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

Cuyahoga Valley National Park

GRI Ancillary Map Information Document

Produced to accompany the Geologic Resources Inventory (GRI) Digital Geologic Data for Cuyahoga Valley National Park

cuva_geology.pdf

Version: 3/19/2020

Geologic Resources Inventory Map Document for Cuyahoga Valley National Park

Table of Contents

Geologic Resources Inventory Map Document

Cuyahoga Valley National Park, Ohio

Document to Accompany Digital Geologic-GIS Data

cuva_geology.pdf

Version: 3/19/2020

This document has been developed to accompany the digital geologic-GIS data developed by the Geologic Resources Inventory (GRI) program for Cuyahoga Valley National Park, Ohio (CUVA).

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 Maps and Source Citations** – A listing of the GRI digital geologic-GIS maps produced for this project along with source maps used in their completion. In addition, a brief explanation of how each source map was used is provided. An index map showing Cuyahoga Valley National Park, and the GRI map extents is also provided.

3)**Digital Bedrock Geologic-GIS Map of Cuyahoga National Park and Vicinity**

a.) **Map Unit List** – A listing of all bedrock map units present on this map.

b.) **Map Unit Descriptions** – Descriptions for all bedrock map units.

4)**Digital Surficial Geologic-GIS Map of Cuyahoga National Park and Vicinity**

a.) **Map Unit List** – A listing of all surficial map units present on this map.

b.) **Map Unit Descriptions** – Descriptions for all surficial map units.

c.) **Ancillary Source Map Information** – Additional source map information present on the source map.

5)**Digital Glacial and Surficial Geologic-GIS Map of Summit County and Parts of Cuyahoga County**

a.) **Map Unit List** – A listing of all glacial and surficial map units present on this map.

b.) **Map Unit Descriptions** – Descriptions for all glacial and surficial map units.

c) **Geologic Cross Sections** – Geologic cross section graphics.

d.) **Ancillary Source Map Information** – Additional source map information present on the source map.

6)**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

Recognizing the interrelationships between the physical (geology, air, and water) and biological (plants and animals) components of the earth is vital to understanding, managing, and protecting natural resources. The Geologic Resources Inventory (GRI) helps make this connection by providing information on the role of geology and geologic resource management in parks.

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 Geologic Resources Inventory aims to raise awareness of geology and the role it plays in the environment, and to provide natural resource managers and staff, park planners, interpreters, researchers, and other NPS personnel with information that can help them make informed management decisions.

The GRI team, working closely with the Colorado State University (CSU) Department of Geosciences and a variety of other partners, provides more than 270 parks with a geologic scoping meeting, digital geologic-GIS map data, and a park-specific geologic report.

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 Report 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 Maps and Source Map Citations

The GRI digital geologic-GIS maps for Cuyahoga Valley National Park, Ohio (CUVA):

Digital Bedrock Geologic-GIS Map of Cuyahoga National Park and Vicinity, Ohio (*GRI MapCode CUVA_bedrock*)

The digital bedrock geologic-GIS map was produced using large-scale 1:24,000 source digital data from the following sources:

Larsen, G.E., 1996, Preliminary Bedrock Geology of the Cleveland South Quadrangle, Ohio: Ohio Division of Geological Survey, Open-File Bedrock-Geology Series Map, scale 1:24,000 (*GRI Source Map ID 2486*)

Larsen, G.E., 1996, Preliminary Bedrock Geology of the Lakewood Quadrangle, Ohio: Ohio Division of Geological Survey, Open-File Bedrock-Geology Series Map, scale 1:24,000 (*GRI Source Map ID 2487*)

Larsen, G.E., and Slucher, E.R., 1996, Preliminary Bedrock Geology of the Broadview Heights Quadrangle, Ohio: Ohio Division of Geological Survey, Open-File Bedrock-Geology Series Map, scale 1:24,000 (*GRI Source Map ID 2488*)

Larsen, G.E., and Slucher, E.R., 1996, Preliminary Bedrock Geology of the West Richfield Quadrangle, Ohio: Ohio Division of Geological Survey, Open-File Bedrock-Geology Series Map, scale 1:24,000 (*GRI Source Map ID 2489*)

Larsen, G.E., and Slucher, E.R., 1996, Reconnaissance Bedrock Geology of the Chagrin Falls Quadrangle, Ohio: Ohio Division of Geological Survey, Open-File Bedrock-Geology Series Map, scale 1:24,000 (*GRI Source Map ID 2490*)

Larsen, G.E., and Slucher, E.R., 1996, Reconnaissance Bedrock Geology of the Northfield Quadrangle, Ohio: Ohio Division of Geological Survey, Open-File Bedrock-Geology Series Map, scale 1:24,000 (*GRI Source Map ID 2491*)

Larsen, G.E., and Slucher, E.R., 1996, Reconnaissance Bedrock Geology of the Peninsula Quadrangle, Ohio: Ohio Division of Geological Survey, Open-File Bedrock-Geology Series Map, scale 1:24,000 (*GRI Source Map ID 2492*)

Larsen, G.E., and Slucher, E.R., 1996, Reconnaissance Bedrock Geology of the Shaker Heights Quadrangle, Ohio: Ohio Division of Geological Survey, Open-File Bedrock-Geology Series Map, scale 1:24,000 (*GRI Source Map ID 2493*)

Larsen, G.E., and Slucher, E.R., 1996, Reconnaissance Bedrock Geology of the Twinsburg Quadrangle, Ohio: Ohio Division of Geological Survey, Open-File Bedrock-Geology Series Map, scale 1:24,000 (*GRI Source Map ID 2494*)

Slucher, E.R., 1996, Reconnaissance Bedrock Geology of the Akron East Quadrangle, Ohio: Ohio Division of Geological Survey, Open-File Bedrock-Geology Series Map, scale 1:24,000 (*GRI Source Map ID 2495*)

Slucher, E.R., 1996, Reconnaissance Bedrock Geology of the Hudson Quadrangle, Ohio: Ohio Division of Geological Survey, Open-File Bedrock-Geology Series Map, scale 1:24,000 (*GRI Source Map ID 2496*)

Slucher, E.R., and Larsen, G.E., 1996, Reconnaissance Bedrock Geology of the Akron West Quadrangle: Ohio: Ohio Division of Geological Survey, Open-File Bedrock-Geology Series Map,

scale 1:24,000 (*GRI Source Map ID 4081*)

Slucher, E.R., and Vorbau, K.E., 1997, Reconnaissance Bedrock Geology of the Wadsworth Quadrangle, Ohio: Ohio Division of Geological Survey, Open-File Bedrock-Geology Series Map, scale 1:24,000 (*GRI Source Map ID 46209*)

The GRI used the full extent of each source dataset, and captured all geologic features within the datasets extent. Geologic unit descriptions were extracted from the following publication for use with the following Open-File Bedrock-Geology Series Maps.

Swinford, E. Mac, Schumacher, Gregory A., Shrake, Douglas L., Larsen, Glenn E. and Slucher, Ernie R., 2003, Descriptions of Geologic Map Units: A Compendium to Accompany Division of Geological Survey Open-File Bedrock-Geology Maps: Ohio Division of Geological Survey, Open-File Report 98-1, updated 20030724

Digital Surficial Geologic-GIS Map of Cuyahoga National Park and Vicinity, Ohio (*GRI MapCode CUVA_surficial*)

The digital surficial geologic-GIS map was produced using small-scale 1:100,000 digital data and map image from the following source:

Pavey, R.R., Schumacher, G.A., Larsen, G.L, Swinford, E.M., and Vorbau, K.E., 2000, Surficial Geology of the Cleveland 30 x 60 minute Quadrangle: Ohio Division of Geological Survey, Digital Map Series SG-2, scale 1:100,000 (*GRI Source Map ID 75183*)

The GRI used a partial extent of the source map, however, all geologic features within this map extent were captured. In addition, relevant source map elements (e.g., unit descriptions, data sources) present on the source map were also incorporated into the GRI digital geologic-GIS product.

