

BASIC MESIC FOREST (PIEDMONT SUBTYPE)

Concept: Basic Mesic Forests are forests of moist but not wet sites, with indicators of unusually high pH or base-rich soils. They are characterized by vegetation dominated or codominated by *Fagus grandifolia*, *Liriodendron tulipifera*, or *Quercus rubra* but lacking the more diverse montane flora of Montane Cove Forests. The Piedmont Subtype covers examples on Piedmont substrates, where *Quercus rubra* and other characteristic Piedmont species are present and characteristic Coastal Plain species are absent or scarce.

Distinguishing Features: Basic Mesic Forests are distinguished from Mesic Mixed Hardwood Forests by higher species richness and by the presence of multiple species that in the Piedmont and Coastal Plain are indicators of higher pH soils (e.g., *Actaea racemosa*, *Asarum canadense*, *Adiantum pedatum*, *Sanguinaria canadensis*, *Cynoglossum virginianum*, *Cubelium (Hybanthus) concolor*, *Actaea pachypoda*, *Carpinus caroliniana*, *Fraxinus americana*, *Lindera benzoin*, and *Aesculus sylvatica*. Additional species are more widespread but tend to be more abundant in Basic Mesic Forest, such as *Cercis canadensis*, *Ostrya virginiana*, and *Acer floridanum*. Because many of the indicator species are herbs, it can be difficult to distinguish Basic Mesic Forests from Mesic Mixed Hardwood Forests in the winter. In addition, because many of them are present at low density, few may appear in plot data.

Rich Cove Forests contain most of the species that distinguish Basic Mesic Forests, but they contain a number of additional montane species that are lacking from Basic Mesic Forest. These include the trees *Aesculus flava*, *Tilia americana* var. *heterophylla*, *Halesia tetraptera*, and *Betula lenta*, and a number of additional herbs such as *Caulophyllum thalictroides*.

Basic Mesic Forests are distinguished from Piedmont Levee Forest (Beech Subtype), Piedmont Headwater Stream Forest, Piedmont Alluvial Forest, and other floodplain communities, which may contain similar tree species, by the absence of evidence of flooding and by the lack of characteristic floodplain plant species such as *Platanus occidentalis*, *Fraxinus pennsylvanica*, *Betula nigra*, and *Xanthorhiza simplicissima*. However, a number of species typical of floodplains are present on slopes in Basic Mesic Forest but not in Mesic Mixed Hardwood Forest (e.g., *Lindera benzoin*, *Elymus hystrix*, *Elymus virginicus*, and *Chasmanthium latifolium*).

The Piedmont Subtype is distinguished from the Coastal Plain Subtype by substrate and by a number of species that occur primarily in the Coastal Plain, at least in mesic uplands. Coastal Plain species include *Quercus nigra*, *Stewartia malacodendron*, *Aesculus pavia*, *Symplocos tinctoria*, *Gaylussacia frondosa*, *Ilex glabra*, and *Clethra alnifolia*. *Quercus rubra* is generally a good indicator of Piedmont flora. However, a number of species considered typical of the Piedmont occur as disjunct populations in the Coastal Plain in Mesic Mixed Hardwood Forests, including *Podophyllum peltatum*, *Epifagus virginiana*, and *Hamamelis virginiana*.

Synonyms: *Fagus grandifolia* - *Quercus rubra* / *Acer barbatum* - *Aesculus sylvatica* / *Actaea racemosa* - *Adiantum pedatum* Forest (CEGL008466).

Ecological Systems: Southern Piedmont Mesic Forest (CES202.342).

Sites: Most examples occur on steep slopes, bluffs, or ravines underlain by diabase, amphibolite, gabbro, or other mafic rocks, or by some metasedimentary formations, in dissected uplands along streams, where slope aspect or topographic sheltering create a cool microclimate and limit the spread of fire.

Soils: Soils in these communities are called “basic,” reflecting long usage of the term by North Carolina’s botanists. The species distinctly associated with them are widely recognized as indicating higher base status. However, the pH measured for CVS plots, as in most studies, is well below neutral, and the difference from Mesic Mixed Hardwood Forests is not as much as often implied (averaging 5.3 and 4.8 respectively in surface soils, 5.2 and 4.7 deeper). Average base saturation in surface soils similarly is 59% versus 43%. Calcium abundance, however, is much greater: 1327 ppm versus 455 ppm. Additional causes of this geologically-driven distinction may remain to be discovered.

Examples are mapped with a wide diversity of soils. Most frequent is Wilkes (Typic Hapludalf). Poindexter is also frequent, and there are several other Typic Hapludalfs mapped. A number of examples are mapped as Goldston (Typic Dystrudept) and some as other Alfisols. Those mapped as Pacolet (Typic Kanhapludult) presumably represent inclusions; those mapped as Chewacla (Fluvaquentic Dystrudept) may also represent inclusions or may indicate mesic river terraces.

Hydrology: Sites are well drained but moist due to topographic sheltering, cool slope aspects, and low slope position.

