

## Wetland Transformation in the Wisconsin Drift Area of Indiana<sup>1</sup>

BENJAMIN F. RICHASON, JR., Carroll College

Land drainage in the past century has played an important part in the development of Indiana agriculture, as well as in the improvement of public health. Although complete drainage statistics have not been compiled, at least 2.4 million acres added to the cultivated land area of the state and approximately an equal amount made more productive and profitable doubtless is a conservative estimate of the benefit of drainage to agriculture in Indiana.<sup>2</sup> The benefits to health would be exceedingly difficult to measure, but it is known from early records that malaria was generally endemic, and occasionally hyperendemic, in those areas of the state where drainage is now most complete, and that this dreaded disease has largely disappeared from those areas today.

Although land drainage in Indiana dates back to 1799 (1), few records were kept of the length of drainage installations, much less of the amount of land actually drained. The first census of drainage was taken in 1920, at which time statistics on farmland actually supplied with drainage were included. The reporting of farmland drained was continued in the 1930 census, but not subsequently. Both the 1940 and 1950 census of drainage present figures for land in drainage enterprises only; a classification that fails to include some land drained by virtue of its location outside of drainage enterprises, as well as including land not supplied with drainage within drainage enterprises because of the "common enemy" rule under which Indiana drainage operations are carried out.

In an effort to determine the location of those areas in Indiana where drainage need was, and is potentially, greatest, an attempt was made to locate the former wetlands of the state. The hydromorphic sequence of I-, VII-, VIII-, IX-, and X-profile soils have been used to locate these areas, as those soil relationships which existed under natural equilibrium persist in spite of the disturbed natural balance due to occupation (2). By using the drainage profile as a means of assessing the natural drainage adequacy of soils, it may be seen (Fig. 1) that wetlands, and their subsequent drainage, are phenomena of the northern two-thirds of Indiana, particularly within the area of Wisconsin Drift.

From Figure 1, based on the soil surveys and Bushnell's soil associations (3), it is observed that wetlands are most extensively developed in the northwestern, prairie section of the state where lacustrine plains predominate. With the exception of the northwest, the mode of wetness by county units in the area of Wisconsin Drift appears to be between 25-50

---

<sup>1</sup> This paper is based on a part of the research carried out with the aid of a Science Faculty Fellowship granted to the author by the National Science Foundation, 1958-59.

<sup>2</sup> In regard to wet lands, these figures are at best estimates, but are based on census statistics. The 1930 Census of Drainage reported 2,430,789 acres in drainage enterprises as unfit for cultivation, and 2,365,603 acres suitable for only a partial crop prior to drainage.

