
GEOLOGICAL SURVEY OF KENTUCKY.

JOHN R. PROCTER, DIRECTOR.

REPORT

ON THE

GEOLOGY OF WASHINGTON COUNTY.

BY W. M. LINNEY.

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INTRODUCTORY LETTER.

HON. JOHN R. PROCTER,

Director of the Kentucky Geological Survey:

DEAR SIR: I herewith submit my report on the Geology and other natural features of Washington county, accompanied by map and section.

Yours, very truly,

W. M. LINNEY.

HARRODSBURG, KY., November, 1882.

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GEOLOGY OF WASHINGTON COUNTY.

TOPOGRAPHY, &C., &C.

Washington was the first county organized after Kentucky was admitted into the Union. It was originally a part of Nelson, and at its formation, and for a number of years afterward, it included the present county of Marion. It now contains about one hundred and seventy-four thousand seven hundred and fifteen acres of land, and a population of fourteen thousand four hundred and nineteen, according to the census of 1880, showing a healthy increase of one thousand nine hundred and fifty-five in ten years. Its position is near the center of the State, and it is bounded on the north by Nelson and Anderson, east by Mercer and Boyle, south by Marion, and west by Marion and Nelson. Springfield is the county seat, with a population of six hundred and ten. A number of villages and post-offices are conveniently distributed through the county.

There are several colleges and academies located in the county, and the people have taken more than ordinary interest in the erection of good buildings, in which the popular schools are taught. Perhaps there is no one county in the State which has a larger proportion of arable lands, as almost every acre can be made productive under a wise system of agriculture. The different soils of the county suit well for the production of cereals, grasses, hemp, and tobacco. A part of the soils are as fine as are found in any portion of the State, producing large and excellent crops; and none of them are really poor, where well taken care of and properly

treated. A system of injudicious treatment has unfortunately been given some tracts of land by which they have become much less productive than their condition should be; yet they are of such character that their reclamation is comparatively easy.

The drainage of the county is perfect, there being no swampy or wet lands within its boundary. Chaplin, Glens, Little Beech, Cartwright, and Hardin creeks are the principal waters; but into these and their tributaries enter a great number of small branches, which carry off the excess of water from every section. Without any exception, all the drainage is into the Beech Fork of Salt river, which flows along the western margin of the county. Properly speaking, the surface is a plane, tilted a little from the southeast corner, where it is highest, towards the northwest and west, where it is lowest. The whole rocky structure has this inclination, and the surface conforms in general to the slope of the rocks. This slope has given rise, in time, to the original direction of the streams, and they have continued since in their old channels. As a result, their channels have cut deep into their rocky floors, and given nearly the whole surface what is usually termed a hilly character. One may stand on the highest ground in the southeast corner, or may go a few miles into Boyle county, and ascend one of the knobs, and have a fair view, which includes nearly the whole of Washington county. The sight is a beautiful one of alternate rolling hills and shaded valleys, extending as far as the eye can reach.

Part of the southern and central sections is comparatively level, or gently rolling; but over the remainder the watersheds are but narrow ridges, having drains leading off on both sides, with inclinations of ten to forty degrees. These are cultivated well, with seemingly but little extraordinary labor. Along some of the streams, whose beds have been widened out by erosion, there are small bottoms which are very much valued for their productiveness.

Washington has no railroad within its limits; yet it is probable that one will be built in a short time from east to

west through the entire county. Formerly, a good deal of shipping was done on flat-boats down the Beech Fork; but that enterprise ceased years ago. Turnpikes have been, and are being, constructed in every part of the county, giving facilities to the citizens to haul their goods and their produce, and to drive their stock to shipping points, of which there are quite a number at convenient distances in the surrounding counties. Turnpikes are built cheaply, as they usually follow the crest of the ridges or the valleys of the creeks, where but little cutting and grading are required. The material for macadamizing them is always close to hand, either in the limestones of the hills or the gravel of the creek beds. The pride and the liberality of the people in thus securing good roads are commendable, and speaks well for their industry, intelligence, and appreciation of their lands and surroundings.

GEOLOGY.

A carefully connected section of all the rock series exposed above the low water drainage in Washington county gives an aggregate of seven hundred and sixty feet. At the top there are seventy feet of the Niagara Period of the Upper Silurian, and the rest is included in the Trenton Period of the Lower Silurian. Fifteen feet of those are at the top of the Trenton Group, and the other six hundred and seventy-five feet are the equivalents of the Utica and Hudson River Groups, here included for the present in the Hudson River Group alone. The Hudson River Group is, for convenience, divided into three series of beds.

The names of the minor divisions used in this report were given to series of rocks first intelligently studied in the State of New York, and are names of localities where they were best exposed for a careful investigation of their phases. To retain the same names for the same group of strata exhibited in each State is a great convenience; and this fact has led to the adoption of the specific names given in New York geological reports by all the other States, so far as their stratified

beds could be made to correlate with those in New York. We have here tabulated them as we find them in Washington county.

| | Feet. |
|-----------------------------|-------|
| NIAGARA PERIOD. | 70 |
| TRENTON PERIOD— | |
| Hudson River Group. | 675 |
| Trenton Group. | 15 |
| | — |
| Total | 760 |

TRENTON PERIOD.

Trenton Group.—The rocks in Washington county belonging to the Trenton Group are not more than fifteen feet in thickness, and this only at the Mercer county line, where Chaplin enters Washington from the former county. They are here seen rising that number of feet above low water. Their dip being greater to the northwest than the fall in the river, they sink below the latter in two or three miles, and do not reappear again.

The rocks of this group are very important ones in other counties not far removed from this; but in Washington their presence is of more scientific than economic interest. Here there are no soils derived from them, nor have they in any way shaped the topography of the county, or given character to timbers or other plant growth. Their thickness is comprised in a few layers of light and dove-colored limestones, which lie at the top of the Trenton in several near counties, and which have received the name of "Upper Birdseye" from its close resemblance to the birdseye limestone below, which is characterized by eye-like spots on its worn surface. Some of these layers make excellent building stones, and also burn into a fine quality of lime; but in this locality they show only on sides of steep hills, and it is not probable that they will ever be quarried for those uses, for other rocks abound in the vicinity which answer well those purposes, and are more easy of access.

