

1910

Some geology on the Weingarten Quadrangle, Missouri

John Whittlesey Bodman

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SOME GEOLOGY
on the
WEINGARTEN QUADRANGLE,
MISSOURI.
T 208

By
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Approved by L. S. Griswold,

Professor of Geology.

L. S. G.

Degree of Bachelor of Science.

1910.

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T A B L E O F C O N T E N T S.



Area covered in Thesis.

Preparation for work.

Methods of work.

Physiography.

Stratigraphy.

Structures.

Economic Aspects.

Summary.

Maps and Cross-sections.

#1.

The work in this report covers about 90 square miles situated in the east and middle portion of Ste. Genevieve County, Missouri, between townships 35-37 north and ranges 7-9 east. It is termed the Weingarten Quadrangle by the State Geological Survey. Ste Genevieve Co. is approximately fifty miles south of St. Louis. Transportation is afforded by the Illinois Southern and Saline Valley R.R. The principal towns of the area are Aron, Coffman, Weingarten and River Rux Vases. Ste Genevieve is the largest town in the county. It is situated about fifteen miles ^{N.E.} from the center of the mapped district.
x

In preparation for the work about eight days were spent in the Flat River and Farmington districts doing general reconnaissance work. This was done in order to become familiar with those formations which lie on either side of the large Weingarten fault in the field mapped. The entire mapping done while working for the State Survey.

Work in the field was carried on from camp. Upon completion of work within four miles of camp a move was made and a new district worked out.

The body of the thesis is detailed areal mapping. All formations and structural features are put on a topographic map with a scale of 1/62,500, contour interval 20 ft, datum mean sea level.

#2.

The Gurley compass was used and was allowed $4\text{-}3/4^\circ$ east for magnetic declination. The features of the map as finished shows:

- (1) Hydrography.
- (2) Physiography.
- (3) Geology.

#3.

Formations in Region.

The region mapped was undifferentiated Cambrian and Ordovician. The Geological structure was unknown.

Those formations which occur in the area are:

Ordovician	{	Ordovician limestones. <i>~ unconformity</i> St. Peters sandstone.
		Unconformity (?)
Upper Cambrian.	{	Jefferson City dolomite. Roubidoux. <i>Sandstone</i> Gasconade limestone (Ind. Gunter sandstone) Potosi. " Doerun. limestone. Derby limestone. Davis shale.
Middle Cambrian.	{	Bonneterre limestone. Lamontte sandstone.
Pre-Cambrian.	{	Unconformity Granite (Pre-Cambrian)

The Doerun, Derby, and Davis formations of the Upper Cambrian will not be treated in the Thesis because they do not outcrop in the area in consideration. The most evident characteristics of the other strata are given below.

#4.

Description of Formations.

Granite.

Granite and phylite outcrop along the streams of the western portion of the sheet. The principal exposures are along Jonca, Pickle and River Rux Vases, the latter exposure being very small. The approximate distribution of these rocks is shown on the map.

Unconformities.

There is conclusive evidence of unconformity between the pre-cambrian granite and the lamotte sandstone. Those fossils in the upper lamotte and lower Bonneterre formations which have been authentically examined, place that part of the Cambrian as now resting upon the granites as the middle and upper horizons. This condition would call for a considerable erosion period as would also the presence of the basal conglomerate and boulder detritus. Then again granite is considered as a rock formed under deep seated conditions as its crystalline character requires slow cooling. Also, elsewhere in the southeast district where the granites are better exposed, the overlying porphyries have been removed to a great extent. The appearance then of granite immediately underlying or even exposed as it is in Jonca, Pickle and Rux Vases Creeks is evidence that a long erosion period took place before the deposition of the Lamotte sandstone. There was no detailed work done upon unconformities above the

#5.

Lamotte, but the majority of the formations appear to overlie each other conformably. Many comparatively thin conglomerate beds and uneven bedding planes were noted, but these better point their peculiarities to shallow water conditions and contemporaneous erosion than to true unconformity.

Lamotte Formation.

This is the oldest Cambrian formation which has been recognized in the State. As stated above it rests unconformably upon the pre-Cambrian basement and as a consequence its thickness varies greatly. The average thickness of the sandstone over southeast Missouri is estimated at 250 feet. The formation consists of boulder detritus at the base which grades up into alternating sandstone and conglomerate beds. The next stage seems to be coarse grained sandstone, the grains averaging the size of peas, and thin cones medium grained sandstone. The transitional zone between the Lamotte and Bonneterre formations is in many places fifty or sixty feet thick and frequently contains thin beds of shale. Near the vicinity of Faults and especially along the Weingarten Fault the sandstone has been altered to quartzite.

Bonneterre Formation.

Overlying the Lamotte sandstone is the Bonneterre Formation which has been determined by drill records to ^{in the Flat River District} average, approximately 360 feet thick.
X

#6.

As indicated above, there is no sharp line of contact between the Bonneterre and Lamotte. For the field work a bed of very chloritic sandstone about three feet in thickness was considered as the datum plane. The Bonneterre near the base has numerous beds of sandstone more or less chloritic, while the upper portion of the Lamotte contains beds of impure dolomite. In this manner the gradation of the Lamotte into the Bonneterre is very gradual.

The lower one hundred feet of the Bonneterre contains, in many places, shale beds twenty-five feet thick. These shale beds are so similar to those of the overlying Dorris formation that confusion may be caused in mapping. The shaly beds are especially well exposed in the vicinity of Coffman. Beds of chloritic dolomite are also found in the lower Bonneterre giving a greenish speckled appearance to the latter. The thickness of these chloritic beds is not constant. Along the contact of Bonneterre and Lamotte, between Coffman and River Rux Vases, they occur so thick as fifty feet, while at other places they disappear almost entirely.

