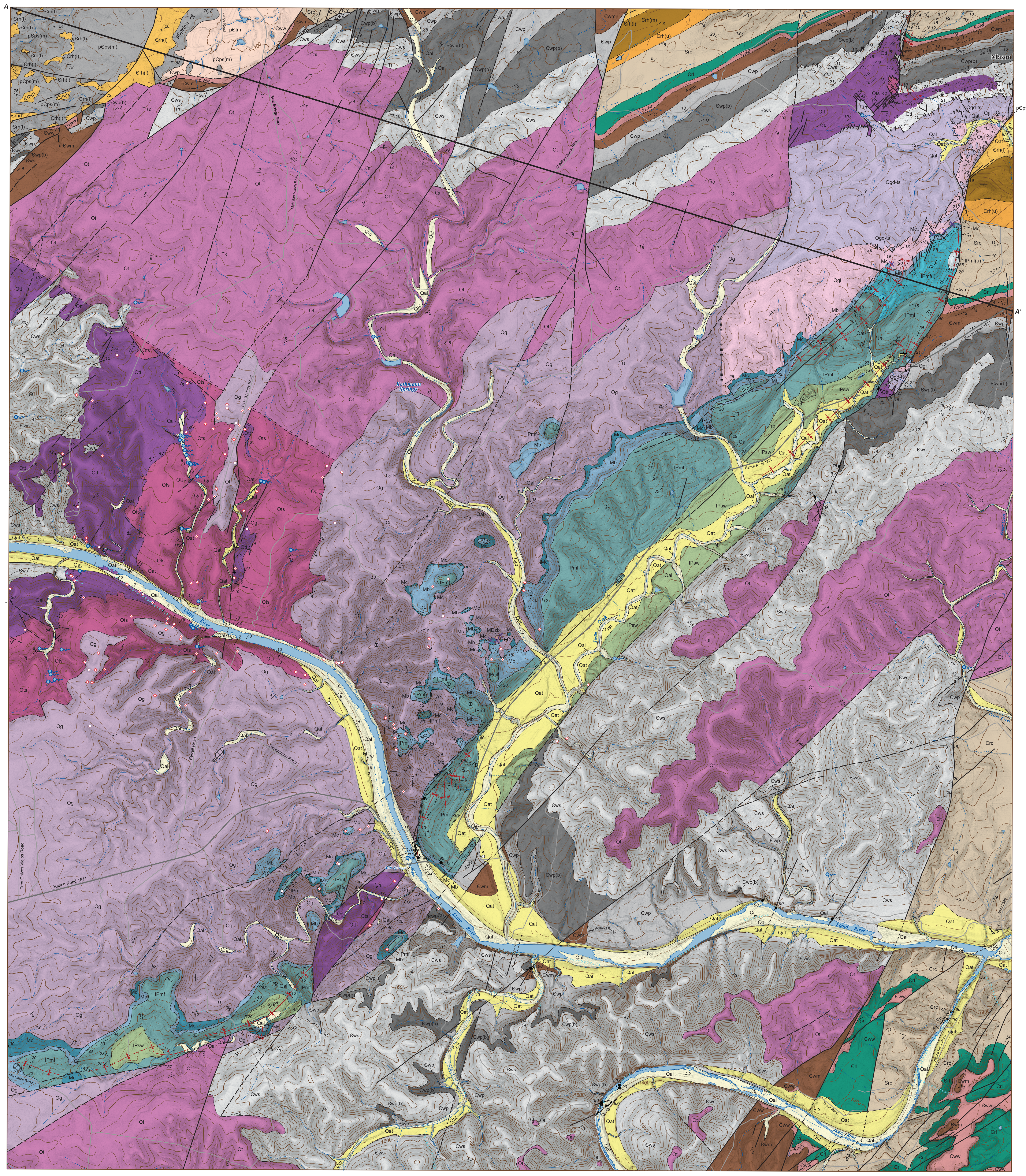
BUREAU OF ECONOMIC GEOLOGY
SCOTT W. TINKER, DIRECTOR JACKSON SCHOOL OF GEOSCIENCES THE UNIVERSITY OF TEXAS AT AUSTIN
In cooperation with the State of Texas Advanced Resource Recovery (STARR) Program and the U.S. Geological Survey National Cooperative Geologic Mapping Program under STATEMAP award number G15AC00250, 2022



QUATERNARY

Qal—Alluvium. Unconsolidated gravel, sand, silt, and clay along stream courses and low floodplains of the Llano River and its tributaries; maximum thickness approx. 20–35 ft; includes local bedrock exposures.