Digital Glacial and Surficial Geologic-GIS Map of Summit County and Parts of Cuyahoga County, Ohio (*GRI MapCode CUVA_glacial_surficial*)

The digital glacial surficial geologic-GIS map was produced using medium-scale 1:62,500 digital data and map images from the following sources:

White, G.W., 1984, Glacial Geology of Summit County, Ohio: Ohio Division of Geological Survey, Report of Investigations 123, scale 1:62,500 (*GRI Source Map ID 21061*)

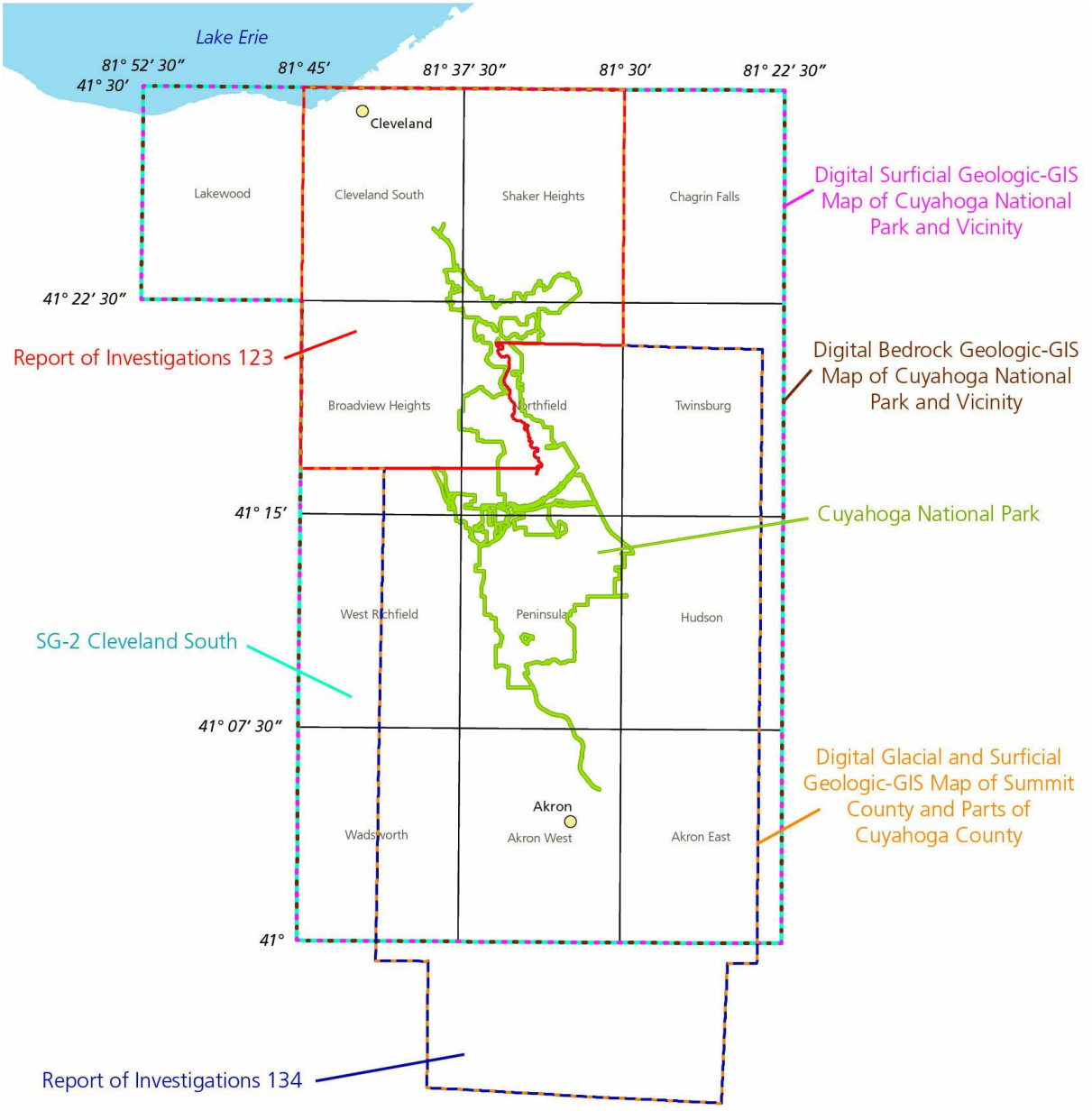
Ford, J.P., 1987, Glacial and Surficial Geology of Cuyahoga County, Ohio: Ohio Division of Geological Survey, Report of Investigations 134, scale 1:62,500 (*GRI Source Map ID 21071*)

The GRI used a partial extent of the Cuyahoga County source map, however, all geologic features within this extent were captured. The GRI used the full extent of the Summit County source map, and captured all geologic features within this extent. Relevant source map elements (e.g., unit descriptions, cross sections) present on each source map were also incorporated into the GRI digital geologic-GIS product.

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

Index Map

The following index map displays the extents of GRI digital geologic-GIS maps produced for Cuyahoga Valley National Park (CUVA). The extents of the GRI Digital Bedrock Geologic-GIS Map of Cuyahoga Valley National Park (*GRI Map Code CUVA_bedrock*) and GRI Digital Surficial Geologic-GIS Map of Cuyahoga Valley National Park and Vicinity (*GRI Map Code CUVA_surficial*) are defined by the dashed brown and purple lines, whereas the extent of the GRI Digital Glacial and Surficial Geologic-GIS Map of Cuyahoga Valley National Park and Vicinity (*GRI Map Code CUVA_glacial_surficial*) is defined by the dashed orange line. The boundary for Cuyahoga Valley National Park (as of March, 2020) is outlined in green. 7.5' quadrangles, extents of individual source maps for the bedrock map, are also shown as are the source map extents used for the surfcial map (SG-2 Cleveland South), and the glacial and surficial map (Report of Investigations 123 and 134).



Index map produced by Jake Suri and Stephanie O'Meara (Colorado State University).

Digital Bedrock Geologic-GIS Map of Cuyahoga National Park and Vicinity

Map Unit List

The geologic units present in the Digital Bedrock Geologic-GIS Map of Cuyahoga National Park and Vicinity (*GRI MapCode CUVA_bedrock*) are listed below. Units are listed with their assigned unit symbol and unit name (e.g., PNap - Allegheny and Pottsville Group, undivided). Units are listed from youngest to oldest. No description for water is provided. Information about each geologic unit is also presented in the map's Geologic Unit Information (CUVAUNIT_bedrock) table included with the GRI geologic-GIS data.

Paleozoic Era

Pennsylvanian Period
PNap - Allegheny and Pottsville Group, undivided

Mississippian Period
Mc - Cuyahoga Formation

Devonian Period
Dbb - Berea Sandstone and Bedford Shale, undifferentiated
Doh - Ohio Shale

Map Unit Descriptions

Descriptions of all bedrock geologic map units, listed from youngest to oldest, are presented below. All unit descriptions were taken from Swinford et. al., 2003.

PNap - Allegheny and Pottsville Group, undivded (Pennsylvanian)

Lithology: shale, siltstone, sandstone, conglomerate, and subordinate amounts of limestone, clay, flint, and coal

Color: predominantly shades of gray and black

Bedding: nonbedded to massive

Thickness: 450 to 620 feet

Diagnostic features: economic beds of coal and clay; marine limestone, flint, and shale beds; local development of thick quartzose sandstone and conglomerate in lower ¼ of unit; predominant gray color of unweathered rock; rapid horizontal and vertical changes of rock types.

