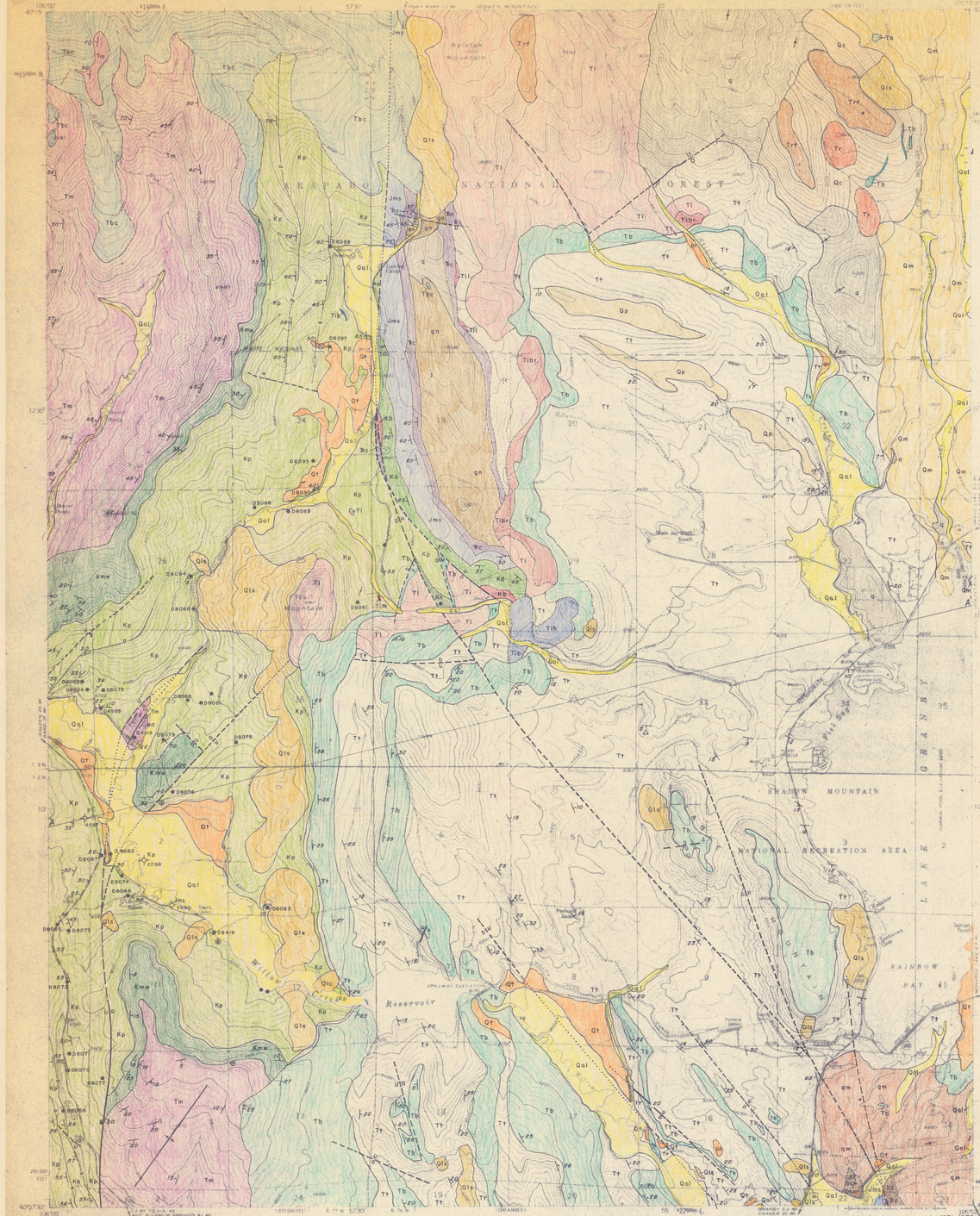
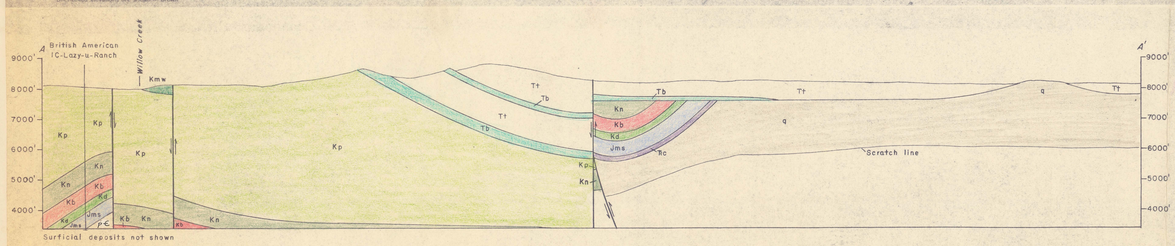
TRAIL MOUNTAIN QUADRANGLE
COLORADO GRAND CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)





