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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.

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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: An ancient chinkapin oak is examined by Dr. Ryan McEwan (in orange) and students in Griffith Woods near Lexington, Kentucky. Photo by Neil Pederson.

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CHANGE—LET'S HOPE FOR THE BETTER!

Change! This sweeping theme helped usher in a new administration in Washington—let's hope one that is more favorable to the environment. Economic change is also in the works, and hopefully this will go smoothly for the forests of the world. Unfortunately, in hard economic times good silvicultural practices and the desire to preserve special places are often subsumed by expedience and financial pressures. The drive to increase biofuel production and consumption may witness large-scale environmental degradation unless properly implemented—untold millions of acres of tropical rain forest, marginal prairie and wetlands, and even virgin boreal forests face the very real risk of being cleared for oil palm plantations, corn and soybean fields, or wood chip production. This threat makes the multiple missions of the Eastern Native Tree Society all the more relevant in today's society, and calls every Ent to practice both good stewardship and good public relations to help ensure we do not build a strong economy by destroying irreplaceable parts of the environment.

Don C. Bragg
Editor-in-Chief

An ancient baldcypress along the Saline River in southern Arkansas and a slough filled with its younger brethren prepare to weather the spring floods. Photo by Don C. Bragg.

ANNOUNCEMENTS AND SOCIETY ACTIONS

ENTS Measuring Blitz on the Congaree Scheduled

After some planning, the ENTS measuring effort in the Congaree is almost here! Final details have yet to be worked out, but a climb of the current national champion loblolly pine is planned Friday (meet at the Congaree Swamp National Park visitor center at 9:30 a.m.). A social is being planned for the afternoon/evening of Friday, February 20, 2009 (time and place yet to be determined). The main effort (height measuring) will begin 8 a.m. Saturday, February 21, departing from the Congaree Swamp National Park visitor center (come early!). The measuring effort will continue through the day on Saturday and into Sunday, and perhaps even Monday, depending on peoples' schedules. There are few organized events—we anticipate individuals or groups will choose the measurement track of their greatest interest. Come join us in this important endeavor!

ENTS Rendezvous at Cook Forest Set

Dale Luthringer reports that the biennial Cook Forest ENTS Rendezvous has been scheduled for October 3-4, 2009, at Cook Forest State Park near Cooksburg, Pennsylvania. Dale promises more details to follow shortly…

Other Events of Possible Interest to Ents

Below is a list of tree-related non-ENTS sponsored events happening soon that ENTS membership may be interested in:

The Tri-State Forest Stewardship Conference is being held March 14, 2009, at Sinsinawa Mound Center at Sinsinawa, Wisconsin. This conference is designed for landowners from Iowa, Illinois, and Wisconsin, but agency professionals, consultants, forestry industry representatives and others interested in woodlands and natural resources are welcome. The sessions provide participants with the knowledge and skills to manage woodlands using good stewardship principles. For more information or to register, check out: http://www.forestry.iastate.edu/

Wild South and the Clinch Coalition present: Saving Our Hemlocks, a March 27-28, 2009, workshop bringing landowners and land managers together to find solutions to protect hemlock forests. This workshop is located at Natural Tunnel State Park's Cove Ridge Center (www.coveridge.com) in Duffield, Virginia, and is FREE and open to the public. For more information and to register visit: www.wildsouth.org or contact Ben Prater at ben@wildsouth.org

The 19th Annual North American Dendro-ecological Fieldweek (NADEF) will be held at Hampshire College in Amherst, Massachusetts. The fieldweek will run from June 4-12, 2009, and registration fees will be $700 US for students and $850 US for professionals. Students should send a photocopy of their student ID with their registration. Your registration fee includes room and board for the entire week and also transportation to and from the Bradley International Airport (BLD) in Hartford, Connecticut. If you are interested in a place at the fieldweek or have any questions, please contact Jim Speer (jspeer3@indstate.edu) or check out:

http://dendrolab.indstate.edu/nadef/

One of the many giant loblolly pines in the Congaree Swamp National Park near Columbia, South Carolina.

Photo by Don C. Bragg.

EASTERN WHITE PINE PROFILES: A SURVEY OF THE STATURE OF *PINUS STROBUS* IN MASSACHUSETTS IN TERMS OF VOLUMES, HEIGHTS, AND GIRTHS

Robert T. Leverett

Executive Director, Eastern Native Tree Society

INTRODUCTION

For many New England tree aficionados, the eastern white pine (*Pinus strobus*) is the icon of their beloved corner of the United States. If there is a competitor to the white pine, it would have to be the autumnally regal sugar maple. The race for top position between the competitors is close, but there are reasons for many of us settling on the white pine. We will look at some of the reasons.

Beyond New England, the species enjoys wide popularity. To quote from Wikipedia:

> Eastern White Pine is the provincial tree of Ontario and the state tree of Maine and Michigan and its "pine cone and tassel" is the "state flower" of Maine. Sprigs of Eastern White Pine were worn as badges as a symbol of Vermont identity during the Vermont Republic and appears in a stained glass window at the Vermont State House, on the Flag of Vermont and the naval ensign of the Commonwealth of Massachusetts. It is occasionally known as White Pine, Northern White Pine, or Soft Pine. It is also known as Weymouth Pine, especially in Britain. In addition, this tree is known to the Haudenosaunee Native Americans as the Tree of Great Peace.

This conifer is the only native five-needle pine in eastern North America. It boasts many current and historical uses to keep it as a practical part of our lives. In historical times the white pine was, and is again today, a valuable timber source. In fact, the white pine's economic importance was second to none during part of the colonial era. However, for true tree lovers, this noble species represents far more than a convenient source of lumber. The eastern white pine is the sacred tree of peace of the Iroquois and Algonquin speaking Indian nations. Its inner bark provided native peoples with a food source. The white pine is also an important wildlife tree.

Eastern white pine's geographical range is extensive. It ranges from southern Canada south the mountain of Georgia, South Carolina, and Alabama and westward to Iowa. It has close relatives in Mexico and in the western United States such as the western white pine (*Pinus monticola*). It can endure the intense cold of Minnesota where temperatures plummet to 45 to 50 degrees below zero Fahrenheit and have even reached minus 60° F.

Most notable is the physical appearance of the species. Its foliage is a very attractive blue-green. The needles are from 2 to 5 inches in length and persist on the tree for 18 to 24 months. The seeds are small and wind dispersed. The white pine is monoecious, having both sexes on the same tree. Mature white pines are attractive trees and old-growth specimens are the essence of stateliness. However, when growing in stands, as a young tree, white pines are cluttered with dead lower limbs. Their appearance can be most unattractive. But as the dead limbs slowly drop off, and the foliage becomes concentrated far up the trunk, in advanced age the white pine becomes regal, outgrowing all other eastern species with the possible exception of the tuliptree (*Liriodendron tulipifera*) in certain locales. In fact, tales of tall white pines are the stuff of big tree legends.

Regrettably, since the appearance of Europeans in North America, the white pine has not been treated kindly. It has suffered from attacks by the white pine weevil and the white pine blister rust. Weevil damaged trees can be contorted and valueless as timber. Entire stands can be compromised.

For some of us, the singular physical distinction of the white pine is its unsurpassed stature. The white pine is our tallest eastern species of tree, and as such, the white pine is especially important to ENTS. We measure the white pine, track its growth, and document significant trees and stands throughout its native range. The white pine is the only native eastern species that ENTS has measured to 200 ft, 207 ft to be precise, and that tree is the famous Boogerman Pine, first measured by Will Blozan and myself in June 1995. But crown breakage from a heavy snow in the fall of 1996 dealt the champion a foul blow. Its crown was pared back to 180 ft. Since then, it has regrown. Its current height is 188.9 ft—still the tallest known tree of any species in the eastern United States.

Tall tree stories abound for many species, but it is incontestable that the white pine reaches loftier heights than any other eastern species. Many anecdotal accounts exist of trees reaching heights of over 200 ft in the 1600s and 1700s. I am sad to say that most of the older reports are of doubtful authenticity. In colonial reports, exaggerations were likely mixed with nonstandard values for the inch and the foot, leading to accounts of trees reaching improbable heights of 264 ft in unlikely locations like Lancaster, New Hampshire. Other reports from New York, Vermont, and Massachusetts suggest the existence of extraordinary pines in colonial times. We can never know the truth about the early forest giants, but an active mission of ENTS is to determine the maximum limits of growth for the species and where it achieves those limits, range-wide and regionally.

