

SURFICIAL GEOLOGY OF THE OHIO PORTIONS OF THE DAYTON 30 X 60 MINUTE QUADRANGLE

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MAPPING CONVENTIONS

This map provides a three-dimensional framework of the area's surficial geology and depicts four important aspects of surficial geology:

1. Geologic deposits, indicated by letters that represent the major lithologies.
2. Thicknesses of the individual deposits, indicated by numbers and modifiers.
3. Lateral extent of the deposits, indicated by map-unit area boundaries.
4. Vertical sequence of deposits, shown by the stack of symbols within each map-unit area.

Figure 1 illustrates mapping conventions. Letters, numbers, and modifiers are arranged in stacks that depict the vertical sequence of lithologic units for a given map-unit area. A single stack of symbols occurs in each map-unit area and applies only to the volume of sediments within that particular map-unit area.

Letters represent geologic deposits (lithologic units) and are described in detail below. Lithologic units may be a single lithology, such as sand (S) or clay (C), or a combination of related lithologies that are found in specific depositional environments, such as sand and gravel (SG) or ice-contact deposits (IC). The bottom symbol in each stack indicates the bedrock lithologies that underlie the surficial deposits. The detailed lithologic unit descriptions below summarize:

1. Geologic characteristics, such as range of textures, bedding, and age.
2. Engineering properties or concerns attributed to the unit.
3. Depositional environment.
4. Cosmopolitan or geomorphic location.
5. Geographic location within the map area, if pertinent.

Numbers (without modifiers) that follow the lithologic designator represent the average thickness of a lithologic unit in feet (for example, 3 represents 30 ft). If no number is present, the average thickness is implied as 1 (10 ft). These unmodified numbers correspond to a thickness range centered on the specified value but may vary up to 50 percent. For example, 74 indicates an average thickness of fill in a map-unit area is 40 ft, but that thickness may vary from 20 to 60 ft.

Modifiers provide additional thickness and distribution information:

1. Parentheses indicate that a unit has a patchy or discontinuous distribution and is missing in portions of that map-unit area. For example, (T2) indicates that till with an average thickness of 20 ft is present in only part of that map-unit area.
2. A minus sign (-) following a number indicates the maximum thickness for that unit in areas such as a buried valley or ridge. Thickness decreases from the specified value, commonly near the center of the map-unit area, to the thickness of the same lithologic unit and vertical position specified in an adjacent map-unit area. For example, a SG0 map-unit area adjacent to a SG1 area indicates a sand-and-gravel unit having a maximum thickness of 90 ft that thins to an average of 30 ft at the edge of the map-unit area. If the material is not present in an adjacent area, it decreases to zero at that boundary.

The scale of this reconnaissance map generates the great local variability within surficial deposits. That variability is explained in the lithologic unit descriptions and by the use of thickness ranges. Some areas and lithologies are too small to delineate at 1:100,000 scale and have been included in adjacent areas. This map should serve only as a regional predictive guide to the area's surficial geology and not as a replacement for subsurface logs and geophysical studies required for site-specific characterizations.

DATA SOURCES

Data were collected from numerous sources (see "References"). The concentration of data was greatest near the surface and decreased with depth. County soil survey maps, which describe the top 5 feet of surficial materials, provided an initial guide to map-unit areas. These maps were modified through interpretation of local geomorphic settings and other data that indicated change of deposits at depth, such as water-well logs from the Ohio Department of Natural Resources (ODNR), Division of Water and soil and gas well logs on file at the ODNR Division of Geological Survey (Fig. 2), test boring logs provided by the Ohio Department of Transportation and Ohio Environmental Protection Agency (EPA) and county engineers (Fig. 3), theses, and published or unpublished geologic reports, maps, and field notes on file at the ODNR Division of Geological Survey. These data also provided the basis for lithologic unit descriptions that summarize, as accurately as possible, recognized associations of genetically related materials. Total thickness of surficial deposits was calculated from ODNR Division of Geological Survey open-file bedrock topography maps, and bedrock units were summarized from ODNR Division of Geological Survey bedrock geology maps, all of which are available for each 7.5-minute quadrangle in the map area. Land-surface topography was derived from LIDAR data, collected as part of the Ohio Statewide Imaging Program, which were converted into a 12.5 x 12.5-ft-resolution digital elevation model (DEM) and shaded-relief model by the Ohio EPA. Detailed descriptions of 3-D mapping methods are described in Veness (2007) and McDonald and McDonald (2007).

