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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: Ed Coyle perched 140 ft above the ground in the crown of the national champion loblolly pine in the Congaree National Park near Columbia, South Carolina. Photo by Andrew Joslin.

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CONGAREE NATIONAL PARK

This exciting weekend of measuring had been planned for some months, but you never know how an event like this will come together until it happens. On the weekend of February 20-22, 2009, several dozen Ents and affiliated individuals gathered to watch some impressive tree climbing and the magnificent pines, oaks, gums, cypress, and other bottomland species of the Congaree National Park. This publicly owned treasure just minutes from the large urban area of Columbia, South Carolina offers much to those interested in big, old trees.

For all of the relative informality of this event, I think those of us fortunate enough to participate in this measuring blitz learned a lot about an ecosystem (bottomland hardwoods) that has declined sharply across much of the South. Perhaps as importantly, it was a chance for us to get together and learn from each other. Some of us met for the first time, others were old friends or acquaintances, but regardless, the networking that was done was priceless. As helpful as our online forums have been, they cannot replace meeting in person, especially when done in such a beautiful setting on such a gorgeous weekend.

For big tree aficionados, there are few places more spectacular in the eastern United States than Congaree National Park. Fortunately for Ents far and wide, we make it a point to meet regularly in such glorious locations. If you have never attended an ENTS-sponsored event, I strongly encourage you to do so. There are two more such events planned for October of 2009 in Pennsylvania and Massachusetts, and I hope to see y'all there!

Don C. Bragg
Editor-in-Chief

Larry Tucei stands next to a giant overcup oak in Congaree National Park during the February 2009 ENTS measuring blitz. Photo by Don C. Bragg.

ANNOUNCEMENTS AND SOCIETY ACTIONS

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…

Ninth Old-Growth Forest Conference to be Held in October

The Ninth Old-Growth Forest Conference will be held October 22-23, 2009. Bob Leverett also promises more details as the planning for this meeting continues.

Other Events of Possible Interest to Ents

Below is a non-ENTS sponsored event happening soon that ENTS membership may be interested in:

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 regis-tration. 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/

The national champion loblolly pine reaches a massive limb out over Spanish moss draped hardwoods in the Congaree National Park near Columbia, South Carolina. Photo by Don C. Bragg.

AN ANALYSIS OF ANNUAL INCREASE IN WHITE PINE VOLUMES AS A FUNCTION OF DIAMETER AND HEIGHT GROWTH

Robert T. Leverett

Executive Director, Eastern Native Tree Society

INTRODUCTION

The unusually high calculated volume increases measured by ENTS for the large white pines in the Mohawk Trail State Forest (MTSF) of Massachusetts point to the need for further study and analysis. Standard forestry volume tables and assumptions from the USDA Forest Service's annual growth analysis cannot be successfully applied to the MTSF pines. This is not a criticism of the forestry data—it just recognizes a reality. As a result of the Mohawk pine data, ENTS is developing predictive models for volume growth in white pines. Two models are presented in this paper, and both point to the direction of our research.

Model 1

In the first model, implemented as an Excel™ spreadsheet, I generated annual volume increases for a hypothetical pine over a period of 150 years. Table 1 is an extract from this spreadsheet and shows years 1 to 10 and 148 to 150. In building this simple model, I used a random number generator to produce the annual height increases. The generator is meant to factor in the vagaries of climate.

The model also generates the trunk form factor by applying a constant increase in its value over the 150-year time spread, starting at 0.333 and ending at 0.37. The annual radial increases are changed at increments of 10 years based on what I believe mirrors actual growth scenarios I have observed.

Interestingly, from the assumptions and values I used in the first model, I calculated an overall volume that is close to what was actually measured for the Jake Swamp Pine. However, the model shows a slowdown in the annual volume increase beyond the 130 year point. This result corresponds to the highest average tree age that I previously believed correlated well to the maximum annual volume increases, but as I explained in the main body of this report, the Jake Swamp Pine has been growing more rapidly in volume than this simple model predicts.

The rapid annual growth may reflect climate change, but I do not know this for certain. This first model changes radial increases at preset intervals. Within each interval, the radial increase is constant.

Table 1. Illustration of the predictions of volume model 1—a hypothetical volume generator for the Jake Swamp Pine.

Year	Height [a] (ft)	Height increment [b] (ft)	Radius (ft)	Radius increment (ft)	Factor [c]	Volume (ft^3)	Volume difference (ft^3)	Avg. annual volume [d] change (ft^3)
1	1.00		0.0104		0.3330	0.000		
2	1.50	0.75	0.0167	0.0119	0.3332	0.000	0.000	
3	3.00	1.50	0.0286	0.0119	0.3335	0.003	0.002	
4	4.50	1.50	0.0452	0.0167	0.3337	0.010	0.007	
5	6.50	2.00	0.0619	0.0167	0.3340	0.026	0.016	
6	8.50	2.00	0.0786	0.0167	0.3342	0.055	0.029	
7	10.00	1.50	0.0952	0.0167	0.3345	0.095	0.040	
8	11.50	1.50	0.1119	0.0167	0.3347	0.151	0.056	
9	13.00	1.50	0.1286	0.0167	0.3350	0.226	0.075	
10	14.50	1.50	0.1452	0.0167	0.3352	0.322	0.096	0.036
148	167.02	0.82	1.7535	0.0042	0.3693	595.752	6.133	
149	167.28	0.26	1.7577	0.0042	0.3695	599.934	4.182	
150	167.94	0.66	1.7619	0.0042	0.3698	605.553	5.619	4.517

[a] Current Jake Swamp dimensions: Height 168.50 ft; girth 10.4 ft; volume 573 ft^3

[b] Random number generator for annual height growth: $n = \left(INT(R)10^4\right) / 10^4 + b$, where R is a random number from generator, and b = the base value.

[c] Factor change rate (r = 0.000247) calculated from: $r = (e - b)/p$, where r = rate of form factor change, e = end value (0.37), s = starting value (0.333), and p = the time period, in years.

[d] Calculated by decade.

Model 2

Ideally, I should introduce a random element to radial change that operates on an annual basis. This occurs in the second model, i.e. height and radial changes are both generated with a random element. The random generators for height and radial growth are implemented in the following way. Let n = minimum annual change in attribute,

m = maximum annual change in attribute,

R = random number between 0 and 1 exclusive, and

A = amount of attribute change (vertical or radial).

$$A = n + (m - n)R \quad [1]$$

Table 2 demonstrates the method used to calculate each next annual height and radial increment for the second model.

Table 2. Height and radial change using increase generators.

Year	Min. AHG[a] (ft)	Max. AHG (in.)	Min. ARG (in.)	Max. ARG (in.)	Max. YTG inch	Min. YTG inch
1	0.20	0.30	0.071	0.091	14	11
5	0.80	1.00	0.111	0.143	9	7
10	1.00	1.33	0.200	0.250	5	4
25	1.25	2.00	0.211	0.235	4.75	4.25
50	1.00	1.75	0.167	0.200	6	5
75	0.80	1.50	0.100	0.167	10	6
100	0.60	1.10	0.067	0.125	15	8
125	0.50	1.00	0.050	0.111	20	9
150	0.35	0.90	0.043	0.100	23	10

[a] AHG = annual height growth; ARG = annual radial growth; YTG = years to grow.

The second spreadsheet model generates N years of growth uses the following equations and process. The following equations are built into the spreadsheet:

$$H_i = H_n + (H_m - H_n)r_n \quad [2]$$

$$H_{ci} = \sum H_i \quad [3]$$

$$R_i = R_n + (R_m - R_n)R_n \quad [4]$$

$$R_{ci} = \sum R_i \quad [5]$$

$$V_j = F(\pi)H_i \left[\left(R_{cj-1}\right)^2 + R_{cj}^2 + \left(R_{cj-1} R_{cj}\right) \right] \quad [6]$$

$$V_{cn} = F \times \pi \times R_{cn}^2 \; H_{cn} = \sum_{i=1}^{n} V_i \quad [7]$$

where: N = period of growth (150 years in our example),

i = subscript denoting ith year,

H_n = minimum potential height growth in a year,

H_m = maximum potential height growth in a year,

rn = random number between 0 and 1,

H_i = height growth for ith year,

H_{ci} = cumulative height growth through ith year,

R_n = Minimum radial growth in a year,

R_m = Maximum radial growth in a year,

R_i = Radial growth for ith year,

R_{ci} = Cumulative radial growth through ith year,

F = Form factor for trunk(typically $0.333 \le F \le 0.45$),

V_j = Volume increase in jth year, and

V_{cn} = Cumulative trunk volume through nth time period.