Mc - Cuyahoga Formation (Mississippian)

Lithology: shale and interbedded sandstone and siltstone

Color: gray to brown

Bedding: thin to thick, planar to lenticular

Thickness: 0 to 180 feet where mapped in portions of northern Ohio

Diagnostic feature: dominance of shale

Dbb - Berea Sandstone and Bedford Shale, undifferentiated (Devonian)

Berea Sandstone

Lithology: sandstone and minor shale

Color: brown, weathers light brown to reddish brown

Bedding: thin to thick, planar to lenticular

Thickness: 5 to 75 feet, locally 100 to 125 feet in Lorain, Cuyahoga, and Medina Counties

Diagnostic feature: dominance of sandstone

Bedford Shale

Lithology: shale and interbedded siltstone and sandstone

Color: gray to brown, locally reddish brown

Bedding: thin to medium, planar to lenticular

Thickness: 80 to 180 feet, locally thin to absent where Berea Sandstone is thick

Diagnostic features: dominance of shale, ripple marks in siltstone beds

Doh - Ohio Shale (Devonian)

Lithology: carbonaceous shale with carbonate/siderite concretions

Color: brownish black to greenish gray, weathers brown

Bedding: laminated to thin bedded, fissile parting

Thickness: 250 to 500+ feet

Diagnostic features: color, petroliferous odor, carbonate/siderite concretions in lowermost 50 feet.

Digital Surficial Geologic-GIS Map of Cuyahoga National Park and Vicinity

Map Unit List

The geologic units present in the Digital Surficial Geologic-GIS Map of Cuyahoga National Park and Vicinity (*GRI MapCode CUVA_surficial*) are listed below. Units are listed with their assigned unit symbol and unit name (e.g., Ha - Alluvium). Units are listed from youngest to oldest. Information about each geologic unit is also presented in the map's Geologic Unit Information (CUVAUNIT_surficial) table included with the GRI geology-GIS data. Geologic unit attributes in the GIS data convey vertical sequencing (e.g. Ha/Wsg/Doh) with links to individual descriptions for each unit listed below. See the Unit Explanation page for detailed information about sequencing nomenclature.

Cenozoic Era

Quaternary Period

Recent
m - Made land

Holocene Epoch
Ha - Alluvium
Ho - Organic deposits

Wisconsinan Glacial Episode
Wat - Alluvial terraces
Wc - Clay
Wl - Silt
Wlc - Silt and clay
Ws - Sand
Wsg - Sand and gravel
Wic - Ice-contact deposits
Wt - Till

Mesozoic Era

Pennsylvanian and Devonian Periods
PNDsc - Sandstone and conglomerate

Mississippian and Devonian Periods
MDcbb - Cuyahoga Formation, Berea Sandstone and Bedford Shale, undifferentiated

Map Unit Descriptions

Descriptions of all geologic map units, generally listed from youngest to oldest, are presented below. All unit descriptions taken from the Cleveland 30 x 60 minute Quadrangle (Surficial) map.

m - Made land

Large cut and fill areas; includes quarries and pits.

Ha - Alluvium (Holocene)

Includes a wide variety of textures from silt and clay to boulders, commonly with organics; generally not compact; rarely greater than 20 feet thick. Found within floodplains of modern streams throughout the entire map area. Mapped only where areal extent and thickness are significant.

Ho - Organic deposits (Holocene)

Muck and peat, formed in undrained depressions. Small areas of organic deposits shown as an asterisk are underlain by material shown in surrounding map-unit area. Found throughout the map area.

Wat - Alluvial terraces (Wisconsinan)

Old floodplain remnants along streams that flowed into high, proglacial predecessors of Lake Erie. Highly variable textures. Commonly found in tens of feet above modern floodplains.

Wc - Clay (Wisconsinan)

Massive to laminated; may contain interbedded silt and fine sand; clay content may exceed 80 percent. Laminated clay commonly contains thin silt or sand partings. Carbonate-cemented concretions present in some areas. Joints 6 to 12 inches apart common. Found throughout the map area as lowland surface deposits, terraces, and as deep-water deposits of high, proglacial predecessors of Lake Erie.

Wl - Silt (Wisconsinan)

Massive or laminated, commonly contains thin, sand partings. Carbonate-cemented concretions present in some areas. May contain clay, sand, or gravel layers. Clay content commonly increases with depth. Found throughout the map area in lowland surface deposits and terraces and as thick, deltaic deposits of high, preglacial predecessors of Lake Erie.

Wlc - Silt and clay (Wisconsinan)

Laminated to interbedded, may contain thin fine sand or gravel layers. Found as thick lacustrine valley-fill deposits of high, proglacial predecessors of Lake Erie.

Ws - Sand (Wisconsinan)

Contains minor amounts of disseminated gravel or thin lenses of silt or gravel; 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. Found in terraces and buried valleys throughout the map area and as nearshore, dune, and beach-ridge

deposits of high, proglacial predecessors of Lake Erie.

Wsg - Sand and gravel (generally Wisconsinan)

Interbedded sand and gravel commonly containing thin, discontinuous layers 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. Found in terraces and buried valleys throughout the map area and as beach-ridge deposits of high, proglacial predecessors of Lake Erie.

Wic - Ice-contact deposits (Wisconsinan)

Highly variable deposits of poorly sorted gravel and sand; inclusions of silt, clay, and till lenses common. Deposited directly from stagnant ice as kame or esker landforms. Found throughout the map area.

Wt - Till (Wisconsinan)

Unsorted mix of clay, silt, sand, gravel, and boulders. May contain silt, sand, and gravel lenses. Joints common. Deposited directly from the ice of several separate advances. Near-surface clay percentage of till as high as 50 percent, decreasing with depth to percentages in the mid-20's. Near-surface sand percentage of till as low as 8 percent, increasing with depth to percentages in the mid 30's. Till in buried valleys and thicker areas may be older than Wisconsinan. Most common surficial unit in the map area.

PNDsc - Sandstone and conglomerate (Pennsylvanian and Devonian)

Ss - Sandstone and conglomerate (Pennsylvanian and Mississippian)
Sharon sandstone gray to white, coarse to medium grained, porous, and friable; weak silica and iron oxide cementation; conglomerate facies generally present at base of unit, consisting of well-rounded quartz pebbles and granules in a sand matrix; thin lens of fissile, gray to gray-black clay shale locally present; thickness of Sharon ranging from zero to locally to 250 feet; resistant unit forming knobs and hills, particularly in Geauga and Portage Counties; basal contact unconformable with underlying Mississippian-age blue-gray shale and siltstone; relief at contact up to 200 feet in channel cuts; unit locally quarried and noted for its high silica content. Berea Sandstone light gray, medium to fine grained, and thin to massive bedded; generally 40 to 60 feet, but ranging from zero to 230 feet because of erosional surface at base of unit; resistant unit forming hills and cliffs in Cuyahoga County.

This unit now recognized to be Pennsylvanian and Devonian in age (as per personnel communication from Mike Angle, Ohio Division of Geology).

MDcbb - Cuyahoga Formation, Berea Sandstone and Bedford Shale, undifferentiated (Mississippian and Devonian)

SSh - Sandstone and Shale, Cuyahoga Formation, Berea Sandstone and Bedford Shale (Mississippian)
Cuyahoga Formation (uppermost unit) gray to brown shale interbedded with minor sandstone and siltstone, present in southern and western portions of map area; rapid vertical and horizontal changes.

