BUREAU OF ECONOMIC GEOLOGY
THE UNIVERSITY OF TEXAS
AUSTIN 12, TEXAS

JOHN T. LONSDALE, DIRECTOR

GEOLOGIC QUADRANGLE MAPS

~~(Rocky Creek, 1:24,000)~~

North Grape Creek Quadrangle
Blanco and Gillespie Counties, Texas

By

VIRGIL E. BARNES

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~~revised, 65~~

GEOLOGY OF THE NORTH GRAPE CREEK QUADRANGLE, BLANCO AND GILLESPIE COUNTIES, TEXAS

VIRGIL E. BARNES

GENERAL SETTING

North Grape Creek quadrangle is south of the Llano region and is mostly in the broad Pedernales River basin. A few outliers of the Edwards Plateau are present in the western part of the quadrangle.

The geology of the North Grape Creek quadrangle is shown on a planimetric map, and the only topographic map available is the reconnaissance 30-minute Fredericksburg quadrangle. Elevations ranging between 1,294 and 1,775 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 640 feet, ranging between about 1,200 and 1,840 feet in elevation.

The quadrangle is entirely within the Pedernales River drainage basin and is mostly drained by North Grape Creek and its tributaries, some of which are White Oak Creek, Basin Spring Hollow, Dry Hollow, and Smith Spring Branch. The southern part of the quadrangle is drained by Pedernales River and its branches, some of which are Iron Rock Creek and Rocky Creek.

North Grape Creek quadrangle is high on the southeastern side of the Llano uplift, and rocks from pre-Cambrian to Ordovican in age outcrop in about three-quarters of the quadrangle. Faults related to the Ouachita orogeny trend mostly northeast-southwest; some trend east-west. The Cretaceous rocks are essentially horizontal, dipping eastward perhaps about 10 feet per mile.

Broader discussions of the stratigraphic, structural, economic, and geophysical problems of the region cannot be given in the space available. References cited below deal with some of the problems. This publication on the North Grape Creek quadrangle is one of a series of similar publications, an index to which is shown on the opposite page. The reader is referred to this index map to locate other quadrangles mentioned in the present text.

GEOLOGIC FORMATIONS

PRE-CAMBRIAN ROCKS

METASEDIMENTARY ROCKS

Valley Spring Gneiss

The Valley Spring gneiss is predominantly fine grained, massive, and pinkish. Only one outcrop, about 1,000 by 1,500 feet in size, situated in the northeastern part of the quadrangle is present. The gneiss dips about 65° northeastward toward Town Mountain granite. To the south it is overlapped by Hickory sandstone and is in contact with a granite that may be Oatman Creek granite, and to the west it is in fault contact with Hickory sandstone and Point Peak shale. A prospect shaft along the fault reveals no mineralization.

IGNEOUS ROCKS

Town Mountain Granite

All the outcrops of Town Mountain granite within the quadrangle probably belong to the Grape Creek granite mass (Barnes, Dawson, and Parkinson, 1947, p. 45). The preponderance of outcrop is in the northeastern part of the quadrangle where much of the granite is in fault blocks separated by fault blocks of Hickory sandstone. A small outcrop of Town Mountain granite in the northwestern part of the quadrangle has Ordovician rocks down-faulted against it.

A sample collected along North Grape Creek, locality 6–28A, by Barnes, Dawson, and Parkinson (1947, B1–11, pp. 52–53) is coarse grained, somewhat porphyritic, and of a light pink color. It is composed predominantly of microcline, quartz, plagioclase, and some biotite. Accessory minerals are magnetite, fluorite, apatite, titanite, and zircon. The granite shows the effects of two periods of shearing accompanied by mylonite—an earlier one in which the mylonite is completely lithified and gradational into undisturbed granite; and a later one connected with the Ouachita orogeny in which the mylonite is mostly about one-quarter inch thick and in sharp contact with unsheared granite.

The granite contains a few small pegmatites, aplites, and quartz bodies, and at locality 6–29A (Barnes, Dawson, and Parkinson, 1947, B1–6, p. 25) a considerable area of fine to medium-grained, white to pink and red granite may be an aplitic phase of the Town Mountain granite. It in turn contains aplites, pegmatites, and inclusions. A sample collected from a lighter colored portion of the mass has an estimated mineral composition of plagioclase 44, quartz 28, microcline 25, biotite 2, and muscovite 1 percent. Accessory minerals are very scarce and consist of fluorite and zircon.

Oatman Creek Granite

Along Iron Rock Creek and Pedernales River all but one of a series of granite knobs (buried hills) are surrounded by Cap Mountain limestone, the one exception being a knob which extends up into and is partly surrounded by Lion Mountain sandstone. The granite is silicic, being very resistant to weathering, and these knobs may have stood as much as 600 to 800 feet above the surrounding surface at the advent of the Cambrian sea.

Granite from four of the knobs, including two chemical analyses, is described by Barnes, Dawson, and Parkinson (1947, pp. 48–52). The granite from two of the localities (6–40B=B1–1 and 6–44A=B1–7) is very similar, having an average grain size of about 7 mm, a salmon-pink color, and composed predominantly of microcline, microperthite, quartz, and plagioclase. Biotite is common but not abundant. Accessory minerals are fluorite, magnetite, and zircon. A third sample, locality 6–44B=B1–8, is somewhat lighter in color, somewhat coarser grained, and of about the same mineral composition as above. However, fluorite crystals up to 3 mm in size are present. The fourth sample examined, locality 6–24F=B1–9, is coarse grained, has an average grain size of 10 mm, is brownish tinged by red and yellowish green, and takes an exceptionally brilliant polish. It is composed predominantly of microperthite and quartz and contains some hornblende and biotite. Plagioclase is extremely rare as individual crystals and where present is associated with the femic mineral areas. Accessory minerals are magnetite, apatite, and zircon.

