Abstract

This data layer shows the generalized lithologic and geochemical (lithogeochemical) character of near-surface bedrock in the Connecticut, Housatonic, and Thames River Basins and several other small basins that drain into Long Island Sound from Connecticut. The area includes most of Connecticut, western Massachusetts, eastern Vermont, western New Hampshire, and small parts of Rhode Island, New York, and Quebec, Canada.

Bedrock geologic rock units are classified into 29 lithogeochemical rock units, on the basis of the relative reactivity of their constituent minerals to dissolution and other weathering reactions and the presence of carbonate or sulfide minerals. The 29 lithogeochemical units (28 of which can be found in the study area) can be grouped into 6 major categories: (1) carbonate-rich rocks, (2) carbonate-poor, clastic sedimentary rocks restricted to distinct depositional basins, (3) metamorphosed, clastic sedimentary rocks (primarily noncalcareous), (4) mafic igneous rocks and their metamorphic equivalents, (5) ultramafic rocks, and (6) felsic igneous and plutonic rocks and their metamorphic equivalents. The lithogeochemical rock units also are grouped into nine lithologic and physiographic provinces (lithophysiographic domains), which can be further grouped into three major regions: (1) western highlands and lowlands, (2) central lowlands, and (3) eastern highlands.

INTRODUCTION

The goals of the National Water Quality Assessment (NAWQA) program are to describe the status and trends of a large representative part of the Nation's surface- and ground-water resources and to identify the natural and human factors that affect the quality of these resources (Leahy and others, 1990). The data set presented here was intended to characterize the bedrock geologic units in the Connecticut, Housatonic, and Thames River Basins study area in terms of mineralogic and chemical characteristics relevant to water quality, such that the geologic data were in digital form and could be used in a Geographic Information System (GIS) to analyze and interpret water-quality and ecosystem conditions.

HOW THIS DATA LAYER WAS CREATED

The data layer was compiled from State and regional geologic maps. The geologic units shown on the State and regional maps were classified using a lithogeochemical classification scheme that reflects geochemical principles and previous studies of the relations among rock types, water quality, and ecosystem characteristics. The classification of specific geologic units was based primarily on descriptions of the lithology, mineralogy, and weathering characteristics (for example, "rusty- weathering" as an indicator of sulfidic character) provided on the maps. Additional information for the Mesozoic Basin of Connecticut and Massachusetts from Smoot (1991) was used to modify the contacts and descriptions shown on the State geologic maps. The lithogeochemical units were further grouped into lithophysiographic domains. The lithophysiographic domains are based on tectonic and lithologic characteristics as well as physiography and are similar to the physiographic provinces of Denny (1982). The digital data layer was created using coded mylar overlays, registered to the State geologic maps, which were digitized at a scale of 1:125,000, attributed with the appropriate lithogeochemical code and other information, and edgematched.

LIMITATIONS OF THE DATA SET

This data layer has several limitations that originate from the procedures used in its compilation. About 95 percent of the data layer was compiled at a scale of 1:125,000 from published maps from various States and years. Thus, the data layer should not be used at scales larger than those of the source materials and should be expected to incorporate any limitations associated with the base materials of the source maps. Compilation of the lithogeochemical map from State geologic maps resulted in some discontinuities at State borders. The lithogeochemical code assigned to a rock unit was based primarily on its description on the appropriate State geologic map. Because the information contained on the individual State maps was interpreted and assembled by different groups of geologists during a 40-year period, the maps do not always represent a coherent or consistent data set when combined. In addition, the chemical and mineral-assemblage characteristics of the rock groups and formations within each State are generalized in the geologic map descriptions; thus regional trends in lithology or metamorphic grade may have resulted in different generalized descriptions of the same geologic unit in adjacent States. Discrepancies across State borders in the lithogeochemical coverage reflect these and other inconsistencies among the State geologic maps that could not be resolved with the existing information. However, the lithogeochemical coding of geologic units is internally consistent within each State, and discrepancies across State boundaries are minor in most cases. Use of the State geologic maps as source materials also left small parts of the study area along the coast of Connecticut unmapped, which reflects the extent of geologic information on the source map.

