# AN AIRPHOTO STUDY OF THE TRIASSIC AREA IN ALBEMARLE COUNTY, VIRGINIA

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## SYNOPSIS

This paper is concerned with an airphoto study of deposits of Triassic age in Virginia. The area investigated is located at the southern part of Albemarle County. The purpose of this investigation is to determine the usefulness of airphotos in correlating existing soils with highway problems.

The problems involved in connection with the occurrence of Triassic formations are manyfold. Successful highway construction has to be specially adapted to the different physiography and has to take into account unusual pedological features.

Though the Virginia Department of Highways has been using airphotos for location work, this study has brought new light on the topography and valuable data on soils. In the past, geological and agriculturo-pedological publications were the only sources of information and they were found more than once to be conflicting. The airphoto pattern furnished easily a more reliable boundary for the Triassic basin and a possibility to differentiate the soils in the basin as a function of their parent materials: sandstones and shales. They are often interbedded and intermixed so that identification on the ground is not always possible. The airphoto pattern shows clearly the main outcrops since the sandstone will weather into a soil which, even if plastic, is less fine-grained, hence somewhat better drained than the soil derived from shales. The shales and sandstones weather at about the same rate. The topography rarely contains series of parallel ridges usually formed by tilted beds of sandstone and shale, but shows the low gradients and flat slopes associated with fine-grained soils. The drainage has not usually the typical trellis pattern. The land is fertile and used intensively and extensively for farming. A remarkable agronomic landmark is the cedar tree: it usually occurs in rows of small trees and its evergreen, dense foliage is easily recognizable either on a ground or an aerial survey.

A road performance survey was made in connection with the investigation. Important differences were observed though lack of original field data was a handicap. Paved roads required more maintenance in the zone of Triassic soils: others had to be stabilized first across the Triassic zone to make then year-round passable, and wherever the traffic became heavier, it was again in the Triassic zone that they had to be reinforced first. A cost survey covering a nine-year period showed that the average maintenance cost of unpaved roads was higher in the Triassic basin than for equivalent routes in the surrounding Pre-Cambrian area.

This study confirms the importance of a thorough knowledge of the Triassic basins for highway engineering and the airphoto survey as used for this investigation has remarkable possibilities for furthering that knowledge. This improved or new knowledge and resulting techniques were rather easily obtained and

**proved to be reliable. It is hoped to extend this method of study to other similar areas and to use airphoto engineering investigations of soils as one more tool for better roads.**

Soil mapping and investigation have made some remarkable progress in recent years, thanks to a new tool which was developed by some distinguished engineers. Most Civil Engineers are familiar by now with the astounding possibilities of aerial photography. It is practically a pass card to the realms of topography, drainage, pedology, geology, agronomy, and ecology. (*3*)[1]

The airphoto is for the highway engineer an accurate record of the physical features of the earth's surface. It is up to him to interpret them and obtain from them the wealth of useful and practical information they contain.

Their value when applied to soil surveying is now a well established fact. Our knowledge of aerial photography for such use is being all the time enhanced by the work of civil engineers connected with various highway departments, universities, the Public Roads Administration, the Civil Aeronautics Administration (*10*), and the US Geological Survey. For a number of years the Highway Research Board *Proceedings* have featured papers on aerial photography (*6*). The study of soil patterns has received special attention at the Joint Highway Research Project of Purdue University under the leadership of Professor Donald J. Belcher (2), now of Cornell University, Robert E, Frost, and others (*7, 8, 9*).

The aim of this study is to apply the principles and known advantages of mapping soils from airphotos to a particular type area of Virginia. Triassic formations occur at different locations in the Commonwealth (see Figure *1*) and it is believed that aerial photography can facilitate the work of the highway engineer. The Triassic zones always contrast very much with their surroundings in geology, topography, pedology, drainage, agronomy, ecology, and especially as far as highway engineering is concerned.

One trip through a Triassic basin in Virginia will be enough to convince anyone, engineer or not, of the unusual nature of the problems involved. Upon crossing the boundary into a Triassic basin one has the impression he is entering a different land. It is indeed striking to witness the effect of soils on men as illustrated by that difference. For the highway engineer this will mean special designs, locations, construction and maintenance problems. The main contrasts will be derived from the nature and properties of the soils. For instance, anyone who has been through a Triassic basin at the time of the spring break-up or even only after a rain cannot help noticing the slick deep red mud. This is just one token reminder of the great importance of the engineering problems involved.

Thus, it is a remarkable opportunity to study the possibilities of aerial photography as applied to the study of the Triassic areas. The Scottsville area was selected as an example: it is one of the smallest Triassic outcrops in the State. Only the larger part of it which lies in Albemarle County was considered for this paper since this study, intended to be for the time being more intensive than extensive, can later be extended if proved successful. The remaining of the Scottsville Triassic Basin lies in Buckingham and Nelson Counties. An attempt especially was

[1] Numbers in parentheses refer to bibliography at the end of this paper.

