

Subsurface mapping, Cambrian to Cretaceous, Great Bear and Mackenzie Plains Northwest Territories

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Abstract

A dataset consisting of reflection seismic lines, wells, and surface maps has been used to develop a set of subsurface maps and cross-sections. The area of study extends from 63° to 66° north latitude and from Great Bear Lake in the east to the Mackenzie Mountains in the west and contains the physiographic areas of Great Bear Plain, Mackenzie Plain, and the Franklin Mountains including the McConnell and St Charles ranges.

The maps all show relatively thin and undeformed Phanerozoic strata under Great Bear Plain that dip westward towards the Laramide deformed belts. Deepest (or thickest) strata are associated either with foreland basins or a central area of subsidence involving rhomboid shaped grabens. Prominent features include the Cambrian Mackenzie Trough and Mahony Arch, the multi-phased Keele Arch, and grabens of Cambrian and younger age that affect the underlying Proterozoic strata. Overprinting these are features created by movement of Cambrian salt and Laramide tectonics.

While Keele Arch may have been established in the Early Cambrian, its earliest documented uplift was during the Middle Ordovician when erosion removed the Franklin Mountain Formation from its southern portion. Subsequent deposition of the Late Ordovician – Silurian Mount Kindle Formation was succeeded by renewed uplift and erosion of the Mount Kindle and older strata during the Late Silurian such that, in the south, Devonian strata were later deposited directly onto Proterozoic rocks. Much later, regional pre-Cretaceous erosion was locally enhanced by renewed uplift of the arch such that Devonian strata were beveled from its crest.