USGS-NPS VEGETATION MAPPING PROGRAM

Vegetation Classification of Great Smoky Mountains National Park (Cades Cove and Mount Le Conte Quadrangles)

Final Report
April 1999

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TABLE OF CONTENTS

I. VEGETATION SAMPLING AND CLASSIFICATION

INTRODUCTION

This report presents the results of the vegetation classification portion of the USGS-NPS Vegetation Mapping Program at the Great Smoky Mountains National Park (GRSM). This project was a pilot that focused on vegetation sampling and classification only on the Cades Cove and Mount Le Conte quadrangles. Sampling strategy, field methods, and data analysis are described and a vegetation classification, field key to the vegetation types, and descriptions of each type are presented. As a supplement to this report, the raw plot data are provided in the form of a Microsoft Access database.

METHODS

Sampling strategy

Vegetation sampling took place over two field seasons; the summers of 1997 and 1998. Plot sampling was done prior to the acquisition and interpretation of final aerial photography, so sampling locations had to be targeted by means other than photosignatures. The sampling strategy for the first field season targeted major vegetation types with high variation and in need of further conceptual resolution (approximately 40 samples) or vegetation that the photointerpreters anticipated would be problematic in future signature delineation (about 20 of the plot samples). During the second field season, sampling objectives for the remaining 160 plot samples focused on associations or ecological groups in need of further documentation, undersampled geographic areas, and polygons identified by the photointerpreters. For each association known to be on the pilot quadrangles, numbers of additional samples needed, and which quadrangles those sample should come from, were determined. Associations that were probable, but not yet documented on the two pilot quadrangles, were identified and teams were directed to areas where these associations were likely to occur. Another portion of samples were directed to five geographic areas that were undersampled in the previous field season and by historic sampling efforts. The photointerpreters identified 36 polygons on each pilot quadrangle that were in need of verification or characterization. Teams were instructed to collect plot samples at these polygons if the vegetation represented a type needing additional documentation for classification or a type not yet described in the classification.

Data collection and field methods

Vegetation samples were collected, as much as possible, in homogeneous stands of vegetation targeted by the sampling objectives. Sample plots were typically 20 X 50 meters (0.1 hectare). Occasionally plots were of smaller dimensions, where the spatial extent of homogeneous vegetation or topography could not accommodate a 0.1 ha plot. Each vegetation sample was georeferenced using a Global Positioning System (GPS), when possible. If a GPS unit was not available or a satellite reading could not be obtained, UTM coordinates were derived from the estimated position on a topographic quadrangle map. Where possible, the sample plot's center point was permanently marked with PVC pipe or iron reinforcement bar and a numbered aluminum tag provided by Twin Creeks Natural Resource Center. The distance and bearing from the plot center to tagged witness trees were recorded. Directions for relocating the sample plots were also recorded.

Environmental data, other site information, and data on vegetation structure and composition were collected according to the standards outlined in *Field methods for vegetation mapping: USGS BRD/NPS Vegetation Mapping Program (*TNC and ESRI 1994). Total coverage for each species (vertical projection onto the ground) was estimated visually, and recorded within ten cover classes: **1** (trace), **2** (0-1%), **3** (1-2%), **4** (2-5%), **5** (5-10%), **6** (10-25%), **7** (25-50%), **8** (50-75%), **9** (75-95%), and **10** (95-100%). The same ten cover classes were also used to estimate each species coverage by stratum. Additional vegetation information collected included the height and coverage of each stratum, the leaf type and leaf phenology of the dominant stratum, and the physiognomic class represented by the stand. The plot survey form used to collect quantitative vegetation samples is provided in Appendix I.

A total of 72 areas identified by the photointerpreters were visited by the field teams. A standard vegetation sample was collected if the polygon represented vegetation targeted by the sampling objectives. Otherwise, notes were made to describe the vegetation and environmental variation within the polygon and how the actual vegetation

compared to what the photointerpreters inferred from air photos.

All field data for 223 vegetation samples were entered into the PLOTS database (a Microsoft Access database developed for the BRD-NPS Vegetation Mapping Program) and are provided as a supplement to this report. The taxonomic nomenclature for this study follows Kartesz (1994).

Review and preparation of existing data

As part of an earlier task order (T.O. # 18, C.O.#1) all available vegetation data for Great Smoky Mountain National Park were assessed for compatibility with and usability in the BRD-NPS Vegetation Mapping Program. The most compatible data sets were some of those collected by researchers associated with the Great Smoky Mountains National Park Uplands Field Research Laboratory from 1977 to 1985 (hereafter Uplands data set). A Park Service technical report by P. S. White and R. T. Busing (White and Busing 1993) summarizes these studies and field methods used to collect these data. Digital data for the Uplands data set were acquired from Dr. Peter S. White (University of North Carolina, Chapel Hill). Digital data for an additional 32 vegetation samples, representing 1996 remeasures of the historic Uplands plots, were obtained from Bob Dellinger (GRSM). A total of 343 sample plots were evaluated and 151 samples were eliminated because they contained incomplete data or represented repeated measures of the same location.

In order to be compatible for quantitative analysis with the samples collected in 1997 and 1998, historic vegetation data were modified to include a single, complete, species list for a sample plot, with a single estimate of abundance for each species, expressed as a percentage cover. Data from a total of 192 historic sample plots were modified for use in quantitative analysis with the samples collected in 1997-98. Data modifications differed depending on the data set and the field measures used. Original data for these historic plots are on file at Twin Creeks Natural Resource Center, Great Smoky Mountains National Park.

Modification of 1996 Dellinger Data

Bob Dellinger (GRSM), sampled 32 vegetation plots using methodology similar to that of the North Carolina Vegetation Survey (NCVS) (Peet et al. 1998). Each 0.1hectare plot was subdivided into 10, 10x10 meter modules, and in the corner of each, a set of nested plots was established. In four of the 10x10 m modules, referred to as "intensive modules", he estimated percentage cover using a ten point cover class scale. The data were modified to obtain a single coverage for each species by summing the midpoints of each cover class, and dividing by 4, the number of intensive modules. Species not present in the four intensive modules, but found elsewhere in the plot, were originally recorded without a coverage value. Based on experience with this type of sample plot, species outside the intensive modules usually have a low cover, therefore, these species were assigned a coverage class of 1. Plant species nomenclature was resolved to follow Kartesz 1994.

Modification of 1977 – 1979 Uplands Data

Vegetation data supplied by Dr. White of UNC-Chapel Hill were collected in a variety of methods and by a variety of researchers (see White and Busing 1993). Samples used to help characterize vegetation associations on the two pilot quadrangles included plots from three studies conducted by researchers at the Great Smoky Mountains Uplands Field Research Laboratory from 1977 to 1979. Mark Harmon established plots in 1977 and 1978 to study to the effects of fire in the western portion of the Park (Harmon 1980; Harmon 1982; Harmon 1984; Harmon et al. 1983). Peter White and D. Kilgore established sample plots on Leadbetter and Davis Ridges (logged) and on Gregory Ridge (unlogged) to study logged and unlogged vegetation on ridges south of Cades Cove (1977-78). In 1979, Sue Bratton collected vegetation samples on the summit of Mount Le Conte to describe high elevation areas impacted by the Balsam Wooly Adelgid. The data from these studies were modified to allow comparison with data collected as part of the mapping project. No original data are presented here. The transformed, historic data were used in combination with the data collected in 1997-1998 to characterize vegetation types and to further explore the potential variation within vegetation types on the two pilot quadrangles.

The original Uplands data set contains diameter at breast height (DBH, cm) measurements for woody species greater than 1.0 cm diameter and percentage coverage for shrubs and herbs, estimated from 25, 1 m^2 subplots. Tree

stem diameter data were converted to a single percentage cover value for each species using regression models developed by Tom Wentworth and Chris Ulrey at North Carolina State University, Botany Department (Wentworth and Ulrey 1996; Newell 1997). The two-step regression model first relates stem diameter to crown diameter and then converts crown area to a ten-point cover class scale (C. Ulrey pers. comm.). Data used to develop the model to predict tree crown area from stem diameter came from areas of the southern Blue Ridge south of the Great Smoky Mountains. An assumption was made that stem diameter to crown area relationships are similar between the different geographic areas. Plant species nomenclature in the Uplands data set was resolved to follow Kartesz 1994.

When originally sampled, the Uplands plot locations were estimated and marked on topographic maps by the original researchers. UTM coordinates for these plot samples were acquired by digitizing the plot locations off copies of the original quadrangle maps. The 192 transformed plot samples were used to help develop a preliminary vegetation classification for GRSM and, later, in the final characterization of associations on the two pilot quadrangles. Considering the age, low precision georeferencing, and highly transformed nature of these data, it is not recommended that they be used as primary plots for mapping purposes.

Data analysis

Initial quantitative analysis used coverage data from the 1997-98 samples combined with the 1996 Dellinger data. These data were considered “high resolution” data because they are the least modified and the most likely to represent existing vegetation conditions. The modified 1977-79 Uplands data were considered “low resolution” and were introduced secondarily to refine the classification developed with the high resolution data and to explore potential variation within vegetation types on the two pilot quadrangles.

Groups of compositionally similar samples were identified by cluster analysis. The Bray-Curtis Dissimilarity (Bray and Curtis, 1957) measure was used in conjuction with the Lance-Williams Flexible Beta linkage method (Lance and Williams, 1967) to achieve a hierarchical, agglomerative, polythetic clustering technique. Cluster analysis was implemented using the program PC-ORD v3.18 (McCune and Medford 1995). Samples representing non-forested vegetation or spatially small ecological communities were removed after initial exploratory analyses because they were compositional outliers and had an undesirable influence on the clustering results. These samples were later analyzed qualitatively and placed within the National Classification framework. Coverage data for compositionally similar groups of samples were further analyzed using indirect ordination techniques implemented by the program DECODA v3.00 (Minchin 1998). Results from applying the ordination method Non-metric Multidimensional Scaling (global), with Bray-Curtis dissimilarity as a distance measure, were used to generate ordination diagrams. Ordination diagrams are useful for detecting compositional variation and trends that are otherwise obscured in cluster analysis and were used to further examine compositional patterns within the data set.

Using the ordination diagrams, the results of the cluster analysis, and prior experience with ecological communities in the southern Blue Ridge region, samples were placed into compositionally similar groups approximating the scale of the community association. Where possible, historic samples were assigned to groups based on an additional cluster analysis (with all samples) and qualitative review. Coverage data from samples within each group were used to create ordered stand tables and constancy tables that listed each species’ average cover and frequency within the group. Environmental data were also summarized for these groups of samples. After evaluating the compositional and environmental summaries, each group was either placed within an existing type in the National Vegetation Classification or a new association was defined from the available data.

RESULTS AND SUMMARY

The vegetation classification for the GRSM describes 42 alliances and 68 associations, including 48 Forests, 2 Woodlands, 6 Shrublands, 10 Herbaceous Vegetation types, and 2 Sparsely Vegetated types. The classification includes natural and semi- natural vegetation as well as vegetation dominated by (or resulting from) exotic and/or invasive species. Fifty-two of these associations are documented on the two pilot quadrangles, while the other 16 described types are either known to occur in the Park or are probable in other areas of the Park. The classification is the result of literature review, expert interview, and analysis of over 400 vegetation samples from the GRSM. It focuses on the Cades Cove and Mount Le Conte quadrangles and should not be considered a comprehensive vegetation classification for the Park, although it does cover the major vegetation types expected in the Park. Additional inventory and analyses will undoubtedly document additional vegetation types, especially in areas with

elevations and geologies different from the pilot quadrangles. In particular, the vegetation on the North Carolina portion of the Park is expected to be quite different from that on the pilot quadrangles.

The vegetation classification of GRSM follows later in this section. A field key to the vegetation on the Cades Cove and Mount Le Conte quadrangles is presented in section II of this report. Descriptions of all vegetation types are included in section III. An index to these descriptions, by database code and by major ecological group, is also provided. The format of the vegetation descriptions with field definitions and field values is outlined in Appendix II.

CONTRIBUTORS
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Other Acknowledgements

The National Vegetation Classification System has been developed in consultation with many individuals and agencies and incorporates information from a variety of published and unpublished sources as well as other classifications. Individuals particularly active in the development of the portion of the National Classification covering the southern Blue Ridge region (which includes the Great Smoky Mountains National Park) include Jon Ambrose, Steve Croy, Dave Danley, Bob Dellinger, Gary Fleming, L.L. Gaddy, Gary Kauffman, Smoot Major, Claire Newell, Karen Patterson, Robert Peet, Mike Schafale, Steve Simon, Chris Ulrey, Alan Weakley, Tom Wentworth, and the North Carolina Vegetation Survey (the Gang of Seven). Field data were collected by Chris Ulrey, William Noel, and Chas Zartman. Peter White, Bob Dellinger, and John Boetsch provided additional vegetation data for use in this project. Scientists at the Great Smoky Mountains National Park, including John Boetsch, Bob Dellinger, Rob Klein, Keith Langdon, Janet Rock, and Mark Whited contributed their time and knowledge to this project.

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VEGETATION CLASSIFICATION

I Forest
I.A Evergreen forest
I.A.8 Temperate or subpolar needle-leaved evergreen forest

I.A.8.N Natural/Semi-natural
I.A.8.N.b Rounded-crowned temperate or subpolar needle-leaved evergreen forest

I.A.8.N.b.5 PINUS ECHINATA FOREST ALLIANCE (A.119)
[Pinus echinata / Vaccinium (pallidum, stamineum) - Kalmia latifolia Forest (CEGL007078)]

I.A.8.N.b.13 PINUS STROBUS - TSUGA CANADENSIS FOREST ALLIANCE (A.127)
Pinus strobus - Tsuga canadensis / Rhododendron maximum - Leucothoe fontanesiana Forest (CEGL007102)

I.A.8.N.b.14 PINUS STROBUS FOREST ALLIANCE (A.128)
[Pinus strobus / Kalmia latifolia - (Vaccinium stamineum, Gaylussacia ursina) Forest (CEGL007100)]

I.A.8.N.b.17 PINUS VIRGINIANA FOREST ALLIANCE (A.131)
Pinus virginiana - Pinus (rigida, echinata) - (Quercus prinus) / Vaccinium pallidum Forest (CEGL007119)
Pinus virginiana Successional Forest (CEGL002591)

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

I.A.8.N.c.1 ABIES FRASERI - PICEA RUBENS FOREST ALLIANCE (A.136)
[Abies fraseri / (Rhododendron catawbiense, Rhododendron carolinianum) Forest (CEGL006308)]
Abies fraseri / Viburnum lantanoides / Dryopteris campyloptera - Oxalis montana / Hylocomium splendens Forest (CEGL006049)
Picea rubens - (Abies fraseri) / (Rhododendron catawbiense, Rhododendron maximum) Forest (CEGL007130)
Picea rubens - (Abies fraseri) / Vaccinium erythrocarpum / Oxalis montana - Dryopteris campyloptera / Hylocomium splendens Forest (CEGL007131)

I.A.8.N.c.3 PICEA RUBENS FOREST ALLIANCE (A.138)
Picea rubens - Tsuga canadensis / Rhododendron maximum Forest (CEGL006272)

I.A.8.N.c.8 TSUGA CANADENSIS FOREST ALLIANCE (A.143)
Tsuga canadensis / Rhododendron maximum - Leucothoe fontanesiana Forest (CEGL007136)

I.B Deciduous forest
I.B.2 Cold-deciduous forest
I.B.2.N Natural/Semi-natural
I.B.2.N.a Lowland or submontane cold-deciduous forest

I.B.2.N.a.9 AILANTHUS ALTISSIMA FOREST ALLIANCE (A.221)
[Ailanthus altissima Forest (CEGL007191)]

I.B.2.N.a.104 BETULA ALLEGHANIENSIS - FAGUS GRANDIFOLIA - AESCULUS FLAVA FOREST ALLIANCE (A.266)
Aesculus flava - Betula alleghaniensis - Acer saccharum / Acer spicatum / Caulophyllum thalictroides - Laportea canadensis Forest (CEGL004973)
Betula alleghaniensis - Fagus grandifolia - Aesculus flava / Viburnum lantanoides / Aster chlorolepis - Dryopteris intermedia Forest (CEGL007285)
Betula alleghaniensis / Acer spicatum / Hydrangea arborescens - Ribes cynosbati / Dryopteris marginalis Forest (CEGL004982)
Betula alleghaniensis / Ribes glandulosum / Polypodium appalachianum Forest (CEGL006124)
[Fagus grandifolia / Ageratina altissima var. roanensis Forest (CEGL006246)]
Fagus grandifolia / Carex pensylvanica - Carex brunnescens Forest (CEGL006130)

I.B.2.N.a.107 JUGLANS NIGRA FOREST ALLIANCE (A.1932)
Juglans nigra / Verbesina alternifolia Forest (CEGL007879)

I.B.2.N.a.23 LIRIODENDRON TULIPIFERA - TILIA AMERICANA VAR. HETEROPHYLLA - AESCULUS FLAVA - ACER SACCHARUM FOREST ALLIANCE (A.235)
Aesculus flava - Acer saccharum - (Fraxinus americana, Tilia americana) / Hydrophyllum canadense - Solidago flexicaulis Forest (CEGL007695)
Liriodendron tulipifera - Aesculus flava - (Fraxinus americana, Tilia americana var. heterophylla) / Cimicifuga racemosa - Laportea canadensis Forest (CEGL007710)
[Liriodendron tulipifera - Tilia americana var. heterophylla - (Aesculus flava) / Cimicifuga racemosa Forest (CEGL007291)]

I.B.2.N.a.24 LIRIODENDRON TULIPIFERA FOREST ALLIANCE (A.236)
Liriodendron tulipifera - Acer rubrum - Robinia pseudoacacia Forest (CEGL007219)

I.B.2.N.a.27 QUERCUS ALBA - (QUERCUS RUBRA, CARYA SPP.) FOREST ALLIANCE (A.239)
Quercus alba - Quercus (rubra, prinus) / Rhododendron calendulaceum - Kalmia latifolia - (Gaylussacia ursina) Forest (CEGL007230)
[Quercus alba - Quercus rubra - Quercus prinus / Collinsonia canadensis - Podophyllum peltatum - Sanguinaria canadensis Forest (CEGL007692)]
Quercus rubra - Acer rubrum / Calycanthus floridus - Pyrularia pubera / Thelypteris noveboracensis Forest (CEGL006192)
Quercus rubra - Tilia americana var. heterophylla - Halesia tetraptera var. monticola / Collinsonia canadensis – Tradescantia subaspera Forest (CEGL007878)

I.B.2.N.a.103 QUERCUS ALBA MONTANE FOREST ALLIANCE (A.271)
[Quercus alba / Kalmia latifolia Forest (CEGL007295)]

I.B.2.N.a.36 QUERCUS PRINUS - (QUERCUS COCCINEA, QUERCUS VELUTINA) FOREST ALLIANCE
(Quercus prinus, Quercus coccinea) / Kalmia latifolia / Galax urceolata Forest (CEGL006271)

I.B.2.N.a.38 QUERCUS PRINUS - QUERCUS RUBRA FOREST ALLIANCE (A.250)
Quercus prinus - (Quercus rubra) - Carya spp. / Oxydendrum arboreum - Cornus florida Forest (CEGL007267)
Quercus prinus - Quercus rubra / Rhododendron maximum / Galax urceolata Forest (CEGL006286)

I.B.2.N.a.8 QUERCUS RUBRA MONTANE FOREST ALLIANCE (A.272)
Quercus rubra / (Kalmia latifolia, Rhododendron maximum) / Galax urceolata Forest (CEGL007299)
Quercus rubra / (Vaccinium simulatum, Rhododendron calendulaceum) / (Dennstaedtia punctilobula, Thelypteris noveboracensis) Forest (CEGL007300)
Quercus rubra / Carex pensylvanica - Ageratina altissima var. roanensis Forest (CEGL007298)

I.B.2.N.d.13 PLATANUS OCCIDENTALIS - (FRAXINUS PENNSYLVANICA, CELTIS LAEVIGATA, ACER SACCHARINUM) TEMPORARILY FLOODED FOREST ALLIANCE (A.288)
Platanus occidentalis - Fraxinus pennsylvanica - Acer negundo / Boehmeria cylindrica Forest

I.B.2.N.d.14 PLATANUS OCCIDENTALIS - (LIQUIDAMBAR STYRACIFLUA, LIRIODENDRON TULIPIFERA) TEMPORARILY FLOODED FOREST ALLIANCE (A.289)
[Platanus occidentalis - Liriodendron tulipifera - Betula (alleghaniensis, lenta) / Alnus serrulata - Leucothoe fontanesiana Forest (CEGL004691)]
Liquidambar styraciflua - Liriodendron tulipifera (Platanus occidentalis) / Carpinus caroliniana – Halesia tetraptera var. monticola / Amphicarpaea bracteata Forest (CEGL007880)

I.B.2.N.e Seasonally flooded cold-deciduous forest

I.B.2.N.e.2 ACER RUBRUM SEASONALLY FLOODED FOREST ALLIANCE (A.317)
Acer rubrum Seasonally Flooded Forest [Provisional] (CEGL006347)

I.B.2.N.e.6 LIQUIDAMBAR STYRACIFLUA - (ACER RUBRUM) SEASONALLY FLOODED FOREST ALLIANCE (A.321)
Liquidambar styraciflua / Sphagnum spp. Forest (CEGL007388)

I.C **Mixed evergreen-deciduous forest**
I.C.3 **Mixed needle-leaved evergreen - cold-deciduous forest**
I.C.3.N **Natural/Semi-natural**
I.C.3.N.a **Mixed needle-leaved evergreen - cold-deciduous forest**

I.C.3.N.a.4 PICEA RUBENS - BETULA ALLEGHANIENSIS FOREST ALLIANCE (A.384)
Picea rubens - (Betula alleghaniensis, Aesculus flava) / Rhododendron (maximum, catawbiense) Forest (CEGL004983)
Picea rubens - (Betula alleghaniensis, Aesculus flava) / Viburnum lantanoides / Oxalis montana - Solidago glomerata Forest (CEGL006256)

I.C.3.N.a.21 PINUS STROBUS - QUERCUS (ALBA, RUBRA, VELUTINA) FOREST ALLIANCE (A.401)
[Pinus strobus - Quercus alba - (Carya alba) / Gaylussacia ursina Forest (CEGL007517)]

I.C.3.N.a.22 PINUS STROBUS - QUERCUS (COCCINEA, PRINUS) FOREST ALLIANCE (A.402)
Pinus strobus - Quercus (coccinea, prinus) / (Gaylussacia ursina - Vaccinium stamineum) Forest (CEGL007519)

I.C.3.N.a.28 PINUS VIRGINIANA - QUERCUS (COCCINEA, PRINUS) FOREST ALLIANCE (A.408)
[Pinus virginiana - Quercus prinus - Quercus rubra / Vaccinium pallidum - Kalmia latifolia Forest (CEGL007539)]

I.C.3.N.a.32 TSUGA CANADENSIS - BETULA ALLEGHANIENSIS FOREST ALLIANCE (A.412)
Tsuga canadensis - Betula alleghaniensis - Prunus serotina / Rhododendron maximum Forest (CEGL007861)

I.C.3.N.a.33 TSUGA CANADENSIS - LIRIODENDRON TULIPIFERA FOREST ALLIANCE (A.413)
Tsuga canadensis - Halesia tetraptera - (Fagus grandifolia, Magnolia fraseri) / Rhododendron maximum / Dryopteris intermedia Forest (CEGL007693)
Tsuga canadensis - Liriodendron tulipifera / Rhododendron maximum / Tiarella cordifolia Forest (CEGL007543)

II **Woodland**
II.A **Evergreen woodland**
II.A.4 **Temperate or subpolar needle-leaved evergreen woodland**
II.A.4.N **Natural/Semi-natural**
II.A.4.N.a **Rounded-crowned temperate or subpolar needle-leaved evergreen woodland**

II.A.4.N.a.17 PINUS ECHINATA WOODLAND ALLIANCE (A.515)
[Pinus echinata / Schizachyrium scoparium Appalachian Woodland (CEGL003560)]

II.A.4.N.a.23 PINUS PUNGENS - (PINUS RIGIDA) WOODLAND ALLIANCE (A.521)
Pinus pungens - Pinus rigida (Quercus prinus) / Kalmia latifolia - Vaccinium pallidum Woodland (CEGL007097)

II.B **Deciduous woodland**
II.B.2 **Cold-deciduous woodland**
II.B.2.N **Natural/Semi-natural**
II.B.2.N.a **Cold-deciduous woodland**

II.B.2.N.a.9 PAULOWNIA TOMENTOSA WOODLAND ALLIANCE (A.609)
[Paulownia tomentosa Woodland (CEGL003687)]

III **Shrubland**
III.A **Evergreen shrubland**
III.A.2 **Temperate broad-leaved evergreen shrubland**
III.A.2.N **Natural/Semi-natural**
III.A.2.N.b **Hemi-sclerophyllous temperate broad-leaved evergreen shrubland**

III.A.2.N.b.4 RHODODENDRON (CATAWBIENSE, CAROLINIANUM) - KALMIA LATIFOLIA SHRUBLAND

ALLIANCE (A.744)
Kalmia latifolia - Rhododendron catawbiense – (Gaylussacia baccata, Pieris floribunda, Vaccinium corymbosum) Shrubland (CEGL003814)
Rhododendron carolinianum - Rhododendron catawbiense - Leiophyllum buxifolium Shrubland (CEGL007876)

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

III.A.2.N.g.1 ARUNDINARIA GIGANTEA TEMPORARILY FLOODED SHRUBLAND ALLIANCE (A.795)
Arundinaria gigantea ssp. gigantea Shrubland (CEGL003836)

III.B Deciduous shrubland
III.B.2 Cold-deciduous shrubland
III.B.2.N Natural/Semi-natural
III.B.2.N.a Temperate cold-deciduous shrubland

III.B.2.N.a.18 VITIS AESTIVALIS VINE-SHRUBLAND ALLIANCE (A.911)
Vitis aestivalis Vine-Shrubland (CEGL003890)

III.B.2.N.b Subalpine or subpolar cold-deciduous shrubland

III.B.2.N.b.2 RUBUS ALLEGHENIENSIS - RUBUS CANADENSIS SHRUBLAND ALLIANCE (A.930)
Rubus canadensis - (Rubus idaeus ssp. strigosus) / Solidago glomerata Shrubland (CEGL003893)

III.B.2.N.d Temporarily flooded cold-deciduous shrubland

III.B.2.N.d.2 ALNUS SERRULATA TEMPORARILY FLOODED SHRUBLAND ALLIANCE (A.943)
[Alnus serrulata - Xanthorhiza simplicissima Shrubland (CEGL003895)]

V.A.5.N.c Medium-tall sod temperate or subpolar grassland

V.A.5.N.c.8 FESTUCA SPP. HERBACEOUS ALLIANCE (A.1213)
Festuca spp. Herbaceous Vegetation (CEGL004048)

V.A.5.N.e.7 DANTHONIA COMPRESSA HERBACEOUS ALLIANCE (A.1280)
Danthonia compressa - (Sibbaldiopsis tridentata) Herbaceous Vegetation (CEGL004242)

V.A.5.N.j Temporarily flooded temperate or subpolar grassland

V.A.5.N.j.4 CAREX TORTA TEMPORARILY FLOODED HERBACEOUS ALLIANCE (A.1340)
Carex torta Herbaceous Vegetation (CEGL004103)

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

V.A.5.N.k.14 JUNCUS EFFUSUS SEASONALLY FLOODED HERBACEOUS ALLIANCE (A.1375)
Juncus effusus Seasonally Flooded Herbaceous Vegetation [Provisional] (CEGL004112)

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

V.A.5.N.m.101. CAREX RUTHII – CAREX GYNANDRA SATURATED HERBACEOUS ALLIANCE (A.1898)
Carex gynandra - Platanthera clavellata - Drosera rotundifolia - Carex ruthii - Carex atlantica / Sphagnum spp. Herbaceous Vegetation (CEGL007697)
Calamagrostis cainii – Carex ruthii – Parnassia asarifolia / Sphagnum spp. Herbaceous Vegetation (CEGL007877)

V.B Perennial forb vegetation
V.B.2 Temperate or subpolar perennial forb vegetation
V.B.2.N Natural/Semi-natural
V.B.2.N.b Low temperate or subpolar perennial forb vegetation

V.B.2.N.b.10 SAXIFRAGA MICHAUXII HERBACEOUS ALLIANCE (A.1621)
Saxifraga michauxii - Carex misera - Calamagrostis cainii Herbaceous Vegetation (CEGL004278)

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

V.B.2.N.f.7 DIPHYLLEIA CYMOSA - SAXIFRAGA MICRANTHIDIFOLIA SATURATED HERBACEOUS ALLIANCE (A.1688)

Diphylleia cymosa - Saxifraga micranthidifolia - Laportea canadensis Herbaceous Vegetation

V.B.2.N.f.9 IMPATIENS (CAPENSIS, PALLIDA) - MONARDA DIDYMA SATURATED HERBACEOUS ALLIANCE (A.1690)

[Impatiens (capensis, pallida) - Monarda didyma - Rudbeckia laciniata var. humilis Herbaceous Vegetation (CEGL004293)]

V.B.2.N.f.15 VITTARIA APPALACHIANA - HEUCHERA PARVIFLORA SATURATED HERBACEOUS ALLIANCE (A.1696)

Vittaria appalachiana - Heuchera parviflora var. parviflora - Houstonia serpyllifolia / Plagiochila spp. Herbaceous Vegetation (CEGL004302)

VII Sparse Vegetation
VII.A Consolidated rock sparse vegetation
VII.A.1 Sparsely vegetated cliffs
VII.A.1.N Natural/Semi-natural
VII.A.1.N.a Cliffs with sparse vascular vegetation

VII.A.1.N.a.1 ASPLENIUM MONTANUM SPARSELY VEGETATED ALLIANCE (A.1831)

Asplenium montanum - Heuchera villosa Felsic Cliff Sparse Vegetation (CEGL004980)

VII.A.1.N.a.2 ASPLENIUM RUTA-MURARIA - PELLAEA ATROPURPUREA SPARSELY VEGETATED ALLIANCE (A.1832)

[Asplenium ruta-muraria - Pellaea atropurpurea Sparse Vegetation (CEGL004476)]

II. FIELD KEYS

KEYS TO VEGETATION OF CADES COVE AND MOUNT LE CONTE QUADRANGLES, GREAT SMOKY MOUNTAINS NATIONAL PARK

1 Wetland (palustrine) communities: Wetland habitats either dominated by plants adapted to anaerobic conditions imposed by substrate saturation or inundation during 10% or more of the growing season, or non-vegetated with saturated or shallowly inundated substrate ..... **Key A**

1 Upland communities: Upland habitats either dominated by plants which are not adapted to anaerobic soils conditions imposed by saturation or inundation for more than 10% of the growing season, or non-vegetated with substrate that is not flooded or saturated

2 Communities at greater than 4000 feet elevation (characteristic of high elevation landscapes, generally above 4000 feet -- communities of intermediate, ambiguous character keyed in both leads).

3 Nonforested communities (trees generally have less than 25% canopy coverage) ..... **Key B**

3 Forested communities (tree canopy coverage greater than 25%), dominated by species such as *Abies fraseri, Picea rubens, Betula alleghaniensis, Aesculus flava, Fagus grandifolia, Quercus rubra*.

4 Evergreen Forests and Woodlands -- stands with canopies dominated by evergreen trees (greater than 75% of the total tree cover) ..... **Key C**

4 Deciduous or Mixed Forests and Woodlands -- stands with less than 25% of the canopy coverage comprised of evergreen trees ..... **Key D**

2 Communities at less than 4000 feet elevation (characteristic of low to intermediate elevation landscapes, generally below 4000 feet -- communities of intermediate, ambiguous character keyed in both leads).

5 Nonforested communities (trees generally have less than 25% canopy coverage) ..... **Key E**

5 Forested communities (tree canopy coverage greater than 25%).

6 Vegetation strongly altered by recent human disturbance, dominated by alien species (*Paulownia tomentosa* or *Ailanthus altissima*) or certain, disturbance-oriented native species, often in monospecific stands (*Pinus virginiana, Liriodendron tulipifera, Acer rubrum, Robinia pseudoacacia, Juglans nigra*). ..... **Key F**

6 Vegetation natural or relatively unaltered by recent disturbance, dominated by native species, usually in more diverse combinations (if with monospecific canopy, not generally of the above species, except *Pinus virginiana*).

7 Stands in exposed topographic positions; ridges and upper slopes. Dominated by species such as *Pinus pungens, Pinus rigida, Pinus virginiana, Pinus echinata, Pinus strobus, Quercus prinus, Quercus coccinea*.

8 Evergreen-dominated ..... **Key G**

8 Deciduous or mixed (evergreen and deciduous) dominated ..... **Key H**

7 Stands in protected (sheltered) topographic positions; coves and lower slopes. Dominated by species such *as Tsuga canadensis, Halesia tetraptera, Liriodendron tulipifera, Tilia americana var. heterophylla, Fraxinus americana, Quercus alba, Quercus rubra, Quercus prinus, Acer saccharum*.

9 Evergreen Forests and Woodlands: Stands with canopies dominated by evergreen trees (greater than 75% of the total tree cover). ..... **Key I**

9 Deciduous or Mixed Forests and Woodlands: Stands with less than 25% of the canopy coverage comprised of evergreen trees. ..... **Key J**

Key A -- wetland (palustrine) communities

1 Non alluvial: Vegetation is seepage-fed (though often in close proximity to or originating with small streams), rarely if ever flooded by alluvial waters [SPHAGNUM AND SHRUB BOGS AND SEEPS; FORESTED SEEPS; UPLAND POOLS; SPRAY CLIFFS]

2 Tree dominated vegetation in seasonally flooded upland depressions; water ponding to significant depths at least in winter season and following rainfall events; dominant or associated trees *Liquidambar styraciflua* or *Acer rubrum var. trilobum.* ....***Liquidambar styraciflua / Sphagnum spp.*** **Forest – (CEGL007388)**

2 Open, herb dominated vegetation with few trees, but may be shaded by overhanging canopies; water rarely ponding to depths greater than a few centimeters; trees (if present) generally *Picea rubens, Betula alleghaniensis, Aesculus flava, Tilia americana var. heterophylla*, and/or *Fagus grandifolia*.

3 Saturated vegetation associated with cliffs (vertical, overhanging, or very steep) in the spray zone of waterfalls, with little soil substrate; often dominated by mosses and liverworts, with very variable cover of vascular plants.
.....*Vittaria appalachiana - Heuchera parviflora var. parviflora - Houstonia serpyllifolia / Plagiochila spp.* **Herbaceous Vegetation – (CEGL004302)**

3 Herbaceous seeps dominated by graminoids or forbs in nearly level to moderately sloping seepages.

4 Vegetation dominated by *Juncus effusus*; at low elevations in disturbed (usually unforested) landscapes..... .....***Juncus effusus*** **Seasonally Flooded Herbaceous Vegetation – (CEGL004112)**

4 Vegetation dominated by other species; at higher elevations, in more natural landscapes, and often with overhanging trees; occurring at over higher elevations in natural contexts.

5 Vegetation dominated by graminoid species, especially *Calamagrostis cainii, Carex ruthii, Carex gynandra, Carex atlantica*, and other *Carex* species; occurring at over 5,000 feet elevation and surrounded by, or formerly surrounded by, forests with *Picea rubens* and *Abies fraseri.*

6 High elevation herbaceous seepage slope dominated by *Calamagrostis cainii* ....***Calamagrostis cainii – Carex ruthii – Parnassia asarifolia / Sphagnum spp.*** **Herbaceous Vegetation – (CEGL007877)**

6 High elevation herbaceous seep dominated by a mix of *Carex* spp. *(Carex ruthii, Carex gynandra, Carex crinita*), well-developed *Sphagnum* mats, and forbs such as *Chelone* spp. ..... **..... *Carex gynandra - Platanthera clavellata - Drosera rotundifolia - Carex ruthii - Carex atlantica / Sphagnum spp.*** **Herbaceous Vegetation – (CEGL007697)**

5 Vegetation dominated by forbs such as *Diphylleia, Impatiens, Saxifraga, Rudbeckia*, and/or *Monarda*, occurring as inclusions in an otherwise forested landscape; occurring at below 5,000 feet elevation and surrounded by, or formerly surrounded by, hardwood forests dominated by *Aesculus flava, Tilia americana var. heterophylla, Liriodendron tulipifera, Betula alleghaniensis, Fagus grandifolia*, and *Acer saccharum*.

7 Forb dominated, shaded seep, at low elevations (below 4,000 feet) with *Diphylleia cymosa* and/or *Saxifrage micranthidifolia*, occurring within forests dominated by *Aesculus flava, Tilia americana var. heterophylla, Liriodendron tulipifera*, and *Acer saccharum*..... ***Diphylleia cymosa - Saxifraga micranthidifolia - Laportea canadensis*** **Herbaceous Vegetation – (CEGL004296)**

[7] Forb dominated shaded seep, at high elevations (above 4,000 feet), with *Impatiens capensis, Impatiens pallida, Monarda didyma, Rudbeckia laciniata var. humilis*, occurring on boulderfields or within forests dominated by *Betula alleghaniensis, Aesculus flava*, and *Fagus grandifolia* ..... **[*Impatiens (capensis, pallida) - Monarda didyma - Rudbeckia laciniata var. humilis*** **Herbaceous Vegetation] – (CEGL004293)**

1 Alluvial: Vegetation associated with the banks or channels of rivers and streams, receiving, at least, occasional flooding. [MONTANE ALLUVIAL FORESTS; RIVER GRAVEL / COBBLE BAR; UNFORESTED FLOODPLAIN CANEBRAKE]

8 Tree dominated; vegetation with tree canopy coverage greater than 25%.

9 Canopy dominated by *Acer rubrum*, occurring with other deciduous trees, on seasonally flooded, disturbed flats near streams..... ..... ***Acer rubrum*** **Seasonally Flooded Forest (CEGL006347)**

9 Canopy dominated by *Liquidambar styraciflua, Liriodendron tulipifera, Platanus occidentalis, Betula alleghaniensis, Betula lenta, Acer negundo var. negundo, Acer rubrum var. trilobum*, or *Quercus imbricaria*; hydrology is temporarily flooded (surface water present for brief periods during the growing season, but water table is usually well below the soil surface).

10 Canopy composed of combinations of *Platanus occidentalis, Acer negundo var. negundo, Acer rubrum var. trilobum, Liriodendron tulipifera*, and *Quercus imbricaria*; occurring along small streams in a landscape of pastures and fields in Cades Cove ....***Platanus occidentalis - Fraxinus pennsylvanica - Acer negundo / Boehmeria cylindrica*** **Forest – (CEGL007339)**

10 Canopy variously dominated by dominated by *Liquidambar styraciflua, Liriodendron tulipifera, Platanus occidentalis, Betula alleghaniensis*, or *Betula lenta*; sites are alluvial flats and high terraces along large rivers, small, disturbed flats along medium-sized perennial streams, or narrow, rocky floodplains and islands in medium-sized rivers, at elevations below 2000 feet.

11 Canopy is dominated by *Liquidambar styraciflua* and *Liriodendron tulipifera*, often with *Platanus occidentalis; Carpinus caroliniana* is characteristic; sites are large alluvial flats and high terraces along large rivers (e.g. Little Pigeon River) or on small, disturbed flats along medium-sized perennial streams, often areas that were formerly cleared for farming or settlement. ..... ***Liquidambar styraciflua - Liriodendron tulipifera (Platanus occidentalis) / Carpinus caroliniana – Halesia tetraptera var. monticola / Amphicarpaea bracteata* Forest – (CEGL007880)**

[11] Canopy dominated by *Platanus occidentalis, Liriodendron tulipifera, Liquidambar styraciflua, Betula alleghaniensis*, and *Betula lenta*; shrub stratum can be dense; characteristic shrubs are *Leucothoe fontanesiana, Rhododendron maximum, Alnus serrulata, Xanthorhiza simplicissima, Hydrangea arborescens*; sites are narrow, rocky floodplains and islands in medium-sized rivers, at elevations below 2000 feet. .... **[*Platanus occidentalis - Liriodendron tulipifera - Betula (alleghaniensis, lenta) / Alnus serrulata - Leucothoe fontanesiana* Forest] – (CEGL004691)**

8 Not tree dominated, open vegetation with less than 25 % tree canopy coverage.

12 Vegetation dominated by herbs; with little or no woody coverage; dominated by *Carex torta*, forming dense, extensive colonies.. ..... ***Carex torta* Herbaceous Vegetation – (CEGL004103)**

12 Vegetation dominated by shrubs (including bamboo); hydrology is seasonally to temporarily flooded.

13 Vegetation dominated by dense, monospecific stand of *Arundinaria gigantea*. .... ***Arundinaria gigantea ssp. gigantea* Shrubland – (CEGL003836)**

[13] Vegetation dominated shrubs characteristic of rocky or gravelly substrates along narrow river margins; common shrubs include *Alnus serrulata, Xanthorhiza simplicissima, Salix (nigra, sericea), Leucothoe fontanesiana, Itea virginica, Viburnum nudum var. cassinoides* ..... **[*Alnus serrulata - Xanthorhiza simplicissima* Shrubland] – (CEGL003895)**

Key B -- high elevation, nonforested, terrestrial communities
[Grass Balds, Heath Balds, Rocky Summits]

1 Nonforested vegetation supported by significant soil substrate without large areas of exposed rock; shrubs, if present, are primarily deciduous
  2 Vegetation is mainly graminoid dominated; with local dominance by shrubs; sites are gentle, broad ridges; *Danthonia compressa* is the common grass*; Rhododendron calenulaceum* and *Vaccinium corymbosum* are common shrubs. .... ***Danthonia compressa*** **Herbaceous Vegetation – (CEGL004242)**

  2 Successional vegetation resulting from the death of *Abies fraseri*; vegetation is variously dominated by dense shrubs (*Rubus canadensis, Diervilla sessilifolia*) or dense forbs (*Athyrium filix-femina, Solidago glomerata*); standing dead trees are common .... ***Rubus canadensis - (Rubus idaeus ssp. strigosus) / Athyrium filix-femina - Solidago glomerata*** **Shrubland – (CEGL003893)**

1 Nonforested vegetation associated with rock outcroppings; vegetation is rooted in crevices or within shallow organic accumulations.
  3 Dense shrub thickets sometimes with inclusions of bare rock; shrubs are predominantly evergreen, although deciduous species may be locally dominant.
    4 Dense shrub thickets one to four meters tall; mostly evergreen, but may have local dominance by deciduous shrubs. Dominant shrubs are *Kalmia latifolia, Rhododendron catawbiense, Gaylussacia baccata, Pieris floribunda*, or *Vaccinium corymbosum*; sites are southerly exposed ridges and steep slopes typically below 5,000 feet elevation ..... ***Kalmia latifolia - Rhododendron catawbiense – (Gaylussacia baccata, Pieris floribunda, Vaccinium corymbosum)*** **Shrubland – (CEGL003814)**

    4 Open to dense shrub dominated vegetation 0.5 to four meters tall. Dominant shrubs *include Rhododendron carolinianum, Rhododendron catawbiense,* and *Leiophyllum buxifolium*; sites are typically above 5000 feet elevation, in the Spruce-Fir zone. .. .. ***Rhododendron carolinianum - Rhododendron catawbiense - Leiophyllum buxifolium*** **Shrubland – (CEGL007876)**

  3 Sparse to moderate vegetation coverage on landslide scars, cliffs, rock outcrops; vegetation is comprised of grasses, forbs and shrubs rooted in rock fissures; characteristic species include *Calamagrostis cainii, Carex misera, Carex debilis, Saxifraga michauxii, Solidago glomerata, Rhododendron carolinianum, Leiophyllum buxifolium, Abies fraseri*..... ..... ***Saxifraga michauxii - Carex misera - Calamagrostis cainii*** **Herbaceous Vegetation – (CEGL004278)**

Key C -- high elevation, terrestrial evergreen forests and woodlands [Spruce / Fir Forests, Table Mountain Pine Woodlands]

1 Stands dominated by *Abies fraseri, Picea rubens*, or *Tsuga canadensis.*
  2 The most abundant trees are *Abies fraseri.*
    3 Shrub strata are relatively open and composed of deciduous species, although *Abies fraseri* regeneration may be dense in patches; common shrubs include *Betula alleghaniesis, Prunus pensylvanica, Sorbus americana, Diervilla sessilifolia, Rubus canadensis, Sambucus racemosa var. pubens, Vaccinium erthyrocarpum, Viburnum lantanoides.* ..... ***Abies fraseri / Viburnum lantanoides / Dryopteris campyloptera - Oxalis montana / Hylocomium splendens* Forest – (CEGL006049)**

    [3] Shrub strata are dense and dominated by evergreen ericads (*Rhododendron catawbiense, Rhododendron carolinianum, Rhododendron maximum*); sites are rocky, steep ridges and exposed south facing slopes over 6,000 feet elevation..... .....**[*Abies fraseri / (Rhododendron catawbiense, Rhododendron carolinianum)* Forest] – (CEGL006308)**

  2 The most abundant trees are *Picea rubens*, with or without *Abies fraseri* or *Tsuga canadensis.*
    4 Canopy dominated by Picea rubens and Tsuga canadensis. ..... ***Picea rubens - Tsuga canadensis / Rhododendron maximum* Forest – (CEGL006272)**

    4 Canopy dominated by *Picea rubens* and sometimes codominated with *Abies fraseri* or standing dead *Abies fraseri.*
      5 Shrub strata are dense; herbaceous coverage is low; dominant shrubs are evergreen ericads, most commonly *Rhododendron catawbiense* and *Leucothoe fontanesiana;* shrub stratum may also include dense patches of *Abies fraseri* seedlings and saplings. .... ***Picea rubens - (Abies fraseri) / (Rhododendron catawbiense, Rhododendron maximum)* Forest – (CEGL007130)**

      5 Shrub strata are absent to dense, but dominated by deciduous shrubs and patches of *Abies fraseri* and *Picea rubens* regeneration; common shrubs include *Rubus canadensis, Vaccinium erythrocarpum, Diervilla sessilifolia, Sorbus americana, Prunus pensylvanica*; bryophyte cover may be high; typical herbs include *Aster acuminatus, Athyrium asplenioides, Oxalis montana*..... ***Picea rubens - (Abies fraseri) / Vaccinium erythrocarpum / Oxalis montana - Dryopteris campyloptera / Hylocomium splendens* Forest – (CEGL007131)**

1 Stands dominated by *Pinus pungens*; canopy is dominated by *Pinus pungens* with dense shrub strata and sparse herbaceous coverage; common .....shrubs are *Pieris floribunda, Kalmia latifolia, Gaylussacia baccata, Vaccinium pallidum*; other typical species are *Galax urceolata, Gaultheria procumbens,* and *Smilax rotundifolia*; sites are exposed slopes and ridges..... .....***Pinus pungens – Pinus rigida (Quercus prinus) / Kalmia latifolia - Vaccinium pallidum* Woodland – (CEGL007097)**

Key D -- high elevation, terrestrial deciduous and mixed forests and woodlands [Boulderfield Forests, Beech Gaps, High Elevation Red Oak, Northern Hardwood Forests]

1 Canopy composed of a mix of evergreen and deciduous trees; dominant species are *Picea rubens, Betula alleghaniensis*, and *Tsuga canadensis*; evergreen trees may overtop deciduous trees in the canopy.
- 2 Canopy dominated by *Picea rubens* and deciduous trees, *Betula alleghaniensis, Fagus grandifolia, Aesculus flava, Prunus pensylvanica.*
  - 3 Shrub strata are dense and dominated by evergreen ericads (*Rhododendron maximum, Leucothoe fontanesiana*) although deciduous shrubs may be present (e.g. *Ilex montana*); herbaceous cover is sparse; bryophyte cover may be high (greater than 50%)..... ***Picea rubens - (Betula alleghaniensis, Aesculus flava) / Rhododendron (maximum, catawbiense)*** **Forest – (CEGL004983)**

  - 3 Shrub strata are sparse to dense (20-90% coverage) and dominated by deciduous species; common shrubs are *Acer spicatum, Vaccinium erythrocarpum, Viburnum lantanoides, Sorbus americana*, and *Rubus canadensis;* herbaceous cover is moderate to dense (30-90% coverage); typical herbs are *Dryopteris campyloptera, Oxalis montana, Solidago glomerata, Clintonia borealis*, and *Rugelia nudicaulis, Athyrium filix-femina, Huperzia lucidula*..... ***Picea rubens - (Betula alleghaniensis, Aesculus flava) / Viburnum lantanoides / Oxalis montana - Solidago glomerata*** **Forest – (CEGL006256)**

- 2 Canopy dominated by *Tsuga canadensis* and *Betula alleghaniensis* with a dense evergreen shrub stratum and sparse herb coverage..... ***Tsuga canadensis – Betula alleghaniensis / Rhododendron maximum / Leucothoe fontanesiana*** **Forest – (CEGL007861)**

1 Canopy dominated by deciduous trees
- 4 Canopy dominated by *Quercus* spp.
  - 5 Canopy strongly dominated by *Quercus alba*..... **[*Quercus alba / Kalmia latifolia Forest*]-(CEGL007295)**
  - 5 Canopy strongly dominated by *Quercus rubra*, although *Quercus alba* may be present
    - 6 Shrub stratum is dense and dominated by evergreen ericads (e.g. *Kalmia latifolia, Rhododendron catawbiense, Rhododendron maximum*); herbaceous cover is sparse..... ***Quercus rubra / (Kalmia latifolia, Rhododendron maximum) / Galax urceolata*** **Forest – (CEGL007299)**

    - 6 Shrub strata are sparse to dense and dominated by deciduous species (e.g. *Ilex montana, Rhododendron calendulaceum, Vaccinium corymbosum*); herbaceous cover is moderate to dense and dominated by ferns, tall forbs, and sedges.
      - 7 Shrub stratum is absent or very sparse and herb coverage is dense, approaching 100 % and dominated by *Carex* spp., although ferns and tall forbs may be present..... ***Quercus rubra / Carex pensylvanica - Ageratina altissima var. roanensis*** **Forest – (CEGL007298)**

      - 7 Shrub stratum is moderate to dense and dominated by deciduous species (e.g. *Ilex montana, Rhododendron calendulaceum, Vaccinium corymbosum*); herbaceous cover is moderate to dense and dominated by ferns, tall forbs, and sedges; common species are *Dennstaedtia punctilobula, Thelypteris noveboracensis, Ageratina altissima var. roanensis Clintonia umbellulata, Silene stellata, Solidago caesia var. curtisii.*..... .***Quercus rubra / (Vaccinium simulatum, Rhododendron calendulaceum) / (Dennstaedtia punctilobula, Thelypteris noveboracensis)*** **Forest – (CEGL007300)**

- 4 Canopy not dominated by Oaks (*Quercus* spp.), but other broad leaved deciduous species (*Betula alleghaniensis, Fagus grandifolia, Aesculus flava, Acer saccharum*).
  - 8 Substrate is bouldery talus of periglacial boulderfields; with limited soil development; often associated with small creeks and seepage; vines and shrubs associated with bouldery habitats are well represented; characteristic species are *Ribes* spp., *Acer spicatum, Hydrangea arborescens, Euonymus obovata.*
    - 9 Canopy is stunted and strongly dominated by *Betula alleghaniensis*; other canopy species can include *Aesculus flava, Prunus pensylvanica, Sorbus americana, Acer spicatum*, and *Picea rubens;* associated species are characteristic of high elevations (*Diervilla sessilifolia, Dryopteris campyloptera, Ribes glandulosum, Rugelia nudicaulis, Streptopus amplexifolius*); site is exposed, generally over 5,000 feet elevation ..... ***Betula alleghaniensis / Ribes glandulosum / Polypodium appalachianum*** **Forest – (CEGL006124)**

    - 9 Canopy is dominated by *Betula alleghaniensis* or *Aesculus flava*; other canopy species can include *Betula lenta, Tilia americana var. heterophylla*; common shrubs are *Acer spicatum, Hydrangea arborescens, Euonymus obovata, Ribes rotundifolium, Ribes cynosbati*; sites are generally below 5,000 feet elevation ..... ***Betula alleghaniensis / Acer spicatum / Hydrangea arborescens - Ribes cynosbati / Dryopteris marginalis*** **Forest – (CEGL004982)**

  - 8 Substrate is relatively well developed soils, although soils may be rocky; species characteristic of bouldery habitats are not common.
    - 10 Canopy strongly dominated by short stature *Fagus grandifolia*; sites are upper slopes, gaps, and ridges.
      - 11 Herbaceous cover is strongly dominated by *Carex* spp. (e.g. *Carex aestivalis, Carex brunnescens, Carex debilis, Carex intumescens, Carex pensylvanica*); sites are concave slopes, flat ridgetops, or upper south to southwest-facing slopes. ..... ***Fagus grandifolia / Carex pensylvanica - Carex brunnescens*** **Forest – (CEGL006130)**

      - [11] Herbaceous cover is dominated by large herbs and patches of ferns, with lesser amounts of sedges; other canopy species can include *Aesculus flava* and *Betula alleghaniensis*; common species include *Ageratina altissima var. roanensis, Aster*

chlorolepis, Athyrium filix-femina ssp. asplenioides, Dryopteris campyloptera, Phacelia bipinnatifida, Prenanthes altissima, Prenanthes roanensis, Stellaria pubera, Thelypteris noveboracensis, Trillium erectum; sites are northerly facing, steep, upper slopes and the north side of gaps..... .....**[*Fagus grandifolia / Ageratina altissima var. roanensis* Forest] – (CEGL006246)**

10 Canopy dominated by various combinations of *Betula alleghaniensis, Fagus grandifolia, Aesculus flava, Acer saccharum.*
12 Shrub stratum is dense and composed of evergreen ericads (*Rhododendron maximum, Leucothoe fontanesiana*); and herb cover is absent or sparse ..... ***Tsuga canadensis – Betula alleghaniensis / Rhododendron maximum / Leucothoe fontanesiana* Forest – (CEGL007861)**

12 Shrub stratum is absent or has sparse to moderate coverage and dominated by deciduous species.
13 Canopy is dominated by *Betula alleghaniensis, Fagus grandifolia, Aesculus flava, Acer saccharum, Halesia tetraptera var. monticola*; herb cover is lush and diverse with species such as *Deparia acrostichoides, Viola canadensis, Cimicifuga americana, Cimicifuga racemosa, Deparia acrostichoides, Dryopteris intermedia, Laportea canadensis, Disporum lanuginosum, Viola canadensis;* sites are relatively protected landforms, such as upper portions of draws and coves, protected slopes, and gaps ..... ***Aesculus flava – Betula alleghaniensis - Acer saccharum / Acer spicatum / Caulophyllum thalictroides – Laportea canadensis* Forest – (CEGL004973)**

13 Canopy is dominated by *Betula alleghaniensis, Fagus grandifolia, Aesculus flava*, occurring singly or in combination; less often with *Halesia tetraptera, Quercus rubra*, or *Acer saccharum*; common shrubs are *Acer spicatum, Viburnum lantanoides*, and *Ilex montana*; herb coverage is a mix of sedges, ferns, and forbs, typically *Ageratina altissima, Athyrium filix-femina ssp. asplenioides, Carex* spp. *(e.g. Carex debilis, Carex intumescens, Carex pensylvanica), Dryopteris intermedia, Aster divaricatus, Stellaria pubera*; on relatively exposed landforms, such as high, exposed slopes, ridges, and gaps, typically with northerly exposures. ..... ***Betula alleghaniensis - Fagus grandifolia - Aesculus flava / Viburnum lantanoides / Aster chlorolepis – Dryopteris intermedia* Forest – (CEGL007285)**

Key E – low elevation, nonforested, terrestrial communities [Grape Holes, Cliffs and Forested Outcrops]

1 Community has large areas of exposed rock; vegetation is scattered or nearly absent; vascular plants have less than 10% cover and are rooted in cracks and on ledges; sites are vertical rock faces which may be shaded by overhanging trees.

