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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, Native Tree Society BBS, at: http://www.ents-bbs.org/index.php. Submissions to the Native Tree Society website in terms of information, art, etc., should be made to Edward Frank at: ed_frank@hotmail.com.

The *Bulletin of the Eastern Native Tree Society* is provided as a free download in Adobe™ PDF format (optimized for version 5 or newer) through the Native Tree Society website. The Native Tree Society, the Eastern Native Tree Society, and the *Bulletin of the Eastern Native Tree Society* editorial staff are solely responsible for its content.

COVER: Decaying hardwood leaves are a sign of the changing seasons at the Fernbank Forest in Atlanta, Georgia. Photo courtesy of Megan Chapman/Eli Dickerson.

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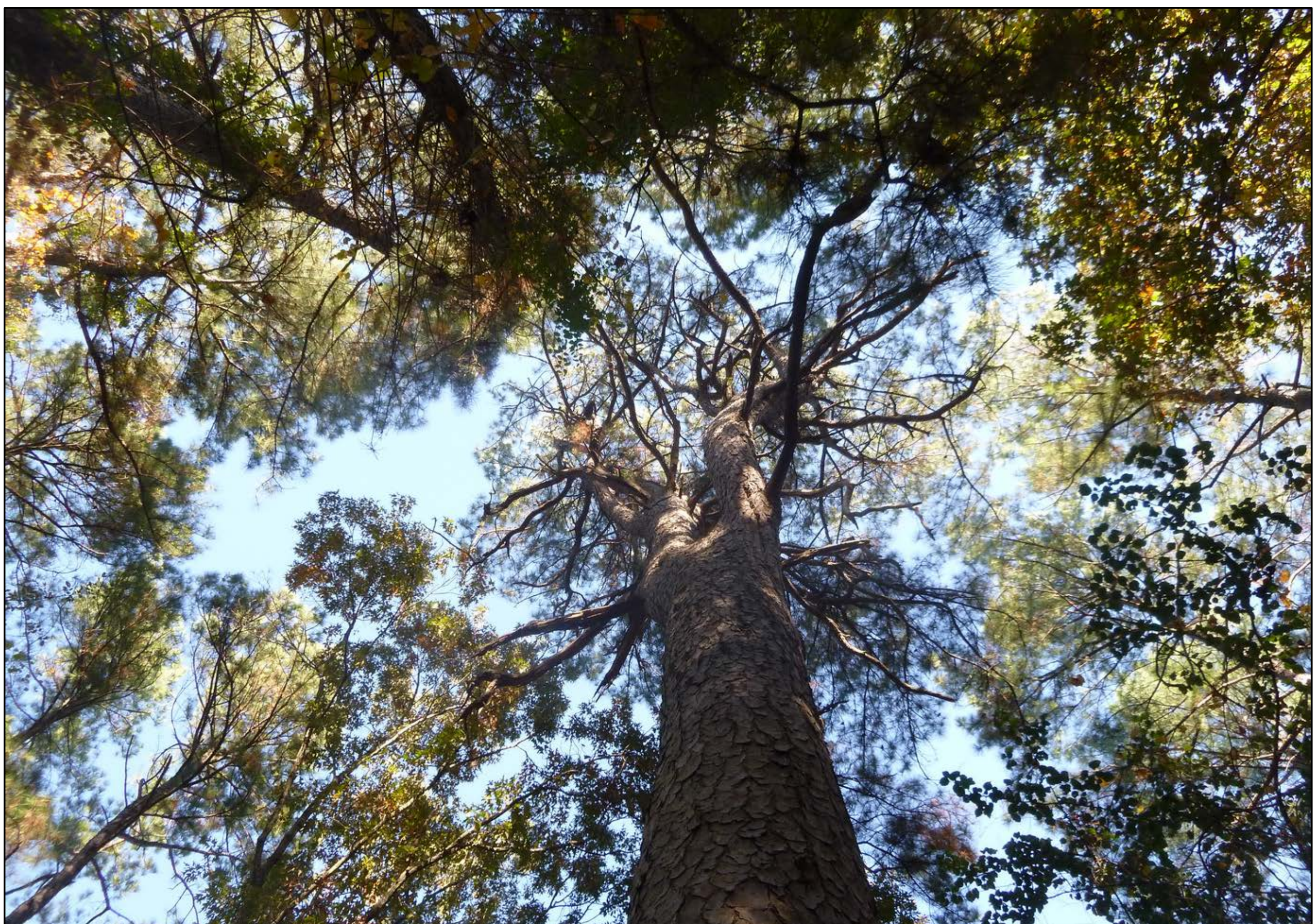
SEARCHING FOR A NEW CHAMPION

You may recall in the last issue I regretfully announced the demise of the national champion shortleaf pine, which had resided in the Levi Wilcoxon Demonstration Forest until July 2013 when it was snapped by a severe windstorm. Jess Riddle and I have spent some time this winter and spring scanning the remaining big pine in the Levi Wilcoxon for a new champion shortleaf. I regret to say that none have been found of the same magnitude as the original, but we did find quite a few over 125 ft tall, and I am confident we'll identify a new (at least state) champion shortleaf pine from this set.

The current issue of the *Bulletin* reports another loss; the passing of Gary Beluzo. Bob Leverett's eulogy speaks more on the man than I could in a few lines here, so that is not my intent: rather, I'd like to recast the title of this op-ed piece in terms of the Native Tree Society's search for a new champion to fill Gary's shoes. Gary was a passionate advocate for the forest, and I like to think that the Native Tree Society ranks are continually being filled by other such champions. I know that I see this constantly in the contributions of new members, and the willingness of many to help make the various projects of the Native Tree Society succeed. In particular, I am grateful for the contributions in this issue of a recent graduate (Megan Chapman) and her work at Fernbank Forest, an incredible tree resource for the people of Atlanta, Georgia, and Karl Heinz, whose work using laser technology on European trees is most appreciated. I know in my heart that Gary's legacy will continue in the efforts of Megan and Karl and scores of other new champions.

Don C. Bragg
Editor-in-Chief

A large loblolly pine towers over younger trees on private land near Monticello, Arkansas.
Photograph by Don C. Bragg.



ANNOUNCEMENTS AND SOCIETY ACTIONS

2014 Western Native Tree Society Rendezvous
"The Southwest's Old-Growth Forests: A Conference"
August 4-6, 2014
Fort Lewis College
Durango, Colorado

Sponsors:
Western Native Tree Society; Center of Southwest Studies, Fort Lewis College; Tree-Ring Laboratory, University of Arkansas; American Forests; Tree Climbers International (TCI), Laser Technology, Inc.; Friends of the Mohawk Trail State Forest; and the Native Tree Society (NTS)

HIGHLIGHTS OF FEATURED SPEAKERS PROGRAM (titles and speakers still subject to change):

Monday, August 4, 2014 [1:30 p.m.]

Don Bertolette and Bob Leverett: Introduction, overview, and comments
Dr. Fred Paillet: "Parallel evolution in iconic American and Siberian timberline trees"
Dr. Alan Craig: presentation title to be announced
Laurie Swisher: "Effects of wildfire in old-growth ponderosa pine stands"
Dr. Robert Van Pelt: "Advanced techniques for the quantification of giant trees—examples from around the globe"

Tuesday, August 5, 2014 (9:00 a.m.)

