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DESCRIPTION OF MAP UNITS

SEDIMENTARY AND VOLCANIC ROCKS

- Qs Surficial deposits (Quaternary)—Alluvium in stream channel, flood plain, and terrace deposits; lake, colluvium, landslide deposits, rock glaciers, and glacial deposits (hill, oxbow, and glacial lake deposits)
- Qt Travertine (Quaternary)
- Qv Lava Creek Tuff of Yellowstone Group (Pleistocene)—Rhyolitic ash-flow tuff in Gardner area
- Qb Basalt (Pleistocene)—Basalt flows in Gardner area
- Tv Absaroka Volcanic Supergroup (Eocene)—Volcanic and volcanoclastic rocks including basaltic, andesitic, and diatitic flows and flow breccias, rhyolitic ash-flow tuff and vitrophyre, tuff breccias, lahars, agglomerates, agglutinates, conglomerate, and minor andesitic and diatitic intrative bodies
- TT Fort Union Formation (Paleocene and Late Cretaceous)—Conglomerate, sandstone, and shale
- Kal Andesite (Late Cretaceous)—Lava flows in Sliderock Mountain area
- Kil Lahars of Livingston Group (Late Cretaceous)—Lahar deposits; mostly clast-supported; minor intercalated ash-flow tuff, lava flows, and flow breccias and epidiotic conglomerate, sandstone, siltstone, and mudstone
- Klc Sedimentary rocks of Livingston Group (Late Cretaceous)—Epidiotic conglomerate, sandstone, siltstone, and mudstone
- Kad Andesite (Late Cretaceous)—Lava flows and flow breccias; at or near base of Livingston Group
- Kus Sedimentary rocks (Late Cretaceous)—Includes Eagle Sandstone, Telegraph Creek Formation, Coxy Shale, Premier Formation, and Montana Formation; sandstone and shale
- Kh Sedimentary rocks (Early Cretaceous)—Includes Mowry Shale, Thermophilus Shale, Kootenai Formation, and Cloverly Formation; sandstone, shale, limestone, and conglomerate

- Ku Sedimentary rocks (Early and Late Cretaceous)—Sandstone, shale, limestone, and conglomerate
 - JTRs Sedimentary rocks (Jurassic and Triassic)—Includes Morrison Formation, Ellis Group, and Chagater Formation; sandstone, shale, and limestone
 - PMs Sedimentary rocks (Permian, Pennsylvanian, and Mississippian)—Includes Phosphoria, Clatskanie, and Ammono Formations and Madison Group; limestone, shale, sandstone, and dolomite
 - DOs Sedimentary rocks (Devonian and Ordovician)—Includes Three Forks Shale, Jefferson Formation, and Big Horn Dolomite; shale, limestone, and dolomite
 - OCs Sedimentary rocks (Ordovician and Cambrian)—Includes Big Horn Dolomite, Grove Creek Formation, Snowy Range Formation, Pilgrim Limestone, Park Shale, Meagher Limestone, Wobsey Shale, and Flathead Sandstone; dolomite, limestone, sandstone, siltstone, and shale
 - CS Sedimentary rocks (Cambrian)—Includes Grove Creek Formation, Snowy Range Formation, Pilgrim Limestone, Park Shale, Meagher Limestone, Wobsey Shale, and Flathead Sandstone; limestone, sandstone, siltstone, and shale
 - Pz Undifferentiated sedimentary rocks (Paleozoic)
- INTRUSIVE ROCKS AND BRECCIA PIPES (TERTIARY AND CRETACEOUS)**
- Ti Intermediate and felsic rocks (Eocene)—Dikes, sills, and irregular-shaped bodies; andesite, quartz latite, diatite, and rhyolite; commonly porphyritic
 - Tjp Rhyolite porphyry of Lulu Pass (Eocene)—Laccolith and dikes
 - Tbh Breccia of Homestake mine area (Eocene)—Explosion-collapse breccia pipe composed of blocks of Cambrian sedimentary rocks, porphyritic intrusive rocks, volcanic rocks, and Precambrian gneissic rocks in chloritic matrix; altered and mineralized; intruded by later dikes of rhyolite and quartz latite porphyry
 - Tbs Breccia of Alice E. mine area (Eocene)—Collapse(?) breccia composed of blocks of Cambrian sedimentary rocks in a pulverized rock-four matrix; locally altered and mineralized; intruded by later dikes of quartz latite porphyry
 - Tbm Rhyolite porphyry of Henderson Mountain (Eocene)—Stock and dike

