The Forest Primeval of Indiana as Recorded in the Original U.S. Land Surveys and an Evaluation of Previous Interpretations of Indiana Vegetation

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Edited by

J. E. Potzger
The *Butler University Botanical Studies* journal was published by the Botany Department of Butler University, Indianapolis, Indiana, from 1929 to 1964. The scientific journal featured original papers primarily on plant ecology, taxonomy, and microbiology. The papers contain valuable historical studies, especially floristic surveys that document Indiana’s vegetation in past decades. Authors were Butler faculty, current and former master’s degree students and undergraduates, and other Indiana botanists. The journal was started by Stanley Cain, noted conservation biologist, and edited through most of its years of production by Ray C. Friesner, Butler’s first botanist and founder of the department in 1919. The journal was distributed to learned societies and libraries through exchange.

During the years of the journal’s publication, the Butler University Botany Department had an active program of research and student training. 201 bachelor’s degrees and 75 master’s degrees in Botany were conferred during this period. Thirty-five of these graduates went on to earn doctorates at other institutions.

The Botany Department attracted many notable faculty members and students. Distinguished faculty, in addition to Cain and Friesner, included John E. Potzger, a forest ecologist and palynologist, Willard Nelson Clute, co-founder of the American Fern Society, Marion T. Hall, former director of the Morton Arboretum, C. Mervin Palmer, Rex Webster, and John Pelton. Some of the former undergraduate and master’s students who made active contributions to the fields of botany and ecology include Dwight. W. Billings, Fay Kenoyer Daily, William A. Daily, Rexford Daudenmire, Francis Hueber, Frank McCormick, Scott McCoy, Robert Petty, Potzger, Helene Starcs, and Theodore Sperry. Cain, Daubenmire, Potzger, and Billings served as Presidents of the Ecological Society of America.

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THE FOREST PRIMEVAL OF INDIANA AS RECORDED IN THE ORIGINAL U. S. LAND SURVEYS AND AN EVALUATION OF PREVIOUS INTERPRETATIONS OF INDIANA VEGETATION

JOHN E. POTZGER, MARGARET ESTHER POTZGER, and JACK MCCORMICK

Between 1799 and 1846, the territory which now comprises the State of Indiana was divided by the United States public land survey into six-mile-square townships as a prerequisite for the equitable distribution of public lands. Each township, in turn, was subdivided into 36 sections one-mile square. Section and quarter-section corners, as well as a number of intermediate points, were marked by blazing trees. The location, name, and diameter of more than 214,500 "witness trees," composed of more than 80 species and generic groups, were recorded in the Indiana surveyors' journals. These journals and the maps compiled from them, records inscribed before a tidal wave of settlers swept away much of the natural vegetation of the State, represent our most tangible account of Indiana's primeval forests. They are the source of data for this study.

PREVIOUS STUDIES BASED UPON SURVEY DATA

Six detailed studies which have drawn upon small segments of the Indiana records of the United States public land survey have been published (Blewett and Potzger 1950, Rohr and Potzger 1950, Potzger and Potzger 1950, Ross 1950, Finley and Potzger 1952, Potzger and Keller 1952). A seventh is in preparation (McCormick mss.). The object of the present paper is to present an over-all picture of the original forest vegetation of Indiana.

In their study of the forest associations of Marion and Johnson Counties, neighboring agricultural counties in the glaciated central part of the State, Blewett and Potzger (1950) found that, "Fagus grandifolia and Acer saccharum combined constituted one-half or more of the stems in all but five of the 28 townships [in the two counties], and Fagus alone has 10 per cent representation or more in most of them, reaching a maximum of sixty-nine per cent . . . Combining hickory with oaks as an ecological group, their maximum representation (Marion County) is 19 per cent . . . , but in most townships it does not exceed ten per cent."

1Dr. Potzger, who conceived the idea of this study and who did most of the research, passed away on September 18, 1955.

2Department of Botany, Butler University, Indianapolis, Indiana.

