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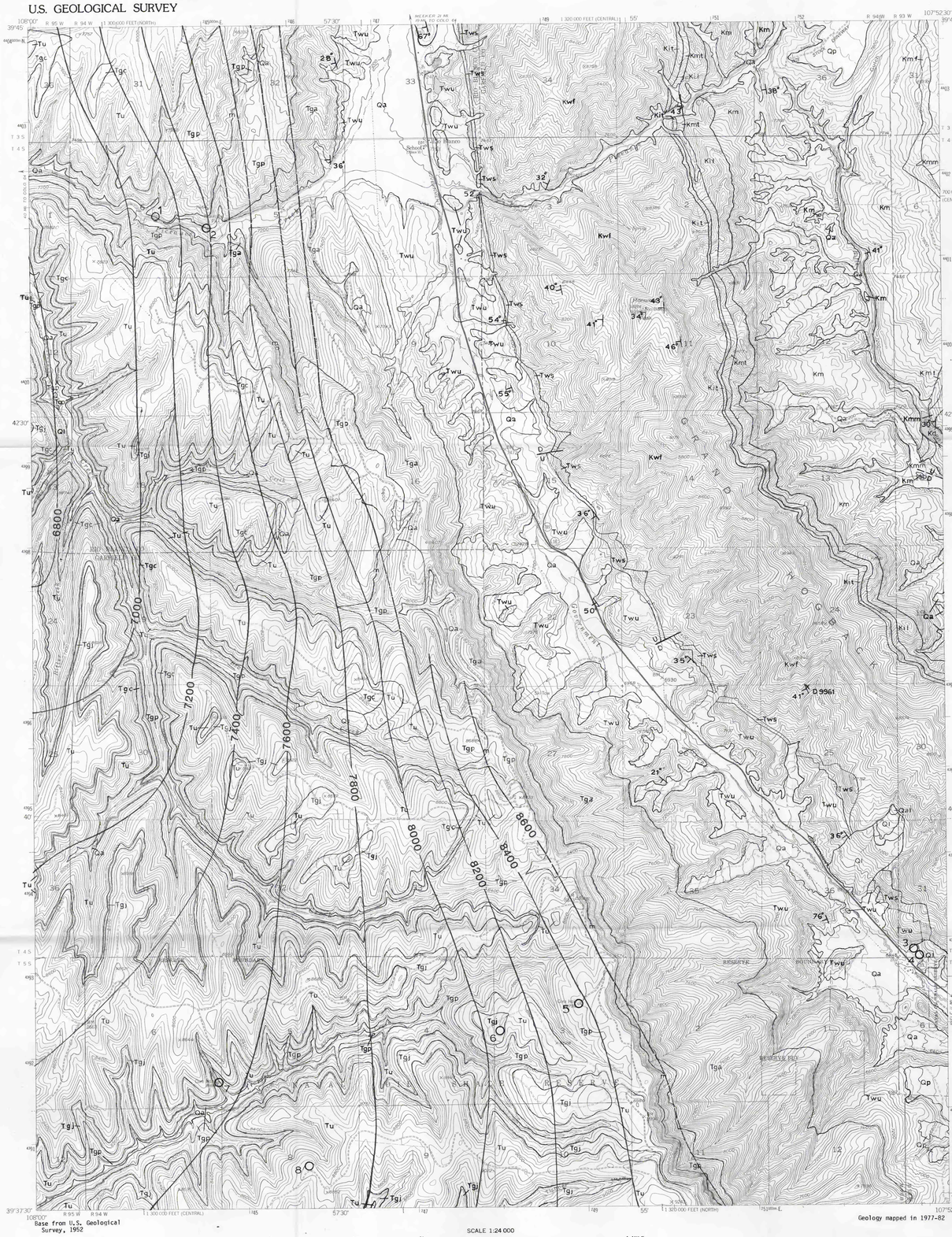