Qat—Alluvial terrace. Tributary deposits of gravel (derived from nearby uplands), sand, and calcareous silt and clay, generally unconsolidated but may have local caliche cement; thickness highly variable but maximum of about 20 ft.

PALEOZOIC

Unconformity

FZ—Fault Zone Breccias. Brecciated bedrock. Zones are generally associated with faults and vary from 1-65 ft wide. Traversing the breccia zone, clasts tend to transition from lithologic mixtures dominated by the footwall into mixtures dominated by hanging wall clasts. However, other intervening stratigraphic units can occur. Clasts are angular to rounded and matrix to clast supported. The matrix is commonly a fine-grained, white carbonate material. Locally contain large relatively undeformed blocks (up to 100s of feet across). The Mason Fault zone is an anomalously wide (up to 650 ft) breccia zone described and mapped by Becker (1985).

Unconformity

IPsw—Smithwick Shale. Shale with minor limestone at base. Dark brown to black shale. Becker (1985) found fresh exposures of shale to consist of brownish yellow convoluted laminated shale and noted the lower Smithwick support dense brush cover, whereas the upper Smithwick appears to support more grasslands. The Smithwick readily weathers and forms the valley of Turtle Creek. Estimated up to 300 ft thick (Becker, 1985).

IPmf—Marble Falls Limestone. Limestone and minor shale. Gray to black, fine- to coarse-grained, highly (crinoid) fossiliferous. Divided into an upper and lower unit based on the relative shale content. The contact with the overlying Smithwick is gradational from a limestone into a shale with several distinct limestone beds. Up to 400 ft thick (Becker, 1985).

IPmf(u)—Marble Falls Limestone, upper. Limestone and minor shale. Gray to black, fine- to coarse-grained, highly (crinoid) fossiliferous limestone. Well-bedded (up to 3 ft) with dark grey to black chert nodules along bedding planes or nodules within beds. Weathers to brownish yellow to white. Up to 215 ft thick (Becker, 1985).

IPmf(l)—Marble Falls Limestone, lower. Limestone and shale. Brown to black, well bedded (24 inches), fine- to medium-grained, cherty, fossiliferous (crinoid) limestone. Weathers to a characteristic yellowish brown with gray to orange colored chert. Contact between the upper and lower unit is gradational but mapped at the top of prominent shale bed expressed as a bench supporting a dense vegetation band on aerial photographs. Up to 200 ft thick (Becker, 1985).

Unconformity

Mb—Barnett Shale. Interbedded limestones, siltstones, and shales. Dark gray to black, medium- to coarse-grained, fossiliferous; limestone is medium- to thick-bedded. Black shale occurring at the base is petroliferous and contains plant detritus. Poorly exposed and covered with colluvium. Expressed as a dark vegetative band on aerial photographs and noted to have the densest vegetative cover of any unit in the quadrangle. Thickness ranges from 0 to 100 ft (Becker, 1985), but reported in other studies to be about 25 ft thick in the quadrangle (Miller, 1957; Grote, 1954; Shoelkopft, 1987). The contact with the overlying Marble Falls is approximate as both contain similar lithologies. The contact was mapped at the top of the basal shale expressed as the upper edge of the densely vegetated band on aerial photographs (Grote, 1954; Shoelkopft, 1987; Becker, 1985).

Mc—Chappel Limestone. Grainstone. Coarse grained, friable, crinoid grainstone interbedded with fine grained mudstones. Sparse brachiopod fossils. Reported to be 0-17 ft thick in quadrangle (Becker, 1985), but this study measured up to 30 ft at White's Crossing of the Llano River. Basal contact often mapped as a "collapse" contact (karst related sinkholes) feature (Cloud and Barnes, 1946), such as at White's Crossing of the Llano River, but instead observed and interpret unit within structural syncline.

MDhi—Ives Breccia of the Houy Formation. Chert breccia. Rounded-to-angular large chert clasts in a chert matrix. Up to 3 ft thick. Very small and localized exposures (located as points on map) observed and mapped on aerial photographs by V.E. Barnes (unpublished mapping).

MDzb—Zesch and Bear Spring Formation, undifferentiated. Granular, brownish- to grayish-yellow fossiliferous limestone, cherty limestone, and white to cream, fine- to coarse-grained limestone, in part fossiliferous; several tens of feet present in a collapse structure, present under Zesch formation (lower Middle Devonian). Zesch formation: thin, highly siliceous limestone, and leached silica rock, contains angular fragments of chert, brownish to yellowish, appears to grade upward to Ives Breccia, up to 2 ft thick; only mapped outcrop occurs in SW of Mason (Upper? Devonian). Unit description from Barnes (1981) and Barnes et al. (1947).

