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FOREST TYPES AT FOX RIDGE STATE PARK, COLES COUNTY, ILLINOIS

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ABSTRACT

The woody overstory of five forest types were surveyed at Fox Ridge State Park, Coles County, Illinois. These included an upland forest (330 stems per ha, basal area of 23.62 sq m per ha), a north-facing hillside forest (407 stems per ha, basal area of 20.19 sq m per ha), a south-facing hillside forest (315 stems per ha, basal area of 21.41 sq m per ha), a terrace forest (433 stems per ha, basal area of 23.00 sq m per ha), and a floodplain forest (616 stems per ha, basal area of 39.62 sq m per ha).

INTRODUCTION

Fox Ridge State Park is located about 8 miles south of Charleston, Coles County, Illinois on the bluffs of the Embarass River, and on the southern edge of the Shelbyville Moraine, the terminal moraine of Wisconsin glaciation. The park is 865 acres in size with the elevation varying from 540 feet to 720 feet above sea level. Leading back from the river bluffs are several deep, relatively narrow valleys. The amount of bottomland in these valleyss is fairly limited, though one valley has been dammed to form an 18 acre lake (Mohlenbrock, 1976). Between these valleys are flat, narrow ridges. Originally the entire area was probably forested since upland and terrace forest soils are the only soil types reported for the area (Smith et al., 1929). Early settlers cleared the relatively flat uplands and bottomlands, but much of the park escaped being clear cut because of its rough topography. The slopes did suffer some cutting in the past, however, and prior to being dedicated as a state park in 1939, most of the area was probably grazed. The present study was undertaken to determine the floristic composition of the forest types that presently exist in the park.

MATERIALS AND METHODS

The forest areas surveyed vary from one to two hecatres in size, and represent the best quality example of each forest type found in the park. Each area was divided

into quadrats 25 m on a side (0.154 acres), and the number, size, and species above 10 cm d.b.h. were recorded for each quadrat. All living and dead-standing trees were identified and measured to the nearest cm. The importance value (IV) was then calculated for each species in each of the forests sampled. As used here, the IV determination follows the procedure developed by McIntosh (1957), and later Boggess (1964), in which the IV is the sum of the relative frequency, relative density, and relative dominance. The nomenclature used follows Mohlenbrock (1975).

RESULTS AND DISCUSSION

A total of five forest areas were studied, an upland forest (Table 1), a north-facing hillside forest (Table 2), a south-facing hillside forest (Table 3), a terrace forest (Table 4), and a floodplain forest. The tree species encountered in each forest area with their relative values, average diameters, and the number of individuals per hectare in broad diameter classes are included in the tables.

Upland Forest: — This forest type occurs on the ridges and gentle slopes throughout much of the park. Most of these areas were probably heavily logged before the area was dedicated as a state park in 1939. During the present study a 1 hectare section of the best quality representative of this forest type was surveyed. In this area the arborescent species encountered average 330 stems per ha with a basal area of 23.62 sq m per ha (Table 1). The dominant overstory species is white oak with an IV of 78.1 (out of a possible 300), followed by black oak (IV of 50.0), and sugar maple (IV of 35.6). White oak is well represented in all diameter classes, and has an average diameter of 33 cm, indicating its continued importance in the woodlot. Black oak, in contrast, has relatively poor size class distribution, being relatively common in the 2-5 dm diameter classes. Most of the remaining species are well represented in the lower diameter classes, and except for sugar maple, rarely exceed the 3-4 dm diameter class. The large number of sugar maple, white ash, and basswood in the 1-2 dm diameter class indicates that these species will increase in importance in the forest.

North-facing Hillside Forest: — This mesic forest is located on the south side of Ridge Lake, and during the present survey a 1.4 ha section was studied. In this area the arborescent species average 407 stems per ha with a basal area of 20.19 sq m per ha (Table 2). Red oak (IV of 86.4), sugar maple (IV of 58.0), and white oak (IV of 44.8) are by far the dominant species. All have fairly good size class distribution indicating their continued importance in the woods. Of these species, sugar maple will probably increase more rapidly, however, due to the large number of individuals in the 1-2 dm diameter class, and because of its high gap phase replacement potential. Other mesic species that will probably increase in importance are basswood and yellow chestnut oak, while hop hornbeam and flowering dogwood will continue as important understory species. Understory trees and shrubs are much more common in this woods than in the other upland forests studied.

