QUATERNARY GEOLOGIC MAP OF THE CHURCHVILLE, NEW YORK 7.5-MINUTE QUADRANGLE

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Abstract

The Churchville, New York 7.5-minute Quaternary geologic quadrangle has been compiled by the Geologic Mapping Team of the State University of New York, College at Brockport. The project was designed to teach students techniques in delineation of mappable geologic landforms, digital integration of mapping data into a GIS, and analysis of the geomorphic evolution of a Quaternary glacial landscape.

Quaternary geologic mapping was complied from multiple layered delineations that are digitally integrated using ArcView GIS. The wetlands and flood plain were initially divided from the upland landforms. Glacial landforms were delineated in the remaining upland areas. Paleozoic formations were projected from general source maps and a field reconnaissance to verify bedrock landform associations and document existing exposures of Paleozoic rock outcrops.

The Onondaga Escarpment along the southern margin of the quadrangle is the topographically highest and most prominent landform in the study area. The Oatka Creek valley occupies a glacial meltwater paleochannel system that is partially bounded by the escarpment. A lacustrine plain occupies low relief areas to the north and west of the paleochannel system. Drumlin swarms with many interspersed wetland and flood plain areas are found in the northern part of the map. Black Creek flows through the Bergen Swamp across the northern portion of the map.

The Quaternary geologic history of the Churchville quadrangle reflects a landscape evolution associated with differential erosion of Paleozoic bedrock. Glacial processes of ice advance, retreat, stagnation, proglacial lake ponding, and meltwater discharge modified the Paleozoic terrain. Holocene landscapes are mostly inherited from relict glacial processes.

Introduction

The mapping of the Churchville, New York 7.5-minute Quaternary geologic map was completed by the definition and delineation of geomorphic features, observation and measurement of lithofacies properties, and assessment of topographic and lithofacies influences on pedogenic development of surficial deposits. Map delineation and field-review allowed for assessment, validation, and interpretation of existing data and newly-acquired data developed in this project. The Churchville Quaternary geologic map is an extension of previous EDMAP compilations produced at SUNY Brockport (Sperber *et al.*, 2000, 2001). Leiner (1995) and Muller (1977) produced the most recent and significant general map compilations of the area to prior to this report. The compilation of a 1:24,000 geologic map provides an outline of the Quaternary stratigraphic framework that defines the geomorphic, sedimentologic, and pedogenic properties relevant to regional mapping in western New York. Map unit criteria and associated field data allow for glacial, geomorphic and sedimentologic process interpretations and the assessment of glacial and post glacial evolution in the area.

Location. The Churchville, New York 7.5-minute topographic quadrangle (43°N;77°52'30"W) is located within western Monroe and northern Genesee counties, New York (Figure 1). This area is at the western edge of the Rochester, New York metropolitan area. The primary geomorphic features of the quadrangle include parts of the Oakta Creek and Black Creek drainage basins. The Bergen Swamp occupies much of the Black Creek flood plain, along with numerous drumlin landform areas. The prominent Onondaga Escarpment borders the souther margin of the Quadrangle south of the Oatka Creek channel. Surficial deposits consist largely of glacial sediments deposited during the Late Wisconsin ice retreat, along with post glacial alluvial deposits and organic sediments.

General geologic setting. The Churchville, NY (43°00'00"N;77°52'30"W) 7.5-minute quadrangle is located on the boundary of the Ontario Lowlands and Allegheny Plateaus physiographic regions of western New York (Isachen *et al.*, 1991). The shaded relief digital elevation model of the quadrangle illustrates the primary landform features of the quadrangle (Figure 2). The Onondaga Escarpment trends east to west across the map area as the regional boundary between Silurian and Devonian formations.

The primary geographic features of the map area are bedrock-scoured glacial channels that cross the quadrangle from east to west. The largest of these channels are occupied by the Black Creek and Oatka Creek valleys, present tributaries of the Genesee River. The Bergen Swamp, a small proglacial lake occupies part of the Black Creek valley in the northern part of the quadrangle.

Holocene alluvial deposits and swamps disrupt the continuity of the Late Wisconsin sediments across the quadrangle. Topographic elevations across the quadrangle range from approximately 650 feet in the Black Creek valley to slightly over 850 feet south of the Onondaga escarpment. Surface landforms are a mixture of constructional glacial landforms, and local exposure of bedrock remnants through the Quaternary cover. Slopes vary predictably and correspond to landform and lithofacies patterns. Maximum slopes recognized by Soil Survey mapping (USDA, 1969, 1973) are about 25°, except for local escarpments.

The surficial deposits in the area consists of mostly thin (<10 m) of ice contact glacial sediments locally overlain by lacustrine and glacio-fluvial deposits (Leiner, 1995; Muller, 1977). Muller (1977) produced the 1:250,000 scale Quaternary geologic map of the Niagara quadrangle. His map is a reconnaissance level regional compilation designed to show general patterns of Quaternary lithofacies and associated landforms. Leiner (1995) produced a general surficial geology map of Monroe County, NY as part of his master's thesis at SUNY-Buffalo. His mapping was designed to produce a general overview of the surficial geology at 1:62,500 scale for the purpose of general environmental planning.

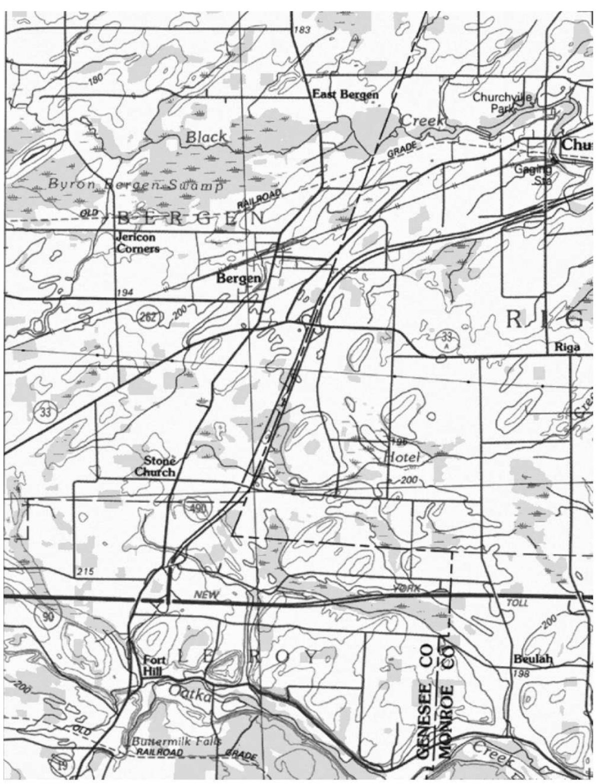
Project Personnel

The Geologic Mapping Team of the State University of New York, College at Brockport are a collaborative team of students in the Department of the Earth Sciences supervises by faculty geologic mapping and scientists. Dr. Whitney J. Autin, Associate Professor (surficial processes) served as the project Principal Investigator and supervised all phases of fieldwork, development of stratigraphic data and map compilation, and edited the final report. Dr. James Zollweg, Associate Professor (water resources and GIS) supervised and assisted the GIS map compilation.

The student members include Matt. A Kaproth, who delineated stream alluvium and swamps, prepared the Soil Survey interpretations, compiled the initial ArcView shapefiles, and produced a preliminary draft of the report. Rosemary Fanelli developed the Pleistocene landform delineations, described the characteristics of the map units, and correlated soils geomorphic characteristics in the map area. Dave Cannon produced field soil profile descriptions, edited the ArcView shapefiles for the final map, and compiled final interpretations of the Quaternary geologic evolution of the quadrangle. Steve Dilger assess and delineated Paleozoic bedrock from existing map sources and produced field soil profile descriptions.

