

DRAINAGE CHANGES IN THE TOLEDO REGION.*

J. ERNEST CARMAN,
Ohio State University.

GENERAL CHARACTERISTICS OF THE DRAINAGE.

The surface south of the west end of Lake Erie in Ottawa, Sandusky, Wood and Lucas counties is a very flat plain which slopes gently northeastward toward the lake at about 5 feet per mile. This plain is the old lake bed of Lake Erie extended, as it existed during the retreat of the Wisconsin glacial stage.

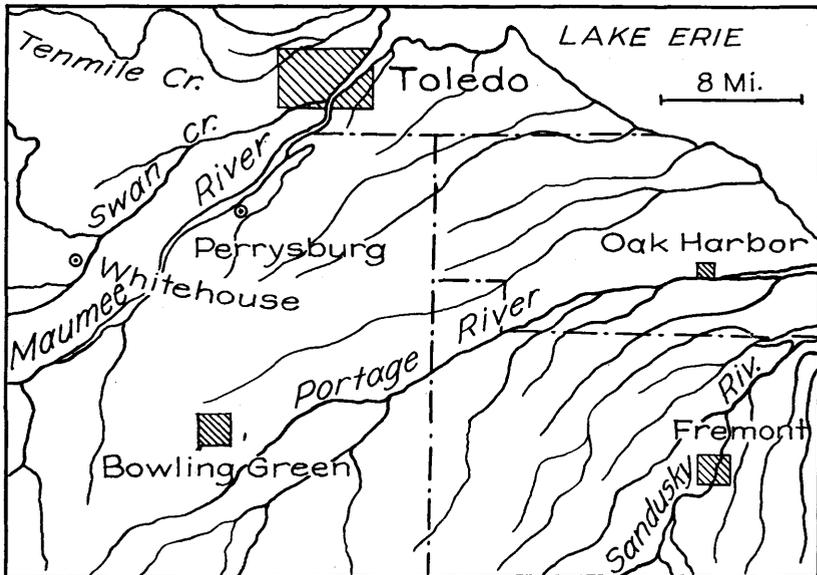


FIG. 1. Map of a portion of northwestern Ohio showing the closely-spaced, parallel, northeastward-flowing streams.

The drainage of the region is by closely-spaced, parallel, northeastward-flowing streams which originated as *consequent streams* on the flat plain as the Pleistocene, ice-border lake withdrew to the present Lake Erie (Fig.1). On this even surface, with very gentle but uniform slope, many of the

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originating streams flowed for great distances parallel with each other, without uniting, although only a mile or two apart.

The Maumee River, the major stream of the region, was formed along the axis of the old lake basin, chiefly by waters which entered the region from the west, but the floor of the median part of the basin had so little slope toward the axis that smaller streams originated and flowed northeast in the direction of the axis, parallel with, though only a short distance from, the far greater Maumee. At the time of the origin of the drainage, the Maumee received no tributaries from the northwest from the southwest corner of Lucas County northeast to its mouth, a distance of 30 miles, and no tributaries from the southeast north of Waterville, a distance of about 20 miles. The two streams which now join the Maumee within these intervals, Swan Creek on the northwest and Otter Creek on the southeast, are both interpreted here as cases of stream capture.

Swan Creek.

Swan Creek heads in Fulton County to the west and, in conformity with the general slope of eastern Fulton and western Lucas counties, flows southeast to near Whitehouse in southwestern Lucas County. Here, at about 3 miles from the Maumee River, it changes direction and flows northeast for about 15 miles parallel with the Maumee River which it joins at Toledo (Fig. 1). This lower, northeastward-flowing course of Swan Creek is a continuation of the course of South Swan Creek which enters at the bend near Whitehouse and these two parts together make a drainage course 25 miles long from the southeast corner of Fulton County to Toledo, parallel with and only 2 to 4 miles from the Maumee River.