Blewe11 and Poczger (1950) stated that quadrant analysis of a small residual stand in Marion County at Fort Harrison near Indianapolis disclosed the structure of the stand to be very similar to that of the forest which the survey records indicated had existed over the two counties before settlement, a typical climax mixed mesophytic forest in which beech and sugar maple were the most important representatives. From their findings, the authors concluded that the association complex of the primeval forest is reflected in the structure of residual stands of little-disturbed forest.

Studies of the survey data from the central portion of the state (Blewett and Poczger 1950, Poczger and Poczger 1950) support the supposition of Poczger and Friesner (1940), based on considerable field data, with regard to the regional climax. The latter authors have shown that north-facing slopes and moist uplands support a modified beech-maple forest. South-facing slopes and ridgetops are typically occupied by oak-hickory stands. And intermediate slope exposures support a mixed mesophytic forest. Many workers have tended to oversimplify the distribution of forest types in the State by considering that the beech-maple forest is virtually restricted to the level till plains and that oak-hickory dominance starts rather abruptly below the glacial boundary. Poczger and Poczger (1950), however, using the survey records from a strip of counties in the west-central portion of the State, demonstrated that there is "no evidence of a sharp break between a mixed mesophytic forest cover in glaciated and oak-hickory in unglaciated areas. The data rather point to a mixed mesophytic forest in which the oak and hickory element is more prominent in rugged areas." In such rugged areas the predominant slope exposure determines which forest type is more abundant.

A study (Ross 1950) of the five southeasternmost counties revealed that, "the most abundant tree of the forest association was beech and the most prominently associated with it was sugar maple (Acer saccharum), hickories (Carya spp.) and tulip popular (Liriodendron tulipifera)." The object of Ross' study, however, was to prove or disprove the contention that, contrary to popular opinion, Pinus virginiana had existed in Indiana prior to white settlement. Regardless of its sporadic distribution, the early surveyors had employed the pine as a witness tree on 14 occasions. Diameters of several of these trees implied an age which would have antedated even the earliest white settlement. Her study demonstrates the potential value of the survey records for clarifying problems of forest history and species distribution.

Three studies have analyzed the vegetation of those counties in the northwestern corner of the State which are included in or border on the prairie peninsula (Rohr and Poczger 1950, Finley and Poczger 1952, Potzger and Keller 1952). Vegetation maps compiled from the survey data are given in the first two of these papers. They illustrate the pattern of progressive change as one goes from forest to grassland. Traveling westward from the mixed mesophytic
andrat analysis of a small residual near Indianapolis disclosed the forest which the survey
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the authors concluded that the
fleeted in the structur eof res;
portion of the state (Blewett
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Potzger 1952, Potzger and Keller
data are given in the first
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ard from the mixed mesophytic

Fig. 1. Map-graph showing distribution in Indiana of the climax beech-sugar
maple-upland ash forest association as percentages of total witness trees recorded by
townships in the original U. S. Land Survey. (Copies of the tables of percentages on
which this and figures 2 and 3 are based have been deposited in the Butler University
Library, Indianapolis, Indiana.)
forest, the more mesic species, such as beech, maple, and ash, become less and less abundant and the more xeric oaks and hickories assume control of the crown. In the forest-grassland transition area, trees decrease both in number and size and oak opening and oak forests alternate with true prairie.

THE MAP-GRAPHS

The data compiled from the survey records were graphed, township by township, on three maps of the State (Figures 1, 2, 3). Percentages for beech (*Fagus grandifolia*), sugar maple (*Acer saccharum*), and the upland ashes (*Fraxinus americana*, *F. quadrangulata*, *F. americana* spp.) are shown in Fig. 1. Percentages for the upland oaks (*Quercus alba*, *Q. coccinea*, *Q. ellipsoidalis*, *Q. falcata*, *Q. muehlenbergii*, *Q. prinus*, *Q. rubra*, *Q. velutina*) and the hickories (*Carya* spp.) are shown in Fig. 2. Fig. 3 presents the combined percentages for beech, sugar maple, and upland ash, the combined percentages of upland oak and hickory, and the combined percentages for all other species in each township.