78°

43°

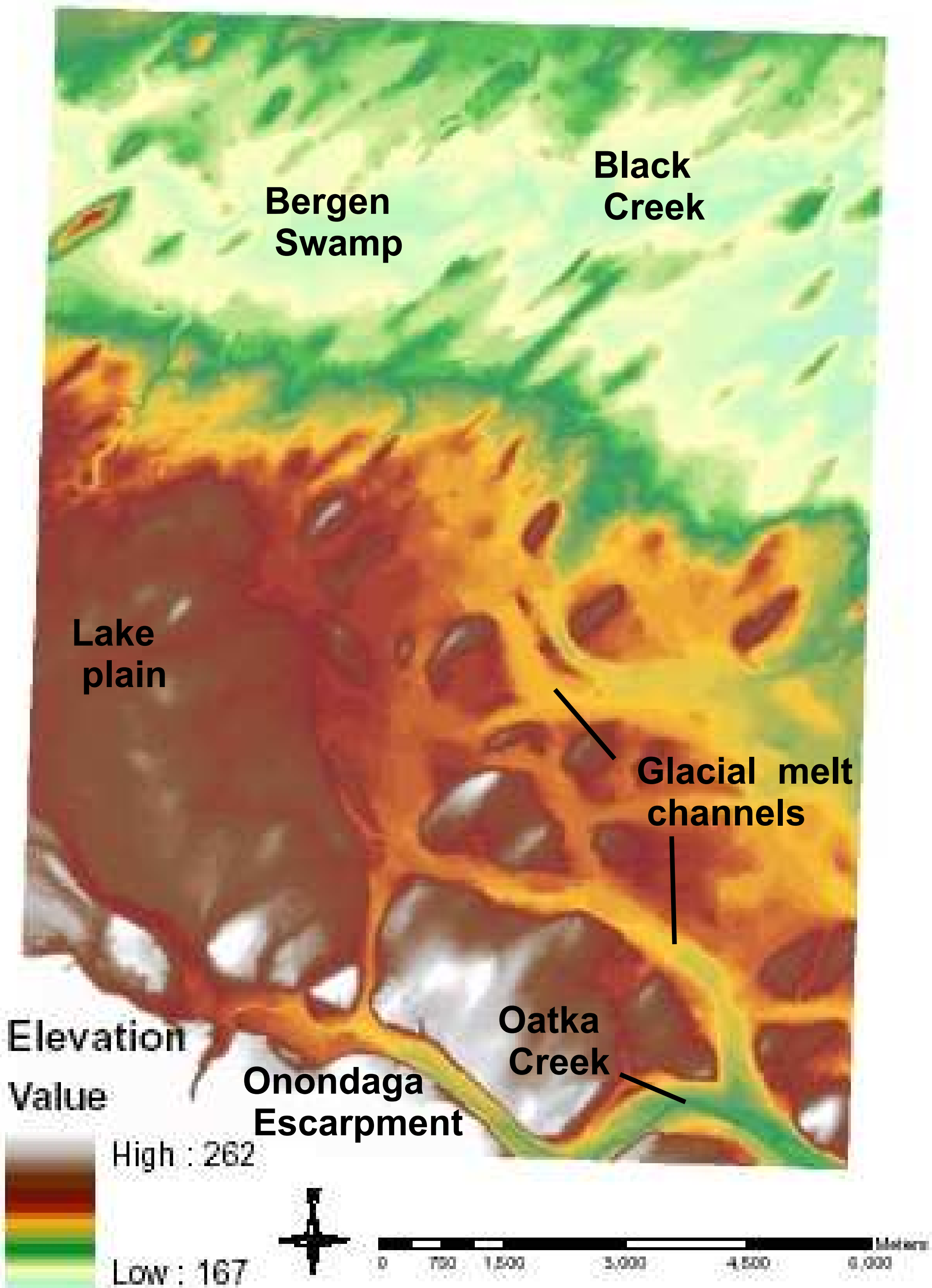


43°00'00"N

77°52'30"W

Figure 1. Location of the Churchville, NY 7.5-minute quadrangle southwest of metropolitan Rochester, NY. The map area is along the boundary between the Ontario Lowlands and the Allegheny Plateaus.

Figure 2. Digital elevation model of the Churchville, NY 7.5-minute quadrangle.



Mapping Approach and Methods

This mapping project is intended to illustrate to earth science students the process of surface geologic mapping at the 1:24,000 scale by the combination and recompilation of existing geologic, geomorphic, and soils data with newly-acquired field data. The compilation revises prior mapping by field testing preliminary map interpretations with a landscape, sediments, and soils investigation using shallow soil/sediment auger data and available exposures.

The geologic map was refined from previously published geological reports and maps with available geotechnical data from various sources (Muller, 1977; Leiner, 1995), and published Soil Survey data of the U. S. Department of Agriculture, Soil Conservation Service (1969, 1973). Field mapping was conducted by reviewing details of landforms in the field, inspecting existing exposures, and field inspection and description of shallow sediment sequences collected with hand augers (Birkeland, 1999; Buol *et al*., 2003). Field geologic interpretations were merged with photogeologic interpretations of high altitude color-infrared imagery and soil survey photomosaics. The field data was used to check the consistency of geologic interpretations and attempt to resolve specific mapping problems that arise from the interpretation of existing information. Both existing and newly collected data was combined into a stratigraphic correlation consistent with both USGS and NYSGS geologic mapping standards.

Geologic contacts were drawn directly on a mylar overlay on the base map at the 1:24000 scale. The initial step was to separate areas of Paleozoic bedrock, Pleistocene glacial and lacustrine deposits, and Holocene deposits. Subdivisions of the Pleistocene units were delineated to provide additional detail as to the character of the landscape and the nature of the underlying glaciogenic sediments. Once the geologic contacts are delineated consistent with topographic patterns, line placements are field checked by members of the mapping team. After all lines are field checked, the overlay is digitized and registered to a digital base map using ArcView GIS software.

The final product is a 1:24,000 geologic quadrangle map and a legend describing the surficial sediments associated with each geologic map unit in the map area (Plate 1). Each geologic map unit is characterized by 1) distinctive topographic patterns discerned in the field and on the 1:24,000 topographic map; 2) field identification of lithologic properties such as color, texture, consistence, pedogenic features, biogenic structures, and stratification types; and 3) the morphologic and stratigraphic properties of diagnostic soil horizon sequences. The general trends of the contacts of Paleozoic formations are delineated on Plate 2. Field core locations and the lines of topographic profiles are depicted on Plate 3.

Characterization of Geologic Map Units

When available, existing data was combined with newly acquired data for the Churchville area. The geologic map units recognized in the mapping area are based on the configuration of the present landscape, the unconformity between Quaternary sediments and Paleozoic bedrock, glacial lithofacies, and the stratigraphy of diagnostic soil horizons. Interpretation of these mapping aspects allows for the development of map units as informal allostratigraphic units (North American Commission on Stratigraphic Nomenclature, 1983). The delineation of geologic units are depicted in the accompanying Quaternary geologic map (Plate 1) and Paleozoic bedrock map (Plate 2). A brief summary of the characteristics of each map unit follows (Tables 1 and 2).

Quaternary map units

Alluvium. Alluvium (Qa) is found along major streams and smaller tributaries of the Churchville quadrangle. The landscapes are characterized as narrow to wide and periodically flooded. Alluvium is deposited as overbank and channel deposits of Holocene streams. Deposits consist of moderate to poorly drained sediments that range in texture from coarse sand to silt and clay. Slopes are generally level to gently sloping (0-6%), and profiles locally have bedrock at depths of 1-2 m below the land surface. Alluvial terraces (Qat) locally flank the valleys of Black Creek and Oatka Creek. Alluvial soils contain both argillic and cambic subsurface diagnostic horizons.

Swamp deposits. Swamps are scattered throughout the Churchville quadrangle, especially in the Bergen Swamp of the northern area of the map. Two mappable swamp areas can be differentiated by surficial sediment texture, regional landform morphology and depth to bedrock. Swamp 1 (Qs1) consists of poorly to very poorly drained organic sediments that unconformably overlies glacial deposits or rock. Surficial sediment is generally less then 1m in thickness. Swamp 2 (Qs2) contains poorly to very poorly drained organic sediments where depth to underlying glacial sediments or bedrock is greater than 1.5m. Lacustrine clays and marl may be present at various depths beneath organic sediments. Swamp deposits commonly have histic epipedons at the surface.

Drumlins. Oriented drumlin landforms (Qpd) and eroded drumlin forms (Qpde) occur in the central portion of the map. Elongated ridges are located among areas of till plains, moraine ridges, and swamp deposits. This unit has relatively high relief, and consists of moderate to well drained sediments with silt loam to sandy loam textures. The blunt nose of the drumlins point towards the source of the ice and the tapered ends point in the direction of ice flow (generally southwest). Eroded drumlins have experienced some erosion and morphologic alteration from the typical spoon-shape to become somewhat distorted. Slopes generally range from 0-6% to 6-12% and depth to bedrock is generally >3m in most areas. The soils on these landform areas typically have argillic and cambic subsurface diagnostic horizons.

Glacio-lacustrine deposits. Flat, low-lying areas are commonly veneered with laminated clays that overlie ground moraine. These areas are mostly discontinuous, but form a mappable landform in the western part of the quadrangle.

Paleoflow channels. Narrow anabranching areas of abandoned flow paths from glacial melt and the draining of proglacial lakes. These area are typically floored by alluvial soils, including silt loam, loam and fine sandy loam. Present day creeks and deranged swamps and flood plain areas occupy these oversized channels, and the flows that created the landforms no longer has a predominant influence on the morphology of the landforms.

Kame delta deposits. These deposits are typically composed of coarse bedded material, such as sand, sandy loam, gravelly loam, and gravel. These deposits were formed in high energy fluvial environments during drainage events. This category includes outwash sand bars and eskers and cambic horizons are the most common diagnostic subsoil horizon.

