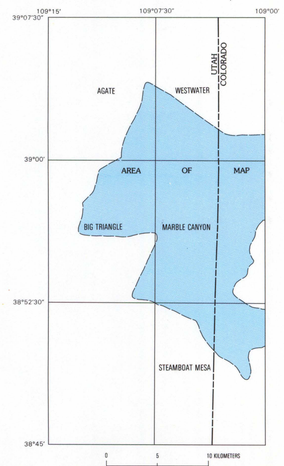
U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

MISCELLANEOUS INVESTIGATIONS SERIES
MAP I–2088 (SHEET 1 OF 2)
Explanatory pamphlet accompanies map



LOCATION OF 1:24,000-SCALE QUADRANGLES AND AREA OF MAP

Base from U.S. Geological Survey, Marble Canyon, Steamboat Mesa, Westwater, 1985; Agate, Big Triangle, provisional edition 1985
Lambert Conformal Conic projection

APPROXIMATE MEAN DECLINATION, 1991

UTAH COLORADO
AREA OF MAP

SCALE 1:24 000
1 ½ 0 1 MILE
1 .5 0 1 KILOMETER
CONTOUR INTERVAL 40 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

CORRELATION OF MAP UNITS

Qs, Qal, Qc, Qf, Qls		QUATERNARY
QTg		QUATERNARY AND TERTIARY(?)
Unconformity		
Jms	Upper Jurassic	JURASSIC
Jmtu	Upper Jurassic	JURASSIC
Jmtl	Upper Jurassic	JURASSIC
Je	Middle Jurassic	JURASSIC
Trk	Upper Triassic(?)	TRIASSIC (?)
Trw	Upper Triassic	TRIASSIC
Trc	Upper Triassic	TRIASSIC
Trm	Middle(?) and Lower Triassic	TRIASSIC
Unconformity		
Pc	Lower Permian	PERMIAN
Unconformity		
Yq, Ya, Yp, Yl		MIDDLE PROTEROZOIC
Yv, Yvz, Ybg		MIDDLE PROTEROZOIC
YXp, YXd		MIDDLE AND EARLY PROTEROZOIC(?)
Xgg, Xbm, Xpmg, Xa, Xq, Xfg		EARLY PROTEROZOIC

DESCRIPTION OF MAP UNITS

[Map-unit symbols may be combined (Yv + Yp), and unit listed first predominates]

Qs **Surficial deposits, undivided (Quaternary)**—Principally alluvium, colluvium, and eolian deposits

Qal **Alluvium**—Includes some terrace deposits and colluvium

Qc **Colluvium**—Includes some landslide, eolian, alluvial, and fan deposits

Qf **Fan deposits**—Includes some colluvium and alluvium. Angular to subrounded pebble and boulder gravel, sandstone, and siltstone

Qls **Landslide deposits**

QTg **Terrace and channel gravels (Quaternary and Tertiary?)**—Pebble and cobble gravels containing quartz and clasts of sedimentary rock, Proterozoic metamorphic and igneous rock, and Tertiary porphyritic volcanic rock

Morrison Formation (Upper Jurassic)

Jms **Salt Wash Member**—Lenticular, crossbedded sandstone, conglomerate, siltstone, and mudstone. Sandstone and conglomerate are buff, cream, or gray. Mudstones are variegated green, tan, or maroon. Only basal part of unit exposed along western parts of Dry Gulch and Little Dolores River fault zones

Tidwell(?) Member

Jmtu **Upper limestone part**—Gray, massive, lenticular; forms low cliff. Exposed only along western part of Dry Gulch fault zone. Exposed thickness about 3 to 4.5 m

Jmtl **Lower part**—Thin-bedded siltstone, sandstone, and mudstone; reddish to brownish. Probably lacustrine or lagoonal. Exposed thickness about 9 to 11 m. Exposed near western ends of Dry Gulch and Little Dolores River fault zones

Je **Entrada Sandstone (Middle Jurassic)**—Massive, crossbedded, cream, yellow, or pink quartzose sandstone. About 30 to 45 m exposed along western ends of Little Dolores River and Dry Gulch fault zones; thickens southwestward

