

UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY

Geologic Map of the Northeast quarter of the
Mountain City quadrangle, Elko county, Nevada
and Owyhee County, Idaho

by

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

Menlo Park, California

1984

DESCRIPTION OF MAP UNITS

- Qc COLLUVIUM, TALUS AND LANDSLIDE DEPOSITS (QUATERNARY)--Unsorted surficial material ranging from boulders through sand and gravel to silt and clay. Development of colluvium is strongly controlled by direction of exposure as the greater amount of vegetation on north-facing slopes favors accumulation. Coarse material at the upper end of mapped bodies forms talus and finer material is washed downslope and becomes colluvium. Poorly resistant formations such as airfall tuffs and non-welded ignimbrites commonly blanketed by colluvium over much of their extent. Landslides common on steeper slopes
- Qa ALLUVIUM (QUATERNARY)--Consists of sand, silt, and gravel along present stream courses. Maybe 2 m thick above normal stream in summer time, thicker alluvium may be present in some small valleys where rate of supply exceeds the transporting power of the stream
- Qtg TERRACE GRAVEL AND DISSECTED ALLUVIAL FANS (QUATERNARY)--Gravel accumulated on stream terraces higher than the present flood level. Thickness as much as 3 m
- Qgm GLACIAL MORAINE (QUATERNARY)--Boulders large to very large, angular. Material unsorted. Typical cross-valley ridge of terminal moraine. Present near south boundary of map area, on north side of Merritt Mountain. No striated boulders observed
- Qgo GLACIAL OUTWASH (QUATERNARY)--Present as valley train below morainal deposit. Distinguished from ordinary stream gravel by presence of boulders of a size beyond the carrying capacity of the present stream
- QTls LANDSLIDES, ROCKSLIDES, AND EARTHFLAWS (QUATERNARY AND TERTIARY)--Unsorted boulders and finer material. Younger bodies have characteristic hummocky topography
- QTs* UNCONSOLIDATED SEDIMENTARY ROCKS (QUATERNARY AND TERTIARY)--Includes such material as alluvium, colluvium, talus, glacial moraine, glacial outwash
- Tcp COUGAR POINT WELDED TUFF (MIOCENE)--Upper part of formation is phenorhyolitic to phenodacitic ignimbrite, purplish gray to dark brown, or black where glassy, and ranging from compact vitrophyres to firable devitrified welded tuff. The tuff contains abundant phenocrysts of sanidine or anorthoclase, plagioclase and, in most quartz. Apatite, zircon and magnetite are common accessories. In some of the compact vitrophyres, fayalite, and ferroaugite are present, the latter may be accompanied or proxied by ferropigeonite, very rarely by hypersthene and hornblende. In less compact welded tuff, fayalite is iddingsitized and pyroxene argillized. The groundmass range from wholly glassy to cryptocrystalline. A potassium-argon age determined (DKA-1068) on a sample of sanidine from near the base of the welded tuff section at Yellow rock in the Owyhee 15' quadrangle, by John Obradovich (oral commun.; 1965) gave a date of 12.2 ± 0.8 m.y.