The upper two hundred and fifty feet of the Bonneterre is of massive character, consisting of dark and light grey dolomite beds. Those latter often present a mottled appearance of buff and grey colors which is very characteristic. The dolomite is thoroughly crystalline and at some horizons weathered surfaces give a very hackly appearance.

#7.

The best exposures of the Bonneterre are found in the vicinity west of the Smith school. Here, in one place, River Rux Vases ~~clauts~~ against a bluff of this formation eighty feet high.

Davis, Derby and Doerun Formations.

As mentioned above, these formations do not outcrop on the mapped territory, being cut off by the Weingarten Fault. Detailed notes of their characteristics may be found in volume 9 of the Missouri State Geological ~~summary~~ ^{Survey}. It may be mentioned here, however, that a gradual increase of small chert druses is noticed in the Doerun which grade up into the very cherty, siliceous and drusy dolomite of the Potosi formation.

Potosi Formation.

This cherty horizon has a thickness approaching three hundred feet. It consists mainly of massive beds of dolomite alternating with chert beds. A large portion of the dolomite contains irregular honeycombed masses of chert and drusy quartz modules. Many of the latter contain large size and beauty. Sometimes the solutions carrying silica have deposited abundantly along joints and the result is roughly intermingled sheet-like forms crossing one another at various angles.

The Potosi formation is seldom found in place because of the easy disintegration and solution of its dolomite. Its presence is indicated, however, by the drusy quartz modules spread over the surface.

Another characteristic which indicates the presence of underlying Potosi is a deep red or reddish clay which is the result of Potosi decomposition. The disintegration of the Bonnetterre limestone also gives a reddish residual clay but embedded drusy chert is absent and the color of the clay is not of such decided character as that derived from the Potosi.

There is difficulty in placing the upper limit of the Potosi as there are no distinctive datum planes. The evidence used in this work was the absence of drusy quartz.

Gasconade Formation.

The Gasconade limestone is, approximately, 250 feet thick. The Topography which accompanies this formation is rough and precipitous as will be seen upon examining the Topography east of the Weingarten Fault to the junction of Jonca Creek and River Rux Vases. High bluffs skirt these streams throughout their entire length in the mentioned region.

Along these bluffs certain horizons seem more susceptible to solution effects than others and the result is cavernous layers on exposed faces.

The formation is composed mainly of beds of chert and one distinct sandstone bed (Gunter) intercalated in beds of massive cherty and non-cherty limestones and dolomites.

#9.

The dolomite is, for the most part, coarsely crystalline but all variations in crystalline character were observed.

The cherty content of the Gasconade gives practically the only variation in composition. The chert occurs in bedded and modular form. The bedded variety is sometimes four feet thick while the modular chert is disseminated along definite elevations in the dolomite or scattered indiscriminately through it.

The best exposure of the Gasconade is found along Jonca Creek.

Roubidoux Formation.

The Roubidoux formation, as found in Ste Genevieve County, is very different from that in Phelps County. Instead of the large characteristic, sandstone bed, the formation was found to be complex consisting of alternating beds of sandstone, cotton-rock, dolomite with quartz druses and thin conglomeritic sandstone beds. The Roubidoux formation in this area was evidently laid down in a sea whose depth fluctuated considerably.

The Roubidoux differs from the Gasconade lithologically in that while some of the dolomite beds in the former are similar to those in the latter the majority of them are finer grained and denser. The cotton-rock beds in the Roubidoux are the usual relatively soft, cream colored, dense limestone which weathers out on the surface plates. The conglomeritic beds consist of small flat lense-like

#10.

pieces of blue fine grained limestone with rounded edges in a matrix of sandstone. The quartz druses in the dolomite and cotton-rocks are sometimes absent and are small when present. The coarsely crystalline limestone beds are massive and weather with a pitted surface. This latter effect is due to the easily removed pulverulent silica segregated in the rock mass.

A characteristic section in the Roubidoux is given in section 5.

Jefferson City Formation.

The average thickness of this formation is something over one hundred feet. The beds are chiefly of dolomite some of which may contain chert modules. This dolomite is either hard dense, medium to fine grained; or soft, argillaceous and arenaceous cotton-rocks.

The cotton-rocks weather as a general rule in smooth and rounded surfaces, and when detached from the bed break out in plates and spools.

The heavy massive beds weather with a rough hackly surface as a result of inequalities in the composition of the dolomite. The pitted surface of these beds differs from that of the Gasconade dolomites in that the pits are deeper, more irregular, and sharper.

#11.

The intercolated sandstones beds of this formation are generally very compact, well cemented with iron oxide and fine grained and being thin are not characteristic.

A seventy-five foot section of Jefferson City beds is shown in section 4-*.

St. Peters Sandstone.

This important formation belongs to the Ordovician period and unconformable overlies the Jefferson City. The thickest section found in the district measured seventy-five feet with the aneroid, the base of the formation not being exposed. It consists of a coarse to a medium grained brown to white sandstone and is usually poorly cemented.

Where the sandstone has not been exposed to extensive weathering it is of the purest white variety and soft enough to be dug out with the hand. Outliers of the formation often are collected in large dome-like individual masses capping the hills. The formation is extensively faulted southwest and south of the town River Rux Vases and along these zones the sandstone is generally changed to a quartzite often taking its direction across the country in dike-like form.

