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DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGICAL SURVEY
Michael P. Angle, Chief

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SURFICIAL GEOLOGY OF JACKSON COUNTY, OHIO

by
Tyler A. Norris, T. Andrew Nash, and Nathan R. Erber

with cartography by Dean R. Martin

JACKSON COUNTY SURFICIAL GEOLOGY

Jackson County is located in south-central Ohio and is known for its geologic resources including coal, clay, aggregates, iron ore, and historic salt springs that originate from Paleozoic-aged bedrock. The westernmost portion of Jackson County is within the Shawnee-Mississippian Plateau physiographic region of the Allegheny Plateaus. This region contains Mississippian-aged bedrock (Brockman, 1998), dominantly sandstones and shales (SsSh) from the Logan and Cuyahoga Formations (Slucher and others, 2006). The rest of Jackson County is within the Ironton Plateau, which is characterized by the dissected mountains of Pennsylvanian-aged sandstones, siltstones, shales, limestones, and coals (P) composing the Pottsville, Allegheny, and Conemaugh Groups. Although Jackson County lies beyond the Wisconsinan and Illinoian glacial margins in Ohio, the area contains notable unconsolidated deposits. Most of these deposits originate from modifications to the preglacial Teays River System caused by prior glaciations (Pavey and others, 1999). The Teays River once entered Ohio from the south and flowed northwest into Indiana (Stout and others, 1943).

A small portion of the exposed master Teays River Valley, also known as the Parker Strath, bends into western Jackson County. Additionally, two major ancient tributaries to the Teays exist in Jackson County: the Marietta River, with its headwaters to the east in Monroe County, and the Albany River, which enters Jackson County from the north in Vinton County and joins the Marietta River (fig. 1; Tight, 1903; Stout, 1916). These drainage systems were largely altered during pre-Illinoinan glaciations when glacial ice dammed the Teays River to the northwest of Jackson County near Chillicothe, creating a large proglacial lake in the ancient valleys. This large ice-dammed lake is known as Lake Tight, and it persisted for thousands of years and disrupted the course of many nearby rivers (Wolfe, 1942; Goldthwait, 1991). Laminated lacustrine silts and clays were deposited on the proglacial lake beds during pre-Illinoian glaciations and are known as Minford Silt or Minford Clay (Lk; Stout and Schaaf, 1931; Hoyer, 1976). These fine-grained deposits often compose abandoned valley floors, old drainage divides, and high-level terraces on hillsides. The thicknesses of these deposits vary greatly in Jackson County. Lake clays and silts are often thin (1–30 feet thick) in minor abandoned tributaries but are typically 10–70 feet thick or more in larger valleys, such as the preglacial Albany River. The thickest lacustrine deposits in the county are mapped in the southeastern portion of the Marietta River Valley. Both valleys contain lacustrine deposits that reach over 100 feet in thickness. Elsewhere in the valleys, some fine-grained deposits (LC) are similar to these pre-Illinoian lacustrine sediments but are typically at lower elevations and may have been reworked or may originate from slackwater settings caused by more recent glaciations. Remains of ancient fluvial channel systems are sometimes found within Jackson County, as evidenced by valley fills and terraces composed of coarser silts and sands (Sk). These coarse materials are known locally as Gallia Sand (Hoyer, 1976) and are likely of pre-Illinioan age as they often underlay Minford Silt deposits. The sand units are typically thin (1–20 feet). Additional coarse materials (SG) are mostly outwash found in valleys in northwestern Jackson County that likely originated from more recent Illinoian or Wisconsinan Glaciations.

As proglacial lake levels rose during the pre-Illinoinan glaciations, water eventually spilled over low points of preglacial drainage divides. These waters created new drainage patterns as they eroded very narrow gorges. Many of these immature streams remain and have surrounded or incised through older valleys over time. Conversely, several modern streams within the ice-dammed valleys have abnormal drainage patterns, with smaller tributaries that can flow in a reversed direction and are underfit because of their wide valley floors. After Lake Tight was drained, the exposed lacustrine materials were weathered and eroded with time. Wind eroded these finer-grained deposits and many other local materials and then deposited them as loess (E) throughout the Quaternary Period. This wind-blown sediment is typically loam-textured and thin (1–10 feet) and is found either proximal to its source or blanketing high ridge tops. In some instances, the similarity in texture and composition between weathered loess, alluvium, colluvium, and even younger lacustrine sediments can make differentiating thin units difficult (Bigham and others, 1991).