PALEOZOIC ROCKS

CAMBRIAN SYSTEM (UPPER CAMBRIAN)

Riley Formation

Hickory sandstone member.—The Hickory sandstone crops out in the northeastern part of the North Grape Creek quadrangle in fault blocks situated on the crest of a broad anticline which pitches southwestward. The lower part of the Hickory sandstone is massive, cross-bedded, coarse grained, contains microcline, and has some conglomerate lenses near its base. Upward the beds become somewhat thinner, cross-bedding when present is in smaller sets, and toward the top shale and silt become sufficiently abundant so that weathering reduces this portion of the Hickory sandstone to a soil-covered bench. The sand in the Hickory is poorly sorted, mostly angular to subrounded, and mostly has rough surfaces. Fossils seen but not collected are linguloid brachiopods in the upper portion. The Hickory sandstone supports deciduous trees, prominent among which are the broad-leaf oaks, and it contrasts with the overlying Cap Mountain limestone which supports cedar, live oak, and an assortment of daggers and cacti.

Cap Mountain limestone member.—The Cap Mountain limestone outcrop belt broken by faults is situated on the southwestward-pitching anticline mentioned above. In the southern part of the quadrangle the Cap Mountain limestone and Oatman Creek granite knobs crop out along the crest of an east-west anticline. Eastward the anticline has been shattered by faulting, and in the vicinity of McDougals Crossing the Cap Mountain is in numerous small fault blocks. A dome centered by Oatman Creek granite brings the Cap Mountain limestone to the surface at the extreme eastern edge of the quadrangle along Pedernales River.

The entire sequence of the Cap Mountain limestone is exposed in a broad outcrop in the vicinity of Hog Thief Bend and in a less broad outcrop near the northern border of the quadrangle. In the southern portion of the quadrangle only about the upper hundred feet of the Cap Mountain is exposed and here it rests directly on pre-Cambrian granite. Initial dips are well displayed in the Cap Mountain limestone about the granite knobs.

The Cap Mountain in its lower portion is composed predominantly of sandstone cemented by calcium carbonate and where so cemented forms a scarp which is distinct from the sandy bench at the top of the Hickory sandstone. Sand becomes less abundant upward, and near the middle of the member relatively pure fairly massive, solution-jointed limestone is present in which the pattern of the solution joints shows on aerial photographs. A persistent silty zone above the jointed limestone grades upward into a granular, medium gray to brownish-gray limestone, containing rare sand grains. Glauconite is mostly sparsely distributed in the Cap Mountain limestone except for the top 30 or 40 feet which is highly glauconitic and highly fossiliferous, containing an *Aphelaspis* fauna. Fossil collections including corneous brachiopods and trilobites were made from localities 6–31A, 6–31B, 6–31C, 6–31D, and 6–27A.

Lion Mountain sandstone member.—The Lion Mountain sandstone outcrop parallels that of the Cap Mountain limestone outlined above. The Lion Mountain is perhaps between 35 and 45 feet thick within the quadrangle and is composed of greensand, sandstone, limestone, and shale in various combinations with shale becoming more plentiful upward. The color in fresh exposures is mostly dark green or grayish green from the high glauconite content. Such exposures are rare; mostly all that is seen is an occasional iron nodule and white cross-beds of a trilobite coquina on a sandy flat. An occasional brown sandstone bed and some dark gray limestone beds crop out. Trilobites and corneous brachiopods are abundant in the limestone beds and cross-beds in the lower part of the section and are less common in the upper portion where limestone is less abundant. The Lion Mountain sandstone forms a sparsely vegetated bench on which mottes of live oak are common. It is readily identified on aerial photographs.

Wilberns Formation

Welge sandstone member.—The Welge sandstone member is perhaps between 10 and 15 feet thick within the quadrangle and forms a narrow band parallel to the Lion Mountain sandstone outcrop. The Welge is medium to fine grained, massively bedded, and predominantly light brown to grayish brown. The sand grains are well rounded and fairly smooth, and in many outcrops secondary growth has produced crystal faces which glitter in the sun. The Welge forms a scarp throughout much of its outcrop area, and a concentration of vegetation along it produces a black line on aerial photographs. The Welge is in sharp contact with the Lion Mountain sandstone beneath but grades upward into the Morgan Creek limestone member.

Morgan Creek limestone member.—About 140 feet of Morgan Creek limestone crops out along the flanks of the structures mentioned above. The lower 25 feet of the Morgan Creek limestone is a coarse-grained, reddish limestone which is highly sandy at its base, becoming less sandy upward. The lower beds are massive and upward the beds become thinner. Above the red zone the limestone is mostly medium to light gray and in part is greenish gray from glauconite. The beds are mostly 4 to 12 inches thick in the lower half of the member. In the upper half, beds of similar thickness alternate with zones of thin-bedded argillaceous limestone. The Morgan Creek contains some cherty, limonite-brown dolomite beds south of Iron Rock Creek. A collection, locality 6–45A, of chert fossils from the dolomite is mostly gastropods of a type not commonly seen in the Morgan Creek limestone.

