WOODY VEGETATION SURVEY OF SARGENTS WOODS, COLES COUNTY, ILLINOIS

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ABSTRACT.—An inventory of the woody vegetation of Sargents Woods, Coles County, Illinois, shows that the present stand is composed of 139 stems per acre (above 4" d.b.h.) with a basal area of 90 square feet per acre. Thirty-seven woody species are present on the site, with white oak being the leading dominant. White ash, red oak, shagback hickory, black oak, and slippery elm followed in order of Importance Value Index. Three broad cover types are recognized on the woodlot. These are a mixed hardwood region, comprising most of the woods, which is dominated by various species of oaks and hickories; a small region dominated by sugar maple; and three small disturbed areas, one formed by recent cutting and two by past home sites.

Sargents Woods is a 25-acre woodlot located about 12 miles southeast of Charleston, Coles County, Illinois, and represents a remnant of a much larger forest that once occupied most of the Shelbyville Moraine. This woodlot was once owned by Paul Sargent, a local artist and amateur naturalist, who maintained the woods in a natural state until his death in 1946. At that time the woods was deeded to the Sam Sargent family, who owns the land at the present time.

The woods has not been grazed during its ownership by the Sargent family and the only major disturb- 172 oaks were cut for lumber. Some ance occurred in 1948, when about of these trees were scattered throughout the woodlot, but a large number were removed from a small area on the south side of the woods. Many of the stumps are still evident and most of the trees averaged 1 to 2 feet in diameter.

The only previous ecological work in the woodlot was conducted by various ecology classes from Eastern Illinois University that made a few line-transects through the woods. The first complete inventory of the vegetation was done in 1966, and the results are presented in this paper. Results of a similar study in Baber Woods, another remnant of a forest located on the Shelbyville Moraine, were reported previously by McClain and Ebinger 1968. The taxonomic nomenclature used in this paper follows that of Jones (1963).

DESCRIPTION OF THE WOODLOT

Sargents Woods is located in the SW¼, NW¼ of Section 11, T11N, R 10E, Coles County, Illinois, which is at the southern edge of the Shelbyville Moraine that traverses this part of the state in an east-west direction. The topography is gently rolling, with a maximum difference in elevation of about 40 feet. The woodlot is well drained by two small, intermittent streams which extend in an east-west direction through the woods. In a few places these streams

have cut steep banks 30 feet tall. Between the streams is a relatively flat ridge. A farm road extends along the ridge to the southeast corner of the woods where the Sargent house is located.

Method of Study

The entire woodlot was divided into 50 meter square blocks (0.61776 acre), and the number, size, and species of trees were recorded in each. The diameter of all trees having a d.b.h. of more than 4 inches was recorded to the nearest 1/10 inch. Dead-standing and dead-downed trees were also measured and identified when possible. The Importance Value Index (IVI) was then calculated from the actual data to provide a better basis of comparison of the various species. As used here, the determination of the IVI follows the procedures outlined by McIntosh (1957) and later by Boggess (1964), in which the IVI is the sum of the relative density $\left(\frac{\textit{number of individuals of a species}}{\textit{number of individuals of all species}} \times 100\right)$ and of the relative dominance $\left(\frac{\textit{Basal area of a species}}{\textit{total basal area of all species}} \times 100\right)$. The IVI was also calculated for each plot to determine if different vegetation zones existed in the woods.

In each 50 meter block, four 1/100 and 1/1000 acre nested, circular quadrats were randomly located. The saplings (1 to 4 inches d.b.h.) were tallied on the larger plot and the seedlings on the smaller. The seedlings were divided into those under one foot in height and those over one foot in height but less than one inch in diameter.

Results and Discussion

A total of 37 woody species were encountered on the woodlot, of which 17 were understory trees and shrubs. These species, along with their density and frequency by height or diameter class, appear in Table 1. The species symbols will be used to identify the species in subsequent tables and figures. An additional listing of the 10 leading species encountered, with their relative values, average diameters, number of trees, and basal area per acre broken down into broad diameter classes, are included in Table 2.

