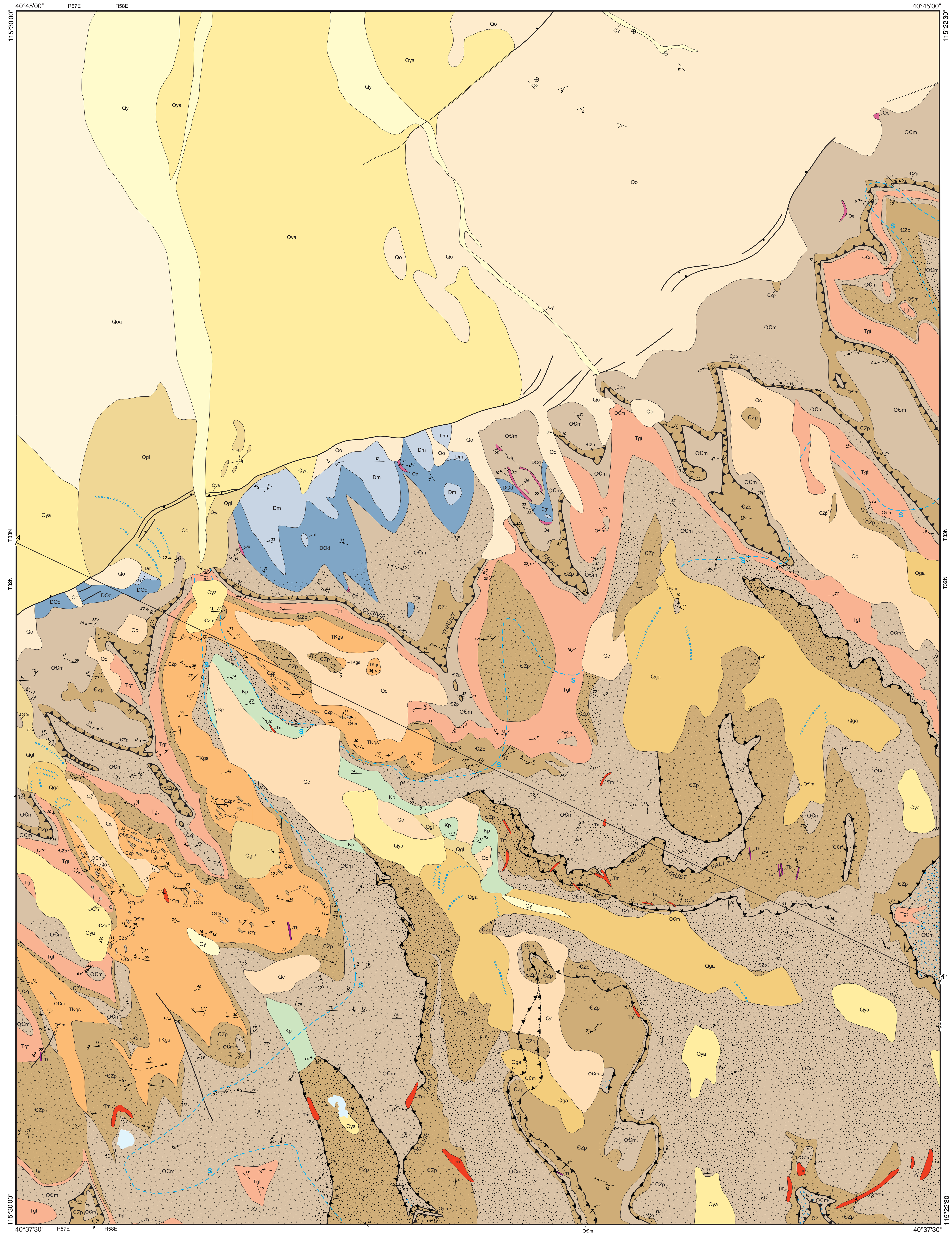

GEOLOGIC MAP OF THE LAMOILLE QUADRANGLE, ELKO COUNTY, NEVADA

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2000

Qc **Colluvium and steep-slope alluvium (Holocene and Pleistocene)** Confined to Ruby Mountains. Largely slope wash, talus deposits, and debris-flow deposits; includes possible solifluction deposits. An age older than Angel Lake moraines is inferred for most deposits downvalley from Angel Lake end moraines (Wayne, 1984). Includes now-breached landslide dam 50 m high across Lamoille Creek 3 km northwest of Camp Lamoille, consisting of house-sized and larger blocks of granite gneiss.

