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Geology and Mineralogy

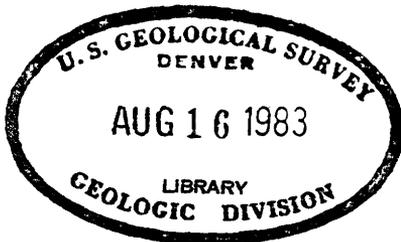
UNITED STATES DEPARTMENT OF THE INTERIOR  
GEOLOGICAL SURVEY

PHOTOGEOLOGIC MAP OF THE FLAT TOP MOUNTAIN NE QUADRANGLE  
CARBON COUNTY, WYOMING\*

By

A. B. Olson

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\*This report concerns work done on behalf of the Division of Raw Materials of the U. S. Atomic Energy Commission.

## USGS - TEM-985

## GEOLOGY AND MINERALOGY

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PHOTOGEOLOGIC MAP OF THE FLAT TOP MOUNTAIN NE QUADRANGLE  
CARBON COUNTY, WYOMING

By A. B. Olson

ABSTRACT

Flat Top Mountain NE quadrangle is on the eastern rim of the Washakie Basin. The Wasatch and Green River formations crop out in the map area and dip generally to the west. The even and persistent bedding of the Green River formation, combined with the strong benching of a few beds, makes it possible to distinguish easily on photographs stratigraphic units within the formation. Structure contours were drawn on one of these units.

INTRODUCTION

Flat Top Mountain NE quadrangle is in the southwest corner of Carbon County, Wyoming near the Colorado State line. (See fig. 1.) The quadrangle is on the eastern rim of the Washakie Basin. "The synclinal structure of the Washakie Basin has given rise to a bold, outward-facing encircling escarpment, developed on beds in the Green River formation that are more resistant to erosion than other beds in the section" (Bradley, 1945). In the mapped area, the relief is 1,300 feet, the vegetation is sparse, and about 2,400 feet of lake beds and fluvial deposits of Tertiary age are exposed. The beds dip generally to the west.

