

U.S. Department of the Interior
National Park Service
Natural Resource Stewardship and Science Directorate
Geologic Resources Division



Fort Donelson National Battlefield

GRI Ancillary Map Information Document

Produced to accompany the Geologic Resources Inventory (GRI) Digital Geologic Data for Fort Donelson National Battlefield

fodo_geology.pdf

Version: 3/4/2021

Geologic Resources Inventory Map Document for Fort Donelson National Battlefield

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Geologic Resources Inventory Map Document



Fort Donelson National Battlefield, Kentucky and Tennessee

Document to Accompany Digital Geologic-GIS Data

[fodo_geology.pdf](#)

Version: 3/4/2021

This document has been developed to accompany the digital geologic-GIS data developed by the Geologic Resources Inventory (GRI) program for Fort Donelson National Battlefield, Kentucky and Tennessee (FODO).

Attempts have been made to reproduce all aspects of the original source products, including the geologic units and their descriptions, geologic cross sections, the geologic report, references and all other pertinent images and information contained in the original publication.

This document contains the following information:

- 1) **About the NPS Geologic Resources Inventory Program** – A brief summary of the Geologic Resources Inventory (GRI) Program and its products. Included are web links to the GRI GIS data model, and to the GRI products page where digital geologic-GIS datasets, scoping reports and geology reports are available for download. In addition, web links to the NPS Data Store and GRI program home page, as well as contact information for the GRI coordinator, are also present.
- 2) **GRI Digital Map and Source Citations** – A listing of all GRI digital geologic-GIS maps produced for this project along with sources used in their completion. In addition, a brief explanation of how each source map was used is provided.
- 3) **Map Unit List** – A listing of all geologic map units present on maps for this project, generally listed from youngest to oldest.
- 4) **Map Unit Descriptions** – Descriptions for all geologic map units. If a unit is present on multiple source maps the unit is listed with its source geologic unit symbol, unit name and unit age followed by the unit's description for each source map.
- 5) **Geologic Cross Section** – Geologic cross section graphic.
- 6) **Mineral Resources Summary Booklets** – Additional information pertaining mineral resource summary booklets related to mine and mine related features (e.g., gravel pits, quarries, prospects, wells, mine areas) present in the GRI digital geologic-GIS data.
- 7) **Ancillary Source Map Information** – Additional source map information presented by source map.

- 8) **GRI Digital Data Credits** – GRI digital geologic-GIS data and ancillary map information document production credits.

For information about using GRI digital geologic-GIS data contact:

Stephanie O'Meara
Geologist/GIS Specialist/Data Manager
Colorado State University Research Associate, Cooperator to the National Park Service
Fort Collins, CO 80523
phone: (970) 491-6655
e-mail: stephanie_o'meara@partner.nps.gov

About the NPS Geologic Resources Inventory Program

Background

The Geologic Resources Inventory (GRI) provides geologic map data and pertinent geologic information to support resource management and science-informed decision making in more than 270 natural resource parks throughout the National Park System. Geologic resources for management consideration include both the processes that act upon the Earth and the features formed as a result of these processes. Geologic processes include: erosion and sedimentation; seismic, volcanic, and geothermal activity; glaciation, rockfalls, landslides, and shoreline change. Geologic features include mountains, canyons, natural arches and bridges, minerals, rocks, fossils, cave and karst systems, beaches, dunes, glaciers, volcanoes, and faults.

The GRI is one of 12 inventories funded by the National Park Service (NPS) Inventory and Monitoring Program. The Geologic Resources Division of the NPS Natural Resource Stewardship and Science Directorate administers the GRI. The NPS Geologic Resources Division partners with the Colorado State University Department of Geosciences to produce GRI products. Many additional partners participate in the GRI process by contributing source maps or reviewing products.

The GRI team undertakes three tasks for each park in the Inventory and Monitoring program: (1) conduct a scoping meeting and provide a summary document, (2) provide digital geologic map data in a geographic information system (GIS) format, and (3) provide a GRI report. These products are designed and written for nongeoscientists.

Products

Scoping Meetings: These park-specific meetings bring together local geologic experts and park staff to inventory and review available geologic data and discuss geologic resource management issues. A summary document is prepared for each meeting that identifies a plan to provide digital map data for the park.

Digital Geologic Maps: Digital geologic maps reproduce all aspects of traditional paper maps, including notes, legend, and cross sections. Bedrock, surficial, and special purpose maps such as coastal or geologic hazard maps may be used by the GRI to create digital Geographic Information Systems (GIS) data and meet park needs. These digital GIS data allow geologic information to be easily viewed and analyzed in conjunction with a wide range of other resource management information data.

For detailed information regarding GIS parameters such as data attribute field definitions, attribute field codes, value definitions, and rules that govern relationships found in the data, refer to the NPS Geology-GIS Data Model document available at: <https://www.nps.gov/articles/gri-geodatabase-model.htm>

Geologic Reports: GRI reports synthesize discussions from the original scoping meeting, follow up conference call(s), and subsequent research. Chapters of each report discuss the geologic setting of the park, distinctive geologic features and processes within the park, highlight geologic issues facing resource managers, and describe the geologic history leading to the present-day landscape. Each report also includes a poster illustrating these GRI digital geologic-GIS data.

For a complete listing of GRI products visit the GRI publications webpage: <https://go.nps.gov/gripubs>. GRI digital geologic-GIS data is also available online at the NPS Data Store: <https://irma.nps.gov/DataStore/Search/Quick>. To find GRI data for a specific park or parks select the appropriate park(s), enter "GRI" as a Search Text term, and then select the Search button.

For more information about the Geologic Resources Inventory Program visit the GRI webpage: <https://>

www.nps.gov/subjects/geology/gri.htm. At the bottom of that webpage is a “Contact Us” link if you need additional information. You may also directly contact the program coordinator:

Jason Kenworthy
Inventory Coordinator
National Park Service Geologic Resources Division
P.O. Box 25287
Denver, CO 80225-0287
phone: (303) 987-6923
fax: (303) 987-6792
email: Jason_Kenworthy@nps.gov

The Geologic Resources Inventory (GRI) program is funded by the National Park Service (NPS) Inventory and Monitoring (I&M) Division. Learn more about I&M and the 12 baseline inventories at the I&M webpage: <https://www.nps.gov/im/inventories.htm>.

GRI Digital Map and Source Map Citations

The GRI digital geologic-GIS map for Fort Donelson National Battlefield, Kentucky and Tennessee (FODO):

Digital Geologic-GIS Map of Fort Donelson National Battlefield and Vicinity, Kentucky and Tennessee (*GRI MapCode FODO*)

The map was produced from the following source maps.

Blade, L.V., 1966, Geologic Map of parts of the Hamlin and Paris Landing Quadrangles, western Kentucky: U.S. Geological Survey, Geologic Quadrangle Map GQ-498, scale 1:24,000 ([Hamlin and Paris Landing Quadrangles \(parts of\)](#)). (*GRI Source Map ID 8239*).

Marcher, M.V., and Larson, L.T., 1965, Geologic Map and Mineral Resources Summary of the Bumpus Mills Quadrangle (Incl. TN Portion of the Johnson Hollow Quadrangle): Tennessee Division of Geology, Geologic Quadrangle Map 28 SE, scale 1:24,000 ([Bumpus Mills Quadrangle and parts of the Johnson Hollow Quadrangle](#)). (*GRI Source Map ID 67745*).

Marcher, M.V., Larson, L.T., and Barnes, R.H., 1965, Geologic Map and Mineral Resources Summary of the Dover Quadrangle: Tennessee Division of Geology, Geologic Quadrangle Map 29 NE, scale 1:24,000 ([Dover Quadrangle](#)). (*GRI Source Map ID 68290*).

Marcher, M.V., Larson, L.T., and Barnes, R.H., 1965, Geologic Map and Mineral Resources Summary of the Standing Rock Quadrangle: Tennessee Division of Geology, Geologic Quadrangle Map 29 NW, scale 1:24,000 ([Standing Rock Quadrangle](#)). (*GRI Source Map ID 68507*).

Marcher, M.V., et al., 1967, Geologic Map and Mineral Resources Summary of the Tharpe Quadrangle (Incl. TN Portions of the Model, Rushing Creek, and Hamlin Quads): Tennessee Division of Geology, Geologic Quadrangle Map 28 SW, scale 1:24,000 ([Tharpe Quadrangle and parts of the Model, Rushing Creek, and Hamlin Quadrangles](#)). (*GRI Source Map ID 68520*).

Tyra, M.A., 2002, Spatial Database of the Hamlin and Paris Landing Quadrangles, western Kentucky: Kentucky Geological Survey, Digitally Vectorized Geological Quadrangle DVGQ-12_498, scale 1:24,000 ([Hamlin and Paris Landing Quadrangles](#)). (*GRI Source Map ID 69758*).

