SOAPSTONE OF NORTHEASTERN GILLESPIE COUNTY, TEXAS

MINERAL RESOURCE SURVEY
Circular No. 55

Prepared By

The Statewide Mineral Resources Survey
Service Division
Work Projects Administration

The University of Texas
Bureau of Economic Geology
Official Sponsor

Published By

The University of Texas
Bureau of Economic Geology
December 1942
/Stencils recut March 1958/

THE UNIVERSITY OF TEXAS
BUREAU OF ECONOMIC GEOLOGY

MINERAL RESOURCE SURVEY
Circular No. 55
/Stencil Recut March 1958/

The information in this circular was partly obtained from work carried on by a unit of the WPA Statewide Mineral Resources Survey Project, sponsored by The University of Texas, Bureau of Economic Geology. The purpose of this survey is to assemble information concerning the mineral resources of Texas and make it available to the public. It is hoped that this information will be a contribution to the industrialization of the State.

SOAPSTONE OF NORTHEASTERN GILLESPIE COUNTY TEXAS */

By Virgil E. Barnes and R. W. Mathis

Introduction

A geologic map and a bulletin describing the geology and mineral deposits of Gillespie County, Texas, is being prepared. Awaiting completion of this map and bulletin, abbreviated mimeographed circulars describing the more important mineral deposits are being issued.

The field work for a map of the area, using aerial photographs for a base, was completed prior to the detailed mapping of soapstone recorded here. The scale of the photographs was too small to permit recording of all the small soapstone deposits. The Work Projects Administration unit (W.P.18926), inaugurated to investigate the gypsum of Gillespie County,1/ was transferred, when the gypsum project was finished, to work on soapstone. The unit was used to dig trenches and to furnish a rodman for making a detailed map of the area under the supervision of the junior author.

Soapstone is found in pre-Cambrian rocks over much of the Central Mineral region of Texas. The deposits with the greatest economic possibilities, however, are located mostly in northeastern Gillespie County. The southern end of the soapstone area is 24 miles from Fredericksburg and 9 miles from Willow City. The nearest railroad is at Marble Falls in Burnet County, a distance of 27.3 miles by the most direct but least improved route. The distance by road via Round Mountain is 30 miles, of which 10.5 miles are paved. The soapstone deposits examined are located on the Nolen Althaus, Alfred Davis, and W. O. Davis properties.

Stratigraphy.--The area mapped is entirely within a complex of pre-Cambrian rocks. The units have been named by Paige.2/ In addition to those named by Paige, Big Branch gneiss has been mapped in Gillespie County.3/ This formation will be more fully described in the detailed publication on Gillespie County.

---

*/ Assistance in the preparation of these materials was furnished by the personnel of Work Projects Administration Official Project No. 265-1-66-214.

1/ Barnes, V. E. Gypsum in Gillespie County, Texas: Univ. Texas, Bur. Econ. Geol., Min. Res. Sur. Cir. 54, 7 pp., map, December, 1942.

2/ Paige, Sidney, Description of the Llano and Burnet quadrangles: U. S. Geol. Survey Geol. Atlas, Llano-Burnet folio (No. 183), pp. 3-5, 1912.

3/ Barnes, V.E., Map of Cut Off Gap, Gillespie County, Texas, accompanying itinerary of Excursion 4: Geol. Soc. Amer., Excursions, 53d Annual Meeting, December, 1940.

Soapstone

Field data.--A plane-table map of the soapstone area located on the Nolen Althaus, Alfred Davis, and W. O. Davis properties was made to a scale of 1 inch equals 200 feet and with a contour interval of 20 feet. This map will be published at a later date. The soapstone-bearing area is about 2-3/4 miles long and extends north and south except at the south end where it swings to the east. One hundred and eight trenches were dug across the soapstone and associated rocks, and cross sections were made of them.

