

CHAPTER XXXVIII.

REPORT ON THE GEOLOGY OF VAN WERT COUNTY.

BY N. H. WINCHELL.

SITUATION AND AREA.

This county lies on the Indiana border, three other counties intervening between it and the State of Michigan. Allen and Putnam counties lie east, and Mercer south. Paulding county joins it on the north. It contains 258,592 acres, of which 51,142 are denominated arable or plow land, 21,042 meadow or pasture land, and 186,408 uncultivated or wood land. The average value per acre is \$11.15, or, including buildings, \$11.87. The county forms nearly a square. It has a projection in the middle of the east side including half a town.

NATURAL DRAINAGE.

The surface drainage consists in a number of gentle, small streams that flow north-easterly, joining the Auglaize River in Putnam and Paulding counties. There are several large, uncultivated prairies, or marshes, which are subject to inundation in spring time. These give rise to some of these small drainage streams.

SURFACE FEATURES.

By saying the county is *flat* the general character of the surface is expressed. It lies in the Black Swamp, the features of which have been already described in reports on other counties, and in a former chapter devoted to the Drift in north-western Ohio. In the south-west corner this county is crossed by the St. Mary's River, which brings into that part of the county a few miles of the more undulating surface characterizing the St. Mary's ridge. Through the center of the county, in a north-west and south-east course, runs the gravelly Van Wert ridge. North of this ridge there is no variety of surface whatever. There is a gentle, very regular descent, sometimes hardly enough to sufficiently drain the land for easy agriculture, from this ridge to the north line of the county, and beyond to the Auglaize River.

The following points of elevation above Lake Erie are obtained from the surveys and profile of the Pittsburgh, Fort Wayne and Chicago Railroad. It will be remembered that Lake Erie is 565 feet above the ocean :

	Feet.
Delphos	211
Middlepoint	211
Van Wert	213
Convoy	218
Dixon	225

The following elevations were derived by aneroid barometer, making connection with the above railroad elevations :

	Feet.
Jennings's Prairie	256
S. W. $\frac{1}{4}$, sec. 31, Union township, on the ridge.....	183
Section 24, Tully, on the Van Wert ridge	178
“ “ “ bench	188

Soil and Timber.—The soil is clayey, and is in need of artificial drainage. The farms that are located on the Van Wert ridge have a greater market valuation than any others in the county. The whole county was originally densely forest-covered, with the exception of the marshes, called prairies, in Jennings, Willshire, Liberty, Harrison, and Tully townships.

In the survey of the county the following species of trees were seen growing native :

Fagus ferruginea—Beech	Ait.
Quercus alba—White Oak.....	L.
Acer saccharinum—Sugar Maple.....	Wang.
Platanus occidentalis—Sycamore	L.
Carya alba—Shag-bark Hickory.....	Nutt.
Fraxinus Americana—White Ash.....	L.
Cornus florida—Flowering Dogwood.....	L.
Ulmus Americana—American Elm (pl. Clayt., Willd).....	L.
Zanthoxylum Americanum—Prickly Ash.....	Mill.
Quercus rubra—Red Oak.....	L.
Fraxinus quadrangulata—Blue Ash.....	Michx.
Amelanchier Canadensis—June Berry.....	Torr and Gray.
Crataegus coccinea—Thorn	L.
Quercus Prinus—Swamp White Oak.....	L.
Gleditschia triacanthos—Honey Locust.....	L.
Carpinus Americana—Water Beech.....	Mich.
Juglans nigra—Black Walnut.....	L.
Ostrya Virginica—Ironwood.....	Willd.
Salix nigra—Black Willow.....	Marsh.
Morus rubra—Mulberry.....	L.

<i>Tilia Americana</i> —Basswood	L.
<i>Populus monilifera</i> —Cottonwood	Ait.
<i>Æsculus glabra</i> —Buckeye	Willd.
<i>Quercus macrocarpa</i> —Burr Oak	Michx.
<i>Populus grandidentata</i> —Large-toothed Aspen	Michx.
<i>Prunus Americana</i> —Plum	Marsh.
<i>Acer rubrum</i> —Swamp Maple	L.
<i>Fraxinus sambucifolia</i> —Black Ash	Lam.
<i>Gymnocladus Canadensis</i> —Kentucky Coffee Bean	Lam.
<i>Prunus serotina</i> —Black Cherry	Ehr.
<i>Populus tremuloides</i> —Trembling Aspen	Michx.
<i>Rhus glabra</i> —Sumach	L.
<i>Cratægus tomentosa</i> —Black Thorn	L.
<i>Populus balsamifera</i> —Balm of Gilead	L.
<i>Quercus palustris</i> —Pin Oak	DuRoi.
<i>Juglans cinerea</i> —Butternut. [Seen only on the Van Wert ridge]..	L.
<i>Asimina triloba</i> —Pawpaw	Dunal.

