Living Collections Policy

Founding Intention

"I want this to be a place where people will learn to appreciate our native plants and to see how these plants can enrich their lives so that they, in turn, will become conservators of our natural habitats."

- Mrs. Lammot du Pont Copeland

Introduction

Importance of the Living Collections

The living collections are a vital part of Mt. Cuba Center's (hereafter referred to as MCC) founding intention. They are the building blocks of our garden display, educational outreach programs, research initiatives, and conservation efforts. Through its collections MCC aims to further its goals and embody the spirit of its founding intention. As a botanical garden and living museum, the collections of MCC are important to the preservation of native biodiversity, the cultural heritage of MCC, and the future of ecological understanding.

Purpose of the Living Collections Policy

The purpose of this document is to establish the Living Collections goals and ensure their efficient, effective, and consistent organization and implementation. It is the context for: collections description and intent documentation; collections development plans; and detailed collections management plans. The living collections policy is the framework that informs the development, protection, and use of the living collections.

Ethical and Legal Considerations

Mt. Cuba Center staff and its representatives strive to serve the public, the institution, and the botanic community with integrity and respect. Therefore, MCC will ensure that all collections are obtained, cared for, and disposed of responsibly. Mt. Cuba Center adheres to all applicable state and federal laws concerning plants and their habitats, and upholds the principles of the Convention on Biological Diversity.

Administration

The living collections policy is written by the Curator under the guidance of the Curatorial Working Group. It is approved by the Board of Managers and implemented by the Executive Director. The Executive Director and the Curator shall review this policy every five years to assure it remains useful and current. They will inform the board of their assessment.

The Living Collections

The living collections are focused on plants native to the Eastern Temperate Forests of the United States ecoregion (see Appendices I and II for maps and descriptions of this area) with a particular emphasis on the Appalachian Piedmont ecoregion. Mt. Cuba Center seeks to collect plant materials that reflect the floristic, taxonomic, ecological, and genetic diversity of this area.

Mt. Cuba Center's living collections are primarily used to:

- Conserve the flora of the eastern United States
- Display the native beauty of the Piedmont
- Support comprehensive ecological systems
- Educate and research as outlined in the *Research Intent Document*
- Maintain the character and cultural heritage of MCC

Mt. Cuba Center recognizes four collection types. They are represented here without order of priority.

Historic Collections

Certain non-native plants were beloved by Mr. and Mrs. Copeland. They will be maintained because of their historical, aesthetic and/or interpretive value out of respect for the Copelands' legacy. In particular the following plantings are to be maintained and propagated for replacement as needed.

- *Syringa vulgaris* (French Hybrids) at the Lilac Allée
- *Buxus* sp. in the Boxwood Allée

- *Taxus baccata* 'Elegantissima' known as the du Pont Yews
- *Primula japonica* and *Mazus reptans* at the First Pond

All other exotic, historic plantings are maintained to reflect the landscape effect developed during the lifetime of the Copelands (1905-2001). In cases of replacement, the landscape design concepts that originally defined these areas are the determining factors in the choice of plants. Even so, where Appalachian Piedmont plants or plants native to Eastern Temperate Forests of the United States create the desired effect, they are preferred. Many existing exotic plants may be allowed to live out their useful ornamental life, but will be replaced with Appalachian Piedmont plants or plants native to Eastern Temperate Forests of the United States plants upon removal.

Native Plant Collections

Plants indigenous to the Eastern Temperate Forests of the United States are considered appropriate for inclusion in Mt. Cuba Center's collections. The highest priority will be given to plants of the Piedmont Uplands. The taxa held in these Native Plant Collections should be native to the Appalachian Piedmont, though not all plant materials are collected from within the Piedmont ecoregions. Wild provenance plant materials are always given preference. When wild materials are being sought for collection building, local (relative to MCC) populations and ecotypes are more desirable than those located further away.
For certain focused design and research needs hybrids and cultivated selections of Appalachian Piedmont species can be utilized. When the parentage is known, plants will be considered appropriate if at least one-half of their parentage consists of plants floristically native to the Appalachian Piedmont.