ELLENBURGER GROUP

Limestone and dolostone. Cherty, non-glauconitic, thick- to thin-bedded, sparingly fossiliferous. Limestones are generally fine-grained, light gray; dolomites are varicolored, micrograngular to very coarse crystalline. Dolostones can be siliceous. Two formations are mapped in the area, the Gorman and the Tanyard formations; the top-most Honeycut Formation of the Ellenburger Group is absent (Cloud and Barnes, 1946). Limestone and dolostone subunits of the Ellenburger partially mapped in the study area by Cloud and Barnes (1946) are generally not included in this map. The Ellenburger Group is up to about 900 ft thick.

Og—Gorman Formation. Limestone and dolostone. Contains an upper limestone unit (Ogl), and a lower dolostone (Ogd) unit that are generally undifferentiated in the area except by the mapping of Cloud and Barnes (1946) and Becker (1985). The Archaeoscyphia sponge (Oga) zone along the Llano River is referenced as marker bed near the boundary of the two subunits (Cloud and Barnes, 1946; Miller et al., 2012). Total thickness of the Gorman is about 400 ft (Barnes and Bell, 1977). Lower unit (Ogd; not mapped): dolostones, cherty, poorly bedded, weather to rounded light brown to brown gray knobs. Limestone and dolostone subunits of the Gorman originally mapped by Cloud and Barnes (1946) are not included in this map. However, the lower dolostone unit (Ogd) is combined with the underlying dolostones of the Staendebach Mbr (Ots) of the Tanyard Formation and mapped as Ogd-ts (Becker, 1985).

Ogl—Upper Gorman Limestone (informal). Microcrystalline limestone. Thin to thick bedded limestone, cherty, light gray to yellowish gray, to bluish gray. Limestones are resistant and often ledge-forming. Mapped by Becker (1985). Upper unit about 230 ft thick (Becker, 1985).

Ot—Tanyard Formation. Limestone and dolostones. Includes the dolostones of the Staendebach Mbr and the limestones of the Threadgill Mbr. Generally non-glauconitic. Total thickness about 480 ft (Barnes and Bell, 1977).

Ots—Staendebach Member of Tanyard Formation. Dolostone. Brown to yellowish gray, microgranular to medium-grained, cherty, and poorly bedded. Weather into light brown to brown gray rounded outcrops. Limestone and dolostone subunits of the Staendebach Mbr originally mapped by Cloud and Barnes (1946) not included in this map. About 180 ft thick.

Ogd-ts—Staendebach Member of Tanyard Formation and lower Gorman Formation, undivided. Dolostones of the undivided Staendebach and lower Gorman mapped by Becker (1985). Light brown to yellowish gray, microgranular to medium-grained, cherty, and poorly bedded. Weather into light brown to brown gray rounded outcrops. Up to 440 ft thick (Becker, 1985). The overlying contact with the upper Gorman Formation limestones is generally sharp and placed at the top of the uppermost dolostone bed. The contact can be mapped by moderate vegetation change with moderate growth on dolomites (liveoaks especially), and sparse vegetation growth on limestones (Becker, 1985).

Ott—Threadgill Member. Limestone. Brownish gray, microcrystalline (micritic), nonglauconitic, to fossiliferous limestone with dolomitic burrows (trace fossils) and occasional chert. Thin- to thickly-bedded (up to several feet). Fossils include sparse gastropods (Lytospira gyrocera) and cephalopods. Pitted and fluted weather surfaces. Relatively resistant to erosion and contains sparse vegetation forming gentle slopes or hilltops (Grote, 1954). Total thickness about 300 ft (Becker, 1985). Threadgill Member grades into overlying Staendebach Member dolostone, but with more abundant chert. Lower contact is lithologically gradational, but mapped above the highest glauconitic calcarenite of the San Saba Mbr (Becker, 1985; Miller et al., 2012). Limestone and dolostone subunits of the Threadgill Mbr originally mapped by Cloud and Barnes (1946) not included in this map.

