

**DESCRIPTION OF MAP UNITS**

**Qa Alluvium (Holocene)**—Unconsolidated deposits of valley fill mapped along major drainages. Locally includes fan deposits at mouths of larger side tributaries.

**Qp Gravel deposits (Holocene)**—Unconsolidated poorly sorted sand, silt, and gravel containing angular pebbles and boulders of sandstone and marlstone derived from nearby hilly areas. Occurs only in extreme south-central and southeastern parts of this quadrangle; deposits are more widespread south of this quadrangle. Thickness probably less than 50 ft.

**Uta Formation (Eocene)**—Light-brown to light-gray tuffaceous and argillaceous sandstone and siltstone and shale and light-gray marlstone. Grain size of sandstone ranges from very fine to coarse. Some sandstone and siltstone beds are resistant and form cliffs; others are friable and weather to slopes. Sandstone beds contain quartz and varying amounts of rock fragments, clay, biotite, and heavy minerals. Lithology of formation is variable and reflects a change from lacustrine depositional environment of the partly underlying and partly intertonguing Parachute Creek Member (Tgp) of the Green River Formation to fluvial and deltaic environments of the Uta Formation.

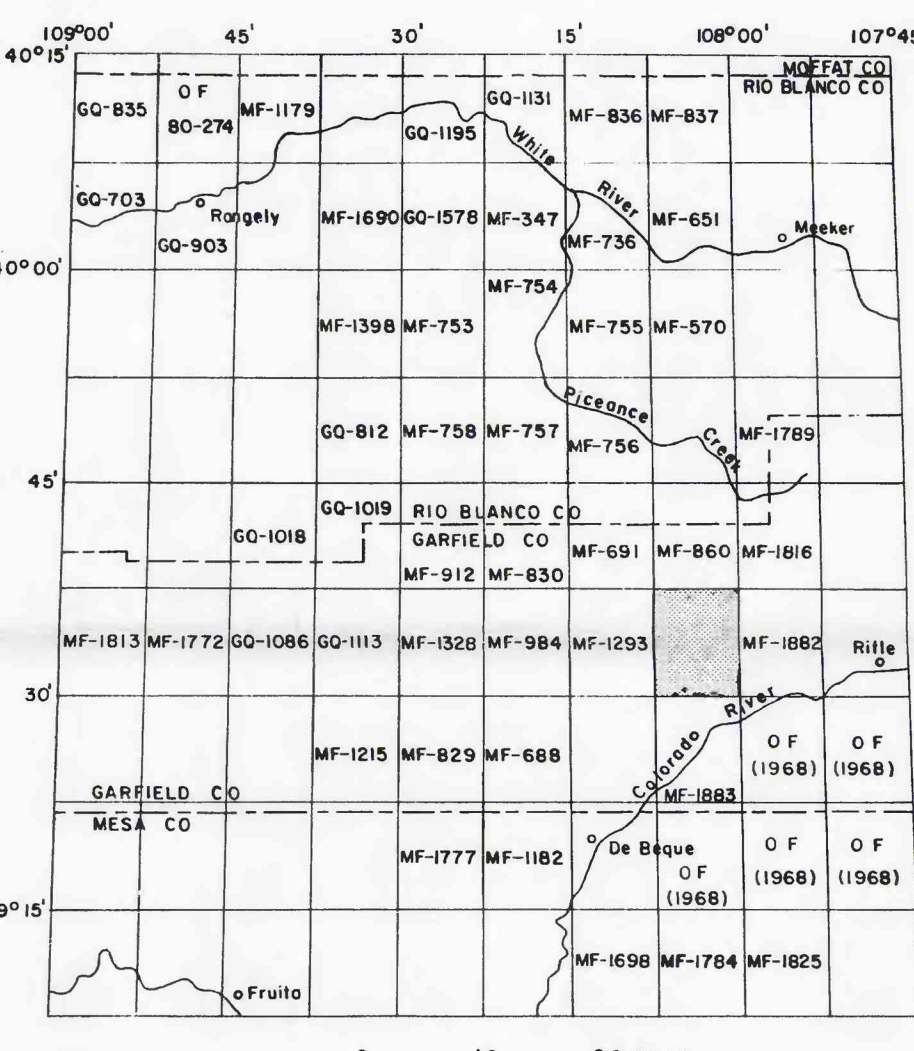
**Unit D**—Upper part and main body of Uta Formation. Total thickness exposed in quadrangle is about 500 ft, but exposed surface of the formation is present-day erosion surface.