Special Collections

When appropriate, specialty collections of Appalachian Piedmont species, hybrids and/or cultivars may be developed that reflect a particular horticultural, research and/or conservation priority**.** These specialty collections may include but are not limited to disjunct populations, unusual forms, endemic plants, and rare plants.
When these collections are of national significance, they may be recommended by staff for inclusion in the North American Plant Collection Consortium (NAPCC) Program of the American Public Gardens Association or other programs. (Such as American Alliance of Museums accreditation or the Center for Plant Conservation.) Collections of national significance are reviewed and endorsed by the Horticulture Committee; final approval by the Board of Managers is required prior to submission of an application. Staff will endeavor to insure the integrity of the collection(s) based upon the commitment presented within the

application. Mt. Cuba Center is currently an NAPCC collection holder for North American *Hexastylis* and North American *Trillium*.

Seasonal Displays and Spontaneous Flora

Non-native seasonal displays are not considered a part of the collection. The primary purpose of these seasonal displays is to enhance the aesthetic experience and these plants are restricted to the Formal Gardens and Main House. Non-native plants for seasonal display are not accessioned.
Spontaneous flora within the gardens is considered unwanted and subject to removal. An Area Horticulturist or the Director of Horticulture may request its addition to the collection if it meets the requirements of specific design intent. Mt. Cuba Center is committed to monitoring for and preventing invasiveness.

Governance of the Living Collections

De-accession and Disposal

Plants may be removed from the living collections with the approval of the Director of Horticulture in consultation with the Curator and Executive Director to maintain the garden quality and standards. Where removing plants from the collection may result in significant design changes, approval of the Horticulture Committee is also required. If possible, the plant materials will be saved for distribution as outlined in the *Plant Material Distribution Policy*.

Documentation and Data Management

Mt. Cuba Center is committed to maintaining a comprehensive plant records/mapping system. Mt. Cuba Center looks to capture documentation that is usable, thorough, and accurate. All cultivated plant accessions at MCC are labeled - and mapped when appropriate. Computerized records are maintained according to appropriate curatorial standards as outlined in the *Accessions Policy*.

Collection Access

Mt. Cuba Center provides open and reasonable access to the Living Collections for research, conservation, education, and enjoyment. Public areas of the garden are open for visitor enjoyment and casual study during all hours of operation. However, no material may be collected or removed without prior permission. This includes all access for teaching, research, and propagation purposes. Mt. Cuba Center maintains the

right to refuse access to the collections and/or associated documentation due to, but not limited to, considerations of resource limitations, availability, applicable restrictions, and time constraints.

Glossary

Native: relative to plants, this term generally describes plants indigenous to a given area in a specific geologic time period.

Native to MCC: Plants indigenous to the Eastern Temperate Forests of the United States (either presently or historically back to the 1500s) are considered native to MCC.

Taxon (plural, taxa): a unit of any rank within the taxonomic hierarchy.

Accession: the basic unit of a collection and identified by a unique accession number. An accession is represented by a single taxon, from a single source, acquired at one time, and through one means of propagation.

De-accession: the process of removing an accession from the permanent living collection.

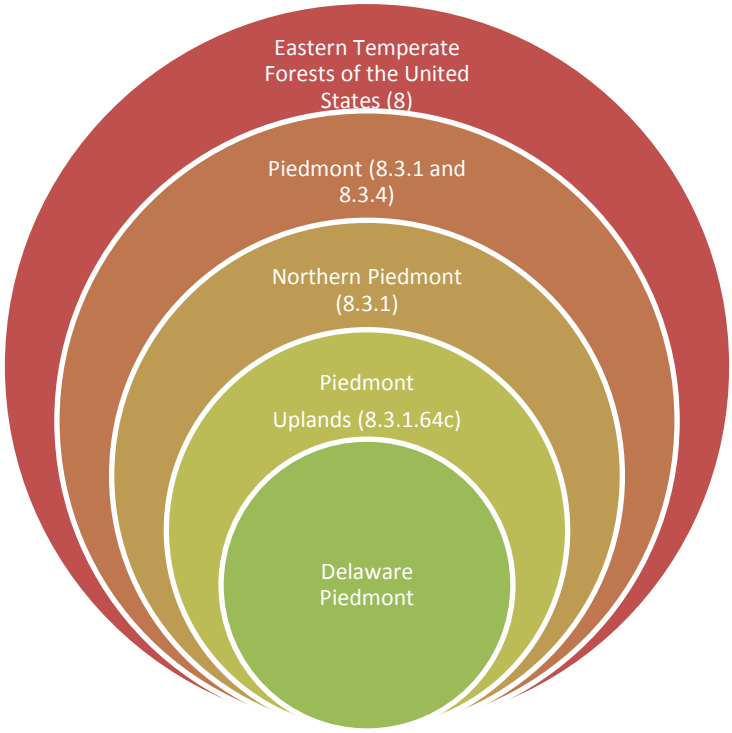
Genetic: of or relating to genes or heredity.

