WOODY VEGETATION OF BABER WOODS: COMPOSITION AND CHANGE SINCE 1965[1]

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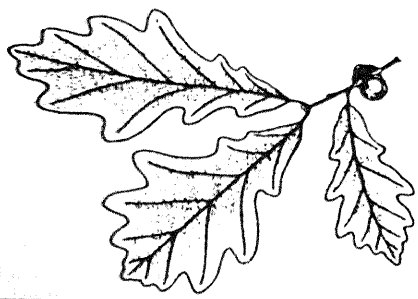

ABSTRACT.--A study of the woody vegetation changes at Baber Woods, Edgar County, Illinois since 1965 was completed in 1983. The present stand consists of 112.8 stems per acre and a basal area of 117.0 sq. ft. per acre. Sugar Maple (I.V. of 51.9) has replaced white oak (I.V. of 48.8) as the dominant species. Minor changes have occurred in other tree species, but most have maintained their importance since 1965.

INTRODUCTION

Baber Woods is a 51 acre woodlot located about 5 miles NE of Westfield, Edgar County, Illinois, and the remnant of the forest which once occupied most of the Shelbyville, Moraine, the terminal moraine of Wisconsin glaciation. In 1835, the Baber family purchased a small section of this timber and by 1894 had obtained the entire 51 acres. At this time the family used the woodlot as a source of wood for fencerails, lumber, and firewood. However, most of the woodlot was left undisturbed except for a small three acre section around two small cabins in the SW corner. Since 1898, the woodlot has been relatively undisturbed with no further cutting of trees. Furthermore, the woodlot has not been grazed during the history of ownership by the Baber family. In 1969, Baber Woods was acquired by The Nature Conservancy and leased to Eastern Illinois University as a nature preserve for educational and research purposes. The original survey of woody vegetation was undertaken in 1965 (McCalin and Ebinger, 1968). The present study reports the results of a second survey and species changes since that time.

DESCRIPTION OF THE WOODLOT

The topography of Baber Woods (NW¼ Sec 18 T12N R13W, Edgar County, Illinois) is gently rolling, ranging from 755-800 feet above sea level. The woods is relatively well-drained with no standing water even during wet periods.

Three distinct vegetation types occur in the woods (McClain and Ebinger, 1968). A sugar maple dominated stand occurs in the west and northwest parts of the woodlot where the relative dominance of this species exceeds 30%. In the southwest corner of the woodlot where two cabins once stood the forest is primarily elm, white ash, hickory, and sugar maple. The third type consists of the majority of the woods which contains many large oaks and hickories.

METHODS

Survey and analysis procedures follow those of McClain and Ebinger (1968). The woodlot was divided into quadrats 50 m on a side (0.6177 acres), and the number, size, and species of all trees four inches dbh and over were recorded. Dead-standing trees were also measured and identified. Frequency, relative density, relative dominance, and importance value of each species were then calculated. The determination of the relative values follows the procedure outlined by McIntosh (1957) and later Boggess (1964) in which the Importance Value (IV) is calculated as the sum of relative density and relative dominance.

In each of the larger quadrats, four .01 and .001 acre nested circular plots were randomly located. Saplings (1-4 inches dbh) were tallied on the larger and seedlings (less than 1 inch dbh) on the smaller plots. Nomenclature follows Mohlenbrock (1975).

RESULTS AND DISCUSSION

A total of 33 woody species were encountered on the woodlot, of which 12 were understory trees and shrubs. The leading dominants encountered, with their frequencies and number of seedlings, saplings, and trees per acre are given in Table 1, while the number of trees per acre in broad diameter classes, basal areas per acre, relative values, and average

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[1]A paper presented at The Central Hardwood Forest Conference held at Urbana, Illinois on April 15-17, 1985.

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TABLE 1.-- Individuals per acre and frequencies of seedlings, saplings, and trees at Baber Woods from the 1983 survey, and the individuals per acre from the 1965 survey completed by McClain and Ebinger (1968).

