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: 6/19/2012

Geologic Resources Inventory Map Document for Cuyahoga Valley National Park

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Geologic Resources Inventory Map Document

Cuyahoga Valley National Park, Ohio

Document to Accompany Digital Geologic-GIS Data

cuva_geology.pdf

Version: 6/19/2012

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.

National Park Service (NPS) Geologic Resources Inventory (GRI) Program staff have assembled the digital geologic-GIS data that accompanies this document.

For information about the status of GRI digital geologic-GIS data for a park contact:

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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: http://science.nature.nps.gov/im/inventory/geology/GeologyGISDataModel.cfm

Geologic Reports: Park-specific geologic reports identify geologic resource management issues as well as features and processes that are important to park ecosystems. In addition, these reports present a brief geologic history of the park and address specific properties of geologic units present in the park.

For a complete listing of Geologic Resource Inventory products and direct links to the download site visit the GRI publications webpage http://www.nature.nps.gov/geology/inventory/gre_publications.cfm

GRI geologic-GIS data is also available online at the NPS Data Store Search Application: http://irma.nps.gov/App/Reference/Search. 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: http://www.nature.nps.gov/geology/inventory, or contact:

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The Geologic Resources Inventory (GRI) program is funded by the National Park Service (NPS) Inventory and Monitoring (I&M) Division.

Bedrock Geology Map

Bedrock Map Unit List

The geologic units present in the bedrock digital geologic-GIS data (*GRI MapCode CUVA*) for Cuyahoga Valley National Park, Ohio (CUVA) 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) table included with the GRI geology-GIS data.

Paleozoic Era

Pennsylvanian

PNap - Allegheny and Pottsville Group, undivided

Mississippian

Mc - Cuyahoga Formation
Mbbd - Berea Sandstone and Bedford Shale, undivided

Devonian

Doh - Ohio Shale

Bedrock Map Unit Descriptions

Descriptions of all geologic map units, generally listed from youngest to oldest, are presented below.

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.

Extracted from Open File Report 98-1

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

Extracted from Open File Report 98-1

Mbbd - Berea Sandstone and Bedford Shale, undivided (Mississippian)

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

Extracted from Open File Report 98-1

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.

Extracted from Open File Report 98-1

Bedrock Map Source Map Citations

The GRI digital geologic-GIS maps for Cuyahoga Valley National Park, Ohio (CUVA) were compiled from the following sources:

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, ODGS, Open-File Report 98-1, updated 20030724 *(Note: Geologic unit descriptions were extracted from this publications for use with the following Open-File Bedrock-Geology Series Maps)*

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

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

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, 1:24,000 scale (*GRI Source Map ID 2494*)

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, 1:24,000 scale (*GRI Source Map ID 2493*)

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, 1:24,000 scale (*GRI Source Map ID 2492*)

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, 1:24,000 scale (*GRI Source Map ID 2491*)

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, 1:24,000 scale (*GRI Source Map ID 2490*)

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, 1:24,000 scale (*GRI Source Map ID 2489*)

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, 1:24,000 scale (*GRI Source Map ID 2488*)

Larsen, G.E., 1996, Preliminary Bedrock Geology of the Lakewood Quadrangle, Ohio, Ohio Division of

Geological Survey, Open-File Bedrock-Geology Series Map, 1:24,000 scale (*GRI Source Map ID 2487*)

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

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

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

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

Surficial Geology Map

Surficial Map Unit List

The geologic units present in the surficial digital geologic-GIS data (*GRI MapCode CLVN*) for Cuyahoga Valley National Park, Ohio (CUVA) 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 (CLVNUNIT) 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 source map Digital Map Series SG-2 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
WPLcg - Complexly interbedded deposits of clay, silt, sand gravel, and till
Wt - Till

Mesozoic Era

Pennsylvanian Period
PNp - Pottsville Group (Pennsylvanian)

Pennsylvanian and Mississippian Periods
PNMsb - Sharon Sandstone and Berea Sandstone, undifferentiated (Pennsylvanian and Mississippian)

Mississippian Period
Mcbb - Cuyahoga Formation, Berea Sandstone and Bedford Shale, undifferentiated (Mississippian)

Devonian Period
Doh - Ohio Shale (Devonian)

Surficial Map Unit Descriptions

Descriptions of all geologic map units, generally listed from youngest to oldest, are presented below.

m - Made land

Large cut and fill areas; includes quarries and pits. *GRI Source Map ID 75183* (Digital Map Series SG-2)

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. *GRI Source Map ID 75183* (Digital Map Series SG-2)

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. *GRI Source Map ID 75183* (Digital Map Series SG-2)

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. *GRI Source Map ID 75183* (Digital Map Series SG-2)

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. *GRI Source Map ID 75183* (Digital Map Series SG-2)

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. *GRI Source Map ID 75183* (Digital Map Series SG-2)

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. *GRI Source Map ID 75183* (Digital Map Series SG-2)

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. *GRI Source Map ID 75183* (Digital Map Series SG-2)

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. *GRI Source Map ID 75183* (Digital Map Series SG-2)

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. *GRI Source Map ID 75183* (Digital Map Series SG-2)

WPLcg - Complexly interbedded deposits of clay, silt, sand, gravel, and till (Wisconsinan and older Pleistocene)

Complexly interbedded deposits of clay, silt, sand, gravel, and till in deeper parts of buried valleys throughout the map area. Up to 30 feet thick. Data insufficient for more detailed information. *GRI Source Map ID 75183* (Digital Map Series SG-2)

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. *GRI Source Map ID 75183* (Digital Map Series SG-2)

PNp - Pottsville Group (Pennsylvanian)

