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Additional Reports and Writings

Eastern Native Tree Society

BELT WOODS, MD: TREE HEIGHTS AND FOREST STRUCTURE IN THE SOUTH WOODS

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`This study provides the maximum heights reached by forty-two species of trees measured in the South Woods in October 2001. These laser-derived measurements provide additional proof of the unique quality of this site, and aid in an overall understanding of the role of tree height capabilities in creating the existing forest structure. Correlations between maximum tree heights, indicator species, habitat influences, and historic references are explored.

Description of Site

The South Woods is a 43-acre National Natural Landmark located at the southeast end of the Belt Woods natural area, which is a 624-acre mosaic of small fields and woodland located in east-central Prince George's County, Maryland. Owned by the State of Maryland, access is by permit, and limited to scientific study.

Often termed the last example of old-growth forest in the Mid-Atlantic region, the woodland has been of considerable interest for many years. As early as 1947, studies by Stewart and Robbins showed the site to have unusually high densities of forest interior dwelling birds. A nearby tract, the North Woods, also was of old-growth character, but its large white oaks and tuliptrees were cut in 1981. This caused the State of Maryland, with the assistance of others, to purchase 109 acres in 1984, which protected the South Woods. By 1997, impending residential development necessitated the State's purchase of an additional 515 acres. The entire property is designated as the Belt Woods Wildland.

The South Woods is somewhat triangular in shape. It is bounded on the east by Church Road, and Central Avenue (Maryland Route 214) on the south. Contours rise gradually from about 140 feet at Church Road to over 180 feet on a crescent-shaped ridge, and then rather steeply down-slope to approximately 125 feet at the southwest corner. To the north and northwest, remnants of an old forest/field interface form an irregular natural boundary.

The soils are primarily Collington fine sandy loam derived from a greensand deposit rich in glauconite, and are extremely fertile, as evidenced by the presence of *Cimicifuga*, *Collinsonia, Dioscorea*, *Heuchera*, broad beechfern, lady fern, and several small patches of glade fern and maidenhair fern. The central ridge is somewhat drier, especially on the south-facing end, where the slopes are Monmouth loamy sand. The ridge is more acidic at the northwest boundary, where some spotted wintergreen and early low blueberry occur. An abundance of *Smilax rotundifolia* indicates wetter Shrewsbury silt loam soils in the low southwestern section and small areas in the northernmost section. A small nearly level area of Adelphia silt loam occurs at about the mid-point of the Church Road boundary.

The South Woods is dominated by large white oaks and tuliptrees, with occasional large black oaks and northern red oaks. The northeast section of the woodland is dominated by a dense stand of mature tuliptrees, probably of old-field origin. Some very large tuliptrees occur, especially in the northernmost portion. Mature hickories are an important forest component, and are scattered throughout most of the stand.

In the southwest section, trees of all heights and ages are present, including many large specimens. In the southeast and northeast sections, the woods is height-segregated more by species than by age classes. Few submature examples of the larger tree species rise above the understory, even in windthrow openings. The dense understory consists of flowering dogwood and spicebush, with some blackhaw viburnum, ironwood, and small American beech. This severely shades the soil, and hinders successful seeding by the larger tree species. Japanese honeysuckle is common, but seldom a serious factor, due to the dense shade. Birds are important in spreading seeds of these understory species. The woods is more open on the ridges and upper slopes, due to the essential absence of spicebush.

The interfaces at the boundaries of the South Woods add some diversity. Some sun reaches areas above road banks on Church Road, but most of that border is dominated by young hickories. The southern boundary is influenced by Route 214 and a utility right-of-way. American elms, river birch and other intolerant species, both native and naturalized, occur here. At the irregular northwest border, a few river birch, red maple, mazzard cherry, black walnut and sassafras occur with many large side-spreading oaks and tuliptrees. The adjoining old-field growth, principally tuliptrees and black locusts, is reducing sunlight for the older border.

Forest Structure: Historic References

The South Woods is often called an example of old-growth forest. Such is not inappropriate, considering the numerous specimens of white oak over 200 years old, with heights to over 140 feet. The trunk of a windthrown white oak on the southeast roadside has been sawed at a point forty inches in diameter, and appears to be about 240 years old. Some tuliptrees may be over 200 years old, but most appear younger, probably in the 120-140 year range. At least seven tuliptrees are over 150 feet tall. Many black oaks are quite old, as evidenced by some dieback, and the shedding of outer bark, exhibiting a tight, light gray surface. Mature hickories occur throughout the stand. Large northern red oaks are scattered throughout the woods; maximum height is over 140 feet.

Excepting the transitional borders, there is limited diversity. This conforms to Chrysler's statements (Shreve, 1910) regarding the original forests found on these soils. Chrysler states (p.196) that Collington soils support the most mesophytic vegetation of the region, and (p.170) the original "Forest of Prince George" consisted of "white oak, black oak, hickories and tuliptree, with chestnut on the higher parts of slopes, and with seedlings of the same species." Stewart and Robbins (1958) quote Harper (1918): "Rich moist upland forests, composed chiefly of white oak and tulip-poplar, occur locally and are especially prominent in east-central Prince George's County on the fertile soils of the Greensand district." Chrysler also holds (p.169) that maple and beech were not a major component of the forest. Therefore, the infrequent occurrence of beech and red maple does not seem to be fire-related. The hickories show no basal cavities or other fire damage, suggesting the absence of fire for well over a century.

The map of the 1907 state forest survey (Besley, 1916) shows the nearly triangular outline of the South Woods, much like that of today, and rates the stand as "M," that being merchantable hardwoods of 2000-6000 board feet per acre. "M" was the highest rating used for Prince George's County. While it is possible that that the board footage was actually higher, the woods was certainly quite different nearly a hundred years ago. Many of today's white oaks were 150 years old, and probably pushed board footage well over 6000 feet on some acres, but few of the other trees were mature at that time. Many areas now predominantly in poplar appear to be old-field forest, and had relatively young trees, perhaps resulting from reduced agriculture after the Civil War. Such areas had little merchantable timber in 1907, and would have brought the overall average within the "2000-6000" board foot designation.

The rather low board footage of 1907 does not seem to be the result of natural causes. While pit-and-mound contours indicate the loss of mature trees to windthrow in the past, and large trees show evidence of recent lightning strikes, it appears that prior cutting and agriculture had affected the structure of the woods at that time. It is said that W. Seton Belt, the former owner, was protective of his woods, but that, in his will, he also allowed for some utilization of timber for farm repairs in the future. This suggests that cutting of farm timber was an accepted activity during his family's ownership. Also, Belt may have endorsed the concept of forestry, and removed many of the less valuable trees. Use of the more slender oaks for firewood, fences and farm construction might have contributed to the rather open woodland along the ridge and a scarcity of intermediate-sized specimens. It also would explain the presence of some multiple-trunked oaks and tuliptrees. Belt became increasingly protective in later years, but it has been more than forty years since his death, and the history of the South Woods remains elusive.

Tree Heights: Methodology

The trees measured in this study were of forty-two species, including eight naturalized taxa and several native escapes probably introduced by birds. Although the non-indigenous species might be shunned by the purist, most are likely to become a permanent part of local woodlands, and it is useful to document their presence. Maximum heights were quite varied, since some species were represented by immature specimens. The smaller trees, up to thirty feet in height, were measured directly to within one-half inch, using an adjustable aluminum pole.

The larger trees were measured with a laser, in conjunction with a clinometer. Dense foliage often made sighting difficult, and care was taken to acquire accurate measurements. The trunk circumference at breast height (CBH) was also measured. CBH was recorded to within the nearest half-inch at a point 4.5 feet above the contour passing through the center of the tree's base.

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

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

Attempts were made to accurately record the location of each tree measured. Unfortunately, the dense crown coverage often blocked GPS signals, and some coordinates were not obtained. The South Woods has been marked with a grid system, which provided some fixed reference points, but many points were hidden in the understory, and some flags have been pulled up. Since it was often unknown if individual trees would prove to be the tallest of their species, more general descriptions of locations were recorded, referencing natural landmarks, in the sequence in which encountered. These field descriptions are not included in this presentation.

Although many species were represented by only a few specimens, and only the height of the highest tree is used in the height profile, the method is consistent, and provides much useful information for interpreting the effect of habitat on tree species within the South Woods. The tallest trees were usually growing under the optimum circumstances existing for that species, which prompts further consideration of such factors.

Field work was undertaken on five dates, between September 30 and November 4, 2001. It is possible that taller examples and additional species have been overlooked. If the study is incomplete, in the long term the height structure is changeable; trees grow, and some die; these measurements only reflect the structural composition of the South Woods at the present time. As presented, these measurements create a height profile that is unique to the South Woods, and should prove useful for comparison with other sites as accurate height profiles are recorded.

Maximum Heights

The following specimens were the tallest of their species seen in the South Woods. The list is divided into height groups, which correspond to general habitat requirements. It can be seen that there are few dominant species, and the rest survive by their shade tolerance, or by competing for solar access at the edge of the forest stand.

Mesic dominants: Moist rich soils.				
Tuliptree	*Liriodendron tulipifera*	159.9'	12' 5.5"	upper swale, SW section
Northern red oak	*Quercus rubra*	144.4'	7' 8.5"	low slope, NE section
White oak	*Quercus alba*	143.7'	11' 1.0"	low slope, mid-E section
Submesic dominants: Mostly well-drained soils, ridges and south slopes.				
Black oak	*Quercus velutina*	143.4	14' 2.0"	broad swale, NE section
Sand hickory	*Carya pallida*	137.4'	7' 7.5"	small ridge, NE section
Subdominants: Height not adequately competitive, often sunlight-deprived.				
Sycamore	*Platanus occidentalis*	126.7'	5' 7.0"	with tuliptrees, N section
Sour gum	*Nyssa sylvatica*	124.1'	6' 5.5"	broad swale, NE section
Sweet gum	*Liquidambar styraciflua*	118.1'	6' 3.5"	broad swale, NE section
Black walnut	*Juglans nigra*	111.4'	5' 11.5"	with tuliptrees, N section

Pignut	*Carya glabra*	98.5’	3’ 7.5”	broad rich swale, NE section
Red maple	*Acer rubrum*	88.4’	4’ 9.5”	opening, bottom, SW section
Bitternut	*Carya cordiformis*	64.3’	3’ 0”	end of ridge, SW section
Forest/field and roadside interfaces:				
Southern red oak	*Quercus falcata*	100.6’	6’ 5.5”	old border, N section
Mazzard cherry	*Prunus avium* (natlzd)	89.2’	6’ 4.0”	old edge, NW section
Bigtooth aspen	*Populus grandidentata*	80.6’	4’ 10.0”	S slope, border SE section
American elm	*Ulmus americana*	73.4’	9’ 3.5”	edge, S section
Black locust	*Robinia pseudoacacia*	71.5’	3’ 2.0”	old edge, NW section
River birch	*Betula nigra*	68.4’	4’ 5.5”	edge utiity r/w, SW section
Paulownia	*Paulownia tomentosa* (nat’d)	46.8’	3’ 1.0”	open bottom, SW section
Hackberry	*Celtis occidentalis*	44.8’	2’ 5.5”	dry bank, S edge
Sassafras	*Sassafras albidum*	42.0’	2’ 6.0”	old edge, NW section
Bradford pear	*Pyrus calleryana* (nat’d)	40.7’	0’ 10.0”	slope with tuliptrees, N sec.
Willow oak	*Quercus phellos*	36.6’	4’ 6.0”	dry bank, S edge
Black cherry	*Prunus serotina*	32.2’	1’ 4.5”	top of road bank, NE section
Red mulberry	*Morus rubra*	29.3’	1’ 2.5”	edge, mid-S section
Mimosa	*Albizzia julibrissin* (nat’d)	24.3’	1’ 9.0”	road bank, mid-E section
Silver maple	*Acer saccharinum*	19.9’	0’ 10.0”	edge, S section
Eastern redcedar	*Juniperus virginiana*	17.0’	0’ 8.0”	top road bank, NE section
Ailanthus	*Ailanthus altissima* (nat’d)	14.1’	0’ 8.5”	S edge, SW section
Peach	*Prunus amygdalus* (nat’d)	8.3’	-	roadside, SE section
Understory species: Shade-tolerant.				
American beech	*Fagus grandifolia*	62.1’	1’ 11.5”	mesic ridge, SE section
Norway maple	*Acer platanoides* (nat’d)	59.3’	1’ 11.5”	near mesic edge, SE section
Ironwood	*Carpinus caroliniana*	48.5’	2’ 5.0”	moist bottom, SW section
Fl. dogwood	*Cornus florida*	38.2’	2’ 0”	low open slope, NW section
American chestnut	*Castanea dentata*	34.4’	0’ 11.0”	low slope, SW section
Boxelder	*Acer negundo*	27.8’	0’ 9.0”	slope with tuliptrees, N sec.
American holly	*Ilex opaca*	25.3’	1’ 4.5”	swale, SW section
Pawpaw	*Asimina triloba*	21.6’	0’ 7.5”	shady swale, mid-E section
Black haw	*Viburnum prunifolium*	19.1’	1’ 3.0”	with tuliptrees, N section
Crape myrtle	*Lagerstroemia indica* *	17.1’	0’ 5.0”	mesic opening, N end ridge
Spicebush	*Lindera benzoin*	15.3’	0’ 4.5”	mesic opening, NE section
White pine	*Pinus strobus* (escape)	7.4’	-	bank, old border, NE section

* tentative identification (escape)

Conclusions

At least five species set new state or national height records. The tallest tuliptree in the South Woods measured 159.9 feet, and another 159.6. These are the tallest trees of any species accurately measured in Maryland, surpassing a 157.6-foot tuliptree measured in the spring of 2000 at Chase Creek Woods, in Anne Arundel County. They also exceed an unconfirmed historic Maryland record: a white pine near the Savage River in Garrett County is said to have measured 159 feet tall (Besley, 1938). Among eastern hardwoods, only trees in the Southern Appalachians are known to be taller; tuliptree has been accurately measured to 175.5 feet, and one white ash reached 163 feet.