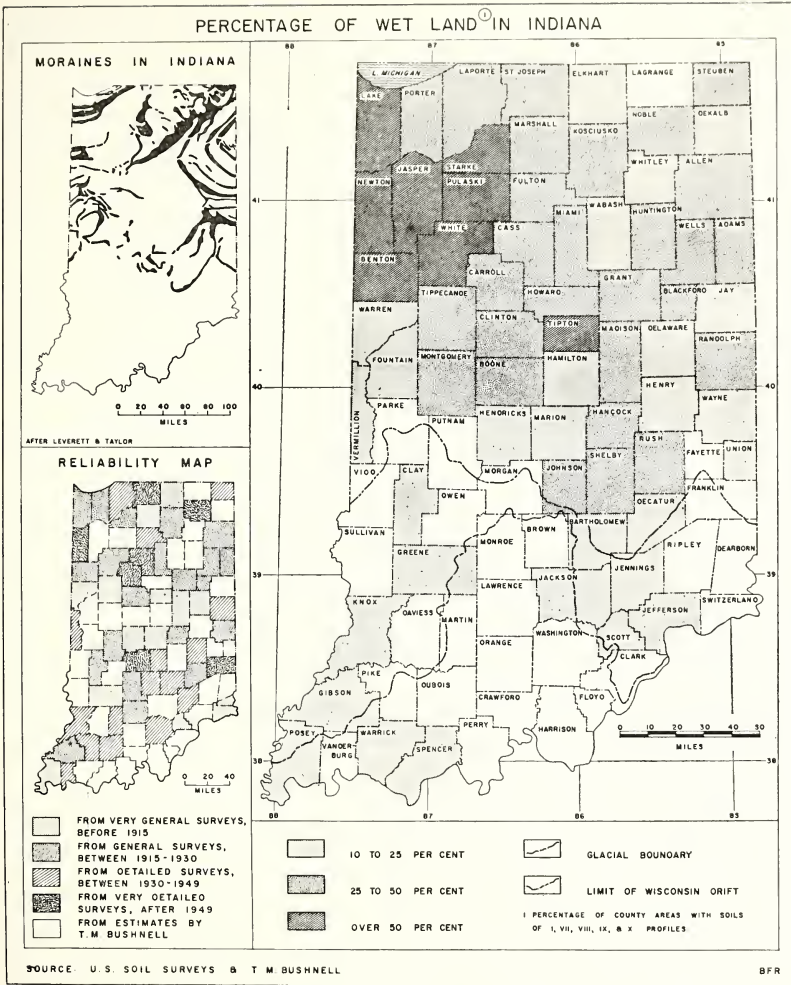


Figure 1

per cent. South of the Shelbyville and Bloomington morainic systems, those counties showing up as having between 10-25 per cent of their areas occupied by wet soils are located primarily within the area of older drift of Illinoian Age. The driftless area of the state, on the other hand, appears to be significantly drier in terms of the natural drainage adequacy of its soils.

The wetlands of Indiana appear to be intimately associated with topography (Fig. 2). Physiographically, northern Indiana may be divided generally into areas of till plains, morainic belts, lacustrine plains, and glaciofluvial terraces and bottoms (4). Throughout much of the area natural drainage is too youthful to have provided outlets for numerous,

