contains graptolites, conodonts, chitnozoans, sponge spicules, radiolarians, pelmatozoans, brachiopods, and trilobites. The total thickness of the unit is

Formation is predominantly a tan to yellowish-gray, very fossiliferous, whole

brown, weakly indurated, medium-grained sandstone; and an upper, olivegreen, mudstone to claystone with thin interbeds of limestone. The McLish

Formation is similar to the Tulip Creek Formation, with a lower light gray, friable, fine-grained sandstone and an upper greenish gray clayshale with limestone

WOMBLE SHALE—The lower part of the Womble Shale consists of brown to

green clayshale with thin lenses of sandstone; it is at least 50 meters thick, but

the base is in fault contact with younger units. As such, the total thickness

cannot be determined. The upper part of the Womble Shale consists of 25 to 30

meters of brown to black, cherty shale containing well-rounded quartz sand

Formation (Ok) is a medium gray carbonate mudstone and intraclastic

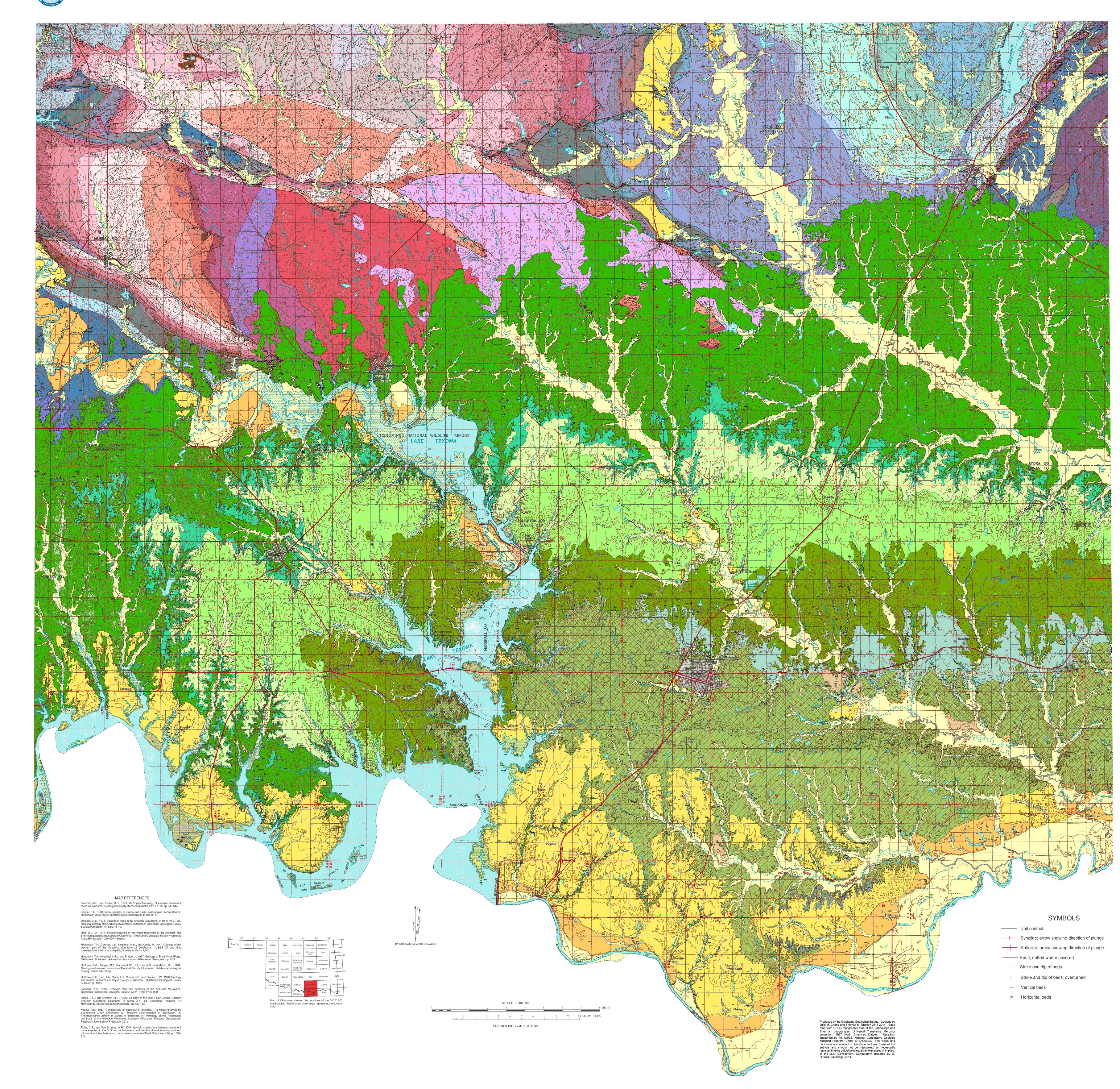
in the lower half of the formation. The basal contact with older formations is

