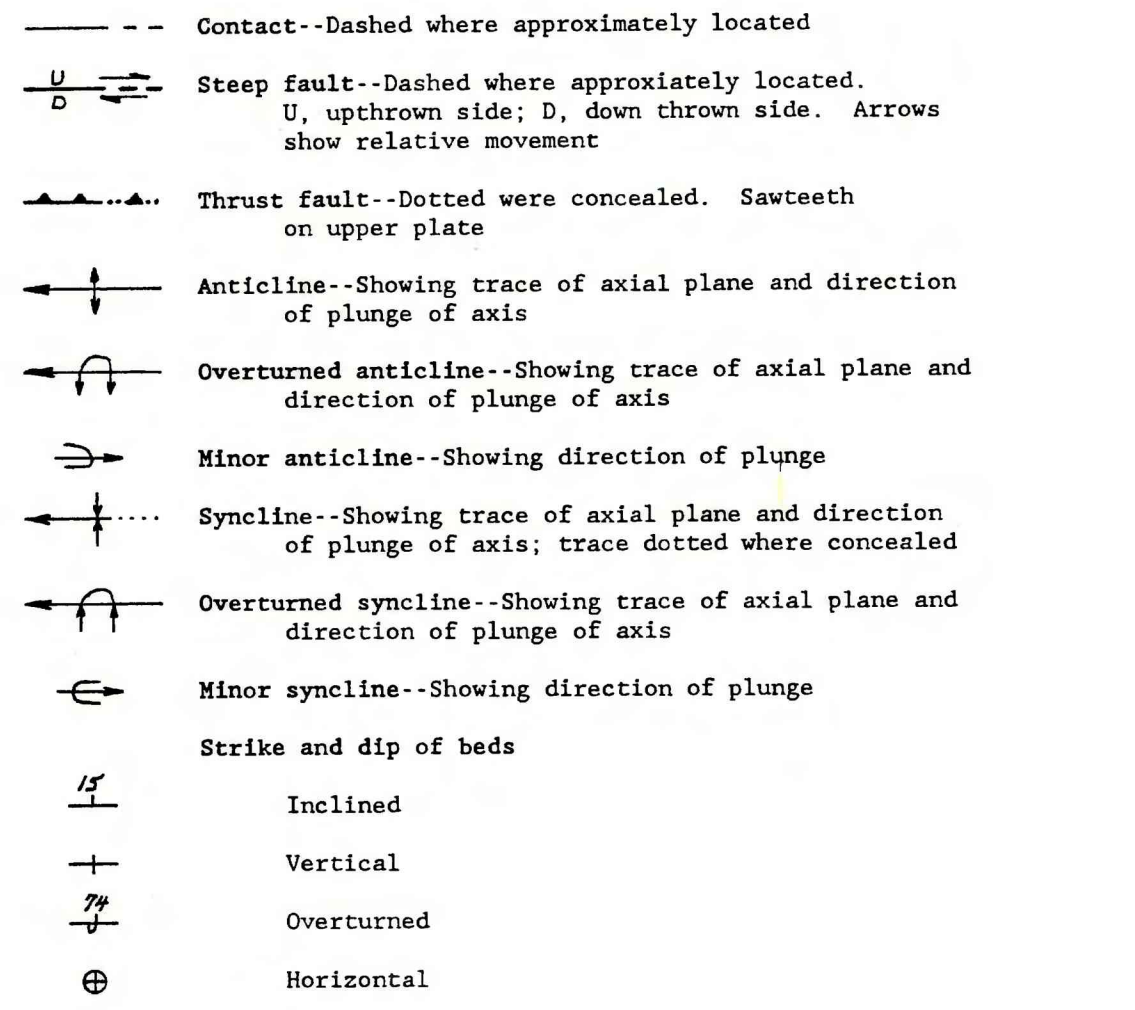


Qac Alluvium and colluvium, undivided (Quaternary)  
Ql Landslide debris (Quaternary)  
Qs Lake deposits (Quaternary)--Light-colored silt, sand, and clay; thin bedded, locally varved. Deposited in Glacial Lake Great Falls in Wisconsin time; 0 ft to more than 60 ft thick  
Kd Ultramafic diatreme (Late Cretaceous)--Alkali basalt, alkali basalt breccia, xenoliths of upper mantle and lower crustal rocks, host rocks, and blocks of overlying sedimentary rocks in a nearly vertical pipe. Alkali basalt is macrocrystal-porphyrific intergranular with xenocrysts and phenocrysts of olivine, clinopyroxene and spinel, and microphenocrysts of clinopyroxene, plagioclase and sanidine in a groundmass of magnetite, zeolites, calcite and devitrified glass. Rounded xenoliths of peridotite (wehrlite, lherzolite and harzburgite), two pyroxene granulite and pyroxenite range to 10 in. across; rounded to subrounded xenocrysts of olivine and chrome diopside range to 3 in. across; abundant rounded to subangular xenoliths of country rock are mostly shale and sandstone of the flanking Flood Member of the Blackleaf Formation and the Kootenai Formation, but also include fragments from Upper Cretaceous rhyodacite welded tuff and upper crustal Precambrian rocks. Inter-basalt areas are occupied by faulted slabs as much as 30 ft across of Flood, Taft Hill, and Vaughn Members of Blackleaf Formation. At south base of Ming bar, NW1/4 sec. 13, T. 13 N., R. 3 W. Basalt (Tertiary or Cretaceous(?) and (or) Precambrian(?))--Dark-greenish-gray rock that contains scattered phenocrysts of augite and olivine in a microcrystalline matrix, generally altered; small dikes and sills; age uncertain: some predate thrust faults and may be Precambrian; others are no older than Late Cretaceous and may be Tertiary  
Kt Trachybasalt and syenogabbro (Late Cretaceous)--Gray, dappled rocks that contain many small phenocrysts of labradorite and augite, and a few phenocrysts of potash feldspar and olivine, in a zeolite-bearing, aphanitic to finely crystalline matrix; in semi-concordant intrusive sheets; probably related to Adel Mountain Volcanics of Lyons (1944)  
Kr Calcic rhyodacite (Late Cretaceous)--Gray-brown aphanitic rock that contains abundant labradorite phenocrysts; widespread amygdalar zones; in semi-concordant intrusive sheets. Equivalent to calcic rhyodacite of Schmidt (1963)  
Ktv Two Medicine Formation (Upper Cretaceous)  