Near the top of the Morgan Creek silicified *Billingsella* are common in several beds and calcareous *Billingsella* are common above the *Eoorthis* zone. Trilobites are common to abundant throughout the Morgan Creek limestone. A specimen of *Sinuella minuta* Knight (1947) was collected from the top bed of the Morgan Creek limestone at locality 6–40A. *Eoorthis* is scarce in the area of the North Grape Creek quadrangle, one specimen being noted on the southeast bank of Pedernales River near the east edge of the quadrangle at the point marked "F" on the map, and one at locality 6–36A on the south bank of North Grape Creek. Fossil collections including trilobites and brachiopods were made from localities 5–66D, 6–34A, 6–34B, 6–35A, and 6–35B. Wilson (1949) described some of the fauna from beneath the *Eoorthis* zone to the base of the Morgan Creek limestone in a bluff along the north side of Pedernales River just upstream from the mouth of Iron Rock Creek.

Point Peak shale member.—The Point Peak shale member varies in thickness, ranging from about 65 feet in the northern part of the quadrangle to 25 feet or less in the southeastern part. Just a short distance to the east of the quadrangle a section measured on the Scott Klett ranch contains 11 feet of stromatolitic limestone followed by 14 feet of thin-bedded argillaceous dolomite which possibly should be included with the Pedernales dolomite but which was provisionally assigned by Cloud and Barnes (1948) to the Point Peak shale.

In the northern part of the quadrangle the top 30 feet of the Point Peak is a stromatolitic biostrome which is persistent throughout the area. The lower 35 feet is mostly an alternation of some thinly bedded limestone and stromatolitic biostromes and covered intervals assumed to be shale. South of Iron Rock Creek near the county line the Point Peak is similar, but eastward its upper boundary is lowered, caused by dolomitization of the stromatolitic limestone, and the lower shale is replaced by stromatolitic limestone. The Point Peak shale crops out on the flanks of the anticlines mentioned above. Fossils collected from the Point Peak shale at locality 6–37A are silicified brachiopods.

Pedernales dolomite member.—The Pedernales dolomite in general flanks the broad anticline of the northern part of the map except that only the lower part of the dolomite is present in the southern limb of the fold, the rest being faulted out. It is present on the southern limb of the east-west anticline in the southern part of the quadrangle, and near the eastern border of the quadrangle all of the member appears to be present.

The thickness of the Pedernales dolomite was estimated in the northern part of the quadrangle in an area where the attitude of the beds is difficult to determine. The thickness obtained for the Pedernales is 230 feet, consisting of a basal 50-foot and an upper 30-foot fine-grained dolomite separated by a 150-foot coarse-grained dolomite. In the Sandy P. O. quadrangle (Barnes, MS.) to the east Cloud and Barnes (1948) measured 195 feet of Pedernales dolomite in the "Upstream Pedernales River Section," the top 5 feet being microgranular, the bottom 86 feet fine grained, and the rest coarse grained. Since the bottom of the Pedernales dolomite becomes lower southeastward by lateral gradation of the Point Peak to dolomite, the top of the Pedernales must drop even more. The interval beneath *Plectotrophia* to the base of the Wilberns remains fairly constant throughout the uplift so the loss of beds must be in the upper part of the Wilberns, probably by erosion before the deposition of Ordovician sediments.

A sample of dolomite was collected by Barnes, Dawson, and Parkinson (1947, pp. 148–149) from a quarry just north of the highway and on the west bank of Rocky Creek. The rock is mottled in gray and brownish-gray tones, and some porosity is present, some of which is filled by calcite. The rock takes a good uniform but not brilliant polish. A thin section reveals a few grains of a green mineral resembling glauconite and a few radial spherulites having a low birefringence in a quarter-millimeter-grained dolomite. Another thin section of a breccia near the northern end of the quarry reveals distorted dolomite rhombs up to 3 mm in size surrounded by a mylonite of dolomite.

Fossils were collected from localities 2–1C, 2–1F, 2–5A, and 2–7A in Gillespie County and localities 6–25A, 6–25C, 6–33A, 6–36B, and 7–28A in Blanco County. All of the fossils are chert fossils except those from locality 7–28A (Barnes, Dawson, and Parkinson, 1947, fossil list, p. 148), where they are calcitic. Fossils at locality 2–1C are trilobites, brachiopods, and *Scaevogyra;* at 2–1F, *Matthevia variabilis* Walcott, identified by Dr. Josiah Bridge; and at 2–7A, gastropods.

San Saba limestone member.—Massive, white, sublithographic San Saba limestone grades laterally to coarse-grained Pedernales dolomite in outcrops within the quadrangle. The San Saba limestone is unfossiliferous and in appearance is entirely similar to the massive limestone of the Threadgill and the Staendebach members of the Tanyard formation within the quadrangle.

ORDOVICIAN SYSTEM (LOWER ORDOVICIAN-ELLENBURGER GROUP)

Tanyard Formation

Threadgill member.—A broad outcrop of Threadgill rocks dipping west-southwest is interrupted by faults in the northwestern portion of the quadrangle. The Threadgill is mostly coarse-grained dolomite but contains some rather large areas of massive, white, sublithographic limestone, especially near the southern terminus of the outcrop. The Threadgill member in this area is entirely characteristic of its appearance elsewhere in the eastern portion of the Llano uplift.

In the southern portion of the quadrangle the upper portion of the Threadgill member is markedly different, consisting of noncherty, thin-bedded, fossiliferous, sublithographic limestone and fine-grained dolomite. The lower portion of the Threadgill member is normal in that it is composed of massive limestone and laterally gradational coarse-grained dolomite. Near the western edge of the quadrangle the coarse-grained dolomite appears to grade laterally to fine-grained dolomite. Such lateral gradation of dolomite grain sizes in Ellenburger rocks has not been noted previously.

