vegetation:** This forest has a canopy dominated by *Tsuga canadensis* and *Halesia tetraptera* var. *monticola*. Other species that can have high coverage in the canopy or subcanopy include *Acer saccharum*, *Fagus grandifolia*, *Magnolia fraseri*, *Betula alleghaniensis*, and *Acer rubrum*. *Prunus serotina* can also be present in the subcanopy. Some occurrences have dense tall-shrub strata dominated by *Rhododendron maximum*, but more typically the shrub stratum is open, with coverage by saplings of the canopy species. *Acer pensylvanicum* is also a typical shrub. The herb stratum has sparse to moderate coverage. Common species include *Eurybia divaricata* (= *Aster divaricatus*), *Dryopteris intermedia*, *Huperzia lucidula*, *Medeola virginiana*, *Mitchella repens*, *Oxalis montana*, *Solidago curtisii* (= *Solidago caesia* var. *curtisii*), *Tiarella cordifolia*, and *Viola* spp. (e.g., *Viola blanda*, *Viola canadensis*, *Viola hastata*, *Viola rotundifolia*).

**Global Vegetation:** The most important canopy trees are *Tsuga canadensis* and *Halesia tetraptera* var. *monticola*, although *Magnolia fraseri* or *Fagus grandifolia* can have high canopy coverage in some examples. Some occurrences have dense, tall-shrub strata dominated by *Rhododendron maximum*, while other occurrences have a more open shrub stratum with greater herbaceous cover, often dominated by *Dryopteris intermedia*. Other subcanopy/shrub species may include *Acer pensylvanicum*, *Acer saccharum*, *Acer rubrum*, *Amelanchier laevis*, *Betula alleghaniensis*, *Betula lenta*, and *Prunus pensylvanica*. Other common herbaceous species include *Mitchella repens*, *Medeola virginiana*, *Polystichum acrostichoides*, *Solidago curtisii* (= *Solidago caesia* var. *curtisii*), *Viola blanda*, and *Viola hastata*. *Rubus canadensis* is also common.

**MOST ABUNDANT SPECIES**

**Great Smoky Mountains National Park**

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Tsuga canadensis</i>
Tree canopy	Broad-leaved deciduous tree	<i>Halesia tetraptera</i> var. <i>monticola</i>

Tall shrub/sapling	Broad-leaved evergreen tree	<i>Rhododendron maximum</i>
Herb (field)	Fern (Spore-bearing forb)	<i>Dryopteris intermedia</i>

**Global****Stratum**

Tree canopy

Tree canopy

Tall shrub/sapling

Herb (field)

**Lifeform**

Needle-leaved tree

Broad-leaved deciduous tree

Broad-leaved evergreen shrub

Fern (Spore-bearing forb)

**Species***Tsuga canadensis**Halesia tetraptera* var. *monticola**Rhododendron maximum**Dryopteris intermedia***CHARACTERISTIC SPECIES**

**Great Smoky Mountains National Park:** *Acer saccharum*, *Dryopteris intermedia*, *Halesia tetraptera* var. *monticola*, *Mitchella repens*, *Tsuga canadensis*

**Global:** *Acer saccharum*, *Dryopteris intermedia*, *Halesia tetraptera* var. *monticola*, *Mitchella repens*, *Tsuga canadensis*

**OTHER NOTEWORTHY SPECIES**

**Global: Vulnerable Plants:** *Rugelia nudicaulis* (G3)

**CONSERVATION STATUS RANK**

**Global Rank & Reasons:** G2 (29-Sep-2004). This community is uncommon and geographically restricted to the Great Smoky Mountains, Tennessee, and to Joyce Kilmer Wilderness in western North Carolina. Occurrences are subject to compositional modification by outbreaks of hemlock woolly adelgid (*Adelges tsugae*), an exotic insect pest that causes decline and eventual mortality of *Tsuga canadensis*.

**RELATED CONCEPTS****Global Similar Types:**

- *Betula alleghaniensis* - (*Tsuga canadensis*) / *Rhododendron maximum* / (*Leucothoe fontanesiana*) Forest (CEGL007861)
- *Liriodendron tulipifera* - *Betula lenta* - *Tsuga canadensis* / *Rhododendron maximum* Forest (CEGL007543)

**Global Related Concepts:**

- *Tsuga canadensis*-*Halesia*/*Dryopteris intermedia* Forest (Newell et al. 1997) ?
- *Tsuga canadensis*-*Magnolia fraseri* Forest, *Tsuga canadensis*-*Fagus*-*Halesia* subtype (Newell et al. 1997) ?
- Silverbell-hemlock (Golden 1974) ?

**CLASSIFICATION**

**Status:** Standard

**Classification Confidence:** 2 - Moderate

**Great Smoky Mountains National Park Other Comments:** This community is distinguished from *Tsuga canadensis* - *Liriodendron tulipifera* - *Betula lenta* / *Rhododendron maximum* Forest (CEGL007543) by not having *Liriodendron tulipifera* as an important component and by generally occurring at higher elevations (over 3000 feet). This community is distinguished from *Tsuga canadensis* - *Betula alleghaniensis* / *Rhododendron maximum* / *Leucothoe fontanesiana* Forest (CEGL007861) by occurring on more protected sites and having more diverse tree and herb strata. On aerial photography, this community may appear similar to other Hemlock-Hardwood communities (i.e., *Tsuga canadensis* - *Liriodendron tulipifera* - *Betula lenta* / *Rhododendron maximum* Forest (CEGL007543) and *Tsuga canadensis* - *Betula alleghaniensis* / *Rhododendron maximum* / *Leucothoe fontanesiana* Forest (CEGL007861)). In some occurrences *Tsuga canadensis* dominates beneath the deciduous upper canopy and may not be evident on air photos. Some occurrences, where *Tsuga canadensis* overtops the deciduous trees, may have signatures similar to Hemlock and Hemlock-White Pine Forests (i.e., *Tsuga canadensis* / *Rhododendron maximum* - (*Clethra acuminata*, *Leucothoe fontanesiana*) Forest (CEGL007136) and *Pinus strobus* - *Tsuga canadensis* / *Rhododendron maximum* - (*Leucothoe fontanesiana*) Forest (CEGL007102)).

**Global Classification Comments:** In an analysis of more than 1100 Southern Appalachian plots for the Appalachian Trail vegetation mapping project, 14 plots from Great Smoky Mountains National Park classified as this type, forming a strong, compositionally cohesive group that was distinct from other cove forest types (Fleming and Patterson 2009a).

**ELEMENT DISTRIBUTION**

**Great Smoky Mountains National Park Range:** This community was sampled from the Cades Cove, Mount Le Conte, and Mount Guyot quadrangles. Historic samples come from the Thunderhead Mountain quadrangle (3420-4600 feet elevation). Samples of this community from the Cades Cove quadrangle ranged in elevation from 2720-3900 feet. Recent and historic samples from the Cades Cove quadrangle come from low slopes above the Left Prong of Anthony Creek; from protected slopes and coves north of McCampbell Knob; and in the vicinity of Forge Creek. Samples from the Mount Le Conte quadrangle ranged from 2602-4120 feet elevation and included samples from the western portion of the quadrangle near the Cherokee Orchard-Rainbow Falls trailhead and from coves east of Piney Mountain above Rocky Spur Branch. In the eastern portion of the Mount Le Conte quadrangle this community was sampled from low slopes above Horseshoe Branch and from Upper Porter's Creek on the far southwestern part of Mount Guyot quadrangle.

**Global Range:** This association occurs in restricted montane areas of western North Carolina and eastern Tennessee.

**Nations:** US

**States/Provinces:** NC, TN

**TNC Ecoregions:** 51:C

**USFS Ecoregions (1994/95):** M221Dd:CCC

**USFS Ecoregions (2007):** M221Dd:CCC

**Federal Lands:** BIA (Eastern Band of Cherokee); NPS (Appalachian Trail [Southern Blue Ridge], Great Smoky Mountains); USFS (Nantahala, Pisgah)

#### ELEMENT SOURCES

**Great Smoky Mountains National Park Plots:** GRSM.1, GRSM.5, GRSM.6, GRSM.10, GRSM.60, GRSM.148.

**Great Smoky Mountains National Park Description Author(s):** K.D. Patterson

**Global Description Author(s):** K.D. Patterson, G. Fleming and P. Coulling

**References:** Fleming and Patterson 2009a, Golden 1974, Newell et al. 1997, Peet et al. unpubl. data, Schafale 2012, Schafale and Weakley 1990, Schafale pers. comm., Southeastern Ecology Working Group n.d.

### [CEGL007143] *Tsuga canadensis* - *Liriodendron tulipifera* - *Platanus occidentalis* / *Rhododendron maximum* - *Xanthorhiza simplicissima* Wet Forest

Translated Name: **Eastern Hemlock - Tuliptree - American Sycamore / Great Laurel - Yellowroot Wet Forest**

Common Name: **Southern Appalachian Small River Floodplain Forest**

#### USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Interior-Northeastern Mesic Forest (M883)
Group	Appalachian-Central Interior Mesic Forest (G020)
Alliance	<i>Tsuga canadensis</i> - <i>Liriodendron tulipifera</i> Forest Alliance (A3304)

#### ELEMENT CONCEPT

**Global Summary:** This association covers forested wetlands dominated by mesophytic species with an admixture of alluvial or wetland species, that occur on temporarily flooded alluvial flats and ravines in the Southern Blue Ridge, the Cumberland, and in adjacent ecoregions. These dense forests usually occur over silty to sandy, acidic soils. The canopy is usually a mix of species that includes *Tsuga canadensis*, *Liriodendron tulipifera*, *Platanus occidentalis*, *Betula lenta*, *Acer rubrum*, and a variety of other mesophytic and upland species. It may range from strong dominance by *Tsuga* to its virtual absence. The shrub and herbaceous strata may be dense to open, but have components indicative of the temporarily flooded hydrology, thus separating this type from similar, non-wetland communities. *Rhododendron maximum* is a typical shrub and can form a dense subcanopy, but *Xanthorhiza simplicissima*, *Alnus serrulata*, or other species indicative of flooding are present. The herbaceous layer generally includes species indicative of flooding as well as mesophytic upland species.

#### ENVIRONMENTAL DESCRIPTION

**Global Environment:** These dense forested alluvial wetlands occur on temporarily flooded alluvial flats and ravines along creeks and small rivers. These forests usually occur over silty or sandy, acidic soils. Forests may be eroded or disturbed by catastrophic floods, sometimes severe enough to return forests to an early-successional stage, but usually causing only local disturbance. The flood-carried sediments provide some nutrient inputs into the system. Beavers may create impoundments that may later form early-successional stands (Schafale and Weakley 1990).

#### VEGETATION DESCRIPTION

**Global Vegetation:** Stands of this forested alluvial association are dominated by combinations of *Tsuga canadensis*, *Liriodendron tulipifera*, *Platanus occidentalis*, *Betula lenta*, *Acer rubrum*, and *Pinus strobus*. Occasionally, *Tsuga canadensis* or *Pinus strobus* is strongly dominant. Other trees may include *Fraxinus americana*, *Betula alleghaniensis*, *Quercus alba*, *Halesia tetraptera*, *Fagus grandifolia*, and *Liquidambar styraciflua*. *Carpinus caroliniana* is the most common subcanopy tree. The shrub and herbaceous strata may be dense to open, but have components indicative of the temporarily flooded hydrology. *Rhododendron maximum* is a typical shrub and can form a dense thicket, or *Leucothoe fontanesiana*, *Lindera benzoin*, *Hamamelis virginiana*, or *Kalmia latifolia* may dominate. *Xanthorhiza simplicissima*, *Alnus serrulata*, or other species indicative of flooding are present. The herbaceous layer includes species indicative of flooding as well as mesophytic upland species. Dominant species include *Amphicarpaea bracteata* or *Thelypteris noveboracensis*, or may be a mixture of species of fertile mesophytic uplands. Occasionally, bryophyte cover is high.

In eastern Kentucky (Campbell 2001), stands may contain *Acer rubrum* and *Liriodendron tulipifera*. Other trees include *Fagus grandifolia*, *Ilex opaca*, *Liquidambar styraciflua*, *Nyssa sylvatica*, and *Oxydendrum arboreum*. Shrub cover may be low but contains patches of *Rhododendron maximum*, with scattered *Alnus serrulata*, *Carpinus caroliniana*, *Clethra acuminata*, *Hamamelis virginiana*, *Leucothoe fontanesiana*, and *Kalmia latifolia*. Ground cover may be sparse, with scattered patches of Carices (*Carex gracilescens*, *Carex laxiculmis*, *Carex lucorum*), *Hexastylis arifolia*, *Medeola virginiana*, *Thelypteris noveboracensis*, and others. Nearer to the stream channel, species such as *Carex torta*, *Carex gynandra*, *Carex baileyi*, *Viola cucullata*, and *Xanthorhiza simplicissima* may be more common. More disturbed parts of the stand may contain *Betula* spp., *Magnolia* spp., and local patches of *Pinus strobus* (Campbell 2001). In North Carolina, the herbaceous layer may include *Arisaema triphyllum*, *Chamaelirium luteum*, *Cicuta maculata*, *Claytonia virginica*, *Glyceria melicaria*, *Polygonum punctatum*, and *Packera aurea* (= *Senecio aureus*) (Schafale and Weakley 1990).

More information is needed to adequately describe the rangewide features of this community and distinguish it from similar vegetation.

**Global Dynamics:** These communities are subject to scouring by floods. Occasionally, flood damage is severe enough to return the community to an early-successional state, but more commonly it consists only of local scouring and sediment deposition.

#### MOST ABUNDANT SPECIES

##### Global

##### Stratum

Tree canopy

##### Lifeform

Needle-leaved tree

##### Species

*Tsuga canadensis*

#### CHARACTERISTIC SPECIES

**Global:** *Leucothoe fontanesiana*, *Pinus strobus*, *Rhododendron maximum*, *Tsuga canadensis*

#### OTHER NOTEWORTHY SPECIES

**Global: Vulnerable Plants:** *Hexastylis contracta* (G3)

#### CONSERVATION STATUS RANK

**Global Rank & Reasons:** G3 (3-Sep-2002).

#### RELATED CONCEPTS

##### Global Similar Types:

- *Liriodendron tulipifera* - *Betula lenta* - *Tsuga canadensis* / *Rhododendron maximum* Forest (CEGL007543)
- *Liriodendron tulipifera* - *Pinus strobus* - (*Tsuga canadensis*) / *Carpinus caroliniana* / *Amphicarpaea bracteata* Forest (CEGL008405)
- *Pinus strobus* - *Tsuga canadensis* / *Acer pensylvanicum* / *Polystichum acrostichoides* Forest (CEGL006019)
- *Pinus strobus* - *Tsuga canadensis* / *Rhododendron maximum* - (*Leucothoe fontanesiana*) Forest (CEGL007102)
- *Tsuga canadensis* - *Acer rubrum* - (*Nyssa sylvatica*) / *Rhododendron maximum* / *Sphagnum* spp. Seep Forest (CEGL007565)
- *Tsuga canadensis* - *Quercus rubra* - *Platanus occidentalis* / *Rhododendron maximum* / *Anemone quinquefolia* Forest (CEGL006620)
- *Tsuga canadensis* / *Rhododendron maximum* - (*Clethra acuminata*, *Leucothoe fontanesiana*) Forest (CEGL007136) is very similar but does not undergo flooding; occurs on sites removed from alluvial influence.
- *Tsuga canadensis* / *Rhododendron maximum* / *Sphagnum* spp. Swamp Forest (CEGL006279)

##### Global Related Concepts:

- Hemlock Type (Schmalzer and DeSelm 1982) >
- Hemlock-Tulip Tree Type (Schmalzer 1978) =
- IIA6e. Southern Appalachian Alluvial Forest (Allard 1990) >

#### CLASSIFICATION

**Status:** Standard

**Classification Confidence:** 2 - Moderate

**Global Classification Comments:** This association may be difficult to separate from similar non-wetland vegetation (e.g., *Liriodendron tulipifera* - *Betula lenta* - *Tsuga canadensis* / *Rhododendron maximum* Forest (CEGL007543), *Pinus strobus* - *Tsuga canadensis* / *Rhododendron maximum* - (*Leucothoe fontanesiana*) Forest (CEGL007102), and *Tsuga canadensis* / *Rhododendron maximum* - (*Clethra acuminata*, *Leucothoe fontanesiana*) Forest (CEGL007136)) and similar vegetation with saturated soils and longer hydroperiods (e.g., *Tsuga canadensis* - *Acer rubrum* - (*Nyssa sylvatica*) / *Rhododendron maximum* / *Sphagnum* spp. Seep Forest (CEGL007565) and *Tsuga canadensis* / *Rhododendron maximum* / *Sphagnum* spp. Swamp Forest (CEGL006279)). The distinction from upland communities can be made based on the presence of multiple species indicative of flooding and alluvial processes, such as *Platanus occidentalis*, *Xanthorhiza simplicissima*, *Boehmeria cylindrica*, *Carex torta*, and a variety of other herbaceous species, even if these species rarely dominate. Because of flood dispersal of seeds, this association is likely to have combinations of species of fertile and infertile soils not found in related uplands. The saturated wetland communities with similar canopies are generally distinguished by an abundance of wetland ferns, sedges, *Sphagnum* spp., and other bryophytes, with a lack of the species characteristic of more fertile soils.

This association can also be difficult to distinguish from forests of larger floodplains, such as *Platanus occidentalis* - *Liriodendron tulipifera* - (*Betula alleghaniensis*) / *Alnus serrulata* - *Leucothoe fontanesiana* Floodplain Forest (CEGL004691). Larger floodplain communities have a larger set of species characteristic of alluvial processes, with many that are rarely or never found in this association. These include *Fraxinus pennsylvanica*, *Celtis laevigata*, *Juglans cinerea*, *Quercus imbricaria*, *Chasmanthium latifolium*, and *Elymus riparius*.

#### ELEMENT DISTRIBUTION

**Global Range:** This community is known from the Southern Blue Ridge from southwestern Virginia, south to northern Georgia, ranging into the Cumberland Mountains of Kentucky, and possibly into the Ridge and Valley of Virginia.

**Nations:** US

**States/Provinces:** GA, KY, NC, SC, TN, VA?

**TNC Ecoregions:** 50:C, 51:C, 52:C, 59:P

**USFS Ecoregions (1994/95):** 221He:CCC, 221He:CCC, M221Cd:CCC, M221Ce:CC?, M221Dc:CCC, M221Dd:CCC

**USFS Ecoregions (2007):** 221He:CCC, 221He:CC?, M221Cd:CCC, M221Ce:CC?, M221Dc:CCC, M221Dd:CCC

**Federal Lands:** BIA (Eastern Band of Cherokee); NPS (Big South Fork, Blue Ridge Parkway, Great Smoky Mountains, Obed River); USFS (Chattahoochee (Southern Blue Ridge)?, Chattahoochee?, Cherokee?, Daniel Boone, Nantahala?, Pisgah, Sumter, Sumter (Mountains))

#### ELEMENT SOURCES

**Great Smoky Mountains National Park Plots:** CVS: 039-01-0079.

**Global Description Author(s):** T. Govus and M.P. Schafale

**References:** Allard 1990, Campbell 2001, GNHP unpubl. data 2018, Nelson 1986, Peet et al. unpubl. data, Schafale 2012, Schafale and Weakley 1990, Schafale pers. comm., Schmalzer 1978, Schmalzer and DeSelm 1982, Southeastern Ecology Working Group n.d., TDNH unpubl. data 2018

### [CEGL007136] *Tsuga canadensis* / *Rhododendron maximum* - (*Clethra acuminata*, *Leucothoe fontanesiana*) Forest

Translated Name: **Eastern Hemlock / Great Laurel - (Mountain Sweet-pepperbush, Highland Doghobble) Forest**

Common Name: **Southern Appalachian Eastern Hemlock Forest (Typic Type)**

#### USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Interior-Northeastern Mesic Forest (M883)
Group	Appalachian-Central Interior Mesic Forest (G020)
Alliance	<i>Tsuga canadensis</i> - <i>Liriodendron tulipifera</i> Forest Alliance (A3304)

#### ELEMENT CONCEPT

**Global Summary:** These are forests of lower or protected slopes and terraces with *Tsuga canadensis* occurring over a dense to patchy shrub stratum of *Rhododendron maximum*. In the southern Appalachians, this forest occurs at elevations greater than 550 m (1800 feet). In Kentucky, disturbed areas may have abundant *Betula lenta* and *Betula alleghaniensis* in the subcanopy. Other canopy species of minor importance may include *Liriodendron tulipifera*, *Tilia americana* var. *heterophylla*, *Pinus strobus*, *Betula lenta*, *Magnolia fraseri*, *Acer rubrum*, and *Fraxinus americana*; these would total less than 25% of the canopy cover. In the Southern Blue Ridge, *Leucothoe fontanesiana* is often a shrub component and sometimes occurs densely. Other typical shrubs can include *Ilex opaca*, *Clethra acuminata*, and *Kalmia latifolia*. Herbs are sparse to moderate, depending on the shrub cover. Typical herbs include *Chimaphila maculata*, *Goodyera pubescens*, *Medeola virginiana*, *Hexastylis shuttleworthii*, *Mitchella repens*, *Polystichum acrostichoides*, *Viola blanda*, and *Galax urceolata*. Bryophyte cover is often dense. Stands in the southern Cumberlands of Kentucky and Tennessee would lack *Leucothoe fontanesiana*; instead, *Clethra acuminata* is a characteristic shrub of these stands.

#### ENVIRONMENTAL DESCRIPTION

**Great Smoky Mountains National Park Environment:** This forest is found in association with streams on low slopes with north aspects. Samples were found from 1705 and 2277 feet elevation, but this forest is likely to occur at higher elevations.

**Global Environment:** Forests of lower or protected slopes and terraces with *Tsuga canadensis* occurring over a dense to patchy shrub stratum of *Rhododendron maximum*. In the southern Appalachians, this forest occurs at elevations greater than 550 m (1800 feet).

#### VEGETATION DESCRIPTION

**Great Smoky Mountains National Park Vegetation:** The canopy of this community is strongly dominated by *Tsuga canadensis*. Other species that have minor coverage in the canopy and subcanopy include *Betula lenta*, *Magnolia fraseri*, and *Liriodendron tulipifera*. The dominant shrubs are *Rhododendron maximum* and *Leucothoe fontanesiana*. Other shrubs include *Hamamelis virginiana*, *Halesia tetraptera* var. *monticola*, *Clethra acuminata*, and *Oxydendrum arboreum*. Herbs are sparse; typical species include *Dryopteris intermedia*, *Goodyera pubescens*, *Medeola virginiana*, *Mitchella repens*, *Polystichum acrostichoides*, and *Thelypteris noveboracensis*.

**Global Vegetation:** Forests with *Tsuga canadensis* occurring over a dense to patchy shrub stratum of *Rhododendron maximum*. Other canopy species of minor importance may include *Liriodendron tulipifera*, *Tilia americana* var. *heterophylla*, *Pinus strobus*, *Betula lenta*, *Magnolia fraseri*, *Acer rubrum*, and *Fraxinus americana*; these would total less than 25% of the canopy cover. *Leucothoe fontanesiana* is often a shrub component, and sometimes occurs densely. Other typical shrubs include *Ilex opaca*, *Clethra acuminata*, and *Kalmia latifolia*. Herbs are sparse to moderate, depending on the shrub cover. Typical herbs include *Chimaphila maculata*, *Goodyera pubescens*, *Medeola virginiana*, *Hexastylis shuttleworthii*, *Mitchella repens*, *Polystichum acrostichoides*, and *Galax urceolata*. Bryophyte cover is often dense. In Kentucky, disturbed areas may have abundant *Betula lenta* and *Betula alleghaniensis* in the subcanopy. Stands in the southern Cumberlands of Tennessee would lack *Leucothoe fontanesiana*.

#### MOST ABUNDANT SPECIES

##### Great Smoky Mountains National Park

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Tsuga canadensis</i>
Tall shrub/sapling	Broad-leaved evergreen tree	<i>Rhododendron maximum</i>

Short shrub/sapling      Broad-leaved evergreen shrub      *Leucothoe fontanesiana*

**Global**

**Stratum**

Tree canopy

Tall shrub/sapling

Short shrub/sapling

**Lifform**

Needle-leaved tree

Broad-leaved evergreen tree

Broad-leaved evergreen shrub

**Species**

*Tsuga canadensis*

*Rhododendron maximum*

*Leucothoe fontanesiana*

**CHARACTERISTIC SPECIES**

**Great Smoky Mountains National Park:** *Leucothoe fontanesiana*, *Rhododendron maximum*, *Tsuga canadensis*

**Global:** *Leucothoe fontanesiana*, *Rhododendron maximum*, *Tsuga canadensis*

**OTHER NOTEWORTHY SPECIES**

**Global: Vulnerable Plants:** *Monotropsis odorata* (G3)

**CONSERVATION STATUS RANK**

**Global Rank & Reasons:** G3G4 (30-Apr-1998).

**RELATED CONCEPTS**

**Global Similar Types:**

- *Pinus strobus* - *Tsuga canadensis* / *Rhododendron maximum* - (*Leucothoe fontanesiana*) Forest (CEGL007102) dominated by *Pinus strobus* or codominated by *Pinus strobus* and *Tsuga canadensis*.
- *Tsuga canadensis* - *Liriodendron tulipifera* - *Platanus occidentalis* / *Rhododendron maximum* - *Xanthorrhiza simplicissima* Wet Forest (CEGL007143)

**Global Related Concepts:**

- Eastern Hemlock: 23 (Eyre 1980) >
- Hemlock Community (Caplenor 1965) =
- IA5b. Southern Appalachian Hemlock Cove Forest (Allard 1990) >

**CLASSIFICATION**

**Status:** Standard

**Classification Confidence:** 3 - Weak

**Great Smoky Mountains National Park Other Comments:** This association can occur adjacent to and grade in and out of *Liriodendron tulipifera* - *Betula lenta* - *Tsuga canadensis* / *Rhododendron maximum* Forest (CEGL007543). It is unclear if there is an environmental factor that distinguishes forests codominated by *Tsuga canadensis* and *Pinus strobus* and those dominated by only *Tsuga canadensis*. It is possible that those codominated by *Pinus strobus* occur on drier, more westerly exposed sites or perhaps on previously disturbed sites. It is unlikely that the signature of this association can be distinguished from that of *Pinus strobus* - *Tsuga canadensis* / *Rhododendron maximum* - (*Leucothoe fontanesiana*) Forest (CEGL007102).

**Global Classification Comments:** In Kentucky, this association occurs in the eastern part of the state (Appalachian plateaus, Cumberland Mountains).

**ELEMENT DISTRIBUTION**

**Great Smoky Mountains National Park Range:** This community was sampled on the Cades Cove quadrangle. It is unlikely to occur on the Mount Le Conte quadrangle but occurs elsewhere in the park. This community was sampled in two locations on the Cades Cove quadrangle; in the northwest along More Licker Branch and in the central portion of the quadrangle along Tipton's Sugar Cove Branch.

**Global Range:** This community is found in the Southern Appalachians, from North Carolina west into Kentucky.

**Nations:** US

**States/Provinces:** GA, KY, NC, SC, TN

**TNC Ecoregions:** 50:C, 51:C, 52:C

**USFS Ecoregions (1994/95):** 221Ha:CCC, 221Hc:CCC, 221He:CCC, 222D:??, M221Cc:CCC, M221Cd:CCC, M221Ce:CCC, M221Dc:CCC, M221Dd:CCC

**USFS Ecoregions (2007):** 221Ha:CCC, 221Hc:CCC, 221He:CC?, 223D:??, M221Cc:CCC, M221Cd:CCC, M221Ce:CCP, M221Dc:CCC, M221Dd:CCC

**Federal Lands:** BIA (Eastern Band of Cherokee); NPS (Blue Ridge Parkway, Cumberland Gap, Great Smoky Mountains, Obed River); USFS (Chattahoochee, Chattahoochee (Piedmont), Chattahoochee (Southern Blue Ridge), Cherokee, Daniel Boone, Nantahala, Pisgah, Sumter, Sumter (Mountains))

**ELEMENT SOURCES**

**Great Smoky Mountains National Park Plots:** GRSM.43, GRSM.205.

**Great Smoky Mountains National Park Description Author(s):** K.D. Patterson

**Global Description Author(s):** K.D. Patterson

**References:** Allard 1990, Caplenor 1965, Evans et al. 2009, Eyre 1980, Golden 1974, Golden 1981, Lorimer 1980, McLeod 1988, Nelson 1986, Newell et al. 1997, Oosting and Bourdeau 1955, Patterson 1994, Peet et al. unpubl. data, Quarterman et al. 1972, Racine

and Hardin 1975, Schafale 2012, Schafale and Weakley 1990, Southeastern Ecology Working Group n.d., White 2006, Whittaker 1956

## **G742. APPALACHIAN-ALLEGHENY NORTHERN HARDWOOD - CONIFER FOREST**

**Group Summary Description:** This forest group occurs in the central and northeastern U.S., ranging from extreme southern Ontario, north-central New York and lower New England west to Lake Erie and south to the higher elevations of the Carolinas, on relatively cool, mesic sites. Northern hardwoods such as *Acer rubrum*, *Acer saccharum*, *Betula alleghaniensis*, *Betula lenta*, *Fagus grandifolia*, *Fraxinus americana*, *Quercus rubra*, and *Tilia americana* are characteristic, either forming a deciduous canopy or mixed with *Tsuga canadensis* (or in some cases *Pinus strobus*). Other common and sometimes dominant trees include *Quercus* spp. (most commonly *Quercus rubra*, but also *Quercus alba*, *Quercus montana*), *Aesculus flava*, *Liriodendron tulipifera*, and *Prunus serotina*. It is of more limited extent and more ecologically constrained in the southern part of its range, in higher elevations of the northern parts of Virginia and West Virginia. This type is one of the matrix forest types in the northern part of the Central Interior and Appalachian Division. In general, this group is dominated by long-lived, mesic species that form multi-layered uneven-aged forests. Canopy dynamics are dominated by single and multiple disturbances, encouraging gap phase regeneration. Larger disturbances include windthrow, insect attack and ice storms. Although stand-replacing wind events are rare, small to medium blowdown events are more common.

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## **A0266 *Betula alleghaniensis* - *Aesculus flava* Forest Alliance**

Yellow Birch - Yellow Buckeye Forest Alliance

*Southern Appalachian High Montane Buckeye - Northern Hardwood Forest*

### **ALLIANCE CONCEPT**

**Summary:** This alliance includes montane forests, mainly of the Southern and Central Appalachians, dominated by *Fagus grandifolia*, *Betula alleghaniensis*, and *Aesculus flava*, occurring in combination or with strong dominance by one of these species. Other species that may form a typically minor canopy component include *Acer saccharum*, *Betula lenta*, *Halesia tetraptera* var. *monticola*, *Picea rubens*, *Prunus serotina* var. *serotina*, *Quercus rubra*, and *Tilia americana* var. *heterophylla*. Subcanopy species can include small stems of canopy species as well as *Acer spicatum*, *Acer pensylvanicum*, *Amelanchier laevis*, and *Sorbus americana*. Shrub density varies among associations, ranging from very high to entirely lacking. Common species in the shrub and sapling strata include *Acer pensylvanicum*, *Acer spicatum*, *Amelanchier arborea* var. *austromontana*, *Aristolochia macrophylla*, *Cornus alternifolia*, *Crataegus punctata*, *Hydrangea arborescens*, *Ilex montana*, *Rhododendron maximum*, *Ribes cynosbati*, *Ribes rotundifolium*, *Ribes glandulosum*, *Rubus allegheniensis*, *Rubus canadensis*, *Vaccinium erythrocarpum*, and *Viburnum lantanoides*. The composition of herbaceous strata varies among associations. Variability in the herbaceous stratum may be related to aspect, elevation, and soil-nutrient status. These forests occur in a cool, humid climate, typically at high elevations (1066-1828 m [3500-6000 feet]) on a variety of sites, from upper concave slopes and steep, periglacial boulderfields and talus slopes, to flat ridgetops and saddles between ridges. Associations will vary with elevation, latitude, and geology and occur as small to large patches surrounded by other forest types, montane grasslands, or shrublands.

**Classification Comments:** *Acer rubrum* - *Betula lenta* - *Magnolia fraseri* / (*Rhododendron maximum*, *Kalmia latifolia*) Ruderal Forest (CEGL008558) is transitional to acidic coves described in Appalachian-Central Interior Mesic Forest Group (G020).

### **Similar Alliances:**

- *Fagus grandifolia* - *Quercus rubra* / *Cornus florida* Forest Alliance (A2054)

**Diagnostic Characteristics:** This alliance includes montane forests, mainly of the Southern and Central Appalachians, dominated by *Fagus grandifolia*, *Betula alleghaniensis*, and *Aesculus flava*, occurring in combination or with strong dominance by one of these species, typically at high elevations (1066-1828 m [3500-6000 feet]).

### **Related Concepts:**

- IA4c. Yellow Birch Boulderfield Forest (Allard 1990) ?
- IA4d. Southern Appalachian Beech Gap (Allard 1990) ?
- IA4e. Southern Appalachian Northern Hardwoods Forest (Allard 1990) ?

### **ALLIANCE DESCRIPTION**

**Environment:** These forests occur in a cool, humid climate, typically at high elevations (1066-1828 m [3500-6000 feet]) on a variety of sites, from upper concave slopes and steep, periglacial boulderfields and talus slopes, to flat ridgetops and saddles between ridges. Associations will vary with elevation, latitude, and geology and occur as small to large patches surrounded by other forest types, montane grasslands, or shrublands.

**Vegetation:** This alliance includes montane forests dominated by *Fagus grandifolia*, *Betula alleghaniensis*, and *Aesculus flava*, occurring in combination or with strong dominance by one of these species. Other species that may form a typically minor canopy component include *Acer saccharum*, *Betula lenta*, *Halesia tetraptera* var. *monticola*, *Picea rubens*, *Prunus serotina* var. *serotina*, *Quercus rubra*, and *Tilia americana* var. *heterophylla*. Subcanopy species can include small stems of canopy species as well as *Acer spicatum*, *Acer pensylvanicum*, *Amelanchier laevis*, and *Sorbus americana*. Shrub density varies among associations, ranging from very high to entirely lacking. Common species in the shrub and sapling strata include *Acer pensylvanicum*, *Acer spicatum*, *Amelanchier arborea* var. *austromontana*, *Aristolochia macrophylla*, *Cornus alternifolia*, *Crataegus punctata*, *Hydrangea*

*arborescens*, *Ilex montana*, *Rhododendron maximum*, *Ribes cynosbati*, *Ribes rotundifolium*, *Ribes glandulosum*, *Rubus allegheniensis*, *Rubus canadensis*, *Vaccinium erythrocarpum*, and *Viburnum lantanoides*. The composition of herbaceous strata varies among associations. Variability in the herbaceous stratum may be related to aspect, elevation, and soil-nutrient status. Forests on drier, south-facing sites (often open convex slopes) typically have dense herbaceous cover, often approaching 100% coverage, and dominated by species of *Carex* (*Carex aestivalis*, *Carex brunnescens* ssp. *sphaerostachya*, *Carex debilis* var. *rudgei*, *Carex intumescens*, *Carex pensylvanica*), while more mesic sites have herbaceous strata dominated by large forbs and patches of ferns, with lesser amounts of sedges. In some forests, seepage areas are common, producing wet microhabitats with unique species assemblages (*Chelone lyonii*, *Circaea alpina*, *Rudbeckia laciniata*, *Impatiens pallida*, and *Monarda didyma*). Woody vines, and vining shrubs, may be common, especially in boulderfield associations. Other typical herbaceous species for this alliance include *Ageratina altissima* var. *roanensis*, *Anemone quinquefolia*, *Angelica triquinata*, *Arisaema triphyllum*, *Eurybia chlorolepis* (= *Aster chlorolepis*), *Athyrium filix-femina* ssp. *asplenioides*, *Cardamine clematitidis*, *Actaea podocarpa* (= *Cimicifuga americana*), *Actaea racemosa* (= *Cimicifuga racemosa*), *Circaea alpina*, *Claytonia caroliniana*, *Clintonia borealis*, *Prosartes lanuginosa* (= *Disporum lanuginosum*), *Dryopteris campyloptera*, *Dryopteris intermedia*, *Dryopteris marginalis*, *Erythronium umbilicatum* ssp. *monostolum*, *Hylocomium splendens*, *Luzula acuminata*, *Maianthemum canadense*, *Medeola virginiana*, *Oxalis montana*, *Phacelia bipinnatifida*, *Phacelia fimbriata*, *Poa alsodes*, *Prenanthes altissima*, *Prenanthes roanensis*, *Rugelia nudicaulis*, *Saxifraga micranthidifolia*, *Solidago curtisii* (= *Solidago caesia* var. *curtisii*), *Solidago glomerata*, *Stellaria corei*, *Stellaria pubera*, *Streptopus lanceolatus* var. *roseus* (= *Streptopus roseus*), *Tiarella cordifolia*, *Thelypteris noveboracensis*, and *Trillium erectum*.

**Physiognomy and Structure:** This alliance includes montane forests. The subcanopy can include small stems of canopy species as well as others. Shrub density varies among associations, ranging from very high to entirely lacking. The composition of herbaceous strata varies among associations. Variability in the herbaceous stratum may be related to aspect, elevation, and soil-nutrient status. Forests on drier, south-facing sites (often open convex slopes) typically have dense herbaceous cover, often approaching 100% coverage, while more mesic sites have herbaceous strata dominated by large forbs and patches of ferns, with lesser amounts of sedges. In some forests, seepage areas are common, producing wet microhabitats with unique species assemblages. Woody vines, and vining shrubs, may be common, especially in boulderfield associations.

**Floristics:** This alliance includes montane forests dominated by *Fagus grandifolia*, *Betula alleghaniensis*, and *Aesculus flava*, occurring in combination or with strong dominance by one of these species. Other species that may form a typically minor canopy component include *Acer saccharum*, *Betula lenta*, *Halesia tetraptera* var. *monticola*, *Picea rubens*, *Prunus serotina* var. *serotina*, *Quercus rubra*, and *Tilia americana* var. *heterophylla*. Subcanopy species can include small stems of canopy species as well as *Acer spicatum*, *Acer pensylvanicum*, *Amelanchier laevis*, and *Sorbus americana*. Shrub density varies among associations, ranging from very high to entirely lacking. Common species in the shrub and sapling strata include *Acer pensylvanicum*, *Acer spicatum*, *Amelanchier arborea* var. *austromontana*, *Aristolochia macrophylla*, *Cornus alternifolia*, *Crataegus punctata*, *Hydrangea arborescens*, *Ilex montana*, *Rhododendron maximum*, *Ribes cynosbati*, *Ribes rotundifolium*, *Ribes glandulosum*, *Rubus allegheniensis*, *Rubus canadensis*, *Vaccinium erythrocarpum*, and *Viburnum lantanoides*. The composition of herbaceous strata varies among associations. Variability in the herbaceous stratum may be related to aspect, elevation, and soil-nutrient status. Forests on drier, south-facing sites (often open convex slopes) typically have dense herbaceous cover, often approaching 100% coverage, and dominated by species of *Carex* (*Carex aestivalis*, *Carex brunnescens* ssp. *sphaerostachya*, *Carex debilis* var. *rudgei*, *Carex intumescens*, *Carex pensylvanica*), while more mesic sites have herbaceous strata dominated by large forbs and patches of ferns, with lesser amounts of sedges. In some forests, seepage areas are common, producing wet microhabitats with unique species assemblages (*Chelone lyonii*, *Circaea alpina*, *Rudbeckia laciniata*, *Impatiens pallida*, and *Monarda didyma*). Woody vines, and vining shrubs, may be common, especially in boulderfield associations. Other typical herbaceous species for this alliance include *Ageratina altissima* var. *roanensis*, *Anemone quinquefolia*, *Angelica triquinata*, *Arisaema triphyllum*, *Eurybia chlorolepis* (= *Aster chlorolepis*), *Athyrium filix-femina* ssp. *asplenioides*, *Cardamine clematitidis*, *Actaea podocarpa* (= *Cimicifuga americana*), *Actaea racemosa* (= *Cimicifuga racemosa*), *Circaea alpina*, *Claytonia caroliniana*, *Clintonia borealis*, *Prosartes lanuginosa* (= *Disporum lanuginosum*), *Dryopteris campyloptera*, *Dryopteris intermedia*, *Dryopteris marginalis*, *Erythronium umbilicatum* ssp. *monostolum*, *Hylocomium splendens*, *Luzula acuminata*, *Maianthemum canadense*, *Medeola virginiana*, *Oxalis montana*, *Phacelia bipinnatifida*, *Phacelia fimbriata*, *Poa alsodes*, *Prenanthes altissima*, *Prenanthes roanensis*, *Rugelia nudicaulis*, *Saxifraga micranthidifolia*, *Solidago curtisii* (= *Solidago caesia* var. *curtisii*), *Solidago glomerata*, *Stellaria corei*, *Stellaria pubera*, *Streptopus lanceolatus* var. *roseus* (= *Streptopus roseus*), *Tiarella cordifolia*, *Thelypteris noveboracensis*, and *Trillium erectum*.

#### ALLIANCE DISTRIBUTION

**Range:** Forests in this alliance are found in the high-elevation regions of the Blue Ridge, Cumberland, and Allegheny Mountains from West Virginia south to northern Georgia and may extend into the adjacent Ridge and Valley and Appalachian Plateau provinces. This alliance is found in Georgia, Kentucky, North Carolina, Tennessee, Virginia, and West Virginia.

**Nations:** US

**Subnations:** GA, KY, NC, SC?, TN, VA, WV

#### ALLIANCE SOURCES

**References:** Allard 1990, Bratton 1975, Brown 1941, Chafin and Jones 1989, Davis 1930, Evans et al. 2009, Faber-Langendoen et al. 2019b, Fuller 1977, Golden 1981, Pittillo and Smathers 1979, Ramseur 1960, Russell 1953, Schafale and Weakley 1990, Singer et al. 1984, Sneddon et al. 1994, Wharton 1978, White et al. 1993, Whittaker 1956

**Author of Concept:** Faber-Langendoen et al. 2019b

**Author of Description:** D.J. Allard and K. D Patterson, in Faber-Langendoen et al. (2013)

**[CEGL004973] *Aesculus flava* - *Betula alleghaniensis* - *Acer saccharum* / *Caulophyllum thalictroides* - *Actaea podocarpa* Forest**

Translated Name: **Yellow Buckeye - Yellow Birch - Sugar Maple / Blue Cohosh - Mountain Bugbane Forest**

Common Name: **Southern Appalachian Northern Hardwood Forest (Rich Type)**

**USNVC CLASSIFICATION**

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Interior-Northeastern Mesic Forest (M883)
Group	Appalachian-Allegheny Northern Hardwood - Conifer Forest (G742)
Alliance	<i>Betula alleghaniensis</i> - <i>Aesculus flava</i> Forest Alliance (A0266)

**ELEMENT CONCEPT**

**Global Summary:** This association includes forests on high but sheltered slopes in the Southern and Central Appalachians, with canopies dominated by species typically known as northern hardwoods (*Aesculus flava*, *Fagus grandifolia*, *Betula alleghaniensis*, *Acer saccharum*), but with a rich herbaceous flora dominated by forbs and more typical of lower elevation "cove" forests. This forest occurs on deep, rocky soils on the upper slopes of coves, and on other protected landforms, at elevations of 1070-1525 m (3500-5000 feet), and can be associated with mafic substrates. Other canopy species can include *Fraxinus americana*, *Tilia americana* var. *heterophylla*, and *Quercus rubra*. In the Great Smoky Mountains and in the Nantahala Mountains (Standing Indian), *Halesia tetraptera* var. *monticola* can be an important canopy component. The shrub stratum is typically open, but small trees such as *Acer spicatum*, *Acer pensylvanicum*, and *Amelanchier laevis* are frequent. Herbaceous cover can be lush, quite diverse, and is typically dominated and characterized by large forbs such as *Caulophyllum thalictroides*, *Actaea racemosa*, *Collinsonia canadensis*, *Ageratina altissima* var. *roanensis*, *Laportea canadensis*, *Campanulastrum americanum*, and *Tiarella cordifolia*. Other species typical of northern hardwood forests such as *Dryopteris intermedia* and *Eurybia chlorolepis* are also common. The canopy of these forests always has a component of *Betula alleghaniensis* and/or *Fagus grandifolia*, occurring with *Acer saccharum*, over a lush and diverse herbaceous stratum.

**ENVIRONMENTAL DESCRIPTION**

**Great Smoky Mountains National Park Environment:** This community occurs on concave or protected landforms such as the upper portions of draws and coves, protected slopes, and gaps. Sites sampled had northerly aspects and a mean elevation of 4200 feet, ranging from 3580 to 4620 feet.

**Global Environment:** This association includes forests on high but sheltered slopes in the Southern and Central Appalachians. This forest occurs on deep, rocky soils on the upper slopes of coves, and on other protected landforms, at elevations of 1070-1525 m (3500-5000 feet), and can be associated with mafic substrates.

**VEGETATION DESCRIPTION**

**Great Smoky Mountains National Park Vegetation:** The canopy of these forests always have a component of *Betula alleghaniensis* and *Fagus grandifolia*, codominating with *Acer saccharum*, *Aesculus flava*, and *Halesia tetraptera* var. *monticola*. Occasionally *Quercus rubra*, *Tilia americana* var. *heterophylla*, and *Fraxinus americana* may have coverage in the canopy, but this situation is not typical. The subcanopy, if present, contains species from the canopy as well as *Prunus pensylvanica* and *Prunus serotina*. The shrub stratum is typically open with scattered shrubs, but shrubs can dominate in patches. Typical shrub species include *Acer pensylvanicum*, *Acer saccharum*, *Acer spicatum*, *Aesculus flava*, *Cornus alternifolia*, *Fagus grandifolia*, *Hydrangea arborescens*, *Ilex montana*, *Rubus allegheniensis*, *Rubus canadensis*, and *Viburnum lantanoides*. The herbaceous stratum is lush and diverse. Species with the highest coverage and constancy include *Ageratina altissima* (var. *altissima* and var. *roanensis*), *Eurybia divaricata* (= *Aster divaricatus*), *Actaea podocarpa* (= *Cimicifuga americana*), *Actaea racemosa* (= *Cimicifuga racemosa*), *Deparia acrostichoides*, *Dryopteris intermedia*, *Laportea canadensis*, *Solidago curtisii* (= *Solidago caesia* var. *curtisii*), *Tiarella cordifolia*, and *Viola blanda*. Other species with greater than 50% constancy include *Arisaema triphyllum* ssp. *triphyllum*, *Athyrium filix-femina* ssp. *asplenioides*, *Carex* spp. (e.g., *Carex aestivalis*, *Carex debilis*, *Carex laxiflora* var. *laxiflora*, *Carex pensylvanica*, *Carex plantaginea*), *Prosartes lanuginosa* (= *Disporum lanuginosum*), *Eupatorium* spp. (e.g., *Eupatorium dubium*, *Eupatorium fistulosum*, *Eupatorium purpureum*, *Eupatorium steelei*), *Galium* spp. (e.g., *Galium lanceolatum*, *Galium latifolium*, *Galium triflorum*), *Impatiens* spp., *Polygonatum pubescens*, *Polystichum acrostichoides* var. *acrostichoides*, *Stellaria corei*, *Stellaria pubera*, and *Viola canadensis*.

**Global Vegetation:** The canopy of these forests always has a component of *Betula alleghaniensis* and/or *Fagus grandifolia*, occurring with *Acer saccharum*, over a lush and diverse herbaceous stratum. The canopies of stands are dominated by species typically known as "northern hardwoods" (*Aesculus flava*, *Fagus grandifolia*, *Betula alleghaniensis*, *Acer saccharum*), but with a rich herbaceous flora dominated by forbs and more typical of lower elevation "cove" forests. Other canopy species can include *Tilia americana* var. *heterophylla*, *Fraxinus americana*, and *Quercus rubra*. In the Great Smoky Mountains and the Nantahala Mountains, *Halesia tetraptera* var. *monticola* can be an important canopy component. The shrub stratum is typically open, but small trees such as *Acer spicatum*, *Acer pensylvanicum*, and *Amelanchier laevis* are frequent. Herbaceous cover can be lush, quite diverse, and is typically dominated and characterized by large forbs such as *Caulophyllum thalictroides*, *Actaea podocarpa* (= *Cimicifuga americana*), *Actaea racemosa* (= *Cimicifuga racemosa*), *Collinsonia canadensis*, *Ageratina altissima* var. *roanensis*, *Laportea canadensis*,

*Campanulastrum americanum*, and *Tiarella cordifolia*. Other species typical of northern hardwood forests such as *Dryopteris intermedia* and *Eurybia chlorolepis* are also common.

#### MOST ABUNDANT SPECIES

##### Great Smoky Mountains National Park

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Broad-leaved deciduous tree	<i>Acer saccharum</i> , <i>Aesculus flava</i> , <i>Betula alleghaniensis</i> , <i>Fagus grandifolia</i>

##### Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Broad-leaved deciduous tree	<i>Acer saccharum</i> , <i>Aesculus flava</i> , <i>Betula alleghaniensis</i> , <i>Fagus grandifolia</i>
Herb (field)	Flowering forb	<i>Actaea racemosa</i> , <i>Laportea canadensis</i>

#### CHARACTERISTIC SPECIES

**Great Smoky Mountains National Park:** *Acer saccharum*, *Betula alleghaniensis*, *Deparia acrostichoides*, *Fagus grandifolia*, *Halesia tetraptera* var. *monticola*, *Viola canadensis*

**Global:** *Acer saccharum*, *Betula alleghaniensis*, *Deparia acrostichoides*, *Fagus grandifolia*, *Halesia tetraptera* var. *monticola*, *Viola canadensis*

#### OTHER NOTEWORTHY SPECIES

**Global: Vulnerable Plants:** *Aconitum reclinatum* (G3G4), *Actaea racemosa* (G3G4), *Ageratina altissima* var. *roanensis* (G5T3T4, Southern Blue Ridge endemic), *Carex ruthii* (G3G4), *Coreopsis latifolia* (G3), *Gentiana austromontana* (G3), *Geum geniculatum* (G2), *Lilium grayi* (G1G2, Southern Blue Ridge endemic), *Prenanthes roanensis* (G3, Southern Blue Ridge endemic), *Solidago glomerata* (G3), *Stachys clingmanii* (G2); **Other Plants:** *Streptopus lanceolatus* var. *roseus* (G5T4)

#### CONSERVATION STATUS RANK

**Global Rank & Reasons:** G3 (27-Oct-2003). This community is naturally uncommon due to specific habitat requirements and a restricted geographic range. It only occurs at moderate to high elevations, on protected landforms, in the Southern Blue Ridge. Most documented occurrences are of moderate to high quality, although destructive silvicultural practices could threaten remaining occurrences. The European gypsy moth (*Lymantria dispar*) is predicted to spread within the range of this community by 2005 and poses a threat to this community. There are potential difficulties in assigning plots or occurrences to this association (Southern Appalachian Northern Hardwood Forest [Rich Type] (CEGL004973)) versus Southern Appalachian Cove Forest (Rich Montane Type) (CEGL007695). The current (2003) understanding of the differences would dictate leaving the rank at G3.

#### RELATED CONCEPTS

##### Global Similar Types:

- *Aesculus flava* - *Acer saccharum* - (*Tilia americana* var. *heterophylla*) / *Hydrophyllum canadense* - *Solidago flexicaulis* Forest (CEGL007695) lacks *Betula alleghaniensis* and occurs at lower elevations.
- *Betula alleghaniensis* - *Fagus grandifolia* / *Viburnum lantanoides* / *Eurybia chlorolepis* - *Dryopteris intermedia* Forest (CEGL007285) occurs on higher, more open slopes with lower soil fertility.

##### Global Related Concepts:

- **Aesculus flava** - **Betula alleghaniensis** - **Acer saccharum** / **Caulophyllum thalictroides** - **Actaea podocarpa** Forest [Southern Appalachian Northern Hardwoods Forest] (Vanderhorst 2018) =

#### CLASSIFICATION

**Status:** Standard

**Classification Confidence:** 2 - Moderate

**Great Smoky Mountains National Park Other Comments:** Some examples of this community, particularly at low elevations, may begin to resemble forests in the *Liriodendron tulipifera* - *Tilia americana* var. *heterophylla* - *Aesculus flava* - *Acer saccharum* Forest Alliance (A.235). The canopy of this forest is distinguished by *Betula alleghaniensis* and *Fagus grandifolia* occurring in combination with *Aesculus flava* and *Acer saccharum*. In some areas, signature distinctions between this association and *Betula alleghaniensis* - *Fagus grandifolia* - *Aesculus flava* / *Viburnum lantanoides* / *Eurybia chlorolepis* - *Dryopteris intermedia* Forest (CEGL007285) may be difficult to make, and mapping may have to be done at the alliance level.

**Global Classification Comments:** These forests occur above the elevational limit of some of the typical "cove" canopy species [see *Liriodendron tulipifera* - *Tilia americana* var. *heterophylla* - *Aesculus flava* Forest Alliance (A0235)] such as *Liriodendron tulipifera* and *Carya cordiformis*.

In West Virginia, five plots from high elevations (1090-1310m) on Black Mountain (Allegheny Mountains) are classified to this association. *Aesculus flava* occurs in these stands at its maximum elevation in the state in association with *Betula alleghaniensis* and other typical northern hardwoods. These forests may have seepage inclusions and support a lush herb layer which includes *Actaea podocarpa*, *Laportea canadensis*, *Allium tricocum*, and both *Caulophyllum thalictroides* and *Caulophyllum giganteum*.

## ELEMENT DISTRIBUTION

**Great Smoky Mountains National Park Range:** This community was sampled on the Mount Le Conte and Cades Cove quadrangles but is widespread throughout the intermediate elevations of the park. On the Cades Cove quadrangle, historic and recent samples of this community ranged from 3580 to 4610 feet elevation. Samples from the southern portion of the Cades Cove quadrangle came from upper coves north of Gregory Bald; slopes below Rich Gap; and the western slopes of Forge Knob. In the central and eastern portion of the Cades Cove quadrangle this community was sampled from the protected high slopes on the west side of Mud Gap; a cove north of Ekaneetlee Gap; high slopes in the vicinity of Devil's Tater Patch; McCampbell Gap, McCampbell Knob, an upper cove north of McCampbell Gap; northwest slopes below McCampbell Knob; and a cove in the upper reaches of Pole Knob Branch. This community was sampled in the southwest portion of the Mount Le Conte quadrangle on the low slopes above Alum Cave Creek (4050 feet) and Walker Camp Prong (3990 feet); on the low slopes above Road Prong in the vicinity of Beech Flats (3650 feet); and in a upper cove below Chimney Tops (4620 feet).

**Global Range:** This community is a regional endemic, found only in the high-mountain areas of the Southern Blue Ridge, from Virginia south through western North Carolina, eastern Tennessee, and northeastern Georgia, with outlying examples in the Cumberlands and Southern Ridge and Valley in Virginia (Clinch Mountain and High Knob massif) and in the Allegheny Mountains (Black Mountain) in West Virginia.

**Nations:** US

**States/Provinces:** GA, NC, TN, VA:S2, WV:S1

**TNC Ecoregions:** 50:C, 51:C

**USFS Ecoregions (1994/95):** M221Aa:CCC, M221Ce:CCC, M221Db:CCC, M221Dc:CCC, M221Dd:CCC

**USFS Ecoregions (2007):** M221Aa:CCP, M221Bc:CCC, M221Ce:CCP, M221Db:CCC, M221Dc:CCC, M221Dd:CCC

**Federal Lands:** BIA (Eastern Band of Cherokee); NPS (Appalachian Trail [Southern Blue Ridge], Blue Ridge Parkway, Great Smoky Mountains); USFS (Chattahoochee, Chattahoochee (Southern Blue Ridge), Cherokee, Jefferson, Monongahela, Nantahala, Pisgah)

## ELEMENT SOURCES

**Great Smoky Mountains National Park Plots:** GRSM.7, GRSM.29, GRSM.30, GRSM.45, GRSM.46, GRSM.53, GRSM.58, GRSM.59, GRSM.108, GRSM.231.

**Great Smoky Mountains National Park Description Author(s):** K.D. Patterson

**Global Description Author(s):** G. Fleming and K. Patterson

**References:** Fleming and Coulling 2001, Fleming and Patterson 2009a, Fleming and Patterson 2009b, Fleming et al. 2017, Major et al. 1999, Peet et al. unpubl. data, Schafale 2012, Schafale and Weakley 1990, Southeastern Ecology Working Group n.d., TDNH unpubl. data 2018, Vanderhorst 2018, WVNHP unpubl. data

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**[CEGL007861] *Betula alleghaniensis* - (*Tsuga canadensis*) / *Rhododendron maximum* / (*Leucothoe fontanesiana*) Forest**

Translated Name: **Yellow Birch - (Eastern Hemlock) / Great Laurel / (Highland Doghobble) Forest**

Common Name: **Blue Ridge Hemlock - Northern Hardwood Forest**

## USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Interior-Northeastern Mesic Forest (M883)
Group	Appalachian-Allegheny Northern Hardwood - Conifer Forest (G742)
Alliance	<i>Betula alleghaniensis</i> - <i>Aesculus flava</i> Forest Alliance (A0266)

## ELEMENT CONCEPT

**Global Summary:** This association occurs in the Great Smoky Mountains and high mountain areas of southwestern Virginia, and at lower elevations in protected mountain settings in West Virginia. This community is found on steep, mostly north-facing slopes, and on slopes and flats along and above streams. These forests occur on midslope or toeslope positions, protected by higher landforms, where solar exposure is very low. The elevations of samples range from as low as 320 m in West Virginia (1040 feet) to around 1350 m (4400 feet), but the community can probably occur as high as 1524 m (5000 feet) or until *Picea rubens* begins to dominate. Sites are rocky, often with many large boulders and talus. Soils are stony with heavy litter layers and pockets of colluvium. This forest is affected by occasional disturbance by ice, wind and landslides. This mixed forest type has an open to closed canopy dominated by *Betula alleghaniensis* and/or *Tsuga canadensis*, although either of these species may be locally dominant at a small scale. In some stands, *Acer rubrum*, *Betula lenta*, *Liriodendron tulipifera* (at lower elevations), *Tilia americana* var. *heterophylla*, *Picea rubens*, or *Quercus rubra* can be important in the canopy or occur as minor associates. Other minor canopy and subcanopy species may include *Fagus grandifolia*, *Prunus serotina*, and *Magnolia acuminata*. The tall-shrub stratum is over 2 m in height, very dense (50-100% coverage) and dominated by *Rhododendron maximum*. Other minor shrubs commonly include *Acer pensylvanicum*, *Amelanchier laevis*, *Amelanchier arborea*, *Clethra acuminata*, *Hamamelis virginiana* (West Virginia), *Ilex montana*, and *Vaccinium erythrocarpum*. The ground layer is dominated by leaf litter, fallen trees and rocks. Herbaceous cover is sparse to moderate and is composed of scattered plants typical of mid- to high-elevation acidic forests. Composition can be quite variable among stands, but some of the more characteristic species include *Dryopteris intermedia*, *Oclemena acuminata*, *Polystichum acrostichoides* (West

Virginia), *Viola blanda*, and *Viola rotundifolia*. The bryophyte layer can be well-developed and diverse. In the Great Smoky Mountains, this association grades into forests dominated by *Picea rubens* or *Tsuga canadensis* at higher elevations.

#### ENVIRONMENTAL DESCRIPTION

**Great Smoky Mountains National Park Environment:** This community was found on steep, mostly north-facing slopes, and on slopes and flats along and above streams. These forests occur on middle slope or toeslope positions, protected by higher landforms. The elevations of samples ranged from as low as 3400 feet elevation to around 4400 feet, but the community can probably occur as high as 5000 feet or until *Picea rubens* begins to dominate. Sites are rocky, often with many large boulders and talus. Soils are stony with heavy litter layers. These forests are affected by occasional disturbance by ice, wind, and landslides.

**Global Environment:** This community occurs on steep, mostly north-facing mesic slopes, and on toeslopes and flats along streams. It typically occupies mid- to lower slope and valley-bottom topographic positions that are well-protected by higher landforms. These sites have low solar exposure and may be subject to cold-air inversions. Elevations (of plot-sampled stands) range from 320-750 m (1040-2400 feet) in West Virginia, to 915-1450 m (3000-4800 feet) in the Virginia mountains, and to 1030-1450 m (3400-4800 feet) in the Great Smoky Mountains. Lower elevation stands may intergrade with *Betula lenta*-dominated forest types. Sites are often rocky, with many large boulders and stones and pockets of colluvium. Soils, weathered from sandstone, acidic shale, or metamorphic igneous rocks, have dense, root-rich duff layers. Samples collected from plots are highly acidic (mean pH = 3.7 to 4.8) with low base status and moderately high organic matter content (mean = 20%). On stream-bottom sites, local areas of seepage are not uncommon, and habitats may be somewhat transitional to a saturated hydrologic regime. Sites occupied by this forest are affected by occasional ice, wind, and landslide disturbances.

#### VEGETATION DESCRIPTION

**Great Smoky Mountains National Park Vegetation:** This mixed forest type has an open to closed canopy dominated by *Betula alleghaniensis* with some stands codominated by *Tsuga canadensis*. Other minor canopy and subcanopy species may include *Aesculus flava*, *Picea rubens*, *Prunus pensylvanica*, *Betula lenta*, *Tilia americana* var. *heterophylla*, and at lower elevations, *Magnolia fraseri*, *Acer rubrum*, *Liriodendron tulipifera*, and *Halesia tetraptera* var. *monticola*. The tall-shrub stratum is over 2 m in height, very dense (50-100% coverage) and dominated by *Rhododendron maximum*. The dense low-shrub stratum is dominated by *Leucothoe fontanesiana*. Other minor shrubs can include *Acer pensylvanicum*, *Ilex montana*, *Kalmia latifolia*, *Rubus allegheniensis*, *Sambucus racemosa* var. *racemosa* (= var. *pubens*), *Tsuga canadensis*, and *Vaccinium erythrocarpum*. The ground layer is dominated by leaf litter, fallen trees, and rocks. Herbaceous cover is sparse (0-5%) and is composed of scattered plants typical of middle to high elevation acid forests. Some of the more characteristic species include *Dryopteris intermedia*, *Medeola virginiana*, *Mitchella repens*, *Tiarella cordifolia*, *Oxalis montana*, and *Polypodium appalachianum*. Additional herb species found in this community include *Arisaema dracontium*, *Arisaema triphyllum*, *Aristolochia macrophylla*, *Oclemena acuminata* (= *Aster acuminatus*), *Eurybia divaricata* (= *Aster divaricatus*), *Circaea alpina*, *Goodyera pubescens*, *Goodyera repens*, *Huperzia lucidula*, *Laportea canadensis*, *Monotropa uniflora*, *Polygonatum pubescens*, *Prenanthes altissima*, and *Viola blanda*.

**Global Vegetation:** This mixed forest has an open to closed canopy codominated by *Betula alleghaniensis* and/or *Tsuga canadensis*, although either of these species may be solely dominant over small areas. In some stands, *Acer rubrum*, *Betula lenta*, *Liriodendron tulipifera* (at lower elevations), *Tilia americana* var. *heterophylla*, *Picea rubens*, or *Quercus rubra* can be important in the canopy or occur as minor associates. Other minor canopy and subcanopy species may include *Fagus grandifolia*, *Prunus serotina*, and *Magnolia acuminata*. The community has a very dense (50-100% cover), evergreen tall-shrub stratum (>2 m tall) dominated by *Rhododendron maximum*. In the Great Smoky Mountains, a dense low-shrub stratum dominated by *Leucothoe fontanesiana* is typical, but this species is absent from Virginia and West Virginia examples of the type. Other minor shrubs commonly include *Acer pensylvanicum*, *Amelanchier laevis*, *Hamamelis virginiana* (in West Virginia stands), *Ilex montana*, and *Vaccinium erythrocarpum*. Herbaceous cover is sparse to occasionally moderate and is composed of scattered plants typical of mid- to high-elevation acidic forests. Composition can be quite variable among stands, but some of the more characteristic species include *Dryopteris intermedia*, *Oclemena acuminata*, *Polystichum acrostichoides* (in West Virginia stands), *Viola blanda*, and *Viola rotundifolia*. Some additional herbaceous species found in this community include *Arisaema triphyllum*, *Dennstaedtia punctilobula*, *Huperzia lucidula*, and *Medeola virginiana*. In Southern Appalachian stands with very dense evergreen shrub layers, species richness can be extraordinarily low (<10 taxa per 1000-m<sup>2</sup> sample), but in stands with somewhat more open shrub layers, richness can exceed 30 taxa per sample. The bryophyte layer can be well-developed and diverse; mosses and liverworts collected from West Virginia plots include *Anomodon attenuatus*, *Aulacomnium heterostichum*, *Bryhnia graminicolor*, *Bryoandersonia illecebra*, *Campylium chrysophyllum*, *Hypnum curvifolium*, *Hypnum imponens*, *Loeskeobryum brevirostre*, *Mnium stellare*, *Plagiothecium denticulatum*, *Rhynchostegium aquaticum* (= *Platyhypnidium riparioides*), *Thuidium delicatulum*, *Bazzania trilobata*, *Leucobryum glaucum*, and *Mnium hornum*. The regionally rare plants *Botrychium oneidense* and *Prenanthes roanensis* are minor components of this vegetation type.

**Global Dynamics:** The *Tsuga canadensis* component of Virginia stands has been devastated by outbreaks of hemlock woolly adelgid over the past several decades, leading to more open canopy conditions, along with increased regeneration and greater importance of *Betula alleghaniensis* in most stands.

#### MOST ABUNDANT SPECIES

##### Great Smoky Mountains National Park

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Broad-leaved deciduous tree	<i>Betula alleghaniensis</i>
Tall shrub/sapling	Broad-leaved evergreen tree	<i>Rhododendron maximum</i>

Short shrub/sapling	Broad-leaved evergreen shrub	<i>Leucothoe fontanesiana</i>
Herb (field)	Fern (Spore-bearing forb)	<i>Dryopteris intermedia</i>

**Global****Stratum**

Tree canopy

Tall shrub/sapling

Herb (field)

**Lifeform**

Broad-leaved deciduous tree

Broad-leaved evergreen tree

Fern (Spore-bearing forb)

**Species***Betula alleghaniensis**Rhododendron maximum**Dryopteris intermedia***CHARACTERISTIC SPECIES**

**Great Smoky Mountains National Park:** *Betula alleghaniensis*, *Leucothoe fontanesiana*, *Rhododendron maximum*, *Tsuga canadensis*

**Global:** *Betula alleghaniensis*, *Betula lenta*, *Botrychium oneidense*, *Magnolia fraseri*, *Mitchella repens*, *Oxalis montana*, *Picea rubens*, *Polypodium appalachianum*, *Polypodium virginianum*, *Polystichum acrostichoides*, *Rhododendron maximum*, *Ribes cynosbati*, *Tiarella cordifolia*, *Tsuga canadensis*, *Viola rotundifolia*

**OTHER NOTEWORTHY SPECIES**

**Global: Vulnerable Plants:** *Abies fraseri* (G2, Southern Blue Ridge endemic), *Botrychium oneidense* (G4, VA state-rare), *Geum geniculatum* (G2), *Hypericum mitchellianum* (G3), *Prenanthes roanensis* (G3, Southern Blue Ridge endemic)

**CONSERVATION STATUS RANK**

**Global Rank & Reasons:** G3 (23-May-2011). This community type is naturally uncommon within its range due to specific requirements for protected, mesic sites at high elevations. Most remaining examples of this community have been affected by past logging and are currently threatened with the loss of their *Tsuga canadensis* component due to ongoing or potential infestations by the exotic pest hemlock woolly adelgid (*Adelges tsugae*). This community type has a restricted but locally extensive distribution in the highest mountains of southwestern and west-central Virginia, North Carolina, West Virginia, and Tennessee. This association was originally described from Great Smoky Mountains National Park.

**RELATED CONCEPTS****Global Similar Types:**

- *Acer rubrum* - *Betula lenta* - *Magnolia fraseri* / (*Rhododendron maximum*, *Kalmia latifolia*) Ruderal Forest (CEGL008558) is a post-disturbance forest, some stands of which could resemble CEGL007861 without *Tsuga*.
- *Liriodendron tulipifera* - *Betula lenta* - *Tsuga canadensis* / *Rhododendron maximum* Forest (CEGL007543)
- *Picea rubens* - (*Betula alleghaniensis*, *Aesculus flava*) / *Rhododendron (maximum, catawbiense)* Forest (CEGL004983)
- *Picea rubens* - (*Betula alleghaniensis*, *Aesculus flava*) / *Viburnum lantanoides* / *Solidago glomerata* Forest (CEGL006256)
- *Picea rubens* / *Betula alleghaniensis* / *Bazzania trilobata* Forest (CEGL008501)
- *Tsuga canadensis* - *Acer saccharum* - *Fagus grandifolia* / *Dryopteris intermedia* Forest (CEGL006639)
- *Tsuga canadensis* - *Betula alleghaniensis* - *Acer saccharum* / *Dryopteris intermedia* Forest (CEGL006638)
- *Tsuga canadensis* - *Betula alleghaniensis* - *Prunus serotina* / *Rhododendron maximum* Forest (CEGL006206) is a high-elevation hemlock - hardwood forest in WV that lacks *Liriodendron tulipifera* and southern species.
- *Tsuga canadensis* - *Betula alleghaniensis* / *Ilex montana* / *Rhododendron catawbiense* Forest (CEGL008513)
- *Tsuga canadensis* - *Halesia tetraptera* - *Magnolia fraseri* / *Rhododendron maximum* / *Dryopteris intermedia* Forest (CEGL007693)

**Global Related Concepts:**

- *Betula alleghaniensis* - (*Tsuga canadensis*, *Liriodendron tulipifera*) / *Rhododendron maximum* Forest [Upside Down Northern Hardwoods Forest] (Vanderhorst 2018) =
- *Betula alleghaniensis* - (*Tsuga canadensis*, *Liriodendron tulipifera*) / *Rhododendron maximum* Forest [Yellow Birch (-Hemlock, Tuliptree) Cold Cove Forest] (Vanderhorst 2017c) =
- *Betula alleghaniensis* - *Tsuga canadensis* - (*Picea rubens*) / *Rhododendron maximum* Forest (Fleming and Coulling 2001) =
- *Betula alleghaniensis* / *Oxalis montana* Association: *Betula alleghaniensis* / *Rhododendron maximum* Variant (Fleming and Moorhead 1996) ?
- *Betula alleghaniensis* / *Rhododendron maximum* forest (Vanderhorst 2001b) =
- Hemlock - Yellow Birch: 24 (Eyre 1980) >
- Red Spruce Community: Hemlock - Spruce Subtype (Adams and Stephenson 1991) ?

**CLASSIFICATION****Status:** Standard**Classification Confidence:** 2 - Moderate

**Great Smoky Mountains National Park Other Comments:** On aerial photography, this community may appear similar to other Hemlock-Hardwood communities (i.e., *Liriodendron tulipifera* - *Betula lenta* - *Tsuga canadensis* / *Rhododendron maximum* Forest (CEGL007543) and *Tsuga canadensis* - *Halesia tetraptera* - (*Fagus grandifolia*, *Magnolia fraseri*) / *Rhododendron maximum* / *Dryopteris intermedia* Forest (CEGL007693)) but should be distinguishable by its higher elevation and topographic position. These forests grade into forests dominated by *Picea rubens* or *Tsuga canadensis* at higher elevations and may grade into *Betula lenta*-dominated forests such as acid cove forests at lower elevations.

**Global Classification Comments:** This acidic cove forest is characterized by species indicative of infertile environments, with a mixed deciduous-evergreen to mostly deciduous canopy over a dense shrub layer of *Rhododendron maximum*. Species richness is typically low, ranging from 4 to 38 species per sample with an average of 19 species per 400-square-meter sample. Analysis of plot samples from the Great Smoky and Virginia mountains, and from Fayette and Raleigh counties, West Virginia, shows the most constant species as *Betula alleghaniensis*, *Rhododendron maximum*, *Tsuga canadensis*, and *Dryopteris intermedia*.

Forests of high-elevation coves at Salt Pond Mountain in Giles County (e.g., War Spur Branch), where *Picea rubens* is codominant with or subordinate to *Tsuga canadensis* and *Betula alleghaniensis*, are tentatively placed here. Some of these stands, however, may be better classified as wetlands and require additional investigation.

In West Virginia, this association is applied to forests with an abundance of *Betula allegheniensis* in deep gorges outside the main high-elevation distribution for this species in the state. *Tsuga canadensis* can be codominant in the canopy or abundant in lower strata, or it may be absent. This association is distinguished from similar forests at higher elevations in the Allegheny Mountains of West Virginia classified as *Tsuga canadensis* - *Betula alleghaniensis* - *Prunus serotina* / *Rhododendron maximum* Forest (CEGL006206) by having *Liriodendron tulipifera* and by lacking *Prunus serotina* and high-elevation herbs such as *Oxalis montana* and *Maianthemum canadense*.

#### ELEMENT DISTRIBUTION

**Great Smoky Mountains National Park Range:** This community was sampled only on the Mount Le Conte quadrangle but is possible on the Cades Cove quadrangle, and certainly in other areas of the park. On the Mount Le Conte quadrangle, samples of this type ranged from 3400-4400 feet elevation and were found on lower slopes on the northern flanks of Mount Le Conte, the steep south-facing slopes southwest of Balsam Point, as well as on the north-facing slopes above the West Prong of the Pigeon River and its tributaries, Walker Camp Prong and Trout Branch, and the steep slopes above and lower slopes and flats along Alum Cave Creek. An historic sample from the southwestern portion of the Cades Cove quadrangle, at 3800 feet, at the head of a cove east of High Point, may represent this community.

**Global Range:** This community has been documented in the Great Smoky Mountains of Tennessee; in the Mount Rogers - Whitetop Mountain area of the Virginia Blue Ridge (Grayson, Smyth and Washington counties); on Salt Pond Mountain in the Ridge and Valley of west-central Virginia (Giles County); on Allegheny Mountain in Highland County, Virginia; and in gorges of the New Gauley and Buckhannon rivers in Fayette, Raleigh, and Nicholas counties in West Virginia. This vegetation type may be locally distributed throughout the Southern and Central Appalachians.

**Nations:** US

**States/Provinces:** NC, TN, VA:S3?, WV:S2

**TNC Ecoregions:** 50:C, 51:C, 59:C

**USFS Ecoregions (1994/95):** M221Aa:CCC, M221Ba:CCC, M221Bd:CC?, M221Ca:CCC, M221Cb:CCC, M221Dc:CCC, M221Dd:CCC

**USFS Ecoregions (2007):** M221Aa:CCP, M221Ba:CCC, M221Bc:CCC, M221Bd:CC?, M221Ca:CCC, M221Cb:CCC, M221Dc:CCC, M221Dd:CCC

**Federal Lands:** BIA (Eastern Band of Cherokee); NPS (Appalachian Trail [Central Appalachians], Appalachian Trail [Southern Blue Ridge], Blue Ridge Parkway, Gauley River, Great Smoky Mountains, New River Gorge); USFS (Cherokee, George Washington, Jefferson, Nantahala, Pisgah)

#### ELEMENT SOURCES

**Great Smoky Mountains National Park Plots:** GRSM.8, GRSM.13, GRSM.28, GRSM.107, GRSM.116, GRSM.117, GRSM.136, GRSM.406, GRSM.530.

**Great Smoky Mountains National Park Description Author(s):** K.D. Patterson, mod. R. White

**Global Description Author(s):** G. Fleming, P. Coulling, S.C. Gawler and K.D. Patterson

**References:** Adams and Stephenson 1991, Eyre 1980, Fleming and Coulling 2001, Fleming and Coulling 2001, Fleming and Moorhead 1996, Fleming and Patterson 2009a, Fleming et al. 2017, Grafton and McGraw 1976, Livingston and Mitchell 1976, NatureServe Ecology - Southeastern U.S. unpubl. data, Newell 1997, Newell et al. 1997, Peet et al. unpubl. data, Schafale 2012, Southeastern Ecology Working Group n.d., Vanderhorst 2001b, Vanderhorst 2017c, Vanderhorst 2018, Vanderhorst et al. 2007, Vanderhorst et al. 2010, WVNHP unpubl. data

### [CEGL007285] *Betula alleghaniensis* - *Fagus grandifolia* / *Viburnum lantanoides* / *Eurybia chlorolepis* - *Dryopteris intermedia* Forest

Translated Name: **Yellow Birch - American Beech / Hobblebush / Appalachian Heartleaf Aster - Intermediate Woodfern Forest**

Common Name: **Southern Appalachian Northern Hardwood Forest (Typic Type)**

#### USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Interior-Northeastern Mesic Forest (M883)
Group	Appalachian-Allegheny Northern Hardwood - Conifer Forest (G742)
Alliance	<i>Betula alleghaniensis</i> - <i>Aesculus flava</i> Forest Alliance (A0266)

## ELEMENT CONCEPT

**Global Summary:** This is a broadly defined association meant to cover typical "northern hardwood forests" over 1220 m (4000 feet) elevation of the Southern Blue Ridge and the highest adjacent ridges of the Virginia Ridge and Valley. This deciduous forest association occurs on exposed landforms such as open, north-facing slopes. The canopy is dominated by various mixtures of *Betula alleghaniensis*, *Fagus grandifolia*, and sometimes *Aesculus flava*. In the northern part of the range, *Acer saccharum* can codominate in the canopy. Other canopy trees may be present but are of minor importance (e.g., *Prunus serotina*, *Quercus rubra*, *Halesia tetraptera* var. *monticola*). Common subcanopy trees include *Acer pensylvanicum*, *Acer spicatum*, *Amelanchier laevis*, and *Acer saccharum*. A shrub stratum may be absent to moderately dense. *Viburnum lantanoides* is a typical shrub. Other possible shrub species include, but are not limited to, *Hydrangea arborescens*, *Ilex montana*, *Rubus canadensis*, and *Sambucus racemosa* var. *racemosa*. Herbaceous cover can be dominated by sedges or ferns or be composed of a mixture of sedges, ferns, and other forbs. Typical herbaceous species include *Ageratina altissima* var. *roanensis*, *Eurybia chlorolepis*, *Arisaema triphyllum*, *Athyrium filix-femina* ssp. *asplenioides*, *Carex pensylvanica*, *Dryopteris intermedia*, *Solidago curtisii*, *Stellaria pubera*, *Stellaria corei*, and *Streptopus lanceolatus* var. *roseus*.

## ENVIRONMENTAL DESCRIPTION

**Great Smoky Mountains National Park Environment:** Samples of this community ranged from 4320 to 5400 feet elevation, averaging 4720 feet. Examples are found on high, exposed slopes, ridges, and gaps, typically with northerly exposures, but occasionally on eastern or western upper slopes.

**Global Environment:** This deciduous forest association occurs at high elevations (typically over 1220 m [4000 feet]) in the Southern Appalachians, on exposed landforms such as open, north-facing slopes. Virginia examples of the type occur at elevations from 1100-1585 m (3600-5200 feet). Mean elevation of 28 plot-sampled Virginia stands is 1340 m (4400 feet). Habitats include a wide range of slope positions and aspects. Surface cover of bedrock and boulders is typically less than 25%, but occasionally higher. Soil samples collected from plot-sampling sites are consistently extremely acidic (mean pH = 3.8) with low base status.

## VEGETATION DESCRIPTION

**Great Smoky Mountains National Park Vegetation:** The canopy is dominated by various mixtures of *Betula alleghaniensis*, *Fagus grandifolia*, and *Aesculus flava*. Other species that may occasionally have high coverage in the canopy include *Halesia tetraptera* var. *monticola*, *Quercus rubra*, and *Acer saccharum*. The subcanopy is usually not well-developed and consists of canopy species. Additional species that may be present in the subcanopy include *Acer pensylvanicum*, *Amelanchier laevis*, and *Prunus serotina*. At the highest elevations *Picea rubens* may be part of the subcanopy, while at lower elevations *Magnolia acuminata* may be present in the subcanopy. Shrubs are typically sparse but can be moderately dense. Common shrubs include *Fagus grandifolia*, *Rubus canadensis*, *Acer spicatum*, *Viburnum lantanoides*, and *Ilex montana*, although other species may occur. Herb coverage varies between occurrences but is composed of a mix of sedges, ferns, and other forbs. Species richness is low in comparison with other deciduous forests, with typically less than 30 total species per 0.1 hectare. Common herbaceous dominants include *Ageratina altissima*, *Athyrium filix-femina* ssp. *asplenioides*, *Carex* spp. (e.g., *Carex debilis*, *Carex intumescens*, *Carex pensylvanica*), and *Dryopteris intermedia*. Other typical herbs include *Eurybia divaricata* (= *Aster divaricatus*), *Solidago curtisii* (= *Solidago caesia* var. *curtisii*), *Stellaria pubera*, and *Viola* spp. (e.g., *Viola blanda*, *Viola canadensis*, *Viola hastata*, *Viola pubescens*), although other species may occur.

**Global Vegetation:** Over most of this community's range, the canopy is dominated by various mixtures of *Betula alleghaniensis*, *Fagus grandifolia* and, less commonly, *Aesculus flava*. In Virginia stands of this type (primarily from the Mount Rogers - Whitetop massif), *Acer saccharum* is generally a codominant canopy tree in mixed stands with *Fagus grandifolia* and *Betula alleghaniensis* and with *Aesculus flava* less important. Other canopy trees, including *Prunus serotina*, *Quercus rubra*, and *Halesia tetraptera* var. *monticola*, may be present but are of minor importance. Common subcanopy trees include *Acer pensylvanicum*, *Acer spicatum*, *Amelanchier laevis*, and *Acer saccharum*. The shrub stratum may vary from nearly undeveloped to moderately dense. *Viburnum lantanoides* is a typical shrub, except in the northern portion of the range, where it varies from infrequent to locally dominant. Other potential shrub components include, but are not limited to, *Hydrangea arborescens*, *Ilex montana*, *Rubus canadensis*, and *Sambucus racemosa* (= *Sambucus pubens*). Herbaceous cover is variably dominated by sedges, ferns and forbs. Typical herbaceous species include *Ageratina altissima* var. *roanensis*, *Eurybia chlorolepis* (= *Aster chlorolepis*), *Arisaema triphyllum*, *Athyrium filix-femina* ssp. *asplenioides* (= *Athyrium asplenioides*), *Carex pensylvanica*, *Carex lucorum* var. *austrolucorum*, *Dryopteris intermedia*, *Solidago lancifolia*, *Stellaria pubera*, *Stellaria corei*, *Streptopus lanceolatus* var. *roseus* (= *Streptopus roseus*), and *Viola blanda* var. *blanda*.

## MOST ABUNDANT SPECIES

## Great Smoky Mountains National Park

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Broad-leaved deciduous tree	<i>Aesculus flava</i> , <i>Betula alleghaniensis</i> , <i>Fagus grandifolia</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Rubus canadensis</i>
Herb (field)	Flowering forb	<i>Ageratina altissima</i>
Herb (field)	Fern (Spore-bearing forb)	<i>Athyrium filix-femina</i> ssp. <i>asplenioides</i> , <i>Dryopteris intermedia</i>

## Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Broad-leaved deciduous tree	<i>Aesculus flava</i> , <i>Betula alleghaniensis</i> , <i>Fagus grandifolia</i>
Tree subcanopy	Broad-leaved deciduous tree	<i>Acer pensylvanicum</i> , <i>Acer saccharum</i> , <i>Acer spicatum</i>

Tall shrub/sapling	Broad-leaved deciduous shrub	<i>Viburnum lantanoides</i>
Herb (field)	Flowering forb	<i>Ageratina altissima</i> var. <i>roanensis</i> , <i>Eurybia chlorolepis</i>
Herb (field)	Graminoid	<i>Carex pensylvanica</i>

#### CHARACTERISTIC SPECIES

**Great Smoky Mountains National Park:** *Acer spicatum*, *Aesculus flava*, *Ageratina altissima* var. *roanensis*, *Allium burdickii*, *Betula alleghaniensis*, *Carex pensylvanica*, *Dryopteris intermedia*, *Eurybia chlorolepis*, *Fagus grandifolia*, *Ilex montana*, *Oxalis montana*, *Solidago glomerata*, *Stellaria corei*, *Stellaria pubera*, *Streptopus amplexifolius*, *Viburnum lantanoides*

**Global:** *Acer pensylvanicum*, *Acer saccharum*, *Acer spicatum*, *Aesculus flava*, *Ageratina altissima* var. *roanensis*, *Betula alleghaniensis*, *Carex lucorum* var. *austrolucorum*, *Carex pensylvanica*, *Eurybia chlorolepis*, *Fagus grandifolia*, *Ilex montana*, *Magnolia fraseri*, *Rubus canadensis*, *Viburnum lantanoides*, *Viola blanda*, *Viola rotundifolia*

#### OTHER NOTEWORTHY SPECIES

**Great Smoky Mountains National Park: Vulnerable Plants:** *Ageratina altissima* var. *roanensis* (G5T3T4), *Solidago glomerata* (G3); **Invasive/Exotic Plants:** *Streptopus amplexifolius*

**Global: Vulnerable Plants:** *Abies fraseri* (G2, Southern Blue Ridge endemic), *Ageratina altissima* var. *roanensis* (G5T3T4, All Virginia stands and Subtype 1; Southern Blue Ridge endemic), *Arnoglossum reniforme* (G4, VA state-rare), *Cardamine clematitidis* (G3), *Carex lucorum* var. *austrolucorum* (G5T3T4, All Virginia stands and Subtype 2), *Carex manhartii* (G3G4), *Carex misera* (G3), *Cetradonia linearis* (G3), *Erythronium umbilicatum* ssp. *monostolum* (G5T3), *Gentiana austromontana* (G3), *Glyceria nubigena* (G2G3, endemic to Great Smoky Mountains and adjacent areas near the park), *Hypericum graveolens* (G3), *Hypericum michellianum* (G3), *Ilex collina* (G3, Southern Blue Ridge endemic), *Prenanthes roanensis* (G3, Southern Blue Ridge endemic), *Rhododendron vaseyi* (G3, NC/Southern Blue Ridge endemic), *Rugelia nudicaulis* (G3), *Solidago glomerata* (G3), *Stachys clingmanii* (G2); **Other Plants:** *Streptopus lanceolatus* var. *roseus* (G5T4)

#### CONSERVATION STATUS RANK

**Global Rank & Reasons:** G3G4 (14-Dec-1998). This is a broadly defined association meant to cover typical "northern hardwood forests" of the Southern Blue Ridge. If needed, more subassociations may be recognized based on differences related to geology and other environmental variables. Even if broadly defined, this type is limited in distribution to western North Carolina, eastern Tennessee, and southwestern Virginia, and in extent by its requirement for higher elevations (typically over 1220 m [4000 feet]). Most of the area of this community type is on public lands administered by the U.S. Forest Service (Pisgah, Nantahala, Cherokee, and Jefferson national forests) and National Park Service (Great Smoky Mountains National Park and Blue Ridge Parkway). Most sites for this community are relatively secure from most threats. Exotics plants and animals, such as garlic mustard (*Alliaria petiolata*) and the gypsy moth may represent significant threats to this community.

#### RELATED CONCEPTS

##### Global Similar Types:

- *Acer saccharum* - *Betula alleghaniensis* - *Prunus serotina* Forest (CEGL006045)
- *Aesculus flava* - *Betula alleghaniensis* - *Acer saccharum* / *Caulophyllum thalictroides* - *Actaea podocarpa* Forest (CEGL004973) has a more diverse canopy and a richer and more diverse herbaceous layer.
- *Betula alleghaniensis* - *Acer saccharum* - *Aesculus flava* / *Acer pensylvanicum* / *Trillium undulatum* Forest (CEGL004417)
- *Betula alleghaniensis* - *Quercus rubra* / *Acer spicatum* / *Dryopteris intermedia* - *Oclemena acuminata* Forest (CEGL008502)
- *Fagus grandifolia* / *Carex pensylvanica* - *Ageratina altissima* var. *roanensis* Forest (CEGL006130)

##### Global Related Concepts:

- *Acer saccharum* - *Aesculus flava* - *Betula alleghaniensis* / *Athyrium filix-femina* ssp. *asplenioides* - *Ageratina altissima* var. *roanensis* Forest (Fleming and Coulling 2001) <
- *Fagus grandifolia* - *Betula alleghaniensis* - *Acer saccharum* / *Viburnum lantanoides* / *Carex lucorum* var. *austrolucorum* - *Viola rotundifolia* Forest (Fleming and Coulling 2001) <
- IA4e. Southern Appalachian Northern Hardwoods Forest (Allard 1990) >
- Northern Hardwoods Community: Beech - Maple Subtype (Rheinhardt and Ware 1984) ?
- Sugar Maple - Beech - Yellow Birch: 25 (Eyre 1980) >

#### CLASSIFICATION

**Status:** Standard

**Classification Confidence:** 2 - Moderate

**Great Smoky Mountains National Park Other Comments:** This community intergrades with both *Fagus grandifolia* / *Carex pensylvanica* - *Carex brunnescens* Forest (CEGL006130) and *Aesculus flava* - *Betula alleghaniensis* - *Acer saccharum* / *Acer spicatum* / *Caulophyllum thalictroides* - *Laportea canadensis* Forest (CEGL004973). The beech gap (CEGL006130) often occurs upslope from this community and transitions into this with lower elevation. Generally the beech gap is dominated almost 100% by *Fagus grandifolia* in the canopy and contains a *Carex pensylvanica* herbaceous layer. On the other hand, the rich northern hardwood forest (CEGL004973) can often be confused with and occasionally intergrades with this community. CEGL004973 tends to have a more lush herbaceous stratum and tends to occur at lower elevations (3580-4620 feet) whereas this community has a less diverse herbaceous stratum and occurs at higher elevations (4320-5300 feet). Lower elevation examples of this community on Cades Cove

(below 4600 feet) have high canopy coverage by *Quercus rubra* and may grade into forests in the *Quercus rubra* Montane Forest Alliance (A.272). Examples are often disturbed by European Wild Boar (*Sus scrofa*).

#### ELEMENT DISTRIBUTION

**Great Smoky Mountains National Park Range:** This community was sampled on the Mount Le Conte and Cades Cove quadrangles. Historic samples are from the Thunderhead Mountain quadrangle (4360 to 5000 feet elevation). On the Cades Cove quadrangle, historic and recent samples of this community ranged from 4320 to 4840 feet elevation. Samples from the southern portion of the Cades Cove quadrangle came from the upper slopes of Gregory Bald; upper slopes north and west of Gregory Bald; a gap west of Forge Knob; and Gregory Ridge, northwest of Rich Gap. In the central and eastern portion of the Cades Cove quadrangle, this community was sampled from the exposed slopes and ridges in the vicinity of Devil's Tater Patch; a ridge east of Mollies Ridge Shelter; and from the northwest slope of McCampbell Knob. In the southern portion of the Mount Le Conte quadrangle this community was sampled on the high north slopes of Masa Knob (5400 feet) and on steep west-facing slopes north of Mount Le Conte (5100 feet).

**Global Range:** The type is nearly endemic to high elevations of the Southern Blue Ridge in eastern Tennessee, western North Carolina, and southwestern Virginia. In the Virginia Blue Ridge, it is prevalent in the Mount Rogers - Whitetop Mountain area and at high elevations of the Iron Mountains. Local outliers also occur at the highest elevations of Clinch Mountain in the adjacent Ridge and Valley province.

**Nations:** US

**States/Provinces:** NC, TN, VA:S3

**TNC Ecoregions:** 50:C, 51:C, 59:C

**USFS Ecoregions (1994/95):** M221Aa:CCC, M221Da:CCP, M221Dc:CCC, M221Dd:CCC

**USFS Ecoregions (2007):** M221Aa:CCP, M221Da:CCP, M221Dc:CCC, M221Dd:CCC

**Federal Lands:** BIA (Eastern Band of Cherokee); NPS (Appalachian Trail [Central Appalachians], Appalachian Trail [Southern Blue Ridge], Blue Ridge Parkway, Great Smoky Mountains); USFS (Cherokee, Jefferson, Nantahala, Pisgah)

#### ELEMENT SOURCES

**Great Smoky Mountains National Park Plots:** GRSM.49, GRSM.51, GRSM.56, GRSM.57, GRSM.114, GRSM.143, GRSM.214, GRSM.404, GRSM.411, GRSM.504, GRSM.531.

**Great Smoky Mountains National Park Description Author(s):** K.D. Patterson, mod. R. White

**Global Description Author(s):** G. Fleming, P. Coulling, K.D. Patterson

**References:** Allard 1990, Brown 1941, Eyre 1980, Fleming and Coulling 2001, Fleming and Patterson 2009a, Fleming and Patterson 2009b, Fleming et al. 2017, McLeod 1988, NatureServe Ecology - Southeastern U.S. unpubl. data, Newell et al. 1997, Peet et al. unpubl. data, Rheinhardt and Ware 1984, Schafale 2012, Schafale and Weakley 1990, Southeastern Ecology Working Group n.d., TDNH unpubl. data 2018

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#### [CEGL004982] *Betula alleghaniensis* - *Tilia americana* var. *heterophylla* / *Acer spicatum* / *Ribes cynosbati* / *Dryopteris marginalis* Forest

Translated Name: **Yellow Birch - Appalachian Basswood / Mountain Maple / Eastern Prickly Gooseberry / Marginal Woodfern Forest**

Common Name: **Southern Appalachian Hardwood Rich Boulderfield Forest**

#### USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Interior-Northeastern Mesic Forest (M883)
Group	Appalachian-Allegheny Northern Hardwood - Conifer Forest (G742)
Alliance	<i>Betula alleghaniensis</i> - <i>Aesculus flava</i> Forest Alliance (A0266)

#### ELEMENT CONCEPT

**Global Summary:** This association includes boulderfield forests of the Southern Appalachians, with abundant *Betula alleghaniensis*, but in habitats that allow for more diverse canopies, including other species such as *Aesculus flava*, *Betula lenta*, and *Tilia americana* var. *heterophylla*. This community occurs in a cool, humid climate, on steep, rocky, northwest- to northeast-facing, middle to upper concave slopes, or in saddles between ridges, at moderate to high elevations (610-1220 m [2000-4000 feet]) of the Blue Ridge and possibly ranging into the Cumberland Mountains and adjacent Ridge and Valley and Appalachian Plateau provinces. It grows on bouldery talus and is often associated with small streams and seepage. *Betula alleghaniensis* in the canopy are often stunted and gnarled, with roots that may have grown to encircle the boulders. The canopy is much more open than the surrounding forest and tree windthrow is common, leaving patches of exposed mineral soil and gaps in the canopy. A woody layer of shrubs and vines is usually well-developed. Rooting opportunities for most herbaceous plants is limited because of the development of this community on periglacial boulderfields of blocky talus, thus herbaceous cover is only sparse to moderate. Typical shrubs and vines which are more abundant in this type than in other associations in this alliance include *Acer spicatum*, *Aristolochia macrophylla*, *Hydrangea arborescens*, *Parthenocissus quinquefolia*, *Toxicodendron radicans*, *Vitis* spp., *Ribes cynosbati*, and *Ribes rotundifolium*. *Dryopteris marginalis* is often an abundant herb. This type is conceptually similar to *Betula alleghaniensis* / *Ribes glandulosum* / *Polypodium appalachianum* Forest (CEGL006124), which is more restricted to more extreme boulderfield situations at high elevations (1370-1615

m [4500-5300 feet]). The association described here generally occurs at lower elevations in less extreme environmental situations and lacks species characteristic of high elevations. However, it ranges to higher elevations than the typical rich cove forests with which it shares canopy species. Similar *Betula alleghaniensis*-dominated forests occur on glaciated rocky slopes in the upper mid-Atlantic and in the northeastern United States. The *Betula alleghaniensis*-dominated periglacial boulderfields of the southern Appalachian Mountains are distinguished from the northern forests by the occurrence of Southern Appalachian endemic species, better developed shrub layers and slightly less species diversity.

#### ENVIRONMENTAL DESCRIPTION

**Great Smoky Mountains National Park Environment:** This community was found on steep to moderately steep slopes, in draws, and on periglacial boulderfields from 4000 to 5000 feet elevation. Aspects were north and west. Disturbance by wind and ice is common. There is little soil development, and the substrate is rubble, large rocks, and boulders. This community is associated with small creeks and seeps.

**Global Environment:** This community occurs in a cool, humid climate, usually found on steep, rocky, northwest- to northeast-facing, middle to upper concave slopes, or in saddles between ridges, at moderate to high elevation (610-1220 m [2000-4000 feet]). These forests grow over bouldery talus and are often associated with small streams and seepage.

#### VEGETATION DESCRIPTION

**Great Smoky Mountains National Park Vegetation:** This forest has a canopy dominated by *Betula alleghaniensis* and/or *Aesculus flava*. *Betula alleghaniensis* in the canopy are often stunted and gnarled, with roots that may have grown to encircle the boulders. Tree windthrow is common, leaving patches of exposed mineral soil and gaps in the canopy. Other species in the canopy and subcanopy can include *Tilia americana* var. *heterophylla*, *Fagus grandifolia*, *Acer saccharum*, *Acer spicatum*, *Tsuga canadensis*, and *Picea rubens*. Shrub density is typically high but may vary between occurrences. The shrub stratum is dominated by the tall shrub *Acer spicatum* and the short shrubs *Hydrangea arborescens* and *Euonymus obovatus*. *Ribes rotundifolium* and *Ribes cynosbati* are conspicuous in the shrub stratum. Other shrubs include *Viburnum lantanoides*, *Sambucus racemosa* var. *racemosa* (= var. *pubens*), and *Rubus canadensis*. Herb cover is moderate to dense, and herb strata tend to be diverse. Herbs and mosses cover the rocks and boulders. *Dryopteris intermedia*, *Stellaria pubera*, and the epiphyte *Polypodium appalachianum* are the most constant species in the stands sampled. Other common herbs include *Ageratina altissima* var. *roanensis*, *Allium tricoccum*, *Angelica triquinata*, *Arisaema triphyllum*, *Eurybia chlorolepis* (= *Aster chlorolepis*), *Actaea podocarpa* (= *Cimicifuga americana*), *Diphylleia cymosa*, *Galium triflorum*, *Hydrophyllum canadense*, *Laportea canadensis*, *Melanthium parviflorum*, *Oxalis montana*, *Solidago curtisii* (= *Solidago caesia* var. *curtisii*), *Tiarella cordifolia*, and *Trillium erectum*.

**Global Vegetation:** This association includes boulderfield forests of the Southern Appalachians, with abundant *Betula alleghaniensis*, but in habitats that allow for more diverse canopies, including other species such as *Aesculus flava*, *Betula lenta*, and *Tilia americana* var. *heterophylla*. *Betula alleghaniensis* in the canopy are often stunted and gnarled, with roots that may have grown to encircle the boulders. The canopy is much more open than the surrounding forest and tree windthrow is common, leaving patches of exposed mineral soil and gaps in the canopy. A woody layer of shrubs and vines is usually well-developed. Rooting opportunities for most herbaceous plants is limited because of the development of this community on periglacial boulderfields of blocky talus, thus herbaceous cover is only sparse to moderate. Typical shrubs and vines which are more abundant in this type than in other associations in this alliance include *Acer spicatum*, *Aristolochia macrophylla*, *Toxicodendron radicans*, *Hydrangea arborescens*, *Parthenocissus quinquefolia*, *Ribes cynosbati*, and *Ribes rotundifolium*. *Dryopteris marginalis* is often an abundant herb.

#### MOST ABUNDANT SPECIES

##### Great Smoky Mountains National Park

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Broad-leaved deciduous tree	<i>Aesculus flava</i> , <i>Betula alleghaniensis</i>
Tall shrub/sapling	Broad-leaved deciduous tree	<i>Acer spicatum</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Hydrangea arborescens</i>
Short shrub/sapling	Broad-leaved evergreen shrub	<i>Euonymus obovatus</i>
Herb (field)	Epiphyte	<i>Polypodium appalachianum</i>
Herb (field)	Fern (Spore-bearing forb)	<i>Dryopteris intermedia</i>

##### Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Broad-leaved deciduous tree	<i>Betula alleghaniensis</i>
Tall shrub/sapling	Broad-leaved deciduous tree	<i>Acer spicatum</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Ribes cynosbati</i> , <i>Ribes rotundifolium</i>

#### CHARACTERISTIC SPECIES

**Great Smoky Mountains National Park:** *Acer spicatum*, *Betula alleghaniensis*, *Euonymus obovatus*, *Polypodium appalachianum*

**Global:** *Acer spicatum*, *Aesculus flava*, *Aristolochia macrophylla*, *Betula alleghaniensis*, *Betula lenta*, *Dryopteris marginalis*, *Hydrangea arborescens*, *Ribes cynosbati*

**OTHER NOTEWORTHY SPECIES**

**Global: Vulnerable Plants:** *Aconitum reclinatum* (G3G4), *Ageratina altissima* var. *roanensis* (G5T3T4, Southern Blue Ridge endemic), *Cardamine clematitidis* (G3), *Geum geniculatum* (G2), *Saxifraga careyana* (G3), *Scutellaria saxatilis* (G3G4), *Solidago glomerata* (G3), *Stachys clingmanii* (G2); **Other Plants:** *Streptopus lanceolatus* var. *roseus* (G5T4)

**CONSERVATION STATUS RANK**

**Global Rank & Reasons:** G2G3 (22-Jan-2008). This community is scattered throughout the high mountains but is fairly uncommon. Unlike many other forest types in the Southern Appalachians, this community has not historically been threatened by logging as much as other types because of the stunted nature of the trees and the relative inaccessibility to loggers of these boulderfields. North Carolina, in which most of the examples should be found, estimates to have about 15 occurrences, mostly small ones (M. Schafale pers. comm. 2007).

**RELATED CONCEPTS****Global Similar Types:**

- *Betula alleghaniensis* / *Ribes glandulosum* / *Polypodium appalachianum* Forest (CEGL006124) more affiliated with northern hardwoods.
- *Liriodendron tulipifera* - *Fraxinus americana* - (*Aesculus flava*) / *Actaea racemosa* - *Laportea canadensis* Forest (CEGL007710) often associated, but on less extremely rocky soils.

**Global Related Concepts:**

- *Betula alleghaniensis* - *Tilia americana* var. *heterophylla* / *Acer spicatum* / *Ribes cynosbati* / *Dryopteris marginalis* Forest (Major et al. 1999) =
- IA4c. Yellow Birch Boulderfield Forest (Allard 1990) >
- Oligotrophic Forest (Rawinski 1992) >

**CLASSIFICATION**

**Status:** Standard

**Classification Confidence:** 2 - Moderate

**Great Smoky Mountains National Park Other Comments:** Examples of this community in Great Smoky Mountains National Park, particularly ones at high elevations, are compositionally similar to *Betula alleghaniensis* / *Ribes glandulosum* / *Polypodium appalachianum* Forest (CEGL006124). In the park, this latter community is distinguished by occurring over 5000 feet elevation and by the occurrence of high-elevation species such as *Abies fraseri*, *Dryopteris campyloptera*, *Ribes glandulosum*, *Rugelia nudicaulis*, *Streptopus amplexifolius*, *Prunus pennsylvanica*, and *Sorbus americana*. The community is not distinguishable from other northern hardwood forest types from aerial photography. Therefore, the only occurrences that are mapped are the ones that were visited by photointerpreters.

**Global Classification Comments:** This association includes boulderfield forests of the Southern Appalachians, with abundant *Betula alleghaniensis*, but in habitats that allow for more diverse canopies, including other species such as *Aesculus flava*, *Betula lenta*, and *Tilia americana* var. *heterophylla*. This community occurs in a cool, humid climate, on steep, rocky, northwest- to northeast-facing, middle to upper concave slopes, or in saddles between ridges, at moderate to high elevations (610-1220 m [2000-4000 feet]) of the Blue Ridge and possibly ranging into the Cumberland Mountains and adjacent Ridge and Valley and Appalachian Plateau provinces. It grows on bouldery talus and is often associated with small streams and seepage. *Betula alleghaniensis* in the canopy are often stunted and gnarled, with roots that may have grown to encircle the boulders. The canopy is much more open than the surrounding forest and tree windthrow is common, leaving patches of exposed mineral soil and gaps in the canopy. A woody layer of shrubs and vines is usually well-developed. Rooting opportunities for most herbaceous plants is limited because of the development of this community on periglacial boulderfields of blocky talus, thus herbaceous cover is only sparse to moderate. Typical shrubs and vines which are more abundant in this type than in other associations in this alliance include *Acer spicatum*, *Aristolochia macrophylla*, *Hydrangea arborescens*, *Parthenocissus quinquefolia*, *Toxicodendron radicans*, *Vitis* spp., *Ribes cynosbati*, and *Ribes rotundifolium*. *Dryopteris marginalis* is often an abundant herb. This type is conceptually similar to *Betula alleghaniensis* / *Ribes glandulosum* / *Polypodium appalachianum* Forest (CEGL006124), which is more restricted to more extreme boulderfield situations at high elevations (1370-1615 m [4500-5300 feet]). The association described here generally occurs at lower elevations in less extreme environmental situations and lacks species characteristic of high elevations. However, it ranges to higher elevations than the typical rich cove forests with which it shares canopy species. Similar *Betula alleghaniensis*-dominated forests occur on glaciated rocky slopes in the upper mid-Atlantic and in the northeastern United States. The *Betula alleghaniensis*-dominated periglacial boulderfields of the southern Appalachian Mountains are distinguished from the northern forests by the occurrence of Southern Appalachian endemic species, better developed shrub layers and slightly less species diversity.

**ELEMENT DISTRIBUTION**

**Great Smoky Mountains National Park Range:** This association was found on both the Cades Cove and Mount Le Conte quadrangles, and it should occur elsewhere in the park on boulderfields below 5000 feet elevation. It was sampled on the southwestern portion of the Cades Cove quadrangle, at the headwaters of Forge Knob Branch. On the southwestern portion of the Mount Le Conte quadrangle, this association was sampled southwest of Rocky Spur in the vicinity of Le Conte Creek and also southwest of Balsam Point. This community was also sampled in the central portion of the Mount Le Conte quadrangle, in a north-facing ravine west of Trillium Gap.

**Global Range:** This community occurs in the southern Appalachian Mountains of the eastern United States.

**Nations:** US

**States/Provinces:** GA, NC, TN:S2, VA?

**TNC Ecoregions:** 50:?, 51:C

**USFS Ecoregions (1994/95):** M221C:CC, M221Dc:CCC, M221Dd:CCC

**USFS Ecoregions (2007):** M221C:CC, M221Dc:CCC, M221Dd:CCC

**Federal Lands:** BIA (Eastern Band of Cherokee); NPS (Appalachian Trail [Southern Blue Ridge], Blue Ridge Parkway?, Great Smoky Mountains); USFS (Chattahoochee, Chattahoochee (Southern Blue Ridge), Cherokee, Nantahala, Pisgah)

#### ELEMENT SOURCES

**Great Smoky Mountains National Park Plots:** GRSM.17, GRSM.75, GRSM.104, GRSM.106, GRSM.251.

**Great Smoky Mountains National Park Description Author(s):** K.D. Patterson

**Global Description Author(s):** M.P. Schafale and M. Pyne

**References:** Allard 1990, Chafin and Jones 1989, Evans et al. 2009, Fleming and Patterson 2009a, GNHP unpubl. data 2018, Major et al. 1999, Peet et al. unpubl. data, Rawinski 1992, Schafale 2012, Schafale and Weakley 1990, Schafale pers. comm., Southeastern Ecology Working Group n.d., TDNH unpubl. data 2018

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### [CEGL006124] *Betula alleghaniensis* / *Ribes glandulosum* / *Polypodium appalachianum* Forest

Translated Name: **Yellow Birch / Skunk Currant / Appalachian Polypody Forest**

Common Name: **Southern Appalachian Boulderfield Forest (Currant & Rockcap Fern Type)**

#### USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Interior-Northeastern Mesic Forest (M883)
Group	Appalachian-Allegheny Northern Hardwood - Conifer Forest (G742)
Alliance	<i>Betula alleghaniensis</i> - <i>Aesculus flava</i> Forest Alliance (A0266)

#### ELEMENT CONCEPT

**Global Summary:** This association includes high-elevation boulderfield forests of the Southern Appalachians, strongly dominated by *Betula alleghaniensis*, with few or no other species in the canopy, and with other species indicative of high elevations. This community occurs in a cool, humid climate, on steep, rocky, northwest- to northeast-facing, middle to upper concave slopes, or in saddles between ridges, at elevations of 1370-1615 m (4500-5300 feet). It is known from the high elevations of the Blue Ridge from West Virginia south to eastern Tennessee and western North Carolina. This forest is distinguished by a closed to somewhat open canopy dominated by *Betula alleghaniensis*, occurring over angular rocks (0.25-1 m diameter) covered by thin soil, lichens, mosses or vines. The rocks may be almost totally covered by moss. *Betula alleghaniensis* in the canopy are often stunted and gnarled, with roots that may have grown to encircle the boulders. Tree density is typically less than that of the surrounding forests. Other species that may form a minor canopy component include *Aesculus flava*, *Prunus pensylvanica*, *Sorbus americana*, *Acer spicatum*, *Picea rubens*, *Tilia americana* var. *heterophylla*, *Sambucus racemosa* var. *racemosa*, or *Quercus rubra*. Tree windthrow is common, leaving patches of exposed mineral soil and gaps in the canopy. The shrub density is typically high but may vary between occurrences. Herbaceous cover is generally sparse because of thin, rocky soil, but herbs and mosses may cover the rocks and boulders. Characteristic species include, in the herb stratum, *Oclemena acuminata*, *Eurybia chlorolepis*, *Aconitum reclinatum*, *Cardamine clematitidis*, *Carex aestivalis*, *Actaea podocarpa*, *Claytonia caroliniana*, *Clintonia borealis*, *Dryopteris campyloptera*, *Dryopteris marginalis*, *Huperzia lucidula*, *Oxalis montana*, *Polypodium appalachianum*, *Streptopus amplexifolius*, and in the shrub stratum, *Acer pensylvanicum*, *Acer spicatum*, *Amelanchier arborea* var. *austromontana*, *Diervilla sessilifolia*, *Hydrangea arborescens*, *Ilex montana*, *Lonicera canadensis*, *Ribes glandulosum*, *Ribes rotundifolium*, *Rubus canadensis*, *Sambucus racemosa* var. *racemosa*, *Vaccinium erythrocarpum*, and *Viburnum lantanoides*. Seepage areas are common, producing wet microhabitats with unique species assemblages (*Chelone lyonii*, *Chrysosplenium americanum*, *Circaea alpina*, *Rudbeckia laciniata*, *Impatiens pallida*, and *Monarda didyma*). This association is distinguished by being strongly dominated by *Betula alleghaniensis*, with few or no other species in the canopy, and with other species indicative of high elevations (e.g., *Abies fraseri*, *Dryopteris campyloptera*, *Ribes glandulosum*, *Rugelia nudicaulis*, *Streptopus amplexifolius*, *Prunus pensylvanica*, and *Sorbus americana*). On less extreme sites, generally at lower elevations in the Blue Ridge and adjacent montane ecoregions, a similar boulderfield forest is *Betula alleghaniensis* - *Tilia americana* var. *heterophylla* / *Acer spicatum* / *Ribes cynosbati* / *Dryopteris marginalis* Forest (CEGL004982). Similar *Betula alleghaniensis*-dominated forests occur on glaciated rocky slopes in the upper mid-Atlantic and in the northeastern United States. The *Betula alleghaniensis*-dominated periglacial boulderfields of the southern Appalachian Mountains are distinguished from the northern forests by the occurrence of Southern Appalachian endemic species, better developed shrub layers and slightly less species diversity.

#### ENVIRONMENTAL DESCRIPTION

**Great Smoky Mountains National Park Environment:** This community is found on steep, north- and northwest-facing, periglacial boulderfields, above 5000 feet elevation. Disturbance by ice and wind is common.

**Global Environment:** This community occurs in rocky habitats with cool, humid microclimates. Typical sites are steep, boulder-strewn slopes; northwest- to northeast-facing, middle to upper concave slopes; or in saddles between ridges. Elevations typically range from 1370-1615 m (4500-5300 feet), but may vary somewhat. Surface substrate is characterized by angular boulders

(0.25-1 m diameter) derived from various bedrock types and covered by thin soil, lichens, mosses or vines. The rocks may be almost totally covered by moss. Seepage areas are frequent, producing wet microhabitats with unique species assemblages. Extreme winter temperatures, high winds, and ice storms periodically affect these forests. Mean elevation of plot-sampled Virginia sites is 1450 m (4760 feet) and aspect ranges from northwest to north. Mean surface cover of exposed bedrock and boulders is 42% and mean cover of bryophytes and lichens is 37%. Soil samples collected from these sites are extremely acidic (mean pH = 3.5), with high organic matter content (mean = 40%) and low base saturation (mean = 10%).

#### VEGETATION DESCRIPTION

**Great Smoky Mountains National Park Vegetation:** This forest has a canopy strongly dominated by *Betula alleghaniensis*. Canopy trees are often stunted and gnarled, with roots that may have grown to encircle the boulders. Tree windthrow is common, leaving patches of exposed mineral soil and gaps in the canopy. Other species in the canopy and subcanopy can include *Aesculus flava*, *Prunus pensylvanica*, *Sorbus americana*, *Acer spicatum*, and *Picea rubens*. The shrub stratum is dominated by *Acer spicatum*, *Hydrangea arborescens*, *Viburnum lantanoides*, and *Ribes glandulosum*. Other shrubs include *Sambucus racemosa* var. *racemosa* (= var. *pubens*), *Diervilla sessilifolia*, *Lonicera canadensis*, *Vaccinium erythrocarpum*, *Ribes rotundifolium*, and *Rubus canadensis*. Herbs and mosses cover the rocks and boulders. Characteristic herbaceous species include *Eurybia chlorolepis* (= *Aster chlorolepis*), *Dryopteris campyloptera*, *Actaea podocarpa* (= *Cimicifuga americana*), *Clintonia borealis*, *Cystopteris protrusa*, *Cardamine clematitidis*, *Huperzia lucidula*, *Rugelia nudicaulis*, *Streptopus amplexifolius*, and *Polypodium appalachianum*.

**Global Vegetation:** Stands of this association are distinguished by a closed to somewhat open canopy overwhelmingly dominated by *Betula alleghaniensis*. Canopy trees are often stunted and gnarled, with roots that have grown to encircle the boulders. Tree density is typically less than that of the surrounding forests. Minor canopy associates include *Aesculus flava*, *Prunus pensylvanica*, *Sorbus americana*, *Acer spicatum*, *Picea rubens*, *Tilia americana* var. *heterophylla*, and *Quercus rubra*. Tree windthrow is common, creating canopy gaps and patches of exposed mineral soil. Shrub density is typically high but varies between occurrences. Characteristic shrubs are *Acer pensylvanicum*, *Acer spicatum*, *Amelanchier arborea* var. *austromontana*, *Diervilla sessilifolia*, *Hydrangea arborescens*, *Ilex montana*, *Lonicera canadensis*, *Ribes glandulosum*, *Ribes rotundifolium*, *Rubus canadensis*, *Sambucus racemosa* var. *racemosa* (= var. *pubens*), *Vaccinium erythrocarpum*, and *Viburnum lantanoides*. Herbaceous cover is generally sparse because of the rocky substrate, but specially adapted herbs and mosses may cover the rocks and boulders. Characteristic herbs over the range of this community include *Oclemena acuminata* (= *Aster acuminatus*), *Eurybia chlorolepis* (= *Aster chlorolepis*), *Aconitum reclinatum*, *Cardamine clematitidis*, *Carex aestivalis*, *Actaea podocarpa* (= *Cimicifuga americana*), *Claytonia caroliniana*, *Clintonia borealis*, *Dryopteris campyloptera*, *Dryopteris marginalis*, *Huperzia lucidula*, *Oxalis montana*, *Polypodium appalachianum*, and *Streptopus amplexifolius*. Local seepage areas may support *Chelone lyonii*, *Chrysosplenium americanum*, *Circaea alpina*, *Rudbeckia laciniata*, *Impatiens pallida*, and *Monarda didyma*. Six plots from North Carolina, Tennessee, and Virginia were classified as this association in the Appalachian Trail classification project (Fleming and Patterson 2009a). In those plots, *Acer spicatum*, *Ribes glandulosum*, *Rubus canadensis*, and *Viburnum lantanoides* are the most constant lower woody species, while *Ageratina altissima* var. *roanensis*, *Arisaema triphyllum*, *Carex aestivalis*, *Dryopteris intermedia*, *Eurybia chlorolepis*, *Huperzia lucidula*, *Oclemena acuminata*, and *Polypodium appalachianum* are the most constant herbs. Mean species richness in these samples is 28 taxa per plot.

**Global Dynamics:** Windthrow of trees and damage to the canopy caused by lightning strikes and ice storms are common phenomena in boulderfields. The ice-fractured boulderfields that characterize this community in the upper elevations of the Southern Appalachians are believed to be remnants of Pleistocene periglacial activity. During this time, the high elevations (1120-1525 m [4000-5000 feet]) of the Southern Appalachians were covered by treeless snow fields and exposed rock. Frost and ice action resulted in the accumulation of boulders that persist on the upper slopes (King and Stupka 1950). Farther north, such as in Pennsylvania, boulderfields are on flat surfaces and are the result of glacial deposition (Allard 1984).

*Betula alleghaniensis* is well-adapted to the environmental dynamics of boulderfields and can perpetuate because it takes advantage of canopy gaps formed during periodic natural disturbances. This species produces a large number of seeds and is able to germinate on logs and rocks in a minimum amount of soil. The roots of trees develop to form false trunks that encircle the rocks. It is possible that over time, due to soil formation and weathering, these forests may succeed to forests dominated by a mixture of northern hardwood species (*Betula alleghaniensis*, *Fagus grandifolia*, *Acer saccharum*, *Aesculus flava*). However, many *Betula alleghaniensis* forests and the boulderfields on which they occur appear fairly stable. Chafin and Jones (1989) found that despite large trees growing on top of boulders, there is no evidence of rock shattering.

#### MOST ABUNDANT SPECIES

##### Great Smoky Mountains National Park

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Broad-leaved deciduous tree	<i>Betula alleghaniensis</i>
Tall shrub/sapling	Broad-leaved deciduous tree	<i>Acer spicatum</i>
Tall shrub/sapling	Broad-leaved deciduous shrub	<i>Hydrangea arborescens</i> , <i>Viburnum lantanoides</i>
Herb (field)	Epiphyte	<i>Polypodium appalachianum</i>
Herb (field)	Flowering forb	<i>Eurybia chlorolepis</i>
Herb (field)	Fern (Spore-bearing forb)	<i>Dryopteris campyloptera</i>

##### Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Broad-leaved deciduous tree	<i>Betula alleghaniensis</i>

Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	<i>Ribes rotundifolium</i>
Shrub/sapling (tall & short)	Liana	<i>Aristolochia macrophylla</i>
Tall shrub/sapling	Broad-leaved deciduous tree	<i>Acer pensylvanicum</i> , <i>Acer spicatum</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Ribes glandulosum</i>
Herb (field)	Flowering forb	<i>Eurybia chlorolepis</i> , <i>Oxalis montana</i>
Herb (field)	Graminoid	<i>Carex aestivalis</i>
Herb (field)	Fern (Spore-bearing forb)	<i>Dryopteris marginalis</i> , <i>Polypodium appalachianum</i>
Nonvascular	Moss	<i>Hylocomium splendens</i>

#### CHARACTERISTIC SPECIES

**Great Smoky Mountains National Park:** *Betula alleghaniensis*, *Diervilla sessilifolia*, *Dryopteris campyloptera*, *Polypodium appalachianum*, *Ribes glandulosum*, *Rugelia nudicaulis*, *Sorbus americana*, *Streptopus amplexifolius*

**Global:** *Acer spicatum*, *Aesculus flava*, *Amelanchier arborea* var. *austromontana*, *Betula alleghaniensis*, *Circaea alpina*, *Dryopteris campyloptera*, *Dryopteris intermedia*, *Ilex montana*, *Lonicera canadensis*, *Oclemena acuminata*, *Polypodium appalachianum*, *Ribes glandulosum*, *Ribes rotundifolium*, *Rubus canadensis*, *Vaccinium erythrocarpum*, *Viburnum lantanoides*

#### OTHER NOTEWORTHY SPECIES

**Great Smoky Mountains National Park: Vulnerable Plants:** *Cardamine clematitidis* (G3, globally vulnerable), *Rugelia nudicaulis* (G3, globally vulnerable); **Invasive/Exotic Plants:** *Streptopus amplexifolius*

**Global: Vulnerable Plants:** *Abies fraseri* (G2, Southern Blue Ridge endemic), *Aconitum reclinatum* (G3G4), *Ageratina altissima* var. *roanensis* (G5T3T4, Southern Blue Ridge endemic), *Cardamine clematitidis* (G3), *Cuscuta rostrata* (G4, VA state-rare), *Geum geniculatum* (G2), *Glyceria nubigena* (G2G3, endemic to Great Smoky Mountains and adjacent areas near the park), *Lilium grayi* (G1G2, Southern Blue Ridge endemic), *Prenanthes roanensis* (G3, Southern Blue Ridge endemic), *Rugelia nudicaulis* (G3), *Solidago glomerata* (G3), *Stachys clingmanii* (G2); **Other Plants:** *Chelone lyonii* (G4), *Conioselinum chinense* (G5), *Meehania cordata* (G5), *Prosartes maculata* (G4), *Stellaria corei* (G4), *Streptopus lanceolatus* var. *roseus* (G5T4)

#### CONSERVATION STATUS RANK

**Global Rank & Reasons:** G2G3 (27-Oct-2003). This community is scattered throughout the high elevations of the Southern Blue Ridge with highly localized outliers also found at the highest elevations of Clinch Mountain in the adjacent Ridge and Valley province. Examples are further confined to boulder strewn substrates which are relatively uncommon. Unlike many other forest types in the Southern Appalachians, this community has been less impacted by logging due to the stunted nature of the trees and the relative inaccessibility of these boulderfield sites. As of 2003, North Carolina has 12 (principal) Element Occurrences, and given their proportion of the total occurrences and their protection status, a rank of G2G3 is probably justified (M. Schafale pers. comm.).

#### RELATED CONCEPTS

##### Global Similar Types:

- *Betula alleghaniensis* - *Tilia americana* var. *heterophylla* / *Acer spicatum* / *Ribes cynosbati* / *Dryopteris marginalis* Forest (CEGL004982)
- *Betula alleghaniensis* / *Sorbus americana* - *Acer spicatum* / *Polypodium appalachianum* Forest (CEGL008504) Both of these associations occur on high-elevation boulderfields and have much species overlap, including many constant and dominant species, but CEGL008504 is geographically restricted to the Central Appalachians, is much less species-rich, and lacks all of the Southern Appalachian species found in CEGL006124.

##### Global Related Concepts:

- *Betula alleghaniensis* / *Acer spicatum* / *Viburnum lantanoides* - *Ribes glandulosum* Forest (Fleming and Coulling 2001) =
- Hemlock - Yellow Birch: 24 (Eyre 1980) >
- IA4c. Yellow Birch Boulderfield Forest (Allard 1990) >
- Oligotrophic Forest (Rawinski 1992) >
- Red Spruce - Yellow Birch: 30 (Eyre 1980) >
- Sugar Maple - Beech - Yellow Birch: 25 (Eyre 1980) >
- Yellow Birch Community: Boulder Field Subtype (Rheinhardt and Ware 1984) ?
- Yellow birch-skunk current/polypody forest (CAP pers. comm. 1998) ?