#12.

The thickness of the formation varies due to the uneven floor upon which it was laid. The overlying limestone formations are conformable as far as they were observed.

Strata Above St. Peters.

No attempt was made to differentiate those limestone beds overlying the St. Peters sandstone although notes of their characteristics, fossil contents and structure were taken. They consist essentially of alternating argillaceous limestones of coarse to fine crystalline texture. Many of the higher beds are of magnesian type, some of these being seen cracked giving rise to what is locally called "Mapped marble". These latter beds were once quarried but their ^{close} jointing prevents their making good building stones.

The magnesian limestones contain three distinct types of fossils, namely, brachiopods, crinoids and bryozoa. Other strata higher up than the magnesian limestones show larger crinoids and abundant sunflower corral. Some of the former are larger than the thumb while the latter often reach a size two and one-half to three inches in diameter.

#13.

P H Y S I C G R A P H Y.

Surface Relief.

The highest elevation (900 feet) in this area is about three miles northeast of Coffman. This is practically maintained throughout the entire western border of the sheet. The lowest elevation is found east of the town, River Rux Vases, near the base of the St. Peters sandstone as is about 400 feet. A difference of 500 feet is thus found between the lowest and highest points of 500 feet.

The greater portion of the territory covered is rough and hilly. An exception to this is a strip of country extending north and south and two miles wide in the vicinity of the town, River Rux Vases. This strip of country is largely underlain with St. Peters sandstone and is worked extensively for agricultural purposes.

River Systems.

The principal river is the Rux Vases which rises in the hills of the western portion of the sheet and flows nearly due east to the Mississippi River. Throughout the hilly portion of the territory its banks are very steep and its course is between high bluffs, the remainder, with the exception of the Becket Hill region, being through narrow flood plains.

#14.

Jonca, Pickle, and Mill creeks are tributaries to River Rux Vases and are perennial through the greater part of their courses and intermittent through the remaining distance. As the springs by which these streams are fed are intermittent the volume of water carried by them varies greatly.

As many of the smaller tributaries are maintained by surface drainage, they are intermittent. None of the streams are deep having as a general rule broad and shallow waters.

The relief being rough in most of the district, the streams rise rapidly after heavy storms and the result is a strong scouring of the stream beds. This gives good exposures of rock formations which is helpful in mapping and getting sections.

Divides.

Divides are numerous in the area but there are two which are very well marked. The longest of these is that between River Rux Vases, Pickle creek and Jonca creek. It is long and tapering with a course a little north of east. Near its eastern termination, at the junction of River Rux Vases and Jonca Creek, it becomes a typical "Hogback" sharp and narrow and these two streams are several times within 1000 feet of each other. The ridge of this divide is practically level.

#15.

The other divide, that between Mill Creek and River Rux Vases is broader than the one above mentioned, but has the same general direction. Like the former, its ridges is comparatively level and roads will generally be found traveling these ridges.

Base Level.

Evidence of a peneplain through this district is not convincing although many of the hills are flat topped and the higher ones are of nearly the same elevation throughout the sheet. The statement of Dr. E. R. Buckley in Vol.9 of the Missouri Geological Survey on the base level about Flat River, Mo. will probably apply here.

"The main flat tops of these hills and ridges are evidently the remnants of a late peneplain. This peneplain marks, as a rule, the upper level of the gravels of this area, which are thought to be of Tertiary age. For this reason, I have been lead to believe that this is a remnant of the Tertiary peneplain. The earlier one may be Cretaceous, but of this we have no proof. An inconceivable length of time has elapsed since the rocks of this area were laid down and more ancient peneplains, had they existed, would probably long since have been obliterated."

#16.

Stratification.

The relative position of the various formations are as shown in the column section ^{below} ~~never~~ ____.

These Geological periods are represented in the district, viz: Orchean of pre-Cambrian, Cambrian and Ordovician. A portion of the Silurian was also worked. All of these horizons, due to the Weingarten Fault and a strong dip averaging about 4° east, are exposed in a strip of territory running east and west less than ten miles in length.

Passing from the Orchean to higher formations the stratigraphic relations may be classified in general by the following sequence:

- (a) Pre-Cambrian of Granite and Rhyolite.
- (b) Porous, poorly cemented sandstone resting unconformably on Pre-Cambrian.
- (c) Dolomite formation, shaly and chloritic in lower portion.
- (d) Shale beds with intercolated arenaceous, argillaceous, dolomite and limestone.
- (e) Heavy bedded hackly dolomite.
- (f) Compact limestone with small cavities filled with quartz.
- (g) Very cherty, drusy, porous dolomite.
- (h) Sandstones alternating with magnesian limestone beds.

#17.

The age of some of the formations and their relations to those in other parts of the Ozark uplift is not settled. This is more especially true of those beds below the Potosi. The fossil contents below the Potosi are very scarce and they have not been systematically investigated. On the west of the St. Peters sandstone quite a few small *Brochiopods* were found while on the east, *Brochiopods*, *Arionoids* and *Eryozoa* were quite abundant, this placing the formations on that side of the St. Peters in or above the Ordovician. The absence of *Eryozoa* on the west of the St. Peters formation indicates the Cambrian period.

Bedding.

In the area included within this report all variations common to sedimentary rocks occur. During the deposition of certain formations such as the Bonneterre limestone the sea was deep resulting, in the whole, in a massive formation. On the other hand, during the formation of Roubidoux sediments the depth of the sea was variable and the bedding planes are often irregular, transitional, close or far apart.

