

Stewart Gulch Tongue — A New Tongue of the Eocene Green River Formation, Piceance Creek Basin, Colorado

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By WILLIAM J. HAIL, JR.

CONTRIBUTIONS TO STRATIGRAPHY

GEOLOGICAL SURVEY BULLETIN 1422 - E

*Definition and description of a useful
stratigraphic marker that tongues into
the Eocene Uinta Formation*



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COMMON MEASURES AND THEIR METRIC EQUIVALENTS

English unit		Metric equivalent
foot (ft)	=	0.305 meter (m)
mile	=	1.609 kilometers (km)
gallon (gal)	=	3.785 liters (l)
ton	=	.908 metric ton (t)

**STEWART GULCH TONGUE — A NEW
TONGUE OF THE EOCENE GREEN RIVER
FORMATION, PICEANCE CREEK BASIN,
COLORADO**

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ABSTRACT

Mapping in the northern and central parts of the Piceance Creek basin of northwestern Colorado shows that several relatively thin dominantly marlstone units tongue northward into the Eocene Uinta Formation and merge southward with the Eocene Parachute Creek Member of the Green River Formation. Five of these tongues, useful in mapping, have been previously named. A sixth is here named the Stewart Gulch Tongue of the Green River Formation. The Stewart Gulch Tongue ranges in thickness from about 10 to 55 feet (3–17 m). It has been identified and locally mapped in the south-central part of the Piceance Creek basin in the area of the Rio Blanco-Garfield County line.

INTRODUCTION

A continuing program of geologic quadrangle mapping in the Piceance Creek basin during the past several years has demonstrated the usefulness of certain marlstone units as stratigraphic markers. Five of these units have been previously named, and a sixth is here named and described.

The Uinta Formation of Eocene age forms most of the surface rocks of the Piceance Creek basin. The Uinta is as much as 1,400 feet (430 m) thick and consists largely of a complex sequence of sandstone and siltstone, with lesser mudstone, shale, and marlstone. The main body of the Uinta overlies the main body of the Green River Formation. Both formations were deposited in or adjacent to the Eocene Lake Uinta (Donnell, 1961, p. 862–863). Rocks of the Green River are dominantly lacustrine; rocks of the Uinta are dominantly alluvial and near-shore lacustrine, deposited during the waning stages of Lake Uinta. The two formations are complexly intertongued. The widespread marlstone tongues of Green River in the Uinta were deposited during short-lived transgressions of the lake during its waning stages.

Mapping and other stratigraphic studies thus far suggest a general stratigraphic rise in the intertonguing Green River-Uinta contact from north to south. Tongues of the Uinta point generally south; marlstone tongues of the Green River point generally north. (See O'Sullivan, 1974; O'Sullivan, 1975, fig. 2; Duncan and others, 1974, fig. 4.) Thus a northerly source is indicated for most of the Uinta Formation clastic sediments at least as far south as the rim of the Piceance Creek drainage basin, and probably beyond (fig. 1).

Duncan and others (1974) named four marlstone tongues that they found useful in mapping the northern and central parts of the Piceance Creek basin. These are, in ascending order, the Yellow Creek, Dry Fork, Thirteenmile Creek, and Black Sulphur Tongues of the Green River Formation. A higher tongue, the Coughs Creek Tongue of the Green River, was named and described by O'Sullivan (1975), as a result of investigations generally south of Piceance Creek. A still higher marlstone tongue of the Green River Formation is here named the Stewart Gulch Tongue of the Green River Formation.

STEWART GULCH TONGUE OF GREEN RIVER FORMATION

DEFINITION AND TYPE SECTION

A light-gray dominantly marlstone sequence of Eocene age is here named the Stewart Gulch Tongue of the Green River Formation for exposures along the Middle Fork of Stewart Gulch, a tributary of Piceance Creek (fig. 1) in Rio Blanco County, Colo. The type section was measured in the SW $\frac{1}{4}$ NE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 3, T. 4 S., R. 96 W., about 2,400 feet (730 m) east of the road along the Middle Fork, and about 500 feet (150 m) above the valley bottom. The locality lies about 7 $\frac{1}{2}$ miles (12 km) south of Piceance Creek via the dirt road which follows the Middle Fork.