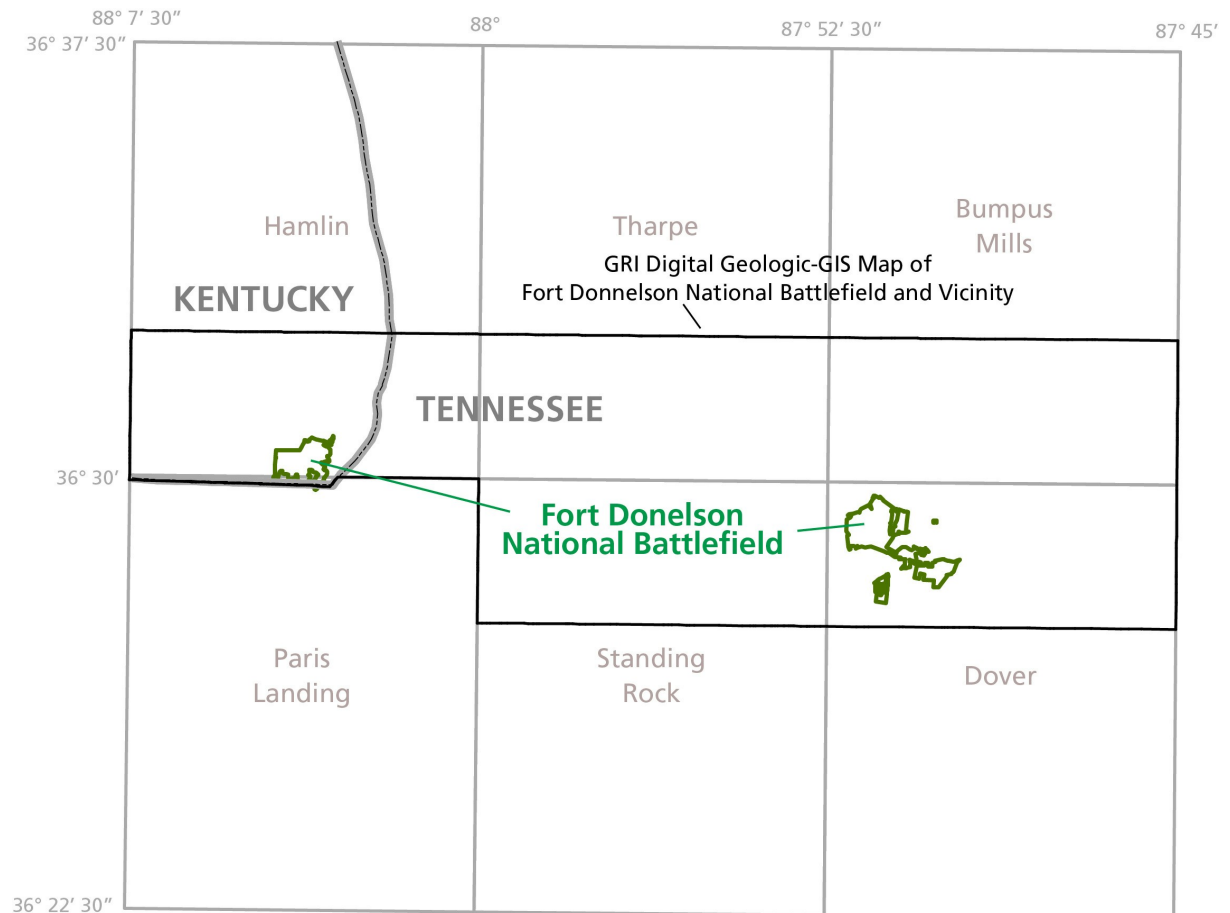
Only a partial extent of the Bumpus Mills (Geologic Quadrangle Map 28 SE), Dover (Geologic Quadrangle Map 29 NE), Standing Rock (Geologic Quadrangle Map 29 NW) and Tharpe (Geologic Quadrangle Map 28 SW) quadrangle source maps were used, however, all geologic features within these extents were captured. GIS data for parts of the Hamlin and Paris Landing quadrangles was produced from digital data from the Digitally Vectorized Geological Quadrangle DVGQ-12_498 source map. The Geologic Quadrangle Map GQ-498 (Hamlin and Paris Landing quadrangles) was only used to capture map symbols associated with faults, the map's cross section line and in some areas to clarify some geologic contacts and units.

Mineral resources summary booklets accompanied each Tennessee Division of Geology (Tennessee Geological Survey) Geologic Quadrangle Map. These booklets are available from the Tennessee Division of Geology (see [Mineral Resources Summary Booklets](#) section of this document for additional information).

Additional information pertaining to each source map is also presented in the GRI Source Map Information (FODOMAP) table included with the GRI geologic-GIS data.

Index Map

The following index map displays the extent (in black) of the GRI digital geologic-GIS map produced for Fort Donelson National Battlefield (FODO). The boundary of Fort Donelson National Battlefield (as of March, 2021) is outlined in green. The extent of relevant 7.5' quadrangles are shown in light gray.



Index map by Stephanie O'Meara (Colorado State University).

Map Unit List

The geologic units present in the digital geologic-GIS data produced for Fort Donelson National Battlefield, Kentucky and Tennessee (FODO) are listed below. Units are listed with their assigned unit symbol and unit name (e.g., Qal - Alluvial deposits). Units are listed from youngest to oldest. No description for water is provided. Information about each geologic unit is also presented in the GRI Geologic Unit Information (FODOUNIT) table included with the GRI geologic-GIS data.

Cenozoic Era

Quaternary Period

[Qal](#) - Alluvial deposits

[Ql](#) - Loess

Quaternary and Tertiary Periods

[QTc](#) - Continental deposits

[QTal](#) - High-level alluvial deposits

Cenozoic and Mesozoic Eras

Tertiary and Cretaceous Periods

[TKcm](#) - Clayton and McNairy Formations

Mesozoic Era

Cretaceous Period

[Km](#) - McNairy Formation

[Kt](#) - Tuscaloosa Gravel

Paleozoic Era

Mississippian Period

[Ste. Genevieve Limestone](#)*

[Msl](#) - St. Louis Limestone

[Mw](#) - Warsaw Limestone

[Mfp](#) - Fort Payne Formation

*The Ste. Genevieve Limestone is listed and described on the Tarpe Quadrangle and parts of the Model, Rushing Creek, and Hamlin Quadrangles source map, but the unit is not mapped on the source map nor is the unit present in the GRI digital geologic-GIS data for Fort Donelson National Battlefield. The unit is listed and described as the source map mentions the unit's presence in one area on the source map. The unit is also mentioned in the St. Louis Limestone ([Msl](#)) unit description for the Bumpus Mills Quadrangle and parts of the Johnson Hollow Quadrangle source map.

Map Unit Descriptions

Descriptions of all geologic map units, generally listed from youngest to oldest, are presented below. Units have descriptions, as well as source map symbol, name and age, for each source map they are present on.

Qal - Alluvial deposits (Quaternary)

Qal - Alluvial Deposits (Quaternary)

Unsorted gravel and sand containing lenses of sandy and silty clay overlain by olive-gray to dark-gray sandy clay and silt. Maximum thickness about 75 feet. Description from source map: [Bumpus Mills Quadrangle and parts of the Johnson Hollow Quadrangle](#)

Qal - Alluvial Deposits (Quaternary)

Unsorted gravel, sand, silt, and clay possibly as much as 80 feet thick along the Cumberland River and 5 to 30 feet thick along some of the other larger streams in the quadrangle. Mapped only along the Cumberland River. Description from source map: [Dover Quadrangle](#)

Qal - Alluvium (Quaternary)

Sand, gravel, and silt; light and dark shades of gray and brown; locally cemented with iron oxide. Sand, generally silty and clayey; composed of fine to very coarse, angular to rounded grains of quartz and minor amounts of heavy minerals and chert; commonly contains scattered granules and pebbles of chert and quartz. Gravel, generally sandy and silty; composed of angular to rounded granules, pebbles, cobbles, and boulders of chert and rounded granules and pebbles of quartz. Silt is generally sandy and clayey. Description from source map: [Hamlin and Paris Landing Quadrangles \(2002\)](#)

Alluvial Deposits (Quaternary)

Unsorted gravel, silt and clay possibly as much as 30 feet thick along some of the larger streams. Not mapped. Description from source map: [Standing Rock Quadrangle](#)

Qal - Alluvial Deposits (Quaternary)

Unsorted gravel and sand containing lenses of sandy and silty clay, overlain by olive-gray to dark-gray sandy clay and silt. Major deposits in valley of Cumberland River; lesser deposits along most streams. Not mapped along streams tributary to Kentucky Lake. Maximum thickness about 75 feet. Description from source map: [Tharpe Quadrangle and parts of the Model, Rushing Creek, and Hamlin Quadrangles](#)

QI - Loess (Quaternary)

QI - Loess Pleistocene (Quaternary)

Silt, tan, brown, and gray; in part clayey and sandy, nonstratified; dark-brown iron oxide nodules commonly present; probably of eolian origin. Description from source map: [Hamlin and Paris Landing Quadrangles \(2002\)](#)

QTc - Continental deposits (Quaternary-Tertiary)

QTc - Continental Deposits (Tertiary and Quaternary)