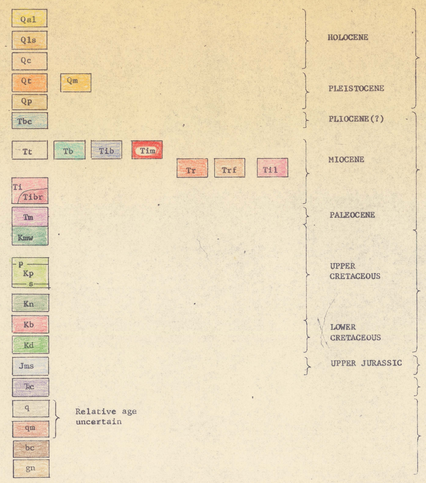
PRELIMINARY GEOLOGIC MAP OF THE TRAIL MOUNTAIN QUADRANGLE, GRAND COUNTY, COLORADO

By

Glen A. Izett

1972

CORRELATION OF MAP UNITS



DESCRIPTION OF MAP UNITS

Qal ALLUVIUM (HOLOCENE)-- Gravel, sand, silt, and clay along modern rivers

Qls LANDSLIDE DEPOSITS (HOLOCENE)

Qc COLLUVIUM (HOLOCENE)-- Sand, silt, and clay

Qt TERRACE DEPOSITS (PLEISTOCENE)-- Sand and gravel as much as 25 feet thick along main rivers and streams

Qm TILL (PLEISTOCENE)-- Poorly sorted sandy till containing large erratics of granitic and gneissic Precambrian rocks

Qp PEDIMENT DEPOSITS (PLEISTOCENE)-- Poorly sorted sand and gravel

Tbc BOULDER CONGLOMERATE OF GRAVEL MOUNTAIN (PLIOCENE?)-- Poorly sorted unconsolidated deposits that characteristically contain well-rounded boulders of pink granitic Precambrian rock as much as 14 feet in diameter; as mapped may include some till and lag slope deposits

Tt TROUBLESOME FORMATION (MIOCENE)-- Gray tuffaceous mudstone and sandstone; several interlayered basalt flows (Tb); locally contains conglomerate composed of Precambrian rocks and middle Tertiary volcanic rocks; thickness not well known but probably 500-1,000 feet thick. Fossil mammals reported by Lovering (1930, p. 74) include Parahippus, Moropus, Procamelus, and Blastomeryx. Fossil rodent remains were found by Peter Robinson of the University of Colorado in the SW¼ sec. 33, T. 2 N., R. 76 W., and identified by him as a Gregorymys-like pocket gopher of probable early Miocene age. Zircons separated from tuff in lower part of formation have a fission-track age of about 23 million years

Tb BASALT FLOWS (MIOCENE)-- Dark-gray to black lavas; some flows contain conspicuous clinopyroxene phenocrysts as much as 10 mm long; a few flows contain small altered olivine phenocrysts; all flows have normal remanent magnetization

Tib BASALT DIKES AND PLUGS (MIOCENE)-- Dark-gray to black dense rock that has normal remanent magnetization

Tim LAMPROPHYRIC INTRUSIVE ROCK (MIOCENE)-- Dark-brown; contains abundant biotite

Tr RHYOLITE INTRUSIVE (MIOCENE)-- Light-reddish-brown laminated and intricately folded lithoidal rock; locally has pitchstone chill border

Trf RHYOLITE FLOWS (MIOCENE)-- Light-reddish-brown laminated intricately folded lithoidal rock; zircon crystals separated from this rock have a fission-track age of about 25 million years

Til LATITE INTRUSIVE (MIOCENE)-- Dark-brown to dark-gray aphanitic rock; locally brecciated

