

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 altitude of the top of the Swift Formation. Other maps show the total thickness (Feltis, 1982a) and the cumulative thickness of sandstone (Feltis, 1982b) in the Swift 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.

SWIFT FORMATION

The Middle and Upper Jurassic Swift Formation of the Ellis Group is the product of a marine transgressive-regressive cycle. A generalized description of the formation across the study area is given by Inlay and others (1948) as follows: "The Swift Formation consists mainly of a sequence of glauconitic sandstone and shale. In the western part of Montana in the Little Belt\*\*\* [and] Castle\*\*\* [Mountains]\*\*\*the formation consists mainly of medium- to thick-bedded sandstone that is fine- to coarse-grained\*\*\*. Elsewhere in Montana the lower part of the Swift Formation contains more or less shale which thickens eastward as the overlying sandstone thins, resulting thereby in a predominantly shale sequence in eastern Montana\*\*\*. Likewise both shaly and sandy beds become more calcareous eastward until the designation of certain beds as sandstone or limestone becomes an arbitrary matter."

The Swift unconformably overlies the Middle Jurassic Riedon Formation of the Ellis Group throughout much of Montana east of the Rocky Mountains but also overlies rocks of Paleozoic age in some areas. In southeast Montana the Swift overlies the Hulet Sandstone Member of the Sundance Formation. The Swift is conformably overlain by the Morrison Formation with a gradational change from deposition of marine glauconitic sediments to nonmarine sediments.

STRUCTURAL FEATURES

The map shows the range in altitude and the configuration of several structural features. The Williston basin is separated from the Powder River basin by the Miles City arch and the Cedar Creek anticline in eastern Montana. In the northern part of the State the map shows the Sweetgrass arch, Sweet Grass Hills, Bearpaw and Little Rocky Mountains, Hogeland basin, Bowdoin dome, and Blood Creek syncline. In the center of the State is the Big Snowy anticlinorium with the Big Snowy, Judith, and North and South Moccasin Mountains at the west end and the Porcupine dome on the east. In south-central Montana the map shows the Bull Mountains and Wheatland basins, the Big Coulee-Hallstone dome, the anticlinal noses of the Big Horn and Pryor Mountains, and the north end of the Big Horn basin and east side of Crazy Mountains basin connected by the Reed Point syncline. The Black Hills uplift is shown in the southeast corner of the State. These and other structural features are shown on the map by Dobbin and Erdmann (1955).

REFERENCES CITED

Dobbin, C. E., and Erdmann, C. E., 1955, Structure contour map of the Montana Plains: U.S. Geological Survey Oil and Gas Investigations Map OM-178B, scale 1:1,000,000.

Feltis, R. D., 1982a, Map showing total thickness of the Swift Formation, Montana: U.S. Geological Survey Water-Resources Investigations 82-4031, scale 1:1,000,000.

1982b, Map showing cumulative thickness of sandstone in the Swift Formation, Montana: U.S. Geological Survey Water-Resources Investigations 82-4030, scale 1:1,000,000.

Inlay, R. W., Gardner, L. S., Rogers, C. P., Jr., and Hadley, H. D., 1948, Marine Jurassic formations of Montana: U.S. Geological Survey Oil and Gas Investigations Preliminary Chart 32.

Ross, C. P., Andrews, D. A., and Witkind, I. J., 1955, Geologic map of Montana: U.S. Geological Survey, scale 1:500,000, 2 sheets.

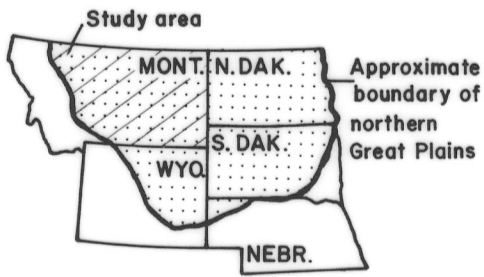
METRIC CONVERSION TABLE

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

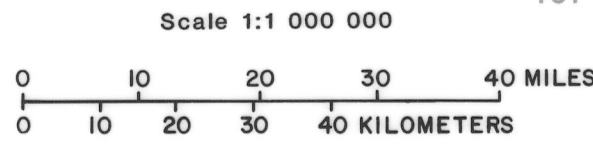
Multiply inch-pound unit	By	To obtain SI unit
foot	0.3048	meter
mile	1.609	kilometer

National Geodetic Vertical Datum of 1929: A geodetic datum derived from a general adjustment of the first-order level nets of both the United States and Canada, formerly called mean sea level.

- EXPLANATION
- JURASSIC ROCKS UNDIFFERENTIATED--Pattern shows general area of outcrop as given on the State geologic map (Ross and others, 1955); the unit includes the Morrison Formation, Ellis Group, Sundance Formation, and equivalent rocks of Jurassic age. The Swift Formation of the Ellis Group crops out near the middle of this interval
- CONTACT--Dashed where concealed by alluvium or terrace deposits
- ▲▲▲▲▲ THRUST FAULT--Sawtooth on upper plate
- U D NORMAL FAULT--Approximately located. U, upthrown side; D, downthrown side
- FAULT ZONE, LINEAMENT, OR TREND--Arrows, where shown, indicate relative horizontal movement
- 1500--- STRUCTURE CONTOUR--Shows altitude of the top of the Swift Formation. Numbers indicate depression contour. Contour intervals 500 and 1000 feet. National Geodetic Vertical Datum of 1929
- CONTROL POINT--Location of oil or gas test well



Base from U.S. Geological Survey  
State base map, 1968



Geologic contacts from Ross, Andrews,  
and Witkind (1955). Structural features  
from Dobbin and Erdmann (1955)

MAP SHOWING ALTITUDE OF THE TOP OF THE SWIFT FORMATION, MONTANA

by  
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