MAPPING UNITS

Water Lakes generally larger than 20 acres and not appearing on base map.

Made land Large areas of cut and fill, such as dams, landfills, and urban areas; may include reclaimed strip mine areas. Underlain by bedrock or other lithologic units.

Alluvium (Holocene) Includes a wide variety of textures from silt and clay to boulders; commonly includes organic material; generally not compacted. Rarely greater than 20-ft thick; unit considered to thin to zero at contact with adjacent polygons. Formed in undrained depressions. Organic deposits too small to map at 1:100,000 scale indicated by an asterisk (*) and underlain by material shown in surrounding map-unit area. Occupies depressions between beach ridges, dunes, and on the lacustrine plain, occurs throughout the map area and is common in areas formerly occupied by interterminal marshes.

Organic deposits (Holocene) Muck and peat, may contain clay at depth. Generally less than 20-ft thick; considered to thin to zero at contact with adjacent polygons. Formed in undrained depressions. Organic deposits too small to map at 1:100,000 scale indicated by an asterisk (*) and underlain by material shown in surrounding map-unit area. Occupies depressions between beach ridges, dunes, and on the lacustrine plain, occurs throughout the map area and is common in areas formerly occupied by interterminal marshes.

Clay (Wisconsinan) Massive to laminated; may contain interbedded silt and fine sand; clay content can exceed 90 percent. Laminated clay commonly contains thin silt or sand partings. Carbonate-oriented concretions occur in some areas. Distributed throughout the Lima map area as isolated surface deposits, terraces, and as deposits of larger, interterminal lakes. Also associated with the deep water deposits of high-proglacial proforecesses of Lake Erie.

Silt (Wisconsinan) Massive or laminated; commonly contains thin sand partings. Carbonate-oriented concretions occur in some areas. May contain localized clay, sand, or gravel lenses. Present throughout the map area as isolated surface deposits, terraces, and thin, delicate deposits in interterminal lakes. Also associated with moderate-depth water and debris deposits of high-proglacial proforecesses of Lake Erie.

Sand (Wisconsinan) Contains minor amounts of disseminated gravel or thin lenses of silt or gravel; grains well to poorly sorted, moderately to well rounded with high quartz percentage; finely laminated to massive, may be cross bedded; locally may contain organics as disseminated particles or sticks and logs. Beds may be laminated by calcium carbonate in stable water-exposed exposures; concretions may be present with varying degrees of cementation. In deep buried valleys, may be older than Wisconsinan. Fluvial deposits in low-level terraces and buried valleys throughout the map area.

Sand and gravel (Wisconsinan) Intermixed and interbedded sand and gravel commonly containing thin, discontinuous lenses of silt and clay; grains well to moderately sorted, moderately to well rounded, finely stratified to massive, may be cross bedded; locally may contain organics. In deep buried valleys, may be older than Wisconsinan age. Present as valley wall terraces and in buried valleys throughout the map area.

Gravel (Wisconsinan) Contains minor amounts of disseminated sand and thin, discontinuous lenses of silt and thicker, more continuous beds of sand; silt well to poorly sorted, angular to well rounded; may be massive, cross bedded, or horizontally bedded. Chert may be included in some areas as exhalative limestone derived from the immediate area, up to 60 feet thick. Some stable slope exposures are locally cemented by calcium carbonate. In deep buried valleys, may be older than Wisconsinan. Fluvial deposits in low-level terraces and buried valleys throughout the map area.

Ice-contact deposits (Wisconsinan) Highly variable deposits of poorly sorted gravel and sand; silt, clay, and till lenses common; may be partially covered or surrounded by till. Deposited directly from stagnant ice as kame or esker landforms. Commonly associated with large, deep buried valleys.