Berea Sandstone, description as above under "Ss;" designated as Ss in some places; resistant unit forming hills and cliffs at or near the northwestern edge of map area.

Bedford Shale predominantly soft, red clay shale grading downward into gray shale; thick siltstone lentils present; thickness ranging from 50 to 150 feet, exposed in northern portion of map area.

This unit now recognized to be Mississippian and Devonian in age (as per personnel communication from Mike Angle, Ohio Division of Geology).

Ancillary Source Map Information

The following sections present ancillary source map information associated with the source maps used for the Digital Glacial and Surficial Geologic-GIS Map of Summit County and Parts of Cuyahoga County.

Surficial Geology of the Cleveland 30 x 60 minute Quadrangle (SG-2)

The formal citation for this source.

Pavey, R.R., Schumacher, G.A., Larsen, G.L, Swinford, E.M., and Vorbau, K.E., 2000, Surficial Geology of the Cleveland 30 x 60 minute Quadrangle: Ohio Division of Geological Survey, Digital Map Series SG-2, scale 1:100,000 (*GRI Source Map ID 75183*)

Prominent graphics and text associated with this source are presented below.

Unit Explanation

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

1) the geologic deposits, indicated by letters which represent the major lithologies,
2) the thickness of the individual deposits, indicated by numbers and modifiers,
3) the lateral extent of the deposits, indicated by map-unit area boundaries, and
4) the vertical sequence of deposits, shown by the stack of symbols within each map-unit area
In effect, each stack represents a generalized cross section for each area.

Letters represent geologic deposits (lithologies) and are described in detail below. Geologic deposits 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 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 geographic location;
5) geographic location within the map area, if pertinent

Numbers (without modifiers) that follow the lithology designator represent the average thickness of a lithology in tens of feet (for example, 3 represents 30 feet). If no number is present, the average thickness is assumed to be 1 (10 feet). These unmodified numbers correspond to a thickness range centered in the specific value, but may vary up to 50 percent. For example, T4 indicates the average thickness of till in a map-unit area is 40 feet, but thickness may vary from 20 to 60 feet.

Modifiers provide additional thickness and distribution information:

1) Parentheses indicate that a unit has a patchy distribution and is missing in portions of that map-unit area. For example, (T2) indicates that till with an average thickness of 20 feet is present in only part of the map-unit area. If no number is present, the unit averages 10 feet or less in thickness, where present.

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 lithology and vertical position specified in an adjacent map-unit area. For example, an SG9- map-unit area adjacent to an SG3 area indicates a sand and gravel unit having a maximum thickness of 90 feet that thins to an average of 30 feet 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.

These letters, numbers, and modifiers area arranged in stacks that depict the vertical sequence of geologic 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. Figure 1 illustrates mapping conventions.

Erosion by modern streams has cut through vertical sequences that surround them and may truncate one or more units in a sequence. The resultant valleys sides, too small to delineate, are generally covered with thin, variable colluvium (weathered material that has moved downslope).

The reconnaissance scale of this map cannot accommodate the great local variability within surficial deposits. That variability is recognized in the unit descriptions and by the use of thickness ranges. Therefore, 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 the site specific characterizations.

Text from source map: Cleveland 30 x 60 minute Quadrangle (Surficial)

Data Sources

Data were collected from numerous sources. The concentration of data is greatest near the surface and decreases with depth. County soil survey maps, which describe the top 5 feet of surficial materials, provided an initial guide to map-unit areas. These areas were modified through interpretation of local geomorphic settings and other data which indicate change of deposits at depth, such as Ohio Department of Natural Resources water-well logs, Ohio Department of Transportation test-boring logs, these, and published or unpublished geologic reports, maps, and field notes. These data provided the basis for lithologic unit descriptions, which summarize, as accurately as possible, recognized associations of genetically related materials. The total thickness of surficial deposits was calculated from Division of Geological Survey open-file bedrock-topography maps, which are available for each 7.5-minute quadrangle in the map area. The bedrock units were summarized from Division of Geological Survey open-file bedrock-geology maps, also available for each 7.5-minute quadrangle.

Text from source map: Cleveland 30 x 60 minute Quadrangle (Surficial)

Digital Glacial and Surficial Geologic-GIS Map of Summit County and Parts of Cuyahoga County

Map Unit List

The geologic units present in the Digital Glacial and Surficial Geologic-GIS Map of Summit County and Parts of Cuyahoga County (*GRI MapCode CUVA_glacial_surficial*) are listed below. Units are listed with their assigned unit symbol and unit name (e.g., m - Made land). Units are listed from youngest to oldest. No description for water is provided. Information about each geologic unit is also presented in the map's Geologic Unit Information (CUVAUNIT_glacial_geology) table included with the GRI geologic-GIS data.

Cenozoic Era

Quaternary Period

Recent
m - Made land
r - Ravines
Qal - Alluvium

Recent and Pleistocene Epoch
Qsc - Silt and clay, undifferentiated
Qsg - Sand and gravel, undifferentiated

Wisconsinan Glacial Episode
Wlg - Lake Maumee gravel terrace
Wo - Outwash and lacustrine deposits
Wk - Kame and kame terraces
Whe - Hiram Till, end moraine (all lobes)
Whg - Hiram Till, ground moraine (all lobes)
Whae - Hayesville Till, end moraine (Killbuck lobe)
Whah - Hayesville Till, hummocky topography without linear trend (Killbuck lobe)
Whag - Hayesville Till, ground moraine (Killbuck lobe)
Wt - Till, primarily Lavery Till
Wlae - Lavery Till, end moraine (Cuyahoga and Grand River lobes)
Wne - Navarre Till, end moraine (Killbuck lobe)
Wkee - Kent Till, end moraine (Cuyahoga and Grand River lobes)
Wmoe - Mogadore Till, end moraine (Cuyahoga lobe)
Wmoh - Mogadore Till, hummocky topography without linear trend (Cuyahoga lobe)
Wmog - Mogadore Till, ground moraine (Cuyahoga lobe)

Mesozoic Era

Pennsylvanian Period
PNp - Pottsville Group, Sharon conglomerate (bedrock unit IV)

Mississippian Period
Mc - Cuyahoga Formation, undifferentiated (bedrock unit III)

Devonian Period
Db - Berea Sandstone (bedrock unit II)
Ds - Shale, undifferentiated (bedrock unit I)

Map Unit Descriptions

Descriptions of all glacial and surficial map units, generally listed from youngest to oldest, are presented below. The source map for each unit description is listed. In addition, a unit's symbol, name and/or age is also present if this differs from the assigned GRI unit symbol, name and/or age.

m - Made land (Recent)

M - Made land (Quaternary)
Areas of excavation or filling, where the original surface has been completely modified. Only larger areas shown. Includes chemical ponds south of Barberton. Description from source map: Summit County (Glacial and Surficial).

cf - Made land (Recent)
Areas of reclaimed land, cut and fill, dumps, and continuous urban cover where 90 percent or more of the surface is covered with concrete, asphalt, building complexes, structures, or other manmade surfaces; does not include urbanized areas where manmade surfaces are intricately associated with other types of cover. Description from source map: Cuyahoga County (Glacial and Surficial).

r - Ravines (Recent)

Steep slopes and sharp ravines, in part contiguous glacial material and in part bedrock, in Cuyahoga River valley north of Akron. Description from source map: Summit County (Glacial and Surficial).

Qal - Alluvium (Recent)

al - Alluvium (Recent)
Silt and silty sand on floodplains. Includes some bog and marsh deposits, especially in Copley Township. Description from source map: Summit County (Glacial and Surficial).

al - Alluvium (Recent)
Clastic deposits and associated organic debris, notably on floodplains of the Cuyahoga, Chagrin, and East Branch Rocky Rivers. Description from source map: Cuyahoga County (Glacial and Surficial).