To track white pine growth, five measurements are recorded by ENTS: trunk volume, height, girth, average crown spread, and maximum limb length. In this article, we will deal with three of these measurements: trunk volume, height, and girth. We will address volume first.

VOLUME MODELING

Over the past several years, much of the ENTS research in Massachusetts has concentrated on modeling white pines for trunk volume and calculating annual rates of volume increase. Trees have been climbed and tape-drop-measured to establish accurate height baselines and to calculate girths at set intervals of trunk length. In climbs of several prominent white pines in Mohawk Trail State Forest (MTSF) and Monroe State Forest (MSF), girth measurements have been taken at intervals of trunk length according to one of two protocols:

1. Set intervals of 1 meters or yard,
2. Variable distances to match points of inflection along the trunk.

Either method allows us to model trunk volume to within 2 to 5 percent of the water displacement volume. We emphasize that to obtain accurate baseline data, tree climbs have been made. Only through actual climbs can we develop tree profile data to the level of accuracy that we seek that allows us to develop the estimation factors such as described in this article. All climbs have been performed by or under the supervision of master climber Will Blozan, President of ENTS. The following table lists the specific tree climbs that Will Blozan has made in Massachusetts. The table includes two species, white pine and eastern hemlock.

Noteworthy in the above table is the calculation of annual height growth. If a tree has not been re-measured since the last climb, annual growth is not calculated. Four trees have been climbed more than once. The record-holder is the Jake Swamp Tree in MTSF. It has been climbed 3 times over a 10-year period and our measurements show that during this time, the Jake Swamp Tree overall has averaged 0.99 ft of height per year. This average incorporates some re-growth from minor crown breakage. The total growth probably averages between 1.1 and 1.3 ft annually, a surprising rate of growth considering that the Jake Swamp pine is around 150 years in age. The Saheda Pine, also in MTSF, has been climbed twice.

The main reason for our concentrated focus on the Jake Swamp and other pines in MTSF and MSF is to obtain a better understanding volume growth for very large, mature pines growing on favorable sites for the species. The pines of Mohawk and Monroe meet this description. In particular, the Indian Pines of MTSF, as we call them, and two pines in MSF have provided us with our most significant data. The MTSF and MSF pines are characterized by the following attributes:

1. have the tallest accurately measured trees in New England;
2. exhibit sustained high growth rates for mature pines;
3. possess excellent form with most trees being free of weevil damage;
4. provide us with a record of what stand-grown white pines are capable of achieving in girth, height, and total volume for an age span of 60 to 180 years; and
5. provide us with picture of how self-thinning occurs over a time period of 120 years.

Table 1. Will Blozan's Massachusetts tree climbs from November 1998 to November 2008.

Tree	Date	Property	Stand	Height when first measured (ft)	Current height (ft)	Average annual growth (ft)
Jake Swamp	November 1998	MTSF	Trees of Peace	158.6	168.5	0.99
Saheda	November 1998	MTSF	Elders	158.3	164.1	0.58
Jake Swamp	October 2001	MTSF	Trees of Peace	160.9	168.5	1.09
Joe Norton	October 2001	MTSF	Trees of Peace	159.6	165.5	0.84
Tecumseh	October 2003	MTSF	Elders	160.1	163	0.58
Thoreau	October 2004	MSF	Dunbar Brook	160.3	160.3	
Metacomet	October 2005	MTSF	Pocumtuck Pines	146.6	147.5	0.30
Ice Glen	October 2006	Laurel Hill Assoc.	Ice Glen	154.4	154.4	
Grandfather	October 2007	MSF	Dunbar Brook	143.3	143.3	
Dunbar Hemlock	October 2007	MSF	Dunbar Brook	115.5	115.5	
Tunkashala	October 2007	Sandisfield SF		99.2	99.2	
Saheda	October 2007	MTSF	Elders	163.6	164.1	0.50
Jake Swamp	November 2008	MTSF	Trees of Peace	168.5	168.5	
Tecumseh	November 2008	MTSF	Elders	163.0	163.0	

Table 2. White pine volume growth analysis for trees listed in Table 1.

Tree name	Form Factor	Girth (ft)	Height (ft)	Year first measured	First volume (ft³)	Girth (ft)	Height (ft)	Last year measured	Last volume (ft³)	Last - first volume	Annual rate (ft³)
Grandfather	0.427	13.6	141.0	2001	886.2	14.1	143.3	2007	967.0	80.8	13.5
Thoreau	0.412	12.2	156.2	2001	762.2	12.6	160.3	2008	864.8	103.0	14.6
King Trout	0.424	11.6	145.4	2001	660.1	11.9	148.6	2008	715.0	54.9	13.7
Jake Swamp	0.395	9.5	155.0	1992	439.7	10.4	168.5	2008	573.0	133.0	8.3
Tecumseh	0.424	11.3	160.1	2003	689.8	11.9	163.0	2008	779.0	89.2	17.8
Saheda	0.382	11.0	158.3	1998	582.3	11.8	163.6	2007	695.0	113.0	12.5
Ice Glen	0.44	12.9	152.9	2001	890.9	13.0	155.5	2006	920.0	29.1	5.8
Jani Tree	0.34	10.4	144.8	2001	423.7	11.0	152.0	2008	502.0	78.3	11.2
Picnic	0.4	9.1	140.6	2002	370.6	9.4	143.5	2008	430.9	60.2	10.0
Joe Norton	0.34	8.9	155.5	1992	333.3	9.6	165.5	2008	518.3	185.0	11.6
Mast Pine	0.424	8.3	150.2	2001	349.1	9.0	155.9	2008	429.1	80.0	11.4
Average											11.9

Accurate measurements of volume growth are hard to obtain. The labor intensive nature of the work necessitates that we concentrate on a few key trees. The following table presents an analysis of the annual growth of 11 significant white pines. Eight are in MTSF, two are in MSF, and one is in Ice Glen, a private conservation property. All but the King Trout, Jani Tree, Picnic, and Mast pines have been climbed, tape drop measured for height, and modeled for volume by taking periodic girth measurements.

The average annual volume increase of 11.9 ft^3 over the referenced time periods is extraordinary even for the most vigorous of the white pines in MTSF that fall within the 90 to 180-year age class. The lone tree in the above table that is not in MTSF or MSF is the Ice Glen Pine in Stockbridge, Massachusetts, which is around 300 years old or possibly older based on dating of nearby pines. The Ice Glen pine shows a decline in annual volume increase to approximately half of that for the trees in the 90 to 180-year age class. The above volumes apply only to the trunk. Limb volume increase likely adds 0.5 to 1.0 ft^3 to the 11.9 average, for a total average annual increase of 12.4 to 12.9 ft^3 for the listed pines.

It was our prior belief that when the total volumes of the above listed trees are averaged over their life spans, the average annual increase should be on the order of 4 ft^3 per year. The average of 4 ft^3/yr increase in volume over the life of the tree can be demonstrated in several ways and we have no reason to doubt it. Are the modeled pines currently adding volume at three times the hypothesized long term rate? This is a question that we will investigate in this article and will continue to study over the next several years. We need pines to use for comparison purposes. We will begin by examining volume increases of younger pines.

As a comparison of the volume change in older, larger pines as compared to younger trees, the following table shows growth rates and volume increases for some fast growing pines on Broad Brook in Florence, Massachusetts. The Broad Brook pines will be used as a control group for monitoring younger pines in the age range of 75 to 90 years. The Broad Brook pines all have good form and are located on a favorable site to create a valid comparison to the site conditions of the Mohawk pines. The following table lists successive annual measurements for six trees.

Annual radial growth varies between 0.3 and 0.6 inches for the six trees. Height growth varies between 1 and 3 ft. As we anticipated, the smaller trees grow at a higher relative rate, but their actual volume increase is less than the larger trees. The average annual volume increase is 6.76 ft^3, a high but believable figure, as will be seen later in growth simulations.

Table 3. White pine volume growth analysis, with volume increases for young pines (form factor = 0.36).