Fossils were not seen in the Threadgill member in the northwestern portion of the quadrangle, but in the southern portion the thin-bedded limestones of the upper portion of the member are quite fossiliferous and contain many burrows and trails. No collections were made but *Gasconadia, Ophileta, Ozarkina, Lytospira,* and cephalopods were noted.

Staendebach member.—The bulk of the Staendebach member crops out in the northwestern portion of the quadrangle, and one outcrop is in the southwestern portion of the quadrangle. In the northwestern area rocks dip mostly west-southwest and are somewhat faulted. Other faults may be present which were not detected, and some of those mapped into the Staendebach outcrop area undoubtedly continue farther but could not be traced.

The Staendebach member within the North Grape Creek quadrangle has been divided into four facies: an upper unit composed of coarse-grained dolomite, Ots(mgc), laterally gradational to massive limestone, Ots(cam), and a lower unit composed of fine-grained dolomite, Ots(mgf), in part grading laterally to thin-bedded limestone, Ots(cat). The upper portion of the Staendebach is practically free from chert and the lower portion is somewhat cherty. The Staendebach member where examined elsewhere in the eastern portion of the Llano uplift is mostly cherty throughout and if calcitic is so only in the upper portion. A tendency toward the development of a coarse grain size in the upper portion of the Staendebach has been seen elsewhere, but nowhere is it as coarse grained as in the North Grape Creek quadrangle and vicinity. The upper portion of the Staendebach within the quadrangle cannot be differentiated from the type of Threadgill member usually seen in the eastern part of the uplift, except by its stratigraphic position.

Sporadic occurrence of breccia along the boundary between the lower calcitic and dolomitic facies of the Staendebach suggests solution accompanied by collapse, and some of the boundary is mapped as a collapse contact.

In the northwestern outcrop area fossils were collected from localities 2–1A, 2–1D, 2–2A, 2–2B, 2–3A, 2–3B, 2–3C, 2–8F, and 2–9A. At locality 2–1A the fossils are calcitic trilobites and gastropods and at the last three localities, silicified brachiopods in limestone. In the southwestern outcrop area fossils were collected from localities 2–12B, 2–12C, 2–12D, and 2–12E. The fossils are trilobites, gastropods, and brachiopods in chert except at locality 2–12E where the fossils are calcitic gastropods.

Gorman Formation

Dolomitic facies.—The dolomitic facies of the Gorman formation crops out in the northwestern portion of the quadrangle and dips westward. It is mostly in fault contact with the Tanyard formation beneath, but two short lengths of normal contact are present in which the microgranular dolomites of the Gorman rest upon the coarser grained dolomites of the Tanyard. The dolomitic Gorman contains a scattering of sand grains in a number of beds, and these along with microgranular dolomite and the fossil *Rombella* serve to identify it. Nodules of porcellaneous to chalcedonic chert are common.

Calcitic facies.—The calcitic facies of the Gorman formation crops out only in a small area in the northwestern portion of the quadrangle. It overlies in normal contact the dolomitic facies and to the west is in fault contact with Town Mountain granite except for a thin intervening sliver of Hickory sandstone. The limestone of the calcitic facies tends to be present in thick massive beds and is sublithographic. The Gorman *Archaeoscyphia* bed is well developed with an abundance of chert nodules containing typical spicules of *Archaeoscyphia.* Cannonball chert is common in a bed just below *Archaeoscyphia,* and porcellaneous to chalcedonic chert is common as nodules in some of the beds above the *Archaeoscyphia* bed.

No fossils were collected from the calcitic facies within the North Grape Creek quadrangle, but just to the west in the Gold quadrangle several collections were obtained.

MESOZOIC ROCKS

CRETACEOUS SYSTEM (LOWER CRETACEOUS)

Shingle Hills Formation

Hensell sand member (Barnes, 1948).—The Cretaceous rocks dip eastward in the North Grape Creek quadrangle, perhaps near the average of 22 feet per mile found for these rocks in the northern part of Blanco County. The maximum thickness of the Hensell sand appears to be north of McDougals Crossing where it is probably less than a hundred feet thick. Westward the Hensell wedges out against a ridge of Paleozoic rock between Pedernales River and North Grape Creek. In the vicinity of Pedernales River the Hensell sand probably averages 30 to 50 feet in thickness and rests on Paleozoic rocks. Within the quadrangle the Hensell rests on all units of the Cambrian and upon the calcitic and dolomitic facies of the Threadgill member of the Tanyard formation.

The Hensell varies widely in color and composition, is in general very poorly sorted, and ranges from cobbles, pebbles, and granules through the various sand sizes to silt and clay. Its composition is influenced somewhat by the type of rock being transgressed. The Hensell is predominantly gray and any red material present has a haphazard distribution, unlike farther west in Gillespie County where red materials are mostly in the basal portion of the Hensell and the gray materials in the upper portion.

The Hensell is so little indurated that it readily breaks down and forms gentle slopes except immediately beneath the Glen Rose limestone. The more siliceous and coarser portions of the Hensell support a dense growth of broad-leaf oak and the rest of the member supports a clumpy vegetation. The Hensell sand area within the quadrangle is small and only a portion of it is cultivated.

Glen Rose limestone member.—It is estimated that about 350 feet of Glen Rose beds are present between the lowest exposure in the southwest corner of the quadrangle and the hills in the west-central part of the quadrangle, where the Glen Rose rests directly on Paleozoic rocks. The total thickness of Glen Rose rocks is not present at any one place and the maximum thickness is probably in the west-central part of the quadrangle where as much as 150 feet of Glen Rose may be present above the Paleozoic surface.

