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PHOTOGEOLOGIC MAPS OF THE MILES RANCH AND LOVE RANCH QUADRANGLES FREMONT AND NATRONA COUNTIES, WYOMING*

By

J. P. Minard

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PHOTOGEOLOGIC MAPS OF THE MILES RANCH AND LOVE RANCH QUADRANGLES, FREMONT AND NATRONA COUNTIES, WYOMING

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ABSTRACT

Love Ranch and Miles Ranch quadrangles are in the Wind River Basin, Wyoming (fig. 1). The rocks exposed in the quadrangles are sedimentary, and range in age from Late Cretaceous to early Tertiary. The youngest formation in the quadrangles, the Wind River formation of Eocene age, is uranium bearing in adjacent areas. Within the two quadrangles the Wind River formation unconformably overlies all the older rocks. In Miles Ranch quadrangle the Wind River formation is divided, on the basis of photo-interpretation, into an upper and lower unit; the relationship of these units to units of the Wind River formation, as mapped in adjoining areas, has not been determined.

INTRODUCTION

The Love Ranch and Miles Ranch quadrangles (fig. 1) are in the southeast part of the Wind River Basin, Wyoming. The area is a sparsely vegetated basin-type terrane of moderate relief. The Wind River Basin is a structural and topographic basin, almost surrounded by mountains. It is a broad region of low ridges and hills, some of which are gravel capped. The photographic appearance of geologic features and factors considered and used in mapping the quadrangles is noted in this report. Such information as detailed lithologic descriptions was obtained largely from published reports; additional data were collected on a two-day field check of the area.