In addition to deposits associated with the Teays River, modern alluvium and bedrock-derived colluvium overlie much of Jackson County. Alluvium (a) contains mostly eroded material from local bedrock along and within streams but may also have notable clay and silt fractions when nestled within valleys affected by glaciations and drainage modifications. At a more local scale, humans caused additional modern drainage modifications to ditch and adequately drain the near-impermeable surfaces of some lacustrine clay-filled valleys, especially near urban areas (m). Additional human-made alterations to drainage include the damming of several lakes (w), such as Lake Katharine. Quarrying operations (quarry) dominate much of the uplands in the county, especially towards the east where Pennsylvanian-aged coal and other bedrock aggregate mining is abundant. Several notable pits (pit) mark locations where unconsolidated material, mostly within ice-dammed valleys, is economically mineable.

MAPPING CONVENTIONS

This map provides a three-dimensional framework of the study 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 extents of the deposits, indicated by map-unit area boundaries (solid and dashed lines).
4. Vertical sequence of deposits, by the stack of symbols within each 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 (IC) deposits. 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 environments.
4. Geomorphology or geomorphic locations.
5. Geographic locations within the map area, if pertinent.

Numbers (without modifiers) that follow the lithology designators represent the average thickness of a lithologic unit in tens of feet (for example, 3 represents 30 feet [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 ±50 percent. For example, T4 indicates an average thickness of till in a map-unit area of 40 ft, but overall 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 negative sign (-) following a number indicates the maximum thickness for that unit in an area 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 SG9- map-unit area adjacent to a SG3 area indicates 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.

Boundary types reflect the relationships among uppermost continuous lithologies only, not patchy, discontinuous lithologies (in parentheses). The colors on the map correspond to the uppermost continuous map units and serve to assist in visualizing the geology of the area. Discontinuous units (in parentheses) and subsurface only-units are not assigned colors on the map.

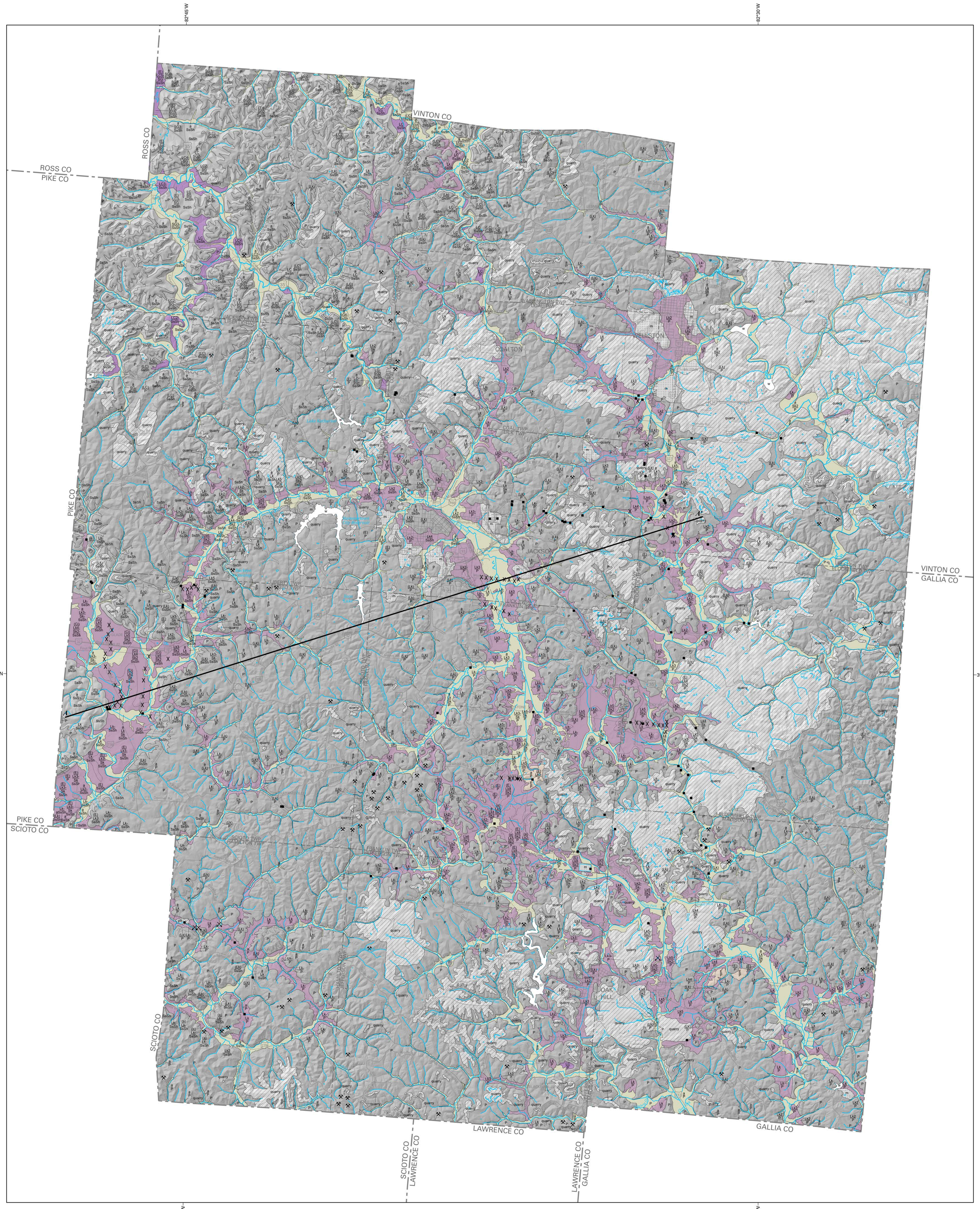
The small scale of this reconnaissance map generalizes the great local variability within surficial deposits. That variability is explained in the lithologic unit descriptions and by the use of thickness ranges. Some areas and lithologies are too small to delineate at 1:24,000 scale and have been included 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 borings and geophysical studies required for site-specific characterizations.