STRATIGRAPHIC RELATIONS

Figure 2 shows the stratigraphic position of the Stewart Gulch Tongue in the Uinta-Parachute Creek sequence. All the named tongues merge with the main body of the Parachute Creek Member of the Green River Formation. The two unnamed Green River units above the Stewart Gulch Tongue, shown in figure 2, were mapped as informal units in parts of the Cutoff Gulch quadrangle (Hail, 1975) and the Bull Fork quadrangle (Hail, 1977). The lower of these two unnamed units was informally designated "marlstone at Barnes Ridge" in these quadrangles. The upper unit was informally designated "marker bed at Bull Fork" in the Bull Fork quadrangle. Figure 3 shows the correlation of the Stewart Gulch Tongue and associated units in two measured sections. It also shows the heterogeneous lithology of the enclosing Uinta Formation.

Type section of the Stewart Gulch Tongue of Green River Formation

[SW 1/4 NE 1/4 NW 1/4 Sec. 3, T. 4 S., R. 96 W., Rio Blanco County, Colo.]

	<i>Thickness</i>	
	<i>(feet)</i>	<i>(m)</i>
Uinta Formation (part):		
Sandstone, medium-brown, fine-grained, impure; contains some light-gray lenses, variably resistant; poorly exposed; higher beds not measured -----	40+	12+
Shale, light-brownish-gray, marly, silty, subfissile; grades to sandstone above -----	11	3.4
Marlstone, light-gray, slightly silty -----	5	1.5
Sandstone, light-brownish-gray, fine- to medium-grained, moderately resistant; forms ledge -----	4	1.2
Siltstone, medium-brown, marly to argillaceous; contains carbon trash; becomes very sandy in upper few feet and grades to overlying unit; weathers out to thin irregular chips -----	16	4.9
Limestone, dark-brownish-gray, finely crystalline; weathers out to thin rusty-brown slabs -----	<u>0.2</u>	<u>0.06</u>
Stewart Gulch Tongue of Green River Formation:		
Marlstone, light-brownish-gray to light-gray, silty -----	9	2.7
Shale, light-brown, marly; gradational from underlying unit -----	1	0.3
Marlstone, light-gray, thin-bedded; locally weathers out to thin flat chips -----	13	4
Sandstone, light-brown, fine- to medium-grained; exhibits some even bedding; forms rounded ledges -----	10	3
Siltstone, greenish-gray, marly; contains sparse carbon trash; weathers out to subfissile chips -----	13	4
Marlstone, light-brown, silty, even-bedded; weathers light gray; weathers out to thin subfissile chips -----	<u>4</u>	<u>1.2</u>
Total, Stewart Gulch Tongue -----	<u><u>50</u></u>	<u><u>15.2</u></u>
Uinta Formation (part):		
Sandstone, light-grayish-brown; forms obscure ledge ----	1	0.3
Siltstone, light-brown, marly -----	4	1.2
Sandstone, light-brown, medium-grained, poorly sorted, impure, massive, resistant; contains some massive spheroidal concretions; forms ledges and major bench to west; lower beds not measured -----	15+	4.6+

DISTRIBUTION, LITHOLOGY, AND THICKNESS

The Stewart Gulch Tongue was mapped throughout the Cutoff Gulch quadrangle (Hail, 1975) where it was designated "marlstone at Stewart Gulch," and throughout the Bull Fork quadrangle (Hail, 1977). The unit has also been recognized in parts of all the adjacent quadrangles. Geologic mapping in the drainage of Stewart Gulch and Willow Creek indicates that the Stewart Gulch Tongue extends about 6 to 7 miles (10–11 km) north of the Rio Blanco-Garfield County line

