Bulletin of the Eastern Native Tree Society

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Eastern Native Tree Society

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Mission Statement:

The Eastern Native Tree Society (ENTS) is a cyberspace interest group devoted to the celebration of trees of eastern North America through art, poetry, music, mythology, science, medicine, and woodcrafts. ENTS is also intended as an archive for information on specific trees and stands of trees, and ENTS will store data on accurately measured trees for historical documentation, scientific research, and to resolve big tree disputes.

Membership and Website Submissions:

Membership is free when you sign up for our discussion group, ENTSTrees, at: http://groups.google.com/group/entstrees?hl=en. Submissions to the ENTS website in terms of information, art, etc., should be made to Edward Frank at: ed_frank@hotmail.com

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COVER: Brightly colored beech leaves reflect the spectacular forests and landscapes of Mohawk Trail State Forest in Massachusetts, site of the 2011 ENTS Rendezvous. Photo by Don C. Bragg.

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2012—END TIMES OR NEW TIMES?

Much has been made in the media (especially those looking for your entertainment dollars) about the Mayan calendar's purported end in 2012… Given that we couldn't even enjoy Christmas 2011 without being inundated with commercials and coverage of the upcoming election year, many may tend to agree. While I find electioneering as disagreeable as the next voter, they are a necessary evil, and an opportunity for us to shape our own destinies—think long and hard about your votes this year!

As far as the Mayans go, just because they didn't design a calendar to extend beyond 2012 means nothing—they have no better sense of the end of times than you or I! As the old saying goes, life's a journey, not a destination, so let's see if we can't make 2012 the best year ever for the Eastern Native Tree Society!

Don C. Bragg
Editor-in-Chief

Ancient baldcypress along Wakulla Springs just south of Tallahassee, Florida. Now a state park, Wakulla Springs was the shooting location for a number of old Hollywood movies, and is the home of manatees, alligators, and myriads of birds. This pristine scene belies the challenges facing this special place—at only a few feet above sea level, it is threatened by sea rise due to global climate change, as well as pollution and water diversions from the growing human population in its watershed. Photo by Don C. Bragg.

ANNOUNCEMENTS AND SOCIETY ACTIONS

No current announcements or society actions, so here's a new "Puzzler" tree species!

Here's something to fill this otherwise blank page—can anyone guess what conifer species this is? A big hint—it is an obscure southern pine… ***Photograph by Don C. Bragg.***

POCKETS FULL OF FOREST: LOCATING, INVESTIGATING, AND DOCUMENTING REMNANTS OF OLD-GROWTH FORESTS AND POCKETS OF OTHERWISE RARE OR UNUSUAL FORESTS IN PENNSYLVANIA

Edward Forrest Frank

Eastern Native Tree Society

INTRODUCTION

One of the goals of the Eastern Native Tree Society (www.nativetreesociety.org) is to locate and document areas of exemplary forests found in the eastern United States. These include among other aspects remaining tracts of old-growth forest and pockets of otherwise unusual forests. This paper provides some ideas and approaches toward accomplishing this goal. Several sites from Pennsylvania are used as examples, but similar considerations are applicable to small pockets of forest wherever they might be found.

BACKGROUND

In Pennsylvania in the 1600s the vista from almost any point would have been an endless sea of trees. However, during the late 1800s through the early 1900s, the virgin forests here in Pennsylvania and across much of northeastern United States were all but eliminated. Forests were cut for timber, the land was cleared for farming and development, and large areas were disturbed by mining operations. A history of the Moshannon State Forest (www.dcnr.state.pa.us/Forestry/stateforests/moshhistory.aspx) describes what once was present:

> White pine and hemlock stands occupied the shady slopes and moist plateaus in the earliest recorded forests in the region. Many areas were covered with a mixture of beech, yellow poplar, birches, maples, oaks, cherry, hickory and chestnut. Some of the best white pine in the U.S. grew here in the stands that sometimes approached one hundred thousand board feet per acre. According to Conrad Weiser in 1737, "The wood is so thick, that for a mile at a time we could not find a place the size of a hand, where the sunshine would penetrate, even on the clearest day."

At that time over 90% of the state was forested. Today only about 60% (17 million ac) of Pennsylvania is forested, but very little of it can be considered primary forest or old-growth forest. What old-growth or primary forest that is still left is typically found in small pockets scattered across the state.

HISTORY OF FOREST UTILIZATION

The Allegheny National Forest website:

www.fs.fed.us/r9/forests/allegheny/about/history/

provided the following details on the history of forest utilization in the Allegheny Plateau region (the same story applies as well to most of Pennsylvania and the rest of northeastern United States):

Two hundred years ago, the forest in northwest Pennsylvania was mostly Eastern hemlock and American beech, with white pine along river bottoms and oak on the slopes of river valleys. Black cherry accounted for less than one percent of all trees on the Plateau. This old-growth forest was characterized by large trees and fallen logs… the understory vegetation was dense and richly diverse.

European settlers reached this area in the early 1800s. At first, trees were cut mostly to clear land for agriculture and provide timber for cabins and barns. Soon, the first commercial water-powered mills cut small amounts of lumber from selected pine, hemlock and large hardwoods. By 1840, portable steam engines made circular sawmills practical, and mills that could process 10,000 board feet of lumber per day were common.

Tanneries that used hemlock bark as their source of tannin for curing leather began to appear in the late 1850s. This infant industry received a great boost by the Civil War demand for harness, military equipment and industrial belting. By the end of the century, the tanning industry was a major forest industry in Pennsylvania using huge quantities of hemlock bark. The logs were removed later and sawn into lumber products.

Photo from Shoemaker (1914).

Between 1850 and 1900, American society and technology changed in dramatic ways. People,

> moving West and in the growing cities in the East, demanded lumber to build homes, stores and furniture. Demand for paper and other wood pulp products increased. An eighty-fold increase in coal production led to the need for more lumber for mine props, timbers, and planks. Band saws came into use after 1880, making possible the construction of huge mills capable of sawing 100,000 feet or more of lumber per day. Railroads provided convenient transportation to consumers and markets. They also opened up extensive and previously inaccessible areas of timber with specialized locomotives such as the Shay which could traverse steep hillsides, uneven tracks and sharp curves. All of these factors supported large sawmill and tannery industries.
>
> A new enterprise, the wood chemical industry, changed the course of forest development. Between 1890 and 1930, wood chemical plants produced charcoal, wood alcohol, acetic acid, acetate of lime and similar products, and provided a market for virtually every size, species and quality of tree growing on the Allegheny Plateau. Harvests during this era were the most complete ever made in the area, clearing nearly every accessible tree of every size.
>
> The once vast forest of the Allegheny Plateau was almost completely removed, leaving barren hillsides as far as the eye could see.
>
> Many large corporate forest landowners in Pennsylvania and other northeastern states simply abandoned the land and moved West in search of new forests. The land left behind often ended up on delinquent tax rolls, prompting a financial crisis for rural counties. The bare soil and logging slash made floods and wildfires a constant danger.
>
> In 1911, Congress passed the Weeks Act, allowing the federal government to buy land in eastern states for the establishment of National Forests.
>
> The Allegheny National Forest was established in 1923. The land was so depleted that many residents jokingly called it the "Allegheny Brush-patch". Some worried the forest would never recover."

Not all of the forest was cut at the same time. By the end of this intense period of logging, many of the forests cut early in the process had since regrown. These same forests were then cut a second, third, or even fourth time. After World War I the Pennsylvania's forest area reached its historical minimum of about 13 million ac. Much of this forest land was poor quality second-growth woodlands, dramatically different from the original cover of virgin forests found in the state. Wildfires were very prevalent at this time. Today, in many areas a healthy forest still cannot grow in some areas impacted by these forest fires because the original rich forest soils were destroyed by the intense fires. With such a history of utilization, and a forest diminished from it, the importance of understanding what made the original forests of the northeastern so healthy and productive cannot be understated.

WHAT IS OLD-GROWTH?

An enormous volume of materials have been published promoting various definitions of old-growth forest. An excellent overview of the complexities of these issues is presented by Frelich and Reich (2003). The detailed arguments in the Frelich and Reich paper are beyond the scope of this paper, but a couple of basic working definitions will serve to provide a useful framework. Frelich and Reich (2003) defined a "primary forest" or "natural heritage forest" as:

> …forest with a continuous heritage of natural disturbance and regeneration. In North America this usually means that the forest was not cleared for agriculture or heavily logged for timber by Native Americans or by European settlers…in many parts of North America large-scale logging is a recent phenomenon and stand ages greater than the dates of first logging can be used to establish primary status.

The term old-growth itself, as opposed to primary forest, is subject to debate and carries a degree of baggage with its usage. Old-growth is still, however, an important part of the public lexicon and cannot in fairness be ignored. The following generalized definition of old-growth is suggested as a basis for discussion (Frank 2006):

> A primary characteristic of an old-growth forest is that it contains a substantial percentage of old trees which are generally late-successional species for that particular region or environmental regime. These forests should also exhibit characteristics of only a limited human impact, but the level of that impact must be considered with respect to other forests in the region. Canopy openings formed by natural processes are often found within the larger old-growth forest.

There are a number physical characteristics that are common to most old-growth forests and can be used as guidelines when trying to identify whether a forest is old or not. Some of these characteristics include: 1) presence of old trees; 2) minimal signs of human disturbance; 3) mixed age stands; 4) canopy openings; 5) pit and mound topography; 6) standing snags; 7) coarse woody debris; and 8) a thick organic soil layer. A second approach deals with the structure of the forest.

WHY ARE OLD-GROWTH FORESTS IMPORTANT?

Old-growth forests have a value beyond their simple aesthetic appeal. Most importantly, they represent a reserve of genetic material. The old trees growing in these forests have often survived hundreds of years of competition with other trees. They have survived changes in climate, periods of drought, and infestations of insects. The genetic legacy they hold may be the key to preserving many species with the advent of global warming. There are other aspects of old-growth forests that are of interest to a wide variety of people. They may contain rare species or yet undiscovered species of plants and animals.

They are examples of complex ecosystems that are not fully understood. They are a laboratory in which the effect of natural processes on forests can be compared to the effects of timber management. If an individually large old-growth forest contains these important genetic elements, then collectively, the aggregate of many smaller old-growth patches must also contain these same genetic reserves and reflect portions of a larger, no longer existent, old-growth ecosystem.

Schall's Gap Natural Area Hemlock—this eastern hemlock* (Tsuga canadensis) *was reportedly cored by graduate student from the Pennsylvania State University Forestry School in the winter of 2000-2001 and was determined to be 550 years old. Similarly, Dr. Ed Cook has cross-dated cores taken from a 555-year-old and 511-year-old hemlocks from the Tionesta Research Area in 1999. Photograph courtesy of Ernie Ostuno.

HOW DO YOU DISTINGUISH OLD TREES?

If a primary characteristic of old-growth forests are old trees, then how can old trees be distinguished? It is impractical and undesirable to take tree core samples of every tree in a forest and count their rings to determine their age. Many old trees are partially hollow and cannot be fully dated. However, there are other characteristics that can be used to estimate the age of a tree or forest section. Size by itself is not an infallible indicator of advanced age. Often the oldest specimens of a particular tree may be nondescript in size or even stunted. In the Niagara Escarpment of Ontario there are 1,600 year old northern whitecedar (*Thuja occidentalis*) that are rarely over twenty feet tall growing among the cliffs.

In a recent paper, Dr. Neil Pederson delineated six common characteristics of old trees in angiosperms: (1) smooth or "balding" bark; (2) low stem taper; (3) high stem sinuosity; (4) crowns comprised of few, large-diameter, twisting limbs; (5) low crown volume; and (6) a low ratio of leaf area to trunk volume. The existence of old trees in the landscape can also be related (Pederson 2010) to life-history traits or land-use histories.

Balding on an old hemlock tree. Photograph by Edward F. Frank.

Bark Patterns

Bark patterns change in a tree over time. When it comes to identifying old trees, bark patterns are useful but not always a reliable tool. Highly shaggy bark is often considered an indicator of old age, and an old tree may have shaggy bark, but many trees that are relatively young may also exhibit this trait. The most reliable characteristic of bark patterns indicating greater age is balding. Balding is an area of relatively smooth bark typically found near the base of an old tree. The bark on the other side of the tree, or higher up on the tree may still be thick and heavily furrowed even if balding is present in some areas.

Trunk Characteristics

Trunk shape provides a second set of characteristics that can be

used to interpret age. One thing that might be surprising is that often the oldest trees on a site are not the ones with the largest diameters. The oldest trees tend to be average in diameter, with the fattest trees simply being those that grew faster or on grow on a portion of the site with better growing conditions. Most old trees have a low amount of taper in their trunks. This means that they retain a relatively large diameter for a substantial distance up the tree. The trunks of the oldest trees often are sinuous and look as if they are snaking upward into the canopy, rather than having the idealized straight boles. Again, these are indicators of age. A fat tree with a straight trunk may very well be the oldest on a particular site, but on average the trunks of the oldest trees tend to have a low taper, are average in size, and are sinuous in form.

