ACKNOWLEDGMENT

Professor W. J. Pierson, Jr., N.Y.U., initiated the project and served as advisor to the group. The Naval Air Development Unit, South Weymouth, Mass. contributed the planes and flight personnel. The Aerial Photographic Experimental Laboratory, Naval Air Development Center, Johnsville, Pa. tested the cameras for mechanical efficiency, and installed them in the planes. The Hydrographic Office, Photogrammetry Division is analyzing the photographs. The Hydrographic Office, Forecasting Section prepared all meteorological intelligence and signaled the start of the exercise. The Woods Hole Oceanographic Institution provided a research vessel, ground baseline and the electronic link for synchronous photography.

Lastly, the Office of Naval Research has sponsored the project under contract Nonr 769(00), assembled all of the interested parties, procured equipment and personnel, arranged meetings, organized schedules, and in general administered and coordinated the entire project.

All of the groups above offered suggestions and criticisms which were extremely useful.

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EXCEPTIONAL MEANDER SCARS AND THEIR SIGNIFICANCE IN DETERMINING THE DIRECTION OF STREAM FLOW

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THE direction in which a stream may be flowing is not always apparent from air photographs, and determinations should rest upon several lines of evidence. Criteria used for streams in youthful stages are commonly of no value for streams which are in an advanced stage of maturity.

Trails of white water below rapids or waterfalls are self-evident for youthful streams or for the youthful stretches of otherwise mature streams. The cut banks formed where strong currents strike and undercut steep valley slopes, are not as self-evident criteria as are the angles made by tributaries where they join major streams. Other criteria include attenuated sand bars. The sharp points are customarily, but not always, on the downsteam side.

Meandering streams, with their loop-like curves, make direction of flow difficult of interpretation if meander markings are not observable. Smith* has called atten-

* Smith, H. T. U., *Aerial Photographs and Their Applications*, D. Appleton Century Company, New York, 1943, pp. 124–125.

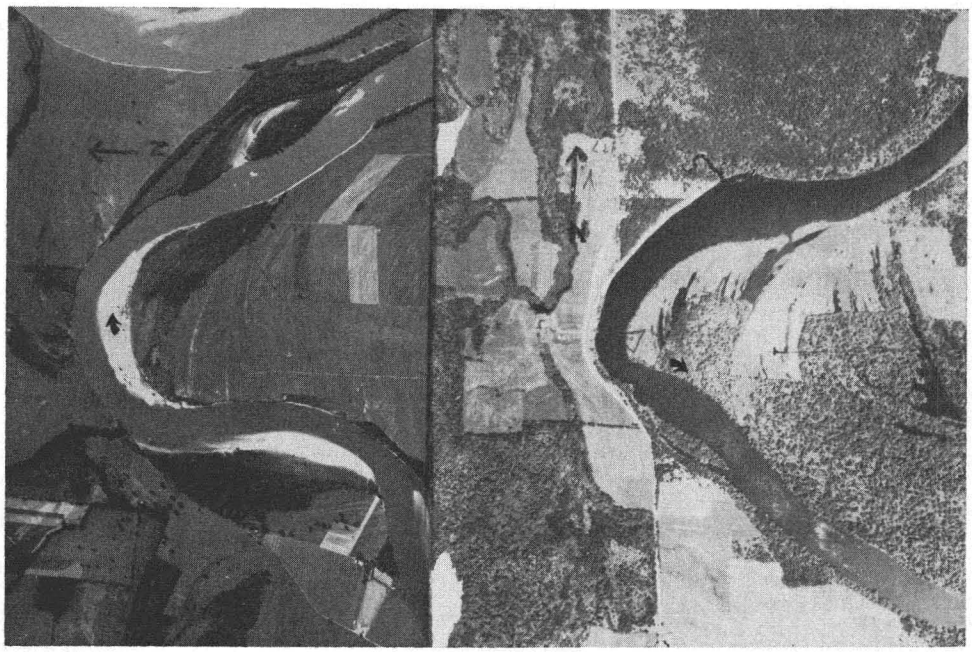

FIG. 1 A FIG. 1 B

tion to the arcuate markings on flood plains which represent old channel scars, and has stated "that they are parallel to the downstream side of the loop, but are cut off by the upstream side, and thus would indicate direction of flow."