Ti LATITE PORPHYRY OF TRAIL MOUNTAIN (MIOCENE)-- Gray to brown rock containing andesine phenocrysts as much as 30 mm long and a few small biotite, sanidine, and clinopyroxene phenocrysts. Zircons from this rock have a fission-track age of about 28 million years

Tibr LATITE PORPHYRY BRECCIA (MIOCENE)-- Brown to reddish-brown monolithologic breccia that grades into the latite porphyry of Trail Mountain

Tm MIDDLE PARK FORMATION (PALEOCENE)-- Variegated in shades of gray, brown, purple, and green; considerable volcanic pebbles and cobbles; complexly interbedded micaceous siltstone, sandstone, and conglomerate; dominantly arkosic; pebbles, boulders, and cobbles consist of Precambrian granitic rock, gneiss, and pegmatite along with andesite and felsite porphyry; local carbonaceous and impure coal beds and thin discontinuous limestone beds near base; local volcanic breccia and conglomerate beds; only lower part exposed in quadrangle, but in nearby areas formation is more than 6,000 feet thick

Kmw WINDY GAP VOLCANIC MEMBER (UPPER CRETACEOUS)-- Medium-gray to dark-gray and purplish-gray andesite and trachyandesite porphyry breccia; locally contains well-bedded volcanic siltstone, sandstone, and conglomerate beds in upper part; poorly sorted and poorly stratified in lower and middle parts of unit; locally contains a few Precambrian rock fragments near base of unit; about 300 feet thick. Apatite grains separated from lava fragments have a fission-track age of about 68 million years

p Kp s PIERRE SHALE (UPPER CRETACEOUS)-- Upper part is interbedded silty shale and sandstone, some as much as 100 feet thick; lower part is dark-gray to black shale about 1,500 feet thick; total thickness of formation not determined owing to faulting and poor exposures. p, prominent sandstone bed; s, prominent sandstone beds probably equivalent to the Hygiene Sandstone Member

Kn NIOBRARA FORMATION (UPPER CRETACEOUS)-- Light- to dark-gray subfissile calcareous shale; only middle part of formation exposed in quadrangle; Inoceramus and Ostrea congesta fragments found at outcrops

Kb BENTON SHALE (UPPER AND LOWER CRETACEOUS)-- Only lower part inferred in map area; elsewhere in region the formation is calcareous shale about 250 feet thick underlain by medium- to dark-gray shale about 150 feet thick, Topsoot beds are fossiliferous recrystallized limestone about 20 feet thick underlain by very fine grained sandstone about 30 feet thick; contain fossils of Juana Lopez age

Kd DAKOTA SANDSTONE (LOWER CRETACEOUS)-- Light-gray to light-brown very fine grained to fine-grained ripple-marked thin- to very thick bedded even-bedded sandstone; locally conglomeratic; a few trails and borings of soft-bodied organisms in upper part; light-gray to light-brown lenticular conglomeratic sandstone and chert pebble conglomerate in lower part; about 250 feet thick

Jms MORRISON AND SUNDANCE FORMATIONS (UPPER JURASSIC)-- Green, greenish-gray, and grayish-red structureless silty claystone intercalated with light-gray siltstone and sandstone; locally calcareous; a few thin discontinuous dense limestone beds; very fine grained sandstone and laminated siltstone probably equivalent of Canyon Springs Sandstone Member of Sundance Formation near base. Sundance Formation about 60 feet thick; Morrison Formation about 300 feet thick

Tc CHUGWATER FORMATION (TRIASSIC)-- Reddish-brown mudstone and sandstone, micaceous; laminated to thin-bedded; contains lenticular limestone 1-3 feet thick in lower part; thickness not well established, but formation is about 200 feet thick

q QUARTZ MONZONITE OF STILLWATER CREEK (PRECAMBRIAN)-- Gray medium-grained weakly foliated intrusive rock; mainly contains quartz, microcline, sodic plagioclase, biotite, and muscovite; contains some pegmatite; locally has dark micaceous clots

qm QUARTZ MONZONITE (PRECAMBRIAN)-- Pink to red fine- to medium-grained weakly foliated intrusive rock; generally contains quartz, microcline, and sodic plagioclase and a few percent of biotite and muscovite; includes some pegmatite and aplite

bc BOULDER CREEK GRANODIORITE (PRECAMBRIAN)-- Gray medium-grained intrusive rock that contains scattered feldspar phenocrysts; locally grades into quartz diorite; commonly foliated; includes some pegmatite

gn GNEISS (PRECAMBRIAN)-- Gray fine- to medium-grained irregularly banded and contorted rock consisting of mica, quartz, and plagioclase; locally migmatized; icpludes some pegmatite