Top of an eastern white pine* (Pinus strobus) *at Heart's Content Scenic Area. Photograph by Edward Frank.

Crown Structure

Crown structure is one of the best indicators of age. Older trees have existed for a long period of time and have been subject to damage from wind and weather. The branches and tops of the trees often exhibit twisted or gnarled branches. Higher branches are often noticeably thick and heavy. They may form club-like shapes, or shapes with near right angles as main leads were broken and side leads took on the task of further growth. Some trees have tops that resemble clumps of lettuce. These crowns have a few thick branches with limited numbers of smaller branches. This means these crowns have a relatively limited crown volume and relatively low leaf to trunk volume ration as described by Dr. Pederson.

These broken tops may include the presence of reiterations in the crowns of the trees. These are branches that have after a short outward segment turned upward and are growing vertically acting as a secondary trunk. These are much more common in conifers than hardwoods. These features have a particularly distinctive morphology that can be seen from a distance. This particular feature may be found in relatively young trees, but the presence of thick reiterations in the crown may be an indication of an old tree.

With experience one learns to recognize the changes in proportions associated with aging in a species. Many of the other characteristics of a patch of old trees are related to the growing condition upon which they grew and circumstances that prevented the trees from being logged. Once it has been determined that old trees are present in a stand, it might be worthwhile in some cases to core date select trees from the site to confirm the age estimates.

THERE ARE NO PRISTINE FORESTS

If the criteria for defining old-growth forest is ideally pristine, totally unaffected forest, then we do not have any old-growth forests in the eastern United States. Even if the trees in an area were never cut, they have been impacted by human activities. In the early 1900s the chestnut blight devastated the American chestnut (*Castanea dentata*) population. It was a species that in some places represented 90% of the basal area of the forest. More recently we have had the gypsy moth (*Lymantria dispar*), emerald ash borer (*Agrilus planipennis*), and hemlock wooly adelgid (*Adelges tsugae*), all exotic invasive species, all introduced by human activities that are killing large numbers of trees and in some cases threatening to destroy entire species of trees and their related ecosystems. Other introduced species of plants and animals are displacing native populations.

Large areas of land are continuing to be logged. Vast areas of land are being cleared for residential and commercial development. Alternate clearing and forest regrowth has been the predominant pattern of European-American settlement. Superimposed on this clearing and regrowth sequence are deleterious impacts associated with industrialization. The effects of acid rain can be seen across the eastern seaboard.

A pragmatic/practical approach to determining old-growth status, given these influences, would be to evaluate a particular forested site to determine what characteristics it retains of the idealized primary old-growth forest and to balance those findings against a baseline of how much impact is acceptable for a forest to be considered old-growth. Since there is a wide variation in the degree to which forests have been impacted across the eastern United States, this baseline needs to be developed in the context of forests in the local region. For example, European presence in eastern New York and New England dates to the early 1600s. Much of the Cross timbers of eastern Oklahoma were still in virgin condition in the mid-1800s.

HOW MUCH OLD-GROWTH AND PRIMARY FOREST IS LEFT?

A Pennsylvania Department of Conservation and Natural

resources website:

www.dcnr.state.pa.us/wlhabitat/forest/oldgrowth.aspx

accessed in November of 2009 gave the following summary:

> Today, the Pennsylvania Bureau of Forestry administers 1,580 acres of old growth forest on its lands. In Allegheny National Forest in northwestern Pennsylvania, the Tionesta Scenic and Research Natural Areas along with Heart's Content encompass 3650 acres of virgin forest. Old growth in state parks or private lands in patches ranging from 35 to 5000 acres and include large barren areas in the Poconos and elsewhere as well as hemlock-hardwood forests such as the Woodbourne Forest in Susquehanna County (200 acres), and the hemlock forest at Ricketts Glen State Park (2000 acres). Total old growth acres in the state, including the pine-scrub oak barrens sites, exceeds 30,000 acres total (< 1.0% total forest land) (Davis 1993, Davis 1999). However, most old growth forest sites occur small patches of less than 500 acres (Davis 1993).

Looking casually at this summary gives a false impression of the abundance of old-growth forest in the state. Yes, there are a few larger stands present: Tionesta Scenic and Scientific Area (3,500 ac), Rickett's Glen State Park (2,000 ac), Cook Forest State Park (2,296 ac), and "large barren areas in the Poconos and elsewhere." The key point to be made here is that while there are many sites that have a tiny patch of old-growth forest, most of these forest patches are indeed tiny.

Cook Forest State Park, Pennsylvania. Photograph by Edward Frank.

The two old-growth sites in Pennsylvania best known by the public are Cook Forest State Park and Heart's Content Scenic Area. Old-growth areas in each are designated as National Natural Landmarks. According to Dale Luthringer, Environmental Education Specialist at Cook Forest State Park, almost 2,300 ac out of the more than 7,000 ac that comprise the park are classified as old-growth forest. This is a larger chunk of old-growth. Heart's Content is a different story. In the mid-1800s, a 20-ac parcel was protected from logging by the Wheeler and Dusenbury Lumber Company. In 1934, the virgin timber area and 102 ac of the land surrounding it was designated a "Scenic Area" by the Chief of the Forest Service. Heart's Content is only a fraction of the size of the old-growth area at Cook Forest. It is more typical of the size of most of the old-growth pockets left in Pennsylvania.

WHY DO THESE POCKETS OF OLD-GROWTH FOREST EXIST?

There are only a few reasons why these pockets of forest were never cut. One reason is that the land was in private ownership and the landowner did not want it cut for some reason. Cook Forest and Heart's Content are both examples of this rationale. Most of the timber around the Cook Forest Area was logged by the Cook and Son's Lumber Company formed by John Cook in the 1830s. The primary forest within present day Cook Forest State Park was the last of forest in the Cooksburg area scheduled to be harvested. It was located adjacent to the Cook Homestead. Anthony Wayne Cook and a number of other prominent men formed the Cook Forest Association in 1917 to raise money to purchase the land from the other shareholders in the company and to set the property aside to be preserved for future generations. The area at Heart's Content surrounded a family hunting lodge before it was set aside.

A second reason that small pockets of forest survived was due to boundary disputes. There were occasional disagreements as to where boundaries between properties lay. Under the timber laws there were severe penalties and fines for cutting trees on someone else's property. So if there was a boundary dispute, these areas were often not harvested for fear of these penalties. A third reason was that in some cases it was impractical because of the terrain for the trees to be harvested profitably. Some examples of this might include the forests growing on the steep slopes in narrow canyons. For example, Dale Luthringer has documented several examples in narrow canyons in and around the Lake Erie escarpment in northwestern Pennsylvania.

A final reason for not harvesting a forest patch was that the trees on a site were of poor quality and not suitable for lumber. These forests include many of the stunted and twisted forest growing on rocky slopes and talus piles in mountainous areas of the state or in other scattered locations.

UNUSUAL FORESTS

In addition to primary and old-growth forests are other types of forest that deserve special consideration. Many of these examples below might include sections that could be considered old-growth depending on the definition of old-growth is used.

> 1) Unusual assemblages: This category would include forests with an unusual assemblage of trees and other plants. Dr. Lee Frelich has mentioned a rock elm (*Ulmus thomasii*) forest in Minnesota near the boundary between prairie and forest. Other such forests might include those growing in various types of barrens in which the assemblage is restricted by the geologic conditions.

2) Mixed conditions: We should also consider those forests such as are growing in a mixed condition like trees in swamp setting or trees in desert setting. These are not what we would normally consider a forest, but they are a vital part of the ecosystem. The old-growth post oak systems in the Cross Timbers of Oklahoma and Texas are a good example of this type of assemblage.

Classic example of a stunted pine forest growing atop Mt. Everett in Massachusetts. Photo courtesy of Gary Beluzo.

3) Forests with character: This is a somewhat subjective category, but a forest segment with these characteristics would likely be recognized by a wide number of people. The term "aged with adversity" has been used and this is really the focus of this characteristic. So we have the concept of trees that have character because they have been aged by adversity. This would include many of the stunted forests growing under harsh environmental conditions. The age of these trees may not be easily apparent, hidden by their unusual form, and certainly they are not large for the species, but they do have character.

4) Forests with unusual structural complexity: This structural complexity often comes in two forms: accumulated biomass and geologic. Older forests tend to have complex structures in the form of nesting cavities, snags, coarse woody debris, moss, tip-up mounds, etc. Forests of any age growing on boulder fields or other rocky situations also have an abundance of complex structural features for wildlife to utilize. Structurally complex forests are often are synonymous with "primary" and "old-growth" forests, but not always.

5) Relict woods: These are forest patches with assemblages of species representative of a previous climatic regime. These are characterized by disjunct populations separated from their typical range by a large distance.

A disjunct population of balsam fir found at Black Moshannon State Park is likely a naturalized population escaping from a planted specimen rather than a true native population. Photograph by Edward Frank.

6) Understory: Certainly the character and composition of the understory of the forests is also worth considering when suggesting that something is unusual or uncommon. I want to include in this listing those forest sections that deserve consideration and discussion about whether they fit this category.

7) Forests with relatively intact ecosystems: With the ecosystems of many of the forests being under assault by invasive species and direct and indirect human impacts, those forests with relatively intact and functional ecosystems should be considered unusual and worth documenting.

These unusual forests are important for a number of reasons, besides simple aesthetics. As Dr. Lee Frelich once emailed the ENTS list server:

> I think unusual forests are important because they may have covered millions of acres in the past, and may again in the future. For example the elm forest of Minnesota which probably now totals only a few hundred acres, covered the southern half of MN, WI, and most of IA, IL and IN 11,000 years before present. It may also be the forest of the future when the climate changes.

SOME EXAMPLES OF SMALL POCKETS OF FOREST
Hogg Woods, Butler County, PA

Hogg Woods is described in the Butler County Natural Heritage Inventory document prepared by the Western Pennsylvania Conservancy:
(www.naturalheritage.state.pa.us/CNAI_PDFs/Butler%20County%20NHI%201991%20WEB.pdf)

Hogg Woods provides an example of a remnant

> old-growth northern hardwood forest community (NC015) which is located northeast of Slippery Rock. This community is dominated by American beech [(*Fagus grandifolia*)] and is one of two examples of a climax forest in the county, the other one being Deshon Woods in the Butler quadrangle... For this reason, it is frequently used as an outdoor laboratory by Slippery Rock University biology classes. The community itself is less than ten acres and it is buffered by a second growth mixed deciduous forest community that has been selectively logged.

Hogg Woods is located in a stream valley head surrounded on three sides by strip mines. One site visit found an old overgrown road, possibly once a mine haul road cutting across the valley. Much of the area was wet with poor drainage. The original drainage patterns in the area had be disrupted by the old mining operation and no longer drained freely. Off to one side was a bright orange bottomed stream flowing into the bottom. The orange is indicative of acid mine drainage, $Fe(OH)_3$ precipitate in particular.

Large beech tree at Hogg Woods with Carl Harting for scale Photograph by Edward Frank.

The most impressive trees at the site were the beech (*Fagus grandifolia*). They were massive; perhaps they are simply remnants that had not been cut when the rest of the area had been logged. It is also possible that they have grown since the logging, but this seems unlikely. Looking in the area we found a number of stumps. In addition to the beeches there was only one tree of size in the area, a good-sized red maple (*Acer rubrum*). Measurements of a few of the larger trees at Hogg Woods:

Species	CBH (ft)	Height (ft)
American beech	10.3	101.5
American beech	10.5	108.0
American beech	8.0	102.0
Red maple	10.2	102.0

The rest of the trees were small and none gave an appearance of age. The area had been logged at some time in the past. Many of the beech trees showed a large amount of decay around their bases. One large specimen had fallen within the last year or so and was lying amidst the others. I think this may be due to the general dampness of the site as a result of changes to the drainage patterns by the mining operations. In the immediate area of the beeches the stream itself had been altered. A high levee had been built up on the one side of a stream to keep it in its channel. This channel modification might have kept large amounts of runoff from the strip mine from flowing directly into the flats, but at the same time it prevented water in the flats from flowing into the stream. There are many of the larger beeches that still appear to be healthy, but their long term future is cloudy. The area has been severely impacted by the mining, there is the problem of beech bark disease in the population as a whole, and on top of this the land is owned by three different absentee land owners.

