

RICH COVE FOREST (MONTANE RICH SUBTYPE)

Concept: Rich Cove Forests are low to mid elevation mesophytic mountain and foothill forests with a diverse mix of trees that includes species of richer soils such as *Fraxinus americana*, *Tilia americana* var. *heterophylla*, *Magnolia acuminata*, *Prunus serotina*, and *Aesculus flava*, along with more widely tolerant mesophytic species. The herb layer also is diverse and contains many species of richer soils. The Montane Rich Subtype includes the less common examples occurring on the unusually rich substrates associated with mafic or calcareous rocks, in the Mountain region. They contain indicators of unusually rich soils, such as *Deparia acrostichoides*, *Diplazium pycnocarpon*, and *Dryopteris goldiana*.

Distinguishing Features: Rich Cove Forests are distinguished by having a diverse mix of mesophytic trees and a diverse mix of herbs, both of which include species of richer soils. Trees common in Rich Cove Forest and scarce to absent in Acidic Cove Forest include *Aesculus flava*, *Fraxinus americana*, *Tilia americana* var. *heterophylla*, and *Magnolia acuminata*, along with less common species such as *Juglans nigra*, *Carya ovata*, and *Cladrastis kentukea* (= *Cladrastis lutea*).

The Montane Rich Subtype is distinguished from the Montane Intermediate Subtype by differences in flora and vegetation that correlate with soil pH and fertility. The distinction can be subtle. Some members of a pool of calciphilic species such as *Cystopteris protrusa*, *Diplazium pycnocarpon*, *Asplenium rhizophyllum*, *Aquilegia canadensis*, *Dryopteris goldiana*, *Philadelphus hirsutus*, or *Acer nigrum* are generally present in a stand but may be sparse and not found in vegetation plots. Other species are more abundant in the Montane Rich Subtype but may still be found sometimes in other subtypes. These include *Carya cordiformis*, *Juglans nigra*, *Carpinus caroliniana*, *Toxicodendron radicans*, *Deparia acrostichoides*, *Asarum canadense*, *Astilbe biternata*, *Phryma leptostachya*, *Cryptotaenia canadensis*, and *Panax quinquefolius*. *Tsuga canadensis*, *Acer rubrum*, and *Oxydendrum arboreum* generally are absent in the Montane Rich Subtype.

The Montane Rich Subtype is distinguished from the Foothills Rich Subtype by occurring in the primary Blue Ridge region rather than in the foothills or low elevation periphery and generally at elevations above 2000 feet. The Foothills Rich Subtype may be distinguished from lower elevation examples of the Montane Rich Subtype by the presence of a few lower elevation species, such as *Liquidambar styraciflua*, and by an herb layer that is less dense even as it is generally highly diverse.

Synonyms: *Aesculus flava* - *Acer saccharum* - (*Fraxinus americana*, *Tilia americana* var. *heterophylla*) / *Hydrophyllum canadense* - *Solidago flexicaulis* Forest (CEGL007695).

Ecological Systems: Southern and Central Appalachian Cove Forest (CES202.373).

Sites: Rich Cove Forests occur in sheltered mesic sites such as valley bottoms, ravines, lower slopes, and concave slopes. The Montane Rich Subtype occurs on rocks such as amphibolite, hornblende gneiss, calc-silicate, dolomite, marble, that produce less acid, more fertile soils than typical. Many are on colluvial deposits. Most examples occur at 2000-4000 feet elevation, but a few examples are lower or higher.

Soils: The Montane Rich Subtype occurs on the same wide variety of Inceptisol and less common Ultisol soil map units as the Montane Intermediate Subtype. The Inceptisols are not classified by the chemical differences that distinguish the community subtypes, but it may be that some soils mapped as Ultisols are unrecognized Alfisols. The soils in the Montane Rich Subtype are acidic, but studies such as Ulrey (2002) and Newell (1997) find them less acidic than those in the other subtypes of Rich Cove Forest, and they are higher in base saturation and in most of the nutritive cations. They may be very rocky but do not have extreme boulder cover.

Hydrology: Sites are well drained but mesic due to topographic sheltering, low slope position, and flow convergence. Local small seepages may be present.