**Unit C**—Brown tuffaceous sandstone separated from unit D by marlstone at Jackrabbit Ridge (Tgj) of Green River Formation. Maximum thickness about 150 ft.

**Unit B**—Brown tuffaceous sandstone separated from overlying parts of Uta Formation by Stewart Gulch Tongue (Tgs) of Green River Formation. Mapped only in northeastern part of quadrangle where maximum thickness is about 50 ft.

**Unit S**—Units C and B are mapped together in cliffs north of East Middle Fork because intertonguing Stewart Gulch Tongue (Tgs) of Green River Formation is thin and poorly exposed. Maximum thickness about 200 ft.

**Unit A**—Brown tuffaceous sandstone separated from overlying parts of Uta Formation by Coughs Creek Tongue (Tgc) of Green River Formation. Mapped only in northern part of quadrangle where maximum thickness is about 45 ft.



INDEX MAP SHOWING LOCATION OF THIS QUADRANGLE (PATTERNED) AND OTHER PUBLISHED U.S. GEOLOGICAL SURVEY 7 1/2-MINUTE GEOLOGIC MAPS IN THE FORKED GULCH BASIN AREA, NORTHWESTERN COLORADO. PUBLISHED USGS MAPS INCLUDE GEOLOGIC QUADRANGLE MAPS (Q), MISCELLANEOUS FIELD STUDIES MAPS (MF), AND OPEN-FILE REPORTS (OF).

**Green River Formation (Eocene)**—Informally named for exposures on Jackrabbit Ridge, a topographic feature that lies to the west of the Forked Gulch quadrangle. Consists of light-gray to light-brown poorly laminated marlstone that 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. Almost entirely of lacustrine origin. Maximum thickness about 100 ft.

**Marlstone at Jackrabbit Ridge (Tgj)** merges with Parachute Creek Member (Tgp) of Green River Formation along Ben Good Creek in northeastern part of quadrangle. The marlstone unit is present, at least locally, in covered north-facing slopes south of East Fork, but there it is mapped with Parachute Creek Member.

**Stewart Gulch Tongue (Tgs)**—Marlstone and marly siltstone and some fine-grained sandstone. Marlstone is medium to dark brown, weathers light gray, and is generally poorly laminated. Almost entirely of lacustrine origin. Maximum thickness about 40 ft. Stewart Gulch Tongue merges with Parachute Creek Member (Tgp) west of Parachute Creek in west-central part of quadrangle. Tongue is thin and poorly exposed in cliffs north of East Middle Fork and is mapped with unit S of Uta Formation (Tud). Stewart Gulch Tongue is probably present at places encircling Long Ridge but is mapped with Parachute Creek Member (Tgp).

**Coughs Creek Tongue (Tgc)**—Light-gray, locally fossiliferous marlstone containing some beds of brown sandstone and siltstone. Marlstone is very hard and breaks to papery, chippy, or blocky pieces. Almost entirely of lacustrine origin. Maximum thickness about 100 ft. Coughs Creek Tongue is present only in extreme northern part of quadrangle and merges with Parachute Creek Member (Tgp) west of Middle Fork of Parachute Creek in northwestern part of quadrangle.

**Parachute Creek Member (Tgp)**—Massive to platy marlstone, weathering light gray, and beds of gray, dark-brown, and bluish-gray oil shale. Contains numerous thin yellowish-brown tuff beds and a few beds of siltstone and sandstone. Marlstone and oil shale beds vary in organic content and the member consists of a sequence of rich and lean zones. Almost entirely of lacustrine origin. Maximum thickness about 1,200 ft.

**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 100-130 ft.

**Garden Gulch Member (Tga)**—Mostly gray fissile clay shale. Contains minor beds of brown sandstone and siltstone and gray ostracodal, oolitic, and algal limestone. Gray marlstone beds are present, particularly in upper part where member grades up into overlying Parachute Creek Member (Tgp). Lacustrine origin. Maximum thickness about 750 ft.

**Anvil Points Member (Tga)**—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 member contains a few beds of marlstone in upper part. Fluvial and marginal lacustrine origin. Maximum thickness about 1,200 ft. In Wheeler Gulch, in extreme south-central part of quadrangle and just west of Clover Point, the sandy beds of Anvil Points Member laterally replace all of the clay shale beds of Garden Gulch Member.