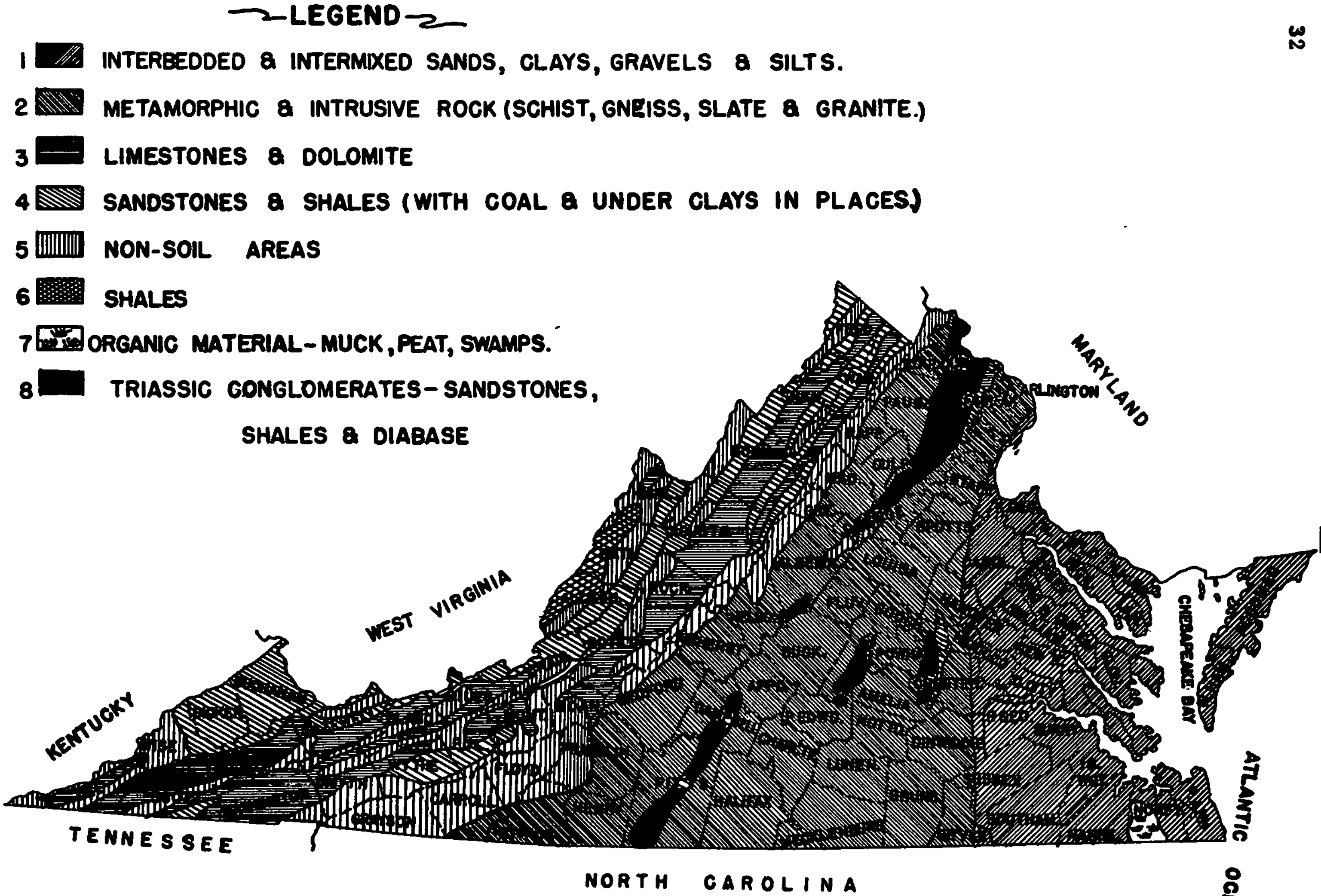


Figure 1. General Soil Areas Of Virginia As Classified By The C.A.A And Purdue University 1946

made at correlating the geology (mainly as reported by the Virginia Geological Survey), the pedology (mainly as reported by the US Department of Agriculture), the airphoto soil survey, and highway performance.

The area is about 80 mi. west of Richmond. It is part of a long belt of such formations extending from northern Massachusetts through northern South Carolina. The Scottsville area is about 20 mi. long and has a maximum width of some four mi. Its total area is about 35 sq. mi. lying in three counties. As stated previously, the project was temporarily restricted for practical purposes to Albemarle County with a square mileage of about 25. Any further reference in this paper to the Scottsville area should thus be construed as being only the part of it in Albemarle County.

It is west of the Fall line within the physiographic province commonly known as the Piedmont Plateau, close to the Blue Ridge. The elevation ranges from about 400 to 500 ft. above sea level. The drainage is fairly simple in pattern and the streams flow into the James River which bounds the area to the southeast. The topography is gentle with flat land and rolling hills as illustrated by Figures 2 and 3. (*11*)

From an agronomical point of view the area is quite important. The agriculture consists mostly of the production of corn, hay, oats, wheat, apples, dairy products, and livestock. Some large farms and beautiful stables may be found there (see Figures 4 and 5). Except for places of rougher topography or where the bedrock is at or near the surface, the area may be broadly described as one of rich farmland. The natural vegetation is comprised mostly of oaks, hickory, persimmon, poplar, some pine and the Triassic landmark: the cedar. The occurrence of cedar trees in connection with Triassic formations is always striking (see Figure 6). Only two primary highways cross the area: Route 6 from Scottsville westward and Route 20 from the same town to Charlottesville. The State Highway Department also maintains a network of secondary roads.

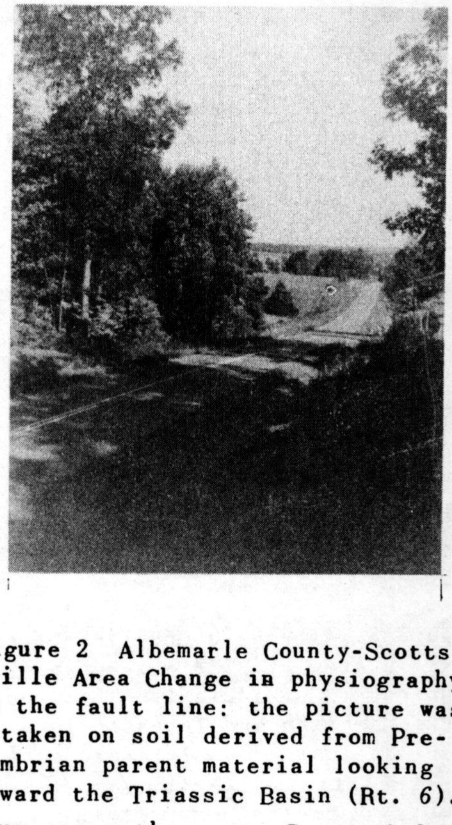

Figure 2 Albemarle County-Scottsville Area Change in physiography at the fault line: the picture was taken on soil derived from Pre-Cambrian parent material looking toward the Triassic Basin (Rt. 6).

