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

GEOLOGICAL SURVEY BULLETIN 1395-G



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

By ROBERT B. O'SULLIVAN

CONTRIBUTIONS TO STRATIGRAPHY

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*Definition and description of a conspicuous
and useful stratigraphic marker that
tongues into the lower part of the
Uinta Formation*



UNITED STATES DEPARTMENT OF THE INTERIOR

ROGERS C. B. MORTON, *Secretary*

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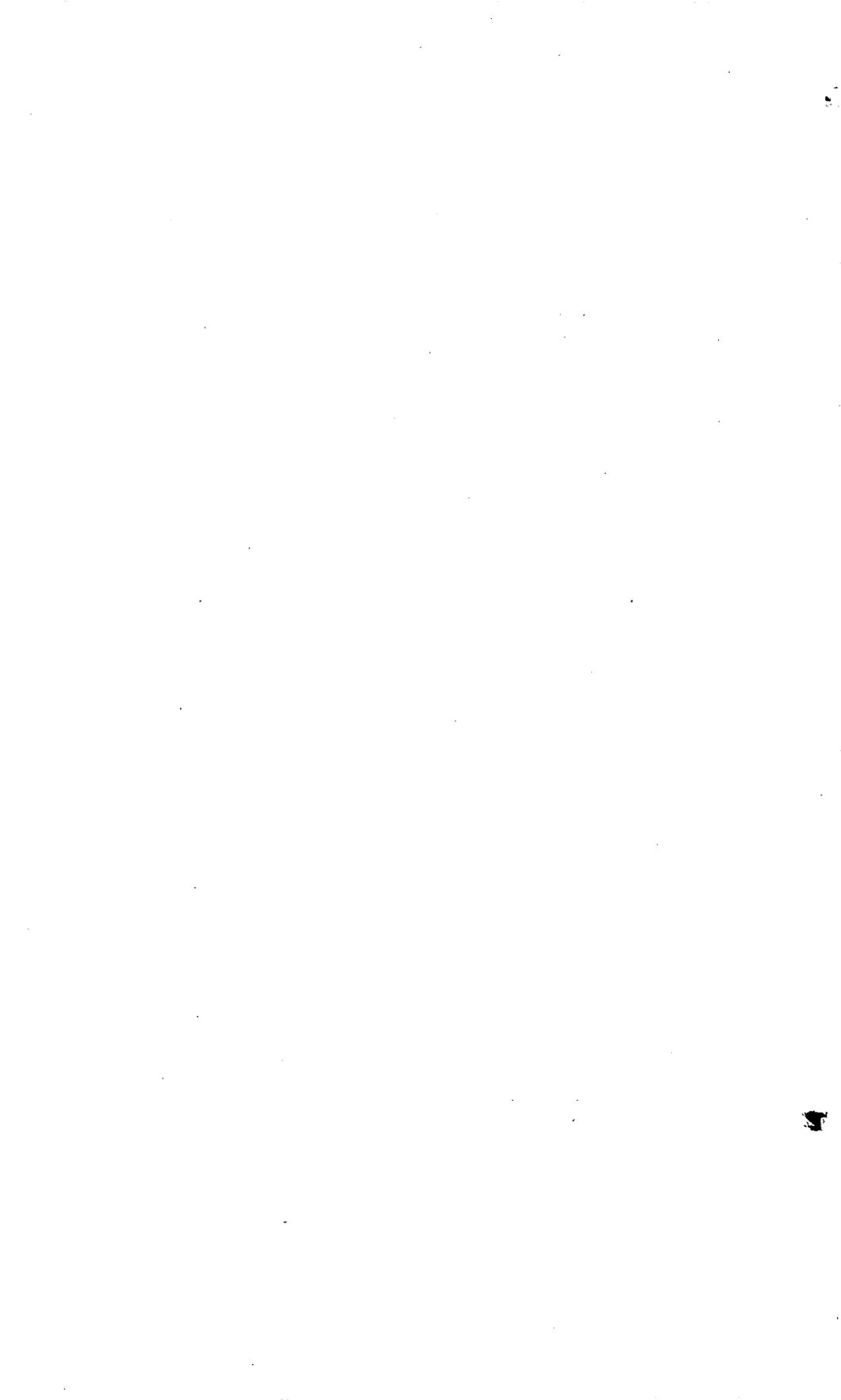
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CONTRIBUTIONS TO STRATIGRAPHY

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

By **ROBERT B. O'SULLIVAN**

ABSTRACT

The Coughs Creek Tongue is the name herein given to a sequence of light-gray marlstone, locally containing beds of sandstone and siltstone, in the upper part of the Green River Formation. The tongue forms a conspicuous stratigraphic marker over wide areas of east-central and southern Piceance Creek basin. At the type section, the Coughs Creek Tongue is 110 feet (33.5 m) thick and is underlain by about 200 feet (61 m) and overlain by about 600 feet (186 m) of dominantly clastic rocks assigned to the Uinta Formation. The tongue probably joined the main body of the Green River Formation in the southern part of the basin in an area where the Coughs Creek rocks are eroded.