Moraine ridges. These landforms were created during a periods of minor advance during general ice retreat. Moraine deposits are diamictons deposited as ridges of typically higher elevations relative to locally surrounding areas. The soils on this landform area typically have argillic and cambic subsurface diagnostic horizons.

Ground moraine deposits. These are flat, low-lying regions that have been blanketed with glacial material that had been deposited during ice advance. This material is typically diamicton, consisting of unsorted material of varying particle sizes, including loam, silt loam, gravelly loam and sandy loam. The soils on this landform area typically has an argillic subsurface diagnostic horizon.

Table 1. Key to the Quaternary Geologic Map of the Churchville Quadrangle.

Symbol	Unit Name	General Description
Qa	Alluvium	Areas along present stream courses; consist of moderate to poorly drained sediments that range in texture from course sand to silt and clay; unconformably overlies either Quaternary glacial sediment or bedrock, and is inset into glacial deposits; predominantly Holocene age.
Qat	Alluvial terraces	Areas of terraced floodplains; mainly flanking Black Creek and Oatka Creek valley.
Qs1 Qs2	Swamp deposits	Swamps of post-glacial, predominantly Holocene age; deposits are generally either organic-rich muck or peat, and laminated silts and clays of lakes and ponds. Qs1 deposits typically have less than 1.5 m of organic sediments, and Qs2 deposits have thicker organic sediments deposits.
Qpd Qpde	Drumlins	Oriented drumlin landforms (Qpd); eroded forms (Qpde); mostly diamictons.
Qpmgl	Glacio-lacustrine deposits	Flat, low-lying areas that have a veneer of lacustrine sediments overlying ground moraine. Laminated clays typically overly generally unsorted gravel and sand.
Qpfc	Paleoflow channels	Areas of abandoned channels which are remnants of a series of drainage systems from glacial melt conduits and the draining of proglacial lakes.
Qpkd	Kame delta deposits	These deposits are typically composed of coarse bedded material, such as sand, sandy loam, gravelly loam, and gravel. These deposits were formed in high energy fluvial environments during drainage events. This category includes sand bars and eskers.
Qpm	Moraine ridges	These landforms were created during minor advances during general ice retreat. Moraine deposits are diamictons with unsorted material of varying particle size. Ridges and are typically higher elevations relative to locally surrounding areas.
Qpmgl	Ground moraine deposits	These are flat, low-lying regions that have been blanketed with glacial material deposited during ice advance. This material is typically diamicton, consisting of unsorted material of varying particle sizes, including loam, silt loam, gravelly loam and sandy loam.

Paleozoic Formations

Data on the Paleozoic formations of the Churchville quadrangle were compiled from various publication sources plus a field examination of known localities. The most noteworthy sources include Brett *et al*. (1992), Wolosz and Paquette (1994), Cassa and Kessling (1982), and Ciurca (1982).

The Paleozoic formations of the quadrangle are flat lying with no deformation and gently dip about 3° to the south. Oatka Creek has cut a major valley through the southern portion of the quadrangle, with many good exposures of bedrock along the creek. The Onondaga Escarpment dominates the southern portion of the quadrangle, and bedrock exposures occur along the escarpment. There is no exposed bedrock in the northern two-thirds of the quadrangle. In the southern area of the quadrangle bedrock is exposed at Buttermilk Falls, along the edges of the Oatka Creek Valley, and the NY Rt. 19 road cut at Fort Hill.

Buttermilk Falls. Buttermilk Falls is capped by the resistant Onondaga cherty limestone. The underlying Bertie Group forms the reentrant at the unconformable contact with the Onondaga Group. At creek level is Uppermost Camillus Formation (Salina Group). The Bertie Group starts with the Fort Hill Waterlime, a complete section of the Oatka Formation, and most of the Fiddlers Green Formation. The Scajaquada, Williamsville, and Akron Formations are missing due to erosion prior to the deposition of the Middle Devonian Onondaga Limestone.

Oatka Creek Valley. The Oatka Creek valley contains important exposures of the Syracuse Formation and higher beds including much of the Camillus Formation. Exposures can be found along the river and in road cuts of the north-trending roads intersecting off of the Oatka Trail.

NY Rt. 19 road cut at Fort Hill. The contact of the Salina Group with the Bertie Group occurs here where the Camillus Formation is directly overlain by the type Fort Hill Waterlime, the basal formation of the Bertie Group.

Onondaga and Bois Blanc Groups

Seneca Formation. Fine grained massive limestone, darker than Morehouse and more argillaceous.

Morehouse Formation. Fine grained massive limestone, interbedded olive grey wackestones, packstones, and grainstones. Abundant chert nodules.

Clarence Formation. Olive grey argillaceous mudstone, dark chert nodules.

Edgecliff Formation. Llight grey, coarsely crystalline massive limestone, light grey nodular chert common.

Bois Blanc Limestone. Medium dark grey, medium bedded, abundantly cherty skeletal wackestones with concentrations of fossils in layers.

Akron Dolostone and Salina Group

Akron Dolostone. Fine grained, grey buff mottled dolomite with cavities from the dissolution of calcareous corals.

Bertie Formation. Massive dolostones with intercalated waterlimes, minor shale and mudstone units, and minor evaporites. Carbonate sequence accumulated during oscillations of sabkha-intertidal-sabkha zones.

Camillus Formation. Thick sequence of shaley dolostones, mudstones and evaporites.

Syracuse Formation. Grey shale, buff dolomite and anhydrite.

Vernon Shale. Red shale and buff dolomite with anhydrite.

Lockport Group

Gasport Formation. Coarse grained richly fossiliferous biohermal limestone and dolomite.

Goat Island Formation. Sugary, massive dolomitic limestone.

Eramosa Formation. Dark grey, silty, thin to medium bedded bituminous dolomitic limestone.

Guelph-Oak Orchard Formation. Buff to dark grey medium to thick bedded massive bituminous dolomitic limestone.

Table 2. Key to the Paleozoic Geologic Map of the Churchville Quadrangle.

Group	Map Symbol	Formation
Onondaga and Bois Blanc Limestones	Dob	Onondaga limestone Seneca Morehouse (cherty) Clarence limestone members Edgecliff cherty limestone Local coral bioherms Bois Blanc Limestones - sandy, thin, discontinuous
Akron Dolostone and Salina Group	Sab	Akron Dolostone Bertie Formation
	Scv	Camillus Formation Syracuse Formation Vernon Formation
Lockport Group	Sl	Guelph, Oak Orchard, Eramosa, and Goat Island Dolostones Gasport Limestone - local bioherms

Findings from Geologic Mapping

Geological mapping of the Churchville, New York quadrangle provides a basis for interpreting the glacial geologic history of the mapping area. As typical of other locations in western New York, the Late Wisconsin age landforms in this quadrangle, have been predominantly influenced by the advance and retreat of the Ontario lobe of the Laurentide ice sheet. The motion of the glacier scoured the underlying bedrock and left deeper scour areas in softer shaley formations and less scouring in harder limestone and dolomite. A thin layer of glacial sediment was deposited during glacial advances, consisting of unsorted material varying in particle size.

The Quaternary geologic history of the Churchville Quadrangle reflects a landscape evolution associated with differential erosion of Paleozoic bedrock. Glacial processes of ice advance, retreat, stagnation, proglacial lake ponding, and meltwater discharge modified the Paleozoic terrain. Holocene landscapes are mostly inherited from glacial processes, and small creeks occupy low, mostly east- west trending lowland landform features.

The basic geology of the area includes four Paleozoic formations overlain by a mantle of glacial, glacio-fluvial, and fluvial sediments. A majority of the landscape is controlled by the glacial deposition during the late Quaternary. However, the southern end of the quadrangle contains the Onondaga Escarpment. This landform is controlled by the Middle Devonian Onondaga Limestone. With a thin mantle of glacial sediments, including what appears to be a low moraine feature on top of the capstone, the ridge itself is mainly due to differential erosion of the limestone and weaker bodies of rock to the north. As you travel north from the Onondaga Escarpment the landscape becomes largely dominated by the glacial sedimentation over the more readily erodible Silurian shaley dolostones and shales. The area exhibits drumlin forms and fluvial lowlands mostly in the form of marshes and swamps. One evident feature is a moraine ridge that cuts across the map and through the town of Bergen. North of this ridge is the Black Creek flood plain, which contains the Bergen Swamp. At the north end of the quadrangle there are oriented drumlins that have experienced Holocene differential erosion within the Black Creek Watershed. Along the northeastern margin of the quadrangle, there is an approximately 1-2 km wide kame delta deposit, composed of bedded sands and gravel. There also is an esker in this area, trending from north of the quadrangle with a source at the Albion Moraine, which parallels the lip of the Niagara Escarpment.