South-facing Hillside Forest: — This forest type is located on a relatively steep south-facing hillside, and is slightly drier than the other upland forests in the park. The area surveyed is 1 ha in size, and the tree species average 315 stems per ha with a basal area of 21.41 sq m per ha (Table 3). White oak is by far the leading dominant, accounting for a third of the entire importance value. It is well represented in all diameter classes, and accounts for about half of the basal area in the woods.

Sugar maple (IV of 75.2) and red oak (IV of 31.4) account for another third of the importance value. All three species are well represented in the lower diameter classes, and as a result will continue as important dominants. Though present, the hickories (shagbark and mockernut) are not extremely common in the woods, and have relatively low importance values. Most of the remaining species are present only in the lower diameter classes. This forest type is extremely common throughout the park, occurring on many of the south-, east-, and west-facing slopes, as well as in many of the steep valleys to the north of Ridge Lake.

Terrace Forest: — This forest type is located along both sides of a small stream near the south edge of the park. It has the highest woody species diversity of the areas studied with 21 woody taxa (Table 4). In this lowland wet mesic forest, of which a 1.2 ha section was surveyed, the arborescent species average 433 stems per ha with a basal area of 23 sq m per ha. Sycamore (IV of 44.9) is the leading dominant followed by buckeye (IV of 32.1), hackberry (IV 31.9), sugar maple (IV of 31.5), and box elder (IV of 28.9). All other species have an IV of less than 18. Except for sycamore, all of the taxa have good size class distribution, and their importance in the woods should increase. Sycamore, in contrast, is well represented only in the higher diameter classes, and its importance will probably decrease as the veteran trees die. Numerous understory trees and shrub are an important feature of this forest type, with blue beech and redbud being extremely common in the 1-2 dm diameter class.

Floodplain Forest: — The floodplain forest in the park was studied by Crites and Ebinger (1969). This wet floodplain, in which prolonged flooding has lowered species diversity, is dominated by cottonwood (IV of 101.1), followed by box elder (IV of 74.1) and silver maple (IV of 62.9). Other woody taxa encountered include black willow, slippery elm, sycamore, white ash, hackberry, black walnut, and buckeye. In this forest the arborescent taxa average 616 stems per ha with a basal area of 39.62 sq m per ha.

Though the forests in the park were heavily disturbed prior to 1939, they have recovered fairly well. Most, however, still show some indication of past disturbance particularly in tree size, the extent of coppice growth, and in the presence of introduced and successional tree species.

In general, the forests of the park are similar to other woods associated with the Shelbyville moraine that have been heavily utilized by man. The upland and hillside forests are very similar to a coppice forest studied by Ebinger (1973) which is also located on the moraine in Coles County, Illinois. Also, the terrace forest is similar in species composition to a low terrace forest located in Clark County, Illinois (Nyboer and Ebinger, 1976), while the floodplain forest is similar to other floodplain forests located along the Embarass River (Crites and Ebinger, 1969), and the Wabash River (Phillippe and Ebinger, 1973).

One disturbing feature of the forests in the park is the large number of sugar maples found. This shade tolerant species, which is well represented in the lower diameter classes, and has a high gap phase replacement potential, will undoubtedly increase in importance. This will result in a shift from the oak-hickory forests that previously occurred in the area to one in which sugar maple will become a leading dominant. Similar results have been observed in Baber Woods, a morainial forest in Edgar County, Illinois, by McClain and Ebinger (1968). It is very possible that the lack of ground fires during the present century is responsible for this change.

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Table 1. Number of trees and basal area per hectare, diameter classes, relative values, and average diameters for the leading dominants in an upland forest at Fox Ridge State Park, Coles County, Illinois.