The climate is fairly mild with a mean annual precipitation of 44.6 in. evenly distributed throughout the year. The average annual snowfall is 19.4 in. The mean temperatures at Charlottsville, the county seat, are: winter 37.5 F; spring 56.0 F; summer 74.6 F; fall 58.7 F (*5*).

## GEOLOGICAL STUDY

It is to be noted that from a geological point of view the Triassic period is one of the most interesting. It is part of what is known as the Mesozoic era. Though the word Mesozoic means medieval life, it is not to be concluded that it is halfway in the past geological time. Just as it is the case for medieval times in history, there is much more elasped time before than after, but this medieval time is the turning point to what we might call "modern" times.

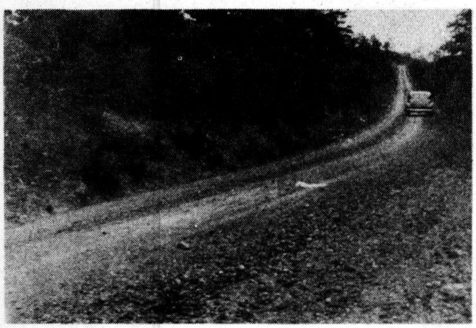

Figure 3 Albemarle County-Scottsville Area Rt. 723 White paper on road is at fault line between Pre-Cambrian and Triassic formations (car is on Triassic soil)

The Triassic period may be remembered as the time of the reptiles. It is the time when some of these huge animals were ruling our world. One has seen in many a museum the reconstructed skeleton of a dinosaur or brontosaurus. For any neophyte in geology who is more interested in stones for highway aggregates, all these bones are extremely impressive but do not mean too much. Yet to complete the picture one should recall that those reptiles sometimes weighed as much as two large size streetcars, that they dominated not only the land but also the seas and the air and it is only with the progressive disappearance of their rule in the animal world over a period of many thousands of years that the first mammals and then the first birds evolved.

The word Triassic was first used in Germany about a century ago to describe a three-fold sequence of rock. The three-fold description is not applicable to this country and the part of this geological period in which we are interested may be more properly described as represented by the Newark series in the latter half of the Triassic time. An arid or semi-arid climate seems to have been most common at that time and no indication of

Figure 4 Albemarle County-Scottsville Area Typical Pre-Cambrian Landscape with farm (Rt. 712)

glaciation has apparently been found in Triassic formations (*12*).

One of the most striking features of the Newark series is the predominantly red color of the sediments. It has been variously described as deep red, chocolate brown, red brown, or "Indian red," and the color is a limited, yet remarkable, "rule of thumb" in identifying Triassic formations. It is not an absolute rule since there are "red beds" of other ages, and as one follows the Newark basins in a southerly direction, more and more of the sediments are greenish gray instead of the typical red. This is due apparently to their mesophytic origin.

From a stratigraphic point of view the Scottsville Triassic basin is almost exclusively composed of sedimentary rocks (see Figure 7). They may be subdivided into three groups: conglomerates, sandstones, and shales. The conglomerate found in the Scottsville zone is quite probably known as a "trap" border conglomerate in view of the large number of "trap" or diabase pebbles in the rock. It has been used very widely as a road metal and the Commonwealth is commonly quarrying it in northern Virginia. It is a heavy stone and will weather very slowly, the matrix and the pebbles weathering usually at about the same rate.

The border conglomerate along the fault line forming the western boundary of the basin is the only formation that is not intermingled with others: at no place can one locate shale - or sandstone - exclusively since they are usually interbedded. But there is sufficient predominance of one or the other to permit the description of any given area as one underlain by shale or by sandstone as the case may be.

The formations which usually grade toward the center of the basin from border conglomerate to sandstone and turn into still finer sediments of the shale group are apparently reversed in the area under study since as a result of some geological phenomena, the shales lie at the western and eastern sides of the belt of sandstones.

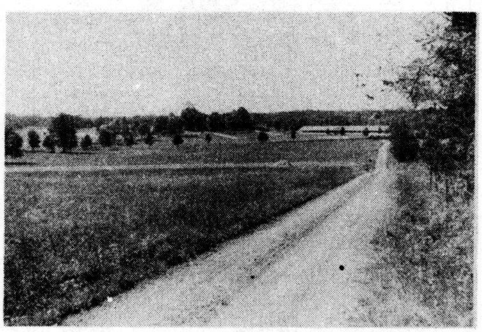

Figure 5 Albemarle County-Scottsville Area Typical Triassic landscape with secondary road leading to farm (Rt. 712)

This is especially noticeable for the main outcrops and an east-west section going through Scottsville would show after the Pre-Cambrian formations: shale for about one mi., sandstone for about one mi., shale for about two mi., border conglomerate for a few hundred feet to the fault line. As shown in Figure 8 this is also the case at other locations where the beds are smaller in extent and not as clearly differentiated.

The sandstone main outcrop is thus a narrow north-south belt of Manassas sandstone as it was identified at the time of the War Between the States. It does not usually withstand weathering too well, furnishing a fairly sandy soil as soon as the iron oxide cement has sufficiently weakened. The shale which lies to the east and west of the sandstone is commonly known as Bull Run shale (*11*).

Alongside the streams and especially in the James River Valley can be found some deposits of recent alluviums.

From a structural point of view one should note that the beds dip west and the existence of a series of faults especially along the western end of the area and of several dikes. The dikes are of diabase and only one being actually in the area under study, the igneous formations may be overlooked as far as this paper is concerned.