MOORE HOLLOW GROUP
Wilburns Formation

Ꞓws—San Saba Member. Calcarenite. Yellowish brown to light gray, medium to coarse-grained, glauconitic, fossiliferous, calcarenite. Well-bedded (up to 10 inches) calcarenite interbedded with micritic limestones with thin recessive silty units. Locally contains intraformational conglomerate interbeds. Unit becomes increasingly micritic, less glauconite and less fossiliferous toward the top. Weathering characteristics include brown limonitic stains and sandy soils. The base of the San Saba is transitional with the underlying Point Peak and defined as the first series of thin-bedded, glauconitic, calcarenite beds. Slope breaks can be used to map the contact depending on whether the Upper Point Peak Bioherm is present. The top of the San Saba is transitional with the overlying Tanyard Formation and generally the last medium- to coarse-grained glauconitic calcarenite. Micritic beds occur within the upper San Saba, similar to the Threadgill. Uncertainty in the upper and lower contacts results in the San Saba thickness reported to vary from 175 ft (Becker, 1985) to 300 ft (Barnes and Bell, 1977).

Point Peak Member

Point Peak Mbr has two distinct subunits: a lower calcareous siltstone and clastic unit, and a discontinuous upper bioherm or stromatolite (microbiolite bioherm) unit. Both units and facies within are described in detail by Lehermann et al. (2020). Total thickness reported to vary from 175 ft (Barnes and Bell, 1977) up to 380 ft thick (Becker, 1985) with the variation attributed to the discontinuous upper bioherm unit.

Ꞓwp(b)—Point Peak, upper bioherm member (informal). Boundstones with thinly layered calcarenites and siltstones. Light gray, white, to darker grey micritic stromatolites (micriobiolitic bioherms). Stromatolites often contain multiple phases of growth, defined by a white limestone outer structure (rind) up to 30 ft in diameter (in plan view). Bioherms contain an internal dolomitic (darker grey) mudstone containing oval to circular (microbial) textures up to 24 inches in diameter. In profile, relief of ovoid bioherms is up to 15 ft for individual clusters. Thin bedded heterolithic units of calcarenites to siltstones occur between and drape over bioherms with multiple dip directions. Upper Point Peak is generally non-glauconitic (Lehrmann et al., 2020). The top of the Point Peak Mbr is transitional with the San Saba Mbr occurring as the first thin-bedded, glauconitic, calcarenite beds above the bioherms. When present, the upper Point Peak Bioherm is more resistant than the overlying San Saba Mbr and may produces a topographic break. The bioherm facies is often a ridge-forming unit. The unit distinctly appears as having an irregular pattern or texture in outcrop on LiDAR.

Ꞓwp—Point Peak, lower member (informal). Heterolithic clastic rocks. Yellowish to green-gray, thinly bedded and intercalated fine-grained sandstone, siltstones grainstones, and packstones. Beds of varicolored intraformational conglomerates with tabular flat clasts of rounded silty limestone are common. Glauconite is abundant. Locally beds contain ripples, cross-beds, and burrows and trace fossils (Cruziana). Small stratiform stromatolites locally occur within the unit (Lehrmann et al., 2020). Locally distinct index fossils include the "Plectorophia" Zone (brachiopoda) are found near the top and beneath the upper bioherms (Barnes and Bell, 1977). The lower unit is easily eroded and often occurs as eroded flat hilltops or valleys. Unit weathers into a light-colored soil with flaggy siltstone clasts creating locally favorable conditions for agricultural use. Top of the lower unit occurs at the base of the massive overlying stromatolite unit, when present. When stromatolites are absent, the top of the Point Peak Member is transitional with the overlying San Saba Mbr and placed below the first glauconitic calcarenite bed (Becker, 1985). The lower contact with the Morgan Creek Limestone is gradational. The base of the Point Peak Member is defined as the top of upper-most glauconitic calcarenite and laterally continuous bed. The contact is mapped at a break in slope associated with the bench-forming character of the transition from the resistant Morgan Creek and Point Peak Member.

Ꞓwm—Morgan Creek Limestone Member. Calcareous glauconitic sandstones and sandy glauconitic limestones. Quartz sandstone: lower sandstone is 25 ft thick, calcite-cemented, glauconitic, pink to red, fine- to medium-grained, grading upwards from underlying Welge Sandstone into the overlying calcareous units. Limestone (wackestone to grainstone): well-bedded, medium-to-light gray to greenish-grey, fine- to coarse-grained, local sparry cement, glauconitic, and fossiliferous (brachiopods and trilobites). Overall a resistant unit forming ridges and steep hillslopes, consisting of thin to thick bands of aligning vegetation. Upper boundary is gradational and locally defined as a transition from fossiliferous limestones of the Morgan Creek into thin bedded silty limestones and intraformational conglomerate of the Point Peak Mbr. This contact is often at the top of a resistant calcarenite that forms a bench below the more recessive lower Point Peak Mbr. The bench is often vegetated with mesquite trees. The unit is often a ridge-forming unit with laterally continuous beds apparent on LiDAR. Up to 140 ft thick.