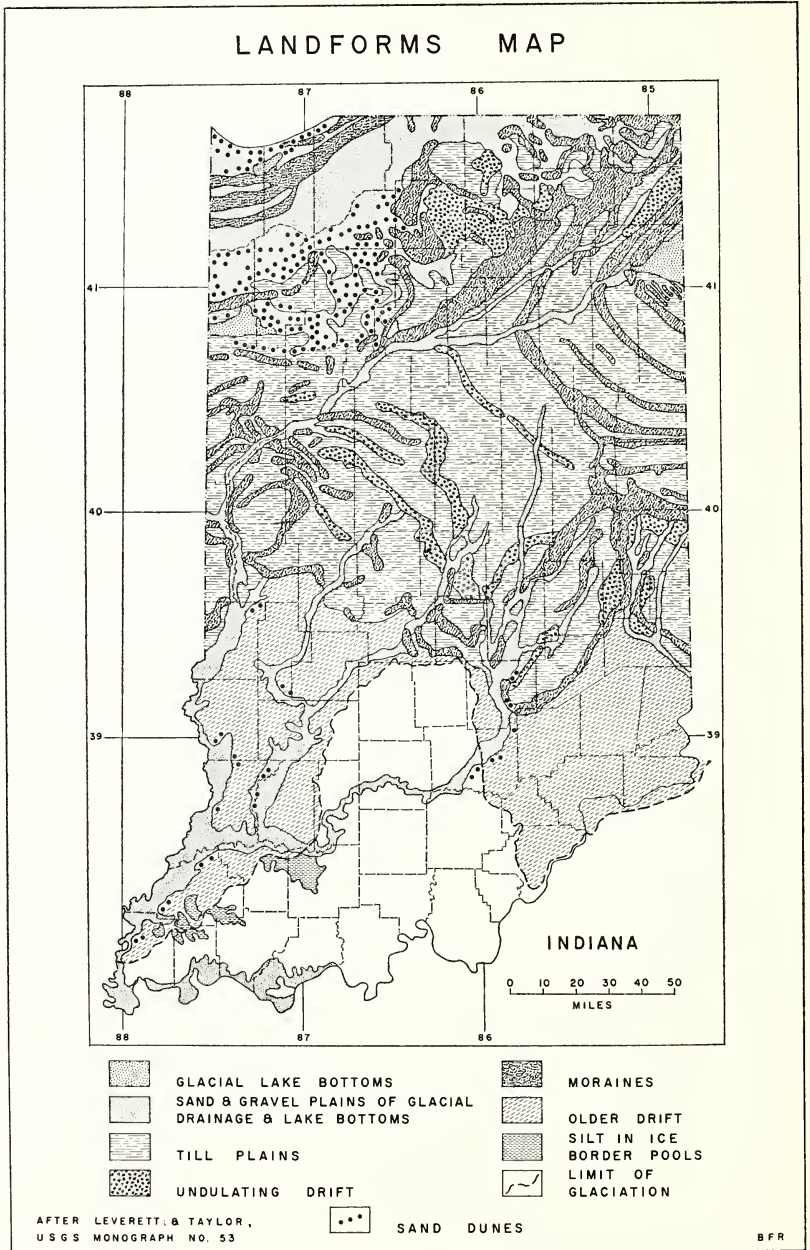


Figure 2

enclosed upland depressions, or to have sufficiently lowered the local and regional water tables so that subsoil saturation is eliminated.

Figure 3 attempts to locate as precisely as possible, within the limits of accuracy of the available soil surveys which served as the source, the wetlands of the Wisconsin Drift area of Indiana. The phenomena of poorly drained and very poorly drained soils may be correlated with the map of landforms (Fig. 1). The dry sections within the area of Wisconsin Drift correspond to the gravelly moraines, porous terraces, and outwash bottoms.

The areal pattern of wet soils within the till plain sections betrays their origin. Figure 3 shows that the soils with wet profiles occupy positions resembling the braided patterns of silt-choked streams. The long attenuated and deranged patterns connect with other wet areas in an irregular and discontinuous fashion; being particularly representative of the patterns of Brookston soils.

The wetland pattern of the morainal-lake section of the northeast stands in contrast to that of the till plains. Here the wet soils, by and large, occur as separate entities, surrounded by the drier soils of the rises and knobs of the moraines. So numerous do these undrained depressions of swamps, marshes, and lakes become that morainal patterns, such as in the areas of the Packerton, Maxinkuckee, and Valparaiso moraines, are almost obliterated.

The pattern of wetlands in the lacustrine plains of the northwest is somewhat transitional between that of the central till plain on the south and the morainal section to the east. Isolated pockets of very poorly drained soils alternate with excessively drained uplands, while threading through the area are better-drained glacial torrent channels interspersed with extensive wet glaciolacustrine plains. Thus, the wetland environment of the Wisconsin Drift area of Indiana may be resolved into those areas with a perched water table which characterizes the till plains, naturally undrained depressions within moraines, and porous sand plains of lacustrine origin characterized by a perennially high regional water table.

A comparison of Figures 3 and 4 shows patterns of similarity. In 1920, the census reported 8.3 million acres of farmland provided with artificial drainage, while the comparable figure reported by the 1930 census was 6.8 million acres; the decrease apparently being explained by more careful enumeration in the latter census report (5). The heart of the area actually provided with drainage in 1930 was located in the central section of the flat lands of the till plain, the most prosperous agricultural area in the state.

By correlating the distribution of phenomena illustrated by the preceding maps with that of land in drainage enterprises in 1950 (Fig. 5), it may be seen that, for the most part, land in drainage enterprises is located in those areas of most extensive wetness, principally within the area of Wisconsin Drift, and that the major areas of land drainage in Indiana correspond to the location of drainage enterprises. The correlation of these phenomena is accentuated by the fact that the areas of less intense wetland distribution and drainage enterprise distribution corresponds, generally, to the better drained areas of the moraines, undulating drift, outwash terraces, and alluvial bottoms of the state. On the other