In places the sandstones appear to be entirely lacking of bedding planes and again they appear very thinly bedded. The absence or scarcity of stratification in a formation such as the Lamotte or St. Peters sandstone would seem to indicate rapid deposition, while on the other hand where thinly bedded it points to a process of more or less intermittent sedimentation.

#18.

Cross-bedding occurs in both the Lamotte and upper sandstone beds, the best observed being in the latter. Here in places false bedding is so pronounced as to make it difficult to obtain the true dip of the rock. The cross-bedded stratum is as a general rule underlaid and overlaid by stratum horizontally bedded. Well defined cross-bedding was also seen in the Bonneterre limestone formation.

Ripple marks are abundant in the sandstone especially those contained in the upper formations.

What appeared to be wave markings were plainly seen in a Bonneterre outcrop about two and one-half miles north of Coffman. The distance from crest to crest was something over two feet while the elevations and depressions averaged nearly four inches. In this case thin beds of limestone overlie conformably the rolls of an underlying massive limestone. This characteristic was found only locally and might best be accounted for by contemporaneous erosion or ocean scour.

Unconformities.

As far as dealt with, these have been described above.

Structures.

FAULTS.

In the area under consideration Faultings has been conspicuously developed. Those Faults seem to occur in groups which taken collectively give rise to zones of Faulting. Some are short in duration literally which others as may be seen from the map were traced ten miles. These longer Faults do not take a straight course across the country but zigzag in every direction.

There are two well defined systems of Faulting. One of these, the Weingarten Fault has a general northwest-southeast strike while the other, south of the town River Rux Vases has a general east-west strike.

The Weigarten Fault is near the western border of the sheet and has a throw of approximately 1000 feet. On the west side of this Fault we have the Lamotte sandstone and Bonneterre limestone while in the valley of Jonca Creek granite outcrops scarcely a quarter of a mile distant from it. On the east side is found the Potosi formation. Between River Rux Vases and the Illinois Southern Railroad track the Fault branches having two parallel Faults for a portion of the distance. Between these is included an immense "Horse" of Bonneterre limestone.

In the area west of the Smith school a number of minor "Sympathetic" Faults were worked out. In one place a large wedge of Lamotte sandstone is included between two parallel Faults in the Bonneterre limestone.

#20.

One would think that in the vicinity of such a large Fault as the Weingarten the strata would be highly tilted and distorted. This is not so, however, in this area. The stratum of sandstone on the west of the Fault is practically horizon up to the Fault plane, while the Potosi and Gasconade formation on the east and downthrow side are highly tilted only in the immediate vicinity of the Fault. A quarter of a mile east the rocks are perfectly horizontal and it is not until a distance of some three miles east of the Fault is reached that a strong dip of the strata is noticed. As has been previously noted the inclination of the rocks here is about 4° east. The contact of the Lamotte sandstone and Bonnetterre limestone on the west of the Weingarten Fault and running north from Coffman shows, however, a decided dip eastward. This can be noted by the way the contact runs over the point of small ridges projecting into creek valley. The dip in this vicinity is from 3° to 6° east towards the Weingarten Fault.

In the district south of the town of River Rux Vases is found a region of distributive Faulting. These have their general strike east and west and while their throw is not on the same scale as the Weingarten Fault with some to them it is quite considerable--400 feet and less.

The St. Peters sandstone has been highly disturbed in this district and the extensive Faulting it has undergone has thrown it much farther west than its true line of contact would have placed it.

The relations of these distributive Faults their throw and hade is shown in the accompanying cross sections.

The Faults in these sections are represented as extending into the granite. There can be no reasonable doubt of this in the case of the Weigarten Fault as here the Potosi formation is practically at the same horizon as the granite in Jonca creek where as it was laid down originally some thousand feet above it. The truth of the extension of the Fault planes into the granite in the distributive Faults south of River Rux Vases might be questioned and argument in favoring solution Faults given. Nevertheless the general nature of all of the faults of the area are of the tension type and it is very probable that the same force which gave rise to the Weigarten Fault caused the Faults south of River Rux Vases. In fact, a more detailed work in the limestone formations between the St. Peters sandstone west to the Weigarten Fault would probably uncover more extensive Faulting than has been shown on the map and there may be a connection between these distributive Faults and the Weigarten Fault. In case of such connection the extension of the distributive Faults into the granites would be more than likely.

ECONOMIC ASPECTS.

The economic features of the district surveyed were not given special attention and therefore a detailed account of them cannot be given. The region, however, is essentially a mineralized one and this feature was continually brought to the attention during the Geological mapping. Under such conditions brief notes were taken on the most evident features viz: Granite, Lead, Onyx and Copper.

GRANITE.

The Pre-Cambrian rocks of the district are for the most part reddish granite and rhyolite, the former predominating. The area covered by these crystalline rocks is comparatively small, occupying, as has been mentioned above, the greater portion of the stream valleys in the extreme western portion of the sheet.

The granite is of the reddish variety as has a medium to coarsely crystalline texture. On the other hand, the rhyolite has a finely crystalline groundness with phenocrysts of feldspar predominating, the latter varying in size but averaging about one-eighth of an inch in diameter. The color of the rhyolite is light grey.

At the present time, there are no granite quarries working but it is understood that a St. Louis Company has bought the greater portion of this granite and intends to work it. Railroad facilities are a little over one mile distant.

#23.

LEAD.

Lead was found in the vicinity of the town of Avan and south of the town River Rux Vases.