	Initial			Final							
Tree	Girth (ft)	Height (ft)	Volume (ft³)	Girth (ft)	Height (ft)	Volume (ft³)	Volume diff. (ft³)	Initial radius (ft)	Final radius (ft)	Annual growth (in.)	Years per inch
BB1	6.8	132.0	174.9	7.0	133.0	184.0	9.18	1.1	1.1	0.3	3.49
BB2	6.0	115.0	118.6	6.2	116.5	128.3	9.69	1.0	1.0	0.4	2.62
BB3	5.0	100.0	71.6	5.2	102.0	79.0	7.39	0.8	0.8	0.4	2.62
BB4	3.5	85.0	29.8	3.8	87.0	36.0	6.16	0.6	0.6	0.6	1.75
BB5	3.0	80.0	20.6	3.3	83.0	25.9	5.27	0.5	0.5	0.6	1.75
BB6	2.0	70.0	8.0	2.3	72.0	10.9	2.89	0.3	0.4	0.6	1.75
Average:							6.76				

Some of the older Mohawk pines are growing at a rate of slightly less than double the rate of the young pines in terms of absolute volume increases. In the case of the 180-year old Tecumseh Pine in MTSF, my calculations in Table 2 show an average annual volume increase of 17.8 ft^3. This is an improbable rate, so more analysis is in order. If further analysis confirms the rate of volume increase, the interpretation will be that it requires 2.76 of the smaller Broad Brook Pines to equal the Tecumseh Tree's annual volume increase. In actuality, most of the pines in the Broad Brook area are not adding two feet of height per growing season, but between 1.5 and 2.0 ft.

By simple comparison to the young, healthy, well-formed Broad Brook pines, the volume growth of the larger, older Mohawk pines listed in Table 2 is extraordinary. Can these older pines be growing at such rates? What do we think the rate of volume increase for the Mohawk pines should be?

From a number of ground-based modeling, a large Mohawk pine growing for 150 years can be expected to achieve a trunk volume of around 600 ft^3. By simple division, this represents an annual average of 4 ft^3 of add-on per year.

At this point, our conclusion is that the larger Mohawk pines are sequestering carbon at a very high rate although the percentage change in the radial growths, to be expected, is relatively low. The lesson may be that over-focusing on radial growth may obscure the actual volume increases of the larger, older trees and their role in carbon sequestration. The expected volume increase of a pine in the 150-year age class and in the size and height class of the Mohawk pines and other aspects of volume are investigated more completely in the technical Appendix to this article.

HEIGHT CONSIDERATIONS

Most people gauge bigness in trees principally through trunk diameter. In Massachusetts, eastern cottonwoods, American sycamores, silver maples, American elms, northern red oaks, white oaks, and sugar maples commonly reach greater trunk diameters than do white pines. That is definitely the case in southern New England. Other species such as white ash can also achieve greater diameters than white pines. As an example, within the Connecticut River corridor of Massachusetts, ENTS has measured five American sycamores to greater than 19 ft in girth. There are at least ten sycamores over 16 ft in girth. In the Valley, ENTS has measured 30 hardwoods to girths of 15 ft or more, and there remain many more to document. The number can be expected to be at least double what has already been measured, if not triple.

By contrast, only one single-stemmed white pine has been measured to a girth of 15 ft or more in the Connecticut River corridor. There are probably a few more, but not many. In terms of significant dimensions, it is not large girth that separates the white pine from other species, but great height. As stated in the Introduction, in the stature department, white pines dominate. As a result, ENTS has concentrated on measuring and tracking the stature of this species in Massachusetts.

In addition, ENTS has been answering the following questions:

1. How tall can pines in Massachusetts grow and at what rate?
2. During what age range do pines on good growing sites begin to experience significantly diminished volume and height growth?
3. Do the white pines on Department of Conservation and Recreation (DCR) properties have pines of special significance from the standpoints of size, age, and historical connections?
4. How do the largest and tallest of the Massachusetts pines compare with those in other states?

We will first address the maximum height of white pines in Massachusetts since we have concentrated on measuring tree height in ENTS. To investigate the maximum, we turn to the site where the species is achieving the greatest height growth, MTSF.

Measurements with the Macroscope 25/45 show the average annual height increase to vary from 0.75 to 1.5 ft among the MTSF pines. While the upper limit of height growth for specified age classes for the Mohawk pines is unknown, if the Cook Forest Pines in Pennsylvania provide us with a good examples, we can expect the Mohawk pines to have a practical upper limit of between 170 and 175 ft within 250 to 300 years, with the possibility of one or two pines reaching between 175 and 180 ft. This age-height association equals what is typically considered to be the historical upper limit of the species with a few statistical outliers recognized in the above 200-ft category.

Interestingly, there are no stands of pine elsewhere in Massachusetts to compare with those in Mohawk for reasons we cannot yet explain. This leads us to the question of how commonly do white pines reach different height thresholds and where do we see them reaching the thresholds? The following outline looks at pines in the 100 ft and over class for Massachusetts in terms of how common they are at different thresholds. . We start at 100 ft. Authors of tree identification guides that place the typical height of mature white pines in the 75 to 100-ft class simply do not know the species. Mature white pines on reasonably good sites can be expected to achieve heights in the 100-ft and over class.

White pines over 100 ft: White pines across Massachusetts over 75 years old growing individually or in stands commonly exceed 100 ft in height. Pines of this stature occur in yards, along roadways, graveyards, and in city parks, as well as in stands. On less favorable sites, it can take the white pine upwards of 150 years to reach 100 ft. On highly favorable sites, the white pine can reach 100 ft in as little as 50 or 60 years.

White pines over 120 ft: White pines over 100 years old growing in stands on good sites often exceed 120 ft in height in western Massachusetts and on occasion in eastern Massachusetts. Pines in the 120 ft and over height class do occur as isolated trees, but more commonly occur in stands where competition is strong. Sites in eastern Massachusetts identified to date with pines in the 120-ft height class number around five. Although, there are unquestionably eastern Massachusetts sites, the percentage of the total number with trees in the 120-ft height class and in the 100-year age range is very low.

White pines over 130 ft: Individual trees and stands with white pines over 130 ft in height are uncommon across the Massachusetts landscape. All that have been documented to date occur from the longitude of Petersham, Massachusetts and westward. In many respects, the 130-ft height threshold distinguishes tall white pines throughout New England. Stands with pines over 130 ft in Vermont have proven are extremely rare. As of this report, none have been found in Rhode Island. Massachusetts, New Hampshire, and Connecticut have the most. The low frequency of pines in the 130-ft height class is attributable primarily to land managers cutting the trees at ages of young ages.

White pines over 140 ft: The number of stands in Massachusetts with white pines 140 ft tall and over is extremely small. To date, 11 sites have been documented with one or more pines reaching the 140-ft threshold. There are likely a few that have not been documented, but the number state-wide will probably not exceed 20. Most of the sites with 140-footers have from 1 to 4 trees reaching the threshold. Of the 11 documented stands, two pines representing two of the 11 sites (one pine per site) are in the Connecticut River Valley region. One of the 11 sites has two pines—the Quabbin Reservoir. The remaining sites with pines in the 140-ft class are in the Berkshire region. Three of those sites have a dozen or more 140-footers and one site, MTSF, has over 200.

White pines over 150 ft: Stands with white pines reaching to 150 ft are extremely rare in Massachusetts as well as other New England states. This is the case despite the reporting of stands in colonial times of trees far taller. To date, only four sites have been confirmed in Massachusetts with pines meeting the 150-ft height threshold: MTSF, MSF, the Bryant Homestead in Cummington, and Ice Glen in Stockbridge. A couple of private sites have trees approaching 145 ft, but none over 150. Of the sites with 150-footers, MSF has one, Ice Glen has three, and Bryant Homestead has at most six. MTSF has at least 86 pines that have reached the threshold. By comparison, only one pine has been found in all Maine that reaches 150 ft. None have been documented in Vermont or Rhode Island. There was once a population of white pines in Cornwall, Connecticut, in this height class, but none today. New Hampshire is the only other New England state with multiple sites with 150-footers. One private site in Claremont, New Hampshire has around 60 pines that reach the threshold. A second site has two and two other sites have one each.

White pines over 160 ft: Stands with pines reaching to 160 ft or more number only two in Massachusetts and three in all New England. One of these two Massachusetts sites, Monroe State Forest, has a single pine that reaches to 160 ft. The other site, MTSF, has eight white pines reaching to 160 ft (the total for Massachusetts is nine trees). By comparison, New Hampshire has six pines reaching the 160-ft threshold and those are all on the Claremont site. There are no other 160-footers in New England that we have measured. Prior to July 1989, the Cathedral Pines in Cornwall had several pines that had reached the 160-ft threshold. The single tallest tree in New England is the Jake Swamp Pine in MTSF at 168.5 ft.