Scientific Name	Common Name	Seedlings (less than 1" dbh) 1983 #	Seedlings 1983 %	Seedlings 1965 #	Saplings (1"-4" dbh) 1983 #	Saplings 1983 %	Saplings 1965 #	Trees (4"+ dbh) 1983 #	Trees 1983 %	Trees 1965 #
Acer saccharum L.	Sugar Maple	2421	67	5369	294	82	143	40.5	100	27.0
Quercus alba L.	White Oak	32	2	315	--	--	1	16.6	97	20.6
Carya glabra (Mill.) Sweet.	Pignut Hickory	175	15	450	1	1	--	9.8	97	12.2
Quercus velutina Lam.	Black Oak	32	4	188	1	1	2	4.8	86	8.0
Fraxinus americana L.	White Ash	266	19	5173	7	6	46	9.7	76	9.4
Quercus rubra L.	Red Oak	12	1	42	1	1	--	3.0	76	2.2
Ulmus rubra Muhl.	Slippery Elm	3873	70	3873	70	33	84	9.0	83	7.3
Carya ovata (Mill.) K. Koch.	Shagbark Hickory	16	1	457	3	2	3	4.4	89	7.9
Carya cordiformis (Wang.) K. Koch.	Bitternut Hickory	194	15	350	2	2	7	2.8	37	1.9
Ulmus americana L.	American Elm	20	6	--	5	2	--	3.3	57	--
Juglans nigra L.	Black Walnut	--	--	8	--	--	--	1.2	44	2.9
Sassafras albidum (Nutt.) Nees.	Sassafras	302	10	227	3	3	9	2.2	44	2.7
Celtis occidentalis L.	Hackberry	76	7	39	1	1	2	1.5	30	.9
Other trees		680	--	1645	28	--	45	4.0	--	4.3
Shrubs and vines		1513	--	3249	--	--	--	--	--	--
Totals		9612		21385	416		342	112.8		107.3

diameters of these species are shown in Table 2. Also included in these tables are some of the totals for the 1965 study conducted by McClain and Ebinger (1968). Of the species not listed, all are common understory trees and shrubs of the region, or tree species that are generally of minor importance in upland forests of central Illinois. All are listed by McClain and Ebinger (1968).

Many changes have taken place since the 1965 survey, most involving the importance value and ranking of some of the species. Another change is in the number of individuals per acre, increasing from 107 stems per acre in 1965 to 112.8 in 1983. This increase is largely the result of an increase in the number of individuals in the 4-6 inch diameter class (36.6 stems/acre in 1965 to 43.7 stems/acre in 1983). Basal area per acre has also increased from 101 sq. ft. per acre in 1965 to 117 sq. ft. per acre in 1983.

Of the woody species encountered in Baber Woods, sugar maple has the highest importance value, and also the highest frequency and relative density. It ranks second in the number of seedlings per acre, first in saplings per acre, and dominates the 4-6 and 7-12 inch diameter classes (Tables 1 and 2). This species has increased from second to first in importance in the woodlot, and has almost doubled in trees per acre. It appears that sugar maple has been increasing steadily over the past few years, and will probably continue to do so. The large number of maple seedlings and saplings per acre, and their high frequencies suggest a continuation of this trend. Also, the quick response of this highly shade tolerant species to canopy openings will probably result in its continued increase.

White oak has the second highest IV because of its high relative dominance as indicated by its average diameter of 19.7 inches. It is poorly represented in the smaller diameter classes (Table 2), and is not well represented in the seedling and sapling categories (table 1). The future status of white oak appears to be one of decreasing importance as the inevitable mortality of the veteran trees continue. Also, the number of white oak seedlings has declined drastically (Table 1). This decrease is probably due to canopy closure and the inability of white oak seedlings to tolerate shade.

The importance of black and red oak is due to their high relative dominance, as indicated by large average diameters of 21.0 and 22.1 inches respectively. Both species rank very low in seedlings and saplings per acre (Table 1), and have very few individuals in the smaller diameter classes. Black oak has maintained its position as fourth in importance mainly due to its density in the larger diameter classes. However, since 1965 the mortality of this species has increased from 0.7 stems/acre to 1.5 stems/acre. Also, the average diameter of this species has increased from 18.8 to 21.0 inches since 1965. Though red oak has increased from eighth to sixth in importance since 1965, its situation is similar to that of black oak. It has poor size class distribution, with most individuals in the larger diameter classes, and relatively high mortality. As a result, it appears that both species will ultimately decrease in importance in the woods.