UNIT DESCRIPTIONS

m	Made land. Large areas of cut and fill, such as dams, landfills, and urban areas.
w	Water. Lakes generally larger than 20 acres and not appearing on the base map.
	Sand-and-gravel pit. Pit bottom generally underlain by surrounding unconsolidated lithologic units. May contain reclaimed areas.
	Quarry. Floored in bedrock; may contain reclaimed areas. Includes strip mine benches.
a	Alluvium (Holocene). Includes a wide variety of textures from silt to clay to boulders. Commonly includes organic material; generally not compact. Occurs in floodplains of modern streams and mapped only where areal extent and thickness are noteworthy. Also includes alluvial terraces, old floodplain remnants that are positioned tens of feet above modern floodplains.
Ci	Clay (predominantly Illinoian). Massive to laminated; may contain interbedded silt and fine sand. Upper part of unit deeply leached and more deeply jointed where near surface.
E	Eolian silt (loess) and fine sand (unspecified age). Deposited by wind, generally on bedrock and Illinoian till-capped ridges. Mapped where thickness and areal extent noteworthy.
Lk	Silt and clay; Minford Silt (predominantly pre-Illinoian). Present on high terraces or as eroded remnants of lacustrine clays and silts. Finely laminated. Often covered with loess and/or colluvium; sometimes underlain by sand and gravel.
LC	Silt and clay with occasional sand-and-gravel interbeds (unspecified age). Present as deltaic deposits, outwash, deposits in upland depressions, intermorainal lake deposits, and backwater lake deposits.
Sk	Sand (predominantly pre-Illinoian). Clayey to pebbly, weathered, and leached. Overlain by loess with sand- to pebble-sized nodules of iron oxide and manganese oxide concentrated near loess/sand contact. Sand mostly quartz and other resistant lithologies. Erodes easily when vegetation removed. Unit fluvial (deposited in high level "Teays-age" paleovalleys) and eolian (loess and sheet sands in uplands). Present only in subsurface.
SG	Sand and gravel (predominantly Wisconsinan). Intermixed and interbedded sand and gravel commonly containing thin, discontinuous layers of silt, clay, and till. Grains well to moderately sorted, moderately to well rounded, finely stratified to massive, may be cross bedded, and locally may contain organic material. Widespread fluvial deposits in terraces and buried valleys. May be older in deeper buried valleys. Present only in subsurface.
SsSh	Sandstone and shale (predominantly Mississippian). Interbedded shale, siltstone, and sandstone and associated colluvium, with common vertical and horizontal changes in rock type.
P	Sandstone, siltstone, shale, clay, limestone, and coal (predominantly Pennsylvanian). Sandstone nonbedded to massive, medium to coarse grained with abundant rounded quartz pebbles; quartz pebble conglomerate present. Interbeds of shale, sandstone, siltstone, clay, coal, and limestone common in upper portions of unit. Common horizontal and vertical changes in rock type.

