PALEOZOIC GEOLOGY OF THE ROUND MOUNTAIN AREA, BLANCO QUADRANGLE, TEXAS

Approved:

E. H. Sellards

F. L. Whitney

E. T. Miller

THIS IS AN ORIGINAL MANUSCRIPT
IT MAY NOT BE COPIED WITHOUT
THE AUTHOR'S PERMISSION

Approved:

Henry W. Harper

Dean of the Graduate School

May 30, 1929.

PALEOZOIC GEOLOGY OF THE ROUND MOUNTAIN AREA, BLANCO QUADRANGLE, TEXAS

THESIS

Presented to the Faculty of the Graduate School of
The University of Texas in Partial Fulfill-
ment of the Requirements

For the Degree of

MASTER OF ARTS

By

William Tarrant Hancock, Jr., B.S.
(Houston, Texas)

Austin, Texas
June, 1929

P R E F A C E

The writer wishes to acknowledge his sincere thanks for the helpful suggestions of Dr. E. H. Sellards in the selection of the subject of this thesis and the preparation thereof. Further acknowledgment is extended to Dr. F. L. Whitney for his helpful criticisms and for the use of his library, and to Mrs. F. B. Plummer for her kind help. The writer is indeed greatly indebted to Mr. F. B. Plummer for his aid in field work and in the preparation of this manuscript.

W. T. Hancock, Jr.

Austin, Texas
May 27, 1929

CONTENTS

I. INTRODUCTION

1. Extent of Area

The area described in this thesis is bounded by parallels 30° 21' 30" and 30° 30' North lat., and by meridians 98° 14' 12" and 98° 25' 30" West long. The area includes approximately 115 square miles (73,000 acres) located mainly in Blanco County with the northern boundary extending into Burnett County.

2. Purpose of Investigation

The purpose of this study is to map and to discuss briefly the geology of the area, and to offer the results of this survey as an independent contribution to fulfill the thesis requirements for a Master's Degree at the University of Texas.

3. Method of Mapping

Due to the limited amount of time in working up this paper it has been necessary to omit the actual mapping of outcrops with a plane table and alidade. The use of a very helpful road map, surveyed by a party from this University under the direction of Dr. Bybee, was donated by Dr. F. L. Whitney. Traverses were run with the aid of a Brunton compass and automobile speedometer on all secondary roads and lanes. Pace traverses were run across fields and up stream valleys and all formation contacts were marked. These traverses together with the road data from Dr. Bybee's map were compiled on the U.S.G.S. Blanco topographic sheet, and constitute the base on which the geologic outcrops were colored.

II. PHYSIOGRAPHY

1. Topography

Topographically the region is divided into two parts--the rolling plains and the higher hills. For the most part the plains are formed by the Paleozoic rocks, although there is a narrow belt of gentle rolling fields that owe their surface shape to the Trinity formation. These Trinity sand plains may be distinguished easily from the rocky Paleozoic plains. The Cretaceous plains are very sandy, have a thicker soil, and are generally of a different color. The higher hills consist of a ridge of Cretaceous limestone ledges extending from east to west across the area, The fact that the Cretaceous limestones form ridges makes it easy to differentiate the Cretaceous from the underlying Paleozoic rocks that occur only on the flats. The Cretaceous rocks in the hills are represented mainly by the Glenrose with Walnut and Comanche Peak at the top on the highest hills.

There is a rather interesting physiographic feature found in the rolling plains belt of Ellenburger limestone rock located three and one-half miles north and one mile east of the town of Round Mountain. Here is a lime sink about ten feet deep and about 400 yards in diameter. It is due to underground solution of limestone causing the surface to settle. The depression was filled previously with water, but it has all leaked out. This sink, if filled with water, would be quite analagous to Mustang Lake in southwestern Burnett County, which is also in the Ellenburger limestone. The action of the water in dissolving the limestone is quite noticeable. The weathered chunks are snow-white, and have been carved in rather peculiar forms resembling a block of rock salt after it has been exposed to the rain.

2. Drainage

The southern part of the area is drained by Cypress Creek, which flows into Pedernalis River. Cypress Creek parallels roughly the Cretaceous ridges which lie to the north and south of it. The region between the creek and these two ridges is drained by intermittent streams flowing southward from the northern ridge and northward from the southern ridge into Cypress Creek. The streams are very small and seldom contain water except in time of rainfall. They are characterized by moderately open, yet sharply cut, shallow valleys with rather steep gradients. They are usually free of gravel and alluvium and furnish good exposures of bed rock.