What makes this site especially complicated is determining if the area is indeed a pocket of old-growth. It appears that the area was selectively logged leaving the beech behind. This does not eliminate it as an old-growth area as some of the original trees are still present, provided the beech trees really are old. The problem is how to determine the age of the beech trees. Beech trees have smooth bark which does not become thicker, more furrowed, or shaggy as do many other trees. Coring of the trees is not a viable solution as most of the large beech trees, if not all, at this site are hollow. There is not even a good understanding of how the appearance of beech trees changes over time because of the limited amount of core data available for the species. The oldest cross-dated beech listed on the Eastern Old-List:

www.people.eku.edu/pedersonn/oldlisteast/

for the species is only 204 years old from Backus Woods, Ontario, Canada. Abrams and Orwig (1996) reported a beech 275 years old from Cook Forest based upon ring counts. Hough and Forbes reported a beech 366 years old based upon ring counts from the Tionesta area. So it is possible that these are really old beech trees, but there also is the possibility that they date from the period since the area was first logged. I just don't know. Perhaps a core could be obtained from the large red maple in the stand if it is not hollow.

Plain Grove Fen, Lawrence County, PA

The Lawrence County Natural Heritage Inventory document (www.naturalheritage.state.pa.us/CNAI_PDFs/Lawrence%20

County%20NAI%202002.pdf) prepared by the Western Pennsylvania Conservancy contained a brief description:

> Plain Grove wetland rates as one of the most significant wetlands in Lawrence County both in terms of its rarity and overall quality. The wetland area hosts a complex of seepages and fens with fourteen plant species of special concern, including a globally rare plant species. Surrounding uplands feature young forests with canopy species typically including white oak (*Quercus alba*) and northern red oak (*Quercus rubra*) with young black cherry (*Prunus serotina*), hawthorn (*Crataegus* spp.), and an understory of American hornbeam (*Carpinus caroliniana*) and dogwood (*Cornus florida*). Other low abundance species present are red maple, black gum (*Nyssa sylvatica*) and green ash (*Fraxinus pensylvanica*).

This was not exactly what we found when we visited the area. Instead of a young forest with smaller trees, the site contains a large number of large oaks and sugar maples (*Acer saccharum*) of some age. The area we visited is located in the upper portion of this aerial photo of the overall site. We parked near the outlet of the mine haul road and headed into the woods from along the road a few hundred yards west of where we parked. Immediately we encountered a large tree. It was a white oak snag still standing 81 ft tall with a girth of 13 ft, just below the roadway.

Large white oak at Plain Grove Fen. Photograph by Edward Frank.

It was one of several large white oaks and a black oak we measured in that immediate area. There were swampy areas near the base of the slope filled with black mud and skunk cabbage. At the bottom of the slope was a shallow free flowing stream perhaps 20 ft wide with a cobble bottom.

Old sugar maple at Plain Grove Fen showing balding of the bark. Photograph by Edward Frank.

On the far side of the stream on the edge of the stream bank was the first of many large sugar maples we encountered. This was a magnificent specimen standing 92 ft tall with a girth of 10.8 ft. The trunk of the tree showed a high degree of balding and had numerous bumps. From this tree we could see many more large trees extending up the slope and to both the left and right. One of the best finds here was a large black cherry, 10.1 ft in girth and 102 ft tall. Looking at the data we measured 17 different species of tree. We measured 12 trees over 10 ft in girth, representing five different species, with several more trees and species just short of the 10 foot barrier.

This is an example where there was a written description of the site available, but that description did not match what was found at the location. Carl Harting learned of this site by talking to a local forester and actually visiting the site rather than simply writing it off based upon an inaccurate report. As with any good site, once we arrived the goal was to measure and photograph as many different types of trees we could find on the site, and to measure and photograph the largest trees we could locate on the site. With a site of this quality a single visit is not adequate to document the forest and additional trips to the area are planned.

Six Mile Run, Moshannon State Forest, Centre County, PA

I became aware of this section of old-growth in trip report written by Gary Thornbloom of the Moshannon Chapter of the Sierra Club about a hike along the Allegheny Front Trail (www.pennsylvania.sierraclub.org/moshannon/OTT/OTT04-5AlleghenyFrontTrail.htm):

> Large rhododendron and hemlocks form a canopy over the path. Here the trail uses two sections of old logging railroad grades. According to Ralph Seeley in Greate Buffaloe Swamp this small grove of hemlock giants survived only because they were along a disputed property boundary. The penalty for cutting your neighbors trees was quite severe. This resulted in numerous stands of trees not being cut and we now have many small glimpses of the forest that once was. The AFT soon comes out on Route 504.

I visited the site in May of 2009. The trail starts on the east side of a of a bridge on Route 504 where it crosses Six Mile Run. It crosses a short plank bridge over a side stream and immediately jogs left to bypass an A-Frame camp and heads up the hill and then after a gain of 100 ft of elevation or so it turns right to parallel and follow Six Mile Run upstream. This level path follows along the base of a scree slope and is overhung by large great rhododendron (*Rhododendron maximum*) bushes. After a short distance the trail drops back down to stream level and continues to follow the run upstream. The trail after a short distance rises over a shallow prong and again drops to the stream level. It is here that the small remnant of older trees is found.

Old hemlocks growing along Six Mile Run, Moshannon State Forest. Photograph by Edward Frank.

There aren't many of them. There are six to eight large hemlock trees growing in a flat area a hundred feet wide along the stream. The area is dissected by old stream channels and is generally populated by great rhododendron, many smaller hemlock trees, yellow birch, and scattered other species. The larger hemlocks are all under a hundred feet tall and 8 to 10 ft in girth. The largest hemlock was 95.1 ft tall and 9.4 ft in girth. Another one nearby likely would have been taller, but its top had broken out and the tree was dying. These would not even be notable in a place like Cook Forest with hundreds of large hemlocks, but here among the smaller trees they really stood out. There was a distinct jump in size between these individuals and the many smaller hemlocks in the area which leads me to believe these are indeed a small remnant pocket from the pre-logging era. Ideally with the limited number of old and large hemlocks present, each of the individual trees should be measured and documented—a practice not widely implemented, but crucial to a complete description and full documentation.

Area of scree slope along Six mile Run, Moshannon State Forest. Photograph by Edward Frank.

Beyond this flat area the trail climbs and turns to the left up a side valley and eventually leads to the hilltop above. Much of this section of the trail crossed a scree slope of generally loose flat stones from cobble- to flagstone-size on a comparatively steep slope. Most interesting is the assemblage of plants growing on these slopes. Huckleberry and bracken fern are the predominant small plants growing on the scree surface, There are some small trees sprouting in the rock slope, generally yellow birch and hemlock, with scattered black cherry, red maple, oak, and white pine. There are clumps of rhododendron. For the most part much of the scree surface is fairly open. Where trees are present their leaf litter allows for some soil formation atop the loose rocks. These form little islands of plant growth among the rocks. Those pine and hemlock trees present are squat in form and the green branches extend all the way to the ground. I don't really know how old any of these trees are without any core data, but some of them could predate the logging operations.

Even if the individual trees are not that old, this type of forest could be primary forest mediated by fire frequency and

represent an old-growth dynamic system. How many places are there where there are primary forests, old forests, or old-growth forest systems where the trees are growing in generally poor conditions? Perhaps they were not logged because of the poor quality of the wood, or because of the terrain upon which they are growing. If they are not gigantic in size, or extremely dwarfed and gnarled, perhaps we are simply not noticing them? How many poor looking, moderately stunted, old forests are growing places that we simply have not noticed? I don't know if this is an example or not, but it could be.

Mount Logan Natural Area, central PA

Mount Logan is a state forest Natural Area located in central Pennsylvania just south of the town of Lock Haven. The location is described on the PADCNR website as: "A 512-acre tract features an old-growth eastern hemlock stand and an outcrop of Tuscarora sandstone, both near the summit." I revisited Mt. Logan Natural Area on June 4, 2009, with Lin Greenaway (fellow ENTS member and a forester with the Pennsylvania Bureau of Forestry).

What most impressed me was not the somewhat stunted white pine and hemlocks atop the mountain, but were the bent old trees growing on the massive talus slope on the south side of this east-west oriented ridge. Some of the trees on the summit were reportedly cored to ages over 200 years. Many of the trees growing in the talus slope are in my opinion every bit as old as those at the top, if not older. The talus consists of quartzite rocks from cobble to boulder sized, generally ranging from 2 to 6 across and flattened. The talus piles are at approximately the natural angle of repose for material at 42.4% (23 degrees). This means that the pile is for the most part stable, with only a slow amount of creep occurring over time.

Stunted white pine growing in the Mt. Logan talus slope. Photograph by Edward Frank.

There is limited vegetative cover on much of the talus slope on the southern side of the ridge and scattered open barren areas. On this talus are the dominant tree species in the short canopy were birch (*Betula* sp.), red oak, red maple, chestnut oak (*Quercus montana*), and white pine.

Birch tree growing in the talus slope of Mt. Logan. Photograph by Edward Frank.

In the understory striped maple (*Acer pennsylvanicum*) and mountain laurel (*Kalmia latifolia*) were prominent. It was surprising that red oak was more common in the talus slope than chestnut oak. American chestnut was also fairly common in the understory. Many other species including cherry, common serviceberry or juneberry (*Amelancher arborea*), black gum (*Nyssa sylvatica*), and butternut (*Juglans cinerea*) were present in lesser numbers or occasionally on the talus slope. Near the top on the south side were a scattered handful of eastern hemlock and even sassafras (*Sassafras albidum*). Ground cover in the talus field was sparse. There were various lichens growing on the rocks themselves—rock tripe, reindeer moss—and various other unidentified crustose, squamulos, fruticose, and foliose lichens. Some species can only be identified through chemical analysis. Various mosses, patches of huckleberry, hay scented fern, currants, and Virginia creeper were also present on tiny pockets of soil. These trees have the appearance of age and are stunted. This is another example of an old-growth or primary system that commonly is not recognized as such because the trees present are not of commercial value.

I am not sure how we should be dealing with sites dominated by stunted trees. Some of the trees that have the most character, the ones that appear to be among the oldest, are neither the largest nor the smallest of the trees present. A standard practice for sites with normal sized tree is to develop a Rucker Height Index. This is the numerical average of the maximum height of each of the ten tallest species on as site. A Rucker Index could be developed for just the talus slope area, but with the irregular heights I am not sure what is gained by this process. The focus on height for sites like these does not seem to be meaningful. There really needs to be some better way the evaluate sites with old but stunted forests than we have in our repertoire presently. We already know the trees are stunted overall, what is gained by measuring a series of trees with differing degrees of how stunted they might be? On these severe sites, maybe the lack of signs of human direct disturbance should be the primary criteria for assessing old-

growth status.

Sixteen Mile Run, Erie County, PA
On Monday, September 21, Dale Luthringer, Rob Frank, and I visited Sixteen Mile Run. Dale had previously documented some impressive trees in other examples of narrow canyons in the Lake Erie Escarpment. These include Wintergreen Gorge, Six-mile Run, Walnut Creek, and Elk Creek. From air photos on Google Earth, this site looked like it has similar potential and it had not been visited by ENTS previously. We arrived at the meeting place at the intersection of 89 and I90 at around ten o'clock and headed to the gorge. We entered the upper end of the western branch of the complex just south of a golf course. I will avoid the suspense and say that the canyon had been cut previously and we did not find any really big trees. You can't win them all. The canyon was a beautiful walk. The one highlight of this trip was the presence of some old looking stunted trees along the upper edge of the steep canyon.

The canyon at Sixteen Mile Run. Photograph by Edward Frank.

I wanted to include this in the discussion because it demonstrates that people must go out into the field and ground truth their assumptions about the potential or lack of potential for large trees or old-growth in a particular area.

Marion Brooks Natural Area, Elk County, PA
Marion brooks is a 979 ac natural area that contains a unique stand of paper birch. In the latter part of the 1800s the entire region had been logged. By around 1912, the area was a wasteland of barren and eroding hills. Repeated fires took place among the branches, brush, and tree tops left behind after the logging operation. These frequent and intense fires burned across the area and devoured even the organic materials in the soil, leaving behind a mineral soil with virtually no organic content. It was in this soil that a few pioneering species, like paper birch were able to establish a foothold, where nothing else would grow. As a result of these fires the area is today occupied by an almost pure stand of paper birch (*Betula papyifera*). Overall in the purest stands around 90% of the mature trees present were paper birch. The floor of the woods was covered by a carpet of green bracken and blueberry. Serviceberry was indeed present and red berries were growing on the trees when I last visited the site in July 2009. Beyond that the most common trees present were sassafras and serviceberry. I was surprised at the number of sassafras present, which is usually not that common of a species in this forest. Sassafras was also commonly present in the shallow herbaceous layer. Other trees that were relatively common were red maple, red oak, and witch hazel (*Hamamelis virginiana*). Scattered small white pine grew here and there. Less commonly found were black cherry, white oak, and pitch pine (*Pinus rigida*). I also encountered a single cucumbertree (*Magnolia acuminata*) just as I was leaving.