Present over eastern half of map area. Sandstone and conglomerate very light to light gray, medium to coarse grained, nonbedded to massive. Sandstone with abundant rounded quartz pebbles and quartz-pebble conglomerate common in basal portion; designated as Ss (GRI labeled PNMsb) in some places. Interbeds of shale, siltstone, coal, and clay common in upper portion. Rapid horizontal and vertical changes of rock types. Average thickness of Pottsville Group 256 feet, but may be greater than 300 feet. Sandstone and conglomerate are resistant units forming hills and cliffs in map area. *GRI Source Map ID 75183* (Digital Map Series SG-2)

PNMsb - Sharon Sandstone and Berea Sandstone, undifferentiated (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. *GRI Source Map ID 75183* (Digital Map Series SG-2)

Mcbb - Cuyahoga Formation, Berea Sandstone and Bedford Shale, undifferentiated (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;" (GRI labeled PNMsb)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. *GRI Source Map ID 75183* (Digital Map Series SG-2)

Doh - Ohio Shale (Devonian)

Present in east-west-oriented belt along Lake Erie shoreline in Cuyahoga County; locally present in buried valleys. Shale black to brown, silty, carbonaceous, fissile parted; containing soft, gray to greenish-gray clay shale beds; unit thickening from 1,000 feet to 2,000 feet from west to east across the map area. *GRI Source Map ID 75183* (Digital Map Series SG-2)

Surficial Map Source Map Citation

The GRI digital geologic-GIS map for Cuyahoga Valley National Park, Ohio (CUVA) was compiled 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, 1:100,000 scale. (*GRI Source Map ID 75183*)

Ancillary map information such as references, an index map and a cross section is available on the source publication pdf: Surficial Geology of the Cleveland 30 x 60 Minute Quadrangle

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

Digital Map Series SG-2 - 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.

Extracted from: GRI Source Map ID 75183 (Digital Map Series SG-2)

Digital Map Series SG-2 - 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. *Extracted from: GRI Source Map ID 75183* (Digital Map Series SG-2)

Glacial and Surficial Geology Map

Glacial and Surficial Geology Map Unit List

The geologic units present in the glacial surficial digital geologic-GIS data (*GRI MapCode SUCU*) for Cuyahoga Valley National Park, Ohio (CUVA) 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 (SUCUUNIT) table included with the GRI geology-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)
Mb - Berea Sandstone (bedrock unit II)

Mississippian and Devonian Periods
MDob - Shale, undifferentiated (bedrock unit I)

Glacial and Surficial Map Unit Descriptions

Descriptions of all geologic map units, generally listed from youngest to oldest, are presented below.

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. *GRI Source Map ID 21061* (Report of Investigations 123).

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. *GRI Source Map ID 21071* (Report of Investigations 134).

r - Ravines (Recent)

Steep slopes and sharp ravines, in part contiguous glacial material and in part bedrock, in Cuyahoga River valley north of Akron. *GRI Source Map ID 21061* (Report of Investigations 123).

Qal - Alluvium (Recent)

al - Alluvium (Recent) Silt and silty sand on floodplains. Includes some bog and marsh deposits, especially in Copley Township. *GRI Source Map ID 21061* (Report of Investigations 123).

al - Alluvium (Recent) Clastic deposits and associated organic debris, notably on floodplains of the Cuyahoga, Chagrin, and East Branch Rocky Rivers. *GRI Source Map ID 21071* (Report of Investigations 134).

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. *GRI Source Map ID 21071* (Report of Investigations 134).

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. *GRI Source Map ID 21071* (Report of Investigations 134).

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. *GRI Source Map ID 21061* (Report of Investigations 123).

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. *GRI Source Map ID 21061* (Report of Investigations 123).

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. *GRI Source Map ID 21061* (Report of Investigations 123).

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. *GRI Source Map ID 21061* (Report of Investigations 123).

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. *GRI Source Map ID 21061* (Report of Investigations 123).

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. *GRI Source Map ID 21071* (Report of Investigations 134).

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. *GRI Source Map ID 21061* (Report of Investigations 123).

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

Sandy till, generally thin, present in narrow belt in southern Franklin and Green Townships. *GRI Source Map ID 21061* (Report of Investigations 123).

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. *GRI Source Map ID 21061* (Report of Investigations 123).

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. *GRI Source Map ID 21061* (Report of Investigations 123).

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. *GRI Source Map ID 21071* (Report of Investigations 134).

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. *GRI Source Map ID 21071* (Report of Investigations 134).

Mb - Berea Sandstone (bedrock unit II; Mississippian)

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. *GRI Source Map ID 21071* (Report of Investigations 134).

MDob - Shale, undifferentiated (bedrock unit I; Mississippian and 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. *GRI Source Map ID 21071* (Report of Investigations 134).

Glacial and Surficial Map Source Map Citations

The GRI digital geologic-GIS maps for Cuyahoga Valley National Park, Ohio (CUVA) were compiled from the following sources:

White, G.W., 1984, Glacial Geology of Summit County, Ohio, Ohio Division of Geological Survey, Report of Investigations 123, 1:62500 scale. (*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, 1:62500 scale. (*GRI Source Map ID 21071*)