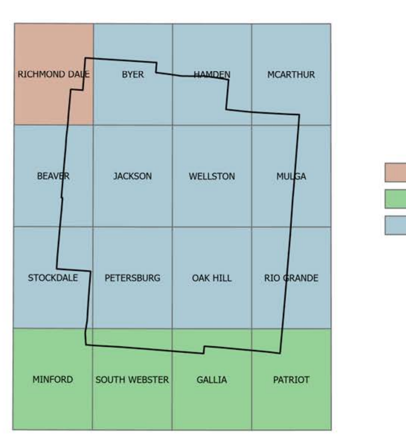
EXPLANATION OF MAP SYMBOLS

▪	Field data collection locality. Includes soil borings, outcrop observations, and field reconnaissance points.
X	Geophysical data collection locality. Includes passive seismic HVSR survey points. A site's resonant frequency, reported in hertz (hz), is used to estimate the thickness (ft) of the soft sediment layer above bedrock by applying either a local calibration equation or assuming an average shear wave velocity for the site.
	Small sand-and-gravel pit. Pit bottom generally underlain by unconsolidated lithologic units of surrounding polygon(s). May contain reclaimed areas.
⚒	Small quarry. Floored in bedrock; may contain reclaimed areas.
———	Boundary between map-unit areas having different uppermost, continuous lithologies or significant bedrock lithology change; underlying lithologies may or may not differ.
- - - - -	Boundary between map-unit areas having the same uppermost, continuous lithology but different thicknesses or underlying lithologies.



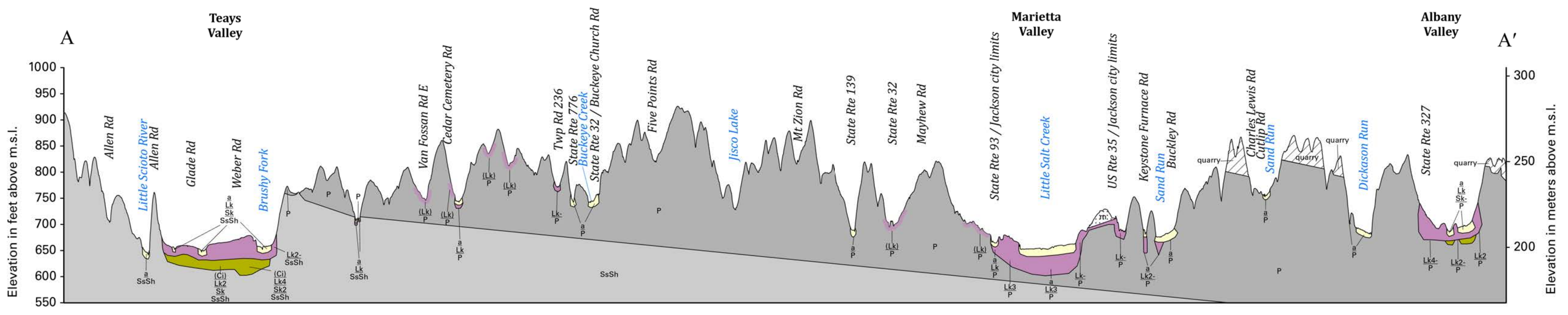
Location of Jackson County in Ohio

Basemap derived from various State of Ohio datasets
Projection is Ohio coordinate system, south zone
North American Datum 1983



7.5-minute quadrangles with full or partial areas in Jackson County. Mapping responsibility by author for each 7.5-minute quadrangle is denoted by color and adjacent legend.

SCALE 1:62,500



Cross section of the Surficial Geology of Jackson County, Ohio. See lithologic unit descriptions for explanation of symbols. m.s.l. = Mean Sea Level. Horizontal scale same as map. Vertical exaggeration is 30x.