Trk **Kayenta Formation (Upper Triassic?)**—Slabby, crossbedded to massive, buff to reddish-brown sandstone; reddish-purple siltstone; brownish mudstone. Forms rim rock and mesa caps over most of map area. Minimum exposed thickness about 30 m; thickens southwestward. Contact with Wingate Sandstone is approximate

Trw **Wingate Sandstone (Upper Triassic)**—Massive, crossbedded, buff to pinkish brown; forms cliff. Thickness about 120 m; thickens southwestward

Trc **Chinle Formation (Upper Triassic)**—Thin-bedded siltstone, mudstone, and sandstone; brownish red to brick red. About 12 to 37 m thick; thickens southwestward

Trm **Moenkopi Formation(?) (Middle? and Lower Triassic)**—Siltstone, sandstone, mudstone, and lenses of conglomerate. Exposed only in southern part of map area in Ryan Creek fault zone. Minimum exposed thickness about 30 m; thickens southwestward

Pc **Cutler Formation (Lower Permian)**—Variegated chocolate-red, brown, and purple arkosic sandstone, pebble and cobble conglomerate, and red siltstone. Exposed only in southern part of area in Ryan Creek fault zone. Minimum exposed thickness about 100 m in Granite Creek; thickens southwestward

Yq **Quartz pegmatite (Middle Proterozoic)**—Large body composed mainly of fine- to coarse-grained quartz. Local feldspar-quartz pegmatite. Exposed north of Ryan Creek

Ya **Aplite (Middle Proterozoic)**—Dikes and sills of fine- to medium-grained quartz-feldspar-mica rock; commonly pinkish. Thickness ranges from 5 cm to 30 m or more. Widespread

Yp **Pegmatite (Middle Proterozoic)**—Medium- to coarse-grained, pinkish to whitish rock composed of various proportions of quartz, potassium feldspar, plagioclase, biotite, and muscovite. Widespread

Yl **Lamprophyre (Middle Proterozoic)**—Dikes, sills, and plugs composed of various amounts of amphibole, biotite, feldspar, and quartz. Widespread; commonly intrudes biotite-microcline gneiss (Xbm)

Yv **Vernal Mesa(?) Quartz Monzonite (Middle Proterozoic)**—Coarse-grained, porphyritic biotite quartz monzonite and granodiorite. Characterized by large pink to white feldspar phenocrysts. Rock composed of plagioclase (about An32), potassium feldspar, biotite, and quartz. Accessory minerals include abundant sphene, epidote, amphibole, magnetite, and apatite. Widely exposed south of Dry Gulch fault zone from Spring Canyon to Granite Creek. Similar rock is exposed in Unaweep Canyon (fig. 1). Intrudes gneissic granodiorite (Xgg) and biotite-microcline gneiss (Xbm)

Yvz **Contact zone rock (Middle Proterozoic)**—Border zone between quartz monzonite (Yv) and biotite-microcline gneiss (Xbm) in Spring Canyon. Contact effects include formation of abundant quartz, aplite, and pegmatite veinlets; growth of micaceous minerals; brecciation; and hornfels development

Ybg **Biotite granodiorite (Middle Proterozoic)**—Gray to pink, fine- to medium-grained granitoid rocks exposed in Ryan Park and near Granite Creek. Composed of various amounts of plagioclase (about An30), potassium feldspar, quartz, and biotite. Locally foliated. Probably includes bodies of different ages. Age relative to quartz monzonite (Yv) unknown

YXp **Metapyroxenite (Middle and Early Proterozoic?)**—Dark-gray to green, medium- to coarse-grained rock composed mainly of amphibole and amphibole pseudomorphs of pyroxene. Commonly altered to chloritic, hematitic, talcose, and zeolitic material. Exposed in upper part of Westwater Canyon

YXd **Metadiorite and metagabbro (Middle and Early Proterozoic?)**—Dark-gray, medium- to coarse-grained metadiorite, metagabbro, and meta-quartz diorite exposed in a pluton in the lower part of Little Dolores River and Marble Canyon. About 3.2 km in diameter. Composed of plagioclase (about An30), green amphibole, quartz, biotite, and potassium feldspar. Accessory minerals include garnet, sphene, apatite, and magnetite. Intrudes biotite-microcline gneiss (Xbm)