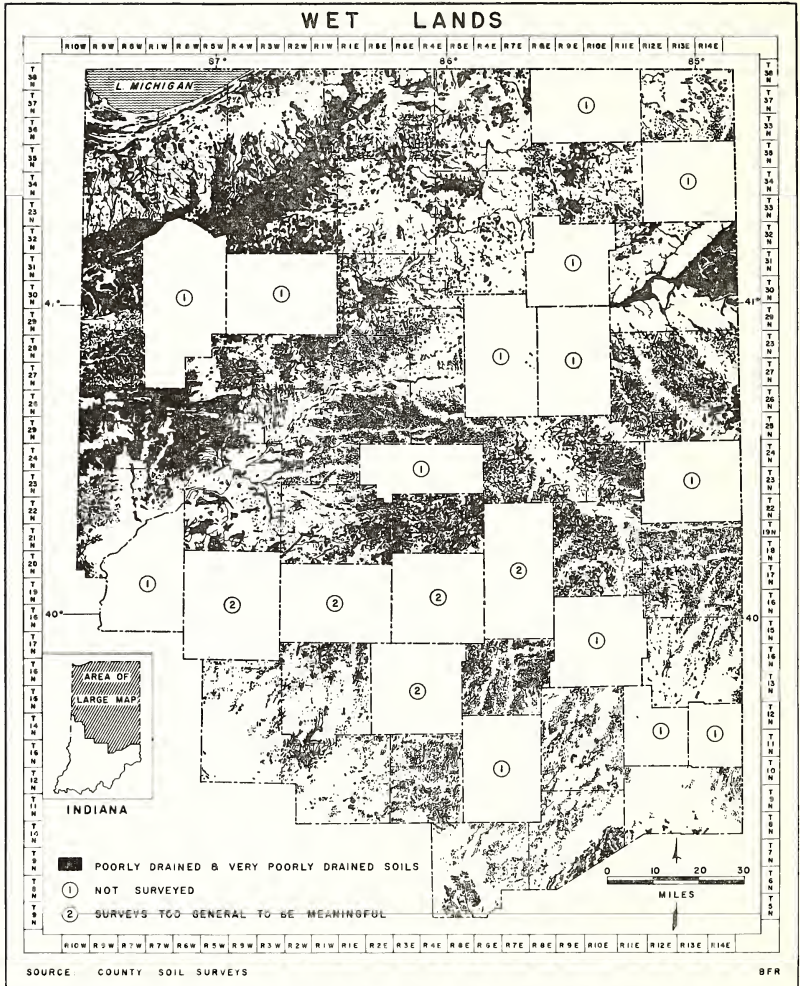


Figure 3

hand, attention is directed to the fact that the areas of most intense land drainage and largest areas of land in drainage enterprises are located within the flat, clay lands of the central till plain. Areas of major drainage enterprise development in the northwestern, northeastern, and southwestern portions of the state alludes to locally acute drainage problems as the map of lands actually provided with drainage (Fig. 4) shows relatively smaller areas of land drained in these sections. A county by county comparison of such quantitative phenomena shows that those counties having the largest areas of farmland drained also have the largest areas in drainage enterprises, because, in most instances, organization for the construc-