Qsc - Silt and clay, undifferentiated (Recent and Pleistocene)

Lacustrine deposits, thin on the Lake Plain and Escarpment, thick and interbedded with sand and gravel in terraces along the Cuyahoga and Chagrin River valleys. Includes thin outwash deposits with interbedded sand and gravel on the Plateau south of Solon. Description from source map: Cuyahoga County (Glacial and Surficial).

Qsg - Sand and gravel, undifferentiated (Recent and Pleistocene)

Beach-ridge and valley-fill deposits on the Lake Plain, kames on the Plateau south of Solon, and local deposits in the valleys of Mill Creek, Chippewa Creek, and Griswold Creek. Terrace deposits along the Cuyahoga and Chagrin River valleys include sand and gravel interbedded with silt and clay. Description from source map: Cuyahoga County (Glacial and Surficial).

Wlg - Lake Maumee gravel terrace (Wisconsinan)

Small southward extension of main Lake Maumee terrace on Cuyahoga County; grades southward into outwash at a higher level. Description from source map: Summit County (Glacial and Surficial).

Wo - Outwash and lacustrine deposits (Wisconsinan)

Generally fine sand , silt, and clay in interstratified meltwater-stream valley trains, outwash plains, and lacustrine plains, commonly as terrace remnants. Coarser material in dissected valley-train terraces in Tuscarawas River valley south of Barberton. May include organic material in low depressions. Description from source map: Summit County (Glacial and Surficial).

Wk - Kame and kame terraces (Wisconsinan)

Gravel and sand in knolls and irregular to level high terraces. May contain included till masses. Overlain by till in places, especially in eastern and northern part of county. Description from source map: Summit County (Glacial and Surficial).

Whe and Whg - Hiram Till (Wisconsinan)

The Hiram Till is mapped as the following sub-units:

Whe - Hiram Till, end moraine (all lobes) (Wisconsinan)
Whg - Hiram Till, ground moraine (all lobes) (Wisconsinan)

Clayey till, generally thin, not everywhere present; at surface in northern Summit County. Description from source map: Summit County (Glacial and Surficial).

Whae, Whah and Whag - Hayesville Till (Wisconsinan)

The Hayesville Till is mapped as the following sub-units:

Whae - Hayesville Till, end moraine (Killbuck lobe) (Wisconsinan)
Whah - Hayesville Till, hummocky topography without linear trend (Killbuck lobe) (Wisconsinan)
Whag - Hayesville Till, ground moraine (Killbuck lobe) (Wisconsinan)

Silty till, very thin, in discontinuous small patches in western Summit County; much of the surface material may be Mogadore Till. Description from source map: Summit County (Glacial and Surficial).

Wt - Till, primarily Lavery Till (Wisconsinan)

Lavery Till is dark gray to dark brown, silty and clayey, strongly, calcareous, and cohesive. Younger Hiram Till identifiable in local outcrops, but in most places is thinner than the modern soil; older tills present in more extensive outcrops and in the subsurface. Description from source map: Cuyahoga County (Glacial and Surficial).

Wlae - Lavery Till, end moraine (Cuyahoga and Grand River lobes; Wisconsinan)

Clayey-silty till, generally thin, at surface in small area in northern Stow Township; present beneath Hiram Till in northern Summit County. Description from source map: Summit County (Glacial and Surficial).

Wne - Navarre Till, end moraine (Killbuck lobe; Wisconsinan)

Sandy till, generally thin, present in narrow belt in southern Franklin and Green Townships. Description from source map: Summit County (Glacial and Surficial).

Wkee - Kent Till, end moraine (Cuyahoga and Grand River lobes; Wisconsinan)

Sandy till, generally thin, at surface in easternmost Summit County; present beneath later tills in northern half of county. Description from source map: Summit County (Glacial and Surficial).

Wmoe, Wmoh and Wmog - Mogadore Till (Wisconsinan)

The Mogadore Till is mapped as the following sub-units:

Wmoe - Mogadore Till, end moraine (Cuyahoga lobe) (Wisconsinan)
Wmoh - Mogadore Till, hummocky topography without linear trend (Cuyahoga lobe) (Wisconsinan)
Wmog - Mogadore Till, ground moraine (Cuyahoga lobe) (Wisconsinan)

Coarse sandy till, generally greater than 15 feet thick, at surface in southern-central Summit County; present beneath later tills in northern part of county. Description from source map: Summit County (Glacial and Surficial).

PNp - Pottsville Group, Sharon conglomerate (bedrock unit IV) (Pennsylvanian)

Medium- to coarse-grained, yellowish-brown to pinkish-brown quartz sandstone; locally contains interbedded pebble layers. Forms resistant bedrock outliers beneath highest hills on the Plateau. Description from source map: Cuyahoga County (Glacial and Surficial).

Mc - Cuyahoga Formation, undifferentiated (bedrock unit III) (Mississippian)

Clayey, soft, medium- to thick-bedded, dark-gray shale, which weathers dark brown; interbedded with flaggy, fine-grained, medium-gray sandstone, which weathers pale yellowish gray; crops out along numerous deep headwater gullies southwest of Strongsville to Parma, across the Escarpment, and in the upper valleys of major tributary streams. Description from source map: Cuyahoga County (Glacial and Surficial).

Db - Berea Sandstone (bedrock unit II) (Devonian)

Massive, medium- to fine-grained, clay-bonded, light-gray to yellowish-brown quartz sandstone; thick bedded to cross bedded in lower portion, thin bedded in upper portion, many beds ripple marked; forms prominent outcrops along the Escarpment, in deep gorges on tributary streams, and in numerous highway and railroad cuts. Description from source map: Cuyahoga County (Glacial and Surficial).

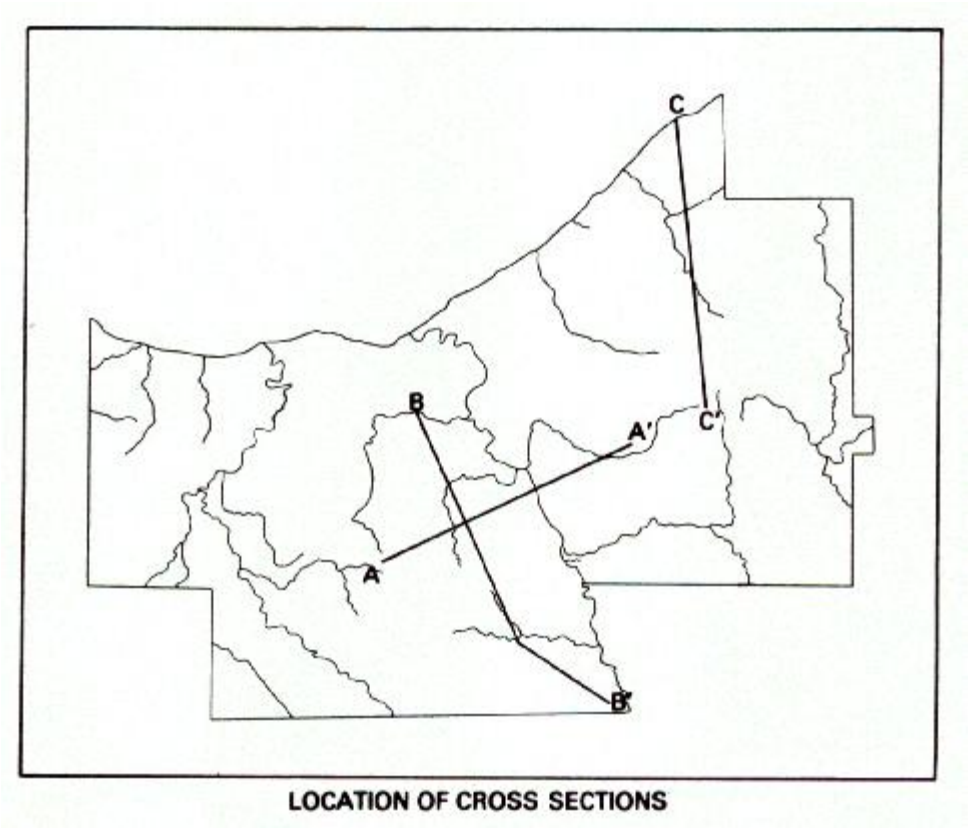
Ds - Shale, undifferentiated (bedrock unit I) (Devonian)