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

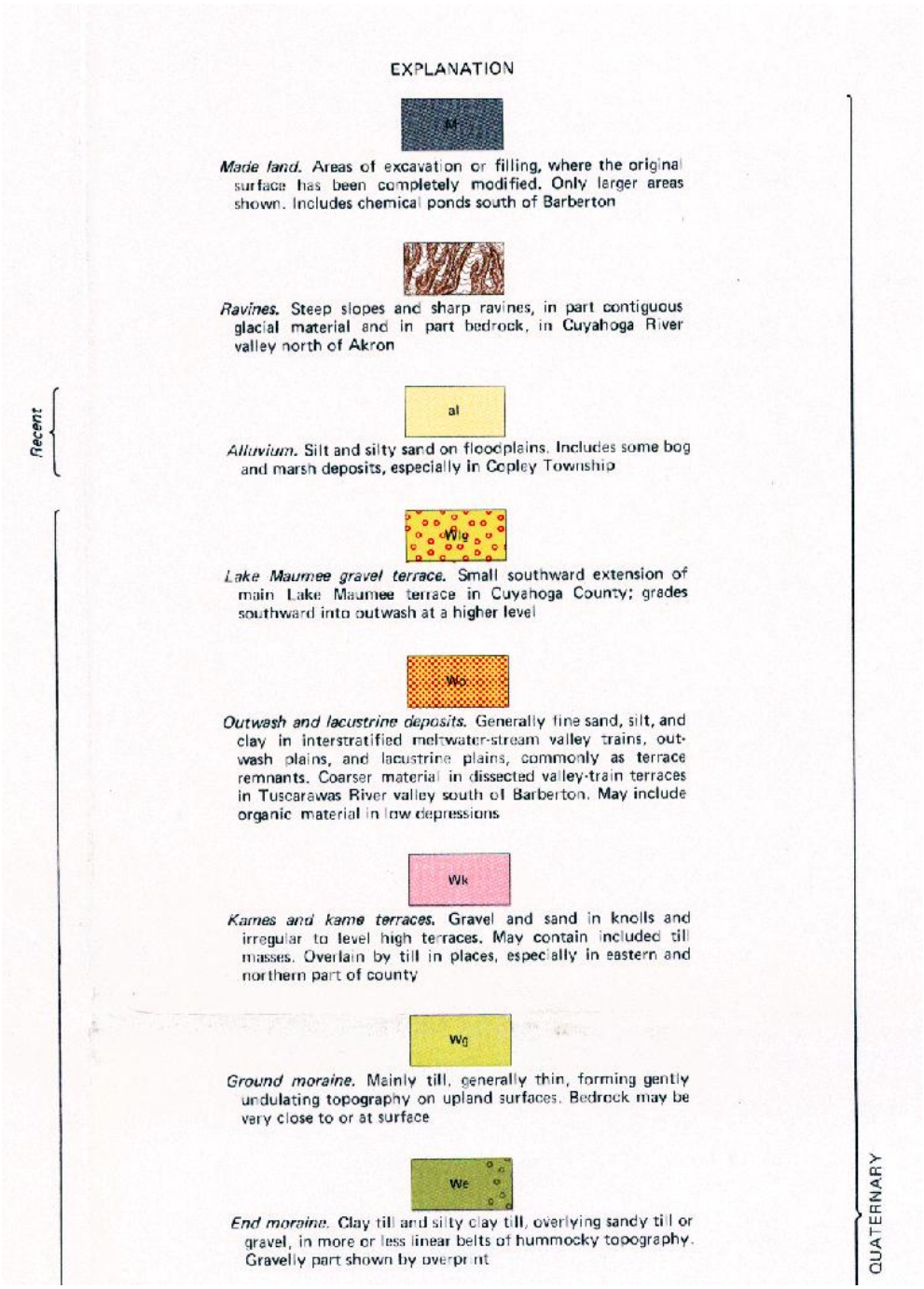
Report of Investigations 123

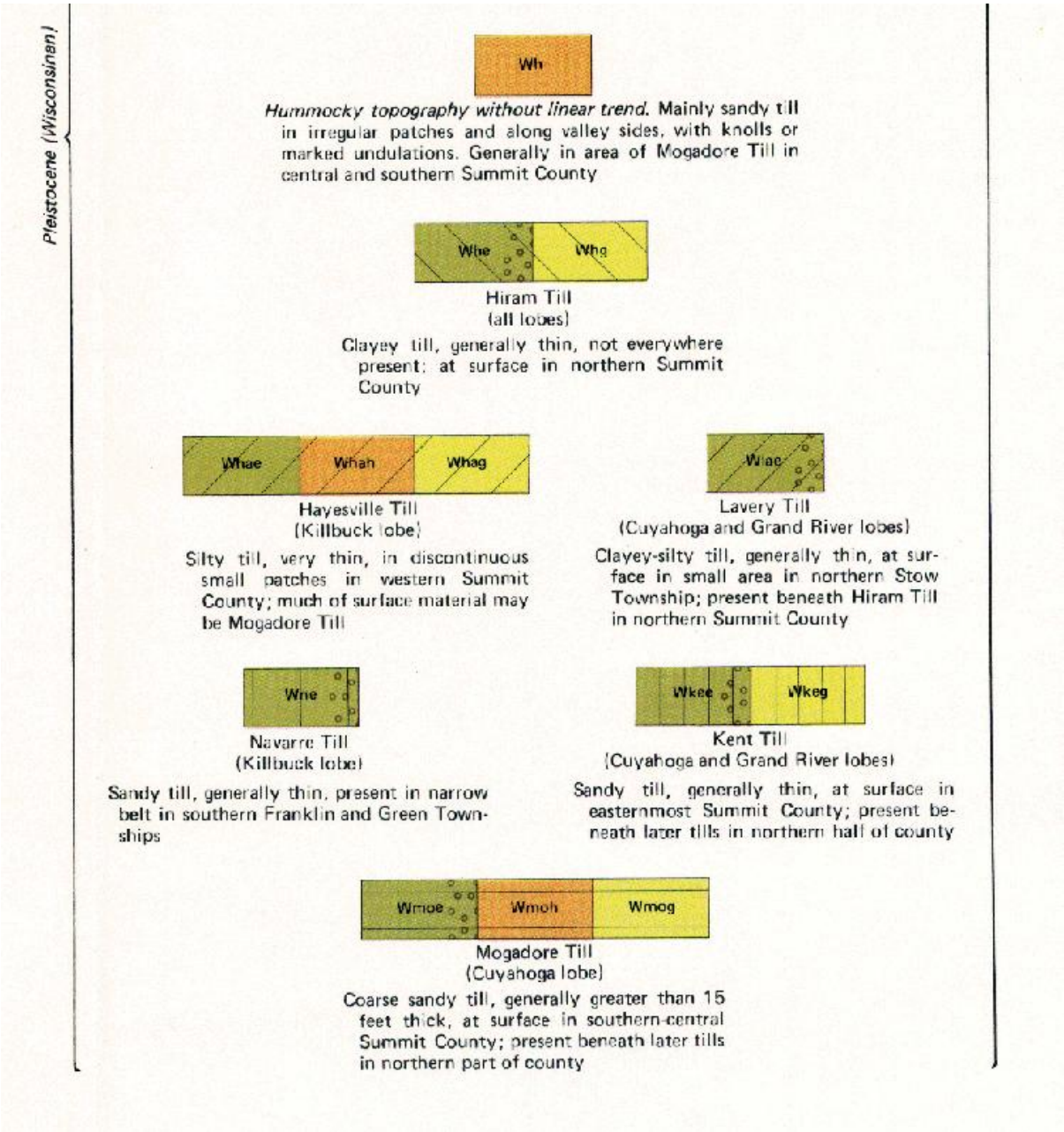
White, G.W., 1984, Glacial Geology of Summit County, Ohio, Ohio Division of Geological Survey, Report of Investigations 123, 1:62500 scale. (*GRI Source Map ID 21061*)