The northern half of the area is drained by similar, though larger, creeks, having broad open valleys whose stream beds are broader and expose more rock than those of the southern portion. The gradients are usually less steep. These creeks flow to the northeastward into Colorado River. The creeks of the latter type are Pecan, Slickrock, Flat Rock, and Double Horn creeks.

In all the creeks little or no water is visible during much of the year, especially in the season of light rainfall. The streams rise rapidly during torrential downpours, but soon fall again and disappear below the rock and sand.

3. Vegetation

On the rolling Paleozoic plains are found mesquite, several varieties of thorny bushes, and cacti of various species, giving a semi-arid aspect to the landscape. Many varieties of grass locally afford good grazing land and along the streams are found numerous deciduous trees, such as oak, gum, elm, pecan, and cottonwood. Along Cypress Creek are rows of huge cypress trees, some attaining a height of one hundred feet and a circumference of twenty to thirty feet. The cutting of cedar, which abounds on this Paleozoic area, has been carried on for years. Postoak, blackjack, and live oak are distributed over much of this region, but not in such abundance as in other areas of the state where only lower Cretaceous rocks outcrop.

III. S T R A T I G R A P H Y

The formations found exposed in this region are those of the Cambrian, Ordovician, Pennsylvanian, and Cretaceous systems.

1. Cambrian Rocks

Wilberns Formation. The Cambrian is represented in this area by the Wilberns formation. The lower limit is not exposed, and the upper limit is seen only in one locality where it grades into the overlying crystalline Ellenburger.

Regionally the Wilberns is composed of thick-bedded, grey, glauconitic limestones interbedded with thin-bedded grey-brown, glauconitic limestone, buff-colored sandy limes, and some pinkish-grey finely crystalline limestone.

The following sections illustrate the sequence of the beds:

Generalized Section of Wilberns formation one mile south of Round Mountain on the road from Round Mountain to Johnson City.

Ellenburger--

1. Coarsely crystalling Ellenburger limestone.

Wilberns--

7.	Poorly bedded, grey-brown, partly crystalline, glauconitic limestone.	20'
6.	Pinkish-grey limestone.	10'
5.	Thick-bedded, brown-grey, glauconitic, fossiliferous limestone containing a 2-inch intraformational conglomerate layer. . . .	40'
4.	Sandy, thin-bedded, glauconitic, fossiliferous grey limestones, weathering to a reddish-brown color.	10'
3.	Thin-bedded, flaggy, sandy, non-fossiliferous limestone.	15'
2.	Massive, grey-brown, glauconitic and crystalline, fossiliferous limestone.	10'
1.	Yellow, non-fossiliferous, clayey shale. .	1'6"
		106'6"

The strata in this exposure are dipping N. 40° E. at an angle of 5° to 8°.

Generalized section of Wilberns formation 5 miles northwest of Round Mountain on road from Round Mountain to Llano.

Wilberns--

7.	Loose fragments composed of rounded quartz grains cemented with a reddish-purple hematite and limonite and some siliceous material. The hematite, in some places, is concentrated into heavy concretions of hematite and iron several inches in diameter.	?
6.	Reddish-brown, crystalline, thin-bedded, glauconitic and fossiliferous limestone. . . .	10'
5.	Thin-bedded, green-grey, sandy fossiliferous limestone.	5'
4.	Glauconitic, medium thin-bedded, fossiliferous limestones.	10'
3.	Pinkish-grey, finely crystalline limestone. .	10'
2.	Medium bedded, coarse-textured, fossiliferous and glauconitic, grey limestone.	30'
1.	Grey-brown, glauconitic, semi-crystalline, non-fossiliferous limestone, grading into Ellenberger limestone below.	?
		65'

The fauna of the Wilberns formation is composed chiefly of brachiopods and trilobites. Numerous fragments of fossils were found, most of which were trilobites. The following brachiopods were noted: Obolus matinalis Hall, O. sp., Linguella sp. The surface of the Wilberns limestone one mile south of Round Mountain at a horizon about 40 feet below the Ellenburger contact contains spheroidal structures which, when viewed in cross section, are from one to five inches in diameter and have faint circular concentric lines slightly resembling the faint growth lines in the cross section of a woody plant. Surrounding these spheroids there is a band from one-half to three-fourths of an inch wide, of a darker colored lime arranged in such a way that the circular blotches are set off in circular frames or coverings. The structure somewhat resembles ancient marl cracks in which the crevices are filled with lime of slightly different color. The spheroids are much too circular and the "frames" too uniform in thickness to represent ancient cracks. These structures may be the result of unexplained concretionary solidification of the lime, or possibly they are of plant origin, most likely algal colonies. In fact, these markings resemble pictures of Eozoön canadense, a peculiar structure in ancient Proterozoic rocks assigned by some geologists to algal origin.

