THICKNESS OF LOESS IN CLARK COUNTY, ILLINOIS

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In 1942, Guy D. Smith published the result of a comprehensive investigation of loess thickness, distribution, texture, etc. throughout the state of Illinois. His map showing the thickness and distribution of loess was mainly the compilation of data gathered by previous workers throughout the state. In certain areas, especially along the Wabash River, the available data were limited, and the map for this region was necessarily generalized.

The present study was conducted in Marshall and Casey Quadrangles, Clark County, Illinois, as a special project for the Agronomy Department of the University of Illinois and was under the direction of Dr. R. T. Odell. Clark County is in east-central Illinois and is bounded to the east by the Illinois-Indiana state line and the Wabash River (fig. 1). This study was made to obtain more detailed information on the distribution and thickness of loess deposits of a limited area west of the Wabash River. The investigation was intended to show the relationship of loess to the Wabash River bottoms and to note what effect, if any, the Shelbyville moraine of Wisconsin age has on the loess.

Sixty holes were drilled with a one-inch screw auger through the loess into the underlying material. Since the loess thickness changes more rapidly adjacent to the bluffs west of the Wabash River than at a greater distance from the river, the borings were spaced more closely near the river to get more detailed information on this critical area. Also, since loess consists predominantly of silt size material, the contact between the loess and the underlying material was chosen at the first appearance, in appreciable quantity, of sand or larger fragments. To avoid errors in thickness due to postglacial erosion or deposition, bore holes were limited to flat, undisected divides. Even so, the authors feel that some of the bore holes were contaminated. Thus, locations and thicknesses of all stations were plotted on a topographic base map and are reproduced on figure 2, but the thicknesses that have been contoured on figure 2 do not take into account obviously questionable values.

Topography and Drainage

The topography and drainage of the area is controlled by the Wabash River. The region is in the middle youthful stage of the erosion cycle. All the streams are tributaries of the Wabash River and are cut about 100 ft below the general level of the divides. The larger tributaries, near their confluences with the Wabash River, have developed fairly extensive flood plains and have reached maturity. Near the headwaters, the streams are youthful and expanding on to the undissected uplands. The stream pattern is dendritic. The Shelbyville moraine cuts across the northwestern corner of the area and stands about 100 ft above the rest of the county. It has the typical knob and kettle topography of a terminal moraine.

Glacial Geology

Casey and Marshall Quadrangles were covered by the ice during the last two stages of the Pleistocene glaciation. Illinoian till was deposited over all of Clark County, altering the preglacial topography. Following the Sangamon interglacial period of weathering, the ice again advanced during the Wisconsin stage, its farthest extent being marked by the Shelbyville moraine. In addition to the till constituting the Shelbyville moraine, Wisconsin deposits also include a sheet of outwash beyond the moraine and loess deposits which cover almost the entire

county. The loess covers the weathered surface of the Illinoin till and is interbedded with the till and outwash of the Shelbyville moraine, part of the loess being older and part younger than the till. Subsequent erosion has removed the loess from the youthful stream valleys.

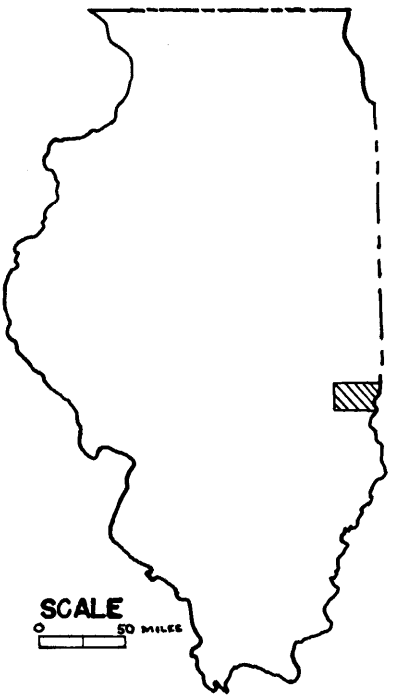

FIGURE 1. Index map showing location of area studied.