Hudson River Group.—This group of rocks is of great extent in the United States, being at the surface in a number of States, both in the east and west; and in all the regions where it is shown it gives character unequaled to soils that are immediately derived from the rocks in place.

These rocks, which had their origin on the floor of a very ancient ocean, are made up of the shells and corals of that period, mixed with some clay and sand distributed by the currents. These rocks, now hundreds of miles from the ocean, and hundreds of feet above it, are year by year crumbling into fragments, and dissolving into soil. Thus the remains of the old life, millions of years ago, give to-day fertility and character to the best soils of the country. As untold ages have been required to give us these soils, it would seem that, as a people, we should make every effort to retain them at their best, not only as a source of prosperity to ourselves, but as a heritage to those who shall come after us. The divisions of this six hundred and seventy-five feet of rocks are here natural ones, yet conform closely to the divisions made in other States.

Lower Hudson River Beds.—The lower two hundred feet of the Hudson River Beds hold the position among the rocks of this county, in part, which the Utica shales do in the New York system. Their lithological characters are not entirely the same, neither are the species of fossils which are found in them so closely related as appears in the other divisions; yet there is sufficient parallelism in their position, in their character, and in their fossils to demonstrate that they are the equivalents of each other, having been deposited at or near the same time, the conditions alone being somewhat different.

The lowest layer is about one foot in thickness, and is semi-crystallized, contains usually some rounded limestone pebbles, some iron, and rolled fragments of shells and corals, evidences of some disturbance which occurred at this time. The pebbles, in their mechanical arrangements and the oxidation of the iron,

cause this rock to disrupt very easily, so that it is not often seen in place, but its fragments strew the surface in some localities.

Succeeding this is a number of layers made up almost exclusively of fragments of one species of coral, showing generally as round branches one third to one half an inch in diameter, but often presenting a form like sections of a small scroll. This form is common in other horizons, but not to the extent shown here. It has received the name of *Chaetetes fibrosus*. The layers are tolerably heavy where shown in a fresh cut, but usually wear thin on exposures, and in many places crumble to pieces, leaving the corals in great numbers on the surface. Those layers are usually unfitted from this character for fences or foundations, and when so used are often destroyed in a few years. There are usually intercalated in those coral beds several layers of crinoidal limestones, which wear very well in any exposure, but are not very regularly bedded.

Upon these are situated some one hundred feet of thin limestones, between every layer of which there is more or less shale, a soft, earthy rock, erroneously called soapstone, which goes to clay rapidly on exposure. This shale is several times the thickness of the limestones, which are too thin and irregularly broken for building purposes. The shales, however, waste so readily, and are so rich in the elements of plant-food, that the soils are restored rapidly where badly worn.

Above the thin limestones and shales there are about eighty feet of heavier limestones, among which are some that are well suited for the builder and for lime-making. The proportion of shales is very much less, and the stones are harder in their character. Some of them are not evenly bedded, and some have small masses of hard clay included in them, which disfigure them for nice work. A reddish tint comes to many of them on exposure. There are among these heavy layers two and sometimes three layers which have their upper surfaces marked with great corrugations. These are seen in

many places in the beds of the creeks; and when the roads run over them, as they often do, they are very rough. These are the hardest, toughest layers of rock in the whole series. It is a curious problem how they should have been left in such shape in the several layers, and so much alike in their appearance, not only in Washington, but in a number of other counties. They are also seen as far north as the State of Ohio, occupying the same horizon, and have been described in the Ohio reports as "wave marks."

All these shales and limestones are internally blue, but change very much to other colors when exposed to the air for any length of time. They contain some little iron oxide, and the alteration of that mineral, when exposed to the atmosphere, is probably the reason of the change of color. All of them contain fossils of many different kinds. Many of these are well preserved, and can be gathered in great numbers at many places.

These two hundred feet of rocks and clay shales are exposed in part over about one half of Washington; and over the northern third they are alone to be seen, except where the series next to be described has been left in small patches on the highest hills. It is generally easy to determine the part of the county composed of this series at a glance. The disintegration of the shales, and their removal by rain, are rapid. Consequently, when the shales decomposed into soil by the action of the elements are removed by ploughing, and by the washing from heavy rains, the limestones are broken down and cover the ground. This is the case to such an extent that one may sometimes walk over a whole field on the blocks of stone alone. Had these been removed year by year, and placed in fences, or used in building walls across the deep hollows to catch the washing soils, farms would only have been improved. Often these rocks were piled up in the fields, or the land, where heavily cumbered with them, turned out to wash still deeper, and to become sterile, except to worthless weeds or stunted shrubs.

Those are good soils on the lower Hudson beds. The very nature of the rocks, with the intercalated shales, produce a steep, hilly surface, so that the slopes near the drainage lines have everywhere inclinations of from ten to forty degrees. With care these soils can be kept in good condition, and will always give a good return to the farmer who knows how to use them. Wet seasons are the most favorable ones for these lands, as the compactness of the rocks and shales does not make them good water-bearers; they do not hold water during times of much dryness, to be diffused through the earth, and to afford by evaporation moisture enough for crops. Springs are, as a general rule, not very plentiful in this part of the county, and the water from them is generally charged with more or less clayey matter; but cisterns are easily made, and their water is very good.

These soils were covered originally with a wonderful growth of forest trees, of which the white oak of the best quality excelled all the other timbers in numbers and worth. The axe has sadly destroyed the forests long since.

There are some remaining tracts where are some good timber trees, but the mills are fast culling the best for destruction. On many of the farms the forests are about gone, and firewood has become scarce. The future supply of lumber for fencing and other purposes is a question which is becoming important.

