

# FEATURES OF THE VALLEY FLOOR OF THE WABASH RIVER NEAR VINCENNES, INDIANA

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## Introduction

It is the purpose of this paper to set forth the characteristics of the valley floor of the lower Wabash River in the vicinity of Vincennes, Indiana, and to present theories concerning the development of the physiographic features found therein. The valley floor is in reality a valley plain in the region about Vincennes, where it attains a width of slightly more than ten miles. This width is approximately retained south of the area mapped (Fig. 1), and in the vicinity of the junction of the Wabash and Ohio rivers the valley plain expands to a breadth of more than fifteen miles. North of Vincennes, the valley floor of the Wabash gradually decreases in width to approximately four miles near Terre Haute, and to even less than this farther north. Much of the physiographic history of the region is related directly or indirectly to glaciation and its attendant phenomena. Eolian processes have also played an important part in the development of the surface features of the valley floor. Forms within the valley floor include alluvial terraces, lacustrine terraces and flats, valley braids and valley braid cores, floodplain features, sand dunes, and loessial deposits. Certain of these features are unusual and have had a very interesting physiographic development.

## Physiographic Forms and Their Development

*Pre-Wisconsin Development.*—The valley of the lower Wabash in pre-Illinoian time was probably in the late maturity stage of the erosion cycle. The master valley itself was broad, and the valley sides were relatively gentle. For the most part, the valleys of the smaller tributary streams must have been graded to the master valley. In the interval between late Tertiary time and the advent of the Illinoian ice invasion, the lands had been warped upward, and the Lafayette gravels (Pliocene?) had been lifted to their present position high above the present base-level.

The Illinoian ice sheets covered nearly all of the lower Wabash region, and the terminus of the continental glacier lay some forty miles southwest of the southern limit of the mapped area (Fig. 1). It is highly probable that most of the valley of the Wabash River was at that time filled with glacial drift, both till and glacio-fluviatile deposits. As the ice receded, the Wabash and some of its tributaries must have acted as sluiceways for the melt waters from the waning ice sheet. If the valleys carrying the melt waters were filled with materials of Illinoian age, most of the deposits must have been removed in the interval between Illinoian and Wisconsin time, for only Wisconsin materials can be identified at the surface of the valleys at present.

*Shelbyville Terrace.*—As the Wisconsin glacier advanced upon the region from the north, the Wabash valley served as a sluiceway or discharge route for the melt waters from the ice front. The waters poured down the valley, carrying great amounts of detrital materials from the