Qy **Youngest alluvium (upper Holocene)** Gravel, sand, and silt along present streams.

Qya **Younger alluvium and outwash (Holocene and Pleistocene)** Alluvial fan deposits of gravel and sand. Includes outwash from Angel Lake glacial advance.

Glacial till (Pleistocene) Moraine crests indicated. Subdivided, using the mapping and descriptions of Sharp (1938) and Wayne (1984), into:

Qga **Angel Lake moraines** Deposited by the Angel Lake glaciation (Angel Lake substage or stage). Boulders on surface and weakly developed soil described by Wayne (1984). Predates a peat carbon-dated at 13±0.9 ka (Wayne, 1984). Correlated with Tioga and Wisconsin drifts (Wayne, 1984).

Qgl **Lamoille moraines** Deposited by the Lamoille glaciation (Lamoille substage or stage). Forms prominent lateral and piedmont moraines. Surface exhibits fewer boulders than do Angel Lake moraines; thick soil profiles comparable in development to those on Bull Lake drift in the Rocky Mountains (Wayne, 1984). Wayne estimated an age an order of magnitude greater than Angel Lake moraines, and proposed correlation with Illinoian drift.

Qoa **Older outwash and alluvium (Pleistocene)** Glacial outwash from Lamoille glacial advance and other alluvial fan deposits of gravel and sand. Proximal deposits gravel and sand; distal deposits (northwest of Lamoille) gravel and interbedded calcite-cemented sandstone, siltstone, and claystone. Gravel clasts mostly metamorphic and granitic rocks typical of Ruby Mountains, and (northwest of Lamoille) very scarce opaline shale, sandstone, and vesicular basalt. Undissected to moderately dissected.

Qo **Oldest alluvium (lower Pleistocene)** Forms and underlies dissected pediment terraces 50 to 100 m above present stream grade. Sharp (1940) proposed several terrace subdivisions. Alluvial-fan deposits of gravel and sand made of subrounded to subangular clasts of metamorphic and granitic rocks derived from the Ruby Mountains. Mostly poorly consolidated, but locally includes calcite-cemented conglomerate and sandstone, and coarse-grained, buff to gray vuggy limestone. Dips suggest terrace is pediment cut on locally tilted beds. Steep 55° dip measured near north-central edge of map suggests landslide or nearby fault. Exposures 2 km north of the quadrangle include megabreccia derived from metamorphosed Eureka Quartzite, granite, brown metaquartzite, and low-grade marble. Thickness at least 100 m. Possibly includes deposits as old as Pliocene.

Tb **Basalt dikes (Miocene)** 1.5 km NE, 3.5 km SSE, and 2 km WSW of Thomas Canyon Campground; also 2 km N of SW corner of quadrangle. Olivine basalt and diabase. Contains plagioclase phenocrysts as long as 2 cm in core of one dike. Locally contains amygdules. Dike margins chilled. Commonly fractured parallel to dike walls. Weathers to form topographic slots or trenches. Most dikes strike north and dip steeply.

Tm **Biotite monzogranite (Oligocene)** Medium- to fine-grained, equigranular. Massive to moderately foliated. Map patterns generalized. Forms dikes, sheets, and small irregular-shaped bodies; not all are mapped. Age about 29 Ma determined from U-Pb dating of zircon (Wright and Snoke, 1993; MacCready and others, 1997).