Five other tuliptrees in the South Woods exceeded 150 feet. These specimens are still growing rapidly, but significant increases in height may be limited by divergence of the upper crown.

The tallest white oak was 143.7 feet. This is the tallest white oak accurately measured in Maryland, and easily exceeds a 118.0-foot specimen at Chase Creek Woods. It is surpassed by a 147.6-foot specimen in the Great Smoky Mountains National Park. Many historic records have been in error. The Maryland Forest Service listed a 149-foot Anne Arundel County white oak in 1990, but recent laser measurements showed it to be 104.5 feet. A Calvert County white oak listed by the Maryland

Forest Service as 158 feet in 2001 was remeasured at 92 feet.

Northern red oak was less abundant, but many large specimens with broad crowns exist, especially on the ridge, where heights were unremarkable. A specimen on a rich swale in the northeast section reached a height of 144.4 feet, which is the tallest accurately measured in Maryland, exceeding a 135.5-foot specimen at Chase Creek Woods. It is second only to a 152.9-foot specimen discovered near the Whitewater River, in South Carolina, in January 2004.

Old black oaks were frequent, especially on the central ridge. A very large specimen in a mesic swale was also the tallest, with a height of 143.4 feet, which is the tallest reported in the eastern United States. In Maryland, it exceeds a 135.6-foot specimen at Chase Creek Woods, and an unconfirmed 140-foot Baltimore County specimen listed by the state in 2001.

Sour gums were rather shade-tolerant, and occupied an important subdominant position. One specimen was 124.1 feet in height, which appears to be the tallest accurately measured, exceeding a record of 121.0 feet in the Great Smoky Mountains National Park.

Although few of the hickories approached the 137.4-foot height of the tallest specimen, bark contours suggest that most are quite old. Sweet gum, black walnut and sycamore reached heights over 110 feet, but were not height-competitive with tuliptree. Most examples were sunlight-deprived; therefore, these species were not present in sufficient numbers to appreciably affect the overall structure of the stand.

A correlation between record heights and optimum habitat was noted. Certain indicator plants were often in the immediate vicinity of exceptional specimens. Useful examples were *Collinsonia*, broad beechfern, maidenhair fern, and glade fern. These were not abundant, but occurred with the tallest tuliptrees, northern red oak, black oak, beech and spicebush. These species, especially glade fern, which is rare in Maryland, also occur with the tallest tuliptrees and tallest northern red oak on similar soils at Chase Creek Woods, in Anne Arundel County.

Structurally, the South Woods is an old stand of unusually tall trees gradually acquiring characteristics associated with old-growth. Pit-and-mound contours, lightning injury, dead snags and large fallen trunks are frequent. Many black oaks are senescent, with frequent dieback, but the white oaks, northern red oaks and tuliptrees show fewer infirmities. Hollow, senescent, or oversized specimens of the latter species were seldom encountered. In many areas, the canopies appear to be height-segregated by species of rather uniform height and, perhaps, age. The north and northeast sections are dominated by tuliptree, probably of old-field origin. Here, and in the central and southeast sections, there are few submature examples of the larger species. Various factors, including the longevity of the essentially continuous upper canopy, prevalence of tuliptree, and the density of the dogwood / spicebush understory, seem to have contributed to this situation. The few windthrow openings receive but limited sunlight, remain dominated by the understory, or become affected by the growth of riverbank grape, *Vitis riparia*. The southwest section, in some ways less spectacular, is more typical of steady-state old growth; windthrow is much more frequent on the heavier soils, diversity is greater, and more specimens of different age classes are present.

Due to the longevity of the taller species, the overall structure of the South Woods is quite stable, but some changes may be expected. The diversity of tree species along the perimeter borders will gradually be diminished by the rapid growth of an adjoining old-field forest to the north and northwest, and the prevalence of young hickories in the roadside thickets at Church Road. Continuing loss of flowering dogwoods to anthracnose will affect the structure of the understory. Pawpaw may be expected to spread vegetatively. American beech will increase in height, creating an intermediate canopy. Ailanthus may become a problem if not controlled, but the other naturalized tree species should remain of infrequent occurrence. Invasive vines and plants are of concern, especially *Celastrus orbiculatus*, *Euonymus fortunei*, *Hedera helix, Rosa multiflora* and *Polygonum perfoliatum*. These will spread beyond control and cause serious damage if not quickly eliminated.

There is evidence suggesting that farm activities, including the abandonment of open land and some selective logging, have played an important role in the existing forest structure. This is but one viewpoint; it is likely that there will be varied opinions regarding the South Woods, which should guarantee continuing interest and study. Despite its limited diversity of habitat, the South Woods is complex, and illustrates the many ways in which a forest reacts to the activities of man, and the undeniable influence of exceptional soils and time in allowing individual trees to reach their full height potential.

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The assistance of Mr. Wayne Longbottom was important in locating numerous additional plants, including indicator species that were valuable in establishing a correlation between tree heights and habitat. A plant list assembled by Mr. Longbottom has been incorporated in Appendix "B."

My appreciation is also extended to Mr. Robert T. Leverett of Holyoke, Massachusetts, who has been a leader in refining methods for the accurate measurement of tree heights, and provided important height data through the Eastern Native Tree Society.

Appendix "A": Comments on Heights of Individual Species

Tuliptree: Tuliptree was common throughout, especially in the north and northeast sections. While few specimens maintained a central leader above 100 feet, many exceeded 10' CBH, and heights over 140' were not unusual. Most exhibited a rather uniform bark pattern, and were probably 120-140 years old. Some trees in the southwest and northeast sections appeared to be contemporary with the white oaks; one at the northern boundary measured 14' 8" CBH and 131.3' tall. Seven trees were over 150 feet. The tallest tuliptree was at the head of a broad swale in the southwest section; competition between its two upper leaders promoted a height of 159.9'; CBH was 12' 5.5". The second tallest example was located on the west slope, above a glade fern site in the southwest section, and was 159.6' tall with a CBH of 10' 7.5". A tree beside a white oak log in the northeast section was the third tallest at 153.7'; it also had a CBH of 10' 7.5". In the northernmost portion, the more dominant of a pair of old trees was the fourth tallest, with a height of 152.9' and a CBH of 12' 2". The fifth tallest, at 152.5', had a CBH of 11' 2", and was located below a glade fern site in the southeast section. The sixth tallest measured 152.3', and was located in a swale on the west side of the ridge, below the second-tallest tree. This tree is quite old, and the base is weakened by decay on the northwest side. The trunk measured 15' 9" CBH, which is the largest of any tree in the South Woods. A tree north of a tall sycamore in the northeast section was seventh at 152.1' tall, with a CBH of 12' 5".

Northern red oak: Although heights were not remarkable on the drier soils along the ridge, large examples occurred throughout the stand. A handsome specimen was seen in the northwest boundary. Another, in the northeast section, had a broad crown, measured 12' 11" CBH and 134.0' in height. A more slender specimen in the northeast section was taller, being 144.4' in height; CBH was 7' 8.5". This tree was at a low elevation with spicebush, *Collinsonia* and tuliptree. A nearby large double-trunked specimen of similar height has fallen recently.

White oak: This species is the oldest component of the South Woods. Numerous old specimens were seen. The crowns were usually quite irregular. Most of the white oaks are of similar dimensions; it appears that competition has deterred the development of trees with broad symmetrical crowns or unusually thick trunks. One of the largest was 11' 1" CBH, and was the tallest, at 143.7'. This tree maintained a central leader, and was located at a low elevation off Church Road, south of the pawpaw site. The presence of *Collinsonia* indicates cool moist soils of high fertility.

Black oak: Black oak was an important forest component, but seldom height-competitive, except along borders, and on the driest sites, especially the central ridge and south slope, where it was a frequent co-dominant. Many specimens were quite old, with an accumulation of outer bark being shed, leaving a rather uniform light-gray surface. The crowns were often heavy-limbed, and quite irregular, limiting height increase, but their breadth assured solar access despite the proximity of taller tuliptrees. A large specimen on dry soil in the south section was 10' 3" CBH, and 117 feet tall. Large examples also occurred in the southwest section, where one measured 135.3' tall, with a CBH of 9' 6.5". The most impressive was a straight-trunked specimen in a broad swale on the northeast side of the central ridge, with broad beechfern. CBH was 14' 2", height was 143.4'.

Sand hickory: Examples of this species occurred throughout, and were somewhat height-competitive on the drier soils of ridges and upper slopes. The globose fruit and seven narrow leaflets provided tentative identification, but a more careful examination should be conducted. The tallest measured was on a small ridge aligned with the high point of Church Road in the northeast section. Height was 137.4', CBH 7' 7.5".

Sycamore: But two specimens were seen, both in the northeast section, and probably of old-field origin, with tuliptree. CBH of the taller was 5' 7", height 126.7'. Height was barely competitive; the other, to the east, with sweet gum, has been overtopped by tuliptree.

Sour gum: Examples of all sizes were found in most areas, particularly the upper portions of the central ridge. A specimen at the north end of the Church Road border had a CBH of 7' 8". Most heights were not remarkable, and all specimens were at a severe height disadvantage. The tallest were in swales in the northeast section, with tuliptree. One slender specimen, which was shedding its outer bark, had a CBH of 5' 4" and a height of 112.8'. The largest, not far from the northeast woods boundary, was 6' 5.5" CBH and 124.1' tall.

Sweet gum: A few specimens were seen with tuliptrees off Church Road. The largest were near the woods boundary in the northeast section; one measured 6' 3.5" CBH and 118.1' tall, but was not height-competitive with nearby tuliptrees.

Black walnut: Four examples of similar diameter were found with spicebush and tuliptree in the northeast section. All were at a height disadvantage, and had limited access to sunlight. The tallest was 111.4', with a CBH of 5' 11.5".

Southern red oak: One specimen of this familiar coastal-plain species was seen on an upper slope in an old west-facing border in the north section. Although the prevalence of greenbrier suggested wetter soils than usual for the species, the warm sunny exposure was typical. Height was 100.6 feet; CBH was 6' 5.5".

Pignut hickory: This species appears to be of infrequent occurrence, and may be expected on the more mesic sites. The necked fruit provides identification. A specimen in the southwest section was 97.5' tall. A slender example on a rich swale above the largest black oak was taller, at 98.5'. CBH was 3' 7.5"

Mazzard cherry: Few specimens were seen. An old example of this naturalized species remains in the old northwest border, where it is somewhat height-competitive. Height was 89.2', CBH 6' 4".

Red maple: This species occurs on low ground in the southwest section. Although rather shade-tolerant, this species was absent from most interior areas. A few specimens were seen in the northwest border. The largest specimen was found in the southwest section; height was 88.4'; CBH measured 4' 9.5".

Bigtooth aspen: But one specimen was seen, on a natural south-facing border slope in the southeast section. Height was 80.6'; CBH was 4' 10".

American elm: This species is common in the borders facing Central Avenue, and occasional in windthrow openings. The largest specimens were along a utility right-of-way, in the south section. The only old example was seen here; this shapely tree had a 9' 3.5" CBH, and a height of 73.4'

Black locust: This intolerant species was common with tuliptrees in comparatively recent old-field growth beyond the northwest border, but infrequent in the South Woods borders. Some occur in an old-field area that forms an extension of the southwest section, and a few near the utility right-of-way. A double-trunked specimen in the old northwest border was 71.5' tall; the larger stem was 3' 2" CBH.

River birch: A few specimens occur in the open woods with remnants of the old northwest border, at its interface with an old-field growth of young tuliptrees. One measured 57.0 feet. This species was more frequent in the south-facing border in the southwest section, where one old tree was seen. The tallest was 68.4', with a CBH of 4' 5.5".

Bitternut hickory: Mature trees were much less common than sand hickory, but small examples were frequently seen. The unique bud served for identification. The tallest measured was on a slope at the south end of the ridge, in the southwest section; CBH was 3' 0", height 64.3'. Taller examples may occur.

American beech: Smaller specimens were frequently seen in the thick understory, especially on the east side of the main ridge. Continued growth of these trees will create a mid-level canopy, intermediate between the dogwoods and hickories. The largest example, with a CBH of 3' 11.5", and a 56.2 foot height, stands between two very large tuliptrees near an old border in the north section. A taller, but more slender specimen was found on a low ridge with glade fern and *Heuchera* in the northeast section; CBH was 1' 11.5"; height was 62.1'.

Norway maple: Several specimens of this non-native tree were seen. The largest, found at a glade fern station near Church Road, was 59.3' in height, with a CBH of 1' 11.5". A smaller specimen was seen near another glade fern site, on the southwest side of the main ridge.

American hornbeam (ironwood): Examples were common, especially on the lower elevations. This species contributed to the dense understory, with spicebush and flowering dogwood. The largest trees were on a silty lowland in the southwest section. One measured 2' 5.0" CBH and 48.5' tall.

Paulownia: Several examples were seen in windthrow openings on a fertile lowland in the southwest section. The tallest was 46.8', with a CBH of 3' 1".

Hackberry: This species is usually associated with neutral or alkaline soils. Several small specimens were seen in the understory. A larger example, on a steep dry bank on the south border, was 44.8' tall and 2' 5.5" CBH.