#### CLASSIFICATION

**Status:** Standard

**Classification Confidence:** 2 - Moderate

**Great Smoky Mountains National Park Other Comments:** Examples of this community in Great Smoky Mountains National Park are compositionally similar to *Betula alleghaniensis* / *Acer spicatum* / *Hydrangea arborescens* - *Ribes cynosbati* / *Dryopteris marginalis* Forest (CEGL004982). In the park, this latter community is distinguished by occurring below 5000 feet elevation, having a somewhat more diverse canopy, and by lacking many of the high-elevation species such as *Abies fraseri*, *Dryopteris campyloptera*, *Ribes glandulosum*, *Rugelia nudicaulis*, *Streptopus amplexifolius*, *Prunus pensylvanica*, and *Sorbus americana*. This community is surrounded by forests dominated by *Picea rubens* and *Betula alleghaniensis*. The community is not distinguishable from other northern hardwood forest types from aerial photography. Therefore, the only occurrences that are mapped are the ones that were visited by photointerpreters.

**Global Classification Comments:** Unlike many other forest types in the Southern Appalachians, this community has not been threatened by logging because of the stunted nature of the trees and the inaccessibility of boulderfields to loggers.

This association is similar to *Betula alleghaniensis* / *Sorbus americana* - *Acer spicatum* / *Polypodium appalachianum* Forest (CEGL008504) of the Central Appalachians, but appears to occupy more mesic boulderfields and contains a number of Southern Appalachian species (e.g., *Ribes glandulosum*, *Eurybia chlorolepis*, *Heuchera villosa*, *Abies fraseri*, *Prenanthes roanensis*, *Vaccinium erythrocarpum*, *Aesculus flava*, etc.) that are generally absent from CEGL008504.

#### ELEMENT DISTRIBUTION

**Great Smoky Mountains National Park Range:** This community was sampled on the Mount Le Conte and Clingman's Dome quadrangles and was not found on the Cades Cove quadrangle. It is likely in other areas of the park and should be sought on steep slopes and boulderfields at elevations over 5000 feet, particularly in areas adjacent to spruce (*Picea rubens*) and fir (*Abies fraseri*) forests. On the Mount Le Conte quadrangle, this community was sampled on the north slope of Mount Le Conte, on the Rainbow Falls Trail, at 5300 feet elevation. On the Clingman's Dome quadrangle, it was sampled off of Forney Ridge Trail south of Andrews Bald at an elevation of approximately 5200 feet.

**Global Range:** This community type ranges at high elevations of the Blue Ridge from eastern Tennessee and western North Carolina north to southwestern Virginia. In the southern Virginia Blue Ridge, it occurs frequently on steep, north-facing slopes of Mount Rogers, Whitetop, and Pine Mountain. Small, highly localized outliers also occur at the highest elevations of Clinch Mountain in the adjacent Ridge and Valley province.

**Nations:** US

**States/Provinces:** GA?, NC, TN, VA:S1, WV?

**TNC Ecoregions:** 51:C, 59:C

**USFS Ecoregions (1994/95):** M221Aa:CCC, M221B:C?, M221C:C?, M221Dc:CCC, M221Dd:CCC

**USFS Ecoregions (2007):** M221Aa:CCP, M221B:C?, M221C:C?, M221Dc:CCC, M221Dd:CCC

**Federal Lands:** NPS (Appalachian Trail [Southern Blue Ridge], Blue Ridge Parkway, Great Smoky Mountains); USFS (Cherokee, Jefferson, Nantahala, Pisgah)

#### ELEMENT SOURCES

**Great Smoky Mountains National Park Plots:** GRSM.98.

**Great Smoky Mountains National Park Description Author(s):** K.D. Patterson, mod. R. White

**Global Description Author(s):** K.D. Patterson, G. Fleming and P. Coulling

**References:** Allard 1984, Allard 1990, CAP pers. comm. 1998, Chafin 2011, Chafin and Jones 1989, Dellinger 1992, Eyre 1980, Fleming and Coulling 2001, Fleming and Patterson 2009a, Fleming and Patterson 2009b, Fleming et al. 2017, Golden 1981, King and Stupka 1950, NatureServe Ecology - Southeastern U.S. unpubl. data, Peet et al. unpubl. data, Pittillo and Smathers 1979, Rawinski 1992, Rheinhardt and Ware 1984, Schafale 2012, Schafale and Weakley 1990, Schafale pers. comm., Southeastern Ecology Working Group n.d., Stamper 1976, Wharton 1978, Wood 1975

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#### [CEGL006130] *Fagus grandifolia* / *Carex pensylvanica* - *Ageratina altissima* var. *roanensis* Forest

Translated Name: American Beech / Pennsylvania Sedge - Appalachian White Snakeroot Forest

Common Name: Southern Appalachian Beech Gap

#### USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Appalachian-Interior-Northeastern Mesic Forest (M883)
Group	Appalachian-Allegheny Northern Hardwood - Conifer Forest (G742)
Alliance	<i>Betula alleghaniensis</i> - <i>Aesculus flava</i> Forest Alliance (A0266)

#### ELEMENT CONCEPT

**Global Summary:** This community includes forest vegetation with short-statured canopies dominated by *Fagus grandifolia* and occurring in the high-elevation landscapes of the Southern Appalachians. On drier sites, such as south slopes, the association is expressed as the classic "beech gap" having a dense, graminoid-dominated herbaceous stratum. On more mesic sites, such as north slopes, the community is thought to be more similar to northern hardwood forests, having a more diverse canopy and subcanopy, occurring over a field stratum that is a mixture of coarse forbs, ferns and sedges. This forest association typically occurs on concave slopes, in gaps, flat ridgetops, or upper slopes of all aspects, at elevations of greater than 1370 m (4500 feet). It is found in scattered sites on high elevations of the southern Appalachian Mountains of North Carolina and Tennessee and possibly Georgia. This community is a broad-leaved deciduous forest with a canopy dominated by stunted, sometimes gnarled *Fagus grandifolia*, sometimes with lesser amounts of *Halesia tetraptera* var. *monticola* or *Aesculus flava* and *Betula alleghaniensis*. The subcanopy, if present, may include small stems of canopy species as well as *Acer spicatum*, *Acer pensylvanicum*, *Amelanchier laevis*, and *Sorbus americana*. Typically there is little shrub development (0-10%) with such species as *Crataegus punctata*, *Ribes* spp., *Viburnum lantanoides*, *Rubus canadensis*, *Hydrangea arborescens*, and *Cornus alternifolia*. Herbaceous cover can vary from dense, often approaching 100% coverage by species of *Carex* including *Carex aestivalis*, *Carex brunnescens*, *Carex debilis*, *Carex intumescens*, and *Carex pensylvanica*, to moderately dense (40-60% cover) and dominated by large herbs and patches of ferns, with lesser amounts of sedges. Other herbaceous species in this community are typical of rich Southern Appalachian forests and may include *Ageratina altissima* var.

*roanensis*, *Anemone quinquefolia*, *Arisaema triphyllum*, *Eurybia chlorolepis*, *Athyrium filix-femina* ssp. *asplenioides*, *Actaea racemosa*, *Dryopteris campyloptera*, *Epifagus virginiana*, *Impatiens pallida*, *Medeola virginiana*, *Oxalis montana*, *Laportea canadensis*, *Luzula acuminata*, *Phacelia bipinnatifida*, *Poa alsodes*, *Prenanthes altissima*, *Prenanthes roanensis*, *Stellaria pubera*, *Thelypteris noveboracensis*, and *Trillium erectum*. This community commonly occurs as small patches surrounded by other forest types, montane grasslands and shrublands.

#### ENVIRONMENTAL DESCRIPTION

**Great Smoky Mountains National Park Environment:** Occurrences of this forest were documented from the Mount Le Conte and Bunches Bald quadrangles, but occur in other high-elevation areas of the park. They all occurred on the high slopes or saddles of high ridges above 4500 feet. In every occurrence, the beech trees were all infected with Beech Bark Disease. The occurrences were surrounded by heath shrublands, spruce-hemlock forests, and northern hardwood forests.

**Global Environment:** This community typically occurs on concave slopes, in gaps, flat ridgetops, or upper slopes of all aspects, at elevations of greater than 1370 m (4500 feet) (Russell 1953, Whittaker 1956, Crandall 1958). High rainfall and low temperatures create mesic conditions. Strong winds and ice storms periodically damage these forests, creating canopy gaps and contributing to its stunted appearance. This community commonly occurs as small patches surrounded by other forest types, montane grasslands and shrublands. In North Carolina, Burton series (Typic Haplumbrept) soils support the Southern Appalachian Beech Gap (Schafale and Weakley 1990). The soil is generally greater than 20 cm deep. The pH ranges from 4.5-6.0, which is considerably less acidic than the adjacent Red Spruce-Fraser Fir Forests (Russell 1953). Leaf mold is thinner compared to the spruce-fir ecosystems. Also lacking is the accumulation of peat or excessive depth of litter (Russell 1953).

#### VEGETATION DESCRIPTION

**Great Smoky Mountains National Park Vegetation:** This forest has a 10-m canopy of *Fagus grandifolia*. The subcanopy is not well-developed, but *Acer pensylvanicum* has the highest coverage. Other species in the subcanopy include *Halesia tetraptera* var. *monticola*, *Picea rubens*, and *Tsuga canadensis*. The herbaceous stratum is strongly dominated by *Carex pensylvanica* (75-85% coverage). Other species present in minor amounts include *Ageratina altissima* var. *roanensis*, *Angelica triquinata*, *Arisaema triphyllum* ssp. *triphyllum*, *Eurybia chlorolepis* (= *Aster chlorolepis*), *Athyrium filix-femina* ssp. *asplenioides*, *Brachyelytrum septentrionale*, *Dryopteris intermedia*, *Laportea canadensis*, *Luzula acuminata*, *Poa alsodes*, *Prenanthes* sp., *Rubus canadensis*, *Rugelia nudicaulis*, *Solidago curtisii* (= *Solidago caesia* var. *curtisii*), *Stellaria pubera*, and *Viola rotundifolia*.

**Global Vegetation:** This community is a broad-leaved deciduous forest with a canopy dominated by stunted, sometimes gnarled *Fagus grandifolia* sometimes with lesser amounts of *Halesia tetraptera* var. *monticola* or *Aesculus flava* and *Betula alleghaniensis*. The subcanopy, if present, may include small stems of canopy species as well as *Acer spicatum*, *Acer pensylvanicum*, *Amelanchier laevis*, and *Sorbus americana*. Typically there is little shrub development (0-10%) with such species as *Crataegus punctata*, *Ribes* spp., *Viburnum lantanoides*, *Rubus canadensis*, *Hydrangea arborescens*, and *Cornus alternifolia*. Herbaceous cover can vary from dense, often approaching 100% coverage by species of *Carex* including *Carex aestivalis*, *Carex brunnescens*, *Carex debilis*, *Carex intumescens*, and *Carex pensylvanica* to moderately dense (40-60% cover) and dominated by large herbs and patches of ferns, with lesser amounts of sedges (Whittaker 1956, Crandall 1958, Bratton 1975). Other herbaceous species in this community are typical of rich Southern Appalachian forests and may include *Ageratina altissima* var. *roanensis*, *Anemone quinquefolia*, *Arisaema triphyllum*, *Eurybia chlorolepis* (= *Aster chlorolepis*), *Athyrium filix-femina* ssp. *asplenioides*, *Actaea racemosa* (= *Cimicifuga racemosa*), *Dryopteris campyloptera*, *Epifagus virginiana*, *Impatiens pallida*, *Medeola virginiana*, *Oxalis montana*, *Laportea canadensis*, *Luzula acuminata*, *Phacelia bipinnatifida*, *Poa alsodes*, *Prenanthes altissima*, *Prenanthes roanensis*, *Stellaria pubera*, *Thelypteris noveboracensis*, and *Trillium erectum* (Whittaker 1956, Crandall 1958, Schafale and Weakley 1990).

**Global Dynamics:** Extreme exposure to wind and storms contribute to the high number of wind-blown trees and the stunted nature of the canopy. Frequent damage caused by wind and ice create gaps in the canopy. The origin and maintenance of this community has been debated by ecologists. It has been proposed that beech gaps became established during warmer climates of 7000-900 BC, and that they were once more extensive than today (Flint 1957 in Schofield 1960). Russell (1953) concluded that cold and high winds were responsible for the occurrence of these forests. Fuller (1977) suggested that the allelopathic effects of beech litter may be a factor in maintaining this community. Due to the extreme environment, growth and reproduction of *Fagus grandifolia* are relatively slow in this mid to late successional community. Despite their small size, canopy trees may be quite old. Although beech nuts may be produced by the larger trees, reproduction of beech appears to be almost entirely vegetative from root or stump sprouts (Russell 1953). Small canopy gaps within this type are commonly invaded by a dense thicket of *Rubus canadensis*.

#### MOST ABUNDANT SPECIES

##### Great Smoky Mountains National Park

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Broad-leaved deciduous tree	<i>Fagus grandifolia</i>
Tree subcanopy	Broad-leaved deciduous tree	<i>Acer pensylvanicum</i>
Herb (field)	Graminoid	<i>Carex pensylvanica</i>

##### Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Broad-leaved deciduous tree	<i>Fagus grandifolia</i> , <i>Halesia tetraptera</i> var. <i>monticola</i>

Herb (field)

Graminoid

*Carex aestivalis*, *Carex brunnescens*, *Carex debilis*, *Carex intumescens*, *Carex pensylvanica***CHARACTERISTIC SPECIES****Great Smoky Mountains National Park:** *Carex pensylvanica*, *Fagus grandifolia*, *Halesia tetraptera* var. *monticola*, *Rugelia nudicaulis***Global:** *Ageratina altissima* var. *roanensis*, *Carex aestivalis*, *Carex albicans*, *Carex brunnescens*, *Carex debilis*, *Carex intumescens*, *Carex pensylvanica*, *Epifagus virginiana*, *Eurybia chlorolepis*, *Fagus grandifolia*, *Halesia tetraptera* var. *monticola***OTHER NOTEWORTHY SPECIES****Great Smoky Mountains National Park: Vulnerable Plants:** *Rugelia nudicaulis* (G3, globally vulnerable)**Global: Vulnerable Plants:** *Abies fraseri* (G2, Southern Blue Ridge endemic), *Ageratina altissima* var. *roanensis* (G5T3T4, Southern Blue Ridge endemic), *Erythronium umbilicatum* ssp. *monostolum* (G5T3), *Gentiana austromontana* (G3), *Geum geniculatum* (G2), *Glyceria nubigena* (G2G3, endemic to Great Smoky Mountains and adjacent areas near the park), *Hypericum graveolens* (G3), *Hypericum mitchellianum* (G3), *Lilium grayi* (G1G2, Southern Blue Ridge endemic), *Platanthera grandiflora* (G5, rare or regionally rare), *Prenanthes roanensis* (G3, Southern Blue Ridge endemic), *Rugelia nudicaulis* (G3), *Solidago glomerata* (G3), *Stachys clingmanii* (G2), *Streptopus lanceolatus* var. *roseus* (G5T4, rare or regionally rare); **Other Plants:** *Phacelia fimbriata* (G4), *Stellaria corei* (G4)**CONSERVATION STATUS RANK****Global Rank & Reasons:** G1 (1-Nov-2002). This community has a very restricted range with scattered occurrences of small acreage. Many occurrences have been, and continue to be, severely damaged by the European wild boar (*Sus scrofa*). Grazing and soil disturbance by this animal reduces understory herb cover to 10-30 percent of undisturbed levels and may affect tree growth and nutrient cycling (Singer et al. 1984). Beech bark disease, a complex made up of the Beech scale insect (*Cryptococcus fagisuga*) and a closely associated fungus (*Nectria coccinea* var. *faginata*) poses a severe threat to this community. Most all of the beech gap communities in the Great Smoky Mountains had succumbed to the beech bark disease or a combination of the beech bark disease and pollution by 2002 (R. White pers. comm.). Presumably this trend is being seen throughout the Southern Appalachians, resulting in the possible extinction of this community in the next few years. Therefore, this community was assigned a rank of G1.**RELATED CONCEPTS****Global Similar Types:**

- *Betula alleghaniensis* - *Fagus grandifolia* / *Viburnum lantanoides* / *Eurybia chlorolepis* - *Dryopteris intermedia* Forest (CEGL007285)
- *Fagus grandifolia* Ridge and Valley Forest (CEGL007200)

**Global Related Concepts:**

- *Fagus grandifolia* / *Carex pensylvanica* - *Ageratina altissima* var. *roanensis* Forest (Fleming and Patterson 2009a) =
- IA4d. Southern Appalachian Beech Gap (Allard 1990) >
- Permesotrophic Forest (Rawinski 1992) ?
- Sugar Maple - Beech - Yellow Birch: 25 (Eyre 1980) >
- Sugar Maple-Beech Yellow Birch (81) (USFS 1988) ?

**CLASSIFICATION****Status:** Standard**Classification Confidence:** 2 - Moderate**Great Smoky Mountains National Park Classification Comments:** This community can intergrade into the northern hardwood community *Betula alleghaniensis* - *Fagus grandifolia* - *Aesculus flava* / *Viburnum lantanoides* / *Eurybia chlorolepis* - *Dryopteris intermedia* Forest (CEGL007285). This community is distinguished from CEGL007285 by the dominance of *Fagus grandifolia* in the canopy to the exclusion of other species. As the *Fagus grandifolia* continues to die and other species take its place, there may be a need to clarify what the new community is classified as since it fits neither community neatly. The other beech gap community, *Fagus grandifolia* / *Ageratina altissima* var. *roanensis* Forest (CEGL006246), is uncommon and possesses an herbaceous stratum mainly comprised of forbs instead of *Carex pensylvanica*.**Global Classification Comments:** This community includes forest vegetation with short-statured canopies dominated by *Fagus grandifolia* and occurring in the high-elevation landscapes of the Southern Appalachians. On drier sites, such as south slopes, the association is expressed as the classic "beech gap" having a dense, graminoid-dominated herbaceous stratum. On more mesic sites, such as north slopes, the community is thought to be more similar to northern hardwood forests, having a more diverse canopy and subcanopy, occurring over a field stratum that is a mixture of coarse forbs, ferns and sedges. This community is thought to be limited to the range of *Picea rubens* and *Abies fraseri* (Whittaker 1956).**ELEMENT DISTRIBUTION****Great Smoky Mountains National Park Range:** This community was sampled from a single location on the Mount Le Conte quadrangle, on the south slope of Trillium Gap (4719 feet elevation). It was not observed on the Cades Cove quadrangle, but it does occur in other areas of the park.

**Global Range:** This community is found in scattered sites on high elevations of the southern Appalachian Mountains of North Carolina, and Tennessee and possibly Georgia.

**Nations:** US

**States/Provinces:** GA?, NC, TN

**TNC Ecoregions:** 51:C

**USFS Ecoregions (1994/95):** M221A:C?, M221B:C?, M221C:C?, M221Dc:CCC, M221Dd:CCC

**USFS Ecoregions (2007):** M221A:C?, M221B:C?, M221C:C?, M221Dc:CCC, M221Dd:CCC

**Federal Lands:** BIA (Eastern Band of Cherokee); NPS (Appalachian Trail [Southern Blue Ridge], Blue Ridge Parkway, Great Smoky Mountains); USFS (Chattahoochee (Southern Blue Ridge)?, Chattahoochee?, Cherokee, Nantahala, Pisgah)

#### ELEMENT SOURCES

**Great Smoky Mountains National Park Plots:** GRSM.12, GRSM.410, GRSM.508.

**Great Smoky Mountains National Park Description Author(s):** K.D. Patterson, mod. R. White

**Global Description Author(s):** K.D. Patterson

**References:** Allard 1990, Allard et al. 1990, Bratton 1975, Crandall 1958, Davis 1930, Eyre 1980, Fleming and Patterson 2009a, Fuller 1977, Golden 1981, Lindsay and Bratton 1979a, McLeod 1988, Peet et al. unpubl. data, Pittillo and Smathers 1979, Ramseur 1960, Rawinski 1992, Rheinhardt 1981, Russell 1953, Schafale 2012, Schafale and Weakley 1990, Schafale pers. comm., Schofield 1960, Singer et al. 1984, Southeastern Ecology Working Group n.d., USFS 1988, White et al. 1993, White pers. comm., Whittaker 1956

## M014. Laurentian-Acadian Mesic Hardwood - Conifer Forest

### G632. CENTRAL & SOUTHERN APPALACHIAN RED SPRUCE - FIR - HARDWOOD FOREST

**Group Summary Description:** These are upland spruce-fir forests and woodlands, or spruce-fir-hardwood forests of eastern North America. They are found within the range of *Picea rubens*, at progressively higher elevations from the Central to the Southern Appalachians. They occur in cool, mostly mesic settings on ridgetops and steep slopes with thin soils. Substrate geology also varies, although soils are generally acidic. At their southern extent, these forests occur only at the highest elevations (above 1370 m [4500 feet]). *Picea rubens* is generally present, and often dominant, but the canopy may be dominated by *Abies fraseri*. Typical canopy associates include *Betula alleghaniensis* and *Tsuga canadensis*. The density and composition of shrub and herbaceous strata vary with association and geographic location. Characteristic shrubs include *Acer spicatum*, *Rhododendron catawbiense*, *Rhododendron maximum*, *Vaccinium erythrocarpum*, and *Viburnum lantanoides*. Characteristic herbs rangewide include *Clintonia borealis*, *Dryopteris campyloptera*, *Mitchella repens*, *Oxalis montana*, and *Trillium undulatum*. The bryophyte layer is generally very well-developed, characterized by *Bazzania trilobata*, *Dicranum* spp., *Pleurozium schreberi*, and many others. Mosses, liverworts, and lichens grow densely on fallen logs, tree trunks, and the forest floor, giving these forests a distinctive carpeted appearance.

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### A0136 *Picea rubens* - *Abies fraseri* Forest Alliance

Red Spruce - Fraser Fir Forest Alliance

*Southern Appalachian Spruce-Fir Forest*

#### ALLIANCE CONCEPT

**Summary:** Canopies can be dominated by *Abies fraseri* and/or *Picea rubens*; *Betula alleghaniensis* and other northern hardwood species may be codominant in mixed stands. Canopy/subcanopy species of minor importance can include *Acer spicatum*, *Acer pensylvanicum*, *Amelanchier laevis*, *Betula alleghaniensis*, *Prunus pensylvanica*, and *Sorbus americana*. Forests on extreme sites may have an open canopy, with stunted appearance and, in some communities, standing dead stems of *Abies fraseri* are common, with extensive patches of *Abies fraseri* seedlings in canopy gaps. The density and composition of the shrub and herbaceous strata vary among associations in this alliance. Forests in this alliance typically have a well-developed bryophyte layer. Mosses, liverworts, and lichens grow densely on fallen logs, tree trunks, and the forest floor, giving these forests a distinctive carpeted appearance. This alliance contains many species endemic to the Southern Blue Ridge or that have the bulk of their worldwide range in that region. This vegetation is restricted to the highest mountain systems of the Southern Blue Ridge, in eastern Tennessee, western North Carolina, and southwestern Virginia, as well as outliers in the Central Appalachians of West Virginia, primarily within the distributional range of *Abies fraseri*. These forests occur on all topographic positions except the steepest rocky cliffs. Elevations range from 1350-2300 m (4400-6600 feet), with pure *Abies fraseri* associations best developed above 1830 m (6000 feet). The dominant soils are Inceptisols with scattered occurrences of Spodosols at the highest elevations. Generally, soils can be described as rocky, with well-developed organic and A horizons. All soils in these high-elevation forests are low in base saturation, high in organic matter, and are acidic in reaction (pH 3-5), with a high aluminum content. The moisture regimes of these areas are mesic to wet due to high rainfall, abundant cloud cover, fog deposition, and low temperatures. The climate has been classified as perhumid, with the temperature varying elevationally from mesothermal to microthermal. The regional geology is dominated by complexly folded metamorphic, sedimentary, and igneous rocks of the Precambrian and early Paleozoic age, including phyllites, slates, schists, sandstones, quartzites, granites, and gneisses. These forests are affected by debris avalanches, wind and ice disturbance, and lightning fire. Because of the rocky soils and

extreme wind exposure, these forests are susceptible to large blowdowns, particularly in areas damaged by the invasive balsam woolly adelgid (*Adelges piceae*).

**Classification Comments:** The alliance is conceptually related to more northern spruce-fir alliances and shares many northern or boreal species (often occurring in communities of this alliance as disjuncts from their main distribution), but is considered a separate alliance because of its large component of Southern Appalachian endemic species. This alliance exists in good condition in only a small portion of its original range due to the impact of early 20th century, post-logging fires and the ongoing outbreak of the balsam woolly adelgid (*Adelges piceae*), an exotic pest that infests and kills mature *Abies fraseri*. Well-developed, undisturbed examples of this alliance are extremely rare. Present day *Picea rubens* and *Abies fraseri* vegetation in the Southern Appalachians is estimated to cover only 48% (69 square kilometers) of the presettlement area (Cogbill and White 1991). These forests may grade into forests dominated by northern hardwood species (*Betula alleghaniensis*, *Fagus grandifolia*, *Acer saccharum*) and may also occur adjacent to montane grasslands, high-elevation shrublands, or high-elevation rock outcrop communities. *Picea rubens* - (*Betula alleghaniensis*, *Aesculus flava*) / *Rhododendron (maximum, catawbiense)* Forest (CEGL004983) is transitional to *Picea rubens* - *Betula alleghaniensis* - *Aesculus flava* Forest Alliance (A0138), and is being placed there.

**Similar Alliances:**

- *Picea rubens* - *Betula alleghaniensis* - *Aesculus flava* Forest Alliance (A0138) contains *Picea rubens*, but lacks *Abies fraseri*.

**Diagnostic Characteristics:** These are spruce-fir forests of the Southern Appalachians characterized by the presence of *Abies fraseri*.

**Rationale for Nominal Species or Physiognomic Features:** *Abies fraseri* and/or *Picea* are characteristic. *Abies fraseri* is a strong obligate.

**Related Concepts:**

- *Abies fraseri* Alliance (Grossman and Goodin 1995) <
- Fraser Fir Forest (Whittaker 1956) < [This Whittaker concept appears to be the pure fir stands.]
- Oligotrophic Forest (Rawinski 1992) ?
- Red Spruce - Fraser Fir: 34 (Eyre 1980) >< [upland portions]
- Red Spruce Forest (Whittaker 1956) > [This Whittaker concept appears to be mixed spruce-fir stands plus spruce-birch-hardwood.]
- Spruce-Fir Forests (White et al. 1993) >

#### ALLIANCE DESCRIPTION

**Environment:** These forests occur on all topographic positions except the steepest rocky cliffs. Elevations range from 1350-2300 m (4400-6600 feet), with pure *Abies fraseri* associations best developed above 1830 m (6000 feet). The dominant soils are Inceptisols with scattered occurrences of Spodosols at the highest elevations. Generally, soils can be described as rocky, with well-developed organic and A horizons. All soils in these high-elevation forests are low in base saturation, high in organic matter, and are acidic in reaction (pH 3-5), with a high aluminum content. The moisture regimes of these areas are mesic to wet due to high rainfall, abundant cloud cover, fog deposition, and low temperatures. The climate has been classified as perhumid, with the temperature varying elevationally from mesothermal to microthermal. The regional geology is dominated by complexly folded metamorphic, sedimentary, and igneous rocks of the Precambrian and early Paleozoic age, including phyllites, slates, schists, sandstones, quartzites, granites, and gneisses.

**Vegetation:** Canopies of this vegetation can be dominated by *Abies fraseri* and/or *Picea rubens*. Canopy/subcanopy species of minor importance can include *Acer spicatum*, *Acer pensylvanicum*, *Amelanchier laevis*, *Betula alleghaniensis*, *Prunus pensylvanica*, and *Sorbus americana*. Forests on extreme sites may have a stunted appearance and, in some communities, standing dead stems of *Abies fraseri* are common, with extensive patches of *Abies fraseri* seedlings in canopy gaps. The density and composition of the shrub and herbaceous strata vary among associations in this alliance. Typical shrub species include *Menziesia pilosa*, *Rhododendron carolinianum*, *Rhododendron maximum*, *Rhododendron catawbiense*, *Ribes rotundifolium*, *Rubus idaeus ssp. strigosus*, *Rubus allegheniensis*, *Sambucus racemosa var. racemosa* (= *Sambucus racemosa var. pubens*), *Vaccinium erythrocarpum*, *Vaccinium simulatum*, *Viburnum nudum var. cassinoides*, and *Viburnum lantanoides*. Typical herbaceous species include *Ageratina altissima var. roanensis*, *Angelica triquinata*, *Athyrium filix-femina ssp. asplenoides*, *Chelone lyonii*, *Circaea alpina ssp. alpina*, *Clintonia borealis*, *Dryopteris campyloptera*, *Eurybia chlorolepis* (= *Aster chlorolepis*), *Geum radiatum*, *Houstonia serpyllifolia*, *Huperzia lucidula*, *Medeola virginiana*, *Oclemena acuminata* (= *Aster acuminatus*), *Oxalis montana*, *Rugelia nudicaulis*, *Solidago glomerata*, *Streptopus lanceolatus var. roseus* (= *Streptopus roseus*), and *Viola macloskeyi ssp. pallens*. Forests in this alliance typically have a well-developed bryophyte layer. Mosses, liverworts, and lichens grow densely on fallen logs, tree trunks, and the forest floor, giving these forests a distinctive carpeted appearance. Typical nonvascular species include *Bazzania trilobata*, *Dicranum scoparium*, *Dicranum fuscescens*, *Hylocomiastrum umbratum*, *Hylocomium splendens*, *Hypnum* spp., *Polytrichum ohioense*, *Ptilium crista-castrensis*, and *Rhytidiadelphus triquetrus*. This alliance contains many species endemic to the Southern Blue Ridge or that have the bulk of their worldwide range in that region. The alliance is conceptually related to more northern spruce-fir alliances and shares many northern or boreal species (often occurring in communities of this alliance as disjuncts from their main distribution), but is considered a separate alliance because of its large component of Southern Appalachian endemic species.

**Physiognomy and Structure:** These are evergreen or mixed evergreen-deciduous forests and woodlands. Canopy height may be limited due to harsh climate conditions, including winds and ice damage. Many stands have lost coverage of *Abies fraseri* due to damage from the balsam woolly adelgid (*Adelges piceae*). Forests on extreme sites may have an open canopy, with stunted appearance and, in some communities, standing dead stems of *Abies fraseri* are common, with extensive patches of *Abies fraseri* seedlings in canopy gaps.

**Floristics:** Canopies of this vegetation can be dominated by *Abies fraseri* and/or *Picea rubens*. Canopy/subcanopy species of minor importance can include *Acer spicatum*, *Acer pensylvanicum*, *Amelanchier laevis*, *Betula alleghaniensis*, *Prunus pensylvanica*, and *Sorbus americana*. Forests on extreme sites may have a stunted appearance and, in some communities, standing dead stems of *Abies fraseri* are common, with extensive patches of *Abies fraseri* seedlings in canopy gaps. The density and composition of the shrub and herbaceous strata vary among associations in this alliance. Typical shrub species include *Menziesia pilosa*, *Rhododendron carolinianum*, *Rhododendron maximum*, *Rhododendron catawbiense*, *Ribes rotundifolium*, *Rubus idaeus* ssp. *strigosus*, *Rubus allegheniensis*, *Sambucus racemosa* var. *racemosa* (= *Sambucus racemosa* var. *pubens*), *Vaccinium erythrocarpum*, *Vaccinium simulatum*, *Viburnum nudum* var. *cassinoides*, and *Viburnum lantanoides*. Typical herbaceous species include *Ageratina altissima* var. *roanensis*, *Angelica triquinata*, *Athyrium filix-femina* ssp. *asplenoides*, *Chelone lyonii*, *Circaea alpina* ssp. *alpina*, *Clintonia borealis*, *Dryopteris campyloptera*, *Eurybia chlorolepis* (= *Aster chlorolepis*), *Geum radiatum*, *Houstonia serpyllifolia*, *Huperzia lucidula*, *Medeola virginiana*, *Oclemena acuminata* (= *Aster acuminatus*), *Oxalis montana*, *Rugelia nudicaulis*, *Solidago glomerata*, *Streptopus lanceolatus* var. *roseus* (= *Streptopus roseus*), and *Viola macloskeyi* ssp. *pallens*. Forests in this alliance typically have a well-developed bryophyte layer. Mosses, liverworts, and lichens grow densely on fallen logs, tree trunks, and the forest floor, giving these forests a distinctive carpeted appearance. Typical nonvascular species include *Bazzania trilobata*, *Dicranum scoparium*, *Dicranum fuscescens*, *Hylocomiastrum umbratum*, *Hylocomium splendens*, *Hypnum* spp., *Polytrichum ohioense*, *Ptilium crista-castrensis*, and *Rhytidiadelphus triquetrus*. This alliance contains many species endemic to the Southern Blue Ridge or that have the bulk of their worldwide range in that region. The alliance is conceptually related to more northern spruce-fir alliances and shares many northern or boreal species (often occurring in communities of this alliance as disjuncts from their main distribution), but is considered a separate alliance because of its large component of Southern Appalachian endemic species.

**Dynamics:** These forests are affected by debris avalanches, wind and ice disturbance, and lightning fire. Because of the rocky soils and extreme wind exposure, these forests are susceptible to large blowdowns, particularly in areas damaged by the invasive balsam woolly adelgid (*Adelges piceae*).

#### ALLIANCE DISTRIBUTION

**Range:** This forest alliance is restricted to the highest mountain systems of the Southern Blue Ridge, in eastern Tennessee, western North Carolina, and southwestern Virginia, with disjunct northern outliers on the summits of West Virginia. With the exception of these disjunct occurrences in West Virginia, all are within the distributional range of *Abies fraseri*. Otherwise, these forests reach their northern range limit in southwestern Virginia, where they are confined to elevations above 1700 m (5400 feet) on Mount Rogers in Grayson and Smyth counties.

**Nations:** US

**Subnations:** NC, TN, VA, WV

#### ALLIANCE SOURCES

**References:** Brown 1941, Bruck 1988, Busing et al. 1988, Cogbill and White 1991, Crandall 1958, Crandall 1960, Davis 1930, Dull et al. 1988b, Eyre 1980, Faber-Langendoen et al. 2019b, Golden 1974, Golden 1981, Grossman and Goodin 1995, Korstian 1937, McLeod 1988, NCNHP 1993, Nicholas et al. 1992, Oosting and Billings 1951, Ramseur 1960, Rawinski 1992, Schafale and Weakley 1990, Schofield 1960, Stephenson and Adams 1984, Stephenson and Clovis 1983, Wentworth et al. 1988a, White 1984a, White and Cogbill 1992, White and Pickett 1985, White et al. 1993, Whittaker 1956, Whittaker 1956, Zedaker et al. 1988

**Author of Concept:** Whittaker 1956

**Author of Description:** R.H. Whittaker (1956)

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### [CEGL006308] *Abies fraseri* / (*Rhododendron catawbiense*, *Rhododendron carolinianum*) Forest

Translated Name: **Fraser Fir / (Catawba Rosebay, Carolina Azalea) Forest**

Common Name: **Fraser Fir Forest (Evergreen Shrub Type)**

#### USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Laurentian-Acadian Mesic Hardwood - Conifer Forest (M014)
Group	Central & Southern Appalachian Red Spruce - Fir - Hardwood Forest (G632)
Alliance	<i>Picea rubens</i> - <i>Abies fraseri</i> Forest Alliance (A0136)

#### ELEMENT CONCEPT

**Global Summary:** This community occurs as island-like stands in the southern Appalachian Mountains of eastern Tennessee, and western North Carolina. It occurs on rocky spurs, steep ridges, and south-facing slopes above 1830 m (6000 feet) elevation, often adjacent to montane shrublands. This forest has a canopy strongly dominated by *Abies fraseri*, occurring over a shrub stratum dominated by evergreen species, typically *Rhododendron catawbiense*, *Rhododendron carolinianum*, or *Rhododendron maximum*. *Abies fraseri* in the canopy are 17-23 cm in diameter and 10-11 m tall, giving these forests a stunted appearance. Other species that may occur with low coverage in the canopy or subcanopy are *Picea rubens*, *Sorbus americana*, *Betula alleghaniensis*, *Prunus pensylvanica*. Herbaceous cover is typically sparse. On steep, rocky, northerly slopes, coverage by mosses, liverworts, and lichens can approach 100%. Bryophyte species include *Hylocomium splendens*, *Ptilium crista-castrensis*, *Sphagnum* spp., and *Polytrichum ohioense*. This forest may grade into forests dominated by *Picea rubens* and *Abies fraseri*, montane grasslands, high-elevation shrublands, or high-elevation rock outcrop communities.

## ENVIRONMENTAL DESCRIPTION

**Great Smoky Mountains National Park Environment:** This forest is extremely rare in the Great Smoky Mountains, but one example of this community occurs on a summit as a relatively small island within a matrix of herb-dominated spruce-fir forest.

**Global Environment:** These forests occur on rocky spurs, steep ridges, and south-facing slopes above 1830 m (6000 feet) elevation, often adjacent to montane shrublands. These forests occur on all topographic positions except the steepest rocky cliffs of the highest summits. Soils that support this community are classified as Inceptisols and are shallow, rocky, and often have a thick organic layer. Moisture regimes are mesic to wet, due to high rainfall, abundant cloud cover, fog deposition, and low temperatures. This forest may grade into forests dominated by *Picea rubens* and *Abies fraseri*, montane grasslands, high-elevation shrublands, or high-elevation rock outcrop communities.

## VEGETATION DESCRIPTION

**Great Smoky Mountains National Park Vegetation:** This community is dominated by *Abies fraseri* with small amounts of *Picea rubens*, *Betula alleghaniensis*, and *Prunus pensylvanica* as well. *Rhododendron maximum* forms a very tall shrub layer under which some low light herbaceous species such as *Oxalis montana*, *Clintonia borealis*, and *Dryopteris campyloptera* exist. In addition, lichen and moss species cover at least 20% of the ground and tree stumps.

**Global Vegetation:** This needle-leaved evergreen forest has greater than 75% canopy coverage by *Abies fraseri*. *Abies fraseri* in the canopy are 17-23 cm in diameter and 10-11 m tall, giving these forests a stunted appearance. Other species that may occur with low coverage in the canopy or subcanopy are *Picea rubens*, *Sorbus americana*, *Betula alleghaniensis*, *Prunus pensylvanica*. The tall-shrub stratum is dominated by evergreen species and, although there may be considerable variation, is usually quite dense. Typical shrub dominants include *Rhododendron catawbiense*, *Rhododendron carolinianum*, and *Rhododendron maximum*. Herbaceous cover is typically sparse. On steep, rocky, northerly slopes, coverage by mosses, liverworts, and lichens can approach 100%. Bryophyte species include *Hylocomium splendens*, *Ptilium crista-castrensis*, *Sphagnum* spp., and *Polytrichum ohioense*. Rare or regionally rare vascular plant species associated with this community include *Abies fraseri*, *Betula papyrifera* var. *cordifolia*, *Cardamine clematidis*, *Glyceria nubigena*, *Phegopteris connectilis*, *Poa palustris*, *Rhododendron vaseyi*, *Stachys clingmanii*, and *Streptopus amplexifolius*. Rare nonvascular plants include *Bazzania nudicaulis*, *Brachydontium trichodes*, *Leptodontium excelsum*, *Metzgeria consanguinea* (= *Metzgeria temperata*), *Nardia scalaris*, *Plagiochila exigua* (= *Plagiochila corniculata*), and *Sphenobolopsis pearsonii*.

**Global Dynamics:** This community is affected by debris avalanches, wind disturbance and lightning fire. Because of the shallow soils and extreme wind exposure, this forest is susceptible to large blowdowns. Logging and damage by the balsam woolly adelgid has greatly increased the effect of natural windfall. An exotic insect, the balsam woolly adelgid (*Adelges piceae*), invaded the Southern Appalachians in the late 1950s and has drastically altered the last undisturbed remnants of this community. This exotic pest kills mature *Abies fraseri* within seven years of infestation. This community is a late-successional type, but it is subject to repeated disturbance. *Prunus pensylvanica* is a dominant species immediately following disturbance. In later successional stages, *Betula alleghaniensis* increases in dominance. In areas where mature *Abies fraseri* has been lost to woolly adelgid infestation, thickets of *Rubus* spp., *Abies fraseri* seedlings and saplings, *Betula alleghaniensis*, and *Sorbus americana* are dominant. Over time, *Picea rubens*, *Betula alleghaniensis*, *Abies fraseri*, *Acer spicatum*, and *Sorbus americana* increase in the tree layer, while *Abies fraseri*, *Menziesia pilosa*, *Rubus idaeus* ssp. *strigosus*, and *Sambucus racemosa* increase in the shrub layer (White et al. 1993). Succession is especially slow after severe disturbance such as logging and slash fires. The most severely disturbed sites are predominately *Prunus pensylvanica* and *Rubus* spp. and may remain in a non-forested stage of succession for 60 years or more.

## MOST ABUNDANT SPECIES

## Great Smoky Mountains National Park

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Abies fraseri</i>
Tall shrub/sapling	Broad-leaved evergreen tree	<i>Rhododendron maximum</i>

## Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Abies fraseri</i>
Tall shrub/sapling	Broad-leaved evergreen tree	<i>Rhododendron catawbiense</i> , <i>Rhododendron maximum</i>
Tall shrub/sapling	Broad-leaved evergreen shrub	<i>Rhododendron carolinianum</i>
Nonvascular	Moss	<i>Hylocomium splendens</i>

## CHARACTERISTIC SPECIES

**Great Smoky Mountains National Park:** *Abies fraseri*, *Rhododendron carolinianum*, *Rhododendron catawbiense*, *Rhododendron maximum*

**Global:** *Abies fraseri*, *Rhododendron carolinianum*, *Rhododendron catawbiense*, *Rhododendron maximum*

## OTHER NOTEWORTHY SPECIES

**Great Smoky Mountains National Park: Vulnerable Plants:** *Abies fraseri* (G2); **Invasive/Exotic Plants:** *Streptopus amplexifolius*; **Other Plants:** *Betula papyrifera* var. *cordifolia* (G5T5), *Metzgeria consanguinea* (G4), *Nardia scalaris* (G5), *Phegopteris connectilis* (G5), *Plagiochila exigua* (G4?), *Poa palustris* (G5)

**Global: Vulnerable Plants:** *Abies fraseri* (G2, Southern Blue Ridge endemic), *Ageratina altissima* var. *roanensis* (G5T3T4, Southern Blue Ridge endemic), *Bazzania nudicaulis* (G2G3, regionally rare), *Betula papyrifera* var. *cordifolia* (G5T5, regionally rare),

*Brachyodontium trichodes* (G2G4, regionally rare), *Cardamine clematitidis* (G3, regionally rare), *Glyceria nubigena* (G2G3, endemic to Great Smoky Mountains and adjacent areas near the park), *Leptodontium viticulosoides* var. *sulphureum* (GNRT2), *Metzgeria consanguinea* (G4, regionally rare), *Nardia scalaris* (G5, regionally rare), *Phegopteris connectilis* (G5, regionally rare), *Plagiochila exigua* (G4?, regionally rare), *Poa palustris* (G5, regionally rare), *Rhododendron vaseyi* (G3, NC/Southern Blue Ridge endemic), *Solidago glomerata* (G3), *Sphenolobopsis pearsonii* (G2?), *Stachys clingmanii* (G2), *Streptopus amplexifolius* (G5, regionally rare); **Other Plants:** *Streptopus lanceolatus* var. *roseus* (G5T4)

#### CONSERVATION STATUS RANK

**Global Rank & Reasons:** G1 (4-Jan-2000). This community has a naturally restricted distribution, occurring only on the highest elevation peaks of the southern Appalachian Mountains. It exists in only a small portion of its original range due to the impact of early 20th century, post-logging fires and the ongoing outbreak of balsam woolly adelgid, an exotic pest that infests and kills mature *Abies fraseri*. Well-developed, undisturbed examples of this community are extremely rare. Most remaining examples of this community exist as patches of dense young trees or dense *Rubus* thickets beneath forests of dead snags or tangles of fallen logs.

#### RELATED CONCEPTS

##### Global Similar Types:

- *Abies fraseri* / *Viburnum lantanoides* / *Dryopteris campyloptera* - *Oxalis montana* / *Hylocomium splendens* Forest (CEGL006049) is a similar forest with a canopy dominated by *Abies fraseri* but lacking an evergreen-dominated shrub stratum.
- *Picea rubens* - (*Abies fraseri*) / (*Rhododendron catawbiense*, *Rhododendron maximum*) Forest (CEGL007130) *Abies fraseri* can codominate with *Picea rubens*.
- *Picea rubens* - (*Abies fraseri*) / *Vaccinium erythrocarpum* / *Dryopteris campyloptera* / *Hylocomium splendens* Forest (CEGL007131) *Abies fraseri* can codominate with *Picea rubens*.

##### Global Related Concepts:

- *Abies fraseri* / (*Rhododendron catawbiense*, *Rhododendron carolinianum*) Forest (Fleming and Patterson 2009a) =
- Fraser Fir (6) (USFS 1988) ?
- IA4b. Fraser Fir Forest (Allard 1990) >
- Red Spruce - Fraser Fir: 34 (Eyre 1980) >

#### CLASSIFICATION

**Status:** Standard

**Classification Confidence:** 2 - Moderate

**Great Smoky Mountains National Park Other Comments:** This community is extremely rare and occurs in such small patches that it is only subtly detectable. It most likely will not be picked up as an individual mapping unit but may be combined with the other *Abies fraseri* / *Picea rubens* categories.

#### ELEMENT DISTRIBUTION

**Great Smoky Mountains National Park Range:** This community was sampled above 6000 feet on Spruce Mountain. It may occur in isolated patches elsewhere but is swiftly declining due to the continuing decline of *Abies fraseri* in the plots. This community may be extinct in the park within the next decade.

**Global Range:** This community occurs as island-like stands on the highest areas, above 1830 m (6000 feet), in the southern Appalachian Mountains of eastern Tennessee, western North Carolina, and southwestern Virginia. It is extremely limited in distribution and is restricted to the following mountain areas: Great Smoky Mountains, Black Mountains, Balsam Mountain, Plott Balsam Mountain, Grandfather Mountain, and Mount Rogers (Ramseur 1960).

**Nations:** US

**States/Provinces:** NC, TN

**TNC Ecoregions:** 51:C

**USFS Ecoregions (1994/95):** M221Dc:CCC, M221Dd:CCC

**USFS Ecoregions (2007):** M221Dc:CCC, M221Dd:CCC

**Federal Lands:** NPS (Appalachian Trail [Southern Blue Ridge], Blue Ridge Parkway?, Great Smoky Mountains); USFS (Cherokee, Pisgah)

#### ELEMENT SOURCES

**Great Smoky Mountains National Park Plots:** GRSM.532.

**Great Smoky Mountains National Park Description Author(s):** K.D. Patterson, mod. R. White

**Global Description Author(s):** K.D. Patterson

**References:** Allard 1990, Anderson et al. 1990, Braun 1950, Brown 1941, Bruck 1988, Busing et al. 1988, Crandall 1958, Davis 1930, Eyre 1980, Fleming and Patterson 2009a, McLeod 1988, NCNHP 1993, Nicholas et al. 1992, Oosting and Billings 1951, Ramseur 1960, Schafale 2012, Schafale and Weakley 1990, Southeastern Ecology Working Group n.d., USFS 1988, Weakley 1993, White 1984a, White 1984b, White and Pickett 1985, White et al. 1993, Whittaker 1956

**[CEGL006049] *Abies fraseri* / *Viburnum lantanoides* / *Dryopteris campyloptera* - *Oxalis montana* / *Hylocomium splendens* Forest**Translated Name: **Fraser Fir / Hobblebush / Mountain Woodfern - Mountain Woodsorrel / Splendid Feathermoss Forest**Common Name: **Fraser Fir Forest (Deciduous Shrub Type)****USNVC CLASSIFICATION**

Division	Eastern North American Forest & Woodland (I.B.2.Na)
Macrogroup	Laurentian-Acadian Mesic Hardwood - Conifer Forest (M014)
Group	Central & Southern Appalachian Red Spruce - Fir - Hardwood Forest (G632)
Alliance	<i>Picea rubens</i> - <i>Abies fraseri</i> Forest Alliance (A0136)

**ELEMENT CONCEPT**

**Global Summary:** This community occurs as island-like stands in the southern Appalachian Mountains. It occurs on steep ridges and mesic, north-facing slopes above 1830 m (6000 feet) elevation, although it may extend lower on some sites. Occurrences of this community have shallow, rocky soils and are often steep and bouldery with seepage areas. This forest has at least 75% of the canopy coverage composed of *Abies fraseri*, occurring over a sparse to moderate shrub stratum dominated by deciduous species, a diverse herb stratum, and, typically, a well-developed bryophyte layer. The tree canopy has standing dead stems of *Abies fraseri* and extensive patches of *Abies fraseri* saplings in canopy gaps. *Oxalis montana*, *Dryopteris campyloptera*, and *Athyrium filix-femina* are often dominant in the herbaceous stratum. Other characteristic species include *Vaccinium erythrocarpum*, *Sambucus racemosa* var. *racemosa*, *Rubus allegheniensis*, *Rubus idaeus* ssp. *strigosus*, *Oclemena acuminata*, *Eurybia chlorolepis*, *Clintonia borealis*, *Solidago glomerata*, *Rugelia nudicaulis*, *Ageratina altissima* var. *roanensis*, *Chelone lyonii*, *Circaea alpina* ssp. *alpina*, *Streptopus lanceolatus* var. *roseus*, *Viola macloskeyi* ssp. *pallens*, *Geum radiatum*, *Huperzia lucidula*, *Ptilium crista-castrensis*, *Rhytidiadelphus triquetrus*, and *Hylocomium splendens*. This is a relatively broadly defined community element with much structural and compositional variation.

**ENVIRONMENTAL DESCRIPTION**

**Great Smoky Mountains National Park Environment:** This community was found on and around the summit of Mount Le Conte, on exposed, broad, flat ridges and on moderately steep, north-facing slopes. This forest typically occurs at elevations over 1830 m (6000 feet), but samples range from 1790-1995 m (5880-6540 feet) in elevation.

**Global Environment:** This community typically occurs on steep ridges and north-facing slopes above 1830 m (6000 feet) elevation, although it may extend lower on some sites. These forests occur on all topographic positions except the steepest rocky cliffs of the highest summits. Soils that support this community are classified as Inceptisols and are shallow, rocky, and often have a thick organic layer. Moisture regimes are mesic to wet, due to high rainfall, abundant cloud cover, fog deposition, and low temperatures.

**VEGETATION DESCRIPTION**

**Great Smoky Mountains National Park Vegetation:** This forest has a canopy strongly dominated by *Abies fraseri*, often with many standing dead and fallen individuals. Minor amounts of other tree species (*Picea rubens*, *Betula alleghaniensis*, *Prunus pensylvanica*, and *Sorbus americana*) may occur in the canopy, subcanopy, or as tall shrubs/saplings. The shrub stratum is typically open and sparse but can have moderately dense coverage, especially in areas disturbed by past logging, deer browsing, or Balsam Woolly Adelgid (*Adelges piceae*). Shrubs can include *Diervilla sessilifolia*, *Rubus canadensis*, *Sambucus racemosa* var. *racemosa* (= var. *pubens*), *Vaccinium erythrocarpum*, and *Viburnum lantanoides*. The shrub stratum may also have areas of dense *Abies fraseri* regeneration, particularly in areas of canopy tree mortality. The herbaceous stratum has moderately dense coverage, with ferns and tall forbs locally dominant. Typical herbaceous dominants include *Oclemena acuminata* (= *Aster acuminatus*), *Athyrium filix-femina*, *Oxalis montana*, *Clintonia borealis*, *Dryopteris campyloptera*, and *Solidago glomerata*. Other herbaceous species include *Carex brunnescens*, *Carex debilis*, *Huperzia lucidula*, *Rugelia nudicaulis*, and, in seepage areas, *Chelone lyonii*, *Impatiens pallida*, and the shrub, *Ribes rotundifolium*. In stands with intact *Abies fraseri* canopies, mosses have high coverage on fallen logs and tree trunks.

**Global Vegetation:** This needle-leaved evergreen forest has greater than 75% canopy coverage by *Abies fraseri*, typically with many standing dead stems. Canopy trees are of small diameter (less than 20 cm) and short stature (less than 10 m tall), giving these forests a stunted appearance. Other species that may occur in the canopy or subcanopy with low coverage are *Picea rubens*, *Sorbus americana*, *Betula alleghaniensis*, *Prunus pensylvanica*, and *Acer spicatum*. There may be considerable variation in the density of shrub cover, but it is typically low (<20%) and dominated by deciduous species. Typical shrub species include *Viburnum lantanoides*, *Vaccinium erythrocarpum*, *Sambucus racemosa* var. *racemosa* (= *Sambucus racemosa* var. *pubens*), *Menziesia pilosa*, *Rubus allegheniensis*, and *Rubus idaeus* ssp. *strigosus*. Where shrubs are sparse, herb cover is usually dense, with *Oxalis montana*, *Athyrium filix-femina* ssp. *asplenioides*, and *Dryopteris campyloptera* often dominant. Other common herbs include *Oclemena acuminata* (= *Aster acuminatus*), *Eurybia chlorolepis* (= *Aster chlorolepis*), *Clintonia borealis*, *Solidago glomerata*, *Rugelia nudicaulis*, *Ageratina altissima* var. *roanensis*, *Chelone lyonii*, *Circaea alpina* ssp. *alpina*, *Streptopus lanceolatus* (= *Streptopus roseus*), *Viola macloskeyi* ssp. *pallens*, *Geum radiatum*, and *Huperzia lucidula*. Mosses, liverworts, and lichens grow densely on fallen logs, tree trunks, and the forest floor, giving the community a distinctive carpeted appearance. Characteristic bryophyte species include *Hylocomium splendens*, *Ptilium crista-castrensis*, *Rhytidiadelphus triquetrus*, and *Hylocomiastrum umbratum*.

**Global Dynamics:** This community is affected by debris avalanches, wind disturbance and lightning fire. Because of the shallow soils and extreme wind exposure, this forest is susceptible to large blowdowns. Logging and damage by the balsam woolly adelgid has greatly increased the effect of natural windfall. This community is a late-successional type, but it is subject to repeated disturbance. *Prunus pensylvanica* is a dominant species immediately following disturbance. In later successional stages, *Betula alleghaniensis*

increases in dominance. An exotic insect, the balsam woolly adelgid (*Adelges piceae*), invaded the Southern Appalachians in the late 1950s and has drastically altered the last undisturbed remnants of this community. This exotic pest kills mature *Abies fraseri* within seven years of infestation. *Abies fraseri* is the only rare plant species associated with this vegetation in Virginia. In areas where mature *Abies fraseri* has been lost to woolly adelgid infestation, thickets of *Rubus* spp., *Abies fraseri* seedlings and saplings, *Betula alleghaniensis*, and *Sorbus americana* are dominant. Over time, *Picea rubens*, *Betula alleghaniensis*, *Abies fraseri*, *Acer spicatum*, and *Sorbus americana* increase in the tree layer, while *Abies fraseri*, *Menziesia pilosa*, *Rubus idaeus* ssp. *strigosus*, and *Sambucus racemosa* increase in the shrub layer (White et al. 1993). Succession is especially slow after severe disturbance such as logging and slash fires. The most severely disturbed sites are predominately *Prunus pennsylvanica* and *Rubus* spp. and may remain in a non-forested stage of succession for 60 years or more.

#### MOST ABUNDANT SPECIES

##### Great Smoky Mountains National Park

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Abies fraseri</i>
Tall shrub/sapling	Broad-leaved deciduous shrub	<i>Rubus allegheniensis</i> , <i>Vaccinium erythrocarpum</i> , <i>Viburnum lantanoides</i>
Herb (field)	Flowering forb	<i>Clintonia borealis</i> , <i>Oclemena acuminata</i> , <i>Oxalis montana</i>
Herb (field)	Fern (Spore-bearing forb)	<i>Athyrium filix-femina</i> , <i>Dryopteris campyloptera</i>

##### Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Abies fraseri</i>
Tall shrub/sapling	Broad-leaved deciduous tree	<i>Sambucus racemosa</i> var. <i>racemosa</i>
Tall shrub/sapling	Broad-leaved deciduous shrub	<i>Rubus allegheniensis</i> , <i>Viburnum lantanoides</i>
Herb (field)	Flowering forb	<i>Oxalis montana</i>
Herb (field)	Fern (Spore-bearing forb)	<i>Athyrium filix-femina</i> ssp. <i>asplenioides</i> , <i>Dryopteris campyloptera</i> , <i>Huperzia lucidula</i>
Nonvascular	Moss	<i>Hylocomium splendens</i> , <i>Ptilium crista-castrensis</i>

#### CHARACTERISTIC SPECIES

**Great Smoky Mountains National Park:** *Abies fraseri*, *Diervilla sessilifolia*, *Rubus allegheniensis*, *Rugelia nudicaulis*, *Sambucus racemosa* ssp. *pubens*, *Solidago glomerata*

**Global:** *Abies fraseri*, *Angelica triquinata*, *Dryopteris campyloptera*, *Eurybia chlorolepis*, *Houstonia serpyllifolia*, *Hylocomium splendens*, *Oxalis montana*, *Ribes rotundifolium*, *Rubus allegheniensis*, *Rugelia nudicaulis*, *Solidago glomerata*, *Vaccinium erythrocarpum*, *Viburnum lantanoides*

#### OTHER NOTEWORTHY SPECIES

**Great Smoky Mountains National Park: Vulnerable Plants:** *Abies fraseri* (G2, globally imperiled), *Rugelia nudicaulis* (G3, globally vulnerable), *Solidago glomerata* (G3, globally vulnerable); **Invasive/Exotic Plants:** *Streptopus amplexifolius*; **Other Plants:** *Betula papyrifera* var. *cordifolia* (G5T5), *Metzgeria consanguinea* (G4), *Nardia scalaris* (G5), *Phegopteris connectilis* (G5), *Plagiochila exigua* (G4?), *Poa palustris* (G5)

**Global: Vulnerable Plants:** *Abies fraseri* (G2, Southern Blue Ridge endemic), *Ageratina altissima* var. *roanensis* (G5T3T4, Southern Blue Ridge endemic), *Bazzania nudicaulis* (G2G3), *Brachydontium trichodes* (G2G4), *Cardamine clematitidis* (G3), *Geum radiatum* (G2, Southern Appalachian endemic), *Glyceria nubigena* (G2G3, endemic to Great Smoky Mountains and adjacent areas near the park), *Leptodontium viticulosoides* var. *sulphureum* (GNRT2), *Rhododendron vaseyi* (G3, NC/Southern Blue Ridge endemic), *Rugelia nudicaulis* (G3), *Solidago glomerata* (G3), *Sphenolobopsis pearsonii* (G2?), *Stachys clingmanii* (G2); **Other Plants:** *Betula papyrifera* var. *cordifolia* (G5T5), *Metzgeria consanguinea* (G4), *Nardia scalaris* (G5), *Phegopteris connectilis* (G5), *Plagiochila exigua* (G4?), *Poa palustris* (G5), *Streptopus amplexifolius* (G5), *Streptopus lanceolatus* var. *roseus* (G5T4)

#### CONSERVATION STATUS RANK

**Global Rank & Reasons:** G1 (15-Jul-1994). This community occurs as island-like stands in the southern Appalachian Mountains. It has a naturally restricted distribution and exists in only a small portion of its original range due to the impact of early 20th century, post-logging fires and the ongoing outbreak of balsam woolly adelgid (*Adelges piceae*). Well-developed, undisturbed examples of this community are extremely rare.

#### RELATED CONCEPTS

##### Global Similar Types:

- *Abies fraseri* / (*Rhododendron catawbiense*, *Rhododendron carolinianum*) Forest (CEGL006308) is a similar forest with a canopy dominated by *Abies fraseri* but with a shrub stratum dominated by evergreen species.
- *Picea rubens* - (*Abies fraseri*) / (*Rhododendron catawbiense*, *Rhododendron maximum*) Forest (CEGL007130) *Abies fraseri* can codominate with *Picea rubens*.
- *Picea rubens* - (*Abies fraseri*) / *Vaccinium erythrocarpum* / *Dryopteris campyloptera* / *Hylocomium splendens* Forest (CEGL007131) *Abies fraseri* can codominate with *Picea rubens*.

**Global Related Concepts:**

- *Abies fraseri* / *Dryopteris campyloptera* - *Oxalis montana* Forest (Fleming and Patterson 2009a) =
- *Abies fraseri* / *Dryopteris campyloptera* - *Oxalis montana* Forest (Fleming and Coulling 2001) =
- Fraser Fir (6) (USFS 1988) ?
- IA4b. Fraser Fir Forest (Allard 1990) >
- Oligotrophic Forest (Rawinski 1992) ?
- Red Spruce - Fraser Fir: 34 (Eyre 1980) >

**CLASSIFICATION****Status:** Standard**Classification Confidence:** 1 - Strong

**Great Smoky Mountains National Park Other Comments:** On Mount Le Conte, this community occurs as discontinuous stands in a mosaic of standing dead *Abies fraseri* and areas variously dominated by shrubs (*Rubus canadensis* and/or *Diervilla sessilifolia*) or herbaceous species (*Athyrium filix-femina* and/or *Solidago glomerata*) - see *Rubus canadensis* - (*Rubus idaeus* ssp. *strigosus*) / *Athyrium filix-femina* - *Solidago glomerata* Shrubland (CEGL003893).

**ELEMENT DISTRIBUTION**

**Great Smoky Mountains National Park Range:** This community is restricted to high-elevation areas within the park such as the summit and high slopes of Mount Le Conte. *Abies fraseri* Forests occur elsewhere within the park boundary and should be looked for at elevations over 6000 feet (1830 m).

**Global Range:** This community occurs as island-like stands on the highest areas (>1830 m [6000 feet]) in the southern Appalachian Mountains of eastern Tennessee, western North Carolina, and southwestern Virginia. It is extremely limited in distribution and is restricted to the following mountain areas: Great Smoky Mountains, Black Mountains, Balsam Mountain, Plott Balsam Mountain, Grandfather Mountain, and Mount Rogers (Ramseur 1960).

**Nations:** US**States/Provinces:** NC, TN, VA:S1**TNC Ecoregions:** 51:C**USFS Ecoregions (1994/95):** M221Dc:CCC, M221Dd:CCC**USFS Ecoregions (2007):** M221Dc:CCC, M221Dd:CCC

**Federal Lands:** NPS (Appalachian Trail [Southern Blue Ridge], Blue Ridge Parkway, Great Smoky Mountains); USFS (Cherokee, Jefferson, Pisgah)

**ELEMENT SOURCES**

**Great Smoky Mountains National Park Plots:** GRSM.92, GRSM.147.

**Great Smoky Mountains National Park Description Author(s):** K.D. Patterson

**Global Description Author(s):** K.D. Patterson

**References:** Adams and Stephenson 1991, Adams et al. 1985, Allard 1990, Anderson et al. 1990, Belden et al. 1994, Braun 1950, Brown 1941, Bruck 1988, Busing et al. 1988, Crandall 1958, Davis 1930, Dull et al. 1988a, Eyre 1980, Fleming and Coulling 2001, Fleming and Patterson 2009a, Fleming et al. 2017, McLeod 1988, NCNHP 1993, Nicholas et al. 1992, Oosting and Billings 1951, Peet et al. unpubl. data, Ramseur 1960, Rawinski 1992, Rheinhardt and Ware 1984, Schafale 2012, Schafale and Weakley 1990, Southeastern Ecology Working Group n.d., Stephenson and Adams 1984, TDNH unpubl. data 2018, USFS 1988, Weakley 1993, White 1984a, White 1984b, White and Pickett 1985, White et al. 1993, Whittaker 1956

**[CEGL007130] *Picea rubens* - (*Abies fraseri*) / (*Rhododendron catawbiense*, *Rhododendron maximum*) Forest**Translated Name: **Red Spruce - (Fraser Fir) / (Catawba Rosebay, Great Laurel) Forest**Common Name: **Red Spruce - Fraser Fir Forest (Evergreen Shrub Type)****USNVC CLASSIFICATION**

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Laurentian-Acadian Mesic Hardwood - Conifer Forest (M014)
Group	Central & Southern Appalachian Red Spruce - Fir - Hardwood Forest (G632)
Alliance	<i>Picea rubens</i> - <i>Abies fraseri</i> Forest Alliance (A0136)

**ELEMENT CONCEPT**

**Global Summary:** This community is restricted to the highest mountain systems of the Southern Appalachians in eastern Tennessee, western North Carolina, and southwestern Virginia. These forests are typically found on moderately steep to steep, convex slopes at elevations between 1550 and 1830 m (5100-6000 feet). This association includes forests of the Southern Appalachians, within the range of *Abies fraseri*, currently dominated by *Picea rubens* but showing some evidence of the historical presence of *Abies fraseri* (either standing dead individuals or ample regeneration), over a shrub stratum dominated by evergreen species, typically *Rhododendron catawbiense* and *Rhododendron maximum*. Herb coverage is characteristically low, but on moist north-facing sites, mosses, ferns and forbs may be dense beneath the shrub stratum.

## ENVIRONMENTAL DESCRIPTION

**Great Smoky Mountains National Park Environment:** This community was found on steep, middle to high slopes at elevations between 5100 and 6000 feet (samples ranged in elevation from 5320 to 5780 feet) over organic soils with thick litter layers. In some areas ice storms and Balsam Woolly Adelgid (*Adelges piceae*) affect the canopy structure.

**Global Environment:** This forest is best developed between 1550 and 1830 m (5100-6000 feet) elevation but may occur at lower elevations and is typically found on moderately steep to steep, convex slopes. Soils are highly variable, from deep mineral soils to well-developed boulderfields, where a thin organic layer and moss mat overlie the rocks and there are pockets of mineral soil in deep crevices between boulders. The dominant soils are Inceptisols with scattered occurrences of Spodosols at the highest elevations (White et al. 1993). Generally, soils can be described as rocky, with well-developed organic and A horizons. All soils in these high-elevation forests are low in base saturation, high in organic matter, and are acidic in reaction (pH 3-5), with a high aluminum content. The moisture regimes of these areas are mesic to wet due to high rainfall, abundant cloud cover, fog deposition, and low temperatures. The climate has been classified as perhumid, with the temperature varying elevationally from mesothermal to microthermal. The regional geology is dominated by complexly folded metamorphic, sedimentary, and igneous rocks of the Precambrian and early Paleozoic age, including phyllites, slates, schists, sandstones, quartzites, granites, and gneisses.

## VEGETATION DESCRIPTION

**Great Smoky Mountains National Park Vegetation:** This community has a closed canopy dominated by large *Picea rubens*. Some occurrences may have standing dead *Abies fraseri* and a more open canopy due to *Abies* mortality or damage by ice storms. The subcanopy may have scattered stems of *Betula alleghaniensis* or *Prunus pensylvanica*, but these species form a minor part of the canopy coverage (less than 25%). The shrub stratum is dense (70-100% coverage) and dominated by *Rhododendron catawbiense*. In some occurrences on the flanks of Mount Le Conte, *Leucothoe fontanesiana* can dominate the short-shrub stratum. Other species that may be present as a minor part of the shrub stratum include *Abies fraseri*, *Ilex montana*, *Kalmia latifolia*, *Picea rubens*, *Rhododendron maximum*, *Rubus canadensis*, *Sorbus americana*, *Vaccinium corymbosum*, *Vaccinium erythrocarpum*, and *Viburnum lantanoides*. The herbaceous stratum is sparse, typically with less than 10% coverage. Herbaceous species include *Oclemena acuminata* (= *Aster acuminatus*), *Athyrium filix-femina*, *Dryopteris campyloptera*, *Dryopteris intermedia*, *Monotropa uniflora*, and *Oxalis montana*. The ground cover is dominated by thick and spongy litter and duff layers and by downed woody debris.

**Global Vegetation:** This association includes forests of the Southern Appalachians, within the range of *Abies fraseri*, currently dominated by *Picea rubens* but showing some evidence of the historical presence of *Abies fraseri*. Other species may occur in the canopy/subcanopy but with low coverage. The shrub stratum is moderate to dense and dominated by evergreen species such as *Rhododendron catawbiense*, *Rhododendron maximum*, and *Rhododendron carolinianum*. Shrub coverage is most dense on drier, convex slopes. Other shrub species with minor coverage may include *Vaccinium simulatum*, *Vaccinium erythrocarpum*, *Viburnum nudum* var. *cassinoides*, *Diervilla sessilifolia*, and *Viburnum lantanoides*. Extensive patches of *Abies fraseri* seedlings and standing dead stems of *Abies fraseri* may be common. Herb coverage is typically low, but moist, north-facing sites may have *Oxalis montana*, *Athyrium filix-femina* ssp. *asplenioides*, *Dryopteris campyloptera*, and mosses (including *Dicranum scoparium* and *Hypnum curvifolium*) dominating beneath the shrub stratum.

**Global Dynamics:** Natural disturbances in this community include lightning fire, debris avalanches, wind disturbance, and ice storms (White and Pickett 1985, Nicholas and Zedaker 1989). The natural fire regime is estimated at longer than 500-1000 years. Human-initiated disturbances have included logging, slash fires, livestock grazing, and damage by atmospheric pollutants. An exotic insect, the balsam woolly adelgid (*Adelges piceae*), invaded the Southern Appalachians in the late 1950s and has drastically altered the last undisturbed remnants of this community. This exotic pest kills mature *Abies fraseri* within seven years of infestation. In areas where mature *Abies fraseri* has been lost to woolly adelgid infestation, thickets of *Rubus* spp., *Abies fraseri* seedlings and saplings, *Betula alleghaniensis*, and *Sorbus americana* are dominant. Over time, *Picea rubens*, *Betula alleghaniensis*, *Abies fraseri*, *Acer spicatum*, and *Sorbus americana* increase in the tree layer, while *Abies fraseri*, *Menziesia pilosa*, *Rubus idaeus* ssp. *strigosus*, and *Sambucus racemosa* var. *pubens* increase in the shrub layer (White et al. 1993). Succession is especially slow after severe disturbance such as logging and slash fires. The most severely disturbed sites are predominately *Prunus pensylvanica* and *Rubus* spp. and may remain in a non-forested stage of succession for 60 years or more.

## MOST ABUNDANT SPECIES

## Great Smoky Mountains National Park

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Picea rubens</i>
Tall shrub/sapling	Broad-leaved evergreen tree	<i>Rhododendron catawbiense</i>

## Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Abies fraseri</i> , <i>Picea rubens</i>
Tall shrub/sapling	Broad-leaved evergreen tree	<i>Rhododendron catawbiense</i> , <i>Rhododendron maximum</i>
Tall shrub/sapling	Broad-leaved evergreen shrub	<i>Rhododendron carolinianum</i>
Nonvascular	Moss	<i>Hylocomium splendens</i> , <i>Polytrichastrum ohioense</i>

## CHARACTERISTIC SPECIES

**Great Smoky Mountains National Park:** *Picea rubens*, *Rhododendron catawbiense*

**Global:** *Abies fraseri*, *Picea rubens*, *Rhododendron catawbiense*

#### OTHER NOTEWORTHY SPECIES

**Great Smoky Mountains National Park: Vulnerable Plants:** *Abies fraseri* (G2, globally imperiled); **Invasive/Exotic Plants:** *Streptopus amplexifolius*; **Other Plants:** *Betula papyrifera* var. *cordifolia* (G5T5), *Botrychium oneidense* (G4), *Calamagrostis canadensis* (G5), *Carex projecta* (G5), *Chelone lyonii* (G4), *Metzgeria consanguinea* (G4), *Nardia scalaris* (G5), *Phegopteris connectilis* (G5), *Plagiochila exigua* (G4?), *Poa palustris* (G5), *Stellaria corei* (G4)

**Global: Vulnerable Plants:** *Abies fraseri* (G2, Southern Blue Ridge endemic), *Ageratina altissima* var. *roanensis* (G5T3T4, Southern Blue Ridge endemic), *Bazzania nudicaulis* (G2G3), *Brachydontium trichodes* (G2G4), *Cardamine clematidis* (G3), *Carex ruthii* (G3G4), *Cetradonia linearis* (G3), *Geum geniculatum* (G2), *Glyceria nubigena* (G2G3, endemic to Great Smoky Mountains and adjacent areas near the park), *Hypericum graveolens* (G3), *Krigia montana* (G3), *Leptodontium viticulosoides* var. *sulphureum* (GNRT2), *Penstemon smallii* (G3), *Prenanthes roanensis* (G3, Southern Blue Ridge endemic), *Pseudevernia cladonia* (G2G4), *Rhododendron vaseyi* (G3, NC/Southern Blue Ridge endemic), *Rugelia nudicaulis* (G3), *Solidago glomerata* (G3), *Sphenolobopsis pearsonii* (G2?), *Stachys clingmanii* (G2); **Other Plants:** *Betula papyrifera* var. *cordifolia* (G5T5), *Botrychium oneidense* (G4), *Calamagrostis canadensis* (G5), *Carex projecta* (G5), *Chelone lyonii* (G4), *Metzgeria consanguinea* (G4), *Nardia scalaris* (G5), *Phegopteris connectilis* (G5), *Plagiochila exigua* (G4?), *Poa palustris* (G5), *Stellaria corei* (G4), *Streptopus amplexifolius* (G5), *Streptopus lanceolatus* var. *roseus* (G5T4)

#### CONSERVATION STATUS RANK

**Global Rank & Reasons:** G1 (23-Feb-1999). This community has a naturally restricted distribution and has been subject to major acreage reduction during the early part of the 20th century and rapid condition decline in the past 30 years. Modern threats include atmospheric pollution deposition and damage by the exotic balsam woolly adelgid (*Adelges piceae*). Well-developed, undisturbed examples of this community are extremely rare.

#### RELATED CONCEPTS

##### Global Similar Types:

- *Abies fraseri* / (*Rhododendron catawbiense*, *Rhododendron carolinianum*) Forest (CEGL006308)
- *Abies fraseri* / *Viburnum lantanoides* / *Dryopteris campyloptera* - *Oxalis montana* / *Hylocomium splendens* Forest (CEGL006049)
- *Picea rubens* - (*Abies fraseri*) / *Vaccinium erythrocarpum* / *Dryopteris campyloptera* / *Hylocomium splendens* Forest (CEGL007131) is a similar forest that has an understory dominated by deciduous shrubs, herbs, and bryophytes and occurs on more mesic sites than the one described here. Similar forests occur in the Central and Northern Appalachians, but have *Abies balsamea* as the fir component, less dense herb and bryophyte cover, and lack a *Rhododendron*-dominated understory (Oosting and Billings 1951, Whittaker 1956, Crandall 1958).
- *Picea rubens* - (*Tsuga canadensis*) / *Rhododendron maximum* Forest (CEGL006152)

##### Global Related Concepts:

- *Picea rubens* - (*Abies fraseri*) / (*Rhododendron catawbiense*, *Rhododendron maximum*) Forest (Fleming and Patterson 2009a) =
- IA4a. Red Spruce - Fraser Fir Forest (Allard 1990) >
- Red Spruce - Fraser Fir (7) (USFS 1988) ?
- Red Spruce - Fraser Fir: 34 (Eyre 1980) >

#### CLASSIFICATION

**Status:** Standard

**Classification Confidence:** 2 - Moderate

**Great Smoky Mountains National Park Other Comments:** On the Mount Le Conte quadrangle, this forest grades into forests dominated by *Picea rubens* and *Betula alleghaniensis* or forests dominated by *Picea rubens*, *Tsuga canadensis*, and *Betula alleghaniensis*. Some occurrences of this community may be floristically similar to *Picea rubens* - (*Betula alleghaniensis*, *Aesculus flava*) / *Viburnum lantanoides* / *Oxalis montana* - *Solidago glomerata* Forest (CEGL006256). Examples on the Mount Le Conte quadrangle include stands of old-growth forest.

**Global Classification Comments:** This community includes forest vegetation where *Picea rubens* and *Abies fraseri* make up 75% of the canopy cover, each contributing 25-75% to the total canopy cover and occurring over a shrub stratum dominated by evergreen species. Other species total less than 25% of the canopy.

#### ELEMENT DISTRIBUTION

**Great Smoky Mountains National Park Range:** This community was sampled on the Mount Le Conte quadrangle on steep, exposed, south-facing slopes in an area north of Mount Kephart known as "The Boulevard," on steep slopes above Rocky Spur, and on steep slopes on the southern flanks of Mount Le Conte. It does not occur on the Cades Cove quadrangle but is likely in other high elevation areas (above 5500 feet elevation) of the park. It is an uncommon component of the spruce-fir complex.

**Global Range:** This community is restricted to the highest mountain systems of the Southern Appalachians in eastern Tennessee, western North Carolina, and southwestern Virginia.

**Nations:** US

**States/Provinces:** NC, TN, VA:S1

**TNC Ecoregions:** 51:C

**USFS Ecoregions (1994/95):** M221Dc:CCC, M221Dd:CCC

**USFS Ecoregions (2007):** M221Dc:CCC, M221Dd:CCC

**Federal Lands:** BIA (Eastern Band of Cherokee); NPS (Appalachian Trail [Southern Blue Ridge], Blue Ridge Parkway, Great Smoky Mountains); USFS (Cherokee, Jefferson, Nantahala, Pisgah)

#### ELEMENT SOURCES

**Great Smoky Mountains National Park Plots:** GRSM.144, GRSM.154, GRSM.158.

**Great Smoky Mountains National Park Description Author(s):** K.D. Patterson

**Global Description Author(s):** K.D. Patterson and T. Govus

**References:** Allard 1990, Anderson et al. 1990, Brown 1941, Bruck 1988, Busing et al. 1988, Cogbill and White 1991, Crandall 1958, Crandall 1960, Davis 1930, Dull et al. 1988b, Eagar and Adams 1992, Eyre 1980, Fleming and Patterson 2009a, Fleming et al. 2017, Korstian 1937, McLeod 1988, NCNHP 1993, NatureServe Ecology - Southeastern U.S. unpubl. data, Nicholas and Zedaker 1989, Nicholas et al. 1992, Oosting and Billings 1951, Peet et al. unpubl. data, Ramseur 1960, Rawinski 1992, Schafale 2012, Schafale and Weakley 1990, Schofield 1960, Southeastern Ecology Working Group n.d., Stephenson and Adams 1984, Stephenson and Clovis 1983, Stotler and Crandall-Stotler 1977, TDNH unpubl. data 2018, USFS 1988, Wentworth et al. 1988a, White 1984a, White 1984b, White and Cogbill 1992, White and Pickett 1985, White et al. 1993, Whittaker 1956, Zedaker et al. 1988

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### [CEGL007131] *Picea rubens* - (*Abies fraseri*) / *Vaccinium erythrocarpum* / *Dryopteris campyloptera* / *Hylocomium splendens* Forest

Translated Name: **Red Spruce - (Fraser Fir) / Southern Mountain Cranberry / Mountain Woodfern / Splendid**

**Feathermoss Forest**

Common Name: **Red Spruce - Fraser Fir Forest (Deciduous Shrub Type)**

#### USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Laurentian-Acadian Mesic Hardwood - Conifer Forest (M014)
Group	Central & Southern Appalachian Red Spruce - Fir - Hardwood Forest (G632)
Alliance	<i>Picea rubens</i> - <i>Abies fraseri</i> Forest Alliance (A0136)

#### ELEMENT CONCEPT

**Global Summary:** This community is restricted to the highest mountain systems of the Southern and Central Appalachians in eastern Tennessee, western North Carolina, and southwestern Virginia, with disjunct northern outliers on the summits of the Allegheny Mountains of West Virginia. It is found on all topographic positions and is best developed between 1680 and 1990 m (5500-6200 feet) elevation. In West Virginia, it occurs on ridgetops at elevations above 1350 m (4400 feet), and at lower elevation (1140 m) in a cold streambottom. This association includes forests of the Southern and Central Appalachians, primarily within the range of *Abies fraseri*, dominated by *Picea rubens*, with or without *Abies fraseri*, occurring over deciduous shrubs, herbs and bryophytes. This community has a characteristic understory of Southern Appalachian endemic species and a conspicuous bryophyte layer. The tree canopy may have standing dead stems of *Abies fraseri* and extensive patches of *Abies fraseri* seedlings in canopy gaps. Characteristic species include *Sorbus americana*, *Acer spicatum*, *Viburnum lantanoides*, *Athyrium filix-femina ssp. asplenioides*, *Eurybia chlorolepis*, *Rugelia nudicaulis*, *Houstonia serpyllifolia*, *Solidago glomerata*, *Ptilium crista-castrensis*, and *Bazzania trilobata*.

#### ENVIRONMENTAL DESCRIPTION

**Great Smoky Mountains National Park Environment:** This community was found on steep, middle to high slopes above 5500 feet to just over 6000 feet. Stands were affected by wind, ice, and Balsam Woolly Adelgid.

**Global Environment:** Over much of its range, this forest community reaches its best development between 1680 and 1990 m (5500-6200 feet) elevation, but it is also found at somewhat lower elevations. Stands occur on all topographic positions. Soils are highly variable, from deep mineral soils to well-developed boulderfields, where a thin organic layer and moss mat overlie the rocks, and there are pockets of mineral soil in deep crevices between boulders. The dominant soils are Inceptisols with scattered occurrences of Spodosols at the highest elevations. Generally, soils are shallow and rocky, with well-developed organic and A horizons. All soils in these high-elevation forests are low in base saturation, high in organic matter, and are acidic in reaction (pH 3.0-5.0), with high aluminum content. The moisture regimes of these areas are mesic to wet due to high rainfall, abundant cloud cover, fog deposition, and low temperatures. The climate has been classified as perhumid, with the temperature varying elevationally from mesothermal to microthermal. The regional geology is dominated by complexly folded metamorphic, sedimentary, and igneous rocks of Precambrian and early Paleozoic age, including phyllites, slates, schists, sandstones, quartzites, granites, and gneisses. The disjunct, outlier stands in the Allegheny Mountains occur only at the very highest elevations in the coldest climate niche in the state, on Pennsylvanian sandstone.

#### VEGETATION DESCRIPTION

**Great Smoky Mountains National Park Vegetation:** These forests have canopies that are strongly dominated by *Picea rubens* and rather open due to *Abies fraseri* mortality. The shrub strata are dense and composed of a mix of deciduous shrubs and regenerating *Picea rubens* and *Abies fraseri*. Other shrub species include *Amelanchier laevis*, *Betula alleghaniensis*, *Diervilla sessilifolia*, *Menziesia pilosa*, *Prunus pensylvanica*, *Vaccinium erythrocarpum*, *Rubus allegheniensis*, *Sambucus racemosa var. racemosa* (= *var. pubens*), *Sorbus americana*, and *Viburnum lantanoides*. Standing dead trees are common, as is abundant coarse woody debris on the

forest floor. The litter layer is thick, and bryophyte cover can be high, while herbaceous cover is sparse. Herbaceous species include *Oclemena acuminata* (= *Aster acuminatus*), *Athyrium filix-femina*, *Clintonia borealis*, *Dennstaedtia punctilobula*, *Dryopteris campyloptera*, *Oxalis montana*, *Solidago glomerata*, and *Viola blanda*.

**Global Vegetation:** These forests are dominated by needle-leaved evergreen trees and have a characteristic understory of Southern Appalachian endemic species and a conspicuous bryophyte layer. Canopies are dominated by *Picea rubens*, with or without *Abies fraseri*, sometimes with lesser amounts of *Betula alleghaniensis* and *Sorbus americana*. The subcanopy contains canopy species as well as *Acer spicatum* and *Amelanchier laevis*. The shrub strata are dominated by deciduous species and can be sparse to dense. Typical shrub species include *Viburnum lantanoides*, *Vaccinium erythrocarpum*, *Vaccinium simulatum*, *Sambucus racemosa* var. *racemosa* (= *Sambucus racemosa* var. *pubens*), *Rubus allegheniensis*, *Ilex montana*, *Rhododendron catawbiense*, and *Rubus canadensis*. Extensive patches of *Abies fraseri* seedlings and standing dead stems of *Abies fraseri* are common. Herb density can be high but is inversely related to the density of the shrub layer. Common herbaceous species include *Oxalis montana*, *Athyrium filix-femina* ssp. *asplenioides*, *Dryopteris campyloptera*, and *Clintonia borealis*. Other herbs include *Oclemena acuminata* (= *Aster acuminatus*), *Eurybia chlorolepis* (= *Aster chlorolepis*), *Carex gynandra*, *Carex pensylvanica*, *Chelone lyonii*, *Circaea alpina* ssp. *alpina*, *Houstonia serpyllifolia*, *Huperzia lucidula*, *Maianthemum canadense*, *Rugelia nudicaulis*, *Solidago glomerata*, *Streptopus lanceolatus* var. *roseus* (= *Streptopus roseus* var. *roseus*), and *Viola macloskeyi* ssp. *pallens*. Bryophytes and lichens make up a considerable percent of the vegetative coverage in this community, occurring on the surface of the soil, trees, and fallen logs. Characteristic nonvascular species include *Hylocomium splendens*, *Ptilium crista-castrensis*, *Leptodontium excelsum*, *Bazzania trilobata*, *Bazzania nudicaulis*, *Alectoria fallacina*, *Hypotrachyna virginica*, *Dicranum scoparium*, and *Dicranum fuscescens*. Disjunct, outlier stands on summits in the Allegheny Mountains of West Virginia lack *Abies* and exhibit a dense canopy of *Picea rubens*, with a sparse to dense understory of *Vaccinium erythrocarpum*, on a luxuriant carpet of *Bazzania trilobata* and mosses. In Virginia, the rare plants *Abies fraseri*, *Cardamine clematitidis*, and *Prenanthes roanensis* are minor components of this community.

Canopy structure and composition are fairly uniform, but understory composition changes continuously along a moisture gradient. Whittaker (1956) described five variations of the understory of Red Spruce - Fraser Fir Forests: (1) Valley subtype: moss, *Oxalis*, and low shrub cover <5%, high herb cover 30% and high shrub cover 20%; (2) North slopes and flats: moss and *Oxalis* cover 25-55%, low and high shrub cover 5-20%, high herb strata is dominated by *Dryopteris* with other mesic herbs; (3) Intermediate east- and west-facing slopes: moss, *Oxalis* and fern cover 15-30%, low and high shrub cover 5-10%; (4) South slope subtype: all five strata are <10% cover; and (5) Ridge and steep upper slope: rhododendron heath approaches full coverage of understory.

**Global Dynamics:** Natural disturbances in this community include lightning fire, debris avalanches, wind disturbance, and ice storms (White and Pickett 1985, Nicholas and Zedaker 1989). The natural fire regime is estimated at longer than 500-1000 years. Stand-replacing fires may affect large-patch sizes but occur rarely, at 300- to 1000-year intervals; wind events are likely at more frequent intervals of 100 to 200 years (Gorman 2007). Human-initiated disturbances have included logging, slash fires, livestock grazing, and atmospheric pollutants. An exotic insect, the balsam woolly adelgid (*Adelges piceae*), invaded the Southern Appalachians in the late 1950s and has drastically altered the last undisturbed remnants of this community. This exotic pest kills mature *Abies fraseri* within seven years of infestation. In areas where mature *Abies fraseri* has been lost to woolly adelgid infestation, thickets of *Rubus* spp., *Abies fraseri* seedlings and saplings, *Betula alleghaniensis*, and *Sorbus americana* are dominant. Over time, *Picea rubens*, *Betula alleghaniensis*, *Abies fraseri*, *Acer spicatum*, and *Sorbus americana* increase in the tree layer, while *Abies fraseri*, *Menziesia pilosa*, *Rubus idaeus* ssp. *strigosus*, and *Sambucus racemosa* var. *pubens* increase in the shrub layer (White et al. 1993). Succession is especially slow after severe disturbance such as logging and slash fires. The most severely disturbed sites are predominately *Prunus pensylvanica* and *Rubus* spp. and may remain in a non-forested stage of succession for 60 years or more.

#### MOST ABUNDANT SPECIES

##### Great Smoky Mountains National Park

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Picea rubens</i>
Tall shrub/sapling	Needle-leaved tree	<i>Abies fraseri</i> , <i>Picea rubens</i>
Tall shrub/sapling	Broad-leaved deciduous shrub	<i>Rubus canadensis</i> , <i>Vaccinium erythrocarpum</i>
Herb (field)	Flowering forb	<i>Oclemena acuminata</i> , <i>Oxalis montana</i>
Herb (field)	Fern (Spore-bearing forb)	<i>Athyrium filix-femina</i>

##### Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree (canopy & subcanopy)	Needle-leaved tree	<i>Abies fraseri</i>
Tree canopy	Needle-leaved tree	<i>Picea rubens</i>
Tree subcanopy	Broad-leaved deciduous tree	<i>Acer spicatum</i> , <i>Amelanchier laevis</i> , <i>Betula alleghaniensis</i> , <i>Sorbus americana</i>
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	<i>Vaccinium erythrocarpum</i>
Tall shrub/sapling	Broad-leaved deciduous shrub	<i>Viburnum lantanoides</i>
Herb (field)	Flowering forb	<i>Oxalis montana</i>
Herb (field)	Fern (Spore-bearing forb)	<i>Athyrium filix-femina</i> ssp. <i>asplenioides</i> , <i>Dryopteris campyloptera</i>
Nonvascular	Moss	<i>Hylocomium splendens</i> , <i>Ptilium crista-castrensis</i>
Nonvascular	Liverwort/hornwort	<i>Bazzania trilobata</i>

## CHARACTERISTIC SPECIES

**Great Smoky Mountains National Park:** *Abies fraseri*, *Clintonia borealis*, *Picea rubens*, *Rubus allegheniensis*, *Solidago glomerata*, *Vaccinium erythrocarpum*

**Global:** *Abies fraseri*, *Angelica triquinata*, *Bazzania trilobata*, *Clintonia borealis*, *Dryopteris campyloptera*, *Eurybia chlorolepis*, *Houstonia serpyllifolia*, *Huperzia lucidula*, *Hylocomium splendens*, *Oxalis montana*, *Picea rubens*, *Ptilium crista-castrensis*, *Ribes rotundifolium*, *Rugelia nudicaulis*, *Solidago glomerata*, *Vaccinium erythrocarpum*, *Viburnum lantanoides*

## OTHER NOTEWORTHY SPECIES

**Great Smoky Mountains National Park: Vulnerable Plants:** *Abies fraseri* (G2, globally imperiled), *Solidago glomerata* (G3, globally vulnerable); **Invasive/Exotic Plants:** *Streptopus amplexifolius*; **Other Plants:** *Betula papyrifera* var. *cordifolia* (G5T5), *Botrychium oneidense* (G4), *Calamagrostis canadensis* (G5), *Carex projecta* (G5), *Chelone lyonii* (G4), *Metzgeria consanguinea* (G4), *Nardia scalaris* (G5), *Phegopteris connectilis* (G5), *Plagiochila exigua* (G4?), *Poa palustris* (G5), *Stellaria corei* (G4)

**Global: Vulnerable Plants:** *Abies fraseri* (G2, Southern Blue Ridge endemic), *Ageratina altissima* var. *roanensis* (G5T3T4, Southern Blue Ridge endemic), *Alectoria fallacina* (G2), *Bazzania nudicaulis* (G2G3), *Brachydontium trichodes* (G2G4), *Cardamine clematitidis* (G3), *Carex ruthii* (G3G4), *Cetradonia linearis* (G3), *Geum geniculatum* (G2), *Glyceria nubigena* (G2G3, endemic to Great Smoky Mountains and adjacent areas near the park), *Hypericum graveolens* (G3), *Hypotrachyna virginica* (G1G2), *Leptodontium viticulosoides* var. *sulphureum* (GNRT2), *Prenanthes roanensis* (G3, Southern Blue Ridge endemic), *Pseudevernia cladonia* (G2G4), *Rugelia nudicaulis* (G3), *Solidago glomerata* (G3), *Sphenolobopsis pearsonii* (G2?), *Stachys clingmanii* (G2); **Other Plants:** *Betula papyrifera* var. *cordifolia* (G5T5), *Botrychium oneidense* (G4), *Calamagrostis canadensis* (G5), *Carex projecta* (G5), *Chelone lyonii* (G4), *Metzgeria consanguinea* (G4), *Nardia scalaris* (G5), *Phegopteris connectilis* (G5), *Plagiochila exigua* (G4?), *Poa palustris* (G5), *Stellaria corei* (G4), *Streptopus amplexifolius* (G5), *Streptopus lanceolatus* var. *roseus* (G5T4)

## CONSERVATION STATUS RANK

**Global Rank & Reasons:** G2 (1-Jun-2009). This community is restricted to the highest mountain systems of the Southern Appalachians in eastern Tennessee, western North Carolina, and southwestern Virginia, with outliers in the highest elevations in the Allegheny Mountains of West Virginia. It has a naturally restricted distribution and has been subject to major acreage reduction during the early part of the 20th century and rapid condition decline in the past 30 years. Modern threats include atmospheric pollution deposition and damage by the exotic balsam woolly adelgid (*Adelges piceae*). Well-developed, undisturbed examples of this community are extremely rare.

## RELATED CONCEPTS

**Global Similar Types:**

- *Abies fraseri* / (*Rhododendron catawbiense*, *Rhododendron carolinianum*) Forest (CEGL006308)
- *Abies fraseri* / *Viburnum lantanoides* / *Dryopteris campyloptera* - *Oxalis montana* / *Hylocomium splendens* Forest (CEGL006049)
- *Picea rubens* - (*Abies fraseri*) / (*Rhododendron catawbiense*, *Rhododendron maximum*) Forest (CEGL007130) is a similar forest that has a shrub stratum dominated by evergreen species and occurs on less mesic sites than the one described here. Similar forests occur in the Central and Northern Appalachians, but have *Abies balsamea* as the fir component and less dense herb and bryophyte cover (Oosting and Billings 1951, Whittaker 1956, Crandall 1958).
- *Picea rubens* - (*Tsuga canadensis*) / *Rhododendron maximum* Forest (CEGL006152)
- *Picea rubens* / *Betula alleghaniensis* / *Bazzania trilobata* Forest (CEGL008501) is the dominant red spruce forest type within West Virginia; stands interfinger at the highest elevations in West Virginia.

**Global Related Concepts:**

- *Picea rubens* / *Vaccinium erythrocarpum* / *Dryopteris campyloptera* Forest [Red Spruce - Southern Mountain Cranberry Forest] (Vanderhorst 2015) =
- *Picea rubens* / *Viburnum lantanoides* - *Vaccinium erythrocarpum* / *Huperzia lucidula* - *Clintonia borealis* Forest (Fleming and Coulling 2001) =
- IA4a. Red Spruce - Fraser Fir Forest (Allard 1990) >
- Oligotrophic Forest (Rawinski 1992) ?
- Red Spruce - Fraser Fir (7) (USFS 1988) ?
- Red Spruce - Fraser Fir: 34 (Eyre 1980) >
- Spruce Community (Rheinhardt and Ware 1984) ?

## CLASSIFICATION

**Status:** Standard

**Classification Confidence:** 2 - Moderate

**Great Smoky Mountains National Park Other Comments:** Examples of this community observed on the Mount Le Conte quadrangle were formerly codominated by *Picea rubens* and *Abies fraseri*. On the Mount Le Conte quadrangle, this forest grades into lower elevation forests dominated by *Picea rubens* and/or *Betula alleghaniensis* or forests dominated by *Picea rubens*, *Tsuga canadensis*, and *Betula alleghaniensis*. Some occurrences of this community may be floristically similar to *Picea rubens* - (*Betula alleghaniensis*, *Aesculus flava*) / *Viburnum lantanoides* / *Oxalis montana* - *Solidago glomerata* Forest (CEGL006256).

**Global Classification Comments:** West Virginia stands assigned here (2009) differ from *Picea rubens* / *Betula alleghaniensis* / *Bazzania trilobata* Forest (CEGL008501) (the "core" red spruce in WV) in their position at the highest elevations and thereby

experiencing the coldest temperatures. Significant indicators that differentiate this type from WV's "core" red spruce are *Vaccinium erythrocarpum* and *Dryopteris campyloptera*. *Abies fraseri* is not native in West Virginia, and *Abies balsamea* is not usually associated with upland spruce communities. Thirteen plots in three counties represent this type in West Virginia. An occurrence on the edge of the Ridge and Valley Province in southwestern Virginia occurs over sandstone on Clinch Mountain.

#### ELEMENT DISTRIBUTION

**Great Smoky Mountains National Park Range:** This community was sampled on the Mount Le Conte quadrangle and other quadrangles that contain land above 5500 feet elevation. This forest was found on the steep slopes and ridges in the vicinity of Mount Kephart and on steep slopes south of the Mount Le Conte summit. It should be looked for at other locations in the park from approximately 5500 to just over 6000 feet elevation. Above this elevation, forests are dominated by *Abies fraseri*.

**Global Range:** This community is restricted to the highest mountain systems of the Southern Appalachians in eastern Tennessee, western North Carolina, and southwestern Virginia, with northern outliers on the summits of West Virginia.

**Nations:** US

**States/Provinces:** NC, TN, VA:S1, WV:S1

**TNC Ecoregions:** 51:C, 59:C

**USFS Ecoregions (1994/95):** M221Aa:CCC, M221Ba:CCC, M221Bc:CCC, M221Dc:CCC, M221Dd:CCC

**USFS Ecoregions (2007):** M221Aa:CCP, M221Ba:CCC, M221Bc:CCC, M221Dc:CCC, M221Dd:CCC

**Federal Lands:** NPS (Appalachian Trail [Southern Blue Ridge], Blue Ridge Parkway, Great Smoky Mountains); USFS (Cherokee, Jefferson, Monongahela, Nantahala, Pisgah)

#### ELEMENT SOURCES

**Great Smoky Mountains National Park Plots:** GRSM.24, GRSM.26, GRSM.155, GRSM.533.

**Great Smoky Mountains National Park Description Author(s):** K.D. Patterson

**Global Description Author(s):** K.D. Patterson, M. Pyne and E.A. Byers

**References:** Adams and Stephenson 1991, Allard 1990, Anderson et al. 1990, Belden et al. 1994, Brown 1941, Bruck 1988, Busing et al. 1988, Byers et al. 2010, Cogbill and White 1991, Crandall 1958, Crandall 1960, Davis 1930, Dull et al. 1988b, Eagar and Adams 1992, Eyre 1980, Fleming and Coulling 2001, Fleming and Patterson 2009a, Fleming et al. 2017, Golden 1974, Gorman 2007, Korstian 1937, McLaughlin et al. 1987, McLeod 1988, NCNHP 1993, NatureServe Ecology - Southeastern U.S. unpubl. data, Nicholas and Zedaker 1989, Nicholas et al. 1992, Oosting and Billings 1951, Peet et al. unpubl. data, Ramseur 1960, Rawinski 1992, Rheinhardt and Ware 1984, Schafale 2012, Schafale and Weakley 1990, Schofield 1960, Southeastern Ecology Working Group n.d., Stephenson and Adams 1984, Stephenson and Clovis 1983, USFS 1988, Vanderhorst 2015, WVNHP unpubl. data, Wentworth et al. 1988a, White 1984a, White 1984b, White and Cogbill 1992, White and Pickett 1985, White et al. 1993, Whittaker 1956, Zedaker et al. 1988

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## A0138 *Picea rubens* - *Betula alleghaniensis* - *Aesculus flava* Forest Alliance

Red Spruce - Yellow Birch - Yellow Buckeye Forest Alliance

*Central Appalachian Red Spruce Forest*

#### ALLIANCE CONCEPT

**Summary:** These are evergreen or mixed forests and woodlands dominated by *Picea rubens* with or without some combination of *Aesculus flava*, *Betula alleghaniensis*, and *Tsuga canadensis*. Other species that may occur with low coverage in the canopy or subcanopy are *Acer pensylvanicum*, *Acer spicatum*, *Amelanchier laevis*, *Halesia tetraptera* var. *monticola*, *Prunus pensylvanica*, and *Sorbus americana*. Density and composition of shrub and herbaceous strata vary with association and geographic location. Exposed, drier sites, such as upper convex slopes or slopes with a southerly aspect, will often have high coverage of evergreen shrub species. Typical shrubs include *Crataegus* spp., *Ilex montana*, *Kalmia latifolia*, *Leucothoe fontanesiana*, *Aronia melanocarpa*, *Rhododendron carolinianum*, *Rhododendron catawbiense*, *Rhododendron maximum*, *Smilax rotundifolia*, *Vaccinium angustifolium*, *Vaccinium erythrocarpum*, *Vaccinium simulatum*, *Viburnum lantanoides*, and *Viburnum nudum* var. *cassinoides*. Herbaceous cover is typically sparse, but where the shrub stratum is more open, a moderate herb stratum may develop. Characteristic herbaceous species include *Athyrium filix-femina*, *Clintonia borealis*, *Dryopteris campyloptera*, *Galax urceolata*, *Huperzia lucidula*, *Lycopodium clavatum*, *Lycopodium dendroideum*, *Lycopodium obscurum*, *Medeola virginiana*, *Mitchella repens*, *Oxalis montana*, *Rugelia nudicaulis*, *Schizachne purpurascens*, and *Trillium undulatum*. Nonvascular plants are common and often abundant, especially on moister sites, where they grow on branches and around the base of trees and shrubs. Bryophyte species include *Bazzania trilobata*, *Hylocomium splendens*, *Polytrichum ohioense*, *Ptilium crista-castrensis*, and *Sphagnum* spp. These forests occur in the Central Appalachians and Southern Blue Ridge, from West Virginia south to western North Carolina and eastern Tennessee, on steep, seepy boulderfields, and on ridges and steep slopes with northeast to southwest exposures, above 1370 m (4500 feet) elevation. It descends to 1000 m (3100 feet) in the Central Appalachians. In local landscapes of the Southern Blue Ridge and Central Appalachians, this vegetation tends to occur bimodally, on high ridges and summits and steep, rocky upper slopes, and at lower elevations in frost pocket situations, where *Picea rubens* apparently has a competitive advantage because of moist, acidic, organic soils and/or cold-air drainage.

**Classification Comments:** Associations in this alliance occur in the central and southern Appalachian Mountains where *Abies fraseri* is absent or below the elevational range of *Abies fraseri*. *Picea rubens* forests in western Virginia and in eastern West Virginia may be more similar to forests in *Picea rubens* - *Abies balsamea* Forest Alliance (A0150) in the northern portion of the Appalachian range,

where *Abies balsamea* replaces *Abies fraseri* and where other Southern Appalachian endemics no longer occur. *Picea rubens* forests in West Virginia may be transitional between forests in these two alliances. This alliance includes both mesic forests and drier rocky woodlands. More information is needed on rocky woodlands across the range of this group. *Picea rubens* - (*Betula alleghaniensis*, *Aesculus flava*) / *Rhododendron (maximum, catawbiense)* Forest (CEGL004983) is transitional to A0138, and is being placed here rather than in *Picea rubens* - *Abies fraseri* Forest Alliance (A0136).

**Similar Alliances:**

- *Picea rubens* - *Abies fraseri* Forest Alliance (A0136) contains *Abies fraseri*.

**Diagnostic Characteristics:** These are red spruce-dominated forests of the central and southern Appalachian Mountains north of the range or below the elevational limit of *Abies fraseri*.

**Related Concepts:**

- IA4a. Red Spruce - Fraser Fir Forest (Allard 1990) ><
- Oligotrophic Forest (Rawinski 1992) ?
- Red Spruce - Yellow Birch: 30 (Eyre 1980) ><
- Red Spruce: 32 (Eyre 1980) ><

**ALLIANCE DESCRIPTION**

**Environment:** These forests and woodlands occur on steep, seepy boulderfields, and on ridges and steep slopes with northeast to southwest exposures, above 1370 m (4500 feet) elevation. It descends to 1000 m (3100 feet) in the Central Appalachians. In local landscapes of the Southern Blue Ridge and Central Appalachians, this vegetation tends to occur bimodally, on high ridges and summits and steep, rocky upper slopes, and at lower elevations in frost pocket situations, where *Picea rubens* apparently has a competitive advantage because of moist, acidic, organic soils and/or cold-air drainage.

**Vegetation:** These evergreen and mixed evergreen-deciduous forests and woodlands are dominated by *Picea rubens* or by *Picea rubens* with some combination of *Aesculus flava*, *Betula alleghaniensis*, and *Tsuga canadensis*. Other species that may occur with low coverage in the canopy or subcanopy are *Acer pensylvanicum*, *Acer rubrum*, *Acer spicatum*, *Amelanchier laevis*, *Halesia tetraptera* var. *monticola*, *Prunus pensylvanica*, and *Sorbus americana*. Density and composition of shrub and herbaceous strata vary with association and geographic location. Exposed, drier sites, such as upper convex slopes or slopes with a southerly aspect, will often have high coverage of evergreen shrub species. Typical shrubs in this alliance include *Crataegus* spp., *Ilex montana*, *Kalmia latifolia*, *Leucothoe fontanesiana*, *Aronia melanocarpa*, *Rhododendron carolinianum*, *Rhododendron catawbiense*, *Rhododendron maximum*, *Smilax rotundifolia*, *Vaccinium angustifolium*, *Vaccinium erythrocarpum*, *Vaccinium simulatum*, *Viburnum lantanoides*, and *Viburnum nudum* var. *cassinoides*. Herbaceous cover is typically sparse, but where the shrub stratum is more open, a moderate herb stratum may develop. Characteristic herbaceous species include *Athyrium filix-femina*, *Clintonia borealis*, *Dryopteris campyloptera*, *Galax urceolata*, *Huperzia lucidula*, *Lycopodium clavatum*, *Lycopodium dendroideum*, *Lycopodium obscurum*, *Medeola virginiana*, *Mitchella repens*, *Oxalis montana*, *Rugelia nudicaulis*, *Schizachne purpurascens*, and *Trillium undulatum*. Nonvascular plants are common and often abundant, especially on moister sites, where they grow on branches and around the base of trees and shrubs. Bryophyte species include *Bazzania trilobata*, *Hylocomium splendens*, *Polytrichum ohioense*, *Ptilium crista-castrensis*, and *Sphagnum* spp.

**Physiognomy and Structure:** These are evergreen or mixed evergreen-deciduous forests and woodlands. Canopy height may be limited due to harsh climate conditions, including winds and ice damage.

**Floristics:** These evergreen and mixed evergreen-deciduous forests and woodlands are dominated by *Picea rubens* or by *Picea rubens* with some combination of *Aesculus flava*, *Betula alleghaniensis*, and *Tsuga canadensis*. Other species that may occur with low coverage in the canopy or subcanopy are *Acer pensylvanicum*, *Acer rubrum*, *Acer spicatum*, *Amelanchier laevis*, *Halesia tetraptera* var. *monticola*, *Prunus pensylvanica*, and *Sorbus americana*. Density and composition of shrub and herbaceous strata vary with association and geographic location. Exposed, drier sites, such as upper convex slopes or slopes with a southerly aspect, will often have high coverage of evergreen shrub species. Typical shrubs in this alliance include *Crataegus* spp., *Ilex montana*, *Kalmia latifolia*, *Leucothoe fontanesiana*, *Aronia melanocarpa*, *Rhododendron carolinianum*, *Rhododendron catawbiense*, *Rhododendron maximum*, *Smilax rotundifolia*, *Vaccinium angustifolium*, *Vaccinium erythrocarpum*, *Vaccinium simulatum*, *Viburnum lantanoides*, and *Viburnum nudum* var. *cassinoides*. Herbaceous cover is typically sparse, but where the shrub stratum is more open, a moderate herb stratum may develop. Characteristic herbaceous species include *Athyrium filix-femina*, *Clintonia borealis*, *Dryopteris campyloptera*, *Galax urceolata*, *Huperzia lucidula*, *Lycopodium clavatum*, *Lycopodium dendroideum*, *Lycopodium obscurum*, *Medeola virginiana*, *Mitchella repens*, *Oxalis montana*, *Rugelia nudicaulis*, *Schizachne purpurascens*, and *Trillium undulatum*. Nonvascular plants are common and often abundant, especially on moister sites, where they grow on branches and around the base of trees and shrubs. Bryophyte species include *Bazzania trilobata*, *Hylocomium splendens*, *Polytrichum ohioense*, *Ptilium crista-castrensis*, and *Sphagnum* spp.

**ALLIANCE DISTRIBUTION**

**Range:** This alliance is confined to the Central Appalachians and Southern Blue Ridge, from West Virginia south to western North Carolina and eastern Tennessee. One association, a "transitional red spruce - northern hardwood forest," is attributed to Maryland and possibly Pennsylvania.

**Nations:** US

**Subnations:** MD, NC, PA?, TN, VA, WV

## ALLIANCE SOURCES

**References:** Allard 1990, Cogbill and White 1991, Eastern Ecology Working Group n.d., Eyre 1980, Faber-Langendoen et al. 2019b, Fike 1999, Fleming and Moorhead 1996, Golden 1974, Golden 1981, Rawinski 1992, Schafale and Weakley 1990, Stephenson and Adams 1984, Stephenson and Clovis 1983, White and Cogbill 1992, White et al. 1993, Whittaker 1956

**Author of Concept:** Whittaker 1956

**Author of Description:** R.H. Whittaker (1956)

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**[CEGL004983] *Picea rubens* - (*Betula alleghaniensis*, *Aesculus flava*) / *Rhododendron (maximum, catawbiense)***
**Forest**

Translated Name: **Red Spruce - (Yellow Birch, Yellow Buckeye) / (Great Laurel, Catawba Rosebay) Forest**

Common Name: **Red Spruce - Northern Hardwood Forest (Shrub Type)**

## USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (I.B.2.Na)
Macrogroup	Laurentian-Acadian Mesic Hardwood - Conifer Forest (M014)
Group	Central & Southern Appalachian Red Spruce - Fir - Hardwood Forest (G632)
Alliance	<i>Picea rubens</i> - <i>Betula alleghaniensis</i> - <i>Aesculus flava</i> Forest Alliance (A0138)

## ELEMENT CONCEPT

**Global Summary:** This association occurs in the broad elevational transition zone between spruce-fir and northern hardwoods in the Southern Blue Ridge (approx. 1400-1550 m [4600-5100 feet]). Sites are steep to very steep, slopes often associated with cliff faces, rock outcroppings, or bouldery situations, and subject to disturbance by wind, ice, and landslides. The canopy is composed of *Picea rubens* codominating with deciduous species *Betula alleghaniensis*, *Fagus grandifolia*, and *Aesculus flava*, occurring singly or in combination. At higher elevations, *Abies fraseri* may be a minor canopy component. The shrub layer is well-developed and dominated by *Rhododendron maximum* or *Rhododendron catawbiense*. In the Great Smoky Mountains, *Leucothoe fontanesiana* can be the dominant shrub. Other minor shrubs include *Ilex montana*, *Viburnum lantanoides*, *Vaccinium erythrocarpum*, and *Rubus allegheniensis*. The thick, evergreen shrub layer precludes the establishment of seedlings or herbaceous plants and creates a heavy, slowly decomposing litter layer. Bryophyte cover can be high (over 50%), and the ground is covered with downed and decaying logs.

## ENVIRONMENTAL DESCRIPTION

**Great Smoky Mountains National Park Environment:** This forest was found on steep to very steep, slightly concave slopes at 5350 feet and 4850 feet elevation, often associated with cliff faces, rock outcroppings, and bouldery situations. Soils are peaty and rocky. This community is subject to disturbance by wind, ice, and landslides.

**Global Environment:** In southwestern Virginia, the type occurs at the highest elevations (1340-1433 m [4400-4700 feet]) of the Ridge and Valley on summits and upper slopes of Clinch Mountain. Soils are organic and shallow to bedrock.

## VEGETATION DESCRIPTION

**Great Smoky Mountains National Park Vegetation:** The tree canopy is dominated by *Picea rubens* and *Betula alleghaniensis*. Other trees that can occur with minor coverage in the canopy and subcanopy include *Acer rubrum*, *Prunus serotina*, and *Tsuga canadensis*. Shrub cover is dense and dominated by *Leucothoe fontanesiana*. Other shrubs include *Ilex montana*, *Viburnum lantanoides*, *Vaccinium erythrocarpum*, *Rhododendron catawbiense*, and *Rubus allegheniensis*. Herbaceous cover is absent or sparse and consists of scattered ferns and other forbs such as *Dryopteris intermedia*, *Dennstaedtia punctilobula*, *Oxalis montana*, *Rugelia nudicaulis*, *Circaea alpina*, *Arisaema triphyllum*, and *Trillium undulatum*. Bryophyte cover can be high (over 50%), and the ground is covered with downed and decaying logs.

**Global Vegetation:** Virginia stands on Clinch Mountain are codominated by *Picea rubens* (most abundant), with variable codominance by *Betula alleghaniensis* and *Fagus grandifolia*. In some areas, *Picea rubens* dominates the canopy and hardwoods dominate a lower, subcanopy layer. *Sorbus americana* is a minor understory tree. The shrub layer is dense with *Rhododendron maximum* generally dominant and *Rhododendron catawbiense* codominant in many areas. Other shrubs occurring at low cover include *Acer pensylvanicum*, *Kalmia latifolia*, and *Vaccinium simulatum*. The ground is thickly covered by coarse woody debris and bryophytes, with few herbaceous species present.

## MOST ABUNDANT SPECIES

**Great Smoky Mountains National Park**

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Picea rubens</i>
Tree canopy	Broad-leaved deciduous tree	<i>Betula alleghaniensis</i>
Tall shrub/sapling	Broad-leaved deciduous tree	<i>Ilex montana</i>
Tall shrub/sapling	Broad-leaved evergreen tree	<i>Rhododendron maximum</i>
Short shrub/sapling	Broad-leaved evergreen shrub	<i>Leucothoe fontanesiana</i>

**Global**

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Picea rubens</i>

Tree canopy	Broad-leaved deciduous tree	<i>Aesculus flava</i> , <i>Betula alleghaniensis</i> , <i>Fagus grandifolia</i>
Tall shrub/sapling	Broad-leaved evergreen tree	<i>Rhododendron catawbiense</i> , <i>Rhododendron maximum</i>

#### CHARACTERISTIC SPECIES

**Great Smoky Mountains National Park:** *Betula alleghaniensis*, *Leucothoe fontanesiana*, *Picea rubens*

**Global:** *Betula alleghaniensis*, *Picea rubens*, *Rhododendron maximum*

#### OTHER NOTEWORTHY SPECIES

**Great Smoky Mountains National Park:** **Vulnerable Plants:** *Rugelia nudicaulis* (G3, globally vulnerable)

**Global:** **Vulnerable Plants:** *Abies fraseri* (G2, Southern Blue Ridge endemic), *Ageratina altissima* var. *roanensis* (G5T3T4, Southern Blue Ridge endemic), *Rugelia nudicaulis* (G3), *Solidago glomerata* (G3); **Other Plants:** *Streptopus lanceolatus* var. *roseus* (G5T4)

#### CONSERVATION STATUS RANK

**Global Rank & Reasons:** G1? (2-Jan-2013). The community is geographically and environmentally restricted to the highest elevations of the Southern Blue Ridge and, in southwestern Virginia, to the highest elevations of Clinch Mountain in the Ridge and Valley province. Very few occurrences are known to exist, and it has only been described from the Great Smoky Mountains and the Beartown Wilderness in southwestern Virginia.

#### RELATED CONCEPTS

##### Global Similar Types:

- *Betula alleghaniensis* - (*Tsuga canadensis*) / *Rhododendron maximum* / (*Leucothoe fontanesiana*) Forest (CEGL007861)
- *Picea rubens* - (*Betula alleghaniensis*, *Aesculus flava*) / *Viburnum lantanoides* / *Solidago glomerata* Forest (CEGL006256)

#### CLASSIFICATION

**Status:** Standard

**Classification Confidence:** 3 - Weak

**Great Smoky Mountains National Park Other Comments:** Examples of this community on more exposed, rocky sites may transition to heath shrublands. At high elevations, this community grades into *Picea rubens*-dominated forests.

**Global Classification Comments:** This association should be compared with other vegetation farther north in the Appalachians. Examples of this community on more exposed, rocky sites may transition to heath shrublands. At high elevations, this community grades into *Picea rubens*-dominated forests. Similar vegetation has been observed and sampled on Beartown, Clinch Mountain in Tazewell County, Virginia (1433 m [4700 feet] elevation), and this association was added to the Virginia State Classification (Fleming and Patterson 2012) based on that observation. Data collected by Steve Adams and Steve Stephenson in the 1980s from spruce forests with a *Rhododendron catawbiense* shrub layer on Beartown, Clinch Mountain in Russell County, Virginia (1403 m [4600 feet] elevation) also seem to match this type and will be targeted for inventory by Virginia DNH ecologists. These sites are out of the range of *Abies fraseri* and have considerable hardwood codominance in places, so *Picea rubens* - (*Abies fraseri*) / (*Rhododendron catawbiense*, *Rhododendron maximum*) Forest (CEGL007130) was not applicable, though it has been documented on Whitetop Mountain, Virginia.

#### ELEMENT DISTRIBUTION

**Great Smoky Mountains National Park Range:** This community was sampled on the Mount Le Conte quadrangle and the Bunches Bald quadrangle and was not found on the Cades Cove quadrangle. It was sampled in the vicinity of Alum Cave on steep slopes at 4850 and 5350 feet elevation and along Balsam Road at an elevation of approximately 4500 feet. It should be sought in other high-elevation areas of the park, between 4500 and 5300 feet elevation.

**Global Range:** This association is known from the Great Smoky Mountains of Tennessee, Clinch Mountain in southwestern Virginia, and the Blue Ridge of North Carolina.

**Nations:** US

**States/Provinces:** NC, TN, VA:S1

**TNC Ecoregions:** 50:C, 51:C

**USFS Ecoregions (1994/95):** M221Dc:CCC, M221Dd:CCC

**USFS Ecoregions (2007):** M221Dc:CCC, M221Dd:CCC

**Federal Lands:** BIA (Eastern Band of Cherokee); NPS (Appalachian Trail [Southern Blue Ridge], Great Smoky Mountains); USFS (Jefferson, Pisgah?)

#### ELEMENT SOURCES

**Great Smoky Mountains National Park Plots:** GRSM.70, GRSM.152.

**Great Smoky Mountains National Park Description Author(s):** K.D. Patterson, mod. R. White

**Global Description Author(s):** K.D. Patterson and G.P. Fleming

**References:** Fleming et al. 2017, Golden 1974, Golden 1981, Livingston and Mitchell 1976, NatureServe Ecology - Southeastern U.S. unpubl. data, Peet et al. unpubl. data, Schafale 2012, Southeastern Ecology Working Group n.d., TDNH unpubl. data 2018

**[CEGL006256] *Picea rubens* - (*Betula alleghaniensis*, *Aesculus flava*) / *Viburnum lantanoides* / *Solidago glomerata*****Forest**Translated Name: **Red Spruce - (Yellow Birch, Yellow Buckeye) / Hobblebush / Clustered Goldenrod Forest**Common Name: **Red Spruce - Northern Hardwood Forest (Herb Type)****USNVC CLASSIFICATION**

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Laurentian-Acadian Mesic Hardwood - Conifer Forest (M014)
Group	Central & Southern Appalachian Red Spruce - Fir - Hardwood Forest (G632)
Alliance	<i>Picea rubens</i> - <i>Betula alleghaniensis</i> - <i>Aesculus flava</i> Forest Alliance (A0138)

**ELEMENT CONCEPT**

**Global Summary:** This association occurs in the broad elevational transition zone between spruce-fir and northern hardwoods in the Southern Blue Ridge at approximately 1400 to 1555 m (4600-5100 feet) elevation. This association occurs on steep slopes and protected ridges, over shallow, stony soils. The canopy is composed of *Picea rubens* codominating with the deciduous species *Betula alleghaniensis*, *Fagus grandifolia*, and *Aesculus flava*, occurring singly or in combination. At higher elevations, *Abies fraseri* may be a minor canopy component. The shrub stratum is open to absent. *Viburnum lantanoides* is a common shrub, and *Acer pensylvanicum* and *Amelanchier laevis* often occur as small trees. The herbaceous stratum is lush and diverse. Typical herbs include *Oclemena acuminata*, *Carex pensylvanica*, *Dryopteris campyloptera*, *Dryopteris intermedia*, *Maianthemum canadense*, *Oxalis montana*, *Solidago glomerata*, and *Rugelia nudicaulis* (in the Great Smoky Mountains).

**ENVIRONMENTAL DESCRIPTION**

**Great Smoky Mountains National Park Environment:** This community was found on steep, north- and south-facing, middle and upper slopes, at elevations over 5000 feet. Landforms were often slightly convex to concave, broad slopes with boulders and rock outcroppings. Soils are stony to gravelly and have high organic content. Major disturbance factors affecting this forest include ice, wind, and feral hogs. Examples on the Mount Le Conte quadrangle include old-growth forest.

**Global Environment:** This association occurs in the broad elevational transition zone between spruce-fir and northern hardwoods in the Southern Blue Ridge at approximately 1400 to 1555 m (4600-5100 feet) elevation. This association occurs on steep slopes and protected ridges, over shallow, stony soils.

**VEGETATION DESCRIPTION**

**Great Smoky Mountains National Park Vegetation:** The forest canopy and subcanopy is codominated by large *Picea rubens* and *Betula alleghaniensis*. In some occurrences, *Picea rubens* can overtop *Betula alleghaniensis*. Other subcanopy trees include *Abies fraseri*, *Aesculus flava*, and *Prunus pensylvanica*. Shrub cover can be sparse to moderate (20-90%) but is always dominated by deciduous species. The tall- and short-shrub strata share many species. The most constant shrubs are *Abies fraseri*, *Acer spicatum*, *Vaccinium erythrocarpum*, *Viburnum lantanoides*, *Sorbus americana*, and *Rubus canadensis*. Other shrubs include *Acer pensylvanicum*, *Ilex montana*, *Lonicera canadensis*, *Ribes cynosbati*, *Ribes glandulosum*, *Hydrangea arborescens*, *Rubus allegheniensis*, *Betula alleghaniensis*, *Sambucus racemosa* var. *racemosa* (= var. *pubens*), *Viburnum nudum* var. *cassinoides*, *Cornus alternifolia*, *Menziesia pilosa*, *Rhododendron maximum*, and *Rhododendron catawbiense*. Herbaceous cover is moderate to dense (30-100%) and is dominated by ferns and other forbs. Herbaceous dominance may vary from site to site, but the most constant herb species are *Dryopteris campyloptera*, *Oxalis montana*, *Solidago glomerata*, *Clintonia borealis*, and *Rugelia nudicaulis*. Other herbaceous species include *Ageratina altissima* var. *roanensis*, *Asplenium montanum*, *Oclemena acuminata* (= *Aster acuminatus*), *Eurybia chlorolepis* (= *Aster chlorolepis*), *Athyrium filix-femina*, *Chelone lyonii*, *Actaea podocarpa* (= *Cimicifuga americana*), *Cinna latifolia*, *Circaea alpina*, *Dryopteris intermedia*, *Huperzia lucidula*, *Impatiens pallida*, *Melanthium parviflorum*, *Monotropa uniflora*, *Polypodium appalachianum*, *Tiarella cordifolia*, and *Trillium undulatum*.

