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VEGETATION SURVEY OF ROCKY BRANCH NATURE PRESERVE, CLARK COUNTY, ILLINOIS

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ABSTRACT

The woody vegetation of a 6.5 ha section of the Rocky Branch Nature Preserve, Clark County, Illinois, was surveyed in 1985, and compared to a similar study completed in 1968. In 1985 the stand consisted of 262.6 stems per ha with a basal area of 24.1 sq m per ha as compared to 337.4 stems per ha and a basal area of 22.76 sq m per ha in 1968. White oak has maintained its dominance, while sugar maple moved from fifth to second in importance value exceeding black and red oak. Other species have undergone minor changes in rank. The data indicate that sugar maple increased significantly since the 1968 survey, and as the veteran oaks die it will probably continue to increase in importance.

INTRODUCTION

Rocky Branch Nature Preserve is located six miles northwest of Marshall, Clark County, Illinois. This woodlot represents a remnant of the typical forests associated with the Illinoian till in east-central Illinois, and is located in the Southern Upland Section of the Wabash Border Division (Schwegman 1973). In this section the oak forests contain a mixture of beech, sugar maple, tulip tree, and other tree species typical of the forests to the east of Illinois. Associated with the woodlot are many species not common in this part of Illinois (Stover 1930, Arzeni 1947). Due to this unique flora, the land bordering parts of Rocky Branch Creek was purchased by the Illinois Chapter of The Nature Conservancy and placed under the trusteeship of Eastern Illinois University. The area is now maintained as a natural area for instructional and research purposes. The woody vegetation of the eastern section of

the preserve was surveyed by Hughes and Ebinger (1973), while the western section was surveyed by Ebinger and Parker (1969).

The present study, completed in 1985, was undertaken in the western section of the preserve. This 6.5 ha (16 acre) woodlot is located in the NE ¼, SE ¼ of Section 30, T12N R12W, Clark County, Illinois. Topography varies from nearly level in the western part to highly dissected with gradually sloping to steep sided ravines in the remainder of the area. Sandstone outcrops and a steep hillside overlooking Rocky Branch Creek occur on the northern edge of the area. Overall relief is about 20 m (60 ft) with the high point being 197 m (645 ft) above sea level.

Studies of other woodlots in central Illinois indicate a major shift in species composition over the past 20 years (Ebinger 1986). The major change involves a dramatic increase in the importance of sugar maple, and a corresponding decrease in the importance of the oak species. The present study was undertaken to determine if a similar situation is occurring in this woodlot, since an earlier study of the area is available for comparison (Ebinger and Parker 1969).

MATERIALS AND METHODS

Survey and analysis procedures follow those of Ebinger and Parker (1969). The study area was divided into 21 quadrats 0.25 ha (0.62 acres) in size, and the number, dbh, and species of all trees above 10 cm (4 inches) dbh were recorded for each quadrat. Dead-standing trees were also measured and identified. In each of the 0.25 ha quadrats two nested circular plots were established at four randomly chosen locations. Saplings (2.5-10.0 cm dbh) were tallied on 0.01 ha plots and seedlings (less than 2.5 cm dbh) on 0.001 ha plots. Seedlings were sampled by size classes which were defined as less than 30 cm tall and greater than 30 cm tall but less than 2.5 cm dbh.

Data were summarized by calculation of density (stems/ha), relative density, relative dominance, and importance value (IV) for tree species. The determination of the relative values follows the procedure outlined by McIntosh (1957) and Boggess (1964) in which the IV is the summation of the relative density and relative dominance. Sapling and seedling data were summarized by calculation of density (stems/ha) and frequency. Nomenclature follows Mohlenbrock (1975).

RESULTS AND DISCUSSION

A total of 35 woody species were recorded on the woodlot. Of this total 21 were canopy trees, six were understory trees, and eight were shrubs and vines. Comparison to the 1968 survey (Ebinger and Parker 1969) indicate a decrease in total stand density from 337.4 to 262.6 stems per ha (Table 1). This decline is the result of a decrease in the number of stems of oak and hickory species in the lower diameter classes. White oak alone decreased from 61 stems per ha in 1968 to 19 stems in 1985 in the 1-2 and 2-3 dm diameter classes (Table 1).

Presence of dead-standing stems in the woodlot also suggested that most of the decrease was in the lower diameter classes. Overall, dead-standing individuals averaged 20 stems per ha with a basal area of 7.7 sq m per ha. White oak and hickory species averaged 6.8 and 6.4 dead-standing stems per ha, respectively. Nearly all of

these individuals had a dbh of less than 25 cm. The only species which consistently had dead-standing individuals in the high diameter classes were red and black oaks.