Sassafras: This species is infrequent throughout, with the largest examples remaining with remnants of the northwest border. Although sassafras is somewhat shade tolerant, the adjoining old-field forest is rapidly obstructing sunlight necessary for the survival of these trees. Maximum height was 42.0', CBH was 2' 6".

Bradford pear: This ornamental species is rapidly becoming naturalized. Several specimens were seen. The largest was in the north section; it measured 10" CBH and 40.7' tall.

Flowering dogwood: A numerous and important component of the understory, dogwoods were most plentiful on upper slopes and ridges, but also occurred with spicebush on lower elevations. Many specimens have been killed by anthracnose. Large examples are no longer common; the maximum seen was 2' 0" CBH and 38.2' tall.

Willow oak: Several small specimens less than four feet tall were seen near the northwest border. Several willow oaks have been planted at a subdivision across Church Road. The small acorns of these trees may be distributed by birds. The only mature example was found on a steep bank at the southern boundary. This bank may have formed the roadside of the original Central Avenue. The low stature of this tree was probably due to the dry situation. CBH was 4' 6"; height was 36.6'.

American chestnut: One specimen was seen near the base of a steep west-facing slope, near a large tuliptree, at the southwest end of the central ridge. Height was 34.4', CBH 11".

Black cherry: Only a few small specimens were seen. All were in sunny border situations. One at Church Road, in the northeast section, was 32.2', CBH 1' 4.5". The essential absence of black cherry was unexpected, since this familiar species is distributed by birds and young trees are somewhat shade-tolerant.

Red mulberry: Associated with rich soils, perhaps ten immature examples were seen within 50 yards of Church Road, roughly 100 yards from Route 214. Another was in the southeast corner. The largest specimen was in the south border; it had a height of 29.3' and a CBH of 1' 2.5". This species has been greatly reduced by disease elsewhere, and mature specimens are rare.

Boxelder: Occasional small specimens were seen, especially on low elevations in the southwest section. A slightly larger example was found on a slope with large tuliptrees in the northern section. Height was 27.8', CBH 0' 9".

American holly: Several small specimens occur in the more open woods on the ridge. A mature specimen, on the northeast side, was 24.5' tall, with a 1' 4" CBH.
A slightly larger tree was found in a swale in the southwest section. Height was 25.3'; CBH was 1' 4.5"

Mimosa: One specimen of this naturalized tree was seen at the top of a steep bank on Church Road. Height was 24.3', CBH was 1' 9".

Pawpaw: This species was seen at perhaps ten locations. Most occurrences consisted of a dozen or less sub-arborescent specimens. A large patch of young trees was seen in a swale perhaps 200' off Church Road. The largest was 21.6' tall. Probably recently introduced by wildlife, this species may be expected to spread vegetatively.

Silver maple: One specimen of this native species was seen in the south border. It is not considered indigenous to the site, and the source is unknown. Height was 19.9'; CBH was 10".

Blackhaw: Small examples were frequent on mid-slopes, but few reached tree stature. The two largest were near black walnuts in the northeast section. Maximum height was 19.1', CBH was 1' 3".

Crape myrtle: This is a very tentative identification of two vigorous young upright trees with compound leaves of 7-15 entire glabrous leaflets. The tips are abruptly acuminate, and the bases round-tapering to a very short petiole. The bark is red-brown, as is the rachis. The foliage was still green on November 4. Height was 17.1', CBH 5".

Eastern redcedar: The side-branching structure of the perimeter thickets provides few niches for this upright species. A young specimen, 17.0' tall, was seen in the open woods above a steep bank on Church Road.

Spicebush: Although forming a continuous low canopy on rich moist soils in the northeast section, and common on the lower slopes facing Church Road in the southeast, few specimens of arborescent stature were seen. The maximum height measured was 15.3'.

Ailanthus: Two small examples of this naturalized species occur in a sunny edge paralleling Central Avenue. Height was 14.1', CBH 8.5". This species will likely spread by root-sprouts.

Peach: Several young examples of this somewhat naturalized species occur at the southernmost edge along Church Road. The source of these trees is unknown. Maximum height was 8.3'.

White pine: One specimen, an escape of unknown origin, was seen by a barbed-wire fence at the north end of the Church Road boundary. Height was 7.4 feet.

Appendix "B": Additional Plants Encountered in the South Woods

Although many herbaceous species, such as mayapple, were no longer visible in October, the following plants shared habitats with various tree species. Some plants were represented by only a few specimens, but many were useful indicators of soil characteristics, and the overall effect of elevation, exposure and other habitat characteristics. Attention to plant distribution was valuable in locating and interpreting optimum habitat for each tree species. The typical habitat is given, and conforms well to the Belt Woods sightings.

Shrubs:		
Berberis thunbergii	Japanese barberry (nat'd)	Rich moist low open woods
Corylus americana	American hazelnut	Rich moist open woods
Euonymus alatus	Winged euonymus (nat'd)	Moist open woods
Euonymus alatus var. *apterus*	Smooth euonymus (nat'd)	Moist open woods
Ilex verticillata	Whorled winterberry	Swamps and wet swales
Ligustrum vulgare	Privet (nat'd)	Low wet woods
Rosa multiflora	Multiflora rose (nat'd)	Moist open woods and edges
Rubus occidentalis	Black raspberry	Edges and woodland openings
Rubus phoenicolasius	Wineberry (nat'd)	Rich moist edges & openings
Vaccinium vacillans	Early low blueberry	Dry open acidic woods
Viburnum acerifolium	Maple-leaved viburnum	Rich dry sandy woods
Viburnum dentatum	Southern arrowwood	Low rich sandy soils
Vines:		
Amphicarpa bracteata	Hog peanut	Moist rich low woodlands
Celastrus orbiculatus	Asian bittersweet (nat'd)	Woodland borders, openings
Euonymus fortunei	Wintercreeper euon. (nat'd)	Moist rich open woodlands
Hedera helix	English ivy (nat'd)	Moist woodlands
Lonicera japonica	Japanese honeysuckle (nat'd)	Moist woods and borders
Parthenocissus quinquefolia	Virginia creeper	Woodland borders
Passiflora lutea	Yellow passionflower	Rich moist woodland borders

Rhus radicans	Poison ivy	Moist woodlands and borders
Smilax glauca	Glaucous greenbrier	Dry sandy open woods
Smilax rotundifolia	Common greenbrier	Wet woodlands and edges
Vitis riparia	Riverbank grape	Moist woodland borders
Ferns:		
Adiantum pedatum	Maidenhair fern	Moist rich shady woods
Asplenium platyneuron	Ebony spleenwort	Rich dry rocky woods
Athyrium felix-femina	Lady fern	Rich shady moist woods
Botrichium dissectum	Common grape fern	Low rich woods
Botrychium virginianum	Rattlesnake fern	Rich deciduous woods
Diplazium pycnocarpon	Glade fern	Rich moist neutral shady woods
Onoclea sensibilis	Sensitive fern	Moist rich woodland openings
Polystichum acrostichoides	Christmas fern	Shady woodland slopes
Thelypteris hexagonaptera	Broad beechfern	Rich shady deciduous woods
Thelypteris noveboracensis	New York fern	Moist thickets in low woods
Other herbaceous plants:		
Aplectrum hyemale	Putty-root	Rich low hardwood forests
Arisaema triphyllum	Jack-in-the-pulpit	Rich moist woods
Chimaphila maculata	Spotted wintergreen	Dry rich acidic forests
Cimicifuga racemosa	Black snakeroot	Rich open deciduous woods
Cinna arundinacea	Wood reedgrass	Moist woods and swamps
Circaea quadrisulcata	Enchanter's nightshade	Moist rich forests and ravines
Collinsonia canadensis	Richweed	Rich moist woods and ravines
Desmodium nudiflorum	Naked-flowered tick trefoil	Dry rich deciduous woods
Dioscorea quaternata	Whorled wild yam	Rich moist open woods
Dioscorea villosa	Wild yam	Wet open woods
Duchesnea indica	Indian strawberry (nat'd)	Moist fields and open woods
Galium aparine	Bedstraw (nat'd)	Moist open woods and edges
Geum canadense	White avens	Woodland borders
Phytolacca americana	Pokeweed	Low grounds and rich soil
Pilea pumila	Clearweed	Cool moist shaded places
Polygonatum biflorum	Solomon's seal	Woods and thickets
Polygonum perfoliatum	Perfoliate tearthumb	Wet borders and openings
Sanguinaria canadensis	Bloodroot	Rich open woods
Scutellaria integrifolia	Larger skullcap	Dry to moist open woods
Heuchera americana	Common alumroot	Rich woodland slopes
Tipularia discolor	Cranefly orchid	Rich, sandy deciduous woods
Tovara virginiana	Virginia knotweed	Rich woods and thickets
Uvularia perfoliata	Perfoliate bellwort	Moist woods
Verbena urticifolia	White vervain	Rich woodland borders

TALL TREES OF CARTER'S GROVE, VA

Colby B. Rucker

Eastern Native Tree Society

Carter's Grove, located on the James River east of Williamsburg, Virginia, is one of America's best-known examples of Georgian and Georgian Revival architecture. The surrounding grounds and acreage have received less attention, although several very handsome tuliptrees figure prominently in photographs of the mansion.

The estate is owned by the Colonial Williamsburg Foundation. A visitor's center and parking area are located beyond a large heavily wooded ravine to the west of the mansion grounds. Visitors cross a concrete footbridge spanning the ravine. Constructed with minimal disturbance to the ravine, this site provides an excellent view of a baldcypress stand and nearby hardwoods.

A pleasant woodland overlook is down a short path from the visitor's center, but it appears the woodland itself has received minimal notice. It is said that students from William and Mary College have done some botanical studies, including a mistletoe study. It is interesting to speculate on the history of the site. We may suppose that the woodland influenced the choice of the name, "Carter's Grove," as was the case at "Tulip Hill," "Poplar Forest," and other colonial estates in Maryland and Virginia. Although the terrain of the ravine system allowed the site to escape clearing for tobacco, it appears that many trees were cut for farm timbers, and later for construction of the mansion in the 1750's. This disturbance resulted in a preponderance of tulip poplar. The presence of very large multiple-trunked specimens suggests that the smaller second growth poplars were also valued for lumber. The age of these trees, and the apparent absence of smaller multiple-trunked trees seem to indicate that no logging has taken place for many years, perhaps not since before the Civil War.

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

While these observations are rather hypothetical, the stature of this woodland is indeed impressive. Comparisons with the James Madison Landmark Forest, a National Natural Landmark in Orange County, Virginia, would seem appropriate. There are also similarities to a woodland, once a deer park and never cleared, at "Cedar Park," a historic site in southern Anne Arundel County, Maryland. I wish to express my gratitude to Colonial Williamsburg for kindly considering my application, and granting me access to the woodland to conduct a study on a day closed to visitors. The following survey and measurements were taken on July 15, 2002.

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

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

Several very fine examples of baldcypress were measured. The large tree near the stream below the bridge is a very significant specimen, and the largest tree seen. Its trunk is not buttressed, and 17 feet 11 inches in circumference at breast height. With a height of 144.7 feet, it is taller than any baldcypress accurately measured in the United States, including such important sites as the Congaree Swamp National Monument in South Carolina.

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

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

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

Common Name	Species	Height
Tuliptree	*Liriodendron tulipifera*	147
Baldcypress	*Taxodium distichum*	144.7
American sycamore	*Platanus occidentali*	140.1
Bitternut	*Carya cordiformis*	125.2
Black walnut	*Juglans nigra*	119.5'
Northern red oak	*Quercus rubra*	118.1'
Black oak	*Quercus velutina*	110.5'
Swamp chestnut oak	*Quercus michauxii*	106.7'
American elm	*Ulmus americana*	104.5'
Southern red oak	*Quercus falcata*	103.2'
Willow oak	*Quercus phellos*	99.9'
American beech	*Fagus grandifolia*	98.4'
Red maple	*Acer rubrum*	97.0'
Hackberry	*Celtis occidentalis*	96.7'
White oak	*Quercus alba*	93.8'

Additional Noteworthy Specimens

Tuliptree	143.1'
Tuliptree	122.4'
Baldcypress	114.4'
American sycamore	131.8'
Black walnut	117.9'

Unmeasured Species

White ash	*Fraxinus americana*
Blackgum	*Nyssa sylvatica*
Black locust	*Robinia pseudoacacia*
Persimmon	*Diospyros virginiana*
Sassafras	*Sassafras albidum*
American holly	*Ilex opaca*
Flowering dogwood	*Cornus florida*
Redbud	*Cercis canadensis*
Pawpaw	*Asimina triloba*
Spicebush	*Lindera benzoin*

CORCORAN WOODS, MD: TREE HEIGHTS AND FOREST STRUCTURE

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

Overall Description of Site

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

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

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

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

Forest Study Areas

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

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

3. Swale Section: The Swale Section bisects the Front Section. It is bordered on either side by a loop of the fence road. This section includes two branches of the main swale, which extend to the rear border of the Front Section. Near Tydings Road, the swale is quite large, with some standing water. The woods/wetland interface provides solar access for a variety of species, including black cherry and black highbush blueberry. The swale was never completely cleared for agriculture, as evidenced by some old trees and greater diversity. The improved drainage and rich silt loam soils make the upper parts of the drainage good habitat for tall trees. Numerous spicebush and occasional sycamores occur on the higher elevation between the two drainages tributary to the swale. Some of the tallest sweet gums and the largest sycamore were found along a long-abandoned farm road that parallels the swale above the bridge.

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

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

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

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

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

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

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

Section, and the side-intrusion of sunlight contributes to a dense understory, which often makes passage difficult.