Of late years quite a demand has been made upon the white oak as material for whisky barrels; and large tracts of land have been swept of their timber to supply this demand. Fine orchards of sugar-maple were formerly utilized for sugar making, but these have almost all been destroyed, and that industry is known no more. Some lands have been turned out to grow up into thickets; but without care they promise little for the future. The white oak, under favorable conditions, grows again; but with it comes every kind of trees formerly indigenous to the soils, the poorer kinds ever in excess (from the multiplication, preservation, and distribution of their seed).

Very little quarrying has been done in these rocks. For local uses the stones are generally taken from the beds of the creeks, or gathered from the hill-sides. The building of foundations and chimneys, the burning of lime, and road-making, are the local uses to which they are applied.

Middle Beds Hudson River Group.—This division of the rocks in the county is a natural one, as it gives a different class of soils, and a peculiar distribution of timber. The one hundred and fifty feet of rocks which comprise these beds are made up of sandstones and sandy shales, with the intercalation of several layers of impure limestones.

The following section, made on the Little Beech Fork, gives an idea of the component elements of these beds. (They were named by Dr. Owen, in the old Geological Reports, the Silicious Mudstone, a name which well represents their character):

| Feet. | Inches. | | Feet. | Inches. |
|-------|---------|--|-------|---------|
| 159 | | Top soils derived from these shales | 10 | |
| 149 | | Soft decomposing shale. | 20 | |
| 129 | | Tough smooth sandstone | 2 | |
| 127 | | Soft shales. | 18 | |
| 109 | | Heavy concretionary layer of sandstone, plated with a grey fossil limestone | 2 | |
| 107 | | Shales. | 3 | |
| 104 | 1 | Layer of limestone, packed with shells. | | 8 |
| 103 | 5 | Shales. | 4 | 4 |
| 99 | 1 | Layer of limestone, with fossils | | 4 |
| 98 | 9 | Shales | 19 | |
| 79 | 9 | Limestone, blueish-grey, semi-crystallized | | 8 |
| 79 | 1 | Shales. | 5 | |
| 74 | 1 | Limestone. | | 3 |
| 73 | 10 | Shales. | 4 | 8 |
| 69 | 2 | Limestone. | | 3 |
| 68 | 11 | Shales. | 8 | 6 |
| 60 | 5 | Limestone. | | 3 |
| 60 | 2 | Shales. | 5 | 2 |
| 55 | 5 | Limestone. | | 5 |
| 55 | | Shales. | 4 | |
| 51 | | Limestone. | | 6 |
| 50 | 6 | Shales. | 10 | |
| 40 | 6 | Limestone. | | 6 |
| 40 | | Thin sandstones and shales. | 10 | |
| 30 | | Top of lower beds | | |
| 10 | | Great wave marks | | |
| | | Bed of creek. | | |

All of these shales, limestones, and sandstones are blue when opened to some depth, but it is rare to see them ex-

posed in any way. When usually seen they are, except the limestones, a dirty yellow. They are quite soft when first exposed, but some of the heavy layers become quite tough on exposure. They all decompose rapidly, and give great depth to the soil. The sandstones and shales contain some lime in their natural state; yet this is largely leached out on exposed sections. The sand is rarely in a condition which shows any grit, though this is sometimes the case. They are rather porous, and when dry are much lighter in weight than usual among such rocks. They are rarely used for building purposes in this county, though they are sometimes seen scattered here and there in stone fences.

The rapid and deep decomposition of this class of rocks, aided by their chemical character, gives a soil which is highly valued in favorable situations. It is very easily worked where it lies well, contains much more moisture than the lower beds, and, from this latter fact, in dry seasons the crops are always better. It is much esteemed as corn land, for which crop it is often cultivated many years in succession. It is disposed to wash on steep slopes, but this is hardly noticed by the mass of farmers, as the next turning of the plough leaves it in as good a condition as before. This is usually the case; yet there are exceptions where in one part of the mass the shales are harder, and sometimes give sterile places unless great care is taken to keep them covered with plants to prevent the crumbling and rapid wear.

On the ridges, wells sunk into the soils give a very good, cool, potable water, and of ample quantity. The springs which flow from it are few and scant, and the water is often charged with earthy particles, which, I should think, from my observations, do not add to its healthfulness.

The drainage lines cut very deep and rapidly into these soft rocks; so much so, that the heads of the hollows usually show inclinations of thirty to forty degrees; and this is true of their lower lines, except where modified by the rocks above or below.

All the roads follow the winding of the water-sheds, unless where the lower beds give better conditions in the creek bottoms. Where there have been no turnpikes built the roads are very bad through the winter, but very fair in dry weather. Good turnpikes already constructed, and others to be completed, have, to a large extent, made it much more convenient for traveling, and have enhanced the value of the lands.

Originally, beech was the great prevailing timber over all those beds; and even to-day, where the timber has been so largely destroyed, this tree in its growth and distribution marks the outcrop of the middle beds. With this species was yellow poplar in considerable quantities, and of the finest proportion, not unfrequently measuring eight or nine feet in diameter, those of six and seven feet being quite common. Fine black walnuts and white oaks were sometimes seen, and quite a number of species were scattered here and there among them. The species named, however, grow in the greatest profusion, and of remarkable quality.

Where young trees have been allowed to grow over a few lands which have been heretofore cleared, there seems to be no settled order in their growth, this depending entirely upon the distribution of the seed. Dogwood, red-bud, sugar-maple, poplar, beech, white oak, red oak, black walnut, swamp white oak, black gum, &c., may be noted. Dogwood and red-bud are the great pests of these forests, coming in as undergrowth in the old woods, and growing in thickets, often to the exclusion of other species in the new. They are often so thick that it is almost impossible to get through them. Notes of this kind must be general in relation to the whole series; there are exceptions to these statements, but they are of a local character, and it is impossible to specify them over many miles of territory.

