A history of Noe Woods : interpreted from the structural organization of the trees and shrubs. 1965

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Noe Woods

The University of Wisconsin Arboretum

This field book is dedicated to Mrs. Jean Otto who loved the Arboretum and visited it often.

Mrs. Otto had a deep appreciation and understanding for the natural world and readily transmitted it to those who knew her. For her each season brought its own delights; migrating birds, colors of fall, the stark beauty of bare branches against the winter sky, the tender wild flowers poking through soft earth in spring, and lush green of summer–all were part of the rhythm of her life.

We hope that those who use this booklet will gain a deeper feeling and understanding of the natural world thereby making this a suitable memorial for Jean Wilson Otto.

A HISTORY OF NOE WOODS

Leach

Interpreted from the Structural Organization of the Trees and Shrubs

The 30 years of land acquisition and development in the Arboretum have produced a complex but interesting historical record. It is no more remarkable, however, than the historical record of forest development made available by intensive study of the wooded communities. Several aspects of the history of Noe Woods emerged as part of a study carried out by Mr. Goff during his term as Arboretum botanist.

There are several steps in the analysis of a forest such as Noe Woods for its historical record. First, one recognizes that many of the past disturbances were patchy, but large enough to create imprints. These provide a continuing record of events right up to the present, and are to be expected in small irregular "pockets," a mosaic of microstands which collectively make up the woods. When aerial photographs of Noe Woods are viewed stereoscopically, the vegetation forms such a mosaic. The pattern is equally apparent to an observer on the ground.

To examine the historical record from these disturbance imprints, the second step requires stand delineation at a size consistent with the smallest units in the mosaic. Careful mapping from the aerial photos and on the ground resulted in 45 mosaic units ranging from one-half to two acres in extent within Noe Woods. Twenty of these were sampled in detail for the material presented in this report, while an additional eight stands were established in the adjacent Grady Woods south of the Beltline.

The data collected were similar to that obtained in most of the other studies carried out by the Plant Ecology Laboratory at The University of Wisconsin. Five concentric-circular sample plots were placed within each stand. In this study, emphasis was placed upon the number of stems representing different size classes of trees. A detailed record was made of the saplings and seedlings, also by size classes, and of the numbers and sizes of the shrubs.

One of the most obvious results is that the 20 stands in Noe Woods form a gradient in species composition from stands dominated by black oak (Compositional Index about 800) to stands dominated by elm and butternut (C. I. about 1450). The latter example is somewhat extreme, for the major part of the gradient runs from stands of black oak to stands that are mostly white oak. Only a few are dominated by the more mesic species that appear to be replacing the oak. In the middle of the gradient is the usual mixture of white oak and black oak that we think of as being Noe Woods.

Thus there is represented on a small scale in Noe Woods a significant segment of the compositional gradient that we see in the southern Wisconsin landscape. The question, as in the southern Wisconsin landscape, is now: How much of the variation along the gradient is attributable to disturbance and is therefore likely to disappear within the life cycle of the oaks, and how much is attributable to physical environmental differences?

Some of the evidence needed to answer this question actually is available from the changes in composition that are represented within the Noe Woods samples themselves. It is possible to calculate a compositional index, first for the overstory trees, second for the stratum slightly younger and lower in the canopy, and so forth, continuing to the calculation of a compositional index among the smaller saplings. Instead of measuring the height of every stem to determine its canopy position, a similar result can be obtained by using diameter size classes of the trees. In this study, eight size-class strata based on stem cross-sectional area were used, four in the tree stratum and four among the saplings. A chart showing the Compositional Index for each of the eight strata in sequence can be

thought of as a compositional profile of the stand. While such a profile actually depicts changing composition with size, it is closely related to changes in time, and hence is representative of the vegetational history.