INTRODUCTION

The youngest sedimentary rocks of Eocene age in the Piceance Creek basin in northwestern Colorado are assigned to the Uinta Formation (Cashion and Donnell, 1974). The Uinta Formation is as much as 1,250 feet (381 m) thick and consists largely of brown sandstone and siltstone with thin beds of greenish-gray mudstone, shale, and light-gray marlstone. The Uinta forms the surface rocks over much of Piceance Creek basin.

The Green River Formation of Eocene age underlies and interfingers with the lower part of the Uinta Formation. The Parachute Creek Member, the uppermost unit in the main body of the Green River Formation, is at least 1,800 feet (548 m) thick and consists largely of marlstone. The member contains the richest and thickest oil-shale beds in the Green River Formation.

Numerous marlstone units in the upper part of the Green River Formation interfinger with the Uinta Formation. Four of these marlstone units have been formally named as tongues of the Green River Formation (Duncan and others, 1974). These are, in ascending

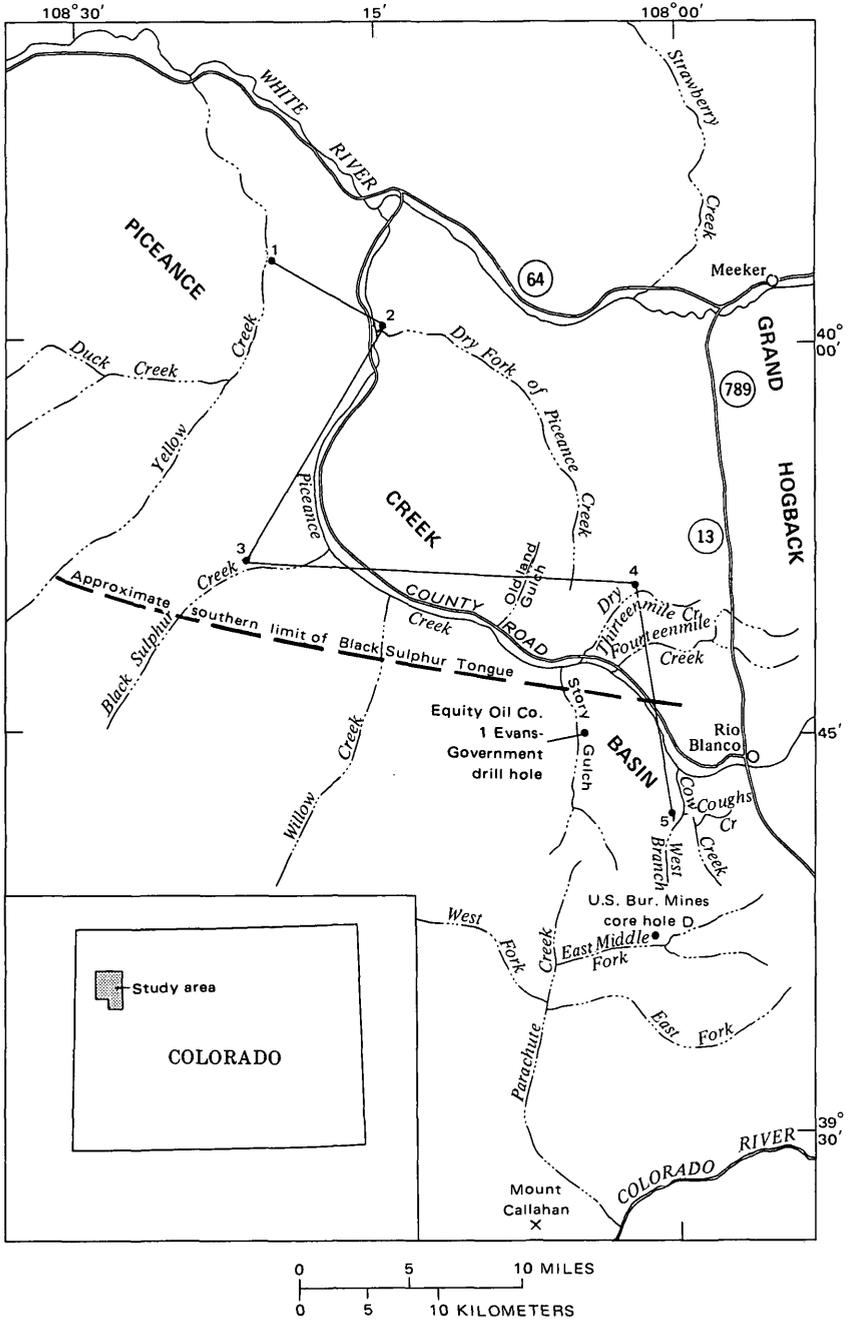


FIGURE 1.—Index map of part of Piceance Creek basin. Locality 5 marks position of type section of Coughs Creek Tongue. Cross section through localities 1–5 shown in figure 2.

stratigraphic order, the Yellow Creek, Dry Fork, Thirteenmile Creek, and Black Sulphur Tongues of the Green River Formation. These four tongues are present in a large part of the northern Piceance Creek basin. Southward they merge with the main body of the Green River Formation, and none of the four is present roughly south of the heavy line in figure 1 which marks the approximate southern limit of the Black Sulphur Tongue.

A stratigraphically higher marlstone unit occurs south of the limits of the tongues just described. It extends over wide areas of the east-central and southern parts of the Piceance Creek basin and forms a useful stratigraphic marker. This marlstone unit is discussed herein and designated the Coughs Creek Tongue of the Green River Formation. Recognition of the Coughs Creek Tongue aids interpretation of local geologic structures, serves to divide the thick sequence of rocks assigned to the Uinta Formation, and aids in determining the character and thickness of overburden above the oil-shale zones of the Parachute Creek Member.

**COUGHS CREEK TONGUE OF GREEN RIVER FORMATION
DEFINITION AND TYPE SECTION**

A light-gray marlstone sequence is here named the Coughs Creek Tongue of the Green River Formation. The name is taken from Coughs Creek, a small tributary to Cow Creek, which, in turn, is a tributary to Piceance Creek (fig. 1). The type section, which is readily accessible by road, is located in Rio Blanco County about 1¼ miles (3 km) south of the junction of the dirt road along Cow Creek and the paved county road along Piceance Creek. The type section was measured on the west side of Cow Creek in the SW¼SE¼ sec. 12, T. 4 S., R. 95 W. The base of the section is about 160 feet (48 m) above the level of Cow Creek.

