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

PROFESSIONAL PAPER 1610
PLATE 1 OF 1

CORRELATION OF MAP UNITS

QTu						Holocene Pleistocene	QUATERNARY
	TKs	Tv	Tb	Tg		Pliocene	TERTIARY
				Tl		Miocene	
				To		Oligocene	
Ku						Upper Cretaceous	CRETACEOUS
Ju							JURASSIC
TrPu							TRIASSIC
							PERMIAN
							PENNSYLVANIAN
MCu							MISSISSIPPIAN
							DEVONIAN
							ORDOVICIAN
							CAMBRIAN
UNCONFORMITY							
Yg							MIDDLE PROTEROZOIC
Xg	Xb	Xfh	Xm				EARLY PROTEROZOIC

DESCRIPTION OF MAP UNITS

QTu **Unconsolidated deposits (Quaternary and Pliocene?)**—Alluvial and landslide deposits, eolian deposits, talus, rock glaciers, and unconsolidated glacial deposits

TKs **Sedimentary basin-fill deposits (Pliocene to Upper Cretaceous)**—Includes Browns Park Formation (Miocene), North Park Formation (Miocene), Troublesome Formation (Miocene and Oligocene), White River Formation (Oligocene), Wasatch Formation (Eocene and Paleocene), Fort Union Formation (Paleocene), Coalmont Formation (Eocene and Paleocene), and Middle Park Formation (Paleocene and Upper Cretaceous?)

Tg **Preglacial gravel (Pliocene)**—Coarse, unconsolidated gravel; present only at the eastern edge of map area

Tb **Basalt of bimodal suite (Pliocene and Miocene)**—Includes basaltic flows, dikes, and plugs

Tv **Volcanic rocks (Pliocene, Miocene, and Oligocene)**—Includes volcanic rocks principally of intermediate compositions. Includes some basalt, light-colored tuffs, and volcanic breccias

Ti **Intrusive rocks (Miocene)**—Includes porphyries of intermediate, basaltic, and trachytic compositions; mainly in the Elkhead Mountains

To **Intrusive rocks (Miocene and Oligocene)**—Includes porphyries of intermediate composition; in dikes, sills, and irregular-shaped bodies. Ages range from 28.8 to 22.8 Ma; most units are Oligocene

Ku **Sedimentary rocks, undivided (Cretaceous)**—Lance Formation, Lewis Shale, Williams Fork Formation and Iles Formation of the Mesaverde Group; Pierre Shale; Mancos Shale; Niobrara Formation and Benton Shale of the Colorado Group; Dakota Sandstone

Ju **Sedimentary rocks, undivided (Jurassic)**—Morrison Formation, Curtis Formation, Sundance Formation, Entrada Sandstone, Glen Canyon Sandstone. Locally includes Dakota Sandstone (Cretaceous)

TrPu **Sedimentary rocks, Undivided (Triassic to Pennsylvanian)**—Chinle Formation (Triassic); Popo Agie, Jelm, and Red Peak Formations of the Chugwater Group (Triassic); thin units of Forelle Limestone Member of the Goose Egg Formation and Satanka Shale (Permian); State Bridge Formation (Triassic and Permian); Maroon Formation and Weber Sandstone (Permian and Pennsylvanian); Minturn Formation and Eagle Valley Evaporite (Pennsylvanian)

MCu **Sedimentary rocks, undivided (Mississippian to Cambrian)**—Includes Leadville Limestone (Mississippian), Gilman Sandstone (Mississippian or Devonian), Dyer Dolomite (Mississippian? and Devonian), Parting Quartzite (Devonian), and Sawatch Quartzite (Cambrian); only present in southernmost part of map area in the Gore Range

Yg **Granitic rocks (Middle Proterozoic, 1,400 Ma)**—Includes Sherman Granite in the northeast part of the map area, Mount Ethel pluton in the Park Range, Silver Plume batholith in the southeast part of the map area, and related rocks; rocks lack metamorphic foliation and most are discordant with enclosing metamorphic country rock

Xb **Biotite gneiss and migmatite (Early Proterozoic, 1,700 Ma)**—Biotite-quartz-plagioclase schist and gneiss. Lenses, pods, and thin layers of pegmatite abundant

Xg **Granitic rocks (Early Proterozoic, 1,700 Ma)**—Quartz monzonite, granodiorite, and quartz diorite compositions; includes some biotite gneiss and migmatite; granitic rocks are generally concordant with metamorphic country rock and most are foliated

Xfh **Interlayered felsic and hornblendic gneisses, amphibolite, and calc-silicate gneiss (Early Proterozoic, 1,700 Ma)**

Xm **Mafic intrusives (Early Proterozoic, 1,700 Ma)**—Gabbro, diabase, and dark hornblende diorite