Some little shot iron ore is distributed in one or two horizons in this division, and in places it is sufficient to show in the roads and some fields as little patches of gravel. The seams and surfaces of some of the layers are often discolored in places by oxide of manganese, which appears as black blotches.

The concretionary layers in these beds are singular, and their origin is very obscure. A section of them shows as if they were made by separate layers of sand and mud that were put on one after another as envelopes around a central nucleus; but it is impossible to see how this could have been done. They split open into bowl-shaped masses, which renders them unfit for any purpose. Some of these concretions are five or six feet in length. This whole stratum is so much like the Lorraine or Pulaski shales of the New York reports in its bowl-shaped concretions, its sandy shales, and its disposition to erode down so deeply and with such steep declivities, that there can be no hesitation in referring it to the same equivalence in time and condition.

The shales and sandstones are bare of fossils, except as moulds or casts. The lime of the structure is gone, but the impressions of shells, corals, and trilobites remain to show that they were deposited when abundant life existed in the seas where they were laid down. Seaweeds of several kinds grew in profusion during portions of that time, as they have left their impress upon the surfaces, and in the interior of the rocks. The limestones, however, are full of shells and corals; but in such condition that it is nearly impossible to get good specimens; besides, the species are few, and found in better condition in the rocks above. The country around Mackville, Willisburg, Thompsonville, and Beechland is based upon this series. These rocks give quite a large area of soils in the blue limestone region of the State, and will be treated of in connection with the other groups in the reports on other counties. The colored map will show their distribution over the county, and the profile section the relation and position they bear to the other divisions.

Upper Hudson River Beds.—The upper beds of the Hudson River Group in the county aggregate a thickness of three hundred and twenty-five feet, and are composed of limestones, shales, and impure sandstones. The following general section gives their average character:

| | Feet. |
|---|-------|
| Upper Silurian beds (on top) | |
| Coral bed | 16 |
| Limestones. | 12 |
| Sandstones, shales, and thin limestones | 75 |
| Limestones and shales. | 47 |
| Earthy silicious limestones | 25 |
| Heavy and thin limestones and a few shales. | 35 |
| Limestones and shales | 50 |
| Thin limestones, with some shale | 65 |
| Middle Hudson River beds (at the bottom) | |
| | — |
| | 325 |

The lowest one hundred and fifty feet of these beds, if we except a few layers in the upper part, are thin-bedded, "shelly" limestones, with some intercalated beds of shales. They disintegrate well in natural exposures, and form by their decomposition the best soils in the county. The layers are very full of a great number of species of shells, corals, and other organic remains. Whole layers are nothing but compacted valves of shells and branches of corals, with a little earthy matter to hold them together, which, dissolving, liberates the specimens by thousands; these in their turn are dissolved, and form the best of soils. One of these shells, known as the *Orthis lynx* among collectors, is a very common form, existing in such vast numbers that it has given a name to part of this section of rocks, "the Lynx bed." This set of rocks is quite uniform in its soil-making character, not only in the part of Washington where it shows itself, but in quite a number of other counties in the State. Blue-grass grows on them well, and it seems to be the particular soil suited for the growth of the White Burley tobacco.

The most level farms in the county lie on these rocks, and their general character everywhere is to wear into gentler slopes than either of the beds which have been considered. One coming off from the lower or middle beds of the Hudson River rocks on to these, sees in a moment the change into a more level country. The changes seen in the forests are no less noticeable, for instead of forests of nearly all white oak or beech, he will observe white and blue ash, hickory, wild

cherry, yellow chestnut oak, swamp white oak, and a distribution of other trees not observable on the other rocks.

The next seventy-two feet contain much more earthy matter, and give quite a distinct soil. They produce a tolerably heavy clay soil, with some amount of silicious material. This soil is highly valued, as wheat lands especially. It does not *grass* so well as the other, and it requires more care in keeping it from washing. White oak grows well on it, and the soils have the local name of "White Oak Lands." Several layers of very good stone are contained in these where it is not injured by small masses of silicious matter in the form of "flint." This division remains only in patches in the county, and gives but comparatively small areas of soil.

The remainder of the division is made up of a number of layers of purer limestone, some shales, and a number of feet of a peculiar rock, which has been termed the Cumberland Sandstone in the Kentucky Reports. Several layers of these limestones are very good for the common building purposes of the county, and a few of them are well suited for the construction of finer houses, as they are remarkably even-bedded, quarry well into dimension blocks, and wear as well in exposed conditions as any building stones in the county. The shales are like the other masses of their kind, composed of clay and a little sand, and go to soils quickly when exposed.

The Cumberland Sandstone is a mixture of clay and silica, is heavy bedded, looks well in a quarry, where it has a blueish-green tint, wears on exposure into a yellowish-green, a fresh fracture often showing a discoloration of green or yellow. It affords a tolerable soil, but it is a treacherous rock, for appear however well it may, when freshly quarried and put up, it soon breaks into fragments, and becomes worthless. This is seen only in the northwestern part of the county, and its area is quite limited.

Above the last is locally seen from two to sixteen feet of a bed that contains a vast number of corals, which resemble honey-comb in their structure. These are in size from an inch to two feet or more in diameter, and they literally cum-

ber the ground in many places where the beds have become exposed to denuding agencies. Quite a number of other fossils are associated with these, all of which will be noticed in another report.

UPPER SILURIAN.

Niagara Period.—As stated before, there are seventy feet of rocks which lie at the summit of the section in Washington county, belonging to the Niagara Period. They are seen only on the higher hills lying between Hardin and Cartwright creeks, being thicker towards the Nelson county line, beyond which they increase in magnitude until they form the only series over a large part of that county.

