GEOLOGICAL SURVEY OF KENTUCKY.

N. S. SHALER, DIRECTOR.

TOPOGRAPHICAL REPORT

OF THE

NOLIN RIVER DISTRICT,

BY WILLIAM BYRD PAGE.

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INTRODUCTORY LETTER.

Professor N. S. SHALER, *Director Kentucky Geological Survey:*

SIR: I herewith submit the following report upon the topography of the Nolin River district:

In accordance with your instructions of June 3d, 1874, designating for field work the country from Green river north towards the Ohio, and the object the delineation of the eastern outcrop of the western coal field, field work was commenced on the 10th of June, 1874, and continued without intermission until the 24th of December of the same year. In connection with this work, a meridian line was established at Brownsville; stones were placed in the line, and the declination of the magnetic needle determined. A map showing this line, and the position of the stones, was placed on record at the court-house at Brownsville.

A map of an Indian fort near Honaker's Ferry, on Green river, was also made.

The map of the Nolin River district was drawn upon a scale of six inches to the mile, to be kept as a record, and reduced for publication to one inch to the mile.

In the field work, material aid was rendered by Messrs. C. W. Beckham and J. B. Marcou, to whom an acknowledgment is due for their energy and interest during the prosecution of the work.

Upon leaving the field, the office work was commenced and continued until the map was prepared for publication.

Very respectfully,

WM. BYRD PAGE.

TOPOGRAPHICAL REPORT OF THE NOLIN RIVER DISTRICT.

The topographical survey of this section extends northward from Green river to the Louisville, Paducah and Southwestern Railroad, and from Bear Creek, on the west, eastward to the Mammoth Cave, including the lower portion of Green river. The extent of area mapped is about three hundred square miles. This area includes portions of Edmonson, Grayson, and Hart counties, and the county towns of Brownsville and Leitchfield. The Mammoth Cave and Grayson Springs and its railroad station are also shown.

THE METHOD OF THE SURVEY.

The following is an outline of the method pursued in mapping this section: The road from Brownsville to Grayson Springs Station was selected as a base line. This road was surveyed with transit and chain, and over the transit line a profile of the road was made with a water level. This line served as a base for the compass work, and, as far as possible, the surveys were closed to it. The profile enabled the barometric work to be checked. Barometric observations were made upon all the compass lines, and from these observations contour lines were shown upon the map.

DRAINAGE.

The drainage of this section is entirely to Green river, and in a southward direction, making this area a portion of the northern water-shed of the river.

The principal channels of drainage are Nolin river and Bear Creek.

The surface rock, the character of which determines the shape and relative positions of the contours, is, over much of

the surface, sandstone. This is shown in the table-land structure of the area in the western portion mapped. The limestone structure, which is flatter and of more irregular form, is confined chiefly to the eastern portion of the district, and to the valleys or bottom lands of the rivers and creeks. Where the shales come to the surface there are characteristic knobs. The thickness of the sandstone gives an additional variety to the features of the country. The height of the table-land will average about 350 feet,* and will vary from 250 feet to 500 feet, the general level rising toward the east. The more important portions of the country will be described in detail.

The head branches of Bear Creek drain the country southward from the railroad, from east of Grayson Springs Station to west of Leitchfield. About four miles from the road, these streams meet at a level about 200 feet below the road.

Lizard Lick Branch, heading at the Springs Station, empties into Bear Creek at Grayson Springs. Here the level of the creek is 175 feet below the railroad.

These branches have no precipitous cliffs or falls, but regular and gradual slopes, mostly covered, and, as they approach Bear Creek, widen into flat bottom lands. From Grayson Springs the general course of Bear Creek is south southwest, and its length, to the mouth, is 41 miles. It is tortuous in its entire length. In air-line, the distance is 22 miles from the Springs to the mouth of Bear Creek. The total fall of the creek in this length is 130 feet. The table-land ridges between Bear Creek and Nolin river and its branches may be considered as spurs of the ridge upon which the Louisville and Paducah road, near the Springs Station, is built. These ridges extend to Green river. At the railroad the ridge is about 325 feet in height above Green river. Where first shown on the map, it is crossed by the road from Grayson Springs to Morrison's Ford, on Rock Creek. Its extreme height at this road is 350 feet. One mile south it is crossed by another road from Grayson Springs to Rock Creek. Here

*Vertical measurements are given in feet above low water of Green river, which datum is 436 feet above the level of the sea.

the streams of Bear and Rock Creeks head close to each other, and cut down the ridge to a height of 300 feet. One mile further, at the junction of the Grayson Springs, Mammoth Cave, and Brownsville roads, the ridge attains a height of 340 feet, and is divided by Canoloway Creek. This creek is about six miles in length; its slopes are gradual and mostly well covered. The branches from the southwest show exposed cliffs. The total fall of this creek, from its head to Nolin river, where it empties, is 310 feet.