- Tcpv COUGAR POINT WELDED TUFF, VITROPHERE UNIT (MIOCENE)--Ignimbrite vitrophere, locally separately mapped
- Tcpo COUGAR POINT WELDED TUFF, LOWER UNIT (MIOCENE)--Ignimbrite similar to main part of Cougar Point Welded Tuff
- Tcpg COUGAR POINT WELDED TUFF, BASAL GRAVEL (MIOCENE)--Gravel, locally separately mapped
- Tjt JENNEY CREEK TUFF (MIOCENE)--Rhyolitic air fall tuff and lapilli tuff, cream to buff, and dark carbonaceous tuff, locally with fossil leaves. Locally combined with Cougar Point Welded Tuff
- Tjr JARBIDGE RHYOLITE (MIOCENE)--Porphyritic rhyolite, with cryptocrystalline or glassy groundmass, locally spherulitic. Phenocrysts very abundant, include quartz up to 5 mm in diameter, sanidine phenocrysts somewhat smaller and less numerous, oligoclase similar in size but scarcer. Clinopyroxene recognizable in glassy phases only, and is generally pigeonite. Accessories include zircon, apatite, ilmenite, magnetite; very rarely topaz (which may be secondary) or pale pink garnet. Two K-Ar dates, one from Meadow Creek, in the Rowland quadrangle, of 16.8 ± 0.5 m.y. (Coats, 1964, p. M11), the other from a basal vitrophyre in the Wildhorse quadrangle, of 15.4 m.y. (Evernden and others, 1964, p. 194). Total thickness may be 600 m
- Twt WELDED LAPILLI TUFF OF WALL CREEK (MIOCENE)--Medium- to dark-gray welded tuff and welded lapilli tuffs, phenorhyodacite to phenorhyolite. Phenocrysts include plagioclase and sanidine, commonly with quartz and/or ferroaugite, and rarely ferropigeonite. Contains coarse glassy lapilli, flow structure common. A few small bodies near west boundary of map area, north of Ditch Creek. K-Ar age determinations on plagioclase-sanidine composite grains from five different localities, four by John Obradovich (oral commun., 1966) and one by Richard Marvin (oral commun., 1967) gave ages ranging from 15 ± 0.8 to 16 ± 0.8 m.y.
- Tsb SEVENTY SIX BASALT (MIOCENE)--Flows of porphyritic olivine basalt, with conspicuous clear phenocrysts of labradorite, up to 2 cm in size, in a subophitic groundmass with plates of purplish augite including grains of olivine, labradorite, magnetite, ilmenite, and apatite. Local patches of mesostasis made up of biotite and sanidine. Locally interbedded with tuff, Tsbt
- Tsbt SEVENTY SIX BASALT, TUFF UNIT (MIOCENE)--Dull-greenish-gray, now nontronitic, with plagioclase crystals like those in flows of Seventy Six Basalt. Crystals of plagioclase from the tuff on Roughtop Mountain gave an age of 22.9 ± 3 m.y. (J. C. von Essen, Menlo Park, Potassium-Argon age report 51, October 15, 1969). Tuffaceous sandstone made up of this basaltic material furnished horse remains of Barstovian age (C. A., Repenning, oral commun., 1965). Possibly some of the tuff was reworked in Barstovian time; the earlier age given by the K-Ar determination is used here for

the age of the volcanic rocks

- Ts* SEVENTY SIX BASALT WITH TUFF UNIT, UNDIVIDED (MIOCENE)--Shown in cross sections
- Tba BIEROTH ANDESITE OF BUSHNELL (1967) (OLIGOCENE?)--Biotite-hypersthene phenodacite welded tuff, with plentiful phenocrysts of plagioclase, sanidine, brown biotite, nontronite after (?)hypersthene. Shard structure clear, but pectinate recrystallization common. Glassier phases may have olive-green hornblende and may lack sanidine and quartz. Type locality is at Bieroth Spring, near the western edge of the Rowland quadrangle. Present near southeast corner of map area
- Tmb MUSTANG BUTTE GRAVEL (OLIGOCENE)--Chiefly coarse, poorly sorted boulder gravel, with angular fragments of granodiorite and of rocks derived from the Reservation Hill, Nelson, and Banner Formations. Oligocene age established by K-Ar date on an interlayered welded tuff, described below. Locally, the unit may include some masses of younger, possibly Miocene, tuff and gravel
- Tmwt MUSTANG BUTTE GRAVEL, WELDED TUFF UNIT (OLIGOCENE)--Phenodacite welded tuff containing phenocrysts of biotite, hornblende, quartz, oligoclase, and accessory zircon, apatite, and perrierite. Biotite from this bed was assigned an age of 38.0 m.y. by E. H. McKee (McKee and others, 1976, date no. 20). Interlayered with Mustang Butte Gravel in northeast part of map area
- Tsd PHENODACITE AND PHENOANDESITE IGIMBRITE OF SALMON SPRINGS (EOCENE)--Crystal-rich ignimbrite, generally devitrified, and relatively fine grained, part contains phenocrysts of quartz, plagioclase (mostly oligoclase), and biotite with local sanidine; another cooling unit includes phenocrysts of plagioclase, biotite, green hornblende, augite, and hypersthene. Present in northwest part of map area around Alder Mountain. Rests on ignimbrite of Reed Creek, locally overlain by gravel of Mustang Butte
- Trc PHENORHYODACITE IGIMBRITE OF REED CREEK (EOCENE)--Welded tuff with abundant phenocrysts, principally quartz, plagioclase, and biotite; locally with hornblende. Magnetite, apatite, and zircon common accessories. One sanidine and one biotite from separate localities gave an age of 39.6 ± 2.0 m.y. (Eocene or Oligocene) by K-Ar analyses (John Obradovich, written commun., 1965, Lab nos. DKA-1073 and DKA-1070). Locally opalized, bleached, and iron stained
- Tjd DACITE OF JONES CREEK (EOCENE)--Phenodacitic ignimbrite, compact to moderately compact, with conspicuous phenocrysts of plagioclase, augite, hypersthene, hornblende, and biotite, grading by increase of quartz and sanidine into a phenorhyodacite. Present near southwest corner of map area
- Tyb IGIMBRITES OF YANKEE BILL SUMMIT (EOCENE)--Welded phenoandesite and phenodacite tuff, ranging from light-brown to black dosemic to semihyaline, glassy constituents now partly crystallized with