Three broad cover types have been recognized on the woodlot (Figure 1). These are: 1) three small disturbed regions, one on the east, one on the south, and the other on the west edge of the woodlot; 2) a mixed hardwood region, comprising most of the woods, in which various species of oaks and hickories are dominant, and 3) a sugar maple dominated region. In the three disturbed areas, the important species are white ash, slippery elm, and black walnut. In the mixed hardwood region, white oak is the leading dominant and usually has an IVI per

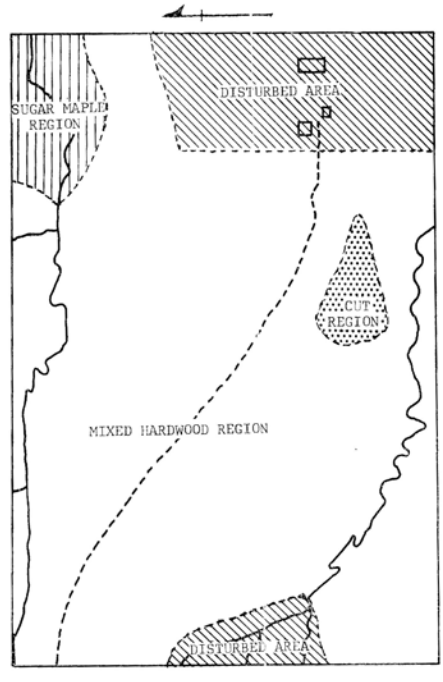

Figure 1.—Map showing the distribution of the broad cover types in Sargents Woods.

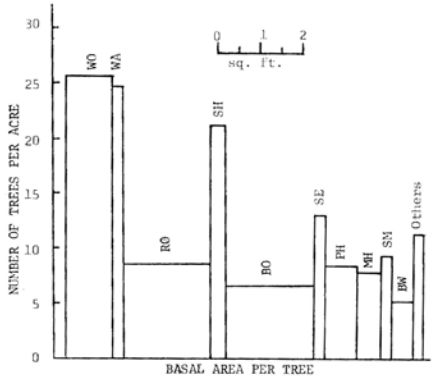

FIGURE 2.—Number of trees per acre and the average basal area per tree for the 10 leading species, and for all other species combined.

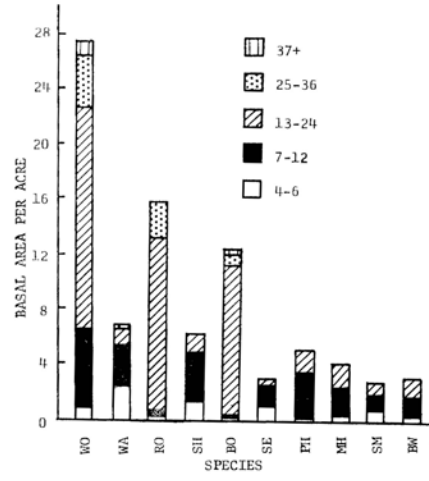

FIGURE 3.—Total basal area and the basal area by diameter classes for the 10 leading species.

plot of more than 40 (maximum possible value, 200). Other important species in this area are white ash, red oak, shagbark hickory, black oak, pignut and mockernut hickory. The sugar maple dominated region occurs in a moist, low area in the extreme northeast corner of the stand.

The present stand composition is shown in Figure 2, which includes the average number of trees per acre and the average basal area per tree for the 10 leading species, and for all other species combined. In this figure, the average basal area per tree is represented by the area included in each bar of the graph (Vestal, 1953). As a further representation of stand structure, the total basal area and the basal area in five broad diameter classes for the 10 dominant species are shown in Figure 3.

Of the woody species encountered in Sargents Woods, white oak has the highest IVI. It comprises about one-fifth of the total number of individuals and almost one-third of the stand basal area. It is well represented throughout the stand, with frequencies ranging from 28 percent in the seedling less than 1 foot tall to 100 percent for the larger trees. On each plot, its IVI ranges from 15 to 88, with an average of 48.78, nearly twice as great as the value for the next important species. White oak ranks fifth in the number of seedlings per acre, eleventh in saplings, and fifth in the 4-6 inch diameter class. In all other broad diameter classes, it ranks first in trees per acre. Its importance is mainly due to the large size of individual trees. The average diameter for this species is 14.0 inches, and the largest tree in the woodlot is a 43-inch white oak.

