

Field Key to Vegetation Types of Great Smoky Mountains National Park (inclusive of the Foothills Parkway)



U.S. NATIONAL VEGETATION CLASSIFICATION

NatureServe

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

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This report is part of a series of publications on the vegetation of the Great Smoky Mountains National Park, including full descriptions of each of the types in this report (see NatureServe 2020) and a vegetation map that depicts the spatial extent of each of these types, either directly or as part of various map units (Hop et al. 2021). See:

NatureServe. 2020. Associations and Alliances of Great Smoky Mountains National Park (inclusive of the Foothills Parkway). U.S. National Vegetation Classification. NatureServe Central Databases. Arlington, VA. Data current as of 9 April 2020.

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

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Key to Keys for vegetation of Great Smoky Mountains National Park

- 1a. Wetland and floodplain communities: Wetland habitats (including floodplains, alluvial zones, and wetland forests) 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 OR levee forests and adjacent active floodplains and alluvial zones. **Key A, p. 5**
- 1b. Upland communities: Upland habitats either dominated by plants which are not adapted to anaerobic soil 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 OR not in floodplains/alluvial zones. **2**
- 2a. Communities at greater than 4,000-4,500 ft. (1220-1370 m) in NC and 3,800 ft. (1160 m) in TN (characteristic of high-elevation landscapes and lacking significant coverage of low elevation tree species**—communities of intermediate character keyed in both leads). **3**
- 2b. Communities at less than 4,500 ft. (1370 m) in NC and 3,800 ft. (1160 m) in TN (characteristic of low to intermediate elevation landscapes, and lacking significant coverage of high elevation tree species*). Communities of intermediate, ambiguous character are keyed in both leads. **5**
- 3a. Higher elevation communities not dominated by trees (shrublands, herbaceous; living trees generally less than 25% canopy/subcanopy coverage). **Key B, p. 10**
- 3b. Higher elevation forested/woodland communities (tree canopy/subcanopy coverage greater than 25%), dominated by *Abies fraseri*, *Picea rubens*, *Betula alleghaniensis*, *Aesculus flava*, *Fagus grandifolia*, *Quercus rubra*, etc. **4**
- 4a. Higher-elevation evergreen Forests and Woodlands: Stands with canopies dominated by evergreen trees (greater than 75%; in cases where the canopy and subcanopy are not clearly differentiated in height, they may be evaluated together for this purpose). **Key C, p. 12**
- 4b. Higher-elevation deciduous or Mixed Forests and Woodlands: Stands with less than 75% of the canopy coverage comprised of evergreen trees. **Key D, p. 13**
- 5a. Low to intermediate elevation non-forested communities, or communities occurring within small forest openings (trees generally have less than 25% canopy/subcanopy coverage). **Key E, p. 16**
- 5b. Low to intermediate elevation forested/woodland communities (tree canopy/subcanopy coverage greater than 25%). . **6**
- 6a. Vegetation strongly altered by recent human disturbance*** and/or strongly altered by stand-reinitiating disturbances such as fire, tornado, insects (hemlock adelgid, balsam wooly adelgid), and dominated by alien species (*Paulownia tomentosa* or *Ailanthus altissima*) or certain, disturbance-oriented native species (e.g. *Pinus virginiana*, *Liriodendron tulipifera*, *Acer rubrum*, *Robinia pseudoacacia*, *Juglans nigra*), often in monospecific, even-aged, stands. **Key F, p. 17**
- 6b. 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**
- 7a. 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 falcata*, *Quercus montana*, *Quercus coccinea*, and occasionally *Acer rubrum*, *Nyssa sylvatica*, and *Magnolia fraseri*. **8**
- 7b. Stands in protected (sheltered) topographic positions but also sometimes upper slopes and ridges in higher elevations or on ridges that are in uniquely protected positions; coves and lower slopes. Dominated by any one or a combination of these species: *Tsuga canadensis*, *Halesia tetraptera* var. *monticola*, *Liriodendron tulipifera*, *Tilia americana* var. *heterophylla*, *Fraxinus americana*, *Quercus alba*, *Quercus rubra*, *Quercus montana*, *Acer saccharum*. **9**
- 8a. Evergreen-dominated (at least 75% relative cover of evergreen species in canopy). **Key G, p. 19**
- 8b. Deciduous-dominated or mixed (evergreen and deciduous) with <75% relative cover of evergreens). **Key H, p. 20**
- 9a. Evergreen Forests and Woodlands: Stands with canopies dominated by evergreen trees (greater than 75%; in cases where the canopy and subcanopy are not clearly differentiated in height, they may be evaluated together for this purpose). **Key I, p. 22**
- 9b. Deciduous or Mixed Forests and Woodlands: Stands with less than 75% of the canopy coverage comprised of evergreen trees. **Key J, p. 23**

*High elevation tree indicators include spruce, fir, and yellow birch. High elevation shrub indicators include *Viburnum lantanoides* and *Rhododendron catawbiense*.

**Low elevation tree indicators include scarlet oak and chestnut oak (except for some instances where it occurs at higher elevations in CEG006271), and tuliptree. Shrub indicators include *Leucothoe fontanesiana*.

***The phrase “strongly altered by recent human disturbance” can be difficult to interpret. Some factors that indicate this is a successional stand include: 1) canopy trees generally less than 70 years old, canopy trees all even-aged, poor herbaceous layer development, and adjacent to areas associated with human disturbance such as roads, unusually flat areas, etc.

Key A - Wetland and Floodplain communities

- 1a. Non-alluvial: Vegetation is seepage-fed; hydrology is maintained by seepage from adjacent streams or slopes, spray, high water table, precipitation; wetlands often form in close proximity to small streams, although rarely if ever flooded by alluvial waters [Sphagnum and shrub bogs and seeps; forested fens and bogs; upland pools and sinkhole ponds; spray cliffs]. 2
- 1b. Alluvial: Vegetation associated with the banks or channels of rivers, streams, and impounded lakes and ponds with variable water levels, receiving occasional or more frequent alluvial flooding. [MONTANE ALLUVIAL FORESTS; RIVER GRAVEL / COBBLE BAR; UNFORESTED FLOODPLAIN CANEBRAKE]..... 15
- 2a. Seasonally flooded upland depressions; water ponding to significant depths at least in winter season and following rainfall events. 3
- 2b. Seeps (high- or low-elevation fens), wet slopes, and wet cliffs, water rarely ponding to depths greater than a few centimeters. 4
- 3a. Canopy dominated by *Liquidambar styraciflua* with *Acer rubrum* var. *trilobum*, *Nyssa sylvatica* or *Liriodendron tulipifera* characteristic; essentially no shrub cover, although *Rhododendron maximum* may be present; ground cover dominated by leaf litter; herb and moss cover generally restricted to tip-up mounds, hummocks and logs.....
..... **Upland Sweetgum - Red Maple Pond - CEGLO07388**
- 3b. Forb-dominated by *Polygonum* (section *Persicaria*), with miscellaneous (upland) canopy trees overhanging; community in small, steeply-sided sinkhole depression. **Smartweed - Cutgrass Beaver Pond - CEGLO04290**
- 4a. Saturated vegetation associated with cliffs (vertical, overhanging, or very steep) in the spray zone of waterfalls, with little soil substrate and often little vascular plant biomass; often dominated by mosses and liverworts, with variable cover of vascular plants ***Generally this is a small patch, “vertical” type.
..... **Southern Blue Ridge Spray Cliff - CEGLO04302**
- 4b. Saturated herbaceous and shrubland vegetation associated with level or moderately sloping seepage areas. 5
- 5a. Vegetation at moderate to high elevations (above 3,000-6,000 ft./915-1830 m), usually on moderate to steep slopes on the upper or middle slopes of the mountains, and not associated with streams (except perhaps high-gradient cascading streams); vegetation composition lacking *Juncus effusus*. 6
- 5b. Vegetation at low to moderate elevations (below 3,000-4,000 ft./915-1340 m), usually on gentle to nearly flat slopes, and often associated with a variety of topography including lower slopes, isolated depressions, streamhead swales, toeslopes, along streams on the floodplain edge or on flats away from the immediate streambed; (hydrology controlled by groundwater seepage, streamlets passing through the wetland, high water table, short-term flooding from adjacent streams [although not a significant characteristic]). Community may be forested or open. 9
- 6a. Vegetation dominated by graminoid species, especially *Calamagrostis cainii*, *Carex ruthii*, *Carex gynandra*, *Carex atlantica*, and other *Carex* species; occurring above 5,000 ft. (1525 m) elevation and surrounded by, or formerly surrounded by, forests with *Picea rubens* and *Abies fraseri*. 7
- 6b. Vegetation dominated by forbs such as *Diphylleia*, *Impatiens*, *Saxifraga*, *Rudbeckia*, and/or *Monarda*, occurring as inclusions in an otherwise forested landscape; occurring below 5,000 ft. (1525 m) 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*. The distinction between CEGLO04293 and CEGLO04296 may be difficult to discern. The nominal species of both may occur in any combination, without any discernable correlation with elevation, often in different small patches in the same seep. A number of *Carex* species may also dominate patches. Wichmann’s (2009) *Betula* spp./*Viburnum cassinoides*/*Athyrium asplenioides* type fits this type well. She noted that it was extremely variable and would probably warrant further subdivision with more data, but did not find a pattern matching the two NVC associations that have been lumped here. 8
- 7a. High-elevation herbaceous seepage slope dominated by *Calamagrostis cainii*.....
..... **Blue Ridge High-Elevation Seep (Mt. Le Conte Type) - CEGLO07877**
- 7b. High-elevation herbaceous seep dominated by a mix of *Carex* spp. (*Carex crinita*, *Carex gynandra*, *Carex ruthii*), well-developed *Sphagnum* mats, and forbs such as *Chelone* spp.
..... **Southern Blue Ridge High-Elevation Seep (Sedge Type) - CEGLO07697**

- 8a. Forb-dominated, shaded seep, at low elevations (below ~4500 ft./1370 m) with *Diphylleia cymosa* and/or *Saxifraga micranthidifolia*, occurring as small patches within and overtopped by forests dominated by *Aesculus flava*, *Tilia americana* var. *heterophylla*, *Liriodendron tulipifera*, and *Acer saccharum*. *Carex* species not present, or with very low coverages. Often small patch types embedded in cove forest matrix. **Warning: CEG004296 and CEG004293 are similar concepts that have not proven to be reliably distinguishable from one another in the field.....
..... **Rich Montane Seep (Cove Type) - CEG004296**
- 8b. Forb-dominated shaded seep, at higher elevations (above ~3,800 ft./1160 m), 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*. *Diphylleia cymosa* is absent, or with very low coverage. Graminoid species are present and common (especially *Carex* spp., *Glyceria* spp.), but not with high enough cover to be considered dominant. Often embedded within cove forest or rich northern hardwood forest types. **Warning: CEG004296 and CEG004293 are similar concepts that are not always reliably distinguishable from one another in the field. **Rich Montane Seep (High-Elevation Type) - CEG004293**
- 9a. Composition generally including small to large amounts of *Juncus effusus*, *Juncus gymnocarpus*, or other *Juncus* spp. **10**
- 9b. Composition generally lacking *Juncus effusus*, *Juncus gymnocarpus*, or other *Juncus* spp. *Rhododendron* often present and sometimes dominant..... **14**
- 10a. Composition is herbaceous-dominated; Scattered trees or shrubs may occur, although canopy is mostly open and shrub stratum is poorly developed; Trees rooted outside the community may provide substantial cover. Occurs in disturbed or more intact landscapes. **11**
- 10b. Vegetation diverse and variable from place to place. Physiognomy highly variable, and may include herbaceous-dominated patches, shrub-dominated areas, and/or areas with an open canopy of trees; trees may dominate in patches; shrubs (such as *Alnus serrulata*, *Salix sericea*, *Salix nigra*, *Rhododendron* spp., or *Lindera benzoin*) often present and sometimes dominant. **12**
- 11a. Vegetation dominated by *Juncus effusus*; at low elevations in disturbed landscapes; few or no shrubs present. Associated species include *Andropogon glomeratus*, *Typha latifolia*, *Carex* spp., other *Juncus* spp. *Scirpus cyperinus*, *Galium aparine*, *Apios americana*. **Common Rush Marsh - CEG004112**
- 11b Physiognomy generally strongly herb-dominated, though scattered shrubs and trees may occur. Characteristic species include *Glyceria* spp., *Carex gynandra*, *Sphagnum* spp., *Osmunda cinnamomea*, and tall forbs such as *Symphyotrichum puniceum*, *Oxypolis rigidior*, *Chelone glabra*, *Solidago patula* var. *patula*.....
..... **Southern Appalachian Wet Seepage Meadow - CEG008438**
- 12a. Very small-patch community generally on a moderate to steep slope and embedded within a related forested type such as a cove or mesic oak-dominated community. Substrate generally rocky. Scattered trees include *Betula lenta*, *Magnolia tripetala*, *Acer rubrum* var. *trilobum*, and *Nyssa sylvatica*. The open to dense shrub stratum is dominated by *Alnus serrulata*, *Lyonia ligustrina*, *Kalmia latifolia*, *Lindera benzoin* var. *benzoin*, and *Vaccinium fuscum* and/or *Vaccinium corymbosum*. Typical herbaceous species include *Scutellaria lateriflora*, *Thelypteris noveboracensis*, *Mimulus ringens*, and *Osmunda cinnamomea*. **Most all examples will be well below MMU.....
..... ****Montane Low-Elevation Seep - CEG003909**
- 12b. Small-patch and very rare community with most examples below MMU but some large enough to map. High-quality examples will have an open canopy whereas lower quality examples may be highly shaded by adjacent forest or large shrubs within the example. Generally level to gently sloping and there may or may not be large amounts of sphagnum moss. Substrate mucky rather than rocky. [three choices here] **13**
- 13a. (1 of 3) A natural bog with highly variable physiognomy; the open to scattered canopy includes species such as *Acer rubrum* and *Liriodendron tulipifera*. Shrub stratum may be patchy to well-developed, consisting of species such as *Alnus serrulata*, *Lindera benzoin*, *Lyonia ligustrina*, *Rosa palustris* and *Spiraea tomentosa*. Herbaceous stratum is well-developed and graminoid- (*Poaceae*, *Cyperaceae*, *Juncaceae*) dominated. Typical species include *Carex* spp., *Osmunda cinnamomea* and *Solidago patula*. *Sphagnum* spp. is common. Other herbs include *Apios Americana*, *Eupatorium* spp., *Glyceria* spp., *Impatiens capensis*, *Juncus effusus*, *Polygonum sagittatum*, and *Symphyotrichum puniceum*. **Southern Appalachian Herb Bog (Low-Elevation Type) - CEG004156**
- 13b. (2 of 3) A natural bog with highly variable physiognomy; examples consist of shrub thickets and herb-dominated