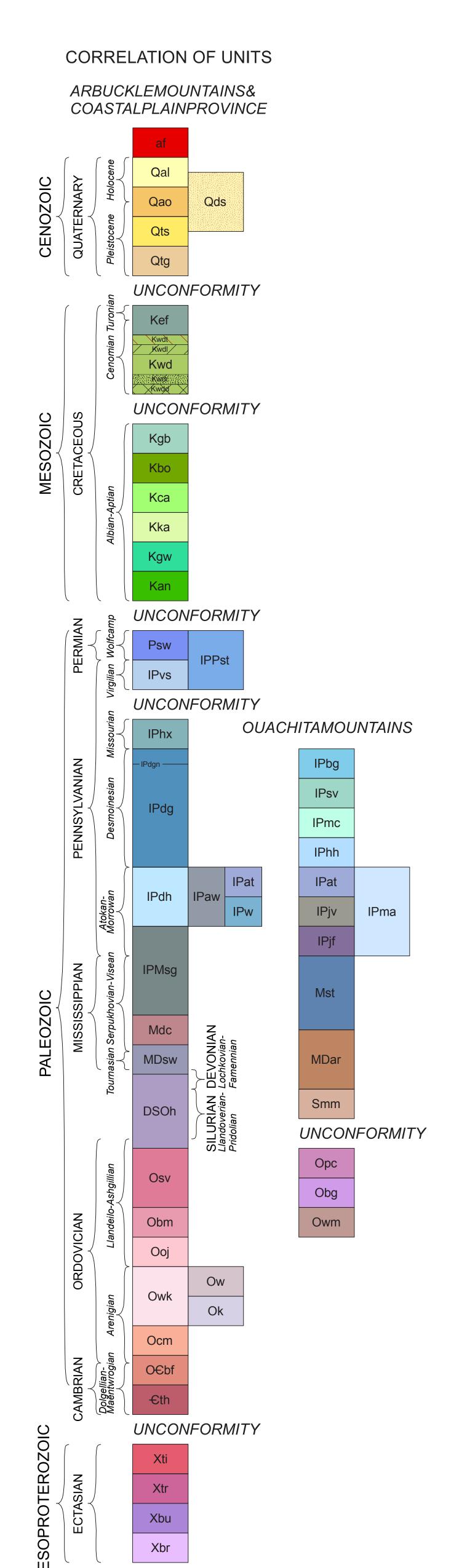
ambiguous at best. Total interval thickness varies between 450 and 700 meters.

interbeds. Thickness of total interval ranges from 230 to 425 meters.

fossil, carbonate mudstone to packstone, with occasional gray clayshale and very fine-grained sandstone interbeds; clastic material is more common in the upper half of the unit. The Tulip Creek Formation consists of a lower, reddish-