A low linear course, occupied largely by a marsh, runs northeast from the Ann Arbor Railway Station on Cherry Street in Toledo to Maumee Bay, parallel with but definitely separated from the Maumee River by a narrow belt of upland one-half mile or less in width (Fig. 2). Its linear form, flat floor, and definite, bounding slopes show plainly that this low course was made by stream erosion but no stream competent to do the work occupies it now, or could have received sufficient water for the work from the few square miles tributary to this depression.

The interpretation offered is that Swan Creek did not formerly join the Maumee River at Toledo, but continued on northeast along this low course to an independent terminus at the head of Maumee Bay. Near the present mouth of

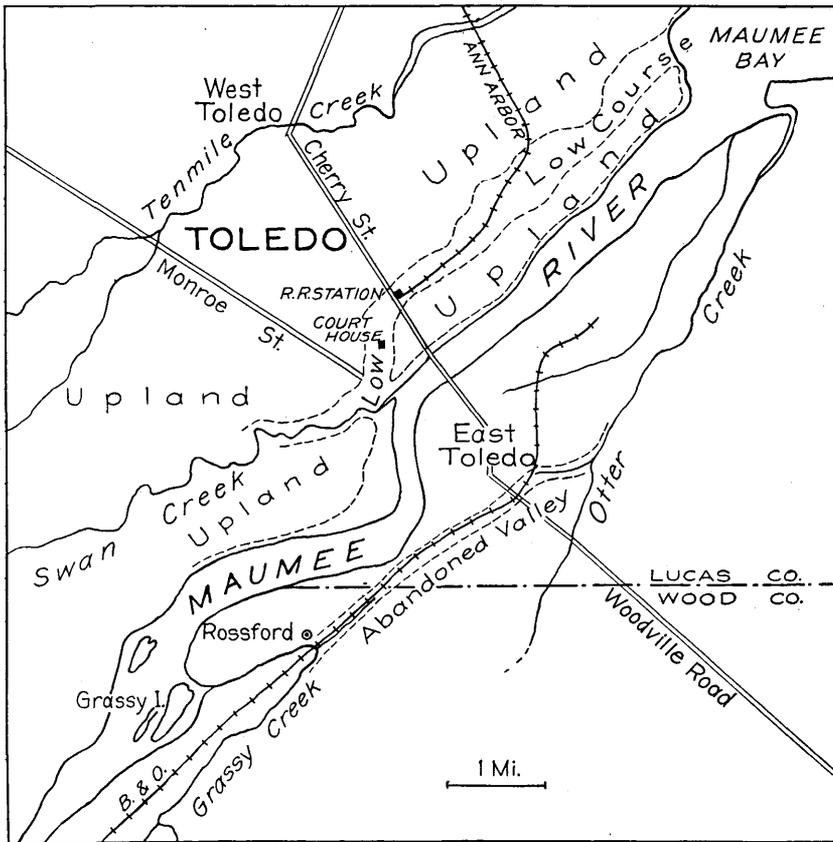


FIG. 2. Map of the Toledo region showing the drainage changes of Swan Creek and Grassy Creek as discussed in the text.

Swan Creek in Toledo the belt of upland between the two valleys was so narrow that the combined undercutting by the streams on the outer curves of loops opposite each other cut completely through the intervening divide and Swan Creek entered directly the larger stream, and thus abandoned its lower course northeast of Toledo (Fig. 2).

The former course of Swan Creek through the down-town part of Toledo is partly obscured by filling and grading but close observation shows definite topographic evidence to support the foregoing interpretation. The former course left the present Swan Creek near the St. Clair Street bridge and, continuing on northeast, crossed Monroe Street near Superior Street, crossed Madison Street near Erie Street, passed across the site of the Court House and the City Prison, and crossed Cherry Street at Seneca Street at the Ann Arbor Railway Station. This course leads through the down-town section of Toledo. It was formerly followed by the Miami and Erie canal. Northeast of Cherry Street the course is very definite as noted in the foregoing.