TKgs **Granodiorite gneiss of Seitz Canyon (Tertiary or Cretaceous)** Medium-grained biotite granodiorite gneiss. Biotite content about 7–10 percent. Locally contains sparse muscovite and garnet. Generally an augen gneiss having coarse feldspar grains (relict phenocrysts); very coarse-grained feldspar grains and pegmatite clots also common. Foliation defined by flakes and thin clusters of biotite. Texture xenomorphic; relict hypidiomorphic-granular texture locally present. Locally exhibits either west-trending mylonitic stretching lineation or north-trending folds. Contains interleaved thin layers of pegmatitic granite gneiss. Interlayered with adjacent metaquartzite and calc-silicate rock. Cut by pegmatite dikes. Forms massive light-gray cliffs. Forms sheet 70–300 m thick that occupies core of the Lamoille Canyon fold nappe and terminates southeastward to mimic a hinge of the nappe. Envelops tabular rafts of the metamorphosed Prospect Mountain Quartzite and marble of Verdi Peak, which outline a ghost stratigraphy and structure suggestive of folding and deformation before the gneiss was emplaced. Interlayered with and locally crosscut by pegmatitic granite gneiss, which suggests Seitz Canyon unit may overlap in age with the pegmatitic granite unit. As mapped, includes gneissic fine- to medium-grained biotite monzogranite (about one tenth of unit), which cuts the main granodiorite gneiss phase and may correlate with the biotite monzogranite unit.

Tgt **Granite gneiss of Thorpe Creek (Eocene)** Garnet-biotite-muscovite monzogranite and leucomonzogranite gneiss. Fine- to medium-grained; pegmatitic clots occur locally. Ubiquitous sparse garnets 1 mm across. Locally contains sillimanite. Color index (content of dark minerals—biotite and garnet) averages 4–5 percent. Strongly foliated; is mylonitic gneiss in most exposures. Locally exhibits either west-trending or north-trending lineation. White to very light gray; rust-toned weathering bands common. Base interleaved with adjacent metaquartzite. Forms a sill averaging 60 m thick intruded along metaquartzite-marble contact in the upper limb of the Lamoille Canyon fold nappe, where base of sill interleaved with adjacent metaquartzite. Sill extends southeastward into marble of Verdi Peak in core of the nappe. U-Pb dates on monazite 36–39 Ma from a sample from lower Lamoille Canyon and 2 samples from the adjacent Verdi Peak 7.5-minute Quadrangle (Wright and Snoke, 1993; MacCready and others, 1997).

Kp **Pegmatitic granite (Late Cretaceous)** Well-foliated to massive leucogranite gneiss and leucogranite. Mostly pegmatitic; inequigranular; grain size variable but generally coarse to very coarse; K-feldspar locally as coarse as 1 m. Locally includes equigranular granite gneiss. Contains muscovite, biotite, commonly garnet or sillimanite. Mapped where metasedimentary rafts or relict layers or restitic pelitic seams nearly absent. Elsewhere in the Ruby Mountains, similar pegmatitic leucogranite and leucogranite gneiss pervasively invades host metasedimentary rocks as pods, sills as thick as 100 m, and dikes; the location and granitic proportions of the resulting migmatite are indicated by overprint pattern on the metasedimentary map units. U-Pb age on monazite approximately 84 Ma determined by J. E. Wright (unpub. data; see MacCready and others, 1997) from pegmatitic granite gneiss outcrop 0.5 km east of quadrangle.

Dm **Marble of Snell Creek (Devonian protolithic age)** Fine-grained, layered light- and dark-gray calcite marble. Contains disseminated dolomite and graphite. Calcite megacrysts 4–6 mm across that occur in fine-grained calcite matrix near the base of the unit may represent relict crinoid columnals. Brecciated at range front near Snell Creek (north-center part of sec. 33, T. 33 N., R. 58 E.). Maximum exposed structural thickness 50 m. Correlated with Guilmette Formation (middle to upper Devonian).