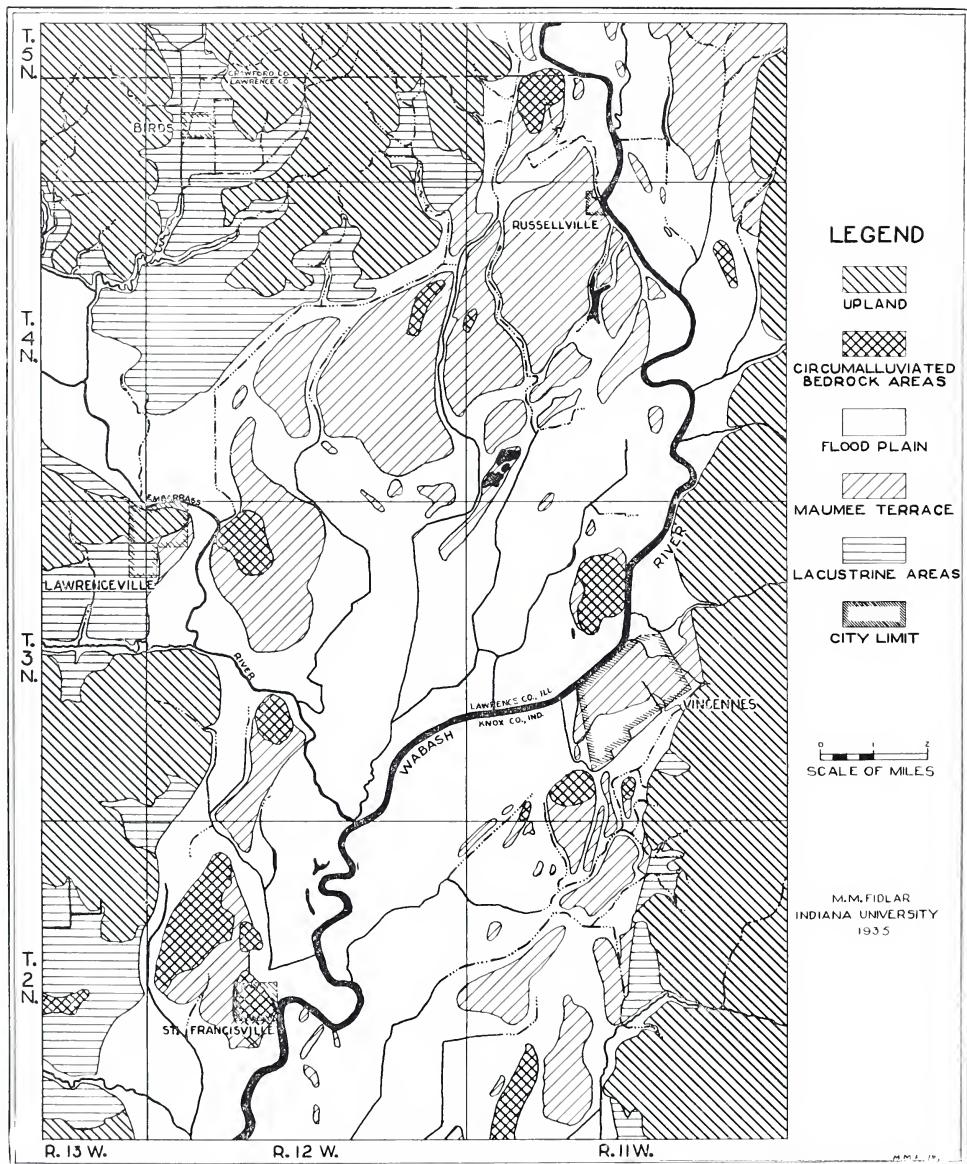


FIG. 1. Map of the Wabash valley region of Illinois and Indiana in the vicinity of Vincennes, showing the principal physiographic features upon and adjacent to the valley floor.

ice, burying portions of the upland in a great valley train, and planing away at the foundations of the valley sides. At the maximum extension of the ice in Wisconsin time, the terminus of the glacier crossed the lower Wabash valley at a point about forty-five miles north of the mapped area. At this time, valley-filling reached its maximum, and portions of the old upland were completely buried beneath the valley train materials. As the ice again withdrew to the north, waters continued to discharge down the Wabash valley, but the greater part of their detrital load was probably deposited north of the Shelbyville moraine.

The Shelbyville terrace, or the surface of the maximum valley-fill in Wisconsin time when the ice lay at the Shelbyville moraine, is not represented in the Wabash valley proper in the region discussed in this paper, nor can it be identified farther south in the valley, where terraces and floodplain merge imperceptibly into one another. However, other terraces in the region near Vincennes indicate the approximate level to which the master valley was once filled. These are the lacustrine flats, found in the larger tributaries to the Wabash.

*Lacustrine Flats.*—At the time that the Wisconsin ice front stood at the Shelbyville moraine, the vast amounts of sands and gravels transported and deposited by the melt waters coursing down the Wabash valley filled the deeper portions of the valley to depths as great as more than 100 feet. Coincident with the deposition of this great valley train, the waters were also cutting at the base of the upland borders. Rather expansive stretches of bedrock upland were planed down to a level slightly below the surface of the glacial river and were buried beneath a thin veneer of sand and gravel. The valley train of the Wabash was constructed so rapidly that the smaller tributary streams could not keep pace in building up their floors. This was especially true of those which received no melt waters. As a consequence, the smaller streams were ponded in their lower courses by the gravel train and water in the master valley, and a series of lakes was formed on each side of the lower Wabash valley. The floors of these tributary valley lakes were slowly raised by the deposition of calcareous silts and finely-laminated, tough, fatty clays carried in by the streams which were ponded and by backwaters from the flooded glacial stream. The resulting lacustrine flats were developed at the level of the surface of the Shelbyville fill before the lakes were destroyed. The elevation of the lacustrine surfaces is, then, dependent upon the height to which the Wabash valley floor was constructed at the point where each individual ponded tributary entered the master valley. That the lacustrine flats are Shelbyville in age is perhaps demonstrated by the fact that evidence of ponded tributaries north of the Shelbyville moraine is apparently lacking.

