

**INTERNATIONAL CLASSIFICATION OF  
ECOLOGICAL COMMUNITIES:**

**TERRESTRIAL VEGETATION OF THE  
UNITED STATES**

**Cherokee National Forest Final Report**

Report from Biological Conservation Datasystem  
June 2002

Prepared for United States Department of Agriculture Forest Service  
Region 8 Fisheries, Wildlife, Range, Botany, and Ecology  
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This subset of the International Classification of Ecological Communities (ICEC) covers vegetation alliances and associations attributed to the Cherokee National Forest, Tennessee, and other units for review as to their occurrence there. This community classification has been developed in consultation with many individuals and agencies and incorporates information from a variety of publications and other classifications. A fully searchable and periodically updated on-line source for the ICEC is at [www.natureserve.org/explorer](http://www.natureserve.org/explorer). Review and feedback is solicited so that improvements may continue to be made to the classification. Comments and suggestions regarding the contents of this subset should be directed to Milo Pyne <[milo\\_pyne@natureserve.org](mailto:milo_pyne@natureserve.org)> or Carl Nordman <[carl\\_nordman@natureserve.org](mailto:carl_nordman@natureserve.org)>.



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<sup>1</sup> NatureServe is an international organization including regional offices, a central office, US State Natural Heritage Programs, and Conservation Data Centres (CDC) in Canada and Latin America and the Caribbean. Ecologists from the following organizations have contributed the development of the ICEC:

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# VEGETATION OF CHEROKEE NATIONAL FOREST

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## PREFACE

This report was created through a continuing agreement between NatureServe, The Nature Conservancy (TNC) and U.S.D.A. Forest Service Region 8. This agreement provides for the application of the United States National Vegetation Classification (USNVC) standard to Region 8 Forests and will result in a basic list of vegetation units (alliances and community associations) presented on a Forest by Forest basis. The USNVC provides a framework for vegetation classification and is intended to serve as a tool for conservation planning and biodiversity protection, as well as resource planning, management, and vegetation mapping. In the southeastern United States, the USNVC is being developed in cooperation with the state Natural Heritage Programs, the U.S.D.A. Forest Service, and other state and Federal partners. Its development has involved consultation with many individuals and agencies and incorporates information from a variety of publications and other classifications.

This classification subset includes all alliances and associations attributed to the Cherokee National Forest of Tennessee, as well as some that are thought to occur on that forest but which are not confirmed. It is an interim report and intended for review by Forest Service personnel and other ecologists in this geographic area. The preliminary fieldwork on the Cherokee National Forest took place in 2000, additional fieldwork is planned for 2001, and analysis will continue into 2002. Field reconnaissance is conducted in coordination with U.S. Forest Service personnel with the objective of visiting representative examples of all the major vegetation types, rare or unusual communities, and vegetation resulting from common forest management regimes.

The vegetation classification produced through this agreement will form the foundation for continuing use of the USNVC on U.S. Forest Service lands in Region 8 for natural resource planning and management. Because this is an interim report, the classification is incomplete and will rely on feedback and additional fieldwork to improve its coverage of the individual Forest unit. Over the coming year refinements, revisions, and additions will be made to this classification based on review by Forest Service personnel, review of other vegetation studies, and analysis of data collected during field reconnaissance. In the meanwhile, the entire National Vegetation Classification is available on-line in a fully searchable database that is updated on a quarterly basis ([www.NatureServe.org](http://www.NatureServe.org)).

Comments and suggestions for additions or revisions are welcome and encouraged. Please submit comments to the authors at the following address: NatureServe; Southern U. S. Office, 6114 Fayetteville Road, Suite 109, Durham, NC 27713-6284 or by phone or electronic mail: Milo Pyne: 919-484-7857 x 136 ([milo\\_pyne@natureserve.org](mailto:milo_pyne@natureserve.org)), or Carl Nordman: 919-484-7857 x 153 ([carl\\_nordman@natureserve.org](mailto:carl_nordman@natureserve.org)).

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# INTRODUCTION

## Background

NatureServe (formerly the Association for Biodiversity Information [ABI]) is a not-for-profit organization dedicated to developing and providing knowledge about the world's natural diversity. Working in partnership with 75 independent Natural Heritage programs and conservation data centers that gather scientific information on rare plants and animals and ecosystems in the U.S., Latin America, and Canada, NatureServe is a leading source for the biodiversity information that is essential for effective conservation action.

NatureServe was formed in July 1999 when The Nature Conservancy and the Natural Heritage Network jointly established an independent organization to achieve their mutual goal of advancing the application of biodiversity information to conservation. Although NatureServe is a new organization, its databases, staff expertise, and methods reflect more than 25 years of experience, research, and development. NatureServe addresses biodiversity information needs at the regional, national, and international levels, complementing the availability of detailed state or province-level information from individual Natural Heritage programs.

NatureServe is continuing to implement and advance approaches to the conservation of biological diversity that have been employed since 1975 by The Nature Conservancy (TNC) and the Network of Natural Heritage Programs. One component of this methodology is referred to as a "coarse filter/fine filter" approach to biological diversity conservation (Jenkins 1976, Hunter 1991). This methodology involves the identification and protection of ecological communities (coarse filter) as well as rare species (fine filter). Identifying and protecting representative examples of all ecological communities assures the conservation and maintenance of biotic interactions and ecological processes, in addition to conservation of most species. Those species whose conservation is not adequately assured through the conservation of communities – those that fall through the coarse community filter -- are generally the rarest species. These species often have specialized life histories, or are simply so rare and restricted that their conservation requires explicit planning based on species-specific information. Using a combination of communities and species as conservation targets ensures protection of a more complete spectrum of biological diversity.

A major obstacle to using ecological communities as conservation units for national, regional, and global projects was the lack of a consistent classification system, developed through analysis of community data from a range-wide perspective. NatureServe and TNC, in conjunction with the network of Natural Heritage Programs and Conservation Data Centers, began developing a standardized, hierarchical vegetation classification system. This system, known as the International Classification of Ecological Communities (ICEC), has now been used to classify and describe terrestrial communities across the United States and other parts of the world (Grossman *et al.* 1994, Grossman *et al.* 1998).

For the past decade, TNC, NatureServe and the international network of Natural Heritage Programs and Conservation Data Centers (CDC) have been developing the ICEC. Within the United States, the domestic component of the international effort, the United States National Vegetation Classification (USNVC), has received widespread support from state, federal, academic, and international partners (Jennings 1993, Greenall 1996, Loucks 1996, FGDC 1996). For the first time, vegetation of all types, whether mountain bogs, shortleaf pine woodlands, or limestone glades can be treated together in one system. This classification serves many natural resource management purposes including conservation planning, biodiversity protection, scientific research, inventory, and mapping.

Many details of the classification are presented in a series of documents by NatureServe's Community Ecology Group (formerly TNC) (Grossman *et al.* 1998, Anderson *et al.* 1998, Maybury 1999). These documents include detailed background on the structure and development of the classification and are available on NatureServe's public web site ([www.natureserve.org](http://www.natureserve.org)) under the Biodiversity Information/Ecological Communities link.

## Purpose and Scope of the USNVC

The purpose of the USNVC classification system is to provide a complete, standardized listing and description of all vegetation types that represent the variation in biological diversity at the community level, and to identify those communities that require protection (Grossman et al. 1994). The shared mission of NatureServe and The Nature Conservancy is the protection of biodiversity; this, along with conservation planning, is also the principal objective for the development of the classification. The classification will be consistent throughout the United States and elsewhere at appropriate scales for conservation planning, and management, and long-term monitoring of ecological communities and ecosystems. It will also have applications as a vegetation data layer in landscape and ecosystem characterization and mapping.

Classifications of ecological systems can be based on a variety of biotic and abiotic factors including hydrology, soils, landform, and vegetation that may be used in combination or individually. The ICEC classification approach presented here is based on vegetation because it is a biotic factor and hence a measurement of biodiversity, which NatureServe and TNC are directed to protect. Moreover, it integrates environmental conditions, ecological processes, and biogeographical dynamics at a site more measurably than any other factor or suite of factors (Mueller-Dombois and Ellenberg 1974, Kimmins 1997); it is often used to infer soil and climate patterns; and it can be easily measured.

The USNVC has been developed for terrestrial vegetation, that is, all upland terrestrial vegetation and all wetland vegetation with rooted vascular plants. In relation to Cowardin et al. (1979), terrestrial includes those portions of the palustrine, lacustrine, riverine, estuarine, and marine systems that have rooted vegetation. Classification of this vegetation (the Terrestrial System) is distinct from that of unvegetated deep-water habitats (Freshwater and Marine Systems) and unvegetated subterranean habitats (Subterranean System), all of which will have their own classification systems (e.g. Lammert et al. 1997).

The classification system focuses on existing vegetation rather than potential natural vegetation, "climax vegetation", or physical habitats. The vegetation types described in the classification range from the ephemeral to the stable and persistent. Recognizing and accommodating this variation is fundamental to protecting biodiversity. The manner in which a community occurs is, in part, an intrinsic property of the vegetation itself. A classification that is not restricted to static vegetation types ensures that the units are useful both for inventory/site description, and as the basis for building dynamic ecological models.

The USNVC includes vegetation occurring anywhere along the continuum of "natural" to "invasive" to "cultural", but it emphasizes vegetation types that are "natural" since these communities are the focus of biodiversity protection. Broadly speaking, natural types include a range of naturalness, namely, "natural" (narrowly defined), "semi-natural" and "modified" vegetation, which together reflect differences in anthropogenic disturbance regimes. However, all natural types occur spontaneously without regular human management, maintenance, or planting, and generally have a strong component of native species (see below). Natural vegetation, narrowly defined, includes plant communities that appear not to have been modified by human activities or only those human activities that mimic natural processes (e.g. prescribed burning). The term semi-natural can include "plant communities where the structure of vegetation has been changed through human activities, but where the species composition is natural" (van der Maarel and Klötzli 1996). In contrast to natural vegetation, then, "cultural" vegetation can be recognized as that which includes planted/cultivated vegetation types. Cultural, modified and exotic vegetation is classified in the USNVC at a much coarser scale than natural and semi-natural vegetation, but other organizations and agencies may refine these coarse units further. To date, most units described with the finest levels in the classification system (association) have been natural and semi-natural types. However, when necessary, modified, cultural and exotic types have been identified in the classification system, especially for the purpose of vegetation mapping. Exotic vegetation is differentiated at association level.

The USNVC has a hierarchical taxonomic structure that is a combination of physiognomic and floristic systems. The rationale for coupling physiognomic and floristic systems has developed over many years (e.g., Rübél 1930,

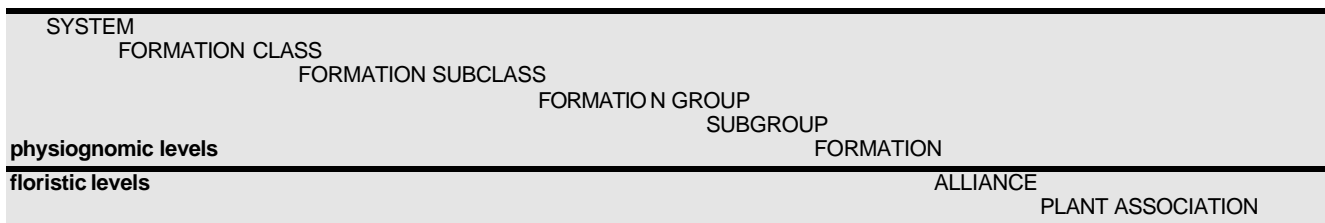


Whittaker 1962, Ellenberg 1963, Webb et al. 1970, Westhoff 1967, Beard 1973, Werger and Spangers 1982, Borhidi 1991). These studies have found a good correlation between floristic and physiognomic classifications of the same vegetation. In the United States, Driscoll et al. (1984) recommended the development of a joint system using the physiognomic units of UNESCO (1973) and the floristic units of habitat types, of which an example has been provided by Dick-Peddie (1993) for New Mexico. The USNVC uses a similar methodology. Vankat (1990) developed a physiognomic-dominance type classification for forest types in North America. Strong et al. (1990) in Canada also proposed a combined physiognomic-floristic approach.

### A Combined Physiognomic/Floristic System

The hierarchy of the classification system employs physiognomic criteria at the highest levels and floristic criteria at the lower levels. The formation concept, with units modified from UNESCO (1973), guides the definition of the physiognomic units, and the association and alliance concepts define the floristic units (see Figure 1 and Table 1). This system allows the broad-scale geographic application of physiognomic characteristics to be tied to local, site-specific, floristically-defined units. In combination, these hierarchical levels can satisfy a broad range of objectives for use in a single classification system.

**FIGURE 1. VEGETATION CLASSIFICATION SYSTEM.**



**TABLE 1. HIERARCHICAL VEGETATION CLASSIFICATION SYSTEM FOR TERRESTRIAL ECOLOGICAL COMMUNITIES. (Examples)**

CLASS	FOREST	WOODLAND	SHRUBLAND
SUBCLASS	Deciduous Forest	Evergreen Woodland	Deciduous Shrubland
GROUP	Cold-deciduous Forest	Temperate or Subpolar Needle-leaved Evergreen Woodland	Temperate Broad-leaved Evergreen Shrubland
SUBGROUP	Natural/Semi-natural	Natural/Semi-natural	Natural/Semi-natural
FORMATION	Lowland or Submontane Cold-deciduous Forest	Saturated Temperate or Subpolar Needle-leaved Evergreen Woodland	Sclerophyllous Temperate Broad-leaved Evergreen Shrubland
ALLIANCE	<i>Quercus stellata</i> - <i>Quercus marilandica</i> Forest Alliance	<i>Pinus palustris</i> Saturated Woodland Alliance	<i>Quercus havardii</i> Shrubland Alliance
ASSOCIATION	<i>Quercus stellata</i> - <i>Quercus marilandica</i> - <i>Carya (glabra, texana)</i> / <i>Vaccinium arboreum</i> Forest	<i>Pinus palustris</i> / <i>Leiophyllum buxifolium</i> / <i>Aristida stricta</i> Woodland	<i>Quercus havardii</i> - ( <i>Penstemon ambiguus</i> , <i>Croton dioicus</i> ) / <i>Sporobolus giganteus</i> Shrubland

The combined physiognomic/floristic system developed by TNC/NatureServe allows identification of units from both a "top-down" (divisive) and "bottom-up" (agglomerative) approach. The top-down approach allows the use of physiognomic distinctions to help map vegetation, to stratify sampling, and to delimit vegetation units where floristic information is lacking. A bottom-up approach employs plot sampling and floristic analysis as the primary means for defining associations. Where physiognomy is variable, the bottom-up approach can also be used to help determine the important physiognomic distinctions. The relationships between physiognomy and floristics are not always simple; when they do not correspond, precedent may be given to the floristic relationships over the physiognomic structure.

The basic unit of inventory, the plant association or community element, is more or less uniform in structure, composition, and habitat. The uniformity of the plant community makes the comparison and identification of protection priorities more objective than would be possible at more heterogeneous scales. The plant association is a suitable unit for conservation planning because it encompasses all the layers of vegetation in a stand, reflects ecological and human-caused processes including management activities, and is a repeating unit in different

landscapes. From a site-based perspective, there may be many different community types at a given location. In fact, it is relatively rare that a site contains only a single community type. However, community elements tend to combine in predictable ways to create repeatable landscape mosaics. Thus the particular mosaic of community elements present at a site and their distribution across the landscape provide information that is fundamental to any type of ecological land management.

The rationale for coupling physiognomic and floristic systems has been developed over the years (e.g., Rubel 1930, Whittaker 1962, Ellenberg 1963, Webb *et al.* 1970, Westhoff 1967, Beard 1973, Werger and Spangers 1982). These studies have found a good fit between floristic and physiognomic classifications of the same vegetation. In the United States, Driscoll *et al.* (1984) recommended the development of a joint system using the physiognomic units of UNESCO (1973) and the floristic units of habitat types, of which an example has recently been provided by Dick-Peddie (1993) in New Mexico. Vankat (1990) developed a physiognomic-dominance type classification for forest types in North America. Strong *et al.* (1990) in Canada also proposed a combined physiognomic-floristic approach. In addition, Specht *et al.* (1974) used the joint approach to develop a conservation evaluation for Australian plant communities.

### **Terrestrial Vegetation; “Natural” and “Semi-natural” Types**

The TNC physiognomic-floristic classification has been developed for terrestrial vegetation, that is, all upland terrestrial vegetation and all wetland vegetation with rooted vascular plants. In relation to Cowardin *et al.* (1979), terrestrial includes those portions of the palustrine, lacustrine, riverine, estuarine, and marine systems that have rooted vegetation. Classification of this vegetation (the Terrestrial System) is distinct from that of unvegetated deep-water habitats (Freshwater and Marine Systems) and unvegetated subterranean habitats (Subterranean System), all of which will have their own classification systems (e.g. Lammert *et al.* 1997).

The USNVC includes all existing vegetation, occurring anywhere along the continuum of "natural" to "cultural", but TNC has emphasized vegetation types that are "natural" since these communities are the focus of biodiversity protection. The classification system separates natural/semi-natural types from cultural types at a certain level in the hierarchy (the formation subgroup, see table 1). Broadly speaking, natural types include a range of naturalness, namely, "natural" (narrowly defined), "semi-natural" and "modified" vegetation, which together reflect differences in anthropogenic disturbance regimes. All natural types occur spontaneously without regular human management, maintenance, or planting, and generally have a strong component of native species. More specifically, "natural" vegetation includes plant communities that appear not to have been significantly modified by human activities, and "semi-natural" vegetation includes plant communities where the structure of vegetation has been noticeably changed through human activities, but where the species composition is unchanged (van der Maarel and Klotzli 1996). In contrast to natural vegetation, then, "cultural" vegetation can be recognized as that which includes planted/cultivated vegetation types. For cultural and modified vegetation, TNC classifies at a much coarser scale than for natural and semi-natural vegetation, but other organizations and agencies may refine these coarse units further. To date, most units described with the finest levels in the classification system have been natural and semi-natural types. However, when necessary, modified and cultural types have been identified in the classification system, especially for the purpose of vegetation mapping.

### **Physiognomic Levels: Description And Definitions**

The hierarchy for the Terrestrial System has seven levels, with five physiognomic levels (formation class, formation subclass, formation group, formation subgroup and formation) and two floristic levels (alliance and association), see Figure 1. The basic unit of the physiognomic portion of the classification is the "formation", a "community type defined by dominance of a given growth form in the uppermost stratum (or the uppermost closed stratum) of the vegetation, or by a combination of dominant growth forms" (Whittaker 1962, see also Schrader-Frechette and McCoy 1993). In practice, formations are defined by varied, conventionally-accepted combinations of growth-form dominance and characteristics of the environment (e.g., cold-deciduous alluvial forests, rounded-crowned temperate needle-leaved evergreen forest, seasonally flooded perennial forb vegetation).

The physiognomic portion of the classification is based upon the UNESCO (1973) world physiognomic classification of vegetation, which was modified and refined to provide greater consistency at all hierarchical levels and to include additional physiognomic types. Some of the revisions made by Driscoll *et al.* (1984) for the United States were incorporated, and the international scope was expanded.

Compatibility with other systems was also a consideration in the development of the physiognomic levels. The subclass level of UNESCO was modified and a new Formation Subgroup that separates natural vegetation from cultural vegetation was added to better conform to the Federal Geographic Data Committee's (FGDC) standards for vegetation classification (FGDC 1997). Hydrological modifiers based on Cowardin *et al.* (1979) also were added at the formation level since they have been used extensively to map wetlands across the United States. Each of the physiognomic levels is described in more detail by Grossman *et al.* (1998).

## Floristic Levels: Description And Definitions

Since this report focuses on the floristic levels of the USNVC, the alliance and the association, the following sections provide more detail about these classification units.

### The Alliance Concept

The alliance is a physiognomically uniform group of plant associations (see Association definition below) sharing one or more diagnostic species (dominant, differential, indicator or character), which, as a rule, are found in the dominant and/or uppermost strata of the vegetation (Mueller-Dombois and Ellenberg 1974). Dominant species are often emphasized in the absence of detailed floristic information (such as quantitative plot data), whereas diagnostic species (including characteristic species, dominant differential, and other species groupings based on constancy) are used where detailed floristic data are available (Moravec 1993). The alliance level includes existing (not just “climax” or potential) vegetation types.

For forested communities, the alliance is similar to the “cover type” of the Society of American Foresters (Eyre 1980), developed to describe the forest types of North America. An alliance is equivalent to a cover type when the dominant species also have diagnostic value. The alliance may be finer than a cover type when the dominant species extend over large geographic areas and varied environmental conditions especially when a diagnostic species occurs in different climate zones or in both upland and wetland situation. The concept for the alliance is also similar to the concept of the “series”, a concept developed by the Habitat Type System to group habitat types that share the same dominant species under climax conditions (Daubenmire 1952, Pfister and Arno 1980). Alliances, however, are described by the diagnostic species for all existing vegetation types, whereas series are restricted to climax types and are described by the primary dominant species (see Pfister and Arno 1980).

Examples include:

- *Fagus grandifolia* - *Quercus alba* Forest Alliance;
- *Quercus alba* – (*Quercus rubra*, *Carya* spp.) Forest alliance
- *Nyssa (aquatica, biflora, ogeche)* Pond Seasonally Flooded Forest Alliance
- *Fagus grandifolia* - *Magnolia grandiflora* Forest Alliance
- *Pinus pungens* - (*Pinus rigida*) Woodland Alliance
- *Quercus stellata* – *Quercus marilandica* Woodland Alliance
- *Cephalanthus occidentalis* Semipermanently Flooded Shrubland Alliance
- *Alnus serrulata* Saturated Shrubland Alliance
- *Andropogon virginicus* Herbaceous Alliance

The use of a joint physiognomic -floristic classification influences the alliance concept developed in the national classification. The alliance is constrained both by the floristic patterns of the associations it contains and by the physiognomic -ecologic patterns of the formation that it represents. From a top-down perspective, this facilitates

identification of alliances. Information from a wide variety of sources that describes the dominant species of different formations (e.g., wet meadows, saturated peatlands, or temperate broad-leaved evergreen forests) can be used to develop some initial floristic groupings. From a bottom-up perspective, however, this may lead to alliances that differ physiognomically, but otherwise share many species in common. Associations that share a number of dominant or diagnostic species may be placed under different alliances that are in separate formations.

Guidelines for alliance nomenclature are as follows. Dominant and diagnostic species are identified from the dominant and/or top strata of the vegetation. Species placed in parentheses are less consistently found in all associations of the alliance, and the names within parentheses generally are listed alphabetically. Vascular plant species nomenclature follows the nationally standardized list, Kartesz (1999), with very few exceptions. Nomenclature for nonvascular plants follows Anderson (1990), Anderson *et al.* (1990), Egan (1987, 1989, 1990), Esslinger and Egan (1995), and Stotler and Crandall-Stotler (1977). Alliance names include the formation class in which they are listed, e.g., *Pinus ponderosa* Forest Alliance. For wetland alliances, the hydrologic regime that the alliance is found in is always provided for clarity, e.g., *Acer saccharinum* Temporarily Flooded Forest Alliance. Therefore, all alliances that have no hydrological modifier are upland alliances. Environmental or geographic descriptors are used sparingly, to more clearly separate alliances with the same nominal species or to provide clarity when differential species are not yet known (e.g., *Quercus stellata* Flatwoods Forest Alliance; *Acer grandidentatum* Montane Forest Alliance; *Taxodium ascendens* Tropical Woodland Alliance).

### **The Association Concept**

The association (or plant association) is the finest level of the classification system. For the terrestrial system, plant association is defined as “a plant community of definite floristic composition, presenting a uniform physiognomy, and growing in uniform habitat conditions” (Flahault and Schroter 1910). This basic concept has been used by most schools of vegetation classification (Whittaker 1962, Braun-Blanquet 1965, Westhoff and van der Maarel 1978). In this traditional sense, the plant association concept applies to existing vegetation regardless of successional status. The terms “association”, “plant association”, “community”, and “community association” are used interchangeably.

The plant association is differentiated from the alliance level by additional plant species, found in any stratum, which indicate finer scale environmental patterns and disturbance regimes. This level is derived from analyzing complete floristic composition of the vegetation unit when plot data are available. In the absence of a complete data set, approximation of this level is reached by using available information on the dominant species or environmental modifiers, and their hypothesized indicator species. NatureServe will primarily use the plant association as the level at which community inventory and conservation action are aimed.

While this definition of a plant association is still generally accepted as an international standard, a few clarifications of the use of the definition for the USNVC may be helpful:

- “Habitat” refers to the combination of environmental conditions and ecological processes influencing the community.
- Uniformity of physiognomy and habitat conditions may include patterned heterogeneity (e.g., hummock/hollow).
- As a rule, community elements occur repeatedly over the natural landscape.
- The scale of the community element varies. Among other factors, the variation is determined by the size and apparent homogeneity of the occurrences across the landscape, the amount of data that has been collected and the interpretation of these data by the field experts.

- The community element may be composed of a complex of plant associations that constitutes a functioning ecological unit if the plant associations always occur together (e.g., prairie mound and intermound, wooded ridge and swale complex).

Associations are named with one or more species from the alliance name, and have additional species that represent dominants or indicators from any layer of the vegetation. Associations are named with one or more component plant species, separated by punctuation to indicate strata, followed by a descriptor of the physiognomic class. Strata are separated by the 'forward slash' /, while species within strata are separated by hyphens. Nominal species which are substantially inconstant, that is, often absent in a given occurrence (stand) of the type, are placed in parentheses. Within a stratum, parenthetic species are always placed following nonparenthetic (more constant) species. If more than one species in a stratum is parenthetic, the species are separated by commas and alphabetized. For instance, the *Pinus palustris* - *Pinus (echinata, taeda)* Woodland can include stands dominated by a mixture of *Pinus palustris* and either or both *Pinus echinata* and *Pinus taeda*. An environmental or geographic descriptor such as wetland, mesic, serpentine, etc., are used sparingly, when species composition for a type is not known well enough to provide full representation using only species in a name. When an environmental/geographic descriptor is used, it is inserted between the floristic nominals and the class descriptor.

EXAMPLES: *Quercus palustris* - *Quercus bicolor* - *Quercus macrocarpa* - *Acer rubrum* Sand Flatwoods Forest  
*Quercus falcata* - *Quercus alba* - *Carya* spp. Interior Plateau Forest

[Association name = floristic nominals in stratal order + [optional environmental/geographic descriptor] + class descriptor]

In theory, additional data will allow a modification to the name (for instance, addition of another nominal) to clearly separate this association from similar associations, and then the environmental/geographic descriptor will be unnecessary.

When an association has several layers, an attempt is made to include species that are dominants or indicators from at least the two most dominant layers. Indicator species are those species, other than dominants, which have been chosen to distinguish an association or alliance from others like it, or to indicate specific environmental conditions that have a controlling influence on vegetation in the community. However, the indicator species are seldom limited to the association. For instance, *Sideroxylon lanuginosum* is added to the name of the Gulf coast shell midden woodland to distinguish this type from its close relative, the Atlantic coast shell midden woodland, since its range does not extend onto the Atlantic Coast. At the same time, this *Sideroxylon* species is present in other communities along the Gulf Coast and in the lower Midwest.

## The Purpose of Naming

The purpose of naming is, in a sense, obvious, but bears restating. The primary purpose of naming the units in a classification is to create a label for the units, to facilitate unambiguous communication. A secondary goal is to create a name which is meaningful and easy to remember and use (mnemonic). These purposes are somewhat in conflict. The primary purpose of an unambiguous label is met by 'Community association 2546', but such a label is not meaningful or easy to remember. A long descriptive name is meaningful, but difficult to remember and use. To meet these varying requirements, we try to create a name that is a good compromise between these needs. We also use codes and common names to achieve these sometimes conflicting needs.

While it is tempting to interpret the floristic name of an association as a shorthand description of the community, it is important to remember that the name is not a description. The name does not describe an association any more than the name of a species describes it. An association is defined by more than the nominal species used in its names -- it is defined as well based on relative similarity of overall floristic composition, vegetation structure, and environment. One does not expect to be able to recognize *Quercus alba* because it is an oak and

white, or *Quercus virginiana* because it is an oak and “from Virginia”. Each association in the classification has (or will have) a detailed description of the floristic composition, physiognomic structure, environment (soils, geology, hydrology, climate, etc.), dynamics (fire, flooding, succession, etc.), geographic distribution, and taxonomic distinction from similar associations.

Ideally, the name of an association should provide, to a person relatively knowledgeable about the vegetation of an area and familiar with the taxonomic and nomenclatural principles of the classification, a clear indication of the type. Thus, community names are more meaningful or descriptive than the names of species, but do not purport to provide a full diagnosis or description of the type.

In this report, at least three identifiers are provided for each association. The **NVCS association name** (or Global Name) is the scientific name of the association and uses Latin names of component species (as described above). The **Database Code** (or Element Code) is a unique, 10 character code assigned to each association in the USNVC. However, in this report the **Common Name**, which is an informal, descriptive name, is the identifier used at the beginning of each association description. Where Common Names have not been developed, a **Translated Name** (using common names instead of scientific names for nominal species) is provided. Since Common Names have not been standardized, the Element Code or Global Name should be used when querying any USNVC database or when providing input about the USNVC.

## Applications Of The Classification System

### Conservation Ranking and its Use in Planning

The ability to apply conservation ranks to vegetation units is integral to the success of the classification system as a tool in biodiversity conservation. Associations are ranked by their relative endangerment to determine their relative conservation priority. These ranks are based on factors such as present geographic extent, threats, number of distinct occurrences, degree of decline from historic extent, and degree of alteration of natural processes affecting the dynamics, composition, or function of the type. Ranks are customarily assigned by the various members of the Natural Heritage Programs and of the national, regional, and state offices of NatureServe. For a given community type, ranks are assigned at three declining hierarchical levels of geography, from global or rangewide (the Global Rank or GRANK), through national or country (the National Rank or NRANK), to state, province, or other subnational unit (the State Rank or SRANK). A numeric scalar of 1 to 5 is added, with 1 indicating critical imperilment due to rarity, endemism, and/or threats, and 5 indicating little or no risk of extirpation or elimination. For example, a rank of G1 indicates critical imperilment on a rangewide basis, i.e. a great risk of “extinction” of the type worldwide; S1 indicates critical imperilment within a specific state, province, or other subnational jurisdiction, i.e. a great risk of extirpation of the type from the subnation.

When detailed information is available, two primary ranking factors are used in assessing the appropriate conservation status rank for a community element: (1) the total number of occurrences and (2) the total area (acreage) of the element. Secondary ranking factors such as the geographic range over which the element occurs, the threats to the occurrences, and the viability of the extant occurrences also affect the rank.

Although community ranking is best done when information on all the factors listed above is available, it is often necessary to establish preliminary ranks when this information is lacking or incomplete. This is particularly true for communities that have not been well described. In practice, four main factors have been useful in arriving at a preliminary assessment of a community’s rangewide (global) rank:

1. The geographic range over which the type occurs.
2. The long term decline of the type across this range.
3. The degree of site specificity exhibited by the type.
4. The rarity across the range based on state ranks assigned by state Natural Heritage Programs.

Most of the ranks currently applied to USNVC types are based on such preliminary assessments of rarity.

Imperiled community types (and species), those ranked G1 through G3, are often regarded as the principal targets for conservation action, although NatureServe is dedicated to the conservation of all native community types. Special attention is generally given to taxa of high endangerment, as opportunities for their conservation may be limited in space and time. However, some highly ranked community types may be essentially secure because of their occurrence in areas that are remote from human alteration, that already have high degrees of protection, or that are unsuitable as human habitat. Others are essentially secure because of their intrinsic resistance to alteration or degradation. The conservation status of highly ranked communities should be assessed and steps should be taken to ensure their adequate protection.

More common and less imperiled community types, those ranked G4 and G5, are also conservation priorities. In most parts of the world, these more common community types have generally been highly altered and degraded by human action, and have often also been fragmented and their functioning impaired. For the conservation of many rare and common species, these relatively secure communities are of critical importance. In North America, a large tract of a common vegetation type in pristine condition that occurs in an essentially intact landscape with relatively intact ecological processes is of high priority for conservation. Though the type itself is common, large, high quality examples are rare and the opportunity to conserve such an example may be very limited. Generally, the conservation of lower ranked community types should be focused on examples in especially good condition, of large extent, with high landscape integrity/connectivity, and with ancillary conservation benefits. Because a primary purpose of the USNVC is to help set conservation priorities for natural community types, the recognition and naming of units reflects their relative naturalness. There generally exists a strong correlation between naturalness and conservation priority.

The dynamic nature of vegetation presents some additional complications in the evaluation of the naturalness and conservation priority of community units. Early- and mid-seral vegetation may be readily classifiable as distinct in composition and physiognomy from later seral vegetation, but may be transient on the landscape. Transience makes this vegetation difficult to “track” or monitor over time and the conservation of seral sequences will generally be dependent on the conservation of large landscapes that contain a mosaic of seral stages.

Also, disturbances cannot be clearly and cleanly classified as “natural” or “anthropogenic”. Some anthropogenic disturbances are similar enough to natural disturbances that the resulting successional communities cannot be clearly distinguished, while others may create unique and unprecedented communities that do not occur in the natural landscape.

We therefore have developed categories and a resulting ranking system for communities that go beyond those used for species conservation. The various ranks used for communities presented in this document are listed and briefly described in Table 2. For further information on ranking see Master (1991).

**TABLE 2: Global Rank Definitions**

GX	ELIMINATED throughout its range, with no restoration potential due to extinction of dominant or characteristic species.
GH	PRESUMED ELIMINATED (HISTORIC) throughout its range, with no or virtually no likelihood that it will be rediscovered, but with the potential for restoration (e.g., <i>Castanea dentata</i> Forest).
G1	CRITICALLY IMPERILED Generally 5 or fewer occurrences and/or very few remaining acres or very vulnerable to elimination throughout its range due to other factor(s).
G2	IMPERILED Generally 6-20 occurrences and/or few remaining acres or very vulnerable to elimination throughout its range due to other factor(s).
G3	VULNERABLE Generally 21-100 occurrences. Either very rare and local throughout its range or found locally, even abundantly, within a restricted range or vulnerable to elimination throughout its range due to specific factors.
G4	APPARENTLY SECURE Uncommon, but not rare (although it may be quite rare in parts of its range, especially at the periphery). Apparently not vulnerable in most of its range.
G5	SECURE Common, widespread, and abundant (though it may be quite rare in parts of its range, especially at the periphery). Not vulnerable in most of its range.
GU	UNRANKABLE Status cannot be determined at this time.
G?	UNRANKED Status has not yet been assessed.
GC	PLANTED/CULTIVATED 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.
GW	INVASIVE EXOTIC Vegetation dominated by invasive alien species.
GD	RUDERAL Vegetation resulting from succession following anthropogenic disturbance of an area.
GM	MODIFIED Vegetation resulting from the management or modification of natural vegetation, it is readily restorable by management or time, and/or the restoration of ecological processes.

Modifiers and Rank Ranges

- ? A question mark added to a rank expresses an uncertainty about the rank in the range of 1 either way on the 1-5 scale. For example a G2? rank indicates that the rank is thought to be a G2, but could be a G1 or a G3.
- G#G# Greater uncertainty about a rank is expressed by indicating the full range of ranks which may be appropriate. For example, a G1G3 rank indicates the rank could be a G1, G2, or a G3.
- Q A "Q" added to a rank denotes questionable taxonomy. It modifies the degree of imperilment and is *only* used in cases where the type would have a *less imperiled* rank, if it were not recognized as a valid type (i.e., if it were combined with a more common type). A GUQ rank often indicates that the type is unrankable *because of* daunting taxonomic/definitional questions.



## **Applications of the USNVC by U.S.D.A. Forest Service and other Federal Agencies of the United States**

The USNVC is increasingly used by the federal agencies (including Forest Service, Fish and Wildlife Service, Dept. of Defense, National Park Service, Bureau of Land Management, USGS Biological Resources Division, Environmental Protection Agency, and others), and The Nature Conservancy as a fundamental basis for ecosystem management, natural resource planning, and land management. The various lower hierarchical levels of the USNVC, particularly the alliance and the association, have particularly appropriate uses.

The **U.S. Forest Service**, a long-time user and supporter of this classification effort, is using the alliance level to describe the existing and potential vegetation for the ecoregional provinces, sections, and subsections in the Eastern and Southern Regions (Keys *et al.* 1996). This information is used for determining management and conservation goals. Other potential uses include using the alliance to characterize stand types in forest inventory or to characterize the habitats of wild life species, including neotropical migrant birds, other birds, and other vertebrate animals. Alliances could easily be aggregated into the USFS “old growth types” or used to map dominant vegetation cover.

The association level is being used to by the Forest Service to describe and classify existing and potential natural vegetation. Individual National Forests throughout the country are using the community associations in the USNVC to conduct inventories of natural plant communities. The conservation status information contained within the USNVC can be used to rank the imperilment status of ecosystems and communities and to assess the conservation needs for both rare and representative community types on National Forest lands. Since rare species are linked to associations in the USNVC, associations can easily be used to help characterize the habitats and habitat needs of Proposed, Endangered, Threatened, and Sensitive (PETS) species. As part of the Forest planning process, the associations can be used to set priorities for representation in Research Natural Areas (RNA) and Special Interest Areas (SIA). Associations can also be used to develop management prescriptions, for prescribed fire, thinning, and other land management and restoration activities.

The **USGS BRD Gap Analysis Program** uses the alliance level of the USNVC to map vegetation using TM satellite imagery on a state level. As a requirement of this program the imagery must be classified at the alliance level, and those states that have not mapped to the alliance level must describe the relationship between their classification units and the alliance units.

The **U.S. Fish and Wildlife Service** is interested in applying the same classification and mapping standards as the NBS/NPS Vegetation Mapping Program for the wildlife refuge system. The Service believes that identifying vegetation communities throughout the National Wildlife Refuge System will improve the management of the System’s fish and wildlife resources. Natural community inventories using the USNVC are currently underway on many refuges.

As part of the National Park Service Inventory and Monitoring Program, the **USGS BRD/NPS Vegetation Mapping Program** is currently involved in a long-term project to map the vegetation of all National Park units using the standard classification. This program requires the mapping of vegetation according to the classification, using a minimum mapping unit of 0.5 hectare (about 1 acre) mapped to a standard 1:24,000 scale USGS topographic quadrangle. Alliances or plant associations must be assigned to each vegetation polygon delineated. All vegetation maps, associated vegetation plot data, and accuracy assessment points are geographically referenced and made available in digital form that is GIS compatible.

As part of an assessment of the status of biodiversity, the **Environmental Protection Agency** has sponsored reviews of natural communities in both the Great Lakes region (TNC, Great Lakes Program 1994) and Great Plains (Ostlie *et al.* 1996). The Great Plains review contributed to a thorough review of the identification and status of all natural communities throughout the Great Plains. Follow-up surveys in specific landscapes are being planned. In addition, the agency has sponsored the Midwest Oak Ecosystems Recovery Plan (Leach and Ross 1995), which uses the structure of this classification to define the Midwest oak savanna and woodland types.

## Structure and Format of this Report

The descriptions in this report may vary widely in length and level of detail. Some vegetation types are well studied, and well documented; while others are poorly known with little or no published material available. Ecological dynamics, disturbance regimes and successional processes of some vegetation types have also been studied and documented, but for others this sort of information is scanty. The user will find some descriptions to be fairly comprehensive and complete, and others to be missing pieces of information. As part of the USNVC, these descriptions are dynamic and are continuously changing and improving as more information becomes available. In its current form, we consider the classification complete and accurate enough to be usable for the full variety of possible potential applications, and that use will inevitably result in revisions, modifications, and enhancements.

All scientific names for vascular species in the report follow that of Kartesz (1999). Nomenclature for nonvascular plants follows Anderson (1990), Anderson *et al.* (1990), Egan (1987, 1989, 1990), Esslinger and Egan (1995), and Stotler and Crandall-Stotler (1977).

The main body of this report is presented in two sections, both containing vegetation descriptions for the area of interest. The first contains information on associations and the second includes information on alliances.

### Format of Alliance Descriptions

The Table of Contents includes an index to alliance descriptions found in this report. The first level of this index is the Class, while the second and third level show the Formation and Alliance. The Formation Code (e.g. I.A.8.N.b.) shows the position of the alliance within the physiognomic portion of the national classification hierarchy. The Alliance Code (e.g. I.A.8.N.b.14) includes the Formation Code plus a one to three digit counter that is assigned by the national classification database. Additionally listed is an Alliance Key (e.g. A.127), which is a unique identifier assigned to each alliance in the national classification.

Alliance descriptions are arranged in the hierarchical order of the national classification, with alliances in the same formation listed in order of their alliance codes.

Each alliance description is divided into sections and fields of information reported from the national classification database. Figure 3 presents the format of an alliance description with a description of the information contained in each field or section, including caveats about the data in that field or section.

**FIGURE 3: Alliance Description Content**

#### **Formation**

**Alliance Code - Translated Name (Common) Of The Alliance - Alliance Key**  
**Scientific Name of the Alliance** (Nomenclature follows Kartesz 1999)

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#### **ALLIANCE CONCEPT**

**Summary:** Description of the conceptual borders of the alliance in terms of vegetation composition and structure, expected geographic distribution, and expected environmental factors such as characteristic landscape position, rock type, soil texture, hydrology, etc..

**Environment:** A description of the landscape context and most important environmental determinants of the biological composition or structure of this alliance.

**Vegetation:** Vegetation attributes of the alliance including physiognomic structure, phenology, and leaf type, species composition by strata, spatial distribution of vegetation, and additional compositional comments.

**Dynamics:** Important natural disturbance regimes, successional status, and temporal dynamics for the association.

**Similar Alliances:** Closely related or similar alliances which make classification difficult.

**Similar Alliance Comments:** Comments on the differentiating features of similar alliances.

**Synonymy:** A list of common synonyms for the alliance from other vegetation or natural community classifications. An exhaustive survey for all possible other names for individual alliances has not been completed. Synonymy is usually provided to the Society of American Foresters (SAF) classification of forest cover types (Eyre 1980), as well as to the first TNC Southeast Regional Ecological

Community Classification (Allard 1990). Synonymy to state Heritage Program classifications is also sometimes given, but this synonymy is not fully populated. The synonym is followed by the short citation for the author of the synonym. There often follows a comment on the relationship of the alliance to its synonym ("In part" is the most common comment). "In part" is used to describe a relationship in which the alliance and its synonym overlap to some degree but are not equivalent. Full citations are provided in the Bibliography at the end of this report.

**Comments:** Text description of any classification questions for the alliance that may not have been addressed in other fields. This includes comments on relationships between similar alliances, comments on the level of documentation for the alliance, discussion of classification problems of individual associations, and reporting of physiognomic variability of the alliance that may affect its placement in the hierarchy.

#### ALLIANCE DISTRIBUTION

**Range:** Text description of the alliance's known or suspected range of distribution. This may be reported by broad geographic regions or a list of states and provinces. A state, province, or country shown without a "?" indicates that the alliance is documented to occur there, or is very likely to occur there. A "?" indicates that the distribution is uncertain or speculative -- the uncertainty often relates to taxonomic questions about the circumscription of the alliance, but sometimes is simply the result of lack of information. For most alliances, this listing is intended to be (and should be) comprehensive. For some alliances, particularly those that are peripheral to our region from north, west, or south (tropical), the listing may only represent partial information, generally biased towards political units or ecoregions in close proximity to our area of concern. Note that a state, may be mentioned in the alliance distribution, but not for any of its associations (see below); this generally indicates that other associations remain to be described in the alliance.

**Nations:** A listing of nations where associations in this alliance have been defined. A country shown without a "?" indicates that the alliance is documented to occur there, or is very likely to occur there. A "?" indicates that the distribution is uncertain or speculative.

**States:** A listing of states or provinces where associations in this alliance have been defined. A state, province, or country shown without a "?" indicates that the alliance is documented to occur there, or is very likely to occur there. A "?" indicates that the distribution is uncertain or speculative.

**TNC Ecoregions:** The distribution of the alliance in ecoregions defined by TNC, with a level of confidence for the alliance's status in that ecoregion. Ecoregion codes from TNC are followed by a colon and letters that indicate confidence in the occurrence of an alliance in each ecoregion. Confidence levels are defined as follows: C = alliance occurrence is certain, P = alliance occurrence is probable, ? = alliance occurrence is possible. Ecoregions that are not listed for an alliance should not necessarily be taken to mean that the alliance absolutely does not occur there. Inventory efforts for many taxonomic groups of vegetation types, and in some geographic areas, are incomplete.

**USFS Ecoregions:** The distribution of the alliance at the ecoregion section level, with a level of confidence for the alliance's status in that ecoregion section. Ecoregion codes are from Keys et al. 1995. Ecological Units of the Eastern United States -- First approximation (map). A list ecoregion codes and names is included in an appendix at the end of this report. Each code is followed by a colon and letters that indicate confidence in the occurrence of an alliance in each section. Confidence levels are defined as follows: C = alliance occurrence is certain, P = alliance occurrence is probable, ? = alliance occurrence is possible. Sections that are not listed for an alliance should not necessarily be taken to mean that the alliance absolutely does not occur there. Inventory efforts for many taxonomic groups of vegetation types, and in some geographic areas, are incomplete.

**Federal Lands:** This field lists federal land units (such as National Park Service units, individual National Forests, etc.) within which the alliance occurs. This field is incompletely populated. The intent is to develop a comprehensive listing of the occurrence of vegetation types on the lands of important federal land-managing agencies, especially (in the Southeast) the U.S. Forest Service, Department of Defense, National Park Service, U.S. Fish and Wildlife Service, and Corps of Engineers. Because the field is in the process of being populated, the absence of a federal land management unit should not be considered to indicate that the type is absent on that unit, but the listing of a federal land management unit is generally a reliable indication of the type's likely occurrence there. The information is currently most complete for U.S. Forest Service units, and for selected other units on which effort has been concentrated.

#### ALLIANCE SOURCES

**References:** References listed are those that have contributed directly to the concept of the alliance. It is by no means an exhaustive list of literature which deals with the alliance. The list of references is in a short citation format and the reader should consult the Bibliography at the back of the report for a full citation.

### Format of Association Descriptions

The hierarchical nature of the USNVC generally places structurally and compositionally related vegetation types (alliances and associations) near one another. Thus, the Forest Class (vegetation dominated by closed canopies of trees) is followed by the Woodland Class (vegetation dominated by open canopies of trees). All temperate pine forests will be found together in I.A. (Evergreen Forest subclass). Of course, such a linear ordering of types does not and cannot capture all relationships, and sometimes communities that are closely related ecologically are separated widely in the physiognomic hierarchy. For example, temperate live oak Woodlands are grouped together in II.C, separately from the temperate live oak Forests (I.C.). Similarly, related

wetland communities, such as tidal flat communities may be found classed all across the hierarchy as Shrublands (III), Dwarf Shrublands (IV) or Herbaceous Vegetation (V).

For this reason, the association descriptions in this report have been organized into ecological groupings rather than following the hierarchical ordering of the upper levels of the USNVC. These groupings are not intended for use as a standard classification level, but are just a way of organizing the report. This ordering is intended to facilitate the use of this document by those unfamiliar with the USNVC hierarchy, by grouping ecologically related associations under a single heading. Additionally, ecological groups may provide another method for aggregating associations into higher level units for mapping or other management purposes.

The Table of Contents includes a index to association descriptions organized by Ecological Groups. The associations are then listed within each group. Within the main body of this report, the ecological group is printed at the beginning of each associations.

Each association description is divided into sections and fields of information reported from the national classification database. Figure 2 presents the format of an association description with a description of the information contained in each field or section, including caveats about the data in that field or section.

**FIGURE 2: Association Description Content**

<p><b><u>COMMON NAME OF ASSOCIATION</u></b></p> <p style="text-align: center;"><b>ELEMENT IDENTIFIERS</b></p> <p><b>NVCS association:</b> The scientific name (Global name) of the association based on Latin names of dominant or characteristic plant species. The standard name used in the USNVC. (nomenclature follows Kartesz 1999).</p> <p><b>Database Code:</b> Element Code (ELCODE). The database code used to identify the association in the national community database (BCD).</p> <p><b>Formation:</b> The lowest physiognomic level of the national classification hierarchy. The formation represents a grouping of community types that share a definite physiognomy or structure and broadly defined environmental factors, such as elevation and hydrologic regime.</p> <p><b>Alliance:</b> Alliance scientific name based on the Latin names of the dominant or characteristic plant species, followed by the alliance code from the national community database (BCD).</p> <p style="text-align: center;"><b>ELEMENT CONCEPT</b></p> <p><b>Summary:</b> A short description of the association including information on physiognomy, landscape setting, dominant species, range, primary environmental characteristics, and any other unique or noteworthy characteristics.</p> <p><b>Environment:</b> A description of the most important environmental determinants of the biological composition or structure of this association and/or its subtypes.</p> <p><b>Vegetation:</b> Vegetation attributes of the association including species richness, diversity, physiognomic structure, spatial distribution of vegetation, strata height, dominant life-forms, coverage of unvegetated substrate, and additional compositional comments.</p> <p><b>Dynamics:</b> Important natural disturbance regimes, successional status, and temporal dynamics for the association.</p> <p><b>Similar Associations:</b> Closely related or similar communities which make classification difficult, with comments on how they differ.</p> <p><b>Synonymy:</b> . A list of common synonyms for the association from other vegetation or natural community classifications and the scientific literature. An exhaustive survey for all possible other names for individual associations has not been completed. Synonymy is usually provided to the Society of American Foresters (SAF) classification of forest cover types (Eyre 1980), as well as to the first TNC Southeast Regional Ecological Community Classification (Allard 1990). Synonymy is also given to names used in the scientific literature, especially when that literature has been used as a primary source for development of the taxonomic unit and its description. Synonymy to state Heritage Program classifications is given in the element distribution section (below).The synonym is followed by the short citation for the author of the synonym. Full citations are provided in the Bibliography at the end of this report. <span style="float: right;"><i>(Continued)</i></span></p> <p><b>Comments:</b> Additional comments about the association, including comments about classification criteria used to define the association, outstanding classification issues, comments on relationships between similar associations, comments on the level of documentation for the association, comments about the variability among occurrences of the association.</p> <p style="text-align: center;"><b>CONSERVATION RANKING &amp; RARE SPECIES</b></p> <p><b>GRank:</b> The Global Element Rank which characterizes the relative rarity or endangerment of the association world-wide and the reason for assigning the Global Element Rank, such as number of occurrences, number of hectares, total area reduction from original, threats, degradation, etc.</p>
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**High-ranked species:** Latin names of high-ranking (G3 or higher) plant species expected to be found within occurrences of this association.

#### ELEMENT DISTRIBUTION

**Range:** Description of the association's present range.

**States:** A listing of states or provinces where the associations are thought to occur. A state, province, or country shown without a “?” indicates that the association is documented to occur there, or is very likely to occur there. A “?” indicates that the distribution is uncertain or speculative.

**Crosswalk to State Classifications:** For states where cross-walking to the USNVC has been completed, synonymy to state Heritage Program classifications is given.

**USFS Ecoregions:** The distribution of the association by USFS Ecoregions. Ecoregion codes are from Keys et al. 1995. Ecological Units of the Eastern United States -- First approximation (map) and are listed to as fine a level as possible (Province, Section, Subsection). A list of ecoregion codes and names is included in an appendix at the end of this report. Each code is followed by a colon and letters that indicate confidence in the occurrence of an association at each mapping level. Confidence levels are defined as follows: C = association occurrence is certain, P = association occurrence is probable, ? = association is possible. Ecoregions that are not listed for an association should not necessarily be taken to mean that the association absolutely does not occur there. Inventory efforts for many taxonomic groups of vegetation types, and in some geographic areas, are incomplete.

**Federal Lands:** This field lists federal land units (such as National Park Service units, individual National Forests, etc.) within which the association occurs. Federal units where an association is predicted to occur, but on which it has not been documented, are marked with a question mark (?). This field is incompletely populated. The intent is to develop a comprehensive listing of the occurrence of vegetation types on the lands of important federal land-managing agencies, especially (in the Southeast) the U.S. Forest Service, Department of Defense, National Park Service, U.S. Fish and Wildlife Service, and Corps of Engineers. Because the field is in the process of being populated, the absence of a federal land management unit should not be considered to indicate that the type is absent on that unit, but the listing of a federal land management unit is generally a reliable indication of the type's likely occurrence there. The information is currently most complete for U.S. Forest Service units, and for selected other units on which effort has been concentrated.

#### ELEMENT SOURCES

**References:** This is a listing (by no means complete at this time) of literature which deals with the association. References listed are those that have contributed directly to its development. The list of references is in a short citation format and the reader should consult the Bibliography at the back of this report for a full citation.

The final section of this report includes several Appendices with ancillary information. These appendices include a listing of USFS ecoregion names and codes for the eastern United States and a common name look-up table for all scientific names used in this report. Other appendices included in this report are listed in the main table of contents at the beginning of the document.

Comments regarding the content of the classification are welcomed and encouraged. Please submit comments and suggestions to the authors at the following address: NatureServe, Southern U.S. Office; 6114 Fayetteville Road #109, Durham, NC 27713; or by electronic mail to:

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Carl Nordman: [carl\\_nordman@natureserve.org](mailto:carl_nordman@natureserve.org)

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## ALLIANCE DESCRIPTIONS

### I. FOREST

#### I.A.8.C.x. Planted/cultivated temperate or subpolar needle-leaved evergreen forest

##### I.A.8.C.x.4 SHORTLEAF PINE PLANTED FOREST ALLIANCE (A.94) PINUS ECHINATA PLANTED FOREST ALLIANCE

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###### ALLIANCE CONCEPT

**Summary:** This alliance includes young, monospecific plantation stands of *Pinus echinata*. These are cultivated forests which do not represent or approximate natural or near-natural vegetation structure. They are typically maintained as plantations for the harvest of forest products. The core concept of stands in this alliance are those which are artificially regenerated to dense stands which are managed and maintained for the extraction of forest products. Stands may be established with mechanical planting, but may also be established through other means. In most cases these stands support almost no other tree species in the overstory, and typically very little understory. This alliance rarely exceeds 20-40 years of age on most timberlands.

###### Synonymy:

- Shortleaf Pine: 75, in part (Eyre 1980)

**Comments:** *Pinus echinata* is one of the most important commercial conifers in the southeastern United States. During the year 2000, a vast majority of stands in the Daniel Boone National Forest (Kentucky) suffered from damage by the Southern Pine Beetle (*Dendroctonus frontalis*). They will apparently be replanted.

###### ALLIANCE DISTRIBUTION

**Range:** This alliance is found throughout the southeastern United States. It is known from Alabama, Arkansas, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, Oklahoma, South Carolina, and Texas.

**States:** AL AR GA KY LA MS NC OK SC TX

**USFS Ecoregions:** 221H:C, 222E:C, 231D:C, 231E:C, 232B:C, M221D:C, M222A:C, M231A:C

**Federal Lands:** DOD (Fort Benning); USFS (Chattahoochee, Cherokee?, Davy Crockett, Daniel Boone, Kisatchie, Ouachita, Ozark, Sabine, Sam Houston, Talladega?, Tuskegee?)

###### ALLIANCE SOURCES

**References:** Burns and Honkala 1990a, Eyre 1980

##### I.A.8.C.x.8 EASTERN WHITE PINE PLANTED FOREST ALLIANCE (A.98) PINUS STROBUS PLANTED FOREST ALLIANCE

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###### ALLIANCE CONCEPT

**Summary:** This alliance contains plantations of *Pinus strobus* that are maintained for the extraction of forest products. The canopy of these stands is usually dense, and the natural vascular species ground layer vegetation may be sparse to absent. Stands of *Pinus strobus* have been widely planted throughout the northeastern and upper midwestern United States. *Pinus strobus* is susceptible to a variety of diseases, including White Pine Blister Rust (*Cronartium ribicola*) and Southern Pine Beetle (*Dendroctonus frontalis*), which has limited some of its commercial use.

###### Synonymy:

- Eastern White Pine: 21, in part (Eyre 1980)

**Comments:** On the Daniel Boone National Forest of Kentucky, *Pinus strobus* plantings are of limited extent, and are related to wildlife plantings. There has been some damage from the Southern Pine Beetle (*Dendroctonus frontalis*).

###### ALLIANCE DISTRIBUTION

**Range:** This alliance is found in the Appalachian Mountain regions of Georgia, Kentucky, North Carolina, South Carolina, Tennessee, and Virginia. It certainly also occurs farther north.

**States:** GA KY MD MI MN NC NY ON PA SC TN VA WI

**USFS Ecoregions:** 212:C, 221H:C, M212:C, M221A:C, M221C:C, M221D:C

**Federal Lands:** USFS (Chattahoochee, Cherokee, Daniel Boone, George Washington, Jefferson, Nantahala, Pisgah, Sumter)

###### ALLIANCE SOURCES

**References:** Eyre 1980

### I.A.8.C.x.9 LOBLOLLY PINE PLANTED FOREST ALLIANCE (A.99)

#### PINUS TAEDA PLANTED FOREST ALLIANCE

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##### ALLIANCE CONCEPT

**Summary:** This alliance represents young, monospecific plantation stands of *Pinus taeda*. These are cultivated forests and are not considered natural or near-natural vegetation. They are maintained as plantations for the harvest of forest products (usually pulpwood). The core concept of these stands are those which support dense, often perfect rows of planted *Pinus taeda* or otherwise dense, young, stands which are managed and maintained for the extraction of forest products. In most cases these stands support almost no other tree species in the overstory, and typically very little understory. This association rarely exceeds 20–40 years of age on most timberlands. Stands are typically established with mechanical planting, but may also be established through other means. Excluded from this association are plantation stands which have "broken up" with age to approximate a more natural structure. Dense planting in rows, if successful, tends to result in nearly complete canopy closure which persists until the stand has either been regenerated or transitions into a different association. Herbaceous ground cover of any kind tends to be sparse due to reduction during site preparation, the typically dense canopy cover, and to the fact that many young plantations are infrequently burned at best.

##### Synonymy:

- Loblolly Pine: 81, in part (Eyre 1980)
- *Pinus taeda* / *Rhus copallina* planted forest alliance (Hoagland 1998a)

##### Comments:

##### ALLIANCE DISTRIBUTION

**Range:** This alliance is found in Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, and possibly Virginia.

**States:** AL AR FL GA KY LA MD MS NC OK SC TN TX VA?

**USFS Ecoregions:** 221:C, 222C:C, 222E:C, 231A:C, 231B:C, 231C:P, 231E:C, 232B:C, 232C:C, 234A:C, M221D:C, M222A:C, M231A:C

**Federal Lands:** DOD (Arnold, Fort Benning, Fort Bragg, Fort Gordon, Fort Stewart); DOE (Savannah River Site); NPS (Shiloh?); USFS (Angelina, Bankhead?, Bienville, Cherokee, Conecuh, Davy Crockett, Delta, De Soto, Kisatchie, Oconee, Ouachita, Ozark, Sabine, Sam Houston, St. Francis?, Sumter, Talladega, Tuskegee)

##### ALLIANCE SOURCES

**References:** Eyre 1980, Hoagland 1998a

### I.A.8.C.x.10 VIRGINIA PINE PLANTED FOREST ALLIANCE (A.100)

#### PINUS VIRGINIANA PLANTED FOREST ALLIANCE

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##### ALLIANCE CONCEPT

**Summary:** This alliance includes planted stands of *Pinus virginiana* with little understory, but may have admixtures of other native or off-site pines. These are cultivated forests and are not considered natural or near-natural vegetation. They are maintained as plantations for the harvest of forest products. Stands have suffered some damage from the Southern Pine Beetle (*Dendroctonus frontalis*).

##### Synonymy:

- Virginia Pine: 79, in part (Eyre 1980)

**Comments:** *Pinus virginiana* is planted for pulpwood and lumber in the southeastern United States. It is also planted for production of Christmas trees and on strip-mined sites. Stands have suffered some damage from the Southern Pine Beetle (*Dendroctonus frontalis*).

##### ALLIANCE DISTRIBUTION

**Range:** This alliance is found throughout the Piedmont of the southeastern United States and ranges into parts of the Cumberland Plateau, Interior Low Plateau, and the Southern Blue Ridge. It is known to occur in Alabama, Georgia, Kentucky, North Carolina, South Carolina, Tennessee, Virginia, and may possibly range into Mississippi.

**States:** AL GA KY MS? NC SC TN VA

**USFS Ecoregions:** 221H:C, 222E:C, 231:C, 232:?, M221D:C

**Federal Lands:** DOD (Arnold, Fort Gordon, Fort Stewart?); USFS (Chattahoochee, Cherokee, Daniel Boone, Nantahala?, Pisgah?, Uwharrie?)

##### ALLIANCE SOURCES

**References:** Burns and Honkala 1990a, Eyre 1980

### I.A.8.C.x.101 PITCH PINE PLANTED FOREST ALLIANCE (A.1995)

#### PINUS RIGIDA PLANTED FOREST ALLIANCE

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##### ALLIANCE CONCEPT

**Summary:** This alliance includes planted stands of *Pinus rigida*, sometime planted outside its native range. These are cultivated forests and are not considered natural or near-natural vegetation. They are maintained as plantations for the harvest of forest products.

**Synonymy:**

- Pitch Pine: 45, in part (Eyre 1980)

**Comments:** In time, if not harvested, and especially with fire, these plantations may develop more natural floristic characteristics and may be reclassified as semi-natural or natural types [see II.A.4.N.a. *Pinus pungens* - (*Pinus rigida*) Woodland Alliance (A.521)].

##### ALLIANCE DISTRIBUTION

**Range:** This alliance has been documented from northern Georgia, where *Pinus rigida* has been planted by the U.S. Forest Service on xeric sites on sandstone, south of the natural distribution of the tree. It could, however, occur anywhere within or beyond the natural range of pitch pine. Stands of the species have also been planted in the Cherokee National Forest of Tennessee.

**States:** GA TN

**USFS Ecoregions:** 231D:C, M221D:C

**Federal Lands:** USFS (Chattahoochee, Cherokee)

##### ALLIANCE SOURCES

**References:** Eyre 1980

### I.A.8.N.b. Rounded-crowned temperate or subpolar needle-leaved evergreen forest

#### I.A.8.N.b.5 SHORTLEAF PINE FOREST ALLIANCE (A.119)

##### PINUS ECHINATA FOREST ALLIANCE

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##### ALLIANCE CONCEPT

**Summary:** This alliance includes forests dominated by *Pinus echinata*, which on very dry sites may be virtually the only tree species present. This is a wide-ranging alliance; it is currently known from wide areas of the the eastern United States from the central Appalachians south, through the Southern Blue Ridge and Cumberland Plateau and Mountains, possibly extending into the Piedmont, and in the central United States in the Ouachita Mountains and Ozarks, extending south into the Gulf Coastal Plain. Other pine species may be present in small amounts; these vary with geography and include *Pinus taeda*, *Pinus virginiana*, *Pinus pungens*, and *Pinus rigida*. Typical hardwood associates include *Quercus alba*, *Quercus falcata*, *Quercus velutina*, *Quercus coccinea*, *Quercus marilandica*, *Nyssa sylvatica*, *Liquidambar styraciflua*, *Carya alba*, and *Carya glabra*. Understory species vary across the range of the alliance, but some common components are *Vaccinium arboreum*, *Vaccinium pallidum*, *Vaccinium stamineum*, *Symplocos tinctoria*, *Ulmus alata*, *Diospyros virginiana*, *Acer rubrum*, *Cornus florida*, and *Oxydendrum arboreum*. One association in the West Gulf Coastal Plain of Arkansas has *Vaccinium elliottii*, *Aesculus pavia* var. *pavia*, and *Chasmanthium laxum*. Common herbaceous species in this Coastal Plain association include *Smilax glauca*, *Silphium compositum*, *Pteridium aquilinum* var. *latiusculum*, *Scleria oligantha*, *Piptochaetium avenaceum*, and *Tephrosia virginiana*. Some associations can result from natural or anthropogenic disturbances such as fire or windstorms, while others occur naturally on the landscape, are maintained by edaphic situations, and may even be 'climax' on these sites. Soils of these forests are acidic and are derived from sandstone, chert or granitic rock situated on ravines, ridges, and steep, often south-facing, slopes; the surface is often rocky. In the Coastal Plain, this alliance is particularly typical of clay soils, on hillsides, ridges, flats, and low hills. In the Ouachita Mountains and Ozarks, forests of this alliance typically occur on south-facing slopes and saddles, and rocky outcrops and bluffs, but may also occur on lower, north-facing slopes.

**Synonymy:**

- IA6a. Dry Shortleaf Pine - Oak - Hickory Forest, in part (Allard 1990)
- IA7a. Xeric Shortleaf Pine - Oak Forest, in part (Allard 1990)
- Dry Shortleaf Pine - Oak Forest, in part (Foti 1994b)
- *Pinus echinata* forest alliance, in part (Hoagland 1998a)
- Pine--Oak/Heath, in part (Nelson 1986)
- Shortleaf Pine CP, BR, RV (Pyne 1994)
- T1A9bI1a. *Pinus echinata* (Foti et al. 1994)
- Shortleaf Pine: 75, in part (Eyre 1980)

**Comments:** Stands have suffered some damage from the southern pine beetle (*Dendroctonus frontalis*).

#### ALLIANCE DISTRIBUTION

**Range:** This is a wide-ranging alliance; it is currently known from wide areas of the eastern United States from the central Appalachians south, through the Southern Blue Ridge and Cumberland Plateau and Mountains, possibly extending into the Piedmont, and in the central United States in the Ouachita Mountains and Ozarks, extending south into the Gulf Coastal Plain. Associations in this alliance are found in southern Missouri, Alabama, Arkansas, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, and possibly in West Virginia.

**States:** AL AR GA KY LA MD MO MS NC OK SC TN TX WV?

**USFS Ecoregions:** 221D:C, 221H:C, 221J:C, 222A:C, 222E:P, 222H:C, 231A:C, 231B:P, 231C:?, 231D:P, 231E:C, 231F:P, 231G:C, 232B:C, 234A:C, M221A:C, M221B:?, M221C:C, M221D:C, M222A:C, M231A:C

**Federal Lands:** DOD (Camp Robinson, Fort Benning); NPS (Buffalo, Great Smoky Mountains?, Shiloh); TVA (Tellico); USFS (Bienville, Chattahoochee, Cherokee?, Daniel Boone, De Soto, Holly Springs, Mark Twain, Nantahala, Oconee, Ouachita, Ozark, St. Francis, Sumter, Talladega?, Tombigbee, Tuskegee)

#### ALLIANCE SOURCES

**References:** Allard 1990, Allred and Mitchell 1955, Bruner 1931, Cain and Shelton 1994, Eyre 1980, Faber-Langendoen et al. 1996, Foti 1994b, Foti et al. 1994, Fountain and Sweeney 1987, Frothingham et al. 1926, Hoagland 1998a, Nelson 1986, Pyne 1994, Racine 1966

### I.A.8.N.b.13 EASTERN WHITE PINE - EASTERN HEMLOCK FOREST ALLIANCE (A.127) PINUS STROBUS - TSUGA CANADENSIS FOREST ALLIANCE

#### ALLIANCE CONCEPT

**Summary:** Forests codominated by *Pinus strobus* and *Tsuga canadensis* occurring from eastern Wisconsin and the upper peninsula of Michigan to eastern Pennsylvania and Maine, south through the Appalachians to northern Georgia and South Carolina. Isolated occurrences could potentially occur in the Cumberland Plateau of Kentucky and Tennessee. Generally, *Tsuga canadensis* and *Pinus strobus* are codominant, but other common associates can include *Fagus grandifolia*, *Acer rubrum*, *Betula lenta*, *Betula alleghaniensis*, *Quercus rubra*. *Picea rubens* is often a component in the northeastern part of range, while *Liriodendron tulipifera* and *Betula lenta* are the common associates in the southern Appalachians. Typical shrubs/saplings include *Acer spicatum*, *Hamamelis virginiana*, and *Acer pensylvanicum* (in the north), and *Ilex opaca*, *Leucothoe fontanesiana*, *Rhododendron maximum* (in the south). The herbaceous stratum may be sparse and generally depauperate, including *Clintonia borealis*, *Cypripedium acaule*, *Gaultheria procumbens*, *Lycopodium* spp., *Maianthemum canadense*, and *Trientalis borealis* (in the north), and *Chimaphila maculata*, *Mitchella repens*, *Galax urceolata*, *Viola blanda*, and *Polystichum acrostichoides* (in the south). Stands of this alliance are found on acidic, nutrient-poor, usually moderately well-drained soils such as sandy loams. Communities of the eastern portion of the range (New England) generally occur on well-drained midslopes, and apparently are not significantly affected by aspect. In the southern Appalachian Mountains and Cumberland Plateau, these forests occur on alluvial terraces and steep, protected gorge slopes. Communities of this alliance are commonly established following disturbance, either natural (fire, windthrow, catastrophic flood events) or anthropogenic (logging). Old-growth examples of the alliance are known, and these forests were likely to have been widespread prior to European settlement. However, without periodic disturbance, communities of this alliance will eventually succeed to other alliances (Barnes 1991).

#### Synonymy:

- IA5b. Southern Appalachian Hemlock Cove Forest, in part (Allard 1990)
- Canada Hemlock Forest, in part (Schafale and Weakley 1990)
- White Pine - Hemlock: 22, in part (Eyre 1980)
- Eastern White Pine: 21, in part (Eyre 1980)
- beech-hemlock association (Morey 1936)
- *Pinus - Tsuga* (Morey 1936)
- hemlock - white pine group (Brown et al. 1982b)
- hemlock - beech forest type (Gordon 1937b)
- white pine region, in part (Bromley 1935)

**Comments:** Forests within this alliance can have significant numbers of associated trees and can thus be similar to several other alliances, but it is distinguished by occurring in non-wetland situations and having a canopy dominated by the two nominal species, with less than 25% canopy coverage by deciduous trees. Disjunct occurrences of *Pinus strobus* are also known from Kentucky's Shawnee Hills (Todd County), but these may be better covered in the *Pinus strobus* Forest Alliance (A.128).

**ALLIANCE DISTRIBUTION**

**Range:** This alliance is found in northern Wisconsin, Michigan, from western Pennsylvania to Maine, including Connecticut, Massachusetts, Maryland (?), New Hampshire, and New York (?), and in Canada in southern Ontario and possibly southern Quebec. It may occur farther south in the Appalachian Mountains to Virginia and West Virginia. This alliance is also found in Georgia, Kentucky, North Carolina, South Carolina, and Tennessee.

**States:** CT GA KY MA MD ME MI NC NH NY ON PA RI SC TN VA VT WI WV

**USFS Ecoregions:** 212A:C, 212B:C, 212C:C, 212D:C, 212E:P, 212F:C, 212G:C, 212H:C, 212J:C, 221A:C, 221B:C, 221D:?, 221E:C, 221F:C, 221H:C, 221J:?, 222D:?, 222E:C, 222I:?, 222J:?, 231A:C, M212A:C, M212B:C, M212C:C, M212D:C, M212E:C, M212F:P, M221A:C, M221B:C, M221C:C, M221D:C

**Federal Lands:** NPS (Acadia, Great Smoky Mountains); USFS (Chattahoochee, Cherokee, Daniel Boone, George Washington, Jefferson, Nantahala, Pisgah, Sumter)

**ALLIANCE SOURCES**

**References:** Allard 1990, Barnes 1991, Bromley 1935, Brown et al. 1982b, DeYoung 1979, Eyre 1980, Faber-Langendoen et al. 1996, Gordon 1937b, Hinkle 1978, Morey 1936, Patterson 1994, Rawinski et al. 1996, Schafale and Weakley 1990, Seischab 1990, Thomas 1966, Thomas 1989, Tobe et al. 1992

### **I.A.8.N.b.14 EASTERN WHITE PINE FOREST ALLIANCE (A.128)** **PINUS STROBUS FOREST ALLIANCE**

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**ALLIANCE CONCEPT**

**Summary:** This alliance, found near the Great Lakes and in the southern Appalachian Mountains and northeastern United States, is composed of dry-mesic to mesic pine forests. Stands of this alliance are characterized by a moderate to complete tree canopy. The shrub layer is absent to well-developed, while the herbaceous layer is moderately to poorly developed. Understory vegetation is sparse where the canopy is closed, due to the limited amount of light and the duff buildup on the forest floor. The overstory is heavily dominated by coniferous trees, usually *Pinus strobus* alone but sometimes with *Pinus resinosa*. Other canopy and subcanopy trees include *Abies balsamea* (in the northern part of this alliance's range), *Acer rubrum*, *Betula papyrifera*, *Populus tremuloides*, and *Thuja occidentalis*. The shrub layer typically contains species such as *Acer spicatum*, *Corylus cornuta*, *Diervilla lonicera*, *Linnaea borealis*, and *Vaccinium* spp., especially *Vaccinium myrtilloides* and *Vaccinium angustifolium*. The herb layer contains species adapted to the dry-mesic nature of stands of this alliance. These include *Aralia nudicaulis*, *Eurybia macrophylla* (= *Aster macrophyllus*), *Gaultheria procumbens*, and *Maianthemum canadense*. ^Stands of this alliance are found on loamy sand, sandy loam, loam, and clay loam soils which are typically moderately deep to deep (60-100 cm) except in the Driftless Area where they may be very shallow. The soils are acidic and rarely contain a significant amount of organic material. Stands of this alliance are often found on glacial till or outwash plains, although in northeastern Minnesota they occur near lakes and on lower slopes. This alliance can be found on a variety of landscapes, varying from nearly level to rolling across much of its range to steep slopes in the Driftless Area. In the southern Appalachians these forests occur below 3000 feet (900 m) elevation on upper slopes and ridgetops protected by higher landforms, or as successional forests on abandoned agricultural land.

**Synonymy:**

- IA6f. Dry White Pine Ridge Forest, in part (Allard 1990)
- White Pine Forest (Schafale and Weakley 1990)
- White Pine BR, RV, CUPL (Pyne 1994)
- Eastern White Pine: 21, in part (Eyre 1980)
- Northern Dry-mesic Forest, in part (Curtis 1959)
- Eastern Needleleaf Forests: 95: Great Lakes Pine Forest (*Pinus*), in part (Kuchler 1964)

**Comments:** Natural *Pinus strobus* stands occur in mesic gorges of eastern Kentucky over *Rhododendron maximum* or with a lush herbaceous stratum. KP 11-99: might these be closer to CEGLO07102, in A.127? MP: *Pinus strobus* occurs as a disjunct species in Tennessee's Western Highland Rim (Cheatham and Dickson counties) but occurs in a mixed pine - oak forest community.

**ALLIANCE DISTRIBUTION**

**Range:** This alliance is found in Michigan, northern Wisconsin, northern and eastern Minnesota, extreme northeastern Iowa, Maine, New Hampshire, North Carolina, South Carolina, Georgia, Tennessee, Kentucky (?), and Virginia. In Canada, it is found in Ontario.

**States:** GA IA KY? MA ME MI MN NB? NC NH NS? NY ON PA QC? SC TN VA VT WI WV

**USFS Ecoregions:** 212A:C, 212B:C, 212C:C, 212D:C, 212E:P, 212F:?, 212G:?, 212H:C, 212I:C, 212J:C, 212K:C, 212L:C, 212M:C, 212N:C, 221A:C, 221B:P, 221H:C, 221J:?, 222E:C, 222I:?, 222L:C, 222M:C, 231:C, M212A:C, M212B:C, M212C:C, M212D:C, M212E:?, M212F:?, M221A:C, M221B:C, M221C:P, M221D:C

**Federal Lands:** NPS (Acadia, Carl Sandburg Home, Great Smoky Mountains, Voyageurs); USFS (Chattahoochee, Cherokee, Daniel Boone, George Washington, Jefferson, Nantahala, Pisgah, Sumter)

#### ALLIANCE SOURCES

**References:** Allard 1990, Burns and Honkala 1990a, Curtis 1959, DeYoung 1979, DuMond 1970, Eyre 1980, Faber-Langendoen et al. 1996, Govus 1982, Hinkle 1989, Kuchler 1964, MNNHP 1993, Ohmann and Ream 1971, Patterson 1994, Pyne 1994, Schafale and Weakley 1990, Sims et al. 1989, Tobe et al. 1992

### I.A.8.N.b.17 VIRGINIA PINE FOREST ALLIANCE (A.131) PINUS VIRGINIANA FOREST ALLIANCE

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#### ALLIANCE CONCEPT

**Summary:** This alliance includes forests dominated by *Pinus virginiana* and occurring in the Piedmont from Pennsylvania south to Alabama, and ranging west into the Appalachians, Ridge and Valley, the Cumberland Plateau, and in scattered locales of the Interior Low Plateau. Forests in this alliance may have admixtures of *Pinus taeda*, *Pinus echinata*, *Pinus pungens*, and/or *Pinus rigida*. These other species, if present, can have canopy coverage between 1 and 50%. Other associated species vary with the geographic distribution of the alliance. In many associations, a dense ericaceous shrub stratum is typical. This alliance includes both early successional forests resulting from natural or anthropogenic disturbance and natural forests in edaphically extreme situations. Typically, *Pinus virginiana* communities are short-lived as a forest and are more common as woodland communities [see II.C.3.N.a *Pinus (rigida, pungens, virginiana) - Quercus prinus* Woodland Alliance (A.677)]. Associated species vary with the geographic distribution of the alliance.

#### Synonymy:

- IA7a. Xeric Shortleaf Pine - Oak Forest, in part (Allard 1990)
- Appalachian pine-oak forest, in part (Evans 1991)
- Pine--Oak/Heath, in part (Schafale and Weakley 1990)
- Pine--Oak/Heath, in part (Nelson 1986)
- Virginia Pine CUPL, BR, RV (Pyne 1994)
- Virginia Pine - Mixed Oaks HR (Pyne 1994)
- Virginia Pine: 79, in part (Eyre 1980)

**Comments:** Appalachian pine-dominated associations need to be revisited in relation to the ecology of shortleaf pine, *Pinus echinata*. Are some stands of this type ones that historically were dominated by shortleaf pine? (MP 2002-03).

#### ALLIANCE DISTRIBUTION

**Range:** Forests in this alliance are possible in the Piedmont from Pennsylvania south to Alabama, and ranging west into the Appalachians, Ridge and Valley, the Cumberland Plateau, and in scattered locales of the Interior Low Plateau. The range of the alliance includes parts of Alabama, Delaware, Georgia, Kentucky, New Jersey, North Carolina, South Carolina, Tennessee, Maryland, Pennsylvania, West Virginia, Virginia, Ohio, and Indiana.

**States:** AL GA IN KY MD NC NJ OH? PA SC TN VA WV

**USFS Ecoregions:** 221E:C, 221H:C, 221J:C, 222D:C, 222E:C, 222F:C, 231A:C, 231B:C, 231C:C, 231D:C, M221A:C, M221B:C, M221C:C, M221D:C

**Federal Lands:** DOD (Fort Jackson); NPS (Chickamauga-Chattanooga, Great Smoky Mountains, Kennesaw Mountain, Kings Mountain, Mammoth Cave, Shiloh); TVA (Land Between the Lakes?, Tellico); USFS (Bankhead, Chattahoochee, Cherokee, Daniel Boone, George Washington, Jefferson, Nantahala, Oconee, Pisgah, Sumter, Talladega, Uwharrie?)

#### ALLIANCE SOURCES

**References:** Allard 1990, Andreu and Tukman 1995, Barden 1977, Burns and Honkala 1990a, Chapman 1957, Cooper 1963, Evans 1991, Eyre 1980, Faber-Langendoen et al. 1996, Frothingham et al. 1926, Gettman 1974, Malter 1977, Nelson 1986, Pyne 1994, Racine 1966, Schafale and Weakley 1990, Whittaker 1956

### I.A.8.N.c. Conical-crowned temperate or subpolar needle-leaved evergreen forest

#### I.A.8.N.c.1 FRASER FIR - RED SPRUCE FOREST ALLIANCE (A.136) ABIES FRASERI - PICEA RUBENS FOREST ALLIANCE

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#### ALLIANCE CONCEPT

**Summary:** This forest alliance is restricted to the highest mountain systems of the Southern Blue Ridge Province, in eastern Tennessee, western North Carolina, and southwestern Virginia, within the distributional range of *Abies fraseri*. Canopies can be dominated by *Abies fraseri* or *Picea rubens*, or codominated by *Abies fraseri* and *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 between 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*, *Eurybia chlorolepis* (= *Aster chlorolepis*), *Oclemena acuminata* (= *Aster acuminatus*), *Athyrium filix-femina* ssp. *asplenioides*, *Chelone lyonii*, *Circaea alpina* ssp. *alpina*, *Clintonia borealis*, *Dryopteris campyloptera*, *Geum radiatum*, *Houstonia serpyllifolia*, *Huperzia lucidula*, *Medeola virginiana*, *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. Forests of this alliance occur on all topographic positions except the steepest rocky cliffs. Elevations range from 1370-2300 m (4500-6600 feet), with pure *Abies fraseri* associations best developed at 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 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 acid 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 disturbance and lightning fire. Because of the shallow soils and extreme wind exposure, these forests are susceptible to large blowdowns, particularly in areas damaged by *Adelges piceae*, the Balsam Woolly Adelgid.

#### Synonymy:

- IA4a. Red Spruce - Fraser Fir Forest (Allard 1990)
- IA4b. Fraser Fir Forest (Allard 1990)
- Fraser Fir Forest (Schafale and Weakley 1990)
- Fraser Fir Forest (Pyne 1994)
- Red Spruce--Fraser Fir Forest (Schafale and Weakley 1990)
- Spruce - Fir, BR (Pyne 1994)
- Oligotrophic Forest (Rawinski 1992)
- Red Spruce - Fraser Fir: 34, in part (Eyre 1980)
- *Abies fraseri* Alliance (Grossman and Goodin 1995)

**Comments:** This alliance 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 the Balsam Woolly Adelgid, 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.

#### ALLIANCE DISTRIBUTION

**Range:** This alliance is found in North Carolina, Tennessee, and Virginia. This forest alliance is restricted to the highest mountain systems of the Southern Blue Ridge Province, in eastern Tennessee, western North Carolina, and southwestern Virginia, within the distributional range of *Abies fraseri*. 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.

**States:** NC TN VA

**USFS Ecoregions:** M221A:C, M221B:C, M221D:C

**Federal Lands:** NPS (Great Smoky Mountains); USFS (Cherokee, George Washington, Jefferson, Nantahala, Pisgah)

**ALLIANCE SOURCES**

**References:** Allard 1990, Brown 1941, Bruck 1988, Busing et al. 1988, Cogbill and White 1991, Crandall 1958, Crandall 1960, Davis 1930, Dull et al. 1988b, Eyre 1980, 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. 1988, White 1984, White and Cogbill 1992, White and Pickett 1985, White et al. 1993, Whittaker 1956, Zedaker et al. 1988

**I.A.8.N.c.2 EASTERN RED-CEDAR FOREST ALLIANCE (A.137)**  
**JUNIPERUS VIRGINIANA FOREST ALLIANCE**


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**ALLIANCE CONCEPT**

**Summary:** Forests in this alliance are strongly dominated by *Juniperus virginiana* var. *virginiana* on usually high pH, fire-suppressed sites or old fields, but also mature (100+ year) stands, on limestone or chalk, mostly in blacklands, but occasionally on sandstone (Oklahoma). This alliance is most common in old fields and pastures, successional cleared land, and other various disturbed areas, especially on calcareous rocks. The growth of low *Juniperus virginiana* var. *virginiana* may be very dense, and the stature may be rather low. In Tennessee examples, other species that may occur in the canopy include *Carya alba*, *Carya ovata*, *Cercis canadensis*, and *Pinus virginiana*. Various oaks (including *Quercus coccinea*, *Quercus falcata*, and *Quercus phellos*) also may be present. The midstory is typically sparse, with canopy species as well as *Cornus florida*, *Ilex opaca*, *Liquidambar styraciflua*, and *Prunus serotina* var. *serotina*. *Frangula caroliniana* may occur in several strata. Herb distribution is patchy, and typical species include *Asplenium platyneuron*, *Chasmanthium laxum*, *Eupatorium* spp., *Polystichum acrostichoides*, and *Carex* spp. This vegetation is also found in the Blackbelt of Alabama, on the margins of Chalk Prairies. In the central and upper midwestern United States, stands of semi-natural vegetation dominated by *Juniperus virginiana* var. *virginiana* typically occur in old fields and other disturbed places. The vegetation may vary in structure from open-canopy woodland (particularly as it invades herbaceous old fields) to dense, closed-canopy forest. *Rhus typhina* may be an associate. This semi-natural red-cedar forest type is expected to be found in locally disturbed areas.

**Synonymy:**

- T1A9c11a. *Juniperus virginiana* (Foti et al. 1994)
- Eastern Redcedar: 46, in part (Eyre 1980)

**Comments:****ALLIANCE DISTRIBUTION**

**Range:** This alliance is found in Alabama, Arkansas, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, Oklahoma, South Carolina (?), Tennessee, Iowa, Missouri, Virginia (?), West Virginia(?), and elsewhere.

**States:** AL AR GA IA KY LA MA MO MS NC NY OK ON SC? TN TX VA? WV?

**USFS Ecoregions:** 221A:C, 221J:C, 222A:C, 222C:C, 222D:C, 222E:C, 222F:C, 222L:C, 222M:C, 231A:C, 231B:C, 231C:C, 231D:C, 231E:C, 231G:C, 232A:C, 232B:C, 251C:C, 251E:C, 251F:C, 255A:C, 311A:C, 332E:C, M221A:C, M221B:C, M222A:C, M231A:C

**Federal Lands:** COE (J. Percy Priest); DOD (Arnold, Camp Gruber); NPS (Cape Cod, Chickamauga-Chattanooga, Chickasaw, Fire Island, Russell Cave, Shiloh, Stones River); TVA (Columbia, Tellico); USFS (Bankhead, Cherokee?, Daniel Boone, Ouachita, Ozark)

**ALLIANCE SOURCES**

**References:** Andreu and Tukman 1995, Eyre 1980, Foti et al. 1994

**I.A.8.N.c.3 RED SPRUCE FOREST ALLIANCE (A.138)**  
**PICEA RUBENS FOREST ALLIANCE**


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**ALLIANCE CONCEPT**

**Summary:** Evergreen forests dominated by *Picea rubens* or codominated by *Picea rubens* and *Tsuga canadensis*, occurring in the Central Appalachians and Southern Blue Ridge, from West Virginia south to western North Carolina and eastern Tennessee. Other species that may occur with low coverage in the canopy or subcanopy are *Acer pensylvanicum*, *Acer spicatum*, *Aesculus flava*, *Amelanchier laevis*, *Betula alleghaniensis*, *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 *Photinia melanocarpa* (= *Aronia melanocarpa*), *Crataegus* spp., *Ilex montana*, *Kalmia latifolia*, *Leucothoe fontanesiana*, *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. This alliance includes forests occurring 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 alliance 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, acid, organic soils and/or cold air drainage.

**Synonymy:**

- IA4a. Red Spruce - Fraser Fir Forest, in part (Allard 1990)
- Red Spruce--Fraser Fir Forest, in part (Schafale and Weakley 1990)
- Spruce - Fir, BR (Pyne 1994)
- Oligotrophic Forest (Rawinski 1992)
- Red Spruce: 32, in part (Eyre 1980)

**Comments:** Associations in this alliance occur in mountain ranges 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 the I.A.8.N.c *Picea rubens* - *Abies balsamea* Forest Alliance (A.150) 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.

**ALLIANCE DISTRIBUTION**

**Range:** This alliance is found in North Carolina, Tennessee, Virginia, and West Virginia.

**States:** NC PA TN VA WV

**USFS Ecoregions:** M221A:C, M221B:C, M221C:C, M221D:C

**Federal Lands:** NPS (Blue Ridge Parkway, Great Smoky Mountains); USFS (Cherokee, George Washington, Jefferson, Monongahela, Nantahala, Pisgah)

**ALLIANCE SOURCES**

**References:** Allard 1990, Cogbill and White 1991, Eyre 1980, Fleming and Moorhead 1996, Pyne 1994, Rawinski 1992, Schafale and Weakley 1990, Stephenson and Adams 1984, Stephenson and Clovis 1983, White and Cogbill 1992, White et al. 1993

**I.A.8.N.c.7 NORTHERN WHITE-CEDAR FOREST ALLIANCE (A.142)**

**THUJA OCCIDENTALIS FOREST ALLIANCE**

**ALLIANCE CONCEPT**

**Summary:** This alliance is found in the Great Lakes region and northeastern United States and southern Canada. The canopy is closed and dominated by *Thuja occidentalis* with a mix of other coniferous and deciduous trees. The associated trees vary across the range of this alliance. In the East, *Acer saccharum*, *Betula alleghaniensis*, *Fraxinus americana*, *Pinus resinosa* (in the eastern parts of this alliance's range), *Quercus muehlenbergii*, *Quercus rubra*, and *Tsuga canadensis* are common associates, while in the northern states and Canada *Abies balsamea*, *Betula papyrifera*, *Pinus strobus* (also in the East), and *Populus tremuloides* can be abundant. The understory is sparse in eastern stands of this alliance but often diverse with a prominent tall-shrub/sapling layer and abundant herbaceous ground layer species in the western Great Lakes states. The tall-shrub/sapling layer contains species such as saplings of *Thuja occidentalis* and *Abies balsamea* (in the North) and the shrubs *Acer spicatum*, *Corylus cornuta*, *Lonicera canadensis*, *Rubus pubescens*, and *Sorbus decora*. The ground layer is diverse on mesic stands and less so on steep, drier stands. Typical species in the North include *Aralia nudicaulis*, *Eurybia macrophylla* (= *Aster macrophyllus*), *Clintonia borealis*, *Cornus canadensis*, *Galium triflorum*, *Maianthemum canadense*, *Mitella nuda*, and *Trientalis borealis*. In the East the sedge *Carex eburnea* and the ferns *Polypodium virginianum*, *Cypripedium arietinum*, *Dryopteris intermedia*, and *Cystopteris bulbifera* characterize the understory. ^Communities in this alliance are found on gentle wet-mesic slopes to very steep well-drained slopes. The predominant aspect is north to northeast. Soils are fine-textured, calcareous, moderately deep to deep (50-100 cm), and often contain boulders at the surface.

**Synonymy:**

- Northern White-Cedar: 37. upland portion (Eyre 1980)
- White Cedar Forest. Minnesota (Ohmann and Ream 1971)
- Cedar (incl. Mixedwood) / Mountain Maple Forest (Sims et al. 1989)

**Comments:**

**ALLIANCE DISTRIBUTION**

**Range:** This alliance is found in the Midwest in northern Minnesota, northern Wisconsin, northern Michigan, and southwestern Ohio. In the East it is known from New York, Vermont, Virginia, and West Virginia (?), and probably is in other New England states as well. This alliance occurs in Canada in Ontario and possibly farther east.

**States:** KY? MI MN NY ON QC? TN VA VT WI WV?

**USFS Ecoregions:** 212E:C, 212H:C, 212I:C, 212J:C, 212L:C, 212M:C, 212N:C, 212O:C, 212P:C, 221B:C, 222E:C, 222I:C, 222N:C, 231A:C, M212A:P, M212D:C, M221A:C

**Federal Lands:** NPS (Isle Royale, Voyageurs); USFS (Jefferson)

**ALLIANCE SOURCES**

**References:** Burns and Honkala 1990a, Eyre 1980, Faber-Langendoen et al. 1996, MNNHP 1993, Ohmann and Ream 1971, Palmer-Ball et al. 1988, Sims et al. 1989, Walker 1987

### I.A.8.N.c.8 EASTERN HEMLOCK FOREST ALLIANCE (A.143) TSUGA CANADENSIS FOREST ALLIANCE

**ALLIANCE CONCEPT**

**Summary:** This alliance is found in the Great Lakes area, the southern Appalachians, and the Coastal Plain of Maryland. The overstory is strongly dominated by *Tsuga canadensis*, typically around 20 m tall in Canada. *Betula alleghaniensis* is often present in the canopy and subcanopy. Other species that may be present in small amounts in the Great Lakes region include *Abies balsamea*, *Acer rubrum*, *Acer saccharum*, *Pinus strobus*, *Tilia americana*, and *Thuja occidentalis*. *Abies balsamea* and *Thuja occidentalis* can be common as saplings, especially in canopy gaps. Shrubs are rare and herbaceous species only moderately abundant under the canopy in *Tsuga canadensis*-dominated forests. Where gaps occur in the canopy, however, *Acer spicatum*, *Amelanchier* spp., *Gaultheria procumbens*, and *Rubus idaeus* may be moderately abundant. Herbaceous species found in stands of this alliance include *Coptis trifolia*, *Cornus canadensis*, *Dicranum* spp., *Maianthemum canadense*, and *Pteridium aquilinum*. In the Southern Blue Ridge, common canopy/subcanopy associates include *Liriodendron tulipifera*, *Tilia americana* var. *heterophylla*, *Pinus strobus*, *Betula alleghaniensis*, *Betula lenta*, *Magnolia fraseri*, *Acer rubrum*, *Halesia tetraptera*, and *Fraxinus americana*. The density and composition of shrub and herbaceous strata vary with geography and habitat. In the south, shrub strata are often dense and dominated by a single species, such as *Rhododendron maximum* or *Leucothoe fontanesiana*, but other typical shrub species include *Ilex opaca*, *Clethra acuminata*, *Hydrangea arborescens*, and *Kalmia latifolia*. In some forests shrubs are sparse or absent and herb diversity is low. Characteristic herbaceous species in Appalachian *Tsuga* forests include *Chimaphila maculata*, *Actaea racemosa* (= *Cimicifuga racemosa*), *Dennstaedtia punctilobula*, *Dryopteris intermedia*, *Galax urceolata*, *Goodyera pubescens*, *Hexastylis shuttleworthii*, *Medeola virginiana*, *Mitchella repens*, *Polystichum acrostichoides*, *Thalictrum clavatum*, *Thelypteris noveboracensis*, *Tiarella cordifolia*, and *Viola rotundifolia*. ^Communities within this alliance are found on acidic soils that may be poorly drained. stands of this alliance occur on sandy loam and loam that averaged 115 cm deep and had a fragipan at 45-70 cm. Windthrow is the most common disturbance; surface fires and crown fires occur rarely. In the Southern Blue Ridge, these forests are found on valley flats, narrow ravines, and north- to east-facing slopes, at elevations from 1800-3500 feet (550-1060 m).

**Synonymy:**

- Hemlock-mixed forest, in part (Evans 1991)
- Canada Hemlock Forest, in part (Schafale and Weakley 1990)
- Hemlock CUPL, BR. ? (Pyne 1994)
- Eastern Hemlock: 23, in part (Eyre 1980)
- Hemlock - Yellow Birch: 24, in part (Eyre 1980)
- habitat type 4. Michigan (Barnes 1991)

**Comments:****ALLIANCE DISTRIBUTION**

**Range:** This alliance is found in Michigan, southwestern Wisconsin, Connecticut, Maine, Maryland, Massachusetts, New York (?), New Hampshire, Pennsylvania, Virginia (?), West Virginia, Georgia, Kentucky, North Carolina, South Carolina, and Tennessee. It also occurs in Canada in southern Ontario.

**States:** GA KY MI NC ON SC TN WI

**USFS Ecoregions:** 212H:C, 212I:C, 212J:C, 212K:C, 221H:C, 221J:?, 222D:?, 222J:C, 222K:C, 222L:C, 231C:C, 232B:P, M221A:C, M221B:P, M221C:C, M221D:C

**Federal Lands:** NPS (Cumberland Gap, Great Smoky Mountains); USFS (Chattahoochee, Cherokee, Daniel Boone, George Washington?, Jefferson?, Nantahala, Pisgah, Sumter)

**ALLIANCE SOURCES**

**References:** Barnes 1991, Burns and Honkala 1990a, Coffman and Willis 1977, Evans 1991, Eyre 1980, Faber-Langendoen et al. 1996, Frelich and Lorimer 1991a, Golden 1974, Golden 1981, Hinkle 1978, Lorimer 1980, Martin 1959a, McLeod 1988, Newell et al. 1997, Oosting and Bourdeau 1955, Patterson 1994, Pyne 1994, Racine and Hardin 1975, Rawinski et al. 1996, Rogers 1980, Schafale and Weakley 1990, Segars et al. 1951, Whittaker 1956

**I.A.8.N.c.9 CAROLINA HEMLOCK FOREST ALLIANCE (A.144)**  
**TSUGA CAROLINIANA FOREST ALLIANCE**


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**ALLIANCE CONCEPT**

**Summary:** Stands of this alliance are forests with dense to open canopies dominated by *Tsuga caroliniana*. Trees may be wind-shorn, gnarled and twisted in exposed situations. Occurrences in gorges sometimes have a substantial admixture of *Tsuga canadensis*. Other associated species may include *Quercus prinus*, *Quercus rubra*, *Pinus rigida*, *Pinus virginiana*, and *Pinus pungens*. The shrub stratum is dense and dominated by ericaceous species, such as *Rhododendron maximum*, *Rhododendron catawbiense*, *Rhododendron carolinianum*, *Kalmia latifolia*, *Gaylussacia* spp., and *Vaccinium* spp. The herbaceous stratum is sparse, with typical species including *Gaultheria procumbens*, *Mitchella repens*, *Chimaphila maculata*, *Galax urceolata*, and *Xerophyllum asphodeloides*. Lichens, including *Cladina rangiferina* and *Cladina subtenuis*, can be abundant. Forests in this alliance occur mostly on cliffs, rocky slopes and ridges, and less commonly on more gentle slopes and flat areas in valleys. Soils are usually nutrient-poor and rocky, with much exposed rock surface. Occurrences of these forests tend to be small and have distinct boundaries. *Tsuga caroliniana* is an Appalachian endemic with a very limited range, scattered in the Southern Blue Ridge and occasional in the Piedmont and Ridge and Valley.

**Synonymy:**

- IA6g. Carolina Hemlock Bluff Forest (Allard 1990)
- Carolina Hemlock Bluff, in part (Schafale and Weakley 1990)
- Oligotrophic Forest (Rawinski 1992)

**Comments:** *Tsuga caroliniana* communities, in general, have a restricted range, occurring in the Southern Blue Ridge with scattered outliers in the upper Piedmont and Ridge and Valley. The main distribution is centered in North Carolina, with a few examples in adjacent states. Occurrences are typically small and restricted to rocky bluff habitats. All occurrences are threatened by fire suppression and the hemlock woolly adelgid (*Adelges tsugae*), an exotic pest which causes tree decline and ultimately death in *Tsuga canadensis* and *Tsuga caroliniana*.

**ALLIANCE DISTRIBUTION**

**Range:** This alliance is found in North Carolina, South Carolina, Tennessee, and Virginia. *Tsuga caroliniana* is a southern Appalachian endemic with a very limited range, scattered in the Southern Blue Ridge and occasional in the Piedmont.

**States:** NC SC TN VA

**USFS Ecoregions:** 231A:C, M221A:C, M221D:C

**Federal Lands:** USFS (Cherokee, Jefferson, Nantahala, Pisgah)

**ALLIANCE SOURCES**

**References:** Allard 1990, Humphrey 1989, McLeod 1988, Newell and Peet 1995, Rawinski 1992, Schafale and Weakley 1990, Weakley et al. 1979

**I.A.8.N.e. Temporarily flooded temperate or subpolar needle-leaved evergreen forest**
**I.A.8.N.e.3 EASTERN HEMLOCK - (EASTERN WHITE PINE) TEMPORARILY FLOODED FOREST ALLIANCE (A.171)**
**TSUGA CANADENSIS - (PINUS STROBUS) TEMPORARILY FLOODED FOREST ALLIANCE**


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**ALLIANCE CONCEPT**

**Summary:** This hemlock forested wetland is found along montane streams and terraces in the Southern Appalachians and Cumberland Mountains of the southeastern United States. Stands are dominated by *Tsuga canadensis* or codominated by *Tsuga canadensis* and *Pinus strobus*. Deciduous species, if present, form only a minor part of the canopy (generally less than 25%). Forests in this alliance often have dense ericaceous shrub layers dominated by *Rhododendron maximum* and/or *Leucothoe fontanesiana*. In some forests shrub strata are sparse or absent, with little or no herbaceous cover; the ground cover is mainly litter or bare soil. This alliance includes forests on floodplains and terraces, where surface water may be present for brief periods during growing season, but the water table usually lies well below the soil surface. Soils tend to be well-developed and silty. Currently this alliance is defined for montane alluvial forests in the Southern Blue Ridge and small streambottoms in Virginia's Ridge and Valley and northern Blue Ridge.

**Synonymy:**

- Montane Alluvial Forest, in part (Schafale and Weakley 1990)
- White Pine - Hemlock: 22, in part (Eyre 1980)
- Eastern Hemlock: 23, in part (Eyre 1980)

**Comments:****ALLIANCE DISTRIBUTION**

**Range:** This alliance is found in Georgia, Kentucky (?), North Carolina, South Carolina, Tennessee, and Virginia. Currently this alliance is defined for montane alluvial forests in the Southern Blue Ridge, extending north into Virginia's Ridge and Valley and northern Blue Ridge.

**States:** GA KY NC SC TN VA

**USFS Ecoregions:** 221H:C, M221A:C, M221C:P, M221D:C

**Federal Lands:** USFS (Chattahoochee?, Daniel Boone, George Washington, Jefferson, Nantahala, Pisgah, Sumter)

**ALLIANCE SOURCES**

**References:** Eyre 1980, Rawinski et al. 1996, Schafale and Weakley 1990

**I.B.2.N.a. Lowland or submontane cold-deciduous forest**
**I.B.2.N.a.15 AMERICAN BEECH - SUGAR MAPLE - (TULIPTREE) FOREST ALLIANCE (A.227)**  
**FAGUS GRANDIFOLIA - ACER SACCHARUM - (LIRIODENDRON TULIPIFERA) FOREST ALLIANCE**


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**ALLIANCE CONCEPT**

**Summary:** This alliance is composed of rich, mesic forests of the east-central United States and southern Canada. The forest canopy and subcanopy are typically dominated by *Acer saccharum* and *Fagus grandifolia*, although *Liriodendron tulipifera* may be an important canopy component in some parts of the range. Other common trees include *Carpinus caroliniana*, *Carya* spp., *Fraxinus americana*, *Ostrya virginiana*, *Quercus rubra*, *Tilia americana*, and *Ulmus americana*. In the southern part of this alliance's range, additional species may include *Quercus alba*, *Tilia americana*, *Liquidambar styraciflua*, *Aesculus glabra*, *Nyssa sylvatica*, and *Carya cordiformis*. Shrubs are usually rare in northern stands but become more abundant in southern stands. *Asimina triloba* (in the southern parts of this alliance's range), *Corylus americana*, *Diervilla lonicera* (in the north), *Euonymus obovata*, *Lindera benzoin* (in the south), *Morus rubra*, and *Sambucus* spp. (in the north) are typical shrubs. The herbaceous layer is well-developed. The most abundant species include *Adiantum pedatum*, *Arisaema triphyllum*, *Claytonia virginica*, *Dicentra canadensis*, *Dryopteris intermedia*, *Galium aparine*, *Maianthemum canadense* (in the north), *Maianthemum racemosum*, *Menispermum canadense*, *Osmorhiza claytonii*, *Phegopteris hexagonoptera* (in the south), *Podophyllum peltatum*, *Polygonatum biflorum*, *Sanguinaria canadensis*, *Trillium grandiflorum*, and *Viola* spp. ^Stands of this alliance are found on flat, rolling, or, in the south, dissected topography. South of the limit of glaciation there is an increasing tendency for this alliance to be found on north- or east-facing slopes. The soils are fertile well-drained, silt, silt loam, sandy loam, or loam. Those in the north have formed over glacial till almost exclusively, while stands south of the limit of Wisconsin glaciation may form from till, alluvium, sandstone, or shale.

**Synonymy:**

- IA5d. Typic Mesophytic Forest (Allard 1990)
- Mixed Mesophytic Forest, in part (Foti 1994b)
- Deep soil mesophytic forest, in part (Evans 1991)
- Acidic mesophytic forest, in part (Evans 1991)
- Coastal Plain mesophytic cane forest. ? (Evans 1991)
- Sugar Maple-Beech-Tulip Poplar HR (Pyne 1994)
- *Acer/Fagus/Liriodendron/Quercus* (Pyne 1994)
- T1B4a11c. *Fagus grandifolia* - *Acer* spp. (*rubrum*, *saccharum*) - *Liriodendron tulipifera* (Foti et al. 1994)
- Beech - Sugar Maple: 60, in part (Eyre 1980)
- Beech - Maple association (Braun 1950)
- Western Mesophytic Forest Region, in part (Braun 1950)
- *Fagus grandifolia* - *Acer saccharum* - *Podophyllum peltatum* association. Ohio (Pell and Mack 1977)
- Eastern Broadleaf Forests: 102: Beech-Maple Forest (*Fagus-Acer*) (Kuchler 1964)

**Comments:****ALLIANCE DISTRIBUTION**

**Range:** This alliance is found in southern Michigan, Ohio, Indiana, Illinois, eastern Missouri, Kentucky, Tennessee, Pennsylvania, New York, West Virginia, and possibly Arkansas (?), Maryland (?), and Virginia (?). It is also found in Canada in southern Ontario.

**States:** AL AR? GA IL IN KY LA? MD MI MO MS NY OH ON PA SC TN VA WV

**USFS Ecoregions:** 212F:P, 212G:P, 221E:C, 221F:C, 221H:C, 221I:P, 221J:C, 222A:P, 222C:C, 222D:C, 222E:C, 222F:C, 222G:C, 222H:C, 222I:C, 222J:C, 222K:C, 231A:C, 231B:C, 231C:C, 232:P, 234A:C, 251D:C, M221A:C, M221B:C, M221C:?, M221D:P

**Federal Lands:** NPS (Shiloh); TVA (Land Between the Lakes, Tellico); USFS (Bankhead, Chattahoochee?, Cherokee?, Daniel Boone, Jefferson, Talladega, Tuskegee)

#### ALLIANCE SOURCES

**References:** Allard 1990, Andreu and Tukman 1995, Braun 1950, Cobbe 1943, Dodge and Harman 1985, Evans 1991, Eyre 1980, Faber-Langendoen et al. 1996, Foti 1994b, Foti et al. 1994, Kuchler 1964, Martin 1975, Muller 1982, Pell and Mack 1977, Pyne 1994, Rogers 1981, Schmalzer 1978, Schmalzer and DeSelm 1982, Schmalzer et al. 1978

### I.B.2.N.a.17 AMERICAN BEECH - NORTHERN RED OAK - WHITE OAK FOREST ALLIANCE (A.229)

#### FAGUS GRANDIFOLIA - QUERCUS RUBRA - QUERCUS ALBA FOREST ALLIANCE

#### ALLIANCE CONCEPT

**Summary:** Forests in this alliance occur in non-montane or low-elevation montane mesic situations and are dominated by *Fagus grandifolia* with or without some combination of the *Quercus rubra* and/or *Quercus alba*. Associated canopy and subcanopy species can include *Liriodendron tulipifera*, *Acer saccharum*, *Magnolia tripetala*, *Magnolia acuminata* (Ozarks), *Tilia americana* var. *americana* (Ozarks), *Tilia americana* var. *heterophylla*, *Quercus muehlenbergii*, *Acer rubrum*, *Cornus florida*, *Ostrya virginiana*, *Aesculus sylvatica*, and *Ilex opaca*. Some of these forests, particularly in the Piedmont of South Carolina, the southern Ridge and Valley of Alabama, or in Arkansas, may have *Acer barbatum* instead of *Acer saccharum*. Shrubs in this alliance include *Vaccinium stamineum*, *Viburnum rafinesquianum*, *Euonymus americana*, and, in some occurrences, *Kalmia latifolia*. The herb layer can be relatively lush with such species as *Polystichum acrostichoides*, *Galium circaezans*, *Hexastylis arifolia*, *Hexastylis minor*, *Desmodium nudiflorum*, *Erythronium umbilicatum* ssp. *umbilicatum*, *Hepatica nobilis* var. *obtusata*, *Epifagus virginiana*, *Tiarella cordifolia* var. *collina*, *Trillium* spp., *Heuchera americana*, *Stellaria pubera*, *Podophyllum peltatum*, *Botrychium virginianum*, and others present. These forests often occur on concave and sheltered landforms such as north-facing slopes, low slopes, high terraces along streams, and possibly other situations. The core concept of the range of this alliance includes areas inland from the Coastal Plain, as *Quercus rubra* is absent from large areas of the Coastal Plain (as in North Carolina). Forests in this alliance occur in the Cumberlands and Southern Ridge and Valley, Piedmont and Interior Low Plateau, and on protected slopes and ravines in the Ozarks, central Ouachita Mountains, and Arkansas Valley.

#### Synonymy:

- IA5g. Typic Mesic Piedmont Forest, in part (Allard 1990)
- Mixed Mesophytic Forest, in part (Foti 1994b)
- Piedmont Mesic Broad-leaved Deciduous Forest (Ambrose 1990a)
- Mesic Mixed Hardwood Forest, Piedmont Subtype (Schafale and Weakley 1990)
- Appalachian mesophytic forest, in part (Evans 1991)
- Beech RV. ? (Pyne 1994)
- T1B4a11a. *Fagus grandifolia* - *Magnolia tripetala* (Foti et al. 1994)
- T1B4a11b. *Fagus grandifolia* - *Acer saccharum* - *Quercus* spp. (*alba*, *muehlenbergii*, *rubra*) (Foti et al. 1994)
- Beech - Sugar Maple: 60, in part (Eyre 1980)
- Northern Red Oak: 55, in part (Eyre 1980)

**Comments:** The relationship between this alliance and I.B.2.N.a *Fagus grandifolia* - *Quercus alba* Forest Alliance (A.228) needs to be clarified. There may be some problems with assignment of associations where *Quercus rubra* does, in fact, enter the Coastal Plain, as in parts of Virginia, Alabama, and western Georgia. Vegetation from this alliance is known from Ozark and Ouachita national forests RNAs (Roaring Branch and Dismal Hollow) and occurs on the Shoal Creek District of the Talladega National Forest. One association, the "Piedmont American Beech Heath Bluff" (CEGL004539) ranges peripherally into the Coastal Plain (ECO57).

#### ALLIANCE DISTRIBUTION

**Range:** The core concept of the range of this alliance includes areas inland from the Coastal Plain, as *Quercus rubra* is absent from large areas of this region. Forests in this alliance occur in the Cumberlands and Southern Ridge and Valley, Piedmont, and Interior Low Plateau, and on protected slopes and ravines in the Ozarks, central Ouachita Mountains, and Arkansas Valley. This alliance is known from the states of Alabama, Arkansas, Delaware, Georgia, Massachusetts, Maryland, North Carolina, New Jersey, New York, Oklahoma, Pennsylvania, Rhode Island, Tennessee, and West Virginia. It may possibly occur in southern Indiana, Kentucky, Connecticut, and Virginia.

**States:** AL AR CT? DE GA IN? KY MA MD NC NJ NY OK PA RI SC TN VA WV

**USFS Ecoregions:** 221A:C, 221D:P, 221E:C, 221H:C, 221J:C, 222A:C, 222C:C, 222D:C, 222E:C, 222F:C, 231A:C, 231B:?, 231C:C, 231D:C, 231G:C, 232A:C, 232B:C, 232C:C, 234A:P, M221D:C, M222A:C, M231A:C

**Federal Lands:** COE (Falls Lake, Jordan Lake, Kerr Reservoir); NPS (Buffalo, Guilford Courthouse, Mammoth Cave, Ninety Six, Rock Creek, Shiloh, Thomas Stone); TVA (Land Between the Lakes, Tellico); USFS (Bankhead, Chattahoochee, Cherokee?, Conecuh, Daniel Boone, Homchitto, Jefferson?, Ouachita, Ozark, Sumter, Talladega, Tuskegee, Uwharrie)

#### ALLIANCE SOURCES

**References:** Allard 1990, Ambrose 1990a, Evans 1991, Eyre 1980, Faber-Langendoen et al. 1996, Foti 1994b, Foti et al. 1994, Golden 1979, Jones 1988a, Jones 1988b, Martin and Smith 1991, Pyne 1994, Schafale and Weakley 1990, USFS 1990

### I.B.2.N.a.23 TULIPTREE - APPALACHIAN BASSWOOD - YELLOW BUCKEYE - SUGAR MAPLE FOREST ALLIANCE (A.235)

LIRIODENDRON TULIPIFERA - TILIA AMERICANA VAR. HETEROPHYLLA - AESCULUS FLAVA - ACER SACCHARUM FOREST ALLIANCE

#### ALLIANCE CONCEPT

**Summary:** This alliance represents the mixed mesophytic forests of the Southern Blue Ridge and Appalachian Plateau, with highly variable canopies, often with no clear canopy dominant. These forests are locally referred to as 'Cove Forests.' Characteristic canopy species include *Liriodendron tulipifera*, *Tilia americana* var. *heterophylla*, *Aesculus flava*, and *Acer saccharum*. Other species that may occur in the canopy include *Prunus serotina* var. *serotina*, *Fraxinus americana*, *Acer rubrum*, *Quercus rubra*, *Fagus grandifolia*, *Carya cordiformis*, *Betula alleghaniensis*, *Halesia tetraptera* var. *monticola*, and *Magnolia fraseri*. Species composition will vary with geology and/or elevation. Shrub strata are open to sparse and can include *Hydrangea arborescens*, *Lindera benzoin*, *Calycanthus floridus*, and *Cornus alternifolia*. Herbaceous strata are typically lush and diverse. A partial list of typical species includes *Actaea racemosa* (= *Cimicifuga racemosa*), *Trillium erectum*, *Caulophyllum thalictroides*, *Impatiens pallida*, *Impatiens capensis*, *Laportea canadensis*, *Adiantum pedatum*, *Polystichum acrostichoides*, *Ageratina altissima* var. *roanensis*, *Hepatica nobilis* var. *acuta*, *Asarum canadense*, *Stellaria pubera*, *Tiarella cordifolia*, *Clintonia umbellulata*, *Sedum ternatum*, *Mitella diphylla*, *Osmorhiza claytonii*, *Dryopteris intermedia*, *Arisaema triphyllum*, *Cystopteris protrusa*, *Trillium grandiflorum*, *Viola canadensis*, *Dicentra canadensis*, *Dicentra cucullaria*, *Hydrophyllum canadense*, *Hydrophyllum virginianum*, *Phacelia bipinnatifida*, *Phacelia fimbriata*, *Delphinium tricornis*, *Carex austrocaroliniana*, *Carex manhartii*, *Carex plantaginea*, and *Carex platyphylla*. These forests mainly occur on protected, mesic, low to moderate elevation (2000-4500 feet, 610-1370 m) sites, 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. 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.

#### Synonymy:

- IA5a. Southern Appalachian Mesophytic Cove Forest (Allard 1990)
- Appalachian mesophytic forest, in part (Evans 1991)
- Rich Cove Forest (Schafale and Weakley 1990)
- Mixed Mesophytic BR (Pyne 1994)
- Beech - Sugar Maple: 60, in part (Eyre 1980)
- Yellow-Poplar: 57, in part (Eyre 1980)

#### Comments:

#### ALLIANCE DISTRIBUTION

**Range:** This alliance is found in southern Indiana, southern Ohio, West Virginia, Virginia (?), Georgia, Kentucky, North Carolina, South Carolina, and Tennessee. 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. 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.

