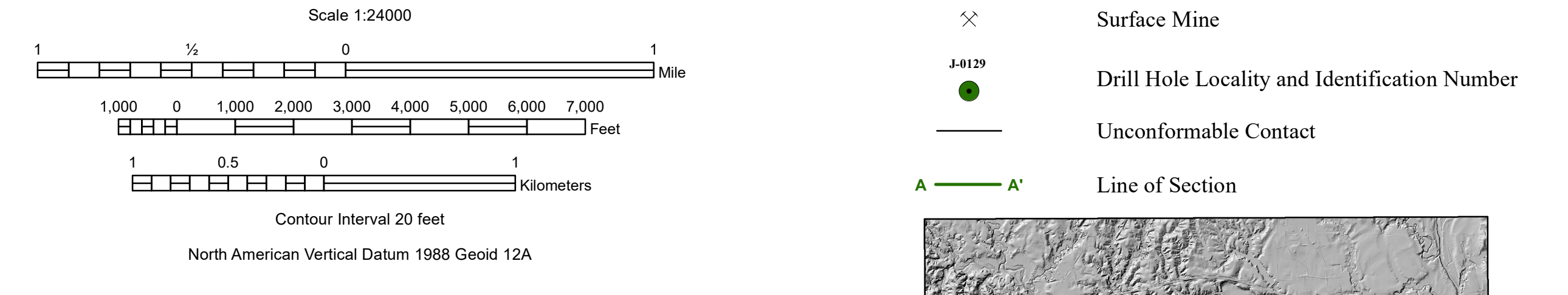


Base Map produced by the Mississippi Geological Survey
Coordinate System: NAD 1983 UTM Zone 15N
Projection: Transverse Mercator
Datum: North American 1983
Units: Meter
Declination: World Magnetic Model, December 31, 2019, estimated Magnetic North declination in 7.5-Minute Bovina Quadrangle, (90°37'30.00"W, 32°18'45.11"N), center area is 1.26° west of True North ± 0.35". Annual rate of declination change is approximately 0.09° west per year.
Base Map Data sourced from <https://nris.mississippi.edu/>.
Contours are derived from LIDAR data.
Borehole data from Mississippi Office of Geology.