The small lacustrine flat west of Russellville, Illinois, has an elevation of 450 to 460 feet above sea level. The floor of glacial Lake Birds, north of Lawrenceville, Illinois, stands 440 to 460 feet above sea level. The altitude of the "Sand Barrens" along Raccoon Creek, west of St. Francisville, Illinois, is 420 to 440 feet. Most of the lacustrine flats along the eastern side of the master valley are heavily masked by eolian sands, blown up from the alluvial materials of the Wabash valley train, and it

is nearly impossible to ascertain here the exact altitudes of the old lacustrine floors.

A comparison of altitudes shows that the surface of the lacustrine deposits lies from 10 to 30 feet above the surface of the Maumee terrace, described elsewhere in this paper. The decreasing difference in altitude, from north to south, between the Maumee terrace level and the Shelbyville lacustrine flats indicates that the Shelbyville valley train surface must have had a gradient in excess of ten inches per mile.

*Valley Braids and Valley Braid Cores.*—As the waters deposited valley train alluvium in Shelbyville time, the floor was constructed increasingly higher, until the river occasionally spilled over lower places in upland spurs between tributaries of the main valley, cleaning away the residual materials and wearing down the bedrock of this newly selected and alternative route. The composite valley consisted of several interlacing parts, all occupied by the great glacial river. Features of this type have been described in the upper Wabash valley by Malott and Shrock,<sup>1</sup> as follows: "Valley braid is a term proposed for the individual runway of a valley which is in anastomosis, its valley parts passing around features in bas-relief or about upland tracts. The floors of the valley braids may be near the level of the one which carries the present stream, or they may be much higher. Valley braids are numerous in some stretches of the Wabash sluiceway." In the upper portion of the Wabash valley, the valley braids are sharp channels; the circumscribed upland tracts are broad and are less conspicuous.

In the lower Wabash valley, however, the upland tracts are the conspicuous features. The valley braids have become so broad and are so merged as to resemble an expansive local plain. The isolated upland remnants rise spectacularly from this veritable sea of alluvium. Owing to the lateral extension of the floors of the valley braids by a combination of erosion and alluviation, the bas-relief features have been reduced to mere fragmentary masses of upland, often separated from the upland sides of the Wabash valley by several miles of alluvial floor. In the region discussed in this paper, however, most of the circumalluviated bedrock masses lie reasonably near to the sides of the present valley. The writer<sup>2</sup> has proposed the name *valley braid core* for the isolated, fragmentary upland masses, circumscribed by the over-widened valley braids. The valley braids may or may not be occupied at the present time by channel or floodplain.

The valley braid cores in the Vincennes region attain a part of their height above the valley floor by virtue of sands blown from the valley train materials below. Bedrock is nearly always exposed somewhere near the base of the cores, especially if a portion of the present floodplain passes beside them. The surface of the Wilbur Hills, north of Russellville, exhibits typical ancient dune topography, as does that of the upland remnant on Sand Ridge, just east of Lawrenceville. The small bedrock area three miles southwest of Russellville is covered with a shallow blanket of wind-blown sand, and the planed surface of the bedrock stands

<sup>1</sup>Malott, C. A., and Shrock, R. R., 1929. Features of the Wabash sluiceway of northern Indiana. Bull. Geol. Soc. Amer., 40:102.

<sup>2</sup>Fidlar, M. M., 1933. Some hills of circumalluviation in the Lower Wabash Valley. Proc. Indiana Acad. Sci., 42:135-140.

only a few feet above the level of the Maumee terrace at this point. It is probable that this portion of the bedrock upland was completely buried by the valley fill in Shelbyville time and that the excavation of a later erosional level has uncovered it again.

