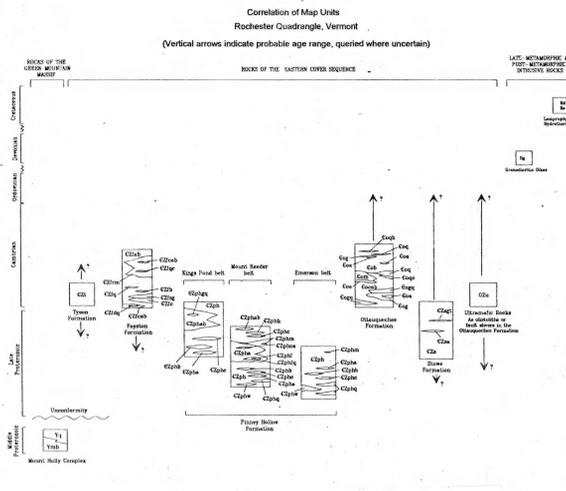




Geologic Map



DESCRIPTION OF MAP UNITS
(Major minerals listed in order of increasing abundance)

LATE-METAMORPHIC AND POST-METAMORPHIC INTRUSIVE ROCKS

Kd Lamprophyre dikes (Cretaceous?) - Aphanitic, dark-gray to black lamprophyre dikes. Dikes range in thickness from 0.5 to 1.5 m and locally contain phenocrysts of biotite, amphibole, pyroxene, and olivine. Locally contains amygdaloid filled with dolomite or calcite. Generally, dikes intrude parallel to joint sets. Dikes are unfoliated but may be jointed. Dikes shown on the map with a strike and dip symbol.

KS Sausserized country rock (Cretaceous?) - Rusty to tan, fine- to medium-grained, dolomite-quartz, muscovite and epidote (saussurite) schist. In this section muscovite is randomly oriented and has a boxwork structure, muscovite and epidote (saussurite) is ultra fine-grained in the groundmass and as vein fillings, quartz is recrystallized and cryptocrystalline locally. Rock is interpreted as hydrothermally altered carbonaceous albite schist of the Fayston formation (C2fab). Alteration zone is approximately 2 m wide and parallel to a joint set in C2fab. Crops out in Corporation Brook.

DS Granodiorite at Liberty Hill (Devonian?) - Very light-gray, non-foliated to weakly-foliated, fine- to medium-grained, porphyritic, muscovite granodiorite to tonalite. Phenocrysts (as much as 3 mm long) of plagioclase (albite-oligoclase) and quartz occur in a matrix of muscovite (5-10%), quartz (20-30%), and plagioclase (60-70%) with accessory calcite and apatite. Seven dikes were found in the north-central part of the map and range from less than 1 m thick in single outcrops to the approximately 150 m wide by 2300 m long dike on Liberty Hill. The six outcrop-scale dikes are shown on the map with a strike and dip symbol.

ROCKS OF THE EASTERN COVER SEQUENCE

C2fa Undifferentiated ultramafic rocks (Ordovician and Late Proterozoic) - Small ultramafic bodies of serpentinite and carbonate-talc schist or carbonate-talc schist. The larger bodies generally consist of serpentinite cores rimmed by carbonate-talc schist, tremolite-chlorite schist, greenschist, and a black wall of chlorite schist (blackwall). A massive, coarse-grained, weakly foliated, magnetite-talc gneiss to granofels crops out within a serpentinite body 1.3 km due west of Stockbridge Village. All ultramafic rocks occur within the Ottauquechee Formation, or along the Stowe - Ottauquechee contact.

Ottawaquechee Formation

Cob Black phyllite (Cambrian) - Dark gray to black, rusty weathering, sulfidic, graphitic, chlorite-quartz-muscovite phyllite and fine-grained schist. Contains accessory albite. Locally contains thin laminations and vein-segregations of quartz, and 0.5- to 1-cm diameter pyrite molds. Contains thin interbedded quartzite and quartz schist, similar to Cogh and Cogq, but too small to show on map.

Cogh Black quartzite (Cambrian) - Dark blue-gray, gray, and black vitreous quartzite with white laminations and vein-segregations of quartz. As much as 10% of graphite in the rock imparts the dark color to the quartzite. Forms prominent ridges in less resistant Cob. Mapped quartzites range in thickness from 1 to 5 m.