White ash ranks second in IVI because of its high relative density. It is first in the number of seedlings with over 3,000 per acre and dominates the 4-6 inch diameter class. The number of larger trees is small as indicated by its average diameter of 7.1 inches (Table 2) and only one tree was found with a diameter ex-

ceeding 20 inches. The highest concentration of this species occurs in the small disturbed areas along the east and west edges of the woodlot. In these areas its IVI per plot sometimes exceeds 90. Smaller diameter trees of this species are well distributed throughout the woodlot and it was found in every plot. Except for in the disturbed area, its IVI per plot is about 20.

The importance of red and black oak (third and fifth in IVI) is due mostly to the large size of individual trees as indicated by their diameters of 18.7 and 19.3 inches, respectively. Both species rank very low in seedlings and saplings per acre and average less than 1 tree per acre in both the 4-6 and 7-12 diameter classes. They rank second and third in tress per acre in the 13-24 and 25-36 inch diameter classes and black oak is the only species other than white oak which has trees in the 37 inch and higher diameter class. Both species occur in nearly all plots and their IVI's on some plots exceed that of white oak.

Four species of hickory are found in the woodlot. Shagbark hickory ranks fourth in IVI mainly because of the large number of small diameter trees that are scattered throughout the woods. This species ranks second in the number of trees per acre in the 4-6 and 7-12 inch diameter classes and is found in every plot. Pignut hickory and mockernut hickory (seventh and eighth in IVI) are represented in the woods by larger diameter trees as indicated by their average diameters of 11.0 and 9.9 inches, respectively. Both species are poorly represented in the sapling and seedling categories as well as in the 4-6 inch diameter class. Also, bitternut hickory is occasionally found through the woods, but is only fifteenth in IVI. The numerous shagbark hickories in the 4-6 and 7-12 inch diameter classes is a possible indication that this species is able to reproduce more readily under forest conditions than the other three species of hickories. Similar results were obtained by McClain and Ebinger (1968) in their study of Baber Woods, which is located on the Shelbyville Moraine.

Sugar maple (ninth in IVI) is poorly represented throughout most of the stand. In the mixed hardwood and disturbed areas a few trees were found in most of the plots, but these chiefly belonged to the 4-6 inch diameter class. In the sugar maple dominated region in the extreme northeast corner of the stand, larger trees of this species occur. Here the IVI for sugar maple exceeds 45, and a few trees exceed 20 inches in diameter. In this region, ironwood also is an important stand component and has an IVI of 25 per plot. In other parts of the woodlot this species is rarely found. This sugar maple dominated region follows along the stream on the north edge of the stand and from here the size and number of sugar maple rapidly decrease through the remainder of the woodlot. It appears that this species has become well established along this small stream and may spread through the entire area. A similar situation was found by McClain and Ebinger (1968) in their study of Baber Woods.

The relative importance of the 10 leading species is illustrated in Table 3, which gives the number of plots

on which each species had the highest IVI, or ranked second, third, or fourth, or less.

The understory is dominated by poison ivy which averages more than 5,000 stems per acre. In the wetter areas of the woods, particularly at the edge of streams, gooseberry *(Ribes missouriense)* is very common. Black haw, hazlenut, and wild hydrangea are also common along with the seedlings and saplings of various tree species.

The number of dead-standing and dead-downed trees is not an important feature of the woodlot. The total mortality of all species is only 8.8 trees per acre with a basal area of 5.5 square feet per acre. Dead elms average 3.2 trees per acre with a basal area of 1.1 square feet per acre. This is extremely low, particularly when compared with the woods to the north of the Shelbyville Moraine. In Trelease Woods (Boggess, 1964), dead elms averaged 27.6 trees per acre with a basal area of 44.9 square feet per acre, while in Burgner Acres (Blackmore and Ebinger, 1967), dead elms averaged 15.1 trees per acre and had a basal area of 14.8 square feet. Nearly all of the dead elms in Sargents Woods are in the 4-6 and 7-12 inch diameter classes and none were found with a diameter in excess of 18 inches. The relatively few large dead elms suggest that this species has never been an important stand component. Even with the large numbers of seedlings and saplings found (Table 1) the high mortality of elms due to phloem necrosis and the Dutch elm disease will probably continue to limit its importance in the woodlot. In contrast to elm, black oak mortality was largely among the veteran trees. These were scattered throughout the woods and averaged 1.3 trees per acre with an average basal area of 1.9 square feet per acre. Cottonwood is not represented by living trees in the woods, but two dead specimens were found along one of the streams. These were 32 and 47 inches in diameter, giving it a total basal area of 17.6 square feet in the woods. The mortality of the other species is extremely low and very few large trees were found.