The contact between the Glen Rose limestone and the Hensell sand is arbitrarily placed at the bottom of the lowest bench-forming limestone, dolomite, or calcareous sandstone. In following the contact, as bench-forming beds come or go, the contact is lowered or raised to the base of the next bench-forming bed. In mapping, however, it is almost impossible to decide at which point a bench-forming bed ceases to exist, so the basal boundary of the Glen Rose is not mapped as a series of steps but is gradually rounded off from the base of one to the base of the next. Most of the contact between observed points was traced on aerial photographs with the aid of a stereoscope, and since the terrace of any one bed gradually merges with the general slope as it dies out, it is easy to raise or lower the contact to the next one.

The Glen Rose limestone consists of alternating beds of limestone, clay, and sand or, better stated, beds having various proportions of these materials. A poorly exposed section of Glen Rose and younger rocks was measured along the county road on the divide between Pedernales River and North Grape Creek. The Glen Rose is not very fossiliferous in the North Grape Creek quadrangle, and no fossil collections were made.

Fredericksburg Group

The Fredericksburg group in the North Grape Creek quadrangle consists of about 40 feet of Edwards limestone, about 28 feet of Comanche Peak limestone, and about 5 feet of Walnut clay. The boundaries of the units are gradational and so far as this quadrangle is concerned, Thompson's (1935) observation that these units should have about the rank of members seems logical. However, instead of introducing a new name, Fredericksburg could easily be dropped from group to formational rank, especially since the U. S. Geological Survey excludes the Kiamichi clay from the Fredericksburg group (Wilmarth, 1938, p. 776).

Walnut clay.—The Walnut clay is very poorly exposed within the quadrangle and any thickness estimated for it is purely a guess. It is present on six small and two medium-sized hills in the west-central part of the quadrangle. The Walnut rests on a rusty-surfaced limestone which contains oysters. It is presumed that the Walnut, as elsewhere in the Gillespie County area, grades upward into the Comanche Peak limestone. Since the bench formed by the Walnut is not wide enough to map, it is represented on the map by a solid color line.

Comanche Peak limestone.—The thickness of the Comanche Peak limestone within the North Grape Creek quadrangle is estimated to be about 28 feet. It is poorly exposed and is present on the same hills as the Walnut. The Comanche Peak limestone is softer than the overlying Edwards limestone and has eroded into a steep slope which is characteristic of its outcrop. The steep slope, however, continues for a short distance down into the Glen Rose limestone. On aerial photographs the Comanche Peak limestone shows on north slopes as a distinct black band caused by a thick growth of vegetation dominated by a narrow-leaf oak identified by Cuyler (1931) as "*Quercus texana* Sargent (Texas oak)."

Edwards limestone.—About 40 feet of Edwards limestone caps two medium-sized hills, and a few feet of Edwards caps two other hills in the west-central part of the quadrangle. The Edwards is composed of limestone, dolomite, and chert which are very poorly exposed. In the area of largest outcrop the vegetation on the Edwards is very well segregated into bands. The harder beds weather slowly and have only a thin soil covering or are nearly void of vegetation. The softer beds develop a more adequate soil and are thickly vegetated.

The Edwards surface is mostly rocky and above some beds is chert-strewn. Some of the chert in the Edwards limestone is of a quality suitable for the manufacture of artifacts, and because it was used extensively by the aborigines is mostly referred to as flint. Only the harder beds are exposed.

QUATERNARY DEPOSITS

Travertine.—A small deposit of travertine is situated along the north side of North Grape Creek and is being deposited by a spring which issues from a disturbed zone in the Tanyard formation. Procknow Spring, about 0.7 mile to the south, is also depositing travertine which is mixed with much alluvium. The deposit extends along a drain about half a mile to North Grape Creek.

High gravel.—Most of the high gravel deposits within the quadrangle are probably stream deposited, but much of the material may be reworked from colluvial deposits farther west which are thought to have covered at one time much of the outcrop area of the Hensell sand. The high gravel is composed chiefly of pebbles, cobbles, and finer materials including caliche. Much of the material is limestone, chert, and dolomite from the Edwards, limestone from the Comanche Peak, reworked siliceous materials from the Hensell sand, and pebbles derived from outcropping Paleozoic and pre-Cambrian rocks.

Alluvium.—Deposits of alluvium are mostly situated along Pedernales River and North Grape Creek. Narrow belts and patches of alluvium follow some of the lesser drainages in the area but are insignificant and have not been mapped. The alluvium is composed of sand and silt at the surface and of coarser materials beneath. The alluvium within the quadrangle is not cultivated and supports a growth of pecan trees.

SUBSURFACE GEOLOGY

Pre-Cambrian rocks, mostly granite, are at the surface at numerous places about the quadrangle. All units of the Cambrian and several of the Ordovician crop out within the quadrangle, and Paleozoic rocks are at the surface in more than half of the quadrangle. All of these units pass under rocks of Cretaceous age, and some rocks of pre-Cambrian age may also underlie the Cretaceous. The outcropping Paleozoic rocks are faulted, and their pattern beneath the Cretaceous probably is equally complicated.

The information about the pre-Cambrian rocks upon which the Cretaceous and Paleozoic rocks lie is limited to several outcrops of Town Mountain granite, a few outcrops of Oatman Creek granite, one outcrop of Valley Spring gneiss, and some gravity data. The gravity data indicate that a gravity minimum occupies most of the quadrangle except for a small area in the northeastern portion and a minor (2-milligal) high in the southeastern portion. Large gravity minima in the area of outcropping pre-Cambrian rocks of the Llano uplift are associated with Town Mountain granite (Romberg and Barnes, 1944, and subsequent unpublished data). Town Mountain granite crops out in the northwestern and northeastern portions of the quadrangle. The granite in the southern part of the quadrangle is Oatman Creek granite and furnishes no information concerning the adjacent subsurface. No well data were obtained.