**States:** GA IN KY NC OH PA SC TN VA WV

**USFS Ecoregions:** 221E:C, 221H:P, 222E:C, 222F:C, 231A:C, M221A:C, M221B:C, M221C:C, M221D:C

**Federal Lands:** NPS (Blue Ridge Parkway, Great Smoky Mountains); USFS (Chattahoochee, Cherokee, Daniel Boone, George Washington, Jefferson, Nantahala, Pisgah, Sumter)

#### ALLIANCE SOURCES

**References:** Allard 1990, Boufford and Wood 1977, Chapman 1957, Cooper 1963, Cooper and Hardin 1970, Dellinger 1992, DuMond 1970, Evans 1991, Eyre 1980, Faber-Langendoen et al. 1996, Golden 1974, Govus 1982, Greenlee 1974, Malter 1977, McLeod 1988, Newell et al. 1997, Patterson 1994, Pyne 1994, Rodgers and Shake 1965, Schafale and Weakley 1990, Thomas 1966, Tobe et al. 1992, Tucker 1973, Weakley et al. 1979, Whigham 1969, Whittaker 1956

## I.B.2.N.a.24 TULIPTREE FOREST ALLIANCE (A.236)

### LIRIODENDRON TULIPIFERA FOREST ALLIANCE

#### ALLIANCE CONCEPT

**Summary:** This alliance includes deciduous forests dominated by *Liriodendron tulipifera*, primarily in areas which were once clearcut, old fields, or cleared by fire or other natural disturbances. These non-wetland forests are also found along mesic stream terraces and on upland mountain benches. Forests in this alliance are abundant in the central and southern Appalachians, below 3000 feet (900 m) elevation, usually associated with disturbance and on the most productive sites, but also occur in the Coastal Plain, Piedmont, Ridge and Valley, and Cumberland Plateau. This alliance includes pure, often even-aged stands of *Liriodendron tulipifera* as well as forests with *Liriodendron tulipifera* associated with other species favored by canopy openings. 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. In the Piedmont and Coastal Plain, *Liquidambar styraciflua* is a common associate. In the Appalachians, *Halesia tetraptera*, *Tsuga canadensis*, *Tilia americana* var. *heterophylla* (= *Tilia heterophylla*), *Prunus serotina* var. *serotina*, and *Magnolia fraseri* can be additional components. In the Ridge and Valley and Cumberland Plateau, additional species include *Quercus rubra*, *Magnolia acuminata*, *Carya alba*, *Carya glabra*, *Pinus virginiana*, *Sassafras albidum*, *Pinus strobus*, *Carpinus caroliniana*, *Asimina triloba*, and *Staphylea trifolia*. Herbaceous strata are not diverse and, in the southern Appalachians, this feature distinguishes these forests from rich cove forests in I.B.2.N.a *Liriodendron tulipifera* - *Tilia americana* var. *heterophylla* - *Aesculus flava* - *Acer saccharum* Forest Alliance (A.235). Vines can be abundant including *Vitis* spp., *Smilax* spp., *Aristolochia macrophylla*, and *Parthenocissus quinquefolia*. Forests in this alliance occur on middle to lower slopes, sheltered coves and gentle concave slopes, and river terraces over various soils and geologies. Vegetation of this alliance is uncommon in Louisiana.

#### Synonymy:

- Yellow-Poplar: 57, in part (Eyre 1980)

#### Comments:

#### ALLIANCE DISTRIBUTION

**Range:** This alliance is found in Alabama, Georgia, Kentucky, Louisiana, Mississippi (?), North Carolina, South Carolina, Tennessee, Maryland, and Virginia. Forests in this alliance are abundant in the central and southern Appalachians, below 3000 feet (900 m) elevation, but also occur in the Coastal Plain, Piedmont, Ridge and Valley, and Cumberland Plateau.

**States:** AL GA KY LA MD MS? NC PA SC TN VA WV?

**USFS Ecoregions:** 221H:C, 221J:C, 222C:C, 222D:C, 222E:C, 231A:C, 231B:C, 231C:C, 231D:C, 232B:C, 232D:P, 234A:C, M221A:C, M221B:C, M221D:C

**Federal Lands:** DOD (Arnold, Fort Benning); NPS (Blue Ridge Parkway, Great Smoky Mountains, Guilford Courthouse, Kennesaw Mountain, Kings Mountain, Shenandoah, Shiloh); TVA (Tellico); USFS (Apalachicola, Bankhead, Bienville, Chattahoochee, Cherokee, Conecuh, Daniel Boone, De Soto, George Washington, Holly Springs, Homochitto, Jefferson, Nantahala, Ocala, Oconee?, Osceola, Pisgah, St. Francis, Sumter, Talladega, Tombigbee, Tuskegee)

#### ALLIANCE SOURCES

**References:** Andreu and Tukman 1995, Eyre 1980, Gallyoun et al. 1996, Golden 1974, Horn 1980, McGee and Hooper 1970, Phillips and Shure 1990, Schmalzer 1978, Thomas 1966

## I.B.2.N.a.27 WHITE OAK - (NORTHERN RED OAK, HICKORY SPECIES) FOREST ALLIANCE (A.239)

### QUERCUS ALBA - (QUERCUS RUBRA, CARYA SPP.) FOREST ALLIANCE

#### ALLIANCE CONCEPT

**Summary:** This alliance is widely distributed in the eastern United States and portions of adjacent Canada and includes dry mesic to mesic upland oak forests dominated by *Quercus alba* and/or *Quercus rubra*, with or without *Carya* species. Stands are 15-25 m tall, with a closed, deciduous canopy. The shrub and herbaceous strata are typically well-developed. *Quercus alba* usually dominates the stands, either alone or in combination with *Quercus rubra* (especially on moister sites) and sometimes *Quercus velutina* (especially on drier sites). Some associations in this alliance are dominated by *Quercus rubra*, although *Quercus alba* is usually also a canopy component. *Carya* species (particularly *Carya alba*, *Carya glabra* or *Carya ovata*) are typically common either in the canopy or subcanopy. In the southeastern United States, this alliance covers dry-mesic forests of the Piedmont, low Appalachian Mountains, and the Cumberland and Interior Low Plateau, and mesic oak-hickory forests of the Blue Ridge and the interior highlands of the Ozarks and Ouachita Mountains. Associated species in the southeastern United States include *Carya glabra*, *Carya ovata*, *Carya alba*, *Fraxinus americana*, *Acer rubrum*, *Acer leucoderme*, *Cornus florida*, *Nyssa sylvatica*, *Ostrya virginiana*, *Calycanthus floridus*, *Pyrularia pubera*, *Tilia americana* var. *caroliniana*, *Oxydendrum arboreum*, and others. This alliance is found throughout the midwestern United States on

moderately rich, upland sites. Typical associates include *Fraxinus americana*, *Ulmus americana*, *Tilia americana*, *Acer saccharum*, *Acer rubrum*, and more locally, *Quercus macrocarpa* and *Quercus ellipsoidalis*. ^Stands are found on gentle to moderately steep slopes on uplands and on steep valley sides. The soils are moderately deep to deep and vary from silts to clays and loams. The parent material ranges from glaciated till to limestone, shale, sandstone and other bedrock types. In the midwestern United States, many stands are succeeding to types dominated by *Acer saccharum*, *Tilia americana*, *Acer rubrum*, and other mesic tree associates. This succession may be delayed by fire and grazing. In the eastern and southeastern United States, *Liriodendron tulipifera*, *Fraxinus americana*, *Acer rubrum*, and other mesic associates often increase after disturbances, such as clearcutting or windstorms, especially in the absence of fire.

**Synonymy:**

- IA6j. Interior Calcareous Oak - Hickory Forest, in part (Allard 1990)
- Mesic Oak - Hickory Forest, in part (Foti 1994b)
- Submesic broadleaf deciduous forest, in part (Ambrose 1990a)
- Oak - Chestnut - Hickory Forest, in part (Ambrose 1990a)
- Acidic mesophytic forest, in part (Evans 1991)
- Calcareous mesophytic forest, in part (Evans 1991)
- Dry-Mesic Oak--Hickory Forest (Schafale and Weakley 1990)
- Basic Oak--Hickory Forest, Mafic Substrate Variant, in part (Schafale and Weakley 1990)
- Montane Oak--Hickory Forest, in part (Schafale and Weakley 1990)
- Basic Oak - Hickory Forest (Nelson 1986)
- Permesotrophic Forest, in part (Rawinski 1992)
- Oak--Hickory Forest, in part (Nelson 1986)
- T1B4aIII. *Quercus rubra* - *Quercus* spp. (Foti et al. 1994)
- White Oak - Black Oak - Northern Red Oak: 52, in part (Eyre 1980)
- White Oak: 53, in part (Eyre 1980)

**Comments:**

**ALLIANCE DISTRIBUTION**

**Range:** This alliance ranges from Ontario, Canada, throughout the midwestern and eastern United States, south to the very northern edges of the Western and Eastern Gulf Coastal Plains.

**States:** AL AR CT DE GA IA IL IN KS KY MA MD ME MI MN MO MS? NC NE NH NJ NY OH OK ON PA RI SC TN VA VT WI

**USFS Ecoregions:** 212F:P, 212H:P, 212J:?, 212K:C, 212M:?, 212N:C, 221A:C, 221B:C, 221D:C, 221E:C, 221H:C, 221J:C, 222A:C, 222C:C, 222D:C, 222E:C, 222F:C, 222G:C, 222H:C, 222I:C, 222J:C, 222K:C, 222L:C, 222M:C, 222Q:C, 231A:C, 231B:C, 231C:C, 231D:C, 231E:C, 231G:C, 232A:C, 232B:C, 232C:C, 234A:P, 251A:C, 251B:C, 251C:C, 251D:C, 251E:C, M212B:C, M212C:C, M221A:C, M221B:?, M221C:C, M221D:C, M222A:C, M231A:C

**Federal Lands:** COE (Dale Hollow?); DOD (Arnold, Fort Benning); DOE (Oak Ridge); NPS (Carl Sandburg Home, Chickamauga-Chattanooga, Great Smoky Mountains, Guilford Courthouse, Kennesaw Mountain, Kings Mountain, Natchez Trace, Ninety Six, Russell Cave, Shenandoah, Shiloh); TVA (Land Between the Lakes, Tellico); USFS (Bankhead, Chattahoochee, Cherokee, Daniel Boone, George Washington, Jefferson, Mark Twain, Nantahala, Oconee, Ouachita, Ozark, Pisgah, St. Francis, Shawnee, Sumter, Talladega, Tuskegee?, Uwharrie)

**ALLIANCE SOURCES**

**References:** Allard 1990, Ambrose 1990a, Andreu and Tukman 1995, Evans 1991, Eyre 1980, Faber-Langendoen et al. 1996, Foti 1994b, Foti et al. 1994, Fountain and Sweeney 1985, Fralish 1988b, Fralish et al. 1991, Golden 1979, Hoagland 1997, Jones 1988a, Jones 1988b, McLeod 1988, Monk et al. 1990, Nelson 1986, Oakley et al. 1995, Oosting 1942, Rawinski 1992, Robertson et al. 1984, Schafale and Weakley 1990, Wharton 1978

**I.B.2.N.a.29 WHITE OAK - (SOUTHERN RED OAK, POST OAK) FOREST ALLIANCE (A.241)  
QUERCUS ALBA - QUERCUS (FALCATA, STELLATA) FOREST ALLIANCE**

**ALLIANCE CONCEPT**

**Summary:** This alliance contains vegetation that can be described as dry oak and oak - hickory forests. These are usually dominated by a mixture of *Quercus alba* and *Quercus falcata*; *Quercus stellata* may be dominant or codominant. In addition, *Quercus coccinea*, *Quercus velutina*, *Quercus marilandica*, *Carya alba*, *Carya glabra*, *Carya pallida*, *Carya carolinae-septentrionalis*, *Carya ovata*, and *Fraxinus americana* often are present. Common subcanopy and shrub species include *Oxydendrum arboreum*, *Acer rubrum*, *Ulmus alata*, *Juniperus virginiana* var. *virginiana*, *Vaccinium arboreum*, *Cornus florida*, *Sassafras albidum*, *Gaylussacia frondosa* (= var. *frondosa*), *Gaylussacia baccata*, *Vaccinium pallidum*, and *Vaccinium stamineum*. Herbaceous species that may be present include *Chimaphila maculata*, *Polystichum acrostichoides*, *Asplenium platyneuron*, *Hexastylis arifolia*, *Coreopsis major*, *Tephrosia virginiana*, *Sanicula canadensis*, *Desmodium*



*nudiflorum*, *Desmodium nuttallii*, *Symphytotrichum urophyllum?* (= *Aster sagittifolius?*), *Symphytotrichum patens* (= *Aster patens*), *Solidago ulmifolia*, and *Hieracium venosum*. These often are successional forests following logging and/or agricultural cropping (and possibly also chestnut blight in the southern Appalachians). Some examples occur in upland flats and have been called xerohydric because they occasionally will have standing water in the winter due to a perched water table, but are droughty by the end of the growing season. Other occurrences are found on well-drained sandy loam or clay loam soils that are often, although not always, shallow. Karst topography can be found in areas where this alliance occurs. Soils are most often a well-drained sandy loam, although clay loams are not uncommon. Forests of this alliance may occupy narrow bands of dry-mesic habitat transitional between lower and midslope mesic communities and xeric ridgetops. This alliance is found in the Upper East Gulf Coastal Plain, Piedmont, low mountains (including Cumberlands, Ridge and Valley, and low parts of the Southern Blue Ridge), and Interior Low Plateau. Distribution in the Atlantic Coastal Plain, East Gulf Coastal Plain, and Upper West Gulf Coastal Plain needs assessment. In the Shawnee Hills, Knobs, Coastal Plain, and Appalachian Plateau regions of Kentucky, these forests form a common matrix vegetation over acid sandstone and shales. These Kentucky forests are dominated by *Quercus alba* with little or no *Quercus falcata* and occupy middle to upper slope positions. In the southern Illinois portion of the range, examples occur on south- to west-facing slopes where increased temperatures favor *Quercus falcata* over *Quercus rubra*.

#### Synonymy:

- IA6i. Interior Upland Dry-Mesic Oak - Hickory Forest, in part (Allard 1990)
- Acidic sub-xeric forest, in part (Evans 1991)
- Xerohydric flatwoods, in part (Evans 1991)
- Dry-Mesic Oak--Hickory Forest, in part (Schafale and Weakley 1990)
- Southern Red Oak RV (Pyne 1994)
- Post Oak-Black Hickory Series (Diamond 1993)
- Submesic Oak - Hickory Forest, in part (Foti 1994b)
- T1B4aIV. *Quercus falcata* - *Quercus* spp. (Foti et al. 1994)
- White Oak - Black Oak - Northern Red Oak: 52, in part (Eyre 1980)

#### Comments:

#### ALLIANCE DISTRIBUTION

**Range:** This alliance is found in southern Illinois, Indiana (?), Kentucky, Tennessee, Arkansas, Louisiana (?), Oklahoma (?), Texas (?), Mississippi, Alabama, Georgia, South Carolina, North Carolina, Virginia, Delaware, Maryland, and New Jersey. This alliance is found in the Upper East Gulf Coastal Plain, Piedmont, low mountains, and Interior Low Plateau. Distribution in the Atlantic Coastal Plain, East Gulf Coastal Plain, and Upper West Gulf Coastal Plain needs assessment. In the Shawnee Hills, Knobs, Coastal Plain, and Appalachian Plateau regions of Kentucky, these forests form a common matrix vegetation over acid sandstone and shales.

**States:** AL AR CT DE GA IL IN? KY LA? MA? MD MS NC NJ NY OK? SC TN TX? VA

**USFS Ecoregions:** 221A:P, 221D:?, 221H:C, 221J:C, 222C:C, 222D:C, 222E:C, 231A:C, 231B:P, 231C:C, 231D:C, 231E:C, 232A:C, 232B:C, 232C:P, 232F:P, 234A:C, M221A:C, M221D:C

**Federal Lands:** DOD (Arnold, Fort Benning, Fort Gordon); DOE (Oak Ridge); NPS (Big South Fork, Chickamauga-Chattanooga, Fire Island, Great Smoky Mountains, Guilford Courthouse, Kennesaw Mountain, Shiloh); TVA (Land Between the Lakes?, Tellico); USFS (Bankhead, Cherokee, Daniel Boone, Holly Springs?, Kisatchie?, Oconee, Sabine?, St. Francis, Shawnee, Sumter, Talladega, Tombigbee?, Tuskegee?, Uwharrie)

#### ALLIANCE SOURCES

**References:** Allard 1990, Andreu and Tukman 1995, Braun 1950, Diamond 1993, Evans 1991, Eyre 1980, Faber-Langendoen et al. 1996, Foti 1994b, Foti et al. 1994, Fralish et al. 1991, Golden 1979, Oosting 1942, Peet and Christensen 1980, Pyne 1994, Robertson and Heikens 1994, Schafale and Weakley 1990, Sneddon et al. 1996, Voigt and Mohlenbrock 1964

### I.B.2.N.a.31 SOUTHERN RED OAK FOREST ALLIANCE (A.243) QUERCUS FALCATA FOREST ALLIANCE

#### ALLIANCE CONCEPT

**Summary:** Dry oak forests with canopies characteristically dominated by *Quercus falcata*, typically with some combination of *Quercus stellata*, *Quercus velutina*, and *Quercus coccinea*. The relative dominance of these four species is variable between associations across the range of this alliance. *Quercus alba* may be present (although more likely in the understory than in the canopy), but it will rarely contribute to the dominance. Within its range, some examples have strong dominance by *Quercus coccinea*. In the Atlantic Coastal Plain, *Quercus nigra* may be the other oak sharing dominance with *Quercus falcata*. *Vaccinium* spp. are common in the understory of often successional stands on subxeric, intermediate sites; some examples are found on sites with unusual soil conditions, such as hardpans with retarded drainage. These typically occur in

upland flats and have been called xerohydric because they occasionally will have standing water in the winter due to a perched water table, but are droughty by the end of the growing season. Other occurrences are found on well-drained sandy loam or clay loam soils that are often, although not always, shallow. The range of forests of this alliance is throughout the East Gulf Coastal Plain, West Gulf Coastal Plain, Upper West Gulf Coastal Plain, Piedmont, Carolina Sandhills, low mountains, and Cumberland and Interior Low Plateaus. The overall distribution in the Atlantic Coastal Plain and Ouachita Mountains needs assessment.

**Synonymy:**

- Acidic xeric forest, in part (Evans 1991)
- Xerohydric flatwoods, in part (Evans 1991)
- Dry Oak--Hickory Forest, Coastal Plain Sand Variant (Schafale and Weakley 1990)
- *Quercus falcata* forest alliance (Hoagland 1998a)
- Southern Red Oak RV (Pyne 1994)
- Post Oak-Black Hickory Series (Diamond 1993)

**Comments:** This alliance is found in central and western Tennessee and Kentucky, rather than the montane portions of these states. There is a *Quercus coccinea*-dominated association in Tennessee (S. Major pers. comm.).

**ALLIANCE DISTRIBUTION**

**Range:** This alliance is found from Oklahoma, Kentucky, and North Carolina, south to Louisiana, Mississippi, and South Carolina, in the East Gulf Coastal Plain, Upper West Gulf Coastal Plain, Piedmont, Cumberland Plateau, Carolina Sandhills, low mountains, Interior Low Plateau, Ozarks, and Ouachitas. Its distribution and extent in the Atlantic Coastal Plain needs assessment. It is also reported from the Chesapeake Bay Region and the Northern Piedmont.

**States:** AL AR DE GA IN? KY LA MD MS NC NJ OK SC TN TX

**USFS Ecoregions:** 221H:P, 221J:C, 222C:C, 222D:C, 222E:C, 231A:C, 231C:C, 231E:C, 232A:C, 232B:C, 232C:C, 232F:C, 234A:C, M222A:C, M231A:C

**Federal Lands:** DOD (Arnold, Fort Benning); NPS (Mammoth Cave); TVA (Tellico); USFS (Angelina, Bankhead, Bienville, Cherokee?, Conecuh, Davy Crockett, De Soto, Holly Springs, Homochitto, Kisatchie?, Ouachita, Sabine, St. Francis, Sam Houston, Talladega, Tombigbee, Tuskegee)

**ALLIANCE SOURCES**

**References:** Andreu and Tukman 1995, Evans 1991, Hoagland 1998a, Major pers. comm., Pyne 1994, Schafale and Weakley 1990, Wharton 1945

**I.B.2.N.a.36 ROCK CHESTNUT OAK - (SCARLET OAK, BLACK OAK) FOREST ALLIANCE (A.248)  
QUERCUS PRINUS - (QUERCUS COCCINEA, QUERCUS VELUTINA) FOREST ALLIANCE**

**ALLIANCE CONCEPT**

**Summary:** This alliance includes xeric oak forests strongly dominated by *Quercus prinus* or *Quercus prinus* with admixtures of *Quercus coccinea* and/or *Quercus velutina*, occurring in the southern and central Appalachians, Ridge and Valley, Cumberland Plateau, Piedmont, Interior Low Plateau, and possibly in the northern Appalachians. In the Piedmont and Ridge and Valley, and in areas transitional to these provinces, *Quercus stellata* and *Quercus marilandica* may be canopy associates. Other canopy/subcanopy associates include *Acer rubrum*, *Amelanchier arborea*, *Carya alba*, *Carya glabra*, *Cornus florida*, *Hamamelis virginiana*, *Magnolia fraseri*, *Nyssa sylvatica*, *Oxydendrum arboreum*, *Pinus rigida*, *Pinus strobus*, *Quercus alba*, *Quercus rubra*, *Robinia pseudoacacia*, and *Sassafras albidum*. In the Appalachians, a dense ericaceous shrub layer is characteristic, with species such as *Gaylussacia baccata*, *Gaylussacia ursina*, *Kalmia latifolia*, *Leucothoe recurva*, *Rhododendron maximum*, *Vaccinium pallidum*, and *Vaccinium stamineum*. In the upper Piedmont *Kalmia latifolia*, *Vaccinium arboreum*, and *Vaccinium pallidum* are common. In the montane distribution of this alliance, forests of this alliance have replaced forests formerly dominated or codominated by *Castanea dentata*, and chestnut sprouts are common in the understory. Other shrub species found in forests of this alliance include *Chionanthus virginicus*, *Diospyros virginiana*, *Robinia hispida*, *Sassafras albidum*, *Styrax grandifolius*, *Symplocos tinctoria*, *Viburnum acerifolium*, *Viburnum prunifolium*, and *Viburnum rufidulum*. Herbaceous cover is typically sparse in these dry, rocky forests and species vary with geographic location. Some typical herbaceous species include *Antennaria plantaginifolia*, *Aureolaria laevigata*, *Chamaelirium luteum*, *Chimaphila maculata*, *Danthonia spicata*, *Dichantherium commutatum*, *Dichantherium dichotomum*, *Dioscorea quaternata*, *Epigaea repens*, *Galax urceolata*, *Galium latifolium*, *Gaultheria procumbens*, *Goodyera pubescens*, *Hieracium venosum*, *Lysimachia quadrifolia*, *Medeola virginiana*, *Monotropa uniflora*, *Potentilla canadensis*, *Pteridium aquilinum*, *Stenanthium gramineum*, *Uvularia puberula*, and *Uvularia sessilifolia*. These forests occur on convex, upper slopes and ridgetops, south-facing slopes, over thin, rocky, infertile soils in the Appalachians, typically below 3500 feet (1066 m), where windthrow and ice damage are common natural disturbances. In the Piedmont these forests occur on low mountains and hills, on rocky, well-drained, acidic soils, sometimes associated with outcrops of quartzite, or other resistant rock.

**Synonymy:**

- IA6d. Chestnut Oak Slope and Ridge Forest (Allard 1990)
- IA7d. Piedmont Monadnock Forest (Allard 1990)
- Appalachian sub-xeric forest, in part (Evans 1991)
- Chestnut Oak Forest, in part (Schafale and Weakley 1990)
- Piedmont Monadnock Forests, in part (Schafale and Weakley 1990)
- Oligotrophic Forest, in part (Rawinski 1992)
- *Quercus prinus* - *Quercus velutina* / *Vaccinium stamineum* Association (Fleming and Moorhead 1996)
- Chestnut Oak: 44, in part (Eyre 1980)

**Comments:****ALLIANCE DISTRIBUTION**

**Range:** This alliance occurs in the southern and central Appalachians, Ridge and Valley, Cumberland Plateau, Piedmont, Interior Low Plateau, and possibly in the northern Appalachians. It is found in Illinois, Indiana, Ohio, Connecticut, Delaware, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, Virginia, Alabama, Georgia, Kentucky, North Carolina, South Carolina, and Tennessee, and possibly Maine (?), Maryland (?), Mississippi (?), and West Virginia (?).

**States:** AL CT DE GA IL IN KY MA MD ME MS? NC NH NJ NY OH PA RI SC TN VA VT WV

**USFS Ecoregions:** 212E:P, 212F:P, 212G:P, 221A:C, 221B:C, 221D:C, 221E:C, 221F:C, 221H:C, 221I:P, 221J:C, 222A:C, 222C:C, 222D:C, 222E:C, 222F:C, 222H:C, 231A:C, 231B:P, 231C:C, 231D:C, 232A:P, 232B:P, 232C:P, M212B:P, M212C:C, M212D:C, M212E:P, M221A:C, M221B:C, M221C:P, M221D:C

**Federal Lands:** DOD (Fort Knox); NPS (Carl Sandburg Home, Chickamauga-Chattanooga, Great Smoky Mountains, Kings Mountain, Rock Creek, Russell Cave); TVA (Land Between the Lakes, Tellico); USFS (Bankhead, Chattahoochee, Cherokee, Daniel Boone, George Washington, Jefferson, Nantahala, Oconee?, Pisgah, Sumter, Talladega?, Uwharrie)

**ALLIANCE SOURCES**

**References:** Allard 1990, Arends 1981, Callaway et al. 1987, Cooper 1963, DuMond 1970, Evans 1991, Eyre 1980, Faber-Langendoen et al. 1996, Fleming and Moorhead 1996, Gibbon 1966, Golden 1974, Martin 1989, McLeod 1988, Mowbray 1966, Nelson 1986, Newell and Peet 1996a, Patterson 1994, Peet and Christensen 1980, Rawinski 1992, Rawinski et al. 1996, Schafale and Weakley 1990, Schmalzer 1978, Tobe et al. 1992, Wells 1974, Wheat 1986, Whittaker 1956

## **I.B.2.N.a.37 ROCK CHESTNUT OAK - (WHITE OAK, SOUTHERN RED OAK, NORTHERN RED OAK, BLACK OAK) FOREST ALLIANCE (A.249)**

### **QUERCUS PRINUS - QUERCUS (ALBA, FALCATA, RUBRA, VELUTINA) FOREST ALLIANCE**

**ALLIANCE CONCEPT**

**Summary:** Dry-mesic to mesic forests dominated by *Quercus prinus* occurring in admixture with other *Quercus* species, in the Blue Ridge, Piedmont, Ridge and Valley, Cumberland Plateau, and the Interior Low Plateau. *Quercus prinus* is the leading dominant in these forests, but other common canopy species can include *Quercus alba*, *Quercus coccinea*, *Quercus falcata*, *Quercus rubra*, *Quercus velutina*, *Acer rubrum*, *Carya alba*, *Carya glabra*, *Carya ovalis*, *Carya ovata*, *Carya pallida*, *Fagus grandifolia*, *Liriodendron tulipifera*, *Nyssa sylvatica*, and *Pinus strobus*. The subcanopy often contains *Cornus florida* and *Oxydendrum arboreum*. Drier examples can contain *Juniperus virginiana* var. *virginiana*. Other common species in the subcanopy/shrub stratum include *Acer rubrum*, *Carya glabra*, *Cercis canadensis*, *Hamamelis virginiana*, *Kalmia latifolia*, *Nyssa sylvatica*, *Rhododendron calendulaceum*, *Rhododendron maximum*, *Robinia pseudoacacia*, *Stewartia ovata*, *Symplocos tinctoria*, *Vaccinium stamineum*, and *Viburnum acerifolium*. The ground flora varies depending on available light, moisture, and soil nutrients but can be quite diverse, especially in associations with sparse shrub cover. Herbaceous species characteristic of these dry-mesic to mesic oak - hickory forests include *Symphyotrichum cordifolium* (= *Aster cordifolius*), *Symphyotrichum retroflexum* (= *Aster curtisii*), *Eurybia macrophylla* (= *Aster macrophyllus*), *Symphyotrichum undulatum* (= *Aster undulatus*), *Botrychium virginianum*, *Carex nigromarginata*, *Chimaphila maculata*, *Actaea racemosa* (= *Cimicifuga racemosa*), *Collinsonia canadensis*, *Coreopsis major*, *Cypripedium parviflorum* var. *pubescens* (= *Cypripedium pubescens*), *Danthonia compressa*, *Danthonia spicata*, *Dioscorea villosa*, *Epigaea repens*, *Eupatorium album*, *Eupatorium purpureum*, *Galax urceolata*, *Galium triflorum*, *Houstonia purpurea* (= *Hedyotis purpurea*), *Hieracium venosum*, *Iris cristata*, *Maianthemum racemosum*, *Medeola virginiana*, *Melanthium parviflorum*, *Polystichum acrostichoides*, *Prenanthes altissima*, *Pycnanthemum incanum*, *Scutellaria ovata*, *Tephrosia virginiana*, *Uvularia perfoliata*, and *Uvularia puberula*. Vines are common and species that may be present include *Parthenocissus quinquefolia*, *Smilax* spp., and *Toxicodendron radicans*. In the Cumberland Plateau, forests in this alliance have replaced forests once dominated by *Castanea dentata* and often have chestnut sprouts in the understory. Forests in this alliance are known from moderately sheltered low ridges, flats, and valleys at lower elevations (762-1036 m; 2500-3400 feet) in the Blue Ridge and from upper

slopes, draws, and gorge slopes in the Cumberland Plateau, and from upper to middle, dry-mesic slopes in the Piedmont. This alliance provisionally includes forests over limestone in the lower portions of the Ridge and Valley.

**Synonymy:**

- Chestnut Oak Slope and Ridge Forest (Wieland 1994b)
- Dry-Mesic Oak--Hickory Forest, in part (Schafale and Weakley 1990)
- Mixed Oak, Yellow Poplar, Hickory (McLeod 1988)
- Mesic Oak-Hickory Forest (Patterson 1994)
- Oak-Hickory Cover Type (Thomas 1966)
- Mixed Oak Cover Type (Thomas 1966)
- Chestnut Oak: 44, in part (Eyre 1980)
- White Oak - Black Oak - Northern Red Oak: 52, in part (Eyre 1980)

**Comments:**

**ALLIANCE DISTRIBUTION**

**Range:** This alliance is found in Alabama, Georgia (?), Kentucky, Mississippi (?), North Carolina, South Carolina, Tennessee, New Jersey, New York, Virginia, West Virginia, and Ohio. Forests in this alliance occur in the Blue Ridge, Piedmont, Ridge and Valley, Cumberland Plateau, and the Interior Low Plateau.

**States:** AL GA? KY? MD? NC NJ NY SC TN VA WV?

**USFS Ecoregions:** 221H:C, 221J:C, 222E:C, 231A:C, 231B:C, 231D:C, 232A:C, M221A:C, M221C:C, M221D:C

**Federal Lands:** DOE (Oak Ridge); NPS (Chickamauga-Chattanooga, Kennesaw Mountain, Kings Mountain); TVA (Land Between the Lakes?, Tellico); USFS (Cherokee, Daniel Boone, George Washington, Jefferson, Nantahala, Oconee?, Pisgah, Sumter, Talladega, Uwharrie)

**ALLIANCE SOURCES**

**References:** Andreu and Tukman 1995, Eyre 1980, Fralish and Crooks 1989, Franklin et al. 1993, Golden 1979, Martin 1971, McLeod 1988, Nowacki and Abrams 1992, Patterson 1994, Schafale and Weakley 1990, Schmalzer 1978, Schmalzer and DeSelm 1982, Thomas 1966, Wells 1970c, Wells 1974, Wieland 1994b

**I.B.2.N.a.38 ROCK CHESTNUT OAK - NORTHERN RED OAK FOREST ALLIANCE (A.250)**  
**QUERCUS PRINUS - QUERCUS RUBRA FOREST ALLIANCE**

**ALLIANCE CONCEPT**

**Summary:** This alliance includes dry-mesic oak forests, codominated by *Quercus prinus* and *Quercus rubra*, at moderate elevations in the Blue Ridge, Ridge and Valley, and High Alleghenies of Virginia, western North Carolina, eastern Tennessee, South Carolina, and Georgia. It also includes transitional oak - hickory forests of Lower New England and 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, but no associations have been defined for these regions. The majority of the 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 prinus*, although other mesic hardwood species can codominate or be present in the canopy and subcanopy. Typical tree associates include *Liriodendron tulipifera*, *Acer rubrum*, *Hamamelis virginiana*, *Acer pensylvanicum*, and *Oxydendrum arboreum*. In the Appalachian Mountains, shrub layers are often dense and dominated by ericaceous species, *Rhododendron maximum* (especially on northerly aspects), *Rhododendron minus*, *Kalmia latifolia*, *Gaylussacia* spp., and *Vaccinium* spp. Herbaceous coverage tends to be inversely proportional to the shrub coverage. *Galax urceolata* and *Gaultheria procumbens* are components in sparse herb strata. Other herbs typical of these forests include *Solidago curtisii*, *Lysimachia quadrifolia*, *Thelypteris noveboracensis*, *Gentiana decora*, *Sanicula trifoliata*, *Prenanthes altissima*, *Dichanthelium* spp. (*Dichanthelium boscii*, *Dichanthelium commutatum*, *Dichanthelium dichotomum*), *Carex pensylvanica*, *Polystichum acrostichoides*, *Chimaphila maculata*, *Desmodium nudiflorum*, *Galium latifolium*, *Houstonia purpurea*, and *Maianthemum racemosum* ssp. *racemosum*. In montane landscapes, these forest 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.

**Synonymy:**

- Appalachian sub-xeric forest, in part (Evans 1991)
- Chestnut Oak Forest, in part (Schafale and Weakley 1990)
- Dry-Mesic Oak--Hickory Forest, in part (Schafale and Weakley 1990)
- Oak - Chestnut - Hickory Forest (Ambrose 1990a)
- Oak--Hickory Forest, in part (Nelson 1986)
- *Quercus prinus* - *Quercus rubra* / *Acer pensylvanicum* Association (Fleming and Moorhead 1996)
- Chestnut Oak: 44, in part (Eyre 1980)

**Comments:**

**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 Lower New England and 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, but no associations have been defined for these regions.

**States:** GA KY MD? NC NJ? PA SC TN VA WV?

**USFS Ecoregions:** 221A:P, 221D:P, 221E:?, 221F:?, 221H:?, 221J:?, 231A:P, M221A:C, M221B:C, M221C:?, M221D:C

**Federal Lands:** NPS (Carl Sandburg Home, Great Smoky Mountains); USFS (Chattahoochee, Cherokee, George Washington, Jefferson, Nantahala, Pisgah, Sumter)

**ALLIANCE SOURCES**

**References:** Ambrose 1990a, Evans 1991, Eyre 1980, Fleming and Moorhead 1996, Golden 1981, Livingston and Mitchell 1976, McLeod 1988, Mowbray 1966, Nelson 1986, Nowacki and Abrams 1992, Rheinhardt 1981, Schafale and Weakley 1990

### **I.B.2.N.a.44 BLACK LOCUST FOREST ALLIANCE (A.256)** ROBINIA PSEUDOACACIA FOREST ALLIANCE

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**ALLIANCE CONCEPT**

**Summary:** Stands of this alliance are forests where *Robinia pseudoacacia* occurs 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. Stands are usually small (10-15 ha, 30-40 acres), with associated species varying widely depending on geography and habitat. *Robinia pseudoacacia* has been planted widely and has become naturalized throughout the United States, southern Canada, and parts of Europe and Asia. The natural range of *Robinia pseudoacacia* is disjunct, with an eastern section centered in the Appalachian Mountains, from central Pennsylvania and southern Ohio, south to northeastern Alabama, northern Georgia, and northwestern South Carolina, and a western section in the Ozarks and Ouachita Mountains of Missouri, Arkansas, and Oklahoma. Forests in this alliance are found locally throughout the eastern United States and in southern Canada on a wide range of sites, but are best developed on moist, rich, loamy soils or those of limestone origin.

**Synonymy:**

- *Robinia pseudoacacia* woodland alliance (Hoagland 1998a)
- Black Locust: 50, in part (Eyre 1980)

**Comments:****ALLIANCE DISTRIBUTION**

**Range:** *Robinia pseudoacacia* has been planted widely and has become naturalized throughout the United States, southern Canada, and parts of Europe and Asia. The natural range of *Robinia pseudoacacia* is disjunct, with an eastern section centered in the Appalachian Mountains, from central Pennsylvania and southern Ohio, south to northeastern Alabama, northern Georgia, and northwestern South Carolina, and a western section in the Ozarks and Ouachita Mountains of Missouri, Arkansas, and Oklahoma. Forests in this alliance are found locally throughout the eastern United States and in southern Canada on a wide range of sites. This alliance is found in Arkansas, Kentucky, Mississippi, North Carolina, Oklahoma, Tennessee, Virginia, West Virginia, and Iowa.

**States:** AR IA KY MS NC OK PA TN VA WV

**USFS Ecoregions:** 221H:P, 221J:C, 222A:C, 232:?, M221A:C, M221B:P, M221C:P, M221D:C, M231A:C

**Federal Lands:** NPS (Shenandoah); TVA (Tellico); USFS (Cherokee?, Daniel Boone, George Washington, Jefferson, Nantahala, Ouachita, Ozark, Pisgah)

**ALLIANCE SOURCES**

**References:** Andreu and Tukman 1995, Burns and Honkala 1990b, Eyre 1980, Hoagland 1998a

### **I.B.2.N.a.100 BLACK OAK - WHITE OAK - (SCARLET OAK) FOREST ALLIANCE (A.1911)** QUERCUS VELUTINA - QUERCUS ALBA - (QUERCUS COCCINEA) FOREST ALLIANCE

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**ALLIANCE CONCEPT**

**Summary:** Forests in this alliance represent the drier end of the white oak - red oak - black oak cover type and are difficult to identify easily. This alliance is distributed in the Ozark Highlands, Ouachita Mountains, Arkansas Valley, the Interior Highlands, Piedmont, Inner Coastal Plain, and Blue Ridge. Stands are codominated by some combination of *Quercus alba*, *Quercus coccinea*, *Quercus velutina*, and/or *Quercus rubra*. In addition, *Quercus stellata*, *Quercus prinus*, *Carya alba*, *Carya glabra*, *Carya ovata*, *Pinus virginiana*, and *Pinus echinata* are common associates. Other common associates can

include *Nyssa sylvatica*, *Acer rubrum* var. *rubrum*, *Sassafras albidum*, *Quercus falcata*, *Quercus macrocarpa* (within its range), and *Prunus serotina* var. *serotina*. Typical shrubs and small trees include *Cornus florida*, *Corylus americana*, *Ostrya virginiana*, *Oxydendrum arboreum*, *Sassafras albidum*, *Kalmia latifolia*, *Rhododendron calendulaceum*, *Gaylussacia ursina*, *Vaccinium* spp., *Viburnum acerifolium*, and *Hamamelis virginiana*. The herbaceous composition varies considerably over the wide range of this alliance. Some common herbs include *Agrimonia rostellata*, *Amphicarpaea bracteata*, *Botrychium virginianum*, *Carex blanda*, *Danthonia spicata*, *Antennaria plantaginifolia*, *Desmodium nudiflorum*, *Thelypteris noveboracensis*, *Prenanthes altissima*, *Galium* spp., *Dioscorea villosa*, *Conopholis americana*, *Polygonatum biflorum*, *Medeola virginiana*, and *Maianthemum racemosum*. Stands can be found on mid to upper slopes and terraces where dry-mesic conditions persist and where soils are more sandy and/or rocky. Bedrock is sandstone, siltstone, chert, or shale. Disturbance in the form of wind and logging tends to favor *Quercus velutina* in these forests. These forests generally occur on slopes and sheltered ridgetops. One example from the Interior Low Plateau of Tennessee occurs on high, ancient, elevated terraces adjacent to river floodplains.

**Synonymy:**

- Submesic Oak - Hickory Forest (Foti 1994b)
- Acidic sub-xeric forest, in part (Evans 1991)
- Montane Oak--Hickory Forest, in part (Schafale and Weakley 1990)
- T1B4aII4c. *Quercus alba* - *Quercus velutina* - *Quercus falcata* (Foti et al. 1994)
- White Oak - Black Oak - Northern Red Oak: 52, in part (Eyre 1980)

**Comments:** It is not clear (2001-08-19) what the Piedmont manifestations of this alliance are. It is attributed to Kings Mountain NMP, Sumter NF, etc. but no association captures these attributes. Is a "provisional" justified? A new association will be added from the Arkansas Field Office Ouachita Inventory. This alliance is also present in Virginia, at least in the Ridge and Valley; a new association is likely needed. Stands previously placed in this alliance that occur in what are called inland maritime situations in older mature stands in the Outer Coastal Plain of South Carolina (C. Aulbach-Smith pers. comm.) need to be accommodated elsewhere. In Kentucky, these forests lack *Quercus rubra* as a dominant and occur in the Shawnee Hills and on upper slopes and ridgetops in the Appalachian Plateaus, and are abundant in the Interior Low Plateau.

**ALLIANCE DISTRIBUTION**

**Range:** This alliance is distributed in the Ozark Highlands, Ouachita Mountains, Arkansas Valley, the Interior Highlands, Piedmont, and Blue Ridge. It is found in Arkansas, Georgia, North Carolina, South Carolina, Tennessee, Connecticut, Massachusetts, Maryland, Maine, New Hampshire, New Jersey, Pennsylvania, Rhode Island, Virginia, West Virginia, Iowa, Illinois, Indiana, Michigan, Minnesota, Missouri, Ohio, and Wisconsin, and in Ontario, Canada, and possibly in Alabama (?), Kentucky (?), Mississippi (?), and Oklahoma (?).

**States:** AL? AR CT DE? GA IA IL IN KY? MA MD MI MN MO MS? NC NH NJ NY OH ON PA RI SC? TN VA WI WV

**USFS Ecoregions:** 212F:P, 212G:P, 212H:P, 221A:C, 221D:P, 221E:P, 221F:P, 221J:C, 222A:C, 222C:C, 222D:C, 222E:C, 222F:C, 222G:C, 222H:C, 222I:C, 222J:C, 222K:C, 222L:C, 222M:C, 231A:P, 231G:C, 232A:C, 232B:C, 251C:C, 251D:C, M221A:C, M221B:C, M221C:P, M221D:C

**Federal Lands:** DOD (Arnold, Fort Benning); NPS (Buffalo, Fire Island, Kings Mountain, Russell Cave, Shiloh?); TVA (Tellico); USFS (Cherokee?, Daniel Boone?, George Washington, Holly Springs?, Jefferson, Nantahala, Ouachita, Ozark, Pisgah, Sumter, Talladega, Tuskegee, Uwharrie)

**ALLIANCE SOURCES**

**References:** Aulbach-Smith pers. comm., Evans 1991, Eyre 1980, Faber-Langendoen et al. 1996, Foti 1994b, Foti et al. 1994, Jones 1988a, Jones 1988b, Schafale and Weakley 1990

**I.B.2.N.a.101 CHINQUAPIN OAK - (SUGAR MAPLE) FOREST ALLIANCE (A.1912)  
QUERCUS MUEHLENBERGII - (ACER SACCHARUM) FOREST ALLIANCE**

**ALLIANCE CONCEPT**

**Summary:** This alliance includes a variety of dry, dry-mesic, and mesic forests, dominated by *Quercus muehlenbergii* and possibly *Acer saccharum*, the canopy often also including other hardwood species associated with high base substrates (e.g., limestone or dolomite) under a variety of moisture conditions. These include *Quercus alba*, *Quercus shumardii*, *Fraxinus americana*, *Fraxinus quadrangulata*, *Acer barbatum*, *Tilia americana*, *Carya* spp., *Juglans nigra*, and *Liriodendron tulipifera* (in the more interior portions of the alliance's distribution), and *Quercus sinuata* var. *sinuata* and *Carya myristiciformis* (in the southwestern, Coastal Plain portion of the alliance's distribution). The habitat of this alliance includes mesic and dry-mesic forests over limestones in the Nashville Basin of Tennessee, dry-mesic slopes associated with prairie openings in Louisiana, moist limestone slopes in the Edwards Plateau of Texas, blackland soils in the upper West Gulf Coastal Plain of Arkansas, lowlands and mesic slopes of Oklahoma and adjacent Arkansas, as well as related habitats in states farther east (e.g., Alleghenies and lower Cumberland Plateau escarpment). Forests in Kentucky and Tennessee have *Quercus shumardii* and *Frangula caroliniana* and occur over limestone on south-facing slopes. There are scattered

occurrences on benches and clifftops on the Daniel Boone National Forest. In the Coastal Plain of Virginia, this alliance is represented by somewhat open canopy 'shell barren' forests dominated by *Quercus muehlenbergii* with *Acer barbatum*. On rare occurrences of limestone in the Southern Blue Ridge of North Carolina, *Quercus muehlenbergii* occurs with *Juglans nigra*, *Fraxinus americana*, and *Acer saccharum*. Understory species may include *Cornus florida*, *Cercis canadensis*, *Calycanthus floridus*, *Cornus alternifolia*, *Ostrya virginiana*, and *Hydrangea arborescens*. In the Northeast, the shrub layer is sparse and may contain *Hamamelis virginiana*, *Zanthoxylum americanum*, and *Cornus alternifolia*. In some more southerly examples, shrubs may include *Forestiera ligustrina*, *Frangula caroliniana*, and *Symphoricarpos orbiculatus*. The herbaceous layer may contain *Asclepias quadrifolia*, *Clematis occidentalis* (= *Clematis verticillaris*) (in northeastern examples), *Packera obovata* (= *Senecio obovatus*), *Phryma leptostachya*, *Saxifraga virginiana*, *Arabis laevigata*, and *Triosteum aurantiacum*. Two unusual communities of this alliance are lowland forests from the Upper West Gulf Coastal Plain of Arkansas. In the Northeast, the habitat is characterized as upper slopes or summits of limestone or marble ridges with dry soil-moisture regimes. Limestone outcrops or boulders may be present, as well as Karst collapse features. In the Southeast, mesic to dry limestone-derived soils may occur as well on flatter landforms, as in the Nashville Basin of Tennessee. In the Southeast, this vegetation is known from the Ridge and Valley, lower Cumberland Plateau escarpment, Highland Rim escarpment, and Nashville Basin in Tennessee; the Highland Rim, Bluegrass and Dripping Springs escarpment in Kentucky; the Cumberland Plateau in Alabama; as well as rarely in the Southern Blue Ridge and Coastal Plain. Isolated occurrences are reported in northern Arkansas on moderately shallow soils, often on glade margins. It also occurs in the Arbuckle Mountains of Oklahoma and the Edwards Plateau of Texas. If this alliance occurs in the Upper East Gulf Coastal Plain, stands would contain *Acer barbatum* instead of *Acer saccharum*.

#### Synonymy:

- IA6k. Sugar Maple - Oak - Hickory Forest, in part (Allard 1990)
- Sugar Maple - Oak - Hickory Forest, in part (Pyne 1994)
- IA6j. Interior Calcareous Oak - Hickory Forest. in part? (Allard 1990)
- Calcareous xeric forest, in part (Evans 1991)
- Calcareous sub-xeric forest, in part (Evans 1991)
- Calcareous mesophytic forest, in part (Evans 1991)
- Basic Mesic Forest, Montane Calcareous Subtype (Schafale and Weakley 1990)
- *Quercus muehlenbergii* forest alliance (Hoagland 1997)
- Bigtooth Maple-Oak Series, in part (Diamond 1993)
- Sugar Maple: 27, in part (Eyre 1980)

**Comments:** This alliance was created by the merger of the former *Acer saccharum* - *Quercus muehlenbergii* Forest Alliance and the former *Quercus muehlenbergii* Forest Alliance. MP 6-01: On the southern flank of the alliance's distribution, the sugar maple which is present is *Acer barbatum* (= *Acer saccharum* var. *floridanum*), not *Acer saccharum* var. *saccharum*. Is this a problem?

#### ALLIANCE DISTRIBUTION

**Range:** This alliance may be found in Alabama, Arkansas, Kentucky, Louisiana, North Carolina, Oklahoma, South Carolina (?), Tennessee, Texas, Connecticut, Maryland, Massachusetts, New Jersey, New York, Pennsylvania, Vermont, Virginia, West Virginia, Illinois, Indiana, Michigan (?), Missouri, Nebraska (?), and Ohio, and in Canada in Ontario. In the Southeast, this vegetation is known from the Ridge and Valley, lower Cumberland Plateau escarpment, Highland Rim escarpment, and Central Basin in Tennessee; the Highland Rim, Bluegrass and Dripping Springs escarpment in Kentucky; the Cumberland Plateau in Alabama; as well as rarely in the Southern Blue Ridge and coastal plain. Isolated occurrences are reported in northern Arkansas on moderately shallow soils, often on glade margins. It also occurs in the Arbuckle Mountains of Oklahoma and the Edwards Plateau of Texas.

**States:** AL AR CT GA IL? IN KY LA MA MD MI? NC NJ NY OH OK ON PA SC? TN TX VA VT WV

**USFS Ecoregions:** 212B:C, 212E:C, 221A:C, 221B:C, 221D:C, 221E:C, 221H:C, 221J:C, 222A:C, 222D:C, 222E:C, 222F:C, 222H:C, 222I:C, 231B:P, 231C:C, 231D:C, 231E:C, 231G:C, 232B:C, 232C:?, 232F:C, 251E:?, 255A:C, 311A:C, 315D:C, M212B:C, M212C:C, M221A:C, M221B:C, M221C:C, M221D:C

**Federal Lands:** COE (J. Percy Priest?, Lake Millwood); NPS (Colonial, Cumberland Gap?, Great Smoky Mountains?, Russell Cave?, Stones River?); TVA (Columbia, Tellico); USFS (Bankhead, Chattahoochee, Cherokee, Daniel Boone, George Washington, Jefferson, Kisatchie, Ozark, Pisgah); USFWS (Wichita Mountains)

#### ALLIANCE SOURCES

**References:** Allard 1990, Andreu and Tukman 1995, Bowen et al. 1995, Campbell 1980, Crites and Clebsch 1986, Evans 1991, Eyre 1980, Faber-Langendoen et al. 1996, Fowells 1965, Hoagland 1998a, Pyne 1994, Schafale and Weakley 1990, Ware and Ware 1992

### I.B.2.N.a.103 WHITE OAK MONTANE FOREST ALLIANCE (A.271)

#### QUERCUS ALBA MONTANE FOREST ALLIANCE

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##### ALLIANCE CONCEPT

**Summary:** This alliance includes montane forests where *Quercus alba* is the main canopy dominant, contributing at least 75% of the canopy coverage. These forests are limited to areas where elevation is the primary gradient influencing vegetation. Associations currently defined for this alliance are naturally rare, being found in uncommon environmental situations. Forests in this alliance include *Quercus alba* forests of 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. Associated species in the Ouachita Mountains association include *Quercus rubra*, *Quercus stellata*, *Carya texana*, *Quercus marilandica*, *Amelanchier arborea*, *Acer rubrum*, *Sassafras albidum*, *Vaccinium* spp., *Rubus* spp., *Nyssa sylvatica*, *Hamamelis virginiana*, *Liquidambar styraciflua*, *Rhus copallinum*, *Rhus glabra*, *Pinus echinata*, *Chionanthus virginicus*, *Ulmus alata*, *Smilax* spp., *Rubus* spp., *Carex pensylvanica*, *Carex albicans* var. *albicans*, *Carex nigromarginata*, and *Carex ouachitana*; in the southern Appalachian association, *Kalmia latifolia*, *Gaylussacia ursina*, *Carex pensylvanica*, *Chimaphila maculata*, *Euphorbia corollata*, *Galax urceolata*, *Galium latifolium*, *Goodyera pubescens*, *Hexastylis shuttleworthii*, *Iris verna*, *Medeola virginiana*, *Castanea dentata*, *Castanea pumila*, *Sassafras albidum*, *Oxydendrum arboreum*, *Nyssa sylvatica*; and over serpentine, *Pinus rigida*, *Tsuga canadensis*, *Acer rubrum*, *Amelanchier arborea*, *Magnolia acuminata*, *Kalmia latifolia*, *Viburnum nudum* var. *cassinoides*, *Vaccinium stamineum*, *Physocarpus opulifolius*, *Packera plattensis* (= *Senecio plattensis*), *Hexastylis arifolia* var. *ruthii*, *Polygala paucifolia*, *Epigaea repens*, *Michella repens*, *Pteridium aquilinum* var. *latiusculum*, *Thalictrum macrostylum*, *Poa saltuensis*, *Phlox stolonifera*, *Andropogon gerardii*, and *Zizia aptera*.

##### Synonymy:

- IA4h. High Elevation White Oak Forest (Allard 1990)
- IE9b. Blue Ridge/Piedmont Ultramafic Barren, in part (Allard 1990)
- IB4a. Dwarf White Oak Woodland (Allard 1990)
- Ultramafic Outcrop Barren, in part (Schafale and Weakley 1990)
- Montane White Oak Forest, in part (Schafale and Weakley 1990)
- *Quercus alba* forest association (Hoagland 1998a)
- Stunted White Oak Woodland (Foti 1994b)
- T1B4bI1a. *Quercus alba* (stunted) (Foti et al. 1994)
- White Oak: 53, in part (Eyre 1980)

##### Comments:

##### ALLIANCE DISTRIBUTION

**Range:** Forests in this alliance occur in the highest portions of the Ouachita Mountains, at middle to high elevations in the southern Appalachians, and in association with serpentine geology in the Southern Blue Ridge of western North Carolina. This alliance is found in Arkansas, Georgia, North Carolina, Oklahoma, South Carolina, and Tennessee.

**States:** AR GA NC OK SC TN

**USFS Ecoregions:** M221A:?, M221D:C, M231A:C

**Federal Lands:** NPS (Great Smoky Mountains?); USFS (Chattahoochee, Cherokee, Nantahala, Ouachita, Pisgah)

##### ALLIANCE SOURCES

**References:** Allard 1990, Eyre 1980, Foti 1994b, Foti et al. 1994, Glenn 1990, Hoagland 1998a, Kauffman pers. comm., Mansberg and Wentworth 1984, McCormick and Platt 1980, Newell and Peet 1995, Nuttall 1821, Palmer 1924, Patterson 1994, Pell and Rettig 1983, Schafale and Weakley 1990

### I.B.2.N.a.104 YELLOW BIRCH - AMERICAN BEECH - YELLOW BUCKEYE FOREST ALLIANCE (A.266)

#### BETULA ALLEGHANIENSIS - FAGUS GRANDIFOLIA - AESCULUS FLAVA FOREST ALLIANCE

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##### 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 between 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*, *Ribes cynosbati*, *Ribes rotundifolium*, *Ribes glandulosum*, *Rubus allegheniensis*, *Rubus canadensis*, *Vaccinium erythrocarpum*, and *Viburnum lantanoides*. The composition of herbaceous strata varies between 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 pennsylvanica*), 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*. These forests occur in a cool, humid climate, typically at high elevations (3500-6000 feet; 1066-1828 m) 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.

#### Synonymy:

- IA4e. Southern Appalachian Northern Hardwoods Forest (Allard 1990)
- IA4d. Southern Appalachian Beech Gap (Allard 1990)
- IA4c. Yellow Birch Boulderfield Forest (Allard 1990)
- Boulderfield Forest (Ambrose 1990a)
- Cumberland highlands forest (Evans 1991)
- Northern Hardwoods Forest (Schafale and Weakley 1990)
- Boulderfield Forest (Schafale and Weakley 1990)
- Spruce - Hardwood, BR, in part (Pyne 1994)
- Yellow Birch, BR (Pyne 1994)
- Beech, BR (Pyne 1994)
- Oligotrophic Forest, in part (Rawinski 1992)
- *Betula alleghaniensis*/*Rubus idaeus* ssp. *strigosus*/*Sedum telephioides* Association (Rawinski et al. 1994)
- Sugar Maple - Beech - Yellow Birch: 25, in part (Eyre 1980)

#### Comments:

#### ALLIANCE DISTRIBUTION

**Range:** Forests in this alliance are found in the high-elevation regions of the Blue Ridge 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.

**States:** GA KY NC TN VA WV

**USFS Ecoregions:** M221A:C, M221B:?, M221C:C, M221D:C

**Federal Lands:** NPS (Blue Ridge Parkway, Great Smoky Mountains); USFS (Chattahoochee, Cherokee, Jefferson, George Washington, Nantahala, Pisgah, Sumter?)

#### ALLIANCE SOURCES

**References:** Allard 1990, Ambrose 1990a, Bratton 1975, Brown 1941, Chafin and Jones 1989, Davis 1930, Dellinger 1992, Evans 1991, Evans, M., pers. comm., Eyre 1980, Fuller 1977, Golden 1974, Golden 1981, Malter 1977, McLeod 1988, Pittillo and Smathers 1979, Pyne 1994, Ramseur 1960, Rawinski 1992, Rawinski et al. 1994, Rheinhardt 1981, Russell 1953, Schafale and Weakley 1990, Schofield 1960, Singer et al. 1984, Stamper 1976, Wharton 1978, White et al. 1993, Whittaker 1956, Wood 1975

## I.B.2.N.a.108 NORTHERN RED OAK MONTANE FOREST ALLIANCE (A.272)

### QUERCUS RUBRA MONTANE FOREST ALLIANCE

#### ALLIANCE CONCEPT

**Summary:** This alliance includes *Quercus rubra*-dominated forest vegetation of high elevations (over 3500 feet), montane landscapes 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*, *Crataegus punctata*, *Crataegus flabellata*, *Betula alleghaniensis*, and *Betula lenta*. *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 *Hamamelis virginiana*, *Amelanchier arborea*, *Acer pensylvanicum*, *Halesia tetraptera*, 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 between occurrences. Typical herbaceous species include *Ageratina altissima* var. *roanensis*, *Oclemena acuminata* (= *Aster acuminatus*), *Eurybia chlorolepis* (= *Aster chlorolepis*), *Eurybia divaricata* (= *Aster divaricatus*), *Athyrium filix-femina* ssp. *asplenoides*, *Carex pensylvanica*, *Clintonia umbellulata*, *Collinsonia canadensis*, *Conopholis americana*, *Dennstaedtia punctilobula*, *Dioscorea villosa*, *Laportea canadensis*, *Lysimachia quadrifolia*, *Medeola virginiana*, *Monarda fistulosa*, *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 *Rhododendron calendulaceum*, *Vaccinium simulatum*, *Vaccinium erythrocarpum*, *Ilex montana*, *Gaylussacia ursina*, *Rubus canadensis*, *Corylus cornuta*, and *Lyonia ligustrina*. Where shrub cover is dense, the herbaceous stratum is not diverse and is typically very sparse with scattered forbs; *Galax urceolata*, *Solidago curtisii*, *Epigaea repens*, *Dennstaedtia punctilobula*, *Conopholis americana*, *Thelypteris noveboracensis*, *Clintonia umbellulata*, *Eurybia divaricata*, and *Dioscorea villosa*. 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. Forests in this alliance typically occur 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. Soils supporting these forests tend to have relatively high base status. Forests in this alliance 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 in this alliance 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. On exposed sites these forests commonly contain, as inclusions, acidic rock outcrop communities and montane shrublands, and may grade into forests dominated by *Tsuga caroliniana*, *Pinus rigida*, *Pinus pungens*, and *Quercus prinus*. At higher elevations these forests often occur adjacent to or grade into forests dominated by *Picea rubens*, *Abies fraseri*, or northern hardwood species (*Betula alleghaniensis*, *Fagus grandifolia*, *Aesculus flava*). In some areas, forests in this alliance are found adjacent to montane shrublands and grasslands. At low elevations, on dry sites, forests in this alliance 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. The fungus *Cryphonectria parasitica* (= *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*.

#### Synonymy:

- IA4g. High Elevation Northern Red Oak Forest (Allard 1990)
- Submesic Oak Ridge Forest (Ambrose 1990a)
- High Elevation Red Oak Forest (Schafale and Weakley 1990)
- Northern Red Oak, BR (Pyne 1994)
- Permesotrophic Forest, in part (Rawinski 1992)
- Submesotrophic Forest, in part (Rawinski 1992)
- *Quercus rubra* - *Carya ovata* / *Helianthus decapetalus* Association (Rawinski et al. 1996)
- *Osmunda claytoniana* Subassociation (Rawinski et al. 1996)
- *Quercus rubra* / *Ilex montana* / *Dennstaedtia punctilobula* - *Melanthium parviflorum* Association (Rawinski et al. 1996)
- *Quercus rubra* - *Betula alleghaniensis* / *Rhododendron catawbiense* / *Angelica triquinata* - *Aster acuminatus* Association (Rawinski et al. 1996)
- Northern Red Oak: 55, in part (Eyre 1980)

**Comments:** Associations yet to be defined in this alliance include forests of the central Appalachians and possibly a distinct amphibolite type in the North Carolina mountains. High-elevation *Quercus rubra* - *Quercus alba* forests also occur over greenstone in Virginia's Ridge and Valley (G. Fleming pers. comm.).

**ALLIANCE DISTRIBUTION**

**Range:** This alliance includes *Quercus rubra*-dominated forest vegetation of high elevations (over 3500 feet), montane landscapes in the central and southern Appalachians. It may possibly range into Kentucky's Cumberland Mountains. This alliance is found in Georgia, North Carolina, Tennessee, and Virginia, and may extend into Kentucky (?), South Carolina (?), and West Virginia (?).

**States:** GA KY? NC SC? TN VA WV?

**USFS Ecoregions:** M221A:C, M221B:C, M221C:?, M221D:C

**Federal Lands:** NPS (Blue Ridge Parkway, Great Smoky Mountains); USFS (Chattahoochee, Cherokee, George Washington, Jefferson, Nantahala, Pisgah)

**ALLIANCE SOURCES**

**References:** Allard 1990, Ambrose 1990a, DeLapp 1978, Eyre 1980, Fleming pers. comm., Golden 1974, McLeod 1988, McNab and Browning 1993, Pyne 1994, Rawinski 1992, Rawinski et al. 1996, Schafale and Weakley 1990, Stephenson and Adams 1989, Weakley 1980, Wharton 1978, Whigham 1969, Whittaker 1956

**I.B.2.N.d. Temporarily flooded cold-deciduous forest****I.B.2.N.d.14 SYCAMORE - (SWEETGUM, TULIPTREE) TEMPORARILY FLOODED FOREST ALLIANCE (A.289)****PLATANUS OCCIDENTALIS - (LIQUIDAMBAR STYRACIFLUA, LIRIODENDRON TULIPIFERA) TEMPORARILY FLOODED FOREST ALLIANCE****ALLIANCE CONCEPT**

**Summary:** Forests in this alliance typically are dominated by *Platanus occidentalis* with *Liquidambar styraciflua* and/or *Liriodendron tulipifera*, and typically occur on rocky streambeds and alluvial deposits on relatively high-gradient rivers. The alliance is distributed in the upper Piedmont, Appalachian Mountains, Interior Low Plateau, Cumberland Mountains, and Cumberland Plateau regions. In the eastern part of the Interior Low Plateau, vegetation of this alliance may be in lower gradient situations. Other canopy and understory species that may be present include *Aesculus sylvatica* (within its range), *Asimina triloba*, *Cornus florida*, *Alnus serrulata*, *Fraxinus americana*, *Acer rubrum*, *Carpinus caroliniana*, *Ulmus americana*, and *Fagus grandifolia* in the non-montane part of the distribution. Species present in the montane occurrences include *Platanus occidentalis*, *Liriodendron tulipifera*, *Betula alleghaniensis*, and *Betula lenta*, with *Carpinus caroliniana*, *Hamamelis virginiana*, *Liquidambar styraciflua*, *Betula nigra*, *Fraxinus americana*, *Acer rubrum*, *Pinus virginiana*, *Pinus strobus*, and *Tsuga canadensis*. *Euonymus americana* is a typical shrub species in the lower elevation occurrences, while *Rhododendron maximum* and *Leucothoe fontanesiana* are common at higher elevations. Herbaceous species vary as well by geography and elevation, and may include *Arisaema triphyllum*, *Sanicula canadensis*, *Saururus cernuus*, *Campanula divaricata*, *Dichanthelium dichotomum* var. *dichotomum*, *Amphicarpaea bracteata*, *Actaea racemosa* (= *Cimicifuga racemosa*), *Polystichum acrostichoides*, *Eurybia divaricata* (= *Aster divaricatus*), *Viola sororia*, and *Viola blanda*. *Carex* species may be common (e.g., *Carex appalachica*, *Carex austrocaroliniana*, *Carex blanda*, *Carex crinita*, *Carex digitalis*, *Carex plantaginea*, *Carex swanii*, and/or *Carex torta*).

**Synonymy:**

- IIA7g. Sycamore - Sweetgum - American Elm Riverfront Forest, in part (Allard 1990)
- Piedmont/Low Mountain Alluvial Forest, in part (Schafale and Weakley 1990)
- Rocky Bar and Shore, in part (Schafale and Weakley 1990)
- Alluvial forest, in part (Evans 1991)
- Eutrophic Seasonally Flooded Forest, in part (Rawinski 1992)
- Sycamore - Sweetgum - American Elm: 94, in part (Eyre 1980)

**Comments:** Vegetation of the Interior Low Plateau, where there is a distribution overlap of related alliances, may also be classified in the I.B.2.N.d *Platanus occidentalis* - (*Fraxinus pennsylvanica*, *Celtis laevigata*, *Acer saccharinum*) Temporarily Flooded Forest Alliance (A.288). Consider a new alliance for montane alluvial vegetation called *Liriodendron tulipifera* - *Fraxinus americana* / *Carpinus caroliniana* Temporarily Flooded Forest Alliance [see North Carolina Vegetation Survey Nantahala Data].

**ALLIANCE DISTRIBUTION**

**Range:** The alliance is distributed in the upper Piedmont, Appalachian Mountains, Interior Low Plateau, Cumberland Mountains, Cumberland Plateau, and Chesapeake Bay regions. In the eastern part of the Interior Low Plateau, vegetation of this alliance may be in lower gradient situations. This alliance is found in Georgia, Kentucky, North Carolina, South Carolina, Tennessee, Maryland, Delaware, and Virginia, and possibly in Alabama (?) and Mississippi (?).

**States:** AL? DE GA KY MD MS? NC SC TN VA

**USFS Ecoregions:** 221H:C, 221J:P, 222C:P, 222D:P, 222E:C, 231A:C, 231B:?, 231C:P, 231D:C, 232A:C, 232B:C, M221C:C, M221D:C

**Federal Lands:** DOD (Arnold); NPS (Great Smoky Mountains, Kings Mountain); USFS (Chattahoochee, Cherokee, Daniel Boone, Nantahala, Pisgah, Sumter)

#### ALLIANCE SOURCES

**References:** Allard 1990, Evans 1991, Eyre 1980, Flinchum 1977, McLeod 1988, Newell and Peet 1995, Rawinski 1992, Schafale and Weakley 1990

### I.B.2.N.d.22 BLACK WILLOW TEMPORARILY FLOODED FOREST ALLIANCE (A.297) SALIX NIGRA TEMPORARILY FLOODED FOREST ALLIANCE

#### ALLIANCE CONCEPT

**Summary:** This alliance contains vegetation that is dominated by *Salix nigra* and that occurs in temporarily flooded sites, i.e., surface water is present for brief periods during the growing season, but the water table usually lies well below soil surface. Other canopy species that may be present include *Populus deltoides*, *Planera aquatica*, *Betula nigra*, *Platanus occidentalis*, *Celtis laevigata*, *Fraxinus pennsylvanica*, *Carya illinoensis*, *Diospyros virginiana*, *Quercus nigra*, *Cornus drummondii*, *Ulmus americana*, *Acer rubrum*, *Acer negundo*, *Acer saccharinum* (in the Mississippi River Alluvial Plain north of Memphis, Tennessee), *Catalpa bignonioides* (in range), and *Morus rubra*. The herbaceous and shrub strata may be absent to fairly dense, and species that may be present include *Ampelopsis arborea*, *Mikania scandens*, *Toxicodendron radicans*, *Polygonum* spp., *Erechtites hieraciifolia*, *Boehmeria cylindrica*, *Commelina virginica*, *Eupatorium serotinum*, *Phytolacca americana*, *Asplenium platyneuron*, and others. This alliance is common on the fronts of both small rivers and streams and larger rivers where it is a component of point bar succession. This alliance is common throughout the southeastern and southern midwestern United States.

#### Synonymy:

- IIA7a. Black Willow Riverfront Forest, in part (Allard 1990)
- Riverfront Forest, in part (Foti 1994b)
- Alluvial forest, in part (Evans 1991)
- Riparian forest, in part (Evans 1991)
- Sand and Mud Bar (Schafale and Weakley 1990)
- Rocky Bar and Shore (Schafale and Weakley 1990)
- Montane Alluvial Forest (Schafale and Weakley 1990)
- R1B3cI3a. *Salix nigra* (Foti et al. 1994)
- Black Willow: 95, in part (Eyre 1980)

#### Comments:

#### ALLIANCE DISTRIBUTION

**Range:** This alliance is found in Indiana, Illinois, Iowa, Missouri, Ohio, Virginia, West Virginia, Alabama, Arkansas, Florida, Georgia (?), Kentucky, Louisiana, Mississippi, North Carolina, Oklahoma (?), South Carolina, Tennessee, and Texas, and in Ontario, Canada.

**States:** AL AR FL GA? GL? IA IL? IN? KY LA MS NC OH? OK? ON SC TN TX VA WV

**USFS Ecoregions:** 221D:C, 221E:C, 221H:C, 221J:C, 222A:C, 222C:C, 222D:C, 222E:C, 222F:C, 231A:C, 231B:C, 231C:C, 231D:C, 231E:C, 231F:C, 231G:C, 232B:C, 232C:C, 232D:C, 232E:C, 232F:C, 234A:C, 251E:C, 251F:C, 255A:C, 255B:C, 255C:C, 255D:C, 311A:C, 315E:C, 332E:C, M221A:C, M221B:C, M221C:C, M221D:C, M222A:C, M231A:C

**Federal Lands:** COE (Arkansas River); DOD (Arnold, Fort Benning); DOE (Savannah River Site); NPS (Congaree Swamp); TVA (Tellico); USFS (Angelina, Apalachicola, Bienville, Cherokee?, Conecuh, Croatan, Daniel Boone, Davy Crockett, Delta, De Soto, Francis Marion, Holly Springs, Kisatchie, Nantahala, Ocala?, Pisgah, Sabine, Sam Houston, St. Francis?, Sumter?, Talladega, Tombigbee, Tuskegee); USFWS (Chickasaw, Lower Rio Grande Valley, Santa Ana)

#### ALLIANCE SOURCES

**References:** Allard 1990, Burns and Honkala 1990b, Evans 1991, Eyre 1980, Faber-Langendoen et al. 1996, Foti 1994b, Foti et al. 1994, Klimas 1988b, Schafale and Weakley 1990, Van Auken and Bush 1988, Wharton et al. 1982

### I.B.2.N.g. Saturated cold-deciduous forest

## I.B.2.N.g.2 RED MAPLE - BLACKGUM SATURATED FOREST ALLIANCE (A.348)

### ACER RUBRUM - NYSSA SYLVATICA SATURATED FOREST ALLIANCE

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#### ALLIANCE CONCEPT

**Summary:** This alliance covers deciduous forested acid seeps, saturated swamp forests, and "basin swamps" of the eastern and 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 *Liquidambar styraciflua*. Understory and shrub species include *Alnus serrulata*, *Ilex opaca* var. *opaca*, *Photinia pyrifolia* (= *Aronia arbutifolia*), and *Ilex verticillata*. Characteristic herbaceous species are *Osmunda cinnamomea* and *Osmunda regalis*. *Sphagnum* spp. are typical. These wetland forests occur where surface water is seldom present, but the substrate is saturated to the surface for extended periods during the growing season, and include forested acid seeps on hillsides or streamheads, on edges of floodplains, and other poorly drained depressions. Individual occurrences of these forests tend to be small in extent, and can provide habitat for rare plant species.

#### Synonymy:

- IIA9a. Forested Mountain Seep, in part (Allard 1990)
- Wooded Seep, in part (Foti 1994b)
- Appalachian acid seep, in part (Evans 1991)
- Cretaceous Hills forested acid seep (Evans 1991)
- Low Elevation Seep (Schafale and Weakley 1990)
- Boggy Streamside Seep (Schafale pers. comm.)

**Comments:** This alliance may only cover a portion of the variation in wooded seeps in Arkansas, where a calcareous shale and a sandstone seep type need to be defined (D. Zollner pers. comm.).

#### ALLIANCE DISTRIBUTION

**Range:** This alliance is known from the Cumberland Plateau of Alabama, Kentucky and Tennessee, the Allegheny Plateau of Kentucky, the upper East Gulf Coastal Plain of Kentucky and Tennessee, the Piedmont of North Carolina, South Carolina, and Virginia, the Arkansas River Valley, and the Coastal Plain of North Carolina, New Jersey, Pennsylvania, Delaware, Maryland, and Virginia. It may also be found in Georgia (?), Oklahoma, Connecticut, Massachusetts, Maine, New Hampshire, New York, Vermont, West Virginia, and Illinois (?).

**States:** AL AR CT DE GA IL? KY MA MD ME NC NH NJ NY OK PA RI SC TN VA VT WV

**USFS Ecoregions:** 212A:C, 212B:C, 212C:C, 212D:C, 212E:P, 212F:P, 212G:P, 221A:C, 221B:C, 221D:P, 221E:C, 221F:P, 221H:C, 222A:C, 222C:C, 222D:C, 222E:C, 222G:C, 222I:P, 231A:C, 231B:C, 231C:C, 231D:C, 231E:C, 231F:C, 231G:C, 232A:C, 232B:C, 232C:P, M212A:C, M212B:C, M212C:C, M221A:C, M221B:C, M221C:P, M221D:C, M222A:C, M231A:C

**Federal Lands:** DOD (Fort Jackson, Pine Bluff Arsenal); NPS (Assateague Island, Big South Fork, Shiloh?); USFS (Angelina, Bankhead, Chattahoochee, Cherokee, Daniel Boone, George Washington, Kisatchie?, Ouachita, Ozark, Sabine, Talladega, Uwharrie); USFWS (Felsenthal?, Mountain Longleaf, Overflow?, Pond Creek?)

#### ALLIANCE SOURCES

**References:** Allard 1990, Breden 1989, Campbell 1989b, Evans 1991, Foti 1994b, Funk 1975, Funk and Fuller 1978, Harvill 1967, Heckscher 1994, Schafale and Weakley 1990, Schafale pers. comm.

## I.C.3.N.a. Mixed needle-leaved evergreen - cold-deciduous forest

### I.C.3.N.a.4 RED SPRUCE - YELLOW BIRCH FOREST ALLIANCE (A.384)

#### PICEA RUBENS - BETULA ALLEGHANIENSIS FOREST ALLIANCE

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#### ALLIANCE CONCEPT

**Summary:** Forests with mixed deciduous/evergreen canopies, dominated by *Picea rubens* and *Betula alleghaniensis*, occurring from the maritime provinces of Canada, through northern New England and eastern New York, south to the High Alleghenies, and high elevations in the northern Ridge and Valley and Southern Blue Ridge. This alliance includes forests transitional between northern hardwoods and spruce - fir forests, as well as successional forests resulting from the death of *Abies fraseri* due to the Balsam Woolly Adelgid. *Picea rubens* is usually the most abundant conifer, with lesser amounts of *Abies balsamea*, in the north, and *Abies fraseri*, in the southern portion of the range. *Betula alleghaniensis* is usually the most abundant deciduous tree, although other deciduous species, such as *Fagus grandifolia* and, in the southern Appalachians, *Aesculus flava*, can be prominent constituents. Associated species vary with geography, but include *Acer spicatum*, *Acer pensylvanicum*, *Acer saccharum*, *Oclemena acuminata* (= *Aster acuminatus*), *Clintonia borealis*, *Dryopteris carthusiana* (=

*Dryopteris spinulosa*), *Dryopteris intermedia*, *Dryopteris campyloptera*, *Ilex montana*, *Menziesia pilosa*, *Oxalis montana*, *Rugelia nudicaulis*, *Rhododendron catawbiense*, *Sambucus racemosa* var. *racemosa* (= *Sambucus racemosa* var. *pubens*), *Solidago glomerata*, *Trillium undulatum*, *Vaccinium erythrocarpum*, and *Viburnum lantanoides* (= *Viburnum alnifolium*).

Forests of this alliance generally occur on midslopes, with soils ranging from somewhat poorly drained to well-drained.

Forests of this alliance in the White Mountains and Green Mountains in New England were noted to occur on soils derived from compact till and ablational till consisting of metamorphic schist and gneiss. Forests in this alliance tend to be on moister sites than deciduous forests dominated by northern hardwood species.

**Synonymy:**

- Red Spruce--Fraser Fir Forest, in part (Schafale and Weakley 1990)
- Red Spruce - Yellow Birch: 30, in part (Eyre 1980)

**Comments:**

**ALLIANCE DISTRIBUTION**

**Range:** This alliance is found in North Carolina, Tennessee, Massachusetts, Maine, New Hampshire, New York, Pennsylvania (?), Vermont, Virginia, and West Virginia.

**States:** MA MD ME NB? NC NH NS NY PA? QC? TN VA? VT WV

**USFS Ecoregions:** 212C:C, 221A:C, 221B:C, 232C:C, M212A:C, M212B:C, M212C:C, M212D:C, M212E:C, M212F:C, M221A:C, M221B:C, M221C:P, M221D:C

**Federal Lands:** NPS (Acadia, Great Smoky Mountains); USFS (Cherokee?, Jefferson?, Nantahala?, Pisgah)

**ALLIANCE SOURCES**

**References:** Eyre 1980, Fincher 1991, Golden 1974, Golden 1981, Schafale and Weakley 1990

**I.C.3.N.a.14 SHORTLEAF PINE - (WHITE OAK, SOUTHERN RED OAK, POST OAK, BLACK OAK) FOREST ALLIANCE (A.394)**

**PINUS ECHINATA - QUERCUS (ALBA, FALCATA, STELLATA, VELUTINA) FOREST ALLIANCE**

**ALLIANCE CONCEPT**

**Summary:** This alliance occurs in the southeastern United States from the Inner Coastal Plain and Piedmont, ranging north and west through the Cumberland Plateau, Ridge and Valley, and low Blue Ridge, and from eastern Texas and Louisiana, through the Ouachita Mountains and Ozarks. It includes mesic to dry-mesic forests with mixed evergreen and deciduous canopies where *Pinus echinata* and one or more of the nominal *Quercus* spp. occur in varying ratios. In some associations *Pinus taeda* may be a dominant evergreen canopy component. *Quercus rubra* codominates in associations in the Ozarks and Ouachita Mountains. Other common species vary greatly with geography, but can include *Carya alba*, *Carya texana*, *Sassafras albidum*, *Oxydendrum arboreum*, *Acer rubrum*, *Nyssa sylvatica*, *Cornus florida*, *Vaccinium arboreum*, *Vaccinium pallidum*, *Vaccinium stamineum*, *Chimaphila maculata*, *Tephrosia virginiana*, *Coreopsis major*, and others. Forests in this alliance occur on dry hilltops, upper slopes, and ridges on acidic soils. The alliance also includes associations from some more non-acidic substrates, including hilltops and upper slopes in Louisiana associated with the Cook Mountain Formation and with calcareous prairies on the Fleming Formation in eastern Texas.

**Synonymy:**

- IA6a. Dry Shortleaf Pine - Oak - Hickory Forest, in part (Allard 1990)
- Dry Shortleaf Pine - Oak Forest (Foti 1994b)
- Dry Oak--Hickory Forest, in part (Schafale and Weakley 1990)
- *Pinus echinata* forest alliance, in part (Hoagland 1998a)
- Shortleaf Pine-White Oak CUPL (Pyne 1994)
- Mixed Oaks-Shortleaf Pine HR (Pyne 1994)
- Shortleaf Pine-Oak Series, in part (Diamond 1993)
- T1B3aII3b. *Quercus alba* - *Pinus echinata* - *Quercus (velutina, falcata)* (Foti et al. 1994)
- Shortleaf Pine - Oak: 76, in part (Eyre 1980)

**Comments:** This alliance has an overall more mesophytic species composition than shortleaf pine - oak forests found in *Pinus echinata* - *Quercus (coccinea, prinus)* Forest Alliance (A.395). This type is recognized as distinct in both Arkansas and the Midwest. It contains oaks such as *Quercus alba*, *Quercus falcata*, *Quercus stellata*, *Quercus velutina*, *Quercus rubra*, plus *Carya texana* and *Carya alba*. In Arkansas, there are many forests dominated by *Pinus echinata* and *Quercus rubra*, as described in *Pinus echinata* - *Quercus (alba, rubra)* / *Vaccinium (arboreum, pallidum)* / *Schizachyrium scoparium* - *Chasmanthium sessiliflorum* - *Solidago ulmifolia* Forest (CEGL007489). Even though *Quercus rubra* is not an alliance nominal, these forests fit within the alliance concept and are placed in this alliance. This alliance was not observed on the Bankhead National Forest. However dry-mesic shortleaf pine vegetation is potentially on the Bankhead and, if found, should be classed in this alliance.

**ALLIANCE DISTRIBUTION**

**Range:** This alliance occurs in the southeastern United States from the inner Coastal Plain and Piedmont, ranging north and west through the Cumberland Plateau, Ridge and Valley, and low Blue Ridge, and from eastern Texas and Louisiana, through the Ouachita Mountains and Ozarks. Associations have been defined in Alabama, Arkansas, Georgia, Kentucky, Illinois, Louisiana, Missouri, North Carolina, South Carolina, Oklahoma, Tennessee, Texas, and Virginia. However, the alliance is thought to also occur in Mississippi, and possibly in Ohio (?). In Mississippi, this vegetation would be more likely found in the middle and inner Coastal Plain.

**States:** AL AR GA IL KY LA MO MS NC OH? OK SC TN TX VA?

**USFS Ecoregions:** 221E:P, 221H:P, 221I:P, 221J:P, 222A:C, 222D:P, 222E:P, 222F:?, 231A:C, 231B:C, 231C:C, 231D:C, 231E:C, 231G:C, 232B:C, 232F:C, 234A:P, M221C:P, M221D:C, M222A:C, M231A:C

**Federal Lands:** DOD (Fort Benning); NPS (Hot Springs, Kennesaw Mountain, Shiloh?); USFS (Angelina, Chattahoochee, Cherokee, Daniel Boone, Davy Crockett, Kisatchie, Oconee, Ouachita, Ozark, Sabine, Sam Houston, Shawnee, St. Francis, Sumter, Talladega, Tuskegee?, Uwharrie)

**ALLIANCE SOURCES**

**References:** Allard 1990, Cain and Shelton 1994, Campbell et al. 1996, Diamond 1993, Eyre 1980, Faber-Langendoen et al. 1996, Foti 1994b, Foti and Guldin 1994, Foti et al. 1994, Fountain and Sweeney 1985, Fountain and Sweeney 1987, Halls and Homesley 1966, Hoagland 1998a, Johnson 1986a, Kennedy 1973, Martin and Smith 1991, Martin and Smith 1993, Pyne 1994, Rice and Penfound 1959, Schafale and Weakley 1990, USFS 1990

### **I.C.3.N.a.15 SHORTLEAF PINE - (SCARLET OAK, ROCK CHESTNUT OAK) FOREST ALLIANCE (A.395)**

#### **PINUS ECHINATA - QUERCUS (COCCINEA, PRINUS) FOREST ALLIANCE**

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**ALLIANCE CONCEPT**

**Summary:** This alliance includes mixed *Pinus echinata* - *Quercus* spp. forests of the low mountains in the Blue Ridge/Piedmont transition, extending into the southern Ridge and Valley and Cumberland Plateau of the southeastern United States. *Pinus echinata* and some combination of the nominal oaks (*Quercus coccinea*, *Quercus prinus*) are dominant. Associated species include *Quercus falcata*, *Quercus stellata*, *Quercus marilandica*, *Carya pallida*, *Oxydendrum arboreum*, and *Cornus florida* in the canopy and subcanopy. *Pinus virginiana* may also be a component. *Gaylussacia baccata*, *Gaylussacia ursina*, *Vaccinium pallidum*, *Vaccinium stamineum*, and *Kalmia latifolia* are typical shrubs. Herbaceous species that are common to these forests include *Chimaphila maculata*, *Iris verna*, *Pteridium aquilinum* var. *latiusculum*, *Silphium compositum*, *Smilax glauca*, *Goodyera pubescens*, *Schizachyrium scoparium*, *Dichanthelium dichotomum*, and *Danthonia sericea*. These forests occur on exposed, rocky ridges and upper, convex slopes, as well as more protected sites. Species composition varies with bedrock geology and exposure.

**Synonymy:**

- IA6a. Dry Shortleaf Pine - Oak - Hickory Forest, in part (Allard 1990)
- Appalachian pine-oak forest (Evans 1991)
- Dry Oak--Hickory Forest, in part (Schafale and Weakley 1990)
- Mixed Oaks-Shortleaf Pine HR (Pyne 1994)
- Shortleaf Pine - Oak: 76, in part (Eyre 1980)

**Comments:** Originally defined from the Chattooga Basin Project, where quantitative analysis showed this alliance concept to apply to a large percentage of the vegetation sampled in this tri-state watershed (S. Simon pers. comm.). This concept was later expanded in range and concept to include shortleaf pine - dry site oak forests of the greater southern Appalachian region (including the southern Ridge and Valley and Cumberland Plateau), and has an overall xerophytic species composition.

**ALLIANCE DISTRIBUTION**

**Range:** This alliance occurs in the low mountains of the Blue Ridge/Piedmont transition, extending into the southern Ridge and Valley and Cumberland Plateau of the southeastern United States. It is known from the states of Alabama, Georgia, Kentucky, North Carolina, and South Carolina, and may possibly occur in Tennessee.

**States:** AL GA KY NC SC TN?

**USFS Ecoregions:** 221H:C, 221J:P, 222E:P, 231A:C, 231C:P, 231D:C, 234A:?, M221C:C, M221D:C

**Federal Lands:** USFS (Bankhead?, Chattahoochee, Cherokee?, Daniel Boone, Nantahala, Sumter, Talladega)

**ALLIANCE SOURCES**

**References:** Allard 1990, Evans 1991, Eyre 1980, Pyne 1994, Schafale and Weakley 1990, Simon pers. comm.

**I.C.3.N.a.21 EASTERN WHITE PINE - (WHITE OAK, NORTHERN RED OAK, BLACK OAK)  
FOREST ALLIANCE (A.401)  
PINUS STROBUS - QUERCUS (ALBA, RUBRA, VELUTINA) FOREST ALLIANCE**

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**ALLIANCE CONCEPT**

**Summary:** This alliance occurs from the western Great Lakes to the northeastern United States and south to the southern Appalachian Mountains. The overstory is a mix of evergreen and deciduous trees which form a moderately closed to closed canopy. *Pinus strobus* is a consistent constituent of the canopy and usually occurs as supercanopy trees, as well. *Quercus alba*, *Quercus rubra*, and *Quercus velutina* are also important canopy trees along with minor amounts of *Acer rubrum*, *Carya alba*, *Liriodendron tulipifera*, *Pinus resinosa*, *Pinus banksiana* (in Wisconsin), *Populus tremuloides* (in the northern parts of this alliance's range), *Quercus ellipsoidalis* (in the northwest), and *Tsuga canadensis*, and *Quercus prinus* (in the southeast). Subcanopy trees can include *Carpinus caroliniana*, *Cornus florida*, *Hamamelis virginiana*, *Halesia tetraptera*, *Oxydendrum arboreum*, and *Nyssa sylvatica*. The shrub layer is often well-developed with *Gaylussacia* spp., *Kalmia latifolia*, *Rubus* spp., and *Vaccinium* spp. most commonly dominant. Other shrubs can include *Corylus americana*, *Gaultheria procumbens*, *Rhododendron maximum*, and *Sassafras albidum*, and in the Ridge and Valley, *Viburnum rafinesquianum* and *Viburnum prunifolium*. The herb stratum is sparse to moderate, but can be quite species rich, especially in the Southern Blue Ridge and Ridge and Valley, where typical species include *Ageratina altissima*, *Amphicarpaea bracteata*, *Brachyelytrum erectum*, *Carex communis*, *Carex platyphylla*, *Carex woodii*, *Carex pensylvanica*, *Chimaphila maculata*, *Desmodium nudiflorum*, *Eupatorium purpureum*, *Galax urceolata*, *Galium latifolium*, *Galium circaeans*, *Geranium maculatum*, *Goodyera pubescens*, *Hexastylis shuttleworthii*, *Hieracium venosum*, *Houstonia purpurea*, *Maianthemum racemosum*, *Maianthemum canadense*, *Medeola virginiana*, *Mitchella repens*, *Monotropa uniflora*, *Poa cuspidata*, *Polygonatum biflorum*, *Polystichum acrostichoides*, *Trillium catesbaei*, and *Viola hastata*. Stands of this alliance are dry-mesic to mesic forests found on acidic, relatively nutrient-poor, sandy loam to sandy soil on a variety of topographic positions. In the upper Midwest, most stands are on flat to rolling topography on outwash plains or moraines. In the Southern Blue Ridge, they occur on mid to lower slopes in the lower elevations (below 3000 feet) on protected ridges, and in disturbed bottoms. In the Ridge and Valley of Virginia, these forests are found on protected ravines, with rocky soils developed over shale, sandstone, or other sedimentary rock.

**Synonymy:**

- Hardwood - White Pine Forest, in part (Ambrose 1990a)
- Dry-Mesic Oak--Hickory Forest, in part (Schafale and Weakley 1990)
- Eastern White Pine: 21, in part (Eyre 1980)
- White Pine - Chestnut Oak: 51, in part (Eyre 1980)
- White Pine - Northern Red Oak - Red Maple: 20 (Eyre 1980)
- *Pinus strobus* - *Pinus resinosa* forest (No. 36), in part (Vankat 1990)
- Northern Dry-mesic Forest, in part (Curtis 1959)

**Comments:** In the Appalachians, these forests are typically transitional between the more mesic, protected cove forests and the more xeric, exposed pine - oak forests with *Quercus prinus* and *Quercus coccinea*. Stands of this alliance are mid-successional but long-lasting and require repeated disturbances to regenerate (MNNHP 1993). Isolated stands of *Pinus strobus* with *Quercus alba* and *Quercus velutina* and scattered *Fagus grandifolia* over *Kalmia latifolia* are found on steep slopes of the Western Highland Rim of (Cheatham and Dickson counties; Chester 1980). Similar isolated stands with *Pinus strobus* are found in the vicinity of Clifty, Kentucky. Their status is unclear as well. These occur on sandstones of the Dripping Springs escarpment (Logan, Muhlenburg, Todd counties). "These are along Clifty Creek Gorge and Rocky Creek/Lake Malone State Park area; no botanical person has reported from here for a long time. The environment is not necessarily more xeric." (Julian Campbell, TNC-KYFO).

**ALLIANCE DISTRIBUTION**

**Range:** This alliance is found in northern Minnesota, Wisconsin, Michigan, northern Illinois, Indiana, Connecticut, Maine, Maryland, Massachusetts, New Jersey, New York, Pennsylvania, Rhode Island, Virginia, West Virginia, northern Georgia, western North Carolina, western South Carolina, and eastern Tennessee (?). It is also found in Canada.

**States:** CT GA IL? IN? MA MD ME MI MN NC NH NJ? NY ON PA QC? RI SC TN? VA? VT WI WV

**USFS Ecoregions:** 212A:P, 212B:P, 212C:C, 212D:P, 212E:P, 212F:C, 212G:C, 212H:C, 212J:C, 212K:C, 212L:P, 212M:P, 212N:P, 212O:C, 221A:C, 221B:C, 221D:P, 221E:C, 222E:C, 222I:C, 222J:C, 222K:C, 222L:C, 222M:C, 232A:C, M212A:C, M212B:C, M212C:C, M212D:C, M212E:P, M221A:C, M221B:C, M221C:C, M221D:C

**Federal Lands:** NPS (Acadia, Great Smoky Mountains?); USFS (Chattahoochee, Cherokee?, George Washington, Nantahala, Pisgah, Sumter)

**ALLIANCE SOURCES**

**References:** Ambrose 1990a, Chester and Scott 1980, Curtis 1959, Eyre 1980, Faber-Langendoen et al. 1996, MNNHP 1993, Rawinski et al. 1996, Schafale and Weakley 1990, Vankat 1990



### I.C.3.N.a.22 EASTERN WHITE PINE - (SCARLET OAK, ROCK CHESTNUT OAK) FOREST ALLIANCE (A.402)

#### PINUS STROBUS - QUERCUS (COCCINEA, PRINUS) FOREST ALLIANCE

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##### ALLIANCE CONCEPT

**Summary:** This alliance includes dry pine - oak forests dominated by *Pinus strobus* occurring with *Quercus coccinea* and/or *Quercus prinus*. Typical species in the subcanopy are *Oxydendrum arboreum*, *Acer rubrum* var. *rubrum*, *Nyssa sylvatica*, and *Cornus florida*. These forests often have dense ericaceous shrub strata with species such as *Rhododendron maximum*, *Kalmia latifolia*, *Vaccinium* spp., or *Gaylussacia* spp. Herbaceous strata have low species richness and are composed of species typical of dry montane forests, such as *Galax urceolata*, *Viola hastata*, *Chimaphila maculata*, *Goodyera pubescens*, *Epigaea repens*, *Smilax glauca*, *Smilax rotundifolia*, and *Chamaelirium luteum*. These forests occur on dry topographic settings at low elevations (below 3000 feet) in the Blue Ridge escarpment region, on upper slopes and ridgetops. In the Ridge and Valley of Virginia, these forests are known from north-facing slopes over shale substrates and on lower to middle elevation knobs and side ridges.

##### Synonymy:

- IA6f. Dry White Pine Ridge Forest, in part (Allard 1990)
- Hardwood - White Pine Forest (Ambrose 1990a)
- White Pine Forest, in part (Schafale and Weakley 1990)
- White Pine, BR (Pyne 1994)
- White Pine - Hardwoods, BR (Pyne 1994)
- *Pinus strobus-Quercus coccinea* Forest (Patterson 1994)
- White Pine - Chestnut Oak: 51 (Eyre 1980)

**Comments:** Isolated stands with *Pinus strobus* are found in the vicinity of Clifty, Kentucky. These occur on sandstones of the Dripping Springs escarpment (Logan, Muhlenburg, Todd counties) and are presumably more xeric. Their placement is unclear.

##### ALLIANCE DISTRIBUTION

**Range:** This alliance is found in Georgia, North Carolina, South Carolina, Tennessee, and may also be found in Virginia (?).

**States:** GA MD? NC SC TN VA WV

**USFS Ecoregions:** 221H:C, 222E:C, 231A:C, M221A:C, M221D:C

**Federal Lands:** NPS (Great Smoky Mountains); USFS (Chattahoochee, Cherokee?, George Washington, Jefferson, Nantahala, Pisgah, Sumter)

##### ALLIANCE SOURCES

**References:** Allard 1990, Ambrose 1990a, DuMond 1970, Eyre 1980, Gattis 1992, Patterson 1994, Pyne 1994, Schafale and Weakley 1990

### I.C.3.N.a.28 VIRGINIA PINE - (SCARLET OAK, ROCK CHESTNUT OAK) FOREST ALLIANCE (A.408)

#### PINUS VIRGINIANA - QUERCUS (COCCINEA, PRINUS) FOREST ALLIANCE

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##### ALLIANCE CONCEPT

**Summary:** This alliance includes xeric forests with mixed evergreen/deciduous canopies composed primarily of *Pinus virginiana* co-occurring with *Quercus coccinea* and/or *Quercus prinus*. These forests often have ericaceous shrub strata, with *Vaccinium* spp. and *Kalmia latifolia* typical. This alliance includes both forests resulting from disturbance and forests maintained by harsh environmental conditions, including dry shale substrates and shallow rocky soils. Forests in this alliance occur on upper slopes and ridges of the Southern Blue Ridge (below 3000 feet), Ridge and Valley, Cumberland Plateau, and Piedmont.

##### Synonymy:

- Virginia pine forest, in part (Evans 1991)
- Chestnut Oak-Pine, BR (Pyne 1994)
- Virginia Pine - Oak: 78, in part (Eyre 1980)

##### Comments:

##### ALLIANCE DISTRIBUTION

**Range:** Forests in this alliance occur on upper slopes and ridges of the Southern Blue Ridge (below 3000 feet), Ridge and Valley, Cumberland Plateau, and Piedmont. It occurs in North Carolina and Tennessee, and may also possibly occur in Maryland (?), West Virginia (?), and South Carolina (?).

**States:** MD? NC PA SC? TN WV?

**USFS Ecoregions:** 221J:P, 231A:C, 231D:C, M221A:C, M221D:C

**Federal Lands:** NPS (Great Smoky Mountains?); USFS (Cherokee, Nantahala, Pisgah)

**ALLIANCE SOURCES**

**References:** Evans 1991, Eyre 1980, Pyne 1994, Racine 1966, Whittaker 1956

**I.C.3.N.a.32 EASTERN HEMLOCK - YELLOW BIRCH FOREST ALLIANCE (A.412)**  
**TSUGA CANADENSIS - BETULA ALLEGHANIENSIS FOREST ALLIANCE**

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**ALLIANCE CONCEPT**

**Summary:** This alliance is found in the Great Lakes region and the northeastern United States and can range as far south as the Southern Blue Ridge of North Carolina and Tennessee, where it can occur in high-elevation areas. Forests in this alliance are late successional upland forests, dominated by coniferous and deciduous trees. *Tsuga canadensis* and some combination of *Acer saccharum*, *Betula alleghaniensis*, and *Fagus grandifolia* are typically the dominant trees. *Fagus grandifolia* is not found in stands west of eastern Wisconsin. Associated trees include *Acer rubrum*, *Betula lenta* (in the eastern portion of this alliance's range), *Carya* spp. (in the south), *Liriodendron tulipifera* (in the south), *Pinus strobus*, *Prunus serotina* var. *serotina* (in the Allegheny Mountains), *Quercus alba*, *Quercus rubra*, and *Ulmus americana*. *Picea rubens* can be found in northern New England. The small tree *Ostrya virginiana* is often present in the subcanopy. In the northern portions of this alliance's range, the shade from the canopy and dense stands of *Acer saccharum* saplings and seedlings inhibits the growth of many other species. These stands often have depauperate ground layer strata. Where the shade is not as complete, shrubs such as *Corylus cornuta*, *Diervilla lonicera*, *Hamamelis virginiana*, *Sambucus racemosa* var. *racemosa* (= *Sambucus pubens*), and *Viburnum lantanoides* (= *Viburnum alnifolium*) may be found along with saplings of *Abies balsamea* and *Picea glauca*. In the southern portion of this alliance's range, ericaceous shrubs are common. Among these *Kalmia latifolia*, *Rhododendron maximum*, and *Vaccinium pallidum* are typically the most abundant. The herbaceous layer consists of species such as *Anemone quinquefolia*, *Cornus canadensis* (in the north), *Dryopteris carthusiana* (in the north), *Epigaea repens*, *Maianthemum canadense*, *Medeola virginiana*, *Mitchella repens*, *Oxalis montana* (in the east), *Trientalis borealis* (in the north), *Trillium grandiflorum* (in the north), and *Viola* spp. Stands of this alliance tend to be on dry-mesic to mesic loam and sand soils. The soil is sometimes acidic, especially in the southern portion of this alliance's range. The parent material is glacial till in the north and sandstone in the unglaciated southern part. Stands can be on flat to moderately steep slopes of any aspect.

**Synonymy:**

- Hemlock - Yellow Birch: 24 (Eyre 1980)
- Hemlock (Braun 1950)
- Hemlock-Hardwood Forests (Braun 1950)
- Beech-Hemlock Association (Braun 1928)
- *Tsuga canadensis*-*Betula alleghaniensis*/*Rhododendron maximum* Forest (Newell et al. 1997)

**Comments:**

**ALLIANCE DISTRIBUTION**

**Range:** This alliance occurs in Michigan and northern and southeastern Wisconsin. It is widespread in the eastern United States in Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, Virginia, and West Virginia. It is also found in Canada from southern Ontario east to Nova Scotia, and in the Southeast in Tennessee and possibly North Carolina (?).

**States:** CT MA MD ME MI NB? NC? NH NJ NS NY ON PA RI TN VA VT WI WV

**USFS Ecoregions:** 212A:C, 212B:C, 212C:C, 212D:C, 212E:C, 212F:C, 212G:C, 212H:C, 212I:C, 212J:C, 212L:C, 212O:C, 212P:C, 221A:C, 221B:C, 221D:C, 221E:C, 221F:C, 221J:?, 222D:?, 222E:C, 222H:C, 222I:C, 222J:C, 222K:C, 222L:C, 231A:?, 232A:P, 232B:?, M212A:C, M212B:C, M212C:C, M212D:C, M212E:C, M212F:C, M221A:C, M221B:C, M221C:?, M221D:C

**Federal Lands:** NPS (Acadia, Great Smoky Mountains); USFS (Cherokee, George Washington, Jefferson, Pisgah)

**ALLIANCE SOURCES**

**References:** Braun 1928, Braun 1950, Eyre 1980, Faber-Langendoen et al. 1996, Kotar et al. 1988, Newell et al. 1997

**I.C.3.N.a.33 EASTERN HEMLOCK - TULIPTREE FOREST ALLIANCE (A.413)**  
**TSUGA CANADENSIS - LIRIODENDRON TULIPIFERA FOREST ALLIANCE**

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**ALLIANCE CONCEPT**

**Summary:** Forests in this alliance are dominated by *Tsuga canadensis*, occurring with various hardwood species of mesic forests, including *Liriodendron tulipifera*, *Tilia americana* var. *heterophylla*, *Magnolia acuminata*, *Quercus rubra*, *Fraxinus*

*americana*, *Betula lenta*, *Fagus grandifolia*, *Halesia tetraptera*, and others. Common shrubs are *Rhododendron maximum*, *Kalmia latifolia*, and *Leucothoe fontanesiana*. Herbaceous cover is typically sparse and includes acid-loving species such as *Polystichum acrostichoides*, *Goodyera pubescens*, *Thelypteris noveboracensis*, *Galax urceolata*, *Hexastylis* sp., and *Tiarella cordifolia*. These forests occur in deep coves, moist flats, and ravines, but are occasionally found along larger stream bottoms, typically at elevations below 1060 m (3500 feet). Forests in this alliance include acidic cove forests and mesic successional forests, mostly of the southern and central Appalachians, but also occurring in the Cumberland Plateau and Cumberland Mountains of Kentucky, Tennessee, and Alabama, the Allegheny Plateau of West Virginia, and isolated occurrences in the Interior Low Plateau of Indiana and Tennessee.

**Synonymy:**

- Acidic Cove Forest, in part (Schafale and Weakley 1990)
- Hemlock-Mixed Mesophytic HR (Pyne 1994)
- Yellow-Poplar - Eastern Hemlock: 58, in part (Eyre 1980)

**Comments:** Occurrences are threatened by the Hemlock Woolly Adelgid (*Adelges tsugae*), an exotic insect pest.

**ALLIANCE DISTRIBUTION**

**Range:** Forests in this alliance include acidic cove forests and mesic successional forests, mostly of the southern and central Appalachians, but also occurring in the Cumberland Plateau and Cumberland Mountains of Kentucky, Tennessee, and Alabama, the Allegheny Plateau of West Virginia, and isolated occurrences in the Interior Low Plateau of Indiana and Tennessee. This alliance is found in Alabama, Georgia, Kentucky, North Carolina, South Carolina, Tennessee, Maryland, Pennsylvania, Virginia, Indiana, Ohio, and West Virginia.

**States:** AL GA IN KY MD NC OH PA SC TN VA WV

**USFS Ecoregions:** 212:C, 221E:C, 221F:C, 221H:C, 222D:?, 222E:C, 222H:C, 231A:C, 231C:C, 232A:C, 232B:C, M221A:C, M221C:P, M221D:C, M231A:C

**Federal Lands:** NPS (Carl Sandburg Home, Great Smoky Mountains, Mammoth Cave); USFS (Bankhead, Chattahoochee, Cherokee, Daniel Boone, George Washington, Jefferson, Nantahala, Pisgah, Sumter)

**ALLIANCE SOURCES**

**References:** Cooper and Hardin 1970, Eyre 1980, Fike 1999, Gettman 1974, Golden 1974, Malter 1977, McLeod 1988, Newell and Peet 1995, Newell et al. 1997, Patterson 1994, Pyne 1994, Schafale and Weakley 1990, Winstead and Nicely 1976

**I.C.3.N.d. Saturated mixed needle-leaved evergreen - cold-deciduous forest****I.C.3.N.d.7 EASTERN HEMLOCK - RED MAPLE SATURATED FOREST ALLIANCE (A.447)  
TSUGA CANADENSIS - ACER RUBRUM SATURATED FOREST ALLIANCE****ALLIANCE CONCEPT**

**Summary:** This alliance includes palustrine forests, often dominated by *Tsuga canadensis* and *Acer rubrum*, with closed to open canopies and an open to dense shrub layer, interspersed with small *Sphagnum* - herb-dominated depressions. Canopies are composed of various mixtures of evergreen and deciduous species, with canopy dominants varying 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 *Betula alleghaniensis*. 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*, *Symphyotrichum puniceum* (= *Aster puniceus*), *Dalibarda repens*, *Osmunda cinnamomea*, *Carex folliculata*, *Carex gynandra*, *Carex scabrata*, *Carex leptalea*, *Carex stricta*, *Sarracenia purpurea*, *Sagittaria latifolia* (= *Sagittaria latifolia* var. *pubescens*), and *Leersia virginica*. Herbs in the forested areas include *Glyceria melicaria*, *Lycopodium obscurum*, *Onoclea sensibilis*, *Maianthemum canadense*, *Thelypteris noveboracensis*, and *Osmunda regalis* var. *spectabilis*. Forests in this alliance are typically at elevations below 1200 m (4000 feet), in poorly drained bottomlands, generally with visible microtopography of ridges and sloughs or depressions. They often occur near streams and are undoubtedly occasionally flooded. These forests are found in the northeastern U.S. and throughout the Southern Blue Ridge, in the Cumberland Mountains and Cumberland Plateau, and in the central Appalachians.

**Synonymy:**

- IIE1a. Southern Appalachian Bog Complex, in part (Allard 1990)
- Appalachian acid seep, in part (Evans 1991)
- Swamp-Forest Bog Complex, in part (Schafale and Weakley 1990)
- Eastern Hemlock: 23, in part (Eyre 1980)

**Comments:**

**ALLIANCE DISTRIBUTION**

**Range:** These forests are found in the northeastern U.S. and throughout the Southern Blue Ridge, in the Cumberland Mountains and Cumberland Plateau, and in the central Appalachians, in Georgia, Kentucky, North Carolina, South Carolina, Tennessee, Virginia, and possibly others.

**States:** GA KY MA? NC NH PA SC TN VA WV?

**USFS Ecoregions:** 221A:C, 221H:C, M212B:C, M221A:C, M221B:C, M221C:C, M221D:C

**Federal Lands:** NPS (Cumberland Gap, Shenandoah); USFS (Chattahoochee, Cherokee, Daniel Boone?, George Washington, Jefferson, Nantahala, Pisgah)

**ALLIANCE SOURCES**

**References:** Allard 1990, Evans 1991, Eyre 1980, Schafale and Weakley 1990, Weakley and Schafale 1994

**II. WOODLAND****II.A.4.N.a. Rounded-crowned temperate or subpolar needle-leaved evergreen woodland****II.A.4.N.a.17 SHORTLEAF PINE WOODLAND ALLIANCE (A.515)****PINUS ECHINATA WOODLAND ALLIANCE****ALLIANCE CONCEPT**

**Summary:** This alliance covers upland woodlands dominated by *Pinus echinata* with less than 25% canopy cover by *Quercus* spp. Some associations occur on dry ridges at the southern end of the Appalachians and in adjacent provinces (Ridge and Valley, Piedmont, Upper East Gulf Coastal Plain?), and have a *Pinus virginiana* or *Pinus rigida* admixture. In the Ouachita Mountains, these woodlands occur naturally on rock outcrops but also as restored *Pinus echinata* savannas in eastern Oklahoma and western Arkansas. In some associations, *Pinus taeda* can also be present, possibly as a result of northward expansion of the range of the species following land-clearing and fire suppression. Most associations are topo-edaphic climaxes, and the woodland structure is maintained by dry site conditions and occasional fire. These woodlands probably were more common historically.

**Synonymy:**

- Xeric Shortleaf Pine - Oak Woodland, in part (Foti 1994b)
- *Pinus echinata* woodland alliance (Hoagland 1998a)
- Bluejack Oak-Pine Series, in part (Diamond 1993)
- Shortleaf Pine: 75, in part (Eyre 1980)
- Shortleaf Pine - Oak: 76, in part (Eyre 1980)

**Comments:** Some woodlands formerly placed in this alliance from Louisiana are successional, or are the result of thinning. *Pinus echinata*-dominated vegetation in the Southern Blue Ridge occurs either as evergreen forests or as mixed woodlands and, therefore, not in this alliance. Conceptually, this alliance may exist in the West Gulf Coastal Plain but that vegetation is currently undescribed or placed in I.C.3.N.a *Pinus (echinata, taeda) - Quercus (incana, margarettiae, arkansana)* Forest Alliance (A.386). The possible occurrence of this alliance in the West Gulf Coastal Plain needs resolution.

**ALLIANCE DISTRIBUTION**

**Range:** This alliance is found in southern Missouri, Virginia, Arkansas, Kentucky, Mississippi, North Carolina, Oklahoma, Georgia, and possibly Tennessee (?) and Alabama (?). Some associations occur on dry ridges at the southern end of the Appalachians and in adjacent provinces (Ridge and Valley, Piedmont, Upper East Gulf Coastal Plain?). In the Ouachita Mountains, these woodlands occur naturally on rock outcrops but also as restored *Pinus echinata* savannas in eastern Oklahoma and western Arkansas.

**States:** AL? AR GA KY MO NC OK TN? VA?

**USFS Ecoregions:** 221H:C, 221J:C, 222A:C, 222E:C, 222H:C, 231A:C, 231E:C, 231G:C, 232B:C, 234A:P, M221D:C, M222A:C, M231A:C

**Federal Lands:** DOD (Camp Robinson); USFS (Chattahoochee, Cherokee, Holly Springs, Ouachita, Ozark, Talladega, Tombigbee, Tuskegee)

**ALLIANCE SOURCES**

**References:** Diamond 1993, Eyre 1980, Faber-Langendoen et al. 1996, Foti 1994a, Hoagland 1998a, Masters and Wilson 1994

## II.A.4.N.a.23 TABLE MOUNTAIN PINE - (PITCH PINE) WOODLAND ALLIANCE (A.521) PINUS PUNGENS - (PINUS RIGIDA) WOODLAND ALLIANCE

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### ALLIANCE CONCEPT

**Summary:** This alliance includes woodland vegetation in the southern and central Appalachians, dominated or codominated by *Pinus pungens*, with or without some admixture of *Pinus rigida* and/or *Pinus virginiana*. This alliance also includes woodlands dominated by *Pinus rigida* that occur within the geographic area where *Pinus pungens* occurs as a canopy dominant. Common canopy and subcanopy associates include *Quercus prinus*, *Quercus coccinea*, *Castanea dentata*, *Nyssa sylvatica*, *Acer rubrum*, and *Oxydendrum arboreum*. Typical shrubs include *Gaylussacia baccata*, *Vaccinium pallidum*, *Vaccinium stamineum*, *Vaccinium corymbosum*, *Vaccinium simulatum*, *Gaylussacia ursina*, *Rhododendron maximum*, *Kalmia latifolia*, *Rhododendron carolinianum*, *Rhododendron catawbiense*, *Leucothoe recurva*, and *Leiophyllum buxifolium*. In the central Appalachians and in the Virginia portion of the Southern Blue Ridge, *Quercus ilicifolia* is a characteristic shrub. Herbaceous species composition will vary within the range of this alliance. Species commonly found in the sparse herb stratum include *Galax urceolata*, *Pteridium aquilinum* var. *latiusculum*, *Xerophyllum asphodeloides*, *Fothergilla major*, *Comptonia peregrina*, and the subshrubs *Gaultheria procumbens*, and *Epigaea repens*. These woodlands typically occur at elevations from 760-1220 m (2500-4000 feet), on xeric ridges and exposed, steep side-slopes over thin, excessively drained, nutrient-poor soils and are often associated with rock outcroppings. Without periodic fire, these woodlands will gradually succeed into forests dominated by *Quercus prinus* and *Quercus coccinea*, except on the most extreme sites, where this vegetation is self-perpetuating. The primary range of associations in this alliance is the Appalachian Mountains (within the range of *Pinus pungens*), although the nominal species, *Pinus pungens*, has insular occurrences in the Upper Piedmont.

### Synonymy:

- IA7b. Xeric Pitch Pine/Table Mountain Pine Ridge Forest, in part (Allard 1990)
- Pine--Oak/Heath, in part (Schafale and Weakley 1990)
- Pine--Oak/Heath, in part (Nelson 1986)
- *Pinus pungens*/*Pinus rigida* (Pyne 1994)

**Comments:** Associations in this alliance generally have a woodland structure (open canopy), although locally vegetation may vary to a denser canopy.

### ALLIANCE DISTRIBUTION

**Range:** The primary range of associations in this alliance is the Appalachian Mountains (within the range of *Pinus pungens*), although the nominal species, *Pinus pungens*, has insular occurrences in the Upper Piedmont. This alliance is found in Georgia, North Carolina, South Carolina, Tennessee, Maryland, Pennsylvania, Virginia, and West Virginia.

**States:** GA MD NC PA SC TN VA WV

**USFS Ecoregions:** 231A:C, M221A:C, M221C:?, M221D:C

**Federal Lands:** NPS (Carl Sandburg Home, Great Smoky Mountains, Shenandoah); USFS (Chattahoochee, Cherokee, George Washington, Jefferson, Nantahala, Pisgah, Sumter)

### ALLIANCE SOURCES

**References:** Allard 1990, Barden 1977, Golden 1981, McLeod 1988, Nelson 1986, Newell and Peet 1995, Pyne 1994, Racine 1966, Rawinski et al. 1996, Schafale and Weakley 1990, 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, Zobel 1969

## II.A.4.N.b. Conical-crowned temperate or subpolar needle-leaved evergreen woodland

### II.A.4.N.b.1 NORTHERN WHITE-CEDAR WOODLAND ALLIANCE (A.544)

#### THUJA OCCIDENTALIS WOODLAND ALLIANCE

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### ALLIANCE CONCEPT

**Summary:** This alliance contains woodlands (with variable canopy closure) of calcareous bedrock outcrops and limestone cliffs on which *Thuja occidentalis* is the dominant canopy tree, although associations can include admixtures of deciduous species. The growth form is generally single-stemmed, but trees may be quite stunted. Associated canopy species can include *Pinus resinosa*, *Ostrya virginiana*, *Quercus rubra*, *Pinus strobus*, *Abies balsamea*, *Betula alleghaniensis*, *Betula papyrifera*, *Picea mariana*, *Picea glauca*, *Acer saccharum*, *Fraxinus americana*, *Tsuga canadensis*, *Celtis occidentalis*, *Ulmus rubra*, *Quercus alba*, and *Quercus muehlenbergii*. Herbaceous species vary with geography but can include *Zigadenus elegans* ssp. *glaucus*, *Carex eburnea*, *Cystopteris bulbifera*, *Pellaea atropurpurea*, *Pinguicula vulgaris*, *Primula laurentiana*, *Saxifraga oppositifolia*, *Waldsteinia fragarioides*, *Oligoneuron album* (= *Solidago ptarmicoides*), and *Carex pennsylvanica*, among others. This alliance occurs in Canada, the Great Lakes region, northern New England, New York, and discontinuously in

Maryland, West Virginia, Virginia, Kentucky, and Tennessee. In the Southeast it is known mostly from the Ridge and Valley Province, but occurrences are known from the periphery of the Tennessee Blue Ridge.