Species	Number of trees per hectare By Diameter Classes (dm) 1-2	2-3	3-4	4-5	5-6	6+	Density (trees/ha)	Basal Area (m^2/ha)	Relative Values Rel. Freq.	Rel. Den.	Rel. Dom.	I.V.	Av. Diam. (cm)
Quercus alba L.	16	26	26	12	10	2	92	8.91	12.5	27.9	37.7	78.1	33
Quercus velutina Lam.	2	10	22	10	2	2	48	5.44	12.5	14.5	23.0	50.0	37
Acer saccharum Marsh.	14	—	—	14	2	2	32	3.55	10.9	9.7	15.0	35.6	33
Fraxinus americana L.	16	18	—	—	—	—	34	1.21	10.9	10.3	5.1	26.3	20
Tilia americana L.	14	10	6	—	—	—	30	1.16	9.4	9.1	4.9	23.4	21
Quercus rubra L.	6	4	8	—	—	—	18	.97	9.4	5.5	4.1	19.0	25
Sassafras albidum (Nutt.) Nees.	28	—	—	—	—	—	28	.37	7.8	8.5	1.6	17.9	13
Ulmus rubra Muhl.	4	4	4	—	—	—	12	.57	6.3	3.6	2.4	12.3	23
Others (9 species)	18	12	4	2	—	—	36	1.44	20.3	10.9	6.2	37.4	
Totals	118	84	70	38	14	6	330	23.62	100.0	100.0	100.0	300.0	

Table 2. Number of trees and basal area per hectare, diameter classes, relative values, and average diameters for the leading dominants on a north-facing hillside at Fox Ridge State Park, Coles County, Illinois.

Species	Number of trees per hectare By Diameter Classes (dm) 1-2	2-3	3-4	4-5	5-6	6+	Density (trees/ha)	Basal Area (m^2/ha)	Relative Values Rel. Freq.	Rel. Den.	Rel. Dom.	I.V.	Av. Diam. (cm)
Quercus rubra L.	23	42	23	17	7	—	112	8.95	14.4	27.7	44.3	86.4	29
Acer saccharum Marsh.	67	30	7	1	—	1	106	3.41	15.1	26.0	16.9	58.0	19
Quercus alba L.	29	16	11	4	—	1	61	3.68	11.6	15.0	18.2	44.8	24
Ostrya virginiana (Mill.) K. Koch.	42	—	—	—	—	—	42	.51	13.7	10.3	2.5	26.5	12
Carya ovata (Mill.) K. Koch.	11	5	5	—	1	—	22	1.13	8.9	5.4	5.6	19.9	23
Tilia americana L.	11	7	2	—	—	—	20	.73	8.2	4.9	3.6	16.7	20
Carya tomentosa (Poir.) Nutt.	7	4	1	—	—	—	12	.44	6.2	2.9	2.2	11.3	20
Querus muhlenbergii Engelm.	5	2	3	—	—	—	10	.48	6.2	2.5	2.4	11.1	22
Fraxinus americana L.	1	—	1	1	—	—	3	.30	2.1	.7	1.5	4.3	29
Fraxinus quadrangulata Michx.	1	1	1	—	—	—	3	.16	2.1	.7	.8	3.6	21
Cornus florida L.	5	—	—	—	—	—	5	.06	2.1	1.2	.3	3.6	12
Others (9 species)	9	1	1	—	—	—	11	.34	9.4	2.7	1.7	13.8	
Totals	211	108	55	23	8	2	407	20.19	100.0	100.0	100.0	300.0	

Table 3. Number of trees and basal area per hectare, diameter classes, relative values, and average diameters for the leading dominants on a south-facing hillside at Fox Ridge State Park, Coles County, Illinois.