Report of Investigations 123 - Location Map

Extracted from: GRI Source Map ID 21061 (Report of Investigations 123).

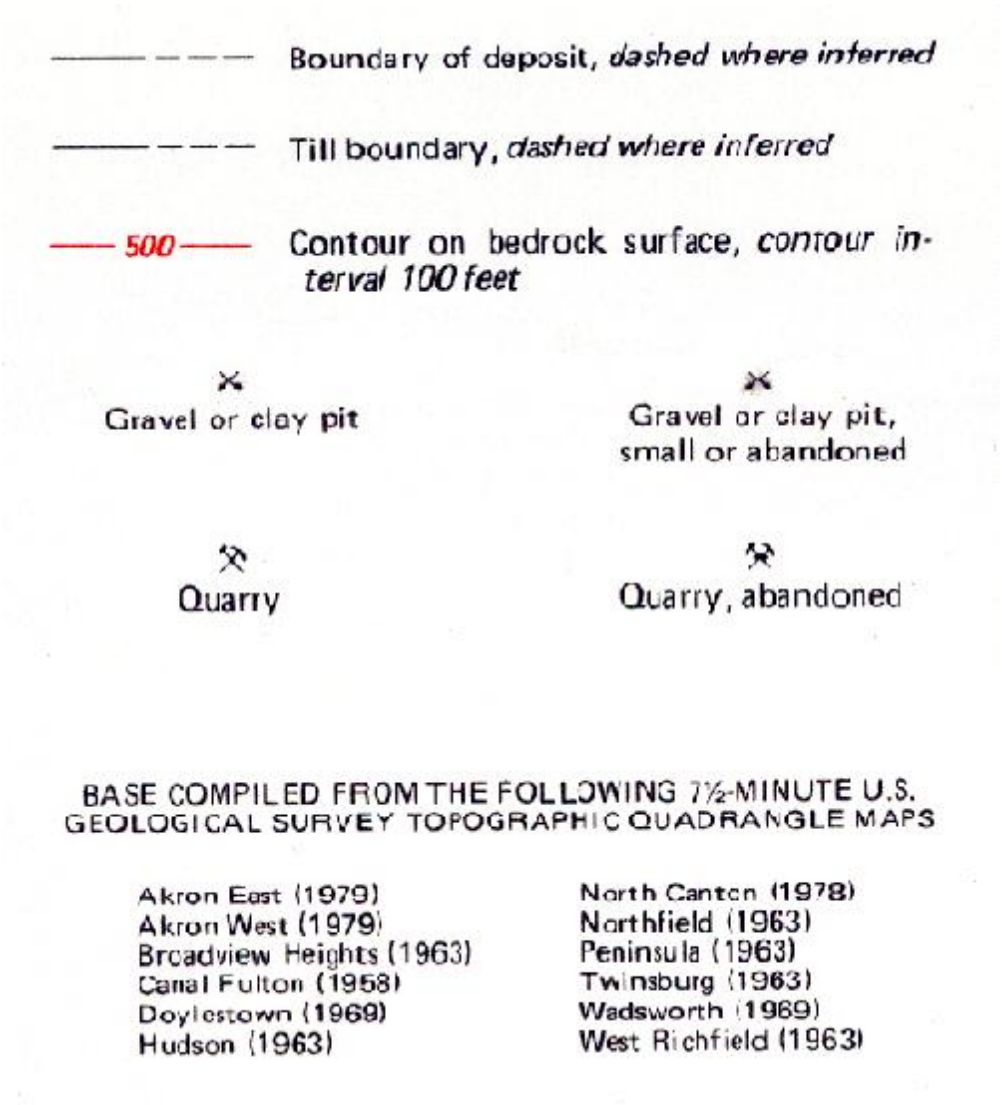
Report of Investigations 123 - Correlation of Units





Extracted from: GRI Source Map ID 21061 (Report of Investigations 123).

Report of Investigations 123 - Legend



Extracted from: GRI Source Map ID 21061 (Report of Investigations 123).