Ohm BROMIDE, TULIP CREEK, & MCLISH FORMATIONS—The Bromide





DESCRIPTION OF UNITS DELAWARE CREEK SHALE — Dark gray to black, fissile, calcareous clayshale ARTIFICIAL FILL—Natural or artificial talus, slumps, and tailings covering containing large septarian concretions. Formerly called the Caney Shale. formally exposed areas around active and inactive mining operations hickness ranges from 50 to 230 meters. In the Black Knob Ridge area, the formation consists of slickensided black clayshale, 6 meters thick, with large ALLUVIUM—Unconsolidated sand, silt, clay, and gravel in stream and river septarian concretions, small phosphate nodules, and plant material. channels on modern flood plains. OLDER ALLUVIUM—Unconsolidated sand, silt, clay, and gravel in stream and SYCAMORE LIMESTONE & WOODFORD SHALE—The Woodford Shale is a dark gray to black, fissile, siliceous clayshale and bedded chert. The Sycamore river channels, mainly between 0–12 m above modern flood plains. imestone overlies the Woodford Shale and is a bluish-gray to tan colored, silty carbonate mudstone. Thickness is between 45 and 170 meters. DUNE SAND—Unconsolidated windblown sand formed into definite dune structures and ridges. ARKANSAS NOVACULITE—The Arkansas Novaculite is divided into 4 TERRACE SAND—Mostly unconsolidated sand, silt, and clay, with little to no members. The lowest member makes up about half of the formation and is composed of thinbedded, apple-green novaculite, interbedded with hard green gravel-sized material. Unit formed at several levels along former courses of shale. No fossils are found in this member. The second member constitutes half present-day rivers and streams. of the upper part of the formation and contains light gray to black novaculite of variable thickness intercalated with partings and beds of black paper shale. The TERRACE GRAVEL—Unconsolidated gravel, sand, silt, and clay laid down at third member makes up about a fourth of the formation and consists of red and several levels along former courses of present-day rivers and streams. green, micaceous shale intercalated with thin beds of novaculite and black, EAGLE FORD FORMATION—Blue-gray, yellow-weathering, silty, thinblocky shale. The upper member also makes up about a fourth of the formation and consists of 2.5 to 30 cm thick beds of green, brown, and gray novaculite. bedded, flaggy limestone interbedded with thin beds of blue calcareous Conodonts, radiolaria, spores, brachiopods, and silicified wood are common in siltstone and blue silty shale. Exposed thickness in quadrangle is about 8 the upper half of the formation. Total thickness ranges from 70 to 105 meters WOODBINE FORMATION—Brown to tan, fine- to coarse-grained, DSOh HUNTON GROUP—Light gray, fossiliferous, carbonate mudstones to grainstones, yellow to buff colored carbonate marlstones, and thin intervals of conglomeratic, ferruginous, moderately to weakly indurated, cross-bedded sandstone interbedded with gray shale and lignite. Subdivided in descending dark gray, fissile clayshales. Comprised of the Frisco, Bois d'Arc, and Haragan order into the Templeton Member (Kwdt), which consists indurated sandstone Formations (Dev.); the Henryhouse, Clarita, and Cochrane Formations (Sil.); and shale; the Lewisville Member (Kwdl), which consists of shale and weakly and the Keel Formation (Ord.). Thickness is about 90 meters. indurated sandstone; the Red Branch Member (Kwdr), which consists of indurated sandstone, shale, and lignite; and the basal Dexter Member (Kwdd), MISSOURI MOUNTAIN SHALE—The Missouri Mountain Shale consists which consists of weakly to moderately indurated sandstone, shale, and lignite. primarily of green clayshale intercalated with siliceous shale, laminated chert, The Templeton and Red Branch Members erode to escarpments. The sandy shale, sandstone, and lenses of hard lenses of well-indurated Templeton, Lewisville, and Red Branch Members are each ~23 meters thick, conglomerate. In some areas, the shale is variegated red and green. Dendritic and the Dexter Member is ~30 meters thick. Thickness is about 100 meters. manganese oxide is common. The conglomerates contain coarse grains and GRAYSON MARLSTONE & BENNIGNTON LIMESTONE, pebbles up to 2.5 cm in diameter of indurated green and black shale clasts and UNDIFFERENTIATED—The Grayson Marlstone is a gray to light greenishchert within a vitreous, siliceous matrix. Fossils in the Missouri Mountain Shale gray marlstone with interbeds of gray to white nodular limestone. In some areas, include conodonts, sponge spicules, brachiopods, and bryozoans. it contains thin bedded, light-gray argillaceous limestones and clays overlain by olive-gray calcareous clays. The marlstone contains abundant oyster fossils. SYLVAN SHALE & VIOLA GROUP—The Sylvan Shale is a yellow to dark greenish gray, siliceous, fissile clayshale; minor interbeds of fine-grained Thickness is about 7.6 meters. The Bennington Limestone is a blue-gray to sandstone and siltstone may occur in the upper part of the shale. The Viola yellow-brown, moderately indurated, massive limestone. The Bennington is Group is composed of an upper fossiliferous limestone (wackestone to fossiliferous and is locally arenaceous. The unit commonly weathers pitted and packstone in texture) called the Welling Limestone; and a lower, interbedded, honeycombed. Thickness is about 3 meters. The Grayson and Bennington may cherty, unfossiliferous carbonate mudstone and fossiliferous wackestone to be thinner or absent in some areas due to pre-Woodbine erosion. packstone called the Viola Springs Formation. Total thickness ranges from 125 BOKCHITO FORMATION—Mostly clay and clayshale, with some tan-colored limestones and fine-grained sandstones. Subdivided in descending order into POLK CREEK SHALE—The Polk Creek Shale consists of hard, black, paper ne Pawpaw Clay at top, the Quarry Limestone, the Weno Clay and the Denton shale in the lower part, grading upward to soft, brown, platy shale with yellow Clay at base. Only the lower 60 meters exposed in quad. clay pellets. In one location, the Polk Creek Shale is brown with chert nodules. Graptolites are common. The formation varies in thickness from 0 to 43 meters. CADDO FORMATION—Light gray, silty limestones and marls interbedded with blue-gray, silty clayshale or mudshale. Formally subdivided into the Fort Worth BIGFORK CHERT—The lower part of the Bigfork Chert is 125 to 155 meters Limestone at top and the Duck Creek Limestone at base, with an unnamed shale between. Fossil Gryphaea common in limestones. Thickness about 46 thick, consisting of light gray to light brown chert intercalated with gray limestone beds, stringers, and lenses. Chert primarily occurs in even-bedded layers 5 to 10 cm thick and can be up to 30 cm thick, but it also occurs as nodules KIAMICHI FORMATION—Dark gray, calcareous clayshales and claystones The upper part of the Bigfork Chert is 30 to 58 meters thick and consists of very interbedded with local occurrences of nodular limestone and fine-grained, dark brown to dull chert intercalated with black paper shale. The Bigfork Chert calcareous sandstone. Limestones are very fossiliferous. Thickness 9 to 10