Floristic: relating to the study of the distribution of plants.

Invasive: a term and categorization used for flora and fauna that adversely affect the habitats and bioregions they invade.

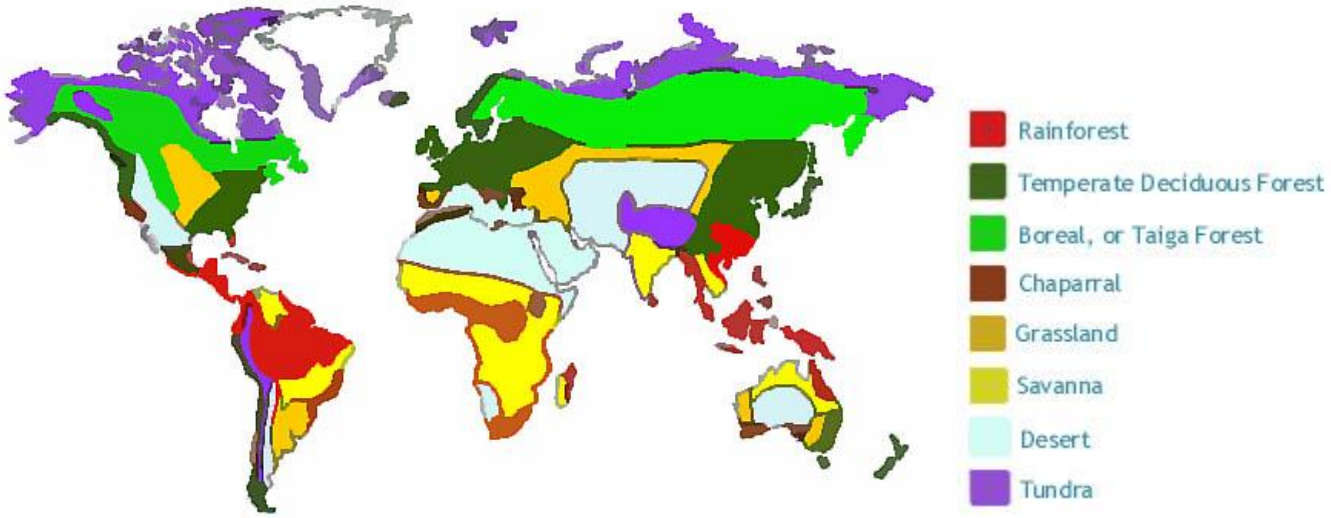
Appendix I: Illustrations

Taxonomic and Genetic Materials Increase in Priority with Locality