pectinate structures. Phenocrysts plagioclase, hypersthene, commonly augite, rare hornblende, and sparse biotite. Magnetite and apatite nearly ubiquitous. Present near southwest corner of map area

- Tmt MICACEOUS IGNIMBRITE (EOCENE)--Found only on west slope of Alder Mountain, near northwest corner of map area. medium-gray vitrophyric crystal-rich welded tuff, with marked fissility. Phenocrysts consist of andesine (An_{37-46}), biotite, hornblende, hypersthene, and augite with minor magnetite, quartz, apatite, and zircon. About 20 m thick. Date of 43.5 m.y. determined on biotite from tuff by John Obradovich (DKA-1074)
- Tmg GRAVEL--(EOCENE)--Locally underlies Micaceous ignimbrite
- Tsl PHENOANDESITE IGNIMBRITE OF SALMON CREEK (EOCENE)--Light-gray to light-brownish-red ignimbrite, sparse phenocryst include biotite, plagioclase, and local hornblende with accessory magnetite, apatite, and zircon. Mostly devitrified
- Tab BIOTITE VITROPHYRE OF ALDER MOUNTAIN (EOCENE)--Vitric welded tuff of similar composition to phenoandesite ignimbrite of Salmon Creek
- Tlb PHENOANDESITIC BRECCIA (EOCENE)--Crumble breccia or mudflow of similar composition to phenoandesite of Salmon Creek
- Kg GRANITE (IN THE BROAD SENSE ACCORDING TO STRECKEISEN, 1967) (CRETACEOUS)--Includes granodiorite and quartz monzonite of previous usage. Generally contains both biotite and hornblende, locally contains perthitic orthoclase megacrysts. Includes marginal microcline-microperthite aplite, locally separately mapped (Ka). Includes some pegmatite, locally separately mapped (Kp). Also includes migmatitic zones adjacent to country rock locally separately mapped (Km).
- Ka APLITE (CRETACEOUS)--Microcline-microperthite aplite, marginal to Granite (Ka)
- Kp PEGMATITE (CRETACEOUS)--Related to Granite (Ka)
- Kmg MIGMATITE (CRETACEOUS)--Mixtures of Granite (Ka) and intruded country rocks
- Jd DIORITE, QUARTZ DIORITE, AND GRANODIORITE (JURASSIC?)--Diorite consisting of andesine and hornblende, with accessory apatite and sphene, secondary chlorite, clinozoisite, calcite, and sphene. Hornblende partially recrystallized to pale-green actinolite. Unit also includes hornblende-biotite quartz diorite and granodiorite. A sample of biotite from the Enright Hill Stock (south-central prt of map area) was dated by E. H. McKee (written commun., 1979) at 110.9 ± 1 m.y. (Cretaceous). Metamorphism of this body and the presence of adjacent Cretaceous intrusions suggest that this date may be reset, therefore an age of Jurassic(?) is assigned

