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SHEET 1 OF 1

GEOLOGIC MAP OF THE SHERBROOKE 1°X2° QUADRANGLE, MAINE, NEW HAMPSHIRE, AND VERMONT,

BY

E. L. BOUDETTE, G. M. BOONE, W. A. BOTHNER, R. G. MARVINNEY, R. H. MOENCH AND J. N. ALEINIKOFF

R. H. MOENCH, N. L. HATCH, JR., A. M. HUSSEY II, AND J. N. ALEINIKOFF

GEOLOGIC MAP OF THE SHERBROOKE – LEWISTON AREA, MAINE, NEW HAMPSHIRE, AND VERMONT

Edited by
Robert H. Moench
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DESCRIPTION OF MAP UNITS

Units queried where lithic or stratigraphic identification is conjectural. Location of small units is given by 15-minute quadrangle (quad)

MESOZOIC ROCKS OF WHITE-MOUNTAIN PLUTONIC-VOLCANIC SUITE—Mainly Jurassic; in map area, but with sparse Cretaceous intrusions and innumerable undated hypabyssal dikes, amorphous diagonal joints, ring dike-caldera complexes, and volcanic rocks. [See explanation of symbols below on PLUTONIC ROCK COMPOSITIONS below]

CRETACEOUS AND CETACEOUS(?) ROCKS

- Kb — Alkali-olivine basalt plug and volcanic breccia at Red Ridge, Jackson, Carroll County, New Hampshire
- E10 — Porphyritic trachyte dike at Pleasant Mountain, Fryeburg quad
- Ek — Kimberlite pipe at Hart Ledge; diatreme rock exposed also in dike 5 mi northeast of North Conway
- E7 — Porphyritic trachyte and syenite dikes at Moat Mountain; Percival Peak, Fryeburg quad
- E7 — Ferrohastingite and/or hedenbergite syenite at Hart Ledge

JURASSIC ROCKS

- J1(a) — Alkali-feldspar intrusive rhyolite porphyry at Gay Brook, Guilford
- Jclb — Conway Granite—Typically coarse-grained biotite granite; locally fine-grained or porphyritic. Includes Black Cap Granite, fine-grained biotite granite
- Jc1(c) — Contact hornfels in Fryeburgite and/or Conway Granite containing abundant angular fragments of Kinsman Quartz Monzonite, Lovell River pluton, Lovell
- J1kb — Alkali-feldspar biotite granite at Mount Bonaparte, Averill quad
- J1kal — Leucocratic, locally porphyritic alkali-feldspar granite with conspicuous grains of smoky quartz, Hustlin quad
- J1k(c) — Intrusion breccia at Pilot Range, Washington County; Biotite granite containing abundant fragments of Ordovician rocks; Conway Granite
- J1k(d) — Alkali-feldspar-biotite-hornblende granite of Pilot Range—porphyritic biotite-hornblende granite of Pine Mountain
- Jcvb — Mount Cleveland Porphyry—Coarse containing biotite, hornblende, fayalite, and ferrohedenbergite; locally includes rocks mapped as hastingsite granite
- J1c — Riebeckite granite—Alkali-feldspar granite with a few percent of riebeckite; locally porphyritic. Includes Porphyritic riebeckite granite at Robbins Ridge, North Conway, Conway Granite at Moat Mountain, Conway, and to Crawford quartz of Quartz, Fryeburg, Hiatt, and Stoneham quads
- J1(c) — Mount Lafayette Granite—Granite with phenocrysts of smoky quartz, microperthite, and minor oligoclase, hastingsite, and fayalite; includes fine to medium-grained marginal zone of minor aplaeula
- Jk — Quartz syenite—Quartz hastingsite-biotite quartz syenite
- J4(c) — Porphyritic quartz syenite with phenocrysts of microperthite and quartz in fine-grained matrix of microperthite, quartz, and minor ferrohastingsite, hedenbergite, and fayalite; includes Quartz Monzonite Garfield Quartz Syenites and other bodies
- J4CSA — Quartz monzonite to diorite of Pliny Range—Variable hornblende-biotite quartz monzonite, quartz monzonite, quartz syenite, and hornblende diorite
- J5 — Hornblende-biotite quartz monzodiorite of Pliny Range—Includes Pliny Range Quartz Monzonite
- J6 — Hornblende-quartz diorite at Copperas Mountain, Stoneham
- J7 — Syenite—Hedenbergite-hornblende syenite; locally grades to quartz syenite
- J7(c) — Porphyritic syenite and alkali-feldspar syenite—At Mt. Carrigan, Crawford Notch quad, rock is gray porphyry with phenocrysts of microperthite, albite, and alkali feldspar, quartz, and ferrohastingsite in dark gray matrix; at Mt. Washington, rock is brownish phenocrysts of alkali feldspar in matrix of alkali feldspar, hornblende, hedenbergite, and magnetite
- J9A — Diorite—In Shelburne Pond quad, hornblende-biotite diorite, brecciated and intruded by Conway Granite. At Mt. Moosilauke, Averill quad, diorite of uncertain origin; hedenbergite diorite
- J9B — Gilman-Sugar gabbro, at Dry River, Crawford Notch quad
- Jmv — Most voluminous—Dufts, Stone, and Sawyer Rivers plutons; rhyolite, basalt, andesite, and sparse trachyte