The overall distribution pattern of the trees is very patchy. The cluster of paper birch near the parking area occupies about 10 acres. Surrounding this area dominated by paper birch are areas of trees where oaks and maples are more common and generally larger in size. In other areas the ground is open with only an occasional tree. These are generally occupied by blueberries and to a lesser extent by bracken ferns.

Paper birch "splays" at Marion Brooks Natural Area. Photograph by Edward Frank.

The paper birch trees are mostly splaying multitrunk clusters of trees. This likely indicated that after the paper birch first sprouted after the initial wave of intense fires, another fire took place. This second fire was less intense but burned the newly growing paper birches off at ground level. Afterwards they resprouted from the surviving roots forming these multitrunk clumps. Some reports have suggested that the paper birch trees are dying out as they are reaching the end of their natural life spans. There are open areas within the paper birch dominated area where birch trees have died and fallen. There are fallen tree trunks on the forest floor. I do not believe that they are generally dying because they are reaching the end of their normal life span. There is the normal thinning of the trees over time. What birch trees that are dying are doing so for a variety of reasons. It is common for individual trunks in a multitrunk clump to be lost over time as the other trunks become more dominant. Many of the larger trees seem completely healthy.

There are single trunked trees growing that also appear to be doing well.

The problem seems to be not that the paper birch colony is dying from old age, but that they are not being replaced by younger trees. Indeed, none of the trees currently growing regardless of species are being replaced by younger trees. Most of the trees in the stands are in the 80 to 100 year old rage. The youngest trees growing I would guess are at least thirty years old. Given the stunted nature of the trees overall they could even be older. What would normally be the sapling "layer" of the forest is generally empty. It is likely that the bracken ferns are inhibiting the growth of new trees and fire would be required to regenerate paper birch.

It is clear from historical accounts that this area had been logged in the past and that a series of fire that developed after the logging operation created the conditions that formed this interesting paper birch forest. What bothers me in these discussions about primary forests and old-growth forests is the question of whether this site is qualitatively different in composition than would be a site that had undergone a severe fire without having been logged first? Is there any substantive difference between the two results, and if not, are we making arbitrary distinctions between these forest types?

Presque Isle State Park, Erie County, PA

The park occupies a peninsula that juts 2 miles out into Lake Erie forming a curved spit about 6 miles total in length. Presque Isle is the most visited state park in the state because of a series of popular beaches facing Lake Erie. I visited the park on August 24, 2009. The park consists of a series of dune ridges separated by low lying marshes and lagoons. The oldest and largest trees I located on this trip were found along the Old Ridge Trail. None of them were exceptionally impressive in size, but this section might be considered to be old-growth forest.

Ridge Pond, Presque Isle State Park. Photograph by Edward Frank.

What caught my imagination were the many stunted and gnarled trees growing elsewhere, especially along the Dead Pond Trail. These oak, cherry, and sassafras trees showed evidence of harsh weather with twisted and bent branches, but were generally small in size. I do not know if these are old or not. A permit would be needed to core some of the trees and get a better idea of the age ranges of the trees growing along various dune ridges in the park. The other aspect of interest is the extensive shrub forests growing along the edges of the interior ponds and marshes. Many of these are potentially quite old and may include specimens that are notable in size for their species. This is another area ripe for research in the heart of the most visited state park in Pennsylvania.

WHERE TO LOOK FOR POCKETS OF OLD FOREST

These pockets are scattered across the state in a wide variety of settings. Problems with boundary locations can be present anywhere. Other potential locations for pockets of old trees include:

- atop and within narrow canyons;
- remnants in swamps and marshes;
- barrens, including shale barrens, pine barrens, serpentine barrens;
- rocky cliffs, talus, and steep scree slopes;
- rock "cities" and islands;
- river islands;
- old private estates;
- churchyards and cemeteries; and
- parks—city, county, state, and national.

Lake Erie area canyon. Photograph courtesy of Dale Luthringer.

For example, Dale Luthringer has found a number of pockets of old trees in the narrow canyons around Lake Erie. Other known locations around the state also are found in narrow, steep walled canyons with relatively small flow volume streams in their bottoms.

Swamps and marshes were generally logged, but there are still small sections found in many of them, along their edges, or on islands within swamps. There are a number of barrens in which trees are often thinly scattered, nearly absent, or

stunted. These are often related to the chemistry and character of the bedrock. Shale barrens and pine barrens are fairly common. Many of these have been logged to some degree, but they may contain patches where the trees were not logged because they were small and stunted.

Old-growth at Conneaut Marsh. Photograph courtesy of Dale Luthringer.

Serpentine barrens and a few others are a direct result of the chemistry of the weathering products of the bedrock being toxic to trees. These are limited in extent, but trees growing around the edges of these rock outcrops are often small and stunted and may be quite old.

Old trees can be found growing in talus and scree slopes as cited in the examples of Mt. Logan Natural Area, and within Moshannon State Forest cited above. There are likely many more similar examples that simply have not been noticed and discovered yet.

An interesting phenomenon is the existence of rock cites and islands. These are large bedrock blocks that sit in clusters in a valley or hillside. The tops of these blocks contain unusual assemblages of trees and other plants as they are not subject to browsing by deer. Old trees often grow among ad around these rock features. Steep rocky cliffs with rock ledges may also form a home for pockets of old forest. In fact, there are 1,600-yr-old northern whitecedars growing on rocky cliffs in Niagara Escarpment.

River islands may preserve pockets of forest. The Allegheny River Islands Wilderness is one example. Some of the islands were in the past farmed, cattle grazing took place in the 1800s, and perhaps some trees were removed. But for many of the islands these impacts were limited to just small sections or had only a limited long term impact on the forest cover of the island. Most of these impacts have been washed clean by annual flooding in the years since they were abandoned. The old-growth forest at Cook Forest State Park and at Heart's Content is pockets that were under private ownership until they were donated to the state to be preserved. There are still many large private estates around that may contain areas of forest that have never been logged. The difficulty is to get permission to explore these forests from their owners.

An enormous white oak at the Old Union Church in Philipsburg, PA. Photograph by Edward Frank.

Individual old trees and smaller pockets of trees may be found in old cemeteries and churchyards. Generally these trees survived because it was deemed inappropriate to harvest them from the sacred ground or resting places. Finally there are often pockets of old forest in existing parks. Some of these patches are known, but others have not been documented or recognized.

In other situations when evaluating the nature of old-growth in an urban area consideration must be given to the context of those remaining patches of forest. In general those forests closer to or within urban areas have been among those most heavily impacted by human activities and utilization. Most forests in the immediate vicinity of urban zones have typically been cut at least several times in their history; any forest section that contains some old-growth characteristics is extremely rare and should be considered valuable and worth documenting and preserving (Frank 2009).

Often the areas with big trees are well known, but those with smaller trees may not be recognized. The old stunted oaks around Little Round Top at Gettysburg National Military Park

are examples of old-growth existing in a park, but not yet adequately documented. Large areas of shorter oak dominated forest in Shenandoah National Park and the Blue Ridge Parkway in Virginia are old-growth forests with trees well over two hundred years old, but are not designated as such on the park maps, and likely are not considered as such n terms of planning either. These areas need to be documented and their extent outlined so that they may be managed properly.

When looking at these forests one thing to remember is to not just look at the biggest trees, but look at the smaller tree species as well. They are part of the matrix of the forest that needs to be documented. The smaller tree in the foreground is a dotted hawthorn on King Island, in the Allegheny River Island Wilderness. It is just under forty feet in height. It has more big tree points than the current national champion for the species, but could easily have been overlooked in the excitement of measuring the tall silver maples and sycamores on the island.

SOURCES OF INFORMATION

One of the best sources for information on the location of these small pockets of forest is other people. Talk to people who spend time in the woods, including foresters, hunters, hikers, farmers, fishermen, old timers, birders, wild flower enthusiasts, etc.

Secondary sources of information are books and published articles. Also, search the internet for the terms "old-growth forest" and your region of interest. Typically the results will provide a wide variety of references, some of which are useful. In Pennsylvania, there are a number of official websites for the Department of Conservation and Natural Resources that discuss old-growth in the state. Other state and federal agencies and non-governmental organizations also have websites that often list old-growth areas.

Other useful tools available on the internet are various map resources. Sites like Google Maps, Google Earth, Map Quest, Terraserver-USA, Bing Maps, etc., all provide surface maps, topographic maps, or aerial photos. Areas of interest can often be seen with enough detail to distinguish individual trees. There are other mapping resources available, but these are a good place to start.

LONG-TERM PROSPECTS

What are the long-term prospects of these sites? Some of them are protected within existing parks and preserves. They are surrounded by younger forests that can serve as a buffer to direct human impacts. Indirect impacts will still affect them, but they have a good prospect for longer term survival. If the chance happenings of fire and winds do not destroy these sites in the short term, their prospects for survival are good. They can potentially serve as the core and seed source for an old-growth ecosystem to develop over time in the surrounding younger forests. Others are small in size and have been impacted to such an extent that their survival for much longer is unlikely. Many of these small forest pockets fall somewhere between these two extremes.

For these forest pockets, their future is a matter of the choices we make. If we chose to give them some protection from development and logging, if we set aside buffers for these pockets, they may survive and flourish. In the smaller pockets some more active measures may need to be taken where invasive species are removed, and some native species replanted. These types of active measures are working well for several small community based conservation groups. On a broader scale we as a people need to determine what we want to do in terms of forest management and wilderness preservation. Only time will tell what will eventually happen.

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ANCIENT CYPRESS OF THE CAROLINA COASTAL PLAIN

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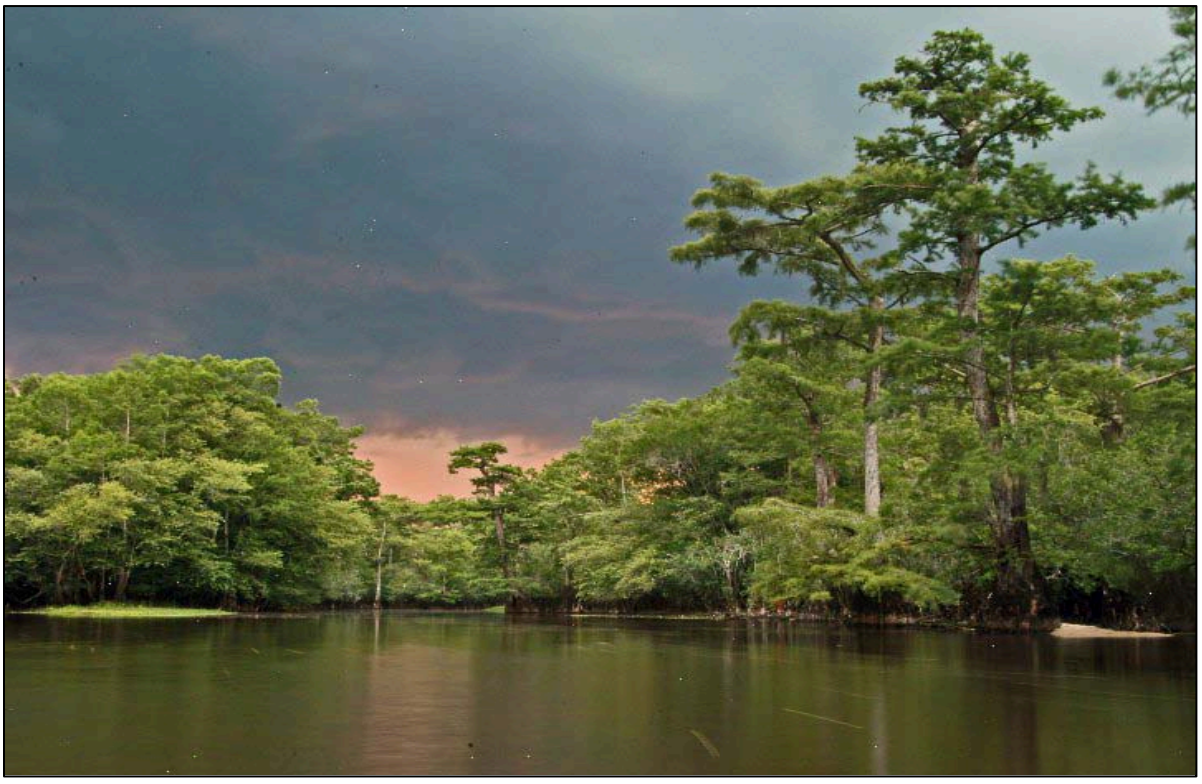
The exceptional age of Black River, North Carolina, baldcypress trees has been known since 1985 when one of us (Stahle) first extracted small core samples from some of the old trees (core sampling does not seriously harm these ancient cypress). Microscopic analysis of the annual growth rings proved their great age and measurements of the dated growth rings have been used to develop a chronology of growing season rainfall for North Carolina dating back to A.D. 372. Black River was the visited three times in the 1980s and 1990s, but the full extent of the old-growth baldcypress forests along the Black River was not realized until the most recent visit this past June. The diverse ecosystem that exists in the bottomland hardwood swamp proves the importance of the conservation of these tracts of land.