Dr. David Stahle: "Dating the ancient Douglas-firs of Mesa Verde and what the trees teach us"
Dr. Lee Frelich: "The effects of climate change on species in the Upper Midwest"
Chris Guiterman: presentation title to be announced
Dr. Don C. Bragg: "Lessons from a by-gone era: what past (and present) southern pine silviculture can tell forest managers in the Southwest about the future "
Cocktail reception with music and poetry will follow the Tuesday program

Wednesday, August 6, 2014 [early]

Day long field trips (destination and details to be announced)

Please keep checking the Native Tree Society website and bulletin board for more details.

New Publications of Interest

Bragg, Don C. 2014. Accurately measuring the height of (real) forest trees. *Journal of Forestry* 112(1):51-54. *This paper provides some of the historical background on the development of tree height measuring techniques, including the sine method; will soon be available for free download at www.treesearch.fs.fed.us*

Larjavaara, Markku. 2013. The world's tallest trees grow in thermally similar climates. *New Phytologist* 202(2):344-349. *This paper does not specifically list this in the methods, but many of the heights used to measure these tall trees were taken by Native Tree Society members using the sine method. Free to download at: http://onlinelibrary.wiley.com/doi/10.1111/nph.12656/full*

Tng, D.Y.P., G.J. Williamson, G.J. Jordan, and DMJS Bowman. 2012. Giant eucalypts—globally unique fire-adapted rain-forest trees? *New Phytologist* 196(4):1001–1014. *Like the paper by Larjavaara, this paper uses data from Native Tree Society members and other places that use the sine method. Free download at: http://onlinelibrary.wiley.com/doi/10.1111/j.1469-8137.2012.04359.x/full*

DENDROCHRONOLOGY AND AIR POLLUTION IN FERNBANK FOREST, ATLANTA, GEORGIA

Megan Chapman[1], Matthew Weand[2], and Eli Dickerson[3]

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ABSTRACT
Urban forest fragments are often small, even-aged, frequently disturbed, and therefore dominated by early successional tree species. In contrast, the Fernbank Forest in Atlanta is a relatively undisturbed remnant of Piedmont forest known to contain some older trees. However, the Forest's health may be affected urban air pollution. The goals of this study were to reconstruct the Forest's growth dynamics using tree-ring data and to determine whether a common pattern of growth among trees is related to changes in air quality. Mean tree age was 132 ± 10 yrs with twenty-eight trees older than 100 yrs (74%). The oldest species in the forest (present for at least 170 yrs) are *Liriodendron tulipifera, Quercus alba, Quercus stellata,* and *Liquidambar styraciflua*. Younger species (aged 50 yrs or less) included *Carpinus caroliniana, Nyssa sylvatica* and *Oxydendrum arboretum.* The uneven age distribution and large number of old trees suggests that Fernbank represents unique habitat within urban Atlanta and supports the conservation value of the forest. Importantly, Atlanta's ozone concentrations were significantly correlated to declines in growth ($r^2 = 0.19$, $P = 0.01$) in *Pinus echinata*. Predicting the future of the Forest's growth will require an expanded consideration of how ozone effects may interact with other changes in climate among many species.

INTRODUCTION
Urban forests are pivotal in helping maintain the quality of life in cities. Among other functions, urban forests provide ecosystem services such as clean air and water, noise reduction, habitat for many species of plants and animals, and recreational, aesthetic, and education value (Bolund and Hunhammar 1999). Urban forests also serve as living ecosystem models for predicting how humans will impact natural systems into the future. For instance, because urban heat-island effects cause urban areas to be warmer than non-urban areas, urban forests can be used as space-for-time substitutes in predicting how regional forest functions will respond to climate change (Carreiro and Tripler 2005). All these services make urban forests an important component for conservation within the urban landscape.

Ecologically, urban forest fragments are often relatively small communities (10s to 100s of hectares), largely due to deforestation caused by the incessant need for more space in cities (Funderburk 1992). In the Eastern US, these "remnant" forests are the legacy of what was once a larger contiguous forest subjected to many years of fragmentation (McBride 1986), and are often located in areas considered undesirable or unsuitable for development. Other urban forests arise from city areas specifically designated to become forest parks (e.g., Central Park of New York City) and are created either through municipal planning, conservation ordinances, or through private landowner actions.

Urban forests are subjected to frequent anthropogenic disturbances that influence forest structure, composition and function (Lawrence 1993). Today, urban forests are often used for recreation and education while in the past traditional economic uses such as timber harvesting or grazing occurred (Tyrväinen et al. 2004). If disturbance frequency and intensity is great enough, urban forests may become composed of largely even-aged (or structured) stands. That is, the majority of trees may often be similar in age or size either because they originated at the time of the forests' creation, or because disturbance has removed exceptionally old or large trees (McBride and Jacobs 1986). For instance, McPherson et al. (1997) found that within a three county region surrounding Chicago, over 50% of trees were in the smallest size classes. Further, a high degree of disturbance causes urban forests to be dominated by early successional species that can tolerate and capitalize on disturbance.

In contrast to the historical disturbance regimes likely experienced by many urban forests in Atlanta, Georgia, Fernbank Forest has a relatively anomalous history (Figure 1). Though specific events in Fernbank's disturbance history are largely unknown, it is thought to have been free of major anthropogenic disturbance since at least 1820 (McCurdy 1967). The first home on the property, the Z.D. Harrison house, was built in the late 1800s and the forest was specifically purchased for preservation in 1939. Although Fernbank has shrunk from an original 162 hectares to its current 26 hectares as different sections were sold or developed, the inner core of the forest has remained intact despite surrounding urbanization and land ownership changes. Today, this property is owned and managed by Fernbank Museum of Natural History.

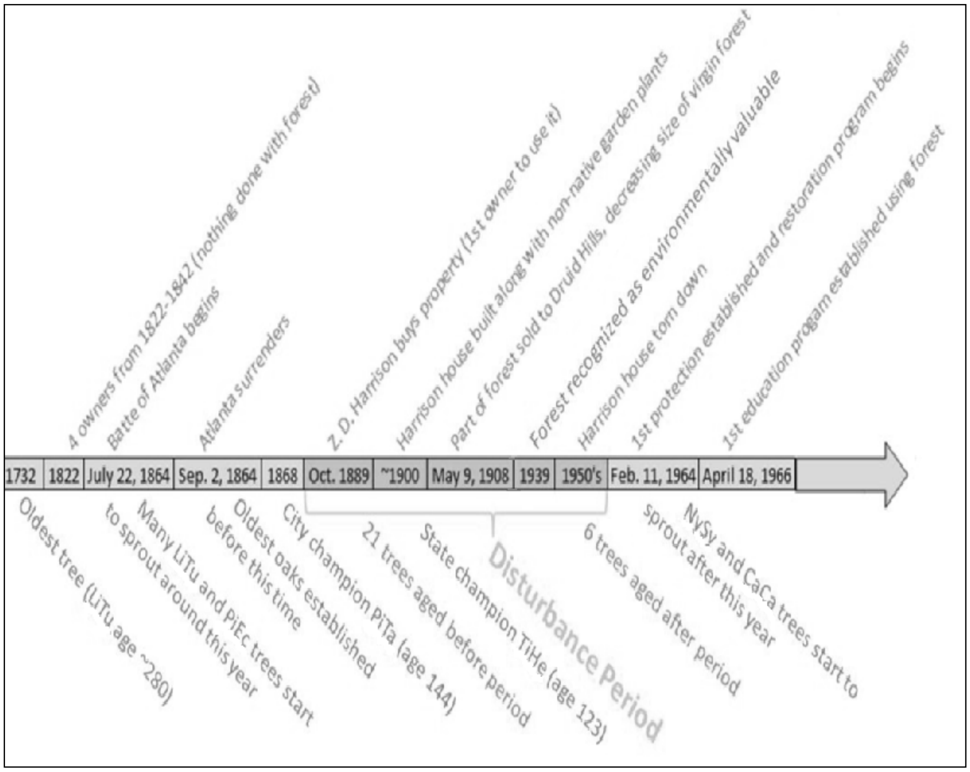

Figure 1. Timeline of Fernbank Forest, Atlanta, Georgia.