Base from U.S. Geological Survey, 1952

Geology mapped in 1977-82

SCALE 1:24 000

1 0 ½ 0 1 MILE

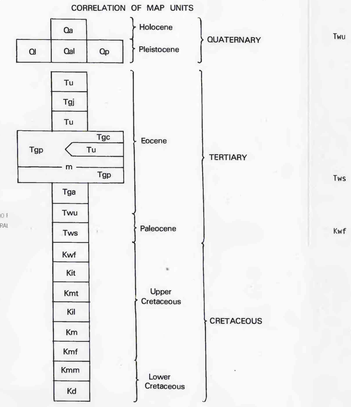
1 0 5 0 1 KILOMETER

CONTOUR INTERVAL 40 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

PRELIMINARY GEOLOGIC MAP OF THE RIO BLANCO QUADRANGLE, RIO BLANCO AND GARFIELD COUNTIES, COLORADO

By
Robert B. O'Sullivan
1985

CORRELATION OF MAP UNITS



DESCRIPTION OF MAP UNITS

Qa ALLUVIUM (HOLOCENE)--Unconsolidated, poorly sorted sand, silt, and clay deposits of valley fill. Mapped only along channels and flood plains of larger drainageways. Thickness probably less than 80 ft

Ql LANDSLIDE DEPOSITS (PLEISTOCENE)--Unconsolidated slumped ground and slide masses made up of a chaotic arrangement of broken rock, boulders, and finer fragments along Bear and Cow Creeks in western part of quadrangle and along Government Creek in southeastern part of quadrangle. Thickness probably less than 40 ft

Qal LANDSLIDE ALLUVIUM (PLEISTOCENE)--Unconsolidated locally derived alluvium deposited in sag ponds associated with the large landslide that is principally in NE1/4 sec. 36, T. 4 S., R. 94 W. Thickness probably less than 10 ft

Qp PEDIMENT DEPOSITS (PLEISTOCENE)--Unconsolidated, poorly sorted sand, silt, and gravel containing angular pebbles and boulders of sandstone and marlstone derived from nearby hilly areas. Forms veneer on pediment surfaces that cut across bedrock and slope towards nearby drainages. Deposits are about 200 ft above local valley floors. Thickness probably less than 50 ft

Tu UINTA FORMATION (EOCENE)--Light-brown to light-gray tuffaceous and argillaceous sandstone and siltstone and minor beds of gray and green mudstone and shale and light-gray marlstone. Sandstone grain size ranges from very fine to coarse. Some sandstone and siltstone beds are resistant and form prominent cliffs; others are friable and weather to slopes. Sandstone beds contain quartz and varying amounts of rock fragments, clay, biotite, and heavy minerals. The lithology of the formation is variable and reflects a change from the lacustrine environment of the partly underlying and partly intertonguing Parachute Creek Member of the Green River Formation (Tgp) to the fluvial and deltaic environment of the Uinta Formation. Total aggregate thickness of the Uinta Formation in the quadrangle is as much as 600 ft, but the exposed surface of the formation is present-day surface of erosion

GREEN RIVER FORMATION (EOCENE)

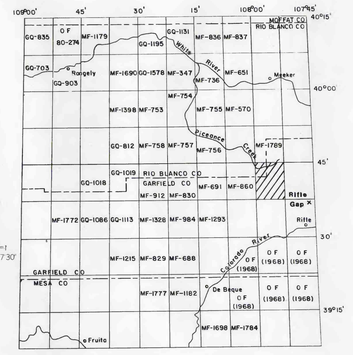
Tgj Marlstone at Jackrabbit Ridge--Informally named for exposures on Jackrabbit Ridge located in the Circle Dot quadrangle, which lies to the southwest of the Rio Blanco quadrangle. Light-gray to light-brown poorly laminated marlstone which weathers very light gray. Includes some marly siltstone and thin fine-grained sandstone beds and a few interbedded tuffs. Fossil insect and plant remains are present locally along bedding planes. Thickness 40-100 ft. Marlstone at Jackrabbit Ridge merges with the Parachute Creek Member (Tgp) southwest of the Rio Blanco quadrangle

Tgc Coughs Creek Tongue--Light-gray marlstone containing some beds of brown sandstone and siltstone. Marlstone is very hard and breaks into papery, chippy, or blocky shaped pieces. Fresh surfaces are light gray and medium brown with medium- to dark-brown laminations. Thickness 80-120 ft. The Coughs Creek Tongue merges with the Parachute Creek Member (Tgp) along Trapper Creek in southern part of quadrangle