The 29-unit lithogeochemical classification scheme presented here has not been tested using actual water-quality data. The classification scheme and associated expected water-quality and ecosystem characteristics are based on geologic and geochemical principles and previous studies of the relations of rock types and these characteristics. Comparison with actual water-quality data likely would result in refinement of the classification scheme and a better understanding of the relations among rock types, water quality, and ecosystem characteristics. Finally, the data layer primarily depicts the lithogeochemical character of bedrock units, not the surficial deposits such as glacial till, glacial outwash, or recent alluvium. Where surficial deposits are derived from the local bedrock, the data layer also might be used to describe the lithogeochemical character of these materials. Chemical characteristics of natural waters associated with surficial deposits may differ from that suggested by the lithogeochemical character of bedrock units to the extent that the surficial deposits consist of or are mixed with materials transported from source areas with differing lithogeochemical characteristics.

ABOUT THE FILES AND PRODUCTS IN THIS DIGITAL PUBLICATION

Several files and products are included in this digital publication. The primary product is an ARC/INFO coverage, which is attributed with lithogeochemical codes and other information and includes documentation or metadata. The metadata describes the data layer and provides information on data quality, spatial data organization, spatial reference, spatial entities and attributes, and other aspects of the data layer; the metadata follows the "Contents Standards for Digital Geospatial Metadata," devised by the Federal Geographic Data Committee (FGDC) as part of the National Spatial Data Infrastructure. A spatial data transfer format (SDTF) version of the ARC/INFO coverage also is included, which conforms to FDGC standards for spatial data transferability across hardware and software boundaries. An ARCVIEW shape file also is included as an option. The data layer may be viewed on-line as map compositions showing the lithogeochemical units or lithophysiographic domains in the entire study area. The map compositions are available in several digital formats.

SOURCES OF MAP AND GEOLOGIC DATA

Billings, M.P., 1955, Geologic Map of New Hampshire: Reston, VA, U.S. Geological Survey, 1:250,000.
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Doll, C.G., Cady, W.M., Thompson, J.B., Jr., and Billings, MP., eds. and compilers, 1961, Centennial Geology Map of Vermont: Montpelier, VT, U.S. Geological Survey, 1:250,000, 1 sheet (transverse mercator projection).
Fisher, D.W., Isachsen, Y.W., Rickard, L.V., eds., 1970, Geologic Map of New York, Lower Hudson Sheet: New York State Museum and Science Service, Map and Chart Series No. 5, 1:250,000 (UTM projection).
Hermes, O.D., Gromet, L.P., Murray, D.P., 1994, Bedrock Geologic Map of Rhode Island: Kingston, RI, Office of the Rhode Island State Geologist, Rhode Island Map Series No:1, scale 1:100,000, 1 sheet (transverse mercator projection, zone 19).
Leahy, P.P., Rosenshein, J.S., and Knopman, D.S., 1990, Implementation plan for the National Water-Quality Assessment Program: U.S. Geological Survey Open-File Report 90-174, 10 p.
Lyons, J.B., Bothner, W.A., Moench, R.H., and Thompson, J.B., Jr., 1986, Interim Geologic Map of New Hampshire: Reston, VA, U.S. Geological Survey, 1:250,000, 1 sheet (Lambert conformal conic projection, standard parallels 33 and 45 degrees).
Moench, R.H., ed., 1984, Geologic maps of the Sherbrooke-Lewiston Area, Maine, New Hampshire, and Vermont: U.S. Geological Survey Open-File Report 84-0650, 1:250,000 (transverse mercator projection).
Moench, R.H., Boone, G.M., Bothner, W.A., Boudette, E.L., Hatch, N.L., Jr., Hussey II, A.M., and Marvinney, R.G., 1995, Geologic map of the Sherbrooke-Lewiston Area, Maine, New Hampshire, and Vermont, United States, and Quebec, Canada: U.S. Geological Survey Miscellaneous Investigations-Series Map I-1898-D, 1:250,000, 2 sheets (transverse mercator projection).
Rogers, J., 1985, Bedrock geological map of Connecticut: Hartford, Conn., Connecticut Geologic and Natural History Survey, 1:125,000, 2 sheets (polyconic projection, zones 18 and 19).
Smoot, J.P., 1991, Sedimentary facies and depositional environments of early Mesozoic Newark Supergroup basins, eastern North America: Paleogeography, Paleoclimatology, Paleoecology, v. 84, p. 369-423.
Zen, E-an, Goldsmith, G.R., Ratcliffe, N.L., Robinson, P., and Stanley, R.S., 1983, Bedrock geologic map of Massachusetts: Washington, D.C., U.S. Geological Survey, 1:250,000, 3 sheets.