Attention is brought here to an apparent exception to this rule. The Mississaugi River, one of the large streams of which the source is near the "Height of Land" in northern Ontario, flows southward to the North Channel of Lake Huron. Its valley is characterized by narrow gorges, steep slopes, waterfalls, rapids, and braided channels impeded by gravel bars. Locally, the stream has developed a series of terraces and flood plains where it is bordered by ancient lake deposits. This is the setting near the abandoned settlement of Goldenburg, where a prominent loop-shaped meander is exemplified some 50 feet below the level of an extensive Pleistocene lake terrace. The flood plain is abruptly terminated about two miles downstream by Slate Falls. The rock ledges there are the apparent reason for the graded stream stage at Goldenburg.

If attention is turned to the channel scars north of the sharp bend in the Mississaugi River (Figure 1B), it is found that the channel scars are "parallel," or "subparallel" to the west bank. If an interpretation were to be based upon this evidence, it would be concluded that the stream was flowing to the north.

The Mississaugi meander is compared with a meander of the Wabash River south of the Indiana border.* There are distinct resemblances between the two photographs, which are oriented in such a manner that meanders from the two regions can be directly compared.

The American photograph exemplifies a stream which erodes on the upstream curve of a meander, and deposits on the downstream side. With reference to cardinal directions, the stream flows from north to south, curves toward the west, and reverses back towards the northeast.

The Canadian photo simulates that from Indiana. The meander markings at the sharp bend of the Mississaugi River—which is to the left of the principal point of the photograph—are abruptly cut off on the south side of the meander, and are suggestive of the upstream side. Convergence of the arcuate markings to the north

* The photograph referred to represents a unit of a flight which was intended to give coverage for Indiana. Actually the photo was taken south of the Indiana-Illinois state line.

are also suggestive of a current flowing in that direction.

Discrepancies in the criteria listed are of two types. A steep cut bank at the sharp bend represents a point of impingement below which gravel bars have been built. The meander is in sharp contrast to the open reaches known to be immediately north, but in accord with an ox-bow lake about 400 yards above Slate Falls.

The great number of channel scars in the central portion of the broad flood plain are semicircular, and almost concentric with the northwest-southeast stretch of the Mississaugi. These features are characteristic of the downstream side.

Trails of white water, also indicate the direction of flow. However, alternate photographs may not show reflections of light on the water due to the changes in the angle of incidence at each camera station.

These notes were prompted by an original misinterpretation based upon one set of criteria, namely the meander markings. Familiarity with the area led, logically, to a search for the anomalous criteria, which eventually proved to be misleading.

Acknowledgment is made to the Department of Lands and Forests of the Province of Ontario, Canada which supplied a copy of photograph #770-56-17 for publication. Permission was also granted by the Director Performance and Aerial Photography Division for the use of photograph QU-QS-1-123.

PHOTO INTERPRETATION IN FLOOD CONTROL APPRAISAL*

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ABSTRACT

Acreage data on land use in river flood plains, by flood frequency zones, is difficult to obtain except by field survey. This type of information was needed by the New England-New York Inter-Agency Committee in a special study of the effect of flood control dams on land enhancement, particularly on agricultural land. Time limitations on the survey and the inadequacy of other methods suggested the use of photo interpretation to provide the needed information. A procedure was developed using photo interpretation to provide acreage data on land use by flood frequency zones on the Merrimack River within the required time limits.

INTRODUCTION

THE effect of flood control dams on agricultural lands downstream was one of several special items investigated in connection with a survey of the resources of the New England-New York Area. The main question requiring an answer was how much enhancement of agricultural land was accomplished by flood control dams. The primary purpose of such dams is to reduce flood damage, but usually they provide some land enhancement due to reduction of flood hazard.

Land enhancement takes place where change to a use yielding a higher net return per acre is made possible by reduction or elimination of flood hazard. For example, sections of flood plain land subject to frequent flooding may be used only for pasture. Reduction in flood frequency may justify use of such land for growing crops. The difference in value between pasture land and cropland would be the monetary value of land enhancement in this case. The New England-New York Inter-Agency Committee was called upon to investigate the degree and monetary value of agricultural land enhancement. This type of study was requested by State agencies in New Hampshire for the Merrimack River flood plain area below a dam at Franklin

* This paper has been officially cleared for publication by the Corps of Engineers, NED, the Agricultural Research Service and the Soil Conservation Service. The author particularly wishes to express his appreciation to Mr. Elco L. Greenshields of the Agricultural Research Service.