In the spreadsheet implementation of the above formulas, I tracked minimum, maximum, and average volume changes for the time intervals shown in Table 2. More advanced models will be parameter driven for the change table so that assumptions for annual height and radial growth and for the change in trunk shape can be quickly changed with automatic table regeneration.

Employing model 2, simulations were run to compute annual height, radial, and volume gains over 150 years for pines in the size class of those growing near the Jake Swamp Pine. The model yields annual volume changes of up to 7.0 ft^3 per season, with an average of around 4.0. The form factor retains the linear trend. Table 3 shows an extract from the spreadsheet.

Table 3. Illustration of volume model 2, with a factor change rate of 0.000378.

Year	Height (ft)	Radius (ft)	Radial increment (ft)	Form factor	Volume (ft^3)	Volume difference (ft^3)	H_n	H_m	Random height (ft)	R_n	R_m	Random radius (ft)
1	0.29	0.007	0.007	0.333	0.000	--	0.2	0.3	0.29	0.07	0.09	0.007
3	0.78	0.020	0.006	0.334	0.000	0.000	0.2	0.3	0.29	0.07	0.09	0.006
5	1.88	0.038	0.011	0.335	0.003	0.002	0.8	1.0	0.84	0.11	0.14	0.011
7	3.64	0.057	0.010	0.336	0.013	0.006	0.8	1.0	0.91	0.11	0.14	0.010
9	5.55	0.079	0.011	0.336	0.037	0.014	0.8	1.0	0.95	0.11	0.14	0.011
⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
140	159.90	1.825	0.006	0.386	645.605	8.430	0.5	1.0	0.95	0.05	0.11	0.006
142	161.11	1.839	0.008	0.387	661.937	8.662	0.5	1.0	0.51	0.05	0.11	0.008
144	162.87	1.851	0.007	0.387	679.096	8.989	0.5	1.0	0.79	0.05	0.11	0.007
146	164.41	1.864	0.007	0.388	696.436	10.257	0.5	1.0	0.98	0.05	0.11	0.007
148	165.91	1.878	0.008	0.389	715.046	10.248	0.5	1.0	0.87	0.05	0.11	0.008
150	167.67	1.893	0.008	0.390	735.276	10.662	0.4	0.9	0.84	0.04	0.10	0.008
Totals	**167.67**	**1.893**	**45.430**	**0.052**	**735.280**	**10.662**						

Summarizing the details in Table 3 produces a minimum annual volume increment of 0.0 ft³, a maximum annual volume increment of 10.662 ft³, an average annual volume increment of 4.935 ft³, a minimum height increment of 0.204 ft, a maximum height increment of 1.983 ft, an average height increment of 1.118 ft, a minimum radial increment of 0.004 ft, a maximum radial increment of 0.021 ft, and an average radial increment of 0.013 ft.

The most useful models I could build should reflect the general slowing of annual radial ring widths over the life span of the tree in accordance with what I can determine from core sampling. I will eventually incorporate growth spurts and slow growth periods, in accordance with what I see in the actual growth data gathered.

EQUAL VOLUME INCREASE ANALYSIS

The final topic I will discuss is how equal volume increases occur for trees in different size classes. There are several reasons for pursuing this line of analysis. Volume increases for young, fast growing trees are often represented by models that show growth trends expressed in percentages. As annual diameter and height grow slow as a percentage of total diameter and height, it can superficially appear that annual volume increases are correspondingly diminishing and young trees can be considered as more effective carbon gatherers.

However, for carbon sequestration, I need to account for the absolute increases in volume. How do I determine annual increases in height and/or diameter that lead to equal volume increases? How can I compare volume increases different size classes? Equation [8] shows how to compute the radial change in order to get an equal volume increase from two different sized trees:

$$I_{R1} = \sqrt{\frac{F_2(R_2 + I_{R2})^2(H_2 + I_{H2}) - F_2 R_2^2 H_2 + F_1 R_1^2 H_1}{F_1(H_1 + I_{H1})}} \qquad [8]$$

for the ith tree, where: F_i is the form factor of the ith tree,
R_i is the radius,
H_i is the height,
I_{Ri} is the radial increase,
I_{Hi} is the height increase,
V_i is the volume, and
I_{vi} is the volume increase.

In the example of equation [8], the first (or larger) tree needs to grow radially only 0.0036 ft to achieve the same volume increase as the second tree that grows radially 0.0208 ft. At these rates, the smaller tree will add an inch of radius in 4 years and the larger will add an inch in 23 years. There are some assumptions that must be met for this to work—first, the volume increase of both trees is assumed to be equal and the starting dimensions of both trees are known. In turn, this also means that the increase in height for both trees is known, and the radial growth of the second tree is known.

Table 4 provides a simple method for calculating the radial increase needed to achieve a specified volume increase (e.g., 5 ft³ of trunk volume), assuming the same form factor and given values of the initial radius, height, and height increase. The following formula allows for the calculation of the necessary change in radius (C_r) to produce a specific change in volume (C_v):

$$C_r = \sqrt{\frac{C_v + F\pi HR^2}{F\pi(H + C_h)}} \qquad [9]$$

where R is the starting radius, H is the starting height, C_h is the change in height, and F is the form factor.

The constancy of the form factor is the weak link in this model. The form factor is always a number between 0 and 1 and actually represents the proportion if a right cylinder that is filled with trunk volume. For a right circular cone, this equals 33.33%, while a paraboloid occupies 50% of the volume of the cylinder, and a classic neiloid fills 25%.

Table 4. Calculated change in radius needed to generate specified volume increases. C_{rin} = radial change expressed in inches, C_g = change in girth, and other variables as defined above.

C_v	R_1 (ft)	H_1 (ft)	C_h (ft)	Form factor	C_r	C_{rin} (in)	Years per inch	C_g (in)
5.000	1.200	95.000	1.000	0.345	0.0137	0.1643	6.0852	0.0860
5.000	1.500	115.000	1.000	0.345	0.0068	0.0813	12.2993	0.0426
5.000	1.655	135.000	0.500	0.345	0.0072	0.0866	11.5477	0.0453
5.000	1.750	150.000	1.000	0.345	0.0029	0.0352	28.4252	0.0184
5.000	1.750	167.500	1.000	0.345	0.0026	0.0315	31.7167	0.0165
10.000	1.200	95.000	1.000	0.345	0.0333	0.4000	2.5001	0.2094
10.000	1.500	115.000	1.000	0.345	0.0199	0.2390	4.1845	0.1251
10.000	1.655	135.000	1.000	0.345	0.0143	0.1722	5.8076	0.0902
12.000	1.655	167.500	1.000	0.380	0.0131	0.1567	6.3807	0.0821

CONGAREE NATIONAL PARK ENTS MEASURING BLITZ: FEBRUARY 2009

With Contributions from Will Blozan, James Parton, and Larry Tucei

Eastern Native Tree Society

From Will Blozan:

I want to thank those who have posted portions of the Congaree trip thus far. I thought I'd send a quick posting to review the trip for those unable to attend.

My Congaree trip "started" Wednesday night when I picked up Bob Van Pelt from the Asheville airport. We had some (very) loose ends to wrap up on the Usis Hemlock Canopy Mapping Project. We spent virtually all of Thursday going over the notes and entering data. It is one super gnarly tree and it will still take some time to finish up the 3-D model and volume calculations. I think we can safely say the tree is the most complex member of the pine family thus far mapped.

4:30 a.m. Friday morning came awfully early to get up and leave Black Mountain, North Carolina, to make it down to Congaree in time to meet with park staff and sign off on the research permit. Brian Ballenger of the Tremont Institute in the Smokies met us the previous night and hitched a ride with us. Jason Childs (Appalachian Arborists) came down for the day to assist with the climb.

Upon arriving, Van Pelt and I met with park ecologists Theresa Thom and Bill Hulslander to discuss the permit and go over the climbing techniques. They were very receptive and it sounds like this is the first research permit ever offered that includes tree climbing—quite an honor!

Andrew Joslin in a (much) shorter adjacent loblolly pine. Photo by Will Blozan.

More of the ENTS group began to gather and we checked into the wonderful dorm facilities near the visitor's center. We were off to a late start but we immediately headed to the National Champion loblolly pine to begin the mapping project. Andrew Joslin was able to set a line in the tree with his folding slingshot after several attempts and (the requisite) tangled lines. This tree was a bear to rig the first time as well back in 2000.

Bob Van Pelt, Jason Childs, Ed Coyle, and I went up the champ. Ed was to do the lower trunk tape wraps and the rest of us began to map the crown. Andrew and his friend went up the neighboring pine to photograph the project. Several National Park Service (NPS) staff came to watch the ascent. Ed soon realized the trunk was too big to measure alone.

Bob Van Pelt standing on the top of the main trunk. Photo by Will Blozan.