- Th Rhyolite porphyry of Homestake mine area (Eocene)—Stock, sills, dikes, and irregular bodies; contains abundant rounded, commonly embayed, quartz phenocrysts; commonly altered and locally mineralized
- Tfm Complex of Fisher Mountain area (Eocene)—Stock(?) composed of felsite, felsite breccia, and rhyolite porphyry; intruded by rhyolite porphyry and andesitic dikes; strongly foliophanized, silicified, sericitized and (or) argillitized, and pyritized
- Tbs Diorite of Scotch Bonnet Mountain (Eocene)—Stock and irregular-shaped intrusive bodies
- Ta Andesite and trachyandesite porphyry (Eocene)—Sills in Cooke City area
- Tgr Granodiorite porphyry of Emigrant area (Eocene)—Stock near head of Emigrant Creek
- Tdp Diatite porphyry (Eocene)—Stock, laccoliths, sills, dikes, plugs, and irregular-shaped bodies; includes some andesitic and rhyolitic rocks
- Tol Diorite porphyry and basaltic andesite (Eocene)—Small stock (or plug) at head of Mill Creek and plug northwest of Cooke City
- Tmz Monzonitic of Independence area (Eocene)—Stock composed of multiple phases of andesitic intrusive breccia, monzonitic, quartz monzonitic, and quartz monzonitic; cut by minor granite dikes
- TKi Intermediate and felsic intrusive rocks (Tertiary or Late Cretaceous)—Laccoliths, plugs, dikes, sills, and irregular-shaped bodies of fine-grained and porphyritic rhyolite, diatite, quartz latite, andesite, and diorite
- Ka Andesite (Late Cretaceous)—Laccolith in Sliderock Mountain area
- Kd Diorite of Sliderock Mountain (Late Cretaceous)—Stock, variable grain size and textures may indicate multiple phases, locally altered
- Ki Rhyolite and quartz latite porphyry (Late Cretaceous)—Sills, dikes, and irregular-shaped bodies in Goose Lake area
- Kgl Syenite of Goose Lake (Late Cretaceous)—Stock composed of multiple phases of syenite and monzonite of variable grain sizes and textures; locally altered and mineralized
- d Intermediate and mafic intrusive rocks (Eocene and Precambrian)—Dikes and sills of andesite and basalt

INTRUSIVE ROCKS (PRECAMBRIAN)

- mi Mafic intrusive rocks (Archean and Proterozoic)—Includes sills, dikes, stock, and irregular-shaped bodies of alkali olivine dolerite, metadolerite, melanorite, megacrysts, and quartz dolerite and dikes of uncertain or unknown affinities
- Ahd Hornblende quartz diorite (Archean)—Small bodies associated with quartz monzonite of Stillwater area
- Agf Granitic intrusive rocks (Archean)—Includes stocks and irregular-shaped bodies of fine-, medium-, and coarse-grained quartz monzonite and aplite of the Stillwater area and of granite in the Gardner area
- Asf Stillwater Igneous Complex (Archean)—Stratiform mafic to ultramafic rocks; divided into seven units as follows:
 - Asw7 Upper mixed, upper gabbros, and upper anorthositic zones
 - Asw6 Middle anorthositic zone
 - Asw5 Lower mixed, middle gabbros, and middle mixed zones
 - Asw4 Lower anorthositic zone
 - Asw3 Noritic and lower gabbro zones
 - Asw2 Bronzitic zone
 - Asw1 Peridotite zone
- Anl Metasedite and metagabbro (Archean)—Stock
- Agn Granitic gneiss (Archean)—Predominantly granitic gneiss and migmatite; commonly consists of alternating bands of more felsic and more mafic gneiss; contains inclusions of metasedimentary and metaigneous rocks
- Au Ultramafic rocks (Archean)—Irregular-shaped bodies and lenses of olivine-bearing rocks and serpentinite