In recent decades the forest was a popular recreation destination for Atlanta residents, but except for occasional guided tours it has not been open to the public since June 2011. When it was open, human impacts to the forest were lessened by requiring all visitors to sign-in before entering and to stay on designated trails. Today, the Fernbank Museum is conducting projects to remove invasive plants and help restore the forests' original state.

Fernbank Forest is home to many plant species. Some of the common understory plant species found in the forest include many types of ferns (hence the name "Fernbank"), wild ginger (*Asarum canadense*), dog hobble (*Leucothoe fontanesiana*), and poison ivy (*Toxicodendron radicans*). However, there are some invasive plant species such as Chinese privet (*Ligustrum sinense*), Japanese honeysuckle (*Lonicera japonica*), and English ivy (*Hedera helix*) (Funderburk 1992). The forest canopy is dominated by tree species including tulip-poplars (*Liriodendron tulipifera*), hickories (*Carya glabra, Carya tomentosa, and Carya cordiformis*), oaks (*Quercus alba* and *Quercus rubra*), basswood (*Tilia heterophylla*) and pines (*Pinus taeda* and *Pinus echinata*).

Many of the Fernbank's trees are relatively large and hence often thought to be old-growth. Previous work showed that at least 16 trees (*Liriodendron tulipifera*, *Quercus* spp., and *Carya* spp.) in the forest predated the Civil War with the oldest having been dated to at least 1819 (Baes and Ragsdale 1981). The presence of old trees may be especially important for conservation of biological diversity in urban forests. The US Forest Service recognizes the many significant values associated with old-growth forests, such as biological diversity, wildlife and fisheries habitat, recreation, aesthetics, soil productivity, water quality, and industrial raw material (US Forest Service 1989). For instance, because tree morphology changes with age, older trees may provide unique habitat for species of wildlife, plants, fungi, lichens, moss, and other organisms that might otherwise become locally extinct. While many trees in the Fernbank have visual characteristics of old-growth trees (Pederson 2010), the age of most is unknown. Tree diameter is not necessarily an indicator of old age, especially in urban forests. Trees grow relatively larger, and faster, when they experience less competition and more resources than neighboring trees. For example, large diameter trees may occur in close proximity to water sources, or where sunlight is abundant in the canopy. Exceptionally large diameter trees could also arise in urban forests due to forest management activities (removing dying trees, fertilizing, etc.) that improve resource availability and allow for increases in growth. Considering the potential importance of old-growth trees especially for an urban forest, our primary goal was to expand on previous work (Baes and Ragsdale 1981) and assess the maximum ages of a greater sampling of trees in the Fernbank.

In addition to strengthening the conservation value of a forest, old-growth trees can provide a record of historical growth and more recent forest responses to urbanization as indicated by annual growth rings. Short-term disturbance events (one to several years) such as droughts, floods, fires, pest outbreaks, as well as "release events" (spurts in growth triggered by the death of neighboring trees) can all be detected in tree rings (Stokes and Smiley 1996).

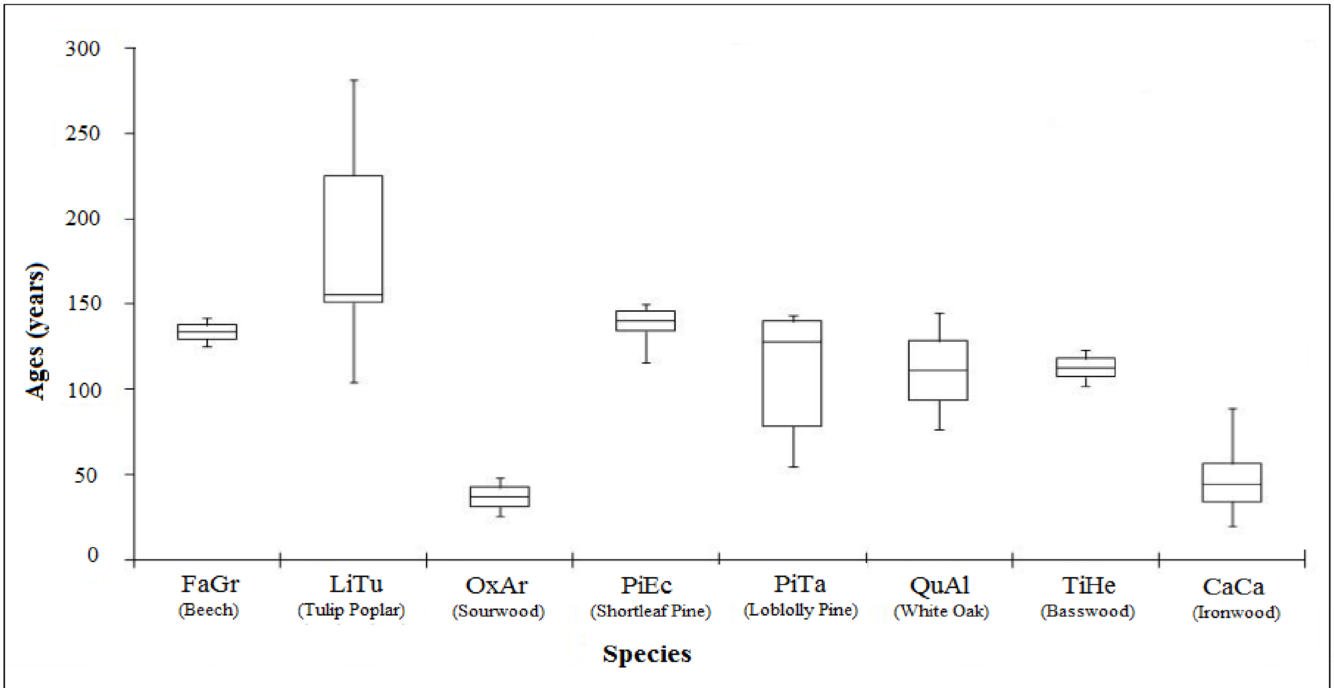

Figure 2. Box and whisker plots for tree ages within the Fernbank Forest. Boxes represent the 25th and 75th percentiles, with the mean represented inside each box. Whiskers represent minimum and maximum ages.

Longer-term growth trends (decadal or more) in urban forests are likely influenced by multiple factors including changes in climate and air quality. Airborne pollutants such as ozone (O_3), nitric oxides (NO_x), sulfur dioxide (SO_2), and particulates can all negatively impact plant growth (Reich 1987, Schulze 1989). These pollutants can interfere with photosynthesis often by directly oxidizing plant tissue, or indirectly by increasing acidity in soil and water, or creating dust coatings on leaves (Lindroth 2002, Beckett et al. 1998). Studies have shown direct correlations between urban and industrial air pollution and tree growth reduction (Hirano and Morimoto 1999, Long and Davis 1999).

