Notes on the Eastern Escarpment of the Knobstone Formation in Indiana. By Lee F. Bennett.

One of the most noticeable topographical features of Indiana is the eastern escarpment of the Knobstone formation. It can easily be traced from New Albany in a north-northwesterly direction for more than one hundred miles.

The Knobstone formation comprises the lower strata of the Sub-carboniferous series in Indiana. It is made up of clay shales, sandy shales and sandstones. The escarpment is due to a great thickness of the soft and easily eroded strata capped by more resisting strata of sandstone and overlying limestone. It generally faces east, and in the extreme southern part of the State it presents a bold precipitous face. Here the name "Knobs" is given to the range of hills formed by the escarpment; farther north this eastern portion of the formation is known as "the hills."

Beginning directly west of New Albany, in Section 3, township 3 south, range 6 east, the escarpment runs north ten miles. It varies from 190 feet to 385 feet above the country to the east which is low and flat and slopes gently towards the Ohio River. There are no foot-hills in this region, but in various places streams have cut through the escarpment forming narrow ravines with almost precipitous sides. With the exception of about two miles where limestone a few feet in thickness is found, sandstone is the capping stratum. In a typical section made six miles north of New Albany the sandstone was found to be 90 feet in thickness and the shale nearly 300 feet.

The drainage is toward the east into Silver Creek or southeast into the Ohio River. A few of the streams head two or three miles west of the escarpment and reach the level country through the narrow ravines before mentioned. The escarpment turns to the west in section 14, township 1 south and 6 east, Clark County, forming the southern boundary of the valley of Muddy Fork Creek as far as the town of Borden.

The knobs in this region vary from 150 to 250 feet in height and are capped by sandstone. Near Borden the knobs are for the most part made up of shales containing large quantities of iron nodules.

On the north side of the valley of Muddy Fork Creek the escarpment extends eastward to section 6, 1 south and 6 east, whence it runs in a north-northeasterly direction twelve miles to section 19, 2 north, 5 east, which

is the most easterly extension of the Knobstone escarpment. Foothills are found in the northern part of township 1 north; they extend one mile to the east of the main escarpment, are low and for the most part uncultivated. The Sub-carboniferous limestone which overlies the Knobstone has receded many miles to the westward, thus leaving the sandstones and shales to make up the hills of this region. In section 24, 2 north and 8 east, on the line between Clark and Scott counties, probably the highest part of the escarpment is found; it is 400 feet above the general level of the country to the east. (The hills of section 24 and 25 are cut off from the main line by a gap cut by streams tributary to the Muscatatuck on the north and the Ohio on the south.)

The line of hills now turns westward, then northwestward twelve miles, passing into Washington County, and again turns west. In township 2 north, 6 east, there are several small valleys cut by streams tributary to the Muscatatuck. The foothills are long, extending two or three miles northeast parallel to the principal creek beds. In township 3 north, the overlying limestones extend to the eastern face of the Knob escarpment.

In section 30, township 4 north, 8 east, the hills turn to the west, running parallel to the Muscatatuck and White rivers. In places the hills "bluff up" against the river and in others the "bottom land" is a half mile or more in width. In the eastern part of township 4 north and 4 east, the line of hills makes a great bend towards the south; another deflection is made to the southeast in the middle of township 4 north and 3 east. In section 26, township 4 north and 2 east, in northwestern Washington County, limestone is found capping the escarpment 125 feet above the river bed and is found as the capping stratum for several miles farther down the river; the hills forming the border of the valley vary from 125 to 300 feet in height.

From Ft. Ritner, on the north side of White River, the hills extend northeast for six miles to near the town of Medora, then nearly north for ten miles to Freetown in the northwestern part of Jackson County. In the first seven miles of this portion there are no foothills, the White River bottoms extending to the face of the escarpment; farther north there are foothills and in many places there is a gradual rise from the eastern lowlands to the hills to the westward. In a few places only are the hills as high as they are to the south. One hill was measured which was 370 feet in height, but this was an exception. In the vicinity of Freetown, in town-

ship 6 north and 3 east, the highest hills along the eastern face are but little over 100 feet. They form the watershed for this section of the country.

East and south of Brownstown, in east-central Jackson County, are the "Brownstown Hills." They are outliers of the hills to the south and west. They are separated from the main line of hills to the south by the Muscatatuck River and two and one-half miles of bottom land; from those on the west, by the White River and four miles of bottom land. They are a very prominent feature in the topography of this region; their greatest extent is six miles from north to south and five miles from east to west. They are made up of muddy sandstones underlaid by clay shales and contain in many places considerable quantities of iron nodules. The hills in many places are nearly 400 feet above the valley; on the east the slope is rather abrupt, with few foothills, but on the west the slope is gradual to the White River bottoms. The hills are nearly cut through in three places by creeks tributary to the White River.