It has been 20 years since the last visit to the Black River. We were amazed to see so many super ancient cypresses along the river and in many areas along the Black it is possible to turn in a circle and see 10 to 20 baldcypress trees over 1,000 years old. This density of millennium-old trees is rare in any forest worldwide. A dozen or so species can live for more than 1,500 years and most of these old growth stands have very few individual trees in the oldest age class. This is not the case at the Black River. There are literally hundreds of millennium-old trees at the Black River, which has the largest concentration of ancient baldcypress trees we have ever found after 30 years of searching in the southeastern United States, Mexico, and Guatemala.

Ancient baldcypress stands can still be found along other streams in the Southeast, but not quite as impressively as on Black River. These remaining ancient cypress stands do not necessarily include huge trees with valuable timber. Their over-mature condition from recurring droughts and gales over the centuries reduced their lumber value. During our June 2010 field trip we also visited a fine tract of ancient cypress trees on South Carolina's Little Pee Dee River with Dr. Maria Whitehead, who is heading a Nature Conservancy conservation effort in the Winyah Bay and Pee Dee River Basin. It will be a big job, but these ancient cypress forest remnants need to be systematically mapped throughout the Southeast. Knowing where these ancient forest parcels are located is the obvious first step in their conservation. Where possible they should be conserved for their beauty, biodiversity, and scientific value. They are among the last pristine examples of the presettlement environment in the Carolinas.

Storm clouds over the ancient baldcypress of Black River, North Carolina.



Dr. David Stahle gazes at the beauty of the ancient baldcypress of the Three Sisters in North Carolina.

We had not realized how large the area of ancient cypress forest actually is along the Black River. During previous trips we had only surveyed about 300 ac, but The Nature Conservancy has helped to conserve over 11,000 ac along the Black River, and much of it includes remarkably old trees. The Black River retains some of the highest surface water quality in the state of North Carolina and has been named outstanding resource water by the Department of Environment and Natural Resources.

We were gratified to learn that our research on the ancient baldcypress trees was helpful in raising awareness and interest in the conservation of these irreplaceable natural resources. But the highlight of our trip was the visit to the ancient cypress wetlands of Black River, North Carolina, certainly one of the greatest natural areas left in the southern United States. It was hot and the river was low. The stream is choked with sand in the Three Sisters area, where the oldest identified trees have been found. It braids into several channels of whiskey-colored water flowing over white sands and among the gigantic baldcypress trees. A colony of wood storks has recently moved into the forest, reclaiming habitat lost during their near extinction. If these ancient forested wetlands can continue to be protected, then we are certain that these efforts will be appreciated by future generations.

From left to right: Dan Griffin, David Stahle, and Kathryn Wolff at Three Sisters.

A VISIT TO SIGURD, GRANDFATHER, AND THOREAU

Robert T. Leverett

Founder, Eastern Native Tree Society

OUR START

On October 23, 2011, Monica and I arose early, made the bed, put on hiking clothes, and headed north. Our first destination was the Charlemont Inn for a quick breakfast and a visit with our friend Charlotte Dewey, the Inn's manager. After that, we hopped back into our car and drove straight to Monroe State Forest, following a scenic route along the Deerfield River. The path we took is the historic route that once served as a toll road for travelers crossing the Berkshires. It is a drive we've done many times before, but one that never gets old. Our destination was the trailhead at Dunbar Brook. We were half serious about trying out an experiment in Japanese "wood-air-bathing," which we read about for the first time in one of our friend Joan Maloof's excellent books. We both agree that Dunbar is the place to try out Shrinrin-Yoku. The basic idea is to absorb the compounds of the forest by breathing them in as free molecules, released by the trees and a myriad of other forest organisms, but mainly by the trees. The molecules enter the lungs and make their way into the blood stream, presumably imparting health benefits. I think that I wood-air-bathe every time I walk in a forest. Now I am more aware of what is happening.

Of course, I had more mundane tree measuring objectives—I always do! This trip I needed to check on the growth and health condition of the huge Sigurd Olson, Grandfather, and Henry David Thoreau eastern white pines growing on the north-facing slopes above Dunbar Brook. I was pretty sure that I'd find them in good condition, since other than flooding along the bed of the brook, Hurricane Irene had maintained a light footprint on the lower slopes as she swept through the region. Nonetheless, I knew I wouldn't rest until I was certain the pines were okay.

THE WALK IN

The day was cool with partial cloudiness and no insects—ideal. We were off to a good start. The nature path enters a thick stand of mature eastern hemlocks that cast dense shade. The sudden drop in the level of light is instantly noticeable. I'll bet the same thought flashes through every head—hey, who turned off the lights? But the very low levels of light exact a price. Flowering herbs are rare in such conditions.

The hemlocks lining the start of the trail grow on a steep slope with numerous rock outcroppings. The trees range in age from 70 or 80 to as much as 240 years, courtesy of actual ring counts. As a consequence, this area of Dunbar was initially confusing to me to interpret when I was mapping the Massachusetts old-growth for the Department of Conservation and Recreation (DCR). There were plenty of old-growth indicators present, but other physical features spoke to a past disturbance, perhaps a century and a half ago. After overstory removal, the suppressed hemlocks, previously relegated to an understory role, were suddenly released. Bathed in fresh sunlight, they put on spurts of growth to take their places in the canopy. They form the forest we see today, but even after 150 years, none of them has reached great size. The growing conditions are too austere. Threading one's way along the slopes, it is easy to see why the hemlocks can't become forest giants. The following image speaks to the challenges of growing on the slopes:

Passing through the hemlocks, we entered a hardwood-dominated forest. After the July drought, the rains had returned, some torrential. The result is luxuriant undergrowth that persists even as we approach the end of October. The sun peeked through holes in the clouds, warming us after we'd passed through pockets of cold air that bottle up along the Dunbar Brook corridor. Water oozed from the springs that were being constantly recharged by the near record-setting rains. Travel along the trail was messy in spots, so we paid extra attention to our footing and tried to walk in a manner to minimize trail damage.

The bright fall colors filtered through gaps in the forest canopy. Autumn finery in the crowns of the trees and the deep green of the ferns and mosses on the forest floor were a tapestry of vivid colors, each accenting the others, all vying for attention. We had caught Dunbar Brook at its best.

I should explain that Dunbar is noted for its variety of herbs, including blue cohosh, foam flower, several species of violets,

trilliums, oxalis, and wild ginger, to name a few. Many Massachusetts forests have a similar variety, but few match Dunbar in abundance. Herb communities are highly developed, especially the trilliums and wild ginger. But the richness doesn't end with the herbs. There are ferns, mosses, liverworts, lichens, and fungi at every step. The ferns, mosses, and liverworts rise to visual prominence as the herbs wane.

The next image showcases a boulder field covered in ferns and mosses that caught Monica's eye. The combination appeared to us as the temperate climate counterpart to a tropical garden. There are usually six to eight species of ferns in these nutrient-rich boulder fields. As for the mosses and liverworts, there are simply more species than I can track.

It quickly becomes apparent to visitors that boulders and rock ledges help define the Dunbar Brook corridor, and the rocks come in all sizes. In some areas they appear uniform, as though nature had purposely chosen one size to distribute here, another there. One also encounters conspicuously large boulders, sitting alone. Polypody ferns cover the isolated boulders across their tops, while two or more species of large ferns typically grow around their bases. The faces of these glacial remnants support thick carpets of moss. Some of the boulders are just too massive to be completely covered by the mosses, allowing patches of the underlying rock to show through. But you still don't see bare surfaces. No square inch is left uncolonized by one or more species of lichen.

There is a hidden corner of Dunbar where one can imagine having entered the abode of Tolkien-like beings. Do nature spirits really inhabit these places, spirits that work tirelessly to weave the fabric of an integrated forest community? I don't know, but I can think of no other place in all the forests of Massachusetts that induces, so satisfyingly, the feeling that real forests are truly cooperative ventures.

Photographic images are often poor communicators of what I am attempting to promote. One misses the fragrances, the changing light, and tactile experiences. In a photograph, one cannot hear the sounds of tumbling waters or feel their spray. Still, something can be captured in the silence of an image, a crystallization of the memory of the moment. Accordingly, I present polypody ferns on top and mosses on the sides of a large boulder.

The mosses cover not only the rocks, but creep up the trunks of the hardwoods, expanding their territory as time goes on and imparting a timeless appearance to the woods, an appearance born of humid summers, snowy winters, and the absence of humans. Mosses on the trunks of trees reach a developmental climax on the old sugar maples and yellow birches. In the image that follows, the green of the moss is accented by sunlight. This leaning yellow birch grows along the trail. Its roots are anchored around a rocky outcropping covered by a deep organic layer. The old birch lends a deep woods feel, characteristic of the Dunbar forests.

Ages of the trees vary widely, especially in the lower region of Dunbar Brook. The imprints of past land uses linger in some spots, but have been erased in others. Old-growth dominates higher on the ridge, principally occupying the boulder fields.

But even in terrain that discouraged early logging operations, tree ages vary significantly. Natural disturbances constantly create light gaps that support regeneration. The trees in these old-growth forests come in all age classes. Interestingly, along the trail corridor, many of the larger, more conspicuous trees are close to 200 years of age. Given the uses that the trail corridor received in the 1800s and through much of the 1900s, it is difficult to account for the advanced tree ages except as a confirmation of observations common throughout New England that swaths of ancient trees often follow old pathways. I presume that people were aware of the dangers of erosion and avoided removing trees above and below a trail or road, especially between a pathway and a stream.

In Dunbar, each species has its niche. Large organisms like trees can take root on the tops of rocks, utilizing the build-up of organic matter to gain a foothold. The little seedlings look innocent, if not cute. After a few decades, a rock can find itself engulfed with the octopus-like roots, and split as roots grow into crevices and expand. Both yellow and black birches specialize in natural tree-rock sculptures, but the yellows create the most impressive works of nature art. Sugar maple, hemlock, and occasionally other species colonize rocks, but never so well as the birches. These tree-rock partnerships excite our woodland imagination as few other features do.

The above image shows a yellow birch that long ago passed its 150th birthday. I expect the tree is at least 225 years old now, maybe older. The venerable old birch has huge roots that snake down the slopes, disappearing and reappearing. The supporting rock on which the birch began life became engulfed long ago. But from the trail, the details are hidden by luxuriant undergrowth. When the tree is closely approached, the root-rock and moss-bark partnerships reveal themselves. I have heard visitors gasp on seeing the intricate weave of roots. In this picture, a large area of decay visible along the trunk forewarns that the old birch is approaching the end of its life as a standing tree. But when that event occurs, its job will be far from over. Once its living tissues die, our birch will begin a second career, returning its nutrients to the forest and providing food for a host of small organisms that collectively perpetuate the web of forest life.

The availability of light defines species colonization. Some trees are genetically adapted to grow in dense shade. Other species require abundant light from the outset. The paper birch belongs somewhere in between, but when plentiful, it usually signals an extensive, past disturbance. That is the ecology. On

a more artful theme, a neighbor of mine once described the white birches as the candles of the forest.

A short stretch of the trail features a cluster of mature white birches that are attractive any time of year, but were exceptionally beautiful on our visit. The contrast between their yellow crowns and the white trunks with the greens and rust colors of the forest floor begged for a photograph.

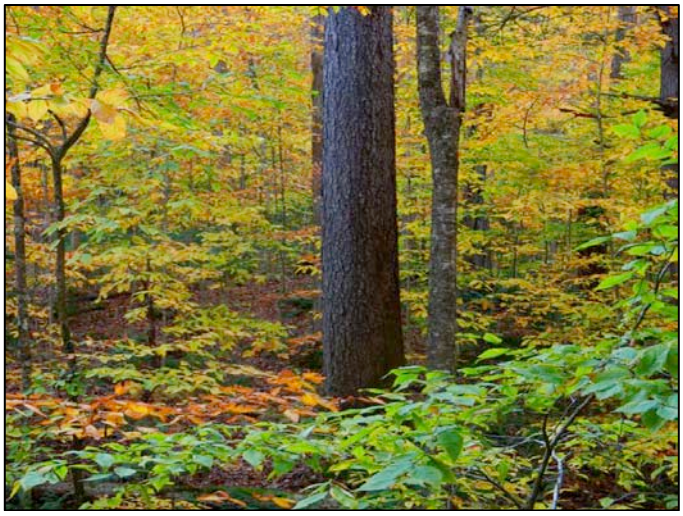
There are many fine woodland walks in Massachusetts, each with its own appeal. Some give us feelings of comfort. Old rock walls beside oak-lined trails promote a sense of security. We know that people once occupied the land and tamed it. Other woodlands, like Dunbar, have a wild look and evoke different emotions, revealing the raw power of nature. For both types of woods, poets tease out their sensory impacts and express them in meter. Artists utilize color palettes. However, my specialty, as most of you know, is capturing a forest's fecundity through numbers, and in this arena, the Dunbar forest has few peers.

