

Pollen Profile from Sediments of an Extinct Lake in Hendricks County, Indiana Marks Time of Drainage*

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On the farm of Mr. H. D. Barlow, three miles northwest of Plainfield, Hendricks County, Indiana, is a magnificent empty bowl of an extinct lake whose wall rises abruptly forty feet or more above the floor. Two large cuts in the eastern embankment give mute evidence of the draining of this lake into the much lower-placed White Lick Creek. The south-eastern part of the extinct lake was a mucky area when Mr. Barlow took possession of the farm, and peat formed a fairly deep deposit. It at once became apparent to the writer that pollen deposits in this peaty layer would not only bear record of forest succession in Hendricks County following retreat of Early Wisconsin glaciation but also mark the approximate time when the lake was drained. So a boring was made in the peat, which totaled eight feet at the maximum.

Thanks is expressed to Mr. Harold Gibbs, who drew the writer's attention to the old lake basin; to Mr. H. D. Barlow, owner of the farm, for his readily granted permission to have the boring made on his property; to my colleagues, C. Mervin Palmer and Ray C. Friesner, also to Mr. C. O. Keller, graduate student in our department, for assistance rendered in the boring work.

Physiographic History of the Region

The region dates origin of its topographic features to Early Wisconsin glaciation and subsequent carving by running water, primarily that of White Lick creek and its larger and smaller tributaries, which in some places have made substantial cuts through the unconsolidated glacial drift, resulting in steep flanking slopes, and dissected topography in general. The glacial drift is at times very deep. Mr. M. F. Gibbs reports that in a well boring on his farm logs were struck at a depth of 85 feet.

The Characteristics of the Ancient Lake

The outline of the old basin perhaps is as definite now as it was in days when water filled the depression, except that two cuts through the eastern wall today mark the head of an intermittent stream to White Lick creek which is placed at least 25 feet lower than the lake bottom. This elevated position of the lake no doubt aided greatly in the breakdown of the rather narrow eastern retaining wall, giving rise to a small creek which gradually cut below the original bottom of the lake. The more substantial flanking walls are even today preserved excellently, enclosing an area of perhaps 80 acres. Large granitic boulders are strewn conspicuously over uplands and the floor of the bowl. Among the unusual features left as evidence of the scouring and grinding action

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of the vanished ice masses is one large granite block ground into a flat base and rising cap-like above the surface soil.

Methods

Boring was made with the movable-sleeve type borer described in many of our previous papers dealing with pollen studies of bogs. Small samples of peat were secured at each foot-level, placed into a bottle, and marked with foot-level and location. The stoppers were sealed with paraffin to retain moisture in the peat sample. Moist samples yield readily separated material. In the preparation of slides the Geisler (2) method was followed. This eliminates the rough treatment with KOH and acids as suggested by a number of workers for the preparation of slides, and prevents excessive breakage of pollen from conifers. 200 grains of pollen of trees were counted at each foot-level except at the pollen-deficient lowest level, where only 75 grains were counted.

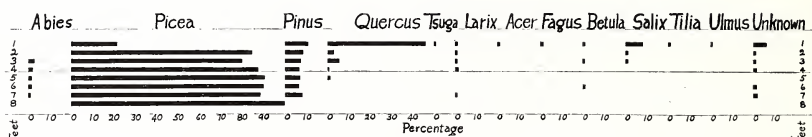


TABLE I.—Pollen Percentages Representing Various Genera in a Pollen Profile from Peat of an Extinct Lake in Hendricks County, Indiana

Foot Level	Abies	Picea	Pinus	Quercus	Tsuga	Larix	Acer	Fagus	Betula	Salix	Tilia	Ulmus	Unknown
1	....	21½	11	46	½	1	1	1½	1	8	1	½	6
2	....	84½	8½	3	....	1	....	....	....	1	....	....	1
3	3½	80	7½	5½	....	1	....	....	½	1	....	....	1
4	2	87½	6½	½	....	1½	....	....	....	....	....	....	1½
5	1½	90½	7	1	....	....	....	....	....	....	....	....	....
6	1½	90	6½	....	....	....	....	....	½	....	....	....	1½
7	1	88½	8	....	....	½	....	....	....	....	....	....	2
8	....	100	....	....	....	....	....	....	....	....	....	....	....