**Global Vegetation:** The canopy is composed of *Picea rubens* codominating with the deciduous species *Betula alleghaniensis*, *Fagus grandifolia*, and *Aesculus flava*, occurring singly or in combination. At higher elevations, *Abies fraseri* may be a minor canopy component. The shrub stratum is open to absent. *Viburnum lantanoides* is a common shrub, and *Acer pensylvanicum* and *Amelanchier laevis* often occur as small trees. The herbaceous stratum is lush and diverse. Typical herbs include *Oclemena acuminata* (= *Aster acuminatus*), *Carex pensylvanica*, *Dryopteris campyloptera*, *Dryopteris intermedia*, *Maianthemum canadense*, *Oxalis montana*, *Solidago glomerata*, and *Rugelia nudicaulis* (in the Great Smoky Mountains).

**MOST ABUNDANT SPECIES****Great Smoky Mountains National Park**

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Picea rubens</i>
Tree canopy	Broad-leaved deciduous tree	<i>Betula alleghaniensis</i>
Tree subcanopy	Broad-leaved deciduous tree	<i>Betula alleghaniensis</i>
Tall shrub/sapling	Broad-leaved deciduous tree	<i>Acer spicatum</i>
Tall shrub/sapling	Broad-leaved deciduous shrub	<i>Viburnum lantanoides</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Vaccinium erythrocarpum</i>
Herb (field)	Flowering forb	<i>Solidago glomerata</i>

Herb (field)                      Fern (Spore-bearing forb)                      *Dryopteris campyloptera*

**Global****Stratum**

Tree canopy

Tree canopy

Tall shrub/sapling

Herb (field)

Herb (field)

**Lifform**

Needle-leaved tree

Broad-leaved deciduous tree

Broad-leaved deciduous shrub

Flowering forb

Fern (Spore-bearing forb)

**Species***Picea rubens**Aesculus flava*, *Betula alleghaniensis*, *Fagus grandifolia**Viburnum lantanoides**Oxalis montana*, *Solidago glomerata**Dryopteris campyloptera*, *Dryopteris intermedia***CHARACTERISTIC SPECIES**

**Great Smoky Mountains National Park:** *Betula alleghaniensis*, *Dryopteris campyloptera*, *Picea rubens*, *Solidago glomerata*, *Viburnum lantanoides*

**Global:** *Abies fraseri*, *Aesculus flava*, *Betula alleghaniensis*, *Dryopteris campyloptera*, *Fagus grandifolia*, *Picea rubens*, *Solidago glomerata*, *Viburnum lantanoides*

**OTHER NOTEWORTHY SPECIES**

**Great Smoky Mountains National Park: Vulnerable Plants:** *Abies fraseri* (G2, globally imperiled), *Rugelia nudicaulis* (G3, globally vulnerable), *Solidago glomerata* (G3, globally vulnerable)

**Global: Vulnerable Plants:** *Abies fraseri* (G2, Southern Blue Ridge endemic), *Ageratina altissima* var. *roanensis* (G5T3T4, Southern Blue Ridge endemic), *Carex ruthii* (G3G4), *Hypericum graveolens* (G3), *Rugelia nudicaulis* (G3), *Solidago glomerata* (G3); **Other Plants:** *Streptopus lanceolatus* var. *roseus* (G5T4)

**CONSERVATION STATUS RANK**

**Global Rank & Reasons:** G2 (4-Jan-2000). The community is geographically and environmentally restricted to the highest elevations of the Southern Blue Ridge. Very few occurrences are known to exist.

**RELATED CONCEPTS****Global Similar Types:**

- *Betula alleghaniensis* - (*Tsuga canadensis*) / *Rhododendron maximum* / (*Leucothoe fontanesiana*) Forest (CEGL007861)
- *Betula alleghaniensis* - *Picea rubens* / *Dryopteris campyloptera* Forest (CEGL006267)
- *Picea rubens* - (*Betula alleghaniensis*, *Aesculus flava*) / *Rhododendron (maximum, catawbiense)* Forest (CEGL004983)

**Global Related Concepts:**

- IA4e. Southern Appalachian Northern Hardwoods Forest (Allard 1990) >
- Spruce - Yellow Birch Type (Golden 1974) >

**CLASSIFICATION**

**Status:** Standard

**Classification Confidence:** 3 - Weak

**Great Smoky Mountains National Park Other Comments:** On Mount Le Conte and Newfound Gap this community grades into forests dominated by *Picea rubens* or by *Picea rubens* and *Abies fraseri* at higher elevations, and to Northern Hardwood and Cove forests at lower elevations.

**Global Classification Comments:** Original type was split into two forest associations [see also *Picea rubens* - (*Betula alleghaniensis*, *Aesculus flava*) / *Rhododendron (maximum, catawbiense)* Forest (CEGL004983)].

**ELEMENT DISTRIBUTION**

**Great Smoky Mountains National Park Range:** This community was sampled on the Mount Le Conte quadrangle and around Newfound Gap and was not found on the Cades Cove quadrangle. It was sampled in the vicinity of Mount Kephart, on the broad, steep slopes on the northern and southern flanks of Mount Le Conte, and in the vicinity of Balsam point, at elevations ranging from 5000 to 5880 feet. It should be sought in other high-elevation (>4500 feet) areas of the park.

**Global Range:** This community is restricted to the Southern Blue Ridge of North Carolina and Tennessee. It may occur at high elevations (above 1220 m [4000 feet]) in Virginia and Georgia.

**Nations:** US

**States/Provinces:** NC, TN

**TNC Ecoregions:** 51:C

**USFS Ecoregions (1994/95):** M221A:CP, M221B:CP, M221Dc:CCC, M221Dd:CCC

**USFS Ecoregions (2007):** M221A:CP, M221B:CP, M221Dc:CCC, M221Dd:CCC

**Federal Lands:** NPS (Appalachian Trail [Southern Blue Ridge], Blue Ridge Parkway, Great Smoky Mountains); USFS (Cherokee?, Nantahala, Pisgah)

**ELEMENT SOURCES**

**Great Smoky Mountains National Park Plots:** GRSM.25, GRSM.142, GRSM.145, GRSM.157.

**Great Smoky Mountains National Park Description Author(s):** K.D. Patterson

**Global Description Author(s):** D.J. Allard and K.D. Patterson

**References:** Allard 1990, Golden 1974, Golden 1981, Livingston and Mitchell 1976, McLeod pers. comm., NatureServe Ecology - Southeastern U.S. unpubl. data, Peet et al. unpubl. data, Schafale 2012, Schafale and Weakley 1990, Southeastern Ecology Working Group n.d., TDNH unpubl. data 2018

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**[CEGL006152] *Picea rubens* - (*Tsuga canadensis*) / *Rhododendron maximum* Forest**

Translated Name: **Red Spruce - (Eastern Hemlock) / Great Laurel Forest**

Common Name: **Red Spruce Forest (Protected Slope Type)**

**USNVC CLASSIFICATION**

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Laurentian-Acadian Mesic Hardwood - Conifer Forest (M014)
Group	Central & Southern Appalachian Red Spruce - Fir - Hardwood Forest (G632)
Alliance	<i>Picea rubens</i> - <i>Betula alleghaniensis</i> - <i>Aesculus flava</i> Forest Alliance (A0138)

**ELEMENT CONCEPT**

**Global Summary:** This association includes moist slope forests of the Central and Southern Appalachians. *Abies fraseri* is a minor component or entirely absent. These communities can occur on high-elevation boulderfields, ridges and steep slopes, as well as sheltered lower slopes above 945 m (3100 feet). This association occurs in the lower elevations of the range of *Picea rubens*, primarily on protected landforms such as steep to gentle slopes but also on ridges at least in parts of its range. In the Southern and Central Appalachians these are closed-canopy conifer forests dominated by *Picea rubens*, with associates *Tsuga canadensis*, *Acer pensylvanicum*, *Amelanchier* spp., *Betula alleghaniensis*, and *Sorbus americana*. This concept includes protected slope forests in the Great Smoky Mountains, as well as in West Virginia in which *Tsuga canadensis* is codominant. The shrub layer is dominated by *Rhododendron maximum*, with associates of *Ilex montana*, *Kalmia latifolia*, *Viburnum lantanoides*, and *Viburnum nudum* var. *cassinoides*. In some examples, the shrub layer can include a mixture of *Rhododendron catawbiense* and *Rhododendron maximum*. Other minor shrub components can include *Vaccinium simulatum*, *Vaccinium erythrocarpum*, and *Aronia melanocarpa*. Herbaceous cover is typically sparse, but where the shrub stratum is more open, a moderate herb stratum may be developed. This can include *Clintonia borealis*, *Dryopteris campyloptera*, *Huperzia lucidula*, *Lycopodium* spp., *Medeola virginiana*, *Mitchella repens*, *Oxalis montana*, and *Rugelia nudicaulis* (in the Great Smoky Mountains).

**ENVIRONMENTAL DESCRIPTION**

**Great Smoky Mountains National Park Environment:** This community is known to occur in the Great Smoky Mountains in the vicinity of Mount Le Conte on steep, middle to high slopes between 4500 and 5000 feet elevation. Sites may be relatively exposed and rocky and subject to disturbance by wind and ice. Soils are well-drained and high in organic matter.

**Global Environment:** This association occurs on steep to gentle, middle to high slopes between 945 and 1524 m (3100-5000 feet) elevation. Sites range from those that are relatively exposed, rocky and subjected to disturbance by wind and ice, to more sheltered lower slopes. Some stands also occur on nearly flat ridgetops (J. Vanderhorst pers. comm.) Soils are well-drained and high in organic matter. In the vicinity of Mount Le Conte in the Great Smoky Mountains, this association occurs on long protected slopes that extend from low to very high elevations. In these sheltered situations *Tsuga canadensis* is a codominant, and the evergreen shrub layer is nearly closed, producing low cover and diversity of herbaceous species. On more-exposed sites the shrub layer may be more open, and a sparse to moderate herb layer may be present. It descends to 945 m (3100 feet) in the Central Appalachians. In local landscapes of the Southern Blue Ridge and Central Appalachians, this association tends to occur bimodally, on high ridges and summits and steep, rocky upper slopes, and at lower elevations in sheltered frost-pocket situations, where *Picea rubens* apparently has a competitive advantage because of moist, acidic, organic soils and/or cold-air drainage.

**VEGETATION DESCRIPTION**

**Great Smoky Mountains National Park Vegetation:** This needle-leaved, evergreen forest has a canopy dominated by mixtures of *Picea rubens* and *Tsuga canadensis*. *Betula alleghaniensis*, *Acer rubrum*, or *Prunus pensylvanica* may form a minor part of the canopy or subcanopy. Typically, there is a dense subcanopy/tall-shrub stratum of *Rhododendron maximum*. Other shrub species can include *Rhododendron catawbiense*, *Ilex montana*, *Rubus canadensis*, and *Amelanchier laevis*. The herb stratum is typically very sparse with scattered ferns and other forbs. The ground cover is dominated by leaf litter and may have scattered large rocks or exposed bedrock.

**Global Vegetation:** In the Southern and Central Appalachians these are closed to partially open conifer forests dominated by *Picea rubens*, with associates *Tsuga canadensis*, *Acer pensylvanicum*, *Acer rubrum*, *Amelanchier* spp., *Betula alleghaniensis*, and *Sorbus americana*. In stands of this type *Abies fraseri* is a minor component or entirely absent. In the vicinity of Mount Le Conte in the Great Smoky Mountains, this association occurs on long protected slopes that extend from low to very high elevations. In these sheltered situations *Tsuga canadensis* may be a codominant, and the evergreen shrub layer (primarily *Rhododendron maximum*) is nearly closed, producing stands whose understory is dominated by ericaceous shrubs with few to no herbaceous species (a so-called "ericad desert"). On more-exposed sites the variable shrub layer is dominated by *Rhododendron maximum*, with associates of *Ilex montana*, *Kalmia latifolia*, *Viburnum lantanoides*, and *Viburnum nudum* var. *cassinoides*. In some examples, the shrub layer can include a mixture of *Rhododendron catawbiense* and *Rhododendron maximum*. Other minor shrub components can include *Vaccinium simulatum*, *Vaccinium erythrocarpum*, and *Aronia melanocarpa*. The sparse herbaceous layer for more open situations can include *Clintonia borealis*, *Dennstaedtia punctilobula*, *Dryopteris campyloptera*, *Dryopteris intermedia*, *Huperzia lucidula*, *Lycopodium*

*clavatum*, *Lycopodium obscurum*, *Lycopodium dendroideum*, *Lycopodium hickeyi* (= *Lycopodium obscurum* var. *isophyllum*), *Medeola virginiana*, *Mitchella repens*, *Oxalis montana*, *Trillium undulatum*, and *Rugelia nudicaulis* (in the Great Smoky Mountains). Nonvascular plants are common, especially on moister sites, where they grow on branches and rocks and around the bases of trees and shrubs. Bryophyte species include *Bazzania trilobata*, *Hylocomium splendens*, *Polytrichum* sp., *Brotherella recurvans*, and *Dicranum* sp.

#### MOST ABUNDANT SPECIES

##### Great Smoky Mountains National Park

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Picea rubens</i> , <i>Tsuga canadensis</i>
Tall shrub/sapling	Broad-leaved evergreen tree	<i>Rhododendron maximum</i>

##### Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Tsuga canadensis</i>
Tall shrub/sapling	Broad-leaved evergreen shrub	<i>Rhododendron maximum</i>

#### CHARACTERISTIC SPECIES

**Great Smoky Mountains National Park:** *Picea rubens*, *Rhododendron maximum*, *Tsuga canadensis*

**Global:** *Picea rubens*, *Rhododendron catawbiense*, *Rhododendron maximum*, *Tsuga canadensis*

#### OTHER NOTEWORTHY SPECIES

**Global: Vulnerable Plants:** *Abies fraseri* (G2, Southern Blue Ridge endemic), *Ageratina altissima* var. *roanensis* (G5T3T4, Southern Blue Ridge endemic), *Rugelia nudicaulis* (G3), *Solidago glomerata* (G3); **Other Plants:** *Bazzania trilobata* (G5), *Streptopus lanceolatus* var. *roseus* (G5T4)

#### CONSERVATION STATUS RANK

**Global Rank & Reasons:** G2G3 (15-Mar-2005). This and related vegetation types are environmentally restricted within a somewhat geographically restricted range. Their former extent has been reduced to more-or-less isolated, small patches by logging and subsequent fires (Allard and Leonard 1952, Clarkson 1964, Pielke 1981, Stephenson and Clovis 1983). Rank changed to G2G3 from G2? with merging in of two related associations (March 2005). The range of the combined type is from West Virginia south to North Carolina and Tennessee.

#### RELATED CONCEPTS

##### Global Similar Types:

- *Picea rubens* - (*Abies fraseri*) / (*Rhododendron catawbiense*, *Rhododendron maximum*) Forest (CEGL007130)
- *Picea rubens* - (*Abies fraseri*) / *Vaccinium erythrocarpum* / *Dryopteris campyloptera* / *Hylocomium splendens* Forest (CEGL007131)
- *Picea rubens* - *Acer rubrum* / *Ilex verticillata* Swamp Forest (CEGL006556)
- *Picea rubens* - *Tsuga canadensis* - *Fagus grandifolia* / *Dryopteris intermedia* Forest (CEGL006029)
- *Picea rubens* / *Betula alleghaniensis* / *Bazzania trilobata* Forest (CEGL008501) dominant matrix red spruce forest type within West Virginia; lacks dense evergreen rhododendron shrub layer
- *Tsuga canadensis* - *Acer rubrum* - (*Nyssa sylvatica*) / *Rhododendron maximum* / *Sphagnum* spp. Seep Forest (CEGL007565)

##### Global Related Concepts:

- *Picea rubens* - (*Tsuga canadensis*) / *Rhododendron maximum* Forest [Red Spruce - Rhododendron Forest] (Vanderhorst 2015) =
- IA4a. Red Spruce - Fraser Fir Forest (Allard 1990) >
- Red Spruce - Fraser Fir: 34 (Eyre 1980) >
- Red spruce-great laurel forest (CAP pers. comm. 1998) ?

#### CLASSIFICATION

**Status:** Standard

**Classification Confidence:** 2 - Moderate

**Great Smoky Mountains National Park Other Comments:** On the Mount Le Conte quadrangle, these forests may grade into lower-elevation forests dominated by *Betula alleghaniensis* or *Tsuga canadensis*. At least some examples are old-growth forest. On more exposed sites, this community may border heath shrublands.

**Global Classification Comments:** Classification of this unit is supported by 17 plots in Pocahontas, Randolph, and Tucker counties in West Virginia. This association was determined not to be distinct from former *Picea rubens* - *Tsuga canadensis* / *Rhododendron maximum* Forest (CEGL006272) which was merged into this concept. Likewise, former *Picea rubens* / *Rhododendron catawbiense* Forest (CEGL006163) of West Virginia also was considered floristically indistinct and is now also included in the concept of this association (CEGL006152).

In Virginia, forests with *Picea rubens* and *Tsuga canadensis* have been classified as *Picea rubens* - *Acer rubrum* / *Ilex verticillata* Swamp Forest (CEGL006556), or as variants of *Betula alleghaniensis* - (*Tsuga canadensis*) / *Rhododendron maximum* / (*Leucothoe fontanesiana*) Forest (CEGL007861), or as examples of *Tsuga canadensis* - *Acer rubrum* - (*Nyssa sylvatica*) / *Rhododendron maximum* / *Sphagnum* spp. Seep Forest (CEGL007565) that contain red spruce as an associate. This concept includes

stands found in the Great Smoky Mountains in the vicinity of Mount LeConte on steep, middle to high slopes between 1372 and 1524 m (4500-5000 feet) elevation. These sites may be relatively exposed and rocky and subject to disturbance by wind and ice. These Mount LeConte stands were the source of CEGLO06272, now merged into CEGLO06152.

#### ELEMENT DISTRIBUTION

**Great Smoky Mountains National Park Range:** This community was sampled on the Mount Le Conte quadrangle and was not found on the Cades Cove quadrangle. It occurs on the northern slopes of Mount Le Conte and on slopes east of Peregrine Peak. It should be looked for in other areas of the park between 4500 and 5000 feet elevation.

**Global Range:** This association ranges sporadically at appropriate elevations from the Great Smoky Mountains in the Southern Blue Ridge of North Carolina and Tennessee, north to the Central Appalachians in West Virginia. It is not known from Pennsylvania.

**Nations:** US

**States/Provinces:** NC, TN, VA?, WV:S2

**TNC Ecoregions:** 51:C, 59:C

**USFS Ecoregions (1994/95):** M221Aa:CCC, M221Ba:CCC, M221Bb:CCP, M221Bc:CCC, M221Bd:CCP, M221Be:CCP, M221C:CC, M221Dc:CCC, M221Dd:CCC

**USFS Ecoregions (2007):** M221Aa:CCP, M221Ba:CCC, M221Bb:CCP, M221Bc:CCC, M221Bd:CCP, M221Be:CCP, M221C:CC, M221Dc:CCC, M221Dd:CCC

**Federal Lands:** NPS (Appalachian Trail [Southern Blue Ridge], Blue Ridge Parkway, Great Smoky Mountains); USFS (Cherokee, Monongahela, Nantahala, Pisgah); USFWS (Canaan Valley)

#### ELEMENT SOURCES

**Great Smoky Mountains National Park Plots:** GRSM.11, GRSM.72.

**Great Smoky Mountains National Park Description Author(s):** K.D. Patterson

**Global Description Author(s):** M. Pyne

**References:** Adams and Stephenson 1989, Allard 1990, Allard and Leonard 1952, Byers et al. 2010, CAP pers. comm. 1998, Clarkson 1964, Cogbill and White 1991, Crandall 1958, Eyre 1980, Golden 1974, Nicholas et al. 1992, Peet et al. unpubl. data, Pielke 1981, Schafale 2012, Schafale and Weakley 1990, Southeastern Ecology Working Group n.d., Stephenson and Adams 1984, Stephenson and Clovis 1983, TDNH unpubl. data 2018, Vanderhorst 2015, WVNHP unpubl. data, White and Pickett 1985, White et al. 1985, Whittaker 1956

## M013. Eastern North American Ruderal Forest

### G030. EASTERN NORTH AMERICAN NATIVE RUDERAL FOREST

**Group Summary Description:** This native ruderal forest group is found in the cool temperate regions of eastern United States and Canada, from the East Coast, west to the Great Lakes and Tallgrass Prairie region and south to the south-central United States. The vegetation of this group shows evidence of former and heavy human disturbance, particularly to the soils, such as through plowing, grading, skidding, etc., but has otherwise been allowed to succeed more-or-less spontaneously. The vegetation is a somewhat disparate mix of weedy and native species, and the ecological and floristic organization of the vegetation is not clear. The tree layer is dominated (>50% cover) by "weedy" or generalist native tree species, sometimes accompanied by exotic/invasive tree species. The list of ruderal tree species is as follows: **Conifers:** *Juniperus virginiana*, *Pinus rigida*, *Pinus strobus*, *Pinus virginiana*. **Hardwoods:** *Acer negundo*, *Acer rubrum*, *Amelanchier* spp., *Betula populifolia*, *Crataegus* spp., *Crataegus crus-galli*, *Crataegus mollis*, *Diospyros virginiana*, *Fraxinus americana*, *Gleditsia triacanthos*, *Gymnocladus dioicus*, *Juglans nigra*, *Liquidambar styraciflua*, *Liriodendron tulipifera*, *Morus* spp., *Malus fusca*, *Morus rubra*, *Populus tremuloides*, *Prunus pensylvanica*, *Prunus serotina*, *Prunus americana*, and *Robinia pseudoacacia*. Naturalized exotics include the conifer *Pinus thunbergii* and hardwoods *Acer platanoides* and *Ailanthus altissima*. *Robinia pseudoacacia*, although a native in the central hardwoods region, is so widely planted outside of its range that it is essentially exotic in character. The weedy natives often form mono-dominant or mixed dominance stands. Understory shrub and herb species vary from exotic invasives to native generalists. Invasive shrub species include a variety of honeysuckles (*Lonicera japonica*, *Lonicera morrowii*, *Lonicera tatarica*, *Lonicera x bella*), *Rhamnus cathartica*, and others. Sites show evidence of former and heavy human use, particularly with extensive and intensive soil disturbances, including plowing, grading, skidding, etc. Sites are often on dry-mesic to wet-mesic sites, suitable for agriculture or forest plantations.

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### A3227 *Juniperus virginiana* - *Pinus virginiana* - *Pinus echinata* Ruderal Forest Alliance

Eastern Red-cedar - Virginia Pine - Shortleaf Pine Ruderal Forest Alliance

**Ruderal Eastern Red-cedar - Virginia Pine - Mixed Conifer Forest**

#### ALLIANCE CONCEPT

**Summary:** This semi-natural forest is found in locally disturbed areas, most commonly in old fields and pastures, and cleared land. Three dominance-based suballiances may be recognized: (1) *Juniperus virginiana* var. *virginiana* stands occur widely and are more common on calcareous sites. Stand may be very dense, and the stature may be rather low. Associated species include *Acer rubrum*, *Carya tomentosa*, *Carya ovata*, *Cercis canadensis*, *Fraxinus americana*, and *Pinus virginiana*. The midstory is typically sparse, with

canopy species, as well as *Cornus florida*, *Ilex opaca*, *Liquidambar styraciflua*, and *Prunus serotina* var. *serotina*. The vegetation may vary in structure from open-canopy woodland (particularly as it invades herbaceous old fields) to dense, closed-canopy forest. (2) A mixed *Juniperus virginiana* var. *virginiana* - *Quercus* spp. suballiance represents stands that may be fire-suppressed native stands, and may not be natural in character. Various oaks (including *Quercus coccinea*, *Quercus phellos*, *Quercus rubra*, *Quercus velutina*) are present. (3) *Pinus* spp. (especially *Pinus echinata*, *Pinus strobus*, and *Pinus virginiana*) stands occur on old fields (often from abandoned farmland), old pastures, clearcuts, and eroded areas. Soils are typically dry, acidic, and infertile. This forest typically has a very dense canopy of *Pinus virginiana* and little understory vegetation. The dense canopy may also include admixtures of other *Pinus* species (e.g., *Pinus taeda*, *Pinus echinata*, *Pinus rigida*, *Pinus strobus*) or other early-successional deciduous trees (e.g., *Acer rubrum*, *Liquidambar styraciflua*, *Prunus serotina*, *Liriodendron tulipifera*, *Fraxinus americana*, *Nyssa sylvatica*). Associated woody and herbaceous species vary with geography but are typically ruderal or exotic species. Shrub and herb layers are frequently very sparse. *Lonicera japonica* and *Rosa multiflora* are common. The herb layer is characterized by weedy natives and exotics such as *Lycopodium digitatum*, *Achillea millefolium* var. *occidentalis*, *Hieracium caespitosum*, and *Lespedeza cuneata*.

**Classification Comments:** This very wide-ranging alliance could be split into northern versus southern alliances based on co-associated tree species. It is more typically found in the central United States. This alliance should exclude natural stands that may be either open rocky juniper woodlands or fire-suppressed native oak-juniper types, where associated woody species include *Quercus muehlenbergii*, *Quercus stellata*, *Celtis tenuifolia*, *Ulmus alata*, *Cercis canadensis*, and *Fraxinus quadrangulata* on calcareous or circumneutral sites.

The *Juniperus virginiana* suballiance formerly included elements that represented mature (100+ year) stands, on limestone or chalk, mostly in blacklands (as in the Blackbelt of Alabama, on the margins of Chalk Prairies), and also on sandstone (e.g., in Oklahoma).

#### Similar Alliances:

- *Acer rubrum* - *Prunus serotina* - *Pinus strobus* Ruderal Forest Alliance (A3229) is more hardwood-dominated.

**Diagnostic Characteristics:** *Juniperus virginiana* and/or *Pinus virginiana* (less often *Pinus echinata* or *Pinus strobus*) are dominant or at least 25% cover and mixed with a variety of other hardwoods, Ground layer species vary with geography but are typically ruderal or exotic species; *Lonicera japonica* and *Rosa multiflora* are common. The herb layer is characterized by weedy natives and exotics such as *Lycopodium digitatum*, *Achillea millefolium* var. *occidentalis*, *Hieracium caespitosum*, and *Lespedeza cuneata*.

#### ALLIANCE DESCRIPTION

**Environment:** Forests in this alliance occur on usually high pH, fire-suppressed sites or old fields. The habitat for this alliance is most commonly old fields and pastures, successional cleared land, and other variously locally disturbed areas, especially on calcareous rocks.

**Vegetation:** Three dominance-based suballiances may be recognized: (1) *Juniperus virginiana* var. *virginiana* stands occur widely and are more common on calcareous sites. Associated species include *Acer rubrum*, *Carya tomentosa* (= *Carya alba*), *Carya ovata*, *Cercis canadensis*, *Fraxinus americana*, and *Pinus virginiana*. The midstory is typically sparse, with canopy species as well as *Cornus florida*, *Ilex opaca*, *Liquidambar styraciflua*, and *Prunus serotina* var. *serotina*. (2) A mixed *Juniperus virginiana* var. *virginiana* - *Quercus* spp. suballiance represents stands, includes various oaks (including *Quercus coccinea*, *Quercus phellos*, *Quercus rubra*, *Quercus velutina*) are present. Review is needed to determine if this suballiance should be moved to a native alliance or group. (3) *Pinus* spp. (especially *Pinus echinata*, *Pinus strobus*, and *Pinus virginiana*) contains a dense canopy of *Pinus virginiana* and may also include admixtures of other *Pinus* species (e.g., *Pinus taeda*, *Pinus echinata*, *Pinus rigida*, *Pinus strobus*) or other early-successional deciduous trees (e.g., *Acer rubrum*, *Liquidambar styraciflua*, *Prunus serotina*, *Liriodendron tulipifera*, *Fraxinus americana*, *Nyssa sylvatica*). Associated woody and herbaceous species vary with geography but are typically ruderal or exotic species. Shrub and herb layers are frequently very sparse. *Lonicera japonica* and *Rosa multiflora* are common. The herb layer is often very sparse and characterized by weedy natives and exotics such as *Lycopodium digitatum*, *Achillea millefolium* var. *occidentalis*, *Hieracium caespitosum*, and *Lespedeza cuneata*. (Eyre 1980, Foti 1994).

**Physiognomy and Structure:** Three dominance-based suballiances may be recognized: (1) *Juniperus virginiana* var. *virginiana* stands may be very dense, and the stature may be rather low. The vegetation may vary in structure from open-canopy woodland (particularly as it invades herbaceous old fields) to dense, closed-canopy forest. (2) A mixed *Juniperus virginiana* var. *virginiana* - *Quercus* spp. suballiance represents stands that may be fire-suppressed native stands, and may not be more natural in character. (3) *Pinus* spp. (especially *Pinus echinata*, *Pinus strobus*, and *Pinus virginiana*) stands typically have a very dense canopy of *Pinus virginiana* and little understory vegetation.

**Floristics:** Three dominance-based suballiances may be recognized: (1) *Juniperus virginiana* var. *virginiana* stands occur widely and are more common on calcareous sites. Associated species include *Acer rubrum*, *Carya tomentosa* (= *Carya alba*), *Carya ovata*, *Cercis canadensis*, *Fraxinus americana*, and *Pinus virginiana*. The midstory is typically sparse, with canopy species as well as *Cornus florida*, *Ilex opaca*, *Liquidambar styraciflua*, and *Prunus serotina* var. *serotina*. (2) A mixed *Juniperus virginiana* var. *virginiana* - *Quercus* spp. suballiance represents stands, includes various oaks (including *Quercus coccinea*, *Quercus phellos*, *Quercus rubra*, *Quercus velutina*) are present. Review is needed to determine if this suballiance should be moved to a native alliance or group. (3) *Pinus* spp. (especially *Pinus echinata*, *Pinus strobus*, and *Pinus virginiana*) contains a dense canopy of *Pinus virginiana* and may also include admixtures of other *Pinus* species (e.g., *Pinus taeda*, *Pinus echinata*, *Pinus rigida*, *Pinus strobus*) or other early-successional deciduous trees (e.g., *Acer rubrum*, *Liquidambar styraciflua*, *Prunus serotina*, *Liriodendron tulipifera*, *Fraxinus americana*, *Nyssa sylvatica*). Associated woody and herbaceous species vary with geography but are typically ruderal or exotic species. Shrub and herb layers are frequently very sparse. *Lonicera japonica* and *Rosa multiflora* are common. The herb layer is often

very sparse and characterized by weedy natives and exotics such as *Lycopodium digitatum*, *Achillea millefolium* var. *occidentalis*, *Hieracium caespitosum*, and *Lespedeza cuneata*. (Eyre 1980, Foti 1994).

#### ALLIANCE DISTRIBUTION

**Range:** This alliance is found in the northeastern U.S. from Massachusetts and New York, adjacent Ontario, Canada, to the southeastern U.S. from Virginia to Oklahoma and Texas, to the midwestern U.S. from Iowa to Missouri, and possibly elsewhere.

**Nations:** CA,US

**Subnations:** AL, AR, CT, DC, DE, GA, IA, IN, KY, LA, MA, MD, ME, MI, MN, MO, MS, NC, NH, NJ, NY, OH?, OK, ON, PA, RI, SC, TN, TX, VA, VT, WI, WV

#### ALLIANCE SOURCES

**References:** Eyre 1980, Faber-Langendoen et al. 2019b, Foti et al. 1994

**Author of Concept:** Faber-Langendoen et al. 2019b

**Author of Description:** D. Faber-Langendoen, D.J. Allard and M. Pyne, in Faber-Langendoen et al. (2013)

#### [CEGL007944] *Pinus strobus* Ruderal Forest

Translated Name: **Eastern White Pine Ruderal Forest**

Common Name: **Ruderal Eastern White Pine Forest**

#### USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Eastern North American Ruderal Forest (M013)
Group	Eastern North American Native Ruderal Forest (G030)
Alliance	<i>Juniperus virginiana</i> - <i>Pinus virginiana</i> - <i>Pinus echinata</i> Ruderal Forest Alliance (A3227)

#### ELEMENT CONCEPT

**Global Summary:** This is an early-successional forest dominated by *Pinus strobus*, typically with a very dense canopy and little understory. It is considered ruderal because it is commonly associated with anthropogenic disturbance (e.g., former old fields and formerly cleared flats along streams) that have caused a mix of species not found with natural disturbances. Associated woody and herbaceous species vary with geography. In the northeastern states, the tree canopy is often monotypic and even-aged, with occasional associates including *Acer rubrum*, *Juniperus virginiana*, *Liriodendron tulipifera* (within its range), or scattered *Quercus rubra* or *Quercus velutina*. In regions where northern hardwoods are more prevalent, canopy associates include *Fraxinus americana* and *Acer saccharum*. In the Southern Blue Ridge and nearby areas, typical canopy and subcanopy associates include *Liriodendron tulipifera*, *Acer rubrum*, *Pinus rigida*, and *Liquidambar styraciflua*, with *Tsuga canadensis* often forming a dense shrub stratum. The understory is typically poorly developed or characterized by scattered individuals found in the canopy. The herbaceous cover is variable depending on the density of tree and shrub cover, and may be characterized by ruderal or exotic species that favor openings or disturbance. In more open stands, typical species are those associated with old fields, including *Solidago rugosa*, *Solidago gigantea*, *Anthoxanthum odoratum*, *Poa pratensis*, *Schizachyrium scoparium*, *Elymus repens*, *Bromus inermis*, *Agrostis gigantea*, *Euthamia graminifolia*, *Achillea millefolium*, and *Daucus carota*. In stands that are more heavily forested, typical herbs include *Aralia nudicaulis*, *Ageratina altissima*, *Galium triflorum*, *Maianthemum canadense*, *Trientalis borealis*, *Mitchella repens*, *Polystichum acrostichoides*, and *Lycopodium* species. The particular composition of the herb layer will vary with geography. The substrate is usually covered by a thick layer of pine needle duff. In the Daniel Boone National Forest of Kentucky, *Pinus strobus* is spreading from plantings, especially in the Red River Gorge.

#### ENVIRONMENTAL DESCRIPTION

**Great Smoky Mountains National Park Environment:** This community is generally found in areas previously cleared as farms and plowed at one point in time. They can also range up onto heavily disturbed slopes, but are best developed on flats near creeks and rivers.

**Global Environment:** This wide-ranging semi-natural forest is commonly associated with anthropogenic disturbance. It typically occurs on former agricultural lands and old fields that are no longer intensively mowed, plowed or managed, developing as *Pinus strobus* colonizes the open fields. Associated woody and herbaceous species vary with geography but are typically ruderal or exotic species that favor openings or disturbance.

#### VEGETATION DESCRIPTION

**Great Smoky Mountains National Park Vegetation:** The canopy is dominated by *Pinus strobus* and is sometimes codominated by other ruderal species such as *Liriodendron tulipifera*. Understory varies with age and stand characteristics.

**Global Vegetation:** The tree canopy ranges from woodland to forest closure, with 25-85% cover. It is often monotypic and even-aged *Pinus strobus*, with occasional associates, including *Acer rubrum*, *Betula lenta*, *Juniperus virginiana*, or scattered *Quercus rubra* or *Quercus velutina*. In regions where northern hardwoods are more prevalent, canopy associates include *Fraxinus americana* and *Acer saccharum*. In the Southern Blue Ridge and nearby areas, typical canopy and subcanopy associates include *Liriodendron tulipifera*, *Acer rubrum*, *Pinus rigida*, and *Liquidambar styraciflua*, with *Tsuga canadensis* often forming a dense shrub stratum. The understory is poorly developed or characterized by scattered individuals found in the canopy. Shrubs are often present in the more open stands and include native species, such as *Cornus racemosa*, *Rhus glabra*, *Viburnum prunifolium*, and *Rubus* spp., as well as exotics, such as

*Elaeagnus umbellata*, *Rosa multiflora*, *Lonicera morrowii*, and *Berberis thunbergii*. The herbaceous cover is variable depending on the density of tree and shrub cover, and may be characterized by ruderal or exotic species that favor openings or disturbance. In more open stands, typical species are those associated with old fields, such as *Solidago rugosa*, *Solidago gigantea*, *Anthoxanthum odoratum*, *Poa pratensis*, *Schizachyrium scoparium*, *Elymus repens* (= *Elytrigia repens*), *Bromus inermis*, *Agrostis gigantea*, *Euthamia graminifolia*, *Achillea millefolium*, and *Daucus carota*. In stands that are more heavily forested, typical herbs include *Aralia nudicaulis*, *Ageratina altissima*, *Galium triflorum*, *Maianthemum canadense*, *Medeola virginiana*, *Polystichum acrostichoides*, *Trientalis borealis*, *Mitchella repens*, and *Lycopodium* species. The particular composition of the herb layer will vary with geography. The substrate is usually covered by a thick layer of pine needle duff.

**Global Dynamics:** In the Daniel Boone National Forest of Kentucky, *Pinus strobus* is spreading from plantings, especially in the Red River Gorge.

#### MOST ABUNDANT SPECIES

##### Global

##### Stratum

Tree canopy

##### Lifeform

Needle-leaved tree

##### Species

*Pinus strobus*

#### CHARACTERISTIC SPECIES

##### Great Smoky Mountains National Park:

**Global:** *Pinus strobus*

#### OTHER NOTEWORTHY SPECIES

**Global: Invasive/Exotic Plants:** *Achillea millefolium*, *Agrostis gigantea* (Medium/Low), *Anthoxanthum odoratum*, *Berberis thunbergii* (High/Medium), *Daucus carota* (Low), *Elaeagnus umbellata* (High), *Elymus repens* (High/Medium), *Lonicera morrowii* (High/Medium), *Rosa multiflora* (Medium/Low)

#### CONSERVATION STATUS RANK

**Global Rank & Reasons:** GNA (ruderal) (23-Jun-2013). This forest represents semi-natural vegetation, i.e., the vegetation contains combinations of species that are not found under natural disturbance regimes, many of them exotic. Thus it is not of high conservation concern and does not receive a conservation status rank.

#### RELATED CONCEPTS

##### Global Similar Types:

- *Pinus strobus* Forest Plantation (CST007178)

##### Global Related Concepts:

- *Pinus strobus* / (*Diphasiastrum digitatum*, *Lycopodium obscurum*) forest (Vanderhorst 2001b) =
- Eastern White Pine Successional Forest (Edinger et al. 2014b) =
- Semi-Natural (Faber-Langendoen 2001) >
- White Pine - White Oak - Chestnut Oak Type (Schmalzer and DeSelm 1982) >

#### CLASSIFICATION

**Status:** Standard

**Classification Confidence:** 1 - Strong

**Global Classification Comments:** This semi-natural type may be expected to occur throughout the range of the alliance but has primarily been attributed in areas where The Nature Conservancy ecoregional planning or other project-specific needs have documented its occurrence. Rangewide review should greatly expand its geographic scope. Association may need to be split based on northern hardwood associates and central hardwood associates.

#### ELEMENT DISTRIBUTION

**Great Smoky Mountains National Park Range:** This community exists throughout the low elevations of the park that have been previously cleared and allowed to grow back with time. Examples of this community sampled in this project were from areas near Oconaluftee River and Abrams Creek.

**Global Range:** This semi-natural type may be expected to occur throughout the range of the alliance (i.e., from Michigan, northern Wisconsin, northern and eastern Minnesota, extreme northeastern Iowa, and from Maine and New Hampshire south to Georgia and Tennessee, as well as in Ontario, Canada). It has been documented primarily in areas where project-specific needs have required it.

**Nations:** US

**States/Provinces:** CT, GA, KY, MA, MD?, ME, MI, MN, NC, NH, NJ?, NY, OH?, PA, RI, SC, TN, VA, VT, WI, WV

**TNC Ecoregions:** 47:P, 48:P, 49:C, 50:C, 51:C, 59:C, 60:C, 61:C, 63:C

**USFS Ecoregions (1994/95):** 212Fc:CCC, 221Ae:CCC, 221Bc:CCC, 221Bd:CCC, 221Da:CCC, 221Fa:CCC, 221Ha:CCC, 221Hc:CCC, 221He:CCC, 222En:CCC, 222Eo:CCC, M212Ba:CCC, M212Bb:CCC, M221Aa:CCC, M221Ab:CCC, M221Be:CCC, M221Cb:CCC, M221Cd:CCC, M221Da:CCC, M221Db:CCC, M221Dc:CCC, M221Dd:CCC

**USFS Ecoregions (2007):** 211Fc:CCC, 221Ae:CCC, 221Bc:CCP, 221Bd:CCP, 221Da:CCC, 221En:CC?, 221Fa:CCC, 221Ha:CCC, 221Hb:CCP, 221Hc:CCC, 221He:CC?, M211Ba:CCP, M211Bb:CCC, M221Aa:CCP, M221Ab:CCC, M221Be:CCC, M221Cb:CCC, M221Cd:CCC, M221Da:CCC, M221Db:CCC, M221Dc:CCC, M221Dd:CCC

**Federal Lands:** BIA (Eastern Band of Cherokee); NPS (Appalachian Trail [Central Appalachians], Appalachian Trail [Lower New England], Appalachian Trail [Northern Appalachians], Appalachian Trail [Southern Blue Ridge], Big South Fork, Blue Ridge Parkway, Bluestone, Carl Sandburg Home, Delaware Water Gap, Gettysburg, Great Smoky Mountains, Marsh-Billings-Rockefeller, Natchez Trace, New River Gorge, Obed River, Roosevelt-Vanderbilt, Saint-Gaudens, Saratoga); USFS (Cherokee?, Daniel Boone, George Washington, Jefferson, Monongahela); USFWS (Great Meadows, Moosehorn)

#### ELEMENT SOURCES

**Great Smoky Mountains National Park Plots:** GRSM.544, GRSM.557.

**Great Smoky Mountains National Park Description Author(s):** R. White

**Global Description Author(s):** K.D. Patterson, L.A. Sneddon and S.C. Gawler

**References:** Edinger 2003b, Edinger et al. 2014a, Edinger et al. 2014b, Faber-Langendoen 2001, Fleming and Coulling 2001, Gawler and Bowman 2012, MNNHP 1993, NRCS 2004a, NatureServe Ecology - Southeastern U.S. unpubl. data, Perles et al. 2007, Schmalzer and DeSelm 1982, Sechler et al. 2014, Southeastern Ecology Working Group n.d., Swain and Kearsley 2014, Vanderhorst 2001b, Vanderhorst et al. 2007, Vanderhorst et al. 2008, White 2003

### [CEGL002591] *Pinus virginiana* Ruderal Forest

Translated Name: **Virginia Pine Ruderal Forest**

Common Name: **Ruderal Virginia Pine Forest**

#### USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Eastern North American Ruderal Forest (M013)
Group	Eastern North American Native Ruderal Forest (G030)
Alliance	<i>Juniperus virginiana</i> - <i>Pinus virginiana</i> - <i>Pinus echinata</i> Ruderal Forest Alliance (A3227)

#### ELEMENT CONCEPT

**Global Summary:** This ruderal Virginia pine forest of the southeastern states occurs in areas where canopy removal has created dry, open conditions and bare mineral soil, allowing for the establishment of *Pinus virginiana*. These habitats include old fields, old pastures, clearcuts, and eroded areas; soils are typically dry, acidic, and infertile. It is common on abandoned farmland. This forest typically has a very dense canopy of *Pinus virginiana* and little understory vegetation. The dense canopy may also include admixtures of other *Pinus* species (e.g., *Pinus taeda*, *Pinus echinata*, *Pinus rigida*, *Pinus strobus*) or other early-successional deciduous trees (e.g., *Acer rubrum*, *Liquidambar styraciflua*, *Prunus serotina*, *Liriodendron tulipifera*, *Fraxinus americana*, *Nyssa sylvatica*). Associated woody and herbaceous species vary with geography but are typically ruderal or exotic species. Shrub and herb layers are frequently very sparse. Stands are short-lived, generally less than 75 years.

#### ENVIRONMENTAL DESCRIPTION

**Great Smoky Mountains National Park Environment:** Potential sites for this community include low-elevation (below 2000 feet) areas that have been subject to anthropogenic disturbance in the past 50 years. Examples around the Cades Cove Loop Road have been heavily browsed by deer.

**Global Environment:** This community occurs in areas where canopy removal has created open conditions and bare mineral soil, allowing for the establishment of *Pinus virginiana*. These conditions can include old fields, old pastures, clearcuts, and eroded areas. In the Ridge and Valley of Tennessee, northeastern Monroe County, early successional forests with *Pinus virginiana* dominance were found on low slopes in areas that were cleared for agriculture prior to the 1970s, when Tellico Lake was created (Andreu and Tukman 1995). In the Central Appalachians, this vegetation occurs where soft shales have been farmed (in valleys or on plateaus), resulting in stands with nothing but successional species in the understory. Soils underlying these communities are of two general types, i.e., those derived in residuum from calcareous shale and calcareous sandstone of the Middle Ordovician and those of some other origin. Series of the former type include Dandridge (Lithic Ruptic-Alfic Eutrochrepts), Tellico (Typic Rhododults), and Steekee (Ruptic-Ultic Dystrochrepts). Other soil series that this forest type may occur on include Litz, Dewey, Alcoa, Bland, Etowah, Lobdell and Neubert. All of these soils are well-drained and range in pH from moderate acidic to very strongly acidic.

#### VEGETATION DESCRIPTION

**Great Smoky Mountains National Park Vegetation:** *Pinus virginiana* Successional Forests have a dense canopy of *Pinus virginiana* but may have an admixture of other successional species (*Acer rubrum*, *Liriodendron tulipifera*, *Pinus strobus*) as well as deciduous species from the surrounding forest vegetation (*Quercus alba*, *Quercus velutina*, *Quercus coccinea*). The understory is typically open with little herb or shrub coverage, although *Tsuga canadensis* or *Pinus strobus* may be locally dominant in the shrub strata. The forest floor is covered with leaf litter and coarse woody debris.

**Global Vegetation:** This forest typically has a very dense canopy of *Pinus virginiana* and little understory vegetation. *Pinus taeda*, *Pinus echinata*, or *Pinus strobus* may co-occur with *Pinus virginiana* in the canopy. The canopy can also have significant admixtures of early-successional deciduous trees (e.g., *Acer rubrum*, *Liquidambar styraciflua*, *Prunus serotina*, *Liriodendron tulipifera*, *Fraxinus americana*, *Oxydendrum arboreum*, *Betula lenta*, *Nyssa sylvatica*). Older stands on abandoned farmland may have tall canopies (>20 m) of decadent *Pinus virginiana* overtopping the shade-tolerant *Tsuga canadensis*, which often dominates the subcanopy and shrub layers. Scattered *Pinus rigida* may be mixed in these stands. Associated woody and herbaceous species vary with geography but are

typically ruderal or exotic species; *Lonicera japonica* and *Rosa multiflora* are common. The herb layer is characterized by weedy natives and exotics such as *Lycopodium digitatum*, *Achillea millefolium* var. *occidentalis*, *Hieracium caespitosum*, and *Lespedeza cuneata*. Shrub and herb strata, where present at all, are usually sparse in coverage. In eastern Tennessee, the subcanopy may contain *Acer saccharum* and *Cornus florida*; other associated species may include *Cercis canadensis*, *Parthenocissus quinquefolia*, *Lonicera japonica*, and *Microstegium vimineum* (Andreu and Tukman 1995). In the Central Appalachians, associates include *Pinus strobus*, *Pinus echinata*, and *Pinus rigida*. Some stands may have a dense ericaceous shrub stratum containing *Vaccinium* spp., *Gaylussacia* spp., *Kalmia latifolia*, and *Rhododendron* spp. This community contains many exotics species such as *Albizia julibrissin*, *Lonicera japonica*, and *Pueraria montana* var. *lobata*. *Lonicera japonica* when present has an average cover of 27%. The associated species in all strata are highly variable.

**Global Dynamics:** This is an early-successional forest type. Damage from ice storms was the main disturbance observed in these stands in the Tellico Pilot Project study area. In addition, fire and insect infestation are likely damaging agents.

#### MOST ABUNDANT SPECIES

##### Great Smoky Mountains National Park

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Pinus virginiana</i>

##### Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Pinus virginiana</i>
Tree subcanopy	Needle-leaved tree	<i>Juniperus virginiana</i>
Tree subcanopy	Broad-leaved deciduous tree	<i>Acer rubrum</i> , <i>Cornus florida</i> , <i>Nyssa sylvatica</i> , <i>Oxydendrum arboreum</i>
Shrub/sapling (tall & short)	Broad-leaved deciduous tree	<i>Cornus florida</i> , <i>Oxydendrum arboreum</i>
Tall shrub/sapling	Needle-leaved tree	<i>Tsuga canadensis</i>
Tall shrub/sapling	Broad-leaved deciduous tree	<i>Nyssa sylvatica</i>
Tall shrub/sapling	Broad-leaved deciduous shrub	<i>Vaccinium stamineum</i>
Tall shrub/sapling	Broad-leaved evergreen shrub	<i>Vaccinium arboreum</i>
Short shrub/sapling	Broad-leaved deciduous tree	<i>Cercis canadensis</i> , <i>Quercus alba</i> , <i>Sassafras albidum</i>
Herb (field)	Liana	<i>Lonicera japonica</i> , <i>Smilax glauca</i> , <i>Toxicodendron radicans</i>
Herb (field)	Fern (Spore-bearing forb)	<i>Lycopodium</i> sp.
Nonvascular	Lichen	<i>Cladonia</i> sp.

#### CHARACTERISTIC SPECIES

##### Great Smoky Mountains National Park:

**Global:** *Pinus virginiana*, *Tsuga canadensis*

#### OTHER NOTEWORTHY SPECIES

**Global: Invasive/Exotic Plants:** *Albizia julibrissin* (High/Low), *Lonicera japonica* (High/Medium), *Microstegium vimineum* (High/Medium), *Pueraria montana* var. *lobata*, *Rosa multiflora* (Medium/Low)

#### CONSERVATION STATUS RANK

**Global Rank & Reasons:** GNA (ruderal) (13-Jun-2000). This forest represents early-successional vegetation and is thus not of high conservation concern.

#### RELATED CONCEPTS

##### Global Similar Types:

- *Pinus echinata* - *Quercus montana* - *Quercus (coccinea, velutina)* Forest (CEGL004761)
- *Pinus echinata* Ruderal Forest (CEGL006327) occurs in similar environments but is dominated (>50% of canopy) by *Pinus echinata* instead of *Pinus virginiana*.
- *Pinus taeda* - *Liquidambar styraciflua* Ruderal Forest (CEGL008462) is commonly found in the same area as CEGL002591 in the Piedmont. CEGL008462 contains at least 50% *Pinus taeda* in the canopy, whereas CEGL002591 is mostly *Pinus virginiana*.
- *Pinus taeda* / *Liquidambar styraciflua* - *Acer rubrum* / *Vaccinium stamineum* Ruderal Forest (CEGL006011) occurs in similar environments with similar disturbance histories but is dominated by (>50% of canopy) *Pinus taeda* instead of *Pinus virginiana*.
- *Pinus virginiana* - *Juniperus virginiana* - *Ulmus alata* Ruderal Forest (CEGL007121) on more calcareous or circumneutral substrates.
- *Pinus virginiana* - *Pinus (rigida, echinata)* - (*Quercus montana*) / *Vaccinium pallidum* Forest (CEGL007119) can have a very similar canopy in the Piedmont and Blue Ridge ecoregions, but CEGL007119 is generally created and maintained by fire and/or logging but not heavy plowing and/or erosion. CEGL002591 generally has signs of heavy agricultural use such as sparse herbaceous or shrub layers, large percentage of invasive exotics such as *Lonicera japonica* in the herbaceous layer, old plowlines, human debris, and extremely even-aged canopy, whereas CEGL007119 generally has a more intact herbaceous/shrub layer (especially *Vaccinium pallidum*) and less signs of severe human disturbance.

##### Global Related Concepts:

- *Pinus virginiana* - *Juniperus virginiana* Forest (Fleming and Weber 2003) =
- *Pinus virginiana* forest (Vanderhorst 2001b) =
- IA7c. Xeric Virginia Pine Ridge Forest (Allard 1990) >
- Pine-Oak Association of the Western Shore District (Shreve et al. 1910) >
- Unclassified Old-Field Successional Forest (Fleming and Moorhead 2000) ?
- Virginia Pine - (Oak) - Heath Mid-Successional Upland (PU3) (Windisch 2014a) <
- Virginia Pine - Oak: 78 (Eyre 1980) >
- Virginia Pine Type (Schmalzer and DeSelm 1982) >
- Virginia Pine: 79 (Eyre 1980) >
- Virginia pine successional forest (Collins and Anderson 1994) =

#### CLASSIFICATION

**Status:** Standard

**Classification Confidence:** 3 - Weak

**Global Classification Comments:** Early-successional *Pinus virginiana* vegetation occurring over calcareous substrates is classed in *Pinus virginiana* - *Juniperus virginiana* - *Ulmus alata* Ruderal Forest (CEGL007121) and has species indicative of calcareous substrates. Like many ruderal USNVC communities, this community has a wide geographic range and vegetation composition of associated species varies over this range.

After conducting fieldwork on Maryland's Inner Coastal Plain during the USFWS Patuxent Research Refuge vegetation mapping project, it was determined that near-pure stands of *Pinus rigida* and stands mixed with *Pinus virginiana* or early-successional deciduous trees such as *Acer rubrum* need to be reflected in the global concept of this type. It is unclear how these stands have developed or been managed, but contemporary fire suppression is an obvious factor as are signs of historical clearing for agriculture and military use (J. Harrison pers. comm. 2011).

#### ELEMENT DISTRIBUTION

**Great Smoky Mountains National Park Range:** This association was not sampled on the Mount Le Conte or Cades Cove quadrangles. However, it was observed at low elevations, in disturbed areas, around the Cades Cove Loop Road.

**Global Range:** This successional community is possible in the Piedmont from New Jersey and Pennsylvania south to Alabama and ranges west into the Appalachians, Ridge and Valley, the Cumberland Plateau, and in scattered locales of the Interior Low Plateau.

**Nations:** US

**States/Provinces:** AL, DC, DE, GA, IN, KY, MD, NC, NJ, PA, SC, TN, VA, WV

**TNC Ecoregions:** 43:C, 44:C, 49:P, 50:C, 51:C, 52:C, 58:C, 59:C, 61:C

**USFS Ecoregions (1994/95):** 221Da:CCC, 221Ha:CCC, 221Hc:CCC, 221He:CCC, 221J:CC, 222Cg:CCC, 222Dg:CCC, 222Eg:CCC, 222Ej:CCC, 222En:CCC, 222Eo:CCC, 231Ae:CCC, 231Ak:CCC, 231An:CCC, 231Be:CCC, 231Cc:CCC, 231Cd:CCC, 232Ad:???, 232Br:???, 232Bt:???, M221Aa:CCC, M221Ab:CCC, M221Ac:CCC, M221Be:CCC, M221Ca:CCC, M221Cb:CCC, M221Cc:CCP, M221Cd:CCC, M221Ce:CCP, M221Da:CCC, M221Db:CCC, M221Dc:CCC, M221Dd:CCC

**USFS Ecoregions (2007):** 221Da:CCC, 221Ej:CCC, 221En:CC?, 221Ha:CCC, 221Hb:CCP, 221Hc:CCC, 221He:CC?, 221J:CC, 223Dg:CCC, 223Eg:CCC, 231Bd:CCC, 231Be:CCC, 231Ce:CCC, 231Cd:CCC, 231Ib:CCC, 231Ic:CCC, 231If:CCC, 232Ad:P??, 232Ha:PP?, 232Hd:PPP, 232Je:PP?, M221Aa:CCP, M221Ab:CCC, M221Ac:CCC, M221Be:CCC, M221Ca:CCC, M221Cb:CCC, M221Cc:CCP, M221Cd:CCC, M221Ce:CCP, M221Da:CCC, M221Db:CCC, M221Dc:CCC, M221Dd:CCC

**Federal Lands:** BIA (Eastern Band of Cherokee); NPS (Abe Lincoln Birthplace, Appalachian Trail [Central Appalachians], Appalachian Trail [Southern Blue Ridge], Appomattox Court House, Big South Fork, Blue Ridge Parkway?, Bluestone, Booker T. Washington, C&O Canal, Cumberland Gap, Fredericksburg-Spotsylvania, Gauley River, George Washington Parkway, Gettysburg, Great Smoky Mountains, Guilford Courthouse, Kings Mountain, Little River Canyon, Mammoth Cave, Manassas, Natchez Trace, National Capital-East, New River Gorge, Obed River, Prince William, Rock Creek, Shenandoah, Shiloh, Thomas Stone, Wolf Trap); TVA (Tellico); USFS (Bankhead, Chattahoochee, Chattahoochee (Piedmont), Chattahoochee (Southern Blue Ridge), Cherokee, Daniel Boone, George Washington, Jefferson, Monongahela, Sumter, Sumter (Mountains), Sumter (Piedmont), Uwharrie?); USFWS (Patuxent)

#### ELEMENT SOURCES

**Great Smoky Mountains National Park Plots:** GRSM.561.

**Great Smoky Mountains National Park Description Author(s):** K.D. Patterson

**Global Description Author(s):** M. Andreu, M. Tukman, J.P. Vanderhorst, K.D. Patterson and S.C. Gawler

**References:** Allard 1990, Andreu and Tukman 1995, Burns and Honkala 1990a, Collins and Anderson 1994, Coxe 2009, Eyre 1980, Faller 1975, Fike 1999, Fleming and Coulling 2001, Fleming and Moorhead 2000, Fleming and Weber 2003, Hall and Mathews 1974, Harrison 2004, Harrison, J. pers. comm., Homoya et al. 1988, Lea et al. 2012, Nelson 1986, Nordman et al. 2011, Patterson 2008a, Patterson 2008b, Patterson 2008e, Patterson et al. 1999, Perles et al. 2006c, Pyne et al. 2010, Schmalzer and DeSelm 1982, Schotz et al. 2008, Shreve et al. 1910, Southeastern Ecology Working Group n.d., TNC 1998c, Taverna and Patterson 2008, Vanderhorst 2001b, Vanderhorst et al. 2007, Vanderhorst et al. 2008, Vanderhorst et al. 2010, White 2006, White and Govus 2005, White and Pyne 2003, Windisch 2014a, Young et al. 2006, Young et al. 2009

**A3228 *Liriodendron tulipifera* - *Juglans nigra* - *Robinia pseudoacacia* Ruderal Forest Alliance**

Tuliptree - Black Walnut - Black Locust Ruderal Forest Alliance

**Ruderal Tuliptree - Black Walnut - Black Locust Forest****ALLIANCE CONCEPT**

**Summary:** This alliance includes deciduous forests dominated by *Gleditsia triacanthos*, *Juglans nigra*, *Liriodendron tulipifera*, or *Robinia pseudoacacia* primarily in areas which were once clearcut, old fields, or cleared by fire or other natural disturbances, and then planted to these species, but with no regular maintenance. Three suballiances are recognized based on dominant species: (1) *Liriodendron tulipifera* stands occur on old clearcut sites and old fields. This suballiance includes pure, often even-aged stands of *Liriodendron tulipifera*. Associated species vary with geographic location. Throughout most of the range of this suballiance *Acer rubrum*, *Robinia pseudoacacia*, *Betula lenta*, *Acer saccharum*, and *Acer negundo* are common components. (2) *Juglans nigra* - *Gleditsia triacanthos* stands are often associated with former homesites or other disturbances on fertile alluvial deposits. Associated canopy trees vary from site to site and can include *Liriodendron tulipifera*, *Juglans cinerea*, *Robinia pseudoacacia*, *Fraxinus americana*, *Ulmus americana*, *Platanus occidentalis*, *Acer saccharum*, *Acer nigrum*, and *Morus rubra*. The shrub layer may or may not be well-developed; common species include *Asimina triloba*, *Viburnum prunifolium*, *Lindera benzoin*, *Corylus americana*, and the exotic invasive *Rosa multiflora*. (3) *Robinia pseudoacacia* stands occur in pure stands or makes up the majority of the canopy. These are short-lived forests that typically result from planting or invasion following land abandonment or fire, or from other severe disturbance.

**Classification Comments:** This type is often planted, but sites are not maintained by regular human activity, so they have native and naturalized species that establish. Non-planted stands may have an overall composition that resembles stands in *Acer rubrum* - *Prunus serotina* - *Pinus strobus* Ruderal Forest Alliance (A3229).

**Similar Alliances:**

- *Acer rubrum* - *Prunus serotina* - *Pinus strobus* Ruderal Forest Alliance (A3229) is a successional stage following abandonment, rather than directly originating from abandoned plantings of these species.

**Diagnostic Characteristics:** This alliance includes pure, often even-aged, and often planted, but not maintained stands of *Liriodendron tulipifera*, *Robinia pseudoacacia*, *Gleditsia triacanthos*, or *Juglans nigra*, as well as mixed forests of these species with other species favored by human-caused disturbances. Associated species vary with geographic location. Throughout most of the range of this alliance, *Acer rubrum*, *Betula lenta*, *Acer saccharum*, and *Acer negundo* are common components.

**ALLIANCE DESCRIPTION**

**Environment:** These forests often occur in areas which were once clearcut, old fields, or cleared by fire or other natural disturbances, and then planted to these species, but with no regular maintenance.

**Vegetation:** This alliance includes deciduous forests dominated by *Gleditsia triacanthos*, *Juglans nigra*, *Liriodendron tulipifera*, or *Robinia pseudoacacia*. Three suballiances are recognized based on dominant species: (1) *Liriodendron tulipifera* stands occur on old clearcut sites and old fields. This alliance includes pure, often even-aged stands of *Liriodendron tulipifera*. Associated species vary with geographic location. Throughout most of the range of this alliance, *Acer rubrum*, *Robinia pseudoacacia*, *Betula lenta*, *Acer saccharum*, and *Acer negundo* are common components. (2) *Juglans nigra* - *Gleditsia triacanthos* stands are often associated with former homesites or other disturbances on fertile alluvial deposits. Associated canopy trees vary from site to site and can include *Liriodendron tulipifera*, *Juglans cinerea*, *Robinia pseudoacacia*, *Fraxinus americana*, *Ulmus americana*, *Platanus occidentalis*, *Acer saccharum*, *Acer nigrum*, and *Morus rubra*. *Sassafras albidum* and/or *Carpinus caroliniana* may be present as small trees. The shrub layer may or may not be well-developed; common species include *Asimina triloba*, *Viburnum prunifolium*, *Lindera benzoin*, *Corylus americana*, and the exotic invasive *Rosa multiflora*. The herb layer is variable, often with one or a few species providing most of the cover. *Verbesina alternifolia* (within its range) and *Ageratina altissima* are characteristic and may be dominant. The invasive exotics *Microstegium vimineum*, *Alliaria petiolata*, and *Polygonum cespitosum* can be common in this community. (3) *Robinia pseudoacacia* stands are often mono-dominant. These are short-lived forests that typically result from planting or invasion following land abandonment or fire, or from other severe disturbance. Stands are usually small (10-15 ha [30-40 acres]), with associated species varying widely depending on geography and habitat.

**Floristics:** This alliance includes deciduous forests dominated by *Gleditsia triacanthos*, *Juglans nigra*, *Liriodendron tulipifera*, or *Robinia pseudoacacia*. Three suballiances are recognized based on dominant species: (1) *Liriodendron tulipifera* stands occur on old clearcut sites and old fields. This alliance includes pure, often even-aged stands of *Liriodendron tulipifera*. Associated species vary with geographic location. Throughout most of the range of this alliance, *Acer rubrum*, *Robinia pseudoacacia*, *Betula lenta*, *Acer saccharum*, and *Acer negundo* are common components. (2) *Juglans nigra* - *Gleditsia triacanthos* stands are often associated with former homesites or other disturbances on fertile alluvial deposits. Associated canopy trees vary from site to site and can include *Liriodendron tulipifera*, *Juglans cinerea*, *Robinia pseudoacacia*, *Fraxinus americana*, *Ulmus americana*, *Platanus occidentalis*, *Acer saccharum*, *Acer nigrum*, and *Morus rubra*. *Sassafras albidum* and/or *Carpinus caroliniana* may be present as small trees. The shrub layer may or may not be well-developed; common species include *Asimina triloba*, *Viburnum prunifolium*, *Lindera benzoin*, *Corylus americana*, and the exotic invasive *Rosa multiflora*. The herb layer is variable, often with one or a few species providing most of the cover. *Verbesina alternifolia* (within its range) and *Ageratina altissima* are characteristic and may be dominant. The invasive exotics *Microstegium vimineum*, *Alliaria petiolata*, and *Polygonum cespitosum* can be common in this community. (3) *Robinia pseudoacacia* stands are often mono-dominant. These are short-lived forests that typically result from planting or invasion following land

abandonment or fire, or from other severe disturbance. Stands are usually small (10-15 ha [30-40 acres]), with associated species varying widely depending on geography and habitat.

**Dynamics:** These forests may not persist with the current set of dominant tree species after the first generation of trees dies, but the direction of long-term development is unclear.

#### ALLIANCE DISTRIBUTION

**Range:** Forests in this alliance are found locally throughout the eastern United States and in extreme southeastern Canada on a wide range of disturbed sites.

**Nations:** CA,US

**Subnations:** AL, AR, DC, DE, GA, IA, IL, IN, KY, LA, MA, MD, MI, MO, MS, NC, NJ, NY, OH, OK, ON, PA, SC, TN, VA, VT, WV

#### ALLIANCE SOURCES

**References:** Faber-Langendoen et al. 2019b

**Author of Concept:** Faber-Langendoen et al. 2019b

**Author of Description:** D. Faber-Langendoen, in Faber-Langendoen et al. (2013)

### [CEGL004184] *Crataegus punctata* - *Crataegus flabellata* Ruderal Forest

Translated Name: **Dotted Hawthorn - Fanleaf Hawthorn Ruderal Forest**

Common Name: **Southern & Central Appalachian Ruderal Hawthorn Forest**

#### USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Eastern North American Ruderal Forest (M013)
Group	Eastern North American Native Ruderal Forest (G030)
Alliance	<i>Liriodendron tulipifera</i> - <i>Juglans nigra</i> - <i>Robinia pseudoacacia</i> Ruderal Forest Alliance (A3228)

#### ELEMENT CONCEPT

**Global Summary:** Stands of this ruderal orchard-like open to closed-canopy woodland are dominated by *Crataegus punctata* and *Crataegus flabellata*. In addition, *Amelanchier laevis* and *Prunus pensylvanica* may be present in the canopy. Some dominant tall herbs include *Ageratina altissima* var. *roanensis*, *Angelica triquinata*, *Helenium autumnale*, and *Solidago puberula*. Open-canopied stands may have *Rubus allegheniensis* or shrubs beneath.

#### ENVIRONMENTAL DESCRIPTION

**Global Environment:** The environment of this association is essentially similar to that of high-elevation northern red oak forests of the Southern Appalachians and southern portion of the Central Appalachians, at elevations of 1000-1525 m (3200-5000 feet). Vegetation typically occurs over well-drained, loamy soils underlain by Precambrian gneisses, schists and granites. These soils are classified as Typic, Umbric, or Lithic Dystrochrepts, and Typic Haplumbrepts (Golden 1974). Vegetation could occur on most of the major mountain ranges within its range, on broad ridges and mid to upper slopes. Moisture regimes are typically dry-mesic to mesic.

#### VEGETATION DESCRIPTION

**Global Vegetation:** Stands of this forest are dominated by *Crataegus punctata* and *Crataegus flabellata*. The tree and tall-shrub stratum is 5 to 15 m tall and ranges from approximately 25-60% cover. In addition, *Amelanchier laevis* and *Prunus pensylvanica* may be present in the canopy. Some dominant tall herbs include *Ageratina altissima* var. *roanensis*, *Angelica triquinata*, *Helenium autumnale*, and *Solidago puberula*. If stands have an open canopy, they may have *Rubus allegheniensis* or shrubs beneath; or they may have residual grasses and graminoids, either *Danthonia compressa*, *Agrostis perennans*, *Carex pensylvanica*, and/or *Phleum pratense*. Some other dominant tall forbs include *Eurybia chlorolepis* and/or *Oclemena acuminata*.

**Global Dynamics:** This vegetation is transitional between, and located adjacent to, high-elevation northern red oak forests and grass/shrub balds. It is distinctive from either of these, having a composition different from northern red oak forests, and a physiognomy distinctive from grass and shrub balds. It may arise from the relaxation of grazing pressure and other management actions in the grassy balds, or it could have arisen from removal of northern red oak, under which an understory of *Crataegus* may occur.

#### MOST ABUNDANT SPECIES

##### Global

##### Stratum

Tree canopy

Shrub/sapling (tall & short)

Herb (field)

##### Lifeform

Broad-leaved deciduous tree

Broad-leaved deciduous shrub

Flowering forb

##### Species

*Crataegus flabellata*, *Crataegus punctata*

*Rubus allegheniensis*

*Ageratina altissima* var. *roanensis*, *Angelica triquinata*, *Helenium autumnale*, *Solidago puberula*

#### CHARACTERISTIC SPECIES

**Global:** *Amelanchier laevis*, *Crataegus flabellata*, *Crataegus punctata*, *Prunus pensylvanica*

**OTHER NOTEWORTHY SPECIES**

**Global: Vulnerable Plants:** *Ageratina altissima* var. *roanensis* (G5T3T4)

**CONSERVATION STATUS RANK**

**Global Rank & Reasons:** GNA (ruderal) (4-Nov-2010). This type has increased in its cover and abundance because of the reduction of fire frequency and grazing intensity. It may arise from the relaxation of grazing pressure and other management actions in the grassy balds, or it could have arisen from removal of northern red oak, under which an understory of *Crataegus* may occur.

**RELATED CONCEPTS****Global Similar Types:**

- *Quercus rubra* / *Carex pensylvanica* - *Ageratina altissima* var. *roanensis* Forest (CEGL007298)

**CLASSIFICATION**

**Status:** Standard

**Classification Confidence:** 3 - Weak

**Global Classification Comments:** This type has increased in its cover and abundance because of the reduction of fire frequency and grazing intensity. Stands only seem to be found where the grazing effects are particularly strong, where grazing was unusually heavy, prolonged, or recent. For conservation target purposes, it can be treated as a complex with the other shrub and grass bald types with which it typically co-occurs, or conversely as a component of the adjacent northern hardwoods forest.

**ELEMENT DISTRIBUTION**

**Global Range:** This vegetation is found on the higher elevations of major mountain ranges in the Southern and Central Appalachians.

**Nations:** US

**States/Provinces:** NC, TN, VA, WV

**TNC Ecoregions:** 51:C, 59:C

**USFS Ecoregions (1994/95):** M221Aa:CCC, M221Ab:CCC, M221Ba:CCC, M221Cc:CC?, M221Ce:CCC, M221Da:CCC, M221Dc:CCC, M221Dd:CCC

**USFS Ecoregions (2007):** M221Aa:CCP, M221Ab:CCC, M221Ba:CCC, M221Cc:CC?, M221Ce:CCP, M221Da:CCC, M221Dc:CCC, M221Dd:CCC

**Federal Lands:** BIA (Eastern Band of Cherokee?); NPS (Appalachian Trail [Central Appalachians], Appalachian Trail [Southern Blue Ridge], Blue Ridge Parkway?, Great Smoky Mountains, Shenandoah?); USFS (Cherokee, George Washington?, Jefferson?, Nantahala?, Pisgah)

**ELEMENT SOURCES**

**Global Description Author(s):** C. Nordman and M. Pyne

**References:** Golden 1974, Govus pers. comm., Kartesz 1999, Schafale pers. comm., Southeastern Ecology Working Group n.d., Weakley 2010, Weakley pers. comm., Young et al. 2009

**[CEGL007879] *Juglans nigra* / *Verbesina alternifolia* Ruderal Forest**

Translated Name: **Black Walnut / Wingstem Ruderal Forest**

Common Name: **Ruderal Black Walnut Forest**

**USNVC CLASSIFICATION**

Division Eastern North American Forest & Woodland (1.B.2.Na)

Macrogroup Eastern North American Ruderal Forest (M013)

Group Eastern North American Native Ruderal Forest (G030)

Alliance *Liriodendron tulipifera* - *Juglans nigra* - *Robinia pseudoacacia* Ruderal Forest Alliance (A3228)

**ELEMENT CONCEPT**

**Global Summary:** This successional black walnut forest of the eastern United States occurs in a variety of habitats, all associated with disturbance, and frequently associated with rich or circumneutral soils, usually having a neutral to basic pH. These habitats include ridgetops, slopes, floodplains, alluvial terraces, and the floors of sinkholes. These are all generally areas that were cleared for agriculture or homesites. It has been documented from various-sized drainages. The community was originally defined from former homesites in Great Smoky Mountains National Park, where this association is an open, successional forest. It has since been found on some old pasture sites, associated with former settlements, from Georgia northeast to Pennsylvania, and is potentially a wide-ranging type. It has also been sampled from the floors of sinkholes and other related areas at Mammoth Cave National Park. The canopy can be closed to somewhat open. *Juglans nigra* forms at least half of the canopy and is often the sole canopy tree. Associated canopy trees vary from site to site and can include *Liriodendron tulipifera*, *Juglans cinerea*, *Robinia pseudoacacia*, *Fraxinus americana*, *Ulmus americana*, *Platanus occidentalis*, *Acer saccharum*, *Acer nigrum*, *Morus rubra*, and *Aesculus flava*. Additional tree species in the subcanopy can include *Carya cordiformis* and *Celtis occidentalis*. *Sassafras albidum* and/or *Carpinus caroliniana* may be present as small trees. The shrub layer may or may not be well-developed; common species include *Asimina triloba*, *Viburnum prunifolium*, *Lindera benzoin*, *Corylus americana*, and the exotic invasive *Rosa multiflora*. The herb layer is variable, often with one or a few species providing most of the cover. *Verbesina alternifolia* (within its range) and *Ageratina altissima* are characteristic and may be

dominant; other herbs include *Ambrosia trifida*, *Amphicarpaea bracteata*, *Agrimonia pubescens*, *Apios americana*, *Cryptotaenia canadensis*, *Galium triflorum*, *Osmorhiza longistylis*, *Dichanthelium clandestinum*, *Packera aurea*, *Polygonum virginianum*, *Rudbeckia laciniata*, *Podophyllum peltatum*, *Impatiens capensis*, *Circaea lutetiana ssp. canadensis*, *Viola striata*, and *Ambrosia trifida*. The invasive exotics *Microstegium vimineum*, *Alliaria petiolata*, *Rosa multiflora*, and *Polygonum cespitosum* can be common in this community.

#### ENVIRONMENTAL DESCRIPTION

**Great Smoky Mountains National Park Environment:** This community was sampled on former homesites along streams, possibly in association with circumneutral soils, at 1500-2000 feet elevation. So far it has only been seen in areas where old homesites are present. The "circumneutral" soils, therefore, might be an artifact of the enrichment of the soil from livestock and other anthropogenic nutrient input.

**Global Environment:** This successional community occurs in a variety of habitats, all associated with disturbance, and frequently associated with rich or circumneutral soils. These habitats include ridgetops, slopes, floodplains, alluvial terraces, and the floors of sinkholes. These are all generally areas that were cleared for agriculture or homesites. It has been sampled on former homesites along streams at 460-610 m (1500-2000 feet) elevation in the Smokies, as well as on ridgetops, slopes, and stream areas in the Cumberlands, Alleghenies, and Central Appalachians at 430-1070 m (1400-3500 feet). In addition, the association was sampled from the Piedmont of South Carolina in low-lying, poor-drainage areas from approximately 170-200 m (550-650 feet) in elevation. At Mammoth Cave National Park, it was most frequently sampled from terraces in the bottoms of sinkholes. Along the Delaware River and nearby waters, the substrate varies from silt loam to gravelly sandy loams.

#### VEGETATION DESCRIPTION

**Great Smoky Mountains National Park Vegetation:** *Juglans nigra* is usually the sole canopy tree in this open, successional forest. Occasionally *Liriodendron tulipifera* codominates. Canopy trees are around 30 cm in diameter. The herb stratum is dominated by *Verbesina alternifolia*. Other herbs include *Amphicarpaea bracteata* and *Ambrosia trifida*. Both *Verbesina alternifolia* and *Microstegium vimineum* are very common in this community. It is possible that high populations of deer such as those in the Smokies reduce competition for these plants and increase their dominance since deer do not eat either of these species but eat many of the other species which would potentially grow on these sites (K. Langdon pers. comm.).

**Global Vegetation:** The canopy can be closed to somewhat open. *Juglans nigra* forms at least half of the canopy and is often the sole canopy tree. Associated canopy trees vary from site to site and can include *Liriodendron tulipifera*, *Juglans cinerea*, *Robinia pseudoacacia*, *Fraxinus americana*, *Ulmus americana*, *Platanus occidentalis*, *Acer saccharum*, *Acer nigrum*, *Morus rubra*, and *Aesculus flava*. Additional tree species in the subcanopy can include *Carya cordiformis* and *Celtis occidentalis*. *Sassafras albidum* and/or *Carpinus caroliniana* may be present as small trees. The shrub layer may or may not be well-developed; common species include *Asimina triloba*, *Viburnum prunifolium*, *Lindera benzoin*, *Corylus americana*, and the exotic invasive *Rosa multiflora*. The herb layer is variable, often with one or a few species providing most of the cover. *Verbesina alternifolia* (within its range) and *Ageratina altissima* are characteristic and may be dominant; other herbs include *Amphicarpaea bracteata*, *Agrimonia pubescens*, *Apios americana*, *Cryptotaenia canadensis*, *Galium triflorum*, *Osmorhiza longistylis*, *Dichanthelium clandestinum*, *Packera aurea*, *Polygonum virginianum*, *Rudbeckia laciniata*, *Podophyllum peltatum*, *Impatiens capensis*, *Circaea lutetiana ssp. canadensis*, *Viola striata*, and *Ambrosia trifida*. The invasive exotics *Microstegium vimineum*, *Alliaria petiolata*, and *Polygonum cespitosum* can be common in this community.

**Global Dynamics:** Since this community is the product of an anthropogenic catastrophic disturbance, the canopy is likely to change drastically as new species of trees colonize gaps left by senescent walnuts. *Juglans nigra* may obtain canopy dominance it is resistant to grazing pressure on young seedlings due to the unpalatable juglone present in the leaves and stems. This allelopathic compound also inhibits the growth of *Rubus argutus*, *Rubus allegheniensis*, and other related species (blackberries), which would help keep the shrub layer open and reduce species diversity.

#### MOST ABUNDANT SPECIES

##### Great Smoky Mountains National Park

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Broad-leaved deciduous tree	<i>Juglans nigra</i>
Herb (field)	Flowering forb	<i>Verbesina alternifolia</i>

##### Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Broad-leaved deciduous tree	<i>Juglans nigra</i>
Herb (field)	Flowering forb	<i>Verbesina alternifolia</i>

#### CHARACTERISTIC SPECIES

**Great Smoky Mountains National Park:** *Juglans nigra*, *Rosa multiflora*, *Verbesina alternifolia*

**Global:** *Cercis canadensis*, *Juglans nigra*, *Rosa multiflora*, *Verbesina alternifolia*

#### OTHER NOTEWORTHY SPECIES

**Great Smoky Mountains National Park: Invasive/Exotic Plants:** *Rosa multiflora* (Medium/Low)

**Global: Invasive/Exotic Plants:** *Alliaria petiolata* (High/Medium), *Microstegium vimineum* (High/Medium), *Polygonum cespitosum*, *Rosa multiflora* (Medium/Low)

#### CONSERVATION STATUS RANK

**Global Rank & Reasons:** GNA (ruderal) (2-Apr-2001). This association represents vegetation created by anthropogenic disturbance and is thus not a conservation priority.

#### RELATED CONCEPTS

##### Global Similar Types:

- *Prunus serotina* - *Liriodendron tulipifera* - *Acer rubrum* - *Fraxinus americana* - (*Robinia pseudoacacia*) Ruderal Forest (CEGL006599) is a modified successional forest that may also have a large component of *Juglans nigra* and occurs on disturbed sites, but it is largely dominated by early-successional trees in the canopy.

##### Global Related Concepts:

- *Juglans nigra* - *Robinia pseudoacacia* / *Lonicera japonica* / *Verbesina alternifolia* Association (Rawinski et al. 1996) =

#### CLASSIFICATION

**Status:** Standard

**Classification Confidence:** 3 - Weak

**Global Classification Comments:** This association was originally described from Great Smoky Mountains National Park where this association can be distinguished with aerial photography.

#### ELEMENT DISTRIBUTION

**Great Smoky Mountains National Park Range:** This community was sampled on the Mount Le Conte and Noland Creek quadrangles and was not sampled on the Cades Cove quadrangle. It is likely in other areas of the park. On the Mount Le Conte quadrangle, this community was sampled on flats along Baskins Creek and was observed on other former homesites in the northern half of the quadrangle. In the Noland Creek quadrangle, it was observed along Goldmine Branch near the confluence with Fontana Lake.

**Global Range:** This association is currently known from Georgia and the Carolinas to Tennessee and Kentucky, north to Pennsylvania and New Jersey where *Juglans nigra* is near the northern end of its range. It may range into adjacent states.

**Nations:** US

**States/Provinces:** GA, KY, MD, NC, NJ, NY?, PA, SC, TN, VA, WV

**TNC Ecoregions:** 44:C, 50:C, 51:C, 52:C, 59:C, 60:C, 61:C

**USFS Ecoregions (1994/95):** 212Fc:CCC, 221Bd:CCC, 221Hc:CCC, 221Ja:C??, 222Dg:CCC, 231Aa:PPP, 231Ae:PPP, M221Bb:CCC, M221Be:CCC, M221Cc:CCC, M221Ce:CCC, M221Dd:CCC

**USFS Ecoregions (2007):** 211Fc:CCC, 221Bd:CCP, 221Hc:CCC, 221Ja:C??, 223Dg:CCC, 231Aa:PPP, 231Ic:PPP, M221Bb:CCC, M221Be:CCC, M221Cc:CCC, M221Ce:CCP, M221Dd:CCC

**Federal Lands:** BIA (Eastern Band of Cherokee); NPS (Antietam, Appalachian Trail [Central Appalachians], Appalachian Trail [Lower New England], Appalachian Trail [Southern Blue Ridge], Appomattox Court House, Big South Fork, Blue Ridge Parkway, Bluestone, C&O Canal, Chickamauga-Chattanooga, Colonial, Cumberland Gap, Delaware Water Gap, Great Smoky Mountains, Harpers Ferry, Kings Mountain, Mammoth Cave, Manassas, Monocacy, Ninety Six, Richmond); USFS (Monongahela)

#### ELEMENT SOURCES

**Great Smoky Mountains National Park Description Author(s):** K.D. Patterson, mod. R. White

**Global Description Author(s):** K.D. Patterson, R. White, S.C. Gawler, and M. Pyne

**References:** Holman pers. comm., Lea 2004, NatureServe Ecology - Southeastern U.S. unpubl. data, Patterson 2008a, Patterson 2008c, Patterson 2008f, Peet et al. unpubl. data, Perles et al. 2007, Pyne et al. 2010, Rawinski et al. 1996, Southeastern Ecology Working Group n.d., Vanderhorst et al. 2008, White 2006, White and Govus 2003, White and Govus 2005

#### [CEGL007184] *Liriodendron tulipifera* - *Acer negundo* Ruderal Forest

Translated Name: **Tuliptree - Box-elder Ruderal Forest**

Common Name: **Ruderal Tuliptree Bottomland Forest**

#### USNVC CLASSIFICATION

Division Eastern North American Forest & Woodland (1.B.2.Na)

Macrogroup Eastern North American Ruderal Forest (M013)

Group Eastern North American Native Ruderal Forest (G030)

Alliance *Liriodendron tulipifera* - *Juglans nigra* - *Robinia pseudoacacia* Ruderal Forest Alliance (A3228)

#### ELEMENT CONCEPT

**Global Summary:** This association includes successional wet to mesic forests occurring in bottoms and on low slopes of the Appalachians and Interior Low Plateau. This vegetation is probably extensive in the Ridge and Valley, Interior Low Plateau, and related provinces. Related vegetation is possible in the Chesapeake Bay region. These stands are apparently successional following intensive timber removal and also occur on old pastures. Examples are generally dominated by *Acer negundo* and *Liriodendron*

*tulipifera*; however, the canopy composition is diverse and variable. In some examples, *Acer rubrum* may also contribute to the canopy cover. *Asimina triloba* is present in the subcanopy or shrub strata where it makes up 5-50% of the total cover. *Liriodendron tulipifera* may share dominance with *Acer rubrum* in the canopy of some examples. The exotic grass *Microstegium vimineum* often dominates the herbaceous layer.

#### ENVIRONMENTAL DESCRIPTION

**Global Environment:** These successional wet to mesic forests occur in bottoms and on low slopes of the Appalachians and Interior Low Plateau. These stands are apparently successional following intensive timber removal and also occur on old pastures. This forest occurs along intermittent streams draining into Tellico Lake and on slopes of intermittent to ephemeral draws on the higher reaches of these streams (Andreu and Tukman 1995). Species composition was found to vary between these two topographic situations. This type represents mesic forest succession on areas cleared prior to Tellico Lake creation in 1979. Possible environments for this semi-natural type include streambanks, flat bottoms, upland mountain benches below 915 m (3000 feet), middle to lower slopes, sheltered coves and gentle concave slopes, and river terraces over various soils and geologies. This element may actually represent a combination of temporarily flooded (stands with *Acer negundo*) and upland (stands with *Acer rubrum*) components.

#### VEGETATION DESCRIPTION

**Global Vegetation:** Examples of this community have diverse and variable canopies, generally dominated by *Acer negundo* and *Liriodendron tulipifera* (Andreu and Tukman 1995). In some examples, *Acer rubrum* may also contribute to the canopy cover. *Asimina triloba* is present in the subcanopy or shrub strata where it makes up 5-50% of the total cover. *Liriodendron tulipifera* may share dominance with *Acer rubrum* in the canopy of some examples. The exotic grass *Microstegium vimineum* often dominates the herbaceous layer.

#### MOST ABUNDANT SPECIES

##### Global

##### Stratum

Tree canopy

Tall shrub/sapling

Herb (field)

##### Lifeform

Broad-leaved deciduous tree

Broad-leaved deciduous shrub

Graminoid

##### Species

*Acer negundo*, *Liriodendron tulipifera*

*Asimina triloba*

*Microstegium vimineum*

#### CHARACTERISTIC SPECIES

**Global:** *Acer negundo*, *Asimina triloba*, *Liriodendron tulipifera*

#### OTHER NOTEWORTHY SPECIES

**Global: Invasive/Exotic Plants:** *Microstegium vimineum* (High/Medium)

#### CONSERVATION STATUS RANK

**Global Rank & Reasons:** GNA (ruderal) (14-Dec-2012). This is a successional forest composed of species native to North America. It is not a rare forest type and is considered semi-natural.

#### RELATED CONCEPTS

##### Global Similar Types:

- *Liriodendron tulipifera* - *Acer negundo* - (*Platanus occidentalis*) / *Carpinus caroliniana* / *Polygonum virginianum* Floodplain Forest (CEGL006492)
- *Liriodendron tulipifera* - *Pinus taeda* Ruderal Forest (CEGL007521)
- *Liriodendron tulipifera* - *Quercus* spp. Ruderal Forest (CEGL007221)

##### Global Related Concepts:

- *Acer negundo* - *Liriodendron tulipifera* (Andreu and Tukman 1995) >

#### CLASSIFICATION

**Status:** Standard

**Classification Confidence:** 3 - Weak

**Global Classification Comments:** This element may actually represent a combination of temporarily flooded (stands with *Acer negundo*) and upland (stands with *Acer rubrum*) components. Described from Tellico Pilot Project (Ridge and Valley of northeastern Monroe County, Tennessee; 31 stands sampled), where this forest occurs along intermittent streams draining into Tellico Lake and on slopes of intermittent to ephemeral draws on the higher reaches of these streams (Andreu and Tukman 1995). Species composition was found to vary between these two topographic situations. This type represents mesic forest succession on areas cleared prior to Tellico Lake creation in 1979.

#### ELEMENT DISTRIBUTION

**Global Range:** This type is found in the Appalachians and Interior Low Plateau from Maryland and Pennsylvania west and south to Kentucky and Tennessee.

**Nations:** US

**States/Provinces:** KY?, MD, NC, PA, TN, WV?

**TNC Ecoregions:** 44:C, 50:C, 58:?, 59:C

**USFS Ecoregions (1994/95):** 221Hc:C??, 221He:C??, 221Jb:CCC, 222Eb:CCC, 222Ed:CCP, M221Aa:CCC, M221Ac:CCC, M221Ad:CCC, M221Bb:CCC, M221D:C?

**USFS Ecoregions (2007):** 221Hc:C??, 221He:C??, 221Jb:CCC, 223Eb:CCC, 223Ed:CCP, M221Aa:CCP, M221Ac:CCC, M221Ad:CCC, M221Bb:CCC, M221D:C?

**Federal Lands:** BIA (Eastern Band of Cherokee); NPS (Chickamauga-Chattanooga?, Great Smoky Mountains); TVA (Tellico); USFS (Cherokee?)

#### ELEMENT SOURCES

**Global Description Author(s):** R.E. Evans

**References:** Andreu and Tukman 1995, Andreu and Tukman 1995, Fike 1999, Harrison 2004, Harrison 2011, Southeastern Ecology Working Group n.d., Vanderhorst 2000b

### [CEGL007219] *Liriodendron tulipifera* - *Acer rubrum* - *Robinia pseudoacacia* Ruderal Forest

Translated Name: **Tuliptree - Red Maple - Black Locust Ruderal Forest**

Common Name: **Appalachian Ruderal Hardwood Forest**

#### USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Eastern North American Ruderal Forest (M013)
Group	Eastern North American Native Ruderal Forest (G030)
Alliance	<i>Liriodendron tulipifera</i> - <i>Juglans nigra</i> - <i>Robinia pseudoacacia</i> Ruderal Forest Alliance (A3228)

#### ELEMENT CONCEPT

**Global Summary:** This early-successional or semi-natural vegetation occurs at approximately 700-1220 m (2300-4000 feet) elevation in the southern Appalachian Mountains and Appalachian Plateaus. Examples are typical of areas which were once clearcut, old fields, strip-mined, graded for road construction, or otherwise cleared. Stands are typically revegetated from root and stump sprouts and wind dispersed seeds. Stands have canopies which are typically dominated by *Liriodendron tulipifera* and *Acer rubrum*, with lesser amounts of *Robinia pseudoacacia*. *Robinia pseudoacacia* is listed as a nominal to indicate the Appalachian distribution of this type. Associated species may vary. Some examples may contain *Pinus virginiana*. Tall shrubs (*Rhododendron periclymenoides*, *Rhododendron calendulaceum*, *Kalmia latifolia*, *Calycanthus floridus*) sprout from root stocks and occur as scattered, dense clumps, while shorter shrubs (*Gaylussacia ursina*, *Leucothoe fontanesiana*, *Rubus* spp., *Vaccinium* spp.) can have dense, continuous cover. Composition of the herbaceous stratum varies with site conditions and moisture regime and may contain field-adapted species, tolerant of high light intensities, as well as many shade-tolerant forest herbs. *Lycopodium digitatum* may also form dense cover.

#### ENVIRONMENTAL DESCRIPTION

**Great Smoky Mountains National Park Environment:** This forest is found on low slopes and flats, typically below 3000 feet elevation and particularly in areas of heavy settlement or past logging or farming activities. It also can occur in isolated patches on steep slopes in areas where road construction destroyed the previous community and the slope was regraded.

**Global Environment:** This community occurs on gentle to moderately steep, middle to upper slopes at approximately 700-1220 m (2300-4000 feet) elevation. Important environmental factors, such as solar irradiation, soil moisture/temperature, and air temperature, vary within and between sites and are related to the size of the opening, age of the stand, and slope direction (Phillips and Shure 1990). Soils are primarily Hapludults and Dystrochrepts. This successional forest occurs on upland areas in the southern Appalachian Mountains and Appalachian Plateaus. It typically occurs as 8- to 16-ha patches in the landscape. These forests are typical of areas which were once clearcut, old fields, strip-mined, or cleared by fire or other natural disturbances.

#### VEGETATION DESCRIPTION

**Great Smoky Mountains National Park Vegetation:** This forest has a canopy strongly dominated by *Liriodendron tulipifera*. Other canopy and subcanopy species include *Acer rubrum*, *Robinia pseudoacacia*, *Acer saccharum*, *Halesia tetraptera* var. *monticola*, *Pinus strobus*, and *Betula lenta*. Shrubs can be sparse to moderate in coverage, with composition varying from site to site, but often composed of saplings of canopy species. *Tsuga canadensis* and *Quercus* spp. can be dominant in the shrub stratum. Herbaceous cover can be sparse to moderate, with no clear dominant, although *Amphicarpaea bracteata*, *Desmodium nudiflorum*, and *Thelypteris noveboracensis* may be dominant in patches. Vines are common and often abundant. Typical vine species are *Aristolochia macrophylla*, *Parthenocissus quinquefolia*, *Smilax glauca*, *Smilax rotundifolia*, *Toxicodendron radicans* ssp. *radicans*, and *Vitis aestivalis*. A more mesic and nutrient-rich version of this association contained large amounts of *Hydrangea arborescens*, *Impatiens pallida*, and *Symphytotrichum prenanthoides*.

**Global Vegetation:** Some stands of this successional vegetation have canopies which are dominated by *Liriodendron tulipifera* and *Acer rubrum*, with lesser amounts of *Robinia pseudoacacia*. Other stands may have *Liriodendron tulipifera* at lower cover, and instead be dominated by a variable combination of other successional hardwoods, including *Acer rubrum*, *Robinia pseudoacacia*, *Sassafras albidum*, *Betula lenta*, *Amelanchier laevis*, *Prunus serotina*, *Nyssa sylvatica*, and/or *Magnolia fraseri*. The subcanopy may contain *Oxydendrum arboreum* and/or *Cornus florida*. Some examples may contain *Pinus virginiana*. Associated species vary. Taller shrubs include *Rhododendron periclymenoides*, *Rhododendron calendulaceum*, *Ilex montana*, *Pyrolaria pubera*, *Kalmia latifolia*, and *Calycanthus floridus*; shorter shrubs include *Gaylussacia ursina*, *Leucothoe fontanesiana*, *Rubus* spp., and *Vaccinium* spp.

Composition of the herbaceous stratum varies with site conditions and moisture regime and may contain field-adapted species which are tolerant of high light intensities, as well as many shade-tolerant forest herbs. *Lycopodium digitatum* may also form dense cover. Most of the regeneration is from stump and root sprouts, however, *Liriodendron tulipifera* establishment is primarily from seedlings. The upper canopy ranges from 5-9 m, but most of the regeneration is in a shrub/sapling layer at 1-3 m. Cover of woody species may be patchy to dense and is characterized by clumps of *Robinia pseudoacacia* and *Acer rubrum*, occurring as stump sprouts. Scattered thickets of evergreen ericads (*Rhododendron* and *Kalmia*) are also typical. Other species occurring as shrubs/saplings include *Calycanthus floridus*, *Halesia carolina*, *Pinus strobus*, *Castanea dentata*, *Prunus serotina*, *Pyralia pubera*, *Sassafras albidum*, *Castanea pumila*, *Hydrangea arborescens*, *Viburnum acerifolium*, *Gaylussacia ursina*, *Rubus* spp., and *Vaccinium* ssp. Short shrubs (<2 m), such as *Gaylussacia ursina*, *Rubus* spp. and, *Vaccinium* ssp., often form a dense, continuous vegetation layer. Herbaceous species and tree seedlings occur in openings and beneath the shrub cover and include ferns (*Thelypteris noveboracensis*, *Dennstaedtia punctilobula*, *Polystichum acrostichoides*, and *Pteridium aquilinum*), other forest forbs (*Potentilla* spp., *Viola* spp., *Ageratina altissima*, Asteraceae spp., *Solidago* spp., *Galium latifolium*, *Lysimachia quadrifolia*, and *Desmodium* spp.) and grasses (*Arundinaria gigantea*, *Panicum* spp., and *Dichanthelium* spp.). Vines are also an important component in these forests with *Vitis* spp., *Smilax* spp., *Parthenocissus quinquefolia*, and *Dioscorea villosa* typical.

**Global Dynamics:** Presumably, individuals arising from sprouts are more susceptible to wind breakage because of constricted vascular tissue at the stump attachment (Phillips and Shure 1990). This is an early-successional forest, on recently cut-over land, dominated by pioneer species. Prior to cutting these areas were dominated by *Pinus strobus* and/or *Quercus* spp. (*Quercus alba*, *Quercus montana*, *Quercus rubra*), occurring with other upland hardwood species such as *Carya* spp. and *Liriodendron tulipifera*. Canopy closure occurs rapidly after time of harvest, and by the fourth year, little unshaded, unvegetated area remains. Mid- and late-successional species will slowly re-establish dominance. Considerable competition of tree species with *Vitis* spp. and *Rhododendron* spp. may affect future stand development on some sites (McGee and Hooper 1970).

#### MOST ABUNDANT SPECIES

##### Great Smoky Mountains National Park

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Broad-leaved deciduous tree	<i>Acer rubrum</i> , <i>Liriodendron tulipifera</i> , <i>Robinia pseudoacacia</i>
Shrub/sapling (tall & short)	Liana	<i>Toxicodendron radicans</i> ssp. <i>radicans</i> , <i>Vitis aestivalis</i>
Short shrub/sapling	Needle-leaved tree	<i>Tsuga canadensis</i>
Short shrub/sapling	Broad-leaved deciduous tree	<i>Acer pensylvanicum</i> , <i>Acer saccharum</i> , <i>Betula lenta</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Quercus</i> spp.
Herb (field)	Liana	<i>Amphicarpaea bracteata</i>
Herb (field)	Flowering forb	<i>Impatiens pallida</i>
Herb (field)	Fern (Spore-bearing forb)	<i>Thelypteris noveboracensis</i>

##### Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Broad-leaved deciduous tree	<i>Acer rubrum</i> , <i>Liriodendron tulipifera</i> , <i>Robinia pseudoacacia</i>
Shrub/sapling (tall & short)	Liana	<i>Smilax</i> spp., <i>Vitis</i> spp.
Tall shrub/sapling	Broad-leaved deciduous tree	<i>Acer rubrum</i> , <i>Magnolia fraseri</i> , <i>Robinia pseudoacacia</i>
Tall shrub/sapling	Broad-leaved deciduous shrub	<i>Calycanthus floridus</i>
Tall shrub/sapling	Broad-leaved evergreen shrub	<i>Kalmia latifolia</i>
Tall shrub/sapling	Shrub	<i>Rhododendron</i> spp.
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Gaylussacia ursina</i> , <i>Rubus</i> spp.
Short shrub/sapling	Shrub	<i>Vaccinium</i> ssp.
Herb (field)	Flowering forb	<i>Ageratina altissima</i> , <i>Potentilla</i> spp., <i>Viola</i> spp., Asteraceae spp.
Herb (field)	Graminoid	<i>Arundinaria gigantea</i> , <i>Dichanthelium</i> spp., <i>Panicum</i> spp.
Herb (field)	Fern (Spore-bearing forb)	<i>Dennstaedtia punctilobula</i> , <i>Thelypteris noveboracensis</i>

#### CHARACTERISTIC SPECIES

**Great Smoky Mountains National Park:** *Acer rubrum*, *Liriodendron tulipifera*, *Robinia pseudoacacia*, *Toxicodendron radicans* ssp. *radicans*, *Vitis aestivalis*

**Global:** *Acer rubrum*, *Betula lenta*, *Castanea dentata*, *Castanea pumila*, *Cornus florida*, *Desmodium* spp., *Dioscorea villosa*, *Galium latifolium*, *Halesia carolina*, *Hydrangea arborescens*, *Liriodendron tulipifera*, *Lysimachia quadrifolia*, *Nyssa sylvatica*, *Parthenocissus quinquefolia*, *Pinus strobus*, *Prunus serotina*, *Pteridium aquilinum*, *Pyralia pubera*, *Robinia pseudoacacia*, *Sassafras albidum*, *Solidago* spp., *Viburnum acerifolium*

#### OTHER NOTEWORTHY SPECIES

**Global: Vulnerable Plants:** *Anemone quinquefolia* var. *minima* (G5T3), *Isotria medeoloides* (G2G3)

#### CONSERVATION STATUS RANK

**Global Rank & Reasons:** GNA (ruderal) (7-Dec-2000). This forest represents early successional vegetation or vegetation resulting from anthropogenic activities and is thus not a conservation priority. These forests are typical of areas which were once clearcut, old fields, strip-mined, or cleared by fire or other natural disturbances.

## RELATED CONCEPTS

**Global Similar Types:**

- *Liriodendron tulipifera* - *Quercus* spp. Ruderal Forest (CEGL007221) resulting from less severe disturbance; a more widespread type as well.

**Global Related Concepts:**

- IF3a. Recently Harvested Timberland (Allard 1990) >
- Yellow Poplar (50) (USFS 1988) ?
- Yellow-Poplar: 57 (Eyre 1980) >

## CLASSIFICATION

**Status:** Standard

**Classification Confidence:** 3 - Weak

**Great Smoky Mountains National Park Other Comments:** The signature of this vegetation may be similar to some stands of *Liriodendron tulipifera* - *Aesculus flava* - (*Fraxinus americana*, *Tilia americana* var. *heterophylla*) / *Actaea racemosa* - *Laportea canadensis* Forest (CEGL007710) and can sometimes resemble successional *Betula lenta* forest. This association is distinguished by its early successional status, often with an even-aged, single-species canopy, and lacking the suite of herbaceous species characteristic of CEGL007710. Occasionally types of this community can have a small component of *Pinus virginiana*, *Pinus echinata*, or *Pinus strobus* which may create some additional confusion over photo-signature.

**Global Classification Comments:** Some examples of this type are not dominated by, and may not even contain, *Liriodendron tulipifera*. It is restricted to the Appalachian ecoregions (TNC Ecoregions 50 and 51) in contrast to other successional *Liriodendron tulipifera* forests (CEGL007220, CEGL007221). This community differs from *Liriodendron tulipifera* - *Quercus* spp. Ruderal Forest (CEGL007221) by its lack or relative lack of *Quercus* spp. It differs from other successional *Liriodendron tulipifera* types by the presence of *Robinia pseudoacacia* as well as other hardwoods characteristic of the Southern Appalachians (e.g., *Betula lenta*, *Amelanchier laevis*, *Magnolia fraseri*).

## ELEMENT DISTRIBUTION

**Great Smoky Mountains National Park Range:** This community was sampled or observed on both the Cades Cove and Mount Le Conte quadrangles and is likely in other areas of the park. On the Cades Cove quadrangle this community is found on low slopes around Cades Cove; on slopes along lower Green Branch Creek; slopes above Rowans Branch; north of Tater Ridge on low slopes above a creek; on low slopes northwest of Pine Ridge, and in the southeast portion of the quadrangle in the vicinity of Eagle Creek. Areas where it is known to occur on the Mount Le Conte quadrangle include Porters Flats, in the eastern portion of the quadrangle, and in the northern portion, on low slopes in the watershed of Rhododendron Creek, and a low cove south of Hills Creek. It is likely on other low slopes below 2000 feet elevation in the northern half of the Mount Le Conte quadrangle, particularly in areas that were once settled by humans. It has also been sampled in the Smokemont Quad along Newfound Gap Road in areas of former road construction and along Big Cove Road adjacent to the Cherokee Indian Reservation.

**Global Range:** This community occurs in upland areas of the Blue Ridge escarpment where there has been removal of the above-ground portion of canopy trees within the past ten years. It occurs in North Carolina, South Carolina, Georgia, and Tennessee, in the Blue Ridge Physiographic Province and is likely in the Cumberland Plateau and Ridge and Valley Province.

**Nations:** US

**States/Provinces:** GA, KY, NC, SC, TN, VA

**TNC Ecoregions:** 50:C, 51:C

**USFS Ecoregions (1994/95):** 221Ha:CCC, 221He:CCC, M221Dc:CCC, M221Dd:CCC

**USFS Ecoregions (2007):** 221Ha:CCC, 221He:CC?, M221Dc:CCC, M221Dd:CCC

**Federal Lands:** BIA (Eastern Band of Cherokee); NPS (Appalachian Trail [Southern Blue Ridge], Blue Ridge Parkway, Great Smoky Mountains); USFS (Chattahoochee, Chattahoochee (Southern Blue Ridge), Cherokee, Daniel Boone, Nantahala, Pisgah, Sumter, Sumter (Mountains))

## ELEMENT SOURCES

**Great Smoky Mountains National Park Plots:** GRSM.79, GRSM.119, GRSM.222, GRSM.526.

**Great Smoky Mountains National Park Description Author(s):** K.D. Patterson, mod. R. White

**Global Description Author(s):** K.D. Patterson and M. Pyne

**References:** Allard 1990, Eyre 1980, Golden 1974, Govus 1982, Horn 1976, Horn 1980, McGee and Hooper 1970, NatureServe Ecology - Southeastern U.S. unpubl. data, Peet et al. unpubl. data, Phillips and Shure 1990, Schmalzer 1978, Southeastern Ecology Working Group n.d., Thomas 1966, USFS 1988

**[CEGL007221] *Liriodendron tulipifera* - *Quercus* spp. Ruderal Forest**

Translated Name: **Tuliptree - Oak species Ruderal Forest**

Common Name: **Ruderal Tuliptree Forest (Typic Type)**

## USNVC CLASSIFICATION

Division Eastern North American Forest & Woodland (1.B.2.Na)  
Macrogroup Eastern North American Ruderal Forest (M013)

Group Eastern North American Native Ruderal Forest (G030)  
 Alliance *Liriodendron tulipifera* - *Juglans nigra* - *Robinia pseudoacacia* Ruderal Forest Alliance (A3228)

#### ELEMENT CONCEPT

**Global Summary:** This broadly defined ruderal or successional community is one of several described upland associations dominated by *Liriodendron tulipifera*. It ranges from the southern Cumberland Plateau, Piedmont, and Interior Low Plateau of the southeastern U.S. north to the northern Piedmont of New Jersey. These successional forests often follow cropping, clearcut logging, or other severe disturbance, and are successional to mixed oak-hickory forests. Examples are common across large areas of the upland landscape which have previously been disturbed. Soils usually exhibit evidence of disturbance and may have little to no organic horizon development. They are typically acidic and well-drained, dry to moist sand, sandy loam, sandy clay loam, or silt loam. Environmental setting is variable, ranging from level to gently sloping uplands to well-drained floodplains and stream terraces. Species found in stands attributable to this type may include a fairly diverse and varied composition. *Acer rubrum*, *Quercus* spp., *Betula lenta*, *Oxydendrum arboreum*, *Acer saccharum*, and occasionally *Liquidambar styraciflua*, *Ilex opaca*, or *Robinia pseudoacacia* may be common in stands of this type. Where oaks are present, they are frequently multi-stemmed, resulting from coppicing. The conifer *Tsuga canadensis* is abundant in the understories of some stands. Shrub composition is variable but may include *Sambucus nigra* ssp. *canadensis*, *Rhododendron maximum*, *Hamamelis virginiana*, and *Vaccinium pallidum*. Herbs are likewise variable; West Virginia samples feature *Dioscorea quaternata*, *Lysimachia quadrifolia*, *Maianthemum racemosum*, *Solidago curtisii*, *Symphotrichum prenanthoides*, *Polystichum acrostichoides*, *Dryopteris intermedia*, *Arisaema triphyllum* ssp. *triphyllum*, *Packera aurea*, *Amphicarpaea bracteata*, *Thelypteris noveboracensis*, *Lycopodium digitatum*, and *Geranium maculatum*.

#### ENVIRONMENTAL DESCRIPTION

**Global Environment:** These ruderal upland deciduous forests are found primarily in areas which were once clearcuts, old fields, or were cleared by fire or other natural disturbances. These successional forests often follow cropping, clearcut logging, or other severe disturbance, and are successional to mixed oak-hickory forests. Examples are common across large areas of the upland landscape which have previously been disturbed. Soils usually exhibit evidence of disturbance and may have little to no organic horizon development. Environmental setting is variable, ranging from level to gently sloping uplands to well-drained floodplains and stream terraces.

#### VEGETATION DESCRIPTION

**Global Vegetation:** The canopy of this ruderal upland association is dominated by *Liriodendron tulipifera*. *Quercus* species (*Quercus alba*, *Quercus rubra*, *Quercus falcata*, *Quercus nigra*, *Quercus velutina*) are often present; additional associates may include *Acer floridanum* (= *Acer barbatum*), *Acer rubrum*, *Carya* spp., *Fagus grandifolia*, *Nyssa sylvatica*, *Cornus florida*, and *Robinia pseudoacacia*. *Betula lenta* is a common associate at the northern range limit. Shrub layers may include saplings of the canopy species and *Acer pensylvanicum*, *Amelanchier arborea*, *Hamamelis virginiana*, *Lindera benzoin* (in small amounts), and *Vaccinium pallidum*. Herbs vary across the range but may include *Actaea racemosa*, *Dichantherium clandestinum*, *Dioscorea quaternata*, *Galium circaezans*, *Geranium maculatum*, *Goodyera pubescens*, *Medeola virginiana*, *Potentilla simplex*, *Scutellaria serrata*, *Thelypteris noveboracensis*, and *Uvularia perfoliata*. *Lycopodium digitatum* may be abundant in some stands.

**Global Dynamics:** This community is widespread in areas that had stand-initiating disturbance such as heavy logging or plowing in the recent past. In areas that have been protected for more than 80 years, this community is uncommon.

#### MOST ABUNDANT SPECIES

##### Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	<i>Liriodendron tulipifera</i>
Tall shrub/sapling	Broad-leaved deciduous tree	<i>Cornus florida</i>
Herb (field)	Fern (Spore-bearing forb)	<i>Lycopodium digitatum</i>

#### CHARACTERISTIC SPECIES

**Global:** *Acer pensylvanicum*, *Acer rubrum*, *Actaea racemosa*, *Amelanchier arborea*, *Carya glabra*, *Dichantherium clandestinum*, *Fagus grandifolia*, *Galium circaezans*, *Geranium maculatum*, *Goodyera pubescens*, *Hamamelis virginiana*, *Lycopodium digitatum*, *Medeola virginiana*, *Nyssa sylvatica*, *Quercus falcata*, *Quercus rubra*, *Quercus velutina*, *Robinia pseudoacacia*, *Thelypteris noveboracensis*, *Uvularia perfoliata*, *Vaccinium pallidum*

#### OTHER NOTEWORTHY SPECIES

**Global: Vulnerable Plants:** *Actaea racemosa* (G3G4), *Hexastylis naniflora* (G3), *Trillium simile* (G3); **Other Plants:** *Trillium rugelii* (G4)

#### CONSERVATION STATUS RANK

**Global Rank & Reasons:** GNA (ruderal) (19-Aug-2002). This forest represents early-successional vegetation and is thus not a priority for conservation. This is a successional vegetation type composed of native species. Its conservation value is limited, but mature examples could provide buffer for communities of greater conservation value. It may also support rare animal and plant species.

## RELATED CONCEPTS

**Global Similar Types:**

- *Liriodendron tulipifera* - *Acer negundo* Ruderal Forest (CEGL007184) a bottomland type.
- *Liriodendron tulipifera* - *Acer rubrum* - *Robinia pseudoacacia* Ruderal Forest (CEGL007219) is generally found on steeper slopes and/or shallow soils and with a more intense history of disturbance.
- *Liriodendron tulipifera* / (*Cercis canadensis*) / (*Lindera benzoin*) Ruderal Forest (CEGL007220) is generally found on calcareous or at least pH neutral soils.
- *Liriodendron tulipifera* Ruderal Forest (CEGL007218) more early-successional.
- *Prunus serotina* - *Liriodendron tulipifera* - *Acer rubrum* - *Fraxinus americana* - (*Robinia pseudoacacia*) Ruderal Forest (CEGL006599)
- *Prunus serotina* - *Sassafras albidum* - (*Fraxinus americana*) / *Juniperus virginiana* Ruderal Forest (CEGL004133)

**Global Related Concepts:**

- Successional forest of low-elevation plateaus (Vanderhorst 2001a) >
- Tulip Poplar Type (Schmalzer and DeSelm 1982) >
- Yellow Poplar community (Ehrenfeld 1977) =

## CLASSIFICATION

**Status:** Standard**Classification Confidence:** 3 - Weak

**Global Classification Comments:** It differs from other described types within its range based on the lack of a significant pine component [see *Liriodendron tulipifera* - *Pinus taeda* Ruderal Forest (CEGL007521)] and the absence of species affiliated with circumneutral conditions [see *Liriodendron tulipifera* / (*Cercis canadensis*) / (*Lindera benzoin*) Ruderal Forest (CEGL007220)]; it is later successional and more diverse than *Liriodendron tulipifera* Ruderal Forest (CEGL007218) and tends to be found on more stable soil substrates and less steep slopes than *Liriodendron tulipifera* - *Acer rubrum* - *Robinia pseudoacacia* Ruderal Forest (CEGL007219).

## ELEMENT DISTRIBUTION

**Global Range:** This association is known from the southern Cumberland Plateau, Piedmont, and Interior Low Plateau of the southeastern U.S. and may also occur in the Upper East Gulf Coastal Plain. It ranges north to the northern Piedmont of New Jersey and adjacent Pennsylvania. It is also known from Alabama, Georgia, Kentucky, Maryland, North Carolina, South Carolina, Tennessee, West Virginia, Virginia, and possibly Delaware.

**Nations:** US**States/Provinces:** AL, DC, DE?, GA, KY, MD, NC, NJ, PA, SC, TN, VA, WV**TNC Ecoregions:** 43:P, 44:C, 50:C, 51:C, 52:C, 58:C, 59:C, 61:C

**USFS Ecoregions (1994/95):** 221Hc:CCC, 221He:CCC, 222Cg:CCC, 222Dg:CCC, 222Eb:CCC, 222Eg:CCC, 222En:CCC, 222Eo:CCC, 231Aa:CCP, 231Ab:CCC, 231Ae:CCC, 231Ak:CCC, 231An:CCC, 231Bc:CCC, 231Bh:CCC, 231Cd:CCP, 231Dc:CCC, 232Ad:C??, 232Br:CCC, M221Bb:CCC, M221Ca:CCC, M221Cb:CCC, M221Cd:CCC, M221Dd:CCC

**USFS Ecoregions (2007):** 221En:C??, 221Hb:CCP, 221Hc:CCC, 221He:CC?, 223Dg:CCC, 223Eb:CCC, 223Eg:CCC, 231Aa:CCP, 231Ab:CCC, 231Bc:CCC, 231Bd:CCC, 231Cd:CCP, 231Dc:CCC, 231Ha:CCC, 231Ib:CCC, 231Ic:CCC, 231If:CCC, 232Ad:C??, 232Ha:CC?, 232Je:C??, M221Bb:CCC, M221Ca:CCC, M221Cb:CCC, M221Cd:CCC, M221Dd:CCC

**Federal Lands:** BIA (Eastern Band of Cherokee); DOD (Fort Benning); NPS (Appalachian Trail [Central Appalachians], Appalachian Trail [Southern Blue Ridge], Appomattox Court House, Big South Fork, Blue Ridge Parkway, Booker T. Washington, C&O Canal, Carl Sandburg Home, Catocin Mountain, Chattahoochee River, Chickamauga-Chattanooga?, Cowpens, Cumberland Gap, Fredericksburg-Spotsylvania, Gauley River, George Washington Parkway, Great Smoky Mountains, Guilford Courthouse, Horseshoe Bend, Kennesaw Mountain, Kings Mountain, Mammoth Cave, Morristown, Natchez Trace, National Capital-East, New River Gorge, Ninety Six, Obed River, Petersburg, Prince William, Richmond, Rock Creek, Shiloh, Valley Forge, Wolf Trap); USFS (Bankhead, Daniel Boone, Oconee?, Talladega, Talladega (Oakmulgee)?, Talladega (Talladega)); USFWS (Patuxent)

## ELEMENT SOURCES

**Global Description Author(s):** R.E. Evans, M. Pyne, L.A. Sneddon, R. White and S.C. Gawler

**References:** Ehrenfeld 1977, Fleming 2002b, Fleming and Patterson 2003, Gallyoun et al. 1996, Keever 1973, NatureServe Ecology - Southeastern U.S. unpubl. data, Nordman et al. 2011, Overlease 1987, Patterson 2008a, Patterson 2008b, Patterson 2008e, Patterson 2008f, Podnieszinski et al. 2005b, Pyne et al. 2010, Russell and Schuyler 1988, Schmalzer and DeSelm 1982, Sneddon et al. 2008, Southeastern Ecology Working Group n.d., Taverna and Patterson 2008, Vanderhorst 2001a, Vanderhorst and Streets 2006, Vanderhorst et al. 2007, Vanderhorst et al. 2010, White 2003, White 2004, White 2006, White and Govus 2003, White and Govus 2005, White and Pyne 2003

**[CEGL007220] *Liriodendron tulipifera* / (*Cercis canadensis*) / (*Lindera benzoin*) Ruderal Forest**Translated Name: **Tuliptree / (Eastern Redbud) / (Northern Spicebush) Ruderal Forest**Common Name: **Ruderal Tuliptree Forest (Rich Type)**

## USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Eastern North American Ruderal Forest (M013)
Group	Eastern North American Native Ruderal Forest (G030)
Alliance	<i>Liriodendron tulipifera</i> - <i>Juglans nigra</i> - <i>Robinia pseudoacacia</i> Ruderal Forest Alliance (A3228)

## ELEMENT CONCEPT

**Global Summary:** This ruderal or successional community dominated by *Liriodendron tulipifera* occurs in the Ridge and Valley of Tennessee and Virginia, the Interior Low Plateau of Kentucky, and the Central Appalachians, Piedmont and Inner Coastal Plain regions of Virginia, West Virginia, Pennsylvania, and Maryland. Plots attributable to this type are also known from the Piedmont of Georgia. It may also occur in similar regions of Delaware. It is distinguished from other upland communities dominated by *Liriodendron tulipifera* by the presence of species associated with soils with moderately high base saturation levels (rich soils). Species found in stands attributable to this type may be fairly diverse and result in a varied composition. In addition to *Liriodendron tulipifera*, other canopy species may include *Liquidambar styraciflua*, *Acer saccharum*, *Aesculus flava*, *Platanus occidentalis*, *Quercus rubra*, *Acer rubrum*, *Robinia pseudoacacia*, *Juglans nigra*, *Halesia tetraptera*, *Fraxinus americana*, *Fagus grandifolia*, *Magnolia acuminata*, *Ulmus rubra*, *Quercus imbricaria*, *Quercus muehlenbergii*, and *Carya ovata*. Species often found in the subcanopy include *Acer saccharum*, *Cercis canadensis*, *Ulmus alata*, *Fraxinus americana*, *Morus rubra*, and *Cornus florida*. Shrubs include saplings of the subcanopy and canopy species, as well as *Lindera benzoin*, *Symphoricarpos orbiculatus*, *Asimina triloba*, *Staphylea trifolia*, *Acer negundo*, and *Juniperus virginiana* var. *virginiana*. Exotic shrubs, including *Rosa multiflora*, *Rubus phoenicolasius*, and *Lonicera japonica*, are present at some sites. Herb-layer species include the exotics *Microstegium vimineum*, *Alliaria petiolata*, and *Veronica hederifolia*, as well as *Toxicodendron radicans*, *Parthenocissus quinquefolia*, *Smilax tamnoides*, *Actaea racemosa*, *Caulophyllum thalictroides*, *Laportea canadensis*, *Impatiens pallida*, *Hydrophyllum canadense*, *Adiantum pedatum*, *Polygonatum pubescens*, *Verbesina alternifolia*, *Amphicarpaea bracteata*, and *Polystichum acrostichoides*.

## ENVIRONMENTAL DESCRIPTION

**Global Environment:** These forests are found on disturbed mesic areas underlain by rich soils with moderately high base saturation levels. It occurs on abandoned farmland and townsites, old strip mines, old clearcuts, burned areas, and other areas where the canopy was removed or heavily disturbed in the past. Small patches may occur in areas where canopy disturbance has resulted from natural causes such as windfall or landslides. Soils may be underlain by a variety of geologic strata that weather to base-rich soils including limestone, dolomite, calcareous shale, shell deposits, metabasalts and granitic complexes. In Kentucky this association may occur on calcareous substrates in the Dripping Springs Escarpment. At Shenandoah National Park in Virginia, this community is underlain by Catoclin metabasalt or a pyroxene-bearing granitic complex. In West Virginia, parent materials include sandstone, shale, and alluvium. Soils in plots were described as moderately well-drained to well-drained clay, silt loam, and sandy loam with pH ranging from 5.0 to 7.5, with relatively high levels of organic matter, estimated N release, Ca, Cu, K, Mg, and Mn, and relatively low levels of S, Al, B, Fe, P, and Zn compared to average values in the area.

## VEGETATION DESCRIPTION

**Global Vegetation:** Stands are dominated by *Liriodendron tulipifera* but also include various other species, including ones indicative of nutrient-rich or circumneutral environments. Other species include *Liquidambar styraciflua*, *Acer saccharum*, *Aesculus flava*, *Platanus occidentalis*, *Quercus rubra*, *Acer rubrum*, *Robinia pseudoacacia*, *Juglans nigra*, *Halesia tetraptera*, *Fraxinus americana*, *Fagus grandifolia*, *Magnolia acuminata*, *Ulmus rubra*, *Quercus imbricaria*, *Quercus muehlenbergii*, and *Carya ovata* (NatureServe Ecology unpubl. data, VDNH unpubl. data, WVNHP unpubl. data.). Species often found in the subcanopy include *Acer saccharum*, *Cercis canadensis*, *Ulmus alata*, *Morus rubra*, *Sassafras albidum*, and *Cornus florida*. *Cercis canadensis* is often abundant on soils underlain by carbonate strata. Shrubs include saplings of the subcanopy and canopy species, as well as *Symphoricarpos orbiculatus*, *Lindera benzoin*, *Asimina triloba*, and *Juniperus virginiana* var. *virginiana*. *Lindera benzoin* is often abundant in occurrences of this community in the Central Appalachians, Piedmont and Inner Coastal Plain regions of Virginia, West Virginia, and Maryland. Exotic shrubs, including *Rosa multiflora*, *Rubus phoenicolasius*, and *Lonicera japonica*, are present at some sites. Vines, which may be abundant, include *Aristolochia macrophylla*, *Toxicodendron radicans*, *Parthenocissus quinquefolia*, *Smilax tamnoides*, and *Vitis aestivalis* var. *bicolor*. Herbaceous species include the exotics *Microstegium vimineum*, *Alliaria petiolata*, and *Veronica hederifolia*, as well as *Actaea racemosa*, *Ageratina altissima*, *Arisaema triphyllum*, *Asarum canadense*, *Caulophyllum thalictroides*, *Cryptotaenia canadensis*, *Galium triflorum*, *Laportea canadensis*, *Impatiens pallida*, *Hydrophyllum canadense*, *Osmorhiza longistylis*, *Adiantum pedatum*, *Polygonatum pubescens*, *Polystichum acrostichoides*, *Verbesina alternifolia*, *Amphicarpaea bracteata*, *Solidago caesia*, and *Polystichum acrostichoides*. (Andreu and Tukman 1995, NatureServe Ecology unpubl. data, VDNH unpubl. data, WVNHP unpubl. data). Examples at Fort Donelson that have been very heavily disturbed may have local dominance by *Celtis laevigata* and *Juglans nigra*.

**Global Dynamics:** This community occurs in successional situations, generally where forest clearing has taken place in the past. In West Virginia, this type is found in areas that have been logged repeatedly, as well as on abandoned farmland and mines.