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

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

Tree Heights: Methodology

The trees measured in this study were of thirty-three native and one naturalized species. Maximum heights were quite varied, with a few species being represented by immature specimens. The smaller trees, up to thirty feet in height, were measured directly, to within one-half inch, using an adjustable aluminum pole.
Heights of the larger trees were determined with a laser, in conjunction with a clinometer. Dense growth often made sighting difficult, and care was taken to acquire accurate measurements. In addition, the trunk circumference at breast height (CBH) was measured to the nearest half-inch at a point 4.5 feet above the contour passing through the center of the tree's base.

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

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

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

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

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

Maximum Heights

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

There are critical height differences between species, indicating that inherent height capabilities affect species survival. Opportunities for some species are created by excessively dry or wet habitats, where species of greater height potential are less well adapted.

The smaller species in each height group are often more shade tolerant, or were found in a Some species obtain solar access at the edge of a wetland, roadway, or in disturbance openings. These interfaces are limited, and windthrow openings are rare, due to the moderate age of the woodland in most sections. In many areas,

stressed condition.

interfaces and openings are infested by vines, which have destroyed most of the smaller species. In the following list, the numerals on the right refer to the twelve sections or groves previously discussed under Forest Study Areas.

Mesic dominants: rich soils with adequate drainage.

Tuliptree	*Liriodendron tulipifera*	142.1’	12’ 4.0”	9
Sweetgum	*Liquidambar styraciflua*	120.9’	6’ 6.0”	3
American sycamore	*Platanus occidentalis*	119.2’	7’ 8.5”	3
Mockernut hickory	*Carya tomentosa*	118.1’	7’ 6.5”	9
Bitternut hickory	*Carya cordiformis*	115.9’	7’ 4.5”	5
Black walnut	*Juglans nigra*	99.7’	8’ 9.5”	10

Dry-mesic dominants: well-drained loamy sand.

Black oak	*Quercus velutina*	122.2’	14’ 0.5”	10
Southern red oak	*Quercus falcata*	109.7’	15’ 9.5”	10
Chestnut oak	*Quercus prinus*	91.6’	8’ 3.0”	12

Lowland dominants: moist / wet silt loams.

White oak	*Quercus alba*	119.4’	11’ 11.5”	1
Willow oak	*Quercus phellos*	115.0’	9’ 10.0”	1
Pignut hickory	*Carya glabra*	114.6’	6’ 9.0”	1
Pin oak	*Quercus palustris*	110.1’	9’ 7.5”	1
Red maple	*Acer rubrum*	106.9’	4’ 6.5”	3
Blackgum	*Nyssa sylvatica*	106.1’	6’ 1.0”	1
Northern red oak	*Quercus rubra*	103.5’	6’ 9.0”	1
American elm	*Ulmus americana*	95.3’	4’ 6.0”	2

Old-field successional series:

Black cherry	*Prunus serotina*	109.9’	10’ 10.0”*	11
Black locust	*Robinia pseudoacacia*	107.8’	6’ 4.0”	8
Sassafras	*Sassafras albidum*	93.7’	2’ 11.5”	8
Loblolly pine	*Pinus taeda* (tree planted)	85.0’	3’ 4.0”	8
Pitch pine	*Pinus rigida*	84.1’	6’ 4.5”	8
Virginia pine	*Pinus virginiana*	82.8’	3’ 10.5”	8

Forest / field interface or disturbance openings:

Persimmon	*Diospyros virginiana*	66.9’	2’ 7.5”	2
Mazzard cherry (nat’d)	*Prunus avium*	48.7’	1’ 5.0”	7
Eastern redcedar	*Juniperus virginiana*	39.4’	1’ 7.5”	11
Hercules club	*Aralia spinosa*	38.7’	1’ 6.0”	9
Common hackberry	*Celtis occidentalis*	28.9’	2’ 7.0”	9

Understory species: shade tolerant.

American holly	*Ilex opaca*	69.3’	4’ 2.0”	4
Flowering dogwood	*Cornus florida*	33.6’	1’ 4.0”	10
Spicebush	*Lindera benzoin*	24.4’	0’ 9.5”	10
American beech	*Fagus grandifolia*	21.2’	0’ 6.0”	2

Black haw	*Viburnum prunifolium*	20.4’	0’ 9.0”	9
Black highbush blueberry	*Vaccinium atrococcum*	16.8’	0’ 9.0”	3

* Girth taken at 2 feet.

New Records

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

Comments

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

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

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

Acknowledgements

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

Appendix: Comments on Heights of Individual Species

Tuliptree (142.1’): Although this species is abundant on all but the driest or wettest soils, form is only average for the species, and few specimens retained a central leader above eighty feet. The upper structures of older trees displayed successive arching, with minimal increase in height. The largest specimens, some in excess of 150 years old, were in the Old Poplar Grove. One measured 13’ 3.0” CBH. Showy orchis was found near the tallest tree, indicating the higher fertility of the soil at this site.

Black oak (122.2’): Probably an important component of the original forest on the drier soils, some very large examples remain in the Big Oak Grove, and a few in the Old Poplar Grove. Some of these aged specimens are in declining condition. The largest (14’ 0.5” CBH) was also the tallest.

Sweetgum (120.9’): Sweetgum is abundant on the moist silt-loam soils, where it is height-competitive with tuliptree. The tallest examples are on better- drained silt loams at the upper end of the swale, with a double-topped specimen reaching 120.9 feet. An unusually large and handsome example was seen in the Big Oak Grove; CBH was 13’ 0.5”. The excellent form of many specimens suggests that maximum heights will continue to increase rapidly.

White oak (119.4’): Undoubtedly once an important dominant throughout the original woodland, this adaptable and long-lived species is now absent from most sections of the preserve. Several very large and aged specimens, up to 14’ 10” CBH, remain on loamy sand soils in the Big Oak Grove. The tallest examples were seen with willow oak, pin oak and blackgum on silt loams in the Greenbrier Section, where it is the largest and tallest species. Many of these white oaks are vigorous specimens of good form, and significant height increases seem likely.

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

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

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

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

Pignut (114.6'): This species occurs on better-drained soils in the Greenbrier Section, where the tallest example was found. The largest specimen (8' 7.0" CBH) was with spicebush in a moist border of the Big Oak Grove.

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

Southern red oak (109.7): Before clearing for agriculture, this species was probably an important dominant on the drier soils. Modest-sized examples occur in the Pine Section. Where it occurs near Virginia pine stands, it may succeed that relatively short-lived species. A few aged specimens remain in the Big Oak Grove, where the tallest example was found. This specimen has the greatest CBH (15' 9.5") of any tree in the preserve. Unfortunately, much of this old tree is dead.

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

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

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

Black walnut (99.7'): Most specimens are not height-competitive, the soils being of marginal quality for this species. A few specimens of poor form remain in former woodland / field interfaces near the Big Oak Grove, where they face increasing old-field competition, and much damage from vines. The largest and tallest tree was found at the edge of the Big Oak Grove. It is of good form, and grows in association with a number of very large spicebushes, indicating richer and moister soil conditions than most of the Big Oak Grove. Without windthrow, black walnut is probably height-restricted from the tuliptree / sweetgum canopies.

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

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

Sassafras (93.7'): This mid-successional species was frequently seen on the driest soils, where it often occurs in close grouping, owing to root-sprout origins. Many specimens are in some competition with Virginia pine (82.8'), and are unusually tall and slender. The largest specimen is in the Vine Section, and essentially covered by bittersweet. The tallest, located on the berm of an old drainage ditch in the Pine Section, was only 2' 11.5" CBH, and was surrounded by specimens of nearly the same slender proportions.

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

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

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

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

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

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

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

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

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

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

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

Spicebush (24.4'): Occurring as a tall shrub on the richer soils, a number of large examples were found under the largest black walnut, at the edge of the Big Oak Section. Although most were of unremarkable height, one specimen near a large hickory is arborescent and attains a record height. Its spread is 25.7' x 18.7' (average 22.2'). CBH is 0' 9.0". This tree is a Maryland point champion. It is threatened by nearby vines.

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

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

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

CORRESPONDENCES

Colby B. Rucker

Eastern Native Tree Society

TOP TEN STUFF

Bob, Sounds like you had a good long tramp around the Glen. I entered the new numbers on the top ten list, but got a slightly higher average. I had the Shagbark as 131.7' by Leverett & Knuerr 12/15/01 (vs. 131.2'), and different addition.

Averaging ten species is very convenient, and seems to strike a balance between a handful of exceptional specimens running away with the prize, and southern diversity taking unfair advantage.

With a decent number of sites on the list, it's interesting to see how specific areas rank, and speculate on why. For starters, I looked at the #10 tree for each site, and noticed that CCW & MTSF were not only taller than the sites ranked lower, but taller than a couple above. This goes to that "deep depth" factor - lots of species over 100 feet.

Belt Woods is quite the opposite. Although the visual impact is rather overwhelming, the tall-tree diversity is very low, with the #10 tree being at the bottom of the list. If the list were based on just five species, the list would be quite different: Sevier 158.1, Congaree 152.7, Belt 145.8, Tamassee 145.8, Cook 141.9, Cohutta 140.0, Mohawk 139.8, Kelly 138.0, Chase 137.6, IceGlen 136.2, L.Pinnacle 130.0, Long Cane 129.7, Monroe 129.0, Green Lake 126.5, Beall 126.1, Corcoran 124.8.

If we take the average of the smaller five (trees #6 through # 10), we see that "deep depth" factor again. Sevier 142.1, Congaree 131.3, Tamassee 125.9, Kelly 124.1, Chase 121.4, Mohawk 119.7, Long Cane 118.7, Cook 118.2, Belt 116.2, LPinnacle 115.8, Corcoran 114.7, IceGlen 114.2, Beall 113.8, Cohutta 109.8, GreenL 109.5, Monroe 105.4.

In the above list, Mohawk & Chase improved their rankings, as did Long Cane, Pinnacle, Ice Glen and Corcoran, suggesting considerable diversity in the upper canopy. Although we are aware that the loss of a single outstanding tree could change the numbers, that single tree does represent, as best as we can determine, the potential of that species at this time, so it's reasonable. If the lost tree is the last of its kind, it suggests that the forest structure has changed, and there's no longer a niche for that species.

Of course, numbers aren't the whole story, but it's interesting. The GSMNP averages go down as we split up the immense acreage. Big is better because there are more trees, more diversity, and more variety of habitat. This goes back to the problem at Belt; 43 acres makes a great grove, but there's little diversity of habitat. Chase Creek is bigger, and has a great deal of diversity. Some of its trees are older, but most are younger than Belt. The Collington soils are the same. In a section of national forest with thousands of acres, both sites might be in the same study area.

Such hypothetical combining gives us a "dream team," with five species from each area, as it turns out. The average would be 136.81, which is just behind Congaree. Yes, that's a bit unfair, and a plug for Maryland trees, but what it really means is that the numbers for GSMNP and Congaree are somewhat misleading. We can see that temperature, rainfall, and old growth aren't the whole story. If we split those areas up until the acreage and the diversity of habitat were not greater than MTSF or CCW, the rankings wouldn't change, but the numbers would be much closer.

Enough! I've gone on too long. Maybe you can make something out of it.

Colby Rucker, June 03, 2002

CHARTER OAK, CONNECTICUT

Bob, in an e-mail of June 10th, you mentioned the Connecticut state quarter, with the Charter Oak on the reverse. At first, I thought the Conn artist who drew the design used a crabapple or a white mulberry for a model since it doesn't look anything like an oak, much less the Charter Oak. However, that wouldn't be fair to Malus or Morus, so I upended the coin, and concluded that the subject was simply the root system of some invasive plant species, which isn't fair to Therestofus.

The famous painting of the Charter oak was done by Charles Dewolf Brownell shortly before it was blown down in August 1856. The treatment of limbs and trunk appears to have been a true rendering, showing an ancient tree with a massive trunk, and a sweep of great angular limbs. The foliage seems a bit too soft, and detracts from the otherwise strong character of the tree.

The 1935 postage stamp commemorating the Connecticut Tercentenary was quite faithfully taken from Brownell's painting, but without the clutter of a few inconsequential small trees. The treatment of twigs was much improved, resulting in a structure which is true to ancient white oaks. Unlike the two-bit coin, there is no pretense of symmetry; the tree has a dramatic sweep of old limbs to the right, somewhat reminiscent of Maryland's Richards Oak, but even more identifiable as an individual specimen.

The commemorative half dollar of 1935 has an image of the Charter Oak which is identifiable, although more a swollen caricature than an actual depiction. Actually, considering the stylized eagle on the obverse, it appears that the whole was influenced by art deco design, and the futuristic ideas leading up to the World's Fair of 1939.

At least both 1935 images are identifiable as the Charter Oak, without the drift to forced anonymity afflicting the present. The "tree" on the 1999 quarter is a bit reminiscent of the air mail stamps of 1941-1944, which showed a transport plane which is said to have been drawn from a variety of actual planes so as to avoid endorsing any of them. Engineers claimed the thing wouldn't have been capable of flight.

So, the 1999 tree may have been influenced by some board of artistic censorship that didn't want to endorse any particular species of tree, lest the nurserymen hawking Bradford pears and other arboreal mediocrities claim their patented selections were being upstaged. The result is arboreal pap, and like the plane, just doesn't fly.

THE 130 FOOT CLUB

So that 62 foot error on a white oak did get your attention! Of course, we've come across some surprisingly tall trees of various species, so I always hesitate to say that any reported height is impossible, but various factors often point to the likelihood of serious errors.