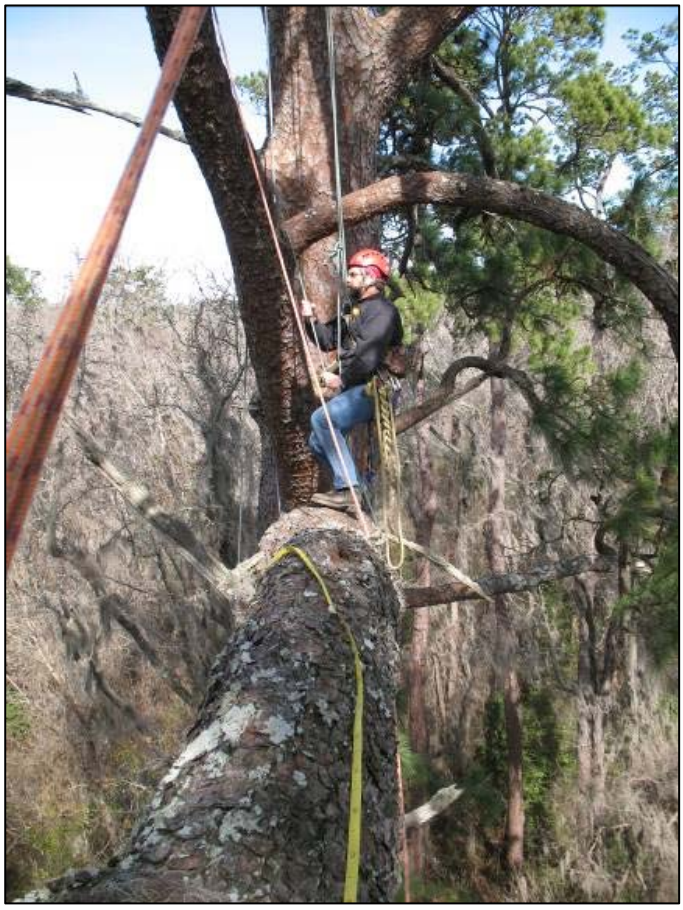
Downtown Columbia, South Carolina as viewed from the top of the pine (16X zoom). All adjacent pines are shorter. Photo by Will Blozan.

The top of the trunk divided into three tops at around 135 ft, the highest point two feet taller (168.7 ft) than the last climb in 2000. The mapping took some time but we progressed down to about 110 ft off the ground by dark. We hiked out and back to the dorm for "Lowland Larry's" fabulous Gulf shrimp and elk sausage boil. WOW! I think we will invite Larry back again, and we had a great time talking trees and stories with the ENTS gang.

Saturday we dropped the climbing gear at the tree and heading into the swamp with the excellent guidance of Marcus to see some new trees and remeasure former champs. The morning was cold and it was our intention to let the day warm up before finishing the pine. As we delved deeper and deeper into the park we soon realized that the climb would not happen (sorry, Vic…) and we hiked to more trees. Unfortunately, lunches were left in the packs and the dead pig we came across alarmingly looked remotely appetizing. We found new park record heights for American holly (97 ft) and American elm (I think; 134 ft). We measured a nice tuliptree at 133 ft and several more nice hollies. An impressive 74 ft ironwood grabbed my attention on this gorgeous day. We hiked back to the dorms where NPS naturalist Stuart Greeter (a.k.a., "The Savior") had burgers, hotdogs, chips and great snacks, and a roaring campfire awaiting our arrival. We ate EVERYTHING and had a blast hanging out by the campfire and listening to owl calls (including Brian's "skid mark" owl… ;). Good times, good trees, good company. Thank you Stuart!!!

On Sunday Coyle, Van Pelt, Ballenger, and I headed back to the pine to finish the mapping. Bob and Brian mapped the basal footprint and lean(s) and took photos for a drawing. Ed and I went up the tree and were quickly assaulted by a steady wind with ~45+ mph gusts. I spotted a gray skink (lizard) holding on to the loose bark at ~85 ft. It was rather terrifying and truly cold and unpleasant. We almost bailed and began to feel seasick with the swaying of the tree. As luck would have it, I had to go out on the longest limb which was over the

swamp water. I looked down, held on tight and avoided looking at the trunk—it, too, was swaying and provided no relief from that queasy feeling of being on a horrid ride that wouldn't stop. Felt like a kite on a string. Misery, I'll tell ya. THE worst climb ever for me. (But worth it, of course!)



Ed Coyle and Will Blozan doing the tape drag ~105 ft up (Will's about 25 ft out on the longest limb). Photo by Will Blozan.

Along with my hands, the laser also decided to stop working way out on the limb. Compounding this snafu, Ed and I could hardly hear each other over the wind noise. We had to drag a meter tape for the last segments and the wind ripped it right out of the spool. We lost one tape and the other spooled out all the way but did not come loose. The tape was stretched between lulls in the wind—otherwise we could not hold it straight. After the lower trunk wraps we were SO relieved to be out of the tree and gain feeling in our hands again. I was able to shoot some incredible video of the wind and sway.

I want to especially thank the Congaree staff for the obvious welcome ENTS received. The dorm facilities were incredible and convenient and the staff very enthusiastic about our work. I believe we have established a great research relationship with Congaree National Park and ENTS will be a key player in the future interpretation of the fantastic arboreal resources of the park. Thank you!

View over the swamp with emergent pines; most hardwood trees less than 120 ft tall. Photo by Will Blozan.

From James Parton:

Here is my summary of the Congaree Expedition on Friday, February 20th to Monday, January 23rd:

Friday—I arrived around noon on the 20th and after stopping by the visitor center I headed off into the forest to locate the other Ents. The woman in the visitor center had told be that they were in a pine down near Weston Lake. As I set off, I was immediately impressed by the forest. However, I quickly realized that many of the trees were so unfamiliar to me. No white pines, and tuliptree was very rare. And what species is this? What is that? Wow, a baldcypress! I had only seen those at Biltmore. Cool.

One tree I was very familiar with was the numerous and here oversized American Holly. I set out measuring some of these and came up with a giant 81-footer. One almost 20 ft taller than any I had found in the North Carolina mountains. After wondering around for over 2 hours I heard voices and stumbled upon an ENTS team with Marcus Houtchings in the lead and "Lowland" Larry Tucei behind with the others. I joined the team which explored the area checking out impressive trees. They had just left the other team led by Will Blozan and Bob Van Pelt (BVP), who were climbing and modeling the champion loblolly pine. I had to leave them a bit early to secure a place in the dorm for the weekend. Larry Tucei fixed up some killer Shrimp Creole after everyone had returned.

Saturday—Today we all met up at the Visitor Center and were joined by a few new faces, such as James Smith. We set off to remeasure old champion trees and find some new ones. Larry has covered the specifics very well in his posts as has Will so I will leave that to them. But I was well impressed by the huge trees and Marcus's skill at navigating the swamp. Today I learned to measure tree spread while helping the others do so. I also learned how useful GPS units are. I gotta get one!

Ents and NPS staff gathering below the champion loblolly pine in anticipation of the climb. Photo by Larry Tucei.

It is great to be involved in a bit of history. We are re-writing the measurements of trees in Congaree National Park! Never before has this number of skilled measurers descended on Congaree. Will Blozan and BVP are in the forefront. As night fell, Stuart Greeter and John Galbary of the NPS served up some great burgers and hot dogs and got a fire going. Now this is the life!!

Sunday—Will Blozan, BVP, Andrew Joslin, and the rest of the team returned to the Champion loblolly pine to finish modeling. The rest of us followed Marcus back into the forest to measure more huge trees like a champion cherrybark oak and two nice willow oaks—one of which I measured to 137.5 ft (the tallest I have seen).

Marcus surprised us all by running off into the bushes chasing a wild hog (someone got a video of it). Tobe Sherrill and a couple of new faces joined us on this outing. I also noticed some really great vines here in Congaree. One could be plenty occupied just studying vines. Some of the muscadine vines are nearly black.

We hiked around at over 5 mph according to GPS. Any faster and I would have had to jog!

After leaving the forest and taking a brief break, some Ents began to leave for home. Marcus, Randy, Larry and I headed out to check out a huge pecan off of the park. After Marcus obtained permission from a hunting party who was leasing the land, we measured this pecan to 18.1 ft in circumference and 105 ft tall. Wow! It is the biggest pecan I have ever seen, easily surpassing one I measured in Abbeville County.

Afterwards, Larry and I examined a pretty live oak, a multi-trunked specimen just over 16 ft in girth. It looked big to me but was not nearly large enough to make Larry's live oak project. Upon arriving back at the dorm, nearly everyone had left for home. Soon Larry also headed back, stopping to measure the Sire Oak in Columbia on his way home.