2 Substrate is of felsic, metamorphic, or igneous geology; species are characteristic of dry, acidic substrates; characteristic species are *Asplenium montanum* and *Heuchera villosa*. ..... ***Asplenium montanum* - *Heuchera villosa* Felsic Cliff Sparse Vegetation – (CEGL004980)**

[2] Substrate is of limestone or dolomite geology; characteristic species are calciphilic herbs such as *Asplenium ruta-muraria, Pellaea atropurpurea, Pellaea glabella ssp. glabella, Asplenium resiliens, Aquilegia canadensis.* ..... **[*Asplenium ruta-muraria* - *Pellaea atropurpurea* Sparse Vegetation] – CEGL004476)**

1 Vegetation supported by significant soil substrate without large areas of exposed rock; well developed vegetation dominated by shrubs, herbs, or vines.

3 Graminoid dominated vegetation associated with pastures and hayfields; more-or-less cultural, though sometimes no longer actively maintained. ..... ***Festuca* spp. Herbaceous Vegetation – (CEGL004048)**

3 Vine dominated vegetation resulting from disturbance by ice storms, wind, or logging; the dominant species is *Vitis aestivalis*; sites are steep north facing slopes ..... ***Vitis aestivalis* Vine-Shrubland – (CEGL003890)**

Key F – altered / anthropogenic / cultural / semi-natural vegetation

1 Canopy mainly evergreen, although may contain admixtures of deciduous trees; canopy dominated by *Pinus virginiana* with other successional species (*Acer rubrum, Liriodendron tulipifera, Pinus strobus*) as well as deciduous species from the surrounding forest vegetation (*Quercus alba, Quercus velutina, Quercus coccinea)*; sites are former fields, pastures, clearcuts, burned or eroded areas ..... ***Pinus virginiana* Successional Forest – (CEGL002591)**

1 Canopy mainly deciduous, dominated by various broadleaf deciduous trees.

2 Canopy dominated by the exotic species *Paulownia tomentosa* or *Ailanthus altissima*.

[3] Canopy dominated by *Paulownia tomentosa* ..... **[*Paulownia tomentosa* Woodland] – (CEGL003687)**

[3] Canopy dominated by *Ailanthus altissima* ..... **[*Ailanthus altissima* Forest] – (CEGL007191)**

2 Canopy dominated by the native species *Juglans nigra, Liriodendron tulipifera, Acer rubrum*, sometimes admixed with other species.

4 Canopy dominated by *Juglans nigra*; open forests on former homesites below 3000 feet elevation. ..... ***Juglans nigra / Verbesina alternifolia* Forest – (CEGL007879)**

4 Canopy dominated by *Liriodendron tulipifera*, sometimes sharing the canopy with other successional species (*Acer rubrum, Robinia pseudoacacia, Acer saccharum, Halesia tetraptera var. monticola, Betula lenta*); sites are low slopes and flats, typically below 3000 feet elevation and particularly in areas of heavy settlement, past logging, or past farming activities ..... ***Liriodendron tulipifera - Acer rubrum - Robinia pseudoacacia* Forest – (CEGL007219)**

Key G – low elevation terrestrial xeric evergreen forest and woodlands in exposed topographic positions [Table Mountain Pine / Pitch Pine Woodlands, Shortleaf Pine Forests, White Pine Forests]

1 Successional vegetation resulting from recent disturbance; canopy dominated by *Pinus virginiana* sometimes with other successional species; sites are former fields, pastures, clearcuts, burned, or eroded areas.....***Pinus virginiana* Successional Forest – (CEGL002591)**

1 Mature, relatively undisturbed vegetation; canopy variously dominated by *Pinus* spp. (including *P. virginiana*).
[2] Canopy dominated by *Pinus strobus;* subcanopy commonly contains *Oxydendrum arboreum, Acer rubrum, Nyssa sylvatica, Cornus florida;* shrubs are patchy to continuous and dominated by ericaceous species (*Gaylussacia ursina, Vaccinium stamineum, Kalmia latifolia*)..... .....**[*Pinus strobus / Kalmia latifolia – (Vaccinium stamineum, Gaylussacia ursina)* Forest] – (CEGL007100)**

2 Canopy dominated by *Pinus virginiana, Pinus rigida, Pinus pungens*, or *Pinus echinata.*
3 Stands dominated by *Pinus echinata*; may have minor coverage by *Pinus virginiana* or *Pinus rigida.*
[4] Closed canopy with shrub stratum dominated by ericacous species with scattered grasses and forbs ....**[*Pinus echinata / Vaccinium (pallidum, stamineum) - Kalmia latifolia* Forest]– (CEGL007078)**

[4] Open canopy with understory dominated by herbs. ....**[*Pinus echinata / Schizachyrium scoparium* Appalachian Woodland – (CEGL003560)]**

3 Stands dominated by *Pinus virginiana, Pinus rigida*, or *Pinus pungens*; may have minor coverage by *Pinus echinata.*
5 Canopy dominated by *Pinus virginiana*; sometimes with lesser amounts of *Pinus rigida* or *Pinus echinata*; sites are typically below 2300 feet elevation on gentle slopes and low ridges ....***Pinus virginiana – Pinus (rigida, echinata) - (Quercus prinus) / Vaccinium pallidum* Forest – (CEGL007119)**

5 Canopy dominated by *Pinus pungens* or *Pinus rigida*, sites are typically above 2,000 feet elevation on exposed ridgetops and slopes with west to southeast aspects ....***Pinus pungens – Pinus rigida (Quercus prinus) / Kalmia latifolia - Vaccinium pallidum* Woodland – (CEGL007097)**

Key H -- low elevation terrestrial deciduous and mixed xeric forests and woodlands in exposed topographic positions [Shortleaf Pine – Oak Forests, White Pine – Oak Forests, Chestnut Oak Forests, Shale Barrens]

1 Successional vegetation resulting from recent disturbance; canopy dominated by *Pinus virginiana* with other successional species (*Acer rubrum, Liriodendron tulipifera, Pinus strobus*) as well as deciduous species from the surrounding forest vegetation (*Quercus alba, Quercus velutina, Quercus coccinea)*; sites are former fields, pastures, clearcuts, burned or eroded areas ..... ***Pinus virginiana* Successional Forest – (CEGL002591)**

1 Mature, relatively undisturbed vegetation.

[2] Vegetation associated with significant areas of exposed mineral substrate; sites are steep, shaley slopes ..... **[*Pinus virginiana - Quercus prinus - Quercus rubra / Vaccinium pallidum - Kalmia latifolia* Forest] – (CEGL007539)**

2 Vegetation supported by significant soil substrate, without large areas of exposed rock.

3 Canopy dominated by a mix of evergreen and deciduous trees; dominant species are *Pinus virginiana, Pinus rigida, Pinus pungens, Pinus strobus, Acer rubrum, Quercus prinus, Quercus coccinea.*

4 Canopy dominated by *Pinus strobus, Quercus prinus, Acer rubrum,* and *Quercus coccinea* ..... ***Pinus strobus – Quercus (coccinea, prinus) / (Gaylussacia ursina - Vaccinium stamineum*) Forest – (CEGL007519)**

4 Canopy dominated by *Pinus virginiana, Pinus rigida,* or *Pinus pungens* with mixes of deciduous species (e.g. *Acer rubrum, Quercus prinus, Quercus coccinea*).

5 Canopy dominated by *Pinus virginiana*; sometimes with lesser amounts of *Pinus rigida* or *Pinus echinata* and with mixes of deciduous species (*Quercus prinus, Quercus coccinea, Quercus alba, Quercus marilandica, Quercus velutina*); sites are typically below 2300 feet elevation on gentle slopes and low ridges ..... ***Pinus virginiana – Pinus (rigida, echinata) - (Quercus prinus) / Vaccinium pallidum* Forest – (CEGL007119)**

5 Canopy dominated by *Pinus pungens* or *Pinus rigida*, with *Quercus prinus* or *Quercus coccinea*; evergreen trees may overtop the deciduous canopy trees; sites are typically above 2,000 feet elevation on exposed ridgetops and slopes with west to southeast aspects ..... ***Pinus pungens – Pinus rigida (Quercus prinus) / Kalmia latifolia - Vaccinium pallidum* Woodland – (CEGL007097)**

3 Canopy is dominated by deciduous species.

6 Canopy dominated by *Quercus prinus, Quercus coccinea,* and *Acer rubrum*, occurring singly or in various combinations over a dense ericaceous shrub layer (*Kalmia latifolia, Gaylussacia ursina*); may have standing dead *Pinus* spp.; sites are middle to upper convex slopes and ridges with southwest and western exposures. ..... ***(Quercus prinus, Quercus coccinea) / Kalmia latifolia / Galax urceolata* Forest – (CEGL006271)**

6 Canopy dominated by *Quercus prinus* occurring with *Quercus rubra* and/or *Acer rubrum* over dense, tall *Rhododendron maximum*; sparse herb cover; sites are very steep, northerly slopes ..... ***Quercus prinus – Quercus rubra / Rhododendron maximum / Galax urceolata* Forest – (CEGL006286)**

Key I -- low elevation terrestrial evergreen forest and woodlands in protected topographic positions [Hemlock Forests]

1 Successional vegetation resulting from recent disturbance; canopy dominated by *Pinus virginiana* sometimes with other successional species; sites are former fields, pastures, clearcuts, burned or eroded areas.....***Pinus virginiana* Successional Forest – (CEGL002591)**

1 Mature, relatively undisturbed vegetation.

2 Canopy dominated by *Pinus strobus* and *Tsuga canadensis* occurring over a shrub stratum dominated by *Rhododendron maximum*; deciduous species may be present in the canopy, but make up less than 25 % of the canopy coverage.....
.....***Pinus strobus - Tsuga canadensis / Rhododendron maximum - Leucothoe fontanesiana* Forest – (CEGL007102)**

2 Canopy dominated by *Tsuga canadensis* occurring over a shrub stratum dominated by *Rhododendron maximum*; deciduous species may be present in the canopy, but make up less than 25 % of the canopy coverage.....
.....***Tsuga canadensis / Rhododendron maximum - Leucothoe fontanesiana* Forest – (CEGL007136)**

Key J -- low elevation terrestrial deciduous and mixed forest and woodlands in protected topographic positions [Mountain Cove Forests, Montane Oak –Hickory Forests]

1 Vegetation strongly altered by recent human disturbance, dominated by alien species *(Paulownia tomentosa* or *Ailanthus altissima*) or certain, disturbance-oriented native species, often in monospecific stands (*Pinus virginiana, Liriodendron tulipifera, Acer rubrum, Robinia pseudoacacia, Juglans nigra*).

2 Canopy a mix of evergreen and deciduous trees; canopy dominated by *Pinus virginiana* with other successional species *(Acer rubrum, Liriodendron tulipifera, Pinus strobus*) as well as deciduous species from the surrounding forest vegetation (*Quercus alba, Quercus velutina, Quercus coccinea*); sites are former fields, pastures, clearcuts, burned or eroded areas ..... ***Pinus virginiana* Successional Forest – (CEGL002591)**

2 Canopy mainly deciduous, dominated by various broadleaf deciduous trees.

3 Canopy dominated by the exotic species *Paulownia tomentosa* or *Ailanthus altissima*.

[4] Canopy dominated by *Paulownia tomentosa* ..... **[*Paulownia tomentosa* Woodland] – (CEGL003687)**

[4] Canopy dominated by *Ailanthus altissima* ..... **[*Ailanthus altissima* Forest] – (CEGL007191)**

3 Canopy dominated by the native species *Juglans nigra, Liriodendron tulipifera, Acer rubrum*, sometimes admixed with other species.

5 Canopy dominated by *Juglans nigra*; open forests on former homesites below 3000 feet ..... ***Juglans nigra / Verbesina alternifolia* Forest – (CEGL007879)**

5 Canopy dominated by *Liriodendron tulipifera*, sometimes sharing the canopy with other successional species (*Acer rubrum, Robinia pseudoacacia, Acer saccharum, Halesia tetraptera var. monticola, Betula lenta*); sites are low slopes and flats, typically below 3000 feet elevation and particularly in areas of heavy settlement, past logging, or past farming activities ..... ***Liriodendron tulipifera - Acer rubrum - Robinia pseudoacacia* Forest – (CEGL007219)**

1 Mature, relatively undisturbed vegetation; vegetation natural or relatively unaltered by recent disturbance, dominated by native species, usually in diverse combinations.

6 Canopy dominated by a mixture of evergreen (*Tsuga canadensis, Pinus strobus*) and deciduous (*Betula alleghaniensis, Halesia tetraptera var. monticola, Magnolia fraseri, Fagus grandifolia, Liriodendron tulipifera, Quercus alba, Carya alba*) trees.

[7] Canopy dominated by *Pinus strobus* and deciduous (*Quercus alba, Carya alba, Acer rubrum*) species; *Pinus strobus* may over top the deciduous trees; sites are protected ridges, middle to upper slopes, and disturbed bottoms. ..... **[*Pinus strobus - Quercus alba - (Carya alba) / Gaylussacia ursina* Forest] – (CEGL007517)**

7 Canopy dominated by *Tsuga canadensis* with deciduous species (*Betula alleghaniensis, Betula lenta, Halesia tetraptera var. monticola, Magnolia fraseri, Fagus grandifolia, Liriodendron tulipifera*).

8 (1 of 3 leads) Canopy dominated by *Tsuga canadensis* and *Betula alleghaniensis* with a dense evergreen shrub stratum and sparse herb coverage; sites are above 3000 feet elevation, on steep, mostly north-facing slopes, and on slopes and flats along and above streams ..... ***Tsuga canadensis – Betula alleghaniensis / Rhododendron maximum / Leucothoe fontanesiana* Forest – (CEGL007861)**

8 (2 of 3 leads) Canopy dominated by *Tsuga canadensis* and *Halesia tetraptera var. monticola*; other canopy species can include *Acer saccharum, Fagus grandifolia, Magnolia fraseri, Betula alleghaniensis*, and *Acer rubrum*; the evergreen canopy may overtop the deciduous trees or occur beneath the deciduous canopy; the shrub stratum is either dense, tall *Rhododendron maximum* or open and dominated by canopy saplings or *Acer pensylvanicum*; the herb stratum has moderate coverage; common species are *Aster divaricatus, Dryopteris intermedia, Huperzia lucidula, Medeola virginiana, Mitchella repens, Oxalis montana, Solidago caesia var. curtisii, Tiarella cordifolia*, and *Viola blanda*; sites are protected slopes and coves, typically above 3,000 feet elevation, but may extend to lower elevations. ..... ***Tsuga canadensis – Halesia tetraptera - (Magnolia fraseri, Fagus grandifolia) / Rhododendron maximum / Dryopteris intermedia* Forest – (CEGL007693)**

8 (3 of 3 leads) Canopy is dominated by *Tsuga canadensis*, occurring with *Liriodendron tulipifera, Betula lenta*, and/or *Acer rubrum*; the shrub stratum has scattered to dominant *Rhododendron maximum*; other characteristic species are *Euonymus americanus, Ilex opaca, Leucothoe fontanesiana, Mitchella repens, Polystichum acrostichoides*; sites are low slopes and flats, is often associated with small streams, mostly below 3000 feet elevation. ..... ***Tsuga canadensis – Liriodendron tulipifera / Rhododendron maximum / Tiarella cordifolia* Forest – (CEGL007543)**

6 Canopy mainly dominated by deciduous trees (less than 25% evergreen coverage in the canopy).

9 Canopy dominated by Oaks (*Quercus* spp.) sometimes codominating with *Carya* spp.

10 Canopy dominated by *Quercus alba* or *Quercus rubra.*

11 Canopy mainly to strongly dominated by *Quercus rubra*, sites are intermediately exposed slopes, sheltered slopes, and steep coves.

12 Canopy is strongly dominated by *Quercus rubra* and *Acer rubrum*; *Carya* spp. may be present but do not dominate; other canopy species may include *Liriodendron tulipifera, Quercus prinus*; shrub strata are well-developed and may be quite dense; common shrubs are *Gaylussacia ursina, Castanea dentata, Calycanthus floridus, Pyrularia pubera,*

Rhododendron calendulaceum; Tsuga canadensis saplings often have moderate coverage in the shrub stratum; herbaceous cover is sparse to moderate but species rich; sites are at intermediate elevations (between 2,000 and 4,000 feet) and on slopes of intermediate to protected exposure.....
***Quercus rubra - Acer rubrum / Calycanthus floridus - Pyrularia pubera / Thelypteris noveboracensis* Forest – (CEGL006192)**

12 Canopy is dominated by *Quercus rubra; Quercus rubra* may be the sole canopy tree or occur with lesser amounts of *Tilia americana var. heterophylla, Halesia tetraptera var. monticola, Acer saccharum,* or *Liriodendron tulipifera;* herbs are sparse to moderate in coverage and characteristic of rich forests in cove landforms; characteristic species include *Collinsonia canadensis, Actaea pachypoda, Caulophyllum thalictroides, Laportea canadensis, Maianthemum racemosum, Phegopteris hexagonoptera, Tradescantia subaspera*; sites are protected steep slopes, often rocky; below 4,000 feet elevation.....
***Quercus rubra - Tilia americana var. heterophylla - Halesia tetraptera var. monticola / Collinsonia canadensis - Tradescantia subaspera* Forest – (CEGL007878)**

11 Canopy dominated by *Quercus alba* or by *Quercus alba* and *Quercus rubra* codominating.

13 Canopy and subcanopy dominated by *Quercus alba*, with *Carya glabra* and *Acer rubrum*; *Carya alba* can share canopy dominance at low elevations (below 2500 feet), *Quercus rubra* often codominates at the highest elevations (over 3800 feet); associated species are typical of montane acidic forests; indicators of circumneutral soils are lacking. .....
Quercus alba – Quercus (rubra, prinus) / Rhododendron calendulaceum - Kalmia latifolia - (Gaylussacia ursina)* Forest – (CEGL007230*)

[13] Canopy dominated by *Quercus alba*, occurring with other *Quercus spp*. and *Carya spp*.; occasionally with typical "cove" species (e.g. *Fraxinus americana or Magnolia acuminata*); heath species (*Rhododendron maximum* or *Kalmia latifolia*) are absent or very minor in the shrub stratum; herbaceous stratum can be quite diverse and is characterized by mesic herbs and species associated with circumneutral soils; characteristic species are *Podophyllum peltatum, Arisaema triphyllum, Amphicarpaea bracteata, Adiantum pedatum, Collinsonia canadensis, Cimicifuga racemosa, Caulophyllum thalictroides, Sanguinaria canadensis* .....
[*Quercus alba – Quercus rubra - Quercus prinus / Collinsonia canadensis – Podophyllum peltatum - Sanguinaria canadensis* Forest] – (CEGL007692)

10 Canopy mainly dominated by *Quercus prinus*.

14 Canopy dominated by *Quercus prinus* and *Acer rubrum*; occasionally *Carya glabra, Liriodendron tulipifera, Quercus velutina; Carya spp.* can have high coverage in the canopy or subcanopy; subcanopy is dominated by *Cornus florida;* shrub stratum is sparse, lacking dense, ericaceous cover; herbaceous cover is sparse to moderate but species rich; characteristic or dominant herbs include *Maianthemum racemosum ssp. racemosum, Thalictrum thalictroides, Desmodium nudiflorum, Polystichum acrostichoides, Thelypteris noveboracensis*.....
***Quercus prinus - (Quercus rubra) - Carya spp. / Oxydendrum arboreum - Cornus florida* Forest -- (CEGL007267)**

14 Canopy dominated by *Quercus prinus* occurring with *Quercus rubra* and/or *Acer rubrum* over dense, tall *Rhododendron maximum*; sparse herb cover; sites are very steep, northerly slopes. .....
.....***Quercus prinus – Quercus rubra / Rhododendron maximum / Galax urceolata* Forest – (CEGL006286)**

9 Canopy not dominated by Oaks (*Quercus spp*.), but dominated by other broad leaved deciduous species (*Acer saccharum, Aesculus flava, Betula alleghaniensis, Betula lenta, Fraxinus americana, Liriodendron tulipifera, Halesia tetraptera var. monticola, Tilia americana*).

15 Herb layer is absent to sparse; dense ericaceous shrub layer is dominated by *Rhododendron maximum*; canopy is dominated by *Liriodendron tulipifera* and *Betula lenta*; sites are associated with small streams, below 3,000 feet elevation. .....
.... ***Tsuga canadensis – Liriodendron tulipifera / Rhododendron maximum / Tiarella cordifolia* Forest -- (CEGL007543)**

15 Herb layer species rich, typically with high coverage; shrub layer is absent to open, lacking evergreen ericads.

16 Canopy with *Betula alleghaniensis* or *Fagus grandifolia* sharing dominance with *Aesculus flava, Acer saccharum, Halesia tetraptera var. monticola*; herb cover is lush and diverse with species such as *Deparia acrostichoides, Viola canadensis, Cimicifuga americana, Cimicifuga racemosa, Dryopteris intermedia, Laportea canadensis, Disporum lanuginosum, Viola canadensis;* sites upper portions of draws and coves with northerly aspects, over 3500 feet elevation.....
.***Aesculus flava – Betula alleghaniensis - Acer saccharum / Acer spicatum / Caulophyllum thalictroides – Laportea canadensis* Forest – (CEGL004973)**

16 Canopy without *Betula alleghaniensis* and *Fagus grandifolia*.

17 Canopy is dominated either *by Acer saccharum, Aesculus flava, Fraxinus americana, Halesia tetraptera var. monticola,* or *Tilia americana*, or by various combinations of these species; herb stratum is lush and diverse; characteristic herbs include *Deparia acrostichoides, Disporum lanuginosum, Hydrophyllum canadense, Laportea canadensis, Solidago flexicaulis, Hepatica nobilis var. acuta, Osmorhiza claytonii, Aristolochia macrophylla, Dryopteris goldiana, Asarum canadense, Viola canadensis*; sites are steep, middle to low protected slopes and coves, mostly below 4,000 feet elevation.....
Aesculus flava - Acer saccharum - (Fraxinus americana, Tilia americana) / Hydrophyllum canadense - Solidago

***flexicaulis* Forest – (CEGL007695)**

17 Canopy dominated by various mixtures of *Liriodendron tulipifera, Halesia tetraptera var. monticola, Tilia americana, Acer rubrum, Fraxinus americana*; other canopy tree can include *Acer saccharum, Aesculus flava, Betula lenta, Prunus serrotina, Tsuga canadensis*; shrub cover is sparse to moderate; herbaceous stratum is sparse to moderate, but always diverse, composed of a mix of species characteristic of high base status soils and those more typical of acidic forests; typically ***lacking*** strong calciphiles such as *Diplazium pycnocarpon, Asplenium rhizophyllum, Dryopteris goldiana, Aquilegia canadensis, Solidago flexicaulis, Deparia acrostichoides*, and *Cystopteris protrusa*; sites are on low, protected topographic positions, often near streams on gentle to moderate slopes with northerly aspects. .....
***Liriodendron tulipifera - Aesculus flava - (Fraxinus americana, Tilia americana var. heterophylla) / Cimicifuga racemosa - Laportea canadensis* Forest -- (CEGL007710)**

ELCODE	ASSOCIATION	COMMON NAME	
CEGL002591	*Pinus virginiana* Successional Forest	Virginia Pine Forest	40
CEGL003560	*Pinus echinata / Schizachyrium scoparium* Appalachian Woodland	Shortleaf Pine / Little Bluestem Appalachian Woodland	133
CEGL003687	*Paulownia tomentosa* Woodland	Princess-Tree Woodland	138
CEGL003814	*Kalmia latifolia - Rhododendron catawbiense – (Gaylussacia baccata, Pieris floribunda, Vaccinium corymbosum)* Shrubland	Southern Appalachian Mountain Laurel Bald	140
CEGL003836	*Arundinaria gigantea ssp. gigantea* Shrubland	Interior Highlands Canebrake	142
CEGL003890	*Vitis aestivalis Vine*-Shrubland	Montane Grape Opening	146
CEGL003893	*Rubus canadensis - (Rubus idaeus ssp. strigosus) / Solidago glomerata* Shrubland	High Elevation Blackberry Thickets	148
CEGL003895	*Alnus serrulata - Xanthorhiza simplicissima* Shrubland	Rocky Bar and Shore (Alder-Yellowroot Type)	150
CEGL004048	*Festuca spp.* Herbaceous Vegetation	Cultivated Meadow	152
CEGL004103	*Carex torta* Herbaceous Vegetation	Rocky Bar and Shore (Twisted Sedge Type)	157
CEGL004112	*Juncus effusus Seasonally Flooded* Herbaceous Vegetation [Provisional]	Rush Marshes (Placeholder)	159
CEGL004242	*Danthonia compressa - (Sibbaldiopsis tridentata)* Herbaceous Vegetation	Grassy Bald (Southern Grass Type)	154
CEGL004278	*Saxifraga michauxii - Carex misera - Calamagrostis cainii* Herbaceous Vegetation	Southern Appalachian High Elevation Rocky Summit (Anakeesta Type)	161
CEGL004293	*Impatiens (capensis, pallida) - Monarda didyma – Rudbeckia laciniata var. humilis* Herbaceous Vegetation	Rich Montane Seep (High Elevation Type)	165
CEGL004296	*Diphylleia cymosa – Saxifraga micranthidifolia – Laportea canadensis* Herbaceous Vegetation	Rich Montane Seep (Cove Type)	163
CEGL004302	*Vittaria appalachiana – Heuchera parviflora var. parviflora - Houstonia serpyllifolia / Plagiochila spp.* Herbaceous Vegetation	Southern Blue Ridge Spray Cliff	167
CEGL004476	*Asplenium ruta-muraria – Pellaea atropurpurea* Sparse Vegetation	Montane Cliff (Calcareous Type)	175
CEGL004691	*Platanus occidentalis – Liriodendron tulipifera - Betula (alleghaniensis, lenta) / Alnus serrulata - Leucothoe fontanesiana* Forest	Montane Alluvial Forest (Large River Type)	111
CEGL004973	*Aesculus flava - Betula alleghaniensis - Acer saccharum / Acer spicatum / Caulophyllum thalictroides - Laportea canadensis* Forest	Southern Appalachian Northern Hardwood Forest (Rich Type)	59
CEGL004980	*Asplenium montanum – Heuchera villosa* Felsic Cliff Sparse Vegetation	Southern Blue Ridge Felsic Cliff	173
CEGL004982	*Betula alleghaniensis / Acer spicatum / Hydrangea arborescens - Ribes cynosbati / Dryopteris marginalis* Forest	Southern Appalachian Hardwood Boulderfield Forest (Typic Type)	63
CEGL004983	*Picea rubens - (Betula alleghaniensis, Aesculus flava) / Rhododendron (maximum, catawbiense)* Forest	Red Spruce - Northern Hardwood Forest (Shrub Type)	117
CEGL006049	*Abies fraseri / Viburnum lantanoides / Dryopteris campyloptera - Oxalis montana / Hylocomium splendens* Forest	Fraser Fir Forest (Deciduous Shrub Type)	44
CEGL006124	*Betula alleghaniensis / Ribes glandulosum / Polypodium appalachianum* Forest	Southern Appalachian Boulderfield Forest (Currant and Rockcap Ferb Type)	65
CEGL006130	*Fagus grandifolia / Carex pensylvanica - Carex brunnescens* Forest	Southern Appalachian Beech Gap (South Slope Sedge Type)	69
CEGL006192	*Quercus rubra - Acer rubrum / Calycanthus floridus – Pyrularia pubera / Thelypteris noveboracensis* Forest	Appalachian Montane Oak - Hickory Forest (Red Oak Type)	87
CEGL006246	*Fagus grandifolia / Ageratina altissima var. roanensis* Forest	Southern Appalachian Beech Gap (North Slope Tall Herb Type)	67
CEGL006256	*Picea rubens - (Betula alleghaniensis, Aesculus flava) / Viburnum lantanoides / Oxalis montana - Solidago glomerata* Forest	Red Spruce - Northern Hardwood Forest (Herb Type)	119

ELCODE	ASSOCIATION	COMMON NAME	
CEGL006271	*(Quercus prinus, Quercus coccinea) / Kalmia latifolia / Galax urceolata* Forest	Chestnut Oak Forest (Xeric Ridge Type)	94
CEGL006272	*Picea rubens - Tsuga canadensis / Rhododendron maximum* Forest	Red Spruce - Fraser Fir Forest (Hemlock Type)	53
CEGL006286	*Quercus prinus - Quercus rubra / Rhododendron maximum / Galax urceolata* Forest	Chestnut Oak Forest (Mesic Slope Heath Type)	98
CEGL006308	*Abies fraseri / (Rhododendron catawbiense, Rhododendron carolinianum)* Forest	Fraser Fir Forest (Evergreen Shrub Type)	42
CEGL006347	*Acer rubrum Seasonally Flooded* Forest [Provisional]	Red Maple Seasonally Flooded Flat	113
CEGL007078	*Pinus echinata / Vaccinium (pallidum, stamineum) – Kalmia latifolia* Forest	Appalachian Shortleaf Pine Forest	32
CEGL007097	*Pinus pungens - Pinus rigida (Quercus prinus) / Kalmia latifolia - Vaccinium pallidum* Woodland	Blue Ridge Table Mountain Pine - Pitch Pine Woodland (Typic Type)	136
CEGL007100	*Pinus strobus / Kalmia latifolia - (Vaccinium stamineum, Gaylussacia ursina)* Forest	Southern Appalachian White Pine Forest	36
CEGL007102	*Pinus strobus - Tsuga canadensis / Rhododendron maximum - Leucothoe fontanesiana* Forest	Southern Appalachian Eastern Hemlock Forest (White Pine Type	34
CEGL007119	*Pinus virginiana - Pinus (rigida, echinata) - (Quercus prinus) / Vaccinium pallidum* Forest	Appalachian Low Elevation Mixed Pine Forest	38
CEGL007130	*Picea rubens - (Abies fraseri) / (Rhododendron catawbiense, Rhododendron maximum)* Forest	Red Spruce - Fraser Fir Forest (Evergreen Shrub Type)	47
CEGL007131	*Picea rubens - (Abies fraseri) / Vaccinium erythrocarpum / Oxalis montana - Dryopteris campyloptera / Hylocomium splendens* Forest	Red Spruce - Fraser Fir Forest (Deciduous Shrub Type)	50
CEGL007136	*Tsuga canadensis / Rhododendron maximum – Leucothoe fontanesiana* Forest	Southern Appalachian Eastern Hemlock Forest (Typic Type)	55
CEGL007191	*Ailanthus altissima* Forest	Tree-of-Heaven Forest	57
CEGL007219	*Liriodendron tulipifera - Acer rubrum – Robinia pseudoacacia* Forest	Early Successional Appalachian Hardwood Forest	81
CEGL007230	*Quercus alba - Quercus (rubra, prinus) / Rhododendron calendulaceum - Kalmia latifolia - (Gaylussacia ursina)* Forest	Appalachian Montane Oak Hickory Forest (Typic Acidic Type)	83
CEGL007267	*Quercus prinus - (Quercus rubra) - Carya spp. / Oxydendrum arboreum – Cornus florida* Forest	Appalachian Montane Oak Hickory Forest (Chestnut Oak Type)	96
CEGL007285	*Betula alleghaniensis - Fagus grandifolia – Aesculus flava / Viburnum lantanoides / Aster chlorolepis – Dryopteris intermedia* Forest	Southern Appalachian Northern Hardwood Forest (Typic Type)	61
CEGL007291	*Liriodendron tulipifera - Tilia americana var. heterophylla - (Aesculus flava) / Cimicifuga racemosa* Forest	Southern Appalachian Cove Forest (Typic Foothills Type)	79
CEGL007295	*Quercus alba / Kalmia latifolia* Forest	High Elevation White Oak Forest	92
CEGL007298	*Quercus rubra / Carex pensylvanica – Ageratina altissima var. roanensis* Forest	High Elevation Red Oak Forest (Tall Herb Type)	105
CEGL007299	*Quercus rubra / (Kalmia latifolia, Rhododendron maximum) / Galax urceolata* Forest	High Elevation Red Oak Forest (Evergreen Shrub Type)	100
CEGL007300	*Quercus rubra / (Vaccinium simulatum, Rhododendron calendulaceum) / (Dennstaedtia punctilobula, Thelypteris noveboracensis)* Forest	High Elevation Red Oak Forest (Deciduous Shrub Type)	102
CEGL007339	*Platanus occidentalis – Fraxinus pennsylvanica - Acer negundo / Boehmeria cylindrica* Forest	Montane Alluvial Forest (Cades Cove)	107
CEGL007388	*Liquidambar styraciflua / Sphagnum spp.* Forest	Gum Swamp Upland Pool	115
CEGL007517	*Pinus strobus - Quercus alba - (Carya alba) / Gaylussacia ursina* Forest	Appalachian White Pine - Mesic Oak Forest	121
CEGL007519	*Pinus strobus - Quercus (coccinea, prinus) / (Gaylussacia ursina – Vaccinium stamineum)* Forest	Appalachian White Pine - Xeric Oak Forest	123
CEGL007539	*Pinus virginiana - Quercus prinus - Quercus rubra / Vaccinium pallidum - Kalmia latifolia* Forest	Blue Ridge Acid Shale Forest	125

ELCODE	ASSOCIATION	COMMON NAME	
CEGL007543	*Tsuga canadensis – Liriodendron tulipifera / Rhododendron maximum / Tiarella cordifolia* Forest	Southern Appalachian Acid Cove Forest (Typic Type)	131
CEGL007692	*Quercus alba - Quercus rubra - Quercus prinus / Collinsonia canadensis – Podophyllum peltatum – Sanguinaria canadensis* Forest	Appalachian Montane Oak - Hickory Forest (Rich Type)	86
CEGL007693	*Tsuga canadensis - Halesia tetraptera - (Fagus grandifolia, Magnolia fraseri) / Rhododendron maximum / Dryopteris intermedia* Forest	Southern Appalachian Acid Cove Forest (Silverbell Type)	129
CEGL007695	*Aesculus flava - Acer saccharum - (Fraxinus americana, Tilia americana) / Hydrophyllum canadense – Solidago flexicaulis* Forest	Southern Appalachian Cove Forest (Rich Montane Type)	73
CEGL007697	*Carex gynandra – Platanthera clavellata – Drosera rotundifolia - Carex ruthii – Carex atlantica / Sphagnum spp.* Herbaceous Vegetation	Blue Ridge High Elevation Seep (Sedge Type)	169
CEGL007710	*Liriodendron tulipifera – Aesculus flava - (Fraxinus americana, Tilia americana var. heterophylla) / Cimicifuga racemosa – Laportea canadensis* Forest	Southern Appalachian Cove Forest (Typic Montane Type)	76
CEGL007861	*Tsuga canadensis – Betula alleghaniensis / Rhododendron maximum / Leucothoe fontanesiana* Forest	Blue Ridge Hemlock - Northern Hardwood Forest	127
CEGL007876	*Rhododendron carolinianum - Rhododendron catawbiense - Leiophyllum buxifolium* Shrubland	Southern Appalachian Heath Bald	142
CEGL007877	*Calamagrostis cainii – Carex ruthii – Parnassia asarifolia / Sphagnum spp.* Herbaceous Vegetation	Blue Ridge High Elevation Seep (Mount Le Conte type)	171
CEGL007878	*Quercus rubra - Tilia americana var. heterophylla – Halesia tetraptera var. monticola / Collinsonia canadensis - Tradescantia subaspera* Forest	Southern Appalachian Red Oak Cove Forest	90
CEGL007879	*Juglans nigra / Verbesina alternifolia* Forest	Successional Black Walnut Forest	71
CEGL007880	*Liquidambar styraciflua – Liriodendron tulipifera (Platanus occidentalis) / Carpinus caroliniana – Halesia tetraptera var. monticola / Amphicarpaea bracteata* Forest	Montane Sweetgum Alluvial Flat	109

Pinus echinata / Vaccinium (pallidum, stamineum) - Kalmia latifolia Forest

COMMON NAME	Shortleaf Pine / (Hillside Blueberry, Deerberry) - Mountain Laurel Forest
SYNONYM	Appalachian Shortleaf Pine Forest
PHYSIOGNOMIC CLASS	Forest (I)
PHYSIOGNOMIC SUBCLASS	Evergreen forest (I.A)
PHYSIOGNOMIC GROUP	Temperate or subpolar needle-leaved evergreen forest (I.A.8)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural (I.A.8.N)
FORMATION	Rounded-crowned temperate or subpolar needle-leaved evergreen forest (I.A.8.N.b)
ALLIANCE	*Pinus echinata* Forest Alliance
CLASSIFICATION CONFIDENCE LEVEL	2
USFWS WETLAND SYSTEM	Upland

RANGE

Globally

This forest is known from the low elevation mountains of Georgia, Kentucky, North Carolina, South Carolina, Tennessee.

Great Smoky Mountains National Park

This association was not observed or sampled on the Mount Le Conte or Cades Cove quadrangles. However, forests dominated by *Pinus echinata* are thought to occur within the Park boundary.

ENVIRONMENTAL DESCRIPTION

Globally

These forests occur in the lower elevations (below 2400 feet) of the southern Appalachian Mountains on ridges and upper slopes, typically with south to west exposures.

Great Smoky Mountains National Park

No information

MOST ABUNDANT SPECIES

Globally

Stratum	Species
Tree canopy	*Pinus echinata*
Subcanopy	*Oxydendrum arboreum, Nyssa sylvatica, Diospyros virginiana*
Shrub	*Vaccinium pallidum, Vaccinium stamineum, Kalmia latifolia*

Great Smoky Mountains National Park

Stratum	Species
No information	

CHARACTERISTIC SPECIES

Globally

Pinus echinata, Kalmia latifolia, Vaccinium pallidum

Great Smoky Mountains National Park

No information

VEGETATION DESCRIPTION

Globally

Includes forest vegetation with greater than 75 percent 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 percent 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 mid-story 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*.

Great Smoky Mountains National Park
No information

OTHER NOTEWORTHY SPECIES

CONSERVATION RANK G4?

RANK JUSTIFICATION

DATABASE CODE CEGL007078

COMMENTS
Globally
Includes fire suppressed forests with a hardwood shrub/sapling stratum.

Great Smoky Mountains National Park

REFERENCES
Evans 1991, Nelson 1986, Schafale and Weakley 1990

Pinus strobus - Tsuga canadensis / Rhododendron maximum - Leucothoe fontanesiana Forest

COMMON NAME	Eastern White Pine - Eastern Hemlock / Great Rhododendron - Doghobble Forest
SYNONYM	Southern Appalachian Eastern Hemlock Forest (White Pine Type)
PHYSIOGNOMIC CLASS	Forest (I)
PHYSIOGNOMIC SUBCLASS	Evergreen forest (I.A)
PHYSIOGNOMIC GROUP	Temperate or subpolar needle-leaved evergreen forest (I.A.8)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural (I.A.8.N)
FORMATION	Rounded-crowned temperate or subpolar needle-leaved evergreen forest (I.A.8.N.b)

ALLIANCE *Pinus strobus - Tsuga canadensis* Forest Alliance

CLASSIFICATION CONFIDENCE LEVEL 2

USFWS WETLAND SYSTEM Upland

RANGE

Globally

This association occurs in the southern Blue Ridge of Georgia, North Carolina, South Carolina, and Tennessee, and may extend into Kentucky, and Virginia.

Great Smoky Mountains National Park

This community was sampled on the Cades Cove and Mount Le Conte quadrangles and is likely in other areas of the Park. Samples on the Cades Cove quadrangle ranged in elevation from 1600 to 2100 feet, mostly in the northwest portion of the quadrangle. Samples of this community came from slopes above More Licker Branch; from slopes along Abrams Creek, northeast of Spruce Double; from slopes above Arbutus Branch; from a ravine south of Coon Butt; and from low slopes in the vicinity of Wildcat Branch. This community is uncommon on the Mount Le Conte quadrangle and was sampled from a single location in the northeastern portion of the quadrangle, on steep, southwest slopes above the Little Pigeon River (1400 feet). This may be the only location for this community on the Mount Le Conte quadrangle.

ENVIRONMENTAL DESCRIPTION

Globally

This community occurs on creek and river margins and on lower or protected slopes.

Great Smoky Mountains National Park

This community is found at low elevations on low, protected slopes, and flats along streams. Samples of this community had a mean elevation of 1800 feet, ranging from 1400 to 2100 feet. Samples had southwest, west, northwest, and northeast aspects.

MOST ABUNDANT SPECIES

Globally

Stratum	Species
Tree canopy	*Pinus strobus, (Tsuga canadensis)*
Tall shrub	*Rhododendron maximum*
Short shrub	*Leucothoe fontanesiana*

Great Smoky Mountains National Park

Stratum	Species
Tree canopy	*Pinus strobus, Tsuga canadensis*
Subcanopy	*Acer rubrum, Oxydendrum arboreum*
Tall shrub	*Rhododendron maximum*
Short shrub	(*Leucothoe fontanesiana)*

CHARACTERISTIC SPECIES

Globally

Pinus strobus, Rhododendron maximum, Leucothoe fontanesiana

Great Smoky Mountains National Park

Pinus strobus, Tsuga canadensis, Rhododendron maximum

VEGETATION DESCRIPTION

Globally

Forest vegetation dominated by *Pinus strobus*, sometimes codominating with *Tsuga canadensis*, occurring over a shrub stratum dominated by *Rhododendron maximum*. Other minor canopy species may include *Liriodendron tulipifera, Betula lenta, Magnolia fraseri, 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.

Great Smoky Mountains National Park

This forest is dominated by *Pinus strobus* and *Tsuga canadensis*. Other species that may have coverage in the subcanopy include *Acer rubrum, Liriodendron tulipifera, Magnolia fraseri, Oxydendrum arboreum*, and *Quercus alba*. The tall-shrub stratum is dominated by *Rhododendron maximum*. *Leucothoe fontanesiana* sometimes dominates a short-shrub stratum. Other shrubs can include *Calycanthus florida, Clethra acuminata, Ilex opaca, Kalmia latifolia*, and *Pyrularia pubera*. Herb coverage is sparse. Typical species include *Chimaphila maculata, Galax urceolata, Goodyera pubescens, Hexastylis arifolia* var. *ruthii*, and *Mitchella repens*.

OTHER NOTEWORTHY SPECIES

No information

CONSERVATION RANK G4

RANK JUSTIFICATION

DATABASE CODE CEGL007102

COMMENTS

Globally

Similar forests in 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.

Great Smoky Mountains National Park

It is unclear if there is an environmental factor that distinguishes forests codominated by *Tsuga canadensis* and *Pinus strobus* and those dominated by only *Tsuga canadensis*. It is possible that those codominated by *Pinus strobus* occur on drier, more westerly exposed sites or perhaps on previously disturbed sites. It is unlikely that the signature of this association will be distinguishable from that of *Tsuga canadensis - Liriodendron tulipifera / Rhododendron maximum / Tiarella cordifolia* Forest (CEGL007136).

REFERENCES

Eyre 1980, Schafale and Weakley 1990

Pinus strobus / Kalmia latifolia - (Vaccinium stamineum, Gaylussacia ursina) Forest

COMMON NAME	Eastern White Pine / Mountain Laurel - (Deerberry, Bear Huckleberry) Forest
SYNONYM	Southern Appalachian White Pine Forest
PHYSIOGNOMIC CLASS	Forest (I)
PHYSIOGNOMIC SUBCLASS	Evergreen forest (I.A)
PHYSIOGNOMIC GROUP	Temperate or subpolar needle-leaved evergreen forest (I.A.8)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural (I.A.8.N)
FORMATION	Rounded-crowned temperate or subpolar needle-leaved evergreen forest (I.A.8.N.b)
ALLIANCE	*Pinus strobus* Forest Alliance
CLASSIFICATION CONFIDENCE LEVEL	1
USFWS WETLAND SYSTEM	Upland

RANGE

Globally

This community occurs in the southern Blue Ridge of Georgia, North Carolina, South Carolina, and Tennessee.

Great Smoky Mountains National Park

This association was not observed or sampled on the Mount Le Conte or Cades Cove quadrangles but is likely in low elevation areas of the Park.

ENVIRONMENTAL DESCRIPTION

Globally

This community occurs at lower elevations (below 3000 feet) in the southern Blue Ridge region of the southern Appalachians on upper slopes and ridgetops protected by higher landforms.

Great Smoky Mountains National Park

No information

MOST ABUNDANT SPECIES

Globally

Stratum	Species
Tree canopy	*Pinus strobus*
Subcanopy	*Oxydendrum arboreum, Acer rubrum*
Tall shrub	*Kalmia latifolia*
Herbaceous	(variable)

Great Smoky Mountains National Park

Stratum	Species
No information	

CHARACTERISTIC SPECIES

Globally

Pinus strobus, Oxydendrum arboreum, Vaccinium stamineum, Kalmia latifolia, Chimaphila maculata.

Great Smoky Mountains National Park

No information

VEGETATION DESCRIPTION

Globally

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

quadrifolia, Uvularia puberula, and *Chamaelirium luteum*.

Great Smoky Mountains National Park
No information

OTHER NOTEWORTHY SPECIES
No information

CONSERVATION RANK G2G3

RANK JUSTIFICATION
This community is geographically restricted and uncommon within its range.

DATABASE CODE CEGL007100

COMMENTS
Globally

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

REFERENCES
DeYoung 1979, Govus 1982, Patterson 1994,Schafale and Weakley 1990

Pinus virginiana - Pinus (rigida, echinata) - (Quercus prinus) / Vaccinium pallidum Forest

COMMON NAME	Virginia Pine - (Pitch Pine, Shortleaf Pine) - (Rock Chestnut Oak) / Hillside Blueberry
SYNONYM	Appalachian Low Elevation Mixed Pine Forest
PHYSIOGNOMIC CLASS	Forest (I)
PHYSIOGNOMIC SUBCLASS	Evergreen forest (I.A)
PHYSIOGNOMIC GROUP	Temperate or subpolar needle-leaved evergreen forest (I.A.8)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural (I.A.8.N)
FORMATION	Rounded-crowned temperate or subpolar needle-leaved evergreen forest (I.A.8.N.b)
ALLIANCE	*Pinus virginiana* Forest Alliance
CLASSIFICATION CONFIDENCE LEVEL	1
USFWS WETLAND SYSTEM	Upland

RANGE

Globally

The potential range of this community is in the mountains and upper Piedmont from Pennsylvania to northern Georgia. It is known from the lower elevations of the Blue Ridge escarpment region, the western margin of the Blue Ridge, and on dry upper slopes in the Ridge and Valley and Cumberland Mountains. It occurs in Georgia, North Carolina, South Carolina, Tennessee, Kentucky, and may possibly occur in Alabama, Maryland, Pennsylvania, Virginia, and West Virginia.

Great Smoky Mountains National Park

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

ENVIRONMENTAL DESCRIPTION

Globally

This community occurs on narrow ridges and knobs, mid and upper slopes, bluff and cliff tops, and other exposed sites. It is found primarily on south-, southeast- or southwest-facing slopes on excessively drained, shallow soils, usually below 2000 feet elevation (at least in the southern Appalachians). Soils associated with this xeric forest are classified as Inceptisols, typically Lithic Dystrochrepts originating from sandstone, shale, and other noncalcareous parent material.

Great Smoky Mountains National Park

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

MOST ABUNDANT SPECIES

Globally

Stratum	Species
Tree canopy	*Pinus virginiana*
Tall shrub	*Kalmia latifolia*
Short shrub	*Vaccinium pallidum, Vaccinium stamineum, Gaylussacia baccata*

Great Smoky Mountains National Park

Stratum	Species
Tree canopy	*Pinus virginiana*
Subcanopy	*Acer rubrum*
Tall shrub	*Kalmia latifolia, Vaccinium stamineum*
Short shrub	*Vaccinium pallidum*
Vine/Liana	*Smilax rotundifolia*

CHARACTERISTIC SPECIES

Globally

Pinus virginiana, Comptonia peregrina, Gaultheria procumbens, Pteridium aquilinum, Xerophyllum asphodeloides

Great Smoky Mountains National Park

Pinus virginiana, Kalmia latifolia, Vaccinium pallidum, Vaccinium hirsutum, Vaccinium stamineum, Pteridium aquilinum, Tephrosia virginiana, Solidago odora.

VEGETATION DESCRIPTION

Globally

Includes forest vegetation of low ridges and slopes, where *Pinus virginiana* dominates the canopy or occurs with mixes of *Pinus rigida, Pinus echinata* or *Pinus strobus. Pinus pungens* may be present but is typically absent or only a very minor component. These forests have sparse to moderate shrub cover, dominated by deciduous ericads, typically *Vaccinium pallidum*, although *Kalmia latifolia* may be locally dominant in some stands. This is often a low-stature forest with a somewhat open to closed canopy. 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 southern parts of the range, *Quercus marilandica, Quercus falcata*, and *Quercus stellata* can be deciduous components. Other shrub species can include *Vaccinium stamineum, Gaylussacia ursina, Gaylussacia baccata, Sassafras albidum*, and (in southwestern North Carolina and southeastern Tennessee) *Vaccinium hirsutum*. Herbaceous cover is typically sparse. Characteristic species include *Galax urceolata, Hypoxis hirsuta, Baptisia tinctoria, Euphorbia corollata, Pityopsis graminifolia* var. *latifolia*, and *Pteridium aquilinum* var. *latiusculum.*

Great Smoky Mountains National Park

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

OTHER NOTEWORTHY SPECIES

No information

CONSERVATION RANK G4?

RANK JUSTIFICATION

DATABASE CODE CEGL007119

COMMENTS

Globally

Formerly *Pinus virginiana / Kalmia latifolia - Vaccinium pallidum* Forest (CEGL007119) but merged with *Pinus (echinata, rigida, virginiana) / Vaccinium (pallidum, stamineum) - Kalmia latifolia* Forest (CEGL006061) by SBR community technical team; 2-98.

Great Smoky Mountains National Park

This community is often bordered by mixed oak forests

REFERENCES

Barden 1977, Burns and Honkala 1990a, Cooper 1963, Evans 1991, Eyre 1980, Gettman 1974, Malter 1977, Nelson 1986, Racine 1966, Rawinski 1992, Schafale and Weakley 1990, Whittaker 1956

Pinus virginiana Successional Forest

COMMON NAME	Virginia Pine Successional Forest
SYNONYM	Virginia Pine Forest
PHYSIOGNOMIC CLASS	Forest (I)
PHYSIOGNOMIC SUBCLASS	Evergreen forest (I.A)
PHYSIOGNOMIC GROUP	Temperate or subpolar needle-leaved evergreen forest (I.A.8)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural (I.A.8.N)
FORMATION	Rounded-crowned temperate or subpolar needle-leaved evergreen forest (I.A.8.N.b)
ALLIANCE	*Pinus virginiana* Forest Alliance
CLASSIFICATION CONFIDENCE LEVEL	1
USFWS WETLAND SYSTEM	Upland

RANGE

Globally

This community is known to occur in Georgia, Indiana, Kentucky, North Carolina, South Carolina, Tennessee, Virginia, and West Virginia.

Great Smoky Mountains National Park

This association was not sampled on the Mount Le Conte or Cades Cove quadrangles. However, it was observed at low elevations, in disturbed areas, around the Cades Cove Loop Road.

ENVIRONMENTAL DESCRIPTION

Globally

This community occurs in areas where canopy removal has created open conditions and bare mineral soil, allowing the establishment of *Pinus virginiana*. These conditions can include old fields, old pastures, clearcuts and burned or eroded areas.

Great Smoky Mountains National Park

Potential sites for this community include low elevation (below 2000 feet) areas that have been subject to anthropogenic disturbance in the past 50 years. Examples around the Cades Cove Loop Road have been heavily browsed by deer.

MOST ABUNDANT SPECIES

Globally

Stratum	Species
Tree canopy	*Pinus virginiana*
Herbaceous	variable

Great Smoky Mountains National Park

Stratum	Species
Tree canopy	*Pinus virginiana*

CHARACTERISTIC SPECIES

No information

VEGETATION DESCRIPTION

Globally

This forest typically has a very dense canopy of *Pinus virginiana* and little understory. This successional forest is commonly associated with old fields, old pastures, clearcuts, and burned or eroded areas. Associated woody and herbaceous species vary with geography but are typically ruderal or exotic species.

Great Smoky Mountains National Park

Pinus virginiana Successional Forests have a dense canopy of *Pinus virginiana* but may have an admixture of other successional species (*Acer rubrum, Liriodendron tulipifera, Pinus strobus*) as well has deciduous species from the surrounding forest vegetation (*Quercus alba, Quercus velutina, Quercus coccinea*). The understory is typically open with little herb or shrub coverage, although *Tsuga canadensis* or *Pinus strobus* may be locally dominant in the shrub strata. The forest floor is covered with leaf litter and coarse woody debris.