The new Md. champion white oak is said to be 22-4 x 102 x 83, which looks perfectly reasonable at first glance. We also read that it's 25 feet from a farmhouse built in 1820. I'd expect an old farmhouse to be on a high flat piece of ground, with no advantageous topographical or competition influences. Fallen limbs yielded seven cords of wood, so it's heavy limbed. The trunk is decayed and leans from the house, but the tree hasn't blown over. From that, I'd guess the big trunk is short, with a low, heavy-limbed canopy. Therefore, I'm skeptical about the 102 height.

I recall my father talking about warships. There were three factors: firepower, speed, and armor. You could have any two, but not all three. Cruisers and battleships had firepower, but the cruiser traded armor for speed, etc. The same approach can be applied to trees. The tree can devote its energies to height, spread or girth, but it usually can't have all three. Tuliptrees grown in the open can have a trunk four or five feet thick, and a ninety foot spread, but the height will be fairly constant at 114, with multiple arching down to twig scale all across the top.

Forest-grown white oaks, like northern reds, can have handsome broad tops dominating a good chunk of woodland atop a big clear trunk, but the height will be around 98-111, and that's it. Any twig that gets up above his companions will develop side branches, moderating upward growth, while his slender neighbors are forced up, and an even top is maintained. With so many twig ends, the energies of the tree go in many directions, least of all height.

That 200 foot Alabama basket oak was doubtful, not just because no hardwood had ever broken the c2 barrier, but because it supposedly had a 148 foot spread. With that much spread, the tree would have had little competition, and no reason (or sufficient concentration of energy) to strive for height.

The big white pines on our list are all surprisingly similar, or at least consistent with the warship example. Within the productive life of the tree it can lay down a certain number of board feet, either short and fat, or long and skinny. The one factor that's needed to do better than average is environment. Chase Creek and Mohawk Trail don't get eighty inches of rainfall, but soil and exposure can be a big advantage.

Of the tallest ten species at Chase Creek, eight come from site 1, which has northern or eastern exposures. The soils are shared with glade fern, maidenhair fern, broad beechfern, Collinsonia, pawpaw, spicebush, black snakeroot, mayapple, bloodroot, etc. Add what may be the steepest terrain on the Maryland coastal plain, and you've got a cove hardwoods growing machine, to use your MTSF phrase.

So, again, things come down to logic and consistency in the numbers. That's where my title for this e-mail comes in - "130 club." A couple of months ago I thought CC had a chance to catch MTSF if I could get a better read on a mid-slope black oak after two years of growth. About then you came up with another winner, and MTSF went to 130.80, just behind Belt at 130.97. Cook had 130.03, leaving CC back at 129.48.

Two days ago I walked over to site 1, and ended up at an east-facing terrace that had oaks and some decent tuliptrees instead of all chestnut oak and scarlet oak. A small ravine flanked the terrace, and a low slope site on the north facing side had lots of pawpaw, black snakeroot, etc. An old black oak on this site was 10' 2.5" cbh. It was impossible to see anything through the pawpaws, so I ran the pole to 19-9.5, which set up a clean total height of 135.6'.

The black oak is shorter than that Belt Woods giant that went 143.4, but taller than the next best at Belt, or anywhere else in the east. Like most black oaks, the form is more heavy-handed than symmetrical, but it's tall. That brings Chase Creek black oaks up 7.1 feet for a big ten average of 130.19. That's only third place in the 130 club, with very little chance of catching MTSF, but it's select company. Most importantly, the matter of location, location, location holds true, with exposure and indicator species right on the mark.

I've always thought that our numbers are more than just a fishing contest. Almost everything we're doing is breaking new ground, but I think we're starting to see some scientific insights from the numbers. What seems to be needed is to record more data regarding soils, exposures, indicator species, etc. This suggests that the sites of many of our old records need to be revisited, and forest profiles created. I'm not sure how much more data is needed, but any additional information would allow our numbers to be evaluated in a more useful context. Creating detailed forest profiles can be a big order, but I think Jess shows much promise in this direction.

Colby Rucker, June 21, 2002

GNARLED TREES

Dale, your comments on an old gnarled maple create a vision much like, and likely produced by, scenes from certain Currier and Ives lithographs. The work of G. H. Durrie (1820-1863) was particularly gifted, and deserves some study concerning what remnants of ancient forest he drew from, and the extent to which his work influences what catches our attention today.

I've mentioned the importance of Bierstadt, Warren and Bodine in influencing how we see reality, and that what we see is preconditioned by art, both visual and the written word, even if Longfellow's "forest primeval" was second growth. Durrie (George Henry Durrie) was a resident of New Haven, Connecticut, but his work suggests short trips to the north and west. His treatment of old trees is, perhaps, the best I've seen - or it may be that he simply meets my expectations, already influenced by his and other works.

That said, I've seen old trees that display such a much-twigged, heavy-limbed, greatly-gnarled structure. Such trees are quite unlike the fast-growing upright second growth that runs through an entire life cycle
without showing any picturesque character of outline. It seems that such is left to a more diverse forest of sour gum, beech, maple and oaks, growing more deliberately, drawing on whatever resources are not already bound up, to produce a woodland of groves within stands. The transition from second growth back to old growth is more than waiting for second growth to get old; the vertical lines must be supplanted by more complex structures.

Perhaps the best of Durrie's work is "The Blacksmith Shop in Winter." Others, not dissimilar, include Winter-time at Jones Inn, A Cold Morning, A Mid-winter Day, Returning to the Farm, The Old Homestead in Winter, The Village Church, The Old

Grist Mill, Returning to the Farm, Journey Resumed, and Getting Ice. In many cases, it appears that new paintings were simply a new arrangement of elements from previous works, rather than drawing from new sites, and new trees. No matter; this suggests that Durrie was, like us, influenced by a few trees - perhaps a single tree, that represented an element being lost even then. However quaint or picturesque, it represented his vision of reality.

And, it may be that our vision, our sense of reality, is so influenced.

Colby Rucker, August 12, 2002

FOREST STRUCTURE AND OLD GROWTH DEFINITIONS

Bob, it's a bright morning, and last night's heavy winds have left the ground bare and frosty, with no trace of yesterday's snow and rain. From the news, I'll guess that you had quite a snowfall; I hope that you're pacing yourself shoveling out the walk and driveway.

I was looking at a stack xeroxes given to me some years ago by Dan Boone. Dan is a gifted plant taxonomist and naturalist. He was in charge of Maryland's Natural Heritage division until ousted for being too strident about preservation. Since then, he has been quite active in locating areas in Maryland (mostly in Garrett, our westernmost county) that mimic old growth. The xeroxes all concern old growth forest structure and habitat.

The definition of old growth is not unlike the chart that Herb Schwartz got from a Maryland forester, and breaks forest succession down into four stages: reorganization, aggradation, transition, and steady state. My woods has passed aggradation, which is that most desired for woodfiber production. Having passed through a long period of natural thinning, and the development of a rather uniform canopy of mature trees, many of the largest tall trees are being lost each year to old age, lightning and windthrow.

It would be easy to suggest that continued loss of large trees and the attainment of a steady state condition will mean the woods has become old growth, but I would disagree. There are two reasons why this will not happen so easily. Whether derived from old-field or selective logging, the stand has a disproportionate amount of tuliptree, northern red oak and other fast-growing species, and those specimens usually have tall straight trunks free of limbs for a great distance. In time, an uneven aged stand with a discontinuous canopy will develop, but structurally, a stand where the oldest specimens originate from a second growth condition is quite different from old growth.

Of course, it is doubtful that Maryland has any old growth left, so it may be argumentative as to what it would look like. This is particularly true for a hardwood forest. I am inclined to believe that the local woodlands which I knew as a boy provided some clues. The many ancient trees which had been spared by logging were often heavy limbed, crooked, or hollow. Of course, the area had been subject to usage since about 1650, so all sorts of logging, clearing, grazing and burning had taken place, but the first colonists commented on the openness of the woods, and the large size of the trees, which they attributed to burning by the Indians.

Whatever the effect of those early influences, the woods I recall seemed to have been composed of trees which often branched at a modest height, and did not attain the considerable height of specimens which have developed over the past one hundred years. Although it might be argued that activity by the early colonists opened the woods and promoted the development of low limbed, broad crowned trees almost like the deer park at Cedar Park, I think the structure was a natural condition typical of old growth.

Considering the age attained by the chestnuts, white oaks, chestnut oaks, sour gum and beech once prevalent at Chase Creek, there were few opportunities for young trees, and successors to lost specimens were likely old themselves, with crooked trunks and uneven crowns. Occasional windthrows of a large tree often took others with it, opening a considerable area to the sunlight, which led to the development of groves of very tall straight tuliptrees, northern red oaks and other species, so not all the trees were crooked or hollow, but the woods was quite different from a second-growth stand grown old.

Besides the differences in structure and distribution of species, there were undoubtedly differences in soil chemistry, fungi and other complex associations. Some of these elements may have been altered by microscopic introduced species, or simply became incompatible with the second growth condition. Such elements may become reestablished, but it seems uncertain what the lag time might be.

So time is an important element. It seems that nearly all vestiges of the second growth forest must pass away before a forest structure more typical of old growth can exist. If "steady state" is defined as simply the fourth stage of succession in which there is a balance between growth and loss, that seems simplistic, suggesting that "old growth" can be regained in "perhaps two centuries from the initial disturbance." For some species, this might be true if the disturbance were a severe wind event in an old growth stand, but it cannot be the time required to convert second growth to old growth.

On sites where the growing conditions are extremely poor and past logging hardly profitable except for charcoal, the limited number of competing species may provide an opportunity for a more rapid return to an old growth condition, but I cannot see that hardwoods on the better sites can return so easily. Part of the problem may be an arbitrary comparison with photogenic stands of tall, straight conifers. People associate old growth with big tall trunks, which is why they call Belt Woods "old growth." At that site, many of the white oaks are 240 years old, but most of the sour gum and beech are small, and crooked or hollow trees are essentially non-existent. Someone played forester ninety years ago, and then didn't have the heart to cut the results.

With such a mind-set, most people simply can't imagine the complexity of an intact ancient woodland containing numerous trees with hollow trunks and broken tops. The simplistic attitude regarding "den trees" doesn't touch the complexity of a truly old stand. A tree severely damaged by wind, fire or lightning decays to the boundary of the active sapwood. A fire may scorch these boundaries, but the dried surface decays little. In time, fungi enter through crevices, and decay reoccurs perhaps two to four inches within, leaving a dry shell within the hollow. This may take another hundred years, but greatly increases habitat greatly for flying squirrels, white-footed mice, lizards and snakes, spiders and millipedes, etc. We might ask, where were house spiders before houses, and chimney swifts before chimneys?

If there's a point to all this rambling, it's to suggest that the lure of ecoforestry is likely to be limited to the aggradation stage, avoiding the losses in board feet of the transition stage, and by any definition, incapable of accommodating the so-called final stage of steady state.

That limitation demands that we think more about what is meant by old growth. Admittedly it means many different things to different people, so no one definition is possible. What does seem possible is that we recognize that allowing a woodland to return to steady state does not mean that the final plateau has been reached. It seems that there is much that continues to develop. Of course, any return to the past is compromised by chestnut blight, the wooly adelgid, and introduced species, not to mention passenger pigeons or global warming. That said, the past is always a moving target.

Despite all the uncertainties, we should continue to look for exemplary examples of the "highest," most complex attainment of "old growth" within "steady state." Does a perfect site exist anywhere? Probably not; as we learn more about the complexities of the ancient forest, the more elusive our goal will be. That is as it should be; to be satisfied with any arbitrary definitions of "perfection" is just not good enough.

Colby Rucker, December 26, 2002

WETHERFIELD ELM

Bob, your reference to the Wetherfield elm set me to looking through my library for anything more on its size or structure.

Although Peattie (1950) gives, on p. 240, the height as 102 feet, spread "about 150 feet," and a girth of 41 feet at breast height, that girth appears to be in error.

Frank H. Lamb, Book of the Broadleaf Trees (1939), p.236, states the tree was 97' feet tall, spread of 165 feet, and 29 1/2 feet in circumference at the ground. A fine photograph on p. 192 shows a large flaring base, so the above circumference appears to have been taken higher.

Dr. Ferdinand C. Lane, in The Story of Trees (1952) p.66, quotes a circumference of 29 feet.

The Internet has the text from a 1967 Illinois nature bulletin, which states the height was 97 feet, spread 147 feet, and the girth at 4 1/2 feet was 30 feet 3 inches.

The AF list for Sept. 1955 lists the champion as a tree near Trigonia, Blount County, Tennessee - 24' 7", 160' high, spread 147' (points would have been 494). Since the Wethersfield elm would have (by the 1967 bulletin) have had 503 points, it may once have been a national champion.

The 1955 AF list also has a photograph of the Wethersfield elm, with the caption, "Down and out.

All the arts of tree surgery failed to save the famous Wethersfield elm, which died in 1950." The photo shows a flaring base, a "waist" at about breast height, several large leads with the lowest fork about 12 feet up, and three large injuries about 20' up filled with concrete.
The injuries are explained by Lamb, who states, "On the morning after the hurricane of 1938, only four of its six magnificent branches, one of them fortunately the largest, seventeen feet in girth, were left standing."

The structure of the tree, said to have been planted in 1758, might, in other pictures, be taken to be more simple, essentially three leads. An illustration on p.29 of the 1949 Yearbook of Agriculture (Trees) is quite misleading. The forks appear too high, the trunk is uninspired, and the crown, though apparently intact, is sparsely limbed.

A very handsome print, ca. 10" x 12", by George Goodlad Vogt, from nearly the same angle, shows much more complex nuances of contour, a less regular basal flare, and a more pronounced "waist". The treatment of the crown, in ample leaf, is very fine.