Contact

Normal Fault—Dotted where concealed, dashed where location inferred. Bar and ball on downthrown side

Thrust Fault—Sawteeth on upper plate

Proterozoic shear zone

C6 **Areas having mineral resource potential**—Areas are labeled by letter and number corresponding to entries in the accompanying table (table 2). The map must be used together with the table to correctly interpret the potential of overlapping areas. Where two or more overlapping areas have different levels of potential, the overlapping area is colored to show the highest level of potential. For ease in reading the map, only areas of moderate and high potential are shown

Geologic terrane having high mineral or energy resource potential

Geologic terrane having moderate mineral or energy resource potential

Base from U.S. Geological Survey; Denver (1978), Leadville (1977), Craig (1974), Greeley (1976) and Rawlins (1988), scale 1:250,000

SCALE 1:250 000

5 0 5 10 15 20 MILES

5 0 5 10 15 20 25 30 KILOMETERS

CONTOUR INTERVAL 10 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

Geology from Tweto (1976), Tweto and others (1978), Bryant and others (1981), Braddock and Cole (1978), and Klipfel (1992)

Table 2. Description of areas of locatable and leasable resources in the Routt National Forest and Middle Park Ranger District of the Arapaho National Forest, Colorado.

[Level of resource potential and certainty explained in Appendix 2. Areas of potential are shown on figures 16-25, 36, and 38-41 and plate 1. --do-- indicates the entry is the same as the one above it]

Map area	Resource potential	Commodities
Stockwork Molybdenum		
A1	H/C	Mo, Cu, Pb, Zn, Ag, Au
A2	H/C	Mo, Cu, Pb, Zn, Ag, Sn, Nb
A3	M/C	Mo, Cu, Pb, Zn, Ag, Sn, Au
Porphyry Copper-Molybdenum		
B1	M/C	Cu, Mo, Pb, Zn, Ag, Au
B2	H/C	Cu, Mo, Pb, Zn, Ag
B3	H/C	Cu, Mo, Pb, Zn, Ag, Au, As
Polymetallic veins		
C1	H/C	Ag, Au, Cu, Pb, Zn
C2	H/C	Pb, Zn, Ag, Mo
C3	M/B	Cu, Pb, Mo, Ag, W
C4	H/C	Cu, Pb, An, Mo, As, Cd, Sb
C5	M/B	Ag, As, V Zn, Cu, Sn, W
C6	H/C	Cu
C7	H/C	Cu, Mo, Pb, As, Ag, W, Zn, Sn
Massive sulfides		
D1	H/C	Cu, Pb, Zn
D2	M/B	--do--
D3	H/C	--do--
Fluorspar veins		
E1	H/C	F
E2	H/C	--do--
E3	H/C	--do--
Vein uranium		
F1	M/B	U
F2	H/C	--do--
Sandstone uranium-vanadium		
G1	M/C	U, V
G2	H/C	--do--
G3	M/B	--do--
G4	H/C	--do--
Placer gold		
H1	M/C	Au
H2	H/B	--do--
H3	H/C	--do--
H4	H/C	--do--
H5	H/C	--do--
H6	M/B	--do---
H7	M/B	--do---
Sandstone uranium-vanadium		
G1	M/C	U, V
G2	H/C	--do--
G3	M/B	--do--
G4	H/C	--do--
Placer gold		
H1	M/C	Au
H2	H/B	--do--
H3	H/C	--do--
H4	H/C	--do--
H5	H/C	--do--
H6	M/B	--do---
H7	M/B	--do---
Platinum group elements in ultramafic rocks		
I1	H/C	Pt, Pd
I2	H/C	--do--
U-Th-REE in pegmatites		
J1	M/C	U, Th, REE
J2	H/C	--do--
J3	H/C	--do--
J4	M/B	--do--
J5	H/C	--do--
Coal		
K1	H/B	Coal
K2	M/B	--do--
K3	L/C	--do--
Conventional and subthrust gas accumulations		
L1	M/B	Gas
L2	M/B	--do--
L3	M/B	--do--
L4	L/C	--do--
L5	L/B	--do--
L6	L/B	--do--
Coal-bed methane		
M1	M/C	Coal-bed methane
M2	L/D	--do--
Basin-centered gas		
N1	L/C	Gas
Oil in fractured shales		
O1	M/D	Oil
O2	M/D	--do--
O3	L/C	--do--

MINERAL RESOURCE POTENTIAL FOR LOCATABLE AND LEASABLE MINERALS AND GEOLOGY OF THE ROUTT NATIONAL FOREST AND MIDDLE PARK RANGER DISTRICT OF THE ARAPAHO NATIONAL FOREST AND ADJACENT AREAS, COLORADO

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