Mississippi Office of Geology
Open-File Report 356

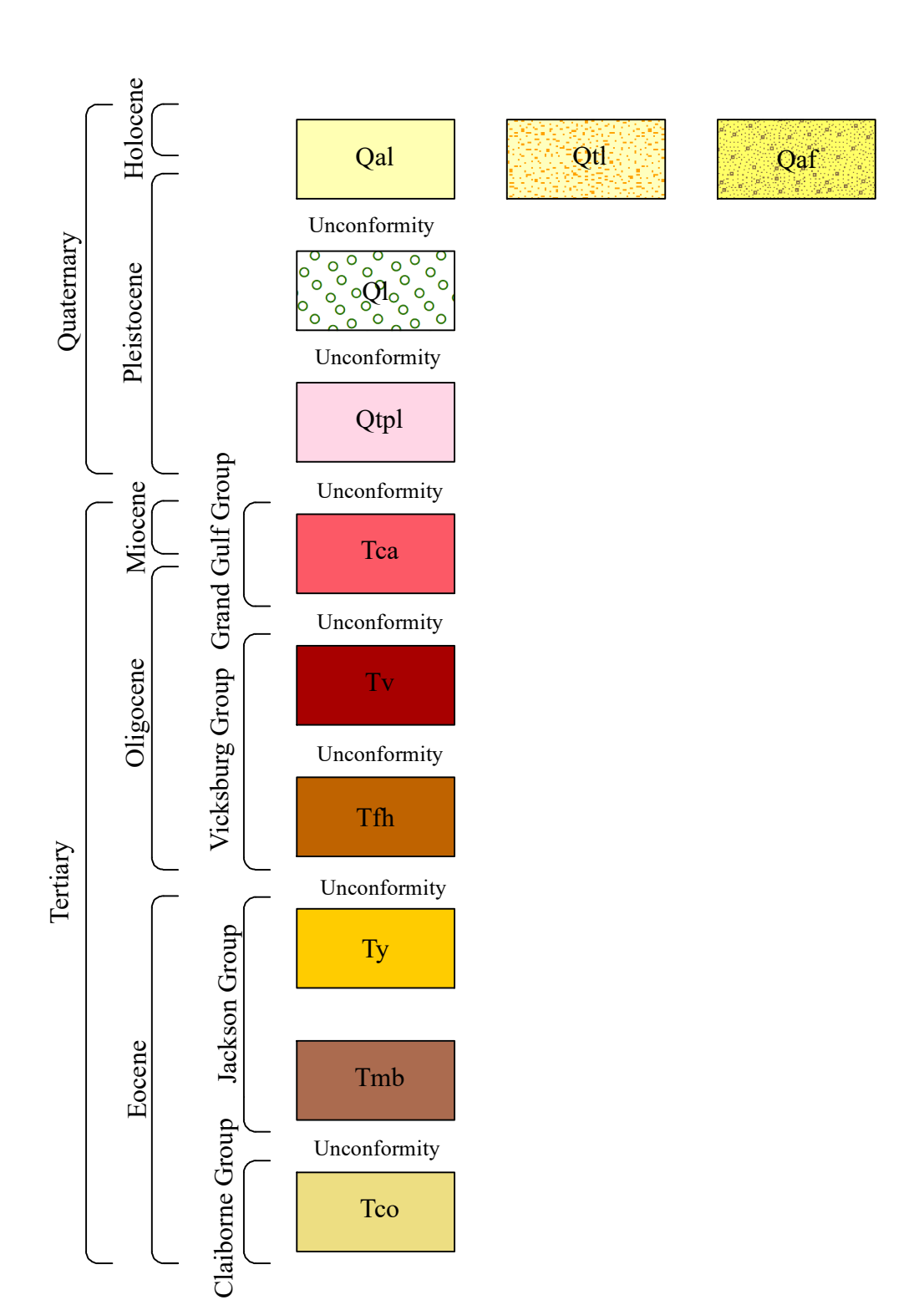
**GEOLOGIC MAP of the BOVINA
7.5-MINUTE QUADRANGLE**
Hinds and Warren Counties, Mississippi
2024
Geology by