An excellent photograph before 1938 by Staley G. Cole appears on p. 192 of Lamb's Book of the Hardwood Trees. This appears to have been taken to the left of the above depictions, causing the forks to appear lower, with three primary leads arising from an immense mass of wood above a smaller "waist". The left and lowest lead is at a considerable angle, and may be a limb upturned early on, accentuating the "waist." This is also shown in the AF photograph, which appears to have been taken from the opposite side.

So, overall, a truly magnificent tree, open grown, with an overpowering crown. Cole's photograph is the best, and indicates the tree was single-trunked, but took advantage of the available space to divide low. To be fair, the diameter of the trunk makes the various leads to appear lower than they actually were. The most inclined lead may have originated below breast height, but everything considered, there wasn't anything "unfair" about the trunk, which appears (from the newsletter) to have been 30 feet 3 inches. For a tree with a "waist," that's mighty impressive.

The elm near Trigonia, Tennessee was pretty impressive too, but the AF record shows it excelled in all three categories. The 24' 7" cbh may have been a single trunk, and the 147' spread seems possible for an elm, but not in combination with a 160' height. It's obviously another case of false top triangulation, and there's no reason to believe the height was greater than the Wethersfield elm's 97 feet.

That would put the Tennessee tree back to 431 AF points, nowhere near the 503-point Connecticut specimen. I've only seen two Maryland trees as large; the Wye Oak in its prime, and the great southern red oak which stood at Cedar Park, here in Anne Arundel County.

Colby Rucker, July 26, 2003

HABITAT

Bob, when you began your cottonwood quest, I sort of yawned because I've only seen cottonwoods that were kidnapped and stuck in some inhospitable piece of soil where they retaliated by growing rapidly just so they could become a stag-headed menace as soon as possible.

Of course, I wasn't being fair, because cottonwoods are rather picky, preferring to luxuriate in soils built or replenished by the seasonal floods. And I, being a child of the coastal plain, think of rivers as being languid estuaries amid the often exhausted sands of a flat landscape inhabited by scrub pine, Spanish oak, post oak, blackjack oak and beetle-infested locusts.

No wonder I retreat to the cool green haunts of Chase Creek Woods, in the Highlands of the Severn, Maryland's "Hudson in Miniature." Chase Creek, once called Timberneck Creek, lies at the narrowest, and therefore, most precipitous part of the Severn watershed. It coincides with the great Aquia Deposit, with its glauconite-laden greensands rich in potassium. Belt Woods is also on the greensands, but lacks the dramatic topography.

The east-running ravines are sheltered from the prevailing westerly winds, and the deepest escape the summer droughts that kill the oaks and maples before their time, and turn the tops of the tuliptrees once eager to reach new heights. In the deepest ravines, unweathered greensands still yield circumneutral soils from ancient deposits where Late Cretaceous shells are but occasional impressions. And so, starting with the entire Chesapeake environment, we come down to a few small low slopes where the afternoon suns never turn the corner, and we find ideal habitat.

Well, I don't know if it's ideal habitat, so I just say it mimicks ideal habitat. The indicator species speak to that. There's glade fern, maidenhair fern, silvery spleenwort, broad beech fern, pawpaw, spicebush, showy orchis, mayapple, richweed, wild hydrangea and hercules club. Here is Maryland's largest white oak, spicebush, northern red oak and perhaps seven other native species. Many of the indicator species also occur at Belt Woods, and both sites have tuliptrees, white oaks, black oaks, northern red oaks and other trees of exceptional height in close proximity to the indicator species.

So, what do indicator species indicate? Obviously, there's the matter of fertile soils, especially those that are circumneutral. Tuliptree, pawpaw and bitternut are associates of the rare glade fern, but those trees aren't rare, so what's special about these tall-tree sites? In large measure, it's the comparative freedom from drought stress. Of course, in the mountains, where rainfall is greater, temperatures lower, and sheltering topography more extensive, trees do grow taller.

That said, are the mentioned indicator species a relevant guide to exceptional tree sites off the coastal plain? Are there others in those habitats? If so, do they indicate factors beyond freedom from drought stress? It appears many are still relevant; after all, glade fern isn't common anywhere.

So, how do we break down habitat in an entire county or state, by the best of the best, until we come down to a few acres of exemplary habitat? If a pawpaw is an uncommon find at Baxter Creek, does that suggest it's not exceptional habitat, but only mimics such? If so, are there sites with better habitat?
What indicators would lead us in that direction? Do we need to pay more attention to shell marl as at Carters Grove, or Chapman's Landing, or limestone, as at the Brevard Fault line?

Yes, your cottonwoods are a picky lot, but impressive with the right habitat. We've measured a lot of tall trees all over, and it's probably time to associate numbers with habitat. Good habitat isn't self-evident; many sites just mimic exceptional conditions, sort of like actors masquerading as the real thing. Still, the numbers are there, are we need to ask what roles these sites play on the larger stage.

Colby Rucker, September 8, 2003

THRESHOLDS FOR SPORT AND SCIENCE

Bob, I suppose, for baseball, we have to consider the conditions which affected the stats for a particular player - expansion, wartime, fences, walls, rabbit balls, leagues, strike zones, etc.

For trees, some obviously have greater natural "talent" for longevity than others, but the stats are subject to various habitat conditions. It all gets pretty involved, but we can start with a few positives and negatives.

Short trunks are usually a positive, bringing the essentials - roots and leaves - closer together. With less trunk surface to be clothed in new wood, there's more energy for broader crowns (more leaves) and greater root development. Also, there's less loss from windthrow. In England, ancient oaks and pollarded trees are good examples. Most of our eastern oaks are tall, and hit the wall when a fixed leaf area no longer produces enough nutrients to add sufficient sapwood on a demanding trunk. The dense, narrow sapwood conducts less water, and becomes subject to fungi clogging the vascular system, especially bleeding canker.

Rapid growth early on takes surface area to the critical stage sooner, with fewer rings to be counted. Of course, for some species, this overwhelms the competition, and provides the necessary elbowroom for long-term survival. Where black walnuts and tuliptrees can kill off the competition, they achieve great structural stability, significant crowns and extensive root systems, and their capacity for longevity can be utilized.

Some trees, like staghorn sumac, spring up on a roadside cut, and die while still dominant in their restricted domain. They seem almost eager to die. Still other staghorns, in a better soil, do live much longer. Of course without someone to run interference for them, they'd be overtopped on a rich site. I saw several old, thick-barked specimens arching over a tall board fence behind a McDonalds - their crowns had no competition, and their roots, in good soil, were kept cool, and protected from drought.

For other species, a stressful environment is positive for longevity. Chestnut oak grows tall in a good soil, but the roots can't withstand a wet soil, so windthrow is common. Sand over a clay hardpan does the same thing in time. Mossy, north-facing mid-slopes produce big chestnut oaks, but not over 200 years or ca. 12' cbh. Moist soil also causes death by shoestring fungus. On a sandy ridge, chestnut oaks withstand drought, surrounded by dying black oaks. Of course, if the site's too bad, it would be in post oak or blackjack. So, there's a balance. Where a steep uppermost slope position is well drained, a short trunked tree can acquire sufficient sunlight over the steep slope, but maintain excellent root stability.

Sour gum takes strict advantage of soil conditions. It grows best in a loose, airy soil with a reliable source of water beneath. It's often restricted to the transitional zone between dry oak woods upslope and floodplain / swamp habitat below. Here, with roundleaf greenbrier and New York fern, sour gum is an important indicator plant, often ringing hydric soils that would otherwise be overlooked. Such habitat often provides sunlight at the lower side, and the strong root system is among the most reliable. With a good deal of shade tolerance, sour gum competes well for elbow room. With its diffuse pores, it seems to escape the vascular limitations afflicting red oaks, and withstands slow annual growth very well. Like beech, sour gum is able to add an additional century by relinquishing its more far-flung extremities, doing quite well with a crown of heavy limbs ending abruptly, but thickly clothed in vigorous twigs.

The matter of reducing the responsibilities of excessive surface area is handled in different ways. Some western conifers have extremely durable wood, and survive via narrow strips of bark connecting roots and foliage. In the east, exposed wood rots too quickly for this, but white cedar seems an exception, and black locust provides some rather shaky examples.

With reduced competition, some species acquire great age. Sassafras may be one of our oldest trees, but it's seldom seen on a site not contested by other species or subject to "improvement" by humans. We don't see sassafras on many longevity lists, but its capabilities are remarkable.

In Maryland, the serpentine barrens at Soldiers Delight are high in magnesium, which prevents the growth of almost all trees except post oak, blackjack, and Virginia pine. The lack of competition gives these species some advantages. The forest looks a bit like a snarly apple orchard, but the oaks, especially the post, do live over 200 years. Past disturbances may have removed older examples, or the severe conditions may just carry a good thing too far.

So, when we scan the stats, we can see that certain players on both scenes had great natural capabilities, but it's good to consider where those numbers come from. Some tree hanging on a cliff face may be older than one on a highly contested flat. The stats still stand, but it's hard to make comparisons. In baseball, some sharpen their spikes, some throw bean balls. Some punch balls through the infield, some hit for the foul poles. Trees are just as varied, finding some advantage, some loophole, some gimmick, to extend their playing days.

Colby Rucker, October 03, 2003

TOTAL VOLUME ESTIMATES

Bob, I like to limit volume calculations to the main trunk and heavier leads so that modeling of hypothetical cuts also provides a total in board feet. This allows comparisons with the historic record of trees that scaled from 12,000 to more than 20,000 board feet. I think it's unwise to add some trifling percentage for brush to the carefully calculated trunk volume of some conifer. It become apples and oranges, and guesswork always ruins good numbers.

All that said, there are some monstrous open-grown trees that wouldn't yield much in board feet, but would displace a great deal in total volume. Of course, there's no decent way to calculate the volume of all the twigs and branches, but it's all wood. One interesting exception was the Wye Oak, a white oak that stood on Maryland's Eastern Shore. Although the total is somewhat of a composite, we can get a pretty good idea of volume from the weight of a fallen limb weighed at the feed mill across the road.

For any kind of argument, I'll say the volume reflects the tree as it was in 1953, with its major limbs intact. Although limbs were weighed that fell after that, a great deal of live wood was removed from the tree, year after year, in an attempt to reduce the weight and sail area of the crown. This suggests that the major components maintained a fairly constant weight and volume, despite unavoidable increases in diameter. I have not counted a low limb weighing perhaps ten to fifteen tons removed as part of the state road upgrade to auto traffic ca. 1912.

So, not perfect, but here goes anyhow:

10 / 6 / 53 (est.)	Large limb fell across road Preston, pp. 110-111.	20.0	tons
8 / 29 / 56	Largest limb fell	30.0	tons

(est.)	Preston pp. 5, 111.	
6/10/84 (feedmill)	Largest remaining limb fell Baltimore Sun 3/20/85	37.0 tons
1984 Baltimore.	Emergency pruning Sun 3/20/85	2.5 tons (est.)
6/6/02 (crane?)	Tree fell; main trunk Baltimore Sun 6/23/02	30.75 tons
6/6/02 (est.)	Limb wood Baltimore Sun 6/23/02	19.25 tons
Total weight of tree		139.50 tons

The estimates were probably from state foresters. The 1984 limb appears heavier than the 1956 limb, which was immense, and the longest. This suggests the estimate of 30 tons may have been somewhat low, or the limb was simply less fully branched. The 6/6/02 limb wood tonnage is derived from an estimate of 100,000 pounds for the entire tree. Leaves and rakings were not included. 19.25 tons seems reasonable. Although less than the individual weight of the three earlier limbs, much of the trunk was removed in one wide-load piece, with portions of the heavier limbs still attached.

139.5 tons = 279,000 lbs. Dividing by 60 lbs./cu. ft. = ca. 4650 cu. ft.

Circumference at grade was 51 feet, cbh was 31' 10". The bottom of the trunk was a hollow shell, accessed via an iron port. This air space, having no weight, receives no volume from the 61,500 lbs. A broad void to four feet up, tapering abruptly to ten feet up, it amounted to about 350 cu. ft. Thus, quite conveniently, the total volume was 5,000 cubic feet.

Colby Rucker, October 15, 2003

NIX ON PEACE PARK

Bob, yep, a peace park at Mohawk Trail would be a dangerous idea. First, there would be paved paths around all the trees for the cripples, a zillion feet of deep trenching for water fountains, drainage and floodlights, several parking lots, homeland security fences, visitors center, an auditorium, sanitary facilities, a highway-speed traffic loop, massive regrading, weed-free sod, and - well, you get the idea.

Peace is sort of a fuzzy theme, so the monuments would be varied at best. Muslims might want a colossal recycled concrete statue of a past winner of the Nobel peace prize - Chairman Arafat. This would include a weekly fireworks display. Other monuments, for no obvious reasons, would include Ronald Reagan, Fawn Hall, John Ashcroft, Clarence Thomas, James Watt, and the Shrub. A supersized genuine authentic replica of the Alabama Ten Commandments would be the big attraction, surpassing Samuel Colt's "Peacemaker."

With all the construction, the big trees would start to die, and tree experts would be summoned. They'd all be scared of being financially liable for any damage caused by trees, so they'd unanimously recommend getting rid of them. This is known as "Nero's thumb tree care." Someone would suggest a win-win situation by selling the trees, and a forester would say that a sale would be more attractive (profitable to him) if they added five hundred more acres. Everyone would agree that was a fine idea - all free money, with the prospect of selectively harvesting the rest of the timber down to a four inch diameter limit as long-term management - not to exceed five years.