OTHER NOTEWORTHY SPECIES
No information
CONSERVATION RANK GW

RANK JUSTIFICATION
This forest represents early successional vegetation and is thus not of conservation concern.

DATABASE CODE CEGL002591

COMMENTS
None

REFERENCES
None

Abies fraseri / (Rhododendron catawbiense, Rhododendron carolinianum) Forest

COMMON NAME	Fraser Fir / (Catawba Rhododendron, Mountain Carolina Rhododendron) Forest
SYNONYM	Fraser Fir Forest (Evergreen Shrub Type)
PHYSIOGNOMIC CLASS	Forest (I)
PHYSIOGNOMIC SUBCLASS	Evergreen forest (I.A)
PHYSIOGNOMIC GROUP	Temperate or subpolar needle-leaved evergreen forest (I.A.8)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural (I.A.8.N)
FORMATION	Conical-crowned temperate or subpolar needle-leaved evergreen forest (I.A.8.N.c.)

ALLIANCE *Abies fraseri - Picea rubens* Forest Alliance

CLASSIFICATION CONFIDENCE LEVEL 1

USFWS WETLAND SYSTEM Upland

RANGE

Globally

This community occurs as island-like stands in the southern Appalachian Mountains of eastern Tennessee and western North Carolina. It is extremely limited in distribution and is restricted to the following mountain areas: Great Smoky Mountains, Black Mountains, Balsam Mountains, Plott Balsams, and Grandfather Mountain.

Great Smoky Mountains National Park

This community was not sampled or observed on the two pilot quadrangles, but it is likely within the Park boundary. It should be looked for at elevations above 6000 feet (1830 meters) on exposed sites (rocky ridges and steep, south-facing slopes).

ENVIRONMENTAL DESCRIPTION

Globally

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.

Great Smoky Mountains National Park

No information

MOST ABUNDANT SPECIES

Globally

Stratum	Species
Tree canopy	*Abies fraseri*
Tall Shrub	*Rhododendron catawbiense, Rhododendron carolinianum, Rhododendron maximum*

Great Smoky Mountains National Park

Stratum	Species
No information	

CHARACTERISTIC SPECIES

Globally

Abies fraseri, Rhododendron catawbiense, Rhododendron carolinianum, Rhododendron maximum

Great Smoky Mountains National Park

No information

VEGETATION DESCRIPTION

Globally

This needle-leaved evergreen forest has greater than 75 percent 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 percent. Bryophyte species include *Hylocomium splendens, Ptilium crista-castrensis, Sphagnum* spp., and *Polytrichum ohioense*.

Great Smoky Mountains National Park
No information

OTHER NOTEWORTHY SPECIES
Rare or regionally rare vascular plant species associated with this community include *Abies fraseri, Betula papyrifera* var. *cordifolia, Cardamine clematitis, Glyceria nubigena, Phegopteris connectilis, Poa palustris, Rhododendron vaseyi, Stachys clingmanii, Streptopus amplexifolius*. Rare non-vascular plants include *Bazzania nudicaulis, Brachydontium trichodes, Leptodontium excelsum, Metzgeria temperata, Nardia scalaris, Plagiochila corniculata,* and *Sphenolobopsis pearsonii*.

Animals endemic to high elevation areas of the southern Appalachians include Carolina Flying Squirrel *(Glaucomys sabrinus coloratus*), Yonahlossee Salamander *Plethodon yonahlossee*, Weller's Salamander (*Plethodon welleri*), Spruce-fir Moss Spider *Microhexura montivaga*. Rare animal species that are northern disjuncts include Black-capped Chickadee (*Parus atricapillus*, and Northern Saw-whet Owl (*Aegolius acadicus*). The spruce-fir moss spider (*Microhexura montivaga* G1) is specific to this community type. The spider populations seem to be decreasing with the decline of these forests. As the canopy thins, moss desiccation increases, thus affecting the spider's habitat.

An exotic insect, the Balsam Woolly Adelgid (*Adelges piceae*), invaded the southern Appalachians in the late 1950s and has drastically altered the last undisturbed remnants of this community. This exotic pest kills mature *Abies fraseri* within seven years of infestation.

CONSERVATION RANK G1

RANK JUSTIFICATION
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.

DATABASE CODE CEGL006308

COMMENTS
Globally
This community may grade into forests dominated by *Picea rubens* and *Abies fraseri*, montane grasslands, high elevation shrublands, or high elevation rock outcrop communities.

Great Smoky Mountains National Park

REFERENCES
Brown 1941, Bruck 1988, Busing et al. 1988, Crandall 1958, Davis 1930, McLeod 1988, Nicholas et al. 1992, North Carolina Natural Heritage Program 1993, Oosting and Billings 1951, Ramseur 1960, Schafale and Weakley 1990, White 1984, White and Pickett 1985, White et al. 1993, Whittaker 1956

Abies fraseri / Viburnum lantanoides / Dryopteris campyloptera - Oxalis montana / Hylocomium splendens Forest

COMMON NAME	Fraser Fir / Hobblebush / Mountain Woodfern - Common Wood Sorrel / Stairstep Moss Forest
SYNONYM	Fraser Fir Forest (Deciduous Shrub Type)
PHYSIOGNOMIC CLASS	Forest (I)
PHYSIOGNOMIC SUBCLASS	Evergreen forest (I.A)
PHYSIOGNOMIC GROUP	Temperate or subpolar needle-leaved evergreen forest (I.A.8)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural (I.A.8.N)
FORMATION	Conical-crowned temperate or subpolar needle-leaved evergreen forest (I.A.8.N.c.)

ALLIANCE *Abies fraseri - Picea rubens* Forest Alliance

CLASSIFICATION CONFIDENCE LEVEL 1

USFWS WETLAND SYSTEM Upland

RANGE

Globally

This forest community is restricted to the highest mountain systems of the southern Blue Ridge Province in eastern Tennessee and western North Carolina.

Great Smoky Mountains National Park

On the two pilot quadrangles, this community is restricted to the summit and high slopes of Mount Le Conte. *Abies fraseri* Forests occur elsewhere within the Park boundary and should be looked for at elevations over 6000 feet (1830 meters).

ENVIRONMENTAL DESCRIPTION

Globally

This community occurs on steep ridges and mesic, north-facing slopes above 6000 feet (1830 meters) 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. Occurrences of this community are often steep and bouldery with seepage areas. 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 community occurs as island-like stands in the southern Appalachian Mountains.

Great Smoky Mountains National Park

This community was found on and around the summit of Mount Le Conte, on exposed, broad, flat ridges and on moderately steep, north-facing slopes. This forest typically occurs at elevations over 6000 feet (1830 meters), but samples ranged from 5880 to 6540 feet elevation.

MOST ABUNDANT SPECIES

Globally

Stratum	Species
Tree canopy	*Abies fraseri*
Tall shrub	*Viburnum lantanoides, Vaccinium erythrocarpum, Sambucus racemosa* var. *pubens, Rubus allegheniensis*
Herbaceous	*Oxalis montana, Dryopteris campyloptera, Athyrium filix-femina, Huperzia lucidula*
Nonvascular	*Ptilium crista-castrensis, Hylocomium splendens*

Great Smoky Mountains National Park

Stratum	Species
Tree canopy	*Abies fraseri*
Tall Shrub	*Vaccinium erythrocarpum, Rubus allegheniensis, Viburnum lantanoides*
Herbaceous	*Aster acuminatus, Athyrium filix-femina, Oxalis montana, Clintonia borealis, Dryopteris campyloptera*

CHARACTERISTIC SPECIES

Globally

Abies fraseri, Vaccinium erythrocarpum, Rubus allegheniensis, Viburnum lantanoides, Oxalis montana, Hylocomium splendens

Great Smoky Mountains National Park
Abies fraseri, Rubus allegheniensis, Diervilla sessilifolia, Sambucus racemosa var. *pubens, Solidago glomerata, Rugelia nudicaulis*

VEGETATION DESCRIPTION
Globally
This needle-leaved evergreen forest has at least 75 percent of the canopy coverage composed of *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 percent) and dominated by deciduous species. Typical shrub species include *Viburnum lantanoides, Vaccinium erythrocarpum, 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 *Aster acuminatus, Aster chlorolepis, Clintonia borealis, Solidago glomerata, Rugelia nudicaulis, Ageratina altissima* var. *roanensis, Chelone lyonii, Circaea alpina* ssp. *alpina, 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, Hylocomiastrum umbratum.*

Great Smoky Mountains National Park
This forest has a canopy strongly dominated by *Abies fraseri,* often with many standing dead and fallen individuals. Minor amounts of other tree species (*Picea rubens, Betula alleghaniensis, Prunus pensylvanica,* and *Sorbus americana*) may occur in the canopy, subcanopy, or as tall shrubs/saplings. The shrub stratum is typically open and sparse but can have moderately dense coverage, especially in areas disturbed by past logging, deer browsing, or Balsam Woolly Adelgid (*Adelges piceae*). Shrubs can include *Diervilla sessilifolia, Rubus canadensis, Sambucus racemosa* var. *pubens, Vaccinium erythrocarpum,* and *Viburnum lantanoides*. The shrub stratum may also have areas of dense *Abies fraseri* regeneration, particularly in areas of canopy tree mortality. The herbaceous stratum has moderately dense coverage, with ferns and tall forbs locally dominant. Typical herbaceous dominants include *Aster acuminatus, Athyrium filix-femina, Oxalis montana, Clintonia borealis, Dryopteris campyloptera*, and *Solidago glomerata.* Other herbaceous species include *Carex brunnescens, Carex debilis, Huperzia lucidula, Rugelia nudicaulis*, and, in seepage areas, *Chelone lyonii, Impatiens pallida*, and the shrub, *Ribes rotundifolia*. In stands with intact *Abies fraseri* canopies, mosses have high coverage on fallen logs, and tree trunks.

OTHER NOTEWORTHY SPECIES
An exotic insect, the Balsam Woolly Adelgid (*Adelges piceae*), invaded the southern Appalachians in the late 1950s and has drastically altered the last undisturbed remnants of this community. This exotic pest kills mature *Abies fraseri* within seven years of infestation.

Rare or regionally rare vascular plant species associated with this community include *Abies fraseri, Betula papyrifera* var. *cordifolia, Cardamine clematitis, Glyceria nubigena, Phegopteris connectilis, Poa palustris, Rhododendron vaseyi, Stachys clingmanii, Streptopus amplexifolius*. Rare non-vascular plants include *Bazzania nudicaulis, Brachydontium trichodes, Leptodontium excelsum, Metzgeria temperata, Nardia scalaris, Plagiochila corniculata, Sphenolobopsis pearsonii*.

Animals endemic to high elevation areas of the southern Appalachians include Carolina Flying Squirrel *(Glaucomys sabrinus coloratus*), Yonahlossee Salamander *Plethodon yonahlossee*, Weller's Salamander (*Plethodon welleri*), Spruce-fir Moss Spider *Microhexura montivaga*. Rare animal species that are northern disjuncts include Black-capped Chickadee (*Parus atricapillus*, and Northern Saw-whet Owl (*Aegolius acadicus*). The spruce-fir moss spider (*Microhexura montivaga* G1) is specific to this community type. The spider populations seem to be decreasing with the decline of these forests. As the canopy thins, moss desiccation increases, thus affecting the spider's habitat.

CONSERVATION RANK G1

RANK JUSTIFICATION
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.

DATABASE CODE CEGL006049

COMMENTS

Globally

This community may grade into forests dominated by northern hardwood species (*Betula alleghaniensis, Fagus grandiflora, Acer saccharum*) or forest codominated by *Picea rubens* and *Abies fraseri*. It may also occur adjacent to montane grasslands, high elevation shrublands, or high elevation rock outcrop communities. A similar forest, *Abies fraseri / (Rhododendron catawbiense - Rhododendron carolinianum)* Forest, has a canopy dominated by *Abies fraseri* but has a shrub stratum dominated by evergreen species.

Great Smoky Mountains National Park

On Mount Le Conte, this community occurs as discontinuous stands in a mosaic of standing dead *Abies fraseri* and areas variously dominated by shrubs (*Rubus canadensis* and/or *Diervilla sessilifolia*) or herbaceous species (*Athyrium filix-femina* and/or *Solidago glomerata*) – see *Rubus canadensis - (Rubus idaeus* ssp. *strigosus) / Solidago glomerata - Athyrium filix-femina* Shrubland (CEGL003893).

REFERENCES

Brown 1941, Bruck 1988, Busing et al. 1988, Crandall 1958, Davis 1930, McLeod 1988, Nicholas et al. 1992, North Carolina Natural Heritage Program 1993, Oosting and Billings 1951,Ramseur 1960, Schafale and Weakley 1990, White 1984, White and Pickett 1985, White et al. 1993, Whittaker 1956

Picea rubens - (Abies fraseri) / (Rhododendron catawbiense, Rhododendron maximum) Forest

COMMON NAME	Red Spruce - (Fraser Fir) / (Catawba Rhododendron, Great Rhododendron) Forest
SYNONYM	Red Spruce - Fraser Fir Forest (Evergreen Shrub Type)
PHYSIOGNOMIC CLASS	Forest (I)
PHYSIOGNOMIC SUBCLASS	Evergreen forest (I.A)
PHYSIOGNOMIC GROUP	Temperate or subpolar needle-leaved evergreen forest (I.A.8)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural (I.A.8.N)
FORMATION	Conical-crowned temperate or subpolar needle-leaved evergreen forest (I.A.8.N.c.)

ALLIANCE *Abies fraseri - Picea rubens* Forest Alliance

CLASSIFICATION CONFIDENCE LEVEL 1

USFWS WETLAND SYSTEM Upland

RANGE

Globally

This community is restricted to the highest mountain systems of the southern Appalachians in eastern Tennessee and western North Carolina. It is not known from Virginia but could possibly occur there.

Great Smoky Mountains National Park

This community was sampled on the Mount Le Conte quadrangle on steep, exposed, south-facing slopes in an area north of Mount Kephart known as "The Boulevard," on steep slopes above Rocky Spur, and on steep slopes on the southern flanks of Mount Le Conte. It does not occur on the Cades Cove quadrangle but is likely in other high elevation areas (above 5500 feet elevation) of the Park.

ENVIRONMENTAL DESCRIPTION

Globally

This forest is best developed between 5100-6000 feet elevation (1550 and 1830 meters) 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.

Great Smoky Mountains National Park

This community was found on steep, middle to high slopes at elevations between 5100 and 6000 feet (samples ranged in elevation from 5320 to 5780 feet) over organic soils with thick litter layers. In some areas ice storms and Balsam Woolly Adelgid (*Adelges piceae*) affect the canopy structure.

MOST ABUNDANT SPECIES

Globally

Stratum	Species
Tree canopy	*Picea rubens*, (*Abies fraseri*)
Tall shrub	*Rhododendron catawbiense, Rhododendron maximum*

Great Smoky Mountains National Park

Stratum	Species
Tree canopy	*Picea rubens*
Tall Shrub	*Rhododendron catawbiense*

CHARACTERISTIC SPECIES

Globally

Picea rubens, Abies fraseri, Rhododendron catawbiense

Great Smoky Mountains National Park
Picea rubens, Rhododendron catawbiense

VEGETATION DESCRIPTION
Globally
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.

Great Smoky Mountains National Park
This community has a closed canopy dominated by large *Picea rubens.* Some occurrences may have standing dead *Abies fraseri* and a more open canopy due to *Abies* mortality or damage by ice storms. The subcanopy may have scattered stems of *Betula alleghaniensis* or *Prunus pensylvanica,* but these species form a minor part of the canopy coverage (less than 25 percent). The shrub stratum is dense (70-100 percent coverage) and dominated by *Rhododendron catawbiense.* In some occurrences on the flanks of Mount Le Conte, *Leucothoe fontanesiana* can dominate the short-shrub stratum. Other species that may be present as a minor part of the shrub stratum include *Abies fraseri, Ilex montana, Kalmia latifolia, Picea rubens, Rhododendron maximum, Rubus canadensis, Sorbus americana, Vaccinium corymbosum, Vaccinium erythrocarpum,* and *Viburnum lantanoides.* The herbaceous stratum is sparse, typically with less than 10 percent coverage. Herbaceous species include *Aster acuminatus, Athyrium filix-femina, Dryopteris campyloptera, Dryopteris intermedia, Monotropa uniflora,* and *Oxalis montana.* The ground cover is dominated by thick and spongy litter and duff layers and by downed woody debris.

OTHER NOTEWORTHY SPECIES
Rare or regionally rare vascular plant species associated with this community include *Abies fraseri, Betula papyrifera* var. *cordifolia, Botrychium oneidense, Calamagrostis canadensis, Cardamine clematitis, Carex projecta, Carex ruthii, Chelone lyonii, Geum geniculatum, Glyceria nubigena, Phegopteris connectilis, Poa palustris, Prenanthes roanensis, Rhododendron carolinianum,, Rugelia nudicaulis, Stachys clingmanii, Stellaria corei,* and *Streptopus amplexifolius.* Rare non-vascular plants include *Bazzania nudicaulis, Brachydontium trichodes, Gymnoderma lineare, Leptodontium excelsum, Metzgeria temperata, Nardia scalaris, Plagiochila corniculata,* and *Sphenolobopsis pearsonii.*

Animals endemic to high elevation areas of the southern Appalachians include Carolina Flying Squirrel *(Glaucomys sabrinus coloratus*), Yonahlossee Salamander *Plethodon yonahlossee,* Weller's Salamander (*Plethodon welleri*), Spruce-fir Moss Spider *Microhexura montivaga.* Rare animal species that are northern disjuncts include Black-capped Chickadee (*Parus atricapillus,* and Northern Saw-whet Owl (*Aegolius acadicus*). The spruce-fir moss spider (*Microhexura montivaga*) is specific to this community type. The spider populations seem to be decreasing with the decline of these forests. As the canopy thins, moss desiccation increases, thus affecting the spider's habitat.

This community provides breeding habitat for many migrant landbird species. Typical bird species that utilize this habitat include Canada Warbler (*Wilsonia canadensis*), Black-throated Blue Warbler (*Dendroica caerulescens*), Blackburnian Warbler (*Dendroica fusca*), Black-throated Green Warbler (*Dendroica virens*), Gray Catbird (*Dumetella carolinensis),* Verry (*Catharus fuscescens*), and Solitary Vireo (*Vireo solitarius*).

An exotic insect, the Balsam Woolly Adelgid (*Adelges piceae*), invaded the southern Appalachians in the late 1950s and has drastically altered the last undisturbed remnants of this community. This exotic pest kills mature *Abies fraseri* within seven years of infestation.

CONSERVATION RANK G1

RANK JUSTIFICATION
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.

DATABASE CODE CEGL007130

COMMENTS

Globally

A similar forest, *Picea rubens – (Abies fraseri) / Vaccinium erythrocarpum / Oxalis montana - Dryopteris campyloptera - Hylocomium splendens* Forest (CEGL007131), has an understory dominated by deciduous shrubs, herbs, and bryophtyes 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; Crandell 1958).

As a result of human disturbance, primarily large-scale corporate logging (1880-1930), sometimes followed by fire and massive soil erosion, present day *Picea rubens* and *Abies fraseri* vegetation in the southern Appalachians is estimated to cover only 48 percent (69 square kilometers) of the presettlement area (Cogbill and White 1991).

Great Smoky Mountains National Park

On the Mount Le Conte quadrangle, this forest grades into forests dominated by *Picea rubens* and *Betula alleghaniensis* or forests dominated by *Picea rubens, Tsuga canadensis*, and *Betula alleghaniensis.* Some occurrences of this community may be floristically similar to *Picea rubens - (Betula alleghaniensis, Aesculus flava) / Viburnum lantanoides / Oxalis montana - Solidago glomerata* Forest (CEGL006256). Examples on the Mount Le Conte quadrangle include stands of old-growth forest.

REFERENCES

Brown 1941, Bruck 1988, Busing et al. 1988, Cogbill and White 1991, Crandall 1958, Crandall 1960, Davis 1930, Korstian 1937, McLeod 1988, Nicholas and Zedaker 1989, Nicholas et al. 1992, North Carolina Natural Heritage Program 1993, 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

Picea rubens - (Abies fraseri) / Vaccinium erythrocarpum / Oxalis montana - Dryopteris campyloptera / Hylocomium splendens Forest

COMMON NAME	Red Spruce - (Fraser Fir) / Highbush Cranberry / Common Wood Sorrel - Mountain Woodfern / Stairstep Moss Forest
SYNONYM	Red Spruce - Fraser Fir Forest (Deciduous Shrub Type)
PHYSIOGNOMIC CLASS	Forest (I)
PHYSIOGNOMIC SUBCLASS	Evergreen forest (I.A)
PHYSIOGNOMIC GROUP	Temperate or subpolar needle-leaved evergreen forest (I.A.8)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural (I.A.8.N)
FORMATION	Conical-crowned temperate or subpolar needle-leaved evergreen forest (I.A.8.N.c.)
ALLIANCE	*Abies fraseri - Picea rubens* Forest Alliance
CLASSIFICATION CONFIDENCE LEVEL	1
USFWS WETLAND SYSTEM	Upland

RANGE

Globally

This community is restricted to the highest mountain systems of the southern Appalachians in eastern Tennessee, western North Carolina, and southwestern Virginia.

Great Smoky Mountains National Park

This community was sampled on the Mount Le Conte quadrangle and is not found on the Cades Cove quadrangle. This forest was found on the steep slopes and ridges in the vicinity of Mount Kephart and on steep slopes south of the Mount Le Conte summit. It should be looked for at other locations in the Park from approximately 5500 to just over 6000 feet elevation. Above this elevation, forests are dominated by *Abies fraseri*.

ENVIRONMENTAL DESCRIPTION

Globally

This forest is best developed between 5500-6200 feet elevation (1680 and 1990 meters) but may occur at lower elevations and is found 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 (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.

Great Smoky Mountains National Park

This community was found on steep, middle to high slopes above 5500 feet to just over 6000 feet. Stands were affected by wind, ice, and Balsam Woolly Adelgid.

MOST ABUNDANT SPECIES

Globally

Stratum	Species
Tree canopy	*Picea rubens, (Abies fraseri)*
Subcanopy	*Betula alleghaniensis, Sorbus americana, Acer spicatum, Amelanchier laevis*
Short Shrub	*Viburnum lantanoides, Vaccinium erythrocarpum*
Herbaceous	*Oxalis montana, Athyrium filix-femina* ssp. *asplenioides, Dryopteris campyloptera*
Nonvascular	*Hylocomium splendens, Ptilium crista-castrensis, Bazzania trilobata*

Great Smoky Mountains National Park

Stratum	Species
Tree canopy	*Picea rubens*
Shrub	*Abies fraseri, Picea rubens, Rubus canadensis, Vaccinium erythrocarpum*
Herbaceous	*Aster acuminatus, Athyrium filix-femina, Oxalis montana*

CHARACTERISTIC SPECIES

Globally

Picea rubens, Abies fraseri, Viburnum lantanoides, Vaccinium erythrocarpum, Oxalis montana, Hylocomium splendens, Bazzania trilobata

Great Smoky Mountains National Park

Picea rubens, Abies fraseri, Rubus allegheniensis, Clintonia borealis, Oxalis montana, Solidago glomerata, Vaccinium erythrocarpum

VEGETATION DESCRIPTION

Globally

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. *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 *Aster acuminatus, 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 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 non-vascular species include *Hylocomium splendens, Ptilium crista-castrensis, Leptodontium excelsum, Bazzania trilobata, Bazzania nudicaulis, Alectoria fallacina, Hypotrachyna virginica, Dicranum scoparium,* and *Dicranum fuscescens*.

Great Smoky Mountains National Park

These forests have canopies that are strongly dominated by *Picea rubens* and rather open due to *Abies fraseri* mortality. The shrub strata are dense and composed of a mix of deciduous shrubs and regenerating *Picea rubens* and *Abies fraseri*. Other shrub species include *Amelanchier laevis, Betula alleghaniensis, Diervilla sessilifolia, Menziesia pilosa, Prunus pensylvanica, Vaccinium erythrocarpum, Rubus allegheniensis, Sambucus racemosa* var. *pubens., Sorbus americana,* and *Viburnum lantanoides*. Standing dead trees are common, as is abundant coarse woody debris on the forest floor. The litter layer is thick, and bryophyte cover can be high, while herbaceous cover is sparse. Herbaceous species include *Aster acuminatus, Athyrium filix-femina, Clintonia borealis, Dennstaedtia punctilobula, Dryopteris campyloptera, Oxalis montana, Solidago glomerata*, and *Viola blanda.*

OTHER NOTEWORTHY SPECIES

Rare or regionally rare vascular plant species associated with this community include *Abies fraseri, Betula papyrifera* var. *cordifolia, Botrychium oneidense, Calamagrostis canadensis, Cardamine clematitis, Carex projecta, Carex ruthii, Chelone lyonii, Geum geniculatum, Glyceria nubigena, Phegopteris connectilis, Poa palustris, Prenanthes roanensis, Rugelia nudicaulis, Stachys clingmanii, Stellaria corei,* and *Streptopus amplexifolius.* Rare non-vascular plants include *Bazzania nudicaulis, Brachydontium trichodes, Gymnoderma lineare, Leptodontium excelsum, Metzgeria temperata, Nardia scalaris, Plagiochila corniculata,* and *Sphenolobopsis pearsonii*.

Animals endemic to high elevation areas of the southern Appalachians include Carolina Flying Squirrel *(Glaucomys sabrinus coloratus*), Yonahlossee Salamander *Plethodon yonahlossee*, Weller's Salamander (*Plethodon welleri*), Spruce-fir Moss Spider *Microhexura montivaga*. Rare animal species that are northern disjuncts include Black-capped Chickadee (*Parus atricapillus*, and Northern Saw-whet Owl (*Aegolius acadicus*). The spruce-fir moss spider (*Microhexura montivaga*) is specific to this community type. The spider populations seem to be decreasing with the decline of these forests. As the canopy thins, moss desiccation increases, thus affecting the spider's habitat.

This community provides breeding habitat for many migrant landbird species. Typical bird species that utilize this habitat include Canada Warbler (*Wilsonia canadensis*), Black-throated Blue Warbler (*Dendroica caerulescens*), Blackburnian Warbler (*Dendroica fusca*), Black-throated Green Warbler (*Dendroica virens*), Gray Catbird (*Dumetella carolinensis)*, Verry (*Catharus fuscescens*), and Solitary Vireo (*Vireo solitarius*).

An exotic insect, the Balsam Woolly Adelgid (*Adelges piceae*), invaded the southern Appalachians in the late 1950's and has drastically altered the last undisturbed remnants of this community. This exotic pest kills mature *Abies fraseri* within seven years of infestation.

CONSERVATION RANK G2

RANK JUSTIFICATION
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.

DATABASE CODE CEGL007131

COMMENTS
Globally
A similar forest, *Picea rubens - Abies fraseri / (Rhododendron catawbiense - Rhododendron maximum*) Forest (CEGL007130), 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; Crandell 1958). As a result of human disturbance, primarily large-scale corporate logging (1880-1930), sometimes followed by fire and massive soil erosion, present day *Picea rubens* and *Abies fraseri* vegetation in the southern Appalachians is estimated to cover only 48 percent (69 square kilometers) of the presettlement area (Cogbill and White 1991).

Great Smoky Mountains National Park
Examples of this community observed on the Mount Le Conte quadrangle were formerly codominated by *Picea rubens* and *Abies fraseri.* On the Mount Le Conte quadrangle, this forest grades into lower elevation forests dominated by *Picea rubens* and/or *Betula alleghaniensis* or forests dominated by *Picea rubens, Tsuga canadensis,* and *Betula alleghaniensis.* Some occurrences of this community may be floristically similar to *Picea rubens - (Betula alleghaniensis, Aesculus flava) / Viburnum lantanoides / Oxalis montana - Solidago glomerata* Forest (CEGL006256).

REFERENCES
Brown 1941, Bruck 1988, Busing et al. 1988, Cogbill and White 1991, Crandall 1958, Crandall 1960, Davis 1930, Dull et al. 1988, Golden 1974, Korstian 1937, McLeod 1988, Nicholas et al. 1992, North Carolina Natural Heritage Program 1993, 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

Picea rubens - Tsuga canadensis / Rhododendron maximum Forest

COMMON NAME	Red Spruce - Eastern Hemlock / Great Rhododendron Forest
SYNONYM	Red Spruce - Fraser Fir Forest (Hemlock Type)
PHYSIOGNOMIC CLASS	Forest (I)
PHYSIOGNOMIC SUBCLASS	Evergreen forest (I.A)
PHYSIOGNOMIC GROUP	Temperate or subpolar needle-leaved evergreen forest (I.A.8)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural (I.A.8.N)
FORMATION	Conical-crowned temperate or subpolar needle-leaved evergreen forest (I.A.8.N.c.)

ALLIANCE *Picea rubens* Forest Alliance

CLASSIFICATION CONFIDENCE LEVEL 2

USFWS WETLAND SYSTEM Upland

RANGE

Globally

This community is known from the southern Blue Ridge of western North Carolina and Tennessee and may be restricted to the Great Smoky Mountains National Park. This association, or one very similar, may possibly occur in Virginia and West Virginia.

Great Smoky Mountains National Park

This community was sampled on the Mount Le Conte quadrangle and was not found on the Cades Cove quadrangle. It occurs on the northern slopes of Mount Le Conte and on slopes east of Peregrine Peak. It should be looked for in other areas of the Park between 4500 and 5000 feet elevation.

ENVIRONMENTAL DESCRIPTION

Globally

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.

Great Smoky Mountains National Park

See above.

MOST ABUNDANT SPECIES

Globally

Stratum	Species
Tree canopy	*Picea rubens, Tsuga canadensis*
Tall shrub	*Rhododendron maximum*

Great Smoky Mountains National Park

Stratum	Species
Tree canopy	*Picea rubens, Tsuga canadensis*
Tall shrub	*Rhododendron maximum*

CHARACTERISTIC SPECIES

Globally

Picea rubens, Tsuga canadensis,Rhododendron maximum

Great Smoky Mountains National Park

See above

VEGETATION DESCRIPTION

Globally

This needle-leaved, evergreen forest has a canopy dominated by mixtures of *Picea rubens* and *Tsuga canadensis*. *Betula allegheniensis, 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.

Great Smoky Mountains National Park
See above

OTHER NOTEWORTHY SPECIES
No information

CONSERVATION RANK G2?

RANK JUSTIFICATION
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.

DATABASE CODE CEGL006272

COMMENTS
Globally
This association may not be distinct enough from *Picea rubens / Rhododendron maximum* Forest (CEGL006152) to warrant recognition from it. Forests with *Picea rubens* and *Tsuga canadensis* occur in Virginia but in a different topographic and hydrologic situation than this association. Occurrences at Salt Pond Mountain, Virginia, are in valley bottoms, within streamheads, and have an unclear hydrology.

Great Smoky Mountains National Park
On the Mount Le Conte quadrangle, these forests may grade into lower elevation forests dominated by *Betula alleghaniensis* or *Tsuga canadensis*. At least some examples are old-growth forest. On more exposed sites, this community may border heath shrublands.

REFERENCES
Schafale and Weakley 1990

Tsuga canadensis / Rhododendron maximum - Leucothoe fontanesiana Forest

COMMON NAME	Eastern Hemlock / Great Rhododendron - Mountain Doghobble Forest
SYNONYM	Southern Appalachian Eastern Hemlock Forest (Typic Type)
PHYSIOGNOMIC CLASS	Forest (I)
PHYSIOGNOMIC SUBCLASS	Evergreen forest (I.A)
PHYSIOGNOMIC GROUP	Temperate or subpolar needle-leaved evergreen forest (I.A.8)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural (I.A.8.N)
FORMATION	Conical-crowned temperate or subpolar needle-leaved evergreen forest (I.A.8.N.c.)

ALLIANCE *Tsuga canadensis* Forest Alliance

CLASSIFICATION CONFIDENCE LEVEL 2

USFWS WETLAND SYSTEM Upland

RANGE

Globally

This community occurs in the mountains of Georgia, North Carolina, South Carolina, and Tennessee, and the Cumberland Plateau of Kentucky, and may range into Virginia.

Great Smoky Mountains National Park

This community was sampled on the Cades Cove quadrangle. It is unlikely to occur on the Mount Le Conte quadrangle but may occur elsewhere in the Park. This community was sampled in two locations on the Cades Cove quadrangle; in the northwest along More Licker Branch and in the central portion of the quadrangle along Tipton's Sugar Cove Branch.

ENVIRONMENTAL DESCRIPTION

Globally

This forests occurs on lower or protected slopes and terraces at elevations greater than 1800 feet.

Great Smoky Mountains National Park

This forest is found in association with streams on low slopes with north aspects. Samples were from 1705 and 2277 feet elevation, but this forest is likely to occur at higher elevations.

MOST ABUNDANT SPECIES

Globally

Stratum	Species
Tree canopy	*Tsuga canadensis*
Tall Shrub	*Rhododendron maximum*
Short shrub	*Leucothoe fontanesiana*

Great Smoky Mountains National Park

Stratum	Species
See above	

CHARACTERISTIC SPECIES

Globally

Tsuga canadensis, Rhododendron maximum, Leucothoe fontanesiana

Great Smoky Mountains National Park

See above.

VEGETATION DESCRIPTION

Globally

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,* and total less than 25 percent 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.

Great Smoky Mountains National Park
The canopy of this community is strongly dominated by *Tsuga canadensis.* Other species that have minor coverage in the canopy and subcanopy include *Betula lenta, Magnolia fraseri,* and *Liriodendron tulipifera*. The dominant shrubs are *Rhododendron maximum* and *Leucothoe fontanesiana*. Other shrubs include *Hamamelis virginiana, Halesia tetraptera* var. *monticola, Clethra acuminata,* and *Oxydendrum arboreum.* Herbs are sparse; typical species include *Dryopteris intermedia, Goodyera pubescens, Medeola virginiana, Mitchella repens, Mitchella repens, Polystichum acrostichoides,* and *Thelypteris noveboracensis*.

OTHER NOTEWORTHY SPECIES
No information

CONSERVATION RANK G3G4

RANK JUSTIFICATION

DATABASE CODE CEGL007136

COMMENTS
Globally
In Kentucky, this association occurs the eastern part of the state (Appalachian Plateaus, Cumberland Mountains), and may occur disjunct in the Shawnee Hills. In Kentucky, disturbed areas may have abundant *Betula lenta* and *Betula alleghaniensis* in the subcanopy.

Great Smoky Mountains National Park
This association can occur adjacent to and grade in and out of *Tsuga canadensis - Liriodendron tulipifera / Rhododendron maximum / Tiarella cordifolia* Forest (CEGL007543). It is unclear if there is an environmental factor that distinguishes forests codominated by *Tsuga canadensis* and *Pinus strobus* and those dominated by only *Tsuga canadensis.* It is possible that those codominated by *Pinus strobus* occur on drier, more westerly exposed sites or perhaps on previously disturbed sites. It is unlikely that the signature of this association can be distinguished from that of *Pinus strobus - Tsuga canadensis / Rhododendron maximum - Leucothoe fontanesiana* Forest (CEGL007102).

REFERENCES
Evans 1991, Eyre 1980, Golden 1974, Golden 1981, Lorimer 1980, McLeod 1988, Newell et al. 1997, Oosting and Bourdeau 1955, Patterson 1994, Racine and Hardin 1975, Schafale and Weakley 1990, Whittaker 1956

Ailanthus altissima Forest

COMMON NAME	Tree-of-Heaven Forest
SYNONYM	Tree-of-Heaven Forest
PHYSIOGNOMIC CLASS	Forest (I)
PHYSIOGNOMIC SUBCLASS	Deciduous forest (I.B)
PHYSIOGNOMIC GROUP	Cold-deciduous forest (I.B.2)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural (I.B.2.N)
FORMATION	Lowland or submontane cold-deciduous forest (I.B.2.N.a)

ALLIANCE *Ailanthus altissima* Forest Alliance

CLASSIFICATION CONFIDENCE LEVEL 1

USFWS WETLAND SYSTEM Upland

RANGE

Globally

This vegetation occurs throughout the Appalachians, in eastern Kentucky, and in the Ozarks and Ouachita Mountains, and probably other areas in the northeastern United States. It is known from Arkansas, Kentucky, North Carolina, Tennessee, Virginia, and West Virginia.

Great Smoky Mountains National Park

This association was not observed or sampled on the Mount Le Conte or Cades Cove quadrangles. However, it occurs in the western portion of the southern Blue Ridge and is thus possible within the Park boundary.

ENVIRONMENTAL DESCRIPTION

Globally

This forest occurs mostly in disturbed areas, along roadsides, urban abandoned lands, and on limestone clifftops.

Great Smoky Mountains National Park

No information

MOST ABUNDANT SPECIES

Globally

Stratum	Species
Tree canopy	*Ailanthus altissima*

Great Smoky Mountains National Park

No information

CHARACTERISTIC SPECIES

Globally

Ailanthus altissima

Great Smoky Mountains National Park

No information

VEGETATION DESCRIPTION

Globally

Vegetation dominated by the alien species *Ailanthus altissima*, a native of eastern Asia. Associated species vary with geography.

Great Smoky Mountains National Park

No information

OTHER NOTEWORTHY SPECIES

No information

CONSERVATION RANK GW

RANK JUSTIFICATION
This vegetation is dominated by an invasive, alien species and is thus not a conservation priority.

DATABASE CODE CEGL007191

COMMENTS
None

REFERENCES
Patterson 1996

Aesculus flava - Betula alleghaniensis - Acer saccharum / Acer spicatum / Caulophyllum thalictroides - Laportea canadensis Forest

COMMON NAME	Yellow Buckeye - Yellow Birch - Sugar Maple / Mountain Maple / Blue Cohosh – Wood-nettle Forest
SYNONYM	Southern Appalachian Northern Hardwood Forest (Rich Type)
PHYSIOGNOMIC CLASS	Forest (I)
PHYSIOGNOMIC SUBCLASS	Deciduous forest (I.B)
PHYSIOGNOMIC GROUP	Cold-deciduous forest (I.B.2)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural (I.B.2.N)
FORMATION	Lowland or submontane cold-deciduous forest (I.B.2.N.a)

ALLIANCE *Betula alleghaniensis - Fagus grandifolia - Aesculus flava* Forest Alliance

CLASSIFICATION CONFIDENCE LEVEL 2

USFWS WETLAND SYSTEM Upland

RANGE

Globally

This community occurs in the southern Blue Ridge of Georgia, North Carolina, Tennessee, and Virginia.

Great Smoky Mountains National Park

This community was sampled on the Mount Le Conte and Cades Cove quadrangles. Additional historic samples are from the Thunderhead Mountain quadrangle. On the Cades Cove quadrangle, historic and recent samples of this community ranged from 3580 to 4610 feet elevation. Samples from the southern portion of the Cades Cove quadrangle came from upper coves north of Gregory Bald; slopes below Rich Gap; and the western slopes of Forge Knob. In the central and eastern portion of the Cades Cove quadrangle this community was sampled from the protected high slopes on the west side of Mud Gap; a cove north of Ekaneetlee Gap; high slopes in the vicinity of Devil's Tater Patch; McCampbell Gap, McCampbell Knob, an upper cove north of McCampbell Gap; northwest slopes below McCampbell Knob; and a cove in the upper reaches of Pole Knob Branch. This community was sampled in the southwest portion of the Mount Le Conte quadrangle on the low slopes above Alum Cave Creek (4050 feet) and Walker Camp Prong (3990 feet); on the low slopes above Road Prong in the vicinity of Beech Flats (3650 feet); and in a upper cove below Chimney Tops (4620 feet).

ENVIRONMENTAL DESCRIPTION

Globally

This forest occurs on deep, rocky soils on the upper slopes of coves and on other protected landforms, at elevations 3500-5000 feet and can be associated with mafic substrates.

Great Smoky Mountains National Park

This community occurs on concave or protected landforms such as the upper portions of draws and coves, protected slopes, and gaps. Sites sampled had northerly aspects and a mean elevation of 4200 feet, ranging from 3580 to 4620 feet.

MOST ABUNDANT SPECIES

Globally

Stratum	Species
Tree canopy	*Acer saccharum, Aesculus flava, Betula alleghaniensis, Fagus grandifolia*
Herbaceous	*Cimicifuga racemosa, Laportea Canadensis*

Great Smoky Mountains National Park

Stratum	Species
Tree canopy	*Acer saccharum, Aesculus flava, Betula alleghaniensis, Fagus grandifolia*
Herbaceous	(variable)

CHARACTERISTIC SPECIES

Globally

No information

Great Smoky Mountains National Park

Betula alleghaniensis, Fagus grandifolia, Acer saccharum, Halesia tetraptera var. *monticola, Deparia acrostichoides, Viola*

canadensis

VEGETATION DESCRIPTION
Globally
This forest is dominated by species typically known as "northern hardwoods" (*Aesculus flava, Fagus grandifolia, Betula alleghaniensis, Acer saccharum*) and has a rich herbaceous flora dominated by forbs. 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, Cimicifuga racemosa, Collinsonia canadensis, Ageratina altissima* var. *roanensis, Laportea canadensis, Campanulastrum americanum,* and *Tiarella cordifolia.*

Great Smoky Mountains National Park
The canopy of these forests always have a component of *Betula alleghaniensis* and *Fagus grandifolia,* codominating with *Acer saccharum, Aesculus flava*, and *Halesia tetraptera* var. *monticola*. Occasionally *Quercus rubra, Tilia americana* var. *heterophylla,* and *Fraxinus americana* may have coverage in the canopy, but this situation is not typical. The subcanopy, if present, contains species from the canopy as well as *Prunus pensylvanica* and *Prunus serotina*. The shrub stratum is typically open with scattered shrubs, but shrubs can dominate in patches. Typical shrub species include *Acer pensylvanicum, Acer saccharum, Acer spicatum, Aesculus flava, Cornus alternifolia, Fagus grandifolia, Hydrangea arborescens, Ilex montana, Rubus allegheniensis, Rubus canadensis,* and *Viburnum lantanoides*. The herbaceous stratum is lush and diverse. Species with the highest coverage and constancy include *Ageratina altissima (*var. *altissima* and var. *roanensis), Aster divaricatus, Cimicifuga americana, Cimicifuga racemosa, Deparia acrostichoides, Dryopteris intermedia, Laportea canadensis, Solidago caesia* var. *curtisii, Tiarella cordifolia,* and *Viola blanda*. Other species with greater than 50 percent constancy include *Arisaema triphyllum* ssp. *triphyllum, Athyrium filix-femina* ssp. *asplenioides, Carex* spp. *(e.g. Carex aestivalis, Carex debilis, Carex laxiflora* var. *laxiflora, Carex pensylvanica, Carex plantaginea), Disporum lanuginosum, Eupatorium* spp. *(e.g. Eupatorium dubium, Eupatorium fistulosum, Eupatorium purpureum, Eupatorium steelei), Galium* spp. *(e.g. Galium lanceolatum, Galium latifolium, Galium triflorum), Impatiens* spp., *Polygonatum pubescens, Polystichum acrostichoides* var. *acrostichoides, Stellaria corei, Stellaria pubera,* and *Viola canadensis.*

OTHER NOTEWORTHY SPECIES
No information

CONSERVATION RANK G3

RANK JUSTIFICATION
No information

DATABASE CODE CEGL004973

COMMENTS
Globally
These forests occur above the elevational limit of some of the typical "cove" canopy species such as *Fraxinus americana, Liriodendron tulipifera,* and *Carya cordiformis* (see the *Liriodendron tulipifera - Tilia americana* var. *heterophylla - Aesculus flava - Acer saccharum* Forest Alliance).

Great Smoky Mountains National Park
Some examples of this community, particularly at low elevations, may begin to resemble forests in the *Liriodendron tulipifera - Tilia americana* var. *heterophylla - Aesculus flava - Acer saccharum* Forest Alliance. The canopy of this forest is distinguished by *Betula alleghaniensis* and *Fagus grandifolia* occurring in combination with *Aesculus flava* and Acer *saccharum*. In some areas, signature distinctions between this association and *Betula alleghaniensis - Fagus grandifolia - Aesculus flava / Viburnum lantanoides / Aster chlorolepis - Dryopteris intermedia* Forest (CEGL007285) may be difficult to make and mapping may have to be done at the alliance level.

REFERENCES
Schafale and Weakley 1990

Betula alleghaniensis - Fagus grandifolia - Aesculus flava / Viburnum lantanoides / Aster chlorolepis - Dryopteris intermedia Forest

COMMON NAME	Yellow Birch - American Beech - Yellow Buckeye / Hobblebush / Appalachian
SYNONYM	Southern Appalachian Northern Hardwood Forest (Typic Type)
PHYSIOGNOMIC CLASS	Forest (I)
PHYSIOGNOMIC SUBCLASS	Deciduous forest (I.B)
PHYSIOGNOMIC GROUP	Cold-deciduous forest (I.B.2)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural (I.B.2.N)
FORMATION	Lowland or submontane cold-deciduous forest (I.B.2.N.a)

ALLIANCE *Betula alleghaniensis - Fagus grandifolia - Aesculus flava* Forest Alliance

CLASSIFICATION CONFIDENCE LEVEL 1

USFWS WETLAND SYSTEM Upland

RANGE

Globally

This community occurs at high elevations in the southern Blue Ridge of North Carolina, Tennessee, and Virginia.

Great Smoky Mountains National Park

This community was sampled on the Mount Le Conte and Cades Cove quadrangles. Historic samples are from the Thunderhead Mountain quadrangle (4360 to 5000 feet elevation). On the Cades Cove quadrangle, historic and recent samples of this community ranged from 4320 to 4840 feet elevation. Samples from the southern portion of the Cades Cove quadrangle came from the upper slopes of Gregory Bald; upper slopes north and west of Gregory Bald; a gap west of Forge Knob; and Gregory Ridge, northwest of Rich Gap. In the central and eastern portion of the Cades Cove quadrangle, this community was sampled from the exposed slopes and ridges in the vicinity of Devil's Tater Patch; a ridge east of Mollies Ridge Shelter; and from the northwest slope of McCampbell Knob. In the southern portion of the Mount Le Conte quadrangle this community was sampled on the high north slopes of Masa Knob (5400 feet) and on steep west-facing slopes north of Mount Le Conte (5100 feet).

ENVIRONMENTAL DESCRIPTION

Globally

This forest occurs at high elevations (typically over 4000 feet), on exposed landforms such as open, north-facing slopes.

Great Smoky Mountains National Park

Samples of this community ranged from 5400 to 4320 feet elevation, averaging 4720 feet. It is found on high, exposed slopes, ridges, and gaps, typically with northerly exposures.

MOST ABUNDANT SPECIES

Globally

Stratum	Species
Tree canopy	*Betula alleghaniensis, Fagus grandifolia, (Aesculus flava)*
Subcanopy	*Acer pensylvanicum, Acer spicatum, Acer saccharum*
Tall shrub	*Viburnum lantanoides*
Herbaceous	*Ageratina altissima* var. *roanensis, Aster chlorolepis, Athyrium asplenioides, Carex pensylvanica, Dryopteris intermedia*

Great Smoky Mountains National Park

Stratum	Species
Tree canopy	*Betula alleghaniensis, Fagus grandifolia, Aesculus flava*
Short shrub	*Rubus canadensis*
Herbaceous	*Ageratina altissima, Athyrium filix-femina* ssp. *asplenioides, Dryopteris intermedia*

CHARACTERISTIC SPECIES

Globally

Aesculus flava, Betula alleghaniensis, Fagus grandifolia, Acer spicatum, Ilex montana, Viburnum lantanoides, Ageratina altissima var. roanensis, Aster chlorolepis, Carex pensylvanica, Dryopteris intermedia

Great Smoky Mountains National Park

Aesculus flava, Betula alleghaniensis, Fagus grandifolia, Acer spicatum, Ilex montana, Viburnum lantanoides, Ageratina altissima var. roanensis, Allium burdickii, Aster chlorolepis, Carex pensylvanica, Dryopteris intermedia, Oxalis montana, Solidago glomerata, Stellaria corei, Stellaria pubera, Streptopus amplexifolius

VEGETATION DESCRIPTION

Globally

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. *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, Aster chlorolepis, Athyrium asplenioides, Carex pensylvanica, Dryopteris intermedia, Solidago caesia* var. *curtisii, Stellaria pubera, Stellaria corei*, and *Streptopus roseus*.

Great Smoky Mountains National Park

The canopy is dominated by various mixtures of *Betula alleghaniensis, Fagus grandifolia,* and *Aesculus flava*. Other species that may occasionally have high coverage in the canopy include *Halesia tetraptera* var. *monticola, Quercus rubra*, and *Acer saccharum.* The subcanopy is usually not well-developed and consists of canopy species. Additional species that may be present in the subcanopy include *Acer pensylvanicum, Amelanchier laevis,* and *Prunus serotina*. At the highest elevations *Picea rubens* may be part of the subcanopy, while at lower elevations *Magnolia acuminata* may be present in the subcanopy. Shrubs are typically sparse but can be moderately dense. Common shrubs include *Fagus grandifolia, Rubus canadensis, Acer spicatum, Viburnum lantanoides,* and *Ilex montana*, although other species may occur. Herb coverage varies between occurrences but is composed of a mix of sedges, ferns, and other forbs. Species richness is low in comparison with other deciduous forests, with typically less than 30 total species per 0.1 hectare. Common herbaceous dominants include *Ageratina altissima, Athyrium filix-femina* ssp. *asplenioides, Carex* spp. *(e.g. Carex debilis, Carex intumescens, Carex pensylvanica*), and *Dryopteris intermedia*. Other typical herbs *include Aster divaricatus, Solidago caesia* var. *curtisii, Stellaria pubera,* and *Viola* spp. *(e.g. Viola blanda, Viola canadensis, Viola hastata, Viola pubescens),* although other species may occur.

OTHER NOTEWORTHY SPECIES

No information

CONSERVATION RANK G3G4

RANK JUSTIFICATION

This is a broadly defined association meant to cover typical "northern hardwood forests" of the southern Blue Ridge. If needed, more associations may be defined based on differences related to geology and other environmental variables. 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. Exotic plants and animals, such as garlic mustard (*Alliaria petiolaris*) and the gypsy moth, may represent significant threats to this community.

DATABASE CODE CEGL007285

COMMENTS

Globally

This is a broadly defined association meant to cover typical "northern hardwood forests" of the southern Blue Ridge. If needed, more associations may be defined based on differences related to geology and other environmental variables. This association differs from *Aesculus flava - Betula alleghaniensis - Acer saccharum / Acer spicatum / Caulophyllum thalictroides - Laportea canadensis* Forest (CEGL004973) by occurring on more exposed landforms and having floristic differences related to the lower moisture regime and less nutrient-rich soils.

Great Smoky Mountains National Park

Lower elevation examples of this community on Cades Cove (below 4600 feet) have high canopy coverage by *Quercus rubra* and may grade into forests in the *Quercus rubra* Montane Forest Alliance. Examples are often disturbed by European Wild Boar (*Sus scrofa*).

REFERENCES

Brown 1941, McLeod 1988, Newell et al. 1997, Schafale and Weakley 1990

Betula alleghaniensis / Acer spicatum / Hydrangea arborescens - Ribes cynosbati / Dryopteris marginalis Forest

COMMON NAME	Yellow Birch / Mountain Maple / Wild Hydrangea - Prickly Gooseberry / Marginal Shield-fern Forest
SYNONYM	Southern Appalachian Hardwood Boulderfield Forest (Typic Type)
PHYSIOGNOMIC CLASS	Forest (I)
PHYSIOGNOMIC SUBCLASS	Deciduous forest (I.B)
PHYSIOGNOMIC GROUP	Cold-deciduous forest (I.B.2)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural (I.B.2.N)
FORMATION	Lowland or submontane cold-deciduous forest (I.B.2.N.a)
ALLIANCE	*Betula alleghaniensis - Fagus grandifolia - Aesculus flava* Forest Alliance
CLASSIFICATION CONFIDENCE LEVEL	1
USFWS WETLAND SYSTEM	Upland

RANGE

Globally

This community is distributed in the moderate to high elevation (2000-4000 feet) regions of the Blue Ridge and Cumberland Mountains, and could possibly extend into the adjacent Ridge and Valley and Appalachian Plateau provinces. It occurs in Georgia, Kentucky, North Carolina, and Tennessee, and could possibly extend into Virginia.

Great Smoky Mountains National Park

This association was found on both the Cades Cove and Mount Le Conte quadrangles, and it should occur elsewhere in the Park on boulderfields below 5000 feet elevation. It was sampled on the southwestern portion of the Cades Cove quadrangle, at the headwaters of Forge Knob Branch. On the southwestern portion of the Mount Le Conte quadrangle, this association was sampled southwest of Rocky Spur in the vicinity of Le Conte Creek and also southwest of Balsam Point. This community was also sampled in the central portion of the Mount Le Conte quadrangle, in a north-facing ravine west of Trillium Gap.

ENVIRONMENTAL DESCRIPTION

Globally

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.

Great Smoky Mountains National Park

This community was found on steep to moderately steep slopes, in draws, and on periglacial boulderfields from 4000 to 5000 feet elevation. Aspects were north and west. Disturbance by wind and ice is common. There is little soil development, and the substrate is rubble, large rocks, and boulders. This community is associated with small creeks and seeps.

MOST ABUNDANT SPECIES

Globally

Stratum	Species
Tree canopy	*Betula alleghaniensis*
Tall shrub	*Acer spicatum*
Short shrub	*Ribes cynosbati, Ribes rotundifolium*

Great Smoky Mountains National Park

Stratum	Species
Tree canopy	(*Betula alleghaniensis, Aesculus flava*)
Tall shrub	*Acer spicatum*
Short shrub	*Hydrangea arborescens, Euonymus obovata*
Herbaceous	*Dryopteris intermedia*
Epiphyte	*Polypodium appalachianum*

CHARACTERISTIC SPECIES

Globally

Betula alleghaniensis, Aesculus flava, Betula lenta, Acer spicatum,Hydrangea arborescens,Ribes cynosbati,Dryopteris marginalis, Aristolochia macrophylla

Great Smoky Mountains National Park
Betula alleghanensis, Acer spicatum, Euonymus obovata, Polypodium appalachianum

VEGETATION DESCRIPTION
Globally
This forest is usually strongly dominated by *Betula alleghaniensis*, though other species such as *Aesculus flava, Betula lenta,* and *Tilia americana* var. *heterophylla* may also be common. *Betula alleghaniensis* in the canopy are often stunted and gnarled, with roots that may have grown to encircle the boulders. Tree windthrow is common, leaving patches of exposed mineral soil and gaps in the canopy. A woody layer of shrubs and vines is usually well-developed, because of the development of this community on periglacial boulderfields of blocky talus, limiting rooting opportunities for most herbaceous plants. Typical shrubs and vines, which are more abundant in this type than in other associations include *Acer spicatum, Aristolochia macrophylla, Hydrangea arborescens, Parthenocissus* quinquefolia, *Ribes cynosbati,* and *Ribes rotundifolium. Dryopteris marginalis* is often an abundant herb.