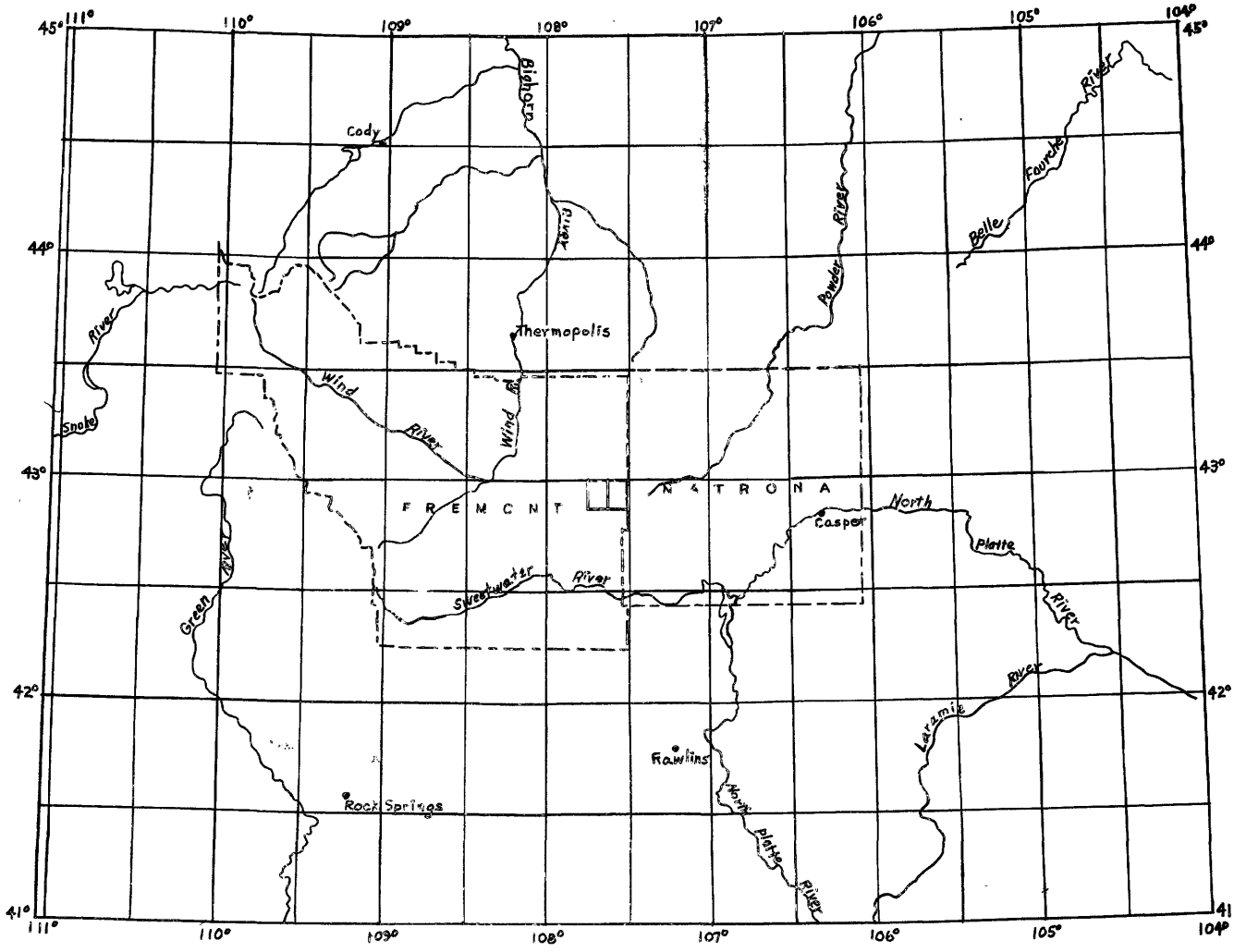

Figure 1.--Index map showing location of Miles Ranch and Love Ranch quadrangles, Fremont and Natrona Counties, Wyoming.

These maps (plates 1 and 2) were compiled primarily from 1/60,000-scale vertical aerial photographs taken in June 1954. Supplementary data were derived from 1/28,400-scale photographs taken in October and November 1949. A Kelsh plotter was used in the map compilation and to make the vertical measurements necessary for certain interpretations. The model scale was 1/12,000. As the information was interpreted, it was plotted directly on the topographic base maps by means of a variable-ratio pantograph attached to the Kelsh plotter. Some additional planimetric detail that was not shown on the existing topographic maps was added to the base map. Such detail includes trails, surveyed lines, and such additional streams that would aid in field location.

As a result of the field inspection some dips were added to the maps, the contact between the Wind River formation and the Cody shale in the southeast corner of Miles Ranch quadrangle was moved stratigraphically upwards approximately 40 feet, and the formation contacts in the southwest part of Love Ranch quadrangle were shifted several hundred feet southward to conform more closely with the northwestward plunging anticline.

This work was done by the U. S. Geological Survey on behalf of the Division of Raw Materials of the U. S. Atomic Energy Commission.

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STRUCTURE

Formations within the Miles Ranch and Love Ranch quadrangles dip generally to the north. Dips of the Cretaceous formations and the Fort Union formation of Tertiary age generally range from 20° to 30° although locally they are as steep as 50°. A northwestward-plunging anticline is present in the southern part of Love Ranch quadrangle. A series of transverse faults offset beds on the northeast limb of this structure. The axis of a shallow syncline trends northwestward across the northern part of the Miles Ranch quadrangle. The gently northward-dipping (3°-8°) Wind River formation unconformably overlies the erosion-beveled beds of the more steeply dipping older formations, and it is difficult to determine the dip of Wind River beds in most places.

Dips of beds measured on the photographs agreed closely with dips later measured in the field. Locally in the southeast part of the Miles Ranch quadrangle, beds within the Cody shale are obscured by slope wash from the overlying Wind River formation, and their attitudes could not be measured accurately on the photographs. Some faults were seen more readily on the photographs than on the ground.