Ꞓww—Welge Sandstone Member. Sandstone. Quartz arenite with silica cement, coarse- to medium-grained, well-sorted with well-rounded quartz grains with quartz overgrowths. Thick bedded (massive) to poorly bedded, non-glauconitic, yellowish-brown to orange in color. Unit generally lacks sedimentary structures and base contains reworked Lion Mountain. Grades into overlying Morgan Creek with the contact placed at the occurrence of carbonate cement and associated heavily vegetated scarps. Important minor aquifer for domestic and livestock use. Up to 25 ft thick.

Ꞓrl—Lion Mountain Member. Sandstone. Glauconitic, quartz-rich, green- to dark brown-colored, fine- to medium-grained, cross-bedded, locally calcite cemented. Contains white sandy limestone lenses composed of calcite cemented phosphatic brachiopod and trilobite coquina. The Lion Mountain is a recessive unit, often forming benches or valleys between more resistive overlying and underlying units. Benches or slopes with sparse vegetation develop deep reddish soil with weathering-produced iron nodules. Locally unit has agricultural use. Becker (1985) reports a thickness up to 55 ft. The contact with the underlying Cap Mountain is placed at the first occurrence of continuous calcarenite and below the first occurrence of discontinuous trilobite coquina. This contact is often as a topographic and vegetation break. When exposed, the contact with the overlying Welge Mbr is sharp. The contact is mapped as as a distinctive densely vegetative slope break and as the most up-slope occurrence of iron-oxide nodules within the soil.

Ꞓrc—Cap Mountain Member. Sandstone and limestone. The Cap Mountain Mbr transitions from a lower quartz sandstone with calcite cement, into a mixed calcarenite and siltstone, to a calcarenite (limestone) at the top. Lower quartz sandstone; fine-grained, poorly sorted, glauconitic, dark-yellowish brown to reddish, calcite-cemented, coarse grained sandstone with rounded to angular grains that transitions upward into a middle portion of interbedded siltstone and calcarenite. This middle section grades upward into light olive gray, prominently bedded (thicknesses up to 25 inches), glauconitic, limestone (wackestone to grainstone) with less quartz and more calcareous grains. Fossil fragments include brachiopod shells. The Cap Mountain is a highly resistant, scarp forming unit, forming vegetation lineaments along internal contacts. The unit forms moderately vegetated hills between the upper Hickory and Lion Mountain benches. It grades into the overlying Lion Mountain, but with a sharp slope contrast. Weathered outcrops and soils contain small limonitic concretions near the top. The contact with the underlying Hickory Mbr (quartz and hematite cement) is gradational, but distinct based on the lack of calcareous cement in the Hickory. The contact is placed at the base of the more resistant calcareous cemented, which is often expressed as a topographic scarp and heavily vegetated break in slope. Up to 330 ft thick (Becker, 1985).

Ꞓrh—Hickory Sandstone Member, undivided. Quartz sandstone. Subdivided into three informal units (upper, middle, and lower) based upon variations in color, grainsize, porosity, bedding thickness, cementation, and topographic expression. Where not differentiated, the unit generally consists of brown to red quartz sandstones. Diagnostically there is little to no calcite and no glauconite. Locally a major aquifer in the subsurface. The contact with the overlying Cap Mountain is placed at the first resistant calcareous cemented sandstone, which is often expressed as a topographic scarp and heavily vegetated break in slope. About 400 ft thick.

Ꞓrh(u)—Upper Hickory (informal). Sandstone. Hematitic quartz arenite. Massive to thinly-bedded, red, medium- to coarse-grained, well-rounded, moderately sorted, friable, hematite and limonite cement, and glauconitic at top. Hematite locally forms ooids-like coatings around quartz grains. Poorly exposed recessive unit, forms topographically low benches that develop deep red soils often used for cultivation or agricultural purposes. Unit grades into overlying Cap Mountain, marked by calcite-cemented sandstone with increased resistance and relief in landscape. The unit is locally an aquifer. About 75 ft thick.