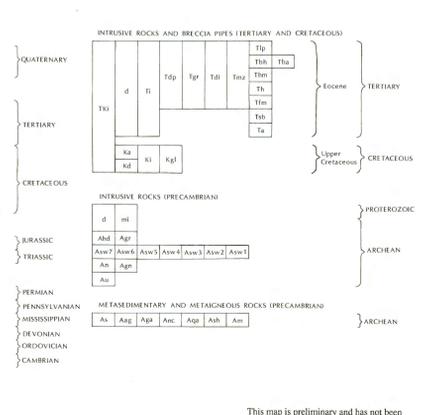
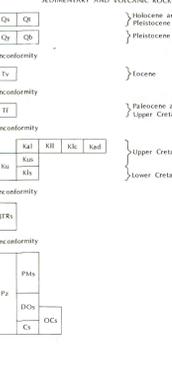
METASEDIMENTARY AND METAIGNEOUS ROCKS (PRECAMBRIAN)

- As Biotite schist (Archean)—Includes minor quartzite, iron formation, and amphibolite
- Agg Amphibolite and hornblende gneiss (Archean)—Mostly tabular and lensoid bodies enclosed in granitic gneiss and migmatite
- Agp Amphibolite and gneiss (Archean)—Includes ironthornitic gneiss-amphibolite, paragneiss, and heterogeneous gneiss sequences; ironthornitic gneiss, tonalitic gneiss, amphibolite; minor schist, quartzite, and iron formation
- Anc Nappe core complex (Archean)—Includes Barney Creek Amphibolite, George Lake Marble, and Jewel Quartzite; amphibolite, dolomitic marble and marble, and quartzite; minor schist and iron formation
- Aqp Quartzite and amphibolite (Archean)—Interfused quartzite and orthoamphibolite; minor schist
- Ash Schist and hornfels (Archean)—Metasedimentary rocks consisting predominantly of schist and hornfels with minor quartzite, amphibolite, and iron formation; contact metamorphosed to hornblende-hornfels and pyroxene-hornfels facies at and near the base of the Stillwater Igneous Complex; host for Homestake-type gold deposits near Jarville
- Am Undifferentiated metamorphic rocks (Archean)—Includes amphibolite, micaceous quartzite, and some gneiss. Also includes some small bodies of chromite-bearing serpentinite

EXPLANATION OF MAP SYMBOLS

- CONTACT—Dashed where approximately located or inferred, dotted where concealed
- FAULT—Dashed where approximately located or inferred, dotted where concealed. Bar and half on downthrown side. U indicates upthrown side; D indicates downthrown side
- MYLONITIC SHEAR ZONE
- TRACE OF SURFACE OF TECTONIC DENUDATION OF HEART MOUNTAIN DETACHMENT—Dashed where approximately located. This surface occurs near Cooke City within the map area
- THRUST FAULT—Dashed where approximately located or inferred, dotted where concealed. Sawtooth on upper plane
- TRACE OF AXIAL PLANE OF MAJOR ANTICLINE
- TRACE OF AXIAL PLANE OF MAJOR SYNCLINE

CORRELATION OF MAP UNITS



GENERALIZED GEOLOGIC MAP OF THE ABSAROKA-BEARTOOTH STUDY AREA, SOUTH-CENTRAL MONTANA

By
B.S. Van Gosen, J.E. Elliott, E.J. LaRock, E.A. du Bray, R.R. Carlson, and M.L. Zientek
1993

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.