

The Proterozoic Dessert Lake Red Bed Basin, Target for Uranium Exploration—An Update

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The Dessert Lake red beds comprise a largely blind sedimentary basin outlier of Proterozoic sandstones to the west of Great Slave Lake (Bleeker & LeCheminant, 2007, GAC abstract). These sandstones are intruded by Mackenzie age diabase and thus older than 1270 Ma. They overlie and geophysically mask Archean to Paleoproterozoic basement rocks of the southwesternmost Slave craton and adjacent Great Bear Magmatic Zone. Only one outcrop of these sandstone is known, on the western shore of Great Slave Lake, the rest of the basin outlier being blind underneath thin but geophysically largely transparent Paleozoic platformal rocks. Although much remains to be learned about this weakly tilted but otherwise undeformed sandstone sequence, it likely represents an erosional remnant of a much more extensive Proterozoic red sandstone cover that may have been present across much of the western Canadian shield. Closest analogues and possibly direct correlatives are the Athabasca Basin to the southeast and the Hornby Bay Basin to the north.

Given these likely correlations, and its proximity to Yellowknife, Great Slave Lake, and the main highway (NWT Highway 3) between Fort Providence and Rae-Edzo, the basin remnant is of some interest to uranium exploration companies. In recent years, much of the basin was staked and a number of exploratory holes were drilled.

Several important questions remained however: 1) What is the detailed age of this red bed sequence? 2) How thick is this basin remnant and is the basal unconformity within reach of drilling and exploration. 3) How far west does this basin remnant extend to the west? And finally, 4) Does this basin extend far enough west to have been imaged on the regional seismic reflection line of LITHOPROBE's SNORCLE Transect.

Having identified the eastern edge of this basin with some confidence, including the one outcrop on Great Slave Lake, our initial hypothesis was that the red bed sequence may correspond with a shallow subhorizontal reflector on the SNORCLE reflection profile. Re-investigation of drillcore cuttings from several old oil and gas exploration drill holes in the area now seem to rule out this possibility: cuttings at the bottom of several drill holes in proximity to Highway 3 show Paleozoic platformal rocks directly overlying a variety of granitoid rocks.

From this we can conclude two things: 1) The Dessert Lake red bed basin wedges out (faulted?) somewhere to the east of Highway 3. And 2), consequently, the major subhorizontal reflector on the SNORCLE seismic profile (at ~3 km depth), between Rae-Edzo and Fort Providence, cannot be the basal unconformity of these red beds. Given that it forms a marked laterally persistent reflector in apparently transparent granitoid basement, we now interpret this major reflector as a large diabase sill, of either Hottah (ca. 780 Ma) or Mackenzie (ca. 1270 Ma) age. If the red beds continue to the west, they likely do so, discontinuously, along a northwesterly trend parallel to the North Arm of Great Slave Lake.