Robeson Hills, the valley braid core in Illinois just north of Vincennes, present a very interesting situation. This core is separated from the upland at the eastern edge of the Wabash valley by a narrow valley braid, the floor of which is only thinly veneered with sands and gravels. The valley braid core certainly represents the end of a spur formerly jutting into the old valley. The spur was dissected, probably during the Shelbyville stage, when the floor of the Wabash valley had been aggraded to an extent sufficient to allow the melt waters to pour over a low place in the spur. In the final adjustment at the close of the Pleistocene, the Wabash inherited the newer route through the restricted flue, in lieu of a course in the older six-mile expanse of the valley braid to the west of the Robeson Hills.

*Maumee Terrace.*—Following the withdrawal of the ice sheet to the northeast from the Shelbyville moraine, it paused successively at the Bloomington, Union City, Mississinewa, Salamonie, Wabash, and Fort Wayne recessional moraines. At each of these points, melt waters possibly constructed a terrace in the sluiceway similar to the Shelbyville level. These same waters, after depositing a portion of their detrital load, may have cut into the Shelbyville fill, so that by the time the ice sheet reached the Fort Wayne moraine, several terrace levels may have been present throughout the entire Wabash sluiceway. In late Wisconsin time, the melt waters from the ice collected at the southern edge of the lobe to form glacial Lake Maumee, of which the present Lake Erie is a remnant. The waters from the ancient lake spilled over the edge of the basin in the vicinity of Fort Wayne, Indiana, and poured across the country to join the present route of the Wabash River at Huntington, Indiana. This water was much clearer than that which was discharged directly from the front of the ice sheet when it stood at the various moraines. As a consequence, this water during the Maumee stage may have erased the traces of other erosional terraces developed in the alluvial fill and cut a lower level. It is the writer's opinion that much of the erosion of the fill was accomplished during the Maumee stage of the Wisconsin ice age. Only a few scattered remnants of the surface of the Shelbyville alluvium were preserved.

The terrace or erosional level resulting from the work of the Maumee waters is very conspicuous in the region around Vincennes. This city is built partially upon a large remnant of the Maumee terrace. Since its development in late Wisconsin time, the Maumee level has been excavated and destroyed to a great extent by the development of an expansive floodplain. The surface of the Maumee terrace stands 425 to 430 feet above sea level at the northern edge of the mapped area, and slopes down-stream with a gradient of eight inches per mile, reaching an elevation of 410 to 413 feet at the southern end of the region. The floodplain of the Wabash in this area has a gradient of only seven inches per mile. To account for the difference in gradient, it would be safe to assume that the waters which carved the Maumee level, although rela-

tively clear when compared to the waters directly from the front of the ice, were more heavily laden with detrital materials than are the present flood waters, and consequently the floor over which they flowed required a steeper gradient to facilitate the seaward movement of the alluvial materials.

Many of the remnants of the Maumee level are covered with heaps and mounds of wind-blown sand. As the prevailing westerly winds moved the sands of the valley floor, some of them came to rest upon these strips of terrace 10 to 15 feet above the reach of the high flood waters. These dunes, then, within the valley plain, must necessarily be late Pleistocene to Recent in age. The terrace remnant just east of Lawrenceville, Illinois, is nearly entirely covered with sand swept from the lacustrine flats and the floodplain to the south and southwest. For this reason, it is locally named "Sand Ridge."

In places where the Maumee level is not covered by dunes, the present surface soil is gravelly and sandy. It is in such localities that many of the gravel pits of the region are located. The largest gravel pit in the Wabash valley in Illinois is located in one of the Maumee remnants, about six and three-fourths miles slightly north of east of the city limits of Lawrenceville.

