Bulletin of the Eastern Native Tree Society

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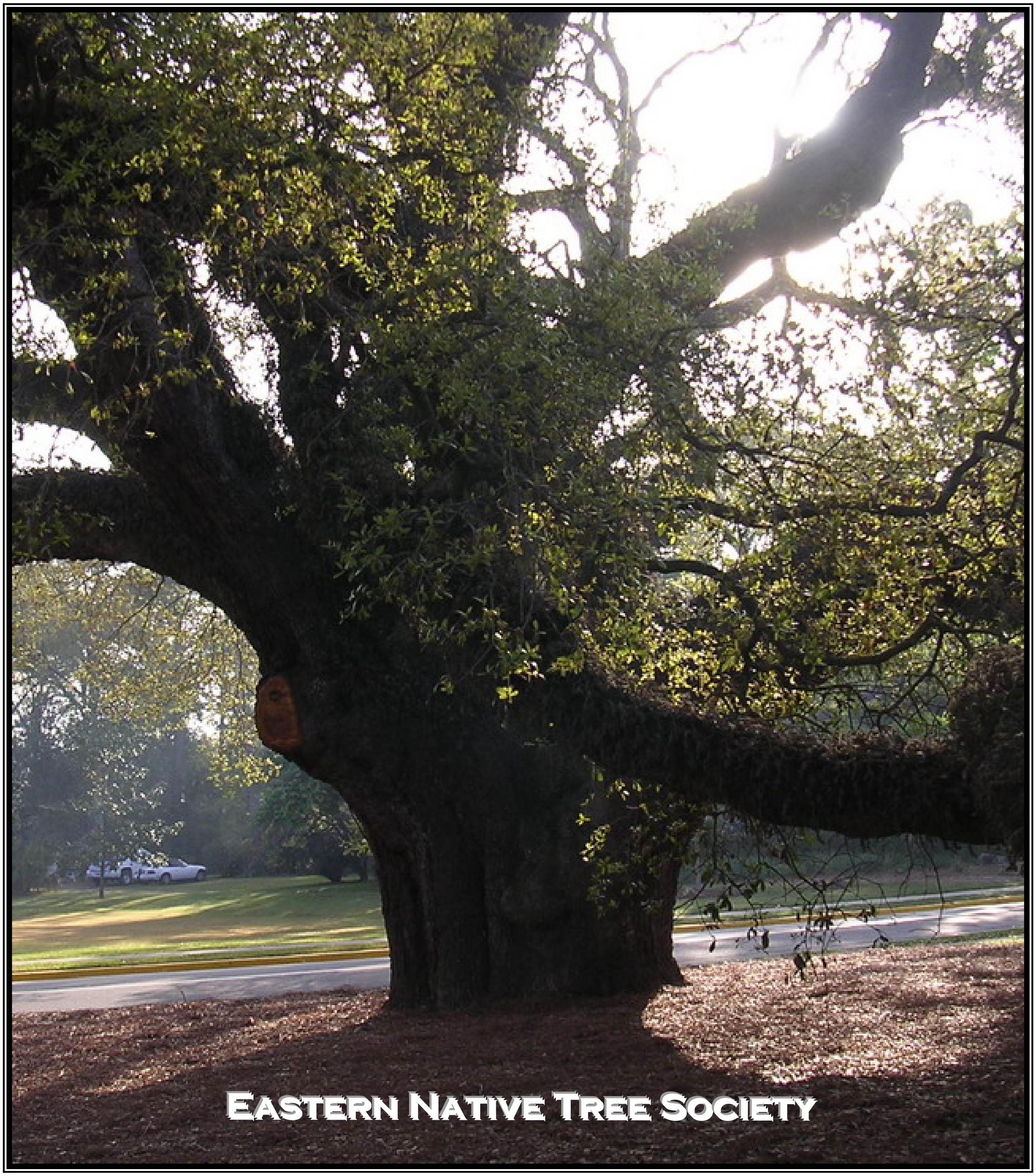

Bulletin of the Eastern Native Tree Society

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Mission Statement:

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

Membership and Website Submissions:

Membership in ENTS is FREE and automatic. Simply sign up for our online discussion list, ENTSTrees, at: http://lists.topica.com or send an e-mail to ENTSTrees-subscribe@topica.com. Submissions to the ENTS 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 ENTS website. The Eastern Native Tree Society and the *Bulletin of the Eastern Native Tree Society* editorial staff are solely responsible for its content.

COVER: Sunlight streams through the mist-shrouded canopy of the Big Oak, a live oak from Thomasville, Georgia. Photo by Don C. Bragg.

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THE LIVE OAK PROJECT—A VITAL PART OF THE ENTS MISSION

Many people tend to think of ENTS as focused solely on the tallest trees of the eastern U.S., especially the majestic eastern white pine, eastern hemlock, and tuliptrees of the Appalachian Mountains. While much of the discourse on our website does revolve around these species, they are but a tiny portion of the richness of the region, and their focus is in large part due to their relative abundance and widespread distribution. We have literally scores of other noteworthy species that are being investigated, measured, and documented by ENTS members, including the featured species of this issue—live oak (*Quercus virginiana*).

Larry Tucei of Mississippi (pictured below) has been a virtual one-man army behind the "Live Oak Project" of ENTS. Over the last couple of years, Larry has been scouring the Gulf Coast documenting this ecologically and historically important species. For centuries now, live oaks have been commercially exploited and marginalized as their habitat has given way to strip malls, parking lots, and Gulf Coast bungalows. Yet this resilient species remains, surviving multitudes of human indignities and the lashings and inundations of numerous hurricanes over their long lives. Well adapted for their harsh environments, live oaks have much to teach us about life along the Gulf Coast, and their description is as vital as any other species we will examine.

Kudos for your initiative and perseverance, Larry!

Don C. Bragg
Editor-in-Chief

P.S.: Check out the following historical correspondence on live oak, provided courtesy of Edward Frank:
http://www.nativetreesociety.org/projects/liveoak_project/Culture%20of%20Live%20Oaks3.htm

Larry Tucei and the Redeemer Live Oak in Biloxi, Mississippi. Photo by Larry Tucei.

ANNOUNCEMENTS AND SOCIETY ACTIONS

Fifth Holyoke Community College Forest Summit and Fall 2007 ENTS Rendezvous

Dr. Gary Beluzo of Holyoke Community College (HCC) is pleased to announce the tentative schedule for the next Forest Summit to be held at the HCC Leslie Phillips Forum from 1:00 p.m. to 9:30 p.m. on October 19, 2007. Currently on the agenda will be talks on forest health-based themes, including the status and future of eastern forests, forestry and red maple, and climate change and tuliptree. Also planned is a talk by featured speaker Dr. David Stahle (Director of the Tree Ring Laboratory at the University of Arkansas-Fayetteville) on the cypress trees of Central America. Keep an eye his website (http://www.hcc.edu/forest/) for further updates and driving directions to the Summit.

The fall 2007 ENTS Rendezvous with be held the next day in Charlemont, Massachusetts, and will include a tree climbing demonstration, tree measuring workshops, and ecology walks to the ENTS Grove of White Pines. More details on the Rendezvous will follow on the ENTS website (http://www.nativetreesociety.org/events/index_events.htm).

ENTS Bookstore Now Open!

Thanks to the dedicated efforts of Edward Frank, ENTS now offers its membership a bookstore—of sorts. Accessible via the ENTS website (http://www.nativetreesociety.org/bookstore/bookstore1.htm), the bookstore is actually an arrangement with Amazon.com to purchase certain titles online. These titles were suggested by ENTS membership and are broadly related to the ENTS mission. If purchased via this link, ENTS will receive a small portion of the proceeds of the sale to support various aspects of the ENTS mission.

Bruce Kershner Memorial Tree Dedicated

Renowned old growth forest authority, naturalist, and author Bruce Kershner passed away on February 15, 2007. Bruce coauthored "The Sierra Club Guide to Old Growth Forests of the Northeast" with Bob Leverett, and published a dozen books on the forests and environment. Cofounder of the New York Old Growth Association, Bruce is credited with discovering more than 150 ancient forest sites, containing many of the tallest and oldest trees in the Northeast.

In a tribute fitting any proud ENTS member, on May 19, 2007, Bob Leverett dedicated an eastern white pine at the Mohawk Trail State Forest in Bruce's honor following a moving private ceremony. Eight of Bruce's family members joined Bob and fellow Ent Howard Stoner. In an e-mail to the ENTS mailing list, Bob stated: "Bruce's family was most appreciative of the dedication. Finding Bruce's tree requires a precise knowledge of the local terrain, so I'll likely be leading family members to the tree in the future until they become comfortable with the way to get to the tree. We will not be marking a path. Bruce's tree was formerly called the "Northern Sentinel." It is the northern most of Mohawk's 150s and until Saturday was the last of the 150s to be confirmed. Beyond the information given above, I will honor the privacy of the ceremony for Bruce and conclude by saying my participation was a singular honor."

Congratulations and Thanks to Dale and Neil!

Dale Luthringer and Dr. Neil Pederson, through their hard work and dedication, offered two more fascinating programs to ENTS and the public during the last few months. In April, Dale once again hosted the Cook Forest Big Tree Extravaganza at Cook Forest State Park (http://www.cookforest.com/) near Cooksburg, Pennsylvania. This was followed in June by the inaugural meeting of the Kentucky Old-Growth Forest Society (http://people.eku.edu/pedersonn/kogs.html) at Pine Mountain State Resort Park in eastern Kentucky. From all of the chatter on the ENTS e-mail listing, both were smashing successes, offering in-depth and cutting-edge science, technical workshops, and big tree measuring galore.

In a related note, Dale is looking for pictures or videos from the Cook Forest that may be included in some park displays. These can be e-mailed to him at dluthringe@state.pa.us or sent to:

Cook Forest State Park, ATTN: Dale Luthringer, P.O. Box 120 (River Rd), Cooksburg, PA 16217

RUCKER INDEXING ANALYSIS – A CASE STUDY IN THE MOHAWK TRAIL STATE FOREST, MASSACHUSETTS

Robert Leverett and Will Blozan

Eastern Native Tree Society

INTRODUCTION

The Mohawk Trail State Forest (MTSF) was one of the first state forests created in Massachusetts, initially covering slightly over 3,000 ac. The recreational value of Mohawk has been recognized for decades, and Mohawk's old-growth forest remnants have been recognized to one extent or another since the 1970s. Until the early 1990s, MTSF was virtually unknown as an extremely important site for exceptionally tall trees.

The Commonwealth Bureau of Forestry uses a system called Continuous Forest Inventory (CFI) to keep track of growth performance in the state forests. However, the system of transects has not proven sensitive to the exceptional stature of Mohawk's trees. One only has to follow a few of the many transects established in CFI to observe why the system does not capture the exceptional tree heights in Mohawk. However, RIA has changed our perception, and as a consequence of intense analysis by ENTS, MTSF has emerged as the number one tall tree site in New England and number three in the entire Northeast. In this respect, Mohawk is a kind of forested rags-to-riches story.

In descriptions of MTSF intended for the forest enthusiasts, ENTS describes the Mohawk as extraordinary from a tall tree perspective. But how do we know this? We will begin our examination of MTSF's position within the hierarchy of tall tree sites through a "top down" perspective. We will first examine MTSF's position within the eastern sites that we have studied. We will compare RHI values for the 48 sites across the eastern United States, which possess RHI values of ≥ 120 ft.

An admitted problem with this eastern-wide comparison is that there is no standard acreage for a site. The largest site is the Great Smoky Mountains National Park (GSMNP) at over 500,000 ac. Ice Glen, one of the smallest sites, is around 50 ac. This is a comparative size ratio of 1000 to 1, an enormous acreage disparity that is problematic. Should the RHI values for sites of such dissimilar sizes be compared? Yes and no. There is still information to be gained by making the comparisons. Small areas within much larger ones often contain most of the tall trees of a site.

Additionally, areas of tall trees are often clustered. In an apples-to-apples comparison, the best areas in the Smoky Mountains comparable in size to MTSF have Rucker indices that lie close to 160 ft—not far from the Park maximum. And in MTSF, which covers approximately 6,500 ac, the productive area for maximum tree heights is less than 2,000 ac. We will first compare the MTSF relative to the entire eastern US.

