Map 601 the First Surficial Geology Map of Alberta: Creation and Content

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This map portrays a generalized compilation of the surficial geology of Alberta at 1:1 000 000 scale, using previously published Alberta Geological Survey, Geological Survey of Canada and Environment Canada maps, university theses, as well as some new data. This map is available at http://www.ags.gov.ab.ca/ in raster/pdf and digital form.

The map is derived from 63 preexisting maps with scales ranging from 1:50 000 to 1:500 000; and the earliest map published in 1960. These maps were digitized using ArcGIS, and unit polygons were reclassified into the Map 601 legend. The remaining unmapped areas were completed at 1:500 000 to 1:1,000,000 scale as part of this compilation. All maps were incorporated into a seamless provincial mosaic.

Boundary discrepancies between adjacent map sheets were largely resolved during the reclassification process, with remapping only being necessary along a few boundaries.
The mosaic was then generalized using Geoscaler software (Huot-Vézina et al., 2009). The resulting simplified surficial geology layer was overlaid on a hill-shaded Shuttle Radar Topographic Mission digital elevation model (U.S. Geological Survey, 2000).

The Surficial Geology Map of Alberta indicates the sediment types to be expected in about the upper 5 metres from the surface. The relative abundance of the map units is: moraine undifferentiated (24%), moraine stagnant ice (19%), moraine fluted (7%), moraine glacially thrust (2%), glaciolacustrine (18%), organic deposits (10%), colluvial (5%), fluvial (4%), glaciofluvial (4%), eolian (3%), bedrock (3%), lacustrine(1%), preglacial fluvial (0.1%). The Alberta landscape is formed predominantly from glacial and related Pleistocene age deposits (74%) with moraine (52 %) and glaciolacustrine deposits (18 %) the most abundant.

The advance of Quaternary glaciers across Alberta has been responsible for the widespread deposition of moraine throughout almost all of Alberta. Moraine is subdivided into four units; undifferentiated moraine, most abundant, is widespread across uplands in northern Alberta, (Cameron Hills, Caribou Mountains, Clear Hills, Birch Mountains), across the Saskatchewan Plains, adjacent to the confluence of the Athabasca and Clearwater rivers, and the benchlands that parallel the Rocky Mountain Foothills. Stagnant ice moraine is widespread in north-central Alberta (Buffalo Head Hills and the Birch Mountains, Clear Hills and Swan Hills). It is also abundant across uplands within the western and eastern Alberta Plains. Fluted moraine is present in low-relief corridors extending south between Edmonton and Calgary to the east and west of Red Deer, and southeast from Lac La Biche. Thrust or glaciotectonic moraine is most common southeast of Lac La Biche, on the northern slopes of the Pelican and Birch Mountains and the Swan Hills, as well as adjacent to the southern margins of the number of lakes in central Alberta and portions of the Lethbridge Moraine (Stalker, 1977).

During the last deglaciation of Alberta, glaciers and ice sheets retreated northwards and eastwards into the Northwest Territories and Saskatchewan, and westwards into the Rocky Mountains. The most widespread surficial geological unit associated this process comprises late Pleistocene glaciolacustrine deposits, which extend distally along the axes of a number of major river valleys in the province and basins near Medicine Hat, Lethbridge, Calgary, Red Deer, Edmonton, Peace River, Grande Prairie and Fort McMurray.

Glaciofluvial deposits are a relatively minor late Pleistocene surficial geology unit associated with the last deglaciation of Alberta. These deposits generally form linear or irregularly shaped bodies, and primarily occur across two major terrain types; first is lowlands incised by major glacial meltwater channels, (include the Hay and Athabasca river) and second along the flanks of stagnant ice moraine dominated uplands (Buffalo Head Hills and the Caribou, Birch and Stony Mountains). However, the most extensive glaciofluvial deposits occur, south of Lake Athabasca, and reflect the proximity of this region to the sandy moraine formed by erosion of the sandstone rich Athabasca Group (Slimmon and Pană, 2010).

Eolian deposits, late Pleistocene to Holocene age, are generally situated adjacent to glaciofluvial units, as well as modern fluvial terraces and flood plains; particularly along the axes of the Athabasca and Peace rivers, and across areas of sandy moraine in northeastern Alberta.

The most widespread postglacial surficial geology unit comprises Holocene organic deposits which occur throughout northern Alberta, and form a significant component of the Boreal Forest. They are common across the lowlands between the Buffalo Head Hills, Birch Mountains and Stony Mountain overlying and/or interspersed with glaciolacustrine deposits. Organic deposits are also present across parts of the Caribou and Birch Mountains and the Cameron Hills where at high elevations they contain areas of discontinuous permafrost.

Colluvium forms a locally significant unit on the slopes of the Rocky Mountains and Foothills, around the flanks of the Swan Hills, and the Birch and Caribou Mountains and along the margins of major valley systems. Lacustrine deposits are rare in Alberta, the most extensive around Zama and Lesser Slave lakes.

Preglacial fluvial deposits (Paleogene to Neogene age) form gravel-capped uplands within widely dispersed settings in Alberta, including Cypress Hills, Hand Hills, Swan Hills and the Pelican Mountains. The preglacial fluvial deposits are the erosional remnants of eastward flowing river formed during Paleogene to Neogene time following the close of Laramide Orogeny. During ongoing uplift and erosion and associated changes in base level these rivers continued to erode the landscape during multiple cycles, redepositing portions of the earlier of the gravels at progressively lower elevations (Edwards and Scafe, 1996).

Bedrock unit is present primarily within the Rocky Mountains, and adjacent to Lake Athabasca in northeast Alberta.

References

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