Contact-- Approximately located; short dashed where inferred

Fault-- Approximately located; short dashed where inferred; dotted where concealed. U, upthrown side; D, downthrown side

Syncline-- Approximately located

Strike and dip of beds

Strike and dip of overturned beds

Horizontal beds

Strike and dip of foliation

Strike of vertical foliation

Dry hole-- Showing formation and total depth

Mammalian vertebrates

● D4023 Cretaceous marine invertebrates-- U.S. Geological Survey collection number (Denver catalogue); catalogue number not assigned for some small collections

FOSSILS FROM THE PIERRE SHALE

[Fossil identifications by W. A. Cobban, U.S. Geological Survey]

USGS Mesozoic locality	Collector and year	Fossils	Ammonite zone
D8083	G. A. Izett and James Gish, 1971.	Pinna sp. Inoceramus sp. Baculites reesidei Elias? Hoploscaphites sp.	Zone of Baculites reesidei.
D8078	G. A. Izett and J. G. Honey, 1971.	Nucula sp. Phelopteria linguaeformis (Evans and Shumard). Inoceramus subcompressus Meek and Hayden. Drepanochilus sp. Baculites sp. Hoploscaphites sp.	
D8418	G. A. Izett and J. G. Honey, 1972.	Inoceramus barabini Morton (of Meek). Ostrea cf. O. gilluly Reeside. Baculites reesidei Elias. Exiteloceras cf. E. oronense Lewy. Hoploscaphites nodosus (Owen).	Zone of Baculites reesidei.
D8066	G. A. Izett, 1971.	Inoceramus sp. Hoploscaphites? sp.	
D8076	---do.	Calcareous worm tubes (attached to baculite). Inoceramus aff. I. vanuxemi Meek and Hayden. Baculites sp. Hoploscaphites sp. Placenticeras sp.	
D8068	---do.	Phelopteria sp. Inoceramus sp. Nymphalucina sp. Baculites compressus Say. Hoploscaphites nodosus (Owen).	Zone of Baculites compressus.
D8074	---do.	Phelopteria linguaeformis (Evans and Shumard). Inoceramus sp. Ostrea sp. Anomalofusus? sp. Baculites compressus Say. Axoniceras compressus Stephenson. Solenoceras sp. Hoploscaphites nodosus (Owen). Placenticeras sp.	---Do.
D8082	---do.	Inoceramus aff. I. vanuxemi Meek and Hayden. Baculites compressus Say. Hoploscaphites sp. Placenticeras sp.	---Do.
D8089	---do.	Hemiaster humphreysiana Meek and Hayden. Nucula sp. Nuculana sp. Inoceramus sagensis Owen. Ostrea sp.	
D8084	---do.	Phelopteria sp. Baculites rugosus Cobban.	Either Zone of Exiteloceras jenneyi or Zone of Didymoceras cheyennense.
D8075	---do.	Inoceramus barabini Morton (of Meek). Baculites pseudovatus Elias. Didymoceras nebrascense (Meek and Hayden). Solenoceras n. sp. Placenticeras sp.	Zone of Didymoceras nebrascense.
D4599	G. A. Izett, 1964.	Oxytoma nebrascana (Evans and Shumard). Baculites scotti Cobban. Didymoceras n. sp.	Zone of Baculites scotti.
D4618	---do.	Pteria n. sp. Oxytoma nebrascana (Evans and Shumard). Ostrea sp. Cymella montanensis Henderson. Baculites scotti Cobban. Menuites n. sp.	---Do.
D8080	G. A. Izett and J. G. Honey, 1971.	Inoceramus sp. Ostrea sp. Baculites sp. Didymoceras sp.	Probably Zone of Baculites scotti.
D8090	G. A. Izett, 1971.	Inoceramus subconvexus Hall and Meek. Oxytoma nebrascana (Evans and Shumard). Baculites scotti Cobban. Didymoceras n. sp. Crab.	Zone of Baculites scotti.
D8091	---do.	Didymoceras n. sp.	---Do.
D8069	---do.	Placenticeras intercalare Meek.	
D8079	G. A. Izett and J. G. Honey, 1971.	Cymbophora canonensis (Meek). Periploma sp. Bit of a heteromorph.	
D8081	G. A. Izett, 1971.	Inoceramus sp. Baculites sp.	
D8095	---do.	Oxytoma nebrascana (Evans and Shumard). Syncyclonema kaufmanensis (Stephenson). Baculites sp. (cregoryensis-scotti suture). Didymoceras sp.	
D8098	---do.	Inoceramus cf. I. subcompressus Meek and Hayden.	
D8070	---do.	Inoceramus aff. I. proximus Tuomey. Baculites cf. B. gregoryensis Cobban.	Zone of Baculites gregoryensis.
D8097	---do.	Inoceramus aff. I. proximus Tuomey. Baculites gregoryensis Cobban.	---Do.
D8071	---do.	Inoceramus aff. I. proximus Tuomey. Baculites sp.	
D8072	---do.	Inoceramus subcompressus Meek and Hayden. Baculites gilberti Cobban.	Zone of Baculites gilberti.
D8077	---do.	Baculites gilberti Cobban?	---Do.
D8065	---do.	Pyriporoid bryozoan. Baculites perplexus Cobban.	Zone of Baculites perplexus.
D8073	---do.	Inoceramus subcompressus Meek and Hayden. Baculites perplexus Cobban.	---Do.
D8067	---do.	Baculites asperiformis Meek.	Zone of Baculites asperiformis.
D8088	G. A. Izett and J. G. Honey, 1971.	Inoceramus cf. I. subcompressus Meek and Hayden.	Unassigned.
D8094	G. A. Izett, 1971.	Phelopteria linguaeformis (Evans and Shumard). Inoceramus cf. I. sagensis Owen. Hoploscaphites nodosus (Owen).	---Do.
D8096	J. G. Honey, 1971.	Inoceramus cf. I. pertenuis Meek and Hayden.	---Do.