The spur of the ridge, upon which is the Mammoth Cave road, preserves its height evenly for some miles. The creeks, as they drain either side of the table-land ridge, show, by their precipitous drop of about 60 feet, the character and thickness of the surface rocks. Three miles from Nolin river the ridge is cut down, and the branches on either side head to the saddle. The ridge to the river gains its original height only at intervals.

The spur of the ridge, upon which is the Bee Spring and Brownsville road, extends in a southerly direction towards Green river. Its height varies considerably, although the same character of table-land exists. Five miles from Grayson Springs, where the Leitchfield road is, the ridge attains its greatest height of 400 feet. Just to the east of this point is a knob about 40 feet higher than the road. From this point to Bee Spring, a distance along the ridge of 10 miles, the height varies from 390 to 270 feet. From Bee Spring the ridge rises to 370 feet, at the Little Mountain road, 3 miles south of the spring.

From here to the southward, although the surface is without apparent change, the creeks indicate, in many points, remarkable alterations. Pigeon, Pine, and Indian Creeks, draining into Nolin and Green rivers on the east, and Beaver Dam and Gulf Creeks of Bear Creek on the west, after a short, gradual, covered slope, break over the heavy conglomerate sandstone in perpendicular cliffs. These cliffs vary in height from 60 and 70 to over 100 feet. From the bottoms of the creeks they rise almost vertically on either side. Here is seen the

Rock-House structure, where the lower portion of the sandstone has receded and the upper part makes a roof, giving good shelter and room. The rock-houses vary much in size; the dimensions of one measured were 100 by 40 by 60 feet.

East of Rock Creek appears the first general erosion of the sandstone, the sandstone table-land structure being replaced by the flat but irregular limestone type of topography. The ridge between Rock Creek and Nolin river has been protected, and remains capped with sandstone. This ridge attains a height, in places, of nearly 500 feet. The lowest gap in the ridge is between Hunting Fork of Rock Creek and Laurel Run of Nolin river. Its height is 300 feet. The ridge towards Rock Creek will average in height from 350 to 400 feet. This ridge does not extend further north than Sinking Creek. This creek is so named because it has no outlet above ground. The bed of the stream has no continuous slope towards the mouth, but a rise of 20 or 30 feet in one or more places. To the northward of Sinking Creek the area remains flat. The country between Nolin and Green rivers presents several curious features of topography. The structure is of the sandstone type and partly of the thickened conglomerate sandstone variety.

The streams head to a common point, which is about 480 feet high. The descent to the bottoms of the creek is very precipitous, and from the bottoms the cliffs extend along almost the entire length of the creeks as vertical walls.

To the valley of Bylew Creek there are said to be only three approaches. In the valley the arable land is of some extent. The heights of the vertical cliffs were measured in several places, and are given below. Bylew and Piney Creeks cut through the thickest of the sandstone, and the cliffs in these creeks are almost unbroken in their wall-like appearance. In some places the cliffs will measure 180 feet. Buzzard's Roost, on White Oak Fork of Dog Creek, is a picturesque overhanging cliff of 160 feet in height. This peculiar structure is confined to the following creeks: First Creek and Gulf on the south, Pigeon, the mouth of Dismal, Piney,

and the western branches of Dog Creek on the north, the western branches of Dog and Buffalo Creeks on the east, and on the west extending to Gulf and Beaver Dam Creeks. The heights of the cliffs were measured in a few places on Green and Nolin rivers. At the mouth of Indian Creek, on the north side, the cliff is 198 feet in height; at the mouth of Nolin river, on the western bank, 175 feet; at the mouth of Second, 209 feet, and Dismal Rock, opposite the mouth of Dismal Creek, is 164 feet in height.

LINES OF ACCESS.

The nearest railroad is the Louisville, Paducah and Southwestern. This road skirts the northern boundary of the country. Grayson Springs Station is distant from Louisville 65½ miles. A branch line from this road 15 miles in length would place, at the road, the coal and iron together with the timber and other produce of this section. The probable routes would present no peculiar difficulties. The ridge extending from the road to Green river has been described in detail as a practical route for the road, and the map has been worked closely along the probable line. This will enable the route to be chosen without much expense of preliminary surveying. Should it be advisable that the road pass Grayson Springs, Lizard Lick Branch presents suitable slopes, and the approach to the ridge could be made by the School-house Branch of Bear Creek. This route would not lengthen the road appreciably.

To the southward of this section of the country is the Louisville and Nashville road, 8 miles south of Green river, and 7 and seven eighths miles south of the Mammoth Cave, by railroad survey. A branch road into this section of the country would give an abundant supply of coal to this road, at a most convenient point, midway between the termini of the road.

RIVERS.

This section has great advantages in the facilities which its rivers will afford. Green river, as shown in this area, is

about 200 feet wide, a deep stream, rarely freezing, and with slight fall per mile. Slack-water exists already within the limits of the map, and the distance by the river to the Ohio is 283 miles. The highest lock on the river is near the mouth of Barren river, 19 miles below the mouth of Bear Creek.

