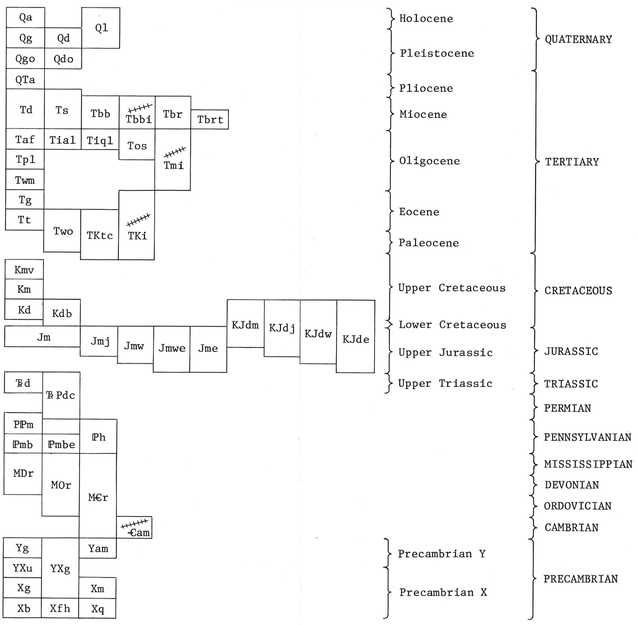
MISCELLANEOUS FIELD STUDIES
MAP MF-761
MONTROSE 1°x 2° QUAD., COLORADO

CORRELATION OF MAP UNITS



CONTACT

FAULT--Dotted where concealed. Bar and ball on downthrown side

THRUST FAULT--Dotted where concealed. Sawteeth on upper plate

DESCRIPTION OF MAP UNITS

(Formations for which no map symbols are shown are grouped with other stratigraphic units to form map units)

Qa ALLUVIUM (HOLOCENE)--Gravel, sand, and silt in stream valleys and alluvial fans

Ql LANDSLIDE DEPOSITS (HOLOCENE AND PLEISTOCENE)--Includes some rock glaciers and talus

UNCONSOLIDATED DEPOSITS (PLEISTOCENE):

Qg Young gravels (Bull Lake and younger)--Stream, terrace, and outwash gravels

Qd Young glacial drift (Bull Lake and younger)--Unsorted bouldery glacial deposits (till) and associated sand and gravel deposits

Qgo Old gravels and alluviums (pre-Bull Lake)--Terrace, outwash, and pediment gravels

Qdo Old glacial drift (pre-Bull Lake)--Unsorted bouldery glacial deposits (till) and associated gravels; morainal form subdued or lacking

QTa HIGH-LEVEL ALLUVIUM (PLEISTOCENE AND/OR PLIOCENE)--Bouldery alluvial deposits high above modern streams

Td DRY UNION FORMATION (PLIOCENE AND MIOCENE)--Light-brown sandy siltstone and interbedded friable sandstone, conglomerate, and volcanic ash. Thickness >5,000 ft (1,500 m) west of Salida

Ts SANTA FE FORMATION (PLIOCENE AND MIOCENE)--Light-brown sandy siltstone and friable sandstone. Name is applied in San Luis Valley to rocks generally equivalent to Dry Union Formation in Arkansas River valley

Tbb BASALT OF BIMODAL SUITE (MIOCENE)--Dense black resistant lava flows 5-200 ft (1.6-61 m) thick, and interbedded tuffs, breccias, and volcanic conglomerates

Tbbi BASALTIC INTRUSIVE ROCKS (MIOCENE)--Dikes and plugs

++++++ Dike

Tbr RHYOLITIC ROCKS OF BIMODAL SUITE (MIOCENE)--In plugs, dikes, sills, laccoliths, and small stocks

Tbrt RHYOLITIC ASH-FLOW TUFF OF BIMODAL SUITE (MIOCENE)--Represented only by Sunshine Peak Tuff in small area near Lake City

Taf ASH-FLOW TUFF (OLIGOCENE)--Ash-flow tuffs from caldera sources in the San Juan Mountains and in the Sawatch Range. Range from crystal-poor rhyolite to crystal-rich quartz latite. Degree of welding varies widely from unit to unit, and with distance from source. Includes several named tuff units in northern part of San Juan volcanic field (Olson and others, 1968; Steven and others, 1974)