From Freetown the hills extend to the northeast six miles near the Bartholomew and Jackson county line, thence nearly north across the western part of Bartholomew County. Near the above-named county line one spur of the hills runs nearly east for three miles, then in a northerly direction, forming the foothills in Bartholomew County. The Knobstone escarpment is generally not well marked in this county. In a few places the slope is gradual; in other places the foothills are five or six miles wide and the escarpment is well marked. Without doubt two or three miles of these lower hills are partially formed of drift, as was shown by well sections obtained in this region; a few places along the west bank of Driftwood River there are bluffs 100 feet high.

The main escarpment varies from 100 to 275 feet above the immediate country to the east. The creek valleys in the lower hills are sometimes more than one-half mile in width. In the northern part of the county in township 10 north and 4 east, there is no distinct escarpment; the country gradually becomes more rolling from the east to the west and passes into the hills of northern Brown and southern Johnson counties.

Beginning with Johnson County the real eastern escarpment is covered with glacial material. In township 11 north and 5 east, extending to Sugar Creek west of Edinburg, the country is gently rolling with an occasional bluff on the west side of the creek; in township 11 north, 4 east, the hills are steeper and more numerous. In township 11 north 4

east, and 12 north 3 east, west and southwest of Franklin, the watershed between the east and west forks of White River is a ridge covered with a glacial material; it is almost level and from one to two miles in width.

The glacial covering can be easily traced along the southern part of this ridge. Here the wells are shallow and water is found in shale; farther north the water is found in gravel and sand, and in this region there is a number of large springs. Well sections also show the character of the original surface; of two wells within seventy-five yards of each other, one was 14 feet deep and the bottom was in blue shale; the other 41 feet deep and the bottom was in a "brush heap" (glacial debris).

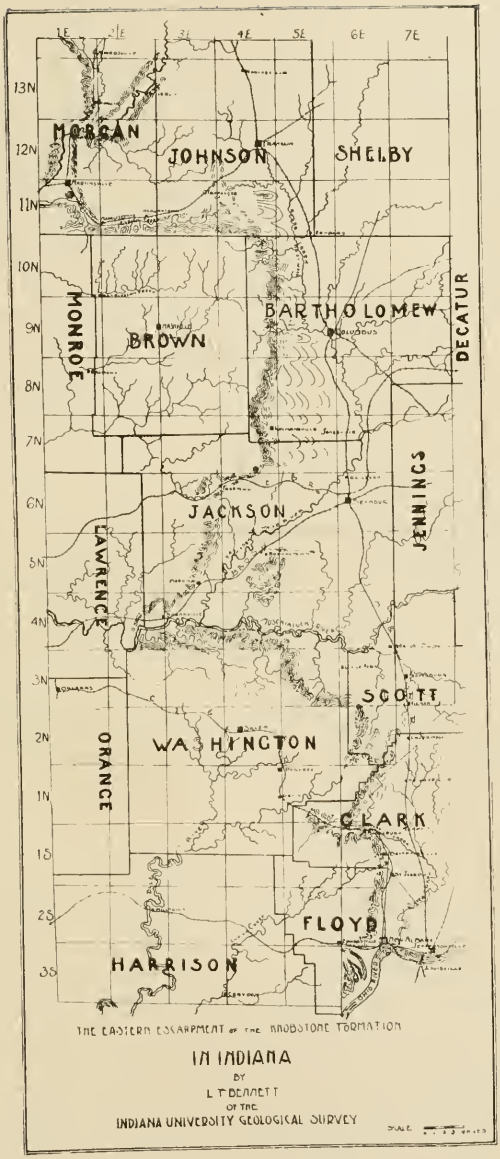
West of this ridge to White River, and especially along the creek beds, the country is very rough and shows the characteristic Knobstone topography. A continuation of the hills of northwest Bartholomew County are found in southern Johnson and Morgan counties; the hills are from 75 to 125 feet above the bed of Indian Creek which they follow to its mouth, three miles southwest of Martinsville.

On either side of White River north of Martinsville to near the Morgan and Johnson county lines, typical Knobstone bluffs are found. Directly west of Martinsville the bluff is 190 feet high. The bluffs on the west side follow close to the river for about five miles; they then turn to the north, forming the west side of the valley of White Lick Creek. They gradually become lower and can be traced two or three miles northwest of Mooresville, in township 14 north, 1 east, where they ceased to be noticeable. Between this spur and White River the country is gently rolling and covered to some depth with glacial material.

On the east side of the river most of the bottom land is found. It varies from a few hundred yards to three-quarters of a mile in width. The hills are not as high as on the west side and gradually become lower as they run northward. In section 2, township 13 north, 2 east, the last hill is found; at Waverly, two miles southeast, there is a sandstone quarry of typical "Knob" sandstone.

This northern portion is a good example of the gradual encroachment of drift material over the residual rock and soil.

In the accompanying map an attempt has been made to give a general idea of the location of the escarpment. The scale is too small to show only the larger valleys. The foothills are indicated by short contour lines some distance apart. No attempt has been made to show the height of the hills by a definite number of contours.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