Slack-water facilities could be given to this section at small expense. This would also affect Nolin river and Bear Creek. Mt. Vernon Mills, on Nolin river, would be brought within the limits of slack-water, and within the reach of a market for the valuable timber which it offers.*

WATER POWER.

The country has superior advantages in this respect. The volume of flow in the rivers will be mentioned later. Springs are numerous, and may be divided into two classes—limestone springs and those flowing from the sandstone. The former are large in volume, with comparatively small fall; the latter are smaller in volume but more numerous, and are in such relation to the vertical cliffs as to have effective falls of considerable height. Both classes of springs represent power, and are susceptible of use. Upon the map is shown the quantity of running water of many of these springs; the quantity for twenty-four hours is given, and from the contours the effective fall in any distance can be determined.

The volume of some of the springs may be mentioned here. At Grayson Springs one spring measured 30,000 gallons. On Slab Run and Barlow's Run are two springs, measuring about 40,000 gallons each. On Beaver Dam Creek is a mill dependent on a spring for its supply; the effective fall is about 30 feet. A spring at the mouth of Nolin river has an effective fall of 90 feet, and was flowing, when measured, about 70,000 gallons. Used, as it is at present, for a mill, about half the power is lost. Dog Creek should be mentioned as furnishing a considerable supply of running water. Its banks are suitable for high dams. The mills on the creek represent good power. A spring near Nolin at Broad Ford, higher on the

* See water power at dam, as given below.

river than shown on the map, measured over 4,000,000 gallons. The volume of flow of Nolin was measured in May, 1875; it was then said to be below its average for the year, exclusive of freshets. The volume was over 8,000 cubic feet per minute, which is equivalent to 15.1 horses' power per foot of fall, or for the dam, 7 feet in height, at Mt. Vernon Mills, there was represented 108 horse-power. The river has measured, at other times, when considered just beyond its usual flow, 48 and 68 horse-power per foot of fall.

Green river, when gauged in May, 1875, was about 10 feet above its ordinary summer level. The volume was measured at the Brownsville ford, and amounted to 430,000 cubic feet per minute. This volume does not give an idea of the average flow, as the river was much beyond its ordinary stage.

For irrigation, the water of the streams and branches can be made of service. In many cases it can be led around the slopes by natural flow; or where there is enough water it can be pumped, by water power, to a desired height and led over the land. The water of heavy rains, causing the subsequent heavy wash, which, in the bottom lands of the creeks, are so destructive, could, with small expense, be so held back and spread upon the land, that it would leave upon it the rich soil in suspension, the benefits of which would be considerable. The difference between head-water and back-water rises is well understood on the river bottoms; the former washing the soil, and taking off fences, &c., the latter, on the contrary, depositing on the lands submerged the sediment in suspension, the value of which is shown in the succeeding crops. The construction of dams for the purposes of slack-water will tend to increase the chances for back-water rises.

ROADS.

The roads of this section have never been improved to any extent. The ridge roads are generally good, the sandstone making excellent road-beds. The roads in the bottom lands, upon the limestone or shales, are easily cut, and often heavy. The difficult parts of the roads are the slopes to and from the

bottom lands to the table-land ridges. In some cases these slopes are well selected, but they do not receive work in sufficient amount. Portions of the roads are frequently changed, and generally to unsuitable ground. This is often done for the benefit of a single individual to the detriment of the public, the only advantage being the saving a single line of fencing. If this is not remedied, the country will be much injured. No portion of a road should be changed without an examination being made by competent authority from a plan and profile of the original and of the proposed road. Many of the worst features noticed were due to these changes to unsuitable ground.

ESTABLISHMENT OF A TEST-MERIDIAN AT BROWNSVILLE.

In connection with the survey of this section, the direction of a meridian was determined and marked by stone monuments. The magnetic declination was also ascertained. The monuments were placed (165) one hundred and sixty-five feet apart.*

These monuments were intended as a check upon the errors of the instruments used for land surveys; the distance between them to test the accuracy of the chain. The discrepancies in the length of chains are often as much a source of error as the inaccuracies of the compass. The monuments are accessible to the surveyors of the several adjacent counties. With little trouble the compasses and chains in use by the surveyor could be tested and the discrepancies recorded. This would not only check compass and chain in use for each survey, but in a few years a table of the variation of the declination, so necessary in the re-survey of old lines, could be made. Although these points may not be considered as very important at the present time, they will become indispensable as the lands of the State increase in value, and subdivisions become necessary.

*The length, 165 feet, is equivalent to 5 half-chains. The half-chain (33 feet) is used in this section of country.

The monuments were placed in the Brownsville court-yard, and covered for protection. A plan showing their position was placed upon record at the Brownsville court. The points on the monuments are marked by copper bolt and cross-lines.

This section of country, from its proximity to two important lines of railway, and with its natural advantages of water transportation, demands, and will in a short time find, a market for its produce and mineral wealth.

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