

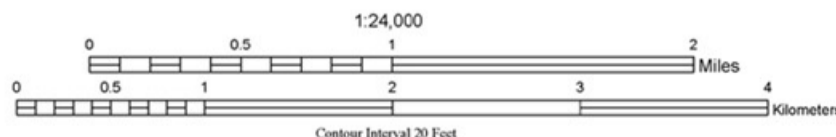
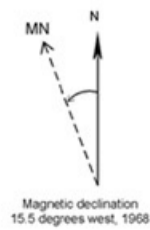
Surficial Geologic Units

- ar** - Artificial Fill. Artificially emplaced earth and areas of extensive grading. Fill consists of sand, gravel, till, and a variety of other materials.
- Hal** - Holocene Alluvial Deposits. Silt, sand, pebble gravel, cobble gravel, and boulder gravel deposited by modern streams. Deposits include stream channel and sand bar deposits and finer-grained floodplain deposits. Minor wetland deposits are common. Thickness is highly variable with the deposits along the smaller streams typically less than 5 feet thick. Thicknesses in the Winooski River floodplain are considerably greater. These areas are typically flooded yearly or every few years.
- Hst** - Holocene Stream Terrace Deposits and Alluvial Deposits, undifferentiated. Silt, sand, pebble gravel, cobble gravel, and boulder gravel deposited on terraces above the modern floodplains of streams. Many areas of modern alluvium are included in this unit. Extensive deposits are located in the valleys of Thatcher Brook, Graves Brook, and Great Brook. The thickness of the individual terrace deposits on the smaller streams is usually less than 5 feet but the finer-grained deposits on the sides of the Winooski River valley locally exceed 30 feet. Water well and soil boring data indicate that there is locally greater than 100 feet of silty and sandy material below the Winooski River valley but it is not clear how much of this material is fluvial rather than glacio-lacustrine. Waterbury Village is largely built on silty to gravelly stream terrace deposits left by the Winooski River.
- Hw** - Holocene Wetland Deposits. Clay, silt, sand, muck or peat of variable thickness. Common in valley bottoms and along streams. Many of the wetlands along smaller streams are beaver-influenced.
- Qaf** - Quaternary Alluvial Fan Deposits.
- Qft** - Quaternary Fan-Terrace Deposits. Pebbly sand, sandy pebble gravel, and coarse sandy cobble gravel deposited on lacustrine terraces. The deposits have a sheet-like form. Fan terrace deposits are well-developed on surfaces just below the Lake Winooski shoreline (Waterbury Center) and the Glacial Lake Mansfield I shoreline (Kneeland Flats). Thickness less than 10 feet.
- Qlm1g** - Quaternary Gravel Deposits in Lake Mansfield I. Pebbly sand overlying lacustrine silt and sand. Exposed at Waterbury Center below the Glacial Lake Mansfield I shoreline. Thickness is less than 10 feet.
- Qlwshb** - Quaternary Lake Winooski Shoreline Boulder Deposit. Boulder gravel deposit exposed on the Glacial Lake Winooski shoreline at approximately 1010 feet elevation east of Kneeland Flat. Thickness less than 10 feet.
- Qlwd** - Quaternary Lake Winooski Delta Deposit. Silt, sand, pebbly sand, and pebble gravel deposits formed by streams flowing into Glacial Lake Winooski. Examples are found north of Waterbury Center and east of Kneeland Flats. Thickness up to 40 feet.
- Qld** - Quaternary Deltaic Deposits. Silt, sand, pebbly sand, and pebble gravel deposits formed by streams flowing into glacial lakes. The deposits are poorly exposed and clear examples of foreset and topset beds are lacking. Not clearly assignable to one of the recognized lake levels. Thickness probably less than 30 feet.
- Qls** - Quaternary Lacustrine Shoreline and Shoaling Deposits. Fine to medium sand and pebbly fine to medium sand deposited in Glacial Lakes. The deposits are well-developed along the Lake Winooski shoreline. Examples include well-sorted sand and pebbly sand deposits on the approximate Lake Winooski shoreline southwest of Loomis Hill, similar deposits occurring at and below the Lake Mansfield I and II shorelines northeast of the village of Waterbury, and on the Lake Winooski shoreline northwest of Great Brook. Thicknesses range locally up to at least 20 feet although these deposits are usually underlain by finer-grained lacustrine material at shallower depths.
- Qlf** - Quaternary Fine-grained Lake Deposits. Clay, silty clay, silt, silty very fine sand, and very fine sand, sometimes with pebbles, laminated and commonly varved, deposited in glacial lakes. Clay and silty clay are dark gray to gray. Fine-grained lacustrine deposits formed in Glacial Lake Loomis occur below about 1200 feet on the west side of the Worcester Range and the deposits are widespread below the Lake Winooski shoreline at 990-1010 feet elevation. Thickness ranges widely from a few feet to greater than 100 feet.
- Ql** - Quaternary Lacustrine Deposits, Undifferentiated.
- Qtr** - Quaternary Readvance Till. Extremely poorly sorted silt-matrix diamict with abundant clasts ranging in size up to boulders up to 6 feet in diameter, moderately dense. Exposed stratigraphically above ice-contact lacustrine deposits at about 1200 feet elevation on the west flank of the Worcester Mountains and also in the Great Brook valley at about 1200 feet elevation. Similar till overlies the outwash deposits south of Middlesex Notch. Commonly less than 10 feet thick.
- Qow** - Quaternary Outwash Deposits. Sand and gravel deposited from meltwater flowing southward through gaps at Middlesex Notch and the notch west of Owls Head Mountain. Includes coarse and fine-grained lacustrine material as well. Thickness appears to exceed 100 feet at the deposit south of Middlesex Notch.
- Qic** - Quaternary Ice-contact Deposits. Includes Qic1 (Quaternary Ice-contact Lacustrine). Stratified sand and gravel deposits showing indications of significant collapse. Thickness up to 200 feet on the bench at 1200 feet elevation west of the Worcester Range and north of Loomis Hill.
- Qt** - Quaternary Till, undifferentiated. Extremely poorly sorted silt-matrix diamict with abundant angular to subangular clasts. When unweathered the till is gray to dark gray in color and dense. Till surfaces are commonly boulder strewn, commonly with angular boulders several feet in diameter. Interpreted as lodgement till. Thickness highly variable, from less than 10 feet on most of the higher terrain to locally at least 75 feet on some hillsides.
- Bedrock Outcrops and Areas of Shallow Bedrock**
- Ice Motion Indicators**
- Lake Thatcher Shoreline**
- Lake Winooski Shoreline**
- Lake Mansfield 1 Shoreline**
- Lake Mansfield 2 Shoreline**
- Holocene Winooski River Meander Traces**
- Study Area boundary**

