The ORR NERP's Mesic Natural Area—Primeval Forest?

Report to Pat Parr, Manager of DOE's Oak Ridge National Environmental Research Park
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Belowground Forest Research

Introduction

Description and Location

The Department of Energy's (DOE) "Mesic Natural Area" (MSN) is located in the northeast portion of its Oak Ridge Reservation (ORR) and is part of DOE's Oak Ridge National Environmental Research Park. The natural area encompasses on its north end approximately 25 acres of unique old-growth deciduous forest. This particular portion of the MSN is unique in the size of its overstory trees, the species composition of those trees, the forest floor flora, and the apparent lack of prior human disturbance.

The MSN is approximately one-half mile south of the bridge over East Fork of Poplar Creek on State Highways 95/58. The area is on the southwest side of a perennial stream that runs parallel to and ~100 yards from an ORR "boundary patrol road" and fence that separate the ORR from private land and residential areas (principally Country Club Estates in Oak Ridge), and it is immediately adjacent to a TVA power line. (MSN is on the southwest side.) The forest is growing on a steep (approximately 30% slope) northeast-facing slope, which gives it minimal exposure to midday and afternoon sun and, hence, a moist microclimate.

Objectives

Objective of this report was to obtain a preliminary estimate of the age of the trees in the old growth portion of the MSN and to make other observations regarding prior disturbance of the area. A principal goal was determine whether the area might be one of the few significant (only?) examples of "primeval forest" (i.e., never logged or otherwise disturbed by European settlers) remaining in the Ridge and Valley Province of Tennessee.

Methods

In order to estimate the age of this uneven-aged stand, wedges of wood were cut from two trees that had been uprooted by high winds in recent years. One tree was a shagbark hickory (*Carya ovata* [Mill.] K. Koch) that appeared to have been uprooted in the past year. This tree had been one of the smaller overstory trees in the area (only ~ 60 cm diameter at breast height [DBH]), but size is often not a good indicator of age. The second was a northern red oak (*Quercus rubra* L.) that appeared to have been uprooted about 5 years prior to this study.

A wedge was removed from the hickory with a chain saw at approximately 2.5 m above the original ground level. Making a lower cutting was made difficult by the

position of the tree. The wedge penetrated to the center of the tree but a very small (1.5 cm diameter) circular center core was lost. A wedge was also removed from the northern red oak at approximately 9 m above the original ground level. An attempt to cut lower on the red oak revealed that the tree's center was rotten near its base and therefore of no use for dating at that height. Hence the cut was made higher on the tree where the wood in the center was sound.

The forest was also examined for evidence of prior disturbance by man, such as: (1) signs of skid trails made by dragging large tree boles down steep slopes via horse or mule; (2) signs of old stumps from logging; (3) signs of disturbance by logging activity of very old, large mounds created by wind blow-downs (i.e., those with no wood or humus apparent below them); and (4) signs of previous carving on many of the large American beech trees (*Fagus grandifolia* L.), which maintain signs of such marking centuries later.

Results

The shagbark hickory contained 203 (+/- 5) tree rings, not including the 1.5 cm diameter central core. Judging from the size of the rings immediately surrounding this core, it was estimated that an additional 10 rings were contained therein. As a slow-growing shagbark hickory tree in a well-shaded mature forest, this tree could have taken from 10 to 50 years to reach the height at which the wedge was secured. Conservatively assuming this tree took 15 years to reach a height of 2.5 m, we estimate that this tree was 228 years old.

The northern red oak contained 121 tree rings. As a moderately fast-growing species (relative to shagbark hickory) growing in the understory, we assumed that the tree took approximately 30 years to reach a height of 9 m. This assumption would place this tree at approximately 155-years-old.

None of the four types of signs of prior disturbance described above in "Methods" were observed anywhere in the portion of the old-growth forest we traversed. Furthermore, the forest appeared to a very healthy old-growth forest by virtue of the paucity of trees with thinning crowns or signs of disease and the small number of recent dead and decaying trees on the ground (mostly only a few blow-downs).