**Synonymy:**

- Northern White-Cedar: 37 (Eyre 1980)

**Comments:** This alliance occurs in Maryland, where it lacks *Pinguicula*, *Saxifraga*, and *Waldsteinia* but has *Pellaea* and *Ostrya*; it occurs in association with rich forests. It may occur in New York in the Champlain valley and may be in association with alvar communities. Above cliffs of Ohio communities, mixed stands grade into oak or oak-maple stands at short distances from the cliffs. In a comparison of two *Thuja occidentalis* forests, Kangas (1989) found that a southern glacial relict site in Ohio, which belongs in this alliance, had a stable population of *Thuja occidentalis*, which was not being replaced by the only subdominant, *Ulmus americana*.

**ALLIANCE DISTRIBUTION**

**Range:** This alliance is found in Kentucky, Tennessee, Maryland, New Hampshire (?), New York, Pennsylvania, Vermont, Virginia, West Virginia, Michigan, Minnesota, Ohio, Minnesota, and Wisconsin (?), and in Canada, in Ontario.

**States:** KY MD ME MI MN NH? NY OH ON PA QC? TN VA VT WI WV

**USFS Ecoregions:** 212C:C, 212E:C, 212H:C, 212J:P, 221A:?, 221B:P, 221D:?, 222E:C, 222F:C, 222H:C, 222I:C, 222L:C, 231A:C, M212A:P, M212B:P, M212C:P, M212D:P, M221A:C, M221B:C, M221D:C

**Federal Lands:** NPS (Acadia); USFS (Cherokee, George Washington)

**ALLIANCE SOURCES**

**References:** Braun 1928, Eyre 1980, Faber-Langendoen et al. 1996, Kangas 1989, Walker 1987

## II.A.4.N.f. Saturated temperate or subpolar needle-leaved evergreen woodland

### II.A.4.N.f.11 NORTHERN WHITE-CEDAR SATURATED WOODLAND ALLIANCE (A.583)

#### THUJA OCCIDENTALIS SATURATED WOODLAND ALLIANCE

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**ALLIANCE CONCEPT**

**Summary:** This alliance includes *Thuja occidentalis* woodlands on cliffs, associated with seepage, or on poorly drained flats. Associated species include *Cypripedium reginae*, *Maianthemum stellatum*, and *Spiranthes lucida*. More information is needed to determine the extent of this alliance and its relationship to II.A.4.N.b *Thuja occidentalis* Woodland Alliance (A.544).

**Synonymy:**

- Northern White-Cedar: 37, in part (Eyre 1980)

**Comments:**

**ALLIANCE DISTRIBUTION**

**Range:** This alliance is found in Tennessee and Virginia.

**States:** ME TN

**USFS Ecoregions:** 212C:C, M221D:C

**Federal Lands:** NPS (Acadia); USFS (Cherokee?)

**ALLIANCE SOURCES**

**References:** Eyre 1980, Walker 1987

## II.B.2.N.a. Cold-deciduous woodland

### II.B.2.N.a.4 WHITE ASH - PIGNUT HICKORY - (EASTERN RED-CEDAR) WOODLAND ALLIANCE (A.604)

#### FRAXINUS AMERICANA - CARYA GLABRA - (JUNIPERUS VIRGINIANA) WOODLAND ALLIANCE

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**ALLIANCE CONCEPT**

**Summary:** Woodlands in this alliance have *Fraxinus americana* and *Carya glabra* as typical canopy dominants, although *Juniperus virginiana*, *Quercus prinus*, or other *Carya* spp. may have significant coverage in some associations. Some associations have a nearly closed or locally closed canopy, and could in some cases as readily be considered as forests, while others have an edaphically maintained woodland physiognomy. Other minor canopy species vary with geography, but may include *Quercus rubra* var. *rubra*, *Pinus virginiana*, *Ulmus alata*, *Quercus stellata*, *Carya ovata*, and *Carya pallida*. Subcanopy and shrub species are variable between associations, but can include *Amelanchier sanguinea*, *Ceanothus*

*americanus*, *Celtis tenuifolia*, *Cercis canadensis*, *Chionanthus virginicus*, *Crataegus* sp., *Hypericum prolificum*, *Juniperus virginiana* var. *virginiana*, *Lonicera flava*, *Ostrya virginiana*, *Philadelphus hirsutus*, *Physocarpus opulifolius*, *Ptelea trifoliata*, *Rhus aromatica* var. *aromatica*, *Rhus typhina*, *Rosa carolina*, *Spiraea betulifolia* var. *corymbosa*, *Symphoricarpos orbiculatus*, *Toxicodendron radicans*, *Vaccinium arboreum*, *Vaccinium pallidum*, *Vaccinium stamineum*, *Viburnum rafinesquianum* (= var. *rafinesquianum*), and *Viburnum rufidulum*. Herbaceous species vary among associations, but species known from these woodlands include *Allium cuthbertii*, *Andropogon gerardii*, *Andropogon gyrans*, *Andropogon ternarius*, *Anemone berlandieri*, *Anemone virginiana*, *Antennaria virginica*, *Aquilegia canadensis*, *Arabis canadensis*, *Arabis hirsuta* var. *pyncocarpa* (= *Arabis hirsuta* var. *adpressipilis*), *Arabis laevigata*, *Aristida purpurascens*, *Aristolochia serpentaria*, *Asclepias quadrifolia*, *Asplenium platyneuron*, *Symphyotrichum oblongifolium* (= *Aster oblongifolius*), *Symphyotrichum patens* var. *patens* (= *Aster patens* var. *patens*), *Campanula divaricata*, *Cardamine parviflora* var. *arenicola*, *Carex pensylvanica*, *Cheilanthes lanosa*, *Claytonia virginica*, *Coreopsis major*, *Coreopsis pubescens*, *Cunila origanoides*, *Danthonia compressa*, *Danthonia sericea*, *Danthonia spicata*, *Desmodium rotundifolium*, *Dichanthelium boscii*, *Dichanthelium scoparium*, *Dodecatheon meadia*, *Draba ramosissima*, *Elymus hystrix*, *Erigeron pulchellus*, *Helianthus divaricatus*, *Helianthus microcephalus*, *Houstonia longifolia*, *Hypericum gentianoides*, *Hypericum punctatum*, *Melica mutica*, *Muhlenbergia tenuiflora*, *Phacelia dubia*, *Phlox nivalis* ssp. *hantzii*, *Piptochaetium avenaceum*, *Polygala paucifolia*, *Polygonum tenue*, *Pycnanthemum incanum*, *Pycnanthemum montanum*, *Saxifraga michauxii*, *Schizachyrium scoparium*, *Sedum glaucophyllum*, *Selaginella rupestris*, *Packera millefolia* (= *Senecio millefolium*), *Packera obovata* (= *Senecio obovatus*), *Solidago arguta* var. *harrisii* (= *Solidago harrisii*), *Solidago juncea*, *Solidago nemoralis*, *Sorghastrum nutans*, *Tradescantia ohioensis*, *Verbesina occidentalis*, *Woodsia ilvensis*, and *Woodsia obtusa*. These woodlands are often a physiognomic complex of woodland, grassland, and rock outcropping, often associated with granitic domes or rocky summits. Soils are circumneutral and derived from such base-rich rocks as greenstone, plagioclase-rich granite, hornblende gneiss, amphibole gneiss, limestones, or calcareous shales. Woodlands in this alliance are currently defined from 1000-3800 feet elevation in the southern and central Blue Ridge, the Ridge and Valley of Virginia, and the upper Piedmont of Georgia, North Carolina, and Virginia.

#### Synonymy:

- Low Elevation Granitic Dome, Basic Variant, in part (Schafale and Weakley 1990)
- Piedmont / Mountain Basic Woodland, in part (Fleming et al. 2001)

**Comments:** Fleming (1999) discusses classification questions related to this alliance in Virginia and in the Nashville Basin of Tennessee: "In a study of woody vegetation in the Tennessee Central Basin, Crites and Clebsch (1986) found communities sorted along a topographic-moisture gradient. A '*Carya* - *Juniperus* - *Quercus* Community' that may be similar to the *Fraxinus americana* - *Carya ovata* / *Frangula caroliniana* / *Helianthus hirsutus* Woodland (CEGL008458) (*sensu* Fleming 1999) was classified from subxeric upland habitats. The dominants of the Tennessee community (based on the importance values of woody species >2.5 cm dbh) were *Fraxinus americana*, either *Carya ovata* or *Carya glabra* (pignut hickory), and *Juniperus virginiana*. *Fraxinus americana* was considered a 'local successional species,' the densities of which were 'masking' the importance values of oaks (Crites and Clebsch 1986). Implicit (but not directly stated) in this assessment is the concept that *Quercus muehlenbergii* and other oaks represent a more advanced successional stage on the subxeric uplands. Of course, without data on shrub and herbaceous composition, it is impossible to accurately evaluate the similarity of the Virginia and Tennessee communities" (Fleming 1999). In relation to the possible presence of this alliance in Tennessee, see the *Fraxinus quadrangulata* - (*Juniperus virginiana*) Woodland Alliance (A.1913).

#### ALLIANCE DISTRIBUTION

**Range:** Woodlands in this alliance are currently defined from 1000-3800 feet elevation in the southern and central Blue Ridge and in the upper Piedmont of the United States.

**States:** AL? GA MD NC PA SC? TN VA WV?

**USFS Ecoregions:** 212A:C, 212B:C, 221A:C, 231A:C, M221A:C, M221B:?, M221C:C, M221D:C

**Federal Lands:** NPS (Blue Ridge Parkway, Great Smoky Mountains?, Shenandoah); USFS (Cherokee, George Washington, Jefferson, Nantahala, Oconee, Pisgah)

#### ALLIANCE SOURCES

**References:** Crites and Clebsch 1986, Dellinger 1992, Fleming 1999, Fleming et al. 2001, Schafale and Weakley 1990, Small 1996

### II.B.2.N.a.6 HONEY-LOCUST WOODLAND ALLIANCE (A.606) GLEDITSIA TRIACANTHOS WOODLAND ALLIANCE

#### ALLIANCE CONCEPT

**Summary:** This alliance covers successional Appalachian and interior woodlands typically dominated by *Gleditsia triacanthos* and *Ulmus* spp., along with a variety of hardwoods and gymnosperms. These successional woodlands typically have a total canopy cover between 25 and 50%. The canopy species vary greatly, but *Gleditsia triacanthos* is always present

(in variable amounts), and *Ulmus alata* or *Ulmus rubra* is usually present. Other species that may occur in this woodland are *Juniperus virginiana* var. *virginiana*, *Pinus virginiana*, *Celtis occidentalis*, *Celtis laevigata* var. *laevigata*, *Liriodendron tulipifera*, *Liquidambar styraciflua*, *Juglans nigra*, *Fraxinus americana*, *Quercus alba*, *Quercus stellata*, *Quercus velutina*, *Quercus rubra*, and *Carya* spp. Common shrubs are *Rhus copallinum* and *Rubus* spp. This successional type results from heavy grazing or other severe disturbance.

**Synonymy:****Comments:****ALLIANCE DISTRIBUTION**

**Range:** This alliance is found in Tennessee and possibly in Alabama (?), Georgia (?), Kentucky (?), and elsewhere.

**States:** AL? GA? KY? TN

**USFS Ecoregions:** 221H:P, 221J:C, 231A:?, 231C:?, 231D:?, M221D:?

**Federal Lands:** TVA (Tellico); USFS (Cherokee?)

**ALLIANCE SOURCES**

**References:** Andreu and Tukman 1995

## **II.B.2.N.a.25 POST OAK - BLACKJACK OAK WOODLAND ALLIANCE (A.625)** **QUERCUS STELLATA - QUERCUS MARILANDICA WOODLAND ALLIANCE**

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**ALLIANCE CONCEPT**

**Summary:** This alliance includes open-canopy stands, typically dominated by *Quercus stellata* and/or *Quercus marilandica*, found throughout the southeastern and lower midwestern United States. These communities are physiognomically variable, locally varying from deciduous to mixed, these mixed stands often having substantial *Juniperus virginiana* var. *virginiana*, especially as a result of fire suppression. These post oak - blackjack oak barrens are more edaphically extreme or frequently burned than the corresponding I.B.2.N.a *Quercus stellata* - *Quercus marilandica* Forest Alliance (A.253), which is currently more common due to fire suppression. Some examples occur on 2:1 montmorillonitic clays, while others are on limestone-derived soils. Canopy and subcanopy associates, in addition to *Quercus stellata* and *Quercus marilandica*, may include *Juniperus virginiana* var. *virginiana*, *Pinus echinata*, *Pinus virginiana*, *Carya texana*, *Carya glabra*, *Cornus florida*, *Quercus alba*, *Quercus falcata*, *Quercus prinus*, *Quercus velutina*, *Diospyros virginiana*, *Chionanthus virginicus*, and *Vaccinium arboreum*. *Pinus palustris* may be present in this alliance in the West Gulf Coastal Plain of eastern Texas and western Louisiana. In associations on mafic substrates, *Carya carolinae-septentrionalis*, *Ulmus alata*, *Fraxinus americana*, and *Cercis canadensis* are common. *Acer rubrum* and *Liquidambar styraciflua* increase with disturbance. Shrubs may be sparse to dense, and species present include *Viburnum rafinesquianum*, *Ilex longipes*, *Symphoricarpos orbiculatus*, *Gaylussacia baccata*, *Rhododendron canescens*, *Vaccinium stamineum*, *Vaccinium corymbosum*, and *Viburnum prunifolium*. In the southeastern Coastal Plain, some stands may contain *Quercus margarettiae*. A rare type that occurs in North and South Carolina has an herbaceous layer containing many prairie species such as *Silphium terebinthinaceum*, *Solidago nemoralis*, *Coreopsis major*, *Liatriis aspera*, *Andropogon gerardii*, and *Sorghastrum nutans*. The most common herbaceous species are *Schizachyrium scoparium* and *Danthonia spicata*. ^In Tennessee, woodlands in this alliance occur in the Central Basin and adjacent Highland Rim and may contain *Andropogon gerardii*, *Schizachyrium scoparium*, and/or *Sorghastrum nutans*. Pines are absent; instead, *Juniperus virginiana* var. *virginiana* may be present in the more-or-less open subcanopy. Shrubs in the Central Basin examples include *Forestiera ligustrina*, *Hypericum frondosum*, *Rhus aromatica*, and *Viburnum rufidulum*. Fire suppression in these sites may lead to dense undergrowth of *Juniperus*. In Louisiana and Texas (and in the Sandhills of the southeastern Coastal Plain), this alliance results mostly from pine removal and fire suppression, and examples only marginally fit this concept. This alliance occurs on xeric sites in northwestern Arkansas and may include some of Arkansas's glade/outcrop complexes and prairie communities, as well as ridgetop savanna / glade communities. This alliance is widespread throughout the southeastern and lower midwestern United States and occurs in the following regions: Ozarks, Interior Low Plateau, Boston Mountains, Southern Piedmont, Southern Ridge and Valley, Arkansas Valley, Ouachita Mountains, Atlantic Coastal Plain, Upper East Gulf Coastal Plain (Black Belt), Crowley's Ridge, and the Prairie Parkland.

**Synonymy:**

- IA6c. Dry Post Oak - Blackjack Oak Forest, in part (Allard 1990)
- Dry Post Oak-Blackjack Oak Forest, in part (Pyne 1994)
- Juniper - Hardwood Woodland (Foti 1994b)
- *Quercus stellata* - *Quercus marilandica* woodland alliance (Hoagland 1998a)
- *Quercus marilandica* woodland alliance (Hoagland 1998a)
- Post Oak-Blackjack Oak Series, in part (Diamond 1993)
- T2A2bI. *Juniperus virginiana* - *Quercus* spp. (Foti et al. 1994)
- T2B4aI1b. *Quercus stellata* - *Quercus marilandica* - *Carya texana* (Foti et al. 1994)
- Post Oak - Blackjack Oak: 40, in part (Eyre 1980)



- Eastern Redcedar: 46, in part (Eyre 1980)

**Comments:** This alliance is attributed to Fort Benning, Georgia, to represent more frequently burned or disturbed areas with dominance by *Quercus marilandica*, *Quercus stellata* over a grassy understory. An association is being described to accommodate this vegetation. The relationship of these stands either to related forests or to *Quercus laevis*-dominated stands is unknown.

#### ALLIANCE DISTRIBUTION

**Range:** This alliance is widespread throughout the southeastern and lower midwestern United States and occurs in the following regions: Ozarks, Interior Low Plateau, Boston Mountains, Southern Piedmont, Southern Ridge and Valley, Arkansas Valley, Ouachita Mountains, Atlantic Coastal Plain, Upper East Gulf Coastal Plain (Black Belt), Crowley's Ridge, and the Prairie Parkland. It is found in Illinois, Indiana, Iowa (?), Kansas, Missouri, Virginia, Alabama, Arkansas, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, and Texas. In addition, an inland dune association of New Jersey (?) and New York is placed here.

**States:** AL AR GA IA? IL IN KS KY LA MO MS NC NJ? NY OK SC TN TX VA

**USFS Ecoregions:** 221D:C, 221H:C, 221J:C, 222A:C, 222C:C, 222D:C, 222E:C, 222F:C, 222G:C, 231A:C, 231B:C, 231C:C, 231D:C, 231E:C, 231G:C, 232B:C, 232F:P, 234A:C, 251C:C, 251E:C, 251F:C, 255A:C, 255B:C, 255C:C, 311A:C, M222A:C, M231A:C

**Federal Lands:** COE (Falls Lake, J. Percy Priest?, Lake Millwood); DOD (Arnold, Fort Benning, Fort Chaffee, Fort Polk); NPS (Buffalo, Chickasaw); USFS (Angelina, Cherokee, Conecuh, Daniel Boone, Davy Crockett?, De Soto, Holly Springs?, Kisatchie, Oconee, Ouachita, Ozark, Sabine, Sam Houston, Shawnee, Sumter, Talladega?, Tombigbee, Tuskegee, Uwharrie)

#### ALLIANCE SOURCES

**References:** Allard 1990, Burns and Honkala 1990b, Diamond 1993, Eyre 1980, Faber-Langendoen et al. 1996, Foti et al. 1994, Hoagland 1998a, Nelson 1986, Pyne 1994, Schafale and Weakley 1990

### II.C.3.N.a. Mixed needle-leaved evergreen - cold-deciduous woodland

#### II.C.3.N.a.9 (PITCH PINE, TABLE MOUNTAIN PINE, VIRGINIA PINE) - ROCK CHESTNUT OAK WOODLAND ALLIANCE (A.677) PINUS (RIGIDA, PUNGENS, VIRGINIANA) - QUERCUS PRINUS WOODLAND ALLIANCE

#### ALLIANCE CONCEPT

**Summary:** This alliance includes woodland vegetation dominated by *Pinus virginiana*, possibly with a mixture of *Pinus rigida*, *Pinus pungens*, and/or *Quercus prinus*. Associations in this alliance are possible from central Pennsylvania southwest to Virginia and Tennessee, but tend to occur under extreme conditions (such as steep, shaley slopes) that maintain the open structure of the vegetation.

#### Synonymy:

- Virginia Pine: 79, in part (Eyre 1980)

#### Comments:

#### ALLIANCE DISTRIBUTION

**Range:** This alliance is found in North Carolina, Tennessee, Maryland, Pennsylvania, Virginia, and West Virginia.

**States:** MD NC PA TN VA WV

**USFS Ecoregions:** 231A:C, 231E:C, M221A:C, M221B:C, M221D:C

**Federal Lands:** USFS (Cherokee, Daniel Boone?, George Washington, Jefferson, Pisgah)

#### ALLIANCE SOURCES

**References:** Eyre 1980

## III. SHRUBLAND

### III.A.2.N.b. Hemi-sclerophyllous temperate broad-leaved evergreen shrubland

**III.A.2.N.b.4 (CATAWBA RHODODENDRON, CAROLINA RHODODENDRON) - MOUNTAIN LAUREL SHRUBLAND ALLIANCE (A.744)**  
**RHODODENDRON (CATAWBIENSE, CAROLINIANUM) - KALMIA LATIFOLIA SHRUBLAND ALLIANCE**

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**ALLIANCE CONCEPT**

**Summary:** This alliance includes evergreen shrublands occurring on steep, exposed slopes, ridges, and rock outcrops 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. The occurrence and relative abundance of associated shrub species vary with elevation and adjacent vegetation. 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.

**Synonymy:**

- IC4a. Heath Bald Shrubland, in part (Allard 1990)
- Blue Ridge Shrub Bald, in part (Ambrose 1990a)
- Heath Bald, in part (Schafale and Weakley 1990)
- Heath Bald, in part (Pyne 1994)
- Oligotrophic Scrub, in part (Rawinski 1992)

**Comments:** Similar, but floristically different, ericaceous shrublands occur in the Mahoosuc Mountains of Maine (Fahey 1976). 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*.

**ALLIANCE DISTRIBUTION**

**Range:** This alliance is found in Georgia, Kentucky, North Carolina, Tennessee, and Virginia

**States:** GA KY NC TN VA

**USFS Ecoregions:** M221A:P, M221B:P, M221D:C

**Federal Lands:** NPS (Great Smoky Mountains); USFS (Chattahoochee, Cherokee, Jefferson, Nantahala, Pisgah)

**ALLIANCE SOURCES**

**References:** Allard 1990, Ambrose 1990a, Brown 1941, Cain 1930, Fahey 1976, Gant 1978, McLeod 1988, Newell and Peet 1995, Newell and Peet 1996a, Pyne 1994, Ramseur 1958, Rawinski 1992, Risk 1993, Schafale and Weakley 1990, Whittaker 1979

**III.A.2.N.b.5 GREAT RHODODENDRON SHRUBLAND ALLIANCE (A.745)**  
**RHODODENDRON MAXIMUM SHRUBLAND ALLIANCE**

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**ALLIANCE CONCEPT**

**Summary:** This alliance includes riparian shrublands and shrub thickets of mesic slopes dominated by *Rhododendron maximum*, without a significant tree canopy. *Rhododendron maximum*-dominated shrublands are less frequently found on more xeric ridges and sideslopes, on sites which have been subjected to extreme crown fires. Shrublands in this alliance are typically tall (over 2 m) and occur over acidic soils. These shrublands can occur as the result of disturbance and will succeed to forest with an ericaceous understory without some form of disturbance. *Rhododendron maximum* shrublands frequently occur adjacent to wet herbaceous cliff vegetation, wetland riparian shrublands, or within forests dominated by *Tsuga canadensis*, *Quercus rubra*, *Liriodendron tulipifera*, *Pinus strobus*, *Quercus prinus*, *Picea rubens*, or *Abies fraseri*.

**Synonymy:**

- IC4b. Montane Rhododendron Thicket (Allard 1990)
- Rhododendron Thicket (Nelson 1986)
- Submesotrophic Scrub (Rawinski 1992)
- *Rhododendron maximum*/Acidophil Herbs (McLeod 1981)
- Rhododendron-Mountain Laurel/Xeric Herbs (McLeod 1981)

**Comments:** Shrublands in this alliance may have scattered woody species that are greater than 5 m tall but with generally less than 10% total cover. Some of what were thought to be examples of this vegetation type are actually *Rhododendron* stands under a canopy of evergreen and/or deciduous trees.

**ALLIANCE DISTRIBUTION**

**Range:** Shrublands in this alliance occur in the Appalachian Mountains, Ridge and Valley, Appalachian Plateaus, and Cumberland Mountains. This alliance is found in Georgia, North Carolina, South Carolina, Tennessee, and West Virginia, and possibly Virginia (?).

**States:** GA NC SC TN VA? WV

**USFS Ecoregions:** 221E:P, M221A:C, M221B:C, M221C:C, M221D:C

**Federal Lands:** USFS (Chattahoochee, Cherokee, Nantahala, Pisgah, Sumter)

#### ALLIANCE SOURCES

**References:** Allard 1990, Core 1966, Gant 1978, Hodgdon and Pike 1961, McGee and Smith 1967, McLeod 1981, Monk et al. 1985, Nekon 1986, Phillips and Murdy 1985, Plocher and Carvell 1987, Rawinski 1992

### III.A.2.N.g. Temporarily flooded temperate broad-leaved evergreen shrubland

#### III.A.2.N.g.1 GIANT CANE TEMPORARILY FLOODED SHRUBLAND ALLIANCE (A.795) ARUNDINARIA GIGANTEA TEMPORARILY FLOODED SHRUBLAND ALLIANCE

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##### ALLIANCE CONCEPT

**Summary:** This alliance encompasses various temporarily flooded wetlands, including alluvial or loess substrates (streamside flats, bottomlands), dominated by *Arundinaria*, without an overstory, or with widely scattered trees. Evidence suggests that this alliance was widespread historically, covering 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 and possibly the Central Appalachians 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. This alliance may be found along larger rivers (Buffalo, White, Norfolk) in the Ozarks, as well as in the Wabash and Ohio drainage systems, at least historically. 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. In the Central Appalachians various wetlands, including those on alluvial or loess substrates (streamside flats, bottomlands), were dominated by *Arundinaria*, without an overstory, or with widely scattered trees.

##### Synonymy:

- *Arundinaria gigantea* shrubland alliance (Hoagland 1998a)
- P5A4bIII4a. *Arundinaria gigantea* (Foti et al. 1994)

**Comments:** *Arundinaria gigantea* is a common component in many bottomland and streamside communities today. Vegetation characterized by a predominance of *Arundinaria* in the understory of a woodland or forest community would not be classified in this alliance. 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 streambanks in Alabama, Arkansas, Florida, Georgia, Illinois, Indiana, Kentucky, Louisiana, Mississippi, Missouri, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, and possibly Virginia (?).

**States:** AL AR FL? GA IL IN KY LA MO MS NC OK SC TN TX VA?

**USFS Ecoregions:** 221H:C, 221J:C, 222A:C, 222C:C, 222D:C, 222E:C, 222F:C, 231A:C, 231B:C, 231C:C, 231D:C, 231E:C, 231G:C, 234A:C, 255D:P, M221D:C, M222A:C, M231A:C

**Federal Lands:** DOD (Fort Benning); NPS (Buffalo, Great Smoky Mountains); USFS (Cherokee?, Mark Twain, Ouachita?, Ozark, St. Francis); USFWS (Little River, San Bernard?)

##### ALLIANCE SOURCES

**References:** Campbell 1980, Campbell 1989b, Davidson 1950, 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, West 1934

### III.B.2.N.a. Temperate cold-deciduous shrubland

#### III.B.2.N.a.11 KUDZU VINE-SHRUBLAND ALLIANCE (A.904) PUERARIA MONTANA VINE-SHRUBLAND ALLIANCE

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##### ALLIANCE CONCEPT

**Summary:** This 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 Southeast. The alliance occupies a variety of sites throughout most

physiographic provinces in the Southeast, with examples ranging in size from less than 1 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 alliance is also known to occur north to central Kentucky, Virginia, and Maryland, and as far west as eastern Texas and Oklahoma. It is also found in Arkansas, Florida, and Louisiana.

**Synonymy:****Comments:****ALLIANCE DISTRIBUTION**

**Range:** 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 alliance is also known to occur north to central Kentucky, Virginia, and Maryland, and as far west as eastern Texas and Oklahoma (Edwards 1982). It is also found in Arkansas, Florida, and Louisiana.

**States:** AL AR FL GA KY LA MD MS NC OK SC TN TX VA

**USFS Ecoregions:** 221H:C, 222A:C, 231C:C, 232B:C, 234A:C, M221A:C, M221C:C, M221D:C, M222A:C, M231A:C

**Federal Lands:** DOD (Fort Benning); TVA (Tellico); USFS (Bankhead, Cherokee, Daniel Boone, George Washington, Jefferson, Oconee?, Ouachita, Ozark, Talladega)

**ALLIANCE SOURCES**

**References:** Edwards 1982, Patterson 1976

**III.B.2.N.a.18 SUMMER GRAPE VINE-SHRUBLAND ALLIANCE (A.911)****VITIS AESTIVALIS VINE-SHRUBLAND ALLIANCE****ALLIANCE CONCEPT**

**Summary:** This alliance includes vine thickets dominated by dense *Vitis aestivalis*. This alliance is represented in the Great Smoky Mountains and other parts of the Southern Blue Ridge, and is possible in the Ozarks and Ouachita Mountains. The dynamics of communities in this alliance are poorly understood. These communities apparently are originally caused by disturbance, such as an ice or wind storm; they apparently persist for decades, and range in size from less than a hectare to 10 hectares. Emergent small to large trees (usually draped in *Vitis*) can occur. Herbaceous diversity is low because of the dense vine cover. Beneath the vine canopy, coarse woody debris and tip-up mounds are typical.

**Synonymy:****Comments:****ALLIANCE DISTRIBUTION**

**Range:** This alliance is known from the Great Smoky Mountains of Tennessee and other parts of the Southern Blue Ridge, and may possibly occur in montane areas of Arkansas (?), Kentucky, North Carolina, and Oklahoma.

**States:** AR? KY? NC? OK? TN

**USFS Ecoregions:** 234A:?, M221D:C, M222A:P, M231A:P

**Federal Lands:** NPS (Great Smoky Mountains); USFS (Cherokee, Ozark?)

**ALLIANCE SOURCES**

**References:** MacKenzie 1993

**III.B.2.N.b. Subalpine or subpolar cold-deciduous shrubland****III.B.2.N.b.1 GREEN ALDER SHRUBLAND ALLIANCE (A.929)****ALNUS VIRIDIS SHRUBLAND ALLIANCE****ALLIANCE CONCEPT**

**Summary:** This alliance includes montane, mainly deciduous shrublands dominated by *Alnus viridis*. These shrubs are typically 1.5-2 m in height, rarely producing a closed canopy but typically occurring as uniformly spaced clumps about 1 m apart. *Rubus allegheniensis* is often a codominant with *Alnus viridis* ssp. *crispa*. Other shrub species occur with low coverage and include *Rhododendron catawbiense*, *Vaccinium corymbosum*, and *Crataegus* spp. Openings in the shrub canopy are dominated by herbs, mainly *Carex pensylvanica* and *Carex debilis* var. *rudgei* but also may include *Danthonia compressa*, *Deschampsia flexuosa*, *Viola blanda*, *Rumex acetosella* (exotic), and *Athyrium filix-femina* ssp. *asplenoides*. In moister areas, bryophyte cover can be up to 75%, with *Polytrichum commune* typical.

**Synonymy:**

- IC4a. Heath Bald Shrubland, in part (Allard 1990)
- Heath Bald, in part (Schafale and Weakley 1990)

**Comments:****ALLIANCE DISTRIBUTION**

**Range:** This alliance is very limited in the Southeast, occurring only in the Roan Mountain massif, Avery and Mitchell counties, North Carolina, and Carter County, Tennessee, where it occupies hundreds of hectares. The alliance likely also occurs in Alaska, Canada, and possibly in other (northern or montane) parts of the East and West.

**States:** NC TN

**USFS Ecoregions:** M221D:C

**Federal Lands:** USFS (Cherokee, Pisgah)

**ALLIANCE SOURCES**

**References:** Allard 1990, Brown 1941, Schafale and Weakley 1990

### III.B.2.N.b.2 ALLEGHENY BLACKBERRY - SMOOTH BLACKBERRY SHRUBLAND ALLIANCE (A.930)

RUBUS ALLEGHENIENSIS - RUBUS CANADENSIS SHRUBLAND ALLIANCE

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**ALLIANCE CONCEPT**

**Summary:** This alliance encompasses *Rubus*-dominated areas at high elevations in the Southern Blue Ridge. 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.

**Synonymy:**

- ID9a. Grass Bald, in part (Allard 1990)
- Grassy Bald, in part (Schafale and Weakley 1990)
- Grass Balds, BR, in part (Pyne 1994)

**Comments:****ALLIANCE DISTRIBUTION**

**Range:** This alliance is found in North Carolina, Tennessee, and Virginia.

**States:** NC TN VA

**USFS Ecoregions:** M221B:C, M221D:C

**Federal Lands:** NPS (Blue Ridge Parkway, Great Smoky Mountains); USFS (Cherokee, Jefferson, Nantahala, Pisgah)

**ALLIANCE SOURCES**

**References:** Allard 1990, Crandall 1958, Feldcamp 1984, Pyne 1994, Schafale and Weakley 1990

### III.C.2.N.e. Saturated mixed evergreen - cold-deciduous shrubland

#### III.C.2.N.e.100 SMOOTH ALDER - SILKY WILLOW - (CATAWBA RHODODENDRON, GREAT RHODODENDRON) SATURATED SHRUBLAND ALLIANCE (A.1880)

ALNUS SERRULATA - SALIX SERICEA - RHODODENDRON (CATAWBIENSE, MAXIMUM)  
SATURATED SHRUBLAND ALLIANCE

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**ALLIANCE CONCEPT**

**Summary:** This alliance includes mostly montane, non-alluvial, palustrine vegetation dominated by shrubs and often, but not always, with substantial *Sphagnum* cover. Occurrences of this alliance can have small to moderately large herbaceous openings, as well, but where open herbaceous patches are large and well-developed, communities in V.A.5.N.m. should be considered. Communities in this alliance are saturated shrublands with *Alnus serrulata* as a nearly constant component, but many other shrub species are typical and may dominate or codominate, including *Salix sericea*, *Salix humilis*, *Spiraea alba*, *Spiraea tomentosa*, *Ilex verticillata*, *Ilex collina*, *Ilex montana*, *Rhododendron catawbiense*, *Rhododendron maximum*, *Rhododendron viscosum*, *Rhododendron arborescens*, *Lyonia ligustrina* var. *ligustrina*, *Kalmia latifolia*, *Menziesia pilosa*, *Kalmia carolina*, *Viburnum nudum* var. *nudum*, *Viburnum nudum* var. *cassinoides*, *Lonicera canadensis*, and *Lonicera dioica*. This alliance includes shrub bogs and bogs with well-developed shrub zones, scattered in the southern Blue Ridge, and may possibly extend to the Cumberland Mountains and northern Ridge and Valley.

**Synonymy:**

- IIE1b. Southern Appalachian Bog Complex, in part (Allard 1990)

- mountain bog/seep shrub/scrub vegetation (Ambrose 1990a)
- mountain bog/seep herbaceous vegetation (Ambrose 1990a)
- Scrub/Shrub Swamp, in part (Smith 1996a)
- Southern Appalachian Bog, Northern Subtype, in part (Schafale and Weakley 1990)
- Southern Appalachian Bog, Southern Subtype, in part (Schafale and Weakley 1990)

**Comments:****ALLIANCE DISTRIBUTION**

**Range:** This alliance includes shrub bogs and bogs with well-developed shrub zones, scattered in the southern Blue Ridge, and may possibly extend to the Cumberland Mountains and northern Ridge and Valley. This alliance is found in Georgia, Kentucky, North Carolina, South Carolina, Tennessee, Virginia. It could potentially range into Alabama (?) and West Virginia (?).

**States:** AL? GA KY NC SC TN VA WV?

**USFS Ecoregions:** 221:C, M221A:C, M221B:C, M221D:C

**Federal Lands:** NPS (Blue Ridge Parkway, Great Smoky Mountains?, Little River Canyon?); USFS (Chattahoochee, Cherokee, Jefferson, Nantahala, Pisgah?, Sumter?)

**ALLIANCE SOURCES**

**References:** Allard 1990, Ambrose 1990a, Schafale and Weakley 1990, Smith 1996a, Weakley and Schafale 1994

**V. HERBACEOUS VEGETATION****V.A.5.N.c. Medium-tall sod temperate or subpolar grassland****V.A.5.N.c.3 COMMON BROOMSEDGE HERBACEOUS ALLIANCE (A.1208)****ANDROPOGON VIRGINICUS HERBACEOUS ALLIANCE****ALLIANCE CONCEPT**

**Summary:** This alliance includes vegetation dominated by *Andropogon virginicus* var. *virginicus* that occurs on old fields, pastures, and rocky sites. Associated species vary with geography and habitat and include typical pioneer species. This is a very wide-ranging alliance. There is no known natural vegetation in this alliance.

**Synonymy:**

- *Andropogon virginicus* herbaceous alliance (Hoagland 1998a)

**Comments:****ALLIANCE DISTRIBUTION**

**Range:** This alliance is found in Alabama, Arkansas, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, and Missouri, and possibly Illinois (?), Indiana (?), and elsewhere.

**States:** AL AR GA IL IN? KY LA MO? MS NC OK SC TN TX VA

**USFS Ecoregions:** 221C:P, 222A:C, 231F:C, 231G:C, 232B:C, 232F:C, 255D:C, M221A:C, M221B:?, M221C:P, M221D:C, M222A:C, M231A:C

**Federal Lands:** DOD (Arnold, Fort Benning, Fort Gordon); USFS (George Washington, Jefferson, Oconee?, Ouachita?, Ozark?, Talladega?, Tuskegee?); USFWS (Anahuac, Big Boggy?, Brazoria)

**ALLIANCE SOURCES**

**References:** Hoagland 1998a

**V.A.5.N.c.8 (TALL FESCUE, MEADOW FESCUE) HERBACEOUS ALLIANCE (A.1213)****LOLIUM (ARUNDINACEUM, PRATENSE) HERBACEOUS ALLIANCE****ALLIANCE CONCEPT**

**Summary:** This alliance includes pastures, hayfields, and old pastures, more-or-less cultural, though sometimes no longer actively maintained. The dominant species in this alliance are the European 'tall or meadow fescues,' of uncertain and controversial generic placement. Although at one time treated as *Festuca elatior* and *Festuca arundinacea*, these two closely related species are now treated as *Lolium pratense* and *Lolium arundinaceum*, respectively. These communities are sometimes nearly monospecific, but can also be very diverse and contain many native species of grasses, sedges, and forbs.

**Synonymy:**

**Comments:** Conversion to Kartesz (1999) standard has changed this to the *Lolium* names from *Festuca*.

**ALLIANCE DISTRIBUTION**

**Range:** This alliance is currently defined for the 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. It is found in Arkansas, Georgia, North Carolina, Oklahoma, South Carolina, Tennessee, Virginia, Missouri, and elsewhere.

**States:** AR GA MO NB? NC NS? OK ON? QC? SC TN VA

**USFS Ecoregions:** 221:C, 222:C, 231A:C, M221D:C, M222A:C, M231A:C

**Federal Lands:** NPS (Blue Ridge Parkway, Buffalo, Carl Sandburg Home, Great Smoky Mountains, Guilford Courthouse, Ninety Six, Shenandoah); USFS (Ouachita, Ozark)

**ALLIANCE SOURCES**

**References:** Kartesz 1999

### V.A.5.N.c.104 TIMOTHY HERBACEOUS ALLIANCE (A.1195) PHLEUM PRATENSE HERBACEOUS ALLIANCE

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**ALLIANCE CONCEPT**

**Summary:** This alliance 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. *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). These grasslands are maintained by periodic mowing or, in some instances, prescribed burning. This alliance is currently known throughout the northeastern United States and from high elevation pastures or grass balds in the southern Appalachians. It is possible throughout the United States and in southern Canada.

**Synonymy:**

- ID9a. Grass Bald, in part (Allard 1990)
- Grassy Bald, in part (Schafale and Weakley 1990)
- Grass Balds, in part (Pyne 1994)

**Comments:****ALLIANCE DISTRIBUTION**

**Range:** This alliance 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 is found in North Carolina, Tennessee, and possibly Virginia (?) and Canada (?).

**States:** IL MI MN NC OH ON TN VA? WI

**USFS Ecoregions:** M221D:C

**Federal Lands:** NPS (Great Smoky Mountains?, Isle Royale); USFS (Cherokee, Pisgah)

**ALLIANCE SOURCES**

**References:** Allard 1990, Pyne 1994, Schafale and Weakley 1990

### V.A.5.N.e. Short sod temperate or subpolar grassland

#### V.A.5.N.e.5 PENNSYLVANIA SEDGE HERBACEOUS ALLIANCE (A.1278) CAREX PENNSYLVANICA HERBACEOUS ALLIANCE

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**ALLIANCE CONCEPT**

**Summary:** This alliance includes montane grasslands strongly dominated by *Carex pensylvanica*. In the Southern Blue Ridge these grasslands are ungrazed grass balds with deep soil. Associated species include *Rumex acetosella* (exotic), *Carex debilis*, *Polytrichum commune*, *Helenium autumnale*, *Danthonia compressa*, *Sibbaldiopsis tridentata*, *Fragaria virginiana*, *Ageratina altissima* var. *roanensis*, *Angelica triquinata*, *Oclemena acuminata* (= *Aster acuminatus*), *Bromus pubescens*, and *Dennstaedtia punctilobula*. These grasslands typically occur over 1220 m (4000 feet) elevation in the Southern Blue Ridge. In the Central Appalachians, these communities are found on acid shale.

**Synonymy:**

- ID9a. Grass Bald, in part (Allard 1990)
- Grassy Bald, in part (Schafale and Weakley 1990)
- Grass Balds, in part (Pyne 1994)

**Comments:** The affinities of this community are northern; it might be better placed in V.A.5.N.g short alpine or subalpine sod grassland.

**ALLIANCE DISTRIBUTION**

**Range:** This alliance is found in North Carolina, Tennessee, Virginia, and West Virginia.

**States:** NC TN

**USFS Ecoregions:** M221D:C

**Federal Lands:** USFS (Cherokee, Pisgah)

**ALLIANCE SOURCES**

**References:** Allard 1990, Pyne 1994, Schafale and Weakley 1990

**V.A.5.N.e.7 MOUNTAIN OATGRASS HERBACEOUS ALLIANCE (A.1280)****DANTHONIA COMPRESSA HERBACEOUS ALLIANCE****ALLIANCE CONCEPT**

**Summary:** This alliance includes montane grasslands dominated by *Danthonia compressa* often with significant cover by the dwarf-shrub *Sibbaldiopsis tridentata* or by *Rhododendron calendulaceum*. Species dominance is highly variable from occurrence to occurrence and within occurrences. Associated species can include *Carex brunnescens*, *Carex pensylvanica*, *Carex debilis*, *Oclemena acuminata* (= *Aster acuminatus*), *Deschampsia flexuosa*, *Stachys clingmanii*, *Solidago glomerata*, *Prenanthes roanensis*, *Smilax herbacea*, and *Houstonia serpyllifolia*. Typical shrubs are *Rhododendron calendulaceum*, *Rhododendron catawbiense*, *Menziesia pilosa*, *Pieris floribunda*, *Vaccinium corymbosum*, *Vaccinium simulatum*, and *Rubus canadensis*. These grasslands occur on high-elevation (usually above 1500 m or 5000 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. 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*.

**Synonymy:**

- ID9a. Grass Bald, in part (Allard 1990)
- Grassy Bald, in part (Schafale and Weakley 1990)
- Grass Balds, BR (Pyne 1994)

**Comments:****ALLIANCE DISTRIBUTION**

**Range:** This alliance is found in North Carolina, Tennessee, and Virginia.

**States:** NC TN VA

**USFS Ecoregions:** M221A:?, M221B:C, M221D:C

**Federal Lands:** NPS (Great Smoky Mountains); USFS (Cherokee, Jefferson, Pisgah)

**ALLIANCE SOURCES**

**References:** Allard 1990, Billings and Mark 1957, Gersmehl 1973, Lindsay and Bratton 1979a, Mark 1958, Mark 1959, Pyne 1994, Schafale and Weakley 1990

**V.A.5.N.j. Temporarily flooded temperate or subpolar grassland****V.A.5.N.j.4 TWISTED SEDGE TEMPORARILY FLOODED HERBACEOUS ALLIANCE (A.1340)****CAREX TORTA TEMPORARILY FLOODED HERBACEOUS ALLIANCE****ALLIANCE CONCEPT**

**Summary:** This alliance includes sedge-dominated alluvial wetlands on sand, gravel, and rock bars in valleys and gorges in the southern Appalachians, ranging west into the Cumberland Plateau and Interior Low Plateau, and north into central Appalachians and Allegheny Mountains. Associations in this alliance are characterized by light-demanding, tough-rooted herbaceous perennials tolerant of frequent inundation and flood-scouring. *Carex torta* often forms dense, extensive colonies. Associated species vary with geography. In the Allegheny Mountains, associated species include *Doellingeria umbellata* (= *Aster umbellatus*), *Dichantheium 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* 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*.

**Synonymy:**

- IIE3a. Riverside Shoal and Stream Bar Complex, in part (Allard 1990)



- Rocky Bar and Shore, in part (Schafale and Weakley 1990)

**Comments:****ALLIANCE DISTRIBUTION**

**Range:** This alliance is known from the southern Appalachians, and ranges west into the Cumberland Plateau and Interior Low Plateau, and north into the central Appalachians and Allegheny Mountains.

**States:** AL GA KY NC SC TN VA WV

**USFS Ecoregions:** 221B:C, 221H:C, 222E:C, 231C:C, M221A:C, M221B:C, M221C:C, M221D:C

**Federal Lands:** NPS (Great Smoky Mountains); USFS (Bankhead, Chattahoochee, Cherokee, Daniel Boone, George Washington, Jefferson, Nantahala, Pisgah, Sumter)

**ALLIANCE SOURCES**

**References:** Allard 1990, Fleming and Moorhead 1996, Hupp 1982, Palmer-Ball et al. 1988, Schafale and Weakley 1990, Tobe et al. 1992

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### V.A.5.N.j.10 LITTLE BLUESTEM TEMPORARILY FLOODED HERBACEOUS ALLIANCE (A.1346) SCHIZACHYRIUM SCOPARIUM TEMPORARILY FLOODED HERBACEOUS ALLIANCE

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**ALLIANCE CONCEPT**

**Summary:** Riverbank 'scour prairies' with *Schizachyrium scoparium* as the primary grass. Associations placed in this alliance have been dominated from boulder 'scour prairies' on the Yadkin River in Montgomery and Stanley counties, North Carolina, and from the Ocoee and Hiwasee rivers in southeastern Tennessee. In Yadkin County, NC, the scour prairie is dominated by *Schizachyrium scoparium*, *Sporobolus clandestinus*, *Solidago plumosa*, *Symphyotrichum dumosum* (= *Aster dumosus*), and many other herbaceous species. Typical woody species here include *Gelsemium sempervirens*, *Amorpha fruticosa*, *Amorpha schwerinii*, and others. In Polk County, Tennessee, the principal grasses are *Schizachyrium scoparium*, *Andropogon ternarius*, and *Panicum* sp. Other abundant herbaceous species include *Liatris microcephala*, *Symphyotrichum novae-angliae* (= *Aster novae-angliae*), *Solidago* sp., *Coreopsis tripteris*, and *Agalinis* sp. This alliance is likely extremely restricted naturally, being limited to short stretches of rivers. Its habitat has been affected and limited by the effects of impoundments and resulting changes in flooding regimes.

**Synonymy:**

- Rocky Bar and Shore (Schafale and Weakley 1990)

**Comments:****ALLIANCE DISTRIBUTION**

**Range:** This alliance is documented from the Yadkin River in Montgomery and Stanley counties, North Carolina, and from the Hiwasee and Ocoee rivers in Polk County, Tennessee.

**States:** NC TN

**USFS Ecoregions:** 231A:C, M221D:C

**Federal Lands:** USFS (Cherokee)

**ALLIANCE SOURCES**

**References:** Schafale and Weakley 1990

### V.A.5.N.k. Seasonally flooded temperate or subpolar grassland

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#### V.A.5.N.k.14 SOFT RUSH SEASONALLY FLOODED HERBACEOUS ALLIANCE (A.1375) JUNCUS EFFUSUS SEASONALLY FLOODED HERBACEOUS ALLIANCE

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**ALLIANCE CONCEPT**

**Summary:** This alliance includes wetland herbaceous vegetation dominated or codominated by *Juncus effusus*. These communities are most characteristically seasonally flooded, but in some cases, examples may have temporarily or semipermanently flooded hydrologies. Still, all these are conceptually placed in this alliance, at least until more detailed information is available. These marshy communities vary greatly in size, situation, geographical location, species composition, and naturalness. Some are beaver-made or human-made impoundments. It should be noted that this species has a very wide ecological amplitude, and additional alliances with different hydrologies may need to be defined.

**Synonymy:**

- Piedmont/Mountain Semipermanent Impoundment, in part (Schafale and Weakley 1990)
- *Juncus effusus* herbaceous alliance (Hoagland 1998a)
- Depression Meadow, in part (Nelson 1986)

- Rush-Sedge Series, in part (Diamond 1993)

**Comments:** In Cades Cove (Great Smoky Mountains), *Juncus effusus* codominates with *Andropogon glomeratus*. On Arnold Air Force Base, Tennessee, vegetation dominated by *Juncus effusus* is maintained by mowing. *Juncus effusus*-dominated vegetation is also found along the border of Woods Reservoir at Arnold Air Force Base, where it is often encountered as the first zone of vegetation along the water's edge. This zone stays inundated with water for the majority of the year. *Juncus effusus* and *Scirpus cyperinus* usually dominate and can form thick stands. Other species include *Cyperus* spp., *Typha latifolia*, and *Galium aparine*.

#### ALLIANCE DISTRIBUTION

**Range:** This alliance is found in Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, and elsewhere.

**States:** AL AR FL GA KY LA MS NC OK SC TN TX VA

**USFS Ecoregions:** 222C:C, 222D:C, 222E:C, 222F:C, 222H:C, 231C:C, 231D:C, 232:C, M221A:C, M221D:C

**Federal Lands:** DOD (Arnold, Fort Benning); NPS (Carl Sandburg Home, Great Smoky Mountains); USFS (Bankhead, Chattahoochee, Oconee?, Talladega)

#### ALLIANCE SOURCES

**References:** Diamond 1993, Hoagland 1997, Nelson 1986, Schafale and Weakley 1990

### V.A.5.N.m. Saturated temperate or subpolar grassland

#### V.A.5.N.m.4 (PRICKLY BOG SEDGE, STAR SEDGE) - TAWNY COTTONGRASS - NORTHERN BEAKSEDEGE - ROUGHLEAF GOLDENROD SATURATED HERBACEOUS ALLIANCE (A.1450) CAREX (ATLANTICA, ECHINATA) - ERIOPHORUM VIRGINICUM - RHYNCHOSPORA CAPITELLATA - SOLIDAGO PATULA SATURATED HERBACEOUS ALLIANCE

#### ALLIANCE CONCEPT

**Summary:** This alliance includes non-alluvial, palustrine vegetation of the unglaciated southern highlands of the eastern United States. Stands are dominated by mixtures of graminoids and forbs, with substantial *Sphagnum* cover and occasional shrubs. The nominal species are characteristic and nearly constant. Typical species include *Carex atlantica*, *Carex echinata*, *Carex folliculata*, *Carex leptalea*, *Carex lurida*, *Eriophorum virginicum*, *Houstonia serpyllifolia*, *Lysimachia terrestris*, *Osmunda cinnamomea*, *Oxypolis rigidior*, *Parnassia asarifolia*, *Polytrichum commune*, *Rhynchospora alba*, *Rhynchospora capitellata*, *Scirpus atrovirens*, *Scirpus cyperinus*, *Scirpus expansus*, *Scirpus polyphyllus*, *Packera aurea* (= *Senecio aureus*), *Solidago patula* var. *patula*, and *Vaccinium macrocarpon*. Typical mosses are *Sphagnum palustre*, *Sphagnum affine* (= *Sphagnum imbricatum*), *Sphagnum bartlettianum*, *Sphagnum recurvum*, and *Aulacomnium palustre*. Scattered shrubs are typically present, and in some cases are patchy dominants. Typical shrub species include *Alnus serrulata*, *Rosa palustris*, *Salix sericea*, *Spiraea tomentosa*, *Ilex verticillata*, *Kalmia latifolia*, *Lyonia ligustrina* var. *ligustrina*, and *Rhododendron maximum*. These seepage-fed communities occur in the unglaciated southern highlands of the eastern United States, on flat to slightly sloping topography, often associated with small streams and rivers.

#### Synonymy:

- IIE1b. Southern Appalachian Bog Complex, in part (Allard 1990)
- Southern Appalachian Bog, Northern Subtype, in part (Schafale and Weakley 1990)
- High Elevation Seep, in part (Schafale and Weakley 1990)
- Southern Appalachian Bog, Long Hope Valley Variant, in part (Weakley and Schafale 1994)
- Southern Appalachian Bog, Typic Variant, in part (Weakley and Schafale 1994)

#### Comments:

#### ALLIANCE DISTRIBUTION

**Range:** This alliance is found in Georgia, North Carolina and Tennessee, and possibly in South Carolina (?), Virginia (?), and West Virginia (?).

**States:** GA NC SC? TN VA? WV?

**USFS Ecoregions:** M221A:?, M221B:C, M221D:C

**Federal Lands:** USFS (Chattahoochee, Cherokee, George Washington, Jefferson?, Nantahala?, Pisgah)

#### ALLIANCE SOURCES

**References:** Allard 1990, Schafale and Weakley 1990, Weakley and Schafale 1994

**V.A.5.N.m.5 FRINGED SEDGE - ROYAL FERN SPECIES / PEATMOSS SPECIES SATURATED HERBACEOUS ALLIANCE (A.1451)****CAREX CRINITA - OSMUNDA SPP. / SPHAGNUM SPP. SATURATED HERBACEOUS ALLIANCE**

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**ALLIANCE CONCEPT**

**Summary:** This seep alliance, found in the central and upper southeastern United States, is dominated by herbaceous species but can also have a significant shrub component. Stands often occur in a forested setting and are small enough that the surrounding trees cast shade and otherwise affect the microenvironment. Some stands contain trees from the surrounding forest communities. The most abundant herbaceous species include *Athyrium* spp., *Carex crinita*, *Carex lurida*, and other *Carex* spp., *Impatiens capensis*, *Dryopteris carthusiana*, *Glyceria striata*, *Leersia oryzoides*, *Osmunda* spp., and *Symplocarpus foetidus*. In some stands of this alliance, *Sphagnum* spp. occur in patches. Although not found in every stand, they may be good diagnostic species. *Alnus serrulata*, *Photinia melanocarpa* (= *Aronia melanocarpa*), and *Physocarpus opulifolius* are common shrubs in some stands. Where trees occur, *Acer rubrum*, *Betula nigra*, *Liriodendron tulipifera*, *Liquidambar styraciflua*, and *Platanus occidentalis* are typical. Stands of this alliance are found where groundwater flows to the surface at the edges of outwash plains, beach ridges, or at the contact between acidic gravel and bedrock. Soils are saturated sandy loams or sandy silts overlain with mucks and peats. They can be shallow to deep (40-100+ cm). There is weak nutrient input from the slightly to highly acidic (pH 3.7-6.0) groundwater. The groundwater flow is generally diffuse, but concentrated localized flows can occur, especially in the spring.

**Synonymy:**

**Comments:** The specific conditions required to support stands of this alliance tend to occur in specialized locations. Thus, several stands of this alliance may be clustered in one valley or within a few kilometers of each other.

**ALLIANCE DISTRIBUTION**

**Range:** This alliance is found in Indiana, Illinois, Missouri, Alabama, Kentucky, Tennessee, Arkansas, Oklahoma, Georgia, South Carolina, North Carolina (?), and Virginia.

**States:** AL AR GA IL IN KY MO NC OH? SC? TN VA

**USFS Ecoregions:** 222A:C, 222C:C, 222D:C, 222E:C, 222F:C, 222G:C, 222J:C, 231C:C, 231D:C, 232:?, 234A:C, 251E:C, M221C:C, M221D:C, M231A:?

**Federal Lands:** NPS (Big South Fork?, Cumberland Gap, Great Smoky Mountains); USFS (Bankhead, Chattahoochee, Cherokee, Daniel Boone, Nantahala?, Ouachita?, Ozark)

**ALLIANCE SOURCES**

**References:** Faber-Langendoen et al. 1996, Homoya 1983, Nelson 1985, White and Madany 1978

**V.A.5.N.m.100 DEERHAIR BULRUSH SATURATED HERBACEOUS ALLIANCE (A.1915)****TRICHOPHORUM CAESPITOSUM SATURATED HERBACEOUS ALLIANCE**

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**ALLIANCE CONCEPT**

**Summary:** This alliance includes saturated, boggy vegetation characterized by *Trichophorum caespitosum* (= *Scirpus cespitosus*). Other typical components include *Carex* spp. Some of the associations placed here at this time are anomalous southern disjuncts, since this alliance reaches its greatest development and diversity in boreal and montane portions of the northern hemisphere. Several of the associations placed here at present are associated with wet cliffs in the southern Appalachians.

**Synonymy:**

**Comments:**

**ALLIANCE DISTRIBUTION**

**Range:** This alliance is found in South Carolina and Tennessee, and may occur in Maine. This alliance is also represented in (at least) Canada and Alaska.

**States:** AK? BC? NT? NU? SC TN YT?

**USFS Ecoregions:** M221D:C

**Federal Lands:** USFS (Cherokee)

**ALLIANCE SOURCES**

**References:** Hill 1999

**V.B.2.N.b. Low temperate or subpolar perennial forb vegetation**

**V.B.2.N.b.10 CLIFF SAXIFRAGE HERBACEOUS ALLIANCE (A.1621)**  
**SAXIFRAGA MICHAUXII HERBACEOUS ALLIANCE**

**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), on various rock types, including amphibolite, metabasalt (greenstone), gneiss, and others. There are several globally rare communities contained in this alliance. More common vegetation in this alliance will have *Saxifraga michauxii* as a characteristic component; other species are variable, but may include *Saxifraga virginensis*, *Saxifraga micranthidifolia*, *Carex* spp., *Schizachyrium scoparium*, and others. Examples at high elevation exhibit a sparse vegetative cover of grasses, forbs and shrubs rooted in rock fissures and occur in a matrix of *Picea rubens* - *Abies fraseri* Forest. On rock outcrops of highly fractured felsic to mafic bedrock (over 1980 m), typical species include *Carex misera*, *Abies fraseri*, *Menziesia pilosa*, *Heuchera villosa*, *Rhododendron catawbiense*, *Saxifraga michauxii*, *Sorbus americana*, *Oclemena acuminata* (= *Aster acuminatus*), *Solidago glomerata*. Other characteristic species are *Minuartia groenlandica* and *Polypodium appalachianum*. On rock outcrops of felsic Anakeesta slate in the Great Smoky Mountains (from 1646-1987 m), typical species include *Saxifraga michauxii*, *Carex misera*, *Calamagrostis cainii*, *Rhododendron carolinianum*, *Solidago glomerata*, *Oclemena acuminata*, *Abies fraseri*, and *Leiophyllum buxifolium*. Other characteristic species are *Gentiana linearis* and *Calamagrostis cainii*. 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, the sparse vegetation consists of graminoids, forbs, and shrubs. It is surrounded by deciduous forests dominated by *Quercus rubra*, *Acer rubrum* var. *rubrum*, and occasionally *Tsuga caroliniana*. Typical species here include *Saxifraga michauxii*, *Coreopsis major*, *Schizachyrium scoparium*, *Kalmia latifolia*, *Dichanthelium acuminatum*, *Danthonia spicata*, and *Paronychia argyrocoma*. Other characteristic species include *Campanula divaricata*, *Solidago bicolor*, and *Allium cernuum* (= *Allium allegheniense*). 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 *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* (= *Sedum telephioides*), *Houstonia purpurea* var. *montana*, *Geum radiatum*, *Solidago spithamea*, and *Huperzia appalachiana*. 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 *Hylotelephium telephioides*, *Solidago simplex* var. *randii*, *Heuchera pubescens*, *Deschampsia flexuosa*, *Houstonia longifolia* (= *Houstonia longifolia* var. *compacta*), *Dennstaedtia punctilobula*, *Campanula divaricata*, *Agrostis perennans*, *Carex pensylvanica*, *Saxifraga michauxii*, *Arabis lyrata*, *Allium allegheniense*?, *Phlox subulata* ssp. *brittonii*, *Sibbaldiopsis tridentata*, *Liatis turgida*, *Huperzia appalachiana*, *Polypodium appalachianum*, *Gymnocarpium appalachianum*, and *Oclemena acuminata*. Shrubs include *Physocarpus opulifolius*, *Sorbus americana*, *Betula alleghaniensis*, *Quercus rubra*, *Ribes rotundifolium*, *Diervilla lonicera*, *Hamamelis virginiana*, *Ilex montana*, *Kalmia latifolia*, *Menziesia pilosa*, and *Abies balsamea*. Rare alpine disjunct species are sometimes present, including *Juncus trifidus* and *Trisetum spicatum*.

**Synonymy:**

- IE4a. Southern Appalachian High Elevation Acidic Rocky Summit, in part (Allard 1990)
- High Elevation Rocky Summit, in part (Schafale and Weakley 1990)
- *Paronychia argyrocoma* - *Potentilla tridentata* - *Arenaria groenlandica* Association (Rawinski and Wieboldt 1993)
- *Aster acuminatus* / *Menziesia pilosa* outcrop community (Wiser 1993)
- *Aster acuminatus* / *Menziesia pilosa* outcrop community (Wiser et al. 1996)
- *Calamagrostis cainii* / *Rhododendron carolinianum* outcrop community (Wiser 1993)
- *Calamagrostis cainii* / *Rhododendron carolinianum* outcrop community (Wiser et al. 1996)
- *Coreopsis major* / *Schizachyrium scoparium* outcrop community (Wiser 1993)
- *Coreopsis major* / *Schizachyrium scoparium* outcrop community (Wiser et al. 1996)
- *Deschampsia flexuosa* / *Angelica triquinata* outcrop community (Wiser 1993)
- *Deschampsia flexuosa* / *Angelica triquinata* outcrop community (Wiser et al. 1996)
- *Paronychia argyrocoma* (sic) / *Polypodium appalachianum* outcrop community (Wiser 1993)
- *Paronychia argyrocoma* (sic) / *Polypodium appalachianum* outcrop community (Wiser et al. 1996)

**ALLIANCE DISTRIBUTION**

**Range:** This alliance is found in the southern and central Blue Ridge (metamorphic rock portions of the southern and central Appalachians), in Georgia, North Carolina, South Carolina, Tennessee, and Virginia.

**States:** GA NC SC TN VA

**USFS Ecoregions:** M221A:P, M221D:C

**Federal Lands:** NPS (Great Smoky Mountains, Shenandoah); USFS (Chattahoochee, Cherokee, George Washington, Nantahala, Pisgah, Sumter)

## ALLIANCE SOURCES

**References:** Allard 1990, Feldcamp 1984, Rawinski and Wieboldt 1993, Schafale and Weakley 1990, Wisner 1993, Wisner et al. 1996

**V.B.2.N.b.100 (HYDRANGEA SPECIES, MOCK-ORANGE SPECIES) / ALUMROOT SPECIES  
HERBACEOUS ALLIANCE (A.1905)  
(HYDRANGEA SPP., PHILADELPHUS SPP.) / HEUCHERA SPP. HERBACEOUS ALLIANCE**

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## ALLIANCE CONCEPT

**Summary:** This alliance contains vegetated, dry to moist, basic cliffs of variable geology, with vegetation composition variable and often with a mixed and variable physiognomy. Individual occurrences may be herb-dominated, shrub-dominated, or sparsely vegetated with vascular plants (though sometimes with dense patchy cover of mosses, hepatics, or lichens). Characteristic shrubs are *Hydrangea* spp. (*Hydrangea arborescens*, *Hydrangea cinerea*, *Hydrangea radiata*), *Philadelphus* spp. (*Philadelphus hirsutus*, *Philadelphus inodorus*, *Philadelphus pubescens*), *Toxicodendron radicans*, *Physocarpus opulifolius*, and *Ribes* spp. (*Ribes cynosbati*). Characteristic herbs are *Heuchera* spp. (*Heuchera americana* var. *americana*, *Heuchera americana* var. *hirsuticaulis*, *Heuchera americana* var. *hispidula*, *Heuchera caroliniana*, *Heuchera villosa* var. *arkansana*, *Heuchera villosa* var. *villosa*). Other species which are typical include *Dichanthelium* spp., *Woodsia obtusa*, *Dryopteris* spp., *Cystopteris* spp., *Danthonia spicata*, *Deschampsia flexuosa*, and others. Characteristic mosses include *Anomodon attenuatus* and *Anomodon rostratus*. The alliance is potentially widespread in the Southern Blue Ridge, Cumberlands and Southern Ridge and Valley, Interior Low Plateau, and Interior Highlands. This alliance is known from vertical and near-vertical exposures of limestone, siltstone, mudstone, calcareous sandstones, and may also occur on mafic metamorphic and igneous rocks.

**Synonymy:**

## ALLIANCE DISTRIBUTION

**Range:** The alliance is potentially widespread in the Southern Blue Ridge, Cumberlands and Southern Ridge and Valley, Interior Low Plateau, and Interior Highlands. It is found in Alabama, Arkansas, Kentucky, North Carolina, Tennessee, and possibly Georgia (?), Mississippi (?), Oklahoma (?), and Virginia (?).

**States:** AL AR GA? KY MS? NC? OK? TN VA?

**USFS Ecoregions:** 221H:C, 222E:C, 231B:P, 231G:C, M221D:C, M222A:C

**Federal Lands:** NPS (Natchez Trace, Russell Cave); USFS (Chattahoochee?, Cherokee, Jefferson, Ouachita, Ozark, Pisgah)

## ALLIANCE SOURCES

**References:****V.B.2.N.d. Temporarily flooded temperate perennial forb vegetation**

**V.B.2.N.d.2 COMMON WATER-WILLOW TEMPORARILY FLOODED HERBACEOUS ALLIANCE  
(A.1657)  
JUSTICIA AMERICANA TEMPORARILY FLOODED HERBACEOUS ALLIANCE**

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## ALLIANCE CONCEPT

**Summary:** This alliance covers rocky river shoals dominated by *Justicia americana* with *Orontium aquaticum*, *Podostemum ceratophyllum*, *Leersia* spp., *Lemna minor*, *Saururus cernuus*, and others. A sparse canopy may be present, and species may include *Carpinus caroliniana* ssp. *caroliniana*, *Fagus grandifolia*, and *Fraxinus pennsylvanica*. There is some apparent regional variation in the associated species. More Appalachian examples may contain *Orontium aquaticum* as a codominant. In parts of the Ridge and Valley and Piedmont, *Hymenocallis caroliniana* (= *Hymenocallis coronaria*) is codominant. In the Edwards Plateau of central Texas, associated with *Justicia americana* are *Bacopa monnieri*, *Fuirena simplex*, *Eleocharis geniculata* (= *Eleocharis caribaea*), *Eleocharis montevidensis*, and *Cyperus* spp.

**Synonymy:**

- IIE3a. Riverside Shoal and Stream Bar Complex, in part (Allard 1990)
- Rocky Bar and Shore, in part (Schafale and Weakley 1990)
- *Justicia americana* herbaceous alliance (Hoagland 2000)
- Shoal and Stream Bar, in part (Nelson 1986)

## ALLIANCE DISTRIBUTION

**Range:** This alliance is distributed in the Edwards Plateau of Texas, Ozark Highlands, Boston Mountains, Ouachita Mountains, Interior Low Plateau, Cumberland Plateau, Piedmont, and Arkansas Valley. It is found in Ohio, Alabama, Arkansas, Georgia, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, and possibly Virginia (?).

**States:** AL AR DE GA KY MD? NC OH OK PA SC TN TX VA? WV

**USFS Ecoregions:** 221E:C, 221H:C, 222A:C, 222E:C, 222H:C, 231A:C, 231B:C, 231C:C, 231D:C, 231G:C, 315D:C, 321B:P, M221A:C, M221B:C, M221C:C, M221D:C, M222A:C, M231A:C

**Federal Lands:** NPS (Natchez Trace, Stones River); USFS (Bankhead, Cherokee, Daniel Boone, Oconee?, Ouachita, Ozark, Pisgah, Sumter, Uwharrie); USFWS (Cahaba River)

#### ALLIANCE SOURCES

**References:** Allard 1990, Faber-Langendoen et al. 1996, Foti et al. 1994, Hoagland 2000, Nelson 1986, Schafale and Weakley 1990, Schmalzer and DeSelm 1982

### V.B.2.N.d.100 JAPANESE KNOTWEED TEMPORARILY FLOODED HERBACEOUS ALLIANCE (A.2005)

#### POLYGONUM CUSPIDATUM TEMPORARILY FLOODED HERBACEOUS ALLIANCE

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#### ALLIANCE CONCEPT

**Summary:** This alliance covers significant (monocultural) stands of the exotic forb *Polygonum cuspidatum* found in temporarily flooded habitats such as scour bars. These disturbed habitats flood very frequently and have lots of light and rocky or sandy soil. Stands of this vegetation may be dense and shrubby, or more open. The patches of *Polygonum* shade out other plant species. In North Carolina, it is found on scour bars and low rocky banks of the Nolichucky and French Broad rivers. In Kentucky, *Polygonum cuspidatum* is primarily along disturbed riverbanks and bars mostly in the Cumberland Plateau and Mountains where it can be in pure, dense stands.

#### Synonymy:

**Comments:** This species has also been treated as *Reynoutria japonica*.

#### ALLIANCE DISTRIBUTION

**Range:** This alliance is potentially found anywhere in the southeastern United States where the exotic rhizomatous forb *Polygonum cuspidatum* has formed significant (monocultural) stands. This includes at least Alabama, Georgia, Kentucky, Maryland, North Carolina, South Carolina, Tennessee, and Virginia.

**States:** AL GA KY NC SC TN VA

**USFS Ecoregions:** 221:C, M221:C

**Federal Lands:** USFS (Daniel Boone)

#### ALLIANCE SOURCES

**References:** Brown, B., pers. comm., Evans, M., pers. comm.

### V.B.2.N.f. Saturated temperate perennial forb vegetation

#### V.B.2.N.f.7 UMBRELLA-LEAF - BRANCH-LETTUCE SATURATED HERBACEOUS ALLIANCE (A.1688)

#### DIPHYLLEIA CYMOSA - SAXIFRAGA MICRANTHIDIFOLIA SATURATED HERBACEOUS ALLIANCE

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#### ALLIANCE CONCEPT

**Summary:** This alliance consists of moderate- to high-elevation, forested (shaded) seeps in the Southern Blue Ridge. *Diphylleia cymosa* and *Saxifraga micranthidifolia* are characteristic and often dominant. Other characteristic species include *Laportea canadensis*, *Cardamine clematitidis*, *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 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.

#### Synonymy:

- IID3a. Herbaceous High Elevation Seepage Slope, in part (Allard 1990)
- High Elevation Seep, in part (Schafale and Weakley 1990)
- High Elevation Seep, in part (Nelson 1986)

#### ALLIANCE DISTRIBUTION

**Range:** This alliance is found in the Southern Blue Ridge of Georgia, North Carolina, Tennessee, and Virginia, and possibly South Carolina (?).

**States:** GA NC SC? TN VA

**USFS Ecoregions:** M221D:C

**Federal Lands:** NPS (Great Smoky Mountains); USFS (Chattahoochee, Cherokee, Jefferson, Nantahala, Pisgah, Sumter?)

**ALLIANCE SOURCES**

**References:** Allard 1990, Dellinger 1992, Nelson 1986, Schafale and Weakley 1990

**V.B.2.N.f.9 (ORANGE JEWELWEED, YELLOW JEWELWEED) - BEEBALM SATURATED HERBACEOUS ALLIANCE (A.1690)**

**IMPATIENS (CAPENSIS, PALLIDA) - MONARDA DIDYMA SATURATED HERBACEOUS ALLIANCE**

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**ALLIANCE CONCEPT**

**Summary:** High-elevation, open seeps in the Southern Blue Ridge dominated by tall forbs. This palustrine vegetation occurs as small wetlands at high elevations (greater than 1200 m or 4000 feet), on upper slopes and ridgetops. These areas lack extensive *Sphagnum* and are typically open, without shading from a forest canopy. Other characteristic species include *Aconitum reclinatum*, *Cardamine clematitidis*, *Carex leptonevia*, *Carex debilis* var. *rudgei* (= *Carex flexuosa*), *Carex ruthii*, *Chelone lyonii*, *Cicuta maculata*, *Claytonia caroliniana*, *Conioselinum chinense*, *Euonymus obovata*, *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*.

**Synonymy:**

- IID3a. Herbaceous High Elevation Seepage Slope, in part (Allard 1990)
- High Elevation Seep, in part (Schafale and Weakley 1990)
- High Elevation Seep, in part (Nelson 1986)

**ALLIANCE DISTRIBUTION**

**Range:** This alliance is found in Georgia, North Carolina, South Carolina, Tennessee, Virginia, and possibly others in the Appalachians.

**States:** GA NC SC TN VA WV?

**USFS Ecoregions:** M221B:C, M221D:C

**Federal Lands:** NPS (Great Smoky Mountains); USFS (Cherokee, George Washington, Jefferson, Nantahala, Pisgah)

**ALLIANCE SOURCES**

**References:** Allard 1990, Nelson 1986, Schafale and Weakley 1990, Weakley 1980

**V.B.2.N.f.15 APPALACHIAN SHOESTRING FERN - CAVE ALUMROOT SATURATED HERBACEOUS ALLIANCE (A.1696)**

**VITTARIA APPALACHIANA - HEUCHERA PARVIFLORA SATURATED HERBACEOUS ALLIANCE**

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**ALLIANCE CONCEPT**

**Summary:** This alliance accommodates saturated communities associated with overhanging to vertical rocks and a seasonal to perennial waterfall as a source of aqueous aerosol. One association includes sparse to moderately dense vegetation of sandstone rockhouses in portions of the Cumberland Plateau, where seasonal waterfalls and strongly overhanging erosion features called rockhouses provide moist conditions. *Vittaria appalachiana* and *Heuchera parviflora* are dominant and characteristic. Endemics such as *Ageratina luciae-brauniae* and *Solidago albopilosa* are associated with the floors of the rockhouses and often dominate the vegetative cover, and the endemic *Minuartia cumberlandensis* also sometimes occupies the floor but is more characteristic of somewhat drier sandstone exposures. *Thalictrum mirabile* is also endemic to this community but is more characteristic of seepages on the rockhouse walls. In the Southern Blue Ridge escarpment region, this alliance includes herbaceous vegetation on rock substrates associated with waterfalls, on nearly vertical rock surfaces and ledges, slopes, and crevices with shallow soils which are constantly saturated. Other characteristic species include *Huperzia porophila*, *Asplenium montanum*, *Asplenium trichomanes* ssp. *trichomanes*, *Asplenium monanthes*, *Cystopteris protrusa*, *Polypodium virginianum*, *Trichomanes boschianum*, *Grammitis nimbata* (= *Micropolypodium nimbatum*), *Hymenophyllum tayloriae*, *Trichomanes intricatum*, *Phegopteris connectilis*, *Adiantum pedatum*, *Saxifraga careyana*, *Saxifraga caroliniana*, *Impatiens capensis*, *Hydrocotyle americana*, *Thalictrum* spp., *Oxalis montana*, *Carex biltmoreana*, *Galax urceolata*, *Sphagnum quinquefarium*, *Sphagnum girgensohnii*, *Plagiomnium carolinianum*, *Plagiomnium affine*, *Mnium marginatum*, *Pseudotaxiphyllum distichaceum*, *Bryocrumia vivicolor*, *Thamnobryum alleghaniense*, *Oncophorus raui*, *Hyophila involuta*, *Dichodontium pellucidum*, *Plagiochila sharpii* ssp. *sharpii*, *Plagiochila caduciloba*, *Plagiochila sullivantii*, *Plagiochila austini*, *Fissidens osmundioides*, *Bazzania denudata*, *Conocephalum conicum*, *Pellia epiphylla*, *Pellia neesiana*, and *Riccardia multifida*.

**Synonymy:**

- IID5a. Wet Acidic Cliff, in part (Allard 1990)
- Spray Cliff (Schafale and Weakley 1990)

- Spray Cliff, in part (Nelson 1986)
- Cumberland Plateau sandstone glade, in part (Evans 1991)
- Moist sandstone cliff, in part (Evans 1991)

**Comments:****ALLIANCE DISTRIBUTION**

**Range:** This alliance is found in Georgia, Kentucky, North Carolina, South Carolina, and Tennessee, and Alabama.

**States:** AL GA KY NC SC TN

**USFS Ecoregions:** 221H:C, 222E:C, 231C:C, M221D:C

**Federal Lands:** NPS (Big South Fork, Great Smoky Mountains); USFS (Bankhead, Chattahoochee, Cherokee, Daniel Boone, Nantahala, Pisgah, Sumter)

**ALLIANCE SOURCES**

**References:** Allard 1990, Dellinger 1992, Evans 1991, Farrar 1998, Nelson 1986, Schafale and Weakley 1990, Walck et al. 1996, Weakley and Schafale 1994, Wharton 1978

**VI. NONVASCULAR VEGETATION****VI.B.1.N.b. Montane/submontane temperate or subpolar lichen vegetation****VI.B.1.N.b.2 TOADSKIN LICHEN - CAROLINA ROCKTRIPE NONVASCULAR ALLIANCE (A.1826)  
LASALLIA PAPULOSA - UMBILICARIA CAROLINIANA NONVASCULAR ALLIANCE****ALLIANCE CONCEPT**

**Summary:** This alliance consists of xeric lichen-dominated vegetation, codominated by *Lasallia papulosa* and *Umbilicaria caroliniana*. This alliance is known from moderate to high elevations of the Southern Blue Ridge of Tennessee and North Carolina, where it occurs on steeply sloping exfoliation outcrops of felsic metamorphic rocks.

**Synonymy:**

- High Elevation Granitic Dome, in part (Schafale and Weakley 1990)
- High Elevation Rocky Summit, in part (Schafale and Weakley 1990)

**Comments:****ALLIANCE DISTRIBUTION**

**Range:** This alliance is found in the Southern Blue Ridge of North Carolina and Tennessee.

**States:** NC TN

**USFS Ecoregions:** M221D:C

**Federal Lands:** USFS (Cherokee, Nantahala, Pisgah)

**ALLIANCE SOURCES**

**References:** Schafale and Weakley 1990

**VI.B.1.N.b.3 COMMON ROCKTRIPE NONVASCULAR ALLIANCE (A.1827)  
UMBILICARIA MAMMULATA NONVASCULAR ALLIANCE****ALLIANCE CONCEPT**

**Summary:** This alliance consists of vegetation dominated by *Umbilicaria mammulata*, of relatively moist rock outcrops. This vegetation occurs where periodic seepage occurs on acidic rock outcrops. Individual occurrences can be as large as an acre. Vascular plants are generally sparse or absent, though trees of adjacent forest communities often shade the outcrop community for much of the day.

**Synonymy:****Comments:****ALLIANCE DISTRIBUTION**

**Range:** This alliance is found in Georgia, North Carolina, South Carolina, Tennessee, Virginia, West Virginia, and others. Potentially very widespread in the Southeast and beyond.

**States:** GA NC SC TN VA WV

**USFS Ecoregions:** 231A:C, M221D:C

**Federal Lands:** USFS (Cherokee?, George Washington, Jefferson, Monongahela?, Nantahala, Pisgah)



## ALLIANCE SOURCES

References:

## VII. SPARSE VEGETATION

## VII.A.1.N.a. Cliffs with sparse vascular vegetation

VII.A.1.N.a.1 MOUNTAIN SPLEENWORT SPARSELY VEGETATED ALLIANCE (A.1831)  
ASPLENIUM MONTANUM SPARSELY VEGETATED ALLIANCE

## ALLIANCE CONCEPT

**Summary:** This alliance includes near-vertical to overhanging cliffs, dry to moist, with crevices, generally with very little vascular vegetation, and little nonvascular vegetation, with *Asplenium montanum* as a characteristic component. This community occurs on a number of different rock types, including sandstone, quartzite, gneiss, schist, phyllite, but all are acidic (pH of soils in crevices is usually less than 4.0). *Asplenium montanum* is a characteristic species in stands of this type, although it may not have high cover and will not necessarily even be present. *Heuchera parviflora* and *Silene rotundifolia* are equally characteristic and diagnostic.

**Synonymy:**

- Dry sandstone cliff, in part (Evans 1991)
- Montane Acidic Cliff, in part (Schafale and Weakley 1990)

**Comments:**

## ALLIANCE DISTRIBUTION

**Range:** This alliance is found in Alabama, Georgia, Kentucky, North Carolina, South Carolina, Tennessee, Virginia, West Virginia, and elsewhere.

**States:** AL GA KY NC SC TN VA? WV

**USFS Ecoregions:** 212D:P, 221A:P, 221H:C, 222E:C, 231A:C, 231C:C, M221A:C, M221C:C, M221D:C

**Federal Lands:** NPS (Big South Fork, Chickamauga-Chattanooga, Great Smoky Mountains); USFS (Bankhead, Chattahoochee, Cherokee, Daniel Boone, George Washington, Jefferson, Nantahala, Pisgah, Sumter)

## ALLIANCE SOURCES

**References:** Evans 1991, Schafale and Weakley 1990

## VII.B.1.N.a. Lowland or submontane talus/scree

VII.B.1.N.a.1 LOWLAND TALUS SPARSELY VEGETATED ALLIANCE (A.1847)  
LOWLAND TALUS SPARSELY VEGETATED ALLIANCE

## ALLIANCE CONCEPT

**Summary:** This is technically not an alliance. It is a placeholder for a group of sparsely vegetated associations that do not have adequate vegetation descriptions, but do share certain substrate characteristics.

**Synonymy:**

## ALLIANCE DISTRIBUTION

**Range:** This alliance is found in Arkansas, Illinois (?), Iowa, Michigan, Minnesota, Missouri, North Carolina, North Dakota, Oklahoma, South Dakota, Tennessee, Virginia, West Virginia, Wisconsin, and Manitoba and Ontario, Canada.

**States:** AR IA IL? MB ME MI MN MO NC NH NS NY OK ON QC? SD TN VA? VT WI WV?

**USFS Ecoregions:** 212C:C, 212J:C, 212K:C, 212L:C, 222A:C, 222G:C, 222H:C, 222K:C, 222L:C, 251C:C, 251D:C, 331:P, 332:?, M221D:C, M231A:C, M334A:C

**Federal Lands:** NPS (Acadia, Theodore Roosevelt); USFS (Cherokee, Nantahala, Ouachita, Ozark)

## ALLIANCE SOURCES

References:

**CHESTNUT OAK FOREST (XERIC RIDGE TYPE)****ELEMENT IDENTIFIERS**

**NVCS association:** *Quercus* (prinus, coccinea) / *Kalmia latifolia* / (*Galax urceolata*, *Gaultheria procumbens*) Forest

**Database Code:** CEGL006271

**Formation:** Lowland or submontane cold-deciduous forest

**Alliance:** QUERCUS PRINUS - (QUERCUS COCCINEA, QUERCUS VELUTINA) FOREST ALLIANCE (I.B.2.N.a.36)

**ELEMENT CONCEPT**

**Summary:** This community includes xeric ridgetop forests in the Southern Blue Ridge, ranging south and east into the upper Piedmont and north into the Central Appalachians, and possibly west into the Ridge and Valley. This community occurs over shallow, rocky soils, primarily on south- to west-facing slopes and ridgetops. It includes forests with canopies strongly dominated by *Quercus prinus* and/or *Quercus coccinea*, with lesser amounts of *Quercus velutina*, *Quercus rubra*, *Quercus falcata*, *Oxydendrum arboreum*, *Nyssa sylvatica*, and *Acer rubrum* var. *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 *Leucothoe recurva*. *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, acid soils.

**Environment:** This community occurs over shallow, rocky soils, primarily on south- to west-facing slopes and ridgetops. This community includes xeric ridgetop forests in the Southern Blue Ridge, ranging south and east into the upper Piedmont and north into the Central Appalachians, and possibly west into the Ridge and Valley.

**Vegetation:** Stands of this association are forests with canopies strongly dominated by *Quercus prinus* and/or *Quercus coccinea*, with lesser amounts of *Quercus velutina*, *Quercus rubra*, *Quercus falcata*, *Oxydendrum arboreum*, *Nyssa sylvatica*, and *Acer rubrum* var. *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 *Leucothoe recurva*. *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, 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 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*.

**Dynamics:** See Summary

**Similar Associations:**

- *Quercus prinus* - *Quercus* (rubra, velutina) / *Gaylussacia baccata* Forest (CEGL006282)--defined for the Northern Piedmont, Central Appalachians; occurs on granite monadnocks.
- *Quercus prinus* - *Quercus* (alba, coccinea, velutina) / *Viburnum acerifolium* - (*Kalmia latifolia*) Forest (CEGL005023)--broadly defined type for the Appalachian Plateau and Interior Low Plateau.
- *Quercus prinus* - (*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 prinus* - *Carya* spp. - *Quercus velutina* / *Vaccinium arboreum* / *Iris verna* var. *smalliana* Forest (CEGL007261)--defined for the lower Piedmont of Alabama and has Coastal Plain affinities.

**Synonymy:**

- Chestnut oak-scarlet oak/ericad forest: (matrix) xeric, S- & SW-facing slopes (CAP 1998)
- IA6d. Chestnut Oak Slope and Ridge Forest (Allard 1990) B. in part
- Chestnut Oak-Chestnut Heath (Whittaker 1956)
- Chestnut Oak Forests (McLeod 1988)
- Chestnut Oak type (Golden 1974)
- *Quercus montana* - *Quercus coccinea* / *Vaccinium pallidum* Forest (Fleming and Moorhead 2000)
- *Quercus prinus* - *Quercus coccinea* / *Kalmia latifolia* / *Vaccinium pallidum* Forest (Fleming and Coulling 2001)

## Association Descriptions

- *Quercus montana* / *Kalmia latifolia* / *Vaccinium pallidum* Association, *pro parte* (Rawinski et al. 1996). see CEGLO06282.
- Chestnut Oak: 44 (Eyre 1980) B. chestnut oak - scarlet oak variant.

**Comments:** 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 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 prinus* - (*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*.

### CONSERVATION RANKING & RARE SPECIES

**GRank:** G5 (97-12-31):

**High-ranked species:** MONOTROPSIS ODORATA (G3), SMILAX BILTMOREANA (G3G4), THERMOPSIS FRAXINIFOLIA (G3?), THERMOPSIS MOLLIS (G3G4), VACCINIUM HIRSUTUM (G3)

### ELEMENT DISTRIBUTION

**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, and could possibly extend west into the Ridge and Valley and the Cumberlands of Kentucky.

**States:** GA KY NC SC TN VA

#### Crosswalk to State Classifications:

- KY: Appalachian Sub-xeric Forest, in part (KY 1991)
- NC: Chestnut Oak Forest, in part (NC 1990)
- SC: Chestnut Oak Forest, in part (SC 1986)
- TN: Chestnut Oak, BR, CUPL (TN 1994)
- VA: Mixed Oak / Heath Forest, in part; Chestnut Oak Forest, in part (VA 2001)

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

**USFS Ecoregions:** 231Ag:CCC, M221Aa:CCC, M221Ab:CCC, M221Bd:CCC, M221Be:CCC, M221Ca:CPP, M221Cb:CPP, M221Cc:CPP, M221Ce:CPP, M221Da:CCC, M221Db:CCP, M221Dc:CCC, M221Dd:CCC

**Federal Lands:** NPS (Carl Sandburg Home, Great Smoky Mountains); USFS (Chattahoochee, Cherokee, Daniel Boone, George Washington, Jefferson, Nantahala, Pisgah, Sumter)

### ELEMENT SOURCES

**References:** Allard 1990, CAP 1998, Evans 1991, Eyre 1980, Fleming and Coulling 2001, Fleming and Moorhead 2000, Fleming et al. 2001, Golden 1974, Major et al. 1999, McLeod 1988, NatureServe Ecology - Southeast U.S. unpubl. data, Nelson 1986, Pyne 1994, Rawinski et al. 1996, Schafale and Weakley 1990, Whittaker 1956

**XERIC RIDGETOP CHESTNUT OAK FOREST****ELEMENT IDENTIFIERS**

**NVCS association:** *Quercus prinus* - (*Quercus coccinea*) / *Carya pallida* / *Vaccinium arboreum* - *Vaccinium pallidum* Forest

**Database Code:** CEGL008431

**Formation:** Lowland or submontane cold-deciduous forest

**Alliance:** QUERCUS PRINUS - (QUERCUS COCCINEA, QUERCUS VELUTINA) FOREST ALLIANCE (I.B.2.N.a.36)

**ELEMENT CONCEPT**

**Summary:** This association includes xeric rock chestnut oak forests on high slopes and ridges in the southern Cumberland Plateau, southern Ridge and Valley, and ranging into the very western fringe of the Southern Blue Ridge. This forest occurs over rocky, shallow soils derived from sandstone or (in the western edge of the Southern Blue Ridge) weakly metamorphosed, metasedimentary rocks. 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 prinus* 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. 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.

**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 ranged from 740 to 2400 feet elevation, with most examples occurring over 900 feet elevation.

**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 prinus* 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. 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.

**Dynamics:** See Summary

**Similar Associations:**

- *Quercus* (*prinus*, *coccinea*) / *Kalmia latifolia* / (*Galax urceolata*, *Gaultheria procumbens*) Forest (CEGL006271)--defined for the Southern Blue Ridge. Has dense, less diverse, ericaceous shrub layer and more acid-loving, Blue Ridge species.
- *Quercus prinus* - *Quercus* (*alba*, *coccinea*, *velutina*) / *Viburnum acerifolium* - (*Kalmia latifolia*) Forest (CEGL005023)--broadly defined type for the Appalachian Plateau and Interior Low Plateau.
- *Quercus prinus* - *Carya* spp. - *Quercus velutina* / *Vaccinium arboreum* / *Iris verna* var. *smalliana* Forest (CEGL007261)--defined for the lower Piedmont of Alabama and has Coastal Plain affinities.
- *Quercus prinus* - *Quercus alba* / *Oxydendrum arboreum* / *Vitis rotundifolia* Forest (CEGL006281)--defined for the Piedmont and occurs on granite monadnocks.

**Synonymy:**

- Chestnut Oak Forest (Lipps 1966)
- Chestnut Oak Forest (Lipps and DeSelm 1969)
- Chestnut Oak Type (Chapman 1957)

**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. This type may be present in the McCreary and Somerset ranger districts of the Daniel Boone National Forest (Kentucky). This association represents the driest oak forests of this region. It is similar to a Chestnut Oak Forest defined for the Southern Blue Ridge, *Quercus* (*prinus*, *coccinea*) / *Kalmia latifolia* / (*Galax urceolata*, *Gaultheria procumbens*) Forest (CEGL006271), but lacks the dense, evergreen ericaceous shrub layer and many species of Blue Ridge affinities. Examples at ecoregional transitions may be difficult to classify. A similar association from the Appalachian and

## Association Descriptions

Interior Plateau, *Quercus prinus* - *Quercus (alba, coccinea, velutina) / Viburnum acerifolium* - (*Kalmia latifolia*) Forest (CEGL005023), has a very different herbaceous composition and many differences in shrub and subcanopy flora. Until further floristic information is available, these two associations will remain distinct.

### CONSERVATION RANKING & RARE SPECIES

**GRank:** G4G5 (00-06-13):

**High-ranked species:** No information

### ELEMENT DISTRIBUTION

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

**States:** AL GA KY? TN

**Crosswalk to State Classifications:** Not yet cross-referenced to state classifications

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

**USFS Ecoregions:** 231Cd:CCC, 231Dc:CCC, M221Dd:CCC

**Federal Lands:** USFS (Bankhead, Daniel Boone?, Chattahoochee, Cherokee)

### ELEMENT SOURCES

**References:** Chapman 1957, Lipps 1966, Lipps and DeSelm 1969, NatureServe Ecology - Southeast U.S. unpubl. data

**APPALACHIAN SHORTLEAF PINE - MESIC OAK FOREST****ELEMENT IDENTIFIERS**

**NVCS association:** *Pinus echinata* - *Quercus alba* / *Vaccinium pallidum* / *Hexastylis arifolia* - *Chimaphila maculata* Forest

**Database Code:** C EGL008427

**Formation:** Mixed needle-leaved evergreen - cold-deciduous forest

**Alliance:** PINUS ECHINATA - QUERCUS (ALBA, FALCATA, STELLATA, VELUTINA) FOREST ALLIANCE (I.C.3.N.a.14)

**ELEMENT CONCEPT**

**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 Piedmont of the southeastern United States, ranging north and west through the Southern Ridge and Valley, Cumberland Plateau, low Southern Blue Ridge, upper Piedmont, perhaps extending into the Interior Low Plateau of Kentucky and Tennessee. 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 by other *Quercus* spp. (*Quercus velutina*, *Quercus coccinea*, *Quercus falcata*, *Quercus rubra*). Xerophytic *Quercus* spp. such as *Quercus prinus*, *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.

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

**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 prinus*, *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. A dense forest from the Talladega National Forest, Talladega Ranger District, included here, is dominated by *Quercus coccinea*, *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.

**Dynamics:** See Summary

**Similar Associations:**

- *Pinus echinata* - *Quercus* (*pinus*, *falcata*) / *Oxydendrum arboreum* / *Vaccinium pallidum* Forest (CEGL007493)
- *Pinus echinata* - *Quercus stellata* - *Quercus prinus* - *Carya glabra* / (*Danthonia spicata*, *Piptochaetium avenaceum*) Forest (CEGL007500)
- *Quercus falcata* - *Quercus alba* - *Carya alba* / *Oxydendrum arboreum* / *Vaccinium stamineum* Forest (CEGL007244)--a related, primarily deciduous type.
- *Quercus alba* - *Quercus falcata* / *Vaccinium* (*arboreum*, *hirsutum*, *pallidum*) Forest (CEGL008567)--a related, primarily deciduous type of the Ridge and Valley and Southern Blue Ridge.

**Synonymy:** No information

**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* (*pinus*, *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.

**CONSERVATION RANKING & RARE SPECIES**

**GRank:** G3G4 (00-06-12):

**High-ranked species:** No information

**ELEMENT DISTRIBUTION**

**Range:** This community occurs in the Piedmont of the southeastern United States, ranging north and west through the Southern Ridge and Valley, Cumberland Plateau, and low Southern Blue Ridge, perhaps extending into the Interior Low Plateau of Kentucky and Tennessee.

**States:** AL GA KY NC SC TN VA?

**Crosswalk to State Classifications:**

- VA?: No equivalent (VA 2001)

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

**USFS Ecoregions:** 221H:PP, 221I:PP, 221J:PP, 222E:PP, 231Ab:CCC, 231C:CP, 231Db:CCC, 231Dc:CCC, M221C:CP, M221Dc:CCC, M221Dd:CCC

**Federal Lands:** USFS (Chattahoochee, Cherokee, Daniel Boone, Sumter, Talladega)

**ELEMENT SOURCES**

**References:** NatureServe Ecology - Southeast U.S. unpubl. data

**DRY-MESIC SOUTHERN APPALACHIAN WHITE OAK - HICKORY FOREST**

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**ELEMENT IDENTIFIERS****NVCS association:** *Quercus alba* - *Carya* (*ovata*, *alba*, *glabra*) - *Pinus virginiana* Forest**Database Code:** CEGL007231**Formation:** Lowland or submontane cold-deciduous forest**Alliance:** QUERCUS VELUTINA - QUERCUS ALBA - (QUERCUS COCCINEA) FOREST ALLIANCE (I.B.2.N.a.100)**ELEMENT CONCEPT****Summary:** This dry-mesic upland southern Appalachian forest is dominated by *Quercus alba* and several *Carya* spp. (*Carya ovata*, *Carya alba*, *Carya glabra*, *Carya pallida*) and contains a variable amount of *Pinus virginiana*. Several other *Quercus* spp. may be present in the canopy (*Quercus falcata*, *Quercus stellata*, *Quercus velutina*, *Quercus coccinea*, *Quercus muehlenbergii*, and *Quercus rubra*). In the Ridge and Valley of northeastern Monroe County, Tennessee, this type occurs as disturbed stands with sparse shrub and herb strata.**Environment:** See Summary**Vegetation:** Stands of this upland forest are dominated by *Quercus alba* and several *Carya* spp. (*Carya ovata*, *Carya alba*, *Carya glabra*, *Carya pallida*) and contain a variable amount of *Pinus virginiana*. Several other *Quercus* spp. may be present in the canopy (*Quercus falcata*, *Quercus stellata*, *Quercus velutina*, *Quercus coccinea*, *Quercus muehlenbergii*, and *Quercus rubra*). In addition, *Pinus strobus* may comprise a small part of the canopy.**Dynamics:** See Summary**Similar Associations:** No information**Synonymy:** No information**Comments:** Described from Tellico Pilot Project (Ridge and Valley, northeastern Monroe County, Tennessee; 33 stands sampled), where this type occurs as disturbed stands with sparse shrub and herb strata (Andreu and Tukman 1995). *Pinus virginiana* is included in the name as a placeholder to indicate the relative xeric nature of this forest until more information is available to define understory indicator species. This may be similar to dry shale forests of Virginia's Ridge and Valley (G. Fleming pers. comm.).**CONSERVATION RANKING & RARE SPECIES****GRank:** G4G5 (97-08-14):**High-ranked species:** No information**ELEMENT DISTRIBUTION****Range:** This forest occurs in the Ridge and Valley physiographic province of the southeastern United States.**States:** AL? KY? TN VA?**Crosswalk to State Classifications:**

- TN: White Oak - Northern Red Oak, RV, in part (TN 1994)
- VA?: No equivalent (VA 2001)

**TNC Ecoregions:** 50:C**USFS Ecoregions:** 221Jb:CCC**Federal Lands:** TVA (Tellico); USFS (Cherokee?)**ELEMENT SOURCES****References:** Andreu and Tukman 1995, Fleming pers. comm., Pyne 1994



**RIDGE-AND-VALLEY DRY-MESIC WHITE OAK - HICKORY FOREST****ELEMENT IDENTIFIERS**

**NVCS association:** *Quercus alba* - *Quercus rubra* - *Carya ovata* / *Cercis canadensis* - *Juniperus virginiana* var. *virginiana* Forest

**Database Code:** CEGL007240

**Formation:** Lowland or submontane cold-deciduous forest

**Alliance:** QUERCUS ALBA - (QUERCUS RUBRA, CARYA SPP.) FOREST ALLIANCE (I.B.2.N.a.27)

**ELEMENT CONCEPT**

**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 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 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.

**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.

**Vegetation:** The canopy is dominated by *Quercus alba*, *Quercus rubra*, *Carya ovata*, and *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 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.

**Dynamics:** See Summary

**Similar Associations:**

- *Quercus alba* - (*Quercus rubra*, *Acer saccharum*, *Fagus grandifolia*) / *Aesculus flava* Forest (CEGL007233)
- *Quercus alba* - *Quercus rubra* - *Quercus muehlenbergii* / *Cercis canadensis* Forest (CEGL002070)--is an apparently related type.

**Synonymy:** No information

**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*, *Acer saccharum*, *Fagus grandifolia*) / *Aesculus flava* Forest (CEGL007233), a more mesic type described from the Tellico Pilot Project. May be similar to some limestone forests in Virginia's Ridge and Valley (G. Fleming pers. comm. 1997).

**CONSERVATION RANKING & RARE SPECIES**

**GRank:** G4 (00-01-14): 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

## Association Descriptions

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 Grank was formerly G3G5. Changing this to G4 helps to clarify its status and indicates that it is not a rare type.

**High-ranked species:** No information

### ELEMENT DISTRIBUTION

**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.

**States:** AL? GA KY? TN VA?

**Crosswalk to State Classifications:**

- TN: White Oak - Northern Red Oak, RV, in part (TN 1994)
- VA?: No equivalent (VA 2001)

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

**USFS Ecoregions:** 221Jb:CCC, 222E:??, 231Cc:CCC, 231Da:CCC, 231Dc:CCC, M221Dd:CCC

**Federal Lands:** DOE (Oak Ridge); NPS (Great Smoky Mountains); TVA (Tellico); USFS (Chattahoochee, Cherokee, Daniel Boone?)

### ELEMENT SOURCES

**References:** Andreu and Tukman 1995, Fleming pers. comm., NatureServe Ecology - Southeast U.S. unpubl. data, Pyne 1994

**SOUTHERN RED OAK - SCARLET OAK FOREST****ELEMENT IDENTIFIERS**

**NVCS association:** *Quercus falcata* - *Quercus* (*coccinea*, *stellata*) / *Vaccinium* (*pallidum*, *stamineum*) Forest

**Database Code:** CEG007247

**Formation:** Lowland or submontane cold-deciduous forest

**Alliance:** QUERCUS FALCATA FOREST ALLIANCE (I.B.2.N.a.31)

**ELEMENT CONCEPT**

**Summary:** This forest is typically codominated by *Quercus falcata*, *Quercus coccinea*, and/or *Quercus stellata*. Other *Quercus* species may be present in the canopy and/or subcanopy (*Quercus velutina* and *Quercus marilandica* in the Cumberland and Interior Low Plateau; *Quercus alba*, *Quercus rubra*, or *Quercus muehlenbergii* in the Ridge and Valley or other more montane or submontane situations) along with several *Carya* species (*Carya alba*, *Carya ovata*, or *Carya glabra*). The canopy, particularly of Ridge and Valley examples, may contain *Pinus virginiana* and/or *Pinus echinata*, as well as *Liriodendron tulipifera*, *Fraxinus americana*, and *Acer saccharum*. The subcanopy is relatively dense, with a coverage of 25-60%. Subcanopy species may include *Acer rubrum*, *Cornus florida*, *Liquidambar styraciflua*, *Liriodendron tulipifera*, *Fraxinus americana*, *Nyssa sylvatica*, *Oxydendrum arboreum*, *Prunus serotina* var. *serotina*, and *Sassafras albidum*. *Juniperus virginiana* var. *virginiana* is prominent in the subcanopy and shrub layers of fire-suppressed Ridge and Valley examples. The low-shrub layer of Interior Low Plateau examples may be sparse or dense, consisting mostly of ericaceous shrubs such as *Vaccinium pallidum*, *Vaccinium stamineum*, *Vaccinium arboreum*, *Gaylussacia baccata*, and rarely *Gaylussacia dumosa*. Herbaceous species nearly always present include *Smilax glauca*, *Rhus copallinum*, *Toxicodendron radicans*, *Vitis rotundifolia*, and *Chimaphila maculata*. Other typical herbs include *Aristolochia serpentaria*, *Symphotrichum dumosum* (= *Aster dumosus*), *Clitoria mariana*, *Cypripedium acaule*, *Desmodium nudiflorum*, *Euphorbia corollata*, *Galium circaezans*, *Ipomoea pandurata*, *Solidago odora*, *Tephrosia virginiana*, *Potentilla simplex*, *Porteranthus stipulatus*, *Pteridium aquilinum*, *Lespedeza* spp., *Dichantheium* spp., *Coreopsis major*, *Mimosa microphylla* (= *Mimosa quadrivalvis* var. *angustata*), and *Hypericum hypericoides*.

**Environment:** This association occurs on flat to gently rolling topography in the Interior Low Plateau of Tennessee and on xeric, lower slopes in Tennessee's Ridge and Valley. In the Cumberland Plateau of Alabama it is found on flat, sandstone nose slopes with a calcareous influence.

**Vegetation:** In the Bankhead National Forest of Alabama, this is a dry ridge forest with a canopy dominated by *Quercus falcata*, *Quercus stellata*, *Carya alba*, *Pinus echinata*, and *Pinus virginiana*. *Quercus prinus*, *Quercus velutina*, and *Quercus alba* can also have a minor presence in the canopy. The subcanopy is dominated by *Carya alba*, *Cornus florida*, and *Nyssa sylvatica*. The shrub layer indicates a possible calcareous influence with *Celtis occidentalis*, *Chionanthus virginicus*, and *Frangula caroliniana*. Other shrubs are *Vaccinium arboreum*, *Vaccinium pallidum*, and *Viburnum acerifolium*. Vines include *Parthenocissus quinquefolia*, *Toxicodendron radicans*, and *Vitis rotundifolia*. The herb stratum is sparse and includes *Sericocarpus asteroides* (= *Aster paternus*), *Dioscorea quaternata*, *Piptochaetium avenaceum*, *Pityopsis graminifolia*, *Ruellia caroliniensis*, *Silphium trifoliatum*, and *Solidago odora* var. *odora*.

**Dynamics:** In more xeric landscapes, fire may have been an important disturbance factor.

**Similar Associations:** No information

**Synonymy:** No information

**Comments:** This association was originally defined from flat to gently rolling topography at Arnold Air Force Base, Coffee County, Tennessee, and later expanded to include TVA Tellico lands, where it is a common successional forest type on xeric lower slopes below 900 feet. It was subsequently expanded to include *Quercus falcata* - *Quercus stellata* forests found on sandstone ridges in Alabama's Cumberland Plateau.

**CONSERVATION RANKING & RARE SPECIES**

**GRank:** G4 (00-01-14): This is not an inherently rare forest type. It is at least a moderately widespread type and 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. This type is poorly documented through EOs, and not much data are available on the specific condition of its examples. Some stands have been impacted by removal of more valuable timber species (e.g., *Quercus falcata*) and the loss of herbaceous species diversity from the disturbance effects of logging. The Grank was formerly G3G4. Changing this to G4 helps to clarify its status and indicates that it is not a rare type.

**High-ranked species:** No information

**ELEMENT DISTRIBUTION**

**Range:** At least a moderately widespread type, present in the Interior Low Plateau and Cumberlands/Southern Ridge and Valley at least from Kentucky to Alabama.

**States:** AL KY TN

**Crosswalk to State Classifications:**

- KY: Acidic Xeric Forest, in part (KY 1991)
- TN: Southern Red Oak, RV (TN 1994)

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

**USFS Ecoregions:** 222Dg:CCC, 222Eb:CCC, 222Ej:CCC, 222El:CCC, 231Cd:CCC

**Federal Lands:** DOD (Arnold); NPS (Mammoth Cave); TVA (Tellico); USFS (Bankhead, Cherokee?)

**ELEMENT SOURCES**

**References:** Evans 1991, Pyne 1994, TNC 1998a

**CHESTNUT OAK - SHAGBARK HICKORY - SUGAR MAPLE FOREST****ELEMENT IDENTIFIERS**

**NVCS association:** *Quercus prinus* - *Carya ovata* - *Quercus rubra* / *Acer saccharum* Forest

**Database Code:** CEGL007268

**Formation:** Lowland or submontane cold-deciduous forest

**Alliance:** QUERCUS PRINUS - QUERCUS (ALBA, FALCATA, RUBRA, VELUTINA) FOREST ALLIANCE (I.B.2.N.a.37)

**ELEMENT CONCEPT**

**Summary:** Dry-mesic forests of the Ridge and Valley and adjacent sedimentary ecoregions (Cumberlands, Interior Low Plateau) dominated by *Quercus prinus* with other oaks and hickories. Some examples are strongly dominated by *Quercus prinus*. Other examples with more diverse canopies include *Quercus rubra*, *Carya ovata*, *Carya glabra*, *Acer saccharum*, *Fraxinus americana*, and *Quercus velutina*. The canopy is generally closed (greater than 75% cover). Subcanopy species that may be present are *Carya ovata*, *Carya glabra*, *Quercus rubra*, *Quercus muehlenbergii*, *Acer saccharum*, *Aesculus flava*, and *Juniperus virginiana*. The subcanopy may be dominated by *Acer saccharum* in some examples due to fire suppression. The subcanopy is relatively sparse with a percent cover of less than 25%. The shrub and herbaceous layers are sparse with small stems of canopy and subcanopy species along with herbaceous species such as *Campanulastrum americanum*, *Chimaphila maculata*, *Parthenocissus quinquefolia*, and *Polystichum acrostichoides*. In the Ridge and Valley of Tennessee, these forests occur near the tops of calcareous ridges and knobs with northerly aspects that range from 900-1240 feet, on very well-drained, gravelly, sandy soils.

**Environment:** In the Ridge and Valley of Tennessee, these forests occur near the tops of calcareous ridges and knobs with northerly aspects that range from 900-1240 feet, on very well-drained, gravelly, sandy soils (Andreu and Tukman 1995).

**Vegetation:** Some stands are strongly dominated by *Quercus prinus* with other oaks and hickories. Other examples with more diverse canopies include *Quercus rubra*, *Carya ovata*, *Carya glabra*, *Acer saccharum*, *Fraxinus americana*, and *Quercus velutina*. The canopy is generally closed (greater than 75% cover). Subcanopy species that may be present are *Carya ovata*, *Carya glabra*, *Quercus rubra*, *Quercus muehlenbergii*, *Acer saccharum*, *Aesculus flava*, and *Juniperus virginiana*. The subcanopy may be dominated by *Acer saccharum* in some examples due to fire suppression. The subcanopy is relatively sparse with a percent cover of less than 25%. The shrub and herbaceous layers are sparse with small stems of canopy and subcanopy species along with herbaceous species such as *Campanulastrum americanum*, *Chimaphila maculata*, *Parthenocissus quinquefolia*, and *Polystichum acrostichoides*.

**Dynamics:** See Summary

**Similar Associations:**

- *Quercus prinus* - *Quercus rubra* - *Carya* (ovata, glabra) - *Pinus virginiana* Forest (CEGL007269)

**Synonymy:** No information

**Comments:** Two variants of this association (14 stands sampled; 19 stands sampled) were described from Tellico Pilot Project (Ridge and Valley of Tennessee, northeast Monroe County). This may be similar to vegetation reported from limestone in the Ridge and Valley of Virginia. A related dry forest association is *Quercus prinus* - *Quercus rubra* - *Carya* (ovata, glabra) - *Pinus virginiana* Forest (CEGL007269).

**CONSERVATION RANKING & RARE SPECIES**

**GRank:** G4? (01-10-09): This community is believed to be relatively common and secure, although good mature examples of large size may be uncommon. Additional information is needed relative to its distribution and relation to other similar communities. The rank was formerly G3G5, and changing it to G4? (which is equivalent) makes it clear that this is not to be considered a rare community type.

**High-ranked species:** No information

**ELEMENT DISTRIBUTION**

**Range:** These dry-mesic forests are found in the Ridge and Valley and adjacent sedimentary ecoregions (Cumberlands, Interior Low Plateau) of the southeastern United States.

**States:** AL? KY? TN VA?

**Crosswalk to State Classifications:**

- TN: Chestnut Oak, RV, in part (TN 1994)
- VA?: No equivalent (VA 2001)

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

**USFS Ecoregions:** 221Ha:CCC, 221Hb:CCC, 221Hc:CCC, 221He:CCP, 221Jb:CCC, 222E:CC, M221Cd:CCC

**Federal Lands:** DOE (Oak Ridge); TVA (Tellico); USFS (Cherokee?)

ELEMENT SOURCES

References: Andreu and Tukman 1995, Pyne 1994

**DRY CHESTNUT OAK FOREST****ELEMENT IDENTIFIERS**

**NVCS association:** *Quercus prinus* - *Quercus rubra* - *Carya* (*ovata*, *glabra*) - *Pinus virginiana* Forest

**Database Code:** C EGL007269

**Formation:** Lowland or submontane cold-deciduous forest

**Alliance:** QUERCUS PRINUS - QUERCUS (ALBA, FALCATA, RUBRA, VELUTINA) FOREST ALLIANCE (I.B.2.N.a.37)

**ELEMENT CONCEPT**

**Summary:** Dry forests of the Ridge and Valley of Tennessee dominated by *Quercus prinus*. This canopy of this association is dominated by *Quercus prinus*, which makes up 25-50% of total canopy cover. It occurs near the top of calcareous ridges and knobs (with westerly aspects) on very well-drained, gravelly sandy soils. Other canopy species include *Quercus rubra*, *Carya ovata*, and *Carya glabra*. In addition, *Pinus virginiana* occurs in the canopy in low abundance (5-10% of total canopy cover). Other species present in the Ridge and Valley occurrences include *Quercus alba*, *Quercus stellata*, *Quercus muehlenbergii*, *Fraxinus americana*, *Juniperus virginiana*, *Pinus echinata*, *Acer rubrum*, *Robinia pseudoacacia*, *Oxydendrum arboreum*, *Vaccinium stamineum*, *Vaccinium arboreum*, *Viburnum rufidulum*, *Sideroxylon lycioides*, *Crataegus* sp., *Amelanchier arborea*, *Ruellia humilis*, *Silene stellata*, and *Potentilla canadensis*.

**Environment:** This forest occurs on xeric, disturbed sites particularly near the top of calcareous ridges and knobs (with westerly aspects) on very well-drained, gravelly sandy soils, in the Ridge and Valley of the southeastern United States (Andreu and Tukman 1995).

**Vegetation:** Stands are dominated by *Quercus prinus*, which makes up 25-50% of total canopy cover. Other canopy species include *Quercus rubra*, *Carya ovata*, and *Carya glabra*. In addition, *Pinus virginiana* occurs in the canopy in low abundance (5-10% of total canopy cover). Other species present in the Ridge and Valley occurrences include *Quercus alba*, *Quercus stellata*, *Quercus muehlenbergii*, *Fraxinus americana*, *Juniperus virginiana*, *Pinus echinata*, *Acer rubrum*, *Robinia pseudoacacia*, *Oxydendrum arboreum*, *Vaccinium stamineum*, *Vaccinium arboreum*, *Viburnum rufidulum*, *Sideroxylon lycioides*, *Crataegus* sp., *Amelanchier arborea*, *Ruellia humilis*, *Silene stellata*, and *Potentilla canadensis*.

**Dynamics:** See Summary

**Similar Associations:**

- *Quercus prinus* - *Carya ovata* - *Quercus rubra* / *Acer saccharum* Forest (CEGL007268)

**Synonymy:** No information

**Comments:** The alliance placement of this forest is uncertain. Some more xeric *Quercus prinus* forest associations are found in I.B.2.N.a *Quercus prinus* - (*Quercus coccinea*, *Quercus velutina*) Forest Alliance (A.248). Described from Tellico Pilot Project (Ridge and Valley of Tennessee, northeastern Monroe County; 7 stands sampled), where this forest occurs on xeric, disturbed sites (Andreu and Tukman 1995). A related dry-mesic association is *Quercus prinus* - *Carya ovata* - *Quercus rubra* / *Acer saccharum* Forest (CEGL007268).

**CONSERVATION RANKING & RARE SPECIES**

**GRank:** G4? (01-10-09): This community is believed to be relatively common and secure, although good mature examples of large size may be uncommon. Additional information is needed relative to its distribution and relation to other similar communities. The rank was formerly G3G5, and changing it to G4? (which is equivalent) makes it clear that this is not to be considered a rare community type. If it was merged with other types, the rank would not be more common than G4.