According to Sidney Paige,[1] the Wilberns formation is of upper Croixian age, and is correlated by him with the Reagan sandstone of Oklahoma.

---

[1] Paige, Sidney: U.S.G.S. Folio 183, Llano-Burnett, 1912.

2. Cambro-Ordovician Rocks

Ellenburger Limestone. The Ellenburger limestone in general is a white, hard, crystalline, massively bedded rock. Due to the paucity of bedding planes and lack of horizon markers it is impossible to measure accurately a complete section. Certain differences, however, have been noted and general stratigraphic descriptions worked out for the following localities:

Outcrop of Ellenburger limestone at a fault four and one-half miles northwest of Round Mountain.

2. Massive, finely crystalline white limestone. 500'-700'

1. Nodular white chert in thick layers. . . . 10'-30'

The Ellenburger limestone is faulted down against the overlying Wilberns formation. The lower part of the outcrop is composed mainly of chert which is from ten to thirty feet in thickness. The writer believes that they are near the base of the Ellenburger, since an abundance of chert is common in the lower layers of this formation in many other places. The silica of these yellow cherts has evidently been dissolved out of the associated limestones by warm alkaline waters and reprecipitated in the solution cavities as chalcedony having a boytryoidal form. The cherts weather into a reddish-yellow soil which has many chert nodules lying on its surface. This nodularity is a characteristic feature of this phase of the Ellenburger.

Outcrop of Ellenburger limestone one-fourth mile northwest of Round Mountain on the road to Llano.

1. Coarsely crystalline, whitish grey, extremely porous limestone, about . . . . . . .100'

The surface of the limestone is pitted with deep holes and hollows due to irregularity of solution caused by slight differences in chemical composition of the rock. It weathers into a dark grey, non-fossiliferous rock that is softer and more porous than the fresh Ellenburger. The character of the formation changes as the basal contact of the Ellenburger with the Wilberns is approached, and becomes more like the latter. Because of this gradational contact it is difficult to draw a sharp distinction between the two formations. The dip of the underlying Wilberns is 6° northwest, and the overlying Ellenburger undoubtedly has the same inclination.

Outcrop of Ellenburger limestone west of the fault on Cypress Mill-Round Mountain road.

The Ellenburger formation changes gradually in texture upward from coarse to fine-grained, and since this is a finer-grained rock than that in the last locality described it is evidently higher stratigraphically. The outcrop is a very finely crystalline rock of uniform texture, with an uneven, undulating fracture, weathering on the surface to small pits. The finely friable surface of the limestone is a most distinguishing feature--the surface of the rock weathers to form a fine calcareous powder which comes off in the hand when the rock is rubbed. This peculiar feature is not found in any of the other Paleozoics in this region. The following explanation is suggested: The Ellenburger limestone is composed of magnesium carbonate and calcium carbonate in combination in the form of dolomite, along with calcium carbonate in the form of calcite. An analysis of rock of the Ellenburger formation shows the following chemical composition: silica, 3%; oxide of iron, 1.8%; lime, 28.98%; magnesia, 20.4%; carbonic acid, 43.7%; loss on ignition, 2.46%; total, 100.34%.[2]

---

[2] Phillips, W. B. : "The Mineral Resources of Texas," University of Texas Bulletin No. 365, October 15, 1914, page 84.

Surface waters working on these rocks dissolve out the more soluble calcium carbonate portion of the rock more easily than the magnesium carbonate part, and leave behind the more insoluble dolomitic grains in the form of fine insoluble powder, which gives to the rock its finely friable surface. Upon weathering and further solution of the rock this powdered, insoluble part becomes the sandy soil which characterizes the Ellenburger outcrop. This process can be best observed actually taking place in the rocks exposed 200 yards south of the gin at the intersection of the Marble Falls-Cypress Mill road with the Marble Falls-Round Mountain road. Many blocks of Ellenburger limestone on the south side of the road when broken open show hard, crystalline, unweathered centers grading outward into weathered white, softer, chalky, friable rock at the edge which disintegrates to form fine sand.

No fossils or other evidences of life were found in the Ellenburger formation. On the basis of stratigraphic position and from the evidence of fossil content outside of this area, it is considered by Sidney Paige[3] to be equivalent to a part of the Arbuckle limestone of

---

[3] Paige, Sidney, op. cit.

Oklahoma and the lower Ordovician limestone of the Franklin Mountains.