A small outcrop of Valley Spring gneiss flanks the north side of the 2-milligal high mentioned above. The Valley Spring gneiss may extend southwestward for a considerable distance beneath the sedimentary cover and may be responsible for the small anomaly.

MINERAL RESOURCES

The mineral resources of the quadrangle are limited to nonmetallic substances and water, except for a minor occurrence of galena and sphalerite about the Oatman Creek granite domes in the southern part of the quadrangle. Outside of the soil, much of which is suited only for range land, the most important nonmetallic resources are construction materials.

CONSTRUCTION MATERIALS

Building stone.—A large quantity of granite crops out within the boundaries of the North Grape Creek quadrangle (Barnes, Dawson, and Parkinson, 1947, pp. 25, 48–53). The four deposits described from the southern part of the quadrangle are from granite knobs partly overlapped by Cap Mountain limestone. The granite from all four localities is of unusual color and none like it has been seen elsewhere in the Llano uplift. The samples obtained are from surface material; in three samples the feldspar shows some alteration, but with depth the alteration should disappear. The fourth sample was collected along Pedernales River near the eastern border of the quadrangle. The rock is from near river level, is fresh, takes an excellent polish, and is of an unusually attractive color, making it a desirable monumental and ornamental stone. Inclusions are sparsely distributed in the outcrop and these, of course, are undesirable.

A fifth sample of granite, locality 6–29A, is fine grained, light gray, nonuniform in color, contains inclusions, and is veined; it is of little value. Another granite sample described, locality 6–28A, is from a large exposure of Town Mountain granite along North Grape Creek. This granite is low lying and is of little value because of the presence of shear zones, calcite, and decomposing biotite.

Outcrops of massive limestone in the San Saba and the Threadgill members have been mapped in which the limestone is light colored and pleasing in appearance. Prospecting of these outcrops might reveal some deposits massive enough to furnish saw-blocks. Limestone beds of the proper thickness to be used as ledge-stone in building are present in the Cap Mountain limestone and the Morgan Creek limestone but little, if any, is present in the rocks of Cretaceous age.

Road material.—Very little road material has been produced within the quadrangle except in a quarry in the Pedernales dolomite along Rocky Creek, locality 7–28A. For local surfacing of secondary roads the material used is mostly caliche from shallow deposits of colluvium. Material of this type, while of value in surfacing secondary roads, is of little value in highway construction. Within the quadrangle there is a wide choice of more stable materials, and these should be investigated when material is needed for replacing the present highways. The dolomite along Rocky Creek has been quarried for crushed stone and is described by Barnes, Dawson, and Parkinson (1947, pp. 148–149).

Sand and gravel.—The gradient of Pedernales River within the quadrangle is so steep that little sand and gravel has had a chance to accumulate along it. Deposits of alluvium which are present mostly are very poorly sorted and contain large boulders which hamper any screening or washing operation that might be attempted. The high gravel deposits contain much extraneous material and would also have to be washed and screened. Reworked decomposed granite along North Grape Creek can be used locally. Much rock is present in the quadrangle that can be crushed for use as an aggregate.

Lead.—Galena and a trace of sphalerite are common in the Cap Mountain limestone in the vicinity of the granite dome along Pedernales River near the eastern border of the quadrangle. Galena and sphalerite are also present in prospect holes about the westernmost occurrence of granite in the southern part of the quadrangle. A deeper prospect hole at the western end of the next granite mass reveals only a very few tiny specks of galena. The lead deposits in the Cambrian limestones of central Texas were sampled during the spring of 1950, mapping was completed, and a publication on the findings is contemplated.

WATER

A ground-water survey of Gillespie County was made by Shield (1937), and one of Blanco County was made by B. A. Barnes and Cumley (1942). Nineteen wells and two springs situated in outcrop areas of a wide variety of rocks were inventoried in North Grape Creek quadrangle. More than half of the wells are in outcrop areas of Cretaceous rocks, but judging from the depths of the wells they probably penetrate to the Paleozoic rocks beneath. So far as can be ascertained, the water is mostly obtained from three Paleozoic rock units, namely, the Cap Mountain limestone, the Pedernales dolomite, and the Threadgill member of the Tanyard formation. The water is probably present along joints and in solution zones and not in aquifers at constant stratigraphic levels.

The wells range from 60 to about 200 feet in depth, and the water level in 1941 stood between 10 and 134 feet below the surface. The total solids range between 240 and 1,532 parts per million, but in most wells which contain more than 500 parts per million total solids, the nitrates are high, indicating contamination.

Several springs have been mapped including the Procknow, Pecan, and other unnamed springs in the northwestern portion of the quadrangle. A number of springs in the faulted area north of McDougals Crossing and some springs in the Pedernales dolomite south of the river along the eastern border of the quadrangle have been mapped.

The outcrop area of the Hensell sand is small and that portion of it which is on the side of the ridge of Paleozoic rocks is not likely to retain much water. The Hickory sandstone crops out in some areas and is present in the subsurface in much of the rest of the quadrangle. Granite knobs extend high into the Cap Mountain limestone and eliminate the possibility of the presence of Hickory sandstone in an area of unknown size in the southern portion of the quadrangle. The Hickory sandstone is water-bearing in many places in central Texas. The depth to the Hickory sandstone can be predicted in the area where the Paleozoic rocks outcrop, but it will be difficult to predict its depth beneath the Cretaceous because of complicated structure in the rocks beneath the Cretaceous.