MTSF'S RHI POSITION IN THE EASTERN US

In Table 1, we examine eastern sites in the ENTS database with RHI values of 120 ft or more. The two Massachusetts sites are bold-faced for convenience. It should also be noted that as ENTS adds more sites, MTSF's position in the list will undoubtedly drop. Consequently, to highlight Mohawk's real strengths, we will quickly move to a regional perspective by progressively zeroing in on Mohawk's role in the Northeast, then New England, and finally Massachusetts. The majority of tall tree sites are clearly in the southern United States. ENTS has barely established coverage in large areas of the South, and there will be many sites added with RHI values above 130 ft. Of the current five sites in the Northeast with RHIs over 130 ft, Pennsylvania records three. As searches are expanded, in all likelihood, Pennsylvania will continue as the highest performer in the Northeast.

How rare is an index over 130 ft in the Northeast? There are probably other northeastern sites with an RHI of 130 ft or more. Based on the pattern of our site discoveries, Pennsylvania likely has up to three more, while New York may have a couple. There is likely at least one in New Jersey, and perhaps one in Connecticut. MTSF's claim to third place in the Northeast may eventually slip by one or possibly two positions. However, given the relatively small size of MTSF and its latitude, Mohawk's position in the hierarchy of northeastern sites will remain remarkable and dominant at latitudes of 42.5 degrees and higher.

Interestingly, trees of a dozen species common to north and south achieve significantly greater heights in the southern parts of their range. For example, tall tree statistics favor the southern parts of the range of *Tsuga canadensis*. *Tsuga*, which reaches heights of 160+ ft in the southern Appalachians, with the tallest ever measured at 171.6 ft. *Liriodendron tulipifera*, reaches heights approaching 180 ft in the Great Smoky Mountains National Park and over 170 ft in several locations. Maximum heights in the Northeast for both species are about 20 ft less than their southern counterparts.

MTSF ranks third in the Northeast and exceeds the next highest site in Massachusetts by 8 ft (Table 2). The probability of finding other Northeastern sites above 120 ft is very high, but the probability of more sites above 130 ft is low without intensive searches in southern Pennsylvania, New York, Connecticut, and New Jersey. Note that ENTS does not yet have complete indices for Maine, Vermont, Connecticut, and Rhode Island.

Table 1. MTSF's Rucker Height Index (RHI) position in the eastern United States for sites with RHI of 120 ft or more.

Site	Rucker Index (ft)	State	Geographic region	Tallest tree (ft)	Tallest tree species
Great Smoky Mountains Nat'l. Park	163.6	NC	Southeast	187.0	eastern white pine
Savage Gulf Wilderness	152.1	TN	Southeast	162.3	pignut hickory
Congaree National Park	151.0	SC	Southeast	168.7	loblolly pine
Central Brevard Zone	150.6	SC	Southeast	172.5	tuliptree
Tamassee Knob, Brevard Fault Zone	148.4	SC	Southeast	172.5	tuliptree
Groundhog Creek	143.6	NC	Southeast	164.0	tuliptree
Wadakoe Mountain	144.2	SC	Southeast	161.3	tuliptree
Fall Creek Falls State Park	142.8	TN	Southeast	159.7	tuliptree
Shelton Laurel	141.1	NC	Southeast	162.2	tuliptree
Cliff Branch	139.5	NC	Southeast	176.1	tuliptree
Station Cove, Brevard Fault Zone	139.3	SC	Southeast	164.8	tuliptree
Lee Branch	139.3	SC	Southeast	168.2	pignut hickory
Indian Creek	138.7	NC	Southeast	154.8	eastern hemlock
Meeman-Shelby State Park	138.6	TN	Southeast	154.4	eastern cottonwood
Panther Creek	137.8	GA	Southeast	157.6	tuliptree
Zoar Valley	137.3	NY	Northeast	156.0	tuliptree
Bankhead National Forest	137.2	AL	Southeast	144.7	tuliptree
Cook Forest State Park	137.2	PA	Northeast	183.1	eastern white pine
Mohawk Trail State Forest	**136.1**	**MA**	**Northeast**	**168.4**	**eastern white pine**
Cliff Creek	135.8	GA	Southeast	185.1	eastern white pine
Kelly Creek Roadless Area	135.4	GA	Southeast	159.0	tuliptree
Wadakoe Mountain	135.0	SC	Southeast	161.1	tuliptree
Grundy Forest State Natural Area	134.4	TN	Southeast	147.5	eastern hemlock
Camp Creek	133.6	GA	Southeast	165.2	eastern white pine
Ocmulgee Flats	133.3	GA	Southeast	144.9	willow oak
Joyce Kilmer Wilderness	133.1	NC	Southeast	164.5	tuliptree
Brasher Woods, Red Mountain	132.9	AL	Southeast	143.2	pignut hickory
Fairmount Park	132.3	PA	Northeast	158.6	tuliptree
Cohutta Wildlife Management Area	132.2	GA	Southeast	152.2	eastern white pine
Opossum Creek	132.2	SC	Southeast	158.1	eastern white pine
Cohutta Wilderness Area	132.0	GA	Southeast	146.4	tuliptree
Overton Park	131.3	TN	Southeast	147.4	tuliptree
Belt Woods	131.0	MD	Central Atlantic	159.9	tuliptree
McConnell Mill State Park	130.6	PA	Northeast	146.0	tuliptree
Rock Creek Park	130.3	DC	Central Atlantic	162.5	tuliptree
Chase Creek Woods	130.2	MD	Central Atlantic	157.6	tuliptree
Rock Creek	129.9	GA	Southeast	149.9	cherrybark oak
Turkey Creek	129.4	SC	Southeast	136.1	tuliptree
Stockbridge (town)	129.0	MA	Northeast	154.3	eastern white pine
Wintergreen Gorge	128.5	PA	Northeast	147.4	tuliptree
Long Cane Creek	128.3	SC	Southeast	138.0	cherrybark oak
Ice Glen (in Stockbridge township)	**128.2**	**MA**	**Northeast**	**154.3**	**eastern white pine**
Fitzhugh's Woods, Red Mountain	127.7	AL	Southeast	144.4	pignut hickory
Vanderbilt Estate	126.9	NY	Northeast	155.1	tuliptree
Ricketts Glen State Park	126.3	PA	Northeast	152.9	tuliptree
Otter Creek	125.1	SC	Southeast	144.0	tuliptree
North Prong Sumac Creek	124.9	GA	Southeast	113.4	sugar maple
Davidson Creek	124.8	GA	Southeast	134.3	mockernut hickory
Mountain Bridge Wilderness	124.3	SC	Southeast	141.1	eastern hemlock
Monroe State Forest	123.7	MA	Northeast	160.3	eastern white pine
Hocking Hills State Park	123.7	OH	Midwest	151.0	sycamore
Big Oak Tree State Park	123.3	MO	Midwest	140.3	eastern cottonwood
Tyler Arboretum	123.1	PA	Northeast	141.3	tuliptree
Widen Stand	122.5	WV	Central Atlantic	173.2	tuliptree
Western North Carolina Nature Center	122.1	NC	Southeast	--	--
Carter's Grove	122.0	VA	Southeast	147.7	tuliptree
Walnut Creek Gorge	121.7	PA	Northeast	135.5	tuliptree
Anders Run Natural Area	121.6	PA	Northeast	159.6	eastern white pine

Table 2. Top 30 northeastern U.S. tree height sites currently documented and ranked by Rucker Height Index.

Site	State	Approx. acreage	Rucker Index (ft)	Number of species	Tallest tree (ft)	Tallest tree species
Zoar Valley	NY	1200	137.3	10	156.0	tuliptree
Cook Forest	PA	3000	137.2	10	183.2	eastern white pine
Mohawk Trail State Forest	MA	2500	136.1	10	168.5	eastern white pine
Fairmount Park	PA	1000	132.3	10	158.6	tuliptree
McConnell Mills State Park	PA	--	130.6	10	146.0	tuliptree
Ice Glen	MA	50	128.2	10	154.3	eastern white pine
Wintergreen Gorge	PA	120	127.5	10	145.4	tuliptree
Vanderbilt Estate	NY	100	126.9	10	155.1	tuliptree
Rickett's Glen State Park	PA	1500	126.3	10	152.9	tuliptree
Monroe State Forest	MA	500	123.7	10	160.2	eastern white pine
Tyler Arboretum	PA	640	123.1	10	141.5	tuliptree
Anders Run	PA	250	122.3	10	167.1	eastern white pine
Walnut Creek Gorge	PA	200	121.7	10	135.5	tuliptree
Little Elk Creek Gorge	PA	--	119.5	10	144.0	sycamore
Long Point State Park	NY	--	118.9	10	130.8	white ash
Robinson State Park	MA	890	118.6	10	140.9	tuliptree
Clear Creek State Park	PA	--	118.3	10	137.0	eastern white pine
Green Lake State Park	NY	250	118.0	10	144.7	tuliptree
Coho (Erie Bluffs State Park)	PA	--	117.6	10	140.3	tuliptree
Claremont	NH	120	116.5	10	166.1	eastern white pine
Mount Tom	MA	300	115.8	10	140.2	eastern white pine
Sisters of Saint Francis	PA	--	115.2	10	137.5	tuliptree
Hemlocks Natural Area	PA	150	114.8	10	138.0	tuliptree
Six Mile Gorge	PA	--	114.6	10	134.2	tuliptree
Kaaterskill Falls	PA	--	114.5	10	140.3	white ash
Hearts Content	PA	120	114.3	10	162.0	eastern white pine
Lake Erie Community Park	PA	--	113.6	10	140.4	tuliptree
Bullard Woods	MA	25	112.9	10	133.0	eastern white pine
Smith College-NH Housing Authority	MA	5	112.9	10	133.1	tuliptree
Laurel Hill-Stockbridge	MA	25	112.5	10	138.1	eastern white pine

DISTRIBUTION OF TALL SPECIES IN THE NORTH-EASTERN SITES

It may be surprising to many that the tallest tree at each of the above sites comes from an extremely small subset of tall tree species. What are these high performing species and how do they contribute to high RHI values on the sites that include them? Table 3 below summarizes what we may call the "flagship" northeastern species.

Table 3. Tallest trees by species for the northeastern U.S., as noted in Table 2.

Species	Representation
Tuliptree	16
Eastern white pine	11
White ash	2
Sycamore	1

Table 3 confirms the unique position of two species. Of the 30 sites listed above, the tallest species is tuliptree on 16 sites and eastern white pine on 11. However, above 42.5 degrees latitude, the tuliptree falls out. As more northerly sites are included, the proportion of sites with eastern white pine will rise. As more southerly sites are added, the proportion of sites with eastern white pine will fall. If the emphasis is on finding the sites with the highest RHI values, the more southerly sites will dominate and the tuliptree will stay at the top of the list.

For the eastern United States, the dominance of the tuliptree and eastern white pine in our list is consistent with historical data. Eastern white pine and tuliptree are the two tallest eastern species and they maintain dominance over fairly wide geographical ranges. The stature of both species is substantiated by historical data, even discounting exaggerations. Looking at MTSF, Mohawk possesses eastern white pine, but not tuliptree. Cook Forest and Zoar Valley have both species. Beyond eastern white pine and tuliptree, the white ash is an important contributor and likely to show up more frequently in the zone of 41 to 44 degrees latitude. White ash is the second dominant species in Mohawk. It shows up on the above list with two entries. The important role of the eastern white pine and white ash in Mohawk raises interesting questions on how the tall species common to Mohawk are represented at other top northeastern sites. This will be our next area of investigation.

MTSF'S RHI POSITION IN MASSACHUSETTS

We will now look at MTSF relative to other sites in Massachusetts. Table 4 lists data collected from individual property sites like state forests, city parks, etc. Also included are sites that represent townships and often include one or more of the bounded property sites. What is immediately striking about the Massachusetts sites is the dominance of eastern white pine as the tall tree. This contrasts with the whole Northeast where tuliptree dominates. The dominance of eastern white pine over tuliptree in Massachusetts is understandable when it is remembered that tuliptree reaches its northeastern range limit in Massachusetts.