Gravel and sand; brown, tan, reddish-brown and rarely light gray; locally cemented with iron oxide; includes alluvial and colluvial deposits. Gravel, massive, poorly bedded and crossbedded; composed of angular to rounded granules, pebbles, cobbles, and boulders up to 1 foot in diameter of chert and less abundant well rounded granules and pebbles of quartz and quartzite in a variable amount of sand, silt, and clay matrix. Sand lenses in the gravel are silty and clayey and composed of fine to very

coarse, angular to rounded grains of quartz and minor amounts of chert and heavy minerals. Very light gray slightly sandy gravel composed of rounded granules and pebbles of chert and quartz occurs near the waterline about 1 mile west of Fort Heiman. Description from source map: [Hamlin and Paris Landing Quadrangles \(2002\)](#)

QTal - High-level alluvial deposits (Quaternary-Tertiary)

QT - High-Level Alluvial Deposits (Quaternary-Tertiary)

Chert and quartz gravel, typically "lima-bean" shaped, ¼ inch to 2 inches in diameter, poorly sorted, well-rounded, with irregular masses and layers of iron-cemented conglomerate, crossbedded, in a matrix of silty and clayey sand. Mapped separately only in the southwest. Maximum thickness about 40 feet. Description from source map: [Hamlin and Paris Landing Quadrangles \(2002\)](#)

TKcm - Clayton and McNairy Formations (Tertiary-Upper Cretaceous)

TKcm - Clayton and McNairy Formations, undivided (Tertiary-Cretaceous)

See unit description for [Km](#) below. Description from source map: [Hamlin and Paris Landing Quadrangles \(2002\)](#)

Km - McNairy Formation (Upper Cretaceous)

Km - McNairy Formation (Upper Cretaceous)

Sand, clay, and gravel: Sand, reddish-tan, very light tan, and very light gray; very fine to medium grains, locally fine to coarse grains, angular to rounded, predominantly quartz; contains minor amounts of chert and minor but locally abundant heavy minerals, generally micaceous, locally silty; locally contains thin stringers of well rounded chert pebbles. Sand, thin-bedded, locally crossbedded; commonly with scour-and-fill structure; locally cemented with iron oxide. Clay, very light gray and light-yellowish-gray; occurs in sand as small tabular fragments along bedding planes and as small tubes up to 1 inch in diameter identified as *Halymenites major* (Lesquereux). Clay, very dark gray and greenish-gray, silty; less commonly sandy; commonly contains marcasite(?) concretions; commonly occurs between sand described above and underlying limestone residuum. Samples of very dark gray silty clay from a fossil locality on Grindstone Creek and from auger holes labeled Km 373, Km <394, and Km 348 (USGS Paleobotanical Locality numbers D3330, D3329, and D3328) in the western and southwestern part of the quadrangle were examined for plant microfossils and were interpreted by R. H. Tschudy (written communication, 1964) to be of McNairy age. Gravel, tan and gray, sandy and silty; composed of angular to rounded granules, pebbles, and cobbles of chert; occurs locally at base of sand and as lenses within the sand. Thickness in part based on drill-hole information. Description from source map: [Hamlin and Paris Landing Quadrangles \(2002\)](#)

Kt - Tuscaloosa Gravel (Cretaceous)

Kt - Tuscaloosa Gravel (Cretaceous)

Gravel, subrounded to well-rounded, ½ inch to 8 inches in diameter, mostly chert with some sandstone and quartz, in a sandy kaolinitic matrix, typically has an ashy or bleached appearance but locally iron-stained, devoid of bedding, and only semi-indurated. Locally contains thin lenses of well-sorted, fine-grained, iron-stained quartz sand. Maximum preserved thickness about 40 feet. Description from source map: [Bumpus Mills Quadrangle and parts of the Johnson Hollow Quadrangle](#)

Kt - Tuscaloosa Gravel (Cretaceous)

Chert gravel, subrounded to well-rounded, ½ inch to 6 inches in diameter, in a tripolitic sandy clay matrix. Locally contains thin lenses of well-sorted, fine-grained iron-stained quartz sand. Maximum preserved thickness 45 feet. Isolated patches of Tuscaloosa Gravel too thin and discontinuous to be mapped also occur on some of the ridges in the area. Description from source map: [Dover Quadrangle](#)

Kt - Tuscaloosa Formation (Upper Cretaceous)

Gravel, silt, and sand: Gravel, light-gray and tan; locally cemented with silica(?); composed of angular to rounded granules, pebbles, and cobbles of chert in sandy silt or chert-sand matrix. Silt, light- to dark-gray, commonly indurated, clayey and sandy; commonly contains thin stringers of chert gravel and sand. Sand, pinkish-gray and light-gray, silty and clayey, very fine to very coarse grains, angular to rounded; dominantly chert and subordinately quartz. The Tuscaloosa Formation occurs as small discontinuous patches throughout the area. Dark-gray clayey silt from auger hole labeled Kt 350 (USGS Paleobotanical Locality number D3331) about 2 miles southwest of Hamlin was examined for plant microfossils, which were interpreted by R. H. Tschudy (written communication, 1964) as being distinctly different and older than those from the McNairy Formation. Description from source map: [Hamlin and Paris Landing Quadrangles \(2002\)](#)

Kt - Tuscaloosa Gravel (Cretaceous)

Chert gravel, subrounded to well-rounded, ½ inch to 6 inches in diameter, in a tripolitic sandy clay matrix. Locally contains thin lenses of well-sorted, fine-grained iron-stained quartz sand. Maximum preserved thickness 45 feet. Isolated patches of Tuscaloosa Gravel too thin and discontinuous to be mapped also occur on some of the ridges in the area. Description from source map: [Standing Rock Quadrangle](#)

Kt - High-Level Alluvial Deposits, Coffee Sand, and Tuscaloosa Gravel (Quaternary, Tertiary, and Cretaceous)

High-level alluvial deposits consist of gravel (chert, quartz, and quartzite), typically "lima-bean" shaped, poorly sorted, well-rounded, iron-stained, locally very sandy, crossbedded; rounded pebbles of limonite and hematite are common; locally contains layers cemented by iron oxides to form conglomerate. Maximum thickness about 15 feet.

Coffee Sand is light-brown to moderate reddish-brown, medium- to coarse-grained, well-rounded to subangular, generally well-sorted, locally very silty, ironstained; very fine heavy minerals (mostly ilmenite with minor magnetite) abundant locally; crossbedding commonly well-developed; contains blebs and stringers of white kaolinitic clay. Maximum thickness about 10 feet.

Tuscaloosa Gravel is composed mostly of chert with some sandstone, ½ inch to 10 inches in diameter, well-rounded, in a sandy and kaolinitic matrix typically has an ashy or bleached appearance, but locally iron-stained; commonly massive and only semi-indurated. Maximum thickness about 50 feet. Description from source map: [Tharpe Quadrangle and parts of the Model, Rushing Creek, and Hamlin Quadrangles](#)

Ste. Genevieve Limestone (Mississippian)**Ste. Genevieve Limestone (Mississippian)**

Limestone, fossil-fragmental, yellowish-gray, medium-grained, highly oolitic. Bedrock known from only one outcrop, along State Highway 49 on the ridge between Bear Creek and Brandon Spring Branch; dense, light-colored chert containing abundant Ste. Genevieve fossils also present at this locality. Thickness unknown; not mapped. Description from source map: [Tharpe Quadrangle and parts of the Model, Rushing Creek, and Hamlin Quadrangles](#)

Of note, the unit listing and description appears (in stratigraphic order) below the Tuscaloosa Gravel (Kt) and above the St. Louis Limestone (Msl) on the above source map. As mentioned, the unit was not mapped on the above source map.

Msl - St. Louis Limestone (Mississippian)

Msl - Monteagle and St. Louis Limestones* (Mississippian)

Monteagle Limestone is very light-gray to yellowish-gray, mostly medium-grained with sublithographic patches, highly oolitic. Monteagle bedrock is known from only a few poorly exposed outcrops near the headwaters of Hayes Fork. Thickness unknown.

St. Louis Limestone is dusky-brown to pale yellowish-brown, fine- to very coarse-grained, medium- to thick-bedded, mostly fossil-fragmental but partly crystalline, commonly silty, locally sublithographic or oolitic, locally dolomitic, fossiliferous, crossbedding locally well-developed; round or irregular nodules of dense light- to dark-colored chert are common, especially in the finer grained more silty beds. In most of the area the St. Louis is represented only by residuum consisting of chert blocks and nodules as much as 1 foot in diameter in sandy clay soil. Maximum preserved thickness about 280 feet.

Description from source map: [Bumpus Mills Quadrangle and parts of the Johnson Hollow Quadrangle](#)

* U.S. Geological survey erratum should read "Ste. Genevieve and St. Louis Limestones". See source map [explanation](#) graphic.