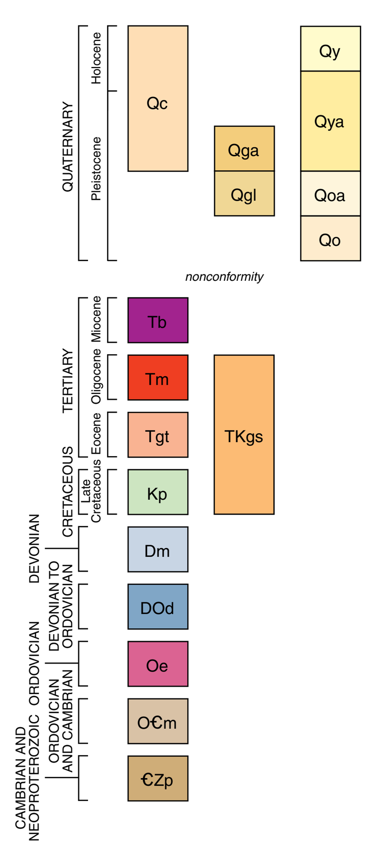
DOd **Dolomite (Devonian to Ordovician protolithic age)** Sugary-textured massive white dolomite marble; weathers white, light gray, or pale buff. Grain size 1–2 mm. Commonly fetid when freshly broken. Contains small amounts of graphite, tremolite, and diopside. Maximum structural thickness 60 m. Correlated to the sequence Fish Haven, Laketown, Sevy, and Simonson Formations.

See accompanying text for references and a discussion of the geology of the Lamoille Quadrangle.

Oe **Metamorphosed Eureka Quartzite (Ordovician)** Massive to mylonitic white metaquartzite. Consists nearly entirely of quartz. Maximum thickness 3 m. Thickens northeastward; local absence may in part represent stratigraphic disconformity.

O€m **Marble of Verdi Peak (Ordovician and Cambrian protolithic age)** Calcite marble, siliceous calcite marble, graphitic marble, calc-silicate rocks; minor mica schist, sillimanite-mica schist, paragneiss, and amphibolite. Mylonitic in northwestern exposures. Diopside and actinolite impart green color to calc-silicate rocks. Rusty-weathering graphitic paragneiss common at the stratigraphic base of the unit where unit is inverted. Intricately intruded by pegmatitic leucogranite, pegmatitic leucogranite gneiss, and biotite granite gneiss in sills, dikes, and irregular bodies, the proportion indicated by overprint pattern. Correlated to Cambrian shale and limestone formations and Ordovician Pogonip Group. Structural thickness 20 m to 1 km.

€Zp **Metamorphosed Prospect Mountain Quartzite (Cambrian and Neoproterozoic protolithic age)** Tan- or brown-weathering, medium-grained micaceous metaquartzite and quartzose schist. Contains 3–10% K-feldspar, less plagioclase, and 4–8% biotite plus muscovite. Sillimanite present southeast of mapped sillimanite isograd. Northwestern and structurally high exposures are fine-grained and flaggy, exhibit conspicuous mylonitic foliation and lineation. Deeper and more eastern exposures are nonmylonitic, medium-grained, and form resistant light-brown cliffs. Intricately intruded by pegmatitic leucogranite, pegmatitic leucogranite gneiss, and granite gneiss in sills, dikes, and irregular bodies, the proportion indicated by overprint pattern. Structural thickness 30–400 m.



Lithologic contact

Fault Dotted where concealed. Ball on downthrown side of normal fault.

Premetamorphic thrust fault Dashed where inferred, dotted where concealed. Metamorphosed; concordant to foliation; lacks cataclastic structures. Identified as contact that repeats mapped stratigraphic sequence; dashed where inferred across map units.

Right-side up Sawteeth on upper plate. Places older over younger rocks.

Overturned Sawteeth point into older rocks, into originally higher plate.