Only Randy and I stayed Sunday night. We cleaned up the dorm a bit before turning in.

A vertical view of a large willow oak. Photo by Larry Tucei.

Monday—Randy departed early this morning, leaving me to enter the forest again for a final 3.5 hours. I measured a few trees and communed with this great forest before returning home. I also looked for big cypress knees.

Here are some of the measurements I took over the weekend:

Tree species	Girth (ft)	Height (ft)	Comments
American holly		69.1	
Loblolly pine		129.3	
Loblolly pine	11.8	157.6	Near Weston Loop Trail
Loblolly pine	7.4	134.5	
Loblolly pine	136.0		
Loblolly pine	13.1		
Loblolly pine	10.8	144.5	

One thing I must say. All the NPS employees were GREAT hosts and made us feel very welcome. I personally thank Theresa Thom, Stuart Greeter, John Galbary and Kathleen O' Grady. Hats off to all of you! Also, we cannot forget our intrepid guide Marcus Houtchings! Thanks Marcus! I hope our data will reward them for their hospitality.

Large tree measurements and championship status notes taken by Larry Tucei.

Scientific name	Common name	Height (ft)	CBH (ft)	Average spread (ft)	Latitude	Longitude	Championship status
			February 20, 2009				
Pinus taeda	Loblolly pine	168.7	15.5	93 x 78			National Champion
Pinus taeda	Loblolly pine	141.5	15.8	63 x 45			Ex- State Champion
Quercus michauxii	Swamp chestnut oak	124.0	16.0	90 x 63			
Liquidambar styraciflua	Sweetgum	130.0	14.5	69 x 45			
			February 21, 2009				
Carpinus caroliniana	American hornbeam	132.0	3.2	43 x 23	33º 48.88′	80º 49.547′	
Quercus lyrata	Overcup oak	132.0	17.3	112.5 x 104	33º 48.721′	80º 49.29′	
Ulmus americana	American elm	134.0	9.0	66 x 63	33º 48.677′	80º 49.254′	
Ilex opaca	American holly	97.0	5.2	16			
Ilex opaca.	American holly	94.1	5.3	29			
Ilex opaca.	American holly	92.0	6.5	22			
Gordonia lasianthus	Loblolly bay	73.8	4.2	29	33º 48.671′	80º 48.811′	
Quercus pagoda	Cherrybark oak	159.8	19.8	133.5 x 110	33º 48.473′	80º 48.678′	
Quercus michauxii	Swamp chestnut oak	123.7	17.9	123 x 97	33º 48.387′	80º 49.299′	State Champion
Quercus michauxii	Swamp chestnut oak	131.0	17.5	114 x 111	33º 48.387′	80º 49.262′	
			February 22, 2009				
Quercus lyrata	Overcup oak	129.0	19.1	121.5 x 114	33º 49.389′	80º 51.606′	State Champion
Quercus phellos	Willow oak	120.0	18.5	108.5 x 106.5	33º 49.324′	80º 51.818′	
Quercus phellos	Willow oak	137.5	16.9	128.5 x 109.5	33º 49.325′	80º 51.907′	
Quercus pagoda	Cherrybark oak	141.0	23.5	146.5 x 124	33º 48.411′	80º 50.284′	State Champion
Fagus grandifolia	American beech	112.0	8.9	93 x 74	33º 48.681′	80º 50.840′	
Carya illinoensis	Pecan	105.0	18.1	150 x 97.5			St. Co-Champ Pending

The setting sun illuminates one of the many virgin loblolly pines growing in the Congaree National Park. Photo by Don C. Bragg.

THE TREE HEIGHTS AND FOREST STRUCTURE OF CORCORAN WOODS, MARYLAND: JULY 2002

Colby B. Rucker (deceased)

Eastern Native Tree Society

This report provides the maximum heights reached by 34 species of trees measured in the Corcoran Environmental Study Area in April and May, 2002. These measurements are laser-derived and aid in an overall understanding of the role of tree height capabilities in creating the existing forest structure. Correlations between maximum tree heights, habitat influences and indicator species are also explored.

OVERALL DESCRIPTION OF SITE

The Corcoran Environmental Study Area, often referred to as Corcoran Woods, or the Corcoran Tract, comprises roughly 210 ac owned by the state of Maryland. Named for Edward S. Corcoran, who once owned the 110-ac northwest portion noted for its old trees, the preserve is located at the northwest end of Sandy Point State Park, in Anne Arundel County, and is administered by the park. Access is controlled by permit, and limited to hiking, nature interpretation and scientific study. The property is roughly rectangular, with the greater depth extending from Tydings Road on the east to Bay Head Road on the west.

The property adjoins numerous privately-owned smaller parcels of wooded or residential character. Corcoran Woods is protected by about 2.7 miles of fencing that completely encircles the property. The fence is green chain-link, 6 ft in height, and topped with barbed wire. Access gates are at Bay Head Road and Tydings Road. The tract is entirely wooded, and in a natural state, with the exception of unpaved roads and paths which extend through the site. An unpaved road is inside the fence, allowing access for fence maintenance. This perimeter road veers inward to cross the head of a natural drainage swale via a small wooden bridge.

The property is nearly flat, being entirely on the geologically recent terrace of the Talbot Deposit, at an elevation of about 25 to 30 ft. Three natural swales and numerous manmade ditches provide drainage from the interior of the tract. Soils over the southeast half of the property, especially toward Tydings Road, are Othello silt loam, with some Mattapex silt loam. These are heavy, poorly drained soils, with a water retaining substrate. Soils at the portion of the property toward Bay Head Road are Evesboro loamy sand and Galestown loamy sand. These soils are well-drained and often droughty, but there are heavier substrates and wet spots in places. Soils on much of the central section are transitional, and are light but fairly rich. Heavier substrates provide some moisture retention.

Although much of the woodland is old-field forest, some areas appear to have been too wet for agricultural use, and retain much of their original forest diversity. Several large groves of older trees, some in excess of 150 years, also have considerable diversity, and are the most useful for study of forest profiles. For this purpose, the property is here divided into 12 sections displaying different forest characteristics. These areas have been given names, which are more convenient than scientific.

FOREST STUDY AREAS

1. Greenbrier Section: Entering the property from Tydings Road, this section is on the left. It is bordered by the fence road at Tydings Road, the main woods road, a large drainage ditch and parallel road, and the Left Border. This area has hydric soils, with standing water in places. A low thick growth of greenbrier occurs in much of this section. Clubmosses are abundant, and the soils are quite acidic. Probably never cleared for agriculture, it appears that this area retains its original diversity. It is dominated by an older stand of pin oak, willow oak, red maple, sweetgum and some blackgum. White oak, pignut hickory, tuliptree, and several northern red oaks were found on better-drained places. These drier sites have little greenbrier, and are often separated from wetter regimes by transitional zones of New York fern.

2. Front Section: From the Tydings Road gate, this section is on the right, and includes a large sign and some seating, now unused. This section is bordered by the fence at Tydings Road, the main woods road, and the side fence. It extends back about the same distance as the Greenbrier Section at the main woods road, but is not so deep at the side fence. It is bisected by the Swale Section. The Front Section was once cleared for agriculture. The silt loam soils are better drained than those in the Greenbrier Section, and probably less acidic. Tuliptree, sweetgum and red maple, perhaps 50 to 80 years old, dominate the old-field forest. These have outgrown the earlier successional species. Most of the black locusts have died and fallen, but some black cherries obtain solar access along the main woods road. Flowering dogwoods occur throughout but many appear to have succumbed to the dense shade, or perhaps to blight. At least one blackgum and an American elm occur at a low elevation by the main woods road, where the habitat is more like the nearby Greenbrier Section.

3. Swale Section: The Swale Section bisects the Front Section. It is bordered on either side by a loop of the fence road. This section includes two branches of the main swale, which extend to the rear border of the Front Section. Near Tydings Road, the swale is quite large, with some standing water. The woods/wetland interface provides solar access for a variety of species, including black cherry and black highbush blueberry.

The swale was never completely cleared for agriculture, as evidenced by some old trees and greater diversity. The improved drainage and rich silt loam soils make the upper parts of the drainage good habitat for tall trees. Numerous spicebush and occasional sycamores occur on the higher elevation between the two drainages tributary to the swale. Some of the tallest sweet gums and the largest sycamore were found along a long-abandoned farm road that parallels the swale above the bridge.

4. Holly Grove: Located at a somewhat higher elevation perhaps one hundred yards beyond the bridge, this feature is an unusually thick grove of mature American hollies, forming a tall understory. Although broken by occasional windthrows of larger trees, the grove has few shrubs or smaller trees, and the dense shade is probably equaled only by a hemlock stand. The tallest measured holly is in this grove. This site is at the near end of the Old Wire Section.