Discussion

The age of the shagbark hickory (~230 years) indicates that this forest has probably been undisturbed at least since about 1775. Since this area of Tennessee was virtually unsettled until after 1800, it appears highly likely that this stand is a "virgin" stand. The hickory tree measured was one of the smaller trees in a dense stand with numerous trees of greater height and diameter, including quite a few American beech and sugar maple trees with DBH's of 1 to 1.3 m.

Other evidence that this forest has not been disturbed by western settlers is the species composition of the overstory and the size of some of the species not commonly found in the overstory in forests of the Ridge and Valley of Tennessee. Very large overstory specimens of yellow buckeye (*Aesculus octandra* Marsh.), cucumber magnolia (*Magnolia acuminata* L.), black walnut (*Juglans nigra* L.), and black tupelo (*Nyssa*

sylvatica Marsh.) are generally found in eastern Tennessee only in old growth stands in the Great Smoky Mountains National Park and in certain coves of the Cumberland Mountains. Also, the very large specimens of shagbark hickory, northern red oak, American beech, and sugar maple (*Acer saccharum* Marsh) are indicative of a climax deciduous cove forest. Finally, the fact no other evidence of human disturbance was found supports the assessment that this forest has not been significantly disturbed by man since settlement of this continent by Europeans began.

Recommendations

The findings in this report would seem to support four primary follow-up actions:

(1) further steps to obtain permanent protection for this unique forest;

(2) further data collection to better establish the age of this forest and its past land-use history and ownership and to delineate its boundaries and an appropriate buffer area;

(3) compilation of data from prior documentation of the species composition of this forest at all floral levels, as well as obtaining additional up-to-date data collection of the same; and

(4) promotion of future use of the forest for recreation and/or research.

Permanent protection from current and future threats

At this time this area is not even an official Tennessee State Natural Area of any kind. Furthermore, there have been in the past (and continue to be at this time) repeated efforts by the City of Oak Ridge (COR) to get DOE to pave the small gravel "patrol road" adjacent to the forest. This fact, coupled with recent efforts by COR to obtain nearby areas of land from DOE for residential development, would seem to place this area and its surrounding essential buffer forest under some threat of development. Even if this area were not truly "virgin," this is clearly one of the finest (if not the finest) example of a healthy climax old-age deciduous forest in all of the Ridge and Valley Province of Tennessee and should be protected for its various values to the public.

Additional forest age documentation

The measurement of additional trees—most easily done by coring—should be undertaken to supplement the findings of this preliminary report. It will probably be necessary to purchase an extra-long tree corer to accomplish this task on some of the trees with DBHs of more than 1 meter. Research into the ownership of this land by deed searches and other means may reveal something about its past land use history. In order to make protection of the forest possible, delineation of the boundaries of the old-growth portion of the entire MNA is essential. Equally important would be a determination and delineation of the amount of buffer area needed to maintain its integrity.

Documentation of species composition

In the summer of 1975 permanent plots were established throughout the MNA, including this old-growth portion, as part of the establishment of ORR's National Environmental Research Park. In these plots were measured the basal area at each point, as well as the species and the DBHs of every tree in the overstory and understory. Compilation of these data would be very useful in description of the forest in efforts for permanent protection. Re-measurement of the plots (or establishment of new plots, if the old ones cannot be located) is recommended at this time, since it has been almost 30 years since that original measurement. Also of great value in describing the forest for permanent protection are the descriptions of the vegetation of the forest floor contained in a Masters Thesis by Linda K. Mann, compiled in the late 1970's. The native wildflower composition of this forest may be as unique as its overstory floral composition.

Possible future uses of the protected forest

This forest has high potential for future research or recreational use or both. Opportunities for research on climax forests in the Ridge and Valley Province are virtually nonexistent. The site is particularly valuable because of its prior data base from the 1970's that allow measurements of change during the past 25-30 years. Another possible use is the establishment of hiking trails through the area to allow local residents and other citizens to experience this very unique example of what cove forests in this region would have looked like prior to European settlement. Of course, to achieve this recreational use, access to the area would have to be obtained from DOE and trails established. Furthermore, potential conflicts between recreation and protection and research would obviously have to be dealt with.

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