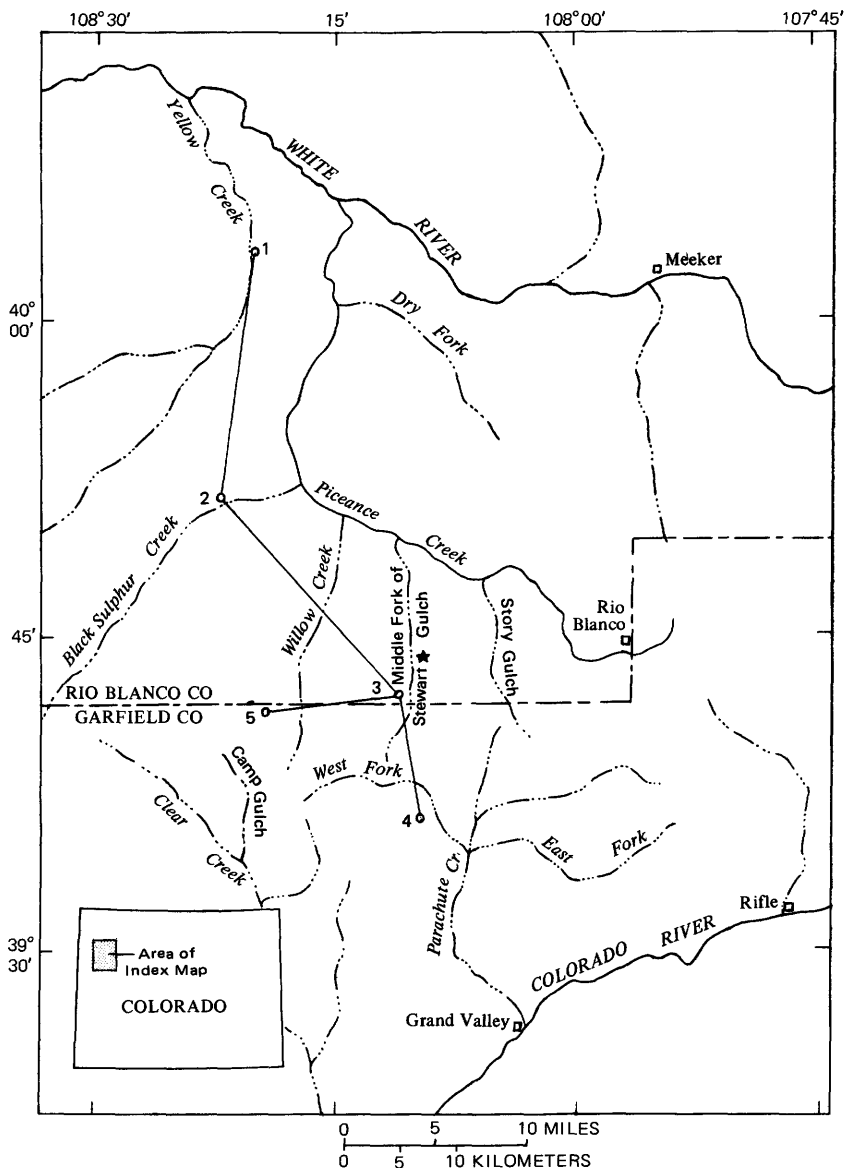


FIGURE 1.—Index map of part of the Piceance Creek basin. Star shows locality of the type section of the Stewart Gulch Tongue. Cross section through localities 1–4 is shown in Figure 2; correlation between localities 3 and 5 is shown in figure 3.

as a useful map unit. Subsurface drill-hole studies indicate that the Stewart Gulch Tongue probably joins the main body of the Parachute Creek Member of the Green River about 11 to 12 miles (18–19 km) south of the county line.