With the prospect of that much clearing, covering the mountain with ski trails would be suggested by the local townsfolk, always looking for more tourism. The rest of the property wouldn't go to waste; it would be open to paint-ball warfare and all-terrain vehicles. A few hundred acres could be preserved for motorcycle courses, with plenty of parking for special events, including the Mohawk Mud Classic.

Massive regrading and erosion would cause water quality problems, so most of the lowland corridors - those still encumbered by trees - would be bulldozed for storm water retention ponds. The ponds would be supported by most of the environmentalists, always interested in water quality and Bradford pears. The rest would be swayed by a birdhouse proposal - plastic birdhouses of both "Graceland" and "Country Outhouse" design. All birdhouses would have pinwheels on top and be mounted on aluminum poles with metal flake finish.

Of course, engineers hate curves, so the ponds would be perfectly rectangular, and surrounded by chain-link fence topped with razor wire for safety. This would also provide emergency detention of the elderly, especially those suspected of terrorism. Maintenance would create more seasonal jobs having little effect on the local economy. Mexican labor would be bused in to keep the pond enclosures well mowed, and weeds sprayed along the chain-link fences. The results would be quite popular; you can't have too much neatness and tidiness these days.

With all the infrastructure, the park would be quite a showplace, deserving of several new roads leading to scenic overlooks where visitors could admire the new layout, and buy postcards and Slurpees. This would require clearing of superfluous vegetation for vistas of the massive landfill, the new sewer plant, maintenance complex, bingo center and tour bus shopping
mall. The mall would be a model of privatization, with no discrimination in hiring, provided no one spoke English. The mall would be a hit with little ladies with blue hair. They would buy candles, potpourri, sweetgum balls and religious items. A nodding-head Jesus and Jerry Falwell salad dressing would be the big sellers.

Since no one's likely to visit the peace memorial auditorium, it could be converted into a wax museum - Great Hacks in Wax, honoring all the state politicians, thereby guaranteeing funding for more improvements to a once useless area infested by trees.

Colby Rucker, Oct. 18, 2003

ASSOCIATIONS, ASSOCIATIONS, ASSOCIATIONS

Bob, your comments on a ceiling for white oaks at MFSP were quite interesting. Although I often stress the importance of "location, location, location," the nuances of habitat within those locations is best known to us by forest types and indicator species, so perhaps I should say, "association, association, association."

I stumbled into something on the Internet that seemed interesting (run a search on "allelopath" + "chestnut"). It seems that a paper by David E. Flora (1977) touched on allelopathy, as did one several years ago by Vandermast, Van Lear & Clinton. The latter group soaked seeds of red maple, tuliptree, e. wh. pine, e. hemlock, & rosebay rhododendron in a tea of chestnut leaves, and found the last two species' germination was zapped. From that they made a rather extreme conclusion - hemlock and chestnut didn't coexist due to allelopathy (ignoring that one's a ridge species, the other's probably dependent on mossy habitat for germination). Further, they concluded that the alarming spread of rhododendron is due to the absence of chestnut.

Well, it's all interesting, at least as a reminder that walnuts zap tomatoes, etc. Apparently a number of trees are considered to be allelopaths - black walnut, hackberry, sycamore, eucalyptus, sassafras, American chestnut and eastern hemlock. All that said, I imagine there's a good deal of buffering in nature, and also many ways in which chemicals produced by one plant affect others. Germination is probably but one of many.

I'm still intrigued by a situation at the edge of the big tree grove at Corcoran Woods. There was a big spreading black walnut that I wanted to measure, but it was surrounded by a dense barrier of multiflora rose. At last, on the shady side toward the grove, I found a small opening, and made my way in. Once inside, the roses were absent, as were most other species. I was rather surprised to see numerous smooth-barked shrubs, each having stems up to several inches thick, but very little height, as if each had been stepped on by an elephant years before, and their decumbent habit had continued.

For a moment I thought it was a species new to me, perhaps some kind of willow or dogwood, until I realized they were spicebushes, quite old, heavy-stemmed, broad-spreading, but of completely different habit. The near absence of other species had allowed them to survive in their lowly stature, but it also seemed that some factor besides considerable shade had affected their ability to venture upwards. A large hickory, perhaps a pignut, stood perhaps sixty feet from the walnut, and I walked to it without encountering the multiflora rose barrier. Here grew an old spicebush, also shaded, but outside the walnut's drip-line. In the rich soils, this had a single trunk, considerable spread and a height of over 24 feet, making it a Maryland champion, and one of the tallest yet found anywhere.

Well, we'd need a whole bunch of walnuts and a zillion spicebushes to reach any real conclusions, but it does seem that there are many factors affecting tree distribution and height. Anyway, let's take a second look at some of our trees of record height, and see what special surrounding factors might be relevant - not only location, but also "association, association, association."

Colby Rucker, Oct. 19, 2003

KILLER TREES

We've got a variety of useful discussions going, but this has some relevance to our combined index.

Killer trees? Yes, it's another of my rather hypothetical observations. Now, I certainly don't suggest that trees think, but some, like walnuts, make it pretty clear that they're programmed to make things miserable for the competition. Some trees survive, some don't. Lots of trees die from lack of sunlight, or are subject to windthrow. Often it's dumb luck, but in some cases it appears that the survivors were not only stronger themselves, but survived by putting their nearest competitors at a disadvantage. Where it appears that the survivor actually influenced the demise of its neighbors, I've applied the term "killer tree," just to see how that might affect my understanding of changes in forest structure.

After two hurricanes and a variety of local storms, parts of my woods look like a war zone. The fallen trees are mostly second growth, two to three feet thick. Here and there trees remain standing. They are usually the more shapely specimens, with large crowns supplying sufficient nutrients to build a strong root system. They had competition, but those trees were more slender, with smaller crowns, often deflected sideways. Of course, trees having trunks both tall and of critical mass were most vulnerable to windthrow or breakage in a severe storm.

A new forest will fill in the openings, and will compete with the older specimens, but those younger trees will be at a structural disadvantage, so that the old specimen will hasten their demise also. So it is, that over several hundred years, older specimens will continue to be "killer trees."

Of course, tuliptrees, by their unusual height, are subject to such thinning, but some massive specimens will survive, their numbers increasingly affected by lightning. So it is that tuliptree becomes only an occasional massive fixture, but offering its seeds to the wind to the broadest possible area, in the slim chance that some opening may give rise to a successor.

Oaks and other species also become "killer trees," hastening the fall of taller, unstable competitors. The survivors are not so tall, but compete successfully by their broad crowns. Certainly, their strong wood gives them that spreading capability, and it follows that capabilities persist because they are utilized. Having no winged seed, there is no reason for an oak to grow taller than necessary.

So, in an old woods, we see killer trees and upstarts. Sometimes the killer trees are numerous, and form continuous open woodlands. Sometimes the upstarts form groves where examples of great height are produced, as in second growth, but eventually, killer trees destabilize the grove. Beech trees, by their shade tolerance, may skew the ascent of other species. Beeches and sour gums can have much influence in parts of a woodland, their crowns persisting despite breakage and eventual dieback.

So, the structure of an old woods can follow rules different and more complex than the simplistic verticality of second growth. With less clear trunk to be maintained, more energies are available for other structural development. An interesting question is how a second growth woodland gets back to such a structure. Tall slender trees can't become rugged stocky ones. Windthrow openings would seem to produce more tall spindly stuff. So, maybe we need to add another influence, and I wondered about killer trees.

Killer trees aren't as tall as second growth, and their trunks aren't as large as field grown specimens. Still, overall, they can be massive structures. That's where our combined index comes in. Of course, we could weight either of the two factors, but the index seems to work as is. Some specimens, like the Seneca Pine or numerous unnamed deciduous examples, aren't the tallest or thickest of their species, but they have an influence on our perception of the forest.

I suspect that frequent exposure to severe storms is a greater factor locally than at CFSP, MTSF, or GSMNP. Killer trees may be more numerous at Carter's Grove, Corcoran Woods, and Cedar Park, where huge trunks and broad crowns impose an unmistakable influence of compact dominating biomass. Renewal is often dramatic, but on a longer cycle than in more fragile second growth.

So, let's see what the combined index tells us about different sites and "killer trees."

Colby Rucker, November 26, 2003

BIG CREEK SOILS

Will, your observations regarding the presence of floodplain species on slopes, and greater height on south-facing slopes is interesting, in that both conditions seem contradictory to our generally accepted viewpoints. I'll attack this situation by starting with several well-separated observations, and then see what that leaves in the center.

Although we associate the rich silty alluvium of floodplains with high fertility, spawning the Egyptian civilization, maybe floodplains aren't altogether perfect. The dense wet soil deposits exclude air, and tree species that are present are noted for their shallow, much-divided root systems, to the delight of nurserymen, being easily transplanted. So, floodplains are a problem environment, being rather two-dimensional, and windthrow usually overtakes tuliptree and deeper-rooted species that venture there.

Tuliptree has rather tender roots. As a result, the crown will deviate from the vertical, with multiple arching on sites affected by mid-summer dryness. The greater annual rainfall in the Southern Appalachians moderates this effect, while on the coastal plain the tallest trees are likely to be found on north facing slopes in those few deep ravines where the sun seldom ventures. The best sites seem to coincide with the presence of glade fern and maidenhair fern.

At Chase Creek, sandy loams on south-facing slopes, especially those toward the southwest, are often unusually dry, resulting in an absence of tuliptree or northern red oak, being dominated by chestnut oak, black oak, Virginia pine, and some post oak. These species are deep-rooted in the loose soil, which is nearly devoid of herbaceous vegetation.

Where subsoils are nearly impermeable clays, typical floodplain species are often found on hilltop terraces. Excess soil moisture drains slowly, moving down slopes, unseen, but creating a more shallow soil than ideal for chestnut oak, often resulting in windthrow or shoestring fungus problems as these trees age. The moisture flows ever-deeper beneath sandy lower terraces that are actually relic sandbars, uplifted over the past million years or so. New York fern and clethra may occur at the upper end of these terraces, and sour gums thrive on these dry sites by extending their root systems down to the constant source of water. Sour gum is a most valuable indicator species, outlining wetlands of all types like a row of fence posts, but not venturing onto saturated soils or ravine bottoms.

At Mohawk Trail, the best white ash sites were somewhat similar to the coastal plain lower terraces, being deep loose soils overlying an impermeable rocky slope below a concave "collector" extending upslope. The white ash benefited by a deep loose soil, but did not experience a shortage of available moisture. If the steep upper slope had been south-facing, not north, it is uncertain if the moisture supply would have been so reliable.

The woods behind my house is south-facing, and the slopes have some chestnut oak, black oak, beech and sour gum to the southwest, but phase to tuliptree-northern red, with a good bit of pignut, pawpaw, redbud, blackhaw, flowering dogwood, American holly, and red mulberry to the south. Similar sites include black walnut, sycamore and slippery elm, phasing to a bit of
sweet gum and basket oak, which are more southern species. Mayapple and other herbaceous plants occur, showing the slopes to be quite different than the chestnut oak - post oak sites.

One difference seems to be whether the slope is concave or convex, the more sheltered coves escaping the drying influence of prevailing winds. This influence can be seen by comparing ravines that run eastward versus those that are west-facing funnels capturing the typical winds from that direction.

Enough! Let's get back to Big Creek, and ask whether south-facing slopes offer deeper soils than the lowlands, whether the rocky substrates conduct a reliable source of moisture downslope throughout the seasons, and if, thus enjoining a deeper and warmer soil environment, tree height is equal to, or greater than the moist, but colder, north-facing sites.

In many ways, it appears that the heavy alluvial floodplain environment is not so advantageous as we suppose, and only certain tree species are adapted to venture there. Many steep slopes are too dry for the taller species, some terraces are too dry, some are too wet. Some exposures conserve moisture, but growth is limited by lower temperatures. So, how do we come up with the ideal compromise, in a locale where annual rainfall is high, the decay of hard rock adds minerals, and both steep terrain and second-growth increase competition?

Big Creek seems to offer such advantages. The boulder fields may act as dams slowing the downslope movement of soil moisture, or simply

break the upward wick action of surface evaporation. What seems to be the limiting factor is the age of the second growth stand. One might assume that older specimens might be taller, although windthrow collapse of such slender
verticality seems likely to overtake these stands, overall. That would leave specimens with larger crowns, which would build upward more slowly, by multiple arching.

So, Big Creek probably mimics ideal habitat, but, without ultimate age development, it's difficult to point to such sites as having the most nearly perfect combination of advantages - or should we say, compromises.

Colby Rucker, Jan. 20 2004

SASSAFRAS HABITAT

Dale, in this area, sassafras does well on deep soils - sandy loams, silt loams and loamy sands. It is one of the old field species, like black cherry, black locust, persimmon, red cedar and Virginia pine. Sassafras is absent from wetter sites suitable for the persimmon and red cedar, and is unimpressive on impoverished soils frequented by the black locust and Virginia pine.

Sassafras does very well with pawpaw on deep rich silt loams with a warm exposure, but it is soon overtopped by tuliptree, only persisting along roadsides and fence rows, where it may be mixed with red mulberry, redbud, and hackberry, none of which are common.

On the loamy sands, sassafras appears to persist as the Virginia pine wears out, but cannot compete with southern red oak. Fire is common on such sites, and is probably beneficial for the root-sprouting sassafras.

Overall, it appears the soil must be deep and well-drained. The edge of a fertile pasture above a roadside bank offers conditions for some of the largest specimens. The tallest examples are unusually slender, and usually on the thinner soils, where they have barely outlasted black locust and Virginia pine.

A straight trunk is necessary to reach any height, but I'm unsure that's a given with competition. I once saw two sassafras thickets in a large field, each a colony of root-sprouts from a single specimen. The site was level, and the two groups about 50 yards apart, and not over 30 feet tall. One group was entirely straight trunked specimens, the other had wavy trunks. I don't know which was male or female, or if that ever has a bearing on form. Unfortunately, the entire site has been destroyed.