3. Pennsylvanian

Marble Falls Limestone. The Pennsylvanian system is represented by the Marble Falls limestone. It is composed of dove-colored, grey to dark blue or black limestones interbedded with thin dark blue limestones. Many beds contain abundant nodules and stringers of dark grey, almost black chert. The color of this chert is diagnostic in distinguishing this formation from the underlying Ellenburger, in which the chert is white or yellow when weathered. Approximately 250 feet of the middle portion of the Marble Falls is represented in this region. The lower part has been faulted below the surface, and the upper part has been overlapped by rocks of Cretaceous age. The following sections best illustrate the lithology of the Marble Falls limestone:

Outcrop of Marble Falls limestone from Cypress Creek south to town of Cypress Mill.

5. Sandy, thin-bedded, flaggy, grayish-white, unfossiliferous limestone weathering reddish-brown.	15'
4. Thin-bedded, blue-grey, shaly, fossiliferous limestone.	15'
3. Thick-bedded, dove-colored, fine-textured, limestone containing an abundance of crinoid stems.	15'
2. Very thin-bedded dark blue limestone. . . .	10'
1. Massive grey, unfossiliferous limestone. . .	30'
	85'

This section is probably in the upper one-half of the Marble Falls limestone. The strata dip southeast at an angle of 10°.

Bed number 5 in the above section is very interesting. It has been altered from the underlying thin-bedded blue limestones by weathering processes into a sandy, white, almost chalk-like limestone.

The actual transition is seen on the broken surface of many of the flags. The unaltered inner horizon is dark grey to black and finely crystalline. The altered portion grades from dark grey at the center to white near the edge, and the surface of the altered portion changes to a reddish-brown color. The altered portion is non-crystalline and unfossiliferous, although the bedding lines are to be seen in the weathered portion as well as in the original rock. The cause of this phenomenon is not clear, but it may be due to acid surface waters which penetrate the surface of the lime and react with the more soluble constituents.

Locality north of Cypress Creek at Cypress Mill.

1. Light grey, very fine-grained massively bedded crystalline limestone containing veins of impure calcite. . . . . . Thickness undetermined.

The rock in this locality was examined in detail. On account of its ill defined bedding, and the fact that the whole outcrop could not be mapped without proceeding outside our area, the thickness of the formation was not measured. The limestone breaks with a subconchoidal fracture, and weathers into large blocks of dark grey color, having finely pitted surfaces. In places the ledges are jointed. The most prominent set of joint planes trends N. 30° W.

Locality at crossing of the Cypress Mill-Marble Falls road by Double Horn Creek.

1. Light grey, crystalline, fossiliferous limestone closely resembling outcrop north of Cypress Creek but containing more stringers of chert. . . . Thickness undetermined.

The ledge is cut by two systems of joints. One system extends N. 30° E. like those at Cypress Creek; the other runs nearly due north. Both this and the outcrop north of Cypress Creek are thought to belong near the middle of the formation, because when this ledge is traced down the creek beyond the limit of the area mapped, it passes beneath upper thin-bedded layers of Marble Falls known to belong to the upper one-third of the formation. The thin-bedded layers which overlie the massive beds dip 12° N. 30° E.

The following fossils were collected:

Productus sp.
Productus cora D'Orbigny
Productus morrowensis Mather
Horn-shaped coral resembling Campophyllum torquium Owen
Numerous crinoid stems
Worthenia sp. ?
Euomphalus sp.?
Small gastropods closely resembling Loxenema? sp.[4]

---

[4] Plummer, F.B. and Moore, R.C.: "Stratigraphy of the Pennsylvanian Formations of North-Central Texas," University of Texas Bulletin No. 2132, June 5, 1921, page 80.

Other gastropods which have not been described as far as the writer knows.

4. Cretaceous

The Cretaceous was not studied in any detail in this area, since the subject of this thesis has to do with the Paleozoic rocks only.

IV. STRUCTURE

1. Regional Structure

The regional structure of the Paleozoic rocks of this area as worked out by measuring dips on the Marble Falls and Ellenburger limestone is that of a monocline dipping northeast and east, broken and interrupted by faults and folds. The details of the regional structure are shown on the accompanying map and cross sections.

2. Faulted Structure

Four major faults and two minor ones have been mapped in this area. The major faults trend N. 40° E. No good exposures of the fault planes were discovered. From the straightness of the outcrop, and the fact that most of the faults outside this area are nearly vertical, it is concluded that these four faults probably have vertical displacements. The maximum amount of throw is estimated to range from 600 to 1000 feet. In most of the faults the maximum displacement is at the north end and minimum at the south, so that the amount of slipping decreases and plays out to the south.