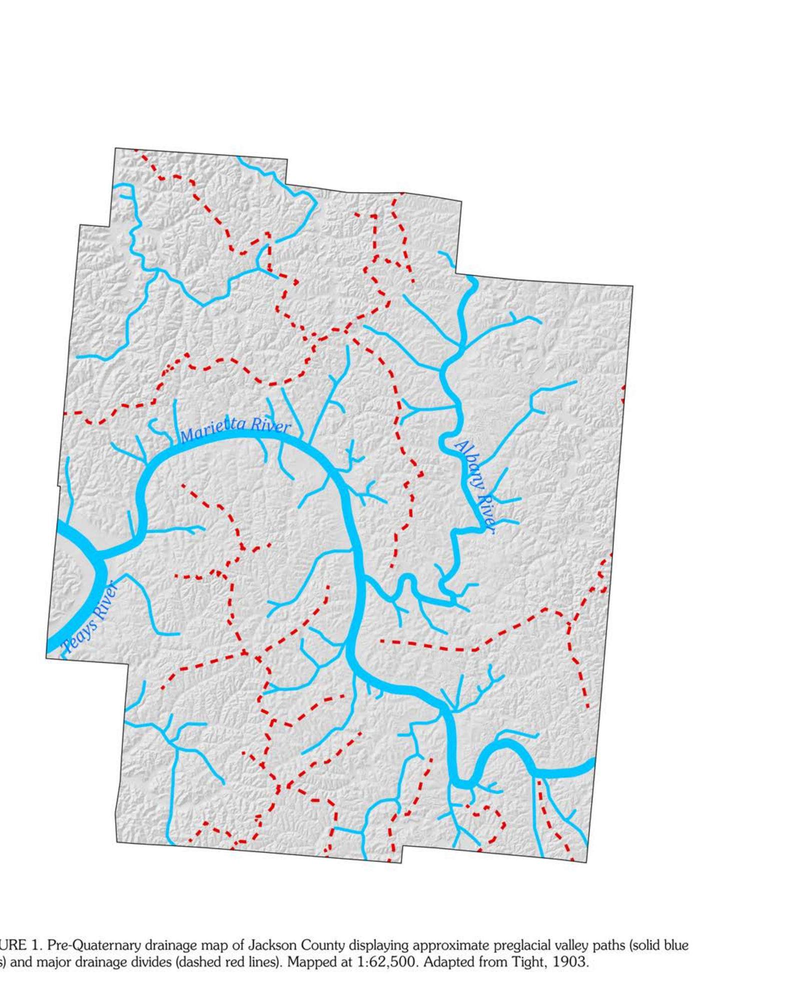


FIGURE 1. Pre-Quaternary drainage map of Jackson County displaying approximate preglacial valley paths (solid blue lines) and major drainage divides (dashed red lines). Mapped at 1:62,500. Adapted from Tight, 1903.

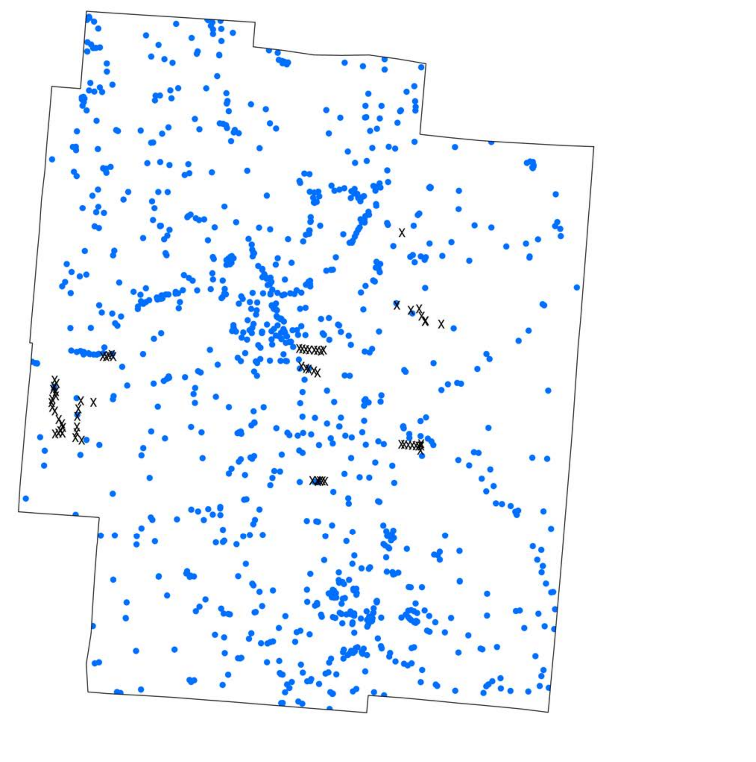


FIGURE 2. Location of water wells (dark blue dots) and geophysical data collection localities (black X's) in Jackson County.

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 ft of surficial materials, provided an initial guide to map-unit areas. These areas were modified through interpretation of local geomorphic settings and other data that indicated changes of deposits at depth, including: water-well logs (fig. 2) from the Ohio Department of Natural Resources (ODNR), Division of Water Resources; test-boring logs provided by the Ohio Department of Transportation, Office of Geotechnical Document Management system, available online at **https://gis.dot.state.oh.us/tims** and at Ohio Environmental Protection Agency and county engineers offices; 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 each surficial deposit was calculated using 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. The Ohio Statewide Imagery Program collected LiDAR data and converted it into a 2.5 x 2.5-ft-resolution digital elevation model (DEM). Using this DEM, the ODNR Division of Geological Survey generated a shaded relief and a percent slope digital model of the land surface.

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DISCLAIMER

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