Near Avan the lead occurs in the lower Bonneterre limestone and upper Lamotte sandstone. Mines were once worked in the district but are now abandoned. The ore is typical disseminated type of southeast Missouri the only peculiar feature being its extension into the Lamotte sandstone. It does not extend deeply into this formation however, and mining it there is difficult because of the poor roof afforded by the sandstone. If the Bonneterre limestone had been of greater thickness about Avan, it is probable that a considerable lead camp would have been developed. The other horizon mentioned above in which lead was found is a limestone outcrop of dense, bluish grey, finely crystalline character. The lead is disseminated through it in streaks and spots and the crystals are very small. This lead horizon is above the St. Peters sandstone about sixty feet. Farmers in the district say they have found the mineral quite abundantly in digging cisterns.

The lead horizon immediately over the Ordovician St. Peters sandstone closely corresponds to the lead horizon of Southwest Wisconsin.

#24.

ONYX.

The best Onyx observed was in a small quarry nearly four and one-half miles west of the town River Rux Vases. This Onyx is not the true silica type but the lime carbonate variety and the name Onyx-marble is perhaps more appropriate.

The Onyx is of very good quality. Medium crystalline and even texture enable it to take a fine polish, its color, white and brown, in some cases, is very pretty.

The face of the small diggings shows two layers, each about one and one-half feet thick. The lower layer is of the brown-white variety, while the upper is snowy white.

This Onyx formation was deposited by horizontally moving waters as is shown by its bedded character and its horizontal colorations. Overlying the beds is sandstone, beneath is massive dolomite. It is quite probable these beds have considerable horizontal extent.

COPPER.

Copper occurs about three miles northwest of the town River Rux Vases or nearly eight miles southwest of Ste. Genevieve. The deposit here called the Cornwall mines were quite extensively worked in the past but at the present time are not operated. There was no opportunity given to examine the interior of the drifts but

the character of country rock and nature of the ore were observed from surface indications and ore on the dumps.

The formations in this region are Jefferson City and at the mines the rock is coarse magnesian limestone with considerable chert modules in places. One hard chert or quartzite bed beneath the ore deposit was noted, its thickness being about two feet.

The ore is in a breccia of chert fragments and what is hand specimens appears to be finely crystalline dolomite. A closer examination with a lense, however, shows considerable silica and this part of the breccia may be an altered flint.

The malachite may be seen in all stages of its replacement of the so called dolomite and it seems very probable that if this so called dolomite is an alteration from chert the copper carbonate deposition took place to a large extent during the process of alteration.

The chalcopyrite fills the interstices of the breccia and on fresh surfaces appears as a massive brassy yellow mineral, weathered surfaces show an irridescent tarnish resembling that of barnite.

The process causing the brecciation is not clear. Two minor Faults were observed--less than one-half a foot throw--and as these were over the roof of the drifts

#26.

they may have been caused by the rotting away of old timbering. Outside of Faulting the most probable cause for brecciation appears to be through ground water agencies. These ground waters attacked the dolomitic country rock dissolving it and leaving behind the chert. The natural result of such a process carried on extensively would be a breccia. Later alteration of this chert together with the deposition of the copper sulphides would tend to intensify this brecciation.

The ore at these mines is rich, that on the dumps running as much as 6%. That which was smelted probably ran from 15 to 20%. At the time the mines were worked all freight had to be hauled by wagons to Ste. Genevieve. At the present time, however, the Illinois Southern R.R. runs within two miles of the property and it seems probable that if the ore was proved, by drilling, of sufficient extent that the mines could be profitably worked.

Summary.

In conclusion it may be stated that the area covered in this thesis has represented upon it strata from the Pre-Cambrian to the Silurian horizon, part of the latter being exposed. These strata are involved in the more or less flat monocline of the eastern portion of the Ozark uplift. Contemporaneous with the Ozark uplift of after

#27.

its completion extensive Faulting has been superimposed upon this monocline. These Faults have a general north-west-southeast and east-west strike.

Most of the rocks are metamorphosed to a considerable extent, there ground water actions and considerable mineralization has taken place. There is a possibility, that under suitable conditions, some of the mineral deposits of the region may prove of commercial value.

