

SOMEWHERE WEST OF YELLOW GRASS: UPSIDE POTENTIAL OF LOW SALINITY MISSISSIPPIAN CARBONATES OF THE WILLISTON BASIN, SOUTHEAST SASKATCHEWAN.

John H. Lake,

Lake Geological Services Inc.,

Donald.M. Kent,

D.M.Kent Consulting Geologist Ltd.

Summary

Introduction

The Mississippian section is anomalously thick in the Yellow Grass area (north and west of the major Mississippian pools in southeast Saskatchewan) and has no production to date. There is a commonly held belief the rocks have been swept by fresh water as suggested by the low formation water salinities. Was the sweep effective, or is there potential for hydrocarbon trapping in this area? Should the fresh water scare us away?

There is Midale Beds production south of Yellow Grass in the Tatagwa-Radville trend. Can we identify a similar hydrocarbon trapping mechanism to the north?

Theory and/or Method

A map of Midale-to-Top of Mississippian Isopach outlines a major east-west lineament along the township 7 – township 8 boundary in the Yellow Grass area. South of the lineament there is 30+ meters of section above the Midale missing due to erosion. North of the lineament lies the anomalously thick section. This is a major escarpment and erosional valley on the Mississippian subcrop surface a regional north-south cross-section shows that we are dealing with a breached anticline.

Examples

Mississippian Midale equivalent age carbonates are exposed in a breached anticline along the Bighorn River north of Greybull, Wyoming. The anticline is in the Rocky Mountains and is doubly plunging. The Bighorn River cross-cuts the anticline and allows a view of reservoir quality rocks which are productive to the north. The Darwin (quartz) Sand is several meters thick and directly overlies the Mississippian Subcrop. The westerly provenance of the sand is evidence for the Antler Orogeny in the region. The exhumed anticline is an excellent analogue for the subsurface structure at Yellow Grass.

Conclusions

An east-west-trending breached anticline is recognized in the Yellow Grass area. It is associated with a significant west-trending erosional valley developed on the Mississippian Subcrop surface with 30+ meters of section removed. Significant salt collapse occurred north of the structure in the Hummingbird Trough. Hydrocarbons are trapped south of the anticline along the Tatagwa-Radville trend. The breached anticline is an Antler Orogeny structure which developed in response to north-south

compression. The cross-section suggests that most of the dissolution of Prairie Evaporite is post Mississippian based on the extreme variation of Lower Watrous (Red Beds) thickness.

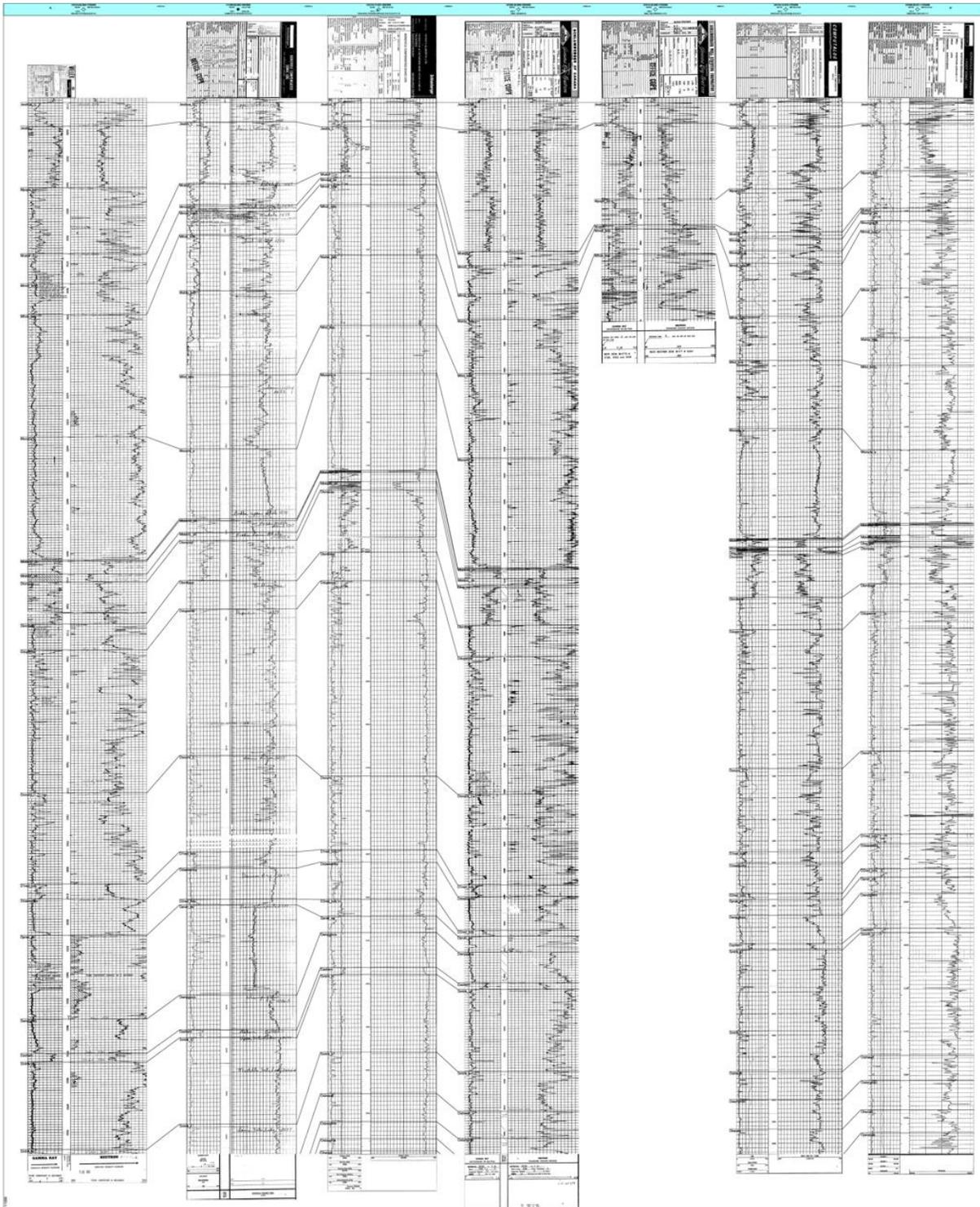
The Yellow Grass area north of the anticline may be perspective for hydrocarbon exploration if a similar parallel structure is developed while water salinities play a major role in the density of the oil water salinity is of less importance than finding a decent hydrocarbon trap.

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References

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North-South cross-section (looking west) showing breached anticline at end of Mississippian. Poplar Beds are entirely eroded. Structure is attributed to compression during the Antler Orogeny. Section uses Upper Watrous as Datum and extends from 101/8-20-11-17W2M in the north to 101/14-2-4-17W2M Radville in the south.

