Perennial and Ephemeral Streams and Lakes Map of Indiana

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The Airphoto Interpretation and Photogrammetry Laboratory has compiled from about 12,000 aerial photographs a series of detailed drainage maps. The State map has been completed. The **Perennial and Ephemeral Streams and Lakes Map** has been prepared as a four color map 48 inches by 76 inches in size. The map has been developed at the same scale as the 1932 **Geological Map of Indiana**, one inch representing four miles.

The **Perennial and Ephermeral Streams and Lakes Map** was the third and final map in the drainage map series compiled by tracing gully systems identified by stereoscopic examination of aerial photographs. Individual county maps (1:63,360) were prepared by drafting reductions from the aerial photographs. An Atlas of all 92 counties was developed by photographic reduction to a scale of 1:126,720. The State map was prepared by tracing minute detail from photographic reductions at a scale of 1:253,440.

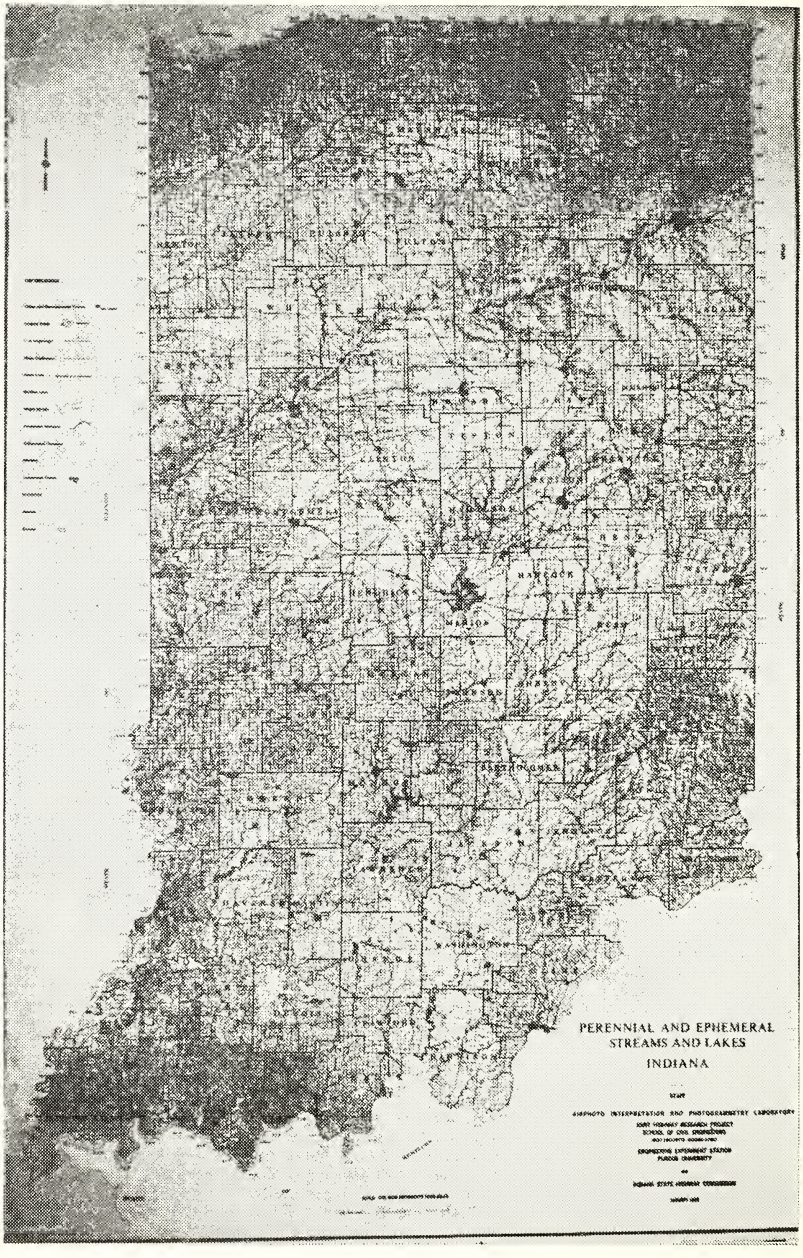
Gully systems are shown on the map as are sinkholes, kettles, kettle lakes, creeks, and rivers. Gullies a few hundred feet long are shown in minute detail. The drainage sytsems related to geomorphic forms are striking.

Introduction

Indiana is blessed with a great natural resource-water. Where is this located? What patterns of drainage prevail? These questions are asked by civil engineers.

The civil engineer's interests embrace all aspects of surface drainage. They assist in development of local water supplies and are responsible for the design of the system and the impounding reservoirs. Civil engineers are greatly concerned with pollution of streams and they design the corrective measures for industries and municipalities. All engineering site selection problems to control the environment or fulfill a need of man are concerned with drainage. Not only are perennial streams and lakes of importance but also ephermeral streams and lakes. It is estimated that in the United States 500 million dollars are spent annually on highway drainage exclusive of bridges (7). To the designer of highways, railways, pipelines, transmission lines, etc., the location of surface drainage forms has significant influence on the economies of the project.