## MOST ABUNDANT SPECIES

## Global

Stratum

Tree (canopy &amp; subcanopy)

Lifeform

Broad-leaved deciduous tree

Species*Liriodendron tulipifera*

**CHARACTERISTIC SPECIES**

**Global:** *Acer saccharum*, *Aesculus flava*, *Ageratina altissima*, *Arisaema triphyllum*, *Aristolochia macrophylla*, *Asarum canadense*, *Asimina triloba*, *Carya ovata*, *Cercis canadensis*, *Cryptotaenia canadensis*, *Galium triflorum*, *Lindera benzoin*, *Osmorhiza longistylis*, *Parthenocissus quinquefolia*, *Polystichum acrostichoides*, *Toxicodendron radicans*, *Ulmus rubra*

**OTHER NOTEWORTHY SPECIES**

**Global: Vulnerable Plants:** *Cardamine clematitis* (G3), *Panax quinquefolius* (G3G4, under collection pressure), *Penstemon smallii* (G3), *Schisandra glabra* (G3), *Scutellaria saxatilis* (G3G4); **Invasive/Exotic Plants:** *Alliaria petiolata* (High/Medium), *Lonicera japonica* (High/Medium), *Microstegium vimineum* (High/Medium), *Rosa multiflora* (Medium/Low), *Rubus phoenicolasius* (Medium), *Veronica hederifolia*; **Other Plants:** *Trillium rugelii* (G4)

**CONSERVATION STATUS RANK**

**Global Rank & Reasons:** GNA (ruderal) (28-Oct-2003). This forest represents successional vegetation and is thus not of high conservation concern. It is composed largely of native species, though exotics may be locally abundant. Its conservation value is limited, but mature examples could provide buffer for communities of greater conservation value.

**RELATED CONCEPTS****Global Similar Types:**

- *Liriodendron tulipifera* - *Pinus taeda* Ruderal Forest (CEGL007521) supports a significant pine component.
- *Liriodendron tulipifera* - *Quercus rubra* - *Fraxinus americana* / *Asimina triloba* / *Actaea racemosa* Forest (CEGL006186)
- *Liriodendron tulipifera* - *Quercus* spp. Ruderal Forest (CEGL007221) on more acidic substrates, lacks species affiliated with circumneutral conditions.
- *Liriodendron tulipifera* Ruderal Forest (CEGL007218) is less diverse and earlier successional.

**Global Related Concepts:**

- *Liriodendron tulipifera* / *Lindera benzoin* Forest (Lea 2000) <
- *Liriodendron tulipifera* / *Lindera benzoin* Successional Forest (Young et al. 2007a) =
- Oak-Hickory Association of the Western Shore District (Shreve et al. 1910) >
- Successional forest of low-elevation plateaus (Vanderhorst 2001a) >
- Tulip Poplar Type (Schmalzer and DeSelm 1982) >
- Yellow Poplar - Sugar Maple - Cucumber (Rentch et al. 2005) ?

**CLASSIFICATION**

**Status:** Standard

**Classification Confidence:** 3 - Weak

**Global Classification Comments:** This type was originally described from the work of Andreu and Tukman (1995) but was later modified to emphasize stands with moderately high base saturation levels. It is apparently a widespread successional forest of relatively fertile substrates in all provinces of the Mid-Atlantic states and in parts of the Southeast.

**ELEMENT DISTRIBUTION**

**Global Range:** This type occurs in the Ridge and Valley and Cumberland Plateau of Tennessee, the Interior Low Plateau of Kentucky, the Upper East Gulf Coastal Plain of Mississippi, and the Central Appalachian, Piedmont and Inner Coastal Plain regions of Virginia, West Virginia, Maryland, Pennsylvania, and possibly Delaware. Plots attributable to this type are also known from the Georgia Piedmont. Its full range has not been documented.

**Nations:** US

**States/Provinces:** AL, DC, DE, GA, KY, MD, MS, NY, PA, TN, VA, WV

**TNC Ecoregions:** 43:C, 44:C, 50:C, 51:C, 52:C, 58:C, 59:C

**USFS Ecoregions (1994/95):** 221Hc:CCC, 221He:CCC, 221Jb:CCC, 222Dg:CCC, 222Dj:CCC, 222Eg:CCC, 231Ae:CCC, 231Al:CCC, 231Ap:CCC, 231Bd:CCC, 232Ad:CCC, M221Ab:CCC, M221Bb:CCC, M221Be:CCC, M221Cb:CCC, M221Da:CCC  
**USFS Ecoregions (2007):** 221Dd:CCC, 221De:CCC, 221Hc:CCC, 221He:CC?, 221Jb:CCC, 223Dg:CCC, 223Dj:CCC, 223Eg:CCC, 231Bd:CCC, 231Ic:CCC, 232Ad:CCC, M221Ab:CCC, M221Bb:CCC, M221Be:CCC, M221Cb:CCC, M221Da:CCC

**Federal Lands:** NPS (Abe Lincoln Birthplace, Antietam, Appalachian Trail [Central Appalachians], Appalachian Trail [Lower New England], Appalachian Trail [Southern Blue Ridge], Big South Fork, Blue Ridge Parkway, Bluestone, C&O Canal, Catoclin Mountain, Chattahoochee River, Chickamauga-Chattanooga, Cumberland Gap, Fort Donelson, George Washington Parkway, Great Smoky Mountains, Harpers Ferry, Mammoth Cave, Monocacy, Natchez Trace, National Capital-East, New River Gorge, Obed River, Rock Creek, Shenandoah, Thomas Stone, Vicksburg, Wolf Trap); TVA (Tellico); USFS (Cherokee?, Monongahela); USFWS (National Conservation Training Center)

**ELEMENT SOURCES**

**Global Description Author(s):** R.E. Evans, M. Pyne, J. Teague, C.W. Nordman, R. White, S.C. Gawler

**References:** Andreu and Tukman 1995, Coxe 2009, Fleming and Coulling 2001, Fleming pers. comm., Hall and Mathews 1974, Lea 2000, Lea 2003, Lea 2004, Lea et al. 2012, Lea et al. 2013, Martin 1989, NatureServe Ecology - Southeastern U.S. unpubl. data, Nordman et al. 2011, Pyne et al. 2010, Rentch et al. 2005, Schmalzer and DeSelm 1982, Shreve et al. 1910, Southeastern Ecology

Working Group n.d., Vanderhorst 2001a, Vanderhorst et al. 2007, Vanderhorst et al. 2008, White 2005, White 2006, Young et al. 2006, Young et al. 2007a, Young et al. 2009

## [CEGL007279] *Robinia pseudoacacia* Ruderal Forest

Translated Name: **Black Locust Ruderal Forest**

Common Name: **Ruderal Black Locust Forest**

### USNVC CLASSIFICATION

Division	Eastern North American Forest & Woodland (1.B.2.Na)
Macrogroup	Eastern North American Ruderal Forest (M013)
Group	Eastern North American Native Ruderal Forest (G030)
Alliance	<i>Liriodendron tulipifera</i> - <i>Juglans nigra</i> - <i>Robinia pseudoacacia</i> Ruderal Forest Alliance (A3228)

### ELEMENT CONCEPT

**Global Summary:** This black locust ruderal forest is found locally throughout the eastern United States. Stands often establish on old fields abandoned after agricultural cropping or pasturing or around old homesites. In some areas it occurs on post-agricultural floodplain terraces. This vegetation has also become established following the planting of *Robinia pseudoacacia* to stabilize and enrich nutrient-poor soils that are subject to erosion. The vegetation is dominated by *Robinia pseudoacacia*. Associated woody species vary from site to site and include *Prunus serotina*, *Juniperus virginiana*, *Ulmus americana*, *Ulmus rubra*, *Carya ovata*, *Celtis occidentalis*, *Juglans nigra*, *Quercus rubra*, *Ulmus rubra*, and in some areas *Acer platanoides* or *Ailanthus altissima*. Understory vegetation is highly variable depending on site history and often includes *Toxicodendron radicans*; *Lindera benzoin* is sometimes present. The invasive non-native *Rosa multiflora* may be present as a shrub, along with the non-native bramble *Rubus phoenicolasius*. Non-native species such as *Alliaria petiolata*, *Chelidonium majus*, *Glechoma hederacea*, and *Convallaria majalis* can characterize the herb layer, which may also have a native component.

### ENVIRONMENTAL DESCRIPTION

**Global Environment:** This type often establishes on old fields abandoned after agricultural cropping or pasturing or around old home sites. This vegetation has also become established following the planting of *Robinia pseudoacacia* to stabilize and enrich nutrient-poor soils that are subject to erosion (Rabie 2000). Soils are variable and may be highly acidic, especially where established on old mine sites.

### VEGETATION DESCRIPTION

**Global Vegetation:** The vegetation is dominated by *Robinia pseudoacacia* forming a partial to nearly complete canopy. Associated woody species vary from site to site and include *Prunus serotina*, *Juniperus virginiana*, *Ulmus americana*, *Ulmus rubra*, *Carya ovata*, *Celtis occidentalis*, *Juglans nigra*, *Quercus rubra*, *Ulmus rubra*, *Acer rubrum*, *Nyssa sylvatica*, and in some areas *Acer platanoides* or *Ailanthus altissima*. In addition, *Cornus florida* may be present in the subcanopy. Understory vegetation is highly variable depending on site history and often includes *Toxicodendron radicans*; *Lindera benzoin* is sometimes present. The invasive non-natives *Rosa multiflora* and *Elaeagnus umbellata* are typically the most common shrubs, along with the non-native bramble *Rubus phoenicolasius*. Non-native species such as *Alliaria petiolata*, *Chelidonium majus*, *Glechoma hederacea*, *Dactylis glomerata*, *Daucus carota*, and *Convallaria majalis* can characterize the herb layer, which may have a native component as well, for example with (depending on geography) *Ageratina altissima*, *Dichanthelium clandestinum*, *Elymus hystrix* var. *hystrix*, *Leersia virginica*, *Parthenocissus quinquefolia*, *Pilea pumila*, *Solidago canadensis*, *Solidago rugosa*, *Verbesina alternifolia*, *Verbesina occidentalis*, and *Viola* spp.

### MOST ABUNDANT SPECIES

#### Global

##### Stratum

Tree canopy

##### Lifeform

Broad-leaved deciduous tree

##### Species

*Robinia pseudoacacia*

### CHARACTERISTIC SPECIES

**Global:** *Acer rubrum*, *Robinia pseudoacacia*, *Rosa multiflora*

### OTHER NOTEWORTHY SPECIES

**Global: Invasive/Exotic Plants:** *Acer platanoides* (High/Medium), *Ailanthus altissima* (Medium), *Alliaria petiolata* (High/Medium), *Chelidonium majus* (Medium/Insignificant), *Convallaria majalis*, *Dactylis glomerata* (Medium/Insignificant), *Daucus carota* (Low), *Elaeagnus umbellata* (High), *Glechoma hederacea* (Low), *Rosa multiflora* (Medium/Low), *Rubus phoenicolasius* (Medium)

### CONSERVATION STATUS RANK

**Global Rank & Reasons:** GNA (ruderal) (24-Oct-2002). Although *Robinia pseudoacacia* is a native species found in the Central Appalachians and Ozark Mountains, it does not typically become a dominant species in these natural habitats (Elias 1980). It is now widespread in the eastern U.S. in disturbed habitats. This forest represents early-successional vegetation and is thus not of high conservation concern and does not receive a conservation status rank.

### RELATED CONCEPTS

#### Global Similar Types:

- *Prunus serotina* - *Liriodendron tulipifera* - *Acer rubrum* - *Fraxinus americana* - (*Robinia pseudoacacia*) Ruderal Forest (CEGL006599) can have *Robinia* as an important canopy component but is not dominated by it as is this type.
- *Prunus serotina* - *Sassafras albidum* - (*Fraxinus americana*) / *Juniperus virginiana* Ruderal Forest (CEGL004133)
- *Robinia pseudoacacia* - *Celtis occidentalis* - (*Fraxinus americana*, *Liriodendron tulipifera*) Ruderal Forest (CEGL007281)

#### Global Related Concepts:

- *Juglans nigra* - *Robinia pseudoacacia* / *Lonicera japonica* / *Verbena alternifolia* Association (Rawinski et al. 1996) ?
- Successional black locust disturbed forests (CAP pers. comm. 1998) ?
- Successional communities (Ehrenfeld 1977) >

#### CLASSIFICATION

**Status:** Standard

**Classification Confidence:** 2 - Moderate

#### ELEMENT DISTRIBUTION

**Global Range:** This black locust ruderal forest is found locally throughout the eastern United States.

**Nations:** US

**States/Provinces:** AR, DC?, DE, IA, KY, MA, MD, MS, NC, NJ, NY, OH, OK, PA, TN, VA, VT, WV

**TNC Ecoregions:** 38:C, 39:C, 43:C, 44:C, 48:C, 49:C, 50:C, 51:C, 59:C, 61:C, 62:C, 63:C

**USFS Ecoregions (1994/95):** 221Aa:CCP, 221Ab:CCC, 221Ae:CCC, 221Ai:CCC, 221Bc:CCC, 221Fa:CCC, 222Ab:CCC, 222Ag:CCC, 222An:CCC, 222Ic:CCC, 231Bh:CCC, 232Ad:CCC, M212Ba:CCC, M221Aa:CCC, M221Ab:CCC, M221Ac:CCP, M221Ad:CCP, M221Ba:CCP, M221Bb:CCC, M221Bc:CCP, M221Bd:CCP, M221Be:CCC, M221Bf:CCP, M221Ca:CPP, M221Cb:CPP, M221Cc:CPP, M221Ce:CPP, M221Da:CCC, M221Db:CCC, M221Dc:CCC, M221Dd:CCP, M231Aa:CCC, M231Ab:CCC, M231Ac:CCC, M231Ad:CCC

**USFS Ecoregions (2007):** 221Aa:CC?, 221Ab:CCC, 221Ae:CCC, 221Ai:CCC, 221Bc:CCP, 221Ea:C??, 221Fa:CCC, 222Ic:CCC, 223Ab:CCC, 223Ag:CCC, 223An:CCP, 231Ha:CCC, 232Ad:CCC, M211Ba:CCP, M221Aa:CCP, M221Ab:CCC, M221Ac:CCP, M221Ad:CCP, M221Ba:CCP, M221Bb:CCC, M221Bc:CCP, M221Bd:CCP, M221Be:CCC, M221Ca:CPP, M221Cb:CPP, M221Cc:CPP, M221Ce:CPP, M221Da:CCC, M221Db:CCC, M221Dc:CCC, M221Dd:CCP, M231Aa:CCC, M231Ab:CCC, M231Ac:CCC, M231Ad:CCC

**Federal Lands:** NPS (Antietam, Appalachian Trail [Southern Blue Ridge], Blue Ridge Parkway, Bluestone, Buffalo River?, C&O Canal, Cape Cod, Catocin Mountain, Cuyahoga Valley, George Washington Birthplace, Great Smoky Mountains, Marsh-Billings-Rockefeller, Minute Man, Morristown, Natchez Trace, National Capital-East, New River Gorge, Roosevelt-Vanderbilt, Saratoga, Vicksburg); USFS (George Washington, Jefferson, Monongahela, Nantahala, Ouachita, Ouachita (Mountains), Ozark, Pisgah); USFWS (Montezuma)

#### ELEMENT SOURCES

**Global Description Author(s):** D. Faber-Langendoen, S.C. Gawler and L.A. Sneddon

**References:** Baalman 1965, CAP pers. comm. 1998, Edinger et al. 2014a, Edinger et al. 2014b, Ehrenfeld 1977, Elias 1980, Fike 1999, Fleming and Coulling 2001, Gaertner 1955, Gawler et al. 2017, Hoagland 2000, Hop et al. 2012a, Hop et al. 2013, INAI 2017, Lea et al. 2013, McDonald 1938, NRCS 2004a, Patterson 2008d, Rabie 2000, Rawinski et al. 1996, Sechler et al. 2014, Sneddon et al. 2008, Sneddon et al. 2010, Southeastern Ecology Working Group n.d., Vanderhorst et al. 2007, Vanderhorst et al. 2008

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## 1.B.3. Temperate Flooded & Swamp Forest

### 1.B.3.NA. EASTERN NORTH AMERICAN-GREAT PLAINS FLOODED & SWAMP FOREST

#### M029. Central Hardwood Floodplain Forest

##### G673. SILVER MAPLE - SUGARBERRY - SWEETGUM FLOODPLAIN FOREST

**Group Summary Description:** Stands of these floodplain forests are dominated by some combination of *Acer saccharinum*, *Betula nigra*, *Celtis laevigata*, *Fraxinus pennsylvanica*, *Liquidambar styraciflua*, *Liriodendron tulipifera*, *Platanus occidentalis*, and *Ulmus americana*. Other species that may be present include *Acer negundo*. This complex and widespread group is found in a broad band in the northeastern and middle parts of the eastern United States from southern New England and the Ontario lakeplains of New York south and west through the Interior Low Plateau of Ohio, Indiana, Illinois and Kentucky to the Ozarks of Arkansas and Missouri.

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#### A3702 *Platanus occidentalis* - *Liquidambar styraciflua* - *Liriodendron tulipifera* Southern Appalachian Floodplain Forest Alliance

American Sycamore - Sweetgum - Tuliptree Southern Appalachian Floodplain Forest Alliance

*Southern Appalachian Sycamore - Sweetgum - Tuliptree Floodplain Forest*

**ALLIANCE CONCEPT**

**Summary:** These are diverse floodplain forests with variable composition, typically dominated by some combination of *Celtis laevigata*, *Fraxinus pennsylvanica*, *Liquidambar styraciflua*, *Liriodendron tulipifera*, *Platanus occidentalis*, and *Ulmus americana*. Stands also probably include *Acer negundo*, *Carya cordiformis*, *Celtis occidentalis*, *Juglans nigra*, *Salix nigra*, and *Ulmus alata*. The understory may be dense and typically contains *Asimina triloba*, *Crataegus spathulata*, and *Lindera benzoin*. Examples are found in the interior south of the United States, including the Interior Low Plateau, southern Cumberland/Ridge and Valley, the Piedmont, and the adjacent Southern Blue Ridge from Alabama north to the Carolinas and west to Kentucky and Tennessee. One association known from the Piedmont and the lower elevations of the adjacent Southern Blue Ridge may contain *Betula alleghaniensis* and/or *Betula lenta*.

**Similar Alliances:**

- *Acer saccharinum* - *Acer negundo* Appalachian-Piedmont Floodplain Forest Alliance (A3697)
- *Betula nigra* - *Platanus occidentalis* Appalachian-Piedmont Floodplain Forest Alliance (A3699)
- *Fraxinus pennsylvanica* - *Platanus occidentalis* - *Acer saccharinum* Ozark-Ouachita Floodplain Forest Alliance (A3700) contains *Platanus* but with a different, more western range.
- *Fraxinus pennsylvanica* - *Platanus occidentalis* - *Ulmus americana* Coastal Plain Floodplain Forest Alliance (A3707) is related and with overlapping range but different composition.
- *Platanus occidentalis* - *Fraxinus pennsylvanica* - *Liriodendron tulipifera* Central Appalachian-Piedmont Floodplain Forest Alliance (A3701)

**Similar Alliance Comments:** The presence of *Liriodendron tulipifera* separates this from similar Ozark-Ouachita alliances.

**Diagnostic Characteristics:** These are floodplain forests of the interior south of the United States typically dominated by some combination of *Celtis laevigata*, *Fraxinus pennsylvanica*, *Liquidambar styraciflua*, *Liriodendron tulipifera*, *Platanus occidentalis*, and *Ulmus americana*. This combination of environment, floristics and biogeography should be diagnostic.

**ALLIANCE DESCRIPTION**

**Environment:** Forests in this alliance occur on the fronts, terraces, and levees of small, medium and large rivers in the Interior Low Plateau, southern Cumberland/Ridge and Valley, the Piedmont, and the lower elevations of the adjacent Southern Blue Ridge.

**Vegetation:** Stands are diverse, and composition is somewhat variable across the range, but they are typically dominated by some combination of *Celtis laevigata*, *Fraxinus pennsylvanica*, *Liquidambar styraciflua*, *Liriodendron tulipifera*, *Platanus occidentalis*, and *Ulmus americana*. One association known from the Piedmont and the lower elevations of the adjacent Southern Blue Ridge may contain *Betula alleghaniensis* and/or *Betula lenta*. Stands also probably include *Acer negundo*, *Carya cordiformis*, *Celtis occidentalis*, *Juglans nigra*, *Salix nigra*, and *Ulmus alata*. The understory may be dense and typically contains *Asimina triloba*, *Crataegus spathulata*, and *Lindera benzoin*.

**Physiognomy and Structure:** These are broad-leaved deciduous forests, with canopy trees typically averaging 20 m in height. The shrub and herbaceous layers range from sparse to relatively lush. There is often an abundance of woody vines.

**Floristics:** Stands are diverse, and composition is somewhat variable across the range, but they are typically dominated by some combination of *Celtis laevigata*, *Fraxinus pennsylvanica*, *Liquidambar styraciflua*, *Liriodendron tulipifera*, *Platanus occidentalis*, and *Ulmus americana*. One association known from the Piedmont and the lower elevations of the adjacent Southern Blue Ridge may contain *Betula alleghaniensis* and/or *Betula lenta*. Stands also probably include *Acer negundo*, *Carya cordiformis*, *Celtis occidentalis*, *Juglans nigra*, *Salix nigra*, and *Ulmus alata*. The understory may be dense and typically contains *Asimina triloba*, *Crataegus spathulata*, and *Lindera benzoin*.

**ALLIANCE DISTRIBUTION**

**Range:** This is a potentially wide ranging alliance, found in the Interior Low Plateau, southern Cumberland/Ridge and Valley, the Piedmont, and lower elevations of the adjacent Southern Blue Ridge from Alabama north to the Carolinas and west to Kentucky and Tennessee.

**Nations:** US

**Subnations:** AL, GA, KY, NC, SC, TN, VA?

**TNC Ecoregions:** 44:C, 50:C, 51:C, 52:C

**Federal Lands:** USFS (Sumter, Sumter (Mountains))

**ALLIANCE SOURCES**

**References:** Faber-Langendoen et al. 2019b

**Author of Concept:** Faber-Langendoen et al. 2019b

**Author of Description:** M. Pyne, in Faber-Langendoen et al. (2013)

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**[CEGL004420] *Acer rubrum* var. *trilobum* - *Fraxinus pennsylvanica* / *Carex crinita* - *Peltandra virginica* Floodplain Forest**

Translated Name: **Carolina Red Maple - Green Ash / Fringed Sedge - Green Arrow-arum Floodplain Forest**

Common Name: **Montane Floodplain Slough Forest**

**USNVC CLASSIFICATION**

Division Eastern North American-Great Plains Flooded & Swamp Forest (1.B.3.Na)

Macrogroup	Central Hardwood Floodplain Forest (M029)
Group	Silver Maple - Sugarberry - Sweetgum Floodplain Forest (G673)
Alliance	<i>Platanus occidentalis</i> - <i>Liquidambar styraciflua</i> - <i>Liriodendron tulipifera</i> Southern Appalachian Floodplain Forest Alliance (A3702)

**ELEMENT CONCEPT**

**Global Summary:** This community occurs in floodplain depressions in the Blue Ridge of North Carolina and possibly Tennessee. Some characteristic and often dominant canopy and subcanopy species include *Acer rubrum* var. *trilobum* and *Fraxinus pennsylvanica*. *Peltandra virginica* is prominent in the herbaceous layer. Other herbaceous species include *Carex crinita* var. *brevicrinis*, *Sparganium americanum*, *Leersia oryzoides*, *Cornus amomum*, *Carex lupulina*, *Juncus effusus*, *Onoclea sensibilis*, and the aliens *Murdannia keisak* and *Microstegium vimineum*.

**ENVIRONMENTAL DESCRIPTION**

**Great Smoky Mountains National Park Environment:** The example of this community within the park was most likely an old farm field at one time that has now reverted to an early version of what it once may have been. The area is relatively flat but does contain numerous depressions and areas of higher land that create opportunities for both wetland species and upland species to be present.

**Global Environment:** This community occurs in floodplain depressions in the Blue Ridge of North Carolina and possibly Tennessee.

**VEGETATION DESCRIPTION**

**Great Smoky Mountains National Park Vegetation:** Within the park, there is most likely only one occurrence of this community. The canopy trees are *Acer rubrum* var. *trilobum* and *Fraxinus* spp. with scattered individuals of *Liriodendron tulipifera*, *Pinus rigida*, and *Pinus strobus*. There is no shrub layer. The herb layer is dominated by *Microstegium vimineum*, but also contains a large amount of *Boehmeria cylindrica*, *Carex crinita*, *Carex squarrosa*, *Gratiola* spp., and other forest wetland species.

**Global Vegetation:** Some characteristic and often dominant canopy and subcanopy species in stands of this association include *Acer rubrum* var. *trilobum* and *Fraxinus pennsylvanica*. *Peltandra virginica* is prominent in the herbaceous layer. Other herbaceous species include *Carex crinita* var. *brevicrinis*, *Sparganium americanum*, *Leersia oryzoides*, *Cornus amomum* (= ssp. *amomum*), *Carex lupulina*, *Juncus effusus*, *Onoclea sensibilis*, and the aliens *Murdannia keisak* and *Microstegium vimineum*.

**MOST ABUNDANT SPECIES****Global****Stratum**

Tree canopy  
Herb (field)

**Lifeform**

Broad-leaved deciduous tree  
Flowering forb

**Species**

*Acer rubrum* var. *trilobum*, *Fraxinus pennsylvanica*  
*Peltandra virginica*

**CHARACTERISTIC SPECIES****Great Smoky Mountains National Park:**

**Global:** *Acer rubrum* var. *trilobum*, *Carex crinita* var. *brevicrinis*, *Fraxinus pennsylvanica*, *Peltandra virginica*

**OTHER NOTEWORTHY SPECIES**

**Global: Invasive/Exotic Plants:** *Microstegium vimineum* (High/Medium), *Murdannia keisak* (Medium/Low)

**CONSERVATION STATUS RANK**

**Global Rank & Reasons:** G1 (31-Jan-2001). This floodplain depression forest occurs at very few sites in the floodplains of rivers in the Blue Ridge physiographic province. It is naturally very limited in extent. Many examples have been destroyed by alteration of floodplains, and all remaining examples have been altered by timber harvest, hydrologic alteration, and exotic species.

**RELATED CONCEPTS****Global Related Concepts:**

- IIA6e. Southern Appalachian Alluvial Forest (Allard 1990) >

**CLASSIFICATION**

**Status:** Standard

**Classification Confidence:** 3 - Weak

**Global Classification Comments:** Known from alluvial depressions along the Little Tennessee River, probably more widespread (though certainly not common). Data are available from the North Carolina Vegetation Survey.

**ELEMENT DISTRIBUTION**

**Great Smoky Mountains National Park Range:** This community type is most likely only represented in one location within the park, an area within the floodplain of Abrams Creek.

**Global Range:** This community occurs in the Blue Ridge of North Carolina and possibly Tennessee.

**Nations:** US

**States/Provinces:** NC, TN?

**TNC Ecoregions:** 51:C

**USFS Ecoregions (1994/95):** M221Dc:CCC, M221Dd:CCC

USFS Ecoregions (2007): M221Dc:CCC, M221Dd:CCC

Federal Lands: BIA (Eastern Band of Cherokee); NPS (Great Smoky Mountains); USFS (Nantahala, Pisgah)

## ELEMENT SOURCES

Great Smoky Mountains National Park Description Author(s): R. White

Global Description Author(s): A.S. Weakley

References: Allard 1990, NatureServe Ecology - Southeastern U.S. unpubl. data, Peet et al. unpubl. data, Schafale 2012, Schafale and Weakley 1990, Southeastern Ecology Working Group n.d.

**[CEGL007880] *Liquidambar styraciflua* - *Liriodendron tulipifera* - (*Platanus occidentalis*) / *Halesia tetraptera* / *Amphicarpaea bracteata* Floodplain Forest**

Translated Name: Sweetgum - Tuliptree - (American Sycamore) / Mountain Silverbell / American Hog-peanut Floodplain Forest

Common Name: Montane Sweetgum Alluvial Flat

## USNVC CLASSIFICATION

Division	Eastern North American-Great Plains Flooded & Swamp Forest (1.B.3.Na)
Macrogroup	Central Hardwood Floodplain Forest (M029)
Group	Silver Maple - Sugarberry - Sweetgum Floodplain Forest (G673)
Alliance	<i>Platanus occidentalis</i> - <i>Liquidambar styraciflua</i> - <i>Liriodendron tulipifera</i> Southern Appalachian Floodplain Forest Alliance (A3702)

## ELEMENT CONCEPT

**Global Summary:** This is a low-elevation montane or submontane alluvial forest which is found on large alluvial flats and high terraces along large rivers (e.g., Little Pigeon River) or on small, disturbed flats along medium-sized perennial streams. It is found at lower elevations in the southern fringes of the Southern Blue Ridge Province, or in the adjacent Piedmont and Southern Ridge and Valley. It often occurs on sites that were formerly cleared for farming or settlement. Soils are typically deep, loamy silts but can have large rocks and cobbles. In the Great Smoky Mountains, the mean elevation of samples is 510 m (1680 feet), ranging from 450 to 580 m (1480-1900 feet). It would be possibly expected at lower elevations as well, especially in the adjacent ecoregions. This forest has an open to closed canopy dominated by *Liquidambar styraciflua* and *Liriodendron tulipifera*, often with *Platanus occidentalis*. It is distinguished from other kinds of Montane Alluvial Forests by the dominance or relatively higher importance of *Liquidambar styraciflua* in its stands, and by its habitat on larger, lower-elevation, riverine situations. *Platanus* is characteristic, but not necessarily dominant in stands of this association. In habitats with a more calcareous influence in the substrate, *Juglans nigra* may have a higher relative importance or even be codominant. The subcanopy is absent to well-developed. Typical dominants are *Carpinus caroliniana*, *Cornus florida*, and *Acer rubrum*. The shrub stratum is absent to moderately dense. *Rhododendron maximum* and *Tsuga canadensis* are the most common shrubs, although other species can be present. Herbaceous cover is often absent or sparse, with ground cover dominated by litter and duff. On smaller streams, near open fields or where animal grazing is evident, herbaceous cover can approach 100% cover. Species often present with high coverage include *Amphicarpaea bracteata*, *Ageratina altissima* var. *altissima*, *Dichanthelium boscii*, *Thelypteris noveboracensis*, and *Toxicodendron radicans* ssp. *radicans*. Stands found on small, disturbed flats along medium-sized perennial streams may contain patches of *Xanthorhiza simplicissima*. The exotic grass *Microstegium vimineum* may have high cover in some stands.

## ENVIRONMENTAL DESCRIPTION

**Great Smoky Mountains National Park Environment:** This forest is found on large alluvial flats and high terraces along large rivers (e.g., Little Pigeon River) or on small, disturbed flats along medium-sized perennial streams. This community often occurs on sites that were formerly cleared for farming or settlement. Soils are typically deep, loamy silts but can have large rocks and cobbles. The mean elevation of samples is 1680 feet, ranging from 1480 to 1900 feet.

**Global Environment:** This low-elevation montane or submontane alluvial forest was defined from Great Smoky Mountains National Park, Tennessee, where it is found on large alluvial flats and high terraces along large rivers (e.g., Little Pigeon River) or on small, disturbed flats along medium-sized perennial streams. It often occurs on sites that were formerly cleared for farming or settlement. Soils are typically deep, loamy silts but can have large rocks and cobbles. The mean elevation of samples is 510 m (1680 feet), ranging from 450 to 580 m (1480-1900 feet). It is found at lower elevations in the southern fringes of the Southern Blue Ridge Province, or in the adjacent Piedmont and Southern Ridge and Valley. Soils are typically deep, loamy silts but can have large rocks and cobbles. It would be possibly expected at lower elevations as well, especially in the adjacent ecoregions. It often occurs on sites that were formerly cleared for farming or settlement.

## VEGETATION DESCRIPTION

**Great Smoky Mountains National Park Vegetation:** This forest has an open to closed canopy dominated by *Liquidambar styraciflua* and *Liriodendron tulipifera*, often with *Platanus occidentalis*. Other minor species that are variably present in the canopy include *Acer rubrum*, *Fraxinus americana*, *Juglans nigra*, *Pinus virginiana*, *Prunus serotina*, *Robinia pseudoacacia*, *Tilia americana* var. *heterophylla*, and *Ulmus americana*. The subcanopy is absent to well-developed. Typical dominants are *Carpinus caroliniana*, *Cornus florida*, and *Acer rubrum*. Other species that can be present in the subcanopy include *Betula alleghaniensis*, *Betula lenta*,

*Tsuga canadensis*, *Juglans cinerea*, *Halesia tetraptera* var. *monticola*, *Acer pensylvanicum*, *Acer saccharum*, *Amelanchier laevis*, *Oxydendrum arboreum*, and *Prunus serotina*. The shrub stratum is absent to moderately dense. *Rhododendron maximum* and *Tsuga canadensis* are the most common shrubs, although other species can be present. Herbaceous cover is often absent or sparse, with ground cover dominated by litter and duff. On smaller streams, near open fields or where animal grazing is evident, herbaceous cover can approach 100% cover. Species often present with high coverage include *Amphicarpaea bracteata*, *Dichanthelium boscii*, *Microstegium vimineum*, *Thelypteris noveboracensis*, and *Toxicodendron radicans* ssp. *radicans*. Other common species include *Arisaema triphyllum*, *Asplenium platyneuron*, *Eurybia divaricata* (= *Aster divaricatus*), *Carex* spp. (e.g., *Carex digitalis*, *Carex intumescens*, *Carex laxiflora* var. *laxiflora*, *Carex plantaginea*, *Carex platyphylla*, *Carex retroflexa*, *Carex swanii*, *Carex torta*), *Dichanthelium* spp. (e.g., *Dichanthelium commutatum*, *Dichanthelium dichotomum*, *Dichanthelium sphaerocarpon*), *Houstonia serpyllifolia*, *Laportea canadensis*, *Mitchella repens*, *Parthenocissus quinquefolia*, *Polystichum acrostichoides*, *Prenanthes* spp., *Sanicula canadensis*, and *Verbesina alternifolia*.

**Global Vegetation:** This forest has an open to closed canopy dominated by *Liquidambar styraciflua* and *Liriodendron tulipifera*, often with *Platanus occidentalis*. Other minor species that are variably present in the canopy include *Acer rubrum*, *Fraxinus americana*, *Juglans nigra*, *Pinus virginiana*, *Prunus serotina*, *Robinia pseudoacacia*, *Tilia americana* var. *heterophylla*, and *Ulmus americana*. In habitats with a more calcareous influence in the substrate, *Juglans nigra* may have a higher relative importance or even be codominant. The subcanopy is absent to well-developed. Typical dominants are *Carpinus caroliniana*, *Cornus florida*, and *Acer rubrum*. Other species that can be present in the subcanopy include *Betula alleghaniensis*, *Betula lenta*, *Tsuga canadensis*, *Juglans cinerea*, *Halesia tetraptera* var. *monticola*, *Acer pensylvanicum*, *Acer saccharum*, *Amelanchier laevis*, *Oxydendrum arboreum*, and *Prunus serotina*. The shrub stratum is absent to moderately dense. *Rhododendron maximum* and *Tsuga canadensis* are the most common shrubs, although other species can be present. Herbaceous cover is often absent or sparse, with ground cover dominated by litter and duff. On smaller streams, near open fields or where animal grazing is evident, herbaceous cover can approach 100% cover. Species often present with high coverage include *Amphicarpaea bracteata*, *Dichanthelium boscii*, *Microstegium vimineum*, *Thelypteris noveboracensis*, and *Toxicodendron radicans* ssp. *radicans*. Other common species include *Arisaema triphyllum*, *Asplenium platyneuron*, *Eurybia divaricata* (= *Aster divaricatus*), *Carex* spp. (e.g., *Carex digitalis*, *Carex intumescens*, *Carex laxiflora* var. *laxiflora*, *Carex plantaginea*, *Carex platyphylla*, *Carex retroflexa*, *Carex swanii*, *Carex torta*), *Dichanthelium* spp. (e.g., *Dichanthelium commutatum*, *Dichanthelium dichotomum*, *Dichanthelium sphaerocarpon*), *Houstonia serpyllifolia*, *Laportea canadensis*, *Mitchella repens*, *Parthenocissus quinquefolia*, *Polystichum acrostichoides*, *Prenanthes* spp., *Sanicula canadensis*, and *Verbesina alternifolia*.

#### MOST ABUNDANT SPECIES

##### Great Smoky Mountains National Park

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Broad-leaved deciduous tree	<i>Liquidambar styraciflua</i> , <i>Liriodendron tulipifera</i> , <i>Platanus occidentalis</i>
Tree subcanopy	Broad-leaved deciduous tree	<i>Carpinus caroliniana</i> , <i>Cornus florida</i>

##### Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Broad-leaved deciduous tree	<i>Liquidambar styraciflua</i> , <i>Liriodendron tulipifera</i> , <i>Platanus occidentalis</i>
Tree subcanopy	Broad-leaved deciduous tree	<i>Carpinus caroliniana</i> , <i>Cornus florida</i>

#### CHARACTERISTIC SPECIES

**Great Smoky Mountains National Park:** *Amphicarpaea bracteata*, *Carpinus caroliniana*, *Cornus florida*, *Halesia tetraptera* var. *monticola*, *Ilex opaca*, *Juglans cinerea*, *Liquidambar styraciflua*, *Liriodendron tulipifera*, *Microstegium vimineum*, *Platanus occidentalis*, *Rhododendron maximum*, *Toxicodendron radicans* ssp. *radicans*, *Tsuga canadensis*

##### Global:

#### OTHER NOTEWORTHY SPECIES

**Great Smoky Mountains National Park:** **Vulnerable Plants:** *Juglans cinerea* (G3); **Invasive/Exotic Plants:** *Microstegium vimineum* (High/Medium)

**Global: Invasive/Exotic Plants:** *Microstegium vimineum* (High/Medium)

#### CONSERVATION STATUS RANK

**Global Rank & Reasons:** G3G4 (8-Jan-2007).

#### RELATED CONCEPTS

##### Global Similar Types:

- *Fraxinus pennsylvanica* - *Platanus occidentalis* - *Celtis laevigata* / *Chasmanthium latifolium* Piedmont Floodplain Forest (CEGL007013)
- *Liriodendron tulipifera* - *Platanus occidentalis* - *Betula lenta* / *Lindera benzoin* / *Circaea lutetiana* ssp. *canadensis* Floodplain Forest (CEGL006255)

- *Platanus occidentalis* - *Liriodendron tulipifera* - (*Betula alleghaniensis*) / *Alnus serrulata* - *Leucothoe fontanesiana* Floodplain Forest (CEGL004691)

**Global Related Concepts:**

- *Liquidambar styraciflua* - *Liriodendron tulipifera* - (*Platanus occidentalis*) / *Carpinus caroliniana* - *Halesia tetraptera* / *Amphicarpaea bracteata* Forest (Patterson et al. 1999) =
- *Platanus/Asimina/Microstegium* Alluvial Forest (Newell and Peet 1995) ?
- IIA6e. Southern Appalachian Alluvial Forest (Allard 1990) >

**CLASSIFICATION**

**Status:** Standard

**Classification Confidence:** 3 - Weak

**Great Smoky Mountains National Park Other Comments:** Given the taxonomic uncertainty of this association, consideration should be given to mapping this vegetation at the Alliance level.

**Global Classification Comments:** This type is distinguished from other kinds of montane alluvial forests by the dominance or relatively higher importance of *Liquidambar styraciflua* in its stands, and by its habitat on larger, lower elevation, riverine situations. Natural forests strongly dominated by *Liquidambar styraciflua* are uncommon in Southern Blue Ridge landscapes, thus this forest may represent a community that is more common at lower elevations in the southern fringes of the Southern Blue Ridge Province, or in the adjacent Piedmont and Southern Ridge and Valley. Information from a larger geographic range is needed to fully distinguish this association from related types. In Great Smoky Mountains National Park, Tennessee, this vegetation is found on the Little Pigeon River. A stand in Linville Gorge, now placed here (Newell and Peet 1995) is referred to as a "large high alluvial flat" in which *Liquidambar styraciflua* shares dominance. This association was initially defined from disturbed floodplains in Great Smoky Mountains National Park and is related to the more broadly defined *Platanus occidentalis* - *Liriodendron tulipifera* - (*Betula alleghaniensis*) / *Alnus serrulata* - *Leucothoe fontanesiana* Floodplain Forest (CEGL004691), Montane Alluvial Forest.

**ELEMENT DISTRIBUTION**

**Great Smoky Mountains National Park Range:** Sweetgum-dominated alluvial forests were sampled from both the Cades Cove and Mount Le Conte quadrangles and are likely in other areas of the Park. They were sampled from the northern portion of the Mount Le Conte quadrangle, on the floodplain of the Little Pigeon River, northeast of the Greenbrier Campground and also near the confluence with Ted's Branch; on the Lower Little Pigeon River, near the northern Park boundary; and on the broad floodplain of Dud's Branch, near Dudley Creek. On the Cades Cove quadrangle this community was sampled in the northern half of the quadrangle, off the Cades Cove Loop Road, in the vicinity of Mills Creek and Abrams Creek and along Rowans Branch; and just south of the Loop Road, in the vicinity of Mill Creek and Forge Creek Road.

**Global Range:** This community was defined from the western fringe of the Southern Blue Ridge, but is also found at lower elevations in the southern fringes of the Southern Blue Ridge Province, and probably in the adjacent Piedmont and Southern Ridge and Valley.

**Nations:** US

**States/Provinces:** AL, GA, NC, SC, TN

**TNC Ecoregions:** 51:C

**USFS Ecoregions (1994/95):** M221Dc:CCC, M221Dd:CCC

**USFS Ecoregions (2007):** M221Dc:CCC, M221Dd:CCC

**Federal Lands:** NPS (Great Smoky Mountains, Little River Canyon); USFS (Chattahoochee, Chattahoochee (Southern Blue Ridge), Cherokee, Nantahala, Pisgah, Sumter, Sumter (Mountains))

**ELEMENT SOURCES**

**Great Smoky Mountains National Park Plots:** GRSM.20, GRSM.64, GRSM.82, GRSM.89, GRSM.112, GRSM.219, GRSM.512.

**Great Smoky Mountains National Park Description Author(s):** K.D. Patterson

**Global Description Author(s):** K.D. Patterson

**References:** Allard 1990, NatureServe Ecology - Southeastern U.S. unpubl. data, Newell and Peet 1995, Patterson et al. 1999, Peet et al. unpubl. data, Schotz et al. 2008, Southeastern Ecology Working Group n.d.

**[CEGL007339] *Platanus occidentalis* - *Fraxinus pennsylvanica* - *Quercus imbricaria* Floodplain Forest**

Translated Name: **American Sycamore - Green Ash - Shingle Oak Floodplain Forest**

Common Name: **Montane Alluvial Forest (Cades Cove/Oconaluftee Type)**

**USNVC CLASSIFICATION**

Division	Eastern North American-Great Plains Flooded & Swamp Forest (1.B.3.Na)
Macrogroup	Central Hardwood Floodplain Forest (M029)
Group	Silver Maple - Sugarberry - Sweetgum Floodplain Forest (G673)
Alliance	<i>Platanus occidentalis</i> - <i>Liquidambar styraciflua</i> - <i>Liriodendron tulipifera</i> Southern Appalachian Floodplain Forest Alliance (A3702)

## ELEMENT CONCEPT

**Global Summary:** This association was described from Cades Cove, a limestone window at 518 m (1700 feet) elevation in Great Smoky Mountains National Park. The description may need substantial revision with additional information. Similar vegetation could be found in Kentucky, Indiana, Illinois, or Missouri. This community occurs on broad flats along streams, within a landscape of pastures and fields. It is impacted by cattle grazing. The forest has a closed canopy dominated by *Platanus occidentalis*, *Acer negundo* var. *negundo*, *Acer rubrum* var. *trilobum*, *Liriodendron tulipifera*, and *Quercus imbricaria*. In some areas the canopy is dominated by *Quercus imbricaria* and *Prunus serotina*, and in other areas it may be dominated by *Juglans nigra* or *Juglans cinerea*. The subcanopy stratum is sparse and primarily composed of canopy species. The shrub stratum is sparse. The herb layer includes *Boehmeria cylindrica*, *Impatiens pallida*, *Verbesina alternifolia*, *Phacelia purshii*, *Packera aurea*, *Carex intumescens*, *Iris* spp., and *Carex* spp. This alluvial forest can contain seasonally wet inclusions dominated by *Juncus effusus*, *Panicum* sp., and *Festuca* sp.

## ENVIRONMENTAL DESCRIPTION

**Great Smoky Mountains National Park Environment:** This community occurs on broad flats along streams and may be associated with calcareous geology. It is within a landscape of pastures and fields and was impacted by cattle grazing.

**Global Environment:** This community occurs on broad flats along streams, within a landscape of pastures and fields. It is impacted by cattle grazing.

## VEGETATION DESCRIPTION

**Great Smoky Mountains National Park Vegetation:** This forest has a closed canopy dominated by *Platanus occidentalis*, *Acer negundo* var. *negundo*, *Acer rubrum* var. *trilobum*, *Liriodendron tulipifera*, and *Quercus imbricaria*. In some areas the canopy is dominated by *Quercus imbricaria* and *Prunus serotina*. The subcanopy stratum is sparse and primarily composed of canopy species. The shrub stratum is sparse. The herb layer includes *Boehmeria cylindrica*, *Verbesina alternifolia*, *Phacelia purshii*, *Packera aurea* (= *Senecio aureus*), *Carex intumescens*, *Iris* spp., and *Carex* spp. This alluvial forest can contain seasonally wet inclusions dominated by *Juncus effusus*, *Panicum* sp., and *Festuca* sp.

**Global Vegetation:** The forest has a closed canopy dominated by *Platanus occidentalis*, *Acer negundo* var. *negundo*, *Acer rubrum* var. *trilobum*, *Liriodendron tulipifera*, and *Quercus imbricaria*. In some areas the canopy is dominated by *Quercus imbricaria* and *Prunus serotina*. The subcanopy stratum is sparse and primarily composed of canopy species. The shrub stratum is sparse. The herb layer includes *Boehmeria cylindrica*, *Verbesina alternifolia*, *Phacelia purshii*, *Packera aurea* (= *Senecio aureus*), *Carex intumescens*, *Iris* spp., and *Carex* spp. This alluvial forest can contain seasonally wet inclusions dominated by *Juncus effusus*, *Panicum* sp., and *Festuca* sp.

## MOST ABUNDANT SPECIES

## Great Smoky Mountains National Park

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Broad-leaved deciduous tree	<i>Platanus occidentalis</i>
Shrub/sapling (tall & short)	Broad-leaved deciduous tree	<i>Lindera benzoin</i>
Herb (field)	Flowering forb	<i>Hydrophyllum canadense</i> , <i>Impatiens pallida</i> , <i>Viola</i> spp.

## Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Broad-leaved deciduous tree	<i>Platanus occidentalis</i>
Shrub/sapling (tall & short)	Broad-leaved deciduous tree	<i>Lindera benzoin</i>
Herb (field)	Flowering forb	<i>Hydrophyllum canadense</i> , <i>Impatiens pallida</i> , <i>Viola</i> spp.

## CHARACTERISTIC SPECIES

**Great Smoky Mountains National Park:** *Acer negundo* var. *negundo*, *Acer rubrum* var. *trilobum*, *Boehmeria cylindrica*, *Platanus occidentalis*, *Prunus serotina*, *Quercus imbricaria*, *Verbesina alternifolia*

**Global:** *Quercus imbricaria*

## OTHER NOTEWORTHY SPECIES

**Great Smoky Mountains National Park: Vulnerable Plants:** *Juglans cinerea* (G3)

**Global: Vulnerable Plants:** *Thaspium pinnatifidum* (G2G3)

## CONSERVATION STATUS RANK

**Global Rank & Reasons:** G2Q (24-Oct-2002). This community occurs on broad flats along streams, within a landscape of pastures and fields. It has been described from a protected example in Great Smoky Mountains National Park at Cades Cove, a limestone window at 518 m (1700 feet) elevation and from another protected but impacted example near Cherokee, NC. It is impacted by cattle grazing. It is distinct from montane alluvial forests found at higher elevations and on acidic substrates in the Blue Ridge but may be similar to alluvial vegetation in the Ridge and Valley and farther west. The "Q" on the Rank indicates that there are issues about the taxonomic distinctiveness of this type, and that its merger with another type would make it less rare. Rank was changed from G3G4 to G2G3 to indicate that this community may be more restricted than originally thought. It may be a distinct type restricted to the Southern Blue Ridge region, or it may be sufficiently related to other associations to be merged with more common and widespread types. More information is needed on it and its relationship to similar types.

## RELATED CONCEPTS

**Global Related Concepts:**

- IIA6e. Southern Appalachian Alluvial Forest (Allard 1990) >

## CLASSIFICATION

**Status:** Standard

**Classification Confidence:** 3 - Weak

**Great Smoky Mountains National Park Other Comments:** This community is meant to cover some streamside forests within the open fields of Cades Cove and along sections of the Oconaluftee River.

**Global Classification Comments:** This association was described from Cades Cove, a limestone window at 518 m (1700 feet) elevation in Great Smoky Mountains National Park. It was also found at the opposite end of the park adjacent to the Oconaluftee River near the Qualla Boundary. This type is distinct from montane alluvial forests found at higher elevations and on acid substrates in the Blue Ridge, but may be similar to alluvial vegetation in the Ridge and Valley and farther west. Presently (2000-12) not attributed to the Ridge and Valley (TNC Ecoregion 50).

## ELEMENT DISTRIBUTION

**Great Smoky Mountains National Park Range:** This community was sampled along a stretch of Abrams Creek on the Tennessee side of the park and along a short stretch of the Oconaluftee River on the North Carolina side of the park. These are most likely the only two occurrences of this community known inside the park (and the only two occurrences of this community known at this time in the U.S.).

**Global Range:** This association may be restricted to the Southern Blue Ridge, but its full range is not known and its relationship to other types is under review.

**Nations:** US

**States/Provinces:** NC, TN

**TNC Ecoregions:** 51:C

**USFS Ecoregions (1994/95):** M221Dd:CCC

**USFS Ecoregions (2007):** M221Dd:CCC

**Federal Lands:** BIA (Eastern Band of Cherokee); NPS (Blue Ridge Parkway, Great Smoky Mountains)

## ELEMENT SOURCES

**Great Smoky Mountains National Park Plots:** GRSM.316.

**Great Smoky Mountains National Park Description Author(s):** K.D. Patterson, mod. R. White

**Global Description Author(s):** A.S. Weakley

**References:** Allard 1990, NatureServe Ecology - Southeastern U.S. unpubl. data, Southeastern Ecology Working Group n.d.

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**[CEGL004691] *Platanus occidentalis* - *Liriodendron tulipifera* - (*Betula alleghaniensis*) / *Alnus serrulata* - *Leucothoe fontanesiana* Floodplain Forest**

Translated Name: **American Sycamore - Tuliptree - (Yellow Birch) / Hazel Alder - Highland Doghobble Floodplain Forest**

Common Name: **Appalachian Montane Alluvial Forest**

## USNVC CLASSIFICATION

Division Eastern North American-Great Plains Flooded & Swamp Forest (1.B.3.Na)

Macrogroup Central Hardwood Floodplain Forest (M029)

Group Silver Maple - Sugarberry - Sweetgum Floodplain Forest (G673)

Alliance *Platanus occidentalis* - *Liquidambar styraciflua* - *Liriodendron tulipifera* Southern Appalachian Floodplain Forest Alliance (A3702)

## ELEMENT CONCEPT

**Global Summary:** This association covers alluvial forests of Southern Blue Ridge and nearby portions of the inner Piedmont. This type is associated with narrow, rocky floodplains and islands in medium-sized rivers, typically at elevations below 915 m (3000 feet). It is more frequent below 610 m (2000 feet). Examples are known from the Nantahala Gorge, Slickrock Creek, the South Toe River, and the Black and Craggy Mountains. Canopy composition of stands is variable but typical dominants are *Platanus occidentalis*, *Liriodendron tulipifera*, *Fraxinus americana*, *Betula alleghaniensis*, and *Betula lenta*. *Platanus* is characteristic, but not necessarily dominant in stands of this association. Other canopy/subcanopy trees can include *Carpinus caroliniana*, *Betula nigra*, *Acer rubrum*, *Pinus virginiana*, *Pinus strobus*, and *Tsuga canadensis*. In contrast to montane alluvial forests on the margins of the Southern Blue Ridge or on larger rivers, *Liquidambar styraciflua* is rare to absent in this type. The shrub stratum can be dense, often with local dominance by *Leucothoe fontanesiana* or *Rhododendron maximum*. Other characteristic shrubs include *Alnus serrulata*, *Xanthorhiza simplicissima*, *Corylus americana*, *Cornus amomum*, *Hamamelis virginiana*, *Euonymus americanus*, and *Hydrangea arborescens*. Vines can be prominent including *Aristolochia macrophylla*, *Parthenocissus quinquefolia*, *Smilax glauca*, *Smilax rotundifolia*, and *Vitis aestivalis*. Herbaceous species composition varies from site to site, and herbaceous strata can be quite patchy on the rocky substrate. Characteristic species known from these forests include *Amphicarpaea bracteata*, *Actaea racemosa*, *Polystichum acrostichoides*, *Eurybia divaricata*, *Anemone quinquefolia*, *Athyrium filix-femina*, *Claytonia virginica*, *Erythronium americanum*,

*Medeola virginiana*, *Packera aurea*, *Stellaria pubera*, *Tiarella cordifolia*, and *Viola blanda*. *Carex* species may be common (e.g., *Carex appalachica*, *Carex austrocaroliniana*, *Carex blanda*, *Carex digitalis*, *Carex plantaginea*, *Carex swanii*, *Carex torta*).

#### ENVIRONMENTAL DESCRIPTION

**Great Smoky Mountains National Park Environment:** This community type is common along medium to large streams, especially sections of streams that are flat or only gently sloping. Although the global description constrains the community to "medium-sized rivers," this community may occur in medium and large high-energy streams as they spill down towards larger rivers. **Global Environment:** This association covers alluvial forests of Southern Blue Ridge and nearby portions of the inner Piedmont. This type is associated with narrow, rocky floodplains and islands in medium-sized rivers, typically at elevations below 915 m (3000 feet). It is more frequent below 610 m (2000 feet). Examples are known from the Nantahala Gorge, Slickrock Creek (Newell et al. 1997), Great Smoky Mountains, the South Toe River, the Black Mountains, Craggy Mountains (McLeod and Ulrey unpubl. data), and the Chattahoochee National Forest of Georgia.

#### VEGETATION DESCRIPTION

**Great Smoky Mountains National Park Vegetation:** Stands within the Smokies typically contain *Platanus occidentalis*, but not usually as the dominant. Often, dominance is shared between *Liriodendron tulipifera*, *Betula lenta*, *Betula alleghaniensis*, *Platanus occidentalis*, and *Tsuga canadensis*. The shrub stratum is usually dominated by either a monoculture of *Rhododendron maximum* or *Leucothoe fontanesiana* or a combination of various medium and low shrubs including the ones just mentioned and *Xanthorhiza simplicissima* and even sometimes *Kalmia latifolia*. The herb layer is only developed in patches of no shrubs.

**Global Vegetation:** Canopy composition of stands is variable but typical dominants are *Platanus occidentalis*, *Liriodendron tulipifera*, *Fraxinus americana*, *Betula alleghaniensis*, and *Betula lenta*. *Platanus* is characteristic but not necessarily present in all stands of this association. Other canopy/subcanopy trees can include *Carpinus caroliniana*, *Betula nigra*, *Acer rubrum*, *Pinus virginiana*, *Pinus strobus*, and *Tsuga canadensis*. In contrast to montane alluvial forests on the margins of the Southern Blue Ridge or on larger rivers, *Liquidambar styraciflua* is rare to absent in this type. The shrub stratum can be dense, often with local dominance by *Leucothoe fontanesiana* or *Rhododendron maximum*. Other characteristic shrubs include *Alnus serrulata*, *Xanthorhiza simplicissima*, *Corylus americana*, *Cornus amomum*, *Hamamelis virginiana*, *Euonymus americanus*, and *Hydrangea arborescens*. Vines can be prominent including *Aristolochia macrophylla*, *Parthenocissus quinquefolia*, *Smilax glauca*, *Smilax rotundifolia*, and *Vitis aestivalis*. Herbaceous species composition varies from site to site, and herbaceous strata can be quite patchy on the rocky substrate. Characteristic species known from these forests include *Amphicarpaea bracteata*, *Actaea racemosa* (= *Cimicifuga racemosa*), *Polystichum acrostichoides*, *Eurybia divaricata* (= *Aster divaricatus*), *Anemone quinquefolia*, *Athyrium filix-femina*, *Claytonia virginica*, *Erythronium americanum*, *Medeola virginiana*, *Packera aurea*, *Stellaria pubera*, *Tiarella cordifolia*, and *Viola blanda*. In addition, *Carex* species may be common (e.g., *Carex appalachica*, *Carex austrocaroliniana*, *Carex blanda*, *Carex digitalis*, *Carex plantaginea*, *Carex swanii*, *Carex torta*).

#### MOST ABUNDANT SPECIES

##### Great Smoky Mountains National Park

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Broad-leaved deciduous tree	<i>Liriodendron tulipifera</i>
Shrub/sapling (tall & short)	Broad-leaved evergreen tree	<i>Rhododendron maximum</i>
Herb (field)	Flowering forb	<i>Xanthorhiza simplicissima</i>

##### Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Broad-leaved deciduous tree	<i>Betula alleghaniensis</i> , <i>Betula lenta</i> , <i>Fraxinus americana</i> , <i>Liriodendron tulipifera</i> , <i>Platanus occidentalis</i>
Tree subcanopy	Broad-leaved deciduous tree	<i>Carpinus caroliniana</i>
Shrub/sapling (tall & short)	Broad-leaved evergreen shrub	<i>Leucothoe fontanesiana</i>
Tall shrub/sapling	Broad-leaved evergreen tree	<i>Rhododendron maximum</i>

#### CHARACTERISTIC SPECIES

**Great Smoky Mountains National Park:** *Leucothoe fontanesiana*, *Platanus occidentalis*

**Global:** *Alnus serrulata*, *Betula alleghaniensis*, *Betula lenta*, *Betula nigra*, *Carpinus caroliniana*, *Fraxinus americana*, *Leucothoe fontanesiana*, *Liquidambar styraciflua*, *Liriodendron tulipifera*, *Platanus occidentalis*, *Rhododendron maximum*, *Tsuga canadensis*, *Xanthorhiza simplicissima*

#### OTHER NOTEWORTHY SPECIES

**Global: Vulnerable Plants:** *Heuchera caroliniana* (G3)

#### CONSERVATION STATUS RANK

**Global Rank & Reasons:** G2? (23-Feb-1999). This community is naturally uncommon in the Southern Blue Ridge. Well-developed examples are rare due to clearing for agriculture and development. This community is threatened by road building and other disturbances causing hydrologic alteration.

## RELATED CONCEPTS

**Global Similar Types:**

- *Liquidambar styraciflua* - *Liriodendron tulipifera* - (*Platanus occidentalis*) / *Halesia tetraptera* / *Amphicarpaea bracteata* Floodplain Forest (CEGL007880) with at least partial dominance by *Liquidambar styraciflua*.
- *Liriodendron tulipifera* - *Platanus occidentalis* - *Betula lenta* / *Lindera benzoin* / *Circaea lutetiana* ssp. *canadensis* Floodplain Forest (CEGL006255)
- *Platanus occidentalis* / *Dichanthelium clandestinum* - *Festuca subverticillata* Floodplain Forest (CEGL004031)

**Global Related Concepts:**

- *Liriodendron* - *Platanus* / *Amphicarpaea* Alluvial Forest (Newell et al. 1997) ?
- *Platanus* - *Betula alleghaniensis* Alluvial Forest (Newell et al. 1997) ?
- *Platanus occidentalis* - *Liriodendron tulipifera* - *Betula (alleghaniensis, lenta)* / *Alnus serrulata* - *Leucothoe fontanesiana* Forest (Fleming and Patterson 2009a) =
- Alluvial Forest (McLeod 1988) ?
- Floodplain Woodlands (Pittillo and Smathers 1979) ?
- IIA6e. Southern Appalachian Alluvial Forest (Allard 1990) >

## CLASSIFICATION

**Status:** Standard

**Classification Confidence:** 3 - Weak

**Global Classification Comments:** This alluvial forest type is less common in the Southern Blue Ridge than alluvial forests dominated by *Tsuga canadensis*, which are found in areas with better-developed soils and less frequent flooding.

## ELEMENT DISTRIBUTION

**Great Smoky Mountains National Park Range:** This community was not sampled from the Cades Cove or Mount Le Conte quadrangles but is likely in the park.

**Global Range:** This community is found in the Southern Blue Ridge of western North Carolina, northern South Carolina, and eastern Tennessee. It likely extends into Georgia.

**Nations:** US

**States/Provinces:** GA?, NC, SC, TN

**TNC Ecoregions:** 51:C, 52:C

**USFS Ecoregions (1994/95):** M221Dc:CCC, M221Dd:CCC

**USFS Ecoregions (2007):** M221Dc:CCC, M221Dd:CCC

**Federal Lands:** BIA (Eastern Band of Cherokee); NPS (Appalachian Trail [Southern Blue Ridge], Blue Ridge Parkway, Great Smoky Mountains); USFS (Chattahoochee (Piedmont)?, Chattahoochee (Southern Blue Ridge)?, Chattahoochee?, Cherokee?, Nantahala, Pisgah)

## ELEMENT SOURCES

**Great Smoky Mountains National Park Plots:** GRSM.516, GRSM.525.

**Great Smoky Mountains National Park Description Author(s):** K.D. Patterson, mod. R. White

**Global Description Author(s):** K.D. Patterson

**References:** Allard 1990, Fleming and Patterson 2009a, McLeod 1988, NatureServe Ecology - Southeastern U.S. unpubl. data, Nelson 1986, Newell and Peet 1995, Newell et al. 1997, Peet et al. unpubl. data, Pittillo and Smathers 1979, Schafale 2012, Schafale and Weakley 1990, Southeastern Ecology Working Group n.d.

**M503. Central Hardwood Swamp Forest****G044. CENTRAL INTERIOR-APPALACHIAN SEEPAGE SWAMP**

**Group Summary Description:** This group of deciduous acidic seepage swamp forest communities is found primarily in two distinctive cool temperate regions of eastern North America. One of these constitutes the broadly conceived Appalachian region, including the southern Piedmont, the Cumberland Plateau and Ridge and Valley regions, parts of the Central Appalachians, and portions of the Southern Blue Ridge including the flat metasedimentary upland surfaces of Chilhowee Mountain, Tennessee. Some of the associations from this region range peripherally into the adjacent Interior Low Plateau and coastal plains, but these areas are not part of the core area. The other part of the group's range includes the unglaciated Interior Low Plateau from Alabama to Kentucky, and the Ouachitas and Ozarks of Arkansas and Oklahoma. These wetland forests generally occur where the substrate is saturated to the surface for extended periods during the growing season, but where surface water is seldom present for more than short periods of time. For example, in the Cumberland Plateau, stands most often occur in streamhead swales or on broad sandstone ridges where soils are sandy and saturated due to a combination of perched water table and seepage flow. Examples range in condition from open woodlands to forests. Typical woody species include *Acer rubrum*, *Nyssa sylvatica*, *Liriodendron tulipifera*, *Liquidambar styraciflua*, *Ilex opaca* var. *opaca*, *Oxydendrum arboreum*, and *Viburnum nudum*. In the Piedmont, vegetation is variable within and among examples. Included are seepage-fed wetlands on gentle slopes, with substantial seepage flow and which may be influenced by wildland fire. In the Ouachita Mountains of central Arkansas, as well as on Mount Magazine and in the Ozarks, examples may be found along the

bottom slopes of smaller valleys, as well as in the upper riparian zones of larger creeks, sometimes extending upslope along small ephemeral drainages. The soil remains saturated to very moist throughout the year. The vegetation is typically forested with highly variable canopy composition. *Acer rubrum* var. *trilobum*, *Nyssa sylvatica*, *Liquidambar styraciflua*, and *Quercus alba* are common and typical. Other canopy species may include *Fagus grandifolia* and *Magnolia tripetala*. Canopy coverage can be moderately dense to quite open. The subcanopy is often well-developed and characteristically includes *Ilex opaca* var. *opaca*, *Magnolia tripetala*, *Carpinus caroliniana*, and *Ostrya virginiana*. Individual occurrences of these forests tend to be small in extent and can provide habitat for rare plant and animal species.

## **A3358 *Acer rubrum* / *Alnus serrulata* - *Ilex verticillata* Appalachian-Piedmont Seepage Forest Alliance**

Red Maple / Hazel Alder - Common Winterberry Appalachian-Piedmont Seepage Forest Alliance  
*Appalachian-Piedmont Red Maple - Blackgum Seepage Forest*

### **ALLIANCE CONCEPT**

**Summary:** Vegetation of this alliance is found in forested acidic seeps and saturated swamp forests of the southern Piedmont and Appalachian regions of the southeastern United States. Forests in this alliance have variable canopy composition, but *Acer rubrum* and *Nyssa sylvatica* are common components. Canopy composition differs from the surrounding upland and varies with geography. Typical canopy species across the range of this alliance include *Acer rubrum* var. *trilobum*, *Nyssa sylvatica*, and *Liriodendron tulipifera*. One association contains *Pinus strobus*. Understory and shrub species include *Alnus serrulata*, *Ilex opaca* var. *opaca*, *Ilex verticillata*, *Aronia arbutifolia*, *Rhododendron canescens*, and *Viburnum nudum* var. *nudum*. Characteristic herbaceous species include *Carex* spp., *Osmunda cinnamomea*, *Osmunda regalis*, and *Woodwardia areolata*. In addition, *Sphagnum* spp. are typical. These wetland forests generally occur where the soils are saturated to the surface for extended periods during the growing season, but where surface water is seldom present. These forested, primarily acidic seeps are found on hillsides, streamheads, floodplain edges, poorly drained depressions, and gentle slopes where saturated conditions influence the vegetation.

**Classification Comments:** The nominal tree species (*Acer rubrum*) is found in a variety of habitats, so it is not sufficiently diagnostic. Shrubs have been added to make the name more geographically specific. *Ilex verticillata* is better distributed in the Piedmont and Appalachian regions, and in contrast is infrequent to rare in the Interior Low Plateau and Ouachitas, so its use as a nominal helps to distinguish this alliance from the related and equivalent one in those regions. The range (southern Piedmont and Appalachian) and habitat (forested acidic seeps, saturated swamp forests, etc.) are also part of the diagnostic criteria.

### **Similar Alliances:**

- *Acer rubrum* - *Fraxinus pennsylvanica* Northeastern Swamp Forest Alliance (A3706)
- *Acer rubrum* - *Nyssa sylvatica* Ozark-Interior Seepage Forest Alliance (A3359) is related vegetation from west of the Appalachians.
- *Acer rubrum* - *Nyssa sylvatica* Swamp Forest Alliance (A2058)

### **ALLIANCE DESCRIPTION**

**Environment:** These wetland forests generally occur where the soils are saturated to the surface for extended periods during the growing season, but where surface water is seldom present. These forested, primarily acidic seeps are found on hillsides, streamheads, floodplain edges, poorly drained depressions, and gentle slopes where saturated conditions influence the vegetation. One woodlands association has seepage areas of mineral soil derived from mafic or circumneutral bedrock.

**Vegetation:** *Acer rubrum* and *Nyssa sylvatica* are common components in examples of this association. Canopy composition differs from the surrounding upland and varies with geography. Typical canopy species across the range of this alliance include *Acer rubrum* var. *trilobum*, *Nyssa sylvatica*, and *Liriodendron tulipifera*. One association contains *Pinus strobus*. Understory and shrub species include *Alnus serrulata*, *Ilex opaca* var. *opaca*, *Ilex verticillata*, *Aronia arbutifolia*, *Rhododendron canescens*, and *Viburnum nudum* var. *nudum*. Characteristic herbaceous species include *Carex* spp., *Osmunda cinnamomea*, *Osmunda regalis* var. *spectabilis*, and *Woodwardia areolata*. Other herbaceous species which may be present include *Aconitum uncinatum*, *Carex atlantica*, *Dichanthelium clandestinum*, *Dichanthelium dichotomum*, *Oxypolis rigidior*, *Pycnanthemum tenuifolium*, *Rhynchospora* spp., *Solidago uliginosa*, and *Viola cucullata*. In addition, *Sphagnum* spp. are typical.

**Floristics:** *Acer rubrum* and *Nyssa sylvatica* are common components in examples of this association. Canopy composition differs from the surrounding upland and varies with geography. Typical canopy species across the range of this alliance include *Acer rubrum* var. *trilobum*, *Nyssa sylvatica*, and *Liriodendron tulipifera*. One association contains *Pinus strobus*. Understory and shrub species include *Alnus serrulata*, *Ilex opaca* var. *opaca*, *Ilex verticillata*, *Aronia arbutifolia*, *Rhododendron canescens*, and *Viburnum nudum* var. *nudum*. Characteristic herbaceous species include *Carex* spp., *Osmunda cinnamomea*, *Osmunda regalis* var. *spectabilis*, and *Woodwardia areolata*. Other herbaceous species which may be present include *Aconitum uncinatum*, *Carex atlantica*, *Dichanthelium clandestinum*, *Dichanthelium dichotomum*, *Oxypolis rigidior*, *Pycnanthemum tenuifolium*, *Rhynchospora* spp., *Solidago uliginosa*, and *Viola cucullata*. In addition, *Sphagnum* spp. are typical.

**Dynamics:** Individual occurrences of these forests tend to be small in extent and can provide habitat for rare plant species. Surface fire, during dry periods, and other disturbances such as windstorms can affect the structure of the canopy. Examples with more open canopies have better-developed herbaceous layers.

**ALLIANCE DISTRIBUTION**

**Range:** Vegetation of this alliance is primarily found in the southern Piedmont and Appalachian regions of the southeastern United States, from West Virginia and Pennsylvania south to Alabama and Georgia, including the southern Ridge and Valley and Cumberland Plateau. Some associations range peripherally into the adjacent Interior Low Plateau and Atlantic Coastal Plain, but these regions are not part of the primary range of this alliance.

**Nations:** US

**Subnations:** AL, DE, GA, KY, MD, NC, NJ, PA, SC, TN, VA, WV

**TNC Ecoregions:** 44:C, 50:C, 51:C, 52:C, 56:P, 57:C, 58:?, 59:C, 60:C

**ALLIANCE SOURCES**

**References:** Breden 1989, Faber-Langendoen et al. 2019b, Fike 1999, Harvill 1967, Heckscher 1994, Schafale and Weakley 1990, Smith 1991

**Author of Concept:** Faber-Langendoen et al. 2019b

**Author of Description:** M. Pyne, in Faber-Langendoen et al. (2013)

**[CEGL007388] *Liquidambar styraciflua* - *Acer rubrum* / *Carex* spp. - *Sphagnum* spp. Seep Forest**

Translated Name: **Sweetgum - Red Maple / Sedge species - Peatmoss species Seep Forest**

Common Name: **Upland Sweetgum - Red Maple Pond**

**USNVC CLASSIFICATION**

Division	Eastern North American-Great Plains Flooded & Swamp Forest (1.B.3.Na)
Macrogroup	Central Hardwood Swamp Forest (M503)
Group	Central Interior-Appalachian Seepage Swamp (G044)
Alliance	<i>Acer rubrum</i> / <i>Alnus serrulata</i> - <i>Ilex verticillata</i> Appalachian-Piedmont Seepage Forest Alliance
(A3358)	

**ELEMENT CONCEPT**

**Global Summary:** This association is designed to accommodate a variety of isolated, poorly understood seasonally flooded forests of upland depressions in the Southern Blue Ridge and the adjacent and submontane Piedmont. This includes an example in Cades Cove in the Great Smokies National Park, an example in the Piedmont portion of the Chattahoochee National Forest (Georgia), the Bankhead National Forest (Alabama). Stands assigned to this concept are dominated by some combination of *Liquidambar styraciflua* and/or *Acer rubrum*, possibly with *Nyssa sylvatica* and/or *Liriodendron tulipifera*. Some shrubs that may be found include *Cornus amomum*, *Cornus foemina*, and *Alnus serrulata*. Some woody vines which are possible components include *Berchemia scandens*, *Decumaria barbara*, and *Smilax laurifolia*. Herbs (which may be abundant to sparse) include *Carex intumescens*, *Carex* spp., *Chasmanthium sessiliflorum*, *Dichantheium dichotomum* var. *dichotomum*, *Dichantheium* spp., *Leersia* spp., *Rhynchospora capitellata*, *Mitchella repens*, and *Arisaema triphyllum*. Some sites may have ground layers dominated by vascular plants (especially graminoids), others dominated by *Sphagnum* spp. One of the *Sphagnum* species associated with these forests may be a disjunct Coastal Plain species, *Sphagnum cuspidatum*. The variable composition of stands assigned here and the lack of understanding of the dynamics of this type (successional trends, disturbance, hydrology) mean that the type is somewhat poorly defined. More information is needed.

**ENVIRONMENTAL DESCRIPTION**

**Great Smoky Mountains National Park Environment:** This is a palustrine, seasonally flooded forest in an upland depression. Water is ponded about one meter deep during the wettest part of the year and below the surface in the summer months. The vegetation is heavily browsed by deer.

**Global Environment:** Stands assigned to this association occur in a variety of upland depressions in the Southern Blue Ridge and Piedmont.

**VEGETATION DESCRIPTION**

**Great Smoky Mountains National Park Vegetation:** The canopy (15-35 m) is strongly dominated by *Liquidambar styraciflua* but with occasional *Acer rubrum* var. *trilobum* and *Nyssa sylvatica*. There is essentially no shrub cover, but *Rhododendron maximum* is present. During the summer, when the pond is dry, ground cover is dominated by leaf litter, and herb cover is restricted to fallen logs and tip-up mounds. Herb density and composition probably vary from year to year. Herb species include *Chasmanthium laxum*, *Dennstaedtia punctilobula*, *Microstegium vimineum*, and *Juncus effusus*. Scattered mosses include *Sphagnum* spp., *Polytrichum commune*, *Atrichum* spp., *Hypnum* spp., and *Thuidium* spp.

**Global Vegetation:** Stands assigned to this concept are dominated by some combination of *Liquidambar styraciflua* and/or *Acer rubrum*, possibly with *Nyssa sylvatica* and/or *Liriodendron tulipifera*. Some shrubs that may be found include *Cornus amomum*, *Cornus foemina*, and *Alnus serrulata*. Some woody vines which are possible components include *Berchemia scandens*, *Decumaria barbara*, and *Smilax laurifolia*. Herbs (which may be abundant to sparse) include *Carex intumescens*, *Carex* spp., *Chasmanthium sessiliflorum*, *Dichantheium dichotomum* var. *dichotomum*, *Dichantheium* spp., *Leersia* spp., *Rhynchospora capitellata*, *Mitchella repens*, and *Arisaema triphyllum*. Some sites may have ground layers dominated by vascular plants (especially graminoids), others

dominated by *Sphagnum* spp. One of the *Sphagnum* species associated with these forests may be a disjunct Coastal Plain species, *Sphagnum cuspidatum* (= var. *floridanum*?).

**Global Dynamics:** The variable composition of stands assigned here, and the lack of understanding of the dynamics of this type (successional trends, disturbance, hydrology) mean that the type is somewhat poorly defined. More information is needed.

#### MOST ABUNDANT SPECIES

##### Great Smoky Mountains National Park

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Broad-leaved deciduous tree	<i>Liquidambar styraciflua</i>
Herb (field)	Graminoid	<i>Chasmanthium laxum</i>
Nonvascular	Moss	<i>Sphagnum</i> spp.

##### Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Broad-leaved deciduous tree	<i>Acer rubrum</i> , <i>Liquidambar styraciflua</i>
Herb (field)	Graminoid	<i>Carex</i> spp.
Nonvascular	Moss	<i>Sphagnum</i> spp.

#### CHARACTERISTIC SPECIES

**Great Smoky Mountains National Park:** *Acer rubrum* var. *trilobum*, *Liquidambar styraciflua*, *Sphagnum* spp.

**Global:** *Acer rubrum*, *Carex intumescens*, *Carex* spp., *Liquidambar styraciflua*, *Sphagnum cuspidatum*, *Sphagnum* spp.

#### OTHER NOTEWORTHY SPECIES

**Global:**

#### CONSERVATION STATUS RANK

**Global Rank & Reasons:** G2G3Q (23-Feb-2007). There is an incomplete understanding of the ecological limits and acceptable variability of this association concept. It was originally based on only one site, but additional stands from several states have been assigned here. The variable composition of stands assigned here and the lack of understanding of the dynamics of this type (successional trends, disturbance, hydrology) mean that the type is somewhat poorly defined. More information is needed.

#### RELATED CONCEPTS

#### CLASSIFICATION

**Status:** Standard

**Classification Confidence:** 3 - Weak

**Global Classification Comments:** This association concept was originally based on one site in Cades Cove (Gum Swamp) at 535 m (1750 feet) elevation. The area is heavily browsed by deer. A similar site upslope has *Acer rubrum* (var. *trilobum*?) occurring with *Liquidambar styraciflua*. One of the *Sphagnum* species associated with these forests may be a disjunct Coastal Plain species, *Sphagnum cuspidatum* (B. Dellinger pers. comm.). More information is needed about the naturalness of these examples. The cited vegetation at Uwharrie National Forest is not actually an upland depression swamp and is thought to be successional vegetation (M. Schafale pers. comm. 2007). The status of a purported example at Duke Forest (Durham or Orange counties, North Carolina) is not known. The naturalness of vegetation at these Piedmont locations is unclear (M. Schafale pers. comm. 2001); this may represent a degraded form of *Quercus phellos* / *Carex (albolutescens, intumescens, jorii)* / *Climacium americanum* Wet Forest (CEGL007403). This association (with an expanded and generalized concept) is being utilized for a sample from the Chattahoochee National Forest (Georgia Piedmont). Data are also available from the Bankhead National Forest (Work Center Gum Pond).

#### ELEMENT DISTRIBUTION

**Great Smoky Mountains National Park Range:** This community was sampled from Gum Swamp, along the Cades Cove Loop Road, on the Codes Cove quadrangle and is most likely the only occurrence of this type within the park.

**Global Range:** The full range of this association is unknown, but it is thought to occur in the Piedmont, Southern Blue Ridge, and Cumberland Plateau of Alabama, Georgia, North Carolina, and Tennessee.

**Nations:** US

**States/Provinces:** AL:S1, GA, NC, TN

**TNC Ecoregions:** 50:C, 51:C, 52:C

**USFS Ecoregions (1994/95):** 231Ad:CCC, 231Af:CCC, 231Cc:CCC, 231Cd:CCC, M221Dd:CCC

**USFS Ecoregions (2007):** 231Ad:CCC, 231Af:CC?, 231Cc:CCC, 231Cd:CCC, 231Id:CPP, M221Dd:CCC

**Federal Lands:** NPS (Great Smoky Mountains, Little River Canyon); USFS (Bankhead, Chattahoochee, Chattahoochee (Piedmont), Chattahoochee (Southern Blue Ridge))

#### ELEMENT SOURCES

**Great Smoky Mountains National Park Description Author(s):** K.D. Patterson

**Global Description Author(s):** M. Pyne

**References:** ALNHP unpubl. data 2018, Dellinger pers. comm., NatureServe Ecology - Southeastern U.S. unpubl. data, Peet et al. unpubl. data, Schotz et al. 2008, Southeastern Ecology Working Group n.d., TDNH unpubl. data 2018

**[CEGL007565] *Tsuga canadensis* - *Acer rubrum* - (*Nyssa sylvatica*) / *Rhododendron maximum* / *Sphagnum* spp.****Seep Forest**Translated Name: **Eastern Hemlock - Red Maple - (Blackgum) / Great Laurel / Peatmoss species Seep Forest**Common Name: **Swamp Forest - Bog (Typic Type)****USNVC CLASSIFICATION**

Division	Eastern North American-Great Plains Flooded & Swamp Forest (1.B.3.Na)
Macrogroup	Central Hardwood Swamp Forest (M503)
Group	Central Interior-Appalachian Seepage Swamp (G044)
Alliance	<i>Acer rubrum</i> / <i>Alnus serrulata</i> - <i>Ilex verticillata</i> Appalachian-Piedmont Seepage Forest Alliance
(A3358)	

**ELEMENT CONCEPT**

**Global Summary:** This palustrine forest has a closed or open canopy and an open to dense shrub layer, interspersed with small *Sphagnum*-herb dominated depressions. These forests are found throughout the Southern Blue Ridge, and in the Cumberland Mountains and Cumberland Plateau, at elevations below 1200 m (4000 feet), in poorly drained bottomlands, generally with visible microtopography of ridges and sloughs or depressions. It often occurs near streams and is undoubtedly occasionally flooded. The canopy is composed of various mixtures of evergreen and deciduous species, often dominated by *Tsuga canadensis* and *Acer rubrum*, and less often by *Liriodendron tulipifera*, *Nyssa sylvatica*, *Pinus strobus*, or *Pinus rigida*. The dominant shrubs are usually *Rhododendron maximum*, *Kalmia latifolia*, and *Leucothoe fontanesiana*, but other shrubs include *Salix nigra*, *Alnus serrulata*, *Ilex montana*, *Cornus amomum*, *Viburnum nudum* var. *cassinoides*, and *Toxicodendron vernix*. Herbs in *Sphagnum*-herb dominated openings include *Solidago patula* var. *patula*, *Symphotrichum puniceum*, *Dalibarda repens*, *Osmunda cinnamomea*, *Carex folliculata*, *Carex gynandra*, *Carex scabrata*, *Carex leptalea*, *Carex stricta*, *Sarracenia purpurea*, *Sagittaria latifolia*, and *Leersia virginica*. Herbs in the forested areas include *Glyceria melicaria*, *Lycopodium obscurum*, *Onoclea sensibilis*, *Maianthemum canadense*, *Thelypteris noveboracensis*, and *Osmunda regalis* var. *spectabilis*.

**ENVIRONMENTAL DESCRIPTION**

**Global Environment:** The type occurs mostly at elevations below 1200 m (4000 feet), in poorly drained bottomlands, generally with visible microtopography of ridges and sloughs or depressions. It often occurs near streams and is undoubtedly occasionally flooded. In Virginia, habitats range from 790-1340 m (2600-4400 feet) elevation and are typically located along small, braided headwaters streams draining visible groundwater discharge. Soils are very strongly acidic (mean pH in plots = 4.8) with low base status.

**VEGETATION DESCRIPTION**

**Global Vegetation:** This palustrine forest has a closed or open canopy and an open to dense shrub layer, interspersed with small *Sphagnum*- and herb-dominated depressions. The canopy is composed of various mixtures of evergreen and deciduous species, including *Tsuga canadensis*, *Acer rubrum*, *Liriodendron tulipifera*, *Nyssa sylvatica*, *Pinus strobus*, and *Pinus rigida*. Canopy dominants vary with elevation. Occurrences at lower elevations tend to be dominated by *Acer rubrum*, *Liriodendron tulipifera*, and/or *Nyssa sylvatica*, while examples at higher elevations are usually dominated by *Tsuga canadensis* and/or *Betula alleghaniensis*. *Picea rubens* is a minor canopy component at the highest elevations. The dominant shrubs are usually *Rhododendron maximum*, *Kalmia latifolia*, and *Leucothoe fontanesiana*, but other shrubs may include *Salix nigra*, *Alnus serrulata*, *Ilex montana*, *Cornus amomum*, *Viburnum nudum* var. *cassinoides*, and *Toxicodendron vernix*. Herbaceous species of sphagnous openings include *Solidago patula*, *Symphotrichum puniceum* (= *Aster puniceus*), *Dalibarda repens*, *Osmunda cinnamomea*, *Carex folliculata*, *Carex gynandra*, *Carex scabrata*, *Carex leptalea*, *Carex stricta*, *Sarracenia purpurea*, *Sagittaria latifolia* (= var. *pubescens*), and *Leersia virginica*. Herbs in more densely shaded areas include *Glyceria melicaria*, *Lycopodium obscurum*, *Onoclea sensibilis*, *Maianthemum canadense*, *Thelypteris noveboracensis*, and *Osmunda regalis* var. *spectabilis*.

Overstory composition of the very few documented examples in Virginia is somewhat heterogeneous and may represent an elevational gradient. The lowest-elevation stand (at 790 m or 2600 feet) in Carroll County (Southern Blue Ridge) is codominated by *Acer rubrum* and *Pinus strobus* with minor associates of *Betula alleghaniensis*, and *Tsuga canadensis*. A Giles County (Ridge and Valley) stand at 1160 m (3800 feet) has a mixed canopy of *Acer rubrum*, *Nyssa sylvatica*, *Picea rubens*, and *Pinus rigida*. The third stand, located at 1335 m (4380 feet) in Grayson County (Southern Blue Ridge) is overwhelmingly dominated by *Betula alleghaniensis*, with minor associates of *Acer rubrum* and *Picea rubens*. *Rhododendron maximum* is the dominant shrub, and *Osmunda cinnamomea* the dominant herb, at all three sites. Other species prominent in at least two of the three stands include *Kalmia latifolia*, *Hamamelis virginiana*, *Rhododendron viscosum*, *Rubus hispidus*, *Viola macloskeyi* ssp. *pallens*, *Carex trisperma*, *Glyceria melicaria*, *Lycopodium obscurum*, and *Carex intumescens*. *Dalibarda repens* is an abundant herb at the Carroll County (lowest-elevation) site, while *Solidago rugosa*, *Carex ruthii*, and *Carex baileyi* are common at the Grayson County (highest-elevation) site. Mean species richness ranges from 30 to 46 taxa per 400 m<sup>2</sup> (mean = 40).

**Global Dynamics:** The factors responsible for creating and maintaining this community are not well known, although beaver activity may play a role. The frequency and role of flooding is not known. This community may represent late successional stage of primary succession from once extensive, open bog areas and will remain in a forest condition unless the canopy is removed by tree blowdown, logging, or fire.

### MOST ABUNDANT SPECIES

#### Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Tsuga canadensis</i>
Tree canopy	Broad-leaved deciduous tree	<i>Acer rubrum</i>
Shrub/sapling (tall & short)	Broad-leaved evergreen tree	<i>Rhododendron maximum</i>
Short shrub/sapling	Broad-leaved evergreen shrub	<i>Kalmia latifolia</i> , <i>Leucothoe fontanesiana</i>
Herb (field)	Graminoid	<i>Carex gynandra</i> , <i>Glyceria melicaria</i>
Herb (field)	Fern (Spore-bearing forb)	<i>Osmunda cinnamomea</i>
Nonvascular	Moss	<i>Sphagnum</i> spp.

### CHARACTERISTIC SPECIES

**Global:** *Carex folliculata*, *Carex ruthii*, *Carex trisperma*, *Dalibarda repens*, *Glyceria melicaria*, *Lycopodium obscurum*, *Osmunda cinnamomea*, *Rhododendron maximum*, *Rhododendron viscosum*, *Sphagnum* spp., *Viola macloskeyi* ssp. *pallens*

### OTHER NOTEWORTHY SPECIES

**Global: Vulnerable Plants:** *Carex ruthii* (G3G4), *Chelone cuthbertii* (G3, Southern Blue Ridge endemic), *Dalibarda repens* (G5, VA state-rare), *Helonias bullata* (G3)

### CONSERVATION STATUS RANK

**Global Rank & Reasons:** G2 (14-Dec-1998). This community is somewhat more common and secure than herbaceous and shrub-dominated nonalluvial wetlands of the Southern Blue Ridge, most of which are ranked G1. However, this community has been severely impacted by development, conversion to pasture and agriculture, and hydrologic alterations--changes which are concentrated in flat areas along streams in the steep landscapes of the Southern Blue Ridge. Most occurrences are small (less than 5 acres), very few are unaltered, and almost all have experienced alterations of hydrology, which makes their long-term viability questionable.

### RELATED CONCEPTS

#### Global Similar Types:

- *Picea rubens* - (*Tsuga canadensis*) / *Rhododendron maximum* Forest (CEGL006152)
- *Tsuga canadensis* - *Liriodendron tulipifera* - *Platanus occidentalis* / *Rhododendron maximum* - *Xanthorhiza simplicissima* Wet Forest (CEGL007143)

#### Global Related Concepts:

- *Acer rubrum* - *Betula alleghaniensis* / *Rhododendron maximum* / *Osmunda cinnamomea* - *Carex trisperma* Forest (Fleming and Coulling 2001) =
- *Tsuga canadensis* - *Acer rubrum* - (*Liriodendron tulipifera*, *Nyssa sylvatica*) / *Rhododendron maximum* / *Sphagnum* spp. Forest (Fleming and Patterson 2009a) =
- Bog Forest (Wichmann et al. 2007) >
- Eastern Hemlock: 23 (Eyre 1980) >
- Eastern hemlock-red maple-great laurel swamp (CAP pers. comm. 1998) ?
- Hemlock-Hardwood (08) (USFS 1988) ?
- IIE1a. Southern Appalachian Bog Complex (Allard 1990) >
- Low Elevation Saturated Forest (Wichmann 2009) >
- Swamp Forest (Wichmann et al. 2007) =

### CLASSIFICATION

**Status:** Standard

**Classification Confidence:** 1 - Strong

**Global Classification Comments:** Canopy dominants vary with elevation. Occurrences at lower elevations tend to be dominated by *Acer rubrum*, *Liriodendron tulipifera*, and/or *Nyssa sylvatica*, while examples at higher elevations are usually dominated by *Tsuga canadensis*. This community is naturally rare, due to the scarcity of flat, wet sites in the Blue Ridge Mountains and Cumberland Mountains. Its rarity is also due to anthropogenic factors, being located in accessible, low-elevation sites which are prone to logging and agricultural activities. Most historic occurrences of this community have been destroyed or strongly altered by draining, impoundment, or conversion to pasture. This community extends to a few sites in the Appalachian Plateau of Kentucky, where similar seeps are known, but these lack *Leucothoe fontanesiana* and *Sarracenia purpurea*. Higher elevation bogs exist in the Smokies and other portions of the Blue Ridge [see *Calamagrostis cainii* - *Carex ruthii* - *Parnassia asarifolia* / *Sphagnum* spp. Herbaceous Seep (CEGL007877) and *Carex gynandra* - *Platanthera clavellata* - *Drosera rotundifolia* - *Carex ruthii* / *Sphagnum* spp. Herbaceous Seep (CEGL007697), for example], but they occur in much higher elevations, have a higher proportion of *Carex* spp., and occur within a matrix of spruce-fir or northern hardwood forests. Four plots (three from the Virginia and one from Cherokee National Forest, Tennessee) were classified as this association in the Appalachian Trail analysis (Fleming and Patterson 2009a). *Acer rubrum* and *Rhododendron maximum* are present and abundant in all the plot samples and species that are present in at least three of the four plots include *Athyrium filix-femina* ssp. *asplenioides*, *Hamamelis virginiana*, *Lycopus uniflorus*, *Oclemena acuminata*, *Osmunda cinnamomea*, *Tsuga canadensis*, *Vaccinium simulatum*, and *Viola cucullata*.

**ELEMENT DISTRIBUTION**

**Global Range:** This community is found in the Southern Blue Ridge and Ridge and Valley from Pennsylvania south to Georgia, ranging west into the Cumberland Mountains and Cumberland Plateau of Kentucky.

**Nations:** US

**States/Provinces:** GA, KY, NC, PA, SC, TN, VA:S1

**TNC Ecoregions:** 50:C, 51:C, 52:C, 59:C

**USFS Ecoregions (1994/95):** M221Aa:CCC, M221Ac:CCC, M221Bb:CCP, M221Bf:CCC, M221Cc:CCC, M221Da:CCP, M221Db:CCC, M221Dc:CCC, M221Dd:CCC

**USFS Ecoregions (2007):** 221Ea:???, M221Aa:CCP, M221Ac:CCC, M221Bb:CCP, M221Cc:CCC, M221Da:CCP, M221Db:CCC, M221Dc:CCC, M221Dd:CCC

**Federal Lands:** NPS (Appalachian Trail [Southern Blue Ridge], Blue Ridge Parkway, Cumberland Gap, Great Smoky Mountains); USFS (Chattahoochee, Chattahoochee (Piedmont), Chattahoochee (Southern Blue Ridge), Cherokee, Daniel Boone?, Jefferson, Nantahala, Pisgah, Sumter (Mountains)?)

**ELEMENT SOURCES**

**Global Description Author(s):** K.D. Patterson, G. Fleming and P. Coulling

**References:** Allard 1990, CAP pers. comm. 1998, Evans et al. 2009, Eyre 1980, Fike 1999, Fleming and Coulling 2001, Fleming and Coulling 2001, Fleming and Patterson 2009a, Fleming et al. 2017, GNHP unpubl. data 2018, Peet et al. unpubl. data, Schafale 2012, Schafale and Weakley 1990, Southeastern Ecology Working Group n.d., TDNH unpubl. data 2018, USFS 1988, Weakley and Schafale 1994, White 2006, Wichmann 2009, Wichmann et al. 2007

## 2. Shrub & Herb Vegetation

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### 2.B.2. Temperate Grassland & Shrubland

#### 2.B.2.NC. EASTERN NORTH AMERICAN GRASSLAND & SHRUBLAND

##### M506. Appalachian Rocky Felsic & Mafic Scrub & Grassland

###### G658. SOUTHERN APPALACHIAN SHRUB BALD

**Group Summary Description:** These dense shrubland communities are found in the highest elevational zone of the Southern Appalachians, generally above 1524 m (5000 feet) but occasionally to 1220 m (4000 feet), and at slightly lower elevations at its northern limit in Virginia and West Virginia, and in the Cumberland Mountains along the Virginia-Kentucky border. The vegetation consists of dense shrubby areas most often dominated by *Rhododendron catawbiense*, but substantial examples are also dominated by *Rhododendron carolinianum*, *Kalmia latifolia*, or a mixture of shrubs. One large (and unusual) example dominated by *Alnus viridis ssp. crispa* is also included. Heath balds may contain sparse stunted trees barely larger than the shrub canopy. This combination of high-elevation, non-wetland sites and dense shrub vegetation without appreciable rock outcrop conceptually distinguishes this group from all others in the Southern Appalachians. However, the widespread areas of degraded spruce-fir with grass and/or shrub cover and the invasion of balds by trees blur the distinction somewhat.

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##### A0744 *Rhododendron catawbiense* - *Rhododendron carolinianum* - *Kalmia latifolia* Shrub Bald Alliance

Catawba Rosebay - Carolina Azalea - Mountain Laurel Shrub Bald Alliance

*Catawba Rosebay* - *Carolina Azalea* - *Mountain Laurel Shrub Bald*

**ALLIANCE CONCEPT**

**Summary:** This alliance includes evergreen shrublands occurring in the southern Appalachian Mountains. These shrublands are dominated by evergreen ericaceous species, most often *Rhododendron catawbiense*, *Rhododendron carolinianum*, or *Kalmia latifolia*. Deciduous shrubs may be present and even locally dominant. Openings in the shrub stratum may contain sparse herbaceous cover, including *Deschampsia flexuosa*, *Galax urceolata*, *Gaultheria procumbens*, *Goodyera pubescens*, *Melampyrum lineare*, *Mitchella repens*, *Pteridium aquilinum*, *Selaginella tortipila*, and *Zigadenus leimanthoides*. Mosses and lichens are also typical in more open occurrences. This evergreen, sclerophyllous vegetation is of low stature (<0.5 m) and occurs at the highest elevations in the southern Appalachian Mountains on steep, exposed slopes, ridges, thin soils and rock outcrops. It is typically found at elevations over 1770 m (5800 feet) in northwestern North Carolina and eastern Tennessee.

**Classification Comments:** Similar, but floristically different, ericaceous shrublands occur in the Mahoosuc Mountains of Maine (Fahey 1976).

**Similar Alliances:**

- *Alnus viridis* ssp. *crispa* Shrub Bald Alliance (A0929)
- *Kalmia latifolia* - *Gaylussacia baccata* - *Gaylussacia brachycera* Cumberland Bedrock Heath Alliance (A3472) occurs at lower elevations in the Cumberlands to the west, on the other side of the Ridge and Valley.

**Diagnostic Characteristics:** Distinctive shrublands dominated primarily by *Rhododendron catawbiense*, *Rhododendron carolinianum*, or *Kalmia latifolia*, but with some examples dominated or codominated by *Leiophyllum buxifolium*, restricted to higher elevations in the Southern Appalachians.

**Related Concepts:**

- *Picea rubens*/*Leiophyllum buxifolium* outcrop community (Wiser 1993) ?
- *Picea rubens*/*Leiophyllum buxifolium* outcrop community (Wiser et al. 1996) ?
- IC4a. Heath Bald Shrubland (Allard 1990) ><
- Oligotrophic Scrub (Rawinski 1992) ><

**ALLIANCE DESCRIPTION**

**Environment:** This alliance includes evergreen shrublands occurring on steep, exposed slopes, ridges, thin soils, and rock outcrops at the highest elevations in the southern Appalachian Mountains. It is typically found at elevations over 1770 m (5800 feet) in northwestern North Carolina and eastern Tennessee. These shrublands are subject to extremes in moisture due to extreme cold, high precipitation, frequent fog, and desiccating winds in combination with shallow, nutrient-poor soils.

**Vegetation:** These shrublands are dominated by low-statured (<0.5 m) evergreen ericaceous species, most often *Rhododendron catawbiense*, *Rhododendron carolinianum*, or *Kalmia latifolia*. Deciduous shrubs may be present and even locally dominant. The occurrence and relative abundance of associated shrub species vary with elevation and adjacent vegetation. Other shrubs include *Clethra acuminata*, *Gaylussacia baccata*, *Leiophyllum buxifolium*, *Leucothoe recurva*, *Aronia melanocarpa*, *Pieris floribunda*, *Rhododendron maximum*, *Vaccinium corymbosum*, *Vaccinium corymbosum*, *Vaccinium simulatum*, *Vaccinium stamineum*, and *Viburnum nudum* var. *cassinoides*. This alliance includes vegetation dominated by *Leiophyllum buxifolium* growing in dense mats with a krummholz structure, with significant areas of bare rock. These examples are at least 25% vegetated with at least 75% of the total shrub cover composed of *Leiophyllum buxifolium*. Openings in the shrub stratum may contain sparse herbaceous cover, including *Deschampsia flexuosa*, *Galax urceolata*, *Gaultheria procumbens*, *Goodyera pubescens*, *Melampyrum lineare*, *Mitchella repens*, *Pteridium aquilinum*, *Selaginella tortipila*, and *Zigadenus leimanthoides*. Mosses and lichens are also typical in more open occurrences.

**Physiognomy and Structure:** These shrublands are dominated by low-statured (<0.5 m) evergreen ericaceous species, most often *Rhododendron catawbiense*, *Rhododendron carolinianum*, or *Kalmia latifolia*.

**Floristics:** These shrublands are dominated by low-statured (<0.5 m) evergreen ericaceous species, most often *Rhododendron catawbiense*, *Rhododendron carolinianum*, or *Kalmia latifolia*. Deciduous shrubs may be present and even locally dominant. The occurrence and relative abundance of associated shrub species vary with elevation and adjacent vegetation. Other shrubs include *Clethra acuminata*, *Gaylussacia baccata*, *Leiophyllum buxifolium*, *Leucothoe recurva*, *Aronia melanocarpa*, *Pieris floribunda*, *Rhododendron maximum*, *Vaccinium corymbosum*, *Vaccinium corymbosum*, *Vaccinium simulatum*, *Vaccinium stamineum*, and *Viburnum nudum* var. *cassinoides*. This alliance includes vegetation dominated by *Leiophyllum buxifolium* growing in dense mats with a krummholz structure, with significant areas of bare rock. These examples are at least 25% vegetated with at least 75% of the total shrub cover composed of *Leiophyllum buxifolium*. Openings in the shrub stratum may contain sparse herbaceous cover, including *Deschampsia flexuosa*, *Galax urceolata*, *Gaultheria procumbens*, *Goodyera pubescens*, *Melampyrum lineare*, *Mitchella repens*, *Pteridium aquilinum*, *Selaginella tortipila*, and *Zigadenus leimanthoides*. Mosses and lichens are also typical in more open occurrences.

**Dynamics:** These shrublands are subject to extremes in moisture due to extreme cold, high precipitation, frequent fog, and desiccating winds in combination with shallow, nutrient-poor soils. Windfall, landslides, and small, localized lightning-caused fires are important in the establishment and maintenance of these shrublands. This community can result from secondary succession after fire or logging or can occur as a topo-edaphic climax on steep or exposed sites. This vegetation may result from primary succession or from secondary succession when lichens, mosses, and eventually shrubs invade rock exposed by landslides or catastrophic fires.

**ALLIANCE DISTRIBUTION**

**Range:** This alliance is found in the southern Appalachian Mountains from Virginia south to Georgia. Examples in the Cumberlands of Kentucky and Southern Blue Ridge and Ridge and Valley of Virginia are rare and of limited extent.

**Nations:** US

**Subnations:** GA, KY, NC, SC?, TN, VA

**TNC Ecoregions:** 50:C, 51:C, 59:C

**USFS Ecoregions (1994/95):** M221Aa:CCC, M221Be:CPP, M221Db:CCC, M221Dc:CCC, M221Dd:CCC

**USFS Ecoregions (2007):** M221Aa:CPP, M221Be:CPP, M221Db:CCC, M221Dc:CCC, M221Dd:CCC

**ALLIANCE SOURCES**

**References:** Allard 1990, Brown 1941, Cain 1930a, Faber-Langendoen et al. 2019b, Fahey 1976, Gant 1978, McLeod 1988, Newell and Peet 1995, Newell and Peet 1996a, Ramseur 1958, Rawinski 1992, Risk 1993, Schafale and Weakley 1990, Whittaker 1979a, Wiser 1993, Wiser et al. 1996

**Author of Concept:** Faber-Langendoen et al. 2019b

**Author of Description:** K.D. Patterson, in Faber-Langendoen et al. (2013)

**[CEGL003814] *Kalmia latifolia* - *Rhododendron catawbiense* - (*Gaylussacia baccata*, *Pieris floribunda*, *Vaccinium corymbosum*) Shrubland**

Translated Name: **Mountain Laurel - Catawba Rosebay - (Black Huckleberry, Mountain Fetterbush, Highbush Blueberry) Shrubland**

Common Name: **Southern Appalachian Mountain Laurel Bald**

**USNVC CLASSIFICATION**

Division	Eastern North American Grassland & Shrubland (2.B.2.Nc)
Macrogroup	Appalachian Rocky Felsic & Mafic Scrub & Grassland (M506)
Group	Southern Appalachian Shrub Bald (G658)
Alliance	<i>Rhododendron catawbiense</i> - <i>Rhododendron carolinianum</i> - <i>Kalmia latifolia</i> Shrub Bald
Alliance (A0744)	

**ELEMENT CONCEPT**

**Global Summary:** This community occurs in the mountains of Georgia, North Carolina, Virginia, and Tennessee, on ridges and steep, rocky slopes at intermediate elevations (1220-1524 m [4000-5000 feet]). It also occurs in very small patches at elevations higher than 1035 m (3400 feet) in the Cumberland Mountains along the Virginia-Kentucky border. It is a mostly evergreen shrubland, although deciduous shrubs may be present and even locally dominant. Shrubs form a dense, sometimes impenetrable thicket, 1-4 m tall. The most typical shrub dominants are *Kalmia latifolia* and *Rhododendron catawbiense*, although *Gaylussacia baccata*, *Leiophyllum buxifolium*, *Pieris floribunda*, *Rhododendron carolinianum*, *Rhododendron maximum*, and *Vaccinium corymbosum* are dominant or have high coverage in some occurrences. Other shrubs include *Aronia melanocarpa*, *Clethra acuminata*, *Ilex montana*, *Vaccinium stamineum*, *Eubotrys recurva*, and *Viburnum nudum* var. *cassinoides*. Small openings in the shrub canopy are dominated by lichens, bare rock or herbs, with some occurrences having up to 60% exposed rock. Herb cover beneath the shrub canopy is absent or very sparse (<5%) and may include *Galax urceolata*, *Gaultheria procumbens*, *Goodyera pubescens*, *Melampyrum lineare*, *Mitchella repens*, and *Pteridium aquilinum*. *Smilax rotundifolia* is a common vine. Small, scattered trees are possible (*Acer rubrum*, *Amelanchier laevis*, *Betula alleghaniensis*, *Ilex montana*, *Magnolia fraseri*, *Nyssa sylvatica*, *Oxydendrum arboreum*, *Picea rubens*, *Prunus pensylvanica*, *Quercus rubra*, and *Sorbus americana*) and may be more typical of shrublands resulting from intense fires on less exposed sites. Windfall, landslides, and small, localized, lightning-caused fires are important in the establishment and maintenance of these shrublands. This community can result from secondary succession after fire or logging or can occur as a topo-edaphic climax on steep or exposed sites.

**ENVIRONMENTAL DESCRIPTION**

**Great Smoky Mountains National Park Environment:** This community occurs on southerly exposed ridges and steep slopes below 5000 feet elevation. Samples range from 4190 to 4900 feet elevation. One example is in a gap, on a convex slope, and may be a fire scar. Another is on a steep northwest-facing slope.

**Global Environment:** This community occurs in the mountains of Georgia, North Carolina, Virginia, and Tennessee on ridges and steep, rocky slopes at intermediate elevations (1220-1524 m [4000-5000 feet]). It also occurs in very small patches at elevations higher than 1035 m (3400 feet) in the Cumberland Mountains along the Virginia-Kentucky border.

**VEGETATION DESCRIPTION**

**Great Smoky Mountains National Park Vegetation:** This community is a mostly evergreen shrubland, although deciduous shrubs may be present and even locally dominant. Shrubs form a dense, sometimes impenetrable thicket, 1-4 m tall. The most typical shrub dominants are *Kalmia latifolia* and *Rhododendron catawbiense*, although *Gaylussacia baccata*, *Leiophyllum buxifolium*, *Pieris floribunda*, *Rhododendron carolinianum*, *Rhododendron maximum*, and *Vaccinium corymbosum* are dominant or have high coverage in some occurrences. Other shrubs include *Photinia melanocarpa* (= *Aronia melanocarpa*), *Clethra acuminata*, *Vaccinium stamineum*, and *Viburnum nudum* var. *cassinoides*. Small openings in the shrub canopy are dominated by rock or herbs, with some occurrences having up to 60% exposed rock. However, herb cover beneath the shrub canopy is absent or very sparse (<5%) and may include *Galax urceolata*, *Gaultheria procumbens*, *Goodyera pubescens*, *Melampyrum lineare*, *Mitchella repens*, and *Pteridium aquilinum*. *Smilax rotundifolia* is a common vine. Small, scattered trees are possible (*Acer rubrum*, *Amelanchier laevis*, *Betula alleghaniensis*, *Ilex montana*, *Magnolia fraseri*, *Nyssa sylvatica*, *Oxydendrum arboreum*, *Picea rubens*, and *Prunus pensylvanica*) and may be more typical of shrublands resulting from intense fires on less exposed sites.

**Global Vegetation:** This association typically manifests as a mostly evergreen shrubland, although deciduous shrubs may be present and even locally dominant. These shrubs form a dense, sometimes impenetrable thicket, 1-4 m tall. The most typical shrub dominants are *Kalmia latifolia* and *Rhododendron catawbiense*, although *Gaylussacia baccata*, *Leiophyllum buxifolium*, *Pieris floribunda*, *Rhododendron carolinianum*, *Rhododendron maximum*, and *Vaccinium corymbosum* are dominant or have high coverage in some occurrences. Other shrubs include *Aronia melanocarpa*, *Clethra acuminata*, *Ilex montana*, *Vaccinium simulatum*, *Vaccinium stamineum*, *Eubotrys recurva* (= *Leucothoe recurva*), and *Viburnum nudum* var. *cassinoides*. Small openings in the shrub canopy are dominated by lichens, bare rock or herbs, with some occurrences having up to 60% exposed rock. Herb cover beneath the shrub canopy is absent or very sparse (<5%) and may include *Galax urceolata*, *Gaultheria procumbens*, *Goodyera pubescens*, *Melampyrum lineare*, *Mitchella repens*, and *Pteridium aquilinum*. *Smilax rotundifolia* is a common vine. Small, scattered trees are possible (*Acer*

*rubrum*, *Amelanchier laevis*, *Betula alleghaniensis*, *Ilex montana*, *Magnolia fraseri*, *Nyssa sylvatica*, *Oxydendrum arboreum*, *Prunus pensylvanica*, *Picea rubens*, *Quercus rubra*, and *Sorbus americana*) and may be more typical of shrublands resulting from intense fires on less exposed sites.

**Global Dynamics:** Windfall, landslides, and small, localized, lightning-caused fires are important in the establishment and maintenance of these shrublands. This community can result from secondary succession after fire or logging or can occur as a topo-edaphic climax on steep or exposed sites.

#### MOST ABUNDANT SPECIES

##### Great Smoky Mountains National Park

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tall shrub/sapling	Broad-leaved evergreen tree	<i>Rhododendron catawbiense</i> , <i>Rhododendron maximum</i>
Tall shrub/sapling	Broad-leaved evergreen shrub	<i>Kalmia latifolia</i>
Short shrub/sapling	Broad-leaved evergreen tree	<i>Rhododendron catawbiense</i>
Short shrub/sapling	Broad-leaved evergreen shrub	<i>Leiophyllum buxifolium</i>

##### Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Shrub/sapling (tall & short)	Broad-leaved evergreen shrub	<i>Rhododendron catawbiense</i>

#### CHARACTERISTIC SPECIES

**Great Smoky Mountains National Park:** *Galax urceolata*, *Gaultheria procumbens*, *Gaylussacia baccata*, *Kalmia latifolia*, *Pieris floribunda*, *Rhododendron catawbiense*, *Vaccinium corymbosum*

**Global:** *Kalmia latifolia*, *Rhododendron catawbiense*

#### OTHER NOTEWORTHY SPECIES

**Global: Vulnerable Plants:** *Abies fraseri* (G2, Southern Blue Ridge endemic), *Glyceria nubigena* (G2G3, endemic to Great Smoky Mountains and adjacent areas near the park), *Hypericum buckleii* (G3, Southern Blue Ridge endemic), *Liatris helleri* (G2Q, NC/Southern Appalachian endemic), *Pseudevernia cladonia* (G2G4)

#### CONSERVATION STATUS RANK

**Global Rank & Reasons:** G2G3 (15-Feb-1999). This is a locally common heath bald type in parts of the Southern Blue Ridge and Cumberland Mountains. Some occurrences represent a topo-edaphic climax, while other areas require fire to maintain the physiognomy. Fire-maintained occurrences are threatened by general fire prevention in the mountains.

#### RELATED CONCEPTS

##### Global Similar Types:

- *Menziesia pilosa* - *Vaccinium (erythrocarpum, simulatum, corymbosum)* - *Sorbus americana* Shrubland (CEGL004819)
- *Rhododendron carolinianum* - *Rhododendron catawbiense* - *Leiophyllum buxifolium* Shrubland (CEGL007876)

##### Global Related Concepts:

- *Kalmia latifolia* - *Rhododendron catawbiense* - (*Gaylussacia baccata*, *Pieris floribunda*, *Vaccinium corymbosum*) Shrubland (Fleming and Patterson 2009a) =
- IC4a. Heath Bald Shrubland (Allard 1990) >
- Mountain laurel-great laurel summits (CAP pers. comm. 1998) ?

#### CLASSIFICATION

**Status:** Standard

**Classification Confidence:** 2 - Moderate

**Great Smoky Mountains National Park Other Comments:** This community typically occurs below the elevation of spruce - fir forests and adjacent to forests dominated by Table Mountain pine, northern red oak, or *Fagus grandifolia* ("Beech Gaps"). Occurrences at high elevations may be transitional to *Rhododendron carolinianum* - *Rhododendron catawbiense* - *Leiophyllum buxifolium* Shrubland (CEGL007876), and it may be difficult to distinguish the two heath bald signatures. The alliance may serve as a better mapping unit for these communities.

**Global Classification Comments:** These shrublands possibly have a broader distribution and typically occur at lower elevations than other montane shrublands in *Rhododendron catawbiense* - *Rhododendron carolinianum* - *Kalmia latifolia* Shrub Bald Alliance (A0744). In the Southern Blue Ridge, this shrubland generally occurs at elevations over 1220 m (4000 feet) and grades into forests dominated by *Quercus coccinea*, *Pinus rigida*, *Pinus pungens*, and/or *Quercus rubra*. High-elevation occurrences may be compositionally similar to another heath bald community, *Rhododendron carolinianum* - *Rhododendron catawbiense* - *Leiophyllum buxifolium* Shrubland (CEGL007876).

#### ELEMENT DISTRIBUTION

**Great Smoky Mountains National Park Range:** This community was sampled on the Mount Le Conte quadrangle and not on the Cades Cove quadrangle, although it is possible there. This community is uncommon in the landscape but possible in other areas of the park. On the Mount Le Conte quadrangle it was sampled on Brushy Mountain, ridges along the Alum Cave Trail south of Mount Le Conte (4600 and 4900 feet), and in the southwestern portion of the quadrangle on the western ridge of Balsam Point, the vicinity of

Chimney Tops, and east of Bullhead. It was also sampled on Spruce Mountain in 2002 and can be easily seen along sections of the Newfound Gap Road on both the Tennessee and North Carolina sides.

**Global Range:** This community is found in the Blue Ridge Mountains of Georgia, North Carolina, and Tennessee. Examples in the Cumberlands of Kentucky, and Southern Blue Ridge and Ridge and Valley of Virginia are rare and of limited extent.

**Nations:** US

**States/Provinces:** GA, KY, NC, TN, VA:S1

**TNC Ecoregions:** 50:C, 51:C, 59:C

**USFS Ecoregions (1994/95):** M221Aa:CCC, M221Be:CPP, M221Dc:CCC, M221Dd:CCC

**USFS Ecoregions (2007):** M221Aa:CCP, M221Be:CPP, M221Dc:CCC, M221Dd:CCC

**Federal Lands:** BIA (Eastern Band of Cherokee); NPS (Appalachian Trail [Southern Blue Ridge], Blue Ridge Parkway, Cumberland Gap, Great Smoky Mountains); USFS (Chattahoochee, Chattahoochee (Southern Blue Ridge), Cherokee, Jefferson, Nantahala, Pisgah)

#### ELEMENT SOURCES

**Great Smoky Mountains National Park Plots:** GRSM.71, GRSM.73, GRSM.76, GRSM.135.

**Great Smoky Mountains National Park Description Author(s):** K.D. Patterson, mod. R. White

**Global Description Author(s):** K.D. Patterson, T. Govus and R. White

**References:** Allard 1990, CAP pers. comm. 1998, Chafin 2011, Fleming and Patterson 2009a, Fleming et al. 2017, GNHP unpubl. data 2018, NatureServe Ecology - Southeastern U.S. unpubl. data, Peet et al. unpubl. data, Risk 1993, Schafale 2012, Schafale and Weakley 1990, Southeastern Ecology Working Group n.d., White 2006

#### [CEGL003951] *Leiophyllum buxifolium* Dwarf-shrubland

Translated Name: Sand-myrtle Dwarf-shrubland

Common Name: Southern Appalachian Sand-myrtle Heath Bald

#### USNVC CLASSIFICATION

Division	Eastern North American Grassland & Shrubland (2.B.2.Nc)
Macrogroup	Appalachian Rocky Felsic & Mafic Scrub & Grassland (M506)
Group	Southern Appalachian Shrub Bald (G658)
Alliance	<i>Rhododendron catawbiense</i> - <i>Rhododendron carolinianum</i> - <i>Kalmia latifolia</i> Shrub Bald
Alliance (A0744)	

#### ELEMENT CONCEPT

**Global Summary:** This evergreen, sclerophyllous dwarf-shrubland occurs at the highest elevations in the southern Appalachian Mountains on steep, exposed slopes. It is typically found at elevations over 1770 m (5800 feet) in northwestern North Carolina. This dwarf-shrubland may occur as inclusions in other communities or as extensive mats. It is dominated by *Leiophyllum buxifolium* growing in dense mats with a krummholz structure. Occurrences of this community may have significant areas of bare rock but are at least 25% vegetated with at least 75% of the total shrub cover composed of *Leiophyllum buxifolium*. Openings in the shrub stratum may contain sparse herbaceous cover including *Selaginella tortipila*, *Zigadenus leimanthoides* and *Deschampsia flexuosa*. Other shrub species that may occur include *Rhododendron catawbiense* and *Vaccinium corymbosum*. Mosses and lichens are also typical in more open occurrences. The largest occurrences of this shrubland are 1-2 hectares. An extreme environment with steep topography, high solar irradiation, desiccating winds in combination with shallow, nutrient-poor soils maintains this community as a topo-edaphic climax. This community often occurs adjacent to or grades into high-elevation rock outcrop communities and other montane shrublands.

#### ENVIRONMENTAL DESCRIPTION

**Global Environment:** This community occurs on exposed slopes and sharp ridges, typically above 1770 m (5800 feet) elevation, although it may occur at lower elevations. Shrubs root in shallow soils associated with rock outcrops or in coarse, sandy soils and organic matter accumulations in crevices. High solar irradiation and desiccating winds in combination with the shallow, nutrient-poor soils are the key environmental factors influencing this community.

#### VEGETATION DESCRIPTION

**Global Vegetation:** This community is dominated by a low-growing (<0.5 m), evergreen, ericaceous shrub, *Leiophyllum buxifolium*, which may occur as scattered patches or as extensive, dense shrub mats. Openings in the shrub stratum may contain sparse herbaceous cover including *Selaginella tortipila*, *Deschampsia flexuosa*, *Hypericum densiflorum*, *Carex umbellata*, and *Danthonia sericea*. Other shrub species that may occur include *Rhododendron carolinianum* and *Vaccinium pallidum*. Mosses and lichens are also typical in more open occurrences. Species endemic to or with the bulk of their worldwide range in the Southern Blue Ridge include *Hudsonia montana*, *Hypericum buckleii*, *Liatris helleri*, *Rhododendron carolinianum*, *Selaginella tortipila*, and *Leiophyllum buxifolium*. The largest occurrences of this shrubland are 1-2 hectares.

**Global Dynamics:** Windfall, landslides, and small, localized lightning-cause fires are important in the establishment and maintenance of this community. This community may result from primary succession or from secondary succession when lichens, mosses, and eventually *Leiophyllum* invade rock exposed by landslides or catastrophic fires. On steep, exposed sites, wind exposure, soil infertility

and drought help maintain this community as a topo-edaphic climax. If soil development is sufficient and the environment is not too extreme, this community may succeed to *Rhododendron carolinianum*- or *Rhododendron catawbiense*-dominated shrublands.

#### MOST ABUNDANT SPECIES

##### Global

##### Stratum

Short shrub/sapling

##### Lifeform

Broad-leaved evergreen shrub

##### Species

*Leiophyllum buxifolium*

#### CHARACTERISTIC SPECIES

**Global:** *Leiophyllum buxifolium*

#### OTHER NOTEWORTHY SPECIES

**Global: Vulnerable Plants:** *Glyceria nubigena* (G2G3, endemic to Great Smoky Mountains and adjacent areas near the park), *Hudsonia montana* (G1, NC/Southern Blue Ridge endemic), *Hypericum buckleii* (G3, Southern Blue Ridge endemic), *Liatris helleri* (G2Q, NC/Southern Blue Ridge endemic); **Other Plants:** *Rhododendron carolinianum* (G4, Southern Blue Ridge endemic)

#### CONSERVATION STATUS RANK

**Global Rank & Reasons:** G1 (15-Aug-1994). One of the most restricted heath bald types, in terms of distribution and acreage, it is known from Grandfather Mountain, North Carolina. The total acreage of this community is limited (<100 hectares) since it occurs as scattered islands of shrubland in the highest elevations. Since this community generally occurs in inaccessible, well-protected sites, it is not highly threatened. Occurrences in areas of high recreation use may be threatened by trampling, while natural succession may threaten other sites.

#### RELATED CONCEPTS

##### Global Related Concepts:

- *Picea rubens* / *Leiophyllum buxifolium* outcrop community (Wiser 1993) ?
- *Picea rubens* / *Leiophyllum buxifolium* outcrop community (Wiser et al. 1996) ?
- IC4a. Heath Bald Shrubland (Allard 1990) >

#### CLASSIFICATION

**Status:** Standard

**Classification Confidence:** 2 - Moderate

**Global Classification Comments:** The species *Leiophyllum buxifolium* may be locally dominant in other Southern Appalachian heath shrublands. This association is restricted to areas where *Leiophyllum buxifolium* dominates areas greater than 0.1 hectare. In the southern part of this community's range, the dominant species, *Leiophyllum buxifolium*, occurs on as an upright shrub (30-50 cm tall), in narrow vegetated zones on granitic domes. In the northwestern part of North Carolina and in eastern Tennessee, on steep, high-elevation areas, this community occurs as low shrub mats with a krummholz structure. Further study may reveal floristic differences between these two situations that may warrant recognition of two community elements.

Similar shrublands in the southern Appalachian Mountains (*Rhododendron carolinianum* Shrubland (CEGL003816), *Rhododendron catawbiense* Shrubland (CEGL003818)) may contain *Leiophyllum buxifolium*, but comprising less than 75% of the total shrub cover. In the Coastal Plain of New Jersey and North Carolina *Leiophyllum buxifolium* occurs as a dense shrub component in *Pinus*-dominated woodlands and sparse woodlands. It is not known if this species occurs in the Coastal Plain as a shrubland without a significant tree canopy.

#### ELEMENT DISTRIBUTION

**Global Range:** This community occurs on rock outcrops in the southern Appalachian Mountains. It is typically found at elevations over 1770 m (5800 feet) in northwestern North Carolina and northeastern Tennessee. It may also occur at lower elevations in western North Carolina, northeastern Georgia, and northwestern South Carolina, in association with granitic domes and gneissic outcrops.

