

UNITED STATES DEPARTMENT OF THE INTERIOR  
GEOLOGICAL SURVEY

PRELIMINARY GEOLOGIC MAP OF THE  
GREELEY 1° x 2° QUADRANGLE,  
COLORADO AND WYOMING

William A. Braddock

James C. Cole

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This report is preliminary and has not been  
edited or reviewed for conformity with U.S.  
Geological Survey standards.

## DESCRIPTION OF MAP UNITS

### SURFICIAL DEPOSITS AND SEDIMENTARY ROCKS

- Qa ALLUVIUM (HOLOCENE)--Piney Creek Alluvium and younger deposits
- Qg GRAVEL AND ALLUVIUM (PLEISTOCENE)--Includes Broadway and Louviers Alluviums of Pinedale and Bull Lake ages
- Qgo OLDER GRAVEL AND ALLUVIUM (PLEISTOCENE)--Includes Slocum, Verdos, and Rocky Flats Alluviums of pre-Bull Lake age
- Ql LANDSLIDE DEPOSITS (HOLOCENE AND PLEISTOCENE)--Locally includes talus and rock glacier deposits
- Qd GLACIAL DRIFT (PLEISTOCENE)--Deposits of Pinedale and Bull Lake ages
- Qdo OLDER GLACIAL DRIFT (PLEISTOCENE)--Deposits of pre-Bull Lake age
- Qe EOLIAN DEPOSITS (HOLOCENE AND PLEISTOCENE)--Holocene silt-sand dunes and Pleistocene loess
- Tgv HIGH-LEVEL GRAVEL DEPOSITS (PLIOCENE? AND MIOCENE)--Probably equivalent to Ogallala and? Arikaree Formations
- To OGALLALA FORMATION (PLIOCENE? AND MIOCENE)--Uncemented to well-cemented stream-deposited gravel, sand, silt, and minor clay; contains caliche horizons; northern Great Plains area; less than 60 meters thick
- Ta ARIKAREE FORMATION (MIOCENE)--Continental gray-brown, fine- to medium-grained, loosely to moderately well cemented sandstone; northern Great Plains area; less than 25 meters thick
- Twr WHITE RIVER FORMATION OR GROUP (OLIGOCENE)--Variegated fluvial tuffaceous siltstone and loosely to moderately well cemented sandstone; local channel sandstone and conglomerate in drainage channels of early Tertiary age; northern Great Plains area and upper Laramie River valley; less than 180 meters thick
- Tnp NORTH PARK FORMATION (MIOCENE)--Continental tuffaceous sandstone, conglomerate, and shale, with minor bentonitic clay near base; poorly consolidated; rests unconformably on White River Formation in North Park; less than 250 meters thick

- Tt TROUBLESOME FORMATION (MIOCENE)--Gray tuffaceous sandstone with interlayered basalt flows; local conglomerate; Colorado River valley; 150-300 meters thick
- Tc COALMONT FORMATION (EOCENE AND PALEOCENE)--Fluvial and alluvial conglomerate with abundant volcanic debris, and sandstone; some carbonaceous shale and coal in lower part; unconformably overlain by White River and North Park Formations, and unconformably overlies pre-Tertiary rocks; North Park area; greater than 300 meters thick
- Tm MIDDLE PARK FORMATION (PALEOCENE)--Variegated arkosic sandstone and conglomerate with abundant volcanic debris; mudstone and claystone in upper part, locally carbonaceous and contains beds of impure coal; arbitrary line at Continental Divide separates Coalmont Formation to the north from Middle Park Formation to the south in the Colorado River valley; as great as 1,800 meters thick
- Kmw Windy Gap Volcanic Member (Upper Cretaceous?)--Andesitic breccia and well-bedded volcanic siltstone; Colorado River valley; less than 90 meters thick
- TKd DENVER FORMATION (PALEOCENE AND UPPER CRETACEOUS)--Yellowish-brown nonmarine sandstone with abundant volcanic debris; local conglomerate and claystone; southeastern Great Plains area; 250-300 meters thick
- ARAPAHOE FORMATION (UPPER CRETACEOUS)--Nonmarine channel deposits consisting of conglomerate, crossbedded sandstone, and minor claystone; southeastern Great Plains area; 90-120 meters thick
- TKda DENVER AND ARAPAHOE FORMATIONS, COMBINED
- Kl LARAMIE FORMATION (UPPER CRETACEOUS)--Yellow-gray-brown nonmarine carbonaceous shale and thick beds of kaolinitic claystone; minor crossbedded sandstone and thin beds of coal; Denver Basin; 100-180 meters thick