ECONOMIC GEOLOGY

Geologic mapping was done as part of the U.S. Geological Survey program of classifying and evaluating lands in the public domain. Deposits of potential economic interest in the quadrangle include coal, oil and gas, gilsonite, placer gold, and sand and gravel. Previous descriptions of the area were given by Marvine (1874), Lovering (1930), Sanders (1957), and Tweto (1957).

Scattered thin beds of coal and carbonaceous mudstone occur in the Middle Park Formation in Middle Park, but no coal was found in the quadrangle. To the north fairly thick extensive coal beds are in rocks equivalent to the Middle Park (Coalmont Formation, Beekly, 1915).

The prospects for accumulations of oil and gas in Middle Park seem fair owing to the thick section of marine Mesozoic rocks, but of about 24 wells that have been drilled in Middle Park none encountered more than a trace of oil or gas. To the north in North Park, however, commercial quantities of oil and gas occur in the Mesozoic rocks. Three wells have been drilled in the quadrangle, and the locations of these together with the deepest formation penetrated are shown on the map. Of the three wells drilled, all were drilled to test the Granby anticline of Lovering (1930).

Fine placer gold is reported to occur in stream gravels along Gold Run Creek in the western part of the quadrangle. Vanderwilt (1947) reported that small quantities of placer gold occur along Willow Creek north of the quadrangle and that the production for the period 1934-37 was less than an ounce. The source of the gold is unknown, but it may have been derived from reworking of the upper Tertiary gravel deposits at Little Gravel and Gravel Mountains.

The occurrence of gilsonite in the Middle Park Formation several miles north of the quadrangle was reported by several geologists including Eldridge (1901, p. 327-330), Beekly (1915), and Vine (1957), but none was found in the quadrangle. According to Vine, the gilsonite that is north of the area should be called grahamite, and it is black and brittle and resembles bituminous coal. Eldridge stated that the gilsonite occurs in steeply pitching veins.

Gravel-bearing Quaternary terrace deposits occur along the Colorado River and its tributaries, and some has been locally excavated, sized, and used for road metal on many roads in the area.

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