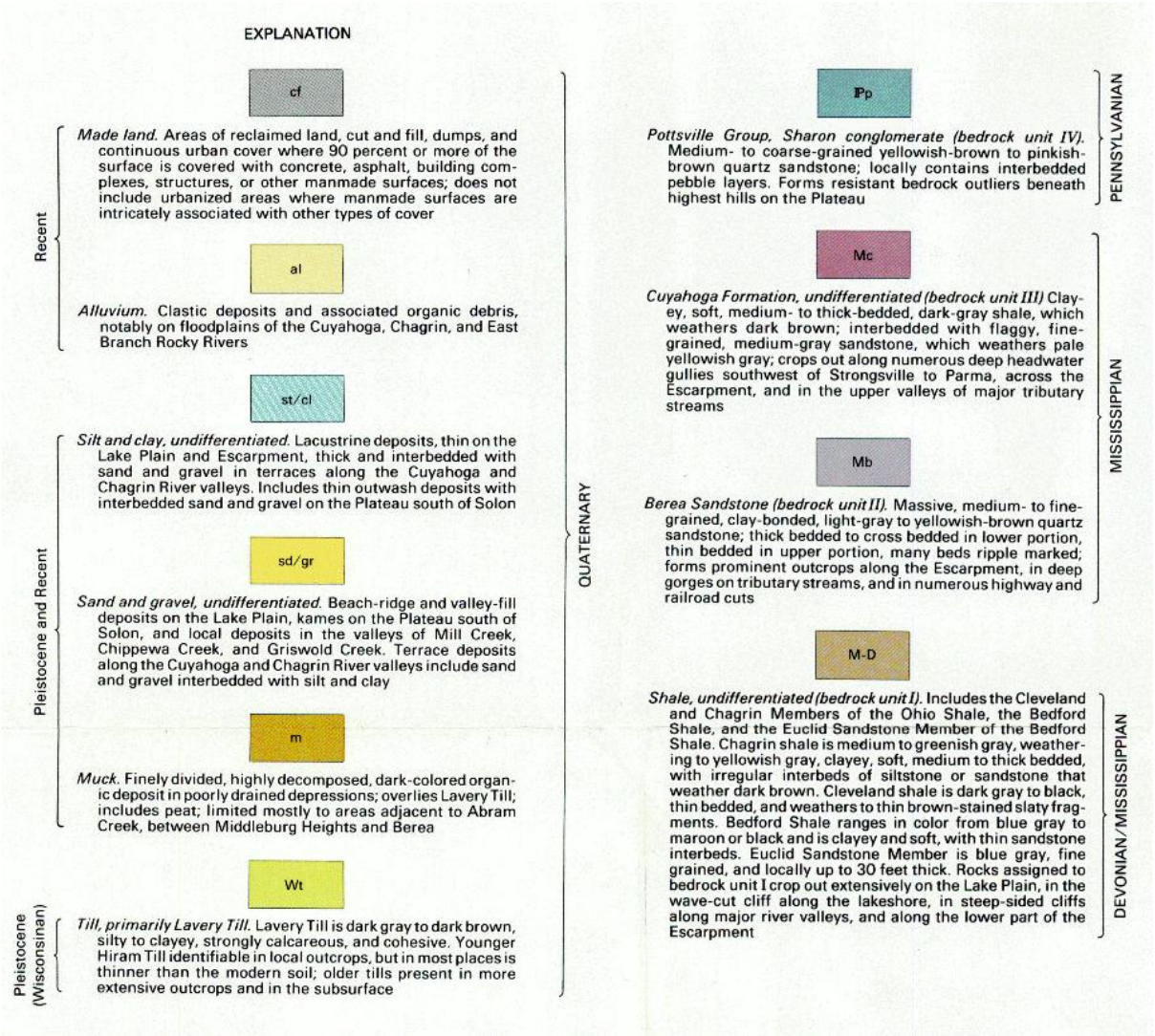
Report of Investigations 134

Ford, J.P., 1987, Glacial and Surficial Geology of Cuyahoga County, Ohio, Ohio Division of Geological Survey, Report of Investigations 134, 1:62500 scale. (*GRI Source Map ID 21071*)

Report of Investigations 134 - Location Map

Extracted from: GRI Source Map ID 21071 (Report of Investigations 134).

