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DISTRIBUTION OF COARSE- AND FINE-GRAINED ROCKS IN THE WASATCH FORMATION AND THEIR RELATIONSHIP TO URANIUM DEPOSITS, POWDER RIVER BASIN, WYOMING

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ABSTRACT

A brief study of the areal distribution of the various rock types of the Wasatch formation in the Powder River Basin, Wyoming, was made during the summer of 1952. In the south and central parts of the basin, the Wasatch formation appears to contain coarser-grained rocks in contrast to the northern part, which contains relatively no coarser-grained rocks. The finer-grained rocks are abundant in the northern and central parts of the basin but relatively scarce in the southern part. The known uranium deposits in the Wasatch are in the central area where coarser-grained sandstones are complemented by abundant finer-grained rocks such as shales and siltstones.

INTRODUCTION

Uranium deposits were discovered in the Eocene Wasatch formation of the Powder River Basin, Wyoming (fig. 1) in October, 1951, by the U. S. Geological Survey (Love, 1952). A Geological Survey field party studied the uranium deposits of the Pumpkin Buttes area (fig. 2) and searched for further deposits during the summer of 1952. A reconnaissance for radioactivity in the Powder River Basin, excepting the Pumpkin Buttes

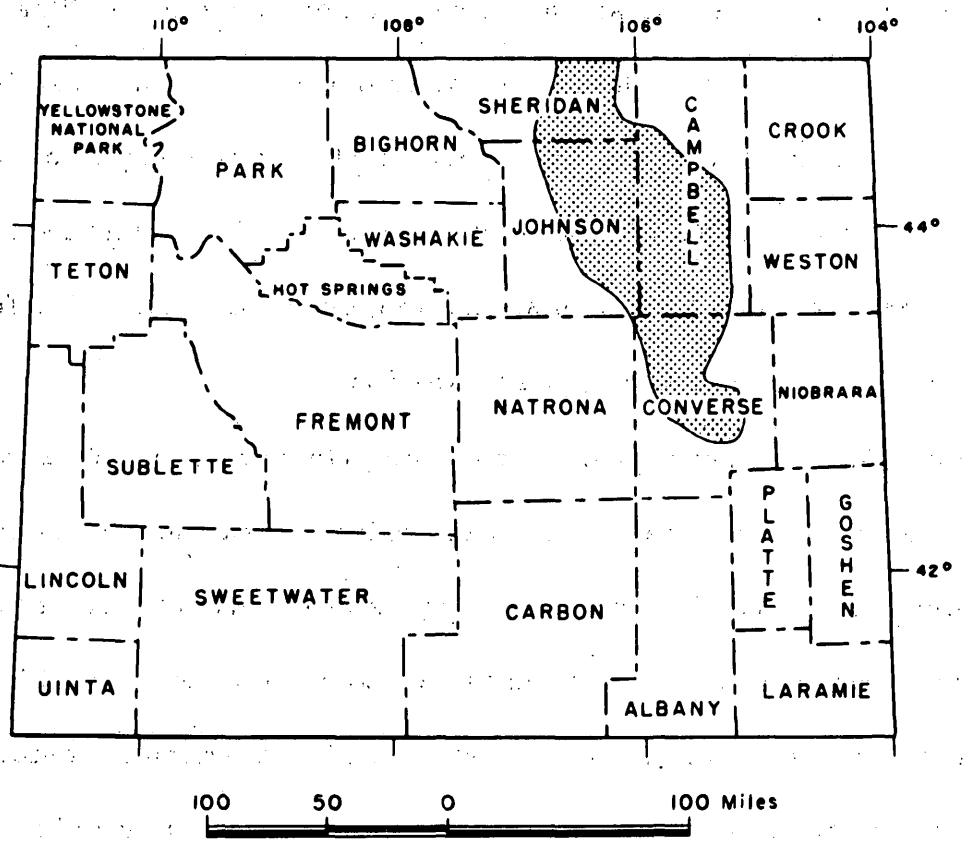

FIGURE 1.--INDEX MAP SHOWING AREAL DISTRIBUTION OF THE WASATCH FORMATION, POWDER RIVER BASIN, WYOMING

area, was made as a part of this search. The work was done on behalf of the Division of Raw Materials, U. S. Atomic Energy Commission.