Slick Rock Creek fault is located in the northwest corner of the area. It trends in a northeast-southwest direction, is about two miles long, and brings the Wilberns formation on the west in contact with Ellenburger on the east. The amount of throw is less than 100 feet.

Shovel Mountain fault is located in the northeast corner of the map. It trends N. 40° E. and has been mapped a distance of three and one-half miles. It extends northeast for a long distance into the Burnett quadrangle, and at its south end disappears beneath the overlying Cretaceous strata. It has a displacement of at least 600 feet and brings the upper part of the Ellenburger in contact with middle Marble Falls limestone.

Round Mountain fault is located in the central part of the area. It trends N. 65° E., and could be traced for about one mile. It is probable, however, that this fault is a southwest extension of the

Shovel Mountain fault. Because of the covering of overlying Cretaceous rocks that occupy the divide between Shovel Mountain and Round Mountain it was impossible to trace the fault line between the two exposures. This fault brings the Wilberns formation on the west in contact with the Ellenburger on the east and has a throw estimated to be thirty feet.

A fault two miles west of Cypress Mill is indicated on the map. It trends N. 10° E. for a distance of one mile, where it is covered by strata of Cretaceous age. It brings Ellenburger limestone on the west in contact with upper Marble Falls limestone and therefore has a displacement of at least 500 feet, possibly more.

Two minor faults are located south of the town of Cypress Mill. They extend in a northeast direction for about one-half mile and have throws of fifty or sixty feet, each bringing middle Marble Falls limestone on the northwest in contact with upper layers of the same formation on the southeast.

3. Folded Structure

Two folds occur in this area. One is located in the northwest corner of the area west of Slick Rock Creek, and the other, one mile southwest of Round Mountain. The fold west of Slick Rock Creek has its axis trending N. 45° E. and plunges northward. Along this fold the Wilberns formation is brought up to the surface and dips beneath the overlying Ellenburger rocks on the west, north, and east. On the east side of the axis the dip is 4° to the southeast, and on the west side about 2° to the northwest. The fold southeast of Round Mountain is a faulted anticline or dome in which the Wilberns formation outcrops in an area about two miles long east and west, and one mile wide north and south. The south side is bounded by a fault which has its down throw side on the southeast. North of the fault the Wilberns formation dips northeast at an angle of about 6°. South of the axis in the area covered by Cretaceous rocks the Wilberns dips apparently southeast and dips beneath the Ellenburger, which outcrops south of the area mapped.

4. Origin of the Structure

The Paleozoic rocks apparently owe their structure to a broad arching of the strata. As a result of differentiated movements of the underlying material, the arch of Paleozoic rocks above broke or collapsed along vertical lines, forming the faults and associated folds that are shown on the accompanying map.

V. GEOLOGIC HISTORY

After the granite intrusion and mountain making epoch of the late Proterozoic,[5] central Texas was subjected to a long period of erosion

[5] Schuchert, C.: Textbook of Geology, Pt. II, page 165.

and complete peneplanation. Then the Croixian seas of upper Cambrian time invaded the area. The direction from which these seas came and the source of sediments is rather doubtful. The Wilberns was laid down in a shallow, shifting sea, as evidenced by 1) great amount of glauconite; 2) unusual haphazard arrangement of fossils, indicating possible wave action; 3) irregularity in bedding planes, which are vary wavy locally; 4) general character of the formation.

The abundance of life and presence of algal deposits imply mild, equitable climates.

From evidence obtained outside this area,[6] the sea seems to have

[6] *Ibid*.

been in a narrow trough extending from the Arbuckle Mountains of Oklahoma through the central Texas region here described and on into the present mountains of west Texas.

This shallowness of middle Wilberns time gave way to relatively deeper waters, as shown by the bedded limestone at the top of the formation.

Then there seems to have been a widening of the trough area and possible clearing up of the seas, and Ellenburger was laid down conformably on the Wilberns. The lower Ellenburger, according to Dr. Ulrich, is upper Cambrian in age, while the upper Ellenburger is definitely Ordovician in age, probably Beekmantown.[7] Paleontologic

[7] Paige, Sidney, *op*. *cit*,, page 54.

evidence is almost totally lacking in this area, so it is futile to advance any theories on the obscure sedimentation of Ellenburger time.

The intervening periods between Ordovician and Pennsylvanian are not represented in this region. Sidney Paige,[8] Charles Schuchert, and

[8] Paige, Sidney, op. cit.; Schuchert, C., op. cit.; Chamberlin, T.C.: Geology, Vol. II, 1923.