Includes the Cleveland and Chagrin Members of the Ohio Shale, the Bedford Shale, and the Euclid Sandstone Member of the Bedford Shale. Chagrin shale is medium to greenish gray, weathering to yellowish gray, clayey, soft, medium to thick bedded, with irregular interbeds of siltstone or sandstone that weather dark brown. Cleveland shale is dark gray to black, thin bedded, and weathers to thin brown-stained slaty fragments. Bedford Shale ranges in color from blue gray to maroon or black and is clayey and soft, with thin sandstone interbeds. Euclid Sandstone Member is blue gray, fine grained, and locally up to 30 feet thick. Rocks assigned to bedrock unit I crop out extensively on the Lake Plain, in the wave-cut cliff along the lakeshore, in steep-sided cliffs along major river valleys, and along the lower part of the Escarpment. Description from source map: Cuyahoga County (Glacial and Surficial).

Geologic Cross Sections

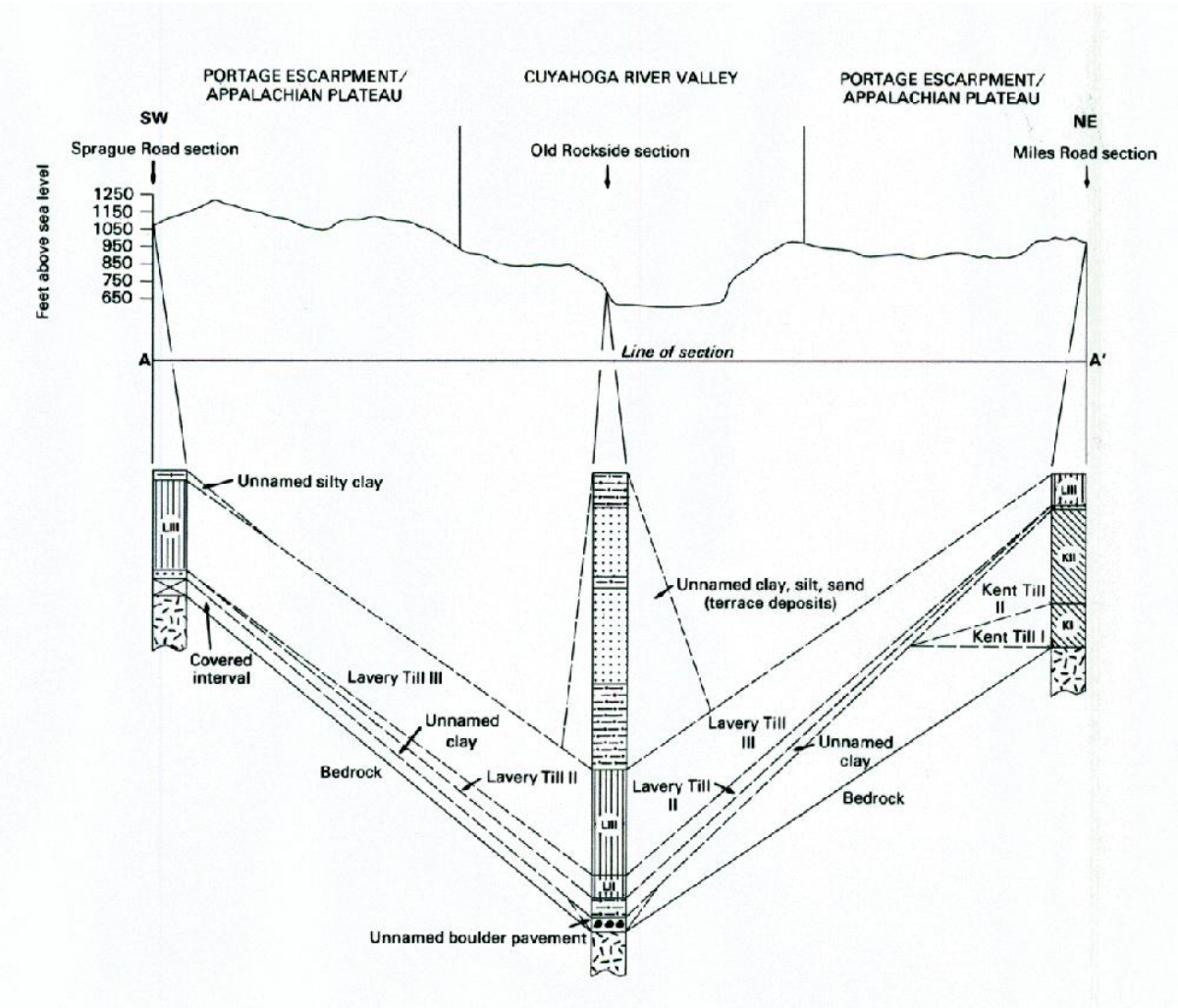
The geologic cross section graphics for the Digital Glacial and Surficial Geologic-GIS Map of Summit County and Parts of Cuyahoga County (*GRI MapCode CUVA_glaical_surficial*) are presented below. Cross section graphics were scanned at a high resolution and can be viewed in more detail by zooming in (if viewing the digital format of this document). Cross section lines are present in the GRI digital geologic-GIS data. The location of these lines is also shown in the following graphic.

Location of Cross Sections



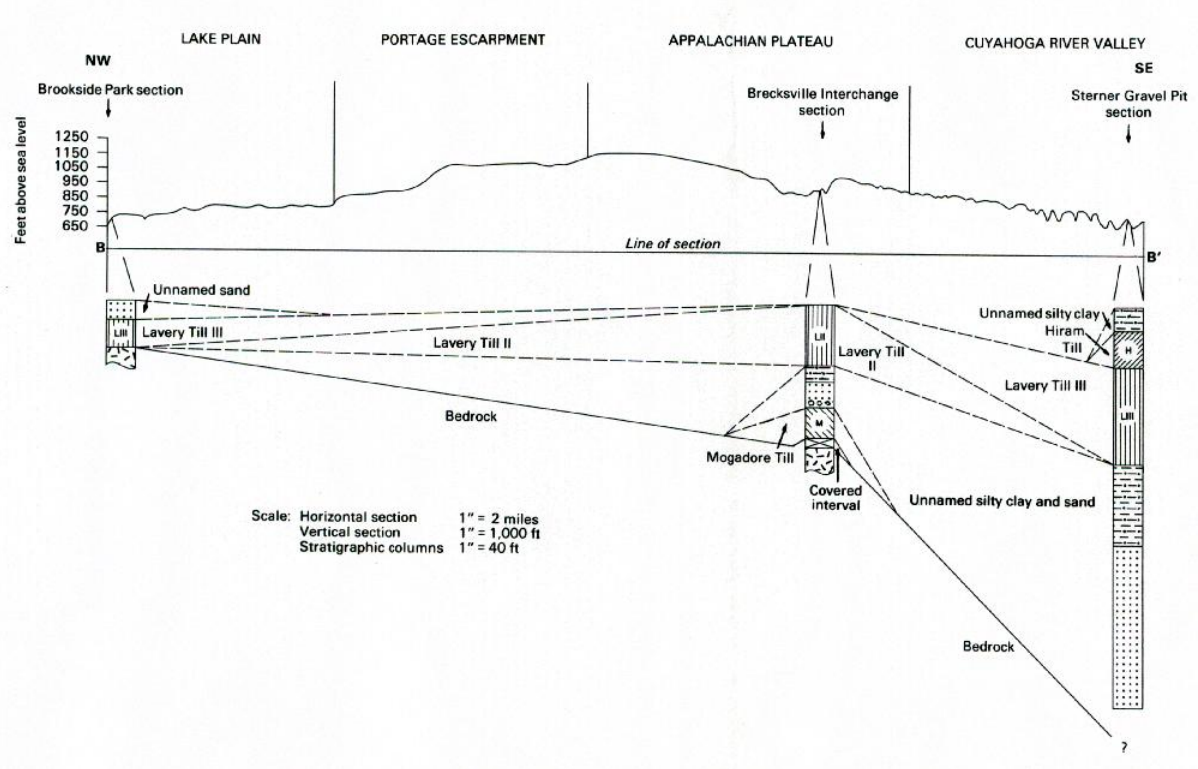
Graphic from source map: Cuyahoga County (Glacial and Surficial).