5. Old Wire Section: This section is bordered by the Holly Grove (which is really part of it), the back of the Front Section, the side fence, and a much younger old-field stand behind it. The name refers to barbed wire deeply embedded in an old pin oak at the rear of this section, and in a large sweetgum toward the Holly Grove. Although probably once cleared for agriculture, the Old Wire Section has been untouched for over 100 years, and has more diversity than the younger old-field stands around it.

6. Left Border: On the left, much of the perimeter road is an old farm road, which separates a long border of mixed oaks, tuliptree and sweetgum along the fence from the younger old-field New Poplar Section. This border is mostly 50 to 100 ft in width, and has pin oak in places, indicating the once-broader distribution of this species.

7. New Poplar Section: This section covers a large area, lying beyond the Greenbrier, Front, and Old Wire Sections. It extends from the old farm road along the Left Border to an extension of the Pine Section on the right. This area has a dense old-field stand perhaps 50 years old dominated by tuliptree, sweetgum and red maple in changing percentages. This section is easily traversed; there is little understory, windthrow, or vine infestation.

8. Pine Section: Remnants of an old-field growth of Virginia pine occurs throughout this section, which extends from the side fence on the right, and extends behind the New Poplar Section to beyond the main woods road. Many of the pines have died, and the intrusion of sunlight has promoted the growth of a dense understory. This and fallen trees often make passage difficult. Sassafras is common on the drier soils, but declining, and may give way to southern red oak. Several rows of loblolly pines have been planted near the main woods road, and some randomly spaced specimens are thought to be of the same origin. The rear of this section is increasingly infested by vines and multiflora rose.

9. Big Poplar Grove: This is an old-field stand of tuliptree, with some specimens in excess of 150 years old. It extends from the side fence on the right to the Big Oak Grove on the left. The soils are somewhat light, but rich. Spicebush is common, but seldom reaches arborescent stature. Showy orchids and Hercules club also occur on rich soils at this site, and several old black oaks and hickories remain in the left portion. Part of this grove shows evidence of a woods fire, with many trees having some charred bark. The largest and tallest tuliptrees were found here.

10. Big Oak Grove: This comparatively narrow band of old trees extends from the Old Poplar Grove nearly to the back gate path. Many specimens are in excess of 150 years old. Most of the old trees are well spaced, with large trunks and broad shapely crowns. There is considerable diversity, the dry mesic habitat supporting trees of both sandy and richer environments. Outstanding specimens of white oak, black oak, southern red oak, sweetgum and tuliptree were seen. Some large black walnuts, bitternuts and other species also occur. Although there is no indication that this site has been disturbed directly, the grove lies between the Pine Section and the Vine Section, and the side-intrusion of sunlight contributes to a dense understory, which often makes passage difficult.

11. Vine Section: Lying behind the Big Poplar Grove and the Big Oak Grove on the right, and the New Poplar Section on the left, this section extends to the fence road at Bay Head Road. This area, once agricultural, is heavily infested by vines, both native and invasive aliens. Oriental bittersweet, multiflora rose and Japanese honeysuckle are common throughout. Large grapevines and bittersweet have overwhelmed many old-field trees, and have greatly suppressed the regeneration of the forest. Excepting the roadways, this section is essentially impenetrable.

12. Back Corner: Located toward the junction of Bay Head Road and Beacon Hill Road, this small area includes an abandoned cinder-block garage, and a dense stand of bamboo. Nearby is a deep drainage swale. Two chestnut oaks occur on the sandy bank of the swale. Both are coppices, indicating their presence for over 100 years. This suggests that a greater diversity of dominant species once occurred on the excessively drained soils, which are common at the northwest part of the property.

TREE HEIGHTS: METHODOLOGY

The trees measured in this study were of 33 native and one naturalized species. Maximum heights were quite varied, with a few species being represented by immature specimens. The smaller trees, up to 30 ft in height, were measured directly, to within one-half inch, using an adjustable aluminum pole.

Heights of the larger trees were determined with a laser, in conjunction with a clinometer. Dense growth often made sighting difficult, and care was taken to acquire accurate measurements. In addition, the trunk circumference at breast height (CBH) was measured to the nearest half-inch at a point

4.5 ft above the contour passing through the center of the tree's base.

Heights reflect the vertical distance between two horizontal planes, one passing through the afore-mentioned basal contour, and the second passing through the highest leaf or twig in the tree's crown. The use of a laser avoided errors caused by the top point not being over the tree's base, or the creation of "false tops" common to clinometer/fixed baseline methods. Use of a telescoping pole established a fixed sighting point above screening vegetation, and increased accuracy by eliminating multiple triangulations.

Tall trees were selected by quick laser readings. Once chosen, more careful measurements were taken. Angles were read to within one-tenth degree, and the laser was positioned to eliminate non-displayed fractional distances. If the pole was not on the basal contour, a level was placed to that point, and a basal adjustment was made. Each measurement component was recorded in the field, and final heights were derived later.

Attempts were made to accurately record the location of each tree measured. Unfortunately, the dense canopy often blocked GPS signals, and many coordinates were not obtained. Therefore, more general descriptions of locations were recorded, referencing natural landmarks, in the sequence in which encountered. These field descriptions are not included in this presentation.

Although some species were represented by only a few specimens, and only the height of the tallest tree is used in the height profile, the method is consistent, and provides useful information for interpreting the effect of habitat and land use on forest structure within Corcoran Woods. The tallest trees were usually growing under the optimum circumstances existing for that species, which prompts consideration of subtle differences in habitat.

Field work was begun on April 8, 2002. While it is possible that taller examples and additional species have been overlooked, significant additions are unlikely. In the long term the height structure will change, and forest succession will continue; individual specimens will grow, and some will die. Several species may be lost, due to suppression by non-native vines. Maximum height measurements provide a profile that is unique to Corcoran Woods, and provide a useful comparison with other sites.

MAXIMUM HEIGHTS

The following specimens were the tallest of their species seen in Corcoran Woods. The list is divided into height groups, which correspond to general habitat requirements. It should be noted that these groups are designed to show the optimum habitats for height development of each species, and do not show the height of all species within each habitat or named study area.

There are critical height differences between species, indicating that inherent height capabilities affect species survival. Opportunities for some species are created by excessively dry or wet habitats, where species of greater height potential are less well adapted. The smaller species in each height group are often more shade tolerant, or were found in a stressed condition.

Some species obtain solar access at the edge of a wetland, roadway, or in disturbance openings. These interfaces are limited, and windthrow openings are rare, due to the moderate age of the woodland in most sections. In many areas, interfaces and openings are infested by vines, which have destroyed most of the smaller species. In the following list, the numerals on the right refer to the twelve sections or groves previously discussed under Forest Study Areas.

NEW RECORDS

Seven species set new state height records. Sweetgum, mockernut, black locust, American holly, Hercules club, spicebush and black highbush blueberry exceed heights for Maryland champion trees, past or present, and recent records for accurately measured tall trees. By the familiar point system, which includes height, girth and average spread, Hercules club, spicebush and black highbush blueberry exceed the present state champions, and have been registered with the Maryland Forest Service as new state champions.

COMMENTS

As a natural resource study area, forest succession has, quite properly, been allowed to proceed without human intervention, and the resulting differences in forest structure show a correlation between existing habitat, past agricultural activities, and the inherent capabilities of the indigenous tree species. Few non- native trees were seen. The bamboo grove, spreading vegetatively, may be of concern in the future.

Vines are a more serious matter. English ivy was seen in several areas, and should be eradicated before it reaches the fruiting stage, which will greatly accelerate the spreading of seeds by birds. Roundleaf (Oriental) bittersweet, which is spread by birds, has overwhelmed many acres of trees. The largest sassafras and black cherry are nearly covered by vines, as are the remaining examples of hackberry and persimmon. These trees will soon be lost unless efforts are taken to reduce non-native invasives.

Another serious problem is the unusual abundance of deer ticks; up to three dozen were found daily. This health hazard is a deterrent to nature interpretation or scientific study of the property. Fence repair, new gate design, deer exclusion and treated cotton for control of ticks on mice might be considered.

ACKNOWLEDGEMENTS

The author wishes to express his appreciation to Kenny Hartman, Assistant Park Manager at Sandy Point State Park, who kindly provided access into the study area.

Table 1. Tallest trees measured at Corcoran Woods, Maryland in July of 2002 Colby Rucker.