Msl - St. Louis Limestone (Mississippian)

Limestone, fossil-fragmental, silty, pale yellowish-brown to brownish-gray, medium- to coarse-grained, commonly thick-bedded but locally platy and slabby, locally dolomitic and siliceous, thicker beds locally crossbedded; dense dark chert as irregular nodules and discontinuous beds is common. Upper part of formation is represented by residuum of angular fragments or rounded nodules of dense chert in yellowish or reddish sandy clay matrix. Maximum preserved thickness 180 feet. Description from source map: [Dover Quadrangle](#)

Msl - St. Louis Limestone (Mississippian)

No additional description provided. Unit present on source map: [Hamlin and Paris Landing Quadrangles \(2002\)](#)

Msl - St. Louis Limestone (Mississippian)

Limestone, light-gray to dark yellowish-brown, very fine- to medium-grained with some beds ranging up to coarse-grained, locally sublithographic or oolitic, partly fossil-fragmental, silty, contains irregular nodules and layers of dense, dark brittle chert; outcrops near Asbury contain large colonies of the coral "*Lithostrotion*." Upper part of formation represented by residuum of angular fragments or rounded nodules of dense chert in yellowish or reddish sandy clay matrix. Maximum preserved thickness about 180 feet. Description from source map: [Standing Rock Quadrangle](#)

Msl - St. Louis Limestone (Mississippian)

Limestone, silty, dusky-brown to pale yellowish-brown, fine- to very coarse-grained, medium- to massive-bedded, mostly fossil-fragmental but locally crystalline, locally dolomitic, silty partings common along bedding planes; crossbedding locally well-developed, in coarser grained beds; round or irregular nodules or thin discontinuous beds of dense chert common locally, especially in finer grained, more silty beds. In most of the area the St. Louis is represented only by residuum consisting of round nodules or irregular blocks of chert, a few inches to a foot or more in diameter, in yellowish or brownish sandy clay soil. Maximum preserved thickness 230 feet. Description from source map: [Tharpe Quadrangle and parts of the Model, Rushing Creek, and Hamlin Quadrangles](#)

Mw - Warsaw Limestone (Mississippian)

Mw - Warsaw Limestone (Mississippian)

Limestone, fossil-fragmental, medium-gray to pale yellowish-gray, medium- to very coarse-grained, medium- to very thick-bedded, locally silty and/or dolomitic, well-developed crossbedding, fossiliferous; chert occurs as irregular dense nodules or irregular layers and lenses as much as 2 feet thick having a porous, spongy texture and containing abundant fossils. In most of its outcrop area the Warsaw is represented only by blocks of chert mixed with sandy clay soil. Maximum thickness about 200 feet. Description from source map: [Bumpus Mills Quadrangle and parts of the Johnson Hollow Quadrangle](#)

Mw - Warsaw Limestone (Mississippian)

Limestone, fossil-fragmental, yellowish-gray to pale yellowish-brown, medium- to very coarse-grained, thick- to very thick-bedded, well-developed cross-bedding; locally contains dense blocky chert or weathers to form porous fossiliferous chert; local discontinuous beds are fine-grained, brownish-gray, silty and dolomitic. Maximum thickness 180 feet. Description from source map: [Dover Quadrangle](#)

Mw - Warsaw Limestone (Mississippian)

Limestone, light-gray to gray, medium- to coarse-grained, mostly bioclastic, crossbedded, locally thin- to thick-bedded, stylonitic; locally contains nodules and lenses as much as 1 foot thick of dense and finely porous light- to dark-gray chert. Formation poorly exposed, and only rock generally seen is blocks of weathered, residual chert which is light to dark gray, tan, and reddish brown, dominantly porous and made up largely of fragments of crinoids, bryozoans and, in lesser amounts, brachiopods, horn corals, and echinoid spines and plates (spines and plates are most abundant in upper few feet of formation). A hole (Mw 243) drilled about 1 mile north of Fort Heiman by the Tennessee Valley Authority penetrated 52 feet of residuum and 118 feet of limestone (J. M. Kellberg, written communication, 1957). Description from source map: [Hamlin and Paris Landing Quadrangles \(2002\)](#)

Mw - Warsaw Limestone (Mississippian)

Limestone, fossil-fragmental, yellowish-gray to pale yellowish-brown, medium- to very coarse-grained, crossbedding common in some medium to very thick beds; locally contains dense blocky chert or weathers to form large blocks of porous fossiliferous chert; lower 2 to 5 feet commonly very silty and siliceous; local discontinuous beds are fine-grained, brownish-gray, silty and dolomitic. Maximum thickness 200 feet. Description from source map: [Standing Rock Quadrangle](#)

Mw - Warsaw Limestone (Mississippian)

Limestone, fossil-fragmental, medium-gray to pale yellowish-brown, fine- to very coarse-grained, medium to massive-bedded, well-developed crossbedding, locally silty and/or dolomitic; dense and porous chert locally common as nodules and as lenses as thick as 2 feet. In most of the area the Warsaw is represented by blocks of porous chert, as large as 1 foot in diameter, in yellowish or reddish sandy clay soil. Thickness 50 to 110 feet. Description from source map: [Tharpe Quadrangle and parts of the Model, Rushing Creek, and Hamlin Quadrangles](#)

Mfp - Fort Payne Formation (Mississippian)

Mfp - Fort Payne Formation (Mississippian)

Chert, yellowish-brown to dusky brown, occurs as beds 6 inches to 1 foot thick separated by layers as much as 1 foot thick of siliceous and dolomitic siltstone; grades laterally into rough, irregular platy and granular chert in a matrix of siliceous and dolomitic siltstone. Maximum exposed thickness about 100 feet. Description from source map: [Bumpus Mills Quadrangle and parts of the Johnson Hollow Quadrangle](#)

Mfp - Fort Payne Formation (Mississippian)

Chert, dusky-brown to olive-gray, very rough and irregular plates in a matrix of yellowish-brown calcareous siltstone or very silty limestone; weathers to yellowish or reddish granular tripolitic chert:

contains a few discontinuous beds of dense, dark brittle chert. Maximum exposed thickness 130 feet. Description from source map: [Dover Quadrangle](#)

Mfp - Fort Payne Formation (Mississippian)

Limestone and chert: Limestone, gray and dark-gray, very fine to fine-grained, locally medium-grained, shaly, fetid, thin bedded. Chert, gray and dark-gray, dense, commonly banded; some nodular, most thin-bedded. Limestone and chert generally interbedded but with chert locally absent are found in scattered outcrops in southern half of quadrangle, best exposed along lake shore. Generally the formation is seen as float from residuum of dense angular chert fragments, very light gray, gray, and yellowish-gray; in very light gray to pinkish-gray silty clay matrix. Crinoid fragments rare. Drill hole labeled Mfp 56 drilled about 1 mile north of Fort Heiman by the Tennessee Valley Authority intersected 234 feet of the Fort Payne Formation (J.M. Kellberg, written communication, 1957). Description from source map: [Hamlin and Paris Landing Quadrangles \(2002\)](#)

Mfp - Fort Payne Formation (Mississippian)

Chert, dusky-brown to brownish-black, very dense and brittle, occurs as beds 6 inches to 1 foot thick intercalated with highly siliceous, shaly silty limestone or calcareous siltstone, or as very rough and irregular plates and granules in a siliceous and calcareous matrix. Maximum exposed thickness about 280 feet. Description from source map: [Standing Rock Quadrangle](#)

Mfp - Fort Payne Formation (Mississippian)

Chert, light-gray to yellowish-brown and brownish-black, very dense, hard, and brittle, in beds as thick as 1 foot, intercalated with very siliceous calcareous and dolomitic siltstone; or as rough irregular plates and granules in the siltstone matrix. Locally contains beds of light brownish-gray, medium- to coarse grained fossil-fragmental limestone; well-preserved fossils abundant locally. Maximum exposed thickness about 160 feet. Description from source map: [Tharpe Quadrangle and parts of the Model, Rushing Creek, and Hamlin Quadrangles](#)

The geologic cross section line present in the GRI digital geologic-GIS data produced for Fort Donelson National Battlefield, Kentucky and Tennessee (FODO) is presented below. The graphic was scanned at a high resolution and can be viewed in more detail by zooming in (if viewing the digital format of this document).

Geological cross-section A-A' showing the transition from the Atlantic branch to the Iberian branch. The section includes stratigraphic columns with units labeled Qd, Ks, Qts, Em, Ma, and Mss. A central 'Channel' is shown with a 'Channel floor' and 'Channel banks'. A 'Vertical exaggeration 4x' note is present. The horizontal axis is labeled 'Distance from where the sea first reaches the shore'.

2021 NPS Geologic Resources Inventory Program

Mineral Resources Summary Booklets

Mineral resources summary booklets accompanied each Tennessee Division of Geology (Tennessee Geological Survey) Geologic Quadrangle Map. On some of these source maps, mineral resource localities (e.g., gravel pits, quarries, prospects, wells, mine areas) mentioned in a booklet were present on the related source map, however, in some cases these localities were not. In the latter case localities were derived using latitude and longitude coordinates mentioned in a booklet. Localities derived from coordinates are mentioned in the GRI digital geologic-GIS data.

If additional information pertaining to these mineral resource localities is sought, users should seek to acquire these booklets from the Tennessee Geological Survey. At the time the GRI developed its maps for Fort Donelson National Battlefield these were only available in paper format.