Cogq Tan quartz schist and quartzite (Cambrian) - Light gray to tan, rusty weathering, finely-laminated (<2 mm), sandy, muscovite-plagioclase-quartz schist, and tan vitreous to sandy quartzite. Locally the quartz schist contains laminations of graphitic phyllite. In the southern part of the map the quartz schist contains small (<5 mm) pebbles of plagioclase and blue-quartz (Cogq).

Cog Gray to gray-green feldspathic schist and gneiss (Cambrian) - Gray to gray-green, locally rusty-weathering, medium- to coarse-grained, chlorite-biotite-muscovite-plagioclase-quartz schist to gneiss. Locally contains thin (2 to 20 mm) muscovite beds (indicated by "C" on map), 2 to 5 mm albite porphyroblasts, 2 to 5 mm biotite porphyroblasts, quartz-vein segregations, and thin black phyllite laminations. Locally contains thin quartz-schist to gneiss layers similar to Cogh. Contacts with Cob and Cogh may be sharp or gradual by intercalation.

Cogq Laminated gray-green quartz schist and feldspathic schist (Cambrian) - Gray-green to light-gray, coarsely- and discontinuously-laminated (<10 mm), gritty, plagioclase-quartz schist to chlorite-biotite-muscovite-plagioclase-quartz schist similar to Cogh. Locally contains thin (2 to 20 mm) coarsule beds (indicated by "C" on map). Contacts with Cogh and Coghq are gradual by intercalation. Locally contains thin (1 to 2 cm) dark-gray quartzite beds near contacts with Cogh. An excellent exposure is located on a ridge 150 m east of Route 100 at Tepper, under a transmission line.

C2fab Carbonaceous albite schist (Cambrian) - Tan to dark-gray, rusty weathering, carbonaceous, medium- to coarse-grained, chlorite-plagioclase-muscovite-quartz schist with thin (<0.5 m) gray, tan, and dark blue-gray quartzite and tan muscovite-quartz schist. Locally contains white, gray, or black albite porphyroblasts as much as 5 mm in diameter. Contains interlayered gray, feldspathic, non-carbonaceous schist similar to Cogh, and black phyllite similar to Cob. Overall distribution of graphite, albite porphyroblasts, and minor mineral lithologies is heterogeneous. Excellent exposures on ridges north and south of Cold Brook.

C2fbc Coarse-muscovite schist (Cambrian) - Silvery-green, coarse-grained, chlorite (15-25%), quartz (3-25%), muscovite (50-65%) schist characterized by coarse (as much as 7 mm in diameter) muscovite porphyroblasts. Locally contains garnet and augen-shaped chlorite pseudomorphs up to 7 mm long. Contains accessory albite, epidote, magnetite, and apatite. Locally contains thin (<10 cm) layers of greenschist. Associated with greenschist and ultramafic rocks within the carbonaceous albite schist (C2fab). Forms the prominent southern ridge of Mt. Lyman (in the adjacent Bethel Quadrangle) that extends into the Rochester Quadrangle 2.5 km north of Stockbridge Village.

C2fca Greenstone (Cambrian) - Green to dark-green, quartz-epidote-plagioclase-chlorite greenschist. Locally contains actinolite and biotite. Weathered surfaces locally have a rusty, pitted texture due to the weathering of calcite. Thin, epidote-laminations (<1 mm) and knots (<1 cm) along the foliation are common. Cca is in contact with Cob, Cogh, Coghq, Cogh, and C2fca; contacts may be sharp or gradual by intercalation.

Stowe Formation

C2za Silvery-green schist (Cambrian and Late Proterozoic) - Fine-grained, silvery-green plagioclase-chlorite-quartz-muscovite schist with abundant quartz-vein segregations to laminated plagioclase-chlorite-muscovite-quartz schist. Laminations consist of metamorphically segregated quartz-plagioclase and chlorite-muscovite layers. Locally contains biotite, garnet, and magnetite.

