PIEDMONT AND COASTAL PLAIN MESIC FORESTS

**Concept:** Piedmont and Coastal Plain Mesic Forests occur on slopes or flats that are moist but well drained, not affected by flooding, and with only brief or very local saturated soil. Their canopy is dominated or codominated by mesophytic deciduous hardwoods such as *Fagus grandifolia*, *Quercus rubra*, *Liriodendron tulipifera*, and *Quercus nigra*.

**Distinguishing Features:** Most of these forests are distinguished from others in the Piedmont and Coastal Plain by dominance by *Fagus grandifolia*, *Quercus rubra*, and *Liriodendron tulipifera* in upland sites. If *Quercus alba*, *Quercus nigra*, or other oaks are abundant, it is in combination with *Fagus* or other mesophytic species. These mesic forests are distinguished from smaller Piedmont and Mountain Floodplain communities by lacking any appreciable presence of alluvial species (e.g., *Fraxinus pennsylvanica*, *Platanus occidentalis*, *Betula nigra*) and lacking evidence of regular flooding. In the upper Piedmont, where Mountain Cove Forests may be present, Piedmont and Coastal Plain Mesic Forests are distinguished by the absence of the more diverse set of Mountain Cove Forest species (e.g., *Tilia americana* var. *heterophylla*, *Betula lenta*, *Aesculus flava*, *Magnolia acuminata*), and by an association with other Piedmont rather than Mountain communities. Rare examples in the Coastal Plain lack all of these species and are dominated by an uncharacteristic combination of other upland oaks (*Quercus alba*, *Quercus nigra*) with wetland species such as *Chamaecyparis thyoides* on steep bluffs.

Low Elevation Cliffs and Rock Outcrops and Piedmont and Mountain Glades and Barrens are distinguished from Piedmont and Coastal Plain Mesic Forests by having more open vegetation, with less tree cover than a typical forest canopy, with openness caused by rock cover, shallow soil, or long term slope instability.

Within Piedmont and Coastal Plain Mesic Forests, the most common communities are distinguished by the floristic differences associated with Piedmont and Coastal Plain locations, and by soil nutrient levels as they are indicated by flora and vegetation.

**Synonyms:**

**Sites:** Piedmont and Coastal Plain Mesic Forests occur on well drained but moist areas. Most occur on steep slopes, bluffs, or in ravines in dissected uplands, where slope aspect or topographic sheltering create a cool microclimate and limit spread of fire. They may also occur on relict river terraces in areas that no longer flood. In the Coastal Plain, they may occur on moist but well-drained flats or low ridges surrounded by extensive Coastal Plain Nonalluvial Wetland Forests.

**Soils:** Most Piedmont and Coastal Plain Mesic Forests occur on moist Ultisols. A few on steep slopes have Inceptisols, and a few occur on Alfisols. Soils may occasionally have substantial amounts of rock or be punctuated by rock outcrops, but rock cover is not enough to change the vegetation cover and structure from that typical of forests.
**Hydrology:** Sites are moist most of the time but are not saturated other than locally or briefly. In most examples, water can move into the site from adjacent higher areas but drains away and does not accumulate.

**Vegetation:** Piedmont and Coastal Plain Mesic Forests generally have well-developed tree canopies that are usually dominated by a mix of several tree species, including *Fagus grandifolia*, *Quercus rubra*, and *Liriodendron tulipifera*. A variety of other species may be present, including *Acer floridanum*, *Quercus nigra*, *Carya spp.*, *Quercus alba*, and *Pinus taeda* or *Pinus echinata*. Rarely, a few wetland trees such as *Quercus michauxii*, *Quercus pagoda*, or *Chamaecyparis thyoides* may be present. A few communities have dense shrub layers but most are open beneath the understory and have dense or sparse herb layers.

**Dynamics:** Piedmont and Coastal Plain Mesic Forests, like most of North Carolina’s hardwood forests, naturally occur primarily as old-growth, uneven-aged stands. Trees up to several centuries old are common in uncut forests. Most tree reproduction is in small, less often medium size, canopy gaps created by the death of one or a few trees, resulting in a fine-scale mosaic of tree ages across the forest and relative stability of the forest cover over large areas. Wind, lightning, and ice damage are important sources of mortality. Lightning creates gaps at a relatively steady rate but probably less frequent in the sheltered settings of bluffs and ravines than it is on ridges. Large wind storms may create numerous gaps at once, while leaving the majority of canopy cover intact. Wind disturbance may be more severe nearer the coast, where hurricanes are more intense. Gap formation rates have not been studied in as much detail as they have for Mountain Cove Forests but probably are similar.

Mesic forests occur in landscapes that were naturally subject to fire at least fairly frequently. The moist conditions, limited flammability of mesophytic tree litter (Kreye, et al. 2013, Kreye, et al. 2018), and occurrence in dissected and sloping topography where fire would usually be spreading downhill all contribute to limiting fire penetration and to reducing its intensity when it did occur. The process recently termed “mesophication” (Nowacki and Abrams 2008), which is believed to be altering upland oak forests, is a natural characteristic of the mesic forest communities. The thin bark of most of the dominant species also suggests that fire was not an important natural influence, though any intense fire that did occur would be a significant natural disturbance.

Fire may have been an important natural determinant of the boundaries of mesic forests. With the removal of fire from the landscape, individuals of mesophytic species are able to establish in drier, more fire-prone locations. This may eventually lead to a shift in the community boundary. Caution is needed in interpreting this extent of this phenomenon, however. Seedlings and saplings of mesophytic trees may be present in dry areas but fail to mature due to stress or because of periodic drought-caused mortality.

Mesic forests often contain a mix of trees that have very different tolerances of shade, from the very shade-tolerant *Fagus* to the intolerant *Liriodendron*. Occasional fire penetration might be a disturbance that would favor such coexistence but may not be necessary. Skeen, Carter, and Ragsdale (1980) argue that the canopy gaps produced by the death of one or several large old-growth trees would be sufficient to allow regeneration of *Liriodendron*. 
Nutrient levels and soil chemistry vary among the different mesophytic forest communities, but the moist conditions favor decomposition of litter. In addition to transport of nutrients into these communities from uphill, rapid recycling of litter may promote more fertile conditions than in drier communities with comparable geologic substrate.

Comments: Mesic forests are one of the few community themes that are shared between the Piedmont and Coastal Plain, where differences in fire frequency, hydrology, and substrates generally create substantial differences among most communities. The limited role of fire and the lack of extremes in moisture levels lead to more similarities than differences in mesic forests, despite the differences in geology. It may be said that the mesic forests are the most Piedmont-like of Coastal Plain communities. Nevertheless, mesic hardwood forests in the Coastal Plain occur in small patches in unusual topography, while in those in the Piedmont are a regular and extensive part of the typical landscape mosaic.

In the Piedmont, mesic forests were treated by Peet and Christensen (1980) as part of their study of typical forest patterns. In the Coastal Plain, the relationship of our mesic hardwood forests to the concept of southern mixed forest or beech-magnolia forest has been a subject of discussion (Nesom and Treiber 1977, Ware 1978).

References:


Ware, S. 1978. Vegetational role of beech in the southern mixed hardwood forest and the Virginia Coastal Plain. Virginia Journal of Science 29: 231-235.