Report of Investigations 134 - Correlation of Units



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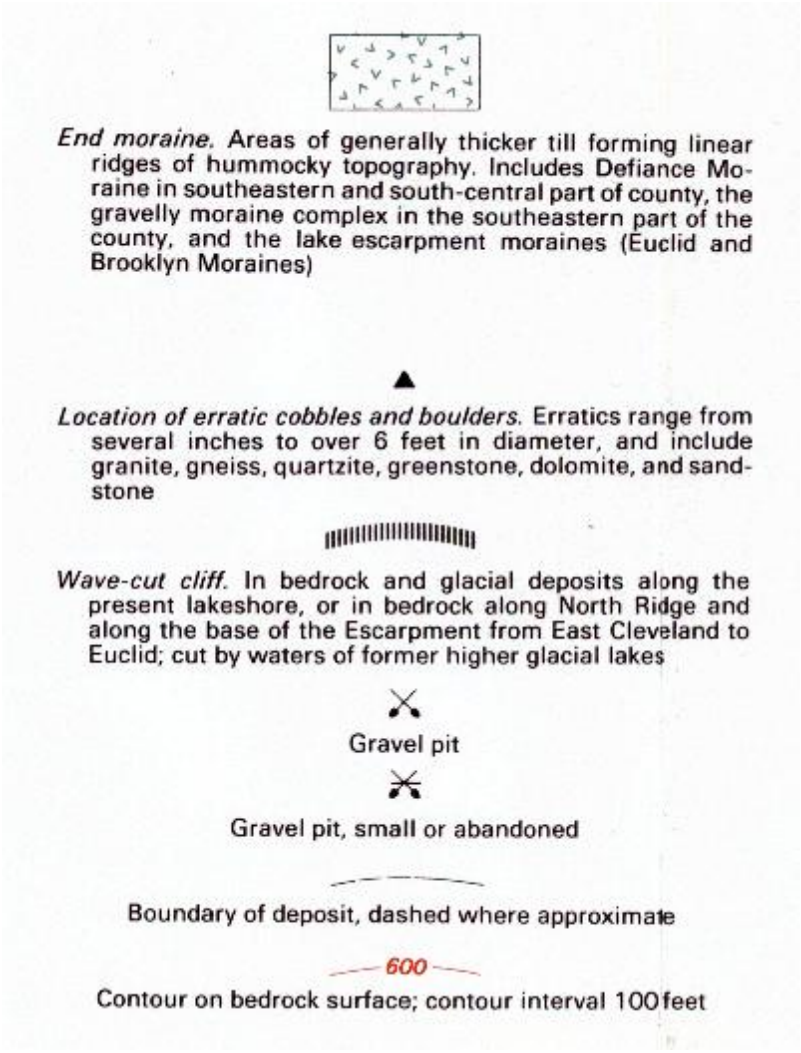
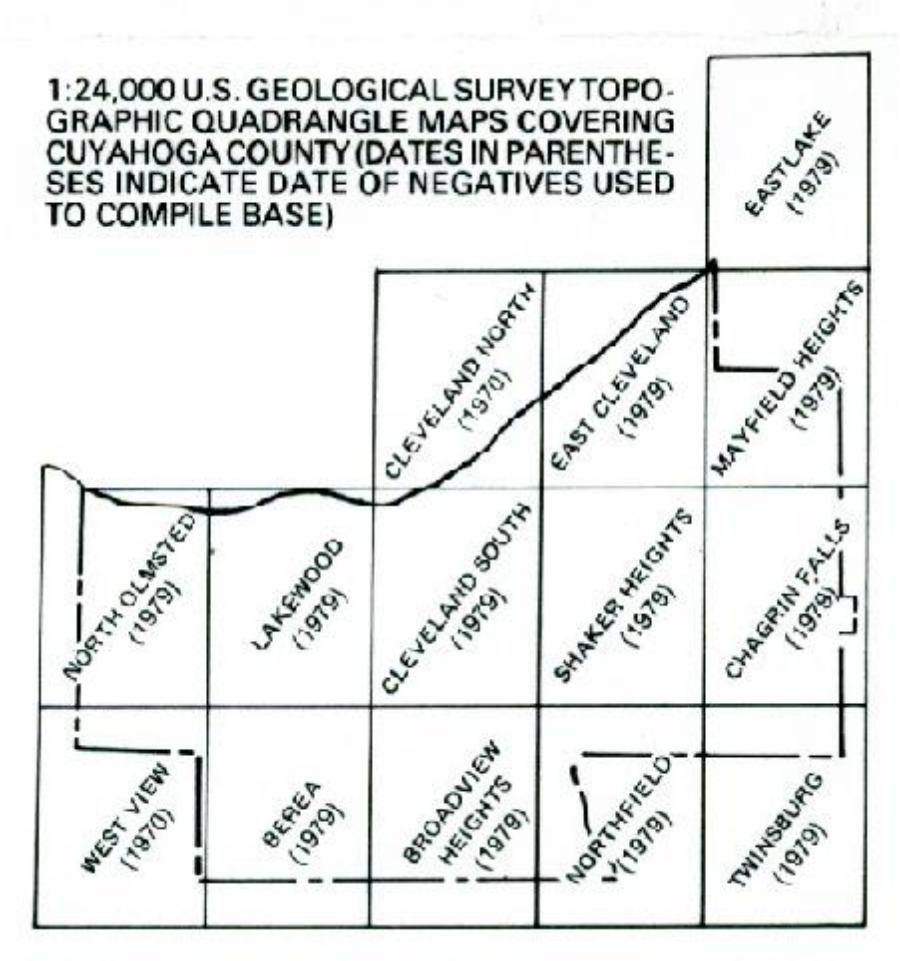
Report of Investigations 134 - Legend



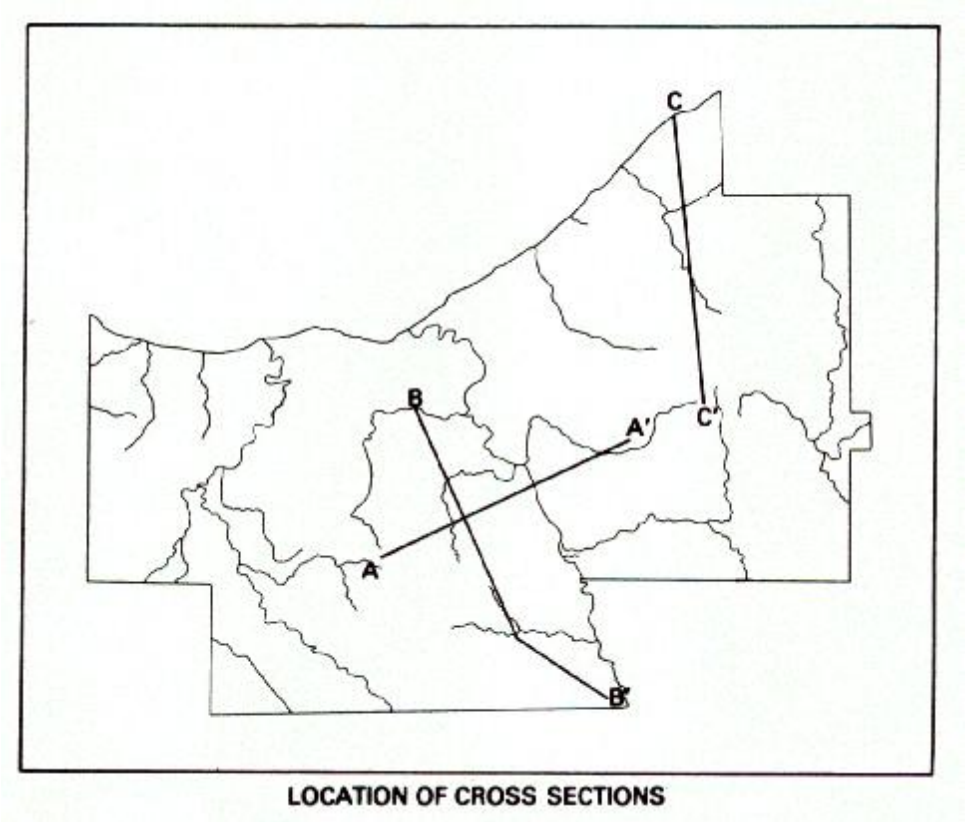
Extracted from: GRI Source Map ID 21071 (Report of Investigations 134).