- areas, much of which is underlain by *Sphagnum* spp. mats. Trees such as *Acer rubrum*, *Liriodendron tulipifera*, *Pinus strobus*, *Tsuga canadensis*, and *Pinus rigida* may be scattered to patchy. Shrub stratum may be patchy to well-developed, consisting of species such as *Alnus serrulata*, *Rosa palustris*, and *Rhododendron* spp. Typical herb species include *Carex* spp., *Scirpus* spp., *Osmunda cinnamomea*, *Solidago patula* var. *patula*, *Juncus* spp., and *Sagittaria latifolia*..... **Southern Appalachian Bog (Low-Elevation Type) - CEGLO03916**
- 13c. (3 of 3) Not a bog, but rather a small patch seep that occurs in low elevation areas of park, generally along streambanks in relatively flat areas. This type is thought to be an artifact of past human disturbance, most likely natural springs that were expanded near homesteads and recolonized with native plants, especially *Carex* spp., *Scirpus* spp., *Osmunda cinnamomea*, *Solidago patula* var. *patula*, and occasionally *Juncus* spp. Small patch type always overtopped by canopy trees from adjacent upland community, generally some combination of *Acer rubrum*, *Liriodendron tulipifera*, *Juglans nigra*, *Prunus serotina*, etc. **Montane Low Elevation Seep (Springhead/Disturbed Type) [GRSM: Old Homestead Seep] - CEPS009726**
- 14a. Forest has a closed or open canopy and an open to dense shrub layer, interspersed with small sphagnum- and herb-dominated depressions. The canopy is composed of various mixtures of evergreen and deciduous species, often dominated by *Tsuga canadensis* and *Acer rubrum*, and less often by *Liriodendron tulipifera*, *Nyssa sylvatica*, *Pinus strobus*, or *Pinus rigida*. The dominant shrubs are usually *Rhododendron maximum*, *Kalmia latifolia*, *Leucothoe fontanesiana*..... **Swamp Forest - Bog (Typic Type) - CEGLO07565**
- 14b. Wetland shrubland dominated by *Rhododendron maximum* found on mountain stream floodplains. **Southern Appalachian Bog (Rhododendron Type) - CEGLO03849**
- 15a. Tree-dominated, tree canopy coverage greater than 25%. **16**
- 15b. Not tree-dominated, open vegetation with less than 25% tree canopy coverage. **21**
- 16a. Canopy dominants are *Acer rubrum* var. *trilobum* and *Fraxinus pennsylvanica*, examples occur on seasonally flooded, disturbed flats near streams. *Peltandra virginica* common in herb layer. Other herbs include *Carex crinita*, *Carex lupulina*, *Juncus effusus*, *Leersia oryzoides*, *Onoclea sensibilis*, *Sparganium americanum*, and exotics *Microstegium vimineum* and *Murdannia keisak*. **Montane Floodplain Slough Forest - CEGLO04420**
- 16b. Canopy not dominated by *Acer rubrum* var. *trilobum* and *Fraxinus pennsylvanica*. **17**
- 17a. Levee or floodplain forest with canopy dominated or co-dominated by *Liquidambar styraciflua* (which can be sparse and spotty in some examples), often with *Liriodendron tulipifera* and *Platanus occidentalis*; other canopy species include *Acer rubrum*, *Fraxinus americana*, *Juglans nigra*, *Pinus virginiana*, *Prunus serotina*, *Tilia americana*, and *Ulmus americana*. *Carpinus caroliniana* and *Cornus florida* are characteristic; shrub stratum can be dense but is more often sparse. Herbaceous cover is often absent to sparse, but can be dense. Common species include *Carex* spp., *Dichanthelium* spp., *Laportea canadensis*, *Amphicarpaea bracteata*, and *Verbesina alternifolia*. **Montane Sweetgum Alluvial Flat - CEGLO07880**
- 17b. Levee, bench, or floodplain forest with canopy dominated by *Liriodendron tulipifera*, *Diospyros virginiana*, *Tsuga canadensis*, *Platanus occidentalis*, *Betula alleghaniensis*, *Betula lenta*, *Acer negundo* var. *negundo*, *Acer rubrum* var. *trilobum*, and/or *Quercus imbricaria*; May include *Liquidambar styraciflua* but not dominated or codominated by it. Hydrology is usually temporarily flooded (surface water present for brief periods during the growing season, but water table usually well below the soil surface) although some examples may now functionally be uplands where human disturbance has caused changes in hydrology. **18**
- 18a. Levee, bench, or floodplain forest with canopy dominated by various combinations of *Platanus occidentalis*, *Liriodendron tulipifera*, *Fraxinus americana*, *Betula alleghaniensis*, and *Betula lenta*; *Carpinus caroliniana*, *Acer rubrum*, *Pinus virginiana*, *Pinus strobus*. In addition, *Tsuga canadensis* may also occur in some examples but will not be dominant in the canopy. Shrub stratum is generally very dense. Characteristic shrubs are *Leucothoe fontanesiana*, *Rhododendron maximum*, *Alnus serrulata*, *Xanthorhiza simplicissima*, and *Hydrangea arborescens*. Vines can be prominent. Herb layer composition can vary, and can be patchy on rocky substrate; characteristic species include *Amphicarpaea bracteata*, *Actaea racemosa* (= *Cimicifuga racemosa*), *Medeola virginiana*, and *Athyrium filix-femina*. Examples are associated with rocky floodplains and islands in medium-sized rivers, at elevations below ~2000 ft.(610 m). **Appalachian Montane Alluvial Forest - CEGLO04691**
- 18b. Similar associations to above, occurring on smaller streams and rivers, generally lacking *Betula alleghaniensis* and with a significant component of either (at least historically) *Tsuga canadensis* in the canopy, or some *Quercus imbricaria* in the canopy and/or subcanopy. **19**

- 19a. Vegetation unusual and noteworthy in that examples generally contain shingle oak (*Quercus imbricaria*) in understory and/or canopy. Vegetation of broad flats along streams, within a landscape of pastures and fields. Canopy composed of combinations of *Platanus occidentalis*, *Acer negundo* var. *negundo*, *Acer rubrum* var. *trilobum*, *Liriodendron tulipifera*, and *Quercus imbricaria*. In addition, *Prunus serotina*, *Juglans nigra*, or *Juglans cinerea* may also be important canopy components. The sparse subcanopy and shrub strata are primarily composed of canopy species. Herbs include *Boehmeria cylindrica*, *Impatiens* spp., *Verbesina alternifolia*, *Packera aurea*, *Carex* spp., *Panicum* spp., and *Juncus effusus*. Very rare type in unique geological situations.
..... **Montane Alluvial Forest (Cades Cove/Oconaluftee Type) - CEGl007339**
- 19b. More typical vegetation of alluvial flats, low slopes, and ravines along creeks and small rivers, dominated by combinations of *Liriodendron tulipifera*, *Platanus occidentalis*, *Betula lenta*, and *Pinus strobus*, canopies of some examples historically dominated or co-dominated by *Tsuga canadensis*, though hemlock adelgid has heavily impacted composition. **20**
- 20a. Vegetation of alluvial flats and ravines along creeks and small rivers up to 3000 ft. (915 m) elevation, subject to temporary flooding. Canopy historically dominated or co-dominated by *Tsuga canadensis*, though hemlock adelgid has heavily impacted composition of most examples of this type. *Liriodendron tulipifera*, *Platanus occidentalis*, *Betula lenta*, and *Pinus strobus*. *Tsuga* may dominate. Other trees may include *Fraxinus americana*, *Betula alleghaniensis*, *Quercus alba*, *Halesia tetraptera*, *Fagus grandifolia*, and *Liquidambar styraciflua*. *Carpinus caroliniana* is the most prevalent subcanopy tree. The shrub and herb layers may be dense to open **with components indicative of temporarily flooded hydrology** mixed with upland mesophytic species, including *Rhododendron maximum*, *Lindera benzoin*, *Hamamelis virginiana*, *Alnus serrulata*, *Clethra acuminata*, *Xanthorhiza simplicissima*, *Amphicarpaea bracteata*, *Thelypteris noveboracensis*, and *Carex* spp.....
..... **Southern Appalachian Small River Floodplain Forest - CEGl007143**
- 20b. Vegetation of low slopes and flats that are mesic and not subjected to flooding, often associated with small streams, mostly below 3,500 ft. (1070 m) elevation on the NC side and below 3,000 ft. (915 m) elevation on the TN side. Canopy historically dominated or co-dominated by *Tsuga canadensis*, occurring with *Liriodendron tulipifera*, *Pinus strobus*, *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*. **Components of this type indicative of upland mesophytic conditions** rather than temporarily flooded hydrology. ***Note: Due to hemlock woolly adelgid, many examples of this type will not have hemlock and instead will have large gaps in the canopy where the hemlock once stood and may be difficult to key. In many of these examples *Betula lenta* or *Acer rubrum* will instead dominate the stand.
..... **Southern Appalachian Acidic Cove Forest (Typic Type) - CEGl007543**
- 21a. Vegetation dominated by herbs; with little or no coverage by woody plants. **22**
- 21b. Vegetation dominated by shrubs (including *Arundinaria gigantea* [giant cane]); hydrology is seasonally to temporarily flooded. **24**
- 22a. Vegetation dominated strongly by weedy perennials and annuals; occurs exclusively along drawdown zones of artificial lakeshores (Fontana Lake). **Artificial Lake Drawdown Zone - CEGl003910**
- 22b. Vegetation dominated by non-weedy perennials; found along medium to large rivers and small ponds made by beavers or human construction. **23**
- 23a. Community found exclusively along medium- to large-sized rocky rivers (e.g., Oconaluftee River); vegetation dominated by *Carex torta*, forming dense, extensive colonies.
..... **Rocky Bar and Shore (Twisted Sedge Type) - CEGl004103**
- 23b. Community found exclusively within impounded shallow ponds created by beaver or human disturbance; vegetation dominated by a mixture of forbs including but not limited to *Juncus effusus*, *Chelone glabra*, *Typha latifolia*, *Leersia* spp. and *Scirpus* spp. **Southern Blue Ridge Ruderal Beaver Pond Marsh - CEGl008433**
- 24a. Vegetation dominated by dense, monospecific stand of *Arundinaria gigantea*.
..... **Floodplain Canebrake - CEGl003836**
- 24b. Vegetation dominated by other species of wetland shrubs. [three choices here] **25**
- 25a. (1 of 3) Natural, undisturbed river margin with vegetation dominated shrubs characteristic of rocky or gravelly

substrates along narrow river margins; common shrubs include *Alnus serrulata*, *Xanthorhiza simplicissima*, *Salix nigra*, *Salix sericea*, *Leucothoe fontanesiana*, *Itea virginica*, and *Viburnum nudum var. cassinoides*.

..... **Rocky Bar and Shore (Alder - Yellowroot Type) - CEGl003895**

25b. (2 of 3) Heavily altered/disturbed area in beaver or human-built ponds or flat areas adjacent to large creeks containing a mix of shrubs, but especially *Alnus serrulata*. Dominated by *Alnus serrulata*, shrubby *Salix nigra*, *Salix sericea*, *Viburnum sp.*, and *Rosa multiflora*.

..... **Southeastern Alder Swamp - CEGl008474**

25c. (3 of 3) Monospecific stands of *Salix nigra*, often in association with beaver impoundments, typically as an outer shrub zone adjacent to an herbaceous zone.