In 1948, about 172 trees were cut out of the woodlot. Many of these were scattered along both sides of the farm road that extends along the ridge to the Sargent house. The remainder were cut from a small area on the south side of the woods (Figure 1). Many of the stumps are still present and it appears that most, if not all of the trees cut were species of oak. Measurements of the stumps indicate that at least 449 square feet of basal area was removed from the woodlot. This past cutting has had some effect on the present composition of the forest. Ash, and to some extent elm, have taken advantage of these canopy openings which is probably the reason for their high IVI in the woods.

Acknowledgments

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TABLE 1.—Density Per Acre and Frequency of Woody Species by Height or Diameter Class. The species symbol will be used to identify species in subsequent tables and figures.

Scientific Name	Common Name	Symbol	Height Class					Diameter Class			
			Density			Frequency %		1″-4″		4″+	
			<1′	>1′<1″ dbh	Total	<1′	>1′<1″ dbh	Density	Frequency %	Density	Frequency %
Quercus alba L.	White oak	WO.	513	237	750	28.8	17.9	7	7.1	25.57	100
Fraxinus americana L.	White Ash	WA.	3,949	865	4,814	78.2	41.7	48	27.6	24.53	100
Quercus rubra L.	Red oak	RO.	109	160	269	9.0	14.1	3	3.2	8.24	91
Carya ovata (Mill.) K. Koch	Shabgark hickory	SH.	468	231	699	32.7	19.2	46	34.6	21.09	100
Quercus velutina Lam.	Black oak	BO.	173	160	333	15.4	14.1	4	3.2	6.03	83
Ulmus rubra Muhl.	Slippery elm	SE.	1,333	1,500	2,833	53.2	59.0	106	47.4	12.75	100
Carya glabra (Mill.) Sweet	Pignut hickory	PH.	58	205	263	5.1	12.8	19	9.6	8.04	82
Carya tomentosa (Poir.) Nutt.	Mockernut hickory	MH.	26	115	141	2.6	10.9	21	16.7	7.70	85
Acer saccharum Marsh.	Sugar maple	SM.	244	199	443	10.9	15.4	142	49.4	9.03	88
Juglans nigra L.	Black walnut	BW.	.....	19	19	.....	1.9	1	1.3	5.20	76
Ostrya virginiana (Mill.) K. Koch	Ironwood	Ir.	987	96	1,083	10.3	7.1	17	9.0	2.80	21
Morus rubra L.	Red mulberry	RM.	6	71	77	0.6	4.5	6	6.4	2.11	58
Celtis occidentalis L.	Hackberry	Ha.	19	32	51	1.9	3.2	6	3.2	1.67	36
Prunus serotina Ehrh.	Black cherry	BC.	244	179	423	16.7	16.0	10	6.4	1.37	52
Carya cordiformis (Wang.) K. Koch	Bitternut hickory	BH.	45	103	148	1.9	9.6	12	7.1	0.59	30
Sassafras albidum (Nutt.) Nees	Sassafras	Sa.	77	45	122	4.5	3.8	7	4.5	0.44	18
Cercis candadensis L.	Red bud	RB.	590	269	859	23.7	13.5	61	24.4	0.59	24
Gleditsia triacanthos L.	Honey locust	HL.	.....	.....	.....	.....	.....	.....	.....	0.15	3
Quercus imbricaria Michx.	Shingle oak	SO.	38	13	51	3.8	0.6	.....	.....	0.39	6

TABLE 1. (Continued)

