

## NORTHERN HARDWOOD FOREST (TYPIC SUBTYPE)

**Concept:** Northern Hardwood Forests are the mesophytic forests of higher elevations, occurring on exposed or somewhat sheltered sites and generally dominated by *Betula alleghaniensis*, *Fagus grandifolia*, *Acer saccharum*, or *Aesculus flava*. The Typic Subtype represents the most common examples, which lack the flora of rich sites and do not have the characteristics of the other subtypes.

**Distinguishing Features:** Northern Hardwood Forests may be distinguished from High Elevation Red Oak Forests, Red Spruce, and Red Spruce–Fraser Fir Forests by the predominance of mesophytic hardwood species over *Quercus rubra*, *Picea rubens*, or *Abies fraseri*. High Elevation Birch Boulderfield Forest also is dominated by mesophytic hardwoods but has over 90% cover of boulders, with substantial open space beneath them. The ground cover vegetation in boulderfields is dominated by plants rooted on rock and shallow soil pockets rather than in deep soil. Though Northern Hardwood Forest sites may be very rocky, most plants are rooted in deep soil and the rocks do not visibly change the nature of the vegetation.

The boundary between the Rich Cove Forest and Northern Hardwood types is one of the most difficult to define. Many species in all strata may be shared, and the gradation is particularly gradual. The transition tends to occur around 4000 feet elevation but may be shifted considerably up or down in response to slope aspect, exposure, and latitude. The distinction is best made by the vegetation, based on the presence of species that are confined to high or low elevations. Typical cove species not expected in Northern Hardwood Forest include *Liriodendron tulipifera*, *Magnolia fraseri*, *Magnolia acuminata*, *Ostrya virginiana*, and *Cornus florida*. Northern Hardwood species uncommon in Rich Cove Forests are fewer, but include *Viburnum lantanoides*, *Rhododendron catawbiense*, and *Picea rubens*.

The Typic Subtype is distinguished most easily by lacking the characteristics of the other subtypes. The herb layer may be dense but is not highly diverse, and the species of rich soils which characterize the Rich Subtype are largely absent from all strata. While *Fagus grandifolia* may be codominant in the Typic Subtype, the Beech Gap Subtype has strong *Fagus* dominance in combination with a lawn-like herb layer dominated by *Carex pensylvanica*,

**Synonyms:** *Betula alleghaniensis* - *Fagus grandifolia* - *Aesculus flava* / *Viburnum lantanoides* / *Eurybia chlorolepis* - *Dryopteris intermedia* Forest (CEGL007285).

**Ecological Systems:** Southern Appalachian Northern Hardwood Forest (CES202.029).

**Sites:** Northern Hardwood Forest (Typic Subtype) occurs on convex to concave slopes and ridges at high elevations. Most examples are above 3600 feet, and they can range to 5600 feet or higher. At all but the highest elevations, most examples are on north or east-facing slopes, concave slopes, or otherwise sheltered sites.

**Soils:** Northern Hardwood Forests occur on a variety of Inceptisols. Common mapped soils include Typic Haplumbrepts (Plott, Wayah), Humic Dystrudepts (Balsam, Porters, Tusquitee), and Typic Humadepts (Burton).

**Hydrology:** Sites are well drained but are mesic due to cool temperatures and high rainfall at their high elevations. Northern Hardwood Forests are more moist than oak forests at the same elevations, because they occur on cooler slope aspects.

**Vegetation:** Northern Hardwood Forest (Typic Subtype) is dominated by varying combinations of *Betula alleghaniensis*, *Fagus grandifolia*, *Aesculus flava*, and *Acer saccharum*. Some forests are nearly pure *Betula*, while others are a mix of the other species with little *Betula*. *Quercus rubra* (presumably var. *ambigua*) is usually present in all but the highest elevation examples. Other canopy tree species are scarce, though some *Picea rubens* or *Abies fraseri* may be present at higher elevations and *Tsuga canadensis*, *Prunus serotina*, or other species may be present at the lower elevations. *Acer pensylvanicum* has high constancy and *Acer spicatum* is also frequent; the understory may be dominated by either or by canopy species. The shrub layer may be sparse or fairly dense. *Rubus canadensis* may be abundant where there has been widespread natural or artificial disturbance. *Viburnum lantanoides* and *Ilex montana* are frequent, and though less frequent, species such as *Vaccinium erythrocarpum*, *Vaccinium simulatum*, *Sambucus racemosa* var. *pubens*, and *Rhododendron catawbiense* indicate the high elevation affinities of this community. The herb layer generally is well developed and may be dense. High constancy species in CVS plot data are *Dryopteris intermedia*, *Athyrium asplenoides*, *Polystichum acrostichoides*, *Carex pensylvanica*, and *Arisaema triphyllum*, and all but the last may dominate substantial patches. Earlier in the spring, *Erythronium umbilicatum* var. *monostolum* and *Claytonia caroliniana* may dominate the herb layer. Other frequent and sometimes locally dominant species in plots include *Eurybia chlorolepis*, *Parathelypteris noveboracensis*, *Ageratina altissima* var. *roanensis*, *Angelica triquinata*, and *Maianthemum canadense*. Other frequent species include *Trillium erectum*, *Maianthemum canadense*, *Dioscorea villosa*, *Tiarella cordifolia*, and *Viola* spp., while species such as *Clintonia borealis*, *Dryopteris campyloptera*, and *Carex intumescens* var. *intumescens* show the community's high elevation affinities.