Great Smoky Mountains National Park
This forest has a canopy dominated by *Betula alleghaniensis* and/or *Aesculus flava. Betula alleghaniensis* in the canopy are often stunted and gnarled, with roots that may have grown to encircle the boulders. Tree windthrow is common, leaving patches of exposed mineral soil and gaps in the canopy. Other species in the canopy and subcanopy can include *Tilia americana* var. *heterophylla, Fagus grandifolia, Acer saccharum, Acer spicatum, Tsuga canadensis,* and *Picea rubens*. Shrub density is typically high but may vary between occurrences. The shrub stratum is dominated by the tall shrub *Acer spicatum* and the short shrubs *Hydrangea arborescens* and *Euonymus obovata*. *Ribes rotundifolium* and *Ribes cynosbati* are conspicuous in the shrub stratum. Other shrubs include *Viburnum lantanoides, Sambucus racemosa* var *pubens*, and *Rubus canadensis*. Herb cover is moderate to dense, and herb strata tend to be diverse. Herbs and mosses cover the rocks and boulders. *Dryopteris intermedia, Stellaria pubera,* and the epiphyte *Polypodium appalachianum* are the most constant species in the stands sampled. Other common herbs include *Ageratina altissima* var. *roanensis, Allium tricoccum, Angelica triquinata, Arisaema triphyllum, Aster chlorolepis, Cimicifuga americana, Diphylleia cymosa, Galium triflorum, Hydrophyllum canadense, Laportea canadensis, Melanthium parviflorum, Oxalis montana, Solidago caesia* var *curtisii, Tiarella cordifolia,* and *Trillium erectum.*

OTHER NOTEWORTHY SPECIES

CONSERVATION RANK G3

RANK JUSTIFICATION
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 a threatened by logging because of the stunted nature of the trees and the inaccessibility, to loggers, of boulderfields.

DATABASE CODE CEGL004982

COMMENTS
Globally
This type is conceptually similar to *Betula alleghaniensis / Ribes glandulosum / Polypodium appalachianum* Forest (CEGL006124), which is more restricted to very moist boulderfield situations at high elevations (4500-5300 feet). *Betula alleghaniensis / Acer spicatum / Hydrangea arborescens - Ribes cynosbati / Dryopteris marginalis* Forest 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.

Great Smoky Mountains National Park
Examples of this community in the Great Smoky Mountains National Park, particularly ones at high elevations, are compositionally similar to *Betula alleghaniensis / Ribes glandulosum / Polypodium appalachianum* Forest (CEGL006124). In the Park, this latter community is distinguished by occurring over 5000 feet elevation and by the occurrence of high elevation species such as *Abies fraseri, Dryopteris campyloptera, Ribes glandulosum, Rugelia nudicaulis, Streptopus amplexifolius, Prunus pensylvanica,* and *Sorbus americana.*

REFERENCES
Chafin and Jones 1989, Evans 1991,Rawinski 1992, Schafale and Weakley 1990

Betula alleghaniensis / Ribes glandulosum / Polypodium appalachianum Forest

COMMON NAME	Yellow Birch / Skunk-currant / Appalachian Rockcap Fern Forest
SYNONYM	Southern Appalachian Boulderfield Forest (Currant and Rockcap Fern Type)
PHYSIOGNOMIC CLASS	Forest (I)
PHYSIOGNOMIC SUBCLASS	Deciduous forest (I.B)
PHYSIOGNOMIC GROUP	Cold-deciduous forest (I.B.2)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural (I.B.2.N)
FORMATION	Lowland or submontane cold-deciduous forest (I.B.2.N.a)

ALLIANCE *Betula alleghaniensis - Fagus grandifolia - Aesculus flava* Forest Alliance

CLASSIFICATION CONFIDENCE LEVEL 1

USFWS WETLAND SYSTEM Upland

RANGE

Globally

This community is known from the high elevation regions of the Blue Ridge from West Virginia south to eastern Tennessee and western North Carolina and may extend into the adjacent Ridge and Valley and Appalachian Plateau provinces.

Great Smoky Mountains National Park

This community was sampled on the Mount Le Conte quadrangle and was not found on the Cades Cove quadrangle. It is likely in other areas of the Park and should be sought on steep slopes and boulderfields at elevations over 5000 feet, particularly in areas adjacent to spruce (*Picea rubens*) and fir (*Abies fraseri*) forests. On the Mount Le Conte quadrangle, this community was sampled on the north slope of Mount Le Conte, on the Rainbow Falls Trail, at 5300 feet elevation.

ENVIRONMENTAL DESCRIPTION

Globally

This community occurs in a cool, humid climate, on steep, boulder-strewn slopes, northwest- to northeast-facing, middle to upper concave slopes, or in saddles between ridges, at elevations of 1370 to 1600 meters (4500-5300 feet). Seepage areas are common, producing wet microhabitats with unique species assemblages. High winds and ice storms periodically affect these forests.

Great Smoky Mountains National Park

This community is found on steep, north-facing, periglacial boulderfields, above 5000 feet elevation. Disturbance by ice and wind is common.

MOST ABUNDANT SPECIES

Globally

Stratum	Species
Tree canopy	*Betula alleghaniensis*
Tall shrub	*Acer spicatum*
Short shrub	*Ribes glandulosum*

Great Smoky Mountains National Park

Stratum	Species
Tree canopy	*Betula alleghaniensis*
Tall shrub	*Acer spicatum, Hydrangea arborescens, Viburnum lantanoides*
Short shrub	*Ribes glandulosum*
Herbaceous	*Aster chlorolepis, Dryopteris campyloptera*
Nonvascular	mosses
Epiphytes	*Polypodium appalachianum*

CHARACTERISTIC SPECIES

Globally

Betula alleghaniensis,Ribes glandulosum, Polypodium appalachianum

Great Smoky Mountains National Park

Betula alleghaniensis, Diervilla sessilifolia, Dryopteris campyloptera, Ribes glandulosum, Rugelia nudicaulis, Streptopus amplexifolius, Sorbus americana

VEGETATION DESCRIPTION

Globally

This community is distinguished by a closed to somewhat open canopy dominated by *Betula alleghaniensis*, occurring over angular rocks (0.25 to > 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 *Tilia americana* var. *heterophylla, Aesculus flava, Picea rubens, 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. Characteristic species in both the herb and shrub strata include *Acer spicatum, Acer pensylvanicum, Aster acuminatus, Ilex montana, Vaccinium erythrocarpum, Amelanchier arborea* var. *austromontana, Ribes glandulosum, Oxalis montana, Aster chlorolepis, Aconitum reclinatum, Carex aestivalis, Hylocomium splendens, Circaea alpina, Lonicera canadensis, Claytonia caroliniana, Cystopteris protrusa,* and *Dryopteris marginalis.* Seepage areas are common, producing wet microhabitats with unique species assemblages (*Chelone lyonii, Chrysosplenium americanum, Circaea alpina, Rudbeckia laciniata, Impatiens pallida,* and *Monarda didyma).*

Great Smoky Mountains National Park

This forest has a canopy strongly dominated by *Betula alleghaniensis.* Canopy trees are often stunted and gnarled, with roots that may have grown to encircle the boulders. Tree windthrow is common, leaving patches of exposed mineral soil and gaps in the canopy. Other species in the canopy and subcanopy can include *Aesculus flava, Prunus pensylvanica, Sorbus americana, Acer spicatum,* and *Picea rubens.* The shrub stratum is dominated by *Acer spicatum, Hydrangea arborescens, Viburnum lantanoides,* and *Ribes glandulosum.* Other shrubs include *Sambucus racemosa* var. *pubens*, *Diervilla sessilifolia, Lonicera canadensis, Vaccinium erythrocarpum, Ribes rotundifolium,* and *Rubus canadensis*. Herbs and mosses cover the rocks and boulders. Characteristic herbaceous species include *Aster chlorolepis, Dryopteris campyloptera, Cimicifuga americana, Clintonia borealis, Cystopteris protrusa, Cardamine clematitis, Huperzia lucidula, Rugelia nudicaulis, Streptopus amplexifolius,* and *Polypodium appalachianum.*

OTHER NOTEWORTHY SPECIES

CONSERVATION RANK G3

RANK JUSTIFICATION

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 a threatened by logging because of the stunted nature of the trees and the inaccessibility, to loggers, of boulderfields.

DATABASE CODE CEGL006124

COMMENTS

Globally

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.

Great Smoky Mountains National Park

Examples of this community in the Great Smoky Mountains National Park are compositionally similar to *Betula alleghaniensis / Acer spicatum / Hydrangea arborescens - Ribes cynosbati / Dryopteris marginalis* Forest (CEGL004982). In the Park, this latter community is distinguished by occurring below 5000 feet elevation, having a somewhat more diverse canopy, and by lacking many of the high elevation species such as *Abies fraseri, Dryopteris campyloptera, Ribes glandulosum, Rugelia nudicaulis, Streptopus amplexifolius, Prunus pensylvanica,* and *Sorbus americana.* This community is surrounded by forests dominated by *Picea rubens* and *Betula alleghaniensis.*

REFERENCES

Chafin and Jones 1989, Dellinger 1992, Golden 1981, King and Stupka 1950, Pittillo and Smathers 1979,Rawinski 1992, Schafale and Weakley 1990, Stamper 1976, Wharton 1978, Wood 1975

Fagus grandifolia / Ageratina altissima var. *roanensis* Forest

COMMON NAME	American Beech / Appalachian White Snakeroot Forest
SYNONYM	Southern Appalachian Beech Gap (North Slope Tall Herb Type)
PHYSIOGNOMIC CLASS	Forest (I)
PHYSIOGNOMIC SUBCLASS	Deciduous forest (I.B)
PHYSIOGNOMIC GROUP	Cold-deciduous forest (I.B.2)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural (I.B.2.N)
FORMATION	Lowland or submontane cold-deciduous forest (I.B.2.N.a)
ALLIANCE	*Betula alleghaniensis - Fagus grandifolia - Aesculus flava* Forest Alliance
CLASSIFICATION CONFIDENCE LEVEL	1
USFWS WETLAND SYSTEM	Upland

RANGE

Globally

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.

Great Smoky Mountains National Park

This association was not observed or sampled on the Mount Le Conte or Cades Cove quadrangles. However, this association is likely within the Park boundary.

ENVIRONMENTAL DESCRIPTION

Globally

This community typically occurs on northerly 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. This community commonly occurs as small patches surrounded by other forest types.

Great Smoky Mountains National Park

No information

MOST ABUNDANT SPECIES

Globally

Stratum	Species
Tree canopy	*Fagus grandifolia, Betula alleghaniensis, Aesculus flava*
subcanopy	*Acer spicatum, Acer pensylvanicum, Amelanchier laevis*
Herbaceous	*Athyrium filix-femina* ssp. *asplenioides, Ageratina altissima* var. *roanensis, Aster chlorolepis, Cimicifuga racemosa*

Great Smoky Mountains National Park

Stratum	Species
No information	

CHARACTERISTIC SPECIES

Globally

Fagus grandifolia, Athyrium filix-femina ssp. asplenioides, Epifagus virginiana

Great Smoky Mountains National Park

No information

VEGETATION DESCRIPTION

Globally

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 percent) 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 percent 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, Aster chlorolepis, Athyrium filix-femina* ssp. *asplenioides, Carex aestivalis, Carex brunnescens, Carex debilis, Carex intumescens, Carex pensylvanica, 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*.

Great Smoky Mountains National Park
No information

OTHER NOTEWORTHY SPECIES
Noteworthy plant species that are known to occur in this community include *Lilium grayi, Platanthera grandiflora, Prenanthes roanensis, Stellaria corei*, and *Streptopus roseus* var. *roseus.* Animals found in association with this forest include Bobcat (*Lynx rufus*) and Black Bear (*Ursus americanus*). The exotic European Wild Boar (*Sus scrofa*) has become well-established in the southern Appalachian Mountains and has had negative impacts on the native animals and vegetation in this community.

CONSERVATION RANK G2

RANK JUSTIFICATION
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.

DATABASE CODE CEGL006246

COMMENTS
Globally
A similar community, *Fagus grandifolia / Carex* spp. Forest, dominated by stunted, gnarled *Fagus grandifolia* with an understory primarily of *Carex* species, occurs on exposed, south-facing slopes above 1370 m (4500 feet) in the southern Appalachian Mountains of North Carolina and Tennessee. The mesic north slope community described here is distinguished from the south slope variant by having a more diverse canopy, a more developed subcanopy, and a less dense (40-60 percent) herbaceous stratum dominated by species other than sedges, although sedges do occur (Crandall 1958; Whittaker 1956). Additionally, *Fagus grandifolia / Ageratina altissima* var. *roanensis* Forest is thought to be more similar to northern hardwood forests (i.e. upper cove forests) and to extend farther into the southwestern Appalachian mountain ranges than does the south slope, sedge-dominated variant, which is thought to be limited to the range of *Picea rubens* and *Abies fraseri* (Whittaker 1958).

Great Smoky Mountains National Park
None.

REFERENCES
Bratton 1975, Crandall 1958, Fuller 1977, Golden 1981, McLeod 1988, Pittillo and Smathers 1979, Ramseur 1960, Rheinhardt 1981, Russell 1953, Schafale and Weakley 1990, Schofield 1960, Singer et al. 1984, White et al. 1993, Whittaker 1956

Fagus grandifolia / Carex pensylvanica - Carex brunnescens Forest

COMMON NAME	American Beech / Pennsylvania Sedge - Brown Sedge Forest
SYNONYM	Southern Appalachian Beech Gap (South Slope Sedge Type)
PHYSIOGNOMIC CLASS	Forest (I)
PHYSIOGNOMIC SUBCLASS	Deciduous forest (I.B)
PHYSIOGNOMIC GROUP	Cold-deciduous forest (I.B.2)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural (I.B.2.N)
FORMATION	Lowland or submontane cold-deciduous forest (I.B.2.N.a)
ALLIANCE	*Betula alleghaniensis - Fagus grandifolia - Aesculus flava* Forest Alliance
CLASSIFICATION CONFIDENCE LEVEL	1
USFWS WETLAND SYSTEM	Upland

RANGE

Globally

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 possibly in Virginia.

Great Smoky Mountains National Park

This community was sampled from a single location on the Mount Le Conte quadrangle, on the south slope of Trillium Gap (4719 feet elevation). It was not observed on the Cades Cove quadrangle, but it does occur in other areas of the Park.

ENVIRONMENTAL DESCRIPTION

Globally

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.

Great Smoky Mountains National Park

The single occurrence documented on the Mount Le Conte quadrangle is on broad, flat, western-oriented saddle. The beech trees were all infected with Beech Bark Disease. The occurrence was surrounded by heath shrublands, spruce-hemlock forests, and northern hardwood forests.

MOST ABUNDANT SPECIES

Globally

Stratum	Species
Tree canopy	*Fagus grandifolia, Halesia tetraptera* var. *monticola*
Herbaceous	*Carex aestivalis, Carex brunnescens, Carex debilis, Carex intumescens, Carex pensylvanica*

Great Smoky Mountains National Park

Stratum	Species
Tree canopy	*Fagus grandifolia*
Subcanopy	*Acer pensylvanicum*
Herbaceous	*Carex pensylvanica*

CHARACTERISTIC SPECIES

Globally

Carex aestivalis, Carex albicans, Carex brunnescens, Ageratina altissima var. *roanensis, Aster chlorolepis, Epifagus virginiana*

Great Smoky Mountains National Park

Fagus grandifolia, Halesia tetraptera var. monticola, Rugelia nudicaulis, Carex pensylvanica

VEGETATION DESCRIPTION

Globally

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 percent coverage, and dominated by species of *Carex* (*Carex aestivalis, Carex brunnescens, Carex debilis, Carex intumescens, Carex pensylvanica).* Ferns and other herbs form 5-20 percent of the herbaceous cover and may include *Ageratina altissima* var. *roanensis, Anemone quinquefolia, Angelica triquinata, Arisaema triphyllum, 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* (Whittaker 1956; Crandall 1958; Schafale and Weakley 1990).

Great Smoky Mountains National Park
This forest has a 10-meter canopy of *Fagus grandifolia*. The subcanopy is not well-developed, but *Acer pensylvanicum* has the highest coverage. Other species in the subcanopy include *Halesia tetraptera* var. *monticola, Picea rubens,* and *Tsuga canadensis*. The herbaceous stratum is strongly dominated by *Carex pensylvanica* (75-85 percent coverage). Other species present in minor amounts include *Ageratina altissima* var. *roanensis, Angelica triquinata, Arisaema triphyllum* ssp. *triphyllum, Aster chlorolepis, Athyrium filix-femina* ssp. *asplenioides, Brachyelytrum septentrionale, Dryopteris intermedia, Laportea canadensis, Luzula acuminata, Poa alsodes, Prenanthes* sp., *Rubus canadensis, Rugelia nudicaulis, Solidago caesia* var. *curtisii, Stellaria pubera,* and *Viola rotundifolia*.

OTHER NOTEWORTHY SPECIES
Species found in this association that are endemic to the southern Blue Ridge or with the bulk of their worldwide distribution there include *Gentiana austromontana, Glyceria nubigena, Lilium grayi, Phacelia fimbriata, Platanthera grandiflora, Prenanthes roanensis, Stellaria corei,* and *Streptopus roseus* var. *roseus.* Animals that are found in association with this forest include Bobcat (*Lynx rufus*) and Black Bear (*Ursus americanus*). The exotic European Wild Boar (*Sus scrofa*) has become well-established in the southern Appalachian Mountains and has had negative impacts on the native animals and vegetation in this community.

CONSERVATION RANK G2

RANK JUSTIFICATION
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.

DATABASE CODE CEGL006130

COMMENTS
Globally
This community is often referred to as a classic "beech gap" forest. It includes forest vegetation with short-statured canopies dominated by *Fagus grandifolia*, occurring over a dense, graminoid-dominated herbaceous stratum. This community is thought to be limited to the range of *Picea rubens* and *Abies fraseri* (Whittaker 1958). A similar community, *Fagus grandifolia / Ageratina altissima* var. *roanensis* Forest, dominated by short-stature *Fagus grandifolia,* occurring with *Betula alleghaniensis* and *Aesculus flava,* occurs on mesic, north-facing slopes in the southern Appalachian Mountains of North Carolina and Tennessee. This mesic northslope community is thought to be more similar to northern hardwood forests, having a more diverse canopy and subcanopy, and to extend farther into the southwest mountain ranges than does the south slope, sedge-dominated variant described here (Whittaker 1956). Well-developed examples of this type are quite distinct from the Typic Southern Appalachian Northern Hardwoods Forest (*Betula alleghaniensis - Fagus grandifolia - Aesculus flava / Viburnum lantanoides / Aster chlorolepis - Dryopteris intermedia* Forest – CEGL007285). However, some beech-dominated forests occurring on upper slopes may be transitional between the two types and therefore difficult to classify. *Fagus grandifolia / Carex pensylvanica - Carex brunnescens* Forest (CEGL006130) may be distinguished by its location in high elevation gaps or ridges, the stature and structure of the gnarled stunted beech trees, the absence of a dense shrub layer, and the predominance of beech in the canopy (Russell 1953).
Great Smoky Mountains National Park

REFERENCES
Bratton 1975, Crandall 1958, Davis 1930, Golden 1981, Lindsay and Bratton 1979, McLeod 1988, Pittillo and Smathers 1979, Ramseur 1960, Rheinhardt 1981, Russell 1953, Schafale and Weakley 1990, Schofield 1960, Singer et al. 1984, White et al. 1993, Whittaker 1956

Juglans nigra / Verbesina alternifolia Forest

COMMON NAME	Black Walnut / Common Wingstem Forest
SYNONYM	Successional Black Walnut Forest
PHYSIOGNOMIC CLASS	Forest (I)
PHYSIOGNOMIC SUBCLASS	Deciduous forest (I.B)
PHYSIOGNOMIC GROUP	Cold-deciduous forest (I.B.2)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural (I.B.2.N)
FORMATION	Lowland or submontane cold-deciduous forest (I.B.2.N.a)

ALLIANCE *Juglans nigra* Forest Alliance

CLASSIFICATION CONFIDENCE LEVEL 3

USFWS WETLAND SYSTEM Upland

RANGE
Globally
This is a potentially widespread association. It is currently defined only for Tennessee, but likely ranges into adjacent states.

Great Smoky Mountains National Park
This community was sampled on the Mount Le Conte quadrangle and was not sampled on the Cades Cove quadrangle. It is likely in other areas of the park. On the Mount Le Conte quadrangle, this community was sampled on flats along Baskins Creek and was observed on other former homesites in the northern half of the quadrangle.

ENVIRONMENTAL DESCRIPTION
Globally
No information

Great Smoky Mountains National Park
This community was sampled on former homesites along streams, possibly in association with circumneutral soils, at 2000 feet elevation.

MOST ABUNDANT SPECIES
Globally

Stratum	Species
No information	

Great Smoky Mountains National Park

Stratum	Species
Tree canopy	*Juglans nigra*
Herbaceous	*Verbesina alternifolia*

CHARACTERISTIC SPECIES
Globally
No information

Great Smoky Mountains National Park
Juglans nigra, Verbesina alternifolia, Rosa multiflora

VEGETATION DESCRIPTION
Globally
No information

Great Smoky Mountains National Park
Juglans nigra is the sole canopy tree in this open, successional forest. Canopy trees are around 30 cm in diameter. The herb stratum is dominated by *Verbesina alternifolia*. Other herbs include *Amphicarpaea bracteata* and *Ambrosia trifida*.

OTHER NOTEWORTHY SPECIES
The *exotic Rosa multiflora* can be common in this community.

CONSERVATION RANK GW

RANK JUSTIFICATION
This vegetation represents vegetation created by anthropogenic disturbance and is thus not a conservation priority.

DATABASE CODE CEGL007879

COMMENTS
Globally
This community was defined from former homesites in the Great Smoky Mountains National Park and may be associated with circumneutral soils.

Great Smoky Mountains National Park

REFERENCES
None

Aesculus flava - Acer saccharum - (Fraxinus americana, Tilia americana) / Hydrophyllum canadense - Solidago flexicaulis Forest

COMMON NAME	Yellow Buckeye - Sugar Maple - (White Ash, Appalachian Basswood) / Mapleleaf Waterleaf – Zigzag Goldenrod Forest
SYNONYM	Southern Appalachian Cove Forest (Rich Montane Type)
PHYSIOGNOMIC CLASS	Forest (I)
PHYSIOGNOMIC SUBCLASS	Deciduous forest (I.B)
PHYSIOGNOMIC GROUP	Cold-deciduous forest (I.B.2)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural (I.B.2.N)
FORMATION	Lowland or submontane cold-deciduous forest (I.B.2.N.a)
ALLIANCE	*Liriodendron tulipifera - Tilia americana* var. *heterophylla - Aesculus flava - Acer saccharum* Forest Alliance
CLASSIFICATION CONFIDENCE LEVEL	1
USFWS WETLAND SYSTEM	Upland

RANGE

Globally

This community occurs in the southern Appalachians of North Carolina and Tennessee and may range into the Blue Ridge of Georgia and Virginia.

Great Smoky Mountains National Park

This community was sampled on the Mount Le Conte, Cades Cove, and Kinzel Springs quadrangles. Additional historic samples are from the Calderwood quadrangle (2780 feet elevation). On the Cades Cove quadrangle, historic and recent samples of this community ranged from 2880 to 3960 feet elevation. Samples from the southern portion of the Cades Cove quadrangle came from an east-facing cove of lower Gregory Ridge; protected upper slopes of the Gregory Ridge Trail; lower slopes above Forge Creek; and protected slopes north of Ekaneetlee Gap. In the western portion of the quadrangle, this community was sampled on the northslope of Pine Ridge. In the northern portion of the Cades Cove quadrangle, this community was sampled from a cove above Bunting Branch, north of Coon Butt; from a cove below the north side of Coon Butt; and from upper Fanny Branch. An additional sample of this community was taken from the southern portion of the Kinzel quadrangle, in a cove along Scotts Mountain Trail. Samples from the Mount Le Conte quadrangle ranged from 2508 to 3890 feet elevation. In the central and eastern portion of the Mount Le Conte quadrangle this community was sampled from a cove below Rocky Spur; from broad, protected slopes below Rainbow Falls; west of Porter's Flat on middle cove slopes above Long Branch; and on the west slope above Porter's Creek. In the southwestern portion of the Mount Le Conte quadrangle this community was sampled on a southwest-facing cove above Highway 441 in the vicinity of Fort Harry; on a slope east and south of Balsam Point; from a low Cove above the west Prong of the Pigeon River; on a cove northwest of Bullhead; and on a lowslope/cove above Le Conte Creek, north of Bullhead. Additional examples of this community were found in the western portion of the quadrangle in a cove north of Mt. Winnesoka, and on the north slopes of Piney Mountain, above Cherokee Orchard Road.

ENVIRONMENTAL DESCRIPTION

Globally

These forests occur on protected, concave, landforms, at elevation ranging from 2000-4600 feet. Soils that support this vegetation are nutrient-rich and probably high in base saturation and of circumneutral acidity.

Great Smoky Mountains National Park

This association is found on steep to moderately steep, middle to low protected slopes and coves, on sites with northerly aspects, although it can occur at all aspects. Samples of this community had a mean elevation of 2430 feet, ranging from 2500 to 3960 feet. This community can occur on moist, bouldery situations or over well-developed, but rocky, nutrient-rich soils.

MOST ABUNDANT SPECIES

Globally

Stratum	Species
No information	

Great Smoky Mountains National Park

Stratum	Species
Tree canopy	*Acer saccharum, Aesculus flava, Tilia americana* var. *heterophylla, Halesia tetraptera* var. *monticola, Fraxinus americana*
Herbaceous	(variable)

CHARACTERISTIC SPECIES

Globally

No information

Great Smoky Mountains National Park

Acer saccharum, Aesculus flava, Halesia tetraptera var. *monticola, Carya cordiformis, Cladrastis kentukea, Ostrya virginiana, Tilia americana* var. *heterophylla, Cymophyllus fraserianus, Deparia acrostichoides, Disporum lanuginosum, Hydrophyllum canadense, Laportea canadensis, Solidago flexicaulis, Hepatica nobilis* var. *acuta, Osmorhiza claytonii, Aristolochia macrophylla, Dryopteris goldiana, Asarum canadense, Viola canadensis*

VEGETATION DESCRIPTION

Globally

Forests of protected coves in the southern Appalachians, associated with nutrient-rich soils and dominated by *Aesculus flava* and *Acer saccharum*, often with *Fraxinus americana* and/or *Tilia americana* var. *heterophylla* sharing dominance. Other canopy species can include *Halesia tetraptera* var. *monticola, Carya cordiformis*, and *Quercus rubra*. A shrub stratum is vary sparse or absent, and the herbaceous stratum is dense and luxurious. Characteristic herbaceous species include *Solidago flexicaulis, Hydrophyllum canadense, Hepatica nobilis* var. *acuta, Deparia acrostichoides, Cystopteris protrusa, Asarum canadense, Carex plantaginea, Cymophyllus fraserianus*, and *Diplazium pycnocarpon*. The herbaceous stratum can have local dominance by *Laportea canadensis, Viola canadensis, Dryopteris intermedia, Cimicifuga americana, Cimicifuga racemosa*, and *Caulophyllum thalictroides*.

Great Smoky Mountains National Park

This forest has a canopy dominated by various combinations of *Acer saccharum, Aesculus flava, Tilia americana* var. *heterophylla, Halesia tetraptera* var. *monticola*, and *Fraxinus americana.* Occasionally *Carya cordiformis* or *Quercus rubra* may have high coverage in the canopy. The subcanopy is dominated by the canopy species, occasionally with high coverage by *Cladrastis kentukea* or *Ostrya virginiana*. The shrub stratum is absent or very sparse, with scattered woody saplings, commonly *Acer saccharum, Aesculus flava*, and *Halesia tetraptera* var. *monticola.* The herbaceous stratum is lush and diverse, with dominance varying among occurrences. Herbaceous species that commonly have high coverage include *Adiantum pedatum, Ageratina altissima, Asarum canadense, Aster divaricatus, Caulophyllum thalictroides, Cimicifuga racemosa, Cystopteris protrusa, Deparia acrostichoides, Disporum lanuginosum, Dryopteris intermedia, Dryopteris marginalis, Hydrophyllum canadense, Impatiens pallida, Laportea canadensis, Parthenocissus quinquefolia, Polystichum acrostichoides, Sedum ternatum, Solidago caesia* var. *curtisii, Solidago flexicaulis, Stellaria pubera, Tiarella cordifolia*, and *Viola canadensis*. Additional species with at least 50 percent constancy include *Arisaema triphyllum* ssp. *triphyllum, Galium triflorum, Hepatica nobilis* var. *acuta, Osmorhiza claytonii, Polygonatum pubescens, Thalictrum* spp. *(e.g. Thalictrum clavatum, Thalictrum dioicum, Thalictrum pubescens, Thalictrum thalictroides), Trillium* spp. *(e.g. Trillium catesbaei, Trillium erectum, Trillium grandiflorum, Trillium rugelii, Trillium undulatum), Uvularia* spp. *(e.g. Uvularia grandiflora, Uvularia perfoliata),* and *Monarda* spp. *(e.g. Monarda clinopodia, Monarda didyma*). *Aristolochia macrophylla* is a common vine. Other species found in this association that are indicative of high-base status soils include *Dryopteris goldiana, Sanguinaria canadensis*, and *Panax quinquefolius*.

OTHER NOTEWORTHY SPECIES

No information

CONSERVATION RANK G3G4

RANK JUSTIFICATION

DATABASE CODE CEGL007695

COMMENTS

Globally

This association was 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. 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 forests dominated by *Aesculus flava.* 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.

Great Smoky Mountains National Park
Relative dominance of canopy species varies among examples of this association. Some examples may have canopies strongly dominated by *Halesia tetraptera* var. *monticola*, while others have major canopy dominance by either *Acer saccharum, Aesculus flava, Tilia americana* var. *heterophylla,* or *Fraxinus americana.* Some examples may have signatures similar to *Aesculus flava - Betula alleghaniensis - Acer saccharum / Acer spicatum / Caulophyllum thalictroides - Laportea canadensis* Forest (CEGL004973). However, *Aesculus flava - Acer saccharum - (Fraxinus americana, Tilia americana) / Hydrophyllum canadense - Solidago flexicaulis* Forest (CEGL007695) is distinguished by a characteristic herbaceous flora, by lacking canopy dominance of *Betula alleghaniensis* and *Fagus grandifolia,* and by overall occurring at lower elevations, or on less extreme landforms.

REFERENCES
None

Liriodendron tulipifera - Aesculus flava - (Fraxinus americana, Tilia americana var. *heterophylla) / Cimicifuga racemosa - Laportea canadensis* Forest

COMMON NAME	Tulip Tree - Yellow Buckeye - (White Ash, Appalachian Basswood) / Common Black Cohosh – Wood-nettle Forest
SYNONYM	Southern Appalachian Cove Forest (Typic Montane Type)
PHYSIOGNOMIC CLASS	Forest (I)
PHYSIOGNOMIC SUBCLASS	Deciduous forest (I.B)
PHYSIOGNOMIC GROUP	Cold-deciduous forest (I.B.2)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural (I.B.2.N)
FORMATION	Lowland or submontane cold-deciduous forest (I.B.2.N.a)
ALLIANCE	*Liriodendron tulipifera - Tilia americana* var. *heterophylla - Aesculus flava - Acer saccharum* Forest Alliance
CLASSIFICATION CONFIDENCE LEVEL	2
USFWS WETLAND SYSTEM	Upland

RANGE

Globally

This association occurs in the southern Blue Ridge of Georgia, North Carolina, Tennessee, and may possibly extend into Virginia.

Great Smoky Mountains National Park

This community was sampled on both the Mount Le Conte and Cades Cove quadrangles. Additional historic samples are from the Calderwood (1440 to 1940 feet elevation) and Thunderhead Mountain (2390 to 3420 feet elevation) quadrangles. On the Cades Cove quadrangle, historic and recent samples of this community ranged from 1680 to 3740 feet elevation. Samples from the southern portion of the Cades Cove quadrangle came from the vicinity of Forge Creek in coves along and above the creek, east and north of Gregory Ridge and below Doe Ridge; and from slopes in the lower portion of Gregory Ridge Trail; and on a slope northeast of Birch Springs Gap. In the northeast portion of the quadrangle this community was sampled from a cove at the head of Maynard Creek; a cove above Rowans Creek; a cove along Cork branch, above Rowans Branch; and from a cove below Anthony Ridge. An additional sample of this community was taken from the northwest portion of the Cades Cove quadrangle northeast of Spruce Double on a low slope above Abrams Creek. Only two examples of this community were sampled on the Mount Le Conte quadrangle, and the community is uncommon on this quadrangle. The community was sampled in the central portion of the quadrangle, northwest of Mt. Winnesoka, in a cove near Indian Camp Branch (2935 feet elevation) and in the western portion of the quadrangle, on a steep, low slope above Baskins Creek (1950 feet elevation).

ENVIRONMENTAL DESCRIPTION

Globally

This forest occurs on concave, lower slopes and flats at middle elevations (2000-4500 feet) in the southern Blue Ridge.

Great Smoky Mountains National Park

This forest was found in low, protected topographic positions, often near small streams, on gentle to moderate slopes with northerly aspects. Samples of this community had a mean elevation of 2500 feet, ranging from 1440 to 3740 feet. Perhaps because of the generally more accessible locations of these forests, many of the sites were logged in the past.

MOST ABUNDANT SPECIES

Globally

Stratum	Species
No information	

Great Smoky Mountains National Park

Stratum	Species
Tree canopy	*Liriodendron tulipifera, Halesia tetraptera* var. *monticola, Tilia americana* var. *heterophylla, Acer rubrum, Fraxinus americana*
Herbaceous	(variable)

CHARACTERISTIC SPECIES
Globally

Great Smoky Mountains National Park
Liriodendron tulipifera, Halesia tetraptera var. *monticola, Carya cordiformis, Fraxinus americana, Tilia americana var. heterophylla, Cimicifuga racemosa, Collinsonia canadensis, Deparia acrostichoides, Disporum lanuginosum, Hepatica nobilis var. acuta, Hydrophyllum canadense, Laportea canadensis, Lindera benzoin, Osmorhiza claytonii, Panax quinquefolius, Polystichum acrostichoides, Thelypteris noveboracensis, Viola canadensis.*

VEGETATION DESCRIPTION
Globally
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 *Cimicifuga racemosa, Caulophyllum thalictroides, Disporum lanuginosum, Aruncus dioicus, Adiantum pedatum, Collinsonia canadensis, Osmorhiza claytonii*, and *Laportea canadensis*.

Great Smoky Mountains National Park
The canopy of this forest is dominated by various mixtures of *Liriodendron tulipifera, Halesia tetraptera* var. *monticola, Tilia americana* var. *heterophylla, Acer rubrum*, and *Fraxinus americana*. Other species that occasionally have high canopy coverage include *Acer saccharum, Aesculus flava, Betula lenta*, and *Tsuga canadensis*. If a subcanopy is present it has species from the canopy and often *Cornus florida*. The shrub stratum is sparse to moderate and is often composed of saplings of canopy species, but composition varies from site to site. Some of the more common shrub species include *Acer pensylvanicum, Calycanthus florida*, and *Rhododendron maximum*. The herbaceous stratum has sparse to moderate coverage but is always diverse and contains a mix of species characteristic of high-base status soils occurring with those more typical of acidic forests. Dominance is variable among occurrences and may relate to varying levels of disturbance. Species that most often have moderate to high coverages include *Adiantum pedatum, Ageratina altissima, Amphicarpaea bracteata, Aster divaricatus, Carex* spp. *(e.g. Carex austrocaroliniana, Carex digitalis, Carex laxiflora* var. *laxiflora, Carex pensylvanica, Carex plantaginea, Carex virescens), Caulophyllum thalictroides, Cimicifuga americana, Collinsonia canadensis, Dryopteris intermedia, Galium triflorum, Laportea canadensis, Maianthemum racemosum* ssp. *racemosum, Mitchella repens, Osmorhiza claytonii, Polystichum acrostichoides* var. *acrostichoides, Solidago caesia* var. *curtisii, Stellaria pubera, Thelypteris noveboracensis, Tiarella cordifolia*, and *Viola* spp. *(e.g. Viola blanda, Viola canadensis, Viola cucullata, Viola hastata, Viola pubescens, Viola rotundifolia).* Other species commonly found include *Arisaema triphyllum, Arisaema triphyllum* ssp. *triphyllum, Botrychium virginianum, Deparia acrostichoides, Dioscorea quaternata, Disporum lanuginosum, Panax quinquefolius, Parthenocissus quinquefolia, Phegopteris hexagonoptera, Sanguinaria canadensis, Sanicula canadensis, Thalictrum thalictroides*, and *Uvularia perfoliata*. Common vines include *Aristolochia macrophylla, Smilax rotundifolia*, and *Vitis aestivalis.* Particularly on disturbed sites, *Vitis aestivalis* can have high coverage.

OTHER NOTEWORTHY SPECIES
No information

CONSERVATION RANK G4

RANK JUSTIFICATION
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.

DATABASE CODE CEGL007710

COMMENTS
Globally
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. 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.

Great Smoky Mountains National Park
Some examples described from the Great Smoky Mountains National Park may be more closely related to the global concept of *Liriodendron tulipifera - Tilia americana* var. *heterophylla - (Aesculus flava) / Cimicifuga racemosa* Forest (CEGL007291), but

because of the range in elevation (mostly above 2000 feet) and compositional variation among examples, they were placed in *Liriodendron tulipifera - Aesculus flava - (Fraxinus americana, Tilia americana* var. *heterophylla) / Cimicifuga racemosa - Laportea canadensis* Forest (CEGL007710), which has a more general concept. Many examples of this community are disturbed and have canopy coverage of early successional species such as *Liriodendron tulipifera, Acer rubrum,* and *Robinia pseudoacacia,* which may tend to make a photosignature similar to *Liriodendron tulipifera - Acer rubrum - Robinia pseudoacacia* Forest (CEGL007219).

REFERENCES

Schafale and Weakley 1990, Schafale pers. comm.

Liriodendron tulipifera - Tilia americana var. heterophylla - (Aesculus flava) / Cimicifuga racemosa Forest

COMMON NAME	Tuliptree - Appalachian Basswood - (Yellow Buckeye) / Common Black-cohosh
SYNONYM	Southern Appalachian Cove Forest (Typic Foothills Type)
PHYSIOGNOMIC CLASS	Forest (I)
PHYSIOGNOMIC SUBCLASS	Deciduous forest (I.B)
PHYSIOGNOMIC GROUP	Cold-deciduous forest (I.B.2)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural (I.B.2.N)
FORMATION	Lowland or submontane cold-deciduous forest (I.B.2.N.a)
ALLIANCE	*Liriodendron tulipifera - Tilia americana* var. *heterophylla - Aesculus flava - Acer saccharum* Forest Alliance

CLASSIFICATION CONFIDENCE LEVEL 2

USFWS WETLAND SYSTEM Upland

RANGE

Globally

This community occurs in the low mountains of Georgia, North Carolina, and South Carolina, and could possibly range into Tennessee and Virginia.

Great Smoky Mountains National Park

This association was not observed or sampled on the Mount Le Conte or Cades Cove quadrangles. As currently defined it does not occur in the Park.

ENVIRONMENTAL DESCRIPTION

Globally

Mixed mesophytic forests of the low mountains and foothills, mostly below 2000 feet elevation in the southern Blue Ridge escarpment.

Great Smoky Mountains National Park

No information

MOST ABUNDANT SPECIES

Globally

Stratum	Species
Tree canopy	*Liriodendron tulipifera*
Herbaceous	variable

Great Smoky Mountains National Park

Stratum	Species
No information	

CHARACTERISTIC SPECIES

Globally

Liriodendron tulipifera, Tilia americana var. *heterophylla, Fraxinus americana, Carya alba, Adiantum pedatum, Phegopteris hexagonoptera, Actaea pachypoda, Carex plantaginea, Carex austrocaroliniana, Trillium catesbaei, Sanguinaria Canadensis*

Great Smoky Mountains National Park

No information

VEGETATION DESCRIPTION

Globally

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, 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.

Great Smoky Mountains National Park
No information

OTHER NOTEWORTHY SPECIES
No information

CONSERVATION RANK G4?

RANK JUSTIFICATION

DATABASE CODE CEGL007291

COMMENTS
Globally
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, Disporum maculatum, Polygonatum pubescens, Streptopus roseus, Astilbe biternata, Veratrum viride,* and *Maianthemum canadense.* This association was originally defined from the Chattooga Basin Project data (S. Simon pers. comm.). Additional examples are known from low escarpment and foothill 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.* 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.

Great Smoky Mountains National Park
Forests similar to this concept found on the Cades Cove quadrangle were classed as *Liriodendron tulipifera - Aesculus flava - (Fraxinus americana, Tilia americana var. heterophylla) / Cimicifuga racemosa - Laportea canadensis* Forest (CEGL007710).

REFERENCES
Nelson 1986, Schafale and Weakley 1990, Simon pers. comm.

Liriodendron tulipifera - Acer rubrum - Robinia pseudoacacia Forest

COMMON NAME	Tuliptree - Red Maple - Black Locust Forest
SYNONYM	Early Successional Appalachian Hardwood Forest
PHYSIOGNOMIC CLASS	Forest (I)
PHYSIOGNOMIC SUBCLASS	Deciduous forest (I.B)
PHYSIOGNOMIC GROUP	Cold-deciduous forest (I.B.2)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural (I.B.2.N)
FORMATION	Lowland or submontane cold-deciduous forest (I.B.2.N.a)
ALLIANCE	*Liriodendron tulipifera* Forest Alliance
CLASSIFICATION CONFIDENCE LEVEL	2
USFWS WETLAND SYSTEM	Upland

RANGE

Globally

This association occurs in the southern Appalachian Mountains and Appalachian Plateaus of Georgia, Kentucky, North Carolina, South Carolina, and Tennessee.

Great Smoky Mountains National Park

This community was sampled or observed on both the Cades Cove and Mount Le Conte quadrangles and is likely in other areas of the Park. On the Cades Cove quadrangle this community is found on low slopes around Cades Cove; on slopes along lower Green Branch Creek; slopes above Rowans Branch; north of Tater Ridge on low slopes above a creek; on low slopes northwest of Pine Ridge, and in the southeast portion of the quadrangle in the vicinity of Eagle Creek. Areas where it is known to occur on the Mount Le Conte quadrangle include Porter's Flats, in the eastern portion of the quadrangle, and in the northern portion, on low slopes in the watershed of Rhododendron Creek, and a low cove south of Hills Creek. It is likely on other low slopes below 2000 feet elevation in the northern half of the Mount Le Conte quadrangle, particularly in areas that were once settled by humans.

ENVIRONMENTAL DESCRIPTION

Globally

This vegetation occurs in areas that have been cleared, clearcut, old fields, or areas cleared by fire or other natural disturbances. It occurs on middle to lower slopes, in sheltered coves and gentle concave slopes, along streams in flat bottoms and on upland mountain benches. It is associated with various soils and geologies. In the southern Appalachians these forests typically occur below 3000 feet and are usually associated with disturbance on the most productive sites. These forests typically occur as small (8-16 hectare) patches in the landscape.

Great Smoky Mountains National Park

This forest is found on low slopes and flats, typically below 3000 feet elevation and particularly in areas of heavy settlement or past logging or farming activities.

MOST ABUNDANT SPECIES

Globally

Stratum	Species
Tree canopy	*Liriodendron tulipifera, Acer rubrum, Robinia pseudoacacia*
Short shrub	(variable)
Herbaceous	(variable)

Great Smoky Mountains National Park

Stratum	Species
Tree canopy	*Liriodendron tulipifera, Acer rubrum*
Short shrub	*Acer saccharum, Acer pensylvanicum, Tsuga canadensis*
Herbaceous	*Amphicarpaea bracteata, Thelypteris noveboracensis*
Liana	*Toxicodendron radicans* ssp. *radicans, Vitis aestivalis*

CHARACTERISTIC SPECIES

Globally

Liriodendron tulipifera, Acer rubrum, Robinia pseudoacacia

Great Smoky Mountains National Park
Liriodendron tulipifera, Acer rubrum, Robinia pseudoacacia, Toxicodendron radicans ssp. radicans, Vitis aestivalis

VEGETATION DESCRIPTION
Globally
This vegetation consists of primarily early successional species, with the majority of regeneration from root and stump sprouts. Canopies are typically dominated by *Liriodendron tulipifera* and *Acer rubrum*, with lesser amounts of *Robinia pseudoacacia*. Associated species vary, but these forests are typical of areas that were once clearcut, old fields, or cleared by fire or other natural disturbances. 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, 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.

Great Smoky Mountains National Park
This forest has a canopy strongly dominated by *Liriodendron tulipifera*. Other canopy and subcanopy species include *Acer rubrum, Robinia pseudoacacia, Acer saccharum, Halesia tetraptera* var. *monticola*, and *Betula lenta.* Shrubs can be sparse to moderate in coverage, with composition varying from site to site, but often composed of saplings of canopy species. *Tsuga canadensis* can be dominant in the shrub stratum. Herbaceous cover can be sparse to moderate, with no clear dominant, although *Amphicarpaea bracteata* and *Thelypteris noveboracensis* may be dominant in patches. Vines are common and often abundant. Typical vine species are *Aristolochia macrophylla, Parthenocissus quinquefolia, Smilax glauca, Smilax rotundifolia, Toxicodendron radicans* ssp. *radicans,* and *Vitis aestivalis.*

OTHER NOTEWORTHY SPECIES
No information

CONSERVATION RANK GW

RANK JUSTIFICATION
This forest represents early successional vegetation or vegetation resulting from anthropogenic activities and is thus not a conservation priority.

DATABASE CODE CEGL007219

COMMENTS
Globally

Great Smoky Mountains National Park
The signature of this vegetation may be similar to some stands of *Aesculus flava - (Fraxinus americana, Tilia americana* var. *heterophylla) / Cimicifuga racemosa - Laportea canadensis* Forest (CEGL007710). This association is distinguished by its early successional status, often with an even-aged, single species canopy, and lacking the suite of herbaceous species characteristic of *Liriodendron tulipifera – Aesculus flava - (Fraxinus americana, Tilia americana* var. *heterophylla) / Cimicifuga racemosa - Laportea canadensis* Forest (CEGL007710).

REFERENCES
Golden 1974, Horn 1980, McGee and Hooper 1970, Phillips and Shure 1990, Schmalzer 1978, Thomas 1966

Quercus alba - Quercus (rubra, prinus) / Rhododendron calendulaceum - Kalmia latifolia - (Gaylussacia ursina) Forest

COMMON NAME	White Oak - (Red Oak, Rock Chestnut Oak) / Flame Azalea - Mountain Laurel – (Bear Huckleberry) Forest
SYNONYM	Appalachian Montane Oak Hickory Forest (Typic Acidic Type)
PHYSIOGNOMIC CLASS	Forest (I)
PHYSIOGNOMIC SUBCLASS	Deciduous forest (I.B)
PHYSIOGNOMIC GROUP	Cold-deciduous forest (I.B.2)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural (I.B.2.N)
FORMATION	Lowland or submontane cold-deciduous forest (I.B.2.N.a)
ALLIANCE	*Quercus alba - (Quercus rubra, Carya* spp.*)* Forest Alliance
CLASSIFICATION CONFIDENCE LEVEL	2
USFWS WETLAND SYSTEM	Upland

RANGE

Globally

This community occurs at low to intermediate elevations in the southern Blue Ridge and in the Blue Ridge/Piedmont transition of Georgia, North Carolina, South Carolina, and Tennessee.

Great Smoky Mountains National Park

This community was sampled from both the Cades Cove and Mount Le Conte quadrangle. Historic samples of this community come from low elevations (1120 to 2600 feet) on the Calderwood quadrangle. On low elevations of the Cades Cove quadrangle this community was sampled north of the Cades Cove Loop Road, in the vicinity of Cave Ridge (low east-facing slope, 1791 feet) and west of Paw Paw Ridge at the head of a southwest-facing cove (2230 feet). In the southern portion of the quadrangle, at higher elevations, this community was sampled on the summits and convex high slopes of High Point; the southwest slopes below Gregory Bald; the southeastern high slopes below Moore Spring Camp; the summit ridge of Brier Lick Gap and the upper slopes south of Brier Lick Gap; the southwest middle slopes south of Doe Knob; the upper south slope of Greer Knob; on Twenty Mile Ridge south of Greer Knob; on the convex slopes north of Ekaneetlee Gap; on a south-facing side ridge of Bill Grill Ridge, south of Devils Tater Patch; and the convex west slopes of Mollies Ridge. This community was sampled from the northern portion of the Mount Le Conte quadrangle, on a low slope and low ridge in the vicinity of Copeland Creek (1590 and 1600 feet) and on a low slope above Dudley Creek (1680 feet).

ENVIRONMENTAL DESCRIPTION

Globally

These forests occur in a wide elevation range (2000-4000 feet) in the southern Blue Ridge and in the Blue Ridge/Piedmont transition, on protected sites, typically lower slopes, bottoms, and coves.

Great Smoky Mountains National Park

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

MOST ABUNDANT SPECIES

Globally

Stratum	Species
Tree canopy	*Quercus alba,(Quercus rubra, Quercus prinus, Quercus coccinea), Carya alba, Carya glabra*
Short shrub	variable
Herbaceous	variable

Great Smoky Mountains National Park

Stratum	Species
Tree canopy	*Quercus alba, Carya glabra, Acer rubrum, (Carya alba, Quercus rubra)*
Subcanopy	*Carya alba, Cornus florida, Halesia tetraptera* var. *monticola*
Herbaceous	*Amphicarpaea bracteata, Dennstaedtia punctilobula, Desmodium nudiflorum, Polystichum acrostichoides* var. *acrostichoides, Thelypteris noveboracensis*

CHARACTERISTIC SPECIES
Globally
No information

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

VEGETATION DESCRIPTION
Globally
Deciduous forests of the southern Blue Ridge 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 americanus, Rhododendron calendulaceum, Vaccinium stamineum, Vaccinium pallidum, Viburnum acerifolium, Calycanthus floridus, Pyrularia 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 rich in species, approaching that of rich cove forests. Associated herbaceous species vary with elevation. Some of the more constant species include *Parthenocissus quinquefolia, Dioscorea quaternata, Dichanthelium* spp., *Carex pennsylvanica, Chimaphila maculata, Desmodium nudiflorum, Goodyera pubescens, Maianthemum racemosum* ssp. *racemosum,* and *Trillium catesbaei*. Other species include *Dichanthelium laxiflorum, Aster acuminatus, 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. *asplenioides, Dennstaedtia punctilobula,* and *Dryopteris intermedia*.

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

OTHER NOTEWORTHY SPECIES
No information

CONSERVATION RANK G5

RANK JUSTIFICATION

DATABASE CODE CEGL007230

COMMENTS

Globally

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.

Great Smoky Mountains National Park

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

REFERENCES

Nelson 1986, Schafale and Weakley 1990

Quercus alba - Quercus rubra - Quercus prinus / Collinsonia canadensis - Podophyllum peltatum - Sanguinaria canadensis Forest

COMMON NAME	White Oak - Red Oak - Rock Chestnut Oak / Richweed - May-apple - Bloodroot
SYNONYM	Appalachian Montane Oak - Hickory Forest (Rich Type)
PHYSIOGNOMIC CLASS	Forest (I)
PHYSIOGNOMIC SUBCLASS	Deciduous forest (I.B)
PHYSIOGNOMIC GROUP	Cold-deciduous forest (I.B.2)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural (I.B.2.N)
FORMATION	Lowland or submontane cold-deciduous forest (I.B.2.N.a)

ALLIANCE *Quercus alba - (Quercus rubra, Carya spp.)* Forest Alliance

CLASSIFICATION CONFIDENCE LEVEL 2

USFWS WETLAND SYSTEM Upland

RANGE

Globally

This community is found in the mountains of North Carolina and South Carolina and may range into Georgia and Tennessee.

Great Smoky Mountains National Park

This association was not observed or sampled on the Mount Le Conte or Cades Cove quadrangles. It is likely within the Park.

ENVIRONMENTAL DESCRIPTION

Globally:

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), and are thought to be associated with circumneutral soils.

Great Smoky Mountains National Park

No information

MOST ABUNDANT SPECIES

Globally

Stratum	Species

No information

Great Smoky Mountains National Park

Stratum	Species

No information

CHARACTERISTIC SPECIES

Globally

Quercus alba, Podophyllum peltatum, Arisaema triphyllum, Amphicarpaea bracteata, Adiantum pedatum, Collinsonia canadensis, Cimicifuga racemosa, Caulophyllum thalictroides, Sanguinaria Canadensis

Great Smoky Mountains National Park

No information

VEGETATION DESCRIPTION

Globally

This association includes forests dominated by *Quercus alba*, occurring over circumneutral soils in the southern Blue Ridge. 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, Cimicifuga racemosa, Caulophyllum thalictroides, Sanguinaria canadensis, Tradescantia subaspera, Euphorbia purpurea, Phegopteris hexagonoptera,*

Polystichum acrostichoides, Athyrium filix-femina ssp. *asplenioides, Dennstaedtia punctilobula,* and *Dryopteris intermedia*.

Great Smoky Mountains National Park

OTHER NOTEWORTHY SPECIES
No information

CONSERVATION RANK G3

RANK JUSTIFICATION

DATABASE CODE CEGL007692

COMMENTS
Globally
This association was 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.