An interesting exercise involves the computation of the probability of encountering a white pine in one of the above height classes. Let's assume that 2.5% of Massachusetts forests are white pine and that 33% of the stands and individual trees are mature. If we take the 3,000,000 ac of forested lands in the state, that would give us 24,975 ac of mature pine. If there are 75 trees/ac in mature stands, we arrive at approximately 1,900,000 white mature pines in Massachusetts. With 96 white pines in the 150-ft class, the likelihood of encountering one from a random search is 0.005%. This miniscule percentage better expresses the rarity of trees in the upper height classes than raw numbers of trees. The probability of encountering a tree in the 160-ft class is 0.0005%. By any reasonable measure these greatest of white pines are a very scarce resource.

GIRTH CONSIDERATIONS

Throughout southern New England, mature white pines growing in stands commonly reach girths between 7 and 10 ft. At this time, it is unclear what the diameter distribution of the species is over the major part of its range for trees in different age classes. It is clear, though, that large pines on the order of 12 ft in girth occur with low frequency throughout the natural range of the species. Although the 12-ft threshold is arbitrary, ENTS considers white pines in this girth class to be statistically significant enough to track as a sub-population of the total. White pines exceeding 12 ft in girth generally reflect time growing with limited competition from nearby trees.

Most of the pines in the 12-ft and above girth class are partially to completely open grown, and it is difficult to predict where they will occur. Old pines in this girth class occur across Massachusetts. The largest white pine we have so far found, as a single trunk tree, is 16 ft in girth and grows in the township of Sheffield, Massachusetts. Several pines between 15 and 16 ft have also been located. All are open grown specimens. Non-weevil, stand-grown pines in the 12-ft and over girth class have been documented on around two dozen sites in Massachusetts. The existence of more pines than these is a certainty. Finding them is a labor intensive undertaking, but a picture of their distribution is slowly emerging.

For Massachusetts, and consequently DCR properties, our conclusion is that the probability of a stand of white pines in the 100-200 year age range supporting one or more pines the 12-ft circumference class is relatively small. To date, MTSF, MSF, and Windsor SF are the DCR properties for which we have documented forest-grown pines in this size class. Savoy Mountain State Forest had a single pine in the 12-ft class, but it is now dead. In fairness to the lesser trees, ENTS also tracks smaller size pines in the 10 to 11.99-ft girth class, but being more numerous, they are not considered a scarce resource in

Massachusetts. Mature pines in the 6 to 9-ft circumference class are common throughout Massachusetts where the trees have been permitted to grow for 100 years or more.

The role of each size class in accumulating volume will eventually help us answer questions about the role of individual trees and stands of trees in sequestering carbon. How do stands with larger, older thinly dispersed trees compare with stands populated with younger trees? The prevailing belief has been that larger, older trees serve little purpose in sequestration and that young, fast growing pines are needed. Forestry data suggests that the slow down of diameter growth is correlated to a commensurate slow down in volume growth, but the association is not straightforward. Diameter represents linear growth and volume is growth within a three dimensional context. Slowdown in radial growth rates can occur without slowdown in corresponding cross-sectional area or volume growth. The way this happens is that the rate of radial growth decrease itself slows or ceases while height growth continues unabated.

Table 4. Currently known white pines that meet the significance criteria on DCR properties.

DCR Property	Township	Number of pines
Mohawk Trail SF	Charlemont	86
Monroe SF	Monroe	5
Mt. Tom SR	Holyoke	3
Quabbin Reservoir	Belchertown	2
Windsor SF	Windsor	2
Savoy Mt SF	Savoy	1
Snow Basin Property	Cummington	1
Bash Bish Falls SP	Mt Washington	0
Beartown SF	Monterey	0
Chester-Blandford SF	Chester	0
Clarksburg SP	Clarksburg	0
Connecticut River Greenway SP	Northampton	0
Halibut Point SP	Rockport	0
Hampton Ponds SP	Westfield	0
Mt. Everett SR	Mt Washington	0
Mt. Greylock SR	Adams	0
Mt. Sugar Loaf SR	S. Deerfield	0
Mt. Washington SF	Washington	0
Natural Bridge SP	Clarksburg	0
Purgatory Chasm SR	Sutton	0
Robinson SP	Agawam	0
Skinner SP	South Hadley	0
Wachusett Mountain SR	Princeton	0
Waconah Falls SP	Dalton	0
Total	**all of above**	**98**

SIGNIFICANT WHITE PINES ON DCR PROPERTIES

Use of height and girth thresholds as separate, standalone criteria misses many trees that do not reach one of the two thresholds, but are nonetheless impressive in physical appearance, in the combination of their dimensions, and on in their total volumes. This begs the question of how do develop a more comprehensive criteria to identify significant pines? I propose the following: an individual pine would be considered significant if it reached a height of 150 ft or more, reached a girth of 12 ft or more, or earned at least 1800 ENTS points. ENTS points (P) are calculated for a tree by multiplying height (H) by girth (G) squared and dividing by 10. That is,

$$P = (H \times G^2) / 10$$

In a sense, ENTS points are a surrogate for trunk volume. White pines on DCR properties are tracked by ENTS and the frequency of occurrence of white pines that meet the above criteria is shown Table 4. Properties are also included that have been searched, but with no pines having been found that meet one or more of the significant criterions.

EASTERN-WIDE COMPARISON

As a final topic to highlight white pines of significant stature in Massachusetts, we note some superlative tall trees in the East and where Massachusetts fits in. The tallest accurately measured tree in the eastern United States is the "Boogerman Pine" in the Great Smoky Mountains National Park. The Boogerman Pine is 188.8 ft tall as of the last measurement. The tree is over 350 years old and has suffered one major crown break, but has recovered and is growing annually at the rate of around 5 or 6 inches per year. The tallest accurately measured tree in the Northeast is the Longfellow Pine in Cook Forest State Park, Pennsylvania. This pine is over 300 years old and is currently 183.6 ft tall. The tallest tree in New England is the MTSF's Jake Swamp Pine, which is approximately 150 years old. It is growing at about one foot per year and is currently 168.5 ft tall. All these trees have been climbed and tape-drop-measured by Will Blozan, President of ENTS.

One way of evaluating the tall pines of Massachusetts is to note that Massachusetts has white pine that is only 20 ft shorter than the tallest tree in the eastern United States. This fact speaks to the growing maturity of Massachusetts forests. Barring damage from weather, insects, fungal attacks, etc., in a couple of years the Jake Swamp tree will surpass 170 ft in height and other Mohawk pines will join the collection of 160-footers. The number of 150-footers will eventually surpass 100 and may rival Cook Forest Pennsylvania's old-growth pines.

If stands of white pine are allowed to continue maturing in Massachusetts, we may see a scattering of sites with pines in the 160-ft class. However, the trend on private lands is to cut white pines that reach diameters of two ft or more, so if large and/or tall white pines are to become more numerous in Massachusetts, it will be on public properties and on conservation properties and one property will in all likelihood remain dominant for tall white pines: MTSF. Why this singularly unique property has remained virtually unknown to the general public (except as a convenient campground) is perplexing. It will be a continuing mission of ENTS to ensure adequate protection and recognition for the premier public white pine site of New England.

OLD TREES IN THE INNER BLUEGRASS REGION OF KENTUCKY: NOVEMBER 2008

Neil Pederson

Assistant Professor, Department of Biological Sciences, Eastern Kentucky University, Richmond, Kentucky

I want to share with fellow tree enthusiasts some exciting discoveries and forest ecology research in the Inner Bluegrass Region (IBR) of Kentucky. This region is based primarily of Ordovician limestone and sits upon a slightly higher formation called the Jessamine Dome. The soils of the region are among the most valuable in the commonwealth. The first settlements in Kentucky (Fort Boonesborough, Harrodsburgh, Danville, Logan's Fort, Bryan's Station, etc.), during the late 1700s, are located in the IBR. Of course, horse farms still dominate the region. Thus, there is little forest across the region, except on the Palisades geologic formation along the Kentucky River.