S

Sillimanite isograd In micaceous, muscovite-K-feldspar-bearing metaquartzite. S on sillimanite side; the metaquartzite lacks aluminosilicate minerals on the other side of the isograd. Host-rock-specific isograd; the first appearance of sillimanite in schists occurs outside the host-rock-defined sillimanite zone. Muscovite content of metaquartzite decreases and K-feldspar content increases in going up-grade across the sillimanite isograd.

Strike and dip of bedding

25 Inclined — Horizontal

Strike and dip of foliation

30 Inclined — Horizontal

5 **Bearing and plunge of mylonitic lineation** Essentially all lineations that strike west-northwest are observed to be stretching lineations in mylonitic textures, so these lineations are distinguished here. May be combined with foliation symbol.

10 **Bearing and plunge of mineral or intersection lineation** Defined by elongate minerals such as sillimanite, intersection lineations, and rodding. May be combined with foliation symbol.

10 **Bearing and plunge of mesoscopic fold**

Shear-sense direction of disharmonic folds Arrow indicates apparent drag sense of upper rocks over lower as determined from facing directions of upper short limbs in sets of local, variably oriented mesoscopic folds. Separation arc indicates degree of uncertainty (Howard, 1968; full data plotted in Howard, 1966).

Moraine crest

<1/3 — 1/3 - 2/3 — >2/3

Proportion of the metasedimentary rock map units in the Ruby Mountains composed of pegmatitic granite Dominantly pegmatitic leucogranite gneiss and pegmatitic leucogranite, lesser biotite granite gneiss, scarce biotite-hornblende granite gneiss.

Areas where small bodies of metamorphosed gabbro occur within mapped units Metamorphosed gabbro sills and dikes containing clinopyroxene, hornblende, cummingtonite, biotite-phlogopite, olivine, plagioclase. Intruded by small sills of leucogranite gneiss. Intrusion mainly or entirely into marble of Verdi Peak unit where in original footwall of Ogilvie thrust fault. May be of Tertiary or Mesozoic age.

Scale 1:24,000

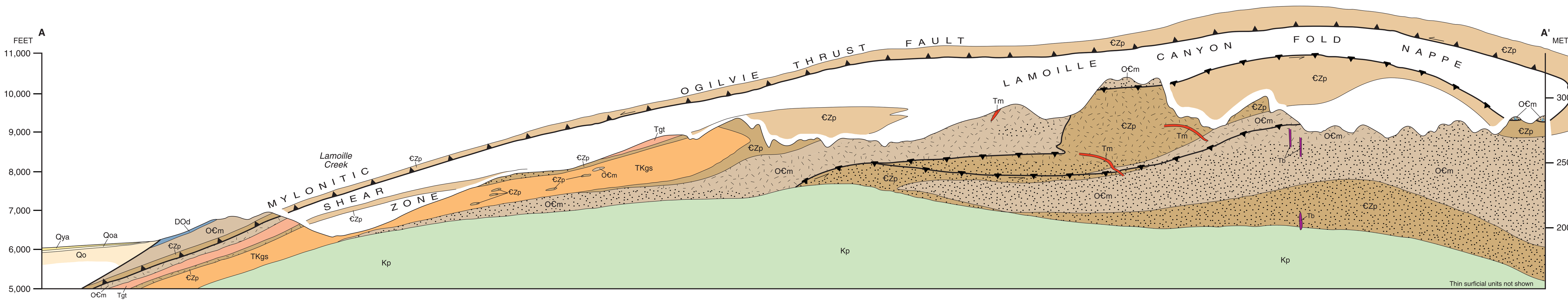
0 — 0.5 — 1 kilometer

0 — 0.5 — 1 mile

0 — 1000 — 2000 — 3000 — 4000 — 5000 feet

CONTOUR INTERVAL 40 FEET

Base map: U.S. Geological Survey Lamoille 7.5' Quadrangle, 1990



Field work done in 1963-65,1996-1997, assisted by Lee Wilson, 1963.

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