

# Hoot Woods, A Remnant of Virgin Timber, Owen County, Indiana

ROBERT O. PETTY and ALTON A. LINDSEY, Wabash College  
and Purdue University

## Introduction

Few examples remain of the presettlement forest of Indiana. Remnants, however small, which have been protected from decimation, are increasingly difficult to find outside of the heavily trampled acreage of our state parks. When such an area is discovered it is important botanically that a detailed description of it be added to our scant record of the original vegetation of the midwest.

The virgin stand reported in this paper is owned by the heirs of the late George and Bertha Hoot. The authors express their gratitude to Anne, Alice and Robert Hoot for permission to conduct the study.

## Location and Description of the Area

Hoot Woods is located approximately 3 miles northwest of the town of Freedom, Owen County, Indiana. The stand occupies 64 acres of a gentle east-facing slope which is drained by a small intermittent stream. The area is on the eastern edge of the Crawford Upland described by Malott (6) and was subjected to Illinoian glaciation and mild subsequent erosion. A few trees have been removed over the years; these primarily from the northern end of the stand. In all other respects the woods has been undisturbed with the natural processes of competitive development, windthrow, gap replacement and decay allowed to operate. Soil supporting the timber is a highly melanized podsollic type having a thick, loose mull humus which grades into an A horizon relatively high in potassium and phosphorus. Soil pH varies between 5.0 and 5.5. Texture analysis of ten samples throughout the tract averaged 28% clay, 68% silt and 4% gravel-sand (these determinations were made by the Bouyoucos hydrometer method).

## Vegetation Analysis

In the summer of 1961, a rectangular segment of the stand, 17 acres in area, was fully tallied and the corners marked with steel posts to allow future reference and the study of subsequent change. All trees four inches *dbh* were tallied and their diameters recorded to the nearest one tenth inch as measured by standard diameter tapes (Table 1). From these data, relative basal area per acre and relative density were determined for each species (Table 2). Species nomenclature follows Fernald (3).

## Stand Attributes

Twenty-two tree species were recorded with 1,263 individuals above 4 inches *dbh*, giving a density per acre of 73 stems. This density correlates with the stands of greatest maturity described by Griffin (4) and confirms the Hoot Woods' relatively undisturbed condition. Griffin relates stands having 80 or less stems per acre to an age in excess of 150 years, which predates settlement of this region of the state. The stand is clearly dominated by beech (*Fagus grandifolia*) having a density per acre of 32, with sugar maple (*Acer saccharum*) expressing a co-dominance with 23 stems