The following section, exhibited at the top of the hill south of Fredericktown, gives an idea of the character of the Niagara here. It is overlaid with a few feet of red clay derived from the waste of the Corniferous limestone:

| | Feet. |
|---------------------------------------|-------|
| Heavy buff limestones | 15 |
| Sandy limestones | 10 |
| Sandy shales | 4 |
| Heavy sandstone | 2 |
| Sandy shales and sandstones | 30 |
| | 61 |

On Wheatley's Branch is a very fair exposure of these rocks, which are also overlaid with the red Corniferous clay. In the hillside, going down the road, these rocks are seen with quite a steep dip.

| | Feet. |
|---------------------------------------|-------|
| Shales | 6 |
| Soft sandstone | 3 |
| Heavy limestone | 12 |
| Sandy shales and sandstones | 14 |
| | 35 |

The lower sandy part of these rocks certainly belongs to the Medina Group, and it is probable that the heavy limestones at the top are Niagara. There is almost an entire absence of fossils everywhere through them. This fact requires that they shall be more particularly studied in Nelson

county, where it will be possible to divide them, and to determine whether the Clinton Group has any position in them.

Not far from Fredericktown I found several inches of conglomerate occupying a position just underneath the heavy limestone of the section, which was composed of fragments of iron ore, cemented in a sandy shale. This conglomerate once extended all over the county, for its remains are seen in all the soils, and as forming gravel beds in all the streams. It consists, perhaps, of the remains of the Clinton iron ore beds, which were broken up by some disturbance, and their fragments distributed over the Medina sandstones.

The soil is very sandy where these rocks exist, and are disposed to wash into hollows very easily. Care, in a large measure, prevents this. Some lands have been so neglected that the mould has disappeared from over them, and left sterile spots almost composed of clean sand. These soils were considered very fair originally, being warm, quick, easy to work, and well drained. They afford clear, pure, sweet water from springs or wells.

Post oak, scarlet oak, white oak, swamp white oak, black gum, black and white walnut, and sassafras, are the principal timbers seen here.

Waste Beds.—On the top of the Upper Silurian, in a few places, there is left a red clay, usually containing fragments of hornstone and worn corals. This clay has resulted from the dissolution of another and higher series of rocks, the Corniferous Limestone, which evidently once covered, with all the other series mentioned in this report, the whole county. The remains of it have been seen over all the other groups, and, mixed with these remains, have also been seen fragments of corals and pebbles, whose positions are much higher in the geological scale.

The rocks of the highest groups now seen in the county are hundreds of feet too low for the existence of coal; yet there are good evidences to show that in time past the coal-measure rocks extended over the county. Time, in the vast

ages past, with its crumbling of rocks and the transporting power of water, has carried them away.

MINERALS.

A very little iron is found in this county, and its presence has been mentioned. The quantity is too small for working, and no hopes should be indulged that it will ever be found in any greater quantity.

Crystals of calcite are not uncommon in all the limestone rocks in the county, and some little sulphate of lime has been seen in the Lower Hudson River Beds, and in the shales of the Upper Silurian.

At Walton's Lick there was formerly a salt spring, at which a small quantity of salt was made; but the enterprise was long since abandoned. This spring was in the Lower Hudson River Beds.

In the northeastern part of the county there are one or two veins of heavy spar (sulphate of Baryta), in which small quantities of lead have been found. These veins are worthless, and any time or money given to their investigation will be thrown away.

ARCHÆOLOGY.

No remains of fortifications or mounds of prehistoric people could be heard of in the county. A few axes, celts, and gorgets have been found, and arrow-heads are not very uncommon in the fields over the country.

GENERAL NOTES.

The surface features of this county have been determined:

First. By a major axis of elevation which passes through Boyle and Marion counties, within a few miles of the southeastern boundary. This disturbance was the cause of the general dip of the rocks to the northwest.

Second. By a number of minor disturbances in different parts of the county, where the rocks have been raised higher

than at other points, and produced a dip in either direction from those lines. These uplifts have produced deflections in the courses of the streams, and often given them very crooked channels.

Third. The drainage, being determined by these disturbances, has followed the law of levels, and thus eroded from the county many hundreds of feet of rocks, always deeper near the region of the earliest and greatest disturbance, and this lies nearest to the northeastern boundary.

As almost every layer of rock in the county is to some extent different in its chemical character, and as the soils of each field are mixed productions of these rocks, it may be supposed that any specimens of soils for analysis, however carefully made, cannot be depended upon, for the mixtures from the alteration of many layers in the same field must differ with every square yard of surface.

Experiments, therefore, over several rods or acres of ground must be the most satisfactory way of determining what is best suited in the way of fertilizers for the promotion of crops.

The following are the most common fossils seen in the county, and may be gathered in numbers in many places on the beds which they characterize. With them are many others that a careful search may bring forth. The shell, *Leptaena sericea*, is in the greatest numbers, making whole layers of rock in the upper part of the Lower Hudson River Beds.

TRENTON.—*Orthis borealis*, *Rhynchonella increbescens*, a small form of *Orthis lynx*, *Tetradium fibratum*, *Modiolopsis winchelli*.

LOWER HUDSON BEDS.—*Orthis multisecta*, *Orthis emacerata*, *Trinucleus concentricus*, *Bellerophon bilobatus*, *Leptaena sericea*, *Climacograptus bicornis*, *Heterocrinus simplex*, *Ptilodictya shafferi*, *Chætetes briarius*, *Stenopora fibrosa*, *Cyclonema percarinatum*.

UPPER HUDSON BEDS [Lower part].—*Orthis lynx*, *Orthis sinuata*, *Orthis linneyi*, *Ptilodictya hilli*, *Ptilodictya falciformis*, *Retepora angulata*, *Pterinea demissa*, *Protarea vetusta*, *Cyrto-*

ceras vallandinghami, *Conchicolites corrugatus*, *Streptorhyncus planoconvexus*, *Cyclonema fluctuatum*.

UPPER PART.—*Columnaria alveolata*, *Columnopora cribri-formis*, *Beatricea undulata*, *Beatricea nodulosa*, *Streptelasma corniculum*.