**High-ranked species:** No information

**ELEMENT DISTRIBUTION**

**Range:** This forest occurs in the Ridge and Valley physiographic province of the southeastern United States.

**States:** AL? TN VA?

**Crosswalk to State Classifications:**

- TN: Chestnut Oak, RV, in part (TN 1994)
- VA?: No equivalent (VA 2001)

**TNC Ecoregions:** 50:C

**USFS Ecoregions:** 221Jb:CCC

**Federal Lands:** TVA (Tellico); USFS (Cherokee?)

**ELEMENT SOURCES**

**References:** Andreu and Tukman 1995, Pyne 1994

## DRY-MESIC CIRCUMNEUTRAL HARDWOOD FORESTS AND WOODLANDS

## APPALACHIAN SUGAR MAPLE - CHINQUAPIN OAK LIMESTONE FOREST

## ELEMENT IDENTIFIERS

**NVCS association:** *Acer saccharum* - *Quercus muehlenbergii* / *Cercis canadensis* Forest

**Database Code:** CEG006017

**Formation:** Lowland or submontane cold-deciduous forest

**Alliance:** QUERCUS MUEHLENBERGII - (ACER SACCHARUM) FOREST ALLIANCE (I.B.2.N.a.101)

## ELEMENT CONCEPT

**Summary:** This circumneutral to basic maple - oak forest is found in the Central Appalachians and adjacent regions of the eastern United States, ranging south and west to the Interior Low Plateau of Tennessee and the Cumberlands of Alabama. Stands occur in thin soils over calcareous substrates, sometimes in association with limestone glades. These are typically closed-canopy, rich, dry to dry-mesic forests; in some stands the canopy may vary from closed to somewhat open, particularly in Pennsylvania at the northern edge of the range. The stands are primarily composed of *Acer saccharum*, *Quercus muehlenbergii*, *Fraxinus americana*, and *Ostrya virginiana*. Associates include *Quercus alba*, *Tilia americana*, *Acer nigrum*, *Ulmus rubra*, *Celtis occidentalis*, *Carya ovalis*, and *Carya ovata*. *Quercus prinus* may also be present in some examples. A variable subcanopy and shrub layer contains *Cornus florida*, *Cercis canadensis*, *Hamamelis virginiana*, *Rosa carolina*, *Rhus aromatica*, *Viburnum prunifolium*, *Viburnum rafinesquianum*, *Viburnum rufidulum*, and *Zanthoxylum americanum*. The sparse to well-developed herb layer may contain *Danthonia spicata*, *Elymus hystrix*, *Bouteloua curtipendula*, *Ageratina altissima* (= *Eupatorium rugosum*), *Antennaria plantaginifolia*, *Aquilegia canadensis*, *Arabis laevigata*, *Asclepias quadrifolia*, *Clematis occidentalis* (to the north), *Houstonia longifolia* (= *Houstonia tenuifolia*), *Polygonum scandens*, *Sanicula canadensis*, *Saxifraga virginiana*, and *Packera obovata* (= *Senecio obovatus*). Some other herbs recorded in Virginia examples include *Agrimonia rostellata*, *Anemone virginiana* var. *virginiana*, *Symphotrichum patens* var. *patens* (= *Aster patens* var. *patens*), *Bromus pubescens*, *Dichanthelium boscii*, *Erigeron pulchellus* var. *pulchellus*, *Galium circaezans*, *Sanicula canadensis*, *Scutellaria elliptica*, and *Solidago ulmifolia* var. *ulmifolia*. Some stands attributed to this type are mesic forests of steep slopes in the southern Ridge and Valley which are dominated by *Acer saccharum* and some combination of *Quercus alba* and/or *Quercus muehlenbergii* with *Liriodendron tulipifera*, *Carya* spp., and *Aesculus flava* in either the canopy or subcanopy. The same, or related forests, are reported from limestones of the lower Cumberland Plateau escarpment of Tennessee and possibly Alabama.

**Environment:** This association is typically found on upper slopes or summits of limestone or marble ridges with dry soils. Limestone outcrops or boulders are often present. These are alkaline forests associated with calcareous soils, often surrounding, or in association with, limestone glades. The soils are well-drained, dry, and shallow with exposures of limestone outcrops or boulders possibly present. In the Ridge and Valley and Central Appalachians of Virginia (Fleming 1999), stands of this type are evidently confined to substrates weathered from limestone and dolomite, most frequently occupying submesic to subxeric, south- to west-facing slopes at relatively low elevations (mean = 569 m [1867 feet]). These habitats usually appear to be quite dry, rocky, and at least somewhat exposed. The stands are most often situated on middle slopes but range into both lower and upper slope topographic positions. The slope shape is typically convex in at least one direction. Soils are yellow-brown to reddish-brown clay loams and silty clay loams; soil reaction ranges from strongly acid (pH 5.3) to mildly alkaline (pH 7.4), with mean calcium (Ca) levels of 2474 ppm. In soils weathered from dolomite, magnesium (Mg) levels may exceed 1000 ppm (Fleming 1999). In the Ridge and Valley and the Central Appalachians of Virginia (Fleming 1999), two subtypes of this vegetation are recognized, varying primarily in the relative abundance and constancy of key shared species. One of these, the *Quercus muehlenbergii* - *Quercus alba* / *Cercis canadensis* var. *canadensis* Subtype (3.1.1), is described as occurring on limestone and occupying very steep, subxeric, middle to upper slopes with southwesterly aspects with considerable exposed mineral soil. In contrast, the *Quercus muehlenbergii* - *Tilia americana* / *Muhlenbergia sobolifera* Subtype (3.1.2) is found on dolomite and occupies less steep, more submesic, lower to middle slopes with more southerly aspects and high cover of surficial rock outcrops and boulders.

**Vegetation:** The stands are primarily composed of *Acer saccharum*, *Quercus muehlenbergii*, *Fraxinus americana*, and *Ostrya virginiana*. Associates include *Quercus alba*, *Tilia americana*, *Acer nigrum*, *Ulmus rubra*, *Celtis occidentalis*, *Carya ovalis*, and *Carya ovata*. *Quercus prinus* may also be present in some examples. A variable subcanopy and shrub layer contains *Cornus florida*, *Cercis canadensis*, *Hamamelis virginiana*, *Rosa carolina*, *Rhus aromatica*, *Viburnum prunifolium*, *Viburnum rafinesquianum*, *Viburnum rufidulum*, and *Zanthoxylum americanum*. The sparse to well-developed herb layer may contain *Danthonia spicata*, *Elymus hystrix*, *Bouteloua curtipendula*, *Ageratina altissima* (= *Eupatorium rugosum*), *Antennaria plantaginifolia*, *Aquilegia canadensis*, *Arabis laevigata*, *Asclepias quadrifolia*, *Clematis occidentalis* (to the north), *Houstonia longifolia* (= *Houstonia tenuifolia*), *Polygonum scandens*, *Sanicula canadensis*, *Saxifraga virginiana*, and *Packera obovata* (= *Senecio obovatus*). Some other herbs recorded in Virginia examples include *Agrimonia rostellata*, *Anemone virginiana* var. *virginiana*, *Symphotrichum patens* var. *patens* (= *Aster patens* var. *patens*), *Bromus pubescens*, *Dichanthelium boscii*, *Erigeron pulchellus* var. *pulchellus*, *Galium circaezans*, *Sanicula canadensis*, *Scutellaria elliptica*, and



*Solidago ulmifolia* var. *ulmifolia*. In the Ridge and Valley and the Central Appalachians of Virginia (Fleming 1999), two subtypes of this vegetation are recognized, varying primarily in the relative abundance and constancy of key shared species. One of these, the *Quercus muehlenbergii* - *Quercus alba* / *Cercis canadensis* var. *canadensis* Subtype (3.1.1), is described as occurring on limestone and occupying very steep, subxeric, middle to upper slopes with southwesterly aspects with considerable exposed mineral soil. In contrast, the *Quercus muehlenbergii* - *Tilia americana* / *Muhlenbergia sobolifera* Subtype (3.1.2) is found on dolomite and occupies less steep, more submesic, lower to middle slopes with more southerly aspects and high cover of surficial rock outcrops and boulders. Some additional taxa that are relatively constant in the broad type (or even more so in the *Quercus muehlenbergii* - *Tilia americana* / *Muhlenbergia sobolifera* Subtype are *Asplenium platyneuron*, *Botrychium virginianum*, *Carex blanda*, *Actaea racemosa* (= *Cimicifuga racemosa*), *Galium triflorum*, *Hybanthus concolor*, *Maianthemum racemosum*, *Polygonatum biflorum*, *Polymnia canadensis*, *Ranunculus recurvatus*, and *Sanguinaria canadensis*. In addition, *Muhlenbergia sobolifera* may dominate the herbaceous stratum of the subtype.

**Dynamics:** See Summary

**Similar Associations:**

- *Acer saccharum* - *Quercus muehlenbergii* Forest (CEGL005010)--more northerly.
- *Quercus muehlenbergii* - *Quercus* (*falcata*, *shumardii*, *stellata*) / *Cercis canadensis* / *Viburnum rufidulum* Forest (CEGL007699)--more oak-dominated.
- *Quercus muehlenbergii* - *Quercus alba* / *Cercis canadensis* / *Dirca palustris* Forest (CEGL004793)--clearly related.
- *Quercus alba* - (*Quercus rubra*, *Acer saccharum*, *Fagus grandifolia*) / *Aesculus flava* Forest (CEGL007233)--a more mesic forest found to the south and west.

**Synonymy:**

- *Acer saccharum* - *Quercus* (*alba*, *muehlenbergii*) Forest (Andreu and Tukman 1995)
- *Quercus muehlenbergii* - *Acer* (*nigrum*, *saccharum* var. *saccharum*) / *Ostrya virginiana* / *Senecio obovatus* Forest, Type 3.1 (Fleming 1999)
- *Quercus muehlenbergii* / *Juniperus virginiana* / *Hybanthus concolor* Association (Rawinski et al. 1996)
- Yellow oak - redbud woodland (Fike 1999)
- Yellow oak-sugar maple-red bud forest of calcareous upper slopes and summits (CAP 1998)
- *Quercus muehlenbergii* - *Acer* (*nigrum*, *saccharum*) / *Ostrya virginiana* / *Erigeron pulchellus* - *Packera obovata* Forest (Fleming and Coulling 2001)

**Comments:** The range of this type, which was initially described from "the High Alleghenies," has gradually extended south to at least the Interior Low Plateau. It may require subdivision. (This type was formerly attributed questionably to the Upper East Gulf Coastal Plain, it was dropped from ECO43 by REE based on input from MP and ASW). Some stands attributed to this type are mesic forests of steep slopes in the southern Ridge and Valley which are dominated by *Acer saccharum* and some combination of *Quercus alba* and/or *Quercus muehlenbergii* with *Liriodendron tulipifera*, *Carya* spp., and *Aesculus flava* in either the canopy or subcanopy (Andreu and Tukman 1995). The same, or related forests, are reported from limestones of the lower Cumberland Plateau escarpment of Tennessee and possibly Alabama (Bowen et al. 1995). There has been discussion of the merits of subdividing this type, in effect re-splitting former *Acer saccharum* - *Quercus* (*alba*, *muehlenbergii*) / *Aesculus flava* Forest (CEGL006136) (or an equivalent) out of it again. ^Two tentative, fully intergrading subtypes have been recognized in Virginia (Fleming 1999): The *Quercus muehlenbergii* - *Quercus alba* / *Cercis canadensis* Subtype occurs (with one exception) on limestone and occupies very steep, subxeric, middle to upper slopes with southwesterly aspects and considerable exposed mineral soil (mean = 28%). *Quercus alba*, *Cercis canadensis*, *Hamamelis virginiana*, *Muhlenbergia tenuiflora*, and *Desmodium glutinosum* are characteristic species of the subtype. The *Quercus muehlenbergii* - *Tilia americana* / *Muhlenbergia sobolifera* Subtype occurs without exception on dolomite and occupies less steep, more submesic, lower to middle slopes with more southerly aspects and high surface cover of bedrock and boulders. Soils have lower mean calcium levels and higher mean magnesium levels than those of the previous subtype. *Tilia americana*, *Juniperus virginiana*, *Dirca palustris*, and *Muhlenbergia sobolifera* are most important in this subtype.

**CONSERVATION RANKING & RARE SPECIES**

**GRank:** G4? (00-10-19): This forest is widely but somewhat locally distributed throughout its range in suitable calcareous habitats. The type often occurs in relatively small patches except where carbonate substrates are more continuously exposed, for example on low hills and knobs (Fleming 1999). There is very little requisite habitat for this vegetation in the George Washington and Jefferson national forests (GWJNF) of Virginia; hence the type can be considered rare there. The largest occurrences on the GWJNF are probably in the Clinch Ranger District.

**High-ranked species:** ARABIS PATENS (G3), DELPHINIUM EXALTATUM (G3)

**ELEMENT DISTRIBUTION**

**Range:** This maple - oak forest is found in the Central Appalachians and adjacent regions of the eastern United States, including the Ridge and Valley and Western Allegheny Plateau regions, ranging from Pennsylvania southward to the Interior Low Plateau of Tennessee and the Ridge and Valley of Virginia.

**States:** AL? KY MD PA TN VA WV

**Crosswalk to State Classifications:**

- PA: Yellow oak-redbud woodland
- VA: Montane Dry Calcareous Forest and Woodland, in part (VA 2001)
- WV: *Acer saccharum* - *Quercus muehlenbergii* / *Houstonia longifolia* Forest

**TNC Ecoregions:** 44:C, 49:C, 50:C, 59:C, 60:?, 61:C

**USFS Ecoregions:** 221A:C?, 221D:C?, 221Ea:CCC, 221Hb:CCC, 221Hc:CCC, 221Jb:CCC, 222Ej:CPP, 222Fd:CCC, 231B:P?, 231Cc:PPP, M221Aa:CCC, M221Ab:CCC, M221Ac:CCC, M221Bd:CP?, M221Be:CPP, M221Ca:CC?, M221Cb:CC?, M221Cc:CC?, M221Ce:CCC, M221Da:CCC, M221Db:CC?, M221Dc:CCC

**Federal Lands:** TVA (Tellico); USFS (Cherokee?, Daniel Boone, George Washington, Jefferson)

**ELEMENT SOURCES**

**References:** Andreu and Tukman 1995, Bartgis 1985a, Bartgis 1993, Bowen et al. 1995, CAP 1998, Fike 1999, Fleming 1999, Fleming and Coulling 2001, Fleming et al. 2001, Rawinski et al. 1996

## DRY-MESIC CIRCUMNEUTRAL HARDWOOD FORESTS AND WOODLANDS

## RIDGE-AND-VALLEY DRY-MESIC WHITE OAK - HICKORY FOREST

## ELEMENT IDENTIFIERS

**NVCS association:** *Quercus alba* - *Quercus rubra* - *Carya ovata* / *Cercis canadensis* - *Juniperus virginiana* var. *virginiana* Forest

**Database Code:** CEGL007240

**Formation:** Lowland or submontane cold-deciduous forest

**Alliance:** QUERCUS ALBA - (QUERCUS RUBRA, CARYA SPP.) FOREST ALLIANCE (I.B.2.N.a.27)

## ELEMENT CONCEPT

**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 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 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.

**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.

**Vegetation:** The canopy is dominated by *Quercus alba*, *Quercus rubra*, *Carya ovata*, and *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 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.

**Dynamics:** See Summary

**Similar Associations:**

- *Quercus alba* - (*Quercus rubra*, *Acer saccharum*, *Fagus grandifolia*) / *Aesculus flava* Forest (CEGL007233)
- *Quercus alba* - *Quercus rubra* - *Quercus muehlenbergii* / *Cercis canadensis* Forest (CEGL002070)--is an apparently related type.

**Synonymy:** No information

**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*, *Acer saccharum*, *Fagus grandifolia*) / *Aesculus flava* Forest (CEGL007233), a more mesic type described from the Tellico Pilot Project. May be similar to some limestone forests in Virginia's Ridge and Valley (G. Fleming pers. comm. 1997).

## CONSERVATION RANKING &amp; RARE SPECIES

**GRank:** G4 (00-01-14): 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

## Association Descriptions

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 Grank was formerly G3G5. Changing this to G4 helps to clarify its status and indicates that it is not a rare type.

**High-ranked species:** No information

### ELEMENT DISTRIBUTION

**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.

**States:** AL? GA KY? TN VA?

**Crosswalk to State Classifications:**

- TN: White Oak - Northern Red Oak, RV, in part (TN 1994)
- VA?: No equivalent (VA 2001)

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

**USFS Ecoregions:** 221Jb:CCC, 222E:??, 231Cc:CCC, 231Da:CCC, 231Dc:CCC, M221Dd:CCC

**Federal Lands:** DOE (Oak Ridge); NPS (Great Smoky Mountains); TVA (Tellico); USFS (Chattahoochee, Cherokee, Daniel Boone?)

### ELEMENT SOURCES

**References:** Andreu and Tukman 1995, Fleming pers. comm., NatureServe Ecology - Southeast U.S. unpubl. data, Pyne 1994

## DRY-MESIC CIRCUMNEUTRAL HARDWOOD FORESTS AND WOODLANDS

## CIRCUMNEUTRAL RED OAK - CHESTNUT OAK SLOPE FOREST

## ELEMENT IDENTIFIERS

**NVCS association:** *Quercus prinus* - *Quercus rubra* - *Carya* spp. - *Fraxinus americana* / *Cercis canadensis* / *Solidago sphacelata* Forest

**Database Code:** CEGL008549

**Formation:** Lowland or submontane cold-deciduous forest

**Alliance:** QUERCUS PRINUS - QUERCUS (ALBA, FALCATA, RUBRA, VELUTINA) FOREST ALLIANCE (I.B.2.N.a.37)

## ELEMENT CONCEPT

**Summary:** This is a dry-mesic forest found on apparently circumneutral slopes in the Southern Blue Ridge of Tennessee (Polk County). The canopy of stands of this forest is dominated by *Quercus prinus*, *Quercus rubra*, *Carya glabra*, *Carya alba*, *Carya ovata*, *Fraxinus americana*, and *Ulmus alata*. The subcanopy and tall-shrub strata contain, in addition to some of the canopy taxa, *Acer rubrum*, *Acer saccharum*, *Celtis occidentalis*, *Cercis canadensis*, *Juniperus virginiana* var. *virginiana*, *Nyssa sylvatica*, *Ostrya virginiana*, and *Prunus serotina*. Some low shrubs and woody vines include *Euonymus americana*, *Hydrangea cinerea*, *Philadelphus hirsutus*, *Rubus allegheniensis*, *Vaccinium arboreum*, *Viburnum acerifolium*, *Bignonia capreolata*, *Cocculus carolinus*, *Parthenocissus quinquefolia*, and *Vitis rotundifolia*. On some of the slopes, *Solidago sphacelata* is an aspect dominant. Other herbs include *Dichanthelium boscii* (with higher values), *Acalypha gracilens*, *Agalinis setacea*, *Arabis laevigata*, *Asclepias variegata*, *Asplenium platyneuron*, *Asplenium trichomanes* ssp. *trichomanes*, *Eurybia divaricata* (= *Aster divaricatus*), *Campanula divaricata*, *Carex sparganioides*, *Desmodium* sp., *Dryopteris marginalis*, *Eupatorium sessilifolium*, *Helianthus microcephalus*, *Heuchera americana*, *Penstemon canescens*, *Pityopsis graminifolia*, *Pleopeltis polypodioides* ssp. *michauxiana*, *Pycnanthemum* sp., *Sedum ternatum*, *Solidago juncea*, *Symphytotrichum* spp., and *Thaspium barbinode*. This association occupies extensive areas between Big Rock Island and "The Narrows" at an elevation of about 300-350 m (1025-1175 feet). It is best developed on exposed areas and convex surfaces. This is a more-or-less closed-canopy forest with some open areas where there are massive bedrock exposures or shaley areas. Upslope, this vegetation grades into *Pinus echinata* and/or *Pinus virginiana* forests and woodlands, and downslope it grades into deciduous floodplain and riverfront forests.

**Environment:** This association is the matrix dry-mesic deciduous forest of most of the south- to southwest-facing slopes of lands adjacent to the Hiwassee River in Tennessee. It occupies extensive areas between Big Rock Island and "The Narrows" at an elevation of about 300-350 m (1025-1175 feet). It is best developed on exposed areas and convex surfaces. This is a more-or-less closed canopy forest with some open areas where there are massive bedrock exposures or shaley areas. Upslope, this vegetation grades into *Pinus echinata* and/or *Pinus virginiana* forests and woodlands, and downslope it grades into deciduous floodplain and riverfront forests. The soils of these areas are mapped as the Cataska channery silt loam, which as described does not have any particularly circumneutral or basic character, but the flora seems to reflect these conditions. The Cataska soil is weathered from low-grade metasedimentary rocks such as siltstone, slate and phyllite with some bands of thinly bedded metasandstone. The term "channery" is applied to the soil series; this means that from 15-35% of the soil material is composed of "channers," a flat particle between a cobble and a flagstone in size (i.e., between 2 and 150 mm long).

**Vegetation:** The canopy of this dry-mesic, circumneutral, slope forest of the southern Blue Ridge is dominated by *Quercus prinus*, *Quercus rubra*, *Carya glabra*, *Carya alba*, *Carya ovata*, *Fraxinus americana*, and *Ulmus alata*. The subcanopy and tall-shrub strata contain, in addition to some of the canopy taxa, *Acer rubrum*, *Acer saccharum*, *Celtis occidentalis*, *Cercis canadensis*, *Juniperus virginiana* var. *virginiana*, *Nyssa sylvatica*, *Ostrya virginiana*, and *Prunus serotina*. Some low shrubs and woody vines include *Euonymus americana*, *Hydrangea cinerea*, *Philadelphus hirsutus*, *Rubus allegheniensis*, *Vaccinium arboreum*, *Viburnum acerifolium*, *Bignonia capreolata*, *Cocculus carolinus*, *Parthenocissus quinquefolia*, and *Vitis rotundifolia*. On some of the slopes, *Solidago sphacelata* is an aspect dominant. Other herbs include *Dichanthelium boscii* (with higher values), *Acalypha gracilens*, *Agalinis setacea*, *Arabis laevigata*, *Asclepias variegata*, *Asplenium platyneuron*, *Asplenium trichomanes* ssp. *trichomanes*, *Eurybia divaricata* (= *Aster divaricatus*), *Campanula divaricata*, *Carex sparganioides*, *Desmodium* sp., *Dryopteris marginalis*, *Eupatorium sessilifolium*, *Helianthus microcephalus*, *Heuchera americana*, *Penstemon canescens*, *Pityopsis graminifolia*, *Pleopeltis polypodioides* ssp. *michauxiana*, *Pycnanthemum* sp., *Sedum ternatum*, *Solidago juncea*, *Symphytotrichum* spp., and *Thaspium barbinode*.

**Dynamics:** Upslope, this vegetation grades into *Pinus echinata* and/or *Pinus virginiana* forests and woodlands, and downslope it grades into deciduous floodplain and riverfront forests.

**Similar Associations:**

- *Quercus alba* - *Quercus rubra* - *Carya ovata* / *Cercis canadensis* - *Juniperus virginiana* var. *virginiana* Forest (CEGL007240)
- *Quercus alba* - (*Quercus rubra*, *Acer saccharum*, *Fagus grandifolia*) / *Aesculus flava* Forest (CEGL007233)--a more mesic forest.

## Association Descriptions

- Quercus alba - Quercus rubra - Quercus muehlenbergii / Cercis canadensis Forest (CEGL002070)--an apparently related type.

**Synonymy:**

- IA6i. Interior Upland Dry-Mesic Oak - Hickory Forest (Allard 1990) B. in part

**Comments:** More information is needed on the geologic and edaphic character of the substrate on which this association occurs. The soils of these areas are mapped as Cataska channery silt loam, which as described does not have any particularly circumneutral or basic character, but the flora seems to reflect these conditions.

### CONSERVATION RANKING & RARE SPECIES

**GRank:** G3? (01-07-02):

**High-ranked species:** No information

### ELEMENT DISTRIBUTION

**Range:** This association is described from the vicinity of the Hiwassee River in the Blue Ridge Province of southeastern Tennessee. It could also occur in adjacent Georgia.

**States:** GA? TN

**Crosswalk to State Classifications:** Not yet cross-referenced to state classifications

**TNC Ecoregions:** 51:C

**USFS Ecoregions:** M221Dd:CCC

**Federal Lands:** USFS (Cherokee)

### ELEMENT SOURCES

**References:** Allard 1990, NatureServe Ecology - Southeast U.S. unpubl. data

## CAROLINA HEMLOCK FOREST (PINE TYPE)

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### ELEMENT IDENTIFIERS

**NVCS association:** *Tsuga caroliniana* - *Pinus* (*rigida*, *pungens*, *virginiana*) Forest

**Database Code:** CEGL006178

**Formation:** Conical-crowned temperate or subpolar needle-leaved evergreen forest

**Alliance:** TSUGA CAROLINIANA FOREST ALLIANCE (I.A.8.N.c.9)

### ELEMENT CONCEPT

**Summary:** This xeric forest community is dominated by a mixture of *Tsuga caroliniana* and any or all of the following pine species: *Pinus rigida*, *Pinus virginiana*, and/or *Pinus pungens*. Additional canopy species may include *Quercus prinus*, *Quercus rubra*, and *Carya glabra*. This association is known from shallow soils over sedimentary and metasedimentary rock strata on exposed ridges and southwest-facing slopes above 2000 feet in the Southern Blue Ridge and upper Piedmont of North Carolina and Tennessee. The structure of the canopy varies from closed to open depending on disturbance history and environment. The patchy to open shrub layer of Tennessee occurrences is characterized by *Buckleya distichophylla* and *Rhododendron minus* in the upper shrub layer, and *Vaccinium pallidum* and *Gaultheria procumbens* in the lower shrub layer. The patchy to open herbaceous layer is characterized by *Schizachyrium scoparium*. As much as 25% of the ground cover may contain lichens, including *Cladina rangiferina* and *Cladina subtenuis*.

**Environment:** This association is known from shallow soils over sedimentary and metasedimentary rock strata on exposed ridges and southwest-facing slopes above 2000 feet in the Southern Blue Ridge and upper Piedmont of North Carolina and Tennessee.

**Vegetation:** This xeric forest community is dominated by a mixture of *Tsuga caroliniana* and any or all of the following pine species: *Pinus rigida*, *Pinus virginiana*, and/or *Pinus pungens*. Additional canopy species may include *Quercus prinus*, *Quercus rubra*, and *Carya glabra*. The structure of the canopy varies from closed to open depending on disturbance history and environment. The patchy to open shrub layer of Tennessee occurrences is characterized by *Buckleya distichophylla* and *Rhododendron minus* in the upper shrub layer, and *Vaccinium pallidum* and *Gaultheria procumbens* in the lower shrub layer. The patchy to open herbaceous layer is characterized by *Schizachyrium scoparium*. As much as 25% of the ground cover may contain lichens, including *Cladina rangiferina* and *Cladina subtenuis*.

**Dynamics:** See Summary

#### Similar Associations:

- *Tsuga caroliniana* / *Kalmia latifolia* - *Rhododendron catawbiense* Forest (CEGL007139)

#### Synonymy:

- IA6g. Carolina Hemlock Bluff Forest (Allard 1990) B. in part

**Comments:** This association is currently recognized as distinct from *Tsuga caroliniana* / *Kalmia latifolia* - *Rhododendron catawbiense* Forest (CEGL007139), due to the presence of *Pinus* species, which may be related to landform and exposure or past fire history or both. The long-term impact of hemlock woolly adelgid on *Tsuga caroliniana* needs systematic study. The role of fires in the ecology of *Tsuga caroliniana* communities is also unclear, since evidence of stand expansion following both fires and periods of fire exclusion have been noted (Schafale and Weakley 1990).

### CONSERVATION RANKING & RARE SPECIES

**GRank:** G2 (97-12-31): *Tsuga caroliniana* communities, in general, have a restricted range, occurring only in the southern Blue Ridge and upper Piedmont and are probably endemic to North Carolina and Tennessee. Occurrences are typically small and restricted to rocky, bluff habitats. All occurrences are threatened by fire suppression and the Hemlock Woolly Adelgid (*Adelges tsugae*), an exotic pest which causes tree decline and ultimately death in *Tsuga canadensis* and *Tsuga caroliniana*.

**High-ranked species:** BUCKLEYA DISTICHOPHYLLA (G2), TSUGA CAROLINIANA (G3)

### ELEMENT DISTRIBUTION

**Range:** This association is known to occur in the Southern Blue Ridge of North Carolina and Tennessee. It may also range into Virginia, but its presence there is not currently verified.

**States:** NC TN

#### Crosswalk to State Classifications:

- NC: Carolina Hemlock Bluff, in part (NC 1990)

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

**USFS Ecoregions:** 231Aa:CCC, M221Db:CCP, M221Dc:CCC, M221Dd:CCC

**Federal Lands:** USFS (Cherokee, Nantahala, Pisgah)

### ELEMENT SOURCES

**References:** Allard 1990, NatureServe Ecology - Southeast U.S. unpubl. data, Schafale and Weakley 1990

**SOUTHERN BLUE RIDGE ESCARPMENT SHORTLEAF PINE - OAK FOREST****ELEMENT IDENTIFIERS**

**NVCS association:** *Pinus echinata* - *Quercus* (*prinus*, *falcata*) / *Oxydendrum arboreum* / *Vaccinium pallidum* Forest

**Database Code:** CEG007493

**Formation:** Mixed needle-leaved evergreen - cold-deciduous forest

**Alliance:** PINUS ECHINATA - QUERCUS (COCCINEA, PRINUS) FOREST ALLIANCE (I.C.3.N.a.15)

**ELEMENT CONCEPT**

**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 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 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. Canopies are codominated by *Pinus echinata* and combinations of dry-site oaks that may include *Quercus falcata*, *Quercus coccinea*, *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*, *Dichantherium* spp., and *Galax urceolata*.

**Environment:** See Summary

**Vegetation:** See Summary

**Dynamics:** See Summary

**Similar Associations:**

- *Pinus echinata* - *Quercus alba* / *Vaccinium pallidum* / *Hexastylis arifolia* - *Chimaphila maculata* Forest (CEGL008427)
- *Pinus echinata* - *Quercus stellata* - *Quercus prinus* - *Carya glabra* / (*Danthonia spicata*, *Piptochaetium avenaceum*) Forest (CEGL007500)-a more open, grassy variant.
- *Pinus echinata* - *Quercus prinus* / *Rhododendron minus* / *Vaccinium pallidum* Forest (CEGL007496)

**Synonymy:**

- IA7a. Xeric Shortleaf Pine - Oak Forest (Allard 1990) B. in part
- Southern Mountain Pine-Oak Forest. [common name]

**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 prinus*, *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 prinus* / *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.

**CONSERVATION RANKING & RARE SPECIES**

**GRank:** G3G4 (00-01-12): 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.

**High-ranked species:** No information



**ELEMENT DISTRIBUTION**

**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.

**States:** GA KY NC SC TN?

**Crosswalk to State Classifications:**

- KY: Appalachian Pine-Oak Forest, in part (KY 1991)
- NC: Dry Oak-Hickory Forest, in part (NC 1990)

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

**USFS Ecoregions:** 231Ag:CCC, 231Dc:CCC, M221Cd:CCC, M221Dc:CCC, M221Dd:CCC

**Federal Lands:** USFS (Chattahoochee, Cherokee?, Daniel Boone, Nantahala, Sumter)

**ELEMENT SOURCES**

**References:** Allard 1990, Evans 1991, NatureServe Ecology - Southeast U.S. unpubl. data

**APPALACHIAN SHORTLEAF PINE - MESIC OAK FOREST****ELEMENT IDENTIFIERS**

**NVCS association:** *Pinus echinata* - *Quercus alba* / *Vaccinium pallidum* / *Hexastylis arifolia* - *Chimaphila maculata* Forest

**Database Code:** CEGL008427

**Formation:** Mixed needle-leaved evergreen - cold-deciduous forest

**Alliance:** PINUS ECHINATA - QUERCUS (ALBA, FALCATA, STELLATA, VELUTINA) FOREST ALLIANCE (I.C.3.N.a.14)

**ELEMENT CONCEPT**

**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 Piedmont of the southeastern United States, ranging north and west through the Southern Ridge and Valley, Cumberland Plateau, low Southern Blue Ridge, upper Piedmont, perhaps extending into the Interior Low Plateau of Kentucky and Tennessee. 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 by other *Quercus* spp. (*Quercus velutina*, *Quercus coccinea*, *Quercus falcata*, *Quercus rubra*). Xerophytic *Quercus* spp. such as *Quercus prinus*, *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.

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

**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 prinus*, *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. A dense forest from the Talladega National Forest, Talladega Ranger District, included here, is dominated by *Quercus coccinea*, *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.

**Dynamics:** See Summary

**Similar Associations:**

- *Pinus echinata* - *Quercus* (*pinus*, *falcata*) / *Oxydendrum arboreum* / *Vaccinium pallidum* Forest (CEGL007493)
- *Pinus echinata* - *Quercus stellata* - *Quercus prinus* - *Carya glabra* / (*Danthonia spicata*, *Piptochaetium avenaceum*) Forest (CEGL007500)
- *Quercus falcata* - *Quercus alba* - *Carya alba* / *Oxydendrum arboreum* / *Vaccinium stamineum* Forest (CEGL007244)--a related, primarily deciduous type.
- *Quercus alba* - *Quercus falcata* / *Vaccinium* (*arboreum*, *hirsutum*, *pallidum*) Forest (CEGL008567)--a related, primarily deciduous type of the Ridge and Valley and Southern Blue Ridge.

**Synonymy:** No information

**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* (*pinus*, *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.

**CONSERVATION RANKING & RARE SPECIES**

**GRank:** G3G4 (00-06-12):

**High-ranked species:** No information

**ELEMENT DISTRIBUTION**

**Range:** This community occurs in the Piedmont of the southeastern United States, ranging north and west through the Southern Ridge and Valley, Cumberland Plateau, and low Southern Blue Ridge, perhaps extending into the Interior Low Plateau of Kentucky and Tennessee.

**States:** AL GA KY NC SC TN VA?

**Crosswalk to State Classifications:**

- VA?: No equivalent (VA 2001)

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

**USFS Ecoregions:** 221H:PP, 221I:PP, 221J:PP, 222E:PP, 231Ab:CCC, 231C:CP, 231Db:CCC, 231Dc:CCC, M221C:CP, M221Dc:CCC, M221Dd:CCC

**Federal Lands:** USFS (Chattahoochee, Cherokee, Daniel Boone, Sumter, Talladega)

**ELEMENT SOURCES**

**References:** NatureServe Ecology - Southeast U.S. unpubl. data

**SHORTLEAF PINE / LITTLE BLUESTEM APPALACHIAN WOODLAND****ELEMENT IDENTIFIERS**

**NVCS association:** *Pinus echinata* / *Schizachyrium scoparium* Appalachian Woodland

**Database Code:** CEGL003560

**Formation:** Rounded-crowned temperate or subpolar needle-leaved evergreen woodland

**Alliance:** PINUS ECHINATA WOODLAND ALLIANCE (II.A.4.N.a.17)

**ELEMENT CONCEPT**

**Summary:** These fire-maintained, shortleaf pine woodlands occurred historically in the Appalachian regions of Alabama, north through Georgia, Tennessee, Kentucky, and possibly Virginia, on dry ridges and slopes or rock outcrops. Today, restoration efforts are underway in the Daniel Boone National Forest, Kentucky, the Chattahoochee National Forest, Georgia, and in the 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 was historically habitat for montane populations of Red-cockaded Woodpecker (*Picoides borealis*). More information is needed to characterize and distinguish this community.

**Environment:** See Summary

**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 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*.

**Dynamics:** See Summary

**Similar Associations:**

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

**Synonymy:** No information

**Comments:** This community occurs outside the range of *Pinus palustris*. In the 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 Cumberland 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.

**CONSERVATION RANKING & RARE SPECIES**

**GRank:** G2 (99-02-15): 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.

**High-ranked species:** No information

**ELEMENT DISTRIBUTION**

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

**States:** AL? GA KY TN? VA?

**Crosswalk to State Classifications:**

- VA?: No equivalent (VA 2001)

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

**USFS Ecoregions:** 221:C, 222Ab:C??, 222Af:C??, 222E:CC, 231Ad:CCC, M221Dc:CCC, M221Dd:CCC

**Federal Lands:** USFS (Chattahoochee, Cherokee)

**ELEMENT SOURCES**

**References:** Campbell pers. comm., Dellinger pers. comm., NatureServe Ecology - Southeast U.S. unpubl. data, Wooster pers. comm.

## APPALACHIAN SHORTLEAF PINE FOREST

## ELEMENT IDENTIFIERS

**NVCS association:** *Pinus echinata* / *Vaccinium* (*pallidum*, *stamineum*) - *Kalmia latifolia* Forest

**Database Code:** CEGLO07078

**Formation:** Rounded-crowned temperate or subpolar needle-leaved evergreen forest

**Alliance:** PINUS ECHINATA FOREST ALLIANCE (I.A.8.N.b.5)

## ELEMENT CONCEPT

**Summary:** 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*. These forests occur in the lower elevations (below 2400 feet) of the southern Appalachian Mountains on ridges and upper slopes, typically with southern to western exposures.

**Environment:** These forests occur in the lower elevations (below 2400 feet) of the southern Appalachian Mountains on ridges and upper slopes, typically with southern to western exposures.

**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*.

**Dynamics:** See Summary

**Similar Associations:** No information

**Synonymy:**

- IA6a. Dry Shortleaf Pine - Oak - Hickory Forest (Allard 1990) B. in part
- Shortleaf pine/heath forest of dry, acidic steep slopes (CAP 1998)

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

## CONSERVATION RANKING &amp; RARE SPECIES

**GRank:** G4? (97-12-01):

**High-ranked species:** CLEISTES BIFARIA (G3G4)

## ELEMENT DISTRIBUTION

**Range:** These forests occur in the lower elevations of the southern Appalachian Mountains.

**States:** GA KY MD NC SC TN

**Crosswalk to State Classifications:**

- KY: Appalachian Pine-Oak Forest, in part (KY 1991)
- MD: *Pinus echinata* / *Vaccinium* (*pallidum*, *stamineum*) - *Kalmia latifolia* Forest
- NC: Dry Oak-Hickory Forest, in part; Pine--Oak/Heath, in part (NC 1990)
- SC: Pine--Oak/Heath, in part (SC 1986)
- TN: Shortleaf Pine, BR (TN 1994)

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

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

**Federal Lands:** NPS (Great Smoky Mountains?); USFS (Chattahoochee, Cherokee?, Nantahala, Sumter)

## ELEMENT SOURCES

**References:** Allard 1990, CAP 1998, Evans 1991, NatureServe Ecology - Southeast U.S. unpubl. data, Nelson 1986, Pyne 1994, Schafale and Weakley 1990

**APPALACHIAN LOW ELEVATION MIXED PINE / LITTLE BLUESTEM FOREST****ELEMENT IDENTIFIERS**

**NVCS association:** *Pinus virginiana* - (*Pinus rigida*, *Pinus pungens*) / *Schizachyrium scoparium* Forest

**Database Code:** CEGLO08500

**Formation:** Rounded-crowned temperate or subpolar needle-leaved evergreen forest

**Alliance:** PINUS VIRGINIANA FOREST ALLIANCE (I.A.8.N.b.17)

**ELEMENT CONCEPT**

**Summary:** This community includes *Pinus virginiana*-dominated vegetation of low-elevation ridges and steep slopes, occurring 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. 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 an admixture of other species, including *Pinus pungens*, *Pinus echinata*, *Pinus rigida*, *Quercus coccinea*, *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, 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 *Tephrosia virginiana*, *Coreopsis major*, *Solidago odora*, *Sorghastrum nutans*, *Solidago speciosa*, *Silphium compositum*, *Dichantherium commutatum*, and *Eurybia surculosa*.

**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 / Cumberlands 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:** The canopy varies from open to closed and may be solely dominated by *Pinus virginiana*, or an admixture of other species, including *Pinus pungens*, *Pinus echinata*, *Pinus rigida*, *Quercus coccinea*, *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 *Tephrosia virginiana*, *Coreopsis major*, *Solidago odora*, *Sorghastrum nutans*, *Solidago speciosa*, *Silphium compositum*, *Dichantherium commutatum*, and *Eurybia surculosa*.

**Dynamics:** This open structure of this community is a result of steep slopes, xeric conditions and fire.

**Similar Associations:**

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

**Synonymy:** No information

**Comments:** This community is described from the Chattahoochee and Cherokee national forests. It is differentiated from the similar community, *Pinus virginiana* - *Pinus* (*rigida*, *echinata*) - (*Quercus prinus*) / *Vaccinium pallidum* Forest (CEGL007119), by the more open canopy and understory, and the denser, grass-dominated herbaceous layer.

**CONSERVATION RANKING & RARE SPECIES**

**GRank:** G? (01-06-29):

**High-ranked species:** No information

**ELEMENT DISTRIBUTION**

**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.

**States:** AL? GA NC SC? TN

**Crosswalk to State Classifications:**

- GA: Xeric Pine Forest, Pine - Heath Ridge Forest, in part (GA 1990)
- NC: Pine--Oak/Heath, in part (NC 1990)
- SC?: Pine--Oak/Heath, in part (SC 1986)
- TN: Virginia Pine, BR, R&V, CUPL; Virginia Pine - Mixed Oaks, HR (TN 1994)

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

**USFS Ecoregions:** 231Ad:CCC, M221Dd:CCC  
**Federal Lands:** USFS (Chattahoochee, Cherokee)

**ELEMENT SOURCES**

**References:** Ambrose 1990a, NatureServe Ecology - Southeast U.S. unpubl. data, Nelson 1986, Pyne 1994, Schafale and Weakley 1990



**APPALACHIAN LOW ELEVATION MIXED PINE / HILLSIDE BLUEBERRY FOREST****ELEMENT IDENTIFIERS**

**NVCS association:** *Pinus virginiana* - *Pinus* (*rigida*, *echinata*) - (*Quercus prinus*) / *Vaccinium pallidum* Forest

**Database Code:** CEGLO07119

**Formation:** Rounded-crowned temperate or subpolar needle-leaved evergreen forest

**Alliance:** PINUS VIRGINIANA FOREST ALLIANCE (I.A.8.N.b.17)

**ELEMENT CONCEPT**

**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 central Pennsylvania, south and west to northern Georgia and northern Alabama. This community occurs on narrow ridges, steep slopes, and other exposed topographic positions, 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 canopy associates, as well as dry site *Quercus* species (e.g., *Quercus prinus*, *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*, 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*, *Dichantheium commutatum*, *Epigaea repens*, *Euphorbia corollata*, *Galax urceolata*, *Hypoxis hirsuta*, *Iris verna*, *Pityopsis graminifolia* var. *latifolia*, *Pteridium aquilinum* var. *latiusculum*, and *Schizachyrium scoparium*.

**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. They are 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 610 meters (2000 feet) elevation, over soils classed as Inceptisols, typically Lithic Dystrochrepts originating from sandstone, shale and other noncalcareous parent material. 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 glade-like situations on steep slopes with thin soils.

**Vegetation:** This community is a needle-leaved evergreen forest with a somewhat open to closed canopy. A deciduous subcanopy may be present, especially in areas where fire has been excluded. The shrub layers can be sparse 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. Small stems of *Quercus prinus*, *Quercus coccinea*, *Acer rubrum*, *Nyssa sylvatica*, and *Oxydendrum arboreum* are common in the subcanopy and sapling strata, particularly in areas where fire has been excluded. 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*, and *Kalmia latifolia*. Other typical shrubs can include *Gaylussacia ursina*, *Gaylussacia baccata*, *Sassafras albidum*, and *Vaccinium hirsutum* (southwestern North Carolina and southeastern Tennessee only). *Smilax glauca* and *Smilax rotundifolia* can be common vines. Characteristic herbaceous species from the southern Blue Ridge and southern Ridge and Valley include *Baptisia tinctoria*, *Chimaphila maculata*, *Dichantheium commutatum*, *Epigaea repens*, *Euphorbia corollata*, *Galax urceolata*, *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*, *Dichantheium 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.

**Dynamics:** This xeric, evergreen forest community will be maintained on sites where 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. Examples affected by southern pine beetle in the Great Smoky Mountains can have up to 80-90% standing dead pine. Throughout most of its range, this community occurs as linear features along ridge tops and may be adjacent to or grade into xeric forests dominated by *Quercus coccinea* or *Quercus prinus* 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 prinus* or *Quercus prinus* - *Quercus alba* forest (e.g., *Quercus prinus* / *Smilax* spp. Forest (CEGL005022) or *Quercus prinus* - *Quercus* (*alba*, *coccinea*, *velutina*) / *Viburnum acerifolium* - (*Kalmia latifolia*) Forest (CEGL005023)), but in more edaphically extreme circumstances.

**Similar Associations:**

- *Pinus virginiana* Successional Forest (CEGL002591)
- *Pinus virginiana* / *Quercus marilandica* Serpentine Forest (CEGL006266)
- *Quercus* (*prinus*, *coccinea*) / *Kalmia latifolia* / (*Galax urceolata*, *Gaultheria procumbens*) Forest (CEGL006271)
- *Pinus virginiana* - *Quercus* (*coccinea*, *prinus*) Forest (CEGL005040)
- *Pinus pungens* - *Pinus rigida* - (*Quercus prinus*) / *Kalmia latifolia* - *Vaccinium pallidum* Woodland (CEGL007097)
- *Pinus virginiana* - *Quercus falcata* - *Carya pallida* Forest (CEGL006354)

**Synonymy:**

- IA7c. Xeric Virginia Pine Ridge Forest (Allard 1990) B
- Virginia Pine: 79 (Eyre 1980) B
- Virginia Pine - Oak: 78 (Eyre 1980) B
- Virginia pine forest (CAP 1998)
- Oligotrophic Forest (Rawinski 1992) B

**Comments:** Some vegetation formerly placed (at least conceptually) in the *Pinus virginiana* - *Quercus* (*coccinea*, *prinus*) Forest Alliance (A.408) and its provisional association *Pinus virginiana* - *Quercus* (*coccinea*, *prinus*) Forest (CEGL005040), has been transferred here, with this association (CEGL007119) becoming more geographically inclusive. 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. ^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* Successional Forest (CEGL002591). Appalachian xeric oak forests with similar floristics, but with a mainly deciduous canopy are classed in *Quercus* (*prinus*, *coccinea*) / *Kalmia latifolia* / (*Galax urceolata*, *Gaultheria procumbens*) Forest (CEGL006271). Appalachian shale forests and woodlands with *Pinus virginiana* occur on steep, shaley slopes and have a stunted canopies and sparse herb and shrub strata, characterized by species adapted to shaley substrates. These shale communities are classed in *Pinus virginiana* - *Quercus* (*coccinea*, *prinus*) Forest Alliance (A.408) and *Pinus* (*rigida*, *pungens*, *virginiana*) - *Quercus prinus* Woodland Alliance (A.677).

**CONSERVATION RANKING & RARE SPECIES**

**GRank:** G4? (01-02-11): This xeric evergreen forest community will be maintained on sites where 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. Examples affected by southern pine beetle in the Great Smoky Mountains can have up to 80-90% standing dead pine.

**High-ranked species:** BUCKLEYA DISTICHOPHYLLA (G2), CLEISTES BIFARIA (G3G4), THERMOPSIS VILLOSA (G3?), PENSTEMON DEAMII (G1), CALAMAGROSTIS PORTERI SSP INSPERATA (G4T3)

**ELEMENT DISTRIBUTION**

**Range:** This community occurs primarily in the Appalachian region of the United States, ranging from central Pennsylvania, 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 reported from the states of Georgia, North Carolina, South Carolina, Tennessee, Kentucky, Pennsylvania, Indiana, Ohio, and is probably in Maryland, Virginia, and West Virginia.

**States:** AL GA IN KY MD? NC OH? PA SC TN VA? WV

**Crosswalk to State Classifications:**

- GA: Xeric Pine Forest, Pine - Heath Ridge Forest, in part (GA 1990)
- IN: dry upland forest
- KY: Virginia Pine Forest, in part; Appalachian Pine-Oak Forest, in part (KY 1991)
- NC: Pine--Oak/Heath, in part (NC 1990)
- OH?: appalachian oak forest
- PA: Virginia pine - mixed hardwood forest
- SC: Pine--Oak/Heath, in part (SC 1986)
- TN: Virginia Pine, BR, R&V, CUPL; Virginia Pine - Mixed Oaks, HR (TN 1994)
- VA?: No equivalent (VA 2001)
- WV: *Pinus virginiana* - *Quercus prinus* - *Nyssa sylvatica*

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

## Association Descriptions

**USFS Ecoregions:** 221Ec:CCP, 221Ed:CCP, 221Ef:CCP, 221Eg:CCC, 221Ha:CCC, 221Hb:CCC, 221Hc:CCP, 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, 231Cd:CCC, 231Da:CCC, 231Dc:CCC, M221Aa:CCP, M221Ab:CCC, M221Ac:CCC, M221Bd:CCP, M221Be:CCP, M221Cd:CCC, M221Dc:CCC, M221Dd:CCC

**Federal Lands:** NPS (Chickamauga-Chattanooga, Great Smoky Mountains, Kennesaw Mountain, Kings Mountain, Mammoth Cave); TVA (Land Between the Lakes?); USFS (Bankhead, Chattahoochee, Cherokee, Daniel Boone, Nantahala, Pisgah, Sumter, Talladega)

### ELEMENT SOURCES

**References:** Allard 1990, Ambrose 1990a, Barden 1977, Burns and Honkala 1990a, CAP 1998, Cooper 1963, Core 1966, Evans 1991, Eyre 1980, Gettman 1974, Homoya pers. comm., Malter 1977, NatureServe Ecology - Southeast U.S. unpubl. data, Nelson 1986, Patterson et al. 1999, Pyne 1994, Racine 1966, Rawinski 1992, Schafale and Weakley 1990, Walton et al. 1997, Whittaker 1956

**APPALACHIAN WHITE PINE - XERIC OAK FOREST**

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**ELEMENT IDENTIFIERS**

**NVCS association:** *Pinus strobus* - *Quercus* (*coccinea*, *prinus*) / (*Gaylussacia ursina*, *Vaccinium stamineum*) Forest

**Database Code:** CEG007519

**Formation:** Mixed needle-leaved evergreen - cold-deciduous forest

**Alliance:** PINUS STROBUS - QUERCUS (COCCINEA, PRINUS) FOREST ALLIANCE (I.C.3.N.a.22)

**ELEMENT CONCEPT**

**Summary:** This association represents mixed forests of the southern Appalachian Mountains with *Pinus strobus*, *Quercus prinus*, 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*, *Leucothoe recurva*, *Kalmia latifolia*, *Castanea dentata*, or *Acer rubrum* var. *rubrum*. On rocky sites, *Deschampsia flexuosa* may be common. This community occurs on exposed upper slopes and ridgetops at elevations below 920 m (3000 feet) in the southern Appalachian Mountains.

**Environment:** This community occurs on exposed upper slopes and ridgetops at elevations below 920 m (3000 feet) in the southern Appalachian Mountains.

**Vegetation:** Stands of this forest association typically contain *Pinus strobus* (contributing 25-75% of the canopy coverage) and *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*, *Leucothoe recurva*, *Kalmia latifolia*, *Castanea dentata*, or *Acer rubrum* var. *rubrum*. On rocky sites, *Deschampsia flexuosa* may be common.

**Dynamics:** See Summary

**Similar Associations:** No information

**Synonymy:**

- IA6f. Dry White Pine Ridge Forest (Allard 1990) B. in part
- *Pinus strobus* - *Quercus coccinea* Forest (Patterson 1994)

**Comments:** None

**CONSERVATION RANKING & RARE SPECIES**

**GRank:** G3 (00-01-04): This community has a restricted range and is uncommon. It is not threatened or particularly vulnerable.

**High-ranked species:** MONOTROPSIS ODORATA (G3), THERMOPSIS FRAXINIFOLIA (G3?), THERMOPSIS MOLLIS (G3G4)

**ELEMENT DISTRIBUTION**

**Range:** This community is known from the escarpment region of the Southern Blue Ridge and may extend into Virginia.

**States:** GA NC SC TN VA?

**Crosswalk to State Classifications:**

- GA: Hardwood - White Pine Forest, in part (GA 1990)
- NC: White Pine Forest, in part (NC 1990)
- TN: White Pine, BR; White Pine - Hardwoods, BR (TN 1994)
- VA?: No equivalent (VA 2001)

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

**USFS Ecoregions:** 221Hb:CCC, 221He:CCC, 222Eo:CCC, M221Db:CCP, M221Dc:CCC, M221Dd:CCC

**Federal Lands:** NPS (Great Smoky Mountains); USFS (Chattahoochee, Cherokee?, Nantahala, Pisgah, Sumter)

**ELEMENT SOURCES**

**References:** Allard 1990, Ambrose 1990a, Patterson 1994, Pyne 1994, Schafale and Weakley 1990

**APPALACHIAN WHITE PINE - MESIC OAK FOREST**

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**ELEMENT IDENTIFIERS**

**NVCS association:** *Pinus strobus* - *Quercus alba* - (*Carya alba*) / *Gaylussacia ursina* Forest

**Database Code:** CEG007517

**Formation:** Mixed needle-leaved evergreen - cold-deciduous forest

**Alliance:** PINUS STROBUS - QUERCUS (ALBA, RUBRA, VELUTINA) FOREST ALLIANCE (I.C.3.N.a.21)

**ELEMENT CONCEPT**

**Summary:** This association covers mesic pine-oak-hickory in the Southern Blue Ridge Escarpment and in the Piedmont transition, found below 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*, *Carya alba*, and *Acer rubrum*. Other canopy species may include *Liriodendron tulipifera*, *Tsuga canadensis*, *Quercus rubra*, *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*, *Pyralaria 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*, *Eupatorium purpureum*, *Galium circaezans*, *Galium latifolium*, *Galax urceolata*, *Hexastylis shuttleworthii*, *Medeola virginiana*, *Mitchella repens*, and *Houstonia purpurea*.

**Environment:** Stands of this association are found below 2900 feet elevation, on protected ridges, mid to upper slopes, and in disturbed bottoms in the Southern Blue Ridge Escarpment and in the Piedmont transition region.

**Vegetation:** Canopies are dominated by variable mixtures of *Pinus strobus*, *Quercus alba*, *Carya alba*, and *Acer rubrum*. Other canopy species may include *Liriodendron tulipifera*, *Tsuga canadensis*, *Quercus rubra*, *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*, *Pyralaria 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*, *Eupatorium purpureum*, *Galium circaezans*, *Galium latifolium*, *Galax urceolata*, *Hexastylis shuttleworthii*, *Medeola virginiana*, *Mitchella repens*, and *Houstonia purpurea*.

**Dynamics:** See Summary

**Similar Associations:** No information

**Synonymy:**

- IA6f. Dry White Pine Ridge Forest (Allard 1990) B. in part

**Comments:** None

**CONSERVATION RANKING & RARE SPECIES**

**GRank:** G2G3 (00-01-04): This community is geographically restricted and uncommon within its range.

**High-ranked species:** AGERATINA ALTISSIMA VAR ROANENSIS (G5T3T4)

**ELEMENT DISTRIBUTION**

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

**States:** GA NC SC TN?

**Crosswalk to State Classifications:**

- GA: Hardwood - White Pine Forest, in part (GA 1990)
- NC: Dry-Mesic Oak-Hickory Forest, in part (NC 1990)

**TNC Ecoregions:** 51:C

**USFS Ecoregions:** M221Dc:CCC, M221Dd:CCC

**Federal Lands:** NPS (Great Smoky Mountains?); USFS (Chattahoochee, Cherokee?, Nantahala, Pisgah, Sumter)

**ELEMENT SOURCES**

**References:** Allard 1990, Ambrose 1990a, NatureServe Ecology - Southeast U.S. unpubl. data, Schafale and Weakley 1990

**BLUE RIDGE TABLE MOUNTAIN PINE - PITCH PINE WOODLAND (TYPIC TYPE)****ELEMENT IDENTIFIERS**

**NVCS association:** *Pinus pungens* - *Pinus rigida* - (*Quercus prinus*) / *Kalmia latifolia* - *Vaccinium pallidum* Woodland

**Database Code:** CEGL007097

**Formation:** Rounded-crowned temperate or subpolar needle-leaved evergreen woodland

**Alliance:** PINUS PUNGENS - (PINUS RIGIDA) WOODLAND ALLIANCE (II.A.4.N.a.23)

**ELEMENT CONCEPT**

**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 2000 feet elevation in the Southern Blue Ridge. This type is also found in limited areas of the inner Piedmont. This woodland occurs across a wide elevational range (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 prinus*, *Quercus coccinea*, *Quercus stellata*, *Nyssa sylvatica*, *Acer rubrum*, and *Oxydendrum arboreum*. *Pinus virginiana* 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 *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*, 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 *Quercus prinus* 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.

**Environment:** This association is typically found on sharp ridges mostly above 2000 feet elevation in the Southern Blue Ridge. This woodland occurs across a wide elevation range (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 (Barden 1977, Zobel 1969).

**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 prinus*, *Quercus coccinea*, *Quercus stellata* (in lower elevation occurrences), *Nyssa sylvatica*, *Acer rubrum*, and *Oxydendrum arboreum*. *Pinus virginiana* 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 *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.

**Dynamics:** 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 prinus* and *Quercus coccinea*, except on the most extreme sites, where this vegetation is self-perpetuating.

**Similar Associations:**

- *Pinus* (*pungens*, *rigida*) / *Quercus ilicifolia* / *Gaylussacia baccata* Woodland (CEGL004996)

**Synonymy:**

- IA7b. Xeric Pitch Pine/Table Mountain Pine Ridge Forest (Allard 1990) B. in part
- Table Mountain Pine type (Golden 1974)
- Xeric Pine Forest (McLeod 1988)

## Association Descriptions

**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 ilicifolia / Gaylussacia baccata* Woodland (CEGL004996).]

### CONSERVATION RANKING & RARE SPECIES

**GRank:** G3 (98-04-30): 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.

**High-ranked species:** FOTHERGILLA MAJOR (G3), ROBINIA HISPIDA VAR FERTILIS (G4TUQ), ROBINIA HISPIDA VAR ROSEA (G4T3?), ROBINIA VISCOSA VAR VISCOSA (G3T3), BUCKLEYA DISTICHOPHYLLA (G2)

### ELEMENT DISTRIBUTION

**Range:** This community ranges throughout the Southern Blue Ridge, from southwestern Virginia, south through western North Carolina and eastern Tennessee, into northeastern Georgia and northwestern South Carolina.

**States:** GA NC SC TN VA?

#### Crosswalk to State Classifications:

- NC: Pine--Oak/Heath, in part (NC 1990)
- SC: Pine--Oak/Heath, in part (SC 1986)
- TN: *Pinus pungens*/*Pinus rigida* (TN 1994)
- VA?: No equivalent (VA 2001)

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

**USFS Ecoregions:** M221Aa:CCP, M221Ab:CCP, M221Ac:CCC, M221Da:CCC, M221Dc:CCC, M221Dd:CCC

**Federal Lands:** NPS (Carl Sandburg Home, Great Smoky Mountains); USFS (Chattahoochee, Cherokee, Nantahala, Pisgah, Sumter)

### ELEMENT SOURCES

**References:** Allard 1990, Barden 1977, Golden 1974, Golden 1981, Hedlin et al. 1981, McLeod 1988, NatureServe Ecology - Southeast U.S. unpubl. data, Nelson 1986, Newell and Peet 1995, Pyne 1994, Racine 1966, Schafale and Weakley 1990, Turrill and Buckner 1995, Wharton 1978, Whittaker 1956, Williams 1991, Williams and Johnson 1990, Williams and Johnson 1992, Williams et al. 1990a, Zobel 1969

**FRASER FIR FOREST (EVERGREEN SHRUB TYPE)****ELEMENT IDENTIFIERS**

**NVCS association:** *Abies fraseri* / (*Rhododendron catawbiense*, *Rhododendron carolinianum*) Forest

**Database Code:** CEGL006308

**Formation:** Conical-crowned temperate or subpolar needle-leaved evergreen forest

**Alliance:** ABIES FRASERI - PICEA RUBENS FOREST ALLIANCE (I.A.8.N.c.1)

**ELEMENT CONCEPT**

**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.

**Environment:** These forests occur on rocky spurs, steep ridges, and south-facing slopes above 6000 feet (1830 m) 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:** 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*.

**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.

**Similar Associations:**

- *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* / *Oxalis montana* - *Dryopteris campyloptera* / *Hylocomium splendens* Forest (CEGL007131)--*Abies fraseri* can codominate with *Picea rubens*.

**Synonymy:**

- IA4b. Fraser Fir Forest (Allard 1990) B. in part
- Red Spruce - Fraser Fir: 34 (Eyre 1980) B

**Comments:** None

**CONSERVATION RANKING & RARE SPECIES**

**GRank:** G1 (00-01-04): 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 the 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.

**High-ranked species:** GLAUCOMYS SABRINUS COLORATUS (G5T1), MICROHEXURA MONTIVAGA (G1),  
AGERATINA ALTISSIMA VAR ROANENSIS (G5T3T4), ABIES FRASERI (G2), SOLIDAGO GLOMERATA (G3),



## Association Descriptions

STREPTOPUS LANCEOLATUS VAR ROSEUS (G5T3?), CARDAMINE CLEMATITIS (G2G3), GLYCERIA NUBIGENA (G2), RHODODENDRON VASEYI (G3), STACHYS CLINGMANII (G2Q), BAZZANIA NUDICAULIS (G2G3), BRACHYDONTIUM TRICHODES (G2G4), LEPTODONTIUM EXCELSUM (G2), PLAGIOCHILA CORNICULATA (G4?), SPHENOLOBOPSIS PEARSONII (G2?)

### ELEMENT DISTRIBUTION

**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 Mountains, Plott Balsams, Grandfather Mountain, and Mount Rogers (Ramseur 1960).

**States:** NC TN

### Crosswalk to State Classifications:

- NC: Fraser Fir Forest, Evergreen Shrub Type (NC 1990)
- TN: Fraser Fir Forest, Evergreen Shrub Type (TN 1994)

**TNC Ecoregions:** 51:C

**USFS Ecoregions:** M221Dc:CCC, M221Dd:CCC

**Federal Lands:** NPS (Great Smoky Mountains); USFS (Cherokee, Pisgah)

### ELEMENT SOURCES

**References:** Allard 1990, Brown 1941, Bruck 1988, Busing et al. 1988, Crandall 1958, Davis 1930, Eyre 1980, McLeod 1988, NCNHP 1993, Nicholas et al. 1992, Oosting and Billings 1951, Pyne 1994, Ramseur 1960, Schafale and Weakley 1990, White 1984, White and Pickett 1985, White et al. 1993, Whittaker 1956

**FRASER FIR FOREST (DECIDUOUS SHRUB TYPE)****ELEMENT IDENTIFIERS**

**NVCS association:** *Abies fraseri* / *Viburnum lantanoides* / *Dryopteris campyloptera* - *Oxalis montana* / *Hylocomium splendens* Forest

**Database Code:** C EGL006049

**Formation:** Conical-crowned temperate or subpolar needle-leaved evergreen forest

**Alliance:** ABIES FRASERI - PICEA RUBENS FOREST ALLIANCE (I.A.8.N.c.1)

**ELEMENT CONCEPT**

**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* seedlings 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* (= *Sambucus racemosa* var. *pubens*), *Rubus allegheniensis*, *Rubus idaeus* ssp. *strigosus*, *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* var. *roseus* (= *Streptopus 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.

**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:** 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*.

**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.

**Similar Associations:**

- *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* / *Oxalis montana* - *Dryopteris campyloptera* / *Hylocomium splendens* Forest (CEGL007131)--*Abies fraseri* can codominate with *Picea rubens*.

**Synonymy:**

- IA4b. Fraser Fir Forest (Allard 1990) B. in part
- Red Spruce - Fraser Fir: 34 (Eyre 1980) B
- *Abies fraseri* / *Dryopteris campyloptera* - *Oxalis montana* Forest (Fleming and Coulling 2001)

**Comments:** None

**CONSERVATION RANKING & RARE SPECIES**

**GRank:** G1 (94-07-15): 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 the Balsam Woolly Adelgid (*Adelges piceae*). Well-developed, undisturbed examples of this community are extremely rare.

**High-ranked species:** BAZZANIA NUDICAULIS (G2G3), BRACHYDONTIUM TRICHODES (G2G4), LEPTODONTIUM EXCELSUM (G2), SPHENOLOBOPSIS PEARSONII (G2?), MICROHEXURA MONTIVAGA (G1), ABIES FRASERI (G2), AGERATINA ALTISSIMA VAR ROANENSIS (G5T3T4), RUGELIA NUDICAULIS (G3), SOLIDAGO GLOMERATA (G3), STREPTOPUS LANCEOLATUS VAR ROSEUS (G5T3?), CARDAMINE CLEMATITIS (G2G3), GLYCERIA NUBIGENA (G2), RHODODENDRON VASEYI (G3), STACHYS CLINGMANII (G2Q), PLA GIOCHILA CORNICULATA (G4?), GEUM RADIATUM (G1)

**ELEMENT DISTRIBUTION**

**Range:** This community occurs as island-like stands on the highest areas (>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 Mountains, Plott Balsams, Grandfather Mountain, and Mount Rogers (Ramseur 1960).

**States:** NC TN VA

**Crosswalk to State Classifications:**

- NC: Fraser Fir Forest (NC 1990)
- TN: Fraser Fir Forest (TN 1994)
- VA: Fraser Fir - Red Spruce Forest, in part (VA 2001)

**TNC Ecoregions:** 51:C

**USFS Ecoregions:** M221Dc:CCC, M221Dd:CCC

**Federal Lands:** NPS (Great Smoky Mountains); USFS (Cherokee, Jefferson, Pisgah)

**ELEMENT SOURCES**

**References:** Adams and Stephenson 1991, Adams et al. 1985, Allard 1990, Belden et al. 1994, Brown 1941, Bruck 1988, Busing et al. 1988, Crandall 1958, Davis 1930, Dull et al. 1988a, Eyre 1980, Fleming and Coulling 2001, Fleming et al. 2001, McLeod 1988, NCNHP 1993, Nicholas et al. 1992, Oosting and Billings 1951, Pyne 1994, Ramseur 1960, Rheinhardt and Ware 1984, Schafale and Weakley 1990, Stephenson and Adams 1984, White 1984, White and Pickett 1985, White et al. 1993, Whittaker 1956

**RED SPRUCE - FRASER FIR FOREST (EVERGREEN SHRUB TYPE)****ELEMENT IDENTIFIERS**

**NVCS association:** *Picea rubens* - (*Abies fraseri*) / (*Rhododendron catawbiense*, *Rhododendron maximum*) Forest

**Database Code:** C EGL007130

**Formation:** Conical-crowned temperate or subpolar needle-leaved evergreen forest

**Alliance:** ABIES FRASERI - PICEA RUBENS FOREST ALLIANCE (I.A.8.N.c.1)

**ELEMENT CONCEPT**

**Summary:** This community is restricted to the highest mountain systems of the southern Appalachians in eastern Tennessee and western North Carolina. 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*, dominated by *Picea rubens* with or without *Abies fraseri*, 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.

**Environment:** This forest is best developed between 1550-1830 m elevation (5100-6000 feet) 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 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 acid 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:** This association includes forests of the southern Appalachians, within the range of *Abies fraseri*, dominated by *Picea rubens* with or without *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 dominating beneath the shrub stratum.

**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, damage by the Balsam Woolly Adelgid (*Adelges piceae*), and atmospheric pollutants.

**Similar Associations:**

- *Picea rubens* - (*Abies fraseri*) / *Vaccinium erythrocarpum* / *Oxalis montana* - *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).

**Synonymy:**

- IA4a. Red Spruce - Fraser Fir Forest (Allard 1990) B. in part
- Red Spruce - Fraser Fir: 34 (Eyre 1980) B

**Comments:** None

**CONSERVATION RANKING & RARE SPECIES**

**GRank:** G1 (99-02-23): 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 *Adelges piceae*, the exotic Balsam Woolly Adelgid. Well-developed, undisturbed examples of this community are extremely rare.

**High-ranked species:** MICROHEXURA MONTIVAGA (G1), ABIES FRASERI (G2), AGERATINA ALTISSIMA VAR ROANENSIS (G5T3T4), RUGELIA NUDICAULIS (G3), SOLIDAGO GLOMERATA (G3), STREPTOPUS LANCEOLATUS VAR ROSEUS (G5T3?), CARDAMINE CLEMATITIS (G2G3), CAREX RUTHII (G3), GEUM GENICULATUM (G2), GLYCERIA NUBIGENA (G2), PRENANTHES ROANENSIS (G3), STACHYS CLINGMANII

## Association Descriptions

(G2Q), BAZZANIA NUDICAULIS (G2G3), BRACHYDONTIUM TRICHODES (G2G4), GYMNODERMA LINEARE (G2), LEPTODONTIUM EXCELSUM (G2), PLAGIOCHILA CORNICULATA (G4?), SPHENOLOBOPSIS PEARSONII (G2?)

### ELEMENT DISTRIBUTION

**Range:** This community is restricted to the highest mountain systems of the southern Appalachians in eastern Tennessee and western North Carolina.

**States:** NC TN

**Crosswalk to State Classifications:**

- NC: Red Spruce--Fraser Fir Forest (NC 1990)
- TN: Spruce - Fir, BR (TN 1994)

**TNC Ecoregions:** 51:C

**USFS Ecoregions:** M221Dc:CCC, M221Dd:CCC

**Federal Lands:** NPS (Great Smoky Mountains); USFS (Cherokee, Nantahala, Pisgah)

### ELEMENT SOURCES

**References:** Allard 1990, Brown 1941, Bruck 1988, Busing et al. 1988, Cogbill and White 1991, Crandall 1958, Crandall 1960, Davis 1930, Eyre 1980, Korstian 1937, McLeod 1988, NCNHP 1993, Nicholas and Zedaker 1989, Nicholas et al. 1992, Oosting and Billings 1951, Pyne 1994, Ramseur 1960, Rawinski 1992, Schafale and Weakley 1990, Schofield 1960, Stephenson and Adams 1984, Stephenson and Clovis 1983, Wentworth et al. 1988, White 1984, White and Cogbill 1992, White and Pickett 1985, White et al. 1993, Whittaker 1956, Zedaker et al. 1988

**RED SPRUCE - FRASER FIR FOREST (DECIDUOUS SHRUB TYPE)****ELEMENT IDENTIFIERS**

**NVCS association:** *Picea rubens* - (*Abies fraseri*) / *Vaccinium erythrocarpum* / *Oxalis montana* - *Dryopteris campyloptera* / *Hylocomium splendens* Forest

**Database Code:** CEG007131

**Formation:** Conical-crowned temperate or subpolar needle-leaved evergreen forest

**Alliance:** ABIES FRASERI - PICEA RUBENS FOREST ALLIANCE (I.A.8.N.c.1)

**ELEMENT CONCEPT**

**Summary:** This community is restricted to the highest mountain systems of the southern Appalachians in eastern Tennessee, western North Carolina, and southwestern Virginia. It is found on all topographic positions and is best developed between 1680-1990 m elevation (5500-6200 feet). This association includes forests of the southern Appalachians, 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* (= *Aster chlorolepis*), *Rugelia nudicaulis*, *Houstonia serpyllifolia*, *Solidago glomerata*, *Ptilium crista-castrensis*, and *Bazzania trilobata*.

**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 acid 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.

**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*, *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*.

**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, damage by the Balsam Woolly Adelgid (*Adelges piceae*), and atmospheric pollutants.

**Similar Associations:**

- *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).

**Synonymy:**

- *Picea rubens* / *Viburnum lantanoides* - *Vaccinium erythrocarpum* / *Huperzia lucidula* - *Clintonia borealis* Forest (Fleming and Coulling 2001)
- IA4a. Red Spruce - Fraser Fir Forest (Allard 1990) B. in part
- Red Spruce - Fraser Fir: 34 (Eyre 1980) B
- Spruce Community (Rheinhardt and Ware 1984)

**Comments:** An occurrence on the edge of the Ridge and Valley province in southwestern Virginia occurs over sandstone on Clinch Mountain.

**CONSERVATION RANKING & RARE SPECIES**

**GRank:** G2 (98-04-30): This community is restricted to the highest mountain systems of the southern Appalachians in eastern Tennessee, western North Carolina, and southwestern 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 *Adelges piceae*, the exotic Balsam Woolly Adelgid. Well-developed, undisturbed examples of this community are extremely rare.

**High-ranked species:** GLAUCOMYS SABRINUS FUSCUS (G5T2), MICROHEXURA MONTIVAGA (G1), AGERATINA ALTISSIMA VAR ROANENSIS (G5T3T4), ABIES FRASERI (G2), GEUM GENICULATUM (G2), GLYCERIA NUBIGENA (G2), RUGELIA NUDICAULIS (G3), SOLIDAGO GLOMERATA (G3), STREPTOPUS LANCEOLATUS VAR ROSEUS (G5T3?), CARDAMINE CLEMATITIS (G2G3), CAREX RUTHII (G3), PRENANTHES ROANENSIS (G3), STACHYS CLINGMANII (G2Q), BAZZANIA NUDICAULIS (G2G3), BRACHYDONTIUM TRICHODES (G2G4), GYMNODERMA LINEARE (G2), LEPTODONTIUM EXCELSUM (G2), PLAGIOCHILA CORNICULATA (G4?), SPHENOLOBOPSIS PEARSONII (G2?)

**ELEMENT DISTRIBUTION**

**Range:** This community is restricted to the highest mountain systems of the southern Appalachians in eastern Tennessee, western North Carolina, and southwestern Virginia.

**States:** NC TN VA

**Crosswalk to State Classifications:**

- NC: Red Spruce--Fraser Fir Forest (NC 1990)
- TN: Spruce - Fir, BR (TN 1994)
- VA: Southern Appalachian Red Spruce Forest (VA 2001)

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

**USFS Ecoregions:** M221Aa:CCC, M221Ba:CCC, M221Bc:CCP, M221Dc:CCC, M221Dd:CCC

**Federal Lands:** NPS (Great Smoky Mountains); USFS (Cherokee, Jefferson, Nantahala, Pisgah)

**ELEMENT SOURCES**

**References:** Adams and Stephenson 1991, Allard 1990, Belden et al. 1994, Brown 1941, Bruck 1988, Busing et al. 1988, Cogbill and White 1991, Crandall 1958, Crandall 1960, Davis 1930, Dull et al. 1988b, Eyre 1980, Fleming and Coulling 2001, Fleming et al. 2001, Golden 1974, Korstian 1937, McLaughlin et al. 1987, McLeod 1988, NCNHP 1993, Nicholas and Zedaker 1989, Nicholas et al. 1992, Oosting and Billings 1951, Pyne 1994, Ramseur 1960, Rawinski 1992, Rheinhardt and Ware 1984, Schafale and Weakley 1990, Schofield 1960, Stephenson and Adams 1984, Stephenson and Clovis 1983, Wentworth et al. 1988, White 1984, White and Cogbill 1992, White and Pickett 1985, White et al. 1993, Whittaker 1956, Zedaker et al. 1988

**RED SPRUCE - NORTHERN HARDWOOD FOREST (HERB TYPE)**

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**ELEMENT IDENTIFIERS**

**NVCS association:** *Picea rubens* - (*Betula alleghaniensis*, *Aesculus flava*) / *Viburnum lantanoides* / *Oxalis montana* - *Solidago glomerata* Forest

**Database Code:** C EGL006256

**Formation:** Mixed needle-leaved evergreen - cold-deciduous forest

**Alliance:** PICEA RUBENS - BETULA ALLEGHANIENSIS FOREST ALLIANCE (I.C.3.N.a.4)

**ELEMENT CONCEPT**

**Summary:** This association occurs in the broad elevational transition zone between spruce - fir and northern hardwoods in the Southern Blue Ridge (approx. 4600-5100 feet). The canopy is comprised 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). This association occurs on steep slopes and protected ridges, over shallow, stony soils.

**Environment:** See Summary

**Vegetation:** See Summary

**Dynamics:** See Summary

**Similar Associations:**

- *Picea rubens* - (*Betula alleghaniensis*, *Aesculus flava*) / *Rhododendron* (maximum, catawbiense) Forest (CEGL004983)

**Synonymy:**

- IA4e. Southern Appalachian Northern Hardwoods Forest (Allard 1990) B. in part

**Comments:** Original type was split into two forest associations [see also *Picea rubens* - (*Betula alleghaniensis*, *Aesculus flava*) / *Rhododendron* (maximum, catawbiense) Forest (CEGL004983)].

**CONSERVATION RANKING & RARE SPECIES**

**GRank:** G2 (00-01-04): The community is geographically and environmentally restricted to the highest elevations of the Southern Blue Ridge. Very few occurrences are known to exist.

**High-ranked species:** AGERATINA ALTISSIMA VAR ROANENSIS (G5T3T4), RUGELIA NUDICAULIS (G3), SOLIDAGO GLOMERATA (G3), STREPTOPUS LANCEOLATUS VAR ROSEUS (G5T3?)

**ELEMENT DISTRIBUTION**

**Range:**

**States:** NC TN

**Crosswalk to State Classifications:**

- NC: Red Spruce--Fraser Fir Forest, in part (NC 1990)

**TNC Ecoregions:** 51:C

**USFS Ecoregions:** M221A:CP, M221B:CP, M221Dc:CCC, M221Dd:CCC

**Federal Lands:** NPS (Great Smoky Mountains); USFS (Cherokee?, Pisgah)

**ELEMENT SOURCES**

**References:** Allard 1990, Golden 1974, Golden 1981, Livingston and Mitchell 1976, McLeod pers. comm., Schafale and Weakley 1990



**RED SPRUCE - FRASER FIR FOREST (HEMLOCK TYPE)**

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**ELEMENT IDENTIFIERS**

**NVCS association:** *Picea rubens* - *Tsuga canadensis* / *Rhododendron maximum* Forest

**Database Code:** CEGL006272

**Formation:** Conical-crowned temperate or subpolar needle-leaved evergreen forest

**Alliance:** PICEA RUBENS FOREST ALLIANCE (I.A.8.N.c.3)

**ELEMENT CONCEPT**

**Summary:** 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. 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.

**Environment:** This community is known to occur in the Great Smoky Mountains in the vicinity of Mt. LeConte 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.

**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.

**Dynamics:** See Summary

**Similar Associations:**

- *Picea rubens* / *Rhododendron maximum* Forest (CEGL006152)

**Synonymy:**

- IA4a. Red Spruce - Fraser Fir Forest (Allard 1990) B. in part

**Comments:** These forests are known from the steep upper slopes of Mount LeConte in the Great Smoky Mountains. Forests with *Picea rubens* and *Tsuga canadensis* occur in Virginia, but in a different topographic and hydrologic situation than this association. Gary Fleming describes occurrences at Salt Pond Mountain that are in valley bottoms, within streamheads, and have an unclear hydrology. This association may not be distinct enough from *Picea rubens* / *Rhododendron maximum* Forest (CEGL006152) to warrant recognition from it.

**CONSERVATION RANKING & RARE SPECIES**

**GRank:** G2? (99-02-15): In the Southern Blue Ridge, this forest is nearly or entirely restricted to the Great Smoky Mountains National Park. While the total distribution of this community is uncertain, the total acreage is certainly small, less than 10,000 hectares. The only known location with substantial, high-quality occurrences is the Great Smoky Mountains National Park.

**High-ranked species:** *AGERATINA ALTISSIMA* VAR *ROANENSIS* (G5T3T4), *RUGELIA NUDICAULIS* (G3), *SOLIDAGO GLOMERATA* (G3), *STREPTOPUS LANCEOLATUS* VAR *ROSEUS* (G5T3?)

**ELEMENT DISTRIBUTION**

**Range:**

**States:** NC TN

**Crosswalk to State Classifications:**

- NC: Red Spruce--Fraser Fir Forest, in part (NC 1990)
- TN: Spruce - Fir, BR, in part (TN 1994)

**TNC Ecoregions:** 51:C

**USFS Ecoregions:** M221Aa:CPP, M221Dd:CCC

**Federal Lands:** NPS (Great Smoky Mountains); USFS (Cherokee?, Pisgah)

**ELEMENT SOURCES**

**References:** Allard 1990, Pyne 1994, Schafale and Weakley 1990

**RED SPRUCE FOREST (PROTECTED SLOPE TYPE)**

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**ELEMENT IDENTIFIERS****NVCS association:** *Picea rubens* / *Rhododendron maximum* Forest**Database Code:** C EGL006152**Formation:** Conical-crowned temperate or subpolar needle-leaved evergreen forest**Alliance:** PICEA RUBENS FOREST ALLIANCE (I.A.8.N.c.3)**ELEMENT CONCEPT**

**Summary:** Moist slope forest of central and southern Appalachians. *Abies fraseri* is a minor component or entirely absent. This association occurs in the lower elevations of the range of *Picea rubens* on protected landforms. In the Central Appalachians these are closed-canopy conifer forests dominated by *Picea rubens* with associates *Tsuga canadensis*, *Acer pensylvanicum*, *Amelanchier* spp., *Betula alleghaniensis*, *Sorbus americana*. The variable shrub layer is dominated by *Rhododendron maximum*, with associates of *Ilex montana*, *Kalmia latifolia*, *Viburnum lantanoides*, *Viburnum nudum*. The sparse herbaceous cover includes *Clintonia borealis*, *Dryopteris campyloptera*, *Huperzia lucidula*, *Lycopodium* spp., *Medeola virginiana*, *Mitchella repens*, *Oxalis montana*. Abundant mosses are present and include *Bazzania trilobata*, *Hylocomium splendens*, *Polytrichum ohioense*, *Ptilium crista-castrensis*, and *Sphagnum* spp. These communities occur on high-elevation boulderfields, ridges and steep slopes with shallow soils above 3500 feet.

**Environment:** See Summary**Vegetation:** See Summary**Dynamics:** See Summary**Similar Associations:**

- *Picea rubens* - *Tsuga canadensis* / *Rhododendron maximum* Forest (CEGL006272)
- *Picea rubens* / *Acer rubrum* / *Maianthemum canadense* - (*Lycopodium clavatum*, *Lycopodium dendroideum*) Forest (CEGL008501)

**Synonymy:**

- IA4a. Red Spruce - Fraser Fir Forest (Allard 1990) B. in part
- Red Spruce - Fraser Fir Forest, Low *Rhododendron* Subtype (Schafale pers. comm.)
- Red spruce-great laurel forest (CAP 1998)

**Comments:** This association may not be distinct from *Picea rubens* - *Tsuga canadensis* / *Rhododendron maximum* Forest (CEGL006272); consider merging these two associations.**CONSERVATION RANKING & RARE SPECIES****GRank:** G2? (98-04-30):**High-ranked species:** *AGERATINA ALTISSIMA* VAR *ROANENSIS* (G5T3T4), *SOLIDAGO GLOMERATA* (G3), *STREPTOPUS LANCEOLATUS* VAR *ROSEUS* (G5T3?)**ELEMENT DISTRIBUTION****Range:****States:** NC PA TN WV**Crosswalk to State Classifications:**

- NC: Red Spruce--Fraser Fir Forest (NC 1990)
- PA: No equivalent

**TNC Ecoregions:** 51:C, 59:C**USFS Ecoregions:** M221Ba:CCC, M221Bb:CCP, M221Bc:CCC, M221C:CC, M221Dc:CCC, M221Dd:CCC**Federal Lands:** NPS (Blue Ridge Parkway, Great Smoky Mountains); USFS (Cherokee, Nantahala, Pisgah)**ELEMENT SOURCES****References:** Allard 1990, CAP 1998, Schafale and Weakley 1990, Schafale pers. comm.

**SOUTHERN APPALACHIAN NORTHERN HARDWOOD FOREST (RICH TYPE)****ELEMENT IDENTIFIERS**

**NVCS association:** *Aesculus flava* - *Betula alleghaniensis* - *Acer saccharum* / *Acer spicatum* / *Caulophyllum thalictroides* - *Laportea canadensis* Forest

**Database Code:** C EGL004973

**Formation:** Lowland or submontane cold-deciduous forest

**Alliance:** BETULA ALLEGHANIENSIS - FAGUS GRANDIFOLIA - AESCULUS FLAVA FOREST ALLIANCE (I.B.2.N.a.104)

**ELEMENT CONCEPT**

**Summary:** This association includes forests on high but sheltered slopes in the Southern Blue Ridge, 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 3500-5000 feet, and can be associated with mafic substrates. Other canopy species can include *Tilia americana* var. *heterophylla* and *Quercus rubra*. In the Great Smoky Mountains, *Halesia tetraptera* var. *monticola* is an important canopy component. The shrub stratum is typically open, but small trees such as *Acer spicatum*, *Acer pensylvanicum*, and *Amelanchier laevis* are common. Herbaceous cover can be lush, quite diverse, and is typically dominated and characterized by large forbs such as *Caulophyllum thalictroides*, *Actaea racemosa* (= *Cimicifuga racemosa*), *Collinsonia canadensis*, *Ageratina altissima* var. *roanensis*, *Laportea canadensis*, *Campanulastrum americanum*, and *Tiarella cordifolia*. 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.

**Environment:** This association includes forests on high but sheltered slopes in the Southern Blue Ridge. This forest occurs on deep, rocky soils on the upper slopes of coves, and on other protected landforms, at elevations of 3500-5000 feet, and can be associated with mafic substrates.

**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* and *Quercus rubra*. In the Great Smoky Mountains, *Halesia tetraptera* var. *monticola* is an important canopy component. The shrub stratum is typically open, but small trees such as *Acer spicatum*, *Acer pensylvanicum*, and *Amelanchier laevis* are common. Herbaceous cover can be lush, quite diverse, and is typically dominated and characterized by large forbs such as *Caulophyllum thalictroides*, *Actaea racemosa* (= *Cimicifuga racemosa*), *Collinsonia canadensis*, *Ageratina altissima* var. *roanensis*, *Laportea canadensis*, *Campanulastrum americanum*, and *Tiarella cordifolia*.

**Dynamics:** See Summary

**Similar Associations:** No information

**Synonymy:**

- Northern Hardwood Forest, Rich Subtype (Schafale pers. comm.)

**Comments:** These forests occur above the elevational limit of some of the typical "cove" canopy species [see I.B.2.N.a *Liriodendron tulipifera* - *Tilia americana* var. *heterophylla* - *Aesculus flava* - *Acer saccharum* Forest Alliance (A.235)] such as *Fraxinus americana*, *Liriodendron tulipifera*, and *Carya cordiformis*.

**CONSERVATION RANKING & RARE SPECIES**

**GRank:** G3 (99-12-29): 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.

**High-ranked species:** AGERATINA ALTISSIMA VAR ROANENSIS (G5T3T4), ACONITUM RECLINATUM (G3), GENTIANA AUSTROMONTANA (G3), GEUM GENICULATUM (G2), LILIUM GRAYI (G3), STREPTOPUS LANCEOLATUS VAR ROSEUS (G5T3?)

**ELEMENT DISTRIBUTION**

**Range:** This community is a regional endemic, found only in the high-mountain areas of the Southern Blue Ridge, south through western North Carolina, eastern Tennessee, and northeastern Georgia.

**States:** GA NC TN

**Crosswalk to State Classifications:**

- NC: Northern Hardwoods Forest, in part (NC 1990)

**TNC Ecoregions:** 51:C

**USFS Ecoregions:** M221Db:CCC, M221Dc:CCC, M221Dd:CCC

**Federal Lands:** NPS (Great Smoky Mountains); USFS (Chattahoochee, Cherokee, Nantahala, Pisgah)

**ELEMENT SOURCES**

**References:** Major et al. 1999, Schafale and Weakley 1990, Schafale pers. comm.

## SOUTHERN APPALACHIAN NORTHERN HARDWOOD FOREST (TYPIC TYPE)

## ELEMENT IDENTIFIERS

**NVCS association:** *Betula alleghaniensis* - *Fagus grandifolia* - *Aesculus flava* / *Viburnum lantanoides* / *Eurybia chlorolepis* - *Dryopteris intermedia* Forest

**Database Code:** C EGL007285

**Formation:** Lowland or submontane cold-deciduous forest

**Alliance:** BETULA ALLEGHANIENSIS - FAGUS GRANDIFOLIA - AESCULUS FLAVA FOREST ALLIANCE (I.B.2.N.a.104)

## ELEMENT CONCEPT

**Summary:** This is a broadly defined association meant to cover typical 'northern hardwood forests' over 4000 feet in elevation of the Southern Blue Ridge. 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*. Other canopy trees may be present but are of minor importance (e.g., *Acer saccharum*, *Prunus serotina*, *Quercus rubra*, *Halesia tetraptera* var. *monticola*). Common subcanopy trees include *Acer pensylvanicum*, *Acer spicatum*, and *Acer saccharum*. A shrub stratum may be absent to moderately dense. *Viburnum lantanoides* is a common shrub. Other possible shrub species include, but are not limited to, *Hydrangea arborescens*, *Ilex montana*, *Rubus canadensis*, and *Sambucus racemosa* var. *racemosa* (= *Sambucus racemosa* var. *pubens*). Herbaceous cover can be dominated by sedges or ferns or be comprised of a mixture of sedges, ferns, and other forbs. Typical herbaceous species include *Ageratina altissima* var. *roanensis*, *Eurybia chlorolepis* (= *Aster chlorolepis*), *Athyrium filix-femina* ssp. *asplenioides* (= *Athyrium asplenioides*), *Carex pensylvanica*, *Dryopteris intermedia*, *Solidago curtisii* (= *Solidago caesia* var. *curtisii*), *Stellaria pubera*, *Stellaria corei*, and *Streptopus lanceolatus* var. *roseus* (= *Streptopus roseus*).

**Environment:** This deciduous forest association occurs at high elevations (typically over 4000 feet) in the Southern Blue Ridge, on exposed landforms such as open, north-facing slopes. Virginia examples of the type occur at elevations from 1100-1600 m (3600-5200 feet). Mean elevation of 28 plot-sampled Virginia stands is 1342 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:** Over most of this community's range, the canopy is dominated by various mixtures of *Betula alleghaniensis*, *Fagus grandifolia* and, less commonly, *Aesculus flava*. Other canopy trees, including *Acer saccharum*, *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*, and *Acer saccharum*. The shrub stratum may vary from nearly undeveloped to moderately dense. *Viburnum lantanoides* is a common shrub throughout the range. 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*), *Athyrium filix-femina* ssp. *asplenioides* (= *Athyrium asplenioides*), *Carex pensylvanica*, *Dryopteris intermedia*, *Solidago curtisii*, *Stellaria pubera*, *Stellaria corei*, and *Streptopus lanceolatus* var. *roseus* (= *Streptopus roseus*). ^In Virginia, two distinct, compositional and environmental variants of this community type are well-supported by quantitative analyses of plot data. These are tentatively segregated as different community types in the Virginia State Classification, but are treated here as global subtypes of the *Betula alleghaniensis* - *Fagus grandifolia* - *Aesculus flava* / *Viburnum lantanoides* / *Eurybia chlorolepis* - *Dryopteris intermedia* Forest (CEGL007285). ^The *Acer saccharum* - *Aesculus flava* - *Betula alleghaniensis* / *Athyrium filix-femina* ssp. *asplenioides* - *Ageratina altissima* var. *roanensis* Subtype (1) of Virginia is widespread throughout the higher elevations of the southern Virginia Blue Ridge and also represents outliers of the global type in the adjacent Ridge and Valley. *Acer saccharum* and *Aesculus flava* are prominent in the canopy of this subtype, along with *Betula alleghaniensis* and *Fagus grandifolia*. *Prunus serotina*, *Fraxinus americana*, and *Quercus rubra* are very minor canopy associates. *Acer saccharum*, *Acer pensylvanicum* and, more locally, *Acer spicatum* are abundant understory species. *Rubus canadensis* is the only common shrub. Herb layers are moderately dense and usually contain nutrient-demanding species such as *Caulophyllum thalictroides* and *Laportea canadensis* at low cover. However, the most abundant and constant herbs of this subtype are *Ageratina altissima* var. *roanensis*, *Dryopteris intermedia*, *Athyrium filix-femina* ssp. *asplenioides*, and *Viola blanda*. Other more or less constant and characteristic herbs are *Arisaema triphyllum*, *Festuca subverticillata*, *Solidago curtisii*, *Eurybia chlorolepis* (= *Aster chlorolepis*), *Viola affinis*, *Maianthemum canadense*, *Prosartes lanuginosa* (= *Disporum lanuginosum*), *Polygonatum pubescens*, and *Carex leptonevia*. This unit generally occurs on straight to concave slopes with west, north, or east aspects and soils with slightly higher base status (particularly manganese levels) than those of the following subtype. Mean species richness of plot-sampled stands is 41 taxa per 400 m<sup>2</sup>. The *Fagus grandifolia* - *Betula alleghaniensis* - *Acer saccharum* / *Viburnum lantanoides* / *Carex lucorum* var. *australucorum* - *Viola rotundifolia* Subtype (2) of Virginia is also widespread but is somewhat more localized and found only on the Blue Ridge. This subtype is typically associated with

convex, often southerly slopes and ridge spurs with very infertile soils. *Fagus grandifolia* is the clear (sometimes overwhelming) canopy dominant, although *Betula alleghaniensis* and *Acer saccharum* are constant, less abundant canopy associates. *Aesculus flava* is essentially absent from this unit, while *Magnolia fraseri*, *Tsuga canadensis*, and *Picea rubens* are locally important canopy associates. Understory and shrub layers are dominated by young *Fagus* and *Acer saccharum*, in addition to *Acer pensylvanicum* and *Acer rubrum*. This subtype often has a well-developed shrub layer with *Viburnum lantanoides* dominant. Herb layers are moderately sparse to moderately dense and graminoid-rich; large patches of *Carex lucorum* var. *australucorum* are particularly characteristic. Other frequent or abundant herbs are *Viola rotundifolia*, *Dryopteris intermedia*, *Eurybia chlorolepis* (= *Aster chlorolepis*), *Oclemena acuminata* (= *Aster acuminatus*), *Huperzia lucidula*, *Oxalis montana*, *Thelypteris noveboracensis*, *Dennstaedtia punctilobula*, *Carex aestivalis*, *Carex debilis* var. *rudgei*, and *Brachyelytrum septentrionale*. Mean species richness of plot-sampled stands is 37 taxa per 400 m<sup>2</sup>.

**Dynamics:** See Summary

**Similar Associations:**

- *Aesculus flava* - *Betula alleghaniensis* - *Acer saccharum* / *Acer spicatum* / *Caulophyllum thalictroides* - *Laportea canadensis* Forest (CEGL004973)

**Synonymy:**

- IA4e. Southern Appalachian Northern Hardwoods Forest (Allard 1990) B. in part
- Northern Hard wood Forest (Typic Subtype) (Schafale pers. comm.)
- Northern Hardwoods Community: Beech - Maple Subtype (Rheinhardt and Ware 1984)
- Sugar Maple - Beech - Yellow Birch: 25 (Eyre 1980) B
- *Acer saccharum* - *Aesculus flava* - *Betula alleghaniensis* / *Athyrium filix-femina* ssp. *asplenioides* - *Ageratina altissima* var. *roanensis* Forest (Fleming and Coulling 2001) F. VA Srank = S3
- *Fagus grandifolia* - *Betula alleghaniensis* - *Acer saccharum* / *Viburnum lantanoides* / *Carex lucorum* var. *australucorum* - *Viola rotundifolia* Forest (Fleming and Coulling 2001) F. VA Srank = S2

**Comments:** High dominance by *Tilia* and *Fraxinus* in stands of this association may be an artifact of disturbance (K. Patterson pers. comm.).

**CONSERVATION RANKING & RARE SPECIES**

**GRank:** G3G4 (98-12-14): 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 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.

**High-ranked species:** *AGERATINA ALTISSIMA* VAR *ROANENSIS* (G5T3T4), *ERYTHRONIUM UMBILICATUM* SSP *MONOSTOLUM* (G5T3), *GENTIANA AUSTROMONTANA* (G3), *HYPERICUM GRAVEOLENS* (G3), *HYPERICUM MITCHELLIANUM* (G3), *ILEX COLLINA* (G3), *PRENANTHES ROANENSIS* (G3), *RUGELIA NUDICAULIS* (G3), *SOLIDAGO GLOMERATA* (G3), *STREPTOPUS LANCEOLATUS* VAR *ROSEUS* (G5T3?), *ABIES FRASERI* (G2), *CAREX MANHARTII* (G3)

**ELEMENT DISTRIBUTION**

**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.

**States:** NC TN VA

**Crosswalk to State Classifications:**

- NC: Northern Hardwoods Forest, Typic Subtype (NC 1990)
- VA: Southern Appalachian Northern Hardwood Forest (VA 2001)

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

**USFS Ecoregions:** M221Da:CCP, M221Dc:CCC, M221Dd:CCC

**Federal Lands:** NPS (Blue Ridge Parkway, Great Smoky Mountains); USFS (Cherokee, Jefferson, Nantahala, Pisgah)

**ELEMENT SOURCES**

**References:** Allard 1990, Brown 1941, Eyre 1980, Fleming and Coulling 2001, Fleming et al. 2001, McLeod 1988, Newell et al. 1997, Rheinhardt and Ware 1984, Schafale and Weakley 1990, Schafale pers. comm.

**SOUTHERN APPALACHIAN HARDWOOD BOULDERFIELD FOREST (TYPIC TYPE)**

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**ELEMENT IDENTIFIERS**

**NVCS association:** *Betula alleghaniensis* / *Acer spicatum* / *Hydrangea arborescens* - *Ribes cynosbati* / *Dryopteris marginalis* Forest

**Database Code:** C EGL004982

**Formation:** Lowland or submontane cold-deciduous forest

**Alliance:** BETULA ALLEGHANIENSIS - FAGUS GRANDIFOLIA - AESCULUS FLAVA FOREST ALLIANCE (I.B.2.N.a.104)

**ELEMENT CONCEPT**

**Summary:** This association includes boulderfield forests of the southern Appalachians, strongly dominated by *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 (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*, *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 (4500-5300 feet). The association described here generally occurs at lower elevations in less extreme environmental situations and lacks species characteristic of high elevations. 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.

**Environment:** 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 elevation (2000-4000 feet). These forests grow over bouldery talus and are often associated with small streams and seepage.

**Vegetation:** This association includes boulderfield forests of the southern Appalachians, strongly dominated by *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*, *Hydrangea arborescens*, *Parthenocissus quinquefolia*, *Ribes cynosbati*, and *Ribes rotundifolium*. *Dryopteris marginalis* is often an abundant herb.

**Dynamics:** See Summary

**Similar Associations:**

- *Betula alleghaniensis* / *Ribes glandulosum* / *Polypodium appalachianum* Forest (CEGL006124)

**Synonymy:**

- IA4c. Yellow Birch Boulderfield Forest (Allard 1990) B. in part
- Rich Cove Forest, Boulderfield Subtype (Schafale pers. comm.)
- Oligotrophic Forest (Rawinski 1992) B
- Mid-elevation Southern Blue Ridge Boulderfield Forest. [common name]

**Comments:** None

**CONSERVATION RANKING & RARE SPECIES**

**GRank:** G3 (99-02-15): This community is scattered throughout the high mountains but fairly uncommon. Unlike many other forest types in the southern Appalachians, this community has not historically been threatened by logging because of the stunted nature of the trees and the inaccessibility of boulderfields to loggers.

## Association Descriptions

**High-ranked species:** AGERATINA ALTISSIMA VAR ROANENSIS (G5T3T4), ACONITUM RECLINATUM (G3), CARDAMINE CLEMATITIS (G2G3), GEUM GENICULATUM (G2), SCUTELLARIA SAXATILIS (G3G4), STACHYS CLINGMANII (G2Q), STREPTOPUS LANCEOLATUS VAR ROSEUS (G5T3?)

### ELEMENT DISTRIBUTION

**Range:** This community occurs in the southern Appalachian Mountains of the eastern United States.

**States:** GA KY? NC TN VA?

### Crosswalk to State Classifications:

- KY?: Cumberland Highlands Forest, in part (KY 1991)
- NC: Boulderfield Forest, in part (NC 1990)
- TN: Yellow Birch, BR, in part (TN 1994)
- VA?: No equivalent (VA 2001)

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

**USFS Ecoregions:** M221C:CC, M221Dc:CCC, M221Dd:CCC

**Federal Lands:** NPS (Great Smoky Mountains); USFS (Chattahoochee, Cherokee, Pisgah)

### ELEMENT SOURCES

**References:** Allard 1990, Chafin and Jones 1989, Evans 1991, Major et al. 1999, Pyne 1994, Rawinski 1992, Schafale and Weakley 1990, Schafale pers. comm.



**SOUTHERN APPALACHIAN BOULDERFIELD FOREST (CURRANT AND ROCKCAP FERN TYPE)****ELEMENT IDENTIFIERS**

**NVCS association:** *Betula alleghaniensis* / *Ribes glandulosum* / *Polypodium appalachianum* Forest

**Database Code:** CEGLO06124

**Formation:** Lowland or submontane cold-deciduous forest

**Alliance:** BETULA ALLEGHANIENSIS - FAGUS GRANDIFOLIA - AESCULUS FLAVA FOREST ALLIANCE (I.B.2.N.a.104)

**ELEMENT CONCEPT**

**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 1370-1600 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* (= *Sambucus racemosa* var. *pubens*), 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* (= *Aster acuminatus*), *Eurybia chlorolepis* (= *Aster chlorolepis*), *Aconitum reclinatum*, *Cardamine clematidis*, *Carex aestivalis*, *Actaea podocarpa* (= *Cimicifuga americana*), *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* / *Acer spicatum* / *Hydrangea arborescens* - *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.

**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 range from 1200 to 1600 m (4000 to 5300 ft). 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 ft) 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:** 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* (= *Sambucus pubens*), *Vaccinium erythrocarpum*, and *Viburnum lantanoides*. Herbaceous cover is generally sparse because of the rocky substrate, but specially adapted herbs and mosses

## Association Descriptions

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*. ^Virginia occurrences of this association appear to be similar to those of the Blue Ridge further south. In plot-sampled stands, *Acer spicatum*, *Acer pensylvanicum*, *Viburnum lantanoides*, *Ribes glandulosum*, and *Rubus canadensis* are the most constant and abundant lower woody species, while *Oclemena acuminata* and *Dryopteris intermedia* are the most important herbs. Mean species richness in these samples is 21 taxa per 400 m<sup>2</sup>.

**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 (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).

### Similar Associations:

- *Betula alleghaniensis* / *Acer spicatum* / *Hydrangea arborescens* - *Ribes cynosbati* / *Dryopteris marginalis* Forest (CEGL004982)
- *Betula alleghaniensis* / *Sorbus americana* - *Acer spicatum* / *Polypodium appalachianum* Forest (CEGL008504)

### Synonymy:

- *Betula alleghaniensis* / *Acer spicatum* / *Viburnum lantanoides* - *Ribes glandulosum* Forest (Fleming and Coulling 2001)
- Yellow birch-skunk current/polypody forest (CAP 1998)
- IA4c. Yellow Birch Boulderfield Forest (Allard 1990) B. in part
- High Elevation Birch Boulderfield Forest (Schafale pers. comm.)
- Yellow Birch Community: Boulder Field Subtype (Rheinhardt and Ware 1984)
- Oligotrophic Forest (Rawinski 1992) B

**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.

## CONSERVATION RANKING & RARE SPECIES

**GRank:** G3 (99-02-15): This community is scattered throughout the high mountains but fairly uncommon. Unlike many other forest types in the Southern Appalachians, this community has not historically been threatened by logging because of the stunted nature of the trees and the inaccessibility to loggers of boulderfields.

**High-ranked species:** AGERATINA ALTISSIMA VAR ROANENSIS (G5T3T4), STREPTOPUS LANCEOLATUS VAR ROSEUS (G5T3?), PRENANTHES ROANENSIS (G3)

## ELEMENT DISTRIBUTION

**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.

**States:** NC TN VA WV

### Crosswalk to State Classifications:

- NC: Boulderfield Forest, in part (NC 1990)
- TN: Yellow Birch, BR, in part (TN 1994)
- VA: High-Elevation Boulderfield Forest and Woodland, in part (VA 2001)

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

**USFS Ecoregions:** M221Aa:CCC, M221B:C?, M221C:C?, M221Dc:CCC, M221Dd:CCC

**Federal Lands:** NPS (Blue Ridge Parkway, Great Smoky Mountains?); USFS (Cherokee, Jefferson, Nantahala, Pisgah)

## ELEMENT SOURCES

**References:** Allard 1984, Allard 1990, CAP 1998, Chafin and Jones 1989, Dellinger 1992, Fleming and Coulling 2001, Fleming et al. 2001, Golden 1981, King and Stupka 1950, Pittillo and Smathers 1979, Pyne 1994, Rawinski 1992, Rheinhardt and Ware 1984, Schafale and Weakley 1990, Schafale pers. comm., Stamper 1976, Wharton 1978, Wood 1975

**SOUTHERN APPALACHIAN BEECH GAP (NORTH SLOPE TALL HERB TYPE)****ELEMENT IDENTIFIERS**

**NVCS association:** *Fagus grandifolia* / *Ageratina altissima* var. *roanensis* Forest

**Database Code:** CEG006246

**Formation:** Lowland or submontane cold-deciduous forest

**Alliance:** BETULA ALLEGHANIENSIS - FAGUS GRANDIFOLIA - AESCULUS FLAVA FOREST ALLIANCE (I.B.2.N.a.104)

**ELEMENT CONCEPT**

**Summary:** This association includes stunted beech forests of the southern Appalachians, occurring on north-facing upper slopes and in gaps in scattered, higher elevation (1370 m) sites. This community is a stunted, broad-leaved deciduous forest with a canopy dominated by *Fagus grandifolia*, with lesser amounts of *Aesculus flava* and *Betula alleghaniensis*. The subcanopy 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 (2-10%) with such species as *Crataegus punctata*, *Ribes* spp., *Viburnum lantanoides*, *Rubus canadensis*, *Hydrangea arborescens*, and *Cornus alternifolia*. The herbaceous stratum is moderately dense (40-60% cover), dominated by large herbs and patches of ferns, with lesser amounts of sedges. Typical herbs include *Athyrium filix-femina* ssp. *asplenioides*, *Ageratina altissima* var. *roanensis*, *Eurybia chlorolepis* (= *Aster chlorolepis*), and *Actaea racemosa* (= *Cimicifuga racemosa*). This community commonly occurs as small patches surrounded by other forest types.

**Environment:** This community typically occurs on north-facing, steep, upper slopes and on the north and northeast side of gaps, at elevations greater than 1370 m (4500 feet) (Whittaker 1956, Crandell 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. The soil is generally greater than 20 cm deep, with pH values ranging from 4.5-6.0, considerably less acidic than soils of the adjacent spruce-and-fir-dominated forests (Russell 1953). This community commonly occurs as small patches surrounded by other forest types.

**Vegetation:** This community is a broad-leaved deciduous forest with a canopy dominated by low-stature, small-stemmed (<38 cm) *Fagus grandifolia*, with lesser amounts of *Aesculus flava* and *Betula alleghaniensis*. The subcanopy 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 (2-10%) with such species as *Crataegus punctata*, *Ribes* spp., *Viburnum lantanoides*, *Rubus canadensis*, *Hydrangea arborescens*, and *Cornus alternifolia*. The herbaceous stratum is moderately dense (40-60% cover) and is dominated by large herbs and patches of ferns, with lesser amounts of sedges (Bratton 1975, Crandall 1958, Whittaker 1956). 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*, *Carex aestivalis*, *Carex brunnescens*, *Carex debilis*, *Carex intumescens*, *Carex pensylvanica*, *Actaea racemosa* (= *Cimicifuga racemosa*), *Dryopteris campyloptera*, *Epifagus virginiana*, *Impatiens pallida*, *Oxalis montana*, *Laportea canadensis*, *Luzula acuminata*, *Phacelia bipinnatifida*, *Poa alsodes*, *Prenanthes altissima*, *Prenanthes roanensis*, *Stellaria pubera*, *Thelypteris noveboracensis*, and *Trillium erectum*.

**Dynamics:** 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.

**Similar Associations:**

- *Fagus grandifolia* / *Carex pensylvanica* - *Carex brunnescens* Forest (CEGL006130)

**Synonymy:**

- IA4d. Southern Appalachian Beech Gap (Allard 1990) B. one of two parts
- Northern Hardwood Forest, Forb Beech Gap Subtype (Schafale pers. comm.)

**Comments:** This mesic north-slope community is thought to be more similar to northern hardwood forests, having a more diverse canopy and subcanopy, and to extend farther into the southwestern mountain ranges than does the south-slope, sedge-dominated variant, *Fagus grandifolia* / *Carex pensylvanica* - *Carex brunnescens* Forest (CEGL006130). *Ageratina altissima* var. *roanensis* was chosen as a nominal to represent the tall forbs that dominate the herbaceous stratum, and is not necessarily the dominant species in this stratum.

**CONSERVATION RANKING & RARE SPECIES**

**GRank:** G2 (98-01-10): 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 (*Crytococcus fagisuga*) and a closely associated fungus (*Nectria coccinea* var. *faginata*) may pose a threat to this community. Another

potential threat to this high-elevation community is atmospheric deposition of air pollutants, which may result in tree growth decline.

**High-ranked species:** AGERATINA ALTISSIMA VAR ROANENSIS (G5T3T4), ERYTHRONIUM UMBILICATUM SSP MONOSTOLUM (G5T3), GEUM GENICULATUM (G2), HYPERICUM GRAVEOLENS (G3), HYPERICUM MITCHELLIANUM (G3), LILIUM GRAYI (G3), PRENANTHES ROANENSIS (G3), RUGELIA NUDICAULIS (G3), STREPTOPUS LANCEOLATUS VAR ROSEUS (G5T3?)

### ELEMENT DISTRIBUTION

**Range:** This community is found in scattered sites on high elevations of the southern Appalachian Mountains. The majority of this community is distributed within the mountains of North Carolina, but it also occurs in Tennessee and may extend into Georgia and Virginia.

**States:** GA? NC TN VA?

#### Crosswalk to State Classifications:

- NC: Northern Hardwoods Forest, Beech Gap Subtype, in part (NC 1990)
- TN: Beech, BR (TN 1994)
- VA?: No equivalent (VA 2001)

**TNC Ecoregions:** 51:C

**USFS Ecoregions:** M221A:C?, M221B:C?, M221C:C?, M221Dc:CCC, M221Dd:CCC

**Federal Lands:** NPS (Great Smoky Mountains); USFS (Chattahoochee?, Cherokee, Jefferson?, Nantahala, Pisgah)

### ELEMENT SOURCES

**References:** Allard 1984, Allard 1990, Allard et al. 1990, Bratton 1975, Crandall 1958, Fuller 1977, Golden 1981, McLeod 1988, Pittillo and Smathers 1979, Pyne 1994, Ramseur 1960, Rheinhardt 1981, Russell 1953, Schafale and Weakley 1990, Schafale pers. comm., Schofield 1960, Singer et al. 1984, White et al. 1993, Whittaker 1956

**SOUTHERN APPALACHIAN BEECH GAP (SOUTH SLOPE SEDGE TYPE)****ELEMENT IDENTIFIERS**

**NVCS association:** *Fagus grandifolia* / *Carex pensylvanica* - *Carex brunnescens* Forest

**Database Code:** CEGL006130

**Formation:** Lowland or submontane cold-deciduous forest

**Alliance:** BETULA ALLEGHANIENSIS - FAGUS GRANDIFOLIA - AESCULUS FLAVA FOREST ALLIANCE (I.B.2.N.a.104)

**ELEMENT CONCEPT**

**Summary:** This association is often referred to as a classic 'beech gap' forest and includes vegetation with short-statured canopies dominated by *Fagus grandifolia*, occurring over a dense, graminoid-dominated herbaceous stratum. This forest is thought to be limited to the range of *Picea rubens* and *Abies fraseri* (Whittaker 1956) and occurs on concave slopes, flat ridgetops, or upper south- to southwest-facing slopes, at elevations of greater than 1370 m (4500 feet) in the southern Blue Ridge. The majority of this community is distributed within the mountains of North Carolina, but it also occurs in Tennessee and possibly in Virginia. This community is a broad-leaved deciduous forest with a canopy dominated by stunted, gnarled *Fagus grandifolia*, often with lesser amounts of *Halesia tetraptera* var. *monticola* or *Betula alleghaniensis*. Typically, there are not significant understory or shrub strata, but scattered shrubs such as *Hydrangea arborescens* may occur. Herbaceous cover is dense, often approaching 100% coverage, and dominated by species of *Carex* (*Carex aestivalis*, *Carex brunnescens*, *Carex debilis*, *Carex intumescens*, *Carex pensylvanica*). Ferns and other herbs form 5-20% of the herbaceous cover and may include *Ageratina altissima* var. *roanensis*, *Anemone quinquefolia*, *Angelica triquinata*, *Arisaema triphyllum*, *Eurybia chlorolepis* (= *Aster chlorolepis*), *Athyrium filix-femina* ssp. *asplenioides*, *Dryopteris campyloptera*, *Epifagus virginiana*, *Erythronium umbilicatum* ssp. *monostolum*, *Impatiens pallida*, *Medeola virginiana*, *Oxalis montana*, *Laportea canadensis*, *Luzula acuminata*, *Phacelia bipinnatifida*, *Phacelia fimbriata*, *Poa alsodes*, *Prenanthes altissima*, *Prenanthes roanensis*, *Rugelia nudicaulis*, *Solidago glomerata*, *Stellaria corei*, *Thelypteris noveboracensis*, and *Trillium erectum*. This community commonly occurs as small patches surrounded by other forest types, montane grasslands and shrublands.

**Environment:** This community typically occurs on concave slopes, flat ridgetops, or upper south- to southwest-facing slopes, at elevations of greater than 1370 m (4500 feet) (Whittaker 1956, Russell 1953). 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

**Vegetation:** See Summary

**Dynamics:** 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.

**Similar Associations:**

- *Fagus grandifolia* / *Ageratina altissima* var. *roanensis* Forest (CEGL006246)

**Synonymy:**

- IA4d. Southern Appalachian Beech Gap (Allard 1990) B. one of two parts
- Northern Hardwood Forest, Sedge Beech Gap Subtype (Schafale pers. comm.)

**Comments:** None

**CONSERVATION RANKING & RARE SPECIES**

**GRank:** G2 (99-02-23): 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 (*Crytococcus fagisuga*) and a closely associated fungus (*Nectria coccinea* var. *faginata*) may pose a threat to this community. Another potential threat to this high-elevation community is atmospheric deposition of air pollutants, which may result in tree growth decline.

**High-ranked species:** AGERATINA ALTISSIMA VAR ROANENSIS (G5T3T4), ERYTHRONIUM UMBILICATUM SSP MONOSTOLUM (G5T3), GENTIANA AUSTROMONTANA (G3), GLYCERIA NUBIGENA (G2), HYPERICUM GRAVEOLENS (G3), HYPERICUM MITCHELLIANUM (G3), LILIUM GRAYI (G3), PRENANTHES ROANENSIS (G3), RUGELIA NUDICAULIS (G3), SOLIDAGO GLOMERATA (G3), STREPTOPUS LANCEOLATUS VAR ROSEUS (G5T3?)