GEOLOGICAL STRUCTURE.

The rocks of the county belong to the Upper Silurian. The upper member of the Niagara, the equivalent of the Guelph of Canada, or of the Racine limestone of the West, is the lowest in outcrop in the county. It underlies a tract of uncertain limit in the south-western part of the county, and is exposed in the St. Mary's River, at Willshire. Over this lies the Waterlime, belonging to the Lower Helderberg.

The former is a porous, magnesian limestone, of rather repulsive aspect, its naturally light color being generally stained with iron-rust. In quarrying it shows a blue color. It lies in thin beds of three to five inches, occupying usually the protected and most retired points of outcrop, owing to the rapidity with which it disintegrates under the forces of nature.

The latter is, in Van Wert county, very similar in general appearance, but it has different fossils, and is harder. It is less porous. It has a drab color, but the color is lighter in Van Wert county, and in counties further north, than it is in Allen and Hardin counties, where it is often blue, or even becomes so bituminous as to be black and slaty. Its most slaty character is seen in Wyandot county. In Van Wert county, and also in Putnam, it is not slaty, or very rarely so, and shows very little bituminous matter. It burns to a very white lime in the township of Union, where there is a surface exposure, but in Washington township, near Delphos, it is thinner bedded and more bituminous, the lime also becoming darker.

Niagara Limestone.—The only exposure of this stone known within the county is at Willshire, in the bed of the St. Mary's River, and in a small

ravine tributary to it at the same place. It is here porous and somewhat fossiliferous, in beds of about three inches. It has been wrought to a limited extent on the land of Mrs. Ann Ramsey for quicklime and common foundations.

The Waterlime.—This limestone underlies the remainder of the county; but affords but few known exposures. It is burned for quicklime at Streughn, by James Lilly, and was formerly also quarried at the same place by Samuel Kessler. The stone here is the same as that seen in Union township, where it is also quarried and calcined on an extensive scale by B. Bohnert & Co. It is of a light color, with a little tendency to a drab, porous and fossiliferous. It makes a beautiful white lime, the average weight of which is said by the owners to be sixty pounds per bushel. It burns easily and cheaply, and sells for twenty-five cents per bushel. At Streughn it rises to within four feet of the surface, and is overlain by hard-pan Drift. Glacier marks immediately below the Drift run north, 15° E., by pocket compass. The section at Streughn is as follows:

SECTION IN THE WATERLIME AT STREUGHN.

No. 1.	Hard-pan	4 ft.
“ 2.	“Gray stone,” i. e., spotted, drab, porous and compact; the porous parts of a lighter color and show no bituminous matter, glistening and crystalline; not difficult to quarry; beds two to four inches.....	5 “
“ 3.	“Black stone,” i. e., bituminous; but the bituminous matter is evenly disseminated through the whole, so as to color it uniformly; slightly porous; without visible fossils; harsh to the touch; heavier and in heavier beds than No. 2; seen...	2 “
	Total	7 “

Both these members make an excellent white lime. The stone has much the aspect of the Fremont stone, in Sandusky county, but it is not so hard nor so close-grained. The fossils seen are principally a small shell resembling *Leperditia alta*. But there are also one or two species of brachiopods, commonly seen in this formation; yet the lithological characters of No. 2 are not those common to the Waterlime. It is with some difficulty distinguished from the Niagara. This outcrop occurs in a very flat and monotonous tract of country, but the upward swell in the rock surface produces a slight elevation in the surface of the Drift. The exposure is not due to erosion, as that of a stream, but is in the open plains, and is owing to the unusual thinness of the Drift.

The Waterlime is seen again in N. E. $\frac{1}{4}$ section 14, Spencer, Allen county, where Mr. S. Marshall owns a quarry. This is located in the bed

of a little stream (Jennings's Creek), and shows the usual features of the formation. It is thin-bedded, but rather close-grained and hard, in wavy bedding, showing some bituminous deposits. This lime is very much darker than that at Streughn, but averages seventy pounds per bushel, selling at the same price. It resembles the quicklime from the same formation made at Lima, in Allen county. The bottom of this creek is rocky for a mile and a quarter. The stone occurs on the land of Joseph, Feierbach, F. W. Courts, and Mat. Boche.