Tgp Parachute Creek Member--Massive to platy marlstone and beds of dark-brown, gray, and bluish-gray oil shale all of which weather light gray. Contains numerous very thin yellowish-brown tuff beds and a few siltstone and sandstone beds. Thickness about 750 ft along Piceance Creek and about 1,200 ft in southern part of quadrangle. Parachute Creek Member and associated Coughs Creek Tongue (Tgc) and marlstone at Jackrabbit Ridge (Tgj) are almost entirely of lacustrine origin

-m- Top of Mahogany ledge at surface--A rich oil-shale zone in the Parachute Creek Member which is termed the Mahogany zone in the subsurface. Thickness 140 ft along Piceance Creek and 130 ft along Trapper Creek

Tga Anvil Points Member--Mostly light gray, light tan, and dark brown fine- to coarse-grained, locally conglomeratic sandstone and interbedded gray and tan siltstone and shale; minor light-tan and yellowish-gray ostracodal limestone. Thickness about 1,850 ft along Piceance Creek (Donnell, 1961, p. 852)



INDEX MAP SHOWING LOCATION OF THIS QUANDRANGLE (PATTERNED) AND OTHER PUBLISHED U.S. GEOLOGICAL SURVEY 7½-MINUTE GEOLOGIC MAPS IN THE PICEANCE CREEK BASIN AREA, NORTHWESTERN COLORADO. PUBLISHED USGS MAPS INCLUDE GEOLOGIC QUADRANGLE MAPS (GQ), MISCELLANEOUS FIELD STUDIES MAPS (MF), AND OPEN-FILE REPORTS (OF).

WASATCH FORMATION

Twu Upper part (Eocene and Paleocene)--Variegated ochre, purple, red, gray, lavender, and yellow shale, silty shale, and siltstone and brown and gray lenticular fine- to coarse-grained sandstone. Minor conglomerate, limestone, coal, and carbonaceous shale. Lower 300-400 ft is drab brown, gray, and black that contrasts markedly with overlying variegated beds and is an equivalent of the Paleocene Fort Union Formation. All of upper part of Wasatch is much less resistant than the overlying Green River Formation and underlying Cretaceous rocks and generally forms a broad valley veneered with surficial deposits. Thickness varies from about 3,500 ft along Piceance Creek to about 5,300 ft in southern part of quadrangle (Donnell, 1961, p. 846)

Tws Basal sandstone (Paleocene)--Gray beds of conglomerate and coarse sandstone. The conglomerate is composed of red and black chert and white quartzite as large as 6 in. in maximum diameter. Tends to make a low white flatiron on the western side of the Grand Hogback. Thickness 50-100 ft

Kwf WILLIAMS FORK FORMATION (UPPER CRETACEOUS)--Heterogeneous sequence of thick lenticular beds of grayish-yellow to brown, fine- to medium-grained crossbedded and massive sandstone and interbeds of dusky-yellow to olive-gray and brown sandy shale and siltstone, moderate-brown sandy limestone, and lenticular beds of carbonaceous shale and shaly coal. Coal beds occur sporadically throughout the Williams Fork Formation. Individual coal beds are as thick as 10 ft and are commonly burned on the outcrop. Formation is dominantly of nonmarine origin and forms conspicuous high ridges that make up most of the Grand Hogback. Thickness 4,500 ft along Piceance Creek and 3,500 ft in southern part of quadrangle. Fossils are present in the NE1/4 NW1/4 sec. 25, T. 4 S., R. 94 W. about 1,200 ft below top of the Williams Fork Formation (USGS Mesozoic locality 09961). The fossils from a silty shale were examined by N. A. Cohan (written commun., 1976) who reported that the collection contains Brachidontes sp. and Corbula sp. which are brackish-water bivalves characteristic of estuarine deposits

ILES FORMATION (UPPER CRETACEOUS)

Kit Trout Creek Sandstone Member--Yellowish-gray to grayish-orange thick-bedded and crossbedded fine- to medium-grained sandstone. Forms prominent light-colored ridge throughout quadrangle. Thickness about 100 ft