**ELEMENT DISTRIBUTION**

**Range:**

**States:** NC TN VA?

**Crosswalk to State Classifications:**

- NC: Northern Hardwoods Forest, Beech Gap Subtype, in part (NC 1990)
- TN: Beech, BR (TN 1994)
- VA?: No equivalent (VA 2001)

**TNC Ecoregions:** 51:C

**USFS Ecoregions:** M221A:C?, M221B:C?, M221C:C?, M221Dc:CCC, M221Dd:CCC

**Federal Lands:** NPS (Blue Ridge Parkway, Great Smoky Mountains); USFS (Cherokee, Jefferson?, Pisgah)

**ELEMENT SOURCES**

**References:** Allard 1990, Bratton 1975, Crandall 1958, Davis 1930, Fuller 1977, Golden 1981, Lindsay and Bratton 1979a, McLeod 1988, Pittillo and Smathers 1979, Pyne 1994, Ramseur 1960, Rheinhardt 1981, Russell 1953, Schafale and Weakley 1990, Schafale pers. comm., Schofield 1960, Singer et al. 1984, White et al. 1993, Whittaker 1956

**BLUE RIDGE HEMLOCK - NORTHERN HARDWOOD FOREST****ELEMENT IDENTIFIERS**

**NVCS association:** *Tsuga canadensis* - *Betula alleghaniensis* / *Rhododendron maximum* / *Leucothoe fontanesiana* Forest

**Database Code:** CEGL007861

**Formation:** Mixed needle-leaved evergreen - cold-deciduous forest

**Alliance:** TSUGA CANADENSIS - BETULA ALLEGHANIENSIS FOREST ALLIANCE (I.C.3.N.a.32)

**ELEMENT CONCEPT**

**Summary:** This association was described from high elevations in the Great Smoky Mountains National Park and needs further regional and national assessment. It is likely that it also occurs in the high mountain areas of western North Carolina. This mixed forest type has an open to closed canopy dominated by *Tsuga canadensis* and *Betula alleghaniensis*, although either of these species may be locally dominant at a small scale. Other minor canopy and subcanopy species may include *Aesculus flava*, *Halesia tetraptera* var. *monticola*, *Picea rubens*, *Prunus pensylvanica*, *Betula lenta*, and *Tilia americana* var. *heterophylla*. 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* if gaps exist in the *Rhododendron maximum* shrub layer. Other minor shrubs can include *Acer pensylvanicum*, *Ilex montana*, *Kalmia latifolia*, *Rubus allegheniensis*, *Sambucus racemosa* var. *racemosa* (= *Sambucus 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*, *Polypodium appalachianum*, and *Smilax rotundifolia*. 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*. 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 toe slope 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. This forest is affected by occasional disturbance by ice, wind, and landslides. It grades into forests dominated by *Picea rubens* or *Tsuga canadensis* at higher elevations.

**Environment:** This community occurs on steep, mostly north-facing mesic slopes, and on toeslopes and flats along streams. It typically occupies middle- to lower-slope and valley-bottom topographic positions that are well protected by higher landforms. In the Great Smoky Mountains, plot-sampled stands range from as low as 1030 m (3400 feet) to around 1350 m (4400 feet) elevation. The elevation range in Virginia is from about 900 m (3000 feet) on Allegheny Mountain to 1450 m (4800 feet) in the Southern Blue Ridge. Sites are often rocky, with many large boulders and stones. Soils, weathered from sandstone, acidic shale, or metamorphic igneous rocks, have dense, root-rich duff layers. Samples collected from plots are extremely acidic (mean pH = 3.7) 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:** This mixed forest community has an open to closed canopy codominated by *Tsuga canadensis* and *Betula alleghaniensis*, although either of these species may be solely dominant over small areas. Minor canopy and subcanopy species may include *Aesculus flava*, *Picea rubens*, *Prunus pensylvanica*, *Betula lenta*, *Magnolia acuminata*, *Magnolia fraseri*, *Fagus grandifolia*, and *Tilia americana* var. *heterophylla*. *Picea rubens* is present in a majority of Virginia sites and is a codominant canopy tree in several. 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 examples of the type. Minor understory species can include *Acer pensylvanicum*, *Ilex montana*, *Kalmia latifolia*, *Rubus allegheniensis*, *Sambucus racemosa* (= *Sambucus pubens*), and *Vaccinium erythrocarpum*. Herbaceous cover is sparse (0-5%) and is composed of scattered plants typical of middle- to high-elevation acidic forests. Some of the more characteristic species include *Dryopteris intermedia*, *Medeola virginiana*, *Mitchella repens*, *Tiarella cordifolia*, *Oxalis montana*, and *Polypodium appalachianum*. Additional herbaceous species found in this community include *Arisaema dracontium*, *Arisaema triphyllum*, *Oclemena acuminata* (= *Aster acuminatus*), *Eurybia divaricata* (= *Aster divaricatus*), *Circaea alpina*, *Goodyera pubescens*, *Goodyera repens*, *Huperzia lucidula*, *Laportea canadensis*, *Maianthemum canadense*, *Monotropa uniflora*, *Polygonatum pubescens*, *Prenanthes altissima*, *Viola blanda*, and *Viola rotundifolia*. Species richness of plot-sampled stands ranges from 10 to 38 taxa per 400 m<sup>2</sup> (mean = 24).

**Dynamics:** See Summary

**Similar Associations:**

- *Tsuga canadensis* - *Betula alleghaniensis* Lower New England / Northern Piedmont Forest (CEGL006109)
- *Tsuga canadensis* - *Betula alleghaniensis* - *Prunus serotina* / *Rhododendron maximum* Forest (CEGL006206)
- *Tsuga canadensis* - *Liriodendron tulipifera* - *Betula lenta* / *Rhododendron maximum* Forest (CEGL007543)

**Synonymy:**

- *Betula alleghaniensis* / *Oxalis montana* Association: *Betula alleghaniensis* / *Rhododendron maximum* Variant (Fleming and Moorhead 1996)
- *Betula alleghaniensis* - *Tsuga canadensis* - (*Picea rubens*) / *Rhododendron maximum* Forest (Fleming and Coulling 2001)
- Red Spruce Community: Hemlock - Spruce Subtype (Adams and Stephenson 1991)
- Hemlock - Yellow Birch: 24 (Eyre 1980) B

**Comments:** This association was originally described from the Great Smoky Mountains National Park. It should be compared with and distinguished from other associations in this alliance, such as *Tsuga canadensis* - *Betula alleghaniensis* Lower New England / Northern Piedmont Forest (CEGL006109), *Tsuga canadensis* - *Betula alleghaniensis* - *Prunus serotina* / *Rhododendron maximum* Forest (CEGL006206), and *Tsuga canadensis* - *Liriodendron tulipifera* - *Betula lenta* / *Rhododendron maximum* Forest (CEGL007543), as well as other vegetation in the Southern Blue Ridge. ^The relationship between this community and CEGL006206 is unclear and needs resolution. Although CEGL006206 is alleged to be the characteristic acidic cove forest of the Allegheny Mountains and higher Ridge and Valley sites, Virginia stands do not have *Prunus serotina* as a prominent component and clearly have much affinity to the Great Smoky Mountains stands that originally formed the basis of the type described here. However, information concerning the environments, composition, and distribution of CEGL006206 is sparse. At present, the distinction between the two types seems dubious, but more information and analysis is needed. ^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.

**CONSERVATION RANKING & RARE SPECIES**

**GRank:** G3G4Q (99-01-28): 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. This association was originally described from the Great Smoky Mountains National Park. It needs to be compared with other associations in this alliance to determine its taxonomy, range, and conservation status.

**High-ranked species:** PRENANTHES ROANENSIS (G3)

**ELEMENT DISTRIBUTION**

**Range:** This community has been documented in the Great Smoky Mountains of North Carolina and 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); and on Allegheny Mountain in Highland County, Virginia and adjacent Pocahontas County, West Virginia. Most likely, this vegetation type is locally distributed throughout higher elevations of the Southern and Central Appalachians.

**States:** NC? TN VA

**Crosswalk to State Classifications:**

- VA: High-Elevation Cove Forest (VA 2001)

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

**USFS Ecoregions:** M221Aa:CCC, M221Ba:CCC, M221Bd:CC?, M221Dc:CCC, M221Dd:CCC

**Federal Lands:** NPS (Great Smoky Mountains); USFS (Cherokee, George Washington, Jefferson)

**ELEMENT SOURCES**

**References:** Adams and Stephenson 1991, Eyre 1980, Fleming and Coulling 2001, Fleming and Moorhead 1996, Fleming et al. 2001, Livingston and Mitchell 1976, Newell 1997, Newell et al. 1997



**SOUTHERN BLUE RIDGE HIGH-ELEVATION WHITE OAK FOREST**

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**ELEMENT IDENTIFIERS**

**NVCS association:** *Quercus alba* / *Kalmia latifolia* Forest

**Database Code:** C EGL007295

**Formation:** Lowland or submontane cold-deciduous forest

**Alliance:** QUERCUS ALBA MONTANE FOREST ALLIANCE (I.B.2.N.a.103)

**ELEMENT CONCEPT**

**Summary:** *Quercus alba*-dominated forests on exposed, rocky ridges and convex upper slopes at high elevations (>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*.

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

**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*.

**Dynamics:** See Summary

**Similar Associations:**

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

**Synonymy:**

- IA4h. High Elevation White Oak Forest (Allard 1990)
- High Elevation White Oak Forest (Schafale pers. comm.)

**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 maximum*) / *Galax urceolata* Forest (CEGL007299), *Quercus rubra* / (*Vaccinium simulatum*, *Rhododendron calendulaceum*) / (*Dennstaedtia punctilobula*, *Thelypteris noveboracensis*) Forest (CEGL007300), and *Quercus alba* - *Quercus* (*rubra*, *prinus*) / *Rhododendron calendulaceum* - *Kalmia latifolia* - (*Gaylussacia ursina*) Forest (CEGL007230). On some sites these forests are transitional to *Quercus rubra*-dominated forests (High Elevation Red Oak Forest).

**CONSERVATION RANKING & RARE SPECIES**

**GRank:** G2Q (99-12-29): 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.

**High-ranked species:** No information

**ELEMENT DISTRIBUTION**

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

**States:** GA NC SC TN

**Crosswalk to State Classifications:**

- NC: Montane White Oak Forest, in part (NC 1990)

**TNC Ecoregions:** 51:C

**USFS Ecoregions:** M221Dc:CCC, M221Dd:CCC

**Federal Lands:** NPS (Great Smoky Mountains?); USFS (Chattahoochee, Cherokee, Nantahala, Pisgah)

**ELEMENT SOURCES**

**References:** Allard 1990, McCormick and Platt 1980, Newell and Peet 1995, Patterson 1994, Schafale and Weakley 1990, Schafale pers. comm.

**HIGH ELEVATION RED OAK FOREST (EVERGREEN SHRUB TYPE)**

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**ELEMENT IDENTIFIERS**

**NVCS association:** *Quercus rubra* / (*Kalmia latifolia*, *Rhododendron maximum*) / *Galax urceolata* Forest

**Database Code:** C EGL007299

**Formation:** Lowland or submontane cold-deciduous forest

**Alliance:** QUERCUS RUBRA MONTANE FOREST ALLIANCE (I.B.2.N.a.108)

**ELEMENT CONCEPT**

**Summary:** This montane community of the southern Appalachians 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 including *Galax urceolata*, *Solidago curtisii* (= *Solidago caesia* var. *curtisii*), *Epigaea repens*, *Dennstaedtia punctilobula*, *Conopholis americana*, *Thelypteris noveboracensis*, *Clintonia umbellulata*, *Eurybia divaricata* (= *Aster divaricatus*), *Dioscorea villosa*. This community occurs on most of the major mountain ranges of the southern Appalachians at elevations of 1070-1525 m (3500-5000 feet) on ridges and mid to upper slope positions, commonly with southern and southeastern exposures. On exposed sites this community commonly contains, as inclusions, acidic rock outcrop communities and montane shrublands, and may grade into forests dominated by *Tsuga caroliniana*, *Pinus rigida*, *Pinus pungens*, and *Quercus prinus*. At higher elevations 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*).

**Environment:** This community occurs on most of the major mountain ranges of the southern Appalachians at elevations of 1070-1525 m (3500-5000 feet) on ridges and mid - to upper-slope positions, commonly with south and southeast exposures. DeLapp (1978) found that this community type occurs on most slope aspects but was most commonly found on southeast and south exposures. 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:** 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 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*.

**Dynamics:** *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*.

**Similar Associations:**

- *Quercus rubra* / (*Vaccinium simulatum*, *Rhododendron calendulaceum*) / (*Dennstaedtia punctilobula*, *Thelypteris noveboracensis*) Forest (CEGL007300)--is related but more diverse and with more deciduous shrubs.
- *Quercus rubra* / *Carex pensylvanica* - *Ageratina altissima* var. *roanensis* Forest (CEGL007298)
- *Quercus rubra* / *Rhododendron catawbiense* - *Rhododendron arborescens* Woodland (CEGL004503)--occurs at higher elevations, in more extreme environments, sometimes adjacent to C EGL007299.

**Synonymy:**

- IA4g. High Elevation Northern Red Oak Forest (Allard 1990) B. in part
- *Kalmia latifolia* Phase (DeLapp 1978)
- *Rhododendron catawbiense* Phase (DeLapp 1978)
- *Rhododendron maximum* Phase (DeLapp 1978)
- High elevation red oak /mt. laurel-great laurel forest (CAP 1998)

**Comments:** Similar *Quercus rubra*-dominated forests occur in the southern Appalachian Mountains. *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.

## Association Descriptions

*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. 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.

### CONSERVATION RANKING & RARE SPECIES

**GRank:** G4 (00-01-04): This community is uncommon but not rare. It is secure within its range.

**High-ranked species:** AGERATINA ALTISSIMA VAR ROANENSIS (G5T3T4), PRENANTHES ROANENSIS (G3), RHODODENDRON VASEYI (G3), STREPTOPUS LANCEOLATUS VAR ROSEUS (G5T3?), VACCINIUM HIRSUTUM (G3)

### ELEMENT DISTRIBUTION

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

**States:** GA NC SC? TN

#### Crosswalk to State Classifications:

- GA: Submesic Oak Ridge Forest, in part (GA 1990)
- NC: High Elevation Red Oak Forest, in part (NC 1990)
- TN: Northern Red Oak, BR (TN 1994)

**TNC Ecoregions:** 51:C

**USFS Ecoregions:** M221Dc:CCC, M221Dd:CCC

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

### ELEMENT SOURCES

**References:** Allard 1990, Ambrose 1990a, CAP 1998, DeLapp 1978, Golden 1974, Pyne 1994, Rawinski 1992, Schafale and Weakley 1990

## HIGH ELEVATION RED OAK FOREST (DECIDUOUS SHRUB TYPE)

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### ELEMENT IDENTIFIERS

**NVCS association:** *Quercus rubra* / (*Vaccinium simulatum*, *Rhododendron calendulaceum*) / (*Dennstaedtia punctilobula*, *Thelypteris noveboracensis*) Forest

**Database Code:** C EGL007300

**Formation:** Lowland or submontane cold-deciduous forest

**Alliance:** QUERCUS RUBRA MONTANE FOREST ALLIANCE (I.B.2.N.a.108)

### ELEMENT CONCEPT

**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 (*Ageratina altissima* var. *roanensis*, *Eurybia divaricata* (= *Aster divaricatus*), *Oclemena acuminata* (= *Aster acuminatus*), *Athyrium filix-femina* ssp. *asplenoides*, *Clintonia umbellulata*, *Collinsonia canadensis*, *Conopholis americana*, *Dennstaedtia punctilobula*, *Dioscorea villosa*, *Laportea canadensis*, *Lysimachia quadrifolia*, *Medeola virginiana*, *Monarda fistulosa*, *Potentilla canadensis*, *Prenanthes roanensis*, *Silene stellata*, *Solidago curtisii* (= *Solidago caesia* var. *curtisii*), *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 (*Betula alleghaniensis*, *Fagus grandifolia*, *Aesculus flava*). 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 mixed *Quercus* species.

**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. 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:** 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 rubrum*, *Betula alleghaniensis*, *Betula lenta*, *Castanea dentata* (root sprouts), *Hamamelis virginiana*, *Fagus grandifolia*, *Ilex montana*, *Acer pensylvanicum*, *Halesia tetraptera*, and on more exposed sites, *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*, *Ilex montana*, *Gaylussacia ursina*, *Rubus canadensis*, *Corylus cornuta*, and *Lyonia ligustrina*. Other shrubs occur with low frequency and may include *Kalmia latifolia*, *Rhododendron catawbiense*, *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*, *Eurybia divaricata* (= *Aster divaricatus*), *Oclemena acuminata* (= *Aster acuminatus*), *Athyrium filix-femina* ssp. *asplenoides*, *Clintonia umbellulata*, *Collinsonia canadensis*, *Conopholis americana*, *Dennstaedtia punctilobula*, *Dioscorea villosa*, *Laportea canadensis*, *Lysimachia quadrifolia*, *Medeola virginiana*, *Monarda fistulosa*, *Potentilla canadensis*, *Prenanthes roanensis*, *Silene stellata*, *Solidago curtisii* (= *Solidago caesia* var. *curtisii*), and *Thelypteris noveboracensis*.

**Dynamics:** *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*.

### Similar Associations:

- *Quercus rubra* / (*Kalmia latifolia*, *Rhododendron maximum*) / *Galax urceolata* Forest (CEGL007299)--is related but less diverse and with more evergreen shrubs.

### Synonymy:

- IA4g. High Elevation Northern Red Oak Forest (Allard 1990) B. in part

- Deciduous Heath Phase (DeLapp 1978)
- Mixed Fern Phase (DeLapp 1978) B. in part
- Tall Herb Phase (DeLapp 1978) B. in part
- *Corylus cornuta* Phase (DeLapp 1978)
- High elevation red oak/blueberry-flame azalea forest (CAP 1998)
- Oligotrophic Forest (Rawinski 1992) B

**Comments:** Similar vegetation may occur in the Cumberland Mountains (Black Mountain, Cumberland Mountain, Kentucky); for more information see Braun 1950 book and Black Mountain paper (Braun 1940). Kentucky occurrences lack *Gaylussacia ursina*, *Corylus cornuta*, *Prenanthes roanensis*, and occur at 3500-3800 feet (M. Evans pers. comm.).

**CONSERVATION RANKING & RARE SPECIES**

**GRank:** G4 (97-12-31): This community is uncommon but not rare. It is secure within its range.

**High-ranked species:** AGERATINA ALTISSIMA VAR ROANENSIS (G5T3T4), CAREX ROANENSIS (G2), DELPHINIUM EXALTATUM (G3), HELIANTHUS GLAUCOPHYLLUS (G3), ROBINIA VISCOSA VAR HARTWEGII (G3T1), STREPTOPUS LANCEOLATUS VAR ROSEUS (G5T3?)

**ELEMENT DISTRIBUTION**

**Range:** This community occurs on most of the major mountain ranges of the southern Appalachians in North Carolina, Tennessee, and Georgia. It may possibly range into Kentucky's Cumberland Mountains and into Virginia and West Virginia.

**States:** GA KY? NC TN VA? WV?

**Crosswalk to State Classifications:**

- GA: Submesic Oak Ridge Forest, in part (GA 1990)
- KY?: Cumberland Highlands Forest, in part (KY 1991)
- NC: High Elevation Red Oak Forest, in part (NC 1990)
- TN: Northern Red Oak, BR (TN 1994)
- VA?: No equivalent (VA 2001)

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

**USFS Ecoregions:** M221Dc:CCC, M221Dd:CCC

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

**ELEMENT SOURCES**

**References:** Allard 1990, Ambrose 1990a, Braun 1940, Braun 1950, CAP 1998, DeLapp 1978, Evans, Evans 1991, Evans, M., pers. comm., Golden 1974, M., Pyne 1994, Rawinski 1992, Schafale and Weakley 1990, Stephenson and Adams 1989, Whigham 1969, Whittaker 1956, pers. comm.

**HIGH ELEVATION RED OAK FOREST (TALL HERB TYPE)**

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**ELEMENT IDENTIFIERS**

**NVCS association:** *Quercus rubra* / *Carex pensylvanica* - *Ageratina altissima* var. *roanensis* Forest

**Database Code:** CEG007298

**Formation:** Lowland or submontane cold-deciduous forest

**Alliance:** QUERCUS RUBRA MONTANE FOREST ALLIANCE (I.B.2.N.a.108)

**ELEMENT CONCEPT**

**Summary:** 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 between 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*. This type 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. 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.'

**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.

**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*.

**Dynamics:** See Summary

**Similar Associations:** No information

**Synonymy:**

- IA4g. High Elevation Northern Red Oak Forest (Allard 1990) B. in part
- Mixed Fern Phase, Tall Herb Phase (DeLapp 1978) B. in part
- High elevation red oak/Pennsylvania sedge forest (CAP 1998)

**Comments:** None

**CONSERVATION RANKING & RARE SPECIES**

**GRank:** G2 (98-04-30): 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.

**High-ranked species:** AGERATINA ALTISSIMA VAR ROANENSIS (G5T3T4), GENTIANA AUSTRUMONTANA (G3), PRENANTHES ROANENSIS (G3), STREPTOPUS LANCEOLATUS VAR ROSEUS (G5T3?)

**ELEMENT DISTRIBUTION**

**Range:**

**States:** NC TN VA

**Crosswalk to State Classifications:**

- NC: High Elevation Red Oak Forest, in part (NC 1990)
- TN: Northern Red Oak, BR (TN 1994)
- VA: Northern Red Oak Forest, in part (VA 2001)

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

**USFS Ecoregions:** M221Dc:CCC, M221Dd:CCC

**Federal Lands:** NPS (Blue Ridge Parkway, Great Smoky Mountains); USFS (Cherokee?, Nantahala, Pisgah)

**ELEMENT SOURCES**

**References:** Allard 1990, CAP 1998, DeLapp 1978, Fleming et al. 2001, Golden 1974, Pyne 1994, Schafale and Weakley 1990



**APPALACHIAN MONTANE OAK HICKORY FOREST (TYPIC ACIDIC TYPE)****ELEMENT IDENTIFIERS**

**NVCS association:** *Quercus alba* - *Quercus* (*rubra*, *prinus*) / *Rhododendron calendulaceum* - *Kalmia latifolia* - (*Gaylussacia ursina*) Forest

**Database Code:** CEG L007230

**Formation:** Lowland or submontane cold-deciduous forest

**Alliance:** QUERCUS ALBA - (QUERCUS RUBRA, CARYA SPP.) FOREST ALLIANCE (I.B.2.N.a.27)

**ELEMENT CONCEPT**

**Summary:** These forests occur in a wide elevation range (2000-4500 feet) in the Southern Blue Ridge and in the Blue Ridge/Piedmont transition, on protected sites, typically 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 prinus*, *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 sites 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 alba*, *Carya glabra*, *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 americana*, *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. Often there is a dominant fern stratum, with *Thelypteris noveboracensis* and *Polystichum acrostichoides* most typically dominant.

**Environment:** These forests occur in a wide elevation range (2000-4500 feet) in the Southern Blue Ridge and in the Blue Ridge/Piedmont transition, on protected sites, typically lower slopes, bottoms, and coves.

**Vegetation:** The canopies of stands of this association are dominated or codominated by *Quercus alba*, occurring with other *Quercus* species (*Quercus rubra*, *Quercus prinus*, *Quercus coccinea*). Species other than oaks that can be important in the canopy include *Carya alba*, *Carya glabra*, *Liriodendron tulipifera*, *Acer rubrum*, and *Magnolia fraseri*. Stands lack indicators of circumneutral soils and also lack low elevation dry sites 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 americana*, *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. Some of the more constant species include *Parthenocissus quinquefolia*, *Dioscorea quaternata*, *Dichanthelium* spp., *Carex pensylvanica*, *Chimaphila maculata*, *Desmodium nudiflorum*, *Goodyera pubescens*, *Maianthemum racemosum* ssp. *racemosum*, and *Trillium catesbaei*. Other species include *Dichanthelium laxiflorum*, *Oclemena acuminata* (= *Aster acuminatus*), *Eurybia divaricata* (= *Aster divaricatus*), *Galax urceolata*, *Galium latifolium*, *Lysimachia quadrifolia*, *Mitchella repens*, *Viola hastata* and *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. *asplenoides*, *Dennstaedtia punctilobula*, and *Dryopteris intermedia*.

**Dynamics:** See Summary

**Similar Associations:** No information

**Synonymy:**

- IA6h. Montane Oak - Hickory Forest (Allard 1990) B. in part

**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.

**CONSERVATION RANKING & RARE SPECIES**

**GRank:** G5 (98-04-30):

**High-ranked species:** AGERATINA ALTISSIMA VAR ROANENSIS (G5T3T4), CAREX LUCORUM VAR AUSTRALUCORUM (G4T3?), CAREX MANHARTII (G3), SISYRINCHIUM DICHOTOMUM (G2)

**ELEMENT DISTRIBUTION**

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

**States:** GA NC SC TN

**Crosswalk to State Classifications:**

- GA: Oak - Chestnut - Hickory Forest, in part (GA 1990)
- NC: Montane Oak--Hickory Forest, in part (NC 1990)
- SC: Oak--Hickory Forest, in part (SC 1986)

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

**USFS Ecoregions:** 231Ag:CCC, M221Dc:CCC, M221Dd:CCC

**Federal Lands:** NPS (Carl Sandburg Home, Great Smoky Mountains); USFS (Chattahoochee, Cherokee, Nantahala, Pisgah, Sumter)

**ELEMENT SOURCES**

**References:** Allard 1990, Ambrose 1990a, Major et al. 1999, Nelson 1986, Schafale and Weakley 1990

## APPALACHIAN WHITE OAK - SOUTHERN RED OAK FOREST

## ELEMENT IDENTIFIERS

**NVCS association:** *Quercus alba* - *Quercus falcata* / *Vaccinium* (arboreum, hirsutum, pallidum) Forest

**Database Code:** CEGL008567

**Formation:** Lowland or submontane cold-deciduous forest

**Alliance:** QUERCUS ALBA - QUERCUS (FALCATA, STELLATA) FOREST ALLIANCE (I.B.2.N.a.29)

## ELEMENT CONCEPT

**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 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 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*.

**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.

**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 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 alba*, *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.

**Dynamics:** See Summary

**Similar Associations:**

- *Pinus echinata* - *Quercus alba* / *Vaccinium pallidum* / *Hexastylis arifolia* - *Chimaphila maculata* Forest (CEGL008427)--with *Pinus echinata* codominant.
- *Pinus strobus* - *Quercus alba* - (*Carya alba*) / *Gaylussacia ursina* Forest (CEGL007517)--with *Pinus strobus* codominant.

**Synonymy:** No information

**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

## Association Descriptions

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., CEG007517, CEG008427). 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.

### CONSERVATION RANKING & RARE SPECIES

**GRank:** G3G4 (02-05-17): 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.

**High-ranked species:** No information

### ELEMENT DISTRIBUTION

**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 and presumably adjacent Georgia.

**States:** GA? TN

**Crosswalk to State Classifications:** Not yet cross-referenced to state classifications

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

**USFS Ecoregions:** 221Jb:CCC, M221Dd:CCC

**Federal Lands:** TVA (Tellico); USFS (Chattahoochee?, Cherokee)

### ELEMENT SOURCES

**References:** Andreu and Tukman 1995, NatureServe Ecology - Southeast U.S. unpubl. data

**APPALACHIAN MONTANE OAK - HICKORY FOREST (RICH TYPE)****ELEMENT IDENTIFIERS**

**NVCS association:** *Quercus alba* - *Quercus rubra* - *Quercus prinus* / *Collinsonia canadensis* - *Podophyllum peltatum* - *Sanguinaria canadensis* Forest

**Database Code:** C EGL007692

**Formation:** Lowland or submontane cold-deciduous forest

**Alliance:** QUERCUS ALBA - (QUERCUS RUBRA, CARYA SPP.) FOREST ALLIANCE (I.B.2.N.a.27)

**ELEMENT CONCEPT**

**Summary:** This association includes forests dominated by *Quercus alba*, occurring over circumneutral soils in the Southern Blue Ridge and adjacent inner Piedmont. Other species that can be important in the canopy include *Quercus rubra*, *Quercus coccinea*, *Quercus prinus*, *Carya glabra*, and *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. 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*, *Dennstaedtia punctilobula*, and *Dryopteris intermedia*. These forests can occur across a broad elevation range (2000-4500 feet), and can occur 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 1000 feet).

**Environment:** This association includes forests dominated by *Quercus alba*, occurring over circumneutral soils in the Southern Blue Ridge and adjacent Piedmont. These forests can occur across a broad elevation range (2000-4500 feet), and can occur 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 1000 feet).

**Vegetation:** This association includes forests dominated by *Quercus alba*. Other species that can be important in the canopy include *Quercus rubra*, *Quercus coccinea*, *Quercus prinus*, *Carya glabra*, and *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*, *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 curtisii*, *Solidago simplex* var. *spathulata* (= *Solidago spathulata*), *Spigelia marilandica*, *Tradescantia subaspera*, and *Uvularia perfoliata*.

**Dynamics:** See Summary

**Similar Associations:**

- *Quercus rubra* - *Tilia americana* var. *heterophylla* - *Halesia tetraptera* var. *monticola* / *Collinsonia canadensis* - *Tradescantia subaspera* Forest (CEGL007878)

**Synonymy:**

- Montane Oak - Hickory, Basic Subtype (Schafale pers. comm.)

**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.

**CONSERVATION RANKING & RARE SPECIES**

**GRank:** G3 (01-01-31): 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.

## Association Descriptions

**High-ranked species:** AGERATINA ALTISSIMA VAR ROANENSIS (G5T3T4), CAREX MANHARTII (G3), CAREX RADFORDII (G2), PROSARTES MACULATA (G3G4), EUPHORBIA PURPUREA (G3), HELIANTHUS GLAUCOPHYLLUS (G3), SILENE OVATA (G2G3), SISYRINCHIUM DICHOTOMUM (G2), TRILLIUM RUGELII (G3)

### ELEMENT DISTRIBUTION

**Range:** This community occurs in the southern Blue Ridge of the Carolinas, Georgia, and Tennessee in the eastern United States.

**States:** GA NC SC TN

#### Crosswalk to State Classifications:

- NC: Montane Oak--Hickory Forest, in part (NC 1990)

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

**USFS Ecoregions:** 231Ad:CCC, M221Dc:CCC, M221Dd:CCC

**Federal Lands:** NPS (Great Smoky Mountains?); USFS (Chattahoochee, Cherokee, Pisgah)

### ELEMENT SOURCES

**References:** NatureServe Ecology - Southeast U.S. unpubl. data, Schafale and Weakley 1990, Schafale pers. comm.

**APPALACHIAN MONTANE OAK HICKORY FOREST (CHESTNUT OAK TYPE)****ELEMENT IDENTIFIERS**

**NVCS association:** *Quercus prinus* - (*Quercus rubra*) - *Carya* spp. / *Oxydendrum arboreum* - *Cornus florida* Forest

**Database Code:** CEG007267

**Formation:** Lowland or submontane cold-deciduous forest

**Alliance:** QUERCUS PRINUS - QUERCUS RUBRA FOREST ALLIANCE (I.B.2.N.a.38)

**ELEMENT CONCEPT**

**Summary:** This community is known from low to intermediate elevations of the Southern Blue Ridge escarpment and Piedmont transition areas. It occurs on relatively exposed landforms below 3000 feet elevation (1200-2900 feet), on moderately steep to steep, convex, middle to upper slopes and ridges, with mostly northern to southwestern aspects. Canopies are dominated by *Quercus prinus*, with *Acer rubrum* often codominating. Other species that can have significant canopy coverage include *Carya glabra*, *Liriodendron tulipifera*, and *Quercus rubra*. The subcanopy is commonly dominated by *Cornus florida*. Additional canopy and subcanopy species can include *Quercus velutina*, *Carya alba*, *Halesia tetraptera* var. *monticola*, *Nyssa sylvatica*, *Robinia pseudoacacia*, *Magnolia fraseri*, and *Oxydendrum arboreum*. The shrub stratum is sparse with no clear dominant. Some typical shrub species include *Gaylussacia ursina*, *Hydrangea arborescens*, *Hydrangea radiata*, *Kalmia latifolia*, *Magnolia fraseri*, *Sassafras albidum*, and *Vaccinium pallidum*. Common vines are *Smilax rotundifolia*, *Smilax glauca*, *Vitis aestivalis*, *Vitis rotundifolia*, and *Vitis vulpina*. Herb cover is sparse, but diversity and species composition vary among occurrences. Some of the more typical species include *Eurybia divaricata* (= *Aster divaricatus*), *Chimaphila maculata*, *Desmodium nudiflorum*, *Dichanthelium* spp. (e.g., *Dichanthelium boscii*, *Dichanthelium commutatum*, *Dichanthelium dichotomum*), *Dioscorea quaternata*, *Galium latifolium*, *Houstonia purpurea*, *Lysimachia quadrifolia*, *Maianthemum racemosum* ssp. *racemosum*, *Polystichum acrostichoides*, *Prenanthes* spp., *Thalictrum thalictroides*, *Thelypteris noveboracensis*, *Uvularia perfoliata*, *Uvularia puberula*, *Uvularia sessilifolia*, and *Viola* spp. (e.g., *Viola blanda*, *Viola hastata*, *Viola X palmata*, *Viola tripartita*). Some occurrences may have areas of exposed rock.

**Environment:** See Summary

**Vegetation:** The canopies of stands of this type are dominated by *Quercus prinus*, with *Acer rubrum* often codominating. Other species that can have significant canopy coverage include *Carya glabra*, *Liriodendron tulipifera*, and *Quercus rubra*. The subcanopy is commonly dominated by *Cornus florida*. Additional canopy and subcanopy species can include *Quercus velutina*, *Carya alba*, *Halesia tetraptera* var. *monticola*, *Nyssa sylvatica*, *Robinia pseudoacacia*, *Magnolia fraseri*, and *Oxydendrum arboreum*. The shrub stratum is sparse with no clear dominant. Some typical shrub species include *Gaylussacia ursina*, *Hydrangea arborescens*, *Hydrangea radiata*, *Kalmia latifolia*, *Magnolia fraseri*, *Sassafras albidum*, and *Vaccinium pallidum*. Common vines are *Smilax rotundifolia*, *Smilax glauca*, *Vitis aestivalis*, *Vitis rotundifolia*, and *Vitis vulpina*. Herb cover is sparse, but diversity and species composition vary among occurrences. Some of the more typical species include *Eurybia divaricata* (= *Aster divaricatus*), *Chimaphila maculata*, *Desmodium nudiflorum*, *Dichanthelium* spp. (e.g., *Dichanthelium boscii*, *Dichanthelium commutatum*, *Dichanthelium dichotomum*), *Dioscorea quaternata*, *Galium latifolium*, *Houstonia purpurea*, *Lysimachia quadrifolia*, *Maianthemum racemosum* ssp. *racemosum*, *Polystichum acrostichoides*, *Prenanthes* spp., *Thalictrum thalictroides*, *Thelypteris noveboracensis*, *Uvularia perfoliata*, *Uvularia puberula*, *Uvularia sessilifolia*, and *Viola* spp. (e.g., *Viola blanda*, *Viola hastata*, *Viola X palmata*, *Viola tripartita*).

**Dynamics:** See Summary

**Similar Associations:**

- *Quercus prinus* - *Quercus rubra* - *Carya* (*glabra*, *alba*) / *Gaylussacia baccata* Forest (CEGL006057)

**Synonymy:**

- IA6h. Montane Oak - Hickory Forest (Allard 1990) B. in part

**Comments:** This forest lacks the dense ericaceous shrub layer typical of other *Quercus prinus*-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. It may become more widespread in the Piedmont of Virginia.

**CONSERVATION RANKING & RARE SPECIES**

**GRank:** G4G5 (97-08-15):

**High-ranked species:** AGERATINA ALTISSIMA VAR ROANENSIS (G5T3T4), CAREX LUCORUM VAR AUSTROLUCORUM (G4T3?), MONOTROPSIS ODORATA (G3)

**ELEMENT DISTRIBUTION**

**Range:** This community occurs in the Southern Blue Ridge and Piedmont transition areas of western North Carolina, eastern Tennessee, northwestern South Carolina, and northeastern Georgia. It may possibly extend into Virginia.

**States:** GA NC SC TN VA?

**Crosswalk to State Classifications:**

- GA: Oak - Chestnut - Hickory Forest, in part (GA 1990)
- NC: Chestnut Oak Forest, in part (NC 1990)
- SC: Oak-Hickory Forest, in part (SC 1986)
- VA?: No equivalent (VA 2001)

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

**USFS Ecoregions:** 231Aa:PPP, M221Dc:CCC, M221Dd:CCC

**Federal Lands:** NPS (Great Smoky Mountains); USFS (Chattahoochee, Cherokee, Nantahala, Pisgah, Sumter)

**ELEMENT SOURCES**

**References:** Allard 1990, Ambrose 1990a, Nelson 1986, Schafale and Weakley 1990, Simon pers. comm.



**CHESTNUT OAK FOREST (MESIC SLOPE HEATH TYPE)****ELEMENT IDENTIFIERS**

**NVCS association:** *Quercus prinus* - *Quercus rubra* / *Rhododendron maximum* / *Galax urceolata* Forest

**Database Code:** CEGL006286

**Formation:** Lowland or submontane cold-deciduous forest

**Alliance:** QUERCUS PRINUS - QUERCUS RUBRA FOREST ALLIANCE (I.B.2.N.a.38)

**ELEMENT CONCEPT**

**Summary:** This montane deciduous forest is known from protected, steep north-facing slopes in the Southern Blue Ridge and ranges into adjacent areas of the upper Piedmont. It is dominated by *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 areas *Rhododendron minus* may dominate or *Tsuga canadensis* may have dense understory regeneration. Other common shrubs can include *Gaylussacia ursina* and *Kalmia latifolia*. Herbs are sparse. The ground cover is dominated by leaf litter, but *Galax urceolata* is in most occurrences. Other herb species than can be typical include *Chimaphila maculata*, *Goodyera pubescens*, and *Polystichum acrostichoides*. Some examples may have sparse (woodland-like) canopies and occur in association with rock outcroppings. This forest is found on moderate to very steep slopes with northerly exposures, on lower slope positions, typically at elevations between 2500 and 4000 feet. In the Great Smoky Mountains it was found consistently as a transitional band of vegetation, downslope from drier *Quercus prinus* ridgetop forests, *Quercus (pinus, coccinea) / Kalmia latifolia / (Galax urceolata, Gaultheria procumbens)* Forest (CEGL006271), and grading into acidic cove forests, *Tsuga canadensis - Liriodendron tulipifera - Betula lenta / Rhododendron maximum* Forest (CEGL007543) on the steep ravines below.

**Environment:** This is typically a mid-slope to lower slope type, but it can be found on upper slopes in a more sheltered position (M. Schafale pers. comm.).

**Vegetation:** The canopy can contain *Betula alleghaniensis* (= *Betula lutea*), *Pinus strobus*, *Quercus alba*, *Nyssa sylvatica*, *Magnolia fraseri*, and *Oxydendrum arboreum*. It is intermediate between acidic cove forest and Chestnut Oak (*Quercus prinus*) forest (M. Schafale pers. comm.).

**Dynamics:** See Summary

**Similar Associations:**

- *Quercus (pinus, coccinea) / Kalmia latifolia / (Galax urceolata, Gaultheria procumbens)* Forest (CEGL006271)
- *Quercus rubra / (Kalmia latifolia, Rhododendron maximum) / Galax urceolata* Forest (CEGL007299)
- *Quercus prinus - (Quercus rubra) - Carya spp. / Oxydendrum arboreum - Cornus florida* Forest (CEGL007267)

**Synonymy:**

- IA6d. Chestnut Oak Slope and Ridge Forest (Allard 1990) B. in part

**Comments:** This association is more protected and more mesic than *Quercus (pinus, 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 maximum) / Galax urceolata* Forest (CEGL007299). It is much less diverse than *Quercus prinus - (Quercus rubra) - Carya spp. / Oxydendrum arboreum - Cornus florida* Forest (CEGL007267), lacking the diverse herbaceous and woody components found in that association.

**CONSERVATION RANKING & RARE SPECIES**

**GRank:** G4 (99-12-21): 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. This community is often overlooked or not distinguished separately in inventories, thus it is more common than the number of documented occurrences suggests.

**High-ranked species:** No information

**ELEMENT DISTRIBUTION**

**Range:** This community occurs in the Southern Blue Ridge of northeastern Georgia, northwestern South Carolina, north through eastern Tennessee and western North Carolina. Its range extends into the upper Piedmont of North Carolina and possibly into Virginia's Blue Ridge.

**States:** GA NC SC TN VA?

**Crosswalk to State Classifications:**

- NC: Chestnut Oak Forest, in part (NC 1990)
- VA?: No equivalent (VA 2001)

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

**USFS Ecoregions:** M221A:C?, M221B:C?, M221C:C?, M221Dc:CCC, M221Dd:CCC

**Federal Lands:** NPS (Carl Sandburg Home, Great Smoky Mountains); USFS (Chattahoochee, Cherokee, Nantahala, Sumter)

**ELEMENT SOURCES**

**References:** Allard 1990, NatureServe Ecology - Southeast U.S. unpubl. data, Schafale and Weakley 1990, Schafale pers. comm., Simon pers. comm.

## SOUTHERN RIDGE AND VALLEY BEECH FOREST

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### ELEMENT IDENTIFIERS

**NVCS association:** *Fagus grandifolia* Ridge and Valley Forest

**Database Code:** C EGL007200

**Formation:** Lowland or submontane cold-deciduous forest

**Alliance:** FAGUS GRANDIFOLIA - QUERCUS RUBRA - QUERCUS ALBA FOREST ALLIANCE (I.B.2.N.a.17)

### ELEMENT CONCEPT

**Summary:** This forest of the Tennessee Ridge and Valley is strongly dominated by *Fagus grandifolia*, which comprises 50-75% of the total canopy cover. Other species which may occur in the canopy are *Acer saccharum* and *Quercus rubra*. The subcanopy and tall-shrub layers contain *Acer saccharum*, *Fagus grandifolia*, and *Carya* spp. Some characteristic herbs include *Polystichum acrostichoides* and *Tiarella cordifolia*.

**Environment:** These forests occur at lower elevations (below 1200 feet) than *Fagus grandifolia* forests described for the southern Appalachians [see *Fagus grandifolia* / *Ageratina altissima* var. *roanensis* Forest (CEGL006246) and *Fagus grandifolia* / *Carex pensylvanica* - *Carex brunnescens* Forest (CEGL006130)].

**Vegetation:** This forest of the Tennessee Ridge and Valley is strongly dominated by *Fagus grandifolia*, which comprises 50-75% of the total canopy cover. Other species which may occur in the canopy are *Acer saccharum* and *Quercus rubra*. The subcanopy and tall-shrub layers contain *Acer saccharum*, *Fagus grandifolia*, and *Carya* spp. Some characteristic herbs include *Polystichum acrostichoides* and *Tiarella cordifolia*.

**Dynamics:** See Summary

#### Similar Associations:

- *Fagus grandifolia* / *Ageratina altissima* var. *roanensis* Forest (CEGL006246)
- *Fagus grandifolia* / *Carex pensylvanica* - *Carex brunnescens* Forest (CEGL006130)
- *Acer saccharum* - *Liriodendron tulipifera* - *Fraxinus americana* / *Staphylea trifolia* Forest (CEGL006201)
- *Fagus grandifolia* - *Quercus alba* / *Cornus florida* Forest (CEGL007881)

**Synonymy:** No information

**Comments:** Described from Tellico Pilot Project (Ridge and Valley of Tennessee, northeastern Monroe County; one stand sampled), where this type is described as a variant of *Acer saccharum* - *Liriodendron tulipifera* - *Fraxinus americana* / *Staphylea trifolia* Forest (CEGL006201) (Andreu and Tukman 1995). More information is needed to develop the concept of *Fagus grandifolia*-dominated forests in the Ridge and Valley Province. These forests occur at lower elevations (below 1200 feet) than *Fagus grandifolia* forests described for the southern Appalachians [see I.B.2.N.a *Fagus grandifolia* / *Ageratina altissima* var. *roanensis* Forest (CEGL006246) and *Fagus grandifolia* / *Carex pensylvanica* - *Carex brunnescens* Forest (CEGL006130)].

### CONSERVATION RANKING & RARE SPECIES

**GRank:** G3G4Q (99-12-17): This vegetation type is only documented for Tennessee, but it is potentially widespread in the Ridge and Valley province from Alabama to Kentucky. Actual element occurrences of this type are limited because of confusion of application of concepts in beech-dominated vegetation. The lack of element occurrences does not reflect the relative abundance of this vegetation type. The Q on the GRANK indicates that there are issues about the taxonomic distinctiveness of this type, and that its merger with another type would make it less rare. The Grank was formerly G3G5Q. Changing this to G3G4Q helps to clarify its rarity and status. If it is merged with other beech communities or its geographic range is expanded, its rank would probably become G4.

**High-ranked species:** No information

### ELEMENT DISTRIBUTION

**Range:** Only documented for Tennessee, but it is potentially widespread in the Ridge and Valley province from Alabama to western Virginia.

**States:** AL? TN

#### Crosswalk to State Classifications:

- TN: Beech, RV? (TN 1994)

**TNC Ecoregions:** 50:C

**USFS Ecoregions:** 221J:CC

**Federal Lands:** TVA (Tellico); USFS (Cherokee?, Daniel Boone?)

### ELEMENT SOURCES

**References:** Andreu and Tukman 1995, Braun 1950, Pyne 1994

**RICH LOW ELEVATION APPALACHIAN OAK FOREST**

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**ELEMENT IDENTIFIERS**

**NVCS association:** *Quercus alba* - (*Quercus rubra*, *Acer saccharum*, *Fagus grandifolia*) / *Aesculus flava* Forest

**Database Code:** CEGL007233

**Formation:** Lowland or submontane cold-deciduous forest

**Alliance:** QUERCUS ALBA - (QUERCUS RUBRA, CARYA SPP.) FOREST ALLIANCE (I.B.2.N.a.27)

**ELEMENT CONCEPT**

**Summary:** This mesic upland forest of the Ridge and Valley is dominated by *Quercus alba*, *Carya ovata*, and *Carya alba*. *Quercus rubra* may be a dominant component of the canopy as well. Other species that may be present in the canopy are *Acer saccharum*, *Liriodendron tulipifera*, *Quercus velutina*, *Carya glabra*, *Fraxinus americana*, *Fagus grandifolia*, *Prunus serotina*, *Ulmus rubra*, and *Juglans nigra*. *Acer saccharum* may strongly dominate the subcanopy, this perhaps being a result of fire suppression. Other common subcanopy species include *Fraxinus americana*, *Ostrya virginiana*, *Asimina triloba*, *Fagus grandifolia*, *Oxydendrum arboreum*, and *Ulmus alata*. In the Ridge and Valley, examples may infrequently contain *Pinus virginiana*, *Quercus prinus*, *Aesculus flava*, *Tilia americana* var. *heterophylla*, *Pinus echinata*, *Pinus strobus*, and *Tsuga canadensis*. Shrubs of various heights are commonly present; these may include *Frangula caroliniana*, *Corylus cornuta*, *Vaccinium stamineum*, *Cercis canadensis*, *Acer rubrum*, *Morus rubra*, and *Lindera benzoin*. The herbaceous stratum may contain *Podophyllum peltatum*, *Toxicodendron radicans*, *Polystichum acrostichoides*, *Maianthemum racemosum* ssp. *racemosum*, and *Desmodium* spp. (specifically *Desmodium pauciflorum* and *Desmodium nudiflorum*).

**Environment:** See Summary

**Vegetation:** A stand on the western edge of the Blue Ridge (Cherokee National Forest, Tennessee, 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 prinus*, 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*, *Dichantheium boscii* (= *Panicum boscii*), *Asplenium resiliens*, *Symphyotrichum undulatum* (= *Aster undulatus*), *Dioscorea quaternata*, *Solidago caesia*, *Galium circaezans*, *Antennaria plantaginifolia*, *Pellaea atropurpurea*, *Verbesina occidentalis*, *Scutellaria elliptica*, *Arabis* sp., *Agrimonia* sp., *Geum* sp., *Symphyotrichum divaricatum* (= *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.

**Dynamics:** See Summary

**Similar Associations:**

- *Quercus alba* - *Quercus rubra* - *Carya ovata* Glaciated Forest (CEGL002068)--is an equivalent of glaciated landscapes of the Midwest.
- *Quercus alba* - *Quercus rubra* - *Carya ovata* / *Cercis canadensis* - *Juniperus virginiana* var. *virginiana* Forest (CEGL007240)--is a related drier forest association.
- *Quercus rubra* - *Acer saccharum* - *Liriodendron tulipifera* Forest (CEGL006125)--has a more northeasterly distribution.
- *Acer saccharum* - *Quercus muehlenbergii* / *Cercis canadensis* Forest (CEGL006017)--is a drier association found to the North and East.

**Synonymy:**

- *Quercus alba* - *Carya ovata* - *Carya alba* Forest (Andreu and Tukman 1995)

**Comments:** Originally described from Tellico Pilot Project (Ridge and Valley of Tennessee, northeastern Monroe County; 26 stands sampled) as the *Quercus alba* - *Carya ovata* - *Carya alba* Forest, where it was recorded from slopes with northwestern, northern and eastern aspects at elevations from 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 fire suppression. More information is needed on the variability of this community across its range. Described from Ridge and Valley, the concept is generally applied to forests in the Southern Cumberlands and adjacent Interior Low Plateau, but the range of variability is not fully understood. 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* var. *virginiana* Forest (CEGL007240). May 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 1870 feet in elevation.

**CONSERVATION RANKING & RARE SPECIES**

**GRank:** G4 (00-01-14): 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 Grank was formerly G3G5. Changing this to G4 helps to clarify its status.

**High-ranked species:** No information

**ELEMENT DISTRIBUTION**

**Range:** At least a moderately widespread type, probably present throughout the Ridge and Valley and possibly adjoining ecoregions. A comprehensive review of related types is not complete.

**States:** AL? KY TN VA?

**Crosswalk to State Classifications:**

- TN: White Oak - Northern Red Oak, RV, in part (TN 1994)
- VA?: No equivalent (VA 2001)

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

**USFS Ecoregions:** 221Ha:CCC, 221Hb:CCC, 221Hc:CCP, 221He:CCC, 221Ja:CCP, 221Jb:CCC, 222Eb:PPP, 231Cc:CCC, 231Dc:CCC, M221Dd:CCC

**Federal Lands:** DOE (Oak Ridge); NPS (Great Smoky Mountains); TVA (Tellico); USFS (Chattahoochee, Cherokee, Daniel Boone)

**ELEMENT SOURCES**

**References:** Andreu and Tukman 1995, Fleming 1999, Fleming pers. comm., NatureServe Ecology - Southeast U.S. unpubl. data, Pyne 1994

**RIDGE AND VALLEY CALCAREOUS FOREST****ELEMENT IDENTIFIERS**

**NVCS association:** *Acer saccharum* - *Liriodendron tulipifera* - *Fraxinus americana* / *Staphylea trifolia* Forest

**Database Code:** C EGL006201

**Formation:** Lowland or submontane cold-deciduous forest

**Alliance:** FAGUS GRANDIFOLIA - ACER SACCHARUM - (LIRIODENDRON TULIPIFERA) FOREST ALLIANCE (I.B.2.N.a.15)

**ELEMENT CONCEPT**

**Summary:** This rich, closed-canopy forest type is described from the southern Ridge and Valley in Tennessee, where it is found on steep to very steep north-facing, rocky-bottomed ephemeral and intermittent creeks, over soils weathered from calcareous shale and calcareous sandstone. This community is dominated by some combination of *Acer saccharum*, *Liriodendron tulipifera* and *Fraxinus americana*. Canopy associates can include *Carya ovata*, *Carya glabra*, *Quercus alba*, *Quercus rubra*, *Fagus grandifolia*, *Juglans nigra*, *Tilia americana* var. *heterophylla*, *Aesculus flava*, and *Asimina triloba*. *Quercus prinus*, *Quercus muehlenbergii*, *Celtis occidentalis*, *Liquidambar styraciflua*, *Ulmus rubra*, and *Quercus velutina* may also be present. The relatively dense tall-shrub stratum includes *Staphylea trifolia*, *Lindera benzoin*, *Carpinus caroliniana*, *Hamamelis virginiana*, *Cercis canadensis* and *Asimina triloba*. The sparse to moderately dense herbaceous stratum includes *Asarum canadense*, *Parthenocissus quinquefolia*, *Sanguinaria canadensis*, *Actaea racemosa*, *Viola* spp., *Impatiens pallida*, *Impatiens capensis*, *Arundinaria gigantea*, *Polystichum acrostichoides*, and *Podophyllum peltatum*.

**Environment:** This forest type is known from the southern Ridge and Valley of Tennessee, on steep to very steep north-facing, rocky bottomed ephemeral and intermittent creeks, over soils weathered from calcareous shale and calcareous sandstone.

**Vegetation:** The canopy of stands of this community is dominated by some combination of *Acer saccharum*, *Liriodendron tulipifera* and *Fraxinus americana*. Canopy associates can include *Carya ovata*, *Carya glabra*, *Quercus alba*, *Quercus rubra*, *Fagus grandifolia*, *Juglans nigra*, *Tilia americana* var. *heterophylla*, *Aesculus flava*, and *Asimina triloba*. *Quercus prinus*, *Quercus muehlenbergii*, *Celtis occidentalis*, *Liquidambar styraciflua*, *Ulmus rubra*, and *Quercus velutina* may also be present. The relatively dense tall-shrub stratum includes *Staphylea trifolia*, *Lindera benzoin*, *Carpinus caroliniana*, *Hamamelis virginiana*, *Cercis canadensis*, and *Asimina triloba*. The sparse to moderately dense herbaceous stratum includes *Asarum canadense*, *Parthenocissus quinquefolia*, *Sanguinaria canadensis*, *Actaea racemosa*, *Viola* spp., *Impatiens pallida*, *Impatiens capensis*, *Arundinaria gigantea*, *Polystichum acrostichoides*, and *Podophyllum peltatum* (Campbell 2001).

**Dynamics:** This type may occupy small disturbed areas within mature forests or it may occur in more uniform stands after large-scale disturbances caused by human activity (Campbell 2001).

**Similar Associations:**

- *Acer saccharum* - *Fraxinus americana* - *Juglans cinerea* / *Staphylea trifolia* Forest (CEGL006020)--may be similar but occurs to the north of the range of *Aesculus flava*.
- *Acer saccharum* - *Fraxinus americana* - *Tilia americana* - *Magnolia acuminata* / *Actaea racemosa* Forest (CEGL006237)
- *Fagus grandifolia* - *Acer saccharum* - *Liriodendron tulipifera* Unglaciated Forest (CEGL002411)--appears to overlap with CEGL006201.

**Synonymy:** No information

**Comments:** This type was initially described from Tellico Pilot Project (Ridge and Valley of Tennessee, northeast Monroe County), (9 stands sampled), where these forests occur along steep, ephemeral and intermittent streams, to 1200 feet, over soils derived from calcareous sandstone and shales. This association seems to be transitional in composition to southern Appalachian mixed mesophytic forests in I.B.2.N.a *Liriodendron tulipifera* - *Tilia americana* var. *heterophylla* - *Aesculus flava* - *Acer saccharum* Forest Alliance (A.235) but lacks the rich herbaceous flora of those forests. More work is needed to resolve this and clarify the floristic, geographic, and environmental relationship of this association to others in this alliance.

**CONSERVATION RANKING & RARE SPECIES**

**GRank:** G4? (01-10-09): This community is believed to be relatively common and secure, although good mature examples of large size may be uncommon. Additional information is needed relative to its distribution and relation to other similar communities. The rank was formerly G3G5, and changing it to G4? (which is equivalent) makes it clear that this is not to be considered a rare community type.

**High-ranked species:** No information

**ELEMENT DISTRIBUTION**

**Range:** This forest was described from the southern Ridge and Valley in Tennessee. Its full range is not known.

**States:** GA? KY TN WV

**Crosswalk to State Classifications:**

- KY: Calcareous Mesophytic Forest, in part (KY 1991)

**TNC Ecoregions:** 50:C

**USFS Ecoregions:** 221J:CC, 222Eo:CCC, M221Aa:???, M221C:??

**Federal Lands:** TVA (Tellico); USFS (Chattahoochee?, Cherokee?, Daniel Boone)

**ELEMENT SOURCES**

**References:** Andreu and Tukman 1995, Campbell 2001, Evans 1991, Fleming 1999

**SOUTHERN APPALACHIAN ACID COVE FOREST (TYPIC TYPE)**

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**ELEMENT IDENTIFIERS**

**NVCS association:** *Tsuga canadensis* - *Liriodendron tulipifera* - *Betula lenta* / *Rhododendron maximum* Forest

**Database Code:** C EGL007543

**Formation:** Mixed needle-leaved evergreen - cold-deciduous forest

**Alliance:** TSUGA CANADENSIS - LIRIODENDRON TULIPIFERA FOREST ALLIANCE (I.C.3.N.a.33)

**ELEMENT CONCEPT**

**Summary:** This association includes hemlock-hardwood forests of lower to intermediate elevations in the Southern Blue Ridge and upper Piedmont, ranging from southwestern Virginia, south and west to northwestern Georgia. These communities occur at low to middle elevations (1300-3500 feet) in the mountains and foothills, generally in coves, gorges, or sheltered slopes, over acid soils. The canopy is usually dominated by *Tsuga canadensis* but can be comprised mainly of deciduous trees such as *Liriodendron tulipifera*, *Betula lenta*, and *Acer rubrum*. Other deciduous species more typical of 'rich' coves may occur as scattered individuals; *Tilia americana* var. *heterophylla*, *Fraxinus americana*, and *Fagus grandifolia*. Other canopy/subcanopy species often include *Quercus alba*, *Quercus rubra*, *Magnolia fraseri*, *Ilex opaca* var. *opaca*, *Calycanthus floridus*, *Halesia tetraptera* var. *tetraptera*, and *Pinus strobus*. *Rhododendron maximum* is scattered to dominant in the shrub stratum. Other typical shrubs include *Kalmia latifolia* and *Leucothoe fontanesiana*. Herbaceous cover is sparse but can be diverse and is composed of acid-loving species. Typical herbs include *Polystichum acrostichoides*, *Dennstaedtia punctilobula*, *Goodyera pubescens*, *Mitchella repens*, *Thelypteris noveboracensis*, *Galax urceolata*, *Viola rotundifolia*, *Hexastylis* sp., and *Tiarella cordifolia*.

**Environment:** Over its full geographic range, this association is typically found at lower to intermediate elevations (400-1060 m or 1300-3500 feet) in the southern Appalachians and adjacent foothills. Habitats are located on gentle to steep, lower slopes and in coves or gorges with acidic soils. The type often occurs in linear patches along stream bottoms and in steep ravines. Although frequently associated with streams, it is not a wetland. Habitats in the Virginia part of the range are similar and are mostly situated below 900 m (3000 feet) elevation. Soils collected from plots are extremely acidic (mean pH = 3.9) and infertile, with high iron and aluminum levels and very low total base saturation.

**Vegetation:** This association encompasses hemlock - hardwood forests with canopies dominated by mixtures of *Tsuga canadensis* with deciduous trees such as *Liriodendron tulipifera*, *Betula lenta*, and *Acer rubrum*. Other deciduous species more typical of fertile coves, including *Tilia americana* var. *heterophylla*, *Fraxinus americana*, and *Fagus grandifolia*, may occur as scattered individuals. Minor overstory and understory species include *Quercus alba*, *Quercus rubra*, *Magnolia fraseri*, *Ilex opaca*, *Calycanthus floridus*, *Halesia tetraptera*, and *Pinus strobus*. *Rhododendron maximum* is scattered to dominant in the shrub stratum. Other typical shrubs include *Kalmia latifolia* and *Leucothoe fontanesiana*. Herbaceous cover is sparse but can be diverse and is composed of acid-loving species. Typical herbs include *Polystichum acrostichoides*, *Goodyera pubescens*, *Mitchella repens*, *Thelypteris noveboracensis*, *Galax urceolata*, *Hexastylis* spp., and *Tiarella cordifolia*. ^Virginia examples of this association are similar to those further south but generally lack *Ilex opaca*, *Calycanthus floridus*, *Halesia tetraptera*, and *Leucothoe fontanesiana*. 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*. *Hamamelis virginiana* and *Acer pensylvanicum* are additional, frequent understory species. The shrub layers of Virginia occurrences are consistently dominated by dense (usually >50% cover), often nearly impenetrable colonies of *Rhododendron maximum*. Frequent low-cover species of sparse herb layers include *Galax urceolata*, *Chimaphila maculata*, *Eurybia divaricata* (= *Aster divaricatus*), *Arisaema triphyllum*, *Monotropa uniflora*, *Mitchella repens*, and *Medeola virginiana*. The spectacular sedge *Cymophyllus fraserianus* is often associated with this forest.

**Dynamics:** See Summary

**Similar Associations:**

- *Tsuga canadensis* - *Betula alleghaniensis* / *Rhododendron maximum* / *Leucothoe fontanesiana* Forest (CEGL007861)
- *Tsuga canadensis* - (*Fagus grandifolia*, *Tilia americana* var. *heterophylla*) / *Magnolia tripetala* Forest (CEGL008407)

**Synonymy:**

- *Liriodendron tulipifera* - *Betula lenta* - *Tsuga canadensis* / *Rhododendron maximum* Forest (Fleming and Coulling 2001)
- IA5b. Southern Appalachian Hemlock Cove Forest (Allard 1990) B. in part
- Cove Forest (Patterson et al. 1994) B. in part
- Type 5 (Newell and Peet 1995)
- Mixed Mesophytic Coves (Gettman 1974)
- Yellow-poplar - Eastern Hemlock: 58 (Eyre 1980) B. in part

**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*



## Association Descriptions

*racemosa* (= *Cimicifuga 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. 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*. ^This community type is grossly under-represented by plot data considering its extensive distribution in southwestern Virginia. In the 900-1060 m (3000-3500 feet) elevation range, the type becomes transitional to *Tsuga canadensis* - *Betula alleghaniensis* / *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.

### CONSERVATION RANKING & RARE SPECIES

**GRank:** G5 (97-12-01): 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*.

**High-ranked species:** AGERATINA ALTISSIMA VAR ROANENSIS (G5T3T4), BETULA UBER (G1Q), BOTRYCHIUM JENMANII (G3G4), DIERVILLA RIVULARIS (G3), HEXASTYLIS CONTRACTA (G3), HEXASTYLIS NANIFLORA (G2), HEXASTYLIS RHOMBIFORMIS (G2), ISOTRIA MEDEOLOIDES (G2G3), MALAXIS BAYARDII (G2?), MONOTROPSIS ODORATA (G3), SHORTIA GALACIFOLIA VAR BREVI-STYLA (G2T1Q), SHORTIA GALACIFOLIA VAR GALACIFOLIA (G2T2), TRILLIUM PERSISTENS (G1), TRILLIUM PUSILLUM VAR 1 (G3T3), WALDSTEINIA LOBATA (G2?)

### ELEMENT DISTRIBUTION

**Range:** This community occurs in the Southern Blue Ridge and peripherally in the upper Piedmont, ranging from southwestern Virginia, south and west to northwestern Georgia.

**States:** GA NC SC TN VA WV

#### Crosswalk to State Classifications:

- NC: Acidic Cove Forest, in part (NC 1990)
- VA: Acidic Cove Forest, in part (VA 2001)

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

**USFS Ecoregions:** 231Aa:CCC, M221Aa:CCC, M221Ab:CCC, M221Ca:CPP, M221Cb:CPP, M221Cc:CPP, M221Ce:CPP, M221Da:CC?, M221Db:CCC, M221Dc:CCC, M221Dd:CCC, M231Ad:CCC

**Federal Lands:** NPS (Carl Sandburg Home, Great Smoky Mountains); USFS (Chattahoochee, Cherokee, Jefferson, Nantahala, Pisgah, Sumter)

### ELEMENT SOURCES

**References:** Allard 1990, Eyre 1980, Fleming and Coulling 2001, Fleming et al. 2001, Gettman 1974, Newell and Peet 1995, Patterson 1994, Patterson et al. 1994, Schafale and Weakley 1990

**SOUTHERN APPALACHIAN COVE FOREST (RICH MONTANE TYPE)****ELEMENT IDENTIFIERS**

**NVCS association:** *Aesculus flava* - *Acer saccharum* - (*Fraxinus americana*, *Tilia americana*) / *Hydrophyllum canadense* - *Solidago flexicaulis* Forest

**Database Code:** C EGL007695

**Formation:** Lowland or submontane cold-deciduous forest

**Alliance:** LIRIODENDRON TULIPIFERA - TILIA AMERICANA VAR. HETEROPHYLLA - AESCULUS FLAVA - ACER SACCHARUM FOREST ALLIANCE (I.B.2.N.a.23)

**ELEMENT CONCEPT**

**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 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 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*, *Cymophyllus fraserianus*, *Cystopteris protrusa*, *Deparia acrostichoides*, *Diplazium pycnocarpon*, *Prosartes lanuginosa* (= *Disporum lanuginosum*), *Dryopteris goldiana*, *Hepatica nobilis* var. *acuta*, *Hydrophyllum canadense*, *Osmorhiza claytonii*, *Solidago flexicaulis*, and *Viola canadensis*. The herbaceous stratum can have local dominance by *Laportea canadensis*, *Viola canadensis*, *Dryopteris intermedia*, *Actaea podocarpa* (= *Cimicifuga americana*), *Actaea racemosa* (= *Cimicifuga 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.

**Environment:** In the southern part of its range, this vegetation type occurs on protected, concave, landforms, at elevations ranging from 600-1400 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 elevation range from 1100-1400 m (3600-4600 feet). Virginia sites supporting this community are on strongly concave, moderately steep (mean = 17 degrees) slopes with north to east aspects. Underlying bedrock includes igneous metamorphic formations, shale, mudstone, and calcareous sandstone. Surface cover of bedrock and boulders ranges from 0-40%. Dark, apparently fertile, loamy soils at plot sampling sites are very strongly acidic (mean pH = 4.7) but have high levels of calcium, magnesium, and manganese.

**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*, *Cymophyllus fraserianus*, *Cystopteris protrusa*, *Deparia acrostichoides*, *Diplazium pycnocarpon*, *Prosartes lanuginosa* (= *Disporum lanuginosum*), *Dryopteris goldiana*, *Hepatica nobilis* var. *acuta*, *Hydrophyllum canadense*, *Osmorhiza claytonii*, *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, at least locally, are *Actaea podocarpa*, *Caulophyllum thalictroides*, *Deparia acrostichoides*, *Dryopteris intermedia*, *Geranium maculatum*, *Hydrophyllum canadense*, *Hydrophyllum virginianum*, *Impatiens pallida*, *Laportea canadensis*, *Phacelia fimbriata*, *Sanicula odorata*, *Solidago flexicaulis*, *Uvularia grandiflora*, *Viola canadensis*, and *Viola pubescens*. Many additional herbs occur at low cover. Mean species richness of plot-sampled stands is 51 taxa per 400 m<sup>2</sup>.

**Dynamics:** See Summary

**Similar Associations:** No information

**Synonymy:**

## Association Descriptions

- *Acer saccharum* - *Tilia americana* var. *heterophylla* - *Fraxinus americana* / *Actaea podocarpa* - *Sanicula odorata* - (*Phacelia fimbriata*) Forest (Fleming and Coulling 2001)
- Rich Cove Forest (Montane Rich Subtype) (Schafale pers. comm.)
- Open Slope Mesophytic Forest (Rheinhardt and Ware 1984)
- Sugar Maple - Basswood: 26 (Eyre 1980) B

**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.

### CONSERVATION RANKING & RARE SPECIES

**GRank:** G3G4 (99-12-29): 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, a region of 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.

**High-ranked species:** AGERATINA ALTISSIMA VAR ROANENSIS (G5T3T4), ACONITUM RECLINATUM (G3), CARDAMINE FLAGELLIFERA (G3)

### ELEMENT DISTRIBUTION

**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.

**States:** GA? NC TN VA

#### Crosswalk to State Classifications:

- NC: Rich Cove Forest, in part (NC 1990)
- VA: Rich Cove and Slope Forest, in part (VA 2001)

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

**USFS Ecoregions:** M221Aa:CCC, M221Bd:C??, M221Cc:CC?, M221Ce:CCC, M221Dc:CCC, M221Dd:CCC

**Federal Lands:** NPS (Great Smoky Mountains); USFS (Cherokee, Jefferson, Nantahala, Pisgah)

### ELEMENT SOURCES

**References:** Eyre 1980, Fleming and Coulling 2001, Fleming et al. 2001, NatureServe Ecology - Southeast U.S. unpubl. data, Patterson et al. 1999, Rheinhardt and Ware 1984, Schafale and Weakley 1990, Schafale pers. comm.

**SOUTHERN APPALACHIAN COVE FOREST (TYPIC MONTANE TYPE)****ELEMENT IDENTIFIERS**

**NVCS association:** Liriodendron tulipifera - Aesculus flava - (Fraxinus americana, Tilia americana var. heterophylla) / Actaea racemosa - Laportea canadensis Forest

**Database Code:** CEG007710

**Formation:** Lowland or submontane cold-deciduous forest

**Alliance:** LIRIODENDRON TULIPIFERA - TILIA AMERICANA VAR. HETEROPHYLLA - AESCULUS FLAVA - ACER SACCHARUM FOREST ALLIANCE (I.B.2.N.a.23)

**ELEMENT CONCEPT**

**Summary:** This association represents deciduous forests of concave lower slopes and flats at middle elevations (2000-4500 feet) in the Southern Blue Ridge. The canopy is dominated by some mixture of rich site mesophytic species such as *Aesculus flava*, *Fraxinus americana*, *Tilia americana* var. *heterophylla*, and *Magnolia acuminata*, occurring with more widely tolerant tree species such as *Liriodendron tulipifera*, *Acer rubrum*, *Tsuga canadensis*, and *Betula lenta*. The herbaceous stratum is diverse and often very lush. Typical herbaceous species include *Actaea racemosa* (= *Cimicifuga racemosa*), *Caulophyllum thalictroides*, *Prosartes lanuginosa* (= *Disporum lanuginosum*), *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 goldiana*, *Aquilegia canadensis*, *Solidago flexicaulis*, *Deparia acrostichoides*, and *Cystopteris protrusa*, by generally occurring at elevations above 2000 feet, and by lacking species typical of lower elevation forests.

**Environment:** This association is characteristic of concave lower slopes and flats at middle elevations (600-1200 m or 2000-4500 feet) in the Southern Blue Ridge. At the northern end of the range in Virginia, elevation of the few known occurrences decreases from 760 m (2500 feet) in the Southern Blue Ridge to as low as 300 m (1000 feet) at the extreme north end of the Blue Ridge in Clarke County. Five plot-sampled stands occupy sites underlain by base-rich substrates, including metabasalt (greenstone), amphibolite, and dolomite. These sites are mostly situated on moderately steep (mean slope = 17 degrees), straight or concave slopes with east to northeast aspects. Soils are deep, dark, and fertile, with the highest mean pH (6.3), calcium (2466 ppm), and magnesium (296 ppm) levels among strictly montane cove forests in Virginia.

**Vegetation:** In the heart of its Southern Blue Ridge range, canopies of this community type are dominated by variable mixtures of nutrient-demanding mesophytic species such as *Aesculus flava*, *Fraxinus americana*, and *Tilia americana* var. *heterophylla*, 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*, *Aruncus 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 goldiana*, *Aquilegia canadensis*, *Solidago flexicaulis*, *Deparia acrostichoides*, and *Cystopteris protrusa*; by generally occurring at elevations above 600 m (2000 feet); and by lacking species typical of lower-elevation forests. ^Virginia examples may represent somewhat transitional or depauperate variants in the northern periphery of the association's range. *Aesculus sylvatica* is entirely absent from the documented stands, in which *Liriodendron tulipifera*, *Fraxinus americana*, *Tilia 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 constant understory tree that occasionally reaches the overstory. All occurrences have a moderately dense shrub layer dominated exclusively by *Lindera benzoin* (25-50% cover in plots). The herbaceous flora is extremely lush and forb-rich throughout the entire growing season, with constantly changing suites of patch-dominants flowering, fruiting, and evanescent. *Trillium grandiflorum* is characteristically abundant in the vernal herbaceous complex, which also includes *Arisaema triphyllum*, *Maianthemum racemosum*, *Galearis spectabilis*, *Viola pubescens*, *Sanguinaria canadensis*, *Stellaria pubera*, *Podophyllum peltatum*, *Asarum canadense*, *Hybanthus concolor*, and *Thalictrum dioicum*. During the summer, prevalent herbs are *Actaea racemosa*, *Impatiens pallida*, *Circaea lutetiana* ssp. *canadensis*, *Monarda clinopodia*, *Sanicula odorata*, and *Collinsonia canadensis*. Species richness of plot-sampled stands ranges from 46 to 59 taxa per 400 m<sup>2</sup> (mean = 52).

**Dynamics:** See Summary

**Similar Associations:** No information

**Synonymy:**

- *Liriodendron tulipifera* - *Tilia americana* - *Fraxinus americana* / *Lindera benzoin* / *Trillium grandiflorum* - *Impatiens pallida* Forest (Fleming and Coulling 2001)
- Rich Cove Forest, Montane Intermediate Subtype (Schafale pers. comm.)
- Yellow-poplar - White Oak - Northern Red Oak: 59 (Eyre 1980) B

## Association Descriptions

**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 goldiana*, *Aquilegia canadensis*, *Solidago flexicaulis*, *Deparia acrostichoides*, and *Cystopteris protrusa*, by generally occurring at elevations above 2000 feet, and by lacking species typical of lower elevation forests. ^Although represented only by a few geographically disparate examples, this community type 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.

### CONSERVATION RANKING & RARE SPECIES

**GRank:** G4 (98-04-30): This community is uncommon due to specialized habitat requirements, but it is not rare. It is secure throughout its range, but susceptible to impacts by logging due to its location in accessible topographic positions.

**High-ranked species:** ACONITUM RECLINATUM (G3), AGERATINA ALTISSIMA VAR ROANENSIS (G5T3T4), CARDAMINE FLAGELLIFERA (G3)

### ELEMENT DISTRIBUTION

**Range:** This association occurs in the southern Appalachian Mountains of eastern Tennessee, western North Carolina, northeastern Georgia, and southwestern Virginia. Scattered outliers occur on the northern Virginia Blue Ridge and in the southwestern Virginia Ridge and Valley region adjacent to the Blue Ridge.

**States:** GA NC TN VA

#### Crosswalk to State Classifications:

- NC: Rich Cove Forest, in part (NC 1990)
- VA: Rich Cove and Slope Forest, in part (VA 2001)

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

**USFS Ecoregions:** M221Ab:CCC, M221Da:CCC, M221Db:CCC, M221Dc:CCC, M221Dd:CCC

**Federal Lands:** NPS (Blue Ridge Parkway, Great Smoky Mountains); USFS (Chattahoochee, Cherokee, Jefferson, Nantahala, Pisgah)

### ELEMENT SOURCES

**References:** Eyre 1980, Fleming and Coulling 2001, Fleming et al. 2001, Major et al. 1999, Schafale and Weakley 1990, Schafale pers. comm.

**SOUTHERN APPALACHIAN COVE FOREST (TYPIC FOOTHILLS TYPE)****ELEMENT IDENTIFIERS**

**NVCS association:** *Liriodendron tulipifera* - *Tilia americana* var. *heterophylla* - (*Aesculus flava*) / *Actaea racemosa* Forest

**Database Code:** CEGL007291

**Formation:** Lowland or submontane cold-deciduous forest

**Alliance:** LIRIODENDRON TULIPIFERA - TILIA AMERICANA VAR. HETEROPHYLLA - AESCULUS FLAVA - ACER SACCHARUM FOREST ALLIANCE (I.B.2.N.a.23)

**ELEMENT CONCEPT**

**Summary:** This association encompasses mixed mesophytic forests of the low mountains and foothills, mostly below 2000 feet elevation in the Southern Blue Ridge escarpment and adjacent Piedmont. This forest is dominated by *Liriodendron tulipifera*, but other canopy species typically include *Tilia americana* var. *heterophylla*, *Fraxinus americana*, *Carya alba*, *Aesculus flava*, *Halesia tetraptera*, *Fagus grandifolia*, *Quercus alba*, and *Acer rubrum*. *Tsuga canadensis* is not dominant, shrubs are sparse, if present. In the vicinity of the Chauga River, South Carolina, *Acer leucoderme* may dominate the understory. Ferns are often locally dominant, typically *Thelypteris noveboracensis*, *Polystichum acrostichoides*, *Adiantum pedatum*, *Phegopteris hexagonoptera*, and *Athyrium filix-femina* ssp. *asplenioides*. The herb stratum is diverse and coverage is often scattered. Typical species include *Actaea pachypoda*, *Asarum canadense*, *Carex plantaginea*, *Carex austrocaroliniana*, *Actaea racemosa* (= *Cimicifuga racemosa*), *Collinsonia canadensis*, *Goodyera pubescens*, *Hepatica nobilis* var. *acuta*, *Viola blanda*, *Galium latifolium*, *Galium circaezans*, *Trillium catesbaei*, *Maianthemum racemosum*, *Sanguinaria canadensis*, *Thalictrum thalictroides*, and *Monarda clinopodia*. This forest occurs on moderately steep, protected slopes and in coves, over nutrient-rich soils formed from colluvium. This association can have species with Piedmont affinities and lacks species typical of higher elevation cove forests, such as *Acer saccharum*, *Impatiens pallida*, *Clintonia umbellulata*, *Prosartes maculata* (= *Disporum maculatum*), *Polygonatum pubescens*, *Streptopus lanceolatus* var. *roseus* (= *Streptopus roseus*), *Astilbe biternata*, *Veratrum viride*, and *Maianthemum canadense*.

**Environment:** This association encompasses mixed mesophytic forests of the low mountains and foothills, mostly below 2000 feet elevation in the Southern Blue Ridge escarpment and adjacent Piedmont. This forest occurs on moderately steep, protected slopes and in coves, over nutrient-rich soils formed from colluvium.

**Vegetation:** The canopy of stands of this forest is dominated by *Liriodendron tulipifera*, but other canopy species typically include *Tilia americana* var. *heterophylla*, *Fraxinus americana*, *Carya alba*, *Aesculus flava*, *Halesia tetraptera*, *Fagus grandifolia*, *Quercus alba*, and *Acer rubrum*. *Tsuga canadensis* is not dominant; shrubs are sparse, if present. In the vicinity of the Chauga River, South Carolina, *Acer leucoderme* may dominate the understory. Ferns are often locally dominant, typically *Thelypteris noveboracensis*, *Polystichum acrostichoides*, *Adiantum pedatum*, *Phegopteris hexagonoptera*, and *Athyrium filix-femina* ssp. *asplenioides*. The herb stratum is diverse and coverage is often scattered. Typical species include *Actaea pachypoda*, *Asarum canadense*, *Carex plantaginea*, *Carex austrocaroliniana*, *Actaea racemosa* (= *Cimicifuga racemosa*), *Collinsonia canadensis*, *Goodyera pubescens*, *Hepatica nobilis* var. *acuta*, *Viola blanda*, *Galium latifolium*, *Galium circaezans*, *Trillium catesbaei*, *Maianthemum racemosum*, *Sanguinaria canadensis*, *Thalictrum thalictroides*, and *Monarda clinopodia*.

**Dynamics:** See Summary

**Similar Associations:**

- *Liriodendron tulipifera* - *Tilia americana* var. *heterophylla* - *Aesculus flava* - *Acer saccharum* / *Magnolia tripetala* Forest (CEGL005222)--of the Cumberland Mountains and Plateau.

**Synonymy:**

- IA5a. Southern Appalachian Mesophytic Cove Forest (Allard 1990) B. in part

**Comments:** This association was originally defined from the Chattooga Basin Project data (S. Simon pers. comm.). Additional examples are known from low escarpment and foothills areas of the Southern Blue Ridge, including the Brushy Mountains (Wilkes County, North Carolina), Linville Gorge (Burke County, North Carolina), and the Highland Ranger District, Nantahala National Forest (Jackson and Macon counties, North Carolina). Similar vegetation in the Cumberland Mountains and Plateau is distinguished by the lack of such species as *Carex austrocaroliniana* and *Trillium catesbaei*. [See *Liriodendron tulipifera* - *Tilia americana* var. *heterophylla* - *Aesculus flava* - *Acer saccharum* / *Magnolia tripetala* Forest (CEGL005222).] 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.

**CONSERVATION RANKING & RARE SPECIES**

**GRank:** G4? (97-08-14):

**High-ranked species:** *AGERATINA ALTISSIMA* VAR. *ROANENSIS* (G5T3T4), *CALYSTEGIA CATESBIANA* (G3), *COLLINSONIA VERTICILLATA* (G3)

**ELEMENT DISTRIBUTION**

**Range:** This community occurs in the escarpment region of the Southern Blue Ridge in western North Carolina, northern South Carolina, and Georgia.

**States:** GA NC SC TN? VA?

**Crosswalk to State Classifications:**

- GA: Cove Hardwood Forest (GA 1990)
- NC: Rich Cove Forest, in part (NC 1990)
- SC: Cove Forest (SC 1986)
- VA?: No equivalent (VA 2001)

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

**USFS Ecoregions:** M221Dc:CCC, M221Dd:CCC

**Federal Lands:** NPS (Great Smoky Mountains?); USFS (Chattahoochee, Cherokee?, Nantahala, Pisgah?, Sumter)

**ELEMENT SOURCES**

**References:** Allard 1990, Ambrose 1990a, Nelson 1986, Schafale and Weakley 1990, Simon pers. comm.

**SOUTHERN APPALACHIAN COVE FOREST (RICH FOOTHILLS TYPE)****ELEMENT IDENTIFIERS**

**NVCS association:** *Tilia americana* var. *heterophylla* - *Fraxinus americana* - (*Ulmus rubra*) / *Sanguinaria canadensis* - (*Aquilegia canadensis*, *Asplenium rhizophyllum*) Forest

**Database Code:** CEGLO07711

**Formation:** Lowland or submontane cold-deciduous forest

**Alliance:** LIRIODENDRON TULIPIFERA - TILIA AMERICANA VAR. HETEROPHYLLA - AESCULUS FLAVA - ACER SACCHARUM FOREST ALLIANCE (I.B.2.N.a.23)

**ELEMENT CONCEPT**

**Summary:** Forests of steep, protected coves and slopes at the lower elevations (below 2000 feet) of the southern Appalachians and upper Piedmont, containing a significant component of species associated with high-base status substrates. These forests share species in common with other southern Appalachian cove forests, but are distinguished by occurring at relatively low elevations (1000-2500 feet) and by the presence of strongly calciphilic species such as *Asplenium rhizophyllum*, *Aquilegia canadensis*, *Cystopteris protrusa*, *Diplazium pycnocarpon*, *Trillium simile*, *Trillium discolor*, and *Collinsonia verticillata*. Common canopy species include *Tilia americana* var. *heterophylla*, *Liriodendron tulipifera*, *Fraxinus americana*, *Quercus rubra*, and *Aesculus flava*. Other species in the canopy and subcanopy include *Ulmus rubra*, *Juglans nigra*, *Betula lenta*, *Carya cordiformis*, *Halesia tetraptera*, and *Cornus florida*. *Acer saccharum* is generally not a constant component in these forests. The shrub stratum can be diverse, but the coverage is often quite sparse. Typical shrubs include *Hydrangea arborescens*, *Lindera benzoin*, *Calycanthus floridus*, *Philadelphus hirsutus*, *Philadelphus inodorus*, and *Rhododendron maximum*. The herbaceous stratum is dense, lush, and diverse. Some of the more characteristic species include *Sanguinaria canadensis*, *Cystopteris protrusa*, *Viola canadensis*, *Caulophyllum thalictroides*, *Hydrophyllum canadense*, *Trillium cuneatum*, *Asplenium rhizophyllum*, *Dicentra cucullaria*, *Tradescantia subaspera*, *Asarum canadense*, *Carex plantaginea*, *Hybanthus concolor*, *Trillium simile*, *Aquilegia canadensis*, *Carex austrocaroliniana*, *Deparia acrostichoides* (= *Athyrium thelypteroides*), *Diplazium pycnocarpon* (= *Athyrium pycnocarpon*), *Trillium rugelii*, and *Trillium luteum*.

**Environment:** This association covers forests of steep, protected coves and slopes at the lower elevations (below 2000 feet) of the southern Appalachians and upper Piedmont. These forests share species in common with other southern Appalachian cove forests, but are distinguished by occurring at relatively low elevations (1000-2500 feet).

**Vegetation:** Common canopy species in stands of this type include *Tilia americana* var. *heterophylla*, *Liriodendron tulipifera*, *Fraxinus americana*, *Quercus rubra*, and *Aesculus flava*. Other species in the canopy and subcanopy include *Ulmus rubra*, *Juglans nigra*, *Betula lenta*, *Carya cordiformis*, *Halesia tetraptera*, and *Cornus florida*. *Acer saccharum* is generally not a constant component in these forests. The shrub stratum can be diverse, but the coverage is often quite sparse. Typical shrubs include *Hydrangea arborescens*, *Lindera benzoin*, *Calycanthus floridus*, *Philadelphus hirsutus*, *Philadelphus inodorus*, and *Rhododendron maximum*. The herbaceous stratum is dense, lush, and diverse. Some of the more characteristic species include *Sanguinaria canadensis*, *Cystopteris protrusa*, *Viola canadensis*, *Caulophyllum thalictroides*, *Hydrophyllum canadense*, *Trillium cuneatum*, *Asplenium rhizophyllum*, *Dicentra cucullaria*, *Tradescantia subaspera*, *Asarum canadense*, *Carex plantaginea*, *Hybanthus concolor*, *Trillium simile*, *Aquilegia canadensis*, *Carex austrocaroliniana*, *Deparia acrostichoides* (= *Athyrium thelypteroides*), *Diplazium pycnocarpon* (= *Athyrium pycnocarpon*), *Trillium rugelii*, and *Trillium luteum*. These forests are distinguished by the presence of strongly calciphilic species such as *Asplenium rhizophyllum*, *Aquilegia canadensis*, *Cystopteris protrusa*, *Diplazium pycnocarpon*, *Trillium simile*, *Trillium discolor*, and *Collinsonia verticillata*.

**Dynamics:** See Summary

**Similar Associations:** No information

**Synonymy:** No information

**Comments:** These forests are distinguished by occurring at relatively low elevations (1000-2500 feet) and by the presence of strongly calciphilic species such as *Asplenium rhizophyllum*, *Aquilegia canadensis*, *Cystopteris protrusa*, *Diplazium pycnocarpon*, *Trillium simile*, *Trillium discolor*, and *Collinsonia verticillata*. 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.

**CONSERVATION RANKING & RARE SPECIES**

**GRank:** G2G3 (98-12-14): This Southern Blue Ridge cove forest is naturally uncommon because of its limitation to mafic substrates. It is threatened by logging, second home development, and forest fragmentation. Very few old-growth sites remain. 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



## Association Descriptions

of associations based on fertility and elevation is provisional and will likely need further refinement; global conservation rank is unlikely to change significantly, however.

**High-ranked species:** AGERATINA ALTISSIMA VAR ROANENSIS (G5T3T4), CARDAMINE FLAGELLIFERA (G3), CAREX RADFORDII (G2), COLLINSONIA VERTICILLATA (G3), COREOPSIS LATIFOLIA (G3), PROSARTES MACULATA (G3G4), HELIANTHUS GLAUCOPHYLLUS (G3), TRILLIUM DISCOLOR (G3), TRILLIUM RUGELII (G3), TRILLIUM SIMILE (G3)

### ELEMENT DISTRIBUTION

**Range:** This community occurs in the escarpment region of the Southern Blue Ridge in western North Carolina, northern South Carolina, and Georgia, possibly ranging into Tennessee.

**States:** GA NC SC TN?

#### Crosswalk to State Classifications:

- NC: Rich Cove Forest, Foothills Rich Subtype (NC 1990)

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

**USFS Ecoregions:** 231Ab:CCC, 231Ad:CCC, M221Dc:CCC, M221Dd:CCC

**Federal Lands:** USFS (Chattahoochee, Cherokee, Pisgah)

### ELEMENT SOURCES

**References:** Major et al. 1999, Schafale and Weakley 1990

**SOUTHERN APPALACHIAN EASTERN HEMLOCK FOREST (WHITE PINE TYPE)****ELEMENT IDENTIFIERS**

**NVCS association:** *Pinus strobus* - *Tsuga canadensis* / *Rhododendron maximum* - (*Leucothoe fontanesiana*) Forest

**Database Code:** CEG007102

**Formation:** Rounded-crowned temperate or subpolar needle-leaved evergreen forest

**Alliance:** PINUS STROBUS - TSUGA CANADENSIS FOREST ALLIANCE (I.A.8.N.b.13)

**ELEMENT CONCEPT**

**Summary:** 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. This community occurs on creek and river margins and on lower or protected slopes. This association occurs in the Southern Blue Ridge and may extend into adjacent ecoregions, such as the Cumberlands of Kentucky. These 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.

**Environment:** This community occurs on creek and river margins and on lower or protected slopes in the Southern Blue Ridge; it may extend into adjacent ecoregions, such as the Cumberlands of Kentucky.

**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, 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. Typical herbs include *Thelypteris noveboracensis*, *Chimaphila maculata*, *Mitchella repens*, *Polystichum acrostichoides*, *Medeola virginiana*, 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.

**Dynamics:** See Summary

**Similar Associations:**

- *Tsuga canadensis* / *Rhododendron maximum* - (*Clethra acuminata*, *Leucothoe fontanesiana*) Forest (CEGL007136)--dominated by *Tsuga canadensis*.

**Synonymy:**

- IA5b. Southern Appalachian Hemlock Cove Forest (Allard 1990) B. in part
- White Pine - Hemlock: 22 (Eyre 1980) B. in part
- Eastern Hemlock: 23 (Eyre 1980) B. in part
- White pine-eastern hemlock/great laurel dry forest: southern type (CAP 1998)

**Comments:** Similar forests in the Cumberlands of Kentucky lack *Leucothoe fontanesiana*, and have *Magnolia macrophylla* rather than *Magnolia fraseri*. This forest is common in the Chattooga River basin of South Carolina and Georgia.

**CONSERVATION RANKING & RARE SPECIES**

**GRank:** G4 (97-12-01):

**High-ranked species:** No information

**ELEMENT DISTRIBUTION**

**Range:** This community occurs in the Southern Blue Ridge, but extends into adjacent Cumberland Plateau or Ridge and Valley (?) ecoregions.

**States:** GA KY NC SC TN VA?

**Crosswalk to State Classifications:**

- KY: No equivalent (KY 1991)
- NC: Canada Hemlock Forest, in part (NC 1990)
- VA?: No equivalent (VA 2001)

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

**USFS Ecoregions:** 221Hc:CCC, 221He:CCC, 222Eo:CCC, M221Be:CPP, M221Dc:CCC, M221Dd:CCC

**Federal Lands:** NPS (Great Smoky Mountains); USFS (Chattahoochee, Cherokee, Daniel Boone, Nantahala, Pisgah, Sumter)

**ELEMENT SOURCES**

**References:** Allard 1990, CAP 1998, Eyre 1980, Schafale and Weakley 1990

**SOUTHERN APPALACHIAN EASTERN HEMLOCK FOREST (TYPIC TYPE)****ELEMENT IDENTIFIERS**

**NVCS association:** *Tsuga canadensis* / *Rhododendron maximum* - (*Clethra acuminata*, *Leucothoe fontanesiana*) Forest

**Database Code:** CEG007136

**Formation:** Conical-crowned temperate or subpolar needle-leaved evergreen forest

**Alliance:** TSUGA CANADENSIS FOREST ALLIANCE (I.A.8.N.c.8)

**ELEMENT CONCEPT**

**Summary:** Forests of lower or protected slopes and terraces 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. 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. In the southern Appalachians, this forest occurs at elevations greater than 1800 feet. In Kentucky, disturbed areas may have abundant *Betula lenta* and *Betula alleghaniensis* in the subcanopy. Stands in the southern Cumberlands of Kentucky and Tennessee would lack *Leucothoe fontanesiana*; instead, *Clethra acuminata* is a characteristic shrub of these stands.

**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 1800 feet.

**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*.

**Dynamics:** See Summary

**Similar Associations:**

- *Pinus strobus* - *Tsuga canadensis* / *Rhododendron maximum* - (*Leucothoe fontanesiana*) Forest (CEGL007102)--dominated by *Pinus strobus* or codominated by *Pinus strobus* and *Tsuga canadensis*.

**Synonymy:**

- IA5b. Southern Appalachian Hemlock Cove Forest (Allard 1990) B. in part
- Hemlock Community (Caplenor 1965)
- Eastern Hemlock: 23 (Eyre 1980) B. in part

**Comments:** In Kentucky, this association occurs in the eastern part of the state (Appalachian plateaus, Cumberland Mountains).

**CONSERVATION RANKING & RARE SPECIES**

**GRank:** G3G4 (98-04-30):

**High-ranked species:** MONOTROPSIS ODORATA (G3)

**ELEMENT DISTRIBUTION**

**Range:** This community is found in the Southern Appalachians, from North Carolina west into Kentucky.

**States:** GA KY NC SC TN

**Crosswalk to State Classifications:**

- KY: Hemlock-Mixed Forest, in part (KY 1991)
- NC: Canada Hemlock Forest, in part (NC 1990)
- TN: Hemlock, CUPL, in part; Hemlock, BR? (TN 1994)

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

**USFS Ecoregions:** 221Ha:CCC, 221Hc:CCC, 221He:CCC, 222D:??, M221Cc:CCC, M221Cd:CCC, M221Ce:CCC, M221Dc:CCC, M221Dd:CCC

## Association Descriptions

**Federal Lands:** NPS (Cumberland Gap, Great Smoky Mountains); USFS (Chattahoochee, Cherokee, Daniel Boone, Nantahala, Pisgah, Sumter)

### ELEMENT SOURCES

**References:** Allard 1990, Caplenor 1965, Evans 1991, Eyre 1980, Golden 1974, Golden 1981, Lorimer 1980, McLeod 1988, Newell et al. 1997, Oosting and Bourdeau 1955, Patterson 1994, Pyne 1994, Quarterman et al. 1972, Racine and Hardin 1975, Schafale and Weakley 1990, Whittaker 1956

**MONTANE SWEETGUM ALLUVIAL FLAT****ELEMENT IDENTIFIERS**

**NVCS association:** Liquidambar styraciflua - Liriodendron tulipifera - (Platanus occidentalis) / Carpinus caroliniana - Halesia tetraptera / Amp hiecarpaea bracteata Forest

**Database Code:** CEGLO07880

**Formation:** Temporarily flooded cold-deciduous forest

**Alliance:** PLATANUS OCCIDENTALIS - (LIQUIDAMBAR STYRACIFLUA, LIRIODENDRON TULIPIFERA) TEMPORARILY FLOODED FOREST ALLIANCE (I.B.2.N.d.14)

**ELEMENT CONCEPT**

**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 1680 feet, ranging from 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. Other minor species that are variably present in the canopy include *Acer rubrum*, *Aesculus flava*, *Fraxinus americana*, *Juglans cinerea*, *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*, *Aesculus flava*, *Tsuga canadensis*, *Juglans cinerea*, *Halesia tetraptera* (var. *monticola*, var. *tetraptera*), *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, including *Alnus serrulata*, *Hamamelis virginiana*, and *Lindera benzoin*. Vines can include *Campsis radicans*, *Menispermum canadense*, *Parthenocissus quinquefolia*, *Smilax bona-nox*, and *Toxicodendron radicans*. 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*, *Dichantherium 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*. Other common species include *Arisaema triphyllum*, *Asplenium platyneuron*, *Eurybia divaricata* (= *Aster divaricatus*), *Rudbeckia laciniata*, *Carex* spp. (e.g., *Carex digitalis*, *Carex intumescens*, *Carex laxiflora* var. *laxiflora*, *Carex plantaginea*, *Carex platyphylla*, *Carex retroflexa*, *Carex swanii*, *Carex torta*), *Dichantherium* spp. (e.g., *Dichantherium commutatum*, *Dichantherium dichotomum*, *Dichantherium sphaerocarpon*), *Collinsonia canadensis*, *Elymus virginicus*, *Houstonia serpyllifolia*, *Laportea canadensis*, *Lobelia cardinalis*, *Mertensia virginica*, *Mitchella repens*, *Polystichum acrostichoides*, *Prenanthes* spp., *Rudbeckia laciniata*, *Sanicula canadensis*, *Smallanthus uvedalius*, *Viola cucullata*, *Viola sororia*, and *Verbesina alternifolia*. The exotic grass *Microstegium vimineum* may have high cover in some stands.

**Environment:** This forest was defined from the 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 1680 feet, ranging from 1480-1900 feet.

**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

## Association Descriptions

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*.

**Dynamics:** See Summary

**Similar Associations:**

- *Platanus occidentalis* - *Liriodendron tulipifera* - *Betula* (*alleghaniensis*, *lenta*) / *Alnus serrulata* - *Leucothoe fontanesiana* Forest (CEGL004691)

**Synonymy:**

- IIA6e. Southern Appalachian Alluvial Forest (Allard 1990) B. in part
- *Platanus/Asimina/Microstegium* Alluvial Forest (Newell and Peet 1995)

**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. A similar alliance is the I.B.2.N.d *Liquidambar styraciflua* - (*Liriodendron tulipifera*, *Acer rubrum*) Temporarily Flooded Forest Alliance (A.287), but it is currently not defined for the Southern Blue Ridge. In the 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 1997) is referred to as a "large high alluvial flat" in which *Liquidambar styraciflua* shares dominance. This association was initially defined from disturbed floodplains in the Great Smoky Mountains National Park and is related to the more broadly defined *Platanus occidentalis* - *Liriodendron tulipifera* - *Betula* (*alleghaniensis*, *lenta*) / *Alnus serrulata* - *Leucothoe fontanesiana* Forest (CEGL004691), Montane Alluvial Forest.

### CONSERVATION RANKING & RARE SPECIES

**GRank:** G? (99-03-22): The conservation status of this community has not yet been assessed.

**High-ranked species:** No information

### ELEMENT DISTRIBUTION

**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.

**States:** GA NC TN

**Crosswalk to State Classifications:** Not yet cross-referenced to state classifications

**TNC Ecoregions:** 51:C

**USFS Ecoregions:** M221Dc:CCC, M221Dd:CCC

**Federal Lands:** NPS (Great Smoky Mountains); USFS (Chattahoochee, Cherokee, Pisgah)

### ELEMENT SOURCES

**References:** Allard 1990, NatureServe Ecology - Southeast U.S. unpubl. data, Newell and Peet 1995, Patterson et al. 1999

## APPALACHIAN MONTANE ALLUVIAL FOREST

## ELEMENT IDENTIFIERS

**NVCS association:** *Platanus occidentalis* - *Liriodendron tulipifera* - *Betula* (*alleghaniensis*, *lenta*) / *Alnus serrulata* - *Leucothoe fontanesiana* Forest

**Database Code:** CEG004691

**Formation:** Temporarily flooded cold-deciduous forest

**Alliance:** PLATANUS OCCIDENTALIS - (LIQUIDAMBAR STYRACIFLUA, LIRIODENDRON TULIPIFERA) TEMPORARILY FLOODED FOREST ALLIANCE (I.B.2.N.d.14)

## ELEMENT CONCEPT

**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 3000 feet. It is more frequent below 2000 feet. 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 americana*, 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*. *Carex* species may be common (e.g., *Carex appalachica*, *Carex austrocaroliniana*, *Carex blanda*, *Carex digitalis*, *Carex plantaginea*, *Carex swanii*, *Carex torta*). Examples are known from the Nantahala Gorge, Slickrock Creek, the South Toe River, and the Black and Craggy Mountains.

**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 3000 feet. It is more frequent below 2000 feet. Examples are known from the Nantahala Gorge, Slickrock Creek (Newell et al. 1997), the South Toe River, the Black and Craggy Mountains (McLeod and Ulrey unpubl. data), and the Chattahoochee National Forest of Georgia.

**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 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 americana*, 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*).

**Dynamics:** See Summary

**Similar Associations:**

- Liquidambar styraciflua - Liriodendron tulipifera - (*Platanus occidentalis*) / *Carpinus caroliniana* - *Halesia tetraptera* / *Amphicarpaea bracteata* Forest (CEGL007880)--with at least partial dominance by *Liquidambar styraciflua*.

**Synonymy:**

- IIA6e. Southern Appalachian Alluvial Forest (Allard 1990) B. in part
- Alluvial Forest (McLeod 1988)
- *Platanus* - *Betula alleghaniensis* Alluvial Forest (Newell et al. 1997)



- *Liriodendron - Platanus / Amphicarpaea* Alluvial Forest (Newell et al. 1997)
- Floodplain Woodlands (Pittillo and Smathers 1979)

**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 than the I.A.8.N.e *Tsuga canadensis* - (*Pinus strobus*) Temporarily Flooded Forest Alliance (A.171).

**CONSERVATION RANKING & RARE SPECIES**

**GRank:** G2? (99-02-23): 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.

**High-ranked species:** No information

**ELEMENT DISTRIBUTION**

**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.

**States:** GA? NC SC TN

**Crosswalk to State Classifications:**

- NC: Montane Alluvial Forest, in part (NC 1990)

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

**USFS Ecoregions:** M221Dc:CCC, M221Dd:CCC

**Federal Lands:** NPS (Great Smoky Mountains?); USFS (Chattahoochee?, Cherokee?, Nantahala, Pisgah)

**ELEMENT SOURCES**

**References:** Allard 1990, McLeod 1988, Newell and Peet 1995, Newell et al. 1997, Pittillo and Smathers 1979, Schafale and Weakley 1990

**MONTANE RHODODENDRON THICKET****ELEMENT IDENTIFIERS**

**NVCS association:** Rhododendron maximum Upland Shrubland

**Database Code:** CEG003819

**Formation:** Hemi-sclerophyllous temperate broad-leaved evergreen shrubland

**Alliance:** RHODODENDRON MAXIMUM SHRUBLAND ALLIANCE (III.A.2.N.b.5)

**ELEMENT CONCEPT**

**Summary:** This community occurs along streams and on protected slopes in the mountains of North Carolina, Tennessee, South Carolina, Georgia, West Virginia, and Kentucky. It is a broad-leaved, evergreen shrubland 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). Soils supporting this community are typically acid. 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.

**Environment:** See Summary

**Vegetation:** See Summary

**Dynamics:** See Summary

**Similar Associations:** No information

**Synonymy:**

- IC4b. Montane Rhododendron Thicket (Allard 1990)

**Comments:** *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 prinus*, *Picea rubens*, or *Abies fraseri*. Similar ericaceous shrublands occur at higher elevations, over 1100 meters (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 *Photinia melanocarpa* (= *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).

**CONSERVATION RANKING & RARE SPECIES**

**GRank:** G3?Q (98-12-14): This association is of uncertain validity and, even if valid, is of uncertain circumscription.

**High-ranked species:** No information

**ELEMENT DISTRIBUTION**

**Range:** This community occurs in the Southern Blue Ridge, but may be possible throughout the range of *Rhododendron maximum*.

**States:** GA NC SC TN VA? WV

**Crosswalk to State Classifications:**

- GA: No equivalent (GA 1990)
- NC: No equivalent (NC 1990)
- SC: Rhododendron Thicket (SC 1986)
- VA?: No equivalent (VA 2001)

**TNC Ecoregions:** 49:P, 51:C

**USFS Ecoregions:** 221E:PP, M221A:CC, M221B:CC, M221C:CC, M221Dc:CCC, M221Dd:CCC

**Federal Lands:** USFS (Chattahoochee?, Cherokee, Nantahala, Pisgah, Sumter)

**ELEMENT SOURCES**

**References:** Allard 1990, Core 1966, 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

**MONTANE ALLUVIAL FOREST (SMALL RIVER TYPE)****ELEMENT IDENTIFIERS**

**NVCS association:** *Tsuga canadensis* - (*Pinus strobus*) Temporarily Flooded Forest

**Database Code:** C EGL007143

**Formation:** Temporarily flooded temperate or subpolar needle-leaved evergreen forest

**Alliance:** TSUGA CANADENSIS - (PINUS STROBUS) TEMPORARILY FLOODED FOREST ALLIANCE (I.A.8.N.e.3)

**ELEMENT CONCEPT**

**Summary:** This association covers forested alluvial wetlands dominated by *Tsuga canadensis* and/or *Pinus strobus* which occur on temporarily flooded alluvial flats and ravines in the Southern Blue Ridge, the Cumberlands, and possibly in adjacent ecoregions. These dense forests usually occur over silty, acidic soils. 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.

**Environment:** These dense forested alluvial wetlands occur on temporarily flooded alluvial flats and ravines. These forests usually occur over silty, acidic soils. Forests may be eroded or disturbed by catastrophic floods, sometimes frequently enough to maintain some stands in an early- to mid-successional stage. 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:** Stands of this forested alluvial wetland association are dominated by *Tsuga canadensis* and/or *Pinus strobus*. 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 subcanopy. 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. In the field, this association may be difficult to separate from similar non-wetland vegetation.

**Dynamics:** See Summary

**Similar Associations:**

- *Tsuga canadensis* / *Rhododendron maximum* / *Sphagnum* spp. Forest (CEGL006279)
- *Pinus strobus* - *Tsuga canadensis* / *Rhododendron maximum* - (*Leucothoe fontanesiana*) Forest (CEGL007102)
- *Pinus strobus* - *Tsuga canadensis* / *Acer pensylvanicum* / *Polystichum acrostichoides* Forest (CEGL006019)
- *Tsuga canadensis* / *Rhododendron maximum* - (*Clethra acuminata*, *Leucothoe fontanesiana*) Forest (CEGL007136)
- *Tsuga canadensis* - *Liriodendron tulipifera* - *Betula lenta* / *Rhododendron maximum* Forest (CEGL007543)
- *Tsuga canadensis* - *Acer rubrum* - (*Liriodendron tulipifera*, *Nyssa sylvatica*) / *Rhododendron maximum* / *Sphagnum* spp. Forest (CEGL007565)

**Synonymy:**

- IIA6e. Southern Appalachian Alluvial Forest (Allard 1990) B. in part
- Montane Alluvial Forest, Small River Subtype (Schafale pers. comm.)

**Comments:** More detailed information is needed to adequately describe this community and distinguish it from similar vegetation. In the field, this association may be difficult to separate from similar non-wetland vegetation (e.g., *Tsuga canadensis* - *Liriodendron tulipifera* - *Betula lenta* / *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 longer hydroperiods (e.g., *Tsuga canadensis* - *Acer rubrum* - (*Liriodendron tulipifera*, *Nyssa sylvatica*) / *Rhododendron maximum* / *Sphagnum* spp. Forest (CEGL007565) and *Tsuga canadensis* / *Rhododendron maximum* / *Sphagnum* spp. Forest (CEGL006279)).

**CONSERVATION RANKING & RARE SPECIES**

**GRank:** G? (97-12-01):

**High-ranked species:** No information

**ELEMENT DISTRIBUTION**

**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.

**States:** GA KY NC SC TN VA?

**Crosswalk to State Classifications:**

- NC: Montane Alluvial Forest, in part (NC 1990)
- VA?: No equivalent (VA 2001)

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

**USFS Ecoregions:** 221Hc:CCC, M221Ce:CP?, M221Dc:CCC, M221Dd:CCC

**Federal Lands:** USFS (Chattahoochee?, Cherokee?, Daniel Boone, Nantahala?, Pisgah)

**ELEMENT SOURCES**

**References:** Allard 1990, Campbell 2001, Schafale and Weakley 1990, Schafale pers. comm.

**SOUTHERN RIDGE AND VALLEY SMALL STREAM HARDWOOD FOREST****ELEMENT IDENTIFIERS**

**NVCS association:** *Quercus alba* - (*Liriodendron tulipifera*, *Liquidambar styraciflua*) / *Acer leucoderme* / *Calycanthus floridus* / *Athyrium filix-femina* Forest

**Database Code:** CEGL008428

**Formation:** Lowland or submontane cold-deciduous forest

**Alliance:** FAGUS GRANDIFOLIA - QUERCUS RUBRA - QUERCUS ALBA FOREST ALLIANCE (I.B.2.N.a.17)

**ELEMENT CONCEPT**

**Summary:** This association includes mesic hardwood forests along small streams and on small stream terraces in the southern Ridge and Valley of Georgia, extending into the western fringe of the Southern Blue Ridge, and possibly into Tennessee. The canopy is dominated by *Quercus alba* with codominance by *Liriodendron tulipifera*, *Liquidambar styraciflua*, and/or *Fagus grandifolia*. Some examples may have large individuals of *Pinus taeda* blending in from forests on adjacent, higher slopes, or as an artifact of past disturbance. The subcanopy is dominated by *Acer leucoderme*, but other common subcanopy trees include *Cornus florida*, *Hamamelis virginiana*, and *Oxydendrum arboreum*. The shrub stratum can be dense and continuous or patchy. The most constant shrub species are *Calycanthus floridus*, *Rhododendron alabamense*, and *Euonymus americana*. The herbaceous stratum is sparse to patchy and composed of mesic forbs and grasses. The most constant herbs are *Amphicarpaea bracteata*, *Athyrium filix-femina*, *Lobelia cardinalis*, *Mitchella repens*, and *Polystichum acrostichoides*, although many other species may occur and may be more diagnostic of the community.

**Environment:** See Summary

**Vegetation:** This association is a deciduous forest with a closed canopy, well-developed subcanopy, and a variable shrub and herbaceous layer. The canopy is dominated by *Quercus alba* with codominance by *Liriodendron tulipifera*, *Liquidambar styraciflua*, and/or *Fagus grandifolia*. Some examples may have large individuals of *Pinus taeda* blending in from forests on adjacent, higher slopes, or as an artifact of past disturbance. The subcanopy is dominated by *Acer leucoderme*, but other common subcanopy trees include *Cornus florida*, *Hamamelis virginiana*, and *Oxydendrum arboreum*. Other canopy and subcanopy species that may be present, but were not constant or dominant among occurrences in northwestern Georgia, are *Acer barbatum*, *Acer rubrum*, *Carpinus caroliniana*, *Carya ovata*, *Fraxinus americana*, *Magnolia acuminata*, *Nyssa sylvatica*, *Ostrya virginiana*, *Pinus echinata*, *Pinus strobus*, *Quercus rubra*, *Tilia americana* var. *heterophylla*, *Tsuga canadensis*, and *Ulmus rubra*. The shrub stratum can be dense and continuous or patchy. The most constant shrub species are *Calycanthus floridus*, *Rhododendron alabamense*, and *Euonymus americana*. Other shrubs that may be present, but were not constant among examples documented in northwestern Georgia, are *Arundinaria gigantea*, *Diospyros virginiana*, *Hydrangea cinerea*, *Itea virginica*, *Kalmia latifolia*, *Vaccinium pallidum*, *Vaccinium stamineum*, and *Viburnum acerifolium*. The herbaceous stratum is sparse to patchy and composed of mesic forbs and grasses. The most constant herbs are *Amphicarpaea bracteata*, *Athyrium filix-femina*, *Lobelia cardinalis*, *Mitchella repens*, and *Polystichum acrostichoides*, although many other species may occur and may be more diagnostic of the community.

**Dynamics:** See Summary

**Similar Associations:**

- *Quercus alba* - *Fagus grandifolia* / *Hydrangea quercifolia* - *Viburnum acerifolium* / *Carex picta* - *Polystichum acrostichoides* Forest (CEGL007213)
- *Fagus grandifolia* - *Quercus* spp. / *Kalmia latifolia* - *Hamamelis virginiana* / *Galax urceolata* Forest (CEGL004549)
- *Fagus grandifolia* - *Quercus alba* / *Cornus florida* Forest (CEGL007881)--of the Interior Low Plateau.

**Synonymy:** No information

**Comments:** This association was defined based on examples from the southern Ridge and Valley in northwestern Georgia. With further review, it may be expanded to cover a greater geographic area, or be combined with a similar association to create a more general concept. *Acer leucoderme* is very limited in its distribution in Tennessee; examples in that state may or may not have this taxon present; *Acer saccharum* could replace it there.

**CONSERVATION RANKING & RARE SPECIES**

**GRank:** G3G4Q (00-06-13): This association needs taxonomic resolution with other similar associations. With further review and taxonomic resolution, this association could receive a lower conservation rank (be determined to be more common).

**High-ranked species:** No information

**ELEMENT DISTRIBUTION**

**Range:** This association is found in the southern Ridge and Valley of Georgia, extending into the western fringe of the Southern Blue Ridge, possibly into Tennessee.

**States:** GA TN?

**Crosswalk to State Classifications:** Not yet cross-referenced to state classifications

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

**USFS Ecoregions:** 231Dc:CCC, M221Dd:CCC

**Federal Lands:** USFS (Chattahoochee, Cherokee?)

**ELEMENT SOURCES**

**References:** NatureServe Ecology - Southeast U.S. unpubl. data

## SOUTHERN APPALACHIAN NORTHERN WHITE-CEDAR SLOPE FOREST

## ELEMENT IDENTIFIERS

**NVCS association:** *Thuja occidentalis* - *Pinus strobus* - *Tsuga canadensis* / *Carex eburnea* Forest

**Database Code:** C EGL008426

**Formation:** Conical-crowned temperate or subpolar needle-leaved evergreen forest

**Alliance:** THUJA OCCIDENTALIS FOREST ALLIANCE (I.A.8.N.c.7)

## ELEMENT CONCEPT

**Summary:** This is essentially a mixed coniferous-deciduous forest of the southern and central Appalachians, with each component contributing approximately 50% of the canopy cover. *Thuja occidentalis* and *Pinus strobus* are codominant in these samples, with *Tsuga canadensis* a less abundant associate. A variety of hardwoods co-occur, the most constant and abundant of which are *Liriodendron tulipifera*, *Quercus alba*, and *Quercus rubra*. Habitats are on moderately steep to steep (mean = 31 degrees), convex, west-northwest-facing slopes at relatively low elevation (mean = 521 m (1710 feet)). These slopes, situated in major stream and river valleys, are geomorphic products of long-term stream incision. Bedrock parent material at one site is interbedded limestone and sandstone of Silurian age; at another site is underlain by Ordovician limestone. Soils at both sites are evidently colluvial and have a neutral pH. The soil moisture regime was assessed as mesic at both sites, but tends toward the submesic end of this moisture class. This community type is extremely rare in Virginia, where it is known only from the two plot-sampled stands and two putative locations in Montgomery and Russell counties, all in the Ridge and Valley province. Patches of this vegetation are very small (0.1-1.0 ha), and additional occurrences are likely in suitable western Virginia habitats. Young reproduction of all three conifers (*Thuja occidentalis*, *Pinus strobus*, and *Tsuga canadensis*) dominates the understory layers; *Sassafras albidum* is also a constant understory tree, and *Amelanchier arborea* codominates in one plot. *Hamamelis virginiana* and young *Tsuga canadensis* dominate the shrub layer of one plot each. Other constant but low cover shrubs are *Dirca palustris* and *Viburnum acerifolium*. Tree height is variable from occurrence to occurrence. Herbaceous growth is sparse (mean stratum cover = 24%) and patchy. Many herbaceous species and woody seedlings occur at low cover. The most important herbaceous species include *Eurybia divaricata* (= *Aster divaricatus*), *Brachyelytrum erectum*, *Chamaelirium luteum*, *Collinsonia canadensis*, *Dioscorea quaternata*, *Hepatica nobilis* var. *obtusata* (= *Hepatica americana*), *Solidago arguta*, *Solidago curtisii*, and *Uvularia perfoliata*.

**Environment:** Habitats are on moderately steep to steep (mean = 31 degrees), convex, WNW-facing slopes at relatively low elevation (mean = 521 m [1710 feet]). These slopes, situated in major stream and river valleys, are geomorphic products of long-term stream incision. Bedrock parent material at one site is interbedded limestone and sandstone of Silurian age; at another site is underlain by Ordovician limestone. Soils at both sites are evidently colluvial and have a neutral pH. The soil moisture regime was assessed as mesic at both sites, but tends toward the submesic end of this moisture class. This community type is extremely rare in Virginia, where it is known only from the two plot-sampled stands and two putative locations in Montgomery and Russell counties, all in the Ridge and Valley province. Patches of this vegetation are very small (0.1 to 1.0 ha) and additional occurrences are likely in suitable western Virginia habitats. One Tennessee site (Pine Knob) is actually east-facing.