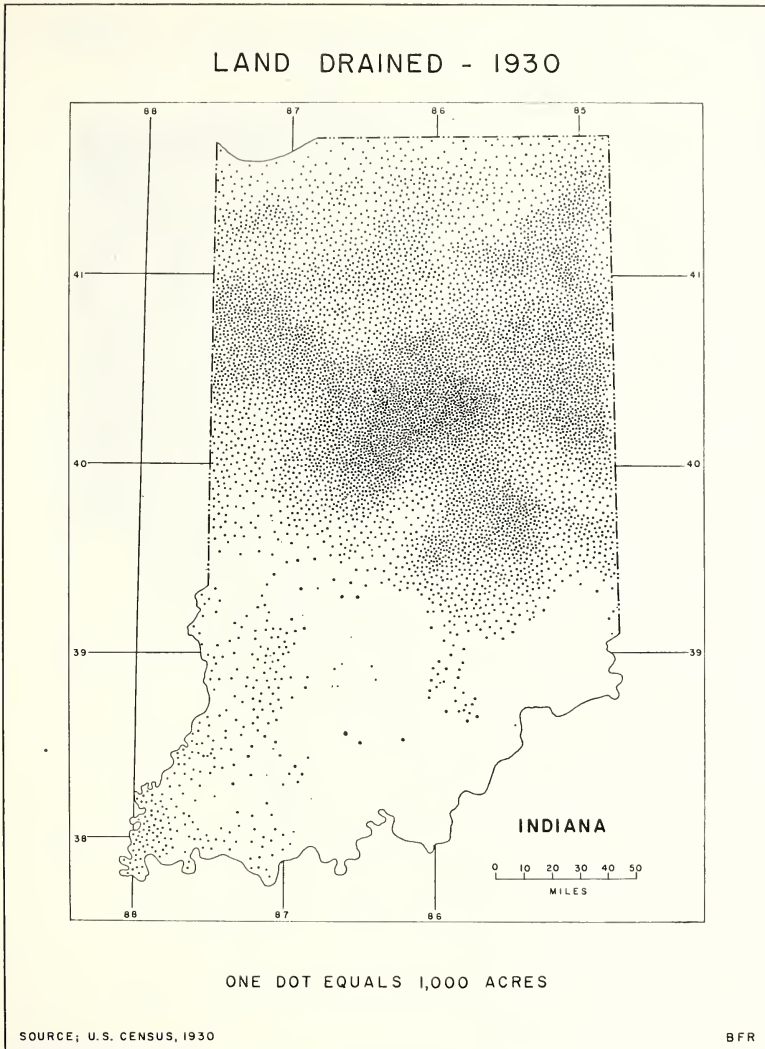


Figure 4

tion and maintenance of outlet drains is necessary to the installation of farm drains.

Following a pattern developed by Leslie Hewes (6), the cartogram of Drainage Condition Prior to Drainage Enterprises (Fig. 6) has been prepared in an effort to further aid in the interpretation of where drainage need was the greatest within the area of Wisconsin Drift, the area already established as being the most extensively and intensively wet area in Indiana. Using the statistics in the 1930 census, the areas of land in