FLORACLIFF NATURE SANCTUARY

I was asked by Beverly James, preserve manager, to look into the age structure of Floracliff Nature Sanctuary along the Inner Bluegrass in southern Fayette County:

http://www.floracliff.org/about.html

I was not hopeful for the potential of old trees as the preserve is adjacent to an ancient and major transportation corridor (from bison to first humans and Daniel Boone and now I-75), has a series of fields within the sanctuary, is close to Lexington, and, from an earlier visit, is dominated by a second-growth forest overrun by bush honeysuckle. Yet, on the first visit, Beverly and her assistant Althea Wiggs, led me to some interesting-looking chinkapin oaks, trees that seemed a bit out of place in the second-growth forest. Sure enough, their ages indicate they are out of place. In fact, come from another time.

With a great crew, now including Dr. Ryan McEwan of University of Dayton, Ciara Lockstadt (a volunteer assistant at Floracliff), and Chris Boyer (undergrad at Eastern Kentucky University), the six of us cored 20 living chinkapin oaks. The first tree we cored came in at 372 years, the oldest documented tree in Kentucky—a record, it turns out, that only lasted 30 minutes. Our second tree came in at 398 years; it is now the oldest documented tree in Kentucky. Like these two trees, about half of the remaining oaks are from a different era.

In the table to the right is the preliminary age structure for these chinkapin oak. These are ring counts, except for the two oldest individuals (who are cross-dated versus the other oak chronologies in eastern Kentucky), so many of these ages could vary ± 5 to 10 years. We have not ring counted all trees—just the oldest looking. Nine trees are over 300 years.

Perhaps most amazing is that six of these trees are roughly 340 years and three of those are 370 years or older!

Tree #	Date/Rings	Comments
1	1637/372 years	cross-dated
2	1611/398 years	cross-dated
3	109 years	ring count
4	153 years	ring count
5	147 years	ring count (released in the 1920s)
6	351 years	ring count
7	321 years	ring count
8	212 years	ring count (rotten tree, ~ ½ radius)
9	219 years	ring count
11	315 years	ring count
12	349 years	ring count
14	287 years	ring count (rotten tree)
16	344 years	ring count
17	370 years	ring count
19	341 years	ring count
20	81 years	ring count (tree next to main trail)

Dr. Ryan McEwan and the oldest-documented tree in Kentucky, dubbed "The One." Photo by Neil Pederson.

View from the South Savanna of Griffith Woods. The four main trees are (from left to right): blue ash, chinkapin oak, blue ash (yellow leaves in the background), and chinkapin oak (large tree closer and on the right). Photo by Neil Pederson.

GRIFFITH WOODS

Under the direction of Dr. McEwan, most of this crew spent a couple days at Griffith Woods; a representation of the oak-blue ash savanna that is thought to be a settlement-era ecosystem that once dominated the Inner Bluegrass :

http://www.friendsofgriffithwoods.org/index.html

This notion, however, is being challenged by the work of Ryan McEwan and Julian Campbell. A small, but powerful sample of remnant oaks and ash across the Greater Lexington area indicates that they are indeed old trees; many date to the late 1600s and early 1700s.

However, most of these trees show an incredible increase in ring widths soon after European settlement, suggesting the Inner Bluegrass was forested prior to Euro-settlement. Initial cores from Griffith Woods seems to suggest something similar:

http://academic.udayton.edu/RyanMcEwan/Pub/Pub.htm

Further Correspondence From The Author:

We are all excited by this—Floracliff has been struggling a bit as a preserve. So, it was a great find by the crew, something that needed to be shared with a larger group of like-minded folks like ENTS.

I want to be clear about these trees: they are obviously left over trees, cull trees if you will. But, I think their value is still great. Not only have they been witnessing changes in the environment since well before Daniel Boone stepped foot into Kentucky, I think they are an important link to the past in an area that has more legend right now than facts. I am also hoping they will be one of the cores of recovery of the Inner Bluegrass landscape. I understand that they were not "superior" trees when the area was cut and that they might represent genetic inferiority. There was likely a significant loss in genetic variation with the logging. Yet, I have a gut feeling most of their shape is determined by what they struggled against to survive—direct competition, rather than weak genes. Plants seem to carry multiple copies of their genes. And, if the new area of study epigentics is any indication, genes are dynamic; the DNA system might be way more dynamic than we had thought. Hope might genetically spring anew from these old chinkapin oaks.

The other thing I think about is putting these trees in a Michael Pollan's *Botany of Desire* framework: though "inferior" to those who logged the area, they have characteristics that made them superior for long-term survival. Now that they are recognized, they will be put on an even higher pedestal. It kind of reminds me of our grassy, but culturally-created lawns. Trees win out over grass in areas with sufficient precipitation, but "lose" when humans are involved.

—Neil Pederson

GETTYSBURG NATIONAL MILITARY PARK, PENNSYLVANIA: APRIL/MAY 2008

Dale Luthringer

Environmental Education Specialist, Cook Forest State Park, Cooksburg, Pennsylvania

From April 29 to May 2, 2008, I had the privilege of spending four whole days in Gettysburg National Military Park (GNMP) in conjunction with our yearly mandatory training held in the area. Needless to say, once the training sessions were done in the day, every evening was spent combing the fields and woods of this epic national battlefield:

http://www.nps.gov/gett

According to GNMP materials:

> The Battle of Gettysburg was a turning point in the Civil War, the Union victory in the summer of 1863 that ended General Robert E. Lee's second and most ambitious invasion of the North. Often referred to as the "High Water Mark of the Confederacy," it was the war's bloodiest battle with 51,000 casualties. It also provided President Abraham Lincoln with the setting for his most famous address.

DAY ONE

The evening of April 29 was mostly used to get acquainted with the general topography of the land. I started by first driving from the beginning of the Pickett's Charge area and ending at Plum Run and Big Round Top along South Confederate Avenue. Just before the road bends to the right towards Plum Run, I noticed some "odd" pines growing off the south side of the road.

Virginia Pine and Redbud

Turns out they were some decent Virginia pine. I never get to see these up at Cook Forest, so they were quite the pleasure to measure. One not only turned out to be what I believe is the tallest ENTS documented so far in the northeast United States, but also a new Pennsylvania state champ at 5.8 ft CBH x 94.5 ft high x 31.6 ft average crown width for 172 AF Points. Granted, there are very few in the database up here, but at least we've got an idea of what they can do when given ~ 100 years to grow. An adjacent and recently cut Virginia pine yielded ~ 94 rings at 0.6 ft up at 1.6 ft in diameter.

It was also nice to measure a few redbud in the area which were in peak bloom. This is another species that I never get to see growing naturally in northwestern Pennsylvania, but down in southeastern Pennsylvania they are a common component along forest edges.

The park is actively managing certain areas of the battlefield to return the land to what they deem was a more period appropriate younger forest. So, the rings that were documented in this post, were taken directly from these recently downed trees. It will be apparent that some of these downed trees actually pre-date the battle of Gettysburg. They were much smaller then, but many had witnessed the battle that raged around and through them. So, trees that are over 145 rings, obviously pre-date the battle in 1863.

A nearby northern red oak, closer to Plum Run was ~ 123 rings 0.7 ft up at 3.3ft diameter. A recently downed white oak in the area of Seminary Ridge and Pitzer Woods came in at ~ 211 rings.

Tree species noted in the vicinity of Plum Run were as follows: Virginia pine, redbud, spicebush, black oak, northern red oak, chestnut oak, white oak, bitternut hickory, shagbark hickory, pignut hickory, eastern white pine, eastern redcedar, and tuliptree.

Virginia pine 5.8 ft in CBH and 94.5 ft tall. Photo by Dale Luthringer.

Continuing further down South Confederate Avenue after passing over Plum Run, a decent stand of tulips emerged near the base of Big Round Top that topped out in the low 130 ft class.

I then turned down Warren Avenue with Little Round Top on my right with the Devil's Den laying out to the front. I stood up on the rocks of the Devil's Den looking down into the Slaughter Pen and attempted the impossible, trying to imagine what it must have been like for the thousands of men who died in this area attempting to take Little Round Top. I felt a definite sense of some sort of strong power at this site. This was a very special area. I had this same feeling years ago when I first looked out from Little Round Top down into the Devil's Den on a prior trip back in the mid 1990's, but this was the first time I set foot in the Devil's Den. What a remarkable place!