Common name	Species name	Height (ft)	CBH (ft)	Site number
	Mesic dominants: rich soils with adequate drainage			
Tuliptree	*Liriodendron tulipifera*	142.1	12.3	9
Sweetgum	*Liquidambar styraciflua*	120.9	6.5	3
American sycamore	*Platanus occidentalis*	119.2	7.7	3
Mockernut hickory	*Carya tomentosa*	118.1	7.5	9
Bitternut hickory	*Carya cordiformis*	115.9	7.4	5
Black walnut	*Juglans nigra*	99.7	8.8	10
	Dry-mesic dominants: well-drained loamy sand			
Black oak	*Quercus velutina*	122.2	14.0	10
Southern red oak	*Quercus falcata*	109.7	15.8	10
Chestnut oak	*Quercus prinus*	91.6	8.2	12
	Lowland dominants: moist/wet silt loams			
White oak	*Quercus alba*	119.4	11.9	1
Willow oak	*Quercus phellos*	115.0	9.8	1
Pignut hickory	*Carya glabra*	114.6	6.8	1
Pin oak	*Quercus palustris*	110.1	9.6	1
Red maple	*Acer rubrum*	106.9	4.5	3
Blackgum	*Nyssa sylvatica*	106.1	6.1	1
Northern red oak	*Quercus rubra*	103.5	6.8	1
American elm	*Ulmus americana*	95.3	4.5	2
	Old-field successional series			
Black cherry	*Prunus serotina*	109.9	10.8*	11
Black locust	*Robinia pseudoacacia*	107.8	6.3	8
Sassafras	*Sassafras albidum*	93.7	2.9	8
Loblolly pine	*Pinus taeda* (tree planted)	85.0	3.3	8
Pitch pine	*Pinus rigida*	84.1	6.4	8
Virginia pine	*Pinus virginiana*	82.8	3.9	8
	Forest/field interface or disturbance openings			
Persimmon	*Diospyros virginiana*	66.9	2.6	2
Mazzard cherry (naturalized)	*Prunus avium*	48.7	1.4	7
Eastern redcedar	*Juniperus virginiana*	39.4	1.6	11
Hercules club	*Aralia spinosa*	38.7	1.5	9
Common hackberry	*Celtis occidentalis*	28.9	2.6	9
	Understory species: shade tolerant			
American holly	*Ilex opaca*	69.3	4.2	4
Flowering dogwood	*Cornus florida*	33.6	1.3	10
Spicebush	*Lindera benzoin*	24.4	0.8	10
American beech	*Fagus grandifolia*	21.2	0.5	2
Black haw	*Viburnum prunifolium*	20.4	0.8	9
Black highbush blueberry	*Vaccinium atrococcum*	16.8	0.8	3

* Girth taken at 2 ft.

Formatting of this table kept consistent with Rucker's original style.

APPENDIX: COMMENTS ON HEIGHTS OF INDIVIDUAL SPECIES

Tuliptree (142.1 ft): Although this species is abundant on all but the driest or wettest soils, form is only average for the species, and few specimens retained a central leader above 80 ft. The upper structures of older trees displayed successive arching, with minimal increase in height. The largest specimens, some in excess of 150 years old, were in the Old Poplar Grove. One measured 13.2 ft CBH. Showy orchid was found near the tallest tree, indicating the higher fertility of the soil at this site.

Black oak (122.2 ft): Probably an important component of the original forest on the drier soils, some very large examples remain in the Big Oak Grove, and a few in the Old Poplar Grove. Some of these aged specimens are in declining condition. The largest (14.1 ft CBH) was also the tallest.

Sweetgum (120.9 ft): Sweetgum is abundant on the moist silt-loam soils, where it is height-competitive with tuliptree. The tallest examples are on better- drained silt loams at the upper end of the swale, with a double-topped specimen reaching 120.9 ft. An unusually large and handsome example was seen in the Big Oak Grove; CBH was 13.1 ft. The excellent form of many specimens suggests that maximum heights will continue to increase rapidly.

White oak (119.4 ft): Once an important dominant throughout the original woodland, this adaptable and long-lived species is now absent from most sections of the preserve. Several very large and aged specimens, up to 14.8 ft CBH, remain on loamy sand soils in the Big Oak Grove. The tallest examples were seen with willow oak, pin oak, and blackgum on silt loams in the Greenbrier Section, where it is the largest and tallest species. Many of these white oaks are vigorous specimens of good form, and significant height increases seem likely.

American sycamore (119.2 ft): Soil acidity is probably a negative factor resulting in an absence of sycamore on the wet silt loam areas. A few specimens were seen in tuliptree-dominated old-field areas. Sycamore was frequently seen on the upper part of the Swale Section, where silt loams are better drained, and spicebush is common. Barely height-competitive with tuliptree or sweetgum, most sycamores will become increasingly sunlight-deprived, and will remain relatively slender. The largest and tallest was a three-topped tree at the uppermost end of the Swale Section.

Mockernut hickory (118.1 ft): This species is infrequent and found on the more mesic sites. Several mature examples were found in the Big Oak Grove, and another in the Old Wire Section. Most were sub-dominant. The tallest was in the Big Poplar Grove.

Bitternut hickory (115.9 ft): Several tall examples were seen in the Big Oak Grove. This species is typical of moist silt loam soils; in this section, height may be limited by the drier conditions. The largest was a well-formed specimen in the Old Wire Section.

Willow oak (115.7 ft): This species is an important dominant with pin oak, white oak, and blackgum on the wetter soils in the Greenbrier Section, where the largest and tallest specimens were seen. Some large well-formed examples were on seasonally flooded sites, nearly as wet as those occupied by pin oaks, and displayed large buttress roots. A few willow oaks remain near the bridge in the Swale Section.

Pignut hickory (114.6 ft): This species occurs on better-drained soils in the Greenbrier Section, where the tallest example was found. The largest specimen (8.6 ft CBH) was with spicebush in a moist border of the Big Oak Grove.

Black cherry (109.9 ft): Starting as a common mid-successional, this species is seldom height-competitive, and remains as a few specimens of poor form gaining some solar access from the forest/wetland interface in the Swale Section, or benefiting from openings along the main woods road in the Front Section. The tallest tree is in the Vine Section; it is multiple trunked, with the one live trunk remaining heavily encumbered by bittersweet.

Southern red oak (109.7 ft): Before clearing for agriculture, this species was probably an important dominant on the drier soils. Modest-sized examples occur in the Pine Section. Where it occurs near Virginia pine stands, it may succeed that relatively short-lived species. A few aged specimens remain in the Big Oak Grove, where the tallest example was found. This specimen has the greatest CBH (15.8 ft) of any tree in the preserve. Unfortunately, much of this old tree is dead.

Pin oak (109.6 ft): This species is common on the wetter sites in the Greenbrier Section, where the largest and tallest example was discovered. Many pin oaks were found growing in seasonally flooded places, and are somewhat height-competitive with nearby willow oaks and white oaks. This species also occurs in the Left Border, and a single old specimen with embedded barbed wire remains at the upper end of the Old Wire Section, suggesting that pin oaks once occurred throughout the wetter old-field areas.

Black locust (107.8 ft): Starting as a mid-successional with tuliptree on the better-drained silt loams, this species is no longer height-competitive. Being highly intolerant, most of the locusts have died and fallen. The tallest and largest example was found with hollies and Virginia pines in the Pine Section, about 100 yards below the Big Poplar Grove.

Red maple (106.9 ft): Common on the moist silt loam soils, this species is barely height-competitive with tuliptree and sweet gum. Being somewhat shade- tolerant, it will remain as an important sub-dominant in the wetter areas. The tallest is by the loop road in the Swale Section.

Black walnut (99.7 ft): Most specimens are not height-competitive, the soils being of marginal quality for this species.

A few specimens of poor form remain in former woodland/field interfaces near the Big Oak Grove, where they face increasing old-field competition, and much damage from vines. The largest and tallest tree was found at the edge of the Big Oak Grove. It is of good form, and grows in association with a number of very large spicebushes, indicating richer and moister soil conditions than most of the Big Oak Grove. Without windthrow, black walnut is probably height-restricted from the tuliptree/sweetgum canopies.

Blackgum (98.0 ft): This species is of limited occurrence in the Greenbrier Section, where the more acidic soils seem favorable. This species is rather shade tolerant, and the scarcity of immature specimens was unexpected.

American elm (95.3 ft): Only one specimen was seen, on moist silt loam soil, near the main woods road in the Front Section.

Sassafras (93.7 ft): This mid-successional species was frequently seen on the driest soils, where it often occurs in close grouping, owing to root-sprout origins. Many specimens are in some competition with Virginia pine (82.8 ft), and are unusually tall and slender. The largest specimen is in the Vine Section, and essentially covered by bittersweet. The tallest, located on the berm of an old drainage ditch in the Pine Section, was only 2.9 ft CBH, and was surrounded by specimens of nearly the same slender proportions.