Kil Main body--Brown and gray massive and crossbedded fine-grained sandstone interbedded with brown and gray shale and siltstone, carbonaceous shale, and thin coal beds. Thickness 450-500 ft

MANCOS SHALE

Kmt Unnamed tongue of Mancos Shale (Upper Cretaceous)--Dark-gray marine shale and thin beds of siltstone and numerous yellowish-brown-weathering limy septarian concretions as much as 1.5 ft across. Thickness about 250 ft

Km Main body (Upper Cretaceous)--Dark-gray and brownish-gray marine shale, variably silty and sandy, and sparse limestone concretions. Locally gypsiferous. Upper part contains even bedded persistent ridge-forming sandstone beds. Lower part calcareous with several thin limestone beds. Thin beds of bentonite at various stratigraphic levels. Forms a broad valley of poorly exposed outcrops on east side of Grand Hogback. In Atlantic Richfield North Rifle Unit 1 drill hole (no. 3 on map) thickness is 4,400 ft

Kmf Frontier Sandstone Member (Upper Cretaceous)--Gray and yellowish-gray, very fine grained, very thinly bedded. Forms a ledge. Top makes a broad dip slope. Thickness about 65 ft

Kmm Mowry Shale Member (Lower Cretaceous)--Gray to black thinly bedded, fissile marine shale; siliceous. Thickness about 200 ft

Kd DAKOTA SANDSTONE (LOWER CRETACEOUS)--Yellowish-brown to gray, fine- to coarse-grained sandstone and interbedded gray shale. Locally conglomeratic and carbonaceous. Thickness 230 ft but only upper part exposed in east-central part of quadrangle

CONTACT--Varies from well exposed to locally obscured or concealed by soil or vegetation

-8000- STRUCTURE CONTOURS--Drawn on top of Mahogany ledge or zone. Contour interval 200 ft

36° STRIKE AND DIP OF BEDS

X D 9961 FOSSIL LOCALITY

U/D FAULT--Dashed where concealed. U, upthrown side; D, downthrown side

4 DRILL HOLE--See table 1

NOTE

The Rio Blanco quadrangle, Colo., was mapped as part of a program designed primarily to show the areal distribution and structure of the Eocene Green River Formation and associated Tertiary formations. Lithologic descriptions of the various stratigraphic units are only summarized here. More complete discussions of the Tertiary bedrock geology are in reports by Brobst and Tucker (1973), Cole and Picard (1975, 1978), Donnell (1961), Johnson and Keighin (1981), Juhan (1965), Ritzma (1965), and Snow (1970). Descriptions of Cretaceous rocks are in reports by Collins (1976) and Warner (1964). Oil shale resources of the Green River Formation are discussed by Pitman (1979), Pitman and Donnell (1973), Donnell and Blair (1970), and Pitman and Johnson (1978).

The presence of the Cretaceous Ohio Creek Member of the Hesaverde Formation in the Rio Blanco quadrangle is uncertain. The white conglomeratic sandstone described in this report, as the basal sandstone of the Wasatch Formation has previously been referred to as the Ohio Creek Conglomerate of Paleocene age (Donnell, 1961, p. 843-844). Work by Johnson and May (1980), however, shows that the Ohio Creek at the type locality and at other places in western Colorado is a white weathered zone at the top of Cretaceous rocks. This zone is probably not at the same stratigraphic position everywhere. A similar white weathered zone was not found at the top of the Williams Fork Formation in the Rio Blanco quadrangle.

