New England Botanical Club – Minutes of the 1018th Meeting

4-6 June 2006

Karen Lombard, Recording Secretary

The second joint meeting of the New England Botanical Club and the Southern Appalachian Botanical Society was held 4-6 June 2006 at Camp Hi-Rock in the Massachusetts town of Mount Washington. The meeting was the 791st meeting of the New England Botanical Club, being the 1018th since its original organization. There were 32 members and guests in attendance. Activities consisted of three evening lectures and numerous field trips, including Bartholomew's Cobble, Mt. Everett, Dolomite Ledges, Cedar Mountain, and Holleran Swamp in Massachusetts, and Joralemon Memorial Park in adjacent New York. After happy hour and dinner on arrival night, a warm welcome was extended to participants by Club President Karen Searcy.

Botanist **Pam Weatherbee** began the two-day gathering with an introduction to the geology and flora of Berkshire County. Pam, author of the *Flora of Berkshire County*, stated that the County welcomed both societies and mentioned that Fernald had said that all compilers of county floras think that their county is the best! She also mentioned that Mount Washington was the only place in the state for *Ilex montana*. Berkshire County is well defined by its geography – bounded on the west by the Taconic Mountains, on the east by the Berkshire Plateau, and on the north by the Green Mountains. To the south it is more open. The area was settled about 100 years later than the rest of Massachusetts, as the mountains impeded migration. A variety of rock types occur in the County due to its former history as a shoreline with beaches and reefs, and the many continental collisions that occurred. There are many types of habitats here, none particularly large, as a result of the many rock types. The area is particularly known for the amount of marble, which has led to several community types that are uncommon in much of New England. Pam followed her discussion of geology with slides of plants from some of the community types including rich mesic woods, oak-hickory-hop horn beam woodlands of dry south facing slopes, calcareous fens and wet meadows, floodplains, calcareous outcrops, and the high elevations of Mt. Greylock, a refugium for northern species that were stranded when the glaciers receded.

Barre Hellquist, Professor Emeritus of the Massachusetts College of Liberal Arts, lectured the second evening on the aquatic plants of the Berkshires. He stated that New England has the largest number of pondweeds (~30 species) in the world, and that the Berkshires have a good representation of aquatic plants in general. He followed his introductory remarks with a slide tour of many of the aquatic species present in the County, focusing on invasive species, species of acidic waters, and finally species of alkaline waters. Barre mentioned seven invasive aquatic species, several of which are common, including *Myriophyllum spicatum, Potamogeton crispus,* and *Trapa natans*. *Cabomba caroliniana* is also present in one pond in Clarksburg. Pondweeds of acidic waters are numerous, with over 30 species mentioned. About 15 species of alkaline-water pondweeds were profiled, including the rare *P. ogdenii*, a rare fertile hybrid of *P. hillii* and *P. zosteriformes*, found at only two sites in Massachusetts, both in the Berkshires.

Jesse Bellemare, a doctoral student in plant ecology at Cornell University, concluded the meeting on the evening of June 6th with a presentation on the "Proximate correlates and ultimate causes of species richness in (Northeastern) temperate deciduous forests." He first presented a biogeographical field trip of temperate deciduous forests across eastern North America, and then concluded with analyses focused on the factors driving species richness gradients in temperate deciduous forests.

In particular, Jesse focused on the rich mesic forests of western New England, which are a northeastern variant of the Mixed Mesophytic Forest type described by Lucy Braun in the 1950s in the southeastern U.S. This vegetation type is noted for its diverse herb-layer flora, including many spring ephemeral species (e.g., *Dicentra canadensis*, *D. cucullaria*, *Claytonia caroliniana*), as well as numerous summer-green forest herbs that flower in spring, but persist through the summer (*Asarum canadense*, *Caulophyllum thalictroides, Actaea alba*). The temperate forest flora of the Northeast migrated into the region from the southeastern U.S. in the last 10,000 years, as the Southeast provided refuge for many temperate species during the last glaciation when the Northeast was extensively glaciated. Many of the plant species characteristic of northeastern rich mesic forests occur in rich sites across the deciduous forest biome in eastern North America, from New England to the southern Appalachians to the Ozarks to the upper Midwest (e.g., *Asarum canadense, Adiantum pedatum, Caulophyllum thalictroides*). In the Southeast, Mesophytic forest vegetation is often best developed in mesic coves on the sides of mountains in colluvial soils. This region has the highest tree species diversity in North America and many tree species found in southeastern Mesophytic forests, such as *Magnolia acuminata*, *Liriodendron tulipifera*, and *Aesculus flava* are absent from rich mesic forests in New England. The herb layer also exhibits compositional differences from the Northeast, most notably in that species such as *Trillium grandiflorum*, *Disporum maculatum*, and *Cimicifuga racemosa* are common in the southeast, but are absent or rare in New England, whereas northern elements, such as *Actaea rubra*, *Polystichum braunii*, and *Millium effusum* are present in the northeastern Mesophytic forest flora, but absent in the Southeast.