**Vegetation:** This is essentially a mixed coniferous-deciduous forest, with each component contributing approximately 50% of the canopy cover. *Thuja occidentalis* and *Pinus strobus* are codominant in these samples, with *Tsuga canadensis* a less abundant associate. A variety of hardwoods co-occur, the most constant and abundant of which are *Liriodendron tulipifera*, *Quercus alba*, and *Quercus rubra*. Young reproduction of all three conifers (*Thuja occidentalis*, *Pinus strobus*, and *Tsuga canadensis*) dominates the understory layers; *Sassafras albidum* is also a constant understory tree, and *Amelanchier arborea* codominates in one plot. *Hamamelis virginiana* and young *Tsuga canadensis* dominate the shrub layer of one plot each. Other constant but low cover shrubs are *Dirca palustris* and *Viburnum acerifolium*. Tree height is variable from occurrence to occurrence. Herbaceous growth is sparse (mean stratum cover = 24%) and patchy. Many herbaceous species and woody seedlings occur at low cover. The most important herbaceous species include *Eurybia divaricata* (= *Aster divaricatus*), *Brachyelytrum erectum*, *Chamaelirium luteum*, *Collinsonia canadensis*, *Dioscorea quaternata*, *Hepatica nobilis* var. *obtusata* (= *Hepatica americana*), *Solidago arguta*, *Solidago curtisii*, and *Uvularia perfoliata*.

**Dynamics:** See Summary

**Similar Associations:**

- *Thuja occidentalis* / *Carex eburnea* - *Pellaea atropurpurea* Woodland (CEGL002596)

**Synonymy:**

- *Thuja occidentalis* - *Pinus strobus* - *Tsuga canadensis* / *Dirca palustris* Forest (Fleming 1999)
- *Thuja occidentalis* - *Pinus strobus* - *Tsuga canadensis* / *Carex eburnea* Forest (Fleming and Coulling 2001)
- White Pine - Hemlock: 22 (Eyre 1980) B

**Comments:** This community type is extremely rare in Virginia, where it is known only from three plot-sampled stands and two putative locations in Montgomery and Russell counties, all in the Ridge and Valley province. Patches of this vegetation

## Association Descriptions

are very small (0.1-1.0 ha), and additional occurrences are likely in suitable western Virginia habitats. The type may also occur in adjacent states. Similar mixed forests of *Thuja occidentalis* with *Tsuga canadensis* and/or *Pinus strobus* were described qualitatively by Walker (1987) from the Eastern Highland Rim, Ridge and Valley, and low Blue Ridge provinces of Tennessee. This type is based primarily on three plot samples from Giles and Rockbridge counties, Virginia. In the Ridge and Valley of Virginia, *Thuja occidentalis* communities occur in two situations; on rocky bluffs with admixtures of hardwood species (placed in the *Thuja occidentalis* Woodland Alliance (A.544)) and on mesic slopes with *Tsuga canadensis* and *Pinus strobus* (Fleming 1999) (placed in this association). Southern *Thuja* stands are more genetically diverse northern populations. This association is now recognized as distinct from open-canopy *Thuja* communities of the Central Appalachians because of excellent documentation provided by Fleming (1999). Additional assessment of *Thuja* stands in adjacent areas will be needed to understand their relationship to documented stands that are the basis for this community type. *Thuja occidentalis* - *Pinus strobus* - *Tsuga canadensis* / *Carex eburnea* Forest (CEGL008426) is readily distinguished from all other calcareous forests in Virginia by its strong coniferous component, particularly *Thuja occidentalis*. It is distinguished from *Thuja occidentalis* / *Carex eburnea* - *Pellaea atropurpurea* Woodland (CEGL002596) by its forest physiognomy and occurrence on relatively mesic slopes with few rock outcrops (vs. shrubland or sparse woodland physiognomy and occurrence on exposed, xeric cliffs and outcrops). Despite having sparse herbaceous cover, this community type has a mean species richness (n=60) comparable to other units in the Dry and Dry-Mesic Calcareous Forests. Both sampled plots contain interesting mixtures of calcium-demanding plants and plants more characteristically associated with acidic habitats. It is possible that bedrock melanges and abundant needle litter from the three dominant conifers contribute to microtopographic variation in the soil environments of these areas. Noteworthy calciphiles include *Berberis canadensis*, *Galium boreale*, *Hepatica nobilis* var. *acuta* (= *Hepatica acutiloba*), *Melanthium latifolium*, *Polygala senega*, *Quercus muehlenbergii*, and *Thuja occidentalis*; species with stronger affiliation to acid soils include *Gaultheria procumbens*, *Hexastylis virginica*, *Oxydendrum arboreum*, *Polygala paucifolia*, *Quercus coccinea*, *Rhododendron maximum*, and *Spiraea betulifolia* var. *corymbosa*. This community type needs additional inventory, and its classification must be considered provisional pending additional plot sampling and analysis. The two tentatively assigned stands in Montgomery and Russell counties have somewhat different compositions than the plots documented here. The Montgomery County occurrence, dominated by *Thuja*, *Pinus strobus*, *Quercus muehlenbergii*, *Hamamelis virginiana*, and *Cornus florida*, occupies a somewhat drier dolomitic habitat and approaches woodland physiognomy. The Russell County stand is a closed-canopy, mesic *Thuja* forest with scattered *Tsuga canadensis*. Similar mixed forests of *Thuja occidentalis* with *Tsuga canadensis* and / or *Pinus strobus* were described qualitatively by Walker (1987) from the Eastern Highland Rim, Ridge and Valley, and low Blue Ridge provinces of Tennessee.

### CONSERVATION RANKING & RARE SPECIES

**GRank:** G1G2 (01-01-31): This community type is limited to rare edaphic situations in the southern Appalachian Mountains of Virginia, Tennessee, and possibly Kentucky and West Virginia. Occurrences are small, and some have been altered by timber harvest. Despite the rarity of this type, its conservation status is apparently fairly stable.

**High-ranked species:** PAXISTIMA CANBYI (G2)

### ELEMENT DISTRIBUTION

**Range:** This community is known from scattered locations in the Ridge and Valley Province of western Virginia, and may occur in the Ridge and Valley of other, adjacent states, such as Tennessee.

**States:** KY? TN VA WV?

#### Crosswalk to State Classifications:

- VA: Northern White-Cedar Slope Forest (VA 2001)

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

**USFS Ecoregions:** M221Aa:CC?, M221Ab:CCC, M221Dc:CCC

**Federal Lands:** USFS (Cherokee, Jefferson)

### ELEMENT SOURCES

**References:** Eyre 1980, Fleming 1999, Fleming and Coulling 2001, Fleming et al. 2001, NatureServe Ecology - Southeast U.S. unpubl. data, Walker 1987



SUCCESSIONAL HONEY-LOCUST - ELM WOODLAND

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ELEMENT IDENTIFIERS

**NVCS association:** *Gleditsia triacanthos* - *Ulmus* (*alata*, *rubra*) Woodland

**Database Code:** CEG003686

**Formation:** Cold-deciduous woodland

**Alliance:** GLEDITSIA TRIACANTHOS WOODLAND ALLIANCE (II.B.2.N.a.6)

ELEMENT CONCEPT

**Summary:** This association covers successional Appalachian and interior woodlands typically dominated by *Gleditsia triacanthos* and *Ulmus* spp., along with a variety of hardwoods and gymnosperms. These successional woodlands typically have a total canopy cover between 25 and 50%. The canopy species vary greatly, but *Gleditsia triacanthos* is present in variable amounts in every occurrence, and one of the *Ulmus* species is usually present. Other species that may occur in this woodland are *Juniperus virginiana* var. *virginiana*, *Pinus virginiana*, *Celtis occidentalis*, *Celtis laevigata* var. *laevigata*, *Liriodendron tulipifera*, *Liquidambar styraciflua*, *Juglans nigra*, *Fraxinus americana*, *Quercus alba*, *Quercus stellata*, *Quercus velutina*, *Quercus rubra*, and *Carya* spp. Common shrubs are *Rhus copallinum* and *Rubus* spp. This successional type results from heavy grazing or other severe disturbance.

**Environment:** See Summary

**Vegetation:** Stands of this type are typically dominated by *Gleditsia triacanthos* and *Ulmus* spp., along with a variety of hardwoods and gymnosperms. The canopy species vary greatly, but *Gleditsia triacanthos* is always present (in variable amounts), and *Ulmus alata* or *Ulmus rubra* is usually present. Other species that may occur in this woodland are *Juniperus virginiana* var. *virginiana*, *Pinus virginiana*, *Celtis occidentalis*, *Celtis laevigata* var. *laevigata*, *Liriodendron tulipifera*, *Liquidambar styraciflua*, *Juglans nigra*, *Fraxinus americana*, *Quercus alba*, *Quercus stellata*, *Quercus velutina*, *Quercus rubra*, and *Carya* spp. Common shrubs are *Rhus copallinum* and *Rubus* spp.

**Dynamics:** This successional type results from heavy grazing or other severe disturbance.

**Similar Associations:** No information

**Synonymy:** No information

**Comments:** Described from Tellico Pilot Project data (10 stands sampled).

CONSERVATION RANKING & RARE SPECIES

**GRank:** GM (97-08-11):

**High-ranked species:** No information

ELEMENT DISTRIBUTION

**Range:** This type is found in Tennessee and possibly in Alabama, Georgia, Kentucky, and could be found elsewhere.

**States:** AL? GA? KY? TN

**Crosswalk to State Classifications:** Not yet cross-referenced to state classifications

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

**USFS Ecoregions:** 221Hc:CP?, 221Hd:CP?, 221Ja:CCC, 221Jb:CCP, 221Jc:CCP, 231Ad:P??, 231Cc:P??, 231Cd:P??, 231Cf:P??, 231Cg:P??, 231Da:P??, 231Dc:P??, 231De:P??

**Federal Lands:** TVA (Tellico); USFS (Cherokee?)

ELEMENT SOURCES

**References:** Andreu and Tukman 1995

## RED-CEDAR SUCCESSIONAL FOREST

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### ELEMENT IDENTIFIERS

**NVCS association:** *Juniperus virginiana* var. *virginiana* - (*Quercus* spp.) Forest

**Database Code:** CEGL007124

**Formation:** Conical-crowned temperate or subpolar needle-leaved evergreen forest

**Alliance:** JUNIPERUS VIRGINIANA FOREST ALLIANCE (I.A.8.N.c.2)

### ELEMENT CONCEPT

**Summary:** Forest with dense *Juniperus virginiana* var. *virginiana* canopy (75-100% total cover) and sparse subcanopy, shrub and herb strata. Other species that may occur in the canopy are *Carya alba*, *Carya ovata*, *Cercis canadensis*, and *Pinus virginiana*. At Arnold Air Force Base, Coffee County, Tennessee, planted pines (*Pinus strobus*, *Pinus taeda*, and *Pinus virginiana*) may invade from adjacent plantations; various oaks (including *Quercus coccinea*, *Quercus falcata*, and *Quercus phellos*) may also be present, seeding in from adjacent oak-hardwood forests. The midstory is typically sparse, with canopy species, as well as *Cornus florida*, *Ilex opaca*, *Liquidambar styraciflua*, and *Prunus serotina* var. *serotina*. *Frangula caroliniana* occurs in various strata. Herbs are patchy and typically include *Asplenium platyneuron*, *Chasmanthium laxum*, *Eupatorium* spp., *Polystichum acrostichoides*, and *Carex* spp. The exotics *Lonicera japonica* and *Microstegium vimineum* may also be present.

**Environment:** See Summary

**Vegetation:** See Summary

**Dynamics:** See Summary

#### Similar Associations:

- *Juniperus virginiana* Midwest Forest (CEGL002593)

#### Synonymy:

- IB5a. Eastern Red Cedar Woodland (Allard 1990)
- Eastern Redcedar: 46 (Eyre 1980) B

**Comments:** Originally described from Tellico Pilot Project (Ridge and Valley of Tennessee, northeastern Monroe County), n=10, where this type was found over eroded soils on abandoned agricultural land, at 820 to 940 feet elevation (Andreu and Tukman 1995). Currently, this type includes the *Juniperus virginiana* var. *virginiana* woodland from Tellico Lake (Andreu and Tukman 1995), which occurs on drier sites with shallow, rocky soils. In Kentucky this vegetation occurs throughout the state (Bluegrass region, Highland Rim, East Gulf Coastal Plain) on calcareous substrates or on abandoned agricultural land. Acreage has increased from presettlement. This community is very closely related to *Juniperus virginiana* Woodland and to mixed juniper - oak forest types but is distinguished by the closed-canopy evergreen dominance of *Juniperus virginiana*. *Juniperus virginiana* woodlands may be equivalent to this type. This type should also be compared to *Juniperus virginiana* Midwest Forest (CEGL002593) of Ontario, Canada.

### CONSERVATION RANKING & RARE SPECIES

**GRank:** GM (00-08-08): This forest represents early successional, modified, or silviculturally managed vegetation and is thus not of conservation concern and does not receive a conservation status rank.

**High-ranked species:** No information

### ELEMENT DISTRIBUTION

**Range:** This community is widely distributed in the southeastern and central United States.

**States:** AL AR GA KY LA MS NC OK SC? TN VA? WV?

#### Crosswalk to State Classifications:

- KY: No equivalent (KY 1991)
- NC: No equivalent (NC 1990)
- OK: *Juniperus virginiana* / *Schizachyrium scoparium* woodland association?, in part (OK 2000)
- TN: Red cedar, RV, in part (TN 1994)
- VA?: No equivalent (VA 2001)

**TNC Ecoregions:** 39:P, 44:C, 50:P, 51:?, 52:?, 53:P, 59:C

**USFS Ecoregions:** 221:C, 222Ak:CCP, 222Eb:CCC, 222Ej:CCC, 222En:CCC, 222Eo:CCC, 222Lc:CCP, 222Me:CCP, 231:C, 251Cc:CC?, 251Ch:CCP, M221Be:CCC

**Federal Lands:** COE (J. Percy Priest); DOD (Arnold, Camp Gruber); NPS (Chickamauga-Chattanooga, Chickasaw, Russell Cave, Shiloh, Stones River); TVA (Columbia, Tellico); USFS (Bankhead, Cherokee?, Daniel Boone, Ouachita)

**ELEMENT SOURCES**

**References:** Allard 1990, Andreu and Tukman 1995, Evans 1991, Eyre 1980, Hoagland 2000, Pyne 1994, Rice 1960, Rosson 1995

## SUCCESSIONAL TULIPTREE FOREST

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### ELEMENT IDENTIFIERS

**NVCS association:** *Liriodendron tulipifera* - *Acer* (*negundo*, *rubrum*) / *Asimina triloba* Forest

**Database Code:** CEG007184

**Formation:** Lowland or submontane cold-deciduous forest

**Alliance:** LIRIODENDRON TULIPIFERA FOREST ALLIANCE (I.B.2.N.a.24)

### ELEMENT CONCEPT

**Summary:** This association includes successional wet to mesic forests occurring in bottoms and on low slopes of the Appalachians and Interior Low Plateau with *Acer negundo* and *Liriodendron tulipifera* each contributing 25-75% of the total canopy cover. 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. These stands are apparently successional following intensive timber removal and also occur on old pastures. This vegetation is probably extensive in the Ridge and Valley, Interior Low Plateaus, and related provinces. Related vegetation is possible in the Chesapeake Bay region.

**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.

**Vegetation:** Examples of this association contain *Acer negundo* and *Liriodendron tulipifera*, with each contributing 25-75% of the total canopy cover. 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.

**Dynamics:** See Summary

**Similar Associations:** No information

**Synonymy:** No information

**Comments:** 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.

### CONSERVATION RANKING & RARE SPECIES

**GRank:** G4G5 (01-04-19): This is a successional forest composed of species native to North America. It is not a rare forest type, and should be secure. GRank was changed from GW 2001-04-19 MP.

**High-ranked species:** No information

### ELEMENT DISTRIBUTION

**Range:**

**States:** KY? MD PA TN VA

**Crosswalk to State Classifications:**

- PA: Tulip poplar-beech-maple forest, successional type
- VA: No equivalent (VA 2001)

**TNC Ecoregions:** 44:C, 50:C, 58:?, 59:C

**USFS Ecoregions:** 221Jb:CCC, 222Eb:CCC, 222Ed:CCP, M221Aa:CCC, M221Ac:CCC, M221Ad:CCC, M221Bb:CCC, M221D:C?

**Federal Lands:** TVA (Tellico); USFS (Cherokee?)

### ELEMENT SOURCES

**References:** Andreu and Tukman 1995

**EARLY SUCCESSIONAL APPALACHIAN HARDWOOD FOREST**

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**ELEMENT IDENTIFIERS**

**NVCS association:** *Liriodendron tulipifera* - *Acer rubrum* - *Robinia pseudoacacia* Forest

**Database Code:** CEG007219

**Formation:** Lowland or submontane cold-deciduous forest

**Alliance:** LIRIODENDRON TULIPIFERA FOREST ALLIANCE (I.B.2.N.a.24)

**ELEMENT CONCEPT**

**Summary:** This vegetation occurs in areas that have been cleared and primarily revegetated from root and stump sprouts. Stands are dominated primarily by early successional species. Canopies are typically dominated by *Liriodendron tulipifera* and *Acer rubrum*, with lesser amounts of *Robinia pseudoacacia*. Some examples may contain *Pinus virginiana*. Associated species vary, but these forests are typical of areas which were once clearcut, old fields, strip-mined, or cleared by fire or other natural disturbances. The relative absence of *Quercus* species in these stands indicates more severe disturbance to this type in contrast to *Liriodendron tulipifera* - *Acer rubrum* - *Quercus* spp. Forest (CEGL007221). 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 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. This successional forest occurs on upland areas in the southern Appalachian Mountains and Appalachian Plateaus. It typically occurs as 8-16 ha patches in the landscape.

**Environment:** 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:** Stands of this successional vegetation have canopies which are typically dominated by *Liriodendron tulipifera* and *Acer rubrum*, with lesser amounts of *Robinia pseudoacacia*. Some examples may contain *Pinus virginiana*. Associated species vary. The relative absence of *Quercus* species in these stands indicates more severe disturbance to this type in contrast to *Liriodendron tulipifera* - *Acer rubrum* - *Quercus* spp. Forest (CEGL007221). Taller shrubs include *Rhododendron periclymenoides*, *Rhododendron calendulaceum*, *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 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.

**Dynamics:** See Summary

**Similar Associations:**

- *Liriodendron tulipifera* - *Acer rubrum* - *Quercus* spp. Forest (CEGL007221)--resulting from less severe disturbance.

**Synonymy:**

- IF3a. Recently Harvested Timberland (Allard 1990) B. in part

**Comments:** None

**CONSERVATION RANKING & RARE SPECIES**

**GRank:** GD (00-12-07): 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.

**High-ranked species:** No information

**ELEMENT DISTRIBUTION**

**Range:** This community occurs in the southern Appalachians and Appalachian Plateaus.

**States:** GA KY NC SC TN

**Crosswalk to State Classifications:**

- KY: No equivalent (KY 1991)
- NC: No equivalent (NC 1990)

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

**USFS Ecoregions:** 221Ha:CCC, 221He:CCC, M221Dc:CCC, M221Dd:CCC

**Federal Lands:** NPS (Great Smoky Mountains); USFS (Chattahoochee, Cherokee, Daniel Boone, Nantahala, Pisgah, Sumter)

**ELEMENT SOURCES**

**References:** Allard 1990, Golden 1974, Horn 1980, McGee and Hooper 1970, NatureServe Ecology - Southeast U.S. unpubl. data, Phillips and Shure 1990, Schmalzer 1978, Thomas 1966

**SUCCESSIONAL TULIPTREE / REDBUD FOREST**

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**ELEMENT IDENTIFIERS**

**NVCS association:** *Liriodendron tulipifera* / *Cercis canadensis* Forest

**Database Code:** CEG007220

**Formation:** Lowland or submontane cold-deciduous forest

**Alliance:** LIRIODENDRON TULIPIFERA FOREST ALLIANCE (I.B.2.N.a.24)

**ELEMENT CONCEPT**

**Summary:** Forests on steep, mesic, typically north-facing slopes dominated by *Liriodendron tulipifera*. This forest is an early successional forest that follows agriculture or grazing, but is known to persist indefinitely (Martin 1989). The canopy is dominated by *Liriodendron tulipifera* (25-50% of total canopy cover) and can include various other species such as *Liquidambar styraciflua*, *Acer saccharum*, *Robinia pseudoacacia*, *Juglans nigra*, *Fraxinus americana*, and *Carya ovata*. Species often found in the subcanopy include *Acer saccharum*, *Cercis canadensis*, *Ulmus alata*, *Morus rubra*, and *Cornus florida*. Shrubs include saplings of the subcanopy and canopy species, as well as *Asimina triloba*, *Staphylea trifolia*, *Acer negundo*, and *Juniperus virginiana* var. *virginiana*.

**Environment:** See Summary

**Vegetation:** See Summary

**Dynamics:** See Summary

**Similar Associations:** No information

**Synonymy:** No information

**Comments:** Described from Tellico Pilot Project (Ridge and Valley of Tennessee, northeastern Monroe County; 9 stands sampled), where it is a common forest type. The most common herbaceous species were the exotics *Microstegium vimineum* and *Lonicera japonica*, as well as *Toxicodendron radicans*, *Parthenocissus quinquefolia*, and *Polystichum acrostichoides* (Andreu and Tukman 1995). In Kentucky this association may occur on calcareous substrates in the Dripping Springs Escarpment.

**CONSERVATION RANKING & RARE SPECIES**

**GRank:** G4G5 (01-04-19): This is a successional forest composed of species native to North America. It is not a rare forest type, and should be secure. Grank was changed from GW 2001-04-19 MP.

**High-ranked species:** No information

**ELEMENT DISTRIBUTION**

**Range:**

**States:** KY? TN

**Crosswalk to State Classifications:**

- KY?: No equivalent (KY 1991)

**TNC Ecoregions:** 44:?, 50:C

**USFS Ecoregions:** 221Jb:CCC

**Federal Lands:** TVA (Tellico); USFS (Cherokee?)

**ELEMENT SOURCES**

**References:** Andreu and Tukman 1995, Martin 1989

## EASTERN WHITE PINE SUCCESSIONAL FOREST

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### ELEMENT IDENTIFIERS

**NVCS association:** *Pinus strobus* Successional Forest

**Database Code:** CEG007944

**Formation:** Rounded-crowned temperate or subpolar needle-leaved evergreen forest

**Alliance:** PINUS STROBUS FOREST ALLIANCE (I.A.8.N.b.14)

### ELEMENT CONCEPT

**Summary:** This forest is an early successional forest dominated by *Pinus strobus*, typically with a very dense canopy and little understory. This successional forest is commonly associated with anthropogenic disturbance and could potentially occur anywhere within the range of the *Pinus strobus* Forest Alliance (A.128). Associated woody and herbaceous species vary with geography but are typically ruderal or exotic species that favor openings or disturbance. In the Southern Blue Ridge, where this association was originally defined, typical canopy and subcanopy associates include *Liriodendron tulipifera*, *Acer rubrum*, *Pinus rigida*, and *Liquidambar styraciflua*, with *Tsuga canadensis* often forming a dense shrub stratum. In this ecoregion, it occurs in former old fields and on formerly cleared flats along streams. In the Daniel Boone National Forest of Kentucky, *Pinus strobus* is spreading from plantings, especially in the Red River Gorge.

**Environment:** This wide-ranging successional forest is commonly associated with anthropogenic disturbance and could potentially occur anywhere within the range of the *Pinus strobus* Forest Alliance (A.128). Associated woody and herbaceous species vary with geography but are typically ruderal or exotic species that favor openings or disturbance.

**Vegetation:** In the Southern Blue Ridge, where this association was originally defined, typical canopy and subcanopy associates include *Liriodendron tulipifera*, *Acer rubrum*, *Pinus rigida*, and *Liquidambar styraciflua*, with *Tsuga canadensis* often forming a dense shrub stratum. In this ecoregion, it occurs in former old fields and on formerly cleared flats along streams. In the Daniel Boone National Forest of Kentucky, *Pinus strobus* is spreading from plantings, especially in the Red River Gorge.

**Dynamics:** See Summary

**Similar Associations:** No information

**Synonymy:** No information

**Comments:** This weedy type may be expected to occur throughout the range of the alliance but has only been attributed in areas where Nature Conservancy ecoregional planning or other project-specific needs have documented its occurrence. Rangeland review should greatly expand its geographic scope.

### CONSERVATION RANKING & RARE SPECIES

**GRank:** GD (01-02-11): This forest represents early successional vegetation and is thus not of conservation concern and does not receive a conservation status rank.

**High-ranked species:** No information

### ELEMENT DISTRIBUTION

**Range:** This weedy 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, Maine and New Hampshire south to North Carolina, South Carolina, Georgia, Tennessee, Kentucky (?), and Virginia, as well as in Ontario, Canada). It has only been documented in areas where project-specific needs have required it

**States:** GA KY? MI? MN NC NY? PA? SC TN VA WI?

#### Crosswalk to State Classifications:

- MI?: semi-natural
- NC: No equivalent (NC 1990)
- VA: No equivalent (VA 2001)
- WI?: semi-natural

**TNC Ecoregions:** 47:P, 48:P, 50:C, 51:C, 59:C, 60:P

**USFS Ecoregions:** 221Ha:CCC, 221Hb:CCC, 221Hc:CCC, 221He:CCC, 222En:CCC, 222Eo:CCC, M221Aa:CCC, M221Ab:CCC, M221Cd:CPP, M221Da:CCC, M221Db:CCC, M221Dc:CCC, M221Dd:CCC

**Federal Lands:** NPS (Carl Sandburg Home, Great Smoky Mountains); USFS (Cherokee?, Daniel Boone, George Washington, Jefferson)

### ELEMENT SOURCES

**References:** Fleming and Coulling 2001



**VIRGINIA PINE - RED-CEDAR SUCCESSIONAL FOREST**

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**ELEMENT IDENTIFIERS**

**NVCS association:** *Pinus virginiana* - *Juniperus virginiana* var. *virginiana* - *Ulmus alata* Forest

**Database Code:** C EGL007121

**Formation:** Rounded-crowned temperate or subpolar needle-leaved evergreen forest

**Alliance:** PINUS VIRGINIANA FOREST ALLIANCE (I.A.8.N.b.17)

**ELEMENT CONCEPT**

**Summary:** This community was originally defined from the Ridge and Valley of Tennessee, where it was found on highly eroded, abandoned agricultural land. The concept may apply to other areas where early successional *Juniperus virginiana* occurs over calcareous substrates. It includes dry-mesic, low- to mid-slope forest vegetation with *Pinus virginiana* and *Juniperus virginiana* var. *virginiana* making up most of the total canopy cover. Other canopy species may include *Quercus prinus*, *Quercus stellata*, *Quercus velutina*, *Liriodendron tulipifera*, *Liquidambar styraciflua*, and others. *Ulmus alata* is prominent in the subcanopy, while other subcanopy species include *Cornus florida*, *Carya ovata*, and *Juniperus virginiana* var. *virginiana*.

**Environment:** This community is found on highly eroded, abandoned, agricultural land (Andreu and Tukman 1995).

**Vegetation:** Stands are dominated by *Pinus virginiana* and *Juniperus virginiana* var. *virginiana*, which make up most of the total canopy cover. Other canopy species may include *Quercus prinus*, *Quercus stellata*, *Quercus velutina*, *Liriodendron tulipifera*, *Liquidambar styraciflua*, and others. *Ulmus alata* is prominent in the subcanopy, while other subcanopy species include *Cornus florida*, *Carya ovata*, and *Juniperus virginiana* var. *virginiana* (Andreu and Tukman 1995).

**Dynamics:** See Summary

**Similar Associations:**

- *Pinus virginiana* Successional Forest (CEGL002591)--on less calcareous, more acidic substrates.

**Synonymy:** No information

**Comments:** Originally described from Tellico Pilot Project (Ridge and Valley of Tennessee, northeastern Monroe County; 42 stands sampled), where this type occurs on highly eroded, abandoned agricultural land, at 820-1000 feet elevation (Andreu and Tukman 1995). Early successional *Pinus virginiana* vegetation occurring over acidic, infertile substrates is classed in *Pinus virginiana* Successional Forest (CEGL002591) and lacks species indicative of calcareous substrates.

**CONSERVATION RANKING & RARE SPECIES**

**GRank:** GD (02-05-15): This community is an early successional one, occurring on highly eroded abandoned agricultural land. It is not of conservation concern and is composed primarily of pioneer species that establish themselves following disturbance. Grank changed from "GW" as the components are native species, not non-native, exotic ones.

**High-ranked species:** No information

**ELEMENT DISTRIBUTION**

**Range:**

**States:** TN

**Crosswalk to State Classifications:**

- TN: Virginia Pine, RV, in part (TN 1994)

**TNC Ecoregions:** 50:C

**USFS Ecoregions:** 221:C

**Federal Lands:** TVA (Tellico); USFS (Cherokee?)

**ELEMENT SOURCES**

**References:** Andreu and Tukman 1995, Pyne 1994

## VIRGINIA PINE SUCCESSIONAL FOREST

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### ELEMENT IDENTIFIERS

**NVCS association:** *Pinus virginiana* Successional Forest

**Database Code:** CEGL002591

**Formation:** Rounded-crowned temperate or subpolar needle-leaved evergreen forest

**Alliance:** PINUS VIRGINIANA FOREST ALLIANCE (I.A.8.N.b.17)

### ELEMENT CONCEPT

**Summary:** This community 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 burned or eroded areas. 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*) or other early successional deciduous trees (e.g., *Acer rubrum*, *Liquidambar styraciflua*, *Liriodendron tulipifera*). 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.

**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 burned or 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 (primarily in valleys), resulting in stands with nothing but successional species in the understory.

**Vegetation:** This forest typically has a very dense canopy of *Pinus virginiana* and little understory vegetation. *Pinus taeda* or *Pinus echinata* 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*, *Liriodendron tulipifera*). Associated woody and herbaceous species vary with geography but are typically ruderal or exotic species. Shrub and herb strata are absent to 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 taeda*, *Pinus echinata*, and *Pinus rigida*. The dense ericaceous shrub stratum contains *Vaccinium* spp., *Gaylussacia* spp., *Kalmia latifolia*, and *Rhododendron* spp.

**Dynamics:** The vegetation at these sites in some cases is the result of the harvest of *Pinus echinata*, followed by lack of fire. Restoration to a *Pinus echinata*-dominated type may be appropriate.

### Similar Associations:

- *Pinus virginiana* - *Juniperus virginiana* var. *virginiana* - *Ulmus alata* Forest (CEGL007121)--on more calcareous or circumneutral substrates.

### Synonymy:

- Virginia Pine: 79 (Eyre 1980) B
- Virginia Pine - Oak: 78 (Eyre 1980) B
- Unclassified Old-Field Successional Forest (Fleming and Moorhead 2000)

**Comments:** Early successional *Pinus virginiana* vegetation occurring over calcareous substrates is classed in *Pinus virginiana* - *Juniperus virginiana* var. *virginiana* - *Ulmus alata* Forest (CEGL007121) and has species indicative of calcareous substrates.

### CONSERVATION RANKING & RARE SPECIES

**GRank:** GD (00-06-13): This forest represents early successional vegetation and is thus not of conservation concern.

**High-ranked species:** No information

### ELEMENT DISTRIBUTION

**Range:** This successional community is possible in the Piedmont from 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.

**States:** AL GA IN KY MD NC NJ PA SC TN VA WV

### Crosswalk to State Classifications:

- IN: semi-natural
- KY: No equivalent (KY 1991)
- NC: No equivalent (NC 1990)
- PA: Virginia pine-mixed hardwood forest
- TN: Virginia Pine, RV, in part (TN 1994)
- VA: No equivalent (VA 2001)

**TNC Ecoregions:** 50:C, 51:C, 52:C, 58:P, 59:C, 61:C

**USFS Ecoregions:** 221Ha:CCC, 221Hb:CCC, 221Hc:CCC, 221He:CCC, 221J:CC, 222Ej:CCC, 222En:CCC, 222Eo:CCC, 231Cd:CCC, M221Aa:CCC, M221Ab:CCC, M221Ac:CCC, M221Ca:CCP, M221Cb:CCP, M221Cc:CCP, M221Cd:CCC, M221Ce:CCP, M221Da:CCC, M221Db:CCC, M221Dc:CCC, M221Dd:CCC

**Federal Lands:** NPS (Great Smoky Mountains, Shiloh); TVA (Tellico); USFS (Bankhead, Chattahoochee, Cherokee, Daniel Boone, George Washington, Jefferson, Sumter, Uwharrie?)

**ELEMENT SOURCES**

**References:** Andreu and Tukman 1995, Eyre 1980, Fleming and Coulling 2001, Fleming and Moorhead 2000, Patterson et al. 1999, Pyne 1994

**CALCAREOUS BLACK LOCUST SUCCESSIONAL FOREST**

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**ELEMENT IDENTIFIERS**

**NVCS association:** Robinia pseudoacacia - Celtis occidentalis - (Fraxinus americana, Liriodendron tulipifera) Forest

**Database Code:** C EGL007281

**Formation:** Lowland or submontane cold-deciduous forest

**Alliance:** ROBINIA PSEUDOACACIA FOREST ALLIANCE (I.B.2.N.a.44)

**ELEMENT CONCEPT**

**Summary:** A dry-mesic to mesic slope forest of the Ridge and Valley, with *Robinia pseudoacacia* (up to 50%) and *Celtis occidentalis* (5-50%) making up most of the total canopy cover; *Fraxinus americana* or *Liriodendron tulipifera* may contribute 1-75% of the total canopy cover. Other common canopy species are *Acer saccharum* and *Ulmus rubra*. The subcanopy is typically dominated by *Acer saccharum* and *Asimina triloba*. This differs from the *Robinia pseudoacacia* Forest (CEGL007279) in having a more mixed canopy, in occurring over calcareous substrates, and in having calciphilic species. This successional forest is found on calcareous shale ridges and knobs, and at least some stands are thought to have resulted from clearcutting.

**Environment:** See Summary

**Vegetation:** Stands of this forest are dominated by *Robinia pseudoacacia* (up to 50%) and *Celtis occidentalis* (5-50%), which make up most of the total canopy cover. In addition, *Fraxinus americana* or *Liriodendron tulipifera* may contribute 1-75% of the total canopy cover. Other common canopy species are *Acer saccharum* and *Ulmus rubra*. The subcanopy is typically dominated by *Acer saccharum* and *Asimina triloba*.

**Dynamics:** This successional forest is found on calcareous shale ridges and knobs, and at least some stands are thought to have resulted from clearcutting (Andreu and Tukman 1995).

**Similar Associations:**

- Robinia pseudoacacia Forest (CEGL007279)
- Juglans nigra - Celtis occidentalis Forest (CEGL004693)--of Interior Low Plateau Kentucky.
- Juglans nigra - Celtis (laevigata, occidentalis) - (Aesculus glabra) Forest (CEGL004697)--of central Tennessee.

**Synonymy:** No information

**Comments:** This association is described from Tellico Pilot Project (Ridge and Valley of Tennessee, northeastern Monroe County; 43 stands sampled), where this successional forest is found on calcareous shale ridges and knobs, and at least some stands are thought to have resulted from clearcutting (Andreu and Tukman 1995).

**CONSERVATION RANKING & RARE SPECIES**

**GRank:** GD (01-05-14): Examples of this association are successional forests composed of species native to North America. Rank changed from GW to GD 2001-05-14.

**High-ranked species:** No information

**ELEMENT DISTRIBUTION**

**Range:** This forest occurs in the Ridge and Valley physiographic province of the southeastern United States, and possibly in the adjacent Southern Blue Ridge.

**States:** TN

**Crosswalk to State Classifications:** Not yet cross-referenced to state classifications

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

**USFS Ecoregions:** 221J:CC

**Federal Lands:** TVA (Tellico); USFS (Cherokee?)

**ELEMENT SOURCES**

**References:** Andreu and Tukman 1995

**MONTANE GRAPE OPENING**

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**ELEMENT IDENTIFIERS**

**NVCS association:** *Vitis aestivalis* Vine-Shrubland

**Database Code:** CEG003890

**Formation:** Temperate cold-deciduous shrubland

**Alliance:** VITIS AESTIVALIS VINE-SHRUBLAND ALLIANCE (III.B.2.N.a.18)

**ELEMENT CONCEPT**

**Summary:** This community is strongly dominated by the vine *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. This community can range in size from less than a hectare to ten hectares. In the Great Smoky Mountains National Park, this community occurs on steep to very steep, northerly, middle to upper slopes at intermediate elevations between 600 and 1000 m (2000-3500 feet). All areas sampled showed evidence of disturbance by wind, ice, or logging.

**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 600 and 1000 m (2000-3500 feet) (MacKenzie 1993).

**Vegetation:** Stands of this community are 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. 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.

**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.

**Similar Associations:** No information

**Synonymy:** No information

**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.

**CONSERVATION RANKING & RARE SPECIES**

**GRank:** G2G3 (97-08-11): This is an uncommon community. It is restricted within its range and could be limited by specific disturbance regimes.

**High-ranked species:** No information

**ELEMENT DISTRIBUTION**

**Range:** This community is known from the Great Smoky Mountains of Tennessee and may possibly occur in montane areas of Arkansas, Kentucky, North Carolina, and Oklahoma.

**States:** AR? KY? NC? OK? TN

**Crosswalk to State Classifications:**

- NC?: No equivalent (NC 1990)

**TNC Ecoregions:** 38:P, 39:P, 50:P, 51:C

**USFS Ecoregions:** M221Dd:CCC, M222Ab:PPP, M231A:PP

**Federal Lands:** NPS (Great Smoky Mountains); USFS (Cherokee, Ozark?)

**ELEMENT SOURCES**

**References:** MacKenzie 1993

## EXOTIC SPECIES DOMINATED SOUTHEASTERN WOODED UPLANDS

**KUDZU VINELAND****ELEMENT IDENTIFIERS**

**NVCS association:** *Pueraria montana* var. *lobata* Vine-Shrubland

**Database Code:** CEG003882

**Formation:** Temperate cold-deciduous shrubland

**Alliance:** PUERARIA MONTANA VINE-SHRUBLAND ALLIANCE (III.B.2.N.a.11)

**ELEMENT CONCEPT**

**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.

**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 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.

**Vegetation:** This vine-dominated vegetation is dominated by *Pueraria montana* var. *lobata*, a fast-growing vine native to Asia.

**Dynamics:** This association chokes out existing vegetation.

**Similar Associations:** No information

**Synonymy:**

- Kudzu thicket (CAP 1998)

**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.

**CONSERVATION RANKING & RARE SPECIES**

**GRank:** GW (00-05-24): 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.

**High-ranked species:** No information

**ELEMENT DISTRIBUTION**

**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).

**States:** AL AR FL GA KY LA MD MS NC OK SC TN TX VA

**Crosswalk to State Classifications:**

- GA: No equivalent (GA 1990)
- NC: No equivalent (NC 1990)
- OK: *Pueraria montana* var. *lobata* vine-shrubland association (OK 2000)
- VA: No equivalent (VA 2001)

**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

**USFS Ecoregions:** 221Hc:CCC, 222Ab:CCC, 222Ag:CCC, 222Ah:CCC, 222An:CCC, 231Ca:CCC, 231Cd:CCC, 232Bm:CCC, 234:C, M221Aa:CCC, M221Ab:CCC, M221Ca:CCP, M221Cb:CCP, M221Cc:CCP, M221Ce:CCP, M221Db:CCP, M221Dc:CCP, M221Dd:CCC, M222Aa:CCC, M222Ab:CCC, M231Aa:CCC, M231Ab:CCC, M231Ac:CCC, M231Ad:CCC

**Federal Lands:** DOD (Fort Benning); TVA (Tellico); USFS (Bankhead, Cherokee, Daniel Boone, George Washington, Jefferson, Oconee?, Ouachita, Ozark, Talladega)

**ELEMENT SOURCES**

**References:** CAP 1998, Edwards 1982, Fleming and Coulling 2001, Hoagland 1998b, Hoagland 2000

**SHORTLEAF PINE PLANTATION**

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**ELEMENT IDENTIFIERS****NVCS association:** *Pinus echinata* Planted Forest**Database Code:** C EGL007169**Formation:** Planted/cultivated temperate or subpolar needle-leaved evergreen forest**Alliance:** PINUS ECHINATA PLANTED FOREST ALLIANCE (I.A.8.C.x.4)**ELEMENT CONCEPT****Summary:** This association includes young, monospecific, dense stands of *Pinus echinata* across a variety of managed site conditions. The majority of stands accommodated in this association were artificially established through mechanical planting, although they may be established through other means such as seed-tree cuts. In most cases these stands support almost no other tree species, and typically very little understory. These are cultivated forests and are not considered natural or near-natural vegetation. If these areas exist on private lands, they are often maintained for the harvest of forest products and rarely exceeds 20-40 years of age.**Environment:** See Summary**Vegetation:** See Summary**Dynamics:** See Summary**Similar Associations:** No information**Synonymy:**

- Shortleaf Pine: 75 (Eyre 1980) B

**Comments:** During the year 2000, a vast majority of stands in the Daniel Boone National Forest (Kentucky) suffered from damage by the Southern Pine Beetle (*Dendroctonus frontalis*). They will apparently be replanted.**CONSERVATION RANKING & RARE SPECIES****GRank:** GC (00-08-08): 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.**High-ranked species:** No information**ELEMENT DISTRIBUTION****Range:** This alliance is found throughout the southeastern United States.**States:** AL AR GA KY LA MS NC OK SC TX**Crosswalk to State Classifications:**

- NC: No equivalent (NC 1990)

**TNC Ecoregions:** 38:C, 39:C, 40:C, 41:P, 43:P, 44:P, 50:C, 51:C, 52:P, 53:C**USFS Ecoregions:** 221Ha:CC?, 221Hc:CCC, 221He:CCC, 222Eb:CCC, 222En:CCC, 222Eo:CCC, 231Dc:CCC, 231E:CC, 232Bm:CCC, M221D:CC, M222A:CC, M231A:CC**Federal Lands:** DOD (Fort Benning); USFS (Chattahoochee, Cherokee?, Davy Crockett, Daniel Boone, Kisatchie, Ouachita, Ozark, Sabine, Sam Houston, Talladega?, Tuskegee?)**ELEMENT SOURCES****References:** Eyre 1980

## PITCH PINE PLANTATION

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### ELEMENT IDENTIFIERS

**NVCS association:** *Pinus rigida* Planted Forest

**Database Code:** CEG008436

**Formation:** Planted/cultivated temperate or subpolar needle-leaved evergreen forest

**Alliance:** PINUS RIGIDA PLANTED FOREST ALLIANCE (I.A.8.C.x.101)

### ELEMENT CONCEPT

**Summary:** Plantations of *Pinus rigida*, generally dense and monospecific. In time, if not harvested, and especially with fire, these plantations may develop more natural floristic characteristics and may be reclassified as semi-natural or natural types.

**Environment:** Variable, but usually planted only on poorer sites.

**Vegetation:** This alliance consists of plantations dominated by *Pinus rigida*.

**Dynamics:** See Summary

**Similar Associations:** No information

#### Synonymy:

- Pitch Pine: 45 (Eyre 1980) B

**Comments:** This type is based on stands seen (but not sampled) on Chattahoochee National Forest. Keith Wooster (pers. comm.) states that there are limited planted areas of *Pinus rigida*, on sandstone ridge sites.

### CONSERVATION RANKING & RARE SPECIES

**GRank:** GC (00-06-13): 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.

**High-ranked species:** No information

### ELEMENT DISTRIBUTION

**Range:** This association has been documented from northern Georgia, where *Pinus rigida* has been planted by the U.S. Forest Service on xeric sites on sandstone, south of the natural distribution of the tree. It could, however, occur anywhere within or beyond the natural range of pitch pine. Stands of the species have also been planted in the Cherokee National Forest of Tennessee.

**States:** GA TN

**Crosswalk to State Classifications:** Not yet cross-referenced to state classifications

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

**USFS Ecoregions:** 231Dc:CCC, M221D:CC

**Federal Lands:** USFS (Chattahoochee, Cherokee)

### ELEMENT SOURCES

**References:** Eyre 1980



**WHITE PINE PLANTATION****ELEMENT IDENTIFIERS**

**NVCS association:** *Pinus strobus* Planted Forest

**Database Code:** C EGL007178

**Formation:** Planted/cultivated temperate or subpolar needle-leaved evergreen forest

**Alliance:** PINUS STROBUS PLANTED FOREST ALLIANCE (I.A.8.C.x.8)

**ELEMENT CONCEPT**

**Summary:** This white pine plantation type is found throughout the northeastern and midwestern United States and adjacent Canada. Stands contain plantations of *Pinus strobus* that are maintained for the extraction of forest products. At maturity, the tree canopy is usually dense and contains a monospecific layer of *Pinus strobus*. The field layer may be sparse to absent. In some stands, mosses may be abundant. Susceptibility to a variety of pests or diseases, including White Pine Blister Rust (*Cronartium ribicola*) and Southern Pine Beetle (*Dendroctonus frontalis*), has had some impact on its commercial use.

**Environment:** Stands contain plantations of *Pinus strobus* that are maintained for the extraction of forest products. The type does well on a variety of soils.

**Vegetation:** The tree canopy at maturity is usually dense and contains a mono-specific layer of *Pinus strobus*. The field layer may be sparse to absent. In some stands, mosses may be abundant.

**Dynamics:** *Pinus strobus* is susceptible to a variety of pests and diseases, including White Pine Blister Rust (*Cronartium ribicola*) and Southern Pine Beetle (*Dendroctonus frontalis*), which have had some impact on its commercial use. Blister rust was a problem on young plantations but is not much of a problem in larger trees in the east (P. Manion pers. comm. 2001).

**Similar Associations:** No information

**Synonymy:**

- IF3b. Plantation (Hardwood or Conifer) (Allard 1990) B. in part
- Unclassified Clearcut Regeneration (Fleming and Moorhead 2000). *pro parte*.

**Comments:** There was a lot of planting of white pine from the 1930s into the 1950s, but there has been very little planting since then (P. Manion pers. comm. 2001). On the Daniel Boone National Forest of Kentucky, *Pinus strobus* plantings are of limited extent, and are related to wildlife plantings. There has been some damage from the Southern Pine Beetle (*Dendroctonus frontalis*). ^These plantations have been observed in the Peters Mountain area (James River Ranger District) and various other sites in the George Washington and Jefferson national forests.

**CONSERVATION RANKING & RARE SPECIES**

**GRank:** GC (00-08-08): 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.

**High-ranked species:** No information

**ELEMENT DISTRIBUTION****Range:**

**States:** GA KY MD MI MN NC NY ON PA SC TN VA WI

**Crosswalk to State Classifications:**

- MD: *Pinus strobus* Planted Forest
- NC: No equivalent (NC 1990)
- VA: No equivalent (VA 2001)

**TNC Ecoregions:** 47:C, 48:C, 51:C, 63:C

**USFS Ecoregions:** 212:C, 221He:CCC, M212:C, M221Aa:CCC, M221Ce:CCC, M221Dc:CCC, M221Dd:CCP

**Federal Lands:** USFS (Chattahoochee, Daniel Boone, George Washington, Jefferson, Nantahala, Pisgah, Sumter)

**ELEMENT SOURCES**

**References:** Allard 1990, Fleming and Coulling 2001, Fleming and Moorhead 2000

LOBLOLLY PINE PLANTATION

ELEMENT IDENTIFIERS

**NVCS association:** Pinus taeda Planted Forest

**Database Code:** CEGL007179

**Formation:** Planted/cultivated temperate or subpolar needle-leaved evergreen forest

**Alliance:** PINUS TAEDA PLANTED FOREST ALLIANCE (I.A.8.C.x.9)

ELEMENT CONCEPT

**Summary:** This association represents young, monospecific plantation stands of *Pinus taeda*. The core concept of these stands are those which support dense, often perfect rows of planted *Pinus taeda* or otherwise dense, young stands which are managed and maintained for the extraction of forest products (usually pulpwood). In most cases these stands support almost no other tree species in the overstory, and typically very little understory. This association rarely exceeds 20-40 years of age on most timberlands. Stands are typically established with mechanical planting, but may also be established through other means. Excluded from this association are plantation stands which have "broken up" with age to approximate a more natural structure. Dense planting in rows, if successful, tends to result in nearly complete canopy closure which persists until the stand has either been regenerated or transitions into a different association. Herbaceous ground cover of any kind tends to be sparse due to reduction during site preparation, the typically dense canopy cover, and to the fact that many young plantations are infrequently burned at best. ^In the Coastal Plain of South Carolina, these include mature loblolly plantations, often with *Prunus serotina* in the understory, that have been prescribed burned (based on seven plots at Savannah River Site). In the Ouachita Mountains planted loblolly is found with a variable amount of *Quercus alba*, *Quercus falcata*, *Quercus marilandica*, *Quercus stellata*, and *Quercus velutina*; on drier sites *Pinus echinata*, *Carya alba*, and *Carya texana*; and *Acer rubrum*, *Liquidambar styraciflua*, and *Quercus nigra* on wetter sites. The understory can be thick especially after thinning and/or burning. Common understory species are *Vaccinium pallidum*, *Vaccinium arboreum*, *Vaccinium stamineum*, *Cornus florida*, *Ulmus alata*, and others. Vines are an important component, including *Berchemia scandens*, *Vitis* spp., *Smilax* spp., and *Toxicodendron radicans*. In dense stands the herbaceous layer is suppressed by dense needle litter. In thinned and burned stands the plantations are often grazed. Herbaceous species can include *Solidago ulmifolia*, *Chasmanthium sessiliflorum*, *Schizachyrium scoparium*, *Danthonia spicata*, *Tephrosia virginiana*, *Lespedeza* spp., *Symphyotrichum patens* (= *Aster patens*), *Eupatorium* spp., and others. In Oklahoma, associates include *Rhus copallinum*, *Hypericum densiflorum*, *Liquidambar styraciflua*, and *Toxicodendron radicans*.

**Environment:** See Summary

**Vegetation:** In the Ouachita Mountains planted loblolly is found with a variable amount of *Quercus alba*, *Quercus falcata*, *Quercus marilandica*, *Quercus stellata*, and *Quercus velutina*; on drier sites *Pinus echinata*, *Carya alba*, and *Carya texana*; and *Acer rubrum*, *Liquidambar styraciflua*, and *Quercus nigra* on wetter sites. The understory can be thick especially after thinning and/or burning. Common understory species are *Vaccinium pallidum*, *Vaccinium arboreum*, *Vaccinium stamineum*, *Cornus florida*, *Ulmus alata*, and others. Vines are an important component, including *Berchemia scandens*, *Vitis* spp., *Smilax* spp., and *Toxicodendron radicans*. In dense stands the herbaceous layer is suppressed by dense needle litter. In thinned and burned stands the plantations are often grazed. Herbaceous species can include *Solidago ulmifolia*, *Chasmanthium sessiliflorum*, *Schizachyrium scoparium*, *Danthonia spicata*, *Tephrosia virginiana*, *Lespedeza* spp., *Symphyotrichum patens* (= *Aster patens*), *Eupatorium* spp., and others. In Oklahoma, associates include *Rhus copallinum*, *Hypericum densiflorum*, *Liquidambar styraciflua* and *Toxicodendron radicans* (Hoagland 1997, 2000).

**Dynamics:** See Summary

**Similar Associations:**

- Pinus taeda / Rhus copallinum Managed Forest (CEGL007108)--may replace this association as stands mature.

**Synonymy:**

- Loblolly Pine: 81 (Eyre 1980) B

**Comments:** At Arnold Air Force Base, Coffee and Franklin counties, Tennessee, *Pinus taeda* is near the edge of its putative natural range, and was apparently absent prior to being planted there between 1945 and 1950 on abandoned agricultural land and along roadsides. Older plantings have not been intensively managed, and many have become 'modified' vegetation (e.g., CEGL007109), and are no longer regarded as plantations. More recently (1998-2001) some of these older pine stands have been harvested and replaced with true *Pinus taeda* plantations. *Pinus taeda* also invades seasonally wet hardwood depressions, but these stands remain recognizable as to their natural identity (e.g., CEGL007364). ^Associations occur as plantations and on old fields on Kisatchie and Sumter national forests and after blowdowns on the Kisatchie. South Carolina information after Jones et al. 1981.

**CONSERVATION RANKING & RARE SPECIES**

**GRank:** GC (00-08-08): 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.

**High-ranked species:** No information

**ELEMENT DISTRIBUTION**

**Range:** This association is found throughout the southeastern United States.

**States:** AL AR FL GA KY LA MD MS NC OK SC TN TX VA?

**Crosswalk to State Classifications:**

- MD: *Pinus taeda* Planted Forest
- NC: No equivalent (NC 1990)
- OK: *Pinus taeda* / *Rhus copallina* forest association, in part (OK 2000)
- TX: No equivalent (TX 1993)
- VA?: No equivalent (VA 2001)

**TNC Ecoregions:** 38:C, 39:C, 40:C, 41:C, 42:P, 43:C, 44:C, 50:C, 51:C, 52:C, 53:C, 56:P, 57:P

**USFS Ecoregions:** 221Jb:CCC, 222C:CC, 222E:CC, 231Aa:CCC, 231B:CC, 231Ca:CPP, 231Cd:CPP, 231E:CC, 232Bm:CCC, 232Br:CCC, 232Ca:CCC, 232Cb:CCC, 232Ce:CCC, 234A:CC, M221D:CC, M222A:CC, M231A:CC

**Federal Lands:** DOD (Arnold, Fort Benning, Fort Bragg, Fort Gordon, Fort Stewart); DOE (Savannah River Site); NPS (Shiloh?); USFS (Angelina, Bankhead?, Bienville, Cherokee, Conecuh, Davy Crockett, Delta, De Soto, Kisatchie, Oconee, Ouachita, Ozark, Sabine, Sam Houston, St. Francis?, Sumter, Talladega, Tuskegee)

**ELEMENT SOURCES**

**References:** Eyre 1980, Hoagland 1998a, Hoagland 2000, Jones et al. 1981b, TNC 1998a

## VIRGINIA PINE PLANTATION

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### ELEMENT IDENTIFIERS

**NVCS association:** *Pinus virginiana* Planted Forest

**Database Code:** CEG004730

**Formation:** Planted/cultivated temperate or subpolar needle-leaved evergreen forest

**Alliance:** PINUS VIRGINIANA PLANTED FOREST ALLIANCE (I.A.8.C.x.10)

### ELEMENT CONCEPT

**Summary:** This association includes planted stands of *Pinus virginiana* with little understory, but may have admixtures of other native or off-site pines. These are cultivated forests and are not considered natural or near-natural vegetation. They are maintained as plantations for the harvest of forest products, or for production of Christmas trees and on strip-mined sites. Stands have suffered some damage from the Southern Pine Beetle (*Dendroctonus frontalis*).

**Environment:** See Summary

**Vegetation:** See Summary

**Dynamics:** See Summary

**Similar Associations:** No information

#### Synonymy:

- IF3b. Plantation (Hardwood or Conifer) (Allard 1990) B. in part
- Virginia Pine: 79 (Eyre 1980) B

**Comments:** Stands have suffered some damage from the Southern Pine Beetle (*Dendroctonus frontalis*). At Arnold Air Force Base, Coffee and Franklin counties, Tennessee, *Pinus virginiana* is dominant in dry-mesic, low to mid-slope forests. *Pinus strobus* is scattered throughout, with *Juniperus virginiana* var. *virginiana* occurring in patches. The subcanopy contains *Acer rubrum*, *Cornus florida*, and *Liquidambar styraciflua*. The tall-shrub layer includes *Sassafras albidum*, *Cornus florida*, *Cercis canadensis*, *Liquidambar styraciflua*, and *Quercus stellata*. The herbaceous layer is sparse or nearly absent, and contains *Polystichum acrostichoides*, *Aster* spp., *Carex* spp., *Botrychium biternatum*, and exotic *Lonicera japonica*.

### CONSERVATION RANKING & RARE SPECIES

**GRank:** GC (00-08-08): 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.

**High-ranked species:** No information

### ELEMENT DISTRIBUTION

**Range:** This alliance is found throughout the Piedmont of the southeastern United States and ranges into part of the Cumberland Plateau, Interior Low Plateau, and the Southern Blue Ridge. It is known to occur in Alabama, Georgia, Kentucky, North Carolina, South Carolina, Tennessee, Virginia, and may possibly range into Mississippi.

**States:** AL GA KY MS? NC SC TN VA

#### Crosswalk to State Classifications:

- NC: No equivalent (NC 1990)
- VA: No equivalent (VA 2001)

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

**USFS Ecoregions:** 221Hc:CCC, 221He:CCC, 222Eb:CCC, 231:C, 232:?, M221Dc:???, M221Dd:???

**Federal Lands:** DOD (Arnold, Fort Gordon, Fort Stewart?); USFS (Chattahoochee, Cherokee, Daniel Boone, Nantahala?, Pisgah?, Uwharrie?)

### ELEMENT SOURCES

**References:** Allard 1990, Eyre 1980

**GRASSY BALD (SEDFE TYPE)**

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**ELEMENT IDENTIFIERS****NVCS association:** *Carex pensylvanica* Herbaceous Vegetation**Database Code:** CEG004094**Formation:** Short sod temperate or subpolar grassland**Alliance:** CAREX PENNSYLVANICA HERBACEOUS ALLIANCE (V.A.5.N.e.5)**ELEMENT CONCEPT****Summary:** Montane grasslands over 1220 m (4000 feet) elevation in the southern Appalachian Mountains dominated by *Carex pensylvanica*. Associated species include *Rumex acetosella* (exotic), *Carex debilis*, *Polytrichum commune*, *Helenium autumnale*, *Danthonia compressa*, *Sibbaldiopsis tridentata*, *Fragaria virginiana*, *Ageratina altissima* var. *roanensis*, *Angelica triquinata*, *Oclemena acuminata* (= *Aster acuminatus*), *Bromus pubescens*, and *Dennstaedtia punctilobula*. Woody species, such as *Rhododendron catawbiense*, *Pieris floribunda*, *Rubus canadensis*, and *Robinia hispida*, may have sparse coverage in some occurrences.**Environment:** See Summary**Vegetation:** See Summary**Dynamics:** See Summary**Similar Associations:** No information**Synonymy:**

- ID9a. Grass Bald (Allard 1990) B. in part

**Comments:** This concept needs to be modified to better describe occurrences at Whitetop Mountain, Virginia (G. Fleming pers. comm.).**CONSERVATION RANKING & RARE SPECIES****GRank:** G1 (94-12-15): 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 and the introduction of exotic plant and animal species, and by successional trends of uncertain cause.**High-ranked species:** AGERATINA ALTISSIMA VAR ROANENSIS (G5T3T4), ERYTHRONIUM UMBILICATUM SSP MONOSTOLUM (G5T3), GENTIANA AUSTROMONTANA (G3), GEUM GENICULATUM (G2), HYPERICUM GRAVEOLENS (G3), HYPERICUM MITCHELLIANUM (G3), KRIGIA MONTANA (G3), LILIUM GRAYI (G3), PRENANTHES ROANENSIS (G3)**ELEMENT DISTRIBUTION****Range:****States:** NC TN**Crosswalk to State Classifications:**

- NC: Grassy Bald, in part (NC 1990)
- TN: Grass Balds, in part (TN 1994)

**TNC Ecoregions:** 51:C**USFS Ecoregions:** M221Dc:CCC, M221Dd:CC?**Federal Lands:** USFS (Cherokee, Pisgah)**ELEMENT SOURCES****References:** Allard 1990, Fleming pers. comm., Pyne 1994, Schafale and Weakley 1990

**GRASSY BALD (SOUTHERN GRASS TYPE)****ELEMENT IDENTIFIERS**

**NVCS association:** *Danthonia compressa* - (*Sibbaldiopsis tridentata*) Herbaceous Vegetation

**Database Code:** CEG004242

**Formation:** Short sod temperate or subpolar grassland

**Alliance:** DANTHONIA COMPRESSA HERBACEOUS ALLIANCE (V.A.5.N.e.7)

**ELEMENT CONCEPT**

**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* (= *Potentilla tridentata*). Other characteristic herbaceous species are *Angelica triquinata*, *Oclemena acuminata* (= *Aster acuminatus*), *Carex pensylvanica*, *Carex debilis*, *Carex intumescens*, *Carex brunnescens*, *Deschampsia flexuosa*, *Erythronium umbilicatum ssp. monostolum*, *Gentiana austromontana*, *Gentianella quinquefolia*, *Houstonia serpyllifolia*, *Ionactis linariifolius* (= *Aster linariifolius*), *Lysimachia quadrifolia*, *Potentilla canadensis*, *Prenanthes roanensis*, *Smilax herbacea*, *Solidago bicolor*, *Solidago glomerata*, *Stachys clingmanii*, *Trautvetteria caroliniensis var. caroliniensis*. The floristic composition is a mixture of widespread species, northern disjunct species (such as *Agrostis mertensii*, *Carex siccata* (= *Carex aenea*), *Minuartia groenlandica*, *Packera schweinitziana* (= *Senecio schweinitzianus*), *Sibbaldiopsis tridentata*), and Southern Appalachian endemics (such as *Erythronium umbilicatum ssp. monostolum*, *Geum geniculatum*, *Geum radiatum*, *Houstonia serpyllifolia*, *Lilium grayi*, *Prenanthes roanensis*, *Solidago glomerata*, *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*, *Prunella vulgaris*. This community occurs on high-elevation (usually above 1350 m or 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*.

**Environment:** This community occurs on high-elevation (usually above 1350 m or 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:** 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*, *Oclemena acuminata* (= *Aster acuminatus*), *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*, *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*, *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*.

**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 (Weigl 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.

**Similar Associations:** No information

**Synonymy:**

- ID9a. Grass Bald (Allard 1990) B. in part
- *Danthonia compressa* - *Carex brunnescens* ssp. *sphaerostachya* - *Sibbaldiopsis tridentata* Herbaceous Vegetation (Fleming and Coulling 2001) =

**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 the 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.

**CONSERVATION RANKING & RARE SPECIES**

**GRank:** G1 (98-12-14): 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.

**High-ranked species:** ALLIUM ALLEGHENIENSE (G3?), ERYTHRONIUM UMBILICATUM SSP MONOSTOLUM (G5T3), HYPERICUM GRAVEOLENS (G3), HYPERICUM MITCHELLIANUM (G3), LILIUM GRAYI (G3), GEUM GENICULATUM (G2), GEUM RADIATUM (G1), GENTIANA AUSTROMONTANA (G3), STACHYS CLINGMANII (G2Q), SOLIDAGO GLOMERATA (G3), PRENANTHES ROANENSIS (G3)

**ELEMENT DISTRIBUTION**

**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.

**States:** NC TN VA

**Crosswalk to State Classifications:**

- NC: Grassy Bald, in part (NC 1990)
- TN: Grass Balds, BR (TN 1994)
- VA: Southern Appalachian Grassy Bald (VA 2001)

**TNC Ecoregions:** 51:C

**USFS Ecoregions:** M221Db:CC?, M221Dc:CCC, M221Dd:CCC

**Federal Lands:** NPS (Great Smoky Mountains); USFS (Cherokee, Jefferson, Pisgah)

**ELEMENT SOURCES**

**References:** Allard 1990, Allard et al. 1990, Billings and Mark 1957, Bratton 1975, Cain 1931, DeSelm and Murdock 1993, Fleming and Coulling 2001, Fleming et al. 2001, 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 - Southeast U.S. unpubl. data, Pyne 1994, Schafale and Weakley 1990, Stratton and White 1982, Weakley pers. comm., Wiegand and Knowles 1999

**SOUTHERN APPALACHIAN BLACKBERRY BALD****ELEMENT IDENTIFIERS**

**NVCS association:** *Rubus allegheniensis* - *Rubus canadensis* / *Carex pensylvanica* Shrubland

**Database Code:** CEGL003892

**Formation:** Subalpine or subpolar cold-deciduous shrubland

**Alliance:** RUBUS ALLEGHENIENSIS - RUBUS CANADENSIS SHRUBLAND ALLIANCE (III.B.2.N.b.2)

**ELEMENT CONCEPT**

**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. *asplenioides*, *Agrostis perennans*, *Angelica triquinata*, *Carex debilis* var. *rudgei*, *Carex brunnescens*, *Carex intumescens* (= var. *fernaldii*), and *Rumex acetosella* (exotic).

**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:** 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*, and *Rumex acetosella*. Virginia examples of this community are heavily dominated by *Rubus canadensis* and contain a wide variety of minor associates.

**Dynamics:** See Summary

**Similar Associations:** No information

**Synonymy:**

- ID9a. Grass Bald (Allard 1990) B. in part
- *Rubus canadensis* Shrubland (Fleming and Coulling 2001) = VA Srank = SM

**Comments:** None

**CONSERVATION RANKING & RARE SPECIES**

**GRank:** GM (98-01-30): 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* Herbaceous Vegetation (CEGL004094) or *Danthonia compressa* - (*Sibbaldiopsis tridentata*) Herbaceous Vegetation (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 CEG004094 or CEG004242.

**High-ranked species:** No information

**ELEMENT DISTRIBUTION**

**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.

**States:** NC TN VA

**Crosswalk to State Classifications:**

- NC: Grassy Bald, in part (NC 1990)
- TN: Grass Balds, BR, in part (TN 1994)
- VA: Southern Appalachian Shrub Bald, in part (VA 2001)

**TNC Ecoregions:** 51:C

**USFS Ecoregions:** M221Dc:CCC, M221Dd:CCC

**Federal Lands:** USFS (Cherokee, Jefferson, Pisgah)



**ELEMENT SOURCES**

**References:** Allard 1990, Fleming and Coulling 2001, Fleming et al. 2001, Pyne 1994, Schafale and Weakley 1990

## SOUTHERN APPALACHIAN ALDER BALD

## ELEMENT IDENTIFIERS

**NVCS association:** *Alnus viridis* ssp. *crispa* / *Carex pensylvanica* Shrubland

**Database Code:** C EGL003891

**Formation:** Subalpine or subpolar cold-deciduous shrubland

**Alliance:** ALNUS VIRIDIS SHRUBLAND ALLIANCE (III.B.2.N.b.1)

## ELEMENT CONCEPT

**Summary:** This mainly deciduous shrubland occurs at the highest elevations, greater than 1750 m (5800 feet) in the southern Appalachian Mountains on summit ridges of the Roan Mountain massif. It is dominated by *Alnus viridis* ssp. *crispa*, typically 1.5-2 m in height, rarely producing a closed canopy but typically occurring as uniformly spaced clumps about 1 m apart. *Rubus allegheniensis* is often a codominant with *Alnus viridis* ssp. *crispa*. Other shrub species occur with low coverage and include *Rhododendron catawbiense*, *Vaccinium corymbosum*, and *Crataegus* spp. Openings in the shrub canopy are dominated by herbs, mainly *Carex pensylvanica* and *Carex debilis* var. *rudgei* but also may include *Danthonia compressa*, *Deschampsia flexuosa*, *Viola blanda*, *Rumex acetosella* (exotic), and *Athyrium filix-femina* ssp. *asplenioides*. In moister areas, bryophyte cover can be up to 75%, with *Polytrichum commune* typical. This community can grade into or occur adjacent to high elevation rock outcrop communities, montane grass-dominated communities, high elevation herbaceous seeps, or forests dominated by stunted *Fagus grandifolia*. It often invades montane grass-dominated communities and may eventually succeed to *Rhododendron catawbiense* Shrubland (CEGL003818).

**Environment:** This community occurs as disconnected patches on summit ridges, interrupted by grass-dominated vegetation. It can grade into or occur adjacent to high-elevation rock outcrop communities, montane grass-dominated communities, high-elevation herbaceous seeps, or forests dominated by stunted *Fagus grandifolia*. It often invades montane grass-dominated communities and may eventually succeed to *Rhododendron catawbiense* Shrubland (CEGL003818).

**Vegetation:** These montane, mainly deciduous shrublands are dominated by *Alnus viridis* typically 1.5-2 m in height, rarely producing a closed canopy but typically occurring as uniformly spaced clumps about 1 m apart. *Rubus allegheniensis* is often a codominant with *Alnus viridis* ssp. *crispa*. Other shrub species occur with low coverage and include *Rhododendron catawbiense*, *Vaccinium corymbosum*, and *Crataegus* spp. Openings in the shrub canopy are dominated by herbs, mainly *Carex pensylvanica* and *Carex debilis* var. *rudgei* but also may include *Danthonia compressa*, *Deschampsia flexuosa*, *Viola blanda*, *Rumex acetosella* (exotic), and *Athyrium filix-femina* ssp. *asplenioides*. In moister areas, bryophyte cover can be up to 75%, with *Polytrichum commune* typical.

**Dynamics:** See Summary

**Similar Associations:** No information

**Synonymy:**

- IC4a. Heath Bald Shrubland (Allard 1990) B. in part

**Comments:** Other communities dominated by *Alnus viridis* ssp. *crispa* may occur in the western and northeastern United States as well as in Canada. This community occurs as disconnected patches on summit ridges, interrupted by grass-dominated vegetation such as *Danthonia compressa* - (*Sibbaldiopsis tridentata*) Herbaceous Vegetation (CEGL004242) or *Carex pensylvanica* Herbaceous Vegetation (CEGL004094). Additionally, this community can grade into or occur adjacent to high-elevation rock outcrop communities, high-elevation herbaceous seeps, or forests dominated by stunted *Fagus grandifolia*.

## CONSERVATION RANKING &amp; RARE SPECIES

**GRank:** G1 (94-08-15): This community occurs only in the Roan Mountain massif, Avery and Mitchell counties, North Carolina and Carter County, Tennessee, where it occupies hundreds of hectares. It is a narrow endemic, naturally rare, but stable, occupying a total acreage of less than 500 hectares.

**High-ranked species:** KRIGIA MONTANA (G3), LILIUM GRAYI (G3), PRENANTHES ROANENSIS (G3)

## ELEMENT DISTRIBUTION

**Range:** This community occurs only in the Roan Mountain massif of the Southern Blue Ridge of North Carolina and Tennessee.

**States:** NC TN

**Crosswalk to State Classifications:**

- NC: Heath Bald, in part (NC 1990)
- TN: Heath Bald, BR, in part (TN 1994)

**TNC Ecoregions:** 51:C

**USFS Ecoregions:** M221Dc:CCC

**Federal Lands:** USFS (Cherokee, Pisgah)

**ELEMENT SOURCES**

**References:** Allard 1990, Pyne 1994, Schafale and Weakley 1990

## SOUTHERN APPALACHIAN MOUNTAIN LAUREL BALD

## ELEMENT IDENTIFIERS

**NVCS association:** *Kalmia latifolia* - *Rhododendron catawbiense* - (*Gaylussacia baccata*, *Pieris floribunda*, *Vaccinium corymbosum*) Shrubland

**Database Code:** CEGL003814

**Formation:** Hemi-sclerophyllous temperate broad-leaved evergreen shrubland

**Alliance:** RHODODENDRON (CATAWBIENSE, CAROLINIANUM) - KALMIA LATIFOLIA SHRUBLAND ALLIANCE (III.A.2.N.b.4)

## ELEMENT CONCEPT

**Summary:** This community occurs in the mountains of Georgia, North Carolina, and Tennessee, on ridges, and steep, rocky slopes at intermediate elevations (4000-5000 feet). 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 *Photinia melanocarpa* (= *Aronia melanocarpa*), *Clethra acuminata*, *Vaccinium simulatum*, *Vaccinium stamineum*, *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*, *Quercus rubra*) 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.

**Environment:** This community occurs in the mountains of Georgia, North Carolina, and Tennessee, on ridges, and steep, rocky slopes at intermediate elevations (4000-5000 feet).

**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 *Photinia melanocarpa* (= *Aronia melanocarpa*), *Clethra acuminata*, *Vaccinium simulatum*, *Vaccinium stamineum*, *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*, *Quercus rubra*) and may be more typical of shrublands resulting from intense fires on less exposed sites.

**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.

**Similar Associations:**

- *Rhododendron carolinianum* - *Rhododendron catawbiense* - *Leiophyllum buxifolium* Shrubland (CEGL007876)

**Synonymy:**

- IC4a. Heath Bald Shrubland (Allard 1990) B. in part
- Mountain laurel-great laurel summits (CAP 1998)

**Comments:** These shrublands possibly have a broader distribution and typically occur at lower elevations than other montane shrublands in the *Rhododendron (catawbiense, carolinianum) - Kalmia latifolia* Shrubland Alliance (A.744). In the Southern Blue Ridge, this shrubland generally occurs at elevations over 1200 meters (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).

**CONSERVATION RANKING & RARE SPECIES**

**GRank:** G2G3 (99-02-15): This is a locally common heath bald type in parts of the Southern Blue Ridge. 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.

**High-ranked species:** GLYCERIA NUBIGENA (G2)

**ELEMENT DISTRIBUTION**

**Range:** This community is found in the Blue Ridge Mountains of Georgia, North Carolina, and Tennessee. Examples in the Cumberlands of Kentucky are rare and of limited extent.

**States:** GA KY NC TN

**Crosswalk to State Classifications:**

- GA: Blue Ridge Shrub Bald, in part (GA 1990)
- NC: Heath Bald, in part (NC 1990)
- TN: Heath Bald, in part (TN 1994)

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

**USFS Ecoregions:** M221Aa:CPP, M221Be:CPP, M221Dc:CCC, M221Dd:CCC

**Federal Lands:** NPS (Great Smoky Mountains); USFS (Chattahoochee, Cherokee, Nantahala)

**ELEMENT SOURCES**

**References:** Allard 1990, Ambrose 1990a, CAP 1998, Pyne 1994, Risk 1993, Schafale and Weakley 1990

## SOUTHERN APPALACHIAN CATAWBA RHODODENDRON HEATH BALD

## ELEMENT IDENTIFIERS

**NVCS association:** Rhododendron catawbiense Shrubland

**Database Code:** CEG003818

**Formation:** Hemi-sclerophyllous temperate broad-leaved evergreen shrubland

**Alliance:** RHODODENDRON (CATAWBIENSE, CAROLINIANUM) - KALMIA LATIFOLIA SHRUBLAND ALLIANCE (III.A.2.N.b.4)

## ELEMENT CONCEPT

**Summary:** This evergreen shrubland occurs at the highest elevations, typically 1500-1980 m (5000-6500 feet), in the southern Appalachian Mountains on steep, exposed slopes, ridges, and rock outcrops. It occurs primarily in the northern portion of the southern Appalachians, north of the Asheville Basin, in mountain ranges lacking *Pieris floribunda* and *Rhododendron carolinianum*. Greater than 75% of the shrub cover is comprised of evergreen species, and the predominant shrub is *Rhododendron catawbiense*. Scattered trees contribute less than 1% cover, typically *Photinia melanocarpa* (= *Aronia melanocarpa*), *Abies fraseri*, and *Picea rubens*. Small openings in the shrub canopy are dominated by rock or herbs. Herb cover beneath the shrub canopy is absent or very sparse (<5%) and may include *Gaultheria procumbens*, *Galax urceolata*, *Epigaea repens*, *Medeola virginiana*, *Trillium undulatum*, *Melampyrum lineare*, *Dryopteris campyloptera*, *Houstonia serpyllifolia*, *Viola* spp., and *Carex debilis* var. *rudgei*. Mosses may be locally dominant at the base of *Rhododendron* clumps, often *Polytrichum commune* or bryophytes from adjacent *Picea* - *Abies* communities. This community can result from secondary succession after fire or logging or can occur as a topo-edaphic climax on steep, exposed sites. Occurrences may range in size from 0.5-200 hectares. This community can grade into or occur adjacent to high-elevation rock outcrop communities, montane grass-dominated communities, or forests dominated by *Picea rubens*, *Abies fraseri*, and northern hardwood species such as *Fagus grandifolia*, *Acer saccharum*, and *Betula alleghaniensis*.

**Environment:** This evergreen shrubland occurs at the highest elevations, typically 1500-1980 m (5000-6500 feet), in the southern Appalachian Mountains on steep, exposed slopes, ridges, and rock outcrops. It occurs primarily in the northern portion of the southern Appalachians, north of the Asheville Basin, in mountain ranges lacking *Pieris floribunda* and *Rhododendron carolinianum*. This community can result from secondary succession after fire or logging or can occur as a topo-edaphic climax on steep, exposed sites. Occurrences may range in size from 0.5-200 hectares. This community can grade into or occur adjacent to high-elevation rock outcrop communities, montane grass-dominated communities, or forests dominated by *Picea rubens*, *Abies fraseri*, and northern hardwood species such as *Fagus grandifolia*, *Acer saccharum*, and *Betula alleghaniensis*.

**Vegetation:** Greater than 75% of the shrub cover is comprised of evergreen species, and the predominant shrub is *Rhododendron catawbiense*. Scattered trees contribute less than 1% cover, typically *Photinia melanocarpa* (= *Aronia melanocarpa*), *Abies fraseri*, and *Picea rubens*. Small openings in the shrub canopy are dominated by rock or herbs. Herb cover beneath the shrub canopy is absent or very sparse (<5%) and may include *Gaultheria procumbens*, *Galax urceolata*, *Epigaea repens*, *Medeola virginiana*, *Trillium undulatum*, *Melampyrum lineare*, *Dryopteris campyloptera*, *Houstonia serpyllifolia*, *Viola* spp., and *Carex debilis* var. *rudgei*. Mosses may be locally dominant at the base of *Rhododendron* clumps, often *Polytrichum commune* or bryophytes from adjacent *Picea* - *Abies* communities.

**Dynamics:** This community can result from secondary succession after fire or logging or can occur as a topo-edaphic climax on steep, exposed sites.

**Similar Associations:** No information

**Synonymy:**

- IC4a. Heath Bald Shrubland (Allard 1990) B. in part
- *Rhododendron catawbiense* - *Menziesia pilosa* Subtype (Fleming and Coulling 2001) F
- *Sorbus americana* / *Menziesia pilosa* - *Vaccinium erythrocarpum* - *Rubus canadensis* Subtype (Fleming and Coulling 2001) F

**Comments:** This community can grade into or occur adjacent to high-elevation rock outcrop communities, montane grass-dominated communities, or forests dominated by *Picea rubens*, *Abies fraseri*, and northern hardwood species such as *Fagus grandifolia*, *Acer saccharum*, and *Betula alleghaniensis*. A more open, low-growing, evergreen shrubland, IV.A.1.N.a *Leiophyllum buxifolium* Dwarf-shrubland Alliance (A.1063), is restricted to areas where *Leiophyllum buxifolium* dominates areas greater than 0.1 hectare. However, the species may be locally dominant as inclusions in this shrubland. Similar, but floristically different, ericaceous shrublands occur in the Mahoosuc Mountains of Maine (Fahey 1976). Exemplary occurrences are known from the Roan Mountain Massif, North Carolina and Tennessee, and Mount Rogers, Virginia.

## CONSERVATION RANKING &amp; RARE SPECIES

**GRank:** G2 (97-12-31): This community occurs at the highest elevations (1500-1980 m, 5000-6500 feet) of the southern Appalachian Mountains in Virginia, North Carolina, and Tennessee. Although there are hundreds of occurrences, the total

## Association Descriptions

acreage of this community is limited since it occurs as scattered islands of shrubland at 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.

**High-ranked species:** RHODODENDRON VASEYI (G3), LIATRIS HELLERI (G2), HYPERICUM BUCKLEII (G3), HUDSONIA MONTANA (G1), HOUSTONIA PURPUREA VAR MONTANA (G5T2), FOTHERGILLA MAJOR (G3), GEUM RADIATUM (G1), LILIUM GRAYI (G3), PRENANTHES ROANENSIS (G3), ABIES FRASERI (G2)

### ELEMENT DISTRIBUTION

**Range:** This community occurs primarily in the northern portion of the southern Appalachians, north of the Asheville Basin, in North Carolina, Tennessee, and Virginia.

**States:** GA? NC TN VA

#### Crosswalk to State Classifications:

- GA?: Blue Ridge Shrub Bald, in part (GA 1990)
- NC: Heath Bald, in part (NC 1990)
- TN: Heath Bald, in part (TN 1994)
- VA: Southern Appalachian Shrub Bald, in part (VA 2001)

**TNC Ecoregions:** 51:C

**USFS Ecoregions:** M221Db:CCC, M221Dc:CCC, M221Dd:CCC

**Federal Lands:** USFS (Chattahoochee?, Cherokee, Jefferson, Nantahala, Pisgah)

### ELEMENT SOURCES

**References:** Allard 1990, Ambrose 1990a, Fahey 1976, Fleming and Coulling 2001, Fleming et al. 2001, Gant 1978, Pyne 1994, Rawinski 1992, Risk 1993, Schafale and Weakley 1990, Whittaker 1979

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**SUCCESSIONAL BROOMSEDGE VEGETATION**


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**ELEMENT IDENTIFIERS**

**NVCS association:** *Andropogon virginicus* var. *virginicus* Herbaceous Vegetation

**Database Code:** CEG004044

**Formation:** Medium-tall sod temperate or subpolar grassland

**Alliance:** ANDROPOGON VIRGINICUS HERBACEOUS ALLIANCE (V.A.5.N.c.3)

**ELEMENT CONCEPT**

**Summary:** This association includes vegetation that occurs on old fields, pastures, and rocky sites which is dominated by *Andropogon virginicus* var. *virginicus*. This is a very common and wide-ranging association. Additional components include typical pioneer species; these and other associated species will vary with geography and habitat.

**Environment:** See Summary

**Vegetation:** See Summary

**Dynamics:** This association may develop temporarily following clear-cutting, and will persist indefinitely under a regular mowing regime, e.g., in powerline corridors. If undisturbed, these grasslands will rapidly succeed to shrubs, and eventually to tree species.

**Similar Associations:** No information

**Synonymy:** No information

**Comments:** On the eastern Highland Rim of Tennessee (Arnold Air Force Base), this vegetation type includes *Andropogon virginicus*, *Diodia teres*, *Aristida dichotoma*, *Aristida oligantha*, *Packera anonyma* (= *Senecio anonymus*), *Paspalum laeve*, *Lespedeza virginica*, and *Plantago virginica*. Former agricultural fields and powerline corridors which are kept open by mowing are typically dominated by *Andropogon virginicus* and *Tridens flavus*, with *Rubus argutus* and *Smilax* spp. This association is also the community that develops following clearcuts of pine plantations on Arnold Air Force Base. In these clearcuts, *Schizachyrium scoparium*, *Danthonia spicata*, and *Dichanthelium* spp. are also common, as are occasional *Quercus* spp. and *Rubus argutus*.

**CONSERVATION RANKING & RARE SPECIES**

**GRank:** GD (00-08-08): This is a ruderal community and represents vegetation resulting from succession following anthropogenic disturbance of an area. It is not a conservation priority for its own sake and does not receive a conservation rank.

**High-ranked species:** No information

**ELEMENT DISTRIBUTION**

**Range:** This community is possible throughout the southeastern United States.

**States:** AL AR GA IL IN? KY LA MO? MS NC OK SC TN TX VA

**Crosswalk to State Classifications:**

- IL: successional field
- IN?: semi-natural
- KY: No equivalent (KY 1991)
- NC: No equivalent (NC 1990)
- OK: *Andropogon virginicus* / *Diospyros virginiana* - *Rhus glabra* herbaceous association (OK 2000)
- SC: No equivalent (SC 1986)
- TX: No equivalent (TX 1993)
- VA: No equivalent (VA 2001)

**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:P, 53:C, 56:C, 57:C, 59:C

**USFS Ecoregions:** 222Ab:CCC, 222Ag:CCC, 222Ah:CCC, 222An:CCC, 231Fa:CCP, 231Fb:CCC, 231Ga:CCC, 231Gb:CCC, 231Gc:CCC, 232B:CC, 232F:CC, 255Da:CCC, 255Dc:CCC, M221Aa:CCC, M221Ab:CCC, M221Ba:C??, M221Bd:C??, M221Ca:CPP, M221Cb:CPP, M221Cc:CPP, M221Ce:CPP, M221Da:CCC, M221Db:CCC, M221Dc:CCP, M221Dd:CCP, M222Aa:CCC, M222Ab:CCC, M231Aa:CCC, M231Ab:CCC, M231Ac:CCC, M231Ad:CCC

**Federal Lands:** DOD (Arnold, Fort Benning, Fort Gordon); USFS (Cherokee, George Washington, Jefferson, Oconee?, Ouachita?, Ozark?, Talladega?, Tuskegee?); USFWS (Anahuac, Big Boggy?, Brazoria)

**ELEMENT SOURCES**

**References:** Fleming and Coulling 2001, Hoagland 2000, Penfound 1953, TNC 1998a, Tarr et al. 1980



## EXOTIC SPECIES DOMINATED HERBACEOUS UPLAND VEGETATION

## CULTIVATED MEADOW

## ELEMENT IDENTIFIERS

**NVCS association:** Lolium (arundinaceum, pratense) Herbaceous Vegetation

**Database Code:** CEG004048

**Formation:** Medium-tall sod temperate or subpolar grassland

**Alliance:** LOLIUM (ARUNDINACEUM, PRATENSE) HERBACEOUS ALLIANCE (V.A.5.N.c.8)

## ELEMENT CONCEPT

**Summary:** This association includes grassland pastures and hayfields, more-or-less cultural, though sometimes no longer actively maintained. The dominant species in this type are the European 'tall or meadow fescues,' of uncertain and controversial generic placement. *Lolium pratense* and *Lolium arundinaceum* are two closely related species which were traditionally treated as *Festuca pratensis* (= *Festuca elatior*) and *Festuca arundinacea*, and could alternately be treated as *Schedonorus pratensis* and *Schedonorus arundinaceus*. These communities are sometimes nearly monospecific but can also be very diverse and contain many native species of grasses, sedges, and forbs. This vegetation is currently defined for the 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.

**Environment:** This association includes grassland pastures and hayfields, more-or-less cultural, though sometimes no longer actively maintained.

**Vegetation:** The dominant species in this alliance 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 now usually treated as either *Lolium pratense* and *Lolium arundinaceum* (Kartesz 1999), or as *Schedonorus pratensis* and *Schedonorus arundinaceus*. These communities are sometimes nearly monospecific but can also be very diverse and contain many native species of grasses, sedges, and forbs.

**Dynamics:** This association varies greatly depending upon the past land-use history and the recent history of the site. Some examples that have been recently farmed may be monocultures of *Lolium*, whereas other fields that were traditionally lightly grazed may have much higher diversity.

**Similar Associations:** No information

**Synonymy:** No information

**Comments:** Conversion to Kartesz (1999) standard has necessitated the shift of this to the *Lolium* names from *Festuca*.

## CONSERVATION RANKING &amp; RARE SPECIES

**GRank:** GW (00-01-05): This vegetation is dominated by an exotic species, is of anthropogenic origin, and is thus not a conservation priority.

**High-ranked species:** No information

## ELEMENT DISTRIBUTION

**Range:** This association is possible throughout much of the eastern United States and southern Canada.

**States:** AR GA MO NB? NC NS? OK ON? QC? SC TN VA

## Crosswalk to State Classifications:

- NC: No equivalent (NC 1990)
- OK: *Festuca arundinacea* herbaceous association (OK 2000)
- SC: No equivalent (SC 1986)
- VA: No equivalent (VA 2001)

**TNC Ecoregions:** 38:C, 39:C, 50:C, 51:C, 52:C, 57:C, 59:C

**USFS Ecoregions:** 221:C, 222:C, 231Ae:CCC, M221Dc:CCC, M221Dd:CCC, M222Ab:CCC, M231A:CC

**Federal Lands:** NPS (Blue Ridge Parkway, Buffalo, Carl Sandburg Home, Great Smoky Mountains, Guilford Courthouse, Ninety Six, Shenandoah); USFS (Cherokee, Ouachita, Ozark)

## ELEMENT SOURCES

**References:** Heath et al. 1973, Hoagland 2000, Kartesz 1999

## EXOTIC SPECIES DOMINATED HERBACEOUS UPLAND VEGETATION

## GRAZED MONTANE GRASSLAND / FIRE MEADOW

## ELEMENT IDENTIFIERS

**NVCS association:** Phleum pratense - Bromus pubescens - Helenium autumnale Herbaceous Vegetation

**Database Code:** C EGL004018

**Formation:** Medium-tall sod temperate or subpolar grassland

**Alliance:** PHLEUM PRATENSE HERBACEOUS ALLIANCE (V.A.5.N.c.104)

## ELEMENT CONCEPT

**Summary:** 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* (= *Hieracium pratense*) (alien), *Potentilla canadensis*, and *Ranunculus acris* (alien). Stands of this type are maintained by periodic mowing or, in some instances, prescribed burning. 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.

**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:** Stands of this type are maintained by periodic mowing or, in some instances, prescribed burning. The nominals *Bromus pubescens* and *Helenium autumnale* are indicative of grazing.

**Dynamics:** See Summary

**Similar Associations:**

- *Dactylis glomerata* - *Rumex acetosella* Herbaceous Vegetation (CEGL006107)

**Synonymy:**

- ID9a. Grass Bald (Allard 1990) B. in part

**Comments:** The nominals *Bromus pubescens* and *Helenium autumnale* are indicative of grazing.

## CONSERVATION RANKING &amp; RARE SPECIES

**GRank:** GM (94-12-15): This vegetation type includes pasture and post-agricultural fields, and is largely composed of non-native grasses and herbs (generally of European origin).

**High-ranked species:** No information

## ELEMENT DISTRIBUTION

**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.

**States:** NC TN VA?

**Crosswalk to State Classifications:**

- NC: Grassy Bald, in part (NC 1990)
- TN: Grass Balds (TN 1994)
- VA?: No equivalent (VA 2001)

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

**USFS Ecoregions:** M221Dc:CCP, M221Dd:CCC

**Federal Lands:** USFS (Cherokee, Pisgah)

## ELEMENT SOURCES

**References:** Allard 1990, Pyne 1994, Schafale and Weakley 1990

**HIGH ELEVATION BLACKBERRY THICKET**

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**ELEMENT IDENTIFIERS**

**NVCS association:** *Rubus canadensis* - (*Rubus idaeus* ssp. *strigosus*) / *Athyrium filix-femina* - *Solidago glomerata* Shrubland

**Database Code:** C EGL003893

**Formation:** Subalpine or subpolar cold-deciduous shrubland

**Alliance:** RUBUS ALLEGHENIENSIS - RUBUS CANADENSIS SHRUBLAND ALLIANCE (III.B.2.N.b.2)

**ELEMENT CONCEPT**

**Summary:** 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 (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). It occurs on exposed summits and high slopes, typically at elevations over 6000 feet. 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). Standing dead *Abies fraseri* tower above the shrubs and herbs, and there is much downed woody debris. 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*, and *Rugelia nudicaulis*. Scattered living *Picea rubens*, *Sorbus americana*, *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.

**Environment:** See Summary

**Vegetation:** Vegetation is variously dominated by dense *Rubus canadensis* or by dense *Athyrium filix-femina* ssp. *asplenioides* and *Solidago glomerata* (on more protected sites). Standing dead *Abies fraseri* tower above the shrubs and herbs, and there is much downed woody debris. 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*, and *Rugelia nudicaulis*. Scattered living *Picea rubens*, *Sorbus americana*, *Betula alleghaniensis*, and *Amelanchier laevis* may occur.

**Dynamics:** See Summary

**Similar Associations:** No information

**Synonymy:**

- Bramble-goldenrod thicket (CAP 1998)

**Comments:** This community differs from *Rubus* thickets on grassy balds by predominance of forbs rather than sedges and by frequent presence of *Rubus idaeus*.

**CONSERVATION RANKING & RARE SPECIES**

**GRank:** GM (97-08-11): This community represents an altered vegetation type, modified by the effects of an alien pest species. 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 the *Abies fraseri* - *Picea rubens* Forest Alliance (A.136).

**High-ranked species:** RUGELIA NUDICAULIS (G3)

**ELEMENT DISTRIBUTION**

**Range:** This vegetation occurs at high elevations in the southern Appalachians of North Carolina and Tennessee.

**States:** NC TN

**Crosswalk to State Classifications:**

- NC: No equivalent (NC 1990)

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

**USFS Ecoregions:** M221Bd:CCC, M221Dc:CCC, M221Dd:CCC

**Federal Lands:** NPS (Blue Ridge Parkway, Great Smoky Mountains); USFS (Cherokee, Nantahala, Pisgah)

**ELEMENT SOURCES**

**References:** CAP 1998

**SOUTHERN APPALACHIAN HIGH ELEVATION ROCKY SUMMIT (HIGH PEAK TYPE)**

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**ELEMENT IDENTIFIERS**

**NVCS association:** *Saxifraga michauxii* - *Carex misera* - *Oclemena acuminata* - *Solidago glomerata* Herbaceous Vegetation

**Database Code:** C EGL004277

**Formation:** Low temperate or subpolar perennial forb vegetation

**Alliance:** SAXIFRAGA MICHAUXII HERBACEOUS ALLIANCE (V.B.2.N.b.10)

**ELEMENT CONCEPT**

**Summary:** This association covers high-elevation (greater than 1980 m) vegetated rock outcrops of highly fractured felsic to mafic bedrock. 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* (= *Aster acuminatus*), and *Solidago glomerata*. This community occurs in a matrix of *Picea rubens* - *Abies fraseri* forest. Other characteristic species are *Minuartia glabra* and *Polypodium appalachianum*.

**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:** 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*.

**Dynamics:** See Summary

**Similar Associations:** No information

**Synonymy:**

- IE4a. Southern Appalachian High Elevation Acidic Rocky Summit (Allard 1990) B. in part
- *Aster acuminatus* / *Menziesia pilosa* outcrop community (Wiser 1993)
- *Aster acuminatus* / *Menziesia pilosa* outcrop community (Wiser et al. 1996)

**Comments:** Occurs on the highest summits of Grandfather Mountain, Mount Craig, Roan High Bluff, Mount Buckley (Great Smoky Mountains National Park), Craggy Pinnacle.

**CONSERVATION RANKING & RARE SPECIES**

**GRank:** G1 (95-01-15): 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.

**High-ranked species:** CALAMAGROSTIS CAINII (G1), CAREX MISERA (G3), GEUM RADIATUM (G1), HOUSTONIA PURPUREA VAR MONTANA (G5T2), RHODODENDRON VASEYI (G3), SELAGINELLA TORTIPILA (G3), SOLIDAGO SPITHAMAEA (G1), ANAPTYCHIA SETIFERA (G3G4)

**ELEMENT DISTRIBUTION****Range:**

**States:** NC TN

**Crosswalk to State Classifications:**

- NC: High Elevation Rocky Summit, in part (NC 1990)

**TNC Ecoregions:** 51:C

**USFS Ecoregions:** M221Dc:CCC, M221Dd:CCC

**Federal Lands:** NPS (Great Smoky Mountains); USFS (Cherokee, Pisgah)

**ELEMENT SOURCES**

**References:** Allard 1990, Schafale and Weakley 1990, Wiser 1993, Wiser et al. 1996

**LOW ELEVATION ROCKY SUMMIT (ACIDIC TYPE)**

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**ELEMENT IDENTIFIERS****NVCS association:** Saxifraga michauxii Herbaceous Vegetation**Database Code:** CEGL004524**Formation:** Low temperate or subpolar perennial forb vegetation**Alliance:** SAXIFRAGA MICHAUXII HERBACEOUS ALLIANCE (V.B.2.N.b.10)**ELEMENT CONCEPT**

**Summary:** This is a broadly defined type which encompasses a diversity of sloping rock outcrops at low to medium elevations in the southern and central Appalachians, with *Saxifraga michauxii* as a characteristic component. Other species are variable, but may include *Saxifraga virginiana*, *Saxifraga micranthidifolia*, *Carex* spp., *Schizachyrium scoparium*, and others. This community shows some relationship to the others in this alliance, *Saxifraga michauxii* Herbaceous Alliance (A.1621), but it lacks most or all of the rare endemic species which are important components of the other types in this alliance.

**Environment:** See Summary

**Vegetation:** A stand in the Chattahoochee National Forest (Almond Bald, M221Dc38) contains the herbaceous species *Carex pensylvanica*, *Danthonia sericea*, *Schizachyrium scoparium*, *Heuchera villosa*, *Packera anonyma* (= *Senecio anonymus*), *Saxifraga michauxii*, *Asplenium platyneuron*, *Houstonia longifolia* var. *glabra*, *Solidago* sp., *Hypericum gentianoides*, *Ambrosia artemisiifolia*, *Asclepias incarnata*, *Symphyotrichum patens* (= *Aster patens*), *Danthonia compressa*, *Dichanthelium* sp., *Dryopteris marginalis*, *Polygonatum biflorum*, and *Tradescantia* sp. Small trees and shrubs are scattered in the stand or appear on the margins. They include *Amelanchier laevis*, *Prunus angustifolia*, *Prunus serotina*, *Carya alba*, *Quercus alba*, *Quercus prinus*, *Robinia pseudoacacia*, *Diospyros virginiana*, *Quercus velutina*, *Vaccinium stamineum*, *Arundinaria gigantea*, *Rhus copallinum*, and *Vaccinium pallidum*. Vines include *Toxicodendron radicans*, *Smilax bona-nox*, and *Smilax rotundifolia*. Trees on the margin of the stand include *Quercus rubra*, *Carya glabra*, and *Juniperus virginiana* var. *virginiana*.

**Dynamics:** See Summary**Similar Associations:** No information**Synonymy:**

- IE4b. Blue Ridge/Piedmont Low Elevation Acidic Rocky Summit (Allard 1990)
- Low Elevation Rocky Summit (Acidic Subtype) (Schafale pers. comm.)

**Comments:** North Carolina recognizes a Low Elevation Rocky Summit (Basic Subtype), a variant on mafic or basic metasedimentary rocks or felsic rocks influenced by base-rich seepage, containing plants that prefer higher pH conditions. It is provisionally classified as a state nonstandard type, *Saxifraga michauxii* - *Cheilanthes lanosa* - *Hylotelephium telephioides* Herbaceous Vegetation (CEGL004989).

**CONSERVATION RANKING & RARE SPECIES****GRank:** G3? (96-09-08):**High-ranked species:** No information**ELEMENT DISTRIBUTION**

**Range:** This community occurs in the Southern Blue Ridge from southwestern Virginia south into Georgia. It may extend north into the Ridge and Valley. It is also reported from the Piedmont (M. Schafale pers. comm. 2001).

**States:** GA NC SC TN VA?**Crosswalk to State Classifications:**

- GA: Blue Ridge Noncalcareous Outcrop Herbaceous Vegetation, in part (GA 1990)
- NC: Low Elevation Rocky Summit, in part (NC 1990)
- VA?: No equivalent (VA 2001)

**TNC Ecoregions:** 51:C, 52:C, 59:?**USFS Ecoregions:** M221Aa:CPP, M221Dc:CCC, M221Dd:CCC**Federal Lands:** USFS (Chattahoochee, Cherokee, Nantahala, Pisgah, Sumter)**ELEMENT SOURCES****References:** Allard 1990, Ambrose 1990a, Schafale and Weakley 1990, Schafale pers. comm.

**HIGH ELEVATION GRANITIC DOME (HIGH PEAK LICHEN TYPE)**

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**ELEMENT IDENTIFIERS****NVCS association:** *Lasallia papulosa* - *Umbilicaria caroliniana* Nonvascular Vegetation**Database Code:** C EGL004386**Formation:** Montane/submontane temperate or subpolar lichen vegetation**Alliance:** LASALLIA PAPULOSA - UMBILICARIA CAROLINIANA NONVASCULAR ALLIANCE (VI.B.1.N.b.2)**ELEMENT CONCEPT**

**Summary:** As defined, this alliance and association are intended to cover vertical cliffs and sometimes more gently sloping large outcrops (often to as large as 1 hectare) which have extremely few or no vascular plants and are relatively dry. In the southern Appalachians, these generally occur because of a combination of outcrop geometry (few or no suitable crevices, as in exfoliation domes) and hydrology (inadequate seepage moisture to support vascular plants). A few crevice vascular plants are allowed. Moister cliffs without crevices support *Umbilicaria mammulata* Nonvascular Vegetation (CEGL004387). This association is known from the steeply sloping exfoliation domes faces on Grandfather Mountain, North Carolina, and probably at Roan Mountain, Tennessee and North Carolina.

**Environment:** See Summary**Vegetation:** See Summary**Dynamics:** See Summary**Similar Associations:**

- *Umbilicaria mammulata* Nonvascular Vegetation (CEGL004387)--of moister crevices.

**Synonymy:**

- IE4c. Southern Appalachian High Elevation Granitic Dome (Allard 1990) B. in part

**Comments:** None**CONSERVATION RANKING & RARE SPECIES****GRank:** G2? (94-08-15): Rare; restricted by codominance of *Umbilicaria caroliniana* to North Carolina and Tennessee.**High-ranked species:** No information**ELEMENT DISTRIBUTION****Range:****States:** NC TN**Crosswalk to State Classifications:**

- NC: High Elevation Granitic Dome, in part; High Elevation Rocky Summit, in part (NC 1990)

**TNC Ecoregions:** 51:C**USFS Ecoregions:** M221Dc:CCC**Federal Lands:** USFS (Cherokee, Nantahala, Pisgah)**ELEMENT SOURCES****References:** Allard 1990, Schafale and Weakley 1990

**RED KNOBS SANDSTONE POST OAK - VIRGINIA PINE WOODLAND**

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**ELEMENT IDENTIFIERS**

**NVCS association:** *Quercus stellata* - *Pinus virginiana* / (*Schizachyrium scoparium*, *Piptochaetium avenaceum*) Woodland

**Database Code:** CEGLO08406

**Formation:** Cold-deciduous woodland

**Alliance:** QUERCUS STELLATA - QUERCUS MARILANDICA WOODLAND ALLIANCE (II.B.2.N.a.25)

**ELEMENT CONCEPT**

**Summary:** This association represents Ridge and Valley woodlands found on the 'Red Knobs' landform in the vicinity of Little Toqua Creek in the Cherokee National Forest. These knobs are composed of red calcareous sandstone. The reddish soils are of the Tellico Soil Series, which consists of well-drained soils on high hills and knobs, formed in residuum from reddish, calcareous sandstone, which contains seams of sandy shale. These knobs are from 275-300 m (900-1000 feet) high, and are capped by a series of openings with xeric vegetation dominated by *Quercus stellata* and *Pinus virginiana*. Canopy closure is variable; the knobs with lower canopy closure exhibit an herbaceous stratum dominated by *Schizachyrium scoparium* and/or *Piptochaetium avenaceum* (= *Stipa avenacea*). These open woodlands have a grass- and forb-dominated understory, exhibiting a barrens-like appearance. The most notable and characteristic species in this stratum are *Andropogon gerardii*, *Lithospermum canescens* and *Manfreda virginica*. Other herbaceous species include *Agrimonia* sp., *Antennaria* sp., *Arabis laevigata*, *Minuartia patula?* (= *Arenaria patula?*), *Asclepias tuberosa*, *Asclepias viridiflora*, *Aster* spp., *Bidens* sp., *Desmodium rotundifolium*, *Desmodium* sp., *Dichanthelium boscii*, *Eupatorium fistulosum*, *Euphorbia corollata*, *Geranium carolinianum*, *Helianthus hirsutus*, *Helianthus* sp., *Hypericum hypericoides* ssp. *multicaule* (= *Hypericum stragulum*), *Hypoxis hirsuta*, *Lespedeza* sp., *Parthenium integrifolium*, *Penstemon canescens*, *Phlox amoena*, *Pycnanthemum tenuifolium*, *Sanicula* sp., *Packera anonyma* (= *Senecio anonymus*), *Sphenopholis nitida?*, *Tephrosia virginiana*, and *Verbena simplex*.

**Environment:** This vegetation is found on the "Red Knobs" landform in the vicinity of Little Toqua Creek in the Cherokee National Forest, which is composed of red calcareous sandstone. The reddish soils are of the Tellico Soil Series, which consists of well-drained soils on high hills and knobs, formed in residuum from reddish, calcareous sandstone, which contains seams of sandy shale. These knobs are from 275 to 300 meters (900-1000 feet) high.

**Vegetation:** The canopy is variable in closure, and is dominated by *Quercus stellata* and *Pinus virginiana*. The lower canopy closure examples have an herbaceous stratum dominated by *Schizachyrium scoparium* and/or *Piptochaetium avenaceum* (= *Stipa avenacea*). The most notable and characteristic species in this stratum are *Andropogon gerardii*, *Lithospermum canescens* and *Manfreda virginica*. Other herbaceous species include *Agrimonia* sp., *Antennaria* sp., *Arabis laevigata*, *Minuartia patula?* (= *Arenaria patula?*), *Asclepias tuberosa*, *Asclepias viridiflora*, *Aster* spp., *Bidens* sp., *Desmodium rotundifolium*, *Desmodium* sp., *Dichanthelium boscii*, *Eupatorium fistulosum*, *Euphorbia corollata*, *Geranium carolinianum*, *Helianthus hirsutus*, *Helianthus* sp., *Hypericum hypericoides* ssp. *multicaule* (= *Hypericum stragulum*), *Hypoxis hirsuta*, *Lespedeza* sp., *Parthenium integrifolium*, *Penstemon canescens*, *Phlox amoena*, *Pycnanthemum tenuifolium*, *Sanicula* sp., *Packera anonyma* (= *Senecio anonymus*), *Sphenopholis nitida?*, *Tephrosia virginiana*, and *Verbena simplex*.

**Dynamics:** Fire had a poorly understood but likely important role in this community, and almost all examples have had fire excluded. The present range of this community is probably very close to its presettlement range, but lack of fire permits increased dominance by woody species. Most individual examples are about 2 acres in extent; the total acreage of this type may be less than 500 acres.

**Similar Associations:** No information

**Synonymy:** No information

**Comments:** Review type with Georgia.

**CONSERVATION RANKING & RARE SPECIES**

**GRank:** G2? (00-03-10): This type is restricted to very scattered and small sites in the Ridge and Valley of Tennessee and possibly Georgia. Sites are vulnerable to logging. Fire had a poorly understood but likely important role in this community, and almost all examples have had fire excluded. The present range of this community is probably very close to its presettlement range, but lack of fire permits increased dominance by woody species. Most individual examples are about 2 acres in extent; the total acreage of this type may be less than 500 acres. Some examples are present in the Cherokee National Forest, Tennessee.

**High-ranked species:** No information

**ELEMENT DISTRIBUTION**

**Range:** This type is restricted to very scattered and small sites in the Ridge and Valley of Tennessee and possibly Georgia.

**States:** GA? TN

**Crosswalk to State Classifications:** Not yet cross-referenced to state classifications

**TNC Ecoregions:** 50:C

**USFS Ecoregions:** 221Jb:CCC  
**Federal Lands:** USFS (Cherokee)

**ELEMENT SOURCES**

**References:** Major pers. comm., NatureServe Ecology - Southeast U.S. unpubl. data



**BLUE RIDGE CALCAREOUS SHALE SLOPE WOODLAND (SHRUBBY TYPE)**

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**ELEMENT IDENTIFIERS**

**NVCS association:** *Carya glabra* - *Fraxinus americana* - *Quercus prinus* / *Ostrya virginiana* / *Philadelphus hirsutus*  
Woodland

**Database Code:** CEG004995

**Formation:** Cold-deciduous woodland

**Alliance:** FRAXINUS AMERICANA - CARYA GLABRA - (JUNIPERUS VIRGINIANA) WOODLAND ALLIANCE (II.B.2.N.a.4)

**ELEMENT CONCEPT**

**Summary:** These deciduous or mostly deciduous edaphically maintained woodlands are known from the Southern Blue Ridge of Tennessee and Virginia, possibly ranging into the Ridge and Valley. These woodlands occur as small openings on steep slopes, below 3000 feet elevation, on outcrops with mixtures of calcareous shales, siltstones, and sandstone. These xeric woodlands have canopies typically dominated by *Carya glabra*, *Fraxinus americana*, and *Quercus prinus*. In addition, *Ulmus alata*, *Carya carolinae-septentrionalis*, *Quercus rubra* and *Juniperus virginiana* var. *virginiana* may also be present in the canopy. Shrub cover can be sparse to moderately dense. Typical shrubs include *Philadelphus hirsutus* and *Ostrya virginiana*. Other shrubs and small trees may include *Acer leucoderme*, *Cornus florida*, *Celtis tenuifolia*, *Staphylea trifolia*, *Cercis canadensis*, *Chionanthus virginicus*, *Ulmus rubra*, *Ptelea trifoliata*, and *Symphoricarpos orbiculatus*. The ground cover is sparse, with large areas of bare substrate common. Coverage by mosses and lichens can be substantial. Characteristic herbaceous species include *Dichanthelium boscii*, *Muhlenbergia tenuifolia*, *Packera obovata* (= *Senecio obovatus*), *Asclepias quadrifolia*, *Erigeron pulchellus*, *Polygala paucifolia*, *Arabis laevigata*, *Campanula divaricata*, and *Aristolochia serpentaria*. Additional herbs from a stand 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*. The exotic grass *Microstegium vimineum* may also be present in stands of this association.

**Environment:** These woodlands occur as small openings on steep slopes, below 3000 feet elevation, on outcrops with mixtures of calcareous shales, siltstones, and sandstone. ^The site in Virginia is a steep (25 degrees), convex, south-facing sideslope along Whitetop Laurel Creek. 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 type occurs. About 30% of the remaining surface substrate consists of exposed, dark-colored, clay-loam mineral soil with substantial coverage by mosses and lichens. Although no chemistry data are available, it is presumed that this soil has at least moderately high base status, based on the abundance of several nutrient-demanding species (e.g., *Philadelphus hirsutus*, *Fraxinus americana*, *Ostrya virginiana*, etc.). The soil moisture regime was assessed as xeric.

**Vegetation:** These xeric woodlands have canopies typically dominated by *Carya glabra*, *Fraxinus americana*, and *Quercus prinus*. In addition, *Ulmus alata*, *Carya carolinae-septentrionalis*, *Quercus rubra*, *Pinus virginiana*, and *Juniperus virginiana* var. *virginiana* may also be present in the canopy. Shrub cover can be sparse to moderately dense. Typical shrubs include *Philadelphus hirsutus* and *Ostrya virginiana*. Other shrubs and small trees may include *Acer leucoderme*, *Cornus florida*, *Celtis tenuifolia*, *Staphylea trifolia*, *Cercis canadensis*, *Chionanthus virginicus*, *Ulmus rubra*, *Ptelea trifoliata*, and *Symphoricarpos orbiculatus*. The ground cover is sparse, with large areas of bare substrate common. Coverage by mosses and lichens can be substantial. Characteristic herbaceous species include *Dichanthelium boscii*, *Muhlenbergia tenuifolia*, *Packera obovata* (= *Senecio obovatus*), *Asclepias quadrifolia*, *Erigeron pulchellus*, *Polygala paucifolia*, *Arabis laevigata*, *Campanula divaricata*, and *Aristolochia serpentaria*. Additional herbs from a stand 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*. The exotic grass *Microstegium vimineum* may also be present in stands of this association. ^The stand in Virginia is a deciduous, apparently edaphically maintained woodland dominated by stunted (6-10 m tall) *Carya glabra*, *Fraxinus americana*, and *Quercus prinus*. Minor canopy trees include *Carya ovata*, *Quercus rubra*, and *Acer saccharum*. Shrub cover varies from moderately to very dense and is dominated by thickets of *Philadelphus hirsutus*. Associated small trees and shrubs include *Ostrya virginiana* and *Amelanchier arborea*. The sparse herb layer contains *Dichanthelium boscii*, *Muhlenbergia tenuifolia*, *Packera obovata* (= *Senecio obovatus*), *Asclepias quadrifolia*, *Erigeron pulchellus*, *Polygala paucifolia*, *Arabis laevigata*, *Campanula divaricata*, *Solidago caesia*, *Potentilla canadensis*, and *Aristolochia serpentaria*.

**Dynamics:** See Summary

**Similar Associations:**

- *Quercus prinus* - *Juniperus virginiana* - (*Pinus virginiana*) / *Philadelphus hirsutus* - *Celtis occidentalis* Woodland (CEGL007720)--a related "grassy type."

**Synonymy:**

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

**Comments:** Known from calcareous shale Whitetop Laurel Slopes, Virginia, and from the Ocoee River Gorge, Tennessee. ^The single Virginia plot representing this community type was analyzed with many other plots representing similar basic or calcareous woodlands and forests, but consistently performed as an outlier in multivariate analyses of compositional data. Additional occurrences of this vegetation should be sought within the range of *Philadelphus hirsutus*, a species which barely enters Virginia from the southwest.

**CONSERVATION RANKING & RARE SPECIES**

**GRank:** G2 (98-04-07):

**High-ranked species:** *SEDUM NEVII* (G3)

**ELEMENT DISTRIBUTION**

**Range:** This community is known from a single site on the southern Virginia Blue Ridge. Additional occurrences in the Blue Ridge, Ridge and Valley, or Cumberland Mountains of Virginia, North Carolina, Tennessee, and Kentucky are possible.

**States:** TN VA

**Crosswalk to State Classifications:**

- VA: Piedmont / Mountain Basic Woodland, in part (VA 2001)

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

**USFS Ecoregions:** M221Ce:C??, M221Db:CCC, M221Dc:CCC

**Federal Lands:** USFS (Cherokee, Jefferson)

**ELEMENT SOURCES**

**References:** Fleming and Coulling 2001, Fleming et al. 2001, NatureServe Ecology - Southeast U.S. unpubl. data

**BLUE RIDGE ACID SHALE FOREST**

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**ELEMENT IDENTIFIERS**

**NVCS association:** *Pinus virginiana* - *Quercus prinus* - *Quercus rubra* / *Vaccinium pallidum* - *Kalmia latifolia* Forest

**Database Code:** CEG007539

**Formation:** Mixed needle-leaved evergreen - cold-deciduous forest

**Alliance:** PINUS VIRGINIANA - QUERCUS (COCCINEA, PRINUS) FOREST ALLIANCE (I.C.3.N.a.28)

**ELEMENT CONCEPT**

**Summary:** This xeric slope forest is found on steep shale substrates in the southern Appalachians. It has a 10- to 25-m, closed (to slightly open) canopy dominated by *Pinus virginiana*, *Quercus prinus*, and *Quercus rubra*. Understory species include *Acer rubrum* var. *rubrum* and *Oxydendrum arboreum*. The moderate to dense shrub layer consists of *Vaccinium pallidum* and *Kalmia latifolia*, with less frequent *Vaccinium stamineum* and *Philadelphus hirsutus*. The herb stratum is poorly developed, usually consisting of scattered individuals of *Campanula divaricata*, *Dichanthelium* spp., *Hieracium venosum*, *Danthonia spicata*, *Houstonia longifolia* (= *Houstonia tenuifolia*), and others. This community is known to occur over somewhat calcareous shales in the Hot Springs Window, in the Blue Ridge of North Carolina and Tennessee. It is also reported from the Chauga Basin, South Carolina and from Chilhowee Mountain, Tennessee. It is apparently a long-lived community, maintained by harsh edaphic conditions of steep slopes and shifting shale substrate.

**Environment:** This xeric slope forest is found on steep shale substrates in the southern Appalachians. It is apparently a long-lived community, maintained by harsh edaphic conditions of steep slopes and shifting shale substrate.