The dominance of MTSF with respect to the RHI among the Massachusetts sites will remain unchallenged. Further searching will bring many Massachusetts sites into the 100 to 112 ft RHI range, but relatively few above 112 ft without broadening the geographical area encompassed by a site, such as including entire townships. But even with such expansions, Mohawk will dominate. Based on our data, the profile of a large township such as Springfield, Massachusetts, might include a distribution such as follows:

1. eastern white pine: 130 – 135 ft
2. tuliptree: 125 – 130 ft
3. sycamore: 120 – 130 ft
4. white ash: 120 – 125 ft
5. eastern cottonwood: 115 – 125 ft
6. pignut hickory: 115 – 120 ft
7. northern red oak: 115 – 120 ft
8. sugar maple: 115 – 120 ft
9. American beech: 110 – 115 ft
10. silver maple: 110 – 115 ft

The above distribution computes to a RHI of between 117.5 and 123.5 ft. The conclusion is that townships in the Connecticut River Valley and eastward are unlikely to have RHI values above 124 ft. The absolute upper limit is almost certainly under 128 ft.

Table 4. Top 20 Massachusetts sites with respect to Rucker Height Index (RHI).

Site	Rucker Index (ft)	Number of species	Tallest tree (ft)	Tallest tree species
Mohawk Trail State Forest	136.1	10	168.5	eastern white pine
Ice Glen	128.2	10	154.3	eastern white pine
Monroe State Forest	123.7	10	160.2	eastern white pine
Northampton	119.1	10	138.1	eastern white pine
Robinson State Park	118.6	10	140.9	tuliptree
Easthampton	117.6	10	140.2	eastern white pine
Holyoke	117.6	10	140.1	eastern white pine
Mount Tom	115.8	10	140.2	eastern white pine
Bullard Woods	113.1	10	133.0	eastern white pine
Laurel Hill	112.5	10	138.1	eastern white pine
Bartholomew Cobble	112.5	10	130.9	eastern white pine
Monica's Woods -Florence	112.1	10	133.3	eastern white pine
Conway-Town	111.7	10	126.1	eastern white pine
Arcadia Wildlife Sanctuary	111.5	10	126.1	eastern white pine
Stanley Park, Westfield	109.1	10	134.0	eastern white pine
Hatfield Floodplain	107.4	10	125.6	eastern cottonwood
Bryant Woods	106.9	10	156.2	eastern white pine
Highland Park, Greenfield	106.7	10	138.7	eastern white pine
Look Park	106.6	10	136.0	eastern white pine
Skinner State Park	101.7	10	117.2	white ash

ROLL OF INDIVIDUAL SPECIES IN MTSF'S RHI

Leaving Massachusetts and returning to the whole Northeast, we key off the dominance of eastern white pine, tuliptree, white ash, and sycamore as the flagship species at Northeastern sites. We can eliminate the tuliptree and sycamore, which are absent in Mohawk, and concentrate on the 12 top species in MTSF and how they are represented at the other sites where our data are sufficiently complete. The 12 species are the native ones in Mohawk that reach 120 ft or more. The species featured are eastern white pine (WP, white ash (WA), sugar maple (SM), northern red oak (NRO), eastern hemlock (HM), bitternut hickory (BNH), American beech (AB), red maple (RM), American basswood (ABW), bigtooth aspen (BTA), black cherry (BC), and American elm (AE). These are the species that give MTSF its RHI of 136.1 ft.

Table 5. Comparison of the Rucker Height Indices (RHI) of 12 key species in MTSF to those from the top 30 northeastern sites.

Site	WP	WA	SM	NRO	HM	BNH	AB	RM	ABW	BTA	BC	AE	RHI
Zoar Valley	134.0	140.5	127.0	140.3	117.9	136.4	130.1	124.8	128.7		126.4		137.3
Cook Forest	183.1	128.3	116.3	126.5	146.5	106.2	127.5	127.3	107.9	110.8	137.3		137.2
Mohawk Trail State Forest	168.5	151.5	133.8	133.5	130.3	131.8	130.5	128.0	126.9	126.0	125.3	120.8	136.1
Fairmount Park		135.7		135.2	122.5	134.2	122.1						132.3
McConnell Mills State Park		137.7	123.0	123.1	122.8	132.7	121.0	107.4	127.1				130.6
Ice Glen	154.3	140.0	117.1	110.9	138.4	108.3		118.5			120.5		128.2
Winter Green State Park		129.8	126.1	111.0	128.0	116.6	119.5	122.0	121.7		121.3		127.5
Vanderbilt Estate	134.0		125.0		111.3	122.0	115.1						126.9
Ricketts Glen State Park	144.6	139.7	115.8	106.8	136.7		116.8	110.6	123.2				126.3
Monroe State Forest	160.2	134.2	118.5	120.5	124.3		116.3	110.0		124.2	117.1		123.7
Tyler Arboretum		120.6		114.9		126.8			116.9				123.1
Anders Run	167.1	118.4			125.4			116.0	120.7		121.8		122.3
Walnut Creek Gorge		124.2	122.9	111.3	112.3	115.0	119.3	98.7	85.7	101.5	106.6		121.7
Little Elk Creek Gorge		118.9	111.4	124.5	116.5	111.1	109.3	109.6	114.3	88.9			119.5
Long Point State Park		130.8	105.8	111.3		126.1		104.6					118.9
Robinson State Park	126.7	126.7	104.2	117.1		110.0	106.2						118.6
Clear Creek State Park	137.0	125.0	110.4	126.7				106.4	117.6		118.7		118.3
Green Lakes State Park		113.0	120.1	115.9	116.0	135.6	104.9	105.8			104.9		118.0
Claremont	166.1	125.8	103.8	102.6	125.7		104.9	112.3	98.3				116.5
Coho Property		120.5	117.1	123.4	111.3		111.0	105.1			105.1		116.3
Sisters of St. Francis		112.1		115.8		111.5							115.2
Mt. Tom SR	140.3	120.1	105.5	108.8	125.1	107.8	100.4	106.7					115.8
Hemlocks Natural Area		104.1		119.0	137.9			115.5	113.4				114.8
6 Mile Creek Gorge	116.9	110.2	107.6	116.6	115.9	113.8	98.9		107.3		108.6		114.6
Kaaterskill State Park	131.0	140.8	107.9	113.1		126.0			115.0	82.0			114.5
Hearts Content	162.0	88.2		98.6	127.8		109.8	119.0			106.4		113.8
Lake Erie Community Park		121.1	122.3	116.3	122.3		125.8	105.1			106.6		113.5
Bullard Woods	133.0	119.6	107.9	111.1	114.6						100.8		113.1
Mill River			114.7			110.0					106.9		112.9
Laurel Hill	138.1	114.4	103.3	110.5	119.9			108.0	107.2		103.0		112.5
Average	146.9	124.7	115.3	117.2	123.9	119.3	115.2	112.4	114.5	105.6	114.0	120.8	121.3

MTSF places first, second, or third in nine of the 12 species within the Northeast. However, it is likely that this high level of performance is at least partly due to under-sampling of tall tree sites in the Northeast. Zoar Valley has placements for seven of the 12 species, while Cook Forest has placements for five of the 12 species. Our next examination will expand on the idea of the previous table and review the championship status of the 25 tallest species that are native to MTSF. The championship status is shown in Table 6 below. Championship status is identified as MTSF, Massachusetts, New England, Northeast, and East.

Of the 25 species listed, MTSF has entries for 17 species as tallest in New England, the Northeast, or the East. Of the ten species that comprise the RHI, MTSF has nine champions for New England, the Northeast, or the East. It is tempting to conclude that part of the explanation for this remarkable record lies in the extensive amount of time that ENTS has devoted to MTSF. However, enough data exists for other sites to confirm MTSF as an exemplary tall tree site. As coverage expands, we will almost assuredly see Mohawk lose some of its dominance, but then so will other high performers in the Northeast. However, it is unlikely that Mohawk will fall behind other sites in its relative ranking.

ITERATED INDEX ANALYSIS IN MTSF

From simple RHI computations, we can examine how deep Mohawk is in tall trees for the species that commonly enter the RHI. We do this through iterating the index. In the iteration process, all individual trees are available for the first iteration. Then the ten selected in the first iteration are removed and the process is applied again using the remaining inventory of unselected trees. This process is done repeatedly so long as the sample of tree species and trees per species is large enough to support another iteration. Table 7 below lists the RHI and RGI for 25 iterations.

The final averages reflect all 250 trees that enter the respective calculations. MTSF holds an index above 130 ft through four iterations. At present, this places MTSF number one in the Northeast for iterations over 130. However, of the five sites in the Northeast with indices over 130 ft, only MTSF and Cook Forest have been measured extensively enough for the 130-ft iterations to be a fair comparison. Mohawk holds an index of 120 ft or more through 20 iterations. Additional searches will raise the number to above 20, perhaps as high as 25. However, based on the extensive experience of the ENTS measurers who work in the MTSF, 25 iterations above 120 ft approaches the limit. Our confidence in these predictions is based on the saturation measurement that we have given MTSF.

Table 6. Height champion status of 25 species in MTSF.

Species	Location	Height	Girth	Last year measured	Champion status
Eastern white pine	Trees of Peace	168.5	10.4	2006	New England
White ash	Trout Brook	151.4	6.2	2006	Northeast
Sugar maple	Trout Brook	134.4	5.0	2006	Northeast
Northern red oak	Todd Mountain	133.5	9.3	2004	New England
Bitternut hickory	Clark Ridge-Indian Flats	131.8	4.3	2006	New England
American beech	Clark Ridge-North	130.5	8.4	2006	Northeast
Eastern hemlock	Black Brook	130.3	10.7	2003	
Red maple	Clark Ridge-Elders Grove	128.0	6.2	2006	New England
American basswood	Clark Ridge-North	126.9	5.9	2006	New England
Bigtooth aspen	Clark-Shunpike	126.0	3.5	2002	East
Black cherry	Trout Brook	125.3	5.5	2005	New England
American elm	Clark Ridge-North	120.8	6.6	2005	New England
Red pine	Red Pine Grove	117.0	5.3	2004	
Black birch	Clark Ridge-North	116.2	3.6	2002	Northeast
Red spruce	Cold River East	114.7	7.3	1999	
Shagbark hickory	Encampment	111.8	3.9	2004	
Black oak	Clark Ridge-Ash Flats	110.5	4.8	2002	Massachusetts
White birch	Clark Ridge-North	110.5	5.2	2002	East
Yellow birch	Trout Brook	105.6	4.8	2005	Northeast
White oak	Encampment	101.8	8.2	2003	
Green ash	Indian Springs	98.2	8.4	2005	
Eastern cottonwood	MTSF-Headquarters	95.0	7.0	2003	
Black locust	Todd Mountain	84.9	5.5	2004	
Eastern hophornbeam	Cold River East	78.2	3.3	2003	Northeast
Striped maple	Encampment	64.8	1.8	2004	Northeast

Table 7. Summary of iterated Rucker Index without species repetition for both height and girth.

Height Iteration	Height	Girth	Girth Iteration	Girth	Height
1	136.1	7.0	1	12.4	105.6
2	134.6	7.2	2	10.6	97.0
3	132.7	7.1	3	10.2	105.2
4	130.6	7.2	4	9.9	108.7
5	129.5	6.6	5	9.4	121.2
6	128.8	6.5	6	9.2	104.7
7	128.1	6.1	7	8.9	112.6
8	127.1	6.9	8	8.7	118.3
9	126.4	6.6	9	8.6	120.0
10	125.7	6.8	10	8.4	112.9
11	125.1	6.7	11	8.2	119.3
12	124.3	6.8	12	8.1	117.8
13	123.5	6.4	13	8.0	116.4
14	123.2	6.4	14	7.8	112.4
15	122.3	6.5	15	7.6	122.5
16	121.6	6.5	16	7.6	113.4
17	121.2	7.5	17	7.5	113.5
18	120.9	5.8	18	7.3	116.7
19	120.5	5.9	19	7.3	118.0
20	120.1	6.4	20	7.2	117.2
21	119.5	6.0	21	7.1	121.0
22	119.3	6.6	22	7.1	111.5
23	118.7	6.3	23	7.0	118.4
24	118.4	6.0	24	6.9	112.8
25	118.1	6.5	25	6.9	112.2
	Avg = 124.7	6.6		Avg = 8.4	114.9

Another way to examine MTSF's performance is to relax the restriction on the rule that precludes a species from being repeated in an iteration of the index. Repetition weights the index toward the dominant tall tree species in MTSF, namely the eastern white pine, which occurs in stands. Of the 200 tallest trees in MTSF, 178 are eastern white pines and 12 are white ashes. The remaining ones are sugar maple and northern red oak. Table 8 below shows the iterated index for MTSF with and without species repetition. We include the comparison because there is a logical curiosity about systems that include versus exclude repetition. The allowance of species repetition also highlights the dominance of eastern white pine and white ash as the quintessential tall tree species in MTSF.