Tree responses to changes in air pollution may be especially apparent in the Fernbank Forest. Air pollution in Atlanta developed from industrialization in the late 1800s and early 1900s, and likely included emissions from coal furnaces, trains, and cars. Continued urban growth, industry, and greater activity of planes and cars increased air pollution through the 20th Century. The population growth rate of Atlanta more than doubled from 1970 to 2004 (Ross 2006) and city residents remain largely reliant on cars. Although there have been many legislative efforts to reduce air pollution, such as the Clean Air Act and car emission tests, pollution in densely populated areas remains a problem. Today the Forest is adjacent to a Ponce de Leon Avenue, a major roadway in the city. Previous work has shown that the Fernbank's trees accumulate lead from car exhaust (Baes and Ragsdale 1981), however it is unknown whether changes in air quality in Atlanta are affecting tree growth at the Fernbank. Therefore, a second goal of this study was to reconstruct the Forest's growth dynamics over time and determine whether a common pattern of growth among trees is related to changes in air quality.

METHODS AND MATERIALS

During March of 2011, an increment borer was used to remove sample cores from 38 trees within Fernbank forest that displayed old-growth characteristics such as balding or smooth bark, gnarly branches, and large diameter size (Pederson 2010). The cores were taken at a height of 107 cm from the base at mid-slope. A second core was taken if the pith was not reached with the first coring (while standard practice is to take two cores per tree, we wanted to avoid causing undue damage to the trees whenever possible). The cores were then stored in straws. Each tree's diameter was taken at 1.37 m from the midslope using a diameter tape. Site moisture characteristics were recorded observationally as either mesic (lowlands or stream sides), intermediate, or xeric (uplands and ridges). Tree GPS location was only recorded if available. Each tree's crown condition was inspected and broken boles, fallen branches or severely bent branches were noted. The direction and degree of lean for each tree and the degree of bark sloughing was also recorded.

After air-drying, the tree cores were mounted and finely sanded. Cores were aged by counting the growth rings from bark to pith and then re-counting. Ring widths of cores were measured in the Geography Department of the University of Georgia using a microscope and a Velmex linear slide attached to a digital micrometer. Rings were measured to the nearest 0.001 mm. Using the ring widths, intraspecific cores were visually cross-dated, and cross-dating validity was confirmed using COFECHA software (Holmes 1983).

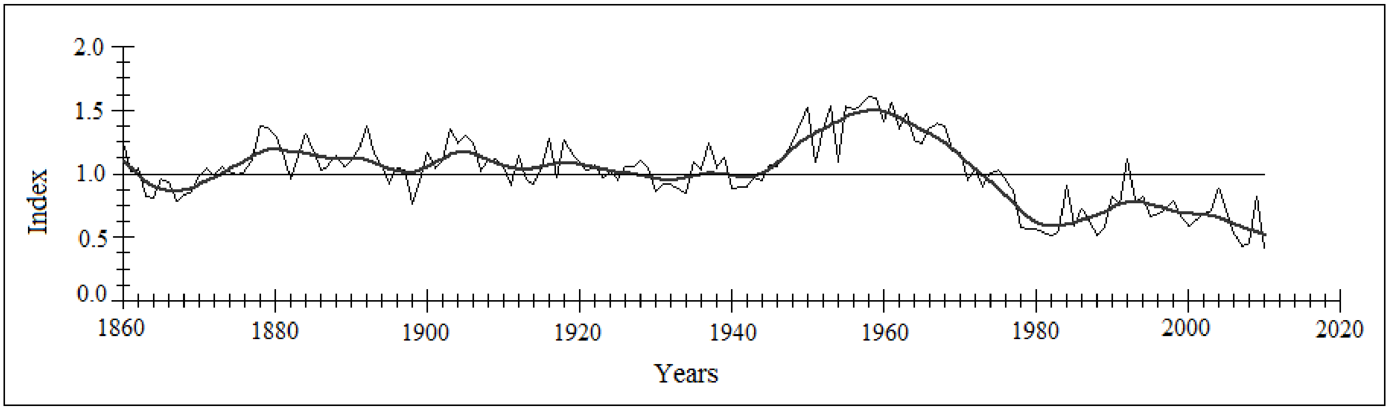

Figure 3. Auto-regressive standardized (ARSTAN) growth indices for **Pinus** *species in Fernbank Forest. Growth indices are unitless.*

Correctly dated time-series of growth were standardized using a detrending method with the intent to preserve as much low frequency information as possible unrelated to competition (Cook and Kairiukstis 1990). A negative exponential curve or linear regression was used to remove biological geometric growth trends caused by the narrowing of rings as stem diameter increases. This correction created the first "standard" index chronology of the tree growth. A second residual index chronology representing extreme departures from normal growth was created by removing autocorrelated growth from the first chronology (tree growth is inherently autocorrelated because previous year's growth affects the next year's growth). A third "ARSTAN" index (auto-regressive standardized) chronology was created by adding a model of the auto-correlated growth pattern back into the residual chronology (Cook and Kairiukstis 1990).

To examine the potential influence of air pollutants on tree growth, monthly mean air quality measures of ozone, carbon monoxide, and all reactive oxides of nitrogen (a more inclusive measure of all nitrogen pollutants) from the South DeKalb monitoring station (Latitude: 33.69060 °N, Longitude: 84.27310 °W) were obtained from Georgia Department of Natural Resources. Annual air quality data (e.g., ozone, nitrous oxide) in Atlanta was examined from 1974 to 2010. Air quality data were compared to tree chronologies using linear regression and correlation.

RESULTS

Mean tree age was 132 ± 10 yrs and the oldest tree sampled was a 285 yr old *Quercus alba.* Twenty-eight trees were older than 100 yrs (74%) and *Liriodendron tulipifera* tended to be the oldest with a mean age of 186 ± 22 yrs. The oldest species in the forest that were present for at least 170 yrs are *Liriodendron tulipifera, Quercus alba, Quercus stellata,* and *Liquidambar styraciflua*. Younger species that were aged 50 yrs or less included *Carpinus caroliniana, Nyssa sylvatica,* and *Oxydendrum arboretum* (Figure 2). The largest diameters were found in *Liriodendron tulipifera*, *Quercus alba*, and *Fagus grandifolia.* Tree age was significantly correlated with tree diameter (r^2= 0.55, P < 0.0001). Among the trees sampled, 27% occupy xeric habitat, 60% occupy intermediate habitat, and 13% occupy mesic habitat.

Unfortunately, small sample size and poor core quality prevented cross-dating of the hardwood species. However, enough usable *Pinus echinata* cores were available for cross-dated and provided the basis for our reconstruction of historical growth. ARSTAN chronology growth indices from the *Pinus echinata* data showed relative increases in growth in the 1880s, early 1900s, and especially in the 1960s, while decreases in growth occurred in the 1980s and 2000s (Figure 3). Measures of air pollution also changed over time (Figure 4).

Mean carbon monoxide and oxides of nitrogen concentrations steadily decreased overtime while ozone levels increased from 1972 to 1987 and then fluctuated around 0.05 ppb from 1987 to the present (Chapman 2012). Some increases in atmospheric pollutants were related to decreased tree growth. Ozone was significantly, negatively correlated with tree growth (r^2= 0.19, slope= -11.7, P = 0.01; Figure 4). Carbon monoxide (CO) and tree growth rates displayed opposing trends over time, i.e., annual increases in CO were associated with relatively decreased growth, but this relationship was not significant (P = 0.17). While there was no clear relationship between trends of growth and nitrous oxide over the entire time period 1980-2010 (P = 0.26), select periods did show opposing trends. For instance between 1983 and 1989 nitrous oxide levels were relatively high and tree growth was relatively low. When all reactive oxides of nitrogen were considered the correlation with growth over the entire time period 1994 to 2010 was weak (r^2= 0.02, P = 0.61). The only time period where growth was negatively related to N oxides was from 1998 to 2004.