The soapstone outcrops as several hundred masses or lenses arranged in long belts which occasionally split into two prongs or form clusters of lenses. The soapstone is associated with mica-, chlorite-, tremolite-, and feldspathic schists, serpentine, and dark gray gneiss. Vermiculite and chlorite bands occasionally mark the contact between the soapstone and bounding schists. The soapstone lenses approach the vertical in position, with deviations rarely as much as 30 degrees. The mineral alignment of the enclosing rocks suggests that the soapstone lenses are ellipsoids and that the maximum dimension will be at an angle of 45 to 60 degrees from the horizontal, dipping to the south. The surface cross sections of the soapstone lenses range from 2 by 6 feet up to 80 by 195 feet.

Tonnage.--The soapstone tonnage is estimated by using the surface dimensions of the lenses, an assumed depth of one-third the surface length, and a specific gravity of the soapstone of 2.80 (averaged from 8 samples). The tonnage for the entire area, using these values, is 660,000 short tons. The W. O. Davis property contains about 470,000 tons, and the Alfred Davis and Nolen Althaus properties contain about 190,000 tons. This tonnage estimate is very conservative since the long dimensions of the lenses dip between 45 and 60 degrees and are considerably greater in length than the longest surface dimension.

Mineralogy of soapstone and associated rocks.--The mineral composition of the soapstones was estimated by microscopic examination of representative powdered samples from each locality sampled. The abundance of each mineral is given by the following symbols in Table I: (X) indicates the predominant mineral, and where two minerals are approximately equally abundant this symbol is used for both; (/) indicates an appreciable amount of a mineral; and (-) indicates that a mineral is present but probably less than 5 percent in amount. One column in the table is headed "Grit." The samples were ground in an agate mortar and the degree of grittiness estimated and indicated by relative terms, such as (X), very gritty; (/), gritty; and (-), slightly gritty. One column in the table is devoted to color. All of the samples are colored even when ground and range from very light buff to very light green in color; the symbols for color are explained as a footnote to the table. Table I is arranged geographically with the samples from the southern end of the area listed first.

This table shows a wide variation in mineral composition with talc and tremolite being the most common and abundant minerals. Chlorite and magnetite are present in practically all of the samples in about the same amounts with chlorite occasionally being prominent. Calcite is present in considerable amounts in 4 samples and in small amounts in 3 others. Serpentine is abundant in two samples and a small amount is contained in another. The table also shows an improvement in grade, with the talc content increasing from south to north.

Table I. Mineral composition, grittiness, and color of northeastern Gillespie County soapstones. 4/

Sample No.	Talc	Tremolite	Chlorite	Magnetite	Calcite	Serpentine	Grit	Color
1	X	/	-	-			/	B
2	/	X	-	-			X	Buff
3	/	X	-	-			X	B
4	X	X	-	-			/	BG
5	X	X		-			-	B
6	/	X	-	-	/		/	B
7	-	X			X		/	BG
8		X	-		/		/	B
9	-	X	-	-	-		X	B
10		X	-	-	/		X	B
11	X	/	-	-				B
12	X	/	-	-			-	G
13	/	X	-	-			-	B
14	/	X	-	-			-	B
15	/	X	-	-			/	B
16	X	X	/	-			-	B
18	X	X	-	-			-	BG
19	X	X	-	-			/	BG
20	X	X	-	-			-	GB
21	X	X	-	-			-	GB
22	X	/	-	-				GB
23	X	/	-	-			/	B
25	/	X	/	-			/	Brown
26	X	/	-	-				GB
27	X	-	-	-			-	GB
28	X	/	-	-			-	BG
29	X	-	-	-			-	BG
30	X	/	-	-			/	GB
31	X	/	-	-			/	GB
32	X	/	-	-			X	GB
33	X	/	-	-			/	GB
34	X	/	-	-			-	GB
35	X	X	-	-			/	GB
36	X	/	-	-			/	GB
37	/	X	-	-			/	Buff
38	X	-	-	-			-	GB
39	X	/	-	-			/	BG
40	X	/	-	-			-	BG
41	X	X	-	-			-	GB
42	/	X	-	-			/	BG
43	X	/	-	-			/	BG
44	X	/	-	-			/	BG
45	X	-	-	-			-	GB
46	X	/	-	-			-	B
47	X	X	/	-			/	G
48	X	/	-	-			-	G
49	X	X	-	-			-	GB
50	X	X	-	-			-	GB
51	X	/	-	-			/	G
52	X		-	-			-	GB
53	X	-	-	-			-	BG
54	X	-	-	-			-	BG
56	X	-	-	-			-	B
57	X	-	-	-			-	BG
58	X	/	-	-			-	GB
59	X	/	-	-			-	BG
60	X		-	-			/	BG
61	X	-	-	-			-	BG
62	X	/	-	-			/	BG
63	X	/	-	-			-	BG
64	X	/	-	-			/	GB
65	X	X	-	-			-	BG
66	X	X	-	-			/	G
67	X	/	-	-			/	BG
68	X	-	/	-			-	G
69	X	/	-	-			/	BG
70	X	/	-	-			-	BG
71	X	/	-	-			/	BG
72	X	/	/	-			-	G
73	X	X	-	-			/	BG
74	X	/	-	-			/	B
75	X	/	-	-			/	G
77	/	X	-	-			/	G
78	X	/	-	-			/	G
80	X	/	-	-			/	GB
82	X	X	-	-		-	-	GB
83	X	/		-		/	-	BG
84	X	-	-	-	-		-	G
85	/	X	-	-			/	GB
86	X	/	-	-				G
87	X	/	-	-			-	BG
88	X	-	-	-			-	GB
90	X	-	-	-			/	G
92	X	/	-	-	-		/	G
93	X	/	-	-			/	BG
95	X	/	-	-			-	BG
96	/	-		-		X	?	Buff
98	X	-	-	-			-	BG
99	X	-	-	-			X	BG
A3	X		-	-			-	GB
A4	X	/	-	-			-	BG
A5	X	-	-	-			/	BG

Table I, continued.

Sample No.	Talc	Tremolite	Chlorite	Magnetite	Calcite	Serpentine	Grit	Color
A7	X	-	-	-			-	BG
A8	X	-	-	-			-	B
A9	X	-	-	-			-	BG
B4	X	-	-	-			-	GB
B5	X	-	-	-			-	B
B6	X	/	-	-			-	GB
B7	X	X	-	-			-	B
B8	X	-	-	-			-	B
B9	X	-	-	-			-	BG
C1	X	-	-	-			-	B
C2	X	/	-	-			-	GB
C3	/	X	/	-			/	B
C4	X	/	-	-			-	B
C5	X	-		-			-	B
C6	X	/	-	-			-	B
C7	X	-	-	-			-	GB
C8	X	-		-			-	B
C9	X	-	-	-			/	GB
D1	X	-	-	-			-	GB

4/ Explanation of symbols: (X) = predominant. (Under "Grit" = very gritty.)
(/) = considerable. (Under "Grit" = gritty.)
(-) = small amount. (Under "Grit" = slightly gritty.)
(B) = very light buff.
(GB) = very light greenish buff.
(BG) = very light buffish green.
(G) = very light green.

Table I also states a relative estimate of the grittiness detected during grinding of the samples in an agate mortar. Only 4 samples appear to be completely free of grit, 59 contain a small amount of grit, 41 contain a medium amount of grit, and 6 are very gritty. Some of the grittiness is caused by magnetite which could easily be removed by an electric separator. The tremolite also contributes to the grittiness in some samples. The tremolite crystals vary considerably in shape, some being short and blocky and others being in long thin needles. The short blocky crystals offer more resistance to grinding, producing the most grittiness.

The color of the samples ranges from a very light green to a very light buff. It seems likely that the buff color is caused by weathering and that fresh material will be green.

Origin of soapstone.--The soapstone is almost entirely within the Packsaddle schist and is considered to have been originally a calcareous sediment within the Packsaddle series. The steps involved in the change appear to be roughly: (1) metamorphism of impure dolomites and limestones into tremolite schist and (2) alteration of the tremolite in part at least to talc. Numerous examples are present in the area of tremolite-dolomite or tremolite-calcite masses, which are interpreted as having been originally somewhat more pure calcareous sediments which did not contain sufficient silica to change entirely to tremolite during metamorphism. Microscopic examination of powdered samples reveal many tremolite needles partly altered to talc. In some the alteration is at the ends of the needle and others irregular zones of alteration cross the needles.

Uses of soapstone.--Soapstone has a great number of uses. However, any one deposit may not be suitable for all the uses enumerated. Johnson 5/ lists the following uses for ground talc, pyrophyllite, and soapstone:

> "Talc serves the paint industry principally as an extender, although in some paints it is the principal pigment. The fibrous talc (asbestine), a mixture of tremolite fibers and talc, is used largely in cold-water paint, the fibers of tremolite bonding the paint film. Flake talc and pyrophyllite are also incorporated in paints.
>
> "White, fine-grained talcs are used for loading the better grades of paper. The low-priced, off-color, low-grade talcs and pyrophyllite are used to form an inert, fireproof, weather-resisting coating for roofing papers.
>
> "Talc and pyrophyllite enter the ceramic industry in considerable quantities. Calcined talc ('lava') meets the special requirements of the electrical and refractory industries, being sold either as calcined sawed and machined block material or compounded from talc and silicate of soda, and then pressed into blocks and calcined. An important use of talc in the ceramic industry is in the preparation of sagger bodies. Considerable quantities of talc are sold to wall-tile and whiteware manufacturers, who also utilize pyrophyllite.
>
> "Various industries needing fillers utilize talc, pyrophyllite, and ground soapstone. Rubber manufacturers are said to take the largest amounts for use either as a filler or as a lubricant. Smaller quantities are used by the makers of asbestos goods, floorings, wall plasters, insecticides, ropes, and plastics.
>
> "The lubricating properties of talc, pyrophyllite, and ground soapstone are utilized in many industries. Manufacturers of cup greases, foundry castings, rubber tires, bottles, and candy and users of box-nailing machinery and dies of various kinds consume small quantities.
>
> "Talc is the principal base in various toilet preparations, but this use is very small compared with total talc consumption. Some pyrophyllite has been used. Fine, pure-white material is required for this use.
>
> "Talc is used for abrasive or polishing purposes where the material to be polished is soft, such as peanuts or coffee beans, or where the dirt is to be removed drom a soft underlying material, such as marble or lacquer."

5/ Johnson, B. L., Marketing talc, pyrophyllite, and ground soapstone: U. S. Bur. Mines, Inf. Cir. 7080, pp. 2-3, 1939.

Soapstone is used in limited quantities as a building material. Because of its physical properties, resistance to weathering, chemical stability, workability, and light color, it is admirably fitted for making laundry tubs, sinks, aquariums, wainscoting, mantels, baseboards, stair treads, tiles, spandrels, laboratory table tops and sinks, hoods, ovens, acid tanks, vats, trays, development tanks for photographs and blue prints, drains, and furnace blocks. Some soapstones are desirable for electrical insulation units such as switchboards, panels, barriers, fuse guards, or shelving, and similar products. Soapstone resists and retains heat to a high degree and for this reason is used for griddles, foot warmers, fireless cooker stones, and for linings of fireplaces, hearths, and furnaces.

The soapstone of this region has been used mostly for fireplace and hearth linings with very satisfactory results. A use not noted above, which was common in this area before the introduction of modern gates, is the use of soapstone as bearing blocks for pole gates.

The following table, Table II, enumerating the amount of soapstone used by the chief soapstone-using industries of the United States is compiled from the U. S. Bureau of Mines Minerals Yearbooks for 1939 and 1940.

Table II. Talc, pyrophyllite, and ground soapstone sold in the United States, 1937-1939, by industries.

Industries	1937		1938		1939	
	Short tons	Percent of total	Short tons	Percent of total	Short tons	Percent of total
Paint	59,660	26	53,506	25	67,859	27
Ceramics	29,793	13	29,590	14	38,407	15
Paper	32,127	14	25,329	13	30,177	12
Roofing	23,551	10	27,607	13	30,516	12
Rubber	26,941	12	25,374	12	31,078	12
Toilet preparations	4,340	2	5,970	3	9,672	4
Foundry facings	3,228	1	2,511	1	3,986	2
Other uses */	28,265	12	20,732	10	12,918	5
Not reported	22,094	10	20,156	9	29,363	11
Total	229,999	100	212,775	100	253,976	100

The soapstone of central Texas will meet the requirements for many of the above uses. However, insufficient testing and grading have been done to specify the uses for which the various types are especially suited. The grades of soapstone vary widely, and any concern contemplating production should submit samples to prospective purchasers of the material.

The U. S. Bureau of Mines Minerals Yearbook for 1940, page 1325, contains the following statement:

> "There are no generally accepted standard specifications, but the largest quantity of talc is sold on the basis of previously satisfactory material or plant tests. Chemical analyses are of interest, but physical tests pertinent to the particular trade, such as size and shape of grain, color, slip, retention, oil-absorption index, bonding strength, melting point, and vitrification range, usually are more significiant."

*/ Includes crayons, bleaching, insecticides, plaster, textile, and other minor uses.

The mineral composition of the central Texas soapstones varies widely. Therefore, an industry based on soapstone in this area will have a wide choice of raw materials.

Sales and prices of soapstone.--The U. S. Bureau of Mines Minerals Yearbook for 1940, page 1324, contains the following table, Table III, showing the amount and value for a five-year period, by classes.

Table III. Talc, pyrophyllite, and ground soapstone sold by producers in the United States, 1935-39, by classes.

	Crude		Sawed and manufactured		Ground		Total	
Year	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
1935	10,725	$57,259	841	$63,211	161,150	$1,727,585	172,716	$1,848,055
1936	10,910	59,556	618	90,542	204,663	2,193,073	216,191	2,343,171
1937	11,087	52,750	1,101	111,680	217,811	2,397,323	229,999	2,561,753
1938	13,498	72,845	1,729	70,268	197,548	2,159,447	212,775	2,302,560
1939	15,722	82,188	1,871	77,915	236,383	2,540,731	253,976	2,700,834

Johnson[6/] reviews the prices on talc, pyrophyllite and ground soapstone as follows:

"Talc is a relatively low-priced commodity. The average value per ton of all grades of talc, pyrophyllite, and ground soapstone, f.o.b. mills, in the last 10 years has ranged between $10.43 and $12.50 a short ton, dropping from the latter figure in 1928 to the former in 1933 and rising to $11.14 a ton in 1937. Talcs suitable for manufacturing into blanks for insulators and gas burner tips ('lava-grade' talc) and for making crayons and pencils command the highest prices. High-grade 'lave talc', lumps, may sell for as much as 6 cents a pound, and the various forms of sawed talc are said to sell generally for at least $100 to $150 a ton, but some of these materials are reported at times to have sold as high as $800 a ton.

"Prices on other kinds of domestic talc, pyrophyllite, and ground soapstone are generally much lower. Virginia crude is quoted at $4 a ton. Domestic ground talcs, except toilet grade, normally range in price between $4 and $20 a ton, according to quality and fineness. Much domestic roofing talc, 20 to 50 mesh, is said to have sold as low as $4 a ton f.o.b. mill. Quotations on finer-ground domestic talcs, f.o.b. works, carload lots, are about as follows in 1939:

Virginia talc, 200 mesh - - - - $4.75 - $5.50
Virginia talc, 325 mesh - - - - $6.25 - $7.00
Georgia talc, 200 mesh - - - - $6.00
Georgia talc, 300 mesh - - - - $7.50 - $10.00
Vermont talc, 200 mesh - - - - $8.00 - $14.00
New York talc, 325 mesh - - - -$11.00 - $17.00
California - - - - - - - - - -$17.00 - $20.00

"Ground soapstone is generally quoted around $5 a ton for 200 mesh and up to $7 a ton for 325 mesh f.o.b. Virginia plant. Vermont soapstone quotations f.o.b. plant are about $10 to $12 a ton.

6/ Johnson, B. L., op. cit., pp. 6-7.

"Current price quotations of talc, pyrophyllite, and ground soapstone are carried in the following trade journals:

1. Oil, Paint, and Drug Reporter (weekly)
2. Engineering and Mining Journal (monthly
3. Chemical Industries (monthly)
4. Chemical and Metallurgical Engineering (monthly)
5. Canadian Chemistry and Process Industries (monthly)

"Soapstone quotations are carried in Chemical and Metallurgical Engineering and pyrophyllite quotations in the Oil, Paint, and Drug Reporter. The basis for the quotations and also the prices vary considerably in the different journals.