Another major change since the 1968 survey was in the IV ranking of some species. White oak remained the highest ranking in IV, relative density, and relative dominance. Although white oak accounted for more than 1/3 of the IV, it is not well represented in the 1-2 and 2-3 dm diameter classes (Table 1). Also it was not well represented in the seedling and sapling categories. Sugar maple, in contrast, increased from fifth to second in IV, exceeding black and red oaks in importance (Table 1). In addition, sugar maple almost doubled in density and dominated the 1-2 dm diameter class, as well as the seedling and sapling categories (Table 2). The average diameter of this species was only 16.8 cm with a few individuals reaching 40 cm dbh.

The decrease of white oak in the smaller diameter classes and the corresponding increase of sugar maple in these categories, is mostly due to the increased recruitment of saplings of sugar maple into the lower diameter classes. Some of the white oak loss is the result of outgrowth of this species to larger diameter classes. Most, however, appears to be the result of death of many of the smaller diameter white oaks due to natural causes and fire. In the early spring of 1980 a ground fire burned about 1 ha of this section of the woodlot. The fire caused a total top kill of all woody seedlings and saplings, and a few smaller trees, but did not kill any trees with a diameter greater than 15 cm dbh. The results of this fire on the woody understory is discussed by Ebinger (1988).

The importance of black and red oak (third and fourth in IV) was primarily due to their high relative dominance, as indicated by their average diameters of 46.5 and 36.1 cm, respectively. Both species ranked low in seedling and sapling density and frequency and have few stems in the 1-2 dm diameter class (Table 1 & 2).

The hickories have undergone changes in order of their ranking within the woodlot. In 1968, shagbark hickory was ranked highest among the hickories followed by mockernut, bitternut, and pignut. By 1985, mockernut hickory had surpassed the other hickory species in importance followed by shagbark, pignut, and bitternut. Hickory seedlings and saplings, in general, decreased in relative importance from 1968 to 1985 (Table 2) and, except for mockernut hickory, decreased in density (Table 1).

The remaining tree species essentially maintained their minor importance. Black walnut decreased slightly in IV while slippery elm maintained its importance (Table 1). Slippery elm ranked second in seedlings density and frequency, nearly doubling in numbers since 1968. White ash, ranked just below slippery elm, changed little in IV, but decreased in seedlings and saplings density (Table 2).

The future status of oak species in this woods appears to be one of continued importance, at least for the near future. However, due to the small number of individuals of this species group in the smaller diameter classes, the oaks will eventually decrease in importance as the inevitable mortality of the veteran trees continues. To some extent they will be replaced by various species of hickories, however, it is more likely that sugar maple will become the leading dominant. Sugar maple presently dominates the 1-2 dm diameter class and far exceeds all other species in the seedling and sapling density and frequency. The data indicate that sugar maple increased significantly over the past 17 years. Since this species has a high gap-phase-replacement-potential (Runkle, 1984), which allows it to take

advantage of canopy openings that occur when veteran trees die, it will probably continue to increase in importance.

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Table 1. Density by diameter class, density all stems, basal area, relative value, and average diameter for the leading dominants in the western section of the Rocky Branch Nature Preserve, Clark County, Illinois. Density and importance value for the 1968 survey are also given.

Species	Density (stems/ha) by diameter classes (dm)						Density (stems/ha)		Basal Area (sq.m. /ha.)	Relative Values				Av. Diam. (cm)
	1-2	2-3	3-4	4-5	5-6	6+	1985	1968		Rel. Den.	Rel. Dom.	I.V. 1985	I.V. 1968	
White Oak	5.7	13.1	23.4	24.8	14.7	5.7	87.4	113.2	12.4	33.3	51.4	84.7	80.9	40.4
Sugar Maple	37.1	5.1	1.1	1.5	.6	.4	45.8	26.7	1.4	17.5	5.8	23.3	12.9	16.8
Black Oak	1.0	1.5	3.2	4.8	4.4	3.4	18.3	23.7	3.4	6.9	14.0	20.9	20.5	46.5
Red Oak	4.9	3.0	3.2	2.9	3.8	1.7	19.5	25.7	2.5	7.5	10.3	17.8	20.0	36.1
Mockernut	9.5	6.5	2.9	.9	.2	—	20.0	18.8	.9	7.6	4.0	11.6	8.7	22.6
Shagbark	13.7	6.1	1.1	.4	—	—	21.3	34.1	.7	8.1	2.9	11.0	14.0	19.1
Pignut	1.3	1.3	3.8	1.3	.2	—	7.9	13.1	.7	3.0	2.9	5.9	6.0	32.0
Black Walnut	.2	1.5	3.4	1.5	—	—	6.6	10.9	.6	2.5	2.6	5.1	6.2	33.8
Slippery Elm	7.8	1.5	.2	—	—	—	9.5	11.4	.2	3.6	.9	4.5	4.5	16.0
White Ash	4.2	.8	.9	.6	—	—	6.5	7.7	.3	2.5	1.2	3.7	3.2	20.8
Bitternut	2.1	1.7	1.1	.4	—	—	5.3	17.0	.3	2.0	1.2	3.2	8.5	25.1
Beech	1.1	.2	.4	.8	—	.8	3.3	2.7	.4	1.2	1.8	3.0	1.9	35.1
Others[1]	9.7	.9	.6	—	—	—	11.2	32.4	.3	4.3	1.0	5.3	12.7	—
Totals	98.3	43.2	45.3	39.9	23.9	12.0	262.6	337.4	24.1	100.0	100.0	200.0	200.0	—