**Range and Abundance:** Ranked G3G4. The Typic Subtype is the most abundant of the Northern Hardwood Forests. It is scattered throughout the mountain region at higher elevations. The equivalent association also occurs in Tennessee and southern Virginia.

**Associations and Patterns:** The Typic Subtype occurs as a large patch community, often occupying the cooler slope aspects while High Elevation Red Oak Forest covers the warmer aspects. The Typic Subtype may grade upslope to Red Spruce–Fraser Fir Forest. It may grade downslope to Rich Cove Forest in sheltered topography or to Chestnut Oak Forest or Montane Oak–Hickory Forest in more exposed areas. High Elevation Birch Boulderfield, Grassy Bald, Heath Bald, High Elevation Rocky Summit, Rich Montane Seep, High Elevation Boggy Seep, or other small patch communities may be embedded. The Typic Subtype may grade to the Rich Subtype or Beech Gap Subtype.

**Variation:** The Typic Subtype is a very broad category, with much variation in species composition, structure, and overall diversity. Several variants can be recognized:

1. Birch Variant occurs at the highest elevations. *Betula alleghaniensis* usually strongly dominates, but *Picea rubens* may be abundant in the transition to Red Spruce–Fraser Fir Forest.

2. Ridge variant occurs on other high, exposed ridgetops or peaks, where *Fagus grandifolia* is dominant. This variant is transitional to the Beech Gap Subtype but has a full stature canopy.
3. Typic Variant occurs at lower elevations and generally has a more mixed canopy containing three or four of the characteristic tree species.
4. Mesic Variant occurs in the transition to Acidic Cove Forest, where *Tsuga canadensis*, *Rhododendron maximum*, and other species of lower elevations may occur.

**Dynamics:** Dynamics of the Typic Subtype are similar to those of the theme as a whole.

**Comments:** In the southern part of the mountains, beyond the geographic range of spruce and fir, Northern Hardwood Forests of the Birch or Beech Variants may occupy large areas on high peaks. A similar pattern appears in several areas within the range of spruce and fir, where mountains reach high enough elevations to support these conifers but lack them. The Craggy Mountains and Elk Knob are examples. The trees in the Northern Hardwood Forest are often small or stunted in these areas. It has been noted that these mountain ranges are slightly lower in elevation than those that do support spruce and fir, and it has been suggested that the species were eliminated from them in a time of warmer climate several thousand years ago. The suggestion is that the spruce-fir forests were “pushed off the top of the mountain” by the shifting of vegetation zones in that warmer climate. An underlying assumption is that these species lack the ability to disperse back to these ranges. It must be noted, however, that the Craggy Mountains are connected at high elevation to the extensive spruce-fir forests of the Black Mountains, and that spruce appears to be dispersing into them at present. At Elk Knob, an anomalous population of spruce occurs in the valley downslope of the stunted Northern Hardwood Forest.

**Rare species:** Vascular plants – *Aconitum reclinatum*, *Betula cordifolia*, *Brachyelytrum aristosum*, *Cardamine clematitis*, *Dendrolycopodium dendroideum*, *Geum geniculatum*, *Glyceria nubigena*, *Lilium grayi*, *Meehania cordata*, *Pyrola elliptica*, *Rhododendron vaseyi*, *Scutellaria saxatilis*, *Spiranthes ochroleuca*. Nonvascular plants – *Drepanolejeunea appalachiana*, *Gymnoderma lineare*, *Metzgeria temperata*, *Plagiochila austini*.

Animals – *Aegolius acadicus*, *Certhia americana*, *Coccyzus erythrophthalmus*, *Empidonax alnorum*, *Glaucomys sabrinus coloratus*, *Plethodon aureolus*, *Plethodon cheoah*, *Plethodon welleri*, *Sorex dispar blitchi*, *Sphyrapicus varius*.

## References: