## GEOLOGY OF THE SQUAW CREEK QUADRANGLE, GILLESPIE AND MASON COUNTIES, TEXAS

## VIRGIL E. BARNES

Squaw Creek quadrangle is partly pictographs. within the Llano region and partly

The geology of the Squaw Creek available is the reconnaissance 30-min- of the interval is oolitic. ute Kerrville quadrangle. Elevations ranging between 1,721 and 2,207 feet were determined during traversing for control, but neither the highest nor the lowest elevation was reached. However, it is estimated that the relief within the quadrangle is about 620 feet, ranging between about 1,600 and 2,220 feet

The quadrangle is almost entirely within the Llano River drainage basin and is drained by Squaw Creek and Threadgill Creek and its tributaries Mormon and Dry Mormon Creeks. The From 600 to 652 feet the rock is son (1948). water reaches Llano River by way of fine-grained, highly silty, medium gray Point Peak shale member.—The thick-Beaver Creek. A small area in the mottled by brown and yellow spots, ness of the Point Peak shale member of beds belonging to the Threadgill northeastern corner of the quadrangle wavy bedded, sparsely glauconitic lime- measured in the Threadgill Creek com- member of the Tanyard formation have is drained by Pecan Spring Branch and stone which weathers along the drain posite section is 154 feet. The lower been mapped, without reaching the top reaches Llano River through Marshall to a smooth surface throughout the 37 feet of the Point Peak is highly of the member. However, from out-Creek and Hickory Creek. An ex- interval and away from the drain calcareous shale and limestone which crops seen elsewhere it is thought that tremely small area in the southeastern weathers to a silty soil with very little are silty, micaceous, and somewhat the top of the Threadgill member has corner of the quadrangle drains into outcrop. A fault with rocks down- glauconitic. The shale is in part fissile been essentially reached. The lower 70 Pecan Creek and reaches Pedernales dropped to the south crosses the inter- and alternates with beds of light brown feet of the member is mostly sublitho-River by way of Live Oak Creek. val, and if an estimate of 90 feet for limestone which range from an inch or graphic limestone including some beds Squaw Creek quadrangle is high on the thickness of the silty zone elsewhere less in thickness to a bed 1 foot thick that are fine grained and others that are the southern side of the Llano uplift, in the area is correct, then more than which in part is stromatolitic. The next very fine grained. The granular beds and rocks of Cambrian and Ordovician 30 feet of section has been cut out. 44 feet is a stromatolitic biostrome are more common in the lower part age outcrop in the northern part of From 652 to 782 feet the limestone which extends throughout the outcrop and decrease in number upward. Brecthe quadrangle. Faults in these rocks is mostly coarse grained in the upper area of the Point Peak shale in the cias containing sublithographic fragare related to the Ouachita orogeny. third, fine grained in the middle half, Squaw Creek quadrangle. An occasional ments in a granular matrix are common

The Cretaceous rocks are essentially sixth of the interval. Much of the limestone is interbedded with the stro-

page. The reader is referred to this out boldly. index map to locate other quadrangles The faunas of the Cap Mountain zones. mentioned in the present text.

## GEOLOGIC FORMATIONS PALEOZOIC ROCKS CAMBRIAN SYSTEM

Creek composite section.

sequence is known as the Threadgill sandstone is composed of greensand, silicified Plectotrophia. The Threadgill Creek composite sec- latter being especially well exposed in composed of limestone and shale. The dolomite is fine grained and light pinktion contains 364 feet of Hickory sand- the lower part of the section along limestone is mostly fine to medium ish brown. stone measured partly in the Squaw Squaw Creek. The limestone in the grained, silty, medium gray to greenish The Threadgill member is highly Creek segment and partly in the lower section is mostly coarse grained, highly gray, contains fine-grained glauconite, fossiliferous and most of the fossils are Threadgill Creek segment a short dis- glauconitic, greenish gray, cross-bedded, and is in part intraformational con- calcitic with only cross sections visible tance north of the boundary of the and highly fossiliferous, and some indi- glomerate. The shale is nodular to on bedding surfaces. The fossils are quadrangle. Hickory sandstone, how- vidual cross-bed sets are white, being fissile and is highly calcareous and mostly gastropods, such as Ophileta, ever, crops out only in the northeastern a coquina of trilobites. The greensand silty. Mica is common in both the Gasconadia, and Lytospira, and cephalocorner of the quadrangle and at this becomes more abundant upward and limestone and shale. point is overlapped by Hensell sand. is composed roughly of equal amounts The Point Peak shale outcrops are the upper interval described above. Si-The outcrop area is flat and the sandy of glauconite and quartz sand. At a in the northwestern part of the quadsoil is deep, suggesting that the upper few horizons hematite concretions are rangle, and in addition to the upper beds, and trilobites are present in a portion of the Hickory sandstone is all formed by the weathering of the and lower boundaries the stromatolitic few beds in the lower part of the

greensand. that crops out. Though only the upper part of the The faunas of the Lion Mountain have been mapped. The shaly portion Staendebach member.—The Staende-Hickory sandstone crops out within the sandstone in the Threadgill Creek com- of the Point Peak has a thicker growth bach member is represented by only a quadrangle the rest is present in the posite section have been described by of vegetation than either the Morgan few small outcrops, some of which are subsurface; a resumé of its charac- Palmer (1950). In addition four col- Creek below or the San Saba limestone in fault blocks. It is predominantly a teristics follows. The bottom 220 feet of lections five-eighths of a mile to the above and shows on aerial photographs fine-grained, medium gray, cherty dolo-Hickory sandstone in the Squaw Creek east-northeast are from the Aphelaspis as two dark bands with minor amounts mite. Two outcrops, one of which is segment is mostly medium to coarse zone. grained, tends to make a bold outcrop, is massively bedded especially in the lower part, and is in large part cross- Welge sandstone member.—The Welge The Point Peak shale in general is and are chiefly identified by their posi-

mostly rough, angular, or at best only to the east is 22 feet thick. In the section, and four others have been made the map as a fault block oriented in an few wind-faceted pebbles were noted. of trilobites. liar excavations preserved as molds on narily seen. undersides of beds are common. These silt and shale, contains glauconite in ing upon the width of outcrop. beds are dark red, others are light Creek composite section is 142 feet.

rangle, but the bulk of the outcrop is in the top of the interval.

map, and the only topographic map One 5-foot limestone bed near the top are present.

6 inches in thickness.

horizontal, dipping northward perhaps limestone throughout the interval is matolitic limestone, and one short lens of cias caused by storms tearing up the a few feet per mile. A small fault in oolitic, glauconite is common, much of intraformational conglomerate was seen. sea bottom. Anastomosing trails and the Cretaceous is exposed in a road the finer grained material is silty, and The stromatolitic limestone is very fine burrows are common in the limestone sand is abundant in the top 6 feet. grained to microgranular, greenish gray, and usually are dolomitized and of a Broader discussions of the strati- The finer grained materials are mostly mottled, massive, and with septae be- yellowish-brown color contrasting with graphic, structural, economic, and geo- medium gray mottled by browns and tween stromatolites poorly defined. The the lighter beige color of the undisphysical problems of the region cannot yellows, and the coarser grained lime- biostrome is followed by 32 feet of turbed limestone. Beds range mostly be given in the space available. Ref- stones are medium gray in the lower limestone and shale, the latter being from about 2 to 12 inches thick but erences cited below deal with some of part of the interval as well as in most highly calcareous, nodular, and silty. some thinner bedded intervals are these problems. This publication on of the upper part but toward the top The limestone is fine to coarse-grained, present in the lower part of the interval. the Squaw Creek quadrangle is one of grade to dark greenish gray and green-slightly glauconitic, silty, mostly intraa series of similar publications, an in- ish brown. Beds range mostly between formational conglomerate, and occurs as lithographic white-weathering limestone dex to which is shown on the opposite 6 and 24 inches in thickness and crop beds and groups of beds 4 inches or containing a few fine-grained areas and

cephalus zones.

purplish red, and some beds toward the sively bedded, and shows some second- thickness of the San Saba limestone can be found for collapse structure. top of the interval are quartzite. Some ary enlargement of quartz grains with member measured in the Threadgill Another fault block of dolomite along pebbles are present in the lower few development of faces that glitter in the Creek composite section is 281 feet. Squaw Creek is predominantly fine feet of the sandstone and laterally a sun. The bottom foot contains molds The lower 103 feet of the San Saba grained but also contains considerable The Hickory sandstone rests on coarse- Along Squaw Creek just north of the nodular appearance being produced by ing on microgranular. Quartz films and grained granite. The next 55 feet of quadrangle the Welge sandstone is rethe Hickory sandstone measured in the markably well exposed and here three films are concentrated. The limestone chert are abundant, and most of the lower part of the lower Threadgill beds-5, 6, and 2 inches thick-of pale is light gray and in part is mottled by evidence indicates that this outcrop is Creek segment is very similar to the olive, fissile shale are interbedded with yellowish-brown mottles. Some of the Staendebach in age. upper part of the first interval dehas turned most of the Welge sequence and trilobite-bearing, and Owenella is

silt and shale, contains glauconite in some beds, and includes a number of Morgan Creek limestone member.—

Morgan Creek limestone member.—

massive stromatolitic bioherm which has been manual for about 2 miles as for the Gorman formation; howe manual for about 2 miles as for the grant formation. beds bearing trilobites and corneous brachiopods. Some of the sandstone limestone measured in the Threadgill been mapped for about 3 miles as far as the north edge of the quadrangle. brown, and the finer grained materials The lower part of the Morgan Creek limestone is mostly coarse grained, glauare mostly dirty grayish brown. The limestone was measured in the lower conitic, dark gray to medium gray and places about the upper top of this interval forms a break between the cedar-supporting Cap Mountween the cedar-supporting Cap Mountain limestone above and the Hickory segment, the shift between segments segment, the shift between segments being made on the Ecorthis bed.

massive beds up to 3 feet thick are common and a few thinner bedded in upper part of the Honeycut in this area trees. The faunas of the Hickory sand
The bottom 64 feet of the Morgan oolitic, a few are intraformational con
Sand grains were found in both lime-

Silicified brachiopods are associated

Cap Mountain limestone member.— massive and dark red, and upward the pattern. The interval is highly fos-The Threadgill Creek composite sec- rocks become thinner bedded, the reds siliferous and trilobites are the most tion crosses into the Squaw Creek quad- being replaced by medium to dark abundant fossils. rangle about midway in the Cap Moungrays and greenish grays. Glauconite
The lower part of the San Saba limeof evidence points to a Gorman age tain limestone, 418 feet of which is is common throughout, quartz sand is stone in the eastern part of its outcrop for these outcrops. measured. One isolated outcrop of Cap abundant in the lower few feet becomis persistently cherty, and the chert is Mountain limestone is along Squaw ing very scarce toward the top, and composed of rounded to elongated ob-Creek near the center of the quad- mica is common along bedding planes jects some of which may be algae.

in the northwestern corner of the quad- The top 78 feet of the interval is with the chert, and about 5 feet above rangle along Threadgill Creek and an alternation of limestones of various the chert similar brachiopods help iden-Onion Creek. The last bend of Onion grain sizes with medium-grained limetify a persistent bed which is useful in

The beds from 364 to 520 feet in the the glauconite in this portion of the brachiopods can be found. Above the within the Edwards Plateau province.
The Edwards Plateau is continuous along the southern border of the quadincreasing amount of arenaceous liments.

The beds from 304 to 520 feet in the glauconite in this portion of the Morgan Creek is finer grained than in the lower part. The fine-grained liments amount of arenaceous liments amount of arenaceous liments. rangle, but erosion has dissected it until long fingers extend northward, in color from dark red for some highly site. The rest is needed and similar patches of dolomite were seen at this level as far west as Threadgill until long fingers extend northward, in color from dark red for some highly of the limestone is mostly medium to Creek. the most important being between Morhematitic beds to light to medium thick bedded. The rocks are mostly

On aerial photographs the San Saba mon and Squaw Creeks and east of brown for the bulk of the interval. medium to dark gray and greenish gray limestone is light colored, and a deli-Mottlings are common, the beds are where glauconite is plentiful. A few cate tracery of beds, except in bioin thinly bedded to massively bedded beds of stromatolitic limestone and hermal areas, sets it off from the lower quadrangle is shown on a planimetric intervals, and silty beds are common. layers containing isolated stromatolites part of the Wilberns. There is little

From 520 to 575 feet the rock is highly fossiliferous with trilobites and stones of the Threadgill member except about equally divided between lime- corneous brachiopods being common to that the latter possibly photographs stone and highly calcareous sandstone. abundant throughout and with cal-slightly lighter. Some of the sandstone is hematitic red careous brachiopods being abundant A large number of fossil collections and the rest is brown, and some of from the vicinity of the Eoorthis beds, have been made in the line of section, the beds are slightly glauconitic. Lime- which is from 51 to 52 feet above the and about 14 collections have been stone from 575 to 600 feet is fine to base of the Morgan Creek limestone, to made elsewhere within the quadrangle. medium grained, medium gray, and the top of the member. Pelmatozoan The fossils are chiefly trilobites, brachisome beds are mottled yellow. The columnals are common in some beds. opods, and gastropods, limestone is in part colitic, in part glauconitic, and the beds average about zone, lower part of the Morgan Creek ordovician system (Lower ordovician-ellenburger group)

less in thickness alternating with shaly numerous dolomitized burrows and

limestone in the Threadgill composite The next 7-foot interval is a dark and the trails are yellowish to pinkish section have been described by Palmer brown weathering limestone composed brown and cinnamon. A very small (1950). Two other collections of trilo- of a top 2-foot bed and lower beds amount of white, granular, quartzose been identified by Dr. Josiah Bridge is coarse grained, glauconitic, oolitic, beds are mostly 1 to 12 inches thick. Lion Mountain sandstone member.— one of the best marker beds in the the general type described above be

biostrome and the alate Billingsella bed member. of interbanding. The biostrome photo- 3,500 feet north of Lange's Mill and graphs white since its vegetative cover the other slightly more than a mile is the least of any rock in the area. southeast of Lange's Mill, are very small bedded with more massive cross-beds sandstone measured in the Threadgill not highly fossiliferous except for the tion above calcitic rocks of the Threadnear the base of the section. The sand Creek composite section is 23 feet thick alate Billingsella bed. A few collec-

slightly rounded. The color is yellow. Threadgill Creek section the sandstone elsewhere within the quadrangle. unusual direction, has been examined ish to reddish brown and in some beds is fine to medium grained, brown, maslimestone is mostly very fine-grained to medium-grained dolomite and some fine-grained nodular limestone, the dolomite that is very fine grained verg-

scribed. Ripple marks, ice crystal markupside down and exposed some feacommon in some of the nodular limepolomitic facies.—Three small outings, rain-drop impressions, and pecu-tures on undersides of beds not ordi-tures on undersides of beds not ordi-stone. Stromatolites about 20 feet beneath the top of the interval occupy 13-15C, may belong to the dolomitic latter resemble Arthrophycus. The top

All of the Welge outcrops are in the a 2-foot zone and die out up dip. The facies of the Gorman formation. The 89 feet of the Hickory sandstone is northwestern corner of the quadrangle limestone of the nodules is very similar western outcrop of the three is mostly markedly different from the lower 220 and are marked on aerial photographs to that of the stromatolites, suggesting limestone and some dolomite. The other feet. It is less well cemented, composed by a dense vegetation which photoof finer materials including considerable graphs as a dark line or band depend-3 miles to the east is occupied by a of the Gorman formation; however, a

Calcitic facies.-Two outcrops of massive limestone along Squaw Creek The top 178 feet of the San Saba resemble only the calcitic facies of the tervals are present. Some beds are was removed by pre-Devonian erosion. stone in the Threadgill Creek composite Creek limestone is coarse grained, with glomerates, some are silty, and the section have been described by Palmer some of the basal beds being very bottom 5 feet is dolomitic, the dolomite abundant. A very poorly preserved foscoarse. The lower 18 feet of beds are standing in relief as an anastomosing sil, locality 13-15D, may be either a piloceratid cephalopod or a Ceratopea. It is even larger than Ceratopea keithi,

> MESOZOIC ROCKS CRETACEOUS SYSTEM (LOWER CRETACEOUS) Shingle Hills Formation

limestone forming a natural shelter, coarse-grained limestone least abundant. by the stromatolitic reef, but where the walls of which display aboriginal Glauconite and mica are common interbedded limestones are present in throughout the interval and in general the bioherm at this level, the silicified

distinction, however, between the San The Morgan Creek limestone is Saba limestone and the overlying lime-

limestone, have been described by Wil-Threadgill member .- In the Thread-

trails. The limestone is mostly beige,

bites, localities 13-17A and 16-1C, have ranging from 4 to 12 inches thick. It chert is present in some beds. The as belonging to the Cedaria and Crepilight brown mottled by gray and some The top 23 feet of the Threadgill green, contains silicified fossils, and is member is predominantly limestone of Hickory sandstone member.—A se- The Lion Mountain sandstone as Wilberns formation. The fossils are somewhat thicker bedded. In addition quence of Cambrian and Ordovician measured in the Threadgill Creek com- an alate Billingsella which stand in re- two dolomite zones are present, one at rocks has been measured partly within posite section is 68 feet thick, and about lief upon the upper surface of the bed. the bottom of the interval being a bed the Squaw Creek quadrangle and partly 2 miles to the east along Squaw Creek In most areas of the Llano uplift, this 1.5 feet thick and another near the north of it. The section including this it is 69 feet thick. The Lion Mountain bed or one very near to it contains middle of the interval being 3 feet thick and composed of a lower 2-foot limestone, silty shale, and shale, the The top 34 feet of the Point Peak is bed and an upper 1-foot bed. The

is poorly sorted and the grains are and along Squaw Creek almost 2 miles tions have been made in the line of bach west of Squaw Creek, shown on

since the U. S. Geological Survey ex- than normal. Fredericksburg group (Wilmarth, 1938, stone above the gypsum horizon is in construction materials.

thick. Additional beds probably are nut as mapped is on the basis of float the collapsed upper part of the Edwards to yellowish gray, limits its use. present in the subsurface in the south- Exogyra, and since Exogyra are com- can be seen; in fact, disturbed beds There is much rock in the Morgan ern part of the guadrangle since the mon also in the base of the Comanche in this portion of the Edwards are the Creek limestone. San Saba limestone. surface on which the Hensell rests Peak limestone the Walnut has prob- rule rather than the exception. The Threadgill limestone, Edwards limestone, slopes in general southward, ably been mapped farther northeast softer portion of the upper Edwards stone, and perhaps the Cap Mountain The Hensell sand varies widely in than it exists. The Walnut clay out- furnishes considerable land that is cul- limestone that is of the proper thickcolor and composition throughout the crop belt is too narrow to map within tivated, and where not cultivated the ness to be used as ledge-stone in buildarea, being influenced to some extent the quadrangle, and it is shown on the vegetation covers the ground much more ing. The limestone in the Edwards is

Within the Squaw Creek quadrangle The Walnut clay is composed of clay part.

clay are missing either because of non- manche Peak limestone is 22 feet thick faulting, the rest must be accounted used in surfacing secondary roads and rial indistinguishable from the Hensell No. 26. It thickens southwestward and is perhaps 30 feet thick in the southinto the Threadgill quadrangle to the limestone containing chert in adjacent deposits are mapped under one desigwest. The deposit may be as much as quadrangles to the south. nation. 40 feet in thickness and toward the top The Comanche Peak limestone, espe-

others may be gastroliths.

tends to be more abundant in the The Comanche Peak limestone is alluvium is cultivated. lower portion of the Hensell, but even fossiliferous especially in its basal por-

neath the Glen Rose limestone and the listed as follows: western part of the quadrangle the surface of the Hensell is so nearly flat that it is not readily distinguished from areas mapped as high gravel which also include colluvial deposits. The Hensell sand furnishes most of the land under cultivation within the quadrangle and supports much the highest density of population of any formation in the

anywhere within the Squaw Creek types including limestone, dolomite, sharp north-and-south boundary between shallow at the point where Threadgill The Glen Rose-Hensell contact within dolomite vary widely in composition, quadrangle to the east and a heavier- coming progressively deeper toward the Squaw Creek quadrangle is in a texture, thickness of beds, and hard- than-usual mass in the Squaw Creek Doss. The Lion Mountain and Welge steep portion of the topography where ness; and this variation is clearly quadrangle. much colluvial material is creeping shown on aerial photographs by vegedownward from the Comanche Peak tational banding. and Edwards limestones, causing the boundary to be poorly exposed. The about 140 feet above the base of the above the base of the about 140 feet above the base of the above the base o well developed within the quadrangle terminated eastward on the map at a point chosen arbitrarily. was at one time a continuous bed which The Glen Rose limestone consists of

alternating beds of limestone, dolomite, clay, and sand or, better stated, beds tion. A thickness of 35 feet of gyphaving various proportions of these sum was measured in the northern part of the Live Oak Creek quadrangle, but Fredericksburg Group within the Squaw Creek quadrangle The Fredericksburg group in the Squaw Creek quadrangle consists of about 290 feet of Edwards limestone, about 30 feet of Comanche Peak limestone, and perhaps as much as 5 feet of Walnut clay. The boundaries of the units are gradational, and so far as this ing appears to be only a small portion siliceous, phosphatic, sparsely disquadrangle is concerned, Thompson's of that originally present.

of that originally present.

of that originally present.

of that originally present. (1935) observation that these units The Edwards surface below the gyp- weathered portion of the formation. should have about the rank of members sum horizon is mostly rocky from the Even if the nodules were of good PALMER, A. R. (1950) The fauna of the seems logical. However, instead of presence of hard limestone beds and grade they are too sparsely distributed introducing a new name, Fredericks- chert. The chert has a fairly general to be considered as iron ore. Outside burg could easily be dropped from distribution, but some outcrop bands of the soils, mostly used for grazing group to formational rank, especially are free of it and others have more and limited cultivation of crops, the

part composed of softer materials. Walnut clay.—The Walnut clay is From 10 to 15 feet of well-bedded, CONSTRUCTION MATERIALS absent in the eastern part of the quad- microgranular to sublithographic, white rangle and is perhaps as much as 5 to yellowish-gray, hard, rather pure Building stone.—The massive reefs in feet thick near the Threadgill Creek limestone is situated immediately above the Wilberns have been mentioned by quadrangle border. In the western part the gypsum horizon, and hard, mostly Barnes, Dawson, and Parkinson (1947, of the quadrangle it rests on Glen honeycombed limestone again comes in p. 128) as a possible source of building remaining portion of the quadrangle sum horizon. Much of the gypsum has Point Peak shale and in the San Saba it rests on Hensell sand. Northeastward been dissolved, allowing the overlying limestone, and along Squaw Creek the Walnut thins and disappears, the beds to collapse, Along streams, in steep exposures of massive reef are Creek before it enters Threadgill Creek stone probably being most abundant, identifying fluctuations in the bottom of —The outcropping portion of the Hen-

the Hensell sand rests upon several grading upward into an impure nodu- In the Squaw Creek quadrangle some tions. The present trend toward the units of Cambrian and Ordovician age lar limestone. The clay is highly cal- of the chert in the vicinity of the use of somber stone should open a and in the subsurface probably rests careous, silty, sandy, fossiliferous, and trace of the Kirschberg evaporite is market for some of the greenish and in addition upon all the other units is mostly yellowish gray. It is too thin fossiliferous, but the fossils are so inof the Cambrian and Ordovician. to influence noticeably the vegetation corporated with the chert that only The Threadgill stone is lighter colored The upper boundary of the Hensell and culture of the area. Most of the portions of specimens can be seen. No but tends to be yellowish gray. Some sand is rather sharp in the eastern part fossil collections made from the Wal- fossil collections were made. beds in the Edwards are light gray to of the quadrangle where it is in con- nut clay also contain fossils from the A fault is exposed in a road cut white and are very attractive. tact with the Comanche Peak limestone, basal portion of the overlying Comanche nearly 3 miles east of Doss. It crosses The conglomerate at the base of the but westward where there are some Peak limestone since the fossils from the road in a direction N. 60° E. Hensell sand in the vicinity of Lange's Glen Rose beds the boundary in many both units weather free and inter- but eastward appears to swing more Mill may be sufficiently cemented for places is not clear-cut. The Glen Rose mingle. A fossil identified by Dr. Ralph nearly to an easterly direction and perlimestone is absent in the eastern part Imlay as Brachydontes pedernalis (Roe- haps dies out with the displacement be- a very attractive stone. of the quadrangle because of lateral mer) is from locality 13-18A, about ing taken up by a monocline. Hand Road material.-Road material progradation of the limestone to clastic 5 miles east-southeast of Doss. No other leveling to the next hill northward indiduced within the quadrangle is from

deposition or lateral gradation to mate- just north of the county line marker for by a monoclinal dip. **OUATERNARY DEPOSITS** The Hensell sand is in general very western portion of the quadrangle. The High gravel. - Most of the area is of little value for base-course matepoorly sorted and ranges from con- Comanche Peak limestone grades down mapped as high gravel is in the western rial since it causes freeze damage. Betglomerate composed of boulders, cobinto the Walnut clay where the Walnut portion of the quadrangle in the vicinbles, pebbles, and granules through is present and in the rest of the quadity of Mormon Creek. Much of the in the Edwards limestone, notably just sand of various grain sizes to silt and rangle rests directly on the Hensell material may be colluvium in part above the gypsum horizon, and in some clay. The conglomerate mapped is sand. Upward it grades into the Ed- reworked by streams. No line of de- units of the Cambrian and Ordovician. indurated basal conglomerate which wards limestone, and the boundary is marcation exists in border-line cases Some of the Paleozoic rocks are hard crops out mostly in proximity to rocks arbitrarily placed at the base of a very between deposits that are truly colluof Paleozoic age. The deposit mapped thin-bedded limestone which is thought vium and those that are deposited by Sand and gravel.—Sand and gravel in the vicinity of Lange's Mill extends to correlate with a very thin-bedded stream action. For this reason the of a quality to be used in building are

conglomerate is composed of a wide quadrangle contains considerable argil- formed over much of the surface cropping Paleozoic rock and some zones assortment of sizes with some boulders laceous material. Northeastward the mapped as high gravel. The soil is in the Edwards limestone are of value near the base of the deposit as much base of the Comanche Peak is very mostly black, whereas the soil on the for crushed rock. as 2 feet in length. The pebbles and sandy where it rests on the Hensell Hensell is mostly lighter in color. Black boulders are mostly composed of lime- sand. The lower part of the Comanche soil in combination with a flat terracestone from the Threadgill member of Peak limestone tends to be nodular, is like surface was used to map the extent Gypsum mining in the quadrangle the Tanyard formation, the Wilberns mostly highly fossiliferous, and is in of the high gravel. The boundary be- was started by O. L. Neyland about formation, and the Cap Mountain mem- part burrowed. The upper part of the tween the Hensell sand and the high 1934 and continued sporadically for ber of the Riley formation. A few of Comanche Peak is mostly well bedded, gravel will be, therefore, in many places about 10 years. Mr. R. W. Mathis the pebbles and cobbles are composed less argillaceous than the portion beof quartzite from the Welge and Hick- neath, and the upper limestone correory sandstones, and an occasional gran- lates with the strata used for building of pebbles, cobbles, and finer materials obtained are reported by Barnes (1944). ite and chert pebble is present. The stone in the vicinity of Fredericksburg. including some caliche. Much of the At the time of the project, Mathis

Squaw Creek, and northeast of Cherry their present position by kelp and sand. Some of the areas mapped as sum and that the major impurity is high gravel are cultivated. Angular granules are common in the The Comanche Peak limestone is Alluvium.—Deposits of alluvium are The solution channels and caverns lower part of the Hensell sand, but softer than the overlying Edwards lime- mostly situated along Squaw, Mormon, within the gypsum, most of which are upward the Hensell is finer grained con- stone and has eroded into a steep Dry Mormon, and Onion Creeks and filled by collapsed materials. compli-

gray, greenish-gray, and yellowish-gray abundant in many of the upper beds. Cambrian and Ordovician rocks crop are in the Hensell sand outcrop area. Only two collections were made di-out at various places in the northern It is possible that some of the wells The Hensell is so slightly indurated rectly from the Comanche Peak lime- part of the quadrangle and continue in the vicinity of Cherry Spring may that it readily breaks down and forms stone within the quadrangle. The fos- southward into the subsurface beneath go through the Hensell into the Hickgentle slopes except immediately be- sils identified by Dr. Ralph Imlay are the Cretaceous rocks. It is unlikely ory sandstone. Another well at Doss, Comanche Peak limestone. In the Locality 13-3A, about 800 feet south older than Cambrian immediately undoubtedly penetrates far into rocks of of the cross-roads at Cherry derlie the Cretaceous rocks. No well Paleozoic age. The rest of the wells Amauropsis? sp teria sp.

east-southeast of Dossonopleura pinguiscula White Monopleura cf. texana Roemer Pseudonerinea? sp. Edwards limestone. - The Edwards zoic rocks lie is limited to some gravity erate at the base of the Hensell. Glen Rose limestone member.—The limestone is about 290 feet thick in the data. Most of the quadrangle is in an The main easily available source of Glen Rose limestone is absent in the southeastern part of the Squaw Creek area of high gravity values, but a nar- water within the quadrangle is in the eastern part of the quadrangle, and quadrangle. The lower boundary, as row strip along the northern edge of Hensell sand. In the outcrop area of though present in the western part of explained above, is gradational and is the quadrangle is in an area of low the Edwards limestone back from the the quadrangle its thickness was not mapped at the base of a thin-bedded gravity values. In the northeastern part scarp, some water should be present measured. To the west in the Thread- limestone which is thought to correlate of the quadrangle there appears to be near the base of the Edwards limestone. gill quadrangle about 45 feet of Glen with one that is chert-bearing in quad- a "plunging nose" of high gravity The Hickory sandstone is an aquifer Rose limestone was measured along a rangles to the southeast. The Edwards values, bounded on the east by an which crops out in the vicinity of branch of Threadgill Creek, and this is limestone in the Squaw Creek quad- extremely steep slope in the gravity Cherry Spring. To the west it is probably a thicker section than exists rangle is composed of a variety of rock contours. This slope indicates a fairly present in the subsurface, being rather

outcropping pre-Cambrian rocks of the are unknown. The Welge should, how-

MINERAL RESOURCES the thickest gypsum recorded is 16 The mineral resources of the quadfeet, measured in the Neyland mine. rangle are limited to nonmetallic sub-In all occurrences of gypsum seen in stances and water. Nodules of red iron CLOUD, P. E., Jr. (1947) Stratigraphy Gillespie County, solution has been very oxide found in the outcrop area of the extensive and the gypsum now remain- Lion Mountain sandstone are highly (1944) Correlation of gravity obser-

by the type of rock being transgressed. map as a solid color line. uniformly than it does in the lower in general softer and easier to work than the limestone in the other forma-

sediments of the Hensell sand. In the fossils were collected from the Walnut cates that equivalent beds are from 25 to colluvial deposits and from shallow pits same area a portion of the Comanche clay within the quadrangle. 30 feet lower, and since only 9 feet of in the Edwards limestone. The mate-Peak limestone and all of the Walnut Comanche Peak limestone.—The Co- the difference can be accounted for by rial is mostly calichified and has been for base-course material in the construction of highways. Such material is of value in surfacing secondary roads but

taining much silt and clay. In the slope, made even steeper than is nor- Pecan Spring Branch. Narrow belts cate mining. Not enough work has western part of the quadrangle in the mal by the subjacent easily eroded and patches of alluvium follow many been done to allow any tonnage es vicinity of the Glen Rose contact some Hensell sand and the almost equally of the lesser drainages in the area but mates to be made of the amount of of the beds of the Hensell are cal. soft Glen Rose limestone. The Co- are insignificant and have not been gypsum available within the quadrangle. careous. The Hensell sand varies manche Peak has a distinctive vegeta- mapped. The alluvium is composed of widely in color with reds and grays tion on north slopes which shows clearly sand and silt at the surface and of being predominant. The red material on aerial photographs as a black band. coarser materials beneath. Some of the here there is considerable material of tion, and indications of fossils are SUBSURFACE GEOLOGY and all of the 18 wells inventoried in

Locality 13-12A, about 6.6 miles

gypsum, and chert. The limestone and a lighter-than-usual mass in the Hilltop Creek leaves the quadrangle but be-

tered by a well to the south in the extended over a large area. Only remnants of this once extensive bed remain, is caused by diorite, especially since the pp. 35-46.

most important nonmetallic resource is vations with the geology of the cludes the Kiamichi clay from the The portion of the Edwards lime- perhaps gypsum, followed by other

that present is mostly along Squaw becomes siliceous and friable. The cially in its basal part, in much of the occur has very low relief, and soil has for local building. Much of the out-

directed a project in test pitting and

pebbles have a wide variety of colors Stray mostly polished siliceous pebbles material is limestone, chert, and dolo- measured 12 feet of gypsum in the and some are variegated. Other out- up to 2 inches in size are present in mite from the Edwards, limestone from Neyland mine and 8.7 feet on the Emil crops of conglomerate are mapped on the Comanche Peak limestone. Some the Comanche Peak, and reworked Crenwelge ranch. Analyses indicated the branches of Mormon Creek, on of these may have been carried to siliceous material from the Hensell between 94.5 and 95.2 percent gyp-

County was made by Shield (1937),

that rocks younger than Ordovician or reported to be 740 feet deep, undata were obtained within the quad- range from 33 to 200 feet in depth, rangle. The outcropping Cambrian and in 1936 the water level stood berocks in the quadrangle are in part tween 17 and 160 feet below the surhighly faulted, and their pattern be- face. The total solids range from 265 neath the Cretaceous within the quad- to 723 parts per million. One spring rangle possibly is equally complicated. listed at Lange's Mill is estimated to The information about the pre- flow at a rate of 300 gallons per Cambrian rocks upon which the Paleo- minute and issues from the conglom-

sandstones crop out within the quad-

Kirschberg evaporite (Barnes, 1944). granite (Romberg and Barnes, 1944, the depth to the Cambrian sandstones as they are farther south; therefore, the stereoscope is of less value in tracing it. The Glen Rose limestone is approximate position as a dashed line the quadrangle, Diorite was encoun-Spring Creek quadrangle, but it is BARNES, V. E. (1944) Gypsum in the Edwards limestone of central Texas Univ. Texas Pub. 4301, Jan. 1, 1943, well is situated on the flank of a sub- (1948) Ouachita facies in central Texas: Bur. Econ. Geol., Rept.

Inv. 2, 12 pp. ----, Dawson, R. F., and Par-KINSON, G. A. (1947) Building stone of central Texas: Univ. Texas Pub exas: Bull. Geol. Soc. Amer., vol. 58,

Minnesota, September, 1950

MBERG, FREDERICK, and BARNES, V. E.

Smoothingiron granite mass, Lland

SHIELD, ELGEAN (1937) Records of wells.

drillers' logs, and water analyses in

County, Texas: Geophysics, vol. 9,

HOMPSON, S. A. (1935) Fredericks Texas: Bull. Amer. Assoc. Petr. Geol Rose limestone, and in about half the about 90 to 100 feet above the gyp-stone. The reefs occur in both the WILMARTH, M. G. (1938) Lexicon of WILSON, J. L. (1948) Two Upper Camhas undercut into the Cap Mountain followed by fine grained, and with the reef. The bed is cut out in places sell sand is estimated to be 250 feet of lack of exposures. Much of the Wal-

THE UNIVERSITY OF TEXAS BUREAU OF ECONOMIC GEOLOGY EXPLANATION SQUAW CREEK QUADRANGLE SEDIMENTARY ROCKS Qal (gravel, sand, and silt along stream bottoms) Qhg High gravel (gravel and sand in terraces along streams and as col-luvial deposits in part changed to caliche on slopes) UNCONFORMITY Edwards limestone showing approximate trace of the Kirschberg evaporite torizon, Kedk. Well bedded, in part cherty, in part magnesian; varies widely in composition, hardness, and thick-ness of beds) Comanche Peak limestone (calcareous clay grading upward into the marl of the overlying member; contains a profusion of Exogyra Kshgr Glen Rose limestone member //K466/ Hensell sand member (sand, silt, and clay, predominantly red and gray, with conglomerate, Kshh(c), at base) UNCONFORMITY Gorman formation (showing calcitic, Og(ca), and dolomitic, Og(mg), facie.
Thickly to thinly bedded cherty limestone and dolomite (p hs (mg) ndebach membe (dolomitic facies, thickly to thinly bedded, cherty, fine to medium grained Off(00) Threadgill member (calcitic facies, thinly to thickly bedded with a few dolo-mite beds at the top) DISCONFORMITY Ews Press San Saba limestone member owing area of massive, sublithographic, greenish gra \* Point Peak shale member €wm Morgan Creek limestone member (granular, glauconitic, thinly to thickly bedded, gray in upper part ranging to red at base) Welge sandstone member (sparingly to nonglauconitic, brown, massive, scarp forming) DISCONFORMITY en Lion Mountain sandstone member highly glauconitic sandstone with limestone beds and lenses more abundant toward base, bench forming) Enc Cap Mountain limestone member (granular, glauconitic, gray to brown; grades to cal-careous sandstone at base) eco. (mostly noncalcareous and nonglauconitic, poorly sorted) D • Known and inferred fault (U, upthrown side; D or downthrown side) Observed and inferred contact Strike and dip of beds Locality of fossil collection 0-0-0-0-V Line of described section showing offset (earth-dammed pond for water storage) Alidade elevation of gravity station × 2045 Alidade elevation 30°22'30' 99°00'00" Geology by Virgil E. Barnes 1939-1947 Base from U. S. Department of Agriculture, Agricultural Adjustment Administration, aerial photographs flown by Kargl 'Aerial Surveys, Ltd., 1938. Assisted by Louis Dixon Cartography by Anita Underwood and J. W. Macon 1 7/2 0 LLANO CO 000 2500 0 Datum is mean sea level GILLESPIE COUNTY SPRING LIVE OAK PALO ALTO CREEK CREEK CREEK KENDALL CO APPROXIMATE MEAN DECLINATION 1947 GEOLOGIC MAP OF THE SQUAW CREEK QUADRANGLE, GILLESPIE AND MASON COUNTIES, TEXAS