Report of Investigations 134 - Quadrangles of Interest



Extracted from: GRI Source Map ID 21071 (Report of Investigations 134).

Report of Investigations 134 - Location of Cross Sections



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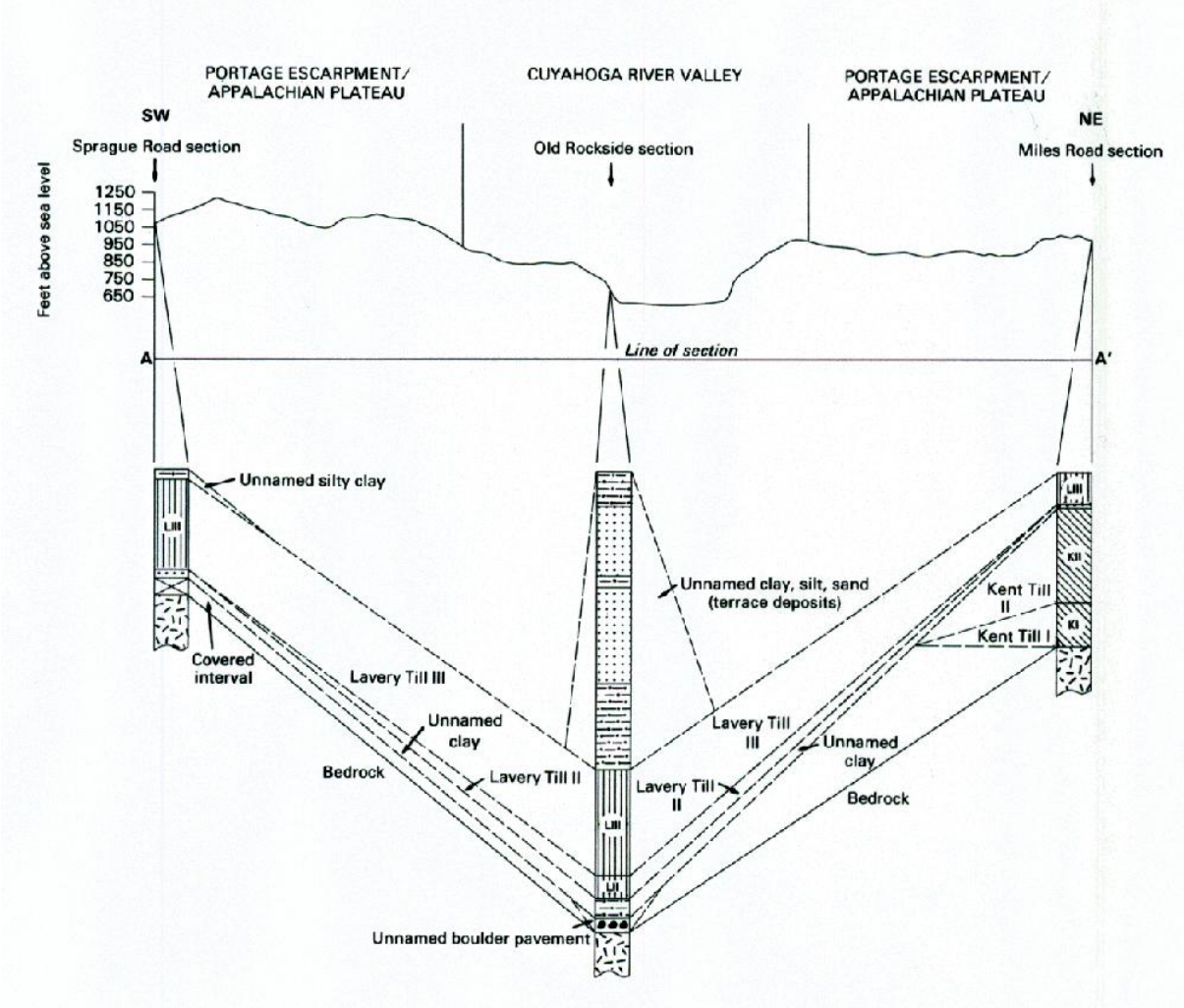
Report of Investigations 134 - Cross Section A-A'