Ꞓrh(m)—Middle Hickory (informal). Sandstone. Quartz arenite. Thick- to thin-bedded, with laterally continuous beds, quartz and hematite cement (increasing upward), fine- to coarse-grained, rounded to subrounded, poorly sorted, smaller scale troughcross-bedding, light brown to orangish brown, and phosphatic brachiopods, and abundant trace fossils. Locally silty laminations and interbeds. Laterally continuous mudstone and siltstone interbeds. This unit is indurated and forms ridges, outcrops and low hills owing to a weathering-produced, near-surface lithification process (Brann Johnson, personal communication). The unit is often thickly vegetated. Little to no agriculture and is considered an aquitard (Brann Johnson, personal communication). Up to 145 ft thick.

Ꞓrh(l)—Lower Hickory (informal). Sandstone. Quartz arenite. Massive and discontinuous beds, large amplitude trough cross-bedding, very coarse- to medium-grained, quartz and hematite cement, poorly sorted, rounded to subrounded, light to dark brown, friable, locally conglomeratic with feldspar grains, granitic to metamorphic pebbles and at base. Ventifacts described and mapped localities near the base (Alexander, 1952). Very porous and permeable and locally is a major aquifer unit. Recessive and poorly exposed unit that forms topographically low benches with well-developed soils often in agricultural use. Top of the unit is the first resistant, well-cemented sandstone. Variable thickness, ranging from 0 to about 55 ft thick.

Unconformity

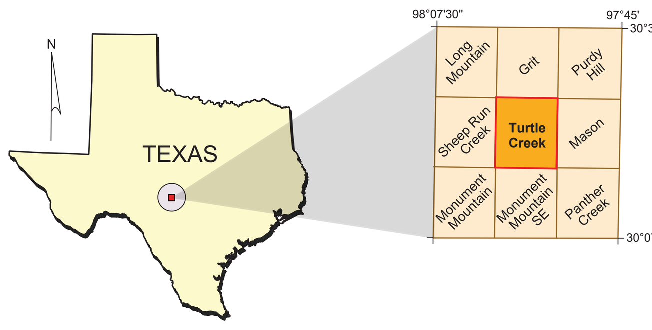
MESO PROTEROZOIC
Igneous

pꞒtm—Town Mountain Suite. Granite. Porphyritic to equigranular, pink, fine- to coarse-grained granite. Composed of pink microcline (up to 3 cm), vitreous gray quartz, cloudy white plagioclase, biotite and hornblende, and containing aplitic to pegmatitic granite dikes and milky quartz veins. Locally topaz-bearing (White, 1960). Microcline phenocrysts locally defines a flow foliation and/or lineation, especially near pluton margins. Weathers to form grus aggregate; where granite is deeply weathered and grus well developed it locally underlies areas in cultivation. Granite exposures occur in the NW corner of the quadrangle and is a continuation of the larger Grit pluton to the north (Grit Quadrangle). Muehlbreger et al (1967) interpret this granite body as part of a larger pluton connected in the subsurface to the Mason pluton to the southeast. The Grit pluton is not dated, but the Katemcy Pluton to the north is reported to be 1070 ± 2 Ma (U/Pb zircon age; Walker, 1992).

Metamorphic

pꞒps—PACKSADDLE SCHIST DOMAIN (SUPERSUITE). Schist and gneiss. Variable lithologies poorly and discontinuously exposed include: fine- to coarse-grained, pink to greenish gray and gray, quartz-feldspar-biotite gneiss, quartz-feldspar-magnetite-schist, quartz-muscovite-sillimanite schist, poorly foliated amphibolite, quartz-biotite-hornblende schist, white to grey quartzite; gray quartz-muscovite schist. Locally well-developed aligned minerals define multiple generations of ductile fabrics and folds in all rock types. Metasedimentary and metaigneous supracrustal protoliths consisting of a ca. 1257-1247 Ma (and possibly older) basinal sequence that formed along a continental shelf/slope near an arc (Reese et al., 2000; Mosher, 1998). Soils tend to have quartz fragments and abundant mica. Very small exposure found along the Mason fault in the Northeastern quadrangle.