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

REFERENCES
None

Quercus rubra - Acer rubrum / Calycanthus floridus - Pyrularia pubera / Thelypteris noveboracensis Forest

COMMON NAME	Red Oak - Red Maple / Sweet-shrub - Buffalo-nut / New York Fern Forest
SYNONYM	Appalachian Montane Oak - Hickory Forest (Red Oak Type)
PHYSIOGNOMIC CLASS	Forest (I)
PHYSIOGNOMIC SUBCLASS	Deciduous forest (I.B)
PHYSIOGNOMIC GROUP	Cold-deciduous forest (I.B.2)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural (I.B.2.N)
FORMATION	Lowland or submontane cold-deciduous forest (I.B.2.N.a)

ALLIANCE *Quercus alba - (Quercus rubra, Carya* spp.*)* Forest Alliance

CLASSIFICATION CONFIDENCE LEVEL 2

USFWS WETLAND SYSTEM Upland

RANGE

Globally

This community is found in the southern Blue Ridge Mountains of Georgia, North Carolina, South Carolina, Tennessee, and Virginia.

Great Smoky Mountains National Park

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

ENVIRONMENTAL DESCRIPTION

Globally

Quercus rubra forests at intermediate elevations (mostly below 3500 feet, ranging from 2000-4000) in the southern Blue Ridge escarpment. These forests occur on mostly north to east, mid to upper, moderately steep slopes of intermediate exposure, over acidic soils.

Great Smoky Mountains National Park

This forest occurs at intermediate elevations, mostly on northern and western slopes of intermediate to protected exposure. Elevations averaged 2870 feet but ranged from 2170 to 4000 feet.

MOST ABUNDANT SPECIES

Globally

Stratum	Species
Tree canopy	*Quercus rubra, Acer rubrum*
Subcanopy	*Acer rubrum, Halesia tetraptera* var. *monticola, Oxydendrum arboreum*
Short shrub	*Gaylussacia ursina*
Herbaceous	*Galax urceolata, Thelypteris noveboracensis*

Great Smoky Mountains National Park

See above

CHARACTERISTIC SPECIES

Globally

Great Smoky Mountains National Park
Quercus rubrum, Acer pensylvanicum, Calycanthus floridus, Pyrularia pubera

VEGETATION DESCRIPTION
Globally
The canopy is dominated by *Quercus rubra*, often with *Acer rubrum* and/or *Liriodendron tulipifera* codominating. Other minor canopy species may include *Carya alba, Carya glabra, Halesia tetraptera, Quercus prinus*, and *Magnolia fraseri*. The subcanopy and sapling strata include the canopy species as well as *Halesia tetraptera, Betula lenta, Tsuga canadensis, Cornus florida, Acer pensylvanicum*, and *Oxydendrum arboreum.* The shrub stratum is typically sparse but may have local dominance by *Gaylussacia ursina* or *Rhododendron maximum*. Other typical species in the shrub stratum include *Castanea dentata, Calycanthus floridus, Pyrularia pubera, Rhododendron calendulaceum, Vaccinium corymbosum*, and *Viburnum acerifolium*. Herbaceous cover is sparse to moderate but species rich. Ferns can be locally dominant, typically *Thelypteris noveboracensis* and *Athyrium filix-femina* ssp. *asplenioides*. Other typical species include *Aster divaricatus*, *Carex* spp. *(e.g. Carex aestivalis, Carex debilis, Carex digitalis, Carex laxiflora* var. *laxiflora, Carex pensylvanica), Chimaphila maculata* var. *maculata, Desmodium nudiflorum, Dioscorea quaternata, Eupatorium purpureum, Galium latifolium, Galax urceolata, Goodyera pubescens, Houstonia purpurea* var. *purpurea, Lysimachia quadrifolia, Maianthemum racemosum* ssp. *racemosum, Medeola virginiana, Polygonatum biflorum, Polystichum acrostichoides, Solidago caesia* var. *curtisii*, and *Uvularia puberula*.

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

OTHER NOTEWORTHY SPECIES
No information

CONSERVATION RANK G3G5

RANK JUSTIFICATION

DATABASE CODE CEGL006192

COMMENTS
Globally
This forest is distinguished from High Elevation Red Oak forests by lack of species such as *Betula alleghaniensis, Ilex montana, Vaccinium simulatum,* and by lacking abundant *Hamamelis virginiana*, as well as its occurrence at lower elevations. In the southern Blue Ridge escarpment region, these montane oak - hickory forests seem to occupy environments intermediate between more protected forests dominated by *Quercus alba* and drier, more exposed *Quercus prinus* forests. This association was originally defined from the Chattooga Basin Project (S. Simon pers. comm.) and later refined with information from the Great Smoky Mountains. Global name and concept may need revision as more information becomes available. This association may be a subset of the more broadly defined *Quercus alba - Quercus (rubra, prinus) / Rhododendron calendulaceum - Kalmia latifolia - (Gaylussacia ursina)* Forest (CEGL007230) but is distinguished by the dominance of *Quercus rubra*, its generally protected topographic setting, and the fact that it may represent areas formerly dominated by *Quercus rubra* and *Castanea dentata*.

Great Smoky Mountains National Park

REFERENCES
Nelson 1986, Schafale and Weakley 1990, Simon pers. comm.

Quercus rubra - Tilia americana var. heterophylla - Halesia tetraptera var. monticola / Collinsonia canadensis - Tradescantia subaspera **Forest**

COMMON NAME	Red Oak – Appalachian Basswood – Mountain Silverbell / Richweed - Zigzag Spiderwort
SYNONYM	Southern Appalachian Red Oak Cove Forest
PHYSIOGNOMIC CLASS	Forest (I)
PHYSIOGNOMIC SUBCLASS	Deciduous forest (I.B)
PHYSIOGNOMIC GROUP	Cold-deciduous forest (I.B.2)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural (I.B.2.N)
FORMATION	Lowland or submontane cold-deciduous forest (I.B.2.N.a)

ALLIANCE *Quercus alba - (Quercus rubra, Carya* spp.*)* Forest Alliance

CLASSIFICATION CONFIDENCE LEVEL 3

USFWS WETLAND SYSTEM Upland

RANGE
Globally
No information

Great Smoky Mountains National Park
This community was sampled from the Cades Cove quadrangle and was not sampled on the Mount Le Conte quadrangle. On the Cades Cove quadrangle, it was sampled from a north-facing slope of Ledbetter Ridge; from an east-facing high slope of Big Abrams Gap; from west-facing upper slopes of Nuna Ridge; a protected draw east of Powell Knob above Ekaneetlah Creek; and a draw southeast of Doe Knob.

ENVIRONMENTAL DESCRIPTION
Globally
No information

Great Smoky Mountains National Park
This community was sampled from protected steep slopes, with east, west, and north aspects, at elevations ranging from 3250 to 4000 feet. Sites are moist and often rocky.

MOST ABUNDANT SPECIES
Globally

Stratum	Species

No information

Great Smoky Mountains National Park

Stratum	Species
Tree canopy	*Quercus rubra, Tilia americana* var. *heterophylla*
Subcanopy	*Halesia tetraptera* var. *monticola*
Herbaceous	*Collinsonia canadensis, Thelypteris noveboracensis*

CHARACTERISTIC SPECIES
Globally
No information

Great Smoky Mountains National Park
Quercus rubra, Halesia tetraptera var. *monticola, Tilia americana* var. *heterophylla, Magnolia acuminata, Caulophyllum thalictroides, Collinsonia canadensis, Disporum lanuginosum, Maianthemum racemosum, Phegopteris hexagonoptera, Sanguinaria canadensis, Thelypteris noveboracensis, Tradescantia subaspera*

VEGETATION DESCRIPTION
Globally
No information

Great Smoky Mountains National Park
This forest has a canopy dominated by *Quercus rubra* (50-95 percent) occurring with lesser amounts of *Tilia americana* var. *heterophylla, Halesia tetraptera* var. *monticola,* or *Acer saccharum*. Occassionally *Liriodendron tulipifera* will have high canopy coverage. Other minor canopy and subcanopy trees include *Magnolia acuminata, Acer pensylvanicum, Acer rubrum, Aesculus flava,* and *Betula lenta.* The shrub stratum is open, made up of saplings from the canopy and subcanopy, with no clear dominant. Herbs are sparse to moderate in coverage, with relatively high species richness. Herbs with the highest coverages are *Thelypteris noveboracensis* and *Collinsonia canadensis.* Other typical herbs are *Actaea pachypoda, Ageratina altissima* var. *roanensis, Agrostis* spp., *Arisaema triphyllum, Athyrium filix-femina* ssp. *asplenioides, Caulophyllum thalictroides, Desmodium nudiflorum, Dioscorea quaternata, Galium lanceolatum, Laportea canadensis, Maianthemum racemosum, Phegopteris hexagonoptera, Polygonatum biflorum, Polystichum acrostichoides, Smilax herbacea, Solidago caesia* var. *curtisii, Tradescantia subaspera,* and *Viola cucullata*.

OTHER NOTEWORTHY SPECIES
No information

CONSERVATION RANK G?

RANK JUSTIFICATION
The conservation status of this community has not yet been assessed.

DATABASE CODE CEGL007878

COMMENTS
Globally
This association may represent a subset of *Quercus alba - Quercus rubra - Quercus prinus / Collinsonia canadensis - Podophyllum peltatum - Sanguinaria canadensis* Forest (CEGL007692), Appalachian Montane Oak - Hickory Forest (Rich Type) or may be transitional between it and *Liriodendron tulipifera - Aesculus flava - (Fraxinus americana, Tilia americana* var. *heterophylla) / Cimicifuga racemosa - Laportea canadensis* Forest (CEGL007710), Southern Appalachian Cove Forest (Typic Montane Type). More regional information is needed to assess the distinctiveness of this type. It is described from a small number of samples from the Great Smoky Mountains National Park. Classification and alliance placement are provisional. A similar alliance is *Quercus rubra - (Acer saccharum)* Forest Alliance (A.251), but it is not defined for the southern Blue Ridge.

Great Smoky Mountains National Park
Samples representing this association occur in AIS polygons 29 and 31 on the Cades Cove quadrangle.

REFERENCES
None

Quercus alba / Kalmia latifolia Forest

COMMON NAME	White Oak / Mountain Laurel Forest
SYNONYM	High Elevation White Oak Forest
PHYSIOGNOMIC CLASS	Forest (I)
PHYSIOGNOMIC SUBCLASS	Deciduous forest (I.B)
PHYSIOGNOMIC GROUP	Cold-deciduous forest (I.B.2)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural (I.B.2.N)
FORMATION	Lowland or submontane cold-deciduous forest (I.B.2.N.a)
ALLIANCE	*Quercus alba* Montane Forest Alliance
CLASSIFICATION CONFIDENCE LEVEL	2
USFWS WETLAND SYSTEM	Upland

RANGE

Globally

This community is found in the mountains of Georgia, North Carolina, South Carolina, and Tennessee.

Great Smoky Mountains National Park

This community was not sampled or observed on the Cades Cove or Mount Le Conte quadrangles. Similar vegetation may occur in the southern portion of the Cades Cove quadrangle.

ENVIRONMENTAL DESCRIPTION

Globally

This forest grows on exposed, rocky ridges and convex upper slopes at high elevations (> 3000 feet).

Great Smoky Mountains National Park

No information

MOST ABUNDANT SPECIES

Globally

Stratum	Species
No information	

Great Smoky Mountains National Park

Stratum	Species
No information	

CHARACTERISTIC SPECIES

Globally

Quercus alba, Kalmia latifolia, Castanea dentata, Castanea pumila

Great Smoky Mountains National Park

No information

VEGETATION DESCRIPTION

Globally

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 percent). 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 latifolia, 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*.

Great Smoky Mountains National Park

No information

OTHER NOTEWORTHY SPECIES
No information

CONSERVATION RANK G2Q

RANK JUSTIFICATION
This community is uncommon and restricted to specific habitat conditions. Its taxonomy is questionable.

DATABASE CODE CEGL007295

COMMENTS
Globally
These forests are related to oak - hickory forests and may be best considered as a variant of them. On some sites these forests are transitional to *Quercus rubra*-dominated forests (High Elevation Red Oak Forest). See Chattooga Basin Project data.

Great Smoky Mountains National Park
Vegetation similar to this association was sampled on the Cades Cove quadrangle but was classified as *Quercus alba - Quercus (rubra, prinus) / Rhododendron calendulaceum - Kalmia latifolia - (Gaylussacia ursina)* Forest (CEGL007230).

REFERENCES
McCormick and Platt 1980, Newell and Peet 1995, Patterson 1994, Schafale and Weakley 1990

(Quercus prinus, Quercus coccinea) / Kalmia latifolia / Galax urceolata Forest

COMMON NAME	(Rock Chestnut Oak - Scarlet Oak) / Mountain Laurel / Galax Forest
SYNONYM	Chestnut Oak Forest (Xeric Ridge Type)
PHYSIOGNOMIC CLASS	Forest (I)
PHYSIOGNOMIC SUBCLASS	Deciduous forest (I.B)
PHYSIOGNOMIC GROUP	Cold-deciduous forest (I.B.2)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural (I.B.2.N)
FORMATION	Lowland or submontane cold-deciduous forest (I.B.2.N.a)
ALLIANCE	*Quercus prinus - (Quercus coccinea, Quercus velutina)* forest Alliance
CLASSIFICATION CONFIDENCE LEVEL	1
USFWS WETLAND SYSTEM	Upland

RANGE

Globally

This community is distributed in the central and southern Appalachians, northern Ridge and Valley, and in the Cumberland Mountains. It occurs in Georgia, Kentucky, North Carolina, South Carolina, Tennessee, and Virginia.

Great Smoky Mountains National Park

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

ENVIRONMENTAL DESCRIPTION

Globally

This community occurs over shallow, rocky soils, on south- to west-facing slopes and ridgetops.

Great Smoky Mountains National Park

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

MOST ABUNDANT SPECIES

Globally

Stratum	Species
Tree canopy	(*Quercus prinus Quercus coccinea)*
Subcanopy	*Oxydendrum arboreum, Nyssa sylvatica, Acer rubrum*
Tall shrub	*Kalmia latifolia, Vaccinium stamineum*
Short shrub	*Vaccinium pallidum*
Herbaceous	*Epigaea repens, Gaultheria procumbens, Galax urceolata*

Great Smoky Mountains National Park

Stratum	Species
Tree canopy	*Quercus prinus, Acer rubrum, Quercus coccinea*
Subcanopy	*Oxydendrum arboreum, Nyssa sylvatica, Acer rubrum*
Tall Shrub	*Kalmia latifolia*

Short shrub	*Gaylussacia ursina*
Herbaceous	*Galax urceolata*
Vine/Liana	*Smilax rotundifolia, Smilax glauca*

CHARACTERISTIC SPECIES

Globally

Quercus prinus, Oxydendrum arboreum, Nyssa sylvatica, Acer rubrum, Kalmia latifolia, Vaccinium pallidum, Galax urceolata

Great Smoky Mountains National Park

Quercus prinus, Quercus coccinea, Acer rubrum, Kalmia latifolia, Gaylussacia ursina

VEGETATION DESCRIPTION

Globally

Forests with canopies strongly dominated by *Quercus prinus* and/or *Quercus coccinea,* with lesser amounts of *Quercus velutina, Quercus rubra, 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*.

Great Smoky Mountains National Park

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

OTHER NOTEWORTHY SPECIES

No information

CONSERVATION RANK G5

RANK JUSTIFICATION

DATABASE CODE CEGL006271

COMMENTS

Globally

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*. In the Great Smoky Mountains *Acer rubrum* is often dominant or codominant in these forests, presumably on former chestnut sites.

Great Smoky Mountains National Park

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

REFERENCES

Evans 1991, Golden 1974, McLeod 1988, Nelson 1986, Schafale and Weakley 1990, Whittaker 1956

Quercus prinus - (Quercus rubra) - Carya spp. */ Oxydendrum arboreum - Cornus florida* Forest

COMMON NAME	Rock Chestnut Oak - (Northern Red Oak) - Hickory species / Sourwood – Flowering Dogwood Forest
SYNONYM	Appalachian Montane Oak Hickory Forest (Chestnut Oak Type)
PHYSIOGNOMIC CLASS	Forest (I)
PHYSIOGNOMIC SUBCLASS	Deciduous forest (I.B)
PHYSIOGNOMIC GROUP	Cold-deciduous forest (I.B.2)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural (I.B.2.N)
FORMATION	Lowland or submontane cold-deciduous forest (I.B.2.N.a)
ALLIANCE	*Quercus prinus - Quercus rubra* Forest Alliance
CLASSIFICATION CONFIDENCE LEVEL	2
USFWS WETLAND SYSTEM	Upland

RANGE

Globally

This community is known from the southern Blue Ridge escarpment and Piedmont transition areas of Georgia, North Carolina, South Carolina, and Tennessee. It possibly extends into Virginia.

Great Smoky Mountains National Park

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

ENVIRONMENTAL DESCRIPTION

Globally

This forest 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. Some occurrences may have areas of exposed rock.

Great Smoky Mountains National Park

This forest occurs at low elevations, on northern, western, and southwestern, middle to upper slopes. Elevations averaged 2084 feet but ranged from 1650 to 2600 feet.

MOST ABUNDANT SPECIES

Globally

No information

Great Smoky Mountains National Park

Stratum	Species
Tree canopy	*Quercus prinus, Acer rubrum, Carya glabra*
Subcanopy	*Cornus florida*
Herbaceous	*Desmodium nudiflorum, Polystichum acrostichoides, Thelypteris noveboracensis*

CHARACTERISTIC SPECIES

Globally

Great Smoky Mountains National Park

Quercus prinus, Acer rubrum, Carya glabra, Quercus velutina, Cornus florida, Maianthemum racemosum ssp. *racemosum, Thalictrum thalictroides*

VEGETATION DESCRIPTION

Globally

Canopies are dominated by *Quercus prinus*, often codominating *Acer rubrum*. 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 diverse, and species composition varies between occurrences. Some of the more typical species include *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 palmata, Viola tripartita).*

Great Smoky Mountains National Park

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

OTHER NOTEWORTHY SPECIES

No information

CONSERVATION RANK G4G5

RANK JUSTIFICATION

DATABASE CODE CEGL007267

COMMENTS

Globally

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.

REFERENCES

Nelson 1986, Schafale and Weakley 1990, Simon pers. comm.

Quercus prinus - Quercus rubra / Rhododendron maximum / Galax urceolata Forest

COMMON NAME	Rock Chestnut Oak - Red Oak / Great Rhododendron / Galax Forest
SYNONYM	Chestnut Oak Forest (Mesic Slope Heath Type)
PHYSIOGNOMIC CLASS	Forest (I)
PHYSIOGNOMIC SUBCLASS	Deciduous forest (I.B)
PHYSIOGNOMIC GROUP	Cold-deciduous forest (I.B.2)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural (I.B.2.N)
FORMATION	Lowland or submontane cold-deciduous forest (I.B.2.N.a)

ALLIANCE *Quercus prinus - Quercus rubra* Forest Alliance

CLASSIFICATION CONFIDENCE LEVEL 2

USFWS WETLAND SYSTEM Upland

RANGE

Globally

This community occurs in the southern Blue Ridge of Georgia, North Carolina, South Carolina, and Tennessee and could range into Virginia.

Great Smoky Mountains National Park

This association is uncommon and was sampled at only a single location in the northern portion of the Mount Le Conte quadrangle, above Hill Creek. It was observed on the Cades Cove quadrangle in the vicinity of Bunting Branch. It is possible elsewhere in the Park.

ENVIRONMENTAL DESCRIPTION

Globally

This forest is found on moderate to very steep slopes with northerly exposures, typically at elevations greater than 2800 feet. Soils are deep and well-drained, although rock outcroppings may occur.

Great Smoky Mountains National Park

This association was sampled on a steep, north-facing slope at 1780 feet elevation. It should be sought on steep, upper, north-facing slopes at elevations up to 3500 feet.

MOST ABUNDANT SPECIES

Globally

Stratum	Species
Tree canopy	*Quercus prinus, Quercus rubra*
Tall shrub	*Rhododendron maximum*

Great Smoky Mountains National Park

Stratum	Species
Tree canopy	*Quercus prinus, Acer rubrum*
Tall shrub	*Rhododendron maximum*

CHARACTERISTIC SPECIES

Globally

Quercus prinus, Quercus rubra, Rhododendron maximum, Galax urceolata

Great Smoky Mountains National Park

See above

VEGETATION DESCRIPTION

Globally

This forest is dominated by *Quercus prinus*, usually with lesser amounts of *Quercus rubra* and *Acer rubrum*, occurring over a dense, very tall shrub stratum of *Rhododendron maximum* (2-6 meters). In some areas *Rhododendron minus* may dominate or *Tsuga canadensis* may have dense understory regeneration. Other common shrubs include *Gaylussacia ursina* and *Kalmia latifolia*. Herbs are sparse, but *Galax urceolata* is in most occurrences. Some examples may have sparse canopies and occur in association with rock outcroppings.

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

OTHER NOTEWORTHY SPECIES
No information

CONSERVATION RANK G3G5

RANK JUSTIFICATION

DATABASE CODE CEGL006286

COMMENTS
Globally

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

REFERENCES
Schafale and Weakley 1990, Simon pers. comm.

Quercus rubra / (Kalmia latifolia, Rhododendron maximum) / Galax urceolata Forest

COMMON NAME	Red Oak / (Mountain Laurel, Great Rhododendron) / Galax Forest
SYNONYM	High Elevation Red Oak Forest (Evergreen Shrub Type)
PHYSIOGNOMIC CLASS	Forest (I)
PHYSIOGNOMIC SUBCLASS	Deciduous forest (I.B)
PHYSIOGNOMIC GROUP	Cold-deciduous forest (I.B.2)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural (I.B.2.N)
FORMATION	Lowland or submontane cold-deciduous forest (I.B.2.N.a)

ALLIANCE *Quercus rubra* Montane Forest Alliance

CLASSIFICATION CONFIDENCE LEVEL 1

USFWS WETLAND SYSTEM Upland

RANGE

Globally

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, Virginia, and West Virginia.

Great Smoky Mountains National Park

This community was sampled from a single location, in the central portion of the Cades Cove quadrangle, on the northeast summit of McCampbell Knob (4400 feet elevation). It was not found on the Mount Le Conte quadrangle but could occur in other areas of the Park.

ENVIRONMENTAL DESCRIPTION

Globally

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).

Great Smoky Mountains National Park

This community was sampled on a flat summit at 4400 feet elevation. The canopy had damage by insects.

MOST ABUNDANT SPECIES

Globally

Stratum	Species
Tree canopy	*Quercus rubra*
Subcanopy	*Acer rubrum, Hamamelis virginiana*
Tall shrub	*Kalmia latifolia, Rhododendron catawbiense, Rhododendron maximum*
Herbaceous	*Galax urceolata*

Great Smoky Mountains National Park

Stratum	Species
Tree canopy	*Quercus rubra*
Subcanopy	*Hamamelis virginiana, Ilex montana*
Tall shrub	*Rhododendron maximum*
Herbaceous	*Dryopteris intermedia*

CHARACTERISTIC SPECIES

Globally

Quercus rubra, Hamamelis virginiana, Ilex montana, Rhododendron catawbiense, Rhododendron maximum, Galax urceolata

Great Smoky Mountains National Park

Quercus rubra, Hamamelis virginiana, Ilex montana, Rhododendron maximum, Galax urceolata

VEGETATION DESCRIPTION

Globally

This montane community includes forest vegetation with *Quercus rubra* making up at least 75 percent of the tree canopy and with greater than 20 percent shrub cover, which may be continuous to patchy. More than 50 percent 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 (*Galax urceolata, Solidago caesia* var. *curtisii, Epigaea repens, Dennstaedtia punctilobula, Conopholis americana, Thelypteris noveboracensis, Clintonia umbellulata, Aster divaricatus, Dioscorea villosa*).

Great Smoky Mountains National Park

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

OTHER NOTEWORTHY SPECIES

Animals that use this community include Red Squirrel (*Tamiasciurus hudsonicus*) and Eastern Chipmunk (*Tamias striatus*). Many plant species in this community are endemic to the southern Blue Ridge or have the bulk of their worldwide range in that region, including *Abies fraseri, Aesculus flava, Ageratina altissima* var. *roanensis, Euphorbia purpurea, Leucothoe recurva, Prenanthes roanensis, Rhododendron catawbiense, Rhododendron vaseyi, Silene ovata,* and *Solidago caesia* var. *curtisii.*

CONSERVATION RANK G4

RANK JUSTIFICATION This community is uncommon but not rare. It is secure within its range.

DATABASE CODE CEGL007299

COMMENTS

Globally

Major compositional variation within this community is related to a moisture gradient, which in turn is a function of topographic position and relative amount of solar radiation received (DeLapp 1978). Occurrences of this community with a shrub understory dominated by *Kalmia latifolia* and/or *Rhododendron catawbiense* are on exposed sites, such as ridgetops or south-facing slopes, with excessively drained, shallow soils. These exposed forests often contain *Quercus prinus, Pinus rigida,* and *Pinus pungens*. Occurrences of this community with a shrub understory dominated by *Rhododendron maximum* are on sites of intermediate exposure, with deeper soils, often with north and east aspects. These less exposed occurrences tend to have taller canopies than those on ridgetops. 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*). 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*.

Great Smoky Mountains National Park

This forest occurs adjacent to north slope forests dominated *Betula alleghaniensis* and *Fagus grandifolia* . It is unlikely that the signature of this community can be distinguished from other forests in this alliance.

REFERENCES

DeLapp 1978, Golden 1974, Rawinski 1992, Schafale and Weakley 1990

Quercus rubra / (Vaccinium simulatum, Rhododendron calendulaceum) / (Dennstaedtia punctilobula, Thelypteris noveboracensis) Forest

COMMON NAME	Red Oak / (Mountain Highbush Blueberry, Flame Azalea) / (Hay-scented Fern, New York Fern) Forest
SYNONYM	High Elevation Red Oak Forest (Deciduous Shrub Type)
PHYSIOGNOMIC CLASS	Forest (I)
PHYSIOGNOMIC SUBCLASS	Deciduous forest (I.B)
PHYSIOGNOMIC GROUP	Cold-deciduous forest (I.B.2)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural (I.B.2.N)
FORMATION	Lowland or submontane cold-deciduous forest (I.B.2.N.a)

ALLIANCE *Quercus rubra* Montane Forest Alliance

CLASSIFICATION CONFIDENCE LEVEL 1

USFWS WETLAND SYSTEM Upland

RANGE

Globally

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.

Great Smoky Mountains National Park

This community was sampled on the Cades Cove quadrangle and was not found on the Mount Le Conte quadrangle. Historic samples are from the Cades Cove quadrangle and the Thunderhead Mountain quadrangle, but the community is likely in other areas of the Park. On the Cades Cove quadrangle, recent and historic samples representing this community come from elevations ranging from just over 4000 feet to 5000 feet, in the southern portion of the quadrangle. This community was sampled from the summits and convex high slopes Gregory Ridge; the southwest slopes below Gregory Bald; the southeastern high slopes below Moore Spring Camp; the western summit of Pond Knob; and the convex west slopes of Mollies Ridge.

ENVIRONMENTAL DESCRIPTION

Globally

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). Occurrences of this community on exposed slopes and south- and west-facing ridges are subject to lightening-caused fires and damage by ice and wind. Damage by ice storms is probably the most common form of natural disturbance.

Great Smoky Mountains National Park

This community was sampled at elevations from 4000 to 5000 feet, on high slopes, ridges, and summits with northern to southwestern aspects. Most examples showed evidence of disturbance by wind, ice, and Chestnut Blight.

MOST ABUNDANT SPECIES

Globally

Stratum	Species
Tree canopy	*Quercus rubra*
Subcanopy	*Acer rubrum, Ilex montana, Hamamelis virginiana*
Tall shrub	*Rhododendron calendulaceum, Vaccinium simulatum*
Short shrub	*Vaccinium erythrocarpum, Vaccinium pallidum, Rubus canadensis*
Herbaceous	*Dennstaedtia punctilobula, Thelypteris noveboracensis, Ageratina altissima var. roanensis*

Great Smoky Mountains National Park

Stratum	Species
Tree canopy	*Quercus rubra*
Subcanopy	*Acer rubrum, Amelanchier laevis*

Tall shrub	*Ilex montana, Rhododendron calendulaceum, Castanea dentata, Vaccinium corymbosum*
Herbaceous	*Dennstaedtia punctilobula, Thelypteris noveboracensis*

CHARACTERISTIC SPECIES

Globally

Quercus rubra, Ilex montana, Hamamelis virginiana, Rhododendron calendulaceum, Vaccinium erythrocarpum, Dennstaedtia punctilobula, Thelypteris noveboracensis, Ageratina altissima var. *roanensis, Carex pensylvanica*

Great Smoky Mountains National Park

See above

VEGETATION DESCRIPTION

Globally

This forest is dominated by *Quercus rubra* with other species making up less than 25 percent 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 percent cover and more than 50 percent 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 between occurrences. Typical herbaceous species include *Ageratina altissima* var. *roanensis, Aster divaricatus, Aster acuminatus, Athyrium filix-femina* ssp. *asplenioides, 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 caesia* var. *curtisii,* and *Thelypteris noveboracensis.*

Great Smoky Mountains National Park

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

OTHER NOTEWORTHY SPECIES

Animals that use this community include Red Squirrel (*Tamiasciurus hudsonicus*) and Eastern Chipmunk (*Tamias striatus*). Many species in this community are endemic to the southern Blue Ridge or have the bulk of their worldwide range in that region. Some of these endemics include *Abies fraseri, Aesculus flava, Ageratina altissima* var. *roanensis, Carex roanensis, Clethra acuminata, Euphorbia purpurea, Leucothoe recurva, Prenanthes roanensis, Rhododendron catawbiense, Rhododendron vaseyi, Silene ovata, Solidago caesia* var. *curtisii,* and *Vaccinium erythrocarpum.*

CONSERVATION RANK	G4
RANK JUSTIFICATION	This community is uncommon but not rare. It is secure within its range.
DATABASE CODE	CEGL007300

COMMENTS

Globally

Major compositional variation within this community is related to a moisture gradient, which in turn is a function of topographic position and relative amount of solar radiation received (DeLapp 1978). Occurrences on open slopes with deeper soils may have understories dominated by clones of *Corylus cornuta*. Density of the shrub layer and the importance of herbs in the understory vary among occurrences. 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*. 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.

Great Smoky Mountains National Park
Particularly along the Tennessee / North Carolina state line on the Cades Cove quadrangle, *Quercus rubra* and *Quercus alba* dominance intergrades and may make delineation of this type difficult. Lower elevation occurrences (below 4500 feet elevation) begin to resemble Typic Acidic Montane Oak – Hickory Forest (*Quercus alba - Quercus (rubra, prinus) / Rhododendron calendulaceum - Kalmia latifolia - (Gaylussacia ursina*) Forest, CEGL007230) in composition, with an increase in coverage of species such as *Acer rubrum, Quercus alba, Cornus florida, Magnolia fraseri, Oxydendrum arboreum, Robinia pseudoacacia, Carya* spp., *Gaylussacia ursina,* and *Vaccinium hirsutum,* and the presence of herbs more indicative of lower elevation forests. It is unlikely that the signature of this community can be distinguished from other forests in the *Quercus rubra* Montane Forest Alliance.

REFERENCES
Braun 1940, Braun 1950, DeLapp 1978, Evans 1991, Evans pers. comm., Golden 1974, Rawinski 1992, Schafale and Weakley 1990, Stephenson and Adams 1989, Whigham 1969, Whittaker 1956

Quercus rubra / Carex pensylvanica - Ageratina altissima var. *roanensis* Forest

COMMON NAME	Red Oak / Pennsylvania Sedge - Appalachian White Snakeroot Forest
SYNONYM	High Elevation Red Oak Forest (Tall Herb Type)
PHYSIOGNOMIC CLASS	Forest (I)
PHYSIOGNOMIC SUBCLASS	Deciduous forest (I.B)
PHYSIOGNOMIC GROUP	Cold-deciduous forest (I.B.2)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural (I.B.2.N)
FORMATION	Lowland or submontane cold-deciduous forest (I.B.2.N.a)
ALLIANCE	*Quercus rubra* Montane Forest Alliance
CLASSIFICATION CONFIDENCE LEVEL	1
USFWS WETLAND SYSTEM	Upland

RANGE

Globally

This type occurs on most of the major mountain ranges of the southern Appalachians in North Carolina, Tennessee, and Virginia.

Great Smoky Mountains National Park

This community was sampled from a single location, in the southwestern portion of the Mount Le Conte quadrangle, on the western ridge of Balsam Point (4640 feet elevation). It was not found on the Cades Cove quadrangle but could occur there as well as in other areas of the Park.

ENVIRONMENTAL DESCRIPTION

Globally

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 lightening-caused fires and damage by ice and wind. Damage by ice storms is probably the most common form of natural disturbance.

Great Smoky Mountains National Park

This type was sampled on a steep, south-facing, high slope at an elevation of 4640 feet. The site showed evidence of Chestnut Blight.

MOST ABUNDANT SPECIES

Globally

Stratum	Species
Tree canopy	*Quercus rubra*
Herbaceous	*Carex pensylvanica, Ageratina altissima* var. *roanensis, Thelypteris noveboracensis, Dennstaedtia punctilobula*

Great Smoky Mountains National Park

Stratum	Species
Tree canopy	*Quercus rubra*
Subcanopy	*Acer rubrum*
Tall shrub	*Halesia tetraptera* var. *monticola, Ilex montana*
Short shrub	*Rubus canadensis*
Herbaceous	*Carex pensylvanica*

CHARACTERISTIC SPECIES

Globally

Quercus rubra, Carex pensylvanica, Ageratina altissima var. roanensis

Great Smoky Mountains National Park

Quercus rubra, Carex pensylvanica, Ageratina altissima var. roanensis

VEGETATION DESCRIPTION

Globally

This community includes forest vegetation, with a closed to very open canopy, where *Quercus rubra* makes up at least 75 percent of the tree canopy and with less than 20 percent 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, Aster chlorolepis, Aster acuminatus,* and *Laportea canadensis*.

Great Smoky Mountains National Park

The canopy of this short-stature forest is strongly dominated by *Quercus rubra*. Other trees that may form a minor portion of the canopy and subcanopy include *Acer rubrum, Halesia tetraptera* var. *monticola,* and P*runus serotina.* The shrub stratum is open with scattered shrubs, mostly *Halesia tetraptera* var. *monticola* and *Ilex montana*. Other species in the shrub stratum include *Acer pensylvanicum, Acer saccharum, Kalmia latifolia, Magnolia fraseri, Prunus serotina, Rubus canadensis, Vaccinium corymbosum,* and *Vaccinium erythrocarpum.* The herbaceous stratum is strongly dominated by *Carex pensylvanica*, which forms a dense carpet. Other herbaceous species include *Angelica triquinata, Aster chlorolepis, Clintonia umbellulata, Cuscuta rostrata, Dioscorea quaternata, Dryopteris intermedia, Gentianella quinquefolia* ssp. *quinquefolia, Lilium superbum, Maianthemum racemosum, Medeola virginiana, Mitchella repens, Prenanthes altissima, Smilax herbacea, Solidago caesia* var. *curtisii*, and *Thelypteris noveboracensis.*

OTHER NOTEWORTHY SPECIES

Animals that use this community include Red Squirrel (*Tamiasciurus hudsonicus*) and Eastern Chipmunk (*Tamias striatus*). Many species in this community are endemic to the southern Blue Ridge or have the bulk of their worldwide range in that region. Some of these endemics include *Abies fraseri, Aesculus flava, Ageratina altissima* var. *roanensis, Carex roanensis, Clethra acuminata, Euphorbia purpurea, Leucothoe recurva, Prenanthes roanensis, Rhododendron catawbiense, Rhododendron vaseyi, Silene ovata, Solidago caesia* var. *curtisii* and *Vaccinium erythrocarpum*.

CONSERVATION RANK G2

RANK JUSTIFICATION

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.

DATABASE CODE CEGL007298

COMMENTS

Globally

This community occurs as smaller stands (30-100 acres) and is less common than other forests in this alliance. It 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." 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*.

Great Smoky Mountains National Park

While the single sample of this community seems to represent the assigned association, the vegetation on the overall ridgeline may be more appropriately mapped as *Quercus rubra / (Vaccinium simulatum, Rhododendron calendulaceum) / (Dennstaedtia punctilobula, Thelypteris noveboracensis)* Forest (CEGL007300) or even as *Quercus rubra* Montane Forest Alliance, as it is unlikely that the various associations in this alliance will have distinguishable signatures.

REFERENCES

DeLapp 1978, Golden 1974, Schafale and Weakley 1990

Platanus occidentalis - Fraxinus pennsylvanica - Acer negundo / Boehmeria cylindrica Forest

COMMON NAME	Sycamore - Green Ash - Box Elder / False-nettle Forest
SYNONYM	Montane Alluvial Forest (Cades Cove)
PHYSIOGNOMIC CLASS	Forest (I)
PHYSIOGNOMIC SUBCLASS	Deciduous forest (I.B)
PHYSIOGNOMIC GROUP	Cold-deciduous forest (I.B.2)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural (I.B.2.N)
FORMATION	Temporarily flooded cold-deciduous forest (I.B.2.N.d)
ALLIANCE	*Platanus occidentalis - (Fraxinus pennsylvanica, Celtis laevigata, Acer saccharinum)* Temporarily Flooded Forest Alliance

CLASSIFICATION CONFIDENCE LEVEL 3

USFWS WETLAND SYSTEM Palustrine

RANGE

Globally

This community is thought to occur in Tennessee and may range into Kentucky.

Great Smoky Mountains National Park

This community was not sampled on the Cades Cove or Mount Le Conte quadrangles. It was observed along the stretch of Abrams Creek, east of the Loop Road and in the vicinity of Sparks Road, on the Cades Cove quadrangle.

ENVIRONMENTAL DESCRIPTION

Globally

No information

Great Smoky Mountains National Park

This community occurs on broad flats along streams and may be associated with calcareous geology. It is within a landscape of pastures and fields and impacted by cattle grazing.

MOST ABUNDANT SPECIES

Globally

Stratum	Species

No information

Great Smoky Mountains National Park

Stratum	Species

No information

CHARACTERISTIC SPECIES

Globally

No information

Great Smoky Mountains National Park

Platanus occidentalis, Acer negundo var. *negundo, Acer rubrum* var. *trilobum, Quercus imbricaria, Prunus serotina, Boehmeria cylindrica, Verbesina alternifolia*

VEGETATION DESCRIPTION

Globally

No information

Great Smoky Mountains National Park

This forest has a closed canopy dominated by *Platanus occidentalis, Acer negundo* var. *negundo, Acer rubrum* var. *trilobum, Liriodendron tulipifera*, and *Quercus imbricaria*. In some areas the canopy is dominated by *Quercus imbricaria* and *Prunus serotina.* The subcanopy stratum is sparse and primarily composed of canopy species. The shrub stratum is sparse. The herb layer includes *Boehmeria cylindrica, Verbesina alternifolia, Phacelia purshii, Senecio aureus, Carex intumescens, Iris* spp., and *Carex* spp. This alluvial forest can contain seasonally wet inclusions dominated by *Juncus effusus, Panicum sp.*, and *Fescue sp*.

OTHER NOTEWORTHY SPECIES
No information

CONSERVATION RANK G3G4

RANK JUSTIFICATION

DATABASE CODE CEGL007339

COMMENTS
Globally
This association was described from Cades Cove, Great Smoky Mountains National Park, and may need substantial revision with additional information. This type is thought to differ from montane alluvial forests found at higher elevations and on acid substrates in the Blue Ridge. Similar vegetation could be in Indiana, Illinois, or Missouri.

Great Smoky Mountains National Park
This community is meant to cover streamside forests within the open fields of Cades Cove.

REFERENCES
None

Liquidambar styraciflua - Liriodendron tulipifera **(***Platanus occidentalis) / Carpinus caroliniana – Halesia tetraptera var. monticola / Amphicarpaea bracteata* **Forest**

COMMON NAME	Sweetgum - Tuliptree – (Sycamore) / Ironwood – Moutain Silverbell / Hog-peanut Forest
SYNONYM	Montane Sweetgum Alluvial Flat
PHYSIOGNOMIC CLASS	Forest (I)
PHYSIOGNOMIC SUBCLASS	Deciduous forest (I.B)
PHYSIOGNOMIC GROUP	Cold-deciduous forest (I.B.2)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural (I.B.2.N)
FORMATION	Temporarily flooded cold-deciduous forest (I.B.2.N.d)
ALLIANCE	*Platanus occidentalis - (Liquidambar styraciflua, Liriodendron tulipifera)* Temporarily Flooded Forest Alliance

CLASSIFICATION CONFIDENCE LEVEL 3

USFWS WETLAND SYSTEM Upland

RANGE
Globally
No information

Great Smoky Mountains National Park
Sweetgum-dominated alluvial forests were sampled from both the Cades Cove and Mount Le Conte quadrangles and are likely in other areas of the Park. They were sampled from the northern portion of the Mount Le Conte quadrangle, on the floodplain of the Little Pigeon River, northeast of the Greenbrier Campground and also near the confluence with Ted's Branch; on the Lower Little Pigeon River, near the northern Park boundary; and on the broad floodplain of Dud's Branch, near Dudley Creek. On the Cades Cove quadrangle this community was sampled in the northern half of the quadrangle, off the Cades Cove Loop Road, in the vicinity of Mills Creek and Abrams Creek and along Rowans Branch; and just south of the Loop Road, in the vicinity of Mill Creek and Forge Creek Road.

ENVIRONMENTAL DESCRIPTION
Globally
No information

Great Smoky Mountains National Park
This forest is found on large alluvial flats and high terraces along large rivers (*e.g*. Little Pigeon River) or on small, disturbed flats along medium-sized perennial streams. This community often occurs on sites that were formerly cleared for farming or settlement. Soils are typically deep, loamy silts but can have large rocks and cobbles. The mean elevation of samples is 1680 feet, ranging from 1480 to 1900 feet.

MOST ABUNDANT SPECIES
Globally

Stratum	Species
No information	

Great Smoky Mountains National Park

Stratum	Species
Tree Canopy	*Liquidambar styraciflua, Liriodendron tulipifera*, (*Platanus occidentalis)*
Tree Subcanopy	*Carpinus caroliniana, Cornus florida*
Herbaceous	variable

CHARACTERISTIC SPECIES
Globally
No information

Great Smoky Mountains National Park
Liquidambar styraciflua, Liriodendron tulipifera, Platanus occidentalis, Carpinus caroliniana, Cornus florida, Tsuga canadensis, Juglans cinerea, Halesia tetraptera var. *monticola, Rhododendron maximum, Ilex opaca, Amphicarpaea bracteata, Microstegium vimineum, Toxicodendron radicans* ssp. *radicans*

VEGETATION DESCRIPTION
Globally
No information

Great Smoky Mountains National Park
This forest has an open to closed canopy dominated by *Liquidambar styraciflua* and *Liriodendron tulipifera*, often with *Platanus occidentalis*. Other minor species that are variably present in the canopy include *Acer rubrum, Fraxinus americana, Juglans nigra, Pinus virginiana, Prunus serotina, Robinia pseudoacacia, Tilia americana* var. *heterophylla*, and *Ulmus americana.* The subcanopy is absent to well-developed. Typical dominants are *Carpinus caroliniana, Cornus florida*, and *Acer rubrum*. Other species that can be present in the subcanopy include *Betula alleghaniensis, Betula lenta, Tsuga canadensis, Juglans cinerea, Halesia tetraptera* var. *monticola, Acer pensylvanicum, Acer saccharum, Amelanchier laevis, Oxydendrum arboreum*, and *Prunus serotina*. The shrub stratum is absent to moderately dense. *Rhododendron maximum* and *Tsuga canadensis* are the most common shrubs, although other species can be present. Herbaceous cover is often absent or sparse, with groundcover dominated by litter and duff. On smaller streams, near open fileds or where animal grazing is evident, herbaceous cover can approach 100 percent 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, Aster divaricatus, Cares* 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.*

OTHER NOTEWORTHY SPECIES
No information

CONSERVATION RANK G?

RANK JUSTIFICATION
The conservation status of this community has not yet been assessed.

DATABASE CODE CEGL007880

COMMENTS
Globally
This association was defined from disturbed floodplains in the Great Smoky Mountains National Park and may represent a subset of the more broadly defined *Platanus occidentalis - Liriodendron tulipifera - Betula (alleghaniensis, lenta) / Alnus serrulata - Leucothoe fontanesiana* Forest (CEGL004691), Montane Alluvial Forest (Large River Type). However, 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 west of the Blue Ridge, in the Ridge and Valley. Information from a larger geographic range is needed to distinguish this association. A similar alliance is the *Liquidambar styraciflua - (Liriodendron tulipifera, Acer rubrum)* Temporarily Flooded Forest Alliance, but it is currently not defined for the southern Blue Ridge.

Great Smoky Mountains National Park
Given the taxonomic uncertainty of this association, consideration should be given to mapping this vegetation at the Alliance level.

REFERENCES
None

Platanus occidentalis - Liriodendron tulipifera - Betula (alleghaniensis, lenta) / Alnus serrulata - Leucothoe fontanesiana Forest

COMMON NAME	Sycamore - Tuliptree - (Yellow Birch, Sweet Birch) / Smooth Alder - Mountain
SYNONYM	Montane Alluvial Forest (Large River Type)
PHYSIOGNOMIC CLASS	Forest (I)
PHYSIOGNOMIC SUBCLASS	Deciduous forest (I.B)
PHYSIOGNOMIC GROUP	Cold-deciduous forest (I.B.2)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural (I.B.2.N)
FORMATION	Temporarily flooded cold-deciduous forest (I.B.2.N.d)

ALLIANCE *Platanus occidentalis - (Liquidambar styraciflua, Liriodendron tulipifera)* Temporarily Flooded Forest Alliance

CLASSIFICATION CONFIDENCE LEVEL 2

USFWS WETLAND SYSTEM Palustrine

RANGE

Globally

This community occurs in the mountains of North Carolina, South Carolina, and Tennessee.

Great Smoky Mountains National Park

This community was not sampled from the Cades Cove or Mount Le Conte quadrangles but is likely in the Park.

ENVIRONMENTAL DESCRIPTION

Globally

This community includes alluvial forests of the southern Blue Ridge associated with narrow, rocky floodplains and islands in medium-sized rivers, typically at elevations below 2000 feet.

Great Smoky Mountains National Park

No information

MOST ABUNDANT SPECIES

Globally

Stratum	Species

No information

Great Smoky Mountains National Park

Stratum	Species

No information

CHARACTERISTIC SPECIES

Globally

Platanus occidentalis, Liriodendron tulipifera, Liquidambar styraciflua, Betula alleghaniensis, Betula lenta, Carpinus caroliniana, Betula nigra, Fraxinus americana, Tsuga canadensis, Leucothoe fontanesiana, Rhododendron maximum, Alnus serrulata, Xanthorhiza simplicissima

Great Smoky Mountains National Park

No information

VEGETATION DESCRIPTION

Globally

Canopy composition is variable but typical dominants are *Platanus occidentalis, Liriodendron tulipifera, Liquidambar styraciflua, Betula alleghaniensis,* and *Betula lenta.* Other canopy/subcanopy trees can include *Carpinus caroliniana, Hamamelis virginiana, Betula nigra, Fraxinus americana, Acer rubrum, Pinus virginiana, Pinus strobus,* and *Tsuga canadensis*. Vines can be prominent, including *Aristolochia macrophylla, Parthenocissus quinquefolia, Smilax glauca, Smilax rotundifolia,* and *Vitis aestivalis*. The shrub stratum can be dense, often with local dominance by *Leucothoe fontanesiana* or *Rhododendron maximum*. Other characteristic shrubs include *Alnus serrulata, Xanthorhiza simplicissima,* and *Hydrangea arborescens.* 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, Cimicifuga racemosa, Polystichum acrostichoides, Aster divaricatus*, and *Viola blanda. Carex* species may be common (*e.g. Carex appalachica, Carex austrocaroliniana, Carex blanda, Carex digitalis, Carex plantaginea, Carex swanii, Carex torta*).

Great Smoky Mountains National Park
No information

OTHER NOTEWORTHY SPECIES
No information

CONSERVATION RANK G2?

RANK JUSTIFICATION
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 hydrologic altering disturbances.

DATABASE CODE CEGL004691

COMMENTS
Globally
Examples are known from Nantahala Gorge, Linville Gorge, Slickrock Creek, and the South Toe River. 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 *Tsuga canadensis - (Pinus strobus)* Temporarily Flooded Forest Alliance (I.A.8.N.e).

Great Smoky Mountains National Park

REFERENCES
McLeod 1988, Newell and Peet 1995, Newell et al. 1997, Schafale and Weakley 1990

Acer rubrum Seasonally Flooded Forest [Provisional]

COMMON NAME	Red Maple Seasonally Flooded Forest
SYNONYM	Red Maple Seasonally Flooded Flat
PHYSIOGNOMIC CLASS	Forest (I)
PHYSIOGNOMIC SUBCLASS	Deciduous forest (I.B)
PHYSIOGNOMIC GROUP	Cold-deciduous forest (I.B.2)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural (I.B.2.N)
FORMATION	Seasonally flooded cold-deciduous forest (I.B.2.N.e)
ALLIANCE	*Acer rubrum* Seasonally Flooded Forest Alliance
CLASSIFICATION CONFIDENCE LEVEL	3
USFWS WETLAND SYSTEM	Palustrine

RANGE
Globally
No information

Great Smoky Mountains National Park
This vegetation was sampled on the Cades Cove quadrangle, but not on the Mount Le Conte quadrangle. It is not expected to be common in the Park. On the Cades Cove quadrangle, this vegetation was found on a disturbed flat along Abrams Creek, on the west end of the Cades Cove Loop Road *[NOTE: photointerpreter polygon 10]*.

ENVIRONMENTAL DESCRIPTION
Globally
No information

Great Smoky Mountains National Park
This is a disturbed, seasonally flooded, flat along a small perennial stream. It is bordered by pastures and fields and was probably grazed and/or cleared in the past. It shows evidence of disturbance by feral hogs.

MOST ABUNDANT SPECIES
Globally
No information

Great Smoky Mountains National Park

Stratum	Species
Tree canopy	*Acer rubrum, Fraxinus americana*
Herbaceous	*Microstegium vimineum*

CHARACTERISTIC SPECIES
Globally
No information

Great Smoky Mountains National Park
No information

VEGETATION DESCRIPTION
Globally

This is a placeholder for community association(s) to be developed in this alliance.
Great Smoky Mountains National Park

OTHER NOTEWORTHY SPECIES
The open, even-aged canopy is dominated by *Acer rubrum* and *Fraxinus americana*. Other species in the canopy and subcanopy include *Liriodendron tulipifera* and *Pinus rigida*. There is no shrub stratum and the dense herbaceous stratum is dominated by the invasive exotic grass, *Microstegium vimineum*. Other species in the herb stratum include *Boehmeria cylindrica, Brachyelytrum erectum, Carex species (Carex annectens, Carex crinita, Carex intumescens, Carex lurida, Carex rosea, Carex*

squarrosa), Chasmanthium laxum var. sessiliflorum, Elymus virginicus, Juncus effusus, Ligusticum canadense, Lycopus virginicus, Polygonum erectum, Polygonum sagittatum, Smilax glauca, Thelypteris noveboracensis, Toxicodendron radicans ssp. radicans, and *Viola macloskeyi ssp. pallens.*

CONSERVATION RANK G?

RANK JUSTIFICATION
The conservation status of this community has not yet been assessed.

DATABASE CODE CEGL006347

COMMENTS
Globally

Great Smoky Mountains National Park
This vegetation should be mapped at the alliance level. The taxonomic identification of *Fraxinus americana* should be checked in the field. If this tree is *Fraxinus pennsylvanica*, the vegetation may be classified in a different alliance.

REFERENCES
None

Liquidambar styraciflua / Sphagnum spp. Forest

COMMON NAME	Sweetgum / Peatmoss species Forest
SYNONYM	Gum Swamp Upland Pool
PHYSIOGNOMIC CLASS	Forest (I)
PHYSIOGNOMIC SUBCLASS	Deciduous forest (I.B)
PHYSIOGNOMIC GROUP	Cold-deciduous forest (I.B.2)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural (I.B.2.N)
FORMATION	Seasonally flooded cold-deciduous forest (I.B.2.N.e)
ALLIANCE	*Liquidambar styraciflua - (Acer rubrum)* Seasonally Flooded Forest Alliance

CLASSIFICATION CONFIDENCE LEVEL 3

USFWS WETLAND SYSTEM Palustrine

RANGE

Globally

This community is known from a single location in the Great Smoky Mountains of Tennessee. Similar vegetation may occur in the Piedmont of North Carolina.

Great Smoky Mountains National Park

This community was sampled from Gum Swamp, along the Cades Cove Loop Road, on the Codes Cove quadrangle.

ENVIRONMENTAL DESCRIPTION

Globally

Great Smoky Mountains National Park

This is a palustrine, seasonally flooded forest in an upland depression. Water is ponded about one meter deep during the wettest part of the year and below the surface in the summer months. The vegetation is heavily browsed by deer.

MOST ABUNDANT SPECIES

Globally

No information

Great Smoky Mountains National Park

Stratum	Species
Tree canopy	*Liquidambar styraciflua*
Herbaceous	*Chasmanthium laxum*
Nonvascular	*Sphagnum* species

CHARACTERISTIC SPECIES

Globally

Liquidambar styraciflua, Acer rubrum var. *trilobum, Sphagnum* species

Great Smoky Mountains National Park

See above

VEGETATION DESCRIPTION

Globally

Canopy (15-35 m) strongly dominated by *Liquidambar styraciflua* but with occasional *Acer rubrum* var. *trilobum* and *Nyssa sylvatica*. There is essentially no shrub cover, but *Rhododendron maximum* is present. During the summers, when the pond is dry, groundcover is dominated by leaf litter, and herb cover is restricted to fallen logs and tip-up mounds. Herb density and composition probably vary from year to year. Herb species include *Chasmanthium laxum, Dennstaedtia punctilobula, Microstegium vimineum,* and *Juncus effusus*. Scattered mosses include *Sphagnum* spp., *Polytrichum commune, Atrichum* spp., *Hypnum* spp., and *Thuidium* spp.

Great Smoky Mountains National Park
OTHER NOTEWORTHY SPECIES
One of the *Sphagnum* species associated with these forests may be a disjunct Coastal Plain species, *Sphagnum cuspidatum* var. *floridanum* (B. Dellinger pers. comm.).