Cross Section A-A'



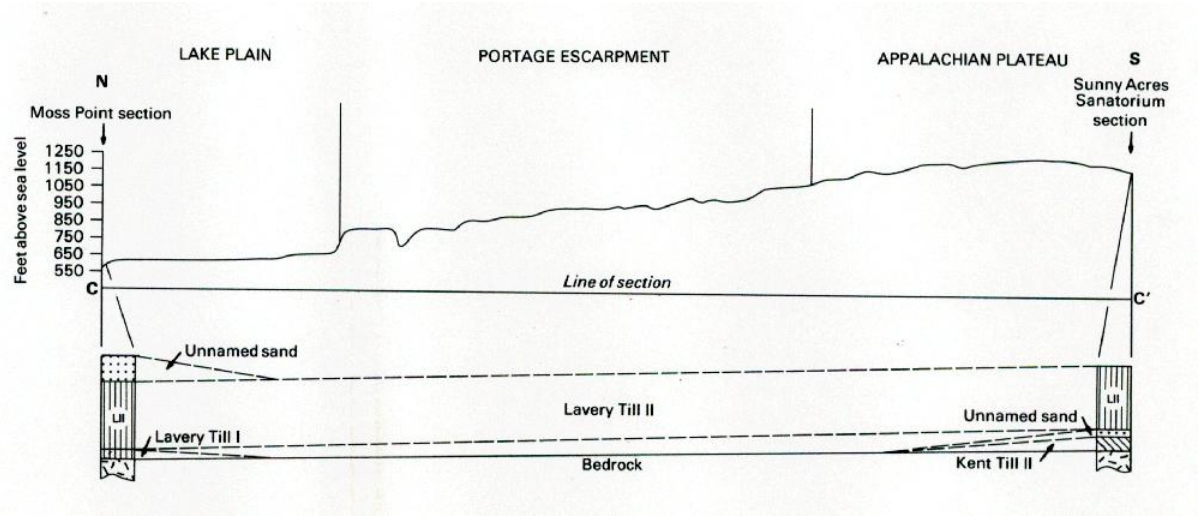
Graphic from source map: Cuyahoga County (Glacial and Surficial).

Cross Section B-B'



Graphic from source map: Cuyahoga County (Glacial and Surficial).

Cross Section C-C'



Graphic from source map: Cuyahoga County (Glacial and Surficial).

Ancillary Source Map Information

The following sections present ancillary source map information associated with the source maps used for the Digital Glacial and Surficial Geologic-GIS Map of Summit County and Parts of Cuyahoga County.

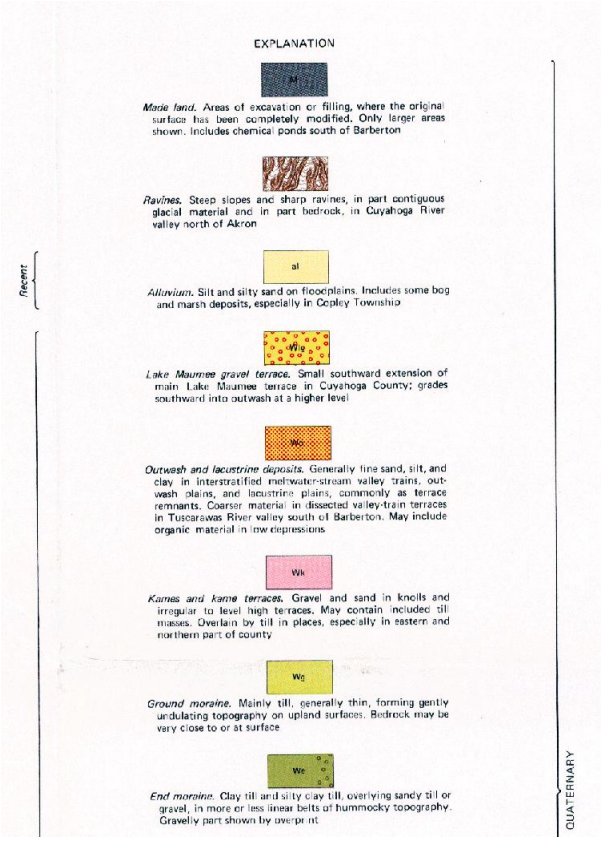
Glacial and Surficial Geology of Summit County (Report of Investigations 123)

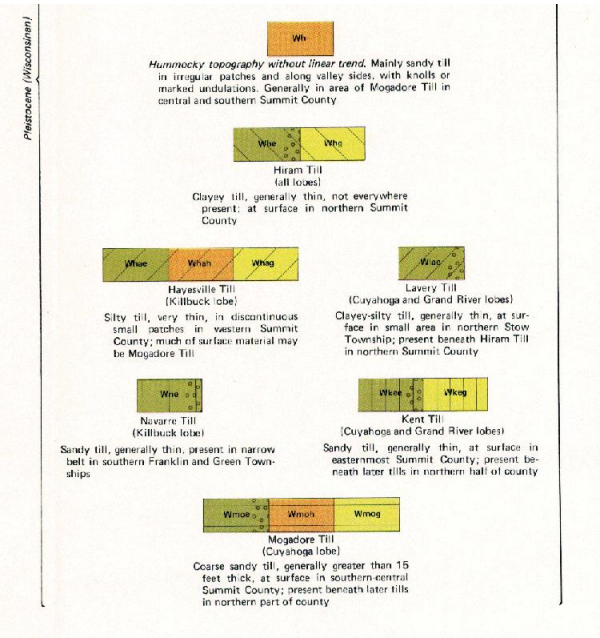
The formal citation for this source.

White, G.W., 1984, Glacial Geology of Summit County, Ohio: Ohio Division of Geological Survey, Report of Investigations 123, scale 1:62,500. (*GRI Source Map ID 21061*)

Prominent graphics and text associated with this source are presented below.