The points of the severed upland are shown on the south by the higher land that begins just south of the St. Clair Street bridge and on the north by the elevation which begins on Summit Street near Jefferson Street. Between these limiting points, about three-eighths of a mile apart, the undercutting of the divide between Maumee River and the former Swan Creek took place, resulting in the diversion of Swan Creek.

The particular type of stream piracy illustrated here by which two streams cut laterally until their valleys unite, is called *planation stream piracy*.* The Maumee River was the *pirate*. Swan Creek is the *diverted stream*. That part of the former valley from Toledo to Maumee Bay that was left without a stream is an *abandoned valley*.

Grassy-Otter Creek.

Grassy Creek heads south of Perrysburg, Wood County, and flows northeast for about 7 miles parallel with, and only one mile or less from, the Maumee valley. Just southeast of Rossford the creek turns sharply to an acute angle of about 25 degrees and flows west-southwest for one and one-fourth miles, through a sharply cut valley, to the Maumee River, (Fig. 2). From the acute angle bend of Grassy Creek a low course, which is very evidently a stream-cut valley, continues on to the northeast through the south part of East Toledo and is occupied by the upper course of Otter Creek which enters Maumee Bay just east of the mouth of the Maumee River.

*1921. Malott, C. A. Planation Stream Piracy. Proc. Indiana Acad. Science, 1920, pp. 249-260.

From Rossford northeast through the south part of East Toledo this low course is followed by the Baltimore and Ohio Railway with extensive railway yards. In East Toledo, Navarre Park is located in this old valley. On northeast it is a distinct, flat-floored valley, much too large for Otter Creek which occupies it.

The existence of such a sharp angle bend, as that of Grassy Creek southeast of Rossford, suggests piracy, and the abandoned valley continuing northeast from the bend gives additional evidence. The interpretation offered is that Grassy Creek and Otter Creek were formerly one stream which originated on the gently sloping, lake plain and for 14 miles, from Perrysburg to the mouth of Otter Creek, had a course parallel with and only one-half to one and one-half miles from the Maumee River. A small tributary of this Grassy-Otter Creek headed within the area of the present Maumee valley at Grassy island and flowed northeast along the course of the present Grassy Creek reversed, joining Grassy-Otter Creek at the location of the present sharp angle of Grassy Creek. The Maumee River then cut laterally, forming the reentrant in which Grassy Island now lies, and in doing so it undercut that part of the plain containing the headwaters of the small tributary of Grassy-Otter Creek. The gradient of this tributary upon the plain was very low and some of its water at its undercut head flowed down the bluff of the Maumee valley and started a gully. Because of the much lower level of its mouth at the Maumee River, this gully had a far steeper gradient than the tributary of Grassy-Otter Creek and because it continually received water at its head from the valley of the tributary, it rapidly lengthened headward along the course of the tributary and, by a process which we may call *headwater piracy*, gradually reversed the direction of drainage of more and more of the tributary until the place of union of the tributary with Grassy-Otter Creek southeast of Rossford was reached. Here, the level of the head of the gully being below the level of Grassy-Otter Creek, the gully captured the creek and took its waters by the reversed course of its former tributary, west-southwest down the gully to the Maumee River.

The type of piracy illustrated here by which a rapidly eroding stream, like the gully, extends itself by *headword erosion* into the course of a more sluggish stream, like Grassy-Otter Creek, is known as *headword erosion piracy*. It is probably the most common type of piracy and is favored by

escarpments or steep bluffs, like those along the Maumee valley, in close proximity to streams which flow with gentle gradients upon a higher plain. In the geologic future many cases of this type of piracy should take place in the area bordering the