"No current prices on crude (except Virginia crude) or sawed and manufactured talc or pyrophyllite are carried in the trade journals, quotations being obtainable only from producers, manufacturers, or dealers in these materials."

E & M J Metal and Minerals Markets, November 12, 1942, carries the following quotations on talc:

"TALC--Per ton, carload lots, f.o.b. works, containers included unless otherwise specified:

"Georgia: 98 percent through 200 mesh, gray, $6; white, $8, packed in paper bags.

"New Jersey: Mineral pulp, ground, $8.50 @ $10.50, bags extra.

"New York: Double air-floated, short fiber, 325 mesh, $12 @ $15.

"Vermont: 100 per cent through 200 mesh, extra white, bulk basis, $11.00; 99½ percent through 200 mesh, medium white, $9.50 @ $10.50. Packed in paper bags, $1.50 per ton extra.

"Virginia: 200 mesh, $5.50 @ $6.25; 325 mesh, $7.00 @ $7.75; crude, $4.25."

As can be seen by a study of the foregoing sales and prices, ground soapstone, pyrophyllite, and talc constitute about 93 percent of the United States sales and averages about $10.75 per ton. This total average includes high priced, high grade white talcs, of which there is none known in the Central Mineral region. Crude materials sold, about 6 percent of the United States sales, averages $5.25 per ton. Soapstone is a low priced commodity, and considering the location of the Gillespie County deposits 30 miles from the nearest railroad, the small average size of each lens, and the uncertain quality of the material, it is apparent that the royalty to the landowner must be low on a per ton basis if the soapstone is to be produced.

The largest markets for soapstone are in the northeastern United States and along the Pacific Coast. These areas are capable of producing all the soapstone required locally. Consequently, higher transportation charges will prevent central Texas soapstone from competing. The use of central Texas soapstones will, therefore, be limited to a small group of Southern States.

Buyers of soapstone.--Johnson[7] lists "Buyers of unmanufactured talc, pyrophyllite, and soapstone." "Buyers of ground talc, pyrophyllite, and soapstone," "Unclassified reported buyers of talc, pyrophyllite, or ground soapstone" and "Buyers of soapstone." The last group is here listed for ready reference.

California: Commercial Minerals Co., San Francisco
Pacific Minerals Co., Ltd., Richmond

Illinois (Chicago): Jas. B. Clow & Sons, 2338 So. Western Ave.
Jas. H. Rhodes & Co., 153 W. Austin Ave.

Michigan: Cummings, Moore Graphite Co., 1636 Green Street, Detroit

Missouri: D. C. Adams Crayon Mfg. Co., 125 Market St., St. Louis

New York: Insulation Mfg. Co., Inc., 15 New York Ave., Brooklyn

New York City: The Barrett Co., 40 Rector St. (soapstone talc)
Binney & Smith Co., 44 East 43d St.
Crystal Co., Inc., 13 Park Place
General Mineral Co., 96-104 Spring St.
Thomas Stanley, Inc., 473 Canal St.

North Carolina: Georgia Talc Co., Asheville

Ohio: Goodyear Tire & Rubber Co., Akron

Pennsylvania: Chas. A. Wagner Co., Inc., 811 Callowhill, Philadelphia

Tennessee: D. M. Steward Mfg. Co., Chattanooga

Virginia: F. G. Hoffman, Claremont

Soapstone literature.--A bibliography of the more important references on soapstone would number several hundred items. Anyone wishing to become more familiar with the soapstone literature should consult the Minerals Yearbooks issued annually by the U. S. Bureau of Mines, U. S. Bureau of Mines Information Circular 7080, and Joseph L. Gillson's chapter on "Talc, soapstone, and Pyrophyllite," in Industrial Minerals and Rocks," pages 873-892, published by the American Institute of Mining and Metallurgical Engineers, New York, N. Y., 1937. This authoritative article has a bibliography of 96 items arranged under main headings such as "General," "Mineralogy," "Talc in Ore Deposits," "Talc Resources," "Marketing and Uses," "Silicosis Hazards," and "Milling."

7/ Johnson, B. L., op. cit., pp. 7-13