Temperate Deciduous Forests of the World

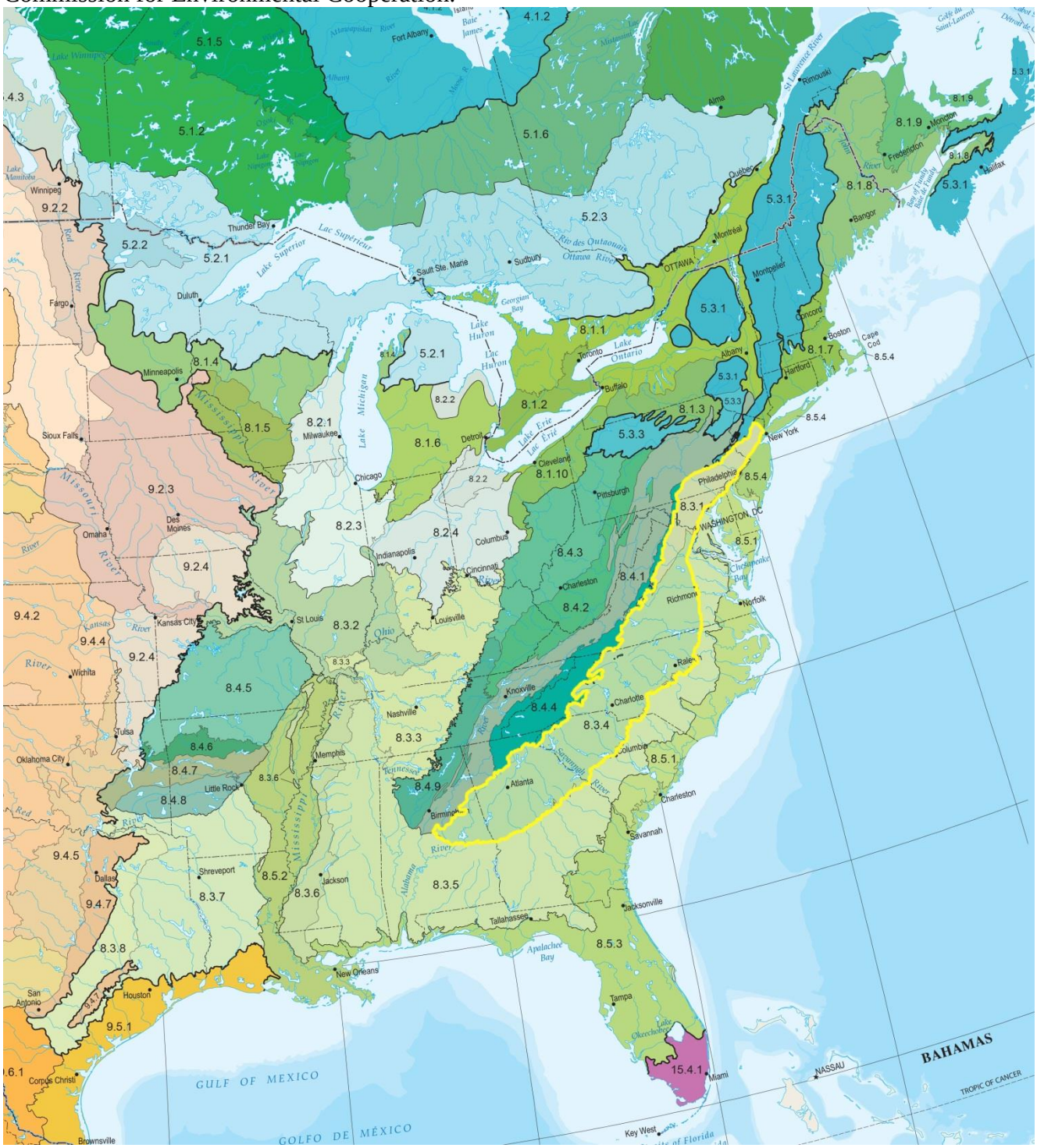
Taken from:World Biomes: http://www.worldbiomes.com/biomes_map.htm The map was based on data compiled from Physical Geography of the Global Environment, 2nd Edition, by H. J. De Blij, et al;