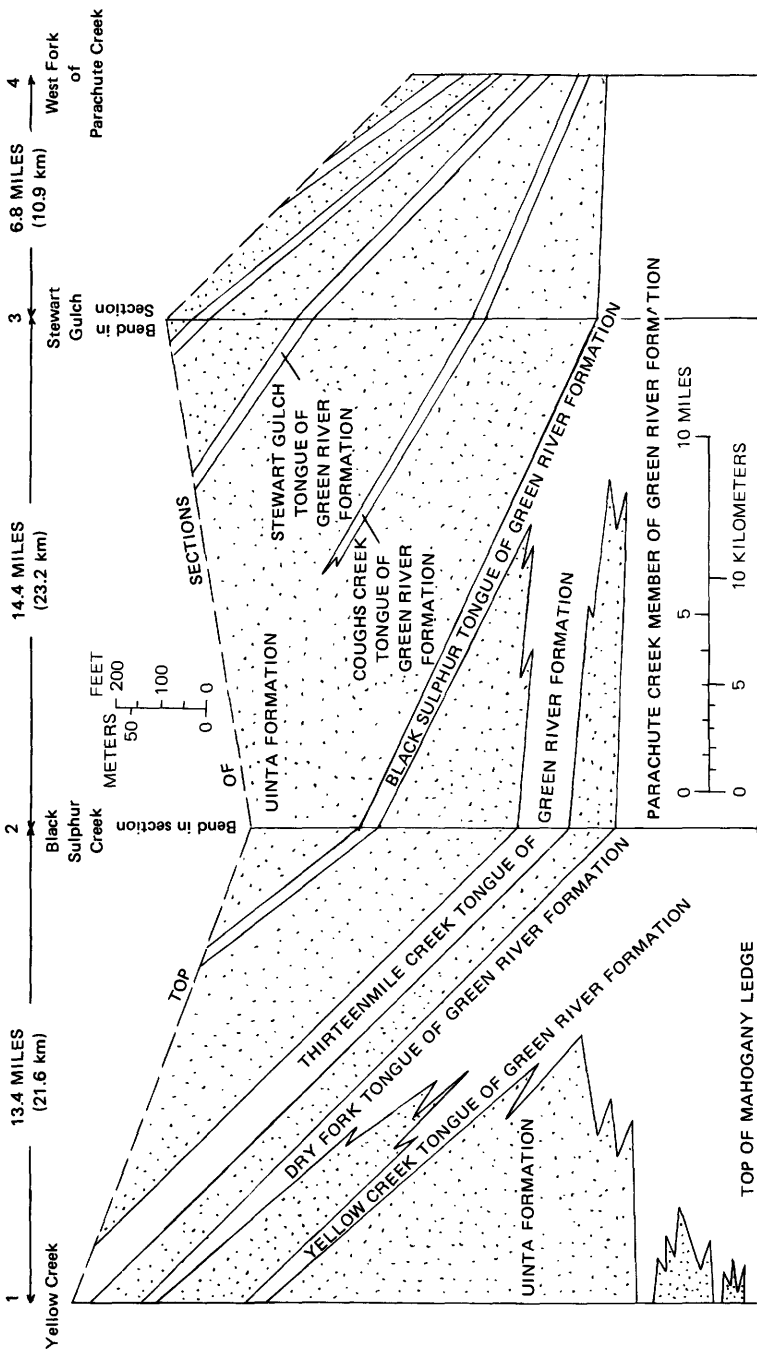


FIGURE 2.—Generalized stratigraphic relations of the Stewart Gulch Tongue to other parts of the Green River Formation and to the Uinta Formation. In part from Duncan and others (1974, fig. 4, p. 12). See also O'Sullivan (1975, fig. 2, p. 6). Green River Formation white; Uinta Formation stippled. Datum is top of Mahogany ledge. Vertical exaggeration about $\times 70$.