Evolution of the present landscape was dramatically affected by late Pleistocene glaciation. Although the area is obviously a very old landscape, all landscape features can be explained in relation to late Wisconsin and Holocene processes. The first stage of development began when the terminus of the Ontario Lobe was south of the southern boundary of the quadrangle. During this time drumlins formed north of the Onondaga Escarpment and south of the Black Creek flood plain. The ablation of the ice moved the terminus north and a subsequent advance oscillated the terminus back south to the Onondaga Escarpment which served as a resistant barrier to further advance. The subsequent deposition of the moraine sediments found on top of the capstone occurred at this time. Contemporaneous with this advance, drumlins in the northern end of the quadrangle formed.

A period of ice ablation pushed the ice terminus north, most likely to the present Black Creek flood plain or further north. Another subsequent advance saw the ice advance south again and create the moraine ridge that bisects the map south of the Bergen Swamp through the town of Bergen. Bordering the south edge of Bergen Swamp and running east to west across the quadrangle is an area of higher elevations associated with this minor moraine ridge. During a time of overall glacial retreat, the ice can surge forward short distances and deposit sediment at its temporary southern terminus. Each of these surges forward and their subsequent step-like retreats create minor moraine ridges that are less apparent than the major moraines mapped in the region. The major ridges are regional in extent and can be traced across several quadrangles, whereas the minor ridges are much less continuous and blend more into the surrounding landscapes.

Based on our sediment descriptions from the area, a proglacial lake may have formed in association with the moraine ridge south of the Bergen Swamp. Sediment description from Core 12 shows lacustrine clays overlying a ground moraine diamicton. Further evidence from reviewing the topographic map reveals that there may be a deltaic formation extending into the plain from the paleochannel system to the south. Contemporaneous with lacustrine development, fluvial channels leading to the lake formed in the southern and eastern end of the quadrangle. A system of drainage channels to the north of the Onondaga Escarpment drained the proglacial lakes as the ice sheet retreated further northward (Muller *et al.*, 1988). Flow in these channels initially drained lakes in the Genessee Valley to the east, then drainage reversals emptied the lakes of the Churchille quadrangle. Drumlins in this region acted as obstacles in the way of the flowing meltwater and further enhanced the anabranching of the channels. The main channel appears to have been the present Oatka Valley with connecting and parallel channels to the north. Some paleochannels have present day streams maintaining active flood plains, but at a much smaller scale than the channels created during paleoflood events.

The lake system emptied because the barrier of ice no longer held the northern shore and water began to feed the current Black Creek flood plain and also reverse the direction of flow along Oatka Valley once base level changed. The moraine ridge south of the Bergen Swamp acts as a topographic and hydrologic barrier for the present flow of Black Creek. Also drumlin features in the northern end of the quadrangle are eroded into the features that are seen presently. Holocene capture of Oatka Valley by Oatka Creek is evident in the sediment sequence of Core 1, which contains fluvial sediment overlying an organic soil and then sandy to gravelly alluvium underneath th organic layer. This stratigraphic relation indicatives a period of active meltwater flow associated with lake drainage, a period of stagnation and swamp development, and eventual establishment of Oatka Creek in the valley.

Subsequent retreat of the ice to north of the quadrangle began a period of post ice contact erosion. The Bergen Swamp is thought of to be the remains of a proglacial lake,

Lake Tcakowageh (Muller and Calkin, 1988). After the lake drained through a large system of conduits, Lake Tcakowageh developed into a swamp through eutrophication.

Assessment of the Educational Mapping Project

This project had three fundamental purposes of educational, scientific, and societal merit. The fundamental goal of this project was to help students develop the research skills necessary to complete mapping of a geologic quadrangle. Matt Kaproth and Rosemary Fanelli have received their diplomas in Environmental Earth Science and have entered graduate study in Environmental Sciences. Dave Cannon and Steve Dilger anticipate graduation in 2005; Cannon plans on studying geology in graduate school, and Dilger is deciding whether to pursue a career as an earth science teacher or as an environmental geologist. The collaborative effort allowed in EDMAP projects when blended with supplemental resources from the SUNY College at Brockport Work Study Program allows for a collaborative mapping team to be assembled and provides opportunity for a number of students to obtain geologic mapping experience.

The second purpose of this project was the evaluation and application of mapping methodology to the region. Besides establishment of an allostratigraphic method in the Ontario lowlands, the resulting map is relevant to questions of Late Wisconsin ice advance and retreat, proglacial lake development, and ice melt paleohydrology. Continued work on detailed correlation of genetically-associated sedimentary lithofacies with constructional landforms and soils should eventually lead to detailed paleonvironmental reconstructions of the western New York region.

The societal benefits of this project relate to the rapid growth of the metropolitan area of Rochester, NY. Environmental stress of suburban development is an important social issue in Monroe County, NY and adjacent counties. Additional detail in geologic mapping assists community planning efforts, both relative to development and growth, and in the identification of possible sources of construction and building materials. The final results of the mapping are being presented to County and Town governments, along with the appropriate State and Federal agencies.

Acknowledgements

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Appendix A. Soil survey map units used in the delineation of landforms.

Symbol	Soil Survey map units and typical environments	Great group	Order
Ad	Alden mucky silt loam	Mollic Endoaquepts	Inceptisol
Al	Alluvial land	Glossoboric Hapludalfs	Alfisol
ApA	Appleton loam, 0-3%, glacial till	Aeric Endoaqualfs	Inceptisol
ArB	Arkport very fine sandy loam, 1-6%	Lamellic Hapludalfs	Alfisol
ArC	Arkport very fine sandy loam, 6-12%	Lamellic Hapludalfs	Alfisol
BcB	Benson channery loam, 0-8%, till on top of Lockport formation (limestone)	Glossoboric Hapludalfs	Alfisol
BeB	Benson soil, 0-8%	Lithic Eutrachept	Inceptisol
BrA	Brockport Silt Clay, 0-2%	Aeric Endoaqualfs	Alfisol
Ca	Canandaigua silt loam, 0-3% low depressions/old lakebeds	Mollic Endoaquepts	Inceptisol
CaA	Canandaigua silt loam, 0-2%	Mollic Endoaquepts	Inceptisol
CeA	Cayuga silt loam, 0-2% lacustrine silt and clay on top of calcareous till	Oxyaquic Glossudalfs	Inceptisol
CeB	Cayuga silt loam, 2-6%	Oxyaquic Glossudalfs	Inceptisol
ChA	Churchville silt loam, 0-2% lacustrine silt/clay over calcareous till in old glacial lakebeds	Aeric Endoaqualfs	Inceptisol
ClA	Collamer silt loam, 0-2% old glacial lakebeds, level to convex slopes	Glossaquic Hapludalfs	Alfisol
CoB	Colonie loamy fine sand, 0-6%	Lamellic Udipsamments	Entisol
Cw	Cut and fill land, relatively flat		
Ed	Edwards muck	Limnic Haplosaprists	Histosol
Ee	Eel silt loam, flood plains	Fluvaquentic Eutrudepts	Alfisol
ElB	Elnora loamy fine sand, 2-6%	Aquic Udipsamments	Entisol
Fw	Fresh water marsh		
GaB	Galen very fine sandy, 2-6%	Oxyaquic Hapludalfs	Alfisol
Ge	Genesee silt loam, alluvium	Fluventic Eutrudepts	Alfisol
GmA	Galen and Minoa very fine sandy loams, 0-2%	Oxyaquic Hapludalfs	Alfisol
		Aquic Dystric Eutrudepts	Inceptisol
GnB	Galen very fine sandy, 2-6%	Oxyaquic Hapludalfs	Alfisol
Gs	Genesee silt loam, alluvium	Fluventic Eutrudepts	Alfisol
Ha	Halsey gravelly loam	Typic Humaquepts	Inceptisol
HlA	Hilton loam, 0-3%, calcareous silt loam	Oxyaquic Hapludalfs	Alfisol
HlB	Hilton loam, 3-8%, calcareous silt loam	Oxyaquic Hapludalfs	Alfisol
HnB	Honeoye silt loam, 3-8%, non-limestone	Glossic Hapludalfs	Alfisol
HoA	Honeoye silt loam, 0-3% limestone substratum, glacial till	Glossic Hapludalfs	Alfisol
HoB	Honeoye silt loam, 3-8% limestone substratum, glacial till	Glossic Hapludalfs	Alfisol
KeA	Kendaia silt loam, moderately variant, 0-4%	Aeric Endoaquepts	Inceptisol
La	Lakemont silt clay	Udollic Endoaqualfs	Alfisol
Ld	Lamson very fine sandy loam	Aeric Endoaquepts	Inceptisol
Le (G)	Lamson mucky very fine sandy loam	Aeric Endoaquepts	Inceptisol

