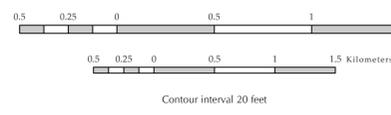


Universal Transverse Mercator, Zone 18
North American Datum of 1983
Elevation contours, hydrography, and planimetry layers
from the New York State Dept. of Transportation Raster
Quadrangle separates for the Westerlo and Clarkville
7.5 minute quads. DDT edition date 1993 for both,
USGS contour dates 1944 (Westerlo) and 1953 (Clarkville).
Magnetic declination from the NOAA online Declination
Calculator:
<http://www.ngdc.noaa.gov/geomag/declination.jsp>

Calculated declination 13.6°W for the year
2011, at the center of the map.



Geologic mapping by C. Ver Straeten, 2010.
Digital data and cartography, J. Mandreiser, 2011.

BEDROCK GEOLOGY OF THE WESTERLO QUADRANGLE, NEW YORK

Charles A. Ver Straeten

2010

QUATERNARY
MIDDLE DEVONIAN

EXPLANATION

GEOLOGIC UNITS

Q

Quaternary (Q) material

mDpl

Plattekill Formation (mDpl)

Gray to red sandstones to siltstones, and red, olive-green, and gray to dark-gray shales, mudstones and paleosols.

Sandstones were deposited chiefly in or adjacent to river channels; red, green, and gray shales, mudstones, and paleosols ("fossil soils") were deposited on floodplains adjacent to river channels; dark-gray shales may represent wetlands. Apparent trace fossils of plant roots occur in some strata; poorly preserved fossil plant material may also occur. Up to approximately 200 feet (61 meters) of the Plattekill Formation occurs in the southwest portion of the Westerlo 7.5-minute quadrangle; the rest of the formation, which is much thicker, continues beyond the edge of the quadrangle.

mDash

Ashokan Formation (mDash)

Generally gray sandstones to siltstones; green and gray to dark-gray shales, mudstones, and paleosols. Primarily distinguished from the overlying Plattekill Formation by a lack of red strata.

Sandstones were deposited chiefly in or adjacent to river channels; floodplains; dark-gray shales may represent wetlands. Apparent trace fossils of plant roots in some intervals; Goldring (1935) also noted fossils of small arthropods *Beyrichia (ostracod)* and *Estheria membranacea* (a brachiopod), which are interpreted to indicate freshwater, not marine, environments. On the adjacent Rensselaerville 7.5' quadrangle to the west, a thin interval within the Ashokan Formation includes separate shell layers with restricted versus normal marine fossils (gastropods-only versus brachiopods - respectively); these appear to indicate separate, temporary floodings of brackish or hypersaline and normal marine waters into the local area. The Ashokan Formation represents terrestrial coastal plain facies, deposited near the coast. Approximately 80 feet (24 meters) thick.

mDm1

mDm2

Mount Marion Formation (mDm1 and mDm2)

Dark-gray to gray to green shales and mudstones, and gray to brown siltstones and sandstones, with a few thin, minor layers to lenses of chert- and milky quartz-rich conglomerate, and a few thin limestones (Hurley and Cherry Valley Members) at the base.

Marine fossils, often occur in distinct layers separated by roughly 10-26 feet (ca. 3-8 meters) of poorly to non-fossiliferous strata. Overall, the percentage of sand in the rocks increases upward through the member; however, two distinct intervals upward through the formation feature a distinct return to relatively more shale/mudstone. The lower interval of more shaly strata is visible above 1280 feet along Cole Hill Road, approximately 1.4 miles southwest of East Berne, and in other localities; the transition occurs above a distinct marker bed with fossil horn corals, termed the Hallihan Hill Bed ("marked by a line"). The upper interval with relatively more shale (which alternate with thick sandstones) occurs below the transition to green and gray terrestrial strata of the Ashokan Formation. The Mount Marion Formation represents intermediate depth to shallow marine environments (from perhaps a few hundred feet at most, to the shoreline at sea level). Using a dip of approximately 160 feet per mile, the Mount Marion Formation from the north-central to south-western area of the Westerlo quadrangle totals approximately 1400 feet (427 meters) in thickness, from the base of the Hurley Member to the base of the overlying Ashokan Formation.