Moving from an intra-continental scale to inter-continental scale, Jesse noted the compositional similarities and biogeographical relationships of the eastern North American temperate deciduous forests to those of East Asia – a pattern that was described by Asa Gray in the 1800s; likewise the temperate deciduous forests of Europe share many compositional similarities with both eastern North America and East Asia. The composition and structure of these northern hemisphere temperate deciduous forests can be remarkably similar, with species from shared disjunct genera often occupying similar ecological niches in two or three of these widely separated regions. These similarities trace to a common biogeographical origin of these currently disjunct temperate deciduous forests in the Northern Hemisphere. Many of the genera characteristic of these deciduous forests originated in a once more extensive and interconnected Mesophytic forest flora that occupied large areas of the Northern Hemisphere during a period of warmer climates and greater terrestrial linkage between northern continents in the Tertiary.

Jesse's research has focused on investigating proximate environmental correlates of species richness in the temperate deciduous forests of the Northeast. To date, he has established 48 20 m H 20 m plots at 21 sites in Vermont and western Massachusetts. The plots include forests across a range of environmental conditions, from sites with fertile,

circumneutral soils to sites with acidic, nutrient-poor soils; across this edaphic gradient, species richness in the herb layer ranges from a maximum of 77 species to a low of 24 species. Species richness in the forest vegetation covered by these plots is positively correlated with soil calcium and higher pH, likely due to soil nutrients being more available to plants at higher pH and to increased nitrogen mineralization and nitrification. Jesse looked at which species are driving these richness patterns by examining species distributions relative to soil calcium. He found that vegetation on calcareous sites often includes many "calciphile" species (e.g., *Carex albursina, Dryopteris goldiana*), but that widespread woodland "generalists" that are found in plots on more acidic soils (e.g., *Arisaema triphyllum, Smilacina racemosa*) also remain part of the flora; as a consequence, an increase in species richness is observed along this edaphic gradient rather than a simple turn-over in species with changing edaphic conditions. Because exotic and invasive species are of considerable concern, Jesse has also examined the distribution of exotic plant species within the plots. While classic community ecological theory seems to predict that species-rich communities should resist invasion better than species-poor communities (because more niches are occupied in the former), this is not the case in his plots. Sites with calcareous soils and higher soil pH have more exotic species than sites with more acidic soils, despite the higher number of native species already occupying these fertile sites. These results suggest that the environmental conditions conducive to high native species richness are also favorable for many exotic species. In a follow-up analysis where the effects of soil calcium were controlled for, there still was no detectable invasion "resistance" effect of higher native species richness. Similar trends in native species and exotic species richness have been found in deciduous forests in Quebec. These results suggest that the flora of northeastern Mesophytic forest sites may not be "saturated" with species, despite having high species richness relative to other northeastern forest types.

To conclude, Jesse discussed several hypotheses that may help explain the ultimate causes of species richness patterns in these forests (i.e., why have more species evolved to occupy nutrient rich soils in temperate deciduous forests?). One important guild of plants that are typical of the Mesophytic forest flora and contribute to higher species richness on these sites are spring ephemeral herbs; Jesse suggested that there is evidence for convergent evolution on the spring ephemeral strategy in several angiosperm lineages (e.g., species in Brassicaceae, Liliaceae, Portulacaceae, Fumariaceae). The spring ephemeral strategy may be uniquely viable on the mesic, nutrient-rich soils found in Mesophytic forests, as spring ephemerals are diverse and abundant in Mesophytic forests, but less abundant or absent in other forest types. In contrast to this pattern of apparent convergent evolution, several of the disjunct plant genera found in temperate deciduous forests across the northern hemisphere suggest an important role for morphological "stasis" and ecological "niche conservatism," as many of these disjunct congeners occupy similar habitats and ecological niches despite millions of years of independent evolution on different continents (e.g., species in *Actaea, Asarum, Caulophyllum*). Among forest herbs, many of the species in these disjunct genera are associated with the fertile soils of Mesophytic forests; this apparent niche conservatism contributes to the greater richness of species in Mesophytic forests, as these taxa are often restricted to nutrient-rich, calcareous soils.