DISCUSSION

This study confirms that Fernbank Forest contains trees well over 200 yrs old, and that these older trees can be identified based on tree diameter—according to our data, large trees tended to be older. While an age-diameter relationship may seem obvious, the strength of this relationship can depend on factors like resource availability, or changes in resource use efficiency as trees age (Binkley et al. 2002). In fact, some studies show that the oldest trees in a stand may be those with a lifetime of relatively lower growth rates compared to younger trees (Black et al. 2008, Johnson and Abrams 2009).

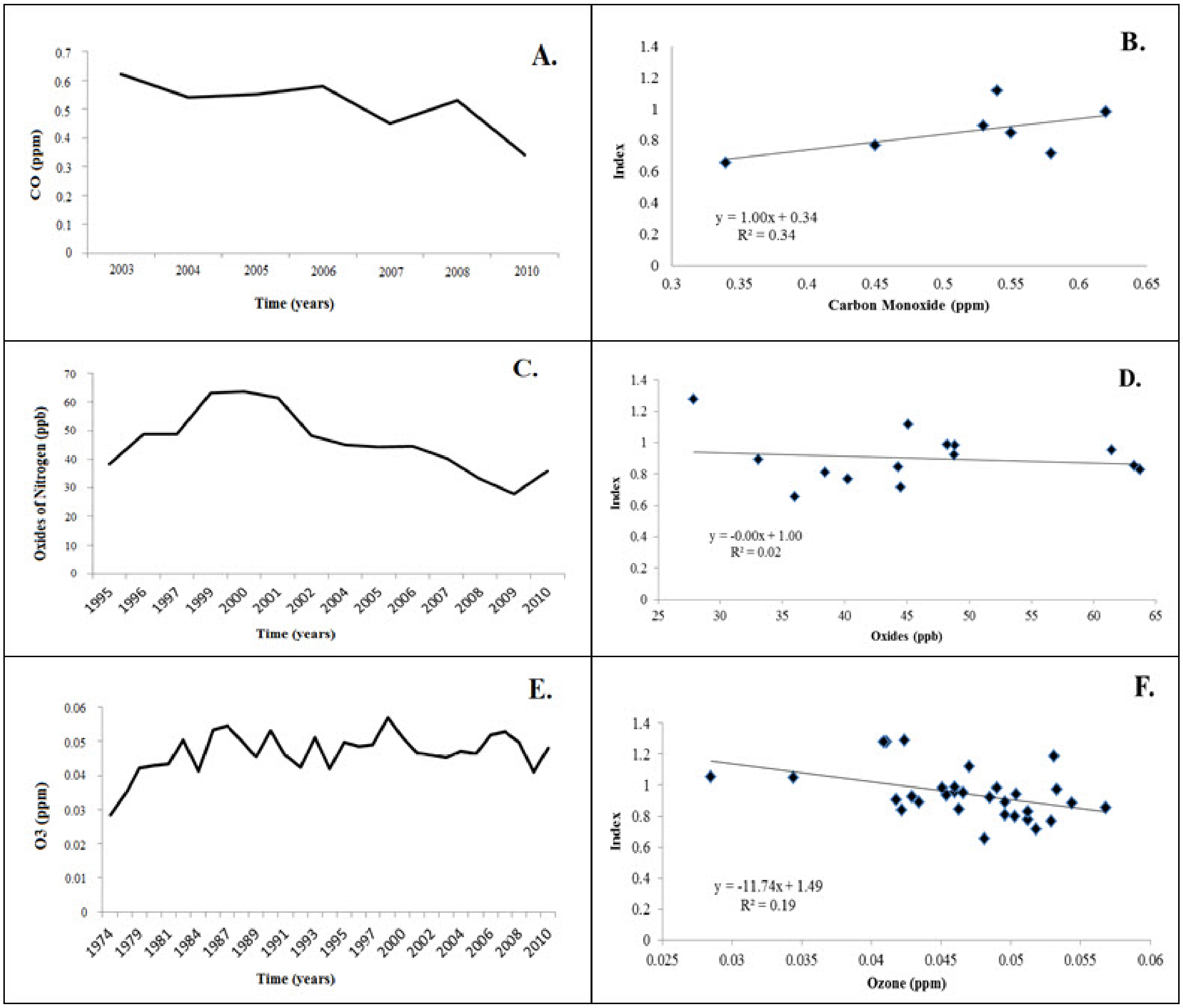

Figure 4. Measures of air pollution and relationship of each pollutant with indices of* Pinus echinata *diameter growth in Fernbank Forest. A) Carbon monoxide concentrations in Atlanta, Georgia's air over time. B) Correlation of residual growth indices and concentrations of carbon monoxide. C) Oxides of nitrogen concentrations in Atlanta's air over time. D) Correlation of residual growth indices and concentrations of all oxides of nitrogen. E) Ozone concentrations in Atlanta's air over time. F) Correlation between residual growth indices and ozone concentrations. Growth indices are unitless.

We also found that Fernbank Forest has a mixed age structure, with the oldest trees ranging in age from 100 to 285 yrs (Figure 2). Few urban forests in the southeastern US have comparable area (>20 ha) and this range of older trees.

The disturbance history of Fernbank Forest undoubtedly affected the establishment of certain canopy trees. However, a clearer picture of this history based on the maximum ages of trees is elusive at best. For example, most of the old *Liriodendron tulipifera* trees were established around or before 1864 (Union troops invaded and destroyed Atlanta during this time at the end of the Civil War). These species are early successional and proliferate in high-light, open conditions, so their establishment may be linked to war, fire, land clearing, or any disturbance which opened up canopy space. We found no evidence of fire scars in the cores during that time period. Further, the ages of other species do not support the suggestion that Fernbank was largely disturbed, or cleared around the Civil War. The oldest *Pinus echinata* (another early successional, shade-intolerant species) established after 1864, while *Fagus grandifolia* (a shade-tolerant, later successional species) clearly established beforehand. Based on these varying dates of establishment, we can only conclude that disturbances were likely patchy rather than widespread in the mid to late 1800s.

From 1889 to the 1950s, Fernbank Forest experienced its highest levels of human disturbance (Figure 1), as portions of the forest were sold and developed and invasive species were introduced, often intentionally (McCurdy 1967). However these disturbances were still likely less severe than those occurring in Atlanta's other urban forests due to Fernbank's long history of conservation and protection. Restoration projects were initiated in 1964 to remove invasive plants and to build designated trails through the forest but the impact of these activities on seedling establishment or tree mortality is unknown.

Ring index chronologies show historical changes in growth patterns which integrate many factors including climate, disturbance, and competition among others. We found that growth was relatively greater during the 1880s, early 1900s, and 1960s compared to intervening decades (Figure 3). In recent decades (1980 to 2010) growth appears to be slowing relative to historical decades (1860 to 1960). There are several possible explanations for a decline in growth. First, because we were only able to analyze growth trends in a single *Pinus* species, we cannot rule out growth declines caused by competition, i.e., successional replacement by hardwood species. Another explanation is age-related decline—it has often been thought that overall growth rates of trees tend to slow down with age (Odum 1969). While the cause for the decrease in productivity with age is not definitive, it may be due to more resources being allocated towards maintenance of existing biomass as opposed to growth (Chapin et al. 2002). However, recent studies have shown that even very old trees are capable of increasing their growth rates (e.g., Salzer et al. 2009). Trees at the Fernbank, while relatively old compared to many urban forests, could be considered only "middle-aged" when compared to known maximum ages (Pederson 2012). So we doubt that simple age-related decline is an underlying cause for the recent decreases in growth.