GOODLAND LIMESTONE and WALNUT CLAY—Upper 10 meters composed of the Goodland Limestone, a medium to light gray, dense, nodular limestone

with thin, dark gray clayshale partings. The Walnut Clay makes up the lower 1

meter of interval and consists of an olive brown, calcareous claystone; the

ANTLERS SANDSTONE—White to light brownish yellow, medium-grained, poorly indurated sandstone. Red to maroon, arkosic conglomerates occur

nudstone with local interbeds of reddish-orange, friable, fine-grained, icaceous channel sandstones; dolomite- and siltstone-pebble conglomerates

are common at the base of sandstone intervals. Base of formation is mapped at

the base of the Hart Limestone. Grades laterally into the Stratford Formation

VANOSS FORMATION—Consists mainly of reddish-brown mudshale and

alcareous clayshale, interbedded with thin limestone and friable, fine- to

coal, Inola Limestone, and Taft Sandstone at the top. Thickness ranges from

MORROWAN-ATOKAN ROCKS, UNDIFFERENTIATED—Gray to brown, fine-

1400 meters. In the Black Knob Ridge area, the Springer consists of slickensided black shale containing septarian concretions and small phosphatic

nodules. The presence of cephalopods distinguishes the formation from the

STANLEY SHALE—The lower beds of the Stanley Shale are green to buff

siltstones and shales. Some of the siltstones contain chert and siliceous

cement. Green to greenish-gray shales are present above the lower beds and alternate with siltstones up to 30 meters thick. Blue-gray to black siliceous shales occur throughout the formation and range from 4.5 to 23 meters thick. A red and green clayshale, 4.5 meters thick, occurs in the upper part of the formation. Cone-incone structure is common. Conodonts, spores, sponge

spicules, and plant material are also present. Thickness is 930 meters.

380 to 850 meters.

350 to 1525 meters.