Throughout the area, the Coughs Creek Tongue is clearly distinguishable by its gray-weathering marlstone which contrasts with the brown-weathering sandstone and siltstone of the Uinta Formation.

Type section of the Coughs Creek Tongue of Green River Formation

[SW¼SE¼ sec. 12, T. 4 S., R. 95 W., Rio Blanco County, Colo.]

| | <i>Thickness</i> | |
|--|------------------|--------------|
| | <i>(ft)</i> | <i>(m)</i> |
| Uinta Formation (part): | | |
| Sandstone, tan, very fine grained, silty, abundant carbonaceous trash..... | | Not measured |
| Coughs Creek Tongue of Green River Formation: | | |
| Marlstone, medium-gray; weathers very light gray; variably silty; in thin beds about ½ in. (12 mm) thick; contains a lenticular bed of very fine grained grayish-orange very calcareous sandstone as much as 1.5 ft (46 cm) thick that is 6.7 ft (2.0 m) above base; unit weathers to very small chips; base is sharp..... | 23.3 | 7.1 |

Type section of the Coughs Creek Tongue of Green River Formation—Continued

| Coughs Creek Tongue of Green River Formation—Continued | <i>Thickness</i> | |
|---|------------------|--------------|
| | <i>(ft)</i> | <i>(m)</i> |
| Siltstone, sandstone, and marlstone in irregular and lenticular beds 2–10 ft (0.6–3.0 m) thick. Siltstone is tan and grades to tan very fine grained sandstone; gray marlstone, variably silty, weathers to very light gray. Unit tends to form a cliff; basal contact is sharp but is mostly obscured | 55.2 | 16.8 |
| Marlstone, gray; weathers very light gray and light tan, particularly in lower part; laminated to thin beds generally less than ½ in. (12 mm) thick; at base of unit a ⅜ in. (1 cm)-thick white tuff; weathers tan; very fine grained; flat and even upper and lower contacts; a 0.1 ft (3 cm)-thick bed of grayish-black oil shale weathers bluish gray and contains 15–20 gallons of oil per ton at 14.5 ft (4.4 m) above base; unit as a whole weathers to plates as much as 2 ft (0.6 m) across | 30.0 | 9.1 |
| Siltstone, tan; weathers tan; in beds 0.1 ft (3 cm) thick; grades upward into light-gray marlstone in beds ¼ in. (6 mm) thick; unit forms a transitional zone with underlying rocks | 2.3 | .7 |
| Total thickness Coughs Creek Tongue | <u>110.8</u> | <u>33.7</u> |
| Uinta Formation (part): | | |
| Siltstone, grades to very fine grained sandstone; light tan; weathers tan and brown; abundant carbonaceous trash; upper part slabby; tends to form a cliff | | Not measured |