pꞒps(m)—Packsaddle Schist Marble. Color banded, compositionally layered calcite and dolomite marble. Calcite marble: very fine- to medium-grained, light gray to white, weathering to light to dark gray to brown-gray. Composed of ~55% subhedral equant calcite; 20% subhedral equant dolomite; 15% asbestos form to acicular tremolite, commonly in radial sprays; 8 % euhedral to subhedral platy phlogopite and 2 % euhedral to subhedral, equant opaque minerals, including hematite and trace concentrations of graphite. Dolomite marble: very fine- to medium-grained, medium to light gray, weathering to dark to medium red-brown to light brown to yellow-orange. Composed of ~70% equant anhedral to subhedral dolomite, 10% equant, subhedral to anhedral quartz, 5% subhedral orthoclase, 8% euhedral to subhedral phlogopite, 5% acicular tremolite and 2% iron oxide. Phlogopite locally occurs in 1x2 cm euhedral books; trace amounts of calcite and apatite are variably present. Millimeter to decimeter scale compositional layering (foliation) in both marble types is defined by slight variations in grain size and mineral concentrations, with calcite marble showing the greatest visible variation in tremolite content and dolomite marble in oxide and phlogopite concentrations. No minerals within the layering define a grain shape fabric. Calcite, quartz and tremolite veins are locally prevalent. Compositional layering is abundantly folded on the millimeter to decameter scale (unit description modified from Schaffer, 1997). Marble bodies found in the northwest corner of the quadrangle form resistant ridges compared to adjacent schist and gneiss found outside of the quadrangle.