ABOUT THIS MAP COMPOSITION

The map composition depicted in this plot shows the lithophysiographic domains (see table below) as depicted in the data layer; the lithogeochemical rock units are depicted in a separate plot file. Additional information about the lithogeochemical classification scheme, the lithogeochemical and lithophysiographic-domain coding of specific geologic map units, the procedures used to create and review the data layer, and spatial and digital characteristics of the data layer are provided in the documentation (metadata) associated with the ARC/INFO coverage. The ARC/INFO coverage and associated digital products can be obtained from the World Wide Web at http://water.usgs.gov/lookup/get?wrir994000.

Lithophysiographic domains and characteristics

[Domain code is attribute "physio_unit" in ARC/INFO coverage. Various shades of gray represent areas outside the study unit and unmapped areas near the coast of Connecticut]

Lithophysiographic Domain		Topographic Expression	Lithology and Lithogeochemical Codes
Domain Code	Description		
Western Highlands and Lowlands			
T	Taconic allochthons and related rocks of early Paleozoic age	mostly uplands in west; moderate hills and ridges in Vermont	mostly schist (32) and slate, phyllite and graywacke (31); some sulfidic units
S	Carbonate platform sequence of early Paleozoicage	lowlands and valleys	mostly marble (12) and bedded limestone and dolomite (11; not mapped separately in study-area source materials)
Y	Proterozoic crystalline massifs and associated early Paleozoic sediments	highland plateaus with sub-dued relief; may have steep slopes along border	mostly granitic gneiss (61) and mafic gneiss (43), with schist and granofels (33) and minor marble (12); mixed granitic gneiss, mafic gneiss, and ermont; minor quartzose metaclastics (34)
Central Lowlands			
H	Hartland-Rowe-Hawley Metamorphic Belt	rolling terrain with moderate hills	mostly granofels and schist (32, 33, 34), with amphibolite (42), mafic gneiss (43), and granitic gneiss (61); some sulfidic units; locally abundant, small, isolated bodies of ultramafic rock (50)
N	Newark Supergroup of early Mesozoic age	lowlands, except in areas of basalt flows and diabase bodies; forms wide valley in Massachusetts and Connecticut	mostly mudstone (21) and sandstone (22, 23) clastic bodies filling fault-bounded grabens; local basalt flows (41), basalt dikes (41), and diabase bodies (44); some calcareous units, local sulfidic horizons, and sediments containing sulfate minerals
C	Connecticut River Valley Metamorphic Belt	subdued rolling terrain; rounded granitic plutons form high ground in north-eastern Vermont	mostly metamorphosed calcareous clastic sediments (13) and granofels and schist (33) in Vermont; less calcareous (33c) in New Hampshire; granite plutons (61) in northeastern Verermont
Eastern Highlands			
B	Bronson Hill Metamorphic Belt	mostly uplands with rolling terrain; local steep slopes and ridges	mostly granitic gneiss (61), mafic gneiss (43), and amphibolite (42), with schist sulfidic schist, and granofels (32, 32s, 33, 33s, 34)
M	Merrimack Metamorphic Belt	rolling terrain with moderate hills and ridges; granite forms mountainous highland in New Hampshire	mostly a variety of metamorphosed clastic rocks (32, 33, and 34) and granite plutons (61); local areas of mafic gneiss (43) and amphibolite (42); some sulfidic and(or) calcareous units
Z	Coastal Gneiss Belt	subdued terrain with gentle slopes along the coast of Connecticut and low to moderate hills and ridges inland	mostly granitic gneiss (61) and mafic gneiss (43)

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by
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