..... **Black Willow Riverbank Shrubland - (CEGL003901)**

Key B - High-elevation, non-forested, terrestrial communities [Grass Balds, Heath Balds, Shrub Balds, Rocky Summits]

- 1a. Non-forested vegetation supported by significant soil substrate without large areas of exposed rock (some exposed rocks may be present); shrubs, when present, are primarily deciduous (grassy and shrub balds, blackberry and pin cherry thickets, grazed fire meadows). 2
- 1b. Non-forested vegetation associated with inclusions of bare rock or with scattered, small trees; found on dry ridges with shallow soil as well as rock outcroppings and landslides; vegetation is rooted in crevices or within shallow organic accumulations (laurel and heath balds, rocky summits)..... 6
- 2a. Vegetation is mainly graminoid-dominated; with local dominance by shrubs; sites are gentle, broad ridges; *Danthonia compressa* is the common grass, with *Deschampsia flexuosa*; *Rhododendron calendulaceum* and *Vaccinium corymbosum* are common shrubs. At GRSM, found primarily in the vicinity of Gregory’s Bald, Andrew’s Bald, and Spence Field, although possibly historic to other high elevation sites that are now in shrubland or forest.....
Grassy Bald (Southern Grass Type) - CEGLO04242
- 2b. Vegetation dominated by dense shrubs (*Rubus allegheniensis* *Rubus canadensis*, *Diervilla sessilifolia*), by dense forbs (*Athyrium filix-femina*, *Solidago glomerata*) and/or deciduous *Rhododendron* species, or by emergent deciduous shrubs (*Prunus pensylvanica* and *Sorbus americana*) over *Rubus* spp. 3
- 3a. Areas dominated by *Rubus* species with emergent deciduous shrubs and small trees (*Prunus pensylvanica*, *Sorbus americana*, and *Amelanchier sp.*). Generally the result of a high-intensity fire and subsequent regeneration/regrowth. Canopy of *Prunus pensylvanica* can vary from very sparse to approaching a forest in cover, most often sparse.....
High-Elevation Pin Cherry - Mountain-ash - Blackberry Thicket - CEGLO07293
- 3b. Shrubland dominated either by deciduous *Rhododendron* species (azaleas) or dominated almost exclusively by *Rubus* species. 4
- 4a. Area dominated by deciduous *Rhododendron* species often described as a “hybrid azalea swarm” consisting of a mix of *Rhododendron calendulaceum*, *Rhododendron arborescens*, *Rhododendron viscosum*, and *Rhododendron cumberlandense*. Hybrid forms with all colors of flowers abound. In the Great Smoky Mountains, the most famous example occurs on Gregory Bald where it is believed to have developed from clearing of pasture for grazing long ago.
Southern Appalachian Hybrid Deciduous Azalea Bald - CEPS009759
- 4b. Areas dominated by *Rubus* species, either with trace amounts of species from the surrounding grassland, or dominated by dense shrubs (*Rubus canadensis*, *Diervilla sessilifolia*) or dense forbs (*Athyrium filix-femina*, *Solidago glomerata*), with standing dead *Abies fraseri* trees. [three choices here] 5
- 5a. (1 of 3) Areas within open montane grasslands dominated by *Rubus allegheniensis* and/or *Rubus canadensis* at high elevations in the Southern Blue Ridge, also with trace amounts of species from the surrounding grassland, such as *Athyrium filix-femina ssp. asplenoides*, *Agrostis perennans*, *Angelica triquinata*, *Carex debilis var. rudgei*, *Carex brunnescens*, *Carex intumescens (= var. fernaldii)*, and *Rumex acetosella* (exotic). **This community has not yet been officially verified for GRSM, but is likely to exist in higher elevation bald areas.**
Southern Appalachian Blackberry Bald - CEGLO03892
- 5b. (2 of 3) Successional vegetation resulting from the death of *Abies fraseri* or other high elevation forest types; vegetation is variously dominated by dense shrubs (*Rubus canadensis*, *Diervilla sessilifolia*) or dense forbs (*Athyrium filix-femina*, *Solidago glomerata*); standing dead trees are common.
High-Elevation Blackberry Thicket - CEGLO03893
- 5c (3 of 3) Successional high elevation herbaceous/shrubby vegetation associated with previous human disturbance, especially cultivation of Christmas tree farms. Examples are generally heavily dominated by *Rubus argutus* or *Rubus allegheniensis* rather than *Rubus canadensis*. Within the park, examples are currently only found on Purchase Knob. Many examples of this type can be have large areas dominated by planted non-native grasses such as fescue and *Phleum pratense*..... **Grazed Montane Grassland / Fire Meadow - CEGLO04018**
- 6a. Dense shrub thickets on dry ridges with shallow soils, sometimes with inclusions of bare rock (often obscured by litter layer) or with scattered, small trees; shrubs are predominantly evergreen, although deciduous species may be locally dominant..... 7
- 6b. Sparse to moderate vegetation coverage on landslide scars, cliffs, rock outcrops; vegetation is comprised of grasses, forbs and shrubs rooted in rock fissures..... [three choices here] 9

- 7a. Dense shrub thickets 1 to 4 m tall; mostly evergreen, but may have local dominance by deciduous shrubs, or scattered deciduous trees. Dominant shrubs are *Kalmia latifolia*, *Rhododendron maximum*, *Gaylussacia baccata*, *Pieris floribunda*, or *Vaccinium corymbosum*; sites are southerly exposed ridges and steep slopes typically below 5,000 ft. (1525 m) elevation. **Southern Appalachian Mountain Laurel Bald - CEG L003814**
- 7b. Open to dense shrub-dominated vegetation 0.5 to 1 m tall. Dominant shrubs include *Rhododendron carolinianum*, *Rhododendron catawbiense*, *Leiophyllum buxifolium* and very occasionally *Menziesia pilosa*; sites are typically above 5,000 ft. (1525 m) elevation, in the Spruce-Fir zone. **8**
- 8a. Open to dense shrub-dominated vegetation 0.5 to 4 m tall. Dominant shrubs include *Rhododendron carolinianum*, *Rhododendron catawbiense*, *Leiophyllum buxifolium* and very occasionally *Menziesia pilosa*; sites are typically above 5,000 ft. (1525 m) elevation, in the Spruce-Fir zone. **Southern Appalachian Heath Bald - CEG L007876**
- 8b. Dominated by *Leiophyllum buxifolium* at >50% coverage. Rare and small-patch type. **Southern Appalachian Sand-myrtle Heath Bald - CEG L003951**
- 9a. (1 of 3) Characteristic species include *Calamagrostis cainii*, *Carex misera*, *Carex debilis*, *Saxifraga michauxii*, *Solidago glomerata*, *Rhododendron carolinianum*, *Leiophyllum buxifolium*, *Abies fraseri*; known from Mount LeConte and other outcrops of Anakeesta Slate (i.e. at Charlies Bunion) at high elevations in the central Great Smokies. **Southern Appalachian High-Elevation Rocky Summit (Anakeesta Type) - CEG L004278**
- 9b. (2 of 3) Characteristic species include *Carex misera*, *Saxifraga michauxii*, but lacks *Calamagrostis cainii*; occurrences on other peaks of the Great Smoky Mountains (such as Mount Buckley), and on non-Anakeesta lithologies. **Southern Appalachian High-Elevation Rocky Summit (High Peak Type) - CEG L004277**
- 9c. (3 of 3) Found within a matrix of *Quercus rubra* forest or high-elevation grasslands and shrublands from 4430 to 6130 ft. (1350-1870 m) elevation, at the highest elevations. Typical species include *Saxifraga michauxii*, *Danthonia spicata*, *Krigia montana*, *Carex misera*, *Angelica triquinata*, *Athyrium filix-femina ssp. asplenioides*, *Rhododendron catawbiense*, and *Heuchera villosa*. Another characteristic species is *Huperzia appalachiana*. Other relatively constant species (>50%) are *Solidago glomerata*, *Deschampsia flexuosa*, *Rumex acetosella* (exotic), and *Rhododendron catawbiense* (seedlings). **Note this community has not been verified for GRSM, so please use caution in assigning this community type. **Southern Appalachian High-Elevation Rocky Summit (Typic Type) - CEG L004279**

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

- 1a. Stands dominated by *Abies fraseri*, *Picea rubens*, or *Tsuga canadensis*. 2
- 1b. Stands dominated by *Pinus pungens* and/or *Pinus rigida* with a sparse to dense heath-dominated shrub stratum that generally includes at least some *Rhododendron catawbiense* and/or other high elevation indicators such as *Picea rubens*; type occurs on narrow ridge crests in the Southern Blue Ridge from 4,000-5,100 ft. (1220-1555 m). Other tree species can include *Quercus rubra*, *Tsuga canadensis*, and *Picea rubens*. In addition to *Rhododendron catawbiense*, other shrubs include *Kalmia latifolia*, *Leucothoe recurva*, *Rhododendron calendulaceum*, and *Vaccinium corymbosum*.
..... **Blue Ridge Table Mountain Pine - Pitch Pine Woodland (High-Elevation Type) - CEGl004985**
- 2a. *Abies fraseri* is strongly dominant in the canopy, subcanopy and emergent layers with a coverage of nearly 75%; the community exists almost exclusively above 6,000 ft. (1830 m) in elevation. 3
- 2b. *Picea rubens* is co-dominant or dominant, with or without *Abies fraseri* or *Tsuga canadensis*; these communities exist below 6,200 ft. (1890 m) in elevation. 4
- 3a. Shrub strata are relatively open and composed of deciduous species, although *Abies fraseri* regeneration may be dense in patches; common shrubs include *Betula alleghaniensis*, *Prunus pensylvanica*, *Sorbus americana*, *Diervilla sessilifolia*, *Rubus canadensis*, *Sambucus racemosa* (= var. *pubens*), *Vaccinium erythrocarpum*, *Viburnum lantanoides*. Community tends towards steep ridges and mesic north-facing slopes.
..... **Fraser Fir Forest (Deciduous Shrub Type) - CEGl006049**
- 3b. Shrub strata are dense and dominated by evergreen heaths (*Rhododendron catawbiense*, *Rhododendron carolinianum*, *Rhododendron maximum*); sites are rocky, steep ridges and exposed south-facing slopes above 6,000 ft. (1830 m) elevation. **Fraser Fir Forest (Evergreen Shrub Type) - CEGl006308**
- 4a. *Abies fraseri* generally absent or a very minor component of the canopy and understory layer. Canopy dominated by *Picea rubens* and *Tsuga canadensis* (combined relative cover of >90% of canopy) with some northern hardwood species potentially present, occurring on sheltered slopes as low as 3,100 ft. (945 m) elevation in the Great Smoky Mountains up to high-elevation boulderfields, ridges, and steep slopes. At lower elevations (below 5,000 ft./1525 m) shrub layer can be dominated by *Rhododendron maximum*, but typically evergreen shrubs are not present in occurrences above 5,000 ft. (1525 m). **Red Spruce Forest (Protected Slope Type) - CEGl006152**
- 4b. *Abies fraseri* generally present (at least 10% cover in canopy or understory). 5
- 5a. 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 *Oclemena acuminata* (= *Aster acuminatus*), *Athyrium filix-femina* ssp. *asplenioides* (= *Athyrium asplenioides*), *Oxalis montana*. Elevation ranges are approximately from 5,500-6,200 ft. (1675-1890 m).
..... **Red Spruce - Fraser Fir Forest (Deciduous Shrub Type) - CEGl007131**
- 5b. Shrub strata dominated by evergreen shrubs. Canopy dominated by *Picea rubens* and sometimes codominated with living or standing dead *Abies fraseri*. Elevation ranges are approximately from 5,100-6,000 ft. (1555-1830 m).
..... **Red Spruce - Fraser Fir Forest (Evergreen Shrub Type) - CEGl007130**