Le (M)	Lakemont silt loam depressions of glacial lakebeds limited exit/runoff areas	Udollic Endoaqualfs	Alfisol
Lk	Lakemont silt loam, loamy subsoil varient	Udollic Endoaqualfs	Alfisol
Lm	Lamson very fine sandy loam level portions of old lakes limited exit/runoff areas	Aeric Endoaquepts	Alfisol
LmB	Lima silt loam, 0-3%	Oxyaquic Hapludalfs	Alfisol
LnA	Lima silt loam, 0-3%, till plains, convex slopes	Oxyaquic Hapludalfs	Alfisol
LnB	Lima silt loam, 3-8%, till plains, convex slopes	Oxyaquic Hapludalfs	Alfisol
LoB	Lima and Cazenovia silt loams, 0-6% limestone, till plains/convex slopes/glacial till	Oxyaquic Hapludalfs	Alfisol
Lp	Lockport silty clay loam	Aeric Endoaqualfs	Alfisol
LpA	Lyons and Kendaia silt loams, 0-3%	Mollic Endoaquepts	Inceptisol
		Aeric Endoaquepts	Inceptisol
Ly	Lyons silt loam	Mollic Endoaquepts	Inceptisol
Mn	Madalin silty clay loam, poorly drained	Mollic Endoaqualfs	Alfisol
Mr	Muck, deep		
Ms	Muck, shallow	Glossoboric Hapludalfs	Alfisol
NaA	Niagara and Collamer silt loam, 0-2%	Aeric Endoaqualfs	Alfisol
		Glossaquic Hapludalfs	Alfisol
Ng	Niagara silt loam	Aeric Endoaqualfs	Alfisol
OdA	Odessa silt loam, 0-2%	Aeric Endoaqualfs	Alfisol
OnB	Ontario loam, 3-8%	Glossic Hapludalfs	Alfisol
OnC	Ontario loam, 8-15%	Glossic Hapludalfs	Alfisol
OnD3	Ontario loam, 15-25%	Glossic Hapludalfs	Alfisol
OnF	Ontario loam, 25-60%	Glossic Hapludalfs	Alfisol
OvA	Ovid silt loam, 0-3%	Aeric Endoaqualfs	Alfisol
Ow	Ovid and Appleton silt loams limestone sub, shores of lakes/glacial till	Aeric Endoaqualfs	Alfisol
		Aeric Endoaqualfs	
PaA	Palmyra fine sandy loam, 0-3%	Glossic Hapludalfs	Alfisol
PaB	Palmyra fine sandy loam, 3-8%	Glossic Hapludalfs	Alfisol
PgB	Palmyra gravelly loam, 3-8% glacial outwash deposits kames/eskers and terraces	Glossic Hapludalfs	Inceptisol
PhA	Phelps gravelly fine sandy loam, 0-3% glacial sand/gravel kames/eskers/terraces	Glossaquic Hapludalfs	Alfisol
PhB	Phelps gravelly fine sandy loam, 3-8% glacial sand/gravel kames/eskers/terraces	Glossaquic Hapludalfs	Alfisol
Pu	Pits and quarries		
RgB	Riga silt loam, 2-8%	Glossaquic Hapludalfs	Alfisol
Ro	Rock land		
Rs	Romulus silt loam	Udollic Endoaqualfs	Alfisol
St	Sun loam, moderately shallow variant glacial till/gravely/water worked	Aeric Epiaquepts	Alfisol
StA	Stafford loamy fine sand, 0-2%	Typic Psammaquents	Entisol
Wa	Wayland silt loam	Fluvaquentic Endoaquepts	Inceptisol

WcA	Wampsville cobbly loam, 0-3% glacial till/occupy kames and terraces	Glossic Hapludalfs	Alfisol
WcB	Wampsville cobbly loam, 3-8% glacial till/occupy kames and terraces	Glossic Hapludalfs	Alfisol
WcC	Wampsville cobbly loam, 8-15% glacial till/occupy kames and terraces	Glossic Hapludalfs	Alfisol
WfA	Wassaic fine sandy loam, 0-4%	Glossic Hapludalfs	Alfisol
Wg	Wayland silt loam, alluvial	Fluvaquentic Endoaquepts	Inceptisol
Wr	Warners loam	Fluvaquentic Endoaquolls	Mollisol

Appendix B. Soil descriptions from the Churchville quadrangle..

Core 1

Location: (UTM Zone 18) 0259 955 E 4766 605 N Date: 30 Sep 04 Quadrangle: Churchville
Core #: 1 Landscape position/land use: Oatka Creek floodplain NYSDEC fishing access, wooded
Water table depth: 140 cm Cover type: forested Elevation: 645 ft
Drilled and described by: Dave Cannon
Official Soils Description Listed as: Eel silt loam

depth, cm	hor.	tex.	matrix	mottles	abund	consis.	Ox	CO_3	org.	comments
0-10	A	SiL	2.5YR 3/3			v fr			rt	
10-20	A	SiL	2.5YR 3/3			v fr			rt	
20-30	Bw1	SiCL	10YR 4/4			fr			rt	
30-40	Bw2	SiCL	10YR 4/3			fm			rt	
40-50	Bw2	SiCL	10YR 4/3			fm			rt	
50-60	Bw2	SiCL	10YR 4/3			fm			rt	
60-70	Bw2	SiCL	10YR 4/3	2.5YR 3/4	10%	fm	Fe		rt	slight sand
70-80	Bw2	SiCL	10YR 4/3			fm			rt	
80-90	B/C	CL	10YR 4/3			fm			rt	
90-100	C	C	2.5YR 4/3	7.5YR 2.5/1 7.5YR 5/6	10%	fm	Fe			
100-110	C	C	2.5YR 4/3	7.5YR 2.5/1 7.5YR 5/6	10%	fm	Fe			
110-120	C	C	2.5YR 4/3	7.5YR 2.5/1 7.5YR 5/6	10%	fm	Fe			
102-130	C	C	2.5YR 4/3	7.5YR 2.5/1 7.5YR 5/6	10%	fm	Fe			
130-140	C	C	2.5YR 4/3	7.5YR 2.5/1 7.5YR 5/6	10%	fm	Fe			
140-150	C	C	2.5YR 4/3	7.5YR 2.5/1 7.5YR 5/6	10%	fm	Fe			
150-160	C	C	2.5YR 4/3	7.5YR 2.5/1 7.5YR 5/6	10%	fm	Fe			
160-170	C	C	2.5YR 4/3	7.5YR 2.5/1 7.5YR 5/6	10%	fm	Fe			
170-180	2C	C	2.5YR 4/3	7.5YR 4/6	50%	fm	Fe			
180-190	2A	L	10YR 3/1			gr			rd	sandy muck
190-200	2Oe	fibric	10YR 3/1			lo			rd	muck
200-210	2Oe	fibric	7.5YR 3/1			lo			rd	sulfuric
210-220	2Oe	fibric	7.5YR 3/1			lo			rd	
220-230	2Oe	fibric	7.5YR 3/1			lo			rd	
230-240	3C	SL	7.5YR 3/1			fm				refusal

Notes: Sampled along Oatka Creek north bank, approximately 100' from channel.

Core 2

Location: (UTM Zone 18) 0258 081 E 4767 497 N Date: 3 Oct 04 Quadrangle: Churchville
Core #: 2 Landscape position/land use: Summit of Fort Hill, lane between two fields
Water table depth: unknown Cover Type: grass, Black Locust Elevation: 790ft
Drilled and described by: Dave Cannon and Steve Dilger
Official Soils Description Listed as: Ontario loam, 8-15% slope

depth, cm	hor.	tex.	matrix	mottles	abund.	consis.	Ox	CO_3	org.	comments
0-10	Ap	SiL	5YR 3/1			lo gr			rt	
10-20	E	SiL	7.5YR 3/2			fr			rt	
20-30	B/E	SiSL	5YR 3/2			lo gr				gravel 15%
30-40	Bt	SiCL	7.5YR 4/2			fr				<5% sand
40-50	B	SiL	5YR 4/2			lo gr				gravel 15%
50-60	C	SiCL	5YR 4/3			fr				
60-70	2C	SiCL	7.5YR 4/4			fr				refusal

Notes: Sampled on hilltop ¼ mile north-northeast of corner of Oatka Trail and Parmalee Rd.

Core 3

Location: (UTM Zone 18): 0259 050 E 4766 140 N Date: 3 Oct 04 Quadrangle: Churchville
Core #: 3 Landscape position/land use: Oatka Creek floodplain, alfalfa field
Water table depth: unknown Cover type: alfalfa Elevation: 680 ft
Drilled and described by: Steve Dilger and Dave Cannon
Official Soils Description Listed as: Lima silt loam, moderately deep, 3-8% slope

depth, cm	hor.	tex.	matrix	mottles	abund.	consis.	Ox	CO_3	org.	comments
0-10	Ap1	SiL	7.5YR 3/2			lo gr			rt gr	
10-20	Ap2	SiL	7.5YR 3/2			fr			rt gr	5% gravel
20-32	Ap2	SiL	7.5YR 3/2			fr				
32-40	E	SiL	10YR 4/3			fr				20% cutans
40-50	E	SiL	10YR 4/3			fr				
50-55	E	SiL	10YR 4/3			fr				
55-60	Bt	SiCL	7.5YR 4/4			fm				
60-70	C	gravel	5Y 5/1			fr				refusal, decomposed till

Notes: Core taken 300’ west of Circular Hill Road at foot of Onondaga escarpment.