In addition, the tongue is exposed in many places in steep slopes that are set back on a bench developed at the top of the part of the Uinta Formation that underlies the Coughs Creek Tongue.

THICKNESS OF TONGUE AND ASSOCIATED ROCKS

The Coughs Creek Tongue ranges in thickness from 50 to 130 feet (15 to 40 m) along Piceance Creek in the area between Cow Creek and Story Gulch. The tongue is thickest where a middle sandstone or siltstone, as much as 55 feet (17 m) thick, separates upper and lower beds of marlstone. The middle sandstone is apparently confined to the east-central part of the Piceance Creek basin.

In Story Gulch the Coughs Creek Tongue is 50–85 feet (15–26 m) thick, and the middle sandstone is absent. Variations in thickness of the tongue in Story Gulch are due to channeling prior to or during deposition of the overlying sandstone beds of the Uinta Formation. North of Piceance Creek and in the area east of Oldland Gulch, the tongue gradually changes northward to gray siltstone, and, about 2 miles (3 km) north of Piceance Creek, the gray siltstone of the Coughs Creek Tongue is indistinguishable from the siltstones of the Uinta Formation.

An unnamed sandstone tongue of the Uinta Formation between the base of the Coughs Creek Tongue and the top of the Parachute Creek Member varies considerably in thickness. Along Story Gulch this tongue is about 400 feet (122 m) thick. In the lower reaches of Cow Creek, the tongue varies locally in thickness because of great irregularities in the upper contact of the Parachute Creek Member. On the east side of Cow Creek in the SE $\frac{1}{4}$ NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 12, T. 4 S., R. 95 W., the tongue of the Uinta Formation below the Coughs Creek Tongue is 130 feet (40 m) thick. Less than one-half mile (0.8 km) to the north in the N $\frac{1}{2}$ SE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 12, the sandstone tongue of the Uinta Formation is more than 240 feet (73 m) thick inasmuch as its base is not exposed at creek level. In several nearby drill holes, the basal tongue of the Uinta Formation appears to average about 200 feet (61 m) in thickness in the Cow Creek area. Farther south, along East Middle Fork of Parachute Creek, the tongue of the Uinta Formation is 85 feet (26 m) thick, and, near Mount Callahan in the southern part of Piceance Creek basin, it is about 60 feet (18 m) thick. The Coughs Creek Tongue is eroded from the area where it probably merged with the main body of the Green River Formation, somewhere east of Mount Callahan in the vicinity of the Colorado River.

STRATIGRAPHIC RELATIONSHIPS

The stratigraphic relation of the Coughs Creek Tongue to the Uinta Formation, to other tongues, and to the Parachute Creek Member of the Green River Formation is shown in figure 2. The diagram is generalized, and lithologic detail is omitted. Detailed stratigraphic changes and thicknesses of units between sections are not precisely recorded. Obviously, however, there are very large differences from north to south in thicknesses of stratigraphic units. Much of this variation is due to pronounced changes in the thickness of the dominantly clastic rocks of the Uinta Formation.

All the named marlstone units are arbitrarily assigned as tongues of the Green River Formation, although they are stratigraphically and lithologically related to the Parachute Creek Member of the Green River Formation. It did not seem appropriate either to raise the stratigraphic rank of the Green River Formation and all its subdivisions or to classify the thick and varied units as beds within the Parachute Creek Member, inasmuch as one of the units, the Thirteenmile Creek Tongue, consists of as much as 200 feet (61 m) of marlstone, sandstone, siltstone, ostracodal beds, limestone, and thin beds of rich oil shale.