History of the Wabash Valley (Fidler, 1948)

In pre-Pleistocene times, the ancestral Wabash River followed approximately the same course as the present Wabash River and laid down extensive gravel deposits. Subsequent erosion during early Pleistocene times cut a bedrock channel over a hundred ft below the present river level and left the gravel as isolated patches on the upland. The deep valley system was developed well before Illinoian glaciation; Kansan till beneath Illinoian drift has been identified within some of the buried valleys. Illinoian glaciation covered all of Clark County and filled the Wabash River Valley with drift. Sangamon erosion removed nearly all of the till from the river valley.

In Wisconsin time the Wabash River acted as a sluiceway for the melt water from the ice front to the north. At about the time the Shelbyville moraine was constructed, a large volume of outwash collected in the Wabash River Valley. Many bedrock features were buried in the alluvium. During later Pleistocene, the ancestral Lake Erie, Lake Maumee, overflowed at the present location of Fort Wayne and poured clear water down the Wabash River. This flood of clear water extensively eroded the older Shelbyville aggradational surface, developing a lower flood plain and leaving the Shelbyville surface as isolated upland remnants. The present floodplain was constructed below the Maumee surface during late Pleistocene or Recent times.

Distribution and Thickness

Loess of varying thickness has been found to cover all the flat uplands of Clark County. The thickness and distribution, however, is closely related to the Wabash River. This is well demonstrated on figure 2. The thickest loess deposits, on the bluffs immediately west of the river, are all over 100 in. in depth. One sample taken on the edge of the bluff totals only 44 in. of loess, but is probably affected by post depositional erosion. The thickness decreases very rapidly away from the bluff and is from 40 to 60 in. in the central part of the area mapped. The loess-depth lines are therefore closely spaced near the bluff but become farther apart toward the center of Clark County.

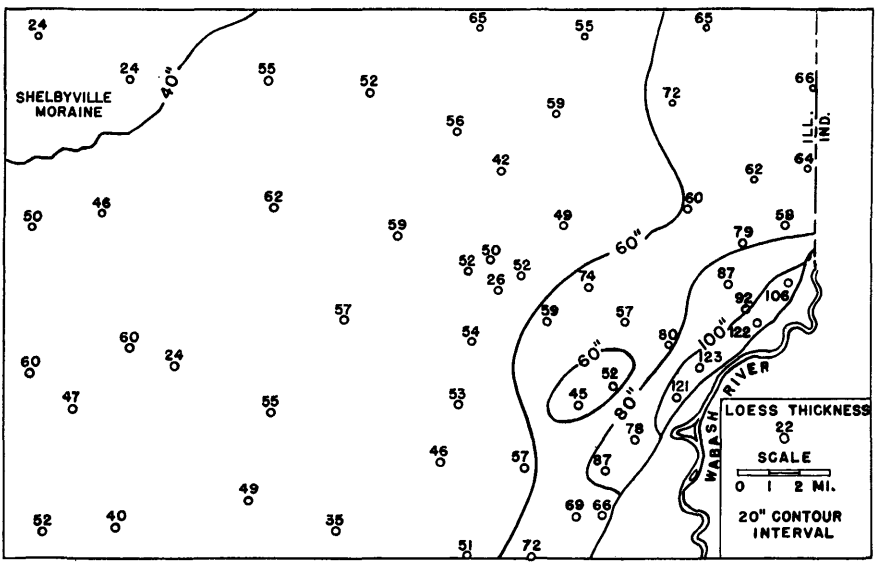

FIGURE 2. Contour map showing thicknesses of loess and location of bore holes.

Following the method devised by Smith (1942), the loess depth is plotted against the distance from the bluff on three cycle semi-log graph paper as shown in figure 3. The thinning of loess away from the bluff can be expressed by the equation: $Y = 87 - 36 \text{ Log } X$. As pointed out before, several anomalous thicknesses occur within zones of otherwise uniform loess thicknesses. There are several possible explanations for this. 1) There is a possibility of human error in determining the loess-till contact. 2) Various organisms burrow beneath the surface and tend to mix the loess and till fragments together. 3) The work covered a much smaller area and was necessarily more detailed; therefore, inconsistencies and inaccuracies of depth not readily apparent in Smith's work are relatively more important in a smaller area. 4) The loess was not deposited on a completely level surface. Thus, protected areas would tend to collect more loess than other areas. 5) The presence of the Shelbyville moraine had some effect on increasing the thickness toward the moraine instead of toward the Wabash River. Twenty-four in. of post-Shelbyville loess were recorded in two borings on top of the moraine. It is reasonable to assume that at least this much post-Shelbyville loess is present directly in front of the moraine and that this loess gets thinner in a southerly direction.