As can be seen, the iterated RHI with repetition for MTSF stays at or above 143 ft for all 20 iterations and averages 148.9 ft. Without repetition, the index stays at or above 120 ft for 20 iterations and the index averages 126.0 ft for the full 20 iterations. The girth of trees that produce these significant heights average 8.2 ft for the repeated group and 6.6 ft for the non-repeated group. The conclusion is that tall eastern white pines are clearly larger trees in girth than their tall hardwood counterparts. But both diameter averages are modest. The explanation is that MTSF's tall trees are relatively young and growing in close competition with their neighbors. In the old-growth sections, the trees have thinned out and grown measurably larger in girth.

Table 8. Summary of iterated Rucker Index with and without species repetition.

Height	Girth	Height	Girth
161.5	9.9	136.2	7.0
154.7	8.7	134.6	7.2
152.3	8.5	132.7	7.1
151.7	8.5	130.6	7.2
151.7	8.4	129.5	6.5
151.1	8.4	128.8	6.7
150.9	8.5	128.0	6.8
150.6	8.5	127.1	6.9
150.4	6.3	126.3	6.6
149.5	8.6	125.6	6.9
148.3	8.1	124.9	6.6
147.7	8.4	124.3	6.8
146.6	8.0	123.5	6.4
145.9	9.0	123.1	6.3
145.2	7.8	122.2	6.2
144.6	7.9	121.5	7.0
144.3	8.3	120.9	6.5
144.0	8.1	120.5	5.5
143.5	6.3	120.0	6.4
143.0	7.4	119.4	6.1
148.9	8.2	126.0	6.6

However, the crowns of the older trees have been pared back by ice storms, wind, insect damage, etc. and overall are usually slightly shorter than their younger cousins. This effect has been observed throughout the MTSF. For height performance, MTSF may be nearing its zenith. Though we are not absolutely sure, maximum tree height probably occurs for most hardwood species in the MTSF at between 100 and 150 years. Maximum height for the conifers usually comes later.

The girth index for MTSF is far less impressive than the height index. To date 1,148 different trees measured with laser and clinometer in MTSF have been recorded in the ENTS database. Of these, 1,035 have girths recorded. One pattern that stands out is that the largest trees in MTSF are seldom the tallest. Northern red oaks and sugar maples growing as boundary trees along old rock walls often fail to break 100 ft in height, but usually surpass 90 ft. When including all the species, the largest girth trees are usually totally or partially open grown plus older in-forest trees that have had their crowns pared back over the years.

While the MTSF's larger girth trees are impressive, many other places equal or surpass Mohawk in tree girth for the hardwoods. This conclusion does not hold for the large eastern white pines that have not reached sufficient age to see crown loss, but are nonetheless large trees. The eastern white pine is the largest species by volume in MTSF—and the tallest.

Presently, we have documented 62 pines that reach 10 ft or more in circumference. While not all the 10-footers in Mohawk have been documented, there are not likely to be more than ten. It is safe to conclude that MTSF presently has at most 75 eastern white pines with circumferences of 10 ft or more.

DOMINANCE-PERSISTENCE AND DROP ANALYSIS FOR MTSF

Table 9 below shows the performance of each species in MTSFs RHI based on 10 species and 25 iterations.

Table 9. Dominance-Persistence Index (DPI) for the MTSF.

Species	Dominance	Persistence	DPI Index
Eastern white pine	100	100	100.0
White ash	90	100	90.0
Sugar maple	80	100	80.0
Northern red oak	64	100	64.0
Eastern hemlock	61.2	100	61.2
Bitternut hickory	36.4	80	29.1
Black cherry	31.2	88	27.5
Red maple	28.4	84	23.9
Bigtooth aspen	16.8	60	10.1
American basswood	14.4	64	9.2
Black birch	9.2	40	3.7
American beech	9.6	32	3.1
White birch	2.4	12	0.3
Red pine	1.6	12	0.2
Black oak	0.8	4	0.0
Yellow birch	0.4	4	0.0

Eastern white pine makes up a relatively small percentage of the total number of trees in MTSF and its distribution is limited to a few sites, but its genetic heritage ensures its first place in both the dominance and persistence indices. As more sites are added to the ENTS database, white ash's performance as a tall hardwood species in the Northeast is likely to rank third, behind tuliptree and sycamore. One or two species of hickories could become competitors with the ash. However, in Massachusetts, white ash ranks as the tallest hardwood and is persistent where disturbance has been prominent. Sugar maple, northern red oak, and eastern hemlock are strong competitors for third, fourth, and fifth places. Bitternut hickory, black cherry, and red maple are strong competitors for sixth, seventh, and eighth places. Other competitors are far less dominant and persistent in MTSF.

The overall dominance of eastern white pine and white ash goes farther than even the preceding analysis reveals. Of the 1,148 trees in the ENTS database for MTSF ranked by height, the first 350 are all eastern white pines and white ashes. The top 30% are those two species before any of the remaining show up. At least 100 more eastern white pines in the 135- to 140-ft height class have not been entered into the database. It is highly probable that the top 40% of Mohawk's trees ordered by height are eastern white pines and white ashes. Looking at Mohawks Drop Index, the DI10 for the tenth iteration is:

$RHI_1 = 136.1$

$RHI_{10} = 125.7$

$DI_{10} = [(136.1 - 125.7)/136.1]100 = 7.6$

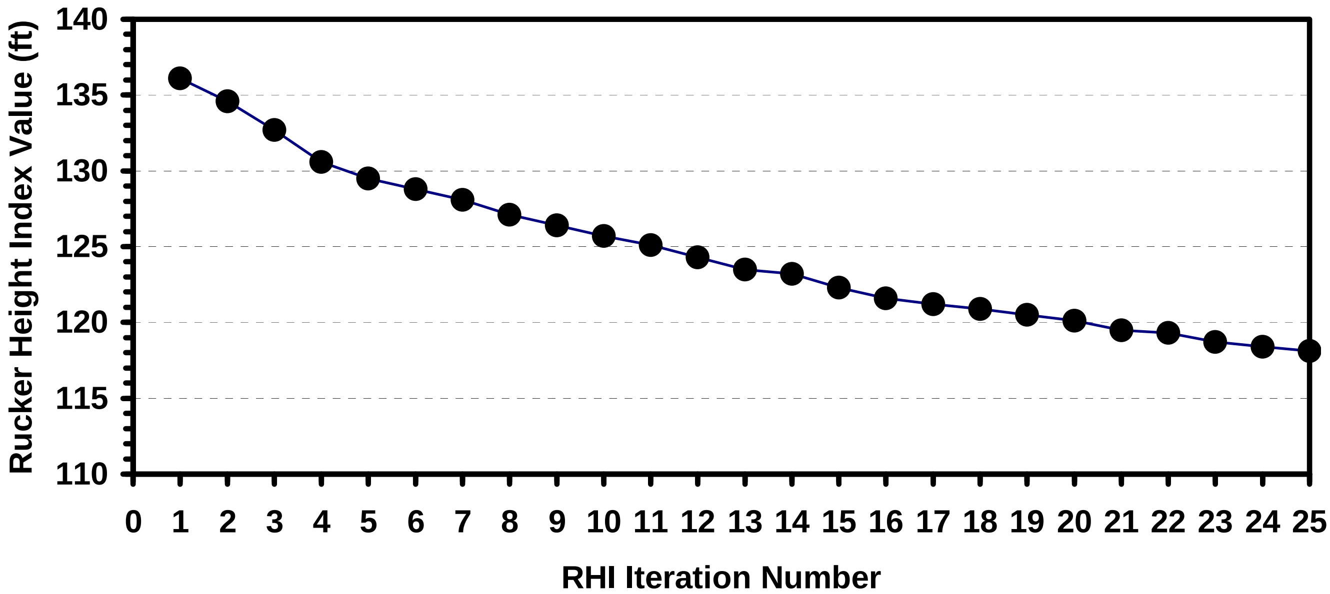

Figure 1. Iterative RHI determinations for the MTSF.

For 20 iterations, the DI is:

RHI_1 = 136.1

RHI_{20} = 120.1

DI_{20} = [(136.1 - 120.1)/136.1]100 = 11.8%

As a more visual approach to examining the behavior of an iterated index, we could plot the iterations on a graph and examine the trend. The following graph (Figure 1) looks at 25 iterations of the MTSF.

As can be seen, the trend is non-linear, indicating that there maybe a small number of each species that acts as statistical outliers. This conclusion is based on our understanding of specific trees and whether or not we think of them as statistical outliers. This kind of analysis is meaningful only from a large dataset of trees for a site.

EXTENSIONS OF ITERATED RIA IN MTSF

There are a number of directions we can go to utilize the data from the iterations. One way to analyze the distribution of tall trees in MTSF is a simple examination of the frequency of occurrence for each species in the RHI iterations. As the number of iterations is increased, the role of each species becomes clearer. Table 10 below looks at the representation of species through 25 iterations. This is a simplified version of persistence.

The roles of eastern white pine, white ash, sugar maple, northern red oak, and eastern hemlock are as consistent performers. The performance of American basswood, bigtooth aspen, and black cherry is somewhat surprising. Basswood is lightly distributed throughout MTSF, yet it competes well for canopy dominance wherever it occurs. Bigtooth aspen can be found as isolated individuals or concentrated in clonal groups. The species is still thinly distributed in Mohawk, but performs well as a tall tree. Black cherry is widely distributed in MTSF, but is nowhere abundant. It competes well in the canopy wherever it occurs.

Table 10. Relative abundances of species in iterated index.

Species	Number of times represented	Percent
Eastern white pine	25	100.0
White ash	25	100.0
Sugar maple	25	100.0
Northern red oak	25	100.0
Eastern hemlock	25	100.0
Black cherry	22	88.0
Red maple	20	80.0
Bitternut hickory	19	76.0
American basswood	17	68.0
Bigtooth aspen	12	48.0
American beech	9	36.0
Black birch	8	32.0
Red spruce	7	28.0
Red pine	4	16.0
White birch	2	8.0
Yellow birch	1	4.0
White birch	1	4.0
Shagbark hickory	1	4.0
Black oak	1	4.0
American elm	1	4.0

HEIGHT THRESHOLD ANALYSIS IN MTSF

Another approach to analyzing MTSF's tall tree performance through the iteration process is to focus on tree species that meet a height threshold. For example, we may choose to focus our attention on species that reach 120 ft or more in height.

What is the height distribution of the species that reach this threshold for the data we currently have in the ENTS database for MTSF? We have chose 120 ft as an arbitrary threshold for identifying tall eastern trees. This threshold has been chosen primarily because there are relatively few northeastern sites that exhibit a RHI of 120 ft or more, whereas sites exceeding 110 ft are common. Table 11 below summarizes what we know about the performance of the species in MTSF that achieve heights of at least 120 ft.

Table 11. Distribution of heights over 120 ft for native tree species in MTSF (as currently in ENTS database).