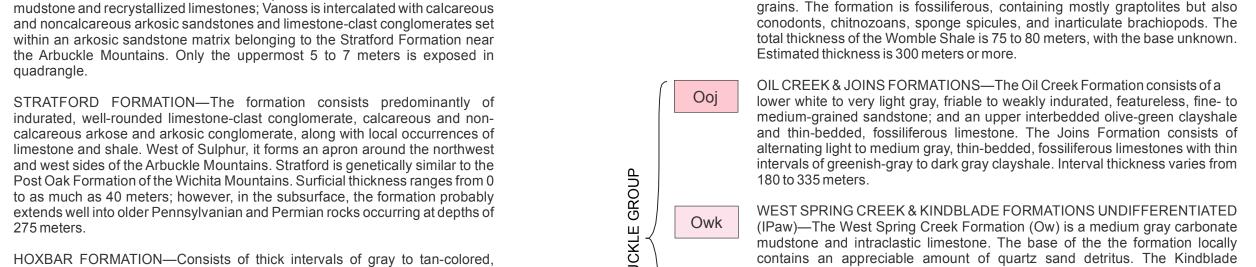
underlying Delaware Creek Shale.

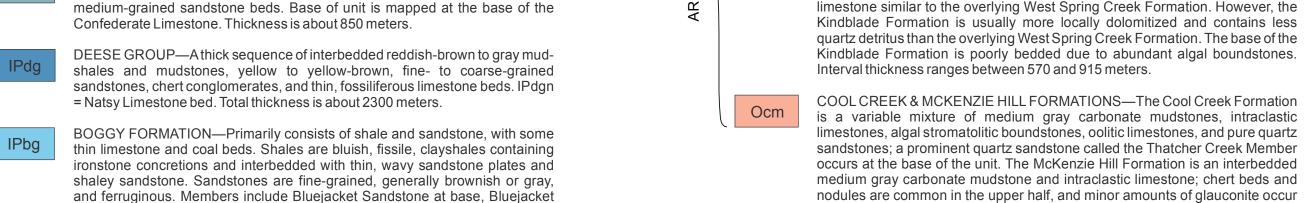
near the Arbuckle Mountains. Total thickness varies from 90 to 150 meters.

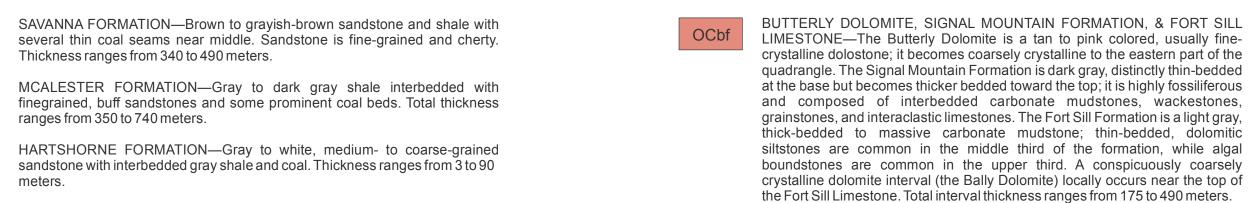
Walnut Clay is poorly exposed. Thickness 6 to 9 meters

STILLWATER FORMATION—Predominantly a reddish-brown concretionary

cally. Thickness ranges from 60 to 215 meters.











Accessory minerals include titanite, zircon, fluorite, apatite, and magnetite. The sandstone with boulders up to 2 meters in diameter. Thickness ranges from Troy Granite intrudes the Burch Granodiorite and has a 1368 ± 3 Ma U/Pb zircon age. The estimated thickness of the Tishomingo and Troy Granites is 16 SPRINGER GROUP—Medium to dark gray, fissile, slightly silty, locally calcareous clayshale interbedded with two to three fine- to medium-grained. BURCH GRANODIORITE—Medium-grained, gray, equigranular granodiorite argillaceous sandstones. Includes the Goddard Shale at base. The Goddard containing plagioclase, K-feldspar, quartz, hornblende, and biotite. Accessory Shale is a medium- to lightgray, noncalcareous, fissile clayshale. Thickness is

granodioritic to quartz dioritic gneiss, and a fine-grained granitic granofels. The Blue River Gneiss has a 1389 ± 10 Ma U/Pb zircon age. The Precambrian units are cut by a variety of dikes, including diabase, amphibolite, pegmatite, aplite,