MESOZOIC OR CARBONIFEROUS ROCKS—Dark-green, medium-grained gabbro or diorite of Jackson and Chocorua Hill, Norway quad; age and structure of body is uncertain

CARBONIFEROUS INTRUSIVE ROCKS

- Cln — Lovell River pluton—Biotite granite
- Cln(m) — Monzonite and monzodiorite
- CCC — Conway Granite
- CR,Ji — Alkali gabbro and ultramafic rocks

CARBONIFEROUS OR DEVONIAN ROCKS

- CDln — Biotite granite—Small bodies of uncertain age east of Schoon Pond

DEVONIAN ROCKS OF NEW HAMPSHIRE AND MAINE—Mainly subhorizontal sheets in regional stratigraphic order; locally subhorizontal sheets in regional stratigraphic order, emplaced near upper boundary of middle crust

- D1(p) — Hypersthene granite
- D1m — Two-mica granite
- D1m(c) — Variably porphyritic two-mica granite of French Pond pluton, Moosilauke quad
- D1m(s) — Sericite-muscovite two-mica granite. Cupuptic quad—Spurwitchit felsite at Mt. Moosilauke
- D1c — Biotite granite—Includes Into Schoonook Formation of Tomah Mountain quad
- D1g — Intrusive garnet rhyolite, Pierce Pond quad—Small bodies intrusive into Lucerne Formation
- D1k — PELSIC TO INTERMEDIATE CALC-ALKALINE ROCKS—Mainly irregular subhorizontal sheets in regional stratigraphic zone, emplaced in middle crust; and steep-walled plutons in roots of Devonian volcanic centers, emplaced in middle- to upper-crustal boundary. Generally peraluminous; the listed varieties of biotite granite, muscovite-biotite granite, and muscovite granite lack hornblende and typically have minor primary or secondary muscovite
- D1-4k(m) — Porphyritic biotite granite and quartz syenite of Lexington batholith
- D1k — Megacrystic-bearing biotite granite of Newark pluton, Belfast quad
- D1b — Biotite granite
- D1b(c) — Feldspar-porphyritic biotite granite
- D1-2k — Biotite-hornblende granite and granite of Phillips pluton, Phillips quad
- D1m(k) — Kinsman Quartz Monzonite—Mainly weakly foliated feldspar-porphyritic biotite granite
- Dh2 — Biotite-hornblende granite—Mainly strongly foliated biotite granodiorite
- D2k — Biotite granodiorite
- D2k(c) — Feldspar-porphyritic biotite granodiorite
- D2h — Hornblende-biotite granodiorite of Hog Island and Chain-of-Ponds plutons, Mt. Abraham quad
- D2k — Biotite quartz monzodiorite of Bulkegan pluton, Island Pond quad
- D2h — Augite-bearing biotite-hornblende quartz monzodiorite of Bulkegan pluton, Island Pond quad
- D2h-3h — Biotite-hornblende quartz monzodiorite of Pyramid Pluton, Copenquin quad
- D2-3 — Biotite granodiorite and hornblende-biotite tonalite and quartz diorite of Songo pluton, Bethel quad, and Bauneslunkers batholith
- D2-4,1 — Subequal amounts of two-mica granite intrusive into unit D2-4 in Bauneslunkers batholith, Bethel quad