Vegetation: Forests generally are dominated by *Fagus grandifolia*, but sometimes by *Liriodendron tulipifera*, *Acer floridanum*, or *Quercus rubra*. Other canopy trees may include *Quercus alba*, *Fraxinus americana*, *Carya glabra*, *Carya ovata*, *Pinus taeda*, *Carya tomentosa*, and less often *Quercus velutina*, *Quercus shumardii*, *Juglans nigra*, and *Carya cordiformis*. The understory may be dominated by *Fagus grandifolia*, *Acer floridanum*, *Ostrya virginiana*, *Carpinus caroliniana*, *Asimina triloba*, *Magnolia tripetala*, or *Cornus florida*. Other understory species frequent in CVS plots include *Cercis canadensis*, *Prunus serotina*, *Morus rubra*, *Ulmus alata*, *Oxydendrum arboreum*, and *Nyssa sylvatica*. Shrubs generally are not dense. Frequent species are *Lindera benzoin*, *Euonymus americana*, and *Viburnum* spp. Other shrub and understory species indicative of Basic Mesic Forest include *Tilia americana* var. *caroliniana*, *Chionanthus virginiana*, *Celtis* sp., *Staphylea trifoliata*, *Hydrangea arborescens*, and *Styrax grandifolia*. The herb layer may be dense to sparse but includes a fairly diversity of species that include a number indicative of basic soil conditions. The most constant species include *Maianthemum canadense*, *Galium circaezans*, *Botrypus virginianus*, *Arisaema triphyllum*, *Uvularia perfoliata*, *Polygonatum biflorum*, *Sanguinaria canadensis*, *Actaea racemosa*, and *Phryma leptostachya*. Additional species that sometimes are abundant include *Podophyllum peltatum*, *Phegopteris hexagonoptera*, *Amphicarpha bracteata*, *Cynoglossum virginianum*, *Geranium maculatum*, *Elymus hystrix*, *Asarum canadense*, *Piptochaetium avenaceum*, and *Elymus virginicus*. Other species indicative of Basic Mesic Forest include *Cubelium concolor*, *Aquilegia canadensis*, *Agrimonia pubescens*, *Collinsonia canadensis*, *Iris cristata*, *Osmorhiza longistylis*, *Oxalis violacea*, *Thaspium barbinode*, and *Actaea pachypoda*. Other species fairly frequently occurring include *Tiarella cordifolia*, *Stellaria pubera*, *Eurybia divaricata*, *Nabalus altissima*, and *Epifagus virginiana*.

Range and Abundance: Ranked G3G4, but probably more appropriately G4. This community has numerous examples widely distributed throughout the Piedmont, though most are small patches confined to the intersection of mesic topographic settings with unusual rock types. The equivalent association ranges from Georgia to Virginia, with its northern range limit at the Nottoway River. A related association replaces it farther north.

Associations and Patterns: Basic Mesic Forests usually occur as small patch communities, occasionally as large patches. Many small examples are associated with diabase dikes, which produce narrow surface expressions of mafic rock. Basic Mesic Forests usually grade to Dry-Mesic Basic Oak—Hickory Forest or Dry Basic Oak—Hickory Forest above, and to floodplain communities below. Mesic Mixed Hardwood Forest may border them along slopes, often with fairly sharp boundaries marking geologic contacts.

Variation: Examples vary greatly in their dominant species and in their overall composition. Harry LeGrand, in several Natural Heritage Program reports, proposed recognition of subtypes with stronger and weaker basic character. Preliminary analysis of CVS plot data did not show consistent differences corresponding to proposed examples of the groups. Though not recognized here as subtypes, they are recognized as variants to allow use of the concepts and to encourage further investigation. The idea of a gradient in basic influence appears reasonable, but may be difficult to apply. The pool of indicator species, especially of the more basic variant, includes many species that have low constancy among sites. Many occur only sparsely within sites, and others are visible only early in the spring, making them unlikely to be detected in plots and often missed in whole-site species lists. Indeed, they appear in almost no CVS plots, even those sampled in places reported to have them.

1. Intermediate Variant is the common variant, containing only the more widespread and broadly tolerant circumneutral plant species such as *Adiantum pedatum*, *Sanguinaria canadensis*, *Cardamine concatenata*, and *Actaea racemosa*.
2. Basic Variant contains the more narrowly tolerant base-loving plant species such as *Cubelium (Hybanthus) concolor*, *Enemion biternatum*, *Trillium cuneatum*, *Dicentra cucullaria*, and *Aquilegia canadensis*. These sites presumably have soils with higher pH and base status, but no difference has been recognized in geologic substrates.

Dynamics: Dynamics are similar to the theme in general.

Comments: Peet and Christensen (1980) demonstrated the distinctness of Basic Mesic Forest vegetation in their analysis of Piedmont communities, calling them mesic eutrophic forests.

Quercus rubra / Magnolia tripetala - Cercis canadensis / Actaea racemosa - Tiarella cordifolia Forest (CEGL003949) is another basic mesic association that apparently overlaps this subtype.

Rare species: *Enemion biternatum*, *Euonymus atropurpureus*, others.

References:

Peet, R.K., and N.L. Christensen. 1980. Hardwood forest vegetation of the North Carolina Piedmont. Veroeff. Geobot. Inst. ETH, Stiftung Rubel, Zurich. 69. Heft: 14-39.