CONSERVATION RANK G1Q

RANK JUSTIFICATION
This community is known from only one location, but the taxonomy of the association is questionable.

DATABASE CODE CEGL007388

COMMENTS
Globally
This concept is based on one site in Cades Cove (Gum Swamp) at 1750 feet elevation. The area is heavily browsed by deer. A similar site upslope has *Acer rubrum (*var. *trilobum?)* occurring with *Liquidambar styraciflua*. One of the *Sphagnum* species associated with these forests may be a disjunct Coastal Plain species, *Sphagnum cuspidatum* var. *floridanum* (B. Dellinger pers. comm.). Examples may also occur at Uwharrie National Forest and in Duke Forest.

Great Smoky Mountains National Park

REFERENCES
Dellinger pers. comm.

Picea rubens - (Betula alleghaniensis, Aesculus flava) / Rhododendron (maximum, catawbiense) Forest

COMMON NAME	Red Spruce - (Yellow Birch, Yellow Buckeye) / (Great Rhododendron, Catawba *Rhododendron)* Forest
SYNONYM	Red Spruce - Northern Hardwood Forest (Shrub Type)
PHYSIOGNOMIC CLASS	Forest (I)
PHYSIOGNOMIC SUBCLASS	Mixed evergreen-deciduous forest (I.C)
PHYSIOGNOMIC GROUP	Mixed needle-leaved evergreen - cold-deciduous forest (I.C.3)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural (I.C.3.N)
FORMATION	Mixed needle-leaved evergreen - cold-deciduous forest (I.C.3.N.a)
ALLIANCE	*Picea rubens - Betula alleghaniensis* Forest Alliance
CLASSIFICATION CONFIDENCE LEVEL	2
USFWS WETLAND SYSTEM	Upland

RANGE

Globally

This community is known from the Great Smoky Mountains of Tennessee but is likely in adjacent areas of North Carolina and Tennessee.

Great Smoky Mountains National Park

This community was sampled on the Mount Le Conte quadrangle and was not found on the Cades Cove quadrangle. It was sampled in the vicinity of Alum Cave on steep slopes at 4850 and 5350 feet elevation. It should be sought in other high elevation areas of the Park, between 4500 and 5300 feet elevation.

ENVIRONMENTAL DESCRIPTION

Globally

This association occurs in the broad elevational transition zone between spruce - fir and northern hardwoods in the southern Blue Ridge (approx. 4600-5100 feet elevation).

Great Smoky Mountains National Park

This forest was found on steep to very steep, slightly concave slopes at 5350 feet and 4850 feet elevation, often associated with cliff faces, rock outcroppings, and bouldery situations. Soils are peaty and rocky. This community is subject to disturbance by wind, ice, and landslides.

MOST ABUNDANT SPECIES

Globally

Stratum	Species
Tree canopy	*Picea rubens, Betula alleghaniensis, Fagus grandifolia, Aesculus flava*
Tall shrub	*Rhododendron maximum, Rhododendron catawbiense*

Great Smoky Mountains National Park

Stratum	Species
Tree canopy	*Picea rubens, Betula alleghaniensis*
Tall Shrub	*Ilex montana*
Short shrub	*Leucothoe fontanesiana*

CHARACTERISTIC SPECIES

Globally

Picea rubens, Betula alleghaniensis, Rhododendron maximum

Great Smoky Mountains National Park

Picea rubens, Betula alleghaniensis, Leucothoe fontanesiana

VEGETATION DESCRIPTION

Globally

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 layer is well-developed and dominated by *Rhododendron maximum* or *Rhododendron catawbiense*. The thick, evergreen shrub layer precludes the establishment of seedlings or herbaceous plants and creates a heavy, slowly decomposing litter layer.

Great Smoky Mountains National Park
The tree canopy is dominated by *Picea rubens* and *Betula alleghaniensis*. Other trees that can occur with minor coverage in the canopy and subcanopy include *Acer rubrum, Prunus serotina,* and *Tsuga canadensis*. Shrub cover is dense and dominated by *Leucothoe fontanesiana*. Other shrubs include *Ilex montana, Viburnum lantanoides, Vaccinium erythrocarpum, Rhododendron catawbiense,* and *Rubus allegheniensis*. Herbaceous cover is absent or sparse and consists of scattered ferns and other forbs such as *Dryopteris intermedia, Dennstaedtia punctilobula, Oxalis montana, Rugelia nudicaulis, Circaea alpina, Arisaema triphyllum,* and *Trillium undulatum*. Bryophyte cover can be high (over 50 percent), and the ground is covered with downed and decaying logs.

OTHER NOTEWORTHY SPECIES
No information

CONSERVATION RANK G1?

RANK JUSTIFICATION
The community is geographically and environmentally restricted to the highest elevations of the southern Blue Ridge. Very few occurrences are known to exist, and it has only been described from the Great Smoky Mountains.

DATABASE CODE CEGL004983

COMMENTS

Globally
This association is known from the Great Smoky Mountains of Tennessee but may possibly occur in the Blue Ridge of North Carolina and Virginia. This association should be compared with other vegetation farther north in the Appalachians.

Great Smoky Mountains National Park
Examples of this community on more exposed, rocky sites may transition to heath shrublands. At high elevations, this community grades into *Picea rubens*-dominated forests.

REFERENCES
Golden 1974, Golden 1981, Livingston and Mitchell 1976

Picea rubens - (Betula alleghaniensis, Aesculus flava) / Viburnum lantanoides / Oxalis montana - Solidago glomerata Forest

COMMON NAME	Red Spruce - (Yellow Birch, Yellow Buckeye) / Hobblebush / Common Wood
SYNONYM	Red Spruce - Northern Hardwood Forest (Herb Type)
PHYSIOGNOMIC CLASS	Forest (I)
PHYSIOGNOMIC SUBCLASS	Mixed evergreen-deciduous forest (I.C)
PHYSIOGNOMIC GROUP	Mixed needle-leaved evergreen - cold-deciduous forest (I.C.3)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural (I.C.3.N)
FORMATION	Mixed needle-leaved evergreen - cold-deciduous forest (I.C.3.N.a)

ALLIANCE *Picea rubens - Betula alleghaniensis* Forest Alliance

CLASSIFICATION CONFIDENCE LEVEL 1

USFWS WETLAND SYSTEM Upland

RANGE

Globally

This community is known from high elevation areas in the southern Blue Ridge of North Carolina, Tennessee, and Virginia.

Great Smoky Mountains National Park

This community was sampled on the Mount Le Conte quadrangle and was not found on the Cades Cove quadrangle. It was sampled in the vicinity of Mount Kephart, on the broad, steep, slopes on the northern and southern flanks of Mount Le Conte, and in the vicinity of Balsam point, at elevations ranging from 5000 to 5880 feet. It should be sought in other high elevation (> 4500 feet) areas of the Park.

ENVIRONMENTAL DESCRIPTION

Globally

This association occurs in the broad elevational transition zone between spruce - fir and northern hardwoods in the southern Blue Ridge (approx. 4600-5100 feet elevation) on steep slopes and protected ridges, over shallow, stony soils.

Great Smoky Mountains National Park

This community was found on steep, north- and south-facing middle and upper slopes, at elevations over 5000 feet. Landforms were often slightly convex to concave, broad slopes with boulders and rock outcroppings. Soils are stony to gravelly and have high organic content. Major disturbance factors affecting this forest include ice, wind, and feral hogs. Examples on the Mount Le Conte quadrangle include old-growth forest.

MOST ABUNDANT SPECIES

Globally

Stratum	Species
Tree canopy	*Picea rubens, Betula alleghaniensis, Fagus grandifolia, Aesculus flava*
Tall shrub	*Viburnum lantanoides*
Herbaceous	*Dryopteris campyloptera, Dryopteris intermedia, Oxalis montana, Solidago glomerata*

Great Smoky Mountains National Park

Stratum	Species
Tree canopy	*Picea rubens, Betula alleghaniensis*
Subcanopy	*Betula alleghaniensis*
Tall shrub	*Viburnum lantanoides, Acer spicatum*
Short shrub	*Vaccinium erythrocarpum*
Herbaceous	*Dryopteris campyloptera, Solidago glomerata*

CHARACTERISTIC SPECIES

Globally

Picea rubens, Betula alleghaniensis, Fagus grandifolia, Aesculus flava, Abies fraseri, Viburnum lantanoides, Dryopteris campyloptera, Solidago glomerata

Great Smoky Mountains National Park

See above

VEGETATION DESCRIPTION

Globally

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 *Aster acuminatus, Carex pensylvanica, Dryopteris campyloptera, Dryopteris intermedia, Maianthemum canadense, Oxalis montana, Solidago glomerata,* and *Rugelia nudicaulis* (in the Great Smoky Mountains).

Great Smoky Mountains National Park

The forest canopy and subcanopy is codominated by large *Picea rubens* and *Betula alleghaniensis*. In some occurrences, *Picea rubens* can overtop *Betula alleghaniensis.* Other subcanopy trees include *Abies fraseri, Aesculus flava,* and *Prunus pensylvanica*. Shrub cover can be sparse to moderate (20 to 90 percent) but is always dominated by deciduous species. The tall- and short-shrub strata share many species. The most constant shrubs are *Abies fraseri, Acer spicatum, Vaccinium erythrocarpum, Viburnum lantanoides, Sorbus americana,* and *Rubus canadensis.* Other shrubs include *Acer pensylvanicum, Ilex montana, Lonicera canadensis, Ribes cynosbati, Ribes glandulosum, Hydrangea arborescens, Rubus allegheniensis, Betula alleghaniensis, Sambucus racemosa* var. *pubens, Viburnum nudum* var. *cassinoides, Cornus alternifolia, Menziesia pilosa, Rhododendron maximum,* and *Rhododendron catawbiense.* Herbaceous cover is moderate to dense (30 to 100 percent) and is dominated by ferns and other forbs. Herbaceous dominance may vary from site to site, but the most constant herb species are *Dryopteris campyloptera, Oxalis montana, Solidago glomerata, Clintonia borealis,* and *Rugelia nudicaulis*. Other herbaceous species include *Ageratina altissima* var. *roanensis, Asplenium montanum, Aster acuminatus, Aster chlorolepis, Athyrium filix-femina, Chelone lyonii, Cimicifuga americana, Cinna latifolia, Circaea alpina, Dryopteris intermedia, Huperzia lucidula, Impatiens pallida, Melanthium parviflorum, Monotropa uniflora, Polypodium appalachianum, Tiarella cordifolia,* and *Trillium undulatum*.

OTHER NOTEWORTHY SPECIES

No information

CONSERVATION RANK G2

RANK JUSTIFICATION

The community is geographically and environmentally restricted to the highest elevations of the southern Blue Ridge. Very few occurrences are known to exist.

DATABASE CODE CEGL006256

COMMENTS

Globally

This forest is known from the Black and Craggy mountains and Grandfather Mountain in North Carolina and from the Great Smoky Mountains in Tennessee. This association was formerly *Picea rubens - Betula alleghaniensis / Vaccinium erythrocarpum* Forest but split into two forest associations (see also CEGL004983).

Great Smoky Mountains National Park

On Mount Le Conte this community grades into forests dominated by *Picea rubens* or by *Picea rubens* and *Abies fraseri* at higher elevations, and to Northern Hardwood and Cove forests at lower elevations.

REFERENCES

Golden 1974, Golden 1981, Livingston and Mitchell 1976, McLeod pers. comm., Schafale and Weakley 1990

Pinus strobus - Quercus alba - (Carya alba) / Gaylussacia ursina Forest

COMMON NAME	Eastern White Pine - White Oak - (Mockernut Hickory) / Bear Huckleberry Forest
SYNONYM	Appalachian White Pine - Mesic Oak Forest
PHYSIOGNOMIC CLASS	Forest (I)
PHYSIOGNOMIC SUBCLASS	Mixed evergreen-deciduous forest (I.C)
PHYSIOGNOMIC GROUP	Mixed needle-leaved evergreen - cold-deciduous forest (I.C.3)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural (I.C.3.N)
FORMATION	Mixed needle-leaved evergreen - cold-deciduous forest (I.C.3.N.a)
ALLIANCE	*Pinus strobus - Quercus (alba, rubra, velutina)* Forest Alliance
CLASSIFICATION CONFIDENCE LEVEL	2
USFWS WETLAND SYSTEM	Upland

RANGE

Globally

This community occurs in the low mountains of Georgia, North Carolina, and South Carolina, and may possibly range into Tennessee.

Great Smoky Mountains National Park

This association was not observed or sampled on the Mount Le Conte or Cades Cove quadrangles but is likely in low elevation, disturbed areas of the Cades Cove quadrangle and in other parts of the Park.

ENVIRONMENTAL DESCRIPTION

Globally

This association includes mesic pine - oak - hickory in the southern Blue Ridge escarpment and in the Piedmont transition, occurring below 2900 feet elevation, on protected ridges, mid to upper slopes, and in disturbed bottoms.

Great Smoky Mountains National Park

No information

MOST ABUNDANT SPECIES

Globally

Stratum	Species
Tree canopy	*Pinus strobus, Quercus alba, Carya alba, Acer rubrum*
Subcanopy	*Cornus florida, Halesia tetraptera, Oxydendrum arboreum, Nyssa sylvatica*
Tall shrub	*Kalmia latifolia*
Short Shrub	*Gaylussacia ursina*
Herbaceous	(variable)

Great Smoky Mountains National Park

Stratum	Species
No information	

CHARACTERISTIC SPECIES

Globally

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

Great Smoky Mountains National Park

VEGETATION DESCRIPTION

Globally

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, Pyrularia pubera, and *Hydrangea radiata*. The herb stratum is sparse, although ferns (*Thelypteris noveboracensis* 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.*

Great Smoky Mountains National Park
No information

OTHER NOTEWORTHY SPECIES
No information

CONSERVATION RANK G2G3

RANK JUSTIFICATION
This community is geographically restricted and uncommon within its range.

DATABASE CODE CEGL007517

COMMENTS
Globally
This community occurs in more topographically protected situations than does the more xeric forest *Pinus strobus - Quercus (coccinea, prinus) / (Gaylussacia ursina - Vaccinium stamineum)* Forest (CEGL007519).

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

REFERENCES
Schafale and Weakley 1990

Pinus strobus - Quercus (coccinea, prinus) / (Gaylussacia ursina - Vaccinium stamineum) Forest

COMMON NAME	Eastern White Pine - (Scarlet Oak - Rock Chestnut Oak) / (Bear Huckleberry) Forest
SYNONYM	Appalachian White Pine - Xeric Oak Forest
PHYSIOGNOMIC CLASS	Forest (I)
PHYSIOGNOMIC SUBCLASS	Mixed evergreen-deciduous forest (I.C)
PHYSIOGNOMIC GROUP	Mixed needle-leaved evergreen - cold-deciduous forest (I.C.3)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural (I.C.3.N)
FORMATION	Mixed needle-leaved evergreen - cold-deciduous forest (I.C.3.N.a)
ALLIANCE	*Pinus strobus - Quercus (coccinea, prinus)* Forest Alliance
CLASSIFICATION CONFIDENCE LEVEL	1
USFWS WETLAND SYSTEM	Upland

RANGE

Globally

This forest occurs in the low mountains of Georgia, North Carolina, South Carolina, and Tennessee, and could possibly range into Virginia.

Great Smoky Mountains National Park

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

ENVIRONMENTAL DESCRIPTION

Globally

This community occurs on exposed upper slopes and ridgetops at elevations below 920 m (3000 feet) in the southern Appalachian Mountains.

Great Smoky Mountains National Park

This community was found mostly below 2000 feet elevation (ranging from 1560 to 2400 feet) convex slopes and low ridges. Many stands showed evidence of past logging, and most examples are in early to middle stages of succession.

MOST ABUNDANT SPECIES

Globally

Stratum	Species
Tree canopy	*Pinus strobus, (Quercus prinus, Quercus coccinea*)
Subcanopy	*Oxydendrum arboreum, Acer rubrum* var. *rubrum*
Short shrub	*Gaylussacia ursina, Vaccinium stamineum*

Great Smoky Mountains National Park

Stratum	Species
Tree canopy	*Pinus strobus, Quercus prinus*
Subcanopy	*Acer rubrum*
Tall shrub	*Kalmia latifolia, Rhododendron maximum*
Short shrub	*Gaylussacia ursina, Vaccinium pallidum*

CHARACTERISTIC SPECIES

Globally

Pinus strobus, Quercus prinus, Quercus coccinea, Kalmia latifolia, Gaylussacia ursine

Great Smoky Mountains National Park

See above

VEGETATION DESCRIPTION

Globally

Forest vegetation with *Pinus strobus* contributing 25-75 percent of the canopy coverage and with *Quercus prinus* and *Quercus coccinea* occurring singly or in combination as 25-75 percent 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.

Great Smoky Mountains National Park

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

OTHER NOTEWORTHY SPECIES
No information

CONSERVATION RANK G3

RANK JUSTIFICATION
This community has a restricted range and is uncommon. It is not threatened or particularly vulnerable.

DATABASE CODE CEGL007519

COMMENTS
None

REFERENCES
Patterson 1994, Schafale and Weakley 1990

Pinus virginiana - Quercus prinus - Quercus rubra / Vaccinium pallidum - Kalmia latifolia Forest

COMMON NAME	Virginia Pine - Rock Chestnut Oak - Red Oak / Hillside Blueberry - Mountain Laurel Forest
SYNONYM	Blue Ridge Acid Shale Forest
PHYSIOGNOMIC CLASS	Forest (I)
PHYSIOGNOMIC SUBCLASS	Mixed evergreen-deciduous forest (I.C)
PHYSIOGNOMIC GROUP	Mixed needle-leaved evergreen - cold-deciduous forest (I.C.3)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural (I.C.3.N)
FORMATION	Mixed needle-leaved evergreen - cold-deciduous forest (I.C.3.N.a)

ALLIANCE *Pinus virginiana - Quercus (coccinea, prinus)* Forest Alliance

CLASSIFICATION CONFIDENCE LEVEL 2

USFWS WETLAND SYSTEM Upland

RANGE
Globally
This community is known from the Blue Ridge in western North Carolina and eastern Tennessee and may range into South Carolina.

Great Smoky Mountains National Park
This community was not sampled, nor is it likely, on the Mount Le Conte or Cades Cove quadrangles. It is an uncommon community but may occur in the Park where shale outcrops occur on steep slopes. One occurrence is known from the Calderwood quadrangle, on Chilhowhee Mountain.

ENVIRONMENTAL DESCRIPTION
Globally
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 apparently a long-lived community, maintained by harsh edaphic conditions of steep slopes and shifting shale substrate.

Great Smoky Mountains National Park
No information

MOST ABUNDANT SPECIES
Globally

Stratum	Species
Tree canopy	*Pinus virginiana, Quercus prinus, Quercus rubra*
Short shrub	*Vaccinium pallidum*
Herbaceous	variable

Great Smoky Mountains National Park

Stratum	Species
No information	

CHARACTERISTIC SPECIES
Globally
No information

Great Smoky Mountains National Park

VEGETATION DESCRIPTION
Globally
Xeric slope forest with a 10- to 25-meter 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 tenuifolia, and others.

Great Smoky Mountains National Park
No information

OTHER NOTEWORTHY SPECIES
No information

CONSERVATION RANK G2?

RANK JUSTIFICATION

DATABASE CODE CEGL007539

COMMENTS
Globally
L.L. Gaddy reports this association from the Chauga Basin, South Carolina. Known from Chilhowee Mountain, Tennessee.

Great Smoky Mountains National Park

REFERENCES
None

Tsuga canadensis – Betula alleghaniensis / Rhododendron maximum / Leucothoe fontanesiana Forest

COMMON NAME	Eastern Hemlock – Yellow Birch / Great Rhododendron / Doghobble Forest
SYNONYM	Blue Ridge Hemlock - Northern Hardwood Forest
PHYSIOGNOMIC CLASS	Forest (I)
PHYSIOGNOMIC SUBCLASS	Mixed evergreen-deciduous forest (I.C)
PHYSIOGNOMIC GROUP	Mixed needle-leaved evergreen - cold-deciduous forest (I.C.3)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural (I.C.3.N)
FORMATION	Mixed needle-leaved evergreen - cold-deciduous forest (I.C.3.N.a)

ALLIANCE *Tsuga canadensis - Betula alleghaniensis* Forest Alliance

CLASSIFICATION CONFIDENCE LEVEL 2

USFWS WETLAND SYSTEM Upland

RANGE

Globally

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 is also occurs in the high mountain areas of western North Carolina.

Great Smoky Mountains National Park

This community was sampled only on the Mount Le Conte quadrangle but is possible on the Cades Cove quadrangle, and certainly in other areas of the Park. On the Mount Le Conte quadrangle, samples of this ranged from 3400 to 4400 feet elevation and was found on lower slopes on the northern flanks of Mount Le Conte, the steep south-facing slopes southwest of Balsam Point, as well as on the north-facing slopes above the West Prong of the Pigeon River and its tributaries, Walker Camp Prong and Trout Branch, and the steep slopes above and lower slopes and flats along Alum Cave Creek. [*This community made up all or part of the photointerpreter's polygons 28, 30, 33, 34, and 35 on the Mount Le Conte quadrangle.*] An historic sample from the southwestern portion of the Cades Cove quadrangle, at 3800 feet, at the head of a cove east of High Point, may represent this community.

ENVIRONMENTAL DESCRIPTION

Globally

No information

Great Smoky Mountains National Park

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. These forests are affected by occasional disturbance by ice, wind, and landslides.

MOST ABUNDANT SPECIES

Globally

Stratum	Species
No information	

Great Smoky Mountains National Park

Stratum	Species
Tree canopy	*Tsuga canadensis, Betula alleghaniensis*
Tall Shrub	*Rhododendron maximum*
Short shrub	*Leucothoe fontanesiana*
Herbaceous	*Dryopteris intermedia*

CHARACTERISTIC SPECIES

Globally

No information

Great Smoky Mountains National Park
Tsuga canadensis, Betula alleghaniensis, Rhododendron maximum, Leucothoe fontanesiana

VEGETATION DESCRIPTION
Globally
No information

Great Smoky Mountains National Park
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, Picea rubens, Prunus pensylvanica, Betula lenta, Tilia americana* var. *heterophylla*, and at lower elevations, *Magnolia fraseri, Acer rubrum, Liriodendron tulipifera*, and *Halesia tetraptera* var. *monticola*. The tall-shrub stratum is over 2 meters in height, very dense (50 to 100 percent coverage) and dominated by *Rhododendron maximum*. The dense low-shrub stratum is dominated by *Leucothoe fontanesiana.* Other minor shrubs can include *Acer pensylvanicum, Ilex montana, Kalmia latifolia, Rubus allegheniensis, Sambucus racemosa* var. *pubens, Tsuga canadensis,* and *Vaccinium erythrocarpum.* The ground layer is dominated by leaf litter, fallen trees, and rocks. Herbaceous cover is sparse (0 to 5 percent) and is composed of scattered plants typical of middle to high elevation acid forests. Some of the more characteristic species include *Dryopteris intermedia, Medeola virginiana, Mitchella repens, Tiarella cordifolia, Oxalis montana,* and *Polypodium appalachianum.* Additional herb species found in this community include *Arisaema dracontium, Arisaema triphyllum, Aristolochia macrophylla, Aster acuminatus, Aster divaricatus, Circaea alpina, Goodyera pubescens, Goodyera repens, Huperzia lucidula, Laportea canadensis, Monotropa uniflora, Polygonatum pubescens, Prenanthes altissima*, and *Viola blanda*.

OTHER NOTEWORTHY SPECIES
No information

CONSERVATION RANK G3G4Q

RANK JUSTIFICATION
This association was 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.

DATABASE CODE CEGL007861

COMMENTS
Globally
This association was described from the Great Smoky Mountains National Park. It should be compared with and distinguished from other associations in this alliance (*Tsuga canadensis - Betula alleghaniensis* Lower New England, Northern Piedmont Forest (CEGL006109) and *Tsuga canadensis - Betula alleghaniensis - Prunus serotina / Rhododendron maximum* Forest (CEGL006206)), as well as other vegetation in the southern Blue Ridge.

Great Smoky Mountains National Park
On aerial photography, this community may appear similar to other Hemlock-Hardwood communities (*i.e. Tsuga canadensis - Liriodendron tulipifera / Rhododendron maximum / Tiarella cordifolia* Forest (CEGL007543) and *Tsuga canadensis - Halesia tetraptera - (Fagus grandifolia, Magnolia fraseri) / Rhododendron maximum / Dryopteris intermedia* Forest (CEGL007693)) but should be distinguishable by its higher elevation and topographic position. Grades into forest dominated by *Picea rubens* or *Tsuga canadensis* at higher elevations.

REFERENCES
Livingston and Mitchell 1976, Newell 1997, Newell et al. 1997

Tsuga canadensis - Halesia tetraptera - (Fagus grandifolia, Magnolia fraseri) / Rhododendron maximum / Dryopteris intermedia Forest

COMMON NAME	Eastern Hemlock - Mountain Silverbell - (American Beech, Fraser Magnolia) / Great Rhododendron / Fancy Fern Forest
SYNONYM	Southern Appalachian Acid Cove Forest (Silverbell Type)
PHYSIOGNOMIC CLASS	Forest (I)
PHYSIOGNOMIC SUBCLASS	Mixed evergreen-deciduous forest (I.C)
PHYSIOGNOMIC GROUP	Mixed needle-leaved evergreen - cold-deciduous forest (I.C.3)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural (I.C.3.N)
FORMATION	Mixed needle-leaved evergreen - cold-deciduous forest (I.C.3.N.a)

ALLIANCE *Tsuga canadensis - Liriodendron tulipifera* Forest Alliance

CLASSIFICATION CONFIDENCE LEVEL 1

USFWS WETLAND SYSTEM Upland

RANGE
Globally
This association is known from the mountains of eastern Tennessee and western North Carolina.

Great Smoky Mountains National Park
This community was sampled from the Cades Cove, Mount Le Conte, and Mount Guyot quadrangles. Historic samples come from the Thunderhead Mountain quadrangle (3420 to 4600 feet elevation). Samples of this community from the Cades Cove quadrangle ranged in elevation from 2720 to 3900 feet. Recent and historic samples from the Cades Cove quadrangle come from low slopes above the Left Prong of Anthony Creek; from protected slopes and coves north of McCampbell Knob; and in the vicinity of Forge Creek. Samples from the Mount Le Conte quadrangle ranged from 2602 to 4120 feet elevation and included samples from the western portion of the quadrangle near the Cherokee Orchard–Rainbow Falls trailhead and from coves east of Piney Mountain above Rocky Spur Branch. In the eastern portion of the Mount Le Conte quadrangle this community was sampled from low slopes above Horseshoe Branch and from Upper Porter's Creek on the far southwestern part of Mount Guyot quadrangle.

ENVIRONMENTAL DESCRIPTION
Globally
This community occurs on protected slopes and coves at elevations between 2800 to 4600 feet.

Great Smoky Mountains National Park
This community is found on moderately steep, protected slopes and coves with western to northeastern aspects. Samples had a mean elevation of 3475 feet, ranging from 2600 to 4600 feet.

MOST ABUNDANT SPECIES
Globally

Stratum	Species
Tree canopy	*Tsuga canadensis*, *Halesia tetraptera* var. *monticola*
Tall shrub	(*Rhododendron maximum)*
Herbaceous	*Dryopteris intermedia*

Great Smoky Mountains National Park

Stratum	Species
See above.	

CHARACTERISTIC SPECIES
Globally
Tsuga canadensis, *Halesia tetraptera* var. *monticola*, *Acer saccharum*, *Dryopteris intermedia*, *Mitchella repens*

Great Smoky Mountains National Park
See above

VEGETATION DESCRIPTION

Globally

Forests of lower slopes and coves dominated by *Tsuga canadensis* and *Halesia tetraptera* var. *monticola. Magnolia fraseri* or *Fagus grandifolia* can also be important in the canopy. Some occurrences have dense, tall-shrub strata dominated by *Rhododendron maximum*, while other occurrences have a more open shrub stratum with greater herbaceous cover, often dominated by *Dryopteris intermedia*. Other subcanopy/shrub species may include *Acer pensylvanicum, Acer saccharum, Acer rubrum, Amelanchier laevis, Betula alleghaniensis, Betula lenta*, and *Prunus pensylvanica*. Other common herbaceous species include *Mitchella repens, Medeola virginiana, Polystichum acrostichoides, Solidago caesia* var. *curtisii, Viola blanda*, and *Viola hastata. Rubus canadensis* is also common.

Great Smoky Mountains National Park

This forest has a canopy dominated by *Tsuga canadensis* and *Halesia tetraptera* var. *monticola.* Other species that can have high coverage in the canopy or subcanopy include *Acer saccharum, Fagus grandifolia, Magnolia fraseri, Betula alleghaniensis*, and *Acer rubrum*. *Prunus serotina* can also be present in the subcanopy. Some occurrences have dense, tall-shrub strata dominated by *Rhododendron maximum*, but more typically the shrub stratum is open, with coverage by saplings of the canopy species. *Acer pensylvanicum* is also a typical shrub. The herb stratum has sparse to moderate coverage. Common species include *Aster divaricatus, Dryopteris intermedia, Huperzia lucidula, Medeola virginiana, Mitchella repens, Oxalis montana, Solidago caesia* var. *curtisii, Tiarella cordifolia,* and *Viola* spp. *(e.g. Viola blanda, Viola canadensis, Viola hastata, Viola rotundifolia).*

OTHER NOTEWORTHY SPECIES

No information

CONSERVATION RANK G2

RANK JUSTIFICATION

This community is uncommon and geographically restricted to the Great Smoky Mountains and to Joyce Kilmer Wilderness in western North Carolina.

DATABASE CODE CEGL007693

COMMENTS

Globally

None

Great Smoky Mountains National Park

This community is distinguished from *Tsuga canadensis - Liriodendron tulipifera / Rhododendron maximum / Tiarella cordifolia* Forest (CEGL007543) by not having *Liriodendron tulipifera* as an important component and by generally occurring at higher elevations (over 3000 feet). This community is distinguished from *Tsuga canadensis – Betula alleghaniensis / Rhododendron maximum / Leucothoe fontanesiana* Forest (CEGL007861) by occurring on more protected sites and having more diverse tree and herb strata. On aerial photography, this community may appear similar to other Hemlock-Hardwood communities (*i.e. Tsuga canadensis - Liriodendron tulipifera / Rhododendron maximum / Tiarella cordifolia* Forest (CEGL007543) and *Tsuga canadensis – Betula alleghaniensis / Rhododendron maximum / Leucothoe fontanesiana* Forest (CEGL007861)). In some occurrences *Tsuga canadensis* dominates beneath the deciduous upper canopy and may not be evident on air photos. Some occurrences, where *Tsuga canadensis* overtops the deciduous trees, may have signatures similar to Hemlock and Hemlock-White Pine Forests (*i.e. Tsuga canadensis / Rhododendron maximum - Leucothoe fontanesiana* Forest (CEGL007136) and *Pinus strobus - Tsuga canadensis / Rhododendron maximum - Leucothoe fontanesiana* Forest (CEGL007102)).

REFERENCES

Golden 1974, Newell et al. 1997, Schafale and Weakley 1990

Tsuga canadensis - Liriodendron tulipifera / Rhododendron maximum / Tiarella cordifolia **Forest**

COMMON NAME	Eastern Hemlock - Tuliptree / Great Rhododendron / Heartleaf Foamflower Forest
SYNONYM	Southern Appalachian Acid Cove Forest (Typic Type)
PHYSIOGNOMIC CLASS	Forest (I)
PHYSIOGNOMIC SUBCLASS	Mixed evergreen-deciduous forest (I.C)
PHYSIOGNOMIC GROUP	Mixed needle-leaved evergreen - cold-deciduous forest (I.C.3)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural (I.C.3.N)
FORMATION	Mixed needle-leaved evergreen - cold-deciduous forest (I.C.3.N.a)

ALLIANCE *Tsuga canadensis - Liriodendron tulipifera* Forest Alliance

CLASSIFICATION CONFIDENCE LEVEL 1

USFWS WETLAND SYSTEM Upland

RANGE

Globally

This community occurs in the mountains of Georgia, North Carolina, South Carolina, Tennessee, and Virginia and may possibly range into West Virginia.

Great Smoky Mountains National Park

This community was sampled from the Cades Cove quadrangle. Additional historic samples came from the Calderwood and Thunderhead Mountain quadrangles. It undoubtedly occurs in other areas of the Park. Samples from the Cades Cove quadrangle ranged in elevation from 1840 to 3020 feet elevation. In the northern portion of the quadrangle this community was sampled along Victory Branch, along the Left Prong of Anthony Creek, and along Tater Branch, north of Tater Ridge. In the central portion of the quadrangle this community was sampled at several locations in the vicinity of Forge Creek. and at the confluence of Big Tommy Branch and Ekaneetlee Creek.

ENVIRONMENTAL DESCRIPTION

Globally

These forests are typically found at lower elevations of the Blue Ridge escarpment, occurring over acid soils, on gentle to moderately steep, lower slopes and in coves.

Great Smoky Mountains National Park

This community was sampled on low slopes and flats, mostly below 3000 feet elevation. This forest is often associated with streams but is not a wetland.

MOST ABUNDANT SPECIES

Globally

Stratum	Species
Tree canopy	*Tsuga canadensis, Liriodendron tulipifera, Betula lenta*
Tall Shrub	*Rhododendron maximum*
Herbaceous	variable

Great Smoky Mountains National Park

Stratum	Species
Tree canopy	*Tsuga canadensis, Liriodendron tulipifera, Betula lenta*
Tall Shrub	*Rhododendron maximum*

CHARACTERISTIC SPECIES

Globally

Tsuga canadensis, Liriodendron tulipifera, Betula lenta, Leucothoe fontanesiana, Tiarella cordifolia

Great Smoky Mountains National Park

See above

VEGETATION DESCRIPTION

Globally

Forests dominated by *Tsuga canadensis* occurring with deciduous trees such as *Liriodendron tulipifera, Betula lenta,* and *Acer rubrum.* Other deciduous species more typical of "rich" coves may occur as scattered individuals, such as *Tilia americana* var. *heterophylla, Fraxinus americana,* and *Fagus grandifolia*. Other canopy/subcanopy species often include *Quercus alba, Quercus rubra, 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. Typical herbs include *Polystichum acrostichoides, Goodyera pubescens, Thelypteris noveboracensis, Galax urceolata, Hexastylis sp.,* and *Tiarella cordifolia.*

Great Smoky Mountains National Park

The canopy of this forests is dominated by *Tsuga canadensis* occurring with deciduous trees such as *Liriodendron tulipifera, Betula lenta,* and *Acer rubrum.* Other deciduous species that will occasionally have high coverage in the canopy or subcanopy include *Betula alleghaniensis, Tilia americana* var. *heterophylla*, and *Fagus grandifolia.* Other canopy/subcanopy species can include *Magnolia fraseri, Ilex opaca, Cornus florida, Halesia tetraptera, Oxydendrum arboreum*, and *Pinus strobus. Rhododendron maximum* is scattered to dominant in the shrub stratum. Other typical shrubs include *Euonymus americanus, Ilex opaca*, and *Leucothoe fontanesiana*. Herbaceous cover is sparse. Typical herbs include *Mitchella repens* and *Polystichum acrostichoides.*

OTHER NOTEWORTHY SPECIES

No information

CONSERVATION RANK G5

RANK JUSTIFICATION

DATABASE CODE CEGL007543

COMMENTS

Globally

None.

Great Smoky Mountains National Park

This community can include areas where *Betula lenta* and *Liriodendron tulipifera* dominate over dense *Rhododendron maximum* without canopy *Tsuga canadensis*. This situation was found on the Cades Cove quadrangle at the confluence of Big Tommy Branch and Ekaneetlee Creek. On aerial photography, this community may appear similar to other Hemlock-Hardwood communities (*i.e. Tsuga canadensis - Halesia tetraptera - (Fagus grandifolia, Magnolia fraseri) / Rhododendron maximum / Dryopteris intermedia* Forest (CEGL007693) and *Tsuga canadensis – Betula alleghaniensis / Rhododendron maximum / Leucothoe fontanesiana* Forest (CEGL007861)). Some occurrences, where *Tsuga canadensis* overtops the deciduous trees, may have signatures similar to Hemlock and Hemlock-White Pine Forests (*i.e. Tsuga canadensis / Rhododendron maximum - Leucothoe fontanesiana* Forest (CEGL007136) and *Pinus strobus - Tsuga canadensis / Rhododendron maximum - Leucothoe fontanesiana* Forest (CEGL007102).

REFERENCES

Gettman 1974, Newell and Peet 1995, Patterson 1994, Schafale and Weakley 1990

Pinus echinata / Schizachyrium scoparium Appalachian Woodland

COMMON NAME	Shortleaf Pine / Little Bluestem Appalachian Woodland
SYNONYM	Shortleaf Pine / Little Bluestem Appalachian Woodland
PHYSIOGNOMIC CLASS	Woodland (II)
PHYSIOGNOMIC SUBCLASS	Evergreen woodland (II.A)
PHYSIOGNOMIC GROUP	Temperate or subpolar needle-leaved evergreen woodland (II.A.4)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural (II.A.4.N)
FORMATION	Rounded-crowned temperate or subpolar needle-leaved evergreen woodland (II.A.4.N.a)
ALLIANCE	*Pinus echinata* Woodland Alliance
CLASSIFICATION CONFIDENCE LEVEL	3
USFWS WETLAND SYSTEM	Upland

RANGE

Globally

These woodlands occurred historically in the Appalachian regions of Alabama, Kentucky, Tennessee, and Virginia. Today, remnant examples are known from Virginia. Restoration efforts are underway in the Daniel Boone National Forest, Kentucky, and in the Great Smoky Mountains National Park, Tennessee.

Great Smoky Mountains National Park

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

ENVIRONMENTAL DESCRIPTION

Globally

These woodlands are typically found on dry ridges or rock outcrops. The woodland structure is maintained by dry site conditions and occasional fire.

Great Smoky Mountains National Park

No information

MOST ABUNDANT SPECIES

Globally

Stratum	Species
No information	

Great Smoky Mountains National Park

Stratum	Species
No information	

CHARACTERISTIC SPECIES

Globally

Pinus echinata, Vaccinium pallidum, Schizachyrium scoparium

Great Smoky Mountains National Park

No information

VEGETATION DESCRIPTION

Globally

These woodlands are dominated by *Pinus echinata* with less than 25 percent cover by *Quercus* spp. They may contain an admixture of *Pinus virginiana* or *Pinus rigida*. The understory is open and dominated by graminoids and forbs.

Great Smoky Mountains National Park

No information

OTHER NOTEWORTHY SPECIES
This community was historically habitat for montane populations of Red-cockaded Woodpecker (*Picoides borealis*).

CONSERVATION RANK G2

RANK JUSTIFICATION
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.

DATABASE CODE CEGL003560

COMMENTS
Globally
More information is needed to characterisze and distinguish this community. Fire-suppressed examples of this community can be found in Virginia on Pine Mountain, with *Baptisia tinctoria* and *Aureolaria pectinata*. 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.). The current presence of related vegetation in the Cumberlands and/or the Interior Low Plateau of Kentucky and Tennessee is more speculative; in those regions, this type was probably more common historically.

Great Smoky Mountains National Park

REFERENCES
Campbell pers. comm., Dellinger pers. comm.

Pinus pungens - Pinus rigida (Quercus prinus) / Kalmia latifolia - Vaccinium pallidum **Woodland**

COMMON NAME	Table Mountain Pine - Pitch Pine (Rock Chestnut Oak) / Mountain Laurel - Hillside Blueberry Woodland
SYNONYM	Blue Ridge Table Mountain Pine - Pitch Pine Woodland (Typic Type)
PHYSIOGNOMIC CLASS	Woodland (II)
PHYSIOGNOMIC SUBCLASS	Evergreen woodland (II.A)
PHYSIOGNOMIC GROUP	Temperate or subpolar needle-leaved evergreen woodland (II.A.4)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural (II.A.4.N)
FORMATION	Rounded-crowned temperate or subpolar needle-leaved evergreen woodland (II.A.4.N.a)
ALLIANCE	*Pinus pungens - (Pinus rigida)* Woodland Alliance
CLASSIFICATION CONFIDENCE LEVEL	1
USFWS WETLAND SYSTEM	Upland

RANGE

Globally

This community is known from the mountains of North Carolina, South Carolina, Tennessee, and Virginia.

Great Smoky Mountains National Park

This community was sampled on both the Cades Cove and Mount Le Conte quadrangles and occurs in other areas of the Park. On the Cade Cove quadrangle it was found at elevations from 2300 to 3800 feet. Areas sampled include Cobb Butt and Cobb Ridge, on south slopes and along the southern ridgeline from 3500 to 3800 feet elevation; an area north of the Cades Cove Loop Road, north of Tater Ridge, on a southwest sideridge of Cave Ridge at 2840 feet; and just southeast of the Cades Cove Loop Road, on northwest, steep, middle slopes above Anthony Creek at 2400 feet. Historic samples that may represent this community on the Cades Cove quadrangle were taken from the broad ridges and upper, west- to southeast-facing slopes north of Parsons Branch Road, above Rabbit Creek (2460 to2500 feet elevation); the upper east slopes of Leadbetter Ridge (2300 feet elevation); the eastern, middle slopes of Gregory Ridge (3040 to 3440 feet elevation); and the middle and upper south slopes of Mollies Ridge / Butt from 2840 to 3500 feet elevation. This community seems to be less common on the Mount Le Conte quadrangle and was found at elevations from 1850 to 4200 feet. It was sampled in the southwestern portion of the quadrangle, on the southeast slopes of Bullhead (4200 feet); in the central portion of the quadrangle on the lower western slopes of Mt. Winnesoka above Roaring Fork (2700 feet); north of Brushy Mountain, on the southeast slopes below Turkey Ridge (3700 feet); on the southern part of Potato Ridge; and on a northeast-running sideridge of Mt. Winnesoka, above Injun Creek (2180 feet). In the northeastern portion of the quadrangle, this community was found north of Copeland Creek, on the southwest high slopes over Copeland Creek (1850 feet).

ENVIRONMENTAL DESCRIPTION

Globally

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. Fire contributes to the maintenance of this community by destroying the litter layer, opening the canopy, releasing seed from the serotinous cones, and killing competing vegetation. Remaining examples of these forests are frequently fire-suppressed or affected by Southern pine beetle (*Dendroctonus frontalis*) and will have standing dead trees, thick litter layers, and much understory encroachment by hardwood species. Red Squirrels are known to cut branches to remove the *Pinus pungens* cones. It is thought this "squirrel grazing" may decrease the growth and vigor of trees (Zobel 1969). Canopy removal by ice storms stimulate oak sprouting and release advanced regeneration (Williams and Johnson 1992).

Great Smoky Mountains National Park

This community is found on the Cades Cove quadrangle at elevations from 2300 to 3800 feet, on exposed ridgetops and on middle to upper slopes with west to southeast aspects. On the Mount Le Conte quadrangle it is found on similar sites, with south and southwest aspects, but reaches elevations over 4000 feet and as low as 1850 feet. Landforms are steep, flat to convex slopes and ridges. Soils are thin, rocky or sandy, and litter layers are thick. Almost all stands sampled showed evidence of Southern pine beetle (*Dendroctonus frontalis*) with dead or dying *Pinus pungens*.

MOST ABUNDANT SPECIES

Globally

Stratum	Species
Tree canopy	(*Pinus pungens, Pinus rigida)*
Subcanopy	*Quercus prinus, Acer rubrum, Nyssa sylvatica, Oxydendrum arboreum*
Tall shrub	*Kalmia latifolia*
Short shrub	*Vaccinium pallidum*
Herbaceous	*Galax urceolata*

Great Smoky Mountains National Park

Stratum	Species
Tree canopy	(*Pinus pungens, Pinus rigida)*
Subcanopy	*Acer rubrum, Nyssa sylvatica*
Tall shrub	*Kalmia latifolia*
Short shrub	*Gaylussacia ursina, Vaccinium pallidum*
Herbaceous	*Galax urceolata, Epigaea repens, Gaultheria procumbens*
Vine/Liana	*Smilax rotundifolia*

CHARACTERISTIC SPECIES

Globally

Pinus pungens, Fothergilla major, Comptonia peregrina, Leiophyllum buxifolium, Gaultheria procumbens, Epigaea repens, Galax urceolata, Xerophyllum asphodeloides

Great Smoky Mountains National Park

Pinus pungens, Pinus rigida, Kalmia latifolia, Gaylussacia ursina, Gaultheria procumbens, Galax urceolata, Epigaea repens, Melampyrum lineare, Pteridium aquilinum

VEGETATION DESCRIPTION

Globally

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. 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* 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 minus, Leucothoe recurva, Gaylussacia ursina, Gaylussacia baccata,* and *Fothergilla major.* Species commonly found in the sparse herb stratum include *Chimaphila maculata, Galax urceolata, Pteridium aquilinum* var. *latusculum, Xerophyllum asphodeloides, Comptonia peregrina, Leiophyllum buxifolium, Gaultheria procumbens, Iris verna, Dichanthelium* spp., and *Epigaea repens*, although herbaceous species composition will vary within the range of this community. *Smilax glauca* is a common vine.

Great Smoky Mountains National Park

This community has a woodland to forest canopy dominated by *Pinus pungens* and/or *Pinus rigida*, which often overtop all other trees species. The canopy can include many standing dead and dying *Pinus* species. Some occurrences may have significant canopy coverage by *Quercus prinus* or *Quercus coccinea*. A tree subcanopy may be absent or well-developed, with as much as 80 percent coverage and composed of small-diameter trees, typically *Acer rubrum, Oxydendrum arboreum,* and *Nyssa sylvatica*. Other tree species that can occur in the canopy and subcanopy include *Amelanchier laevis, Castanea dentata, Magnolia fraseri, Pinus virginiana, Quercus rubra, Robinia pseudoacacia, Carya alba, Pinus strobus*, and *Tsuga canadensis*. A tall-shrub stratum varies from sparse and patchy to dense and continuous, often dominated by *Kalmia latifolia* and/or *Vaccinium stamineum*. Occurrences at high elevations (over 4000 feet) have *Pieris floribunda* as a dominant shrub. The short shrub stratum ranges in coverage from 0 to 80 percent and is often dominated by *Gaylussacia ursina*. Other shrubs that may dominate this stratum include *Vaccinium hirsutum, Vaccinium pallidum,* and *Gaylussacia baccata*. Additional shrub species that are found in this community include species from the canopy and subcanopy, as well as *Acer pensylvanicum, Ilex montana, Pyrularia pubera, Quercus velutina, Rhododendron carolinianum, Rhododendron calendulaceum, Rhododendron maximum,* and *Sassafras albidum*. The herbaceous stratum can be sparse to moderate in coverage and is composed of various sub-shrubs and dry site forbs. *Epigaea repens, Galax urceolata,* and *Gaultheria procumbens* typically have the most coverage. Other species in the herbaceous stratum can include *Chimaphila maculata,Cleistes divaricata, Coreopsis major, Cypripedium acaule, Dichanthelium commutatum, Goodyera pubescens, Melampyrum lineare, Pteridium aquilinum, Schizachyrium scoparium,* and *Tephrosia virginiana.* The litter layer is thick and often makes up greater than 50 percent of the ground cover. *Smilax rotundifolia* is a common vine.

OTHER NOTEWORTHY SPECIES
Species in this community, which have the bulk of their worldwide range in the southern Blue Ridge, include *Leiophyllum buxifolium, Pieris floribunda, Pinus pungens,* and *Xerophyllum asphodeloides*. Animals found in this community include Red Squirrel *(Tamiasciurus hudsonicus*) and Wild Turkey *(Meleagris gallopavo*). The Mountain Pine Coneworm (*Dioryctria yatesi*), a moth larva that feeds only on the cones of *Pinus pungens,* may be locally abundant in this community (Hedlin *et al.* 1981).

CONSERVATION RANK G3

RANK JUSTIFICATION
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.

DATABASE CODE CEGL007097

COMMENTS
Globally
Without periodic fire, this community will gradually succeed into forests dominated by *Quercus prinus* and *Quercus coccinea* (CEGL006271), 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 (Barden 1977, Zobel 1969). 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.*

Great Smoky Mountains National Park
Examples at the lowest elevations (below 2300 feet) on the Mount Le Conte quadrangle lacked *Pinus pungens* and *Pinus virginiana* and were dominated by *Pinus rigida* and *Quercus coccinea*. Many former examples of this community now exist as chestnut oak forests (CEGL006271) due to fire suppression and pine mortality due to Pine Bark Beetle. This community often grades into *Quercus prinus*-dominated forests (CEGL006271) on the ridgelines above. Other adjacent communities can include heath shrublands or oak - hickory forests on less exposed sites.

REFERENCES
Barden 1977, Golden 1981, Hedlin et al. 1981, McLeod 1988, Nelson 1986, Newell and Peet 1995, 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. 1990, Zobel 1969

Paulownia tomentosa Woodland

COMMON NAME	Princess-tree Woodland
SYNONYM	Princess-Tree Woodland
PHYSIOGNOMIC CLASS	Woodland (II)
PHYSIOGNOMIC SUBCLASS	Deciduous woodland (II.B)
PHYSIOGNOMIC GROUP	Cold-deciduous woodland (II.B.2)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural (II.B.2.N)
FORMATION	Cold-deciduous woodland (II.B.2.N.a)

ALLIANCE *Paulownia tomentosa* Woodland Alliance

CLASSIFICATION CONFIDENCE LEVEL 2

USFWS WETLAND SYSTEM Upland

RANGE

Globally

Paulownia tomentosa is native to eastern Asia, where it is a minor component of deciduous mesophytic forests. It has become naturalized in portions of the eastern United States, where it occurs as small, scattered populations along roadsides, in disturbed woodlots, and in streamside forests. The species has been widely planted in eastern North America from Montreal to Florida, and west to Missouri and Texas. The association, however, is currently only defined for montane portions of North Carolina, Tennessee, and Virginia.

Great Smoky Mountains National Park

This community was not sampled on the Cades Cove or Mount Le Conte quadrangles. It is possible in the park.

ENVIRONMENTAL DESCRIPTION

Globally

This woodland occurs on steep roadcuts, highway rights-of-way, and in other disturbed steep and rocky areas. *Paulownia tomentosa* is not likely to become an invasive pest, since it requires large-scale, substrate-scarifying disturbance for optimal establishment and maintenance.

Great Smoky Mountains National Park

No Information

MOST ABUNDANT SPECIES

Globally

Stratum	Species
No Information	

Great Smoky Mountains National Park

Stratum	Species
No Information	

CHARACTERISTIC SPECIES

Globally

No Information

Great Smoky Mountains National Park

No Information

VEGETATION DESCRIPTION

Globally

No Information

Great Smoky Mountains National Park

No Information

OTHER NOTEWORTHY SPECIES
No Information

CONSERVATION RANK GW

RANK JUSTIFICATION This vegetation is dominated by invasive alien species and is thus not a conservation priority.

DATABASE CODE CEGL003687

COMMENTS
Globally
No Information

Great Smoky Mountains National Park

REFERENCES
Burns and Honkala 1990b, Williams 1993

Kalmia latifolia - Rhododendron catawbiense – (Gaylussacia baccata, Pieris floribunda, Vaccinium corymbosum) Shrubland

COMMON NAME	Mountain Laurel - Catawba Rhododendron – (Black Huckleberry, Mountain Fetterbush, Southern Appalachian Blueberry) Shrubland
SYNONYM	Southern Appalachian Heath Bald
PHYSIOGNOMIC CLASS	Shrubland (III)
PHYSIOGNOMIC SUBCLASS	Evergreen shrubland (III.A)
PHYSIOGNOMIC GROUP	Temperate broad-leaved evergreen shrubland (III.A.2)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural (III.A.2.N)
FORMATION	Hemi-sclerophyllous temperate broad-leaved evergreen shrubland (III.A.2.N.b)

ALLIANCE *Rhododendron (catawbiense, carolinianum) - Kalmia latifolia* Shrubland Alliance

CLASSIFICATION CONFIDENCE LEVEL 2

USFWS WETLAND SYSTEM Upland

RANGE

Globally

This community occurs in the mountains of Georgia, North Carolina, and Tennessee.

Great Smoky Mountains National Park

This community was sampled on the Mount Le Conte quadrangle and not on the Cades Cove quadrangle, although it is possible there. This community is uncommon in the landscape but possible in other areas of the Park. On the Mount Le Conte quadrangle it was sampled on Brushy Mountain, ridges along the Alum Cave Trail south of Mount Le Conte (4600 and 4900 feet), and in the southwestern portion of the quadrangle on the western ridge of Balsam Point, the vicinity of Chimney Tops, and east of Bullhead.

ENVIRONMENTAL DESCRIPTION

Globally

This community occurs on ridges and steep rocky slopes at intermediate elevations in the southern Blue Ridge (4000 to 5000 feet elevation). 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.

Great Smoky Mountains National Park

This community occurs on southerly exposed ridges and steep slopes below 5000 feet elevation. Samples range from 4190 to 4900 feet elevation. One example is in a gap, on a convex slope, and may be a fire scar.

MOST ABUNDANT SPECIES

Globally

Stratum	Species
No information	

Great Smoky Mountains National Park

Stratum	Species
Tall shrub	*Rhododendron catawbiense, Kalmia latifolia*
Short shrub	*Rhododendron catawbiense, Leiophyllum buxifolium*

CHARACTERISTIC SPECIES

Globally

No information

Great Smoky Mountains National Park

Kalmia latifolia, Rhododendron catawbiense, Gaylussacia baccata, Pieris floribunda, Vaccinium corymbosum, Galax urceolata, Gaultheria procumbens

VEGETATION DESCRIPTION

Globally

No information

Great Smoky Mountains National Park

This community is a mostly evergreen shrubland, although deciduous shrubs may be present and even locally dominant. Shrubs form a dense, sometimes impenetrable thicket, one to four meters tall. The most typical shrub dominants are *Kalmia latifolia* and *Rhododendron catawbiense*, although *Gaylussacia baccata, Leiophyllum buxifolium, Pieris floribunda, Rhododendron carolinianum, Rhododendron maximum, Vaccinium corymbosum* are dominant or have high coverage in some occurrences. Other shrubs include *Aronia melanocarpa, Clethra acuminata, Vaccinium simulatum, Vaccinium stamineum,* and *Viburnum nudum* var. *cassinoides.* Small openings in the shrub canopy are dominated by rock or herbs, with some occurrences having up to 60 percent exposed rock. However, herb cover beneath the shrub canopy is absent or very sparse (< 5 percent) 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)* and may be more typical of shrublands resulting from intense fires on less exposed sites.