I then headed back up towards Little Round Top for a panoramic view of the area at dusk. I walked back down the hill a ways towards Warren Avenue and stumbled upon the site where Colonel Strong Vincent fell from his wounds. The story of Colonel Vincent and the 83rd Pennsylvania really hit home to me. This particular unit was formed mainly from men from my home town of Erie, Pennsylvania. If you remember other posts where I've described measurements taken at the Erie Cemetery, this is where Colonel Vincent was eventually buried.

The first day's tree tally follows:

Species	CBH (ft)	Height (ft)
Black oak	7.3	92.0
Chestnut oak	6.9	97.7
Eastern redcedar	3.6	67.9
Eastern white pine	8.3	106.6
Eastern white pine	8.3	110.8
Redbud	2.6	23.1
Shagbark hickory	N/A	92.0
Sycamore	8.7	72.2
Tuliptree	7.9	115.2
Tuliptree	9.2	122.0
Tuliptree	9.4	130.5
Tuliptree	9.2	130.9
Virginia pine	5.8	94.5*
White oak	12.9	86.4
White oak	15.1(2x)	111.0

* Northeastern ENTS height record, new Pennsylvania state champion.

DAY TWO

Then next day, April 30, I had very little time to explore, so I decided I'd try to see some of the trees in the Gettysburg National Cemetery. An older gentlemen I met in the Devil's Den suggested I see the large tuliptree that was growing there. The dimensions he described seemed too good to be true, but when I got there, I was not disappointed. Even though time was limited it was very productive. As soon as you walk through the gate, you're greeted by a bald cypress at 10 ft CBH by 81.6 ft tall. This WAS the largest I've observed in Pennsylvania, but later came across a really big one (for up here).

White Fir and Balsam Fir

Just inside and to the right of the gate a nice balsam fir and white fir were growing together. The balsam fir was the largest I've come across at 8.3 ft circumference at 6.9 ft (above the lower limb, which magnifies its girth) and 9.6 ft in girth at the waist (2.9 ft up). The height was 91.8 ft (tallest known in Pennsylvania) with a crown spread of 38.2 ft for a total of 217 AF points (using the 9.6 ft girth), or one of the largest document balsam firs in Pennsylvania. The adjacent white fir was 10 ft CBH and 88.2 ft high, with a 45.3 ft crown spread for 220 AF Points—a new species in the Pennsylvania Champion Tree list, thus a new state champion as well.

A baldcypress 15.7 ft CBH and 97.6 ft tall. Photo by Dale Luthringer.

Baldcypress and Tuliptree

I then turned my attention to the north, and just out of sight of the first baldcypress was another. This one measured in at 15.7 ft CBH by 97.6 ft tall, with a 56.1 ft crown spread for 300 AF Points, another new state champ!

Just beyond the cypress, the large tuliptree loomed about 150 yards out. It was getting towards dusk, so I had to work quickly before I lost the light. The highest part of it's top was blown out, but still stood at a very respectable 18.8 ft CBH by 116.7 ft high, with a 98.1 ft crown spread for 367 AF Points. Not a new champ, but definitely the largest tulip I've had the pleasure of measuring so far in Pennsylvania.

The second day's tree tally:

Species	CBH (ft)	Height (ft)
Baldcypress	10.0	81.6
Baldcypress	15.7	97.6*
Balsam fir	9.6	91.8*
Tuliptree	18.8	116.7
White fir	10.0	88.2*

* New Pennsylvania state champion.

Next, I found my way to the Pennsylvania Monument after dark and started searching the numerous bronze tablets attached to this mammoth structure in hopes of finding relatives. Sure enough, found two relatives on my mothers side that fought here, one from the 119th Pennsylvania Infantry, Company I, and the other in the 147th Pennsylvania Infantry, Company F. I was also greeted by a friendly ranger who wondered what I was doing out there well after dark, scouring the monument with a small pen flashlight.

Pignut (?) hickory, 10.2 ft CBH, 136.8 ft tall. Photo by Dale Luthringer.

DAY THREE

The third day, May 1, I decided to take some friends of mine who also have the same appreciation for unique forests. One I've mentioned in earlier posts from time to time, Bill Sweeney, the naturalist supervisor at Jacobsburg Environmental Education Center, who has intimate knowledge of the trees in this park. He mentioned that Mary Byrd Davis had noted old growth in areas of the park. It was his intention to show us some of these areas as well as other noteworthy forests. Bill continues to amaze me with his eye for big, tall, and old trees.

Our first stop was the infamous Plum Run. We got out of the vehicle and headed west along the northern edge of the stream on a path that heads up the hill back towards the area where I earlier measured the nice Virginia pines. Along the run and heading up the hill we noted a number of recently felled trees. A white oak went to ~ 112 rings, another white oak went to ~ 225 rings at 0.8 ft up (at 3.3 ft diameter). An old chestnut oak on the hilltop went to ~ 182 rings 0.7 ft up (2.8 ft diameter). Other species in the area were likely old as well, but were not yet felled. Visual age estimates would easily put 8 species over 150 years old in the Plum Run and Big Round Top areas:

Species	Visual age estimate (years)	Location
White oak	225	Plum Run
Chestnut oak	200	Plum Run
Northern red oak	200	Big Round Top
Tuliptree	200	Big Round Top
Black gum	200	Big Round Top
White ash	200	Big Round Top
Black oak	175	Plum Run
Eastern white pine	150	Big Round Top
Pignut hickory	150	Plum Run

It wasn't long before Bill led us into some incredible hickory trees going up the path from Plum Run to the hilltop. About halfway up, hickories started creeping up in the "respectable" height level. Further up, a few were downright impressive. The problem is that I'm not sure of their identification. My initial reaction was that they were pignut hickories, but after talking with a few other Ents on the subject, now I'm not so sure. There were no leaves on the trees since it was early May, and the area was devoid of good nut samples. All I had to go on was bark, and I just saw more pignut hickory character on them than anything. The jury is still out, some say they're bitternut, others suggest they may be red hickory, but until I can attain a nut sample, I won't be 100% sure. So, the long and short of it is, I'm going with my initial call as probably pignut, and won't be surprised if I'm proved otherwise once more evidence is gathered. But still, they're heights were impressive, be it bitternut, pignut or red hickory, at 10.2 ft CBH, 136.8 ft tall and the other at 7.5 ft CBH and 137.9 ft tall. This will be a new northeastern height record for any of these three species. Both trees grow along the path not more than 75 yards from each other.

Bill still had some nice stuff in store for us. He then led us on a trail that works its way behind Big Round Top. Along the trail we found some really odd looking nuts on the ground. Thought on it a little while, then it hit us—Kentucky coffeetree! Cool, I had never measured these in the woods before, and had only seen them previously in yards. Finally, another nice little surprise—a small patch of pawpaw, another new species to add to the list.

The third day's tree tally:

Species	CBH (ft)	Height (ft)
Kentucky coffeetree	4.8	96.1+
Northern red oak	N/A	96.1+
Pawpaw	1.1	34.0+
Pignut hickory	N/A	93.1+
Pignut hickory?	10.2	136.8
Pignut hickory?	7.5	137.9
Tuliptree	N/A	135.1
White ash	13.2	114.1+
White oak	N/A	111.1+

