

INTRODUCTION

In 1978 the U.S. Geological Survey began a 4-year study of aquifers in the northern Great Plains. The purpose of this map, which is a product of that study, is to show the cumulative thickness of sandstone in the Judith River Formation. Other maps show the altitude of the top (Feltis 1982a), total thickness (Feltis, 1982b), and potentiometric surface of water (Levings, 1982) of the Judith River Formation. These maps are part of a series that describes the geology and potentiometric surface of selected rock units of Jurassic or younger age in the plains area of Montana.

SOURCE OF DATA

Most geologic data used to compile the map have been obtained from records of oil and gas exploration wells on file in offices of the Montana Department of Natural Resources and Conservation and the U.S. Geological Survey. The data were derived from interpretation of geophysical logs of oil or gas test wells. One site per township was the optimum density of data selected for map compilation; however, geophysical logs were not available for all townships.

JUDITH RIVER FORMATION

The Upper Cretaceous Judith River Formation consists of eastward-pointing wedges of nonmarine, regressive-shoreline and shallow-water marine strata that are enclosed by the westward-pointing wedges of fine-grained Claggett and Bearpaw Shales. The source material for the Judith River Formation and other Cretaceous formations was mostly from a north-trending cordilleran highland in western Wyoming and Montana. The stratigraphy and geologic history of the Judith River Formation are described by Gill and Cobban (1973), who show by stratigraphic diagrams and strandline maps the relationship of the formation to other Cretaceous rocks and the position and directions of strandline movement.

In the Crazy Mountains basin of south-central Montana, the Judith River sediments interfinger with continental sediments of the Cokedale Formation of the Livingston Group. The Cokedale Formation is the westward nonmarine equivalent of the Claggett Shale and part of the Judith River Formation of central Montana, or to part of the Two Medicine Formation of northwestern Montana (Roberts, 1972, p. C45). The Two Medicine Formation crops out on the west flank of the Sweetgrass arch, in the northwest part of the study area. The Two Medicine also consists mostly of continental sediments and is equivalent to the Eagle Sandstone, the Claggett Shale, and the Judith River Formation of the area east of the Sweetgrass arch (Mudge, 1972, p. A73).

CUMULATIVE SANDSTONE THICKNESS

Areas of cumulative sandstone thickness of the Judith River Formation were not identified in the Crazy Mountains basin or west of the Sweetgrass arch because of the complexity of the stratigraphy. However, on the west edge of the Crazy Mountains basin, a 1,550-foot measured section of the Cokedale Formation contained 520 feet of sandstone (Roberts, 1972, p. C77-C84). On the west flank of the Sweetgrass arch a 580-foot measured section of the 2,125-foot-thick Two Medicine Formation contained 304 feet of sandstone (Mudge, 1972, p. A131-A133).

In the vicinity of the Bearpaw Mountains in north-central Montana, faulting has either thickened or thinned the formation at some sites. The complexity of the geology in the area of the Bearpaw Mountains is shown on maps by Hearn (1976) but is not shown on the State geologic map (Ross and others, 1955). However, the State map shows the thrust-fault areas south of the mountains. Many gas wells have been drilled in the vicinity of the Bearpaw Mountains. A comparison of geophysical logs from these wells shows variations in thickness of sandstone that have resulted from thickening or thinning of the formation by faulting. The geophysical logs selected for this map represent wells that penetrated the full thickness of the Judith River Formation.

As shown on the map, the regressive-shoreline and shallow-water marine deposits of the Judith River Formation contain as much as 350 feet of sandstone in central Montana. In eastern Montana, the Judith River Formation contains 25 feet or less of sandstone.

REFERENCES CITED

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Gill, J. R., and Cobban, W. A., 1973, Stratigraphy and geologic history of the Montana Group and equivalent rocks, Montana, Wyoming, and North and South Dakota: U.S. Geological Survey Professional Paper 776, 37 p.

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Levings, G. W., 1982, Potentiometric-surface map of water in the Judith River Formation in the northern Great Plains of Montana: U.S. Geological Survey Open-File Report 82-562, scale 1:1,000,000.

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METRIC CONVERSION TABLE

The following factors can be used to convert inch-pound units in this report to the International System of units (SI):

Multiply inch-pound unit	By	To obtain SI unit
foot	0.3048	meter
mile	1.609	kilometer



MAP SHOWING CUMULATIVE THICKNESS OF SANDSTONE IN THE JUDITH RIVER FORMATION, MONTANA

by
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