Vegetation: The Montane Rich Subtype is dominated by a varying mix of mesophytic trees, which may locally have one or a couple of predominant species but which usually include many species within the stand. Canopy species in 50% or more of CVS plots are *Acer saccharum* (probably including some *Acer nigrum*), *Aesculus flava*, *Fraxinus americana*, *Tilia americana* var. *heterophylla*, *Carya cordiformis*, *Quercus rubra*, *Prunus serotina*, *Liriodendron tulipifera*, and *Betula alleghaniensis*. Also frequent are *Fagus grandifolia*, *Halesia tetraptera*, *Magnolia acuminata*, and *Betula lenta*. Less frequent, but notable, trees include *Juglans nigra*, *Ulmus rubra*, and *Cladrastis kentukea*. In addition to canopy species, the understory usually includes *Acer pensylvanicum* and *Ostrya virginiana*, and fairly frequently includes *Cornus alternifolia*. The shrub layer usually is sparse, but moderate cover of *Hydrangea arborescens*, *Lindera benzoin*, or *Hamamelis virginiana* may be present. The vines *Isotrema macrophyllum*, *Parthenocissus quinquefolius*, and *Smilax rotundifolia* are highly constant or frequent, though their cover usually is limited. The herb layer generally is extremely dense and diverse, but patches may be strongly dominated by a single species and therefore be less diverse. High constancy species that sometimes dominate patches include *Caulophyllum thalictroides*, *Laportea canadensis*, *Hydrophyllum canadense*, *Asarum canadense*, and *Viola canadensis*. Other species occurring in 50% or more of CVS plots or of Ulrey's (2002) plots are *Arisaema triphyllum*, *Actaea racemosa*, *Prosartes lanuginosa*, *Dryopteris marginalis*, *Maianthemum racemosum*, *Osmorhiza claytonia*, *Deparia acrostichoides*, *Dryopteris intermedia*, *Botrypus virginianus*, *Galium triflorum*, *Stellaria pubera* (probably including *Stellaria corei*), *Trillium erectum*, *Solidago curtissii*, *Eurybia divaricata*, *Impatiens pallida*, *Sanguinaria canadensis*, and *Polygonatum pubescens*. Other frequent species in plots include *Adiantum pedatum*, *Uvularia grandiflora*, *Collinsonia canadensis*, *Solidago flexicaulis*, *Tiarella cordifolia*, *Astilbe biternata*, *Cystopteris protrusa*, *Thalictrum dioicum*, *Dioscorea villosa*, *Panax quinquefolius*, *Sanicula odorata*, *Podophyllum peltatum*, *Cryptotaenia canadensis*, *Lilium superbum*, *Veratrum parviflorum*, *Actaea podocarpa*, *Hepatica acutiloba*, *Athyrium asplenoides*, and *Arnoglossum reniforme*. Additional characteristic species, though less frequent in plots, include *Uvularia perfoliata*, *Ageratina altissima*, *Amphicarpaea bracteata*, *Allium tricoccum*, *Dryopteris goldiana*, *Galearis spectabilis*, *Persicaria virginiana*, *Phryma leptostachya*, *Thalictrum dioicum*, *Diplazium pycnocarpon*, *Carex (Cymophilus) fraseriana*, *Carex plantaginea*, *Dicentra canadensis*, *Delphinium tricornis*, *Hydrophyllum macrophyllum*, *Aquilegia canadensis*, and several species of *Carex*. Many of these species that are less frequent in plot data are more frequently observed in surveys of whole stands. Compared to the Montane Intermediate Subtype, the greater number of species with high constancy in plots reflects that greater density and abundance of many species in stands.

Range and Abundance: Ranked G3G4, but probably appropriately G4. The overall abundance is somewhat uncertain because of difficulty and varying criteria used in distinguishing this subtype from others. Numerous occurrences are known, but the overall area of occurrence is much less than for the Montane Intermediate Subtype. The equivalent NVC association is attributed to Alabama, Georgia, Tennessee, and Virginia, as well as North Carolina. The association may be more broadly conceived than the subtype defined here.

Associations and Patterns: The Montane Rich Subtype generally occurs in small patches, occasionally large patches, corresponding to the distinctive underlying rock. It may grade to Montane Oak–Hickory Forest (Basic Subtype) on drier slopes and may contain embedded small patches of Montane Cliff (Mafic or Calcareous Subtype), Rich Montane Seep, or Rich Cove Forest (Boulderfield Subtype). The Montane Rich Subtype may sometimes grade to, or sharply border, the Montane Intermediate Subtype, and may occasionally grade to Northern Hardwood Forest (Rich Subtype) at higher elevations.

Variation: No variants are recognized, but further analysis may distinguish biogeographic or elevational variants analogous to those found by Ulrey (2002) in the range of the Montane Intermediate Subtype.

Dynamics: The Montane Rich Subtype presumably has dynamics similar to the Mountain Cove Forest theme as a whole. As in the Montane Intermediate Subtype, the importance of dispersal limitation in Rich Cove Forests (Tessell 2017) may create some interesting dynamics, with herb layer composition changing in response to infrequent dispersal and metapopulation processes in a way different from many other communities.

Comments: Botanists have long highlighted sites with the Rich Subtype as unusually rich by several meanings of the term – in having long lists of species present on the site, having high abundance of species associated with rich soils, having a high potential for finding rare species, containing species absent even in less rich Rich Cove Forests, and, to use Ulrey’s (2002) term, aesthetic lavishness. It is the presence of the most restricted “base-loving” species that is used to conceptually define the Rich Subtype here, but examples also differ in the quantitative abundance of many other species.

Nevertheless, the distinction between the Montane Rich and Montane Intermediate subtypes is subtle and somewhat confused. The majority of frequent and abundant species are shared among all Rich Cove Forest subtypes, though some tend to be more abundant in different subtypes. Though there is a substantial pool of species that distinguish the Montane Rich Subtype, many occur in only a minority of sites. Individual sites thus vary substantially in flora. The problem is magnified in plot data, because many of these species occur at low density or are patchy when they are present and may be missed in standard 1/10 hectare plots. Ulrey (2002) noted that most of the species suggested as indicative of the Rich Subtype at the time of his study were not found in any of the plots in his analysis. Nevertheless, those species can be found on whole-site species lists from the same locations, and the sites often were targeted for sampling on that basis.

It appears that different conceptual boundaries may have been used by different authors or that analysis of different sets of plots may have led to different impressions of which species are dominant or frequent. For example, Ulrey (2002) found *Liriodendron tulipifera*, *Carya cordiformis*, *Juglans nigra*, and *Ulmus rubra* to be character species, present at high frequency in his rich grouping of plots and distinguishing it from other groups. Adding more recent CVS plot data attributed this subtype suggests that all of these species but *Carya cordiformis* have low frequency in the Rich Subtype. The NVC description mentions only *Carya cordiformis* among these species, and Fleming and Patterson (2009) cited there have *Tilia* and *Aesculus* among the most diagnostic species. All of these analyses used large numbers of plots – numbers considered suitable for characterization of communities.

Rare species:

References:

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