TABLE II. Stand Attributes

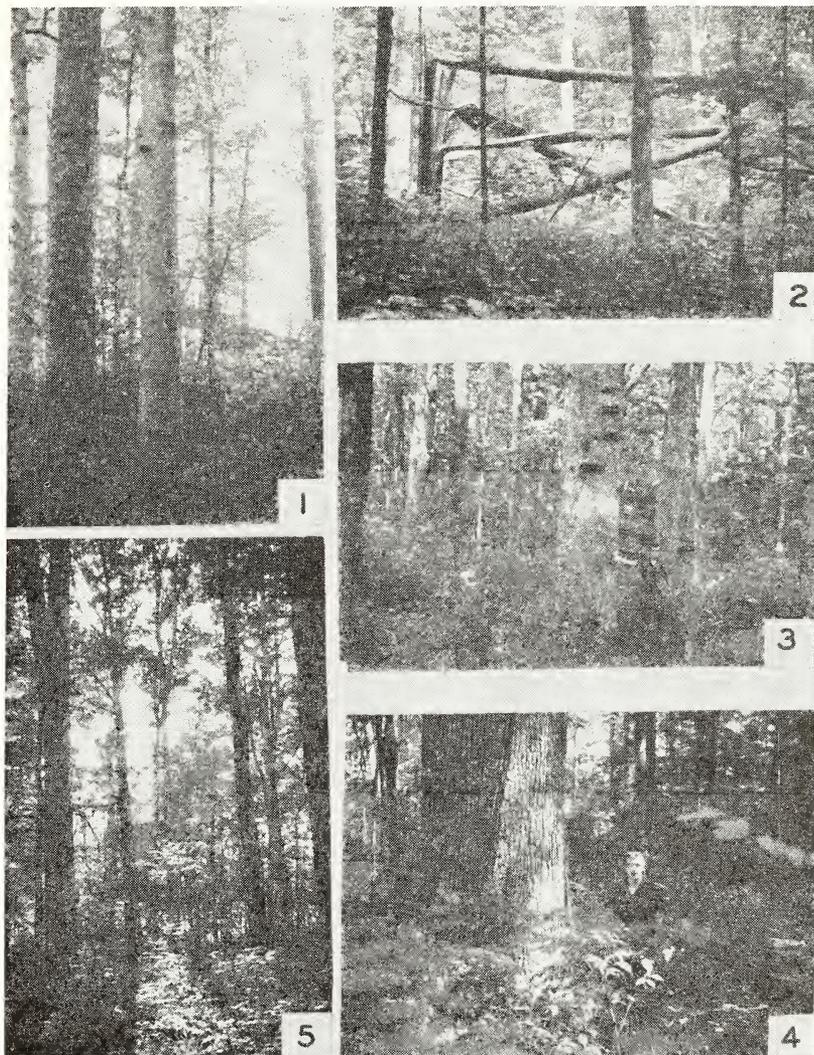
Species	D <sub>2</sub>	D <sub>3</sub>	B <sub>2</sub>	B <sub>3</sub>	V <sub>3</sub>
<i>Fagus grandifolia</i>	30.3	41.5	63.40	46.5	44.0
<i>Acer saccharum</i>	23.8	32.6	41.42	30.4	31.5
<i>Liriodendron tulipifera</i>	6.3	8.6	14.76	10.8	9.7
<i>Fraxinus americana</i>	2.5	3.4	4.60	3.4	3.4
<i>Sassafras albidum</i>	2.0	2.7	1.98	1.5	2.1
<i>Ulmus fulva</i>	1.4	1.9	1.81	1.3	1.6
<i>Prunus serotina</i>	0.87	1.19	1.40	1.02	1.1
<i>Quercus rubra</i>	0.52	0.71	1.33	0.97	0.84
<i>Ulmus americana</i>	0.92	1.26	0.31	0.22	0.74
<i>Fraxinus penn. var. lan.</i>	0.52	0.71	0.98	0.71	0.71
<i>Quercus Muehlenbergii</i>	0.23	0.31	1.51	1.1	0.70
<i>Nyssa sylvatica</i>	0.81	1.11	0.20	0.14	0.62
<i>Carya cordiformis</i>	0.52	0.71	0.59	0.43	0.57
<i>Celtis occidentalis</i>	0.52	0.71	0.54	0.39	0.55
<i>Quercus alba</i>	0.55	0.47	0.52	0.38	0.47
<i>Juglans nigra</i>	0.23	0.31	0.27	0.19	0.25
<i>Carya ovata</i>	0.29	0.39	0.24	0.17	0.23
<i>Juglans cinerea</i>	0.23	0.31	0.14	0.10	0.20
<i>Carpinus caroliniana</i>	0.17	0.23	0.02	0.01	0.16
<i>Carya glabra</i>	0.125	0.16	0.01	0.007	0.08
<i>C. laciniosa</i>	0.06	0.08	0.01	0.007	0.04
<i>Ostrya virginiana</i>	0.06	0.08	0.006	0.004	0.04

per acre. Tulip poplar (*Liriodendron tulipifera*) and white ash (*Fraxinus americana*) ranked third and fourth. Many of the trees measured with an Abney level exceeded 120 feet in height (Plate II). Thirty-three stems were greater than 30 inches *dbh*, notable of which was a yellow oak (*Quercus Muehlenbergii*), 46.5 inches *dbh* (Plate II-4). Beech also contributed the greatest basal area per acre (Plate I-2). Numerical expression of density and basal area are presented in Table 2. Attribute symbols are those of Lindsey (5): D<sub>2</sub>, density per acre; D<sub>3</sub>, relative density; B<sub>1</sub>, basal area; B<sub>2</sub>, basal area per acre; B<sub>3</sub>, relative basal area; V<sub>3</sub>, importance value, in this instance the average of the D<sub>2</sub> and B<sub>3</sub> figures.