At Delphos, S. W. $\frac{1}{4}$ section 24, Washington, the Waterlime has formerly been taken from the bed of Jennings's Creek, and burned for quicklime by L. G. Roebuch. The stone is rather rough, and in thick, somewhat cavernous beds, with considerable calcite. Thinner beds also occur.

In Union township (N. W. $\frac{1}{4}$ section 8) the quarry of B. Bohnert & Co. is in a gentle anticlinal in the Waterlime, or in that member of the Lower Silurian which is quarried at Streughn. It may be some other member of the Lower Helderberg. The exposure is not sufficient in the county to identify, without doubt, its horizon. It is hard, light-drab, yet often porous, in beds of two to six inches, which run irregularly and break into angular pieces of all sizes. Although its color is a light drab, yet it has some spots almost a cream-color. It is occasionally variegated somewhat with blue, and looks then very much like Niagara. No fossils are visible except a fine Favosites coral, a small Orthoceras, *Atrypa sulcata*, and *Leperditia alta*. (?) It shows about eight feet.

At the quarry the surface of the rock is not glaciated. The soil is not more than eighteen inches, and of a black color, and the Drift is almost wanting. The rock is rounded and smoothed rather by the slow action of water and air than by ice.

A gray, close-grained limestone, that in hand-samples takes a good polish, is met also on the land of Thomas P. Johnson, S. W. $\frac{1}{4}$ section 17, Union, in surface exposure. It is in the Waterlime. On the N. W. $\frac{1}{4}$ section 4, Ridge, on the land of the heirs of Wm. Palmer, stone was struck in digging a ditch. It is a drab-gray, crystalline Waterlime, in beds of four to six inches, or perhaps thicker. It has not been opened to any extent.

The Drift.—The only exception to the generally unstratified and unsorted composition of the Drift in Van Wert county, is seen in the Van Wert ridge, which crosses the county through Tully, Pleasant, Ridge, and Washington townships. The cities of Van Wert and Delphos are situated on it. It consists generally of gravel and sand, in varied and oblique stratification. In a few places it has been penetrated to the depth of over thirty feet without meeting much gravel. In those cases

it contains the common hard-pan Drift only, the same as that which prevails on either side of the ridge. This occurs in some wells at Van Wert. Water of excellent quality for domestic use is almost invariably found in penetrating the gravel of the ridge, and occasionally an artesian well is obtained, having a depth of but few feet. Such are usually on the northward slope. The underlying hard-pan clay being impervious to water, and the ridge lying in a slight depression of its surface, the water of surface drainage naturally gathers in the trough, and is held as in a reservoir by the gravel, by which it is also filtered and cleansed from impurities injurious to health, while it is apt to take up the salts of the protoxide of iron. Capillary attraction also serves to hold the water within the gravel, thus preventing it from completely draining off at the low places, or into the streams that intersect it. If wells find no water in this gravel, they are necessarily sunk below the hard-pan; and at Van Wert a second water-bearing stratum of sand and gravel is found lying on the bed-rock. From this a number of artesian wells are derived. Their head and source must be several miles further south, the descent being to the north, and the county being very flat. The confining stratum is the hard-pan Drift. In west Delphos wells are shallow. Some are in gravel, probably penetrating the Van Wert ridge. Such are eleven or twelve feet deep. Others are fifteen to eighteen feet, striking the rock. At Middlepoint, and southward, in Washington and Jennings townships, wells are twenty to twenty-five feet deep, frequently going to the rock. At Van Wert, in the central part of the city, some of the cellars which are dug in the gravel of the ridge have springs of good water. One man walled his well by inserting two flour barrels. The following is a record of a well drilled by the city corporation, at Van Wert, reported by Mayor Geo. C. Wells:

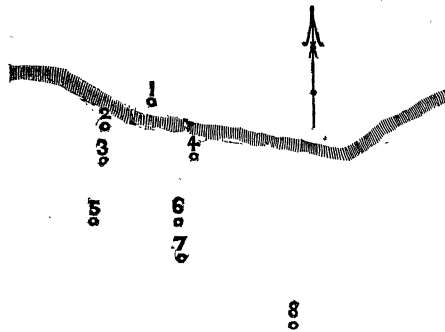
Soil.....	1½ ft.
Subsoil	2½ "
Yellowish-brown clay; traces of iron and sand	11 "
Dark, bluish-gray sand	2 "
Sky-blue clay, little or no stone, including two inches of gravelly hard-pan.....	5 "
Boulders and gravel, with water which rose to within fifteen or eighteen inches of the surface	9 "
Limestone	1 "
Waxy, light-blue clay	5 "
Crystalline, compact or slightly porous, dark-drab limestone, appearing a little granular	22 "
Fine-grained drab waterlime, very hard drilling	28 "
Blue clay, very waxy; light blue.....	6 "

Limestone, about	1 foot.
Blue clay, rather coarse	9 feet.
Total depth.....	103 "

(Rock not entered again.)