Tial INTER-ASH FLOW ANDESITIC LAVAS AND BRECCIAS (OLIGOCENE)--Fine-grained to porphyritic intermediate lavas and breccias from many local centers

Tiql INTER-ASH FLOW QUARTZ LATITIC LAVAS AND BRECCIAS (OLIGOCENE)--Porphyritic quartz latite and minor rhyolite in thick flows and associated breccias

Tos OLIGOCENE SEDIMENTARY DEPOSITS--Gravels, water-laid tuffs, sands, and silts in various stratigraphic positions within the volcanic sequence. Coarse gravels northwest of Parlin consist principally of Precambrian rocks derived from Sawatch Range

Tmi MIDDLE TERTIARY INTRUSIVE ROCKS (MIOCENE AND OLIGOCENE)--Granodioritic, quartz monzonitic, and granitic rocks in stocks, dikes, sills, laccoliths, and irregular bodies

++++++ Dike or sill

Tpl PRE-ASH FLOW ANDESITIC LAVAS AND BRECCIAS (OLIGOCENE--Vent-facies lavas and breccias at numerous widely scattered volcano sources surrounded by coalescing aprons of volcaniclastic debris. Includes extensive bodies of San Juan, Lake Fork, Conejos, and West Elk Formations as well as many local units

Twm WALL MOUNTAIN TUFF (OLIGOCENE)--Reddish-brown densely welded moderately crystal-rich rhyolite ash-flow tuff. Maximum thickness about 500 ft (150 m), but generally is 100 ft (30 m) or less. Tuff is of Sawatch Range provenance and older than the tuffs of San Juan provenance; preserved in quadrangle only in small bodies in Arkansas River valley and Mosquito Range

Tg GREEN RIVER FORMATION (EOCENE)--Marlstone, oil shale, siltstone, and sandstone. Thin bodies near northwest corner of quadrangle are near the southern depositional edge of the formation

Tt TELLURIDE CONGLOMERATE (EOCENE)--Light-gray to red conglomerate, grit, and sandstone, and lesser quantities of mudstone and shale. Maximum thickness about 500 ft (150 m)

WASATCH FORMATION (EOCENE AND PALEOCENE)--Variegated claystone, siltstone, sandstone, and conglomerate. Maximum thickness about 1,800 ft (550 m)

OHIO CREEK FORMATION (PALEOCENE)--Sandstone and conglomerate. Thickness about 400 ft (120 m)

Two WASATCH AND OHIO CREEK FORMATIONS

TKtc TELLURIDE CONGLOMERATE (EOCENE) AND CIMARRON RIDGE FORMATION (UPPER CRETACEOUS)

Cimarron Ridge Formation--Interbedded rhyodacitic conglomerate, laharic breccia, and flow breccia. Maximum thickness about 600 ft (183 m)

TKi LARAMIDE INTRUSIVE ROCKS (EOCENE, PALEOCENE, AND UPPER CRETACEOUS)--Granodioritic and quartz monzonitic stocks, sills, and dikes

++++++ Dike or sill

Kmv MESAVERDE FORMATION (UPPER CRETACEOUS)--Brown to gray, fine- to medium-grained sandstone and gray shale; commercially important coal beds in lower part; Rollins Sandstone Member at base. Maximum thickness about 2,300 ft (700 m)

Km MANCOS SHALE (UPPER CRETACEOUS)--Dark-gray to dark-brown clay shale; locally calcareous or sandy. Maximum thickness >5,000 ft (1.5 km)

Kd DAKOTA SANDSTONE (UPPER CRETACEOUS)--Light-gray to light-brown resistant sandstone, locally carbonaceous; some dark-gray carbonaceous shale, coal beds, and chert-pebble conglomerate. Maximum thickness about 200 ft (60 m)

BURRO CANYON FORMATION (LOWER CRETACEOUS)--Light-gray lenticular chert-pebble conglomerate and sandstone; light-gray to green claystone. Maximum thickness about 100 ft (30 m); eastward from Gunnison, formation is present only in sporadic lenses

Kdb DAKOTA AND BURRO CANYON FORMATIONS

Jm MORRISON FORMATION (UPPER JURASSIC)--In west part of quadrangle, consists of variegated mudstone, shale, and sandstone of Brushy Basin Member and light-gray sandstone of underlying Salt Wash Member; thickness about 500 ft (150 m). Salt Wash wedges out and Brushy Basin thins eastward; thickness <200 ft (60 m) in some eastern exposures