At nearby Rifle Gap about 6 mi east and a little south of the Rio Blanco quadrangle, the Williams Fork Formation is thinner than it is at Piceance Creek in the north-central part of the quadrangle. A series of white sandstone beds about 400 ft thick (R. C. Johnson, oral commun., 1984) is at the top of Cretaceous rocks (the Williams Fork Formation) at Rifle Gap and is recognized as Ohio Creek (Lorenz, 1982; and Rutledge and Lorenz, 1984). The presence of fossil logs burrowed by fossil Teredinidae, glauconite, and low-angle hummocky crossbedding (Lorenz, 1982, p. 36) suggests a marine origin for the Ohio Creek at Rifle Gap. In the Rio Blanco quadrangle brackish-water fossils (USGS Mesozoic locality 09961) 1,200 ft below the top of the Williams Fork Formation are about at the stratigraphic level of the Lion Canyon coal group along Piceance Creek. The Lion Canyon coal group appears to be stratigraphically equivalent to the marine Lion Canyon Sandstone Member of the Williams Fork Formation near Meeker. The Ohio Creek at Rifle Gap and the Lion Canyon coal group along Piceance Creek are at about the same stratigraphic level above the Trout Creek Sandstone Member of the Iles Formation. This suggests that the Ohio Creek at Rifle Gap may be equivalent to the Lion Canyon Sandstone Member at Meeker.

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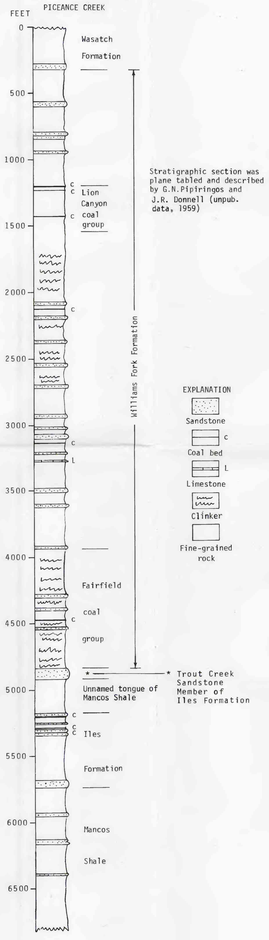
MEASURED SECTION OF CRETACEOUS ROCKS ALONG PICEANCE CREEK

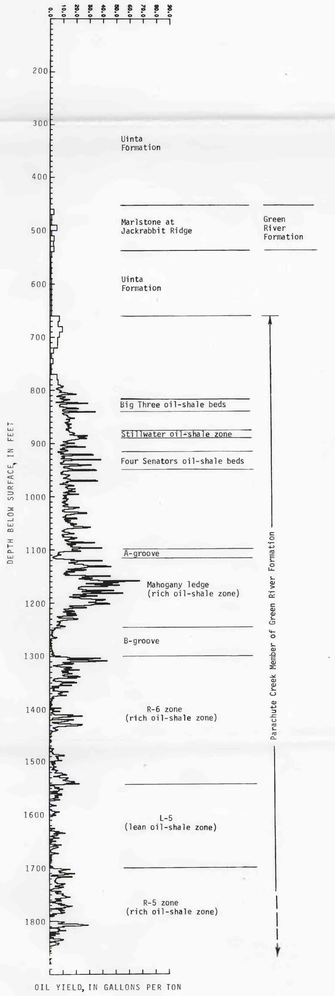


Stratigraphic section was plane tabled and described by G.N. Pipiringos and J.R. Donnell (unpub. data, 1959)

Table 1.--Drill-hole data, Rio Blanco quadrangle, Rio Blanco and Garfield Counties, Colorado

Map no.	Section	Drill hole	Total depth (feet)
		T. 4 S., R. 94 W.	
1	NW1/4 sec. 6	U.S. Geological Survey, core hole 78-1	232
2	SE1/4 sec. 6	U.S. Geological Survey, core hole 78-1A	100
		T. 4 S., R. 93 W.	
3	SW1/4 sec. 31	Atlantic Richfield, North Rifle Unit 1	17,299
4	SW1/4 sec. 31	Maguire Oil Company, North Rifle Unit 2	5,505
		T. 5 S., R. 94 W.	
5	NE1/4 sec. 3	U.S. Bureau of Mines, core hole G	930
6	NW1/4 sec. 3	TRW, core hole 12-x-3(19)	798
7	SE1/4 sec. 6	U.S. Bureau of Mines, core hole F	766
8	NE1/4 sec. 8	Naval Oil Shale Reserve No. 1, core hole 17	1,880

NAVAL OIL SHALE RESERVE NO. 1
CORE HOLE 17



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