



Grassy Butte Quadrangle, North Dakota

Salt Isopach of the Devonian Prairie Formation

Grassy Butte 100K Sheet, North Dakota

Sibley	Western City	Peachell
Steele	Elk River	
Wahpet	Southfield	Dickinson

Adjoining 100K Maps

7'46"
2019 Magnetic North
Declination at Center of Sheet

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General Information on the Prairie Formation

The Prairie Formation consists of a thick sequence of evaporites of middle Devonian age. At the time of deposition, open ocean water, at what is now the southern Northwest Territories of Canada, flowed through the interior of Canada via a corridor referred to as the Elk Point Basin. Water became increasingly concentrated with solutes as reefs restricted inflow from the open sea and as circulation was impeded by additional reefs forming on structural divides within the basin (Holter, 1969). The resulting brines deposited horizontally bedded salts over large areas including parts of Saskatchewan, southwestern Manitoba, northwestern North Dakota, and northeastern Montana. The deposition followed a typical progression of gypsum or anhydrite, followed by halite, sylvite, and carnallite. Alternating beds of halite, sylvite, and carnallite occurred when the introduction of fresh water into the system reversed the depositional sequence (Anderson and Swinehart, 1979; Kruger, 2014).

There are six potash-containing members identified in the Prairie Formation salts of North Dakota. From lowest to highest they are the Esterhazy, White Bear, Belle Plaine, Patience Lake, Mountrail, and White Lake members (Kruger, 2014). These potassium-salt bearing intervals include extensions of those currently mined for potash in the Canadian province of Saskatchewan.

The Grassy Butte Sheet

The isopach contours of this sheet are based upon 31 well log interpretations of the tops and bottoms of the main body of salt and exclude the basal clay or anhydrite layer where observed. The salt deposits of this sheet are located at the northeastern corner, approximately 3 miles (5 kilometers) northeast of the town of Grassy Butte, where the depth to salt exceeds 12,000 feet (3,658 meters) (Kruger, 2019). From this region, salt thicknesses extend only several miles into the sheet as they thin to the south and southwest toward the depositional limit. Measured thicknesses of the Prairie Formation salt within the sheet ranged from 0 to 46 feet (0 to 14 meters).

Symbols

• Well Control

Other Features

□ Section Line

■ City

↔ Federal Highway

↔ State Highway

Thickness (ft)

0-25

26-50



Scale 1:100,000

0 1 2 3 4
Miles

0 1 2 3 4
Kilometers

Mercator Projection
Standard Parallel 47°0'0"N
North American 1983 Datum
Central Meridian 103°30'0"E

References

- Anderson, S.B. and Swinehart, R.P., 1979. Potash Salts in the Williston Basin: Economic Geology, v. 74, no. 2, p. 358-376.
- Holter, M.E., 1969, The Middle Devonian Prairie Evaporate of Saskatchewan: Saskatchewan Department of Mineral Resources, Rep. 123, 134p.
- Kruger, N.W., 2014, The Potash Members of the Prairie Formation in North Dakota: North Dakota Geological Survey, Report of Investigation no. 113, 39p.
- Kruger, N.W., 2019, Measured Depths to the Prairie Formation Salt: North Dakota Geological Survey, Geologic Investigation no. 221, Plate II.