In the western section of the State the bar graphs have been modified into a checkered pattern—derived from the vegetation maps in the prairie studies of the present series (Rohr and Potzger 1950 and Finley and Potzger 1952)—to indicate the distribution of savannah or oak-opening vegetation. In this same region, disjunct forest trees are denoted by dots. The dots are placed so that the first and last delimit the length of an imaginary percentage bar. The base map utilized for the map-graphs is somewhat stylized; the size and arrangement of the townships is, in reality, not quite so regular.

Survey records were not available for 17 townships. These include eight townships in two eastern areas which were included in the Ohio survey; eight townships of the George Rogers Clarke Reserve Land in the southeast; and one township in the Vincennes Donation Tract along the lower western border of the State.

The authors wish to express their appreciation to Mr. Jules Milette for aid in preparation of the map-graphs and to the Service de Biogeographie, Universite de Montreal, for his services.

TOPOGRAPHY AND PHYSIOGRAPHY OF INDIANA

Indiana has a land surface of more than 36,000 square miles (Visher 1922). Nearly 90 per cent of this area is situated between 500 and 1000 feet above sea level. The maximum elevation, which occurs in the east-central section, is 1285 feet. The minimum elevation, at the southwestern tip of the State, is 313 feet.

Approximately five-sixths of the State has been glaciated. The glaciated section, a part of the Central Lowland province of Fenneman (1938), is an area of small relief with broad areas of poor natural drainage (Visher 1922,
maple, and ash, become less and hickories assume control of the trees decrease both in number and with true prairie.

PHS were graphed, township by tow-
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pp.) are shown in Fig. 1. Per-
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ce of Fenneman (1938), is an
atural drainage (Visher 1922,
Fig. 3. Map-graph presenting summary of the primeval forest association in Indiana as combined percentages of beech-sugar maple-upland ash, of upland oak-hickory, and of all remaining tree species of total witness trees recorded by townships in the original U. S. Land Survey.
Throughout the northern quarter of the State there are frequent moraines and numerous glacial lakes. But the remainder of the glaciated section is "chiefly characterized by a covering of glacial till of nearly level surface without lakes and not well dissected by streams" (Malott 1922).

The unglaciated area comprises about 6000 square miles in the southwest and south-central portions of the State. In general, it has a diverse and broken topography. The more eastern portion of the area consists of a dissected upland famed for its forested hills or knobs. The western portion contains broad expanses of nearly level riverbottom and terrace lands.

**Discussion of the Map-Graphs**

Primeval Indiana was primarily a forested region. Only in the northwest, where the tall grass prairie extended into the State, did tree vegetation give way to extensive grassland (Figs. 1, 2, 3).

The open aspect of the prairie was reflected by the dearth of trees tallied in sixteen prairie townships. These townships had an average of ten witness trees each, in contrast to more than 200 in an average forested township. Absolutely no witness trees were recorded in three of the prairie townships (T25N, R8W; T26N, R8W; T26N, R7W).

Oak-opening vegetation bordered the true prairie (Fig. 2, 3). The savanna, in turn, gradually merged into the oak-hickory forest. The distribution of these various vegetation types and the transition from forest to grassland have been discussed by Rohr and Potzger (1950), Finley and Potzger (1952), and Potzger and Keller (1952).

The forest vegetation of Indiana was composed of two principal complexes, the beech-sugar maple-upland ash, or mixed mesophytic forest and the oak-hickory forest. In addition, various bottomland and transition associations occupied a considerable portion of the State.

**Beech-Maple-Ash Forests.** Townships in which at least 50 per cent of the witness trees were beech, sugar maple, and upland ashes, individually or in any combination, were considered to have been occupied by beech-maple-ash forests. Three hundred and ninety townships, 39 per cent of the total number considered, were covered by this type of forest (Figs. 1, 3). Most of these townships lie in a single block which occupies the central and eastern sections of the State.

