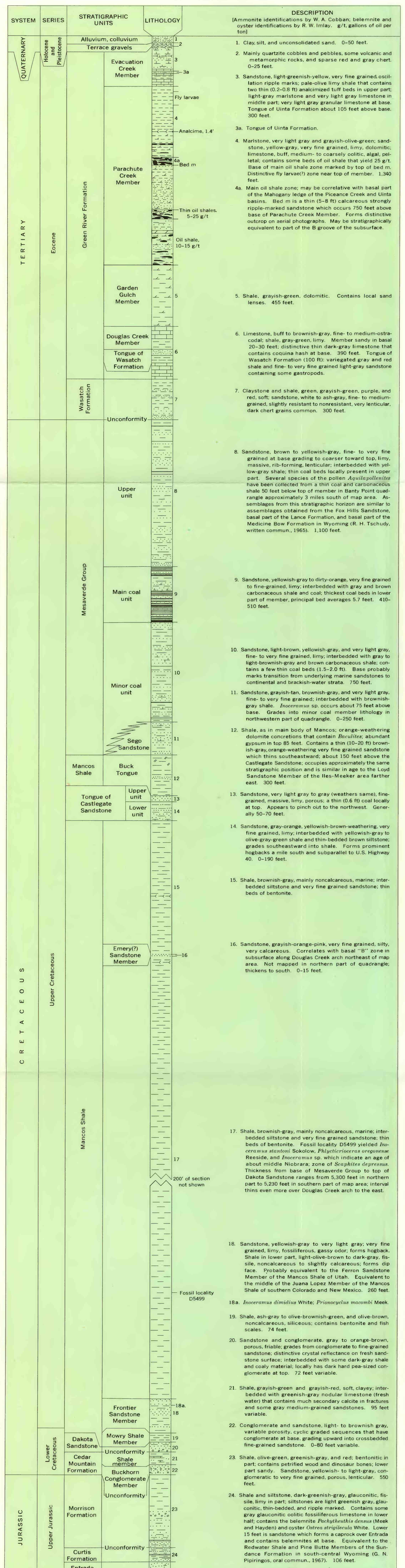
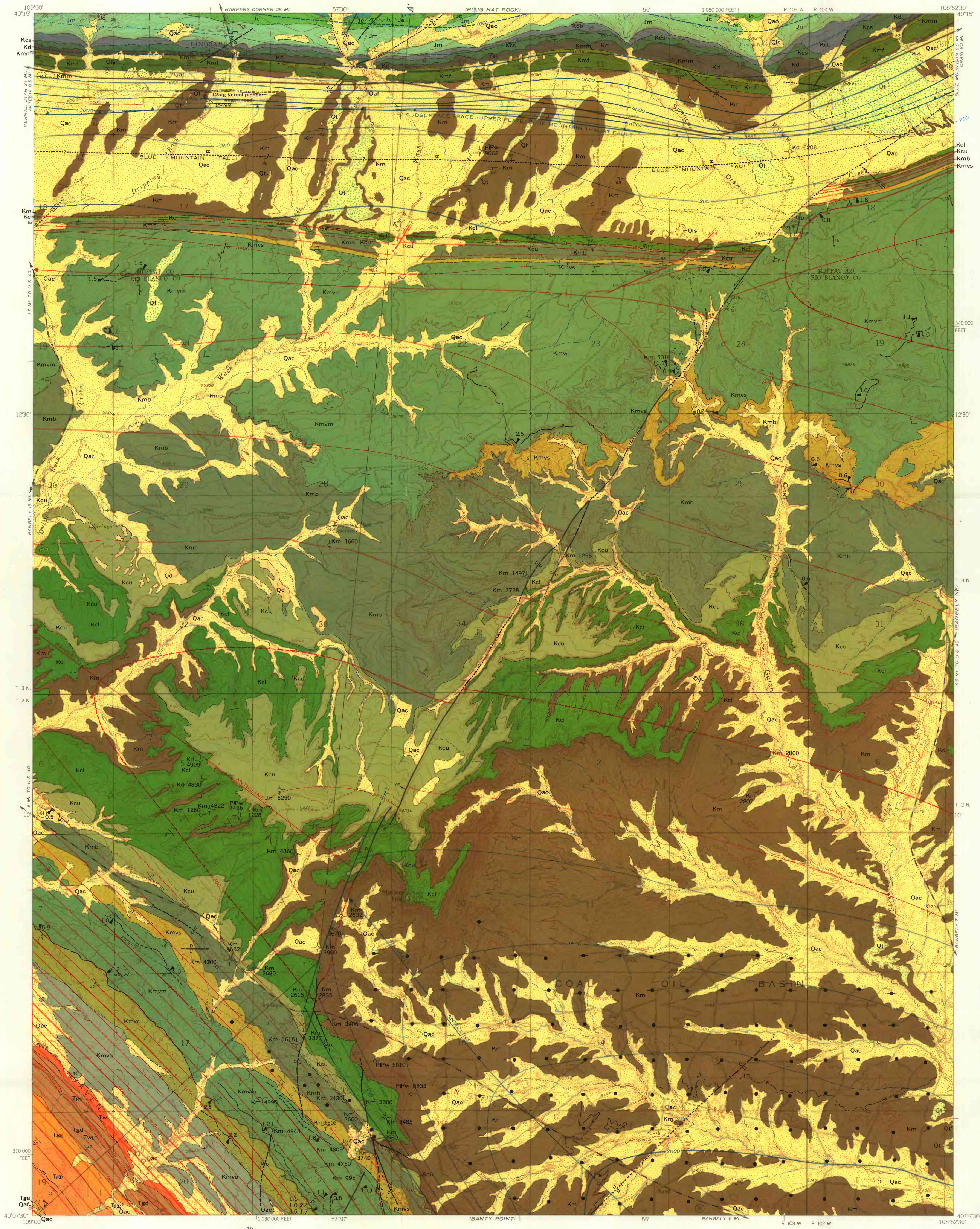
DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