Chestnut oak (91.6 ft): Only two specimens were seen. These are multiple-trunked coppices, located on the sandy slope of a deep swale draining to Beacon Hill at the north end of the preserve, in the Back Corner area. This species may once have been fairly common with other oaks on excessively-drained sandy soils in this area.

Loblolly pine (85.0 ft): This species has been planted in rows at several locations in the Pine Section. A random group off the main woods road appears more natural, but is probably of similar origin. Maximum heights were taken at this latter group. This species should remain height-competitive on somewhat drier sites where tuliptree is less abundant. It is possible that these trees are pitch-loblolly hybrids.

Pitch pine (84.1 ft): Only two examples were seen. The tallest, located near the back gate path not far from the Bay Head Road gates, was fairly old, and in declining condition.

Virginia pine (82.8 ft): This species is a common old-field dominant on the driest soils in the Pine Section. Most specimens are of similar size and probably of similar age. Height is unremarkable. Dead trees and windthrow are common, especially on the heavier soils, where the pines are not height-competitive with sweet gum and tuliptree.

American holly (69.3 ft): Shade tolerant, this species is common in most areas, but benefits from additional sunlight at a forest/field interface or disturbance opening. Most noteworthy is a large grove on a slight rise perhaps 100 yards beyond the bridge, where a dense growth of mature hollies in the Holly Grove casts a dark, hemlock-like shade over the forest floor. The tallest specimen is in this area. Another large specimen, also hollow, is at a crossing for a footpath in the Swale Section.

Persimmon (66.9 ft): Only two examples were seen. These are near the northeast fence corner at Tydings Road in the Front Section. Both trees have been overwhelmed by Oriental bittersweet, and survival is doubtful.

Sweet cherry (48.7 ft): Only one specimen of this naturalized species was seen. Undoubtedly introduced by birds, it was found in the New Poplar Section, above the Swale Section. Only slightly shade-tolerant, this modest-sized example has survived due to the irregular canopy of the grape-affected old-field forest at this location.

Eastern redcedar (39.4 ft): Only one specimen was seen, in the Vine Section near the back gate path leading from Bay Head Road. This tree is losing solar access due to vines and canopy closure by the larger trees; survival is doubtful.

Hercules club (38.7 ft): A group of perhaps six trees was found in an opening on rich soil near the tallest tuliptree in the Big Poplar Grove. One specimen was unusually large, and proved to be a Maryland point champion.

Flowering dogwood (33.6 ft): This species is occasional on silt loam soils, with tuliptree and sweet gum in the Front Section, likely succumbing to heavy shade and perhaps blight. The best examples remain on lighter soils in the Big Oak Grove.

Common hackberry (28.9 ft): Typically found on rich circumneutral soils, hackberry is uncommon in Anne Arundel County. But one example was seen, near the largest white oak in the Big Oak Grove. This tree has been almost completely overwhelmed by vines.

Spicebush (24.4 ft): Occurring as a tall shrub on the richer soils, a number of large examples were found under the largest black walnut, at the edge of the Big Oak Section. Although most were of unremarkable height, one specimen near a large hickory is arborescent and attains a record height. Its spread is 25.7 ft by 18.7 ft (average 22.2 ft) and CBH is 0.8 ft. This tree is a Maryland point champion. It is threatened by nearby vines.

American beech (21.2 ft): Some small specimens were seen on better-drained silt loams in the vicinity of the swale, especially near Tydings Road in the Swale Section. Another is in the Greenbrier Section, near the main road. They may, in time, become more numerous, and create an ever-higher intermediate canopy.

Blackhaw (20.4 ft): Only two specimens were seen. Both were on well-drained rich soils. One was in the Old Wire Section and the other, slightly larger, was just beyond the largest-trunked (13′ 2″ CBH) tuliptree in the Big Poplar Grove.

Black highbush blueberry (16.8 ft): Usually occurring as a large shrub, this species is fairly common on the wettest soils, especially along drainage ditches, the main swale, and seasonally flooded portions of the Greenbrier Section. The tallest example was found by the lower swale in the Swale Section. Its spread has been reduced by competition, but this specimen is still a new Maryland point champion.

THE FRANCIS BEIDLER FOREST, HARLEYVILLE, SOUTH CAROLINA

Don C. Bragg

Research Forester, USDA Forest Service, Southern Research Station, Monticello, Arkansas

The Francis Beidler Forest, a 15,000 ac portion of the Four Holes Swamp complex, contains 1,800 ac of old-growth cypress-tupelo swamp. Nestled in the piney hills near Harleyville, South Carolina, the Beidler Forest is not nearly as famous as its neighbor, the Congaree National Park, but it has an incredible amount of old baldcypress and tupelo gum, and represents a unique and invaluable ecological resource.

The Beidler Forest is owned by the Audubon Society, and for a modest fee, I recently had the privilege of spending a beautiful late winter afternoon hiking its set of extensive (if somewhat rickety) set of boardwalks.

One of the first segments of the 1.75-mile long boardwalk that invites visitors to explore the Francis Beidler Forest. Photo by Don C. Bragg.

Baldcypress knees crowding the waters of the Beidler Forest. Photo by Don C. Bragg.

The old-growth bottomland portion of the Beidler Forest is generally wetter than all but the wettest parts of the Congaree (given its preservation of a cypress-tupelo swamp, you'd expect that), so the boardwalks are a must for all but the beginning part of the trail. This limited section passes through a stretch of second-growth upland pine-hardwood forest, with a mixture of loblolly pine and upland oak species gradually yielding to those more typical of low terrace sites, including spruce pine.

The transition to cypress-tupelo is rather abrupt, and these two species dominate the overstory for the rest of the boardwalk tour. The baldcypress are the most substantial of these hardy bottomland trees, and can grow to tremendous size over their long lives.

The Beidler Forest is not chock-full of truly giant specimens—several very large cypress are passed along the boardwalk, but none reach the enormous girth I've seen in places such as Sky Lake WMA near Belzoni, Mississippi, or along parts of the White River NWR in eastern Arkansas. For most of the area covered by the boardwalks, the baldcypress were 75 to 100 ft tall and perhaps 5 to 10 ft in circumference. The tupelo gums were smaller still, and definitely younger than the ancient specimens I've seen in parts of eastern Arkansas.

The size of the individual trees is not what makes the Beidler Forest special. Rather, it is the age of the trees—cypress > 1,000 years old can be found here—and the extent of the preserve (1,800 ac) that really set this area apart.

The complex branching and crown architecture of this virgin cypress-gum swamp is very apparent during the winter. Photo by Don C. Bragg.

Unfortunately, my busy schedule spurred me on through the trails. I also hastened my pace to be clear of the area before the wedding of a park employee began (her special day in the glorious sunshine and warm temperatures of that late February afternoon is a far contrast from what she would have experienced 6 months later).