We found that ozone levels slightly increased over time (Figure 4), and that years with relatively high ozone pollution were years in which *Pinus* trees grew relatively less (Figure 4). While the correlation between ozone and decreased growth was not strong ($r^2 = 0.19$), it was significant, and suggests that ozone may be a cause for concern in the future. Barring any major changes in transportation (increased mass transit, electric vehicles), if Atlanta's population rises as projected then car exhaust will also increase, and the city's *Pinus* trees may suffer long-term reductions in growth.

Oxides of N and CO slightly decreased over the entire time period examined (Figure 4) and had no significant relationship to growth of *Pinus*. The slow temporal decrease in these pollutants likely reflects the fact that while the concentration of these pollutants in car emissions has declined over time as a result of changes in automotive technology, the number of cars on the road (and hence volume of emissions) has increased, offsetting major change. For oxidized N, the lack of a relationship to tree growth is somewhat surprising given that these N compounds are known to be destructive to plants (Reich 1987, Schulze 1989). Carbon monoxide on the other hand is rapidly oxidized to carbon dioxide in the atmosphere, and we would not expect it to have a strong negative impact on plants.

Factors such as climate (temperature and precipitation) interact with the effects of air pollution to influence tree growth. Extreme climate events can obscure the influence of pollution (Löw et al. 2006) or vice versa (McClenahen and Dochinger 1985, LeBlanc 1993). Though we detected a negative relationship between ozone and *Pinus* growth, the relationship was weak and additional studies will be needed to confirm whether ozone is a cause of concern at Fernbank Forest. Future studies should examine the relative influence of climate and air pollution across Atlanta. If ozone is a problem, the potentially exacerbating or moderating role of climate will be important to consider in management of air quality and urban forest health.

CONCLUSIONS

We found that Fernbank Forest contains many trees of advanced age, some of whose growth has slowed in recent decades. Further study will be required to determine how extensive this decline is among Atlanta's urban forests and the factors causing it. The continued health of the Fernbank's trees is important for several reasons. Functionally, the trees contribute to the environmental benefits and ecosystem services of urban green spaces (reducing storm water runoff, erosion, and heat island effects, etc.), which are vital to the sustainability of Atlanta.

From a scientific perspective, the trees serve as an example of Piedmont forest with a relatively uncommon history of conservation within an urban area. This history is in contrast to other urban forests where human caused disturbances may have gone unchecked. Current management efforts including an invasive species removal program and limits on foot traffic will likely create even greater differences between Fernbank and other urban forests. The Forest has been touted as an "old-growth" forest for decades though there was little data to substantiate this claim. Our study provides definitive ages (or "not less than" ages) for the Forest's trees. However, the term "old-growth" has various definitions and criteria for use (Spies 2004) and Fernbank Forest may only meet some of them. Whether Fernbank Forest is truly a "unique" urban forest is debatable and more research on its trees and their community are needed. For example, the large size and advanced age of the Fernbank's trees might provide ecological niches for organisms that do not exist in other urban forests (tree roosting bats, migrating birds, etc.).

Fernbank's trees are also important educational and cultural resources. Because Atlanta was largely destroyed during the Civil War, Fernbank serves as an example of the resilience of natural communities following disturbance and demonstrates how the city has flourished since that time. Visitors to the Fernbank Museum of Natural History can learn about many aspects of tree growth by comparing these trees to the more "usual" trees encountered in Atlanta. Indeed the large, old trees at Fernbank Forest are important contributors to Atlanta's 'sense of place' as the "city in a forest."

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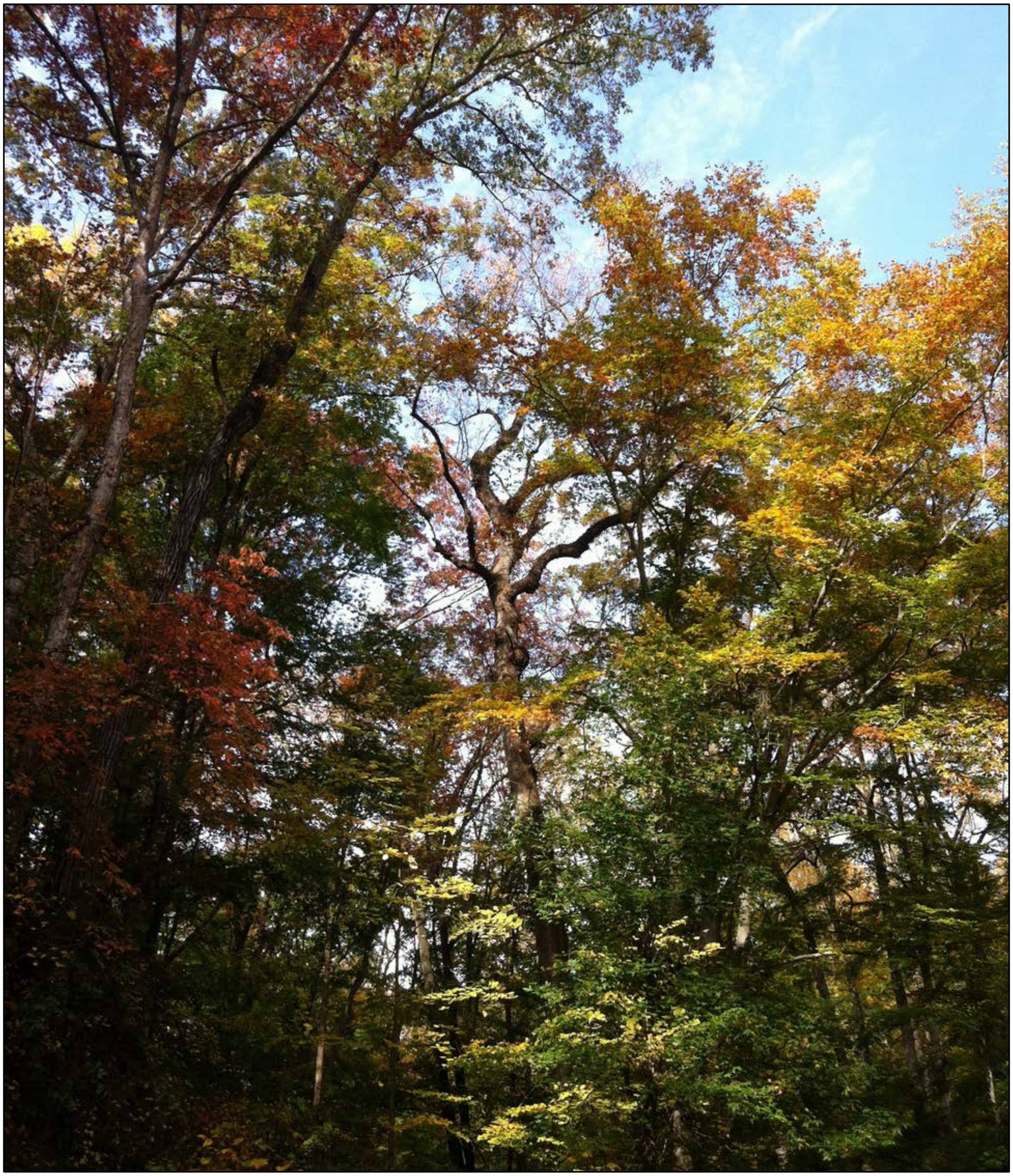
An example of the old trees found at Fernbank Forest, Atlanta, Georgia. Photograph courtesy of Eli Dickerson.



TESTING THREE DIFFERENT RANGEFINDERS WITH BUILT-IN INCLINOMETERS

Karlheinz Brüne

Velbert, Germany

Editor's Note: This paper is an adaptation of a couple of posts to the Native Tree Society BBS in December 2013, and are reprinted with the author's permission. The author is not a native English speaker, but only limited editing was done to avoid changing any of his meanings.