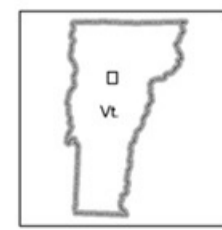
Base map from U.S. Geological Survey.
 Quadrangle names printed in blue.
 Coordinate System: Vermont State Plane, meters, NAD 83.
 Geographic coordinates shown at topo corners are in NAD 83.
 Grid overlay on map is Universal Transverse Mercator,
 Zone 18N, NAD 27.

Cartography and digitizing by George Springston of Norwich
 University Department of Geology and Sarah King.

This map is not a survey and is for planning purposes only.
 March 9, 2006.



**Surficial Geologic Map of the Southern
 Worcester Mountains, Vermont
 by George Springston and Rick Dunn
 2006**



Field Area Location

All lake shorelines rise 4.74 feet per mile to N 21 W as per Larsen, Frederick, D., 1987, History of glacial lakes in the Dog River Valley, Central Vermont in Guidebook for Field Trips in Vermont, Volume 2, Westerman, D.S., ed.; New England Interglacial Geology Conference, Northfield, Vt., p. 213-236. Glacial Lake Loomis is a local, high-level lake graded to the north end of Middlesex Notch (1230 feet) and bounded on the west by ice in the Thatcher Brook valley. Glacial Lake Winooski and Lakes Mansfield I and II are regional lakes graded to the Williamstown Gulf, Gillett Pond, and Hollow Brook outlets respectively. See Larsen (1987) for details.

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