THE DESTINATION

A feature that inevitably grabs the attention of the tree-conscious are the huge white pines along the nature trail. Most of these highly conspicuous trees date to the middle 1800s. At that time substantial land clearings gave the pines a foothold. Thick stands of young trees likely followed with each tree fiercely competing with its neighbors. Over time the stands self-thinned, and today we are left with a scattering of super pines that thrust their crowns high above the surrounding hardwoods. These conspicuously big trees satisfy our desire to experience a species in the fullness of its development. As best as I can tell, the pines do not all date to the same period. The majority of the older looking trees are probably between 150 and 190 years of age. A few are obviously younger, but all exceed 100 years.

Remembering that most of the pines date to a period when there was considerable land clearing, there would have been subsequent smaller openings, allowing for a limited number of trees to seed in (these are the younger ones we see). The collective existence of these bona fide New England natives reflects pioneer values, i.e., a countryside meant to consist of fields and farms with woodlots on hillsides.

The pioneer land ethic may speak to the origin of the pines, but time has allowed the surviving trees to express themselves as their own beings, as the true monarchs of the New England woods. And each is like a child to me that must be periodically checked upon. But on our October visit, time was limited. I had three trees in mind. Reaching them required that we cut off the trail and head up the steep north-facing ridge that becomes part of Spruce Mountain in its upper elevations. Not far from our first destination, I made a quick check on a beautiful black cherry tree that I call the "Dunbar Cherry." I photographed it from the top of a small rise. Its columnar form makes a statement for the species. In Massachusetts, a single-trunk black cherry 8.6-ft girth and 111 ft tall is a cherry to be reckoned with. Meet the Dunbar Cherry:



The Sigurd Olson Pine

After leaving the cherry, we reached the first of the three post-colonial-aged giants—the Sigurd Olson Pine. First, a few words about Olson... He was a towering figure in the environmental movement. He was one of the principal drafters of the 1964 Wilderness Act, and instrumental in getting the Boundary Waters Canoe Area Wilderness established. Olson was also an accomplished nature writer. He was a recipient of

the John Burroughs Medal, the highest award that a nature writer can receive. Today, Olson remains a towering figure in the annals of wilderness protection, and so the naming of an outstanding pine in Monroe State Forest for him seemed appropriate. Let's take a look at Sigurd's pine:

The pine is obviously large, but how large? Suppose I tell you that it is 12.3 ft around at the height of my chest, and that its highest twigs sway in breezes a full 130 ft above its large, widely rooted base. Do these numbers mean much? I suppose it depends on who hears them.

If you are a timber specialist, the dimensions may convey either of two messages. They may suggest that this huge tree has been allowed to stand far too long, that its value as lumber has been compromised. Better the pine had been converted to planks a hundred years ago. Alternatively, the dimensions could remind the timber specialist that the pine is a behemoth, dwarfing the slender young trees being cut so soon in today's myopic financial climate. In this second interpretation, Sigurd's existence serves to remind lumbermen how compromised our woodlands have become.

How might the dimensions sound to other ears? To an architect or engineer, Sigurd's height will compare to a human-designed building about 12 floors high. To a big tree aficionado, Sigurd's girth will stretch the reach of two large people. To a naturalist who emphasizes the qualitative over the quantitative, the numbers simply convey the idea that the pine is a huge organism, fulfilling many roles such as cleaning the air and providing sanctuary for numerous life forms. And finally, to the poetically inclined, the numbers suggest a Treebeard, an overlord of the forest.

Monica was especially drawn, not only to Sigurd, but the environment surrounding the huge pine. She could linger and relate to her surroundings in comfort. Not all of Dunbar's terrain is conducive to meditation. On the slopes above, one must worry about tumbling down or turning an ankle.

The Grandfather Pine

From Sigurd, we moved uphill toward our final destination—two even larger pines growing on the boulder-strewn ridge side. I needed to check on and re-measure both, for each holds a special place in my heart. They were the first truly great New England white pines I discovered in searching for colonial and pre-colonial era trees that possessed the power to rekindle the spirit of New England past.

The pine highest on the ridge is the larger of the two in terms of girth (circumference). I named it the Grandfather pine, and rightly so. Grandfather bears the distinction of being the only New England white pine that the Eastern Native Tree Society (ENTS) has modeled to trunk volume surpassing 1,000 ft^3, the high bar volume mark for the species. Furthermore, Grandfather carries its branches on a single trunk, distinguishing it from multi-trunk, awkward-looking field pines, the result of damage sustained by early white pine weevil attacks, which killed their terminal leaders.

But in its youth, Grandfather suffered no such damage, so it grew tall and straight. Today, the huge tree has achieved a breast-high girth of 14.2 ft. It carries water to its highest twigs 145 ft above its spreading base. Its limbs have become thick. We calculate that Grandfather's combination of trunk and limbs holds between 1,080 and 1,100 ft^3 of wood. The trunk alone exceeds 1,000 cubes. This allows Grandfather to sequester nearly 14,000 pounds of carbon. How can we know this?

In 2007, Will Blozan, President of ENTS, climbed and measured Grandfather. Will took circumferential measurements every few feet to develop a geometrical model of the trunk. We concluded that Grandfather held 977 ft^3 of wood in its trunk. We calculate that the tree is adding volume at the rate of about 8 ft^3 per year. So today we believe its volume to be between 1,000 and 1,010 cubes. To emphasize how large this is, so far, we have not found Grandfather's equal anywhere in Massachusetts for single-trunk white pines, and Grandfather has only one competitor in all New England.

It is important to note that very few white pines are lucky enough to seed in just the right places to have a chance of reaching a size suggestive of what the species is capable of achieving, based on anecdotal accounts of yesteryear. Even if a pine does get a good start on life in an ideal location, it is highly unlikely that the pine will be allowed to grow for a

century, let alone two. Let's now take a look at Grandfather. Again, I pose for scale:

The Thoreau Pine

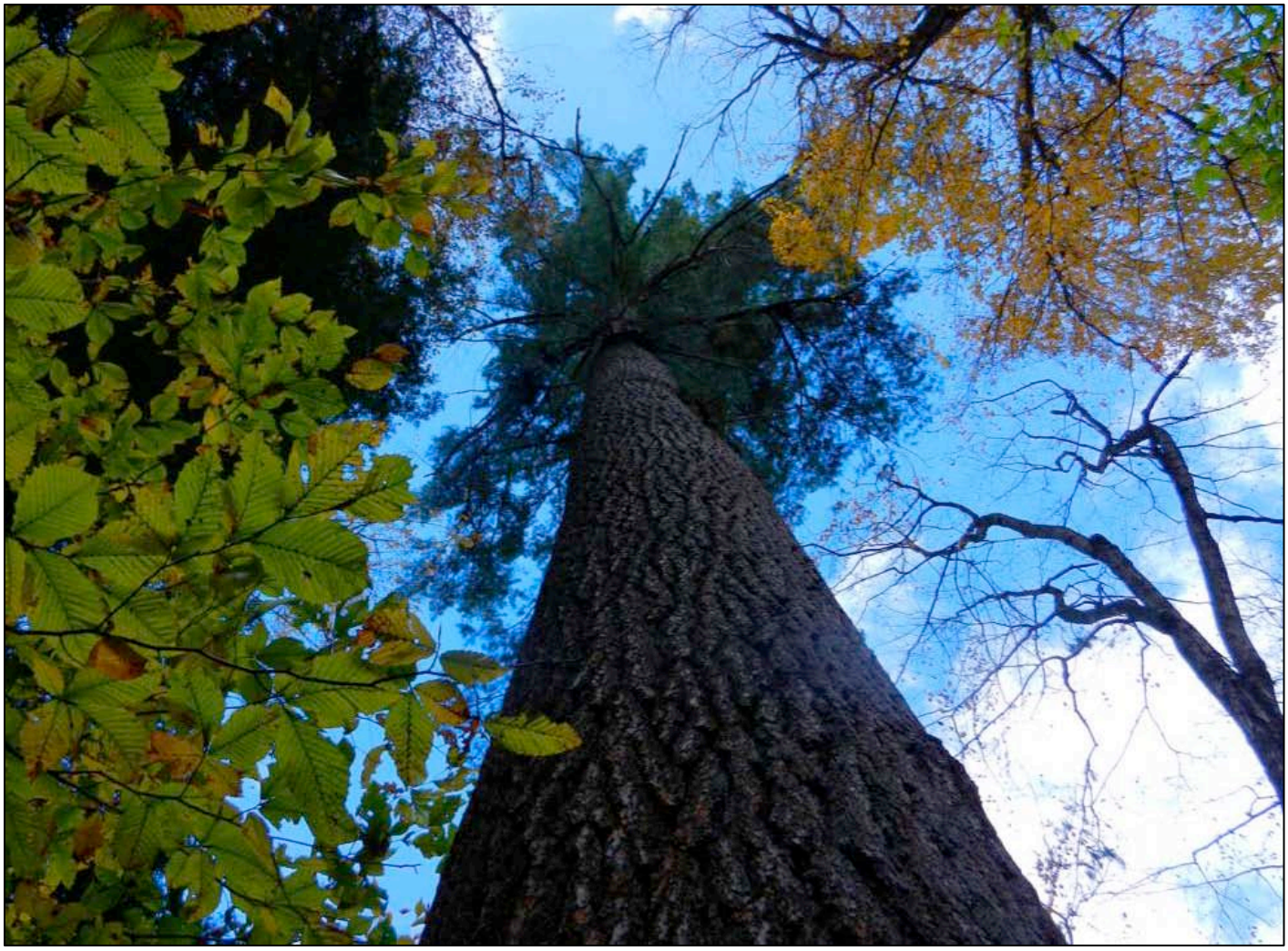
On the ridge just below Grandfather, the other giant rears its head. It is probably an offspring of Grandfather. Judging by outward characteristics, junior began life between 150 and 170 years ago. Consequently, this second pine would have been a seedling or sapling when Henry Thoreau passed on. It is appropriately named the Thoreau Pine. Both Grandfather and Thoreau thrust their crowns far above a 100 plus-foot tall hardwood canopy. You would think they would be easy to see. However, spotting either pine from the ground and lower on the ridge is practically impossible. The vegetation is much too thick. So who found Grandfather and Thoreau and how?

Well, it was around 1987, if I recall correctly. My son Rob and I were out searching for big pines and we were scrambling around on the opposite side of Dunbar Brook from Grandfather and Thoreau, about a third of the way up the ridge, as I recall, when we both sang out simultaneously. There on the other side of Dunbar were the crowns of what were obviously two huge pines. From where we stood, they appeared to overshadow any of the pines we had previously seen. A much younger Bob, full of woodsman spunk, and his athletic son spoke not a word. We tore down the ridge headed in the direction of the two pines. We jumped in and forded Dunbar Brook without a thought to getting wet or slipping on the rocks. We were on a mission. Once on the other side, we scrambled up the banks, continuing in the direction where we thought we'd find the trees. As if guided by an unseen hand, we homed right in on the pines that were to eventually be named Grandfather and Thoreau.

Thoreau, the lower on the ridge of the two, loomed high overhead, and the significance of the discovery quickly became apparent. Here was a tree to fan the flames of tree passion, to appeal to the imagination of artist, poet and lumberman alike. The rest is history. I eventually attracted a group of foresters to visit the tree with me. They were duly impressed. Later Jack Sobon, a timber framer and architect friend who happened to own a transit, and I, measured the Thoreau pine to a height of 152.4 ft (give or take about an inch and a half). I'm unsure of its exact circumference at the time, because we didn't mark the point on the trunk at which we measure its girth, but the Thoreau pine would have been at least 12 ft around. These two measurements, height and girth, were taken around 1990.

With the transit-based height measurement ensuring accuracy, the Thoreau pine became the first of its species in Massachusetts to be accurately confirmed to a height of 150 ft, fulfilling the descriptions of great pines of yesteryear, the passing of which Thoreau bemoaned.