STRATIGRAPHY

General

Several shale and sandstone units of Late Cretaceous age and two sandstone units of early Tertiary age are present in the Love Ranch and Miles Ranch quadrangles. They include the Cody shale, Mesaverde formation, Lewis shale and Lance formation of Cretaceous age, and the Fort Union and

Wind River formations of Tertiary age. The Cretaceous beds consist mainly of marine shales grading upward into sandstone. The Tertiary formations are composed primarily of continental siltstone, sandstone, and conglomerate.

Cody shale

In this area the Cody shale (Kc) is approximately 3,000 feet thick. It consists of dark gray marine shale with some sandstone beds near the top. Some of these upper beds weather rusty brown and appear dark on the photographs. The general topography is subdued, with low rounded hills and ridges and broad shallow valleys constituting most of the outcrop area. No resistant beds crop out prominently; rather a suggestion of bedding is seen on the photographs in the low, parallel, gently sloping ridges and banded tonal differences. On the aerial photographs, the upper contact of the Cody shale is difficult to distinguish in the westward facing bluff in the southeast part of Miles Ranch quadrangle because of slope wash from the overlying Wind River formation. This contact was later observed and mapped in the field.

Mesaverde formation

The Mesaverde formation (Kmv) consists of alternating massive and thin-bedded sandstones and gray sandy shales. In this area the sandstones are mainly at the base and top of the formation and tend to exhibit more relief than the intervening shales. The base of the Mesaverde formation was picked at the base of a dark ledgy bed (on the aerial photographs) a short distance below a light-colored, massive bed that is readily apparent and easily traced on the aerial photographs. The dark bed forms the first

conspicuous, resistant bed above the Cody shale and appears to represent the first major transition from the soft Cody shales and siltstones to the more resistant Mesaverde beds. Bauer (1934, p. 665) lists a measured section in this area as 790 feet thick.

Lewis shale

The Lewis shale (Kle) in this area is mainly gray marine shale with some sandstone beds. A shallow strike valley occupies much of its outcrop area. Sandstone beds form minor ridges on the slope of this small valley. The sandstone beds near the top may be correlative with the Fox Hills sandstone. The Lewis shale is 975 feet thick in this area, according to Bauer (1934, p. 665).

Lance formation

The Lance formation (Kl) consists of gray sandy shale in the lower part with many carbonaceous shale and sandstone beds in the remainder. Many of the sandstone beds are brown, thin-bedded and fine to medium grained. Marly, bentonitic and fragmental clinkerlike, clay-ironstone beds are present. The topography is largely a narrow strike valley with some light-colored, ledgy sandstone beds cropping out on the southwest slope of the valley. The Lance formation is 955 feet thick in this area, according to Bauer (1934, p. 665).

Fort Union formation

The Fort Union formation (Tf) is largely massive, locally friable sandstone which forms prominent dipping ledges and, locally, jagged,

angular landforms resulting from erosion. Where the Fort Union formation crops out in Castle Gardens in the west part of Miles Ranch quadrangle, wind- and water-sculptured sandstone spires and pillars rise from the valley floor and along the irregular cliff face. Here the sandstone is light gray to white and is loosely cemented by calcite. In the outcrop farthest to the northwest in the Love Ranch quadrangle, sandstone in the Fort Union formation is dark gray, massive, blocky, and resistant. The dipping ledges and sculptured spires and pillars, from which the name "Castle Gardens" is derived, are distinctive features on the photographs. The Fort Union formation in this area is 940 feet thick, according to Bauer (1934, p. 665).

Wind River formation

The Wind River formation (Twd) in this area consists of several hundred feet of terrestrial deposits. The Wind River formation occupies the same stratigraphic interval here as the Wasatch formation does on the south flank of the Sweetwater arch just to the south. As the Sweetwater arch was uplifted, weathered material was stripped off and deposited on the north and south flanks of the uplift. The bulk of the fluviatile deposits making up the lower part of the Wind River formation was derived primarily from post-Cambrian Paleozoic and Mesozoic rocks. The deposits composing the upper part of the Wind River formation were derived largely from Cambrian and Precambrian rocks as the streams cut deeper into the uplift.