GEOLOGIC QUADRANGLE MAP
MELLEN HILL QUADRANGLE, COLORADO
GQ-835

GENERALIZED COLUMNAR SECTION



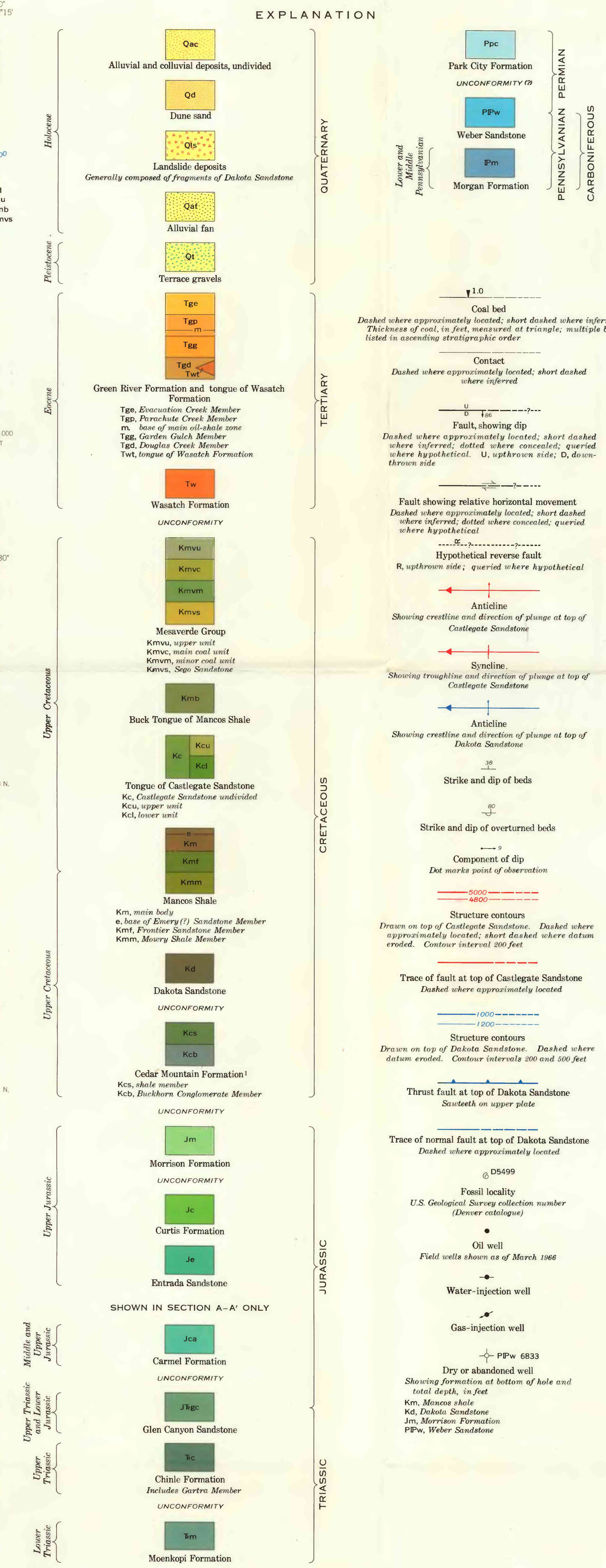


Base by U.S. Geological Survey, 1962
10,000 foot grid based on Colorado coordinate system, north zone