Beech composed up to 80 per cent of the forest in some townships. But the contribution of the sugar maple never exceeded 40 per cent and that of the ashes did not exceed 19 per cent of the total number of stems in any township. Blewett and Potzger (1950), who analyzed the data from 25 townships in central Indiana, and Potzger and Potzger (1950), who tabulated the data from 57 townships in west-central Indiana, present a more complete picture of the composition of the beech-maple forest.
Oak-Hickory Forests. Townships in which at least 50 per cent of the witness trees were upland oaks and hickories are considered to have been covered by oak-hickory forests. These forests occupied large blocks of townships in the southern, southwestern, northwestern, and northern portions of the State (Fig. 2). In all, 280 townships, 28 per cent of the townships surveyed, were covered by oak-hickory forests. The composition of the association varied from place to place. Oaks comprised as much as 98 per cent of the stems in certain townships. Hickory rarely exceeded 40 per cent of the total number of stems and was commonly much less prominent.

Bottomland and Transition Forests. Bottomland and transition forests, in which neither oaks and hickories nor beech, sugar maple, and upland ashes aggregated as much as 50 per cent of the total number of witness trees, occupied one out of every three of the townships included in the survey. The fluctuations in abundance of these types throughout the State are indicated in Fig. 3 by the variations in lengths of the percentage bars representing "other tree species." Of course, these bars also include a varying proportion of understory and less common canopy species of the two major upland types. The composition of the primeval forests in two townships, one in southwestern and one in northwestern Indiana, in which bottomland hardwoods comprised more than 50 per cent of all witness trees is shown in Tables 1 and 2.

**TABLE 1**

Primeval forest composition in a southern Indiana township occupied primarily by bottomland hardwoods (T. 3 S., R. 13 W.—Gibson County). Figures indicate the percentage of land survey witness trees comprised by a given species.

<table>
<thead>
<tr>
<th>Species</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ulmus spp.</td>
<td>17.89%</td>
</tr>
<tr>
<td>Liquidambar styraciflua</td>
<td>15.26%</td>
</tr>
<tr>
<td>Acer saccharinum &amp; rubrum</td>
<td>12.10%</td>
</tr>
<tr>
<td>Fraxinus nigra</td>
<td>9.47%</td>
</tr>
<tr>
<td>Carya spp.</td>
<td>6.84%</td>
</tr>
<tr>
<td>Quercus alba</td>
<td>4.21%</td>
</tr>
<tr>
<td>Acer negundo</td>
<td>3.16%</td>
</tr>
<tr>
<td>Celtis occidentalis</td>
<td>3.16%</td>
</tr>
<tr>
<td>Quercus velutina</td>
<td>3.16%</td>
</tr>
<tr>
<td>Platanus occidentalis</td>
<td>2.63%</td>
</tr>
<tr>
<td>Morus rubra</td>
<td>1.57%</td>
</tr>
<tr>
<td>Quercus rubra</td>
<td>1.57%</td>
</tr>
<tr>
<td>Cercis canadensis</td>
<td>1.05%</td>
</tr>
</tbody>
</table>

*From the records that beech-maple-ash forests. These forests north by oak-hickory hickory forests beech-maple-ash then gave way to these irrefutable recognition with the interpretation can be divided into two interpretations that are noncommittal interpretations of the United States which, even Raphael Zon, who interpreted Indiana’s oak-hickory forest as part of the oak-hickory forest. The southeastern*
at least 50 per cent of the witness trees considered to have been covered by large blocks of townships in the northern portions of the State (Fig. 9). Townships surveyed, were covered to a highest frequency varied from place to place, to the stems in certain townships. Total number of stems and was

Northland and transition forests, in sugar maple, and upland ashes number of witness trees, occupied in the survey. The fluctuations are indicated in Fig. 3 by the percentage "other tree species." Of understory and less common types. The composition of the western and one in northwestern prairie more than 50 per cent of