C2zpa Garnetiferous schist (Cambrian and Late Proterozoic) - Silvery-green to gray-green, plagioclase-chlorite-quartz-muscovite schist characterized by large (>1 cm) garnet porphyroblasts. Locally contains biotite and magnetite. The contact with C2za is gradational, marked by a decrease in size and abundance of garnet porphyroblasts into C2za. Crops out as a thin unit on the ridge east of Bartlett Brook in the southeast corner of the quadrangle.

C2zsa Greenstone (Cambrian and Late Proterozoic) - Green to dark-green biotite-quartz-chlorite-epidote-plagioclase greenschist; locally contains actinolite. Weathered surfaces locally have a rusty, pitted texture due to the weathering of calcite. C2sa is in contact with C2za, and contacts may be sharp or gradational by intercalation.

Fayston Formation

C2fcb Carbonaceous albite schist (Cambrian and Late Proterozoic) - Tan to dark-gray or black, rusty weathering, carbonaceous to graphitic, chlorite-plagioclase-quartz-muscovite schist with light gray to black albite porphyroblasts as much as 4 mm in diameter. Locally contains thin (<20 cm) dark-gray to white tan quartzite. Contains thin (<1 m) beds of tan, rusty weathering, laminated, dolomitic quartzite (C2fca) on the south slope of Hedgehog Knoll. Contacts with C2fab and C2fca are gradational by intercalation.

C2fcb Gray-green albite schist (Cambrian and Late Proterozoic) - Gray-green, medium- to coarse-grained, chlorite-albite-quartz-muscovite schist with white to light-gray albite porphyroblasts as much as 5 mm in diameter and abundant quartz-knots and quartz-veins. Locally contains biotite and magnetite, and thin (<20 cm) light-gray to tan quartzite layers.

C2fbc Biotite granofels (Cambrian and Late Proterozoic) - Light-gray, medium- to coarse-grained, locally laminated, chlorite-muscovite-biotite-plagioclase-quartz granofels to gneiss. Crops out in Corporation Brook.

C2fca Quartzite (Cambrian and Late Proterozoic) - White, tan, and light-gray, coarse-grained quartzite and light-gray, rusty weathering, muscovite quartzite with large (10 to 15 mm) muscovite porphyroblasts. Locally contains magnetite. Rock is similar to Yq, but contains no blue-quartz grains and is in contact with C2fab southeast of Corporation Brook. The contact with C2fab is sharp, not interbedded, but poorly exposed.

C2fcm Rusty muscovite-quartz schist (Cambrian and Late Proterozoic) - Rusty to rusty-gray, fine- to medium-grained, muscovite-quartz schist and chlorite-plagioclase-muscovite-quartz schist. Contains light-gray to rusty, muscovite-plagioclase-quartz granofels and muscovite quartzite with small (<5 mm) blue-quartz pebbles (C2fqc). Contacts with C2fab and C2fcb are gradational by intercalation.

C2fqc Silvery-green schist (Cambrian and Late Proterozoic) - Silvery-green to light-green, lustrous, quartz-knotted, chlorite-quartz-sericite phyllite to fine grained schist, and silvery-gray to steel-gray, locally rusty weathering, quartz-chlorite-sericite phyllite. Locally contains magnetite and less commonly biotite and albite. Similar to C2fbc. In contact with C2fab; contacts are gradational by intercalation.

C2fca Chlorite schist (Cambrian and Late Proterozoic) - Gray to steel-gray, and light-gray to silvery-tan, quartz-knotted, chlorite-chlorite-quartz-sericite schist. Small (<2 mm) porphyroblasts of chloritoid are visible in hand sample. Locally contains magnetite. Similar to C2fbc.

Pinney Hollow Formation

C2zph Silvery-green schist (Cambrian and Late Proterozoic) - Silvery-green to light green, lustrous, quartz-knotted, chlorite-quartz-sericite phyllite to fine grained schist, and silvery-gray to steel-gray, locally rusty weathering, quartz-chlorite-sericite phyllite. Locally contains magnetite, and in fewer places, biotite and albite.

C2zpc Chlorite schist (Cambrian and Late Proterozoic) - Gray to steel-gray, and light-gray to silvery-tan, quartz-knotted, chlorite-chlorite-quartz-sericite schist. Small (<2 mm) porphyroblasts of chloritoid are visible in hand sample. Locally contains magnetite.