Volcanic member (Upper Cretaceous)--Thick sheets of brown and purple rhyodacite welded tuff; a few flows of calcic rhyodacite and quartz latite lava; related tuff breccia; only lower part exposed; more than 1,200 ft thick  
Ktm Sedimentary member (Upper Cretaceous)--Gray, green, and brown sandstone, siltstone, and mudstone; tongues of dark-gray volcanic wacke that are thicker and more numerous southward; fossiliferous coaly shale at base; only lower part exposed; more than 700 ft thick. Equivalent to Kts and Ktv1 units of Schmidt (1963)  
Kvi Virgelle Sandstone (Upper Cretaceous)--Grayish-green thick-bedded, volcanoclastic sandstone; concretionary; marine; 50-150 ft thick  
Ktc Telegraph Creek Formation (Upper Cretaceous)--Alternating gray, limy, buffaceous sandstone and gray shale; marine; 250-350 ft thick  
Kmk Maries River Shale (Upper Cretaceous)  
Kevin Shale Member (Upper Cretaceous)--Dark-gray to black shale; many thin beds of olive-gray siltstone and yellowish-orange bentonite; marine; thickness uncertain owing to ubiquitous deformation: more than 1,000 ft thick where deformed, but probably less than 400 ft thick where undeformed  
Kml Ferdig Shale, Cone Calcareous, and Floweree Members, undivided (Upper Cretaceous)--Upper half, alternating dark-gray silty shale and gray concretionary ledge-forming sandstone (Ferdig Member); lower half, dark-gray shale and limy shale, and a few beds of yellowish-orange bentonite (Cone and Floweree Members); marine; 250-350 ft thick  
Kbv Blackleaf Formation (Upper and Lower Cretaceous)  
Vaughn Member (Upper Cretaceous)--Grayish-green sandstone and siltstone, dark-gray siltstone and shale; buffaceous; thin beds of greenish-gray bentonite; thick pebble conglomerate locally near base; marine; 300-400 ft thick  
Kbt Taft Hill Member (Lower Cretaceous)--Grayish-green sandstone, dark-gray shale, and olive-gray siltstone; marine; 150-250 ft thick  
Kbf Flood Member (Lower Cretaceous)--Upper part is olive-gray ledge-forming sandstone that contains much carbonaceous debris; middle part is dark-gray to black ferruginous shale and olive-gray siltstone; lower part white ledge-forming quartz sandstone; marine; 150-250 ft thick  
Kk Kootenai Formation (Lower Cretaceous)--Purple, maroon, gray, orange, brown, and green siltstone and mudstone, gray to orange-brown sandstone; and dark-brown to gray gastropod-rich limestone near top; beds of grayish-brown ledge-forming salt-and-pepper sandstone, as much as 60 ft thick, at and near base; nonmarine; 600-700 ft thick