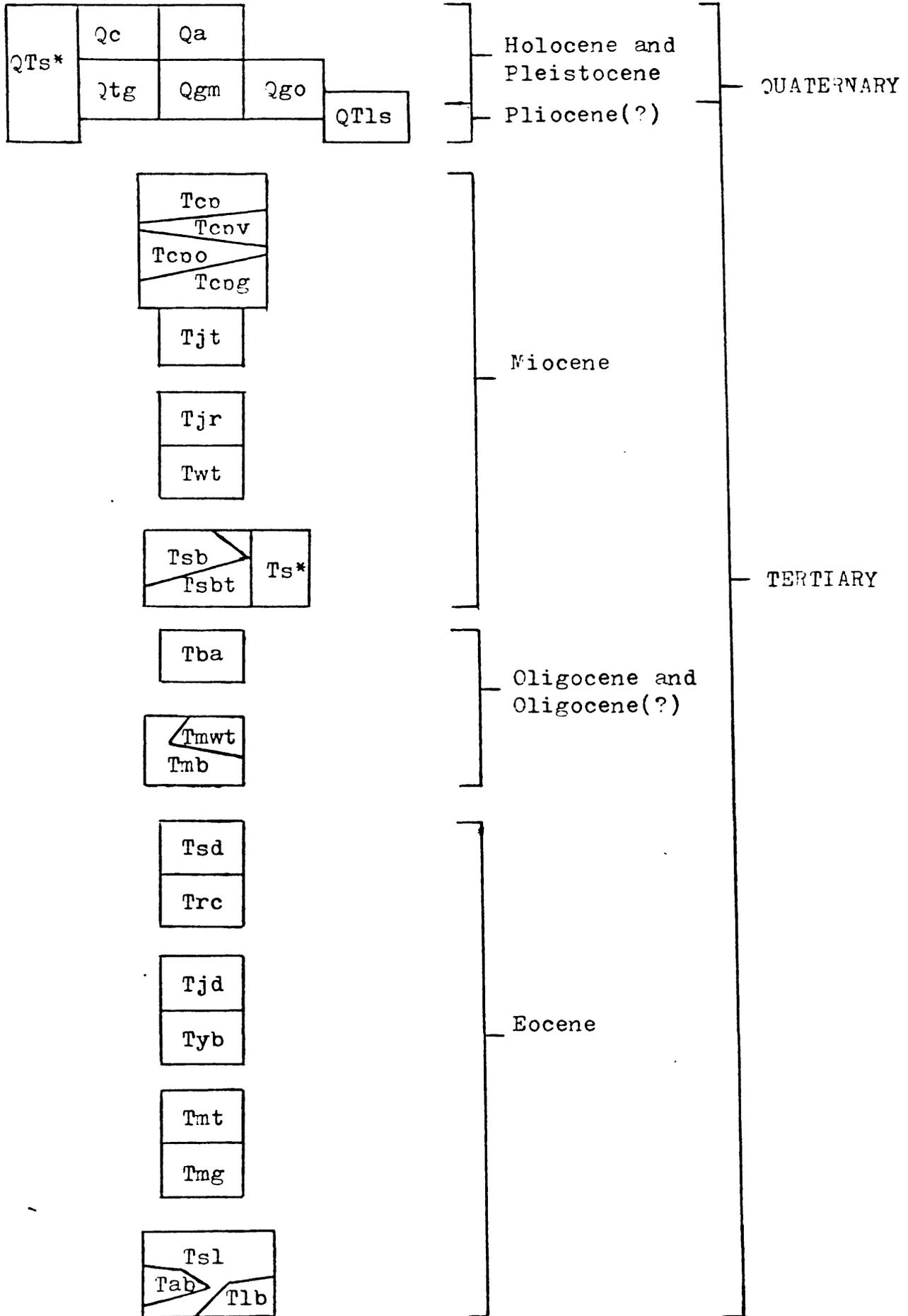
- P Prh RESERVATION HILL FORMATION (PERMIAN? AND PENNSYLVANIAN?)--Mostly fine grained dolomitic metasandstone and siltstone; pale gray, weathering white or pale reddish brown, in beds 2 cm to 5 cm thick, interbedded regularly with thinner beds of graphitic phyllite. The dolomitic meta-sandstone is composed of various combinations of quartz, calcite, tremolite, diopside, and wolastonite, the last locally coarsely prismatic. Also present are metagraywacke, micaceous and tremolitic quartzite, rare metachert, actinolite-epidote-plagioclase schist derived from andesite and hornblende plagioclase schist. A few lenses of gray, siliceous dolomitic limestone, locally with coarse calcitic "eyes" suggesting former presence of crinoids
- Mdc DIAMOND PEAK AND CHAINMAN FORMATIONS, UNDIVIDED (MISSISSIPPIAN)-- Present west and south of Enright Hill in the south-central part of the map area. Sandstone, medium to coarse grained with some conglomerate containing clasts of quartz and chert. Locally contains fossils, mostly brachiopods
- Mc CHAINMAN FORMATION (MISSISSIPPIAN)--Forms the top of a sequence including; in descending order, the Nelson Banner, and Grossman formations, all of Mississippian age. Includes the Mountain City Formation (Coats, 1971). Largely quartz-muscovite biotite schist, locally with orthoclase, garnet, or graphite, rarely with andalusite, when thermally metamorphosed. Includes beds, of calc-silicate granulite up to 2 ft thick composed of quartz, calcite, diopside, tremolite, clinozoisite, and orthoclase. Contains a bed of quartz-plagioclase-orthoclase hornfels derived from rhyolite tuff
- Mct CHAINMAN FORMATION, TUFF UNIT (MISSISSIPPIAN)--Present near southwest corner of map area. Rhyolitic to andesitic tuff
- Mn NELSON FORMATION (MISSISSIPPIAN)--Greenschist, locally amphibolite, composed of tremolite-actinolite, chlorite, epidote, calcite, ilmenite, and relict andesine, in part altered to albite. Derived from flows, tuff breccias, and minor sills of andesitic and basaltic composition. Includes one lens of rhyolitic tuff. At the base, locally an extrusive breccia, possibly a peperite, with limy matrix, locally fossiliferous
- Mn1 NELSON FORMATION, LIMESTONE UNIT (MISSISSIPPIAN)--Thin bedded limestone interbedded with greenschist as described above
- Mb BANNER FORMATION (MISSISSIPPIAN)--Soft massive bluish-gray limestone, containing solitary and colonial corals, brachiopods, and bryozoans. Grades downward through medium- to fine-grained brownish quartz arenite and gray tan-weathering siliceous siltstone through arenaceous limestone into conglomerate with rounded white quartzite boulders as much as 15 cm in diameter. Maximum thickness 200 m. Age: Osagian or Meramecian (mid-Mississippian)
- Mg GROSSMAN FORMATION (MISSISSIPPIAN?)--Coarse conglomerate with clasts of gray quartzite, black chert, phyllite, and magnetiferous