The columnar section shown at Cow Creek (loc. 5, fig. 2) is a composite that includes the type section of the Coughs Creek and several measurements of overlying and underlying rocks along Cow Creek and Piceance Creek. The interval from the base of the Coughs Creek Tongue to the top of the Mahogany ledge is about 600 feet

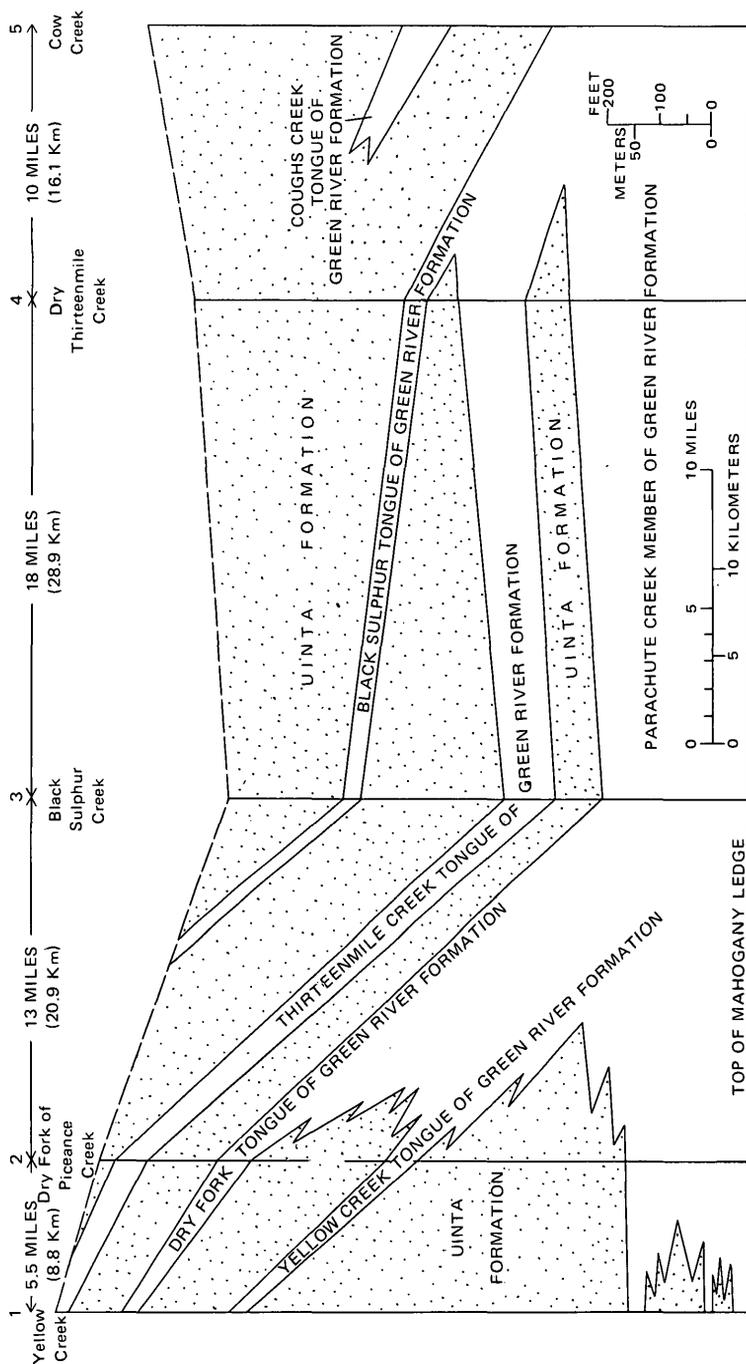


FIGURE 2.—Generalized stratigraphic relations of the Coughs Creek Tongue to other subdivisions of the Green River Formation and to the Uinta Formation. In part from Duncan, Hail, O'Sullivan, and Pipingos (1974, fig. 4). Green River Formation, white; Uinta Formation, stippled. Datum is top of Mahogany ledge, a rich oil-shale sequence in the upper part of the Parachute Creek Member. Vertical exaggeration about $\times 100$.

(183 m) thick near the Coughs Creek type section. Southward, at the U.S. Bureau of Mines corehole D (fig. 1) in sec. 11, T. 5 S., R. 95 W., on the north side of East Middle Fork of Parachute Creek, the same interval is about 575 feet (175 m). The interval thickens westward from Cow Creek and is about 1,050 feet (320 m) at the Equity Oil Co. 1 Evans-Government drill hole in sec. 29, T. 3 S., R. 95 W., on Story Gulch.

The Coughs Creek Tongue is overlain by very fine grained sandstone and siltstone several hundred feet thick assigned to the Uinta Formation. Judged from a composite of three sections measured along the West Branch of Cow Creek, about 1–2 miles (1.6–3.2 km) south of the type section, the Uinta Formation overlying the Coughs Creek Tongue is 610 feet (186 m) thick.

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