Climbing up the ridge from the Sigurd Olson pine, I pointed out Thoreau's crown to Monica. You can't see Grandfather's crown until you reach the base of Thoreau, so it is Henry's tree



that greets guests coming up the ridge from Dunbar Brook, and Grandfather for those descending the ridge. The appearance of Thoreau is always electrifying for me. I instantly feel the connection. Recalling my estimate of Thoreau's 1990 girth of 12 ft, the tree now measures an impressive 13.3 ft around at chest height. It is an easy measurement to take. However, Thoreau's height has always been a challenge to measure. The tree grows on a steep slope with tall hardwoods all around, and it has a broad, flat crown with many twigs that vie for dominance.

Thoreau has lost its apical dominance, meaning that there is no longer one leader that grows straight to maintain a single trunk and visibly the highest point. After all, Thoreau has seen many seasons pass, and has taken numerous hits from wind, ice, and snow. The only way we were going to be sure of its height was to climb and tape drop measure it. So, in 2004, Will Blozan and Dr. Robert Van Pelt (University of Washington) headed a team that climbed Thoreau and established an absolute height through tape drop of 160.2 ft.

However, subsequent ground-based measurements never confirmed the 160.2-ft height because of visibility problems described above. So, a couple of growing seasons ago, Thoreau was climbed again by Andrew Joslin and Bart Bouricius and a height of 156.5 ft was obtained. Had Thoreau lost is highest leader, or had a different top been measured? We couldn't be sure, but Thoreau lost status. Monroe State Forest was no longer the only location in Massachusetts other than Mohawk Trail State Forest with white pines reaching the important height threshold of 160 ft. I felt let down. We needed to take another crack at locating the highest sprig in Thoreau's crown. So, on this occasion, I established a viewing location from well uphill where I could see both crown and a point on the trunk where I had placed a highly reflective marker.

After multiple ground-based measurements taken with my Laser Technologies TruPulse 360 hypsometer and my Nikon Prostaff 440 laser rangefinder, while Monica sat patiently beside Grandfather absorbing the molecules, I satisfied myself that I had found the Thoreau's top. I am pleased to announce that Thoreau has regained its status, in fact it has been elevated. My measurements of a sprig on the opposite side of the crown from the 156.5-ft tape drop gave exactly 160.2 ft. I doubt that it is the same point as measured in 2004. Rather it probably represents a spurt of growth from internodes on the west side of the crown. You can see the particular growth candle in the uphill image of Thoreau, first of the three. The

160.2-ft spot is the rightmost vertical growth candle in the image. In fact, that sprig appears to be the highest point viewed looking uphill, but this sprig is difficult to locate from above Thoreau, and impossible to measure from below.

So how is it that Thoreau has gained additional status? There are 14 white pines in Massachusetts that reach the height of 160 ft. Thoreau is one of them. There are two pines in New England that have the combined dimensions of a 12-ft or greater girth and a height of 160 ft or more. Thoreau is one of the two. But Thoreau is the only white pine in New England we know of that combines the dimensions of girth, 13 ft or more with a height of 160 ft or more. In fact, with the death of the Cornplanter pine in Anders Run, Pennsylvania, Thoreau is the only pine in the Northeast that achieves this distinction. Viva la Thoreau!

TIME TO RETURN

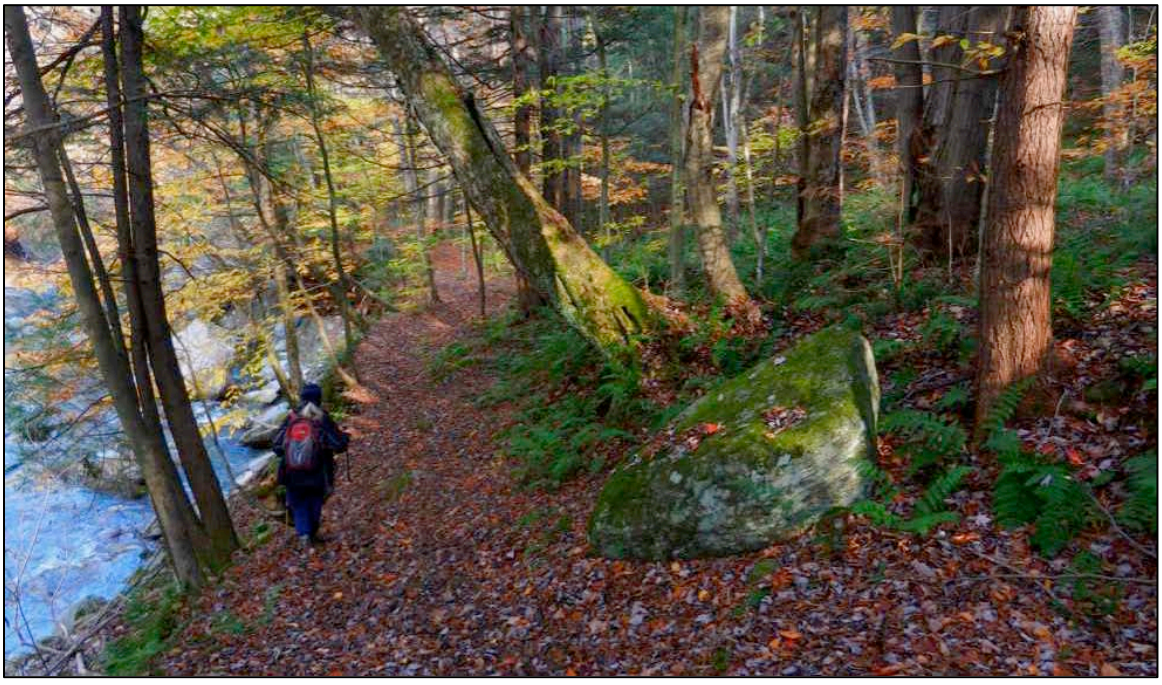
From Grandfather and Thoreau, we made our way down the ridge, back past Sigurd Olson, and on to Dunbar Brook. Following a rocky route along edge of the brook, we returned to the trail, where the walking instantly became easy. I had accomplished my mission and could relax. I settled into just enjoying what a New England fall is all about. The early cloudiness had abated. The sun had broken through and rays of light spotlighted the crowns and trunks of the trees. The foliage of the beeches was especially beautiful. In the image below we see Monica making her way back on a carpet of leaves with dappled sunlight illuminating nearby trees.

THE MEANING OF IT ALL

In a recent gathering of the Friends Network to our state forests and parks, I was inspired by a lady from the Boston area who was doing everything she could to stave off development along a nature corridor bordering the Charles River. Her persistence reflected her deep love for small, vulnerable surviving nature corridor. She spoke proudly of the foxes, coyotes, various species of birds, and rare plants that would be lost were development to convert the precious green space into a corporate venture. People come to the aid of nature when it is threatened in places they hold dear.

It was with this sense of mission that I sought to get parts of Monroe State Forest declared as a forest reserve. With the help of others, most notably, the Massachusetts Audubon Society and the DCR, I can say with relief, that the Dunbar corridor is part of Forest Reserve #9. I believe with many who have walked the trail along Dunbar Brook or looked into the Deerfield River Gorge from the observation platform on Hunt Hill, that there is no amount of protection too much for this forest gem. Many will walk the trail and feel the sense of peace and tranquility induced by the tumbling of Dunbar over large glacial boulders. They will marvel at the mature forest and how luxuriant it looks. Only a few will ever know the exact whereabouts of the great pines that overlook the cascading brook. The seclusion of Sigurd, Grandfather, and Thoreau is essential for their protection. Trees like these can literally be loved to death. Yet, their effects can still be felt. Forest giants cast long shadows. Their massive energy fields extend beyond their presence.

The massive forms of Grandfather, Thoreau, and Sigurd are not only inspiring to see, but more fundamentally, reflect the raw power of Dunbar's forests. Fortunately, visitors do not have to negotiate tricky boulder fields and steep slopes to experience this primal power. A simple, relaxing walk along the nature trail will do it. The rewards are spiritual renewal and an unforgettable experience in wood-air-bathing.



UPDATES IN DENDROMORPHOMETRY

Robert T. Leverett

Founder, Eastern Native Tree Society

I finally jumped into the huge project of revising our draft book on Dendromorphometry. Folks, it is no small task. I'd been dragging my feet, knowing what lay ahead. The first draft, which was a huge undertaking in itself, languished while several of us forged ahead, developing new methods of tree measuring. But, it became apparent that we needed to hold off and allow time for developments to be completed. However, now it is time to produce, to get the show on the road. I am confident that we've got enough material to write one heck of a book. In fact, we have so much material that our plan is to divide it into elementary, intermediate, and advanced sections on tree measuring.

For new members who are unfamiliar with the book project, when completed, we believe that the book will be the definitive guide to measuring trees in the field, at least for the types of measurements that interest us, and by dividing the book into three distinct sections, we will be providing material for the widest range of potential readers. Folks who are just beginning will find straightforward explanations of tree measuring. That section will basically be a Tree Measuring 101 guide. It will stand on its own. For people who want to achieve the highest levels of accuracy attainable with affordably priced laser rangefinders, clinometers, and compasses available today, the intermediate section has them in mind. And for those who want to push the envelope as far as it can be pushed, we will have an advanced section. The heavy math types can check out our formulas by following our derivations in the appendices. In addition to mathematical derivations, there will be other appendices that give interesting lists of all kinds—measurements for outstanding trees. We will also have appendices that evaluate specific equipment. This latter set could almost be a book itself.

I expect that there will eventually be more than one version of our book. The initial plan is to produce a hardcopy version. Later there could be Internet options. I don't know how that would work, but as you might expect, the Internet is where Ed Frank comes in. But we need to get much farther down the road before bugging Ed. However, at some point, Ed's role will become important, and sooner than later, if it turns out that a hardcopy version proves not to be feasible.

As a side issue, and to keep all of you informed, Michael Taylor and I had a second consultative session with Laser Technologies Inc. (LTI). LTI makes the Impulse 200LR, the RD1000, the TruPulse 200, and the TruPulse 360, among other instruments. Michael owns an Impulse 200LR and a TruPulse 200. I own an RD1000, a TruPulse 200, and a TruPulse 360. Michael now has on loan a TruPulse 360 and advanced mapping software. LTI is serious about the recommendations we made in the first consultation session. What is especially exciting now is that it appears that American Forests will be part of this meeting, courtesy of Michael's invitation to them. This is an important development, and opens the door to American Forests becoming a more important player in "high-end" tree measuring. That can only lead to good things for all concerned. In particular, it could result in closer cooperation between American Forests and NTS. That is a relationship that I have sought in the past, and almost pulled off a couple of times, but the stars weren't in alignment then. Now, they just may be…

I realize that many NTS members are not into heavy tree measuring, and that is just fine. There is no reason for every Ent to pursue the quantitative side of our passion. There is plenty to do along artistic, historical, and cultural lines, and just simple enjoyment of trees with no particular goal in mind. So, please don't view those of us with the measuring gene jumping all the time as not considering the other missions of NTS as equally important to our own. However, I do hope that all members will take pride in being part of what is arguably the Cadillac tree measuring group on the planet. No false modesty there, folks. Facts are facts. We produce!

INSTRUCTIONS FOR CONTRIBUTORS

SCOPE OF MATERIAL

The *Bulletin of the Eastern Native Tree Society* accepts solicited and unsolicited submissions of many different types, from quasi-technical field reports to poetry, from peer-reviewed scientific papers to digital photographs of trees and forests. This diverse set of offerings also necessitates that (1) contributors specifically identify what type of submission they are providing; (2) all submissions should follow the standards and guidelines for publication in the *Bulletin*; and (3) the submission must be new and original material or be accompanied by all appropriate permissions by the copyright holder. All authors also agree to bear the responsibility of securing any required permissions, and further certify that they have not engaged in any type of plagiarism or illegal activity regarding the material they are submitting.

SUBMITTING A MANUSCRIPT

As indicated earlier, manuscripts must either be new and original works, or be accompanied by specific written permission of the copyright holder. This includes any figures, tables, text, photographs, or other materials included within a given manuscript, even if most of the material is new and original.

Send all materials and related correspondence to:

Don C. Bragg
Editor-in-Chief, *Bulletin of the ENTS*
USDA Forest Service-SRS
P.O. Box 3516 UAM
Monticello, AR 71656

Depending on the nature of the submission, the material may be delegated to an associate editor for further consideration. The Editor-in-Chief reserves the right to accept or reject any material, regardless of the reason. Submission of material is no guarantee of publication, but does imply the consent to do so.

All submissions must be made to the Editor-in-Chief in digital format. Manuscripts should be written in Word (*.doc), WordPerfect (*.wpd), rich-text format (*.rtf), or ASCII (*.txt) format.