	Tree heights greater than or equal to:				
Species	160 ft	150 ft	140 ft	130 ft	120 ft
Eastern white pine	6	82	243	333	361
White ash		2	25	77	133
Sugar maple				6	38
Northern red oak				4	11
American beech				2	5
Eastern hemlock				1	15
Bitternut hickory				1	9
American basswood					6
Bigtooth aspen					6
Red maple					3
Black cherry					3
American elm					1
Totals	6	84	267	423	591

COMPANION SPECIES ANALYSIS IN MTSF

Another way of utilizing data from an iterated index calculation is to do a companion species analysis. Table 12 below lists prominent companions for the tallest of members of the 13 species in MTSF confirmed to heights of 120 ft or more. By prominent, we mean close by and abundant in the canopy. An exceptional eastern white pine growing among other tall eastern white pines is to be expected. The tallest eastern white pine at a site is usually in a stand surrounded by companion pines. Isolated trees and old field pines are usually shorter. Bigtooth aspen clones often have a ramet taller than the rest.

The clustering of clonal aspens seems to generate the highest probability of a height champion as opposed to isolated trees. The red maple champion growing next to an eastern white pine in Mohawk was initially surprising to some of us. However, we have found other examples of red maple excelling among eastern white pines. American basswood grows in rich soils. Its common companions are sugar maple and white ash. Basswood tends to compete well with the sugar maples, height-wise, but is topped by the ashes by 10 to 20 ft.

What shows up in this form of analysis is the importance of intra-species competition for the stand-based species that are abundantly represented and inter-species competition among tall varieties for the species that are sparsely represented like black cherry. We acknowledge that is conclusion is speculative and will direct future analysis.

DISTRIBUTIONS OF HEIGHT AND DIAMETER IN MTSF

We will now take a broader look at the data compiled for MTSF through RIA. We will examine some girth/diameter to height distributions and explore strengths and deficiencies in the data. To date 1,488 tree measurements for MTSF have been recorded in the ENTS database that utilizes the sine top-sine bottom height measurement technique (see our website at http://www.nativetreesociety.org on this approach).

Of these measurements, 1,148 represent different trees. The remaining measurements are re-measurements of existing trees. In almost all cases, determining tree height was the primary objective for a conspicuously tall tree for the species. For 1,035 of the 1,148 trees, girths were also recorded. The availability of the girth dimension and its diameter derivative allows us to raise questions about the relationship of girth to height in the dataset. Table 14 below shows the distribution of diameters for the 1,035 trees.

Table 12. Companion species.

Species	Maximum height (ft)	Most prominent companion species of the tallest trees
Eastern white pine	168.5	eastern white pine
White ash	151.5	white ash, sugar maple
Sugar maple	134.4	sugar maple, white ash
Northern red oak	133.5	sugar maple, white ash
Bitternut hickory	131.8	white ash
Eastern hemlock	130.3	eastern hemlock
American beech	130.5	sugar maple, white ash
Red maple	128.0	eastern white pine
Norway spruce	127.1	Norway spruce
American basswood	126.9	sugar maple, white ash
Bigtooth aspen	126.0	bigtooth aspen
Black cherry	125.3	sugar maple, white ash
American elm	120.8	sugar maple, white ash, northern red oak

Table 13. Diameter distribution for the ENTS-measured trees of the Mohawk Trail State Forest.

Size threshold	Number of trees
Diameter greater than or equal to 0.33 ft	1035
Diameter greater than or equal to 1.0 ft	998
Diameter greater than or equal to 2.0 ft	698
Diameter greater than or equal to 3.0 ft	140
Diameter greater than or equal to 4.0 ft	12
Diameter greater than or equal to 5.0 ft	1

As previously mentioned, the trees in Table 13 were measured principally for conspicuous height. There is a population of trees over 3 ft in diameter that are not particularly tall that have not yet been measured. However, very few trees over 4 ft remain unmeasured, regardless of height. The diameter distribution emphasizes the point that the tall trees in MTSF are not overwhelming in terms of their diameters. When walking the trails, many visitors pay little heed to the trees in Mohawk because of the modest diameters. For them, impressiveness is understandably seen through large girth as opposed to significant height.

HEIGHT-GIRTH THRESHOLD ANALYSIS IN MTSF

At the risk of redundancy, we stress that the application of RIA in MTSF emphasizes the trees of significant height for their species. This has been the objective to date of RIA as applied to Mohawk. Since RIA is a top-down system of tree documentation, the tallest and/or largest girth trees of each species are sought out first and measured. One works from the top down, so many trees are left unmeasured in the lower height classes. This obviously skews the numbers in RIA away from the means, but clearly reveals maximum site performance for the species studied.

Recognizing the orientation of the dataset, we might choose to investigate the distribution of girths for trees that meet various height thresholds such as intervals of 10 ft. In the Table 15 below, we start with trees that are 100 ft or more in height and consider the distribution of girths at 1-ft intervals for girth and 10-ft intervals for height. A question that comes immediately to mind is: Do the tallest trees tend to be the largest ones in girth? A second question is: Do different species behave differently, reaching significant height at earlier stages of growth? This leads to an examination of height to girth performance of early successional versus late successional species.

The present state of the MTSF dataset does not allow for these questions to be answered precisely, but some trends are apparent. The data are most representative for heights of 120 ft and over for non-eastern white pine species and 140 ft and over for eastern white pines. A complete census has been taken of trees over 150 ft in height and the great majority of trees over 140 ft have been measured. However, moving down in height, there are many young eastern white pine and white ash trees in the 5 to 7-ft girth class in Mohawk that are over 100 ft in height, but have not been measured as a consequence of the top-down approach. With these caveats in mind, let us examine the numbers in Table 14. Girths are measured at 4.5 ft above midslope.

The combination of height and girth analysis is revealing. In particular, the concentration of tall trees in the girth range of 5.0 to 9.99 ft is striking, especially to researchers who expect to see significant height to be paired with large girth. Growing conditions in MTSF do not commonly produce trees that are concurrently very wide and tall, except for one species—eastern white pine. But even with eastern white pine, the limits are clear. In time, a few more of the Mohawk eastern white pines will grow into the 12-ft girth range, but in all probability there will never be a large number of them. The number of 13-ft girth pines will be extremely small, most likely under 4. The maximum heights are likely to be around 170 ft and only for a tiny population.

Most tree species in MTSF appear to reach their greatest heights between the ages of 75 and 150 years, despite the fact that most can live 200 to 300 years. Eastern hemlock, for example, commonly approaches 350 years, and can rarely reach 400 to 500 years. We are confident in these results because MTSF contains the largest acreage of old-growth forest remaining in Massachusetts.

A FINAL LOOK AT MTSF

One interesting conclusion that we have reached as a consequence of RIA in Mohawk is the role of eastern white pine. We have always recognized its importance to height statistics, but it is so dominant in both the simple and iterated RHI values of MTSF that it is logical to investigate the impact on the RHI for Mohawk if eastern white pine is removed. The impact is dramatic. RHI_1 drops to 131.8 ft and RHI_2 drops to 129.9 ft. However, these resulting indices are still higher than Ice Glen, the nearest Massachusetts competitor, which has an RHI value of 128.2 ft. Extending this approach and dropping out the white ash, the #2 tall tree species in Mohawk, results in a RHI of 128.8 ft. This is still higher than Massachusetts's second best site. Nothing confirms the dominance of Mohawk as a tall tree site as does this approach.

In terms of competitors, there are still sites in Massachusetts that may have RHI values above 120, but the chances of another site reaching 130 ft in Massachusetts are negligible. Private landowners in Massachusetts seldom allow forests to mature to the point that multiple species reach great heights. State properties nurturing forests with outstanding height characteristics are extremely limited. The Deerfield River and Housatonic River corridors rank #1 and #2, respectively. The Connecticut River Valley corridor ranks #3, but the locations to look for forests of outstanding stature are limited. There is an assemblage of landowners, foresters, wildlife biologists, naturalists, etc. on the lookout for large and/or tall tree properties. Small ravines with three to five species in the 120-ft height class may be more widespread than we realize, but these small spots will not challenge either Mohawk of Ice Glen. The upper elevations of the Berkshires and Taconics do not provide the growing conditions to support tall forests. In summary, our conclusion is that MTSF is the unchallenged tall tree forest of New England and likely to remain so.

ACKNOWLEDGMENTS
We would be remiss if we did not recognize the members of ENTS who have made the major contributions to RIA, both conceptualizing the process and spending countless hours trudging through difficult terrain, peering up into the canopy, and carefully recording their measurements. The intrepid tree measurers are listed below, in no particular order with the exception of Colby Rucker, whose name is listed first in remembrance of his contribution to the Rucker Index. So, thanks to: Colby Rucker, Jess Riddle, Lee Frelich, Dale Luthringer, John Eichholz, Tom Diggins, Scott Wade, Howard Stoner, Anthony Kelly, Don Bragg, Ed Frank, Carl Harting, Michael Davie, Josh Kelly, Darian Copiz, John Knuerr, Gary Beluzo, Susan Scott, Holly Post, Robert Van Pelt, and Paul Jost.

Table 14. Distribution of heights to girth in the MTSF data for trees at least 100 ft tall.

All species, including eastern white pine

Height	Total	Girth class (in ft)												
range (ft)	stems	2	3	4	5	6	7	8	9	10	11	12	14	18
100-109.9	167	5	13	25	31	36	36	10	5	2	2		1	1
110-119.9	180		4	31	33	36	31	28	6	9	1	1		
120-129.9	155		4	19	25	30	31	21	15	9	1			
130-139.9	137			3	7	22	43	26	23	8	4	1		
140-149.9	180				11	22	46	47	39	9	3	2	1	
150-159.9	77					8	20	18	15	13	3			
160-169.9	6							1	1	2	2			
all classes	902	5	21	78	107	154	207	151	104	52	16	4	2	1

Eastern white pine only

Height	Total	Girth class (in ft)									
range (ft)	stems	4	5	6	7	8	9	10	11	12	14
100-109.9	5			1		1	1	1	1		
110-119.9	10			2	1	1	1	5			
120-129.9	27		1	1	5	4	8	8			
130-139.9	80	2	2	8	17	21	20	7	2	1	
140-149.9	157		5	17	42	41	37	9	3	2	1
150-159.9	75			6	20	18	15	13	3		
160-169.9	6					1	1	2	2		
all classes	360	2	8	35	85	87	83	45	11	3	1

All species except eastern white pine

Height	Total	Girth class (in ft)												
Range (ft)	stems	2	3	4	5	6	7	8	9	10	11	12	14	18
100-109.9	162	5	13	25	31	35	36	9	4	1	1		1	1
110-119.9	170		4	31	33	34	30	27	5	4	1	1		
120-129.9	128		4	19	24	29	26	17	7	1	1			
130-139.9	57			1	5	14	26	5	3	1	2			
140-149.9	23				6	5	4	6	2					
150-159.9	2					2								
all classes	542	5	21	76	99	119	122	64	21	7	5	1	1	1

A SURVEY OF CORE-BASED SPECIES MAXIMUM AGE ESTIMATES IN THE ZOAR VALLEY, WESTERN NEW YORK STATE

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ABSTRACT
During 2005 and 2006 we increment cored to estimate stand ages in more than 70 canopy/understory survey plots in Zoar Valley, western New York State. On pristine riverside terraces and in a narrow strip of old growth along the canyon rims above, 12 species exceeded 150 years at breast height, and six reached 200 years. Especially impressive were maximum ages of *Tsuga canadensis* (eastern hemlock) and *Platanus occidentalis* (American sycamore) at 385 and 359 years, respectively. Because the objective of this coring was not a species-by-species survey of maximum ages, it is likely other trees of advanced age remain undocumented at this site.

INTRODUCTION
During our research group's efforts within the extensive old-growth woodlands of western New York State's Zoar Valley (Diggins and Kershner 2005, Diggins 2005, Pfeil et al. 2007) we have generally followed a credo of "less coring and more exploring." I am thus occasionally confronted by the question (as I presume are also other ecologists), "Well, how many trees did you core to classify the site as old growth?" In actuality, the status "old-growth" represents a sum total of factors including disturbance history, ecological function, and present-day characteristics (see Frelich and Reich 2005 for an excellent discussion of this point), so it is rarely necessary or desirable to conduct a labor-intensive and invasive series of tree corings to make such an assessment. That said, however, increment coring *as applied to a defined scientific objective* is a powerful tool to quantify the age and growth history of trees. Increment cores can establish gradients in stand age among sites and localities (e.g., Tyrell and Crow 1994), and can reveal forest dynamics ranging from local disturbance histories (Nowacki and Abrams 1994) to regional and even global patterns of climate change (D'Arrigo et al. 2000).