Unsorted mix of silt, clay, sand, gravel, and boulders (Wisconsinan) Variable carbonate content; fractures common. May contain silt, sand, and gravel lenses. Deposited directly from several separate ice advances. Undifferentiated and nonspelled age in buried valleys or where separated by intervening nonfill units from an overlying, designated till. Surface may be wave planed or modified by lacustrine erosion and deposition.

Loam till (Wisconsinan) Overlain by up to 3 feet of loess; loess generally thin or absent on slopes. Till may contain silt, sand, and gravel lenses. Average sand/silt/clay percentages of till 25/45/30 percent, ranging from 15/50/35 percent to 30/45/25 percent (Westworth classification). Chert larger than medium pebbles average about 5% of total volume of till, but vary from 1% to 20%. Flat, well-drained areas leached to a depth of about 3 feet, including loess cap. Joints/fractures common. Averages 20 to 30 feet thick and ranges to 50 feet thick in buried valleys and on steep slopes. In deep buried valleys includes pre-Wisconsinan till and may include clay and silt beds. Stratigraphic name: Shelbyville Till. Local roll-in loess and landfills are generally limited to valley walls. Deposited by glacial ice. Common surficial unit in the southern part of the map area.

Loam till (Illinoian) Generally overlain by up to 3.5 ft of loess, but loess may be 10-ft thick along bluffs bordering major rivers. Till may contain silt, sand, and gravel lenses. Sand/silt/clay percentages of till vary widely, averaging 25/47/28 percent and range from 5/43/49 percent to 38/41/23 percent (Westworth classification). Upward areas leached to 6 feet, including loess cap. Joints/fractures common. Averages 20-30 ft thick and ranges to 50 ft thick in buried valleys. Stratigraphic names: Richmond and Centerville. Till approximately west of the Great Miami River; Raisin River Till east of the river. Landsliding may occur in overstepped, wet areas. Deposited by glacial ice. Most common surficial unit in the eastern part of the map area.

BEDROCK UNITS

Limestone bedrock and limestone-derived colluvium (Silurian) Limestone, tan to reddish tan, coarse crystalline, medium to fine bedded; hard. Brossfield Formation. Present as a single, small outlier in the southeast portion of the study area.

Limestone-dominant bedrock and bedrock-derived colluvium (Ordovician) Interbedded limestone, medium gray, thin to medium bedded, fossiliferous, and shale, gray, thin to medium bedded. Limestone ranges from 50%-90% of the unit, although shaly/silt beds are present. Includes Piquet, Pleasant, Fairview, Grant Lake, Armbeth, Liberty, and Whiteaker Formations. On side-slopes and toe-slopes, unit is colluvium, predominantly clay with downslope-oriented limestone slabs and organic matter. Colluvium has relatively low shear strength and is the source of numerous landslides, especially on steep slopes.

Interbedded shale, limestone, and dolomite, Cincinnati group (Upper Ordovician) Shale is shades of gray, olive, red, and green; calcareous; dolomite, locally gray. Limestone is shades of gray and olive, finely to coarsely crystalline, contains thin to medium, irregular, nodular to wavy bedding; argillaceous. Dolomite is shades of olive and yellowish gray; finely to coarsely crystalline; mostly in thin to medium beds; argillaceous. Sparse to abundant fossils. Unit not exposed. Occurs in deep buried valleys.