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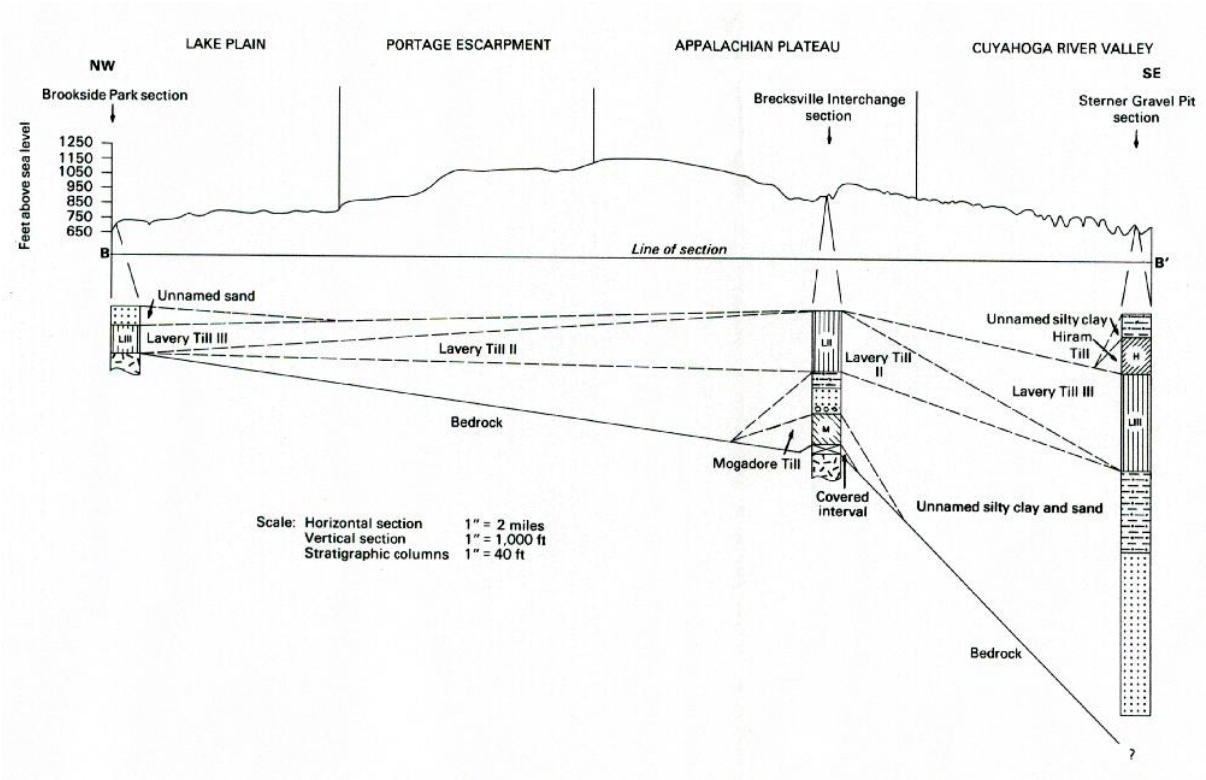
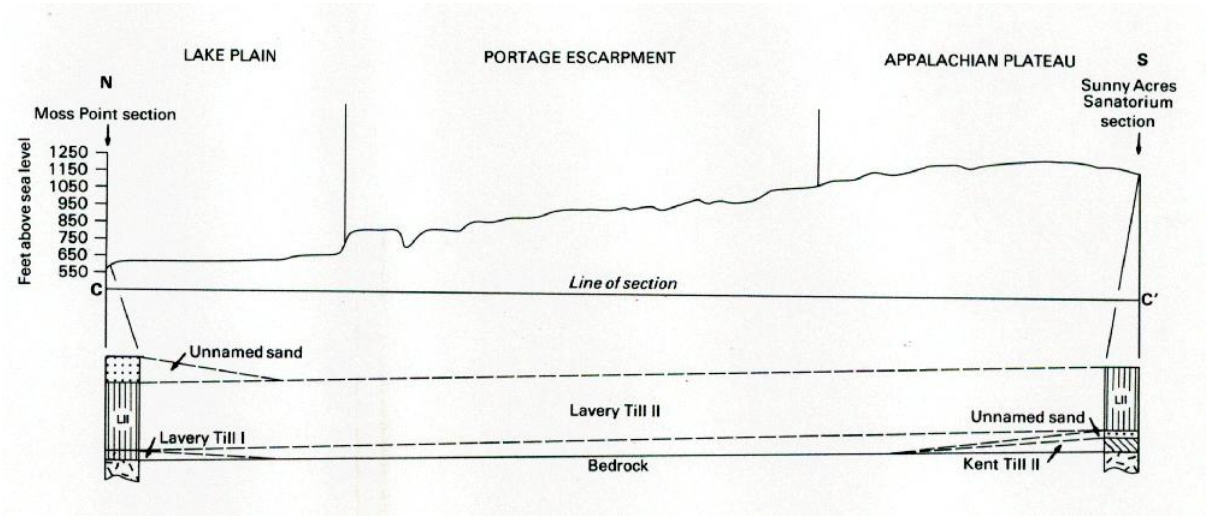
Report of Investigations 134 - Cross Section B-B'



Extracted from: GRI Source Map ID 21071 (Report of Investigations 134).

Report of Investigations 134 - Cross Section C-C'



Extracted from: GRI Source Map ID 21071 (Report of Investigations 134).

GRI Digital Data Credits

This document was developed and completed by Georgia Hybels (NPS GRD) for the NPS Geologic Resources Division (GRD) Geologic Resources Inventory(GRI) Program. Quality control of this document by Jim Chappell and Stephanie O'Meara (Colorado State University).

The information contained here was compiled to accompany the digital geologic-GIS map(s) and other digital data for Cuyahoga Valley National Park, Ohio (CUVA) developed by Georgia Hybels (NPS GRD) and Stephanie O'Meara (Colorado State University) using source maps provided by the Ohio Division of Geological Survey. Bedrock GIS data and related ancillary files were derived from an earlier GRI bedrock geology map using the same sources.

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).