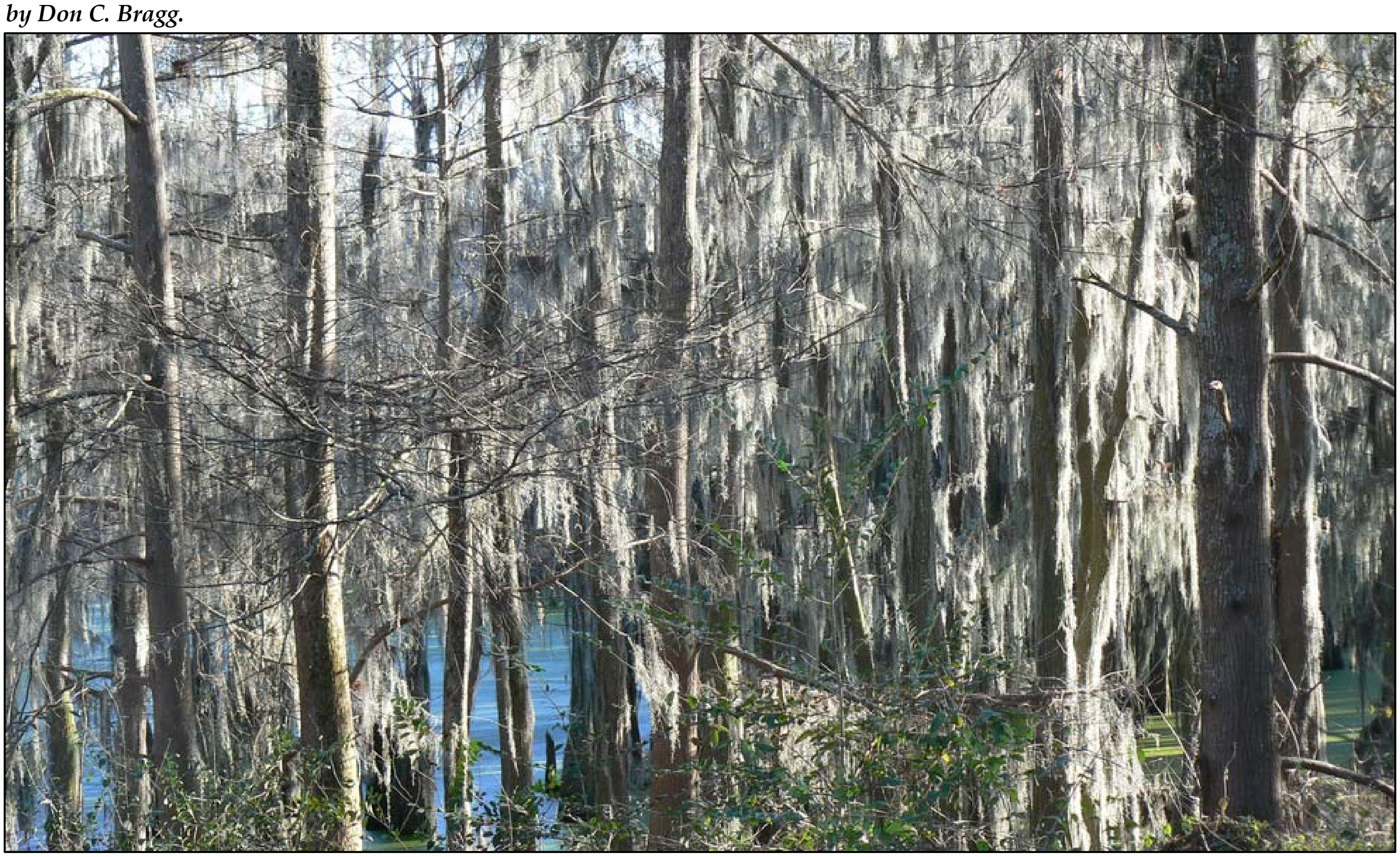
With more searching, I'm sure we should get all ten species over 100 ft. The RI for Gettysburg is just for starters, as we barely scratched the surface in terms of its tall tree potential.

The Rucker Index for Gettysburg National Military Park follows:

Species	CBH (ft)	Height (ft)
Pignut hickory?	7.5	137.9
Tuliptree	9.2	130.9
White ash	13.2	114.1+
White oak	N/A	111.1+
Eastern white pine	8.3	110.8
Chestnut oak	6.9	97.7
Kentucky coffeetree	4.8	96.1+
Northern red oak	N/A	96.1+
Virginia pine	5.8	94.5
Black oak	7.3	92.0
Shagbark hickory	N/A	92.0

I highly encourage all Ents to visit this site if you find yourself to be in the area. If not for the exceptional history of the area, then definitely for the hidden big and tall tree records. Besides, we'll need someone to try and collect nut samples if they're in the vicinity of Plum Run, and I don't have a clue when my next opportunity to visit that site will be!

The late winter sun illuminates the profusion of Spanish moss dangling from second-growth baldcypress along the shores of Lake Enterprise in Ashley County, Arkansas. Lake Enterprise is an oxbow lake from an ancestral channel of the Arkansas River. Photo by Don C. Bragg.



THE TALL TREES OF CARTER'S GROVE, VIRGINIA: JULY 2002

Colby B. Rucker (deceased)

Eastern Native Tree Society

Carter's Grove, located on the James River east of Williamsburg, Virginia, is one of America's best-known examples of Georgian and Georgian Revival architecture. The surrounding grounds and acreage have received less attention, although several very handsome tuliptrees figure prominently in photographs of the mansion. The estate is owned by the Colonial Williamsburg Foundation. A visitor's center and parking area are located beyond a large heavily wooded ravine to the west of the mansion grounds. Visitors cross a concrete footbridge spanning the ravine. Constructed with minimal disturbance to the ravine, this site provides an excellent view of a baldcypress stand and nearby hardwoods.

A pleasant woodland overlook is down a short path from the visitor's center, but it appears the woodland itself has received minimal notice. It is said that students from William and Mary College have done some botanical studies, including a mistletoe study. It is interesting to speculate on the history of the site. We may suppose that the woodland influenced the choice of the name, "Carter's Grove," as was the case at "Tulip Hill," "Poplar Forest," and other colonial estates in Maryland and Virginia.

Although the terrain of the ravine system allowed the site to escape clearing for tobacco, it appears that many trees were cut for farm timbers, and later for construction of the mansion in the 1750s. This disturbance resulted in a preponderance of tulip poplar. The presence of very large multiple-trunked specimens suggests that the smaller second growth poplars were also valued for lumber. The age of these trees, and the apparent absence of smaller multiple-trunked trees, indicate that no logging has taken place for many years, perhaps not since before the Civil War.

Although the availability of a good woodlot was important in running a large farm, and most woodlands in the tidewater region were repeatedly stripped for additional income, this site seems to have escaped heavy cutting for either purpose. The presence of many large black walnuts suggests that later owners of Carter's Grove did not need to plunder this woodland for spending money. Also, protection of the site for reasons of aesthetics or wildlife may have been a factor, and would reflect the cultural interests of the owners.

While these observations are rather hypothetical, the stature of this woodland is indeed impressive. Comparisons with the James Madison Landmark Forest, a National Natural Landmark in Orange County, Virginia, would seem appropriate. There are also similarities to a woodland, once a deer park and never cleared, at "Cedar Park," a historic site in southern Anne Arundel County, Maryland.

I wish to express my gratitude to Colonial Williamsburg for kindly considering my application, and granting me access to the woodland to conduct a study on a day closed to visitors. The following survey and measurements were taken on July 15, 2002.

The ravine system is much divided, and extends to the James River. Only the upper portion, to perhaps 100 yards below the footbridge, was examined. The surrounding field/woodland interfaces and upland/lowland interfaces provide access to sunlight throughout much of the site, as do windthrows, creating a stand with trees of varied sizes, much like the concept of old-growth forest. Large dead snags and fallen trunks are typical of old-growth, and pileated woodpeckers were seen. A thick understory of pawpaw increases the density of the stand, providing secluded habitat for birds and other wildlife.

By their height and abundance, tuliptrees dominate the woodland. Northern red oaks, black oaks and bitternuts are competitive on ridges, where the elevation and well-drained sandy soils are to their advantage. Exposure is also a factor, with beech, northern red oak and black oak being more dominant on the east-facing slopes, and some hackberry, willow oak and southern red oak being present on the warmer west-facing slopes. The moist lowland corridors are important for sycamore, red maple, and baldcypress. Overall, the ravine system is south facing, which is probably a factor favoring the baldcypress.

Several very fine examples of baldcypress were measured. The large tree near the stream below the bridge is a very significant specimen, and the largest tree seen. Its trunk is not buttressed, and 17.9 ft in circumference at breast height. With a height of 144.7 ft, it is taller than any baldcypress accurately measured in the United States, including such important sites as the Congaree Swamp National Monument in South Carolina.

By averaging the maximum height of the ten tallest species, a convenient height index can be obtained for a given site. Although only a small portion of the woodland was examined, the species measured provided an overall index of 122.02 ft. This is very high for a coastal plain site lacking major terrain influences.

The following trees (Table 1) were measured on July 15, 2002, using single triangulation above an adjustable pole extended from the central basal contour at the tree's base ("where the acorn sprouted") to eye level. The height of the triangle was determined by measuring the length of the hypotenuse with a laser rangefinder backed to a whole number, and multiplying by the sine of the angle measured with a standard forestry clinometer. The pole length, to the nearest half-inch, was then added to the height of the triangle, together with any basal adjustments for elevations between the base of the pole and the central basal contour.