Core 4

Location: (UTM Zone 18): 0257 675 E 4765 614 N Date: 3 Oct 04 Quadrangle: Churchville
Core #: 4 Landscape position/land use: Top of hill, harvested corn lot
Water table depth: unknown Cover type: corn Elevation: 790 ft
Drilled and described by: Dave Cannon and Steve Dilger
Official Soils Description Listed as: Ontario loam, 3-8% slope

depth, cm	hor.	tex.	matrix	mottles	abund.	consis.	Ox	CO_3	org.	comments
0-10	Ap	SiL	7.5YR 3/2			v fr			rt	
10-20	Ap	SiL	7.5YR 3/2			v fr			rt	
20-30	Ap	SiL	7.5YR 3/2			v fr				
30-40	C	SiL	10YR 5/4			v fr				
40-45	2C	SiL	10YR 5/4			v fr				30% gravel, refusal

Notes: 100' northeast of Buttermilk Falls, top of rise, in harvested sweet corn lot. Possible mixing and agriculturally deposited gravelly layer at 30-45 cm.

Core 5

Location: (UTM Zone 18): 0256 181 E 4767 782 N Date: 3 Oct 04 Quadrangle: Churchville
Core #: 5 Landscape position/land use: top of drumlin, alfalfa field
Water table depth: unknown Cover type: alfalfa Elevation: 740 ft
Drilled and described by: Steve Dilger and Dave Cannon
Official Soils Description Listed as: Palmyra gravelly loam, 0-3% slope

depth, cm	hor.	tex.	matrix	mottles	abund.	consis.	Ox	CO_3	org.	comments
0-10	Ap	SiL	10YR 3/2			lo gr			rt gr	
10-20	B	SiL	7.5YR 3/2			fr				
20+	C		5Y 3/1							gravel and cobbles, refusal

Notes: Core taken ~ 500' from Seldon Road in a haylot. Unable to cut deeper than 20 centimeters because of glacial till. Agriculturally tilled layer is possible at 20-25 cm.

Core 6

Location: (UTM Zone 18): 0261 492 E 4770 596 N Date: 3 Oct 04 Quadrangle: Churchville
Core #: 6 Landscape position/land use: top of drumlin, abandoned field
Water table depth: unknown Cover type: grass, weeds, shrub Elevation: 685 ft
Drilled and described by: Dave Cannon and Steve Dilger
Official Soils Description Listed as: Honeoye silt loam, 3-8% slope

depth, cm	hor.	tex.	matrix	mottles	abund.	consis.	Ox	CO_3	org.	comments
0-10	Ap	SiL	7.5YR 3/3			v fr			rt gr	
10-15	Ap	SiL	7.5YR 3/3			v fr				
15+	C		5Y 3/1							gravel, refusal

Notes: Core taken ~50' from Brew Road on east side. Unable to cut deeper than 15 centimeters because of glacial till. Possible agriculturally deposited till layer.

Core 7

Location: (UTM Zone 18): 0264 423 E 4776 792 N Date: 21 Nov 04 Quadrangle: Churchville
Core #: 7 Landscape position/land use: Black Creek flood plain, Churchville Park, recreation area
Water table depth: 60 cm Cover type: grass Elevation: 570 ft
Drilled and described by: Steve Dilger and Dave Cannon
Official Soils Description Listed as: Canandaigua silt loam

depth, cm	hor.	tex.	matrix	mottles	abund.	consis.	Ox	CO_3	org.	comments
0-10	Ap	SiCL	7.5YR 4/2			lo gr			rt gr	
10-20	Ap	SiCL	7.5YR 4/2			lo gr			rt gr	
20-30	Ap	SiCL	7.5YR 4/2			lo gr			rt gr	
30-40	Bg1	SiCL	7.5YR 4/2	7.5 YR 4/6	10%	lo gr	Fe		rt gr	
40-50	Bg2	SiCL	5YR 2.5/1	5YR 4/4	10%	fr	Fe		rt gr	
50-60	Bg2	SiCL	5YR 2.5/1	5YR 4/4	10%	fr	Fe		rt gr	
60-70	C	SiCL	10YR 5/4	10YR 5/6 2.5YR 5/2	10% 15%	fr	Fe			lamination sed. origin
70-80	C	SiCL	10YR 5/4	10YR 5/6 2.5YR 5/2	10% 15%	fr	Fe			lamination sed. origin
80-90	C	SiCL	10YR 5/4	10YR 5/6 2.5YR 5/2	10% 15%	fr	Fe			lamination sed. origin
90-100	2C	SiCL	10YR 5/4			v fr				massive
100-107	2C	SiCL	10YR 5/4			v fr				massive
107-110	2C	SiCL	10YR 5/4			fr				alluvium?
110-120	3C	CL	5YR 6/3	10YR 6/6	50%	fr	Fe	high		massive, alluvium

Note: Core taken along Black Creek, ~500' north on floodplain.

Core 8

Location: (UTM Zone 18): 0263 592 E 4777 588 N Date: 21 Nov 04 Quadrangle: Churchville
Core #: 8 Landscape position/land use: top of small rise, wooded area adjacent to golf course
Water table depth: unknown Cover type: grass, weeds, pine trees Elevation: 580 ft
Drilled and described by: Steve Dilger and Dave Cannon
Official Soils Description Listed as: Hilton loam, 3-8% slope

depth, cm	hor.	tex.	matrix	mottles	abund.	consis.	Ox	CO_3	org.	comments
0-10	Ap	SiL	7.5YR 3/2			lo gr			rt gr	
10-15	Ap	SiL	7.5YR 3/2			lo gr			rt gr	
15-20	Bw	SiL	7.5YR 4/3	7.5YR 3/1	10%	v fr				root traces
20-30	Bw	SiL	7.5YR 4/3	7.5YR 3/1	10%	v fr				root traces
30-40	Bw	SiL	7.5YR 4/3	7.5YR 3/1	10%	v fr				root traces
40-50	C	SL	7.5YR 4/3			lo gr				
50-60	C	SL	7.5YR 4/3			lo gr				10% gravel
60-70	2C	SL	10YR 4/4			lo gr				glacial outwash
70-80	2C	SL	10YR 4/4			lo gr				glacial outwash
80-90	2C	SL	10YR 4/4			lo gr				glacial outwash
90-100	C	SL	10YR 4/4			lo gr				glacial outwash

Notes: Core taken ~50’ south of Kendall Road in a forested area adjacent to open golf course.

Core 9

Location: (UTM Zone 18): 0265 311 E 4774 722 N Date: 21 Nov 04 Quadrangle: Churchville
Core #: 9 Landscape position/land use: summit of drumlin, fallow field
Water table depth: unknown Cover type: wheat stubble Elevation: 590 ft
Drilled and described by: Dave Cannon and Steve Dilger
Official Soils Description Listed as: Ontario loam, 3-8% slope

depth, cm	hor.	tex.	matrix	mottles	abund.	consis.	Ox	CO_3	org.	comments
0-10	Ap	SiL	7.5YR 4/3			lo gr			rt	15% gravel
10-20	E	SiL	10YR 4/4			v fr				10% gravel
20-30	E	SiL	10YR 4/4			v fr				10% gravel
30-40	Bt1	SiCL	7.5YR 4/3			fr				5% gravel cutans
40-50	Bt1	SiCL	7.5YR 4/3			fr				5% gravel cutans
50-60	Bt2	SiCL	7.5YR 4/4			fr				5% gravel
60-70	C	SiCL	7.5YR 4/4	5Y 7/3	20%		Fe			5% gravel
70-75	2C	SiCL	7.5YR 4/4	5Y 7/4	50%		Fe	mild		20% gravel
75+	3C		5Y 3/1					high		glacial till, refusal

Notes: Core taken ~50’ north of Robertson Road at the edge of harvested wheat field.

Core 10

Location: (UTM Zone 18): 0264 040 E 4768 153 N Date: 21 Nov 04 Quadrangle: Churchville
Core #: 10 Landscape position/land use: flat plain, fallow, adjacent to planted pine trees
Water table depth: ~200 cm Cover type: grass, weeds Elevation: 660 ft
Drilled and described by: Steve Dilger and Dave Cannon
Official Soils Description Listed as: Cut and fill land (Thruway?)

depth, cm	hor.	tex.	matrix	mottles	abund.	consis.	Ox	CO_3	org.	comments
0-10	Ap	SiL	5YR 3/3			lo gr			rt tr	
10-20	Ap	SiL	5YR 3/3			lo gr			rt tr	
20-30	Bw	SiL	7.5YR 4/3	5YR 4/6	5%	v fr	Fe			20% gravel
30-40	Bw	SiL	7.5YR 4/4			v fr		mild		20% gravel
40+	C							high		calcareous till; refusal

Notes: Core taken ~500' west of Mallock Road and 200' south of NYS Thruway. Site was between an agricultural access road and planted pine trees.