Where changes are taking place, an index close to 1400 is typical of the sapling strata, substantially higher than the C. I. of the overstory. On the other hand, stands in which there is no evidence of major compositional change are characterized by having approximately the same Compositional Index all the way down through the canopy into the reproduction layer. The data from this study show that a few of the stands in Noe Woods have little evidence of change taking place, while others appear to be changing very rapidly indeed. Some of the understory saplings now present may not survive to form a future stand, but on the basis of the overall differences in composition between overstory and understory, one must conclude that change is taking place. The essential feature of the change is from a relatively uniform dominance by one or another oak species, to a mixed pattern of oaks, elms and butternut, depending on the topography and soil drainage.

However, the most interesting results of this study show that not all of Noe Woods originated at one time. Several parts of it are dominated by white oaks of large diameter and wide-branched low crowns that probably date from a time when prairie fires raced through the thin grass between the trees. Other parts of the woods appear to have been clear-cut for fuel wood about the turn of the century. This is most apparent in the north half of the woods, adjacent to McCaffrey Drive, where the overstory stems are nearly all small in diameter. In addition, the stems frequently originate in groups, indicating the survival of several sprouts. At the base of some of these clumps, one can find the remains of a cleanly sawn stump.

The cutover stands were particularly obvious in the analysis of data and prompted the separation of several groups of stands within the woods. The two most important groups have been called "cut" and "uncut." The uncut stands are characterized by the presence of trees of very large size, specifically having the basal area of the two larger tree-size classes substantially greater than the basal area in the two smaller tree-size classes. The reverse holds for the stands that were cut. Designation of these groups as simply "cut" and "uncut" is an oversimplification, however, for there is some evidence of light selective cutting throughout Noe Woods, and probably no part of it is literally "uncut." An occasional larger tree can be found within the so-called "cut" stands. Nonetheless, this early disturbance of the woods has left a strong, recognizable imprint today, and is a major influence on the present trends toward change.

One of the important changes in the present vegetation that can be attributed partially to the cutting is taking place within the understory shrub cover. It is very difficult to describe shrubs quantitatively because of their diverse growth forms and irregular stocking. In this study, an index of shrub importance was developed to include measures of shrub density as well as basal diameter and height. Taking all the shrub species together, the index shows an initial rise in the importance of shrubs from stands of low C. I. (primarily in the Grady samples), reaching a peak near C. I. 700, and declining in the more mesic stands.

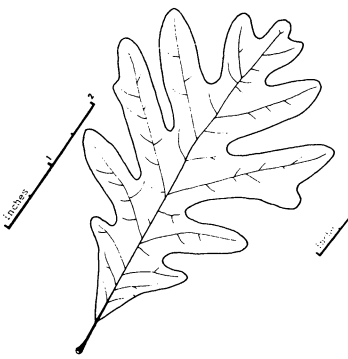
There are also significant differences in shrub development between the cut and the uncut groups of stands. In both groups there is a general trend for a decreased importance of shrubs where there is a high overstory tree basal area. This is a strong relationship in the uncut group of stands, with few samples having abnormally high shrub cover. In the stands that were cut, however, there is slight relationship between overstory basal area and the shrub importance, and

the overall importance of shrubs is very much greater. The mean shrub value in the uncut stands is 93, while that of the cutover stands is 133, indicating effectively 50 percent larger and more numerous shrubs persisting in the disturbed portions of the woods.

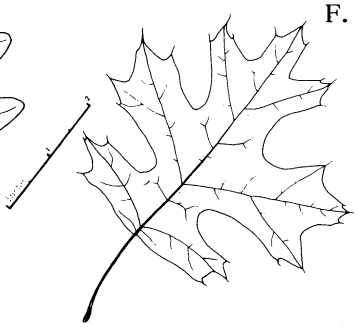
Finally, there are stands in which very little oak remains, designated the "non-oak" group. There is no direct evidence that the oak was removed either by cutting or by an early attack of oak wilt disease, but the stands are the youngest and the sites are more mesic than the remainder of Noe Woods. Disease may have invaded more rapidly or there may have been a somewhat different composition in these stands from early times. Right now the largest trees are no more than 40 to 45 years old. The overstory composition is varied, but two important species are butternut and elm, with box elder as the leading sapling species. The understory shrub composition is also very different from the remainder of the woods, with elderberry, gooseberry and nannyberry as the most prominent species.