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

- 1a. Successional vegetation resulting from recent disturbance..... 2
- 1b. Mature, relatively undisturbed vegetation..... 3
- 2a. Canopy dominated by *Betula alleghaniensis*, *Fagus grandifolia*, *Aesculus flava*, occurring singly or in combination; less often with *Halesia tetraptera* var. *monticola*, *Quercus rubra*, or *Acer saccharum*; successional examples may contain abundant *Prunus serotina*. Common shrubs include *Acer spicatum*, *Viburnum lantanoides*, and *Ilex montana*; herb coverage is a mix of sedges, ferns, and forbs (less lush and diverse than CEGLO04973), typically with *Ageratina altissima*, *Athyrium filix-femina* ssp. *asplenioides*, *Carex* spp. (e.g., *Carex debilis*, *Carex intumescens*, *Carex pensylvanica*), *Dryopteris intermedia*, *Eurybia divaricata* (= *Aster divaricatus*), *Stellaria pubera*; on relatively exposed landforms, such as high, exposed slopes, ridges, and gaps, typically with northerly exposures. Elevation range of 4,300-5,900 ft. (1310-1800 m).... **Southern Appalachian Northern Hardwood Forest (Typic Type) - CEGLO07285**
- 2b. Canopy dominated by a mix of *Acer rubrum*, *Halesia tetraptera* var. *monticola*, *Betula lenta*, *Magnolia fraseri*, and/or *Nyssa sylvatica*. Many examples have a dense shrub layer of *Rhododendron maximum* and/or *Kalmia latifolia*. Chestnut sprouts generally present/abundant in ground layer. **Southern Appalachian Ruderal Acidic Mixed Hardwood Forest - CEGLO08558**
- 3a. Canopy composed of a mix of evergreen and deciduous trees. 4
- 3b. Canopy dominated by deciduous trees..... 7
- 4a. Dominant species are *Pinus pungens* and/or *Pinus rigida* with a sparse to dense heath-dominated shrub stratum that generally includes at least some *Rhododendron catawbiense* and/or other high elevation indicators such as *Picea rubens*..... **Blue Ridge Table Mountain Pine - Pitch Pine Woodland (High-Elevation Type) - CEGLO04985**
- 4b. Dominant species are *Picea rubens*, *Betula alleghaniensis*, and *Tsuga canadensis*; evergreen trees may overtop deciduous trees in the canopy. 5
- 5a. Canopy dominated by *Picea rubens* and deciduous trees, including *Betula alleghaniensis*, *Fagus grandifolia*, *Aesculus flava*, and *Prunus pensylvanica*, without significant coverage by *Tsuga canadensis*, generally above 4,500 to 4,800 ft. (1370-1465 m)..... 6
- 5b. Canopy dominated by *Tsuga canadensis* and *Betula alleghaniensis* with a dense evergreen shrub stratum and sparse herb coverage; generally below 4,500 to 4,800 ft. (1370-1465 m) elevation and without significant *Picea rubens*..... **Blue Ridge Hemlock - Northern Hardwood Forest - CEGLO07861**
- 6a. Shrub strata are dense and dominated by evergreen heaths (*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%). Note: this community is difficult to distinguish from pure spruce forests such as Red Spruce Forest (Protected Slope Type) - CEGLO06152 and Red Spruce - Fraser Fir Forest (Evergreen Shrub Type) - CEGLO07130 where they meet. The main difference will be the presence of deciduous trees in the canopy in this community. **Red Spruce - Northern Hardwood Forest (Shrub Type) - CEGLO04983**
- 6b. 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*, *Rugelia nudicaulis*, *Athyrium filix-femina*, *Huperzia lucidula*. Note: this community is difficult to distinguish from pure spruce forests such as Red Spruce Forest (Protected Slope Type) - CEGLO06152 and Red Spruce - Fraser Fir Forest (Evergreen Shrub Type) - CEGLO07130. The main difference will be the presence of deciduous trees in the canopy. **Red Spruce - Northern Hardwood Forest (Herb Type) - CEGLO06256**
- 7a. Canopy dominated by *Quercus* spp. (50% relative cover, but *Acer rubrum* should be considered a “neutral” canopy species that isn’t counted in relative cover for oak types). 8
- 7b. Canopy not dominated by oaks (*Quercus* spp.), but other broad-leaved deciduous species (*Betula alleghaniensis*, *Fagus grandifolia*, *Aesculus flava*, *Acer saccharum*, *Crataegus* spp.)..... 13

- 8a. Canopy strongly dominated by *Quercus alba* (sometimes with a high component of hickory as well)..... 9
- 8b. Canopy strongly dominated by *Quercus rubra* or *Quercus montana*, although *Quercus alba* may be present (as well as other deciduous trees). 10
- 9a. Canopy consistently dominated by *Quercus alba*. Shrub layer generally includes at least 25% cover of *Kalmia latifolia* and herbaceous species characteristic of dry and acidic sites (*Chimaphila maculata*, *Galax urceolata*, *Medeola virginiana*). Many examples have large numbers of *Castanea dentata* sprouts as well.
.....**Southern Blue Ridge High-Elevation White Oak Forest - CEGLO07295**
- 9b. 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*, *Actaea racemosa* (= *Cimicifuga racemosa*), *Caulophyllum thalictroides*, *Sanguinaria canadensis*. Generally found at elevations below 3500 ft. (1070 m), but some examples reach as high as 4600 ft. (1400 m).
.....**Appalachian Montane Oak - Hickory Forest (Rich Type) - CEGLO07692**
- 10a. Canopy strongly dominated (>50% relative cover) by *Quercus montana* and generally below 5000 ft. (1525 m).....
.....**Chestnut Oak Forest (Subxeric Ridge Type) - CEGLO06271**
- 10b. Canopy strongly dominated by *Quercus rubra*, although *Quercus alba* may be present (as well as other deciduous trees). Elevation varies. 11
- 11a. Shrub stratum is dense and dominated by evergreen heaths (e.g., *Kalmia latifolia*, *Rhododendron catawbiense*, *Rhododendron maximum*); herbaceous cover is sparse.....
.....**Southern Appalachian High-Elevation Red Oak Forest (Evergreen Shrub Type) - CEGLO07299**
- 11b. 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. 12
- 12a. 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.....**High-Elevation Red Oak Forest (Tall Herb Type) - CEGLO07298**
- 12b. 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 curtisii* (= *Solidago caesia* var. *curtisii*).....
.....**Southern Appalachian High-Elevation Red Oak Forest (Deciduous Shrub Type) - CEGLO07300**
- 13a. 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 obovatus*. Stand is more open than the surrounding forest (often less than 60% coverage). 14
- 13b. Substrate is relatively well-developed soils, although soils may be rocky; species characteristic of bouldery habitats are not common. Canopy is closed (generally greater than 60% coverage). 15
- 14a. 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 ft. elevation (above 4,500 ft./1370 m in NC).
.....**Southern Appalachian Boulderfield Forest (Currant & Rockcap Fern Type) - CEGLO06124**
- 14b. Canopy is dominated by *Betula alleghaniensis* or *Aesculus flava* or *Tilia Americana* var. *heterophylla*; *Betula lenta* may sometimes be present in canopy; common shrubs are *Acer spicatum*, *Hydrangea arborescens*, *Euonymus obovatus*, *Ribes rotundifolium*, *Ribes cynosbati*; sites are generally above 3,500 ft. (1070 m) but below 5,000 ft. (1525 m) elevation (except Big Creek, where examples can be as low as 3,000 ft./915 m elevation).
.....**Southern Appalachian Hardwood Rich Boulderfield Forest - CEGLO04982**

- 15a. Low-statured forest and/or successional forest dominated by *Crataegus* spp. or *Robinia pseudoacacia*. 16
- 15b. Northern hardwood forests, of short to medium stature, dominated by *Betula alleghaniensis*, *Fagus grandifolia*, *Aesculus flava*, *Acer saccharum*, and others; not dominated by *Crataegus* spp. nor by *Robinia pseudoacacia*. 17
- 16a. Low-statured forest, transitional between grassy balds and northern hardwood forests, dominated by *Crataegus* spp. and varying from 100% hawthorn and very dense to 50% hawthorn with other shrub and tree species mixed in.
.....**Southern & Central Appalachian Ruderal Hawthorn Forest - CEGLO04184**
- 16b. Early to mid-successional forest with at least 50% cover of *Robinia pseudoacacia*, generally found on ridges and upper slopes in areas that were heavily grazed historically.**Ruderal Black Locust Forest - CEGLO07279**
- 17a. Canopy strongly dominated by short- to medium-statured *Fagus grandifolia*; sites are upper slopes, gaps, and ridges.
.....**Southern Appalachian Beech Gap - CEGLO06130**
- 17b. Canopy dominated by various combinations of *Betula alleghaniensis*, *Betula lenta*, *Acer rubrum*, *Fagus grandifolia*, *Aesculus flava*, *Acer saccharum*, *Halesia tetraptera*, and/or *Prunus serotina*. 18
- 18a. Shrub stratum is dense (usually more than 75% cover of evergreen shrubs) and herb cover is absent or sparse. 19
- 18b. Shrub stratum is absent or has sparse to moderate coverage and dominated by deciduous species; herb coverage is moderate to high. 20
- 19a. Canopy a mixture of Northern Hardwood species occurring with *Tsuga canadensis* (currently living and/or historic) and little or no *Picea rubens* (cutoff is <10% cover of *Picea*); with a dense shrub stratum dominated by evergreen heaths (*Rhododendron maximum*, *Leucothoe fontanesiana*) and sparse to absent herb coverage; generally below 4,500 ft. (1370 m) elevation. **Blue Ridge Hemlock - Northern Hardwood Forest - CEGLO07861**
- 19b. Canopy is a generally some mixture of *Acer rubrum*, *Betula lenta*, *Magnolia fraseri*, *Nyssa sylvatica* and *Halesia tetraptera* occurring over a dense shrub layer (or patchy) of *Rhododendron maximum* or *Kalmia latifolia*. A highly variable association that may look natural but is believed a result of past disturbance (natural or human-caused). Occurs up to 4,000 ft (1440 m). ... **Southern Appalachian Ruderal Acidic Mixed Hardwood Forest - CEGLO08558**
- 20a. Spruce comprises between 25-75% of canopy (relative cover). Elevations range from 4,600-5,100 ft. (1400-1555 m), occurring as a transitional type between northern hardwood forest and spruce-fir forests. Herbaceous cover low to high, but generally low cover of evergreen shrubs. Note: This type keys out primarily in the high elevation evergreen forest key, but is placed also in this key to catch any potential examples that have enough spruce (to be considered mixed spruce rather than northern hardwood). **Red Spruce - Northern Hardwood Forest (Herb Type) - CEGLO06256**
- 20b. Spruce is less than 25% relative cover. 21
- 21a. Elevations range from 3,500-4,700 ft. (1070-1430 m; up to 5300 ft./1615 m in NC). Canopy is dominated by *Betula alleghaniensis*, *Fagus grandifolia*, *Aesculus flava*, *Acer saccharum*, *Halesia tetraptera* var. *monticola*, *Prunus serotina*; herb cover is lush and diverse with species such as *Deparia acrostichoides*, *Viola canadensis*, *Actaea podocarpa* (= *Cimicifuga americana*), *Actaea racemosa* (= *Cimicifuga racemosa*), *Dryopteris intermedia*, *Laportea canadensis*, *Prosartes lanuginosa* (= *Disporum lanuginosum*); sites are relatively protected landforms, such as upper portions of draws and coves, protected slopes, and gaps.
.....**Southern Appalachian Northern Hardwood Forest (Rich Type) - CEGLO04973**
- 21b. Elevations range from 4,300-5,900 ft. (1310-1800 m). Canopy is dominated by *Betula alleghaniensis*, *Fagus grandifolia*, *Aesculus flava*, occurring singly or in combination; less often with *Halesia tetraptera* var. *monticola*, *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 (less lush and diverse than CEGLO04973), typically *Ageratina altissima*, *Athyrium filix-femina* ssp. *asplenioides*, *Carex* spp. (e.g., *Carex debilis*, *Carex intumescens*, *Carex pensylvanica*), *Dryopteris intermedia*, *Eurybia divaricata* (= *Aster divaricatus*), *Stellaria pubera*; on relatively exposed landforms, such as high, exposed slopes, ridges, and gaps, typically with northerly exposures.
.....**Southern Appalachian Northern Hardwood Forest (Typic Type) - CEGLO07285**

Key E - Low-elevation, non-forested, terrestrial communities [Grape Holes, Powerline ROWs, Kudzu patches, and Cliffs and Forested Outcrops]

- 1a. Community has large areas of exposed rock; vegetation is scattered, in small patches or nearly absent; vascular plants have from 10 to 50% cover and are rooted in cracks, on ledges, or scattered patches of soil; sites are vertical rockfaces which may be shaded by overhanging trees, or sites are naturally occurring rock outcrops with shallow soils. 2
- 1b. Vegetation supported by significant soil substrate without large areas of exposed rock; well-developed vegetation dominated by shrubs, herbs, or vines. 5
- 2a. Sites are vertical and near vertical cliffs with sparse vegetation, typically less than 10%..... 3
- 2b. Sites are naturally occurring rock outcrops, sometimes very steep, with substantial exposure of rock and typically more than 10% coverage, and sometimes up to 50% coverage by graminoids and forbs. Known occurrences are associated with exposed slate and include scattered dwarf *Quercus montana*, but dominated by *Schizachyrium scoparium*, *Andropogon gerardii*, *Eurybia surculosa*, and *Selaginella rupestris*.....
 **Low-Elevation Acidic Glade (Grass Type) - CEGLO04990**
- 3a. Substrate is of felsic, metamorphic, or igneous geology; species are characteristic of dry, acidic substrates; characteristic species are *Asplenium montanum* and *Heuchera villosa*. **Appalachian Felsic Cliff - CEGLO04980**
- 3b. Substrate is of limestone or dolomite geology; characteristic species are calciphilic..... 4
- 4a. North-facing slope surrounded by a matrix of drier pine communities. Calciphilic herbs such as *Asplenium ruta-muraria*, *Pellaea atropurpurea*, *Asplenium resiliens*, *Aquilegia canadensis* occur in this community.
 **Montane Cliff (Calcareous Type) - CEGLO04476**
- 4b. South-facing slope occurring in a matrix of mesic calcareous forests. Calciphilic herbs such as *Cystopteris bulbifera* and shrubs such as *Physocarpus opulifolius* common. **Appalachian Wet Limestone Cliff - CEGLO04394**
- 5a. Vegetation associated with current or recent maintenance practices that keep it non-forested (cultivated fields and rights-of-way)..... 6
- 5b. Vegetation dominated by shrubs or vines, not associated with recent maintenance practices. Density of living trees less than 25% cover. Cover of dead *Tsuga* or other trees may exceed 25%. 7
- 6a. Graminoid-dominated vegetation associated with pastures and hayfields; more-or-less cultural, though sometimes no longer actively maintained. **Cultivated Grassland - CEGLO04048**
- 6b. Ruderal vegetation dominated by blackberries/dewberries (*Rubus* spp.) in associated with *Smilax*. These sites typically occur 3-5 years after major disturbances, and can include a multitude of tree species saplings, grasses, and shrubs. In GRSM, associated with reverting old fields and maintained powerline rights-of-way.
 **Ruderal Blackberry - Greenbrier Shrub Thicket - CEGLO04732**
- 7a. Shrubland; dominated by *Rhododendron maximum* in areas of heavy disturbance, with tree cover less than 25%. Generally in wind-throw or insect-related canopy death areas. Very rare type in park.
 **Ruderal Montane Rhododendron Thicket - CEGLO03819**
- 7b. Vegetation dominated by either native or non-native vines..... 8
- 8a. Vine-dominated vegetation resulting from disturbance by ice storms, wind, or logging; the dominant species is *Vitis aestivalis*; sites are steep north- and northeast-facing slopes. **Montane Grape Opening - CEGLO03890**
- 8b. Sites dominated by a complete cover of kudzu (*Pueraria montana var. lobata*). Typically found in rights-of-way and other ruderal areas. **Ruderal Kudzu Vineland - CEGLO03882**