Ancillary Source Map Information

The following sections present ancillary source map information associated with sources used for this project.

Bumpus Mills Quadrangle and parts of the Johnson Hollow Quadrangle

The formal citation for this source.

Marcher, M.V., and Larson, L.T., 1965, Geologic Map and Mineral Resources Summary of the Bumpus Mills Quadrangle (Incl. TN Portion of the Johnson Hollow Quadrangle): Tennessee Division of Geology, Geologic Quadrangle Map 28 SE, scale 1:24,000 (*GRI Source Map ID 67745*).

Prominent graphics associated with this source.

Explanation

EXPLANATION	
Qal Alluvial Deposits Unsorted gravel and sand containing lenses of sandy and silty clay overlain by olive-gray to dark-gray sandy clay and silt. Maximum thickness about 75 feet.	QUATERNARY
Kt Tuscaloosa Gravel Gravel, subrounded to well-rounded, $\frac{1}{2}$ inch to 8 inches in diameter, mostly chert with some sandstone and quartz, in a sandy kaolinitic matrix, typically has an ashy or bleached appearance but locally iron-stained, devoid of bedding, and only semi-indurated. Locally contains thin lenses of well-sorted, fine-grained, iron-stained quartz sand. Maximum preserved thickness about 40 feet.	
Msl Monteagle and St. Louis Limestones Monteagle Limestone is very light-gray to yellowish-gray, mostly medium-grained with sublithographic patches, highly oolitic. Monteagle bedrock is known from only a few poorly exposed outcrops near the headwaters of Hayes Fork. Thickness unknown. St. Louis Limestone is dusky-brown to pale yellowish-brown, fine- to very coarse-grained, medium- to thick-bedded, mostly fossil-fragmental but partly crystalline, commonly silty, locally sublithographic or oolitic, locally dolomitic, fossiliferous, crossbedding locally well-developed; round or irregular nodules of dense light- to dark-colored chert are common, especially in the finer grained more silty beds. In most of the area the St. Louis is represented only by residuum consisting of chert blocks and nodules as much as 1 foot in diameter in sandy clay soil. Maximum preserved thickness about 280 feet.	CRETACEOUS
Mw Warsaw Limestone Limestone, fossil-fragmental, medium-gray to pale yellowish-gray, medium- to very coarse-grained, medium- to very thick-bedded, locally silty and/or dolomitic, well-developed crossbedding, fossiliferous; chert occurs as irregular dense nodules or irregular layers and lenses as much as 2 feet thick having a porous, spongy texture and containing abundant fossils. In most of its outcrop area the Warsaw is represented only by blocks of chert mixed with sandy clay soil. Maximum thickness about 200 feet.	
Mfp Fort Payne Formation Chert, yellowish-brown to dusky brown, occurs as beds 6 inches to 1 foot thick separated by layers as much as 1 foot thick of siliceous and dolomitic siltstone; grades laterally into rough, irregular platy and granular chert in a matrix of siliceous and dolomitic siltstone. Maximum exposed thickness about 100 feet.	

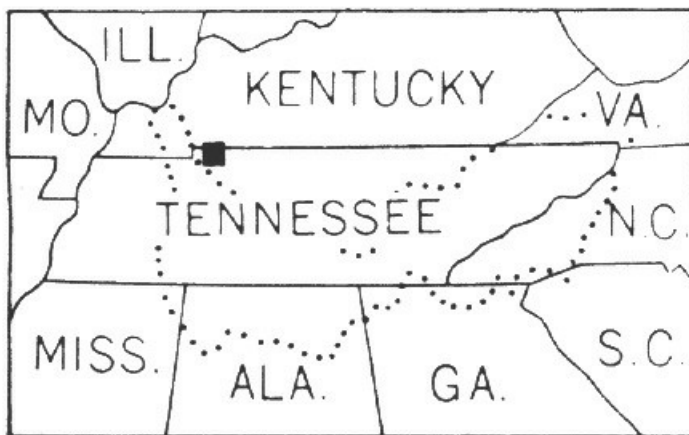
Graphic from source map: [Bumpus Mills Quadrangle and parts of the Johnson Hollow Quadrangle](#)

Map Legend

	Contact, dashed where approximate	
	Fault, dashed where approximately located; U upthrown side; D downthrown side; ? extent questionable	
	Strike and dip of beds	
	Abandoned quarry	gr Gravel
	Active pit	Fe Iron
	Inactive pit	ls Limestone
	Prospect	
	Abandoned furnace site	
	Slag	
	Oil and gas test (oil show)	
2	Map numbers refer to descriptions in Mineral Resources Summary	

Graphic from source map: [Bumpus Mills Quadrangle and parts of the Johnson Hollow Quadrangle](#)

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QUADRANGLE LOCATION

Graphic from source map: [Bumpus Mills Quadrangle and parts of the Johnson Hollow Quadrangle](#)

Dover Quadrangle

The formal citation for this source.

Marcher, M.V., Larson, L.T., and Barnes, R.H., 1965, Geologic Map and Mineral Resources Summary of the Dover Quadrangle: Tennessee Division of Geology, Geologic Quadrangle Map 29 NE, scale 1:24,000 (*GRI Source Map ID 68290*).

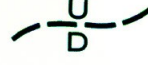
Prominent graphics associated with this source.

Explanation

EXPLANATION	
Qal Alluvial Deposits Unsorted gravel, sand, silt, and clay possibly as much as 80 feet thick along the Cumberland River and 5 to 30 feet thick along some of the other larger streams in the quadrangle. Mapped only along the Cumberland River.	QUATERNARY
Kt Tuscaloosa Gravel Chert gravel, subrounded to well-rounded 1/8 inch to 6 inches in diameter, in a tripolitic sandy clay matrix. Locally contains thin lenses of very fine- to fine-grained yellowish-brown quartz sand. Maximum preserved thickness about 45 feet. Isolated patches of Tuscaloosa Gravel too thin and discontinuous to be mapped also occur on some of the ridges in the area.	
Msl St. Louis Limestone Limestone, fossil-fragmental, silty, pale yellowish-brown to brownish-gray, medium- to coarse-grained, commonly thick-bedded but locally platy and slabby, locally dolomitic and siliceous, thicker beds locally crossbedded; dense dark chert as irregular nodules and discontinuous beds is common. Upper part of formation is represented by residuum of angular fragments or rounded nodules of dense chert in yellowish or reddish sandy clay matrix. Maximum preserved thickness 180 feet.	CRETACEOUS
Mw Warsaw Limestone Limestone, fossil-fragmental, yellowish-gray to pale yellowish-brown, medium- to very coarse-grained, thick- to very thick-bedded, well-developed cross-bedding; locally contains dense blocky chert or weathers to form porous fossiliferous chert; local discontinuous beds are fine-grained, brownish-gray, silty and dolomitic. Maximum thickness 180 feet.	
Mfp Fort Payne Formation Chert, dusky-brown to olive-gray, very rough and irregular plates in a matrix of yellowish-brown calcareous siltstone or very silty limestone; weathers to yellowish or reddish granular tripolitic chert; contains a few discontinuous beds of dense, dark brittle chert. Maximum exposed thickness 130 feet.	

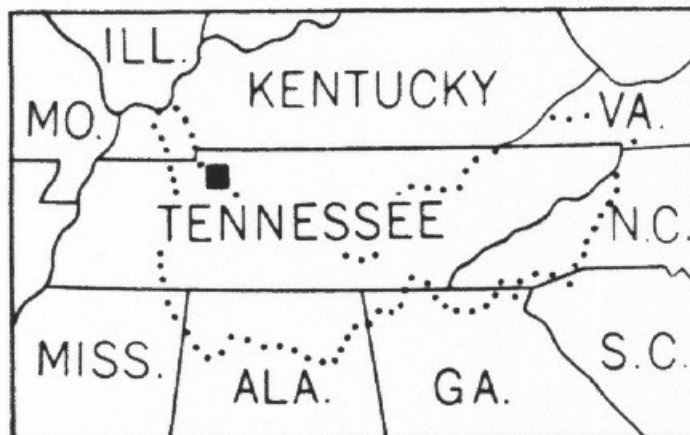
Graphic from source map: [Dover Quadrangle](#)

Map Legend

	Contact, dashed where approximate	
	Fault, approximately located; U upthrown side; D downthrown side	
	Strike and dip of beds	
	Abandoned quarry	gr Gravel
	Abandoned mine	Fe Iron
	Inactive pit	ls Limestone
	Prospect	
	Area of numerous prospects	
	Abandoned furnace	
	Slag	
	Map numbers refer to descriptions in Mineral Resources Summary	

Graphic from source map: [Dover Quadrangle](#)

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QUADRANGLE LOCATION

Graphic from source map: [Dover Quadrangle](#)

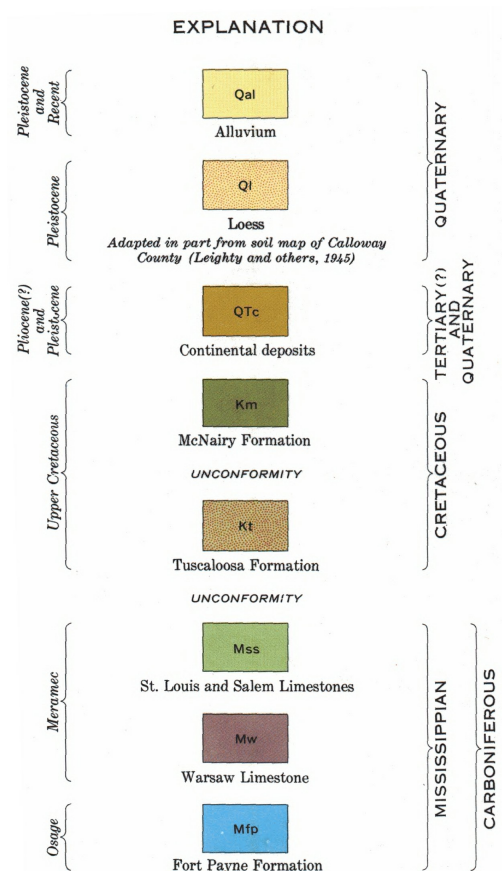
Hamlin and Paris Landing Quadrangles (parts of)

The formal citation for this source.