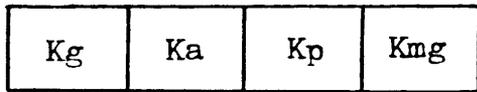
siltstone. Sandstone, siltstone, and phyllite. Formerly regarded as Devonian or Mississippian, but presence of numerous clasts derived from the Valmy suggests that it is younger than the Antler Orogeny. It unconformably underlies the Banner formation

Ov VALMY FORMATION (ORDOVICIAN)--Micaceous quartz-calcarenite and calcareous sandstone, locally containing phyllocarid shells and small lenticular masses of thin-bedded chert with slaty partings, and ranging in color from light to dark gray, rarely black or grayish green; locally phosphatic or baritic. Also contains hard, well-bedded micaceous siltstone and black quartzose phyllite, and micaceous phyllitic limestone, locally phosphatic. Numerous irregular masses of quartz-albite-chlorite schist derived from andesite. Gray to black, locally tan, fine-grained with interlocking textures; rare detrital tourmaline and zircon and, in the black quartzite, carbonaceous material interstitially and disseminated through the quartz grains

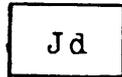
Ovq VALMY FORMATION, QUARTZITE UNIT (ORDOVICIAN)--Gray to black, locally tan, fine-grained with interlocking textures; rare detrital tourmaline and zircon and, in the black quartzite, carbonaceous material interstitially and disseminated through the quartz grains

CORRELATION OF MAP UNITS





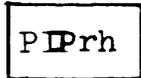
CRETACEOUS



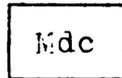
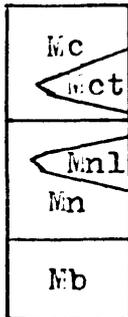
JURASSIC(?)

ALLOCHTHONOUS
UNITS

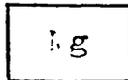
AUTOCHTHONOUS
AND PARAAUTOCHTHONOUS
UNITS



PERMIAN(?) AND
PENNSYLVANIAN(?)

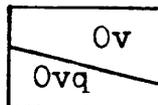


MISSISSIPPIAN



MISSISSIPPIAN(?)

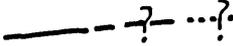
WESTERN FACIES



ORDOVICIAN

Space between boxes indicates unconformity
* indicates shown in cross-section only

SYMBOLS

-  CONTACT
-  FAULTS--Dashed where inferred; dotted where concealed; queried where doubtful
-  Thrust fault
-  High angle fault--Bar and ball on downthrown side; arrows show relative movement
-  STRIKE AND DIP OF BEDS
Inclined
-  Vertical
-  STRIKE AND DIP OF FOLIATION
Inclined
-  STRIKE AND DIP OF CLEAVAGE
Inclined
-  MINOR FOLD AXES
Fold axis--showing plunge