The surrounding formations are all of Pre-Cambrian or Cambrian age with the exception of some deposits of Ordovician limestone. The older deposits are extremely metamorphosed (schists, gneisses, phyllites, slates, and soapstones).

## PEDOLOGICAL STUDY

As it may be expected from a study of the parent materials, the soils of the area will have one common visible trait: the red to brown color. Two main types are recognized by the US Department of Agriculture and identified as the Bucks and the Penn soils (see Figure 9).

The Bucks soils are derived from the purple or Indian red to brown sandstones and shales. It is a good agricultural soil with fair drainage. The Penn soils are more shallow and are usually better drained than the Bucks soils. Both will vary in properties whenever larger beds of shales occur. The Bucks soil is more favorable to cultivation and this explains why the Penn soil areas are still heavily forested.

Besides the two main soil series three minor ones have been identified. The Granville soil is fairly sandy and is usually derived from the sandstones and has good natural drainage. The Landsdale soil is heavier in texture and is derived from sandstones and shales. The small occurrences of igneous rocks, as previously noted, as diabase dikes result in soil of the Iredell series, which is quite properly nicknamed the "blackjack" soil. It has a poor drainage.

The surrounding Pre-Cambrian area contains soils derived from the older rocks. The main series are: Davidson, Congaree, Altavista, Nason, Wickham, Orange, York, and Tatum (5).

Figure 6 Albemarle County-Scottsville Area A Triassic landmark, the cedar tree (Rt. 626)

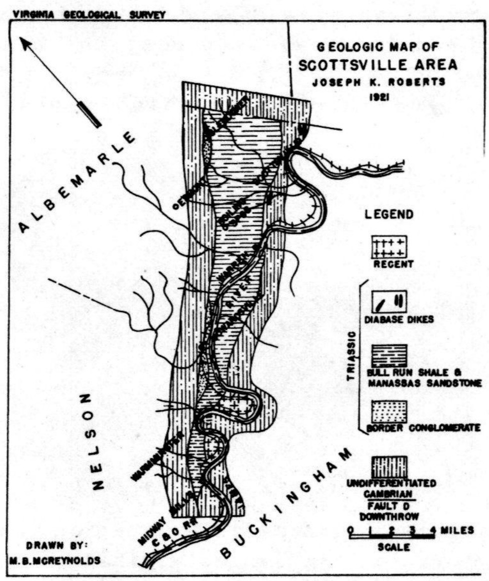


Figure 7

If one compares the geological to the pedological map it is obvious that they differ to a large extent as far as types of formation and boundaries are concerned. Of course one cannot expect them to be identical since the geologist will base his observation on rock outcrops and structural formation, while the pedologist will be more interested in what the soil is regardless of where it comes from. The geologist gives less extent to the Scottsville Triassic area and especially he places the western and still more the northern boundaries several miles inside where the US Department of Agriculture has located them. This may be explained by two facts. First is the "flow" of weathered materials, within a certain range, away from the rock parent material, and second is the fact that the northern and western boundaries are, as far as the geologist is concerned, made by a series of faults. Those faults may have been located more exactly as far as the structure, than as far as the stratigraphy of the basin is concerned. The eastern boundaries coincide quite satisfactorily.

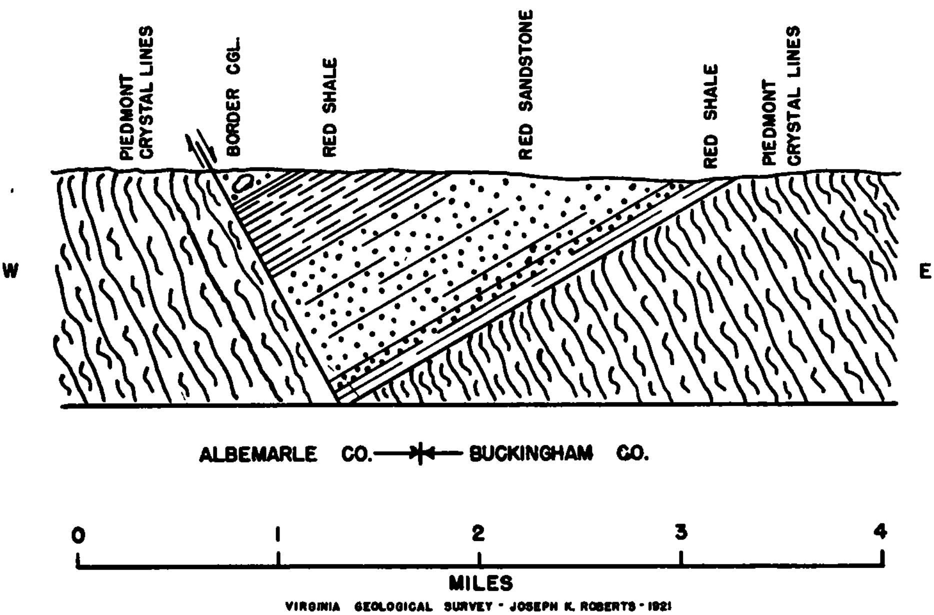


Figure 8 Cross Section Of Triassic Through Howardsville, Albemarle County

## AIRPHOTO STUDY

Figure 10 shows an uncorrected airphoto mosaic of the area, and Figures 11, 12, and 13 are close-up views of the three main patterns that may be observed. The first one shows the rugged topography resulting from the Pre-Cambrian gneisses and schists. In opposition the two others show long, low uniform grades and smooth slopes. The latter patterns are quite typical of plastic fine-grained soils (*10*).