MY RANGEFINDERS

Now that I have been measuring the height of tall European trees for more than two years, I would like to report about my experiences with my instruments. I have the following rangefinders with built-in inclinometers:

Leica Disto D8 (bought in July 2011)
Nikon550AS (bought in September 2012)
TruPulse200X (bought in November 2013)

I was not satisfied with the Leica because sine measurement to the top of tall trees was successful only under particularly favorable conditions (no wind, twilight). I was also not satisfied with the Nikon because the inclinometer "fidgets" so much, the measurement result is too dependent on experience, skill and a steady hand of the measurer. Now the TruPulse200X is new to the market and I was able to get one of the first units (firmware version 1466), thanks to good relations to the German distributor. My main reason for buying this expensive device was the expectation of being able to measure treetops more easily and accurately than before.

THE TRUPULSE 200X

Exactly these above-mentioned expectations does the TP200X fulfill! After my first test experience, I can say that the measurements are accurate and reproducible, but concrete comparison measurements with Leica set as the reference are still pending. Distance is displayed in increments of 1 cm and inclination in steps of 0.1° (Leica shows on in steps of 1 mm and 0.05°). The Filter Modes "Closest", "Farthest" and "Gate" work effectively. The hiding of unwanted reflections when measuring through cluttered environments succeeded in a surprising number of situations where my other devices have long ceased. The effort to search for a reasonably free measuring corridor should thus be much lower in the future. If or to what extent the accuracy decreases when measuring with filter functions through clutter, I can't judge yet.

The automatic adjustment of the laser at the distance and the reflective qualities of the target works well and easily. According to the manual the TP200X is specified for a measurement range of 0 m to 2,500 m. Such large range is not available with the other devices. I was able to test that the laser actually does not need any minimum distance, it measures from just a few centimeters—but this specification of the manufacturer is misleading! The built-in scope can't focus at close range below about 10 meters, it has no setting option for distance. The ring on the eyepiece is intended to focus the in-scope display. Thus, precise sighting and the differentiation between closely-spaced small targets in this distance range is no longer possible. Relying on this specification I had expected, I can use the TP200X in tape-drop actions for measuring the rest to the top. After climbing to the crown of a beech I wanted to scan their tips. But whether it still makes sense with the washed-out target image is doubtful.

The scope of the TP200X has in contrast to Nikon a high-quality optics, the clear view through the scope is less tiring and can be used also in twilight. Also for "digiscoping" the scope of TP200X is well suited. LTI offers an iPhone holder, but totally overpriced with $300. I'll probably try it with a self-construction, where I can flip a compact camera in front of the eyepiece. I think that in future we will see more target photos taken through the eyepiece of a scope.

The laser of the TP200X is an infrared pulse laser. About beam width you will not find any information in the technical specifications. Derrick Reish from LTI did not respond to my emails. The German distributor Breithaupt told on request: The laser spot of the TP200X is an ellipse, at 50 m distance 10 cm wide and 7.5 cm high. Thus, the beam is about three times wider than on the Leica. The beam width is always a compromise. With a wide beam you do not need to aim so accurately, but it may not select small targets separately. I prefer a narrow beam like the Leica.

I do not want to conceal: the TP200X leaves an ancient impression on me. The development of modern electronic equipment from computer and smartphone technology seems to have gone completely past at the TruPulse. A much more modern impression makes, for example, the new Leica Disto D810 with touch-screen display, where menus, measured values and target photos are clearly displayed and stored in the device.

The TP200X has no display on the housing. Only when looking through the scope you will see an illuminable, rough structured internal display. It shows the crosshair for envisaging the target and various icons and after the measurement one each measured or calculated value. The four associated values of a measurement point can't be represented together at same time. They can only be displayed stepwise singly one after by pressing an arrow key.

After 90 seconds all values will be deleted. I found no way to stop or to delay this expiration. If you want to write down all four values, you need quickly and cleverly play with your eyes switching between eyepiece and book and your hands switching between button, book and pen. I hope that this problem can be solved via firmware update. But that is not so easy, the unit must be returned.

I have not found a solution as I can document this four values of one measurement point. When copying by hand, errors can creep in, this is no documentation. Should I take, for example, four individual photos through the eyepiece after each measurement? With Leica and Nikon I can do it by taking one photo of the external display, with Leica also later by retrieval from memory. Nevertheless, a device of this price range should offer more! The transmission of a measured value via Bluetooth or serial port is apparently possible only during measurement. I have not tested this, because I would have to carry and set up a corresponding receiving device out in the woods. That would be another story. Why doesn't LTI install a memory chip so that I can retrieve the data on my PC at home later?

The operation principle of TP200X with the four push-buttons is learned fast. However, I have continuously difficulties in finding the keys with my fingers without visual control. I wished for better palpable keys and I think the arrow keys are ergonomically unfavorably arranged. Probable the designers have prevailed over the engineers. The enclosed neck strap I would not trust: I fear the expensive device could be pulled out from the buckle.

The manual is currently available only in the English version as a pdf file. Here, as usual, the three-point measurement method is described again as the standard method for tree height measurement. To the inherently much higher accuracy of the two point sine measuring method isn't pointed out. So that once again is preprogrammed that crowds of foresters in spite of precise measuring instruments again will produce only second-class readings. They have learned and internalized that the forest-customary measurement towards treetop only needs the angle. In the past when good devices for sine measurements to treetop not were available, the three-point measurement had its authorization. At least now with the abilities of TP200X the situation has changed. But apparently LTI has not the courage to enlighten this large group of their customers in the forestry and timber industry, it might be understood as an unreasonable instruction.

It would be interesting to compare with the previous model TP200 and whether the significant additional expenditure for the TP200X are worthwhile. On this topic someone should speak who knows both devices.

THE LEICA DISTO D8

The Leica Disto D8 measures with a tightly focused red laser beam (6 cm in diameter per 100 m), which is visible as a red point when hitting an object. With visual contact to this red point of impact you can steer the beam accurately at a target. Perhaps field glasses will render good services here. Thus even thin twigs can be targeted and measured selectively to the millimeter. This is more accurate than aiming by the crosshairs of the TP200X. Alternatively you can use the built-in digital aim camera with 4x-zoom for targeting.

If one assumes the specifications of the manufacturers, the

Leica measures by a factor of 40 more accurate than the TP200X, especially in the near distance range up to 10 meters. By comparing measurements with steel measuring tape I was convinced that this high accuracy in the mm range really was achieved. Even with larger distances to good reflecting targets each repetition of the measurement leads to almost identical values—a level of reproducibility in measured values Nikon owners can only dream about!

The display shows the distance in meters to three decimal places (mm). For better clarity and because I do not need the millimeters when measuring trees, in the options menu I have reduced the display by one decimal place to show only the centimeters (cm). For reasons of eye safety the power and thus the range is limited. A measurement to treetop succeeds in bright daylight to about 20 m, at twilight I had success up to 80 m. But with such weak targets at the limit of what is possible, the measurement accuracy decreases. For reflective targets in shaded woods the measuring range is about 200 m. The photo below shows the measurement setup with Leica and rifle scope to the top of Bavaria's highest tree, a Douglas-fir.