Jme Morrison Formation and Ellis Group, undivided (Upper and Middle Jurassic)--Mapped together where Ellis Group is thin or exposures are poor  
Jm Morrison Formation (Upper Jurassic)--Gray to orange-brown ferruginous and calcareous sandstone and siltstone, and greenish-gray to pink and light-red siltstone and mudstone; minor gray-brown limestone; black coaly shale near top; nonmarine; 150-300 ft thick  
Je Ellis Group (Upper and Middle Jurassic)--Thins irregularly northward  
Swift Formation (Upper and Middle Jurassic)--Gray ledge-forming sandstone at top underlain by gray siltstone, and subordinate chert pebble conglomerate and gray limestone; marine; 50-100 ft thick  
Sawtooth Formation (Middle Jurassic)--Yellow-brown limy sandstone and sandy limestone; oyster beds and chert pebble conglomerate at base; marine; 50-100 ft thick  
PFPq Phosphoria and Quadrant Formations, undivided (Permian and Pennsylvanian)  
Phosphoria Formation (Lower Permian)--Brown to gray bedded chert, yellow-brown to olive-gray phosphatic sandstone, sandy dolomitic limestone, and nodular cherty limestone; marine. Generally absent by pre-Ellis erosion, but as much as 70 ft preserved locally, mostly near south-central edge and north of Cottonwood Creek  
Quadrant Formation (Pennsylvanian)--Light-gray to pale-orange quartzitic sandstone, dolomitic limestone near base; marine; forms cliffs, thickness ranges irregularly from 150 ft in south to 0 ft in north  
Fa Amnden Formation (Pennsylvanian)--Red and maroon sandstone and mudstone that grades upward into pink and gray limestone and quartzitic sandstone; limestone pebble conglomerate common at base; marine; limestone forms ledges 200-350 ft thick  
Mhho Big Snowy Group (Upper Mississippian)  
Mbh Heath Formation (Upper Mississippian)--Dark-gray to black, petroliferous limestone and shale, gray-brown limy sandstone, and gray limestone; calcareous beds fossiliferous; marine; 100-200 ft thick  
Mbo Otter Formation (Upper Mississippian)--Gray, green, black, and purple shale, limestone, and siltstone; marine; 200-300 ft thick  
Mbk Kibbey Formation (Upper Mississippian)--Yellowish-gray shale, siltstone, and limestone; subordinate light-gray to black limestone and yellow to orange-gray limy sandstone; dolomite breccia locally at base; marine; 200-300 ft thick  
Mm Madison Group (Upper and Lower Mississippian)  
Mission Canyon Limestone (Upper and Lower Mississippian)--Gray, thick-bedded to massive-weathering fossiliferous limestone, upper part cherty; marine; forms cliffs; many caves in upper few hundred feet; 1,150-1,250 ft thick  
Ml Lodgepole Limestone (Lower Mississippian)--Gray to gray-brown, thin to thick-bedded, fossiliferous limestone; few feet dark-gray shale at base; marine; forms ledges; 750-800 ft thick, but only upper half exposed in map area  
Yg Belt Supergroup (Middle Proterozoic)  
Greyson Formation (Middle Proterozoic)--Dark-gray, green, olive-brown, and yellow-brown siltite, argillite, and minor quartzite; marine; more than 3,000 ft exposed; base cut off by thrust fault, top not exposed



NOTE  
Geologic mapping in the Beartooth Mountain quadrangle was completed in 1966 by G.D. Robinson and M.E. McCallum but remained unpublished. The geologic quadrangle map now is released in the open-files because part of it was used to support study of the Sleeping Giant Wilderness Study Area (Tysdal and others, 1990), some of which occurs within part of the quadrangle. The map has not been modified from the original compilation of Robinson and McCallum. Descriptions of rock units shown on the map remain unchanged, except that McCallum modified the description of the ultramafic diatreme (unit Kd) in 1991. Currently used names of the rock units and currently accepted Period names have been substituted where appropriate, however.

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## PRELIMINARY GEOLOGIC MAP OF THE BEARTOOTH MOUNTAIN QUADRANGLE, LEWIS AND CLARK COUNTY, MONTANA

By  
G. D. Robinson and M. E. McCallum  
1991

This map is preliminary and has not been reviewed for conformity with U. S. Geological Survey editorial standards nor with the North American stratigraphic code.