TABLE 2

<table>
<thead>
<tr>
<th>Species</th>
<th>Percentage of Stems Covered</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fraxinus nigra</td>
<td>26.40%</td>
</tr>
<tr>
<td>Ulmus spp.</td>
<td>15.17</td>
</tr>
<tr>
<td>Fagus grandifolia</td>
<td>10.67</td>
</tr>
<tr>
<td>Carya spp.</td>
<td>9.55</td>
</tr>
<tr>
<td>Fraxinus spp.</td>
<td>9.55</td>
</tr>
<tr>
<td>Quercus macrocarpa</td>
<td>5.06</td>
</tr>
<tr>
<td>Acer saccharum</td>
<td>3.92</td>
</tr>
<tr>
<td>Quercus rubra</td>
<td>3.37</td>
</tr>
<tr>
<td>Platanus occidentalis</td>
<td>2.24</td>
</tr>
</tbody>
</table>

PREVIOUS INTERPRETATIONS OF INDIANA VEGETATION

From the records of the original United States Land Survey it is apparent that beech-maple-ash forests occupied the central and eastern portions of Indiana. These forests were enclosed on the south, southwest, northwest, and north by oak-hickory forests. In the northwest quarter of the State, the oak-hickory forests became more sparse, forming an oak-opening vegetation and thence gave way to tall grass prairie (Figs. 1, 2, 3). It is of interest to compare these irrefutable records of the composition and distribution of Indiana vegetation with the interpretations of several modern workers. These interpretations can be divided into three categories:

1. Interpretations which depict Indiana as covered by deciduous forests. This "noncommittal" interpretation is often used in small scale maps of the vegetation of the United States or of the North American continent. Examples are included in papers, such as those by Shreve (1917), Livingston and Shreve (1921), Sheldrake, Jones, and Dice (1926) and Pitelka (1941), in textbooks, such as those by Weaver and Clements (1938) and Transeau, Sampson and Tiffany (1940), and in maps published by the United States Forest Service (1948).

2. Interpretations which depict Indiana as covered principally by oak-hickory forests. Shantz and Zon (1924) compiled a map of the vegetation of the United States which, even today, is unexcelled for inclusiveness and detail. However, Raphael Zon, who was responsible for mapping the forest regions, grossly misinterpreted Indiana's forests by mapping all but the southeastern portion as oak-hickory forest (Figure 4). In the text, the authors state, "In the western part of the oak region embracing western Ohio, Indiana, Missouri, and Oklahoma, and largely bordering on the prairies, the chestnut, chestnut oak, and yellow poplar gradually disappear and the forest becomes characteristically an oak-hickory forest."

The southeastern section of Indiana was mapped by Zon as chestnut-chestnut-
The interpretation by the extensive survey of Indiana in 1925, Huffaker (September 1953), is apparently the most correct in its classification of the forest regions of Indiana, relative to his published maps. 2

Interpretation of the forests in Indiana is apparently best done in his revision of Den Uyl's classification (cited by Den Uyl, 1925, p. 11). That classification was termed "oak-hickory" and it was clearly the most correct in the west.

Gordon's early survey of Indiana's "oak-hickory" classification (1925) and his subsequent reinterpretation of the "oak-hickory" forests in Indiana is apparently the most correct in the west.
From the Land Survey records, it is obvious that the boundary of this area is entirely erroneous. The section actually contained a large portion of beech-maple forest as well as a smaller amount of oak-hickory forest. Ross (1950), working from the Survey data, stated that in the five southeasternmost counties of the State, "The most abundant tree of the forest association was beech and the most prominently associated with it were sugar maple (Acer saccharum), hickories (Carya spp.) and tulip poplar (Liriodendron tulipifera)."

The interpretive errors in the Shantz and Zon map have been perpetuated by the extensive use of the work by authors of scientific papers (e.g., McDougall 1921, Huffaker 1942) and of text books (e.g., Davis 1943; Goode 1950; Kroemer 1953). Zon (1941), in a later, simplified map did not attempt to correct his classificatory error. Rather than that, he characterized the entire forested area of the State as "oak" forest. Dayton (1949), writing for the U. S. Forest Service in the Yearbook of Agriculture, copied the Shantz and Zon map without correction or criticism.