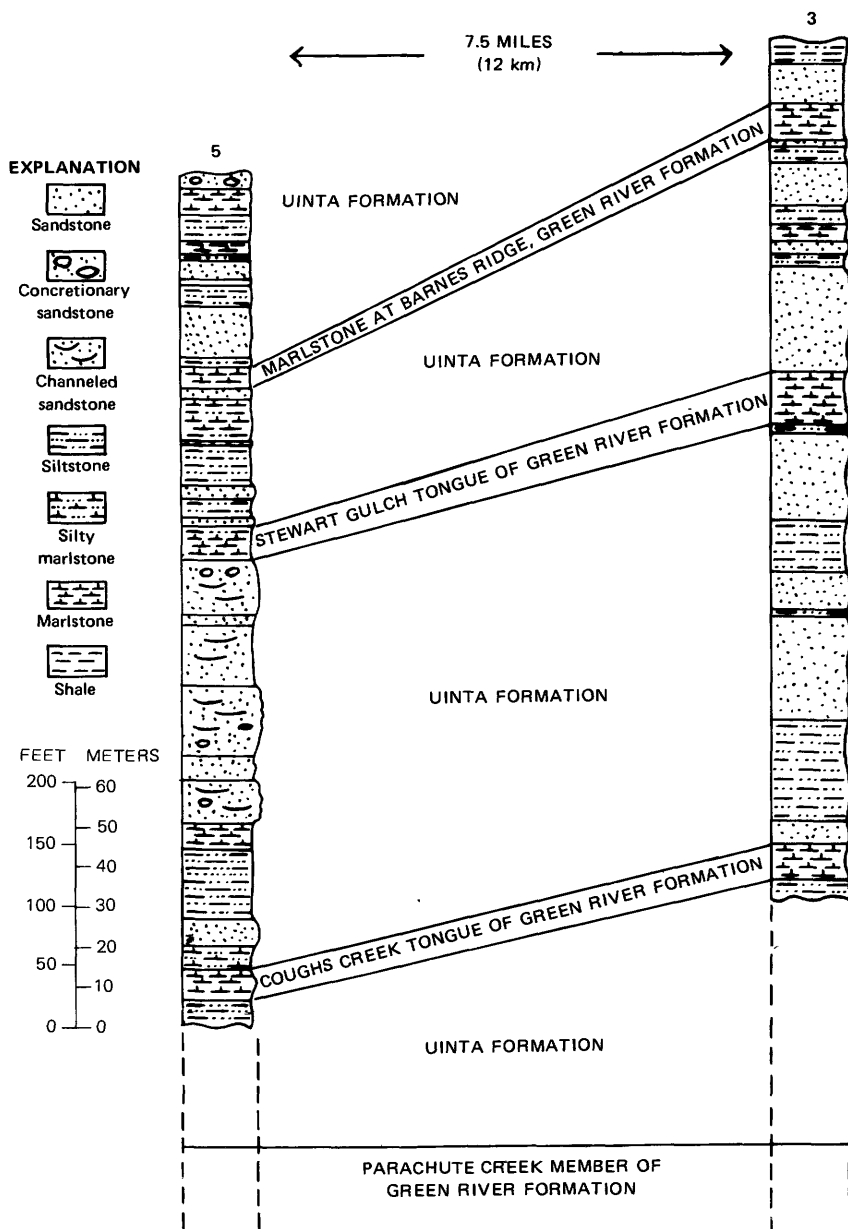


FIGURE 3.—Measured sections showing position of Stewart Gulch Tongue and associated units. Section at locality 5 was measured in the S $\frac{1}{2}$ sec. 18, and the N $\frac{1}{2}$ sec. 19, T. 4 S., R. 97 W. Section at locality 3 was measured in the SW $\frac{1}{4}$ sec. 9, NW $\frac{1}{4}$ sec. 16, and the NE $\frac{1}{4}$ sec. 17, T. 4 S., R. 96 W. Position of Uinta-Parachute Creek contact was determined from nearby drill holes.

The Stewart Gulch Tongue locally forms prominent outcrops. In areas of good exposure, its light-gray color contrasts with the brown color of the Uinta Formation. In many places, the Stewart Gulch Tongue caps benches or crops out at the break between benches of Uinta Formation sandstones.

Where examined thus far, the Stewart Gulch ranges in thickness from about 10 to 55 feet (3–17 m), probably averaging about 35 feet (11 m). It is generally thinnest near its northern limit.

Throughout most of its known outcrop area, the Stewart Gulch Tongue is dominantly marlstone. In the southern part of its outcrop area, near its merger point with the Parachute Creek Member, the marlstone is largely low grade oil shale with values ranging mostly between 5 and 10 gallons per ton (about 20–40 l/t), but locally as much as 15 gallons per ton (about 60 l/t). Farther north, oil-shale values in the Stewart Gulch become generally sparse, silt content increases, and a few beds of siltstone are present. In the northern part of its outcrop area, oil-shale values are generally lacking, the proportion of silty marlstone and siltstone increases, and sand becomes a prominent constituent. At its northern edge, the Stewart Gulch is marked locally by greenish-gray clayey siltstone; it becomes very silty and sandy and loses its identity as a distinctive map unit.

The wedge of dominantly clastic Uinta Formation sediments separating the Stewart Gulch Tongue from the underlying Coughs Creek Tongue varies in thickness but in general thins markedly from north to south. The maximum known thickness is near the Rio Blanco-Garfield County line, where it ranges from about 250 to 400 feet (75–120 m) in thickness (figs. 2, 3). To the south, along the West Fork of Parachute Creek, the Uinta wedge is only about 50 to 150 feet (15–45 m) thick, diminishing to the vanishing point still farther south. The wedge of Uinta separating the Stewart Gulch Tongue from the overlying marlstone at Barnes Ridge is also highly variable in thickness but thins generally to the south. The Uinta wedge ranges from about 150 to 400 feet (46–120 m) in thickness in the drainages of Stewart Gulch and Willow Creek, thinning southwestward to about 50 feet (15 m) in upper Camp Gulch. Presumably, it too thins to the vanishing point farther south.

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