C2zpa Greenstone (Cambrian and Late Proterozoic) - Green to light-green, fine- to medium-grained, quartz-chlorite-epidote-albite greenschist to carbonate-muscovite-albite-quartz-chlorite schist. The greenschist may be massive to well-layered, and locally contains epidote laminations and knots. Greenschist grades by intercalation into the less-mafic schist. Weathered surfaces locally have a rusty, pitted texture due to the weathering of calcite. Locally contains randomly oriented muscovite porphyroblasts up to 3 mm in diameter. C2zpa is in contact with C2fbc, C2fca, and C2fcb; contacts may be sharp or gradational by intercalation. The unit is interpreted as a mafic volcanoclastic deposit. The unit locally contains thin layers of silvery-gray to cream, discontinuously laminated, chlorite-quartz-muscovite-caliche schist, where large enough this rock is mapped separately as C2zpb.

C2zpb Metafelsite at Austin Hill (Cambrian and Late Proterozoic) - White to pale-green, well-laminated to massive, medium- to fine-grained, light-pink to rusty-gray weathering, calcite (5-10%) quartz (15-20%) muscovite (25-30%) albite (45-50%) calcite (5-10%) muscovite (15-20%) quartz (25-30%) albite (45-50%) laminated schist to gneiss with accessory epidote and opaque. The matrix consists largely of 0.05- to 0.20-mm grains of quartz and albite with muscovite defining the foliation. Metamorphically segregated layers of quartz and plagioclase, 0.2- to 1.0-mm thick, are bounded by muscovite where the rock is laminated. The matrix of the rock contains rectangular to semi-rectangular porphyroblasts (crystals) of plagioclase, as much as 0.4 mm wide and 1.5 mm long, that are interpreted as fragmental phenocrysts. Natural exposures are rusty-weathered and form prominent exposures with poor soil and vegetation cover; the freshest exposures are located at roadcuts along Austin Hill Road in a housing development at an approximate elevation of 1830 feet on the southwest slopes of Austin Hill. Contains 1- to 2-m thick, gray to dark purple-gray, muscovite feldspathic schist with accessory calcite and opaque (C2zphq). C2zph is interlayered with C2zpb; contacts are gradational by intercalation. The metafelsite is interpreted as a tuffaceous sediment or crystal tuff within a largely mafic volcanoclastic deposit - C2zpa.

C2zphq Black schist (Cambrian and Late Proterozoic) - Dark gray to black, rusty weathering, carbonaceous to graphitic, locally sulfidic, chlorite-quartz-muscovite schist and chlorite-albite-quartz-muscovite schist with gray to black albite porphyroblasts as much as 2 mm in diameter. In contact with C2zph and C2zpa. Contact may be sharp or gradational by intercalation; where intercalated with C2zph, the transitional non-carbonaceous schist is tan to rusty weathering. Locally contains thin (10-20 cm) beds of light-gray to dark-gray quartzite. A single 3 m thick quartzite (C2zphq) was mapped near the saddle along the Liberty Hill Road, 1.6 km southeast of Little Wilcox Peak.

C2zph Feldspathic quartz schist (Cambrian and Late Proterozoic) - Light-gray to gray-green, coarsely- to finely-laminated, gritty, chlorite-muscovite-plagioclase-quartz schist to poorly-laminated granofels, locally contains biotite and magnetite. Unit is lithologically similar to Cogh, but is interlayered with C2zph and C2zphq. Contacts with C2zph and C2zphq are gradational by intercalation.

C2zph Feldspathic granofels (Cambrian and Late Proterozoic) - Dark gray to gray-brown, coarse-grained, massive, weakly foliated, biotite-chlorite-muscovite-plagioclase-quartz granofels or metawacke. Locally contains small (<5 mm) pebbles of blue-quartz and plagioclase-quartz rock fragments. Contains porphyroblasts (dical grains) of plagioclase with relict igneous twins. Locally contains magnetite. In contact with C2zph and C2zphq; contacts with C2zph are generally sharp, and contacts with C2zphq are generally gradational by intercalation.