The hickories have either maintained their position in the woodlot, or have undergone minor changes. Pignut hickory still ranks third in IV, shagbark hickory has decreased from fifth to eighth, while bitternut has increased from tenth to ninth. In general, the number of seedlings and saplings of these species have declined, and except for bitternut hickory, have declined in all diameter classes as well as in density. The small increase of bitternut hickory in the smaller diameter classes is mostly due to the increased importance of this species in the disturbed area.

TABLE 2.-- Basal areas per acre, diameter classes, relative values, importance values, and average diameters for the leading dominants at Baber Woods. Also included are the basal areas per acre and the importance values for the study completed in 1965 by McClain and Ebinger (1968).

Species	Number of trees per acre by diameter classes					Basal areas per acre		Rel. Den.	Rel. Dom.	I.V. 1983	I.V. 1965	Av. Diam. in.
	4-6	7-12	13-18	19-24	25+	1965	1983					
Sugar Maple	20.5	14.5	4.6	.8	.1	10.9	18.4	36.1	15.8	51.9	35.7	8.2
White Oak	.6	2.2	4.8	5.6	3.4	34.9	39.7	14.8	34.0	48.8	54.2	19.7
Pignut Hickory	.1	1.3	5.0	2.9	.5	15.9	17.4	8.6	14.9	23.5	26.9	17.6
Black Oak	.3	.5	.8	1.5	1.7	15.6	13.3	4.3	11.4	15.7	22.0	21.0
White Ash	5.4	3.6	.4	.2	.1	3.1	4.5	8.7	3.8	12.5	12.0	7.9
Red Oak	.2	.4	.5	.6	1.3	6.5	9.6	2.7	8.1	10.8	8.2	22.1
Slippery Elm	7.0	1.8	.1	.1	--	1.7	2.2	8.0	1.9	9.9	8.5	6.2
Shagbark Hickory	.6	1.5	1.7	.6	--	6.6	4.5	3.7	3.9	7.6	14.4	13.2
Bitternut Hickory	1.5	.8	.3	.2	--	1.6	1.7	2.5	1.4	3.9	3.3	8.9
American Elm	2.5	.8	--	--	--	--	.7	2.9	.6	3.5	--	5.9
Black Walnut	--	.5	.4	.2	.1	2.0	1.5	1.0	1.3	2.3	5.0	14.8
Sassafras	1.7	.5	--	--	--	.4	.5	1.9	.4	2.3	3.0	5.8
Hackberry	1.0	.4	.1	--	--	.1	.5	1.3	.3	1.6	1.0	7.1
Other trees	2.3	.8	.5	.3	.1	1.5	2.5	3.5	2.2	5.7	5.8	--
Totals	43.7	29.6	19.2	13.0	7.3	100.8	117.0	100.0	100.0	200.0	200.0	

The importance of white ash has increased slightly in the woods, changing in rank from sixth to fifth. This species ranks third in individuals in the 4-6 and 7-12 inch diameter classes with most of the increase occurring in the disturbed area. The number of seedlings of this species has drastically decreased since 1965 (Table 1). This trend is probably due to the drought conditions that existed during the summer of 1983 when the survey was completed. Almost no first year seedlings of this species were found, while they were common during the 1965 survey. Also, this drought is probably responsible for the reduction in the number of seedlings of most species observed during the present survey.

Both slippery and American elm are well represented in the smaller diameter classes. These species are fairly shade tolerant, and would probably be more important components of the woodlot if it was not for their high mortality from phloem necrosis and Dutch Elm Disease.

The present survey indicates that Baber Woods is changing from a prevailing oak-hickory-dominated forest to one in which sugar maple is the most important constituent. The large number of seedlings and saplings of this species indicates that it is an extremely aggressive taxon that will probably increase in importance. Also, its high gap phase replacement potential will enable it to take advantage of canopy openings that occur when the veteran trees die.

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