**Vegetation:** The canopy of stands is dominated by *Pinus virginiana*, *Quercus prinus*, and *Quercus rubra*. Understory species include *Acer rubrum* var. *rubrum* and *Oxydendrum arboreum*. The moderate to dense shrub layer consists of *Vaccinium pallidum* and *Kalmia latifolia*, with less frequent *Vaccinium stamineum* and *Philadelphus hirsutus*. The herb stratum is poorly developed, usually consisting of scattered individuals of *Campanula divaricata*, *Dichanthelium* spp., *Hieracium venosum*, *Danthonia spicata*, *Houstonia longifolia* (= *Houstonia tenuifolia*), and others.

**Dynamics:** See Summary

**Similar Associations:**

- *Pinus virginiana* / *Schizachyrium scoparium* - *Carex pensylvanica* Woodland (CEGL003624)--a related woodland also from the Hot Springs Window, in the Blue Ridge Mountains.

**Synonymy:**

- IE6a. Southern Appalachian Shale Barren (Allard 1990) B. in part

**Comments:** L.L. Gaddy reports this association from the Chauga Basin, South Carolina. Known from Chilhowee Mountain, Tennessee.

**CONSERVATION RANKING & RARE SPECIES**

**GRank:** G2? (98-06-23):

**High-ranked species:** No information

**ELEMENT DISTRIBUTION**

**Range:** This forest is found in the southern Appalachians of the Carolinas and Tennessee.

**States:** NC SC? TN

**Crosswalk to State Classifications:** Not yet cross-referenced to state classifications

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

**USFS Ecoregions:** 221Jb:PPP, M221Dd:CCC

**Federal Lands:** NPS (Great Smoky Mountains?); USFS (Cherokee, Pisgah)

**ELEMENT SOURCES**

**References:** Allard 1990

**BLUE RIDGE ACID SHALE WOODLAND**

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**ELEMENT IDENTIFIERS**

**NVCS association:** *Pinus virginiana* / *Schizachyrium scoparium* - *Carex pensylvanica* Woodland

**Database Code:** CEG003624

**Formation:** Mixed needle-leaved evergreen - cold-deciduous woodland

**Alliance:** PINUS (RIGIDA, PUNGENS, VIRGINIANA) - QUERCUS PRINUS WOODLAND ALLIANCE (II.C.3.N.a.9)

**ELEMENT CONCEPT**

**Summary:** This community occurs on steep, shaley slopes in the southern Appalachians and has an open 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, as well. The stunted open canopy (5-8 m tall, 25-75% cover) is dominated by *Pinus virginiana*, with scattered individuals of *Quercus prinus* and *Quercus rubra* sometimes present. 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*, *Dichanthelium 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 *Cladina rangiferina* and *Cladonia* spp. Loose shale fragments cover 80-90% of the ground surface.

**Environment:** This community occurs on steep, shaley slopes in the southern Appalachians and has an open, stunted canopy and sparse herb and shrub strata characterized by species able to grow in loose shale fragments. Loose shale fragments cover 80-90% of the ground surface.

**Vegetation:** The stunted open canopy (5-8 m tall, 25-75% cover) of stands of this type is dominated by *Pinus virginiana*, with scattered individuals of *Quercus prinus* and *Quercus rubra* sometimes present. 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*, *Dichanthelium 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 *Cladina rangiferina* and *Cladonia* spp.

**Dynamics:** See Summary

**Similar Associations:**

- *Pinus virginiana* - *Quercus prinus* - *Quercus rubra* / *Vaccinium pallidum* - *Kalmia latifolia* Forest (CEGL007539)--a related "forest" from the same area.

**Synonymy:**

- IE6a. Southern Appalachian Shale Barren (Allard 1990) B. in part
- Acidic Shale Slope Woodland (Schafale pers. comm.)
- Southern Blue Ridge Shale Barren. [common name]

**Comments:** 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.

**CONSERVATION RANKING & RARE SPECIES**

**GRank:** G2? (98-12-11): 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 may be found to be somewhat more widespread in the Ridge and Valley of Tennessee, southwestern Virginia, and northern Alabama. 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 because of their steep slope and poor timber.

**High-ranked species:** No information

**ELEMENT DISTRIBUTION**

**Range:** This community is known from the Hot Springs Window, in the Blue Ridge Mountains, and occurs elsewhere in the southern Appalachians as well.

**States:** NC TN

**Crosswalk to State Classifications:**

- NC: No equivalent (NC 1990)

**TNC Ecoregions:** 51:C

**USFS Ecoregions:** M221Dd:CCC

**Federal Lands:** USFS (Cherokee, Pisgah)

**ELEMENT SOURCES**

**References:** Allard 1990, Schafale pers. comm.

**BLUE RIDGE CALCAREOUS SHALE SLOPE WOODLAND (GRASSY TYPE)**

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**ELEMENT IDENTIFIERS**

**NVCS association:** *Quercus prinus* - *Juniperus virginiana* - (*Pinus virginiana*) / *Philadelphus hirsutus* - *Celtis occidentalis* Woodland

**Database Code:** C EGL007720

**Formation:** Cold-deciduous woodland

**Alliance:** FRAXINUS AMERICANA - CARYA GLABRA - (JUNIPERUS VIRGINIANA) WOODLAND ALLIANCE (II.B.2.N.a.4)

**ELEMENT CONCEPT**

**Summary:** This association occurs on rocky slopes, some parts with thin soil over bedrock, other parts covered with loose gravel-sized shale fragments. Trees are sparse and stunted, generally 2-6 m tall. Primary species include *Quercus prinus*, *Juniperus virginiana* var. *virginiana*, *Pinus virginiana*, and *Acer rubrum*. Shrubs include *Philadelphus hirsutus*, *Cercis canadensis* var. *canadensis*, *Celtis occidentalis*, and *Rhus copallinum* var. *latifolia*. *Toxicodendron radicans* ssp. *radicans* and *Parthenocissus quinquefolia* are common. Herbs include *Sedum ternatum*, *Aster* spp., *Solidago* spp., *Danthonia sericea*, *Danthonia spicata*, *Andropogon virginicus*, *Carex pensylvanica*, *Paronychia argyrocoma*, *Selaginella rupestris*, *Houstonia longifolia* (= var. *compacta*), and *Amsonia tabernaemontana*. 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. This community occurs on calcareous shales and interbedded siltstones in sedimentary windows in the Southern Blue Ridge. It may also occur in the sedimentary provinces further west.

**Environment:** Stands included from shale slopes above the French Broad River (Cherokee National Forest, Tennessee) seem to fit the concept of C EGL007720 as renamed and move to woodland. These are open stands on "sub-calcareous" shales. The vegetation has an open canopy of *Quercus prinus* 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.

**Vegetation:** See Summary

**Dynamics:** See Summary

**Similar Associations:**

- *Carya glabra* - *Fraxinus americana* - *Quercus prinus* / *Ostrya virginiana* / *Philadelphus hirsutus* Woodland (C EGL004995)--related but not as floristically diverse.

**Synonymy:**

- Calcareous Shale Slope Woodland. [common name]

**Comments:** This should really be placed as a woodland but is classified in a forest alliance until alliance issues can be resolved. Moved to *Fraxinus americana* - *Carya glabra* - (*Juniperus virginiana*) Woodland Alliance (A.604) by MP 2001-06-16.

**CONSERVATION RANKING & RARE SPECIES**

**GRank:** G2 (01-01-31): This Southern Blue Ridge shale barren community is limited in occurrence to steep riverine bluffs with exposed and eroding shale. This community is also apparently maintained by periodic fires. Fewer than 10 occurrences totaling less than 1000 acres are known.

**High-ranked species:** No information

**ELEMENT DISTRIBUTION**

**Range:**

**States:** NC TN

**Crosswalk to State Classifications:** Not yet cross-referenced to state classifications

**TNC Ecoregions:** 51:C

**USFS Ecoregions:** M221Dd:CCC

**Federal Lands:** USFS (Cherokee, Pisgah)

**ELEMENT SOURCES**

**References:** NatureServe Ecology - Southeast U.S. unpubl. data

## APPALACHIAN TALUS SLOPE

## ELEMENT IDENTIFIERS

**NVCS association:** Parthenocissus quinquefolia / Dicentra eximia Sparse Vegetation

**Database Code:** CEG004454

**Formation:** Lowland or submontane talus/scree

**Alliance:** LOWLAND TALUS SPARSELY VEGETATED ALLIANCE (VII.B.1.N.a.1)

## ELEMENT CONCEPT

**Summary:** Talus slopes varying from very sparse to sometimes with substantial cover of *Toxicodendron radicans* and *Parthenocissus quinquefolia*, and with scattered herbs including *Dicentra eximia*, *Dryopteris marginalis*, *Polymnia canadensis*, and *Dioscorea quaternata*. Known from low elevations (below 2500 feet) in the Appalachians (e.g., Nantahala Gorge, North Carolina, and Neddly Mountain, Tennessee).

**Environment:** Known from talus slopes at low elevations (below 2500 feet) in the Appalachians (e.g., Nantahala Gorge, North Carolina, and Neddly Mountain, Tennessee).

**Vegetation:** Stands of this vegetation vary from very sparse to sometimes with substantial cover of *Toxicodendron radicans* and *Parthenocissus quinquefolia*, and with scattered herbs including *Dicentra eximia*, *Dryopteris marginalis*, *Dioscorea quaternata*. An (apparent) example of this vegetation in the Cherokee National Forest, Tennessee (Neddly Mountain #1) has coverage by *Toxicodendron radicans*, *Parthenocissus quinquefolia*, *Dryopteris marginalis*, *Polymnia canadensis*, *Vitis rotundifolia*, and foliose lichens.

**Dynamics:** See Summary

**Similar Associations:** No information

**Synonymy:** No information

**Comments:** None

## CONSERVATION RANKING &amp; RARE SPECIES

**GRank:** G2G3Q (98-12-14): This community is of uncertain circumscription. Its global rank is dependent on its circumscription. As defined, it is definitely known to occur in North Carolina, and a stand attributed to this type has been found in Tennessee. It may also be found in other Appalachian states. It is unlikely to be common, since unforested talus slopes are limited in this region.

**High-ranked species:** No information

## ELEMENT DISTRIBUTION

**Range:** As defined, this type is definitely known to occur in North Carolina, and a stand attributed to this type has been found in Tennessee. It may also be found in other Appalachian states.

**States:** NC TN VA? WV?

**Crosswalk to State Classifications:**

- NC: No equivalent (NC 1990)
- VA?: No equivalent (VA 2001)

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

**USFS Ecoregions:** M221Dd:CCC

**Federal Lands:** USFS (Cherokee, Nantahala)

## ELEMENT SOURCES

**References:**

## APPALACHIAN FELSIC CLIFF

## ELEMENT IDENTIFIERS

**NVCS association:** *Asplenium montanum* - *Heuchera villosa* Felsic Cliff Sparse Vegetation

**Database Code:** CEG004980

**Formation:** Cliffs with sparse vascular vegetation

**Alliance:** ASPLENIUM MONTANUM SPARSELY VEGETATED ALLIANCE (VII.A.1.N.a.1)

## ELEMENT CONCEPT

**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* (= *Aster divaricatus*), *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.

**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:** 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 the 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*.

**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.

**Similar Associations:** No information

**Synonymy:** No information

**Comments:** None

## CONSERVATION RANKING &amp; RARE SPECIES

**GRank:** G3G4 (98-01-04):

**High-ranked species:** CARDAMINE CLEMATITIS (G2G3), HYMENOPHYLLUM TAYLORIAE (G1G2), KRIGIA MONTANA (G3), SAXIFRAGA CAREYANA (G3), SAXIFRAGA CAROLINIANA (G2), SHORTIA GALACIFOLIA VAR GALACIFOLIA (G2T2), TRICHOMANES INTRICATUM (G3G4)

## ELEMENT DISTRIBUTION

**Range:** This community occurs in the Blue Ridge and upper Piedmont of Georgia, North Carolina, South Carolina, Tennessee, and Virginia.

**States:** GA NC SC TN VA?

**Crosswalk to State Classifications:**

- NC: Montane Acidic Cliff, in part (NC 1990)
- VA?: No equivalent (VA 2001)

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

**USFS Ecoregions:** 231Aa:CCC, M221Dc:CCC, M221Dd:CCC

**Federal Lands:** NPS (Great Smoky Mountains); USFS (Chattahoochee, Cherokee, George Washington, Jefferson, Nantahala, Pisgah, Sumter)



**ELEMENT SOURCES**

**References:** NatureServe Ecology - Southeast U.S. unpubl. data, Schafale and Weakley 1990

## SOUTHERN APPALACHIAN MOIST SILTSTONE CLIFF

## ELEMENT IDENTIFIERS

**NVCS association:** *Heuchera villosa* - *Asplenium trichomanes* - *Thalictrum clavatum* / *Conocephalum conicum* Herbaceous Vegetation

**Database Code:** C EGL008435

**Formation:** Low temperate or subpolar perennial forb vegetation

**Alliance:** (HYDRANGEA SPP., PHILADELPHUS SPP.) / HEUCHERA SPP. HERBACEOUS ALLIANCE (V.B.2.N.b.100)

## ELEMENT CONCEPT

**Summary:** This type occurs on moist, shaded, north-facing cliffs of thin-bedded sedimentary rocks (siltstones and shales). It has sparse to moderately dense cover of vascular plants, and also has substantial coverage of nonvascular plants. Vascular plants root in the horizontal crevices. Most abundant vascular species are *Heuchera villosa* var. *villosa*, *Asplenium trichomanes* ssp. *trichomanes*, and *Thalictrum clavatum*. Other vascular species present include *Hydrangea arborescens*, *Rhododendron maximum*, *Laportea canadensis*, *Trautvetteria caroliniensis* var. *caroliniensis*, *Dryopteris intermedia*, *Dryopteris marginalis*, *Polypodium appalachianum*, *Asplenium montanum*, and (rarely) *Phegopteris connectilis* and *Saxifraga caroliniana*. *Conocephalum conicum* is a common and conspicuous nonvascular plant.

**Environment:** This community is known from north-facing, seepy cliffs over siltstones and shales of intermediate composition, at 2500-3000 feet elevation, in the Ridge and Valley and western Blue Ridge provinces.

**Vegetation:** This community has sparse to moderately dense cover of vascular plants, and also has substantial coverage of nonvascular plants. Vascular plants root in the horizontal crevices. Most abundant vascular species are *Heuchera villosa* var. *villosa*, *Asplenium trichomanes* ssp. *trichomanes*, and *Thalictrum clavatum*. Other vascular species present include *Hydrangea arborescens*, *Rhododendron maximum*, *Laportea canadensis*, *Trautvetteria caroliniensis* var. *caroliniensis*, *Dryopteris intermedia*, *Dryopteris marginalis*, *Polypodium appalachianum*, *Asplenium montanum*, and (rarely) *Phegopteris connectilis* and *Saxifraga caroliniana*. *Conocephalum conicum* is a common and conspicuous nonvascular plant.

**Dynamics:** This community is generally stable. Periodic rock fall occurs.

**Similar Associations:** No information

**Synonymy:** No information

**Comments:** This community is arguably also closely related to the *Asplenium montanum* Sparsely Vegetated Alliance (A.1831). It seems better placed here, because of the overall floristic composition, the subcalcareous sedimentary rock substrate, the relatively continuously moist conditions, and the high cover of nonvascular plants. The description and concept of the type may require substantial revision when additional information is available. An example of this community has been documented from the Dickey Branch Preserve (The Nature Conservancy), Johnson County, Tennessee (Plot CHER.4).

## CONSERVATION RANKING &amp; RARE SPECIES

**GRank:** G2 (00-06-12): This type appears to be naturally rare. It has few threats.

**High-ranked species:** SAXIFRAGA CAROLINIANA (G2)

## ELEMENT DISTRIBUTION

**Range:** This type is known from a small area of Ridge and Valley and adjacent Blue Ridge (with sedimentary inclusions) in Tennessee. Its potential occurrence is more widespread.

**States:** AL? GA? TN VA?

**Crosswalk to State Classifications:**

- VA?: No equivalent (VA 2001)

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

**USFS Ecoregions:** M221Dd:CCC

**Federal Lands:** USFS (Chattahoochee?, Cherokee, Jefferson?)

## ELEMENT SOURCES

**References:** NatureServe Ecology - Southeast U.S. unpubl. data

## SOUTHERN APPALACHIAN MOIST SANDSTONE CLIFF

## ELEMENT IDENTIFIERS

**NVCS association:** *Heuchera villosa* - *Dicentra eximia* - *Campanula divaricata* Herbaceous Vegetation

**Database Code:** CEG008546

**Formation:** Low temperate or subpolar perennial forb vegetation

**Alliance:** (HYDRANGEA SPP., PHILADELPHUS SPP.) / HEUCHERA SPP. HERBACEOUS ALLIANCE (V.B.2.N.b.100)

## ELEMENT CONCEPT

**Summary:** This type occurs on moist, shaded, north-facing cliffs of sedimentary rocks (sandstones and siltstones). It has sparse cover of vascular plants, which root in the crevices. The most abundant vascular species are *Heuchera villosa* var. *villosa*, *Dicentra eximia*, *Campanula divaricata*, *Dryopteris marginalis*, *Polypodium appalachianum*, and *Eurybia divaricata* (= *Aster divaricatus*). Scattered woody plants are also present, rooting in crevices, including *Rhododendron minus*, *Hydrangea arborescens*, *Clethra acuminata*, *Toxicodendron radicans*, and *Parthenocissus quinquefolia*.

**Environment:** This community is known from north-facing, seepy cliffs over siltstones and shales of intermediate composition, at 2100-2500 feet elevation, in the western Blue Ridge provinces.

**Vegetation:** The most abundant vascular species are *Heuchera villosa* var. *villosa*, *Dicentra eximia*, *Campanula divaricata*, *Dryopteris marginalis*, *Polypodium appalachianum*, and *Eurybia divaricata* (= *Aster divaricatus*). Scattered woody plants are also present, rooting in crevices, including *Rhododendron minus*, *Hydrangea arborescens*, *Clethra acuminata*, *Toxicodendron radicans*, and *Parthenocissus quinquefolia*.

**Dynamics:** This community is generally stable. Periodic rock fall occurs.

**Similar Associations:** No information

**Synonymy:** No information

**Comments:** This community is arguably also closely related to the *Asplenium montanum* Sparsely Vegetated Alliance (A.1831). It seems better placed here, because of the overall floristic composition, the subcalcareous sedimentary rock substrate, the relatively continuously moist conditions, and the high cover of nonvascular plants. The description and concept of the type may require substantial revision when additional information is available. An example of this community has been documented at Doe River Gorge #1 (Plot CHER.38) (NatureServe Ecology - Southeast U.S. unpubl. data 2000).

## CONSERVATION RANKING &amp; RARE SPECIES

**GRank:** G2 (01-06-29): This type appears to be naturally rare. It has few threats.

**High-ranked species:** No information

## ELEMENT DISTRIBUTION

**Range:** This type is known from a small area of Ridge and Valley and adjacent Blue Ridge (with sedimentary inclusions) in Tennessee. Its potential occurrence is more widespread.

**States:** GA? TN VA?

**Crosswalk to State Classifications:**

- VA?: No equivalent (VA 2001)

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

**USFS Ecoregions:** M221Dd:CCC

**Federal Lands:** USFS (Chattahoochee?, Cherokee, Jefferson?)

## ELEMENT SOURCES

**References:** NatureServe Ecology - Southeast U.S. unpubl. data

**DOE RIVER GORGE SEEPAGE CLIFF****ELEMENT IDENTIFIERS**

**NVCS association:** *Trichophorum caespitosum* - *Osmunda regalis* - *Rhynchospora capitellata* - *Oxypolis rigidior*  
Herbaceous Vegetation

**Database Code:** CEGL008490

**Formation:** Saturated temperate or subpolar grassland

**Alliance:** TRICHOPHORUM CAESPITOSUM SATURATED HERBACEOUS ALLIANCE (V.A.5.N.m.100)

**ELEMENT CONCEPT**

**Summary:** This community occurs on near-vertical, north-facing sandstone cliffs at about 700 m (2200 feet) elevation, and is known only from northeastern Tennessee. Near-constant seepage, the steep north-facing aspect, and the position of this community in a deep gorge maintain saturated conditions. The most abundant plants are *Trichophorum caespitosum* (= *Scirpus cespitosus*), *Osmunda regalis* var. *spectabilis*, *Oxypolis rigidior*, *Rhynchospora capitellata*, *Alnus serrulata*, and *Acer rubrum*. Other species include *Rhododendron minus*, *Fraxinus americana*, *Clethra acuminata*, *Nyssa sylvatica*, *Spiranthes cernua*, *Linum striatum*, *Schizachyrium scoparium*, *Eurybia divaricata* (= *Aster divaricatus*), *Hypericum mutilum*, and *Dichanthelium* sp.

**Environment:** This community occurs on near-vertical, north-facing sandstone cliffs at about 700 m (2200 feet) elevation, and is known only from northeastern Tennessee. Near-constant seepage, the steep north-facing aspect, and the position of this community in a deep gorge maintain saturated conditions.

**Vegetation:** A scattered to open shrub stratum has *Alnus serrulata*, *Acer rubrum*, *Rhododendron minus*, *Fraxinus americana*, *Clethra acuminata*, and *Nyssa sylvatica*. The open to dense herbaceous stratum includes *Trichophorum caespitosum*, *Osmunda regalis* var. *spectabilis*, *Oxypolis rigidior*, *Rhynchospora capitellata*, *Spiranthes cernua*, *Linum striatum*, *Schizachyrium scoparium*, *Eurybia divaricata* (= *Aster divaricatus*), *Hypericum mutilum*, and *Dichanthelium* sp.

**Dynamics:** See Summary

**Similar Associations:**

- *Trichophorum caespitosum* - *Osmunda cinnamomea* - *Carex barrattii* - *Carex buxbaumii* Herbaceous Vegetation (CEGL007723)

**Synonymy:** No information

**Comments:** This community is described from sites in the Doe River Gorge, Carter County, Tennessee, and is documented by Plot CHER.40. While it has unique composition, its taxonomic recognition may be questionable; it should be compared to other Appalachian cliff communities.

**CONSERVATION RANKING & RARE SPECIES**

**GRank:** G1Q(01-06-21): As defined, this community is extremely rare naturally, being restricted to north-facing seepage cliffs in the Doe River Gorge, Carter County, Tennessee. It is apparently stable, but could be damaged by renovations or maintenance to the narrow-gauge railroad track through the gorge.

**High-ranked species:** No information

**ELEMENT DISTRIBUTION**

**Range:** This community is known from the Appalachian Mountains of northeastern Tennessee.

**States:** TN

**Crosswalk to State Classifications:** Not yet cross-referenced to state classifications

**TNC Ecoregions:** 51:C

**USFS Ecoregions:** M221Dc:CCC

**Federal Lands:** USFS (Cherokee)

**ELEMENT SOURCES**

**References:** NatureServe Ecology - Southeast U.S. unpubl. data

**MONTANE CLIFF (CAROLINA ROCKTRIPE TYPE)**

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**ELEMENT IDENTIFIERS****NVCS association:** Umbilicaria mammulata Nonvascular Vegetation**Database Code:** C EGL004387**Formation:** Montane/submontane temperate or subpolar lichen vegetation**Alliance:** UMBILICARIA MAMMULATA NONVASCULAR ALLIANCE (VI.B.1.N.b.3)**ELEMENT CONCEPT**

**Summary:** Vegetation strongly, dominated by *Umbilicaria mammulata*, on relatively moist, shaded, rock outcrops. This vegetation occurs where periodic seepage occurs on acidic rock outcrops. Individual occurrences can be as large as an acre. Vascular plants are generally sparse or absent, though trees of adjacent forest communities often shade the outcrop community for much of the day. Other umbilicate lichens may also occur. Associates include *Dryopteris intermedia*, *Polypodium virginianum* (= *Polypodium vulgare*). Typically found on northeast-facing slopes.

**Environment:** See Summary**Vegetation:** See Summary**Dynamics:** See Summary**Similar Associations:** No information**Synonymy:**

- IE2a. Southern Appalachian Acidic Cliff (Allard 1990)
- Lichen-dominated shaded outcrops (CAP 1998)

**Comments:** Potentially very widespread in Southeast and beyond.**CONSERVATION RANKING & RARE SPECIES****GRank:** G4? (94-08-15):**High-ranked species:** No information**ELEMENT DISTRIBUTION****Range:****States:** GA NC SC TN VA WV**Crosswalk to State Classifications:**

- NC: Montane Acidic Cliff, in part (NC 1990)

**TNC Ecoregions:** 51:C, 52:C, 59:C**USFS Ecoregions:** 231Aa:CCC, 231Ab:CCC, 231Ac:CCC, 231Ad:CCC, 231Ag:CCC, 231Ak:CCC, M221Da:CCC, M221Db:CCC, M221Dc:CCC, M221Dd:CCC**Federal Lands:** USFS (Cherokee?, George Washington, Jefferson, Monongahela?, Nantahala, Pisgah)**ELEMENT SOURCES****References:** Allard 1990, CAP 1998, Schafale and Weakley 1990

## SOUTHERN BLUE RIDGE SPRAY CLIFF

## ELEMENT IDENTIFIERS

**NVCS association:** *Vittaria appalachiana* - *Heuchera parviflora* var. *parviflora* - *Houstonia serpyllifolia* / *Plagiochila* spp.  
Herbaceous Vegetation

**Database Code:** C EGL004302

**Formation:** Saturated temperate perennial forb vegetation

**Alliance:** VITTARIA APPALACHIANA - HEUCHERA PARVIFLORA SATURATED HERBACEOUS ALLIANCE (V.B.2.N.f.15)

## ELEMENT CONCEPT

**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 sharpii* ssp. *sharpii*, *Plagiochila* spp., *Plagiochila sullivantii*, *Riccardia multifida*); mosses (*Bryocrumia vivicolor*, *Dichodontium pellucidum*, *Fissidens osmundioides*, *Hyophila involuta*, *Mnium marginatum*, *Oncophorus raii*, *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*). 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.

**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.

**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*, *Mnium affine*, *Mnium marginatum*, *Isopterygium distichaceum*, *Bryocrumia vivicolor*, *Flakea papillosa*, *Hookeria acutifolia*, *Thamnobryum alleghaniense*, *Oncophorus raii*, *Hyophila involuta*, *Dichodontium pellucidum*, *Radula* spp., *Plagiochila sharpii*, *Plagiochila caduciloba*, *Plagiochila sullivantii*, *Plagiochila austinii*, *Fissidens osmundioides*, *Bazzania denudata*, *Conocephalum conicum*, *Pellia epiphylla*, *Pellia neesiana*, and *Riccardia multifida*.

**Dynamics:** See Summary

**Similar Associations:** No information

**Synonymy:**

- IID5a. Wet Acidic Cliff (Allard 1990) B. in part

**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.

**CONSERVATION RANKING & RARE SPECIES**

**GRank:** G2 (98-04-30): 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.

**High-ranked species:** BRYOCRUMIA VIVICOLOR (G1G2), PLAGIOCHILA SULLIVANTII (G2), PLAGIOMNIUM CAROLINIANUM (G3), PLAGIOCHILA CADUCILOBA (G2), PLAGIOCHILA SHARPII SSP SHARPII (G2G3T2T3), HEUCHERA PARVIFLORA VAR PUBERULA (G4T3T4), HYMENOPHYLLUM TAYLORIAE (G1G2), KRIGIA MONTANA (G3), TRICHOMANES INTRICATUM (G3G4), ACROBOLBUS CILIATUS (G3?), ANEURA SHARPII (G1G2), CAREX BILTMOREANA (G3), SAXIFRAGA CAROLINIANA (G2), SAXIFRAGA CAREYANA (G3)

**ELEMENT DISTRIBUTION**

**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.

**States:** GA NC SC TN

**Crosswalk to State Classifications:**

- NC: Spray Cliff (NC 1990)
- SC: Spray Cliff (SC 1986)

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

**USFS Ecoregions:** M221Dc:CCC, M221Dd:CCC

**Federal Lands:** NPS (Great Smoky Mountains); USFS (Chattahoochee, Cherokee, Nantahala, Pisgah, Sumter)

**ELEMENT SOURCES**

**References:** Allard 1990, Dellinger 1992, Farrar 1998, Nelson 1986, Schafale and Weakley 1990, Weakley 1993, Weakley and Schafale 1994, Wharton 1978, Zartman and Pittillo 1998

## APPALACHIAN CLIFF WHITE-CEDAR WOODLAND

## ELEMENT IDENTIFIERS

**NVCS association:** *Thuja occidentalis* / *Carex eburnea* - *Pellaea atropurpurea* Woodland

**Database Code:** CEG002596

**Formation:** Conical-crowned temperate or subpolar needle-leaved evergreen woodland

**Alliance:** THUJA OCCIDENTALIS WOODLAND ALLIANCE (II.A.4.N.b.1)

## ELEMENT CONCEPT

**Summary:** This white-cedar cliff woodland type is found in the Appalachian and Allegheny Plateau region of the United States. The type extends to near the southern limit of *Thuja occidentalis*, in the southeastern Highland Rim of Kentucky and Tennessee, where it tends to increase its distinctiveness from more northern communities. Stands occur on north-facing bluffs or cliffs of dolomite or limestone, where dip slopes provide slight seepage and maintain humidity higher than the regional average, or provide a cooler-than-normal microclimate. In Ohio it occurs as pure isolated patches on steep calcareous cliffs. It is also found as mixed stands on the uplands above the cliffs. Stands are dominated by coniferous trees but can have a significant amount of deciduous species. The structure of this association can vary from a stunted, very open canopy of *Thuja* to a mixed conifer-deciduous woodland approaching a forest structure. Canopy species other than *Thuja occidentalis* vary with geography. The most abundant tree species are *Thuja occidentalis*, *Acer saccharum*, *Tsuga canadensis*, *Juniperus virginiana*, *Quercus alba*, *Quercus muehlenbergii*, and *Quercus rubra*. Other associates include *Celtis occidentalis* and *Ulmus rubra* in more northern stands. Shrub and small tree species include *Cercis canadensis*, *Cornus florida*, *Hydrangea arborescens*, *Ostrya virginiana*, and *Rhus aromatica*. Closed-canopy stands have very few vascular species in the lower strata, while stands with broken canopies contain scattered shrubs and a substantial number of herbaceous species. Composition of the herbaceous and shrub strata can also vary due to seepage influence. Composition is quite variable, but some of the most constant herbaceous plants include *Asarum canadense*, *Carex eburnea*, *Cystopteris bulbifera*, and *Hepatica nobilis* var. *acuta* (= *Hepatica acutiloba*). In Kentucky, sites are small (0.1-1 acre), with scattered *Thuja occidentalis* codominating with *Acer saccharum*, *Fraxinus americana*, *Ostrya virginiana*, and *Philadelphus hirsutus*. Other associated species include *Juniperus virginiana* var. *virginiana*, *Cercis canadensis* var. *canadensis*, *Pachysandra procumbens*, *Hamamelis virginiana*, *Parthenocissus quinquefolia*, *Solidago flexicaulis*, *Solidago sphacelata*, *Symphotrichum cordifolium* (= *Aster cordifolius*), and *Dioscorea quaternata*.

**Environment:** This community is found primarily on steep calcareous cliffs, as well as on the uplands above the cliffs. The bedrock is typically limestone or dolomite (Braun 1928, Anderson 1996). Soils are shallow, dry, and calcareous, and plants often root in crevices or on narrow ledges, or adjacent clifftops and talus. In Ohio this woodland community occurs as pure, isolated patches on steep calcareous cliffs. It is also found as mixed stands on the uplands above the cliffs. The site of a glacial relict stand in Ohio is maintained by seepage springs from underground limestone formations (Kangas 1989). In Kentucky, *Thuja occidentalis* occurs within the Cumberland River drainage in the southeastern Highland Rim region. These woodlands are associated with steep, rocky, limestone, mostly north- and east-facing slopes along permanent streams. Some stands are associated with cold-air drainages. In Virginia the type is evidently confined to north-facing cliffs and escarpments produced by incision of high order streams and rivers into carbonate bedrock of the Ridge and Valley province. Often situated on steep cut-slopes on the outside bends of stream meanders, habitats are more or less open but have limited solar exposure because of their north aspects. Microtopography is rugged and complex, encompassing sheer faces, ledges, and crevices of variable configuration. Slopes range from 40-90 degrees and exposed bedrock constitutes >90% of the surface substrate. Substrate moisture regime is generally subxeric but is ameliorated to some degree by frequent zones of ephemeral seepage and by sheltered north aspects that slow evaporation.

**Vegetation:** Stands are dominated by coniferous trees, but with a significant amount of deciduous species. The most abundant tree species are *Thuja occidentalis*, *Acer saccharum*, *Tsuga canadensis*, *Juniperus virginiana*, *Quercus alba*, *Quercus muehlenbergii*, and *Quercus rubra*. Other associates include *Quercus coccinea* and *Liriodendron tulipifera* in more southern stands, and *Celtis occidentalis* and *Ulmus rubra* in more northern stands. Shrub and small tree species include *Cercis canadensis*, *Cornus florida*, *Hydrangea arborescens*, *Ostrya virginiana*, and *Rhus aromatica*. Closed-canopy stands have very few vascular species in the lower strata, while stands with broken canopies contain scattered shrubs and a substantial number of herbaceous species. Composition is quite variable, but some of the most constant herbaceous plants include *Asarum canadense*, *Carex eburnea*, *Cystopteris bulbifera*, and *Hepatica nobilis* var. *acuta* (= *Hepatica acutiloba*) (Anderson 1996). In Kentucky, *Thuja occidentalis* occurs within the Cumberland River drainage in the southeastern Highland Rim region. These woodlands are associated with steep, rocky, limestone, mostly north- and east-facing slopes along permanent streams. Some stands are associated with cold-air drainages. These sites are small (0.1-1 acre), with scattered *Thuja occidentalis* codominating with *Acer saccharum*, *Fraxinus americana*, *Ostrya virginiana*, and *Philadelphus hirsutus*. Other associated species include *Juniperus virginiana* var. *virginiana*, *Cercis canadensis* var. *canadensis*, *Pachysandra procumbens*, *Hamamelis virginiana*, *Parthenocissus quinquefolia*, *Solidago flexicaulis*, *Solidago sphacelata*,



*Symphytotrichum cordifolium* (= *Aster cordifolius*), and *Dioscorea quaternata*. ^This vegetation type is represented in Virginia by open woodlands and sparse scrub occurring on nearly vertical limestone cliffs. Because these habitats cannot be fully accessed or plot-sampled, composition is described from qualitative examination of two stands. The dominant woody species is *Thuja occidentalis*. In the observed stands, specimens of this tree are shrubby and mostly <6 m tall. Associated woody species include *Hydrangea arborescens* and stunted individuals of *Celtis tenuifolia*, *Cercis canadensis*, *Physocarpus opulifolius*, *Tilia americana* (including both var. *americana* and var. *heterophylla*), and *Ulmus rubra*. Vines of *Parthenocissus quinquefolia* and *Toxicodendron radicans* are abundant climbers on rock faces at both sites. *Carex eburnea* is the most conspicuous, if not the most abundant, herbaceous species, forming dense turfs on ledges. Constant herbs in the two stands are *Aquilegia canadensis*, *Asplenium resiliens*, *Asplenium rhizophyllum*, *Carex eburnea*, *Cystopteris bulbifera*, *Draba ramosissima*, *Eurybia divaricata* (= *Aster divaricatus*), *Pellaea atropurpurea*, and *Sedum glaucophyllum*. Of these, *Eurybia divaricata*, *Cystopteris bulbifera*, and *Sedum glaucophyllum* are relatively abundant locally.

**Dynamics:** See Summary

**Similar Associations:**

- *Thuja occidentalis* / *Carex eburnea* Forest (CEGL006021)-is a similar upland white-cedar cliff community.

**Synonymy:**

- Arbor vitae forest (Braun 1928) =
- *Thuja occidentalis* / *Carex eburnea* - *Sedum glaucophyllum* Shrubland (Fleming 1999)
- *Thuja occidentalis* / *Carex eburnea* - *Sedum glaucophyllum* Woodland (Fleming and Coulling 2001)

**Comments:** This type is simply defined by the presence of white-cedar or mixed white-cedar - hardwoods, and either forest or woodland canopy; hence all four physiognomic categories fall under this one type. Small-scale occurrences are worth documenting. The relationship between this type and *Thuja occidentalis* / *Carex eburnea* Forest (CEGL006021) should be examined and clarified. Stands on lower slopes often grade into swamps, especially those dominated by *Thuja occidentalis*. There are also many similarities between this vegetation and that in the I.C.3.N.a *Thuja occidentalis* - *Betula alleghaniensis* Forest Alliance (A.417). In the Ridge and Valley of Virginia, *Thuja occidentalis* communities occur in two situations: on rocky bluffs with admixtures of hardwood species and on mesic slopes with *Tsuga canadensis* and *Pinus strobus* (G. Fleming pers. comm. 1999). Southern *Thuja* stands are more genetically diverse than northern populations (Walker 1987). One Tennessee site is a proposed State Natural Area, Window Cliffs. This association is peripheral in the Southern Blue Ridge of Tennessee.

**CONSERVATION RANKING & RARE SPECIES**

**GRank:** G2G3 (98-08-04): There are probably fewer than 50 occurrences of this community rangewide. It is restricted to north-facing calcareous bedrock cliffs and summits in the Ridge and Valley section of the central Appalachians. About 10 occurrences are known in Virginia and West Virginia, with a total acreage of about 120 acres. It is also known from Pennsylvania, Tennessee, and Maryland. Due to their location on small ledges of steep cliffs, these communities are difficult to survey, and few field surveys have been conducted. This community has probably always been rare, and there are no imminent threats. In Ohio, the type has apparently always been restricted to a few stands.

**High-ranked species:** PAXISTIMA CANBYI (G2)

**ELEMENT DISTRIBUTION**

**Range:** This white-cedar cliff woodland type is found in the Appalachian and Allegheny Plateau region of the United States.

**States:** KY MD OH PA TN VA WV

**Crosswalk to State Classifications:**

- OH: arbor vitae-mixedwood forest
- VA: Mesic Calcareous Cliff (VA 2001)

**TNC Ecoregions:** 44:C, 45:C, 50:C, 51:C, 52:C, 59:C

**USFS Ecoregions:** 222Ea:CCC, 222Eb:CCC, 222Ej:CCC, 222Fd:CCC, 222Ha:CCC, 222Hb:CCC, 222Hc:CCP, 231Ak:CCC, M221Aa:CCC, M221Ab:CCC, M221Bd:CC?, M221Be:CCC, M221Dd:CCC

**Federal Lands:** USFS (George Washington)

**ELEMENT SOURCES**

**References:** Anderson 1996, Braun 1928, Fleming 1999, Fleming and Coulling 2001, Fleming et al. 2001, Fleming pers. comm., Kangas 1989, Palmer-Ball et al. 1988, Walker 1987

**FLOODPLAIN CANEBRAKE**

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**ELEMENT IDENTIFIERS**

**NVCS association:** *Arundinaria gigantea* ssp. *gigantea* Shrubland

**Database Code:** CEGLO03836

**Formation:** Temporarily flooded temperate broad-leaved evergreen shrubland

**Alliance:** ARUNDINARIA GIGANTEA TEMPORARILY FLOODED SHRUBLAND ALLIANCE (III.A.2.N.g.1)

**ELEMENT CONCEPT**

**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 and possibly the Central Appalachians 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 Central Appalachians various wetlands, including those on alluvial or loess substrates (streamside flats, bottomlands), were dominated by *Arundinaria*, without an overstory, or with widely scattered trees.

**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:** 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, Kentucky, Missouri, Arkansas, eastern Texas, 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." As currently described, this association refers only to the former, cane shrublands. 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. In the Central Appalachians various wetlands, including those on alluvial or loess substrates (streamside flats, bottomlands), were dominated by *Arundinaria*, without an overstory, or with widely scattered trees (Central Appalachian Forest Ecoregional Team pers. comm. 1998). 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.

**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).

**Similar Associations:** No information

**Synonymy:**

- P5A4bIII4a. *Arundinaria gigantea* (Foti et al. 1994)
- Canebrake. [common name]

**Comments:** This is a general placeholder, covering a broad geographic range, and several associations may ultimately be recognized. Dense, monospecific stands of *Arundinaria gigantea* ssp. *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." As currently described, this association refers only to the former, cane shrublands.

## CONSERVATION RANKING &amp; RARE SPECIES

**GRank:** G2? (99-02-15): 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* ssp. *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.

**High-ranked species:** VERMIVORA BACHMANII (GH)

## ELEMENT DISTRIBUTION

**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, and possibly Virginia (?).

**States:** AL AR FL? GA IL IN KY LA MO MS NC OK SC TN TX VA?

**Crosswalk to State Classifications:**

- GA: No equivalent (GA 1990)
- IL: wet-mesic upland forest (S)
- NC: No equivalent (NC 1990)
- OK: *Arundinaria gigantea* shrubland association (OK 2000)
- VA?: No equivalent (VA 2001)

**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:P, 53:P, 56:C, 57:P, 59:C

**USFS Ecoregions:** 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:CC?, 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

**Federal Lands:** DOD (Fort Benning); NPS (Buffalo, Great Smoky Mountains); USFS (Cherokee?, Mark Twain, Ouachita?, Ozark, St. Francis); USFWS (Little River, San Bernard?)

## ELEMENT SOURCES

**References:** Blair 1938, Campbell 1980, Campbell 1989b, Davidson 1950, Flores 1984, Foti et al. 1994, Heineke 1987, Hoagland 1997, Hoagland 1998c, Hoagland 2000, Hughes 1966, McClain pers. comm., McInteer 1952, Meanley 1972, Mohr 1901, Nigh pers. comm., Nuttall 1821, Platt and Brantley 1992, Platt and Brantley 1997, Smeins et al. 1992, West 1934

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**Database Code:** CEGLO03836

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**Alliance:** ARUNDINARIA GIGANTEA TEMPORARILY FLOODED SHRUBLAND ALLIANCE (III.A.2.N.g.1)

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**Comments:** This is a general placeholder, covering a broad geographic range, and several associations may ultimately be recognized. Dense, monospecific stands of *Arundinaria gigantea* ssp. *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." As currently described, this association refers only to the former, cane shrublands.

## CONSERVATION RANKING &amp; RARE SPECIES

**GRank:** G2? (99-02-15): 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* ssp. *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.

**High-ranked species:** VERMIVORA BACHMANII (GH)

## ELEMENT DISTRIBUTION

**Range:** This association was widespread historically but now occupies very little acreage. It may be found along rivers and streamsides in Alabama, Arkansas, Florida, Georgia, Illinois, Indiana, Kentucky, Louisiana, Mississippi, Missouri, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, and possibly Virginia (?).

**States:** AL AR FL? GA IL IN KY LA MO MS NC OK SC TN TX VA?

**Crosswalk to State Classifications:**

- GA: No equivalent (GA 1990)
- IL: wet-mesic upland forest (S)
- NC: No equivalent (NC 1990)
- OK: *Arundinaria gigantea* shrubland association (OK 2000)
- VA?: No equivalent (VA 2001)

**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:P, 53:P, 56:C, 57:P, 59:C

**USFS Ecoregions:** 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:CC?, 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

**Federal Lands:** DOD (Fort Benning); NPS (Buffalo, Great Smoky Mountains); USFS (Cherokee?, Mark Twain, Ouachita?, Ozark, St. Francis); USFWS (Little River, San Bernard?)

## ELEMENT SOURCES

**References:** Blair 1938, Campbell 1980, Campbell 1989b, Davidson 1950, Flores 1984, Foti et al. 1994, Heineke 1987, Hoagland 1997, Hoagland 1998c, Hoagland 2000, Hughes 1966, McClain pers. comm., McInteer 1952, Meanley 1972, Mohr 1901, Nigh pers. comm., Nuttall 1821, Platt and Brantley 1992, Platt and Brantley 1997, Smeins et al. 1992, West 1934

**ROCKY BAR AND SHORE (TWISTED SEDGE TYPE)**

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**ELEMENT IDENTIFIERS**

**NVCS association:** *Carex torta* Herbaceous Vegetation

**Database Code:** CEG004103

**Formation:** Temporarily flooded temperate or subpolar grassland

**Alliance:** CAREX TORTA TEMPORARILY FLOODED HERBACEOUS ALLIANCE (V.A.5.N.j.4)

**ELEMENT CONCEPT**

**Summary:** *Carex torta*-dominated alluvial wetlands on sand, gravel, and rock bars along riverbanks in valleys and gorges in southern Appalachians, west into the Cumberland Plateau and the Interior Low Plateau, and north into the Central Appalachians and Allegheny Mountains. 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 *Verbena hastata*, *Doellingeria umbellata* (= *Aster umbellatus*), *Dichanthelium clandestinum*, *Solidago rugosa* ssp. *aspera*, *Juncus effusus*, *Scirpus expansus*, *Scirpus cyperinus*, *Equisetum arvense*, *Onoclea sensibilis*, *Vernonia noveboracensis*, *Lycopus virginicus*, *Scutellaria lateriflora*, *Lobelia cardinalis*, *Symphyotrichum dumosum* (= *Aster dumosus*), *Lycopus virginicus*, *Osmunda regalis*, *Hypericum mutilum*, *Eupatorium fistulosum*, *Solidago patula*, and *Salix sericea*.

**Environment:** This association occupies boulder and gravel bars on the frequently flooded, active channel shelves of high-gradient rivers and large streams. Along Laurel Fork, 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. 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.

**Vegetation:** Vegetation is characterized by light-demanding, tough-rooted herbaceous perennials tolerant of frequent inundation and flood-scouring. *Carex torta* is the dominant species and typically forms dense, extensive colonies. Associated species vary with geography but can include *Verbena hastata*, *Doellingeria umbellata* (= *Aster umbellatus*), *Dichanthelium clandestinum*, *Solidago rugosa* ssp. *aspera*, *Juncus effusus* var. *solutus*, *Scirpus expansus*, *Scirpus cyperinus*, *Equisetum arvense*, *Onoclea sensibilis*, *Vernonia noveboracensis*, *Lycopus virginicus*, *Scutellaria lateriflora*, *Lobelia cardinalis*, *Symphyotrichum dumosum* (= *Aster dumosus*), *Osmunda regalis* var. *spectabilis*, *Eupatorium fistulosum*, *Solidago patula*, and *Hypericum mutilum*. Small specimens of *Salix sericea* and other woody plants are also frequent.

**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.

**Similar Associations:** No information

**Synonymy:**

- Torturous sedge gravel rivershore (CAP 1998)
- IIE3a. Riverside Shoal and Stream Bar Complex (Allard 1990) B. in part
- Rocky Bar And Shore (Twisted Sedge Subtype) (Schafale pers. comm.)
- *Carex torta* Association (Fleming and Moorhead 1996)
- *Carex torta* Herbaceous Vegetation (Fleming and Coulling 2001)

**Comments:** None

**CONSERVATION RANKING & RARE SPECIES**

**GRank:** G3G4 (00-01-21): This community is found as linear occurrences along waterways in the Southern Appalachians, west into the Cumberland Plateau and the Interior Low Plateau, and north into the Central Appalachians and Allegheny Mountains. 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.

**High-ranked species:** No information

### ELEMENT DISTRIBUTION

**Range:** This community is found as linear occurrences along waterways in the Southern Appalachians, west into the Cumberland Plateau and the Interior Low Plateau, and north into the Central Appalachians and Allegheny Mountains.

**States:** AL GA KY NC SC TN VA WV

#### Crosswalk to State Classifications:

- NC: Rocky Bar and Shore, in part; Sand and Mud Bar, in part (NC 1990)
- SC: No equivalent (SC 1986)
- TN: No equivalent (TN 1994)
- VA: Rocky Bar and Shore, in part (VA 2001)

**TNC Ecoregions:** 44:C, 50:C, 51:C, 58:C, 59:C

**USFS Ecoregions:** 221Ba:CCC, 221Ha:CC?, 221Hb:CCC, 221Hc:CCC, 221He:CCC, 222Eg:CCC, 222En:CCC, 222Eo:CCC, 231Cd:CCC, M221Aa:CCC, M221Ab:CCC, M221Ac:CCC, M221Ad:CCP, M221Ba:CCC, M221Bb:CCC, M221Bd:CCC, M221Be:CCC, M221Cd:CCP, M221Dc:CCC, M221Dd:CCC

**Federal Lands:** NPS (Great Smoky Mountains); USFS (Bankhead, Chattahoochee, Cherokee, Daniel Boone, George Washington, Jefferson, Nantahala, Pisgah, Sumter)

### ELEMENT SOURCES

**References:** Allard 1990, CAP 1998, Fleming and Coulling 2001, Fleming and Moorhead 1996, Fleming et al. 2001, Hupp 1982, NatureServe Ecology - Southeast U.S. unpubl. data, Palmer-Ball et al. 1988, Schafale and Weakley 1990, Schafale pers. comm.

**HIWASSEE / OCOEE RIVER BOULDER SCOUR VEGETATION**

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**ELEMENT IDENTIFIERS**

**NVCS association:** Schizachyrium scoparium - Andropogon ternarius - Liatris microcephala - (Pityopsis ruthii) Herbaceous Vegetation

**Database Code:** CEGL008455

**Formation:** Temporarily flooded temperate or subpolar grassland

**Alliance:** SCHIZACHYRIUM SCOPARIUM TEMPORARILY FLOODED HERBACEOUS ALLIANCE (V.A.5.N.j.10)

**ELEMENT CONCEPT**

**Summary:** This is a river scour community of the Hiwassee and Ocoee rivers of southeastern Tennessee. In this temporarily flooded river scour community, the herbaceous species are limited to the cracks and crevices of the boulders, with *Pityopsis ruthii* dominating in many places. In its more open phase, it is dominated by perennial grasses and forbs. The principal grasses here are *Schizachyrium scoparium*, *Andropogon ternarius* (both becoming abundant in areas with increased soils), and *Panicum* sp. Other abundant herbaceous species include *Liatris microcephala*, *Symphyotrichum novae-angliae* (= *Aster novae-angliae*), *Solidago* sp., *Coreopsis tripteris*, and *Agalinis* sp. The shrub stratum is also clumpy in distribution with *Cornus amomum*, *Hypericum prolificum*, and *Leucothoe racemosa* also present. Several liana species are present, most notably *Bignonia capreolata* and *Toxicodendron radicans*, along with the non-native *Lonicera japonica*. The adjacent blufftop is dominated by *Pityopsis ruthii* and lichens, with small clusters of *Pinus virginiana* and *Juniperus virginiana* scattered throughout, where soils have accumulated covering between 25% and 40% of the more open areas. The woody plants become thicker about 25 m from the edge, with coverage approaching 75-90% where lack of scour has allowed woody species to invade. Other canopy species noted include *Pinus strobus*, *Platanus occidentalis*, and *Acer rubrum*. In the more open areas, these species are small and stunted.

**Environment:** This association occurs on the immediate edges of the Hiwassee River growing on phyllite or graywacke boulders. Under a natural flooding regime, these communities may have been more extensive, but lack of scour has resulted in limited habitat for them. An adjacent "blufftop" area dominated by *Pityopsis ruthii* and lichens, with small clusters of *Pinus virginiana* and *Juniperus virginiana* scattered throughout, where soils have accumulated covering between 25% and 40% of the more open areas. The woody plants become thicker about 25 m from the edge, with coverage approaching 75-90% where lack of scour has allowed woody species to invade. These "blufftop" areas receive some scouring from a smaller drain which is a tributary of the River. This area is anomalous in that *Pityopsis ruthii* is growing in a somewhat different habitat from the actual boulders in the river which receive (or did receive) the scouring action of the river.

**Vegetation:** In this temporarily flooded river scour community, the herbaceous species are limited to the cracks and crevices of the boulders, with *Pityopsis ruthii* dominating in many places. In its more open phase, it is dominated by perennial grasses and forbs. The principal grasses here are *Schizachyrium scoparium*, *Andropogon ternarius* (both becoming abundant in areas with increased soils), and *Panicum* sp. Other abundant herbaceous species include *Liatris microcephala*, *Symphyotrichum novae-angliae* (= *Aster novae-angliae*), *Solidago* sp., *Coreopsis tripteris*, and *Agalinis* sp. The shrub stratum is also clumpy in distribution with *Cornus amomum*, *Hypericum prolificum*, and *Leucothoe racemosa* also present. Several liana species are present, most notably *Bignonia capreolata* and *Toxicodendron radicans*, along with the non-native *Lonicera japonica*. The adjacent blufftop is dominated by *Pityopsis ruthii* and lichens, with small clusters of *Pinus virginiana* and *Juniperus virginiana* scattered throughout, where soils have accumulated covering between 25% and 40% of the more open areas.

**Dynamics:** The habitat of this association has been affected and limited by the effects of impoundments and resulting changes in flooding regimes.

**Similar Associations:**

- Schizachyrium scoparium - Schoenoplectus americanus - Juncus marginatus - Eupatorium serotinum Herbaceous Vegetation (CEGL008496)

**Synonymy:**

- The Bluffs of Hiwassee Glades (Major pers. comm.)

**Comments:** None

**CONSERVATION RANKING & RARE SPECIES**

**GRank:** G2 (00-12-20): This association is restricted in distribution, being limited to phyllite or graywacke boulders in unimpounded sections of rivers with a narrowed flow and a higher gradient regime. Only two rivers in this area meet these conditions, the Hiwassee and the Ocoee. This community is restricted to about 3.5 miles on Hiwassee River in Polk County, Tennessee; and specifically confined to about 100 m on either side of the river. Most occurrences are 20 m or less in width. The habitat of this association has been affected and limited by the effects of impoundments and resulting changes in flooding regimes. It is threatened by recreational use, vegetational succession, and alterations in the flow regime.

**High-ranked species:** PITYOPSIS RUTHII (G1)



**ELEMENT DISTRIBUTION**

**Range:** This association is restricted in distribution to the Hiwassee and the Ocoee rivers in southeastern Tennessee. It is restricted to about 3.5 miles on the Hiwassee River in Polk County, Tennessee.

**States:** TN

**Crosswalk to State Classifications:** Not yet cross-referenced to state classifications

**TNC Ecoregions:** 51:C

**USFS Ecoregions:** M221Dd:CCC

**Federal Lands:** USFS (Cherokee)

**ELEMENT SOURCES**

**References:** Major et al. 1999, Major pers. comm., NatureServe Ecology - Southeast U.S. unpubl. data

**HIWASSEE / OCOEE BEDROCK SCOUR VEGETATION**

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**ELEMENT IDENTIFIERS**

**NVCS association:** Schizachyrium scoparium - Schoenoplectus americanus - Juncus marginatus - Eupatorium serotinum  
Herbaceous Vegetation

**Database Code:** C EGL008496

**Formation:** Temporarily flooded temperate or subpolar grassland

**Alliance:** SCHIZACHYRIUM SCOPARIUM TEMPORARILY FLOODED HERBACEOUS ALLIANCE (V.A.5.N.j.10)

**ELEMENT CONCEPT**

**Summary:** This is a river scour community of the Hiwassee and Ocoee rivers of southeastern Tennessee. In this temporarily flooded river scour community, the herbaceous species occur in bedrock crevices. Dominant species can be *Schizachyrium scoparium* (in the drier phase sites) or *Schoenoplectus americanus* (in the wetter phase sites). Other typical species include *Juncus marginatus*, *Eupatorium serotinum*, and scattered woody plants, including *Platanus occidentalis*, *Betula nigra*, and *Salix nigra*.

**Environment:** This is a river scour community of the Hiwassee and Ocoee rivers of southeastern Tennessee. In this temporarily flooded river scour community, the herbaceous species occur in bedrock crevices.

**Vegetation:** In this temporarily flooded river scour community, the herbaceous species occur in bedrock crevices. Dominant species can be *Schizachyrium scoparium* (in the drier phase sites) or *Schoenoplectus americanus* (in the wetter phase sites). Other typical species include *Juncus marginatus*, *Eupatorium serotinum*, and scattered woody plants, including *Platanus occidentalis*, *Betula nigra*, and *Salix nigra*.

**Dynamics:** The habitat of this association has been affected and limited by the effects of impoundments and resulting changes in flooding regimes.

**Similar Associations:**

- Schizachyrium scoparium - Andropogon ternarius - Liatris microcephala - (Pityopsis ruthii) Herbaceous Vegetation (CEGL008455)

**Synonymy:**

- The Bluffs of Hiwassee Glades (Major pers. comm.)

**Comments:** None

**CONSERVATION RANKING & RARE SPECIES**

**GRank:** G2 (01-06-29): This association is restricted in distribution, being limited to phyllite or graywacke boulders in unimpounded sections of rivers with a narrowed flow and a higher gradient regime. Only two rivers in this area meet these conditions, the Hiwassee and the Ocoee. The habitat of this association has been affected and limited by the effects of impoundments and resulting changes in flooding regimes. It is threatened by recreational use, vegetational succession, and alterations in the flow regime.

**High-ranked species:** No information

**ELEMENT DISTRIBUTION**

**Range:** This association is restricted in distribution to the Hiwassee and the Ocoee rivers in southeastern Tennessee.

**States:** TN

**Crosswalk to State Classifications:** Not yet cross-referenced to state classifications

**TNC Ecoregions:** 51:C

**USFS Ecoregions:** M221Dd:CCC

**Federal Lands:** USFS (Cherokee)

**ELEMENT SOURCES**

**References:** Major pers. comm., NatureServe Ecology - Southeast U.S. unpubl. data

**ROCKY BAR AND SHORE (TWISTED SEDGE TYPE)****ELEMENT IDENTIFIERS**

**NVCS association:** *Carex torta* Herbaceous Vegetation

**Database Code:** CEG004103

**Formation:** Temporarily flooded temperate or subpolar grassland

**Alliance:** CAREX TORTA TEMPORARILY FLOODED HERBACEOUS ALLIANCE (V.A.5.N.j.4)

**ELEMENT CONCEPT**

**Summary:** *Carex torta*-dominated alluvial wetlands on sand, gravel, and rock bars along riverbanks in valleys and gorges in southern Appalachians, west into the Cumberland Plateau and the Interior Low Plateau, and north into the Central Appalachians and Allegheny Mountains. 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 *Verbena hastata*, *Doellingeria umbellata* (= *Aster umbellatus*), *Dichanthelium clandestinum*, *Solidago rugosa ssp. aspera*, *Juncus effusus*, *Scirpus expansus*, *Scirpus cyperinus*, *Equisetum arvense*, *Onoclea sensibilis*, *Vernonia noveboracensis*, *Lycopus virginicus*, *Scutellaria lateriflora*, *Lobelia cardinalis*, *Symphotrichum dumosum* (= *Aster dumosus*), *Lycopus virginicus*, *Osmunda regalis*, *Hypericum mutilum*, *Eupatorium fistulosum*, *Solidago patula*, and *Salix sericea*.

**Environment:** This association occupies boulder and gravel bars on the frequently flooded, active channel shelves of high-gradient rivers and large streams. Along Laurel Fork, 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. 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.

**Vegetation:** Vegetation is characterized by light-demanding, tough-rooted herbaceous perennials tolerant of frequent inundation and flood-scouring. *Carex torta* is the dominant species and typically forms dense, extensive colonies. Associated species vary with geography but can include *Verbena hastata*, *Doellingeria umbellata* (= *Aster umbellatus*), *Dichanthelium clandestinum*, *Solidago rugosa ssp. aspera*, *Juncus effusus var. solutus*, *Scirpus expansus*, *Scirpus cyperinus*, *Equisetum arvense*, *Onoclea sensibilis*, *Vernonia noveboracensis*, *Lycopus virginicus*, *Scutellaria lateriflora*, *Lobelia cardinalis*, *Symphotrichum dumosum* (= *Aster dumosus*), *Osmunda regalis var. spectabilis*, *Eupatorium fistulosum*, *Solidago patula*, and *Hypericum mutilum*. Small specimens of *Salix sericea* and other woody plants are also frequent.

**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.

**Similar Associations:** No information

**Synonymy:**

- Torturous sedge gravel rivershore (CAP 1998)
- IIE3a. Riverside Shoal and Stream Bar Complex (Allard 1990) B. in part
- Rocky Bar And Shore (Twisted Sedge Subtype) (Schafale pers. comm.)
- *Carex torta* Association (Fleming and Moorhead 1996)
- *Carex torta* Herbaceous Vegetation (Fleming and Coulling 2001)

**Comments:** None

**CONSERVATION RANKING & RARE SPECIES**

**GRank:** G3G4 (00-01-21): This community is found as linear occurrences along waterways in the Southern Appalachians, west into the Cumberland Plateau and the Interior Low Plateau, and north into the Central Appalachians and Allegheny Mountains. 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.

**High-ranked species:** No information

### ELEMENT DISTRIBUTION

**Range:** This community is found as linear occurrences along waterways in the Southern Appalachians, west into the Cumberland Plateau and the Interior Low Plateau, and north into the Central Appalachians and Allegheny Mountains.

**States:** AL GA KY NC SC TN VA WV

#### Crosswalk to State Classifications:

- NC: Rocky Bar and Shore, in part; Sand and Mud Bar, in part (NC 1990)
- SC: No equivalent (SC 1986)
- TN: No equivalent (TN 1994)
- VA: Rocky Bar and Shore, in part (VA 2001)

**TNC Ecoregions:** 44:C, 50:C, 51:C, 58:C, 59:C

**USFS Ecoregions:** 221Ba:CCC, 221Ha:CC?, 221Hb:CCC, 221Hc:CCC, 221He:CCC, 222Eg:CCC, 222En:CCC, 222Eo:CCC, 231Cd:CCC, M221Aa:CCC, M221Ab:CCC, M221Ac:CCC, M221Ad:CCP, M221Ba:CCC, M221Bb:CCC, M221Bd:CCC, M221Be:CCC, M221Cd:CCP, M221Dc:CCC, M221Dd:CCC

**Federal Lands:** NPS (Great Smoky Mountains); USFS (Bankhead, Chattahoochee, Cherokee, Daniel Boone, George Washington, Jefferson, Nantahala, Pisgah, Sumter)

### ELEMENT SOURCES

**References:** Allard 1990, CAP 1998, Fleming and Coulling 2001, Fleming and Moorhead 1996, Fleming et al. 2001, Hupp 1982, NatureServe Ecology - Southeast U.S. unpubl. data, Palmer-Ball et al. 1988, Schafale and Weakley 1990, Schafale pers. comm.

**WATER-WILLOW ROCKY BAR AND SHORE****ELEMENT IDENTIFIERS**

**NVCS association:** *Justicia americana* Herbaceous Vegetation

**Database Code:** CEG004286

**Formation:** Temporarily flooded temperate perennial forb vegetation

**Alliance:** JUSTICIA AMERICANA TEMPORARILY FLOODED HERBACEOUS ALLIANCE (V.B.2.N.d.2)

**ELEMENT CONCEPT**

**Summary:** This association is found primarily in the Piedmont, Cumberland Plateau, Interior Low Plateau, Ozarks, Ouachita Mountains, and adjacent provinces. Stands occur on the shoals or bars of rocky streams and riverbeds. It provides habitat in some portions of its range for globally rare dragonflies and herbs. *Justicia americana* is the characteristic dominant. Other herbaceous species that may be present include *Diodia teres*, *Gratiola brevifolia*, *Leersia* sp., *Lemna minor*, *Orontium aquaticum*, *Podostemum ceratophyllum*, *Scirpus* sp., *Saururus cernuus*, and *Xyris difformis* var. *difformis*. A sparse canopy layer, which can include *Carpinus caroliniana* ssp. *caroliniana*, *Salix interior*, *Fagus grandifolia*, and *Fraxinus pennsylvanica* among other species, may be present.

**Environment:** This association occurs on the shoals or bars of rocky streams and riverbeds, or gravelly sands.

**Vegetation:** *Justicia americana* is the characteristic dominant. Other herbaceous species that may be present include *Diodia teres*, *Gratiola brevifolia*, *Leersia* sp., *Lemna minor*, *Orontium aquaticum*, *Podostemum ceratophyllum*, *Saururus cernuus*, and *Xyris difformis* var. *difformis*. In Ohio, *Justicia* usually grows in nearly pure patches, so that few other species are associated with it. *Bidens* spp., *Cuscuta gronovii*, *Mimulus ringens*, *Polygonum* spp., *Rumex* spp., and *Salix interior* can occur (Anderson 1982). A sparse canopy layer may be present, which can include *Carpinus caroliniana*, *Fagus grandifolia*, and *Fraxinus pennsylvanica*, among others. In the Cumberland Plateau of Alabama, *Justicia americana* is present in dense patches with some interspersions of other species including *Pilea pumila*, *Boehmeria cylindrica*, *Eclipta prostrata* (= *Eclipta alba*), *Juncus coriaceous*, *Mikania scandens*, *Ludwigia palustris*, *Leersia* sp. and *Bidens* sp. Schmalzer and DeSelm (1982) discuss *Orontium aquaticum* growing along streambanks or in shallow riffles "along or with" *Justicia americana* in the Obed River in the Cumberland Plateau of Tennessee.

**Dynamics:** Stands in some situations may be obliterated by ongoing river channeling. Anderson (1982) describes some of the life-history characteristics of *Justicia americana* that allow it to persist in river channels.

**Similar Associations:** No information

**Synonymy:**

- IIE3a. Riverside Shoal and Stream Bar Complex (Allard 1990) B. in part
- Aquatic Types (Schmalzer and DeSelm 1982) B. in part
- Water-willow Aquatic Bed. [common name]

**Comments:** This type, in Ohio, often forms pure patches, but consistent identification may require a simple cutoff rule, such as at least 50% cover of *Justicia* (Anderson 1982). However, Anderson (1996) no longer recognizes this type.

**CONSERVATION RANKING & RARE SPECIES**

**GRank:** G4G5 (97-09-12):

**High-ranked species:** No information

**ELEMENT DISTRIBUTION**

**Range:** This type is found primarily in the Piedmont, Interior Low Plateau, Cumberland Plateau, Ozarks, Ouachita Mountains, and adjacent provinces. It ranges from Alabama, Georgia and the Carolinas west to Arkansas and Oklahoma and north to Ohio, Pennsylvania, and Delaware.

**States:** AL AR DE GA KY MD? NC OH OK PA SC? TN VA? WV

**Crosswalk to State Classifications:**

- NC: Rocky Bar and Shore, in part (NC 1990)
- OH: water-willow riverine community
- OK: *Justicia americana* herbaceous association (OK 2000)
- SC?: Shoal & Stream Bar, in part (SC 1986)
- VA?: No equivalent (VA 2001)

**TNC Ecoregions:** 38:C, 39:C, 43:C, 44:C, 45:C, 48:C, 49:C, 50:C, 51:C, 52:C, 59:C, 61:C

**USFS Ecoregions:** 221Ec:CCC, 221Ed:CCP, 221Ef:CCP, 221Ha:CCC, 221Hb:CCC, 221Hc:CCC, 221He:CCC, 222Eb:CCC, 222Ej:CCP, 222En:CCC, 222Eo:CCC, 222Ha:CCC, 231Af:CCC, 231B:CC, 231Cd:CCC, 231D:CC, M221Aa:CCC, M221Ac:CCC, M221Ad:CCC, M221Bb:CCC, M221Bd:CCC, M221Be:CCC, M221Bf:CCC, M221Cd:CCC, M221Da:CCC, M221Dc:CCC, M222A:CC, M231A:CC

## Association Descriptions

**Federal Lands:** NPS (Natchez Trace, Stones River); USFS (Bankhead, Cherokee, Daniel Boone, Oconee?, Ouachita, Ozark, Pisgah, Sumter?, Uwharrie)

### ELEMENT SOURCES

**References:** Allard 1990, Anderson 1982, Anderson 1996, Fleming et al. 2001, Hoagland 1997, Hoagland 2000, Major et al. 1999, McCoy 1958, Nelson 1986, Palmer-Ball et al. 1988, Penfound 1953, Schafale and Weakley 1990, Schmalzer and DeSelm 1982

**JAPANESE KNOTWEED GRAVELBAR**

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**ELEMENT IDENTIFIERS****NVCS association:** *Polygonum cuspidatum* Temporarily Flooded Herbaceous Vegetation**Database Code:** CEG008472**Formation:** Temporarily flooded temperate perennial forb vegetation**Alliance:** POLYGONUM CUSPIDATUM TEMPORARILY FLOODED HERBACEOUS ALLIANCE (V.B.2.N.d.100)**ELEMENT CONCEPT****Summary:** Examples of this vegetation type are significant (monocultural) stands of the exotic forb *Polygonum cuspidatum*, which are found in temporarily flooded habitats such as scour bars. These disturbed habitats flood very frequently and have lots of light and rocky or sandy soil. Stands of this vegetation may be dense and shrubby, or somewhat more open. Species diversity is low, as the patches of *Polygonum* shade out other plant species. In North Carolina, this vegetation is found on scour bars and low rocky banks of the Nolichucky and French Broad rivers. In Kentucky, *Polygonum cuspidatum* is primarily along disturbed riverbanks and bars mostly in the Cumberland Plateau and Mountains where it can be in pure, dense stands.**Environment:** Stands of this type are found in temporarily flooded habitats such as scour bars. These disturbed areas flood very frequently and have lots of light and rocky or sandy soil. In North Carolina, it is found on scour bars and low rocky banks of the Nolichucky and French Broad rivers (B. Brown pers. comm. 2001). In Kentucky, *Polygonum cuspidatum* is primarily along disturbed riverbanks and bars mostly in the Cumberland Plateau and Mountains where it can be in pure, dense stands (M. Evans pers. comm. 2001).**Vegetation:** These are primarily monospecific stands of *Polygonum cuspidatum* with few other plant species. Some disturbance-oriented annual forbs may be present, along with seedlings of some woody plants (e.g., *Platanus occidentalis*, *Salix nigra*).**Dynamics:** Stands of this vegetation may be dense and shrubby, or more open. The patches of *Polygonum* shade out other plant species.**Similar Associations:** No information**Synonymy:** No information**Comments:** This species has also been treated as *Reynoutria japonica*.**CONSERVATION RANKING & RARE SPECIES****GRank:** GW (01-05-31): This vegetation is composed of and dominated by a species which is not native to North America.**High-ranked species:** No information**ELEMENT DISTRIBUTION****Range:** This vegetation is potentially found anywhere in the southeastern United States where the exotic rhizomatous forb *Polygonum cuspidatum* has formed significant (monocultural) stands. This includes at least Alabama, Georgia, Kentucky, Maryland, North Carolina, South Carolina, Tennessee, and Virginia.**States:** AL GA KY NC SC TN VA**Crosswalk to State Classifications:**

- VA: No equivalent (VA 2001)

**TNC Ecoregions:** 42:P, 43:P, 44:P, 50:C, 51:C, 52:P, 56:P, 57:P**USFS Ecoregions:** 221:C, M221:C**Federal Lands:** USFS (Cherokee?, Daniel Boone)**ELEMENT SOURCES****References:** Brown, B., pers. comm., Evans, M., pers. comm., Schafale pers. comm.

**BLACK WILLOW - SYCAMORE MONTANE BOTTOMLAND FOREST**

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**ELEMENT IDENTIFIERS****NVCS association:** *Salix nigra* - *Platanus occidentalis* Forest**Database Code:** C EGL004626**Formation:** Temporarily flooded cold-deciduous forest**Alliance:** SALIX NIGRA TEMPORARILY FLOODED FOREST ALLIANCE (I.B.2.N.d.22)**ELEMENT CONCEPT****Summary:** This low slope or bottom forest of the Tennessee Blue Ridge/Ridge and Valley transition zone is dominated by *Salix nigra*. Other common canopy species include *Platanus occidentalis*, *Liriodendron tulipifera*, and *Pinus virginiana*. This early successional forest occurs at the mouth of perennial drainages that flow into Tellico Lake, Tennessee.**Environment:** This early successional forest occurs at the mouth of perennial drainages that flow into Tellico Lake (Andreu and Tukman 1995), in the Tennessee Blue Ridge/Ridge and Valley transition zone (221Jb). It is possible in related areas of the Interior Low Plateau and southern Appalachians. These areas are subject to altered hydrology due to lake construction (M. Pyne pers. obs.).**Vegetation:** The canopies of stands of this low slope or bottom forest are dominated by *Salix nigra*. Other common canopy species include *Platanus occidentalis*, *Liriodendron tulipifera*, and *Pinus virginiana*.**Dynamics:** This is often an early-successional community, but its regeneration and survival depend on natural flooding and hydrologic regimes being maintained. These areas are subject to altered hydrology due to lake construction (M. Pyne pers. obs.).**Similar Associations:**

- *Salix nigra* Forest (CEGL002103)--of more general concept and distribution.
- *Salix nigra* Large River Floodplain Forest (CEGL007410)--of larger rivers (e.g., Mississippi).

**Synonymy:**

- IIA7a. Black Willow Riverfront Forest (Allard 1990)

**Comments:** Originally described from Tellico Pilot Project (Ridge and Valley of Tennessee, northeastern Monroe County; 12 stands sampled), where this early successional forest occurs at the mouth of perennial drainages that flow into Tellico Lake (Andreu and Tukman 1995), in the Tennessee Blue Ridge/Ridge and Valley transition zone (221Jb). Formerly attributed to the Mississippi River Alluvial Plain, on riverfronts, in Kentucky; see instead *Salix nigra* Large River Floodplain Forest (CEGL007410). This association may actually belong in a "small stream forest alliance."**CONSERVATION RANKING & RARE SPECIES****GRank:** G5 (97-06-23): This is often an early-successional community, but its regeneration and survival depend on natural flooding and hydrologic regimes being maintained.**High-ranked species:** No information**ELEMENT DISTRIBUTION****Range:** Described from the Ridge and Valley of Tennessee; likely in the adjacent Cumberlands, possible in the Interior Low Plateau and southern Appalachians.**States:** KY TN**Crosswalk to State Classifications:**

- TN: Black Willow, RV? (TN 1994)

**TNC Ecoregions:** 44:?, 50:C, 51:?**USFS Ecoregions:** 221Jb:CCC, 222E:CP, 231D:PP, M221D:??**Federal Lands:** TVA (Tellico); USFS (Cherokee?)**ELEMENT SOURCES****References:** Allard 1990, Andreu and Tukman 1995, Pyne 1994



## RUSH MARSH

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### ELEMENT IDENTIFIERS

**NVCS association:** *Juncus effusus* Seasonally Flooded Herbaceous Vegetation

**Database Code:** CEG004112

**Formation:** Seasonally flooded temperate or subpolar grassland

**Alliance:** JUNCUS EFFUSUS SEASONALLY FLOODED HERBACEOUS ALLIANCE (V.A.5.N.k.14)

### ELEMENT CONCEPT

**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.

**Environment:** This is a seasonally (to temporarily) flooded marsh vegetation type; it may occur in natural or artificial ponds, including beaver-enhanced ones.

**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*, *Cyperus* spp., *Typha latifolia*, *Scirpus cyperinus*, *Triadenum walteri*, *Apios americana*, and *Galium aparine*. In Georgia, Wharton (1978) cites *Carex rostrata*, *Carex stipata*, *Schoenoplectus pungens* (as *Scirpus americanus*), and *Sagittaria latifolia* as associates of beaver pond vegetation containing *Juncus effusus*.

**Dynamics:** See Summary

**Similar Associations:** No information

#### Synonymy:

- IID6a. Natural Impoundment Pond (Allard 1990) B. in part
- Beaver Dam Type (Wharton 1978)

**Comments:** Though this association was not seen at the Bankhead National Forest, it is expected to occur there.

### CONSERVATION RANKING & RARE SPECIES

**GRank:** G5 (01-03-28): This is a broadly defined, widely distributed, and reasonably secure vegetation type.

**High-ranked species:** No information

### ELEMENT DISTRIBUTION

**Range:** The range of this broadly defined association has not been fully described. It is confirmed as occurring in 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.

**States:** AL AR FL GA KY LA MS NC OK SC TN TX VA

#### Crosswalk to State Classifications:

- OK: *Juncus effusus* herbaceous association (OK 2000)
- VA: Coastal Plain Semipermanent Impoundment, in part; Piedmont / Mountain Semipermanent Impoundment, in part (VA 2001)

**TNC Ecoregions:** 43:C, 44:C, 50:P, 51:C, 52:P, 53:P, 56:P, 57:P, 58:P, 59:C

**USFS Ecoregions:** 222Eb:CCC, 231Ca:CPP, 231Cd:CPP, 231Db:CCC, M221Ab:CCC, M221Dc:CCC, M221Dd:CCC

**Federal Lands:** DOD (Arnold, Fort Benning); NPS (Carl Sandburg Home, Great Smoky Mountains); USFS (Bankhead, Cherokee?, Oconee?, Talladega)

### ELEMENT SOURCES

**References:** Allard 1990, Fleming et al. 2001, Hoagland 1998c, Hoagland 2000, TNC 1998a, Wharton 1978

**SWAMP FOREST-BOG COMPLEX (TYPIC TYPE)****ELEMENT IDENTIFIERS**

**NVCS association:** *Tsuga canadensis* - *Acer rubrum* - (*Liriodendron tulipifera*, *Nyssa sylvatica*) / *Rhododendron maximum* / *Sphagnum* spp. Forest

**Database Code:** CEG007565

**Formation:** Saturated mixed needle-leaved evergreen - cold-deciduous forest

**Alliance:** TSUGA CANADENSIS - ACER RUBRUM SATURATED FOREST ALLIANCE (I.C.3.N.d.7)

**ELEMENT CONCEPT**

**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* (= *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 the forested areas include *Glyceria melicaria*, *Lycopodium obscurum*, *Onoclea sensibilis*, *Maianthemum canadense*, *Thelypteris noveboracensis*, and *Osmunda regalis* var. *spectabilis*.

**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:** 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 sphagnum 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).

**Dynamics:** See Summary

**Similar Associations:** No information

**Synonymy:**

- IIE1a. Southern Appalachian Bog Complex (Allard 1990) B. in part
- Eastern hemlock-red maple-great laurel swamp (CAP 1998)

## Association Descriptions

- *Acer rubrum* - *Betula alleghaniensis* / *Rhododendron maximum* / *Osmunda cinnamomea* - *Carex trisperma* Forest (Fleming and Coulling 2001)

**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. It is also anthropogenically rare, because of its location in accessible, low elevation sites, sites 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 lack *Leucothoe fontanesiana* and *Sarracenia purpurea*. There may be a need to define a similar community that occurs over 4000 feet elevation, dominated by *Betula alleghaniensis*. This high-elevation version has been documented in the Great Smoky Mountains National Park and may range into the Blue Ridge of Virginia, but no association has been defined (SCS 2/99).

### CONSERVATION RANKING & RARE SPECIES

**GRank:** G2 (98-12-14): 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 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.

**High-ranked species:** CHELONE CUTHBERTII (G3), HELONIAS BULLATA (G3)

### ELEMENT DISTRIBUTION

**Range:** This community is found in the Blue Ridge and Ridge and Valley from Pennsylvania south to Georgia, ranging west into the Cumberland Mountains and Cumberland Plateau of Kentucky.

**States:** GA KY NC PA SC TN VA

#### Crosswalk to State Classifications:

- KY: Appalachian Acid Seep, in part (KY 1991)
- NC: Swamp Forest-Bog Complex, in part (NC 1990)
- PA: Hemlock-mixed hardwoods palustrine forest
- VA: High-Elevation Seepage Swamp, in part (VA 2001)

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

**USFS Ecoregions:** M221Aa:CCC, M221Ac:CCC, M221Bb:CCP, M221Bf:CCC, M221Cc:CCC, M221Da:CCP, M221Db:CCC, M221Dc:CCC, M221Dd:CCC

**Federal Lands:** NPS (Cumberland Gap); USFS (Chattahoochee, Cherokee, Daniel Boone?, Jefferson, Nantahala, Pisgah)

### ELEMENT SOURCES

**References:** Allard 1990, CAP 1998, Evans 1991, Fleming and Coulling 2001, Fleming et al. 2001, Schafale and Weakley 1990

CUMBERLAND FORESTED ACID SEEP

ELEMENT IDENTIFIERS

**NVCS association:** *Acer rubrum* var. *trilobum* - *Nyssa sylvatica* / *Osmunda cinnamomea* - *Chasmanthium laxum* - *Carex intumescens* / *Sphagnum lescurii* Forest

**Database Code:** C EGL007443

**Formation:** Saturated cold-deciduous forest

**Alliance:** ACER RUBRUM - NYSSA SYLVATICA SATURATED FOREST ALLIANCE (I.B.2.N.g.2)

ELEMENT CONCEPT

**Summary:** Forested acid seeps occurring in the Cumberland Plateau of Alabama, Tennessee and Kentucky, the Ridge and Valley, and lower elevation areas of the western portions of the Southern Blue Ridge. Canopy coverage can be moderately dense to quite open. Canopy composition is highly variable, but *Acer rubrum* var. *trilobum*, *Nyssa sylvatica*, *Liriodendron tulipifera*, and *Liquidambar styraciflua* are common. Subcanopy trees can include *Ilex opaca* var. *opaca*, *Carpinus caroliniana*, and (within range) *Magnolia macrophylla*. Tall shrubs are scattered and may be locally dominant. Typical shrubs include *Ilex verticillata*, *Alnus serrulata*, *Rhododendron maximum*, *Photinia melanocarpa* (= *Aronia melanocarpa*), *Vaccinium simulatum*, *Viburnum nudum* var. *nudum*, and *Cornus foemina*. In examples from the Southern Blue Ridge, *Viburnum nudum* var. *cassinoides* will replace var. *nudum* in this type. Woody vines can be common, and include *Toxicodendron radicans* and (especially towards the southern part of the association's distribution), *Decumaria barbara* and *Bignonia capreolata*. Typical herbaceous species include *Osmunda cinnamomea*, *Osmunda regalis* var. *spectabilis*, *Chasmanthium laxum*, *Thelypteris noveboracensis*, *Woodwardia areolata*, *Oxypolis rigidior*, *Carex intumescens*, *Carex debilis*, *Carex crinita*, *Medeola virginiana*, *Lobelia cardinalis*, *Oxypolis rigidior*, *Juncus effusus* var. *pylaei*, *Scirpus polyphyllus*, *Rubus hispidus*, *Solidago patula* var. *patula*, *Athyrium filix-femina* ssp. *asplenioides*, and *Viola X primulifolia*. *Platanthera integrilabia* and *Platanthera clavellata* are also known from these forested seeps but are more typical in the more open woodland seeps [see *Acer rubrum* Saturated Woodland Alliance (A.657)]. Patches of *Sphagnum* spp. are common and *Sphagnum lescurii* is typical. These forests are found primarily in streamhead swales on broad ridges on sandy, saturated soils derived from shales and sandstones. This community develops where a perched water table is present, as opposed to seepage from the base of a slope [for vegetation related to this latter condition, see *Acer rubrum* var. *trilobum* - *Nyssa sylvatica* / *Rhododendron canescens* - *Viburnum nudum* var. *nudum* / *Woodwardia areolata* Forest (CEGL004425)]. In the Daniel Boone National Forest (Kentucky), some stands can contain *Tsuga canadensis*, and be transitional to *Tsuga canadensis* - *Acer rubrum* - (*Liriodendron tulipifera*, *Nyssa sylvatica*) / *Rhododendron maximum* / *Sphagnum* spp. Forest (CEGL007565).

**Environment:** These forests are found primarily in streamhead swales on broad ridges on sandy, saturated soils derived from shales and sandstones. This community develops where a perched water table is present, as opposed to seepage from the base of a slope.

**Vegetation:** Canopy coverage can be moderately dense to quite open. Canopy composition is highly variable, but *Acer rubrum* var. *trilobum*, *Nyssa sylvatica*, *Liriodendron tulipifera*, and *Liquidambar styraciflua* are common. Subcanopy trees can include *Ilex opaca* var. *opaca*, *Carpinus caroliniana*, and (within range) *Magnolia macrophylla*. Tall shrubs are scattered and may be locally dominant. Typical shrubs include *Ilex verticillata*, *Alnus serrulata*, *Rhododendron maximum*, *Photinia melanocarpa* (= *Aronia melanocarpa*), *Photinia pyrifolia* (= *Aronia arbutifolia*), *Vaccinium simulatum*, *Viburnum nudum* var. *nudum*, *Arundinaria gigantea*, and *Cornus foemina*. In examples from the Southern Blue Ridge, *Viburnum nudum* var. *cassinoides* will replace var. *nudum* in this type. Woody vines can be common, and include *Toxicodendron radicans* and (especially towards the southern part of the association's distribution), *Decumaria barbara* and *Bignonia capreolata*. Typical herbaceous species include *Osmunda cinnamomea*, *Osmunda regalis* var. *spectabilis*, *Chasmanthium laxum*, *Thelypteris noveboracensis*, *Woodwardia areolata*, *Woodwardia virginica*, *Oxypolis rigidior*, *Carex intumescens*, *Carex debilis*, *Carex crinita*, *Medeola virginiana*, *Lobelia cardinalis*, *Oxypolis rigidior*, *Juncus effusus* var. *pylaei*, *Scirpus polyphyllus*, *Rubus hispidus*, *Solidago patula* var. *patula*, *Lycopus uniflorus*, *Athyrium filix-femina* ssp. *asplenioides*, and *Viola X primulifolia*. *Platanthera integrilabia* and *Platanthera clavellata* are also known from these forested seeps but are more typical in the more open woodland seeps [see *Acer rubrum* Saturated Woodland Alliance (A.657)]. Patches of *Sphagnum* spp. are common and *Sphagnum lescurii* is typical. These forests are found primarily in streamhead swales on broad ridges on sandy, saturated soils derived from shales and sandstones. This community develops where a perched water table is present, as opposed to seepage from the base of a slope [for vegetation related to this latter condition, see *Acer rubrum* var. *trilobum* - *Nyssa sylvatica* / *Rhododendron canescens* - *Viburnum nudum* var. *nudum* / *Woodwardia areolata* Forest (CEGL004425)]. In the Daniel Boone National Forest (Kentucky), some stands can contain *Tsuga canadensis*, and be transitional to *Tsuga canadensis* - *Acer rubrum* - (*Liriodendron tulipifera*, *Nyssa sylvatica*) / *Rhododendron maximum* / *Sphagnum* spp. Forest (CEGL007565).

**Dynamics:** See Summary

**Similar Associations:**

- *Acer rubrum* var. *trilobum* - *Nyssa sylvatica* / *Rhododendron canescens* - *Viburnum nudum* var. *nudum* / *Woodwardia areolata* Forest (CEGL004425)--is related to seepage at the base of a slope.
- *Acer rubrum* var. *trilobum* / *Alnus serrulata* / *Calamagrostis coarctata* Saturated Woodland (CEGL003737)--is more open and on coarser substrates.

**Synonymy:**

- IIA9a. Forested Mountain Seep (Allard 1990) B. in part

**Comments:** Examples are known from the Somerset and Stearns ranger districts of the Daniel Boone National Forest, in the Appalachian Plateaus, Cliff section of Kentucky. Similar seeps are known from western Kentucky, at the edge of the Shawnee Hills; they are included here for now. Related vegetation from the Cretaceous Gravel Hills of the Mississippi Embayment, which occurs at the bases of slopes rather than in streamheads on broad ridges, is accommodated in *Acer rubrum* var. *trilobum* - *Nyssa sylvatica* / *Rhododendron canescens* - *Viburnum nudum* var. *nudum* / *Woodwardia areolata* Forest (CEGL004425). This association is known from Tennessee in the southwestern portion of the southern Blue Ridge. A similar woodland community is *Acer rubrum* var. *trilobum* / *Alnus serrulata* / *Calamagrostis coarctata* Saturated Woodland (CEGL003737). In general, stands of this association (CEGL007443) have greater canopy cover and thereby denser shade, as well as being in a finer-textured, mucky substrate - in contrast to the more open canopy and coarser-textured, sandier substrate of CEGL003737.

**CONSERVATION RANKING & RARE SPECIES**

**GRank:** G3? (97-12-01):

**High-ranked species:** PLATANThERA INTEGRa (G3G4), PLATANThERA INTEGRILABIA (G2G3), HEXASTYLIS SHUTTLEWORTHII VAR HARPERI (G4T3), CYPRIPEDIUM KENTUCKIENSE (G3)

**ELEMENT DISTRIBUTION**

**Range:** This community is known from the Cumberland Plateau, Ridge and Valley, and western (low elevation) Blue Ridge of Tennessee, Kentucky, Georgia and Alabama.

**States:** AL GA KY TN

**Crosswalk to State Classifications:**

- KY: Appalachian Acid Seep, in part (KY 1991)

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

**USFS Ecoregions:** 221Hc:CCC, 221He:CCC, 222Eo:CCC, 222G:CC, 231Ca:CCC, 231Cd:CCC, 231Db:CCC, 231Dc:CCC, 231De:CCC, M221Dd:CCC

**Federal Lands:** NPS (Big South Fork); USFS (Bankhead, Chattahoochee, Cherokee, Daniel Boone); USFWS (Mountain Longleaf)

**ELEMENT SOURCES**

**References:** Allard 1990, Evans 1991, NatureServe Ecology - Southeast U.S. unpubl. data

## NORTHERN WHITE-CEDAR FEN

## ELEMENT IDENTIFIERS

**NVCS association:** *Thuja occidentalis* Limestone Seepage Woodland

**Database Code:** C EGL003675

**Formation:** Saturated temperate or subpolar needle-leaved evergreen woodland

**Alliance:** THUJA OCCIDENTALIS SATURATED WOODLAND ALLIANCE (II.A.4.N.f.11)

## ELEMENT CONCEPT

**Summary:** These are *Thuja occidentalis* woodlands on cliffs, associated with seepage over limestone or dolomite. Stands are dominated by *Thuja occidentalis*. Associated species may include *Cypripedium reginae*, *Maianthemum stellatum*, and *Spiranthes lucida*.

**Environment:** See Summary

**Vegetation:** Stands are dominated by *Thuja occidentalis*. Associated species may include *Cypripedium reginae*, *Maianthemum stellatum*, and *Spiranthes lucida*.

**Dynamics:** See Summary

**Similar Associations:** No information

**Synonymy:**

- Northern white cedar wooded swamps (CAP 1998)

**Comments:** The placement of this vegetation in the *Thuja occidentalis* Saturated Woodland Alliance (A.583) is problematic. They may be better treated as seepage inclusions in I.A.8.N.c *Thuja occidentalis* Forest Alliance (A.142) or II.A.4.N.b *Thuja occidentalis* Woodland Alliance (A.544).

## CONSERVATION RANKING &amp; RARE SPECIES

**GRank:** G? (97-12-01):

**High-ranked species:** No information

## ELEMENT DISTRIBUTION

**Range:**

**States:** TN

**Crosswalk to State Classifications:** Not yet cross-referenced to state classifications

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

**USFS Ecoregions:** 221Ja:CCC, M221Dd:CCC

**Federal Lands:** USFS (Cherokee)

## ELEMENT SOURCES

**References:** CAP 1998

**SOUTHERN APPALACHIAN SHRUB BOG (TYPIC TYPE)**

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**ELEMENT IDENTIFIERS**

**NVCS association:** *Alnus serrulata* - *Kalmia carolina* - *Rhododendron catawbiense* - *Spiraea alba* / *Carex folliculata* - *Lilium grayi* Shrubland

**Database Code:** CEG003915

**Formation:** Saturated mixed evergreen - cold-deciduous shrubland

**Alliance:** ALNUS SERRULATA - SALIX SERICEA - RHODODENDRON (CATAWBIENSE, MAXIMUM) SATURATED SHRUBLAND ALLIANCE (III.C.2.N.e.100)

**ELEMENT CONCEPT**

**Summary:** This wetland community is dominated by shrubs, occurring over graminoids, forbs, and *Sphagnum* spp. It has a strong component of species of northern phyto geography occurring in combination with species endemic to the southern Appalachians, and in association with felsic gneisses or schists and acidic, nutrient-poor seepage. Shrub cover ranges from 25-100%, and trees may be scattered throughout or dominate in patches or on the edges. *Ilex verticillata*, *Salix sericea*, *Spiraea alba*, and *Spiraea tomentosa* are often dominant, occurring with *Alnus serrulata*, *Rosa palustris*, *Photinia pyrifolia* (= *Aronia arbutifolia*), *Photinia melanocarpa* (= *Aronia melanocarpa*), *Rhododendron maximum*, *Rhododendron viscosum*, *Rhododendron catawbiense*, *Kalmia latifolia*, *Kalmia carolina*, *Hypericum densiflorum*, *Lyonia ligustrina* var. *ligustrina*, and *Menziesia pilosa*. Typical tree species are *Pinus strobus*, *Tsuga canadensis*, *Pinus rigida*, and *Picea rubens*. Herbaceous cover may be sparse to dense and typically includes *Carex atlantica*, *Carex intumescens*, *Carex folliculata*, *Schoenoplectus* spp. (= *Scirpus* spp.), and *Osmunda cinnamomea*. *Sphagnum* spp. include *Sphagnum palustre*, *Sphagnum affine* (= *Sphagnum imbricatum*), *Sphagnum bartlettianum*, *Sphagnum recurvum*, and, rarely, northern disjuncts such as *Sphagnum fallax*. Other characteristic species include *Poa paludigena*, *Lilium grayi*, *Platanthera grandiflora*, *Melanthium virginicum*, *Stenanthium gramineum* var. *robustum*, *Arethusa bulbosa*, *Calopogon tuberosus*, *Chelone cuthbertii*, *Thelypteris simulata*, *Carex trisperma*, *Rhizomnium appalachianum*, *Polytrichum commune*, *Aulacomnium palustre*, and *Bazzania trilobata*. This community can occur on flat areas in valley bottoms, on portions where wet conditions are maintained hydrologically by rainwater and a high water table rather than by flooding, or in the upper portions of stream watersheds, on slight slopes, hydrologically maintained by very nutrient-poor to fairly nutrient-rich seepage. This community occurs at elevations from 900-1250 m (3000-4200 feet) in the northern part of its range and, in the southern part of the range, at elevations from 1000-1800 m (3300-5800 feet).

**Environment:** This community can occur on flat areas in valley bottoms, on portions where wet conditions are maintained hydrologically by rainwater and a high water table rather than by flooding, or in the upper portions of stream watersheds, on slight slopes, hydrologically maintained by very nutrient-poor to fairly nutrient-rich seepage. This community occurs at elevations from 900-1250 m (3000-4200 feet) in the northern part of its range and, in the southern part of the range, at elevations from 1000-1800 m (3300-5800 feet). These occurrences are in association with felsic gneisses or schists and acidic, nutrient-poor seepage.

**Vegetation:** Shrub cover in stands of this association range from 25-100%, and trees may be scattered throughout or dominate in patches or on the edges. *Ilex verticillata*, *Salix sericea*, *Spiraea alba*, and *Spiraea tomentosa* are often dominant, occurring with *Alnus serrulata*, *Rosa palustris*, *Photinia pyrifolia* (= *Aronia arbutifolia*), *Photinia melanocarpa* (= *Aronia melanocarpa*), *Rhododendron maximum*, *Rhododendron viscosum*, *Rhododendron catawbiense*, *Kalmia latifolia*, *Kalmia carolina*, *Hypericum densiflorum*, *Lyonia ligustrina* var. *ligustrina*, and *Menziesia pilosa*. Typical tree species are *Pinus strobus*, *Tsuga canadensis*, *Pinus rigida*, and *Picea rubens*. Herbaceous cover may be sparse to dense and typically includes *Carex atlantica*, *Carex intumescens*, *Carex folliculata*, *Schoenoplectus* spp. (= *Scirpus* spp.), and *Osmunda cinnamomea*. *Sphagnum* spp. include *Sphagnum palustre*, *Sphagnum affine* (= *Sphagnum imbricatum*), *Sphagnum bartlettianum*, *Sphagnum recurvum*, and, rarely, northern disjuncts such as *Sphagnum fallax*. Other characteristic species include *Poa paludigena*, *Lilium grayi*, *Platanthera grandiflora*, *Melanthium virginicum*, *Stenanthium gramineum* var. *robustum*, *Arethusa bulbosa*, *Calopogon tuberosus*, *Chelone cuthbertii*, *Thelypteris simulata*, *Carex trisperma*, *Rhizomnium appalachianum*, *Polytrichum commune*, *Aulacomnium palustre*, and *Bazzania trilobata*.

**Dynamics:** See Summary

**Similar Associations:** No information

**Synonymy:**

- IIE1b. Southern Appalachian Bog Complex (Allard 1990) B. in part
- Southern Appalachian Bog, Typic Variant (Weakley and Schafale 1994) B. in part

**Comments:** This community may dominate a site or occur as a complex with *Carex atlantica* - *Solidago patula* var. *patula* - *Lilium grayi* / *Sphagnum bartlettianum* Herbaceous Vegetation (CEGL004158). It is typically surrounded by forests dominated by *Picea rubens*, *Fagus grandifolia*, *Betula alleghaniensis*, *Quercus rubra*, *Tsuga canadensis*, and/or *Liriodendron tulipifera* with dense *Rhododendron maximum* understories.

**CONSERVATION RANKING & RARE SPECIES**

**GRank:** G1G2 (98-04-30): This community is known from western North Carolina and southwestern Virginia on felsic metamorphic rocks, in the Southern Blue Ridge. Few sites remain, probably less than 500 acres in total, and nearly all of that hydrologically modified to one degree or another. Remaining occurrences of this community have been degraded or are threatened by grazing, agricultural runoff, and construction activities.

**High-ranked species:** CAREX BROMOIDES SSP MONTANA (G5T3?), CHELONE CUTHBERTII (G3), LILIUM GRAYI (G3), POA PALUDIGENA (G3), RUDBECKIA LACINIATA VAR HUMILIS (G5T3?)

**ELEMENT DISTRIBUTION**

**Range:**

**States:** NC TN? VA?

**Crosswalk to State Classifications:**

- NC: Southern Appalachian Bog, Northern Subtype, in part (NC 1990)
- VA?: No equivalent (VA 2001)

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

**USFS Ecoregions:** M221Dc:CCC

**Federal Lands:** USFS (Cherokee?, Nantahala?, Pisgah?)

**ELEMENT SOURCES**

**References:** Allard 1990, Schafale and Weakley 1990, Weakley and Schafale 1994



**SOUTHERN APPALACHIAN BOG (LOW ELEVATION TYPE)**

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**ELEMENT IDENTIFIERS**

**NVCS association:** *Alnus serrulata* - *Rhododendron viscosum* - *Rhododendron maximum* / *Juncus gymnocarpus* - *Chelone cuthbertii* Shrubland

**Database Code:** C EGL003916

**Formation:** Saturated mixed evergreen - cold-deciduous shrubland

**Alliance:** ALNUS SERRULATA - SALIX SERICEA - RHODODENDRON (CATAWBIENSE, MAXIMUM) SATURATED SHRUBLAND ALLIANCE (III.C.2.N.e.100)

**ELEMENT CONCEPT**

**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. 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*, *Photinia pyrifolia* (= *Aronia arbutifolia*), *Photinia melanocarpa* (= *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 imbricatum*), *Sphagnum bartlettianum*, and *Sphagnum recurvum*. Other important bryophytes include *Polytrichum commune*, *Rhizomnium appalachianum*, and *Aulacomnium palustre*. 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, and probably in adjacent Virginia. 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).

**Environment:** See Summary

**Vegetation:** See Summary

**Dynamics:** See Summary

**Similar Associations:** No information

**Synonymy:**

- IIE1b. Southern Appalachian Bog Complex (Allard 1990) B. in part
- Southern Appalachian Bog, Low Elevation Variant (Weakley and Schafale 1994)
- Southern Appalachian Bog, Southern Floodplain Variant (Weakley and Schafale 1994)

**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.

**CONSERVATION RANKING & RARE SPECIES**

**GRank:** G1G2 (98-04-30): 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, and probably in adjacent Virginia. 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.

**High-ranked species:** CHELONE CUTHBERTII (G3), HELONIAS BULLATA (G3), RUDBECKIA LACINIATA VAR HUMILIS (G5T3?)

**ELEMENT DISTRIBUTION**

**Range:** This community is known from the northern part of the Southern Blue Ridge, primarily in Allegheny and Ashe counties, North Carolina, in Monroe County, Tennessee, and probably in adjacent Virginia. It also occurs south of the Asheville Basin in southwestern North Carolina and probably in adjacent South Carolina and Georgia.

**States:** GA NC SC TN VA?

**Crosswalk to State Classifications:**

- GA: Mountain Bog/Seep Shrub/Scrub Vegetation, in part; Mountain Bog/Seep Herbaceous Vegetation, in part (GA 1990)

## Association Descriptions

- NC: Southern Appalachian Bog, Northern Subtype, in part; Southern Appalachian Bog, Southern Subtype, in part (NC 1990)
- VA?: No equivalent (VA 2001)

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

**USFS Ecoregions:** M221Db:CCC, M221Dc:CCC, M221Dd:CCC

**Federal Lands:** NPS (Blue Ridge Parkway); USFS (Chattahoochee, Cherokee, Nantahala, Pisgah?, Sumter?)

### ELEMENT SOURCES

**References:** Allard 1990, Ambrose 1990a, NatureServe Ecology - Southeast U.S. unpubl. data, Schafale and Weakley 1990, Weakley and Schafale 1994

**SOUTHERN APPALACHIAN HERB BOG (LOW ELEVATION TYPE)**

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**ELEMENT IDENTIFIERS**

**NVCS association:** Carex (atlantica, echinata, leptalea, lurida) - Solidago patula Herbaceous Vegetation

**Database Code:** CEGLO04156

**Formation:** Saturated temperate or subpolar grassland

**Alliance:** CAREX (ATLANTICA, ECHINATA) - ERIOPHORUM VIRGINICUM - RHYNCHOSPORA CAPITELLATA - SOLIDAGO PATULA SATURATED HERBACEOUS ALLIANCE (V.A.5.N.m.4)

**ELEMENT CONCEPT**

**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.

**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:** 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*, *Photinia pyrifolia* (= *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*, *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*.

**Dynamics:** See Summary

**Similar Associations:** No information

**Synonymy:**

- II31a. Southern Appalachian Bog Complex (Allard 1990) B. in part

**Comments:** None

**CONSERVATION RANKING & RARE SPECIES**

**GRank:** G1 (01-01-16): 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.

**High-ranked species:** No information

**ELEMENT DISTRIBUTION**

**Range:**

**States:** GA SC? TN WV?

**Crosswalk to State Classifications:** Not yet cross-referenced to state classifications

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

**USFS Ecoregions:** M221Dc:CCC, M221Dd:CCC

**Federal Lands:** USFS (Chattahoochee, Cherokee)

**ELEMENT SOURCES**

**References:** Allard 1990, NatureServe Ecology - Southeast U.S. unpubl. data

**SOUTHERN APPALACHIAN HERB BOG (TYPIC TYPE)**

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**ELEMENT IDENTIFIERS**

**NVCS association:** *Carex atlantica* - *Solidago patula* var. *patula* - *Lilium grayi* / *Sphagnum bartlettianum* Herbaceous Vegetation

**Database Code:** CEG004158

**Formation:** Saturated temperate or subpolar grassland

**Alliance:** CAREX (ATLANTICA, ECHINATA) - ERIOPHORUM VIRGINICUM - RHYNCHOSPORA CAPITELLATA - SOLIDAGO PATULA SATURATED HERBACEOUS ALLIANCE (V.A.5.N.m.4)

**ELEMENT CONCEPT**

**Summary:** This community is an open, graminoid-dominated wetland with significant cover of *Sphagnum* spp. It has a strong component of species of northern phyto geography occurring in combination with species endemic to the southern Appalachians, and in association with felsic gneisses or schists and acidic, nutrient-poor seepage. The dwarf-shrub (less than 0.5 m), *Vaccinium macrocarpon*, may be scattered throughout or be locally dominant. Typical dominants are *Carex echinata*, *Solidago patula* var. *patula*, *Carex leptalea*, *Carex atlantica*, *Rhynchospora capitellata*, *Scirpus atrovirens*, *Osmunda cinnamomea*, *Lysimachia terrestris*, *Vaccinium macrocarpon*, *Eriophorum virginicum*, and *Polytrichum commune*. Other characteristic species are *Arethusa bulbosa*, *Aulacomnium palustre*, *Bazzania trilobata*, *Calopogon tuberosus*, *Carex folliculata*, *Carex gynandra*, *Carex trisperma*, *Chelone cuthbertii*, *Juncus effusus*, *Juncus subcaudatus*, *Lilium grayi*, *Melanthium virginicum*, *Orontium aquaticum*, *Osmunda regalis* var. *spectabilis*, *Oxypolis rigidior*, *Parnassia asarifolia*, *Platanthera grandiflora*, *Poa paludigena*, *Rhizomnium appalachianum*, *Sagittaria latifolia* (= var. *pubescens*), *Scirpus cyperinus*, *Scirpus expansus*, *Scirpus polyphyllus*, *Packeria aurea* (= *Senecio aureus*), *Sphagnum bartlettianum*, *Sphagnum fallax*, *Sphagnum affine* (= *Sphagnum imbricatum*), *Sphagnum palustre*, *Sphagnum recurvum*, *Spiraea alba*, *Spiraea tomentosa*, *Stenanthium gramineum* var. *robustum*, *Thelypteris palustris* var. *pubescens*, *Thelypteris simulata* (rarely), and *Rhizomnium appalachianum*. This community can occur on flat areas, in portions of valley bottoms that are not subject to flooding, but maintained hydrologically by rainwater and a high water table, or in the upper portions of stream watersheds, on slight slopes, hydrologically maintained by very nutrient-poor to fairly nutrient-rich seepage.

**Environment:** See Summary

**Vegetation:** See Summary

**Dynamics:** See Summary

**Similar Associations:** No information

**Synonymy:**

- IIE1b. Southern Appalachian Bog Complex (Allard 1990) B. in part
- Southern Appalachian Bog, Typic Variant (Weakley and Schafale 1994) B. in part

**Comments:** This community may dominate a site or occur as a complex with *Alnus serrulata* - *Kalmia carolina* - *Rhododendron catawbiense* - *Spiraea alba* / *Carex folliculata* - *Lilium grayi* Shrubland (CEGL003915). It is typically surrounded by forests dominated by *Picea rubens*, *Fagus grandifolia*, *Betula alleghaniensis*, *Quercus rubra*, *Tsuga canadensis*, and *Liriodendron tulipifera* with dense *Rhododendron maximum* understories. Few sites remain, probably less than 500 acres in total, and all are degraded from hydrological modification or are threatened by grazing, agricultural runoff, and construction activities. Similar open, herbaceous bogs are at Grayson Highlands, Virginia. The definition of this association may need to be modified to cover these Virginia occurrences.

**CONSERVATION RANKING & RARE SPECIES**

**GRank:** G1 (95-06-15): Few sites remain, probably less than 200 acres in total, and nearly all of that hydrologically modified to one degree or another. Remaining occurrences of this community have been degraded or are threatened by grazing, agricultural runoff, and construction activities.

**High-ranked species:** LILIUM GRAYI (G3), PARNASSIA GRANDIFOLIA (G3G4)

**ELEMENT DISTRIBUTION**

**Range:** In western North Carolina, possibly in eastern Tennessee, and in southwestern Virginia, on felsic metamorphic rocks in the Southern Blue Ridge.

**States:** NC TN? VA?

**Crosswalk to State Classifications:**

- NC: Southern Appalachian Bog, Northern Subtype, in part (NC 1990)
- VA?: No equivalent (VA 2001)

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

**USFS Ecoregions:** M221Db:CCC, M221Dc:CCC

**Federal Lands:** USFS (Cherokee?, Nantahala?, Pisgah?)

**ELEMENT SOURCES**

**References:** Allard 1990, Schafale and Weakley 1990, Weakley and Schafale 1994

**RICH MONTANE SEEP (COVE TYPE)**

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**ELEMENT IDENTIFIERS**

**NVCS association:** *Diphylleia cymosa* - *Saxifraga micranthidifolia* - *Laportea canadensis* Herbaceous Vegetation

**Database Code:** C EGL004296

**Formation:** Saturated temperate perennial forb vegetation

**Alliance:** DIPHYLLEIA CYMOSA - SAXIFRAGA MICRANTHIDIFOLIA SATURATED HERBACEOUS ALLIANCE (V.B.2.N.f.7)

**ELEMENT CONCEPT**

**Summary:** 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. Other characteristic species include *Cardamine clematitidis*, *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.). This association often occurs in cove forests.

**Environment:** See Summary

**Vegetation:** See Summary

**Dynamics:** See Summary

**Similar Associations:**

- *Impatiens* (*capensis*, *pallida*) - *Monarda didyma* - *Rudbeckia laciniata* var. *humilis* Herbaceous Vegetation (CEGL004293)

**Synonymy:**

- IID3a. Herbaceous High Elevation Seepage Slope (Allard 1990) B. in part

**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. *humilis* Herbaceous Vegetation (CEGL004293), often occurs on boulder fields or in northern hardwood forests, at higher elevations than the association defined here.

**CONSERVATION RANKING & RARE SPECIES**

**GRank:** G3 (98-12-14): 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.

**High-ranked species:** ACONITUM RECLINATUM (G3), CARDAMINE CLEMATITIS (G2G3), GEUM GENICULATUM (G2), LILIUM GRAYI (G3), RUDBECKIA LACINIATA VAR HUMILIS (G5T3?)

**ELEMENT DISTRIBUTION**

**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.

**States:** GA NC SC? TN VA

**Crosswalk to State Classifications:**

- NC: High Elevation Seep, in part (NC 1990)
- SC?: High Elevation Seep, in part (SC 1986)
- VA: High-Elevation Seep, in part (VA 2001)

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

**USFS Ecoregions:** M221Dc:CCC, M221Dd:CCC

**Federal Lands:** NPS (Great Smoky Mountains); USFS (Chattahoochee, Cherokee, Jefferson, Nantahala, Pisgah, Sumter?)

**ELEMENT SOURCES**

**References:** Allard 1990, Fleming et al. 2001, Kauffman pers. comm., Nelson 1986, Schafale and Weakley 1990

**SOUTHERN APPALACHIAN ACID SEEP**

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**ELEMENT IDENTIFIERS**

**NVCS association:** *Glyceria striata* - *Carex gynandra* - *Chelone glabra* - *Symphytotrichum puniceum* / *Sphagnum* spp.  
Herbaceous Vegetation

**Database Code:** C EGL008438

**Formation:** Saturated temperate or subpolar grassland

**Alliance:** CAREX CRINITA - OSMUNDA SPP. / SPHAGNUM SPP. SATURATED HERBACEOUS ALLIANCE (V.A.5.N.m.5)

**ELEMENT CONCEPT**

**Summary:** This acidic seep occurs in small-scale patch communities 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*, *Symphytotrichum puniceum* (= *Aster puniceus*), *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.

**Environment:** This acidic seep occurs in small-scale patch communities 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:** 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*, *Symphytotrichum 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*.

**Dynamics:** These communities appear to be relatively stable. They can be affected by beaver activity.

**Similar Associations:**

- *Carex gynandra* - *Scirpus cyperinus* - *Eriophorum virginicum* - *Osmunda cinnamomea* Herbaceous Vegetation (CEGL007771)-is associated with smaller streams in the Cumberland Plateau from Virginia south possibly to Tennessee.

**Synonymy:** No information

**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").

**CONSERVATION RANKING & RARE SPECIES**

**GRank:** G2G3 (01-06-26): This community is rather widespread but always occurs in very small patches.

**High-ranked species:** No information

**ELEMENT DISTRIBUTION**

**Range:** This community was defined from the western fringe of the Southern Blue Ridge in northern Georgia, but likely extends into adjacent areas of Alabama, Tennessee, and the Carolinas.

**States:** AL? GA NC SC? TN

**Crosswalk to State Classifications:**

- NC: Swamp Forest-Bog Complex, in part (NC 1990)

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

**USFS Ecoregions:** 231Dc:CCC, 231De:CCP, M221Dd:CCC

**Federal Lands:** NPS (Great Smoky Mountains); USFS (Chattahoochee, Cherokee, Nantahala?)

**ELEMENT SOURCES**

**References:** NatureServe Ecology - Southeast U.S. unpubl. data, Schafale and Weakley 1990

**RICH MONTANE SEEP (HIGH ELEVATION TYPE)**

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**ELEMENT IDENTIFIERS**

**NVCS association:** *Impatiens (capensis, pallida)* - *Monarda didyma* - *Rudbeckia laciniata* var. *humilis* Herbaceous Vegetation

**Database Code:** CEG004293

**Formation:** Saturated temperate perennial forb vegetation

**Alliance:** IMPATIENS (CAPENSIS, PALLIDA) - MONARDA DIDYMA SATURATED HERBACEOUS ALLIANCE (V.B.2.N.f.9)

**ELEMENT CONCEPT**

**Summary:** This association covers forb-dominated palustrine vegetation occurring as small wetlands at high elevations (greater than 1200 m or 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. *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 obovata*, *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*. This vegetation is often associated with boulder fields or other northern hardwood forests [see I.B.2.N.a *Betula alleghaniensis* - *Fagus grandifolia* - *Aesculus flava* Forest Alliance (A.266)].

**Environment:** Stands of this association are forb-dominated palustrine vegetation occurring as small wetlands at high elevations (greater than 1200 m or 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 boulder fields or other northern hardwood forests.

**Vegetation:** Typical dominant species include *Impatiens capensis*, *Impatiens pallida*, *Monarda didyma*, and *Rudbeckia laciniata* 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 obovata*, *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.

**Dynamics:** See Summary

**Similar Associations:**

- *Diphylleia cymosa* - *Saxifraga micranthidifolia* - *Laportea canadensis* Herbaceous Vegetation (CEGL004296)-typically occurs at lower elevations and is associated with cove forests.

**Synonymy:**

- IID3a. Herbaceous High Elevation Seepage Slope (Allard 1990) B. in part
- Jewelweed-beebalm-coneflower seep (CAP 1998)

**Comments:** Another high-elevation herbaceous seep association known from the southern Appalachians, *Diphylleia cymosa* - *Saxifraga micranthidifolia* - *Laportea canadensis* Herbaceous Vegetation (CEGL004296), typically occurs at lower elevations and is associated with cove forests.

**CONSERVATION RANKING & RARE SPECIES**

**GRank:** G3 (98-12-14): 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.

**High-ranked species:** ACONITUM RECLINATUM (G3), CAREX BROMOIDES SSP MONTANA (G5T3?), GEUM GENICULATUM (G2), LILIUM GRAYI (G3), RUDBECKIA LACINIATA VAR HUMILIS (G5T3?)