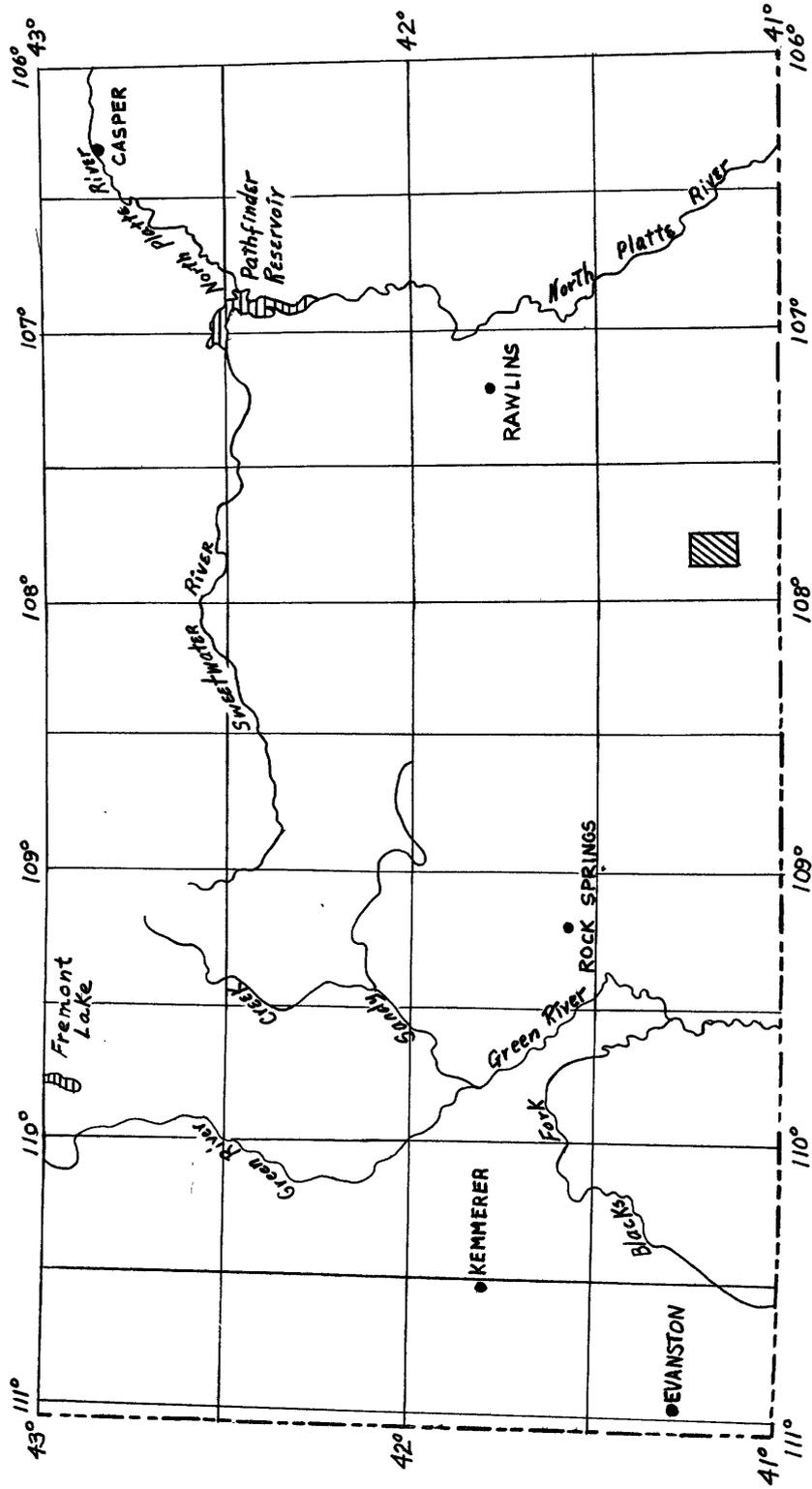


FIGURE 1.---Index map of part of Wyoming, showing the location of Flat Top Mountain NE quadrangle.

Uranium has been found in Tertiary rocks in nearby areas; for example, in Poison Basin (Vine and Prichard, 1954) about 7 miles to the south of this quadrangle, in the Great Divide Basin (Pipiringos, 1956) about 35 miles to the north, and in the Crooks Gap area (Stephens, 1956) about 70 miles to the north.

This study is part of a program conducted by the U. S. Geological Survey on behalf of the Division of Raw Materials of the U. S. Atomic Energy Commission.

#### METHODS OF COMPILATION

The base map, scale 1:20,000, was modified from a multiplex manuscript prepared for the U. S. Army Map Service 1:250,000-scale maps of the United States. Some planimetric detail was changed, and other detail was added during compilation. Photogeologic interpretation was made from high-altitude photographs (scale 1:63,000) and from the stereoscopic model (scale 1:12,000) in the Kelsh plotter. Geology was compiled on the base by means of the Kelsh plotter and pantograph. The completed map was reduced photographically to a scale of 1:24,000.

Structure contours were drawn on the top of a bench-forming bed, conspicuous on the photographs. Elevations were measured on this bed with the aid of the Kelsh plotter. Where the bed did not crop out, elevations were measured on beds higher in the section; and the thickness of section above the bench-forming bed was subtracted from these measurements.

Topographic and planimetric data on the multiplex manuscript were not sufficiently dense or detailed to insure precise orientation of the stereoscopic models, particularly the model covering the south half of the map.

For this reason the positions of the structure contours shown in the south half of the map are questioned.

Geologic formations were delimited on the aerial photographs on the basis of descriptions given in reports and maps by Bradley (1936, p. 170-179, and 1945) and from a report in preparation by G. E. Prichard and others.

## GENERAL GEOLOGY

### Stratigraphy

The four formal stratigraphic units exposed in the area mapped are from oldest to youngest: the Tipton tongue of the Green River formation (Tgrt), the Cathedral Bluffs tongue of the Wasatch formation (Twc), the upper part of the Green River formation (here photogeologically subdivided into three parts, Tgr<sub>3</sub>, Tgr<sub>2</sub>, Tgr<sub>1</sub>) all of Eocene age; and the Bishop(?) conglomerate of Miocene(?) age (Tb).

The Tipton tongue of the Green River formation consists of lake sediments "of rather soft, brown papery, varved organic shale and low-grade oil shale, in which somewhat harder beds of gray, flaky marlstone and thin regular beds of brown limy sandstone are interbedded" (Bradley, 1945). The complete section, exposed in the northeast corner of the map area and in the adjoining quadrangle to the east, is about 120 feet thick. Although the Tipton tongue grades laterally into the Cathedral Bluffs tongue of the Wasatch formation, the Tipton tongue is readily recognized on aerial photographs. It forms prominent dip slopes that are expressed as a dark band between the overlying and underlying lighter-colored Wasatch beds.