JUNCTION CREEK SANDSTONE (UPPER JURASSIC)--Light-yellow to white crossbedded sandstone. Maximum thickness 180 ft (55 m); thins northeastward and wedges out near Taylor River. Mapped as a member of the Wanakah Formation along Black Canyon of the Gunnison River

Jmj MORRISON FORMATION AND JUNCTION CREEK SANDSTONE

WANAKAH FORMATION (UPPER JURASSIC)--In western part of quadrangle, consists from top down of: (1) interbedded gray mudstone and cherty algal limestone; (2) Junction Creek Sandstone Member; (3) gypsiferous mudstone and sandstone; and (4) Pony Express Limestone Member. Maximum thickness about 300 ft (90 m); all parts except Junction Creek wedge out eastward near mouth of Lake Fork of Gunnison River

Jmw MORRISON AND WANAKAH FORMATIONS

ENTRADA SANDSTONE (UPPER JURASSIC)--Pale-orange, white, and pink crossbedded eolian sandstone. Maximum thickness 85 ft (26 m). Present in western and north-central parts of quadrangle; wedges out eastward and southward, respectively, from those localities

Jmwe MORRISON FORMATION, WANAKAH FORMATION, AND ENTRADA SANDSTONE

Jme MORRISON AND ENTRADA FORMATIONS

KJdm DAKOTA AND MORRISON FORMATIONS

KJdj DAKOTA, ± BURRO CANYON, AND MORRISON AND JUNCTION CREEK FORMATIONS

KJdw DAKOTA, BURRO CANYON, MORRISON, AND WANAKAH FORMATIONS

KJde DAKOTA, MORRISON, AND ENTRADA FORMATIONS

TRd DOLORES FORMATION (UPPER TRIASSIC)--Red, brown, and gray siltstone and sandstone. Thickness >400 ft (122 m) at southwest corner of quadrangle; thins eastward beneath pre-Entrada unconformity to about 80 ft (25 m) near Ouray and 40 ft (12 m) at Cow Creek, about 5 mi (8 km) to the east

CUTLER FORMATION (PERMIAN)--Arkosic red sandstone, shale, and siltstone. Thickness ranges from 0 to 2,000 ft (0 to 610 m) beneath pre-Dolores unconformity. Exposed only near Ouray and Cow Creek

TRPdc DOLORES AND CUTLER FORMATIONS

PPm MAROON FORMATION (PERMIAN AND PENNSYLVANIAN)--Maroon and grayish-red sandstone, conglomerate, and mudstone. Thickness >9,500 ft (2.9 km) near north edge of quadrangle; wedges out southward between Cement Creek and Taylor River by combination of depositional thinning and truncation beneath pre-Entrada unconformity

MINTURN FORMATION (PENNSYLVANIAN)--Gray, pale-yellow, and red sandstone, grit, conglomerate, and shale, and scattered beds of limestone. Includes rocks of Gothic Formation of Langenheim (1952). Evaporitic facies present in northeast corner of quadrangle. Maximum preserved thickness 4,000 ft (1,200 m) in Garfield area; in north-central part of quadrangle, unit thins southward by combination of depositional thinning and truncation beneath pre-Entrada unconformity, and wedges out at Taylor River

BELDEN FORMATION (PENNSYLVANIAN)--Dark-gray to black shale, carbonate rocks, and sandstone. Includes Kerber Formation (Pennsylvanian) of Bonanza area, and thin lenses of Molas Formation (Pennsylvanian) in north-central part of quadrangle. Maximum thickness 1,700 ft (515 m) in northeast corner of quadrangle. Thins depositionally to west and southwest and is absent at Taylor River

PPmb MINTURN AND BELDEN FORMATIONS

PPmbe Evaporite-bearing facies of Minturn and Belden Formations--Mapped only in South Park in northeast corner of quadrangle

PPh HERMOSA FORMATION (PENNSYLVANIAN)--Red and gray arkosic sandstone, conglomerate, and shale, and scattered beds of limestone. Mapped only in Ouray area, where thickness is about 1,500 ft (450 m)