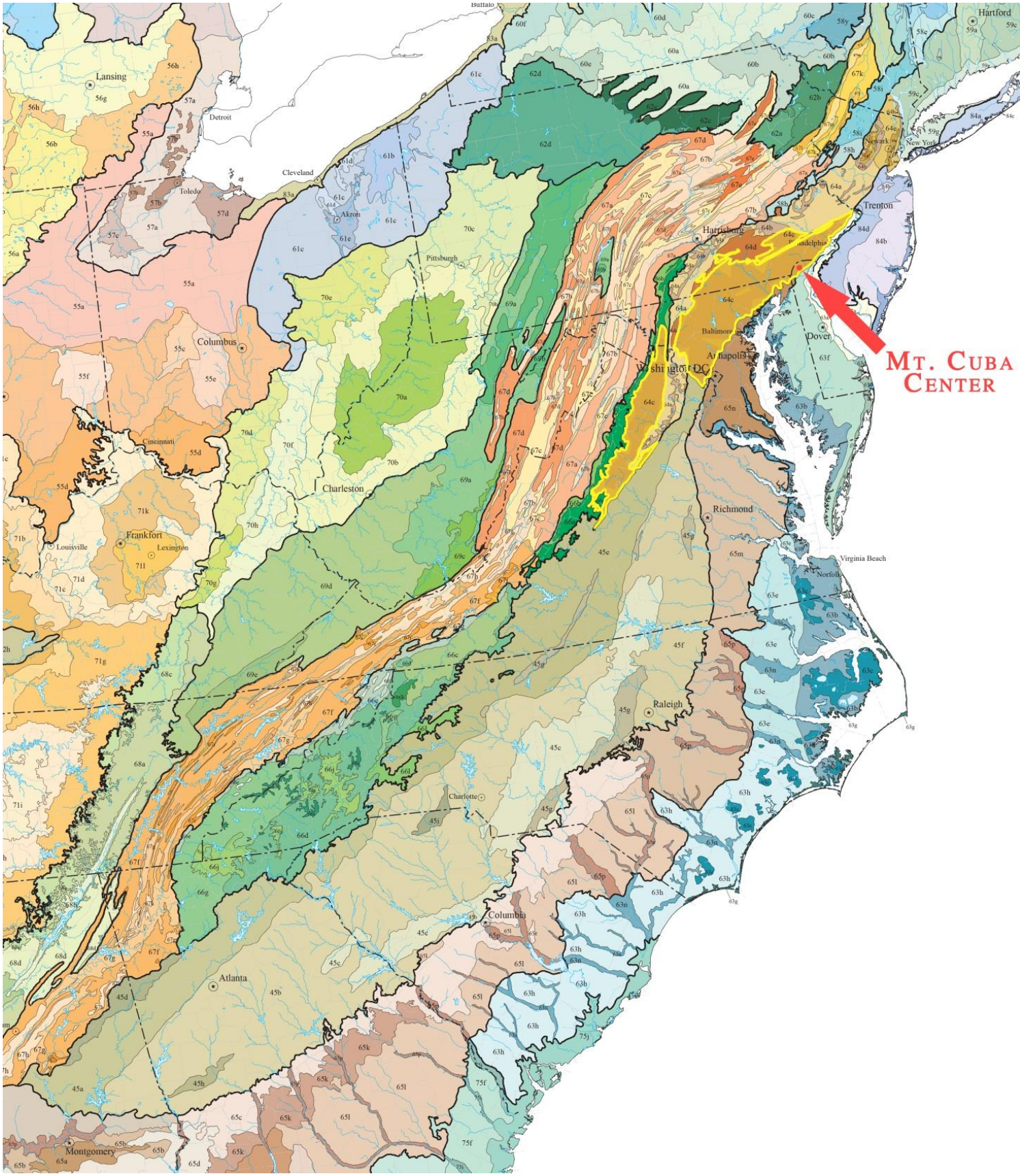


Level III and IV Ecoregions of the eastern United States

Taken from:

The United States Environmental Protection Agency: http://www.epa.gov/wed/pages/ecoregions/na_eco.htm The map was based on data compiled by the Commission for Environmental Cooperation.





Appendix II: Ecoregion Descriptions

Taken from:
Secretariat of the Commission for Environmental Cooperation. 1997. Ecological Regions of North America – Toward a Common Perspective. Commission for Environmental Cooperation, Montreal, Canada.
Wiken, Ed, Francisco Jiménez Nava, and Glenn Griffith. 2011. North American Terrestrial Ecoregions—Level III. Commission for Environmental Cooperation, Montreal, Canada.
Alan J. Woods, James M. Omernik, Douglas D Brown. 1999. Level III and IV Ecoregions of Delaware, Maryland, Pennsylvania, Virginia, and West Virginia. U.S. Environmental Protection Agency
National Health and Environmental Effects Research Laboratory

8. Eastern Temperate Forests

Location: This ecological region extends from the Great Lakes in the north to the Gulf of Mexico in the south. From the Atlantic Coast, it extends westward approximately 620 km into eastern Texas, Oklahoma, Missouri, Iowa and Minnesota. The region is distinguished by its moderate to mildly humid climate, its relatively dense and diverse forest cover, and its high density of human inhabitants that approximates 160 million. Urban industries, agriculture and some forestry are major activities.

Physical setting: A variety of geologic materials and landforms are present. Younger-age sedimentary coastal plains in the south and east abut the older, folded and faulted sedimentary, metamorphic and igneous rocks of the Appalachian Mountains that reach elevations over 2,000 m. A mixed limestone-dolomite terrain of plains and hills dominate much of the central part of the region, with other sedimentary rock found on the plateaux and plains in the north and west. Glacially derived materials and landforms and areas of glacial lake deposits shape the landscape in the north. Soils are mostly leached, being nutrient-poor to calcium-rich. Surface waters are characterized by an abundance of perennial streams, small areas with high densities of lakes, a diversity of wetland communities and a rich array of maritime ecosystems.

Climate: The climate is generally warm, humid and temperate, although there is a latitudinal gradient from cool, continental temperatures to those that are subtropical. Summers are hot and humid, and winters are mild to cool. The average daily minimum temperature in winter is –12°C in the north and 4°C in the south. Average daily maximum summer temperatures are 27°C to 32°C. Precipitation amounts of 1,000-1,500 mm per year are relatively evenly distributed throughout the year, with most areas having either a summer or spring maximum.