**Nations:** US

**States/Provinces:** GA?, NC, SC?, TN

**TNC Ecoregions:** 51:C

**USFS Ecoregions (1994/95):** M221Dc:CCP, M221Dd:CCC

**USFS Ecoregions (2007):** M221Dc:CCP, M221Dd:CCC

**Federal Lands:** NPS (Great Smoky Mountains); USFS (Chattahoochee (Southern Blue Ridge)?, Chattahoochee?, Cherokee?, Nantahala?, Pisgah)

#### ELEMENT SOURCES

**Global Description Author(s):** K.D. Patterson

**References:** Allard 1990, Chafin 2011, Newell and Peet 1995, Peet et al. unpubl. data, Risk 1993, Schafale 2012, Schafale and Weakley 1990, Southeastern Ecology Working Group n.d., TDNH unpubl. data 2018, Weakley 1993, Whittaker 1956, Whittaker 1979a, Wiser 1993, Wiser et al. 1996

**[CEGL007876] *Rhododendron carolinianum* - *Rhododendron catawbiense* - *Leiophyllum buxifolium* Shrubland**Translated Name: **Carolina Azalea - Catawba Rosebay - Sand-myrtle Shrubland**Common Name: **Southern Appalachian Heath Bald****USNVC CLASSIFICATION**

Division	Eastern North American Grassland & Shrubland (2.B.2.Nc)
Macrogroup	Appalachian Rocky Felsic & Mafic Scrub & Grassland (M506)
Group	Southern Appalachian Shrub Bald (G658)
Alliance	<i>Rhododendron catawbiense</i> - <i>Rhododendron carolinianum</i> - <i>Kalmia latifolia</i> Shrub Bald
Alliance (A0744)	

**ELEMENT CONCEPT**

**Global Summary:** This high-elevation shrubland occurs in the Great Smoky Mountains of eastern Tennessee, on steep ridges, rock outcroppings, and landslides at elevations over 1676 m (5500 feet), in the Spruce-Fir zone. It has 25-100% shrub cover and may occur as a dense shrubland, 2-4 m tall, or as a shorter, more open shrubland with areas of exposed rock, scattered mats of prostrate vegetation, and isolated clumps of herbaceous species. The most common shrubs are *Rhododendron carolinianum*, *Rhododendron catawbiense*, and *Leiophyllum buxifolium*, locally dominant in patches and forming a mosaic. Shrubs are less than 1 m tall on the steepest, rockiest, most exposed sites, and taller on gentle, more protected sites with greater soil development. Other associated shrubs with minor coverage may include *Abies fraseri*, *Aronia arbutifolia*, *Aronia melanocarpa*, *Diervilla sessilifolia*, *Ilex montana*, *Menziesia pilosa*, *Pieris floribunda*, *Prunus pensylvanica*, *Vaccinium corymbosum*, *Vaccinium erythrocarpum*, and *Viburnum nudum* var. *cassinoides*. Under tall, dense shrubs there is little herb cover, but in more open shrublands, on steep cliffs with seepage, herbaceous species may grow in dense patches on ledges and crevices. Herbaceous species such as *Calamagrostis cainii*, *Carex misera*, *Geum radiatum*, *Saxifraga michauxii*, *Solidago glomerata*, and *Trichophorum cespitosum* are associated with this community on the summits of Mount LeConte. Thick hummocks of lichens and mosses can occur on flatter sites, and scattered wind-sheared trees of *Picea rubens* or *Abies fraseri* are possible in some examples. High solar irradiation and desiccating winds, in combination with the shallow, nutrient-poor soils, are key environmental factors influencing this community. Locally, vegetation is influenced by seepage areas on steep cliffs and ledges. It is known from areas of exposed slate on the steep ridges of Mount LeConte.

**ENVIRONMENTAL DESCRIPTION**

**Great Smoky Mountains National Park Environment:** This community occurs on steep ridges, rock outcroppings, and landslides at elevations over 5500 feet, in the spruce-fir zone. High solar irradiation and desiccating winds, in combination with the shallow, nutrient-poor soils, are key environmental factors influencing this community. Locally vegetation is influenced by seepage areas on steep cliffs and ledges (e.g., southwest portion of the Mount Le Conte summit). This community is known from areas of exposed slate on the steep ridges of Mount Le Conte (Ramseur 1958). Perhaps the best examples of this community exist on Charlies Bunion.

**Global Environment:** This association occurs on steep ridges, rock outcroppings, and landslides at elevations over 1676 m (5500 feet), in the Spruce-Fir zone.

**VEGETATION DESCRIPTION**

**Great Smoky Mountains National Park Vegetation:** This community has 25-100% shrub cover and may occur as a dense shrubland, 2-4 m tall, or as a shorter, more open shrubland with areas of exposed rock, scattered mats of prostrate vegetation, and isolated clumps of herbaceous species. The most common shrubs are *Rhododendron carolinianum*, *Rhododendron catawbiense*, and *Leiophyllum buxifolium*, locally dominant in patches and forming a mosaic. Shrubs are less than 1 m tall on the steepest, rockiest, most exposed sites, and taller on gentle, more protected sites with greater soil development. Other associated shrubs with minor coverage may include *Abies fraseri*, *Photinia pyrifolia* (= *Aronia arbutifolia*), *Photinia melanocarpa* (= *Aronia melanocarpa*), *Diervilla sessilifolia*, *Ilex montana*, *Menziesia pilosa*, *Pieris floribunda*, *Prunus pensylvanica*, *Vaccinium corymbosum*, *Vaccinium erythrocarpum*, and *Viburnum nudum* var. *cassinoides*. Under tall dense shrubs there is little herb cover, but in more open shrublands, on steep cliffs with seepage, herbaceous species may grow in dense patches on ledges and crevices. Herbaceous species such as *Calamagrostis cainii*, *Carex misera*, *Geum radiatum*, *Saxifraga michauxii*, *Solidago glomerata*, *Trichophorum caespitosum* (= *Scirpus cespitosus*) are associated with this community on the summits of Mount Le Conte. Thick hummocks of lichens and mosses can occur on flatter sites. Scattered wind-sheared trees of *Picea rubens* or *Abies fraseri* are possible in some examples.

**Global Vegetation:** This association has 25-100% shrub cover and may occur as a dense shrubland, 2-4 m tall, or as a shorter, more open shrubland with areas of exposed rock, scattered mats of prostrate vegetation, and isolated clumps of herbaceous species. The most common shrubs are *Rhododendron carolinianum*, *Rhododendron catawbiense*, and *Leiophyllum buxifolium*, locally dominant in patches and forming a mosaic. Shrubs are less than 1 m tall on the steepest, rockiest, most exposed sites, and taller on gentle, more protected sites with greater soil development. Other associated shrubs with minor coverage may include *Abies fraseri*, *Aronia arbutifolia*, *Aronia melanocarpa*, *Diervilla sessilifolia*, *Ilex montana*, *Menziesia pilosa*, *Pieris floribunda*, *Prunus pensylvanica*, *Vaccinium corymbosum*, *Vaccinium erythrocarpum*, and *Viburnum nudum* var. *cassinoides*. Under tall, dense shrubs there is little herb cover, but in more open shrublands, on steep cliffs with seepage, herbaceous species may grow in dense patches on ledges and crevices. Herbaceous species such as *Calamagrostis cainii*, *Carex misera*, *Geum radiatum*, *Saxifraga michauxii*, *Solidago glomerata*, and *Trichophorum cespitosum* (= *Scirpus cespitosus*) are associated with this community on the summits of Mount LeConte. Thick hummocks of lichens and mosses can occur on flatter sites, and scattered wind-sheared trees of *Picea rubens* or *Abies fraseri* are possible in some examples.

**Global Dynamics:** High solar irradiation and desiccating winds, in combination with the shallow, nutrient-poor soils, are key environmental factors influencing this community. Locally, vegetation is influenced by seepage areas on steep cliffs and ledges. It is known from areas of exposed slate on the steep ridges of Mount LeConte (Ramseur 1958).

#### MOST ABUNDANT SPECIES

##### Great Smoky Mountains National Park

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tall shrub/sapling	Broad-leaved evergreen tree	<i>Rhododendron catawbiense</i>
Short shrub/sapling	Broad-leaved evergreen shrub	<i>Leiophyllum buxifolium</i> , <i>Rhododendron carolinianum</i>

##### Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Shrub/sapling (tall & short)	Broad-leaved evergreen shrub	<i>Leiophyllum buxifolium</i> , <i>Rhododendron carolinianum</i> , <i>Rhododendron catawbiense</i>

#### CHARACTERISTIC SPECIES

**Great Smoky Mountains National Park:** *Abies fraseri*, *Diervilla sessilifolia*, *Leiophyllum buxifolium*, *Menziesia pilosa*, *Picea rubens*, *Rhododendron carolinianum*, *Rhododendron catawbiense*

**Global:** *Leiophyllum buxifolium*, *Rhododendron carolinianum*, *Rhododendron catawbiense*

#### OTHER NOTEWORTHY SPECIES

**Great Smoky Mountains National Park: Vulnerable Plants:** *Abies fraseri* (G2, globally imperiled), *Carex misera* (G3, globally vulnerable), *Solidago glomerata* (G3, globally vulnerable)

**Global: Vulnerable Plants:** *Abies fraseri* (G2, Southern Blue Ridge endemic), *Calamagrostis cainii* (G1), *Carex misera* (G3), *Geum radiatum* (G2, Southern Appalachian endemic), *Hypericum graveolens* (G3), *Prenanthes roanensis* (G3, Southern Blue Ridge endemic), *Solidago glomerata* (G3)

#### CONSERVATION STATUS RANK

**Global Rank & Reasons:** G1 (16-Feb-1999). This community is limited in extent, occurring as scattered pockets in the southern Appalachian Mountains, possibly limited to the Great Smoky Mountains. This fragile community is threatened by heavy recreational use.

#### RELATED CONCEPTS

##### Global Similar Types:

- *Kalmia latifolia* - *Rhododendron catawbiense* - (*Gaylussacia baccata*, *Pieris floribunda*, *Vaccinium corymbosum*) Shrubland (CEGL003814)
- *Rhododendron carolinianum* Shrubland (CEGL003816)

##### Global Related Concepts:

- *Rhododendron carolinianum* - *Rhododendron catawbiense* - *Leiophyllum buxifolium* Shrubland (Fleming and Patterson 2009a) =
- IC4a. Heath Bald Shrubland (Allard 1990) >

#### CLASSIFICATION

**Status:** Standard

**Classification Confidence:** 2 - Moderate

**Great Smoky Mountains National Park Other Comments:** This shrubland grades into vegetation dominated by *Picea rubens* and/or *Abies fraseri*. Particularly on the summit and high slopes of Mount Le Conte, the taxonomic distinction between *Rhododendron minus* and *Rhododendron carolinianum* is uncertain. Some of what is treated here as *Rhododendron carolinianum* may prove to be *Rhododendron minus*. It may be difficult to distinguish the signature of this heath bald type from that of *Kalmia latifolia* - *Rhododendron catawbiense* - (*Gaylussacia baccata*, *Pieris floribunda*, *Vaccinium corymbosum*) Shrubland (CEGL003814), especially at transitional elevations. The alliance may serve as a better mapping unit for these communities.

**Global Classification Comments:** The taxonomic distinctions between *Rhododendron minus* and *Rhododendron carolinianum* are currently uncertain. Some of what is treated here as *Rhododendron carolinianum* may prove to be *Rhododendron minus*. This association contains a portion of the former concept of *Rhododendron carolinianum* Shrubland (CEGL003816), which occurs at lower elevations in areas of quartzite and meta-arkose geology.

#### ELEMENT DISTRIBUTION

**Great Smoky Mountains National Park Range:** This community was sampled from the highest elevations of the Mount Le Conte quadrangle and neighboring quadrangles. It may occur in other high-elevation areas of the park. On the Mount Le Conte quadrangle this community was sampled from Rocky Spur north of Mount Le Conte; from Clifftop west of the Mount Le Conte summit; and from the Jumpoff, in the vicinity of Mount Kephart. In addition, it was sampled from Charlie's Bunion off of the Appalachian Trail.

**Global Range:** This high-elevation shrubland occurs in the Great Smoky Mountains of eastern Tennessee. It is known from areas of exposed slate on the steep ridges of Mount LeConte (Ramseur 1958).

**Nations:** US

**States/Provinces:** NC, TN

**TNC Ecoregions:** 51:C

**USFS Ecoregions (1994/95):** M221Dd:CCC

**USFS Ecoregions (2007):** M221Dd:CCC

**Federal Lands:** NPS (Appalachian Trail [Southern Blue Ridge], Great Smoky Mountains)

#### ELEMENT SOURCES

**Great Smoky Mountains National Park Plots:** GRSM.96, GRSM.97.

**Great Smoky Mountains National Park Description Author(s):** K.D. Patterson, mod. R. White

**Global Description Author(s):** K.D. Patterson and T. Govus

**References:** Allard 1990, Fleming and Patterson 2009a, NatureServe Ecology - Southeastern U.S. unpubl. data, Peet et al. unpubl. data, Ramseur 1958, Risk 1993, Schafale 2012, Schafale and Weakley 1990, Southeastern Ecology Working Group n.d., Whittaker 1979a

### G657. SOUTHERN APPALACHIAN GRASS BALD

**Group Summary Description:** These densely vegetated herbaceous communities are found in the highest elevational zone of the Southern Appalachians, generally above 1524 m (5000 feet) but occasionally to 1220 m (4000 feet), and at slightly lower elevations at its northern limit in Virginia and West Virginia. The vegetation consists of dense herbaceous cover characteristically dominated by *Danthonia compressa* or *Carex* spp. Extensive areas have become dominated by *Rubus allegheniensis* and by mixtures of native grasses and exotic pasture grasses. Most examples of grassy balds have some invading shrubs and trees, often dense enough to threaten the herbaceous vegetation. The combination of high-elevation, non-wetland sites and dense herbaceous vegetation without appreciable rock outcrop conceptually distinguish this group from all others in the Southern Appalachians. However, the widespread areas of degraded spruce-fir with grass and/or shrub cover and the invasion of grassy balds by trees blur the distinction somewhat.

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### A2026 *Carex pensylvanica* - *Danthonia compressa* - *Hypericum mitchellianum* Grass Bald Alliance

Pennsylvania Sedge - Flattened Oatgrass - Blue Ridge St. John's-wort Grass Bald Alliance

*Southern Appalachian Pennsylvania Sedge - Flattened Oatgrass Grass Bald*

#### ALLIANCE CONCEPT

**Summary:** This alliance includes montane grasslands dominated by *Danthonia compressa* and/or *Carex pensylvanica*. Some examples have significant cover of *Sibbaldiopsis tridentata* or *Rhododendron calendulaceum*. Species dominance is highly variable among and within occurrences. Associated species can include *Carex brunnescens*, *Carex debilis*, *Deschampsia flexuosa*, *Houstonia serpyllifolia*, *Oclemena acuminata*, *Prenanthes roanensis*, *Smilax herbacea*, *Solidago glomerata*, and *Stachys clingmanii*. Other associated species include *Ageratina altissima* var. *roanensis*, *Angelica triquinata*, *Bromus pubescens*, *Dennstaedtia punctilobula*, *Fragaria virginiana*, *Helenium autumnale*, and *Polytrichum commune*. The exotic *Rumex acetosella* may also be present. Typical shrubs are *Menziesia pilosa*, *Pieris floribunda*, *Rhododendron calendulaceum*, *Rhododendron catawbiense*, *Rubus canadensis*, *Vaccinium corymbosum*, and *Vaccinium simulatum*. Examples dominated by *Carex pensylvanica* are typically ungrazed grass balds with deep soil, and lack significant shrub cover. Grasslands in this alliance occur at the highest elevations of the southern Appalachian Mountains, often adjacent to montane shrublands or dwarfed forests dominated by *Fagus grandifolia* or *Quercus rubra*. These grasslands occur at high elevations (usually above 1200-1500 m [4000-5000 feet]) in the Southern Blue Ridge, often on south- to southwest-facing domes, ridgetops and gentle slopes. Strong winds, high rainfall, frequent fog, shallow, rocky soils, and extremes of temperature and moisture are characteristic of these environments.

#### Similar Alliances:

- *Danthonia spicata* - *Danthonia compressa* - *Solidago rugosa* ssp. *aspera* Ruderal Montane Grassland Alliance (A3906) represents similar semi-natural vegetation in the Central Appalachians.
- *Rubus allegheniensis* - *Rubus canadensis* Shrubland Alliance (A0930)

**Diagnostic Characteristics:** Montane grasslands dominated by *Danthonia compressa* and/or *Carex pensylvanica*.

**Rationale for Nominal Species or Physiognomic Features:** This alliance accommodates montane grasslands dominated by *Danthonia compressa* and/or *Carex pensylvanica*.

#### Related Concepts:

- Grassy Bald Community (Brown 1941) =
- ID9a. Grass Bald (Allard 1990) ><
- Southern Appalachian Grassy Balds (Fleming et al. 2013) =

#### ALLIANCE DESCRIPTION

**Environment:** These grasslands occur at high elevations (usually above 1200-1500 m [4000-5000 feet]) in the Southern Blue Ridge, often on south- to southwest-facing domes, ridgetops and gentle slopes. Strong winds, high rainfall, frequent fog, shallow, rocky soils, and extremes of temperature and moisture are characteristic of these environments. Examples dominated by *Carex pensylvanica* are typically ungrazed grass balds with deep soil, and lack significant shrub cover. Grasslands in this alliance occur at the highest

elevations of the southern Appalachian Mountains, often adjacent to montane shrublands or dwarfed forests dominated by *Fagus grandifolia* or *Quercus rubra*.

**Vegetation:** This alliance accommodates montane grasslands dominated by *Danthonia compressa* and/or *Carex pensylvanica*. Some examples have significant cover of *Sibbaldiopsis tridentata* or *Rhododendron calendulaceum*. Species dominance is highly variable among and within occurrences. Associated species can include *Carex brunnescens*, *Carex debilis*, *Deschampsia flexuosa*, *Houstonia serpyllifolia*, *Oclemena acuminata* (= *Aster acuminatus*), *Prenanthes roanensis*, *Smilax herbacea*, *Solidago glomerata*, and *Stachys clingmanii*. Other associated species include *Ageratina altissima* var. *roanensis*, *Angelica triquinata*, *Bromus pubescens*, *Dennstaedtia punctilobula*, *Fragaria virginiana*, *Helenium autumnale*, and *Polytrichum commune*. The exotic *Rumex acetosella* may also be present. Typical shrubs are *Menziesia pilosa*, *Pieris floribunda*, *Rhododendron calendulaceum*, *Rhododendron catawbiense*, *Rubus canadensis*, *Vaccinium corymbosum*, and *Vaccinium simulatum*.

**Physiognomy and Structure:** This vegetation is graminoid-dominated, with some (mostly low) shrubs.

**Floristics:** This alliance accommodates montane grasslands dominated by *Danthonia compressa* and/or *Carex pensylvanica*. Some examples have significant cover of *Sibbaldiopsis tridentata* or *Rhododendron calendulaceum*. Species dominance is highly variable among and within occurrences. Associated species can include *Carex brunnescens*, *Carex debilis*, *Deschampsia flexuosa*, *Houstonia serpyllifolia*, *Oclemena acuminata* (= *Aster acuminatus*), *Prenanthes roanensis*, *Smilax herbacea*, *Solidago glomerata*, and *Stachys clingmanii*. Other associated species include *Ageratina altissima* var. *roanensis*, *Angelica triquinata*, *Bromus pubescens*, *Dennstaedtia punctilobula*, *Fragaria virginiana*, *Helenium autumnale*, and *Polytrichum commune*. The exotic *Rumex acetosella* may also be present. Typical shrubs are *Menziesia pilosa*, *Pieris floribunda*, *Rhododendron calendulaceum*, *Rhododendron catawbiense*, *Rubus canadensis*, *Vaccinium corymbosum*, and *Vaccinium simulatum*.

**Dynamics:** Strong winds, high rainfall, frequent fog, shallow, rocky soils, and extremes of temperature and moisture are characteristic of these environments.

#### ALLIANCE DISTRIBUTION

**Range:** This vegetation is restricted to higher elevations in the Southern Blue Ridge of North Carolina, Tennessee, and Virginia.

**Nations:** US

**Subnations:** NC, TN, VA

**TNC Ecoregions:** 51:C

**USFS Ecoregions (1994/95):** M221Db:CC?, M221Dc:CCC, M221Dd:CCC

**USFS Ecoregions (2007):** M221Db:CC?, M221Dc:CCC, M221Dd:CCC

#### ALLIANCE SOURCES

**References:** Allard 1990, Billings and Mark 1957, Brown 1941, Faber-Langendoen et al. 2019b, Fleming and Patterson 2009a, Fleming et al. 2013, Gersmehl 1973, Lindsay and Bratton 1979a, Mark 1958, Mark 1959, Peet et al. unpubl. data, Schafale 2012, Schafale and Weakley 1990

**Author of Concept:** Faber-Langendoen et al. 2019b

**Author of Description:** M. Pyne, in Faber-Langendoen et al. (2013)

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#### [CEGL004242] *Danthonia compressa* - (*Sibbaldiopsis tridentata*) Grassland

Translated Name: **Flattened Oatgrass - (Shrubby Fivefingers) Grassland**

Common Name: **Grassy Bald (Southern Grass Type)**

#### USNVC CLASSIFICATION

Division	Eastern North American Grassland & Shrubland (2.B.2.Nc)
Macrogroup	Appalachian Rocky Felsic & Mafic Scrub & Grassland (M506)
Group	Southern Appalachian Grass Bald (G657)
Alliance	<i>Carex pensylvanica</i> - <i>Danthonia compressa</i> - <i>Hypericum mitchellianum</i> Grass Bald Alliance
(A2026)	

#### ELEMENT CONCEPT

**Global Summary:** This community consists of graminoid-dominated vegetation with scattered shrubs, occurring on moderate to high-elevation peaks and saddles in the Southern Blue Ridge. Characteristically, this vegetation is strongly dominated by *Danthonia compressa*, or in some areas codominated by the subshrub *Sibbaldiopsis tridentata*. Other characteristic herbaceous species are *Angelica triquinata*, *Carex pensylvanica*, *Carex debilis*, *Carex intumescens*, *Carex brunnescens*, *Deschampsia flexuosa*, *Erythronium umbilicatum* ssp. *monostolum*, *Gentiana austromontana*, *Gentianella quinquefolia*, *Houstonia serpyllifolia*, *Ionactis linariifolius*, *Lysimachia quadrifolia*, *Oclemena acuminata*, *Potentilla canadensis*, *Prenanthes roanensis*, *Smilax herbacea*, *Solidago bicolor*, *Solidago glomerata*, *Stachys clingmanii*, and *Trautvetteria caroliniensis* var. *caroliniensis*. The floristic composition is a mixture of widespread species, northern disjunct species, such as *Agrostis mertensii*, *Carex siccata*, *Minuartia groenlandica*, *Packera schweinitziana*, and *Sibbaldiopsis tridentata*, and Southern Appalachian endemics, such as *Erythronium umbilicatum* ssp. *monostolum*, *Geum geniculatum*, *Geum radiatum*, *Houstonia serpyllifolia*, *Lilium grayi*, *Prenanthes roanensis*, *Solidago glomerata*, and *Stachys clingmanii*). Typical shrubs (which may occur as scattered individuals or as patches) are *Rhododendron calendulaceum*, *Rhododendron catawbiense*, *Menziesia pilosa*, *Vaccinium corymbosum*, and *Rubus canadensis*. Species indicative of past grazing include *Phleum pratense*, *Agrostis gigantea*, *Hieracium scabrum*, *Rumex acetosella*, and *Prunella vulgaris*. This community occurs on

high-elevation (usually above 1350 m [4500 feet]), often south- to southwest-facing domes, ridgetops, and gentle slopes. Strong winds, high rainfall, frequent fog, shallow rocky soils, and extremes of temperature and moisture are characteristic of these environments. It is known from the highest elevations of the southern Appalachian Mountains. It is typically surrounded by dwarfed forests dominated by *Fagus grandifolia* or *Quercus rubra*.

#### ENVIRONMENTAL DESCRIPTION

**Great Smoky Mountains National Park Environment:** Examples of this community sampled were on gentle ridges at between 4320 feet and approximately 5300 feet. Invasion by woody species is occurring in all examples to various extents, and trails by humans have heavily impacted examples near Clingman's Dome.

**Global Environment:** This community occurs on high-elevation (usually above 1350 m [4500 feet]), often south- to southwest-facing domes, ridgetops, and gentle slopes. Strong winds, high rainfall, frequent fog, shallow rocky soils, and extremes of temperature and moisture are characteristic of these environments. In North Carolina and Tennessee, this grassland vegetation is typically surrounded by dwarfed forests dominated by *Fagus grandifolia* or *Quercus rubra*. On Whitetop Mountain, Virginia, the type occurs at elevations from 1525-1655 m (5000-5430 feet), adjacent to both well-developed *Picea rubens*-dominated forests and stunted northern hardwoods. Soils are extremely acidic (pH = 3.8), with low (5%) base saturation, high aluminum levels (1600 ppm), and relatively high (27%) organic matter content.

#### VEGETATION DESCRIPTION

**Great Smoky Mountains National Park Vegetation:** This community includes open vegetation dominated by graminoid species, sometimes with large patches dominated by deciduous ericads. *Danthonia compressa* is the aspect dominant herb, although other herbaceous species with high coverage include *Arnoglossum muehlenbergii*, *Cinna latifolia*, *Danthonia spicata*, *Phleum pratense*, *Poa compressa*, *Potentilla canadensis*, and *Rumex acetosella*. Other species present in the herbaceous stratum include *Achillea millefolium*, *Ageratina altissima* var. *roanensis*, *Arrhenatherum elatius*, *Symphotrichum dumosum* (= *Aster dumosus*), *Sericocarpus asteroides* (= *Aster paternus*), *Carex siccata* (= *Carex aenea*), *Carex leavenworthii*, *Dichanthelium laxiflorum*, *Galium pilosum*, *Houstonia purpurea* var. *purpurea*, *Houstonia serpyllifolia*, *Hypericum punctatum*, *Juncus effusus*, *Juncus marginatus*, *Luzula acuminata*, *Lysimachia quadrifolia*, *Malaxis unifolia*, *Melampyrum lineare*, *Potentilla simplex*, *Prenanthes altissima*, *Prunella vulgaris*, *Rubus canadensis*, *Rudbeckia hirta*, *Rumex acetosella*, *Packera anonyma* (= *Senecio anonymus*), *Solanum carolinense*, and *Viola X primulifolia* (= var. *villosa*). Alien species present that may indicate past grazing include *Agrostis stolonifera*, *Carduus acanthoides*, *Cerastium nutans*, *Holcus lanatus*, *Leucanthemum vulgare*, *Phleum pratense*, *Trifolium pratense*, and *Veronica serpyllifolia*. On Gregory Bald, the shrubs *Rhododendron calendulaceum* and *Vaccinium corymbosum* are locally dominant. Other scattered woody plants in this community include *Amelanchier laevis*, *Kalmia latifolia*, *Magnolia acuminata*, and *Prunus serotina*.

**Global Vegetation:** This vegetation is graminoid-dominated with scattered shrubs. Most occurrences are strongly dominated by *Danthonia compressa*, but some sites are codominated by the subshrub *Sibbaldiopsis tridentata* (= *Potentilla tridentata*). Other characteristic herbaceous species are *Angelica triquinata*, *Carex pensylvanica*, *Carex debilis* var. *rudgei*, *Carex intumescens*, *Carex brunnescens* ssp. *sphaerostachya*, *Deschampsia flexuosa*, *Erythronium umbilicatum* ssp. *monostolum*, *Gentiana austromontana*, *Gentianella quinquefolia*, *Houstonia serpyllifolia*, *Ionactis linariifolius* (= *Aster linariifolius*), *Lysimachia quadrifolia*, *Oclemena acuminata* (= *Aster acuminatus*), *Potentilla canadensis*, *Prenanthes roanensis*, *Smilax herbacea*, *Solidago bicolor*, *Solidago glomerata*, *Stachys clingmanii*, and *Trautvetteria caroliniensis* var. *caroliniensis*. The floristic composition is a mixture of widespread species, northern disjunct species such as *Sibbaldiopsis tridentata*; and Southern Appalachian endemics such as *Houstonia serpyllifolia*, *Lilium grayi*, and *Prenanthes roanensis*. Typical shrubs, which may occur as scattered individuals or patches are *Rhododendron calendulaceum*, *Rhododendron catawbiense*, *Menziesia pilosa*, *Vaccinium corymbosum*, and *Rubus canadensis*. Invasive, introduced species indicative of past grazing include *Phleum pratense*, *Agrostis gigantea*, *Hieracium caespitosum*, *Poa compressa*, *Rumex acetosella*, and *Prunella vulgaris*.

In the least disturbed, most natural areas, the most abundant or characteristic herbaceous associates are *Carex brunnescens* ssp. *sphaerostachya*, *Carex debilis* var. *rudgei*, *Lysimachia quadrifolia*, *Dennstaedtia punctilobula*, *Carex pensylvanica*, *Potentilla canadensis*, *Prenanthes roanensis*, *Solidago rugosa*, *Ageratina altissima* var. *roanensis*, and *Hypericum mitchellianum*. Despite the exposed topography, atmospheric conditions create a very moist microclimate, as evidenced by large populations of species often associated with wetlands, including *Helenium autumnale*, *Packera aurea*, *Houstonia serpyllifolia*, *Solidago patula*, and *Carex intumescens*.

Rare or northern disjunct plant species reported from this community include *Agrostis mertensii*, *Alnus viridis* ssp. *crispa*, *Botrychium multifidum*, *Calamagrostis canadensis*, *Carex siccata* (= *Carex aenea*), *Carex cristatella*, *Carex misera*, *Delphinium exaltatum*, *Gentiana austromontana*, *Geum geniculatum*, *Houstonia purpurea* var. *montana*, *Huperzia selago*, *Hypericum buckleii*, *Lilium grayi*, *Lilium philadelphicum*, *Lycopodium dendroideum*, *Lycopodium hickeyi*, *Minuartia groenlandica*, *Monarda media*, *Phlox subulata*, *Platanthera grandiflora*, *Poa palustris*, *Prenanthes roanensis*, *Rhododendron cumberlandense*, *Rhododendron vaseyi*, *Packera schweinitziana* (= *Senecio schweinitzianus*), *Spiranthes ochroleuca*, and *Trisetum spicatum* (Schafale and Weakley 1990). Exotic species that occur, probably as a result of grazing, include *Prunella vulgaris*, *Phleum pratense*, and *Poa compressa*.

**Global Dynamics:** The origin and ecological dynamics of this vegetation type are not clear. Several disturbance mechanisms, both natural and anthropogenic, have been hypothesized, including fire, grazing, trampling, clearing, climatic change, windthrow, or some combination of these influences. The importance of megaherbivores in long-term bald maintenance has recently been proposed (Wiegand and Knowles 1999). It appears that new occurrences of this community are not being created, and that many existing ones are being encroached by shrub and tree species. The presence of northern disjunct species requiring open habitat suggests that some of these

areas have been open since the Pleistocene. This is the case at Whitetop Mountain, Virginia, although there is little question that the original openings were greatly expanded during a long history of grazing and the development of a 19th century resort. A. Weakley (pers. comm. 2001) suggests that the balds of Roan Mountain, Tennessee, are primarily natural, whereas those farther north are of anthropogenic origin.

#### MOST ABUNDANT SPECIES

##### Great Smoky Mountains National Park

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Rhododendron calendulaceum</i> , <i>Vaccinium corymbosum</i>
Herb (field)	Graminoid	<i>Danthonia compressa</i>

##### Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Rhododendron calendulaceum</i> , <i>Rubus allegheniensis</i>
Short shrub/sapling	Dwarf-shrub	<i>Sibbaldiopsis tridentata</i>
Herb (field)	Flowering forb	<i>Potentilla canadensis</i>
Herb (field)	Graminoid	<i>Agrostis perennans</i> , <i>Carex brunnescens</i> , <i>Carex debilis</i> , <i>Carex pensylvanica</i> , <i>Danthonia compressa</i> , <i>Deschampsia flexuosa</i>

#### CHARACTERISTIC SPECIES

**Great Smoky Mountains National Park:** *Danthonia compressa*

**Global:** *Carex brunnescens* ssp. *sphaerostachya*, *Carex debilis* var. *rudgei*, *Carex normalis*, *Danthonia compressa*, *Danthonia spicata*, *Deschampsia flexuosa*, *Houstonia serpyllifolia*, *Hypericum mitchellianum*, *Lysimachia quadrifolia*, *Packera schweinitziana*, *Prenanthes roanensis*, *Sibbaldiopsis tridentata*, *Solidago roanensis*

#### OTHER NOTEWORTHY SPECIES

**Global: Vulnerable Plants:** *Abies fraseri* (G2, Southern Blue Ridge endemic), *Ageratina altissima* var. *roanensis* (G5T3T4, Southern Blue Ridge endemic), *Agrostis mertensii* (G5, rare or northern disjunct), *Allium allegheniense* (G3?), *Alnus viridis* ssp. *crispa* (G5T5, rare or northern disjunct), *Botrychium multifidum* (G5, rare or northern disjunct), *Calamagrostis canadensis* (G5, rare or northern disjunct), *Carex cristatella* (G5, rare or northern disjunct), *Carex misera* (G3, rare or northern disjunct), *Carex siccata* (G5, rare or northern disjunct), *Cuscuta rostrata* (G4, VA state-rare), *Delphinium exaltatum* (G3, rare or northern disjunct), *Erythronium umbilicatum* ssp. *monostolum* (G5T3), *Gentiana austromontana* (G3), *Geum geniculatum* (G2), *Geum radiatum* (G2, Southern Appalachian endemic), *Houstonia purpurea* var. *montana* (G5T2, Southern Blue Ridge endemic), *Huperzia selago* (G5, rare or northern disjunct), *Hypericum buckleii* (G3, Southern Blue Ridge endemic), *Hypericum graveolens* (G3), *Hypericum mitchellianum* (G3), *Lilium grayi* (G1G2, Southern Blue Ridge endemic), *Lilium philadelphicum* (G5, rare or northern disjunct), *Lycopodium dendroideum* (G5, rare or northern disjunct), *Lycopodium hickeyi* (G5, rare or northern disjunct), *Minuartia groenlandica* (G5, rare or northern disjunct), *Monarda media* (G4?, rare or northern disjunct), *Packera schweinitziana* (G5?, Rare or northern disjunct), *Phlox subulata* (G5, rare or northern disjunct), *Platanthera grandiflora* (G5, rare or northern disjunct), *Poa palustris* (G5, rare or northern disjunct), *Prenanthes roanensis* (G3, Southern Blue Ridge endemic), *Rhododendron cumberlandense* (G4?, rare or northern disjunct), *Rhododendron vaseyi* (G3, NC/Southern Blue Ridge endemic), *Solidago glomerata* (G3), *Spiranthes ochroleuca* (G4, rare or northern disjunct), *Stachys clingmanii* (G2), *Trisetum spicatum* (G5, rare or northern disjunct); **Invasive/Exotic Plants:** *Agrostis gigantea* (Medium/Low), *Agrostis stolonifera* (Medium/Low), *Hieracium caespitosum* (Medium/Insignificant), *Phleum pratense* (Medium), *Poa compressa* (High/Low), *Prunella vulgaris* (weedy native), *Rumex acetosella* (Medium/Low); **Other Plants:** *Huperzia appalachiana* (G5), *Vaccinium hirsutum* (G4)

#### CONSERVATION STATUS RANK

**Global Rank & Reasons:** G1 (14-Dec-1998). This community has small range, few occurrences, and is rapidly disappearing due to vegetational succession. This community is threatened by high levels of recreational use and the introduction of exotic plant and animal species, as well as by successional trends of uncertain cause.

#### RELATED CONCEPTS

##### Global Related Concepts:

- *Danthonia compressa* - *Carex brunnescens* ssp. *sphaerostachya* - *Sibbaldiopsis tridentata* Herbaceous Vegetation (Fleming and Coulling 2001) =
- ID9a. Grass Bald (Allard 1990) >

#### CLASSIFICATION

**Status:** Standard

**Classification Confidence:** 2 - Moderate

**Great Smoky Mountains National Park Other Comments:** Gregory Bald and Andrews Bald are currently maintained by manual woody species removal.

**Global Classification Comments:** Notable examples include various peaks of the Roan Mountain complex, Long Hope Valley, Shining Rock Wilderness, and Great Smoky Mountains National Park. The origin of this community is not clear, and in fact, several mechanisms, both natural and anthropogenic, have been proposed including fire, grazing, trampling, clearing, climatic change,

windthrow, or some combination of these influences. The presence of northern disjunct species requiring open habitat may suggest that some of these areas have been open since the Ice Age. A. Weakley (pers. comm.) suggests that the balds of Roan Mountain, Tennessee, are primarily natural, whereas those farther north are of anthropogenic origin. It appears that new occurrences of this community are not being created, and those that exist are being encroached by shrub and tree species. Lindsay (1976) reported that examples of this community in Great Smoky Mountains National Park will have disappeared by the end of the century if management is not undertaken to halt invasion by woody plants. However, these balds are among those most likely to be of anthropogenic origin. Six plots from Roan Mountain, Whitetop Mountain, and Gregory Bald were classified as this association in the Appalachian Trail project (Fleming and Patterson 2009a). Several plots have high cover by shrubs (*Amelanchier laevis*, *Rhododendron catawbiense*, *Rubus canadensis*, *Vaccinium corymbosum*, *Vaccinium erythrocarpum*, *Vaccinium pallidum*) indicating woody encroachment or plot placement in an ecotone. Species that have  $\geq 67\%$  constancy are, in order of descending constancy, *Danthonia compressa*, *Sibbaldiopsis tridentata*, *Dennstaedtia punctilobula*, *Carex debilis* var. *rudgei*, *Rubus canadensis*, *Rumex acetosella*, and *Saxifraga michauxii*.

#### ELEMENT DISTRIBUTION

**Great Smoky Mountains National Park Range:** This community was sampled from Russell Field Bald, Gregory Bald, Spence Fields, and Andrews Bald.

**Global Range:** This montane sparse dwarf-shrubland is found in the high mountain areas of the Southern Appalachians. While the majority of examples occur in North Carolina, this community is also known from Tennessee and Virginia.

**Nations:** US

**States/Provinces:** NC, TN, VA:S1

**TNC Ecoregions:** 51:C

**USFS Ecoregions (1994/95):** M221Db:CC?, M221Dc:CCC, M221Dd:CCC

**USFS Ecoregions (2007):** M221Db:CC?, M221Dc:CCC, M221Dd:CCC

**Federal Lands:** NPS (Appalachian Trail [Southern Blue Ridge], Blue Ridge Parkway, Great Smoky Mountains); USFS (Cherokee, Jefferson, Pisgah)

#### ELEMENT SOURCES

**Great Smoky Mountains National Park Plots:** GRSM.213, GRSM.247, GRSM.248, GRSM.314, GRSM.536.

**Great Smoky Mountains National Park Description Author(s):** K.D. Patterson, mod. R. White

**Global Description Author(s):** K.D. Patterson

**References:** Allard 1990, Allard et al. 1990, Billings and Mark 1957, Bratton 1975, Cain 1931, DeSelm and Murdock 1993, Fleming and Coulling 2001, Fleming and Patterson 2009a, Fleming et al. 2017, Gersmehl 1969, Gersmehl 1971, Gersmehl 1973, Lindsay 1976, Lindsay 1977, Lindsay 1978, Lindsay and Bratton 1979a, Lindsay and Bratton 1979b, Lindsay and Bratton 1980, Mark 1958, Mark 1959, NCNHP 1993, NatureServe Ecology - Southeastern U.S. unpubl. data, Peet et al. unpubl. data, Schafale 2012, Schafale and Weakley 1990, Southeastern Ecology Working Group n.d., Stratton and White 1982, TDNH unpubl. data 2018, Weakley pers. comm., Wiegl and Knowles 1999

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## A0930 *Rubus allegheniensis* - *Rubus canadensis* Shrubland Alliance

Allegheny Blackberry - Smooth Blackberry Shrubland Alliance

*Southern Appalachian Blackberry Shrubland*

#### ALLIANCE CONCEPT

**Summary:** This alliance encompasses *Rubus*-dominated areas at high elevations in the Southern Blue Ridge, as well as related stands dominated by *Prunus pensylvanica*. This includes grassy balds (open montane grasslands), areas where the balsam woolly adelgid has caused *Abies fraseri* death, or other disturbed areas such as landslide scars that create open conditions. Stands of this alliance are dominated by *Rubus allegheniensis*, *Rubus canadensis*, and *Rubus idaeus* ssp. *strigosus*. Examples in otherwise grassy balds may also contain trace amounts of other species from adjacent grasslands, such as *Athyrium filix-femina* ssp. *asplenioides*, *Agrostis perennans*, *Angelica triquinata*, *Carex debilis* var. *rudgei*, *Carex brunnescens*, *Carex intumescens*, and *Rumex acetosella* (exotic). Successional stands at high elevation resulting from severe disturbance of spruce-fir forests (i.e., balsam woolly adelgid-affected stands), as well as exposed sites with other frequent, natural disturbance (such as shrub invasion of grazed fire meadows), may contain dense *Athyrium filix-femina* ssp. *asplenioides* and *Solidago glomerata* (on more protected sites). Scattered living trees and shrubs of *Amelanchier laevis*, *Betula alleghaniensis*, *Picea rubens*, *Prunus pensylvanica*, and *Sorbus americana* may occur.

**Classification Comments:** The associations in this alliance can, to varying degrees, be regarded as "semi-natural" or even "ruderal" in that their presence may be related to successional situations following the cessation of grazing, the death of *Abies fraseri*, intense fires, as well as other possible factors and situations. The placement of the alliance in this group as opposed to a ruderal shrubland group should be investigated. In the Southern Appalachians of North Carolina and Tennessee, *Prunus pensylvanica* often forms an open low-canopy layer (<50% cover). In areas such as Shining Rock Wilderness and parts of the Great Smoky Mountains, fires were started after logging had taken place and the intensity of the fires, due to the accumulated slash, burned down nearly to mineral soil. These areas do not have as much coarse woody debris from downed spruce or fir and often have a canopy approaching that of a woodland with sparse cover of *Prunus pensylvanica* and *Sorbus americana*.

**Similar Alliances:**

- *Carex pensylvanica* - *Danthonia compressa* - *Hypericum mitchellianum* Grass Bald Alliance (A2026) represents similar natural vegetation in the Southern Appalachians, but not dominated by *Rubus allegheniensis* and *Rubus canadensis*.
- Diagnostic Characteristics:** Distinctive shrublands dominated primarily by *Rubus allegheniensis* and/or *Rubus canadensis*, restricted to higher elevations in the Southern Appalachians.
- Rationale for Nominal Species or Physiognomic Features:** This high-elevation Appalachian bald vegetation is dominated by *Rubus allegheniensis* and *Rubus canadensis*.
- Related Concepts:**
- ID9a. Grass Bald (Allard 1990) ><

#### ALLIANCE DESCRIPTION

**Environment:** These grasslands occur at high elevations (usually above 1200-1500 m [4000-5000 feet]) in the Southern Blue Ridge, often on south- to southwest-facing domes, ridgetops and gentle slopes. Strong winds, high rainfall, frequent fog, shallow, rocky soils, and extremes of temperature and moisture are characteristic of these environments. This alliance may occur intermixed with grassy balds (which are open montane grasslands), in areas where the balsam woolly adelgid has caused *Abies fraseri* death, or in other disturbed areas such as landslide scars that create open conditions.

**Vegetation:** Stands of this alliance are dominated by *Rubus allegheniensis*, *Rubus canadensis*, and *Rubus idaeus* ssp. *strigosus*. Examples in otherwise grassy balds may also contain trace amounts of other species from adjacent grasslands, such as *Athyrium filix-femina* ssp. *asplenioides*, *Agrostis perennans*, *Angelica triquinata*, *Carex debilis* var. *rudgei*, *Carex brunnescens*, *Carex intumescens* (= var. *fernaldii*), and *Rumex acetosella* (exotic). Successional stands at high elevation resulting from severe disturbance of spruce-fir forests (i.e., balsam woolly adelgid-affected stands), as well as exposed sites with other frequent, natural disturbance (such as shrub invasion of grazed fire meadows), may contain dense *Athyrium filix-femina* ssp. *asplenioides* and *Solidago glomerata* (on more protected sites). Scattered living trees and shrubs of *Amelanchier laevis*, *Betula alleghaniensis*, *Picea rubens*, *Prunus pensylvanica*, and *Sorbus americana* may occur.

**Physiognomy and Structure:** This high-elevation Appalachian bald vegetation is dominated by *Rubus allegheniensis* and *Rubus canadensis*. Herbaceous plants typical of grassy balds may be found in this vegetation, and scattered living trees and shrubs of *Amelanchier laevis*, *Betula alleghaniensis*, *Picea rubens*, *Prunus pensylvanica*, and *Sorbus americana* may occur.

**Floristics:** Stands of this alliance are dominated by *Rubus allegheniensis*, *Rubus canadensis*, and *Rubus idaeus* ssp. *strigosus*. Examples in otherwise grassy balds may also contain trace amounts of other species from adjacent grasslands, such as *Athyrium filix-femina* ssp. *asplenioides*, *Agrostis perennans*, *Angelica triquinata*, *Carex debilis* var. *rudgei*, *Carex brunnescens*, *Carex intumescens* (= var. *fernaldii*), and *Rumex acetosella* (exotic). Successional stands at high elevation resulting from severe disturbance of spruce-fir forests (i.e., balsam woolly adelgid-affected stands), as well as exposed sites with other frequent, natural disturbance (such as shrub invasion of grazed fire meadows), may contain dense *Athyrium filix-femina* ssp. *asplenioides* and *Solidago glomerata* (on more protected sites). Scattered living trees and shrubs of *Amelanchier laevis*, *Betula alleghaniensis*, *Picea rubens*, *Prunus pensylvanica*, and *Sorbus americana* may occur.

**Dynamics:** Strong winds, high rainfall, frequent fog, shallow, rocky soils, and extremes of temperature and moisture are characteristic of these environments, and keep the areas from becoming dominated by deciduous trees. Successional stands at high elevation resulting from severe disturbance of spruce-fir forests (i.e., balsam woolly adelgid-affected stands), as well as exposed sites with other frequent, natural disturbance (such as shrub invasion of grazed fire meadows), may contain dense *Athyrium filix-femina* ssp. *asplenioides* and *Solidago glomerata* (on more protected sites).

#### ALLIANCE DISTRIBUTION

**Range:** Stands are found in the Southern Appalachians and adjacent Central Appalachians from Tennessee, North Carolina, and Virginia.

**Nations:** US

**Subnations:** NC, TN, VA

**TNC Ecoregions:** 51:C, 59:C

**USFS Ecoregions (1994/95):** M221Bd:CCC, M221Dc:CCC, M221Dd:CCC

**USFS Ecoregions (2007):** M221Bd:CCC, M221Dc:CCC, M221Dd:CCC

#### ALLIANCE SOURCES

**References:** Allard 1990, Crandall 1958, Faber-Langendoen et al. 2019b, Feldcamp 1984, Schafale and Weakley 1990

**Author of Concept:** Faber-Langendoen et al. 2019b

**Author of Description:** S. Simon, G. Kauffman, D.M. Danley, in Faber-Langendoen et al. (2013)

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#### [CEGL007293] (*Prunus pensylvanica*, *Sorbus americana*) - *Rubus* spp. Shrubland

Translated Name: (Pin Cherry, American Mountain-ash) - Blackberry species Shrubland

Common Name: High-Elevation Pin Cherry - Mountain-ash - Blackberry Thicket

#### USNVC CLASSIFICATION

Division	Eastern North American Grassland & Shrubland (2.B.2.Nc)
Macrogroup	Appalachian Rocky Felsic & Mafic Scrub & Grassland (M506)
Group	Southern Appalachian Grass Bald (G657)

Alliance *Rubus allegheniensis* - *Rubus canadensis* Shrubland Alliance (A0930)

#### ELEMENT CONCEPT

**Global Summary:** This vegetation includes early-successional stands of variable physiognomy (typically emergent woody species over *Rubus* spp.) that occur at high elevations in the southern Appalachian Mountains of North Carolina and Tennessee. Stands result from severe disturbances such as fire, windthrow, or clearcutting. The emergent trees/shrubs may be primarily a variable mixture of *Prunus pensylvanica* and *Sorbus americana*, or a variable combination of high-elevation woody species, including *Betula alleghaniensis*, *Acer spicatum*, and *Aesculus flava*. Common shrub and herbaceous species include *Rubus canadensis*, *Sambucus racemosa* var. *racemosa*, *Viburnum lantanoides*, *Rhus typhina*, *Aralia nudicaulis*, *Eurybia macrophylla*, *Viola* spp., *Pteridium aquilinum* var. *latiusculum*, *Dryopteris campyloptera*, and *Huperzia lucidula*. In the Southern Appalachians, *Prunus pensylvanica*-dominated communities result from severe disturbance in *Picea rubens* forests or *Picea rubens* - *Abies fraseri* forests and sometimes never recover to their original composition. Stands of this type have developed in areas such as Shining Rock Wilderness and parts of the Great Smoky Mountains, where intense fires occurred after logging had taken place. These intense fires, due to the accumulated slash, burned down nearly to mineral soil. These areas do not have as much coarse woody debris from downed spruce or fir and often have a canopy approaching that of a woodland with sparse coverage of *Sorbus americana* and *Prunus pensylvanica*.

#### ENVIRONMENTAL DESCRIPTION

**Global Environment:** This vegetation occurs at high elevations in the southern Appalachian Mountains of North Carolina and Tennessee. It is successional vegetation resulting from severe disturbance of spruce-fir forests (including balsam woolly adelgid-affected stands and stands which were severely burned after logging), as well as exposed sites with other frequent, natural disturbances (such as shrub invasion of grazed fire meadows). It occurs on exposed summits and high slopes, typically at elevations over 1830 m (6000 feet).

#### VEGETATION DESCRIPTION

**Global Vegetation:** This vegetation is successional. There can be a large variation in the structural characteristics of these communities, and in some instances, they may approach (or technically reach) a woodland condition with *Prunus pensylvanica* and/or *Sorbus americana* forming a scattered, open canopy (typically emergent over *Rubus* spp.). Other high-elevation woody species such as *Betula alleghaniensis*, *Acer spicatum*, and *Aesculus flava* can also be important. Standing dead *Abies fraseri* often tower above the shrubs and herbs, and there is usually much downed woody debris. *Prunus pensylvanica* forms an open low-canopy shrub or small-tree layer (<50% cover). *Sorbus americana*, *Rhus typhina*, *Ilex montana*, *Acer rubrum*, *Cornus alternifolia*, and *Vaccinium simulatum* are some other woody species that can occur as a part of this sparse canopy or tall-shrub layer. Herbaceous species present include *Agrostis perennans*, *Angelica triquinata*, *Oclemena acuminata* (= *Aster acuminatus*), *Carex brunnescens*, *Carex crinita*, *Carex intumescens*, *Carex debilis*, *Cinna latifolia*, *Clintonia borealis*, *Danthonia compressa*, *Diervilla sessilifolia*, *Oxalis montana*, *Rugelia nudicaulis* and *Solidago glomerata*. Scattered living *Picea rubens*, *Betula alleghaniensis*, and *Amelanchier laevis* may occur. The long-term future of this community is uncertain, but it appears to be fairly stable over periods of several decades.

**Global Dynamics:** This is successional vegetation resulting from severe disturbance of spruce-fir forests (including balsam woolly adelgid-affected stands and stands which were severely burned after logging), as well as exposed sites with other frequent, natural disturbances (such as shrub invasion of grazed fire meadows).

#### MOST ABUNDANT SPECIES

##### Global

##### Stratum

Tall shrub/sapling

##### Lifeform

Broad-leaved deciduous shrub

##### Species

*Prunus pensylvanica*, *Sorbus americana*

#### CHARACTERISTIC SPECIES

**Global:** *Prunus pensylvanica*, *Sorbus americana*

#### OTHER NOTEWORTHY SPECIES

**Global: Vulnerable Plants:** *Abies fraseri* (G2, Southern Blue Ridge endemic), *Prenanthes roanensis* (G3, Southern Blue Ridge endemic), *Rugelia nudicaulis* (G3), *Solidago glomerata* (G3)

#### CONSERVATION STATUS RANK

**Global Rank & Reasons:** GNR (6-Jan-2016). This community represents an altered vegetation type, modified by the effects of an alien pest species and/or the effects of past land use. Examples of this vegetation once represented what is now a globally rare and critically imperiled community that has an uncertain future. This modified vegetation is now a natural part of high-elevation landscapes in the Southern Blue Ridge and an important part of the functioning landscape, providing habitat for many southern Appalachian species. For conservation planning purposes, examples of this community may be best considered low-quality occurrences of forests in *Picea rubens* - *Abies fraseri* Forest Alliance (A0136).

#### RELATED CONCEPTS

##### Global Similar Types:

- *Rubus canadensis* - (*Rubus idaeus* ssp. *strigosus*) / *Athyrium filix-femina* - *Solidago glomerata* Shrubland (CEGL003893)

## CLASSIFICATION

**Status:** Standard

**Classification Confidence:** 3 - Weak

**Global Classification Comments:** This vegetation has been treated as a variant of *Rubus canadensis* - (*Rubus idaeus* ssp. *strigosus*) / *Athyrium filix-femina* - *Solidago glomerata* Shrubland (CEGL003893). It occurs in areas such as Shining Rock Wilderness and parts of the Great Smoky Mountains where fires were started after logging had taken place. The intensity of the fires due to the accumulated slash burned down nearly to mineral soil. These areas do not have as much coarse woody debris from downed spruce or fir and often have a canopy approaching that of a woodland with sparse coverage of *Sorbus americana* and *Prunus pensylvanica*.

## ELEMENT DISTRIBUTION

**Global Range:** This vegetation occurs at high elevations in the Southern Appalachians of North Carolina and Tennessee.

**Nations:** US

**States/Provinces:** NC, TN

**TNC Ecoregions:** 51:C

**USFS Ecoregions (1994/95):** M221Dc:CCC, M221Dd:CCC

**USFS Ecoregions (2007):** M221Dc:CCC, M221Dd:CCC

**Federal Lands:** BIA (Eastern Band of Cherokee); NPS (Blue Ridge Parkway, Great Smoky Mountains); USFS (Cherokee, Nantahala, Pisgah)

## ELEMENT SOURCES

**Global Description Author(s):** D.J. Allard and M. Pyne

**References:** NatureServe Ecology - Southeastern U.S. unpubl. data, Southeastern Ecology Working Group n.d.

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**[CEPS009759] *Rhododendron (calendulaceum, cumberlandense)* Appalachian Bald Shrubland**

Translated Name: **(Flame Azalea, Cumberland Rhododendron) Appalachian Bald Shrubland**

Common Name: **Southern Appalachian Hybrid Deciduous Azalea Bald**

## USNVC CLASSIFICATION

Division	Eastern North American Grassland & Shrubland (2.B.2.Nc)
Macrogroup	Appalachian Rocky Felsic & Mafic Scrub & Grassland (M506)
Group	Southern Appalachian Grass Bald (G657)
Alliance	<i>Rubus allegheniensis</i> - <i>Rubus canadensis</i> Shrubland Alliance (A0930)

## ELEMENT CONCEPT

**Global Summary:** These are shrub balds dominated by stands of a variety of deciduous *Rhododendron* species, including primarily *Rhododendron calendulaceum* and *Rhododendron cumberlandense*, as well as *Rhododendron arborescens* and *Rhododendron viscosum*, and various interspecific and interploidy hybrids among these species. Examples are known from Gregory Bald in the Great Smoky Mountains National Park (primarily North Carolina, possibly Tennessee), Copper Ridge Bald (near Burningtown Bald), Wayah Bald, and Wine Spring Bald in the Nantahala National Forest (North Carolina). In addition, *Rhododendron catawbiense*, *Menziesia pilosa*, *Vaccinium corymbosum*, *Rubus allegheniensis*, and *Rubus canadensis* may also be present.

## ENVIRONMENTAL DESCRIPTION

## VEGETATION DESCRIPTION

**Global Vegetation:** These shrub balds are dominated by stands of a variety of deciduous *Rhododendron* species, including primarily *Rhododendron calendulaceum* and *Rhododendron cumberlandense*, as well as *Rhododendron arborescens* and *Rhododendron viscosum*, and various interspecific and interploidy hybrids among these species (Shearer et al. 2012). In addition, *Rhododendron catawbiense*, *Menziesia pilosa*, *Vaccinium corymbosum*, *Rubus allegheniensis*, and *Rubus canadensis* may also be present.

## MOST ABUNDANT SPECIES

## Global

Stratum

Shrub/sapling (tall & short)

Lifeform

Broad-leaved deciduous shrub

Species

*Rhododendron calendulaceum*, *Rhododendron cumberlandense*

## CHARACTERISTIC SPECIES

**Global:** *Rhododendron calendulaceum*, *Rhododendron cumberlandense*

## OTHER NOTEWORTHY SPECIES

**Global:**

## CONSERVATION STATUS RANK

**Global Rank & Reasons:** GNR (11-Sep-2019). These stands of vegetation are thought to be of anthropogenic origin, and may not be long-persisting in the absence of management. This modified vegetation is now a part of certain high-elevation landscapes in the Southern Blue Ridge and constitutes an important part of the functioning landscape.

## RELATED CONCEPTS

**Global Similar Types:**

- *Rubus allegheniensis* - *Rubus canadensis* / *Carex pensylvanica* Shrubland (CEGL003892)
- *Rubus canadensis* - (*Rubus idaeus* ssp. *strigosus*) / *Athyrium filix-femina* - *Solidago glomerata* Shrubland (CEGL003893)

**Global Related Concepts:**

- Grassy Bald (Schafale and Weakley 1990) >
- Grassy Bald (Schafale 2002) >

## CLASSIFICATION

**Status:** Nonstandard

**Classification Confidence:**

**Global Classification Comments:** These stands of vegetation are thought to be of anthropogenic origin, and may not be long-persisting in the absence of management. Other alternatives are to treat this as a shrubby "phase" of *Danthonia compressa* - (*Sibbaldiopsis tridentata*) Grassland (CEGL004242), or as something related to the *Rubus canadensis*-dominated shrub types that normally surround grassy balds (e.g., *Rubus allegheniensis* - *Rubus canadensis* / *Carex pensylvanica* Shrubland (CEGL003892)). T. Govus (pers. comm. 2017): "I think the blackberry areas, I have heard from Paul Super, are believed to be a result of the burning of large piles of logging refuse. I believe the azalea balds were grown up grazing areas, but their origins and floristics may be quite different. I am not certain there is enough of them to warrant a new association." A shrub-dominated VegBank plot (040-05-0248) from Gregory Bald may represent this vegetation; it has *Vaccinium corymbosum* at 62.5% and "*Rhododendron* sp." at 37.5% (Peet et al. unpubl. data 2017).

## ELEMENT DISTRIBUTION

**Global Range:** This community is found in the Blue Ridge Mountains of North Carolina and Tennessee. Examples are known from Gregory Bald in the Great Smoky Mountains National Park (primarily North Carolina, possibly Tennessee), Copper Ridge Bald (near Burningtown Bald), Wayah Bald, and Wine Spring Bald in the Nantahala National Forest (North Carolina) (Shearer et al. 2012).

**Nations:** US

**States/Provinces:** NC, TN?

**TNC Ecoregions:** 51:C

**USFS Ecoregions (1994/95):** M221Dc:CC?, M221Dd:CCC

**Federal Lands:** NPS (Great Smoky Mountains); USFS (Nantahala)

## ELEMENT SOURCES

**Global Description Author(s):** M. Pyne and T. Govus

**References:** Govus pers. comm., NatureServe Ecology - Southeastern U.S. unpubl. data, Peet et al. unpubl. data, Schafale 2002, Schafale and Weakley 1990, Shearer et al. 2012, Southeastern Ecology Working Group n.d.

**[CEGL003892] *Rubus allegheniensis* - *Rubus canadensis* / *Carex pensylvanica* Shrubland**

Translated Name: **Allegheny Blackberry - Smooth Blackberry / Pennsylvania Sedge Shrubland**

Common Name: **Southern Appalachian Blackberry Bald**

## USNVC CLASSIFICATION

Division	Eastern North American Grassland & Shrubland (2.B.2.Nc)
Macrogroup	Appalachian Rocky Felsic & Mafic Scrub & Grassland (M506)
Group	Southern Appalachian Grass Bald (G657)
Alliance	<i>Rubus allegheniensis</i> - <i>Rubus canadensis</i> Shrubland Alliance (A0930)

## ELEMENT CONCEPT

**Global Summary:** Areas within open montane grasslands dominated by *Rubus* spp. (*Rubus allegheniensis* and/or *Rubus canadensis*) at high elevations in the Southern Blue Ridge. These shrublands also contain trace amounts of other species from the surrounding grassland, such as *Athyrium filix-femina* ssp. *asplenoides*, *Agrostis perennans*, *Angelica triquinata*, *Carex debilis* var. *rudgei*, *Carex brunnescens*, *Carex intumescens*, and *Rumex acetosella* (exotic).

## ENVIRONMENTAL DESCRIPTION

**Global Environment:** This deciduous shrubland typically occurs at elevations from 1500-1980 m (5000-6500 feet). The developmental and ecological dynamics of this vegetation are poorly understood. Occurrences are thought to result from successional processes on natural grass balds following grazing and other disturbances, or following the cessation of natural disturbance regimes (e.g., periodic fires). Habitats are in exposed, upper-slope to crest positions, where low winter temperatures, high winds, and ice storms are characteristic. Stands occur both on edges of the natural bald on Whitetop Mountain, and in artificial balds that resulted from intensive logging, fires, and grazing on Mount Rogers and Wilburn Ridge.

## VEGETATION DESCRIPTION

**Global Vegetation:** These shrublands are dominated by *Rubus allegheniensis* and *Rubus canadensis*, usually occurring within and on the edges of open montane grasslands at high elevations in the Southern Blue Ridge. Stands may contain large colonies of *Carex*

*pensylvanica* under the dominant shrubs, as well as scattered individuals of other species from the surrounding grassland, such as *Athyrium filix-femina* ssp. *asplenioides*, *Agrostis perennans*, *Angelica triquinata*, *Carex debilis* var. *rudgei*, *Carex brunnescens* ssp. *sphaerostachya*, *Carex intumescens* (= var. *fernaldii*), and *Rumex acetosella* (exotic). Virginia examples of this community are heavily dominated by *Rubus canadensis* and contain a wide variety of minor associates.

#### MOST ABUNDANT SPECIES

##### Global

##### Stratum

Shrub/sapling (tall & short)

##### Lifeform

Broad-leaved deciduous shrub

##### Species

*Rubus allegheniensis*

#### CHARACTERISTIC SPECIES

**Global:** *Rubus allegheniensis*, *Rubus canadensis*

#### OTHER NOTEWORTHY SPECIES

**Global: Vulnerable Plants:** *Cuscuta rostrata* (G4, VA state-rare); **Invasive/Exotic Plants:** *Rumex acetosella* (Medium/Low)

#### CONSERVATION STATUS RANK

**Global Rank & Reasons:** GNR (6-Jan-2016). This community is known from the highest elevations of the southern Appalachian Mountains. It has a small range, few occurrences, and is rapidly disappearing due to vegetational succession. This community supports a diverse flora with many rare, unusual, and threatened species. It is threatened by high levels of recreational use, by the introduction of exotic plant and animal species, and by successional trends of uncertain cause. Sometimes this montane shrubland is regarded as a more advanced successional stage of *Carex pensylvanica* Grassland (CEGL004094) or *Danthonia compressa* - (*Sibbaldiopsis tridentata*) Grassland (CEGL004242). This modified vegetation is now a natural part of high-elevation landscapes in the Southern Blue Ridge and an important part of the functioning landscape, providing habitat for many Southern Appalachian species. For conservation planning purposes, examples of this community may be best considered lower quality occurrences of CEGL004094 or CEGL004242.

#### RELATED CONCEPTS

##### Global Similar Types:

- *Rhododendron (calendulaceum, cumberlandense)* Appalachian Bald Shrubland (CEPS009759)
- *Rubus canadensis* - (*Rubus idaeus* ssp. *strigosus*) / *Athyrium filix-femina* - *Solidago glomerata* Shrubland (CEGL003893) results from natural disturbance at higher elevations.

##### Global Related Concepts:

- *Rubus canadensis* Shrubland (Fleming and Coulling 2001) =
- ID9a. Grass Bald (Allard 1990) >

#### CLASSIFICATION

**Status:** Standard

**Classification Confidence:** 3 - Weak

**Global Classification Comments:** This vegetation type is thought to result from successional processes on natural grass balds following grazing and other disturbances, or following the cessation of natural disturbance regimes (e.g., periodic fires). This vegetation is now a natural part of high-elevation landscapes in the Southern Blue Ridge and an important part of the functioning landscape, but it is not a conservation target in and of itself.

#### ELEMENT DISTRIBUTION

**Global Range:** This community occurs only at the highest elevations of the Southern Appalachians in North Carolina, Tennessee, and Virginia. Occurrences in Virginia are known only from the upper slopes of Whitetop Mountain, Mount Rogers, and Wilburn Ridge in the Southern Blue Ridge.

**Nations:** US

**States/Provinces:** NC, TN, VA

**TNC Ecoregions:** 51:C

**USFS Ecoregions (1994/95):** M221Dc:CCC, M221Dd:CCC

**USFS Ecoregions (2007):** M221Dc:CCC, M221Dd:CCC

**Federal Lands:** NPS (Appalachian Trail [Southern Blue Ridge], Great Smoky Mountains?); USFS (Cherokee, Jefferson, Pisgah)

#### ELEMENT SOURCES

**Global Description Author(s):** S. Simon, G. Kauffman, D. Danley

**References:** Allard 1990, Fleming and Coulling 2001, Schafale and Weakley 1990, Southeastern Ecology Working Group n.d., TDNH unpubl. data 2018

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**[CEGL003893] *Rubus canadensis* - (*Rubus idaeus* ssp. *strigosus*) / *Athyrium filix-femina* - *Solidago glomerata* Shrubland**

Translated Name: **Smooth Blackberry - (Grayleaf Red Raspberry) / Common Ladyfern - Clustered Goldenrod Shrubland**

Common Name: **High-Elevation Blackberry Thicket****USNVC CLASSIFICATION**

Division	Eastern North American Grassland & Shrubland (2.B.2.Nc)
Macrogroup	Appalachian Rocky Felsic & Mafic Scrub & Grassland (M506)
Group	Southern Appalachian Grass Bald (G657)
Alliance	<i>Rubus allegheniensis</i> - <i>Rubus canadensis</i> Shrubland Alliance (A0930)

**ELEMENT CONCEPT**

**Global Summary:** This vegetation occurs at high elevations in the southern Appalachian Mountains of North Carolina, Tennessee, and Virginia. It is a successional type found on exposed sites with frequent or intense natural disturbances (such as shrub invasion of grazed fire meadows). Some examples result from severe disturbance of spruce-fir forests (including balsam woolly adelgid-affected stands and stands which were severely burned after logging). It occurs on exposed summits and high slopes, typically at elevations over 1830 m (6000 feet), but slightly lower in Virginia. This community includes high-elevation Appalachian *Rubus* thickets and differs from *Rubus* thickets on grassy balds by predominance of forbs rather than sedges and by frequent presence of *Rubus idaeus*. Vegetation is variously dominated by dense *Rubus canadensis* or by dense *Athyrium filix-femina* ssp. *asplenioides* and *Solidago glomerata* (on more-protected sites). In examples related to death of *Abies fraseri*, the standing dead *Abies fraseri* often tower above the shrubs and herbs, and there is usually much downed woody debris. There can be a large variation in the structural characteristics of these communities, and in some instances they may approach (or technically reach) a woodland condition with *Prunus pensylvanica* forming a scattered, open, low-canopy layer (<50% cover). In addition, *Sorbus americana*, *Ilex montana*, *Acer rubrum*, *Cornus alternifolia*, and *Vaccinium simulatum* are some other woody species that can occur as a part of this sparse canopy or tall-shrub layer. Other species present include *Agrostis perennans*, *Angelica triquinata*, *Oclemena acuminata*, *Carex brunnescens*, *Carex crinita*, *Carex intumescens*, *Carex debilis*, *Cinna latifolia*, *Clintonia borealis*, *Danthonia compressa*, *Diervilla sessilifolia*, *Oxalis montana*, and *Rugelia nudicaulis*. Scattered living *Picea rubens*, *Betula alleghaniensis*, and *Amelanchier laevis* may occur. The long-term future of this community is uncertain, but it appears to be fairly stable over periods of several decades. A variation of this community occurs in areas such as Shining Rock Wilderness and parts of the Great Smoky Mountains, where intense fires occurred after logging had taken place. These intense fires, due to the accumulated slash, burned down nearly to mineral soil. These areas do not have as much coarse woody debris from downed spruce or fir and often have a canopy approaching that of a woodland with sparse coverage of *Sorbus americana* and *Prunus pensylvanica*.

**ENVIRONMENTAL DESCRIPTION**

**Great Smoky Mountains National Park Environment:** This vegetation results from severe disturbance of spruce - fir forests (i.e., Balsam Woolly Adelgid-affected stands), past logging followed by severe fire, as well as exposed sites with other frequent natural disturbance. It occurs on exposed summits and high slopes, typically at elevations over 6000 feet.

**Global Environment:** This successional vegetation occurs at high elevations in the southern Appalachian Mountains of North Carolina, Tennessee, and Virginia. It occurs on exposed sites with frequent or intense natural disturbances (such as shrub invasion of grazed fire meadows). Some examples result from severe disturbance of spruce-fir forests (including balsam woolly adelgid-affected stands and stands which were severely burned after logging). It occurs on exposed summits and high slopes, typically at elevations over 1830 m (6000 feet), slightly lower in Virginia.

**VEGETATION DESCRIPTION**

**Great Smoky Mountains National Park Vegetation:** This is successional vegetation on the summit of Mount Le Conte and Clingman's Dome resulting from the death of *Abies fraseri*. Vegetation is variously dominated by *Rubus canadensis* and *Diervilla sessilifolia* (on the most exposed sites), by dense *Rubus canadensis*, or by dense *Athyrium filix-femina* ssp. *asplenioides* and *Solidago glomerata* (on more protected sites). Standing dead trees tower above the shrubs and herbs, and there is much downed woody debris. Other species present include *Abies fraseri*, *Agrostis perennans*, *Angelica triquinata*, *Oclemena acuminata* (= *Aster acuminatus*), *Carex brunnescens*, *Carex crinita*, *Carex intumescens*, *Carex debilis*, *Cinna latifolia*, *Clintonia borealis*, *Danthonia compressa*, *Oxalis montana*, *Picea rubens*, *Prunus pensylvanica*, *Rugelia nudicaulis*, and *Sorbus americana*. A variant of this type that originated from logging followed by severe fire tends to have a 10-40% canopy cover of *Prunus pensylvanica* and *Sorbus americana*, but a similar herbaceous/shrub layer.

**Global Vegetation:** Stands of this vegetation are variously dominated by dense *Rubus canadensis* or by dense *Athyrium filix-femina* ssp. *asplenioides* and *Solidago glomerata* (on more protected sites). Other species present include *Agrostis perennans*, *Angelica triquinata*, *Oclemena acuminata* (= *Aster acuminatus*), *Carex brunnescens*, *Carex crinita*, *Carex intumescens*, *Carex debilis*, *Cinna latifolia*, *Clintonia borealis*, *Danthonia compressa*, *Diervilla sessilifolia*, *Oxalis montana*, *Prunus pensylvanica*, *Sorbus americana*, and *Rugelia nudicaulis*. Scattered living *Picea rubens*, *Betula alleghaniensis*, and *Amelanchier laevis* may occur. In examples related to death of *Abies fraseri*, the standing dead *Abies fraseri* often tower above the shrubs and herbs, and there is usually much downed woody debris. A variation of this community occurs in areas such as Shining Rock Wilderness and parts of the Great Smoky Mountains, where intense fires occurred after logging had taken place. These intense fires, due to the accumulated slash, burned down nearly to mineral soil. These areas do not have as much coarse woody debris from downed spruce or fir and often have a canopy approaching that of a woodland with sparse coverage of *Sorbus americana* and *Prunus pensylvanica*.

**Global Dynamics:** This is successional vegetation that results from frequent or intense natural disturbances (such as shrub invasion of grazed fire meadows). Some examples result from severe disturbance of spruce-fir forests (including balsam woolly adelgid-affected stands and stands which were severely burned after logging).

#### MOST ABUNDANT SPECIES

##### Great Smoky Mountains National Park

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Abies fraseri</i>
Tall shrub/sapling	Broad-leaved deciduous shrub	<i>Diervilla sessilifolia</i> , <i>Rubus canadensis</i>
Herb (field)	Flowering forb	<i>Solidago glomerata</i>
Herb (field)	Fern (Spore-bearing forb)	<i>Athyrium filix-femina</i> ssp. <i>asplenioides</i>

##### Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Needle-leaved tree	<i>Abies fraseri</i>
Tall shrub/sapling	Broad-leaved deciduous shrub	<i>Rubus canadensis</i>

#### CHARACTERISTIC SPECIES

**Great Smoky Mountains National Park:** *Athyrium filix-femina* ssp. *asplenioides*, *Diervilla sessilifolia*, *Solidago glomerata*

**Global:** *Athyrium filix-femina* ssp. *asplenioides*, *Diervilla sessilifolia*, *Rubus canadensis*, *Solidago glomerata*

#### OTHER NOTEWORTHY SPECIES

**Great Smoky Mountains National Park: Vulnerable Plants:** *Abies fraseri* (G2, dead), *Rugelia nudicaulis* (G3, globally vulnerable), *Solidago glomerata* (G3, globally vulnerable)

**Global: Vulnerable Plants:** *Abies fraseri* (G2, dead; Southern Blue Ridge endemic), *Prenanthes roanensis* (G3, Southern Blue Ridge endemic), *Rugelia nudicaulis* (G3), *Solidago glomerata* (G3)

#### CONSERVATION STATUS RANK

**Global Rank & Reasons:** GNR (6-Jan-2016). This community represents an altered vegetation type, modified by the effects of an alien pest species and/or the effects of past land use. Examples of this vegetation once represented what is now a globally rare and critically imperiled community that has an uncertain future. This modified vegetation is now a natural part of high-elevation landscapes in the Southern Blue Ridge and an important part of the functioning landscape, providing habitat for many Southern Appalachian species. For conservation planning purposes, examples of this community may be best considered low-quality occurrences of forests in *Picea rubens* - *Abies fraseri* Forest Alliance (A0136).

#### RELATED CONCEPTS

##### Global Similar Types:

- (*Prunus pensylvanica*, *Sorbus americana*) - *Rubus* spp. Shrubland (CEGL007293)
- *Rhododendron* (*calendulaceum*, *cumberlandense*) Appalachian Bald Shrubland (CEPS009759)
- *Rubus allegheniensis* - *Rubus canadensis* / *Carex pensylvanica* Shrubland (CEGL003892) occurs within and adjacent to open natural montane grasslands.

##### Global Related Concepts:

- Bramble-goldenrod thicket (CAP pers. comm. 1998) ?

#### CLASSIFICATION

**Status:** Standard

**Classification Confidence:** 3 - Weak

**Great Smoky Mountains National Park Other Comments:** This community grades into *Abies fraseri* / *Viburnum lantanoides* / *Dryopteris campyloptera* - *Oxalis montana* / *Hylocomium splendens* Forest (CEGL006049).

**Global Classification Comments:** This community differs from *Rubus* thickets on grassy balds by predominance of forbs rather than sedges and by frequent presence of *Rubus idaeus*. This association does not include Grass Balds that have been invaded by *Rubus*; such situations are covered in *Rubus allegheniensis* - *Rubus canadensis* / *Carex pensylvanica* Shrubland (CEGL003892).

This is successional vegetation resulting from severe disturbance of spruce-fir forests. It appears to be fairly stable over periods of several decades. This vegetation is now a natural part of high-elevation landscapes in the Southern Blue Ridge and an important part of the functioning landscape, but it is not a conservation target in and of itself.

#### ELEMENT DISTRIBUTION

**Great Smoky Mountains National Park Range:** This community was sampled on the summit of Mount Le Conte on the Mount Le Conte quadrangle and on Clingman's Dome. It was not sampled, nor is it expected, on the Cades Cove quadrangle, although it may occur in other areas of the park. It occurs in most areas of the park that reach an elevation of 6000 feet or more and have spruce-fir forest.

**Global Range:** This vegetation occurs at high elevations in the Southern Appalachians of North Carolina, Tennessee, and Virginia.

**Nations:** US

**States/Provinces:** NC, TN, VA

**TNC Ecoregions:** 51:C, 59:C

**USFS Ecoregions (1994/95):** M221Bd:CCC, M221Dc:CCC, M221Dd:CCC

**USFS Ecoregions (2007):** M221Bd:CCC, M221Dc:CCC, M221Dd:CCC

**Federal Lands:** BIA (Eastern Band of Cherokee); NPS (Appalachian Trail [Southern Blue Ridge], Blue Ridge Parkway, Great Smoky Mountains); USFS (Cherokee, Nantahala, Pisgah)

#### ELEMENT SOURCES

**Great Smoky Mountains National Park Plots:** GRSM.501.

**Great Smoky Mountains National Park Description Author(s):** K.D. Patterson, mod. R. White

**Global Description Author(s):** K.D. Patterson, T. Govus and M. Pyne

**References:** CAP pers. comm. 1998, NatureServe Ecology - Southeastern U.S. unpubl. data, Peet et al. unpubl. data, Southeastern Ecology Working Group n.d.

### G670. SOUTHERN APPALACHIAN ROCKY OUTCROP

**Group Summary Description:** These are treeless rock outcrops of the southern and central Appalachian Mountains, best developed in western North Carolina and eastern Tennessee. The vegetation is generally characterized by a mixture of low-growing lifeforms, especially lichens, mosses, and short-statured forbs. Less commonly, graminoids and low shrubs are encountered. Species common to all outcrop vegetation types include *Carex misera*, *Saxifraga michauxii*, and *Vaccinium corymbosum*. Outcrops may be vertical to horizontal, rugged or fractured rock outcrops of peaks, ridgetops, upper slopes, and other topographically exposed locations. Higher elevation examples occur from 1200 to 2030 m in elevation; other examples may be found at elevations of 305 m (1000 feet) or lower on foothills. These outcrops occur on felsic to mafic rocks and are distinguished from surrounding systems by the prevalence of bare or lichen-encrusted rocks. This group unifies several vegetation types with widely differing physiognomies, ranging from woodland to low shrubland, to perennial grassland, to lichen-dominated with low vascular plant cover. They are unified by their common environments, which include rock outcrops, boulderfields, exfoliation outcrops, consolidated cliffs, unconsolidated bouldery talus, and rocky domes and summits in the Central and Southern Appalachians.

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### A3960 *Quercus montana* - *Pinus echinata* / *Schizachyrium scoparium* Scrub Alliance

Chestnut Oak - Shortleaf Pine / Little Bluestem Scrub Alliance

*Chestnut Oak - Shortleaf Pine / Little Bluestem Acidic Glade Open Scrub*

#### ALLIANCE CONCEPT

**Summary:** This alliance contains xeric open woodlands found in the southern Piedmont and the lower elevations of the Southern Blue Ridge. Examples are dominated by scattered *Pinus* spp. and *Quercus* spp. with dry-site grasses, including *Schizachyrium scoparium*, and short clonal shrubs such as *Gaylussacia baccata*, *Vaccinium stamineum*, and/or *Vaccinium pallidum*. In the southern Piedmont, examples are found on thin soils over shallow bedrock but without substantial rock outcrop, and in the Southern Blue Ridge, they occur on gently to moderately sloping outcrops of felsic rocks with irregular or undulating surfaces, but few crevices.

**Classification Comments:** In the southern Piedmont, this vegetation is conceptually intermediate between rock-dominated communities and more typical dry upland forest communities. While glades and rock outcrop communities are often heterogeneous, responding to varying rock configuration and soil depth, this vegetation typically occupies a zone where soil and vegetation cover are predominant but where shallow rock prevents development of a closed forest. It should be recognized only where there is a substantial expanse of this kind of vegetation, and not used for small pockets of woody/herbaceous growth in more rock-dominated sites. In the Southern Blue Ridge, low-elevation acidic glades are distinguished from low-elevation rocky summits by having few crevices and having abundant grassy mats and low shrub mats in shallow soil but relatively few forbs or woody plants rooted in crevices.

**Diagnostic Characteristics:** These are xeric open woodlands or scrubby open vegetation in the southern Piedmont and the lower elevations of the Southern Blue Ridge, dominated by scattered *Quercus* spp. and *Pinus* spp. with dry-site grasses, including *Schizachyrium scoparium*, and short clonal shrubs such as *Gaylussacia baccata*, *Vaccinium stamineum*, and/or *Vaccinium pallidum*.

**Rationale for Nominal Species or Physiognomic Features:** *Quercus montana*, *Pinus echinata*, and *Schizachyrium scoparium* are widespread species found in a variety of habitats, but the combination of species with the environmental modifier ("acidic glade open scrub") will serve to identify this vegetation.

#### ALLIANCE DESCRIPTION

**Environment:** Woodlands in this alliance occur on south- to west-facing slopes and similar sites. Exposure and topography contribute to maintenance of woodland physiognomy. Rocks, typically quartzite exposures, are present at the surface. Examples typically occur downslope from *Quercus montana*-dominated forests.

**Vegetation:** In the southern Piedmont, the predominant trees are *Pinus echinata*, *Pinus virginiana*, *Quercus montana* (= *Quercus prinus*), and *Quercus stellata*, in varying proportions. Other trees may include *Carya glabra*, *Juniperus virginiana*, *Quercus alba*, and *Quercus marilandica*. Grassy areas are generally dominated by *Schizachyrium scoparium*, but may include *Andropogon gerardii*, *Andropogon gyrans*, *Andropogon ternarius*, *Danthonia spicata*, *Piptochaetium avenaceum*, and *Sorghastrum nutans*. A variety of forbs may also be present, including *Coreopsis verticillata*, *Cunila origanoides*, *Parthenium integrifolium*, *Pityopsis graminifolia*, *Pteridium aquilinum*, and *Tephrosia virginiana*. In the lower elevations of the Southern Blue Ridge, this vegetation is predominantly characterized by dry-site grasses, graminoids and low shrubs in fairly shallow soil mats. In these examples, the scattered woody plants

include *Quercus montana* and *Vaccinium pallidum*. The drier examples are dominated by *Danthonia* spp., *Schizachyrium scoparium*, or other dry-site grasses. Lichens may include *Cladonia* spp.

**Physiognomy and Structure:** In the southern Piedmont, the vegetation ranges from an open woodland to low shrub or herbaceous vegetation with some tree cover, but not a typical forest canopy. The dominant trees may be widely spaced and often small and stunted, or there may be substantial tree cover. Canopy cover is up to 75-80% at present, but likely was significantly less when fires periodically burned these areas. These woodlands occur on south- to west-facing slopes, and the exposure and topography at these sites contribute to maintenance of woodland physiognomy. Rocks, typically quartzite exposures, are present at the surface.

**Floristics:** In the southern Piedmont, the predominant trees are *Pinus echinata*, *Pinus virginiana*, *Quercus montana* (= *Quercus prinus*), and *Quercus stellata*, in varying proportions. Other trees may include *Carya glabra*, *Juniperus virginiana*, *Quercus alba*, and *Quercus marilandica*. Grassy areas are generally dominated by *Schizachyrium scoparium*, but may include *Andropogon gerardii*, *Andropogon gyrans*, *Andropogon ternarius*, *Danthonia spicata*, *Piptochaetium avenaceum*, and *Sorghastrum nutans*. A variety of forbs may also be present, including *Coreopsis verticillata*, *Cunila origanoides*, *Parthenium integrifolium*, *Pityopsis graminifolia*, *Pteridium aquilinum*, and *Tephrosia virginiana*. In the lower elevations of the Southern Blue Ridge, this vegetation is predominantly characterized by dry-site grasses, graminoids and low shrubs in fairly shallow soil mats. In these examples, the scattered woody plants include *Quercus montana* and *Vaccinium pallidum*. The drier examples are dominated by *Danthonia* spp., *Schizachyrium scoparium*, or other dry-site grasses. Lichens may include *Cladonia* spp.

**Dynamics:** In the southern Piedmont, the open canopy in these communities appears to be maintained both by difficulty of tree establishment and by tree mortality, due to a combination of shallow soils and fire effects. Death of established trees has been observed during droughts. Periodic fire probably had a significant effect on these communities, interacting with the dry conditions and difficulty of tree establishment to make them more open in the past.

#### ALLIANCE DISTRIBUTION

**Range:** Examples of this vegetation are known from the southern Piedmont and Southern Blue Ridge of North Carolina. No examples are known from Virginia. It may possibly be found in South Carolina and/or Georgia.

**Nations:** US

**Subnations:** GA, NC, SC?

**TNC Ecoregions:** 51:C

#### ALLIANCE SOURCES

**References:** Faber-Langendoen et al. 2019b, Gallyoun et al. 1996

**Author of Concept:** Faber-Langendoen et al. 2019b

**Author of Description:** M. Pyne, in Faber-Langendoen et al. (2013)

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### [CEGL004990] (*Quercus montana*) / *Vaccinium pallidum* / *Schizachyrium scoparium* - *Danthonia spicata* / *Cladonia* spp. Scrub Grassland

Translated Name: (Chestnut Oak) / Blue Ridge Blueberry / Little Bluestem - Poverty Oatgrass / Cup Lichen species Scrub Grassland

Common Name: Low-Elevation Acidic Glade (Grass Type)

#### USNVC CLASSIFICATION

Division	Eastern North American Grassland & Shrubland (2.B.2.Nc)
Macrogroup	Appalachian Rocky Felsic & Mafic Scrub & Grassland (M506)
Group	Southern Appalachian Rocky Outcrop (G670)
Alliance	<i>Quercus montana</i> - <i>Pinus echinata</i> / <i>Schizachyrium scoparium</i> Scrub Alliance (A3960)

#### ELEMENT CONCEPT

**Global Summary:** This type is found on gently to moderately sloping outcrops of felsic rocks with irregular or undulating surfaces but few crevices, and is characterized predominantly by graminoids and low shrubs in fairly shallow soil mats. It includes drier examples where *Schizachyrium scoparium*, *Danthonia* spp., or other dry-site grasses predominate. This community is distinguished by the predominance of somewhat deeper soil mats, capable of supporting grasses. Grassy mats and low-shrub patches are prominent, but lichen-covered bare rock and thin mats dominated by *Selaginella* spp. are often present. Trees may be dispersed throughout the community. This type is similar to a granitic dome, but it has more soil, less exposed bedrock, and the vegetation is more stable

#### ENVIRONMENTAL DESCRIPTION

**Global Environment:** This type, which is similar to granitic dome vegetation, occupies gently to steeply sloping outcrops of felsic or other metamorphic rock with irregular or undulating surfaces but few crevices. Examples are scattered in the Southern Blue Ridge, where granitic igneous or metamorphic rocks occur. It may occur on other kinds of substrates; for example, a site was observed in Great Smoky Mountains National Park on a steep exposure of slate at an elevation of 1100 m (3600 feet). Some outliers occur in the upper Piedmont of North Carolina. Examples may be physiognomically variable, with a mixture of fairly shallow soil mats dominated predominantly by graminoids and low shrubs, as well as with somewhat deeper-soil mats which are capable of supporting larger shrubs and trees. Lichen-covered bare rock and thin mats dominated by *Selaginella* spp. are often present but are less prominent than in granitic dome communities, while grassy mats and low-shrub patches are more prominent.

### VEGETATION DESCRIPTION

**Global Vegetation:** Stands of this association are characterized predominantly by graminoids and low shrubs, but may have sparse to even moderate tree cover. In drier examples, *Schizachyrium scoparium*, *Danthonia* spp., and other dry-site grasses predominate. Low shrubs such as *Vaccinium pallidum* may be abundant. Lichen-covered bare rock and thin mats dominated by *Selaginella* spp. are also often present. Lichens may include *Cladonia* spp. Scattered trees most typically are *Quercus montana* (= *Quercus prinus*), but may be other oaks, or pines. In an example of this vegetation type observed in Great Smoky Mountains National Park, the dominant grasses include *Schizachyrium scoparium*, *Andropogon gerardii*, and *Sorghastrum nutans*. In addition, *Eurybia surculosa* and *Selaginella rupestris* are prominent.

**Global Dynamics:** The soils and arrangement of bare rock and vegetation appear to be relatively stable in these communities, unlike the cyclic succession of short-lived vegetation mats in granitic dome communities. Nevertheless, the shallow soils presumably make them prone to drought-caused mortality and is a major reason they stay open. The vegetation is dense enough that fire is probably important under natural conditions. Lack of fire may have caused increased shrub and tree cover in some examples, and may lead to gradually reduced size of glades.

### MOST ABUNDANT SPECIES

#### Global

##### Stratum

Short shrub/sapling  
Herb (field)  
Nonvascular

##### Lifeform

Broad-leaved deciduous shrub  
Graminoid  
Lichen

##### Species

*Vaccinium pallidum*  
*Danthonia spicata*, *Schizachyrium scoparium*  
*Cladonia* spp.

### CHARACTERISTIC SPECIES

**Global:** *Cladonia* spp., *Danthonia spicata*, *Schizachyrium scoparium*, *Vaccinium pallidum*

### OTHER NOTEWORTHY SPECIES

**Global:**

### CONSERVATION STATUS RANK

**Global Rank & Reasons:** G2 (14-Aug-2017). Stands of this type are limited to gently to moderately sloping outcrops of felsic or other metamorphic rocks widely scattered in the Southern Blue Ridge of North Carolina. An example of this type was also observed on Big Shuckstack in Great Smoky Mountains National Park, North Carolina. It may occur in the Nantahala National Forest. The degree of formal protection of these examples on public land is unknown. In North Carolina there are at least 14 Element Occurrences. Threats are not unduly high, but any examples, especially those not found on public land, would likely be threatened by ridgetop roads, communication towers or other developments, as well as by lack of fire management.

### RELATED CONCEPTS

#### Global Similar Types:

- *Quercus montana* - *Quercus stellata* - *Pinus echinata* / *Vaccinium pallidum* / *Schizachyrium scoparium* Scrub (CEGL004910)
- *Selaginella rupestris* - *Schizachyrium scoparium* - *Hylotelephium telephioides* - *Allium cernuum* Granitic Glade Vegetation (CEGL004991) has similar vegetation structure but flora that indicates basic substrate (but many examples are not on mafic rock).
- *Selaginella rupestris* - *Schizachyrium scoparium* - *Hypericum gentianoides* - *Bulbostylis capillaris* Rocky Grassland (CEGL007690) typically has less vegetative cover.

#### Global Related Concepts:

- Low Elevation Acidic Glade (Grass Subtype) (Schafale 2012) =

### CLASSIFICATION

**Status:** Standard

**Classification Confidence:** 3 - Weak

**Global Classification Comments:** Occurrences are found throughout the Southern Blue Ridge and on mountain-like outliers in the upper Piedmont, including Crowders Mountain State Park and Hanging Rock State Park in North Carolina (M. Schafale pers. comm.). A good example of this type was observed in the Great Smoky Mountains National Park occurring on an exposure of outcropped slate. It also occurs in the Nantahala National Forest and also possibly in the Pisgah National Forest. This association is distinguished from Low Elevation Mafic (or Basic) Glades (CEGL004991) by the absence of plant species characteristic of higher pH conditions, such as *Hylotelephium telephioides* (= *Sedum telephioides*), *Dodecatheon meadia*, *Sedum glaucophyllum*, *Cheilanthes lanosa*, *Arabis laevigata*, and *Penstemon canescens*. This type is also distinguished from Low Elevation Rocky Summits (CEGL004524, CEGL004989) by having few crevices and having abundant grassy mats and low-shrub mats in shallow soil but relatively few forbs or woody plants rooted in crevices. This type is also distinguished from the Biltmore Sedge Type (CEGL004523) by having grassy mats predominantly consisting of *Schizachyrium scoparium*, *Danthonia spicata*, or other dry-site grasses or herbs rather than *Carex biltmoreana* or other *Carex* spp.

### ELEMENT DISTRIBUTION

**Global Range:** This type is restricted to the Southern Blue Ridge of North Carolina and possibly South Carolina, and is also found on mountain-like locations in the upper Piedmont.

**Nations:** US

**States/Provinces:** NC, SC?

**TNC Ecoregions:** 51:C, 52:C

**USFS Ecoregions (1994/95):** 231Aa:CCC, M221Dc:CCC, M221Dd:CCC

**USFS Ecoregions (2007):** 231Aa:CCP, M221Dc:CCC, M221Dd:CCC

**Federal Lands:** NPS (Great Smoky Mountains); USFS (Nantahala?, Pisgah?)

#### ELEMENT SOURCES

**Global Description Author(s):** M. Pyne and M.P. Schafale

**References:** Govus pers. comm., NatureServe Ecology - Southeastern U.S. unpubl. data, Peet et al. unpubl. data, Schafale 2012, Schafale 2012, Schafale and Weakley 1990, Schafale pers. comm., Southeastern Ecology Working Group n.d.

## A1621 *Saxifraga michauxii* - *Carex misera* - *Schizachyrium scoparium* Rocky Grassland Alliance

Michaux's Saxifrage - Wretched Sedge - Little Bluestem Rocky Grassland Alliance

*Appalachian Michaux's Saxifrage - Wretched Sedge - Little Bluestem Rocky Grassland*

#### ALLIANCE CONCEPT

**Summary:** This alliance consists of moderate- to high-elevation rocky summit communities of the Southern and Central Blue Ridge (metamorphic rock portions of the Southern and Central Appalachians), as well as in the adjacent southern Piedmont. The vegetation will typically have *Saxifraga michauxii* as a component; other species may include *Carex* spp., *Saxifraga micranthidifolia*, *Saxifraga virginensis*, *Schizachyrium scoparium*, and others. There are several globally rare communities contained in this alliance. One association placed here is dominated by *Carex biltmoreana*, *Krigia montana*, *Pycnanthemum beadleii*, and *Saxifraga michauxii*. Examples are found on various rock types, including amphibolite, metabasalt (greenstone), gneiss, and others. It is found on steeply sloping outcrops of felsic to mafic rock, primarily south of the Asheville Basin, North Carolina. These are small exfoliated (spalled) outcrops surrounded by forests or woodlands.

#### Similar Alliances:

- *Selaginella rupestris* - *Selaginella tortipila* - *Schizachyrium scoparium* Rocky Grassland Alliance (A3961)

**Diagnostic Characteristics:** These are moderate- to high-elevation rocky summit communities of the Southern and Central Blue Ridge and the adjacent southern Piedmont, dominated primarily by *Saxifraga michauxii*.

**Rationale for Nominal Species or Physiognomic Features:** *Saxifraga michauxii*, *Carex misera*, and *Schizachyrium scoparium* are characteristic and codominant. *Carex misera* is a Southern Appalachian endemic.

#### Related Concepts:

- *Aster acuminatus* / *Menziesia pilosa* outcrop community (Wiser et al. 1996) ?
- *Aster acuminatus* / *Menziesia pilosa* outcrop community (Wiser 1993) ?
- *Calamagrostis cainii* / *Rhododendron carolinianum* outcrop community (Wiser et al. 1996) ?
- *Calamagrostis cainii* / *Rhododendron carolinianum* outcrop community (Wiser 1993) ?
- *Coreopsis major* / *Schizachyrium scoparium* outcrop community (Wiser et al. 1996) ?
- *Coreopsis major* / *Schizachyrium scoparium* outcrop community (Wiser 1993) ?
- *Deschampsia flexuosa* / *Angelica triquinata* outcrop community (Wiser 1993) ?
- *Deschampsia flexuosa* / *Angelica triquinata* outcrop community (Wiser et al. 1996) ?
- *Paronychia argycoma* (sic) / *Polypodium appalachianum* outcrop community (Wiser 1993) ?
- *Paronychia argycoma* (sic) / *Polypodium appalachianum* outcrop community (Wiser et al. 1996) ?
- *Paronychia argycoma* - *Potentilla tridentata* - *Arenaria groenlandica* Association (Rawinski and Wieboldt 1993) ?
- IE4a. Southern Appalachian High Elevation Acidic Rocky Summit (Allard 1990) ><

#### ALLIANCE DESCRIPTION

**Environment:** This alliance consists of moderate- to high-elevation rocky summit communities. Examples are found on various rock types, including amphibolite, metabasalt (greenstone), gneiss, and others. It is found on steeply sloping outcrops of felsic to mafic rock, primarily south of the Asheville Basin, North Carolina. These are small exfoliated (spalled) outcrops surrounded by forests or woodlands.

**Vegetation:** More common vegetation in this alliance will have *Saxifraga michauxii* as a characteristic component; other species are variable, but may include *Carex misera*, *Saxifraga micranthidifolia*, *Saxifraga virginensis*, *Schizachyrium scoparium*, and others. High-elevation examples found on rock outcrops of highly fractured felsic to mafic bedrock contain *Abies fraseri*, *Heuchera villosa*, *Menziesia pilosa*, *Minuartia groenlandica*, *Oclemena acuminata* (= *Aster acuminatus*), *Polypodium appalachianum*, *Rhododendron catawbiense*, *Saxifraga michauxii*, *Solidago glomerata*, and *Sorbus americana*. On rock outcrops of felsic Anakeesta slate in the Great Smoky Mountains (from 1646-1987 m), typical species include *Abies fraseri*, *Calamagrostis cainii*, *Carex misera*, *Gentiana linearis*, *Leiophyllum buxifolium*, *Oclemena acuminata*, *Rhododendron carolinianum*, *Saxifraga michauxii*, and *Solidago glomerata*. At low to middle elevations (1256-1713 m) in the Southern Appalachians on outcrops of mafic rock, or on felsic rock where perennial seepage exists, typical species include *Allium allegheniense*, *Campanula divaricata*, *Coreopsis major*, *Danthonia spicata*, *Dichanthelium acuminatum*, *Kalmia latifolia*, *Paronychia argycoma*, *Saxifraga michauxii*, *Schizachyrium scoparium*, and *Solidago bicolor*. On

amphibolite, metabasalt, metagabbro, or metagraywacke bedrock from 1350-1870 m elevation within a matrix of *Quercus rubra* forest or high-elevation grasslands and shrublands, the vegetation includes *Carex misera*, *Danthonia spicata*, and *Saxifraga michauxii* with *Angelica triquinata*, *Athyrium filix-femina* ssp. *asplenioides*, *Geum radiatum*, *Heuchera villosa*, *Houstonia purpurea* var. *montana*, *Huperzia appalachiana*, *Hylotelephium telephioides* (= *Sedum telephioides*), *Krigia montana*, *Rhododendron catawbiense*, *Sanguisorba canadensis*, *Sibbaldiopsis tridentata*, and *Solidago spithamea*. Some examples are strongly dominated by *Carex biltmoreana* with *Ambrosia artemisiifolia*, *Coreopsis pubescens*, *Coreopsis major*, *Dichanthelium dichotomum* var. *dichotomum* (= *Dichanthelium dichotomum* var. *ramulosum*), *Dichanthelium acuminatum* var. *lindheimeri*, *Diervilla sessilifolia*, *Houstonia longifolia* (= *Houstonia longifolia* var. *glabra*), *Krigia montana*, *Melampyrum lineare*, and *Schizachyrium scoparium*. In the central Blue Ridge Mountains of Virginia, at elevations of 850-1200 m, this alliance occurs on greenstone (metabasalt, a mafic metamorphic rock).

Characteristic herbaceous species include *Agrostis perennans*, *Allium allegheniense*, *Arabis lyrata*, *Campanula divaricata*, *Carex pennsylvanica*, *Dennstaedtia punctilobula*, *Deschampsia flexuosa*, *Gymnocarpium appalachianum*, *Heuchera pubescens*, *Houstonia longifolia* (= *Houstonia longifolia* var. *compacta*), *Huperzia appalachiana*, *Hylotelephium telephioides*, *Liatris turgida*, *Oclemena acuminata*, *Phlox subulata* ssp. *brittonii*, *Polypodium appalachianum*, *Saxifraga michauxii*, *Sibbaldiopsis tridentata*, and *Solidago simplex* var. *randii*. Shrubs include *Abies balsamea*, *Betula alleghaniensis*, *Diervilla lonicera*, *Hamamelis virginiana*, *Ilex montana*, *Kalmia latifolia*, *Menziesia pilosa*, *Physocarpus opulifolius*, *Quercus rubra*, *Ribes rotundifolium*, and *Sorbus americana*. Rare alpine disjunct species are sometimes present, including *Juncus trifidus* and *Trisetum spicatum*.

**Physiognomy and Structure:** Examples of this vegetation have sparse cover of grasses, graminoids, forbs and shrubs rooted in rock fissures, and may be surrounded by deciduous forest.

**Floristics:** More common vegetation in this alliance will have *Saxifraga michauxii* as a characteristic component; other species are variable, but may include *Carex misera*, *Saxifraga micranthidifolia*, *Saxifraga virginensis*, *Schizachyrium scoparium*, and others. High-elevation examples found on rock outcrops of highly fractured felsic to mafic bedrock contain *Abies fraseri*, *Heuchera villosa*, *Menziesia pilosa*, *Minuartia groenlandica*, *Oclemena acuminata* (= *Aster acuminatus*), *Polypodium appalachianum*, *Rhododendron catawbiense*, *Saxifraga michauxii*, *Solidago glomerata*, and *Sorbus americana*. On rock outcrops of felsic Anakeesta slate in the Great Smoky Mountains (from 1646-1987 m), typical species include *Abies fraseri*, *Calamagrostis cainii*, *Carex misera*, *Gentiana linearis*, *Leiophyllum buxifolium*, *Oclemena acuminata*, *Rhododendron carolinianum*, *Saxifraga michauxii*, and *Solidago glomerata*. At low to middle elevations (1256-1713 m) in the Southern Appalachians on outcrops of mafic rock, or on felsic rock where perennial seepage exists, typical species include *Allium allegheniense*, *Campanula divaricata*, *Coreopsis major*, *Danthonia spicata*, *Dichanthelium acuminatum*, *Kalmia latifolia*, *Paronychia argyrocoma*, *Saxifraga michauxii*, *Schizachyrium scoparium*, and *Solidago bicolor*. On amphibolite, metabasalt, metagabbro, or metagraywacke bedrock from 1350-1870 m elevation within a matrix of *Quercus rubra* forest or high-elevation grasslands and shrublands, the vegetation includes *Carex misera*, *Danthonia spicata*, and *Saxifraga michauxii* with *Angelica triquinata*, *Athyrium filix-femina* ssp. *asplenioides*, *Geum radiatum*, *Heuchera villosa*, *Houstonia purpurea* var. *montana*, *Huperzia appalachiana*, *Hylotelephium telephioides* (= *Sedum telephioides*), *Krigia montana*, *Rhododendron catawbiense*, *Sanguisorba canadensis*, *Sibbaldiopsis tridentata*, and *Solidago spithamea*. Some examples are strongly dominated by *Carex biltmoreana* with *Ambrosia artemisiifolia*, *Coreopsis pubescens*, *Coreopsis major*, *Dichanthelium dichotomum* var. *dichotomum* (= *Dichanthelium dichotomum* var. *ramulosum*), *Dichanthelium acuminatum* var. *lindheimeri*, *Diervilla sessilifolia*, *Houstonia longifolia* (= *Houstonia longifolia* var. *glabra*), *Krigia montana*, *Melampyrum lineare*, and *Schizachyrium scoparium*. In the central Blue Ridge Mountains of Virginia, at elevations of 850-1200 m, this alliance occurs on greenstone (metabasalt, a mafic metamorphic rock). Characteristic herbaceous species include *Agrostis perennans*, *Allium allegheniense*, *Arabis lyrata*, *Campanula divaricata*, *Carex pennsylvanica*, *Dennstaedtia punctilobula*, *Deschampsia flexuosa*, *Gymnocarpium appalachianum*, *Heuchera pubescens*, *Houstonia longifolia* (= *Houstonia longifolia* var. *compacta*), *Huperzia appalachiana*, *Hylotelephium telephioides*, *Liatris turgida*, *Oclemena acuminata*, *Phlox subulata* ssp. *brittonii*, *Polypodium appalachianum*, *Saxifraga michauxii*, *Sibbaldiopsis tridentata*, and *Solidago simplex* var. *randii*. Shrubs include *Abies balsamea*, *Betula alleghaniensis*, *Diervilla lonicera*, *Hamamelis virginiana*, *Ilex montana*, *Kalmia latifolia*, *Menziesia pilosa*, *Physocarpus opulifolius*, *Quercus rubra*, *Ribes rotundifolium*, and *Sorbus americana*. Rare alpine disjunct species are sometimes present, including *Juncus trifidus* and *Trisetum spicatum*.

#### ALLIANCE DISTRIBUTION

**Range:** Vegetation of this alliance is found in the Southern and Central Blue Ridge and the adjacent southern Piedmont from Virginia to Georgia.

**Nations:** US

**Subnations:** GA, NC, SC, TN, VA

**TNC Ecoregions:** 51:C, 52:C, 59:C

**USFS Ecoregions (1994/95):** 231Aa:CCC, M221Aa:CPP, M221Da:CCC, M221Dc:CCC, M221Dd:CCC

**USFS Ecoregions (2007):** 231Aa:CPP, M221Aa:CPP, M221Da:CCC, M221Dc:CCC, M221Dd:CCC

#### ALLIANCE SOURCES

**References:** Allard 1990, Faber-Langendoen et al. 2019b, Feldcamp 1984, Rawinski and Wieboldt 1993, Schafale and Weakley 1990, Southeastern Ecology Working Group n.d., Wiser 1993, Wiser et al. 1996

**Author of Concept:** Faber-Langendoen et al. 2019b

**Author of Description:** A.S. Weakley, in Faber-Langendoen et al. (2013)

**[CEGL004278] *Saxifraga michauxii* - *Carex misera* - *Calamagrostis cainii* Grassland**Translated Name: **Michaux's Saxifrage - Wretched Sedge - Cain's Reedgrass Grassland**Common Name: **Southern Appalachian High-Elevation Rocky Summit (Anakeesta Type)****USNVC CLASSIFICATION**

Division	Eastern North American Grassland & Shrubland (2.B.2.Nc)
Macrogroup	Appalachian Rocky Felsic & Mafic Scrub & Grassland (M506)
Group	Southern Appalachian Rocky Outcrop (G670)
Alliance	<i>Saxifraga michauxii</i> - <i>Carex misera</i> - <i>Schizachyrium scoparium</i> Rocky Grassland Alliance
(A1621)	

**ELEMENT CONCEPT**

**Global Summary:** This community is known from the Great Smoky Mountains of Tennessee and North Carolina, where it occurs on high-elevation landslide scars, cliffs, rock outcrops, and summits. Slopes can be extremely steep (landslide scars and cliffs) or relatively flat (summits and ledges). This community occurs mostly above 1830 m (6000 feet) elevation but can occur as low as 1375 m (4500 feet). It is most often associated with exposed outcrops of Anakeesta slate and has very sparse to moderate vegetative cover, made up of grasses, forbs and shrubs rooted in rock fissures. These extreme habitats may have up to 80% exposed bedrock and talus, and often have seepage inclusions. Occurrences can range in size from 25 square meters to 2.5 ha (one acre). Composition and vegetative coverage vary from site to site, but common dominants include the herbs *Calamagrostis cainii*, *Carex debilis*, *Carex misera*, and *Saxifraga michauxii*, and the shrubs *Diervilla sessilifolia*, *Rhododendron carolinianum*, and *Rubus canadensis*. Other typical species include *Ageratina altissima* var. *roanensis*, *Oclemena acuminata*, *Athyrium filix-femina*, *Danthonia compressa*, *Dennstaedtia punctilobula*, *Gentiana linearis*, *Rugelia nudicaulis*, *Saxifraga michauxii*, and *Solidago glomerata*. Other woody species found in this community include *Abies fraseri*, *Betula alleghaniensis*, *Picea rubens*, *Leiophyllum buxifolium*, *Menziesia pilosa*, *Prunus pennsylvanica*, *Rhododendron catawbiense*, *Sorbus americana*, and *Vaccinium erythrocarpum*. This community occurs in a matrix of *Picea rubens* - *Abies fraseri* forest.

**ENVIRONMENTAL DESCRIPTION**

**Great Smoky Mountains National Park Environment:** This community occurs on high-elevation landslide scars, cliffs, rock outcrops, and summits. Slopes can be extremely steep (landslide scars and cliffs) or relatively flat (summits and ledges). This community occurs mostly above 6000 feet elevation but can occur as low as 4500 feet. This community is most often associated with exposed outcrops of Anakeesta slate in the Great Smoky Mountains.

**Global Environment:** This community is known from the Great Smoky Mountains of Tennessee, where it occurs on high-elevation landslide scars, cliffs, rock outcrops, and summits. Slopes can be extremely steep (landslide scars and cliffs) or relatively flat (summits and ledges). This community occurs mostly above 1830 m (6000 feet) elevation but can occur as low as 1375 m (4500 feet). It is most often associated with exposed outcrops of Anakeesta slate and has very sparse to moderate vegetative cover, made up of grasses, forbs and shrubs rooted in rock fissures. These extreme habitats may have up to 80% exposed bedrock and talus, and often have seepage inclusions.

**VEGETATION DESCRIPTION**

**Great Smoky Mountains National Park Vegetation:** This community has very sparse to moderate vegetative cover made up of grasses, forbs and shrubs rooted in rock fissures. These extreme habitats may have up to 80% exposed bedrock and talus and often have seepage inclusions. Occurrences can range in size from 25 square meters to over an acre. Composition and vegetative coverage vary from site to site, but common dominants include the herbs *Calamagrostis cainii*, *Carex debilis*, *Carex misera*, and *Saxifraga michauxii*, and the shrubs *Diervilla sessilifolia*, *Rhododendron carolinianum*, and *Rubus canadensis*. Other typical species include *Ageratina altissima* var. *roanensis*, *Oclemena acuminata* (= *Aster acuminatus*), *Athyrium filix-femina*, *Danthonia compressa*, *Dryopteris campyloptera*, *Gentiana linearis*, *Rugelia nudicaulis*, *Saxifraga michauxii*, and *Solidago glomerata*. Other woody species found in this community include *Abies fraseri*, *Betula alleghaniensis*, *Picea rubens*, *Leiophyllum buxifolium*, *Menziesia pilosa*, *Prunus pennsylvanica*, *Rhododendron catawbiense*, *Sorbus americana*, and *Vaccinium erythrocarpum*. This community occurs in a matrix with *Picea rubens* - *Abies fraseri* Forest.

**Global Vegetation:** The composition and vegetative coverage of stands varies from site to site, but common dominants include the herbs *Calamagrostis cainii*, *Carex debilis*, *Carex misera*, and *Saxifraga michauxii*, and the shrubs *Diervilla sessilifolia*, *Rhododendron carolinianum*, and *Rubus canadensis*. Other typical species include *Ageratina altissima* var. *roanensis*, *Oclemena acuminata* (= *Aster acuminatus*), *Athyrium filix-femina*, *Danthonia compressa*, *Dennstaedtia punctilobula*, *Gentiana linearis*, *Rugelia nudicaulis*, *Saxifraga michauxii*, and *Solidago glomerata*. Other woody species found in this community include *Abies fraseri*, *Betula alleghaniensis*, *Picea rubens*, *Leiophyllum buxifolium*, *Menziesia pilosa*, *Prunus pennsylvanica*, *Rhododendron catawbiense*, *Sorbus americana*, and *Vaccinium erythrocarpum*.

**Global Dynamics:** In some areas this community may occur as a mosaic with *Rhododendron carolinianum* - *Rhododendron catawbiense* - *Leiophyllum buxifolium* Shrubland (CEGL007876). The vegetation of landslide scars on Mount LeConte is included in this association, along with vegetation of more stable cliffs, ledges and seeps. The vegetation on the stable rocky substrates serves as a source pool for the more ephemeral scars, which revegetate slowly in a rather chaotic, stepwise succession, thus the different habitats are not compositionally distinct (J. Boetsch pers. comm.).

## MOST ABUNDANT SPECIES

## Great Smoky Mountains National Park

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Diervilla sessilifolia</i> , <i>Rubus canadensis</i>
Short shrub/sapling	Broad-leaved evergreen shrub	<i>Rhododendron carolinianum</i>
Herb (field)	Flowering forb	<i>Saxifraga michauxii</i>
Herb (field)	Graminoid	<i>Carex debilis</i> , <i>Carex misera</i>

## Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Diervilla sessilifolia</i> , <i>Rubus canadensis</i>
Short shrub/sapling	Broad-leaved evergreen shrub	<i>Rhododendron carolinianum</i>
Herb (field)	Flowering forb	<i>Saxifraga michauxii</i>
Herb (field)	Graminoid	<i>Carex debilis</i> , <i>Carex misera</i>

## CHARACTERISTIC SPECIES

**Great Smoky Mountains National Park:** *Abies fraseri*, *Calamagrostis cainii*, *Carex misera*, *Diervilla sessilifolia*, *Leiophyllum buxifolium*, *Oclemena acuminata*, *Rhododendron carolinianum*, *Saxifraga michauxii*, *Solidago glomerata*, *Vaccinium erythrocarpum*

**Global:** *Abies fraseri*, *Calamagrostis cainii*, *Diervilla sessilifolia*, *Leiophyllum buxifolium*, *Oclemena acuminata*, *Rhododendron carolinianum*, *Saxifraga michauxii*, *Solidago glomerata*, *Vaccinium erythrocarpum*

## OTHER NOTEWORTHY SPECIES

**Great Smoky Mountains National Park: Vulnerable Plants:** *Abies fraseri* (G2, globally imperiled; emergent tree), *Calamagrostis cainii* (G1), *Carex misera* (G3, globally vulnerable), *Rugelia nudicaulis* (G3, globally vulnerable), *Solidago glomerata* (G3, globally vulnerable)

**Global: Vulnerable Plants:** *Abies fraseri* (G2, Southern Blue Ridge endemic), *Calamagrostis cainii* (G1), *Carex misera* (G3), *Geum radiatum* (G2), *Rugelia nudicaulis* (G3), *Solidago glomerata* (G3)

## CONSERVATION STATUS RANK

**Global Rank & Reasons:** G1 (15-Feb-1999). This rock outcrop community is known only from outcrops of Anakeesta slate in the Great Smoky Mountains of Tennessee. This community is naturally rare, representing a tiny fraction of the high-mountain landscape. It is known from only a few occurrences. Atmospheric deposition of air pollutants may have an adverse effect on these high-elevation communities. It is a fragile community and can be damaged by trampling in areas of high recreational use.

## RELATED CONCEPTS

## Global Related Concepts:

- *Calamagrostis cainii* / *Rhododendron carolinianum* outcrop community (Wiser 1993) ?
- *Calamagrostis cainii* / *Rhododendron carolinianum* outcrop community (Wiser et al. 1996) ?
- *Saxifraga michauxii* Type (Feldcamp 1984) =
- IE4a. Southern Appalachian High Elevation Acidic Rocky Summit (Allard 1990) >

## CLASSIFICATION

**Status:** Standard

**Classification Confidence:** 2 - Moderate

**Great Smoky Mountains National Park Other Comments:** In some areas this community may occur as a mosaic with *Rhododendron carolinianum* - *Rhododendron catawbiense* - *Leiophyllum buxifolium* Shrubland (CEGL007876). The vegetation of landslide scars on Mount Le Conte is included in this association, along with vegetation of more stable cliffs, ledges and seeps. The vegetation on the stable rocky substrates serves as a source pool for the more ephemeral scars, which revegetate slowly in a rather chaotic, stepwise succession, thus the different habitats are not compositionally distinct (J. Boetsch pers. comm.).

**Global Classification Comments:** In some areas this community may occur as a mosaic with *Rhododendron carolinianum* - *Rhododendron catawbiense* - *Leiophyllum buxifolium* Shrubland (CEGL007876). The vegetation of landslide scars on Mount LeConte is included in this association, along with vegetation of more stable cliffs, ledges and seeps. The vegetation on the stable rocky substrates serves as a source pool for the more ephemeral scars, which revegetate slowly in a rather chaotic, stepwise succession, thus the different habitats are not compositionally distinct (J. Boetsch pers. comm.).

## ELEMENT DISTRIBUTION

**Great Smoky Mountains National Park Range:** This community does not occur on the Cades Cove quadrangle. This community was sampled or observed on the Mount Le Conte quadrangle on the high slopes and summits of Mount Le Conte and in the vicinity of Mount Kephart and has not been seen in any other part of the park as part of this project..

**Global Range:** This community is known from the Great Smoky Mountains of Tennessee and North Carolina.

**Nations:** US

**States/Provinces:** NC:S1, TN

**TNC Ecoregions:** 51:C

**USFS Ecoregions (1994/95):** M221Dd:CCC

USFS Ecoregions (2007): M221Dd:CCC

Federal Lands: NPS (Great Smoky Mountains); USFS (Pisgah)

## ELEMENT SOURCES

Great Smoky Mountains National Park Description Author(s): K.D. Patterson

Global Description Author(s): A.S. Weakley and K.D. Patterson

References: Allard 1990, Boetsch pers. comm., Feldcamp 1984, Peet et al. unpubl. data, Southeastern Ecology Working Group n.d., TDNH unpubl. data 2018, Wisner 1993, Wisner et al. 1996

**[CEGL004279] *Saxifraga michauxii* - *Carex misera* - *Danthonia spicata* - *Krigia montana* Grassland**

Translated Name: Michaux's Saxifrage - Wretched Sedge - Poverty Oatgrass - Mountain Dwarf-dandelion Grassland

Common Name: Southern Appalachian High-Elevation Rocky Summit (Typic Type)

## USNVC CLASSIFICATION

Division	Eastern North American Grassland & Shrubland (2.B.2.Nc)
Macrogroup	Appalachian Rocky Felsic & Mafic Scrub & Grassland (M506)
Group	Southern Appalachian Rocky Outcrop (G670)
Alliance	<i>Saxifraga michauxii</i> - <i>Carex misera</i> - <i>Schizachyrium scoparium</i> Rocky Grassland Alliance
(A1621)	

## ELEMENT CONCEPT

**Global Summary:** This association consists of rock outcrops with sparse vegetative cover of forbs, grasses and shrubs which are rooted in rock fissures. This vegetation occurs in the Southern Appalachians of Tennessee and North Carolina at 1350-1870 m elevation within a matrix of *Quercus rubra* forest or high-elevation grasslands and shrublands. Typical species include *Saxifraga michauxii*, *Danthonia spicata*, *Krigia montana*, *Carex misera*, *Angelica triquinata*, *Athyrium filix-femina* ssp. *asplenioides*, *Rhododendron catawbiense*, and *Heuchera villosa*. Other characteristic species are *Sanguisorba canadensis*, *Sibbaldiopsis tridentata*, *Hylotelephium telephioides*, *Houstonia purpurea* var. *montana*, *Geum radiatum*, *Solidago spithamea*, and *Huperzia appalachiana*.

## ENVIRONMENTAL DESCRIPTION

**Global Environment:** This association consists of rock outcrops with sparse vegetative cover of forbs, grasses and shrubs which are rooted in rock fissures. It occurs at 1350-1870 m elevation within a matrix of *Quercus rubra* forest or high-elevation grasslands and shrublands. The rock types on which it may occur include amphibolite, metabasalt, metagabbro, and metagraywacke.

## VEGETATION DESCRIPTION

**Global Vegetation:** Typical species in stands of this type include *Saxifraga michauxii*, *Danthonia spicata*, *Krigia montana*, *Carex misera*, *Angelica triquinata*, *Athyrium filix-femina* ssp. *asplenioides*, *Rhododendron catawbiense*, and *Heuchera villosa* var. *villosa*. Other characteristic species are *Sanguisorba canadensis*, *Sibbaldiopsis tridentata*, *Hylotelephium telephioides* (= *Sedum telephioides*), *Houstonia purpurea* var. *montana*, *Geum radiatum*, *Solidago spithamea*, and *Huperzia appalachiana*. In addition, some examples contain *Agrostis perennans*, *Alnus viridis* ssp. *crispa*, *Carex debilis*, *Krigia montana*, *Minuartia glabra*, *Minuartia groenlandica*, and *Potentilla canadensis*.

## MOST ABUNDANT SPECIES

## Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Flowering forb	<i>Saxifraga michauxii</i>
Herb (field)	Graminoid	<i>Danthonia spicata</i>

## CHARACTERISTIC SPECIES

**Global:** *Carex misera*, *Danthonia spicata*, *Krigia montana*, *Saxifraga michauxii*

## OTHER NOTEWORTHY SPECIES

**Global: Vulnerable Plants:** *Ageratina altissima* var. *roanensis* (G5T3T4), *Allium allegheniense* (G3?), *Carex misera* (G3), *Geum radiatum* (G2, Southern Appalachian endemic), *Gymnocarpium appalachianum* (G3), *Houstonia purpurea* var. *montana* (G5T2, Southern Blue Ridge endemic), *Krigia montana* (G3), *Liatris helleri* (G2Q, NC/Southern Appalachian endemic), *Prenanthes roanensis* (G3), *Solidago glomerata* (G3), *Solidago spithamea* (G2)

## CONSERVATION STATUS RANK

**Global Rank & Reasons:** G2 (30-Apr-1998). This high-elevation community is associated with amphibolite, metabasalt, metagabbro, or metagraywacke bedrock outcrops in the Southern Appalachians of Tennessee and North Carolina. This community is naturally rare, representing a tiny fraction of the high-mountain landscape. It is known from scattered, small acreage occurrences. Heavy recreational use in these fragile communities has damaged, and continues to threaten, many examples. Additionally, atmospheric deposition of air pollutants may have an adverse effect on these high-elevation communities.

## RELATED CONCEPTS

## Global Related Concepts:

- *Deschampsia flexuosa* / *Angelica triquinata* outcrop community (Wiser 1993) ?
- *Deschampsia flexuosa* / *Angelica triquinata* outcrop community (Wiser et al. 1996) <
- *Paronychia argycoma* (sic) / *Polypodium appalachianum* outcrop community (Wiser 1993) ?
- *Paronychia argycoma* / *Polypodium appalachianum* outcrop community (Wiser et al. 1996) <
- *Saxifraga michauxii* - *Carex misera* - *Danthonia spicata* - *Krigia montana* Herbaceous Vegetation (Fleming and Patterson 2009a) =
- IE4a. Southern Appalachian High Elevation Acidic Rocky Summit (Allard 1990) >

## CLASSIFICATION

**Status:** Standard

**Classification Confidence:** 2 - Moderate

**Global Classification Comments:** This community is associated with amphibolite, metabasalt, metagabbro, or metagraywacke bedrock. In an 1134-plot regional analysis (Georgia, North Carolina, Tennessee, Virginia) for the Southern Appalachian portion of the Appalachian Trail, nine plots were classified as this association (Fleming and Patterson 2009a). These plots are all from various localities on the Roan Mountain Massif (NC and TN), and five are located along the Appalachian Trail. The most constant species (>50%) in this group are *Danthonia spicata*, *Minuartia groenlandica*, *Rumex acetosella*, *Saxifraga michauxii*, *Heuchera villosa* var. *villosa*, *Athyrium filix-femina* ssp. *asplenoides*, *Sibbaldiopsis tridentata*, *Krigia montana*, *Solidago glomerata*, *Deschampsia flexuosa*, *Alnus viridis* ssp. *crispa* (seedlings), and *Rhododendron catawbiense* (seedlings).

## ELEMENT DISTRIBUTION

**Global Range:** This high-elevation community is restricted to the Southern Appalachians of Tennessee and North Carolina.

**Nations:** US

**States/Provinces:** NC, TN

**TNC Ecoregions:** 51:C

**USFS Ecoregions (1994/95):** M221Dc:CCC, M221Dd:CCC

**USFS Ecoregions (2007):** M221Dc:CCC, M221Dd:CCC

**Federal Lands:** NPS (Appalachian Trail [Southern Blue Ridge], Blue Ridge Parkway?, Great Smoky Mountains); USFS (Cherokee, Nantahala, Pisgah)

## ELEMENT SOURCES

**Great Smoky Mountains National Park Plots:** CVS: 014-01-0077, 014-01-0078, 014-01-0079, 014-01-0080, 014-01-0081, 014-01-0082, 014-01-0084, 014-01-0085, 014-01-0086.