Blade, L.V., 1966, Geologic Map of parts of the Hamlin and Paris Landing Quadrangles, western Kentucky: U.S. Geological Survey, Geologic Quadrangle Map GQ-498, scale 1:24,000 (*GRI Source Map ID 8239*).

Prominent graphics and text associated with this source.

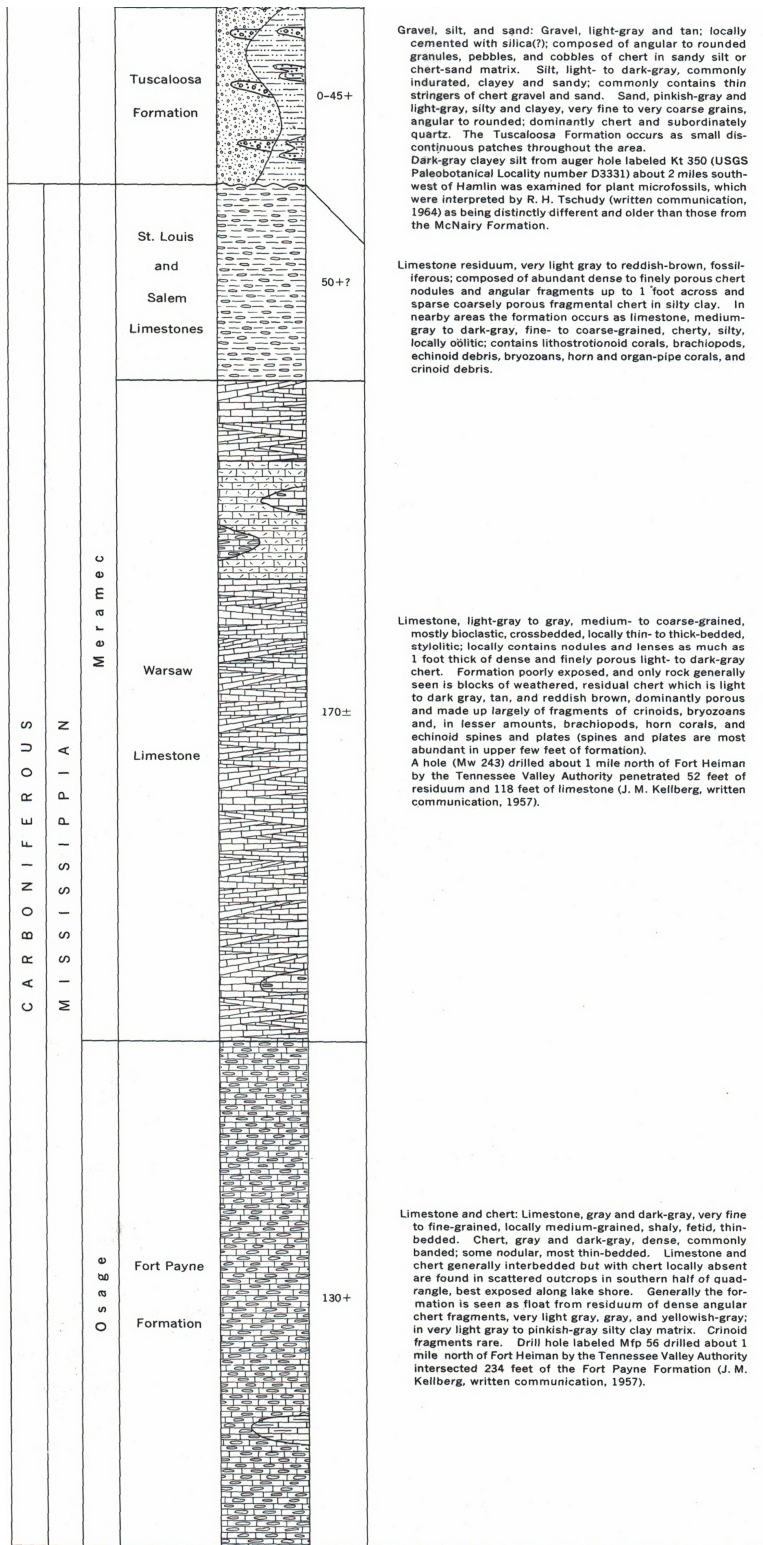
Explanation



Graphic from source map: [Hamlin and Paris Landing Quadrangles \(parts of\)](#)