In Zoar Valley, we used increment coring to estimate stand age within more than 70 survey quadrats (rectangular plots) established for the study of canopy structure and composition (Diggins and Kershner 2005), treefall and woody debris dynamics (Pfeil et al. 2007), and ecological succession (Diggins 2005) on riverside floodplains and older raised terraces. We also cored some additional trees belonging to species not well represented by quadrat coring in order to estimate their maximum ages in the Zoar Valley Canyon and its surrounding uplands. A summary of increment coring results is presented here in much more detail than will be found in any of the research articles for which these data were collected.

METHODS
Specific coring methods are described by Pfeil et al. (2007, pp. 162-163) as follows:

> Increment cores (obtained with Suunto 10-in. [25 cm] and 16-in. [41 cm] borers) of one or more of the suspected oldest trees in each quadrat were used to estimate minimum stand ages. Trees were cored perpendicular to any lean and at or near breast height (1.37 m [4.5 ft]), at which age estimates are presented. If a core missed the pith, a concentric circle overlay was used to estimate pith location. The innermost five rings (ten if tight) were then used to estimate the missing growth. Large and old sugar maple and American beech were often hollow, and it was decided to extrapolate the age of such individuals rather than summarily excluding them from stand age data. The potential length of missing core was calculated as the average radius minus the length of the core. Missing growth was then estimated as the average growth over this increment (starting at pith) displayed by 3 – 5 conspecific trees for which the pith was reliably located. Some additional trees were cored solely for this purpose. To keep these estimates conservative, cores displaying periods of suppression were not used to estimate missing growth. A close agreement between extrapolated maximum ages and those obtained from complete cores (257 vs. 243 years, and 235 vs. 233 years, for sugar maple and American beech, respectively) suggested these hollow tree estimates were reasonable.

Additionally, the ages of other hollow trees and of the largest individuals of several other species (borer could not reach pith) were estimated as described above for sugar maple and American beech. Typically, complete cores could not be extracted from trees > 85 cm DBH with the 41 cm borer. No elms (either *Ulmus americana* (American elm) or *Ulmus rubra* (slippery elm)) were cored, to avoid even the remotest possibility that doing so might increase their susceptibility to Dutch elm disease.

All cores were returned to the laboratory where they were mounted and sanded flat. Various combinations of fine-sanding, polishing, and lemon oil treatment were applied to cores to achieve maximum distinction of age rings. Rings that appeared unusually faint or incomplete were assumed to be "false" sub-annual rings, and were not counted. Unexpectedly

Table 1. Notable ages for canopy-dominant or mid-story trees in Zoar Valley, New York.

Species	DBH in cm	Core	Breast height age	Comments
		Age maximum relatively well established		
Eastern hemlock (*Tsuga canadensis*)	77	Complete	385	
	81	Incomplete	351	Part of core broke off inside tree.
	58	Complete	289	
	53	Complete	257	
	56	Complete	237	
American sycamore (*Platanus occidentalis*)	99	Incomplete	359	Hollow—271 rings in outer 21 cm.
	82	Complete	187	
	69	Complete	129	
Yellow birch (*Betula alleghaniensis*)	51	Incomplete	276	Hollow—181 rings in outer 6 cm.
	64	Incomplete	228	Hollow—138 rings in outer 13 cm.
Sugar maple (*Acer saccharum*)	82	Incomplete	257	Hollow—155 rings in outer 18 cm.
	68	Complete	243	
	83	Incomplete	194	
	84	Incomplete	192	
	68	Incomplete	188	Hollow—140 rings in outer 24 cm.
	63	Incomplete	184	Hollow—117 rings in outer 18 cm.
Cucumbertree (*Magnolia acuminata*)	78	Complete	219	Above gorge. Cored at 2.2 m.
	59	Complete	145	Above gorge.
White ash (*Fraxinus americana*)	103	Incomplete	188	Hollow—105 rings in outer 24 cm.
	95	Incomplete	134	
	79	Complete	108	
Bitternut hickory (*Carya cordiformis*)	74	Incomplete	167	
	81	Incomplete	135	
Black birch (*Betula nigra*)	63	Complete	156	Above gorge.
Red maple (*Acer rubrum*)	86	Incomplete	143	
	90	Incomplete	133	
		Age maximum poorly established (see footnotes)		
American beech [a] (*Fagus grandifolia*)	86	Incomplete	235	Hollow—185 rings in outer 26 cm.
	57	Complete	233	
	51	Complete	208	
Chestnut oak [b] (*Quercus montana*)	102	Incomplete	171	Low-branching tree on canyon rim.
Tuliptree [b] (*Liriodendron tulipifera*)	108	Incomplete	170	120 rings in outer 36 cm.
	86	Incomplete	162	Above gorge.
White oak [b] (*Quercus alba*)	96	Incomplete	156	Low-branching tree on canyon rim.
Eastern white pine [b] (*Pinus strobus*)	69	Complete	145	
American basswood [a] (*Tilia americana*)	67	Complete	122	
	67	Complete	105	
Northern red oak [b] (*Quercus rubra*)	93	Incomplete	129	
	81	Incomplete	101	
Eastern cottonwood [c] (*Populus deltoides*)	106	Incomplete	116	
	61	Complete	115	

[a] Oldest specimens likely much too hollow to extract reliable cores.
[b] Older specimens may occur on steep canyon slopes.
[c] Largest specimens have not been cored.

narrowly spaced rings that occurred individually, and not within regions of suppressed growth, were also assumed to be false, and were likewise not counted.

RESULTS AND DISCUSSION

Increment coring in Zoar Valley generally yielded age ranges and maxima to be expected in an eastern woodland well established as presettlement old growth (Diggins and Kershner 2005, Pfeil et al. 2007), but it also produced some surprises. Much as expected, eastern hemlock (*Tsuga canadensis*) was consistently the oldest, or among the oldest, species on terrace flats, even when occurring in the mid-story. Its maximum age of 385 years (Table 1) was impressive, and older trees may exist on steep slopes that are too dangerous to justify any attempts at coring. The significant positive relationship of hemlock age to DBH (Table 2) among the Zoar Valley core data was somewhat surprising, given this species' propensity to tolerate long periods of canopy suppression and reach advanced age at small size. I suspect this result may be an artifact of our having cored relatively few large canopy hemlocks (eastern hemlock is not common as a canopy dominant on the terrace flats), two of which happened to be the oldest individuals. In a 2004 communication with Jim Battaglia of New York Audubon, he told me he independently recorded an age of only 243 years from a field-counted core of a canopy-dominant hemlock (about 83 cm DBH) in a "younger" stand, suggesting that, as expected for a very shade tolerant species, size may not necessarily predict age.

Coring of sugar maple (*Acer saccharum*) likewise revealed a wide range of ages of canopy specimens, and an impressive maximum of about 250 years (Table 1). Nearly all of the sugar maples cored on terrace flats were canopy dominants, and there was no relationship between age and DBH (Table 2). Qualitative characteristics such as balding bark and high gnarled first branches (Figure 1a) tended to indicate advanced age (i.e., ≥ 180 years at breast height), but were not reliably diagnostic – some trees defied simple age estimate without coring. The oldest sugar maples were frustratingly hollow, but several old specimens yielded complete cores, and incomplete cores from hollow trees usually displayed high ring counts, both providing evidence that conservatively extrapolated ages of up to 257 years were plausible.

American beech (*Fagus grandifolia*) proved especially difficult to age due to the prevalence of heart-rot in large canopy specimens. Unlike sugar maple, it is doubtful that increment coring was able to establish an age maximum for this species in Zoar Valley. The largest beeches (90 to 120 cm DBH) were all so extensively hollow (Figure 1b) that cores taken near breast height might have represented as little as one-quarter of the radius of the tree. Although the ages of such trees will likely never be known, it is not unreasonable to surmise American beech exceeds the reported 235-year core-based maximum in Zoar Valley (Table 1), and might even reach 300 years of age.

Coring of American sycamore (*Platanus occidentalis*) in Zoar Valley produced a notable surprise. Although this species is widely regarded as capable of reaching substantial age (300 to > 400 years), I had suspected the tall and vigorously growing specimens on Zoar Valley's rich terraces might be more modestly aged. However, in 2002, Bruce Kershner and I encountered a fallen tree of about 80-cm diameter, cleanly broken through, on which I conservatively counted 190 rings at about 4 m above breast height. This specimen made me reconsider my skepticism regarding old terrace sycamores. The incomplete core extracted from a hollow 99-cm DBH tree nearby yielded an impressive 271 rings from less than half the radius of the tree. The 359-year extrapolated estimate presented here is frustratingly uncertain, but this is clearly a tree of great age.

This particular tree was chosen for coring because I felt it might be the oldest sycamore on its terrace. It is located well upstream and close to the canyon slope (where the depositional landform is likely oldest), and it possesses an imposing twisted trunk with a massive spreading crown. In contrast, taller trees in a grove at the downstream end of the same terrace (i.e., on land likely more recently deposited) are more youthful in appearance (with more slender conical crowns) and proved to be less than 150 years old. Very large and isolated sycamores in Zoar Valley seem to represent aging remnants of the original floodplain vegetation, whereas groves, especially in association with eastern cottonwood (see Figure 1c), indicate a younger stand.

Table 2. Age-DBH relationships for the most commonly cored canopy dominant or mid-story trees in Zoar Valley, New York. R^2 given for simple linear regression of age on DBH. Asterisk (*) indicates significant regression (P < 0.05), and all significant regression slopes were positive.

Species	Number of trees cored	DBH range (cm)	Age range (years)	Age-DBH R^2
Acer saccharum	15	51 - 88	114 - 257	0.078
Fagus grandifolia	5	51 - 86	128 - 235	0.090
Fraxinus americana	5	67 - 103	92 - 188	*0.841
Liriodendron tulipifera	5	74 - 108	94 - 170	*0.681
Platanus occidentalis	5	69 - 99	97 - 359	0.464
Tsuga canadensis	15	38 - 81	119 - 385	*0.635