***Sine-measuring the treetop of Bavaria's tallest tree, with Leica Disto D8 and rifle scope, with no wind and at twilight*.**

THE NIKON550AS

The Nikon measures like the TruPulse with an invisible pulse laser. Beside the display in the eyepiece it has yet an additional display outside of the housing, where all values of a measurement point are clearly displayed. It has no internal memory for permanent storage of measured values. The measured values fall irrevocably when turning off the device. This occurs automatically when more than 30 seconds no key has been pressed. It is specified as a handheld device and has no tripod mount. There is no specific measurement accuracy guaranteed. The height is displayed in increments of 20 cm. This is compared to the other devices just little and particularly unsatisfactory at close range. Below 10 m measurement is not possible, the range is up to 500 m. The more expensive Nikon Forestry Pro additionally masters the three-point measurement program, it brings in my opinion no rewarding benefits. I did get higher measurement accuracy by mounting on tripod using a self-made rubber mount.

SUMMARY

The Leica convinces by unsurpassed accuracy at short to medium distances. Due to its limited range, using the Leica as the only instrument for tree height measurement is not advised. The TruPulse has its strengths at medium to long distances and under difficult conditions. Nikon is the affordable entry-level device.

As the great difference in price can be expected, the TruPulse200X is clearly superior in all measurement disciplines to the Nikon. Anyone who previously has struggled with the Nikon in dense forest to find a measurement position with reasonably clear line to the treetop will be surprised now how easily a measurement with the TP200X succeeds. The filter functions to penetrate clutter are convincing. You can combine the filter modes Farthest and Gate; I found this the best to penetrate clutter. I think this is a step forward in measuring technology. However, I do not know how well the previous TP200 already could handle the job with the filter mode Farthest. Somebody who owns both TruPulses should comment. On the other hand, you should also not expect any miracles from the filter functions, somewhere there are limits.

At Nikon I stated the tolerance range when measuring a tall tree with about 1% (up to 2%). At TP200X I hope to be able to reduce the tolerance down to ±0.2%. Whether this assessment is correct, remains to be seen in future. Comparative measurements with other instruments or other measurement methods are still required. Our most precise so far measured values we believe to have achieved with the tape-drop method, there we estimate the tolerance also at about ±0.2%.

The ability to measure the distance to the treetop directly, easily and reliably, even under difficult conditions, and with high measurement accuracy, that's the really big plus point of the TP200X. None of the other devices that I know can match that. I wouldn't like to do without the TP200X anymore! There I have to accept its old-fashioned inconvenience and weakness at close range.

For measurements in trunk and forest floor areas, in particular for the calibration of intermediate reference points and at short distances the Leica Disto D8 (or D810) is by far the most accurate and my preferred instrument. In future will appear whether the exactness of the TP200X in the close and medium distance range is sufficient for me, to do without carrying along the Leica as second equipment.

In order to compare the measured values of Leica and TruPulse, I will build a mounting plate where I can mount both devices side by side on a tripod. I can also use the scope of TP200X as a tool for the Leica to align the red laser beam on the target. In order to increase the measurement accuracy of the TP200X, I will initiate the measurement process without shaking or wobbling by using a remote trigger cable. With the Leica I start the measurement process by using the timer.

As a future development, I would like to see a modern device with a large display, a watch chip and a GPS chip, camera and data storage that combines the two lasers and the capabilities of both devices in one housing. The measured values must be documented with photo finish, time and GPS stamp. Both laser beams must be accurately calibrated to the same direction. Then I could use the red laser as a targeting device for the invisible pulse laser and increase its measurement accuracy

The Nikon is now dispensable for me. Nevertheless, I want to keep the Nikon for use as an "always have with me" device for quick first measurements and as a spare device. The Nikon will continue to keep its importance as a reasonably priced entry-level device. With its modest display accuracy, it puts me never ceases to amaze how accurate measuring results trained users can achieve with it. Still, I could imagine that for European tree measurers the current dominance of Nikon equipment is ending.

Important for accurate measurement is: it must not wobble during the measurement. This requires a stable high tripod with a video-pan-tilt head that provides smooth, jerk-free guiding. Also touching the case and pressing the release button with your hand are disturbing factors that you can turn off by using a self-timer or a remote release cable.

THE PROBLEM WITH THE WIND AND MY LEICA

The more precise the instrument focuses the beam, the greater becomes the problem with the wind. Even small, barely perceptible movement of air lets swing the top of a large conifer by decimeters. At a distance of 70 m the red laser beam of the Leica Disto is not larger than about 4 cm, which is of the same order as the width of the top shoot of a Douglas-fir. You can certainly imagine how quickly the beam disappears at the slightest movement of air in the empty background of the sky. And for a successful measurement the laser spot must have to remain on the top shoot for a few seconds. Thus it is clear that my Leica Disto is strongly affected by the wind problem.

For the measurement I strive to align the red laser point about the middle of the range of variation and then no longer alter its position (not touch the device). Then by timer I start a continuous measurement and the device then tries to detect measuring points. If several measuring points could be successfully detected, only that one with the maximum distance is displayed and stored. It may be that only after several minutes a first reading comes about, there you must have patience.

Unfortunately, for security reasons, the power of the red laser cannot be increased. Hence, with adverse conditions such as long distance or bright daylight, a measurement will quickly become impossible. Therefore, a point measurement to the top of a tall tree with the Leica often will require a great deal of time and effort and is not very practicable. I am glad that for this job now I have the TP200X.

THE PASSING OF A GREAT ENT

Robert T. Leverett

Founder, Eastern Native Tree Society

It is with the greatest sadness that I must announce the passing of my great friend and colleague Professor Gary Beluzo. He fought gallantly against the cancer that had metastasized, and in a final act of defiance, willed his body to the American Cancer Society for research.

Gary was an environmental science professor at Holyoke Community College, the Executive Director of Friends of Mohawk Trail State Forest, and my partner in a variety of projects accomplished for the Massachusetts DCR relating to old growth forests. He also was my partner in the series of conferences collectively entitled the Forest Summit Lecture Series, offered as a public service. He was the lead conceptualizer and most productive member of the pair of us in a project to refine the boundaries of *Liriodendron tulipifera* in the Northeast. Gary was a member of NTS and was a regular contributor before a cancer operation.

Gary had many nature passions. He especially loved the Great Smoky Mountains National Park and spent time there over a period of many years. He conducted classes via the Internet from the Smokies. Gary's mentor was the late, great scientist Dr. Lynn Margulis. But Gary had another mentor, who was also Lynn's mentor: Mother Nature. He was happiest when in the field doing his research and communing with denizens of the forest, lakes, and ponds.

When my first wife Jani died, Gary and Lisa sat up with me all night, giving me emotional support. He was that kind of friend. For several years Gary, John Knuerr, and I roamed the forests together comically presenting ourselves as the "Tree Amigos." During that period, we also inventoried and mapped the old growth forest remnants of Massachusetts. Those were golden days that I shall never forget.

It is my intention to write an essay in memory of my great friend. It is the only way I know how to do my part in telling a piece of a larger story about this wonderful human being whom so many of us loved. Lisa, Gary's devoted wife, has lost her husband and best friend. Gary's children have lost a model father. Many have lost a treasured friend. The Earth has lost a dedicated warrior. But I wouldn't want to paint Gary only as an environmental scientist. He was a great husband, a great father, a giving friend, a fine musician, and a spiritual seeker. We shall miss him very much.

Professor Gary Alan Beluzo
March 14, 1954 – December 19, 2013

INSTRUCTIONS FOR CONTRIBUTORS

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

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

Send all materials and related correspondence to:

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Journal:

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

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

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

Proceedings:

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

Book:

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

Website:

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

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

ACCEPTED SUBMISSIONS

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

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

One of the numerous old trees found at Fernbank Forest in Atlanta, Georgia. Photo courtesy of Megan Chapman/Eli Dickerson.