Images can be submitted in any common format like *.jpg, *.bmp, *.tif, *.gif, or *.eps, but not PowerPoint (*.ppt). Images must be of sufficient resolution to be clear and not pixilated if somewhat reduced or enlarged. Make sure pictures are at least 300 dots per inch (dpi) resolution. Pictures can be color, grayscale, or black and white. Photographs or original line drawings must be accompanied by a credit line, and if copyrighted, must also be accompanied by a letter with express written permission to use the image. Likewise, graphs or tables duplicated from published materials must also have expressly written copyright holder permission.

PAPER CONTRIBUTIONS (ALL TYPES)

All manuscripts must follow editorial conventions and styling when submitted. Given that the *Bulletin* is edited, assembled, and distributed by volunteers, the less work needed to get the final product delivered, the better the outcome. Therefore, papers egregiously differing from these formats may be returned for modification before they will be considered for publication.

Title Page

Each manuscript needs a separate title page with the title, author name(s), author affiliation(s), and corresponding author's postal address and e-mail address. Towards the bottom of the page, please include the type of submission (using the categories listed in the table of contents) and the date (including year).

Body of Manuscript

Use papers previously published in the *Bulletin of the Eastern Native Tree Society* as a guide to style formatting. The body of the manuscript will be on a new page. Do not use headers or footers for anything but the page number. Do not hyphenate text or use a multi-column format (this will be done in the final printing). Avoid using footnotes or endnotes in the text, and do not use text boxes. Rather, insert text-box material as a table.

All manuscript submissions should be double-spaced, left-justified, with one-inch margins, and with page and line numbers turned on. Page numbers should be centered on the bottom of each new page, and line numbers should be found in the left margin.

Paragraph Styles. Do not indent new paragraphs. Rather, insert a blank line and start the new paragraph. For feature articles (including peer-reviewed science papers), a brief abstract (100 to 200 words long) must be included at the top of the page. Section headings and subheadings can be used in any type of written submission, and do not have to follow any particular format, so long as they are relatively concise. The following example shows the standard design:

FIRST ORDER HEADING
Second Order Heading
Third Order Heading. The next sentence begins here, and any other levels should be folded into this format.

Science papers are an exception to this format, and must include sections entitled "Introduction," "Methods and Materials," "Results and Discussion," "Conclusions," "Literature Cited," and appendices (if needed) labeled alphabetically. See the ENTS website for a sample layout of a science paper.

Trip reports, descriptions of special big trees or forests, poetry, musings, or other non-technical materials can follow less rigid styling, but will be made by the production editor (if and when accepted for publication) to conform to conventions.

Table and figure formats. Tables can be difficult to insert into journals, so use either the table feature in your word processor, or use tab settings to align columns, but DO NOT use spaces. Each column should have a clear heading, and provide adequate spacing to clearly display information. Do not use extensive formatting within tables, as they will be modified to meet *Bulletin* standards and styles. All tables, figures, and appendices must be referenced in the text.

Numerical and measurement conventions. You can use either English (e.g., inches, feet, yards, acres, pounds) or metric units (e.g., centimeters, meters, kilometers, hectares, kilograms), so long as they are consistently applied throughout the paper. Dates should be provided in month day, year format (June 1, 2006). Abbreviations for units can and should be used under most circumstances.

For any report on sites, heights must be measured using the methodology developed by ENTS (typically the sine method). Tangent heights can be referenced, especially in terms of historical reports of big trees, but these cannot represent new information. Diameters or circumference should be measured at breast height (4.5 ft above the ground), unless some bole distortion (e.g., a burl, branch, fork, or buttress) interferes with measurement. If this is the case, conventional approaches should be used to ensure diameter is measured at a representative location.

Taxonomic conventions. Since common names are not necessarily universal, the use of scientific names is strongly encouraged, and may be required by the editor in some circumstances. For species with multiple common names, use the most specific and conventional reference. For instance, call *Acer saccharum* "sugar maple," not "hard maple" or "rock maple," unless a specific reason can be given (e.g., its use in historical context).

For science papers, scientific names MUST be provided at the first text reference, or a list of scientific names corresponding to the common names consistently used in the text can be provided in a table or appendix. For example, red pine (*Pinus resinosa*) is also known as Norway pine. Naming authorities can also be included, but are not required. Be consistent!

Abbreviations. Use standard abbreviations (with no periods) for units of measure throughout the manuscript. If there are questions about which abbreviation is most appropriate, the editor will determine the best one to use. Here are examples of standardized abbreviations:

inch = in	feet = ft
yard = yd	acre = ac
pound = lb	percent = %
centimeter = cm	meter = m
kilometer = km	hectare = ha
kilogram = kg	day = d

Commonly recognized federal agencies like the USDA (United States Department of Agriculture) can be abbreviated without definition, but spell out state names unless used in mailing address form. Otherwise, spell out the noun first, then provide an abbreviation in parentheses. For example: The Levi Wilcoxon Demonstration Forest (LWDF) is an old-growth remnant in Ashley County, Arkansas.

Citation formats. Literature cited in the text must meet the following conventions: do not use footnotes or endnotes. When paraphrasing or referencing other works, use the standard name date protocol in parentheses. For example, if you cite this issue's Founder's Corner, it would be: "…and the ENTS founder welcomed new members (Leverett 2006)." If used specifically in a sentence, the style would be: "Leverett (2006) welcomed new members…" Finally, if there is a direct quotation, insert the page number into the citation: (Leverett 2006, p. 15) or Leverett (2006, p. 16-17). Longer quotations (those more than three lines long) should be set aside as a separate, double-indented paragraph. Papers by unknown authors should be cited as Anonymous (1950), unless attributable to a group (e.g., ENTS (2006)).

For citations with multiple authors, give both authors' names for two-author citations, and for citations with more than two, use "et al." after the first author's name. An example of a two-author citation would be "Kershner and Leverett (2004)," and an example of a three- (or more) author citation would be "Bragg et al. (2004)." Multiple citations of the same author and year should use letters to distinguish the exact citation: Leverett 2005a, Leverett 2005b, Leverett 2005c, Bragg et al. 2004a, Bragg et al. 2004b, etc.

Personal communication should be identified in the text, and dated as specifically as possible (not in the Literature Cited section). For example, "…the Great Smoky Mountains contain most of the tallest hardwoods in the United States (W. Blozan, personal communication, March 24, 2006)." Examples of personal communications can include statements directly quoted or paraphrased, e-mail content, or unpublished writings not generally available. Personal communications are not included in the Literature Cited section, but websites and unpublished but accessible manuscripts can be.

Literature Cited. The references used in your work must be included in a section titled "Literature Cited." All citations should be alphabetically organized by author and then sorted by date. The following examples illustrate the most common forms of citation expected in the *Bulletin*:

Journal:

Anonymous. 1950. Crossett names giant pine to honor L.L. Morris. Forest Echoes 10(5):2-5.

Bragg, D.C., M.G. Shelton, and B. Zeide. 2003. Impacts and management implications of ice storms on forests in the southern United States. Forest Ecology and Management 186:99-123.

Bragg, D.C. 2004a. Composition, structure, and dynamics of a pine-hardwood old-growth remnant in southern Arkansas. Journal of the Torrey Botanical Society 131:320-336.

Proceedings:

Leverett, R. 1996. Definitions and history. Pages 3-17 *in* Eastern old-growth forests: prospects for rediscovery and recovery, M.B. Davis, editor. Island Press, Washington, DC.

Book:

Kershner, B. and R.T. Leverett. 2004. The Sierra Club guide to the ancient forests of the Northeast. University of California Press, Berkeley, CA. 276 p.

Website:

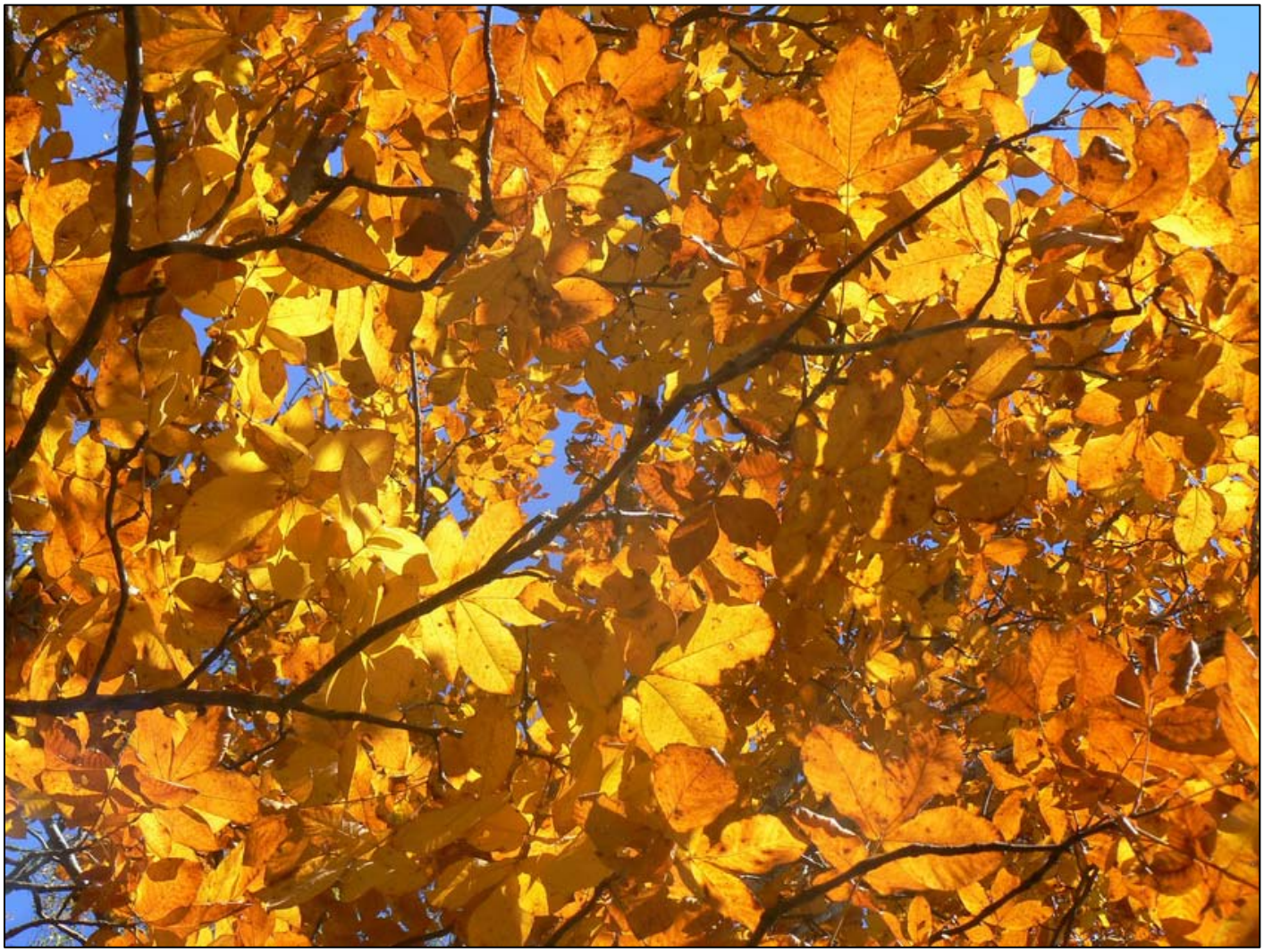
Blozan, W. 2002. Clingman's Dome, May 14, 2002. http://www.uark.edu/misc/ents/fieldtrips/gsmnp/clingmans_dome.htm. Accessed June 13, 2006.

Use the hanging indent feature of your word processor (with a 0.5-in indent). Do not abbreviate any journal titles, book names, or publishers. Use standard abbreviations for states, countries, or federal agencies (e.g., USDA, USDI).

ACCEPTED SUBMISSIONS

Those who have had their submission accepted for publication with the *Bulletin of the Eastern Native Tree Society* will be mailed separate instructions to finalize the publication of their work. For those that have submitted papers, revisions must be addressed to the satisfaction of the editor. The editor reserves the right to accept or reject any paper for any reason deemed appropriate.

Accepted materials will also need to be accompanied by an author contract granting first serial publication rights to the *Bulletin of the Eastern Native Tree Society* and the Eastern Native Tree Society. In addition, if the submission contains copyrighted material, express written permission from the copyright holder must be provided to the editor before publication can proceed. Any delays in receiving these materials (especially the author contract) will delay publication. Failure to resubmit accepted materials with any and all appropriate accompanying permissions and/or forms in a timely fashion may result in the submission being rejected.



The brilliant golden foliage of a hickory decorates the landscape of Horseshoe Bend National Military Park in eastern Alabama. Photo by Don C. Bragg.