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WOODY VEGETATION OF WARD WOODS, CUMBERLAND COUNTY, ILLINOIS

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ABSTRACT

The woody vegetation of sections of Ward Wood, Cumberland County, Illinois was surveyed in 1987. On a steep, east-facing hillside the present stand consists of 296 individuals per hectare. Sugar maple is the dominant species with an importance value of 132.6 (out of 300), is well represented in all diameter classes, and dominates the seedling and sapling categories. Other important species include hickories, hackberry, and slippery elm. In the poorly drained lowlands of this woods green ash dominates with an importance value of 76.4. Other important components include red maple, American elm, silver maple, cottonwood and hackberry.

INTRODUCTION

Ward Woods is a 10.1 hectare (25 acre) woodlot located in the Effingham Plain Section of the Southern Till Plain Division (Schwegman 1973), approximately five miles east of Greenup, Cumberland County, Illinois (NW 1/4, Sec 16, T9N R9E). The woodland was purchased by the Ward Family in the early 1900's. In the late 1950's, the larger black walnut trees were selectively lumbered, while during the mid-1960's, numerous large oaks were removed. These lumbering activities left large open areas in the forest canopy and disrupted the understory vegetation.

The topography of the woodlot varies from a small, nearly level upland in the western part, to a steep east-facing hillside through the middle of the woods with a slope that averages 30 degrees, while the eastern part is a flat poorly drained lowland bordering a small creek that enters the Embarras River about one-half mile away. Overall relief is about 20 m (66 ft.) with the high point 177 m (584 ft.) above sea level.

A survey of the woody vegetation of parts of this woodlot was conducted during the summer of 1987, to determine which woody species have invaded since the extensive disturbance in this woodlot during the 1950's and 1960's.

MATERIALS AND METHODS

A total of 24 quadrats, 25 m on a side (1½ ha), were located on the steep, east-facing hillside while 16 quadrats, 25 m on a side (1 ha), were located in the lowland part of the woods. In each quadrat the number, dbh, and species of all trees above 10 cm (4 inches) dbh were recorded for each tree. Relative frequency, relative dominance, relative density, and importance value (IV) of each species were then calculated for each of the two areas. The determination of the relative values follows McIntosh (1957) and Boggess (1964) in which the IV is the summation of the relative frequency, relative dominance, and relative density.

In each of the quadrats a .01 ha circular plot was randomly located. The saplings (2.5-10.0 cm dbh) were tallied on these plots and the frequency and density (individuals per ha) for each species determined for the east-facing hillside and the lowland. In conducting the woody seedling survey, eight 50 m transects were randomly located in the study area, six on the east-facing hillside and two in the flat lowland. Along each transect continuous 1 sq m quadrats were established and all seedlings (less than 2.5 cm dbh) counted and identified (Mohlenbrock 1975). From this data the seedling density (individuals per ha) and frequency was determined for each species for both areas.

RESULTS AND DISCUSSION

Hillside Forest: On the steep east-facing hillside a total of 20 woody species was recorded (Table 1), including 17 canopy trees and three understory trees. In this part of the woods *Acer saccharum* L. (sugar maple) had an IV of 132.6, far exceeding all other species. This species dominated all diameter classes, as well as the seedling and sapling categories. As indicated by its high relative frequency and relative density sugar maple was well distributed throughout the hillside, and a number of individuals exceeded 50 cm dbh.

The hickories (*Carya* spp.) as a species group were second with an IV of 47.1. Few hickory seedlings were encountered and no saplings were recorded, indicating that these species are not reproducing in this habitat. Most of the hickory seedlings found were of *C. cordiformis* (Wang.) K. Koch. Of the hickories, *C. ovata* (Mill.) K. Koch. dominated with an IV of 21.8, *C. cordiformis* had an IV of 11.6, followed by *C. tomentosa* (Poir.) Nutt., and *C. glabra* (Mill.) Sweet. *Celtis occidentalis* L. (hackberry) and *Ulmus rubra* Muhl. (slippery elm) ranked third and fourth in IV, respectively. These two species were well represented in the seedling category and the smaller diameter classes, while hackberry was also found in the 4-5 and 5+ cm diameter classes.