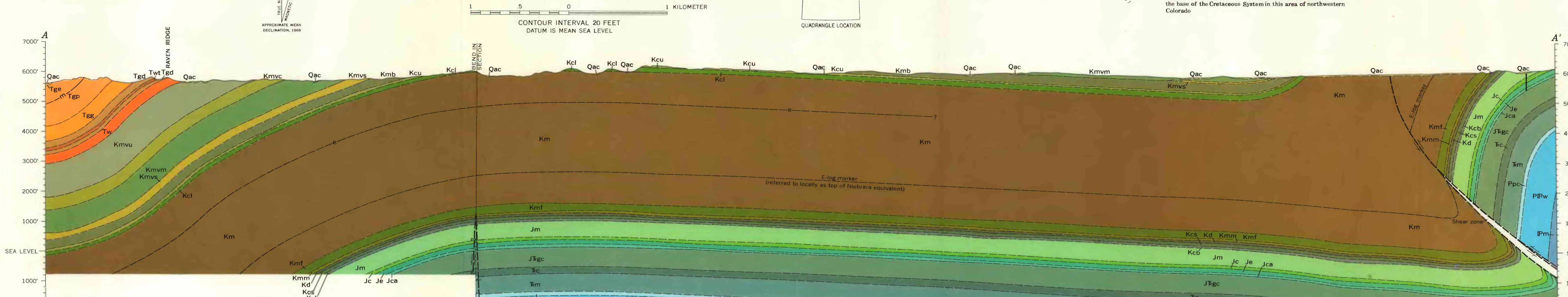
Geology by H. L. Cullins, assisted by S. A. Wilbur, 1966

SCALE 1:24 000
CONTOUR INTERVAL 20 FEET
DATUM IS MEAN SEA LEVEL

EXPLANATION



[1] W. L. Stokes (1944, p. 966) originally proposed the term Cedar Mountain Shale to include the variegated beds between the Buckhorn Conglomerate and the Dakota Sandstone. He later (1952, p. 1774) redefined the unit to include the Buckhorn Conglomerate, reducing the Buckhorn to member status within the Cedar Mountain Formation. The type section of the formation as well as the Buckhorn is on the southwest flank of Cedar Mountain, Emery County, Utah, in the vicinity of Buckhorn Reservoir. As used here, the Cedar Mountain Formation is proposed as the proper term to include the nonmarine beds at the base of the Cretaceous System in this area of northwestern Colorado



ECONOMIC GEOLOGY AND STRUCTURE

The quadrangle was mapped as part of the U.S. Geological Survey program of classifying and evaluating lands in the Public Domain. Oil and gas, coal, oil shale, sodium zeolites, and sand and gravel occur within the map area, but only oil and gas and sand and gravel were being exploited in 1968.

The Rangely oil field, part of which lies in the map area, produces oil from several formations at depths ranging from about 560 feet to more than 6,700 feet along the flanks and crest of a large northwest-trending asymmetric fold, the Rangely anticline. The first well in the Rangely field was drilled during the summers of 1901 and 1902, and oil shows were found at 750 feet (Gale, 1908, p. 40–41); the well was abandoned at a total depth of 2,130 feet in the Mancos Shale. Oil was discovered in the Weber Sandstone in March 1933 in the California Co. A-1 Raven well in sec. 30, T. 2 N., R. 102 W. The well had a potential of 213 barrels of oil per day, but it was shut in due to lack of market and refining problems created by the relatively high sulfur content of the oil. From 1933 to 1944 oil exploration in the Rangely field consisted only of shallow drill holes. In 1944 active development of the Weber Sandstone reservoir started. The following table shows cumulative production figures for each formation that has produced oil or gas (Colorado Oil and Gas Conservation Commission, 1967).

Cumulative production to January 1, 1967, Rangely field

Reservoir	Oil (barrels)	Gas (thousand cubic feet)
Mancos Shale	10,480,784	22
Morrison Formation	14,735	1,326
Entrada Sandstone	0	52,293
Gartra Member of Chinle Formation[1]	212,087	51,937
Weber Sandstone	385,197,995	633,791,218
Total	395,905,601	633,896,796

[1] New usage after Poole and Stewart (1964), formerly reported as Shinarump Conglomerate Member.