Species	Number of trees per hectare By Diameter Classes (dm) 1-2	2-3	3-4	4-5	5-6	6+	Density (trees/ha)	Basal Area (m^2/ha)	Relative Values Rel. Freq.	Rel. Den.	Rel. Dom.	I.V.	Av. Diam. (cm)
Quercus alba L.	22	29	28	22	4	4	109	10.19	17.8	34.6	47.6	100.0	32
Acer saccharum Marsh.	39	35	17	6	3	—	100	5.86	16.1	31.7	27.4	75.2	25
Quercus rubra L.	17	4	7	2	2	—	32	1.79	12.9	10.2	8.3	31.4	24
Quercus velutina Lam.	4	6	4	—	—	—	14	.82	9.7	4.4	3.8	17.9	26
Carya ovata (Mill.) K. Koch.	4	7	4	—	—	—	15	.90	8.1	4.8	4.2	17.1	25
Carya tomentosa (Poir.) Nutt.	4	4	2	—	—	—	10	.48	8.1	3.2	2.3	13.6	23
Sassafras albidum (Nutt.) Nees.	10	—	—	—	—	—	10	.11	8.1	3.2	.5	11.8	12
Querus muhlenbergii Engelm.	—	—	2	3	—	—	5	.52	4.8	1.6	2.4	8.8	39
Fraxinus americana L.	4	4	—	—	—	—	8	.28	4.8	2.5	1.3	8.6	20
Ulmus rubra Muhl.	2	3	—	—	—	—	5	.21	3.2	1.6	1.0	5.8	24
Others (3 species)	3	2	2	—	—	—	7	.25	6.4	2.2	1.2	9.8	
Totals	109	94	66	33	9	4	315	21.41	100.0	100.0	100.0	300.0	

Table 4. Number of trees and basal area per hectare, diameter classes, relative values, and average diameters for the leading dominants in a terrace forest at Fox Ridge State Park, Coles County, Illinois.

Species	Number of trees per hectare By Diameter Classes (dm) 1-2	2-3	3-4	4-5	5-6	6+	Density (trees/ha)	Basal Area (m^2/ha)	Relative Values Rel. Freq.	Rel. Den.	Rel. Dom.	I.V.	Av. Diam. (cm)
Platanus occidentalis L.	5	8	15	14	1	4	47	6.09	7.8	10.9	26.2	44.9	39
Aesculus glabra Willd.	42	14	6	2	—	—	64	1.95	8.8	14.9	8.4	32.1	18
Celtis occidentalis L.	22	17	8	2	2	--	51	2.64	8.8	11.8	11.3	31.9	24
Acer saccharum Marsh.	35	10	4	1	2	—	52	2.13	10.4	12.0	9.1	31.5	20
Acer negundo L.	34	17	3	1	—	—	55	1.85	8.3	12.7	7.9	28.9	20
Tilia americana L.	12	6	6	1	1	—	26	1.33	5.7	6.0	5.7	17.4	23
Ulmus americana L.	12	3	2	1	—	—	18	.57	7.3	4.2	2.4	13.9	18
Juglans nigra L.	2	5	2	3	--	1	13	1.24	4.7	3.0	5.3	13.0	33
Ulmus rubra Muhl.	3	6	3	1	—	—	13	.77	5.2	3.0	3.3	11.5	26
Quercus macrocarpa Michx.	6	1	2	1	—	2	12	1.08	4.1	2.8	4.6	11.5	29
Carya cordiformis (Wang.) K. Koch.	6	3	3	1	—	—	13	.76	4.7	3.0	3.3	11.0	25
Carpinus caroliniana Walt.	18	—	—	—	—	—	18	.21	5.7	4.2	.9	10.8	12
Quercus muhlenbergii Englem.	6	1	2	1	—	—	10	.42	4.1	2.3	1.8	8.2	21
Fraxinus pennsylvanica Marsh.	3	2	2	—	—	1	8	.75	3.1	1.8	3.2	8.1	28
Cercis canadensis L.	11	—	--	—	—	—	11	.16	4.1	2.5	.8	7.4	13
Others (6 species)	9	6	5	2	—	—	22	1.35	7.2	4.9	5.8	17.9	
Totals	226	99	63	31	6	8	433	23.30	100.0	100.0	100.0	300.0	