Den Uyl (1954), after studying figures pertaining to the annual hardwood lumber production in Indiana from 1869 to 1915, incorrectly concluded that Indiana's "old growth forests were predominantly oak." He further misconception that "These figures would indicate that . . . the 'beech-maple' association must have occupied a minor position or must have been very much restricted in area." Den Uyl attempts to discredit the fact that many recent ecological analyses (Esten 1932, Potzger and Friesner 1940, Braun 1950) have shown the beech-maple type to be wide-spread and of prime importance in the State by assuming that, " . . . it is probable that when the early ecologists came into Indiana and our neighboring states they did see residual stands in which beech and maple could easily have been prominent. The lumber production records clearly indicate that the oaks were the favored trees to be cut and hence . . . one's observations would put beech and maple into the ecological picture."

Interpretations which depict Indiana as covered by oak-hickory and beech-maple forests. Perhaps the first map to indicate the prominence of beech-maple forests in Indiana was published by Shelford (1931). Shelford's map, however, is apparently little more than an adaptation of the Shantz and Zon map (1924). In his revision, Shelford substituted the name "beech-maple" for the former classification, "oak-hickory." The prairie area was virtually unaltered. The chestnut-chestnut oak-yellow poplar type in the southern portion of the State was returned "oak-chestnut" forest and its limits were extended slightly to the west.

Gordon (1932), who supplemented field studies with data culled from the early surveyor's records, compiled a map of the natural vegetation of the east-central states. Two tongues of prairie grassland were shown to project into the oak-yellow poplar forest. From the Land Survey records, it is obvious that the boundary of this area is entirely erroneous. The section actually contained a large portion of beech-maple forest as well as a smaller amount of oak-hickory forest. Ross (1950), working from the Survey data, stated that in the five southeasternmost counties of the State, "The most abundant tree of the forest association was beech and the most prominently associated with it were sugar maple (Acer saccharum), hickories (Carya spp.) and tulip poplar (Liriodendron tulipifera)."
northwestern section of Indiana. Oak-hickory forests were indicated throughout the north, west, and in a portion of the southwest sections. Beech-maple forests were mapped in the entire central and eastern sections and also in the southwestern section. An oak-chestnut type was shown to occupy a long, narrow area oriented longitudinally along the southern quarter of the long axis of the State. This distribution is very similar, in its gross aspects, to the distribution determined in the present study.

Kendeigh (1934) indicated that the entire State, with the exception of a small section in the northwest, was occupied by beech-maple forests. However, by an overprinted symbol, he also indicated widely distributed oak-hickory forests.

In 1936, Gordon published a detailed "Preliminary Vegetation Map of Indiana" based on observations made during trips throughout the State (Fig. 5). Eight vegetation units were recognized: prairie grassland, upland oak forest, northern swamp forest, beech forest, mixed forest, beech-sweet gum forests, southern swamp forest, and bald cypress forest. Except for variations introduced by considerable dissection due to subdivision, the general distribution of oak-hickory and beech-maple forests remained the same as shown in his previous map (Gordon 1932). The map is especially notable in that it shows that scattered prairie patches existed far to the north, east and south of the main prairie projections. Mapping of the "prairie counties" correlates extremely well with maps compiled from the Survey Records by Rohr and Potzger (1950) and Finley and Potzger (1952). The manuscript of Gordon's map served as the source of data for the distribution of Indiana prairie areas shown in Transeau's map of the "Prairie Peninsula" (1935).

It is beyond the scope of this paper to evaluate the validity of categorization of Gordon's other forest types or the accuracy of the mapping of those types. Potzger and Friesner (1940), however, considered that Shantz and Zon (1924) had "classified the State too dry and Gordon (1936) [had classified it] too mesophytic." McCoy (1939) indicated that Gordon's interpretation of forest-type distribution in southwestern Indiana may also be incorrect.