Circumference was measured to the nearest half inch at breast height, or 4.5 ft, taken above the central basal contour. Double-hearted or multiple-trunked trees were not included. Although tall trees were of interest in determining the effect of height upon forest diversity and structure, the modest acreage of the area studied limited the application of this goal. In view of the time available, trees were selected for diversity of species, with emphasis on both unusually tall and large-trunked specimens.

Table 1. Tallest trees measured at Carter's Grove, Virginia, by Colby Rucker in July of 2002.

Common name	Species name	Height (ft)	CBH (ft)	Slope exposure	Habitat
Tuliptree	*Liriodendron tulipifera*	147.0	9.2	East	low slope
Baldcypress	*Taxodium distichum*	144.7	17.9	Southwest	lowland
American sycamore	*Platanus occidentalis*	140.1	N/A [a]	Southwest	floodplain
Bitternut	*Carya cordiformis*	125.2	7.5	East	mid slope
Black walnut	*Juglans nigra*	119.5	6.0	West	mid slope
Northern red oak	*Quercus rubra*	118.1	11.2	East	upland
Black oak	*Quercus velutina*	110.5	10.2	East	upland
Swamp chestnut oak	*Quercus michauxii*	106.7	10.8	West	upper slope
American elm	*Ulmus americana*	104.5	6.5	East	upper slope
Southern red oak	*Quercus falcata*	103.2	14.3	West	upper slope
Willow oak	*Quercus phellos*	99.9	10.8	West	upper slope
American beech	*Fagus grandifolia*	98.4	7.3	West	upland
Red maple	*Acer rubrum*	97.0	6.9	South	lowland
Hackberry	*Celtis occidentalis*	96.7	7.9	West	upper slope
White oak	*Quercus alba*	93.8	15.2	East	upper slope
	Additional noteworthy specimens [b]				
Tuliptree		143.1	15.2	N	mid slope
Tuliptree		122.4	16.9	W	upland
Baldcypress		114.4	15.9	W	low swale
American sycamore		131.8	13.0	S	upland
Black walnut		117.9	10.5	W	upper slope

[a] N/A = not available

[b] Other species encountered, but not measured, include: white ash (*Fraxinus americana*), blackgum (*Nyssa sylvatica*), black locust (*Robinia pseudoacacia*), persimmon (*Diospyros virginiana*), sassafras (*Sassafras albidum*), American holly (*Ilex opaca*), flowering dogwood (*Cornus florida*), redbud (*Cercis canadensis*), pawpaw (*Asimina triloba*), and spicebush (*Lindera benzoin*).

THE BIBLE TREE

Edward Frank

Eastern Native Tree Society

ENTS,

I recently (late 2008) spent the morning and afternoon with archaeologists, historians, and interested members of the local community visiting a series of “Scripture Rocks” In the area around Brookville, Pennsylvania. One account by Nicole Park of the rocks reads:

> In the early 1900s, 500 rock carvings were cut by Douglas Stahlman, a Brookville man who believed he had a vision instructing him to carry out that mission. Stahlman was born in Kirkman, Jefferson County in 1861, graduated from the Erie Commercial School, and died in Pittsburgh in 1942. Stahlman removed himself from society and lived among the rocks above Mill Creek. At one point he conducted church services at a rock he had named appropriately “Alter Rock.”
>
> Each rock carries some biblical inscription and was named by Stahlman. In a journal he cataloged each stone and its approximate location. When he completed his project, the carvings stretched roughly in an arc around Brookville from the old Northfork Park north of the town to Tunnel Hill south of Brookville.

Ken Burkett, a local archaeologist and others are organizing a project to document the character and locations of these rocks located at many known, and likely many unknown sites in the area. What may be of more interest to a tree group like ENTS is that he also carved verses into trees in the area. I am given to understand he preferred American beech trees because of their smooth bark. Of the many trees he carved, one is know to remain. I had the opportunity to measure and photograph this tree, known today as the “Bible Tree.” The tree is in severely hollow, and I do not believe it will last much longer.

Death Rock. Photo by Edward Frank.

The Bible Tree. Measurements: girth, 10.3 ft; height, 81 ft. Photo by Edward Frank.

I am guessing the tree may be 150 years old at least, given that the carvings were done almost 100 years ago, circa 1912, and the tree must have been large at the time it was carved. More detailed documentation of the tree is one of the higher priorities of the proposed project as carvings in tree tend to be more ephemeral than those in stone. The other Bible trees have been lost already.

Detailed close-up of the Bible Tree, an American beech carved by Douglas Stahlman decades ago. Photo by Edward Frank.

MAKE A DEPOSIT IN THE BANK OF SOLVED PROBLEMS

Robert T. Leverett

Founder, Eastern Native Tree Society

Recently, Monica and I returned from a trip to Schuylerville and Schenectady, New York. Monica had a concert at Union College in Schenectady and we stayed with Hilary Tann and her husband David Bullard in Schuylerville. Hilary is a professor of music and the recognized national composer of Wales. Her music concentrates on nature. She writes beautifully and captures the moods of the landscapes that she musically profiles. Of special interest to me is that her music is accessible to the general public, a feature not shared by all contemporary composers of serious music.

Staying with David and Hillary was a real treat. They live in a historic home called the Marshall House. You can read about it at:

www.themarshallhouse.org

The history of the house is fascinating and the surrounding countryside is bucolic. To the east, the Taconic mountains rise and to the west the southern tip of the Adirondacks. The Marshall House is on a hill above the Hudson River. Located north of Schuylerville about 12 miles is Argyle. There stands the northern most stand of tuliptrees according to a local lumberman who I met. Needless to say there will be a trip to Argyle when the weather improves. On Wednesday night, the temperature was minus 7° F degrees in Schuylerville. On Thursday, it was bitterly cold all day with a bone chilling wind. No tree hunting in such unpleasant weather.

On Wednesday afternoon I waited while Monica conducted a class as a guest lecturer for Hilary. I began thinking about presenting a set of simple problems to the list—one at a time. Each problem would hopefully stimulate the tree measuring Ents among us to think not just about the problem being presented, but also about related problems and their solutions. We would gradually build up a bank of solved problems relating to determining tree dimensions. Maybe Ed could create another button on the website to store the problems and solutions as a worthy topic. We would start fairly simple and build up to include a more sophisticated problem set over time.

It might seem odd to some Ents that I would suggest building a bank of solved problems. Don't all Ents who measure trees know how to solve a sufficiently broad set of problems associated with determining tree dimensions? Do we really need an on-line tree measuring course #101? Well, some Ents do currently possess the basic knowledge, but we need to always be sensitive to the fact that others are still in the learning phase. Then there will always be the new recruits who come into the game amidst technical terms being bandied about with no accompanying explanations. While the mathematics we employ is usually limited to basic algebra, trigonometry, and geometry, this level can be intimidating to people who tend to shy away from math. Seeing formulas can quickly discourage an even enthusiastic and talented would-be tree measurer. However, there are no true shortcuts. People who try to master tree measuring by peering through an instrument and reading a scale that presumably does all the necessary math behind the scenes tend to make whopping big errors. There are no free lunches.

How do we transfer our reservoir of tree measuring knowledge in ENTS to the beginners and those who become stuck on two or three types of measurements? The solution is to present lots of online problems to expand the base of problem solvers that we can call upon. We need to expand the number of Ents who deal not only with tree girth, height, and crown spread, but also measurements like limb length, crown area, trunk volume, limb volume, and perhaps trunk form ratios that can be quickly applied to the more uniform trunk shapes to derive volumes and predict radius at specified heights.

Okay, I've made my sales pitch. Later today, I will attempt to jump start the process with an e-mail devoted to problem #1. I welcome comments from all interested parties on how to make this new project/mission work for us.

Editor's note: True to form, Bob Leverett has already posted two solved problems to the bank.

--DCB

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.

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. ENTS website 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 "furry" appearance of the bark on this overcup oak is due to an abundance of resurrection fern (**Pleopeltis polypodioides** *ssp.* **michauxiana**)*, a small, epiphytic fern commonly found in the southeastern United States. It gets the label "resurrection" because it can remained dried out and looks dead for extended time periods until a rain event moistens its tissues, causing the fern to return to a brilliant green color. Photo by Don C. Bragg.*