C2zpb Gray-green albite schist (Cambrian and Late Proterozoic) - Gray-green to silvery-green, fine- to medium-grained, chlorite-albite-quartz-muscovite schist with white to light gray albite porphyroblasts up to 3 mm and abundant quartz-knots and veins. Locally contains biotite and magnetite. Locally contains thin (<20 cm) light-gray to tan quartzite layers; a single 1 to 2 m thick quartzite was mapped in the northwest corner of the quadrangle (C2zphq). C2zpb is in contact with C2zph; contacts are gradational by intercalation. Unit resembles C2fca, but is generally finer-grained.

C2zph Calcite marble (Cambrian and Late Proterozoic) - Cream to light-pink, orange- to buff-weathering, fine- to medium-grained, calcite marble. Locally contains chlorite-muscovite laminations and suspended grains (<1 mm) of quartz. In sharp contact with C2zph and C2zpa.

Mount Holly Complex

Ymh Gneiss (Middle Proterozoic) - Light- to medium-gray, white weathering, biotite-chlorite-muscovite-quartz-plagioclase gneiss. Locally contains small disarticulated lenses of light-gray, very coarse-grained, granitic pegmatite that locally contain coarse tourmaline crystals (as much as 5 cm long) and books (1 to 3 cm in diameter) of muscovite.

Yq Quartzite (Middle Proterozoic) - White to light-bluish gray, coarse-grained, locally vitreous, muscovite quartzite or chlorite-muscovite quartzite. Interbedded by coarse (2 to 10 mm) blue-gray quartz veins. Locally contains a large (10 to 20 mm) porphyroblasts of muscovite. Contains accessory garnet, biotite, tourmaline, and magnetite.

ROCKS OF THE GREEN MOUNTAIN MASSIF

Mount Holly Complex

Ymh Gneiss (Middle Proterozoic) - Light- to medium-gray, white weathering, biotite-chlorite-muscovite-quartz-plagioclase gneiss. Locally contains small disarticulated lenses of light-gray, very coarse-grained, granitic pegmatite that locally contain coarse tourmaline crystals (as much as 5 cm long) and books (1 to 3 cm in diameter) of muscovite.

Yq Quartzite (Middle Proterozoic) - White to light-bluish gray, coarse-grained, locally vitreous, muscovite quartzite or chlorite-muscovite quartzite. Interbedded by coarse (2 to 10 mm) blue-gray quartz veins. Locally contains a large (10 to 20 mm) porphyroblasts of muscovite. Contains accessory garnet, biotite, tourmaline, and magnetite.

EXPLANATION OF MAP SYMBOLS

Contact - Dashed where approximately located

Faults - Dashed where approximately located

Thrust fault or shear zone parallel to regional S3 foliation, interpreted Acadian age; teeth on upper plate

Overturned thrust fault or shear zone parallel to regional S3 foliation, interpreted Acadian age; teeth point in direction of dip, bar on upper plate

Vertical thrust fault or shear zone parallel to regional S3 foliation, interpreted Acadian age

Thrust fault or shear zone parallel to regional S2 foliation, interpreted Taconian age; teeth on upper plate

Pre-metamorphic conjunctural thrust fault, interpreted Taconian age; teeth on upper plate

FOLDS

Approximate axial trace and dip direction of axial surface; arrow indicates plunge direction where shown

F1 fold - Axial trace; rectangle shows dip direction of axial surface. Interpreted as Taconian folds

F3 fold - Axial trace; rectangle shows dip direction of axial surface. Interpreted as Acadian folds

Inclined axial trace

Vertical axial trace

MINOR FOLDS

Strike and dip of axial surface of minor fold

Inclined F2 fold parallel to S2 schistosity

Vertical F2 fold parallel to S2 schistosity

Inclined F3 fold parallel to S3 schistosity

Vertical F3 fold parallel to S3 schistosity

Inclined F3 fold parallel to S3 crenulation cleavage

Vertical F3 fold parallel to S3 crenulation cleavage

Inclined F4 fold

Vertical F4 fold

Bearing and plunge of axis of minor fold

F2 fold axis; shown with F2 axial surface symbol

Bearing of horizontal F3 fold axis; shown with F3 axial surface symbol

F3 fold axis; shown with F3 axial surface symbol

F3 fold axis showing down-plunge counterclockwise rotation; shown with F3 axial surface symbol

F3 fold axis showing down-plunge clockwise rotation; shown with F3 axial surface symbol