The oaks (*Quercus* spp.) were poorly represented in this part of the woods. *Quercus rubra* L. (red oak) was the only oak species recorded in the top eleven species in IV. Most oaks were in the 3 dm and higher diameter classes, and few oak seedlings and saplings were recorded.

Of the remaining species encountered on the steep east-facing hillside, none were common throughout the woods. Only a few *Juglans nigra* L. (black walnut) were recorded, since the larger individual of this species were removed about 35 years ago. All of the *Gymnocladus dioica* (L.) K. Koch. (Kentucky coffee tree) occurred near the base of the hillside, and in this area were a fairly important forest component.

Numerous forest surveys conducted during the past 25 years indicate that sugar maple is becoming an important component in the oak-hickory forests of central Illinois (Ebinger 1986a). Before European man settled in Illinois and altered the existing ecosystems, sugar maple was not an important species in central Illinois. A review of the General Land Office Survey notes reveals that only 23 individuals of sugar maples (out of a total of 1,627 witness trees) were recorded for Douglas (Ebinger 1987b) and Coles Counties (Ebinger 1987), the two counties just north of the study area. All of these sugar maples had been recorded from areas of dissected topography. It is quite possible that these dissected areas were protected from prairie fires by the terrain. When the pre-settlement IV's are combined and averaged, sugar maple had a pre-settlement IV of 3.0 (out of an IV of 200). This value is extremely low when compared to the average IV of the oaks (130.8 out of 200), and the hickories (29.8 out of 200).

The data from the present survey suggests that sugar maple is continuing to increase on the steep east-facing hillside in Ward's woods, dominating all diameter classes as well as the seedling and sapling categories. The opening of the canopy in this area by past cutting is probably responsible for this explosive increase. Runkle (1984) found that this aggressive species is able to rapidly fill tree-fall gaps. Also, this species grows rapidly, even in fairly small gaps, due to its ability to grow and form extensive root systems at low light levels (Logan 1965). Similar increases have been observed in other woods in east-central Illinois (Ebinger 1986a).

Lowland Forest: In the flat, poorly drained part of the woods a total of 21 woody species was recorded (Table 2), including of 19 canopy trees and two understory trees. In this part of the woods *Fraxinus pennsylvanica* Marsh. var. *subintegerrima* (Vahl.) Fern. (green ash) was the most important species with an IV of 76.4. This species is well represented in the smaller diameter classes, has some individuals in the larger diameter classes, averages 111 individuals per ha, and has a large number of seedlings per ha. Most of the seedlings were one and two year old plants that rarely exceeded 20 cm in height, and based on the few saplings found, few of the seedlings will probably survive.

Other common forest components with large numbers of seedlings were *Acer rubrum* L. (red maple), *Ulmus americana* L. (American elm), and hackberry which ranked second, third and sixth in IV, respectively. These three species had most individuals in the smaller diameter classes, relatively small average diameters, few saplings, and numerous seedlings. As with green ash, the seedlings of these three species were small, rarely exceeding 20 cm in height, and most probably will not survive to the sapling stage.

Acer saccharinum L. (silver maple), and *Populus deltoides* Marsh. (cottonwood), in contrast, were not represented in the seedling and sapling categories, had many individuals in the 5+ dm diameter class, and average diameters of 35 cm and 46 cm, respectively. The oak species encountered occurred mostly in the larger diameter classes, and were not represented in the seedling and sapling categories. All other woody species encountered in this lowland forest had IV's of less than 11, and were poorly represented in the seedling and sapling categories.

The data suggests that green ash, red maple, American elm, and hackberry will probably increase in importance in this lowland area. Since saplings and smaller diameter trees of these species are already established, they will enter the canopy as

veteran trees die. Silver maple and cottonwood, in contrast, are not reproducing, and will decrease in importance as the veteran trees die.

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Table 1. Number of woody individuals per hectare by diameter classes, relative values, and average diameters for the leading dominants in a hillside forest, Cumberland County, Illinois.