**Manatch Formation (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. Fluvial and paludal origin. Thickness over 3,000 ft but only upper 300 ft exposed in quadrangle.

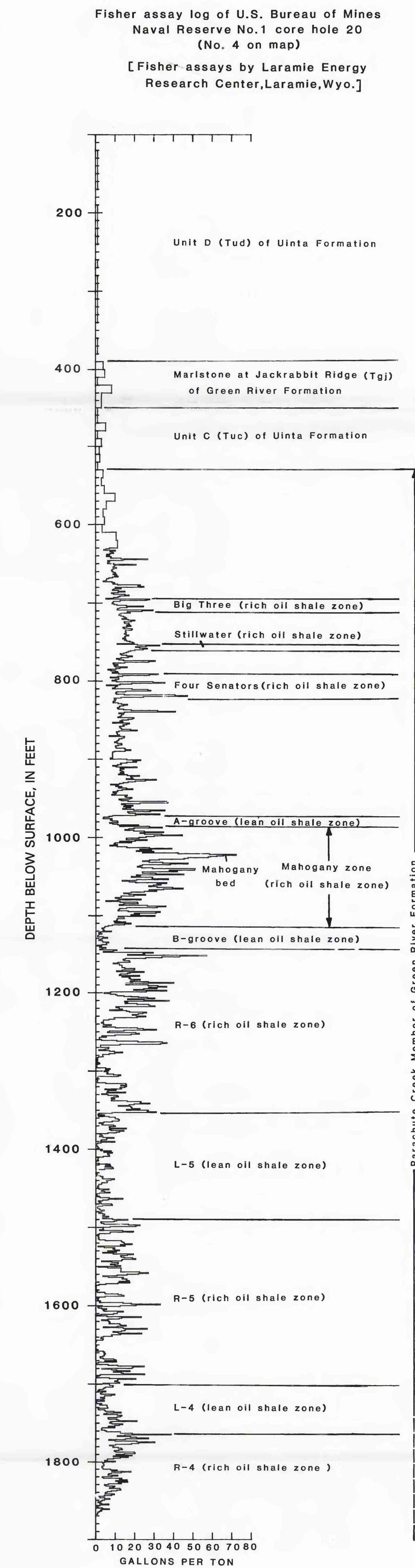
— Contact—Varies from well exposed to locally obscured or concealed by soil or vegetation.

-7200— Structure contours—Drawn on top of Mahogany ledge or zone. Dashed where approximately located. Termed Mahogany ledge at surface and Mahogany zone in subsurface. Contour interval 100 ft; datum is mean sea level.

○ 15 Drill hole—See table 1.

Table 1.—Drill holes used to evaluate oil shale in Forked Gulch quadrangle

Map no.	Drill hole	Section	Total depth (feet)
T. 5 S., R. 95 W.			
1	Colony Development, core hole 1A (drilled inside a mine)	SM1/4 7	1,100
2	Colony Development, core hole 1B (drilled inside a mine)	SM1/4 7	360
3	U.S. Bureau of Mines, Naval Reserve No. 1, core hole D	SM1/4 11	700
4	U.S. Bureau of Mines, Naval Reserve No. 1, core hole 20	SM1/4 14	1,920
5	Union Oil Co., Bella Castle 1	SE1/4 19	1,059
6	Union Oil Co., Lignum Vita 9	SE1/4 20	685
7	Union Oil Co., Lignum Vita 13	NE1/4 21	548
8	U.S. Bureau of Mines, Naval Reserve No. 1, core hole H	SM1/4 23	842
T. 5 S., R. 96 W.			
9	Colony Development, core hole CH 13-1	SM1/4 13	1,098
T. 6 S., R. 95 W.			
10	U.S. Bureau of Mines, Naval Reserve No. 1, core hole K	SM1/4 5	798
11	Mobil Oil Co., core hole C	NM1/4 8	1,028
12	Mobil Oil Co., core hole D	NM1/4 18	855
T. 6 S., R. 96 W.			
13	Union Oil Co., JRM 6	NM1/4 10	387
14	Mobil Oil Co., core hole E	NE1/4 11	1,116
15	Mobil Oil Co., core hole F	SM1/4 11	904



**PRELIMINARY GEOLOGIC MAP OF THE FORKED GULCH QUADRANGLE, GARFIELD COUNTY, COLORADO**

By  
Robert B. O'Sullivan and William J. Hail, Jr.