T. C. Chamberlin believe that they were not deposited here.

The next epoch of which we have any record is lower Pennsylvanian. At the beginning of the Pennsylvanian period the underlying Ellenburger surface was evidently rather featureless, as shown by the character of the Marble Falls sediments; namely, 1) even texture of the Marble Falls; 2) even bedding; 3) lack of any unusual conglomerate at its base. The character of these limestones indicates a shallow, quiet Carboniferous sea with the upper black shales suggesting lagoonal conditions. Though Pennsylvanian strata both earlier and later than these may have been deposited in this region, there is now no evidence of them.

Folding and faulting were marked accompaniments of the uplift which closed the Paleozoic era. The faulting occurred after Marble Falls time and before Strawn, for in the region north of this area the undisturbed Strawn overlaps the faulted Marble Falls.[9] The area

[9] Plummer, F. B. and Moore, R. C., op. cit., page 205.

was subjected again to erosion during Permian, Triassic and Jurassic time. Cretaceous rocks are laid down nearly horizontally on the folded, faulted, and eroded Paleozoics. Since the Cretaceous period the area has suffered a long, continuous process of erosion until the present. In places the Cretaceous strata have been entirely removed and the underlying Paleozoic rocks exposed over about one-third of the area.

B I B L I O G R A P H Y

Chamberlin, T. C.: Textbook of Geology, Part II, 1923.

Paige, Sydney: U.S.G.S. Folio 183, Llano-Burnett, 1912.

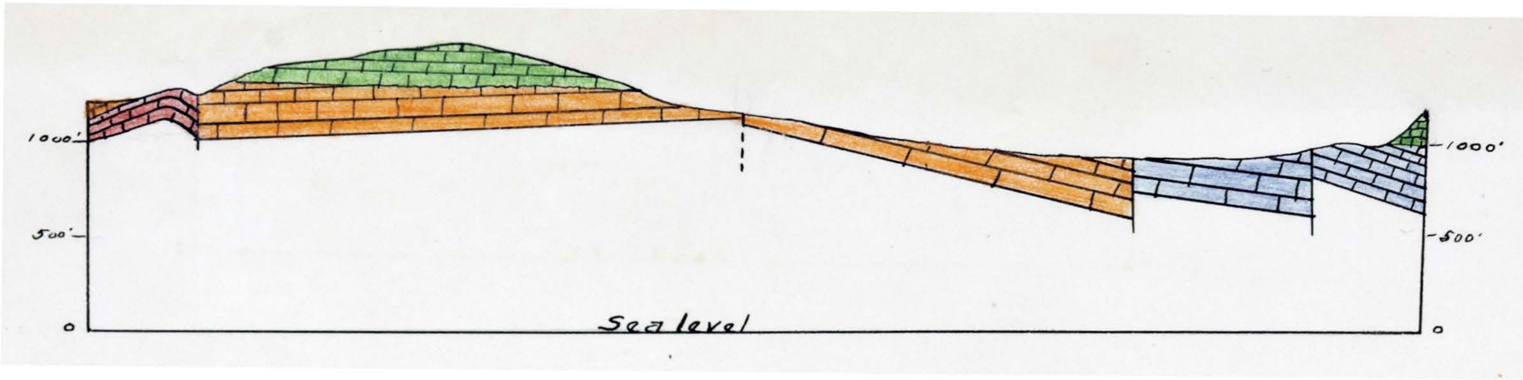
Phillips, W. B.: "The Mineral Resources of Texas," University of Texas Bulletin 365, 1914.

Plummer, F. B. and Moore, R. C.: "Stratigraphy of the Pennsylvanian Formations of North Central Texas," University of Texas Bulletin 2132, Austin, 1921.

Schuchert, Charles: Textbook of Geology, Part II, 1924.

Willis, Bailey: "Index to the Stratigraphy of North America," U.S.G.S. Proffessional Paper 71, Chapter III, Washington, 1912.