- Kf FOX HILLS SANDSTONE (UPPER CRETACEOUS)--Yellow-brown calcareous marine sandstone interbedded with carbonaceous sandy shale; Denver Basin; 15-120 meters thick
- Klf LARAMIE FORMATION AND FOX HILLS SANDSTONE, COMBINED
- Kp PIERRE SHALE (UPPER CRETACEOUS)--Denver Basin and Middle Park
- Kpu Upper unit--Dark-gray silty marine shale with minor carbonaceous shale; above zone of Baculites reesidei; 1,200 meters thick
- Kpm Middle unit--Also known as Hygiene interval; dominantly muddy marine sandstone and sandy mudstone including the Hygiene Sandstone Member at the base, and the Roberts sand of informal usage at the top; includes zone of Baculites scotti at the base; 700 meters thick
- Kpl Lower unit--Black marine shale, including the Sharon Springs Member composed of carbonaceous shale and bentonite beds; 450 meters thick
- Kc COLORADO GROUP (CRETACEOUS)--Includes Niobrara Formation (Upper Cretaceous), dark-gray calcareous shale and limestone, 100 meters thick; and underlying Benton Group or Shale (Upper and Lower Cretaceous), consisting of upper marine black shale unit, middle limestone unit known by various local names, and lower marine black shale unit, 90-120 meters thick in total; Denver Basin and western flank of Front Range
- DAKOTA GROUP OR SANDSTONE (LOWER CRETACEOUS)--Includes South Platte Formation, fine- to medium-grained gray sandstone and shale, 75 meters thick; and underlying Lytle Formation, fine- to coarse-grained sandstone with variegated siltstone, 30 meters thick; Denver Basin and western flank of Front Range
- MORRISON FORMATION (UPPER JURASSIC)--Variegated shale and siltstone with minor limestone and sandstone; eastern and western flanks of Front Range; 90-120 meters thick

- SUNDANCE FORMATION (UPPER AND MIDDLE JURASSIC)--Buff, eolian crossbedded sandstone whose base is a regional unconformity; eastern and northwestern flanks of Front Range; 30-60 meters thick
- CHUGWATER FORMATION (TRIASSIC)--Red sandstone, siltstone, and shale; locally contains gypsum; eastern and western flanks of northern Front Range; 90-240 meters thick
- KT dc DAKOTA GROUP OR SANDSTONE, MORRISON FORMATION, AND UPPER PART OF CHUGWATER FORMATION, COMBINED
- KJds DAKOTA GROUP OR SANDSTONE, MORRISON FORMATION, AND SUNDANCE FORMATION, COMBINED
- KJdm DAKOTA GROUP OR SANDSTONE, AND MORRISON FORMATION, COMBINED
- Mz MESOZOIC ROCKS, UNDIVIDED--Symbol used only in areas of complex structure; western flank of Front Range
- JELM FORMATION (UPPER TRIASSIC)--Buff-red continental crossbedded arkosic sandstone; eastern foothills north of Lyons, and Laramie River valley; 60 meters thick
- FORELLE LIMESTONE (UPPER PERMIAN)--Reddish marine impure dolomitic limestone and minor red mudstone with gypsum; eastern foothills north of Lyons, and Laramie River valley; 6 meters thick
- SATANKA FORMATION (LOWER PERMIAN)--Red-brown marine mudstone, siltstone, and minor sandstone and limestone; locally contains gypsum; eastern foothills and Laramie River valley; 30-90 meters thick
- R Pr JELM FORMATION, FORELLE LIMESTONE, AND SATANKA FORMATION, COMBINED
- LYKINS FORMATION (LOWER TRIASSIC AND UPPER PERMIAN)--Red mudstone containing some dolomite and gypsum in lower part; eastern foothills area; 120 meters thick

LYONS SANDSTONE (PERMIAN)--Reddish nonmarine eolian dune sandstone with large-scale crossbedding; local fluvial coarse-grained arkose and conglomerate; eastern foothills area; 45-75 meters thick