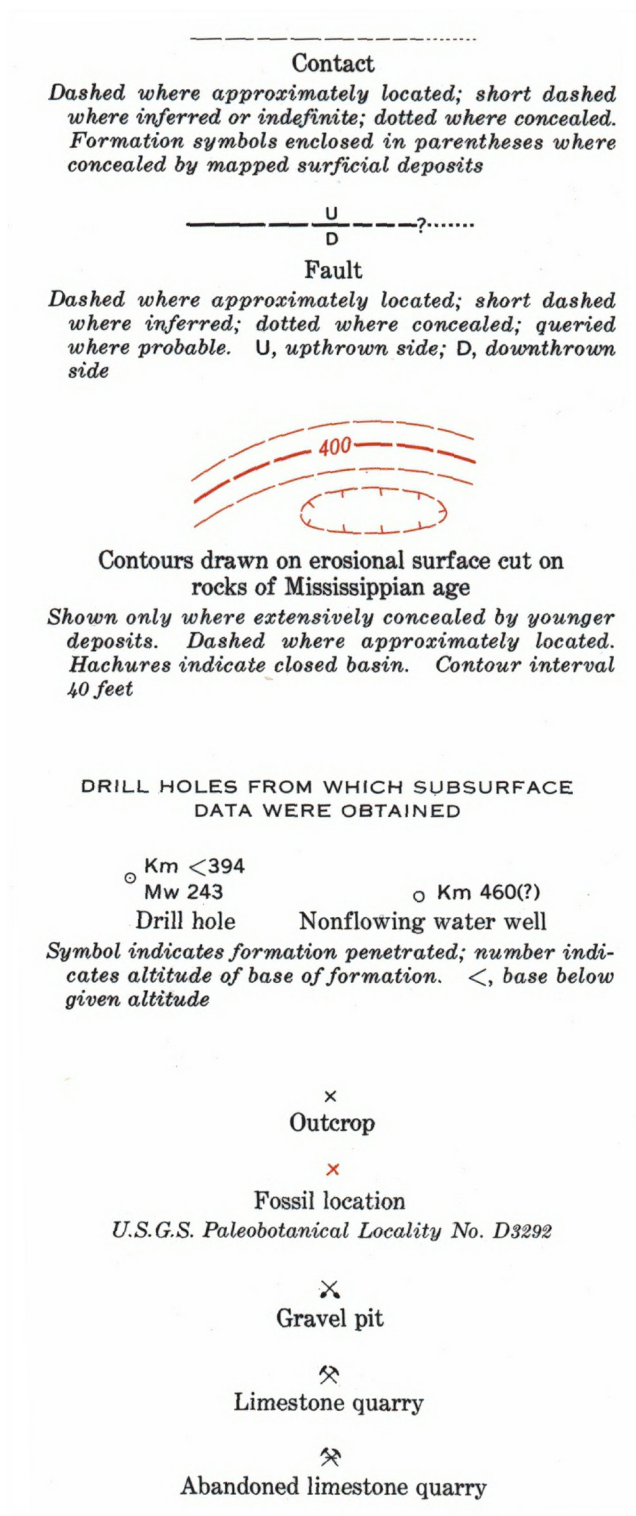
Stratigraphic Column

SYSTEM	SERIES	FORMATION	LITHOLOGY	THICKNESS, IN FEET	DESCRIPTION
QUATERNARY	Pleistocene and Recent	Alluvium		0-20	Sand, gravel, and silt; light and dark shades of gray and brown; locally cemented with iron oxide. Sand, generally silty and clayey; composed of fine to very coarse, angular to rounded grains of quartz and minor amounts of heavy minerals and chert; commonly contains scattered granules and pebbles of chert and quartz. Gravel, generally sandy and silty; composed of angular to rounded granules, pebbles, cobbles, and boulders of chert and rounded granules and pebbles of quartz. Silt is generally sandy and clayey. Silt, tan, brown, and gray; in part clayey and sandy, nonstratified; dark-brown iron oxide nodules commonly present; probably of eolian origin.
		Loess		0-10	
TERTIARY(?) AND QUATERNARY	Pliocene(?) and Pleistocene	Continental deposits		0-65+	Gravel and sand; brown, tan, reddish-brown and rarely light-gray; locally cemented with iron oxide; includes alluvial and colluvial deposits. Gravel, massive, poorly bedded and crossbedded; composed of angular to rounded granules, pebbles, cobbles, and boulders up to 1 foot in diameter of chert and less abundant well rounded granules and pebbles of quartz and quartzite in a variable amount of sand, silt, and clay matrix. Sand lenses in the gravel are silty and clayey and composed of fine to very coarse, angular to rounded grains of quartz and minor amounts of chert and heavy minerals. Very light gray slightly sandy gravel composed of rounded granules and pebbles of chert and quartz occurs near the waterline about 1 mile west of Fort Heiman.
CRETACEOUS	Upper Cretaceous	McNairy Formation		207+	Sand, clay, and gravel: Sand, reddish-tan, very light tan, and very light gray; very fine to medium grains, locally fine to coarse grains, angular to rounded, predominantly quartz; contains minor amounts of chert and minor but locally abundant heavy minerals, generally micaceous, locally silty; locally contains thin stringers of well rounded chert pebbles. Sand, thin-bedded, locally crossbedded; commonly with scour-and-fill structure; locally cemented with iron oxide. Clay, very light gray and light-yellowish-gray; occurs in sand as small tabular fragments along bedding planes and as small tubes up to 1 inch in diameter identified as <i>Halymentes major</i> (Lesquereux). Clay, very dark gray and greenish-gray, silty; less commonly sandy; commonly contains marcasite(?) concretions; commonly occurs between sand described above and underlying limestone residuum. Samples of very dark gray silty clay from a fossil locality on Grindstone Creek and from auger holes labeled Km 373, Km <394, and Km 348 (USGS Paleobotanical Locality numbers D3330, D3329, and D3328) in the western and southwestern part of the quadrangle were examined for plant microfossils and were interpreted by R. H. Tschudy (written communication, 1964) to be of McNairy age. Gravel, tan and gray, sandy and silty; composed of angular to rounded granules, pebbles, and cobbles of chert; occurs locally at base of sand and as lenses within the sand. Thickness in part based on drill-hole information.



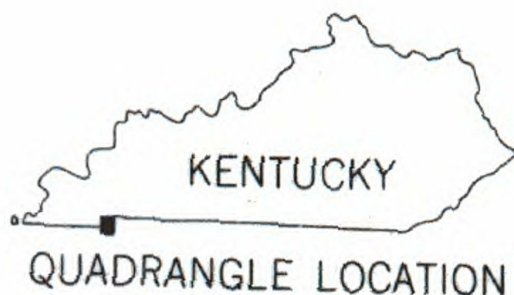
Graphic from source map: [Hamlin and Paris Landing Quadrangles \(parts of\)](#)

Map Legend



Graphic from source map: [Hamlin and Paris Landing Quadrangles \(parts of\)](#)

Index Map



Graphic from source map: [Hamlin and Paris Landing Quadrangles \(parts of\)](#)

Economic Geology Report

The McNairy Formation contains abundant sand which locally may be of sufficient purity for glass making or foundry use. Similar deposits are mined for foundry, glass, and refractory purposes (McGrain and Crawford, 1959, p. 11) along the east bank of the Blood River, 2.7 miles west of New Mt. Carmel Church. Gravel is mined from small pits in the continental deposits over the area and used for road metal. Agricultural lime, road metal, and concrete aggregate are produced by Western Materials of Kentucky, Inc., from a quarry about 1 mile west of the mouth of Shannon Creek. Warsaw Limestone that is relatively chert free was encountered in one hole (Mw 243) drilled by the Tennessee Valley Authority (J. M. Kellberg, written communication, 1957) in an area about 1 mile north of the site of old Fort Heiman (Carter Coordinates 17-A-18 and 24-A-18). The Warsaw Limestone is probably the best source for limestone aggregate and road metal in the area, but drilling is needed to determine the overburden and amounts of chert and shale in the formation at any site.

Only one oil test is known to have been drilled in the quadrangle. According to Jillson (1930), a test hole was drilled about 2 miles northwest of Hamlin (Carter Coordinates 19-B-17), but it was dry and abandoned.

Water in sufficient quantities for domestic supply can be obtained from rocks of Mississippian age and from the McNairy Formation (McCary and Lambert, 1962, p. 8).

Piles of slag and charcoal about 1500 feet east of the Western Materials of Kentucky, Inc., quarry and small pits throughout the area are evidences of 19th century iron smelting. The ore was mined largely from the continental deposits.

Text from source map: [Hamlin and Paris Landing Quadrangles \(parts of\)](#)

References

- Jillson, W. R., 1930 [1931]. Oil and gas in western Kentucky: Kentucky Geol. Survey, ser. 6, v.-39, 632 p.
- Leighty, W. J., Higbee, H. W., Reed, W. S., and Wyatt, C. K., 1945, Soil survey of Calloway County, Kentucky: U.S. Dept. Agriculture, ser. 1937, no. 15, 94 p.

MacCary, L. M., and Lambert, T. W., 1962, Reconnaissance of groundwater resources of the Jackson Purchase region, Kentucky: U.S. Geol. Survey Hydrol. Inv. Atlas HA-13, 9 p.

McGrain, Preston, and Crawford, T. J., 1959, High-silica sands in Calloway and Carlisle Counties, Kentucky: Kentucky Geol. Survey, ser. 10, Inf. Circ. 2, 14 p.

References from source map: [Hamlin and Paris Landing Quadrangles \(parts of\)](#)

Hamlin and Paris Landing Quadrangles (2002)

The formal citation for this source.

Tyra, M.A., 2002, Spatial Database of the Hamlin and Paris Landing Quadrangles, western Kentucky: Kentucky Geological Survey, Digitally Vectorized Geological Quadrangle DVGQ-12_498, scale 1:24,000 (*GRI Source Map ID 69758*).

No graphics or additional text was associated with this source.

Standing Rock Quadrangle

The formal citation for this source.

Marcher, M.V., Larson, L.T., and Barnes, R.H., 1965, Geologic Map and Mineral Resources Summary of the Standing Rock Quadrangle: Tennessee Division of Geology, Geologic Quadrangle Map 29 NW, scale 1:24,000 (*GRI Source Map ID 68507*).

Prominent graphics associated with this source.

Explanation

EXPLANATION	
Alluvial Deposits Unsorted gravel, sand, silt, and clay possibly as much as 30 feet thick along some of the larger streams. Not mapped.	QUATERNARY
Terrace Deposits Chert and quartz gravel, subangular to well-rounded, ¼ inch to 1 inch in diameter, iron-stained, in a clayey sand matrix. Maximum thickness 20 feet. Present only on some of the ridges in the northwestern corner of the quadrangle. Not mapped.	QUATERNARY
Kt Tuscaloosa Gravel Chert gravel, subrounded to well-rounded, ½ inch to 6 inches in diameter, in a tripolitic sandy clay matrix. Locally contains thin lenses of well-sorted, fine-grained iron-stained quartz sand. Maximum preserved thickness 45 feet. Isolated patches of Tuscaloosa Gravel too thin and discontinuous to be mapped also occur on some of the ridges in the area.	CRETACEOUS
Msl St. Louis Limestone Limestone, light-gray to dark yellowish-brown, very fine- to medium-grained with some beds ranging up to coarse-grained, locally sublithographic or oolitic, partly fossil-fragmental, silty, contains irregular nodules and layers of dense, dark brittle chert; outcrops near Asbury contain large colonies of the coral "Lithostrotion." Upper part of formation represented by residuum of angular fragments or rounded nodules of dense chert in yellowish or reddish sandy clay matrix. Maximum preserved thickness about 180 feet.	MISSISSIPPIAN
Mw Warsaw Limestone Limestone, fossil-fragmental, yellowish-gray to pale yellowish-brown, medium- to very coarse-grained, crossbedding common in some medium to very thick beds; locally contains dense blocky chert or weathers to form large blocks of porous fossiliferous chert; lower 2 to 5 feet commonly very silty and siliceous; local discontinuous beds are fine-grained, brownish-gray, silty and dolomitic. Maximum thickness 200 feet.	
Mfp Fort Payne Formation Chert, dusky-brown to brownish-black, very dense and brittle, occurs as beds 6 inches to 1 foot thick intercalated with highly siliceous, shaly silty limestone or calcareous siltstone, or as very rough and irregular plates and granules in a siliceous and calcareous matrix. Maximum exposed thickness about 280 feet.	