OTHER NOTEWORTHY SPECIES

Animals observed in this community include Black Bear, Peregrine Falcon, Dark-eyed Junco, and Black-throated Green Warbler.

CONSERVATION RANK G2G3

RANK JUSTIFICATION

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.

DATABASE CODE CEGL003814

COMMENTS

Globally

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. 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).

Great Smoky Mountains National Park

This community typically occurs below the elevation of spruce - fir forests and adjacent to forests dominated by Table Mountain pine, northern red oak, or *Fagus grandifolia* ("Beech Gaps"). Occurrences at high elevations may be transitional to *Rhododendron carolinianum - Rhododendron catawbiense - Leiophyllum buxifolium* Shrubland (CEGL007876), and it may be difficult to distinguish the two heath bald signatures. The alliance may serve as a better mapping unit for these communities.

REFERENCES

Risk 1993, Schafale and Weakley 1990

Rhododendron carolinianum - Rhododendron catawbiense - Leiophyllum buxifolium Shrubland

COMMON NAME	Carolina Rhododendron - Catawba Rhododendron – Sand Myrtle Shrubland
SYNONYM	Southern Appalachian Heath Bald
PHYSIOGNOMIC CLASS	Shrubland (III)
PHYSIOGNOMIC SUBCLASS	Evergreen shrubland (III.A)
PHYSIOGNOMIC GROUP	Temperate broad-leaved evergreen shrubland (III.A.2)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural (III.A.2.N)
FORMATION	Hemi-sclerophyllous temperate broad-leaved evergreen shrubland (III.A.2.N.b)
ALLIANCE	*Rhododendron (catawbiense, carolinianum) - Kalmia Latifolia* Shrubland Alliance
CLASSIFICATION CONFIDENCE LEVEL	3
USFWS WETLAND SYSTEM	Upland

RANGE

Globally

This community occurs in the Great Smoky Mountains of eastern Tennessee.

Great Smoky Mountains National Park

This community was sampled from the highest elevations of the Mount Le Conte quadrangle and is not expected on the Cades Cove quadrangle. It may occur in other high elevation areas of the Park. On the Mount Le Conte quadrangle this community was sampled from Rocky Spur north of Mount Le Conte; from Clifftop west of the Mount Le Conte summit; and from the Jumpoff, in the vicinity of Mount Kephart.

ENVIRONMENTAL DESCRIPTION

Globally

Great Smoky Mountains National Park

This community occurs on steep ridges, rock outcroppings, and landslides at elevations over 5500 feet, in the spruce - fir zone. High solar irradiation and desiccating winds, in combination with the shallow, nutrient-poor soils, are key environmental factors influencing this community. Locally, vegetation is influenced by seepage areas on steep cliffs and ledges (*e.g.* southwest portion of the Mount Le Conte summit). This community is known from areas of exposed slate on the steep ridges of Mount Le Conte (Ramseur 1958).

MOST ABUNDANT SPECIES

Globally

Stratum	Species
No information	

Great Smoky Mountains National Park

Stratum	Species
Tall shrub	*Rhododendron catawbiense*
Short shrub	*Rhododendron carolinianum, Leiophyllum buxifolium*

CHARACTERISTIC SPECIES

Globally

No information

Great Smoky Mountains National Park

Rhododendron carolinianum, Rhododendron catawbiense, Leiophyllum buxifolium, Abies fraseri, Picea rubens, Diervilla sessilifolia, Menziesia pilosa

VEGETATION DESCRIPTION

Globally

No information

Great Smoky Mountains National Park

This community has 25 to 100 percent shrub cover and may occur as a dense shrubland, two to four meters tall, or as a shorter,

more open shrubland with areas of exposed rock, scattered mats of prostrate vegetation, and isolated clumps of herbaceous species. The most common shrubs are *Rhododendron carolinianum, Rhododendron catawbiense,* and *Leiophyllum buxifolium,* locally dominant in patches and forming a mosaic. Shrubs are less than one meter tall on the steepest, rockiest, most exposed sites, and taller on gentle, more protected sites with greater soil development. Other associated shrubs with minor coverage may include *Abies fraseri, Aronia arbutifolia, Aronia melanocarpa, Diervilla sessilifolia, Ilex montana, Menziesia pilosa, Pieris floribunda, Prunus pensylvanica, Vaccinium corymbosum, Vaccinium erythrocarpum,* and *Viburnum nudum* var. *cassinoides*. Under tall dense shrubs there is little herb cover, but in more open shrublands, on steep cliffs with seepage, herbaceous species may grow in dense patches on ledges and crevices. Herbaceous species such as *Calamagrostis cainii, Carex misera, Geum radiatum, Saxifraga michauxii, Solidago glomerata, Scirpus cespitosus* are associated with this community on the summits of Mount Le Conte. Thick hummocks of lichens and mosses can occur on flatter sites. Scattered wind-sheared trees of *Picea rubens* or *Abies fraseri* are possible in some examples.

OTHER NOTEWORTHY SPECIES
No information

CONSERVATION RANK G1

RANK JUSTIFICATION
This community is limited in extent, occurring as scattered pockets in the southern Appalachian Mountains, possibly limited to the Great Smoky Mountains. This fragile community is threatened by heavy recreational use.

DATABASE CODE CEGL007876

COMMENTS
Globally
The taxonomic distinctions between *Rhododendron minus* and *Rhododendron carolinianum* is currently uncertain. Some of what is treated here as *Rhododendron carolinianum* may prove to be *Rhododendron minus.* This association contains a portion of the former concept of *Rhododendron carolinianum* Shrubland (CEGL003816), which occurs at lower elevations in areas of quartzite and meta-arkose geology.

Great Smoky Mountains National Park
This shrubland grades into vegetation dominated by *Picea rubens* and/or *Abies fraseri*. Particularly on the summit and high slopes of Mount Le Conte, the taxonomic distinction between *Rhododendron minus* and *Rhododendron carolinianum* is uncertain. Some of what is treated here as *Rhododendron carolinianum* may prove to be *Rhododendron minus*. It may be difficult to distinguish the signature of this heath bald type from that of *Kalmia latifolia - Rhododendron catawbiense – (Gaylussacia baccata, Pieris floribunda, Vaccinium corymbosum*) Shrubland (CEGL003814), especially at transitional elevations. The alliance may serve as a better mapping unit for these communities.

REFERENCES
Ramseur 1958, Risk 1993, Whittaker 1979

Arundinaria gigantea ssp. *gigantea* Shrubland

COMMON NAME	Giant Cane Shrubland
SYNONYM	Interior Highlands Canebrake
PHYSIOGNOMIC CLASS	Shrubland (III)
PHYSIOGNOMIC SUBCLASS	Evergreen shrubland (III.A)
PHYSIOGNOMIC GROUP	Temperate broad-leaved evergreen shrubland (III.A.2)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural (III.A.2.N)
FORMATION	Temporarily flooded temperate broad-leaved evergreen shrubland (III.A.2.N.g)
ALLIANCE	*Arundinaria gigantea* Temporarily Flooded Shrubland Alliance
CLASSIFICATION CONFIDENCE LEVEL	3
USFWS WETLAND SYSTEM	Palustrine

RANGE

Globally

Remnants of this community are found throughout the southeastern United States in Alabama, Arkansas, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, and Texas, and may range into Virginia.

Great Smoky Mountains National Park

This community was sampled from one location on the Cade Cove quadrangle. It is unlikely on the Mount Le Conte quadrangle. It could occur in other areas of the Park, particularly along larger rivers. This community was sampled from the western end of the Cades Cove Loop Road, along Abrams Creek.

ENVIRONMENTAL DESCRIPTION

Globally

This is a seasonally to temporarily flooded wetland, occurring on alluvial and loess substrates, associated with streamside flats and bottomlands. This vegetation is thought to be maintained by frequent fire and may have historically been the result of burning by Native Americans or succession on extensive, abandoned aboriginal floodplain agricultural lands.

Great Smoky Mountains National Park

This vegetation occurs in association with an oxbow pond.

MOST ABUNDANT SPECIES

Globally

Stratum	Species
Tall shrub	*Arundinaria gigantean*

Great Smoky Mountains National Park

Stratum	Species
See above	

CHARACTERISTIC SPECIES

Globally

Arundinaria gigantean

Great Smoky Mountains National Park

See above

VEGETATION DESCRIPTION

Globally

This wetland is dominated by dense coverage of *Arundinaria gigantea* from one to over three meters tall. There is no tree understory, but widely scattered trees may be present.

Great Smoky Mountains National Park

The single example of this community observed on the Cades Cove quadrangle covers approximately 750 square meters. It is a dense, monospecific stand of *Arundinaria gigantea.*

OTHER NOTEWORTHY SPECIES
None

CONSERVATION RANK G2?

RANK JUSTIFICATION
This vegetation was widespread historically and now occupies 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 in the southeastern United States. Today, this vegetation exists as small remnants, and high quality examples are extremely rare, if not absent.

DATABASE CODE CEGL003836

COMMENTS
Globally
This association is a general placeholder for several associations that are likely to be recognized.

Great Smoky Mountains National Park
On the Cades Cove quadrangle this vegetation occurs adjacent to a shrub swamp and abandoned agricultural fields.

REFERENCES
Campbell 1980, Campbell 1989, Davidson 1950, Foti et al. 1994, Heineke 1987, Hoagland 1997, Hughes 1966, McInteer 1952, Meanley 1972, Mohr 1901, Platt and Brantley 1992, Platt and Brantley 1997

Vitis aestivalis Vine-Shrubland

COMMON NAME	Summer Grape Vine-Shrubland
SYNONYM	Montane Grape Opening; "Grapehole"
PHYSIOGNOMIC CLASS	Shrubland (III)
PHYSIOGNOMIC SUBCLASS	Deciduous shrubland (III.B)
PHYSIOGNOMIC GROUP	Cold-deciduous shrubland (III.B.2)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural (III.B.2.N)
FORMATION	Temperate cold-deciduous shrubland (III.B.2.N.a)
ALLIANCE	*Vitis aestivalis* Vine-Shrubland Alliance
CLASSIFICATION CONFIDENCE LEVEL	2
USFWS WETLAND SYSTEM	Upland

RANGE

Globally

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.

Great Smoky Mountains National Park

This community was sampled on both the Cades Cove and Mount Le Conte quadrangles, and it is likely elsewhere in the Park. It was sampled in the central and eastern portion of the Mount Le Conte quadrangle, on steep slopes north of Potato Ridge and north of Mt. Winnesoka. On the Cades Cove quadrangle it was sampled or observed on the north slopes of Allnight Ridge, in the northern portion of the quadrangle, and on steep slopes over Rowans Branch and steep slopes south of Pond Knob, in the eastern portion of the quadrangle.

ENVIRONMENTAL DESCRIPTION

Globally

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

Great Smoky Mountains National Park

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

MOST ABUNDANT SPECIES

Globally

Stratum	Species
Vine/Liana	*Vitis aestivalis*

Great Smoky Mountains National Park

Stratum	Species
See above	

CHARACTERISTIC SPECIES

Globally

Vitis aestivalis

Great Smoky Mountains National Park

Vitis aestivalis, Aristolochia macrophylla

VEGETATION DESCRIPTION

Globally

This vegetation includes thickets dominated by dense *Vitis aestivalis.* Emergent small to large trees (usually draped in *Vitis*) can occur. Herbaceous cover is low because of the dense vine cover.

Great Smoky Mountains National Park

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 to 100 percent coverage. Trees in the canopy and subcanopy have zero to 50 percent coverage and vary from site to site, but typical species include *Acer rubrum, Acer saccharum, Halesia tetraptera* var. *monticola,* and *Liriodendron tulipifera*. The shrub layer is sparse. The herb layer is sparse to moderate, decreasing with vine coverage. Herbaceous composition varies from site to site but is typical of mesic forests in the Park. Some of the more common species from the sampled areas are *Ageratina altissima* var. *altissima, Amphicarpaea bracteata, Arisaema triphyllum* ssp. *triphyllum, Polystichum acrostichoides, Sanguinaria canadensis,* and *Viola* spp. Beneath the vine canopy, coarse woody debris and tip-up mounds are typical.

OTHER NOTEWORTHY SPECIES
Black Bear use this community.

CONSERVATION RANK G2G3

RANK JUSTIFICATION
This is an uncommon community. It is restricted within its range and could be limited by specific disturbance regimes.

DATABASE CODE CEGL003890

COMMENTS
Globally
This community can be important for wildlife, especially bears.

Great Smoky Mountains National Park
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 treefall and gap formation.

REFERENCES
MacKenzie 1993

Rubus canadensis - (Rubus idaeus ssp. *strigosus) / Athyrium filix-femina - Solidago glomerata* Shrubland

COMMON NAME	Smooth Blackberry - (Red Raspberry) / Lady Fern - Skunk Goldenrod Shrubland
SYNONYM	High Elevation Blackberry Thickets
PHYSIOGNOMIC CLASS	Shrubland (III)
PHYSIOGNOMIC SUBCLASS	Deciduous shrubland (III.B)
PHYSIOGNOMIC GROUP	Cold-deciduous shrubland (III.B.2)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural (III.B.2.N)
FORMATION	Subalpine or subpolar cold-deciduous shrubland (III.B.2.N.b)

ALLIANCE *Rubus allegheniensis - Rubus canadensis* Shrubland Alliance

CLASSIFICATION CONFIDENCE LEVEL 2

USFWS WETLAND SYSTEM Upland

RANGE

Globally

This forest occurs at high elevations in the southern Appalachian Mountains of North Carolina and Tennessee.

Great Smoky Mountains National Park

This community was sampled on the summit of Mount Le Conte on the Mount Le Conte quadrangle. It was not sampled, nor is it expected, on the Cades Cove quadrangle, although it may occur in other areas of the Park.

ENVIRONMENTAL DESCRIPTION

Globally

This vegetation results from severe disturbance of spruce - fir forests (*i.e.* Balsam Woolly Adelgid-affected stands), as well as exposed sites with other frequent natural disturbance. It occurs on exposed summits and high slopes, typically at elevations over 6000 feet.

Great Smoky Mountains National Park

See above

MOST ABUNDANT SPECIES

Globally

Stratum	Species
Tree Canopy	*Abies fraseri* (dead)
Tall shrub	*Rubus canadensis*

Great Smoky Mountains National Park

Stratum	Species
Tree Canopy	*Abies fraseri* (dead)
Tall shrub	*Rubus canadensis, (Diervilla sessilifolia)*
Herbaceous	(*Athyrium filix-femina* ssp. *asplenioides, Solidago glomerata)*

CHARACTERISTIC SPECIES

Globally

Great Smoky Mountains National Park

Rubus canadensis, Diervilla sessilifolia, Athyrium filix-femina ssp. *asplenioides, Solidago glomerata*

VEGETATION DESCRIPTION

Globally

High elevation Appalachian *Rubus* thickets resulting from death of *Abies fraseri* or shrub invasion of grazed fire meadows. Differs from *Rubus* thickets on grassy balds by predominance of forbs rather than sedges and by frequent presence of *Rubus idaeus*. Long-term future of this community is uncertain, but it appears to be fairly stable over periods of several decades. Standing dead *Abies fraseri* are frequent. Scattered living *Picea rubens, Sorbus americana, Betula allegheniensis*, and *Amelanchier laevis* may occur.

Great Smoky Mountains National Park
This is successional vegetation on the summit of Mount Le Conte resulting from the death of *Abies fraseri*. Vegetation is variously dominated by *Rubus canadensis* and *Diervilla sessilifolia* (on the most exposed sites), by dense *Rubus canadensis,* or by dense *Athyrium filix-femina* ssp. *asplenioides* and *Solidago glomerata* (on more protected sites). Standing dead trees tower above the shrubs and herbs, and there is much downed woody debris. Other species present include *Abies fraseri, Agrostis perennans, Angelica triquinata, Aster acuminatus, Carex brunnescens, Carex crinita, Carex intumescens, Carex debilis, Cinna latifolia, Clintonia borealis, Danthonia compressa, Oxalis montana, Picea rubens, Prunus pensylvanica, Rugelia nudicaulis,* and *Sorbus americana.*

OTHER NOTEWORTHY SPECIES
No information

CONSERVATION RANK GM

RANK JUSTIFICATION
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.

DATABASE CODE CEGL003893

COMMENTS
Globally

Great Smoky Mountains National Park
This community grades into *Abies fraseri / Viburnum lantanoides / Dryopteris campyloptera - Oxalis montana / Hylocomium splendens* Forest (CEGL006049).

REFERENCES
None

Alnus serrulata - Xanthorhiza simplicissima Shrubland

COMMON NAME	Smooth Alder - Yellowroot Shrubland
SYNONYM	Rocky Bar and Shore (Alder-Yellowroot Type)
PHYSIOGNOMIC CLASS	Shrubland (III)
PHYSIOGNOMIC SUBCLASS	Deciduous shrubland (III.B)
PHYSIOGNOMIC GROUP	Cold-deciduous shrubland (III.B.2)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural (III.B.2.N)
FORMATION	Temporarily flooded cold-deciduous shrubland (III.B.2.N.d)
ALLIANCE	*Alnus serrulata* Temporarily Flooded Shrubland Alliance
CLASSIFICATION CONFIDENCE LEVEL	2
USFWS WETLAND SYSTEM	Palustrine

RANGE

Globally

This community is found in the Blue Ridge escarpment gorges and ranges into the Cumberland Plateau. It is known from Kentucky, North Carolina, South Carolina, and Tennessee.

Great Smoky Mountains National Park

This association was not observed or sampled on the Mount Le Conte or Cades Cove quadrangles, but it is likely in the Park.

ENVIRONMENTAL DESCRIPTION

Globally

These riverine shrublands are found on rocky or gravelly substrates along narrow river margins.

Great Smoky Mountains National Park

No information

MOST ABUNDANT SPECIES

Globally

Stratum	Species
No information	

Great Smoky Mountains National Park

Stratum	Species
No information.	

CHARACTERISTIC SPECIES

Globally

Alnus serrulata, Xanthorhiza simplicissima, Leucothoe fontanesiana, Carpinus caroliniana, Diospyros virginiana, Liquidambar styraciflua, Liriodendron tulipifera, Platanus occidentalis, Tsuga canadensis

Great Smoky Mountains National Park

No information

VEGETATION DESCRIPTION

Globally

Vegetation composition, density, and height vary with frequency of flooding, substrate, and soil depth. *Alnus serrulata* and *Xanthorhiza simplicissima* are common and characteristic. Other shrubs may include *Arundinaria gigantea, Diervilla sessilifolia, Salix (nigra, sericea), Rhododendron (arborescens, viscosum, maximum, periclymenoides), Kalmia latifolia, Leucothoe fontanesiana, Itea virginica,* and *Viburnum nudum* var. *cassinoides.* Arborescent species that occur as tall shrubs (or as occasional trees, less than 10 percent cover) include *Acer rubrum, Carpinus caroliniana, Diospyros virginiana, Liquidambar styraciflua, Liriodendron tulipifera, Platanus occidentalis,* and *Tsuga canadensis.* Open areas dominated by grasses and forbs include species such as *Agrostis perennans, Boykinia aconitifolia, Carex torta, Holcus lanatus* (exotic), *Lycopus virginicus, Trautvetteria caroliniensis, Houstonia serpyllifolia, Impatiens capensis, Hypericum mutilum, Viola primulifolia,* and *Eupatorium fistulosum.* Adjacent alluvial forests are dominated by *Tsuga canadensis, Liriodendron tulipifera, Betula lenta,* and, at lower elevations below 600 meters (2000 feet), *Platanus occidentalis* and *Liquidambar styraciflua.*

Great Smoky Mountains National Park
No information

OTHER NOTEWORTHY SPECIES
No information

CONSERVATION RANK G3

RANK JUSTIFICATION

DATABASE CODE CEGL003895

COMMENTS
Globally
This community is often associated with *Carex torta*-dominated vegetation.

Great Smoky Mountains National Park

REFERENCES
Nelson 1986, Newell and Peet 1995, Schafale and Weakley 1990

Festuca spp. Herbaceous Vegetation

COMMON NAME	Fescue species Herbaceous Vegetation
SYNONYM	Cultivated Meadow
PHYSIOGNOMIC CLASS	Herbaceous Vegetation (V)
PHYSIOGNOMIC SUBCLASS	Perennial graminoid vegetation (V.A)
PHYSIOGNOMIC GROUP	Temperate or subpolar grassland (V.A.5)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural (V.A.5.N)
FORMATION	Medium-tall sod temperate or subpolar grassland (V.A.5.N.c)

ALLIANCE *Festuca* spp. Herbaceous Alliance

CLASSIFICATION CONFIDENCE LEVEL 2

USFWS WETLAND SYSTEM Upland

RANGE

Globally

This ruderal vegetation occurs throughout the southeastern United States and beyond. It is documented as occurring in Arkansas, Georgia, Missouri, North Carolina, Oklahoma, South Carolina, Tennessee, and Virginia.

Great Smoky Mountains National Park

This community occurs in the open fields of Cades Cove on the Cades Cove quadrangle. It was not observed on the Mount Le Conte quadrangle, nor is it likely there.

ENVIRONMENTAL DESCRIPTION

Globally

This vegetation occurs in pastures, hayfields, and old pastures. It is more-or-less cultural, though sometimes no longer actively maintained.

Great Smoky Mountains National Park

MOST ABUNDANT SPECIES

Globally

Stratum	Species
No information	

Great Smoky Mountains National Park

Stratum	Species
No information	

CHARACTERISTIC SPECIES

Globally

Fescue sp.

Great Smoky Mountains National Park

Fescue sp.

VEGETATION DESCRIPTION

Globally

Open graminoid-dominated vegetation, sometimes nearly monospecificly dominated by *Festuca sp*. This vegetation can also be very diverse and contain many native species of grasses, sedges, and forbs.

Great Smoky Mountains National Park

The open fields in and around Cades Cove appear to be quite variable in composition. Some areas are dominated by *Festuca* spp. and *Andropogon glomeratus*. More information is needed to better describe compositional variation in this community.

OTHER NOTEWORTHY SPECIES

No information

CONSERVATION RANK GW

RANK JUSTIFICATION
This vegetation is dominated by an exotic species, is of anthropogenic origin, and is thus not a conservation priority.

DATABASE CODE CEGL004048

COMMENTS
Globally
None

Great Smoky Mountains National Park
Park scientists are attempting the restoration of native grasses in some parts of Cade Cove.

REFERENCES
None

Danthonia compressa - (Sibbaldiopsis tridentata) Herbaceous Vegetation

COMMON NAME	Mountain Oatgrass - (Mountain-cinquefoil) Herbaceous Vegetation
SYNONYM	Grassy Bald (Southern Grass Type)
PHYSIOGNOMIC CLASS	Herbaceous Vegetation (V)
PHYSIOGNOMIC SUBCLASS	Perennial graminoid vegetation (V.A)
PHYSIOGNOMIC GROUP	Temperate or subpolar grassland (V.A.5)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural (V.A.5.N)
FORMATION	Short sod temperate or subpolar grassland (V.A.5.N.e)

ALLIANCE *Danthonia compressa* Herbaceous Alliance

CLASSIFICATION CONFIDENCE LEVEL 2

USFWS WETLAND SYSTEM Upland

RANGE

Globally

This community occurs in the southern Blue Ridge of North Carolina, Tennessee, and Virginia.

Great Smoky Mountains National Park

This community was sampled from the Cade Cove quadrangle. It was not sampled on the Mount Le Conte quadrangle, nor is it expected to occur there. This community is possible in other areas of the Park. On the Cade Cove quadrangle this community was sampled from Russell Field Bald and from Gregory Bald.

ENVIRONMENTAL DESCRIPTION

Globally

This community occurs on moderate to high elevation peaks and saddles in the southern Blue Ridge. It is found on high elevation (usually above 1350 meters 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.

Great Smoky Mountains National Park

The two examples of this community sampled were on gentle ridges, at 4320 and 4950 feet elevation. Invasion by woody species is occurring in both examples.

MOST ABUNDANT SPECIES

Globally

Stratum	Species
Short shrub	(*Rubus allegheniensis, Rhododendron calendulaceum, Sibbaldiopsis tridentata)*
Herbaceous	*Danthonia compressa, Carex brunnescens, Carex pensylvanica, Carex debilis, Potentilla canadensis, Agrostis perennans, Deschampsia flexuosa*

Great Smoky Mountains National Park

Stratum	Species
Short shrub	(*Rhododendron calendulaceum, Vaccinium corymbosum)*
Herbaceous	*Danthonia compressa*

CHARACTERISTIC SPECIES

Globally

Danthonia compressa, Danthonia spicata, Deschampsia flexuosa, Houstonia serpyllifolia, Hypericum mitchellianum, Prenanthes roanensis, Senecio schweinitzianus, Sibbaldiopsis tridentata, Solidago roanensis

Great Smoky Mountains National Park

Danthonia compressa

VEGETATION DESCRIPTION

Globally

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 sub-shrub *Sibbaldiopsis tridentata (= Potentilla tridentata*). Other characteristic herbaceous species are *Angelica triquinata, Aster acuminatus (= Oclemena acuminata), 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 aenea, Minuartia groenlandica, 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.*

Great Smoky Mountains National Park

This community includes open vegetation dominated by graminoid species, sometimes with large patches dominated by deciduous ericads. *Danthonia compressa* is the aspect dominant herb, although other herbaceous species with high coverage include *Arnoglossum muehlenbergii, Cinna latifolia, Danthonia spicata, Phleum pratense, Poa compressa, Potentilla canadensis,* and *Rumex acetosella.* Other species present in the herbaceous stratum include *Achillea millefolium, Ageratina altissima* var. *roanensis, Arrhenatherum elatius, Aster dumosus, Aster paternus, Carex aenea, Carex leavenworthii, Dichanthelium laxiflorum, Galium pilosum, Houstonia purpurea* var. *purpurea, Houstonia serpyllifolia, Hypericum punctatum, Juncus effusus, Juncus marginatus, Luzula acuminata, Lysimachia quadrifolia, Malaxis unifolia, Melampyrum lineare, Potentilla simplex, Prenanthes altissima, Prunella vulgaris, Rubus canadensis, Rudbeckia hirta, Rumex acetosella, Senecio anonymus, Solanum carolinense,* and *Viola primulifolia* var. *villosa.* Alien species present that may indicate past grazing include *Agrostis stolonifera, Carduus acanthoides, Cerastium nutans, Holcus lanatus, Leucanthemum vulgare, Phleum pratense, Trifolium pratense,* and *Veronica serpyllifolia.* On Gregory Bald, the shrubs *Rhododendron calendulaceum* and *Vaccinium corymbosum* are locally dominant. Other scattered woody plants in this community include *Amelanchier laevis, Kalmia latifolia, Magnolia acuminata,* and *Prunus serotina.*

OTHER NOTEWORTHY SPECIES

Rare or northern disjunct plant species reported from this community include *Agrostis mertensii*, *Alnus viridis* ssp. *crispa*, *Botrychium multifidum, Calamagrostis canadensis, Carex aenea, Carex cristatella, Carex misera, Delphinium exaltatum, Gentiana austromontana, Geum geniculatum, Houstonia purpurea* var. *montana*, *Huperzia selago, Hypericum buckleyi, Lilium grayi, Lilium philadelphicum, Lycopodium dendroideum, Lycopodium hickeyi, Minuartia groenlandica, Monarda media, Phlox subulata, Platanthera grandiflora*, *Poa palustris*, *Prenanthes roanensis, Rhododendron cumberlandense, Rhododendron vaseyi, Senecio schweinitzianus*, *Spiranthes ochroleuca*, and *Trisetum spicatum* (Schafale and Weakley 1990). Rare animals include *Microtus chrotorrhinus carolinensis* and *Thryomanes bewickii altus* (DeSelm and Murdock 1993). Exotic species that occur, probably as a result of grazing, include *Prunella vulgaris*, *Phleum pratense*, and *Poa compressa*.

CONSERVATION RANK G1

RANK JUSTIFICATION

This community has a 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.

DATABASE CODE CEGL004242

COMMENTS

Globally

This montane grassland is typically surrounded by dwarfed forests dominated by *Fagus grandifolia* or *Quercus rubra*. Notable examples include various peaks of the Roan Mountain complex, Long Hope Valley, Shining Rock Wilderness, and the 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.

Great Smoky Mountains National Park

Gregory Bald is currently maintained by manual woody species removal.

REFERENCES

Billings and Mark 1957, DeSelm and Murdock 1993, Gersmehl 1973, Lindsay 1976, Lindsay and Bratton 1979, Mark 1958, Mark 1959, Schafale and Weakley 1990

Carex torta Herbaceous Vegetation

COMMON NAME	Twisted Sedge Herbaceous Vegetation
SYNONYM	Rocky Bar and Shore (Twisted Sedge Type)
PHYSIOGNOMIC CLASS	Herbaceous Vegetation (V)
PHYSIOGNOMIC SUBCLASS	Perennial graminoid vegetation (V.A)
PHYSIOGNOMIC GROUP	Temperate or subpolar grassland (V.A.5)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural (V.A.5.N)
FORMATION	Temporarily flooded temperate or subpolar grassland (V.A.5.N.j)
ALLIANCE	*Carex torta* Temporarily Flooded Herbaceous Alliance
CLASSIFICATION CONFIDENCE LEVEL	2
USFWS WETLAND SYSTEM	Temporarily Flooded

RANGE

Globally

This community occurs in the southern Appalachians of Georgia, North Carolina, South Carolina, and Tennessee, in the Cumberland Plateau of Kentucky, the Interior Low Plateau of Tennessee, the Allegheny Mountains of Virginia, and may range into Alabama.

Great Smoky Mountains National Park

This community was sampled from the northeast portion of the Mount Le Conte quadrangle, along the Little Pigeon and Greenbrier rivers. It was not sampled on the Cades Cove quadrangle. It should occur in other areas of the Park, in association with larger rivers.

ENVIRONMENTAL DESCRIPTION

Globally

This community occurs on sand, gravel, and rock bars on larger rivers and streams where the tree canopy does not completely cover the riverbed.

Great Smoky Mountains National Park

This community occurs on river margins, rocky non-forested islands, and small shaded overflow outlets.

MOST ABUNDANT SPECIES

Globally

Stratum	Species
Herbaceous	*Carex torta*

Great Smoky Mountains National Park

Stratum	Species
See above	

CHARACTERISTIC SPECIES

Globally

Carex torta

Great Smoky Mountains National Park

See above

VEGETATION DESCRIPTION

Globally

This association is characterized by light-demanding, tough-rooted herbaceous perennials tolerant of frequent inundation and flood-scouring. *Carex torta* forms dense, extensive colonies. There is often bare substrate of boulders, cobbles, gravel or sand.

Great Smoky Mountains National Park

See above

OTHER NOTEWORTHY SPECIES
No information

CONSERVATION RANK G3G4

RANK JUSTIFICATION

DATABASE CODE CEGL004103

COMMENTS
Globally
None

Great Smoky Mountains National Park
This community occurs adjacent to alluvial forests of *Liquidambar styraciflua* and *Platanus occidentalis*, surrounded by floodplain forests (*i.e*. Poplar-Gum-Hemlock). The Little Pigeon River has many seasonally dry forks that support this community. It may be visible on air photography.

REFERENCES
Schafale and Weakley 1990

Juncus effusus Seasonally Flooded Herbaceous Vegetation [Provisional]

COMMON NAME	Soft Rush Seasonally Flooded Herbaceous Vegetation
SYNONYM	Rush Marshes (Placeholder)
PHYSIOGNOMIC CLASS	Herbaceous Vegetation (V)
PHYSIOGNOMIC SUBCLASS	Perennial graminoid vegetation (V.A)
PHYSIOGNOMIC GROUP	Temperate or subpolar grassland (V.A.5)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural (V.A.5.N)
FORMATION	Seasonally flooded temperate or subpolar grassland (V.A.5.N.k)

ALLIANCE *Juncus effusus* Seasonally Flooded Herbaceous Alliance

CLASSIFICATION CONFIDENCE LEVEL 2

USFWS WETLAND SYSTEM Seasonally flooded

RANGE
Globally
This is a widespread community occurring throughout the southeastern United States.

Great Smoky Mountains National Park
This wetland occurs in wet ditches and wet fields within Cades Cove, on the Cades Cove quadrangle. It was not sampled on the Mount Le Conte quadrangle. It is likely in other areas of the Park.

ENVIRONMENTAL DESCRIPTION
Globally
No information
Great Smoky Mountains National Park
This community is seasonally to temporally flooded and occurs along artificial waterways and disturbed, wet fields.

MOST ABUNDANT SPECIES
Globally

Stratum	Species

Great Smoky Mountains National Park

Stratum	Species
Herbaceous	*Juncus effusus*

CHARACTERISTIC SPECIES
Globally
Juncus effuses

Great Smoky Mountains National Park
See above

VEGETATION DESCRIPTION
Globally
This is a placeholder for community association(s) to be developed in this alliance.

Great Smoky Mountains National Park
Artificial and natural wetlands dominated by *Juncus effusus*, sometimes codominating with *Andropogon glomeratus*. Other wetland shrubs and herbs may be present; for example, *Alnus serrulata, Boehmeria cylindrica, Carex lurida, Cinna arundinacea, Cornus foemina, Eleocharis* spp., *Polygonum setaceum, Rhexia mariana* var. *mariana, Rhynchospora capitellata, Scirpus* spp., and *Woodwardia areolata.*

OTHER NOTEWORTHY SPECIES
No information

CONSERVATION RANK G?

RANK JUSTIFICATION
The conservation status of this community has not yet been assessed.

DATABASE CODE CEGL004112

COMMENTS
Globally
None

Great Smoky Mountains National Park
None

REFERENCES
None

Saxifraga michauxii - Carex misera - Calamagrostis cainii Herbaceous Vegetation

COMMON NAME	Cliff Saxifrage - Wretched Sedge - Cain Reedgrass Herbaceous Vegetation
SYNONYM	Southern Appalachian High Elevation Rocky Summit (Anakeesta Type)
PHYSIOGNOMIC CLASS	Herbaceous Vegetation (V)
PHYSIOGNOMIC SUBCLASS	Perennial forb vegetation (V.B)
PHYSIOGNOMIC GROUP	Temperate or subpolar perennial forb vegetation (V.B.2)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural (V.B.2.N)
FORMATION	Low temperate or subpolar perennial forb vegetation (V.B.2.N.b)
ALLIANCE	*Saxifraga michauxii* Herbaceous Alliance
CLASSIFICATION CONFIDENCE LEVEL	1
USFWS WETLAND SYSTEM	Upland

RANGE

Globally

This community is known from the Great Smoky Mountains of Tennessee.

Great Smoky Mountains National Park

This community does not occur on the Cades Cove quadrangle. This community was sampled or observed on the Mount Le Conte quadrangle on the high slopes and summits of Mount Le Conte and in the vicinity of Mount Kephart.

ENVIRONMENTAL DESCRIPTION

Globally

This community occurs on high elevation landslide scars, cliffs, rock outcrops, and summits. Slopes can be extremely steep (landslide scars and cliffs) or relatively flat (summits and ledges). This community occurs mostly above 6000 feet elevation but can occur as low as 4500 feet. This community is most often associated with exposed outcrops of felsic Anakeesta slate in the Great Smoky Mountains.

Great Smoky Mountains National Park

See above

MOST ABUNDANT SPECIES

Globally

Stratum	Species
Short shrub	*Diervilla sessilifolia, Rhododendron carolinianum, Rubus canadensis*
Herbaceous	Rock, *Carex debilis, Carex misera, Saxifraga michauxii*

Great Smoky Mountains National Park

Stratum	Species
See above	

CHARACTERISTIC SPECIES

Globally

Abies fraseri, Aster acuminatus, Calamagrostis cainii, Carex misera, Diervilla sessilifolia, Leiophyllum buxifolium, Rhododendron carolinianum, Saxifraga michauxii, Solidago glomerata, Vaccinium erythrocarpum

Great Smoky Mountains National Park

See above

VEGETATION DESCRIPTION

Globally

This community has very sparse to moderate vegetative cover made up of grasses, forbs and shrubs rooted in rock fissures. These extreme habitats may have up to 80 percent exposed bedrock and talus and often have seepage inclusions. Occurrences can range in size from 25 square meters to over an acre. Compostion and vegtative coverage vary from site to site, but common dominants include the herbs *Calamagrostis cainii, Carex debilis, Carex misera, and Saxifraga michauxii,* and the shrubs *Diervilla sessilifolia, Rhododendron carolinianum,* and *Rubus canadensis.* Other typical species include *Ageratina altissima* var. *roanensis, Aster acuminatus, Athyrium filix-femina, Danthonia compressa, Dennstaedtia campyloptera, Gentiana linearis,*

Rugelia nudicaulis, Saxifraga michauxii, and *Solidago glomerata*. Other woody species found in this community include *Abies fraseri, Betula alleghaniensis, Picea rubens, Leiophyllum buxifolium, Menziesia pilosa, Prunus pensylvanica, Rhododendron catawbiense, Sorbus americana,* and *Vaccinium erythrocarpum.* This community occurs in a matrix with *Picea rubens - Abies fraseri* Forest.

Great Smoky Mountains National Park
See above

OTHER NOTEWORTHY SPECIES
No information

CONSERVATION RANK G1

RANK JUSTIFICATION
This rock outcrop community is known only from outcrops of Anakeesta slate in the Great Smoky Mountains of Tennessee. This community is naturally rare, representing a tiny fraction of the high mountain landscape. It is known from only a few occurrences. Atmospheric deposition of air pollutants may have an adverse effect on these high elevation communities. It is a fragile community and can be damaged by trampling in areas of high recreational use.

DATABASE CODE CEGL004278

COMMENTS
Globally
Similar vegetation may range into the Black and Craggy Mountains of North Carolina but associated with a different geology.

Great Smoky Mountains National Park
In some areas this community may occur as a mosaic with *Rhododendron carolinianum - Rhododendron catawbiense - Leiophyllum buxifolium* Shrubland (CEGL007876). The vegetation of landslide scars on Mount Le Conte is included in this association, along with vegetation of more stable cliffs, ledges and seeps. The vegetation on the stable rocky substrates serves as a source pool for the more ephemeral scars, which revegetate slowly in a rather chaotic, stepwise succession, thus the different habitats are not compositionally distinct (J. Boetsch pers. comm.).

REFERENCES
Boetsch pers. comm., Feldcamp 1984, Wiser 1993, Wiser et al. 1996

Diphylleia cymosa - Saxifraga micranthidifolia - Laportea canadensis Herbaceous Vegetation

COMMON NAME	Umbrella-leaf - Branch-lettuce - Wood-nettle Herbaceous Vegetation
SYNONYM	Rich Montane Seep (Cove Type)
PHYSIOGNOMIC CLASS	Herbaceous Vegetation (V)
PHYSIOGNOMIC SUBCLASS	Perennial forb vegetation (V.B)
PHYSIOGNOMIC GROUP	Temperate or subpolar perennial forb vegetation (V.B.2)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural (V.B.2.N)
FORMATION	Saturated temperate perennial forb vegetation (V.B.2.N.f)
ALLIANCE	*Diphylleia cymosa - Saxifraga micranthidifolia* Saturated Herbaceous Alliance
CLASSIFICATION CONFIDENCE LEVEL	2
USFWS WETLAND SYSTEM	Palustrine

RANGE

Globally

This community occurs in the mountains of Georgia, North Carolina, Tennessee, and Virginia, and may range into South Carolina.

Great Smoky Mountains National Park

This community was sampled on both the Cades Cove and Mount Le Conte quadrangles. It is undoubtedly in other areas of the Park. On the Cades Cove quadrangle this community was sampled in the southern portion of the quadrangle on a high slope north of Rich Gap and in the eastern portion of the quadrangle along Pole Knob Branch. On the Mount Le Conte quadrangle, this community was sampled north of Cherokee Orchard, above Baskins Creek; and in the vicinity of Rainbow Falls, along Le Conte Creek.

ENVIRONMENTAL DESCRIPTION

Globally

These small wetlands occur at moderate to high elevations (below 4000 feet) on steep rocky slopes or in flat mucky seeps, sometimes associated with streams.

Great Smoky Mountains National Park

This community is found at low to intermediate elevations (samples ranged from 1960 to 4100), on steep, rocky slopes. Substrates range from boulders and rocks to saturated, gravelly muck. These are small wetlands that occur as inclusions in an otherwise forested landscape.

MOST ABUNDANT SPECIES

Globally

Stratum	Species
Herbaceous	*Diphylleia cymosa, Saxifraga micranthidifolia*

Great Smoky Mountains National Park

Stratum	Species
Herbaceous	*Diphylleia cymosa, (Saxifraga micranthidifolia)*

CHARACTERISTIC SPECIES

Globally

Diphylleia cymosa, Saxifraga micranthidifolia

Great Smoky Mountains National Park

See above

VEGETATION DESCRIPTION

Globally

A characteristic association of shaded seeps of the southern Appalachian Mountains, usually with overhanging canopies though trees not typically rooted in the seep itself. *Diphylleia cymosa* and *Saxifraga micranthidifolia* are characteristic and often dominant. Other characteristic species include *Laportea canadensis, Cardamine clematitis, 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.

Great Smoky Mountains National Park
This community includes forested seeps in cove forests dominated by *Aesculus flava, Tilia americana* var. *heterophylla,* and *Betula alleghaniensis*. The seeps are open herbaceous vegetation, but canopy trees hang over the seep and can have up to 70 percent coverage. Shrubs are absent to sparse. Herbs have 50 to 100 percent coverage. Species with the highest coverages are *Diphylleia cymosa, Saxifraga micranthidifolia, Cimicifuga americana, Laportea canadensis, Tiarella cordifolia,* and *Impatiens pallida*. Other common herbs include *Ageratina altissima* var. *roanensis, Aster divaricatus, Chrysosplenium americanum, Euonymus obovatus,* and *Monarda didyma.* Bryophytes, other than *Sphagnum*, can have substantial cover on rocks.

OTHER NOTEWORTHY SPECIES
No information

CONSERVATION RANK G3

RANK JUSTIFICATION
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.

DATABASE CODE CEGL004296

COMMENTS
Globally
These communities are often not large enough to be readily mappable but a distinctive habitat for many plants, invertebrate and vertebrate animals. 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, often occurs on boulder fields or in northern hardwood forests, at higher elevations than the association defined here.

Great Smoky Mountains National Park
This community is too small to map and often occurs under a forested canopy.

REFERENCES
Kauffman pers. comm., Nelson 1986, Schafale and Weakley 1990

Impatiens (capensis, pallida) - Monarda didyma - Rudbeckia laciniata var. *humilis* Herbaceous Vegetation

COMMON NAME	(Orange Jewelweed, Pale Jewelweed) - Beebalm - Appalachian Black-eyed
SYNONYM	Rich Montane Seep (High Elevation Type)
PHYSIOGNOMIC CLASS	Herbaceous Vegetation (V)
PHYSIOGNOMIC SUBCLASS	Perennial forb vegetation (V.B)
PHYSIOGNOMIC GROUP	Temperate or subpolar perennial forb vegetation (V.B.2)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural (V.B.2.N)
FORMATION	Saturated temperate perennial forb vegetation (V.B.2.N.f)

ALLIANCE *Impatiens (capensis, pallida) - Monarda didyma* Saturated Herbaceous Alliance

CLASSIFICATION CONFIDENCE LEVEL 2

USFWS WETLAND SYSTEM Palustrine

RANGE

Globally

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.

Great Smoky Mountains National Park

This community was not sampled on the Cades Cove or Mount Le Conte quadrangles. It is likely on the Mount Le Conte quadrangle, as well as in other high elevation areas of the Park.

ENVIRONMENTAL DESCRIPTION

Globally

These small wetlands at occur at high elevations, over 4000 feet, on upper slopes and ridgetops, within forest openings and on boulderfields.

Great Smoky Mountains National Park

No information

MOST ABUNDANT SPECIES

Globally

Stratum	Species
Herbaceous	*Impatiens capensis, Impatiens pallida, Monarda didyma, Rudbeckia laciniata* var. *humilis*

Great Smoky Mountains National Park

Stratum	Species
No information	

CHARACTERISTIC SPECIES

Globally

Impatiens capensis, Impatiens pallida, Monarda didyma, Rudbeckia laciniata var. humilis

Great Smoky Mountains National Park

No information

VEGETATION DESCRIPTION

Globally

Forb-dominated palustrine vegetation occurring as small wetlands at high elevations (greater than 1200 meters or 4000 feet), on upper slopes and ridgetops. These areas lack extensive *Sphagnum* and are typically open, without shading from a forest canopy. The nominal species often have high coverage (*Impatiens capensis, Impatiens pallida, Monarda didyma, Rudbeckia laciniata* var. *humilis)*. Other characteristic species include *Aconitum reclinatum, Cardamine clematitis, Carex leptonervia, Carex flexuosa, Carex ruthii, Chelone lyonii, Cicuta maculata, Claytonia caroliniana, Conioselinum chinense, Euonymus obovatus, Geum geniculatum, Helenium autumnale, Houstonia serpyllifolia, Lilium superbum, Lilium grayii, Senecio aureus, Solidago patula, Thalictrum clavatum, Trautvetteria carolinensis, Veratrum viride, Viola cucullata,* and *Viola macloskeyi* ssp. *pallens.*

This vegetation is often associated with boulderfields or other northern hardwood forests; see *Betula alleghaniensis - Fagus grandifolia - Aesculus flava - (Acer saccharum*) Forest Alliance (I.B.2.N.b).

Great Smoky Mountains National Park
No information

OTHER NOTEWORTHY SPECIES
No information

CONSERVATION RANK G3

RANK JUSTIFICATION
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.

DATABASE CODE CEGL004293

COMMENTS
Globally
Another high elevation herbaceous seep association known from the southern Appalachians, *Diphylleia cymosa - Saxifraga micranthidifolia - Laportea canadensis* Herbaceous Vegetation, typically occurs at lower elevations and is associated with cove forests.

Great Smoky Mountains National Park
This community is too small to map and often occurs under a forested canopy.

REFERENCES
Nelson 1986, Schafale and Weakley 1990

Vittaria appalachiana - Heuchera parviflora var. *parviflora - Houstonia serpyllifolia / Plagiochila* spp. Herbaceous Vegetation

COMMON NAME	Appalachian Shoestring Fern - Cave Alumroot - Appalachian Bluet / Liverworts Herbaceous Vegetation
SYNONYM	Southern Blue Ridge Spray Cliff
PHYSIOGNOMIC CLASS	Herbaceous Vegetation (V)
PHYSIOGNOMIC SUBCLASS	Perennial forb vegetation (V.B)
PHYSIOGNOMIC GROUP	Temperate or subpolar perennial forb vegetation (V.B.2)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural (V.B.2.N)
FORMATION	Saturated temperate perennial forb vegetation (V.B.2.N.f)
ALLIANCE	*Vittaria appalachiana - Heuchera parviflora* Saturated Herbaceous Alliance
CLASSIFICATION CONFIDENCE LEVEL	2
USFWS WETLAND SYSTEM	Palustrine

RANGE

Globally

This community occurs 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 Tennessee.

Great Smoky Mountains National Park

This community was sampled only from the Mount Le Conte quadrangle but is possible on the Cades Cove quadrangle. On Mount Le Conte, it was sampled at Rainbow Falls, Grotto Falls, and Thousand Drips.

ENVIRONMENTAL DESCRIPTION

Globally

This community occurs on saturated rock outcrops associated with the spray of cascades and waterfalls. This community is found on nearly vertical rock surfaces and ledges, slopes, and crevices with shallow soils that are constantly saturated.

Great Smoky Mountains National Park

See above.

MOST ABUNDANT SPECIES

Globally

Stratum	Species
Herbaceous	variable
Nonvascular	variable

Great Smoky Mountains National Park

Stratum	Species
See above	

CHARACTERISTIC SPECIES

Globally

Vittaria appalachiana, Heuchera parviflora var. parviflora, Houstonia serpyllifolia, Plagiochila spp.

Great Smoky Mountains National Park

VEGETATION DESCRIPTION

Globally

This community includes herbaceous vegetation on rock substrates associated with waterfalls. Vegetative coverage is sparse to moderate with 50 to 75 percent unvegetated surface (bedrock) possible. Vegetation grows in cracks and on organic accumulations on ledges. It is characterized by a variable but unique assemblage of vascular herbs, algae, and bryophytes, many of which are endemic to this community. Composition of this community varies from location to location, in part due to its insular nature (Zartman and Pittillo 1998). Characteristic species include liverworts (*Bazzania denudata, Conocephalum conicum, 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 raui, Plagiomnium affine, Plagiomnium carolinianum, Pseudotaxiphyllum distichaceum, Sphagnum girgensohnii, Sphagnum quinquefarium, Thalictrum spp.*, Thamnobryum alleghaniense*), ferns (*Adiantum pedatum, Asplenium monanthes, Asplenium montanum, Asplenium trichomanes* ssp. *trichomanes, Cystopteris protrusa, Grammitis nimbata (= Micropolypodium nimbatum), Hymenophyllum tayloriae, olypodium 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*).

Great Smoky Mountains National Park
See above

OTHER NOTEWORTHY SPECIES
No information

CONSERVATION RANK G2

RANK JUSTIFICATION
This community is very limited, known only from a few dozen occurrences, most of which are less than one acre in size, and 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.

DATABASE CODE CEGL004302

COMMENTS
Globally
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. 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.

Great Smoky Mountains National Park
This community occurs adjacent to deciduous and hemlock cove forests

REFERENCES
Dellinger 1992, Farrar 1998, Nelson 1986, Schafale and Weakley 1990, Weakley and Schafale 1994, Wharton 1978, Zartman and Pittillo 1998

Carex gynandra - Platanthera clavellata - Drosera rotundifolia - Carex ruthii - Carex atlantica / Sphagnum spp. Herbaceous Vegetation

COMMON NAME	Mountain Fringed Sedge - Small Green Wood Orchid - Roundleaf Sundew - Ruth Sedge - Prickly Bog Sedge / Peatmosses Herbaceous Vegetation
SYNONYM	Blue Ridge High Elevation Seep (Sedge Type)
PHYSIOGNOMIC CLASS	Herbaceous Vegetation (V)
PHYSIOGNOMIC SUBCLASS	Perennial graminoid vegetation (V.A)
PHYSIOGNOMIC GROUP	Temperate or subpolar perennial forb vegetation (V.B.2)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural (V.A.5.N)
FORMATION	Saturated temperate perennial forb vegetation (V.A.5.N.m.)
ALLIANCE	*Carex ruthii – Carex gynandra* Saturated Herbaceous Alliance
CLASSIFICATION CONFIDENCE LEVEL	2
USFWS WETLAND SYSTEM	Palustrine

RANGE

Globally

This community occurs at high elevations in the southern Blue Ridge of North Carolina and Tennessee and may range into Virginia.

Great Smoky Mountains National Park

This community was sampled from a single location on the Mount Le Conte quadrangle but is likely in other high elevation areas of the Park. It was not found, nor is it likely, on the Cade Cove quadrangle. It was sampled in the southestern portion of the Mount Le Conte quadrangle, in the vicinity of Ice Water Springs, east of Mount Kephart.

ENVIRONMENTAL DESCRIPTION

Globally

This community occurs on seepage slopes and is scattered throughout the high elevations (> 5000 feet) of the southern Blue Ridge. These perennial seeps tend to be rocky and occur over gravelly muck or with some bedrock outcropping. Slopes are gentle to moderately steep. They are influenced by the high rainfall and low evaporation rates in these high mountain landscapes.

Great Smoky Mountains National Park

This community was sampled from a flat area around Ice Water Springs, at 5900 feet elevation. It is a relatively open, sunny seep with standing water and a mucky substrate.

MOST ABUNDANT SPECIES

Globally

Stratum	Species
Herbaceous	*Carex* species (*Carex gynandra, Cares ruthii, Carex crinita*)
Nonvascular	*Sphagnum* species

Great Smoky Mountains National Park

Stratum	Species
Herbaceous	*Chelone obliqua, Carex ruthii, Ageratina altissima*
Nonvascular	*Sphagnum* species

CHARACTERISTIC SPECIES

Globally

Carex gynandra, Carex ruthii, Carex atlantica, Carex flexuosa, Glyceria striata, Glyceria melicaria, Hypericum graveolens, Hypericum mitchellianum, Hypericum mutilum, Chelone lyonii, Platanthera clavellata, Drosera rotundifolia

Great Smoky Mountains National Park

Carex ruthii, Carex gynandra, Sphagnum spp., Glyceria nubigena, Solidago glomerata

VEGETATION DESCRIPTION

Globally

This non-alluvial wetland is generally graminoid-dominated but may have significant coverage by trees or shrubs, especially around the edges. Particularly small examples may be completely shaded by trees in the community and in the adjacent forests. Typically this community has well-developed *Sphagnum* mats. Characteristic species include *Carex gynandra, Carex ruthii, Carex atlantica, Carex flexuosa, Glyceria striata, Glyceria melicaria, Hypericum graveolens, Hypericum mitchellianum, Hypericum mutilum, Chelone lyonii, Platanthera clavellata,* and *Drosera rotundifolia*. Occurrences of this community are surrounded by or were formerly surrounded by forests dominated by *Abies fraseri* and *Picea rubens* or by the highest northern hardwood forests (forests dominated by *Fagus grandifolia, Betula alleghanensis,* and *Aesculus flava*).

Great Smoky Mountains National Park
This community is a spring-associated seep dominated by patches of forbs, sedges, and peatmoss. The aspect dominants are *Ageratina altissima* var. *roanensis* and *Chelone obliqua*; however, *Carex ruthii, Viola* spp., *Sphagnum* spp., and *Carex gynandra* also have high coverage. Other species include *Aconitum uncinatum* ssp. *muticum, Agrostis perennans, Angelica triquinata, Aster acuminatus* var. *acuminatus, Cinna latifolia, Dennstaedtia punctilobula, Diervilla sessilifolia, Glyceria nubigena, Oxalis montana,* and *Solidago glomerata*.

OTHER NOTEWORTHY SPECIES
No information

CONSERVATION RANK G2

RANK JUSTIFICATION
This community occurs in a limited portion of high elevation areas of the southern Blue Ridge. Occurrences are small and embedded in forests or sometimes high elevation grassy balds or heath balds. Many examples are in protected areas. Those that are not are vulnerable to logging and alteration of hydrology.