The Welge and Lion Mountain sandstones are present in a somewhat smaller area than the Hickory sandstone and at a depth about 500 feet nearer the surface. These sandstones are much thinner than the Hickory sandstone, and their qualities as an aquifer are little known; however, the Welge at least should carry some water.

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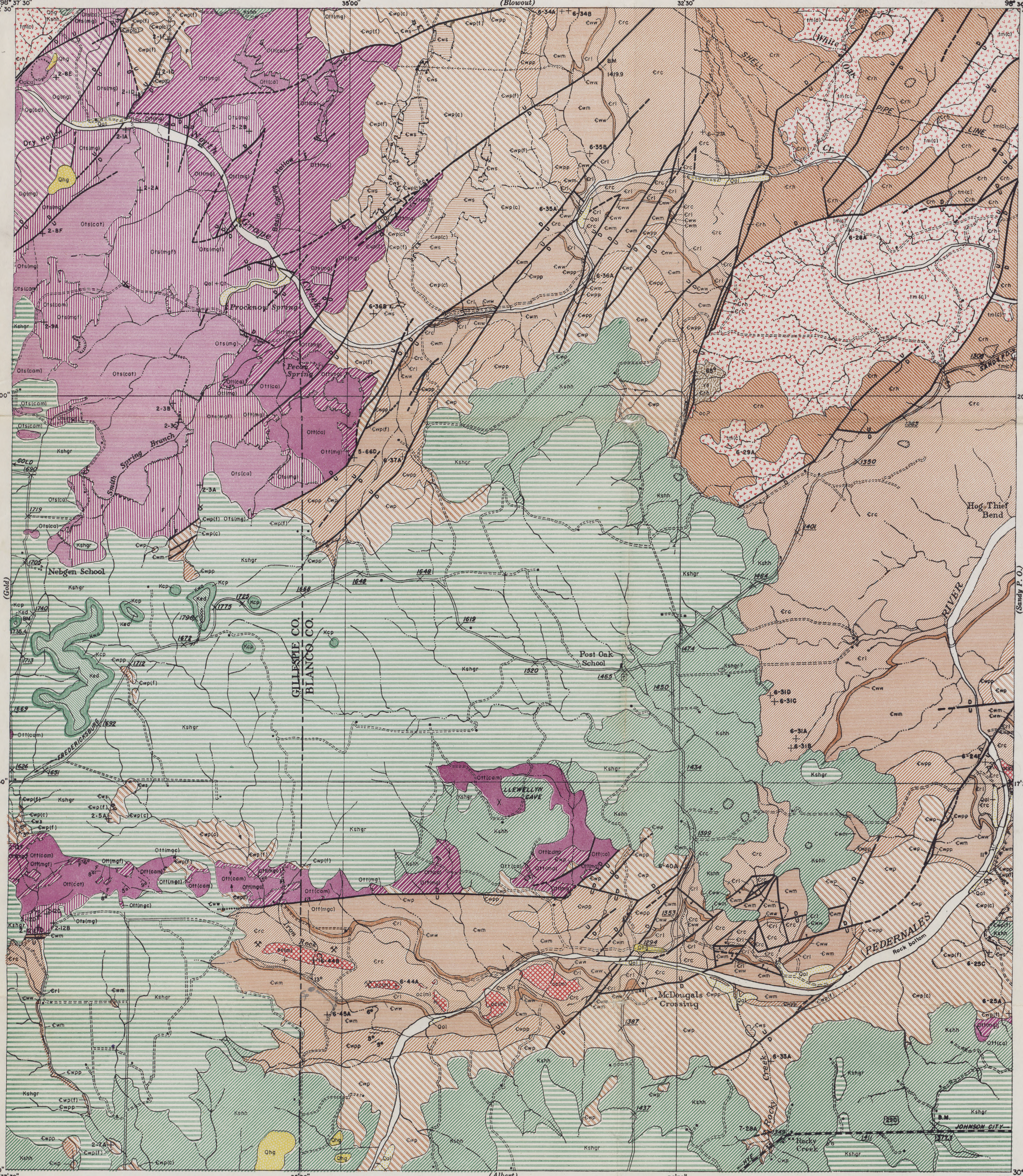
THE UNIVERSITY OF TEXAS
BUREAU OF ECONOMIC GEOLOGY

TEXAS
NORTH GRAPE CREEK QUADRANGLE



EXPLANATION

SEDIMENTARY ROCKS

QUATERNARY

Qal — Alluvium
(gravel, sand, and silt along stream bottoms)

Qhg — High gravel
(gravel and sand in terraces along streams and as colluvial deposits in part changed to caliche on slopes)

Qt — Travertine
(spring and stream deposited calcium carbonate)

UNCONFORMITY

CRETACEOUS — Lower Cretaceous — Comanche series

Ked — Edwards limestone
(well bedded, in part cherty, in part magnesian; varies widely in composition, hardness, and thickness of beds)

Kcp — Comanche Peak limestone
(marl and marly limestone ranging from nodular at base to well bedded at top)

Kwa — Walnut clay
(calcareous clay grading upward into the marl of the overlying member; contains a profusion of Exogyra texana)

Shingle Hills formation

Kshgr — Glen Rose limestone member
(alternating beds of limestone, marl, and clay, some of which are highly arenaceous)