Key F - Altered / anthropogenic / cultural / semi-natural Forests

- 1a. Canopy mainly evergreen, although may contain admixtures of deciduous trees. 2
- 1b. Canopy mainly deciduous, dominated by various broadleaf deciduous trees..... 5
- 2a. Forest with its origin as a planted stand of non-native *Picea abies*, although over time the canopy may have become partially open and possibly with understory ingrowth of other species. **Picea abies Planted Forest - (CST007167)**
- 2b. Forest not planted, canopy composed of native evergreen species including *Pinus strobus*, *Pinus virginiana*, *Tsuga canadensis*, possibly with inmixture of deciduous species as canopy or understory components..... 3
- 3a. Stand with an open to very open canopy of living *Tsuga canadensis* with typically greater than 80% canopy mortality of *Tsuga*, and generally with just *Rhododendron catawbiense* or *Rhododendron maximum* dominating the shrub stratum and understory. Treated as a “semi-natural” example of the “montane *Rhododendron* thicket” at the present time. **Ruderal Montane Rhododendron Thicket - CEG003819**
- 3b. Stand is a conventional forest/woodland with canopy closure around 60% or more..... 4
- 4a. Canopy with *Pinus virginiana* (25-100%) with other early-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. **Ruderal Virginia Pine Forest - CEG002591**
- 4b. Canopy with *Pinus strobus* (25-100%) with other early-successional species (*Liriodendron tulipifera*, *Acer rubrum*, *Pinus rigida*, *Liquidambar styraciflua*); *Tsuga canadensis* often forms a dense shrub strata; sites are former fields and pastures..... **Ruderal Eastern White Pine Forest - CEG007944**
- 5a. Canopy primarily dominated by some mixture of mesic ruderal species such as *Juglans nigra*, *Acer negundo*, *Robinia pseudoacacia*, *Fraxinus pennsylvanica*, *Acer rubrum*, *Celtis occidentalis*, and *Prunus serotina* in highly disturbed successional sites. May contain a significant amount of *Liriodendron tulipifera*, but if so, found in conjunction with the mesic species listed above and the stand located on bottomlands. 6
- 5b. Canopy either dominated by a mixture of ruderal species including *Acer rubrum*, *Acer saccharum*, *Betula lenta*, *Carya* species, *Robinia pseudoacacia*, *Oxydendrum arboreum*, etc. OR primarily by *Liriodendron tulipifera* or *Liquidambar styraciflua* on more upland sites. These stands may also contain a significant amount of other such ruderal species. Sites for these *Liriodendron* types are often highly disturbed mesic/submesic locations on lower slopes and flats, but are not associated with highly disturbed bottomland flats as is the mixed ruderal type ***Dead hemlock stands with a heavy understory of mesic species such as *Acer rubrum* and/or *Betula lenta* that are growing into the canopy can be keyed here. 8
- 6a. Canopy dominated by *Juglans nigra*; open forests on former homesites below 3,500 ft. (1070 m) elevation. Understory may contain *Symphoricarpos orbiculatus* and *Verbesina* spp. **Ruderal Black Walnut Forest - CEG007879**
- 6b. Canopy not dominated by *Juglans nigra* but instead by *Robinia pseudoacacia* or alternately by a mixture of *Liriodendron tulipifera* and *Acer negundo*; this latter type is often diverse and may include a significant amount of *Acer rubrum*, *Robinia pseudoacacia*, *Juglans nigra*, *Platanus occidentalis*, and *Prunus serotina*..... 7
- 7a. Canopy dominated by *Robinia pseudoacacia*, ranging widely in elevation and position, but generally on ridgetops or steep upper slopes just below ridgetops; open forests; Understory often very diverse with a mix of forbs and shrubs. **Ruderal Black Locust Forest - CEG007279**
- 7b. Canopy generally dominated by a mixture of *Liriodendron tulipifera* and *Acer negundo*; this type is often diverse and may include a significant amount of *Acer rubrum*, *Robinia pseudoacacia*, *Juglans nigra*, *Platanus occidentalis*, and *Prunus serotina*. Shrub layer is often dominated by invasive exotics, and the herb layer may be completely dominated by *Microstegium vimineum*. Typically on highly disturbed logging/old pasture/homesites in bottomlands and benches associated with streams, or old orchards..... **Ruderal Tuliptree Bottomland Forest - CEG007184**
- 8a. Canopy dominated by hardwoods, but not oaks or hickories (mainly a mix of *Acer rubrum*, *Betula lenta*, *Halesia tetraptera* var. *monticola*, *Magnolia fraseri*, and *Nyssa sylvatica*. Chestnut sprouts generally present/abundant in ground layer. *** (Generally only applies to stands more than ~70 years old with younger stands instead keying to CEG007219). **Southern Appalachian Ruderal Acidic Mixed Hardwood Forest - CEG008558**
- 8b. Stands dominated by some mixture involving *Liriodendron tulipifera* or *Liquidambar styraciflua*..... 9

- 9a. Young successional forest with canopy is a mix of species that is often co-dominated by *Liriodendron tulipifera* (often less than 50% relative cover) sharing the canopy with other successional species (*Acer rubrum*, *Acer saccharum*, *Betula lenta*, *Halesia tetraptera* var. *monticola*, *Robinia pseudoacacia*), and typically lacking canopy *Quercus* spp. Some examples can be heavily dominated by *Acer rubrum*, *Betula lenta*, or *Robinia pseudoacacia*, and in some cases *Oxydendrum arboreum* can dominate sites are low slopes and flats, typically below 3,000 ft. (915 m) elevation, including areas of past heavy settlement, logging, or farming activities.
**Appalachian Ruderal Hardwood Forest - CEGL007219¹**
- 9b. Older successional forest with canopy heavily dominated (>50%) by *Liriodendron tulipifera* and/or *Liquidambar styraciflua*, possibly with codominating *Quercus* spp. **10**
- 10a. Canopy dominated by *Liriodendron tulipifera* (> 50%). **11**
- 10b. Canopy dominated almost exclusively by *Liquidambar styraciflua* in upland sites (so far only documented on the Foothills Parkway). **Ruderal Sweetgum Forest – CEGL007216**
- 11a. Canopy dominated by *Liriodendron tulipifera* with a large presence of understory species indicative of circumneutral soils (including species such as *Symphoricarpos orbiculatus* and *Lindera benzoin*). Generally more diverse than CEGL007221 (below). **Ruderal Tuliptree Forest (Rich Type) - CEGL007220**
- 11b. Canopy dominated by *Liriodendron tulipifera* with a large presence of understory species indicative of acidic soils (such as *Betula lenta*, *Cornus florida*, *Nyssa sylvatica*, and shrub *Vaccinium pallidum*). In areas where hemlocks have been treated for adelgids, *Tsuga* regeneration may be abundant. In addition, *Dennstaedtia punctilobula* is a common fern. Generally less diverse than CEGL007220 (above). **Ruderal Tuliptree Forest (Typic Type) - CEGL007221**

¹Herbaceous indicators of highly disturbed forested soils include monocultural patches of ground pine (*Lycopodium/ Diphasiastrum/ Dendrolycopodium*), partridgeberry (*Mitchella repens*), periwinkle (*Vinca* sp.), poison ivy (*Toxicodendron radicans*), wingstem (*Verbesina* sp.), and hog-peanut (*Amphicarpea bracteata*). Persistent planted populations of horticultural shrubs (e.g. *Forsythia* spp., Winter jasmine [*Jasminum nudiflorum*], boxwood [*Buxus sempervirens*], Russian olive [*Elaeagnus* spp.], rose [*Rosa* spp.]), as well as exotic specimen trees also indicate this condition.

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]

1a. Successional vegetation resulting from recent disturbance²..... 2

1b. Mature, relatively undisturbed vegetation; canopy variously dominated by *Pinus* spp. (including *Pinus virginiana*). ... 3

2a. Canopy dominated by *Pinus virginiana* (>50% relative canopy cover) sometimes with other successional species; sites are former fields, pastures, clearcuts, burned, or eroded areas. **Ruderal Virginia Pine Forest - CEGl002591**

2b. Canopy dominated *Pinus strobus* (>50% relative canopy cover) often with other early-successional species (*Liriodendron tulipifera*, *Acer rubrum*, *Pinus rigida*, *Liquidambar styraciflua*); *Tsuga canadensis* often forms a dense shrub strata; sites are former fields and pastures.....**Ruderal Eastern White Pine Forest - CEGl007944**

3a. Canopy dominated by *Pinus strobus*; subcanopy commonly contains *Oxydendrum arboreum*, *Acer rubrum*, *Nyssa sylvatica*, *Cornus florida*; shrubs are patchy to continuous and dominated by heaths (*Gaylussacia ursina*, *Vaccinium stamineum*, *Kalmia latifolia*)..... **Southern Appalachian White Pine Forest - CEGl007100**

3b. Canopy dominated by *Pinus virginiana*, *Pinus rigida*, *Pinus pungens*, or *Pinus echinata*. 4

4a. Stands dominated by *Pinus echinata* (50% relative cover compared to other pine species present); may have minor coverage by *Pinus virginiana* or *Pinus rigida*. 5

4b. Stands dominated by *Pinus virginiana*, *Pinus rigida*, or *Pinus pungens* (combined having more cover than *Pinus echinata*)..... 7

5a. Open canopy with understory dominated by graminoids (especially *Schizachyrium scoparium*) and herbs. **Appalachian Shortleaf Pine / Little Bluestem Woodland - CEGl003560**

5b. Closed canopy (>60% total canopy cover). 6

6a. *Pinus echinata*-dominated canopy with shrub stratum dominated by heaths (*Vaccinium pallidum*, *Vaccinium stamineum*, and *Kalmia latifolia*) and with scattered grasses and forbs. **Appalachian Shortleaf Pine Forest - CEGl007078**

6b. Mixed canopy of *Pinus echinata* and dry site oaks with understory of only scattered heath shrubs and a sparse to medium coverage of herbs. **Southern Blue Ridge Escarpment Shortleaf Pine - Oak Forest - CEGl007493**

7a. Open, stunted canopy dominated by *Pinus virginiana* typically with a poorly developed shrub stratum and occurring on steep slopes of exposed and fragmented shale..... **Blue Ridge Acidic Shale Woodland - CEGl003624**

7b. Closed canopy with shrub stratum dominated by heaths and/or rarely with a high diversity of dry woodland herbaceous/graminoid species..... 8

8a. Canopy dominated by *Pinus pungens* or *Pinus rigida*, sites are typically above 1,800 ft. (550 m) elevation on exposed ridgetops and slopes with west to southeast aspects. **Blue Ridge Table Mountain Pine - Pitch Pine Woodland (Typic Type) - CEGl007097**

8b. Canopy dominated by *Pinus virginiana*; sometimes with lesser amounts of *Pinus rigida* or *Pinus echinata*; sites are typically below 2,300 ft. (700 m) elevation on gentle slopes and low ridges. 9

9a. Canopy dominated by *Pinus virginiana*; sometimes with lesser amounts of *Pinus rigida* or *Pinus echinata*; sites are typically below 2,300 ft. (700 m) elevation on gentle slopes and low ridges. **Appalachian Low-Elevation Mixed Pine / Blue Ridge Blueberry Forest - CEGl007119**

9b. Very rare dry pine woodland / low-density forest, primarily dominated by *Pinus virginiana*, with at least 10% cover of diverse herbs with dry woodland species such as *Schizachyrium scoparium*, *Tephrosia virginiana*, *Solidago odora*, etc. ****This community has not yet been verified as existing at GRSM****. **Appalachian Low-Elevation Mixed Pine / Little Bluestem Forest - CEGl008500**

²The phrase “successional vegetation resulting from recent human disturbance” can be difficult to interpret. Some factors that may indicate this is a successional stand include: 1) canopy trees generally less than 70 years old, canopy trees all even-aged, poor herbaceous layer development, and proximity to areas associated with human disturbance such as roads, unusually flat areas, etc.