Bearing of horizontal F4 fold axis; shown with F4 axial surface symbol

F4 fold axis; shown with F4 axial surface symbol

F4 fold axis showing down-plunge counterclockwise rotation; shown with F4 axial surface symbol

F4 fold axis showing down-plunge clockwise rotation; shown with F4 axial surface symbol

PLANAR FEATURES

Strike and dip of inclined dike

Strike and dip of vertical dike

Strike and dip of inclined gneissic layering of Proterozoic age

Average strike and dip of highly-plunged inclined early schistosity in cover rocks; parallel to compositional layering (Taconian, S1)

Strike and dip of inclined schistosity in Late Proterozoic through Cambrian rocks; probably Late Ordovician (Taconian, S2)

Strike and dip of vertical schistosity in Late Proterozoic through Cambrian rocks; probably Late Ordovician (Taconian, S2)

Generalized strike and dip of highly-plunged S2 schistosity

Strike and dip of inclined dominant schistosity in Late Proterozoic through Cambrian rocks; may represent a composite foliation of at least two or more foliations (S6)

Strike and dip of vertical dominant schistosity in Late Proterozoic through Cambrian rocks; may represent a composite foliation of at least two or more foliations (S6)

Strike and dip of inclined schistosity in Late Proterozoic through Cambrian rocks that transposes an older S2 schistosity, probably Devonian (Acadian, S3)

Strike and dip of vertical schistosity in Late Proterozoic through Cambrian rocks that transposes an older S2 schistosity, probably Devonian (Acadian, S3)

Strike and dip of inclined crenulation cleavage in Proterozoic through Devonian rocks that cuts an older S2 schistosity, probably Devonian (Acadian, S3)

Strike and dip of vertical crenulation cleavage in Proterozoic through Devonian rocks that cuts an older S2 schistosity, probably Devonian (Acadian, S3)

Strike and dip of inclined, spaced, pressure-solution cleavage, kink bands, or crenulation cleavage in Late Proterozoic through Devonian rocks that cuts older foliations, probably Devonian (Acadian, S4)

LINEAR FEATURES

Bearing and plunge of lineation comprised of chlorite and grain cluster lineations such as quartz rods; shown individually or with foliation symbol

L2 lineation on S2 foliation surface

Bearing of folded L2 lineation on folded S2 foliation surface, generally deformed by F3 folds

L3 lineation on S3 foliation surface

L3 lineation on S3 foliation surface

Lineation of uncertain age; shown with dominant foliation symbol, either L2 or L3

Bearing and plunge of intersection lineation; shown with foliation symbol

Intersection of S3 with older foliation

Bearing of horizontal intersection of S3 with older foliation

Intersection of S4 with older foliation

Bearing of horizontal intersection of S4 with older foliation

OTHER FEATURES

Strike and dip of inclined quartz vein

Strike and dip of vertical quartz vein

Location of small (<2 mm) idiosyncratic (Acadian) garnets visible at the outcrop

Location of abandoned mine shaft, mine adit, prospect pit, or quarry

Area of exposed outcrop examined in this study

PRELIMINARY BEDROCK GEOLOGIC MAP OF THE ROCHESTER QUADRANGLE, RUTLAND, WINDSOR, AND ADDISON COUNTIES, VERMONT

By
Gregory J. Walsh¹ and Christine K. Falta²

Acknowledgments:
Falta (1991) conducted mapping as part of a Master's thesis research project that was funded through a grant from the National Science Foundation (NSF-EAR 8516799) awarded to Rolf S. Stanley at the University of Vermont.

References:
Falta, C.K., 1991, Tectono-stratigraphic geology of the Rochester-Hancock area, central Vermont. Master of Science thesis, University of Vermont, Burlington, Vermont, 223 p., scale 1:12,000.

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A digital version of this map is available from the Vermont Geological Survey, telephone (802) 241-3448.
Refer to: Walsh, G.J., and Falta, C.K., Digital bedrock geologic map of the Rochester Quadrangle, Vermont, U.S. Geological Survey Open-File Report 96-25.

This report is preliminary and has not been reviewed for conformity with U.S. Geological Survey standards and procedures (see with the North American Stratigraphic Code). Use of trade names is for descriptive purposes only and does not imply endorsement by the U.S. Government.