Biological setting: The Eastern Temperate Forests form a dense forest canopy consisting mostly of tall broadleaf, deciduous trees and needle-leaf conifers. Beech-maple and maple-basswood forest types occur widely especially in the eastern reaches of this region, mixed oak-hickory associations are common in the Upper Midwest, changing into oak-hickory-pine mixed forests in the south and the Appalachians. These forests have a diversity of tree, shrub, vine and herb layers. While various species of oaks, hickories, maples and pines are common, other wide-ranging tree species include ashes, elms, black cherry, yellow poplar, sweet gum, basswood, hackberry, common persimmon, eastern red cedar and flowering dogwood. A key tree species, the American chestnut, was virtually eliminated from the Eastern Temperate Forests in the first half of the twentieth century by an introduced fungus. Two essentials for wildlife—food and shelter—are relatively abundant in the Eastern Temperate Forests. Because it is a significant evolutionary area for the continent's fauna, the region contains a great diversity of species within several groups of animals. Mammals of the region include the white-footed mouse, gray squirrel, eastern chipmunk, raccoon, porcupine, gray fox, bobcat, white-tailed deer and black bear. The region has extremely diverse populations of birds, fish, reptiles and amphibians.

Human activities: In the past, woodland indigenous cultures incorporated a mixture of hunting, gathering and agricultural activities. Food sources included deer, small mammals, fish, shellfish, wild fruits and vegetables, and crops such as corn, beans, squash and tobacco were grown. Annual or occasional fires were used to clear the forest understory for ease of travel, preparation of cropland, or to encourage growth of forage plants for both wild game and human consumption. The shift from Indian to European dominance led to more extensive forest clearing, burning, and conversion to pasturage and cropland. Several

valley and plain areas continue today as rich, productive cropland, while other cleared areas have reverted to mixed forest. Pine plantations for pulp and paper are common in the South. With a historical concentration of the continent's political, economic and industrial power, the region's landscape was also transformed by extensive manufacturing and urbanization. This urban population occupies the mid-Atlantic megalopolis from Boston to Washington, DC; the large urban areas near the Great Lakes such as Chicago, Detroit, Toronto and Montreal; and hundreds of smaller cities and towns. Approximately 160 million people, more than 40 percent of North America's population, live in this region.

8.3.1 Northern Piedmont

Location: This ecoregion lies between more mountainous regions to the west and coastal plains to the east, in northern New Jersey, southeast Pennsylvania, northern Delaware, central Maryland, and northern Virginia.

Climate: The ecoregion has a transitional climate, between mild, mid-latitude, humid subtropical to the south and severe mid-latitude to the north. It is marked by hot summers and mild to cold winters. The mean annual temperature is approximately 11°C. The frost-free period ranges from 160 to 230 days. The mean annual precipitation is 1,097 mm, ranging from 930 to 1,250 mm.

Vegetation: This region was once a predominantly Appalachian oak forest, as compared to the mostly oak-hickory-pine forests of the Piedmont ecoregion (8.3.4) to the southwest. Chestnut oak, white oak, red oak, hickories, ash, elm, and yellow-poplar occur, and eastern redcedar is common on abandoned farmland. Much of the natural vegetation has been removed.

Hydrology: Streams are mostly perennial, of low to moderate gradient. Some springs occur.

Terrain: The Northern Piedmont is a transitional region of low rounded hills, irregular plains, and open valleys in contrast to the low mountains of ecoregions 5.3.1, 8.4.1, and 8.4.4 to the north and west and the flatter coastal plains of ecoregions 8.3.5 and 8.5.1 to the east. It is mostly above the "fall line." The region is underlain by a mix of metamorphic, igneous, and sedimentary rocks. Gabbro, granite, gneiss, schist, and slate are common and Triassic sandstone, shale, and conglomerate also occur. Some intrusive dikes and sills form relatively sharp low ridges. Elevations are mostly 100 m to 300 m but range to over 500 m. Soils are mostly Alfisols, Inceptisols, and some Ultisols, with a mesic soil temperature regime and udic soil moisture regime.