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]

- 1a. Successional vegetation resulting from recent disturbance..... 2
 1b. Mature, relatively undisturbed vegetation or vegetation resulting from disturbance over 70 years ago. 4
- 2a. Canopy composed primarily of hardwood species..... **Appalachian Ruderal Hardwood Forest - CEGLO07219**
 2b. Canopy composed primarily of pine species. 3
3. Canopy composed of *Pinus virginiana* (>25%) with other successional species (*Acer rubrum*, *Liriodendron tulipifera*, *Pinus rigida*) 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.
 **Ruderal Virginia Pine Forest - CEGLO02591**
3. Canopy with *Pinus strobus* (>25) with other early-successional species (*Liriodendron tulipifera*, *Acer rubrum*, *Pinus rigida*, *Liquidambar styraciflua*); *Tsuga canadensis* often forms a dense shrub strata; sites are former fields and pastures..... **Ruderal Eastern White Pine Forest - CEGLO07944**
- 4a. Vegetation an open woodland dominated by *Pinus virginiana* and *Quercus montana*, associated with significant areas of exposed mineral substrate; sites are steep, shaley slopes. **Blue Ridge Acidic Shale Woodland - CEGLO03624**
 4b. Vegetation more developed, supported by significant soil substrate, without large areas of exposed rock. 5
- 5a. Canopy dominated by a mix of evergreen and deciduous trees (>25% evergreen tree relative cover); dominant species are *Pinus virginiana*, *Pinus rigida*, *Pinus pungens*, *Pinus strobus*, *Pinus echinata*, *Acer rubrum*, *Quercus montana*, *Quercus coccinea*, and *Quercus falcata*..... 6
 5b. Canopy dominated by deciduous species (>75% relative cover of deciduous species)..... 9
- 6a. Canopy usually dominated or codominated by *Pinus strobus* with subxeric oaks such as *Quercus coccinea*, *Quercus montana*, and/or *Quercus falcata*..... **Appalachian White Pine - Subxeric Oak Forest - CEGLO07519**
 6b. Canopy dominated by a mixture of xeric oak and pine species, but usually not containing *Pinus strobus*..... 7
- 7a. Canopy open to closed, dominated by >40% combined cover of *Pinus pungens* and/or *Pinus rigida*, with *Quercus montana* or *Quercus coccinea*; evergreen trees may overtop the deciduous canopy trees; sites are typically above 2,000 ft. (610 m) elevation on exposed ridgetops and slopes with west to southeast aspects.
 **Blue Ridge Table Mountain Pine - Pitch Pine Woodland (Typic Type) - CEGLO07097**
 7b. Canopy closed and with *Pinus virginiana* or *Pinus echinata* as co-dominants. 8
- 8a. Canopy dominated by *Pinus virginiana*; sometimes with lesser amounts of *Pinus rigida* or *Pinus echinata* and with mixes of deciduous species (*Quercus montana*, *Quercus coccinea*, *Quercus alba*, *Quercus marilandica*, *Quercus velutina*); sites are typically below 2,300 ft. (700 m) elevation on gentle slopes and low ridges.....
 **Appalachian Low-Elevation Mixed Pine / Blue Ridge Blueberry Forest - CEGLO07119**
- 8b. Canopy dominated by *Pinus echinata*, but often codominated or dominated by low-elevation dry-site oaks such as *Quercus montana*, *Quercus falcata*, and *Quercus stellata*. Typically only a poorly developed shrub stratum.....
 **Southern Blue Ridge Escarpment Shortleaf Pine - Oak Forest - CEGLO07493**
- 9a. Canopy dominated by hardwoods, but not oaks or hickories; mainly a mix of *Acer rubrum*, *Betula lenta*, *Halesia tetraptera* var. *monticola*, *Magnolia fraseri*, and *Nyssa sylvatica* often occurring over a dense shrub layer of *Rhododendron maximum* or *Kalmia latifolia*. Chestnut sprouts generally present/abundant in ground layer.
 ***Generally only applies to stands more than ~70 years old with younger stands instead keying to CEGLO07219.
 **Southern Appalachian Ruderal Acidic Mixed Hardwood Forest - CEGLO08558**
- 9b. Oak and/or hickory-dominated canopy with or without chestnut sprouts. (Note: *Acer rubrum* and *Betula lenta* are considered “neutral” canopy species, so ignore these species when calculating relative cover of oaks to other species).
 10
- 10a. Mesic community of north-facing slopes; canopy dominated by *Quercus montana* occurring with *Quercus rubra*

- and/or *Acer rubrum* over dense, tall *Rhododendron maximum*; sparse herb cover; sites are very steep, northerly slopes and adjacent ridgetops..... **Chestnut Oak Forest (Mesic Slope Heath Type) - CEGL006286**
- 10b. Xeric communities generally of south-facing slopes and dry ridgetops. Canopy dominated by *Quercus montana*, *Quercus coccinea*, or *Quercus alba* and sometimes *Carya sp.*..... **11**
- 11a. Sites located within the Great Smoky Mountains National Park proper and occurring on a variety of substrates, but typically not sandstone, well located within the Metasedimentary Mountains ecological unit of the Southern Blue Ridge Mountains. **12**
- 11b. Sites located along the Foothills Parkway and typically on sandstone, these areas are adjacent to the Sandstone Hills ecological unit of the Central Ridge and Valley. **13**
- 12a. Canopy dominated by *Quercus montana*, *Quercus coccinea*, *Carya sp.*, and *Acer rubrum*, and occasionally even co-dominated by *Quercus alba* in rare examples. Shrub layer is generally 50-100% cover of *Kalmia latifolia* or 50-100% cover of *Gaylussacia sp.* Herbaceous species diversity low, but often *Galax* and *Goodyera pubescens* are present. *Quercus alba* dominated stands key to CEGL007230 if shrub-layer is dominated by *Gaylussacia* and to this (CEGL006271) if dominated by *Kalmia latifolia*; may have standing dead *Pinus spp.*; sites are middle to upper convex slopes and ridges with southwest and west exposures. Sites generally occur below 3,000 ft. (915 m) but can often occur as high as 4,700-5000 ft. (1430-1525 m) (this type may also be keyed out in the high elevation key).....
..... **Chestnut Oak Forest (Subxeric Ridge Type) - CEGL006271**
- 12b. Canopy dominated by *Quercus alba*, *Quercus coccinea*, and *Quercus falcata* sometimes with a component of *Carya sp.*. Shrub layer is heath-dominated, but is rarely dense. Herbaceous species are key indicators, with presence of dry-site open woodland species such as *Piptochaetium avenaceum*, *Solidago odora*, and *Pteridium aquilinum* INSTEAD of heavy heath cover. Sites are on convex slopes and ridges at elevations below 2,500 ft. (760 m). *Note: If community contains dry site oaks but with a ground layer of *Vaccinium* and/or sparse herbs such as *Desmodium nudiflorum* then key community in Key J to CEGL007267.
..... **Appalachian Montane Oak - Hickory Forest (Low-Elevation Xeric Type) - CEGL007691**
- 13a. Canopy dominated by *Quercus montana* and *Quercus coccinea*, and sometimes including *Quercus stellata* and *Carya pallida* (*Quercus marilandica* can also be present). Sites are subxeric, exposed ridgetops occurring primarily on sandstone, and sometimes quartzite. **Subxeric Ridgetop Chestnut Oak Forest (CEGL008431)**
- 13b. Canopy dominated by *Quercus alba* with a small but constant presence of *Quercus falcata*, occurring in more sheltered locations with deeper soils and with species of more mesic affinities such as *Cornus florida*, *Sassafras albidum* and *Ostrya virginiana*. **Appalachian White Oak - Southern Red Oak Forest (CEGL008567)**

Key I - Low-elevation terrestrial evergreen forest and woodlands in protected topographic positions

- 1a. Successional vegetation² resulting from recent disturbance (except hemlock adelgid disturbance, which should be keyed out in couplet 3a/3b); canopy dominated by *Pinus virginiana* or *Pinus strobus*. sometimes with other successional species; sites are former fields, pastures, clearcuts, burned or eroded areas..... **2**
- 1b. Mature, historically undisturbed vegetation (or mature stand very recently disturbed by hemlock adelgid infestation). **3**

- 2a. Canopy dominated by *Pinus virginiana* (>50% cover)..... **Ruderal Virginia Pine Forest - CEGl002591**
- 2b. Canopy with *Pinus strobus* (>25% relative cover) with other early-successional species (*Liriodendron tulipifera*, *Acer rubrum*, *Pinus rigida*, *Liquidambar styraciflua*); *Tsuga canadensis* often forms a dense shrub stratum; sites are former fields and pastures. This community is often transitional to *Liriodendron* dominated types. The deciding factor should be which species is in the canopy and which is in the subcanopy. Once *Liriodendron* overtops the white pine, the stand should be keyed as a hardwood type..... **Ruderal Eastern White Pine Forest - CEGl007944**

- 3a. Canopy dominated by *Pinus strobus* and *Tsuga canadensis* occurring over a shrub stratum dominated by *Rhododendron maximum*, at times with *Kalmia latifolia*; deciduous species may be present in the canopy, but these make up less than 25% of the canopy coverage. This type can be very difficult to distinguish from CEGl007136 (below). **Southern Appalachian Eastern Hemlock Forest (White Pine Type) - CEGl007102**
- 3b. Canopy dominated by *Tsuga canadensis* ONLY and occurring over a shrub stratum dominated by *Rhododendron maximum*, at times with *Kalmia latifolia*; deciduous species may be present in the canopy, but these make up less than 25% of the canopy coverage, making this type very difficult to distinguish from CEGl007102 (above)..... **Southern Appalachian Eastern Hemlock Forest (Typic Type) - CEGl007136**

²The phrase “successional vegetation resulting from recent human disturbance” can be difficult to interpret. Some factors that may indicate this is a successional stand include: 1) canopy trees generally less than 70 years old, canopy trees all even-aged, poor herbaceous layer development, and proximity to areas associated with human disturbance such as roads, unusually flat areas, etc.

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

- 1a. Vegetation strongly altered by recent human disturbance (even-aged), dominated by disturbance-oriented native and non-native species, often in monospecific stands (including *Pinus virginiana*, *Liriodendron tulipifera*, *Acer rubrum*, *Robinia pseudoacacia*, *Juglans nigra*)..... 2
- 1b. Mature, relatively undisturbed vegetation; vegetation natural or relatively unaltered by recent disturbance, dominated by native species, usually in diverse combinations; not even-aged. 8
- 2a. Canopy a mixture of evergreen and deciduous trees..... 3
- 2b. Canopy mainly deciduous, dominated by various broadleaf deciduous trees..... 4
- 3a. Canopy dominated or co-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. **Ruderal Virginia Pine Forest - CEG L002591**
- 3b. Canopy with *Pinus strobus* (>25% relative cover) with other early-successional species (*Liriodendron tulipifera*, *Acer rubrum*, *Pinus rigida*, *Liquidambar styraciflua*); *Tsuga canadensis* often forms a dense shrub stratum; sites are former fields and pastures. This community is often transitional to *Liriodendron* dominated types. The deciding factor should be which species is in the canopy and which is in the subcanopy. Once *Liriodendron* overtops the white pine, stand should be keyed as a hardwood type..... **Ruderal Eastern White Pine Forest - CEG L007944**
- 4a. Stand is dominated by very early regeneration following hemlock die off from adelgid (mostly *Acer rubrum* and/or *Betula lenta*)..... Young version of **Southern Appalachian Ruderal Acidic Mixed Hardwood Forest - CEG L008558**
- 4b. Stand is not primarily composed of regeneration from hemlock die off from adelgid in the early 2010s..... 5
- 5a. Canopy dominated by *Robinia pseudoacacia*, ranging widely in elevation and position, but generally on ridgetops or steep upper slopes just below ridgetops; open forests; Understory often very diverse with a mix of forbs and shrubs. **Ruderal Black Locust Forest - CEG L007279**
- 5b. 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*) or with Oaks (*Quercus* species)..... 6
- 6b. Canopy dominated by *Liriodendron tulipifera* and many other successional species (*Acer rubrum*, *Robinia pseudoacacia*, *Acer saccharum*, *Halesia tetraptera* var. *monticola*, *Betula lenta*) and lacking oak species; sites are low slopes and flats, typically below 3,000 ft. (915 m) elevation and particularly in areas of heavy settlement or past logging or farming activities. **Appalachian Ruderal Hardwood Forest - CEG L007219**
- 6b. Canopy dominated by *Liriodendron tulipifera* (> 50%), possibly with oaks or other less successional species. 7
- 7a. Canopy dominated by *Liriodendron tulipifera* with a large presence of understory species indicative of circumneutral soils (including species such as *Symphoricarpos orbiculatus* and *Lindera benzoin*). Generally more diverse than CEG L007221 (below)..... **Ruderal Tuliptree Forest (Rich Type) - CEG L007220²**
- 7b. Canopy dominated by *Liriodendron tulipifera*, often with codominant young oaks (*Quercus* species) with a large presence of understory species indicative of acidic soils (such as *Betula lenta*, *Cornus florida*, *Nyssa sylvatica*, and shrub *Vaccinium pallidum*). In areas where hemlocks have been treated for adelgids, *Tsuga* regeneration may be abundant. *Dennstaedtia punctilobula* is a common fern. Generally less diverse than CEG L007220 (above). **Ruderal Tuliptree Forest (Typic Type) - CEG L007221**
- 8a. Canopy dominated by a mixture of evergreen (*Tsuga canadensis*, *Pinus strobus*, *Pinus echinata*) and deciduous (*Betula alleghaniensis*, *Halesia tetraptera* var. *monticola*, *Magnolia fraseri*, *Fagus grandifolia*, *Liriodendron tulipifera*, *Quercus alba*, *Carya tomentosa*) trees..... 9
- 8b. Canopy mainly dominated by deciduous trees (less than 25% evergreen coverage in the canopy). 14