**Global Description Author(s):** A.S. Weakley, M.P. Schafale and K.D. Patterson

**References:** Allard 1990, Fleming and Patterson 2009a, Schafale 2012, Schafale and Weakley 1990, Southeastern Ecology Working Group n.d., Wiser 1993, Wiser et al. 1996

[CEGL004277] *Saxifraga michauxii* - *Carex misera* - *Oclemena acuminata* - *Solidago glomerata* Grassland

Translated Name: Michaux's Saxifrage - Wretched Sedge - Whorled Wood Aster - Clustered Goldenrod Grassland

Common Name: Southern Appalachian High-Elevation Rocky Summit (High Peak Type)

## USNVC CLASSIFICATION

Division	Eastern North American Grassland & Shrubland (2.B.2.Nc)
Macrogroup	Appalachian Rocky Felsic & Mafic Scrub & Grassland (M506)
Group	Southern Appalachian Rocky Outcrop (G670)
Alliance	<i>Saxifraga michauxii</i> - <i>Carex misera</i> - <i>Schizachyrium scoparium</i> Rocky Grassland Alliance
(A1621)	

## ELEMENT CONCEPT

**Global Summary:** This association covers high-elevation (greater than 1980 m) vegetated rock outcrops of highly fractured felsic to mafic bedrock of the southern Appalachian Mountains in North Carolina and Tennessee. The vegetative cover is sparse with grasses, forbs and shrubs rooted in rock fissures. Typical species in stands of this type are *Carex misera*, *Abies fraseri*, *Menziesia pilosa*, *Heuchera villosa*, *Rhododendron catawbiense*, *Saxifraga michauxii*, *Sorbus americana*, *Oclemena acuminata*, and *Solidago glomerata*. This community occurs in a matrix of *Picea rubens* - *Abies fraseri* forest. Other characteristic species are *Minuartia glabra* and *Polypodium appalachianum*.

## ENVIRONMENTAL DESCRIPTION

**Great Smoky Mountains National Park Environment:** Same as global.

**Global Environment:** This association covers high-elevation (greater than 1980 m) on rock outcrops of highly fractured felsic to mafic bedrock. This community occurs in a matrix of *Picea rubens* - *Abies fraseri* forest.

## VEGETATION DESCRIPTION

**Great Smoky Mountains National Park Vegetation:** Same as global.

**Global Vegetation:** Typical species in stands of this type are *Carex misera*, *Abies fraseri*, *Menziesia pilosa*, *Heuchera villosa*, *Rhododendron catawbiense*, *Saxifraga michauxii*, *Sorbus americana*, *Oclemena acuminata* (= *Aster acuminatus*), and *Solidago glomerata*. Other characteristic species are *Minuartia glabra* and *Polypodium appalachianum*.

## MOST ABUNDANT SPECIES

## Global

Stratum

Short shrub/sapling  
Herb (field)  
Herb (field)

Lifeform

Broad-leaved deciduous shrub  
Flowering forb  
Graminoid

Species

*Menziesia pilosa*  
*Heuchera villosa*, *Oclemena acuminata*, *Saxifraga michauxii*  
*Carex misera*

## CHARACTERISTIC SPECIES

**Great Smoky Mountains National Park:**

**Global:** *Carex misera*, *Minuartia glabra*, *Oclemena acuminata*, *Polypodium appalachianum*, *Saxifraga michauxii*, *Solidago glomerata*

## OTHER NOTEWORTHY SPECIES

**Global: Vulnerable Plants:** *Abies fraseri* (G2, Southern Blue Ridge endemic), *Calamagrostis cainii* (G1), *Carex misera* (G3), *Geum radiatum* (G2, Southern Appalachian endemic), *Houstonia purpurea* var. *montana* (G5T2, Southern Blue Ridge endemic), *Prenanthes roanensis* (G3), *Rhododendron vaseyi* (G3, NC/Southern Blue Ridge endemic), *Selaginella tortipila* (G3, Southern Appalachian endemic), *Solidago glomerata* (G3), *Solidago spithamea* (G2); **Other Plants:** *Anaptychia crinalis* (G5)

## CONSERVATION STATUS RANK

**Global Rank & Reasons:** G1 (15-Jan-1995). This community is naturally rare, representing a tiny fraction of the high-mountain landscape. It is known from scattered, small acreage occurrences. Heavy recreational use in these fragile communities has damaged, and continues to threaten, many examples. Additionally, atmospheric deposition of air pollutants may have an adverse effect on these high-elevation communities.

## RELATED CONCEPTS

**Global Related Concepts:**

- *Aster acuminatus* / *Menziesia pilosa* outcrop community (Wiser et al. 1996) ?
- *Aster acuminatus* / *Menziesia pilosa* outcrop community (Wiser 1993) =
- IE4a. Southern Appalachian High Elevation Acidic Rocky Summit (Allard 1990) >

## CLASSIFICATION

**Status:** Standard

**Classification Confidence:** 2 - Moderate

**Global Classification Comments:** This community occurs on the highest summits of Grandfather Mountain, Mount Craig, Roan High Bluff, Mount Buckley (Great Smoky Mountains National Park), and Craggy Pinnacle. In an 1134-plot regional analysis (Georgia, North Carolina, Tennessee, Virginia) for the Southern Appalachian portion of the Appalachian Trail, only two plots were classified as this association (Fleming and Patterson 2009a). Both plots are from Mount Buckley (TN) and are located along the Appalachian Trail at a mean elevation of 1986 m (6514 feet). The most constant species (100%) in this group are *Carex misera*, *Abies fraseri*, *Clintonia borealis*, *Carex brunnescens* ssp. *sphaerostachya*, *Menziesia pilosa*, *Sorbus americana*, *Oxalis montana*, *Oclemena acuminata*, *Athyrium filix-femina* ssp. *asplenioides*, and *Saxifraga michauxii*.

## ELEMENT DISTRIBUTION

**Great Smoky Mountains National Park Range:** This community was not documented in this project. However, historical records indicate that this community is/was found on Mount Buckley. It most likely occurs in other high-elevation areas of the park.

**Global Range:** Occurs on high summits of the southern Appalachian Mountains in North Carolina and Tennessee.

**Nations:** US

**States/Provinces:** NC, TN

**TNC Ecoregions:** 51:C

**USFS Ecoregions (1994/95):** M221Dc:CCC, M221Dd:CCC

**USFS Ecoregions (2007):** M221Dc:CCC, M221Dd:CCC

**Federal Lands:** NPS (Appalachian Trail [Southern Blue Ridge], Blue Ridge Parkway, Great Smoky Mountains); USFS (Cherokee, Pisgah)

## ELEMENT SOURCES

**Great Smoky Mountains National Park Description Author(s):** R. White

**Global Description Author(s):** A.S. Weakley, M.P. Schafale and K.D. Patterson

**References:** Allard 1990, Fleming and Patterson 2009a, Schafale 2012, Schafale and Weakley 1990, Southeastern Ecology Working Group n.d., Wiser 1993, Wiser et al. 1996

## M123. Eastern North American Ruderal Grassland & Shrubland

### G059. EASTERN NORTH AMERICAN RUDERAL MEADOW & SHRUBLAND

**Group Summary Description:** This group encompasses shrub or herb meadows or old fields in the northern and central regions of the eastern United States and adjacent Canada dominated by native and exotic forbs, grasses, ferns and shrubs that occur on sites that have been cleared and plowed (for farming or development), and then abandoned. Characteristic herbs and shrubs include three variants. Dry variants are less well-described. The mesic open old-field meadow variant has characteristic forbs that include *Asclepias syriaca*, *Cerastium arvense*, *Centaurea stoebe ssp. micranthos*, *Daucus carota*, *Euthamia graminifolia*, *Fragaria virginiana*, *Oenothera biennis*, *Picris hieracioides*, *Potentilla simplex*, *Rudbeckia hirta*, *Solidago altissima*, *Solidago canadensis*, *Solidago nemoralis*, *Solidago rugosa*, *Solidago juncea*, *Symphotrichum lateriflorum*, and *Symphotrichum novae-angliae*. Common grasses include *Anthoxanthum odoratum*, *Bromus inermis*, *Dactylis glomerata*, *Elymus repens*, *Phleum pratense*, *Poa compressa*, and *Poa pratensis*. Shrubs may be present, but collectively they have less than 25% cover. Characteristic shrubs include *Cornus amomum*, *Cornus racemosa*, *Cornus sericea*, *Juniperus virginiana*, *Lonicera* spp., *Rubus* spp., *Rhus typhina*, *Rhus glabra*, and *Viburnum recognitum*. The mesic old-field shrubland variant includes *Amelanchier* spp., *Cornus racemosa*, *Cornus sericea*, *Crataegus* spp., *Prunus americana*, *Prunus virginiana*, *Rhus glabra*, *Rhus typhina*, *Rubus* spp., *Viburnum lentago*, and *Viburnum recognitum*. The exotic shrubs *Elaeagnus angustifolia*, *Lonicera* spp., *Rhamnus cathartica*, and *Rosa multiflora* may be invasive in some areas. The dry old-field grassland and shrubland is found on sandy or rock substrates and includes *Andropogon virginicus*, *Poa compressa*, *Solidago nemoralis*, *Schizachyrium scoparium*, and an assortment of dry weedy species such as *Centaurea stoebe ssp. micranthos*.

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### A1190 *Dactylis glomerata* - *Festuca* spp. - *Solidago canadensis* Ruderal Mesic Meadow Alliance

Orchardgrass - Fescue species - Canada Goldenrod Ruderal Mesic Meadow Alliance  
*Northern & Central Ruderal Mesic Old-field Meadow*

#### ALLIANCE CONCEPT

**Summary:** This broadly defined type includes mesic abandoned pastures and agricultural fields and is largely composed of non-native cool-season grasses and herbs (generally of European origin) in the early stages of succession. The fields are typically mowed every one to five years. Physiognomically, these grasslands are generally composed of mid-height (0.5 to 1 m tall) grasses and forbs, with occasional scattered shrubs (<25%). Species composition varies from site to site, depending on land-use history and perhaps soil type, but in general this vegetation is quite wide-ranging in northeastern and midwestern states and at higher elevations (610-1220 m [2000-4000 feet]) in the southeastern states. Dominant grasses vary from site to site but generally include the exotic grasses *Agrostis stolonifera*, *Agrostis hyemalis*, *Anthoxanthum odoratum*, *Bromus inermis*, *Bromus tectorum*, *Dactylis glomerata*, *Schedonorus arundinaceus*, *Lolium perenne*, *Phleum pratense* as well as weedy natives such as *Elymus repens*, *Poa pratensis*, and, less commonly, *Schizachyrium scoparium*. Forbs may be minor or dominant and include the exotic forbs *Achillea millefolium*, *Cerastium arvense* (and hybrids), *Daucus carota*, *Hieracium* spp., *Vicia cracca*, as well as weedy natives such as *Ambrosia artemisiifolia*, *Asclepias syriaca*, *Euthamia graminifolia*, *Oenothera biennis*, *Potentilla simplex*, *Solidago altissima*, *Solidago canadensis*, *Solidago juncea*, *Solidago nemoralis*, *Solidago rugosa*, *Trifolium* spp., *Symphotrichum lanceolatum*, *Symphotrichum lateriflorum*, *Symphotrichum novae-angliae*, and many others. This vegetation is quite wide-ranging in northeastern and midwestern states and possibly occurs at higher elevations in the southeastern states and southern Canada.

#### Similar Alliances:

- *Poa compressa* - *Solidago nemoralis* - *Centaurea stoebe ssp. micranthos* Ruderal Dry Meadow & Shrubland Alliance (A3934)

**Diagnostic Characteristics:** This is a broadly defined type, and diagnostic features are complex. Shrubs are <25% and trees are <10% cover. Dominant grasses vary from site to site but generally include the exotic grasses *Agrostis stolonifera*, *Agrostis hyemalis*, *Anthoxanthum odoratum*, *Bromus inermis*, *Bromus tectorum*, *Dactylis glomerata*, *Schedonorus arundinaceus*, *Lolium perenne*, *Phleum pratense*, as well as weedy natives such as *Elymus repens*, *Poa pratensis* and, less commonly *Schizachyrium scoparium*. Forbs may be minor or dominant and include the exotic forbs *Achillea millefolium*, *Cerastium arvense* (and hybrids), *Daucus carota*, *Hieracium* spp., *Vicia cracca*, as well as weedy natives such as *Ambrosia artemisiifolia*, *Asclepias syriaca*, *Euthamia graminifolia*, *Oenothera biennis*, *Potentilla simplex*, *Solidago altissima*, *Solidago canadensis*, *Solidago juncea*, *Solidago nemoralis*, *Solidago rugosa*, *Trifolium* spp., *Symphotrichum lanceolatum*, *Symphotrichum lateriflorum*, *Symphotrichum novae-angliae*, and many others.

#### ALLIANCE DESCRIPTION

**Environment:** This broadly defined alliance includes pasture and post-agricultural fields, and is largely composed of non-native grasses and herbs (generally of European origin).

**Vegetation:** Species composition varies from site to site, depending on land-use history and perhaps soil type, but in general this vegetation is quite wide-ranging in northeastern and midwestern states and at higher elevations (610-1220 m [2000-4000 feet]) in the southeastern states. Dominant grasses vary from site to site but generally include the exotic grasses *Agrostis stolonifera*, *Agrostis hyemalis*, *Anthoxanthum odoratum*, *Bromus inermis*, *Bromus tectorum*, *Dactylis glomerata*, *Schedonorus arundinaceus*, *Lolium perenne*, *Phleum pratense*, as well as weedy natives such as *Elymus repens*, *Poa pratensis* and, less commonly *Schizachyrium scoparium*. Forbs may be minor or dominant and include the exotic forbs *Achillea millefolium*, *Cerastium arvense* (and hybrids),

*Daucus carota*, *Hieracium* spp., *Vicia cracca*, as well as weedy natives such as *Ambrosia artemisiifolia*, *Asclepias syriaca*, *Euthamia graminifolia*, *Oenothera biennis*, *Potentilla simplex*, *Solidago altissima*, *Solidago canadensis*, *Solidago juncea*, *Solidago nemoralis*, *Solidago rugosa*, *Trifolium* spp., *Symphytotrichum lanceolatum* (= *Aster simplex*), *Symphytotrichum lateriflorum* (= *Aster lateriflorus*), *Symphytotrichum novae-angliae* (= *Aster novae-angliae*), and many others.

A variant dominated by *Phleum pratense*, a native of Europe, is currently known throughout the northeastern United States and from high-elevation pastures or grass balds in the Southern Appalachians. It includes grasslands primarily dominated by alien species not native to North America, presumably originally planted or introduced by grazing animals. Vegetation of this alliance is widely distributed in the northeastern United States, as well as in montane and higher-elevation areas of the southeastern United States.

Occurrences are variable and patchy, often with local dominance of tall forbs. Other characteristic species include *Hieracium caespitosum* (= *Hieracium pratense*) (alien), *Potentilla canadensis*, and *Ranunculus acris* (alien). These grasslands are maintained by periodic mowing or, in some instances, prescribed burning.

**Physiognomy and Structure:** Physiognomically, these grasslands are generally composed of mid-height (0.5 to 1 m tall) grasses and forbs, with occasional scattered shrubs.

**Floristics:** Species composition varies from site to site, depending on land-use history and perhaps soil type, but in general this vegetation is quite wide-ranging in northeastern and midwestern states and at higher elevations (610-1220 m [2000-4000 feet]) in the southeastern states. Dominant grasses vary from site to site but generally include the exotic grasses *Agrostis stolonifera*, *Agrostis hyemalis*, *Anthoxanthum odoratum*, *Bromus inermis*, *Bromus tectorum*, *Dactylis glomerata*, *Schedonorus arundinaceus*, *Lolium perenne*, *Phleum pratense*, as well as weedy natives such as *Elymus repens*, *Poa pratensis* and, less commonly *Schizachyrium scoparium*. Forbs may be minor or dominant and include the exotic forbs *Achillea millefolium*, *Cerastium arvense* (and hybrids), *Daucus carota*, *Hieracium* spp., *Vicia cracca*, as well as weedy natives such as *Ambrosia artemisiifolia*, *Asclepias syriaca*, *Euthamia graminifolia*, *Oenothera biennis*, *Potentilla simplex*, *Solidago altissima*, *Solidago canadensis*, *Solidago juncea*, *Solidago nemoralis*, *Solidago rugosa*, *Trifolium* spp., *Symphytotrichum lanceolatum* (= *Aster simplex*), *Symphytotrichum lateriflorum* (= *Aster lateriflorus*), *Symphytotrichum novae-angliae* (= *Aster novae-angliae*), and many others.

A variant dominated by *Phleum pratense*, a native of Europe, is currently known throughout the northeastern United States and from high-elevation pastures or grass balds in the Southern Appalachians. It includes grasslands primarily dominated by alien species not native to North America, presumably originally planted or introduced by grazing animals. Vegetation of this alliance is widely distributed in the northeastern United States, as well as in montane and higher-elevation areas of the southeastern United States.

Occurrences are variable and patchy, often with local dominance of tall forbs. Other characteristic species include *Hieracium caespitosum* (= *Hieracium pratense*) (alien), *Potentilla canadensis*, and *Ranunculus acris* (alien). These grasslands are maintained by periodic mowing or, in some instances, prescribed burning.

**Dynamics:** These grasslands are maintained by periodic mowing or, in some instances, prescribed burning, and in other cases are succeeding to ruderal forests.

#### ALLIANCE DISTRIBUTION

**Range:** This vegetation is quite wide-ranging in northeastern and midwestern states and possibly occurs at higher elevations in the southeastern states and southern Canada.

**Nations:** CA,US

**Subnations:** CT, DE, IL, KY, MA, MB, MD, ME, MI, MN, NB?, NC, NH, NJ, NS?, NY, OH, ON, PA, QC?, RI, TN, VA, VT, WI, WV

#### ALLIANCE SOURCES

**References:** Faber-Langendoen et al. 2019b, Schafale and Weakley 1990

**Author of Concept:** Faber-Langendoen et al. 2019b

**Author of Description:** D. Faber-Langendoen, in Faber-Langendoen et al. (2013)

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### [CEGL004018] *Phleum pratense* - *Bromus pubescens* - *Helenium autumnale* Ruderal Meadow

Translated Name: **Timothy - Hairy Woodland Brome - Common Sneezeweed Ruderal Meadow**

Common Name: **Grazed Montane Grassland / Fire Meadow**

#### USNVC CLASSIFICATION

Division	Eastern North American Grassland & Shrubland (2.B.2.Nc)
Macrogroup	Eastern North American Ruderal Grassland & Shrubland (M123)
Group	Eastern North American Ruderal Meadow & Shrubland (G059)
Alliance	<i>Dactylis glomerata</i> - <i>Festuca</i> spp. - <i>Solidago canadensis</i> Ruderal Mesic Meadow
Alliance (A1190)	

#### ELEMENT CONCEPT

**Global Summary:** This vegetation type is currently known from high-elevation pastures or grass balds in the Southern Appalachians but is possible throughout the United States and in southern Canada. It represents montane grasslands with many alien species, presumably planted or introduced by grazing animals. *Phleum pratense*, a native of Europe, is characteristic. Occurrences are variable and patchy, often with local dominance of tall forbs. Other characteristic species include *Hieracium caespitosum* (alien), *Potentilla*

*canadensis*, and *Ranunculus acris* (alien). Stands of this type are maintained by periodic mowing or, in some instances, prescribed burning.

#### ENVIRONMENTAL DESCRIPTION

**Global Environment:** This vegetation type is currently known from high-elevation pastures or grass balds in the Southern Appalachians but is possible throughout the United States and in southern Canada.

#### VEGETATION DESCRIPTION

**Global Vegetation:** Stands of this type are maintained by periodic mowing or, in some instances, prescribed burning. *Phleum pratense*, a native of Europe, is characteristic. Occurrences are variable and patchy, often with local dominance of tall forbs. Other characteristic species include *Hieracium caespitosum* (= *Hieracium pratense*) (alien), *Potentilla canadensis*, and *Ranunculus acris* (alien). The nominals *Bromus pubescens* and *Helenium autumnale* are indicative of grazing.

#### MOST ABUNDANT SPECIES

##### Global

##### Stratum

Herb (field)

##### Lifeform

Graminoid

##### Species

*Phleum pratense*

#### CHARACTERISTIC SPECIES

**Global:** *Helenium autumnale*, *Phleum pratense*

#### OTHER NOTEWORTHY SPECIES

**Global: Invasive/Exotic Plants:** *Phleum pratense* (Medium); **Other Plants:** *Bromus pubescens* (G5)

#### CONSERVATION STATUS RANK

**Global Rank & Reasons:** GNA (ruderal) (8-Nov-2001). This vegetation type includes pasture and post-agricultural fields, and is largely composed of non-native grasses and herbs (generally of European origin).

#### RELATED CONCEPTS

##### Global Similar Types:

- *Dactylis glomerata* - *Phleum pratense* - *Festuca* spp. - *Solidago* spp. Ruderal Meadow (CEGL006107)
- *Schizachyrium scoparium* - (*Andropogon virginicus*) - *Solidago* spp. Ruderal Meadow (CEGL006333)

##### Global Related Concepts:

- ID9a. Grass Bald (Allard 1990) >

#### CLASSIFICATION

**Status:** Standard

**Classification Confidence:** 3 - Weak

**Global Classification Comments:** The nominals *Bromus pubescens* and *Helenium autumnale* are indicative of grazing.

#### ELEMENT DISTRIBUTION

**Global Range:** This vegetation type is currently known from high-elevation pastures or grass balds in the Southern Appalachians but is possible throughout the United States and in southern Canada.

**Nations:** US

**States/Provinces:** NC, TN, VA

**TNC Ecoregions:** 51:C, 59:C

**USFS Ecoregions (1994/95):** M221Dc:CCP, M221Dd:CCC

**USFS Ecoregions (2007):** M221Dc:CCP, M221Dd:CCC

**Federal Lands:** NPS (Appalachian Trail [Southern Blue Ridge], Blue Ridge Parkway, Great Smoky Mountains); USFS (Cherokee, Pisgah)

#### ELEMENT SOURCES

**Global Description Author(s):** K.D. Patterson and A.S. Weakley

**References:** Allard 1990, Schafale and Weakley 1990, Southeastern Ecology Working Group n.d.

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## A4246 *Rhododendron maximum* Ruderal Shrubland Alliance

Great Laurel Ruderal Shrubland Alliance

*Ruderal Great Laurel Shrubland*

#### ALLIANCE DISTRIBUTION

**Nations:** US

**Subnations:** GA, NC, SC, TN, VA?

**TNC Ecoregions:** 51:C

**USFS Ecoregions (2007):** M221A:C?, M221B:C?, M221C:C?, M221Dc:CCC, M221Dd:CCC

**Federal Lands:** NPS (Appalachian Trail, Blue Ridge Parkway?, Great Smoky Mountains); USFS (Chattahoochee?, Cherokee, Nantahala, Pisgah, Sumter)

#### ALLIANCE SOURCES

**References:** Faber-Langendoen et al. 2019b

**Author of Concept:** Faber-Langendoen et al. 2019b

**Author of Description:** M. Pyne, in Faber-Langendoen et al. (2016)

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### [CEGL003819] *Rhododendron maximum* Montane Ruderal Thicket

Translated Name: **Great Laurel Montane Ruderal Thicket**

Common Name: **Ruderal Montane Rhododendron Thicket**

#### USNVC CLASSIFICATION

Division	Eastern North American Grassland & Shrubland (2.B.2.Nc)
Macrogroup	Eastern North American Ruderal Grassland & Shrubland (M123)
Group	Eastern North American Ruderal Meadow & Shrubland (G059)
Alliance	<i>Rhododendron maximum</i> Ruderal Shrubland Alliance (A4246)

#### ELEMENT CONCEPT

**Global Summary:** This community occurs along streams and on protected slopes in the mountains of North Carolina, Tennessee, South Carolina, Georgia, and possibly Virginia. It can also occur on xeric ridges and sideslopes, or sites which have been subjected to extreme crown fires or other catastrophic disturbance that has removed the canopy. It is a broad-leaved, evergreen shrubland, dominated by *Rhododendron maximum* which forms a continuous, dense shrub canopy up to 5 m tall. *Kalmia latifolia*, *Rhododendron minus*, and *Rhododendron catawbiense* may also occur as components of the shrub stratum. Shrub vegetation beneath the upper shrub canopy may be open to dense depending on the stand's age and topographic setting. The ground layer is dominated by leaf litter or bare soil, although scattered herbs and woody seedlings do occur. Seedlings and saplings of *Rhododendron maximum*, *Acer rubrum*, *Betula lenta*, *Betula alleghaniensis*, and *Tsuga canadensis* are common and typical herbs include *Dryopteris intermedia*, *Heuchera villosa*, *Viola* spp., *Thelypteris noveboracensis*, *Listera smallii*, and *Galax urceolata*. This shrubland is typical along streams and on mesic, unexposed, often north-facing slopes at elevations of approximately 300-1100 m (1000-3000 feet), but can also occur on steep slopes and ridges where natural disturbances have removed the canopy. Soils supporting this community are typically acidic. Occurrences at edges of streams may flood during rainy seasons. This community can occur as the result of disturbance and will succeed to forest with an ericaceous understory without some form of disturbance. This community may have scattered woody species that are greater than 5 m tall but with generally less than 10% total cover.

#### ENVIRONMENTAL DESCRIPTION

**Global Environment:** This community occurs along streams and on mesic, unexposed, often north-facing slopes at elevations of approximately 300-1100 m (1000-3000 feet). Soils supporting this community are typically acidic. Occurrences at edges of streams may flood during rainy seasons. It can occur at higher elevations on steep slopes and ridges where extreme crown fires or other catastrophic disturbance have removed the canopy.

#### VEGETATION DESCRIPTION

**Global Vegetation:** This evergreen, sclerophyllous shrubland is dominated by *Rhododendron maximum* which forms a continuous, dense shrub canopy up to 5 m tall. *Kalmia latifolia*, *Rhododendron minus*, and *Rhododendron catawbiense* may also occur as components of the shrub stratum. Shrub vegetation beneath the upper shrub canopy may be open to dense depending on the stand's age and topographic setting. Species such as *Tsuga canadensis*, *Pinus strobus*, *Acer rubrum*, *Betula lenta*, and *Liriodendron tulipifera* in the tree canopy stratum make up less than 10% cover. The ground layer is dominated by leaf litter or bare soil although scattered herbs and woody seedlings do occur. Seedlings and saplings of *Rhododendron maximum*, *Acer rubrum*, *Betula lenta*, *Betula alleghaniensis*, and *Tsuga canadensis* are common, and typical herbs include *Dryopteris intermedia*, *Heuchera villosa*, *Viola* spp., *Thelypteris noveboracensis*, *Listera smallii*, and *Galax urceolata*.

**Global Dynamics:** *Rhododendron maximum* sprouts vigorously after disturbance, and this community often results from logging, fire, chestnut blight, death of canopy trees, or cessation of grazing. Stems greater than 4 cm in diameter survive hot fires, and fire generally stimulates basal sprouting, although intense annual fires may suppress reestablishment (Core 1966). Drastic overstory removal, heavy shading, and disease have been found to decrease the density of or kill *Rhododendron* (Hodgdon and Pike 1961).

This shrubland will become established by invading disturbed or cleared lands if there is adequate moisture and lack of direct sunlight. This community can also result from secondary succession when a forest's canopy is removed (by logging, disease, etc.) and the *Rhododendron* understory closes, forming a dense shrubland. The reestablishment of woody competitors is inhibited by the shade of the dense shrub canopy as well as by phytotoxins in the litter and soil (Gant 1978). *Rhododendron maximum* Shrubland may persist for over 60 years on a site (Plocher and Carvell 1987) but will succeed to a forested community as trees that become established in thicket openings mature.

**MOST ABUNDANT SPECIES****Global****Stratum**

Tall shrub/sapling

**Lifeform**

Broad-leaved evergreen tree

**Species***Rhododendron maximum***CHARACTERISTIC SPECIES****Global:** *Rhododendron maximum***OTHER NOTEWORTHY SPECIES****Global:****CONSERVATION STATUS RANK**

**Global Rank & Reasons:** GNA (ruderal) (16-Nov-2016). This community often results from logging, fire, chestnut blight, death of canopy trees, or cessation of grazing. It is of uncertain validity as a genuine association, and, even if valid, is of uncertain circumscription. It is not of conservation importance, but it has been used as a mapping unit.

**RELATED CONCEPTS****Global Related Concepts:**

- IC4b. Montane Rhododendron Thicket (Allard 1990) ?
- Submesotrophic Scrub (Rawinski 1992) ?

**CLASSIFICATION****Status:** Standard**Classification Confidence:** 3 - Weak

**Global Classification Comments:** This *Rhododendron maximum* shrubland frequently occurs adjacent to wet herbaceous cliff vegetation, riparian shrublands, or within forests dominated by *Tsuga canadensis*, *Quercus rubra*, *Liriodendron tulipifera*, *Pinus strobus*, *Quercus montana*, *Picea rubens*, or *Abies fraseri*. Similar ericaceous shrublands occur at higher elevations, over 1100 m (3500 feet), in the southern Appalachian Mountains. These high-elevation "heath balds" are distinguished from *Rhododendron maximum* Upland Shrubland by the dominance of *Rhododendron catawbiense* or by the occurrence of ericaceous shrubs typical of high-elevation environments such as *Leiophyllum buxifolium*, *Menziesia pilosa*, and *Aronia melanocarpa*. Disjunct populations of *Rhododendron maximum* are found in Maine and New Hampshire, but these populations may represent a different community (Hodgdon and Pike 1961). Similar vegetation has been observed at 1400 m (4600 feet) elevation on Beartown Mountain (Tazewell County, Virginia), where historical logging and subsequent fires burned *Picea* / *Rhododendron* forests, consuming the organic soil and exposing bare rock. Today this site has large areas of dense *Rhododendron maximum* on ridgecrests and upper slopes, with an occasional spruce tree growing above the shrubs and some shrub-sized spruce regeneration intermixed. These areas are currently treated as a disturbance stage of *Picea rubens* - (*Betula alleghaniensis*, *Aesculus flava*) / *Rhododendron (maximum, catawbiense)* Forest (CEGL004983).

**ELEMENT DISTRIBUTION**

**Global Range:** This community occurs in the Southern Blue Ridge, but may be possible throughout the range of *Rhododendron maximum*.

**Nations:** US**States/Provinces:** GA, NC, SC, TN, VA?**TNC Ecoregions:** 51:C**USFS Ecoregions (1994/95):** M221A:C?, M221B:C?, M221C:C?, M221Dc:CCC, M221Dd:CCC**USFS Ecoregions (2007):** M221A:C?, M221B:C?, M221C:C?, M221Dc:CCC, M221Dd:CCC

**Federal Lands:** NPS (Appalachian Trail [Southern Blue Ridge], Blue Ridge Parkway?, Great Smoky Mountains); USFS (Chattahoochee (Southern Blue Ridge)?, Chattahoochee?, Cherokee, Nantahala, Pisgah, Sumter, Sumter (Mountains))

**ELEMENT SOURCES****Global Description Author(s):** K.D. Patterson

**References:** Allard 1990, Core 1966, Fleming and Patterson 2009a, Gant 1978, Hodgdon and Pike 1961, McGee and Smith 1967, Monk et al. 1985, Nelson 1986, Phillips and Murdy 1985, Plocher and Carvell 1987, Rawinski 1992, Southeastern Ecology Working Group n.d.

**2.B.2.NH. SOUTHEASTERN NORTH AMERICAN GRASSLAND & SHRUBLAND****M307. Southeastern Ruderal Grassland & Shrubland****G583. SOUTHEASTERN RUDERAL GRASSLAND & SHRUBLAND**

**Group Summary Description:** This group comprises vegetation that occurs on disturbed sites that were cleared and the soils disturbed (e.g., old fields, abandoned quarries, old homesteads, etc.). Stands may be composed of native or exotic species, or

combinations of these. These are combinations of taxa for which no natural analog exists. In the southeastern Piedmont, the herbs and grasses that dominate old fields undergo a rapid turnover in the first three years after abandonment. By the third year, *Andropogon virginicus* often is the dominant plant. Before it achieves dominance, *Ambrosia artemisiifolia*, *Conyza canadensis*, *Digitaria sanguinalis*, and *Symphotrichum pilosum* may be more prominent. Other perennial grasses may include *Andropogon gyrans*, *Andropogon ternarius*, and *Dichanthelium dichotomum*. Shrubs and vines appear in these communities, and some genera may form stands, including the native genera *Baccharis*, *Cornus*, *Prunus*, *Rubus*, and *Sophora secundiflora* (in Texas), as well as the exotics *Ligustrum*, *Pueraria*, and *Wisteria*. This variation is accommodated at the alliance level within this group, as in the absence of disturbance, small trees rapidly overtake them and become dominant.

## A3321 *Andropogon virginicus* - *Ambrosia artemisiifolia* - *Conyza canadensis* Eastern Ruderal Grassland Alliance

Broomsedge Bluestem - Annual Ragweed - Canadian Horseweed Eastern Ruderal Grassland Alliance  
*Eastern Ruderal Grassland*

### ALLIANCE CONCEPT

**Summary:** This alliance encompasses a variety of herbaceous vegetation that occurs in the eastern United States on sites that were cleared and the soils disturbed (e.g., old fields, abandoned quarries, old homesteads). Stands are composed of combinations of native and/or exotic species for which no natural analog exists. These species include *Ambrosia artemisiifolia*, *Andropogon virginicus* var. *virginicus*, *Conyza canadensis*, *Cynodon dactylon*, *Eremochloa ophiuroides*, *Eupatorium* spp., *Imperata cylindrica*, *Schedonorus arundinaceus*, *Schedonorus pratensis*, *Paspalum notatum*, *Pennisetum glaucum*, *Solidago* spp., *Sorghum halepense*, *Stenotaphrum secundatum*, and *Urochloa ramosa*. Scattered shrubs may be present, including *Rhus copallinum*. In the southeastern Piedmont, the herbs and grasses that dominate old fields undergo a rapid turnover in the first three years after abandonment. By the third year, *Andropogon virginicus* often is the dominant plant. Before it achieves dominance, *Ambrosia artemisiifolia*, *Conyza canadensis*, *Digitaria sanguinalis*, and *Symphotrichum pilosum* may be more prominent; other combinations of native and exotic species also may occur.

**Classification Comments:** Stands of this alliance are composed of combinations of taxa for which no natural analog exists. One significant reference is Wright and Fridley (2010), from which more information can be obtained on regional variation in semi-natural vegetation in the eastern United States.

**Diagnostic Characteristics:** This alliance encompasses a variety of native- and exotic-dominated herbaceous vegetation that occurs on disturbed sites in the eastern United States. There may be no clear dominant, and the sites may undergo year-to-year changes in composition and dominance as succession occurs.

### Related Concepts:

- Herblands of abandoned fields; *Andropogon virginicus*, *Eupatorium compositifolium* (Penfound 1967) <
- Herblands of abandoned fields; *Digitaria sanguinalis*, *Erigeron canadensis* (Penfound 1967) <
- Seral grasslands on abandoned fields; *Andropogon virginicus* (Penfound 1967) <

### ALLIANCE DESCRIPTION

**Vegetation:** Examples of this diverse alliance may be dominated by stands of, or combinations of, a variety of native and exotic grasses and forbs. *Andropogon virginicus* var. *virginicus* is often the dominant plant by the third year of succession in Piedmont old fields (Oosting 1942). Before it achieves dominance, *Ambrosia artemisiifolia*, *Conyza canadensis*, *Digitaria sanguinalis*, and *Symphotrichum pilosum* may be more prominent. Other species that may be present include *Ambrosia artemisiifolia*, *Conyza canadensis*, *Cynodon dactylon*, *Eremochloa ophiuroides*, *Imperata cylindrica*, *Schedonorus arundinaceus* (= *Lolium arundinaceum*), *Schedonorus pratensis* (= *Lolium pratense*), *Paspalum notatum*, *Pennisetum glaucum*, *Sorghum halepense*, *Stenotaphrum secundatum*, and *Urochloa ramosa*. In the Piedmont of North Carolina, other (mostly native) herbaceous taxa may include *Antennaria plantaginifolia*, *Bulbostylis capillaris*, *Chamaecrista fasciculata*, *Chamaesyce nutans*, *Cyperus compressus*, *Diodia teres*, *Eupatorium capillifolium*, *Eupatorium compositifolium*, *Eupatorium serotinum*, *Fimbristylis autumnalis*, *Gamochaeta purpurea* (= *Gnaphalium purpureum*), *Helenium amarum* (= *Helenium tenuifolium*), *Hypericum drummondii*, *Hypericum gentianoides*, *Ipomoea lacunosa*, *Ipomoea pandurata*, *Juncus tenuis*, *Plantago aristata*, *Pseudognaphalium obtusifolium* (= *Gnaphalium obtusifolium*), *Solanum carolinense*, and *Solidago* spp. (Oosting 1942). Scattered shrubs may be present, including *Rhus copallinum*. In the southeastern Piedmont, the herbs and grasses that dominate old fields undergo a rapid turnover in the first three years after abandonment. There may be no clear dominant, and the sites may undergo year-to-year changes in composition and dominance as succession occurs (Oosting 1942).

**Floristics:** Examples of this diverse alliance may be dominated by stands of, or combinations of, a variety of native and exotic grasses and forbs. *Andropogon virginicus* var. *virginicus* is often the dominant plant by the third year of succession in Piedmont old fields (Oosting 1942). Before it achieves dominance, *Ambrosia artemisiifolia*, *Conyza canadensis*, *Digitaria sanguinalis*, and *Symphotrichum pilosum* may be more prominent. Other species that may be present include *Ambrosia artemisiifolia*, *Conyza canadensis*, *Cynodon dactylon*, *Eremochloa ophiuroides*, *Imperata cylindrica*, *Schedonorus arundinaceus* (= *Lolium arundinaceum*), *Schedonorus pratensis* (= *Lolium pratense*), *Paspalum notatum*, *Pennisetum glaucum*, *Sorghum halepense*, *Stenotaphrum secundatum*, and *Urochloa ramosa*. In the Piedmont of North Carolina, other (mostly native) herbaceous taxa may include *Antennaria plantaginifolia*, *Bulbostylis capillaris*, *Chamaecrista fasciculata*, *Chamaesyce nutans*, *Cyperus compressus*, *Diodia teres*, *Eupatorium*

*capillifolium*, *Eupatorium compositifolium*, *Eupatorium serotinum*, *Fimbristylis autumnalis*, *Gamochaeta purpurea* (= *Gnaphalium purpureum*), *Helenium amarum* (= *Helenium tenuifolium*), *Hypericum drummondii*, *Hypericum gentianoides*, *Ipomoea lacunosa*, *Ipomoea pandurata*, *Juncus tenuis*, *Plantago aristata*, *Pseudognaphalium obtusifolium* (= *Gnaphalium obtusifolium*), *Solanum carolinense*, and *Solidago* spp. (Oosting 1942). Scattered shrubs may be present, including *Rhus copallinum*. In the southeastern Piedmont, the herbs and grasses that dominate old fields undergo a rapid turnover in the first three years after abandonment. There may be no clear dominant, and the sites may undergo year-to-year changes in composition and dominance as succession occurs (Oosting 1942).

**Dynamics:** In the southeastern Piedmont, the herbs and grasses that dominate old fields undergo a rapid turnover in the first three years after abandonment. By the third year, *Andropogon virginicus* often is the dominant plant. There may be no clear dominant, and the sites may undergo year-to-year changes in composition and dominance as succession occurs (Oosting 1942).

#### ALLIANCE DISTRIBUTION

**Range:** This vegetation is found across the eastern United States, in the coastal plains and the unglaciated interior provinces.

**Nations:** BS, PR, US

**Subnations:** AL, AR, FL, GA, IL, IN, KY, LA, MD, MO, MS, NC, OK, SC, TN, TX, VA, WV

**TNC Ecoregions:** 31:C, 32:C, 38:C, 39:C, 40:C, 41:C, 42:C, 43:C, 44:C, 50:C, 51:P, 52:C, 53:C, 56:C, 57:C, 59:C

**Federal Lands:** NPS (Jean Lafitte, Natchez Trace)

#### ALLIANCE SOURCES

**References:** Faber-Langendoen et al. 2019b, Oosting 1942, Penfound 1967, Wright and Fridley 2010

**Author of Concept:** Faber-Langendoen et al. 2019b

**Author of Description:** M. Pyne, in Faber-Langendoen et al. (2013)

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### [CEGL004048] *Schedonorus (arundinaceus, pratensis)* Ruderal Grassland

Translated Name: (Tall Fescue, Meadow Fescue) Ruderal Grassland

Common Name: Cultivated Grassland

#### USNVC CLASSIFICATION

Division	Southeastern North American Grassland & Shrubland (2.B.2.Nh)
Macrogroup	Southeastern Ruderal Grassland & Shrubland (M307)
Group	Southeastern Ruderal Grassland & Shrubland (G583)
Alliance	<i>Andropogon virginicus</i> - <i>Ambrosia artemisiifolia</i> - <i>Conyza canadensis</i> Eastern Ruderal Grassland Alliance (A3321)

#### ELEMENT CONCEPT

**Global Summary:** This association includes grassland pastures and hayfields, more-or-less cultural, though sometimes no longer actively maintained. It is currently defined for the Central and Southern Appalachians, Ozarks, Ouachita Mountains, and parts of the Piedmont and Interior Low Plateau, but it is possible throughout much of the eastern United States and southern Canada. The dominant species in this type are the European "tall or meadow fescues" (*Schedonorus* spp.) of uncertain and controversial generic placement. Several other exotic grasses, including *Agrostis gigantea*, *Dactylis glomerata*, *Holcus lanatus*, *Phleum pratense*, and *Poa pratensis*, are common associates. These communities are sometimes nearly monospecific but can also be very diverse and contain many native as well as exotic species of grasses, sedges, and forbs. Exotic forbs include the legumes *Lespedeza cuneata*, *Trifolium campestre*, *Trifolium hybridum*, *Trifolium pratense*, and *Trifolium repens*, as well as *Achillea millefolium* var. *occidentalis*, *Calystegia sepium*, *Daucus carota*, *Leucanthemum vulgare*, *Oxalis stricta*, and *Plantago lanceolata*. Common native herbs include *Apocynum cannabinum*, *Desmodium canescens*, *Dichanthelium clandestinum*, *Erigeron annuus*, *Fragaria virginiana*, *Potentilla simplex*, *Solanum carolinense*, *Solidago canadensis*, and *Verbesina occidentalis*.

#### ENVIRONMENTAL DESCRIPTION

**Great Smoky Mountains National Park Environment:** This association includes most low-elevation cultivated fields within the park.

**Global Environment:** This association includes grassland pastures and hayfields, more-or-less cultural, though sometimes no longer actively maintained. It occurs in areas which have been cleared in the past, including abandoned farmlands, strip mines, and other areas disturbed by human activities.

#### VEGETATION DESCRIPTION

**Great Smoky Mountains National Park Vegetation:** The open fields in and around Cades Cove appear to be quite variable in composition. Some areas are dominated by *Lolium* spp. and *Andropogon glomeratus*. More information is needed to better describe compositional variation in this community. This is a broad community type and so encompasses most of the variations seen in various areas of the park.

**Global Vegetation:** This association represents early-successional herbaceous and herb-shrub vegetation dominated by or having a large component of exotic grasses and legumes. The dominant species in this association are the European "tall or meadow fescues" (*Schedonorus* spp.). These communities are sometimes nearly monospecific but can also be very diverse and contain many native species of grasses, sedges, and forbs. Woody encroachment is restricted to low cover by *Toxicodendron radicans* and species of

*Rubus*, both of which become more abundant in older stands. Scattered individuals of various shrubs may be present, including *Crataegus crus-galli*, *Fraxinus pennsylvanica*, *Fraxinus americana*, *Rosa multiflora*, *Robinia pseudoacacia*, *Cornus florida*, *Elaeagnus umbellata*, *Sambucus nigra ssp. canadensis*, and *Sassafras albidum*. In the Central Appalachians and northern Cumberlands, the dominant exotic grasses include *Agrostis gigantea*, *Dactylis glomerata*, *Holcus lanatus*, *Schedonorus pratensis* (= *Lolium pratense*), *Phleum pratense*, and *Poa pratensis*. Exotic forbs include the legumes *Lespedeza cuneata*, *Trifolium campestre*, *Trifolium hybridum*, *Trifolium pratense*, and *Trifolium repens*, as well as *Achillea millefolium var. occidentalis*, *Calystegia sepium*, *Daucus carota*, *Leucanthemum vulgare*, *Oxalis stricta*, and *Plantago lanceolata*. Common native herbs include *Apocynum cannabinum*, *Desmodium canescens*, *Dichanthelium clandestinum*, *Erigeron annuus*, *Fragaria virginiana*, *Potentilla simplex*, *Solanum carolinense*, *Solidago canadensis*, and *Verbesina occidentalis*. In the Black Belt region of Alabama and Mississippi, it is commonly found in mixture with *Paspalum dilatatum* (Bransby n.d.), and the exotic *Bromus tectorum* may be present in stands.

**Global Dynamics:** This association varies greatly depending upon past land use and recent history of the site. Some examples that have been recently farmed may be monocultures of *Schedonorus*, whereas other fields that were traditionally lightly grazed may have much higher diversity. If not grazed, periodically mowed or burned, vegetation will succeed towards woody physiognomy.

#### MOST ABUNDANT SPECIES

##### Global

##### Stratum

Herb (field)

##### Lifeform

Graminoid

##### Species

*Agrostis gigantea*, *Phleum pratense*, *Schedonorus* spp.

#### CHARACTERISTIC SPECIES

**Great Smoky Mountains National Park:** *Lolium* sp.

**Global:** *Achillea millefolium*, *Apocynum cannabinum*, *Calystegia sepium*, *Dactylis glomerata*, *Daucus carota*, *Desmodium canescens*, *Dichanthelium clandestinum*, *Erigeron annuus*, *Fragaria virginiana*, *Holcus lanatus*, *Lespedeza cuneata*, *Leucanthemum vulgare*, *Oxalis stricta*, *Plantago lanceolata*, *Poa pratensis*, *Potentilla simplex*, *Solanum carolinense*, *Solidago canadensis*, *Trifolium hybridum*, *Trifolium pratense*, *Trifolium repens*

#### OTHER NOTEWORTHY SPECIES

**Global: Vulnerable Plants:** *Berberis canadensis* (G3G4); **Invasive/Exotic Plants:** *Achillea millefolium*, *Agrostis gigantea* (Medium/Low), *Bromus tectorum* (High), *Calystegia sepium*, *Dactylis glomerata* (Medium/Insignificant), *Daucus carota* (Low), *Holcus lanatus* (High/Medium), *Lespedeza cuneata* (Medium), *Leucanthemum vulgare* (Medium/Low), *Phleum pratense* (Medium), *Plantago lanceolata* (High/Low), *Poa pratensis* (Medium), *Schedonorus* spp., *Trifolium hybridum* (Medium/Low), *Trifolium pratense* (Low/Insignificant), *Trifolium repens* (Medium/Low)

#### CONSERVATION STATUS RANK

**Global Rank & Reasons:** GNA (ruderal) (5-Jan-2000). This vegetation is dominated by an exotic species, is of anthropogenic origin, and is thus not a conservation priority.

#### RELATED CONCEPTS

##### Global Similar Types:

- *Dactylis glomerata* - *Phleum pratense* - *Festuca* spp. - *Solidago* spp. Ruderal Meadow (CEGL006107)
- *Schizachyrium scoparium* - (*Andropogon virginicus*) - *Solidago* spp. Ruderal Meadow (CEGL006333)

##### Global Related Concepts:

- *Festuca pratensis* - (*Holcus lanatus*) - *Solidago canadensis* herbaceous vegetation (Vanderhorst 2001b) =
- *Lolium* (*arundinaceum*, *pratense*) Herbaceous Vegetation (Nordman 2004a) =
- *Schedonorus* (*phoenix*, *pratensis*) Herbaceous Vegetation (Diamond et al. 2013) =
- Cleared Areas (Schmalzer and DeSelm 1982) >

#### CLASSIFICATION

**Status:** Standard

**Classification Confidence:** 3 - Weak

**Great Smoky Mountains National Park Other Comments:** Park scientists are attempting the restoration of native grasses in some parts of Cade Cove.

**Global Classification Comments:** The dominant species in this association are the European "tall or meadow fescues" of uncertain and controversial generic placement. Although traditionally treated as *Festuca pratensis* (= *Festuca elatior*) and *Festuca arundinacea*, these two closely related species are treated here as *Schedonorus pratensis* and *Schedonorus arundinaceus*, respectively. Conversion to USDA Plants (2017) standard has necessitated the shift to the *Schedonorus* names from *Lolium*.

#### ELEMENT DISTRIBUTION

**Great Smoky Mountains National Park Range:** This community occurs in the open fields of Cades Cove, Cataloochee Valley, parts of the area along the Oconaluftee River, and other scattered low-elevation areas that are mowed yearly.

**Global Range:** This association is currently documented from the southern half of the Central Appalachians through the Gulf Coastal Plain and west to the Ozarks and Ouachitas. It is possible throughout much of the eastern United States.

**Nations:** US

**States/Provinces:** AL, AR, GA, KY, MD, MO, MS, NC, OK, SC, TN, VA, WV

**TNC Ecoregions:** 38:C, 39:C, 40:P, 43:C, 44:C, 50:C, 51:C, 52:C, 57:C, 59:C

**USFS Ecoregions (1994/95):** 221Hc:CCC, 221He:CCC, 222Eg:CCC, 231Ae:CCC, 231Ba:CCC, 231Bh:CCC, 231Bi:CCC, M221Cb:CCC, M221Cd:CCC, M221Dc:CCC, M221Dd:CCC, M222Ab:CCC, M231A:CC

**USFS Ecoregions (2007):** 221Hc:CCC, 221He:CC?, 223Eg:CCC, 231Ba:CCC, 231Ha:CCC, 231Hc:CCC, 231Ic:CCC, M221Cb:CCC, M221Cd:CCC, M221Dc:CCC, M221Dd:CCC, M223Ab:CCC, M231A:CC

**Federal Lands:** BIA (Eastern Band of Cherokee); NPS (Abe Lincoln Birthplace, Appalachian Trail [Southern Blue Ridge], Big South Fork, Blue Ridge Parkway, Buffalo River, Carl Sandburg Home, Chickamauga-Chattanooga, Cowpens, Cumberland Gap, Fort Donelson, Great Smoky Mountains, Guilford Courthouse, Kings Mountain, Little River Canyon, Mammoth Cave, Natchez Trace, New River Gorge, Ninety Six, Obed River, Pea Ridge, Russell Cave, Shiloh, Stones River, Thomas Stone, Vicksburg); USFS (Cherokee, Ouachita, Ouachita (Coastal Plain)?, Ouachita (Mountains), Ozark)

#### ELEMENT SOURCES

**Great Smoky Mountains National Park Plots:** GRSM.416.

**Great Smoky Mountains National Park Description Author(s):** K.D. Patterson, mod. R. White

**Global Description Author(s):** A.S. Weakley and S.C. Gawler

**References:** Bransby n.d., Diamond et al. 2013, Heath et al. 1973, Hoagland 2000, Hop et al. 2012a, Kartesz 1999, Lea et al. 2012, Lea et al. 2013, NatureServe Ecology - Southeastern U.S. unpubl. data, Nordman 2004a, Nordman 2004a, Nordman et al. 2011, Pyne et al. 2010, Schmalzer and DeSelm 1982, Schotz et al. 2006, Schotz et al. 2008, Southeastern Ecology Working Group n.d., Vanderhorst 2001b, Vanderhorst et al. 2007, White 2003, White 2004, White 2005, White 2006, White and Govus 2003, White and Govus 2005, White and Pyne 2003

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### A4082 *Pueraria montana* - *Wisteria sinensis* Exotic Ruderal Vine-Shrubland Alliance

Kudzu - Chinese Wisteria Exotic Ruderal Vine-Shrubland Alliance

*Eastern Exotic Ruderal Vine-Shrubland*

#### ALLIANCE CONCEPT

**Summary:** This alliance encompasses a variety of vine-dominated vegetation that occurs in the eastern United States on sites that were cleared and the soils disturbed (e.g., old fields, abandoned quarries, old homesteads). Stands may be composed of exotic vine species, particularly *Pueraria montana* var. *lobata* and *Wisteria sinensis*. These are combinations of taxa for which no natural analog exists in North America.

**Classification Comments:** These are combinations of taxa for which no natural analog exists in North America. Penfound (1967) states: "It is probable that many plant ecologists will object to vinelands as discrete communities. However, those who have lived in the deep south, and have seen Japanese honeysuckle and kudzu vine overwhelm forest trees and prevent forest regeneration, will not be among the doubters. Even native vines may injure or destroy some trees by climbing to the tree-tops and shading out the branches beneath. It should be emphasized, however, that vinelands are rare, and of limited extent, except in southeastern United States." This group now contains a *Rubus* - *Prunus* - *Cornus* alliance, a vine-shrubland alliance, and an exotic bamboo alliance.

**Diagnostic Characteristics:** This alliance encompasses a variety of exotic vine-dominated vegetation that occurs on disturbed sites in the eastern United States.

#### Related Concepts:

- Vinelands, herbaceous, Kudzu-vine (Penfound 1967) <

#### ALLIANCE DESCRIPTION

**Vegetation:** Exotic vines that may form stands in successional environments include the genera *Pueraria* and *Wisteria*. *Pueraria montana* var. *lobata* and *Wisteria sinensis* are the species most typically encountered.

**Floristics:** Exotic vines that may form stands in successional environments include the genera *Pueraria* and *Wisteria*. *Pueraria montana* var. *lobata* and *Wisteria sinensis* are the species most typically encountered.

**Dynamics:** *Pueraria montana* var. *lobata* and *Wisteria sinensis* can overwhelm forest trees and prevent forest regeneration. Even native vines may injure or destroy some trees by climbing to the tree-tops and shading out the branches beneath (Penfound 1967).

#### ALLIANCE DISTRIBUTION

**Range:** This vegetation is found across the eastern United States.

**Nations:** US

**Subnations:** AL, AR, DE, FL, GA, KY, LA, MD, MS, NC, OK, SC, TN, TX, VA, WV

#### ALLIANCE SOURCES

**References:** Faber-Langendoen et al. 2019b, Penfound 1967

**Author of Concept:** Faber-Langendoen et al. 2019b

**Author of Description:** M. Pyne, in Faber-Langendoen et al. (2014)

**[CEGL003882] *Pueraria montana* var. *lobata* Ruderal Vine-Shrubland**Translated Name: **Kudzu Ruderal Vine-Shrubland**Common Name: **Ruderal Kudzu Vineland****USNVC CLASSIFICATION**

Division Southeastern North American Grassland & Shrubland (2.B.2.Nh)  
 Macrogroup Southeastern Ruderal Grassland & Shrubland (M307)  
 Group Southeastern Ruderal Grassland & Shrubland (G583)  
 Alliance *Pueraria montana* - *Wisteria sinensis* Exotic Ruderal Vine-Shrubland Alliance (A4082)

**ELEMENT CONCEPT**

**Global Summary:** This vine-dominated vegetation is dominated by *Pueraria montana* var. *lobata*, a fast-growing vine native to Asia. The species was introduced into the United States in 1885, primarily as an ornamental and as a potential source for cattle forage. It was subsequently widely used for erosion control in the southeastern United States. This association occupies a variety of sites throughout most physiographic provinces in the Southeast, ranging in size from less than a hectare to 5-10 hectares or more. It chokes out existing vegetation. Edges of examples of this vegetation may consist of small to large trees in the process of being overwhelmed by kudzu. More than 2 million acres of forest land in Alabama, Georgia, Mississippi, Tennessee, North Carolina, and South Carolina are estimated to be infested with kudzu. This association is also known to occur north to central Kentucky, Virginia, and Maryland, and as far west as eastern Texas and Oklahoma.

**ENVIRONMENTAL DESCRIPTION**

**Global Environment:** The association occupies a variety of sites throughout most physiographic provinces in the southeastern U.S., with examples ranging in size from less than one hectare to 5-10 hectares or more. It occurs on disturbed sites, including abandoned town sites and mine lands and on landslides. It chokes out existing vegetation. Edges of examples of this vegetation may consist of small to large trees in the process of being overwhelmed by kudzu. In West Virginia, *Pueraria montana* var. *lobata* may be limited in its ability to spread due to relatively cold climate.

**VEGETATION DESCRIPTION**

**Global Vegetation:** This vine-dominated vegetation is dominated by *Pueraria montana* var. *lobata*, a fast-growing vine native to Asia.

**Global Dynamics:** This association chokes out existing vegetation.

**MOST ABUNDANT SPECIES****Global****Stratum**

Shrub/sapling (tall &amp; short) Liana

**Lifeform****Species***Pueraria montana* var. *lobata***CHARACTERISTIC SPECIES****Global:** *Pueraria montana* var. *lobata***OTHER NOTEWORTHY SPECIES****Global: Invasive/Exotic Plants:** *Pueraria montana* var. *lobata***CONSERVATION STATUS RANK**

**Global Rank & Reasons:** GNA (ruderal) (24-May-2000). This vegetation is dominated by an exotic species, is of anthropogenic origin, and is thus not a conservation priority. *Pueraria montana* var. *lobata*, native to Asia, was introduced into the United States in 1885, primarily as an ornamental and as a potential source for cattle forage. More than 2 million acres of forest land in Alabama, Georgia, Mississippi, Tennessee, North Carolina, and South Carolina are estimated to be infested with kudzu.

**RELATED CONCEPTS****Global Similar Types:**

- *Wisteria sinensis* Ruderal Vine-Shrubland (CEGL008568)

**Global Related Concepts:**

- Kudzu thicket (CAP pers. comm. 1998) ?

**CLASSIFICATION****Status:** Standard**Classification Confidence:** 3 - Weak

**Global Classification Comments:** *Pueraria montana* var. *lobata*, native to Asia, was introduced into the United States in 1885, primarily as an ornamental and as a potential source for cattle forage. More than 2 million acres of forest land in Alabama, Georgia, Mississippi, Tennessee, North Carolina, and South Carolina are estimated to be infested with kudzu.

**ELEMENT DISTRIBUTION**

**Global Range:** This vegetation is known to occur in the southeastern United States from central Kentucky, Virginia, and Maryland, south through Tennessee, North Carolina, South Carolina, Georgia, and Alabama to Florida and west through Mississippi and Louisiana to eastern Texas, Arkansas, and Oklahoma (Edwards 1982).

**Nations:** US

**States/Provinces:** AL, AR, DE, FL, GA, KY, LA, MD, MS, NC, OK, SC, TN, TX, VA, WV

**TNC Ecoregions:** 38:C, 39:C, 40:C, 43:C, 44:C, 50:C, 51:C, 52:C, 53:C, 56:C, 57:C, 59:C, 61:C

**USFS Ecoregions (1994/95):** 221Db:CCC, 221Hc:CCC, 222Ab:CCC, 222Ag:CCC, 222Ah:CCC, 222An:CCC, 231Ba:CCC, 231Bh:CCC, 231Ca:CCC, 231Cd:CCC, 232Bd:CCC, 232Bm:CCC, 234:C, M221Aa:CCC, M221Ab:CCC, M221Ca:CCP, M221Cb:CCC, M221Cc:CCP, M221Ce:CCP, M221Db:CCP, M221Dc:CCP, M221Dd:CCC, M222Aa:CCC, M222Ab:CCC, M231Aa:CCC, M231Ab:CCC, M231Ac:CCC, M231Ad:CCC

**USFS Ecoregions (2007):** 221Db:CCC, 221Hc:CCC, 223Ab:CCC, 223Ag:CCC, 223Ah:CCC, 223An:CCP, 231Ba:CCC, 231Ca:CCC, 231Cd:CCC, 231Ha:CCC, 231Hi:CCC, 232Bm:CCC, 234:C, M221Aa:CCP, M221Ab:CCC, M221Ca:CCP, M221Cb:CCC, M221Cc:CCP, M221Ce:CCP, M221Db:CCP, M221Dc:CCP, M221Dd:CCC, M223Aa:CCC, M223Ab:CCC, M231Aa:CCC, M231Ab:CCC, M231Ac:CCC, M231Ad:CCC

**Federal Lands:** BIA (Eastern Band of Cherokee); DOD (Fort Benning); NPS (Appalachian Trail [Central Appalachians], Appalachian Trail [Southern Blue Ridge], C&O Canal, Chickamauga-Chattanooga?, Cumberland Gap, Great Smoky Mountains?, Mammoth Cave?, Natchez Trace, New River Gorge, Vicksburg); TVA (Tellico); USFS (Bankhead, Cherokee, Daniel Boone, George Washington, Jefferson, Oconee?, Ouachita, Ouachita (Coastal Plain), Ouachita (Mountains), Ozark, Talladega, Talladega (Oakmulgee), Talladega (Talladega))

**ELEMENT SOURCES**

**Global Description Author(s):** A.S. Weakley and S.C. Gawler

**References:** CAP pers. comm. 1998, Coxe 2009, Edwards 1982, Fleming and Coulling 2001, GNHP unpubl. data 2018, Hoagland 1998b, Hoagland 2000, Lea et al. 2013, Nordman et al. 2011, Pyne et al. 2010, Remo 1999, Southeastern Ecology Working Group n.d., Vanderhorst et al. 2007, White 2006

**A3322 *Rubus* spp. - *Prunus* spp. - *Cornus drummondii* Eastern Ruderal Shrubland Alliance**

Blackberry species - Plum species - Roughleaf Dogwood Eastern Ruderal Shrubland Alliance

*Eastern Ruderal Native Shrubland*

**ALLIANCE CONCEPT**

**Summary:** This alliance encompasses a variety of semi-natural native shrub-dominated vegetation that occurs in the eastern United States on sites that were cleared and the soils disturbed (e.g., old fields, abandoned quarries, old homesteads). Stands are primarily composed of native species. A variety of *Rubus* species (the taxa depending on biogeography) may be dominant in stands of one association, but other combinations of native species also occur, including *Baccharis halimifolia*, *Cornus drummondii*, *Prunus angustifolia*, other *Prunus* spp., and *Smilax* spp. These are combinations of taxa for which no natural analog exists.

**Classification Comments:** These are combinations of semi-natural native shrub taxa for which no natural analog exists. One significant reference is Wright and Fridley (2010), from which more information can be obtained on regional variation in semi-natural vegetation in the eastern United States.

**Diagnostic Characteristics:** This alliance encompasses a variety of semi-natural native shrub-dominated vegetation that occurs on disturbed sites in the southeastern United States.

**ALLIANCE DESCRIPTION**

**Vegetation:** Stands are primarily composed of native shrub species. A variety of *Rubus* species (the taxa depending on biogeography) may be dominant in stands of one association, but other combinations of native species also occur, including *Baccharis halimifolia*, *Cornus drummondii*, *Prunus angustifolia*, other *Prunus* spp., and *Smilax* spp. These are combinations of taxa for which no natural analog exists.

**Floristics:** Stands are primarily composed of native shrub species. A variety of *Rubus* species (the taxa depending on biogeography) may be dominant in stands of one association, but other combinations of native species also occur, including *Baccharis halimifolia*, *Cornus drummondii*, *Prunus angustifolia*, other *Prunus* spp., and *Smilax* spp. These are combinations of taxa for which no natural analog exists.

**ALLIANCE DISTRIBUTION**

**Range:** This semi-natural native shrub-dominated vegetation is found across the southeastern United States from Virginia to Texas. It may be more widespread.

**Nations:** US

**Subnations:** AL, AR, FL?, GA, KY, LA, MS, NC, SC, TN, TX, VA

**TNC Ecoregions:** 31:C, 32:P, 38:C, 39:C, 40:C, 41:C, 42:C, 43:C, 44:C, 50:C, 51:C, 52:C, 53:C, 56:C, 57:C, 59:C, 61:C

**ALLIANCE SOURCES**

**References:** Faber-Langendoen et al. 2019b, Penfound 1967, Wright and Fridley 2010

**Author of Concept:** Faber-Langendoen et al. 2019b

**Author of Description:** M. Pyne, in Faber-Langendoen et al. (2013)

**[CEGL004732] *Rubus (argutus, trivialis) - Smilax (glauca, rotundifolia)* Ruderal Shrubland**

Translated Name: (Sawtooth Blackberry, Southern Dewberry) - (Cat Greenbrier, Roundleaf Greenbrier) Ruderal Shrubland

Common Name: **Ruderal Blackberry - Greenbrier Shrub Thicket**

**USNVC CLASSIFICATION**

Division	Southeastern North American Grassland & Shrubland (2.B.2.Nh)
Macrogroup	Southeastern Ruderal Grassland & Shrubland (M307)
Group	Southeastern Ruderal Grassland & Shrubland (G583)
Alliance	<i>Rubus</i> spp. - <i>Prunus</i> spp. - <i>Cornus drummondii</i> Eastern Ruderal Shrubland
Alliance (A3322)	

**ELEMENT CONCEPT**

**Global Summary:** Stands of this successional community develop following disturbance (complete forest canopy removal). These stands are dominated by blackberries/dewberries (*Rubus argutus*, *Rubus trivialis*) and by greenbrier species (*Smilax glauca*, *Smilax rotundifolia*). Many examples include a great variety of tree saplings and other woody species (*Quercus* spp., *Liquidambar styraciflua*, *Acer rubrum*, *Diospyros virginiana*, *Juniperus virginiana* var. *virginiana*, *Rhus copallinum*), herbs (*Solidago* spp., Asteraceae spp., *Helianthus* spp., *Hypericum* spp., *Potentilla simplex*), and grasses (*Andropogon* spp., *Dichanthelium* spp., *Panicum* spp., *Schizachyrium scoparium*, *Lolium* spp., and *Sorghastrum nutans*). Communities that are surrounded by relatively intact ecosystems will tend to have more native species. In the Southern Blue Ridge, at intermediate elevations, *Rubus allegheniensis* may be a component. Those surrounded by old fields or fragmented by development tend to have *Lonicera japonica* and/or *Rosa multiflora* as a codominant vine overtopping much of the blackberry and greenbrier.

**ENVIRONMENTAL DESCRIPTION**

**Global Environment:** This community can exist in both lowlands and uplands that have been cleared but have not been further disturbed by continued mowing or plowing for 3-5 years.

**VEGETATION DESCRIPTION**

**Global Vegetation:** Stands of this association are dominated by blackberries/dewberries (*Rubus argutus*, *Rubus trivialis*) and by greenbrier species (*Smilax glauca*, *Smilax rotundifolia*). In parts of the range, other *Rubus* species may be components (e.g., *Rubus allegheniensis* in the northern and eastern parts of the range). They also contain a great variety of tree saplings and other woody species (e.g., *Quercus* spp., *Liquidambar styraciflua*, *Acer rubrum*, *Rhus copallinum*). Some herbs in central Tennessee examples may include *Solidago* spp., Asteraceae spp., *Helianthus* spp., *Hypericum* spp., *Potentilla simplex*; grasses may include *Andropogon* spp., *Dichanthelium* spp., *Panicum* spp., *Schizachyrium scoparium*, *Lolium* spp., and *Sorghastrum nutans*. Communities that are surrounded by relatively intact ecosystems will tend to have more native species. Those surrounded by old fields or fragmented by development tend to have *Lonicera japonica* and/or *Rosa multiflora* as a codominant vine overtopping much of the blackberry and greenbrier.

**Global Dynamics:** Stands of this successional community develop following disturbance (complete forest canopy removal) followed by a period of no disturbance of 3-5 years.

**MOST ABUNDANT SPECIES**

**Global**

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Shrub/sapling (tall & short)	Liana	<i>Rosa multiflora</i> , <i>Rubus allegheniensis</i> , <i>Rubus argutus</i> , <i>Rubus trivialis</i> , <i>Smilax glauca</i> , <i>Smilax rotundifolia</i>
Herb (field)	Liana	<i>Lonicera japonica</i>

**CHARACTERISTIC SPECIES**

**Global:** *Rubus allegheniensis*, *Rubus argutus*, *Rubus trivialis*, *Smilax glauca*, *Smilax rotundifolia*

**OTHER NOTEWORTHY SPECIES**

**Global: Vulnerable Plants:** *Symphyotrichum georgianum* (G3); **Invasive/Exotic Plants:** *Lonicera japonica* (High/Medium), *Rosa multiflora* (Medium/Low)

**CONSERVATION STATUS RANK**

**Global Rank & Reasons:** GNA (ruderal) (3-Oct-2001). This type represents ruderal successional vegetation dominated by species native to North America.

**RELATED CONCEPTS**

**Global Related Concepts:**

- *Rubus (argutus, trivialis) - Smilax (glauca, rotundifolia)* Shrubland (TNC 1998a) =
- Abandoned Strip Mines (Schmalzer and DeSelm 1982) ><

- Cleared Areas (Schmalzer and DeSelm 1982) ><

#### CLASSIFICATION

**Status:** Standard

**Classification Confidence:** 3 - Weak

**Global Classification Comments:** In sandy parts of the southeastern U.S. Coastal Plain (e.g., Fort Benning, Georgia) the common blackberry is *Rubus cuneifolius*, and it does not form monocultural stands worthy of recognition as a vegetation type. At Arnold Air Force Base, Coffee and Franklin counties, Tennessee, this community is often found in powerline corridors and other areas that have experienced total canopy removal.

#### ELEMENT DISTRIBUTION

**Global Range:** This ruderal successional vegetation could be found throughout the upper southern United States.

**Nations:** US

**States/Provinces:** AL?, GA, KY, MS, NC, SC, TN, VA

**TNC Ecoregions:** 43:C, 44:C, 50:C, 51:C, 52:C, 56:C

**USFS Ecoregions (1994/95):** 221Hc:CCC, 221He:CCC, 222Eb:CCC, 222Ed:CCC, 231Aa:CCC, 231Ae:CCC, 232Ce:CCC, M221Dd:CCC

**USFS Ecoregions (2007):** 221Hc:CCC, 221He:CC?, 223Eb:CCC, 223Ed:CCC, 231Aa:CCP, 231Ic:CCC, 232Ce:CCP, M221Dd:CCC

**Federal Lands:** BIA (Eastern Band of Cherokee); DOD (Arnold); NPS (Appalachian Trail [Southern Blue Ridge], Big South Fork, Blue Ridge Parkway, Chattahoochee River, Chickamauga-Chattanooga?, Cowpens, Cumberland Gap, Great Smoky Mountains, Kings Mountain, Mammoth Cave?, Natchez Trace, Ninety Six, Obed River, Stones River); USFS (Talladega (Oakmulgee)?, Talladega (Talladega)?, Talladega?, Tuskegee?)

#### ELEMENT SOURCES

**Global Description Author(s):** M.J. Russo, R. White and M. Pyne

**References:** NatureServe Ecology - Southeastern U.S. unpubl. data, Nordman 2004a, Peet et al. unpubl. data, Pyne et al. 2010, Schmalzer and DeSelm 1982, Southeastern Ecology Working Group n.d., TNC 1998a, White 2004, White 2006, White and Govus 2003, White and Govus 2005

## 2.C.4. Temperate to Polar Freshwater Marsh, Wet Meadow & Shrubland

### 2.C.4.ND. EASTERN NORTH AMERICAN TEMPERATE FRESHWATER MARSH, WET MEADOW & SHRUBLAND

#### M061. Eastern North American Cool Temperate Seep

##### G184. CENTRAL & SOUTHERN APPALACHIAN SEEP

**Group Summary Description:** Vegetation of this group is associated with wetlands typically found on flat to gently sloping sites in the Southern Blue Ridge, Cumberland Mountains, upper Piedmont, Ridge and Valley, and parts of the Central Appalachians. These wetlands are found over a wide range of elevations and a variety of substrate types, including low-elevation limestone and ultramafic rocks as well as high-elevation acidic rocks. These sites occur at elevations below 1220 m (4000 feet) in poorly drained bottomlands on soils which are often saturated and mucky. Wetness results from a combination of groundwater input, seepage from adjacent slopes, rainfall and impeded drainage. The amount of seepage water input is variable among examples. In a hydrogeomorphic sense these wetlands would be regarded as primarily a slope type, although typically on very gentle slopes. The vegetation is at least partially open, with herbaceous-dominated areas as well as shrub thickets and often forested zones, exhibiting a complex of zones or patches with a mix of physiognomies. The wettest areas have herbaceous vegetation dominated by *Carex* spp., usually with abundant *Sphagnum*. Scattered trees and shrubs may be present in the herbaceous zones. Most examples also have a dense shrub zone around the edges. Some examples have forested zones, as well, around the edges or as a matrix in which numerous small herbaceous openings are embedded. Characteristic tree species include *Acer rubrum*, *Nyssa sylvatica*, *Picea rubens*, *Pinus rigida*, and *Tsuga canadensis*. Characteristic shrubs include *Alnus serrulata*, *Toxicodendron vernix*, and *Viburnum nudum* var. *cassinoides*.

#### A3381 *Carex atlantica* - *Solidago patula* - *Parnassia asarifolia* Seep Alliance

Prickly Bog Sedge - Roundleaf Goldenrod - Kidneyleaf Grass-of-Parnassus Seep Alliance

*Southern Appalachian Acidic Seep*

#### ALLIANCE CONCEPT

**Summary:** This alliance accommodates shrub- and herb-dominated vegetation of Southern Appalachian "bogs," seeps or poor fens, found at a variety of elevations. Physiognomy is variable and may include herbaceous-dominated patches, shrubby areas, and areas

with an open canopy of trees. There may be a mosaic or zoned pattern of shrub thickets and herb-dominated areas, much of it underlain by *Sphagnum* mats. The shrub stratum is open to dense, and is dominated by *Alnus serrulata*, *Kalmia latifolia*, *Lindera benzoin* var. *benzoin*, *Lyonia ligustrina*, *Rhododendron maximum*, and *Vaccinium fuscatum*. Typical herbaceous species include *Carex atlantica*, *Carex folliculata*, *Carex gynandra*, *Carex leptalea*, *Impatiens capensis*, *Juncus gymnocarpus*, *Mimulus ringens*, *Osmunda cinnamomea*, *Oxypolis rigidior*, *Rhynchospora capitellata*, *Rudbeckia laciniata* var. *laciniata*, *Scirpus georgianus*, *Scutellaria lateriflora*, *Solidago patula* var. *patula*, and *Thelypteris noveboracensis*. *Sphagnum* species include *Sphagnum affine*, *Sphagnum bartlettianum*, *Sphagnum palustre*, and *Sphagnum recurvum*. If a tree canopy is present, it will be open and contain species such as *Acer rubrum* var. *trilobum*, *Betula lenta*, *Magnolia tripetala*, and *Nyssa sylvatica*. Examples can be physiognomically mixed or variable, with shrubby examples interspersed with small to moderately large herbaceous openings. Examples may occur in stream headwaters and on the edges of small stream floodplains where groundwater seepage emerges and provides a relatively constant flow and saturated conditions. Examples also occur on slight to fairly steep slopes (1-15%) on shallow soils over bedrock.

#### Similar Alliances:

- *Carex gynandra* - *Glyceria melicaria* - *Glyceria striata* Seep Alliance (A3382)
- *Carex scabrata* - *Chrysosplenium americanum* Seep Alliance (A1685)
- *Diphylleia cymosa* - *Saxifraga micranthidifolia* Seep Alliance (A1688)
- *Eriophorum virginicum* - *Dulichium arundinaceum* - *Carex echinata* Seep Alliance (A3373)
- *Impatiens capensis* - *Symplocarpus foetidus* - *Caltha palustris* Seep Alliance (A3374)
- *Impatiens pallida* - *Equisetum scirpoides* - *Parnassia glauca* Seep Alliance (A1871)
- *Lyonia ligustrina* - *Aronia arbutifolia* / *Drosera rotundifolia* Seep Alliance (A3383)
- *Sanguisorba canadensis* - *Parnassia grandifolia* Seep Alliance (A3384)

#### Related Concepts:

- IIE1b. Southern Appalachian Bog Complex (Allard 1990) ><
- Mountain Bog (Richardson and Gibbons 1993) >
- Southern Appalachian Bog, Long Hope Valley Variant (Weakley and Schafale 1994) ><
- Southern Appalachian Bog, Typic Variant (Weakley and Schafale 1994) ><

#### ALLIANCE DESCRIPTION

**Environment:** These seepage-fed communities occur in the unglaciated southern and central highlands of the eastern United States, on flat to slightly sloping topography, often associated with small streams and rivers. Sites are fed by seepage from the adjacent substrate. Some examples are nearly flat and occur in the higher (rarely or never flooded) portions of the floodplains of creeks or small rivers, and receive minimal seepage. Water levels are very rarely above the ground (*Sphagnum*) surface, but are generally at or slightly below surface level. After extended droughts and late in the summer, the water table may drop substantially below the ground surface.

**Vegetation:** Examples can be physiognomically mixed or variable, with shrubby examples interspersed with small to moderately large herbaceous openings. Typical herbaceous species include *Carex atlantica*, *Carex folliculata*, *Carex gynandra*, *Carex leptalea*, *Carex trisperma*, *Chelone cuthbertii*, *Eriophorum virginicum*, *Houstonia serpyllifolia*, *Impatiens capensis*, *Juncus gymnocarpus*, *Lysimachia terrestris*, *Mimulus ringens*, *Osmunda cinnamomea*, *Oxypolis rigidior*, *Packera aurea* (= *Senecio aureus*), *Parnassia asarifolia*, *Rhynchospora capitellata*, *Rudbeckia laciniata* var. *laciniata*, *Scirpus georgianus*, *Scutellaria lateriflora*, *Solidago patula* var. *patula*, and *Thelypteris noveboracensis*. The low shrub *Vaccinium macrocarpon* may be present. *Sphagnum* species include *Sphagnum affine* (= *Sphagnum imbricatum*), *Sphagnum bartlettianum*, *Sphagnum palustre*, *Sphagnum recurvum*, and *Sphagnum warnstorffii*. The shrub stratum, if present, may be open to dense, and is typically dominated by a combination of *Alnus serrulata*, *Ilex verticillata*, *Kalmia latifolia*, *Lindera benzoin* var. *benzoin*, *Lyonia ligustrina*, *Rhododendron maximum*, *Rosa palustris*, *Salix sericea*, *Spiraea tomentosa*, and *Vaccinium fuscatum*. *Alnus serrulata* may be a strong dominant component, and substantial *Sphagnum* cover may be present under the shrubs. If a tree canopy is present, it will be open and contain species such as *Acer rubrum* var. *trilobum*, *Betula lenta*, *Magnolia tripetala*, and *Nyssa sylvatica*.

**Physiognomy and Structure:** Examples of this non-alluvial, palustrine vegetation can be physiognomically mixed or variable, with shrubby examples interspersed with small to moderately large herbaceous openings.

**Floristics:** Examples can be physiognomically mixed or variable, with shrubby examples interspersed with small to moderately large herbaceous openings. Typical herbaceous species include *Carex atlantica*, *Carex folliculata*, *Carex gynandra*, *Carex leptalea*, *Carex trisperma*, *Chelone cuthbertii*, *Eriophorum virginicum*, *Houstonia serpyllifolia*, *Impatiens capensis*, *Juncus gymnocarpus*, *Lysimachia terrestris*, *Mimulus ringens*, *Osmunda cinnamomea*, *Oxypolis rigidior*, *Packera aurea* (= *Senecio aureus*), *Parnassia asarifolia*, *Rhynchospora capitellata*, *Rudbeckia laciniata* var. *laciniata*, *Scirpus georgianus*, *Scutellaria lateriflora*, *Solidago patula* var. *patula*, and *Thelypteris noveboracensis*. The low shrub *Vaccinium macrocarpon* may be present. *Sphagnum* species include *Sphagnum affine* (= *Sphagnum imbricatum*), *Sphagnum bartlettianum*, *Sphagnum palustre*, *Sphagnum recurvum*, and *Sphagnum warnstorffii*. The shrub stratum, if present, may be open to dense, and is typically dominated by a combination of *Alnus serrulata*, *Ilex verticillata*, *Kalmia latifolia*, *Lindera benzoin* var. *benzoin*, *Lyonia ligustrina*, *Rhododendron maximum*, *Rosa palustris*, *Salix sericea*, *Spiraea tomentosa*, and *Vaccinium fuscatum*. *Alnus serrulata* may be a strong dominant component, and substantial *Sphagnum* cover may be present under the shrubs. If a tree canopy is present, it will be open and contain species such as *Acer rubrum* var. *trilobum*, *Betula lenta*, *Magnolia tripetala*, and *Nyssa sylvatica*.

**Dynamics:** Some occurrences may have formed as the result of logging or catastrophic fire, followed by beaver activity. Reduction of *Sphagnum* cover, due to siltation, trampling, or nutrient input, promotes succession by woody species. Little is known about the

successional dynamics of mountain wetlands. It is thought that beaver may have been responsible for maintaining a shifting mosaic of boggy habitats which included this community (Weakley and Schafale 1994).

#### ALLIANCE DISTRIBUTION

**Range:** This vegetation occurs in the southern Blue Ridge Mountains and adjacent ecoregions of southwestern Virginia, western North Carolina, eastern Tennessee, northeastern Georgia, and northwestern South Carolina.

**Nations:** US

**Subnations:** GA, NC, SC, TN, VA

**TNC Ecoregions:** 50:C, 51:C, 59:C

**USFS Ecoregions (1994/95):** M221Aa:CCC, M221Db:CCC, M221Dc:CCC, M221Dd:CCC

**USFS Ecoregions (2007):** M221Aa:CPP, M221Db:CCC, M221Dc:CCC, M221Dd:CCC

#### ALLIANCE SOURCES

**References:** Allard 1990, Chafin 2011, Faber-Langendoen et al. 2019b, Richardson and Gibbons 1993, Schafale and Weakley 1990, Weakley and Schafale 1994

**Author of Concept:** Faber-Langendoen et al. 2019b

**Author of Description:** M. Pyne, in Faber-Langendoen et al. (2013)

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### [CEGL003909] *Alnus serrulata* - *Lindera benzoin* / *Scutellaria lateriflora* - *Thelypteris noveboracensis* Seepage Shrubland

Translated Name: **Hazel Alder - Northern Spicebush / Blue Skullcap - New York Fern Seepage Shrubland**

Common Name: **Montane Low-Elevation Seep**

#### USNVC CLASSIFICATION

Division Eastern North American Temperate Freshwater Marsh, Wet Meadow & Shrubland (2.C.4.Nd)

Macrogroup Eastern North American Cool Temperate Seep (M061)

Group Central & Southern Appalachian Seep (G184)

Alliance *Carex atlantica* - *Solidago patula* - *Parnassia asarifolia* Seep Alliance (A3381)

#### ELEMENT CONCEPT

**Global Summary:** This low-elevation seep is known from low elevations in the Southern Blue Ridge of North Carolina and Georgia, but is likely more widespread. The type may need substantial revision as more information is collected. This community occurs in stream headwaters and on the edges of small stream floodplains, where groundwater seepage emerges and provides a relatively constant flow and saturated conditions. A small streamlet (less than 1 m wide) flows through the community, and saturated and upland conditions form a mosaic through the remainder of the community. Physiognomy is variable, and may include herbaceous-dominated patches, shrubby areas, and areas with an open canopy of trees. The open to scattered canopy includes species such as *Betula lenta*, *Magnolia tripetala*, *Acer rubrum* var. *trilobum*, and *Nyssa sylvatica*. The shrub stratum is open to dense, and is dominated by *Alnus serrulata*, *Lyonia ligustrina*, *Kalmia latifolia*, *Lindera benzoin* var. *benzoin*, and *Vaccinium fuscatum*. Typical herbaceous species include *Scutellaria lateriflora*, *Thelypteris noveboracensis*, *Mimulus ringens*, *Osmunda cinnamomea*, *Ludwigia palustris*, *Apios americana*, *Oxypolis rigidior*, *Leersia virginica*, *Galium obtusum*, *Viola cucullata*, *Lycopus virginicus*, *Vernonia noveboracensis*, *Boehmeria cylindrica*, *Solidago canadensis*, *Impatiens capensis*, *Scirpus georgianus*, *Hypericum mutilum*, *Rhexia virginica*, *Ludwigia alternifolia*, *Solidago patula* var. *patula*, *Rudbeckia laciniata* var. *laciniata*, *Carex gynandra*, and *Juncus gymnocarpus*.

#### ENVIRONMENTAL DESCRIPTION

**Great Smoky Mountains National Park Environment:** Same as global.

**Global Environment:** This community occurs in stream headwaters and on the edges of small stream floodplains, where groundwater seepage emerges and provides a relatively constant flow and saturated conditions. A small streamlet (less than 1 m wide) flows through the community, and saturated and upland conditions form a mosaic through the remainder of the community.

#### VEGETATION DESCRIPTION

**Great Smoky Mountains National Park Vegetation:** Same as global.

**Global Vegetation:** Physiognomy is variable and may include herbaceous-dominated patches, shrubby areas, and areas with an open canopy of trees. The open to scattered canopy includes species such as *Betula lenta*, *Magnolia tripetala*, *Acer rubrum* var. *trilobum*, and *Nyssa sylvatica*. The shrub stratum is open to dense, and is dominated by *Alnus serrulata*, *Lyonia ligustrina*, *Kalmia latifolia*, *Lindera benzoin* var. *benzoin*, and *Vaccinium fuscatum*. Typical herbaceous species include *Scutellaria lateriflora*, *Thelypteris noveboracensis*, *Mimulus ringens*, *Osmunda cinnamomea*, *Ludwigia palustris*, *Apios americana*, *Oxypolis rigidior*, *Leersia virginica*, *Galium obtusum*, *Viola cucullata*, *Lycopus virginicus*, *Vernonia noveboracensis*, *Boehmeria cylindrica*, *Solidago altissima*, *Impatiens capensis*, *Scirpus georgianus*, *Hypericum mutilum*, *Rhexia virginica*, *Ludwigia alternifolia*, *Solidago patula* var. *patula*, *Rudbeckia laciniata* var. *laciniata*, *Carex gynandra*, and *Juncus gymnocarpus*.

**MOST ABUNDANT SPECIES****Global****Stratum**

Shrub/sapling (tall & short) Broad-leaved deciduous shrub  
 Shrub/sapling (tall & short) Broad-leaved evergreen shrub

**Lifeform****Species**

*Alnus serrulata*, *Lindera benzoin* var. *benzoin*, *Lyonia ligustrina*  
*Kalmia latifolia*

**CHARACTERISTIC SPECIES****Great Smoky Mountains National Park:**

**Global:** *Alnus serrulata*, *Lindera benzoin* var. *benzoin*, *Scutellaria lateriflora*, *Thelypteris noveboracensis*

**OTHER NOTEWORTHY SPECIES**

**Great Smoky Mountains National Park: Other Plants:** *Juncus gymnocarpus* (G4)

**Global: Other Plants:** *Vaccinium fuscum* (G5)

**CONSERVATION STATUS RANK**

**Global Rank & Reasons:** G2? (1-Nov-2002).

**RELATED CONCEPTS****Global Similar Types:**

- *Acer rubrum* / *Alnus serrulata* - *Lindera benzoin* / *Glyceria striata* - *Impatiens capensis* Seep Forest (CEGL007031) apparently a more "forested" version of the same thing or something very similar; they may be combined somehow.

**CLASSIFICATION**

**Status:** Standard

**Classification Confidence:** 3 - Weak

**Global Classification Comments:** More information is needed in order to fully understand the composition and distribution of this type.

**ELEMENT DISTRIBUTION**

**Great Smoky Mountains National Park Range:** Documented by Plot 546, along the Gold Mine Loop Trail, in the area north of Lake Fontana.

**Global Range:** This low-elevation seep is found in the Southern Appalachians at low elevations. It has been documented from North Carolina and Georgia, and is likely to occur in adjacent states (South Carolina, Tennessee).

**Nations:** US

**States/Provinces:** GA, NC, SC, TN?

**TNC Ecoregions:** 51:C

**USFS Ecoregions (1994/95):** M221Dd:CCC

**USFS Ecoregions (2007):** M221Dd:CCC

**Federal Lands:** BIA (Eastern Band of Cherokee); NPS (Appalachian Trail [Southern Blue Ridge], Blue Ridge Parkway?, Great Smoky Mountains); USFS (Chattahoochee, Sumter (Mountains)?)

**ELEMENT SOURCES**

**Great Smoky Mountains National Park Plots:** GRSM.546.

**Great Smoky Mountains National Park Description Author(s):** A.S. Weakley

**Global Description Author(s):** A.S. Weakley

**References:** NatureServe Ecology - Southeastern U.S. unpubl. data, Nelson 1986, Southeastern Ecology Working Group n.d.

**[CEGL003916] *Alnus serrulata* - *Rhododendron viscosum* - *Rhododendron maximum* / *Juncus gymnocarpus* - *Chelone cuthbertii* Seepage Shrubland**

Translated Name: **Hazel Alder - Swamp Azalea - Great Laurel / Pennsylvania Rush - Cuthbert's Turtlehead Seepage Shrubland**

Common Name: **Southern Appalachian Bog (Low-Elevation Type)**

**USNVC CLASSIFICATION**

Division Eastern North American Temperate Freshwater Marsh, Wet Meadow & Shrubland (2.C.4.Nd)

Macrogroup Eastern North American Cool Temperate Seep (M061)

Group Central & Southern Appalachian Seep (G184)

Alliance *Carex atlantica* - *Solidago patula* - *Parnassia asarifolia* Seep Alliance (A3381)

**ELEMENT CONCEPT**

**Global Summary:** This montane wetland occurs as a mosaic or zoned pattern of shrub thickets and herb-dominated areas, much of it underlain by *Sphagnum* mats. All or nearly all examples are flat and occur in the higher portions of the floodplains of creeks or small rivers, receive minimal seepage, and are rarely or never flooded. This community occurs at moderate elevations from about 750-950 m (2400-3200 feet), in the northern part of the Southern Blue Ridge, primarily in Allegheny and Ashe counties, North Carolina. It also

occurs south of the Asheville Basin in southwestern North Carolina and probably in adjacent South Carolina and Georgia at elevations of 900-1200 m (3000-4000 feet). Trees such as *Acer rubrum*, *Liriodendron tulipifera*, *Pinus strobus*, *Tsuga canadensis*, and *Pinus rigida* may be scattered throughout or may dominate in patches or on the edges. Shrubs may include *Alnus serrulata*, *Rosa palustris*, *Salix sericea*, *Aronia arbutifolia*, *Aronia melanocarpa*, *Rhododendron maximum*, *Rhododendron viscosum*, *Kalmia latifolia*, *Kalmia carolina*, *Hypericum densiflorum*, *Lyonia ligustrina*, *Ilex verticillata*, *Spiraea tomentosa*, *Spiraea alba*, and *Menziesia pilosa*. The herb layer may include *Carex leptalea*, *Carex folliculata*, *Carex gynandra*, *Carex atlantica*, *Rhynchospora capitellata*, *Scirpus expansus*, *Scirpus cyperinus*, *Scirpus atrovirens*, *Osmunda cinnamomea*, *Osmunda regalis* var. *spectabilis*, *Solidago patula* var. *patula*, *Packera aurea*, *Thelypteris palustris* var. *pubescens*, *Juncus effusus*, *Juncus subcaudatus*, *Lysimachia terrestris*, *Vaccinium macrocarpon*, *Eriophorum virginicum*, *Oxypolis rigidior*, *Sagittaria latifolia*, and *Orontium aquaticum*. *Sphagnum* species include *Sphagnum palustre*, *Sphagnum affine*, *Sphagnum bartlettianum*, and *Sphagnum recurvum*. Other important bryophytes include *Polytrichum commune*, *Rhizomnium appalachianum*, and *Aulacomnium palustre*.

#### ENVIRONMENTAL DESCRIPTION

**Global Environment:** This community occurs at moderate elevations from about 750-950 m (2400-3200 feet), in the northern part of the Southern Blue Ridge, primarily in Allegheny and Ashe counties, North Carolina. This community also occurs south of the Asheville Basin in southwestern North Carolina and probably adjacent South Carolina and Georgia at elevations of about 900-1200 m (3000-4000 feet). All or nearly all examples are nearly flat and occur in the higher (rarely or never flooded) portions of the floodplains of creeks or small rivers, and receive minimal seepage.

#### VEGETATION DESCRIPTION

**Global Vegetation:** The vegetation generally consists of a mosaic or zoned pattern of shrub thickets and herb-dominated areas, much of it underlain by *Sphagnum* mats. Trees such as *Acer rubrum*, *Liriodendron tulipifera*, *Pinus strobus*, *Tsuga canadensis*, and *Pinus rigida* may be scattered throughout or may dominate in patches or on the edges. Shrubs may include *Alnus serrulata*, *Rosa palustris*, *Salix sericea*, *Aronia arbutifolia*, *Aronia melanocarpa*, *Rhododendron maximum*, *Rhododendron viscosum*, *Kalmia latifolia*, *Kalmia carolina*, *Hypericum densiflorum*, *Lyonia ligustrina*, *Ilex verticillata*, *Spiraea tomentosa*, *Spiraea alba*, and *Menziesia pilosa*. The herb layer may include *Carex leptalea*, *Carex folliculata*, *Carex gynandra*, *Carex atlantica*, *Rhynchospora capitellata*, *Scirpus expansus*, *Scirpus cyperinus*, *Scirpus atrovirens*, *Osmunda cinnamomea*, *Osmunda regalis* var. *spectabilis*, *Solidago patula* var. *patula*, *Packera aurea* (= *Senecio aureus*), *Thelypteris palustris* var. *pubescens*, *Juncus effusus*, *Juncus subcaudatus*, *Lysimachia terrestris*, *Vaccinium macrocarpon*, *Eriophorum virginicum*, *Oxypolis rigidior*, *Sagittaria latifolia* (= var. *pubescens*), and *Orontium aquaticum*. *Sphagnum* species include *Sphagnum palustre*, *Sphagnum affine*, *Sphagnum bartlettianum*, and *Sphagnum recurvum*. Other important bryophytes include *Polytrichum commune*, *Rhizomnium appalachianum*, and *Aulacomnium palustre*. *Eriophorum virginicum* and *Vaccinium macrocarpon*, distributed primarily in the northeastern United States and adjacent Canada, are found at or near the southern limit of their distribution in this community. *Helonias bullata* occurs disjunct from the northern Coastal Plain. *Lilium grayi* is endemic to the Southern Blue Ridge.

**Global Dynamics:** Some occurrences of this community may have formed as the result of logging or catastrophic fire, followed by beaver activity. Reduction of *Sphagnum* cover, due to siltation, trampling, or nutrient input, promotes succession by woody species. Little is known about the successional dynamics of mountain wetlands. It is thought that beaver may have been responsible for maintaining a shifting mosaic of boggy habitats which included this community (Weakley and Schafale 1994). With the extirpation of beaver in the North Carolina mountains, vegetative succession proceeds in these habitats and will eventually result in a forested community.

#### MOST ABUNDANT SPECIES

##### Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Short shrub/sapling	Broad-leaved deciduous tree	<i>Ilex verticillata</i>
Short shrub/sapling	Broad-leaved evergreen tree	<i>Rhododendron maximum</i>
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Aronia arbutifolia</i> , <i>Rhododendron viscosum</i> , <i>Toxicodendron vernix</i>
Herb (field)	Graminoid	<i>Calamagrostis coarctata</i> , <i>Carex</i> spp., <i>Juncus gymnocarpus</i> , <i>Scirpus</i> spp.
Nonvascular	Moss	<i>Sphagnum palustre</i> , <i>Sphagnum recurvum</i>

#### CHARACTERISTIC SPECIES

**Global:** *Calamagrostis coarctata*, *Eupatorium perfoliatum*, *Impatiens capensis*, *Juncus acuminatus*, *Juncus gymnocarpus*, *Lindera benzoin*, *Liriodendron tulipifera*, *Mimulus ringens*, *Onoclea sensibilis*, *Salix nigra*, *Vernonia noveboracensis*

#### OTHER NOTEWORTHY SPECIES

**Global: Vulnerable Plants:** *Carex schweinitzii* (G3G4), *Chelone cuthbertii* (G3, Southern Blue Ridge endemic), *Helonias bullata* (G3), *Lilium grayi* (G1G2, Southern Blue Ridge endemic), *Poa paludigena* (G3G4); **Other Plants:** *Eriophorum virginicum* (G5, at or near the southern limit of its distribution in this community), *Helenium brevifolium* (G4), *Rudbeckia laciniata* var. *digitata* (G5TNR, (= var. *humilis*)), *Vaccinium macrocarpon* (G5, at or near the southern limit of its distribution in this community)

**CONSERVATION STATUS RANK**

**Global Rank & Reasons:** G1G2 (30-Apr-1998). This community occurs at moderate elevations (750-950 meters; 2400-3200 feet), in the northern part of the Southern Blue Ridge, primarily in Allegheny and Ashe counties, North Carolina. It also occurs south of the Asheville Basin in southwestern North Carolina and probably adjacent South Carolina and Georgia. Few examples remain, and many of these are in degraded condition. Threats include grazing, agricultural inputs, aerial deposition of air pollutants, and watershed alteration, including road building and development, all which can alter the natural hydrologic regime.

**RELATED CONCEPTS****Global Related Concepts:**

- Acidic Bog (Wichmann 2009) >
- IIE1b. Southern Appalachian Bog Complex (Allard 1990) >
- Low Elevation Bog (Wichmann 2009) ><
- Southern Appalachian Bog, Low Elevation Variant (Weakley and Schafale 1994) ?
- Southern Appalachian Bog, Southern Floodplain Variant (Weakley and Schafale 1994) ?

**CLASSIFICATION**

**Status:** Standard

**Classification Confidence:** 2 - Moderate

**Global Classification Comments:** The nominals are used to distinguish this type from high-elevation bogs; *Juncus gymnocarpus* is not in all occurrences and perhaps another nominal should be found. *Carex stricta*-dominated wetlands may occur adjacent to this community. Similar wetland communities occur in the southern and central Appalachian Mountains. This community typically occurs at lower elevations, is associated with floodplains, and lacks species characteristic of higher elevations, such as *Houstonia serpyllifolia*, *Picea rubens*, *Betula alleghaniensis*, and *Carex trisperma*.

**ELEMENT DISTRIBUTION**

**Global Range:** This community is known from the northern part of the Southern Blue Ridge, primarily in Allegheny and Ashe counties, North Carolina, and in Monroe County, Tennessee. It also occurs south of the Asheville Basin in southwestern North Carolina and probably in adjacent South Carolina and Georgia.

**Nations:** US

**States/Provinces:** GA, NC, SC, TN

**TNC Ecoregions:** 51:C, 59:C

**USFS Ecoregions (1994/95):** M221Db:CCC, M221Dc:CCC, M221Dd:CCC

**USFS Ecoregions (2007):** M221Db:CCC, M221Dc:CCC, M221Dd:CCC

**Federal Lands:** NPS (Blue Ridge Parkway, Great Smoky Mountains); USFS (Chattahoochee, Chattahoochee (Southern Blue Ridge), Cherokee, Nantahala, Pisgah?, Sumter (Mountains)?, Sumter?)

**ELEMENT SOURCES**

**Global Description Author(s):** A.S. Weakley and K.D. Patterson

**References:** Allard 1990, Chafin 2011, NatureServe Ecology - Southeastern U.S. unpubl. data, Nelson 1986, Peet et al. unpubl. data, Schafale 2012, Schafale and Weakley 1990, Southeastern Ecology Working Group n.d., Weakley 1993, Weakley and Schafale 1994, Weakley and Schafale 1994, Wichmann 2009

**[CEGL004156] *Carex (atlantica, echinata, leptalea, lurida) - Solidago patula* Herbaceous Seep**

Translated Name: (Prickly Bog Sedge, Star Sedge, Bristly-stalk Sedge, Shallow Sedge) - Roundleaf Goldenrod Herbaceous Seep

Common Name: Southern Appalachian Herb Bog (Low-Elevation Type)

**USNVC CLASSIFICATION**

Division	Eastern North American Temperate Freshwater Marsh, Wet Meadow & Shrubland (2.C.4.Nd)
Macrogroup	Eastern North American Cool Temperate Seep (M061)
Group	Central & Southern Appalachian Seep (G184)
Alliance	<i>Carex atlantica - Solidago patula - Parnassia asarifolia</i> Seep Alliance (A3381)

**ELEMENT CONCEPT**

**Global Summary:** This broadly defined type represents the least floristically distinctive Southern Appalachian herb bog vegetation, occurring most typically peripheral to the main bulk of the Appalachians and at lower elevations. It generally lacks distinctive Southern Appalachian endemic components and also is depauperate in northern disjunct species (as compared to other associations in the alliance). The shrub stratum may be patchy or locally well-developed, and consists of species such as *Spiraea tomentosa*, *Kalmia latifolia*, *Lindera benzoin* var. *benzoin*, *Lyonia ligustrina* var. *ligustrina*, and *Alnus serrulata*. Typical dominants in the well-developed herbaceous stratum are *Carex atlantica*, *Carex folliculata*, *Carex intumescens*, *Carex leptalea*, *Carex lurida*, *Osmunda cinnamomea*, and *Solidago patula* var. *patula*. *Sphagnum* is common.

**ENVIRONMENTAL DESCRIPTION**

**Global Environment:** This community occurs associated with small streams or rivers, and the saturated hydrology is maintained by groundwater seepage. Less typically, this community may occur away from rivers or streams on slight to moderate slopes with a strong seepage source.

**VEGETATION DESCRIPTION**

**Global Vegetation:** This broadly defined type generally lacks distinctive Southern Appalachian endemic components and also is depauperate in northern disjunct species (as compared to other associations in the alliance). Scattered trees may be present, especially *Acer rubrum* and *Liriodendron tulipifera*. The shrub stratum may be patchy or locally well-developed, and consists of species such as *Alnus serrulata*, *Kalmia latifolia*, *Lindera benzoin* var. *benzoin*, *Lyonia ligustrina* var. *ligustrina*, *Aronia arbutifolia*, *Rosa palustris*, and *Spiraea tomentosa*. Typical dominants in the well-developed herbaceous stratum are *Carex atlantica*, *Carex folliculata*, *Carex intumescens*, *Carex leptalea*, *Carex lurida*, *Osmunda cinnamomea*, and *Solidago patula*. *Sphagnum* is common. Other herbaceous species may include *Apios americana*, *Arisaema triphyllum*, *Chelone glabra*, *Eutrochium fistulosum* (= *Eupatorium fistulosum*), *Eupatorium perfoliatum*, *Glyceria melicaria*, *Hypericum mutilum*, *Impatiens capensis*, *Juncus effusus*, *Lobelia siphilitica*, *Ludwigia alternifolia*, *Lycopus* sp., *Onoclea sensibilis*, *Parnassia asarifolia*, *Platanthera clavellata*, *Polygonum sagittatum*, *Scirpus expansus*, *Symphotrichum puniceum* (= *Aster puniceus*), *Thelypteris noveboracensis*, and *Viola cucullata*.

**MOST ABUNDANT SPECIES****Global****Stratum**

Herb (field)

Herb (field)

**Lifeform**

Flowering forb

Graminoid

**Species***Solidago patula**Carex atlantica*, *Carex leptalea*, *Carex lurida***CHARACTERISTIC SPECIES**

**Global:** *Carex atlantica*, *Carex leptalea*, *Carex lurida*, *Solidago patula*

**OTHER NOTEWORTHY SPECIES**

**Global:**

**CONSERVATION STATUS RANK**

**Global Rank & Reasons:** G1 (16-Jan-2001). This association is broadly defined, yet still encompasses very few occurrences, all of which are small. Additionally, nearly all occurrences are highly threatened by hydrologic alteration, timber harvest on adjacent lands, siltation, and ditching and draining. Probably less than 200 acres total of this association remain. It was naturally very limited in occurrence, and has been further reduced in extent and condition.

**RELATED CONCEPTS****Global Related Concepts:**

- Acidic Bog (Wichmann 2009) >
- II31a. Southern Appalachian Bog Complex (Allard 1990) >
- Low Elevation Herbaceous Bog (Wichmann et al. 2007) <

**CLASSIFICATION**

**Status:** Standard

**Classification Confidence:** 2 - Moderate

**Global Classification Comments:** The only documented occurrence of this type in Virginia to date was from plots taken at the Blue Ridge Parkway. Classification of plots documenting its occurrence there are under review.

**ELEMENT DISTRIBUTION**

**Global Range:** This broadly defined type is peripheral to the main bulk of the Appalachians and is found only at lower elevations. It is not found in West Virginia (E. Byers pers. comm.).

**Nations:** US

**States/Provinces:** GA, SC, TN, VA?

**TNC Ecoregions:** 50:?, 51:C

**USFS Ecoregions (1994/95):** M221Dc:CCC, M221Dd:CCC

**USFS Ecoregions (2007):** M221Dc:CCC, M221Dd:CCC

**Federal Lands:** NPS (Blue Ridge Parkway?, Great Smoky Mountains); USFS (Chattahoochee, Chattahoochee (Southern Blue Ridge), Cherokee, Pisgah, Sumter (Mountains)?)

**ELEMENT SOURCES**

**Global Description Author(s):** A.S. Weakley

**References:** Allard 1990, NatureServe Ecology - Southeastern U.S. unpubl. data, Nelson 1986, Southeastern Ecology Working Group n.d., TDNH unpubl. data 2018, Wichmann 2009, Wichmann et al. 2007, Wichmann et al. 2007

**[CEGL003849] *Rhododendron maximum* / *Sphagnum* spp. Seepage Shrubland**Translated Name: **Great Laurel / Peatmoss species Seepage Shrubland**Common Name: **Southern Appalachian Bog (Rhododendron Type)****USNVC CLASSIFICATION**

Division Eastern North American Temperate Freshwater Marsh, Wet Meadow & Shrubland (2.C.4.Nd)  
 Macrogroup Eastern North American Cool Temperate Seep (M061)  
 Group Central & Southern Appalachian Seep (G184)  
 Alliance *Carex atlantica* - *Solidago patula* - *Parnassia asarifolia* Seep Alliance (A3381)

**ELEMENT CONCEPT**

**Global Summary:** This wetland shrubland with saturated substrates is found on mountain stream floodplains. This association includes some bogs in the Southern Appalachians and does not extend into the Piedmont. Stands are dominated by *Rhododendron maximum* with *Kalmia latifolia* and *Ilex opaca*. There may be limited coverage by *Sphagnum* spp., but peat development is typical. In addition, *Chelone* sp. may be present in the ground layer.

**ENVIRONMENTAL DESCRIPTION**

**Global Environment:** This shrubland occurs on saturated substrates within mountain stream floodplains.

**VEGETATION DESCRIPTION**

**Global Vegetation:** Stands are dominated by *Rhododendron maximum* with *Kalmia latifolia* and *Ilex opaca*. There may be limited coverage by *Sphagnum* spp., but peat development is typical. In addition, *Chelone* sp. may be present in the ground layer.

**MOST ABUNDANT SPECIES****Global****Stratum**

Shrub/sapling (tall & short)  
 Nonvascular

**Lifeform**

Broad-leaved evergreen shrub  
 Moss

**Species**

*Ilex opaca*, *Kalmia latifolia*, *Rhododendron maximum*  
*Sphagnum* sp.

**CHARACTERISTIC SPECIES**

**Global:** *Chelone* sp., *Rhododendron maximum*, *Sphagnum* sp.

**OTHER NOTEWORTHY SPECIES**

**Global:**

**CONSERVATION STATUS RANK**

**Global Rank & Reasons:** G2G3Q (31-Dec-1997). Bogs, in general, are uncommon and highly threatened in the Southern Blue Ridge. Few examples remain, and many of these are in degraded condition. Threats include grazing, agricultural inputs, aerial deposition of air pollutants, and watershed alteration, including road building and development, all which can alter the natural hydrologic regime. This association needs further taxonomic assessment in order to better distinguish it from other bog communities.

**RELATED CONCEPTS****Global Similar Types:**

- *Carex atlantica* - *Solidago patula* var. *patula* - *Lilium grayi* / *Sphagnum bartlettianum* Herbaceous Seep (CEGL004158)

**Global Related Concepts:**

- IIE1a. Southern Appalachian Bog Complex (Allard 1990) >

**CLASSIFICATION**

**Status:** Standard

**Classification Confidence:** 3 - Weak

**Global Classification Comments:** Southern Blue Ridge shrub bogs of Virginia are treated as *Rhododendron (maximum, catawbiense)* - *Ilex collina* - *Salix sericea* / *Eriophorum virginicum* Seepage Shrubland (CEGL003913).

**ELEMENT DISTRIBUTION**

**Global Range:** This association includes some bogs in the Southern Appalachians and does not extend into the Piedmont. North Carolina and Virginia do not recognize it, so it is at least conceptually restricted to Georgia and Tennessee.

**Nations:** US

**States/Provinces:** GA, TN

**TNC Ecoregions:** 51:C

**USFS Ecoregions (1994/95):** M221Aa:CCC, M221Db:CCP, M221Dc:CCC, M221Dd:CC?

**USFS Ecoregions (2007):** M221Aa:CCP, M221Db:CCP, M221Dc:CCC, M221Dd:CC?

**Federal Lands:** NPS (Appalachian Trail [Southern Blue Ridge], Blue Ridge Parkway?, Great Smoky Mountains)

**ELEMENT SOURCES**

**Global Description Author(s):** M.P. Schafale, A.S. Weakley, K.D. Patterson

**References:** Allard 1990, Southeastern Ecology Working Group n.d.

**[CEPS009726] *Carex* spp. - *Solidago patula* - *Osmunda cinnamomea* / *Sphagnum* spp. Seep**

Translated Name: **Sedge species - Rough-leaved Goldenrod - Cinnamon Fern / Sphagnum Seep**

Common Name: **Montane Low-Elevation Seep (Springhead/Disturbed Type)**

Great Smoky Mountains National Park Name: **Old Homestead Seep**

**USNVC CLASSIFICATION**

Division	Eastern North American Temperate Freshwater Marsh, Wet Meadow & Shrubland (2.C.4.Nd)
Macrogroup	Eastern North American Cool Temperate Seep (M061)
Group	Central & Southern Appalachian Seep (G184)
Alliance	<i>Carex atlantica</i> - <i>Solidago patula</i> - <i>Parnassia asarifolia</i> Seep Alliance (A3381)

**ELEMENT CONCEPT**

**Global Summary:** This vegetation type is a small patch mucky seep that occurs in low elevation areas of Great Smokies National Park, generally along streamsides in relatively flat areas. This type is thought to be an artifact of past human disturbance, most likely natural springs that were expanded near homesteads and which have recolonized with native plants, especially *Carex crinita*, *Carex gynandra*, *Scirpus* spp., *Osmunda cinnamomea*, *Solidago patula* var. *patula*, and occasionally *Juncus* spp. This is a small wetland always overtopped by canopy trees from adjacent upland communities, generally with some combination of *Acer rubrum*, *Liriodendron tulipifera*, *Juglans nigra*, *Prunus serotina*, or other hardwoods.

**ENVIRONMENTAL DESCRIPTION**

**Global Environment:** This small patch seep occurs in low elevation areas of Great Smokies National Park, generally along streamsides in relatively flat areas.

**VEGETATION DESCRIPTION**

**Global Vegetation:** Occurrences are dominated by *Carex crinita*, *Carex gynandra*, *Scirpus* spp., *Osmunda cinnamomea*, *Solidago patula* var. *patula*, and occasionally *Juncus* spp. This small patch type is always overtopped by canopy trees from adjacent upland communities, generally some combination of *Acer rubrum*, *Liriodendron tulipifera*, *Juglans nigra*, *Prunus serotina*, etc.

**Global Dynamics:** This type is thought to be an artifact of past human disturbance, or it may represent a degraded form of a more widespread native type.

**MOST ABUNDANT SPECIES**

**CHARACTERISTIC SPECIES**

**Global:**

**OTHER NOTEWORTHY SPECIES**

**Global:**

**CONSERVATION STATUS RANK**

**Global Rank & Reasons:** GNR (6-Oct-2016). This type may be an artifact of human disturbance, or may represent a degraded condition of a more widespread native type. It is not rankable until its concept is assessed more widely.

**RELATED CONCEPTS**

**Global Similar Types:**

- *Alnus serrulata* - *Lindera benzoin* / *Scutellaria lateriflora* - *Thelypteris noveboracensis* Seepage Shrubland (CEGL003909) is likely a more natural, less disturbed version of this community.

**CLASSIFICATION**

**Status:** Nonstandard

**Classification Confidence:** 3 - Weak

**Global Classification Comments:** This type does not have sufficient data to allow for its acceptance into the USNVC at this time. In the Great Smoky Mountain National Park project (Hop et al. 2021), this type is locally called "Old Homestead Seep." It is a placeholder for a disturbed/homestead area, low-elevation, wetland type that was consistently a poor fit for either Montane Low-Elevation Seep (*Alnus serrulata* - *Lindera benzoin* / *Scutellaria lateriflora* - *Thelypteris noveboracensis* Seepage Shrubland (CEGL003909)) or Southern Appalachian Wet Seepage Meadow (*Glyceria striata* - *Carex gynandra* - *Chelone glabra* - *Symphotrichum puniceum* / *Sphagnum* spp. Herbaceous Seep (CEGL008438)).

**ELEMENT DISTRIBUTION**

**Global Range:** North Carolina. Appears to be restricted to the Southern Blue Ridge.

**Nations:** US

**States/Provinces:** NC

**TNC Ecoregions:** 51:C

**USFS Ecoregions (2007):** M221Dd:CCC

Federal Lands: NPS (Great Smoky Mountains)

## ELEMENT SOURCES

Global Description Author(s): Rickie White

References: Hop et. al 2021, Southeastern Ecology Working Group n.d.

**A3382 Carex gynandra - Glyceria melicaria - Glyceria striata Seep Alliance**

Nodding Sedge - Melic Mannagrass - Fowl Mannagrass Seep Alliance

*Southern Appalachian Herbaceous Seep*

## ALLIANCE CONCEPT

**Summary:** These are Southern Appalachian, primarily high-elevation seeps and other non-alluvial wetlands found on a variety of sites associated with groundwater seepage. Some characteristic herbaceous species include *Calopogon* sp., *Carex atlantica*, *Carex gynandra*, *Carex leptalea* ssp. *harperi*, *Carex lurida*, *Carex scoparia* var. *scoparia*, *Carex stipata*, *Chelone glabra*, *Doellingeria umbellata*, *Dryopteris cristata*, *Eriophorum virginicum*, *Glyceria melicaria*, *Glyceria striata*, *Impatiens capensis*, *Lycopus virginicus*, *Lygodium palmatum*, *Platanthera clavellata*, *Platanthera flava* var. *flava*, *Pogonia ophioglossoides*, *Osmunda cinnamomea*, *Osmunda regalis* var. *spectabilis*, *Oxypolis rigidior*, *Polygonum sagittatum*, *Solidago patula* var. *patula*, *Solidago rugosa*, and *Solidago uliginosa*. *Sphagnum* spp. may occur in mats and include *Sphagnum palustre* and *Sphagnum recurvum*. Shrubs can occur as scattered clumps or zones and include *Hypericum densiflorum*, *Ilex opaca*, *Kalmia latifolia*, *Aronia arbutifolia*, *Rhododendron maximum*, *Salix sericea*, and *Viburnum nudum* var. *cassinoides*. At higher elevations, component species may include *Calamagrostis cainii*, *Carex debilis*, *Carex misera*, *Carex ruthii*, *Dennstaedtia punctilobula*, *Gentiana linearis*, *Glyceria nubigena*, *Hypericum graveolens*, *Krigia montana*, *Parnassia asarifolia*, and *Solidago glomerata*. Woody species in these examples include *Abies fraseri*, *Picea rubens*, *Prunus pennsylvanica*, *Rhododendron catawbiense*, *Rubus canadensis*, and *Vaccinium erythrocarpum*. Sites are influenced by high rainfall and low evaporation rates in the mountainous landscapes. Examples may be small-scale patches. These non-alluvial wetlands are generally graminoid-dominated but may have significant coverage by trees or shrubs, especially around their edges. Particularly small examples may be completely shaded by trees within the community occurrence and in the adjacent forests. Examples of this alliance may occur on a variety of sites associated with groundwater seepage. These include areas of flat to very gently sloping topography (0-2°) located near streams, in flats away from the immediate streambed, along wetland margins, and in seepage-fed oxbow fens. These small palustrine, open seeps generally occur at higher elevations, greater than 1200 m [4000 feet]), on upper slopes and ridgetops. Some associations occur on pronounced slopes at elevations over 1525 m (5000 feet).

**Similar Alliances:**

- *Carex atlantica* - *Solidago patula* - *Parnassia asarifolia* Seep Alliance (A3381)
- *Carex scabrata* - *Chrysosplenium americanum* Seep Alliance (A1685)
- *Diphylleia cymosa* - *Saxifraga micranthidifolia* Seep Alliance (A1688)
- *Eriophorum virginicum* - *Dulichium arundinaceum* - *Carex echinata* Seep Alliance (A3373)
- *Impatiens capensis* - *Symplocarpus foetidus* - *Caltha palustris* Seep Alliance (A3374)
- *Impatiens pallida* - *Equisetum scirpoides* - *Parnassia glauca* Seep Alliance (A1871)
- *Lyonia ligustrina* - *Aronia arbutifolia* / *Drosera rotundifolia* Seep Alliance (A3383)
- *Sanguisorba canadensis* - *Parnassia grandifolia* Seep Alliance (A3384)

**Diagnostic Characteristics:** These are Southern Appalachian herbaceous seeps. This group of associations is not very "boggy" (i.e., they do not have a particularly organic or mucky soil, and are not "rich" or mafic in their soil and water chemistry). They are primarily graminoid-dominated but one distinctive association (CEGL004293) is forb-dominated.

**Related Concepts:**

- *Carex gynandra* Wetland (Newell and Peet 1996a) ?
- *Carex ruthii* Wetland (Newell and Peet 1996a) ?
- IID3a. Herbaceous High Elevation Seepage Slope (Allard 1990) ><

## ALLIANCE DESCRIPTION

**Environment:** Examples of this alliance may occur on a variety of sites associated with groundwater seepage. These include areas of flat to very gently sloping topography (0-2°) located near streams, in flats away from the immediate streambed, along wetland margins, and in seepage-fed oxbow fens. These small palustrine, open seeps generally occur at higher elevations, greater than 1200 m [4000 feet]), on upper slopes and ridgetops. Some associations occur on pronounced slopes at elevations over 1525 m (5000 feet).

**Vegetation:** Some characteristic herbaceous species include *Calopogon* sp., *Carex atlantica*, *Carex gynandra*, *Carex leptalea* ssp. *harperi*, *Carex lurida*, *Carex scoparia* var. *scoparia*, *Carex stipata*, *Chelone glabra*, *Doellingeria umbellata* (= *Aster umbellatus*), *Dryopteris cristata*, *Eriophorum virginicum*, *Glyceria melicaria*, *Glyceria striata*, *Impatiens capensis*, *Lycopus virginicus*, *Lygodium palmatum*, *Platanthera clavellata*, *Platanthera flava* var. *flava*, *Pogonia ophioglossoides*, *Osmunda cinnamomea*, *Osmunda regalis* var. *spectabilis*, *Oxypolis rigidior*, *Polygonum sagittatum*, *Solidago patula* var. *patula*, *Solidago rugosa*, and *Solidago uliginosa*. *Sphagnum* spp. may occur in mats and include *Sphagnum palustre* and *Sphagnum recurvum*. One distinctive association is forb-dominated. Its stands may lack extensive *Sphagnum* and include *Aconitum reclinatum*, *Cardamine clematitidis*, *Carex debilis* var. *rudgei* (= *Carex flexuosa*), *Carex leptonevia*, *Carex ruthii*, *Chelone lyonii*, *Cicuta maculata*, *Claytonia caroliniana*, *Conioselinum chinense*, *Euonymus obovatus*, *Geum geniculatum*, *Helenium autumnale*, *Houstonia serpyllifolia*, *Lilium superbum*, *Lilium grayi*,

*Packera aurea* (= *Senecio aureus*), *Solidago patula*, *Thalictrum clavatum*, *Trautvetteria caroliniensis*, *Veratrum viride*, *Viola cucullata*, and *Viola macloskeyi* ssp. *pallens*. Shrubs can occur as scattered clumps or zones and include *Hypericum densiflorum*, *Ilex opaca*, *Kalmia latifolia*, *Aronia arbutifolia*, *Rhododendron maximum*, *Salix sericea*, and *Viburnum nudum* var. *cassinoides*. At higher elevations, component species may include *Calamagrostis cainii*, *Carex debilis*, *Carex misera*, *Carex ruthii*, *Dennstaedtia punctilobula*, *Gentiana linearis*, *Glyceria nubigena*, *Hypericum graveolens*, *Krigia montana*, *Parnassia asarifolia*, and *Solidago glomerata*. Woody species in these examples include *Abies fraseri*, *Picea rubens*, *Prunus pensylvanica*, *Rhododendron catawbiense*, *Rubus canadensis*, and *Vaccinium erythrocarpum*.

**Physiognomy and Structure:** Examples may be small-scale patches. Examples are generally graminoid-dominated but may have significant coverage by trees or shrubs, especially around their edges. Shrubs can occur as scattered clumps or zones. One distinctive association (CEGL004293) is forb-dominated. Particularly small examples may be completely shaded by trees within the community occurrence and in the adjacent forests. Some component associations have well-developed *Sphagnum* mats.

**Floristics:** Some characteristic herbaceous species include *Calopogon* sp., *Carex atlantica*, *Carex gynandra*, *Carex leptalea* ssp. *harperi*, *Carex lurida*, *Carex scoparia* var. *scoparia*, *Carex stipata*, *Chelone glabra*, *Doellingeria umbellata* (= *Aster umbellatus*), *Dryopteris cristata*, *Eriophorum virginicum*, *Glyceria melicaria*, *Glyceria striata*, *Impatiens capensis*, *Lycopus virginicus*, *Lygodium palmatum*, *Platanthera clavellata*, *Platanthera flava* var. *flava*, *Pogonia ophioglossoides*, *Osmunda cinnamomea*, *Osmunda regalis* var. *spectabilis*, *Oxypolis rigidior*, *Polygonum sagittatum*, *Solidago patula* var. *patula*, *Solidago rugosa*, and *Solidago uliginosa*. *Sphagnum* spp. may occur in mats and include *Sphagnum palustre* and *Sphagnum recurvum*. One distinctive association is forb-dominated. Its stands may lack extensive *Sphagnum* and include *Aconitum reclinatum*, *Cardamine clematidis*, *Carex debilis* var. *ridgei* (= *Carex flexuosa*), *Carex leptonevia*, *Carex ruthii*, *Chelone lyonii*, *Cicuta maculata*, *Claytonia caroliniana*, *Conioselinum chinense*, *Euonymus obovatus*, *Geum geniculatum*, *Helenium autumnale*, *Houstonia serpyllifolia*, *Lilium superbum*, *Lilium grayi*, *Packera aurea* (= *Senecio aureus*), *Solidago patula*, *Thalictrum clavatum*, *Trautvetteria caroliniensis*, *Veratrum viride*, *Viola cucullata*, and *Viola macloskeyi* ssp. *pallens*. Shrubs can occur as scattered clumps or zones and include *Hypericum densiflorum*, *Ilex opaca*, *Kalmia latifolia*, *Aronia arbutifolia*, *Rhododendron maximum*, *Salix sericea*, and *Viburnum nudum* var. *cassinoides*. At higher elevations, component species may include *Calamagrostis cainii*, *Carex debilis*, *Carex misera*, *Carex ruthii*, *Dennstaedtia punctilobula*, *Gentiana linearis*, *Glyceria nubigena*, *Hypericum graveolens*, *Krigia montana*, *Parnassia asarifolia*, and *Solidago glomerata*. Woody species in these examples include *Abies fraseri*, *Picea rubens*, *Prunus pensylvanica*, *Rhododendron catawbiense*, *Rubus canadensis*, and *Vaccinium erythrocarpum*.

**Dynamics:** Sites are influenced by the high rainfall and low evaporation rates in the mountainous landscapes. Some areas can be modified by beaver activity, though they do not appear to be formed by beavers.