Wildlife: White-tailed deer, gray fox, red squirrel, raccoon, cottontail rabbit, mink, muskrat, ruffed grouse, meadowlark, field sparrow, and blue heron occur. Land Use/Human Activities: Mostly agriculture and urban, suburban, and industrial uses prevail. The region now contains a higher proportion of cropland compared to the Piedmont (8.3.4). Feed and forage crops and soybeans are typical. Nurseries and horticultural products, and Christmas tree farms occupy some areas, as do woodlots and horse and hobby farms. Larger settlements include Paterson, Hackensac, Newark, Morristown, New Brunswick, Norristown, Lancaster, York, Gettysburg, Westminster, Frederick, Towson, Gaithersburg, Rockville, Manassas, harlottesville, and western suburbs of Philadelphia, Wilmington, Baltimore, and Washington, DC.

8.3.4 Piedmont (Southern Piedmont)

Location: This ecoregion extends from Virginia in the north to Alabama in the south. It comprises a transitional area between the mostly mountainous ecological regions of the Appalachians to the northwest and the relatively flat coastal plain to the southeast. Its eastern border is the fall line, where erosionresistant rocks give way to the sands and lays of the coastal plain. Climate: The ecoregion has a mild, mid-latitude, humid subtropical climate. It has hot, humid summers and mild winters with little snow. The mean annual temperature is approximately 13°C in the north to 17°C in the south. The frost-free period ranges from 170 days to 250 days. The mean annual precipitation is 1,229 mm, ranging from 1,080 to 1,650 mm, and is fairly evenly distributed throughout the year.

Vegetation: The historic oak-hickory-pine forest was dominated by white oak, southern red oak, post oak, and hickory, with some shortleaf pine and loblolly pine.

Hydrology: There is a moderate to dense network of perennial streams and rivers, of generally moderate to low gradient. Stream drainage in the Piedmont tends to be perpendicular to the structural trend of the rocks across which they flow. Few natural lakes but numerous large reservoirs are to be found.

Terrain: The ecoregion's dominant landform is an erosional terrain of moderately dissected irregular plains with some hills, with a complex mosaic of Precambrian and Paleozoic metamorphic and igneous rocks. Most rocks of the Piedmont are covered by a thick mantle of saprolite, except along some major stream valley bluffs and on a few scattered granitic domes and flatrocks. Rare plants and animals are often found on the rock outcrops. The soils are mostly Ultisols and are generally finer-textured than those found in coastal plain regions with less sand and more clay.

Wildlife: Mammals include white-tailed deer, black bear, bobcat, gray fox, raccoon, gray squirrel, eastern chipmunk, pine vole. Birds include eastern wild turkey, northern cardinal, Carolina wren, wood thrush, tufted titmouse, prairie warbler, field sparrow. Herpetofauna includes eastern box turtle, common garter snake, copperhead, timber rattlesnake.

Land Use/Human Activities: Several major land cover transformations have occurred in the Piedmont over the past 200 years, from forest to farm, back to forest, and now in many areas, spreading urban- and suburbanization. Once largely cultivated with crops such as cotton, corn, tobacco and wheat, most of the Piedmont soils were moderately to severely eroded. Much of this region is now in planted pine or has reverted to successional pine and hardwood woodlands, with some pasture in the landcover mosaic. Larger cities include Lynchburg, Greensboro, Raleigh, Charlotte, Greenville, and Atlanta.

8.3.1 64c Piedmont Uplands

Ecoregion 64c is characterized by rounded hills, low ridges, relative high relief, and narrow valleys and is underlain by metamorphic rock. Irregular plains and narrow valleys typically have elevations that often range from about 450 feet to 1,000 feet (137-304 m) and a local relief that is often 130 feet to 330 feet (40 to 101 m). Ruggedness increases toward the southwest and local relief can be as much as 590 feet (180 m) adjacent to the 20 incised Susquehanna River. Here gorges containing high-gradient streams and waterfalls occur, including Otter Creek, Tucquan Glen, Wildcat Run, Counselman Run, Kelly Run, Ferncliff Run, and Oakland Run (Geyer and Bolles, 1979, pp. 442-465; Guilday, 1985, p. 19). The Piedmont Uplands (64c) has substantially higher relief than the Triassic Lowlands (64a), Piedmont Limestone/Dolomite Lowlands (64d), or the Outer Piedmont (45f). Channel gradient is generally moderate and is greater than that of neighboring ecoregions with less relief; Piedmont fish habitats vary in relation to gradient (Jenkins and Burkhead, 1993 (1994)).