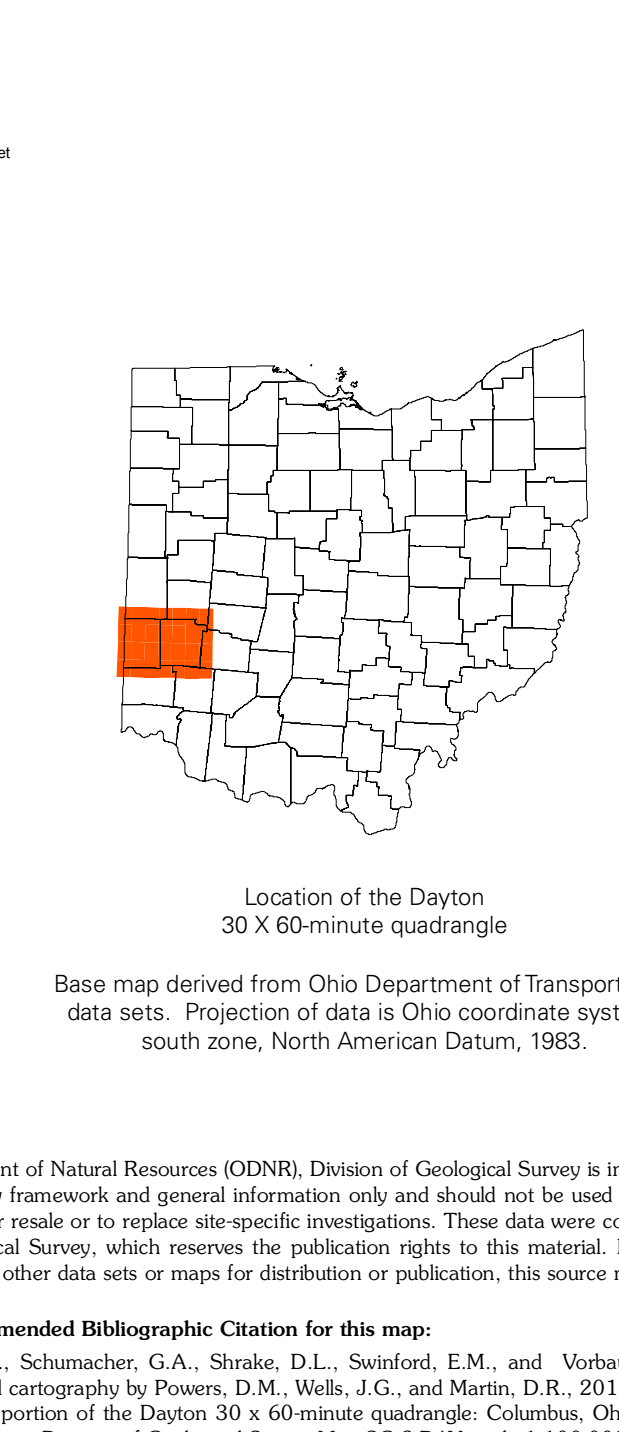
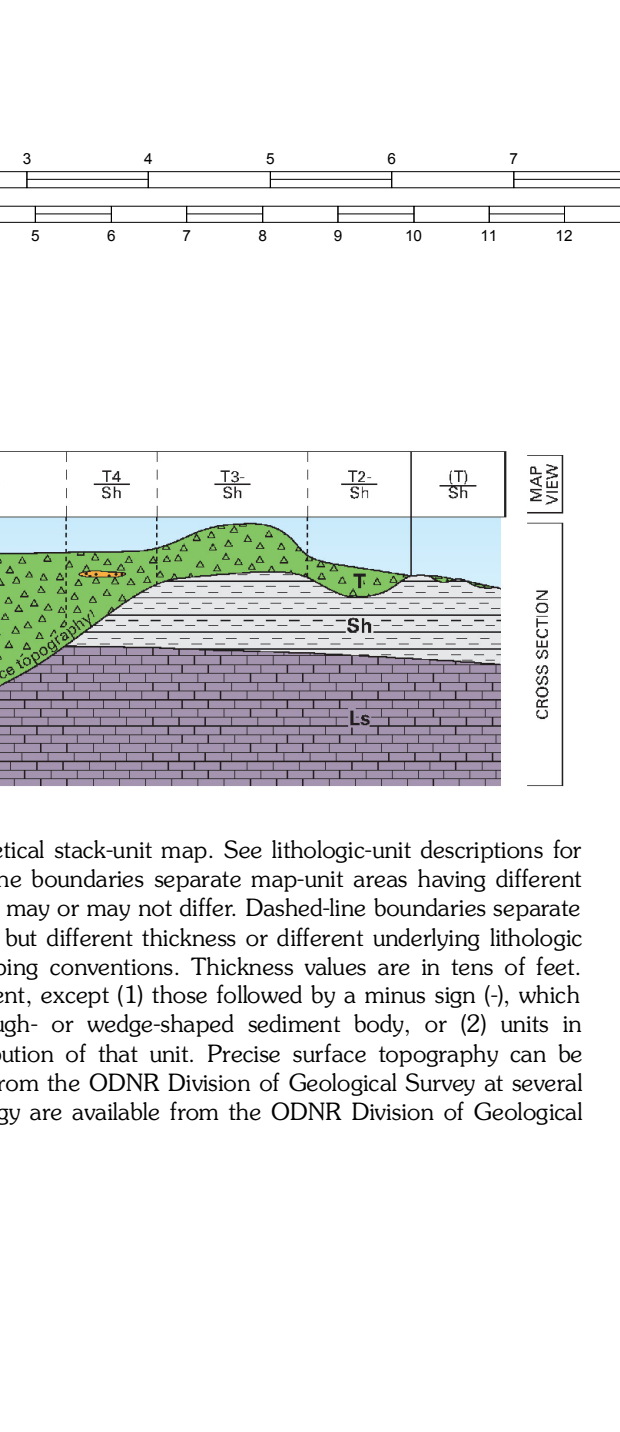
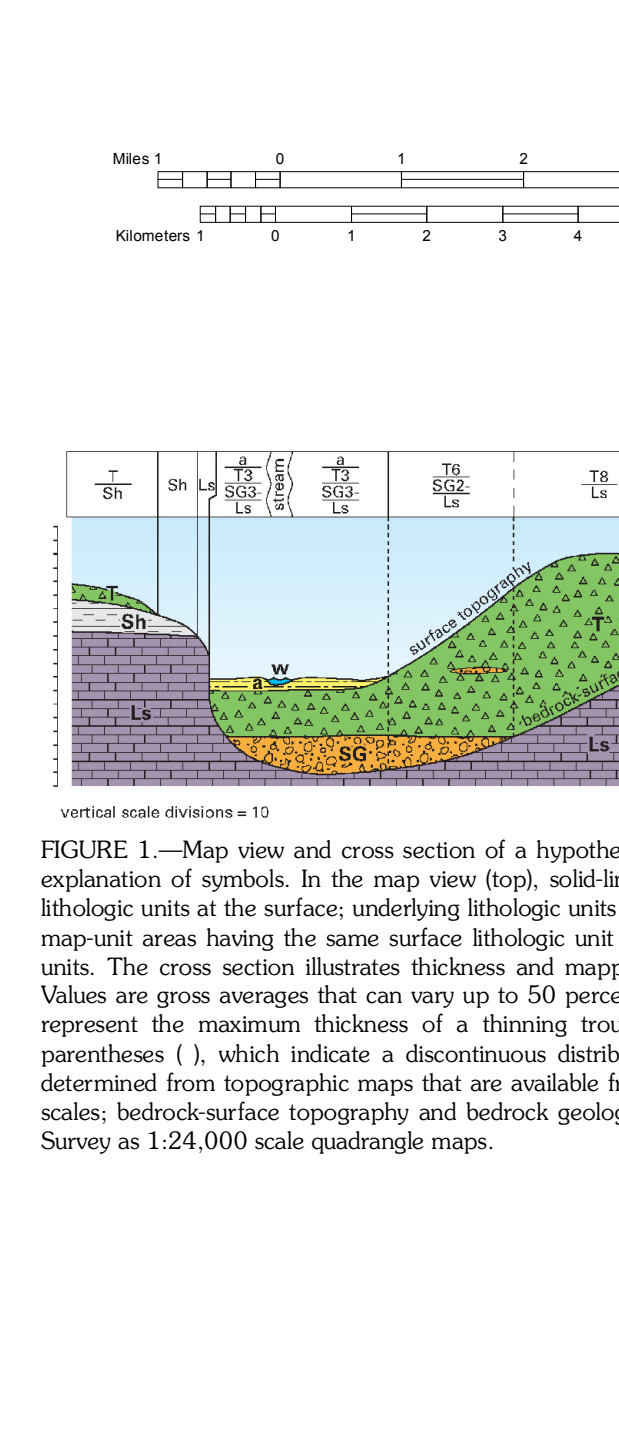
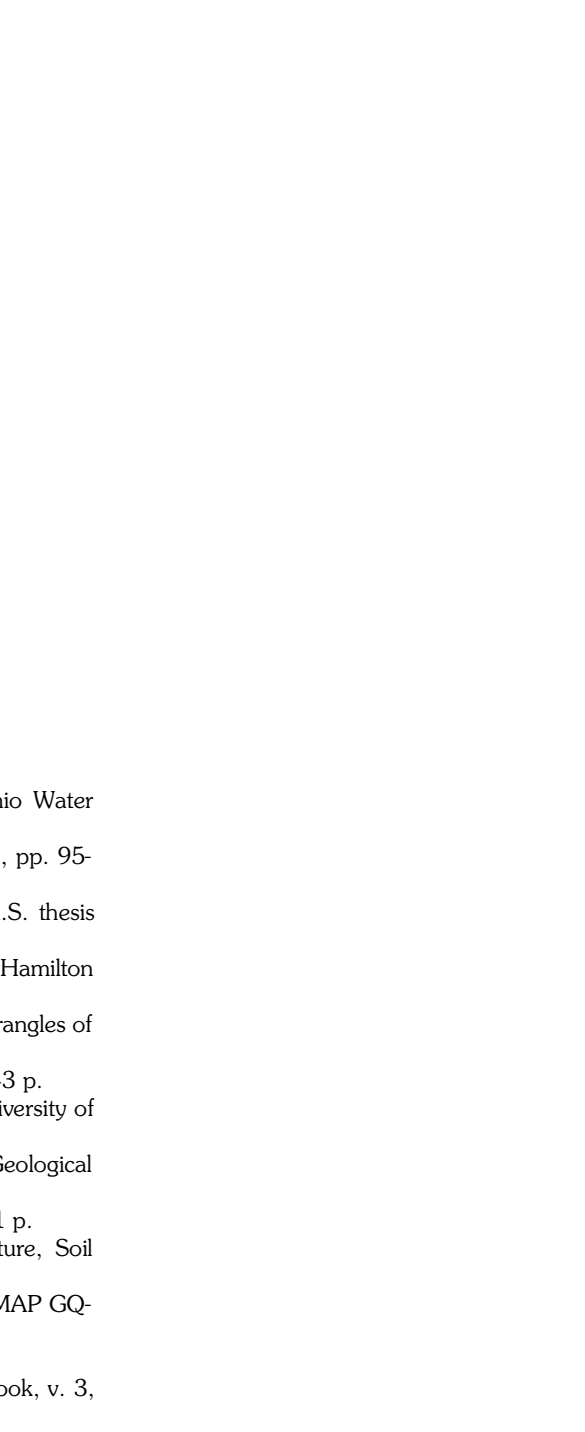
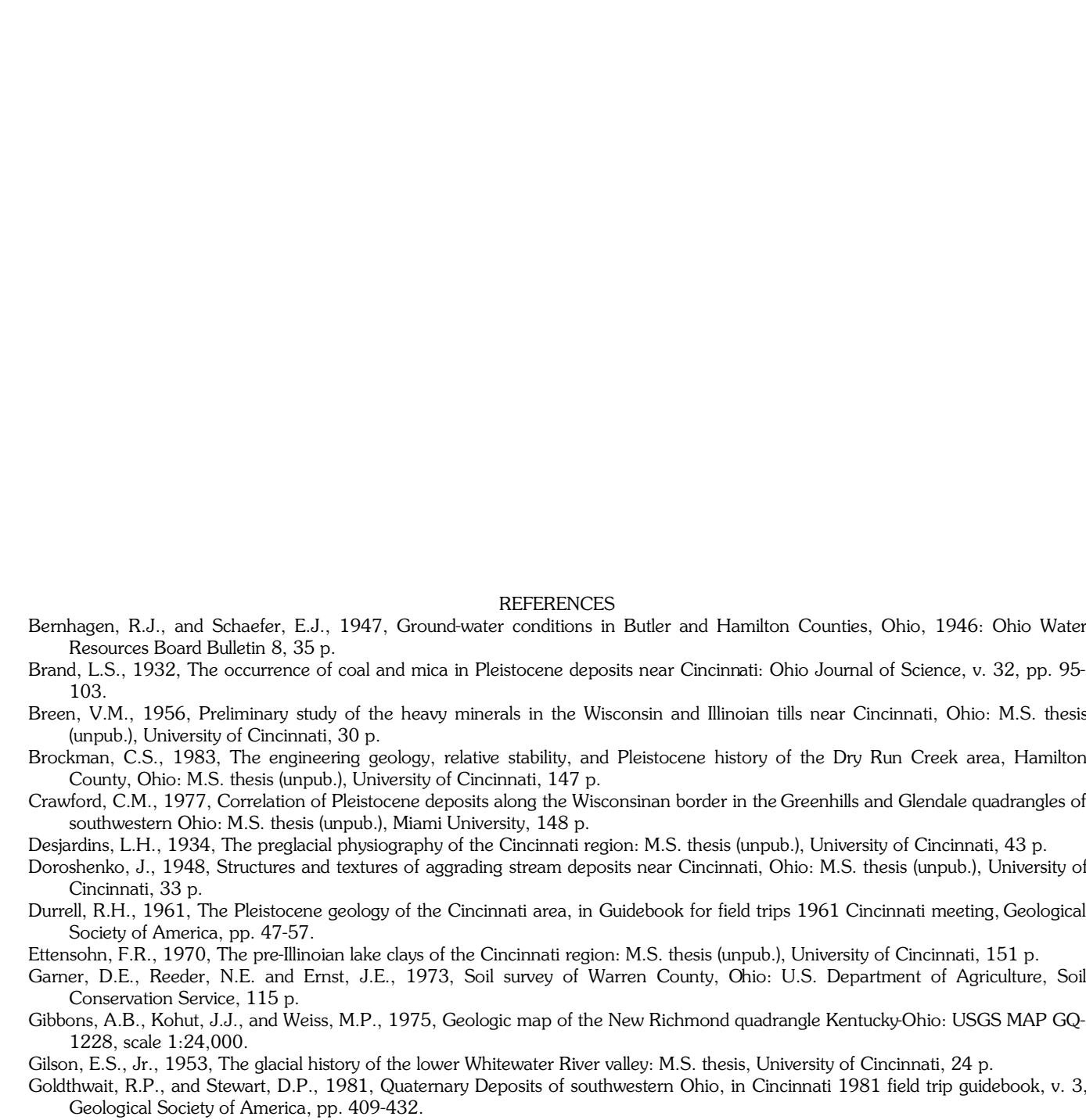
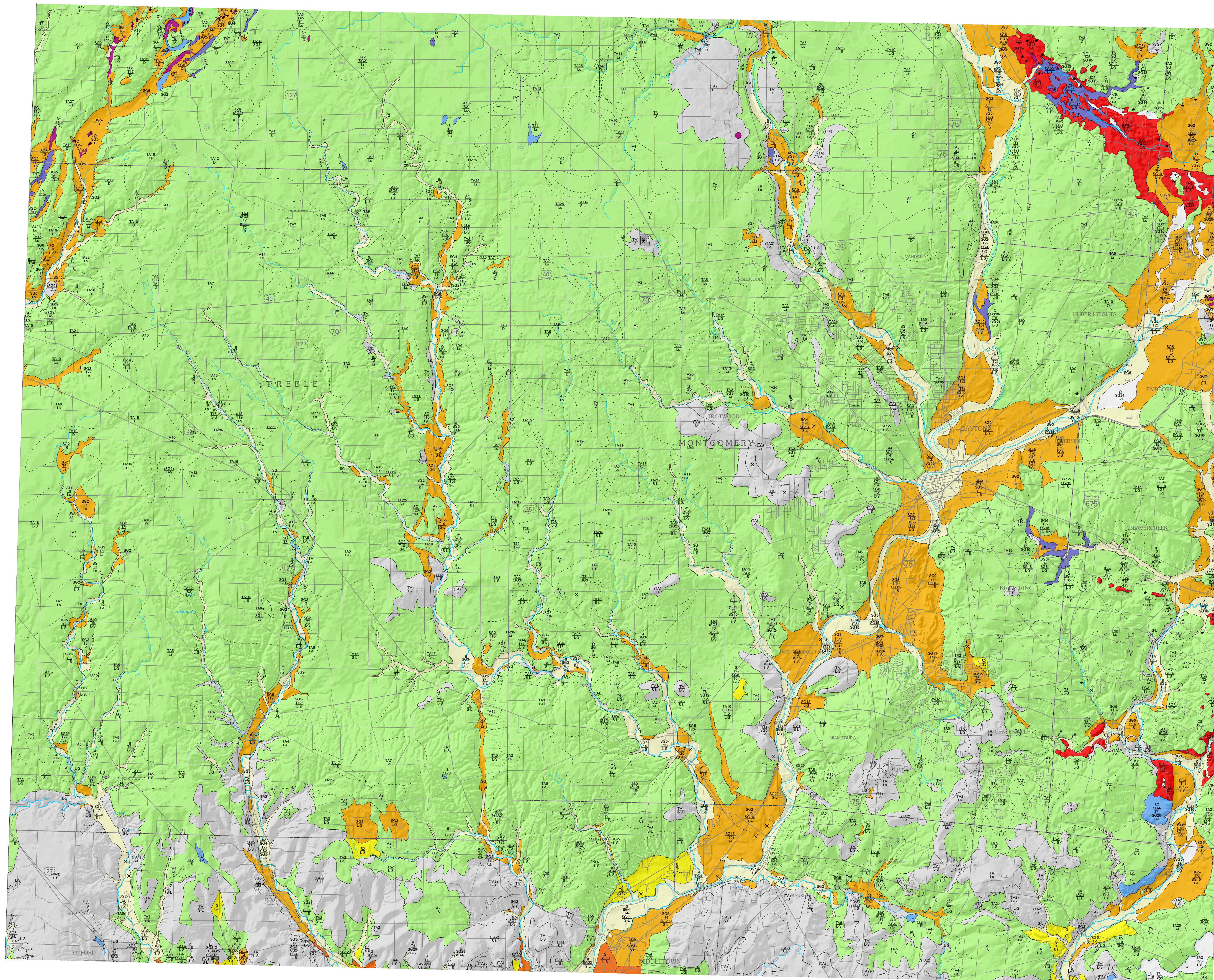
Dolomite Dominant bedrock stack unit present in the map. Stratigraphic names of the dolomites in descending stratigraphic order: Salina Group undifferentiated, Tymochtee and Greenfield Dolomites, and Lockport Dolomite. Salina Group undifferentiated Upper and Lower Salina; shades of gray and brown; very finely crystalline; mostly thin to medium beds and laminae; locally includes shale, argillaceous, and/or gypsum beds and laminae. Tymochtee and Greenfield Dolomites undivided (Upper and Lower Silurian); dolomite and shale. Tymochtee Dolomite, shades of gray and brown; very finely crystalline; occurs in thin to massive beds with carbonaceous shale laminae and beds. Greenfield Dolomite, shades of gray and brown; very finely to coarsely crystalline; occurs as massive beds to thin-bedded argillaceous laminae in lower portion. Lockport Dolomite (Upper and Lower Silurian) variegated white to shades of gray; finely to coarsely crystalline; mostly in medium to massive beds; fossiliferous; vuggy; locally cherty in lower portion of unit.

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