#### Phytosociological Considerations

The Hoot Woods lies in a tension zone between the beech-maple type extending northeast, east and southeast and an arm of oak-hickory type; these communities were described by Braun (1). The stand's current development affiliates it with the beech-maple dominated mixed-mesophytic system. The nature of this regional type, dominated so clearly by beech and its frequent co-dominant, sugar maple, has been reported extensively for Indiana by the late John E. Potzger, Ray C. Friesner and their students (9), (10), (11), (12), both as it occurs today in isolated mature secondary stands and as depicted by the systematic records of the original land surveys of 1819-1830. Petty (7) has recently related a contemporary virgin stand in Parke County, both to the regional forest complex and to the original land survey records of 1820. In his study, and in Potzger's data, beech and maple dominate the size classes below

30-36 inches *dbh*, while white oak and tulip poplar contribute the larger diameters, being conspicuously reduced in the lower size classes. This is true of tulip poplar and yellow oak in the Hoot stand.



- Plate II (1) Typical tulip poplar and beech in the Hoot Woods. Man gives scale.  
 (2) Stems of white ash damaged by recent localized tornado. Note the extent of crown opening, providing a niche for opportunizing intolerant species, e.g. tulip poplar, sassafras and wild black cherry, in addition to the previously established seedlings of the tolerant genera. Man gives scale.  
 (3) Yellow oak (*Quercus Muehlenbergii*), 42 inches *dbh*.  
 (4) Yellow oak, 46.2 inches *dbh*.  
 (5) Aspect of clear-length; a typical group. Many individuals exceed 120 ft. in height; 60 and 90 ft. to the first limb. Man gives scale.

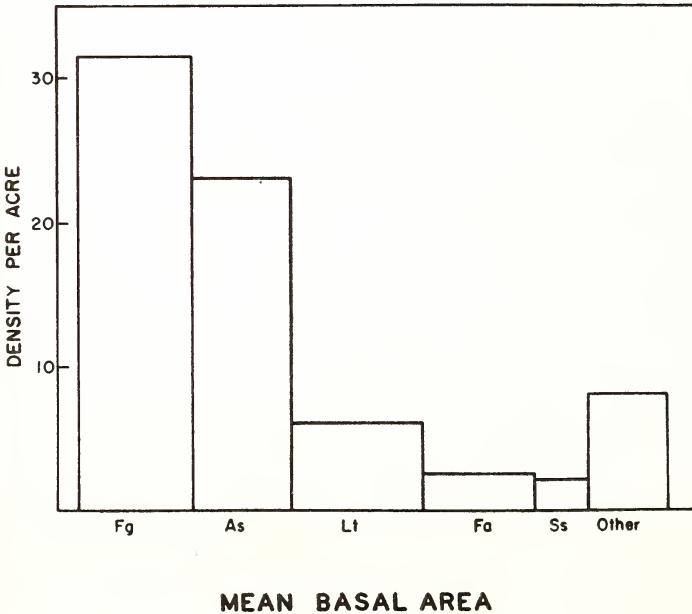
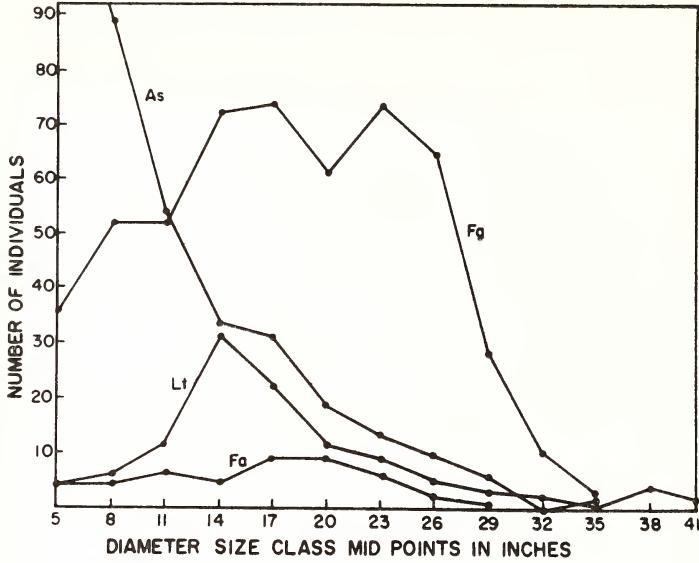