Scientific Name	Common Name	Symbol	Height Class					Diameter Class			
			Density			Frequency %		1"-4"		4" +	
			<1'	>1'<1" dbh	Total	<1'	>1'<1" dbh	Density	Frequency %	Density	Frequency %
Gymnocladus dioicus (L.) K. Koch	Ky. coffee tree	KC						1	0.6	0.34	3
Tilia americana L.	Basswood	Ba								0.20	3
Quercus macrocarpa Michx.	Bur oak	Bu								0.10	3
Quercus muhlenbergii Engelm.	Chinquapin oak	CO	6		6	0.6				0.10	6
Morus alba L.	White mulberry	WM						1	0.6	0.10	3
Maclura pomifera (Raf.) Schneid.	Osage orange	OO		6	6		0.6			0.05	3
Cornus florida L.	Flowering dogwood	FD						1	0.6	0.05	3
Crataegus crusgalli L.	Cockspur thorn	CT		6	6		0.6			0.05	3
Rhus radicans L.	Poison ivy	PI	1,481	4,506	5,987	48.7	53.9				
Viburnum prunifolium L.	Blackhaw	Bl	38	109	147	3.8	3.8	4	1.9		
Corylus americana Walt.	Hazelnut	Hz	13	128	141	1.3	8.3				
Ribes missouriense Nutt.	Gooseberry	Go	64	51	115	5.1	3.8				
Celastrus scandens L.	Bittersweet	Bi	32		32	2.6					
Hydrangea arborescens L.	Wild hydrangea	WH		77	77		0.6				
Crataegus mollis (T.&G.) Scheele	Red haw	RH	13		13	0.6					
Diospyros virginiana L.	Persimmon	Pe	26	19	45	1.9	1.9				
Asimina triloba (L.) Dunal	Pawpaw	Pa		6	6		0.6				
Ceanothus americanus L.	New Jersey tea	NJ		6	6		0.6				
Total			10,552	9,413	19,965			523		139.28	

TABLE 2.—Number of Trees, Basal Area Per Acre, Importance Value Index and Average Diameter for Leading Dominants.

Species	4-6		7-12		13-24		25-36		37 +		Total		Percent Total		I.V.I.	Av. Diam., In.
	No.	B.A.	No.	B.A.	No.	B.A.	No.	B.A.	No.	B.A.	No.	B.A.	Rel. Den.	Rel. Dom.		
WO	4.12	0.62	9.76	5.66	10.79	16.49	0.78	3.70	0.10	0.88	25.55	27.35	18.34	30.44	48.78	14.0
WA	16.04	2.31	7.51	3.13	0.93	1.16	0.05	0.18	.....	.....	24.53	6.78	17.62	7.55	25.17	7.1
RO	0.39	0.06	0.74	0.49	6.62	13.22	0.49	2.02	.....	.....	8.24	15.79	5.92	17.57	23.49	18.7
SH	12.51	1.83	7.51	3.63	1.08	1.22	.....	.....	.....	.....	21.10	6.68	15.15	7.43	22.58	7.6
BO	0.29	0.05	0.34	0.23	5.10	10.57	0.25	0.95	0.05	0.45	6.03	12.25	4.33	13.63	17.96	19.3
SE	8.88	1.22	3.58	1.47	0.30	0.36	.....	.....	.....	.....	12.76	3.05	9.16	3.39	12.55	6.6
PH	0.74	0.13	5.69	3.24	1.62	1.94	.....	.....	.....	.....	8.05	5.31	5.78	5.91	11.69	11.0
MH	2.40	0.39	4.02	2.09	1.28	1.67	.....	.....	.....	.....	7.70	4.15	5.53	4.62	10.15	9.9
SM	6.33	0.85	2.16	0.85	0.54	0.78	.....	.....	.....	.....	9.03	2.48	6.48	2.76	9.24	7.1
BW	1.57	0.26	2.70	1.22	0.93	1.43	.....	.....	.....	.....	5.20	2.91	3.73	3.24	6.97	10.1
Others	7.85	1.11	2.80	1.16	0.39	0.65	0.05	0.19	.....	.....	11.09	3.11	7.96	3.46	11.42	8.0
Total	61.12	8.83	46.81	23.17	29.58	49.49	1.62	7.04	0.15	1.33	139.28	89.86	100.00	100.00	200.00	.....

TABLE 3.—Importance Value Index, by Numbers of Plots for the Ten Leading Species.

Species	IVI Rank by Numbers of Plots			
	1st	2nd	3rd	4th or Below
WO	19	8	4	2
WA	4	4	9	16
RO	5	2	7	16
SH	1	10	3	19
BO	3	3	1	22
SE	.....	1	4	28
PH	.....	2	1	24
MH	.....	1	1	26
SM	1	.....	2	26
BW	.....	2	.....	23