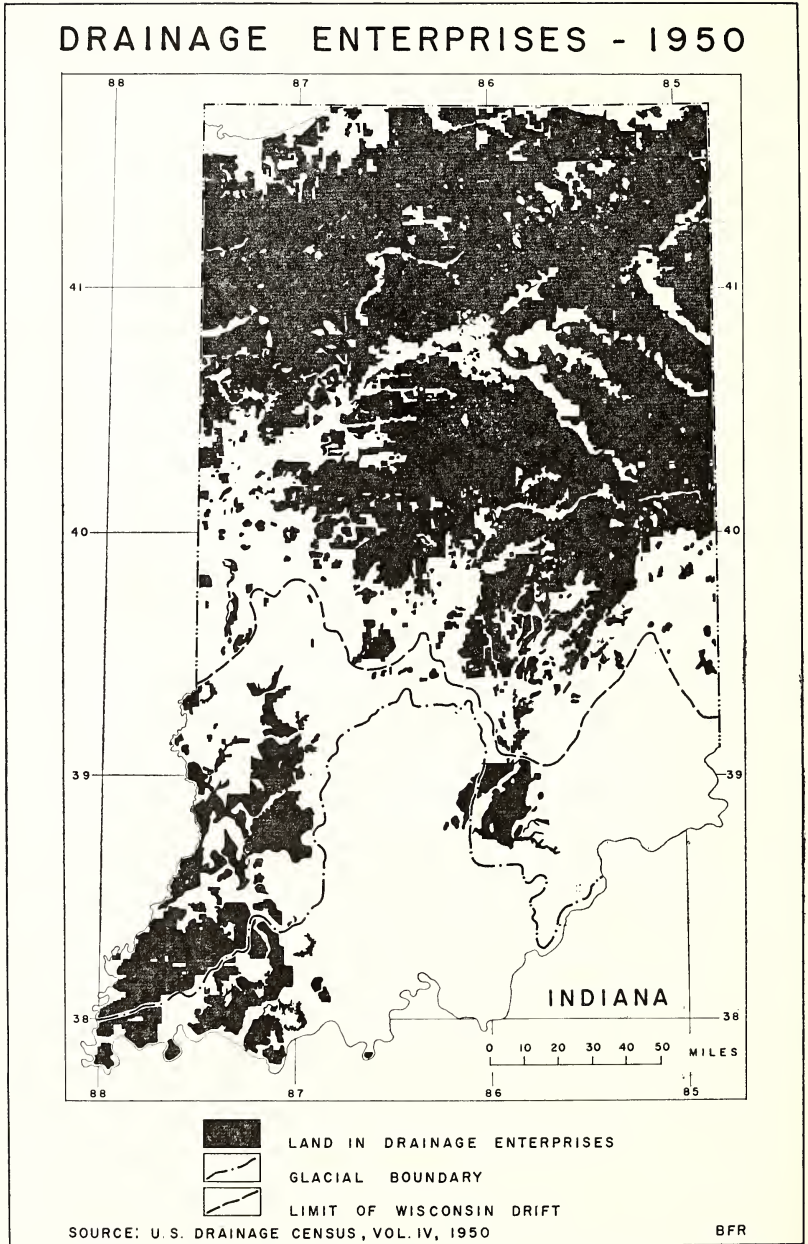


Figure 5

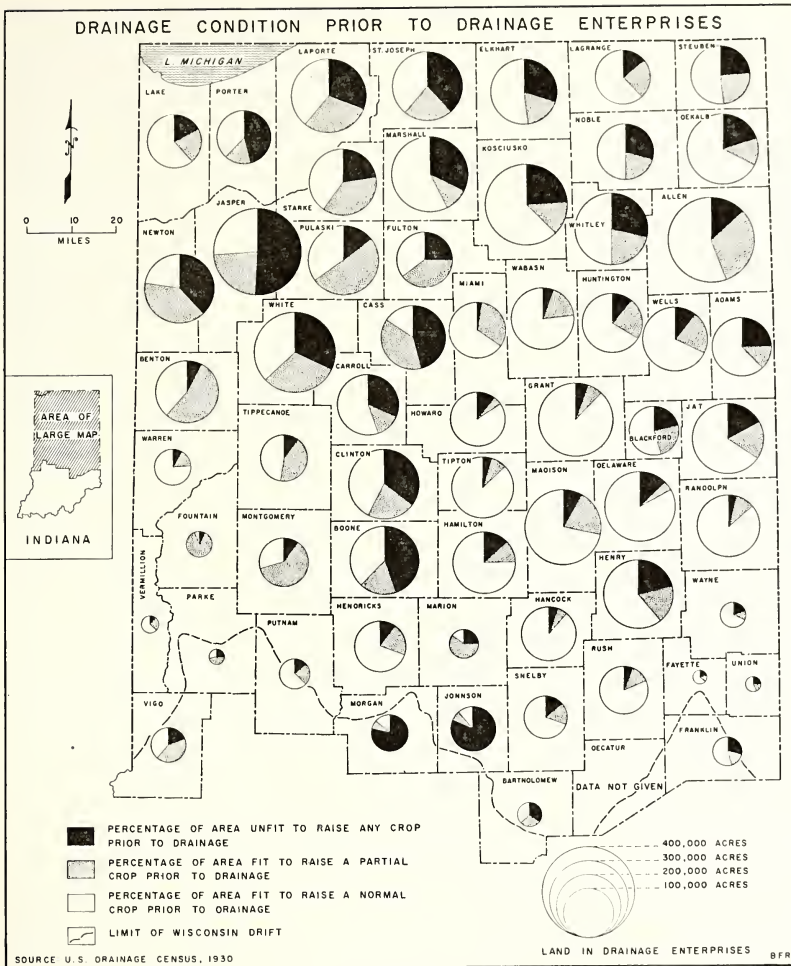


Figure 6

drainage enterprises that were unfit for any crop, suitable to raise only a partial crop, and fit to raise a normal crop prior to the establishment of drainage enterprises were plotted. Where a large percentage of a county was incorporated in drainage enterprises, these figures become meaningful. In the northwestern part of the state, with local exceptions, over one-half of the areas within drainage enterprises were not able to raise any crop, or at best only a partial crop, prior to the establishment of drainage enterprises. Again, the cartogram shows that in the counties of the morainal area, over one-third of the land in drainage enterprises was unable to raise a normal crop prior to drainage. In the central till plain it is seen that large percentages of the area were capable of producing a normal crop prior to the establishment of drainage enterprises, indicating a naturally



better drained environment than is indicated by the map of wetland distribution.

In the extreme southern section of the till plain it may be seen that large percentages of small drainage enterprise areas were unfit to raise any crop prior to drainage, indicating that drainage enterprises were established only in areas where drainage problems were acute, and that little had been done by way of private land drainage within areas incorporated in drainage enterprises before the establishment of the latter.

In an effort to determine the amount of land now drained in Indiana, sources in addition to the census reports have been consulted. Under the Agricultural Conservation Program (ACP), federal funds are available to landowners in order to help defray the expenses of inaugurating certain conservational practices. The drainage of agricultural lands by both ditches and tile are included in this program. Such drainage works are usually planned and surveyed by the Soil Conservation Service county work units and reported to the ACP for authorization of financing. Thus, the amount of land actually drained by ACP funds is a matter of record.