Kshh — Hensell sand member
(sand, silt, and clay, predominantly red and gray)

UNCONFORMITY

ORDOVICIAN — Lower Ordovician — Ellenburger group

Og(ca), Oga, Og(mg) — Gorman formation
(showing calcitic, Og(ca), and dolomitic, Og(mg), facies and principal Archaeoscyphia bed, Oga. Thickly to thinly bedded cherty limestone and dolomite; dolomite predominantly microgranular to fine grained)

Tanyard formation

(cam), Ots(mgc), Ots(mgf), (cat) — Staendebach member
(showing thin bedded, cherty, Ots(cat), and massive, noncherty, Ots(cam), calcitic facies; and fine grained, cherty, Ots(mgf), and coarse grained noncherty, Ots(mgc), dolomitic facies)

(cat), Ott(mgf), Ott(mgc), (cam) — Threadgill member
(showing thin bedded, Ott(cat), and massive, Ott(cam), calcitic facies and fine grained, Ott(mgf), and coarse grained Ott(mgc), dolomitic facies. Chert rare)

DISCONFORMITY

CAMBRIAN — Upper Cambrian — Wilberns formation

Ꞓwp(f), Ꞓwp(c), Ꞓwp(f) — Pedernales dolomite member
(showing sparingly to abundantly cherty, thinly to thickly bedded, fine grained facies, Ꞓwp(f); and predominantly noncherty, massive, coarse grained facies, Ꞓwp(c))

Ꞓws — San Saba limestone member
(sublithographic, thickly bedded, light gray)

Ꞓwpp — Point Peak shale member
(thinly bedded to fissile, argillaceous, in part magnesian limestone and massive, sublithographic, greenish gray, stromatolitic bioherms)

Ꞓwm — Morgan Creek limestone member
(granular, glauconitic, thinly to thickly bedded, gray in upper part ranging to red at base)

Ꞓww — Welge sandstone member
(sparingly to nonglauconitic, brown, massive, scarp forming)

DISCONFORMITY

Riley formation

Ꞓrl — Lion Mountain sandstone member
(highly glauconitic sandstone with limestone beds and lenses more abundant toward base, bench forming)

Ꞓrc — Cap Mountain limestone member
(granular, glauconitic, gray to brown; grades to calcareous sandstone at base)

Ꞓrh — Hickory sandstone member
(mostly noncalcareous and nonglauconitic, poorly sorted, variable amount of conglomerate at base)

UNCONFORMITY

METAMORPHOSED SEDIMENTARY ROCKS

PRE-CAMBRIAN

vs — Valley Spring gneiss
(light colored, predominantly pink, highly feldspathic)

IGNEOUS ROCKS

oc(m), oc(c) — Oatman Creek granite
(aplogranite of pink to red color and medium, oc(m), and coarse, oc(c), grain)

tm — Town Mountain granite
(coarse grained, pink)

D, U — Known and inferred fault
(U, upthrown side; D or ┳ downthrown side)

Observed and inferred contact

Laterally gradational contact
(diagrammatic)

Collapse contact

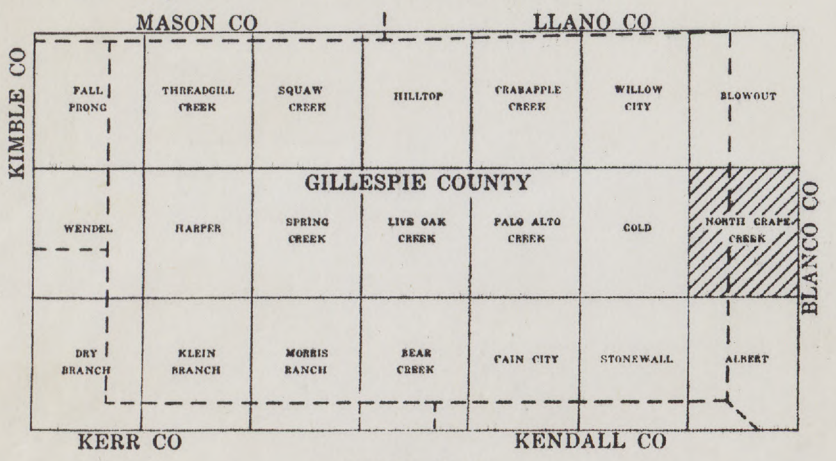
5° — Strike and dip of geological elements
(bed in sedimentary rocks and planes of schistosity in metamorphic rocks)

Prevailing dip of beds

+2-1F — Locality of fossil, rock, or mineral collection

F — Fossils noted but not collected

Base for Gillespie County from U. S. Department of Agriculture, Agricultural Adjustment Administration, aerial photographs flown by Kargl Aerial Surveys, Ltd., 1938; and for Blanco County from U. S. Department of Agriculture, Soil Conservation service, aerial photographs flown by Park Aerial Surveys, Inc., 1939–1940.



INDEX MAP

Scale 1/31,680

1 ½ 0 1 Mile

5000 2500 0 5000 Feet

1 ½ 0 1 Kilometer

Datum is mean sea level

10° N

APPROXIMATE MEAN DECLINATION 1947

Geology by Virgil E. Barnes 1939–1948
Assisted by L. E. Warren, A. R. Palmer, and Louis Dixon
Cartography by Ann Connor and J. W. Macon

Line of described section showing offset

Line of undescribed section

Windmill

1308 — Alidade elevation of gravity station

1648 — Alidade elevation

GEOLOGIC MAP OF THE NORTH GRAPE CREEK QUADRANGLE, BLANCO AND GILLESPIE COUNTIES, TEXAS