DATABASE CODE CEGL007697

COMMENTS
Globally
This community is distinguished from other high elevation seeps in the Blue Ridge (*Impatiens (capensis, pallida) - Monarda didyma - Rudbeckia laciniata* var. *humilis* Herbaceous Vegetation (CEGL004293) and *Diphylleia cymosa - Saxifraga micranthidifolia - Laportea canadensis* Herbaceous Vegetation (CEGL004296)) by being graminoid-dominated and having *Sphagnum* present. Examples of this association generally lack *Rudbeckia laciniata, Laportea canadensis, Monarda didyma,* and *Diphylleia cymosa*. It is distinguished from southern Blue Ridge bog communities by floristic differences and by occurring on a pronounced slope at high elevations.

Great Smoky Mountains National Park
This community is surrounded by forests dominated by *Picea rubens, Betula alleghaniensis,* and *Abies fraseri*.

REFERENCES
Newell and Peet 1996, Schafale and Weakley 1990

Calamagrostis cainii – Carex ruthii – Parnassia asarifolia / Sphagnum spp. Herbaceous Vegetation

COMMON NAME	Cain's Reedgrass – Ruth Sedge - Kidneyleaf Grass-of-Parnassus / Peatmosses Herbaceous Vegetation
SYNONYM	Blue Ridge High Elevation Seep (Mount Le Conte type)
PHYSIOGNOMIC CLASS	Herbaceous Vegetation (V)
PHYSIOGNOMIC SUBCLASS	Perennial graminoid vegetation (V.A)
PHYSIOGNOMIC GROUP	Temperate or subpolar perennial forb vegetation (V.B.2)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural (V.A.5.N)
FORMATION	Saturated temperate perennial forb vegetation (V.A.5.N.m.)
ALLIANCE	*Carex ruthii – Carex gynandra* Saturated Herbaceous Alliance
CLASSIFICATION CONFIDENCE LEVEL	3
USFWS WETLAND SYSTEM	Palustrine

RANGE

Globally

This community is known from Mount Le Conte in the Great Smoky Mountains of Tennessee. It is currently known from only a single location.

Great Smoky Mountains National Park

See above

ENVIRONMENTAL DESCRIPTION

Globally

This community occurs on a steep, south-facing, exposed slope, at 6000 feet elevation. The site is thought to be a former landslide scar (Feldcamp 1984). It is a perennial seep, with small rock outcroppings. This community occurs in the spruce – fir zone and is adjacent to forests affected by Balsam Woolly Adelgid (*Adelges piceae*).

Great Smoky Mountains National Park

See above

MOST ABUNDANT SPECIES

Globally

Stratum	Species
Herbaceous	*Calamagrostis cainii*
Nonvascular	*Sphagnum* species

Great Smoky Mountains National Park

Stratum	Species
See above	

CHARACTERISTIC SPECIES

Globally

Calamagrostis cainii, *Gentiana linearis*, *Parnassia asarifolia*, *Solidago glomerata*, *Sphagnum* spp.

Great Smoky Mountains National Park

See above

VEGETATION DESCRIPTION

Globally

This is a herbaceous-dominated seepage slope, one to two acres in size. The vegetation is open with little or no shading by the surrounding forest. Graminoid species have almost continuous coverage, growing within large mats of *Sphagnum*. It is strongly dominated by *Calamagrostis cainii*. Other species with moderate coverage include *Carex ruthii*, *Carex misera*, *Gentiana linearis*, and *Dennstaedtia punctilobula*. Additional herbaceous species include *Carex debilis*, *Glyceria nubigena*, *Hypericum graveolens*, *Krigia montana*, *Parnassia asarifolia*, and *Solidago glomerata*. Shrubs and small trees may be scattered within the seep but are more prominent around the perimeter. Woody species include *Abies fraseri*, *Picea rubens*, *Prunus pensylvanica*,

Rhododendron catawbiense, Rubus canadensis, and *Vaccinium erythrocarpum.*

Great Smoky Mountains National Park
See above

OTHER NOTEWORTHY SPECIES

CONSERVATION RANK G1

RANK JUSTIFICATION
This is a highly restricted, naturally rare community and known from only a single location. The dominant species *Calamagrostis cainii* is only known from the summits of Mount Le Conte and in the Blacks and Craggy Mountains. Its current taxonomy is uncertain; it may be better classified as a very local expression of Blue Ridge High Elevation Seep (Sedge Type) (CEGL007697), a G2 community.

DATABASE CODE CEGL007877

COMMENTS
Globally

Great Smoky Mountains National Park
Calamagrostis cainii may be locally dominant in seepage inclusions of other communities on Mount Le Conte, such as cliffs, heath shrublands, and steep landslide scars. The site that supports this community is a former landslide scar directly downslope from Cliff Tops, where there is a large concentration of *Calamagrostis cainii,* growing in stable ledge and seeps. These stable substrates provide propagule sources for revegetating landslide scars, thus there is a tight spatial autocorrelation for species composition between scars and nearby ledges and cliffs (J. Boetsch pers. comm.). This community may be better classified as a very local expression of Blue Ridge High Elevation Seep (Sedge Type) (CEGL007697).

REFERENCES
Boetsch 1998, Feldcamp 1984

Asplenium montanum – Heuchera villosa Felsic Cliff Sparse Vegetation

COMMON NAME	Mountain Spleenwort - Rock Alumroot Sparse Vegetation
SYNONYM	Southern Blue Ridge Felsic Cliff
PHYSIOGNOMIC CLASS	Sparse Vegetation (VII)
PHYSIOGNOMIC SUBCLASS	Consolidated rock sparse vegetation (VII.A)
PHYSIOGNOMIC GROUP	Sparsely vegetated cliffs (VII.A.1)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural (VII.A.1.N)
FORMATION	Cliffs with sparse vascular vegetation (VII.A.1.N.a)

ALLIANCE *Asplenium montanum* Sparsely Vegetated Alliance

CLASSIFICATION CONFIDENCE LEVEL 2

USFWS WETLAND SYSTEM Upland

RANGE

Globally

This community occurs in the Blue Ridge and upper Piedmont of Georgia, North Carolina, South Carolina, Tennessee, and Virginia.

Great Smoky Mountains National Park

This community was sampled on the Cades Cove and Mount Le Conte quadrangles. It is likely in other areas of the Park. On the Cades Cove quadrangle it was sampled from cliffs in the northeast portion of the quadrangle, along Rowans Creek (2200 feet) and Crooked Arm Branch (2960 feet). On the Mount Le Conte quadrangle, this community was sampled from cliffs northwest of Bullhead (3840 feet) and above Highway 441, in the vicinity of Fort Harry (3400 feet).

ENVIRONMENTAL DESCRIPTION

Globally

This community includes vertical rock faces associated with felsic, metamorphic and igneous geologies. These cliffs are typically dry, although small seepages may occur. They are usually shaded by trees rooted on ledges and by the surrounding forest.

Great Smoky Mountains National Park

See above

MOST ABUNDANT SPECIES

Globally

Stratum	Species
Herbaceous	rock, variable herbaceous species
Nonvascular	variable

Great Smoky Mountains National Park

Stratum	Species
See above	

CHARACTERISTIC SPECIES

Globally

Asplenium montanum, Heuchera villosa

Great Smoky Mountains National Park

See above

VEGETATION DESCRIPTION

Globally

This community has little vegetative cover, often with 90 percent of the rock surface unvegetated. Mosses (*e.g. Thuidium* spp., *Fissiden* 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, Aster divaricatus, Cystopteris protrusa, Dryopteris marginalis, Hydrangea arborescens, Parthenocissus quinquefolia, Polypodium appalachianum,* and *Rubus canadensis.*

Great Smoky Mountains National Park
See above

OTHER NOTEWORTHY SPECIES
No information

CONSERVATION RANK G3G4

RANK JUSTIFICATION

DATABASE CODE CEGL004980

COMMENTS
Globally
This community is not large enough to be readily mappable but is a distinctive habitat for many plants.

Great Smoky Mountains National Park
This community is not mappable and usually occurs beneath a forest canopy.

REFERENCES
Schafale and Weakley 1990

Asplenium ruta-muraria - Pellaea atropurpurea Sparse Vegetation

COMMON NAME	Wall-rue - Purple Cliff-brake Sparse Vegetation
SYNONYM	Montane Cliff (Calcareous Type)
PHYSIOGNOMIC CLASS	Sparse Vegetation (VII)
PHYSIOGNOMIC SUBCLASS	Consolidated rock sparse vegetation (VII.A)
PHYSIOGNOMIC GROUP	Sparsely vegetated cliffs (VII.A.1)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural (VII.A.1.N)
FORMATION	Cliffs with sparse vascular vegetation (VII.A.1.N.a)

ALLIANCE *Asplenium ruta-muraria - Pellaea atropurpurea* Sparsely Vegetated Alliance

CLASSIFICATION CONFIDENCE LEVEL 2

USFWS WETLAND SYSTEM Upland

RANGE

Globally

This community occurs in areas of limestone or dolomite geology in Alabama, Kentucky, Maryland, North Carolina, Pennsylvania, South Carolina, Tennessee, Virginia, and West Virginia, and may possibly range into South Carolina.

Great Smoky Mountains National Park

This community was not sampled or observed on the Cades Cove or Mount Le Conte quadrangles. It is possible in areas of limestone geology on the Cades Cove quadrangle. One potential area for this community is in the vicinity of Gregory's Cave on the Cades Cove quadrangle.

ENVIRONMENTAL DESCRIPTION

Globally

This community includes dry to rather moist limestone and dolomite outcrops, usually shaded by trees rooted in adjacent forested communities.

Great Smoky Mountains National Park

No information

MOST ABUNDANT SPECIES

Globally

Stratum	Species
Herbaceous	rock, variable herbaceous species
Nonvascular	variable

Great Smoky Mountains National Park

Stratum	Species
No information	

CHARACTERISTIC SPECIES

Globally

Asplenium ruta-muraria, Pellaea atropurpurea, Pellaea glabella ssp. *glabella, Asplenium resiliens, Aquilegia Canadensis*

Great Smoky Mountains National Park

No information

VEGETATION DESCRIPTION

Globally

This community has little vegetative cover, often with 90 percent of the rock surface unvegetated. Mosses and lichens can have moderate coverage, and vascular plants occur on ledges and rooted in cracks. Calciphilic herbs, such as *Asplenium ruta-muraria, Pellaea atropurpurea, Pellaea glabella* ssp. *glabella, Asplenium resiliens, Aquilegia canadensis*, are characteristic. Moister microhabitats of the crevice may have mosses such as *Anomodon rostratus* and *Anomodon attenuatus*.

Great Smoky Mountains National Park

No information

OTHER NOTEWORTHY SPECIES
No information

CONSERVATION RANK G3G4

RANK JUSTIFICATION

DATABASE CODE CEGL004476

COMMENTS
Globally
This community is extremely uncommon in the southern Blue Ridge.
Great Smoky Mountains National Park

REFERENCES
Schafale and Weakley 1990

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GREAT SMOKY MOUNTAINS NATIONAL PARK VEGETATION MAPPING: PLOT SURVEY FORM PAGE _____ of _____

IIDENTIFIERS/LOCATORS

Plot Code GRSM._____ ☐ Primary Plot (Plot length_____ m Plot width_____ m) ☐ Secondary Plot

*Provisional Community Name_____

*Site Name (Sublocation) _____ *Quad. ☐Cades Cove ☐ Mount LeConte

Aerial photo # _____ Polygon code _____ *Extent of occurrence (acres) _____

*Date:___-_____-_1998 *Surveyor(s): _____

*Plot Photos (y/n) ___ Roll Number _____ Frame Number(s) _____ Plot Permanent (y/n) ____

WITNESS TREE SPECIES | DBH | Bearing/Distance to plot center	Diagram (include azimuth of center line):
1.	
2.	
3.	

Directions to Plot:

*GPS Techniques/Equipment _____ GPS file name ___ ___ ___ ___ ___ ___ ___ ___

*Field UTM X ___ ___ ___ ___ ___ ___ m E *Field UTM Y ___ ___ ___ ___ ___ ___ ___ m N

ENVIRONMENTAL / SITE INFORMATION

*Elevation _____ ft./ _____ m

Via: ■: topo map ■: altimeter ■: DEM ■ : GPS

Topographic Postion

- ☐ Interfluve (crest, summit, ridge)
- ☐ High Slope (upper slope, convex slope)
- ☐ Midslope (middle slope)
- ☐ Lowslope (lower slope, footslope)
- ☐ Toeslope (alluvial toeslope)
- ☐ Low level (terrace)

Slope

Measured Slope _____ ° _____ %

☐ Flat	0 °	0 %
☐ Gentle	0-5 °	1-9%
☐ Moderate	6-14 °	10-25%
☐ Somewhat steep	15-25 °	26-49%
☐ Steep	27-45 °	50-100%
☐ Very steep	45-69 °	101-275%
☐ Abrupt	70-100 °	276-300%
☐ overhanging/sheltered	>100 °	>300%

Aspect

Measured Aspect _____ ° (N = 0 °)

☐ Flat	
☐ Variable	
☐ N	338-22 °
☐ NE	23-67 °
☐ E	68-112 °
☐ SE	113-157 °
☐ S	157-202 °
☐ SW	203-247 °
☐ W	248-292 °
☐ NW	293-337 °

*Landform (check most applicable)

- ☐ Alluvial flat
- ☐ Alluvial terrace
- ☐ Bald
- ☐ Bank
- ☐ Bar
- ☐ Bench
- ☐ Cliff
- ☐ Colluvial Slope
- ☐ Cove
- ☐ Debris slide
- ☐ Depression
- ☐ Draw
- ☐ Floodplain
- ☐ Gap
- ☐ Hanging valley
- ☐ Knob
- ☐ Midslope
- ☐ Mountain Valley
- ☐ Nose slope
- ☐ Periglacial boulderfield
- ☐ Ridge
- ☐ Ridgetop bedrock outcrop
- ☐ Saddle
- ☐ Scour
- ☐ Seep
- ☐ Toe slope
- ☐ Slope
- ☐ Streambed
- ☐
- ☐
- ☐
- ☐

GREAT SMOKY MOUNTAINS NATIONAL PARK VEGETATION MAPPING : PLOT SURVEY FORM PAGE _____ of _____

Plot Code GRSM._____ Date:___-_____-_1998 ☐ Primary Plot ☐ Secondary Plot*

*Cowardin System	*Hydrologic Regime	*Unvegetated Surface with > 5% cover
☐ Upland ☐ Riverine ☐ Palustrine ☐ Lacustrine Soil Depth ____ cm (ave.) 1. _____ 2. _____ 3. _____ 4. _____	☐ Temporarily Flooded (e.g. floodplains) ☐ Seasonally Flooded (e.g. seasonal ponds) ☐ Saturated (e.g. bogs, perennial seeps) ☐ Unknown ☐ Not a wetland	(20 m X 20 m) _____% Bedrock _____% Wood (> 1 cm) _____% Litter, duff _____% Large rocks (cobbles, boulders > 10cm) _____% Small rocks (gravel, 0.2-10 cm) _____% Sand (0.1-2 mm) _____% Bare soil _____% Other _____

Hydrologic evidence

Environmental comments

Landscape Comments

*Natural and Anthropogenic Disturbance

Comments:

☐ logging	☐ fire
☐ erosion	☐ trails/roads
☐ grazing/browsing	☐ wind/ice damage
☐ pine bark beetle	☐ exotic plants
☐ dogwood anthracnose	☐ adelgid
☐ chestnut blight	☐ ferral hogs

Animal Use

*Other Comments
(If plot objective is to characterize a polygon -- include Plot Representativeness)

GREAT SMOKY MOUNTAINS NATIONAL PARK VEGETATION MAPPING : PLOT SURVEY FORM PAGE _____ of _____

Plot Code GRSM._____ Date:___-_____-_1998 ☐ Primary Plot ☐ Secondary Plot

*VEGETATION DESCRIPTION

STRATA	HEIGHT	% COVER	DIAGNOSTIC SPECIES (if known)
T2 Canopy	_____	_____	_____
T3 Sub-canopy	_____	_____	_____
S1 Tall shrub (2-5m)	_____	_____	_____
S2 Short Shrub (<2m)	_____	_____	_____
H Herbaceous	_____	_____	_____
N Non-vascular	_____	_____	_____
V Vine/liana	_____	_____	_____
E Epiphyte	_____	_____	_____

Height scale	Stratal
01 <0.5 m	1 5%
02 0.5-1 m	2 10%
03 1-2 m	3 20%
04 2-5 m	4 30%
05 5-10 m	5 40%
06 10-15 m	6 50%
07 15-20 m	7 60%
08 20-35 m	8 70%
09 35-50 m	9 80%
10 >50 m	10 90%
	11 100%

*Leaf type (dominant stratum)	*Leaf phenology (dominant stratum)	*Physiognomic class
☐ Broadleaf	☐ Evergreen	☐ Forest
☐ Needleleaf	☐ Deciduous	☐ Woodland
☐ Microphyllous	☐ Mixed Evergreen / Cold deciduous	☐ Shrubland
☐ Graminoid	☐ Herb - _Perennial	☐ Dwarf-shrubland
☐ Broadleaf Herbaceous	☐ Herb - Annual	☐ Herbaceous Vegetation
☐ Pteridophyte		☐ Nonvascular Vegetation
		☐ Sparse Vegetation

Provisional Community Name_____

Plot length _____ **m Plot width**_____ **m**

*SPECIES COMPOSITION AND COVER/ABUNDANCE CLASS BY STRATUM
(for secondary plots, list dominant species and coverage for each stratum -- up to five for each stratum)

SPECIES	C	**Total**	T2	T3	S1	S2	H	N	V	E

Cover cls (mdpt)	
1 trace	0.05
2 0.1-1%	0.55
3 1-2%	1.5
4 2-5%	3.5
5 5-10%	7.5
6 10-25%	17.5
7 25-50%	37.5

8 50-75% 62.5

9 75-95% 85

10 **>**95% 97.5

INFORMATION IN VEGETATION DESCRIPTIONS

GLOBAL NAME
Association name based on Latin names of dominant or characteristic plant species. The association (or plant association) is the finest level of the classification system. It is the level at which community inventory and conservation action are aimed.

COMMON NAME
Association common name; same as the GNAME, but with common names instead of scientific names for the species.

SYNONYM
A unique name by which the community may be more easily recognized or described.

PHYSIOGNOMIC CLASS
The second level of National Vegetation Classification System which is a vegetation structural classification adapted from UNESCO 1973 and Driscoll et al. 1984. This level is based on the structure of the vegetation. This is determined by the height and relative percentage of cover of the dominant life-forms: tree, shrub, dwarf-shrub, herbaceous and nonvascular.

PHYSIOGNOMIC SUBCLASS
The third level of National Vegetation Classification System. This level is determined by the predominant leaf phenology of classes defined by a tree, shrub or dwarf-shrub stratum, the persistence and growth form of herbaceous and nonvascular vegetation, and particle size of the substrate for sparse vegetation (e.g., consolidated rocks, gravel/cobble).

PHYSIOGNOMIC GROUP
The fourth level of National Vegetation Classification System. The group generally represents a grouping of vegetation units based on leaf characters, such as broad-leaf, needle-leaf, microphyllous, and xeromorphic. These units are identified and named with broadly defined macroclimatic types to provide a structural-geographic orientation, but the ecological climate terms do not define the groups *per se*.

PHYSIOGNOMIC SUBGROUP
The fifth level of National Vegetation Classification System represents a distinction between natural vegetation, including natural, semi-natural and some modified vegetation, and cultural vegetation (planted/cultivated).

FORMATION
The six level of National Vegetation Classification System; represents a grouping of community types that share a definite physiognomy or structure and broadly defined environmental factors, such as elevation and hydrologic regime.

ALLIANCE: Level of National Vegetation Classification System reflecting a physiognomically uniform group of plant associations sharing one or more diagnostic species (dominant, differential, indicator, or character), which (generally) are found in the uppermost stratum of the vegetation.

CLASSIFICATION CONFIDENCE LEVEL: the degree of confidence associated with the classification of the Element. This confidence is based on the quality and type of data used in the analysis as well as the extent to which the entire (or potential) range of the Element was considered

1 STRONG
Classification based on recent field data. Information is based on Element Occurrences or other data based on occurrences that can be relocated. Classification considers information collected across the entire range or potential range of the Element. Classification may be based on quantitative or qualitative data

2 MODERATE
Classification is based on data that is of questionable quality, limited numbers of sample points, or data from a limited range.

3 WEAK
Classification is based on secondary or anecdotal information. Or a new type for which data have only been collected at a very small number of sites.

USFWS WETLAND SYSTEM:
USFWS Wetland Classification System, if applicable. (Cowardin, L.M., V. Carter, F.C. Golet, E.T. LaRoe. 1979. *Classification*

of Wetlands and Deepwater Habitats of the United States. United States Fish and Wildlife Service. Washington, DC.).

RANGE:
Globally
Description of the association's present range, including states of occurrence

Great Smoky Mountains National Park
Description of where the community is found on the two pilot quadrangles, or elsewhere in the Park (if known)

ENVIRONMENTAL DESCRIPTION
Globally
Most important environmental determinants of the biological composition or structure of this association and/or its subtypes.
Great Smoky Mountains National Park
Important environmental determinants of the biological composition or structure of this association within the two pilot quadrangles, or in other area of the Park (if known).

MOST ABUNDANT SPECIES
Globally
Stratum Species
Most abundant species by stratum
Great Smoky Mountains National Park
Stratum Species
Most abundant species by stratum, based on the two pilot quadrangles.

CHARACTERISTIC SPECIES
Globally
Latin names of plant species not necessarily most abundant, but which are characteristic or diagnostic of the association when taken singly or in combination with other species.
Great Smoky Mountains National Park
Characteristic species for the association on the two pilot quadrangles, if different from global species.

VEGETATION DESCRIPTION
Globally
Additional comments on 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.
Great Smoky Mountains National Park
Vegetation description for the association on the two pilot quadrangles, if different from global concept.

OTHER NOTEWORTHY SPECIES
High ranked species, animals, endemics, disjuncts, exotics that are found within occurrences of this association.

CONSERVATION RANK
Global Element rank which characterizes the relative rarity or endangerment of the association worldwide.

RANK JUSTIFICATION
Reason for assigning the Global Element Rank, such as number of occurrences, number of hectares, total area reduction from original, threats, degradation, etc.

DATABASECODE
Element Code from the National Community Database.

COMMENTS
Globally
Any other comments about this association not covered in the fields above such as landscape relationships, inclusion communities, etc.
Great Smoky Mountains National Park
Any other comments about this association specific to the Park, including notes about possible problems in photointerpretation.

REFERENCES
Sources of information used to define or describe the association

ELCODE	*CONF.	PLOT #	SUBLOCATION	QUAD.	UTMX	UTMY
CEGL003814	?	GRSM.71	Alum Cave Trail	Mt. Leconte	278850	3946080
CEGL003814		GRSM.73	Brushy mtn.	Mt. Leconte	280059	3950753
CEGL003814		GRSM.135	Western Ridge off Balsam Point	Mt. Leconte	275307	3947672
CEGL003814		GRSM.76	Gap East of Bull Head	Leconte	275258	3948870
CEGL003814		GRSM.74	Brushy Mtn	Mt. Leconte	279960	3950625
CEGL003814		GRSM.153	Razorback ridge on Alum Cave Trail	Mt. Leconte	278473	3946293
CEGL003814		GRSM.AA6	Chimneys	Mount LeConte	275559	3945472
CEGL003814		GRSM.AA2	Brushy Mountain	Mount LeConte	280028	3950737
CEGL003836		GRSM.243	Abrams Creek	Cades Cove	242905	3942550
CEGL003890		GRSM.220	Rowans Branch	Cades Cove	248047	3941411
CEGL003890		GRSM.139	North of Mt. Winnesoka	Mt. Leconte	279082	3953056
CEGL003890		GRSM.131	North of Potato Ridge	Mt. Leconte	282971	3952793
CEGL003890		GRSM.132	North of Potato Ridge	Mt. Leconte	282863	3952824
CEGL003890		GRSM.125	South of Pond Knob	Cades Cove	248828	3935099
CEGL003890	?	3002	Davis Ridge	Thunderhead Mtn.	259730	3943682
CEGL003893		GRSM.93	Gap between Cliff top and High top	Mt Leconte	279089	3947997
CEGL003893		GRSM.94	East of Cliff Top	Mt Leconte	278965	3948012
CEGL003893		GRSM.95	North of Cliff Top	Mt Leconte	278863	3948059
CEGL004103		GRSM.81	Little Pigeon River	Mt Leconte	283945	3955264
CEGL004103		GRSM.113	Greenbrier	Mt. Leconte	281651	3957206
CEGL004112		GRSM.244	Inside Cades Cove loop on the west end.	Cades Cove	242937	3942265
CEGL004242		GRSM.213	Russell Field Bald	Cades Cove	248883	3939009
CEGL004242		GRSM.247	Gregory Bald	Cades Cove	240111	3934328
CEGL004242		GRSM.248	Gregory Bald	Cades Cove	240224	3934381
CEGL004278		GRSM.91	Upper Alum Cave Trail	Mt Leconte	278966	3947771
CEGL004278		GRSM.146	Boulevard Trail	Mt. Leconte	279977	3948060
CEGL004278		GRSM.151	Alum Cave Trail	Mt. Leconte	279205	3946653
CEGL004296		GRSM.250	Rich Gap	Cades Cove	241448	3934670
CEGL004296		GRSM.232	Pole Knob Branch	Cades Cove	248425	3939610
CEGL004296		GRSM.62	Baskins Creek	Mt. Leconte	274880	3952950
CEGL004296		GRSM.105	Leconte creek	Mt Leconte	276717	3949141
CEGL004302		GRSM.141	Place of a thousand drips	Mt. Leconte	275492	3954461
CEGL004302		GRSM.150	Grotto Falls	Mt. Leconte	278280	3950390
CEGL004302		GRSM.159	Rainbow Falls	Mt. Leconte	277030	3949080
CEGL004476	?	GRSM.239	Gregory's Cave	Cades Cove	245846	3944094
CEGL004691		GRSM.215	Forge Creek Road and Mill Creek	Cades Cove	242880	3941272
CEGL004973	?	2040		Cades Cove	249761	3939048
CEGL004973	?	2135		Cades Cove	240246	3934985
CEGL004973	?	3016		Thunderhead Mtn.	261677	3939399
CEGL004973	?	2130		Cades Cove	241177	3935007
CEGL004973	?	2134	North of Gregory Bald	Cades Cove	240174	3934634
CEGL004973	?	2151		Cades Cove	241165	3934615
CEGL004973		GRSM.231	Upper ploe knob Ranch	Cades Cove	248475	3939375
CEGL004973		2042	Ledbetter Ridge	Cades Cove	249678	3938777
CEGL004973		2043	Ledbetter Ridge	Cades Cove	250549	3938813
CEGL004973		2054	Ledbetter Ridge	Cades Cove	249464	3938908
CEGL004973		2133	Gregory Ridge	Cades Cove	240103	3934974
CEGL004973		3006	Davis Ridge	Thunderhead Mtn.	260376	3940682
CEGL004973		GRSM.29	Cove below Chimney tops	Mount LeConte	275553	3945217
CEGL004973		GRSM.30	Beech Flats	Mount LeConte	276391	3945464
CEGL004973		GRSM.58	Devils Tater Patch	Cades Cove	248017	3937562

*CONF = Confidence in classification attribution; ?= low confidence

ELCODE	*CONF.	PLOT #	SUBLOCATION	QUAD.	UTMX	UTMY
CEGL004973		GRSM.53	North of Ekaneetlee Gap	Cades Cove	245370	3936745
CEGL004973		GRSM.59	Upper Anthony Creek Trail	Cades Cove	249188	3939332
CEGL004973		GRSM.45	Forge Knob West	Cades Cove`	242149	3934425
CEGL004973		GRSM.46	Mud Gap	Cades Cove	244729	3935366
CEGL004973		GRSM.7	"Grassy Patch" above Alum Cave Creek	Mount LeConte	278610	3945506
CEGL004973		GRSM.108	Walker Camp Prong	Mt. Leconte	277274	3945402
CEGL004980		GRSM.223	Rowans Branch	Cades Cove	248014	3941603
CEGL004980		GRSM.241	Crooked Arm Branch	Cades Cove	248930	3944721
CEGL004980		GRSM.156	Bullhead Trail	Mt. Leconte	274306	3949153
CEGL004980		GRSM.160	Above 441 in the Fort Harry vicinity	Mt. Leconte	275280	3946970
CEGL004982		GRSM.251	Forge Knob Branch headwaters	Cades Cove	242380	3934610
CEGL004982		GRSM.17	Bull Head Trail-Southwest of Balsam Point	Mount LeConte	275676	3947577
CEGL004982		GRSM.75	Ravine West of Trillium Gap	Mt. Leconte	279420	3949840
CEGL004982		GRSM.104	LeConte Creek	Mt Leconte	276649	3948774
CEGL004982		GRSM.106	Leconte Creek	Mt Leconte	276735	3949039
CEGL004983		GRSM.70	Alum cave trail	Mt. Leconte	278530	3946580
CEGL004983		GRSM.152	Below Alum Cave	Mt. Leconte	278600	3946371
CEGL006049	?	6133		Mt. LeConte	278512	3948296
CEGL006049	?	6134		Mt. LeConte	279157	3948510
CEGL006049	?	6139		Mt. LeConte	278457	3948611
CEGL006049	?	6136		Mt. LeConte	279181	3948403
CEGL006049	?	6135		Mt. LeConte	278737	3948173
CEGL006049	?	6137		Mt. LeConte	279624	3948169
CEGL006049		GRSM.92	Mt. Leconte Summit	Mt Leconte	279090	3948090
CEGL006049		GRSM.147	Boulevard Trail -- past Myrtle Point	Mt. Leconte	279480	3948120
CEGL006124		GRSM.98	North slope of Leconte, on Rainbow Falls trail.	Mt Leconte	277974	3949264
CEGL006130		GRSM.12	Trillium Gap	Mount LeConte	279742	3950290
CEGL006192	?	2056		Cades Cove	249131	3940817
CEGL006192	?	2124		Cades Cove	242540	3936531
CEGL006192	?	2058		Cades Cove	248714	3941054
CEGL006192	?	3019		Thunderhead Mtn.	258921	3943378
CEGL006192	?	1029		Calderwood	237077	3937542
CEGL006192		2052	Ledbetter Ridge	Cades Cove	249432	3940474
CEGL006192		2127	Gregory Ridge	Cades Cove	241998	3935553
CEGL006192		2106	Gregory Ridge	Cades Cove	243384	3936580
CEGL006192		2109	Gregory Ridge	Cades Cove	242681	3937697
CEGL006192		2129	Gregory Ridge	Cades Cove	243119	3936122
CEGL006192		3003		Thunderhead Mtn.	259252	3944201
CEGL006192		GRSM.4	Horseshoe Cove-North Porter's Mountain	Mount LeConte	283947	3952076
CEGL006192		GRSM.14	Baskin's Creek Trail South	Mount LeConte	275814	3950843
CEGL006192		GRSM.16	Piney Mountain-Northwest	Mount LeConte	276452	3951274
CEGL006192		GRSM.120	Eagle Creek	Cades Cove	250283	3934399
CEGL006192		GRSM.31	Boring Ridge-Rabbit Creek Road	Cades Cove	240775	3941436
CEGL006192	?	GRSM.266	McCampbell Gap	Cades Cove	249725	3938310
CEGL006192	?	3028	Davis Ridge	Thunderhead Mtn.	259983	3943705
CEGL006192	?	2100		Cades Cove	243068	3937139
CEGL006192	?	2115		Cades Cove	243063	3937560
CEGL006256		GRSM.25	Boulevard Trail	Mount LeConte	283222	3945572
CEGL006256		GRSM.142	Above Trillium Gap	Mt. Leconte	279321	3949601
CEGL006256		GRSM.145	Boulevard Trail	Mt. Leconte	280622	3946799
CEGL006256		GRSM.157	Bullhead Trail -- Balsam Point	Mt. Leconte	275883	3947646

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ELCODE	*CONF.	PLOT #	SUBLOCATION	QUAD.	UTMX	UTMY
CEGL006271	?	1028		Calderwood	237448	3936898
CEGL006271	?	2053		Cades Cove	249280	3941762
CEGL006271	?	2123		Cades Cove	243689	3936052
CEGL006271	?	2167		Cades Cove	244384	3936473
CEGL006271	?	2122		Cades Cove	243198	3936196
CEGL006271	?	2154		Cades Cove	244988	3937113
CEGL006271	?	1015		Calderwood	235941	3938085
CEGL006271	?	1058		Cades Cove	241943	3944955
CEGL006271	?	1056		Cades Cove	241742	3944964
CEGL006271	?	1085		Calderwood	238407	3945493
CEGL006271	?	2157		Cades Cove	245093	3937383
CEGL006271	?	2160		Cades Cove	244609	3937494
CEGL006271	?	2158		Cades Cove	243962	3937420
CEGL006271		GRSM.212	Russell Field trail	Cades Cove	249464	3940315
CEGL006271		3014	Davis Ridge	Thunderhead Mtn.	260298	3941657
CEGL006271		2114	Gregory Ridge	Cades Cove	243099	3937559
CEGL006271		2110	Gregory Ridge	Cades Cove	242719	3937449
CEGL006271		GRSM.122	Nuna Ridge	Cades Cove	250514	3936281
CEGL006271		GRSM.54	Mollies Ridge - Lonesome Branch	Cades Cove	245572	3937070
CEGL006271		GRSM.128	Paw Paw Ridge	Cades Cove	250116	3932738
CEGL006271		GRSM.35	Anthony Creek Trail-West Cooper Branch	Cades Cove	249036	3942128
CEGL006271		GRSM.42	Forge Creek	Cades Cove	243058	3937122
CEGL006271		GRSM.80	Grapeyard Trail	Mt Leconte	284099	3953800
CEGL006271		GRSM.18	Lower Rainbow Falls Trail	Mount LeConte	275632	3949796
CEGL006271		GRSM.109	Cherokee Orchard	Mt Leconte	275429	3951090
CEGL006271		GRSM.111	Cherokee Orchard	Mt. Leconte	275231	3951113
CEGL006271		GRSM.9	Baskin's Creek Trail	Mount LeConte	276235	3952777
CEGL006271		GRSM.99	Hills Creek	Mt Leconte	280340	3956530
CEGL006271		GRSM.22	High South Slope -- Potato Ridge	Mount LeConte	282538	3952503
CEGL006271		GRSM.130	Potato Ridge	Mt. Leconte	283162	3952697
CEGL006271		GRSM.124	Big Grill Ridge	Cades Cove	248650	3934840
CEGL006271		GRSM.110	Cherokee Orchard	Mt. Leconte	275392	3951176
CEGL006272		GRSM.11	Trillium Gap-LeConte Trail	Mount LeConte	279661	3950053
CEGL006272		GRSM.72	Alum Cave Trail	Mt Leconte	279030	3946375
CEGL006286		GRSM.100	Hills Creek	Mt Leconte	280320	3956385
CEGL006347		GRSM.240	Abrams Creek	Cades Cove	242112	3942433
CEGL007097	?	1001		Calderwood	23462	393942
CEGL007097	?	1014		Calderwood	235274	3937758
CEGL007097	?	1068		Cades Cove	239514	3938362
CEGL007097	?	1026		Calderwood	234355	3935797
CEGL007097	?	1064		Cades Cove	240156	3938298
CEGL007097	?	1069		Cades Cove	239487	3938282
CEGL007097	?	1065		Cades Cove	240108	3938523
CEGL007097	?	1067		Cades Cove	239577	3938427
CEGL007097	?	2103		Cades Cove	242606	3936942
CEGL007097	?	2119		Cades Cove	242609	3936026
CEGL007097	?	2155		Cades Cove	244581	3937267
CEGL007097	?	2156		Cades Cove	245184	3937270
CEGL007097	?	2159		Cades Cove	244608	3937425
CEGL007097	?	2153		Cades Cove	243783	3937394
CEGL007097	?	1009		Calderwood	237766	3941811

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ELCODE	*CONF.	PLOT #	SUBLOCATION	QUAD.	UTMX	UTMY
CEGL007097		GRSM.224	Cobb Butt	Cades Cove	246500	3940132
CEGL007097		GRSM.226	Allnight Ridge	Cades Cove	250012	3942584
CEGL007097		2057	Ledbetter Ridge	Cades Cove	249472	3940581
CEGL007097		GRSM.84	Below Turkey Rock	Leconte	280651	3951923
CEGL007097		GRSM.140	Grapeyard Trail	Mt. Leconte	277218	3952618
CEGL007097		GRSM.102	Cobbs Butt	Cades Cove	246760	3940141
CEGL007097		GRSM.77	Bull Head	Mt Leconte	274987	3949005
CEGL007097		GRSM.34	Anthony Cr. Trail-East Cooper Branch	Cades Cove	249191	3942104
CEGL007097		GRSM.AA3	Baskin's Creek Trail	Mount LeConte	275761	3950959
CEGL007097		GRSM.39	North of Tater Ridge	Cades Cove	245366	3945346
CEGL007097		GRSM.86	Ridge N. of Copeland Creek	Mt Leconte	283505	3957058
CEGL007097		GRSM.103	Injun Creek	Mt Leconte	281357	3954550
CEGL007102	?	1052		Cades Cove	240249	3943501
CEGL007102	?	1050		Cades Cove	240811	3941927
CEGL007102		GRSM.209	Arbutus branch	Cades Cove	241115	3942910
CEGL007102		GRSM.217	Wildcat Branch	Cades Cove	242892	3939255
CEGL007102		GRSM.33	Coon Butt Ravine	Cades Cove	239920	3940939
CEGL007102		GRSM.69	Slope of Little Pigeon River	Mt Leconte	282238	3956800
CEGL007119	?	1073		Calderwood	235056	3943456
CEGL007119	?	1088		Blockhouse	238879	3946003
CEGL007119	?	1027		Calderwood	238947	3950315
CEGL007119	?	1036		Calderwood	238440	3949973
CEGL007119	?	1035		Calderwood	238250	3949880
CEGL007119	?	1070		Calderwood	235172	3943829
CEGL007119	?	1072		Calderwood	235100	3943788
CEGL007119	?	1080		Calderwood	230351	3938972
CEGL007119	?	1082		Calderwood	230688	3939174
CEGL007119	?	1062		Cades Cove	241278	3941389
CEGL007119	?	1089		Cades Cove	240596	3945671
CEGL007119	?	1033		Calderwood	234931	3940288
CEGL007119		GRSM.200	Tater Ridge	Cades Cove	244622	3944415
CEGL007119		GRSM.216	Forge Creek Road	Cades Cove	242488	3939187
CEGL007119		GRSM.38	Rich Mountain Road	Cades Coves	243842	3944541
CEGL007119		GRSM.32	Boring Ridge	Cades Cove	240741	3941109
CEGL007130		GRSM.154	Alum Cave Trail	Mt. Leconte	279060	3947078
CEGL007130		GRSM.144	Boulevard trail	Mt. Leconte	283032	3946124
CEGL007130		GRSM.158	Above Rocky Spur on Rainbow Falls Trail	Mt. Leconte	278426	3948804
CEGL007131		GRSM.24	Boulevard trail	Mount LeConte	283308	3945930
CEGL007131		GRSM.26	Boulevard Trail	Mount LeConte	283483	3945315
CEGL007131		GRSM.155	Alum Cave Trail	Mt. Leconte	278836	3947803
CEGL007136		GRSM.205	Abrams Creek	Cades Cove	240875	3942547
CEGL007136		GRSM.43	Tipton's Sugar Cove Branch	Cades Cove	242054	3937979
CEGL007219		GRSM.222	Rowans Branch	Cades Cove	248119	3941369
CEGL007219		GRSM.79	Rhododendron Creek	Mt Leconte	281910	3953510
CEGL007219		GRSM.AA1	Porter's Creek Flats	Mount LeConte	283714	3952086
CEGL007219		GRSM.119	Eagle Creek	Cades Cove	250214	3934579
CEGL007219		GRSM.67	Lower little pigeon river	Mt Leconte	281080	3956870
CEGL007230	?	1031		Calderwood	235107	3940838
CEGL007230	?	1008		Calderwood	238068	3941945
CEGL007230	?	1083		Calderwood	239763	3946042
CEGL007230	?	1060		Cades Cove	241340	3941466

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ELCODE	*CONF.	PLOT #	SUBLOCATION	QUAD.	UTMX	UTMY
CEGL007230	?	1025		Calderwood	233638	3935979
CEGL007230	?	1077		Calderwood	230510	3938538
CEGL007230	?	1078		Calderwood	230292	3938826
CEGL007230	?	1081		Calderwood	230573	3938726
CEGL007230	?	2136		Cades Cove	239847	3935647
CEGL007230	?	2144		Cades Cove	243179	3934717
CEGL007230	?	2162		Cades Cove	245639	3936605
CEGL007230	?	2164		Cades Cove	245863	3936539
CEGL007230		GRSM.261	Big Grill Ridge	Cades Cove	247217	3936792
CEGL007230		GRSM.257	Greer knob	Cades Cove	245230	3933520
CEGL007230		GRSM.260	Greer Knob South	Cades Cove	245050	3933125
CEGL007230		GRSM.127	West of Paw Paw Ridge	Cades Cove	249946	3932586
CEGL007230		GRSM.65	Dudley creek	Mt Leconte	279010	3956680
CEGL007230		GRSM.118	Copeland Creek	Mt. Leconte	282880	3958085
CEGL007230		GRSM.85	Copeland Creek	Mt Leconte	282921	3957896
CEGL007230		GRSM.88	Cades Cove Loop	Cades Cove	246143	3943768
CEGL007230		GRSM.47	Appalachian Trail south of Doe Knob	Cades Cove	244336	3934529
CEGL007230		GRSM.52	North of Ekaneetlee Gap	Cades Cove	245581	3936327
CEGL007230		GRSM.48	Brier Lick Gap	Cades Cove	243317	3934621
CEGL007230	?	GRSM.37	Rich Mountain Road Gate	Cades Cove	244120	3944144
CEGL007230?		GRSM.256	Ridge south of Doe Knob	Cades Cove	244280	3934220
CEGL007267	?	1003		Calderwood	235314	3939679
CEGL007267	?	1007		Calderwood	237803	3941930
CEGL007267	?	1087		Calderwood	238594	3945702
CEGL007267	?	1047		Calderwood	235527	3943005
CEGL007267	?	1084		Calderwood	239103	3945901
CEGL007267	?	1063		Cades Cove	240174	3941673
CEGL007267	?	1061		Cades Cove	241204	3941328
CEGL007267	?	1055		Cades Cove	241807	3944856
CEGL007267	?	1057		Cades Cove	241338	3944866
CEGL007267	?	2152		Cades Cove	243464	3937769
CEGL007267		GRSM.21	East slope of Potato Ridge	Mount LeConte	283697	3952779
CEGL007267		GRSM.23	Copeland Divide	Mount LeConte	282980	3956426
CEGL007267		GRSM.40	Cooper Road-Stony Ridge	Cades Cove	240974	3945388
CEGL007267		GRSM.41	Cooper Road-Arbutus Ridge	Cades Cove	241550	3944677
CEGL007267		GRSM.66	Lower Little Pigeon River	Mt Leconte	281480	3957003
CEGL007267	?	GRSM.237	Anthony Creek	Cades Cove	249775	3942110
CEGL007267	?	GRSM.238	Green Branch adjacent to the Cades Cove loop road	Cades Cove	249555	3943570
CEGL007285	?	3022		Thunderhead Mtn.	260582	3941043
CEGL007285	?	2132		Cades Cove	240330	3934701
CEGL007285	?	2140		Cades Cove	240040	3934524
CEGL007285	?	2141		Cades Cove	240224	3934475
CEGL007285	?	2147		Cades Cove	240711	3934431
CEGL007285	?	3011		Thunderhead Mtn.	261257	3939375
CEGL007285	?	3012		Thunderhead Mtn.	261198	3939482
CEGL007285	?	2139		Cades Cove	239868	3934357
CEGL007285	?	2145		Cades Cove	242357	3934395
CEGL007285		GRSM.214	North slope of McCampbell Knob	Cades Cove	249054	3939042
CEGL007285		2142	Gregory Ridge	Cades Cove	242125	3934384
CEGL007285		GRSM.49	Upper Gregory Ridge Trail	Cades Cove	241038	3934703
CEGL007285		GRSM.51	Mollies Ridge Shelter	Cades Cove	246780	3936970

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ELCODE	*CONF.	PLOT #	SUBLOCATION	QUAD.	UTMX	UTMY
CEGL007285		GRSM.56	Devils Tater Patch	Cades Cove	247382	3937227
CEGL007285		GRSM.57	Devils Tater Patch	Cades Cove	247776	3937451
CEGL007285		GRSM.114	Masa Knob	Mt. Leconte	284806	3945831
CEGL007285		GRSM.143	Trillium Gap Trail	Mt. Leconte	279142	3949123
CEGL007298		GRSM.137	Western Ridge of Balsam Point	Mt. Leconte	274878	3947563
CEGL007299		GRSM.228	MacCampbell Knob	Cades Cove	249189	3939063
CEGL007300	?	2148		Cades Cove	241138	3934723
CEGL007300	?	3013		Thunderhead Mtn.	261207	3939205
CEGL007300	?	2146		Cades Cove	240957	3934430
CEGL007300	?	2149		Cades Cove	240461	3934324
CEGL007300		GRSM.249	Gregory Bald, south slope	Cades Cove	234697	3934190
CEGL007300		GRSM.262	Lower Big Grill Ridge near Pond Knob	Cades Cove	248539	3935473
CEGL007300		GRSM.44	Moore Spring Camp	Cades Cove	240792	3934208
CEGL007300		GRSM.55	Mollies Ridge	Cades Cove	246052	3937105
CEGL007388		GRSM.242	Gum pond	Cades Cove	242762	3941875
CEGL007519	?	1076		Calderwood	235431	3943758
CEGL007519		GRSM.206	Crooked Arm Ridge	Cades Cove	248810	3944240
CEGL007519		GRSM.204	Abrams Creek	Cades Cove	241028	3942320
CEGL007519		GRSM.208	Abrams Creek	Cades Cove	241282	3942703
CEGl007519		GRSM.218	Wildcat Branch	Cades Cove	242788	3939197
CEGL007519		GRSM.36	Laurel Creek	Cades Cove	250172	3943368
CEGL007519		GRSM.AA5	Tipton's Sugar Cove Branch	Cades Cove	241970	3937995
CEGL007543	?	1002		Calderwood	235017	3940269
CEGL007543	?	1051		Cades Cove	241387	3941854
CEGL007543	?	1005		Calderwood	236953	3942612
CEGL007543	?	1022		Calderwood	237072	3943689
CEGL007543	?	1030		Calderwood	235308	3940881
CEGL007543	?	1034		Calderwood	234612	3939304
CEGL007543	?	2046		Cades Cove	250024	3940882
CEGL007543	?	2113		Cades Cove	243030	3937558
CEGL007543	?	3027		Thunderhead Mtn.	261124	3943049
CEGL007543	?	3004		Thunderhead Mtn.	261463	3942286
CEGL007543	?	3018		Thunderhead Mtn.	259694	3942139
CEGL007543		GRSM.201	Streamside north of Tater Ridge	Cades Cove	244709	3944931
CEGL007543		GRSM.254	Ekaneetlah confluence	Cades Cove	246200	3934710
CEGL007543		2101		Cades Cove	243166	3936813
CEGL007543		2116		Cades Cove	242844	3935721
CEGL007693	?	3023		Thunderhead Mtn.	260886	3941127
CEGL007693	?	2041		Cades Cove	250022	3939454
CEGL007693	?	2047		Cades Cove	249431	3939332
CEGL007693	?	3015		Thunderhead Mtn.	260671	3939352
CEGL007693	?	2117		Cades Cove	242557	3935412
CEGL007693	?	3024		Thunderhead Mtn.	260359	3941324
CEGL007693	?	3026		Thunderhead Mtn.	260887	3941772
CEGL007693		2105	Gregory Ridge	Cades Cove	243252	3936606
CEGL007693		3007	Davis Ridge	Thunderhead Mtn.	260664	3941009
CEGL007693		2055	Ledbetter Ridge	Cades Cove	249125	3939414
CEGL007693		3008		Thunderhead Mtn.	260499	3940748
CEGL007693		GRSM.5	Upper Porter's Creek	Mount Guyot	285325	3947414
CEGL007693		GRSM.6	Porter's Creek-Horseshoe Branch	Mount LeConte	283944	3948849
CEGL007693		GRSM.148	North watershed of Rocky Spur	Mt. Leconte	277519	3949904

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ELCODE	*CONF.	PLOT #	SUBLOCATION	QUAD.	UTMX	UTMY
CEGL007693		GRSM.60	Left prong Anthony Creek.	Cades Cove	250000	3940690
CEGL007693		GRSM.1	Cherokee Orchard-Rainbow Falls Trailhead	Mount LeConte	240775	3941436
CEGL007693		GRSM.10	Trillium Gap-Grotto Falls Connector	Mount LeConte	277222	3950974
CEGL007693	?	3025	Davis Ridge	Thunderhead Mtn.	260426	3941520
CEGL007695	?	2163		Cades Cove	245675	3936663
CEGL007695	?	1011		Calderwood	235686	3938387
CEGL007695	?	2104		Cades Cove	242675	3936750
CEGL007695	?	2131		Cades Cove	242476	3936200
CEGL007695		GRSM.246	Pine Ridge north slope	Cades Cove	240762	3937934
CEGL007695		GRSM.207	Scotts Mountain Trail	Kinzel Springs	249742	3945539
CEGL007695		GRSM.225	Cove below Cobb Butt	Cades Cove	246648	3940369
CEGL007695		GRSM.236	Upper Fanny Branch	CAdes Cove	248938	3941657
CEGL007695		GRSM.50	Mid- Gregory Ridge Trail	Cades Cove	242303	3935956
CEGL007695		GRSM.3	Porter's Creek	Mount LeConte	283032	3950858
CEGL007695		GRSM.27	Chimineys Picnic area - Nature trail	Mount LeConte	274021	3946118
CEGL007695		GRSM.78	Lower Bullhead Trail	Mt Leconte	274290	3949450
CEGL007695		GRSM.138	N. of Mt. Winnesoka	Mt. Leconte	279187	3952352
CEGL007695		GRSM.101	Bunting Branch	Cades Cove	246851	3940480
CEGL007695		GRSM.2	Cherokee Orchard-LeConte Creek	Mount LeConte	275010	3949896
CEGL007695		GRSM.15	Piney Mountain-Northeast	Mount LeConte	276571	3951285
CEGL007695		GRSM.133	Fort Harry	Mt. Leconte	275700	3946770
CEGL007695		GRSM.134	Ravine E and S of Balsam Point	Mt. Leconte	274949	3947237
CEGL007695		GRSM.19	Rainbow Falls Trail-Below Falls	Mount LeConte	276144	3949314
CEGL007695		GRSM.83	Long Branch	Mt Leconte	281152	3951500
CEGL007695		GRSM.149	N.watershed below Rocky Spur	Mt. Leconte	277343	3950480
CEGL007697		GRSM.115	Icewater Springs	Mt. Leconte	283846	3945381
CEGL007710		GRSM.210	Abrams creek	Cades Cove	240325	3943196
CEGL007710		GRSM.211	Russell Field Trail before it gets steep	Cades Cove	250195	3941350
CEGL007710		GRSM.221	Cork Branch/Rowans Branch junction	Cades Cove	248148	3941140
CEGL007710		GRSM.63	Lower Baskins Ck	Mt.Leconte	273883	3953564
CEGL007710		GRSM.87	Indian Creek	Mt Leconte	278152	3953003
CEGL007710	?	GRSM.258	Birch Springs Shelter	Cades Cove	244830	3932125
CEGL007861	?	2138		Cades Cove	240406	3935346
CEGL007861		3010		Thunderhead Mtn.	261605	3940939
CEGL007861		GRSM.107	Alum Cave Creek	Mt Leconte	278143	3945476
CEGL007861		GRSM.28	Alum Cave Creek/Walker Camp Prong	Mount LeConte	277750	3945410
CEGL007861		GRSM.13	East Limb of Rocky Spur Branch	Mount LeConte	278095	3950478
CEGL007861		GRSM.136	Cove off Balsam Ridge	Mt. Leconte	275272	3947463
CEGL007861		GRSM.116	Chimney's Trailhead	Mt. Leconte	276153	3946090
CEGL007861		GRSM.8	Alum Cave Creek-Steep Rhodo Pass	Mount LeConte	278565	3945484
CEGL007861		GRSM.117	Trout Branch	Mt. Leconte	277452	3945920
CEGL007876	?	6138		Mt. LeConte	278630	3948184
CEGL007876		GRSM.96	Rocky Spur	LeConte	278036	3949089
CEGL007876		GRSM.97	Rocky Spur	Mt Leconte	278032	3949078
CEGL007876		GRSM.AA4	Jumpoff	Mount LeConte	283635	3945783
CEGL007877		GRSM.90	Alum Cave trail	Mt Leconte	279013	3947786
CEGL007878		GRSM.252	Upper Big Tommy Creek	Cades Cove	244717	3934660
CEGL007878		GRSM.255	Ekaneetlah Creek	Cades Cove	246025	3935111
CEGL007878		GRSM.265	Big Abrams Gap (south slope in NC.)	Cades Cove	248801	3938219
CEGL007878		2045	Ledbetter Ridge	Cades Cove	249241	3941084
CEGL007878		GRSM.121	West of Nuna Ridge	Cades Cove	250399	3936091

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CEGL007879		GRSM.61	Baskins Creek	Mt Leconte	275295	3952910
CEGL007880		GRSM.219	Rowan Branch	Cades Cove	247485	3942354
CEGL007880		GRSM.20	Greenbrier Flats	Mount LeConte	284326	3955018
CEGL007880		GRSM.64	Dudley Creek	Mt. LeConte	279030	3956360
CEGL007880		GRSM.82	Lower Little Pigeon River	Mt Leconte	281570	3957420
CEGL007880		GRSM.89	Alluvial flat along Abrams Creek	Cades Cove	241779	3941993
CEGL007880		GRSM.112	Greenbrier - Little Pigeon River	Mt. Leconte	283114	3955789

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