- D3-6 — Hornblende-biotite tonalite to diorite at border of Bauneslunkers batholith
- D4 — Quartz diorite—Subordinately contains biotite and hornblende
- D4c — Cummingtonite-bearing quartz diorite of Flagstaff Lake Intrusions
- D3-4 — Biotite quartz monzonite and quartz monzodiorite of Phillips pluton, Strafield quad
- D3gp — Porphyritic-textured Porphyritic tonalite, northeastern Rumford quad—Pentlandite is intergrown with pyrrhotite and chalcopyrite; also has minor primary muscovite, alunite and Mg-rich biotite. Interpreted as hybrid tonalite contaminated by ultramafic rock
- D3l — Troubjanite of Howard Pond, southeastern Rumford quad—Probably related to mafic-ultramafic rocks of Flamboy pluton, both emplaced along Flamboy Monolith premetamorphic slide
- D3C-D — Biotite granite of Echo Lake pluton, Island Pond quad—Grades westward into feldspar-porphyritic granodiorite of pluton
- MAINE TRIASSIC(?) MAFIC ROCKS—Emplaced largely in upper crust prior to emplacement of most calc-alkaline felsic and intermediate rocks; mostly lowermost granite; wide variety of shapes controlled by earlier structural fracures, particularly premetamorphic slides. Strongly metamorphosed to amphibolite in allimantie zone
- D4a — Diorite at Bacon Brook, Little Bigelow Mts. quad—Mixed with feldspar-porphyritic biotite granite
- D4B — Metagabbro—Massive to layered lenticular, norite, gabbro, and minor diorite of Flagstaff Lake Intrusions, Pierce Pond and Flamboy Monolith plutons, Sugarloaf sheet, Doctors Island dike, and many small bodies
- D1 — Layered gabbro and diorite of Pierce Pond gabbro pluton, southeastern Rumford quad—Mostly funnel-shaped body emplaced along Flamboy Monolith slide

SILURIAN PLUTONIC ROCKS—May be more abundant than shown, at expense of Ordovician plutonic rocks. Variably metamorphosed and foliated felsic rocks

- Sml — Marble Mountain Granite, Moose Bog quad—Shelved hypabyssal felsic dikes; probably part of biomodal dike swarm intrusive into Cambrian or Ordovician volcanics at Mahoosuc Range
- S11 — Leucocratic biotite granite of Moody Ledge pluton, Moosilauke quad
- Sel-2 — Biotite granite to granodiorite of East Inlet pluton, Second Connecticut Lake quad—Interpreted as hybrid intrusive into Cambrian or Ordovician volcanics at Mahoosuc Range and intrusive at east Bel

MIDDLE AND UPPER ORDOVICIAN ROCKS—Further dating may reveal presence of Silurian plutonic rocks in this assemblage

INTRUSIONS AT CHIGGOGGAMIST STREAM—Weakly to strongly foliated and metamorphosed theralitic mafic and tonalitic intrusions in Milan quad, and possible mafic correlatives in Moose Bog and Errol Pond quads. Interpreted as small, subvolcanic spreading center