Core 11

Core #: 11 Landscape position/land use: moraine breakthrough valley, flat, alfalfa field
Water table depth: unknown Cover type: alfalfa Elevation: 635 ft
Drilled and described by: Dave Cannon and Steve Dilger
Official Soils Description Listed as: Benson channery loam, 0-8% slope

depth, cm	hor.	tex.	matrix	mottles	abund.	consist.	Ox	CO_3	org.	comments
0-10	Ap	SiL	10YR 3/2			lo gr			rt gr	
10-20	Bw	SiL	10YR 3/2			lo gr				50% gravel
20-30	Bw	SiL	10YR 4/2			lo gr		high		50% gravel
30+	C							high		calcareous till refusal

Notes: Core was taken ~50' east of Mallock Road, near fencerow of haylot.

Core 12

Location: (UTM Zone 18): 0256 123 E 4772 536 N Date: 21 Nov 04 Quadrangle: Churchville
Core #: 12 Landscape position/land use: open plain, woodlot
Water table depth: 100 cm Cover type: forested, Maple and Ash Elevation: 675 ft
Drilled and described by: Steve Dilger and Dave Cannon
Official Soils Description Listed as: Lyons and Appleton silt loam, 0-3% slope

depth, cm	hor	tex	matrix	mottles	abund.	consis.	Ox	CO_3	org.	comments
2-0	Oi									leaf litter
0-10	A	SiL	10YR 3/2			v fr			rt tr	
10-20	E	SiCL	10YR 4/3			fr			rt tr	
20-30	E	SiCL	10YR 4/3			fr			rt tr	
30-40	B/E	SiL	7.5YR 3/2			v fr				
40-50	B/E	SiL	7.5YR 3/2	7.5YR 4/6	5-10%	v fr	Fe			
50-60	Bt1	SiCL	2.5YR 4/4	10YR 5/6 10YR 4/1	10% 10%	fr	Fe			redox
60-70	Bt2	CL	10YR 5/6	10YR 4/1 10YR 5/8	5% 5%	fm	Fe			redox
70-80	Bt2	CL	10YR 5/6	10YR 4/1 10YR 5/8	5% 5%	fm	Fe			redox
80-90	Bt2	CL	10YR 5/6	10YR 4/1 10YR 5/8	5% 5%	fm	Fe			redox
90-100	C	CL	10YR 5/3	10YR 5/8	5%	fm	Fe			
100-110	C	CL	10YR 5/3	10YR 5/8	5%	fm	Fe			
110-120	C	CL	10YR 5/3	10YR 5/8	5%	fm	Fe			
120-130	C	CL	10YR 5/3	10YR 5/8	5%	fm	Fe			stratified
130-140	C	CL	10YR 5/3	10YR 5/8	5%	fm	Fe			stratified
140+	2C	SiL	5Y 3/1							gravel till

Notes: Core was taken in a mature woodlot ~75' north of Dublin Road.

Core 13

Location: (UTM Zone 18): 0256 949 E 4777 001 N Date: 21 Nov 04 Quadrangle: Churchville
Core #: 13 Landscape position/land use: Black Creek flood plain, wooded
Water Table depth: 140 cm Cover type: Wooded, Maple and Ash Elevation: 570 ft
Drilled and described by: Dave Cannon and Steve Dilger
Official Soils Description Listed as: Wayland silt loam

depth, cm	hor	tex	matrix	mottles	abund.	consis	Ox	CO_3	org.	comments
0-10	A	SiL	10YR 3/2			v fr			rt	
10-20	E	SiL	10YR 4/3			fr			lg rt	
20-30	E	SiL	10YR 4/3			fr			lg rt	
30-40	E	SiL	10YR 4/3			fr			lg rt	
40-50	E	SiL	10YR 4/3			fr			lg rt	
50-60	Bt	CL	10YR 4/3	5Y 5/1 7.5YR 5/6	30% 20%	fm	Fe			redox
60-70	Bt	CL	10YR 4/3	5Y 5/1 7.5YR 5/6	30% 20%	fm	Fe			redox
70-80	Bt	CL	10YR 4/3	5Y 5/1 7.5YR 5/6	30% 20%	fm	Fe			redox
80-90	Bt	CL	10YR 4/3	5Y 5/1 7.5YR 5/6	30% 20%	fm	Fe			redox
90-100	Bt	CL	10YR 4/3	5Y 5/1 7.5YR 5/6	30% 20%	fm	Fe			redox
100-110	Btg	SiCL	5Y 5/1	7.5YR 5/6	50%	st pl	Fe			gleying
110-120	Btg	SiCL	5Y 5/1	7.5YR 5/6	50%	st pl	Fe			gleying
120-130	Btg	SiCL	5Y 5/1	7.5YR 5/6	50%	st pl	Fe			gleying
130-140	Btg	SiCL	5Y 5/1	7.5YR 5/6	50%	st pl	Fe			gleying
140-150	C	SiC	10YR 5/2			sticky wet				below water table
150-160	C	SiC	10YR 5/2			sticky wet				below water table
160+	C	SiC	10YR 5/2			sticky wet				below water table

Notes: Core was taken ~50' north of Black Creek, 100' west of West Sweden Road, on the lower flood plain terrace. Unable to retrieve core after 140 centimeters, as the soil material was too waterlogged and liquefied.

List of abbreviations for field descriptions

Texture

S - sand
Si - silt
C - clay

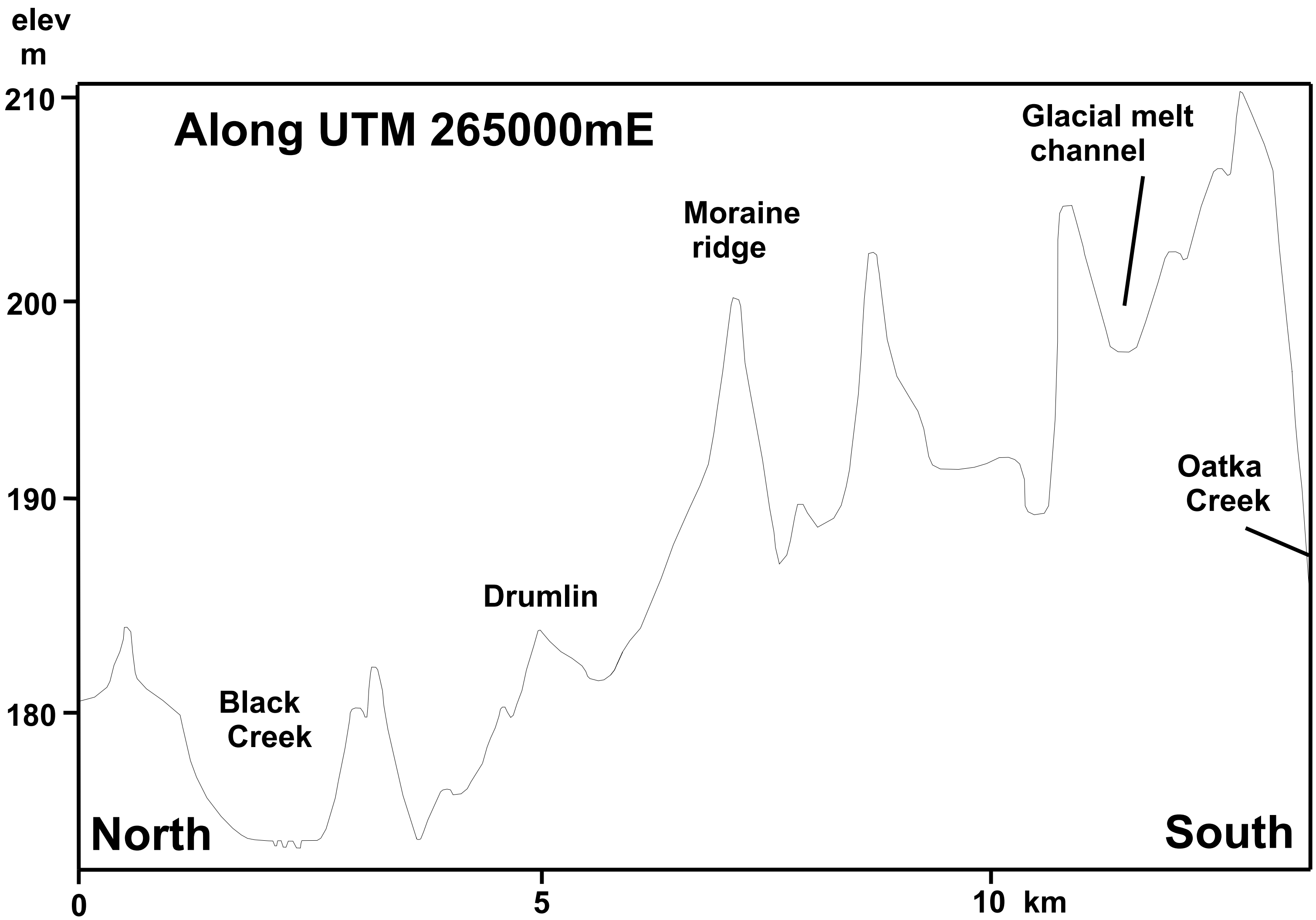
Consistence (consis.)