MDr MISSISSIPPIAN AND DEVONIAN ROCKS--Consists of Leadville Limestone (Mississippian), Ouray Limestone (Devonian), and Elbert Formation (Devonian) exposed near Ouray. Leadville thickness ranges from 180 to 235 ft (55-72 m) beneath pre-Hermosa unconformity; Ouray thickness is 70 ft (21 m); Elbert thickness is about 40 ft (12 m)

MOr MISSISSIPPIAN, DEVONIAN, AND ORDOVICIAN ROCKS--Consists of Leadville Limestone (Mississippian), Chaffee Group (Ordovician), Harding Sandstone (Ordovician), and Manitou Dolomite (Ordovician) in eastern part of quadrangle. Leadville thickness 0-400 ft (0-122 m) beneath pre-Belden unconformity. Chaffee Group consists of Gilman Sandstone (Mississippian or Devonian), Dyer Dolomite (Mississippian? and Devonian), and Parting Formation (Devonian). Maximum thickness of group is 300 ft (91 m). Thicknesses of Ordovician units vary beneath pre-Parting, pre-Fremont, and pre-Harding unconformities; total maximum at one place, about 500 ft (152 m) in Kerber Creek area 10 mi (16 km) northeast of Saguache

MCr MISSISSIPPIAN, DEVONIAN, ORDOVICIAN, AND CAMBRIAN ROCKS--Combination of formations as in MOr unit plus Peerless Formation (Cambrian) and underlying Sawatch Quartzite (Cambrian) on western side of Sawatch Range and near Buffalo Peaks in northeast corner of quadrangle. Peerless and Sawatch thickness about 300 ft (90 m) in Elk Mountains at north edge of quadrangle; Peerless wedges out southward beneath pre-Manitou unconformity near Taylor River, and Sawatch wedges out between White Pine and Garfield. Overlying Ordovician units thin and wedge out in opposite direction; Fremont and Harding disappear near Taylor River

Ꞓam CAMBRIAN ALKALIC AND MAFIC INTRUSIVE ROCKS--Includes alkalic complex at Iron Hill near Powderhorn and diabase dikes along trend of Cimarron and Red Rocks faults. Alkalic complex is of earliest Cambrian age or may straddle the Cambrian-Precambrian boundary; analytical uncertainties in age determinations would permit diabase dikes to be Ordovician

++++++ Dike

Yg GRANITIC ROCKS (PRECAMBRIAN Y--~ 1,400 m.y. AGE GROUP)--Includes Vernal Mesa and Curecanti Quartz Monzonites and equivalent rocks

Yam ALKALIC AND MAFIC ROCKS (PRECAMBRIAN Y--~ 1,400 m.y. AGE GROUP)--In northwest-trending line of small plutons near Cebolla Creek

YXu UNCOMPAHGRE FORMATION (PRECAMBRIAN Y AND X?)--Quartzite and slate exposed in canyon of Uncompahgre River south of Ouray. Exposed thickness >3,000 ft (915 m)

YXg PRECAMBRIAN Y AND PRECAMBRIAN X GRANITIC ROCKS, UNDIVIDED--Includes granite of problematic age along Spring Creek north of Taylor River, and an area of mixed 1,400- and 1,700-m.y.-old granites in northeast corner of quadrangle

Xg GRANITIC ROCKS (PRECAMBRIAN X--~ 1,700 m.y. AGE GROUP)--Includes Denny Creek Granodiorite Gneiss, Kroenke Granodiorite, Pitts Meadow Granodiorite, Browns Pass Quartz Monzonite, rocks mapped previously as Pikes Peak and Silver Plume Granites in Garfield quadrangle (Dings and Robinson, 1957), and related rocks

Xm MAFIC INTRUSIVE ROCKS (PRECAMBRIAN X)--Gabbro and mafic diorites and monzonites in small plutons

Xb BIOTITIC GNEISSES AND MIGMATITE (PRECAMBRIAN X)--Contains minor interlayered hornblende gneiss and calc-silicate rocks and, in places, much pegmatite

Xfh INTERLAYERED FELSIC AND HORNBLENDIC GNEISSES (PRECAMBRIAN X)--Includes metarhyolites, metabasalts, and interbedded metagraywackes as well as more highly metamorphosed gneisses

Xq QUARTZITE (PRECAMBRIAN X)--Dark-gray to white arkosic quartzite and conglomerate. Many lenses in Xfh and Xb map units are too small to show at map scale

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