- Ocln — Hornblende-biotite tonalite
- Ocln(m) — Hornblende-biotite tonalite—Irregular plutons and small segregations associated with mafic rocks
- Ocln(k) — Quartz-porphyritic hornblende-biotite tonalite
- Ocln(g) — Gabbro and diabase—Includes strongly foliated coarse-grained gabbro, and less foliated fine-grained gabbro; intruded by subsurface diabase dikes, commonly shelved
- HIGHLANDCROFT PLUTONIC SUITE—Mainly or strongly foliated and metamorphosed plutons north of the Chiverick and Norumbega faults, in Milan and Errol Pond quads; and minor two-mica granite emplaced in middle(?) and upper crust
- Ohl — Granite—Undivided
- Ohlm — Two-mica granite of Cambridge Black pluton, Milan quad
- Ohl-2(k) — Feldspar-porphyritic granite or granodiorite of Adamstown pluton
- Ohl(k) — Feldspar-porphyric hornblende-biotite granite of Antrim pluton
- Ohl(f) — Biotite granite facies of Antrem pluton
- Oh2-3h — Hornblende-biotite granite to granodiorite of Skinner pluton
- Oh2-3h — Hornblende-biotite granodiorite to tonalite of Lancaster pluton
- Oh4Ch — Hornblende-biotite quartz monzonite—Rock of type locality of Highlandcroft Plutonic Suite, Littleton quad
- Oh2-3h(a) — Hornblende-biotite tonalite—Mainly strongly foliated core intrusions of the Olivetian domes; mainly calcrichalkline felsic to intermediate rocks emplaced in middle(?) and upper crust, in part probably compatric with and subvolcanic to the Ammonoosuc Volcanics. Core intrusive rock of domes may represent resurgent chambers of calderas
- Oh3m — Biotite granite of Jefferson batholith
- Oh3h — Biotite granite of Jefferson batholith, and of Owls Head and Sugar Hill plutons
- Oh4(k) — Feldspar-porphyritic biotite granite of Jefferson batholith
- Oh4-3h — Biotite granite to tonalite of Jefferson batholith
- Oh2-3h(a) — Quartz-porphyritic biotite granite to tonalite of Jefferson batholith
- Oh3h — Hornblende-biotite granite of Jefferson batholith
- Oh2-3h — Hornblende-biotite tonalite of Jefferson batholith
- Oh3h — Hornblende granodiorite and tonalite of Landoff pluton
- Oh3h — Biotite tonalite of Newick pluton
- Oh4Ch — Hornblende-biotite granite of Jefferson batholith
- Oe7h — Hornblende-biotite syenite of Jefferson batholith

9 — UNDATED FOLIATED MAFIC INTRUSIVE ROCKS—Isoleiat dikes, sheeted dikes, and small plutons of gabbro, diorite, metadiabase, and metagabbro; weakly to strongly foliated and metamorphosed to greenschist or amphibolite. Mainly theralitic gabbro in composition; in part feeder to Ordovician and younger mafic volcanic rocks

CAMBRIAN PLUTONIC ROCKS

BOIL MOUNTAIN OPHIOLITE COMPLEX—Interpreted as plutonic member of ophiolite, ramped onto Proterozoic Y rocks of Chain Lakes massif; occurs locally as rafts in melange of Berwicks Mountain Formation. Volcanic upper member of the ophiolite is represented by metabasalt, commonly in pillows, and felsic volcanic rocks

- €b4 — Quartz diorite and trondhjemite
- €b13 — Spidicrite, gabbro, and ultramafic rocks
- 8 — Serpentinite—Foliated emeshlilled ultramafic rocks intruded along faults

Gary M. Boone; Maine Geological Survey, Orono, University
ELB — Elizabeth L. Boudette, U.S. Geological Survey
WAB — William A. Bothner; U. S. Geological Survey
NLH — Nelson L. Hatch, Jr., U.S. Geological Survey
AMH — Arthur M. Hussey, III; Maine Geological Survey
RGM — Robert G. Marvinney; Maine Geological Survey, Orono
RHM — Robert H. Moench; U.S. Geological Survey