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Correlation of Map Units



Descriptions of Map Units

- Qal Alluvium (Holocene to Pleistocene)**
Sand, yellow- to brownish-white in color, fine- to coarse-grained, subrounded to rounded, predominately quartzose, locally graveliferous containing aggregate derived from the Pre-Loess Terrace deposits, silty to clayey; humus lenses common; floodplain deposits are heavily loess-derived. Silicified wood common. Tributaries have narrow alluvial valleys and are deeply incised through the loess terrain. Stream Alluvium thickness is interpreted to be approximately 10 feet.
- Qol Stream Terrace (Holocene to Pleistocene)**
Flood Plain deposits dominantly associated with the Big Black River; Sand, yellow- to brownish-white in color, fine- to coarse-grained, subrounded to rounded, predominately quartzose, locally graveliferous containing aggregate derived from the Pre-Loess Terrace deposits, silty to clayey; humus lenses common; floodplain deposits are heavily loess-derived. Silicified wood common. These terraces are likely locations of pre-historic archeological sites.
- Qof Alluvial Fans (Holocene to Pleistocene)**
Silt, sands, and gravels. Coarsest at the apex of the fan. Grades into Big Black River alluvium.
- Qopl Loess (Pleistocene)**
Silt, buff to tan, pale yellow, red, grey to grey-green where in anoxic conditions, quartzose to feldspathic. Loess is considered an eolian deposit derived from glacial outwash. Loess is typically calcareous with dolomite and calcite; however, the upper portion of the loess can be deeply weathered, leached / noncalcareous, and has been commonly referred to as "brown loam." Loess deposits unconformably blanket the pre-loess topography with substantial local variations in thickness but generally thickening towards the west. In places, weathered loess contains secondary deposits of small calcareous concretions (caliche, loess dolls). Loess can be locally and sparingly fossiliferous, commonly containing tests or stemkerns of pulmonate gastropods and less commonly containing fossils of Pleistocene vertebrates.
- Tca Pre-Loess Terrace Deposits (Pleistocene)**
Pleistocene ancestral Mississippi River terraces deposited prior to Pleistocene ice sheeting. Sand, yellow, orange, purple, red, pink, fine- to coarse-grained, predominately quartzose, cross-bedded to massive, graveliferous, pea to large cobble size clasts, boulder size ice-rafted clasts of sandstone and chert. Economically significant gravels are predominantly chert with lesser amounts of vein quartz, metaquartzite, agate, sandstone, and rare rhyolite clasts; clay, pink to white, generally occurring as discontinuous lenses and as rip-up clasts up to boulder-size. Conglomeratic ironstone ledges are common in the graveliferous sands at the base of the deposits. The base of this terrace occurs at approximately 220 ft MSL.
- Tt Grand Gulf Group**
- Tth Catahoula Formation (Oligocene)**
Deltaic sands, silts, and clays; Sand, grey, pale yellow to white, fine- to coarse-grained, cross-bedded to massive, predominately quartzose with lesser amounts of chert, metaquartzite, mica, and heavy minerals, slightly glauconitic in places with rare thinly-bedded pea gravels; Gravel, black chert and milky quartz, highly polished, immature, subangular to well rounded, Clay, green, grey, brown, kaolinitic, weathers white to brown exhibiting a "popcorn" appearance, silty to sandy, lignitic common in basal clays. Often indurates to opaline-cemented sandstones and rarer orthoquartzites where exposed, silicified wood and fossil palm common. Ironstone common where sands overlie clays. The Catahoula Formation unconformably overlies the Bucatunna Formation. Total thickness is not represented on this map.
- Ty Vicksburg Group**
- Tmb Vicksburg Limestone Undifferentiated (Oligocene)**
Includes the Bucatunna Formation, Byram Formation, Glendon Limestone, Marianna Limestone, and Mint Spring Formation. The Bucatunna is predominantly dark brown carbonaceous clay with thinly interbedded fine sands. It contains sparse estuarine mollusks towards its base and carbonized palaeobotanical fossil remains are common throughout. The Glendon Limestone is white to grey, commonly indurated to semi-crystalline bioclastic limestone, either massive or with alternating ledges separated by thinly-bedded glauconitic marl. The Glendon Limestone commonly contains solution cavities at or near outcrop. Larger cavities usually form at the contact with the underlying Marianna Limestone. The Marianna Limestone is white to pale-yellow, soft to indurated, glauconitic marl, containing an admixture of fine-grained sands and clays in places. There is an abundance of the large Foraminifera *Lepidocyclina mantelli* in the Marianna Limestone and *Lepidocyclina supera* in the Glendon Limestone and the echinoid *Clypeaster rugosus*. Mint Spring Formation is a fossiliferous, fine-grained quartz marly sand containing the cassidoid echinoid *Rhyncholanthus gaultii*. The Vicksburg Limestone unconformably overlies the Forest Hill Formation. Thickness is approximately 150 feet.
- Tco Cockfield Formation (Eocene)**
Clay, brown, reddish-brown to grey in color; silty to fine sandy; strongly carbonaceous to lignitic, slightly micaceous, pyritic. Carbonized and silicified palaeobotanical fossil remains common.

Field Photographs

Clovis Paleolindian cultural period artifact manufactured from high quality Tallahatta Agate found in the Pleistocene stream alluvium of Clear Creek near Bovina in Warren County. Photographed by James Starnes in August 2023.