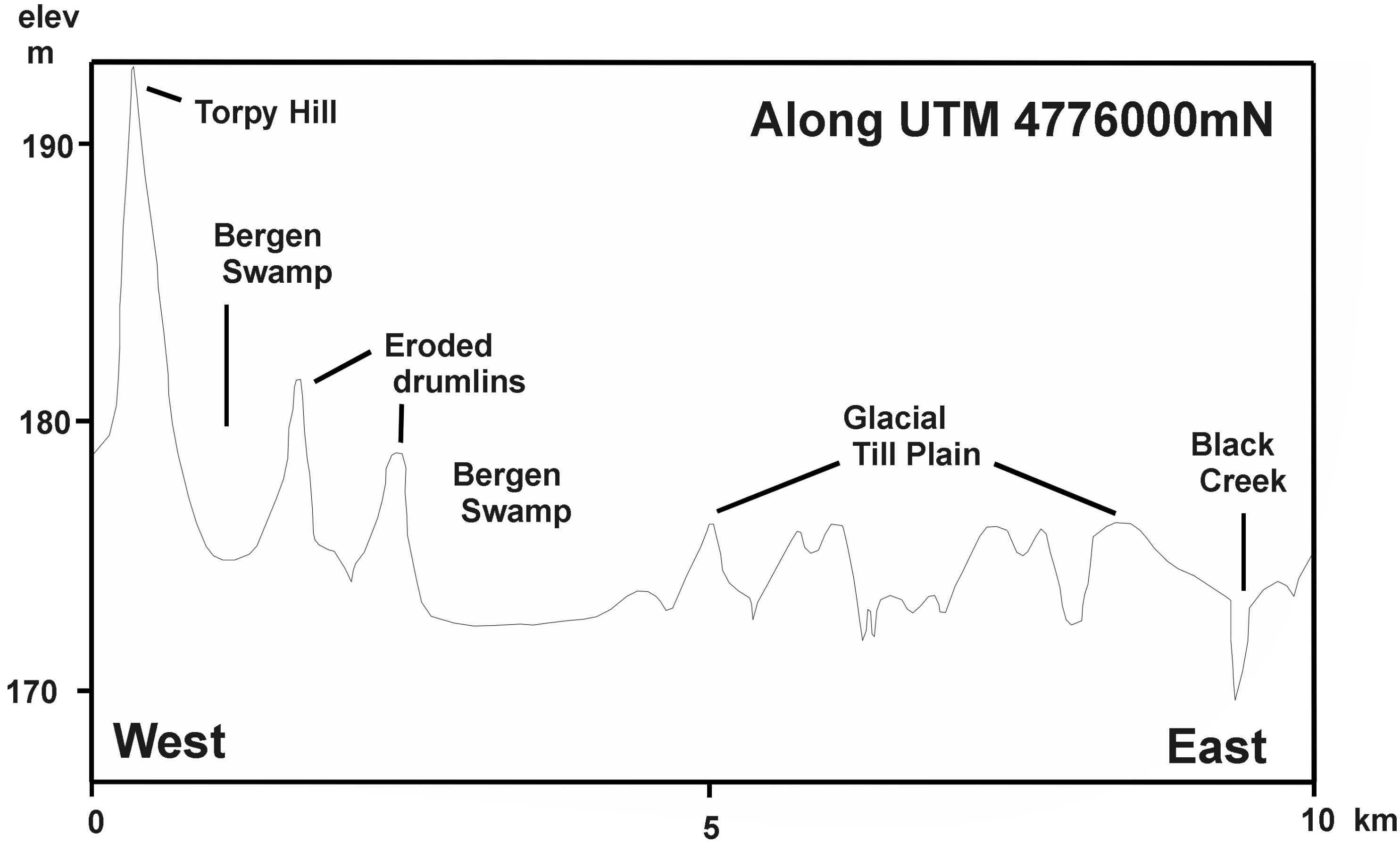
lo - loose
gr - granular
f - friable
v fr- very friable
fm - firm

Organic content (org.)

rt - roots
gr - grass
rd - reeds
tr - tree
lg - large

Appendix C. Topographic profiles across the Churchville quadrangle.




elev
m
190
180
170
Torpy Hill
Along UTM 4776000mN
Bergen
Swamp
Eroded
drumlins
Glacial
Till Plain
Black
Creek
Bergen
Swamp
West
East
0
5
10 km

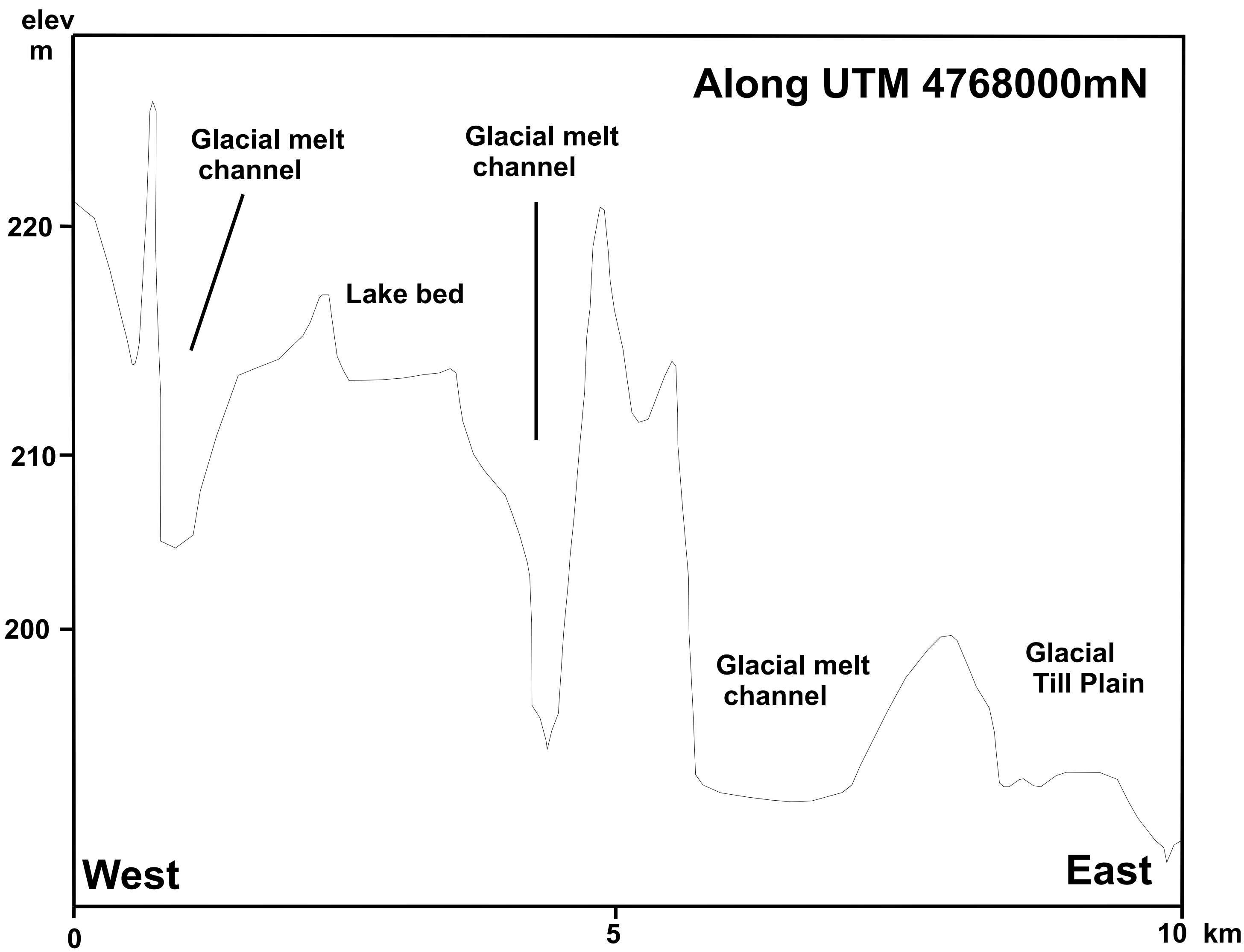

elev
m
Along UTM 4768000mN
Glacial melt channel
Glacial melt channel
220
Lake bed
210
200
Glacial melt channel
Glacial Till Plain
West
East
0
5
10 km

Plate 1: Quaternary Geology of the Churchville Quadrangle