The colored map which accompanies this report exhibits the distribution of the rocks and soils over the county, while the profile section shows how the rocks of one kind are lost beneath those of another. From a careful study of those a good idea of the arrangement of the groups and their relation to each other may be obtained.

APPENDIX A.

STATISTICS OF WASHINGTON COUNTY, COMPILED FROM THE REPORTS OF THE 10TH CENSUS OF THE UNITED STATES, 1880.

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|----------------------------------|--------|-------------------------|--------|-------------------------|--------|-------------------------|--------|-------------------------|--------|-------------------------|-------|---------------------------|-------|---------------------------|-------|---------------------------|-------|--------------------------|--------|--------------------------|--------|--------------------------|--------|---------------------------|-----|---------------------------|-----|---------------------------|-----|---|-----|---------------------------------------|-----|-------------------------------|---------|---|--------|---------------------------|-------|----------------------------------|---------|---|-------------|--|-----------|-------------------------------|-----------|--|----------|-------------------------------------|-------|---|-----------|--|--|--|--|-------------------------------------|-------------|---|---------------------------|----------|----------------------------|----------|---|---------|---------------------------|----------|-------------------------------|------|---|---------|-----------------------------------|-----------|----------------------------|-------|-------------------------------------|-------|----------------------------------|----|--------------------------------|-------|----------------------------------|-------|---------------------------|--------|---------------------------|--------|--------------------------|--------|----------------------------|---------|----------------------------|-----|----------------------------------|---------|----------------------------|---------|---------------------------|--------|--------------------------|--------|-------------------------------------|--------|-------------------------------------|-------|--------------------------------|----|-----------------------------|--------|-----------------------|-------|-------------------------------------|----------|---|----|-------------------------------|-----------|-----------------------------|----|----------------------------------|----------|-----------------------------|-----------|-----------------------------|-----------|-----------------------|----------|
| <table border="0" style="width: 100%;"> <tr><td>1880. Total population</td><td style="text-align: right;">14,419</td></tr> <tr><td>1870. Total "</td><td style="text-align: right;">12,464</td></tr> <tr><td>1860. Total "</td><td style="text-align: right;">11,575</td></tr> <tr><td>1880. White "</td><td style="text-align: right;">11,988</td></tr> <tr><td>1870. White "</td><td style="text-align: right;">10,354</td></tr> <tr><td>1860. White "</td><td style="text-align: right;">8,707</td></tr> <tr><td>1880. Colored "</td><td style="text-align: right;">2,430</td></tr> <tr><td>1870. Colored "</td><td style="text-align: right;">2,110</td></tr> <tr><td>1860. Colored "</td><td style="text-align: right;">2,868</td></tr> <tr><td>1880. Native "</td><td style="text-align: right;">14,288</td></tr> <tr><td>1870. Native "</td><td style="text-align: right;">12,310</td></tr> <tr><td>1860. Native "</td><td style="text-align: right;">11,396</td></tr> <tr><td>1880. Foreign "</td><td style="text-align: right;">131</td></tr> <tr><td>1870. Foreign "</td><td style="text-align: right;">153</td></tr> <tr><td>1860. Foreign "</td><td style="text-align: right;">179</td></tr> <tr><td>1880. Springfield, population</td><td style="text-align: right;">610</td></tr> <tr><td>1880. Mackville, population</td><td style="text-align: right;">158</td></tr> <tr><td>*Total acreage 1881</td><td style="text-align: right;">175,094</td></tr> <tr><td>*Average value per acre, 1881</td><td style="text-align: right;">\$9.56</td></tr> <tr><td>Number of farms</td><td style="text-align: right;">1,770</td></tr> <tr><td>Acres of improved land</td><td style="text-align: right;">137,732</td></tr> <tr><td>Value of farms, including build- ings and fences</td><td style="text-align: right;">\$3,532,977</td></tr> <tr><td>Value of farming implements and machinery</td><td style="text-align: right;">\$105,041</td></tr> <tr><td>Value of live stock</td><td style="text-align: right;">\$696,127</td></tr> <tr><td>Cost of building and repairing fences, 1879</td><td style="text-align: right;">\$34,216</td></tr> <tr><td>Cost of fertilizers, 1879</td><td style="text-align: right;">\$101</td></tr> <tr><td>Estimated value of all farm pro- ducts, 1879</td><td style="text-align: right;">\$679,480</td></tr> <tr><td>Assessed valuation, real estate, \$1,792,033</td><td></td></tr> <tr><td>Assessed valuation, per'l prop'ty, \$514,767</td><td></td></tr> <tr><td>Assessed valuation, total</td><td style="text-align: right;">\$2,306,800</td></tr> </table> | 1880. Total population | 14,419 | 1870. Total " | 12,464 | 1860. Total " | 11,575 | 1880. White " | 11,988 | 1870. White " | 10,354 | 1860. White " | 8,707 | 1880. Colored " | 2,430 | 1870. Colored " | 2,110 | 1860. Colored " | 2,868 | 1880. Native " | 14,288 | 1870. Native " | 12,310 | 1860. Native " | 11,396 | 1880. Foreign " | 131 | 1870. Foreign " | 153 | 1860. Foreign " | 179 | 1880. Springfield, population | 610 | 1880. Mackville, population | 158 | *Total acreage 1881 | 175,094 | *Average value per acre, 1881 | \$9.56 | Number of farms | 1,770 | Acres of improved land | 137,732 | Value of farms, including build- ings and fences | \$3,532,977 | Value of farming implements and machinery | \$105,041 | Value of live stock | \$696,127 | Cost of building and repairing fences, 1879 | \$34,216 | Cost of fertilizers, 1879 | \$101 | Estimated value of all farm pro- ducts, 1879 | \$679,480 | Assessed valuation, real estate, \$1,792,033 | | Assessed valuation, per'l prop'ty, \$514,767 | | Assessed valuation, total | \$2,306,800 | <table border="0" style="width: 100%;"> <tr><td>Taxation, State</td><td style="text-align: right;">\$10,496</td></tr> <tr><td>Taxation, county</td><td style="text-align: right;">\$10,909</td></tr> <tr><td>Taxation, town and school dist.</td><td style="text-align: right;">\$1,567</td></tr> <tr><td>Taxation, total</td><td style="text-align: right;">\$22,972</td></tr> <tr><td>†Miles of turnpikes</td><td style="text-align: right;">130½</td></tr> <tr><td>†Average cost of turn'kes per mile,</td><td style="text-align: right;">\$1,800</td></tr> <tr><td>Total cost of turnpikes</td><td style="text-align: right;">\$234,900</td></tr> <tr><td>Number of horses</td><td style="text-align: right;">5,500</td></tr> <tr><td>Number of mules and asses</td><td style="text-align: right;">1,379</td></tr> <tr><td>Number of working oxen</td><td style="text-align: right;">99</td></tr> <tr><td>Number of milch cows</td><td style="text-align: right;">3,404</td></tr> <tr><td>Number of other cattle</td><td style="text-align: right;">7,034</td></tr> <tr><td>Number of sheep</td><td style="text-align: right;">12,242</td></tr> <tr><td>Number of swine</td><td style="text-align: right;">28,035</td></tr> <tr><td>Pounds of wool</td><td style="text-align: right;">63,431</td></tr> <tr><td>Pounds of butter</td><td style="text-align: right;">202,858</td></tr> <tr><td>Pounds of cheese</td><td style="text-align: right;">820</td></tr> <tr><td>Bushels of Indian corn</td><td style="text-align: right;">987,576</td></tr> <tr><td>Bushels of wheat</td><td style="text-align: right;">135,099</td></tr> <tr><td>Bushels of oats</td><td style="text-align: right;">53,942</td></tr> <tr><td>Bushels of rye</td><td style="text-align: right;">18,832</td></tr> <tr><td>Bushels of Irish potatoes</td><td style="text-align: right;">10,953</td></tr> <tr><td>Bushels of sweet potatoes</td><td style="text-align: right;">5,115</td></tr> <tr><td>Bushels of buckwheat</td><td style="text-align: right;">90</td></tr> <tr><td>Pounds of tobacco</td><td style="text-align: right;">43,800</td></tr> <tr><td>Tons of hay</td><td style="text-align: right;">1,913</td></tr> <tr><td>Value of orchard products</td><td style="text-align: right;">\$16,662</td></tr> <tr><td>Manufact'ing establishments, No.,</td><td style="text-align: right;">62</td></tr> <tr><td>Capital invested in</td><td style="text-align: right;">\$103,225</td></tr> <tr><td>Hands employed in</td><td style="text-align: right;">90</td></tr> <tr><td>Wages paid in the year</td><td style="text-align: right;">\$16,795</td></tr> <tr><td>Cost of materials</td><td style="text-align: right;">\$179,597</td></tr> <tr><td>Value of products</td><td style="text-align: right;">\$240,390</td></tr> <tr><td>Bonded debt</td><td style="text-align: right;">\$52,000</td></tr> </table> | Taxation, State | \$10,496 | Taxation, county | \$10,909 | Taxation, town and school dist. | \$1,567 | Taxation, total | \$22,972 | †Miles of turnpikes | 130½ | †Average cost of turn'kes per mile, | \$1,800 | Total cost of turnpikes | \$234,900 | Number of horses | 5,500 | Number of mules and asses | 1,379 | Number of working oxen | 99 | Number of milch cows | 3,404 | Number of other cattle | 7,034 | Number of sheep | 12,242 | Number of swine | 28,035 | Pounds of wool | 63,431 | Pounds of butter | 202,858 | Pounds of cheese | 820 | Bushels of Indian corn | 987,576 | Bushels of wheat | 135,099 | Bushels of oats | 53,942 | Bushels of rye | 18,832 | Bushels of Irish potatoes | 10,953 | Bushels of sweet potatoes | 5,115 | Bushels of buckwheat | 90 | Pounds of tobacco | 43,800 | Tons of hay | 1,913 | Value of orchard products | \$16,662 | Manufact'ing establishments, No., | 62 | Capital invested in | \$103,225 | Hands employed in | 90 | Wages paid in the year | \$16,795 | Cost of materials | \$179,597 | Value of products | \$240,390 | Bonded debt | \$52,000 |
| 1880. Total population | 14,419 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1870. Total " | 12,464 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1860. Total " | 11,575 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1880. White " | 11,988 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1870. White " | 10,354 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1860. White " | 8,707 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1880. Colored " | 2,430 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1870. Colored " | 2,110 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1860. Colored " | 2,868 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1880. Native " | 14,288 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1870. Native " | 12,310 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1860. Native " | 11,396 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1880. Foreign " | 131 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1870. Foreign " | 153 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1860. Foreign " | 179 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1880. Springfield, population | 610 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1880. Mackville, population | 158 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *Total acreage 1881 | 175,094 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *Average value per acre, 1881 | \$9.56 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Number of farms | 1,770 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Acres of improved land | 137,732 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Value of farms, including build- ings and fences | \$3,532,977 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Value of farming implements and machinery | \$105,041 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Value of live stock | \$696,127 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Cost of building and repairing fences, 1879 | \$34,216 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Cost of fertilizers, 1879 | \$101 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Estimated value of all farm pro- ducts, 1879 | \$679,480 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Assessed valuation, real estate, \$1,792,033 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Assessed valuation, per'l prop'ty, \$514,767 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Assessed valuation, total | \$2,306,800 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Taxation, State | \$10,496 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Taxation, county | \$10,909 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Taxation, town and school dist. | \$1,567 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Taxation, total | \$22,972 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| †Miles of turnpikes | 130½ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| †Average cost of turn'kes per mile, | \$1,800 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Total cost of turnpikes | \$234,900 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Number of horses | 5,500 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Number of mules and asses | 1,379 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Number of working oxen | 99 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Number of milch cows | 3,404 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Number of other cattle | 7,034 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Number of sheep | 12,242 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Number of swine | 28,035 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Pounds of wool | 63,431 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Pounds of butter | 202,858 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Pounds of cheese | 820 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bushels of Indian corn | 987,576 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bushels of wheat | 135,099 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bushels of oats | 53,942 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bushels of rye | 18,832 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bushels of Irish potatoes | 10,953 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bushels of sweet potatoes | 5,115 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bushels of buckwheat | 90 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Pounds of tobacco | 43,800 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Tons of hay | 1,913 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Value of orchard products | \$16,662 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Manufact'ing establishments, No., | 62 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Capital invested in | \$103,225 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Hands employed in | 90 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Wages paid in the year | \$16,795 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Cost of materials | \$179,597 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Value of products | \$240,390 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bonded debt | \$52,000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