Tilted shales and sandstones usually result in fairly rugged relief. Yet since the angle of dip (west dip in this case) is small and the interbedding extremely pro-

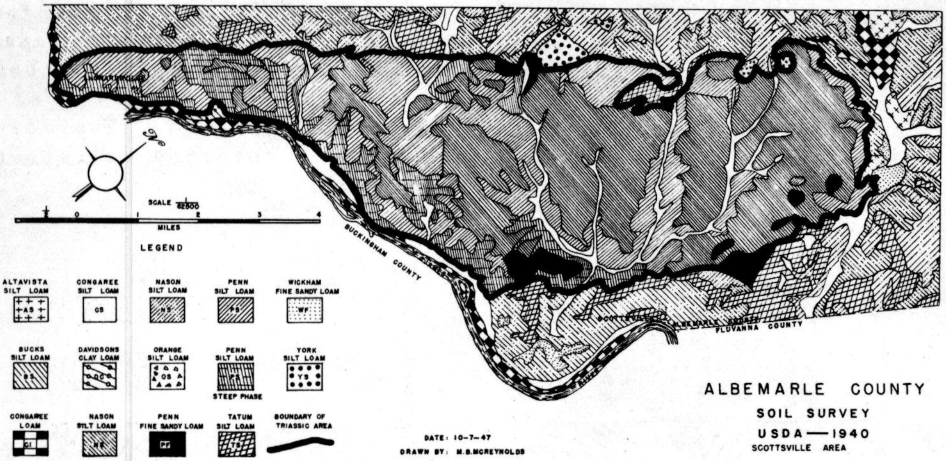


Figure 9

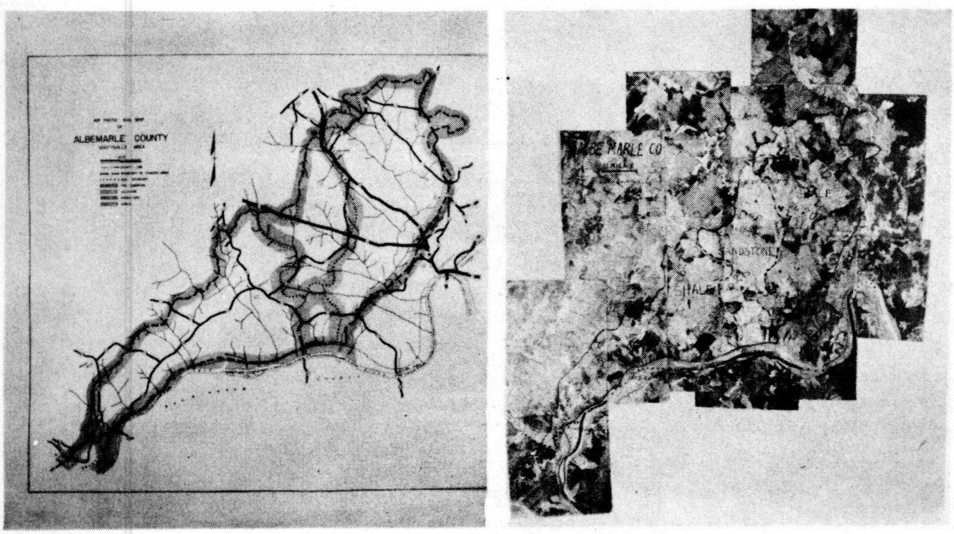

Figure 10

nounced, the landform is not strongly developed. The pattern of parallelism that one would expect from the alternance of strata is hardly existent. This is due to the fact that the sandstones and the shales have weathered at about the same rate and that (with one outstanding exception which will be studied in detail) they are usually closely interbedded and intermixed. It is only at a few places (due north of Scottsville, for instance) that a series of ridges may be observed. The strike is almost due north and the short depressions in between are filled with alluviums, often of Pre-Cambrian origin. A more definite landform due to different weathering may be attributed to the border conglomerate along the fault line. But it is so small in extent that it is not significant for highway soil engineering.

shows some extremely interesting features. The soil boundaries were established after a careful and close study of soil patterns, drainage and landform.

The limits of the Triassic Basin which were thus determined coincide closely with those offered in the pedological study (see PEDOLOGICAL STUDY). One should remember that the map shown on Figure 9 was made from ground surveys without quoted reference to airphotos. Thus, the airphoto soil survey

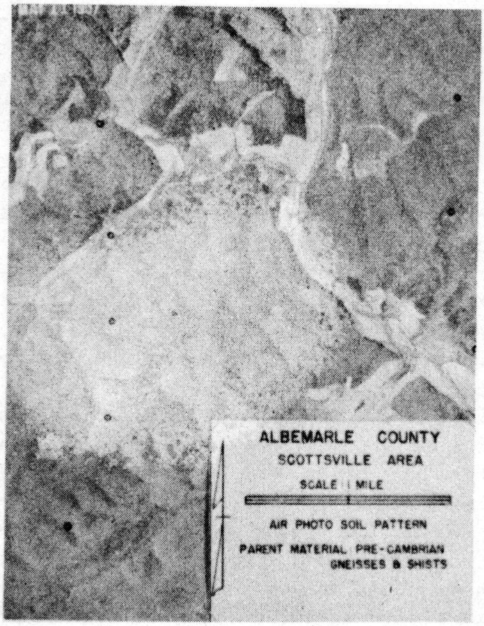


Figure 11

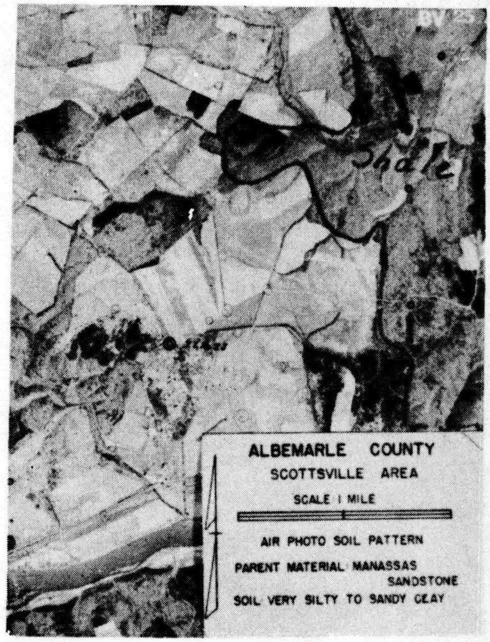


Figure 12

The drainage pattern also is not typical of an area of tilted sandstones and shales. The usual "trellis pattern" is almost non-existent except at one or two locations such as the above mentioned area due north of Scottsville. No major stream crosses the area but all the drainage is south or east, usually against the dip, toward the James River.