In the course of the reconnaissance a brief study was made of the areal distribution of the coarse- and fine-grained rocks of the Wasatch formation. The purpose of the study was to determine if the uraniferous deposits of the Pumpkin Buttes area were related in any way to a particular lithologic facies of the Wasatch formation, for if such a relationship were known to exist, it would be of assistance in guiding the search for further uraniferous deposits in the Wasatch formation.

This report is based upon information gathered at 26 localities while making automobile traverses of all of the principal and secondary roads and a number of the trails which lie on rocks of the Wasatch formation in the Powder River Basin. Where exposures were adequate, the thickness of each rock type was estimated, and at localities at which sandstone is exposed, the grain size was noted by comparison with a grain size chart based upon the Wentworth size scale (Wentworth, 1922).

PREVIOUS INVESTIGATIONS OF THE WASATCH FORMATION OF THE POWDER RIVER BASIN

A review of the geologic literature describing areas in the Powder River Basin known to contain Wasatch rocks has shown that a regional study of the lithology of the formation has never been undertaken and that only very sparse lithologic data, even in small areas, are available. Reports by Davis (1910), Dobbin and Barnett (1927), Gale and Wegemann

(1908), Shaw (1909), Stone and Lupton (1908), Taff (1909), Wegemann (1910, 1913), Wegemann, Howell, and Dobbin (1928), and Winchester (1910), concern only the coal resources of various parts of the basin. Reports by Hembree, Colby, Swenson, and Davis (1952), and Littleton (1950) discuss ground and surface waters of parts of the basin but contain little data describing the lithology of the Wasatch. Early workers in the Powder River Basin did not differentiate between the Fort Union formation of Paleocene age, and the Wasatch formation of Eocene age until Wegemann (1917) reported Eocene fossils from beds which had previously been assigned to the Fort Union formation.

COMPILATION OF FIELD DATA

To prepare figure 2, the grain size of the coarsest sandstone present at a locality was plotted on a map showing the area of outcrop of the Wasatch formation as indicated by Love and Weitz (1951). For each locality at which a stratigraphic section was measured, a ratio of fine-grained rocks (including coal, carbonaceous shale, claystone and siltstone) to coarse-grained rocks (sandstone), was computed and plotted. Data are included from the principal stratigraphic section described by Troyer, McKay, Soister, and Wallace (1953).

No attempt has been made to show the areal distribution of the Moncrief and Kingsbury conglomerate members of the Wasatch formation in the vicinity of Buffalo. These represent the coarse clastic western