SYMBOLS

- CONTACT—Queried where conjectural or poorly located; dotted across lakes
- BOUNDARY OF UNDIVIDED ROCKS
- STRATIGRAPHIC DISCONTINUITY—Roughness of uncertain origin where one or more formations in normal sequence are absent, owing alternatively to erosion, or nondeposition, or faulting
- FAULTS—Queried where conjectural; dotted across lakes
- 7 — Late faults—Characterized by brittle deformation or cataclasis of rocks. Includes faults active after Acadian metamorphism and between emplacement of Paleozoic and younger rocks. Dot is on upthrown side. Faults active prior to metamorphism and emplacement of Devonian plutons
- Normal fault—Bar and ball on downthrown side
- Strike slip fault—Arrows indicate relative movement of opposing walls
- Thrust fault—Medium to high angle; teeth on side of hanging wall
- Early fault or slide—Bar and ball on downthrown side. Characterized by sharp surfaces crossed by early metamorphic fabric, but not by later one; may include or be entirely deformation; close temporal relation inferred between faulting and early faulting
- 25 / 4 — METAMORPHIC ISOGRAD—Approximately located; hachures point to area of higher rank. Bi, stilbenite; Bi, staurolite (partly based on retrograded pseudomorphs); CG, chlorite to garnet; Cz, chlorite
- 11 — APPROXIMATE BOUNDARY OF MIGMATITIC GNEISS—Hachures point to area where metasedimentary rocks are unbedded, poorly layered, coarsely crystallized gneiss that commonly contains embayed-contact lenses and wisps of granitoid rocks, pods of quartz, and meter-sized remnants of calc-silicate rock and graphitic zones. Gneissosity relative to the fabric of the gneiss. Identification of formations in the gneiss is based on comparison with Rumford quadrangle and calc-silicate rocks of the Bethel Formation and Madrid Formation are particularly disrupted and these rocks are commonly the only rocks in areas where their remnants are abundant and recognized with certainty
- W1 — ISOTOPICALLY DATED INTRUSIVE AND METAMOLCANIC ROCKS