*Floodplain and Anastomosing Fluvia.*—Since the cutting of the Maumee level or terrace in the gravels and sands of the valley plain, the Wabash River has excavated a floodplain at a lower level. The gradient of the floodplain in the region under consideration is approximately seven inches per mile, while the gradient of the channel of the river is about six inches per mile. This discrepancy exists because of the fact that the channel winds through the floodplain. The floodplain is 415 feet above sea level at the northern end of the mapped area, and its elevation is 402 feet at the southern end. The floodplain in this region is not a simple one, developed adjacent to the channel, but is a very complex system of anastomosing flood water fluvia. An especially interesting set of such intertwining routes is to be found between Russellville and Lawrenceville, Illinois. Here some of the floodplain fluvia are extremely narrow. One of the flood water routes leaves the river at the extreme northern edge of the area and follows the western side of the valley to the southern limit of the mapped region. The Embarrass River enters this fluvium at Lawrenceville, follows it for several miles, and then turns southeast to join the Wabash. A series of small, restricted floodplain fluvia surround portions of the Maumee erosional terrace and some remnants of the partially-buried upland in the region south of Vincennes, Indiana.

The channel of the Wabash in this vicinity is developed 15 to 20 feet below the surface of the floodplain. It is cut, for the most part, in the materials of the Shelbyville valley train. In some places, however, bedrock is exposed in the floor or sides of the channel. Perhaps the most notable of these places occurs in the restricted valley braid between Robeson Hills and Old Fort Knox, on the upland to the east. Owing to the shifting of the river over its alluvial floor, many channel scars and partially-silted meander routes are to be found on the floodplain throughout the entire lower Wabash valley. These features are not so conspicuous in the area under consideration as they are to the north and south.

### Summary

From the evidence cited in the preceding pages, it is apparent that the lower Wabash River has not undergone a normal cycle of development. Little evidence can be found that sheds any light upon the physiographic situation in the Wabash valley following the withdrawal of the Illinoian ice sheet. The valley may have been filled with drift as the ice rode over it. In any case, it was cleared out by the pre-Wisconsin Wabash River to a level below the present base-level. No Illinoian materials can be found within the valley proper. During the Shelbyville stage of the Wisconsin ice invasion, the valley was filled with outwash materials in the form of a valley train. In the region discussed, alluviation reached its peak at the time that the ice stood farthest south in Indiana. The great amount of water and the rapid aggradation of the valley floor of the Wabash induced the ponding of the tributaries and the consequent construction of lacustrine flats, dependent upon the level of the valley train of the master stream at the points where the tributaries entered the main stream. It was also during this stage that valley braids and valley braid cores were developed extensively by a combination of alluviation and erosion. The period of greatest aggradation in the region was probably followed by a period of continuous removal of a part of the alluvial fill, climaxed by the erosion of the Maumee level, when the waters of glacial Lake Maumee discharged down the sluiceway. In more recent time, a floodplain, composed of anastomosing flood water fluves, has been carved below the Maumee erosional terrace.

The writer wishes to call attention to some misconceptions concerning the development of the broad expanse of valley floor of the Wabash River. The topography of the region would certainly suggest that the great valley expanse had been carved during a normal erosion cycle, and that the region as a whole represented an area in the old-age stage of the cycle of land reduction. However, this is certainly not the case. The valley plain of the lower Wabash is not a true degradational floor, such as would be found in a normal valley; rather, it is aggradational in character.

In Professional Paper 60, United States Geological Survey, "The Interpretation of Topographic Maps," Salisbury and Atwood discuss a portion of the lower Wabash valley (pp. 33-34). They accept the region just south of the area mapped in this paper as a good illustration of old age topography. Some of the valley braid cores are brought to attention, and it is deduced that, since the hills standing in the valley flat reach nearly the same altitude as that of the upland, the great valley expanse has been *degraded* from the level represented by the hills and the adjacent upland border. The writer wishes to call attention to the fact that the isolated hills reach the altitude of the upland by virtue of a rather thick covering of eolian sands and loess. Further, the present surface of the valley, though it is truly degradational in character, is developed in a great mass of alluvium which at one time stood higher than the present valley floor, yet lacked many feet of ever reaching the top of the upland border. The true degradational floor of the valley lies in many places more than 100 feet beneath the present alluviated lowland floor.

This citation is only one of several instances where the lower Wabash

valley has been proposed as an illustration of a valley in the old age stage of the cycle of erosion. However, fluvial erosion has reduced the bedrock floor of the Wabash valley to a point far beneath the present floor, and the area should not be taken as a typical example of a valley in perfect old age, since it has passed through an abnormal cycle of development.