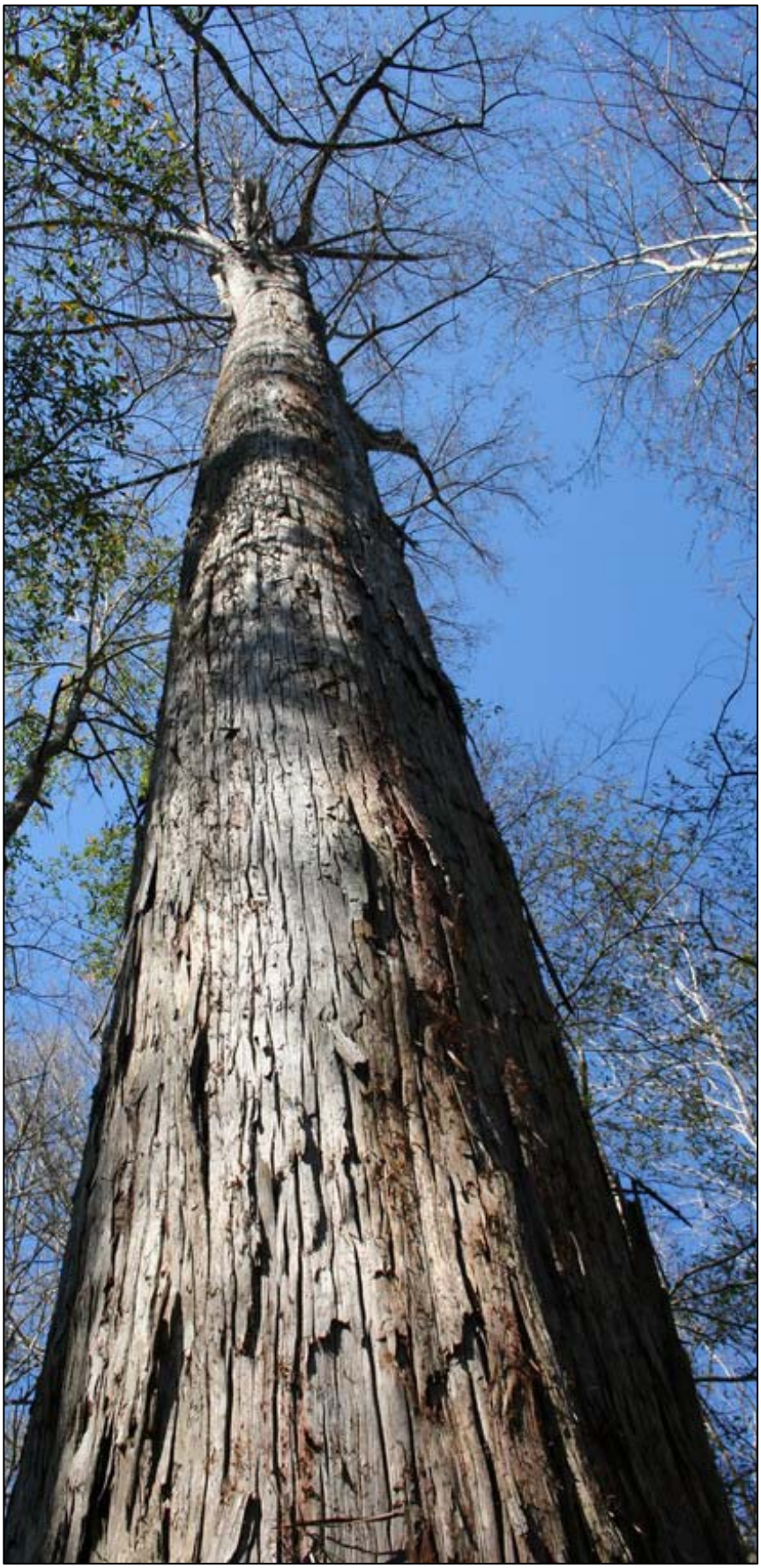
I lack the time and space to described the myriads of natural features and curiosities that abound in the dark waters of Four Holes Swamp. Nearly continuous immersion in the swamp leads to fascinating rooting and branching patterns, as the trees snake around obstacles and continually strive to better their position in life.

The animated roots of a flooded forest.

Photo by Don C. Bragg

Yet the eye always returns to the cypress. Given their imposing size and relative dominance of the stand, it is not hard to see why this species continually captures the public's imagination.

More information on the Francis Beidler Forest can be found on the following webpage:
http://sc.audubon.org/Centers_FBF.html



Left: An ancient baldcypress in Beidler Forest that is reportedly 1,000 years old. This tree is at least 115 ft tall and over 15 ft in girth. Photo by Don C. Bragg.

Bottom: Photographs of a "secret" entry to a hollow cypress along the Beidler Forest boardwalk, including a view from within. Photos by Don C. Bragg.

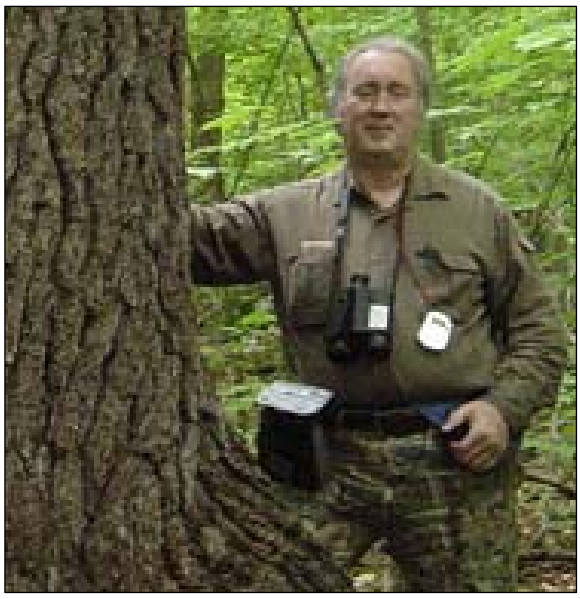
The ancient baldcypress and tupelo gum reflected in the still waters of the Four Hole Swamp in the Francis Beidler Forest. Photo by Don C. Bragg.

SEEING THE FOREST WITH AN ATTITUDE

Robert T. Leverett

Founder, Eastern Native Tree Society

If some of us on the list seem obsessed with big tree and site lists and rankings, several good reasons have surfaced in our e-mail exchanges for having these trappings of interest. Here is a question to ponder. How do those with plenty of experience either working in or traipsing around in eastern woodlands come to the conclusion that the forests of the Great Smoky Mountains are not exemplary? Consider what grows in the Smokies, first via a recap of the response from Will Blozan to my question about 20-ft circumference trees in the Smokies: Cataloochee: one tuliptree, one red oak; Greenbrier/Cosby: at least nine tulips (used to be ten), one red maple; Deep Creek: one tuliptree; West end: one tuliptree.



By my count that's 14 trees plus whatever Jess Riddle knows about that's not included above. Let's say he knows of just one more. That would equal 15 trees that reach 20 ft in circumference in the Smokies. These are forest grown trees. If we drop down to an 18-ft circumference as the criteria, then the number soars. Suppose we set out to count all the Smoky Mountain trees that make 15 ft in circumference—we'd be at our task for a long time!

But, if the Smokies are outstanding for large-girth trees, they are absolutely unbeatable in the height department. We could list superlative after superlative to make the point, but suffice it to say that the Congaree is the Smoky Mountains only competitor.

Well, if the Smokies have so many great trees, and they do, then why do some otherwise experienced people not see them as special? I think it stems from what I've started to call seeing the forest with an attitude. Here is an example. When the late Dr. Michael Perlman was collecting material for his book "The Power of Trees", he interviewed a logger from one of the Carolinas—I forget which. The logger spoke freely since he understood Mike to be a psychologist only. In the conversation Mike asked the logger what he thought of the Smokies. The logger frowned and stated that the Smokies wasn't a healthy forest and consisted of only one kind (species) of tree. Now Park naturalists have catalogued 131 species of trees in the Smokies including some exotics. Our logger friend seems to have failed to have noticed a mere 130 different species. A woodsman making such a mistake? What is the explanation? The logger saw the Smokies through an attitude. Of course, he probably did recognize more than one species of tree in the Smokies, but symbolically he acknowledged only one. He blanked the incredible diversity of the Smokies out of his mind. He wanted to see the Smokies as a waste, so he conjured up an appropriate image and verbal description to match.

Though not so blatant, others with varying backgrounds as timber specialists have made puzzling observations about the Smokies. Each has his/her reasons for diminishing those incredible woodlands. But all see the Smoky Mountain forests with an attitude. There is no shortage of examples applicable to other regions. Some of the timber managers of Pennsylvania see Cook Forest State Park with an attitude—meaning they don't recognize the exemplary stature of the trees relative to other Pennsylvania sites.

I'd be hypocritical if I didn't admit to having seen trees and forests with an attitude. I now find outstanding sycamores, silver maples, and cottonwoods in the Connecticut River Valley. Jani and I returned from Arcadia Wildlife Sanctuary a short time ago. I found a cottonwood right on the side of a road that proved to be 94.5 ft tall and 14.1 ft around. A 14-ft cottonwood is no mean tree. The number of the three species just mentioned in the Valley that exceed 12 ft grows steadily. Well, why hadn't I seen them before? My eyes had, but my brain repackaged the images to fit a perception—a negative one. I was seeing the trees with an attitude, which means I wasn't seeing them at all. I was seeing a mental reconstruction to fit a perception.

So how does seeing with an attitude relate to tree measuring, i.e., is the latter a cure for the former? The collection of measurements and their presentation via a host of lists eventually penetrates the attitude and opens up the mind to more realistic assessments. Thus, one is less likely to proclaim a mediocre woodland as exemplary and vice versa.

When we look at forest through the eyes of the artist, the scientist, the forester, the arborist, the mystic, we pick up different aspects of the multi-dimensional life forms that we call trees. To see trees as mere numbers is to dishonor them, but seeing them with the information that numbers can communicate can keep us from making ourselves look pretty silly at times. Viva la tree numbers. May the great Silver maples, cottonwoods, and sycamores that I keep finding in the Connecticut River Valley, now that the blinders are off, live long and prosper.

Editor's note: The original posting of this message dates to May 8, 2002, and substitutes for new material while Bob recovers from surgery.

--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.

Water tupelo and baldcypress dominate the slow moving wooded swamps of the Francis Beidler Forest near Harleyville, South Carolina. This preserve is owned by the Audubon Society, and is open (for a small fee) to the public. This preserve protects an important old-growth cypress-gum swamp and valuable fish and wildlife habitat. Photo by Don C. Bragg.