* From Auditor's Report.

From County Clerk.

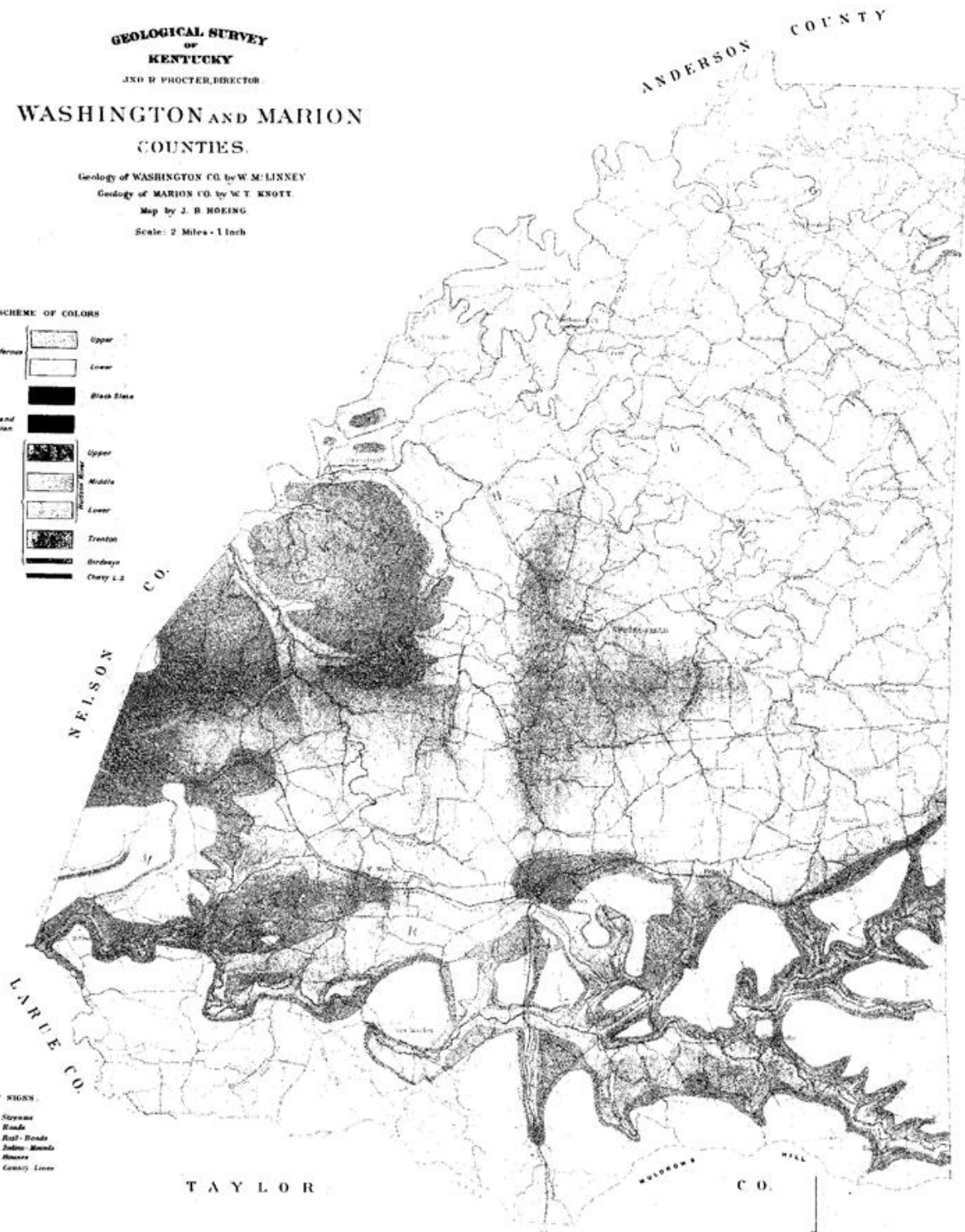
**GEOLOGICAL SURVEY
OF
KENTUCKY**
JNO R PROCTER, DIRECTOR

**WASHINGTON AND MARION
COUNTIES.**

Geology of WASHINGTON CO. by W M LINNEY
Geology of MARION CO. by W T KROTT
Map by J. B. HOEING
Scale: 2 Miles - 1 Inch

SCHEME OF COLORS

| | | |
|----------------------------------|--|-------------|
| Sub-Carboniferous | | Upper |
| | | Lower |
| Devonian | | Black Slate |
| Carboniferous and Upper Silurian | | Upper |
| | | Middle |
| Lower Silurian | | Lower |
| | | Trenton |
| | | Burdway |
| Cambrian | | Chevy L-1 |



CONVENTION OF SIGNS

| | |
|--|--------------|
| | Stations |
| | Roads |
| | Rail-Roads |
| | Indian Roads |
| | Rivers |
| | County Lines |



Hor. Scale 2 Miles - 1 Inch

SECTION ON A-B

Vert. Scale 1000 Ft. - 1 Inch