

Stratigraphic Relationships in the Middle Devonian (Givetian) Elk Point Group, Saskatchewan Sub-Basin

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The Winnipegosis Carbonate-Prairie Evaporite succession of the Middle Devonian Elk Point Group in the Saskatchewan Sub-Basin (Fig. 1) provides a unique opportunity to examine the transition from fully marine to desiccation in an ancient intracratonic basin. These rocks have been extensively studied since 1960 because of the hydrocarbon potential of the carbonate rocks and high-grade potash deposits in the evaporite. There is good understanding of the deposition and distribution of the carbonate including development of the carbonate bank and pinnacle reefs, recognition of different lithologic units. Many important aspects of evaporite formation and diagenesis are still poorly understood because of the lack of modern analogs of large evaporite deposits and their susceptibility to post-depositional diagenesis. There is considerable debate surrounding: 1) formation of vadose diagenetic features in the Winnipegosis reefs and their chronological relationship with the formation of the Ratner Member, 2) depth of deposition of the Ratner laminite, 3) spatial and temporal relationship between the Winnipegosis reefs and potash beds, especially the Esterhazy Member, and 4) spatial and temporal relationship between the Winnipegosis reefs and deposits of the carbonate-evaporite transition. Areal distribution and contour maps of Winnipegosis carbonate and Prairie evaporite have been previously published, however, with continued hydrocarbon exploitation and exploration in the Winnipegosis and potash in the Prairie Evaporite, many new wells have been drilled and the data sets have increased. There have been no contour or isopach maps of the lithologic units published in the Saskatchewan Sub-basin since 1960.

Using core and log data, a regional allostratigraphic framework for the Winnipegosis and Prairie Evaporite formations is constructed inside the Saskatchewan Sub-basin for the section from the top of the Ashern Formation to the top of the Prairie Evaporite Formation (Fig. 2). This framework is used to examine the spatial and temporal relationships of the various deposits contained in the Elk Point Basin in order to understand the evolution of the Sub-basin. Comparing the isopach map of the Whitkow Anhydrite and the Shell Lake Marker Bed with the Winnipegosis Formation in the Quill Lake Bank area, there is a good correlation between the distribution of carbonate banks and the deposition of the Whitkow Anhydrite and Shell Lake Marker Bed. The thickest anhydrite commonly occurs to the south of the carbonate bank. Ratner is well developed in the inter-bank part of the Quill Lake Bank area and locally occurs directly above the drowned reefs in the southern part of the Sub-basin. The typical Brightholme unit

and Shell Lake Marker Bed are mostly well developed in the Quill Lake Bank area.

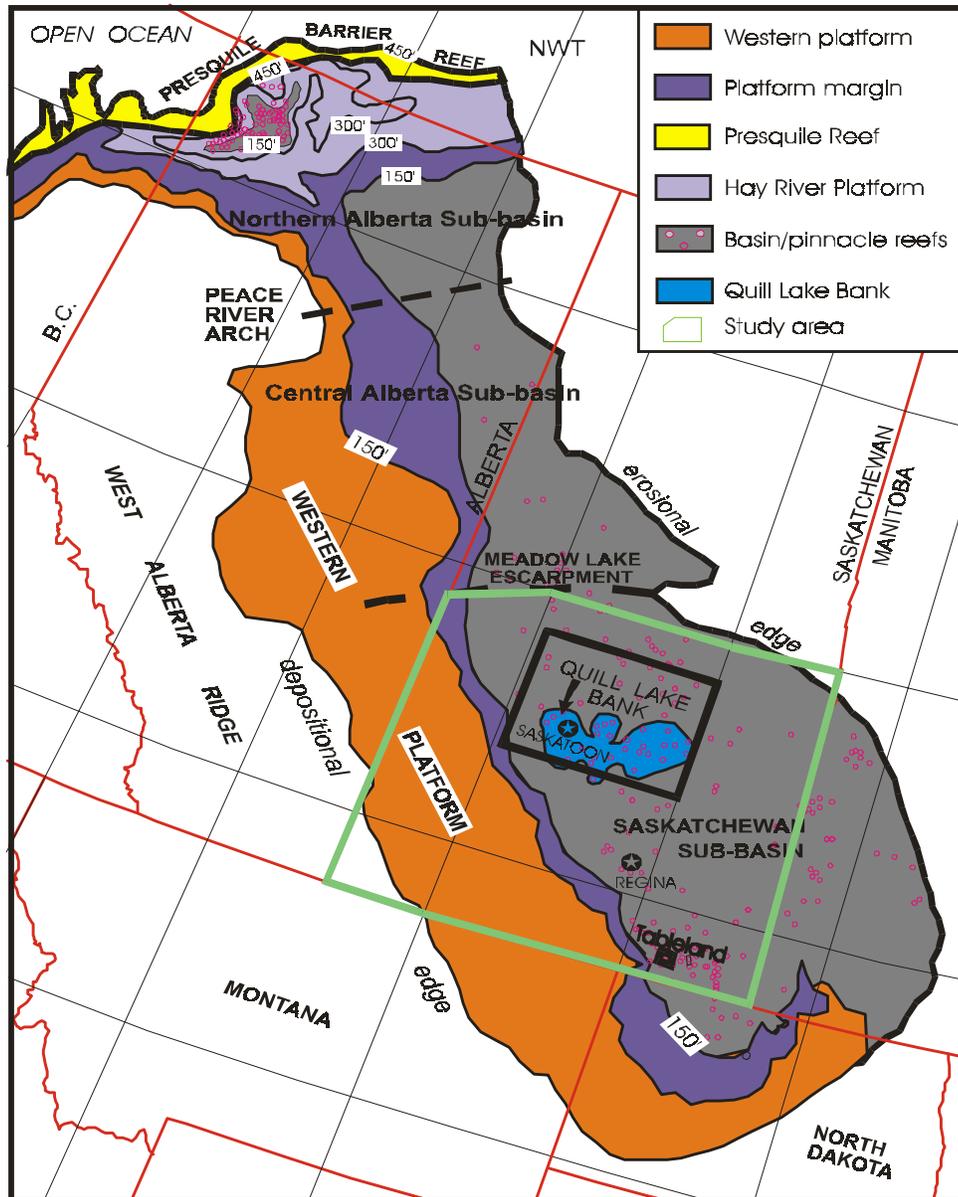


Fig. 1. Geological Map of the Middle Devonian Elk Point Basin. The study area is from the Meadow Lake Escarpment to US-Canada border (From Jin and Bergman, 1998)



Figure 2 Lithostratigraphy and distribution of each lithological unit of the Middle Devonian Elk Point Group in Saskatchewan Sub-basin