Currently, oil is produced in the Rangely field from the Weber Sandstone, the Morrison Formation, and the Mancos Shale. At the present time, only the Mancos and the Weber produce oil in the Mellen Hill quadrangle. The Gartra Member of the Chinle Formation produced oil from a well in sec. 15, T. 2 N., R. 103 W., but the well is now abandoned. During 1966, 314 wells produced 16,212,520 barrels of oil and 22,604,837,000 cubic feet of gas from the Weber Sandstone in the Rangely field (Colorado Oil and Gas Conservation Commission, 1967). Average daily production from the Weber was about 45,000 barrels of oil. The Mancos Shale yielded 460,942 barrels of oil from 80 wells during 1966. Average daily production of the Mancos wells was about 16 barrels of oil; the median value of daily Mancos production was about 8 barrels of oil per well. Only one well, the Pan American Petroleum 1 UPRR (NE¼NW¼ sec. 32, T. 2 N., R. 102 W.), produced from the Morrison in 1966. This well was completed in January 1966 and produced 12,264 barrels of oil and 1,326,000 cubic feet of gas during the year. The following table lists general characteristics of the crude oil from the various formations. No analysis was available for crude oil from the Morrison Formation.

Crude petroleum analyses (Wenger and others, 1957)

Formation	Color	API gravity	Pour-point	Sulfur (percent)	Specific gravity	Base
Mancos Shale	Green	39.4°	5°F	<0.1	0.828	Paraffinic
Gartra Member of Chinle Formation	Brownish-black	38.4°	35°F	0.44	0.833	Do.
Weber Sandstone	do.	35.0°	<5°F	0.72	0.850	Intermediate

The thickest coal bed occurs in the main coal unit of the Mesaverde Group in the southwestern part of the quadrangle. The coal beds strike northwest and dip 20°–30° southwest. Coal thicknesses in the Mesaverde are variable, and the coal beds do not seem to be as thick as those farther southeast in the adjoining Banty Point quadrangle (Cullins, 1968). The maximum measured coal thickness in the Mellen Hill quadrangle was 6.2 feet, whereas a coal bed as much as 12 feet thick was measured in the Banty Point quadrangle. The only coal bed that can be traced for any appreciable distance along the outcrop is the thick bed at the base of the main coal unit of the Mesaverde Group. The minor coal unit contains thin discontinuous coals no thicker than 2 feet. Locally, a thin (0.6 ft) coal is present at the top of the Castlegate Sandstone.

No coal mines are operating in the map area, and no fresh unweathered samples were available for analysis. The Mesaverde coals in the region are similar in Btu, sulfur, and ash content. In the Rangely 7½-minute quadrangle to the southeast, Gale (1910, p. 196, 197, 250) collected Mesaverde coal samples from a mine in sec. 14, T. 1 N., R. 102 W. Analyses on an "air-dried" basis indicated a calorific value of 11,080–11,490 Btu; average sulfur content was 0.40–0.46 percent. The coal is classified as high volatile C bituminous (Landis, 1959, p. 150).

Oil shale occurs in the Parachute Creek Member of the Green River Formation in the southwest corner of the quadrangle, and analyses of weathered outcrop oil-shale samples indicate oil yields ranging from 10 to 25 gallons per ton. Somewhat larger yields could reasonably be expected from unweathered shale. The highest grade oil shale occurs in a 175-foot interval of rock above bed m in strata from 5 to 15 feet thick interlayered with leaner oil shale. The strata above bed m are correlative in part with the Mahogany ledge of the Uinta basin. Bed m may be correlative in part with the "B groove", an electric log marker used in the subsurface throughout much of the Piceance Creek basin.

The sodium zeolite analcime ($NaAlSi_2O_6.H_2O$) occurs upward from the Parachute Creek Member of the Green River Formation into the lower part of the overlying Uinta Formation of late Eocene age. The thickest bed of analcime is 1.4 feet. Analcime is not present in sufficient quantities to be considered economically valuable in the foreseeable future. Dawsonite [$Na_3Al(CO_3)_3.2Al(OH)_3$] may be present in trace amounts, but X-ray diffraction analyses of 29 samples taken from various parts of the Green River Formation did not reveal its presence.

Sand and gravel are obtained from terrace deposits as needed for use on the county roads.

The largest structural feature other than the Rangely anticline is a fault, here named the Blue Mountain thrust fault, in the northern part of the map area. The fault has been discussed briefly by Anderman (1961, p. 103, 104) and his interpretation of it is believed to be essentially correct. The thrust passes into a left lateral fault on the section line between secs. 7 and 18, T. 3 N., R. 102 W. The fault extends westward out of the map area. The exact location of the surface trace of the thrust fault is conjectural but it probably lies south of the dry hole in sec. 15, T. 3 N., R. 103 W. Whether or not the fault actually reaches the surface is unknown at this time, but a line of deformed bedding in the Mancos Shale could mark the trace of the fault. Frank Tully (oral commun., 1966) believes that the thrust fault may be of economic significance in that oil or gas may be trapped somewhere along the subthrust plate.

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GEOLOGIC MAP OF THE MELLEN HILL QUADRANGLE, RIO BLANCO AND MOFFAT COUNTIES, COLORADO

By
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1969