Wells in the southeast part of Tully are eighteen to twenty feet. At Van Wert natural springs occur along the south side of the ridge. This is the first exception known to the observed location of such springs in the "Spring Row," as in other counties, which is on the north side of the ridge. There are some others at Van Wert on the north side also. On Mr. E. R. Wells's farm, four miles west of Van Wert, is red soil, charged with protoxide of iron, and other evidences of extinct springs, on the north slope of the ridge. In all deep wells (*i. e.*, those that pass through the blue clay) at Van Wert, the water rises nearly or quite to the surface, and considerable effort has been put forth to secure such constant flow at various places in the city, although the shallow wells are unfailling and easily obtained.

DIAGRAM SHOWING POSITION OF ARTESIAN WELLS AT VAN WERT, WITH RESPECT TO THE VAN WERT RIDGE.



These artesian wells which rise from the water-bearing gravel below the Drift clay, together with others in different parts of the county, prove the Drift to be about 40 feet thick in Van Wert county.

The Van Wert ridge is sometimes double. Such an instance may be seen north from Streughn. The first one lies within half a mile of that village, but the principal ridge road is half a mile further north, located on the second ridge. Both rise abruptly from the adjoining flat land, having descent in both directions. They seem to be perfectly identical in form and composition, although the former can only be traced two or three miles toward the west, when, turning a little more to the south, it slowly sinks away and disappears in the general Drift. A similar gravel

ridge was noticed running north-west and south-east about half a mile in sections 21 and 22, Union township, nearly parallel with the main gravel ridge, separated from it about three miles, and on the Lake Erie side. It is not known how far this might be traced. In section 24, Tully township, the ridge on which the road from Van Wert is located runs out, or sinks away. The road then crosses a narrow belt of clay land and ascends, within a quarter of a mile, another ridge lying further north, which determines the location of the road further west. In section 14, Tully township, the Van Wert ridge runs along the inner side of another ridge or bench in the general surface, its summit being ten feet lower than that of the bench. They are separated a quarter to a half mile. This bench consists of the common hard-pan clay of the country, and shows no descent toward the south. Further south-east it passes through Convoy, the Van Wert ridge running about a mile further north-east, and through sections 17, 18, 22, and 23 in Pleasant township, beyond which place it has not been identified. This bench rises about five or six feet above the level land to the north, in Pleasant township, about ten feet in Tully township, south of the Bear Swamp, and thirty feet at New Haven, Indiana, to which place it may be followed, the "ridge road" between Van Wert and Fort Wayne passing several times, between those two cities, from the Van Wert ridge to the bench, and *vice versa*. The Van Wert ridge crosses the Maumee about three miles below Fort Wayne, where it is known as the *Irish ridge*, and for about a mile a road runs on it. The country there, however, being densely wooded, its location is unknown for several miles, although it has been followed about six miles east from New Haven.

Glacier marks were observed within the county at but one point. At Streughn they occur on the Waterlime (?) running north 15° east.

Wells and Springs.—Besides the foregoing observations on the phenomena of wells and springs in Van Wert county, the following minutes were taken. This list will afford a pretty reliable basis on which to predicate the thickness of the Drift in the county, since the water-bearing stratum, when not in the Van Wert Ridge, is generally that last member of the Drift, consisting of gravel and stones, which well-drillers often denominate hard-pan, especially if cemented along its upper surface by lime, and which, when so cemented, is often mistaken for the bedded rock itself.