A soil map attached to Figure 10 was prepared from the mosaic and verifies the findings of the Agricultural Soil Survey and conflicts with some opinions of the Virginia Geological Survey.

One of the most important features brought out by the airphoto study is the location of the major sandstone deposit in relation to the beds of shale. As stated previously it is hardly possible to take them apart in geological or agriculturo-pedological study on account of interbedding, blending, close similarity in composition and rate of weathering. As a rule the sandstone in this area will furnish a sandy to silty clay at about the same rate as the shale will give a very plastic, silty clay (*4, 1*).

Yet Figure 10 clearly indicated the major area of sandstone and those of shale. This distinction can be made through the difference in drainage properties of the resulting soils. The sandstone will weather into a coarser grained, somewhat better drained soil than the shale. It has been found at some locations that the sandstone will result in a sandy clay with sufficiently good vertical drainage to give on the mosaic a light gray to whitish pattern. The color pattern for the shale is a dark uniform gray.


Figure 13

As shown in Table 1, a series of soil samples was obtained along State Highway 6. The samples were taken from the side of cuts about three to five ft. below the ground surface and represent vertically from three to 24 in. below the surface of the cut. All tests were performed according to current standard specifications.

As it will be seen, the soil samples corresponding to a shale parent material showed more plasticity than those derived from the outcrops of border conglomerate and still more than those weathered from beds of sandstone. This verifies the findings of the airphoto survey though the outcrops of border conglomerate are not of sufficient continuous extent to be significant for airphoto survey unless some low altitude pictures are used.

It can be readily observed that the area is one of rich farmland. About the only places where the ground has not been cleared of its natural vegetation are where the bedrock is too close to the surface. The fairly regular field pattern indicates that there is little variation in ground elevation. The occurrence of cedar trees, as previously noted, is noticeable on the airphotos. They often occur in straight lines and have dense evergreen foliage.

From the point of view of constructional materials, the airphoto pattern indicates that small deposits of sand and gravel (mostly fine grained alluviums) are available along the James River (*9*). Neither the shale nor the sandstones would be very suitable as a highway aggregate since they would weather fairly readily into the too common very plastic clay. The border conglomerate could be quarried at a number of places along the western fault line.

## PERFORMANCE

In 1932 the State Highway Department took charge of the maintenance and construction of practically all

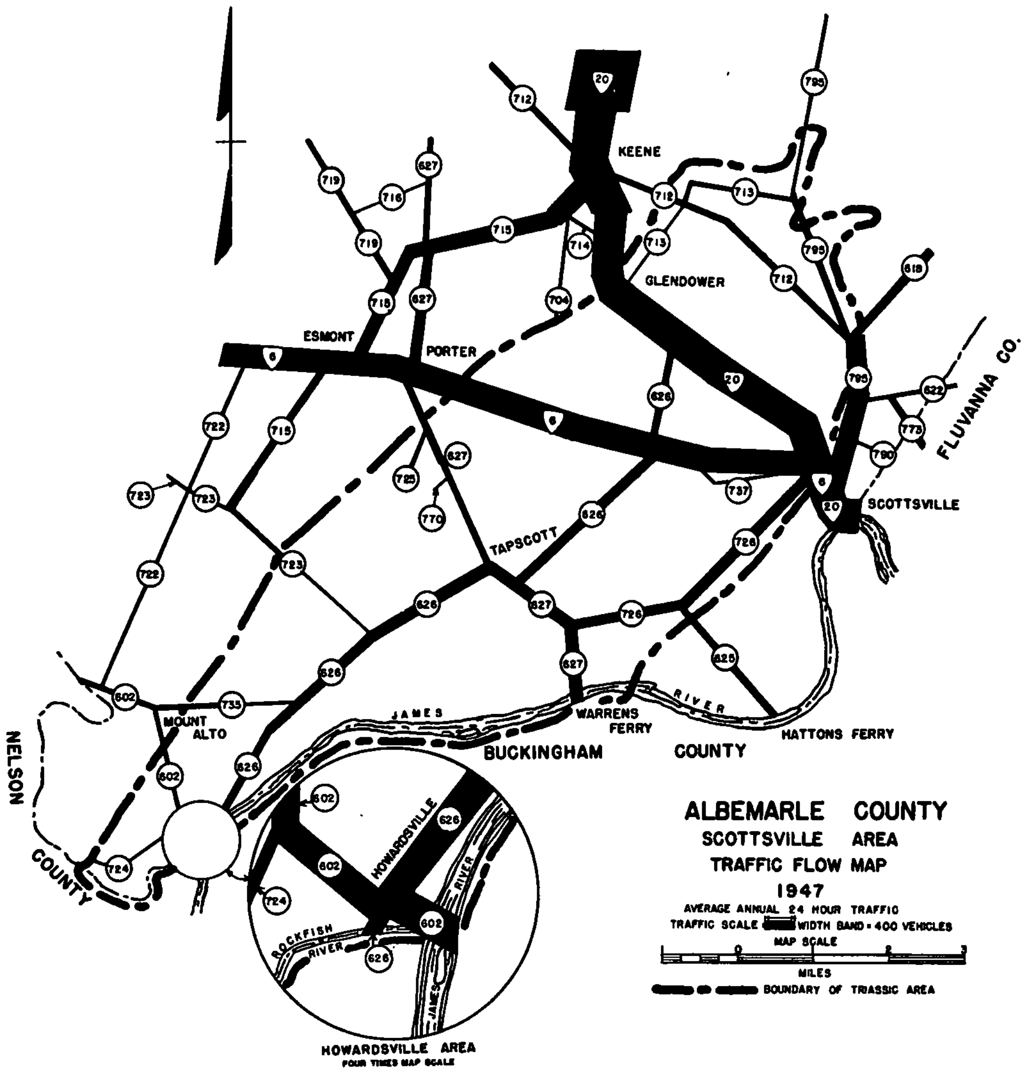


Figure 14

the county roads; some of them were added to the primary road system, others formed the secondary network. As a result, adequate records of the work done under county supervision are not available today. This was a handicap for the road performance survey which was made in connection with this study.