**ELEMENT DISTRIBUTION**

**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.

**States:** GA NC SC TN VA WV?

**Crosswalk to State Classifications:**

- NC: High Elevation Seep, in part (NC 1990)
- SC: High Elevation Seep, in part (SC 1986)



- VA: High-Elevation Seep, in part (VA 2001)

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

**USFS Ecoregions:** M221Ba:CCC, M221Bb:CCP, M221Bc:CCC, M221Da:CCC, M221Db:CCC, M221Dc:CCC, M221Dd:CCC

**Federal Lands:** NPS (Great Smoky Mountains); USFS (Cherokee, Jefferson, Nantahala, Pisgah)

**ELEMENT SOURCES**

**References:** Allard 1990, CAP 1998, Fleming et al. 2001, Nelson 1986, Schafale and Weakley 1990

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## APPENDIX 1: Table of Ecoregion Map Units (after Keys et al. 1995)

<b>212</b>	<b>Laurentian Mixed Forest</b>	212Jb	Gogebic-Penokee Iron Range
212A	Aroostook Hills and Lowlands	212Jc	Winegar Moraines
212Aa	Aroostook Hills	212Jd	St. Croix Moraine
212Ab	Aroostook Lowlands	212Je	Central-Northwest Wisconsin Loess Plains
		212Jf	Perkinstown End Moraine
		212Jg	"Lincoln Formation Till Plain, Mixed Hardwoods"
212B	Maine-New Brunswick Foothills and Lowlands	212Jh	Neilsville Sandstone Plateau
212Ba	Central Main Foothills	212Ji	Rib Mountain Rolling Ridges
212Bb	Main-New Brunswick Lowlands	212Jj	Green Bay Lobe Stagnation Moraine
		212Jk	Spread Eagle-Dunbar Barrens
212C	Fundy Coastal and Interior	212Jl	Brule and Paint Rivers-Drumlinized Ground Moraine
212Ca	Main Eastern Interior	212Jm	Northern Highlands Pitted Outwash
212Cb	Main Eastern Coastal	212Jn	Baraga-Keweenaw Coarse Rocky Till
		212Jo	Ewen Dissected Lake Plain
212D	Central Maine Coastal and Embayment	212Jp	Reserved
212Da	Central Maine Embayment	212Jq	Reserved
212Db	Penobscot Bay Coast	212Jr	Michigamme Highlands
212Dc	Casco Bay Coast	212Js	Lincoln Formation Till Plain -Hemlock-Hardwoods
212E	St. Lawrence and Champlain Valley	212K	Western Superior Uplands
212Ea	St. Lawrence Glacial Marine Plain	212Ka	Bayfield Sand Plains
212Eb	St. Lawrence Till Plain	212Kb	Mille Lacs Uplands
212Ec	Champlain Glacial Lake and Marine Plains		
212Ed	Champlain Hills		
212Ee	St. Lawrence Glacial Lake Plain		
212F	Northern Glaciated Allegheny Plateau	212L	Northern Superior Uplands
212Fa	Cattaraugus Highlands	212La	Border Lakes
212Fb	Central Allegheny Plateau	212Lb	North Shore Highlands
212Fc	Eastern Allegheny Plateau	212Lc	Laurentian Highlands
212Fd	Pocono Plateau	212Ld	Toimi Uplands
212G	Northern Unglaciated Allegheny Plateau	212M	Northern Minnesota and Ontario
212Ga	Allegheny High Plateau	212Ma	Littlefork-Vermillion Uplands
212Gb	Allegheny Deep Valleys	212Mb	Agassiz Lowlands
212H	Northern Great Lakes	212N	Northern Minnesota Drift and Lake Plains
212Ha	Gwinn-Deerton Outwash and Sand Ridges	212Na	Chippewa Plains
212Hb	West Green Bay Till Plain	212Nb	St. Louis Moraines
212Hc	Green Bay Clayey and Silty Lake Plain	212Nc	Pine Moraine and Outwash Plains
212Hd	Manitowoc Till Plain	212Nd	Tamarack Lowlands
212He	Door and Escanaba Peninsulas and Lake Plains		
212Hh	Seney Sand Lake Plain	212O	Lake Michigan
212Hi	Grand Marais Sand End Moraine and Outwash	212Oa	Lake Michigan and Islands
212Hj	St. Ignace Lake Plain	212Ob	Green Bay
212Hk	Rudyard Clay Lake Plain	212Oc	Grand Traverse Bay
212Hl	Cheboygon Lake Plain		
212Hm	Harrisville Moraines	212P	Lake Huron
212Hn	Stutsmanville Sand Ridges	212Pa	Lake Huron and Islands
212Ho	Traverse City Drumlin Fields	212Pb	Saginaw Bay
212Hp	Vanderbilt Moraines	212Pc	Manitoulin Island
212Hq	Mio Outwash Plains		
212Hr	Tawas Lake Plain	<b>M212</b>	<b>New England-Adirondack</b>
212Hs	Cadillac End Moraines		
212Ht	Big Rapids Loamy Moraines	M212A	White Mountain
212Hu	Newago Outwash and Ice Contact	M212Aa	International Boundary Plateau
212Hv	Wellston Outwash and Ice Contact	M212Ab	St. John Upland
212Hw	Manistee Outwash and Lake Sands	M212Ac	Maine Central Mountains
212Hx	Hart Outwash and Lake Sands	M212Ad	White Mountains
212Hy	Kalkaska Moraines	M212Ae	Mahoosuc Rangely Lakes
		M212Af	Connecticut Lakes
		M212Ag	Western Maine Foothills
212I	Lake Superior	M212B	Vermont-New Hampshire Upland
212Ia	Lake Superior and Islands	M212Ba	Vermont Piedmont
212Ib	Isle Royale	M212Bb	Northern Connecticut River Valley
		M212Bc	Sunapee Uplands
212J	Southern Superior Uplands	M212C	Green-Taconic-Berkshire Mountain
212Ja	Lake Superior Clay Plain	M212Ca	Northern Green Mountain
M212Bd	Hillsboro Inland Hills and Plains		

**Appendix 1: Table of Ecoregion Map Units (after Keys et al. 1995)**

M212Cb	Taconic Mountains		
M212Cc	Berkshire-Vermont Upland		
M212Cd	Southern Green Mountain		
		<b>M221 Central Appalachian Broadleaf Forest-Coniferous Forest-Meadow</b>	
M212D	Adirondack Mountain	M221A	Northern Ridge and Valley
M212Da	Adirondack Hills and Flats	M221Aa	Ridge and Valley
M212Db	Western Adirondack Foothills	M221Ab	Great Valley of Virginia
M212Dc	Adirondack Highlands and Lakes	M221Ac	Northern Ridge and Valley
M212Dd	Central Adirondack Mountains	M221Ad	Northern Great Valley
M212De	Eastern Adirondack Low Maintains		
M212Df	Adirondack Peaks	M221B	Allegheny Mountains
		M221Ba	Northern High Allegheny Mountains
M212E	Catskill Mountain	M221Bb	Western Allegheny Mountains
M212Ea	Catskill Mountains	M221Bc	Southern High Allegheny Mountains
M212Eb	Catskill Highlands	M221Bd	Eastern Allegheny Mountain and Valley
		M221Be	West Allegheny Mountain and Valley
M212F	Tug Hill Plateau	M221Bf	Allegheny Mountain Plateau
M212Fa	Tug Hill Plateau		
M212Fb	Tug Hill Transition	M221C	Cumberland Mountains
		M221Ca	Western Coal Fields
		M221Cb	Eastern Coal Fields
		M221Cc	Black Mountains
		M221Cd	Southern Cumberland Mountains
		M221Ce	Pine and (The) Cumberland Mountain
<b>221 Eastern Broadleaf Forest (Oceanic)</b>			
221A	Lower New England	M221D	Blue Ridge Mountains
221Aa	Boston Basin	M221Da	Northern Blue Ridge Mountains
221Ab	Cape Cod Coastal Lowland and Islands	M221Db	Central Blue Ridge Mountains
221Ac	Narragansett-Bristol Lowland and Islands	M221Dc	Southern Blue Ridge Mountains
221Ad	Southern New England Coastal Lowland	M221Dd	Metasedimentary Mountains
221Ae	Hudson Highlands		
221Af	Lower Connecticut River Valley	<b>222</b>	<b>Eastern Broadleaf Forest (Continental)</b>
221Ag	Southeast New England Coastal Hills and Plains	222A	Ozark Highland
221Ah	Worcester-Monadnock Plateau	222Aa	St. Francis Knobs and Basins
221Ai	Gulf of Maine Coastal Plain	222Ab	Central Plateau
221Aj	Reserved	222Ac	Osage River Hills
221Ak	Gulf of Maine Coastal Plain Lowland	222Ad	Gasconade River Hills
221Al	Sebago-Ossipee Hills and Plains	222Ae	Meramec River Hills
221Am	Reading Prong	222Af	Current River Hills
		222Ag	White River Hills
221B	Hudson Valley	222Ah	Elk River Hills
221Ba	Hudson Limestone Valley	222Ai	Prairie Ozark Border
221Bb	Taconic Foothills	222Aj	Inner Ozark Border
221Bc	Hudson Glacial Lake Plains	222Ak	Outer Ozark Border
221Bd	Kittatinny-Shawangunk Ridges	222Al	Black River Ozark Border
		222Am	Springfield Plain
221D	Northern Appalachian Piedmont	222An	Springfield Plateau
221Da	Gettysburg Piedmont Lowland	222Ao	Mississippi River Alluvial Plain
221Db	Piedmont Upland	222Ap	Missouri River Alluvial
221Dc	Newark Piedmont	222Aq	Illinois Ozarks
221E	Southern Unglaciaded Allegheny Plateau	222C	Upper Gulf Coastal Plain
221Ea	Pittsburgh Low Plateau	222Ca	Cretaceous Hills
221Eb	Teays Plateau	222Cb	Northern Deep Loess Hills and Bluffs
221Ec	Ohio Valley Lowland	222Cc	Deep Loess Hills and Bluffs
221Ed	East Hocking Plateau	222Cd	Clay Hills
221Ee	Unglaciaded Muskingum Plateau	222Ce	Northern Loessial Hills
221Ef	West Hocking Plateau	222Cf	Northern Pontotoc Ridge
221Eg	Lower Scioto River Plateau	222Cg	Upper Loam Hills
		222Ch	Ohio and Cache River Alluvial Plain
221F	Western Unglaciaded Allegheny Plateau		
221Fa	Allegheny Plateau	222D	Interior Low Plateau-Shawnee Hills
221Fb	Grand River-Pymatuning Lowlands	222Da	Interior Western Coalfields
221Fc	Akron Kames	222Db	Lower Ohio-Cache-Wabash Alluvial plains
		222Dc	Outer Western Coalfields
221H	Northern Cumberland Plateau	222Dd	Marion Hills
221Ha	Rugged Eastern Hills	222De	Crawford Uplands
221Hb	Reserved	222Df	Crawford Escarpment
221Hc	Southwestern Escarpment	222Dg	Southern Dripping Springs
221Hd	Squatchie Valley	222Dh	Greater Shawnee Hills
221He	Low Hills Belt	222Di	Lesser Shawnee Hills
		222Dj	Northern Dripping Springs
221J	Central Ridge and Valley		
221Ja	Rolling Limestone Hills		
221Jb	Sandstone Hills		
221Jc	Holston Valley		

**Appendix 1: Table of Ecoregion Map Units (after Keys et al. 1995)**

222E	Interior Low Plateau-Highland Rim	222L	North Central U.S. Driftless and Escarpment
222Ea	Eastern Highland Rim	222La	Menominee Eroded Pre-Wisconsinan Till
222Eb	Eastern Karst Plain	222Lb	Melrose Oak Forest and Savannah
222Ec	Outer Nashville Basin	222Lc	Mississippi-Wisconsin River Ravines
222Ed	Inner Nashville Basin	222Ld	Kickapoo-Wisconsin River Ravines
222Ee	Highland Rim-Hilly and Rolling	222Le	Mineral Point Prairie-Savannah
222Ef	Tennessee-Gasper Valley	222Lf	Western Paleozoic Plateau
222Eg	Western Pennyroyal Karst Plain		
222Eh	Pennyroyal Karst Plain	222M	Minnesota and Northeast Iowa Morainal-Oak Savannah
222Ei	Western Knobs	222Ma	Alexandria Moraine-Hardwood Hills
222Ej	Eastern Knobs Transition	222Mb	Big Woods Moraines
222Ek	Mitchell Karst Plains	222Mc	Anoka Sand Plain
222El	Knobstone Escarpment	222Md	Rosemont Baldwin Plains and Moraines
222Em	Brown County Hills	222Me	Oak Savannah Till and Loess Plains
222En	Kinniconick and Licking Knobs		
222Eo	The Cliffs	222N	Lake Agassiz-Aspen Parklands
		222Na	Aspen Parklands
222F	Interior Low Plateau-Bluegrass	222O	Mohawk and Black River Valley
222Fa	Outer Bluegrass	222Oa	Mohawk Valley
222Fb	Inner Bluegrass	222Ob	Black River Valley
222Fc	Western Bluegrass		
222Fd	Northern Bluegrass	222P	Lake Ontario
222Fe	Muscatatuck Flats and Valleys	222Pa	Lake Ontario/Bays and Islands
222Ff	Scottsburg Lowland		
222G	Central Till Plains-Oak Hickory	222Q	Lake Erie
222Ga	Effingham Plain	222Qa	Lake Erie/Bays and Islands
222Gb	Mount Vernon Hill Country	222Qb	Lake St. Claire
222Gc	Lower Wabash Alluvial Plain		
222Gd	Wabash Uplands	<b>M222</b>	<b>Ozark Broadleaf Forest-Meadow</b>
222Ge	Southwest Indiana Glaciated Lowlands	M222A	Boston Mountains
222H	Central Till Plains-Beech-Maple	M222Aa	The Boston Mountain
222Ha	Bluffton-Ann Arbor Till Plains	M222Ab	Boston Hills
222Hb	Miami-Scioto Plain-Tipton Till Plain		
222Hc	Little Miami Old Drift Plain	<b>231</b>	<b>Southeastern Mixed Forest</b>
222Hd	Mad River Interlobate Plains	231A	Southern Appalachian Piedmont
222He	Darby Plains	231Aa	Midland Plateau Central Uplands
222Hf	Entrenched Valleys	231Ab	Piedmont Ridge
222I	Erie and Ontario Lake Plain	231Ac	Schist Plains
222Ia	Lake Erie Plain	231Ad	Lower Foot Hills
222Ib	Erie-Ontario Lake Plain	231Ae	Charlotte Belt
222Ic	Eastern Ontario Till Plain	231Af	Carolina Slate
222Id	Cattaraugus Finger Lakes Moraine and Hills	231Ag	Schist Hills
222Ie	Eastern Ontario Lake Plain	231Ah	Granite Hills
222If	Maumee Lake Plain	231Ai	Opelika Plateau
222Ig	Lake Erie Sand Plain	231Aj	Mica Rich Plateau
222J	South Central Great Lakes	231Ak	Lynchburg Belt
222Ja	Southeast Lake Michigan Plains and Dunes	231Al	Northern Piedmont
222Jb	Southeast Lake Michigan Moraines	231Am	Triassic Uplands
222Jc	Iona Moraines	231An	Western Coastal Plain-Piedmont Transition
222Jd	Saginaw Clay Lake and Till Plain	231Ao	Southern Triassic Uplands
222Je	Huron Clay Lake and Till Plain	231Ap	Triassic Basins
222Jf	Lum Interlobate Moraine	231B	Coastal Plains-Middle
222Jg	Jackson Interlobate Moraine	231Ba	Black Belt
222Jh	Kalamazoo-Elkhart Moraines and Plains	231Bb	Interior Flatwoods
222Ji	Steuben Interlobate Moraines	231Bc	Upper Clay Hills
222Jj	Southeast Lake Michigan Plains and Dunes	231Bd	Upper Loam Hills
222K	Southwestern Great Lakes Morainal	231Be	Transition Loam Hills
222Ka	Central Wisconsin Sand Plain	231Bf	Floodplains and Terraces
222Kb	Central Wisconsin Moraines and Outwash	231Bg	Northern Loessial Hills
222Kc	Lake Winnebago Clay Plain	231Bh	Deep Loess Hills and Bluffs
222Kd	South Central Wisconsin Prairie and Savannah	231Bi	Deep Loess Plains
222Ke	Southern Green Bay Lobe	231Bj	Jackson Hills
222Kf	Geneva-Darien Moraines and Till Plains	231Bk	Southern Pontotoc Ridge
222Kg	Kenosha-Lake Michigan Plain and Moraines	231Bl	Jackson Prairie
222Kh	Rock River Old Drift Country	231C	Southern Cumberland Plateau
222Ki	Chicago Lake Plain	231Ca	Shale Hills and Mountain
222Kj	Valparaiso Moraine	231Cb	Sandstone Plateau

**Appendix 1: Table of Ecoregion Map Units (after Keys et al. 1995)**

231Cc	Table Plateau	232Bq	Sand Hills
231Cd	Sandstone Mountain	232Br	Atlantic Southern Loam Hills
231Ce	Moulton Valley	232Bs	Floodplains and Terraces
231Cf	Southern Cumberland Valleys	232Bt	Delmarva Upland
231Cg	Sequatchie Valley	232Bu	Southwestern Loam Hills
		232Bv	Northern Loam Plains
231D	Southern Ridge and Valley	232Bx	Eastern Chesapeake Lowland
231Da	Chert Valley	232Bz	Delmarva Outer Coastal Plain Bays and Islands
231Db	Sandstone-Shale and Chert Ridge		
231Dc	Sandstone Ridge	232C	Atlantic Coastal Flatwoods
231Dd	Quartzite and Talladega Slate Ridge	232Ca	Upper Terraces
231De	Shaley Limestone Valley	232Cb	Lower Terraces
		232Cc	Okefenokee Uplands
231E	Mid Coastal Plains-Western	232Cd	Okefenokee Swamp
231Ea	South Central Arkansas	232Ce	Coastal Marsh and Island
231Eb	Southwestern Arkansas	232Cf	Bacon Terraces
231Ec	Ouachita Alluvial Valleys	232Cg	Flatwoods Floodplains and Terraces
231Ed	Sabine Alluvial Valley	232Ch	Tidal Area
231Ee	Southern Oklahoma Subsection	232Ci	Pamlico and Albemarle Sounds and Barrier Islands
231Ef	Piney Woods Transition		
231Eg	Sand Hills	232Cj	Chesapeake Bay
231Eh	Southern Loam Hills		
231Ei	Southwest Flatwoods	232D	Florida Coastal Lowlands-Western
231Ej	South Central Arkansas Flatwoods	232Da	Immokalee Rise
231Ek	Southwestern Arkansas Blackland Prairies	232Db	Gulf Coastal Lowlands
231El	Trinity Alluvial Valley	232Dc	Gulf Coast Flatwoods-Bays and Barrier Islands
231Em	Red River Alluvial Plain	232Dd	"Mobile Bay, Sounds and Islands"
231En	East Texas Timberlands-Cross Timbers	232De	Florida Gulf Coastal Bays and Islands
231F	Eastern Gulf Prairies and Marshes	232E	Louisiana Coast Prairies and Marshes
231Fa	Gulf Coast Prairies	232Ea	Gulf Coast Prairies
231Fb	Marshes and Inland Bays	232Eb	Gulf Coast Marshes and Inland Bays
		232Ec	Lake Ponchartrain
231G	Arkansas Valley	232Ed	Gulf Coast Bays and Islands
231Ga	Eastern Arkansas Valley and Ridges	232Ee	"Lake Borgne, Sounds and Islands"
231Gb	Mount Magazine		
231Gc	Western Arkansas Valley and Ridges	232F	Coastal Plains and Flatwoods-Western Gulf
		232Fa	Southern Loam Hills
<b>M231</b>	<b>Ouachita Mixed Forest-Meadow</b>	232Fb	Southwest Flatwoods
M231A	Ouachita Mountains	232Fc	Sabine Alluvial Valley
M231Aa	Fourche Mountains	232Fd	Neches Alluvial Valley
M231Ab	West Central Ouachita Mountains	232Fe	Piney Woods Transition
M231Ac	East Central Ouachita Mountains		
M231Ad	Athens Piedmont Plateau	232G	Florida Coastal Lowlands-Eastern
		232Ga	Eastern Beach and Lagoons
<b>232</b>	<b>Outer Coastal Plain Mixed Forest</b>	232Gb	Eastern Beach and Dunes
232A	Middle Atlantic Coastal Plain	232Gc	Okeechobee Plain
232Aa	Long Island Coastal Lowland and Moraine	232Gd	Kissimmee River
232Ab	New Jersey Outer Coastal Plain		
232Ac	New Jersey Inner Coastal Plain	<b>234</b>	<b>Lower Mississippi Riverine Forest</b>
232Ad	Western Chesapeake Uplands	234Aa	Southern Mississippi River Alluvial Plain
232Ae	Delaware Bay	234Ab	Crowleys Ridge
232Af	Long Island Sound	234Ac	White and Black Rivers Alluvial Plain
		234Ad	Baton Rouge Terrace
232B	Coastal Plains and Flatwoods-Lower	234Ae	Arkansas Grand Prairie
232Ba	Fragipan Loam Hills	234Af	Atchafalaya Alluvial Plain
232Bb	Southern Loessial Plains	234Ag	Arkansas Alluvial Plain
232Bc	Citronelle Plains	234Ah	Macon Ridge
232Bd	Southern Deep Loess Hills and Bluffs	234Ai	Red River Alluvial Plain
232Be	Florida Northern Highlands	234Aj	Bastrop Ridge
232Bf	Florida Central Highlands	234Ak	Opelousas Ridge
232Bg	South Coastal Plains	234Al	Teche Terrace
232Bh	Gulf Southern Loam Hills	234Am	St. Francis River Alluvial Plain
232Bi	The Plains	234An	North Mississippi River Alluvial Plain
232Bj	Southern Loam Hills		
232Bk	Southern Clay Hills	<b>251</b>	<b>Prairie Parkland (Temperate)</b>
232Bl	Lower Loam and Clay Hills	251A	Red River Valley
232Bm	Lower Clay Hills	251Aa	Lake Agassiz Plain
232Bn	Lower Loam Hills	251Ab	Souris-Agassiz Stratified Fan Deposits
232Bo	Border Sand Hills		
232Bp	Wiregrass Plains	251B	North Central Glaciated Plains

## Appendix 1: Table of Ecoregion Map Units (after Keys et al. 1995)

251Ba	Upper Minnesota River-Des Moines Lobe	255D	Central Gulf Prairies and Marshes
251Bb	Outer Coteau des Prairies	255Da	Texas Coastal Prairies
251Bc	Inner Coteau des Prairies	255Db	Brazos and Brazonia Alluvial Valley
251Bd	Northwest Iowa Plains	255Dc	Marshes-Inlands Bays-and Barrier Islands
251Be	Southern Des Moines Lobe	255Dd	Southern Texas Coastal Prairies and Savannah
251Bf	Yankton Hills and Valleys		
251C	Central Dissected Till Plains	<b>311</b>	<b>Great Plains Steppe</b>
251Ca	Deep Loess Hills	311A	Redbed Plains
251Cb	Loess Hills		
251Cc	Central Dissected Till and Loess Plain	<b>M313</b>	<b>Arizona-New Mexico Mountains Semi Desert Open Woodland - Coniferous Forest - Alpine Meadow</b>
251Cd	Claypan Till Plain		
251Ce	West Mississippi River Hills		
251Cf	Mississippi River and Illinois Alluvial Plains	M313B	Sacramento-Monzano Mountain
251Cg	Missouri River Alluvial Plain		
251Ch	Southeast Iowa Rolling Loess Hills	<b>315</b>	<b>Southwest Plateau and Plains Dry Steppe and Shrub</b>
251Ci	East Mississippi River Hills	315A	Pecos Valley
251Cj	Galesburg Dissected Till Plain	315B	Texas High Plains
251Ck	Carlinville Dissected Till Plain	315C	Rolling Plains
251Cl	Reserved	315D	Edwards Plateau
251Cm	Northeast Nebraska Rolling Hills	315E	Rio Grande Plain
251Cn	Lower Platte Valley	315F	Southern Gulf Prairies and Marshes
251Co	York Plains		
251Cp	Pawnee City-Sececa Rolling Hills	<b>321</b>	<b>Chihuahuan Semi-Desert</b>
251Cq	Kansas River	321A	Basin and Range
		321B	Stockton Plateau
251D	Central Till Plains		
251Da	Green River Lowland	<b>331</b>	<b>Great Plains-Palouse Dry Steppe</b>
251Db	Western Grand Prairie	331B	Southern High Plains
251Dc	Northern Grand Prairie	331I	Arkansas Tablelands
251Dd	Eastern Grand Prairie		
251De	Southern Grand Prairie	<b>332</b>	<b>Great Plains-Steppe</b>
251Df	Springfield Plains	332E	South-Central Great Plains
251Dg	Kankakee Sands		
251Dh	Kankakee Marsh	<b>411</b>	<b>Everglades</b>
251E	Osage Plains	411A	Everglades
251Ea	Scarped Osage Plains	411Aa	Lake Okeechobee
251Eb	Cherokee Plains	411Ab	Everglades
251Ec	Central Tallgrass	411Ac	Southern Slope
251Ed	Elk Prairie	411Ad	Atlantic Coastal Ridge
		411Ae	Coastal Lowlands-Tidal Marshes and Bays
251F	Osage Plains	411Af	Big Cypress Spur
251Fa	Western Flint Hills	411Ag	Florida Keys and Biscayne Bay
251Fb	Eastern Flint Hills		
251Fc	Southern Flint Hills		
251Fd	Glaciated Flint Hills		
<b>255</b>	<b>Prairie Parkland (Subtropical)</b>		
255A	Cross Timbers and Prairies		
255Aa	Cross Timbers-Cherokee Prairies		
255Ab	Central Oklahoma Cross Timbers		
255Ac	Central Red Rolling Prairies		
255Ad	Southern Oklahoma Grand Prairies		
255Ae	Cross Timbers and Central Rolling Red Prairies		
255Af	Cross Timbers - Southern Oklahoma		
255Ag	Red River Alluvial Plain		
255Ah	Texas Eastern Cross Timbers		
255Ai	Texas Grand Prairie		
255Aj	Texas Western Cross Timbers		
255Ak	Southwestern Timbers		
255B	Blackland Prairies		
255Ba	Blackland Prairie		
255C	Oak Woods and Prairies		
255Ca	Texas Claypan Savannah		
255Cb	Reserved		
255Cc	Interior Savannah		
255Cd	Interior Blackland Prairie		
255Ce	Trinity Alluvial Valley		
255Cf	Blackland Prairie		
255Cg	Southern Texas Claypan Savannah		

## APPENDIX 2: Scientific and Common Names for Species Referenced in this Report

SCIENTIFIC NAME	COMMON NAME
<i>Abies</i>	Fir
<i>Abies balsamea</i>	Balsam Fir
<i>Abies fraseri</i>	Fraser Fir
<i>Acalypha gracilens</i>	Slender Three-seed-mercury
<i>Acer</i>	Maple
<i>Acer barbatum</i>	Southern Sugar Maple
<i>Acer leucoderme</i>	Chalk Maple
<i>Acer negundo</i>	Box-elder
<i>Acer nigrum</i>	Black Maple
<i>Acer pensylvanicum</i>	Striped Maple
<i>Acer rubrum</i>	Red Maple
<i>Acer rubrum</i> var. <i>rubrum</i>	Red Maple
<i>Acer rubrum</i> var. <i>trilobum</i>	Carolina Red Maple
<i>Acer saccharinum</i>	Silver Maple
<i>Acer saccharum</i>	Sugar Maple
<i>Acer saccharum</i> var. <i>floridanum</i>	Florida Sugar Maple
<i>Acer saccharum</i> var. <i>saccharum</i>	Sugar Maple
<i>Acer spicatum</i>	Mountain Maple
<i>Aconitum reclinatum</i>	Trailing White Monkshood
<i>Actaea pachypoda</i>	White Baneberry
<i>Actaea podocarpa</i>	Mountain Bugbane
<i>Actaea racemosa</i>	Black Cohosh
<i>Adelges piceae</i>	Balsam Woolly Adelgid
<i>Adelges tsugae</i>	Hemlock Woolly Adelgid
<i>Adiantum pedatum</i>	Northern Maidenhair
<i>Aesculus flava</i>	Yellow Buckeye
<i>Aesculus glabra</i>	Ohio Buckeye
<i>Aesculus pavia</i> var. <i>pavia</i>	Red Buckeye
<i>Aesculus sylvatica</i>	Painted Buckeye
<i>Agalinis</i>	False Foxglove
<i>Agalinis setacea</i>	Thread-leaf False Foxglove
<i>Ageratina altissima</i>	White Snakeroot
<i>Ageratina altissima</i> var. <i>altissima</i>	White Snakeroot
<i>Ageratina altissima</i> var. <i>roanensis</i>	Appalachian White Snakeroot
<i>Ageratina aromatica</i>	Lesser Snakeroot
<i>Ageratina luciae-brauniae</i>	Rockhouse White Snakeroot
<i>Agrimonia</i>	Grooveburr
<i>Agrimonia rostellata</i>	Beaked Grooveburr
<i>Agrostis gigantea</i>	Black Bent
<i>Agrostis mertensii</i>	Northern Bent
<i>Agrostis perennans</i>	Upland Bent
<i>Alectoria fallacina</i>	lichen
<i>Alliaria petiolata</i>	Garlic-Mustard
<i>Allium allegheniense</i>	Allegheny Onion
<i>Allium cernuum</i>	Nodding Onion
<i>Allium cuthbertii</i>	Narrowleaf Wild Leek
<i>Alnus serrulata</i>	Smooth Alder
<i>Alnus viridis</i>	Green Alder
<i>Alnus viridis</i> ssp. <i>crispa</i>	Mountain Alder
<i>Ambrosia artemisiifolia</i>	Annual Ragweed
<i>Amelanchier</i>	Serviceberry
<i>Amelanchier arborea</i>	Downy Serviceberry

SCIENTIFIC NAME	COMMON NAME
<i>Amelanchier arborea</i> var. <i>austromontana</i>	Downy Serviceberry
<i>Amelanchier laevis</i>	Allegheny Serviceberry
<i>Amelanchier sanguinea</i>	Round-leaf Serviceberry
<i>Amorpha fruticosa</i>	Tall Indigobush
<i>Amorpha schwerinii</i>	Piedmont Indigobush
<i>Ampelopsis arborea</i>	Peppervine
<i>Amphicarpaea</i>	Hog-peanut
<i>Amphicarpaea bracteata</i>	Hog-peanut
<i>Amsonia tabernaemontana</i>	Eastern Bluestar
<i>Andropogon gerardii</i>	Big Bluestem
<i>Andropogon glomeratus</i>	Bushy Broomsedge
<i>Andropogon gyrans</i>	Elliott's Beardgrass
<i>Andropogon ternarius</i>	Splitbeard Bluestem
<i>Andropogon virginicus</i>	Common Broomsedge
<i>Andropogon virginicus</i> var. <i>virginicus</i>	Common Broomsedge
<i>Anemone berlandieri</i>	Ten-petal Thimbleweed
<i>Anemone quinquefolia</i>	Nightcaps
<i>Anemone virginiana</i>	Tall Thimbleweed
<i>Anemone virginiana</i> var. <i>virginiana</i>	Tall Thimbleweed
<i>Angelica triquinata</i>	Filmy Angelica
<i>Anomodon attenuatus</i>	moss
<i>Anomodon rostratus</i>	moss
<i>Antennaria</i>	Pussytoes
<i>Antennaria plantaginifolia</i>	Woman's-Tobacco
<i>Antennaria solitaria</i>	Single-head Pussytoes
<i>Antennaria virginica</i>	Shalebarren Pussytoes
<i>Apios americana</i>	Groundnut
<i>Aquilegia canadensis</i>	Eastern Columbine
<i>Arabis</i>	Rockcross
<i>Arabis canadensis</i>	Sicklepod
<i>Arabis hirsuta</i> var. <i>pyncocarpa</i>	Hairy Rockcross
<i>Arabis laevigata</i>	Smooth Rockcross
<i>Arabis lyrata</i>	Lyre-leaf Rockcross
<i>Aralia nudicaulis</i>	Wild Sarsaparilla
<i>Arethusa bulbosa</i>	Dragon's-Mouth
<i>Arisaema dracontium</i>	Green Dragon
<i>Arisaema triphyllum</i>	Jack-in-the-Pulpit
<i>Aristida dichotoma</i>	Forktip Three-awn
<i>Aristida oligantha</i>	Prairie Three-awn
<i>Aristida purpurascens</i>	Arrowfeather Three-awn
<i>Aristolochia macrophylla</i>	Pipevine
<i>Aristolochia serpentaria</i>	Turpentine-root
<i>Aruncus dioicus</i>	Bride's-Feathers
<i>Arundinaria</i>	Giant Cane
<i>Arundinaria gigantea</i>	Giant Cane
<i>Arundinaria gigantea</i> ssp. <i>gigantea</i>	Giant Cane
<i>Asarum canadense</i>	Wild Ginger
<i>Asclepias incarnata</i>	Swamp Milkweed
<i>Asclepias quadrifolia</i>	Four-leaf Milkweed
<i>Asclepias tuberosa</i>	Butterfly Milkweed



SCIENTIFIC NAME	COMMON NAME
<i>Asclepias variegata</i>	Red-ring Milkweed
<i>Asclepias viridiflora</i>	Green Comet Milkweed
<i>Asimina triloba</i>	Common Pawpaw
<i>Asplenium monanthes</i>	Single-sorus Spleenwort
<i>Asplenium montanum</i>	Mountain Spleenwort
<i>Asplenium platyneuron</i>	Ebony Spleenwort
<i>Asplenium resiliens</i>	Black-stem Spleenwort
<i>Asplenium rhizophyllum</i>	Walking Fern
<i>Asplenium trichomanes</i>	Maidenhair Spleenwort
<i>Asplenium trichomanes</i> ssp. <i>trichomanes</i>	Maidenhair Spleenwort
<i>Aster</i>	Aster
<i>Astilbe biternata</i>	Appalachian False Goat's-Beard
<i>Athyrium</i>	Lady Fern
<i>Athyrium filix-femina</i>	Lady Fern
<i>Athyrium filix-femina</i> ssp. <i>asplenioides</i>	Southern Lady Fern
<i>Atrichum oerstedianum</i>	
<i>Aulacomnium palustre</i>	moss
<i>Aureolaria laevigata</i>	Entire-leaf Yellow False Foxglove
<i>Bacopa monnieri</i>	Coastal Water-hyssop
<i>Baptisia tinctoria</i>	Honesty-weed
<i>Bazzania denudata</i>	liverwort
<i>Bazzania nudicaulis</i>	liverwort
<i>Bazzania trilobata</i>	liverwort
<i>Berberis canadensis</i>	American Barberry
<i>Berchemia scandens</i>	Supplejack
<i>Betula</i>	Birch
<i>Betula alleghaniensis</i>	Yellow Birch
<i>Betula lenta</i>	Sweet Birch
<i>Betula nigra</i>	River Birch
<i>Betula papyrifera</i>	Paper Birch
<i>Bidens</i>	Beggarticks
<i>Bignonia capreolata</i>	Crossvine
<i>Boehmeria cylindrica</i>	False Nettle
<i>Botrychium biternatum</i>	Sparse-lobe Grape Fern
<i>Botrychium virginianum</i>	Rattlesnake Fern
<i>Bouteloua curtipendula</i>	Sideoats Grama
<i>Boykinia aconitifolia</i>	Allegheny Brookfoam
<i>Brachyelytrum erectum</i>	Bearded Shorthusk
<i>Brachyelytrum septentrionale</i>	Northern Shorthusk
<i>Bromus pubescens</i>	Common Eastern Brome
<i>Bryoandersonia</i>	moss
<i>Bryocrumia vivicolor</i>	moss
<i>Buckleya distichophylla</i>	Piratebush
<i>Calamagrostis cainii</i>	Cain's Reedgrass
<i>Calamagrostis coarctata</i>	Nuttall's Reedgrass
<i>Calamagrostis porteri</i> ssp. <i>insperata</i>	Porter's Reedgrass
<i>Calopogon tuberosus</i>	Tuberous Grass-Pink
<i>Calycanthus floridus</i>	Sweet-shrub
<i>Campanula divaricata</i>	Appalachian Bellflower
<i>Campanulastrum americanum</i>	American-Bellflower
<i>Campsis radicans</i>	Trumpetvine
<i>Campylium</i>	moss
<i>Cardamine clematidis</i>	Small Mountain Bittercress

SCIENTIFIC NAME	COMMON NAME
<i>Cardamine parviflora</i> var. <i>arenicola</i>	Sand Bittercress
<i>Carex</i>	Sedge
<i>Carex aestivalis</i>	Summer Sedge
<i>Carex albicans</i> var. <i>albicans</i>	White-tinge Sedge
<i>Carex appalachica</i>	Appalachian Sedge
<i>Carex atlantica</i>	Prickly Bog Sedge
<i>Carex austrocaroliniana</i>	Tarheel Sedge
<i>Carex baileyi</i>	Bailey's Sedge
<i>Carex biltmoreana</i>	Biltmore Sedge
<i>Carex blanda</i>	Eastern Sedge
<i>Carex brunescens</i>	Brown Sedge
<i>Carex brunescens</i> ssp. <i>sphaerostachya</i>	Brown Sedge
<i>Carex communis</i>	Fibrous-root Sedge
<i>Carex crinita</i>	Fringed Sedge
<i>Carex debilis</i>	White-edge Sedge
<i>Carex debilis</i> var. <i>rudgei</i>	White-edge Sedge
<i>Carex digitalis</i>	Slender Wood Sedge
<i>Carex eburnea</i>	Bristleleaf Sedge
<i>Carex echinata</i>	Star Sedge
<i>Carex folliculata</i>	Northern Long Sedge
<i>Carex gracilescens</i>	Slender Loose-flower Sedge
<i>Carex gynandra</i>	Mountain Fringed Sedge
<i>Carex intumescens</i>	Bladder Sedge
<i>Carex laxiculmis</i>	Spreading Sedge
<i>Carex laxiflora</i>	Broad Loose-flower Sedge
<i>Carex laxiflora</i> var. <i>laxiflora</i>	Broad Loose-flower Sedge
<i>Carex leptalea</i>	Little Bog Sedge
<i>Carex leptoneuria</i>	Nerveless Woodland Sedge
<i>Carex lucorum</i>	Blue Ridge Sedge
<i>Carex lucorum</i> var. <i>austrolucorum</i>	Blue Ridge Sedge
<i>Carex lurida</i>	Sallow Sedge
<i>Carex manhartii</i>	Manhart's Sedge
<i>Carex misera</i>	Wretched Sedge
<i>Carex nigromarginata</i>	Black-edge Sedge
<i>Carex ouachitana</i>	Ouachita Sedge
<i>Carex pennsylvanica</i>	Pennsylvania Sedge
<i>Carex plantaginea</i>	Plantain-leaf Sedge
<i>Carex platyphylla</i>	Broadleaf Sedge
<i>Carex purpurifera</i>	Purple Sedge
<i>Carex retroflexa</i>	Reflexed Sedge
<i>Carex rostrata</i>	Swollen-beak Sedge
<i>Carex ruthii</i>	Ruth's Sedge
<i>Carex scabrata</i>	Eastern Rough Sedge
<i>Carex siccata</i>	Dry-spike Sedge
<i>Carex sparganioides</i>	Burr-Reed Sedge
<i>Carex stipata</i>	Stalk-grain Sedge
<i>Carex stricta</i>	Tussock Sedge
<i>Carex swanii</i>	Swan's Sedge
<i>Carex torta</i>	Twisted Sedge
<i>Carex trisperma</i>	Three-seed Sedge
<i>Carex woodii</i>	Pretty Sedge
<i>Carpinus caroliniana</i>	Ironwood
<i>Carpinus caroliniana</i> ssp. <i>caroliniana</i>	Ironwood

SCIENTIFIC NAME	COMMON NAME
<i>Carya</i>	Hickory
<i>Carya alba</i>	Mockernut Hickory
<i>Carya carolinae-septentrionalis</i>	Carolina Shagbark Hickory
<i>Carya cordiformis</i>	Bitternut Hickory
<i>Carya glabra</i>	Pignut Hickory
<i>Carya illinoensis</i>	Pecan
<i>Carya myristiciformis</i>	Nutmeg Hickory
<i>Carya ovalis</i>	Red Hickory
<i>Carya ovata</i>	Shagbark Hickory
<i>Carya pallida</i>	Sand Hickory
<i>Carya texana</i>	Black Hickory
<i>Castanea</i>	Chestnut
<i>Castanea dentata</i>	American Chestnut
<i>Castanea pumila</i>	Allegheny-Chinkapin
<i>Catalpa bignonioides</i>	Southern Catalpa
<i>Caulophyllum thalictroides</i>	Blue Cohosh
<i>Ceanothus americanus</i>	New Jersey-tea
<i>Celtis laevigata</i>	Sugarberry
<i>Celtis laevigata</i> var. <i>laevigata</i>	Sugarberry
<i>Celtis occidentalis</i>	Northern Hackberry
<i>Celtis tenuifolia</i>	Georgia Hackberry
<i>Cercis canadensis</i>	Redbud
<i>Cercis canadensis</i> var. <i>canadensis</i>	Redbud
<i>Chamaelirium luteum</i>	Fairywand
<i>Chasmanthium latifolium</i>	River-oats
<i>Chasmanthium laxum</i>	Slender Spikegrass
<i>Chasmanthium sessiliflorum</i>	Longleaf Spikegrass
<i>Cheilanthes lanosa</i>	Hairy Lipfern
<i>Chelone cuthbertii</i>	Cuthbert's Turtlehead
<i>Chelone glabra</i>	White Turtlehead
<i>Chelone lyonii</i>	Pink Turtlehead
<i>Chimaphila maculata</i>	Striped Wintergreen
<i>Chionanthus virginicus</i>	White Fringetree
<i>Chrysosplenium americanum</i>	Golden-saxifrage
<i>Cicuta maculata</i>	Southern Poison-hemlock
<i>Cinna latifolia</i>	Slender Woodreed
<i>Circaea alpina</i>	Alpine Enchanter's-nightshade
<i>Circaea alpina</i> ssp. <i>alpina</i>	Alpine Enchanter's-nightshade
<i>Circaea lutetiana</i> ssp. <i>canadensis</i>	Broadleaf Enchanter's-nightshade
<i>Cladina rangiferina</i>	Reindeer Lichen
<i>Cladina subtenuis</i>	Reindeer Lichen
<i>Cladonia</i>	Reindeer Lichen
<i>Claytonia caroliniana</i>	Carolina Springbeauty
<i>Claytonia virginica</i>	Virginia Springbeauty
<i>Clematis occidentalis</i>	Mountain Clematis
<i>Clethra acuminata</i>	Mountain Sweet-pepperbush
<i>Clintonia borealis</i>	Yellow Bluebead-Lily
<i>Clintonia umbellulata</i>	White Bluebead-Lily
<i>Clitoria mariana</i>	Atlantic Pigeonwings
<i>Cocculus carolinus</i>	Carolina Coralbead
<i>Collinsonia canadensis</i>	Richweed
<i>Collinsonia verticillata</i>	Stoneroot
<i>Commelina virginica</i>	Swamp Dayflower
<i>Comptonia peregrina</i>	Sweetfern
<i>Conioselinum chinense</i>	Chinese Hemlock-Parsley

SCIENTIFIC NAME	COMMON NAME
<i>Conocephalum conicum</i>	liverwort
<i>Conopholis americana</i>	American Squawroot
<i>Conyza canadensis</i>	Canada Horseweed
<i>Coptis trifolia</i>	Three-leaf Goldthread
<i>Coreopsis major</i>	Greater Tickseed
<i>Coreopsis pubescens</i>	Star Tickseed
<i>Coreopsis tripteris</i>	Tall Coreopsis
<i>Cornus alternifolia</i>	Alternate-leaf Dogwood
<i>Cornus amomum</i>	Silky Dogwood
<i>Cornus canadensis</i>	Canadian Bunchberry
<i>Cornus drummondii</i>	Roughleaf Dogwood
<i>Cornus florida</i>	Flowering Dogwood
<i>Cornus foemina</i>	Stiff Dogwood
<i>Corylus americana</i>	American Hazelnut
<i>Corylus cornuta</i>	Beaked Hazelnut
<i>Crataegus</i>	Hawthorn
<i>Crataegus flabellata</i>	Fan-Leaf Hawthorn
<i>Crataegus punctata</i>	Dotted Hawthorn
<i>Crataegus uniflora</i>	Dwarf Hawthorn
<i>Cronartium ribicola</i>	White Pine Blister Rust
<i>Cryphonectria parasitica</i>	fungus
<i>Cryptococcus fagisuga</i>	Beech Scale Insect
<i>Cunila organoides</i>	Rock Oregano
<i>Cuscuta gronovii</i>	Scaldweed
<i>Cymophyllus fraserianus</i>	Fraser's Sedge
<i>Cyperus</i>	Flat Sedge
<i>Cypripedium acaule</i>	Pink Lady's-Slipper
<i>Cypripedium arietinum</i>	Ram-head Lady's-Slipper
<i>Cypripedium parviflorum</i> var. <i>pubescens</i>	Lesser Yellow Lady's-Slipper
<i>Cypripedium reginae</i>	Showy Lady's-Slipper
<i>Cystopteris</i>	Bladder Fern
<i>Cystopteris bulbifera</i>	Bulblet Bladderfern
<i>Cystopteris protrusa</i>	Lowland Bladderfern
<i>Dalibarda repens</i>	Robin-Run-Away
<i>Danthonia compressa</i>	Mountain Oatgrass
<i>Danthonia sericea</i>	Silky Oatgrass
<i>Danthonia spicata</i>	Poverty Oatgrass
<i>Decumaria barbara</i>	Woodvamp
<i>Delphinium tricorne</i>	Dwarf Larkspur
<i>Dendroctonus frontalis</i>	Southern Pine Beetle
<i>Dennstaedtia punctilobula</i>	Hay-scented Fern
<i>Deparia acrostichoides</i>	Silvery-Spleenwort
<i>Deschampsia flexuosa</i>	Wavy Hairgrass
<i>Desmodium</i>	Tick-Trefoil
<i>Desmodium glutinosum</i>	Large Tick-trefoil
<i>Desmodium nudiflorum</i>	Naked-stem Tick-trefoil
<i>Desmodium nuttallii</i>	Nuttall's Tick-trefoil
<i>Desmodium pauciflorum</i>	Few-flower Tick-trefoil
<i>Desmodium rotundifolium</i>	Prostrate Tick-trefoil
<i>Dicentra canadensis</i>	Squirrel-Com
<i>Dicentra cucullaria</i>	Dutchman's-Breeches
<i>Dicentra eximia</i>	Appalachian Bleeding Heart
<i>Dichanthelium</i>	Rosette Grass
<i>Dichanthelium acuminatum</i>	Tapered Rosette Grass

SCIENTIFIC NAME	COMMON NAME
Dichanthelium boscii	Bosc's Panicgrass
Dichanthelium clandestinum	Deer-Tongue Rosette Grass
Dichanthelium commutatum	Variable Rosette Grass
Dichanthelium dichotomum	Witchgrass
Dichanthelium dichotomum var. dichotomum	Witchgrass
Dichanthelium laxiflorum	Open-Flower Rosette Grass
Dichanthelium linearifolium	Slim-Leaf Rosette Grass
Dichanthelium scoparium	Broom Witchgrass
Dichanthelium sphaerocarpon	Round-fruit Witchgrass
Dichodontium pellucidum	moss
Dicranum	moss
Dicranum fuscescens	moss
Dicranum scoparium	moss
Diervilla lonicera	Bush-Honeysuckle
Diervilla sessilifolia	Southern Bush-Honeysuckle
Diodia teres	Rough Buttonweed
Dioscorea oppositifolia	Chinese Yam
Dioscorea quaternata	Four-leaf Yam
Dioscorea villosa	Wild Yam
Diospyros virginiana	Eastern Persimmon
Diphylleia cymosa	Umbrella-leaf
Diplazium pycnocarpon	Glade Fern
Dirca palustris	Leatherwood
Dodecatheon meadia	Pride-of-Ohio
Doellingeria umbellata	Parasol White-top
Draba ramosissima	Branched Whitlow-grass
Dryopteris	Wood Fern
Dryopteris campyloptera	Mountain Woodfern
Dryopteris carthusiana	Spinulose Woodfern
Dryopteris goldiana	Goldie's Wood Fern
Dryopteris intermedia	Fancy Fern
Dryopteris marginalis	Marginal Woodfern
Eclipta prostrata	False Daisy
Eleocharis geniculata	Capitate Spikerush
Eleocharis montevidensis	Sand Spikerush
Elymus hystrix	Eastern Bottle-brush Grass
Elymus virginicus	Virginia Wild Rye
Endothia parasitica	fungus
Epifagus virginiana	Beechdrops
Epigaea repens	Trailing-Arbutus
Equisetum arvense	Field Horsetail
Erechtites hieraciifolia	American Burnweed
Erigeron pulchellus	Robin's-Plantain
Erigeron pulchellus var. pulchellus	Robin's-Plantain
Eriophorum virginicum	Tawny Cottongrass
Erythronium americanum	Trout-lily
Erythronium umbilicatum ssp. monostolum	Dimpled Trout-lily
Erythronium umbilicatum ssp. umbilicatum	Dimpled Trout-lily
Euonymus americana	American Strawberry-bush
Euonymus obovata	Running Strawberry-bush
Eupatorium	Boneset, Joe-pyeweed, Thoroughwort
Eupatorium album	White Thoroughwort

SCIENTIFIC NAME	COMMON NAME
Eupatorium fistulosum	Trumpetweed
Eupatorium perfoliatum	Common Boneset
Eupatorium purpureum	Purple Joe-pyeweed
Eupatorium serotinum	Late Thoroughwort
Eupatorium sessilifolium	Upland Boneset
Euphorbia corollata	Flowering Spurge
Euphorbia purpurea	Darlington's Glade Spurge
Eurybia chlorolepis	Appalachian Heartleaf Aster
Eurybia divaricata	White Wood-Aster
Eurybia macrophylla	Large-Leaf Wood-Aster
Eurybia surculosa	Creeping Aster
Fagus	Beech
Fagus grandifolia	American Beech
Festuca	Fescue
Festuca subverticillata	Nodding Fescue
Fissidens	moss
Fissidens osmundioides	moss
Flakea papillosa	Flakea
Forestiera ligustrina	Glade-privet
Fothergilla major	Mountain Witch-Alder
Fragaria virginiana	Virginia Strawberry
Frangula caroliniana	Carolina Buckthorn
Fraxinus	Ash
Fraxinus americana	White Ash
Fraxinus pennsylvanica	Green Ash
Fraxinus quadrangulata	Blue Ash
Fuirena simplex	Western Umbrella Sedge
Galactia volubilis	Downy Milk-Pea
Galax urceolata	Galax
Galearis spectabilis	Showy Orchid
Galium	Bedstraw
Galium aparine	Sticky-Willy
Galium boreale	Northern Bedstraw
Galium circaezans	Licorice Bedstraw
Galium latifolium	Purple Bedstraw
Galium triflorum	Sweet-scented Bedstraw
Gaultheria procumbens	Wintergreen
Gaylussacia	Huckleberry
Gaylussacia baccata	Black Huckleberry
Gaylussacia dumosa	Dwarf Huckleberry
Gaylussacia frondosa	Dangleberry
Gaylussacia ursina	Bear Huckleberry
Gelsemium sempervirens	Carolina Jessamine
Gentiana austromontana	Appalachian Gentian
Gentiana decora	Showy Gentian
Gentiana linearis	Narrow-Leaf Gentian
Gentianella quinquefolia	Agueweed
Geranium carolinianum	Carolina Crane's-Bill
Geranium maculatum	Wild Geranium
Geum	Avens
Geum geniculatum	Bent Avens
Geum radiatum	Appalachian Avens
Gleditsia triacanthos	Honey-locust
Glyceria melicaria	Melic Manna Grass
Glyceria striata	Fowl Mannagrass

SCIENTIFIC NAME	COMMON NAME
Goodyera pubescens	Downy Rattlesnake-Plantain
Goodyera repens	Dwarf Rattlesnake-Plantain
Grammitis nimbata	West Indian Dwarf-Polypody
Gratiola brevifolia	Shortleaf Hedge-hyssop
Gymnocarpium appalachianum	Appalachian Oak Fern
Halesia tetraptera	Mountain Silverbell
Halesia tetraptera var. monticola	Mountain Silverbell
Halesia tetraptera var. tetraptera	Mountain Silverbell
Hamamelis virginiana	Witch-hazel
Helenium autumnale	Autumn Sneezeweed
Helianthus	Sunflower
Helianthus decapetalus	Thin-leaf Sunflower
Helianthus divaricatus	Spreading Sunflower
Helianthus hirsutus	Whiskered Sunflower
Helianthus microcephalus	Small Woodland Sunflower
Hepatica nobilis var. acuta	Sharp-lobe Liverleaf
Hepatica nobilis var. obtusa	Round-lobe Liverleaf
Heuchera	Alumroot
Heuchera americana	Common Alumroot
Heuchera americana var. americana	Common Alumroot
Heuchera americana var. hirsuticaulis	Midwestern Alumroot
Heuchera americana var. hispida	Common Alumroot
Heuchera caroliniana	Carolina Alumroot
Heuchera parviflora	Cave Alumroot
Heuchera parviflora var. parviflora	Cave Alumroot
Heuchera pubescens	Downy Alumroot
Heuchera villosa	Rock Alumroot
Heuchera villosa var. arkansana	Ozark Crag-jangle
Heuchera villosa var. villosa	Rock Alumroot
Hexastylis	Heartleaf
Hexastylis arifolia	Arrowleaf Heartleaf
Hexastylis arifolia var. ruthii	Appalachian Arrowleaf Heartleaf
Hexastylis minor	Little Heartleaf
Hexastylis shuttleworthii	Large-flower Heartleaf
Hexastylis virginica	Virginia Heartleaf
Hieracium caespitosum	Meadow Hawkweed
Hieracium gronovii	Queendevil
Hieracium scabrum	Rough Hawkweed
Hieracium venosum	Rattlesnake-weed
Hookeria acutifolia	moss
Houstonia longifolia	Longleaf Summer Bluet
Houstonia longifolia var. glabra	Longleaf Summer Bluet
Houstonia purpurea	Venus'-Pride
Houstonia purpurea var. montana	Venus'-Pride
Houstonia serpyllifolia	Appalachian Bluet
Huperzia appalachiana	Appalachian Club-Moss
Huperzia lucidula	Shining Club-Moss
Huperzia porophila	Rock Club-Moss
Hybanthus concolor	Green-violet
Hydrangea	Hydrangea
Hydrangea arborescens	Smooth Hydrangea
Hydrangea cinerea	Ashy Hydrangea
Hydrangea radiata	Silver-Leaf Hydrangea
Hydrocotyle americana	American Marsh -Pennywort

SCIENTIFIC NAME	COMMON NAME
Hydrophyllum canadense	Mapleleaf Waterleaf
Hydrophyllum virginianum	Shawnee-Salad
Hylacomiastrum umbratum	
Hylocomium splendens	moss
Hybotelephium telephioides	Appalachian Live-forever
Hymenocallis caroliniana	Rocky-shoal Spiderlily
Hymenophyllum tayloriae	Taylor's Filmy Fern
Hyophila involuta	moss
Hypericum densiflorum	Bushy St. John's-wort
Hypericum frondosum	Golden St. John's-wort
Hypericum gentianoides	Pineweed
Hypericum hypericoides	St. Andrew's-Cross
Hypericum hypericoides ssp. multicaule	St. Andrew's-Cross
Hypericum mitchellianum	Blue Ridge St. John's-Wort
Hypericum mutilum	Dwarf St. John's-Wort
Hypericum prolificum	Shrubby St. John's-wort
Hypericum punctatum	Spotted St. John's-Wort
Hypnum	
Hypotrachyna virginica	
Hypoxis hirsuta	Eastern Yellow Stargrass
Ilex collina	Hill Holly
Ilex longipes	Georgia Holly
Ilex montana	Mountain Holly
Ilex opaca	American Holly
Ilex opaca var. opaca	American Holly
Ilex verticillata	Winterberry
Impatiens capensis	Orange Jewelweed
Impatiens pallida	Yellow Jewelweed
Ionactis linariifolius	Stiff Aster
Ipomoea pandurata	Man-of-the-Earth
Iris cristata	Dwarf Crested Iris
Iris verna	Dwarf Violet Iris
Iris verna var. smalliana	Upland Dwarf Iris
Isopterygium distichaceum	moss
Itea virginica	Virginia-willow
Juglans cinerea	Butternut
Juglans nigra	Black Walnut
Juncus coriaceus	Tough Rush
Juncus effusus	Soft Rush
Juncus effusus var. pylaei	Soft Rush
Juncus effusus var. solutus	Soft Rush
Juncus gymnocarpus	Naked-fruit Rush
Juncus marginatus	Grassleaf Rush
Juncus subcaudatus	Woodland Rush
Juncus trifidus	Highland Rush
Juniperus	Juniper
Juniperus virginiana	Eastern Red-cedar
Juniperus virginiana var. virginiana	Eastern Red-cedar
Justicia	Water-willow
Justicia americana	Common Water-willow
Kalmia carolina	Southern Sheepkill
Kalmia latifolia	Mountain Laurel
Krigia biflora	Two-flower Dwarf-Dandelion
Krigia montana	Mountain Cynthia

SCIENTIFIC NAME	COMMON NAME
Laportea canadensis	Wood Nettle
Lasallia papulosa	lichen
Lechea racemulosa	Oblong-Fruit Pinweed
Leersia	Cut Grass
Leersia oryzoides	Rice Cutgrass
Leersia virginica	White Cutgrass
Leiophyllum buxifolium	Sand-myrtle
Lemna minor	Lesser Duckweed
Leptodontium excelsum	
Lespedeza	Bushclover
Lespedeza violacea	Violet Bushclover
Lespedeza virginica	Slender Bushclover
Leucothoe fontanesiana	Mountain Doghobble
Leucothoe racemosa	Swamp Doghobble
Leucothoe recurva	Red-twig Doghobble
Liatis	Gayfeather
Liatis aspera	Rough Blazingstar
Liatis microcephala	Small-head Blazingstar
Liatis scariosa	Devil's-Bite
Liatis turgida	Turgid Gayfeather
Ligustrum japonicum	Japanese Privet
Lilium grayi	Gray's Lily
Lilium superbum	Turk's-Cap Lily
Lindera benzoin	Northern Spicebush
Lindera benzoin var. benzoin	Northern Spicebush
Linnaea borealis	American Twinflower
Linum striatum	Ridged Yellow Flax
Liquidambar styraciflua	Sweetgum
Liriodendron	Tuliptree
Liriodendron tulipifera	Tuliptree
Listera smallii	Kidney-leaf Twayblade
Lithospermum canescens	Hoary Puccoon
Lobelia cardinalis	Cardinal-Flower
Lobelia puberula	Downy Lobelia
Lobelia siphilitica	Great Blue Lobelia
Lolium	Rye Grass
Lolium arundinaceum	Tall Fescue
Lolium pratense	Meadow Fescue
Lonicera canadensis	Fly Honeysuckle
Lonicera dioica	Limber Honeysuckle
Lonicera flava	Yellow Honeysuckle
Lonicera japonica	Japanese Honeysuckle
Ludwigia alternifolia	Seedbox
Ludwigia palustris	Marsh Primrose-Willow
Luzula acuminata	Hairy Wood-Rush
Lycopodium	Ground-Pine
Lycopodium clavatum	Staghorn Clubmoss
Lycopodium dendroideum	Tree Clubmoss
Lycopodium digitatum	Fan Ground-Pine
Lycopodium obscurum	Princess-Pine
Lycopus	Water-Horehound
Lycopus uniflorus	Northern Water-Horehound
Lycopus virginicus	Virginia Water-horehound
Lymantria dispar	Gypsy Moth
Lyonia ligustrina	Maleberry

SCIENTIFIC NAME	COMMON NAME
Lyonia ligustrina var. ligustrina	Maleberry
Lysimachia quadrifolia	Whorled Loosestrife
Lysimachia terrestris	Swamp-candles
Magnolia	Cucumber-Tree, Magnolia
Magnolia acuminata	Cucumber-tree
Magnolia fraseri	Fraser Magnolia
Magnolia macrophylla	Bigleaf Magnolia
Magnolia tripetala	Umbrella Magnolia
Maianthemum canadense	Wild Lily-of-the-Valley
Maianthemum racemosum	Solomon's Plume
Maianthemum racemosum ssp. racemosum	Solomon's Plume
Maianthemum stellatum	Starflower False Solomon's-seal
Manfreda virginica	Eastern Agave
Medeola virginiana	Indian Cucumber-root
Melampyrum lineare	American Cow-Wheat
Melanthium latifolium	Slender Bunchflower
Melanthium parviflorum	Appalachian Bunchflower
Melanthium virginicum	Virginia Bunchflower
Melica mutica	Two-flower Melicgrass
Menispermum canadense	Canadian Moonseed
Menziesia pilosa	Minniebush
Mertensia virginica	Virginia Bluebells
Microstegium vimineum	Nepalese Browntop
Mikania scandens	Climbing Hempvine
Mimosa microphylla	Little-Leaf Mimosa
Mimulus ringens	Allegheny Monkey-Flower
Minuartia cumberlandensis	Cumberland Stitchwort
Minuartia glabra	Smooth Sandwort
Minuartia groenlandica	Greenland Stitchwort
Minuartia pat ula	Pitcher's Stitchwort
Mitchella repens	Partridgeberry
Mitella diphylla	Two-leaf Bishop's-Cap
Mitella nuda	Bare-stem Bishop's-Cap
Mnium affine	moss
Mnium marginatum	moss
Monarda clinopodia	White Bergamot
Monarda didyma	Beebalm
Monarda fistulosa	Oswego-Tea
Monotropa uniflora	One-Flower Indian-Pipe
Morus rubra	Red Mulberry
Muhlenbergia capillaris	Hair-awn Muhly
Muhlenbergia sobolifera	Rock Muhly
Muhlenbergia tenuiflora	Slender Muhly
Muhlenbergia tenuifolia	Slim-Flower Muhly
Nectria coccinea var. faginata	fungus
Nyssa sylvatica	Blackgum
Oclemena acuminata	Whorled Wood Aster
Oligoneuron album	Prairie Goldenrod
Oncophorus raii	moss
Onoclea sensibilis	Sensitive Fern
Opuntia humifusa	Eastern Prickly-pear
Orontium aquaticum	Golden Club
Osmorhiza claytonii	Blank Sweet-cicely
Osmunda	Royal Fern species

SCIENTIFIC NAME	COMMON NAME
<i>Osmunda cinnamomea</i>	Cinnamon Fern
<i>Osmunda claytoniana</i>	Interrupted Fern
<i>Osmunda regalis</i>	Royal Fern
<i>Osmunda regalis</i> var. <i>spectabilis</i>	Royal Fern
<i>Ostrya</i>	Hop-Hornbeam
<i>Ostrya virginiana</i>	Eastern Hop-hornbeam
<i>Oxalis grandis</i>	Great Yellow Wood-Sorrel
<i>Oxalis montana</i>	Common Wood Sorrel
<i>Oxydendrum arboreum</i>	Sourwood
<i>Oxypolis rigidior</i>	Common Water-dropwort
<i>Pachysandra procumbens</i>	Mountain-Spurge
<i>Packera anonyma</i>	Small's Groundsel
<i>Packera aurea</i>	Golden Groundsel
<i>Packera millefolia</i>	Piedmont Groundsel
<i>Packera obovata</i>	Round-leaf Groundsel
<i>Packera plattensis</i>	Prairie Ragwort
<i>Packera schweinitziana</i>	Schweinitz's Groundsel
<i>Panicum</i>	Panic Grass
<i>Parnassia asarifolia</i>	Kidneyleaf Grass-of-Parnassus
<i>Paronychia argyrocoma</i>	Silverling
<i>Parthenium integrifolium</i>	Wild Quinine
<i>Parthenocissus quinquefolia</i>	Virginia Creeper
<i>Paspalum laeve</i>	Field Crown Grass
<i>Pellaea</i>	Cliffbrake
<i>Pellaea atropurpurea</i>	Purple Cliffbrake
<i>Pellia epiphylla</i>	liverwort
<i>Pellia neesiana</i>	liverwort
<i>Penstemon</i>	Beardtongue
<i>Penstemon canescens</i>	Eastern Gray Beardtongue
<i>Phacelia bipinnatifida</i>	Fern-Leaf Scorpion-Weed
<i>Phacelia dubia</i>	Small-flower Scorpionweed
<i>Phacelia fimbriata</i>	Fringed Scorpion-Weed
<i>Phegopteris connectilis</i>	Narrow Beech Fern
<i>Phegopteris hexagonoptera</i>	Broad Beech Fern
<i>Philadelphus</i>	Mock Orange
<i>Philadelphus hirsutus</i>	Hairy Mock-orange
<i>Philadelphus inodorus</i>	Scentless Mock Orange
<i>Philadelphus pubescens</i>	Hoary Mock Orange
<i>Phleum pratense</i>	Timothy
<i>Phlox amoena</i>	Hairy Phlox
<i>Phlox nivalis</i> ssp. <i>hantzii</i>	Trailing Phlox
<i>Phlox stolonifera</i>	Creeping Phlox
<i>Phlox subulata</i> ssp. <i>brittonii</i>	Moss Phlox
<i>Photinia melanocarpa</i>	Black Chokeberry
<i>Photinia pyrifolia</i>	Red Chokeberry
<i>Phryma leptostachya</i>	American Lopseed
<i>Physocarpus opulifolius</i>	Eastern Ninebark
<i>Phytolacca americana</i>	American Pokeweed
<i>Picea</i>	Spruce
<i>Picea glauca</i>	White Spruce
<i>Picea mariana</i>	Black Spruce
<i>Picea rubens</i>	Red Spruce
<i>Picoides borealis</i>	Red-cockaded Woodpecker
<i>Pieris floribunda</i>	Mountain Fetterbush
<i>Pilea pumila</i>	Canadian Clearweed

SCIENTIFIC NAME	COMMON NAME
<i>Pinguicula</i>	Butterwort
<i>Pinguicula vulgaris</i>	Common Butterwort
<i>Pinus</i>	Pine
<i>Pinus banksiana</i>	Jack Pine
<i>Pinus echinata</i>	Shortleaf Pine
<i>Pinus palustris</i>	Longleaf Pine
<i>Pinus pungens</i>	Table Mountain Pine
<i>Pinus resinosa</i>	Red Pine
<i>Pinus rigida</i>	Pitch Pine
<i>Pinus strobus</i>	Eastern White Pine
<i>Pinus taeda</i>	Loblolly Pine
<i>Pinus virginiana</i>	Virginia Pine
<i>Piptochaetium avenaceum</i>	Eastern Speargrass
<i>Pityopsis graminifolia</i>	Narrow-leaf Silk-grass
<i>Pityopsis graminifolia</i> var. <i>latifolia</i>	Common Goldenaster
<i>Pityopsis ruthii</i>	Ruth's Goldenaster
<i>Plagiochila</i>	liverwort
<i>Plagiochila austini</i>	liverwort
<i>Plagiochila austinii</i>	liverwort
<i>Plagiochila caduciloba</i>	liverwort
<i>Plagiochila sharpii</i>	liverwort
<i>Plagiochila sharpii</i> ssp. <i>sharpii</i>	liverwort
<i>Plagiochila sullivantii</i>	liverwort
<i>Plagiomnium</i>	moss
<i>Plagiomnium affine</i>	moss
<i>Plagiomnium carolinianum</i>	moss
<i>Plagiomnium ciliare</i>	moss
<i>Planera aquatica</i>	Planertree
<i>Plantago virginica</i>	Pale-seed Plantain
<i>Platanthera clavellata</i>	Small Green Wood Orchid
<i>Platanthera grandiflora</i>	Greater Purple Fringed Orchid
<i>Platanthera integrilabia</i>	White Fringeless Orchid
<i>Platanus</i>	Planetree, Sycamore
<i>Platanus occidentalis</i>	Sycamore
<i>Pleopeltis polypodioides</i> ssp. <i>michauxiana</i>	Resurrection Fern
<i>Poa alsodes</i>	Grove Blue Grass
<i>Poa cuspidata</i>	Early Blue Grass
<i>Poa paludigena</i>	Bog Blue Grass
<i>Poa saltuensis</i>	Old-Pasture Blue Grass
<i>Podophyllum peltatum</i>	May-apple
<i>Podostemum ceratophyllum</i>	Riverweed
<i>Polygala paucifolia</i>	Gaywings
<i>Polygala senega</i>	Seneca-Snakeroot
<i>Polygonatum biflorum</i>	King Solomon's-Seal
<i>Polygonatum pubescens</i>	Hairy Solomon's-Seal
<i>Polygonum</i>	Knotweed, Smartweed, Tearthumb
<i>Polygonum cuspidatum</i>	Japanese Knotweed
<i>Polygonum punctatum</i>	Dotted Smartweed
<i>Polygonum sagittatum</i>	Arrow-Leaf Tearthumb
<i>Polygonum scandens</i>	Climbing False Buckwheat
<i>Polygonum tenue</i>	Pleat-Leaf Knotweed
<i>Polymnia canadensis</i>	Canada Leafcup
<i>Polypodium appalachianum</i>	Appalachian Rockcap Fern
<i>Polypodium virginianum</i>	Rock Polypody

SCIENTIFIC NAME	COMMON NAME
Polystichum acrostichoides	Christmas Fern
Polytrichum commune	moss
Polytrichum ohioense	moss
Populus deltoides	Eastern Cottonwood
Populus tremuloides	Quaking Aspen
Porteranthus stipulatus	Indian-Physic
Potentilla canadensis	Dwarf Cinquefoil
Potentilla simplex	Oldfield Cinquefoil
Prenanthes	Rattlesnake-root
Prenanthes altissima	Tall Rattlesnake-root
Prenanthes roanensis	Roan Mountain Rattlesnake-Root
Primula laurentiana	Bird-eye Primrose
Prosartes lanuginosa	Yellow Fairybells
Prosartes maculata	Yellow-Mandarin
Prunella vulgaris	Common Selfheal
Prunus angustifolia	Chickasaw Plum
Prunus pensylvanica	Pin Cherry
Prunus serotina	Black Cherry
Prunus serotina var. serotina	Black Cherry
Pseudotaxiphyllum distichaceum	moss
Ptelea trifoliata	Hop-tree
Pteridium aquilinum	Northern Bracken
Pteridium aquilinum var. latiusculum	Northern Bracken
Ptilium crista-castrensis	moss
Pueraria montana var. lobata	Kudzu
Pycnanthemum	Mountain -mint
Pycnanthemum incanum	Hoary Mountain -mint
Pycnanthemum montanum	Thin -leaf Mountain -mint
Pycnanthemum tenuifolium	Narrowleaf Mountain -mint
Pyrularia pubera	Buffalo-nut
Quercus	Oak
Quercus alba	White Oak
Quercus coccinea	Scarlet Oak
Quercus ellipsoidalis	Northern Pin Oak
Quercus falcata	Southern Red Oak
Quercus ilicifolia	Bear Oak
Quercus incana	Bluejack Oak
Quercus laevis	Turkey Oak
Quercus macrocarpa	Bur Oak
Quercus margarettiae	Sand Post Oak
Quercus marilandica	Blackjack Oak
Quercus muehlenbergii	Chinquapin Oak
Quercus nigra	Water Oak
Quercus phellos	Willow Oak
Quercus prinus	Rock Chestnut Oak
Quercus rubra	Northern Red Oak
Quercus rubra var. rubra	Northern Red Oak
Quercus shumardii	Shumard Oak
Quercus sinuata var. sinuata	Durand Oak
Quercus stellata	Post Oak
Quercus velutina	Black Oak
Radula	liverwort
Ranunculus acris	Tall Buttercup
Ranunculus recurvatus	Blisterwort

SCIENTIFIC NAME	COMMON NAME
Rhizomnium appalachianum	moss
Rhododendron	Azalea, Rhododendron
Rhododendron alabamense	Alabama Azalea
Rhododendron arborescens	Smooth Azalea
Rhododendron calendulaceum	Flame Azalea
Rhododendron canescens	Wild Azalea
Rhododendron carolinianum	Carolina Rhododendron
Rhododendron catawbiense	Catawba Rhododendron
Rhododendron maximum	Great Rhododendron
Rhododendron minus	Foothills Rhododendron
Rhododendron periclymenoides	Pink Azalea
Rhododendron viscosum	Swamp Azalea
Rhus aromatica	Fragrant Sumac
Rhus aromatica var. aromatica	Fragrant Sumac
Rhus copallinum	Winged Sumac
Rhus copallinum var. latifolia	Winged Sumac
Rhus glabra	Smooth Sumac
Rhus typhina	Staghorn Sumac
Rhynchospora alba	Northern White Beaksedge
Rhynchospora capitellata	Northern Beaksedge
Rhytidadelphus triquetrus	
Ribes	Currant, Gooseberry
Ribes cynosbati	Eastern Prickly Gooseberry
Ribes glandulosum	Skunk Currant
Ribes rotundifolium	Appalachian Gooseberry
Riccardia multifida	liverwort
Robinia hispida	Bristly Locust
Robinia pseudoacacia	Black Locust
Rosa carolina	Carolina Rose
Rosa palustris	Swamp Rose
Rubus	Blackberry, Dewberry, Raspberry
Rubus allegheniensis	Allegheny Blackberry
Rubus argutus	Southern Blackberry
Rubus canadensis	Smooth Blackberry
Rubus hispidus	Bristly Dewberry
Rubus idaeus	Red Raspberry
Rubus idaeus ssp. strigosus	Red Raspberry
Rubus pubescens	Dewberry
Rudbeckia laciniata	Green-head Coneflower
Rudbeckia laciniata var. humilis	Appalachian Black-eyed-Susan
Rudbeckia triloba	Brown-eyed-Susan
Ruellia caroliniensis	Carolina Wild Petunia
Ruellia humilis	Low Wild Petunia
Rugelia nudicaulis	Rugel's-Indian -Plantain
Rumex	Dock, Sorrel
Rumex acetosella	Sheep-sorrel
Sagittaria latifolia	Broadleaf Arrowhead
Salix humilis	Prairie Willow
Salix interior	Sandbar Willow
Salix nigra	Black Willow
Salix sericea	Silky Willow
Sambucus	Elder
Sambucus racemosa	European Red Elder
Sambucus racemosa var. racemosa	European Red Elder
Sanguinaria canadensis	Bloodroot

SCIENTIFIC NAME	COMMON NAME
Sanguisorba canadensis	Canada Burnet
Sanicula	Black-Snakeroot
Sanicula canadensis	Canadian Black-Snakeroot
Sanicula odorata	Clustered Black-Snakeroot
Sanicula trifoliata	Large-fruit Black-Snakeroot
Sarracenia purpurea	Purple Pitcherplant
Sassafras albidum	Sassafras
Saururus cernuus	Lizard's-tail
Saxifraga	Saxifrage
Saxifraga careyana	Golden-Eye Saxifrage
Saxifraga caroliniana	Carolina Saxifrage
Saxifraga michauxii	Cliff Saxifrage
Saxifraga micranthidifolia	Branch-lettuce
Saxifraga oppositifolia	Purple Mountain Saxifrage
Saxifraga virginensis	Early Saxifrage
Schizachne purpurascens	False Melic Grass
Schizachyrium scoparium	Little Bluestem
Schoenoplectus	Club-Rush
Schoenoplectus americanus	Chairmaker's Bulrush
Schoenoplectus pungens	Threesquare
Scirpus	Bulrush
Scirpus atrovirens	Dark-green Bulrush
Scirpus cyperinus	Woolgrass Bulrush
Scirpus expansus	Woodland Bulrush
Scirpus polyphyllus	Leafy Bulrush
Scleria oligantha	Little-head Nutrush
Scutellaria elliptica	Hairy Skullcap
Scutellaria lateriflora	Mad Dog Skullcap
Scutellaria ovata	Heart-leaf Skullcap
Sedum glaucophyllum	Cliff Stonecrop
Sedum nevii	Nevius' Stonecrop
Sedum ternatum	Woodland Stonecrop
Selaginella rupestris	Rock Spikemoss
Senna marilandica	Maryland Wild Sensitive-Plant
Sericocarpus asteroides	Toothed White-Top-Aster
Sibbaldiopsis tridentata	Mountain-Cinquefoil
Sideroxylon lycioides	Buckthorn Bumelia
Silene rotundifolia	Sandstone Fire-pink
Silene stellata	Widow's-Frill
Silphium compositum	Kidney-leaf Rosinweed
Silphium terebinthinaceum	Prairie-dock
Silphium trifoliatum	Threeleaf Rosinweed
Smallanthus uvedaluis	Bear's-Foot
Smilax	Carrion-flower, Greenbrier
Smilax bona-nox	Fringed Greenbrier
Smilax glauca	Whiteleaf Greenbrier
Smilax herbacea	Smooth Carrion-Flower
Smilax rotundifolia	Common Greenbrier
Solidago	Goldenrod
Solidago albopilosa	Rockhouse Goldenrod
Solidago arguta	Atlantic Goldenrod
Solidago arguta var. harrisii	Atlantic Goldenrod
Solidago bicolor	White Goldenrod
Solidago caesia	Wreath Goldenrod
Solidago curtisii	Curtis' Goldenrod

SCIENTIFIC NAME	COMMON NAME
Solidago erecta	Slender Goldenrod
Solidago flexicaulis	Zigzag Goldenrod
Solidago glomerata	Skunk Goldenrod
Solidago juncea	Early Goldenrod
Solidago nemoralis	Gray Goldenrod
Solidago odora	Anise-scented Goldenrod
Solidago odora var. odora	Anise-scented Goldenrod
Solidago patula	Roughleaf Goldenrod
Solidago patula var. patula	Roughleaf Goldenrod
Solidago plumosa	Yadkin River Goldenrod
Solidago rugosa	Wrinkleleaf Goldenrod
Solidago rugosa ssp. aspera	Wrinkleleaf Goldenrod
Solidago simplex var. randii	Mt. Albert Goldenrod
Solidago simplex var. spathulata	Mt. Albert Goldenrod
Solidago speciosa	Showy Goldenrod
Solidago sphacelata	Limestone Goldenrod
Solidago spithamea	Blue Ridge Goldenrod
Solidago squarrosa	Stout Goldenrod
Solidago ulmifolia	Elmleaf Goldenrod
Solidago ulmifolia var. ulmifolia	Elmleaf Goldenrod
Sorbus americana	American Mountain -ash
Sorbus decora	Mountain -ash
Sorghastrum nutans	Yellow Indiangrass
Sphagnum	Peatmoss
Sphagnum affine	Peatmoss
Sphagnum bartlettianum	Peatmoss
Sphagnum fallax	Peatmoss
Sphagnum girgensohnii	Peatmoss
Sphagnum lescurii	Peatmoss
Sphagnum palustre	Peatmoss
Sphagnum quinquefarium	Peatmoss
Sphagnum recurvum	Peatmoss
Spigelia marilandica	Woodland Pinkroot
Spiraea alba	White Meadowsweet
Spiraea betulifolia var. corymbosa	Shiny-leaf Meadowsweet
Spiraea tomentosa	Hardhack
Spiranthes cernua	White Nodding Ladies'-Tresses
Spiranthes lucida	Shining Ladies'-Tresses
Sporobolus clandestinus	Secret Dropseed
Stachys clingmanii	Clingman's Hedge-Nettle
Staphylea trifolia	Bladdernut
Stellaria corei	Tennessee Starwort
Stellaria pubera	Great Chickweed
Stenanthium gramineum	Eastern Featherbells
Stenanthium gramineum var. robustum	Eastern Featherbells
Stewartia ovata	Mountain-Camellia
Streptopus amplexifolius	Clasping Twisted-stalk
Streptopus lanceolatus	Rosy Twisted-stalk
Streptopus lanceolatus var. roseus	Rosy Twisted-stalk
Styrax grandifolius	Big-leaf Snowbell
Sus scrofa	Wild Boar
Symphoricarpos orbiculatus	Coralberry
Symphyotrichum	American-Aster
Symphyotrichum cordifolium	Common Blue American-Aster



SCIENTIFIC NAME	COMMON NAME
<i>Symphotrichum divaricatum</i>	Lawn American-Aster
<i>Symphotrichum dumosum</i>	Rice Button American-Aster
<i>Symphotrichum novae-angliae</i>	New England American-Aster
<i>Symphotrichum oblongifolium</i>	Aromatic Aster
<i>Symphotrichum patens</i>	Late Purple American-Aster
<i>Symphotrichum patens</i> var. <i>patens</i>	Late Purple American-Aster
<i>Symphotrichum puniceum</i>	Purple-stem Aster
<i>Symphotrichum retroflexum</i>	Rigid White-top American-Aster
<i>Symphotrichum undulatum</i>	Wavy-leaf American-Aster
<i>Symphotrichum urophyllum</i>	White Arrow American-Aster
<i>Symplocarpus foetidus</i>	Skunk-cabbage
<i>Symplocos tinctoria</i>	Sweetleaf
<i>Tephrosia virginiana</i>	Goat's-rue
<i>Thalictrum</i>	Meadow-Rue
<i>Thalictrum clavatum</i>	Mountain Meadowrue
<i>Thalictrum dioicum</i>	Early Meadowrue
<i>Thalictrum macrostylum</i>	Small-Leaf Meadow-Rue
<i>Thalictrum mirabile</i>	Rockhouse Meadowrue
<i>Thalictrum thalictroides</i>	Rue-Anemone
<i>Thamnobryum alleghaniense</i>	moss
<i>Thaspium barbinode</i>	Hairy-jointed Meadow-Parsnip
<i>Thelypteris noveboracensis</i>	New York Fern
<i>Thelypteris palustris</i> var. <i>pubescens</i>	Marsh Fern
<i>Thelypteris simulata</i>	Bog Fern
<i>Thuidium</i>	moss
<i>Thuidium delicatulum</i>	moss
<i>Thuja</i>	Arborvitae
<i>Thuja occidentalis</i>	Northern White-cedar
<i>Tiarella cordifolia</i>	Heartleaf Foamflower
<i>Tiarella cordifolia</i> var. <i>collina</i>	Heartleaf Foamflower
<i>Tilia</i>	Basswood, Linden
<i>Tilia americana</i>	American Basswood
<i>Tilia americana</i> var. <i>americana</i>	American Basswood
<i>Tilia americana</i> var. <i>caroliniana</i>	Southern Basswood
<i>Tilia americana</i> var. <i>heterophylla</i>	Appalachian Basswood
<i>Tipularia discolor</i>	Crippled-Crane-fly
<i>Toxicodendron radicans</i>	Poison-ivy
<i>Toxicodendron radicans</i> ssp. <i>radicans</i>	Poison-ivy
<i>Toxicodendron vernix</i>	Poison-sumac
<i>Tradescantia</i>	Spiderwort, Wandering-Jew
<i>Tradescantia ohimensis</i>	Bluejacket
<i>Tradescantia subaspera</i>	Zigzag Spiderwort
<i>Trautvetteria caroliniensis</i>	Carolina Tassel-rue
<i>Trautvetteria caroliniensis</i> var. <i>caroliniensis</i>	Carolina Tassel-rue
<i>Triadenum walteri</i>	Greater Marsh-St. John's-Wort
<i>Trichomanes boschianum</i>	Appalachian Bristle Fern
<i>Trichomanes intricatum</i>	Weft Fern
<i>Trichophorum caespitosum</i>	Deerhair Bulrush
<i>Tridens flavus</i>	Tall Redtop
<i>Trientalis borealis</i>	Maystar
<i>Trillium</i>	Wakerobin
<i>Trillium catesbaei</i>	Bashful Wakerobin

SCIENTIFIC NAME	COMMON NAME
<i>Trillium cuneatum</i>	Little-Sweet-Betsy
<i>Trillium discolor</i>	Mottled Wakerobin
<i>Trillium erectum</i>	Stinking-Benjamin
<i>Trillium grandiflorum</i>	White Trillium
<i>Trillium luteum</i>	Yellow Wakerobin
<i>Trillium rugelii</i>	Ill-Scented Wakerobin
<i>Trillium simile</i>	Jeweled Wakerobin
<i>Trillium undulatum</i>	Painted Wakerobin
<i>Triosteum aurantiacum</i>	Orange-fruit Horse-Gentian
<i>Trisetum spicatum</i>	Narrow False Oats
<i>Tsuga</i>	Hemlock
<i>Tsuga canadensis</i>	Eastern Hemlock
<i>Tsuga caroliniana</i>	Carolina Hemlock
<i>Typha latifolia</i>	Broadleaf Cattail
<i>Ulmus</i>	Elm
<i>Ulmus alata</i>	Winged Elm
<i>Ulmus americana</i>	American Elm
<i>Ulmus rubra</i>	Slippery Elm
<i>Umbilicaria caroliniana</i>	lichen
<i>Umbilicaria mammulata</i>	lichen
<i>Uvularia grandiflora</i>	Large-flower Bellwort
<i>Uvularia perfoliata</i>	Perfoliate Bellwort
<i>Uvularia puberula</i>	Mountain Bellwort
<i>Uvularia sessilifolia</i>	Sessile-leaf Bellwort
<i>Vaccinium</i>	Blueberry, Cranberry
<i>Vaccinium angustifolium</i>	Northern Lowbush Blueberry
<i>Vaccinium arboreum</i>	Farkleberry
<i>Vaccinium corymbosum</i>	Highbush Blueberry
<i>Vaccinium elliotii</i>	Mayberry
<i>Vaccinium erythrocarpum</i>	Highbush Cranberry
<i>Vaccinium fuscatum</i>	Black Highbush Blueberry
<i>Vaccinium hirsutum</i>	Hairy Blueberry
<i>Vaccinium macrocarpon</i>	Large Cranberry
<i>Vaccinium myrtilloides</i>	Velvetleaf Blueberry
<i>Vaccinium pallidum</i>	Hillside Blueberry
<i>Vaccinium simulatum</i>	Mountain Highbush Blueberry
<i>Vaccinium stamineum</i>	Deerberry
<i>Veratrum viride</i>	American False Hellebore
<i>Verbena hastata</i>	Simpler's-Joy
<i>Verbena simplex</i>	Narrow-leaf Vervain
<i>Verbesina alternifolia</i>	Common Wingstem
<i>Verbesina occidentalis</i>	Yellow Crownbeard
<i>Verbesina virginica</i>	Common Frostweed
<i>Vernonia noveboracensis</i>	New York Ironweed
<i>Viburnum acerifolium</i>	Mapleleaf Viburnum
<i>Viburnum dentatum</i>	Southern Arrow-wood
<i>Viburnum lantanoides</i>	Hobblebush
<i>Viburnum nudum</i>	Wild Raisin
<i>Viburnum nudum</i> var. <i>cassinoides</i>	Wild Raisin
<i>Viburnum nudum</i> var. <i>nudum</i>	Southern Wild Raisin
<i>Viburnum prunifolium</i>	Smooth Blackhaw
<i>Viburnum rafinesquianum</i>	Downy Arrow-wood
<i>Viburnum rufidulum</i>	Rusty Blackhaw
<i>Viola</i>	Violet
<i>Viola affinis</i>	Sand Violet

SCIENTIFIC NAME	COMMON NAME
<i>Viola blanda</i>	Sweet White Violet
<i>Viola canadensis</i>	Canadian White Violet
<i>Viola cucullata</i>	Marsh Blue Violet
<i>Viola hastata</i>	Halberd-leaf Yellow Violet
<i>Viola macloskeyi</i> ssp. <i>pallens</i>	Smooth White Violet
<i>Viola pubescens</i>	Downy Yellow Violet
<i>Viola rotundifolia</i>	Round-leaf Yellow Violet
<i>Viola sororia</i>	Hooded Blue Violet
<i>Viola tripartita</i>	Three-parted Yellow Violet
<i>Viola</i> X <i>palmata</i>	Early Blue Violet
<i>Viola</i> X <i>primulifolia</i>	Violet
<i>Vitis</i>	Grape
<i>Vitis aestivalis</i>	Summer Grape
<i>Vitis rotundifolia</i>	Muscadine
<i>Vitis vulpina</i>	Frost Grape
<i>Vittaria appalachiana</i>	Appalachian Shoestring Fern
<i>Waldsteinia</i>	Barren-Strawberry
<i>Waldsteinia fragarioides</i>	Appalachian Barren-Strawberry
<i>Woodsia ilvensis</i>	Rusty Cliff Fern
<i>Woodsia obtusa</i>	Common Cliff Fern
<i>Woodwardia areolata</i>	Netted Chainfern
<i>Woodwardia virginica</i>	Virginia Chainfern
<i>Xanthorhiza simplicissima</i>	Yellowroot
<i>Xerophyllum asphodeloides</i>	Eastern Turkeybeard
<i>Xyris difformis</i> var. <i>difformis</i>	Bog Yellow-eyed-grass
<i>Zanthoxylum americanum</i>	Common Prickly -ash
<i>Zigadenus elegans</i> ssp. <i>glaucus</i>	Mountain Deathcamas
<i>Zizia aptera</i>	Heart-leaf Alexanders

SCIENTIFIC NAME      COMMON NAME

### Appendix 3 – Plant associations occurring or potentially occurring on Cherokee National Forest

ECOLOGICAL GROUP	COMMON NAME	GLOBAL NAME	ELEMENT CODE	Global Rank
Xeric Oak Forests and Woodlands	Chestnut Oak Forest (Xeric Ridge Type)	Quercus (prinus, coccinea) / Kalmia latifolia / (Galax urceolata, Gaultheria procumbens) Forest	CEGL006271	G5
Xeric Oak Forests and Woodlands	Xeric Ridgetop Chestnut Oak Forest	Quercus prinus - (Quercus coccinea) / Carya pallida / Vaccinium arboreum - Vaccinium pallidum Forest	CEGL008431	G4G5
Dry-mesic Oak Forests and Woodlands	Appalachian Shortleaf Pine - Mesic Oak Forest	Pinus echinata - Quercus alba / Vaccinium pallidum / Hexastylis arifolia - Chimaphila maculata Forest	CEGL008427	G3G4
Dry-mesic Oak Forests and Woodlands	Dry-mesic Southern Appalachian White Oak - Hickory Forest	Quercus alba - Carya (ovata, alba, glabra) - Pinus virginiana Forest	CEGL007231	G4G5
Dry-mesic Oak Forests and Woodlands	Ridge-and-valley Dry-mesic White Oak - Hickory Forest	Quercus alba - Quercus rubra - Carya ovata / Cercis canadensis - Juniperus virginiana var. virginiana Forest	CEGL007240	G4
Dry-mesic Oak Forests and Woodlands	Southern Red Oak - Scarlet Oak Forest	Quercus falcata - Quercus (coccinea, stellata) / Vaccinium (pallidum, stamineum) Forest	CEGL007247	G4
Dry-mesic Oak Forests and Woodlands	Chestnut Oak - Shagbark Hickory - Sugar Maple Forest	Quercus prinus - Carya ovata - Quercus rubra / Acer saccharum Forest	CEGL007268	G4?
Dry-mesic Oak Forests and Woodlands	Dry Chestnut Oak Forest	Quercus prinus - Quercus rubra - Carya (ovata, glabra) - Pinus virginiana Forest	CEGL007269	G4?
Dry-mesic Circumneutral Hardwood Forests and Woodlands	Appalachian Sugar Maple - Chinquapin Oak Limestone Forest	Acer saccharum - Quercus muehlenbergii / Cercis canadensis Forest	CEGL006017	G4?
Dry-mesic Circumneutral Hardwood Forests and Woodlands	Ridge-and-valley Dry-mesic White Oak - Hickory Forest	Quercus alba - Quercus rubra - Carya ovata / Cercis canadensis - Juniperus virginiana var. virginiana Forest	CEGL007240	G4
Dry-mesic Circumneutral Hardwood Forests and Woodlands	Circumneutral Red Oak - Chestnut Oak Slope Forest	Quercus prinus - Quercus rubra - Carya spp. - Fraxinus americana / Cercis canadensis / Solidago sphacelata Forest	CEGL008549	G3?
Carolina Hemlock Forests	Carolina Hemlock Forest (Pine Type)	Tsuga caroliniana - Pinus (rigida, pungens, virginiana) Forest	CEGL006178	G2
Xeric Shortleaf Pine Woodlands and Forests	Southern Blue Ridge Escarpment Shortleaf Pine - Oak Forest	Pinus echinata - Quercus (prinus, falcata) / Oxydendrum arboreum / Vaccinium pallidum Forest	CEGL007493	G3G4
Xeric Shortleaf Pine Woodlands and Forests	Appalachian Shortleaf Pine - Mesic Oak Forest	Pinus echinata - Quercus alba / Vaccinium pallidum / Hexastylis arifolia - Chimaphila maculata Forest	CEGL008427	G3G4
Xeric Shortleaf Pine Woodlands and Forests	Shortleaf Pine / Little Bluestem Appalachian Woodland	Pinus echinata / Schizachyrium scoparium Appalachian Woodland	CEGL003560	G2
Xeric Shortleaf Pine Woodlands and Forests	Appalachian Shortleaf Pine Forest	Pinus echinata / Vaccinium (pallidum, stamineum) - Kalmia latifolia Forest	CEGL007078	G4?
Xeric Virginia / Shortleaf Pine Woodlands	Appalachian Low Elevation Mixed Pine / Little Bluestem Forest	Pinus virginiana - (Pinus rigida, Pinus pungens) / Schizachyrium scoparium Forest	CEGL008500	G?
Xeric Virginia / Shortleaf Pine Woodlands	Appalachian Low Elevation Mixed Pine / Hillside Blueberry Forest	Pinus virginiana - Pinus (rigida, echinata) - (Quercus prinus) / Vaccinium pallidum Forest	CEGL007119	G4?
Upland White Pine Forests	Appalachian White Pine - Xeric Oak Forest	Pinus strobus - Quercus (coccinea, prinus) / (Gaylussacia ursina, Vaccinium stamineum) Forest	CEGL007519	G3

ECOLOGICAL GROUP	COMMON NAME	GLOBAL NAME	Code	Gramk
Upland White Pine Forests	Appalachian White Pine - Mesic Oak Forest	<i>Pinus strobus</i> - <i>Quercus alba</i> - ( <i>Carya alba</i> ) / <i>Gaylussacia ursina</i> Forest	CEGL007517	G2G3
Pitch and Table Mountain Pine Woodlands	Blue Ridge Table Mountain Pine - Pitch Pine Woodland (Typic Type)	<i>Pinus pungens</i> - <i>Pinus rigida</i> - ( <i>Quercus prinus</i> ) / <i>Kalmia latifolia</i> - <i>Vaccinium pallidum</i> Woodland	CEGL007097	G3
High Elevation Spruce-Fir Forests	Fraser Fir Forest (Evergreen Shrub Type)	<i>Abies fraseri</i> / ( <i>Rhododendron catawbiense</i> , <i>Rhododendron carolinianum</i> ) Forest	CEGL006308	G1
High Elevation Spruce-Fir Forests	Fraser Fir Forest (Deciduous Shrub Type)	<i>Abies fraseri</i> / <i>Viburnum lantanoides</i> / <i>Dryopteris campyloptera</i> - <i>Oxalis montana</i> / <i>Hylocomium splendens</i> Forest	CEGL006049	G1
High Elevation Spruce-Fir Forests	Red Spruce - Fraser Fir Forest (Evergreen Shrub Type)	<i>Picea rubens</i> - ( <i>Abies fraseri</i> ) / ( <i>Rhododendron catawbiense</i> , <i>Rhododendron maximum</i> ) Forest	CEGL007130	G1
High Elevation Spruce-Fir Forests	Red Spruce - Fraser Fir Forest (Deciduous Shrub Type)	<i>Picea rubens</i> - ( <i>Abies fraseri</i> ) / <i>Vaccinium erythrocarpum</i> / <i>Oxalis montana</i> - <i>Dryopteris campyloptera</i> / <i>Hylocomium splendens</i> Forest	CEGL007131	G2
High Elevation Spruce-Fir Forests	Red Spruce - Northern Hardwood Forest (Herb Type)	<i>Picea rubens</i> - ( <i>Betula alleghaniensis</i> , <i>Aesculus flava</i> ) / <i>Viburnum lantanoides</i> / <i>Oxalis montana</i> - <i>Solidago glomerata</i> Forest	CEGL006256	G2
High Elevation Spruce-Fir Forests	Red Spruce - Fraser Fir Forest (Hemlock Type)	<i>Picea rubens</i> - <i>Tsuga canadensis</i> / <i>Rhododendron maximum</i> Forest	CEGL006272	G2?
High Elevation Spruce-Fir Forests	Red Spruce Forest (Protected Slope Type)	<i>Picea rubens</i> / <i>Rhododendron maximum</i> Forest	CEGL006152	G2?
High Elevation Northern Hardwood Forests	Southern Appalachian Northern Hardwood Forest (Rich Type)	<i>Aesculus flava</i> - <i>Betula alleghaniensis</i> - <i>Acer saccharum</i> / <i>Acer spicatum</i> / <i>Caulophyllum thalictroides</i> - <i>Laportea canadensis</i> Forest	CEGL004973	G3
High Elevation Northern Hardwood Forests	Southern Appalachian Northern Hardwood Forest (Typic Type)	<i>Betula alleghaniensis</i> - <i>Fagus grandifolia</i> - <i>Aesculus flava</i> / <i>Viburnum lantanoides</i> / <i>Eurybia chlorolepis</i> - <i>Dryopteris intermedia</i> Forest	CEGL007285	G3G4
High Elevation Northern Hardwood Forests	Southern Appalachian Hardwood Boulderfield Forest (Typic Type)	<i>Betula alleghaniensis</i> / <i>Acer spicatum</i> / <i>Hydrangea arborescens</i> - <i>Ribes cynosbati</i> / <i>Dryopteris marginalis</i> Forest	CEGL004982	G3
High Elevation Northern Hardwood Forests	Southern Appalachian Boulderfield Forest (Currant And Rockcap Fern Type)	<i>Betula alleghaniensis</i> / <i>Ribes glandulosum</i> / <i>Polypodium appalachianum</i> Forest	CEGL006124	G3
High Elevation Northern Hardwood Forests	Southern Appalachian Beech Gap (North Slope Tall Herb Type)	<i>Fagus grandifolia</i> / <i>Ageratina altissima</i> var. <i>roanensis</i> Forest	CEGL006246	G2
High Elevation Northern Hardwood Forests	Southern Appalachian Beech Gap (South Slope Sedge Type)	<i>Fagus grandifolia</i> / <i>Carex pensylvanica</i> - <i>Carex brunnescens</i> Forest	CEGL006130	G2
High Elevation Northern Hardwood Forests	Blue Ridge Hemlock - Northern Hardwood Forest	<i>Tsuga canadensis</i> - <i>Betula alleghaniensis</i> / <i>Rhododendron maximum</i> / <i>Leucothoe fontanesiana</i> Forest	CEGL007861	G3G4Q
High Elevation Oak Forests	Southern Blue Ridge High-elevation White Oak Forest	<i>Quercus alba</i> / <i>Kalmia latifolia</i> Forest	CEGL007295	G2Q
High Elevation Oak Forests	High Elevation Red Oak Forest (Evergreen Shrub Type)	<i>Quercus rubra</i> / ( <i>Kalmia latifolia</i> , <i>Rhododendron maximum</i> ) / <i>Galax urceolata</i> Forest	CEGL007299	G4

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High Elevation Oak Forests	High Elevation Red Oak Forest (Deciduous Shrub Type)	Quercus rubra / (Vaccinium simulatum, Rhododendron calendulaceum) / (Dennstaedtia punctilobula, Thelypteris noveboracensis) Forest	CEGL007300	G4
High Elevation Oak Forests	High Elevation Red Oak Forest (Tall Herb Type)	Quercus rubra / Carex pensylvanica - Ageratina altissima var. roanensis Forest	CEGL007298	G2
Montane Oak-Hickory Forests	Appalachian Montane Oak Hickory Forest (Typic Acidic Type)	Quercus alba - Quercus (rubra, prinus) / Rhododendron calendulaceum - Kalmia latifolia - (Gaylussacia ursina) Forest	CEGL007230	G5
Montane Oak-Hickory Forests	Appalachian White Oak - Southern Red Oak Forest	Quercus alba - Quercus falcata / Vaccinium (arboreum, hirsutum, pallidum) Forest	CEGL008567	G3G4
Montane Oak-Hickory Forests	Appalachian Montane Oak - Hickory Forest (Rich Type)	Quercus alba - Quercus rubra - Quercus prinus / Collinsonia canadensis - Podophyllum peltatum - Sanguinaria canadensis Forest	CEGL007692	G3
Montane Oak-Hickory Forests	Appalachian Montane Oak Hickory Forest (Chestnut Oak Type)	Quercus prinus - (Quercus rubra) - Carya spp. / Oxydendrum arboreum - Cornus florida Forest	CEGL007267	G4G5
Montane Oak-Hickory Forests	Chestnut Oak Forest (Mesic Slope Heath Type)	Quercus prinus - Quercus rubra / Rhododendron maximum / Galax urceolata Forest	CEGL006286	G4
Mesic Acid Hardwood Forests	Southern Ridge And Valley Beech Forest	Fagus grandifolia Ridge and Valley Forest	CEGL007200	G3G4Q
Mesic Acid Hardwood Forests	Rich Low Elevation Appalachian Oak Forest	Quercus alba - (Quercus rubra, Acer saccharum, Fagus grandifolia) / Aesculus flava Forest	CEGL007233	G4
Mesic Circumneutral Hardwood Forests	Ridge And Valley Calcareous Forest	Acer saccharum - Liriodendron tulipifera - Fraxinus americana / Staphylea trifolia Forest	CEGL006201	G4?
Hemlock-Hardwood Forests	Southern Appalachian Acid Cove Forest (Typic Type)	Tsuga canadensis - Liriodendron tulipifera - Betula lenta / Rhododendron maximum Forest	CEGL007543	G5
Mixed Mesophytic/Cove Forests	Southern Appalachian Cove Forest (Rich Montane Type)	Aesculus flava - Acer saccharum - (Fraxinus americana, Tilia americana) / Hydrophyllum canadense - Solidago flexicaulis Forest	CEGL007695	G3G4
Mixed Mesophytic/Cove Forests	Southern Appalachian Cove Forest (Typic Montane Type)	Liriodendron tulipifera - Aesculus flava - (Fraxinus americana, Tilia americana var. heterophylla) / Actaea racemosa - Laportea canadensis Forest	CEGL007710	G4
Mixed Mesophytic/Cove Forests	Southern Appalachian Cove Forest (Typic Foothills Type)	Liriodendron tulipifera - Tilia americana var. heterophylla - (Aesculus flava) / Actaea racemosa Forest	CEGL007291	G4?
Mixed Mesophytic/Cove Forests	Southern Appalachian Cove Forest (Rich Foothills Type)	Tilia americana var. heterophylla - Fraxinus americana - (Ulmus rubra) / Sanguinaria canadensis - (Aquilegia canadensis, Asplenium rhizophyllum) Forest	CEGL007711	G2G3
Upland Eastern Hemlock Forests	Southern Appalachian Eastern Hemlock Forest (White Pine Type)	Pinus strobus - Tsuga canadensis / Rhododendron maximum - (Leucothoe fontanesiana) Forest	CEGL007102	G4
Upland Eastern Hemlock Forests	Southern Appalachian Eastern Hemlock Forest (Typic Type)	Tsuga canadensis / Rhododendron maximum - (Clethra acuminata, Leucothoe fontanesiana) Forest	CEGL007136	G3G4
Montane Alluvial Forests and Shrublands	Montane Sweetgum Alluvial Flat	Liquidambar styraciflua - Liriodendron tulipifera - (Platanus occidentalis) / Carpinus caroliniana - Halesia tetraptera / Amphicarpaea bracteata Forest	CEGL007880	G?

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Montane Alluvial Forests and Shrublands	Appalachian Montane Alluvial Forest	Platanus occidentalis - Liriodendron tulipifera - Betula (alleghaniensis, lenta) / Alnus serrulata - Leucothoe fontanesiana Forest	CEGL004691	G2?
Montane Alluvial Forests and Shrublands	Montane Rhododendron Thicket	Rhododendron maximum Upland Shrubland	CEGL003819	G3?Q
Montane Alluvial Forests and Shrublands	Montane Alluvial Forest (Small River Type)	Tsuga canadensis - (Pinus strobus) Temporarily Flooded Forest	CEGL007143	G?
Small Stream and Lower Slope Forests	Southern Ridge And Valley Small Stream Hardwood Forest	Quercus alba - (Liriodendron tulipifera, Liquidambar styraciflua) / Acer leucoderme / Calycanthus floridus / Athyrium filix -femina Forest	CEGL008428	G3G4Q
Northern White-cedar Bluffs	Southern Appalachian Northern White-cedar Slope Forest	Thuja occidentalis - Pinus strobus - Tsuga canadensis / Carex eburnea Forest	CEGL008426	G1G2
Semi-Natural Wooded Uplands	Successional Honey-locust - Elm Woodland	Gleditsia triacanthos - Ulmus (alata, rubra) Woodland	CEGL003686	GM
Semi-Natural Wooded Uplands	Red-cedar Successional Forest	Juniperus virginiana var. virginiana - (Quercus spp.) Forest	CEGL007124	GM
Semi-Natural Wooded Uplands	Successional Tuliptree Forest	Liriodendron tulipifera - Acer (negundo, rubrum) / Asimina triloba Forest	CEGL007184	G4G5
Semi-Natural Wooded Uplands	Early Successional Appalachian Hardwood Forest	Liriodendron tulipifera - Acer rubrum - Robinia pseudoacacia Forest	CEGL007219	GD
Semi-Natural Wooded Uplands	Successional Tuliptree / Redbud Forest	Liriodendron tulipifera / Cercis canadensis Forest	CEGL007220	G4G5
Semi-Natural Wooded Uplands	Eastern White Pine Successional Forest	Pinus strobus Successional Forest	CEGL007944	GD
Semi-Natural Wooded Uplands	Virginia Pine - Red-cedar Successional Forest	Pinus virginiana - Juniperus virginiana var. virginiana - Ulmus alata Forest	CEGL007121	GD
Semi-Natural Wooded Uplands	Virginia Pine Successional Forest	Pinus virginiana Successional Forest	CEGL002591	GD
Semi-Natural Wooded Uplands	Calcareous Black Locust Successional Forest	Robinia pseudoacacia - Celtis occidentalis - (Fraxinus americana, Liriodendron tulipifera) Forest	CEGL007281	GD
Semi-Natural Wooded Uplands	Montane Grape Opening	Vitis aestivalis Vine-Shrubland	CEGL003890	G2G3
Exotic species Dominated Southeastern Wooded Uplands	Kudzu Vineland	Pueraria montana var. lobata Vine-Shrubland	CEGL003882	GW
Timber Plantations	Shortleaf Pine Plantation	Pinus echinata Planted Forest	CEGL007169	GC
Timber Plantations	Pitch Pine Plantation	Pinus rigida Planted Forest	CEGL008436	GC
Timber Plantations	White Pine Plantation	Pinus strobus Planted Forest	CEGL007178	GC
Timber Plantations	Loblolly Pine Plantation	Pinus taeda Planted Forest	CEGL007179	GC
Timber Plantations	Virginia Pine Plantation	Pinus virginiana Planted Forest	CEGL004730	GC
Grassy Balds	Grassy Bald (Sedge Type)	Carex pensylvanica Herbaceous Vegetation	CEGL004094	G1
Grassy Balds	Grassy Bald (Southern Grass Type)	Danthonia compressa - (Sibbaldiopsis tridentata) Herbaceous Vegetation	CEGL004242	G1
Grassy Balds	Southern Appalachian Blackberry Bald	Rubus allegheniensis - Rubus canadensis / Carex pensylvanica Shrubland	CEGL003892	GM
Shrub Balds	Southern Appalachian Alder Bald	Alnus viridis ssp. crispa / Carex pensylvanica Shrubland	CEGL003891	G1
Shrub Balds	Southern Appalachian Mountain Laurel Bald	Kalmia latifolia - Rhododendron catawbiense - (Gaylussacia baccata, Pieris floribunda, Vaccinium corymbosum) Shrubland	CEGL003814	G2G3

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Shrub Balds	Southern Appalachian Catawba Rhodo dendron Heath Bald	Rhododendron catawbiense Shrubland	CEGL003818	G2
Semi-Natural Upland Herbaceous Vegetation	Successional Broomsedge Vegetation	Andropogon virginicus var. virginicus Herbaceous Vegetation	CEGL004044	GD
Exotic Species Dominated Herbaceous Upland Vegetation	Cultivated Meadow	Lolium (arundinaceum, pratense) Herbaceous Vegetation	CEGL004048	GW
Exotic Species Dominated Herbaceous Upland Vegetation	Grazed Montane Grassland / Fire Meadow	Phleum pratense - Bromus pubescens - Helenium autumnale Herbaceous Vegetation	CEGL004018	GM
Rocky Summits	High Elevation Blackberry Thicket	Rubus canadensis - (Rubus idaeus ssp. strigosus) / Athyrium filix - femina - Solidago glomerata Shrubland	CEGL003893	GM
Rocky Summits	Southern Appalachian High Elevation Rocky Summit (High Peak Type)	Saxifraga michauxii - Carex misera - Oclemena acuminata - Solidago glomerata Herbaceous Vegetation	CEGL004277	G1
Rocky Summits	Low Elevation Rocky Summit (Acidic Type)	Saxifraga michauxii Herbaceous Vegetation	CEGL004524	G3?
Granitic Domes	High Elevation Granitic Dome (High Peak Lichen Type)	Lasallia papulosa - Umbilicaria caroliniana Nonvascular Vegetation	CEGL004386	G2?
Sandstone Glades and Barrens	Red Knobs Sandstone Post Oak - Virginia Pine Woodland	Quercus stellata - Pinus virginiana / (Schizachyrium scoparium, Piptochaetium avenaceum) Woodland	CEGL008406	G2?
Shale Glades and Barrens	Blue Ridge Calcareous Shale Slope Woodland (Shrubby Type)	Carya glabra - Fraxinus americana - Quercus prinus / Ostrya virginiana / Philadelphus hirsutus Woodland	CEGL004995	G2
Shale Glades and Barrens	Blue Ridge Acid Shale Forest	Pinus virginiana - Quercus prinus - Quercus rubra / Vaccinium pallidum - Kalmia latifolia Forest	CEGL007539	G2?
Shale Glades and Barrens	Blue Ridge Acid Shale Woodland	Pinus virginiana / Schizachyrium scoparium - Carex pensylvanica Woodland	CEGL003624	G2?
Shale Glades and Barrens	Blue Ridge Calcareous Shale Slope Woodland (Grassy Type)	Quercus prinus - Juniperus virginiana - (Pinus virginiana) / Philadelphus hirsutus - Celtis occidentalis Woodland	CEGL007720	G2
Acid Talus	Appalachian Talus Slope	Parthenocissus quinquefolia / Dicentra eximia Sparse Vegetation	CEGL004454	G2G3Q
Dry Acid Cliffs	Appalachian Felsic Cliff	Asplenium montanum - Heuchera villosa Felsic Cliff Sparse Vegetation	CEGL004980	G3G4
Moist Acid Cliffs	Southern Appalachian Moist Siltstone Cliff	Heuchera villosa - Asplenium trichomanes - Thalictrum clavatum / Conocephalum conicum Herbaceous Vegetation	CEGL008435	G2
Moist Acid Cliffs	Southern Appalachian Moist Sandstone Cliff	Heuchera villosa - Dicentra eximia - Campanula divaricata Herbaceous Vegetation	CEGL008546	G2
Moist Acid Cliffs	Doe River Gorge Seepage Cliff	Trichophorum caespitosum - Osmunda regalis - Rhynchospora capitellata - Oxypolis rigidior Herbaceous Vegetation	CEGL008490	G1Q
Moist Acid Cliffs	Montane Cliff (Carolina Rocktripe Type)	Umbilicaria mammulata Nonvascular Vegetation	CEGL004387	G4?
Moist Acid Cliffs	Southern Blue Ridge Spray Cliff	Vittaria appalachiana - Heuchera parviflora var. parviflora - Houstonia serpyllifolia / Plagiochila spp. Herbaceous Vegetation	CEGL004302	G2
Dry Alkaline Cliffs	Appalachian Cliff White-cedar Woodland	Thuja occidentalis / Carex eburnea - Pellaea atropurpurea Woodland	CEGL002596	G2G3
Floodplain Shrublands	Floodplain Canebrake	Arundinaria gigantea ssp. gigantea Shrubland	CEGL003836	G2?
Riverfront and Levee Forests and Shrublands	Floodplain Canebrake	Arundinaria gigantea ssp. gigantea Shrubland	CEGL003836	G2?

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Riverscour Vegetation	Rocky Bar And Shore (Twisted Sedge Type)	Carex torta Herbaceous Vegetation	CEGL004103	G3G4
Riverscour Vegetation	Hiwassee / Ocoee River Boulder Scour Vegetation	Schizachyrium scoparium - Andropogon ternarius - Liatris microcephala - (Pityopsis ruthii) Herbaceous Vegetation	CEGL008455	G2
Riverscour Vegetation	Hiwassee / Ocoee Bedrock Scour Vegetation	Schizachyrium scoparium - Schoenoplectus americanus - Juncus marginatus - Eupatorium serotinum Herbaceous Vegetation	CEGL008496	G2
Rocky Riverbeds	Rocky Bar And Shore (Twisted Sedge Type)	Carex torta Herbaceous Vegetation	CEGL004103	G3G4
Rocky Riverbeds	Water-willow Rocky Bar And Shore	Justicia americana Herbaceous Vegetation	CEGL004286	G4G5
Exotic Species Dominated Herbaceous Wetlands	Japanese Knotweed Gravelbar	Polygonum cuspidatum Temporarily Flooded Herbaceous Vegetation	CEGL008472	GW
Semi-Natural Riparian and Willow Forests	Black Willow - Sycamore Montane Bottomland Forest	Salix nigra - Platanus occidentalis Forest	CEGL004626	G5
Emergent Ponds and Marshes	Rush Marsh	Juncus effusus Seasonally Flooded Herbaceous Vegetation	CEGL004112	G5
Forested Bogs	Swamp Forest -bog Complex (Typic Type)	Tsuga canadensis - Acer rubrum - (Liriodendron tulipifera, Nyssa sylvatica) / Rhododendron maximum / Sphagnum spp. Forest	CEGL007565	G2
Forested Acid Seeps	Cumberland Forested Acid Seep	Acer rubrum var. trilobum - Nyssa sylvatica / Osmunda cinnamomea - Chasmanthium laxum - Carex intumescens / Sphagnum lescurii Forest	CEGL007443	G3?
Forested Fens and Calcareous Seeps	Northern White-cedar Fen	Thuja occidentalis Limestone Seepage Woodland	CEGL003675	G?
Acid Herbaceous Seeps	Southern Appalachian Shrub Bog (Typic Type)	Alnus serrulata - Kalmia carolina - Rhododendron catawbiense - Spiraea alba / Carex folliculata - Lilium grayi Shrubland	CEGL003915	G1G2
Acid Herbaceous Seeps	Southern Appalachian Bog (Low Elevation Type)	Alnus serrulata - Rhododendron viscosum - Rhododendron maximum / Juncus gymnocarpus - Chelone cuthbertii Shrubland	CEGL003916	G1G2
Acid Herbaceous Seeps	Southern Appalachian Herb Bog (Low Elevation Type)	Carex (atlantica, echinata, leptalea, lurida) - Solidago patula Herbaceous Vegetation	CEGL004156	G1
Acid Herbaceous Seeps	Southern Appalachian Herb Bog (Typic Type)	Carex atlantica - Solidago patula var. patula - Lilium grayi / Sphagnum bartlettianum Herbaceous Vegetation	CEGL004158	G1
Acid Herbaceous Seeps	Rich Montane Seep (Cove Type)	Diphylleia cymosa - Saxifraga micranthidifolia - Laportea canadensis Herbaceous Vegetation	CEGL004296	G3
Acid Herbaceous Seeps	Southern Appalachian Acid Seep	Glyceria striata - Carex gynandra - Chelone glabra - Symphyotrichum puniceum / Sphagnum spp. Herbaceous Vegetation	CEGL008438	G2G3
Acid Herbaceous Seeps	Rich Montane Seep (High Elevation Type)	Impatiens (capensis, pallida) - Monarda didyma - Rudbeckia laciniata var. humilis Herbaceous Vegetation	CEGL004293	G3