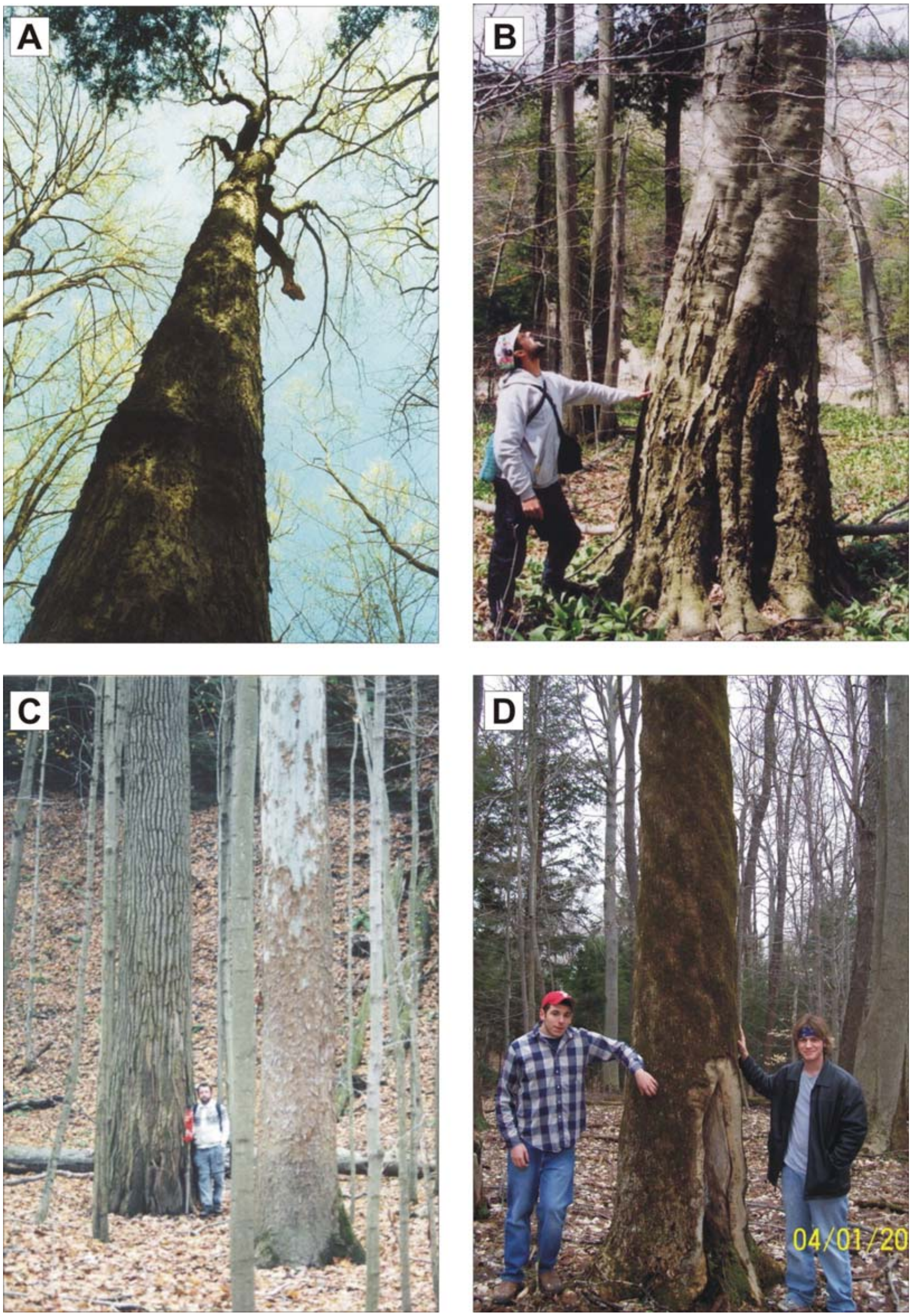

Figure 1. Examples of advanced-age trees in Zoar Valley, New York. A) **Acer saccharum** *(sugar maple) with excellent "gnarl factor"—extensive bark balding and high contorted first branches. Estimated at 257 years by incomplete core (tree was hollow). B) Very large and old* **Fagus grandifolia** *(American beech) of 114 cm DBH – much too hollow to extract a useful core at breast height. C)* **Populus deltoides** *(eastern cottonwood) of 126 cm DBH—too large, and possibly hollow, to be effectively cored with a 41 cm borer. A nearby* **Platanus occidentalis** *(American sycamore) not pictured here was core dated to 129 years, suggesting a possible age range for this uncored cottonwood. D) A large* **Magnolia acuminata** *(cucumbertree) in a narrow strip of old growth along Zoar Valley Canyon's southern rim. The tree pictured was too hollow to core, but fortunately a complete core was extracted from another specimen (not pictured) along the south rim that proved to be 219 years old at its 2.5 m coring height.*

Because the objective of increment coring at Zoar Valley was not to exhaustively survey maximum ages species by species, a number of trees were very much under-represented (e.g., *Liriodendron tulipifera* (tuliptree), *Quercus rubra* (northern red oak), *Pinus strobus* (eastern white pine), *Tilia americana* (American basswood)). Still, an impressive 12 species were confirmed over 150 years at breast height, and several others likely reach this threshold, although not yet verified. The old-growth woodlands of Zoar Valley Canyon and its immediate surroundings could provide a rare opportunity to systematically reconstruct age structure and stand history in a northeastern riparian corridor nearly free of human alteration.

ACKNOWLEDGEMENTS
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The Jack Wade Live Oak in Moss Point, Mississippi. Photo by Larry Tucei.

THE LIVE OAK PROJECT

Larry Tucei

Eastern Native Tree Society

EDITORS' NOTE: A BRIEF DESCRIPTION OF THE LIVE OAK PROJECT
Larry Tucei, an ENTS member from Mississippi, is exploring the dimensions of live oak (*Quercus virginiana*) from the southeastern United States. These trees represent some of the largest volume hardwoods, with some of the greatest girths and crown spreads of any tree in the eastern United States (Table 1). The plan is to measure as many of these trees as possible to obtain accurate documentation of their girth, height, and crown spread.

The ENTS results will be compared with existing listings of the Live Oak Society. Some trees on that list were measured in 1934 and this provides a benchmark of how much radial growth has taken place in the past 73 years. In addition, Larry has collected samples for dendrochronological dating from downed tree specimens as there are only limited age information for this species. Measurements will typically also be accompanied by photographic documentation of the specimens and descriptions.

This field report represents a mere sampling of the information Larry has provided us over the last couple of years, plus a healthy dose of pictures of these impressive oaks. Note that Larry is also very productive, continually sending in new reports as he visits live oaks along the Gulf Coast. These are some of the prizes as of mid-June, 2007.

Edward Frank and Don C. Bragg

The Dedeaux Oak. Picture by Larry Tucei.

The Dedeaux Oak

[I was told] of a very large Live Oak located at Wolf Town. He gave me directions and off I went. Months ago, several co-workers had also told me about this oak, I just had not made it to the tree yet…

When I drove, up I new instantly that the oak was one of the biggest trees I'd seen on the Mississippi coast! Growing about 75 yds from the bayou at 10 ft above sea level, this oak is found on a small hillside adjacent to the marsh.

This tree had about 15 ft of water during Hurricane Katrina, due to the 25 ft surge here. Undamaged, it has been through countless hurricanes.

The Dedeaux Oak is the third largest Live Oak I've measured in Mississippi! Trees 30 ft or better [in circumference] are rare down here, and it is a real pleasure to measure and photograph one! This live oak is the most perfect specimen of its kind that I have encountered thus far—an awesome tree! Perfectly straight trunk with massive limbs, very similar to the Middleton Oak.

Bob [Leverett], another 30 footer!

Table 1. A compilation of the largest live oaks (*Quercus virginiana*) measured by ENTS, arranged by circumference at breast height (CBH). These records are current as of June 19, 2007—for more up-to-date listings, check:
http://www.nativetreesociety.org/projects/liveoak_project/index_liveoak.htm.

Tree name	Location	CBH (ft)	Crown width (ft)	Height (ft)	Date of ENTS field trip report	Measurer [a]
E.O. Hunt Oak	Long Beach, MS	37.0	170	45	March 2, 2007	Tucei
Audubon Park Oak	New Orleans, LA	35.2	165	60	May 21, 2007	Tucei
Biloxi Oak	Biloxi, MS	35.0	144	57	January 1, 2007	Tucei
Middleton Oak [b]	Charleston, SC	32.7	118	67	February 21, 2004	Blozan et al.
Dedeaux Oak	Delisle, MS	30.1	148	69	June 19, 2007	Tucei
Andrew Jackson Oak	Daphne, AL	29.5	148	81	September 30, 2006	Tucei
Long Beach Oak	Long Beach, MS	28.7	135	48	April 2, 2007	Tucei
Gulfport Oak	Gulfport, MS	28.5	130	48	December 15, 2006	Tucei
Schmitt Oak	Pass Christian, MS	28.2	129	69	June 19, 2007	Tucei
Meeting Oak	Pass Christian, MS	27.8	120	60	June 13, 2007	Tucei
Ruskin Oak	Ocean Springs, MS	27.2	153	57	December 29, 2006	Tucei
Aunt Jenny's Oak	Ocean Springs, MS	27.1	121	72	February 19, 2007	Tucei
Redeemer Oak	Biloxi, MS	27.0	142	60	April 12, 2007	Tucei
Edgewater Mall Oak	Biloxi, MS	26.8	120	57	March 1, 2007	Tucei
Sara Hunt Oak	Long Beach, MS	26.6	136.5	51	March 2, 2007	Tucei
Pascagoula Oak	Pascagoula, MS	26.0	126	57	February 26, 2007	Tucei
Sycamore Street Oak	Bay St. Louis, MS	25.4	111	60	June 4, 2007	Tucei
Central Park Condo Oak	Mobile, AL.	25.1	142	75	March 23, 2007	Tucei
Thomas Family Oak	Moss Point, MS	25.0	135	66	March 12, 2007	Tucei
Danielle's Oak Treasure Oak	Ocean Springs, MS	25.0	123	57	June 4, 2007	Tucei
Colosseum Oak	Biloxi, MS	24.5	126	54	January 1, 2007	Tucei
McGowen-Zoghby Oak	Mobile, AL	24.5	120.5	57	March 23, 2007	Tucei
Frankes Oak	Delisle, MS	24.7	126	57	June 19, 2007	Tucei
Treasure Oak	Ocean Springs, MS	24.3	137	66	December 29, 2006	Tucei
Jack Wade Oak	Moss Point, MS	24.2	111	75	March 12, 2007	Tucei
Bridge Street Oak	Gulfport, MS	24.2	135	66	June 6, 2007	Tucei
James Padgett Oak	Apalachicola, FL	24.0	137	48	May 26, 2007	Tucei
University Mall Oak	Pensacola, FL	23.7	127.5	57	May 13, 2007	Tucei
Collin's Oak Treasure Oak	Ocean Springs, MS	23.3	120	75	June 4, 2007	Tucei
Lumberyard Art Center Oak	Bay St. Louis, MS	23.3	105	66	June 4, 2007	Tucei
Audubon Park Oak #2	New Orleans, LA	23.2	105	60	May 21, 2007	Tucei
Friendship Oak	Long Beach, MS	23.0	157	39	October 6, 2006	Tucei
Audubon Park Oak #3	New Orleans, LA	23.0	120	78	May 21, 2007	Tucei
Edgewater Park Oak	Biloxi, MS	22.9	120	47	May 17, 2007	Tucei
Water Street Apartments Oak	Biloxi, MS	22.8	114	63	May 23, 2007	Tucei
United Methodist Oak	Biloxi, MS	22.0	131.5	51	January 13, 2007	Tucei
Lee Street Oak	Biloxi, MS	21.5	117	60	May 24, 2007	Tucei
Audubon Park Oak # 4	New Orleans, LA	21.3	118	54	May 21, 2007	Tucei
Lewis Oak	Gautier, MS	21.0	120	66	January 23, 2007	Tucei
Skip and Carol's Oak	Gulfport, MS	20.3	129	69	June 13, 2007	Tucei
Bridge and College Street Oak	Gulfport, MS	20.2	105	58.5	June 6, 2007	Tucei
Handsboro Oak	Gulfport, MS	20.0	125	66	February 22, 2007	Tucei
Mulat Oak	Mulat, FL	20.0	130	57	March 4, 2007	Tucei

[a] Tucei = Larry Tucei; Blozan et al. = Will Blozan, Robert Van Pelt, Randy Cyr, Ed Coyle, Brian Hinshaw, and Guy Mullier.
[b] The Middleton Oak work of the ENTS, including detailed volume measurements, can be found at:
http://www.nativetreesociety.org/fieldtrips/south_carolina/middeltonoak/middelton.htm

The E.O. Hunt Oak

I went to the South Mississippi Regional Center located in Long Beach to measure the E.O. Hunt Oak. The tree is a double-stemmed specimen, with massive limbs touching the ground in all directions and has a gigantic spread.

What a magnificent tree! [It grows] in an open setting, adjacent to the Center's many buildings. The tree is approximately one-quarter to one-half of a mile from the Gulf of Mexico.

The E.O. Hunt Oak is the second largest live oak in the state—and the largest and widest tree I have ever seen and measured!

Another live oak adjacent to the E.O. Hunt Oak is the Sara Hunt Oak, both of which are very healthy and well-loved by all at the Center.

The E.O. Hunt Oak (above and below). Photos by Larry Tucei.

The Redeemer Oak. Photo by Larry Tucei.

The Redeemer Oak

[I recently] measured another large live oak over in Biloxi. The tree grows adjacent to the former site of the Old Church of the Redeemer, built in 1849, which is no longer there due to Hurricane Katrina. This tree is around 250 to 300 years old, as are most or the trees I've been reporting on.

I know you guys may be tired of my live oak postings, but they are such a fantastic tree that I could just measure and photograph them for an eternity!