All the roads in the area were driven over at low speed and their condition recorded as it could be determined by careful visual inspection. In order to avoid variables due to climatic conditions, the survey was accomplished in two consecutive days of uniform weather conditions. This should be kept in

TABLE 1

RESULTS OF SOIL TESTS

Rt. 6

| Sample No. | Mileage from Scottsville | Sp. Gr. | LL | PL | PI | Opt.Moist. | Max. Dens. | Parent Material |
|---|---|---|---|---|---|---|---|---|
| S1 | 2.8 | 2.69 | 64 | 32 | 32 | 27 | 95 | Shale |
| S3 | 3.5 | 2.66 | 46 | 29 | 17 | 23 | 102 | Sandstone |
| S4 | 4.0 | 2.74 | 54 | 31 | 23 | 26 | 97 | Sandstone |
| S5 | 4.7 | 2.73 | 65 | 37 | 28 | 28 | 97 | Shale |
| S6 | 5.0 | 2.73 | 53 | 38 | 15 | 30 | 93 | Border Conglomerate |

mind when examining the illustrations. A traffic flow map was prepared from counts taken during the summer of 1947 (see Figure 14). It shows that the traffic was quite light on the secondary roads which may be classified as belonging to the "farm-to-market" type. The two primary roads (Routes 6 and 20) have slightly heavier traffic counts and were at the time of the survey the only two paved roads (*13*)

Route 6 is an important east-west highway. It has a waterbound macadam base covered with a bituminous surface treatment. Though it is in excellent condition both on Triassic and non-Triassic soils, it is interesting to note that it was in 1938 that the section through the Triassic basin had to be modernized to the present standard while the old soil base road outside of the area under study was not rebuilt until 1942. Though other factors will enter into the picture, it is obvious that the drainage and bearing power conditions encountered in connection with Triassic soils made necessary a better and more expensive type of pavement in the Triassic basin four years before it was necessary in an adjoining Pre-Cambrian area.

The other primary highway is Route 20 linking Scottsville and Charlottesville. It is one of the oldest portland cement pavements in the state and was built by the County Road Department in 1919. Since accurate records on this pavement are not available, one should remember that any findings of the performance survey might be infirmed by the fact that different sections were built by different contractors with different materials. This fact will obviously affect the quality of the resulting concrete, but since the section boundaries are not available, it had to be overlooked in the survey. Nevertheless, it is indeed striking to note the difference in performance of the pavement in the two soil areas as shown in Figures 15 and 16. A crack count was made over two five mile stretches of road: in the Triassic basin the average number of cracks for 0.1 mile was 32 against 12 on adjoining Pre-Cambrian soil for approximately the same traffic. This means a crack interval of 44.0 against 16.5 feet. The pavement built without joints (either longitudinal or transversal) is still in excellent condition for its age in the Pre-Cambrian area but shows generalized failure in the Triassic basin. Map cracking, spalling, and scaling were observed, but from the large amount of patching it was not possible to determine the occurrence of blowups. Thus, it appears that the poor drainage and bearing power properties of soils derived from Triassic parent materials were reflected in the performance of the pavements, but it was not possible from the data available to determine different performances of primary highways between the shale and the sandstone areas.

This is also clearly shown in another way on the secondary road system. At the time of the study, all were soil roads with variable amounts of crusher run or crushed rock material for stabilization added every year to the surface as needed. Some of the rock used has also been of Triassic age but most of it has come from the surrounding Pre-Cambrian area.

Figure 15 Albemarle County-Scottsville Area Poor performance of concrete pavement on soil derived from Triassic parent material. (Rt. 20)

An inspection of Figures 17 and 18 will show clearly the difference in appearance of the roads in the two areas. Especially obvious is the difference in drainage characteristics which are emphasized at the time of the "spring break-up." As shown in Figure 19, at any season the surface water will remain for days after any rain while it disappears much faster on surrounding soils derived from Pre-Cambrian parent materials. The deep red-brown sticky mud is unfortunately too common a sight on secondary roads built on Triassic soils.

A study of expenditures on secondary roads was undertaken to determine the relative costs of construction and maintenance as a function of soil types. This undertaking was handicapped by the fact that in the Scottsville area only four secondary roads are exclusively on one soil type and all other routes cross soil boundaries. The result of the investigation is representative inasmuch as the data covers a nine-year period. As the routes were selected by a process of elimination not based on their performance, the process was thus about equivalent to lot sampling.