That sassafras is held to be an indicator of poor soils begs some explanation. I must assume that would be true for sites so challenging that the larger species are absent, and sassafras, by default, is left to eke out an existence, attaining some size due to its exceptional longevity. On the better sites, sassafras owes its presence to the influence of agriculture, and it appears the natural occurrence was once more spotty, as would be the case for black locust and the other "field trees."

Colby Rucker, Feb. 10, 2004

DETERMINING THE AGE OF STREET TREES

Including trees in the cultural history of an area is most rewarding, in that the trees tell much about the past use of the land, whether forest, agricultural, residential, etc., and the cultural aspects of the area tell
much about the use, appreciation, retention, selection and care of the trees.

As one learns more about the area, the life of each tree becomes more apparent. This is a gradual process, and one must avoid the temptation to assign arbitrary ages to trees too freely. Too often, some age, say 350 or 400 years, is assigned to a tree simply because it sounds good, encourages recognition or protection, and increases tourism. In time, that age becomes thoroughly accepted, and the tree's age becomes adjusted as "436 years," or something, as if the first claim were absolute.

I've been asked the age of a tree by many owners of trees, and invariably confuse them by turning my back on the tree and surveying the immediate neighborhood. The first clue to a tree's age is its natural environment and the age of what surrounds it. If it's a non-native, when was the species first introduced? When was the species popular? Why was it planted there? What is the age of the nearby structures? How has the property changed? How have road alignments changed? Did the tree grow in an open pasture, or at the edge of a woods?

Once you know the local history in the time frame in which the tree has existed, the structural form of the tree makes more sense, and you can make some assumptions as to how fast the tree grew. Depending on the species and the competition, the trunk may have been three or four feet thick at age 75, or less than one foot. Twig growth patterns give some idea of how long it's been nearly the same height. Certainly, as Bob says, bark is a useful indicator of age, but it takes a good deal of experience to recognize how bark patterns not only change with time, but are influenced by the immediate environment. How long does it take a black oak to turn white?

Although some trees are undoubtedly very old, it's often surprising how many are recent interlopers masquerading as associates of the early colonists. Enough trees are cut down each year to permit some ring-counting, and anything over a hundred years is unusual. A ring-count of a lower limb can be most revealing. A red oak eight feet thick had limbs 140 years old. A review of old photographs may show the tree as a mere sapling or completely absent. Rehder's manual may show that the species wasn't introduced until later than supposed.

You may find measurements for famous trees, and that may be helpful, but if you find enough measurements, you'll probably find that some of them suggest the tree has been getting smaller, not larger. If the circumference was taken six feet up, that height was probably a guess added later, and circumference may have been calculated by someone pacing the maximum diameter. Still, taking very careful measurements now can tell much about a tree even several years from now, and it's surprising how rapidly your measurements become a record of over fifty years past.

Everything considered, the absolute numerical age of a tree is of little importance. What is important is understanding how a tree can testify to its interaction with its surroundings, both the natural environment and different cultural times. Anything that moves people from their infatuation with mere numbers would open new doors and would be a great step forward.

Colby Rucker, April 28, 2004

THOREAU AND ECOLOGY

Ed, it's best that you have not tried to follow Thoreau. His message is independence of thought, and you must live your life as you see it, and then, perhaps, compare the logic of your approach to what he thought.

Thoreau was an exciting individual. He was much more than a lover of nature. It is useful to also consider Emerson and Jefferson. Jefferson said he was dedicated to opposing all forms of tyranny over the mind of man. Indeed, in New England, the Puritan Church employed a vision of God as a being of personality - a vicious personality - to maintain an iron grip over New England society. My family lived in Salem; at least twenty members were caught up in the witch trials, and my 7x great grandmother was hanged.

There could be no appreciation of nature, no art, literature or poetry that did not serve God. Jefferson would not have survived in New England. The Transcendentalists did not condemn Puritanism, but were daring in displaying a variety of interpretations of God - admittedly at a late date. Emerson deftly raised God from a vicious being of personality to a symbol of perfection, thereby following the teachings of Jesus (embraced by Jefferson) that the role of Man is to get off his knees and become more god-like.

It was a difficult journey, sometimes fostered by happenstance. Without freedom of the mind, there could be no nature, no naturalists, or any of the inter-connected realm of art, literature and poetry inspired by an
appreciation of nature where none had existed before.

To the extent that Thoreau was a founder of Nature, it is important to consider that he got out of Harvard with a classic education, and found that there were no professions acceptable for his inquiring mind. Not a clergyman (which Emerson tried and rejected), not a lawyer, businessman or engineer. Not much was left, so Henry and his brother went into teaching. After the death of his brother, Henry considered writing. It seems that almost no one except Hawthorne had made a go of it. Still, Henry adopted a frugal lifestyle, taking on surveying and various odd jobs, and began to write.

He wrote about the things he knew - nature, the classics, philosophy, and strong feelings concerning the rights of the individual. He felt they were all interconnected; he thought of them that way, and wrote about all of them at once. He demonstrated a marvelous skill as a writer in being able to maintain such a feat of juggling. Sometimes Thoreau confuses us, but his work is painstakingly constructed, and we must not expect mundane simplicity.

Thoreau was not an environmentalist, and I suspect he would have despised the self-satisfied simplicity of their message. Nature is different. Nature cannot be taught. We can encourage others to take a path that will lead to an appreciation of the complexity of a nature which is part science, but includes art, literature and poetry - and so on.

Nature has enjoyed a brief ascendance over those industries bent on mind control - education, religion, environmentalism, politics, advertising, and commercialism, to name a few. Sadly, nature will be destroyed, not at the point of a spear, like competing religions, but by education, and the perpetual enemy - religion. By breaking nature into its basic elements, the education industry may claim to be addressing nature, but a collective mediocrity of is not nature. Nature is not linear, like a textbook. Nature is a complex structure of many elements that attains its magic by being the flowering of a liberated mind.

So, we must appreciate why nature is different - otherwise there will be no liberated minds, and we will face another dark age.

For Jefferson, Emerson and Thoreau, a classic education wasn't enough. It is exciting to see how much they contributed to raising man from his down-trodden position, to where education could come from his own inquiring mind, not "the company line." It's also exciting to see the contributions of Thoreau in combating "all forms of tyranny over the mind of man.

Colby Rucker, September 1, 2004

ESSAYS ON NATURE

Colby B. Rucker

Eastern Native Tree Society

WOODLAND APPRECIATION

There are many compelling reasons why we should protect our small woodlands, good practical reasons: buffers and scenery, aquifer recharge and water quality, air quality and noise reduction, rare plant and animal habitat, and an alternative to development. All those are reasons enough, but there is something more: reasons beyond reasoning, and values beyond value.

In these eastern woodlands there is something special, yet hidden to most. True, there are no sequoias, no rainbow-girded cataracts, no grizzly bears or ancient bristlecones; but these are differences of quantity, not substance. Nature, even the smallest bit of it, provides a broad window, linking us to the tarn and fen, and beck and lea of our far yesterdays, providing truth and beauty for today, and promising a bit of today in a tomorrow beyond our ken.

Life is but the pursuit of knowledge. Through art, music, literature and poetry we extend the limits of our sensitivity and understanding, but these are but imitations of nature. In the study and contemplation of nature itself we are drawn further, toward a sublime unity both real and elusive.

Through our access to nature we may move through progressive levels of understanding. In the defense of the smallest creature is the salvation of the whole, for in preservation we exhibit the highest attributes of our existence, being at one with the theme of creation. Conversely, whatever our wealth, or office, in the unnecessary destruction of one tree we consign ourselves to the Stone Age of intellectual progress.

Though we strive to understand nature, we cannot judge nature; ultimately, it is nature that judges each of us. That we understand all the intricacies of our eastern forests is not essential. What is essential is that each of us respects these areas, and protects them. If we fail, we shall have turned our backs on true progress, and shall have permanently denied a dimension of truth and enlightenment to all who may follow.

HOW TREES AFFECT THE INNER SELF

The study of trees is a journey along many avenues, leading us to that gate which is both the first and the last – the psychological impact of size – how do trees affect our inner selves? It's a wonderful subject, but I hesitate to enter, for it is not something to be taught, but something to be experienced, being the product of our own personal perceptions and expectations. Having said that, perhaps I can share some impressions, which taken together, may strike some common chord.

In winter, the silhouette of distant bare trees against the even glow of sunset is pleasing, but our attention is drawn to some great cluster of limbs, divergent, higher and denser than all its neighbors. Perhaps it is a single tree, perhaps several, perhaps the country seat of some family, now forgotten. It prompts many questions. Above all, it dominates the landscape.

Yes, size is comparative; it dominates, it must have the right presentation, and it must affect our experience and our curiosity. Dominance can be more; it can border on intimidation. In the movie, "Dr. Zhivago," when Yuri bursts out of the woods and sees the locomotive, that is size, and it is intimidating. This is simply to say that different individual trees affect us differently, because we feel that each has a different aura – a different character.

Tuliptrees are large, but they are as benign as their spring foliage – a green so fine, that were it blue, it would be the sky. White oaks are stately, trees of history, but approachable. Black oaks are big and rough, coarse, uncultured, but completely honest. Sycamores are cold, self-centered, boorish, with no refinements – in short, unfriendly. Such feelings affect how we perceive the size of individual trees.

The trunk of a great tree inspires awe; it is like a silo; nearby trees become insignificant. To do this, it must do more than stand on a big stump. It must hold its size as it goes up. In so doing, it is overpowering, like a locomotive. The silvery trunks of great chestnuts did this. There was no crown, and it was not needed. To walk through the woods in the moonlight, among those ancient monuments, was awe-inspiring.

Is it mass that is so dominating, or is it all silhouette? Perhaps the latter is the impact on our animal minds, and mass just the product of education. No matter. If a large trunk forks repeatedly, so that a great concentration of wood occupies much space, it affects us. Though our eyes seek to find their way through, all attention returns to wood. But it is bark – so much of it – which we see. Bark, by its texture, creates feeling. An old white oak limb, endowed with broad overlapping shingles of bark, two hundred years old, commands respect.

So, respect can be part of size. Perhaps trees with large basal hollows seem larger. The silhouette may be the same, but these trunks can surround you, demonstrating their size benignly, yet overpoweringly. And we respect them; no hint of commercial value can enter into it; we respect them for themselves.

Of course, presentation is essential, like art galleries, with walls, lighting and frames. While seeing a great-crowned tree at a distance is one thing, approaching it gradually diminishes impact. It must come upon us, like Yuri and the locomotive. We may know the tree is there, but to be suddenly confronted by its size has maximum impact. I often would stop my truck by a pasture fence, in the shade of a large oak, and suggest that some new employee hop over the fence and see how large the tree was. Most were, at that point, unimpressed, but obeyed. When suddenly confronted by a cylinder thirty feet in girth, they were, without exception, completely overwhelmed.

Height does not always have the same impact. It has less impact on our animal minds. In tall groves there may be an expanse of empty space, and the play of sunlight. This evokes comparisons to cathedrals, which are surely awe-inspiring, so there is less of the primal, more of the artistic. More difficult is how we perceive the individual tree. To follow the broad orange-brown bark plates of a pine gradually upward to a green focal point may be a long visual journey, and we are impressed. In the case of a tuliptree, there are no orange plates, but the journey does not stop so abruptly, and more trunk may be above – and we strain to see it, still expecting another path leading upward. Thus height becomes a journey of anticipation and hope. The more stations the train reaches, and yet continues, the greater the sense of distance.

Of course, a tree approached from downhill has the presentation advantage of being elevated – like the Statue of Liberty. Perhaps equally effective is the act of climbing, of physical effort – to reach even the lowest part of something larger than ourselves. This is where the sense of height takes on the aspects of dominance and even intimidation.

The matter of spread is different. Although, in my first example, the dominance of oak limbs against an evening sky concerns the crown of the tree, the effect comes from the visual density of standing wood. From under a tree, a great leafy umbrella may be cool and inviting, and if large enough, noteworthy. Our recognition of size seems to come from a visual calculation of the distances and enclosed space involved, not from any psychological effect different from that of a more modest tree. Individual limbs, if heavy and horizontal, may inspire awe, but much less so if they rise at an angle.

In summer, spread is welcome and inviting. In winter, it is all different, and a low spreading crown impresses us with its innumerable branches, limbs and twigs, all competing for our attention, so that the winter sky is forgotten, and only the cold wind intervenes. The rougher the bark, and the more thoroughly the limbs are clothed in small twigs, the greater the impact.

Bare sycamores, like red maples and beeches, long for a blue winter sky; or better, for a dark ominous sky as a cold front approaches, and sunlight still illumines their structure. Sycamores are the thing of Victorian oil landscapes, with cattle and horses standing by broad rocks and gentle brooks. It is all light and color; size has no part in it.

Our perception of tree size can be focused downward, where twisted roots are the inspiration of storybook illustrators. Beechen roots, and trunks, short, twisted and well twigged, are the stuff of enchantment, with elves and pixies galore. It is the twigged trunk that holds our attention downward. There is a painting of skirmishers in the Battle of the Wilderness - a man firing from the base of an old white oak, and a dead limb holds our attention downward, to the deadly thickets.

So, finally, tree size comes down to what we are, ourselves. Hopefully, there is a bit of the child still in us. In the woods, we may recapture some of that world, where most trees seem huge, with contours like storybooks, thick-barked and ancient, and there is still the shadow of the unknown. Great trees can bring this back, and we may be both intimidated and enchanted.