Results

Table 1 and figure 1 present in summary the story of forest succession up to the time of drainage of the ancient lake. The first tree cover consisted entirely of *Picea*; scattered and open forest are indicated by the somewhat sparse representation of pollen in the sediment. *Abies* was not abundant at any time, and passed out at the 3-foot level. While *Pinus* was never very important, it increased towards the topmost level. The boreal forest yielded suddenly to the deciduous forest complex, with *Quercus* as most important genus. No pronounced *Pinus* period is indicated. This lack of *Pinus* is a characteristic feature of pollen profiles from bogs located in Early Wisconsin territory in Indiana. In Hendricks county *Quercus* advanced from insignificant representation at the 5- and 4-foot levels to co-dominance with *Picea* and *Pinus* in the surface layer, indicating a moderating climate. This change of climate is further to be

inferred from the invasion of a number of our typical mesophytic climax genera, such as *Fagus*, *Acer*, *Tilia* and *Ulmus*. At this stage the record ends, marking the closing chapter and drainage of the ancient lake. Apparently the small creeks had now cut deeply enough into the loose material of the narrow retaining wall along the eastern border to accomplish the drainage of the lake to White Lick creek. This took place rather early in Post-Pleistocene times, coinciding with the decline of the boreal forest, in fact, it might have occurred during the *Picea* period and pollen of the broadleaved genera might have accumulated in the pool-like southwest area after the major part of the lake had been drained.

Discussion

Peat deposits are not common in the region of southernmost extension of Early Wisconsin glaciation. The most typical well-developed bog along the border is perhaps Bacons Swamp in Indianapolis, where peat has accumulated to a depth of 32 feet. While the story of forest succession in the Hendricks county peat is only fragmentary, it involves at least the whole *Picea* period and reaches into that pronounced change to moderating climate which enabled the deciduous genera to compete with and replace the coniferous forests in Indiana (fig. 1, table 1). If we compare the truncated profile from Hendricks county with the complete ones reported by Otto (3), Prettyman (4) and Barnett (1) for bogs in different areas of Indiana which were affected by Early Wisconsin glaciation we find that only about one-third to one-half of the forest history had been recorded in the Hendricks county peat.

The large number of foot-levels recording control by *Picea* in Hendricks county is characteristic of regions where silt and clay constitute the soil adjacent to the lake. In lakes and bogs flanked by sandy soil, and in which boring is limited to the organic sediments, the number of foot-levels recording forest made up chiefly of *Picea* is much reduced. In such lakes early sediments consist primarily of fine sand in which the pollen of pioneer forests is embedded.

The ancient lake in Hendricks county existed as a body of water only a comparatively short time, perhaps only a few thousand years. When its waters ebbed away to the nearby White Lick Creek recording ceased, and the magnificent empty bowl with high, steep walls has continued as an extinct lake since that day, while countless centuries rolled on unmarked, as spruce and pine declined, and eventually disappeared entirely when the last of these genera yielded to the pressure of the climatically favored southern deciduous forest.

Summary

1. The paper presents a pollen profile of a shallow peat deposit in an extinct lake in Hendricks county, Indiana.
2. The old lake basin is excellently preserved, but a cut through the eastern wall drained the waters to White Lick Creek before deep lake and peat sediments could accumulate.
3. The small deeper southwest section of the old bowl had an 8-foot deep layer of peat.

Picea to the period when broadleaved genera, primarily Quercus, began to crowd out the conifers. From a complete dominance (100%) at the 8-foot level, Picea declined to 21½% at the top-most level, while Quercus is here represented with 46%.

5. At this period, or perhaps earlier, the old lake must have been drained, and records closed. Drainage thus occurred at the very beginning of the characteristic long oak period, which in Indiana is represented by the upper two-thirds of the total sediment.

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