Potzger (1935) candidly summarized the findings of his intensive field studies of a small area near Bloomington, Indiana: "The most outstanding single feature of the upland forest, however, is the dual nature of the forest type. The transition from beech-maple on the north-facing slopes to oak-hickory on the south-facing slopes is not gradual but abrupt and decisive, marked by a sharp line along the ridge."

Later, on the basis of extensive quadrat data collected in lower central Indiana, Potzger and Friesner (1940) found this situation to be general throughout the area. They reported that "In all the counties studied the two forests types customarily termed Acer-Fagus and Quercus-Carya are sensitively bal-
ory forests were indicated through the southwest sections. Beech-maple and eastern sections and also in the type was shown to occupy a long, the southern quarter of the long axis, in its gross aspects, to the distribu-
tion State, with the exception of a led by beech-maple forests. However, areas widely distributed oak-hickory

Preliminary Vegetation Map of Indi-
trips throughout the State (Fig. 5). prairie grassland, upland oak forest, sed forest, beech-sweet gum forests, rest. Except for variations introduced, the general distribution of oak-

Seven categories of native vegetation were mapped by the Indiana Soil Survey (1941). According to its compilers, "this map does not outline vegetation areas, but rather characterizes soil regions as to vegetation." It is difficult to evaluate this map or to compare it with the land-survey data because of the peculiar categories employed. For example, one category lumped "oak-hickory, beech-maple, ash-elm, tulip, walnut," another is comprised of "pin oak-sweet gum: beech-maple: oak-hickory," and a third category includes "chestnut, scarlet, black, white, and red oaks: maple, beech, hickory, tulip, walnut, scrub pine." The distribution of predominantly-grass vegetation in the northwestern section appears to be in close agreement with the distribution recorded by the original surveyors. The importance of floodplain and swamp forests along the Wabash, White, and Whitewater Rivers, however, is perhaps overemphasized.

Kittredge (1948) revised the Shantz and Zon map (1924) or a later modi-
fication of it. His map depicts Indiana as covered primarily by oak-hickory forests. However, an arm of the "birch-beech-maple-hemlock forest" is shown to project into the east-central portion of the State. Following Shantz and Zon, Kittredge mapped southern Indiana as "oak-chestnut-yellow poplar." He also mapped small areas of tall grass prairie in the northwest and "riverbottom hardwoods and cypress" in the extreme southwest and northeast portions of the State.

The recent United States Forest Service map (1949), "Areas characterized by major forest types in the United States," is in general agreement with the Indiana land survey (Figure 6). Several points of disagreement, however, are obvious. On the Forest Service map the entire northern third of the State is typed as oak-hickory. The survey data indicate that this area was divided be-
tween oak-hickory (in the west and extreme north), beech-maple (in the central and southeastern portions), and bottomland forests in the central and eastern portions) (Fig. 3). Oak-hickory is also shown by the Forest Service to occupy virtually the entire unglaciated section. This is in general agreement with the survey data (Fig. 3), but the importance of the association along the western edge of the State was ignored by the Forest Service.

Beech-maple forests are shown by the Forest Service map to occupy a strip

anced, ..." and concluded that "apparently the climate favors a modified Acer-Fagus climax, and microclimate induced by topography causes and main-
tains the Quercus-Carya forest cover type in central Indiana."

Potzger and Friesner (1940) also emphasized that the common designation, maple-beech type, "must be made very inclusive of many other species which play a part in the crown cover when Indiana forests of this type are considered." They concurred with Braun (1938) who suggested that Indiana beech-maple forests are actually representatives of "the 'mixed mesophytic association' in which beech and maple are the most prominent members."
of land extending across the southern half of the central portion of the State. This band is narrow at the east and broad at the west. Finger-like projections extend into the southwestern and southern portions. But the land survey records show that the beech-maple type actually occupied a wide area in the east-central and southeastern portion of the State which abruptly narrowed to the west (Fig. 1). An arm of beech-maple did extend to the south, but not to the southwest. The Forest Service map shows bottomland forests to occupy a narrow strip along the southwestern border of the State. The land survey data (Fig. 3), however, do not support the contention that the type was of great importance very far north of the confluence of the Wabash and White Rivers. And the survey data illustrate that the large area in the southeastern portion of the State shown by the Forest Service map to be bottomland forest is actually an area in which beech is especially prominent.