Cross-section along line A-A'

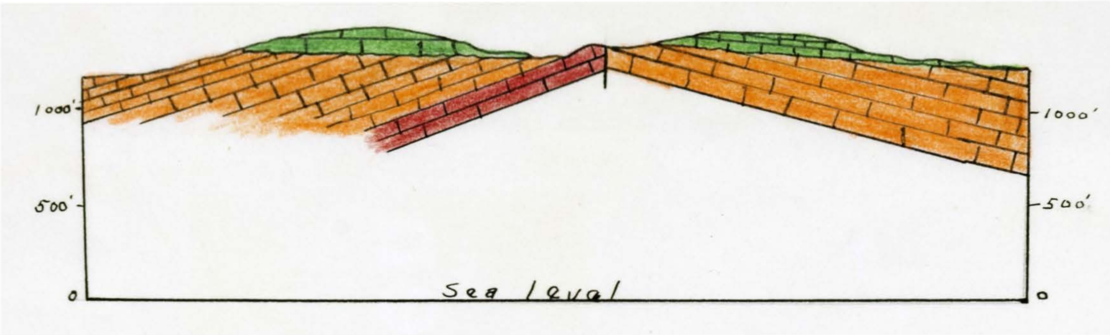


Horizontal scale 1" = 2 miles

Vertical scale 1" = 1000'

See Areal Map for location

Cross-section along line B-B'



Horizontal scale 1" = 2 miles

Vertical scale 1" = 1000'

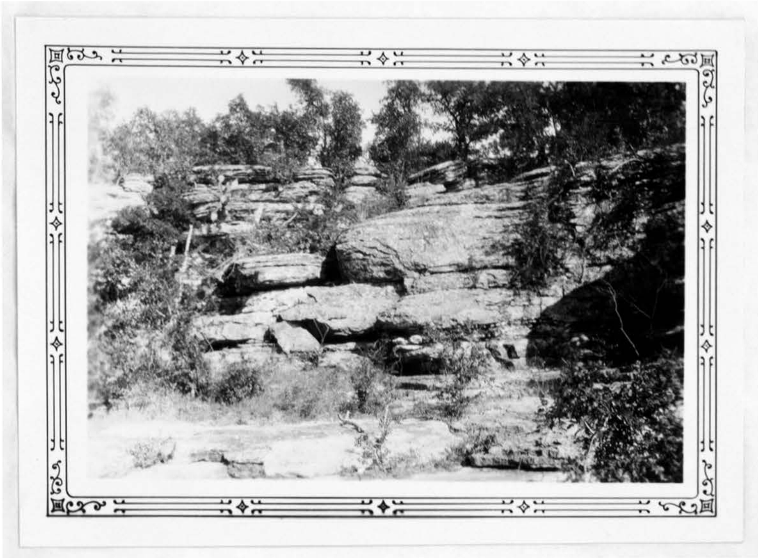
See Areal Map for location.

Outcrop of the Wilberns formation showing the massive glauconitic limestone ledge with the underlying yellow clayey shale--1 mile south of Round Mountain.

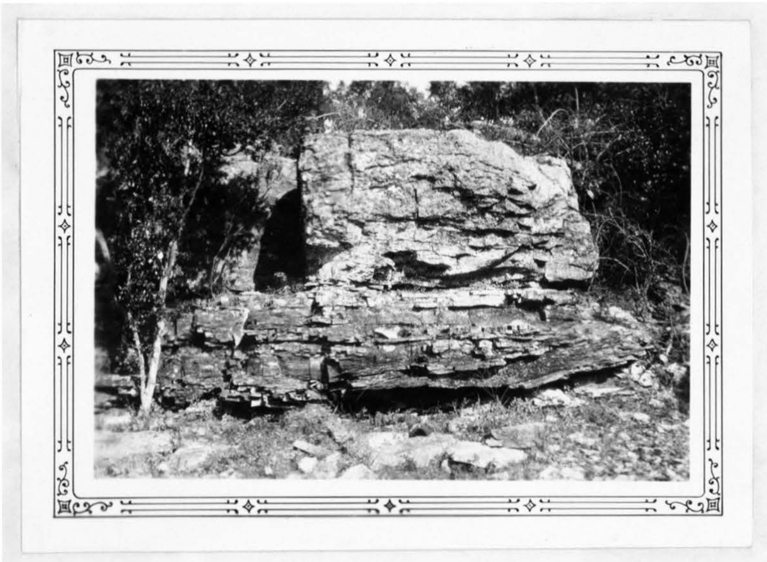
Outcrop of Ellenburger limestone showing the smooth, friable, white surface of the weathered rock--3 miles east of Round Mountain on the road to Cypress Creek.

Outcrop of coarsely crystalline, porous Ellenburger limestone--one-fourth mile northwest of Round Mountain.

Outcrop of massive Marble Falls limestone--on Cypress Creek one-fourth mile below Cypress Mill.