Xgg **Gneissic granodiorite (Early Proterozoic)**—Foliated to massive, gray, medium- to coarse-grained granodiorite composed of plagioclase (about An33), biotite, amphibole, quartz, potassium feldspar, and minor epidote and garnet. Exposed along drainage of upper part of Little Dolores River and along Dry Gulch fault zone. Intrudes the biotite-microcline gneiss (Xbm) but is synkinematic with deformation of the gneiss

Xbm **Biotite-microcline gneiss (Early Proterozoic)**—Fine- to medium-grained pink gneiss. Well foliated; layer thickness variable; highly deformed by crenulation and flowage folds; locally migmatitic. Prominent lineations are defined by axes of small folds and mineral elongation. Widely exposed in central and northern part of map area. Intruded by gneissic granodiorite (Xgg), Vernal Mesa(?) quartz monzonite (Yv), and metadiorite and metagabbro (YXd). Structurally above the amphibole gneiss and amphibolite (Xa) and porphyroblastic microcline gneiss (Xpmg), except near head of Westwater Canyon where an amphibolite body lies within the biotite-microcline gneiss unit. Thought to be metasedimentary. Structurally incompetent

Xpmg **Porphyroblastic microcline gneiss (Early Proterozoic)**—Forms foliated sill-like masses as much as 300 m thick. Composed of 2.5-cm long porphyroblasts of microcline in a groundmass of plagioclase (about An28), quartz, biotite, and minor muscovite. Exposed in upper part of Westwater Canyon and tributaries. Within and structurally above the amphibole gneiss and amphibolite (Xa) and structurally below the biotite-microcline gneiss (Xbm). Quartz monzonite in composition; regarded as metaigneous. Structurally competent

Xa **Amphibole gneiss and amphibolite (Early Proterozoic)**—Exposed in Westwater Canyon, its tributaries, and along Dry Gulch fault zone. Conspicuous lineation formed by long axes of amphibole crystals. Fine- to medium-grained rock composed of amphibole, plagioclase (about An28), quartz, and potassium feldspar; minor apatite and opaque minerals. Tholeiitic composition. Forms sill-like masses in and adjacent to the feldspathic gneiss (Xfg). Most of the unit is structurally above the feldspathic gneiss and below the biotite-microcline gneiss (Xbm). Probably metaigneous (sills and flows). Structurally competent

Xq **Quartzite (Early Proterozoic)**—Fine-grained, reddish weathering, thin-layered, hematitic quartz-amphibole quartzite. Interlayered with the amphibole gneiss and amphibolite (Xa). Thickness ranges from about 0.3 to 3 m

Xfg **Feldspathic gneiss (Early Proterozoic)**—Medium- to coarse-grained, homogeneous quartz-feldspar gneiss that contains abundant biotite and minor amphibole and epidote. Exposures are white to gray. Keratophyric in composition. Prominent lineation formed by elongate biotite and amphibole. Exposed in Westwater Canyon, its tributaries, and along Dry Gulch fault zone. Thought to be metaigneous, perhaps great thickness of flows, ignimbrite sheets, or sills

7 **Contact**—Dashed where approximately located; queried where uncertain

55 **Fault**—Dashed where approximately located; dotted where concealed or inferred; queried where uncertain. Bar and ball on downthrown side; arrow indicates dip. In cross sections, arrows indicate direction of relative movement

FA **Minor fold axis, showing plunge**

15 **Strike and dip of beds**

70 **Strike and dip of foliation**

Inclined

Vertical

Bearing and plunge of lineation—May be combined with other symbols

53 **Primary lineation (L1)**

20 **Secondary lineation (L2)**

80 **Strike and dip of axial surface of small fold**

× **Prospect pit or outcrop**

GEOLOGIC MAP OF THE NORTHWESTERN PART OF THE UNCOMPAHGRE UPLIFT, GRAND COUNTY, UTAH, AND MESA COUNTY, COLORADO, WITH EMPHASIS ON PROTEROZOIC ROCKS

By
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1991

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