The Fall Zone occurs near the eastern edge of Ecoregion 64c and is characterized by areas of high stream gradient, exposed bedrock, islands, falls, and a mixture of metamorphic and sedimentary rock. Parts are suited to many upper Piedmont and montane fishes. The Fall Zone is an ecologic barriers to lowland, calm-water species. The Great Falls of the Potomac is the largest physical river barrier of natural origin in Virginia and is insurmountable to fishes at low and normal river levels; it has barred anadromous fishes from potential spawning grounds and may have curtailed the upstream distribution of Coastal Plain fish species (Jenkins and Burkhead, 1993 (1994)).

Metamorphic rocks of Lower Paleozoic and Precambrian age underlie the ecoregion and are folded and faulted; lithology is distinct from the sedimentary rocks of the neighboring Southeastern Plains (65). Schists of the Wissahickon and Peters Creek formations predominate and Precambrian gneisses are common in the east. Very resistant quartzite and phyllite of the Chickies, Antietam, and Harpers formations form the highest areas, the Pigeon Hills and Hellam Hills. Scattered outcrops of very basic serpentinite also occur.

Deep Ultisols and Inceptisols are common and have developed from residuum. Chester and Glenelg soils are common. These Ultisols are capable of supporting highly diversified farms, even though they are less fertile than the soils of Ecoregion 64d. Soils derived from quartzite are commonly stony and are often

forested. Chrome soils from serpentinite occur locally and are low in calcium and high in magnesium, chromium, and nickel.

Scattered serpentine barrens occur on chrome soils and support a specialized vegetation composed of dry oak/pine forests (e.g., Quercus marilandica, Q. stellata, Q. velutina, Pinus virginiana), greenbrier (Smilax rotundifolia), prairie grasses (e.g., Schizachyrium scoparius, Sporobolus heterolepis), and herbs (e.g., Aster depauperatus, Cerastium arvense var. villossissimum, Talinum teretifolium) (Cuff and others, 1989, p. 56). Most of these are rare in Pennsylvania and some are threatened, including the prairie dropseed (Sporobolus heterolepis) (Wiegman, 1985, p. 57). In addition, the buckmoth (Hemileuca maia) occurs only in the serpentine barrens and is threatened in Pennsylvania (Opler, 1985, p. 88). Pitch pine (Pinus rigida) is a co-dominant in serpentine barren woodlands and an important component of bluestem-dropseed savannas; it is found at seven serpentine barren sites in Chester, Delaware, and Lancaster counties. Those at Nottingham County Park and at Goat Hill State Forest Natural Area are among the largest remaining barrens in the eastern United States (R. Latham, Department of Geology, University of Pennsylvania, written communication, 1995). Grazing, quarrying, and suburban development continue to threaten the remaining barrens (Wiegman, 1985, p. 57) and The Nature Conservancy has given them second-highest priority on their state biodiversity conservation agenda (Roger Latham, Department of Geology, University of Pennsylvania, written communication, 1995).

The potential natural vegetation is mapped as Appalachian Oak Forest (dominated by white and red oaks); it distinct from the Oak-Hickory-Pine of the Inner Piedmont (45e) (Kuchler, 1964). Some Mixed Mesophytic Forest also occurred. Remnants of the original vegetation can be found in the cool, very rugged Otter Creek gorge, where virgin chestnut oak (Quercus prinus), hemlock (Tsuga canadensis), beech (Fagus grandifolia), sugar maple (Acer saccharum), and basswood (Tilia heterophylla) still grow (Erdman and Wiegman, 1974, p. 98).

Today, forests are less extensive than they were originally and there is more agriculture than in the Inner Piedmont (45e). Extensive urban, commercial, and industrial development occurs in the Philadelphia area. Suburban development is common, especially near Philadelphia, Wilmington, and the major transportation corridors. Farms become progressively more common with distance from the cities. Grain, potatoes, and hay are produced and many of the farms have pastures for dairy and beef cattle or ranges for poultry. Farming is favored by nearness to market, rather fertile soils, and Pennsylvania's longest growing season, up to 200 days. Agricultural erosion has been a serious problem in many places (Kunkle, 1963).

The boundary of Ecoregion 64c follows the limit of the Lower Paleozoic and Precambrian metamorphic rocks; they are distinct from the largely sedimentary rock of the surrounding ecoregions. The Northern Piedmont (64) is divided from the Middle Atlantic Coastal Plain (63) by the Fall Line. The southern boundary is close to Braun's (1950) natural vegetation line. The western boundary with the high, rugged, forested Blue Ridge Mountains (66) is based on topography and vegetation density.