At the other extreme in the age gradient of stands in Noe Woods is the area of open-grown white oak and bur oak that forms an oak-opening grove in the hollow on the east side of the woods. This stand has only recently been weeded of a complete cover by Tartarian honeysuckle so did not qualify for sampling. The shrub cover may have prevented any previous growth of understory saplings, but the result now is that the grove has all the characteristics of the earliest stages in the development of Noe Woods, except for the absence of prairie grasses in the understory. With special care, it may be possible to maintain this remnant of oak-opening in Noe Woods so that as changes proceed elsewhere in the woods, we can continue to have the complete spectrum of dry-mesic oak forests within a short distance along one of the Arboretum trails.

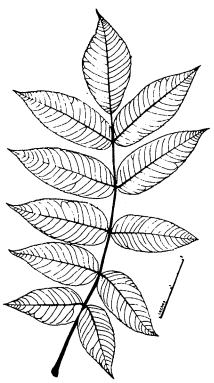
O. L. Loucks
F. Glenn Goff
1965



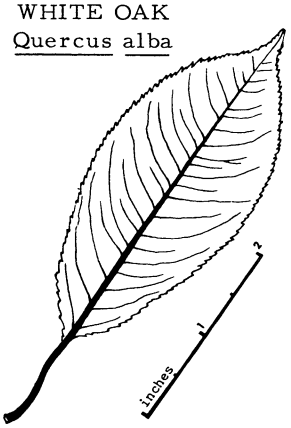
WHITE OAK
Quercus alba



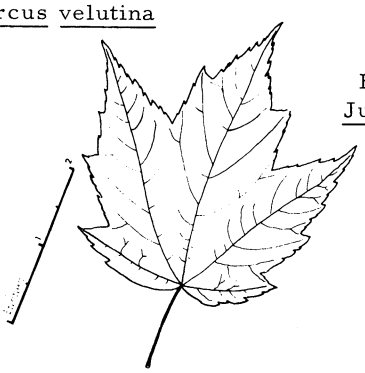
BLACK OAK
Quercus velutina



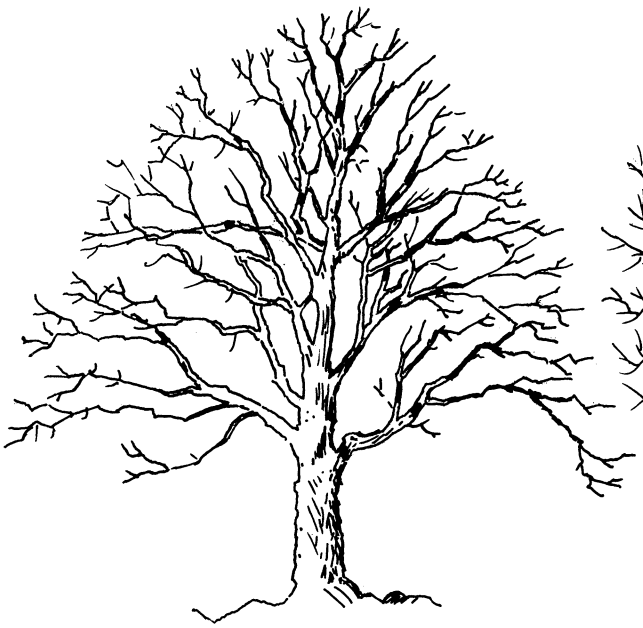
BUTTERNUT
Juglans cinerea



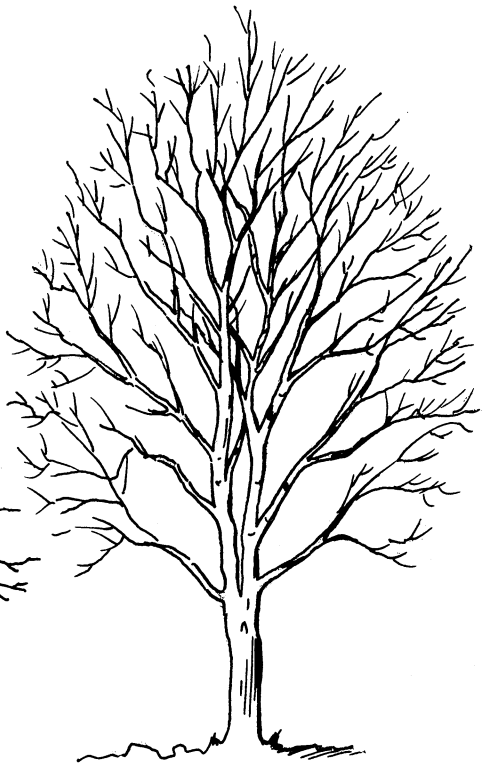
BLACK CHERRY
Prunus serotina



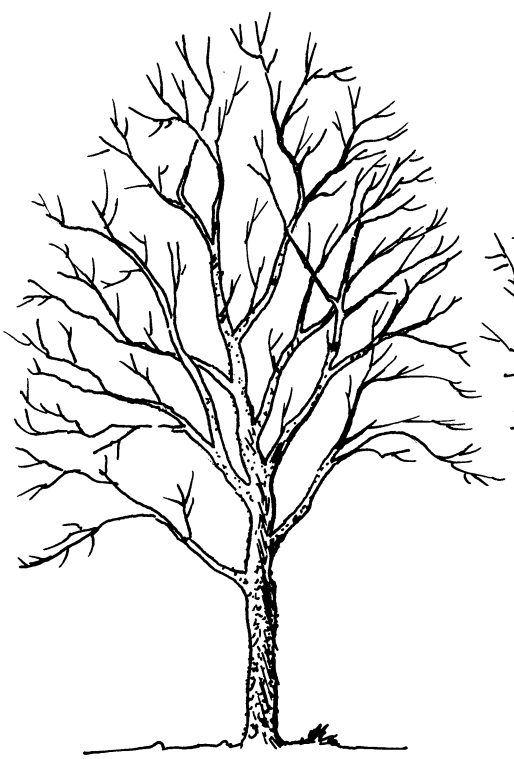
RED MAPLE
Acer rubrum



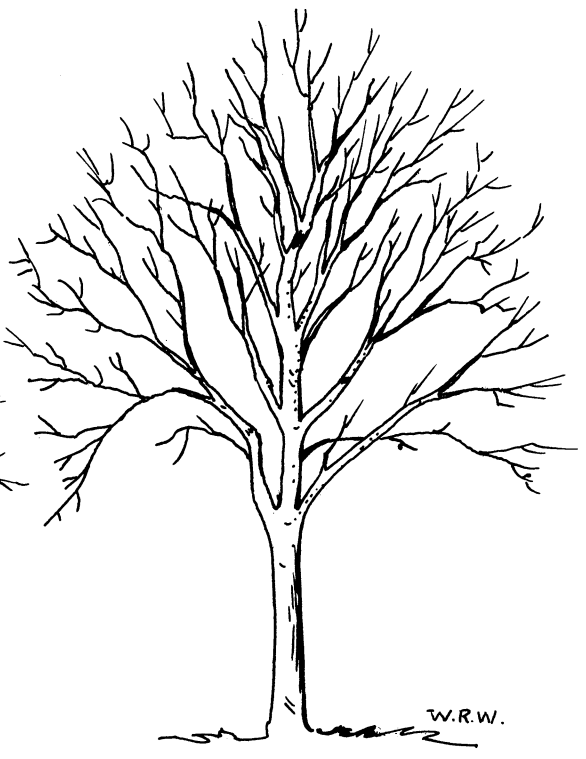
WHITE OAK



RED MAPLE



BLACK CHERRY



BUTTERNUT