In Indiana, 1,107,744 acres of land were drained with the aid of ACP funds from 1936 to 1957, while 1,041,013 acres of land were drained with the aid of ACP funds between 1940 and 1957, inclusive (8). The difference between the above figures shows that 66,731 acres were actually provided with drainage by ACP funds in Indiana prior to 1940, and after ACP was organized. Thus, only 6.2 per cent of the land drained with the aid of ACP funds was drained before 1940. This still leaves a four-year period unaccounted for in terms of land drainage in Indiana, as the next authoritative report on the amount of land drained is contained in the 1930 Census. Statements by ACP officials and Soil Conservation Service personnel, coupled with the small amount of land drained by ACP funds prior to 1940, would lead to the belief that little land drainage was carried out in the decade 1930-1940. Various authorities state that little was done in their respective counties in regard to land drainage between 1930 and 1940, primarily because of the depressed agricultural conditions in that decade; being more acute prior to 1936 than afterwards. Thus, it may be safely assumed that the vast majority of land drained with the aid of ACP funds was drained after 1940, and that in all probability, little land drainage was undertaken in the economically depressed years prior to 1936 when federal funds for agricultural improvements were not available. If the 1,107,744 acres of land drained by ACP funds from 1936 to 1957, inclusive, are added to the 1930 Census figures of all farmland supplied with drainage, it is apparent that somewhere in the neighborhood of 7.9 million acres of land are being drained in Indiana.

The 1,107,744 acres of land drained with the aid of ACP funds, however, does not take account of other land drained privately, land drained by individuals who do not qualify for ACP funds, or land that is actually drained by county ditch and tile lines. The ACP estimates that the figures for land supplied with drainage for Indiana represents about 75 per cent of the land actually drained between 1936 and 1957. Assuming this figure, although highly subjective, to be approximately correct, then 1,476,990 acres of land were supplied with artificial drainage between 1936 and 1957, bringing the total amount of land provided with drainage in Indiana

to approximately 8.3 million acres. From this, and previous conclusions, it becomes apparent that the major amount of farmland drainage in Indiana was inaugurated prior to 1930.

A county by county comparison of ACP statistics on land drainage in Indiana reveals that the largest percentages of land drained in the area outside of the region of Wisconsin Drift were drained after 1940, utilizing ACP aid. Areas within the Wisconsin Drift of Indiana show smaller percentages of land drained after 1940. Evidently, where artificial outlets were early supplied by legally organized drainage enterprises, the greatest amount of land drainage was undertaken prior to 1930, while in those areas where drainage problems are not extensive, locally needed drainage was inaugurated only when the costs of such installations were at least partially subsidized by federal funds.

Probably few other land areas in the United States presented such an imposing and inhospitable picture to settlers and travelers as did the wet forests and prairies of Indiana, and probably no other natural phenomenon, excepting the forests, has been so completely eradicated. Artificial drainage has smoothed out the differences in the natural environment so that one can now travel the breadth and length of the area of Wisconsin Drift in Indiana unaware of the silent enterprises that must be continually and vigilantly maintained as a bulwark in the battle against too much water in an effort to insure high crop yields and to minimize crop failures.

#### Literature Cited

1. KETTLERBOROUGH, CHARLES. 1914. Drainage and Reclamation of Swamp and Overflow Lands, Indiana Bureau of Legislative Information, Bulletin No. 2, Indianapolis.
2. BUSHNELL, T. M. 1939. An Outline of the Classification of Indiana Soils. Proceedings of the Indiana Academy of Science 49:151-158.
3. ————. 1936. Acres of Principal Soil Associations in Indiana by Counties and By Type-of-Farming Areas, Labeled According to Key Soil Types in Each Association. Chart.
4. MALOTT, CLYDE A. 1922. The Physiography of Indiana, Part II, Handbook of Indiana Geology, Indiana Department of Conservation, Publication No. 21, pp. 59-256.
5. HEWES, LESLIE. 1953. Drained Land in the United States in Light of the Drainage Census, The Professional Geographer 5:6-12.
6. ————. 1951. The Northern Wet Prairie of the United States: Nature, Sources of Information, and Extent, Annals of the Association of American Geographers. 41:307-323.
7. U. S. Drainage Census, 1930.
8. Agricultural Conservation Program, Summary, 1957, U. S. D. A., p. 89.