The Cathedral Bluffs tongue of the Wasatch formation is a fluvial deposit and "consists predominantly of gray mudstone that is banded with pink and red layers" (Bradley, 1945). It is about 1,250 feet thick in this area. The tongue is readily recognized on aerial photographs and appears to be more easily eroded than the overlying and underlying units; it forms gentle slopes. It occupies a broad band along the edge of the basin although much of it is covered by surficial deposits. The outcrops form badlands and appear rounded and either very dark or very light. The upper contact of the tongue is not easily recognized on aerial photographs.

At the southern end of the map area the Cathedral Bluffs-Green River contact was placed at the base of a light bed and the top of a thick dark bed, 180-200 feet below the lowermost prominent bench-forming bed of the Green River formation. This contact separates an overlying 60- to 80-foot section of thinly banded rocks of the Green River formation from an underlying section of widely banded rocks of the Cathedral Bluffs tongue. This contact is believed to correspond with that mapped by Prichard. In the central and northern parts of this quadrangle the contact is obscure and difficult to recognize on the aerial photographs, as the banding of the Green River beds becomes more pronounced and appears on aerial photographs to be similar to that of the underlying beds. In the central and northern parts of the quadrangle, the contact was mapped about 80 feet lower stratigraphically than in the southern part -- at the top of a light-colored slightly resistant bed.

The part of the Green River formation that overlies the Cathedral Bluffs tongue of the Wasatch formation is about 850 feet thick in the map area. It consists of lake sediments "of light-gray to buff, varved and

thin bedded marlstone containing more or less organic matter. Oil shales, beds of marlstone and shale, oolitic limestone and bedded algal deposits, and limy sandstone or sandy marlstone characterize various facies of the formation\* (Bradley, 1945).

On aerial photographs the Green River formation appears to be evenly bedded and has a generally light photographic tone but some contrasting darker and lighter beds. It is relatively resistant to erosion and forms most of the upland area. Two beds in the lower half of the Green River formation in this quadrangle form prominent benches; the unit between them appears on the aerial photographs as a distinctive smooth light-toned slope that supports little vegetation. This unit has been mapped as Tgr<sub>2</sub>. It separates the overlying beds of the Green River formation, Tgr<sub>1</sub> from the underlying beds of the Green River formation, Tgr<sub>3</sub>. The Tgr<sub>1</sub> - Tgr<sub>2</sub> contact was placed below the upper bench at the base of the first dark bed and the top of a white bed. The Tgr<sub>2</sub> - Tgr<sub>3</sub> contact was placed below the lower bench at the base of the first dark bed and the top of a white bed.

The unit mapped as the Bishop(?) conglomerate lies unconformably on the Green River formation. It is a fine- to medium-grained gray sandstone that weathers to a rusty or buff color, is massive bedded, and forms ledges and cliffs (J. P. Minard, 1956, personal communication). As the lower contact crops out in a steep cliff or is covered by slump, it is not clearly expressed on the photographs. The unit is probably not more than 180 feet thick.

#### Structure

The beds of the Green River formation dip westward toward the center of the Washakie Basin. In the northern half of this map area the Green River

formation strikes north-northwestward and dips  $2^{\circ}$  -  $3^{\circ}$  southwest. In the southern half, the strike of the Green River formation changes to north and north-northeast and the dip to  $1^{\circ}$  -  $2^{\circ}$  west. Structure contours were drawn on the top of the lower map unit ( $Tgr_3$ ) of the Green River formation, or below the lower prominent bench-forming bed.

The "flat" surface on Flat Top Mountain is a prominent feature on the aerial photographs. It is similar to others in adjacent areas mentioned by Bradley where a resistant capping of Bishop conglomerate has protected the smooth Gilbert Peak erosion surface. The discordance in dip between the Bishop(?) conglomerate and the Green River formation is evidence of a post-Eocene erosion surface. To the west, the Bishop conglomerate was deposited on the Gilbert Peak erosion surface of Oligocene or Miocene age (Bradley, 1936, p. 163-204).

#### CONCLUSIONS

Photogeologic methods may be used to map units within the Green River formation in the Flat Top Mountain area. The even and persistent bedding, combined with the topographic expression and bands of vegetation along certain beds, makes it possible to distinguish easily units within the formation.

Although on photographs the appearance of the Green River formation is quite different from that of the Cathedral Bluffs tongue, the contrast in appearance at the contact between the two formations is not great enough to allow the ready recognition of the exact position of the contact.

Because of the strong benching of the gently dipping beds in the Green River formation, strikes and dips were easily determined by photographic

procedures; and it was possible to draw structure contour lines on some units in the Green River formation. Where two linear features were mapped in the Cathedral Bluffs tongue of the Wasatch formation, field check showed beds were disturbed and possibly fractured.

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