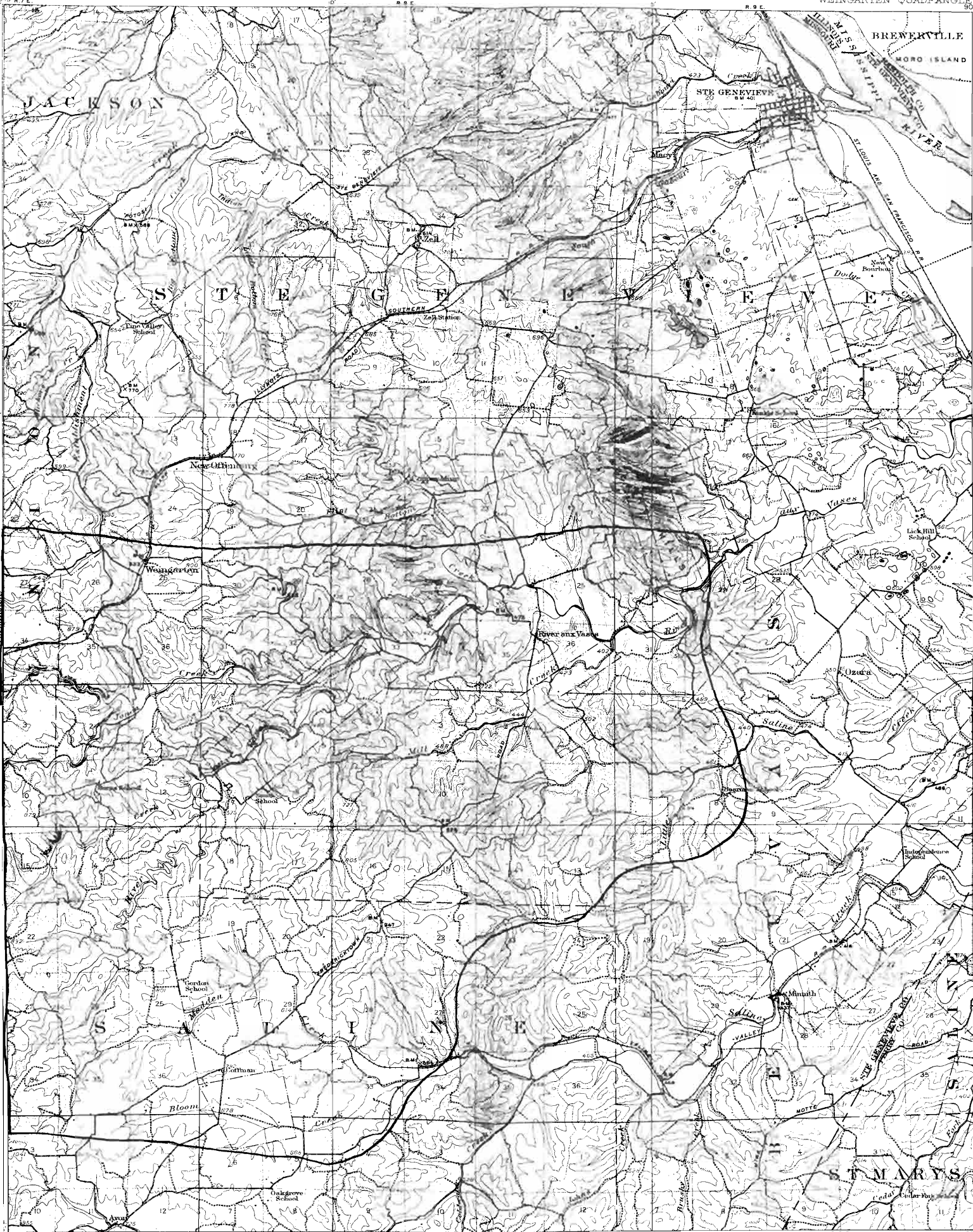
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TOPOGRAPHY

STATE OF MISSOURI
BUREAU OF GEOLOGY AND MINES
E.R. BUCKLEY, DIRECTOR AND STATE GEOLOGIST

MISSOURI-ILLINOIS
WEINGARTEN QUADPANGLE

U.S. GEOLOGICAL SURVEY
GEORGE OTIS SMITH, DIRECTOR



W.H. Herron, Geographer in charge
Topography by C.G. Anderson and J.A. Duck
Control by J.R. Ellis
Surveyed in 1907.
SURVEYED IN COOPERATION WITH THE STATE OF MISSOURI.

APPROXIMATE MEAN
DECLINATION 1907.

Scale 1:62,500
1 2 3 4 5 Miles
1 2 3 4 5 Kilometers
Contour interval 20 feet.
Datum to mean sea level.

Edition of Apr. 1909

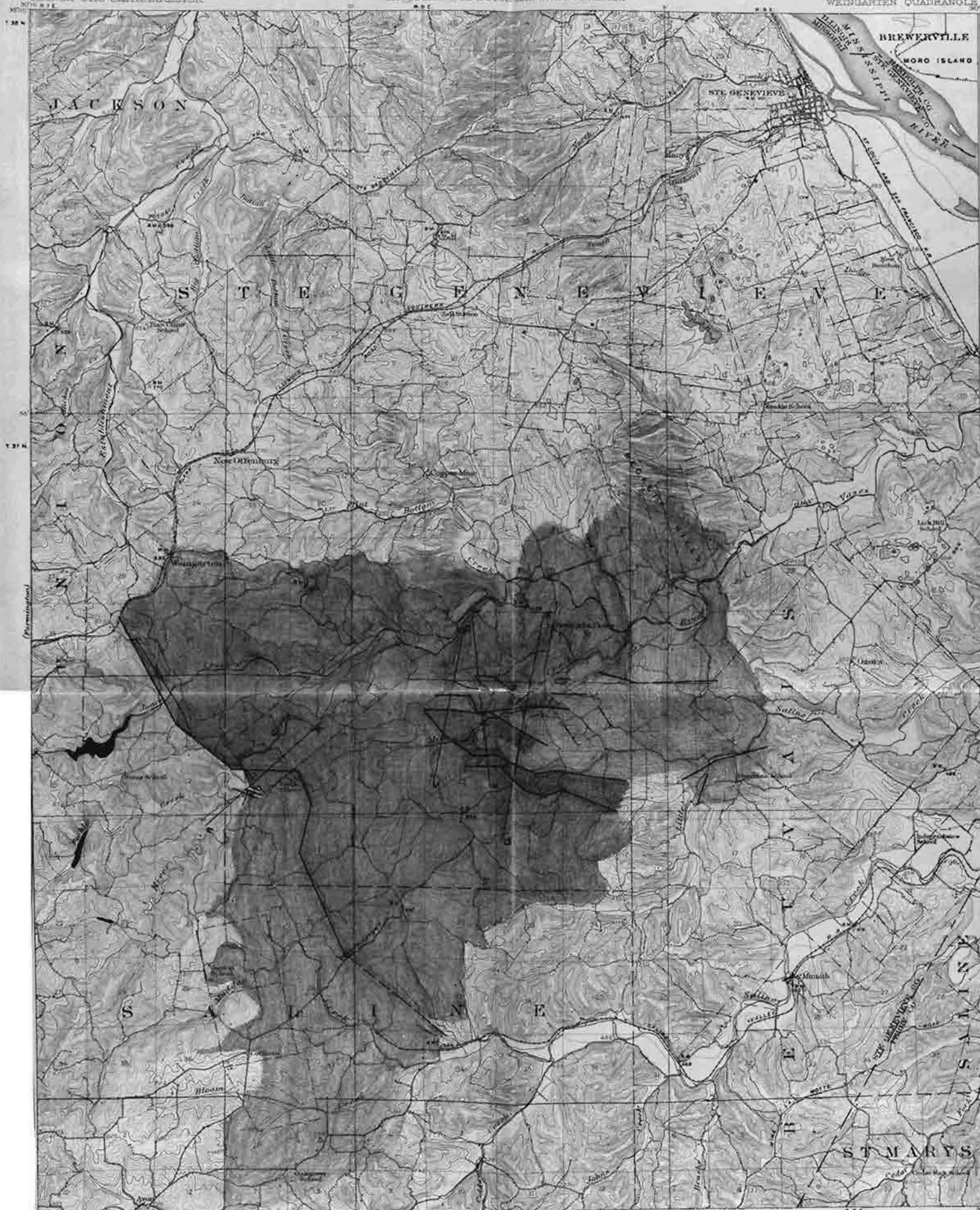
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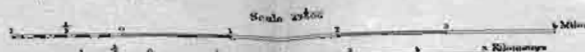
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Control by J. R. Ellis
Surveyed in 1907