Age

The loess lies on top of weathered Illinoian till and, therefore, is Wisconsin in age. Leighton and Willman (1950) state that Wisconsin loess in Illinois may be divided into two parts, a lower Farmdale loess and an upper Peorian loess of Iowan, Tazewell, Cary and perhaps Mankato age. The Farmdale loess has a distinctive pinkish-gray color in contrast to the buff colored Peorian loess and can only be recognized when the overlying Peorian loess is calcareous and when the Farmdale is thick enough to be uncontaminated with materials from below. Since the Peorian loess is leached and the Farmdale is apparently thin in this

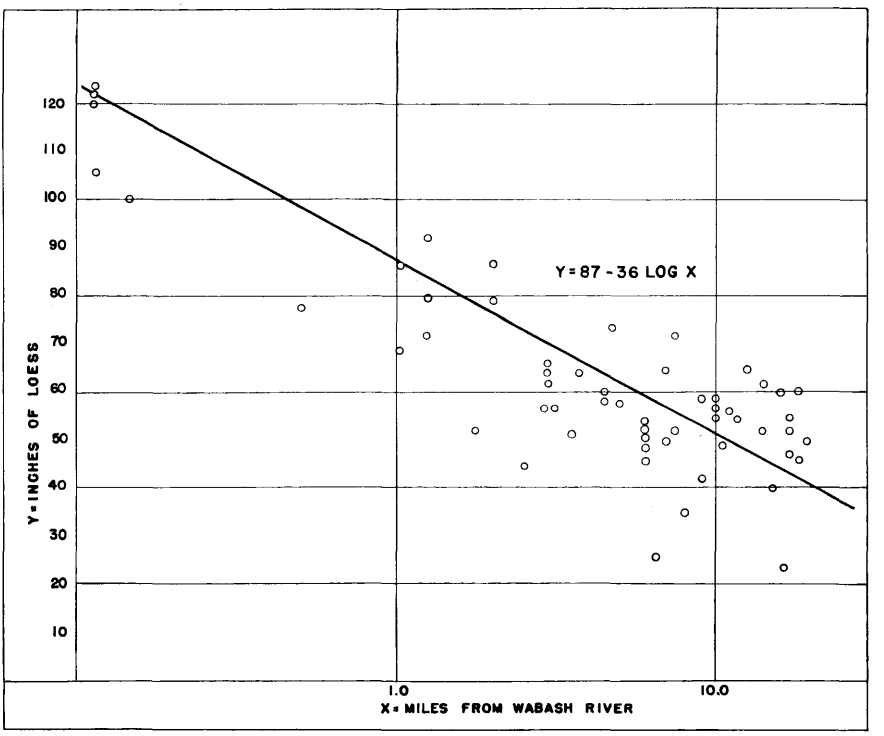

FIGURE 3. Graph showing relationship between thickness of loess and distance from Wabash River.

area, it is very difficult to recognize the Farmdale here. Farmdale loess has been identified by the authors in only one bore hole and if present in other holes, was not apparent. Recent borings by J. B. Fehrenbacher (personal communication from R. T. Odell, 1959) show that from 7 to 17 in. of Farmdale loess do occur in borings he has made in Clark County.

Texture

Although no mechanical analyses were run, it was observed that the loess near the Wabash River bluffs is composed of coarser silt, with a smaller percentage of clay minerals and a larger percentage of sand than the loess farther away from the river.

Origin

It was originally believed that loess was desposited by water. T. C. Chamberlin (1897) proposed that loess was carried by wind from outwash plains and valley trains which were filled with silt derived from the continental glaciers. This origin has been strengthened by subsequent observation. Smith (1942) showed almost incontravertable evidence that the thickness, texture, calcium carbonate content, and degree of weathering of loess are very closely related to glacial drainageways. The present investigation shows a very distinct thickening of loess toward the Wabash River and a less obvious but still apparent thickening near the Shelbyville moraine. This study, therefore, is an additional bit of evidence that loess is of wind blown origin being derived in the main from glacial outwash. This represents the first systematic and detailed study of the western side of any Illinois river with regards to thickness of loess.

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