[1]Includes *Carpinus caroliniana* Walt. (blue beech), *Celtis occidentalis* L. (hackberry), *Cornus florida* L. (flowering dogwood), *Nyssa sylvatica* Marsh. (sour gum), *Ostrya virginiana* (Mill.) K. Koch. (hop hornbeam), *Platanus occidentalis* L. (sycamore), *Populus deltoides* Marsh. (cottonwood), *Prunus serotina* Ehrh. (wild black cherry), *Quercus imbricaria* Michx. (shingle oak), *Sassafras albidum* (Nutt.) Nees. (sassafras), *Tilia americana* L. (basswood), and *Ulmus americana* L. (American elm).

Table 2. Density (stems/ha) and frequency of seedlings and saplings in the western section of the Rocky Branch Nature Preserve, Clark County, Illinois. Seedlings and saplings density for the 1968 survey are also given.

		Seedlings						Saplings		
		Less than 30 cm tall		Greater than 30 cm tall		Total Density		Total Density		
Scientific Name	Common Name	Den.	Freq.	Den.	Freq.	1985	1968	1985	1968	Freq.
Acer saccharum Marsh.	sugar maple	9914	26.2	2207	28.6	12121	11003	418	324	54.8
Ulmus rubra Muhl.	slippery elm	472	14.3	3118	33.3	3590	1700	64	156	16.7
Fraxinus americana L.	white ash	912	17.9	912	22.6	1824	5058	10	40	3.6
Cornus florida L.	fl. dogwood	119	4.8	1030	23.8	1149	1080	148	180	32.1
Carya spp.[1]	hickories	442	—	645	—	1087	1460	109	136	—
Ostrya virginiana K. Koch.	hop hornbeam	148	6.0	235	8.3	383	2970	57	84	16.6
Prunus serotina Ehrh.	black cherry	119	4.8	205	7.1	324	1001	2	5	1.2
Carpinus caroliniana Walt.	blue beech	119	3.6	148	4.8	267	1352	15	54	4.8
Sassafras albidum Nees.	sassafras	89	3.6	175	4.8	264	385	—	—	—
Quercus spp.[2]	oaks	89	—	148	—	237	803	—	17	—
Fagus grandifolia Ehrh.	beech	30	1.2	59	2.4	89	77	5	7	2.4
Juglans nigra L.	black walnut	30	1.2	30	1.2	60	—	—	—	—
Other trees[3]		30	—	119	—	149	304	7	25	—
Vines and shrubs[4]		4030	—	1500	—	5530	8377	—	—	—
Totals		16543	—	10531	—	27074	35570	835	1028	—

[1]Includes *Carya cordiformis* (Wang.) K. Koch. (bitternut), *C. glabra* (Mill.) Sweet. (pignut), *C. ovata* (Mill.) K. Koch. (shagbark), and *C. tomentosa* (mockernut).

[2]Includes *Quercus alba* L. (white oak), *Q. imbricaria* Michx. (shingle oak), *Q. rubra* L. (red oak), and *Q. velutina* Lam. (black oak).

[3]Includes *Celtis occidentalis* L. (hackberry), *Crataegus mollis* (Torr. & Gray) Scheele. (red haw), *Amelanchier arborea* (Michx. f.) Fern. (shadbush), *Morus rubra* L. (red mulberry), *Tilia americana* L. (basswood), and *Ulmus americana* L. (American elm).

[4]Includes *Corylus americana* Walt. (hazelnut), *Hydrangea arborescens* L. (wild hydrangea), *Ribes missouriense* Nutt. (Missouri gooseberry), *Rubus allegheniensis* Porter. (common blackberry), *Sambucus canadensis* L. (elderberry), *Staphylea trifolia* L. (bladdernut), *Toxicodendron radicans* (L.) Kuntze. (poison ivy), and *Viburnum recognitum* Fern. (smooth arrowwood).