#### ALLIANCE DISTRIBUTION

**Range:** This vegetation occurs at moderate to high elevations in the southern Blue Ridge Mountains and adjacent ecoregions of West Virginia, eastern Kentucky, southwestern Virginia, western North Carolina, northwestern South Carolina, eastern Tennessee, and northern Georgia. It may be found in northern Alabama as well.

**Nations:** US

**Subnations:** AL?, GA, KY, NC, SC, TN, VA, WV

**TNC Ecoregions:** 50:C, 51:C, 59:C

**USFS Ecoregions (1994/95):** M221Ba:CCC, M221Bb:CCC, M221Bc:CCC, M221Da:CCC, M221Db:CCC, M221Dc:CCC, M221Dd:CCC

**USFS Ecoregions (2007):** M221Ba:CCC, M221Bb:CCC, M221Bc:CCC, M221Da:CCC, M221Db:CCC, M221Dc:CCC, M221Dd:CCC

#### ALLIANCE SOURCES

**References:** Allard 1990, Faber-Langendoen et al. 2019b, Feldcamp 1984, Nelson 1986, Newell and Peet 1996a, Schafale and Weakley 1990, Schafale pers. comm., Southeastern Ecology Working Group n.d., Weakley 1980

**Author of Concept:** Faber-Langendoen et al. 2019b

**Author of Description:** M. Pyne, in Faber-Langendoen et al. (2013)

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**[CEGL007877] *Calamagrostis cainii* - *Carex ruthii* - *Parnassia asarifolia* / *Sphagnum* spp. Herbaceous Seep**  
Translated Name: **Cain's Reedgrass - Ruth's Sedge - Kidneyleaf Grass-of-Parnassus / Peatmoss species Herbaceous Seep**  
Common Name: **Blue Ridge High-Elevation Seep (Mt. Le Conte Type)**

#### USNVC CLASSIFICATION

Division	Eastern North American Temperate Freshwater Marsh, Wet Meadow & Shrubland (2.C.4.Nd)
Macrogroup	Eastern North American Cool Temperate Seep (M061)
Group	Central & Southern Appalachian Seep (G184)
Alliance	<i>Carex gynandra</i> - <i>Glyceria melicaria</i> - <i>Glyceria striata</i> Seep Alliance (A3382)

#### ELEMENT CONCEPT

**Global Summary:** This is a herbaceous-dominated seepage slope community, 1-2 acres in size. It is known from a single location on Mount Le Conte in the Great Smoky Mountains of Tennessee. This community occurs on a steep, south-facing, exposed slope, at 1830 m (6000 feet) elevation. The site is thought to be a former landslide scar. It is a perennial seep, with small rock outcroppings. This

community occurs in the spruce-fir zone and is adjacent to forests affected by balsam woolly adelgid (*Adelges piceae*). The vegetation is open with little or no shading by the surrounding forest. Graminoid species have almost continuous coverage, growing within large mats of *Sphagnum*. It is strongly dominated by *Calamagrostis cainii*. Other species with moderate coverage include *Carex ruthii*, *Carex misera*, *Gentiana linearis*, and *Dennstaedtia punctilobula*. Additional herbaceous species include *Carex debilis*, *Glyceria nubigena*, *Hypericum graveolens*, *Krigia montana*, *Parnassia asarifolia*, and *Solidago glomerata*. Shrubs and small trees may be scattered within the seep but are more prominent around the perimeter. Woody species include *Abies fraseri*, *Picea rubens*, *Prunus pensylvanica*, *Rhododendron catawbiense*, *Rubus canadensis*, and *Vaccinium erythrocarpum*.

#### ENVIRONMENTAL DESCRIPTION

**Great Smoky Mountains National Park Environment:** This community occurs on a steep, south-facing, exposed slope, at 6000 feet elevation. The site is thought to be a former landslide scar (Feldcamp 1984). It is a perennial seep, with small rock outcroppings. This community occurs in the spruce - fir zone and is adjacent to forests affected by Balsam Woolly Adelgid (*Adelges piceae*).

**Global Environment:** This is a herbaceous-dominated seepage slope community, 1-2 acres in size. It is known from a single location on Mount Le Conte in the Great Smoky Mountains of Tennessee. This community occurs on a steep, south-facing, exposed slope, at 1830 m (6000 feet) elevation. The site is thought to be a former landslide scar (Feldcamp 1984). It is a perennial seep, with small rock outcroppings. This community occurs in the spruce-fir zone and is adjacent to forests affected by balsam woolly adelgid (*Adelges piceae*).

#### VEGETATION DESCRIPTION

**Great Smoky Mountains National Park Vegetation:** This is a herbaceous-dominated seepage slope, one to two acres in size. The vegetation is open with little or no shading by the surrounding forest. Graminoid species have almost continuous coverage, growing within large mats of *Sphagnum*. It is strongly dominated by *Calamagrostis cainii*. Other species with moderate coverage include *Carex ruthii*, *Carex misera*, *Gentiana linearis*, and *Dennstaedtia punctilobula*. Additional herbaceous species include *Carex debilis*, *Glyceria nubigena*, *Hypericum graveolens*, *Krigia montana*, *Parnassia asarifolia*, and *Solidago glomerata*. Shrubs and small trees may be scattered within the seep but are more prominent around the perimeter. Woody species include *Abies fraseri*, *Picea rubens*, *Prunus pensylvanica*, *Rhododendron catawbiense*, *Rubus canadensis*, and *Vaccinium erythrocarpum*.

**Global Vegetation:** Stands of this vegetation type are open with little or no shading by the surrounding forest. Graminoid species have almost continuous coverage, growing within large mats of *Sphagnum*. Examples are strongly dominated by *Calamagrostis cainii*. Other species with moderate coverage include *Carex ruthii*, *Carex misera*, *Gentiana linearis*, and *Dennstaedtia punctilobula*. Additional herbaceous species include *Carex debilis*, *Glyceria nubigena*, *Hypericum graveolens*, *Krigia montana*, *Parnassia asarifolia*, and *Solidago glomerata* (Feldcamp 1984). Shrubs and small trees may be scattered within the seep but are more prominent around the perimeter. Woody species include *Abies fraseri*, *Picea rubens*, *Prunus pensylvanica*, *Rhododendron catawbiense*, *Rubus canadensis*, and *Vaccinium erythrocarpum*.

#### MOST ABUNDANT SPECIES

##### Great Smoky Mountains National Park

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Graminoid	<i>Calamagrostis cainii</i>

##### Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Graminoid	<i>Calamagrostis cainii</i>
Nonvascular	Moss	<i>Sphagnum</i> spp.

#### CHARACTERISTIC SPECIES

**Great Smoky Mountains National Park:** *Calamagrostis cainii*, *Gentiana linearis*, *Parnassia asarifolia*, *Solidago glomerata*

**Global:** *Calamagrostis cainii*, *Gentiana linearis*, *Parnassia asarifolia*, *Solidago glomerata*, *Sphagnum* spp.

#### OTHER NOTEWORTHY SPECIES

**Great Smoky Mountains National Park: Vulnerable Plants:** *Abies fraseri* (G2, globally imperiled), *Calamagrostis cainii* (G1), *Carex misera* (G3, globally vulnerable), *Carex ruthii* (G3G4, globally vulnerable), *Glyceria nubigena* (G2G3, globally imperiled), *Hypericum graveolens* (G3, globally vulnerable), *Krigia montana* (G3, globally vulnerable), *Solidago glomerata* (G3, globally vulnerable)

**Global: Vulnerable Plants:** *Abies fraseri* (G2, Southern Blue Ridge endemic), *Calamagrostis cainii* (G1), *Carex misera* (G3), *Carex ruthii* (G3G4), *Glyceria nubigena* (G2G3, endemic to Great Smoky Mountains and adjacent areas near the park), *Hypericum graveolens* (G3), *Krigia montana* (G3), *Solidago glomerata* (G3)

#### CONSERVATION STATUS RANK

**Global Rank & Reasons:** G1Q (23-Feb-1999). This is a highly restricted, naturally rare community and known from only a single location. The dominant species *Calamagrostis cainii* is only known from the summits of Mt. Le Conte and in the Blacks and Craggy mountains. Its current taxonomy is uncertain; it may be better classified as a very local expression of Blue Ridge High Elevation Seep (Sedge Type), *Carex gynandra* - *Platanthera clavellata* - *Drosera rotundifolia* - *Carex ruthii* / *Sphagnum* spp. Herbaceous Seep (CEGL007697), a G2 community.

## RELATED CONCEPTS

**Global Similar Types:**

- *Carex gynandra* - *Platanthera clavellata* - *Drosera rotundifolia* - *Carex ruthii* / *Sphagnum* spp. Herbaceous Seep (CEGL007697)

**Global Related Concepts:**

- *Calamagrostis cainii* Type (Feldcamp 1984) =

## CLASSIFICATION

**Status:** Standard

**Classification Confidence:** 3 - Weak

**Great Smoky Mountains National Park Other Comments:** *Calamagrostis cainii* may be locally dominant in seepage inclusions of other communities on Mount Le Conte, such as cliffs, heath shrublands, and steep landslide scars. The site which supports this community is a former landslide scar directly downslope from Cliff Tops, where there is a large concentration of *Calamagrostis cainii* growing in stable ledges and seeps. These stable substrates provide propagule sources for revegetating landslide scars, thus there is a tight spatial autocorrelation for species composition between scars and nearby ledges and cliffs (J. Boetsch pers. comm.). This community may be better classified as a very local expression of Blue Ridge High Elevation Seep (Sedge Type) (CEGL007697).

**Global Classification Comments:** *Calamagrostis cainii* may be locally dominant in seepage inclusions of other communities on Mount Le Conte, such as cliffs, heath shrublands, and steep landslide scars. The site which supports this community is a former landslide scar directly downslope from Cliff Tops, where there is a large concentration of *Calamagrostis cainii*, growing in stable ledge and seeps. These stable substrates provide propagule sources for revegetating landslide scars, thus there is a tight spatial autocorrelation for species composition between scars and nearby ledges and cliffs (J. Boetsch pers. comm.). This community may be better classified as a very local expression of Blue Ridge High Elevation Seep (Sedge Type), *Carex gynandra* - *Platanthera clavellata* - *Drosera rotundifolia* - *Carex ruthii* / *Sphagnum* spp. Herbaceous Seep (CEGL007697).

## ELEMENT DISTRIBUTION

**Great Smoky Mountains National Park Range:** This community is known from Mount Le Conte in the Great Smoky Mountains of Tennessee. It is currently known from only a single location.

**Global Range:** This association is known from a single location on Mount Le Conte (Feldcamp 1984), in the Great Smoky Mountains of Tennessee.

**Nations:** US

**States/Provinces:** TN

**TNC Ecoregions:** 51:C

**USFS Ecoregions (1994/95):** M221Dd:CCC

**USFS Ecoregions (2007):** M221Dd:CCC

**Federal Lands:** NPS (Great Smoky Mountains)

## ELEMENT SOURCES

**Great Smoky Mountains National Park Description Author(s):** K.D. Patterson

**Global Description Author(s):** K.D. Patterson and M. Pyne

**References:** Boetsch unpubl. data 1998, Feldcamp 1984, Peet et al. unpubl. data, Southeastern Ecology Working Group n.d.

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**[CEGL007697] *Carex gynandra* - *Platanthera clavellata* - *Drosera rotundifolia* - *Carex ruthii* / *Sphagnum* spp.  
Herbaceous Seep**

Translated Name: **Nodding Sedge - Small Green Wood Orchid - Roundleaf Sundew - Ruth's Sedge / Peatmoss species**

**Herbaceous Seep**

Common Name: **Southern Blue Ridge High-Elevation Seep (Sedge Type)**

## USNVC CLASSIFICATION

Division	Eastern North American Temperate Freshwater Marsh, Wet Meadow & Shrubland (2.C.4.Nd)
Macrogroup	Eastern North American Cool Temperate Seep (M061)
Group	Central & Southern Appalachian Seep (G184)
Alliance	<i>Carex gynandra</i> - <i>Glyceria melicaria</i> - <i>Glyceria striata</i> Seep Alliance (A3382)

## ELEMENT CONCEPT

**Global Summary:** This association accommodates sedge-dominated, seepage slopes scattered throughout the high elevations (>1524 m [5000 feet]) of the Southern Blue Ridge. This non-alluvial wetland is generally graminoid-dominated but may have significant coverage by trees or shrubs, especially around the edges. Particularly small examples may be completely shaded by trees in the community and in the adjacent forests. Typically this community has well-developed *Sphagnum* mats. Characteristic species include *Carex gynandra*, *Carex ruthii*, *Carex atlantica*, *Carex debilis* var. *rudgei*, *Glyceria striata*, *Glyceria melicaria*, *Hypericum graveolens*, *Hypericum mitchellianum*, *Hypericum mutilum*, *Chelone lyonii*, *Platanthera clavellata*, and *Drosera rotundifolia*. Occurrences of this community are surrounded by or were formerly surrounded by forests dominated by *Abies fraseri* and *Picea rubens* or by the highest northern hardwood forests (forests dominated by *Fagus grandifolia*, *Betula alleghaniensis*, and *Aesculus flava*). They are influenced by the high rainfall and low evaporation rates in these high mountain landscapes.

## ENVIRONMENTAL DESCRIPTION

**Great Smoky Mountains National Park Environment:** This community was sampled from a flat area around Ice Water Springs, at 5900 feet elevation, and a gently sloping area just downslope from the peak of Andrews Bald. They were both relatively open, sunny seeps with standing water and a mucky substrate.

**Global Environment:** These seepage slopes are scattered throughout the high elevations (>1525 m [>5000 feet]) of the Southern Blue Ridge. They are influenced by the high rainfall and low evaporation rates in these high mountain landscapes. This non-alluvial wetland is generally graminoid-dominated but may have significant coverage by trees or shrubs, especially around the edges. Particularly small examples may be completely shaded by trees in the community and in the adjacent forests.

## VEGETATION DESCRIPTION

**Great Smoky Mountains National Park Vegetation:** This community is a spring-associated seep dominated by patches of forbs, sedges, and peatmoss. The aspect dominants are *Ageratina altissima* var. *roanensis* and *Chelone obliqua*; however, *Carex ruthii*, *Viola* spp., *Sphagnum* spp., and *Carex gynandra* also have high coverage. Other species include *Aconitum uncinatum* ssp. *muticum*, *Agrostis perennans*, *Angelica triquinata*, *Oclemena acuminata* (= *Aster acuminatus* var. *acuminatus*), *Cinna latifolia*, *Dennstaedtia punctilobula*, *Diervilla sessilifolia*, *Glyceria nubigena*, *Hypericum* spp., *Oxalis montana*, *Solidago glomerata*, and *Solidago patula* var. *patula*.

**Global Vegetation:** Characteristic species in stands of this type include *Carex gynandra*, *Carex ruthii*, *Carex atlantica*, *Carex debilis* var. *rudgei* (= *Carex flexuosa*), *Glyceria striata*, *Glyceria melicaria*, *Hypericum graveolens*, *Hypericum mitchellianum*, *Hypericum mutilum*, *Chelone lyonii*, *Platanthera clavellata*, and *Drosera rotundifolia*. Typically this community has well-developed *Sphagnum* mats.

## MOST ABUNDANT SPECIES

## Great Smoky Mountains National Park

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Flowering forb	<i>Ageratina altissima</i> , <i>Hypericum</i> spp.
Herb (field)	Graminoid	<i>Carex ruthii</i> , <i>Carex</i> spp.
Nonvascular	Moss	<i>Sphagnum</i> spp.

## Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Flowering forb	<i>Ageratina altissima</i> var. <i>roanensis</i> , <i>Chelone obliqua</i>
Herb (field)	Graminoid	<i>Carex crinita</i> , <i>Carex gynandra</i> , <i>Carex ruthii</i>
Nonvascular	Moss	<i>Sphagnum</i> spp.

## CHARACTERISTIC SPECIES

**Great Smoky Mountains National Park:** *Carex gynandra*, *Carex ruthii*, *Glyceria nubigena*, *Solidago glomerata*, *Sphagnum* spp.

**Global:** *Carex atlantica*, *Carex debilis* var. *rudgei*, *Carex gynandra*, *Carex ruthii*, *Chelone lyonii*, *Drosera rotundifolia*, *Glyceria melicaria*, *Glyceria striata*, *Hypericum graveolens*, *Hypericum mitchellianum*, *Hypericum mutilum*, *Platanthera clavellata*, *Sphagnum* spp.

## OTHER NOTEWORTHY SPECIES

**Great Smoky Mountains National Park: Vulnerable Plants:** *Carex ruthii* (G3G4, globally vulnerable), *Glyceria nubigena* (G2G3, globally imperiled), *Solidago glomerata* (G3, globally vulnerable)

**Global: Vulnerable Plants:** *Ageratina altissima* var. *roanensis* (G5T3T4), *Carex ruthii* (G3G4), *Glyceria nubigena* (G2G3, endemic to Great Smoky Mountains and adjacent areas near the park), *Hypericum buckleii* (G3, Southern Blue Ridge endemic), *Hypericum graveolens* (G3), *Hypericum mitchellianum* (G3), *Krigia montana* (G3), *Solidago glomerata* (G3); **Other Plants:** *Carex oklahomensis* (G4), *Rudbeckia laciniata* var. *digitata* (G5TNR, (= var. *humilis*))

## CONSERVATION STATUS RANK

**Global Rank & Reasons:** G2 (14-Dec-1998). This community occurs in a limited portion of high-elevation areas of the Southern Blue Ridge. Occurrences are small and embedded in forests or sometimes high-elevation grassy balds or heath balds. Many examples are in protected areas. Those which are not are vulnerable to logging and alteration of hydrology.

## RELATED CONCEPTS

## Global Similar Types:

- *Calamagrostis cainii* - *Carex ruthii* - *Parnassia asarifolia* / *Sphagnum* spp. Herbaceous Seep (CEGL007877)
- *Diphylleia cymosa* - *Saxifraga micranthidifolia* - *Laportea canadensis* Forested Herbaceous Seep (CEGL004296)
- *Impatiens (capensis, pallida)* - *Monarda didyma* - *Rudbeckia laciniata* var. *digitata* Herbaceous Seep (CEGL004293)

## Global Related Concepts:

- *Carex gynandra* Wetland (Newell and Peet 1996a) ?
- *Carex ruthii* Wetland (Newell and Peet 1996a) ?
- Boggy Seep (Wichmann et al. 2007) <
- High Elevation Sedge Seep (Wichmann 2009) =
- Sedge Seep (Wichmann et al. 2007) <

## CLASSIFICATION

**Status:** Standard

**Classification Confidence:** 2 - Moderate

**Great Smoky Mountains National Park Other Comments:** This community is surrounded by forests dominated by *Picea rubens*, *Betula alleghaniensis*, and *Abies fraseri*.

**Global Classification Comments:** This community is distinguished from other high-elevation seeps in the Blue Ridge, such as *Impatiens (capensis, pallida) - Monarda didyma - Rudbeckia laciniata var. digitata* Herbaceous Seep (CEGL004293) and *Diphylleia cymosa - Saxifraga micranthidifolia - Laportea canadensis* Forested Herbaceous Seep (CEGL004296), by being graminoid-dominated and having *Sphagnum* present. Examples of this association generally lack *Rudbeckia laciniata*, *Laportea canadensis*, *Monarda didyma*, and *Diphylleia cymosa*. It is distinguished from Southern Blue Ridge bog communities by floristic differences and by occurring on a pronounced slope at high elevations.

## ELEMENT DISTRIBUTION

**Great Smoky Mountains National Park Range:** This community was sampled from two locations, one in the vicinity of Ice Water Springs and the other on Andrews Bald. It may be found in other high-elevation areas in the park, but is most likely very rare on the landscape.

**Global Range:** This community occurs in a limited portion of high-elevation areas of the Southern Blue Ridge (Tennessee, North Carolina, Virginia?).

**Nations:** US

**States/Provinces:** NC, TN, VA?

**TNC Ecoregions:** 51:C

**USFS Ecoregions (1994/95):** M221Dc:CCC, M221Dd:CCC

**USFS Ecoregions (2007):** M221Dc:CCC, M221Dd:CCC

**Federal Lands:** NPS (Appalachian Trail [Southern Blue Ridge], Blue Ridge Parkway, Great Smoky Mountains); USFS (Nantahala, Pisgah)

## ELEMENT SOURCES

**Great Smoky Mountains National Park Description Author(s):** K.D. Patterson, mod. R. White

**Global Description Author(s):** M.P. Schafale and A.S. Weakley

**References:** Newell and Peet 1996a, Peet et al. unpubl. data, Schafale 2012, Schafale and Weakley 1990, Southeastern Ecology Working Group n.d., Wichmann 2009, Wichmann et al. 2007, Wichmann et al. 2007

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**[CEGL008438] *Glyceria striata - Carex gynandra - Chelone glabra - Symphyotrichum puniceum / Sphagnum spp.***  
**Herbaceous Seep**

Translated Name: **Fowl Mannagrass - Nodding Sedge - White Turtlehead - Purple-stem Aster / Peatmoss species**

**Herbaceous Seep**

Common Name: **Southern Appalachian Wet Seepage Meadow**

## USNVC CLASSIFICATION

Division Eastern North American Temperate Freshwater Marsh, Wet Meadow & Shrubland (2.C.4.Nd)

Macrogroup Eastern North American Cool Temperate Seep (M061)

Group Central & Southern Appalachian Seep (G184)

Alliance *Carex gynandra - Glyceria melicaria - Glyceria striata* Seep Alliance (A3382)

## ELEMENT CONCEPT

**Global Summary:** This acidic seep occurs as small-scale patches along streams in the Southern Appalachians. Occurrences are nearly always less than 0.4 hectare (1 acre) in size. Hydrology is seepage-fed, and these sites may also receive short-term flooding from adjacent streams. Characteristic species include *Glyceria striata*, *Glyceria melicaria*, *Osmunda cinnamomea*, *Carex gynandra*, *Symphyotrichum puniceum*, *Solidago patula var. patula*, *Chelone glabra*, and *Sphagnum recurvum*. Most occurrences are herbaceous-dominated, though scattered shrubs and trees may occur, and trees rooted outside the community sometimes provide substantial shade.

## ENVIRONMENTAL DESCRIPTION

**Great Smoky Mountains National Park Environment:** Same as global.

**Global Environment:** This acidic seep occurs as small-scale patches along streams in the Southern Appalachians. Occurrences are nearly always less than 0.4 hectare (1 acre) in size. Hydrology is seepage-fed, and these sites may also receive short-term flooding from adjacent streams.

## VEGETATION DESCRIPTION

**Great Smoky Mountains National Park Vegetation:** Same as global.

**Global Vegetation:** The physiognomic structure of this community type is variable. Most occurrences are herbaceous-dominated, though scattered shrubs and trees may occur, and trees rooted outside the community sometimes provide substantial shade. The most characteristic species include *Glyceria striata*, *Glyceria melicaria*, *Osmunda cinnamomea*, *Carex gynandra*, *Symphyotrichum*

*puniceum* (= *Aster puniceus*), *Solidago patula* var. *patula*, *Chelone glabra*, and *Sphagnum recurvum*. Other species reported from some occurrences include *Betula lenta*, *Liriodendron tulipifera*, *Pinus strobus*, *Acer rubrum*, *Kalmia latifolia*, *Lyonia ligustrina* var. *ligustrina*, *Vaccinium fuscum*, *Oxypolis rigidior*, *Athyrium filix-femina* ssp. *asplenioides*, *Salix nigra*, *Salix sericea*, and *Laportea canadensis*.

**Global Dynamics:** These communities appear to be relatively stable. They can be affected by beaver activity.

#### MOST ABUNDANT SPECIES

##### Global

##### Stratum

Herb (field)  
Herb (field)  
Herb (field)

##### Lifeform

Flowering forb  
Graminoid  
Fern (Spore-bearing forb)

##### Species

*Solidago patula* var. *patula*  
*Carex gynandra*, *Glyceria melicaria*, *Glyceria striata*  
*Osmunda cinnamomea*

#### CHARACTERISTIC SPECIES

##### Great Smoky Mountains National Park:

**Global:** *Carex gynandra*, *Chelone glabra*, *Glyceria melicaria*, *Glyceria striata*, *Osmunda cinnamomea*, *Solidago patula* var. *patula*, *Symphytotrichum puniceum*

#### OTHER NOTEWORTHY SPECIES

**Global: Vulnerable Plants:** *Carex ruthii* (G3G4); **Other Plants:** *Sphagnum recurvum* (G5)

#### CONSERVATION STATUS RANK

**Global Rank & Reasons:** G2G3 (26-Jun-2001). This community is rather widespread but always occurs in very small patches.

#### RELATED CONCEPTS

##### Global Similar Types:

- *Carex gynandra* - *Scirpus cyperinus* - *Eriophorum virginicum* - *Osmunda cinnamomea* Herbaceous Seep (CEGL007771) is associated with smaller streams in the Cumberland Plateau from Virginia south possibly to Tennessee.

##### Global Related Concepts:

- *Glyceria striata* - *Carex gynandra* - *Chelone glabra* - *Symphytotrichum puniceum* / *Sphagnum* spp. Herbaceous Vegetation (Fleming and Patterson 2009a) =
- Low Elevation Saturated Forest (Wichmann 2009) >

#### CLASSIFICATION

**Status:** Standard

**Classification Confidence:** 2 - Moderate

**Global Classification Comments:** These communities are sometimes regarded as "poorly-developed bogs." This type needs additional study and reconciliation against communities in North Carolina currently treated as forests ("Swamp Forest - Bog Complexes"). Three plots from North Carolina and Georgia (APPA.545, APPA.652, and CVS plot 020-03-0351) in the Appalachian Trail study (Fleming and Patterson 2009a) were classified as this association. While the composition of these samples varies, *Carex gynandra*, *Chelone glabra*, and *Oxypolis rigidior* are 100% constant and have 2-25% coverage in the samples. Other species that have high diagnostic value are *Carex ruthii*, *Juncus gymnocarpus*, *Parnassia asarifolia*, *Scirpus polyphyllus*, and *Solidago patula* var. *patula*.

#### ELEMENT DISTRIBUTION

**Global Range:** This community was defined from the western fringe of the Southern Blue Ridge in northern Georgia, eastern Tennessee, and western North Carolina, but likely extends into adjacent areas of Alabama, Kentucky, and South Carolina.

**Nations:** US

**States/Provinces:** AL?, GA, NC, SC, TN

**TNC Ecoregions:** 50:P, 51:C

**USFS Ecoregions (1994/95):** 231Dc:CCC, 231De:CCP, M221Dd:CCC

**USFS Ecoregions (2007):** 231Dc:CCC, 231De:CCP, M221Dd:CCC

**Federal Lands:** BIA (Eastern Band of Cherokee); NPS (Appalachian Trail [Southern Blue Ridge], Blue Ridge Parkway?, Great Smoky Mountains); USFS (Chattahoochee, Chattahoochee (Southern Blue Ridge), Cherokee, Nantahala, Sumter (Mountains)?)

#### ELEMENT SOURCES

**Great Smoky Mountains National Park Plots:** GRSM.315, GRSM.317.

**Great Smoky Mountains National Park Description Author(s):** A.S. Weakley

**Global Description Author(s):** A.S. Weakley

**References:** Fleming and Patterson 2009a, GNHP unpubl. data 2018, NatureServe Ecology - Southeastern U.S. unpubl. data, Nelson 1986, Schafale 2012, Schafale and Weakley 1990, Southeastern Ecology Working Group n.d., Wichmann 2009, Wichmann 2009

**[CEGL004293] *Impatiens (capensis, pallida) - Monarda didyma - Rudbeckia laciniata var. digitata* Herbaceous Seep**Translated Name: **(Orange Jewelweed, Pale Touch-me-not) - Scarlet Beebalm - Greenhead Coneflower Herbaceous Seep**Common Name: **Rich Montane Seep (High-Elevation Type)****USNVC CLASSIFICATION**

Division	Eastern North American Temperate Freshwater Marsh, Wet Meadow & Shrubland (2.C.4.Nd)
Macrogroup	Eastern North American Cool Temperate Seep (M061)
Group	Central & Southern Appalachian Seep (G184)
Alliance	<i>Carex gynandra - Glyceria melicaria - Glyceria striata</i> Seep Alliance (A3382)

**ELEMENT CONCEPT**

**Global Summary:** This association covers forb-dominated palustrine vegetation occurring as small wetlands at high elevations (greater than 1200 m [4000 feet]), on upper slopes and ridgetops in the Southern Blue Ridge ecoregion. These areas lack extensive *Sphagnum* and are typically open, without shading from a forest canopy. Typical dominant species include *Impatiens capensis*, *Impatiens pallida*, *Monarda didyma*, and *Rudbeckia laciniata var. digitata*. Other characteristic species include *Aconitum reclinatum*, *Cardamine clematidis*, *Carex leptonevia*, *Carex debilis var. rudgei*, *Carex ruthii*, *Chelone lyonii*, *Cicuta maculata*, *Claytonia caroliniana*, *Conioselinum chinense*, *Euonymus obovatus*, *Geum geniculatum*, *Helenium autumnale*, *Houstonia serpyllifolia*, *Lilium superbum*, *Lilium grayi*, *Packera aurea*, *Solidago patula*, *Thalictrum clavatum*, *Trautvetteria caroliniensis*, *Veratrum viride*, *Viola cucullata*, and *Viola macloskeyi ssp. pallens*. This vegetation is often associated with boulderfield forests or other northern hardwood forests [see *Betula alleghaniensis - Aesculus flava* Forest Alliance (A0266)].

**ENVIRONMENTAL DESCRIPTION**

**Great Smoky Mountains National Park Environment:** Stands of this association occur both in open areas without an overstory and along high-elevation forested and semi-forested streams, especially in northern hardwood forests. Although usually very small in size (often less than 10 meters across), this community can occasionally occur as a larger patch in areas where a high-elevation stream runs through a flat stretch of land.

**Global Environment:** Stands of this association are forb-dominated palustrine vegetation occurring as small wetlands at high elevations (greater than 1200 m [4000 feet]), on upper slopes and ridgetops in the Southern Blue Ridge ecoregion. These areas lack extensive *Sphagnum* and are typically open, without shading from a forest canopy. This vegetation is often associated with boulderfield forests or other northern hardwood forests.

**VEGETATION DESCRIPTION**

**Great Smoky Mountains National Park Vegetation:** Typical dominant species in the Great Smoky Mountains include *Rudbeckia laciniata var. humilis*, *Symphyotrichum puniceum*, *Monarda didyma*, *Carex lurida*, and other *Carex* species. In some patches *Angelica triquinata*, *Stachys latidens*, *Impatiens* sp., and *Juncus effusus* were dominant. This community is best picked out from the matrix in late July when the *Rudbeckia laciniata* and *Monarda didyma* are both in full bloom.

**Global Vegetation:** Typical dominant species include *Impatiens capensis*, *Impatiens pallida*, *Monarda didyma*, and *Rudbeckia laciniata var. digitata* (= *var. humilis*). Other characteristic species include *Aconitum reclinatum*, *Cardamine clematidis*, *Carex leptonevia*, *Carex debilis var. rudgei* (= *Carex flexuosa*), *Carex ruthii*, *Chelone lyonii*, *Cicuta maculata*, *Claytonia caroliniana*, *Conioselinum chinense*, *Euonymus obovatus*, *Geum geniculatum*, *Helenium autumnale*, *Houstonia serpyllifolia*, *Lilium superbum*, *Lilium grayi*, *Packera aurea* (= *Senecio aureus*), *Solidago patula*, *Thalictrum clavatum*, *Trautvetteria caroliniensis*, *Veratrum viride*, *Viola cucullata*, and *Viola macloskeyi ssp. pallens*. These stands lack extensive cover by *Sphagnum* spp., and are typically open, without shading from a forest canopy.

**MOST ABUNDANT SPECIES****Great Smoky Mountains National Park**

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Flowering forb	<i>Monarda didyma</i> , <i>Rudbeckia laciniata var. humilis</i>

**Global**

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Flowering forb	<i>Impatiens capensis</i> , <i>Impatiens pallida</i> , <i>Monarda didyma</i> , <i>Rudbeckia laciniata var. digitata</i>

**CHARACTERISTIC SPECIES**

**Great Smoky Mountains National Park:** *Monarda didyma*, *Rudbeckia laciniata var. humilis*

**Global:** *Impatiens capensis*, *Impatiens pallida*, *Monarda didyma*, *Rudbeckia laciniata var. digitata*

**OTHER NOTEWORTHY SPECIES**

**Great Smoky Mountains National Park: Vulnerable Plants:** *Rudbeckia laciniata var. humilis* (G5T3?)

**Global: Vulnerable Plants:** *Aconitum reclinatum* (G3G4), *Cardamine clematidis* (G3), *Carex bromoides ssp. montana* (G5T3?), *Carex ruthii* (G3G4), *Geum geniculatum* (G2), *Glyceria nubigena* (G2G3, endemic to Great Smoky Mountains and adjacent areas near the park), *Hypericum mitchellianum* (G3), *Lilium grayi* (G1G2, Southern Blue Ridge endemic)

**CONSERVATION STATUS RANK**

**Global Rank & Reasons:** G3 (14-Dec-1998). This community occurs at moderate to high elevations of the southern Blue Ridge Mountains of western North Carolina, eastern Tennessee, southwestern Virginia, northern Georgia, and probably northwestern South Carolina. It occurs as a small patch community, embedded in a variety of regional forest types. While restricted in range and of small size, the community is relatively frequent within its range, many examples are protected, and threats are relatively few and minor.

**RELATED CONCEPTS****Global Similar Types:**

- *Caltha palustris* - *Impatiens capensis* - *Viola cucullata* Seepage Meadow (CEGL006258)
- *Carex gynandra* - *Platanthera clavellata* - *Drosera rotundifolia* - *Carex ruthii* / *Sphagnum* spp. Herbaceous Seep (CEGL007697)
- *Diphylleia cymosa* - *Saxifraga micranthidifolia* - *Laportea canadensis* Forested Herbaceous Seep (CEGL004296) typically occurs at lower elevations and is associated with cove forests.

**Global Related Concepts:**

- High Elevation Seep (Wichmann 2009) >
- High-elevation Seepage Wetland (Wichmann et al. 2007) =
- IID3a. Herbaceous High Elevation Seepage Slope (Allard 1990) >
- Jewelweed-beebalm-coneflower seep (CAP pers. comm. 1998) ?

**CLASSIFICATION**

**Status:** Standard

**Classification Confidence:** 2 - Moderate

**Great Smoky Mountains National Park Other Comments:** This community is usually too small to map and often occurs under a forested canopy.

**Global Classification Comments:** Four plots were classified as this association in the Appalachian Trail project (Fleming and Patterson 2009a). Three plots are in the vicinity of Standing Indian (Nantahala Mountains, North Carolina) and one is on the slopes of Whitetop (Jefferson National Forest, Virginia); both sites are above 1220 m (4000 feet) elevation. The plots sampled forested seeps that vary in their physiognomy and composition; most have significant cover by woody species and are likely shaded by the forest canopy. *Chelone glabra* and *Tiarella cordifolia* are present in all plots. Species with 75% constancy include *Aesculus flava*, *Athyrium filix-femina* ssp. *asplenioides*, *Betula alleghaniensis*, *Eurybia chlorolepis*, *Fraxinus americana*, *Houstonia serpyllifolia*, *Monarda didyma*, *Packera aurea*, *Veratrum viride*, and *Viola cucullata*.

*Diphylleia cymosa* - *Saxifraga micranthidifolia* - *Laportea canadensis* Forested Herbaceous Seep (CEGL004296), another high-elevation herbaceous seep association known from the Southern Appalachians, typically occurs at lower elevations and is associated with cove forests.

**ELEMENT DISTRIBUTION**

**Great Smoky Mountains National Park Range:** This community was not sampled on the Cades Cove or Mount Le Conte quadrangles but was sampled near the Heintooga Spur in the Bunche's Bald quadrangle. It is likely on the Mount Le Conte quadrangle, as well as in most other high-elevation areas of the park.

**Global Range:** This community occurs at moderate to high elevations in the southern Blue Ridge Mountains of western North Carolina, eastern Tennessee, southwestern Virginia, northern Georgia, and northwestern South Carolina. It is not found in West Virginia (E. Byers pers. comm.).

**Nations:** US

**States/Provinces:** GA, NC, SC, TN, VA:S2?

**TNC Ecoregions:** 51:C, 59:P

**USFS Ecoregions (1994/95):** M221Ba:CCC, M221Bb:CCP, M221Bc:CCC, M221Da:CCC, M221Db:CCC, M221Dc:CCC, M221Dd:CCC

**USFS Ecoregions (2007):** M221Ba:CCC, M221Bb:CCP, M221Bc:CCC, M221Da:CCC, M221Db:CCC, M221Dc:CCC, M221Dd:CCC

**Federal Lands:** BIA (Eastern Band of Cherokee); NPS (Appalachian Trail [Southern Blue Ridge], Blue Ridge Parkway, Great Smoky Mountains); USFS (Cherokee, Jefferson, Nantahala, Pisgah)

**ELEMENT SOURCES**

**Great Smoky Mountains National Park Plots:** GRSM.510.

**Great Smoky Mountains National Park Description Author(s):** K.D. Patterson, mod. R. White

**Global Description Author(s):** A.S. Weakley

**References:** Allard 1990, CAP pers. comm. 1998, Fleming and Patterson 2009a, Fleming et al. 2017, NatureServe Ecology - Southeastern U.S. unpubl. data, Nelson 1986, Peet et al. unpubl. data, Schafale 2012, Schafale and Weakley 1990, Southeastern Ecology Working Group n.d., Wichmann 2009, Wichmann et al. 2007, Wichmann et al. 2007

**A1688 *Diphylleia cymosa* - *Saxifraga micranthidifolia* Seep Alliance**

American Umbrella-leaf - Lettuceleaf Saxifrage Seep Alliance

**Rich Appalachian Montane Cove Forested Seep****ALLIANCE CONCEPT**

**Summary:** This alliance consists of moderate- to high-elevation, forested (shaded) seeps in the Southern Blue Ridge. *Diphylleia cymosa*, *Laportea canadensis*, and *Saxifraga micranthidifolia* are characteristic and often dominant. Other characteristic species include *Boykinia aconitifolia*, *Cardamine clematitidis*, *Chelone glabra*, *Chelone lyonii*, *Chrysosplenium americanum*, *Cicuta maculata*, *Geum geniculatum*, *Houstonia serpyllifolia*, *Laportea canadensis*, *Lilium grayi*, *Oxypolis rigidior*, *Parnassia asarifolia*, *Stellaria corei*, *Thalictrum clavatum*, *Tiarella cordifolia*, *Trautvetteria caroliniensis*, *Viola cucullata*, and *Viola macloskeyi ssp. pallens*. Occurrences are typically small, but can be extensive (to more than a hectare in size). Vegetation of this alliance has a strong component of species endemic to the Southern Blue Ridge.

**Classification Comments:** The distinctive vegetation of this alliance has a strong component of species endemic (or near-endemic) to the Southern Blue Ridge. These include *Diphylleia cymosa* and *Saxifraga micranthidifolia*, which are dominant and characteristic, as well as *Cardamine clematitidis*, *Chelone lyonii*, *Geum geniculatum*, *Houstonia serpyllifolia*, *Lilium grayi*, *Parnassia asarifolia*, *Stellaria corei*, *Thalictrum clavatum*, *Trautvetteria caroliniensis*, *Viola cucullata*, and *Viola macloskeyi ssp. pallens*.

**Similar Alliances:**

- *Carex atlantica* - *Solidago patula* - *Parnassia asarifolia* Seep Alliance (A3381)
- *Carex gynandra* - *Glyceria melicaria* - *Glyceria striata* Seep Alliance (A3382)
- *Carex scabrata* - *Chrysosplenium americanum* Seep Alliance (A1685)
- *Eriophorum virginicum* - *Dulichium arundinaceum* - *Carex echinata* Seep Alliance (A3373)
- *Impatiens capensis* - *Symplocarpus foetidus* - *Caltha palustris* Seep Alliance (A3374)
- *Impatiens pallida* - *Equisetum scirpoides* - *Parnassia glauca* Seep Alliance (A1871)
- *Lyonia ligustrina* - *Aronia arbutifolia* / *Drosera rotundifolia* Seep Alliance (A3383)
- *Sanguisorba canadensis* - *Parnassia grandifolia* Seep Alliance (A3384)

**Diagnostic Characteristics:** These are very distinctive shaded herbaceous seeps found in the Southern Appalachians, containing a strong component of species which are endemic (or near-endemic) to this region.

**Related Concepts:**

- High Elevation Seep (Wichmann 2009) >
- IID3a. Herbaceous High Elevation Seepage Slope (Allard 1990) ><
- Rich Montane Seep (Wichmann et al. 2007) =

**ALLIANCE DESCRIPTION**

**Environment:** This alliance occurs in moderate- to high-elevation, forested (shaded) seeps.

**Vegetation:** Stands typically contain *Diphylleia cymosa*, *Laportea canadensis*, and *Saxifraga micranthidifolia*. Other characteristic species include *Boykinia aconitifolia*, *Cardamine clematitidis*, *Chelone glabra*, *Chelone lyonii*, *Chrysosplenium americanum*, *Cicuta maculata*, *Geum geniculatum*, *Houstonia serpyllifolia*, *Lilium grayi*, *Oxypolis rigidior*, *Parnassia asarifolia*, *Stellaria corei*, *Tiarella cordifolia*, *Thalictrum clavatum*, *Trautvetteria caroliniensis*, *Viola cucullata*, and *Viola macloskeyi ssp. pallens*. Occurrences associated with more acidic soil conditions often contain *Juncus gymnocarpus*. Vegetation of this alliance has a strong component of species endemic to the Southern Blue Ridge.

**Physiognomy and Structure:** These shaded seeps of the southern Appalachian Mountains usually have overhanging canopies, although trees are not rooted in the seep itself. This vegetation often occurs in cove forests. Stands often are not large enough to be readily mappable, but they are a distinctive habitat for many plants, invertebrate and vertebrate animals.

**Floristics:** Stands typically contain *Diphylleia cymosa*, *Laportea canadensis*, and *Saxifraga micranthidifolia*. Other characteristic species include *Boykinia aconitifolia*, *Cardamine clematitidis*, *Chelone glabra*, *Chelone lyonii*, *Chrysosplenium americanum*, *Cicuta maculata*, *Geum geniculatum*, *Houstonia serpyllifolia*, *Lilium grayi*, *Oxypolis rigidior*, *Parnassia asarifolia*, *Stellaria corei*, *Tiarella cordifolia*, *Thalictrum clavatum*, *Trautvetteria caroliniensis*, *Viola cucullata*, and *Viola macloskeyi ssp. pallens*. Occurrences associated with more acidic soil conditions often contain *Juncus gymnocarpus*. Vegetation of this alliance has a strong component of species endemic to the Southern Blue Ridge.

**ALLIANCE DISTRIBUTION**

**Range:** This alliance is found in the southern Blue Ridge Mountains of western North Carolina, eastern Tennessee, southwestern Virginia, northern Georgia, and probably northwestern South Carolina.

**Nations:** US

**Subnations:** GA, NC, SC?, TN, VA

**TNC Ecoregions:** 51:C, 59:C

**USFS Ecoregions (1994/95):** M221D:CC

**USFS Ecoregions (2007):** M221D:CC

**ALLIANCE SOURCES**

**References:** Allard 1990, Dellinger 1992, Faber-Langendoen et al. 2019b, Nelson 1986, Schafale and Weakley 1990, Wichmann 2009, Wichmann et al. 2007

**Author of Concept:** Faber-Langendoen et al. 2019b

**Author of Description:** A.S. Weakley, in Faber-Langendoen et al. (2013)

**[CEGL004296] *Diphylleia cymosa* - *Saxifraga micranthidifolia* - *Laportea canadensis* Forested Herbaceous Seep**Translated Name: **American Umbrella-leaf - Lettuceleaf Saxifrage - Canadian Woodnettle Forested Herbaceous Seep**Common Name: **Rich Montane Seep (Cove Type)****USNVC CLASSIFICATION**

Division	Eastern North American Temperate Freshwater Marsh, Wet Meadow & Shrubland (2.C.4.Nd)
Macrogroup	Eastern North American Cool Temperate Seep (M061)
Group	Central & Southern Appalachian Seep (G184)
Alliance	<i>Diphylleia cymosa</i> - <i>Saxifraga micranthidifolia</i> Seep Alliance (A1688)

**ELEMENT CONCEPT**

**Global Summary:** This community occurs at moderate to high elevations of the southern Blue Ridge Mountains of western North Carolina, eastern Tennessee, southwestern Virginia, northern Georgia, and probably northwestern South Carolina. It is a characteristic association of shaded seeps of the southern Appalachian Mountains, usually with overhanging canopies, though trees are not rooted in the seep itself. They often are not large enough to be readily mappable, but they are a distinctive habitat for many plants, invertebrate and vertebrate animals. Stands typically contain *Diphylleia cymosa*, *Saxifraga micranthidifolia*, and *Laportea canadensis*. Other characteristic species include *Cardamine clematidis*, *Chelone lyonii*, *Chelone glabra*, *Chrysosplenium americanum*, *Boykinia aconitifolia*, *Cicuta maculata*, *Houstonia serpyllifolia*, *Viola cucullata*, *Viola macloskeyi* ssp. *pallens*, *Lilium grayi*, *Oxypolis rigidior*, *Parnassia asarifolia*, *Tiarella cordifolia*, *Thalictrum clavatum*, *Trautvetteria caroliniensis*, *Stellaria corei*, and *Geum geniculatum*. Occurrences associated with more acidic soil conditions often contain *Juncus gymnocarpus*. This association often occurs in cove forests, and the canopy species may include *Liriodendron tulipifera*, *Tilia americana*, *Fraxinus americana*, *Acer saccharum*, and *Aesculus flava*.

**ENVIRONMENTAL DESCRIPTION**

**Great Smoky Mountains National Park Environment:** This community is found at low to intermediate elevations (samples ranged from 1960-4100 feet), on steep, rocky slopes. Substrates range from boulders and rocks to saturated, gravelly muck. These are small wetlands that occur as inclusions in an otherwise forested landscape.

**Global Environment:** This association often occurs in cove forests. It is a characteristic association of shaded seeps of the southern Appalachian Mountains, usually with overhanging canopies though trees not rooted in the seep itself. Often not large enough to be readily mappable, but a distinctive habitat for many plants, invertebrate and vertebrate animals.

**VEGETATION DESCRIPTION**

**Great Smoky Mountains National Park Vegetation:** This community includes forested seeps in cove forests dominated by *Aesculus flava*, *Tilia americana* var. *heterophylla*, and *Betula alleghaniensis*. The seeps are open herbaceous vegetation, but canopy trees hang over the seep and can have up to 70% coverage. Shrubs are absent to sparse. Herbs have 50-100% coverage. Species with the highest coverages are *Diphylleia cymosa*, *Saxifraga micranthidifolia*, *Actaea podocarpa* (= *Cimicifuga americana*), *Laportea canadensis*, *Tiarella cordifolia*, and *Impatiens pallida*. Other common herbs include *Ageratina altissima* var. *roanensis*, *Eurybia divaricata* (= *Aster divaricatus*), *Chrysosplenium americanum*, *Euonymus obovata*, and *Monarda didyma*. Bryophytes, other than *Sphagnum*, can have substantial cover on rocks.

**Global Vegetation:** Stands typically contain *Diphylleia cymosa*, *Saxifraga micranthidifolia*, and *Laportea canadensis*. Other characteristic species include *Cardamine clematidis*, *Chelone lyonii*, *Chelone glabra*, *Chrysosplenium americanum*, *Boykinia aconitifolia*, *Cicuta maculata*, *Houstonia serpyllifolia*, *Viola cucullata*, *Viola macloskeyi* ssp. *pallens*, *Lilium grayi*, *Oxypolis rigidior*, *Parnassia asarifolia*, *Tiarella cordifolia*, *Thalictrum clavatum*, *Trautvetteria caroliniensis*, *Stellaria corei*, and *Geum geniculatum*. Occurrences associated with more acidic soil conditions often contain *Juncus gymnocarpus* (G. Kauffman pers. comm.). Canopy species may include *Liriodendron tulipifera*, *Tilia americana*, *Fraxinus americana*, *Acer saccharum*, and *Aesculus flava*.

**MOST ABUNDANT SPECIES****Great Smoky Mountains National Park**

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Flowering forb	<i>Diphylleia cymosa</i> , <i>Saxifraga micranthidifolia</i>

**Global**

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Flowering forb	<i>Diphylleia cymosa</i> , <i>Saxifraga micranthidifolia</i>

**CHARACTERISTIC SPECIES**

**Great Smoky Mountains National Park:** *Diphylleia cymosa*, *Saxifraga micranthidifolia*

**Global:** *Diphylleia cymosa*, *Saxifraga micranthidifolia*

**OTHER NOTEWORTHY SPECIES**

**Global: Vulnerable Plants:** *Aconitum reclinatum* (G3G4), *Cardamine clematidis* (G3), *Geum geniculatum* (G2), *Lilium grayi* (G1G2, Southern Blue Ridge endemic); **Other Plants:** *Rudbeckia laciniata* var. *digitata* (G5TNR, (= var. *humilis*))

**CONSERVATION STATUS RANK**

**Global Rank & Reasons:** G3 (14-Dec-1998). This community occurs at moderate to high elevations of the southern Blue Ridge Mountains of western North Carolina, eastern Tennessee, southwestern Virginia, northern Georgia, and probably northwestern South Carolina. It occurs as a small patch community, embedded in a variety of regional forest types. While restricted in range and of small size, the community is relatively frequent within its range, many examples are protected, and threats are relatively few and minor.

**RELATED CONCEPTS****Global Similar Types:**

- *Caltha palustris* - *Impatiens capensis* - *Viola cucullata* Seepage Meadow (CEGL006258)
- *Carex gynandra* - *Platanthera clavellata* - *Drosera rotundifolia* - *Carex ruthii* / *Sphagnum* spp. Herbaceous Seep (CEGL007697)
- *Impatiens (capensis, pallida)* - *Monarda didyma* - *Rudbeckia laciniata* var. *digitata* Herbaceous Seep (CEGL004293)

**Global Related Concepts:**

- High Elevation Seep (Wichmann 2009) >
- IID3a. Herbaceous High Elevation Seepage Slope (Allard 1990) >
- Rich Montane Seep (Wichmann et al. 2007) =

**CLASSIFICATION**

**Status:** Standard

**Classification Confidence:** 2 - Moderate

**Great Smoky Mountains National Park Other Comments:** This community is too small to map and often occurs under a forested canopy.

**Global Classification Comments:** The nominal species *Diphylleia cymosa*, is a conspicuous component of this association, but may also be found in seeps of varying canopy closure at middle and high elevations. The associated nominal species, *Saxifraga micranthidifolia* and *Laportea canadensis*, are indicative of shaded seeps (G. Kauffman pers. comm.). Another high-elevation herbaceous seep association known from the Southern Appalachians, *Impatiens (capensis, pallida)* - *Monarda didyma* - *Rudbeckia laciniata* var. *digitata* Herbaceous Seep (CEGL004293), often occurs on boulderfields or in northern hardwood forests, at higher elevations than the association defined here. Four plots (three from the Great Smoky Mountains National Park and one from Towns County, Georgia) were classified as this association in the Appalachian Trail analysis (Fleming and Patterson 2009a). *Diphylleia cymosa* and *Laportea canadensis* are present and abundant in all the plot samples, and *Saxifraga micranthidifolia* is present in two of the plots, but otherwise, the samples varied in species composition.

**ELEMENT DISTRIBUTION**

**Great Smoky Mountains National Park Range:** This community was sampled on both the Cades Cove and Mount Le Conte quadrangles and observed in most other areas of the park with mesic slopes. On the Cades Cove quadrangle this community was sampled in the southern portion of the quadrangle on a high slope north of Rich Gap and in the eastern portion of the quadrangle along Pole Knob Branch. On the Mount Le Conte quadrangle, this community was sampled north of Cherokee Orchard, above Baskins Creek; and in the vicinity of Rainbow Falls, along Le Conte Creek.

**Global Range:** This community is found at moderate to high elevations of the southern Blue Ridge Mountains of western North Carolina, eastern Tennessee, southwestern Virginia, northern Georgia, and probably northwestern South Carolina.

**Nations:** US

**States/Provinces:** GA, NC, SC?, TN:S2S3, VA:S1?

**TNC Ecoregions:** 51:C, 59:C

**USFS Ecoregions (1994/95):** M221Dc:CCC, M221Dd:CCC

**USFS Ecoregions (2007):** M221Dc:CCC, M221Dd:CCC

**Federal Lands:** BIA (Eastern Band of Cherokee); NPS (Appalachian Trail [Southern Blue Ridge], Blue Ridge Parkway?, Great Smoky Mountains); USFS (Chattahoochee, Chattahoochee (Southern Blue Ridge), Cherokee, Jefferson, Nantahala, Pisgah, Sumter (Mountains)?, Sumter?)

**ELEMENT SOURCES**

**Great Smoky Mountains National Park Plots:** GRSM.250.

**Great Smoky Mountains National Park Description Author(s):** K.D. Patterson

**Global Description Author(s):** A.S. Weakley

**References:** Allard 1990, Fleming and Patterson 2009a, Fleming et al. 2017, Kauffman pers. comm., Nelson 1986, Peet et al. unpubl. data, Schafale and Weakley 1990, Southeastern Ecology Working Group n.d., TDNH unpubl. data 2018, Wichmann 2009, Wichmann 2009, Wichmann et al. 2007

**M069. Eastern North American Marsh, Wet Meadow & Shrubland****G599. CENTRAL INTERIOR WET MEADOW & SHRUB SWAMP**

**Group Summary Description:** This open shrub and herb vegetation group encompasses ponds of the unglaciated eastern United States, found landward of the coastal plains (i.e., in the Ozark, Ouachita, and Interior Low Plateau, as well as the Southern and Central Appalachians and the Piedmont regions). Stands occur on flat to gently sloping to undulating surfaces, as well as in shallow to deep

basins of sinkholes or other isolated depressions on uplands. Soils are poorly drained to very poorly drained, and surface water may be present for extended periods of time, rarely becoming dry. The typical hydrology is seasonally flooded, but the hydroperiod may be of greater or lesser length, depending on the depth of the basin or depression feature and the annual rainfall. Water depth may vary greatly on a seasonal basis and may be a meter deep or more in the winter in longer hydroperiod examples. Some examples become dry in the summer. Soils may be deep (100 cm or more), consisting of poorly drained mineral soil, as well as of peat or muck, with parent material of peat, muck or alluvium. Pondered examples vary from open scattered to more closed herb- or shrub-dominated ponds. The vegetation may be zoned, with an outer ring of trees, a more interior ring of shrubs, herbs and vines, and possibly a deeper central area with or without standing water year-round depending on precipitation. The shrub-dominated examples typically contain *Cephalanthus occidentalis*, or *Dulichium arundinaceum* and *Salix* spp. The herbaceous layer is widely variable depending on geography, but includes *Carex aquatilis*, *Carex comosa*, *Panicum virgatum*, *Juncus* spp., *Scirpus* and/or *Schoenoplectus* spp., and *Polygonum* spp. Trees fringing the ponds include *Quercus* spp. (particularly *Quercus phellos* [to the south] or *Quercus palustris* [to the north]), *Platanus occidentalis*, *Fraxinus pennsylvanica*, *Acer saccharinum*, or *Nyssa* spp.

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## A0795 *Arundinaria gigantea* Wet Canebrake Alliance

Giant Cane Wet Canebrake Alliance

*Giant Cane Wet Canebrake*

### ALLIANCE CONCEPT

**Summary:** This alliance encompasses vegetation of various wet to moist floodplain wetlands, occurring on alluvial or loess substrates, including streamside flats and bottomlands, dominated by *Arundinaria gigantea*, without an overstory, or with widely scattered trees. These are frequently monospecific or near-monospecific stands. Canebrakes are successional communities and may have originated following abandonment of aboriginal agricultural fields or catastrophic disturbances such as windstorms. They are thought to have been maintained in part by fires set by Native Americans. Evidence suggests that this alliance was widespread historically, covering large areas of many floodplains and streambanks in the Southeastern Coastal Plain from North Carolina to Texas, the Mississippi River Alluvial Plain north to Illinois and Missouri, Interior Highlands, Interior Low Plateau, Southern Blue Ridge, Cumberland Mountains, and Western Allegheny Plateau of the southeastern United States. It now occupies very little of its former acreage, and high-quality examples are extremely rare. It was also reported historically along the Red and Mississippi rivers in Louisiana, Coastal Prairie rivers in Texas, and the Black, Washita, Arkansas, Pearl, Tombigbee, Yazoo, Savannah, and St. Mary's rivers. Large, extant canebrakes still exist and have been documented from the Ocmulgee Basin, south of Macon, Georgia.

**Classification Comments:** The description is based on the old alliance *Arundinaria gigantea* Temporarily Flooded Shrubland Alliance (A.795). The only association in this alliance (CEGL003836) has a range that is not confined to the coastal plains. It is possible that this association should be split into biogeographic components with some of those non-coastal plain components needing to be placed in different groups. One reviewer has commented that "Why is a grassland community in a forest group? Is it simply because of their small size and thus constituency in a landscape matrix? If so, probably not an alliance concept." Even though *Arundinaria* is technically a grass, in terms of stature it is a shrub, and is therefore placed in a "woody" group. This placement should be reviewed and clarified.

**Diagnostic Characteristics:** These are typically monospecific or near-monospecific stands of *Arundinaria gigantea*.

### Related Concepts:

- *Arundinaria gigantea* shrubland alliance (Hoagland 1998a) ?
- P5A4bIII4a. *Arundinaria gigantea* (Foti et al. 1994) ?

### ALLIANCE DESCRIPTION

**Environment:** This alliance is found in wetlands on wet to moist alluvial or loess substrates. Dense monospecific stands of *Arundinaria gigantea* were historically found in bottomlands and streambanks in the southeastern United States. In presettlement times, a single river valley grove could be 2 or 3 miles wide and 100 miles long.

**Vegetation:** Vegetation of this alliance is dominated by *Arundinaria gigantea* (= *ssp. gigantea*). These are frequently monospecific or near-monospecific stands. Widely scattered trees may be present and the cane thicket may also include various briars (*Smilax* spp.) and other vines.

**Physiognomy and Structure:** These are typically monospecific or near-monospecific stands of *Arundinaria gigantea* without an overstory, or with widely scattered trees. *Arundinaria gigantea* is a "woody" grass, a North American member of the bamboo tribe (Bambuseae) of grasses.

**Floristics:** Vegetation of this alliance is dominated by *Arundinaria gigantea* (= *ssp. gigantea*). These are frequently monospecific or near-monospecific stands. Widely scattered trees may be present and the cane thicket may also include various briars (*Smilax* spp.) and other vines.

**Dynamics:** Evidence suggests that this alliance was widespread historically, covering large areas of many wet to moist floodplains and streambanks in the Southeastern Coastal Plain from North Carolina to Texas, the Mississippi River Alluvial Plain north to Illinois and Missouri, Interior Highlands, Interior Low Plateau, Southern Blue Ridge, Cumberland Mountains, and Western Allegheny Plateau of the southeastern United States. It now occupies very little of its former acreage. Canebrakes are successional communities and may have originated following abandonment of aboriginal agricultural fields or catastrophic disturbances such as windstorms. They are

thought to have been maintained in part by fires set by Native Americans. Today, high-quality examples of this alliance are extremely rare.

#### ALLIANCE DISTRIBUTION

**Range:** This alliance was widespread historically but now occupies very little acreage. It may be found along rivers and streamsides in Alabama, Arkansas, Georgia, Illinois, Kentucky, Louisiana, Mississippi, Missouri, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, West Virginia, and possibly Florida and Virginia.

**Nations:** US

**Subnations:** AL, AR, FL?, GA, IL, KY, LA, MO, MS, NC, OK, SC, TN, TX, VA?, WV

**TNC Ecoregions:** 31:P, 32:P, 38:C, 39:C, 40:C, 41:P, 42:C, 43:P, 44:C, 50:C, 51:C, 52:C, 53:P, 56:C, 57:P, 59:C

**USFS Ecoregions (1994/95):** 221H:CC, 221J:CC, 222A:CC, 222C:CC, 222D:CC, 222E:CC, 222F:CC, 231A:CC, 231B:CC, 231C:CC, 231D:CC, 231E:CC, 231G:CC, 234A:CC, 255D:PP, M221D:CC, M222A:CC, M231A:CC

**USFS Ecoregions (2007):** 221H:CC, 221J:CC, 223A:CC, 223D:CC, 223E:CC, 223F:CC, 231A:CC, 231B:CC, 231C:CC, 231D:CC, 231E:CC, 231G:CC, 232A:CC, 255D:PP, M221Ca:CCC, M221D:CC, M223A:CC, M231A:CC

#### ALLIANCE SOURCES

**References:** Campbell 1980a, Campbell 1989b, Davidson 1950, Faber-Langendoen et al. 2019b, Flores 1984, Foti et al. 1994, Heineke 1987, Hoagland 1998a, Hughes 1966, McInteer 1952, Meanley 1972, Mohr 1901, Platt and Brantley 1992, Platt and Brantley 1997, Roosevelt 1908, West 1934

**Author of Concept:** Faber-Langendoen et al. 2019b

**Author of Description:** A.S. Weakley and J. Teague, in Faber-Langendoen et al. (2013)

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### [CEGL003836] *Arundinaria gigantea ssp. gigantea* Wet Canebrake

Translated Name: **Giant Cane Wet Canebrake**

Common Name: **Floodplain Canebrake**

#### USNVC CLASSIFICATION

Division Eastern North American Temperate Freshwater Marsh, Wet Meadow & Shrubland (2.C.4.Nd)

Macrogroup Eastern North American Marsh, Wet Meadow & Shrubland (M069)

Group Central Interior Wet Meadow & Shrub Swamp (G599)

Alliance *Arundinaria gigantea* Wet Canebrake Alliance (A0795)

#### ELEMENT CONCEPT

**Global Summary:** This association is characterized by dense, often monospecific thickets of the bamboo shrub *Arundinaria gigantea* occupying large areas referred to as canebrakes. The canebrake shrubland type was historically widespread, but is now rare and occupies very little of its former acreage. It was best developed in streamside flats and alluvial floodplains on ridges and terraces where it was protected from prolonged inundation. Historically, this community covered large areas of many floodplains and streambanks in the Coastal Plain from North Carolina to Texas, Mississippi River Alluvial Plain, Interior Highlands, Interior Low Plateau, Southern Blue Ridge, Cumberland Mountains, and Western Allegheny Plateau of the southeastern United States. Stands occur on alluvial and loess soils and are often associated with bottomland hardwood forest vegetation. This association is successional and is thought to be maintained by periodic fires. It may have originated following abandonment of aboriginal agricultural fields or other natural and anthropogenic disturbances such as blow-downs and catastrophic floods. Historical accounts report cane as abundant along the Wabash and Ohio drainage systems, as well as common along larger rivers (Buffalo, White, Norfolk) in the Ozarks and Ouachitas. It was also reported as common along the Red and Mississippi rivers in Louisiana, Coastal Prairie rivers in Texas, and the Black, Washita, Arkansas, Sabine, Pearl, Tombigbee, Yazoo, Savannah, and St. Mary's rivers. Large, extant canebrakes still exist and have been documented from the Ocmulgee Basin, south of Macon, Georgia. In the Cumberland Mountains and Western Allegheny Plateau, streamside flats and bottomlands were dominated by *Arundinaria*, without an overstory, or with widely scattered trees.

#### ENVIRONMENTAL DESCRIPTION

**Great Smoky Mountains National Park Environment:** This vegetation occurs in association with an oxbow pond.

**Global Environment:** Stands of this association occur on alluvial and loess soils often affiliated with bottomland hardwood forest vegetation. Historically, it was best developed in streamside flats and alluvial floodplains on ridges and terraces where it was protected from prolonged inundation.

#### VEGETATION DESCRIPTION

**Great Smoky Mountains National Park Vegetation:** The single example of this community observed on the Cades Cove quadrangle covers approximately 750 square meters. It is a dense, monospecific stand of *Arundinaria gigantea*.

**Global Vegetation:** The vegetation is dominated by *Arundinaria gigantea*. Little else is known about its vegetational characteristics. However, information on its historic patterns of distribution provides some clues as to its ecology. General Land Office surveys and other historical accounts indicate that canebrakes were present in southern Illinois, southern Indiana, West Virginia, Kentucky, Missouri, Arkansas, eastern Texas (south to Wharton County), Louisiana, Tennessee, Mississippi, Alabama, Georgia, and South Carolina. Historical accounts refer to both "pure" stands of cane without an overstory of trees (cane shrublands) and areas with variable overstory closure (woodlands or forests) but with a dense understory dominated by cane as "canebrakes." Cane was abundant

along the Wabash and Ohio drainage systems (B. McClain pers. comm. 2000). In Missouri, these canebrakes were also thought to be common in the Ozark Highlands, particularly in southward-draining rivers and streams with finer-textured, more developed soils on upper floodplain terraces (T. Nigh pers. comm. 2000). Stands may be found along larger rivers (Buffalo, White, Norfolk) in the Arkansas Ozarks in addition to the Ouachitas. Historic accounts describe large expanses (one area was described as 75 miles long by 1-3 miles wide) of an "ocean of cane" in bottomlands of the Coastal Prairie of Texas (Smeins et al. 1992). No extant occurrences of this vegetation are known from this area today. In the Cumberland Mountains and Western Allegheny Plateau of West Virginia, numerous streamside flats and bottomlands were dominated by *Arundinaria*. Remnant patches persist under canopies of *Acer saccharinum*, *Acer negundo*, and *Platanus occidentalis*. Associated species with low cover in two West Virginia plots include *Magnolia acuminata*, *Parthenocissus quinquefolia*, *Verbesina alternifolia*, *Hydrophyllum canadense*, and species of *Impatiens* and *Viola*. Small patches of *Arundinaria gigantea* without a tree canopy have also been documented in disturbed areas.

**Global Dynamics:** A canebrake is an early-successional community. It is suggested that Native Americans maintained canebrakes with the use of periodic fire to provide a ready source of cane for a myriad of uses. Canebrakes may have expanded greatly in cover following the abandonment of aboriginal agricultural lands after the collapse of Native American populations due to exotic diseases (Platt and Brantley 1997).

#### MOST ABUNDANT SPECIES

##### Great Smoky Mountains National Park

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tall shrub/sapling	Graminoid	<i>Arundinaria gigantea</i>

##### Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tall shrub/sapling	Bamboo tree	<i>Arundinaria gigantea</i>

#### CHARACTERISTIC SPECIES

**Great Smoky Mountains National Park:** *Arundinaria gigantea*

**Global:** *Arundinaria gigantea*

#### OTHER NOTEWORTHY SPECIES

**Global:**

#### CONSERVATION STATUS RANK

**Global Rank & Reasons:** G2? (15-Feb-1999). Stands of this vegetation type were historically widespread, but now are rare or occupy very little acreage. It is thought to be maintained by frequent fire and may have historically resulted from aboriginal agriculture and burning. Dense, monospecific stands of *Arundinaria gigantea* were historically found in bottomland sites throughout the southeastern United States. Today, this vegetation exists as small remnants, and high-quality examples are extremely rare.

#### RELATED CONCEPTS

##### Global Related Concepts:

- *Arundinaria gigantea* ssp. *gigantea* Shrubland (Faber-Langendoen 2001) =
- *Arundinaria gigantea* Floodplain Woodland [Giant Cane Woodland] (Vanderhorst 2017a) <
- P5A4bIII4a. *Arundinaria gigantea* (Foti et al. 1994) ?

#### CLASSIFICATION

**Status:** Standard

**Classification Confidence:** 3 - Weak

**Great Smoky Mountains National Park Other Comments:** On the Cades Cove quadrangle this vegetation occurs adjacent to a shrub swamp and abandoned agricultural fields.

**Global Classification Comments:** This is a general placeholder, covering a broad geographic range, and several associations may ultimately be recognized. Dense, monospecific stands of *Arundinaria gigantea* were historically found in bottomland sites in the southeastern United States. Today, high-quality examples are extremely rare, if not absent. Historical accounts refer to both "pure" stands of cane without an overstory of trees (cane shrublands) and areas with variable overstory closure (woodlands or forests) but with a dense understory dominated by cane as "canebrakes."

In West Virginia, two plots from the valleys of the Ohio and Kanawha rivers are classified to this association. These stands are thought to be remnants of previously more extensive canebrakes that now persist under open tree canopies dominated by *Acer negundo*. Many place names in southwestern West Virginia that reference cane and remnant patches give clues to the former distribution and extent of canebrakes in the state. Historical accounts of canebrakes along the Kanawha and Ohio rivers are given by Thomas Nuttall (1821) and by George Washington in the late 1700s (Jackson and Twohig 1976).

#### ELEMENT DISTRIBUTION

**Great Smoky Mountains National Park Range:** This community was sampled from one location on the Cade Cove quadrangle. It is unlikely on the Mount Le Conte quadrangle. It could occur in other areas of the park, particularly along larger rivers. This community was sampled from the western end of the Cades Cove Loop Road, along Abrams Creek.

**Global Range:** This association was widespread historically but now occupies very little acreage. It may be found along rivers and streambanks in Alabama, Arkansas, Florida, Georgia, Illinois, Indiana, Kentucky, Louisiana, Mississippi, Missouri, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, West Virginia, and possibly Virginia.

**Nations:** US

**States/Provinces:** AL, AR, FL?, GA, IL, KY, LA, MO, MS, NC, OK, SC, TN, TX, VA?, WV:SI

**TNC Ecoregions:** 31:P, 32:P, 38:C, 39:C, 40:C, 41:P, 42:C, 43:P, 44:C, 50:C, 51:C, 52:C, 53:P, 56:C, 57:P, 59:C

**USFS Ecoregions (1994/95):** 221Ha:CC?, 221Hc:CCP, 221Hd:CCP, 221He:CC?, 221Ja:CCC, 221Jb:CCP, 221Jc:CCP, 222Ab:CCC, 222Ag:CCC, 222Ah:CCC, 222An:CCC, 222Ca:CCP, 222Cb:CCP, 222Cc:CCP, 222Cd:CCP, 222Ce:CCP, 222Cf:CCP, 222Cg:CCP, 222Ch:CCP, 222Da:CCP, 222Db:CCP, 222Dc:CCP, 222Dd:CCP, 222De:CCP, 222Dg:CCP, 222Di:CCP, 222Dj:CCP, 222Ea:CCC, 222Eb:CCC, 222Ec:CCC, 222Ed:CCC, 222Ef:CCP, 222Eg:CCP, 222Eh:CCC, 222Ei:CCP, 222Ej:CC?, 222Ek:CCP, 222El:CCP, 222Em:CCP, 222En:CC?, 222Eo:CC?, 222Fa:CCC, 222Fb:CCC, 222Fc:CCC, 222Fd:CCC, 222Ff:CC?, 231Aa:CCP, 231Ab:CCC, 231Ac:CCP, 231Ad:CCP, 231Ae:CCP, 231Af:CCP, 231Ag:CC?, 231Ah:CC?, 231Ai:CCP, 231Am:CC?, 231An:CC?, 231Ao:CCP, 231Ba:CCP, 231Bb:CCP, 231Bc:CCP, 231Bd:CCP, 231Be:CCP, 231Bf:CCP, 231Bg:CCP, 231Bh:CCP, 231Bi:CCP, 231Bj:CCP, 231Bk:CCP, 231Bl:CCP, 231Ca:CCP, 231Cb:CCP, 231Cc:CCP, 231Cd:CCP, 231Ce:CCP, 231Cf:CCP, 231Cg:CCP, 231Da:CCP, 231Db:CCP, 231Dc:CCP, 231Dd:CCP, 231De:CCP, 231Ea:CCP, 231Eb:CCP, 231Ec:CCC, 231Ed:CCC, 231Ee:CCP, 231Ej:CCP, 231Ek:CCP, 231Em:CCC, 231Ga:CCC, 231Gb:CCC, 231Gc:CCC, 234Aa:CCC, 234Ab:CC?, 234Ac:CCP, 234Ad:CCP, 234Ae:CCC, 234Af:CCP, 234Ag:CCC, 234Ah:CC?, 234Ai:CCC, 234Aj:CC?, 234Ak:CC?, 234Al:CCP, 234Am:CCC, 234An:CCC, 255Da:PPP, 255Db:PPP, M221Dc:CCC, M221Dd:CCC, M222Aa:CCC, M222Ab:CCC, M231Aa:CCC, M231Ab:CCC, M231Ac:CCC, M231Ad:CCC

**USFS Ecoregions (2007):** 221Ec:CCC, 221Ej:CC?, 221En:CC?, 221Ha:CC?, 221Hb:CC?, 221Hc:CCP, 221Hd:CCP, 221He:CC?, 221Ja:CCC, 221Jb:CCP, 221Jc:CCP, 223Ab:CCC, 223Ag:CCC, 223Ah:CCC, 223An:CCP, 223Ba:CCP, 223Bc:CCP, 223Bd:CCP, 223Da:CCP, 223Db:CCP, 223Dc:CCP, 223Dd:CCP, 223De:CCP, 223Dg:CCP, 223Di:CCP, 223Dj:CCP, 223Ea:CCC, 223Eb:CCC, 223Ec:CCC, 223Ed:CCC, 223Ef:CCP, 223Eg:CCP, 223Eh:CCC, 223Fa:CCC, 223Fb:CCC, 223Fc:CCC, 223Fd:CCC, 223Ff:CC?, 231Aa:CCP, 231Ab:CCC, 231Ac:CCP, 231Ad:CCP, 231Af:CC?, 231Ag:CC?, 231Ah:CC?, 231Ai:CCP, 231Ba:CCP, 231Bb:CCP, 231Bc:CCP, 231Bd:CCP, 231Be:CCP, 231Bf:CCP, 231Bj:CCP, 231Bk:CCP, 231Bl:CCP, 231Ca:CCP, 231Cb:CCP, 231Cc:CCP, 231Cd:CCP, 231Ce:CCP, 231Cf:CCP, 231Cg:CCP, 231Da:CCP, 231Db:CCP, 231Dc:CCP, 231Dd:CCP, 231De:CCP, 231Ea:CCC, 231Eb:CCP, 231Ec:CCC, 231Ee:CCP, 231Ej:CCP, 231Ek:CCP, 231Eo:CCC, 231Ga:CCC, 231Gb:CCC, 231Gc:CCC, 231Ha:CCP, 231Hb:CCP, 231Hc:CCP, 231Hd:CCP, 231He:CCP, 231Hf:CCP, 231Hg:CCP, 231Ic:CCP, 231Id:CCP, 231Ie:CCP, 231If:CC?, 231Ig:CC?, 234Aa:CCC, 234Ad:CCP, 234Ah:CC?, 234Cb:CCP, 234Cc:CCP, 234Cd:CC?, 234Da:CCC, 234Db:CC?, 234Dc:CCP, 234Do:CCC, 234Ea:CCC, 234Eb:CCC, 234Ec:CC?, 255Da:PPP, 255Db:PPP, M221Ca:CCC, M221Dc:CCC, M221Dd:CCC, M222Aa:CCC, M222Ab:CCC, M231Aa:CCC, M231Ab:CCC, M231Ac:CCC, M231Ad:CCC

**Federal Lands:** BIA (Eastern Band of Cherokee); NPS (Abe Lincoln Birthplace?, Blue Ridge Parkway?, Buffalo River, Chickamauga-Chattanooga?, Cowpens, Great Smoky Mountains, Horseshoe Bend, Natchez Trace, Ninety Six, Ozark Riverways?); USFS (Cherokee?, Mark Twain, Ouachita (Coastal Plain)?, Ouachita (Mountains)?, Ouachita?, Ozark, St. Francis); USFWS (Little River, San Bernard?)

#### ELEMENT SOURCES

**Great Smoky Mountains National Park Description Author(s):** K.D. Patterson

**Global Description Author(s):** K.D. Patterson, D. Faber-Langendoen and J. Teague

**References:** Barden 1997, Blair 1938, CAP pers. comm. 1998, Campbell 1980a, Campbell 1989b, Chastain et al. 2006, Davidson 1950, Faber-Langendoen 2001, Flores 1984, Foti et al. 1994, GNHP unpubl. data 2018, Heineke 1987, Hoagland 1997, Hoagland 1998c, Hoagland 2000, Hop et al. 2012a, Hughes 1966, Jackson and Twohig 1976, McClain pers. comm., McInteer 1952, Meanley 1972, Mohr 1901, Nelson 1986, Nelson 2010, Nigh pers. comm., Nuttall 1821, Peet et al. unpubl. data, Platt and Brantley 1992, Platt and Brantley 1997, Schafale 2012, Smeins et al. 1992, Southeastern Ecology Working Group n.d., TDNH unpubl. data 2018, Vanderhorst 2017a, WVNHP unpubl. data, West 1934, White 2004, White and Govus 2003, White and Madany 1978

### G903. APPALACHIAN-NORTHEAST WET MEADOW & SHRUB SWAMP

**Group Summary Description:** This group is found in the Laurentian region of the Great Lakes and the northeastern United States and adjacent Canada north from West Virginia. It is characterized by wet-mesic to wet sites and can be dominated by a variety of graminoids and forbs. Common abundant species include the graminoids *Calamagrostis canadensis*, *Carex lacustris*, *Carex stricta*, *Carex vesicaria*, *Carex utriculata*, *Glyceria striata*, *Leersia oryzoides*, and *Scirpus cyperinus*. Forbs that may be common or dominant include *Boltonia asteroides* var. *asteroides*, *Eutrochium fistulosum*, *Eupatorium perfoliatum*, *Impatiens capensis*, *Impatiens pallida*, *Mentha arvensis*, *Sagittaria latifolia*, *Solidago canadensis*, *Solidago rugosa*, *Symphotrichum racemosum*, and *Verbesina alternifolia*. Sites are found in basins or along slow-moving rivers and streams and are flooded or saturated for at least some of the growing season but rarely more than 0.3 m deep.

### A3685 *Alnus* spp. - *Salix* spp. - *Cornus sericea* Shrub Swamp Alliance

Alder species - Willow species - Red-osier Dogwood Shrub Swamp Alliance

*Alder - Willow - Dogwood Shrub Swamp*

**ALLIANCE CONCEPT**

**Summary:** This alliance contains tall-shrub swamps in the northeastern and north-central United States and eastern temperate Canada in a variety of non-alluvial topographic depressions. The vegetation is dominated by *Alnus incana*, *Alnus serrulata*, *Salix sericea*, or *Hypericum densiflorum*. Associates may include *Cornus sericea*, *Rosa palustris*, *Spiraea alba* var. *alba*, *Spiraea alba* var. *latifolia*, *Viburnum nudum* var. *cassinoides*, and others. These wetlands are often successional following disturbance. They are found in beaver meadows, lakeshores, headwater wetlands, and basin wetlands, as well as backwater floodplains of streams and rivers. Soils vary from deep organic mucks to mineral soils with high organic content (muck), and are saturated for much of the year.

**Classification Comments:** This is a broadly defined alliance, based more on hydrologic and topographic setting than on floristics. Additional data are required to define this alliance with confidence. This alliance is distinguished from the alluvial shrubland alliance *Alnus incana* Shrub Swamp Alliance (A4377), at least in the northeastern United States [see Sperduto and Nichols (2004)], and when it is, it is restricted to mucky or peat shrublands in depressions or backwaters of floodplains (Thompson and Sorenson 2000). Care is needed in how to distinguish these two types. More information is needed on herbs and mosses.

**Similar Alliances:**

- *Alnus incana* - *Cornus amomum* Tidal Shrub Swamp Alliance (A4376)
- *Alnus incana* Shrub Swamp Alliance (A4377)

**Diagnostic Characteristics:** Tall-shrub wetlands in non-alluvial settings characterized by *Alnus incana*, *Alnus serrulata*, *Salix sericea*, or *Hypericum densiflorum*.

**Related Concepts:**

- Alder swamp (Thompson and Sorenson 2000) <

**ALLIANCE DESCRIPTION**

**Environment:** Stands are found in beaver meadows, lakeshores, headwater wetlands, and basin wetlands, as well as backwater floodplains of streams and rivers. Soils vary from deep organic mucks to mineral soils with high organic content (muck), and are saturated for much of the year.

**Vegetation:** The vegetation is dominated by *Alnus incana*, *Alnus serrulata*, *Salix sericea*, or *Hypericum densiflorum*. Associates may include *Cornus sericea*, *Rosa palustris*, *Spiraea alba* var. *alba*, *Spiraea alba* var. *latifolia* (= *Spiraea latifolia*), *Viburnum nudum* var. *cassinoides*, and others.

**Floristics:** The vegetation is dominated by *Alnus incana*, *Alnus serrulata*, *Salix sericea*, or *Hypericum densiflorum*. Associates may include *Cornus sericea*, *Rosa palustris*, *Spiraea alba* var. *alba*, *Spiraea alba* var. *latifolia* (= *Spiraea latifolia*), *Viburnum nudum* var. *cassinoides*, and others.

**Dynamics:** These wetlands are often successional following disturbance, including hydrological disturbances caused by beaver.

**ALLIANCE DISTRIBUTION**

**Range:** This alliance contains tall-shrub swamps in the northeastern and north-central United States and eastern temperate Canada.

**Nations:** CA,US

**Subnations:** CT, DE, IA, IL, IN?, KY, MA, MB?, MD, ME, MI, MN, NH, NJ, NY, OH, ON, PA, QC, RI, TN, VA, VT, WI, WV

**ALLIANCE SOURCES**

**References:** Eastern Ecology Working Group n.d., Egler and Niering 1976, Faber-Langendoen et al. 2019b, Gordon 1937b, Niering 1953, Sperduto and Nichols 2004, Thompson and Sorenson 2000, Walbridge and Lang 1982

**Author of Concept:** Faber-Langendoen et al. 2019b

**Author of Description:** L. Sneddon, in Faber-Langendoen et al. (2013)

**[CEGL008474] *Alnus serrulata* Southeastern Shrub Swamp**

Translated Name: **Hazel Alder Southeastern Shrub Swamp**

Common Name: **Southeastern Alder Swamp**

**USNVC CLASSIFICATION**

Division	Eastern North American Temperate Freshwater Marsh, Wet Meadow & Shrubland (2.C.4.Nd)
Macrogroup	Eastern North American Marsh, Wet Meadow & Shrubland (M069)
Group	Appalachian-Northeast Wet Meadow & Shrub Swamp (G903)
Alliance	<i>Alnus</i> spp. - <i>Salix</i> spp. - <i>Cornus sericea</i> Shrub Swamp Alliance (A3685)

**ELEMENT CONCEPT**

**Global Summary:** This alder swamp is found in the upper southeastern United States, most probably from Kentucky south to central Alabama and Georgia, and west to Mississippi and Arkansas. These shrublands are found on muck overlying mineral soils, at the edges of forested swamps, or in other related seasonally flooded situations, including depressions in floodplains and the backwaters of lakes and beaver ponds. Hydrologic alteration of systems (e.g., creation of impoundments by the agency of humans and/or beaver) may expand habitat for this association. The vegetation is dominated by tall shrubs, and is characterized by some combination of *Alnus serrulata*, *Viburnum* spp., *Cornus* spp., and *Salix* spp. In addition, saplings of *Acer rubrum* are typical. Other shrubs present may include *Cephalanthus occidentalis*, *Decodon verticillatus*, and *Ilex verticillata*. Herbaceous associates include *Osmunda regalis*,

*Thelypteris palustris*, *Galium* spp., *Typha latifolia*, *Peltandra virginica*, and *Carex* spp. Tree species such as *Acer rubrum* and *Juglans nigra* may exist on the fringes of such an association, occasionally overshadowing parts of the association.

#### ENVIRONMENTAL DESCRIPTION

**Global Environment:** These shrublands are found on muck overlying mineral soils, at the edges of forested swamps, or in other related seasonally flooded situations, including depressions in floodplains and the backwaters of lakes and beaver ponds. Hydrologic alteration of systems (e.g., creation of impoundments by the agency of humans and/or beaver) may expand habitat for this association.

#### VEGETATION DESCRIPTION

**Global Vegetation:** Stands of this vegetation are dominated by tall shrubs and are characterized by some combination of *Alnus serrulata*, *Viburnum* spp., *Cornus* spp., and *Salix* spp. In addition, saplings of *Acer rubrum* are typical. Other shrubs present may include *Cephalanthus occidentalis*, *Decodon verticillatus*, and *Ilex verticillata*. Herbaceous associates include *Osmunda regalis*, *Thelypteris palustris*, *Boehmeria cylindrica*, *Polygonum sagittatum*, *Commelina virginica*, *Galium* spp., *Lycopus* spp., *Typha latifolia*, *Peltandra virginica*, *Mikania scandens*, and *Carex* spp. (e.g., *Carex crinita*, *Carex atlantica*). Tree species such as *Acer rubrum* and *Juglans nigra* may exist on the fringes of such an association, occasionally overshadowing parts of it. The exotic *Murdannia keisak* (= *Aneilema keisak*) may also be present.

**Global Dynamics:** Hydrologic alteration of systems (e.g., creation of impoundments by the agency of humans and/or beaver) may expand habitat for this association.

#### MOST ABUNDANT SPECIES

##### Global

##### Stratum

Tall shrub/sapling

##### Lifeform

Broad-leaved deciduous shrub

##### Species

*Alnus serrulata*

#### CHARACTERISTIC SPECIES

**Global:** *Alnus serrulata*

#### OTHER NOTEWORTHY SPECIES

**Global: Invasive/Exotic Plants:** *Murdannia keisak* (Medium/Low)

#### CONSERVATION STATUS RANK

**Global Rank & Reasons:** G4 (15-Oct-2002). This association occurs in a variety of seasonally flooded habitats in the upper southeastern United States. This includes the edges of forested swamps, depressions in floodplains, and the backwaters of lakes and beaver ponds. Hydrologic alteration of systems (e.g., creation of impoundments by the agency of humans and/or beaver) may expand habitat for this association. This is not a rare or imperiled vegetation type, even though its occurrence is very poorly documented.

#### RELATED CONCEPTS

##### Global Similar Types:

- *Alnus serrulata* / *Calamagrostis canadensis* Shrub Swamp (CEGL005082)
- *Alnus serrulata* Appalachian Seepage Shrubland (CEGL007062)

#### CLASSIFICATION

**Status:** Standard

**Classification Confidence:** 3 - Weak

**Global Classification Comments:** The range of this type may abut the range of *Alnus serrulata* / *Calamagrostis canadensis* Shrub Swamp (CEGL005082) in the vicinity of the Ohio River; the distinction there is obscure. Occurrences on the edges of impoundments would be assumed to be of lower quality than those in more hydrologically natural situations.

#### ELEMENT DISTRIBUTION

**Global Range:** This smooth alder swamp is found in the upper southeastern United States, most probably from Kentucky south to central Alabama and Georgia and west to Mississippi and Arkansas.

**Nations:** US

**States/Provinces:** AL, AR, GA, KY, MS, NC, SC, TN

**TNC Ecoregions:** 40:C, 42:C, 43:C, 44:C, 50:C, 51:C, 52:C

**USFS Ecoregions (1994/95):** 221Hc:CCC, 222Eg:CCC, 222En:CCC, 222Eo:CCC, 231Aa:CCC, 231Ab:CCC, 231Bd:CCC, 231Be:CCC, 231Bg:CCC, 231C:CP, 231D:CP, 234A:CC, M221Dd:CCC

**USFS Ecoregions (2007):** 221En:C??, 221Hb:CCP, 221Hc:CCC, 223Eg:CCC, 231Aa:CCP, 231Ab:CCC, 231Bd:CCC, 231Be:CCC, 231C:CP, 231D:CP, 231Hb:CCC, 234:C, M221Dd:CCC

**Federal Lands:** BIA (Eastern Band of Cherokee); DOD (Fort Benning); NPS (Big South Fork, Buffalo River, Chattahoochee River, Chickamauga-Chattanooga?, Great Smoky Mountains, Horseshoe Bend, Kings Mountain, Mammoth Cave?, Natchez Trace); USFS (Daniel Boone, Holly Springs, Oconee, Ouachita, Talladega (Oakmulgee)?, Talladega (Talladega)?, Talladega?, Tuskegee?)

#### ELEMENT SOURCES

**Global Description Author(s):** M. Pyne

**References:** GNHP unpubl. data 2018, MSNHP 2006, NatureServe Ecology - Southeastern U.S. unpubl. data, Nordman et al. 2011, Pyne et al. 2010, Schafale 2012, Southeastern Ecology Working Group n.d.

## M880. Eastern North American Wet Shoreline Vegetation

### G755. EASTERN NORTH AMERICAN RIVERINE WETLAND VEGETATION

**Group Summary Description:** This eastern North American group consists of riverine wetlands. Even with this reduced concept, composition is variable enough that individual character species are somewhat difficult to isolate, but some reasonably constant species might include *Alnus serrulata*, *Carex torta*, *Elymus* spp., *Eupatorium* spp., *Panicum virgatum*, *Salix caroliniana*, *Salix interior* (more Midwest), *Solidago gigantea*, and others.

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#### A0943 *Alnus serrulata* Riverscour Shrubland Alliance

Hazel Alder Riverscour Shrubland Alliance

*Hazel Alder Riverscour Shrubland*

##### ALLIANCE CONCEPT

**Summary:** This alliance includes temporarily flooded shrub thickets characterized by high-energy flooding events along rivers and streams on rocky shoals and gravel bars in the Appalachians and Interior Highlands. *Alnus serrulata* is characteristic; other common species include *Cephalanthus occidentalis*, *Cornus amomum*, *Cornus obliqua*, *Cornus foemina*, *Hypericum prolificum*, *Lyonia ligustrina*, *Viburnum nudum*, *Physocarpus opulifolius*, *Amorpha fruticosa*, *Xanthorhiza simplicissima*, and others.

**Classification Comments:** This alliance is broadly defined and highly variable in composition due to the dynamic processes influencing it.

**Diagnostic Characteristics:** *Alnus serrulata* occurring on high-energy rivershores, often flood-battered.

##### Related Concepts:

- *Alnus/Xanthorhiza* rocky stream margin (Newell and Peet 1995) ?
- IIE3a. Riverside Shoal and Stream Bar Complex (Allard 1990) ?
- Mountain River (Wharton 1978) ><

##### ALLIANCE DESCRIPTION

**Environment:** Stands of this alliance are found along rivers and streams on rocky shoals and gravel bars.

**Vegetation:** Stands of this alliance are dominated by *Alnus serrulata*. Other common species include *Cephalanthus occidentalis*, *Cornus amomum*, *Cornus obliqua* (= *Cornus amomum* ssp. *obliqua*), *Cornus foemina*, *Hypericum prolificum*, *Lyonia ligustrina*, *Viburnum nudum*, *Physocarpus opulifolius*, *Amorpha fruticosa*, *Xanthorhiza simplicissima*, and others. Some herbaceous associates may include *Osmunda regalis*, *Decodon verticillatus*, *Utricularia* spp., *Limnium spongia*, *Oxypolis rigidior*, *Chelone glabra*, and *Cicuta bulbifera*.

**Physiognomy and Structure:** Stands are dominated by tall broadleaf deciduous shrubs.

**Floristics:** Stands of this alliance are dominated by *Alnus serrulata*. Other common species include *Cephalanthus occidentalis*, *Cornus amomum*, *Cornus obliqua* (= *Cornus amomum* ssp. *obliqua*), *Cornus foemina*, *Hypericum prolificum*, *Lyonia ligustrina*, *Viburnum nudum*, *Physocarpus opulifolius*, *Amorpha fruticosa*, *Xanthorhiza simplicissima*, and others. Some herbaceous associates may include *Osmunda regalis*, *Decodon verticillatus*, *Utricularia* spp., *Limnium spongia*, *Oxypolis rigidior*, *Chelone glabra*, and *Cicuta bulbifera*.

##### ALLIANCE DISTRIBUTION

**Range:** This alliance occurs in the Southern Blue Ridge, Ozarks, Ouachitas, Cumberland Plateau, High Allegheny and Western Allegheny plateaus, and the northern Ridge and Valley.

**Nations:** US

**Subnations:** AL, AR, GA, KY, LA, MD, MO, NC, NH, NY, OH, OK, PA, SC, TN, VA, WV

##### ALLIANCE SOURCES

**References:** Allard 1990, Cooper 1963, DuMond 1970, Faber-Langendoen et al. 2019b, Fike 1999, Hoagland 1998a, Nelson 1986, Newell and Peet 1995, Rodgers 1965, Schafale and Weakley 1990, Smith 1991, Tiner 1985a, Tobe et al. 1992, Wharton 1978

**Author of Concept:** Faber-Langendoen et al. 2019b

**Author of Description:** D.J. Allard, in Faber-Langendoen et al. (2013)

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#### [CEGL003895] *Alnus serrulata* - *Xanthorhiza simplicissima* Wet Shrubland

Translated Name: Hazel Alder - Yellowroot Wet Shrubland

Common Name: Rocky Bar and Shore (Alder - Yellowroot Type)

##### USNVC CLASSIFICATION

Division Eastern North American Temperate Freshwater Marsh, Wet Meadow & Shrubland (2.C.4.Nd)  
Macrogroup Eastern North American Wet Shoreline Vegetation (M880)

Group Eastern North American Riverine Wetland Vegetation (G755)  
 Alliance *Alnus serrulata* Riverscour Shrubland Alliance (A0943)

#### ELEMENT CONCEPT

**Global Summary:** This association includes shrublands on rocky or gravelly substrates along narrow river margins in the southeastern Blue Ridge Escarpment gorges, ranging elsewhere on the Southern Blue Ridge and into the Cumberland Plateau. Vegetation composition, density, and height vary with frequency of flooding, substrate, and soil depth. *Alnus serrulata* and *Xanthorhiza simplicissima* are common and characteristic but not always dominant. Other shrubs may include *Arundinaria gigantea*, *Diervilla sessilifolia*, *Salix nigra*, *Salix sericea*, *Rhododendron arborescens*, *Rhododendron viscosum*, *Rhododendron maximum*, *Rhododendron periclymenoides*, *Kalmia latifolia*, *Leucothoe fontanesiana*, *Cornus foemina*, *Cornus amomum*, *Physocarpus opulifolius*, *Itea virginica*, and *Viburnum nudum* var. *cassinoides*. Arborescent species that occur as tall shrubs (or as occasional trees, less than 10% cover) include *Acer rubrum*, *Carpinus caroliniana*, *Diospyros virginiana*, *Liquidambar styraciflua*, *Liriodendron tulipifera*, *Platanus occidentalis*, and *Tsuga canadensis*. Open areas dominated by grasses and forbs include species such as *Agrostis perennans*, *Boykinia aconitifolia*, *Carex torta*, *Eutrochium fistulosum*, *Lycopus virginicus*, *Trautvetteria caroliniensis*, *Houstonia serpyllifolia*, *Impatiens capensis*, *Hypericum mutilum*, *Viola x primulifolia*, and *Holcus lanatus* (exotic). Adjacent alluvial forests in the Blue Ridge are dominated by *Tsuga canadensis*, *Liriodendron tulipifera*, *Betula lenta*, and, at lower elevations, below 610 m (2000 feet), *Platanus occidentalis* and *Liquidambar styraciflua*.

#### ENVIRONMENTAL DESCRIPTION

**Great Smoky Mountains National Park Environment:** In the Smokies, this community only occurs at low elevations (below 2000 feet) along the largest creeks and rivers. The community exists in very narrow bands along the river, often so small as to be unsamplable.

**Global Environment:** This association includes shrublands on rocky or gravelly substrates along narrow river margins in the southeastern Blue Ridge Escarpment gorges, ranging elsewhere on the Southern Blue Ridge and into the Cumberland Plateau. Vegetation composition, density, and height vary with frequency of flooding, substrate, and soil depth. The occurrences can be in very narrow bands of 1-2 m or wider bars of up to 10-20 m wide adjacent to large creeks and small rivers.

#### VEGETATION DESCRIPTION

**Great Smoky Mountains National Park Vegetation:** The vegetation of this association within the park is dominated by the shrub *Alnus serrulata* at 0.5-2 m tall and the shrub *Xanthorhiza simplicissima* at below 0.5 m in height. Other shrub and small tree species such as *Toxicodendron radicans* can also be quite common. The community usually has an overarching canopy of *Carpinus caroliniana* and various upland species from the adjacent higher ground and a fairly well-developed herbaceous stratum, especially in patches where shrub cover is low.

**Global Vegetation:** *Alnus serrulata* and *Xanthorhiza simplicissima* are common shrubs and characteristic but not always dominant. Other shrubs may include *Arundinaria gigantea*, *Diervilla sessilifolia*, *Salix nigra*, *Salix sericea*, *Rhododendron arborescens*, *Rhododendron viscosum*, *Rhododendron maximum*, *Rhododendron periclymenoides*, *Kalmia latifolia*, *Leucothoe fontanesiana*, *Cornus foemina*, *Cornus amomum*, *Physocarpus opulifolius*, *Itea virginica*, and *Viburnum nudum* var. *cassinoides*. Arborescent species that occur as tall shrubs (or as occasional trees, less than 10% cover) include *Acer rubrum*, *Carpinus caroliniana*, *Diospyros virginiana*, *Liquidambar styraciflua*, *Liriodendron tulipifera*, *Platanus occidentalis*, and *Tsuga canadensis*. Open areas dominated by grasses and forbs include species such as *Agrostis perennans*, *Boykinia aconitifolia*, *Carex torta*, *Eutrochium fistulosum* (= *Eupatorium fistulosum*), *Lycopus virginicus*, *Trautvetteria caroliniensis*, *Houstonia serpyllifolia*, *Impatiens capensis*, *Hypericum mutilum*, *Viola x primulifolia*, and *Holcus lanatus* (exotic). Adjacent alluvial forests in the Blue Ridge are dominated by *Tsuga canadensis*, *Liriodendron tulipifera*, *Betula lenta*, and, at lower elevations, below 610 m (2000 feet), *Platanus occidentalis* and *Liquidambar styraciflua*.

#### MOST ABUNDANT SPECIES

##### Great Smoky Mountains National Park

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tall shrub/sapling	Broad-leaved deciduous tree	<i>Alnus serrulata</i>
Herb (field)	Flowering forb	<i>Xanthorhiza simplicissima</i>

##### Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tall shrub/sapling	Broad-leaved deciduous tree	<i>Alnus serrulata</i>
Herb (field)	Flowering forb	<i>Xanthorhiza simplicissima</i>

#### CHARACTERISTIC SPECIES

**Great Smoky Mountains National Park:** *Alnus serrulata*, *Carpinus caroliniana*, *Diospyros virginiana*, *Leucothoe fontanesiana*, *Liquidambar styraciflua*, *Liriodendron tulipifera*, *Platanus occidentalis*, *Tsuga canadensis*

**Global:** *Alnus serrulata*, *Carpinus caroliniana*, *Diospyros virginiana*, *Leucothoe fontanesiana*, *Liquidambar styraciflua*, *Liriodendron tulipifera*, *Platanus occidentalis*, *Tsuga canadensis*, *Xanthorhiza simplicissima*

**OTHER NOTEWORTHY SPECIES**

**Global: Vulnerable Plants:** *Diervilla rivularis* (G3), *Spiraea virginiana* (G2); **Invasive/Exotic Plants:** *Holcus lanatus* (High/Medium)

**CONSERVATION STATUS RANK**

**Global Rank & Reasons:** G3G4 (17-Dec-1999). This community is naturally restricted in terms of geography and habitat, thus could be vulnerable to elimination. However, this community is often overlooked in inventories or not separately distinguished, and is likely much more common than the number of documented occurrences suggests. Threats to this community include alteration of the natural flooding regime due to damming of rivers and invasion by exotic species carried on river courses.

**RELATED CONCEPTS****Global Similar Types:**

- *Platanus occidentalis* / *Dichanthelium clandestinum* - *Festuca subverticillata* Floodplain Forest (CEGL004031)

**Global Related Concepts:**

- *Alnus/Xanthorhiza* rocky stream margin (Newell and Peet 1995) ?
- IIE3a. Riverside Shoal and Stream Bar Complex (Allard 1990) >
- River Sandbar (Patterson 1994) =

**CLASSIFICATION**

**Status:** Standard

**Classification Confidence:** 2 - Moderate

**Global Classification Comments:** This association is known from the Bankhead National Forest, Alabama, but further inventory is needed to fully describe the variation of this type on the Bankhead and elsewhere in the Cumberland Plateau. In the Appalachian Trail study (Fleming and Patterson 2009a), four plots from North Carolina, Tennessee, and Virginia were classified as this association. Species that are 100% constant are *Alnus serrulata*, *Apios americana*, *Dichanthelium clandestinum*, *Rudbeckia laciniata*, *Solidago rugosa*, *Toxicodendron radicans*, *Verbesina alternifolia*, and *Viola sororia*; species that are 75% constant include *Ambrosia artemisiifolia*, *Amphicarpaea bracteata*, *Carpinus caroliniana*, *Clematis virginiana*, *Cryptotaenia canadensis*, *Impatiens capensis*, and *Xanthorhiza simplicissima*. Exotic species that may be present (at 75% constancy) include *Holcus lanatus*, *Microstegium vimineum*, and *Rosa multiflora*.

**ELEMENT DISTRIBUTION**

**Great Smoky Mountains National Park Range:** This association was only sampled on one small section of Abrams Creek in the Calderwood quadrangle. It most likely exists along other stretches of Abrams and the Little Pigeon rivers on the Tennessee side of the park.

**Global Range:** This association is found along montane rivers in the Southern Blue Ridge and Cumberlands. Occurrences in adjacent regions are possible.

**Nations:** US

**States/Provinces:** AL, GA, KY, NC, SC, TN, VA:SU

**TNC Ecoregions:** 50:C, 51:C, 52:P

**USFS Ecoregions (1994/95):** 221Ha:CCC, 221Hc:CCC, 221He:CCC, 231Cc:CCC, 231Cd:CCC, M221Db:CCC, M221Dc:CCC, M221Dd:CCC

**USFS Ecoregions (2007):** 221Ha:CCC, 221Hc:CCC, 221He:CC?, 231Cc:CCC, 231Cd:CCC, M221Db:CCC, M221Dc:CCC, M221Dd:CCC

**Federal Lands:** BIA (Eastern Band of Cherokee); NPS (Appalachian Trail [Southern Blue Ridge], Big South Fork, Blue Ridge Parkway, Chickamauga-Chattanooga?, Great Smoky Mountains, Little River Canyon, Obed River); USFS (Bankhead, Chattahoochee, Chattahoochee (Piedmont)?, Chattahoochee (Southern Blue Ridge), Daniel Boone, Nantahala, Pisgah, Sumter, Sumter (Mountains), Sumter (Piedmont)?)

**ELEMENT SOURCES**

**Great Smoky Mountains National Park Plots:** GRSM.559.

**Great Smoky Mountains National Park Description Author(s):** K.D. Patterson, mod. R. White

**Global Description Author(s):** R. White and K.D. Patterson

**References:** Allard 1990, Fleming and Patterson 2009a, Fleming et al. 2017, NatureServe Ecology - Southeastern U.S. unpubl. data, Nelson 1986, Newell and Peet 1995, Patterson 1994, Patterson 1994, Peet et al. unpubl. data, Schafale 2012, Schafale and Weakley 1990, Schotz et al. 2008, Southeastern Ecology Working Group n.d.

**A3647 *Carex torta* Riverbed Alliance**

Twisted Sedge Riverbed Alliance

*Twisted Sedge Riverbed*

### ALLIANCE CONCEPT

**Summary:** This herbaceous vegetation occurs on large coarse substrates deposited along medium- to high-energy river channels and, less frequently, exposed lakeshores with heavy wave action. Seasonal flooding and ice-scour maintain the open nature of these communities; generally, they develop in areas of the active channel that are exposed at low water or in drought years. Vegetation can be sparse to dense depending on degree of flooding and length of exposure. Characteristic perennial species that tolerate inundation and flood-scouring include *Carex torta* and low *Salix* spp. Associated species tend to vary widely from site to site, can be diverse, and may be sparse. Associated species vary with geography. In the Allegheny Mountains, associated species include *Doellingeria umbellata*, *Dichanthelium clandestinum*, *Solidago rugosa* ssp. *aspera*, *Juncus effusus* var. *solutus*, *Scirpus expansus*, *Scirpus cyperinus*, *Equisetum arvense*, *Onoclea sensibilis*, *Vernonia noveboracensis*, *Lycopus virginicus*, *Scutellaria lateriflora*, and *Salix sericea*. In Southern Appalachian gorges, this vegetation often is associated with *Alnus serrulata* - *Xanthorhiza simplicissima* Wet Shrubland (CEGL003895). In the Cumberland Plateau of Alabama, herbaceous components may include *Lobelia cardinalis*, *Symphotrichum dumosum*, *Lycopus virginicus*, *Osmunda regalis*, and *Hypericum mutilum*. Physiognomy varies from strictly herbaceous to shrubby to wooded herbaceous. Scattered shrubs and small, battered specimens of *Platanus occidentalis*, *Betula nigra*, *Cornus amomum*, *Alnus serrulata*, and *Carpinus caroliniana* are present in some stands. Stands in disturbed landscapes may be heavily invaded by *Microstegium vimineum*, *Polygonum cespitosum* var. *longisetum*, and other weedy exotics.

**Classification Comments:** Additional classification work may suggest splitting this alliance.

**Diagnostic Characteristics:** Dominance by *Carex torta* on rivershores scoured by high-energy flooding.

#### Related Concepts:

- IIE3a. Riverside Shoal and Stream Bar Complex (Allard 1990) ><

### ALLIANCE DESCRIPTION

**Environment:** This alliance includes sedge-dominated alluvial wetlands on sand, gravel, and rock bars in valleys and gorges.

**Vegetation:** *Carex torta* often forms dense, extensive colonies. Associated species in the Allegheny Mountains include *Doellingeria umbellata* (= *Aster umbellatus*), *Dichanthelium clandestinum*, *Solidago rugosa* ssp. *aspera*, *Juncus effusus* var. *solutus*, *Scirpus expansus*, *Scirpus cyperinus* (= var. *pelius*), *Equisetum arvense*, *Onoclea sensibilis*, *Vernonia noveboracensis*, *Lycopus virginicus*, *Scutellaria lateriflora*, and *Salix sericea*. In Southern Appalachian gorges this vegetation often is associated with *Alnus serrulata* - *Xanthorhiza simplicissima* Wet Shrubland (CEGL003895). In the Cumberland Plateau of Alabama, herbaceous components may include *Lobelia cardinalis*, *Symphotrichum dumosum* (= *Aster dumosus*), *Lycopus virginicus*, *Osmunda regalis*, and *Hypericum mutilum*. Scattered shrubs and small, battered specimens of *Platanus occidentalis*, *Betula nigra*, *Cornus amomum*, *Alnus serrulata*, and *Carpinus caroliniana* are present in some stands. Stands in disturbed landscapes may be heavily invaded by *Microstegium vimineum*, *Polygonum cespitosum* var. *longisetum*, and other weedy exotics.

**Physiognomy and Structure:** Stands of this alliance are characterized by light-requiring, tough-rooted herbaceous perennials tolerant of frequent inundation and flood-scouring, which often form dense, extensive colonies.

**Floristics:** *Carex torta* often forms dense, extensive colonies. Associated species in the Allegheny Mountains include *Doellingeria umbellata* (= *Aster umbellatus*), *Dichanthelium clandestinum*, *Solidago rugosa* ssp. *aspera*, *Juncus effusus* var. *solutus*, *Scirpus expansus*, *Scirpus cyperinus* (= var. *pelius*), *Equisetum arvense*, *Onoclea sensibilis*, *Vernonia noveboracensis*, *Lycopus virginicus*, *Scutellaria lateriflora*, and *Salix sericea*. In Southern Appalachian gorges this vegetation often is associated with *Alnus serrulata* - *Xanthorhiza simplicissima* Wet Shrubland (CEGL003895). In the Cumberland Plateau of Alabama, herbaceous components may include *Lobelia cardinalis*, *Symphotrichum dumosum* (= *Aster dumosus*), *Lycopus virginicus*, *Osmunda regalis*, and *Hypericum mutilum*. Scattered shrubs and small, battered specimens of *Platanus occidentalis*, *Betula nigra*, *Cornus amomum*, *Alnus serrulata*, and *Carpinus caroliniana* are present in some stands. Stands in disturbed landscapes may be heavily invaded by *Microstegium vimineum*, *Polygonum cespitosum* var. *longisetum*, and other weedy exotics.

**Dynamics:** Stands of this alliance are characterized by light-demanding, tough-rooted herbaceous perennials that are able to withstand frequent inundation and flood-scouring. Periodic large or severe floods transport and deposit large numbers of cobbles, stones, and even boulders in characteristic bars both within the channel (islands) and along its edges (streambanks). These bars provide a matrix for deposition of finer alluvium and habitats for the establishment of tough, adaptable herbaceous plants, which in turn stabilize the bars with massive networks of perennial rootstocks. Regular flood-scouring batters or removes woody plants which take root in these habitats, maintaining open-canopy conditions. These habitats are highly dynamic, with conditions more or less constantly shifting in response to an irregular but powerful disturbance regime. While some of the bar habitats may be damaged or removed by severe floods, others may accrete or be newly deposited during the same events (Hupp 1982). Successionally, this unit can be considered a pioneering type on new, coarse alluvial land, but it is also more or less permanently maintained by natural disturbances.

### ALLIANCE DISTRIBUTION

**Range:** This alliance has a broad geographic range, from Alabama north to northern New England and southern Quebec.

**Nations:** CA,US

**Subnations:** AL, CT, DE, GA, KY, MA, MD, ME, NC, NH, NY, PA, QC, RI, SC, TN, VA, VT, WV

### ALLIANCE SOURCES

**References:** Allard 1990, Faber-Langendoen et al. 2019b, Fleming and Moorhead 1996, Hupp 1982, Palmer-Ball et al. 1988, Schafale and Weakley 1990, Tobe et al. 1992

**Author of Concept:** Faber-Langendoen et al. 2019b

**Author of Description:** L. Sneddon, in Faber-Langendoen et al. (2013)

**[CEGL004103] *Carex torta* Riverbed Vegetation**Translated Name: **Twisted Sedge Riverbed Vegetation**Common Name: **Rocky Bar and Shore (Twisted Sedge Type)****USNVC CLASSIFICATION**

Division	Eastern North American Temperate Freshwater Marsh, Wet Meadow & Shrubland (2.C.4.Nd)
Macrogroup	Eastern North American Wet Shoreline Vegetation (M880)
Group	Eastern North American Riverine Wetland Vegetation (G755)
Alliance	<i>Carex torta</i> Riverbed Alliance (A3647)

**ELEMENT CONCEPT**

**Global Summary:** This association accommodates herbaceous alluvial wetlands in which *Carex torta* is a dominant or characteristic species. It occupies sand, gravel, and rock bars along small rivers and streams in valleys and gorges in the Southern Appalachians, ranging west into the Cumberland Plateau and the Interior Low Plateau, and north into the Central Appalachians, Allegheny Mountains, and Piedmont. This association is characterized by light-requiring, tough-rooted herbaceous perennials tolerant of frequent inundation and flood-scouring. *Carex torta* often forms dense, extensive colonies. Associated species vary with geography but can include *Polygonum sagittatum*, *Dichanthelium clandestinum*, *Solidago rugosa* ssp. *aspera*, *Juncus effusus*, *Equisetum arvense*, *Onoclea sensibilis*, *Vernonia noveboracensis*, *Lycopus virginicus*, *Lobelia cardinalis*, *Symphyotrichum dumosum*, *Lycopus virginicus*, *Osmunda regalis*, *Hypericum mutilum*, *Eutrochium fistulosum*, *Solidago patula*, *Boehmeria cylindrica*, *Amphicarpaea bracteata*, *Acalypha rhomboidea*, *Impatiens capensis*, *Leersia oryzoides*, and *Symphyotrichum lateriflorum*. Physiognomy of this type varies from strictly herbaceous to wooded herbaceous to shrubby. Scattered shrubs and small, battered specimens of *Platanus occidentalis*, *Betula nigra*, *Cornus amomum*, *Alnus serrulata*, and *Carpinus caroliniana* are present in some stands. An overhanging canopy may include *Platanus occidentalis*, *Betula alleghaniensis* var. *alleghaniensis*, or *Acer rubrum*. Overhanging shrubs often include *Rhododendron maximum*. Stands in disturbed landscapes may be heavily invaded by *Microstegium vimineum*, *Polygonum cespitosum* var. *longisetum*, and other weedy exotics.

**ENVIRONMENTAL DESCRIPTION**

**Great Smoky Mountains National Park Environment:** This community occurs on river margins, rocky non-forested islands, and small shaded overflow outlets.

**Global Environment:** This association occupies boulder and gravel bars on the frequently flooded, active channel shelves of high-gradient streams and small rivers, often forming small, discontinuous, linear patches. It is subject to frequent, high-energy inundation and flood-scouring, which can occur at any time of year. Flooding duration is probably similar to that documented along Passage Creek in Shenandoah County, Virginia, by Hupp (1982). In that drainage, the channel shelf was inundated approximately 15% of the time. Elevations in West Virginia range from 390-1200 m. Soils are moderately to poorly drained sand with pH averaging 6.5 (n=5). Organic soils are not present. Soil chemistry is characterized by high Cu, Mn; moderate B, Ca, Mg; and low Al, ENR, Fe, H, K, Na, P, S, TEC, Zn, and organic matter (n=3).

**VEGETATION DESCRIPTION**

**Great Smoky Mountains National Park Vegetation:** This association is characterized by light-demanding, tough-rooted herbaceous perennials tolerant of frequent inundation and flood-scouring. *Carex torta* forms dense, extensive colonies. There is often bare substrate of boulders, cobbles, gravel or sand.

**Global Vegetation:** Vegetation is characterized by light-demanding, tough-rooted herbaceous perennials tolerant of frequent inundation and flood-scouring. *Carex torta* is usually the dominant species and typically forms dense, extensive colonies. Associated species vary with geography. *Polygonum sagittatum*, *Solidago rugosa*, and *Dichanthelium clandestinum* are typical; others include *Acalypha rhomboidea*, *Amphicarpaea bracteata*, *Boehmeria cylindrica*, *Equisetum arvense*, *Eutrochium fistulosum* (= *Eupatorium fistulosum*), *Euthamia graminifolia* var. *graminifolia*, *Juncus effusus*, *Hypericum mutilum*, *Hypericum perforatum*, *Impatiens capensis*, *Leersia oryzoides*, *Lobelia cardinalis*, *Lycopus virginicus*, *Onoclea sensibilis*, *Osmunda regalis*, *Prunella vulgaris*, *Solidago patula*, *Symphyotrichum dumosum* (= *Aster dumosus*), *Symphyotrichum lateriflorum* (= *Aster lateriflorus*), *Symphyotrichum prenanthoides*, *Thalictrum* spp., *Trautvetteria caroliniensis* var. *caroliniensis*, *Verbesina alternifolia*, and *Vernonia noveboracensis*. Cover by nonvascular plants is insignificant. Physiognomy of this type varies from strictly herbaceous to wooded herbaceous to shrubby. Scattered shrubs and small, battered specimens of *Platanus occidentalis*, *Betula nigra*, *Cornus amomum*, *Alnus serrulata*, and *Carpinus caroliniana* are present in some stands. An overhanging canopy with an average cover of 20% may include *Platanus occidentalis*, *Betula alleghaniensis* var. *alleghaniensis*, or *Acer rubrum*. Sparse overhanging shrubs often include *Rhododendron maximum*. Stands in disturbed landscapes may be heavily invaded by *Microstegium vimineum*, *Polygonum cespitosum* var. *longisetum*, and other weedy exotics. Mean species richness of vascular plants in six West Virginia plots was 36 taxa per 400 m<sup>2</sup>, with most of the diversity in the herbaceous stratum.

**Global Dynamics:** Periodic large or severe floods transport and deposit large numbers of cobbles, stones, and even boulders in characteristic bars both within the channel (islands) and along its edges (streambanks). These bars provide a matrix for deposition of finer alluvium and habitats for the establishment of tough, adaptable herbaceous plants, which in turn stabilize the bars with massive networks of perennial rootstocks. Regular flood-scouring batters or removes woody plants which take root in these habitats, maintaining open-canopy conditions. These habitats are highly dynamic, with conditions more or less constantly shifting in response to an irregular but powerful disturbance regime. While some of the bar habitats may be damaged or removed by severe floods, others

may accrete or be newly deposited during the same events (Hupp 1982). Successionally, this unit can be considered a pioneering type on new, coarse alluvial land, but it is also more or less permanently maintained by natural disturbances.

#### MOST ABUNDANT SPECIES

##### Great Smoky Mountains National Park

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Graminoid	<i>Carex torta</i>

##### Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Graminoid	<i>Carex torta</i>

#### CHARACTERISTIC SPECIES

**Great Smoky Mountains National Park:** *Carex torta*

**Global:** *Carex torta*, *Polygonum sagittatum*, *Solidago rugosa*

#### OTHER NOTEWORTHY SPECIES

**Global: Invasive/Exotic Plants:** *Microstegium vimineum* (High/Medium), *Polygonum cespitosum* var. *longisetum*; **Other Plants:** *Dichanthelium clandestinum* (G5)

#### CONSERVATION STATUS RANK

**Global Rank & Reasons:** G3G4 (21-Jan-2000). This community is found as small-patch linear occurrences along waterways in the Southern Appalachians, west into the Cumberland Plateau and the Interior Low Plateau, and north into the Central Appalachians, Allegheny Mountains, and Piedmont. Although this community has a moderately large geographic range, it is uncommon within its range and occurrences are small. This community is more common than the number of documented occurrences would suggest, since it is often overlooked in inventories.

#### RELATED CONCEPTS

##### Global Similar Types:

- *Carex torta* - *Apocynum cannabinum* - *Cyperus* spp. Riverbed Vegetation (CEGL006536) has a more northern distribution (Pennsylvania, New York, and New England).
- *Platanus occidentalis* / *Dichanthelium clandestinum* - *Festuca subverticillata* Floodplain Forest (CEGL004031)

##### Global Related Concepts:

- *Carex torta* Association (Fleming and Moorhead 1996) ?
- *Carex torta* Herbaceous Vegetation (Fleming and Coulling 2001) =
- *Carex torta* Herbaceous Vegetation (Bowman 2000) =
- *Carex torta* Herbaceous Vegetation (Fleming and Taverna 2006) =
- *Carex torta* Riverscour Prairie (Byers et al. 2007) =
- *Carex torta* riparian herbaceous vegetation (Vanderhorst 2001b) =
- IIE3a. Riverside Shoal and Stream Bar Complex (Allard 1990) >
- Sedge - spotted joe pye weed riverine herbaceous vegetation (Perles et al. 2004) =
- Torturous sedge gravel rivershore (CAP pers. comm. 1998) ?

#### CLASSIFICATION

**Status:** Standard

**Classification Confidence:** 2 - Moderate

**Great Smoky Mountains National Park Other Comments:** This community occurs adjacent to alluvial forests of *Liquidambar styraciflua* and *Platanus occidentalis*, surrounded by floodplain forests (i.e., Poplar-Gum-Hemlock). The Little Pigeon River has many seasonally dry forks that support this community. It may be visible on air photography.

#### ELEMENT DISTRIBUTION

**Great Smoky Mountains National Park Range:** This community was sampled from the northeast portion of the Mount Le Conte quadrangle, along the Little Pigeon and Greenbrier rivers. It was not sampled on the Cades Cove quadrangle. It should occur in other areas of the park, in association with larger rivers.

**Global Range:** This community is found as small-patch linear occurrences along waterways in the Southern Appalachians, west into the Cumberland Plateau and the Interior Low Plateau, and north into the Central Appalachians, Allegheny Mountains, and Piedmont.

**Nations:** US

**States/Provinces:** AL, DE:S1, GA, KY, MD, NC, PA:S4, SC, TN, VA:S3, WV:S3

**TNC Ecoregions:** 44:C, 50:C, 51:C, 52:C, 58:C, 59:C, 60:C, 61:C

**USFS Ecoregions (1994/95):** 212Fa:CCC, 212Fb:CCC, 212Fc:CCC, 212Fd:CCC, 212Ga:CCC, 212Gb:CCC, 221Ba:CCC, 221Da:CCC, 221Db:CCC, 221Ea:CCC, 221Fa:CCC, 221Ha:CC?, 221Hc:CCC, 221He:CCC, 222Eg:CCC, 222En:CCC, 222Eo:CCC, 231Cd:CCC, M221Aa:CCC, M221Ab:CCC, M221Ac:CCC, M221Ad:CCC, M221Ba:CCC, M221Bb:CCC, M221Bd:CCC, M221Be:CCC, M221Bf:CCC, M221Cb:CCC, M221Cd:CCP, M221Da:CCC, M221Dc:CCC, M221Dd:CCC

**USFS Ecoregions (2007):** 211Fa:CCP, 211Fb:CCC, 211Fc:CCC, 211Fd:CCC, 211Ga:CCC, 211Gb:CCC, 221Ba:CCC, 221Da:CCC, 221Db:CCC, 221Ea:CCP, 221En:CC?, 221Fa:CCC, 221Ha:CC?, 221Hb:CCP, 221Hc:CCC, 221He:CC?, 223Eg:CCC, 231Cd:CCC, M221Aa:CCP, M221Ab:CCC, M221Ac:CCC, M221Ad:CCC, M221Ba:CCC, M221Bb:CCC, M221Bd:CCC, M221Be:CCC, M221Cb:CCC, M221Cd:CCP, M221Da:CCC, M221Dc:CCC, M221Dd:CCC

**Federal Lands:** BIA (Eastern Band of Cherokee); NPS (Appalachian Trail [Central Appalachians], Blue Ridge Parkway?, C&O Canal, Catoclin Mountain, Great Smoky Mountains, New River Gorge, Prince William); USFS (Bankhead, Chattahoochee, Chattahoochee (Piedmont), Chattahoochee (Southern Blue Ridge), Cherokee, Daniel Boone, George Washington, Jefferson, Monongahela, Nantahala, Pisgah, Sumter, Sumter (Mountains), Sumter (Piedmont))

#### ELEMENT SOURCES

**Great Smoky Mountains National Park Plots:** GRSM.322.

**Great Smoky Mountains National Park Description Author(s):** K.D. Patterson

**Global Description Author(s):** G. Fleming, P. Coulling, S.C. Gawler

**References:** Allard 1990, Bowman 2000, Byers et al. 2007, CAP pers. comm. 1998, Coxe 2009, Eyre 1980, Fleming and Coulling 2001, Fleming and Coulling 2001, Fleming and Moorhead 1996, Fleming and Taverna 2006, Fleming et al. 2017, Harrison 2004, Hupp 1982, NatureServe Ecology - Southeastern U.S. unpubl. data, Nelson 1986, PNHP 2004, Palmer-Ball et al. 1988, Peet et al. unpubl. data, Perles et al. 2004, Schafale 2012, Schafale and Weakley 1990, Schafale pers. comm., Southeastern Ecology Working Group n.d., Vanderhorst 2001b, Vanderhorst et al. 2007, WVNHP unpubl. data, Zimmerman 2011p, Zimmerman and Podniesinski 2008, Zimmerman et al. 2012

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## A0948 *Salix nigra* Riverscour Scrub Alliance

Black Willow Riverscour Scrub Alliance

*Black Willow Riverscour Scrub*

#### ALLIANCE CONCEPT

**Summary:** This alliance is composed of vegetation occurring on sand and gravel rivershores receiving high-energy flood-scour. The physiognomy is best characterized as scrub, formed by intermittent flood-scour. *Salix nigra* is characteristic, but floristic composition and structure is widely variable. Other species of *Salix* may co-occur, as well as *Alnus serrulata*, *Cornus sericea*, and a variety of herbaceous species that tolerate flood disturbance. Alluvial tree saplings often occur as well, including *Acer saccharinum*, *Populus deltoides*, and others. This alliance occurs throughout the eastern United States and possibly adjacent Canada.