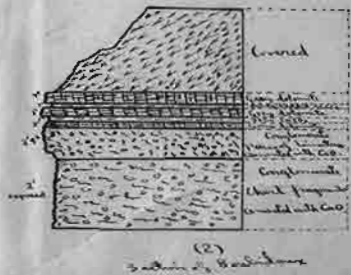
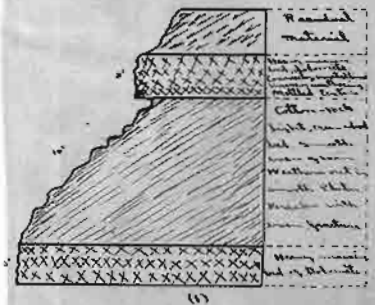
Surveyed in cooperation with the State of Missouri



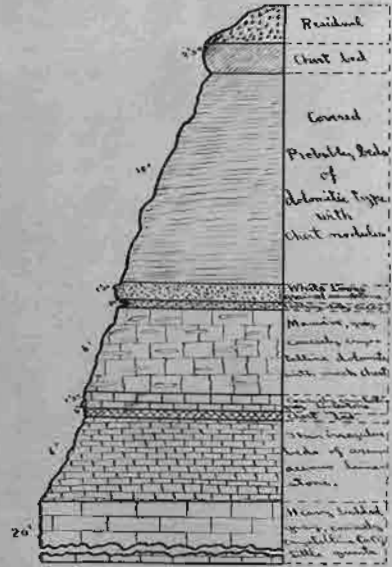
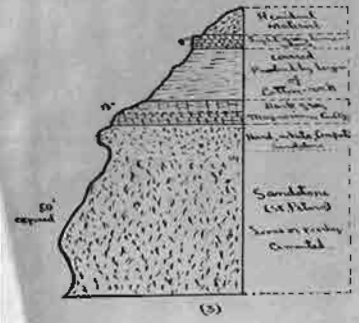
Contours interval 20 feet
Indicated by brown and grey