Civil engineers, geologists, pedologists, and geographers frequently use drainage patterns and drainage densities to infer land forms, parent material types and soil types by remote means such as aerial photographs. Drainage patterns and their significance are dependent not only upon the high order streams and rivers but also the low order gullies and rills (2, 3, 4, 5). The location, length, number, form and relative gradient of perennial and ephermeral streams and lakes is important not only in the visible spectrum but also in the infrared and microwave



NEW STREAM AND LAKE MAP OF INDIANA

regions in which high resolution remote sensors are used. Drainage patterns are primary elements of interpretation for aerial photography and radar imagery.

The Airphoto Interpretation and Photogrammetry Laboratory at Purdue University has been engaged in developing remote sensor applications for over 25 years. For approximately 20 years the group has been concerned with mapping the detailed drainage systems within the State. The project has been completed this year. The final map compilation—**Perennial and Ephemeral Streams and Lakes Map of Indiana** has been published during this the Sesquicentennial Year.

It is the purpose of this presentation to announce to the scientific community the publication of the map. Geologist, geographers and pedologist may find the minute detail on drainage systems of value in their terrain evaluations.

History of Development

The drainage map series was compiled at three publication scales. The first series was prepared by directly tracing the drainage detail identified by stereoscopic study of aerial photographs. M. Parvis developed the drainage map of Parke County at a scale of one inch representing one mile (3). Parke County was compiled from about 275 aerial photographs. The effort involved 318 man hours of work (3). This was approximately 0.7 man hours/square mile.

Individual county drainage maps at a scale of one inch representing one mile for all 92 counties were completed during the period 1946 to 1956. This series of maps used the existing county transportation maps as base maps. The minute detail of drainage detected in stereoscopic study of about 12,000 aerial photographs was reduced from a scale of three inches per mile to one inch per mile by projection. Section corners were used as control and detail was traced section by section. These maps were made available to the public as they were developed. Marshall County was the last county to be completed in July 1956.

The **ATLAS** of county drainage maps was prepared during the period 1956 to 1959. The **ATLAS** was prepared by photographic reduction of the county maps to a scale of one inch representing two miles. A brief description of the drainage systems, geology, and soils of each county was prepared on a facing page to make the **ATLAS** complete. The **ATLAS** was published in July, 1959.

Individual county drainage maps were photographed and reduced to a scale of one inch representing four miles to compile the complete State map. A base map was prepared from the 1932 Geology Map of Indiana published in publication number 112, by Division of Geology, Department of Conservation. Tracings were made by hand from the photographic prints to the cloth base map. Tracing was performed section by section, township by township, and county by county. Section lines formed the basic control. Extremely fine point inking pens were used. At frequent intervals the draftsman had to sharpen the pens to keep a fine point. The delineation of all the detail was extremely exacting and tedious.

The **Perennial and Ephemeral Streams and Lakes Map** was completed in 1966. The final map in the drainage map series is 48 inches

by 76 inches. It is published with counties, cities, towns, highways and stream names annotated in three colors.

The map is a study in contrasts. Drainage systems and drainage densities are related to land form types, parent material types and soil types. Extreme contrasts in drainage are shown for the glaciated versus the unglaciated region. The greater densities and the stronger local control of runoff are visible in the unglaciated sections particularly the areas of clastic rocks. The sinkhole drainage pattern of the non-clastic rocks contrasts with the rectangular drainage pattern of the clastic rocks. Harrison County shows the distinct drainage system associated with the carbonate rocks.

The ground moraines of Illinoian age contrast in dendritic drainage development with the various ground moraines of Wisconsinan age. A few measurements of stream densities were made in the various ground moraines of Wisconsin age to determine differences related to quantification of drainage in airphoto interpretation studies (1). Results of this study are summarized in Table 1.

TABLE 1
Drainage Pattern Analysis in Wisconsinan Ground Moraines (1)

Stage	Average Drainage Densities Miles per square mile Natural	Man-Made	% Man-Made
Early	6	0.3	5
Middle	3	0.8	25
Late	2.5	0.7	30

Additional work of this type is needed to further define the element of drainage system as a diagnostic feature in airphoto interpretation. The **Perennial and Ephemeral Streams and Lakes Map of Indiana** will be of significant value in this respect.

Contrasts in drainage systems and densities are readily determined between the ridge moraines, the outwash plains and the terraces. Particular details of the terrace face or bench face are well illustrated in the reach of the Wabash River from Lafayette to Attica.

The discussion of contrasts in drainage shown on the map could continue. Our purpose though is to announce the availability of the map for further studies in understanding and controlling our great natural resource—WATER.

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