The Wind River formation is composed of clayey siltstone, sandstone, and conglomerate beds. Abrupt lateral gradation, lensing, and tonguing are common. The siltstones are generally thin bedded. The

sandstones are crossbedded channel-type deposits, occurring as light-colored, loosely to well-cemented layers and lenses. The conglomerates, which make up a large part of the Wind River formation, consist of thick beds of cobbles and boulders with a loose matrix of interstitial pebbles, granules, sand, and silt particles.

In the Miles Ranch quadrangle, the Wind River formation is divided, on the basis of photointerpretation, into upper and lower units. The relationship of these units to units of the Wind River formation mapped elsewhere in this region has not been determined. The upper unit is less dissected than the lower unit and locally forms benches. The upper unit is generally composed of coarser material than the lower unit and includes well-rounded granite boulders up to 2 feet in diameter, whereas the lower unit is more silty. The contact mapped between the upper and lower units of the Wind River formation in the Miles Ranch quadrangle is an arbitrary one. Because of poor exposures in the Love Ranch quadrangle, these units, if present, are not differentiated. On the bluff just east of the switchback in the road in the southeast corner of the Miles Ranch quadrangle, reddish-brown rocks mapped as part of the Wind River formation may be cemented gravels of Pleistocene age.

Within the Miles Ranch and Love Ranch quadrangles, the Wind River formation lies unconformably on the eroded edges of the older formations. This angular unconformity can be seen distinctly on the aerial photographs. In the eastern part of the Miles Ranch quadrangle, the lower silty beds of the Wind River formation form distinctive, well-dissected badlands. The angular unconformity is obvious where remnants of

the erosion-thinned, obscurely-bedded, gently dipping (approximately 4°) Wind River formation lie on the well bedded, moderately dipping (approximately 20°), eroded edges of the underlying Lewis, Lance and Fort Union formations.

Gravels

This map unit (Qg) includes gravel deposits which have been mapped separately from other surficial deposits because of their locations and distinct appearance on the aerial photographs. These deposits occupy the tops of low ridges and hills formed by the Cody shale and are similar in composition to those constituting the Wind River formation. The deposits consist mainly of pebbles and cobbles of granite and considerable amounts of material derived from the Mowry shale and Cloverly conglomerate There is no evidence of cementation as in the Wind River formation, and bedding is indistinguishable.

The topographic position of these gravel deposits, considerably above the present stream levels on the interstream divides, distinguishes them from other surficial deposits. They may have been laid down as former valley fill to at least their present level or as stream channel deposits. Their present high position may be the result of erosion removing more silty adjacent deposits or they may be residual remnants of the Wind River formation, possibly somewhat reworked as the bulk of that formation was eroded away.

Surficial deposits

This map unit (Qs) includes surficial deposits not otherwise differentiated. These deposits include stream deposits such as channel wash, sand bars and low terraces; slope wash; evaporite; and stabilized sand dunes.

Stabilized dunes cover an area of several square miles in the northern part of Love Ranch quadrangle. Irregular mounds, dry depressions, and absence of surface drainage typify this area. The dunes are more sharp and distinct when viewed in their entirety on the aerial photographs than when viewed on the ground. This is partly because of sagebrush and clump grass cover and partly because of the limited nature of the ground view. Sand grains in the dune area exhibit frosted, wind-faceted surfaces. Two small playa lakes are present adjacent to the southwest part of the dune area.

URANIUM DEPOSITS

Uranium is present in the Wind River formation in adjoining areas, especially in the Puddle Springs and Gas Hills quadrangles which border the Love Ranch and Miles Ranch quadrangles on the south (Zeller, Soister, and Hyden, 1956). Zeller (personal communication) stated that the uranium in many of these deposits was precipitated from ground water against faults with miner displacements (one to several feet). Detailed seismic surveys are necessary to locate many of these small faults, although some can be discerned on the photographs as linear features.

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