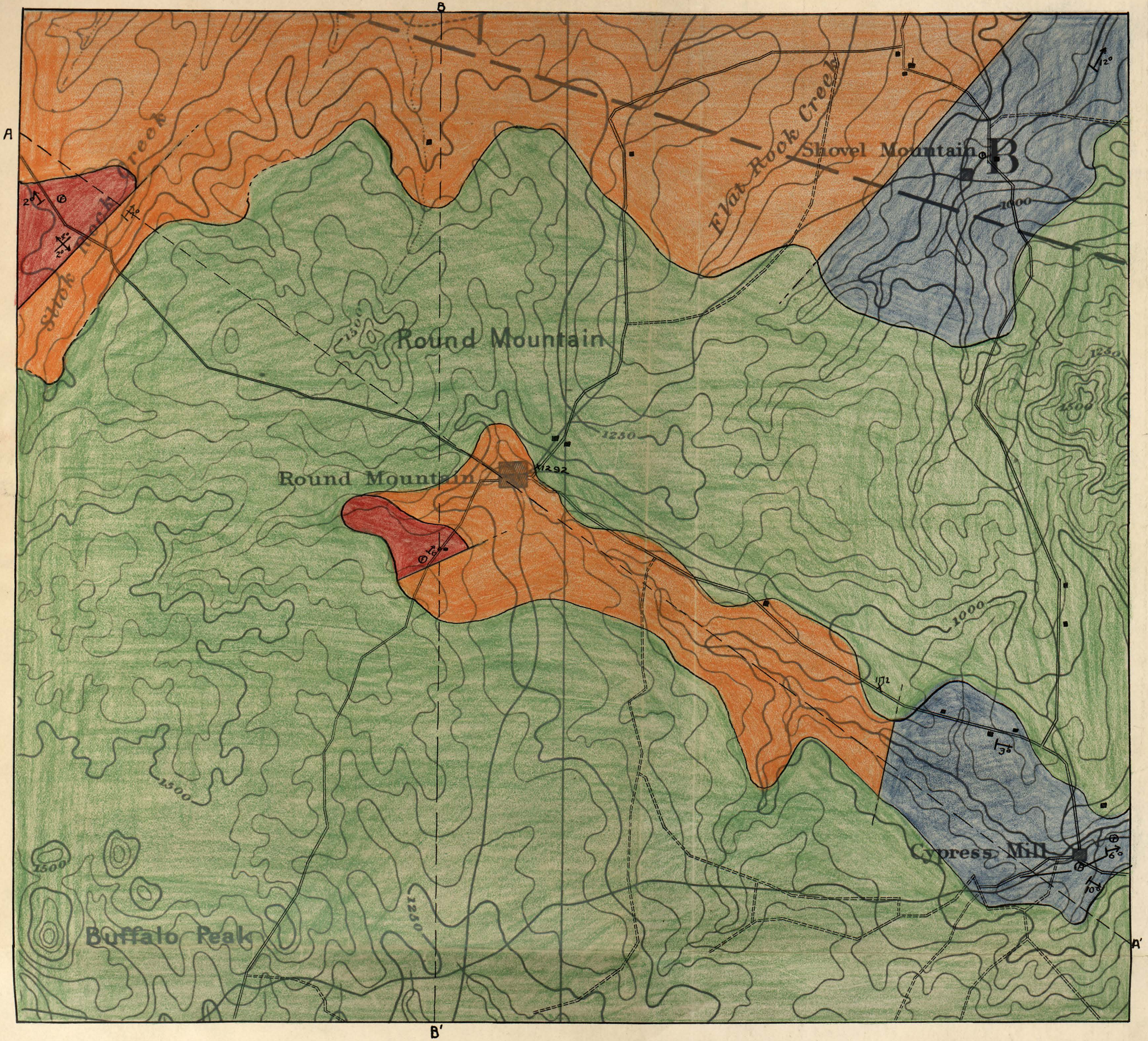
Outcrop of massive Marble Falls lime-
stone--on Cypress Creek one-fourth
mile below Cypress Mill.



Outcrop of massive Marble Falls lime-
stone--on Cypress Creek one-fourth
mile below Cypress Mill.

Outcrop of thin-bedded, blue-black limestone with the overlying reddish-brown shales--in creek one-fourth mile south of Cypress Mill.

AREAL GEOLOGY



LEGEND

CRETACEOUS Undifferentiated

PENNSYLVANIAN Marble Falls

CAMBRO-ORDOVICIAN Ellenburger

CAMBRIAN Wilberns

1st Class Roads

2nd " "

Trails

Faults

X Bench Mark

■ House

(F) Fossil locality

Scale 1" = 1 mile

Contour Interval 50'

W. T. Hancock

May, 1929.