There are thousands of live oaks along just the Mississippi Gulf Coast. Since so many are 20 ft or more CBH, I am now only measuring the larger trees. Imagine what these magnificent trees went through with Hurricane Katrina—to still survive is impressive. I haven't even made it to Hancock County, which has many 20 ft + trees. So I hope you guys and gals don't mind, but I'll just keep on posting them!

The Audubon Park Oak #1

The first Audubon Park Oak. Photo by Larry Tucei.

Monday morning a co-worker and I met up in Slidell, Louisiana. We changed vehicles and headed for Audubon Park in New Orleans looking for the elusive 30-footer. My co-worker grew up in New Orleans, so he showed me around town before we got to the park. He knew of a larger tree near the back of the park so we started there.

Wow! I saw the tree from the car, a huge tree. When we got over to it, I thought of how old this live oak must be—perhaps 400 to 500 years!

It is a beautiful rounded crown specimen, with the largest root mass I've ever seen on any tree. This oak has a single trunk with forked limbs splitting at 15 ft above the ground, and also looks similar to the Middleton Oak.

The Ruskin Oak. Photo by Larry Tucei.

The Ruskin and Treasure Oaks

The last week in 2006, I spent a few days measuring and photographing some of the larger Live Oaks I know of. My daughter, grandson and I went to Ocean Springs, Mississippi, to measure the Ruskin Oak and the Treasure Oak. Both are large and majestic trees. I enjoyed sharing this with them and they seemed to really like the idea of all this measuring—maybe some future tree measurers.

The Treasure Oak. Photo by Larry Tucei.

Anyway, the Ruskin Oak grows atop a small hillside overlooking a dry branch, about 200 yds from the Mississippi Sound. I talked with the adjacent land owner and he said Hurricane Katrina pushed water within a few feet of the tree. Incredible, since this tree is 20 ft above sea level! By the way, the limbs on this tree grow along the ground, some are underground for a moment then grow back up. It's the greatest spread of a Live Oak I've measured to date.

Next, we went about a mile east and a mile north to the Treasure Oak, located at a Country Club just north of Hwy 90 on slight ridge adjacent to a small bayou system called Ft. Bayou. Both of these trees are quite majestic with minor damage from Hurricane Katrina.

The Middleton Oak in Charleston, South Carolina. Photo by Will Blozan.

The Middleton Oak was measured by Dr. Robert Van Pelt in 2004 to be over 10 feet in diameter, over 67 feet tall, with a crown spread of 118 feet.

Dr. Van Pelt, Will Blozan, Randy Cyr, Ed Coyle, Brian Hinshaw, and Guy Mullier worked hard to measure the volume of this fine specimen of live oak, with tallied out at 4,820 cubic feet!

Even the local "wildlife" enjoy the splendor of the Middleton Oak.

Photo by Will Blozan.

"THE LIVE OAK AT DRAYTON MANOR"

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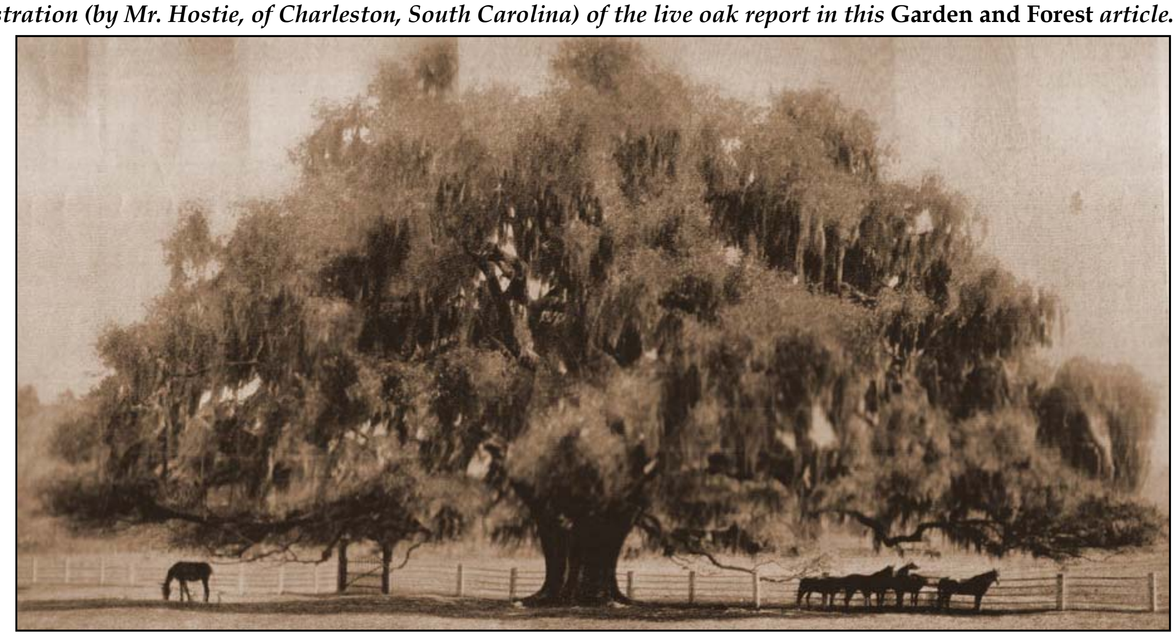
Editor's note—In keeping with this issue's theme, I have included the following article from the June 12, 1895, issue of an early botany/forestry/landscaping journal called *Garden and Forest*. This journal, though short in its run, is considered quite influential in the early years of botany and forestry. In large part, this is due to its prominent editor, Professor Charles Sprague Sargent, who was the director of Harvard University's herbarium for many years, and a prominent early figure in the American conservation movement. This article appeared anonymously, and the author seems to have only a limited appreciation for the great numbers of massive live oaks found across the South, as Larry Tucei's Live Oak Project is finding (and the more massive Middleton Oak is just a few miles down the road!). However, without a doubt, the individual oak in question is a beautiful specimen.

The Live Oak at Drayton Manor.

The illustration on page 235 is the reproduction of a photograph of what, so far as we can judge from our observations, is the most massive, symmetrical and imposing tree in eastern North America. It is a Live Oak, Quercus Virginiana [sic], standing on one side of the entrance to Drayton Manor House, on the Ashley River, near Charleston, South Carolina. The home of the Drayton family, a handsome red brick Elizabethan mansion, was built while South Carolina was a British colony, and it is said that the site of the house was selected on account of this tree, although, as the Live Oak grows very rapidly, it is not impossible that it was planted with its mate on the other side of the drive, where the house was first built. At the present time the short trunk girths twenty-three feet four inches at the smallest place between the ground and the branches, which spread one hundred and twenty-three feet in one direction and one hundred and nineteen in the other. This tree is growing over a bed of phosphate, and the demands of trade will, therefore, probably cause its death before its time. More than once we have visited this tree, and each visit has increased our reverence for nature as we stood in the presence of this wonderful expression of her power.

Our illustration, for which we are indebted to Mr. Hostie, of Charleston, gives a feeble and unsatisfactory idea of this tree. Some one who sees the picture, however, may be moved to go and look at the original; and this traveler will be rewarded, for no one who has not seen the Drayton Oak can form a true idea of the majestic beauty of the Live Oak, the most beautiful of the fifty species of Oaks which grow within the borders of the United States, or of all that Nature in a supreme effort at tree-growing can produce.

"Fig. 35.—The Live Oak, Quercus Virginiana, at Drayton Hall, South Carolina.—See page 232." Original caption and illustration (by Mr. Hostie, of Charleston, South Carolina) of the live oak report in this* Garden and Forest *article.



"WALNUT TIMBER FROM ARKANSAS"

Don C. Bragg

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Editor's note—The following article is quoted in its entirety from the July 24, 1880, issue of *Scientific American*. Aside from the vivid description of how this timber was shipped to market, this article is most notable for the magnitude of the timber described. The groves of black walnut required to produce this raft have long since disappeared. It is interesting to note that the Singer Tract of Louisiana, the last documented location of the ivory-billed woodpecker prior to its recent rediscovery in Arkansas, was named after the sewing machine company that owned it prior to its being sold and logged by another company into oblivion during the 1940s.

Walnut Timber from Arkansas

The towboat Ida reached New Orleans, out of the Arkansas River, on June 8, with a walnut log raft of unusual proportions. Additional interest attaches itself to this raft on account of it being part of an order for 10,000,000 feet from a Bridgeport, Conn., sewing machine factory. The growing scarcity of this desirable wood in the Eastern States, and the demand by European furniture makers has developed distant sources of supply. The raft in question had been ninety days making the trip from the forests along the White and St. Francis rivers, in Arkansas, and in that time drift, five feet deep, had accumulated beneath the logs. Of these the raft contained 2,500, 2,000 being walnut and 500 cypress. The latter are used as buoys for the heavier timber. This log island measured 400 by 208 feet, and many of the walnut logs were over six feet in diameter. They were cut by a band of 200 Canadians who are adepts [sic] at working in hard timber, and can get out 500 logs per day under favorable circumstances. From New Orleans the logs go by rail to New England, this transportation being found to be just $2 per 1,000 less than by steamship. Col. S. M. Markel, of Missouri, has this contract, and has orders for walnut logs from Liverpool parties. The raft in question contained 500,000 feet, and is among the first shipments of the kind to the East.

A large baldcypress graces the bottomlands of the White River near Des Arc, Arkansas. Photo by Don C. Bragg.

FANFARE FOR THE JAKE SWAMP PINE— WHY DOES IT MATTER?

Robert T. Leverett

Founder, Eastern Native Tree Society

Is all the ENTS fanfare for tall trees really necessary? Does it matter if the Jake Swamp pine makes 169 ft this season, or that there are such and such a number of trees meeting this or that height or diameter threshold? What is the significance that we are gradually but surely closing in on profiling the maximum height of a species over its latitude range, and that we can measure tree heights to within one foot of absolute accuracy? Does ENTS further any worthy objectives or promote any useful values by all the measuring and comparing that we do?

Well, it is my unbiased and humble judgment that we do further worthy objectives and promote useful values by practicing and promoting our unusual craft. For one thing, we build the public's knowledge of what is common versus what is rare or exceptional, and that accomplishment has served to activate the protection gene in more than a few people. By contrast, widespread public ignorance is a one-way ticket to unacceptable habitat, species, and tree loss.

Public ignorance as to what is exceptional versus run of the mill gives the scalawags among us free reign to exploit. As an example, before the ENTS promotion of the Mohawk Trail State Forest's (MTSF) splendid trees, the MTSF was an attractive state timber resource with some associated recreational features. The timber would be exploited under green certification—that was virtually guaranteed.

Prior to the formation of Friends of the Mohawk Trail State Forest (FMTSF) and later ENTS, the upper echelons of management of the Massachusetts Department of Conservation and Recreation (DCR), and more specifically, the State Bureau of Forestry, were largely oblivious to: (1) the significance of the historic Mohawk Trail within the boundaries of MTSF; (2) the surprising status and uniqueness of the Mohawk pines; (3) the growth performance of the pines (an unusual situation for a forestry department); and (4) the wealth of opportunities to turn the Mohawk into the Commonwealth's forest icon and a source of pride for the citizens of Massachusetts.

I can't say that the mindset of the DCR has changed completely, but most of the key players are very cautious when dealing with MTSF. Managers seem to understand that Mohawk has some kind of forest significance beyond that possessed by other DCR properties, and they turn to FMTSF and ENTS to provide the interpretation.

So, in terms of individual performances, I'm counting on the Jake Swamp pine to exceed 169 ft this season. Barring disaster, the October 2008 Forest Summit should include a cozy "170-foot party" for Jake.

Way cool!

EDITOR'S NOTE: Thanks to the efforts of Bob, the general ENTS membership, and other members of the public, large sections of the Mohawk Trail State Forest have recently received permanent protection from further manipulations, thus helping to preserve this special legacy for generations to come.

Check out the Forest's website for opportunities:
(http://www.mass.gov/dcr/parks/western/mhwk.htm)

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:

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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.

Old-growth tuliptree from Spring Mill State Park, Indiana. Photo by Don C. Bragg.