Members of the Mount Marion Formation, from low to high, include:

- 1) Hurley Member: Limestone, mudstone and minor silt- to sandstone. Approximately 4.3 feet thick (1.3 meters), but varies locally. Two to three thin, fossiliferous limestones and a thin sandstone separated by shales of varying thicknesses.
- 2) Cherry Valley Member: Limestone, with famous *Agoniatites vanuxemi* cephalopod fauna. Approximately 4.6 feet (1.4 meters) thick.
- 3) East Berne Member: Dark-gray shale and mudstone, with minor thin sandstone beds through the member and a thick sandstone at the top. Member marked by distinct basal and top contacts, above Cherry Valley Limestone, and below the overlying Hallihan Hill Bed (see below). Approximately 300 feet thick (91 meters) thick on the eastern edge of the quadrangle.
- 4) Otsego Member: Shale and sandstone, with an overall increase in the percent sandstone upward through the member. The base of the Otsego is distinct, marked by a generally three foot thick fossiliferous zone, at the top of a thick sandstone (Hallihan Hill Bed of Ver Straeten (1994)). The upper part of the Otsego Member is gradational into the overlying "undifferentiated upper member," with no distinct boundary. The Otsego Member comprises the bulk of the rocks that form the escarpment running N40W to ESE just south of the hamlet of East Berne (e.g., Irish Hill and Filkins Hill). Cooper (in Goldring, 1935, p. 191) estimated the Otsego Member to be 505 feet (154 meters) thick along Cole Hill Road/Albany Co. Rte. 2, southwest of East Berne (top of Cooper's section marked by the number 1 on the map).
- 5) undifferentiated upper member: Sandstone-dominated strata, with an increased though still lesser amount of shale in its upper portion (beginning at the top of the "flagstone" sandstones quarried by Heldeberg Bluestone, east of the village of South Berne). Notable marker unit near the top is a dark-gray mudstone interval with corals, brachiopods, and bivalves (Cotton Hill coral bed). Strata are generally not well exposed south of the previously noted escarpment, except in ravines coming into the Switzkill Valley. Approximately 600 feet (180 m) in thickness.

NOTE: The Hurley, Cherry Valley and East Berne members of the Mount Marion Formation are mapped as mDm1 (ca. 300 feet/91 meters thick). The Otsego Member and undifferentiated upper strata of the Mount Marion Formation are mapped together as mDm2 (ca. 1100 feet/335 meters thick).

mDus

Union Springs Formation (mDus)

Dominantly black to dark-gray shales and mudstones, with some thin impure limestone layers. Thin calcareous unit at the top (Stony Hollow Member) in the eastern part of the quadrangle disappears to the west, and thickens to the south. Strata are generally non-fossiliferous to poorly fossiliferous, with straight and coiled cephalopods, very small conical shells (styliolids, dactyloconarids), and some small brachiopods and bivalves. The base of the Union Springs Formation, placed at the top of the underlying Onondaga Limestone, is not found on the quadrangle.

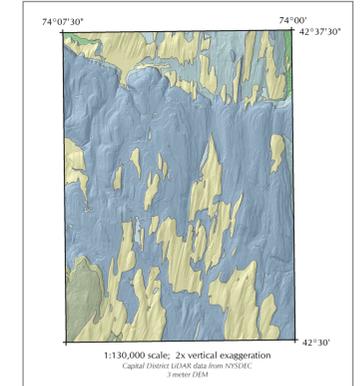
Two members of the Union Springs Formation are found on the Westerlo quadrangle, from low to high:

- 1) Bakoven Member: Black to dark-gray shales and mudstones, with thin, minor limestone beds and limestone concretions. Generally non-fossiliferous to poorly fossiliferous; fossils consist largely of shelled animals that lived up in the water column, not on the sea floor (e.g., straight and coiled cephalopods, and styliolids/dactyloconarids). Approximately 165 feet (50 meters) thick in the south branch of Onesquethaw Creek, on the east edge of the quadrangle and just over the border. Lowest strata of the Bakoven Member are not found on the Westerlo quadrangle.
- 2) Stony Hollow Member: Thin, buff-colored, calcareous shale to siltstone at the top of the Union Springs formation in the easternmost portion of the quadrangle. Thin bed at or near base with fossils, including brachiopods and pieces of the trilobite *Dechenella haldemanni*. Some strata are bioturbated. Pyrite nodules present; the pyrite secondarily replaces barite, as is found at the same strata in other states (e.g., PA, VA, WV). To the west, the Stony Hollow Member disappears as strata change laterally to dark-gray mudstones of the upper part of the Bakoven Member. Approximately 12 feet (ca. 4 meters) thick in the south branch of Onesquethaw Creek, on the east edge of the quadrangle.

GEOLOGIC SYMBOLS

- Contact, definite
- - - - Contact, approximate
- Contact, inferred
- Limit of Quaternary cover

SHADED TERRAIN MAP



LOCATION MAP



NOTICE
This geologic map was funded in 2010 in part by the USGS National Cooperative Geologic Mapping Program. The views and conclusions contained in this document are those of the authors and should not be interpreted as necessarily representing the official policies, either expressed or implied, of the U.S. Government. While every effort has been made to ensure the integrity of this digital map and the fidelity of the data upon which it is based, the New York State Education Department ("NYSED") makes no representation or warranty, expressed or implied, with respect to the accuracy, completeness, or suitability for any particular purpose or scale. NYSED assumes no liability for damages resulting from the use of any information, apparatus, method, or process disclosed in this map and text, and urges independent site-specific verification of the information contained herein. Any use of trade, product, or firm names is for descriptive purposes only and does not imply endorsement by NYSED.