Owner's name.	Location.	Feet above the rock.	Feet in the rock.	Total depth.	Through what.	Remarks.
Jos. Oslendorf	Delphos	18	.....	18	.....	On the rock.
James Ward.....	"	15	.....	15	.....	"
Evan Evans	N. E. $\frac{1}{4}$ sec. 9 (N), Jennings	18	.....	18	.....	Good water.
D. T. Cook.....	Middlepoint ..	21	.....	21	Blue clay	On the rock.
Albert Fife.....	"	24	.....	24	"	"
Isaac Grosscost.....	"	16	.....	16	"	"
Andrew Cook	Sec. 1, Liberty	37	?	.....	.....	In the rock.
George Hood	Sec. 4, Ridge ..	9 $\frac{1}{2}$	.....	9 $\frac{1}{2}$	Soil and blue clay.....	In boulders.
Widow Gillen	Sec. 9, Ridge ..	12	.....	12	Gravel.....	On the ridge.
Dr. P. J. Hines	Van Wert.....	36	.....	36	Gravelly, 12 ft.; gravel, 1 ft.; blue clay, 15 ft.; gravel and hard-pan, 8 ft.	"
"	"	45	.....	45	Blue clay	Just on S. edge of the ridge.
Reuben Frisbie.....	"	10	.....	10	Gravelly	On the ridge.
Davis Johnson.....	"	12	.....	12	Gravel, 12 ft.; blue clay, 2 ft.	"
Widow Buckingham	"	8	.....	8	In gravel	"
Heinly and Hertz...	"	40	4	44	Blue clay	Artesian.
D. H. Clippinger...	"	40	.....	40	Blue clay, 36 ft.; boulders, etc., 4 ft	"
W. F. Exline.....	S. W. $\frac{1}{4}$ sec. 17, Liberty.....	40	.....	40	.....	Good water.
Van Wert Woolen Mills Co.	Van Wert.....	28	.....	28	Blue clay, 26 ft.; boulders, etc., 2 ft	Artesian.
David Bonewitz.....	Sec. 35, Tully..	18	.....	18	Blue clay and sand	Sulphury.
Pitts. Ft. Wayne and Chicago R. R. Co..	Van Wert.....	60	141	201	.....	Water at bottom of Drift. None below.
Fire Dep't well	"	39	62	101	.....	Water at bottom of Drift, and 2 or 3 ft. below. Filled again.
O. P. Clark	"	40	.....	40	Blue clay	Strongly artesian.
M. Boner.....	"	40	.....	40	"	Artesian.
Union Mills Co.....	"	30	.....	30	In boulders.....	Slight flow.
E. R. Welles.....	N. W. $\frac{1}{4}$ sec. 8, Pleasant.....	22	.....	22	Blue clay and quicksand	Good water rises within 6 feet of the top.
Rob't M. Thompson	N. E. $\frac{1}{4}$ sec. 21, Pleasant.....	35?	.....	35?	.....	Artesian.

MATERIAL RESOURCES.

The rocks of the county hold no minerals of economical value. They can only be used for quicklime and for ordinary foundations. The wealth of the county will always be largely agricultural. The soil is very fertile and enduring, but is rather heavy and wet for the quick growth of crops. The farms of the county are undergoing more or less thorough artificial drainage, and will be valuable in a corresponding ratio. The heavy forest with which the surface is largely covered is an important item of wealth, which, although retarding the opening of farms and the occupancy of the county, is yet destined to be of great benefit to the county. Extensive stave manufactories are established at Van Wert and Delphos.

Lime.—The lime-kilns at Streughn and on section 8, Union township, are the only important establishments of the kind in the county. They are of the old style, and have to be emptied after burning before filling again. At Streughn two cords of wood burn sufficiently one hundred bushels of lime, requiring forty-five hours, at the cost of two dollars per cord. Lime sells at twenty-five cents per bushel. Most of it goes to Fort Wayne, and thence is shipped throughout Indiana. Stone at the quarry brings \$1.50 per perch. These kilns are worked by William Wehrs. Two constant draw-kilns were formerly run at the same place by Mr. J. E. Noble, consuming one and a half cords of wood per one hundred bushels.

Messrs. Bohnert & Co., in Union township, ship lime, *via* Convoy, to Van Wert, Fort Wayne, and Chicago, at twenty cents per bushel, wholesale. It retails at thirty cents per bushel. There are six kilns here of the common kind, burning two and a half cords of mixed wood per one hundred bushels of lime, at \$1.50 per cord. From the kilns a wooden railroad conveys the lime about six miles to the station at Convoy.

Brick and Tile.—The Drift clay of the county is well fitted for the manufacture of red brick and tile, and the following list embraces all known establishments of this kind:

Joseph Fetter, Delphos.....	Brick.
Hummel & Metzker	“
Steinmetz Brothers, three miles north-west of Delphos.....	“
Samuel Norris, Van Wert.....	Brick and tile.
Thomas Lahue, “	Brick.
Amos Price, “	“
Tucker Brothers	Tile.