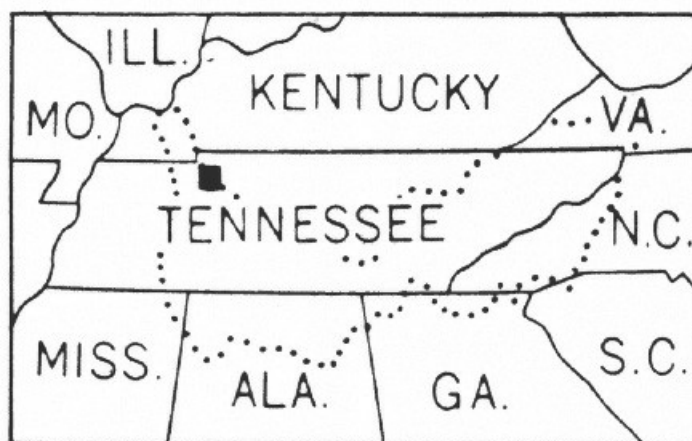
Graphic from source map: [Standing Rock Quadrangle](#)

Map Legend

	Contact, dashed where approximate	
	Fault, approximately located; U upthrown side; D downthrown side	
	Strike and dip of beds	
	Abandoned mine	ch Chert
	Abandoned quarry	gr Gravel
	Active pit	Fe Iron
	Inactive pit	ls Limestone
	Prospect	
	Area of numerous prospects	
	Oil and gas test (oil show)	
	Abandoned furnace site	
	Slag	
2	Map numbers refer to descriptions in Mineral Resources Summary	

Graphic from source map: [Standing Rock Quadrangle](#)

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QUADRANGLE LOCATION

Graphic from source map: [Standing Rock Quadrangle](#)

Tharpe Quadrangle and parts of the Model, Rushing Creek, and Hamlin Quadrangles

The formal citation for this source.

Marcher, M.V., et al., 1967, Geologic Map and Mineral Resources Summary of the Tharpe Quadrangle (Incl. TN Portions of the Model, Rushing Creek, and Hamlin Quads): Tennessee Division of Geology, Geologic Quadrangle Map 28 SW, scale 1:24,000 (*GRI Source Map ID 68520*).

Prominent graphics associated with this source.

Explanation

EXPLANATION

Qal Alluvial Deposits Unsorted gravel and sand containing lenses of sandy and silty clay, overlain by olive-gray to dark-gray sandy clay and silt. Major deposits in valley of Cumberland River; lesser deposits along most streams. Not mapped along streams tributary to Kentucky Lake. Maximum thickness about 75 feet.	QUATERNARY
QT High-Level Alluvial Deposits Chert and quartz gravel, typically "lima-bean" shaped, $\frac{1}{4}$ inch to 2 inches in diameter, poorly sorted, well-rounded, with irregular masses and layers of iron-cemented conglomerate, crossbedded, in a matrix of silty and clayey sand. Mapped separately only in the southwest. Maximum thickness about 40 feet.	QUATERNARY
Kt High-Level Alluvial Deposits, Coffee Sand, and Tuscaloosa Gravel High-level alluvial deposits consist of gravel (chert, quartz, and quartzite), typically "lima-bean" shaped, poorly sorted, well-rounded, iron-stained, locally very sandy, crossbedded; rounded pebbles of limonite and hematite are common; locally contains layers cemented by iron oxides to form conglomerate. Maximum thickness about 15 feet. Coffee Sand is light-brown to moderate reddish-brown, medium- to coarse-grained, well-rounded to subangular, generally well-sorted, locally very silty, iron-stained; very fine heavy minerals (mostly ilmenite with minor magnetite) abundant locally; crossbedding commonly well-developed; contains blebs and stringers of white kaolinitic clay. Maximum thickness about 10 feet. Tuscaloosa Gravel is composed mostly of chert with some sandstone, $\frac{1}{2}$ inch to 10 inches in diameter, well-rounded, in a sandy and kaolinitic matrix; typically has an ashy or bleached appearance, but locally iron-stained; commonly massive and only semi-indurated. Maximum thickness about 50 feet.	QUATERNARY, TERTIARY and CRETACEOUS

Ste. Genevieve Limestone
 Limestone, fossil-fragmental, yellowish-gray, medium-grained, highly oolitic. Bedrock known from only one outcrop, along State Highway 49 on the ridge between Bear Creek and Brandon Spring Branch; dense, light-colored chert containing abundant Ste. Genevieve fossils also present at this locality. Thickness unknown; not mapped.

Msl

St. Louis Limestone
 Limestone, silty, dusky-brown to pale yellowish-brown, fine- to very coarse-grained, medium- to massive-bedded, mostly fossil-fragmental but locally crystalline, locally dolomitic, silty partings common along bedding planes; crossbedding locally well-developed, in coarser grained beds; round or irregular nodules or thin discontinuous beds of dense chert common locally, especially in finer grained, more silty beds. In most of the area the St. Louis is represented only by residuum consisting of round nodules or irregular blocks of chert, a few inches to a foot or more in diameter, in yellowish or brownish sandy clay soil. Maximum preserved thickness 230 feet.

Mw

Warsaw Limestone
 Limestone, fossil-fragmental, medium-gray to pale yellowish-brown, fine- to very coarse-grained, medium- to massive-bedded, well-developed crossbedding, locally silty and/or dolomitic; dense and porous chert locally common as nodules and as lenses as thick as 2 feet. In most of the area the Warsaw is represented by blocks of porous chert, as large as 1 foot in diameter, in yellowish or reddish sandy clay soil. Thickness 50 to 110 feet.

Mfp

Fort Payne Formation
 Chert, light-gray to yellowish-brown and brownish-black, very dense, hard, and brittle, in beds as thick as 1 foot, intercalated with very siliceous calcareous and dolomitic siltstone; or as rough irregular plates and granules in the siltstone matrix. Locally contains beds of light brownish-gray, medium- to coarse-grained fossil-fragmental limestone; well-preserved fossils abundant locally. Maximum exposed thickness about 160 feet.

MISSISSIPPIAN

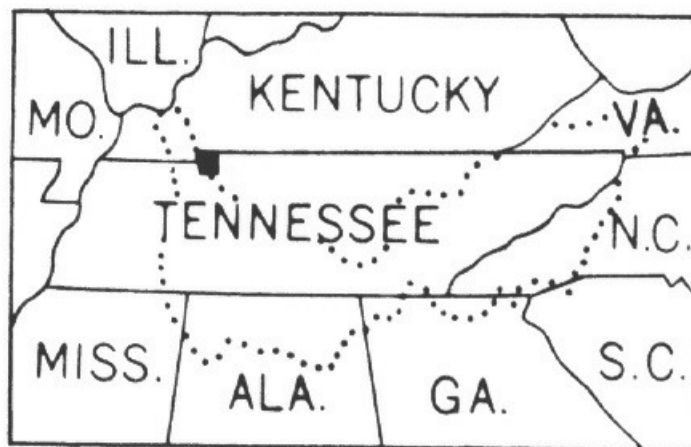
Graphic from source map: [Tharpe Quadrangle and parts of the Model, Rushing Creek, and Hamlin Quadrangles](#)

Map Legend

	Contact, dashed where approximate		
	Fault, dashed where approximate, dotted where concealed; U upthrown side, D downthrown side		
	Abandoned mining area	Fe	Iron
	Abandoned mine or quarry	gr	Gravel
	Active pit	ls	Limestone
	Inactive pit	s	Sand
	Area of numerous prospects		
	Prospect		
	Abandoned furnace		
	Oil and gas test (dry)		
	Oil and gas test (gas show)		
	Map numbers refer to descriptions in Mineral Resources Summary		

Graphic from source map: [Tharpe Quadrangle and parts of the Model, Rushing Creek, and Hamlin Quadrangles](#)

Index Map



QUADRANGLE LOCATION

Graphic from source map: [Tharpe Quadrangle and parts of the Model, Rushing Creek, and Hamlin Quadrangles](#)

GRI Digital Data Credits

This document was developed and completed by Stephanie O'Meara (Colorado State University) for the NPS Geologic Resources Division (GRD) Geologic Resources Inventory(GRI) Program. Quality control of this document by Ron Karpilo (Colorado State University). An earlier version of this document was produced by John Gilbert, Stephanie O'Meara and Heather Stanton (Colorado State University).

The information in this document was compiled from GRI source maps, and is intended to accompany the digital geologic-GIS map and other digital data for Fort Donelson National Battlefield, Kentucky and Tennessee (FODO) developed by Heather Stanton, Stephanie O'Meara, Ethan Schaefer and John Gilbert (Colorado State University) (see the [GRI Digital Map and Source Map Citations](#) section of this document for all sources used by the GRI in the completion of this document and related GRI digital geologic-GIS map).

GRI finalization by Stephanie O'Meara.

GRI program coordination and scoping provided by Bruce Heise, Jason Kenworthy and Tim Connors (NPS GRD, Lakewood, Colorado).