R Pjs JELM FORMATION, LYKINS FORMATION, LYONS SANDSTONE, AND SATANKA FORMATION, COMBINED, south of about 40°45'; JELM FORMATION, CHUGWATER FORMATION, FORELLE LIMESTONE, AND LYONS SANDSTONE AND SATANKA FORMATION (WHERE PRESENT), COMBINED, north of about 40°45'

R P11 LYKINS FORMATION AND LYONS SANDSTONE, COMBINED

INGLESIDE FORMATION (LOWER PERMIAN)--Gray-white sandstone and crinoidal limestone; eastern foothills area; 30-40 meters thick

CASPER FORMATION (LOWER PERMIAN AND UPPER AND MIDDLE PENNSYLVANIAN)--Continental, well-sorted, crossbedded arkosic sandstone, interbedded with thin beds of marine limestone; Laramie River valley; 30-120 meters thick

PPf FOUNTAIN FORMATION (LOWER PERMIAN AND UPPER AND MIDDLE PENNSYLVANIAN)--Red, continental, fine- to coarse-grained arkosic sandstone and conglomerate, and thin beds of variegated siltstone; eastern foothills and Laramie River valley; 300 meters thick

R P1f LYKINS FORMATION, LYONS SANDSTONE, AND FOUNTAIN FORMATION, COMBINED

PPif INGLESIDE AND FOUNTAIN FORMATIONS, COMBINED

PPcf CASPER AND FOUNTAIN FORMATIONS, COMBINED

## IGNEOUS ROCKS

- Tbb BASALT FLOWS OF BIMODAL SUITE (MIOCENE)--Near Granby; about 25 m.y. old
- Tbr RHYOLITE PLUGS AND FLOWS OF BIMODAL SUITE (MIOCENE)--Near Granby; about 25 m.y. old
- Taf ASH-FLOW TUFF (OLIGOCENE)--Near Cameron Pass; about 28 m.y. old
- Tv VOLCANIC ROCKS (MIOCENE AND OLIGOCENE)--Primarily flows, breccias, and tuffs, dominantly of intermediate composition, and volcanoclastic sediments
- Tmi INTRUSIVE ROCKS (MIOCENE TO EOCENE)--Dominantly intermediate to felsic in composition; 20-40 m.y. old
- TKi INTRUSIVE ROCKS (LOWER TERTIARY AND CRETACEOUS)--Dominantly intermediate to felsic in composition; some syenite and monzonite; 40-70 m.y. old
- \* KIMBERLITE (DEVONIAN?)--Diatremes and dikes
- Ymg GABBRO OF THE IRON DIKE (PRECAMBRIAN Y)--Exposed along a trend from Boulder to La Poudre Pass, and perhaps extending along the east side of the Medicine Bow Range; intrudes Silver Plume Granite; paleomagnetism suggests an age of about 1,200 m.y.
- Yg GRANITIC ROCKS (PRECAMBRIAN Y)--Includes Silver Plume Granite and Sherman Granite; 1,350-1,450 m.y. old
- Ym ANDESITE AND BASALT DIKES (PRECAMBRIAN Y)--Intrude Sherman Granite, but are deformed and metamorphosed by Silver Plume Granite; approximately 1,400 m.y. old
- Xg GRANODIORITE AND GRANITE (PRECAMBRIAN X)--Includes Boulder Creek Granodiorite and tonalite in the Front Range, and granite in southern Medicine Bow Range; approximately 1,750 m.y. old

METAMORPHIC ROCKS

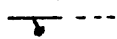
(Peak of metamorphism dated at approximately 1,750 m.y.;  
original stratigraphy unknown)

Xb BIOTITE GNEISS, SCHIST, AND MIGMATITE (PRECAMBRIAN X)--  
Principally derived from sedimentary rocks; locally  
contain interbedded hornblende gneiss, calc-silicate rock,  
quartz-rich rock, and metaconglomerate

Xfh FELSIC AND HORNBLENDIC GNEISSES (PRECAMBRIAN X)--May have been  
principally derived from volcanic rocks; locally contain  
interbedded biotite gneiss, amphibolite, and calc-silicate  
rock



CONTACT



FAULT--Dotted where concealed, designated F near western map  
border; bar and ball on down-thrown side where known; many  
faults show evidence of repeated movement since  
Precambrian time



LOW-ANGLE FAULT--Teeth on upper plate; related to Laramide  
deformation



AREA OF RECONNAISSANCE MAPPING



LAKE OR RESERVOIR



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# CORRELATION OF MAP UNITS