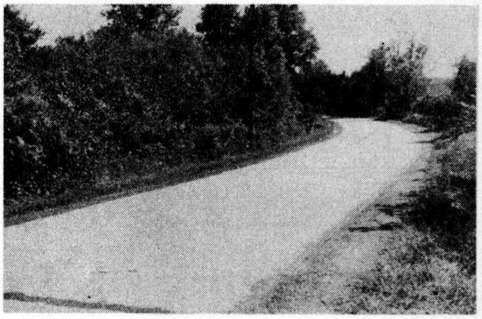

Figure 16 Albemarle County-Scottsville Area Excellent performance of concrete pavement on soil derived from Pre-Cambrian parent material. (Rt. 20)

The results are shown on Table 2. The first two lines are for routes entirely in the Triassic area while the two other ones are just on the outside. Otherwise they are the same kind of untreated soil roads, though Route 626 is subjected to a much heavier traffic than the others. It will be seen that the average cost per mile per year for maintenance on Triassic soil has a mean value of $226 against $81 for Pre-Cambrian soil. The striking difference would still be

TABLE 2

COSTS OF TYPICAL SECONDARY ROADS IN ALBEMARLE COUNTY-SCOTTSVILLE AREA

1939-1947

| Rt. | Mileage | Soil Area | Avg. Daily Traffic 1947 | Total Cost in Dollars (1939-1947) | | Yearly Avg. Cost in Dollars | | Yearly Avg. per Mile in Dollars | | Yearly Avg. Cost per Mile per Car in Cents | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Maint. | Const. | Maint. | Const. | Maint. | Const. | Maint. | Const. |
| 626 | 10.4 | Triassic | 104 | 19126 | 5209 | 2125 | 579 | 204 | 56 | .54[a] | .15 |
| 713 | 2.3 | Triassic | 25 | 5123 | 343 | 569 | 38 | 247 | 17 | 2.71 | .18 |
| 714 | 1.0 | Pre-Cambrian | 15 | 569 | - | 63 | - | 63 | - | 1.15 | - |
| 725 | 0.6 | Pre-Cambrian | 24 | 535 | 74 | 59 | 8 | 99 | 14 | 1.13 | .16 |

[a] This low value is due to the much heavier traffic to which this route is subjected.

larger if Route 626 were omitted on account of the heavier traffic on this road as compared to that on the other three routes. If the traffic is taken into account, Route 626 cannot be used for comparison, but for approximately the same total mileage, one can compare Route 713 against a combination of Routes 714 and 725. Yet for Route 713 on Triassic soil, the yearly average cost per mile per car is 2.71 cents against a mean value on Pre-Cambrian soil of 1.14 cents. Similar conclusions may be drawn from an analysis of the construction costs though they are less striking as far as performance is concerned.

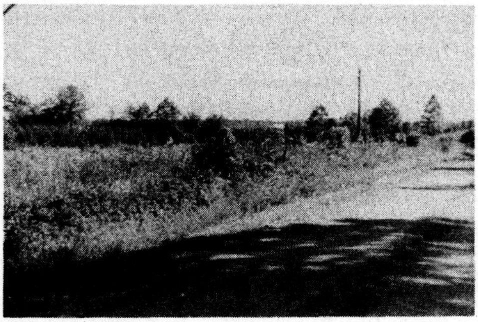

Figure 17 Albemarle County-Scottsville Area A secondary road on poorly drained soil from Triassic parent material (note typical flat landscape and vegetation of cedar trees

## CONCLUSIONS

From the airphoto study of the Triassic basin of Scottsville, the following conclusions are indicated:

1. It is possible to use airphotos to investigate the soil areas connected with Triassic outcrops. It was found that whenever a formation was of sufficient extent to be of highway engineering significance it could be determined and bounded.

2. Existing geological data, though highly valuable, are conflicting with information obtained from agricultural soil surveys. Airphoto investigations agree with the latter though no evidence was found of correlation between parent materials and agricultural soil

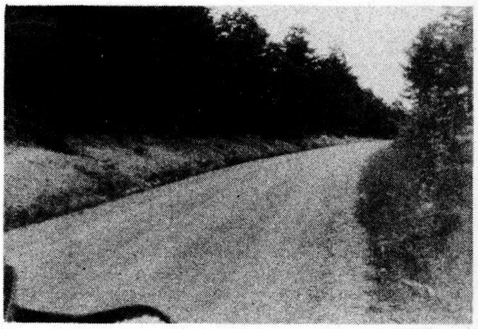

Figure 18 Albemarle County-Scottsville Area A secondary road on fairly well drained soil from Pre-Cambrian parent material (note typical vegetation of pine trees)

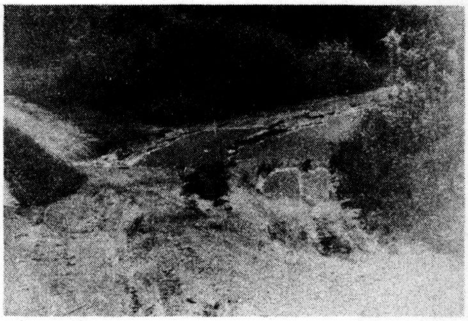

Figure 19 Albemarle County-Scottsville Area A secondary road on soil derived from Triassic parent material. Note poor drainage of plastic soil. (Rt. 735)

series.

3. The airphoto soil pattern is typical of a fine-grained plastic soil but due to local conditions the landform and drainage do not usually conform to the "trellis" pattern expected from tilted beds

of sandstones and shales.

4. Only the airphotos permitted an easy distinction between the major outcrops of Triassic sandstone and shale, and all significant soil boundaries were found reliable.

5. The area is one of fertile farmland and as is usually the case, the rich agricultural soils correspond to poor highway soils on account of their plastic properties.

6. A performance survey indicated that for over a period of years more maintenance and a higher type of pavement were required for primary highways inside the Triassic basin. The average cost of maintenance of secondary roads was also higher when built on soils derived from Triassic parent material than for similar routes on nearby soils derived from Pre-Cambrian parent material.

7. Though it was possible to determine the major outcrops within the Triassic basin from the airphoto patterns and to evaluate a difference in performance between roads in the basin and outside, it has not yet been possible to correlate performance and the different outcrops within the Triassic basin.

8. The findings from the airphoto investigation were verified by every soil test performed to ascertain the reliability of the investigation.

9. This investigation thus is considered worthwhile, reliable and practical, and would apparently warrant a systematical extension to other similar Triassic basins in Virginia and other states.

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