9a. Canopy dominated by <i>Pinus strobus</i> or <i>Pinus echinata</i> along with deciduous mesic oak and hickory species (<i>Quercus alba</i> , <i>Carya tomentosa</i> , <i>Acer rubrum</i>).	10
9b. Canopy dominated by <i>Tsuga canadensis</i> with deciduous species (<i>Betula alleghaniensis</i> , <i>Betula lenta</i> , <i>Halesia tetraptera</i> var. <i>monticola</i> , <i>Magnolia fraseri</i> , <i>Fagus grandifolia</i> , <i>Liriodendron tulipifera</i>). ***Many examples of these communities currently have standing dead <i>Tsuga</i> but no live <i>Tsuga</i> . If <i>Tsuga</i> is not alive, you can consider it in the classification “equation”, but avoid considering it to be the dominant species.	11
10a. Canopy dominated by <i>Pinus strobus</i> , which may overtop the deciduous trees; sites are protected ridges, middle to upper slopes, and disturbed bottoms.	Appalachian White Pine - Mesic Oak Forest - CEG007517
10b. Canopy dominated by a mixture of <i>Pinus echinata</i> and <i>Quercus alba</i> and other more mesic oaks and hickories, sites are low to midslope sheltered positions , often near streams, known only from low elevations (1200 – 1400 ft. [365-425 m]) in the Abrams Creek drainage.	Appalachian Shortleaf Pine - Mesic Oak Forest - CEG008427
11a. Canopy dominated or co-dominated by <i>Tsuga canadensis</i> , with and a variety of other species (<i>Betula alleghaniensis</i> , <i>Pinus strobus</i> , <i>Liriodendron tulipifera</i> , <i>Betula lenta</i> , and/or <i>Acer rubrum</i>), but generally without <i>Halesia tetraptera</i> var. <i>monticola</i> **Note: Hemlock woolly adelgid has heavily impacted the composition of this type, and most examples will have large gaps where hemlock once stood and may be difficult to key. If the canopy is < 25% cover, the stand may need to be keyed as a shrubland. If all the canopy hemlock is dead, but the stand retains a > 25% canopy, key it as a forest/woodland.	12
11b. Canopy co-dominated (or at least with heavy presence of) <i>Halesia tetraptera</i> var. <i>monticola</i> ; other canopy species can include <i>Acer saccharum</i> , <i>Fagus grandifolia</i> , <i>Magnolia fraseri</i> , <i>Betula alleghaniensis</i> , and <i>Acer rubrum</i> ; the evergreen canopy may overtop the deciduous trees or occur beneath the deciduous canopy; the shrub stratum is either dense, tall <i>Rhododendron maximum</i> or is open and dominated by canopy saplings or <i>Acer pensylvanicum</i> ; the herb stratum has moderate coverage; common species are <i>Eurybia divaricata</i> (= <i>Aster divaricatus</i>), <i>Dryopteris intermedia</i> , <i>Huperzia lucidula</i> , <i>Medeola virginiana</i> , <i>Mitchella repens</i> , <i>Oxalis montana</i> , <i>Solidago curtisii</i> , <i>Tiarella cordifolia</i> , and <i>Viola blanda</i> ; sites are protected slopes and coves, typically above 3,500 ft. (1070 m) elevation in NC and above 3,000 ft. (915 m) in TN, but may extend to lower elevations. [note: this is a mixed version of this variable association, which is also keyed as primarily deciduous below].	Southern Appalachian Acidic Cove Forest (Silverbell Type) - CEG007693
12a. Canopy co-dominated by <i>Tsuga canadensis</i> with tree species typical of rich cove forests such as <i>Aesculus flava</i> and <i>Tilia americana</i> var. <i>heterophylla</i> , also possessing a rich, diverse and well developed herb layer indicative of calcium rich soils including species such as <i>Hydrophyllum canadense</i> and <i>Laportea canadensis</i>	Southern Appalachian Rich Cove Forest (Typic Type) - CEG007710
12b. Canopy dominated or co-dominated by <i>Tsuga canadensis</i> but with a different composition, lacking species associated with calcium rich soils, typically with well-developed dense evergreen shrub layer and a poorly developed herb layer consisting of species associated with acidic soils.	13
13a. Canopy dominated by <i>Tsuga canadensis</i> and <i>Betula alleghaniensis</i> with a dense evergreen shrub stratum and sparse herb coverage; sites are above 3,500 ft. (1070 m) elevation in NC and above 3,000 ft. (915 m) in TN, on steep, mostly north-facing slopes, and on slopes and flats along and above streams. **Note: Due to hemlock woolly adelgid, most examples of this type will have large gaps where hemlock once stood and may be difficult to key.	Blue Ridge Hemlock - Northern Hardwood Forest - CEG007861
13b. Canopy is dominated by <i>Tsuga canadensis</i> , occurring with <i>Liriodendron tulipifera</i> , <i>Pinus strobus</i> , <i>Betula lenta</i> , and/or <i>Acer rubrum</i> ; the shrub stratum has scattered to dominant <i>Rhododendron maximum</i> ; other characteristic species are <i>Euonymus americanus</i> , <i>Ilex opaca</i> , <i>Leucothoe fontanesiana</i> , <i>Mitchella repens</i> , <i>Polystichum acrostichoides</i> ; sites are low slopes and flats, often associated with small streams, mostly below 3,500 ft. (1070 m) elevation in NC and below 3,000 ft. (915 m) elevation in TN. ***Note: Due to hemlock woolly adelgid, many examples of this type will not have hemlock and instead will have large gaps in the canopy where the hemlock once stood and may be difficult to key. In many of these examples <i>Betula lenta</i> or <i>Acer rubrum</i> will instead dominate.	Southern Appalachian Acidic Cove Forest (Typic Type) - CEG007543
14a. Shrub layer is dominated by <i>Rhododendron maximum</i>	15
14b. Shrub layer is not dominated by <i>Rhododendron maximum</i>	16
15a. Shrub layer dominated by <i>Rhododendron maximum</i> and/or <i>Gaylussacia</i> spp.; canopy dominated by oaks (<i>Quercus</i>	

- spp.) or sometimes codominated or dominated by *Carya* spp. Some examples may also have codominance of red maple (*Acer rubrum*) and/or sourwood (*Oxydendrum arboreum*). ****Quercus velutina* may have very high cover in these communities. When keying out these types, ignore *Quercus velutina* when considering relative cover since this species has a wide ecological amplitude and can occur within any of these oak communities..... 17
- 15b. Shrub layer dominated by *Rhododendron maximum*; 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*, *Carya glabra*, *Liriodendron tulipifera*, *Halesia tetraptera* var. *monticola*, *Tilia americana* var. *heterophylla*). [three choices here] 18
- 16a. Shrub layer NOT dominated by *Rhododendron maximum*; canopy dominated by oaks (*Quercus* spp.) or sometimes codominated or dominated by *Carya* spp. Some examples may also have codominance of red maple (*Acer rubrum*) and/or sourwood (*Oxydendrum arboreum*). ****Quercus velutina* may have very high cover in these communities. When keying out these types, ignore *Quercus velutina* when considering relative cover since this species has a wide ecological amplitude and can occur within any of these oak communities... 19
- 16b. Shrub layer NOT dominated by *Rhododendron maximum*; canopy **not** dominated by oaks (*Quercus* spp.), but dominated by other broad-leaved deciduous species; this includes woodlands dominated by *Carya glabra* and *Fraxinus americana* (with some *Quercus montana*); as well as closed canopy forests dominated by *Acer saccharum*, *Aesculus flava*, *Betula alleghaniensis*, *Betula lenta*, , *Liriodendron tulipifera*, *Halesia tetraptera* var. *monticola*, *Tilia americana* var. *heterophylla*, etc. 27
- 17a. Canopy dominated by *Quercus montana* or in some cases *Quercus alba* (although also can be dominated by any combination of *Quercus coccinea*, and/or *Quercus velutina/falcata*) often occurring with *Quercus rubra* and/or *Acer rubrum* over dense, tall *Rhododendron maximum* (typically 50%-100% cover); sparse herb cover (often *Galax* is the only herbaceous species); sites are very steep, northerly slopes. Examples at elevations below 2000 ft on the TN side of the park are often dominated by *Quercus alba*. **Chestnut Oak Forest (Mesic Slope Heath Type) - CEGLO06286**
- 17b. Canopy and subcanopy dominated by *Quercus alba*, with *Carya glabra* and *Acer rubrum*; *Carya tomentosa* can share canopy dominance at low elevations (below 2,500 ft./760 m), *Quercus rubra* often codominates at higher elevations (above 3,800 ft./1160 m); at times can have a very dense hemlock shrub/understory layer, although in many places these hemlocks are dead from adelgid; associated species are typical of montane acidic oak forests; indicators of circumneutral soils are lacking. Can have a sparse shrub layer of *Kalmia* or up to 100% cover of *Gaylussacia* spp.
..... **Appalachian Montane Oak - Hickory Forest (Typic Acidic Type) - CEGLO07230**
- 18a. (1 of 3) Canopy dominated by *Liriodendron tulipifera* and *Betula lenta*. Formerly, *Tsuga canadensis* was present to co-dominant in some examples, but it is no longer present in examples where *Tsuga Canadensis* has been killed by hemlock adelgid. Herb layer is absent to sparse; dense shrub layer dominated by *Rhododendron maximum*; sites are associated with small streams, mostly below 3,500 ft. (1070 m) elevation except *Betula lenta* / *Rhododendron maximum* can range up to 4200 ft. (1270 m) at times.
..... **Southern Appalachian Acidic Cove Forest (Typic Type) - CEGLO07543**
- 18b. (2 of 3) Canopy historically dominated by *Tsuga canadensis* and *Halesia tetraptera* var. *monticola* BUT may be exclusively dominated by *Halesia tetraptera* and *Acer rubrum* in examples where *Tsuga Canadensis* has been killed by hemlock adelgid; other canopy species can include *Pinus strobus*, *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 *Leucothoe fontanesiana*, or is open and dominated by canopy saplings or *Acer pensylvanicum*; the herb stratum has moderate coverage; common species are *Eurybia divaricata* (= *Aster divaricatus*), *Dryopteris intermedia*, *Huperzia lucidula*, *Medeola virginiana*, *Mitchella repens*, *Oxalis montana*, *Solidago curtisii*, *Tiarella cordifolia*, and *Viola blanda*; sites are protected slopes and coves, typically above 3,500 ft. (1070 m) elevation in NC and above 3,000 ft. (915 m) in TN, but may extend to lower elevations..... **Southern Appalachian Acidic Cove Forest (Silverbell Type) - CEGLO07693**
- 18c. (3 of 3) Canopy dominated by hardwoods, mainly a mixture of *Acer rubrum*, *Halesia tetraptera* var. *monticola*, *Magnolia fraseri*, and *Nyssa sylvatica*. Oaks (*Quercus* spp.) generally absent. In this more mesic (less dry) version of CEGLO08558, there is a dense shrub stratum of *Rhododendron maximum*, with less *Sassafras albidum*. Sprouts of *Castanea dentata* are generally present/abundant in the ground layer. ***Generally only applies to stands more than ~70 years old with very young stands instead either keying to CEGLO07219 or in some cases where hemlock die-off has led to release of the species listed above, a young “early successional” version of 8558.
..... **Southern Appalachian Ruderal Acidic Mixed Hardwood Forest - CEGLO08558**