Unrupted fossil molar from a Mastodon (*Mammot americanum*) collected from the Pleistocene alluvium of Clear Creek near Bovina in Warren County by James Starnes in July 1995. MMNSVP Collections #3685.

Root casts in stream travertine precipitated from the calcium carbonate rich stream waters draining the loess terraces. Collected in Clear Creek near Bovina in Warren County in Section 17, Township 16 North, Range 5 East.

Stream alluvium at the confluence of Clear and Muddy Creek consisting of a bedload of sand and gravel derived from the Pleistocene ancestral Mississippi River Pre-Loess Terrace Deposits and floodplain silts derived from Pleistocene loess exposed along the wall of the active channel. Photographed near Bovina in Warren County in December 2019 in Section 17, Township 16 North, Range 5 East.

Glacially faceted and striated chert cobble from the Pleistocene ancestral Mississippi River Pre-Loess Terrace Deposits (Rawhide allomit). Collected in Clear Creek near Bovina in Warren County in Section 17, Township 16 North, Range 5 East.

Paleoproterozoic clast of Sioux Quartzite from the Pleistocene ancestral Mississippi River Pre-Loess Terrace Deposits (Rawhide allomit). Collected in Clear Creek near Bovina in Warren County in Section 17, Township 16 North, Range 5 East.

A Devonian reef-forming sponge fossil, *Stromatopora*, from the Pleistocene ancestral Mississippi River Pre-Loess Terrace Deposits (Rawhide allomit). Collected in Clear Creek near Bovina in Warren County in Section 17, Township 16 North, Range 5 East.

St. Francois mountain rhyolitic welded volcanic tuff cobbles exhibiting flow banding from the Pleistocene ancestral Mississippi River gravel of the Pre-Loess Terrace Deposits. Collected from the stream alluvium of Clear Creek near Bovina in Warren County in Section 17, Township 16 North, Range 5 East.

Potosi druse collected from Pre-Loess Terrace deposits in Clear Creek in Section 17, Township 16 North, Range 5 East.

Common agate collected from Pre-Loess Terrace Deposits in Clear Creek in Section 17, Township 16 North, Range 5 East.

Fossil tusk section from a Mastodon (*Mammot americanum*) collected from the Pleistocene alluvium of Clear Creek near Bovina in Warren County by James Starnes in July 1995. MMNSVP Collections #3685.

Marine decapod burrow swarm of the ichnogenus *Thalassinoides*, eroding in relief from sandy clay of the Oligocene Catahoula Formation outcropping along the stream channel of Silver Creek near Bovina in Warren County. Photographed in January 2002 in Section 5, Township 16 North, Range 5 East.

Unconformable contact of boulder clasts in the basal sand gravel of Pleistocene ancestral Mississippi River Pre-Loess Terrace Deposits (Rawhide allomit) with the underlying deltaic clays of the Oligocene Catahoula Formation exposed along steep in the floor of the Hill Bros. gravel pit near Edwards in Hinds County. Photographed in August 2024 in Section 6, Township 5 North, Range 4 West.

Large gastropod fossil, *Turbinella Wilsoni*, from the Oligocene Byram Formation collected from MGS Locality 106 along the eastern bank of the Big Black River in Hinds County near Edwards. Photographed by James Starnes in July 2024 in Section 29, Township 6 North, Range 4 West.

Lower jaws of an Oligocene Titanother, *Subhyracodon*, excavated from the Byram Formation (MGS Locality 106) along the Big Black River near Edwards in Hinds County. Photographed by Gil Ford in October 1999 in Section 29, Township 6 North, Range 4 West.

Fossil crab *Necronectes vaughani Rathbun* in a block of Vicksburg Group limestone at the foundation of an old Civil War railroad bridge destroyed by the Confederate Army over the Big Black River near Edwards in Hinds County. Photographed in January 2014 in Section 22, Township 6 North, Range 4 West.

Structural Cross-Section of the Bovina 7.5-Minute Geologic Quadrangle