**Classification Comments:** This alliance is wide-ranging and broadly defined. There are likely to be multiple alliances housed within this alliance as a result of inclusion of the very broadly defined *Salix nigra* Wet Shrubland (CEGL003901). Additional data collection and analysis will be necessary to differentiate them.

**Diagnostic Characteristics:** Flood-pruned trees and shrubs characterized by *Salix nigra* occurring on alluvial sand, gravel, and cobble.

#### Related Concepts:

- Black Willow: 95 (Eyre 1980) ><

#### ALLIANCE DESCRIPTION

**Environment:** This alliance is composed of vegetation occurring on sand and gravel rivershores receiving high-energy flood-scour.

**Vegetation:** *Salix nigra* is characteristic, but floristic composition and structure are widely variable. Other species of *Salix* may co-occur, as well as *Alnus serrulata*, *Cornus sericea*, and a variety of herbaceous species that tolerate flood disturbance. Alluvial tree saplings often occur as well, including *Acer saccharinum*, *Populus deltoides*, and others.

**Physiognomy and Structure:** The physiognomy is best characterized as scrub (low tree species 2-5 m tall), formed by intermittent flood-scour.

**Floristics:** *Salix nigra* is characteristic, but floristic composition and structure are widely variable. Other species of *Salix* may co-occur, as well as *Alnus serrulata*, *Cornus sericea*, and a variety of herbaceous species that tolerate flood disturbance. Alluvial tree saplings often occur as well, including *Acer saccharinum*, *Populus deltoides*, and others.

**Dynamics:** These young, or frequently disturbed, thickets, often have few to no other species present. The presence of this vegetation is related to disturbance frequency, both natural and anthropogenic.

#### ALLIANCE DISTRIBUTION

**Range:** This alliance occurs throughout the eastern United States and possibly adjacent Canada.

**Nations:** CA?, US

**Subnations:** AL, AR, CT, DE, FL, GA, IL?, KY, LA, MA, MD, ME, MS, NC, NH, NJ, NY, OH, OK, ON?, PA, SC, TN, TX, VA?, VT, WV

#### ALLIANCE SOURCES

**References:** Cogan 2007c, Eyre 1980, Faber-Langendoen et al. 2019b, Fike 1999, Lea 2000, Lea 2004, Schafale and Weakley 1990, Smith 1991

**Author of Concept:** Faber-Langendoen et al. 2019b

**Author of Description:** A.S. Weakley, in Faber-Langendoen et al. (2013)

**[CEGL003901] *Salix nigra* Wet Shrubland**Translated Name: **Black Willow Wet Shrubland**Common Name: **Black Willow Riverbank Shrubland****USNVC CLASSIFICATION**

Division Eastern North American Temperate Freshwater Marsh, Wet Meadow & Shrubland (2.C.4.Nd)  
 Macrogroup Eastern North American Wet Shoreline Vegetation (M880)  
 Group Eastern North American Riverine Wetland Vegetation (G755)  
 Alliance *Salix nigra* Riverscour Scrub Alliance (A0948)

**ELEMENT CONCEPT**

**Global Summary:** This broadly defined type represents vegetation dominated by scrubby forms of *Salix nigra* across the southeastern and northeastern United States, and possibly into Canada. Stature and closure may vary depending on disturbance. Additional types may be developed as more information becomes available.

**ENVIRONMENTAL DESCRIPTION**

**Global Environment:** Temporarily flooded riverbank vegetation.

**VEGETATION DESCRIPTION**

**Global Vegetation:** Alluvial shrubland dominated by scrubby *Salix nigra*.

**MOST ABUNDANT SPECIES****Global****Stratum**

Tall shrub/sapling

**Lifeform**

Broad-leaved deciduous tree

**Species***Salix nigra***CHARACTERISTIC SPECIES**

**Global:** *Salix nigra*

**OTHER NOTEWORTHY SPECIES**

**Global:**

**CONSERVATION STATUS RANK**

**Global Rank & Reasons:** G4? (19-Sep-2001).

**RELATED CONCEPTS****Global Similar Types:**

- *Populus deltoides* - *Salix nigra* - *Acer saccharinum* Floodplain Forest (CEGL002018)
- *Salix nigra* - *Betula nigra* / *Schoenoplectus pungens* Riverscour Shrubland (CEGL006463)

**Global Related Concepts:**

- *Salix nigra* Temporarily Flooded Shrubland (Faber-Langendoen 2001) =
- IIE3a. Riverside Shoal and Stream Bar Complex (Allard 1990) >

**CLASSIFICATION**

**Status:** Standard

**Classification Confidence:** 3 - Weak

**Global Classification Comments:** This type conceptually includes communities formerly treated as woodlands [see the archived *Salix nigra* Woodland (CEGL003731)].

**ELEMENT DISTRIBUTION**

**Global Range:** This is a potentially wide-ranging association found throughout the southeastern and eastern United States, and possibly into Canada. This broadly defined association is found from the Ozarks and Interior Low Plateau, south to the West and East Gulf coastal plains and Florida Peninsula, east to the Atlantic Coastal Plain (excluding the Southern Blue Ridge) and north into the Central Appalachians and Northern Piedmont.

**Nations:** CA?,US

**States/Provinces:** AL, AR, FL, GA, IL?, KY, LA, MD, MS, NC, OH, OK, ON?, SC, TN, TX, WV

**TNC Ecoregions:** 38:C, 39:C, 40:C, 41:C, 42:C, 43:C, 44:C, 50:C, 51:C, 52:C, 53:C, 55:P, 56:C, 57:C, 59:C

**USFS Ecoregions (1994/95):** 221Ec:C??, 221Ed:C??, 221Ef:C??, 222Ab:CCC, 222Ag:CCC, 222Ah:CCC, 222An:CCC, 222Eg:CCC, 231Bg:CCC, 231Bi:CCC, 231Ca:CCC, 231Cd:CCC, 231Ga:CCC, 231Gb:CCC, 231Gc:CCC, 232:C, M221Aa:CCP, M221Ab:CCP, M221Ac:CCC, M221Ad:CCC, M221Bb:CCC, M221Bf:CCC, M221Da:CCC, M221Dc:CCC, M222Aa:CCC, M222Ab:CCC, M231Aa:CCC, M231Ab:CCC, M231Ac:CCC, M231Ad:CCC

**USFS Ecoregions (2007):** 221Ea:C??, 221Ec:C??, 221Ed:C??, 221Ef:C??, 223Ab:CCC, 223Ag:CCC, 223Ah:CCC, 223An:CCP, 223Eg:CCC, 231Ca:CCC, 231Cd:CCC, 231Ga:CCC, 231Gb:CCC, 231Gc:CCC, 231Hb:CCC, 231Hc:CCC, 232:C, M221Aa:CCP, M221Ab:CCP, M221Ac:CCC, M221Ad:CCC, M221Bb:CCC, M221Da:CCC, M221Dc:CCC, M223Aa:CCC, M223Ab:CCC, M231Aa:CCC, M231Ab:CCC, M231Ac:CCC, M231Ad:CCC

**Federal Lands:** DOD (Fort Benning); NPS (Chattahoochee River, Chickamauga-Chattanooga?, Great Smoky Mountains, Natchez Trace); USFS (Bankhead, Cherokee?, Oconee?, Ouachita (Coastal Plain)?, Ouachita (Mountains)?, Ouachita?, Ozark?); USFWS (Eufaula)

#### ELEMENT SOURCES

**Global Description Author(s):** E. Largay

**References:** ALNHP 2002, Allard 1990, Baalman 1965, Blair 1938, Blair and Hubbell 1938, Faber-Langendoen 2001, GNHP unpubl. data 2018, Harrison 2004, Harrison 2011, Hefley 1937, Hoagland 2000, Johnson 1984, Kelting and Penfound 1950, McCoy 1958, McManamay 2015, Nelson 1986, Nordman et al. 2011, ONHD unpubl. data, Penfound 1953, Penfound 1961, Penfound 1965, Petranks and Holland 1980, Schafale and Weakley 1990, Southeastern Ecology Working Group n.d., White and Madany 1978

### G756. EASTERN NORTH AMERICAN WET SHORELINE VEGETATION

**Group Summary Description:** This group consists of low-energy shorelines of rivers and ponds, characterized by low annual plants, emergent aquatic plants, graminoids, leafy forbs, and scattered shrubs. Typical taxa include *Boehmeria cylindrica*, *Carex* spp., *Cyperus* spp., *Eragrostis hypnoides*, *Hydrocotyle umbellata*, *Juncus effusus*, *Leersia oryzoides*, *Lindernia dubia*, *Ludwigia palustris*, *Peltandra virginica*, *Polygonum* spp., *Saururus cernuus*, *Schoenoplectus* spp., *Triadenum walteri*, and *Utricularia gibba*. Diminutive annuals include *Eragrostis hypnoides*, *Lipocarpa micrantha*, and *Fimbristylis autumnalis*. Aquatic species include *Heteranthera* spp., *Nuphar*, and *Nymphaea* spp. *Cephalanthus occidentalis* may occur as scattered individuals. Stands occur in shallow basins, shores of slow-moving rivers, or lake and pond margins that flood in the spring and draw down later in the season. This group ranges broadly in the southeastern, mid-Atlantic, and midwestern U.S.

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### A1881 *Polygonum* spp. Shoreline Wet Meadow Alliance

Knotweed species Shoreline Wet Meadow Alliance

*Eastern Knotweed Shoreline Wet Meadow*

#### ALLIANCE CONCEPT

**Summary:** This alliance covers various southeastern and Mid-Atlantic wet depressions, lakes, and ponds dominated by various *Polygonum* species (section *Persicaria*), singly or in combination, or with other obligate wetland plant species. Associations have been described that are dominated by, or contain, *Polygonum amphibium*, *Polygonum glabrum*, *Polygonum hydropiperoides*, *Polygonum lapathifolium*, *Polygonum pennsylvanicum*, *Polygonum punctatum*, and/or related *Polygonum* spp. The many associated species vary with geography and habitat. In western Kentucky, this alliance occurs in marshes associated with the Ohio River in backflood areas around oxbows, beaver-flooded areas, levees, and depressional drainages. Associated species include *Nelumbo lutea*, *Cephalanthus occidentalis*, *Sagittaria brevirostra*, *Peltandra virginica*, and *Juncus effusus*. Associates in Oklahoma include *Ammannia coccinea*, *Helianthus annuus*, *Lemna minor*, *Stuckenia pectinata*, *Spirodela polyrrhiza*, *Utricularia gibba*, and *Xanthium strumarium*. In Mississippi, one example of this vegetation is dominated by the perennial *Polygonum glabrum*; associated species include *Lemna minor*, *Saccharum giganteum*, *Hydrocotyle umbellata*, *Saururus cernuus*, *Carex lupulina*, *Triadenum walteri*, *Cephalanthus occidentalis*, *Leersia* sp., *Ludwigia peploides*, *Boehmeria cylindrica*, *Juncus effusus*, *Rhynchospora corniculata*, *Ludwigia decurrens*, *Habenaria repens*, *Mikania scandens*, *Scirpus cyperinus*, and others. It occurs as a band ringing the shores of ponds in the East Gulf Coastal Plain and along the banks of ditches and sloughs in the Mississippi River Alluvial Plain. This alliance also occurs in a wide variety of human- and beaver-created wetlands. Composition is highly variable and re-evaluation may be required as additional data become available. In the western United States and adjacent Canada, this alliance is found primarily over a wide elevational range from near sea level to over 2700 m. Stands are found in permanently flooded depressions such as margins of lake shores and oxbow lakes in river floodplains. The vegetation is characterized by the dominance or codominance of *Polygonum amphibium*. Associates may include species of *Potamogeton* and other aquatic plants.

**Classification Comments:** The alliance as described is currently limited to the southeastern U.S., but its occurrence in the northeastern states is known but not well-documented.

#### Similar Alliances:

- Inland Mud Lakeshore Alliance (A3696)
- *Panicum rigidulum* - *Polygonum hydropiperoides* - *Polygonum punctatum* Southeastern Sandbar Alliance (A3405)
- *Peltandra virginica* - *Pontederia cordata* - *Sagittaria* spp. Marsh Alliance (A3669)

**Diagnostic Characteristics:** Wetland basins or shores of lakes or ponds where wave action is minimal.

#### Related Concepts:

- *Polygonum amphibium* herbaceous series (Hoagland 1997) ><
- *Polygonum pennsylvanicum* herbaceous series (Hoagland 1997) ><
- *Polygonum* spp. (section *Persicaria*) herbaceous alliance (Hoagland 1998a) ?

#### ALLIANCE DESCRIPTION

**Environment:** In the southeastern United States, this alliance occurs in a wide variety of human- and beaver-created wetlands (wet depressions, lakes, and ponds), including a band ringing the shores of ponds in the East Gulf Coastal Plain and in ditches and sloughs in the Mississippi River Alluvial Plain.

**Vegetation:** Stands of this alliance are dominated by various *Polygonum* species (section Persicaria), singly or in combination, or with other obligate wetland plant species. Associations have been described that are dominated by, or contain, *Polygonum amphibium*, *Polygonum glabrum* (= *Polygonum densiflorum*), *Polygonum hydropiperoides*, *Polygonum lapathifolium*, *Polygonum pensylvanicum*, *Polygonum punctatum*, and/or related *Polygonum* spp. The many associated species vary with geography and habitat. In western Kentucky, associated species include *Nelumbo lutea*, *Cephalanthus occidentalis*, *Sagittaria brevirostra*, *Peltandra virginica*, and *Juncus effusus*. Associates in Oklahoma include *Ammannia coccinea*, *Helianthus annuus*, *Lemna minor*, *Stuckenia pectinata* (= *Potamogeton pectinatus*), *Spirodela polyrrhiza*, *Utricularia gibba* (= *Utricularia biflora*), and *Xanthium strumarium*. In Mississippi, one example of this vegetation is dominated by the perennial *Polygonum glabrum*; associated species include *Lemna minor*, *Saccharum giganteum*, *Hydrocotyle umbellata*, *Saururus cernuus*, *Carex lupulina*, *Triadenum walteri*, *Cephalanthus occidentalis*, *Leersia* sp., *Ludwigia peploides*, *Boehmeria cylindrica*, *Juncus effusus*, *Rhynchospora corniculata*, *Ludwigia decurrens*, *Habenaria repens*, *Mikania scandens*, *Scirpus cyperinus*, and others. In the western United States and adjacent Canada, stands are characterized by the dominance or codominance of *Polygonum amphibium*. Associates may include species of *Potamogeton* and other aquatic plants. Floating-leaved aquatic forbs cover at least 30% of the water's surface (Kunze 1994).

**Physiognomy and Structure:** This vegetation is generally dominated by forbs.

**Floristics:** Stands of this alliance are dominated by various *Polygonum* species (section Persicaria), singly or in combination, or with other obligate wetland plant species. Associations have been described that are dominated by, or contain, *Polygonum amphibium*, *Polygonum glabrum* (= *Polygonum densiflorum*), *Polygonum hydropiperoides*, *Polygonum lapathifolium*, *Polygonum pensylvanicum*, *Polygonum punctatum*, and/or related *Polygonum* spp. The many associated species vary with geography and habitat. In western Kentucky, associated species include *Nelumbo lutea*, *Cephalanthus occidentalis*, *Sagittaria brevirostra*, *Peltandra virginica*, and *Juncus effusus*. Associates in Oklahoma include *Ammannia coccinea*, *Helianthus annuus*, *Lemna minor*, *Stuckenia pectinata* (= *Potamogeton pectinatus*), *Spirodela polyrrhiza*, *Utricularia gibba* (= *Utricularia biflora*), and *Xanthium strumarium*. In Mississippi, one example of this vegetation is dominated by the perennial *Polygonum glabrum*; associated species include *Lemna minor*, *Saccharum giganteum*, *Hydrocotyle umbellata*, *Saururus cernuus*, *Carex lupulina*, *Triadenum walteri*, *Cephalanthus occidentalis*, *Leersia* sp., *Ludwigia peploides*, *Boehmeria cylindrica*, *Juncus effusus*, *Rhynchospora corniculata*, *Ludwigia decurrens*, *Habenaria repens*, *Mikania scandens*, *Scirpus cyperinus*, and others. In the western United States and adjacent Canada, stands are characterized by the dominance or codominance of *Polygonum amphibium*. Associates may include species of *Potamogeton* and other aquatic plants. Floating-leaved aquatic forbs cover at least 30% of the water's surface (Kunze 1994).

#### ALLIANCE DISTRIBUTION

**Range:** This alliance is widespread but scattered throughout the eastern United States.

**Nations:** CA,US

**Subnations:** AL, FL?, GA, KY, LA, MS, NC, NJ, OK, PA, SC, TN, TX?

**TNC Ecoregions:** 31:C, 42:?, 43:C, 44:P, 49:C, 50:C, 51:P, 52:C, 53:C, 56:C, 57:P, 62:C

**Federal Lands:** DOD (Fort Benning); NPS (Chickamauga-Chattanooga, Friendship Hill, Great Smoky Mountains, Horseshoe Bend, Jean Lafitte, Kennesaw Mountain, Morristown, Natchez Trace, Ocmulgee, Shiloh); USFS (Bankhead, Daniel Boone?, Oconee, Talladega (Oakmulgee)?, Talladega (Talladega)?); USFWS (Supawna Meadows)

#### ALLIANCE SOURCES

**References:** Faber-Langendoen et al. 1996, Faber-Langendoen et al. 2019b, Hoagland 1997, Hoagland 1997, Hoagland 1998a, Kunze 1994

**Author of Concept:** Hoagland 1997

**Author of Description:** B.W. Hoagland (1997)

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### [CEGL004290] *Polygonum (hydropiperoides, punctatum) - Leersia* spp. Shoreline Wet Meadow

Translated Name: (Swamp Smartweed, Dotted Smartweed) - Cutgrass species Shoreline Wet Meadow

Common Name: Smartweed - Cutgrass Beaver Pond

#### USNVC CLASSIFICATION

Division	Eastern North American Temperate Freshwater Marsh, Wet Meadow & Shrubland (2.C.4.Nd)
Macrogroup	Eastern North American Wet Shoreline Vegetation (M880)
Group	Eastern North American Wet Shoreline Vegetation (G756)
Alliance	<i>Polygonum</i> spp. Shoreline Wet Meadow Alliance (A1881)

#### ELEMENT CONCEPT

**Global Summary:** This association incorporates vegetation of beaver ponds and other semipermanent impoundments in the Piedmont, Ridge and Valley, South Atlantic Coastal Plain, Mississippi River Alluvial Plain, Upper East Gulf Coastal Plain, scattered localities in the Blue Ridge, and possibly other adjacent provinces. Stands of this vegetation are dominated by some combination of *Polygonum punctatum*, *Polygonum hydropiperoides*, *Leersia lenticularis*, *Leersia oryzoides*, and/or *Leersia virginica*. Other herbaceous species present include *Saururus cernuus*, *Proserpinaca* sp., *Bidens aristosa*, and *Xanthium strumarium*. Scattered individuals of *Cephalanthus occidentalis* and *Acer saccharinum* may be present. A Piedmont North Carolina example contains *Impatiens capensis*, *Boehmeria cylindrica*, and the exotic *Murdannia keisak*.

**ENVIRONMENTAL DESCRIPTION**

**Great Smoky Mountains National Park Environment:** This community is associated with a limestone sinkhole that serves as an impoundment at 1970 feet in the Kinzel Springs quadrangle.

**Global Environment:** This association incorporates vegetation of beaver ponds and other semipermanent impoundments.

**VEGETATION DESCRIPTION**

**Great Smoky Mountains National Park Vegetation:** The only stand of this association in the park is dominated by *Polygonum* spp. and *Polygonum virginianum* with some overhanging canopy trees such as *Aesculus flava*, *Carya alba*, *Nyssa sylvatica*, and *Fraxinus americana*. In addition, herbaceous species such as *Sanicula canadensis*, *Lobelia siphilitica*, *Collinsonia canadensis*, and *Spigelia marilandica* are present.

**Global Vegetation:** Stands of this vegetation are dominated by some combination of *Polygonum punctatum*, *Polygonum hydropiperoides*, *Leersia lenticularis*, *Leersia oryzoides*, and/or *Leersia virginica*. Other herbaceous species which may be present include *Polygonum glabrum* (= *Polygonum densiflorum*), *Saururus cernuus*, *Proserpinaca* sp., *Sparganium americanum*, *Typha latifolia*, *Scirpus cyperinus*, *Lobelia cardinalis*, *Onoclea sensibilis*, *Penthorum sedoides*, *Boehmeria cylindrica*, *Sambucus nigra* ssp. *canadensis*, *Bidens aristosa* (= *Bidens polylepis*), and *Xanthium strumarium*. Scattered individuals of *Cephalanthus occidentalis* and *Acer saccharinum* or other woody plants may be present. Examples which have become dried-out (through drought and/or beaver dam failure) may exhibit greater dominance by *Leersia* rather than *Polygonum*. The combination of *Polygonum punctatum* - *Leersia virginica* was first noted, but the combination of *Polygonum hydropiperoides* and *Leersia lenticularis* has also been observed in the Oconee National Forest. At Ocmulgee National Monument near Macon, Georgia, *Leersia oryzoides* was the sole dominant at the time of sampling.

**Global Dynamics:** This community is highly dynamic, affected by changes in water level related to flooding, beaver activity, beaver abandonment, etc. The dominance of *Polygonum* spp. may vary depending on hydroperiod. Examples which have become dried-out (through drought and/or beaver dam failure) may exhibit greater dominance by *Leersia* rather than *Polygonum*. Conversely, deeper water for sustained periods would promote relatively more *Polygonum* dominance.

**MOST ABUNDANT SPECIES****Great Smoky Mountains National Park**

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Flowering forb	<i>Polygonum</i> spp.

**Global**

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Flowering forb	<i>Polygonum hydropiperoides</i> , <i>Polygonum punctatum</i>
Herb (field)	Graminoid	<i>Leersia lenticularis</i> , <i>Leersia virginica</i>

**CHARACTERISTIC SPECIES****Great Smoky Mountains National Park:**

**Global:** *Leersia lenticularis*, *Leersia virginica*, *Polygonum hydropiperoides*, *Polygonum punctatum*

**OTHER NOTEWORTHY SPECIES**

**Global: Invasive/Exotic Plants:** *Murdannia keisak* (Medium/Low)

**CONSERVATION STATUS RANK**

**Global Rank & Reasons:** G4? (21-Dec-2000). This association is found in the Coastal Plain and Interior from Tennessee and Alabama to the Carolinas. The full extent of its distribution is not known. This is not a rare community type, but it is threatened by filling of wetlands.

**RELATED CONCEPTS****Global Related Concepts:**

- *Polygonum (hydropiperoides, punctatum) - Leersia* spp. Herbaceous Vegetation (Gallyoun et al. 1996) =

**CLASSIFICATION**

**Status:** Standard

**Classification Confidence:** 3 - Weak

**Great Smoky Mountains National Park Classification Comments:** The example within the park is only marginally related to similar associations in the Coastal Plain. It is most likely more akin to Piedmont examples of this association.

**Global Classification Comments:** This association is documented from a beaver pond in the floodplain of Owl Creek, Shiloh National Battlefield, Tennessee, on Collins silt loam; it is also documented on Bailey Island in the ACE Basin (C. Aulbach-Smith pers. comm.). It has also been seen in the Bankhead National Forest and Horseshoe Bend National Military Park, Alabama, and the Oconee National Forest, Georgia.

**ELEMENT DISTRIBUTION**

**Great Smoky Mountains National Park Range:** An example of this community only exists in one place in the park, a limestone sinkhole in the Kinzel Springs quad at approximately 1970 feet in elevation.

**Global Range:** This association is found in the Coastal Plains, Mississippi River Alluvial Plain, Ridge and Valley, Piedmont, Blue Ridge, and other interior provinces from Louisiana, Tennessee, and Alabama to the Carolinas and north to Pennsylvania and New Jersey. The full extent of its distribution is not known.

**Nations:** US

**States/Provinces:** AL, GA, KY?, LA, MS, NC, NJ:S2S3, PA, SC, TN

**TNC Ecoregions:** 31:C, 42:?, 43:C, 44:P, 49:C, 50:C, 51:P, 52:C, 53:C, 56:C, 57:P, 62:C

**USFS Ecoregions (1994/95):** 221Ea:CCC, 221Ha:CCC, 221Hc:CCC, 221Hd:CC?, 221He:CCC, 222Ce:CCP, 222Cf:CCP, 222Cg:CCC, 222Eb:CCC, 222Eg:CCP, 222Ej:CCC, 222En:CCC, 222Eo:CCC, 231Aa:CCC, 231Ab:CCC, 231Ae:CCP, 231Af:CCP, 231Ao:CCC, 231Bc:CC?, 231Bd:CC?, 231Be:CC?, 231Bi:CCC, 231Cc:CCC, 231Cd:CCC, 232Ac:CCC, 232Bl:CCC, 232Bq:CCC, 232Eb:CCC, M221Cd:CCC

**USFS Ecoregions (2007):** 221Ea:CCP, 221Ej:CCC, 221En:CC?, 221Ha:CCC, 221Hb:CCP, 221Hc:CCC, 221Hd:CC?, 221He:CC?, 223Eb:CCC, 223Eg:CCP, 231Aa:CCP, 231Ab:CCC, 231Af:CC?, 231Bc:CC?, 231Bd:CCC, 231Be:CC?, 231Bk:CCP, 231Cc:CCC, 231Cd:CCC, 231Hb:CCP, 231Hc:CCC, 231Ic:CCP, 231Id:CCP, 231Ie:CCC, 232Ac:CCP, 232Bl:CCC, 232Ef:CCP, 232Ja:CCC, M221Cd:CCC

**Federal Lands:** DOD (Fort Benning); NPS (Chickamauga-Chattanooga, Friendship Hill, Great Smoky Mountains, Horseshoe Bend, Jean Lafitte, Kennesaw Mountain, Morristown, Natchez Trace, Ocmulgee, Shiloh); USFS (Bankhead, Daniel Boone?, Oconee, Talladega (Oakmulgee)?, Talladega (Talladega)?, Talladega?); USFWS (Supawna Meadows)

#### ELEMENT SOURCES

**Great Smoky Mountains National Park Plots:** GRSM.309.

**Great Smoky Mountains National Park Description Author(s):** R. White

**Global Description Author(s):** M. Andreu, M. Tukman, H. Summer

**References:** Aulbach-Smith pers. comm., Ehrenfeld 1977, Gallyoun et al. 1996, MSNHP 2006, McManamay 2015, NatureServe Ecology - Southeastern U.S. unpubl. data, Nordman et al. 2011, Perles et al. 2006b, Schafale 2012, Sneddon et al. 2008, Southeastern Ecology Working Group n.d.

## M303. Eastern-Southeastern North American Ruderal Marsh, Wet Meadow & Shrubland

### G557. SOUTHEASTERN RUDERAL MARSH, WET MEADOW & SHRUBLAND

**Group Summary Description:** These are herbaceous wetlands which are characterized by ruderal conditions or dominance by exotic plant species. Also included here are wetlands which may have been severely disturbed by vehicles or equipment, such as coastal plain depressions which have been subjected to intensive forest management (i.e., bedded and site-prepped) and ponds used by recreational off-road vehicles. These ruderal herbaceous and shrub wetlands tend to be dominated by *Andropogon glomeratus*, *Juncus effusus*, and exotic plant species, such as the exotic shrub *Ligustrum sinense* or exotic grasses *Pennisetum purpureum* or *Arundo donax*.

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### A3412 *Juncus effusus* - *Andropogon glomeratus* var. *pumilus* - *Saccharum giganteum* Ruderal Marsh Alliance

Common Rush - Bushy Bluestem - Giant Plumegrass Ruderal Marsh Alliance

*Southern Ruderal Graminoid Marsh*

#### ALLIANCE CONCEPT

**Summary:** These disturbed marshes and other open wetlands are dominated by native graminoid plants, and have few or no trees. These areas may be dominated by *Andropogon glomeratus* var. *pumilus*, *Juncus effusus*, *Saccharum giganteum*, *Scirpus cyperinus*, *Typha* spp., or other graminoid plants. This alliance is found in the southern and eastern United States, from Maryland and West Virginia, south to Florida and Texas. This vegetation occurs in disturbed wetland sites, such as old fields (particularly old fields in bottomlands), as well as low areas and ditches in old fields.

#### Similar Alliances:

- *Arthraxon hispidus* - *Cyperus entrerianus* - *Pennisetum purpureum* Ruderal Marsh Alliance (A3413) is dominated by exotic graminoid wetland plants.
- *Colocasia esculenta* - *Ludwigia grandiflora* ssp. *hexapetala* Ruderal Marsh Alliance (A3410) is dominated by exotic broadleaf forbs.
- *Ligustrum sinense* - *Tamarix* spp. Southern Ruderal Wet Shrubland Alliance (A3409)
- *Rotala ramosior* - *Eleocharis obtusa* - *Fimbristylis autumnalis* Annual Ruderal Wet Meadow Alliance (A3411)

**Diagnostic Characteristics:** Southeastern graminoid semi-natural wetland vegetation dominated by native graminoid plants, including disturbed marshes.

**ALLIANCE DESCRIPTION**

**Environment:** This vegetation occurs in disturbed wetland sites, such as old fields. In Louisiana, this vegetation can dominate old fields in bottomlands. In Texas, this vegetation may dominate low areas and ditches in old fields in the Gulf Coast Prairies and Marshes.

**Vegetation:** Stands of this vegetation type may be dominated by *Andropogon glomeratus* var. *pumilus*, *Juncus effusus*, *Saccharum giganteum*, *Scirpus cyperinus*, *Typha* spp., or other graminoid plants, with few or no trees.

**Physiognomy and Structure:** The vegetation is characterized by native graminoid plants, with few or no trees.

**Floristics:** Stands of this vegetation type may be dominated by *Andropogon glomeratus* var. *pumilus*, *Juncus effusus*, *Saccharum giganteum*, *Scirpus cyperinus*, *Typha* spp., or other graminoid plants, with few or no trees.

**Dynamics:** This semi-natural vegetation occurs on disturbed wetland sites, such as bottomland old fields, or cutover bottomlands where trees or shrubs have not become dominant again.

**ALLIANCE DISTRIBUTION**

**Range:** This alliance is found in the southern and eastern United States, from Maryland and West Virginia, south to Florida and Texas.

**Nations:** US

**Subnations:** AL, AR, FL, GA, IN, KY, LA, MD, MS, NC, OK, SC, TN, TX, VA, VT, WV

**ALLIANCE SOURCES**

**References:** Faber-Langendoen et al. 2019b, Nelson 1986

**Author of Concept:** Faber-Langendoen et al. 2019b

**Author of Description:** C. Nordman, in Faber-Langendoen et al. (2013)

**[CEGL008433] *Juncus effusus* - *Chelone glabra* - *Scirpus* spp. Southern Blue Ridge Beaver Pond Ruderal Marsh**

Translated Name: **Common Rush - White Turtlehead - Bulrush species Southern Blue Ridge Beaver Pond Ruderal Marsh**

Common Name: **Southern Blue Ridge Ruderal Beaver Pond Marsh**

**USNVC CLASSIFICATION**

Division Eastern North American Temperate Freshwater Marsh, Wet Meadow & Shrubland (2.C.4.Nd)

Macrogroup Eastern-Southeastern North American Ruderal Marsh, Wet Meadow & Shrubland (M303)

Group Southeastern Ruderal Marsh, Wet Meadow & Shrubland (G557)

Alliance *Juncus effusus* - *Andropogon glomeratus* var. *pumilus* - *Saccharum giganteum* Ruderal Marsh

Alliance (A3412)

**ELEMENT CONCEPT**

**Global Summary:** This community occurs in beaver-impounded sites along mountain streams in the Southern Blue Ridge and Cumberland Mountains and Ridge and Valley physiographic provinces. Vegetative composition is highly variable, but *Juncus effusus* is a characteristic dominant. The physiognomy of the type is also extremely variable. Examples of this community range from no shrub cover to high levels of cover depending upon the amount of time since inundation and the fluctuation of the water level over time.

**ENVIRONMENTAL DESCRIPTION**

**Great Smoky Mountains National Park Environment:** Same as global.

**Global Environment:** This association is known from moderately high elevations of 610 to 915 m (2000-3000 feet) in the southern terminus of the Blue Ridge and Ridge and Valley physiographic provinces.

**VEGETATION DESCRIPTION**

**Great Smoky Mountains National Park Vegetation:** Same as global.

**Global Vegetation:** Composition is highly variable from place to place and time to time. *Juncus effusus* dominates. Other species may include *Chelone glabra*, *Scirpus atrovirens*, *Scirpus hattorianus*, *Hypericum mutilum*, *Carex gynandra*, *Oxypolis rigidior*, *Ludwigia palustris*, *Mimulus ringens*, *Eleocharis* spp., *Thelypteris noveboracensis*, *Leersia virginica*, *Carex lurida*, and *Carex echinata*.

**Global Dynamics:** These are very dynamic communities, changing as a result of alteration of water levels by beaver activity and dam washouts or abandonment. They undergo major successional transformations.

**MOST ABUNDANT SPECIES****Global****Stratum**

Herb (field)

**Lifeform**

Graminoid

**Species**

*Juncus effusus*

**CHARACTERISTIC SPECIES****Great Smoky Mountains National Park:**

**Global:** *Chelone glabra*, *Juncus effusus*, *Scirpus atrovirens*, *Scirpus hattorianus*

## OTHER NOTEWORTHY SPECIES

## Global:

## CONSERVATION STATUS RANK

**Global Rank & Reasons:** GNA (ruderal) (18-Feb-2015).

## RELATED CONCEPTS

## Global Similar Types:

- *Alnus serrulata* Appalachian Seepage Shrubland (CEGL007062)

## Global Related Concepts:

- Disturbed Bog (Wichmann 2009) >

## CLASSIFICATION

**Status:** Standard

**Classification Confidence:** 2 - Moderate

**Global Classification Comments:** As the beaver pond ages, the vegetation may quickly succeed into a shrubby version of this association, eventually becoming an *Alnus*- or *Salix*-dominated association. The variable communities of beaver marshes and meadows are poorly understood. This type may need substantial revision and clarification.

## ELEMENT DISTRIBUTION

**Great Smoky Mountains National Park Range:** The only documented occurrence of this community was off of US 441 in the Smokemont quadrangle.

**Global Range:** The distribution of this type is poorly understood, since its circumscription is as yet unclear. It was originally defined from the southern terminus of the Blue Ridge and Ridge and Valley physiographic provinces.

**Nations:** US

**States/Provinces:** AL?, GA, KY, NC, TN?

**TNC Ecoregions:** 50:C, 51:C

**USFS Ecoregions (1994/95):** 231D:CC, M221Dd:CCC

**USFS Ecoregions (2007):** 231D:CC, M221Dd:CCC

**Federal Lands:** BIA (Eastern Band of Cherokee); NPS (Blue Ridge Parkway, Cumberland Gap, Great Smoky Mountains); USFS (Chattahoochee, Chattahoochee (Southern Blue Ridge), Pisgah)

## ELEMENT SOURCES

**Great Smoky Mountains National Park Plots:** GRSM.318.

**Great Smoky Mountains National Park Description Author(s):** R. White

**Global Description Author(s):** A.S. Weakley

**References:** GNHP unpubl. data 2018, NatureServe Ecology - Southeastern U.S. unpubl. data, Schafale 2012, Schafale and Weakley 1990, Southeastern Ecology Working Group n.d., White 2006, Wichmann 2009, Wichmann 2009

**[CEGL004112] *Juncus effusus* Marsh**

Translated Name: **Common Rush Marsh**

Common Name: **Common Rush Marsh**

## USNVC CLASSIFICATION

Division	Eastern North American Temperate Freshwater Marsh, Wet Meadow & Shrubland (2.C.4.Nd)
Macrogroup	Eastern-Southeastern North American Ruderal Marsh, Wet Meadow & Shrubland (M303)
Group	Southeastern Ruderal Marsh, Wet Meadow & Shrubland (G557)
Alliance	<i>Juncus effusus</i> - <i>Andropogon glomeratus</i> var. <i>pumilus</i> - <i>Saccharum giganteum</i> Ruderal Marsh
Alliance (A3412)	

## ELEMENT CONCEPT

**Global Summary:** This broadly defined type represents freshwater marsh vegetation dominated by *Juncus effusus*. Additional types may be developed as more information becomes available. This vegetation may occur in natural or artificial ponds, including beaver-enhanced ones. In various parts of its broad range as currently defined, associated species may include *Andropogon glomeratus*, *Cyperus* spp., *Typha latifolia*, *Scirpus cyperinus*, *Triadenum walteri*, *Apios americana*, and *Galium aparine*. This type includes seasonally to temporarily flooded vegetation dominated or codominated by *Juncus effusus* in the Central and Southern Appalachians.

## ENVIRONMENTAL DESCRIPTION

**Great Smoky Mountains National Park Environment:** This community is seasonally to temporarily flooded and occurs along artificial waterways and disturbed, wet fields.

**Global Environment:** This is a seasonally (to temporarily) flooded marsh vegetation type; it may occur in natural or artificial ponds, including beaver-enhanced ponds, artificial waterways (wet ditches), and disturbed wet fields.

## VEGETATION DESCRIPTION

**Great Smoky Mountains National Park Vegetation:** This type includes artificial and natural wetlands dominated by *Juncus effusus*, sometimes codominating with *Andropogon glomeratus*. Other wetland shrubs and herbs may be present, for example, *Alnus serrulata*, *Boehmeria cylindrica*, *Carex lurida*, *Cinna arundinacea*, *Eleocharis* spp., *Polygonum* spp., *Rhexia mariana* var. *mariana*, *Rhynchospora capitellata*, and *Scirpus* spp.

**Global Vegetation:** This type is currently broadly and literally defined, based on dominance by *Juncus effusus*. In various parts of its broad range as currently defined, associated species may include *Andropogon glomeratus*, *Carex* spp., *Cyperus* spp., other *Juncus* spp., *Typha latifolia*, *Scirpus cyperinus*, *Triadenum walteri*, *Apios americana*, and *Galium aparine*. In Georgia, Wharton (1978) cites *Carex rostrata*, *Carex stipata*, *Schoenoplectus americanus* (= *Scirpus americanus*), and *Sagittaria latifolia* as associates of beaver pond vegetation containing *Juncus effusus*.

## MOST ABUNDANT SPECIES

## Great Smoky Mountains National Park

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Graminoid	<i>Juncus effusus</i>

## Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Graminoid	<i>Juncus effusus</i>

## CHARACTERISTIC SPECIES

**Great Smoky Mountains National Park:** *Juncus effusus*

**Global:** *Juncus effusus*

## OTHER NOTEWORTHY SPECIES

**Global: Vulnerable Plants:** *Pycnanthemum beadlei* (G2G3)

## CONSERVATION STATUS RANK

**Global Rank & Reasons:** G5 (28-Mar-2001). This is a broadly defined, widely distributed, and reasonably secure vegetation type.

## RELATED CONCEPTS

## Global Related Concepts:

- *Carex stricta* - *Juncus effusus* - *Carex lurida* Semipermanently Flooded Herbaceous Vegetation (McCoy and Fleming 2000) =
- Beaver Dam Type (Wharton 1978) ?
- Disturbed Bog (Wichmann 2009) >
- IID6a. Natural Impoundment Pond (Allard 1990) >
- Semipermanent Impoundment (Fleming pers. comm.) >

## CLASSIFICATION

**Status:** Standard

**Classification Confidence:** 2 - Moderate

**Global Classification Comments:** A new association is likely to be split from CEG004112 to represent northeastern expressions of the community as new data become available.

Though this association was not seen at the Bankhead National Forest, it is expected to occur there.

## ELEMENT DISTRIBUTION

**Great Smoky Mountains National Park Range:** This wetland occurs in wet ditches and wet fields within Cades Cove, on the Cades Cove quadrangle. It was not sampled on the Mount Le Conte quadrangle. It has not been found in other areas of the park but is likely to exist elsewhere within the boundary.

**Global Range:** The range of this broadly defined association has not been fully described. It is confirmed as occurring in the Northern Appalachians south through the Central Appalachians and is thought to occur in the Interior Low Plateau, Cumberland Plateau, Southern Ridge and Valley, Southern Blue Ridge, Piedmont, Chesapeake Bay Lowlands, and the Coastal Plain from the Mid-Atlantic to the Upper East Gulf Coastal Plain.

**Nations:** US

**States/Provinces:** AL, AR, FL, GA, KY, LA, MD, MS, NC, OK, SC, TN, TX, VA:SU, VT, WV

**TNC Ecoregions:** 38:C, 39:C, 40:C, 42:C, 43:C, 44:C, 50:P, 51:C, 52:C, 53:P, 56:P, 57:P, 58:P, 59:C

**USFS Ecoregions (1994/95):** 222Eb:CCC, 231Bg:CCC, 231Bi:CCC, 231Ca:CPP, 231Cd:CPP, 231Db:CCC, 232Ce:PPP, M221Ab:CCC, M221Dc:CCC, M221Dd:CCC

**USFS Ecoregions (2007):** 223Eb:CCC, 231Ca:CPP, 231Cd:CPP, 231Db:CCC, 231Hb:CCC, 231Hc:CCC, 232Ce:PPP, M221Ab:CCC, M221Dc:CCC, M221Dd:CCC

**Federal Lands:** BIA (Eastern Band of Cherokee); DOD (Arnold, Fort Benning); NPS (Appalachian Trail [Lower New England], Blue Ridge Parkway, Carl Sandburg Home, Chattahoochee River, Chickamauga-Chattanooga?, Cumberland Island?, Great Smoky Mountains, Mammoth Cave?, Natchez Trace); USFS (Bankhead, Cherokee?, Nantahala, Oconee?, Pisgah, Talladega, Talladega (Oakmulgee), Talladega (Talladega?)); USFWS (Patuxent)

## ELEMENT SOURCES

**Great Smoky Mountains National Park Description Author(s):** K.D. Patterson

**Global Description Author(s):** Southeastern Ecology Group

**References:** Allard 1990, Fleming et al. 2017, Fleming pers. comm., GNHP unpubl. data 2018, Hillestad et al. 1975, Hoagland 1998c, Hoagland 2000, MSNHP 2006, McCoy and Fleming 2000, McManamay 2015, McManamay 2017a, Nordman et al. 2011, Peet et al. unpubl. data, Pyne et al. 2010, Schafale 2012, Schotz pers. comm., Southeastern Ecology Working Group n.d., TDNH unpubl. data 2018, TNC 1998a, Wharton 1978, White 2003, Wichmann 2009, Wichmann 2009

### **A3411 *Rotala ramosior* - *Eleocharis obtusa* - *Fimbristylis autumnalis* Annual Ruderal Wet Meadow Alliance**

Lowland Toothcup - Blunt Spikerush - Slender Fimbr Annual Ruderal Wet Meadow Alliance

*Ruderal Annual Mudflat Wet Meadow*

## ALLIANCE CONCEPT

**Summary:** These semi-natural wetlands are vegetated with annual plants. These are generally areas which may be flooded in the winter and spring, but not in the summer. This allows an annual flora to thrive. The vegetation is characterized by plants which complete their germination, growth, flowering, seed set, and senescence in the same year. Sites include floodplains exposed river bars, and the exposed areas of drawdown zones of reservoirs of the southern United States, from Oklahoma to Alabama, Kentucky and Virginia.

**Similar Alliances:**

- *Arthraxon hispidus* - *Cyperus entrerianus* - *Pennisetum purpureum* Ruderal Marsh Alliance (A3413) is dominated by exotic graminoid wetland plants.
- *Colocasia esculenta* - *Ludwigia grandiflora* ssp. *hexapetala* Ruderal Marsh Alliance (A3410) is not dominated by annual plants, or native plants.
- *Juncus effusus* - *Andropogon glomeratus* var. *pumilus* - *Saccharum giganteum* Ruderal Marsh Alliance (A3412) is dominated by native wetland graminoid plants.

**Diagnostic Characteristics:** Semi-natural wetlands which are vegetated with annual plants, including in floodplains, exposed river bars, or drawdown zones of reservoirs.

**Rationale for Nominal Species or Physiognomic Features:** *Rotala ramosior*, *Eleocharis obtusa*, and *Fimbristylis autumnalis* are the plants with the highest frequency and biomass found in mudflats along six Tennessee Valley Authority mainstream reservoirs (Webb et al. 1988).

**Related Concepts:**

- *Iva annua* Herbaceous Alliance (Hoagland 2000) =

## ALLIANCE DESCRIPTION

**Environment:** Stands of this alliance are found in successional, temporarily flooded habitats such as drawdown zones of reservoirs and impoundments, river bar depositional zones or post-cultivation floodplain (fallow or old field) areas. These are mainly sites that flood in the winter or spring, but dry out later in the season.

**Vegetation:** The composition and structure of the vegetation are highly variable among locations and from year to year. The flora of mudflats of TVA mainstream reservoirs has been well-documented (Webb et al. 1988). In general, a number of short-statured annuals are characteristic, including *Eleocharis obtusa*, *Eragrostis hypnoides*, *Fimbristylis autumnalis*, *Fimbristylis littoralis* (= *Fimbristylis miliacea*), *Lindernia dubia*, *Lipocarpha micrantha* (= *Hemicarpha micrantha*), *Rotala ramosior*, and others (Webb et al. 1988). Several perennial species may also be encountered, especially along the upper edges and boundaries of mudflats. Species can include *Juncus acuminatus*, *Justicia americana*, *Leersia oryzoides*, *Ludwigia* spp., *Panicum rigidulum* (= *Panicum agrostoides*), *Symphytotrichum lanceolatum* var. *lanceolatum* (= *Aster simplex*), and others. River floodplain stands of the weedy forb *Iva annua* (usually monodominant or heavily dominated) are also included here. In Oklahoma, associated species include *Ambrosia trifida*, *Bothriochloa saccharoides*, *Cnidoscolus texanus*, *Lespedeza cuneata* (= *Lespedeza sericea*), *Passiflora incarnata*, and *Sorghum halepense* (Hoagland 2000).

**Physiognomy and Structure:** Stands of this vegetation may be dense or more patchy and open. The vegetation is characterized by annual plants which complete their germination, growth, flowering, seed set, and senescence in the same year.

**Floristics:** The composition and structure of the vegetation are highly variable among locations and from year to year. The flora of mudflats of TVA mainstream reservoirs has been well-documented (Webb et al. 1988). In general, a number of short-statured annuals are characteristic, including *Eleocharis obtusa*, *Eragrostis hypnoides*, *Fimbristylis autumnalis*, *Fimbristylis littoralis* (= *Fimbristylis miliacea*), *Lindernia dubia*, *Lipocarpha micrantha* (= *Hemicarpha micrantha*), *Rotala ramosior*, and others (Webb et al. 1988). Several perennial species may also be encountered, especially along the upper edges and boundaries of mudflats. Species can include *Juncus acuminatus*, *Justicia americana*, *Leersia oryzoides*, *Ludwigia* spp., *Panicum rigidulum* (= *Panicum agrostoides*), *Symphytotrichum lanceolatum* var. *lanceolatum* (= *Aster simplex*), and others. River floodplain stands of the weedy forb *Iva annua* (usually monodominant or heavily dominated) are also included here. In Oklahoma, associated species include *Ambrosia trifida*, *Bothriochloa saccharoides*, *Cnidoscolus texanus*, *Lespedeza cuneata* (= *Lespedeza sericea*), *Passiflora incarnata*, and *Sorghum halepense* (Hoagland 2000).

**Dynamics:** These are generally areas which may be flooded in the winter and spring, but not in the summer. This allows an annual flora to thrive. The vegetation is characterized by plants which complete their germination, growth, flowering, seed set, and senescence in the same year.

#### ALLIANCE DISTRIBUTION

**Range:** This alliance is found in the southern United States, from Oklahoma to Alabama, Kentucky and Virginia.

**Nations:** US

**Subnations:** AL, AR, GA, IL?, IN?, KS?, KY, MO?, NC, OK, SC?, TN, TX?, VA

#### ALLIANCE SOURCES

**References:** Baskin et al. 1993, Baskin et al. 2002, DeBerry and Perry 2005, Faber-Langendoen et al. 2019b, Hoagland 2000, Luken and Thieret 2001, Webb et al. 1988a

**Author of Concept:** Faber-Langendoen et al. 2019b

**Author of Description:** C. Nordman, in Faber-Langendoen et al. (2013)

### [CEGL003910] (*Diospyros virginiana*, *Platanus occidentalis*) / *Eupatorium serotinum* - *Diodia virginiana* Ruderal Wet Meadow

Translated Name: (Common Persimmon, American Sycamore) / Late-flowering Thoroughwort - Virginia Buttonweed Ruderal Wet Meadow

Common Name: Artificial Lake Drawdown Zone

#### USNVC CLASSIFICATION

Division	Eastern North American Temperate Freshwater Marsh, Wet Meadow & Shrubland (2.C.4.Nd)
Macrogroup	Eastern-Southeastern North American Ruderal Marsh, Wet Meadow & Shrubland (M303)
Group	Southeastern Ruderal Marsh, Wet Meadow & Shrubland (G557)
Alliance	<i>Rotala ramosior</i> - <i>Eleocharis obtusa</i> - <i>Fimbristylis autumnalis</i> Annual Ruderal Wet Meadow
Alliance (A3411)	

#### ELEMENT CONCEPT

**Global Summary:** This association consists of drawdown zones around artificial impoundments in the Southern Appalachians and likely adjacent provinces. Physiognomy and composition are highly variable. A scattering to sometimes well-developed stratum of woody trees and saplings is sometimes present, and often includes species such as *Diospyros virginiana*, *Betula nigra*, and *Platanus occidentalis*. Characteristic herbs are weedy colonizers, such as *Eupatorium serotinum*, *Diodia virginiana*, *Juncus effusus*, *Ambrosia artemisiifolia*, *Juncus tenuis*, *Scirpus cyperinus*, *Lobelia inflata*, *Lobelia cardinalis*, *Apocynum cannabinum*, *Polygonum hydropiperoides*, *Acalypha virginica*, *Andropogon virginicus*, *Panicum* spp., *Hypericum mutilum*, *Hypericum punctatum*, *Plantago* spp., *Pseudognaphalium* spp., and others.

#### ENVIRONMENTAL DESCRIPTION

**Great Smoky Mountains National Park Environment:** This community is found along the shores of Lake Fontana. It occupies significant area.

**Global Environment:** This community occurs along shores of artificial impoundments.

#### VEGETATION DESCRIPTION

**Great Smoky Mountains National Park Vegetation:** Same as global.

**Global Vegetation:** Physiognomy and composition are highly variable. A scattering to sometimes well-developed stratum of woody trees and saplings is sometime present, and often includes species such as *Diospyros virginiana*, *Betula nigra*, and *Platanus occidentalis*. Characteristic herbs are weedy colonizers, such as *Eupatorium serotinum*, *Diodia virginiana*, *Juncus effusus*, *Ambrosia artemisiifolia*, *Juncus tenuis*, *Scirpus cyperinus*, *Lobelia inflata*, *Lobelia cardinalis*, *Apocynum cannabinum*, *Polygonum hydropiperoides*, *Acalypha virginica*, *Andropogon virginicus*, *Panicum* spp., *Hypericum mutilum*, *Hypericum punctatum*, *Plantago* spp., *Pseudognaphalium* spp., and others.

**Global Dynamics:** This community is highly variable in space and time, due to differences in substrate, flooding regime, length of time since flooding, etc.

#### MOST ABUNDANT SPECIES

##### Great Smoky Mountains National Park

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Broad-leaved deciduous tree	<i>Diospyros virginiana</i> , <i>Platanus occidentalis</i>
Shrub/sapling (tall & short)	Broad-leaved deciduous tree	<i>Diospyros virginiana</i> , <i>Platanus occidentalis</i>
Herb (field)	Flowering forb	<i>Diodia virginiana</i> , <i>Eupatorium serotinum</i>

##### Global

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Broad-leaved deciduous tree	<i>Diospyros virginiana</i> , <i>Platanus occidentalis</i>
Herb (field)	Flowering forb	<i>Diodia virginiana</i> , <i>Eupatorium serotinum</i>

#### CHARACTERISTIC SPECIES

##### Great Smoky Mountains National Park:

**Global:** *Diodia virginiana*, *Eupatorium serotinum*

#### OTHER NOTEWORTHY SPECIES

**Global:**

#### CONSERVATION STATUS RANK

**Global Rank & Reasons:** GNA (ruderal) (1-Nov-2002).

#### RELATED CONCEPTS

#### CLASSIFICATION

**Status:** Standard

**Classification Confidence:** 3 - Weak

**Great Smoky Mountains National Park Other Comments:** Documented from Great Smoky Mountains National Park Plot #556, from north shore of Lake Fontana.

**Global Classification Comments:** This type will need substantial additional documentation, likely leading to classification and nomenclatural changes.

#### ELEMENT DISTRIBUTION

**Great Smoky Mountains National Park Range:** This community was sampled on the shores of Lake Fontana.

**Global Range:** This community is found at low elevations of the southern Blue Ridge Mountains of western North Carolina, eastern Tennessee, northern Georgia, and probably northwestern South Carolina.

**Nations:** US

**States/Provinces:** GA, NC, SC?, TN

**TNC Ecoregions:** 51:C

**USFS Ecoregions (1994/95):** M221Dd:CCC

**USFS Ecoregions (2007):** M221Dd:CCC

**Federal Lands:** BIA (Eastern Band of Cherokee); NPS (Great Smoky Mountains); USFS (Nantahala)

#### ELEMENT SOURCES

**Great Smoky Mountains National Park Description Author(s):** A.S. Weakley

**Global Description Author(s):** A.S. Weakley

**References:** NatureServe Ecology - Southeastern U.S. unpubl. data, Southeastern Ecology Working Group n.d., Weakley pers. comm.

## 6. Open Rock Vegetation

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### 6.B.1. Temperate & Boreal Cliff, Scree & Other Rock Vegetation

#### 6.B.1.NA. EASTERN NORTH AMERICAN TEMPERATE CLIFF, SCREE & ROCK VEGETATION

#### M111. Eastern North American Cliff & Rock Vegetation

#### G840. APPALACHIAN CLIFF & ROCK VEGETATION

**Group Summary Description:**

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#### A2071 Appalachian Acidic Cliff Alliance

Appalachian Acidic Cliff Alliance

*Appalachian Acidic Cliff*

#### ALLIANCE CONCEPT

**Summary:** This alliance is made up of sparse, patchy vascular vegetation with variable nonvascular cover occurring on cliff faces of acidic rock types in the Southern Appalachian and Piedmont regions of the U.S., north to the Central Appalachians. Mosses and lichens are often abundant. Vascular plants are generally confined to crevices, and cover is generally less than 10% over all but can be patchy and reach up to 25% cover in areas. Common ferns and forbs include *Asplenium montanum*, *Deschampsia flexuosa*, *Polypodium appalachianum*, and *Polypodium virginianum*, as well as scattered shrubs, such as *Hydrangea arborescens*, *Kalmia latifolia*, and *Rhododendron* spp.

**Classification Comments:** This alliance is broadly defined and requires further data collection and analysis.

**Similar Alliances:**

- Laurentian-Acadian-Great Lakes Acidic Cliff Alliance (A4007)
- *Pellaea atropurpurea* - *Cystopteris bulbifera* Appalachian Circumneutral Cliff Alliance (A2076)

**Diagnostic Characteristics:** Acidic cliff faces supporting sparse vascular vegetation in the eastern U.S. in the Southern and Central Appalachians and Piedmont regions.

**Related Concepts:**

- Montane Acidic Cliff (Schafale and Weakley 1990) ><

**ALLIANCE DESCRIPTION**

**Environment:** This alliance includes dry to moist, near-vertical to overhanging cliffs with crevices, on generally acidic substrates. This vegetation occurs on a number of different rock types, including sandstone, quartzite, gneiss, schist, and phyllite. Some examples may be shaded by trees rooted in adjacent forested communities. In the Piedmont, examples are found in topographically low settings such as river bluffs that are not subject to flood scouring. Substrates may include various felsic igneous or metamorphic rocks, acidic saprolite, and occasionally unconsolidated acidic sediments.

**Vegetation:** This alliance generally contains very little vascular vegetation and variable cover of nonvascular vegetation. It includes vegetation of both acidic and circumneutral substrates. Mosses (e.g., species of *Bryoandersonia*, *Campylium*, *Fissidens*, *Plagiomnium*, *Thuidium*) and lichens, such as species of *Umbilicaria*, can have moderate coverage, and vascular plants may be restricted to ledges and rooting in cracks. Common ferns and forbs include *Asplenium montanum*, *Deschampsia flexuosa*, *Polypodium appalachianum*, and *Polypodium virginianum* (= *Polypodium vulgare*). Other herbs occasionally present include *Agrostis perennans*, *Arisaema triphyllum*, *Aristolochia macrophylla*, *Asplenium trichomanes*, *Campanula divaricata*, *Cystopteris protrusa*, *Dryopteris marginalis*, *Eurybia divaricata* (= *Aster divaricatus*), *Galax urceolata*, *Heuchera parviflora*, *Iris cristata*, *Muhlenbergia tenuiflora*, *Polygonatum biflorum*, *Rubus canadensis*, *Silene rotundifolia*, *Silene stellata*, and *Solidago sphacelata*. Occasional shrubs include *Hydrangea arborescens*, *Kalmia latifolia*, *Parthenocissus quinquefolia*, *Vaccinium arboreum*, and *Vaccinium simulatum*. In the Piedmont, frequent herbs include *Asplenium platyneuron*, *Cheilanthes lanosa*, *Cheilanthes tomentosa*, *Danthonia spicata*, *Hieracium venosum*, *Opuntia humifusa*, *Pleopeltis polypodioides* (= *Polypodium polypodioides*), *Schizachyrium scoparium*, and *Tephrosia virginiana*. Frequent woody species include the shrubs *Chionanthus virginicus*, *Kalmia latifolia*, *Vaccinium arboreum*, *Vaccinium pallidum*, and trees of *Carya glabra*, *Diospyros virginiana*, *Juniperus virginiana*, *Pinus virginiana*, and *Quercus stellata*.

**Physiognomy and Structure:** Physiognomy and structure are somewhat variable among associations and within occurrences. Some examples are typically shaded by trees rooted in adjacent forested communities and/or adjacent rock outcrops. Up to 90% of the rock surface may lack cover of vascular plants. Mosses and lichens can have moderate coverage, and vascular plants typically occur on ledges and rooted in cracks, occasionally forming patches up to 25% cover. On a given cliff, more than one association can occur in close proximity to one another, in lower, more shaded portions versus upper, less shaded ones.

**Floristics:** This alliance generally contains very little vascular vegetation and variable cover of nonvascular vegetation. It includes vegetation of both acidic and circumneutral substrates. Mosses (e.g., species of *Bryoandersonia*, *Campylium*, *Fissidens*, *Plagiomnium*, *Thuidium*) and lichens, such as species of *Umbilicaria*, can have moderate coverage, and vascular plants may be restricted to ledges and rooting in cracks. Common ferns and forbs include *Asplenium montanum*, *Deschampsia flexuosa*, *Polypodium appalachianum*, and *Polypodium virginianum* (= *Polypodium vulgare*). Other herbs occasionally present include *Agrostis perennans*, *Arisaema triphyllum*, *Aristolochia macrophylla*, *Asplenium trichomanes*, *Campanula divaricata*, *Cystopteris protrusa*, *Dryopteris marginalis*, *Eurybia divaricata* (= *Aster divaricatus*), *Galax urceolata*, *Heuchera parviflora*, *Iris cristata*, *Muhlenbergia tenuiflora*, *Polygonatum biflorum*, *Rubus canadensis*, *Silene rotundifolia*, *Silene stellata*, and *Solidago sphacelata*. Occasional shrubs include *Hydrangea arborescens*, *Kalmia latifolia*, *Parthenocissus quinquefolia*, *Vaccinium arboreum*, and *Vaccinium simulatum*. In the Piedmont, frequent herbs include *Asplenium platyneuron*, *Cheilanthes lanosa*, *Cheilanthes tomentosa*, *Danthonia spicata*, *Hieracium venosum*, *Opuntia humifusa*, *Pleopeltis polypodioides* (= *Polypodium polypodioides*), *Schizachyrium scoparium*, and *Tephrosia virginiana*. Frequent woody species include the shrubs *Chionanthus virginicus*, *Kalmia latifolia*, *Vaccinium arboreum*, *Vaccinium pallidum*, and trees of *Carya glabra*, *Diospyros virginiana*, *Juniperus virginiana*, *Pinus virginiana*, and *Quercus stellata*.

**ALLIANCE DISTRIBUTION**

**Range:** This alliance occurs in the Southern and Central Appalachians of the eastern U.S., as well as the Piedmont.

**Nations:** US

**Subnations:** AL, GA, KY, MD, NC, OH, PA, SC, TN, VA, WV

**ALLIANCE SOURCES**

**References:** Faber-Langendoen et al. 2019b, Schafale and Weakley 1990, Schafale and Weakley 1990, Schmalzer and DeSelm 1982, Vanderhorst et al. 2010

**Author of Concept:** Schafale and Weakley 1990

**Author of Description:** M. Pyne, after M.P. Schafale and A.S. Weakley (1990)

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**[CEGL004980] *Asplenium montanum* - *Heuchera villosa* Felsic Cliff Vegetation**

Translated Name: **Mountain Spleenwort - Hairy Alumroot Felsic Cliff Vegetation**

Common Name: **Appalachian Felsic Cliff**

## USNVC CLASSIFICATION

Division	Eastern North American Temperate Cliff, Scree & Rock Vegetation (6.B.1.Na)
Macrogroup	Eastern North American Cliff & Rock Vegetation (M111)
Group	Appalachian Cliff & Rock Vegetation (G840)
Alliance	Appalachian Acidic Cliff Alliance (A2071)

## ELEMENT CONCEPT

**Global Summary:** This community occurs in the Blue Ridge and upper Piedmont of Georgia, North Carolina, South Carolina, Tennessee, and Virginia. It includes vertical rock faces associated with felsic, metamorphic and igneous geologies. This community generally has little vegetative cover, often with 90% of the rock surface unvegetated. Mosses (e.g., *Thuidium* spp., *Fissidens* spp., *Campylium* sp., *Bryoandersonia* sp., *Plagiomnium* sp.) and lichens can have moderate coverage, and vascular plants occur on ledges and rooted in cracks. *Asplenium montanum* and *Heuchera villosa* are characteristic components. Other typical species include *Agrostis perennans*, *Arisaema triphyllum*, *Aristolochia macrophylla*, *Asplenium trichomanes*, *Eurybia divaricata*, *Cystopteris protrusa*, *Dryopteris marginalis*, *Hydrangea arborescens*, *Parthenocissus quinquefolia*, *Polypodium appalachianum*, and *Rubus canadensis*. These cliffs are typically dry, although small seepages may occur. They are usually shaded by trees rooted on ledges and by the surrounding forest.

## ENVIRONMENTAL DESCRIPTION

**Great Smoky Mountains National Park Environment:** This community includes vertical rock faces associated with felsic, metamorphic and igneous geologies. These cliffs are typically dry, although small seepages may occur. They are usually shaded by trees rooted on ledges and by the surrounding forest.

**Global Environment:** This community includes vertical rock faces associated with felsic, metamorphic and igneous geologies. Some occurrences attributed to this type appear to be on subcalcareous substrates. These cliffs are typically dry, although small seepages may occur. They are usually shaded by trees rooted on ledges and by the surrounding forest.

## VEGETATION DESCRIPTION

**Great Smoky Mountains National Park Vegetation:** This community has little vegetative cover, often with 90% of the rock surface unvegetated. Mosses (e.g., *Thuidium* spp., *Fissidens* spp., *Campylium* sp., *Bryoandersonia* sp., *Plagiomnium* sp.) and lichens can have moderate coverage, and vascular plants occur on ledges and rooted in cracks. *Asplenium montanum* and *Heuchera villosa* are characteristic components. Other typical species include *Agrostis perennans*, *Arisaema triphyllum*, *Aristolochia macrophylla*, *Asplenium trichomanes*, *Eurybia divaricata* (= *Aster divaricatus*), *Cystopteris protrusa*, *Dryopteris marginalis*, *Hydrangea arborescens*, *Parthenocissus quinquefolia*, *Polypodium appalachianum*, and *Rubus canadensis*.

**Global Vegetation:** This community has little vegetative cover, often with 90% of the rock surface unvegetated. Mosses (e.g., *Thuidium* spp., *Fissidens* spp., *Campylium* sp., *Bryoandersonia* sp., *Plagiomnium* sp.) and lichens can have moderate coverage, and vascular plants occur on ledges and rooted in cracks. *Asplenium montanum* and *Heuchera villosa* are characteristic components. Other typical species include *Agrostis perennans*, *Arisaema triphyllum*, *Aristolochia macrophylla*, *Asplenium trichomanes*, *Eurybia divaricata* (= *Aster divaricatus*), *Cystopteris protrusa*, *Dryopteris marginalis*, *Hydrangea arborescens*, *Parthenocissus quinquefolia*, *Polypodium appalachianum*, and *Rubus canadensis*. An example of a shaded rock outcrop from the Chattahoochee National Forest (Georgia) which is assigned here contains low coverages of the woody plants *Hydrangea arborescens*, *Kalmia latifolia*, *Vaccinium arboreum*, and *Vaccinium simulatum*, along with the herbs *Campanula divaricata*, *Dryopteris marginalis*, *Galax urceolata*, *Iris cristata*, *Muhlenbergia tenuiflora*, *Polygonatum biflorum*, *Silene stellata*, and *Solidago sphacelata*. An example in Great Smoky Mountains National Park (Tennessee) consisted of *Heuchera villosa*, *Pilea pumila*, *Impatiens pallida*, *Sedum ternatum*, and various moss species but did not contain *Asplenium montanum*.

**Global Dynamics:** These cliffs are typically dry, although small seepages may occur. They are usually shaded by trees rooted on ledges and by the surrounding forest.

## MOST ABUNDANT SPECIES

<u>Global Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Flowering forb	<i>Heuchera villosa</i>
Herb (field)	Fern (Spore-bearing forb)	<i>Asplenium montanum</i>

## CHARACTERISTIC SPECIES

**Great Smoky Mountains National Park:** *Asplenium montanum*, *Heuchera villosa*

**Global:** *Asplenium montanum*, *Heuchera villosa*

## OTHER NOTEWORTHY SPECIES

**Global: Vulnerable Plants:** *Cardamine clematitidis* (G3), *Hymenophyllum tayloriae* (G2), *Hypericum buckleii* (G3), *Krigia montana* (G3), *Saxifraga careyana* (G3), *Saxifraga caroliniana* (G3), *Shortia galacifolia* var. *galacifolia* (G3T2T3); **Other Plants:** *Trichomanes intricatum* (G4G5)

## CONSERVATION STATUS RANK

**Global Rank & Reasons:** G3G4 (4-Jan-1998).

## RELATED CONCEPTS

**Global Similar Types:**

- Piedmont Acidic Cliff Vegetation (CEGL003979)

## CLASSIFICATION

**Status:** Standard

**Classification Confidence:** 2 - Moderate

**Great Smoky Mountains National Park Other Comments:** This community is not mappable and usually occurs beneath a forest canopy.

## ELEMENT DISTRIBUTION

**Great Smoky Mountains National Park Range:** This community was sampled on the Cades Cove and Mount Le Conte quadrangles. It is likely in other areas of the park. On the Cades Cove quadrangle it was sampled from cliffs in the northeast portion of the quadrangle, along Rowans Creek (2200 feet) and Crooked Arm Branch (2960 feet). On the Mount Le Conte quadrangle, this community was sampled from cliffs northwest of Bullhead (3840 feet) and above Highway 441, in the vicinity of Fort Harry (3400 feet).

**Global Range:** This community occurs in the Blue Ridge and upper Piedmont of Georgia, North Carolina, South Carolina, Tennessee, and Virginia.

**Nations:** US

**States/Provinces:** GA, NC, SC, TN, VA?

**TNC Ecoregions:** 51:C, 52:C

**USFS Ecoregions (1994/95):** 231Aa:CCC, M221Dc:CCC, M221Dd:CCC

**USFS Ecoregions (2007):** 231Aa:CCP, M221Dc:CCC, M221Dd:CCC

**Federal Lands:** BIA (Eastern Band of Cherokee); NPS (Appalachian Trail [Southern Blue Ridge], Blue Ridge Parkway?, Great Smoky Mountains); USFS (Chattahoochee, Chattahoochee (Piedmont), Chattahoochee (Southern Blue Ridge), Cherokee, George Washington, Jefferson, Nantahala, Pisgah, Sumter, Sumter (Mountains))

## ELEMENT SOURCES

**Great Smoky Mountains National Park Plots:** GRSM.223, GRSM.235, GRSM.310.

**Great Smoky Mountains National Park Description Author(s):** K.D. Patterson

**Global Description Author(s):** K.D. Patterson

**References:** NatureServe Ecology - Southeastern U.S. unpubl. data, Nelson 1986, Peet et al. unpubl. data, Schafale 2012, Schafale and Weakley 1990, Southeastern Ecology Working Group n.d.

**A3915 Appalachian Wet Cliff Alliance**

Appalachian Wet Cliff Alliance

*Appalachian Wet Cliff*

## ALLIANCE CONCEPT

**Summary:** This alliance of the Appalachian region is composed of sparse or patchy vascular vegetation of cliffs, sinkhole walls, and rock outcrops of marl, limestone, sandstone, and granitic substrates continuously or seasonally saturated with spray from nearby waterfalls, or wet by wave splash or seepage. Characteristic species include *Adiantum capillus-veneris*, *Decumaria barbara*, *Heuchera parviflora* var. *parviflora*, *Hydrangea arborescens*, *Osmunda cinnamomea*, *Osmunda regalis*, *Sanguisorba canadensis*, *Trichophorum cespitosum*, *Trautvetteria caroliniensis* var. *caroliniensis* or *Vittaria appalachiana*. There is often a high cover of bryophytes.

**Classification Comments:** This alliance is classified largely by near-constant saturation from seepage or spray. The Spray Cliff of Fleming and Patterson (2013) bears superficial resemblance in its environmental setting, but there is no floristic overlap.

**Diagnostic Characteristics:** Rock substrates associated with waterfalls, on nearly vertical rock surfaces and ledges, slopes, and crevices with shallow soils which are constantly saturated, occurring in the southeastern U.S., supporting variable combinations of the characteristic species *Adiantum capillus-veneris*, *Heuchera parviflora* var. *parviflora*, *Trichophorum cespitosum*, or *Osmunda cinnamomea*.

**Related Concepts:**

- IID5a. Wet Acidic Cliff (Allard 1990) ><

## ALLIANCE DESCRIPTION

**Environment:** Calcareous rockfaces include shaded riverbanks, sinkhole sides, stream ravines, and river bluffs, usually more-or-less vertical, continuously or seasonally saturated with spray from nearby waterfalls, or wet by wave splash or seepage. Sandstone and granitic rockfaces affected by at least seasonal seepage or spray include rockhouses, north-facing sandstone cliffs up to 700 m in elevation, and cliff bases, with dry microhabitats interspersed.

**Vegetation:** Calcareous rockfaces are characterized by substantial or dominant *Adiantum capillus-veneris*, with other associates including *Adiantum pedatum*, *Aristolochia serpentaria*, *Asplenium* spp., *Carex biltmoreana*, *Carex* spp., *Cystopteris protrusa*, *Decumaria barbara*, *Galax urceolata*, *Heuchera parviflora*, *Huperzia porophila*, *Hydrangea arborescens*, *Hydrocotyle americana*, *Impatiens capensis*, *Oxalis montana*, *Phegopteris connectilis*, *Polypodium virginianum*, *Saxifraga* spp., *Selaginella ludoviciana*,

*Thalictrum* spp., *Trichomanes* spp., *Vittaria appalachiana*, and others. Bryophytes are abundant and lush, often dominated by the thallose liverwort *Dumortiera hirsuta*, as well as *Sphagnum quinquefarium* and *Sphagnum girgensohnii*, and a wide variety of other bryophyte flora.

**Physiognomy and Structure:** Vegetation structure is widely variable, ranging from sparse vascular vegetation, to scattered shrubs and herbaceous cover; nonvascular cover, usually bryophytes, is generally high.

**Floristics:** Calcareous rockfaces are characterized by substantial or dominant *Adiantum capillus-veneris*, with other associates including *Adiantum pedatum*, *Aristolochia serpentaria*, *Asplenium* spp., *Carex biltmoreana*, *Carex* spp., *Cystopteris protrusa*, *Decumaria barbara*, *Galax urceolata*, *Heuchera parviflora*, *Huperzia porophila*, *Hydrangea arborescens*, *Hydrocotyle americana*, *Impatiens capensis*, *Oxalis montana*, *Phegopteris connectilis*, *Polypodium virginianum*, *Saxifraga* spp., *Selaginella ludoviciana*, *Thalictrum* spp., *Trichomanes* spp., *Vittaria appalachiana*, and others. Bryophytes are abundant and lush, often dominated by the thallose liverwort *Dumortiera hirsuta*, as well as *Sphagnum quinquefarium* and *Sphagnum girgensohnii*, and a wide variety of other bryophyte flora.

#### ALLIANCE DISTRIBUTION

**Range:** This alliance occurs in the Southern Appalachian region.

**Nations:** US

**Subnations:** GA, KY, NC, SC, TN

#### ALLIANCE SOURCES

**References:** Allard 1990, Evans et al. 2009, Faber-Langendoen et al. 2019b, Farrar 1998, Nelson 1986, Schafale and Weakley 1990, Walck et al. 1996

**Author of Concept:** Faber-Langendoen et al. 2019b

**Author of Description:** A.S. Weakley and K.D. Patterson, in Faber-Langendoen et al. (2013)

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### [CEGL004302] *Vittaria appalachiana* - *Heuchera parviflora* var. *parviflora* - *Houstonia serpyllifolia* / *Plagiochila* spp. Cliff Vegetation

Translated Name: Appalachian Shoestring Fern - Little-flower Alumroot - Appalachian Bluet / Liverwort species Cliff Vegetation

Common Name: Southern Blue Ridge Spray Cliff

#### USNVC CLASSIFICATION

Division	Eastern North American Temperate Cliff, Scree & Rock Vegetation (6.B.1.Na)
Macrogroup	Eastern North American Cliff & Rock Vegetation (M111)
Group	Appalachian Cliff & Rock Vegetation (G840)
Alliance	Appalachian Wet Cliff Alliance (A3915)

#### ELEMENT CONCEPT

**Global Summary:** This community includes herbaceous vegetation on rock substrates associated with the spray of cascades and waterfalls in the Southern Blue Ridge and adjacent portions of the Piedmont. It is found in southwestern North Carolina, northwestern South Carolina, and northeastern Georgia, in the escarpment gorges of the Southern Blue Ridge and west of the escarpment in eastern Tennessee. It occurs on saturated rock outcrops, on nearly vertical rock surfaces and ledges, slopes, and crevices with shallow soils which are constantly saturated. Vegetative coverage is sparse to moderate with 50-75% unvegetated surface (bedrock) possible. Vegetation grows in cracks and on organic accumulations on ledges. It is characterized by a variable but unique assemblage of vascular herbs, algae, and bryophytes, many of which are endemic to this community. Composition of this community varies from location to location, in part due to its insular nature. Characteristic species include liverworts (*Bazzania denudata*, *Conocephalum conicum*, *Oxalis montana*, *Pellia epiphylla*, *Pellia neesiana*, *Plagiochila austini*, *Plagiochila caduciloba*, *Plagiochila retrorsa*, *Plagiochila* spp., *Plagiochila sullivantii*, *Riccardia multifida*); mosses (*Bryocrumia vivicolor*, *Dichodontium pellucidum*, *Fissidens osmundioides*, *Hyophila involuta*, *Mnium marginatum*, *Oncophorus rauii*, *Plagiomnium ciliare*, *Plagiomnium carolinianum*, *Pseudotaxiphyllum distichaceum*, *Sphagnum girgensohnii*, *Sphagnum quinquefarium*, *Thalictrum* spp., *Thamnobryum alleghaniense*); ferns (*Adiantum pedatum*, *Asplenium monanthes*, *Asplenium montanum*, *Asplenium trichomanes* ssp. *trichomanes*, *Cystopteris protrusa*, *Grammitis nimbata*, *Hymenophyllum tayloriae*, *Polypodium virginianum*, *Trichomanes boschianum*, *Trichomanes intricatum*, *Vittaria appalachiana*); and other vascular species (*Galax urceolata*, *Heuchera parviflora* var. *parviflora*, *Houstonia serpyllifolia*, *Huperzia porophila*, *Hydrocotyle americana*, *Impatiens capensis*, *Phegopteris connectilis*, *Saxifraga careyana*, *Saxifraga caroliniana*, *Carex biltmoreana*). This community varies in composition with no consistent dominant species. Nominal species are either constant or regional endemics. South and west of the Blue Ridge Escarpment, this association is less diverse than those occurrences in the central portion of the range.

#### ENVIRONMENTAL DESCRIPTION

**Great Smoky Mountains National Park Environment:** This community occurs on saturated rock outcrops associated with the spray of cascades and waterfalls. This community is found on nearly vertical rock surfaces and ledges, slopes, and crevices with shallow soils which are constantly saturated. It is not a mappable unit as it is vertical and tends to be very small in size.

**Global Environment:** The hydrology of this community is supplied by constant spray from waterfalls. The community consists of nearly vertical rock surfaces and ledges, slopes, and crevices with shallow soils which are constantly saturated by spray from adjacent waterfalls. Freezing occurs very rarely, and flooding damage very seldom or never. Small pockets or mats of mineral or organic matter are interspersed with bare rock, and may or may not have seepage as well.

These communities occur in unusually stable and equitable environments. The humidity is high, and moisture supply is essentially constant. Temperatures are moderated by water, rock, and sheltering from sun and wind, resulting in only rare freezes or high temperatures. Potential disturbances include extreme droughts or freezes that may result in some die-off of sensitive species. Floods or rock falls may damage some parts, but in general spray cliffs are well sheltered from physical disturbance. This community type is considered distinct from other cliff communities (even those wetted by seepage), because of the very distinctive flora, featuring many endemic or tropically disjunct pteridophytes and bryophytes. Spray cliffs differ from cliffs with seepage in having a more constant water supply, higher humidity in the air, and a more strongly moderated climate.

#### VEGETATION DESCRIPTION

**Great Smoky Mountains National Park Vegetation:** This community includes herbaceous vegetation on rock substrates associated with waterfalls. Vegetative coverage is sparse to moderate with 50-75% unvegetated surface (bedrock) possible. Vegetation grows in cracks and on organic accumulations on ledges. It is characterized by a variable but unique assemblage of vascular herbs, algae, and bryophytes, many of which are endemic to this community. Composition of this community varies from location to location, in part due to its insular nature (Zartman and Pittillo 1998). Characteristic species include liverworts (*Bazzania denudata*, *Conocephalum conicum*, *Pellia epiphylla*, *Pellia neesiana*, *Plagiochila austini*, *Plagiochila caduciloba*, *Plagiochila sharpii* ssp. *sharpii*, *Plagiochila* spp., *Plagiochila sullivantii*, *Riccardia multifida*), mosses (*Bryocrumia vivicolor*, *Dichodontium pellucidum*, *Fissidens osmundioides*, *Hyophila involuta*, *Mnium marginatum*, *Oncophorus raui*, *Plagiomnium affine*, *Plagiomnium carolinianum*, *Pseudotaxiphyllum distichaceum*, *Sphagnum girgensohnii*, *Sphagnum quinquefarium*, *Thalictrum* spp., *Thamnobryum alleghaniense*), ferns (*Adiantum pedatum*, *Asplenium monanthes*, *Asplenium montanum*, *Asplenium trichomanes* ssp. *trichomanes*, *Cystopteris protrusa*, *Grammitis nimbata* (= *Micropolypodium nimbatum*), *Hymenophyllum tayloriae*, *Phegopteris connectilis*, *Polypodium virginianum*, *Trichomanes intricatum*, *Vittaria appalachiana*), and other vascular species (*Galax urceolata*, *Heuchera parviflora* var. *parviflora*, *Houstonia serpyllifolia*, *Huperzia porophila*, *Hydrocotyle americana*, *Impatiens capensis*, *Oxalis montana*, *Saxifraga careyana*, and *Saxifraga caroliniana*).

**Global Vegetation:** This association consists of a variable collection of mosses, liverworts, algae, vascular herbs, and occasional shrubs (generally less than 10%), most of them requiring constantly moist substrate and very high relative humidity. Many of the typical species of this community are bryophytes and ferns disjunct from tropical regions, endemic bryophytes, and ferns disjunct from boreal regions. Shrubs include *Rhododendron maximum* and *Kalmia latifolia*. Herb species include *Huperzia porophila*, *Asplenium montanum*, *Asplenium trichomanes*, *Asplenium rhizophyllum*, *Asplenium monanthes*, *Cystopteris protrusa*, *Polypodium appalachianum*, *Trichomanes boschianum*, *Grammitis nimbata*, *Vittaria appalachiana*, *Hymenophyllum tayloriae*, *Trichomanes intricatum*, *Phegopteris connectilis*, *Adiantum pedatum*, *Saxifraga careyana*, *Saxifraga caroliniana*, *Heuchera parviflora* var. *parviflora*, *Circaea alpina* ssp. *alpina*, *Impatiens capensis*, *Houstonia serpyllifolia*, *Hydrocotyle americana*, *Thalictrum* spp., *Oxalis montana*, *Carex biltmoreana*, and *Galax urceolata*. Bryophyte species, many of them nearly or entirely limited to this community, include *Sphagnum quinquefarium*, *Sphagnum girgensohnii*, *Plagiomnium carolinianum*, *Plagiomnium ciliare* (= *Mnium affine*), *Mnium marginatum*, *Pseudotaxiphyllum distichaceum* (= *Isopterygium distichaceum*), *Bryocrumia vivicolor*, *Flakea papillata* (dominant and diagnostic), *Hookeria acutifolia*, *Thamnobryum alleghaniense*, *Oncophorus raui*, *Hyophila involuta*, *Dichodontium pellucidum*, *Radula* spp., *Plagiochila retrorsa* (= *Plagiochila sharpii* ssp. *sharpii*), *Plagiochila caduciloba*, *Plagiochila sullivantii*, *Plagiochila austini*, *Fissidens osmundioides*, *Bazzania denudata*, *Conocephalum conicum*, *Pellia epiphylla*, *Pellia neesiana*, and *Riccardia multifida*. Mosses include *Bryocrumia vivicolor*, *Dichodontium pellucidum*, *Fissidens osmundioides*, *Hyophila involuta*, *Mnium marginatum*, *Oncophorus raui*, *Plagiomnium ciliare* (= *Plagiomnium affine*), *Plagiomnium carolinianum*, *Pseudotaxiphyllum distichaceum*, *Sphagnum girgensohnii*, *Sphagnum quinquefarium*, *Thalictrum* spp., *Thamnobryum alleghaniense*); ferns (*Adiantum pedatum*, *Asplenium monanthes*, *Asplenium montanum*, *Asplenium trichomanes* ssp. *trichomanes*, *Cystopteris protrusa*, *Grammitis nimbata* (= *Micropolypodium nimbatum*), *Hymenophyllum tayloriae*, *Polypodium virginianum*, *Trichomanes boschianum*, *Trichomanes intricatum*, *Vittaria appalachiana*); and other vascular species (*Galax urceolata*, *Heuchera parviflora* var. *parviflora*, *Houstonia serpyllifolia*, *Huperzia porophila*, *Hydrocotyle americana*, *Impatiens capensis*, *Phegopteris connectilis*, *Saxifraga careyana*, *Saxifraga caroliniana*, *Carex biltmoreana*).

Examples vary considerably, depending on amount and dependability of spray, elevation, rock type, orientation of rocks, degree of shading, and past and present climate. Some examples have well-developed herb or bryophyte mats, while others are nearly barren. The most diverse occurrences are found in the Blue Ridge Escarpment gorges of Transylvania, Jackson, and Macon counties, North Carolina, and Oconee and Pickens counties, South Carolina.

**Global Dynamics:** These communities occur in unusually stable and equitable environments. The humidity is high and moisture supply is essentially constant. Temperatures are moderated by water, rock, and sheltering from sun and wind, resulting in only rare freezes or high temperatures. Potential disturbances include extreme droughts or freezes that may result in some die-off of sensitive species. Floods or rock falls may damage some parts, but in general this community is well sheltered from physical disturbance.

#### MOST ABUNDANT SPECIES

#### Great Smoky Mountains National Park

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Flowering forb	<i>Circaea alpina</i> ssp. <i>alpina</i> , <i>Heuchera parviflora</i> var. <i>parviflora</i> , <i>Houstonia serpyllifolia</i> , <i>Thalictrum clavatum</i>
Herb (field)	Fern (Spore-bearing forb)	<i>Vittaria appalachiana</i>
Nonvascular	Moss	<i>Hookeria acutifolia</i>
<u>Global Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Flowering forb	<i>Circaea alpina</i> ssp. <i>alpina</i> , <i>Heuchera parviflora</i> var. <i>parviflora</i> , <i>Houstonia serpyllifolia</i> , <i>Thalictrum clavatum</i>
Herb (field)	Fern (Spore-bearing forb)	<i>Vittaria appalachiana</i>
Nonvascular	Moss	<i>Hookeria acutifolia</i>
Nonvascular	Lichen	<i>Flakea papillata</i>
Nonvascular	Liverwort/hornwort	<i>Pellia</i> spp., <i>Radula</i> spp.

#### CHARACTERISTIC SPECIES

**Great Smoky Mountains National Park:** *Houstonia serpyllifolia*, *Vittaria appalachiana*

**Global:** *Adiantum pedatum*, *Asplenium monanthes*, *Asplenium montanum*, *Asplenium rhizophyllum*, *Asplenium trichomanes* ssp. *trichomanes*, *Bazzania denudata*, *Bryocrumia vivicolor*, *Carex biltmoreana*, *Circaea alpina* ssp. *alpina*, *Conocephalum salebrosum*, *Cystopteris protrusa*, *Dichodontium pellucidum*, *Fissidens osmundioides*, *Flakea papillata*, *Galax urceolata*, *Grammitis nimbata*, *Heuchera parviflora* var. *parviflora*, *Hookeria acutifolia*, *Houstonia serpyllifolia*, *Huperzia porophila*, *Hydrocotyle americana*, *Hymenophyllum tayloriae*, *Hyophila involuta*, *Impatiens capensis*, *Mnium marginatum*, *Oncophorus rauei*, *Oxalis montana*, *Pellia epiphylla* var. *epiphylla*, *Pellia neesiana*, *Phegopteris connectilis*, *Plagiochila austinii*, *Plagiochila caduciloba*, *Plagiochila sullivanii*, *Plagiomnium carolinianum*, *Polypodium virginianum*, *Radula* spp., *Riccardia multifida*, *Saxifraga careyana*, *Saxifraga caroliniana*, *Sphagnum girgensohnii*, *Sphagnum quinquefarium*, *Thamnobryum alleghaniense*, *Trichomanes boschianum*, *Trichomanes intricatum*, *Vittaria appalachiana*

#### OTHER NOTEWORTHY SPECIES

**Great Smoky Mountains National Park: Vulnerable Plants:** *Bryocrumia vivicolor* (G1G2, globally critically imperiled), *Carex biltmoreana* (G3, globally vulnerable), *Hymenophyllum tayloriae* (G2, globally imperiled), *Oncophorus rauei* (G3, globally vulnerable), *Plagiochila caduciloba* (G3, globally imperiled), *Plagiochila retrorsa* (G2G4), *Plagiochila sullivanii* (G2, globally imperiled), *Plagiomnium carolinianum* (G3, globally vulnerable), *Saxifraga careyana* (G3, globally vulnerable), *Saxifraga caroliniana* (G3, globally vulnerable)

**Global: Vulnerable Plants:** *Acrobolbus ciliatus* (G3?), *Bryocrumia vivicolor* (G1G2), *Carex biltmoreana* (G3), *Heuchera parviflora* var. *puberula* (G4T3T4), *Hymenophyllum tayloriae* (G2), *Krigia montana* (G3), *Oncophorus rauei* (G3), *Plagiochila austinii* (G3), *Plagiochila caduciloba* (G3), *Plagiochila retrorsa* (G2G4), *Plagiochila sullivanii* (G2), *Plagiomnium carolinianum* (G3), *Saxifraga careyana* (G3), *Saxifraga caroliniana* (G3); **Other Plants:** *Aneura maxima* (G4?, (= *Aneura sharpii*))

#### CONSERVATION STATUS RANK

**Global Rank & Reasons:** G2 (30-Apr-1998). This community is very limited, known only from a few dozen occurrences, most of which are less than one acre in size; the largest are only about two acres in size. Most examples are in rugged montane areas and have escaped direct disturbance, though many may have been affected by logging or development on surrounding lands. Water-quality declines may have detrimental impacts on this very delicate and easily impacted community. Even limited human visitation has degraded some occurrences.

#### RELATED CONCEPTS

##### Global Similar Types:

- *Heuchera parviflora* var. *parviflora* - *Trichomanes boschianum* - *Thalictrum mirabile* - (*Ageratina luciae-brauniae*, *Solidago albopilosa*) Cliff Vegetation (CEGL004301)

##### Global Related Concepts:

- IID5a. Wet Acidic Cliff (Allard 1990) >
- Spray Cliff (Schafale and Weakley 1990) =

#### CLASSIFICATION

**Status:** Standard

**Classification Confidence:** 2 - Moderate

**Great Smoky Mountains National Park Other Comments:** This community occurs adjacent to deciduous and hemlock cove forests

**Global Classification Comments:** Zartman and Pittillo (1998) found *Thuidium delicatulum*, *Atrichum oerstedianum*, *Houstonia serpyllifolia*, and *Plagiomnium ciliare* to be the most constant species in spray cliff communities sampled from the Chattooga River Watershed, in northern Georgia, western North Carolina, and northwestern South Carolina.

## ELEMENT DISTRIBUTION

**Great Smoky Mountains National Park Range:** This community was sampled only from the Mount Le Conte quadrangle. On Mount Le Conte, it was sampled at Rainbow Falls, Grotto Falls, and Thousand Drips. It is most common on the Tennessee side but may also occur at some waterfalls on the North Carolina side.

**Global Range:** It is found in southwestern North Carolina, northwestern South Carolina, and northeastern Georgia, in the escarpment gorges of the Southern Blue Ridge and west of the escarpment in eastern Tennessee.

**Nations:** US

**States/Provinces:** GA, NC, SC, TN

**TNC Ecoregions:** 51:C, 52:C

**USFS Ecoregions (1994/95):** M221Dc:CCC, M221Dd:CCC

**USFS Ecoregions (2007):** M221Dc:CCC, M221Dd:CCC

**Federal Lands:** BIA (Eastern Band of Cherokee); NPS (Blue Ridge Parkway?, Great Smoky Mountains); USFS (Chattahoochee, Chattahoochee (Piedmont), Chattahoochee (Southern Blue Ridge), Cherokee, Nantahala, Pisgah, Sumter, Sumter (Mountains))

## ELEMENT SOURCES

**Great Smoky Mountains National Park Description Author(s):** K.D. Patterson, mod. R. White

**Global Description Author(s):** K.D. Patterson

**References:** Allard 1990, Anderson et al. 1990, Dellinger 1992, Farrar 1998, Nelson 1986, Peet et al. unpubl. data, Schafale 2012, Schafale and Weakley 1990, Southeastern Ecology Working Group n.d., Stotler and Crandall-Stotler 1977, TDNH unpubl. data 2018, Weakley 1993, Weakley and Schafale 1994, Wharton 1978, Zartman and Pittillo 1998

**A2076 *Pellaea atropurpurea* - *Cystopteris bulbifera* Appalachian Circumneutral Cliff Alliance**

Purple Cliffbrake - Bulblet Bladderfern Appalachian Circumneutral Cliff Alliance

*Central Appalachian Circumneutral Fern Cliff*

## ALLIANCE CONCEPT

**Summary:** This alliance includes vegetation of dry to rather moist igneous, metamorphic, and sedimentary rock outcrops and cliffs of essentially neutral base status. Vascular plants are generally confined to crevices. Stands are usually shaded by trees rooted in adjacent forested communities, generally with very little vascular vegetation and little nonvascular vegetation. Characteristic species include *Aquilegia canadensis*, *Aralia racemosa*, *Asplenium* spp., *Cystopteris fragilis*, *Pellaea* spp., *Rubus odoratus*, and *Solidago canadensis*. Examples may have low cover of vascular plants. The moister microhabitats of crevices may have mosses such as *Anomodon rostratus* and *Anomodon attenuatus*. Examples are found primarily in the Ridge and Valley, Blue Ridge, Cumberland Plateau, Central Appalachians, and Allegheny Plateau, extending into the northern Piedmont of New Jersey and New York. This vegetation occurs primarily on limestone and dolomite, but there are some examples on apparently nutrient-rich sandstones.

**Classification Comments:** *Pellaea atropurpurea* Cliff Sparse Vegetation (CEGL006527), formerly part of this alliance, was moved to the more appropriate Central Midwest-Interior Alkaline Cliff Alliance (A3998).

**Similar Alliances:**

- Appalachian Acidic Cliff Alliance (A2071)
- Appalachian Mafic - Circumneutral Cliff Alliance (A3994) occurs on dry cliffs of mafic to calcareous rocks; has superficial geologic resemblance, but has nearly no floristic overlap.

**Diagnostic Characteristics:** Sparse vegetation of circumneutral rock cliffs of the Central Appalachians, Blue Ridge, Ridge and Valley, Allegheny Plateau, to the northern Piedmont of New York and New Jersey.

## ALLIANCE DESCRIPTION

**Environment:** This alliance includes vegetation of dry to rather moist limestone and dolomite outcrops and cliffs, with vascular plants rooted in suitable crevices. Some examples may be shaded by trees rooted in adjacent forested communities. This vegetation occurs primarily on limestone and dolomite, but there are some examples on apparently nutrient-rich sandstones.

**Vegetation:** Vascular and nonvascular vegetation are sparse in stands of this alliance. This alliance includes cliff vegetation of circumneutral substrates. Characteristic species include *Aquilegia canadensis*, *Asplenium resiliens*, *Asplenium ruta-muraria*, *Asplenium trichomanes*, *Cystopteris bulbifera*, *Pellaea atropurpurea*, *Pellaea glabella* ssp. *glabella*, and others. In addition, *Cystopteris bulbifera* and *Asplenium rhizophyllum* are characteristic and diagnostic in some associations. Additional species may include *Allium cernuum*, *Arabis hirsuta*, *Arabis lyrata*, *Bouteloua curtipendula*, *Carex oligocarpa*, *Dodecatheon meadia*, *Dryopteris marginalis*, *Heuchera americana*, *Hylotelephium telephioides* (= *Sedum telephioides*), *Phlox subulata*, *Saxifraga virginiana*, *Sedum ternatum*, *Symphytotrichum ericoides*, and *Symphytotrichum oblongifolium*. The moister microhabitats of crevices may have mosses such as *Anomodon attenuatus*, *Anomodon rostratus*, *Dumortiera hirsuta*, and others, which can be locally abundant. In some examples, woody species may occur scattered throughout or at the margins of occurrences; these species may include *Carya* spp., *Cercis canadensis*, *Cornus florida*, *Fraxinus americana*, *Hydrangea arborescens*, *Juniperus virginiana*, *Ostrya virginiana*, *Parthenocissus quinquefolia*, *Physocarpus opulifolius*, *Quercus muehlenbergii*, *Rhus aromatica*, *Tilia americana*, and *Toxicodendron radicans*.

**Physiognomy and Structure:** Physiognomy and structure are somewhat variable among associations and within occurrences. Some examples are typically shaded by trees rooted in adjacent forested communities and/or adjacent rock outcrops. Up to 90% of the rock

surface may lack cover of vascular plants. Mosses and lichens can have moderate coverage, and vascular plants typically occur on ledges and rooted in cracks.

**Floristics:** Vascular and nonvascular vegetation are sparse in stands of this alliance. This alliance includes cliff vegetation of circumneutral substrates. Characteristic species include *Aquilegia canadensis*, *Asplenium resiliens*, *Asplenium ruta-muraria*, *Asplenium trichomanes*, *Cystopteris bulbifera*, *Pellaea atropurpurea*, *Pellaea glabella* ssp. *glabella*, and others. In addition, *Cystopteris bulbifera* and *Asplenium rhizophyllum* are characteristic and diagnostic in some associations. Additional species may include *Allium cernuum*, *Arabis hirsuta*, *Arabis lyrata*, *Bouteloua curtipendula*, *Carex oligocarpa*, *Dodecatheon meadia*, *Dryopteris marginalis*, *Heuchera americana*, *Hylotelephium telephioides* (= *Sedum telephioides*), *Phlox subulata*, *Saxifraga virginensis*, *Sedum ternatum*, *Symphotrichum ericoides*, and *Symphotrichum oblongifolium*. The moister microhabitats of crevices may have mosses such as *Anomodon attenuatus*, *Anomodon rostratus*, *Dumortiera hirsuta*, and others, which can be locally abundant. In some examples, woody species may occur scattered throughout or at the margins of occurrences; these species may include *Carya* spp., *Cercis canadensis*, *Cornus florida*, *Fraxinus americana*, *Hydrangea arborescens*, *Juniperus virginiana*, *Ostrya virginiana*, *Parthenocissus quinquefolia*, *Physocarpus opulifolius*, *Quercus muehlenbergii*, *Rhus aromatica*, *Tilia americana*, and *Toxicodendron radicans*.

#### ALLIANCE DISTRIBUTION

**Range:** This alliance ranges from Pennsylvania, Maryland, West Virginia, and Virginia, south through Kentucky and Tennessee to Alabama, Georgia, and the Carolinas.

**Nations:** US

**Subnations:** AL, GA, KY, MD, NC, NJ?, NY, PA, SC, TN, VA, VT, WV

#### ALLIANCE SOURCES

**References:** Faber-Langendoen et al. 2019b, Schafale and Weakley 1990

**Author of Concept:** Schafale and Weakley 1990

**Author of Description:** M. Pyne, after M.P. Schafale and A.S. Weakley (1990)

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### [CEGL004476] *Asplenium ruta-muraria* - *Pellaea atropurpurea* Cliff Sparse Vegetation

Translated Name: **Wall-rue - Purple Cliffbrake Cliff Sparse Vegetation**

Common Name: **Montane Cliff (Calcareous Type)**

#### USNVC CLASSIFICATION

Division	Eastern North American Temperate Cliff, Scree & Rock Vegetation (6.B.1.Na)
Macrogroup	Eastern North American Cliff & Rock Vegetation (M111)
Group	Appalachian Cliff & Rock Vegetation (G840)
Alliance	<i>Pellaea atropurpurea</i> - <i>Cystopteris bulbifera</i> Appalachian Circumneutral Cliff Alliance (A2076)

#### ELEMENT CONCEPT

**Global Summary:** This community includes calcareous cliffs associated with limestone or dolomite geology in Alabama, Kentucky, Maryland, North Carolina, Pennsylvania, South Carolina, Tennessee, Virginia, and West Virginia. This community includes dry to rather moist limestone and dolomite outcrops, usually shaded by trees rooted in adjacent forested communities. It has little vegetative cover, often with 90% of the rock surface unvegetated. Mosses and lichens can have moderate coverage; vascular plants occur on ledges and rooted in cracks. Calciphilic herbs such as *Asplenium ruta-muraria*, *Pellaea atropurpurea*, *Pellaea glabella* ssp. *glabella*, *Asplenium resiliens*, *Aquilegia canadensis* are characteristic. Moister microhabitats of the crevice may have mosses such as *Anomodon rostratus* and *Anomodon attenuatus*.

#### ENVIRONMENTAL DESCRIPTION

**Great Smoky Mountains National Park Environment:** A very low-quality occurrence of this community may exist in the area adjacent to Gregorys Cave near Cades Cove. However, the occurrence was too small to map or to document as a plot.

**Global Environment:** This community occurs on calcareous cliffs, outcrops, and rocky slopes and is often shaded by trees rooted in adjacent forested communities and/or the outcrops. It has little vegetative cover, often with 90% of the rock surface unvegetated. Mosses and lichens can have moderate coverage, and vascular plants occur on ledges and rooted in cracks.

#### VEGETATION DESCRIPTION

**Great Smoky Mountains National Park Vegetation:** The example within the park contains herbs such as *Pellaea atropurpurea* but does not contain the other nominals in the association name.

**Global Vegetation:** Calciphilic herbs such as *Aquilegia canadensis*, *Dodecatheon meadia*, *Symphotrichum ericoides*, *Symphotrichum oblongifolium*, *Cystopteris bulbifera*, *Bouteloua curtipendula*, *Pellaea atropurpurea*, *Dryopteris marginalis*, *Allium cernuum*, *Heuchera americana*, *Carex oligocarpa*, *Asplenium trichomanes*, *Arabis hirsuta*, *Arabis lyrata*, *Phlox subulata*, *Hylotelephium telephioides* (= *Sedum telephioides*), and *Saxifraga virginensis* are characteristic. Woody species may occur scattered throughout or at the margins; these species include *Juniperus virginiana*, *Rhus aromatica*, *Toxicodendron radicans*, *Hydrangea arborescens*, *Fraxinus americana*, *Parthenocissus quinquefolia*, *Cercis canadensis*, *Tilia americana*, *Carya* spp., *Quercus muehlenbergii*, *Ostrya virginiana*, and *Cornus florida*.

**Global Dynamics:** Species composition varies with moisture, shade and exposure on the rocky surface. Introduced weeds, including *Ailanthus altissima*, *Centaurea stoebe* ssp. *micranthos*, *Sedum acre*, *Verbascum thapsus*, *Lonicera japonica*, and *Melilotus officinalis*, may become established on more sheltered and mesic faces.

#### MOST ABUNDANT SPECIES

##### Great Smoky Mountains National Park

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Herb (field)	Fern (Spore-bearing forb)	<i>Pellaea atropurpurea</i>

#### CHARACTERISTIC SPECIES

##### Great Smoky Mountains National Park:

**Global:** *Aquilegia canadensis*, *Asplenium resiliens*, *Asplenium ruta-muraria*, *Pellaea atropurpurea*, *Pellaea glabella* ssp. *glabella*

#### OTHER NOTEWORTHY SPECIES

**Global:**

#### CONSERVATION STATUS RANK

**Global Rank & Reasons:** G3G4 (11-Aug-1997).

#### RELATED CONCEPTS

##### Global Related Concepts:

- IE1a. Southern Appalachian Calcareous Cliff (Allard 1990) ?
- Spleenwort-cliffbrake calcareous cliff (CAP pers. comm. 1998) ?

#### CLASSIFICATION

**Status:** Standard

**Classification Confidence:** 3 - Weak

**Great Smoky Mountains National Park Classification Comments:** This community is extremely uncommon in the park and may only exist near Gregorys Cave. Even this occurrence is so small and poorly developed that the attribution to CEG004476 remains up for debate. This community may be distinguished from CEG004394 by the presence of *Pellaea atropurpurea* and the absence of all of the nominals for CEG004394.

**Global Classification Comments:** This community is scattered in the Central Appalachian and Ridge and Valley provinces but is extremely uncommon in the Southern Blue Ridge.

#### ELEMENT DISTRIBUTION

**Great Smoky Mountains National Park Range:** This community potentially exists in the vicinity of Gregorys Cave on the Cades Cove quadrangle.

**Global Range:** This community occurs in areas of limestone or dolomite geology from Pennsylvania south to Alabama. It is found primarily in the Ridge and Valley and Cumberland Plateau, but ranges into scattered areas in the Blue Ridge.

**Nations:** US

**States/Provinces:** AL, GA?, KY, MD, NC, PA, SC, TN, VA:S2?, WV:S1

**TNC Ecoregions:** 50:C, 51:C, 59:C, 60:P

**USFS Ecoregions (1994/95):** 221Hc:CCC, 221Ja:CCC, 222Eo:CCC, M221Aa:CCC, M221Ac:CCC, M221Bb:CCP, M221Be:CCC, M221Dc:CCC

**USFS Ecoregions (2007):** 221Hb:CCP, 221Hc:CCC, 221Ja:CCC, M221Aa:CCP, M221Ac:CCC, M221Bb:CCP, M221Be:CCC, M221Dc:CCC

**Federal Lands:** NPS (C&O Canal, Chickamauga-Chattanooga?, Great Smoky Mountains); USFS (Pisgah)

#### ELEMENT SOURCES

**Great Smoky Mountains National Park Description Author(s):** K.D. Patterson, mod. R. White

**Global Description Author(s):** E. Largay and G.P. Fleming

**References:** Allard 1990, CAP pers. comm. 1998, Fike 1999, Fleming et al. 2017, Harrison 2004, Harrison 2011, Metzler and Barrett 2006, Nelson 1986, Schafale 2012, Schafale and Weakley 1990, Southeastern Ecology Working Group n.d., WVNHP unpubl. data

#### [CEGL004394] *Cystopteris bulbifera* - (*Asplenium rhizophyllum*) Cliff Sparse Vegetation

Translated Name: **Bulblet Bladderfern - (Walking Fern) Cliff Sparse Vegetation**

Common Name: **Appalachian Wet Limestone Cliff**

#### USNVC CLASSIFICATION

Division	Eastern North American Temperate Cliff, Scree & Rock Vegetation (6.B.1.Na)
Macrogroup	Eastern North American Cliff & Rock Vegetation (M111)
Group	Appalachian Cliff & Rock Vegetation (G840)
Alliance	<i>Pellaea atropurpurea</i> - <i>Cystopteris bulbifera</i> Appalachian Circumneutral Cliff Alliance (A2076)

**ELEMENT CONCEPT**

**Global Summary:** This broadly defined type represents sparse vegetation on calcareous rocks and cliff exposures ranging from Kentucky to Virginia and south to Georgia. Examples have substantial cover of bare rock and bryophytes, along with scattered vascular plants. Dominant species may be *Cystopteris bulbifera* and *Asplenium rhizophyllum*. An example from the Chattahoochee National Forest contains *Heuchera villosa*, *Adiantum pedatum*, *Asplenium rhizophyllum*, *Carex platyphylla*, *Cystopteris protrusa*, *Hepatica nobilis* var. *acuta*, *Laportea canadensis*, and *Solidago flexicaulis*. Additional species at a similar site in Great Smoky Mountains National Park included *Sedum ternatum*, *Physocarpus opulifolius*, *Pellaea atropurpurea*, and *Packera obovata*. Additional types may be developed as more information becomes available.

**ENVIRONMENTAL DESCRIPTION**

**Great Smoky Mountains National Park Environment:** The only occurrence within the park exists on a southeast-facing limestone cliff at about 1800 feet elevation at White Oak Sink in the Kinzel Springs quadrangle.

**Global Environment:** This vegetation is found on calcareous cliffs in the Southern Blue Ridge and adjacent ecoregions, from Kentucky to Virginia and south to Georgia.

**VEGETATION DESCRIPTION**

**Great Smoky Mountains National Park Vegetation:** Within the park, only one occurrence of this community has been documented. This example contained *Sedum ternatum*, *Physocarpus opulifolius*, *Pellaea atropurpurea*, and *Packera obovata* in addition to *Cystopteris bulbifera*.

**Global Vegetation:** Vegetation assigned here from Chattahoochee National Forest (NatureServe Ecology unpubl. data) contains substantial cover by bare rock and bryophytes, along with scattered vascular plants, including *Heuchera villosa*, *Adiantum pedatum*, *Asplenium rhizophyllum*, *Carex platyphylla*, *Cystopteris protrusa*, *Hepatica nobilis* var. *acuta*, *Laportea canadensis*, and *Solidago flexicaulis*. Another example from Great Smoky Mountains National Park contains *Sedum ternatum*, *Physocarpus opulifolius*, *Pellaea atropurpurea*, and *Packera obovata*. Additional types may be developed as more information becomes available.

**MOST ABUNDANT SPECIES****Great Smoky Mountains National Park**

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Shrub/sapling (tall & short)	Broad-leaved deciduous tree	<i>Ulmus rubra</i>
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	<i>Hydrangea arborescens</i> , <i>Physocarpus opulifolius</i>
Herb (field)	Flowering forb	<i>Heuchera villosa</i>
Herb (field)	Succulent forb	<i>Sedum ternatum</i>
Herb (field)	Fern (Spore-bearing forb)	<i>Cystopteris bulbifera</i>

**Global**

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Shrub/sapling (tall & short)	Broad-leaved deciduous tree	<i>Ulmus rubra</i>
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	<i>Hydrangea arborescens</i> , <i>Physocarpus opulifolius</i>
Herb (field)	Flowering forb	<i>Heuchera villosa</i>
Herb (field)	Succulent forb	<i>Sedum ternatum</i>
Herb (field)	Fern (Spore-bearing forb)	<i>Cystopteris bulbifera</i>

**CHARACTERISTIC SPECIES**

**Great Smoky Mountains National Park:** *Cystopteris bulbifera*, *Physocarpus opulifolius*

**Global:** *Cystopteris bulbifera*, *Physocarpus opulifolius*

**OTHER NOTEWORTHY SPECIES**

**Global: Vulnerable Plants:** *Stellaria fontinalis* (G3)

**CONSERVATION STATUS RANK**

**Global Rank & Reasons:** G3G4 (8-Jan-2007).

**RELATED CONCEPTS****Global Similar Types:**

- Central Midwest-Interior Limestone - Dolostone Moist Cliff Vegetation (CEGL002292)

**Global Related Concepts:**

- IE1c. Interior Upland Calcareous Cliff (Allard 1990) >

**CLASSIFICATION**

**Status:** Standard

**Classification Confidence:** 3 - Weak

**Great Smoky Mountains National Park Classification Comments:** This community may be distinguished from *Asplenium ruta-muraria* - *Pellaea atropurpurea* Sparse Vegetation (CEGL004476) by the difference in herbaceous species composition.

**Global Classification Comments:** This broadly defined type is being geographically subdivided into an eastern type and an Ozarkian placeholder, which is being split off. In Missouri, and perhaps elsewhere in the Interior Highlands region of the Midwest, this

vegetation is synonymous with Central Midwest-Interior Limestone - Dolostone Moist Cliff Vegetation (CEGL002292)]; so it is not tracked there. Further Midwest/Southeast review is needed. Vegetation has been assigned here from Chattahoochee National Forest (Chattooga Ranger District, 231Ab33). In Virginia this vegetation is embedded in forested habitat and occurrences may be too small to target as a distinct association.

#### ELEMENT DISTRIBUTION

**Great Smoky Mountains National Park Range:** This community most likely only exists at one location near the White Oak Sinks area on the Kinzel Springs quadrangle. Other occurrences are not likely since the geology that this association requires is not present in the right combination elsewhere in the park.

**Global Range:** This generally defined alkaline cliff type is found in the southeastern United States, from Kentucky to Virginia and south to Georgia. It is not known from North Carolina.

**Nations:** US

**States/Provinces:** GA, KY, TN, VA?, WV?

**TNC Ecoregions:** 44:C, 50:C, 51:C, 52:C

**USFS Ecoregions (1994/95):** 221:C, 222Eg:CCC, 231Ab:CCC, M221Dd:CCC

**USFS Ecoregions (2007):** 221:C, 223Eg:CCC, 231Ab:CCC, M221Dd:CCC

**Federal Lands:** NPS (Great Smoky Mountains, Natchez Trace); USFS (Chattahoochee, Chattahoochee (Piedmont), Chattahoochee (Southern Blue Ridge))

#### ELEMENT SOURCES

**Great Smoky Mountains National Park Plots:** GRSM.300.

**Great Smoky Mountains National Park Description Author(s):** R. White

**Global Description Author(s):** A.S. Weakley

**References:** Allard 1990, NatureServe Ecology - Southeastern U.S. unpubl. data, Southeastern Ecology Working Group n.d.

## 7. Agricultural & Developed Vegetation

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### 7.A.2. Forest Plantation & Agroforestry

#### 7.A.2.1. FOREST PLANTATION

#### CGR007. Temperate & Boreal Plantation

##### CSG005. EASTERN NORTH AMERICAN TEMPERATE FOREST PLANTATION

**Cultural Subgroup Summary Description:** Native southern pine conifers do not exceed native non-conifers (native *Pinus* spp. >50% cover); tree composition typically dominated by species other than *Pinus clausa*, *Pinus elliottii*, *Pinus palustris*, or *Pinus taeda*.

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#### CTY013 Native Miscellaneous Southern Conifer Plantation Cultural Type

Native Miscellaneous Southern Conifer Plantation Cultural Type

*Native Miscellaneous Southern Conifer Plantation*

#### CULTURAL TYPE CONCEPT

**Summary:** Native southern pine conifers do not exceed native non-conifers (native *Pinus* spp. >50% cover); tree composition typically dominated by species other than *Pinus clausa*, *Pinus elliottii*, *Pinus palustris*, or *Pinus taeda*.

#### CULTURAL TYPE DISTRIBUTION

**Nations:** US

#### CULTURAL TYPE SOURCES

**References:** Faber-Langendoen et al. 2013

**Author of Concept:** Faber-Langendoen et al. 2013

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#### [CST008544] Native Miscellaneous Southern Conifer Plantation

Translated Name: **Native Miscellaneous Southern Conifer Plantation**

Common Name: **Native Miscellaneous Southern Conifer Plantation**

**USNVC CLASSIFICATION**

Cultural Subformation Forest Plantation (7.A.2.1)  
Cultural Group Temperate & Boreal Plantation (CGR007)  
Cultural Subgroup Eastern North American Temperate Forest Plantation (CSG005)  
Cultural Type Native Miscellaneous Southern Conifer Plantation (CTY013)

**ELEMENT CONCEPT**

**Global Summary:**

**ENVIRONMENTAL DESCRIPTION**

**VEGETATION DESCRIPTION**

**MOST ABUNDANT SPECIES**

**CHARACTERISTIC SPECIES**

**Global:**

**OTHER NOTEWORTHY SPECIES**

**Global:**

**CONSERVATION STATUS RANK**

**Global Rank & Reasons:** GNA (cultural) (5-Aug-2019).

**RELATED CONCEPTS**

**CLASSIFICATION**

**Status:** Standard

**Classification Confidence:**

**Great Smoky Mountains National Park Classification Comments:** Leftover Christmas tree farms (Fraser Fir Plantations) in Purchase Knob area, 5,000 ft elevation.

**ELEMENT DISTRIBUTION**

**Nations:** US

**States/Provinces:**

**TNC Ecoregions:**

**Federal Lands:** NPS (Great Smoky Mountains)

**ELEMENT SOURCES**

**Global Description Author(s):**

**References:** Faber-Langendoen et al. 2013

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**CTY014 Exotic Northern Conifer Plantation Cultural Type**

Exotic Northern Conifer Plantation Cultural Type

*Exotic Northern Conifer Plantation*

**CULTURAL TYPE CONCEPT**

**Summary:** Exotic northern conifers exceed native conifers (native *Pinus* spp. <50% cover).

**CULTURAL TYPE DISTRIBUTION**

**Nations:** US

**CULTURAL TYPE SOURCES**

**References:** Faber-Langendoen et al. 2013

**Author of Concept:** Faber-Langendoen et al. 2013

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**[CST007167] *Picea abies* Forest Plantation**

Translated Name: **Norway Spruce Forest Plantation**

Common Name: **Norway Spruce Plantation**

**USNVC CLASSIFICATION**

Cultural Subformation Forest Plantation (7.A.2.1)  
Cultural Group Temperate & Boreal Plantation (CGR007)  
Cultural Subgroup Eastern North American Temperate Forest Plantation (CSG005)  
Cultural Type Exotic Northern Conifer Plantation (CTY014)

**ELEMENT CONCEPT**

**Global Summary:** These plantation forests are dominated by the exotic species *Picea abies*, which typically makes up 70-100% of the canopy. The understory is typically sparse with little, if any, spruce regeneration. Hardwood regeneration and herbaceous species composition tend to reflect the pre-plantation forest types. In the Southeast this occurs as experimental plantations.

**ENVIRONMENTAL DESCRIPTION**

**Global Environment:** This community represents vegetation that has been planted in its current location by humans.

**VEGETATION DESCRIPTION**

**Global Vegetation:** These plantation forests are dominated by the exotic species *Picea abies*, which makes up 70-100% of the canopy. The understory is typically sparse with little, if any, spruce regeneration. Hardwood regeneration and herbaceous species composition tend to reflect the pre-plantation forest types.

**MOST ABUNDANT SPECIES****Global****Stratum**

Tree canopy

**Lifeform**

Needle-leaved tree

**Species***Picea abies***CHARACTERISTIC SPECIES**

**Global:** *Picea abies*

**OTHER NOTEWORTHY SPECIES**

**Global: Invasive/Exotic Plants:** *Picea abies*

**CONSERVATION STATUS RANK**

**Global Rank & Reasons:** GNA (cultural) (8-Aug-2000). This community represents vegetation which has been planted in its current location by humans and/or is treated with annual tillage, a modified conservation tillage, or other intensive management or manipulation. It is not a conservation priority and does not receive a conservation rank.

**RELATED CONCEPTS****Global Related Concepts:**

- IF3b. Plantation (Hardwood or Conifer) (Allard 1990) >

**CLASSIFICATION**

**Status:** Standard

**Classification Confidence:** 3 - Weak

**ELEMENT DISTRIBUTION**

**Global Range:** These plantations are known from the northeastern United States extending south to North Carolina and west to Ohio.

**Nations:** US

**States/Provinces:** DE, ME, NC, NJ, NY, OH, PA, VA?, VT

**TNC Ecoregions:** 48:C, 49:C, 51:C, 61:C, 62:C, 63:C

**USFS Ecoregions (1994/95):** 212Ab:CCC, 221Ae:CCC, 221Bc:CCC, 221Fa:CCC, 222Ib:CCC, 232Ac:CCC, M212Ba:CCC, M221D:CC

**USFS Ecoregions (2007):** 211Ab:CCC, 221Ae:CCC, 221Bc:CPP, 221Fa:CCC, 222Ib:CCC, 223:C, 232Ac:CCP, M211Ba:CCP, M221D:CC

**Federal Lands:** NPS (Appalachian Trail [Central Appalachians], Appalachian Trail [Lower New England], Appalachian Trail [Northern Appalachians], C&O Canal, Cuyahoga Valley, George Washington Parkway, Great Smoky Mountains, Marsh-Billings-Rockefeller, Roosevelt-Vanderbilt, Saratoga); USFWS (Aroostook, Erie, Iroquois, Supawna Meadows)

**ELEMENT SOURCES**

**Global Description Author(s):** S.C. Gawler

**References:** Allard 1990, Coxe 2009, Edinger et al. 2014b, Hop et al. 2013, NRCS 2004a, Sechler et al. 2014, Southeastern Ecology Working Group n.d.

**Group Summary Description:** The vegetation is broadly characterized as agricultural and developed vegetation. Agricultural vegetation includes a wide variety of growth forms, often with distinctive cultural forms (e.g., orchards, vineyards, row crops, rice paddies) or structure (e.g., linear spacing, regular mowing, plowing), often to facilitate harvesting. "Agro-mesomorphic" tree, shrub, and herb growth forms are most typical. Structure is often very regular, with open to closed horizontal spacing. There is typically regular human management, such as plowing, mowing, or pruning that determines the structure and growth forms that are present. Climates vary, but this type is typically absent from polar or arid climates, where agricultural growth forms cannot grow and practices are not feasible, unless substantial irrigated water is provided (e.g., northern Africa and the Middle East). Substrates are dry to wet, including aquatic.

Developed vegetation is the vegetation of urban, suburban and rural cities and villages, typically lawns, parks, gardens, and urban ponds. A wide variety of growth forms dominate, but low, regularly mowed mesomorphic graminoid (lawn) growth forms often predominate, with or without tree cover. Growth forms may be atypical of the climate or substrate because of human activities that

allow them to persist (winter protection, watering, etc.). The vegetation varies from highly regular to irregular horizontal spacing. There may be frequent, repeated disturbances, typically mowing, clipping, herbiciding, and watering. Climates are various, but this type is typically absent from polar or dry climates. Substrates are dry to wet, including urban aquatic ponds.

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## 7.B. Herbaceous Agricultural Vegetation (CSC02)

Scientific Name: **Herbaceous Agricultural Vegetation Cultural Subclass**

### ELEMENT CONCEPT

**Global Summary:** Agricultural vegetation, including row crops, planted grain crops, pastures, hayfields, horticultural crops (such as commercial flower operations), fallow fields and early-successional weed fields, and wetland rice and taro crop fields.

### ENVIRONMENTAL DESCRIPTION

#### VEGETATION DESCRIPTION

#### MOST ABUNDANT SPECIES

#### CHARACTERISTIC SPECIES

**Global:**

### OTHER NOTEWORTHY SPECIES

**Global:**

### CONSERVATION STATUS RANK

**Global Rank & Reasons:** GNA (cultural) (18-Nov-2011).

### RELATED CONCEPTS

#### Global Similar Types:

- Herbaceous & Woody Developed Vegetation Cultural Subclass (CSC03) Residential vegetable gardens overlap with 7.B.
- Woody Agricultural Vegetation Cultural Subclass (CSC01)

### CLASSIFICATION

**Status:** Standard

**Classification Confidence:** 3 - Weak

### ELEMENT DISTRIBUTION

**Global Range:** Widely distributed across the globe, except in very dry or very cold regions.

**Nations:** CA,US

**States/Provinces:**

**TNC Ecoregions:**

**Federal Lands:** NPS (Great Smoky Mountains)

### ELEMENT SOURCES

**Global Description Author(s):** D. Faber-Langendoen

**References:** Faber-Langendoen et al. 2015c

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## 7.C. Herbaceous & Woody Developed Vegetation (CSC03)

Scientific Name: **Herbaceous & Woody Developed Vegetation Cultural Subclass**

### ELEMENT CONCEPT

**Global Summary:** Vegetation includes closely-cropped vegetation such as lawns, gardens, sports fields, and golf courses, as well as vegetation growing in urban materials, such as pavement, from dry lands to emergent wetlands. Tree canopy varies from 0 to 100% (e.g., open to shaded lawns and gardens).

### ENVIRONMENTAL DESCRIPTION

#### VEGETATION DESCRIPTION

#### MOST ABUNDANT SPECIES

#### CHARACTERISTIC SPECIES

**Global:**

### OTHER NOTEWORTHY SPECIES

**Global:**

#### CONSERVATION STATUS RANK

**Global Rank & Reasons:** GNA (cultural) (21-Sep-2011).

#### RELATED CONCEPTS

##### **Global Similar Types:**

- Freshwater Aquatic Vegetation Subclass (S13)
- Herbaceous Agricultural Vegetation Cultural Subclass (CSC02) Herbaceous & Woody Developed Vegetation (S21) contains residential vegetable gardens that overlap with Herbaceous Agricultural Vegetation (S23).
- Woody Agricultural Vegetation Cultural Subclass (CSC01)

#### CLASSIFICATION

**Status:** Standard

**Classification Confidence:** 3 - Weak

#### ELEMENT DISTRIBUTION

**Global Range:** Widely distributed across the globe, except in very dry or very cold regions.

**Nations:** CA,US

**States/Provinces:**

**TNC Ecoregions:**

**Federal Lands:** NPS (Great Smoky Mountains)

#### ELEMENT SOURCES

**Global Description Author(s):** D. Faber-Langendoen

**References:** Faber-Langendoen et al. 2015c

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