Edition of April 1908

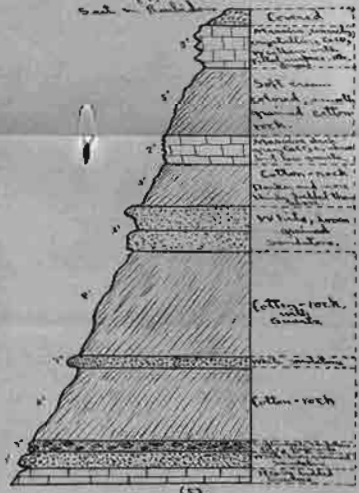
WEINGARTEN



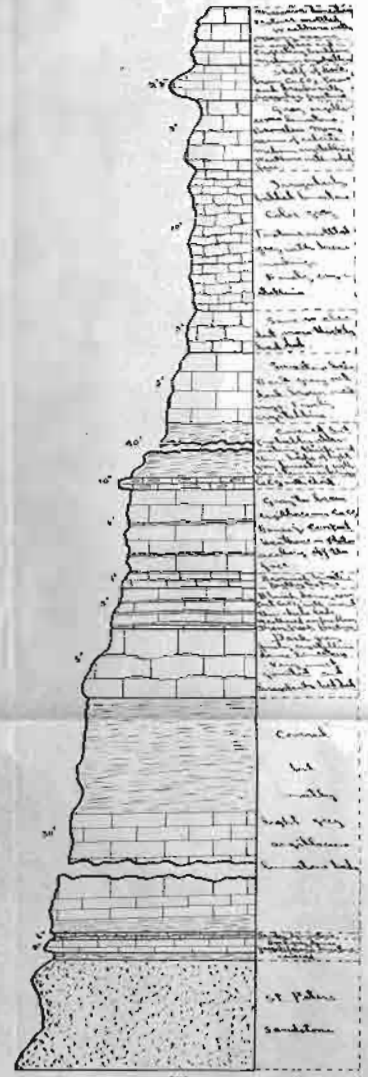
Section 2 - Rockledge



Section 4 - Rockledge

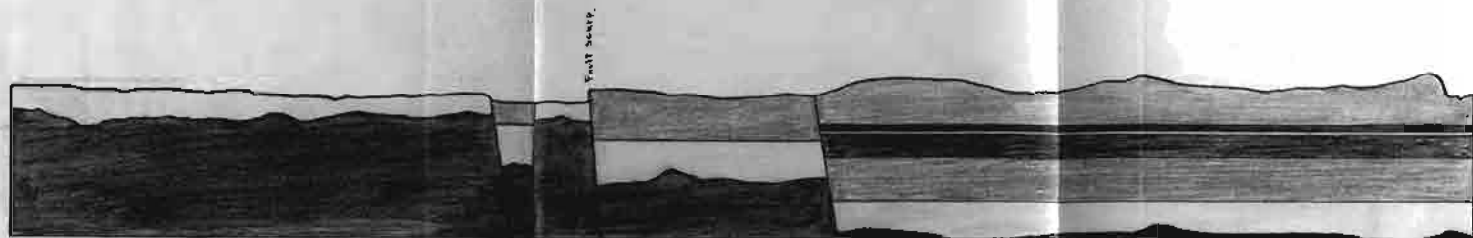


Section 5 - Rockledge



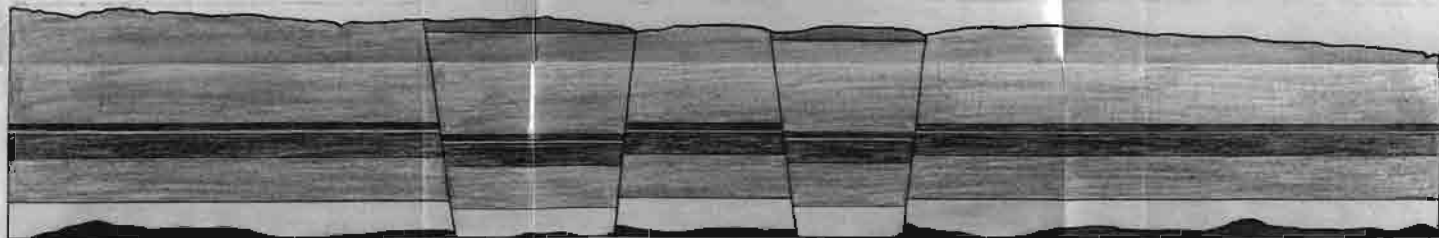
Section 6 - Rockledge

A



B

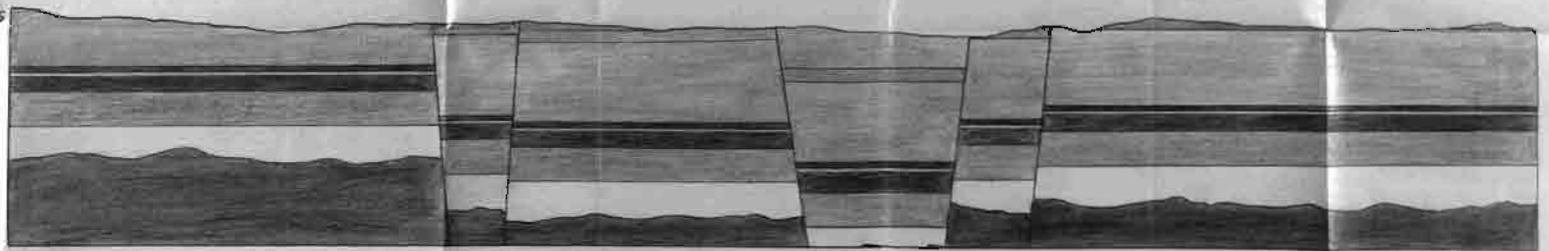
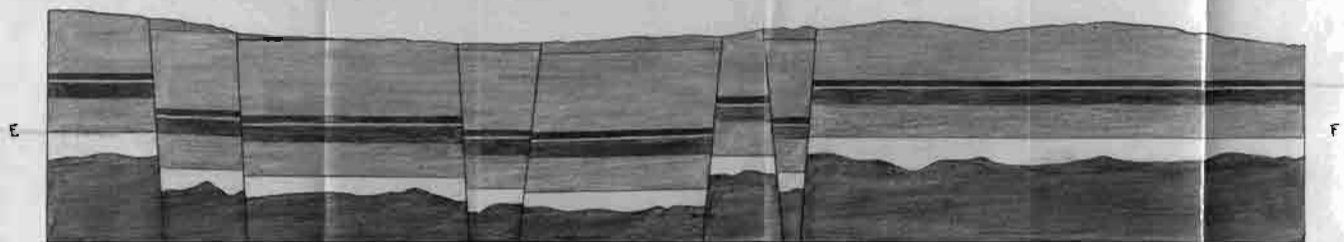
C



D

- Ordovician limestone.
- St. Peter's sandstone.
- Jefferson City, Washburn, Gasconade & Polk formation.
- Devonian limestone.
- Herby limestone.
- Davis shales.
- Pennsylvanian limestone.
- Lanette sandstone.
- Pre-Cambrian.

Scale.
 $\frac{1}{10}$ " = 60'



Scale
1" = 40'