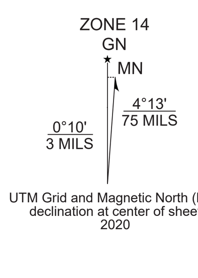


SCALE 1:24,000

0 1 2 3 MILES

0 1 2 3 4 KILOMETERS

UNIVERSAL TRANSVERSE MERCATOR PROJECTION, ZONE 14N NAD 83
CONTOUR INTERVAL 50 FT
DATUM IS MEAN SEA LEVEL

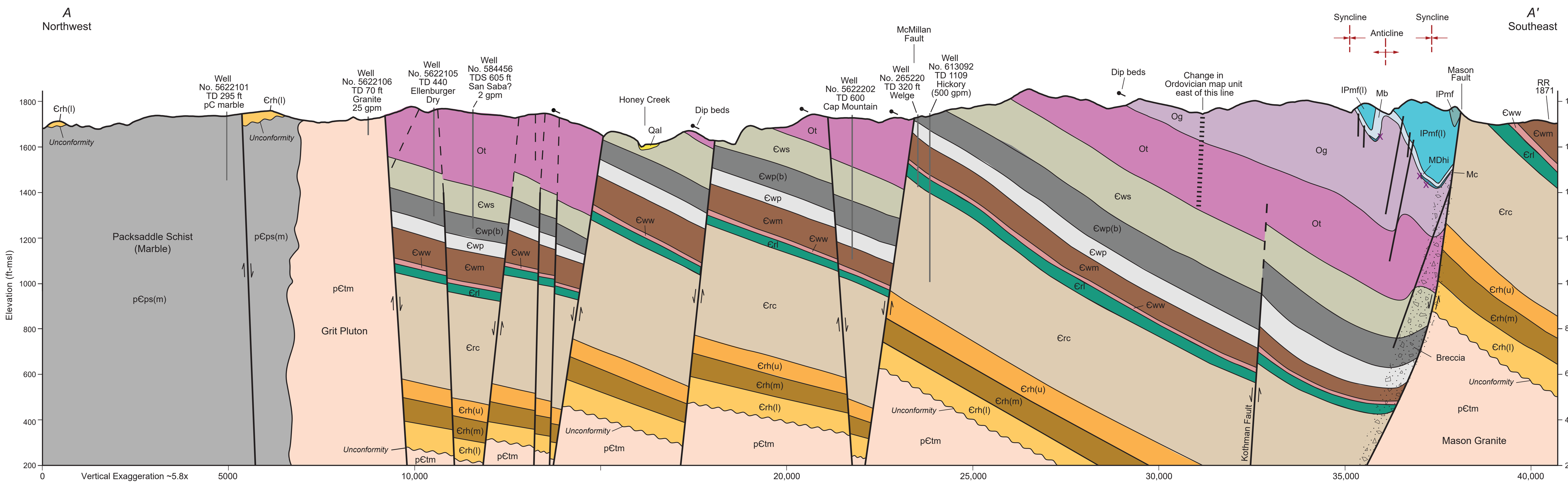


UTM Grid and Magnetic North (MN) declination at center of sheet 2020

GEOLOGIC MAP OF THE TURTLE CREEK QUADRANGLE
MASON COUNTY, TEXAS

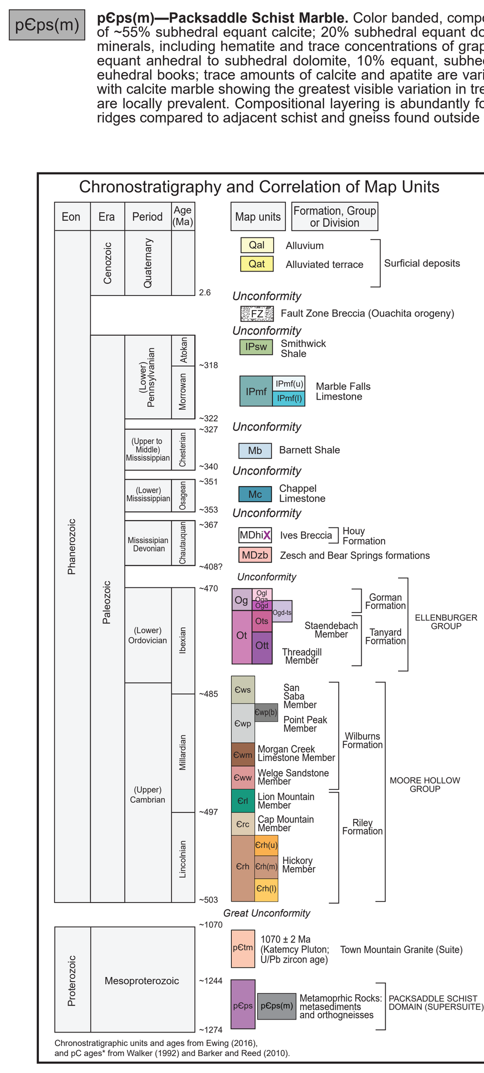
Brian B. Hunt, Brann Johnson, Mark Helper, and Andre Droxler

2022



Due to vertical exaggeration and scale, the cross section is simplified and schematic in some areas.Unit thicknesses vary due to apparent dips and structures. Ordovician units simplified from mapped units. Wells and spring projected into line of section. Shallowing dip of western-most fault from interpretation of Becker (1985). Well information and ID from the TWDB Groundwater database (5622202) or the Submitted Well Drillers Report Tracking Number (#265220). Dip of beds icon at surface represents an apparent dip with vertical exaggeration; elsewhere dip is inferred.

Chronostratigraphy and Correlation of Map Units

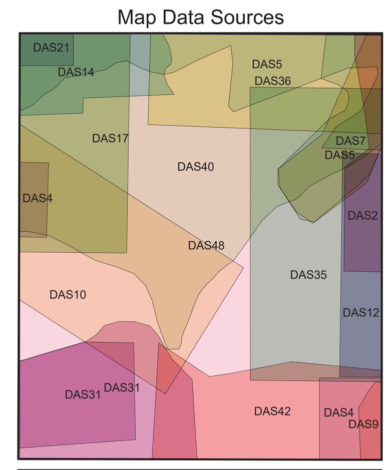


Chronostratigraphic units and ages from Ewing (2016), and pC ages* from Walker (1992) and Barker and Reed (2010).

MAP SYMBOLS

Contact	Axial plane	Sinkhole
Approximate contact	Axis; lineation	Fossil bed ellenburger (oga)
Road	Dip	Sandstone bed (cws)
Elevation; contour interval 20 ft	Foliation	Normal fault
Intermittent stream	Fracture	Inferred fault
Ponds	Foliation-vertical	Buried fault
Gravel pit	Fault trend	Waterline
Spring	Fault; fault	Fabric
Flowing well	Dip-horizontal	Collapse contact
Well with geologic control.	Fossilpoints	Supersuite boundary
Quarry	Small fault trend	Measured section
Quarry	Small fault (Strike and dip)	Internal contact
Water		Antiform
		Syncline
		Synform
		Overturned antiform
		Anticline

Map Data Sources



Data Source	Citation
DAS2	Alexander, 1952
DAS3	Barker and Reed, 2010
DAS4	Barnes and Bell, 1977
DAS5	Barnes and Schofield, 1964
DAS6	Barnes, 1981
DAS7	Becker, 1985
DAS9	Bryant, 1959
DAS10	Cloud and Barnes, 1946
DAS12	Duval, 1953
DAS14	Fritz, 1954
DAS17	Grote, 1954
DAS31	Miller, 1957
DAS35	Parke, 1953
DAS36	Polk, 1952
DAS37	Pool, 1960
DAS40	Schoellkopf, 1987
DAS42	Sliger, 1957
DAS44	USGS, 2018
DAS47	Wilson, 1957
DAS54	Barnes et al., 1947

Acknowledgments

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