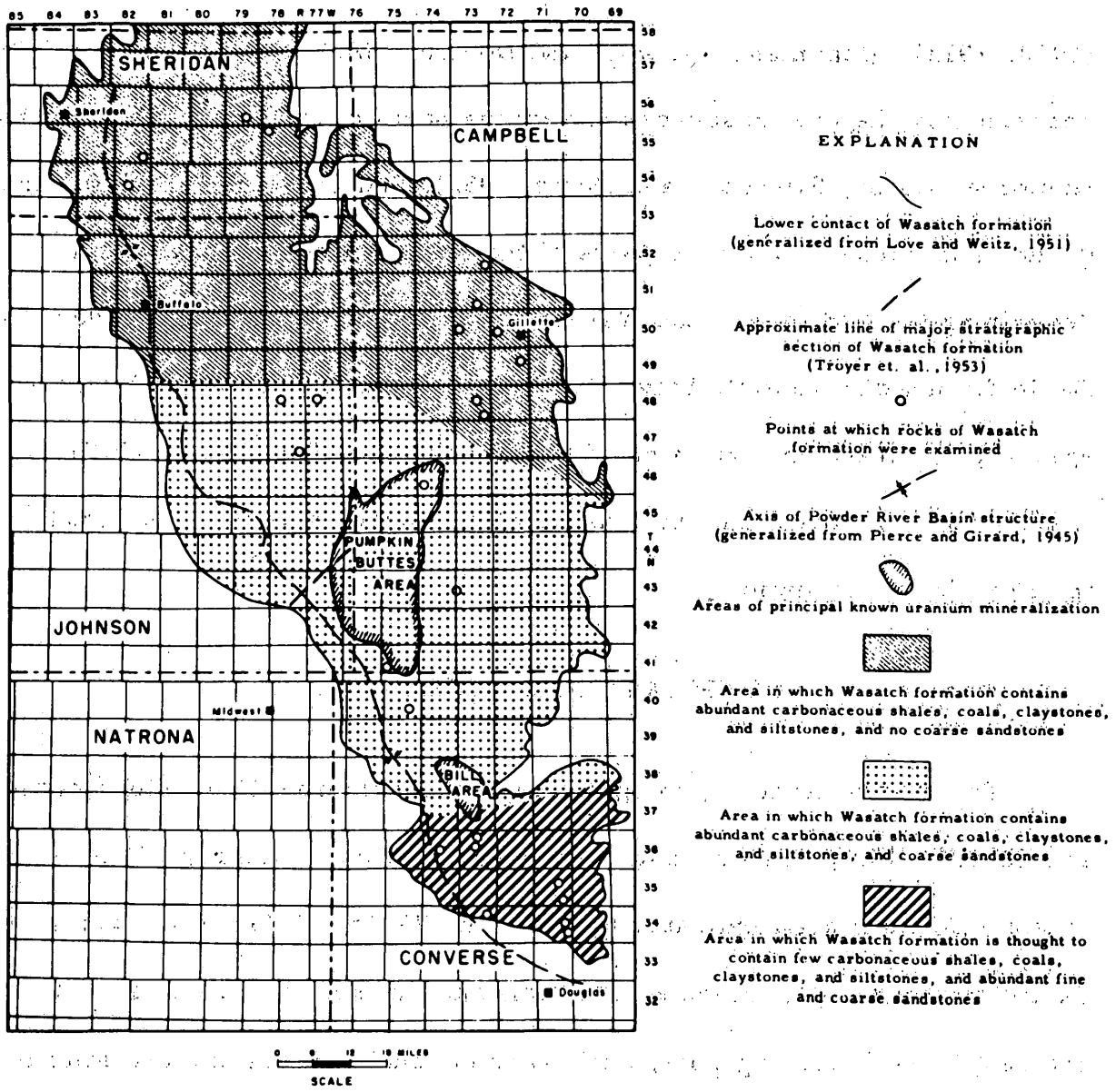

FIGURE 2.-- MAP SHOWING AREAL DISTRIBUTION OF FINE AND COARSE GRAINED ROCKS IN THE WASATCH FORMATION, POWDER RIVER BASIN, WYOMING

facies of the Wasatch formation derived from the Big Horn Mountains adjacent on the west (Darton, 1906, Sharp, 1948).

AREAL RELATIONSHIPS OF FINE- TO COARSE-GRAINED ROCKS OF THE WASATCH FORMATION IN THE POWDER RIVER BASIN

Figure 2 shows (1) that coarse-grained sandstones in the Wasatch formation are exposed in the southern and south-central parts of the Powder River Basin, but not in the northern part, and (2) that fewer fine-grained rocks are exposed in the southern part of the basin than in the northern and south-central parts.

This distribution may be only apparent and a result of exposure of different stratigraphic levels in the Wasatch formation. At the present time, not enough data are available to determine the stratigraphic relation of the various measured sections to each other. Further data bearing on these relationships will be gathered during the coming field season.

As shown on figure 2, the known uranium deposits appear to be restricted to the area in which the Wasatch formation has been observed to contain both coarse-grained sandstones and abundant carbonaceous shales, thin coals, claystones, and siltstones. Uranium deposits are not known in the area to the north where coarse-grained sandstones are absent, nor in the area to the south where fine-grained rocks are less abundant. The uranium deposits so far known in the Pumpkin Buttes area (Troyer, and others), and in the Bill area, are in medium and coarse-grained sandstones

that are crossbedded at many places and which are thought to represent stream channel fillings.

The areas of known uranium mineralization lie along the lower parts of the gently dipping east flank of the basin close to the major synclinal axis (fig. 2).

CONCLUSIONS

The Wasatch formation appears to contain coarse-grained rocks in the southern part of the Powder River Basin but not in the northern part. In most of the south-central part of the basin, the formation contains a mixture of coarse-grained sandstone and claystone, siltstone, carbonaceous shale, and coal. The known uranium deposits of the basin are in sandstones in this part of the basin.

Much further work is necessary to identify the facies of the Wasatch formation in more detail, to locate the boundaries between facies, and to study the relationship between the location of uranium deposits and facies. Such studies may aid in establishing guides in the search for uranium deposits in the Powder River Basin.

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