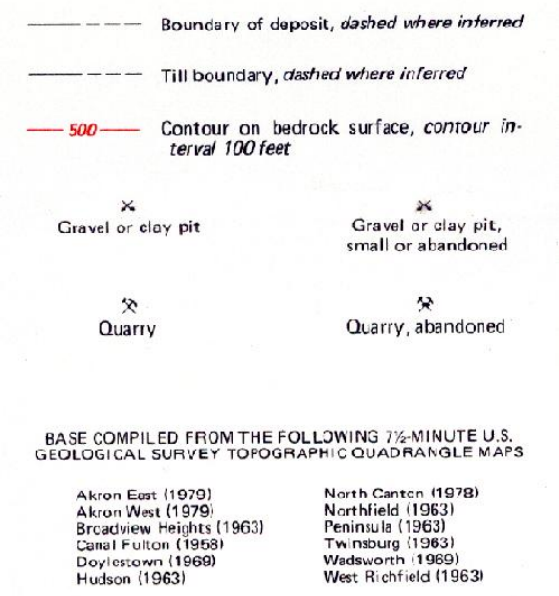
Explanation





Graphic from source map: Summit County (Glacial and Surficial).

Map Legend



Graphic from source map: Summit County (Glacial and Surficial).

Location Map

Graphic from source map: Summit County (Glacial and Surficial)

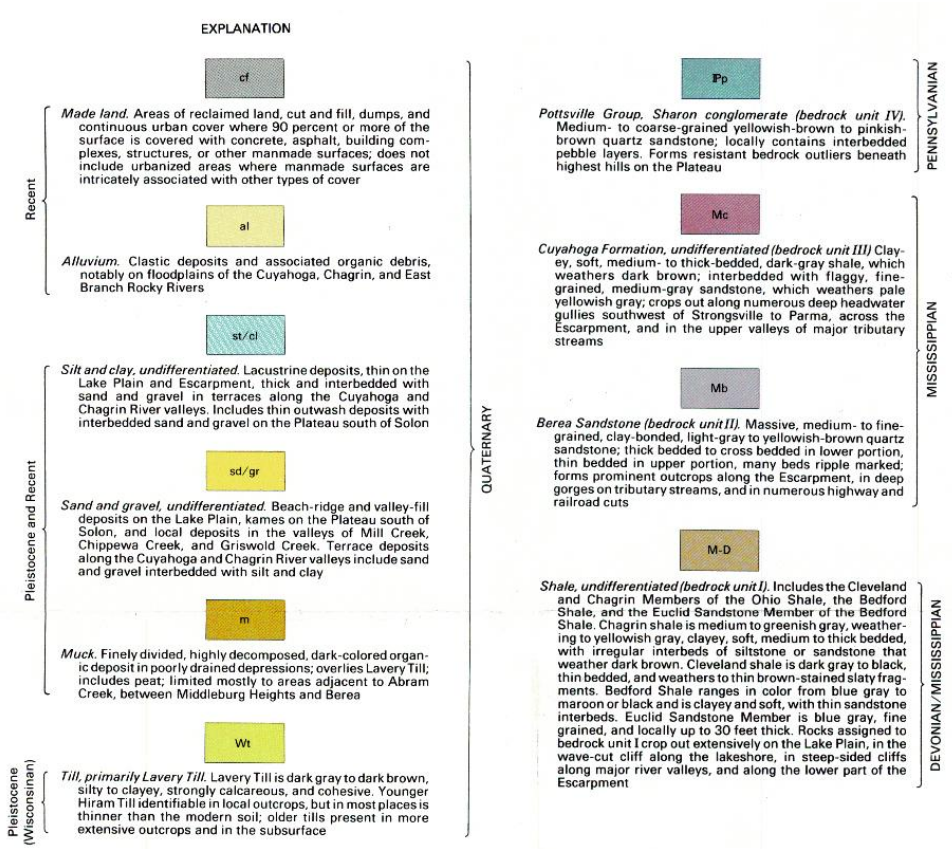
Glacial and Surficial Geology of Cuyahoga County (Report of Investigations 134)

The formal citation for this source.

Ford, J.P., 1987, Glacial and Surficial Geology of Cuyahoga County, Ohio: Ohio Division of Geological Survey, Report of Investigations 134, scale 1:62,500. (*GRI Source Map ID 21071*).

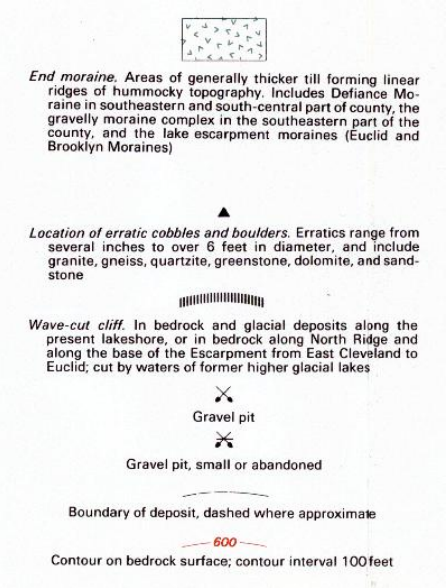
Prominent graphics and text associated with this source are presented below.

Explanation



Graphic from source map: Cuyahoga County (Glacial and Surficial).

Map Legend

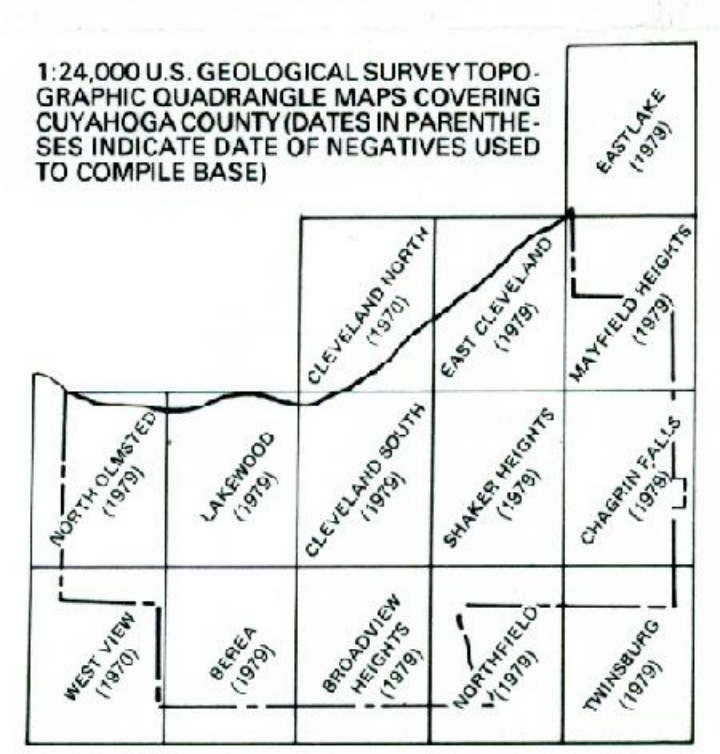


Graphic from source map: Cuyahoga County (Glacial and Surficial).

Location Map

Graphic from source map: Cuyahoga County (Glacial and Surficial).

Quadrangles of Interest



Graphic from source map: Cuyahoga County (Glacial and Surficial).

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 James Winter (Colorado State University). The document was updated from a previous version of the document producted by Georgia Hybels (NPS GRD), Stephanie O'Meara and Jim Chappell (Colorado State University).

The information contained here was compiled to accompany the digital geologic-GIS maps and other digital data for Cuyahoga Valley National Park, Ohio (CUVA) developed by Stephanie O'Meara, Jake Suri and Sarah Lowe (Colorado State University) using source maps provided by the Ohio Division of Geological Survey (see the GRI Digital Maps 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 maps). The GRI digital geologic-GIS data was initially developed by Georgia Hybels and Stephanie O'Meara.

GRI finalization by Stephanie O'Meara (Colorado State University).

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