- 19a. Canopy dominated largely by *Quercus montana*..... 20
- 19b. Canopy generally dominated by *Quercus alba* or *Quercus rubra* (and usually without *Quercus montana*, *Quercus coccinea*, and *Quercus falcata*, or these at low cover) and sometimes *Carya sp.*, generally without heavily evergreen dominance in shrub layer. 21
- 20a. Canopy mainly dominated by *Quercus montana* and/or *Quercus coccinea* and/or *Quercus falcata* (this latter species only at low elevations) and *Acer rubrum*; occasionally also with *Carya glabra*, *Liriodendron tulipifera*, *Quercus velutina*; *Carya* spp. can have high coverage in the canopy or subcanopy. In addition, *Sassafras albidum* and *Cornus florida* are often present in subcanopy or shrub layer; shrub stratum is sparse, usually lacking dense heath cover; herbaceous cover is sparse to moderate but often can be species-rich; characteristic or dominant herbs include *Maianthemum racemosum ssp. racemosum*, *Thalictrum thalictroides*, *Desmodium nudiflorum*, *Polystichum acrostichoides*, and *Thelypteris noveboracensis*.
..... **Appalachian Montane Oak - Hickory Forest (Chestnut Oak Type) - CEGLO07267**
- 20b. Canopy dominated by *Quercus montana* and/or *Quercus coccinea* and *Acer rubrum* but with a dense heath shrub layer of *Gaylussacia ursina* with little or no herbaceous layer except perhaps *Galax urceolata*. This association is usually found on exposed ridgetops but occasionally extends downslope into drainages.
..... **Chestnut Oak Forest (Subxeric Ridge Type) - CEGLO06271**
- 21a. Canopy mainly to strongly dominated by *Quercus rubra*, sites are intermediately exposed slopes, sheltered slopes, and steep coves. Sites do not generally have a high component of *Carya* spp. and are at 2000-4000 ft. (610-1220 m; up to 4500 ft./1370 m in some cases in NC). 22
- 21b. Canopy dominated by *Quercus alba* or by *Quercus alba* with *Quercus rubra* codominating; can often have high amounts of *Carya* spp. in the canopy. 23
- 22a. 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 montana*; 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 1,600-4,000 ft. [610-1220 m] but occasionally up to 4500 ft./1370 m) and on slopes of intermediate to protected exposure.
..... **Appalachian Montane Oak - Hickory Forest (Red Oak Type) - CEGLO06192**
- 22b. Canopy dominated by *Quercus rubra* (>50% relative cover of *Quercus rubra*), which 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*; little to no hickory present; herbs are sparse to moderate in coverage and characteristic of rich forests in cove landforms; characteristic herbaceous species include *Collinsonia canadensis*, *Actaea pachypoda*, *Caulophyllum thalictroides*, *Laportea canadensis*, *Maianthemum racemosum*, *Phegopteris hexagonoptera*, *Tradescantia subaspera*; sites are protected steep slopes, often rocky; found from 2,500-4,000 ft. (760-1220 m) elevation. **Southern Appalachian Red Oak Cove Forest - CEGLO07878**
- 23a. Community found in a variety of situations, including exposed locations and south-facing slopes. Communities found at low to very low elevations, ranging from 1,000-2,000 ft. (305-610 m) in one example, 1,500-2,800 ft. (460-850 m) in another. These types are most likely restricted to the northwest portion of the park, and/or present on the Foothills Parkway on sedimentary rock such as shale and limestone; *Quercus muehlenbergii* is an indicator for these types (but may not be present in all examples). 24
- 23b. Community found in protected slopes or coves, at elevations ranging from 1,500-4,000 ft. 26
- 24a. Canopy dominated largely by a combination of *Quercus alba* and varying amounts of *Quercus falcata*; *Quercus stellata* is also a common component. The shrub layer is characterized by a dominance of ericaceous species including *Vaccinium pallidum*, *Vaccinium hirsutum*, *Vaccinium arboreum*, and *Rhododendron calendulaceum*. This association is largely restricted to the Foothills Parkway. ... **Appalachian White Oak - Southern Red Oak Forest - CEGLO08567**
- 24b. Canopy more diverse usually including *Quercus rubra*, *Quercus alba*, and various *Carya* species; lacking *Quercus falcata*. In addition, *Quercus muehlenbergii* is a frequent component, but is not present in all examples. Often with a species rich herbaceous layer, not restricted to the Foothills Parkway. In these types, soils tend to be circumneutral, and very rich in calcium or other basic minerals. 25
- 25a. A more dry-mesic community found in exposed locations and south-facing slopes at very low elevations (1,000-

- 2,000 ft./305-610 m). Canopy is dominated by *Quercus alba*, *Quercus rubra*, *Carya ovata*, and *Carya tomentosa* and often can have *Pinus* spp. and/or *Juniperus virginiana* as components. Shrub layer dominated by *Cercis canadensis*. Herb layer dense to sparse and very species-rich. Additional characteristic species may include *Hexastylis arifolia*, *Oxydendrum arboreum*, *Vaccinium arboreum*, and *Vaccinium stamineum*. (may appear very similar to the following).....
.....**Ridge and Valley Dry-Mesic White Oak - Hickory Forest - CEGLO07240**
- 25b. A slightly more mesic community found on a variety of sites, slope positions and aspects, from 1,500-2,800 ft. (460-850 m), most commonly northwestern to eastern, typically underlain by sedimentary and metasedimentary rocks, with a variable mixed overstory of *Quercus rubra*, *Quercus alba*, *Carya ovalis*, *Carya ovata*, *Carya tomentosa*, *Liriodendron tulipifera* and, less frequently, *Carya cordiformis*, *Magnolia acuminata*, *Quercus velutina*, and *Quercus montana*, the herb layer may contain many mesic species such as *Actaea racemosa*, *Ageratina altissima*, *Collinsonia canadensis*, *Desmodium nudiflorum*, *Geranium maculatum*, and *Podophyllum peltatum*. (may appear very similar to the preceding).**Rich Low-Elevation Appalachian Oak - Hickory Forest - CEGLO07233**
- 26a. Canopy and subcanopy dominated by *Quercus alba*, with *Carya glabra* and *Acer rubrum*; *Carya tomentosa* can share canopy dominance at low elevations (below 2,500 ft./760 m), *Quercus rubra* often codominates at the highest elevations (over 3,800 ft./1160 m); at times can have a very dense hemlock shrub/understory layer, although in many places these hemlocks are dead from adelgid; associated species are typical of montane acidic forests; indicators of circumneutral soils are lacking. Can have a sparse shrub layer or up to 100% cover of *Gaylussacia* spp. ***Note: If with *Quercus montana* canopy, and if 50-100% *Kalmia latifolia* in shrub layer, keys instead to CEGLO06271. If 50%-100% *Rhododendron maximum*, then will key out to CEGLO06286.....
.....**Appalachian Montane Oak - Hickory Forest (Typic Acidic Type) - CEGLO07230**
- 26b. Canopy dominated by *Quercus alba*, occurring with other *Quercus* spp. and *Carya* spp. (*Carya* spp. can sometimes dominate stands of this type); 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*, *Actaea racemosa* (= *Cimicifuga racemosa*), *Caulophyllum thalictroides*, *Sanguinaria canadensis*.**Appalachian Montane Oak - Hickory Forest (Rich Type) - CEGLO07692**
- 27a. Open canopy woodland/shrubland mainly comprised of *Carya glabra*, *Fraxinus* spp., and some *Quercus montana*. Found only on calcareous shale in the Kinzel Springs quadrangle or on the Foothills Parkway.....
.....**Blue Ridge Calcareous Shale Slope Woodland - CEGLO07720 (formerly CEGLO04995)**
- 27b. Closed canopy dominated by *Acer saccharum*, *Aesculus flava*, *Betula alleghaniensis*, *Betula lenta*, *Liriodendron tulipifera*, *Halesia tetraptera* var. *monticola*, and/or *Tilia americana* var. *heterophylla*. **28**
- 28a. Dense shrub layer dominated by *Leucothoe fontanesiana* (possibly with *Rhododendron maximum*). Canopy historically dominated by *Tsuga canadensis* and *Halesia tetraptera* var. *monticola* BUT may be exclusively dominated by *Halesia tetraptera* and *Acer rubrum* in examples where *Tsuga Canadensis* has been killed by hemlock adelgid; other canopy species can include *Pinus strobus*, *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 *Leucothoe fontanesiana* (possibly with *Rhododendron maximum*) or is open and dominated by canopy saplings or *Acer pensylvanicum*; the herb stratum has moderate coverage; common species are *Eurybia divaricata* (= *Aster divaricatus*), *Dryopteris intermedia*, *Huperzia lucidula*, *Medeola virginiana*, *Mitchella repens*, *Oxalis montana*, *Solidago curtisii*, *Tiarella cordifolia*, and *Viola blanda*; sites are protected slopes and coves, typically above 3,500 ft. (1070 m) elevation in NC and above 3,000 ft. (915 m) in TN, but may extend to lower elevations.**Southern Appalachian Acidic Cove Forest (Silverbell Type) - CEGLO07693**
- 28b. Shrub layer not dominated by *Leucothoe fontanesiana* or *Rhododendron maximum*. **29**
- 29a. Canopy dominated by hardwoods, mainly a mixture of *Acer rubrum*, *Halesia tetraptera* var. *monticola*, *Magnolia fraseri*, and *Nyssa sylvatica*. *Betula lenta* can be a component but is generally not dominant. Oaks (*Quercus* spp.) generally absent. In this drier version of CEGLO08558, there is more *Kalmia latifolia* than *Rhododendron maximum*, and more *Sassafras albidum*. Sprouts of *Castanea dentata* are generally present/abundant in the ground layer. ***Generally only applies to stands more than ~70 years old with younger stands instead keying to CEGLO07219).....
.....**Southern Appalachian Ruderal Acidic Mixed Hardwood Forest - CEGLO08558**
- 29b. Canopy dominated by a variety of mesic hardwood species, including *Acer rubrum*, *Acer saccharum*, *Aesculus flava*, *Fraxinus americana*, *Halesia tetraptera* var. *monticola*, *Liriodendron tulipifera*, or *Tilia americana* var. *heterophylla*,

- with or without *Betula alleghaniensis* and *Fagus grandifolia*. 30
- 30a. Canopy is dominated by *Betula alleghaniensis* and/or *Fagus grandifolia*. 31
- 30b. Canopy without *Betula alleghaniensis* or *Fagus grandifolia*. Generally found below 4,000 ft. (1220 m) elevation..... 32
- 31a. Canopy is dominated by *Betula alleghaniensis* and/or *Fagus grandifolia*, sharing dominance with *Aesculus flava*, *Acer saccharum*, *Halesia tetraptera* var. *monticola*, *Prunus serotina*; herb cover is lush and diverse with species such as *Deparia acrostichoides*, *Viola canadensis*, *Actaea podocarpa* (= *Cimicifuga americana*), *Actaea racemosa* (= *Cimicifuga racemosa*), *Dryopteris intermedia*, *Laportea canadensis*, *Prosartes lanuginosa* (= *Disporum lanuginosum*); sites are relatively protected landforms, such as upper portions of draws and coves, protected slopes, and gaps, typically with northerly aspects, ranging from 3,500-4,700 ft. (1070-1430 meters; up to 5,300 ft. [1615 meters] on the NC side of park)..... **Southern Appalachian Northern Hardwood Forest (Rich Type) - CEGLO04973**
- 31b. Canopy is dominated by *Betula alleghaniensis*, *Fagus grandifolia*, *Aesculus flava*, occurring singly or in combination; less often with *Halesia tetraptera* var. *monticola*, *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 (less lush and diverse than CEGLO04973), typically *Ageratina altissima*, *Athyrium filix-femina* ssp. *asplenioides*, *Carex* spp. (e.g., *Carex debilis*, *Carex intumescens*, *Carex pensylvanica*), *Dryopteris intermedia*, *Eurybia divaricata* (= *Aster divaricatus*), *Stellaria pubera*; on relatively exposed landforms, such as high, exposed slopes, ridges, and gaps, typically with northerly exposures, ranging from 4,300-5,900 ft. (1310-1800 meters)..... **Southern Appalachian Northern Hardwood Forest (Typic Type) - CEGLO07285**
- 32a. Canopy dominated either by *Acer saccharum*, *Aesculus flava*, *Fraxinus americana*, *Halesia tetraptera* var. *monticola*, and/or *Tilia americana* var. *heterophylla*, or by various combinations of these species, with or without lesser amounts of *Liriodendron tulipifera*; *Liriodendron tulipifera* may be present, but should not be even a co-dominant tree; herb stratum is lush and diverse; diagnostic herbs include *Deparia acrostichoides*, *Hydrophyllum canadense*, *Laportea canadensis*, *Solidago flexicaulis*, *Hepatica nobilis* var. *acuta*, *Dryopteris goldiana*, *Asarum canadense*, *Diplazium pycnocarpon*, *Asplenium rhizophyllum*, *Aquilegia canadensis*, *Cystopteris protrusa*, *Phacelia bipinnatifida*; sites are steep, middle to low protected slopes and coves, mostly below 4,000 ft. (1220 m) elevation..... **Southern Appalachian Rich Cove Forest (Montane Calcareous Type) - CEGLO07695**
- 32b. Canopy dominated by various mixtures of *Liriodendron tulipifera*, *Halesia tetraptera* var. *monticola*, *Tilia americana* var. *heterophylla*, *Acer rubrum*, and *Fraxinus americana*; other canopy trees can include *Acer saccharum*, *Aesculus flava*, *Betula lenta*, *Prunus serotina*, *Tsuga canadensis*; *Quercus rubra* can be present, but generally less than 25% cover; 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 high coverage of strong calciphiles (see list above in 32a); sites are on low, protected topographic positions, often near streams on gentle to moderate slopes with northerly aspects..... **Southern Appalachian Rich Cove Forest (Typic Type) - CEGLO07710**