Number	Description, source of data, and method	Age (m.y.)
	White Mountain intrusive-volcanic suite	
W1	Alkali-feldspar biotite granite of Mt. Monadnock stock; Foland and Faul, 1977; K/Ar biotite	171± 4
W2	Conway Granite of Lightning Rock intrusion (Core Mass); Foland and Faul, 1977; K/Ar biotite	167± 3
W3	Conway Granite of Percy Peaks pluton; Foland and Faul, 1977; K/Ar biotite	165± 4
W4	Conway Granite of Kilsey-Pine intrusions; Foland and Faul, 1977; K/Ar biotite	181± 4
W5	Feldspar-porphyritic hornblende-biotite granite (Lonesoftgate granite) of Pilot-Pine intrusions; Foland and Faul, 1977; K/Ar biotite	188± 3
W6	Conway Granite at Franconia Notch; Foland and Faul, 1977; K/Ar biotite	194± 4
W7	Conway Granite at Bald Face Mtn.; Foland and Faul, 1977; K/Ar biotite	171± 4
W8	Conway Granite of White Mountain batholith; Foland and Faul, 1977; K/Ar biotite	180± 4
W9	Conway Granite of Mt. Osceola batholith at Redstone quarry; Foland and Faul, 1977; K/Ar biotite	173± 3
W10	Porphyritic fold-bearing syenite at Mt. Pleasant; Foland and Faul, 1977; K/Ar biotite	112± 3
W11	Porphanitic syenite of Hart Ledge intrusions; Weston Geophysical Laboratory; K/Ar biotite	136
	Devonian intrusive rocks	
D1	Pink two-mica granite of Sebago batholith; Aleinikoff, 1984; U/Pb zircon	324± 3
D2	Gray two-mica granite of Sebago batholith; Aleinikoff, 1984; U/Pb zircon	324± 3
	Devonian intrusive rocks	
D3	Biotite granite of Lexington batholith; Naylor, 1973; Rb/Sr mineral isochron	352±12
D4	Two-mica granite of Moosilauke-Kinsman batholith; Foland and Faul, 1977; K/Ar biotite	371± 6
D5	Quartz monzonite (Kinsman Quartz Monzonite phase) Aleinikoff (this map); U/Pb zircon	382± 3
D6	Two-mica granite of Odell pluton; Aleinikoff (this map); U/Pb zircon	380± 5
	Silurian plutonic suite and associated Silurian rocks	
S1	Granite correlated with Moody Ledge pluton; Aleinikoff (this map); U/Pb zircon	423± 4
O2	Medium- and coarse-grained syenite of Jefferson batholith; Foland and Loiselle, 1981; Rb/Sr whole rock	441± 5
O3	Muscovite-bearing biotite granite of Jefferson batholith; Aleinikoff (this map); U/Pb zircon	436± 4
O4	Granitic rocks of Owls Head, Sugar Hill, and Whitefield plutons, and Jefferson batholith of map unit Ohl; Foland and Faul, 1977; K/Ar biotite	About 455
	Highlandcroft plutonic suite and associated Silurian rocks	
H1	Hornblende quartz monzonite at type locality; Aleinikoff and J. N. Ayuso, 1985; U/Pb zircon	450± 5
H2	Feldspar-porphyritic granite of Adamstown pluton Aleinikoff (this map); U/Pb zircon	450± 5
H3	Feldspar-porphyritic granite of Antrem pluton; Aleinikoff and J. N. Ayuso (this map); U/Pb zircon	443± 3
H4	Biotite granite to granodiorite of East Inlet pluton; Aleinikoff and J. N. Ayuso (this map); U/Pb zircon	429± 3
H5	Hypabyssal felsic dike or felsic tuff; Aleinikoff and J. N. Ayuso (this map); U/Pb zircon	418± 4
H6	Hypabyssal felsic dike; Aleinikoff and J. N. Ayuso (this map); U/Pb zircon	418± 4
	Boil Mountain Ophiolite Complex	
B1	Quartz diorite or trondhjemite intrusive into mafic rocks of complex; Eisenberg, 1981, 1982; U/Pb zircon	520±12
	Metavolcanic rocks	
V1	Felsic lithic-crystal metatuff of Rocks at Tumble Down Mountain; Aleinikoff (this map), analysis of zircons furnished by John C. Green; U/Pb zircon	414± 4
V2	Felsic metatuff lying above metabasalt of volcanics at Clear Stream; Aleinikoff (this map); U/Pb zircon	434± 8
V3	Altered felsic metatuff (pristine quartz-sericite schist) at Kennebago Lake; Aleinikoff (this map); U/Pb zircon	500±10

PLUTONIC ROCK COMPOSITIONS

Modified from new Bedrock Geologic Map of Maine (Osberg and others, 1984); compositions in accord with Streckeisen (1973)

From left to right, labels for plutonic rocks give: (1) age (except where unknown); (2) formation name by small letter (only regionally important names shown); (3) primary mineralogical composition by number and, where appropriate, by capital letter (two or more numbers indicate compositional range or mixtures); (4) accessoryal minerals or rock color by small letter (delated from some units to shorten symbol); (5) rock texture, structure, or admixtures by small letter in parenthesis

Accessory mineralogy	Texture and structure
b Biotite; may include minor muscovite	(a) Porphyritic
m Muscovite, and muscovite and biotite	(p) Pegmatitic
h Hornblende or hastingite (phibolite)	(g) Syrlate
l Leucocratic	(f) Foliated or aplitic
g Garnet or cummingtonite	(d) Aphanitic
c Cordierite or fayalite	(i) Intrusive breccia
p Pentlandite in unit Dbp	(m) Metasedimentary inclusions

Examples:

- Jclb — Jurassic Conway Granite
- J4CSA — Jurassic quartz monzonite to diorite
- S1a(a) — Devonian porphyritic two-mica granite
- Oh2-3h — Ordovician Highlandcroft hornblende granodiorite to tonalite

This map is preliminary and has not been reviewed for conformity with U.S. Geological Survey editorial standards and stratigraphic nomenclature.