Plate I

- (1) Graph showing size class distribution for the four most important species.
- (2) Basal area per acre of the five most important species: density ( $D_2$ ) plotted against mean basal area per tree determines the area of the rectangle. Fg refers to *Fagus grandifolia*; As, *Acer saccharum*; Lt, *Liriodendron tulipifera*; Fa, *Fraxinus americana*; Ss *Sassafras albidum*; plus all other species combined.

The most typical seral pattern, following extensive cutting in west-central Indiana, is a progression from second growth oak (predominantly white, red and black) to oak-maple (chiefly *Acer saccharum*, but on some sites *Acer rubrum*) to maple-oak, and with increased mesic conditioning of the seedling environment, beech accomplishes ecesis, gradually resulting in maple-beech, with the eventual shift to beech dominated mixed-mesophytic hardwoods. The oaks are rarely completely eliminated during climax equilibration. A few of the species of oak (*Quercus alba*, *Q. rubra*, *Q. Muehlenbergii* and even *Q. velutina*) and the hickories (predominantly *Carya glabra*, *C. ovata*, *C. laciniosa* and *C. cordiformis*) continue to ecize under natural release conditions of windthrow and death removal of a canopy area. In many localities of Indiana, chiefly in the unglaciated portion, drought cycles and general moisture regime retard mesic conditioning and maintain the oak, oak-hickory or oak-maple phase in the more xeric edaphic equilibrium. Stands within this region were also described by Potzger (8).

It should perhaps be pointed out that while it is possible to characterize small isolated stands as continuous or discontinuous with a proposed regional type, both vegetationally and microclimatically, it is important to remember that contemporary vegetational distributions within phytosociological patterns cannot be explained solely by means of environmental parameters. The causation of our contemporary patterns is at best imperfectly interpreted due to our scant knowledge of post-Pleistocene population centers, rates of segregation and the more specific invasion radii.

In the Hoot Woods, as in many mature stands in Indiana, white oak is probably somewhat under-represented due to extensive selection of this species by the lumber industry (adjacent to the stand is an even-aged second-growth of 3 or 4 acres which is comprised of a rapidly moving midseral oak complex dominated by white oak). If, however, we accept the aforementioned characterization of seral pattern, then the selective cutting of oak since early settlement days (which left depressurized places for beech, maple, ash and other mesic components) simply augmented a natural process.

Despite notoriously low germination percentages, the abundant seed source and rapid growth rate of tulip poplar, together with sufficient windthrow, clearings, abandoned fields, etc. has maintained this intolerant species as a major climax associate, frequently ranking third after beech and maple as it does in the Hoot Woods. Periodic disturbance in the stand has also allowed the maintenance of such intolerant species as sassafras and wild black cherry (*Prunus serotina*) in the dominant complex, ranking fifth and seventh respectively in *importance value* ( $V_3$ , Table II). This natural process of gap replacement is frequently under-emphasized. High prevalence of natural canopy opening by death removal can be a major selective factor in the maintenance of seedling environments, which are the ultimate immediate determiners of species composition in the mature stratum (Plate II-2).

Should the Hoot Woods continue to survive the pressures of civilization, the dominant expression of beech should increase with increased trends toward equilibration of the soil, climate and vegetation.

### Acknowledgment

The authors wish to thank Mr. Joseph Ludlow, senior botany major at Wabash College, for his assistance in the field.

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