Braun’s recent (1950) book on the deciduous forests of eastern North America presents a remarkably accurate picture of the distribution of oak-hickory and beech-maple forests in Indiana. Braun’s map (Figure 7) shows that the former type occupies the entire northern and western sections of the State, while the latter covers the central and eastern sections. The Hill Section of the Western Mesophytic Forest Region is shown to occupy the west-central portion of southern Indiana. “Vegetationally, this is an area of mixed forests—usually some phase of mixed mesophytic forest on northerly slopes, and of oak or oak-hickory forest on drier slopes and ridges” (Braun 1950). The southeastern section is characterized as the Area of Illinoian Glaciation of the Western Mesophytic Forest Region. “The drier slopes and exposed river bluffs [in this section] display remnants of an oak-ash-maple forest . . . . On less dry slopes and in maturely dissected places, forest development has progressed to a mixed mesophytic forest climax.” (Braun 1950). On flats, “Pin oak, sweet gum, red maple and white elm separately, and in various combinations, together with some accessory species as swamp white oak, sour gum, white oak, shell bark hickory, and beech compose the developmental forest stages. In secondary forests, pin oak and/or sweet gum frequently dominate. The hydrarch succession of the undissected flats terminates in a beech forest, which is here a physiographic climax. Sugar maple is not a part of this community” (Braun 1950). The validity of this last statement is witnessed by the fact that in most of the townships in the southeastern section which are regarded as beech-maple in the present study, beech alone comprised more than 50 per cent of the witness trees (Fig. 1). Distribution of prairie areas is obviously adapted from Gordon (1936).

In a map embodying his physiognomic system of classification, Kuchler (1953) presents a clear picture of the distribution of various forms of vegetation throughout the United States. His physiognomic types are divided into floristic types. Five floristic types are shown to occur in Indiana (Figure 8). Beech-maple forests are indicated throughout most of the northeastern quarter
Records of the original land survey of Indiana reveal that, prior to settlement, the State was primarily covered by deciduous forests. These forests were composed of two major complexes, a mixed mesophytic forest in which beech and sugar maple were usually outstanding and an oak-hickory forest. The former type, which covered at least 40 per cent of the area, occurred primarily in a single block which occupied the central and eastern sections of the State. The oak-hickory type covered about 30 per cent of the State. It occupied peripheral areas to the south, southwest, northwest and north of the beech-maple. Approximately 32 per cent of the townships in the State were either occupied by nearly equal mixtures of beech-maple and oak-hickory forests or they were occupied by forests in which other species were predominant.

SUMMARY

Records of the original land survey of Indiana reveal that, prior to settlement, the State was primarily covered by deciduous forests. These forests were composed of two major complexes, a mixed mesophytic forest in which beech and sugar maple were usually outstanding and an oak-hickory forest. The former type, which covered at least 40 per cent of the area, occurred primarily in a single block which occupied the central and eastern sections of the State. The oak-hickory type covered about 30 per cent of the State. It occupied peripheral areas to the south, southwest, northwest and north of the beech-maple. Approximately 32 per cent of the townships in the State were either occupied by nearly equal mixtures of beech-maple and oak-hickory forests or they were occupied by forests in which other species were predominant.

LITERATURE CITED


McCormick, Jack. Miss. Cypress and grassland in the precambrian vegetation of southwestern Indiana.

UNITED STATES FOREST SERVICE. 1949. Areas characterized by major forest types in the United States (Map). From National Survey of Forest Resources.
ZON, RAPHAEL. 1941. Climate and the nation's forests. In Climate and Man, Yearbook of Agriculture for 1941, pp. 477-498.