Species	Seedlings		Saplings		Trees per hectare by diameter classes (dm)						Relative Values				Av. Diam. (cm)
	Den.	Freq.	Den.	Freq.	1-2	2-3	3-4	4-5	5+	Total	Rel. Freq.	Rel. Dom.	Rel. Den.	I.V.	
Sugar Maple	4933	33	333	79	65	30	24	24	15	158	20.0	59.0	53.6	132.6	27.6
Hickories*	167	2	—	—	8	14	11	3	1	37	21.8	12.5	12.8	47.1	27.7
Hackberry	2233	18	21	13	19	14	5	3	2	43	15.8	11.5	14.5	41.8	23.8
Slippery Elm	1867	8	17	13	13	3	1	—	—	17	12.5	2.3	5.7	20.5	17.9
Red Oak	100	1	4	4	—	—	1	1	3	5	5.8	4.9	1.6	12.3	51.5
Ky. Coffee Tree	133	1	13	4	4	6	1	1	—	12	5.8	2.6	3.9	12.3	23.4
Black Walnut	67	1	—	—	1	2	1	1	1	6	4.2	3.2	2.0	9.4	23.4
Green Ash	—	—	4	4	4	1	--	—	—	5	3.3	0.5	1.6	5.4	16.0
Others**	1632	—	87	—	8	1	1	1	2	13	10.8	3.5	4.3	18.6	22.7
Totals	11132		479		122	71	45	34	24	296	100.0	100.0	100.0	300.0	

*Includes *Carya cordiformis* (Wang.) K. Koch. (bitternut hickory), *C. glabra* (Mill.) Sweet. (pignut hickory), *C. ovata* (Mill.) K. Koch. (shagbark hickory), and *C. tomentosa* (Poir.) Nutt. (mockernut hickory).

**Includes *Acer negundo* L. (box elder), *Asimina triloba* (L.) Dunal. (pawpaw), *Cercis canadensis* L. (redbud), *Juglans nigra* L. (black walnut), *Quercus alba* L. (white oak), *Q. muhlenbergii* Engelm. (yellow chestnut oak), *Q. velutina* Lam. (black oak), *Tilia americana* L. (basswood), and *Ulmus americana* L. (American elm).

Table 2. Number of woody individuals per hectare by diameter classes, relative values, and average diameters for the leading dominants in a lowland forest, Cumberland County, Illinois.

Species	Seedlings		Saplings		Trees per hectare by diameter classes (dm)						Relative Values				Av. Diam. (cm)
	Den.	Freq.	Den.	Freq.	1-2	2-3	3-4	4-5	5+	Total	Rel. Freq.	Rel. Dom.	Rel. Den.	I.V.	
Green Ash	38100	66	150	38	38	40	20	9	4	111	13.9	28.6	33.9	76.4	25.6
Red Maple	94500	95	100	31	26	11	8	3	7	55	11.5	17.5	16.8	45.8	26.8
American Elm	1500	7	31	31	40	8	1	—	—	49	16.1	4.3	15.0	35.4	15.6
Silver Maple	—	—	—	—	11	4	2	2	7	26	8.1	16.5	8.0	32.6	35.5
Cottonwood	—	—	—	—	3	2	—	2	11	18	8.1	15.2	5.5	28.8	46.4
Hackberry	15200	69	25	25	14	5	3	3	—	25	10.3	5.4	7.7	23.4	22.8
Bitternut Hickory	—	—	—	—	8	2	1	—	—	11	5.7	1.6	3.4	10.7	20.3
Bur Oak	—	—	—	—	2	2	—	3	—	7	2.3	2.2	2.1	6.6	27.9
Others*	—	—	25	—	13	6	1	1	4	25	24.0	8.7	7.6	40.3	26.6
Totals	149300		331		155	80	36	23	33	327	100.0	100.0	100.0	300.0	

*Includes *Acer saccharum* Marsh. (sugar maple), *Asimina triloba* (L.) Dunal. (pawpaw), *Carya laciniosa* (Michx.) Loud. (kingnut hickory), *C. ovata* (Mill.) K. Koch. (shagbark hickory), *Cercis canadensis* L. (redbud), *Gymnocladus dioica* (L.) K. Koch. (Kentucky Coffee-tree), *Juglans nigra* L. (black walnut), *Platanus occidentalis* L. (sycamore), *Quercus bicolor* Willd. (swamp white oak), *Q. palustris* Muenchh. (pin oak), *Q. rubra* L. (red oak), *Salix nigra* Marsh. (black willow), and *Ulmus rubra* Muhl. (slippery elm).