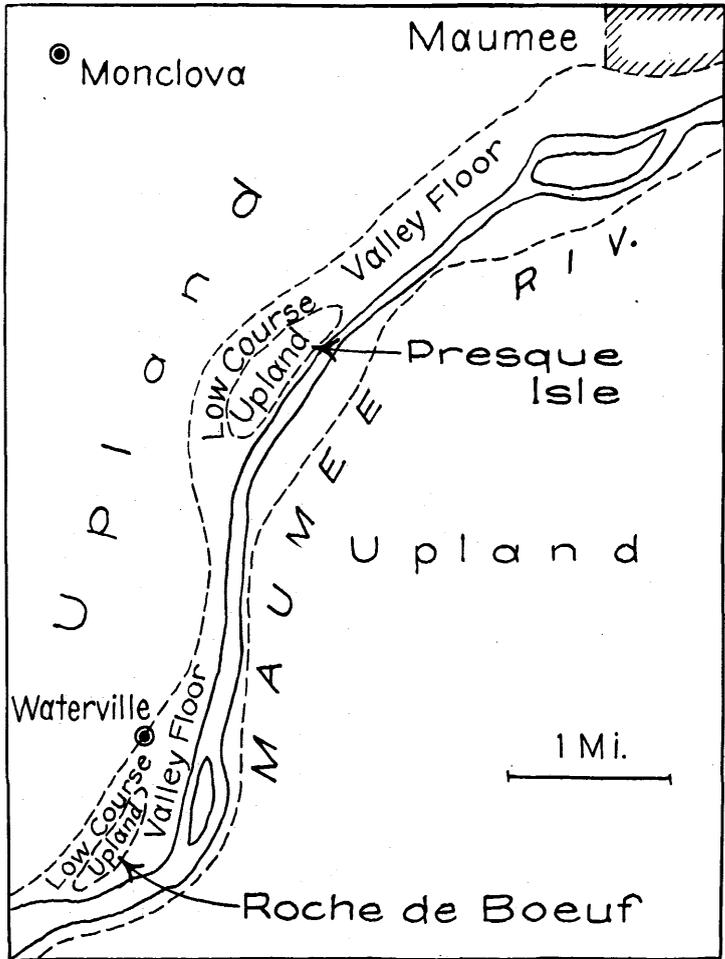


FIG. 3. Map of the Maumee River valley from Maumee southwest through Waterville showing the location of the island-like areas, Presque Isle and Roche de Boeuf, which are separated from the upland by low courses.

Maumee valley. The especial feature of this case is that the gully that did the capturing, the *pirate*, was apparently producing reversal of drainage by working headward along the course of a tributary of the stream which it finally captured.

Grassy Creek south of the sharp angle is the *diverted stream*. Otter Creek is the *beheaded stream*. The part of the former course for several miles northeast of the point of capture through the south part of East Toledo is an *abandoned valley* and the direction of drainage of the southern part of this abandoned course for at least a mile northeast of the place of capture has been reversed and now flows southwest.

Maumee River.

Three miles southwest of the village of Maumee there is, within the Maumee valley proper, an island-like elevation, known as Presque Isle, one mile long and less than one-fourth of a mile wide and rising to the level of the adjoining upland plain (Fig. 3). The river is on the east of Presque Isle in a rock channel, while on the west, Presque Isle is separated from the upland by an abandoned, flat-bottomed valley about one-fourth of a mile wide. The floor of this valley is on rock at 25 to 30 feet below the upland and about 20 feet above the river. Apparently the Maumee River lowered both valleys concurrently until the bed rock was reached when the valley on the east of Presque Isle acquired all the river and the valley on the west was abandoned.

A similar but smaller, elongate, island-like area which was known in an early day as Roche de Boeuf, exists in the Maumee valley south of Waterville at the north end of the Ohio Electric Railway bridge (Fig. 3). The abandoned valley on the west is followed here by the Miami and Erie canal. This is another case where the Maumee River cut a larger and smaller valley concurrently until the bed rock was reached when the larger valley on the east acquired the entire river.