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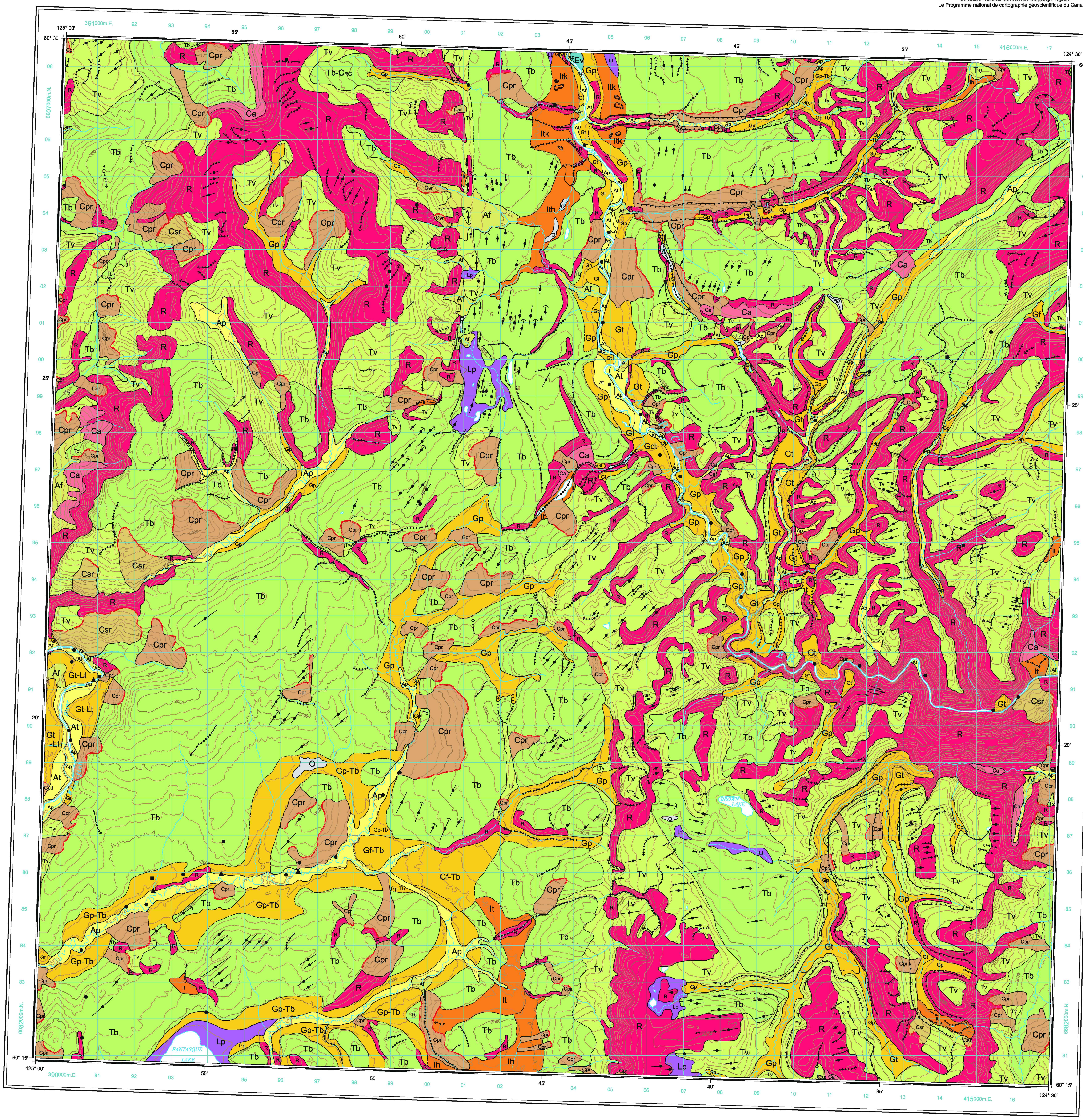
GEOLOGICAL SURVEY OF CANADA

COMMISSION GÉOLOGIQUE DU CANADA

NATMAP CARTNAT

Canada's National Geoscience Mapping Program

Le Programme national de cartographie géoscientifique du Canada



UNIVERSAL TRANSVERSE MERCATOR GRID, ZONE 10

LEGEND

Coloured legend blocks indicate units that appear on this map

QUATERNARY SURFICIAL DEPOSITS

POST LAST GLACIATION

NONGLACIAL ENVIRONMENTS

O — ***ORGANIC DEPOSITS:*** *organic matter; >1 m thick; formed by the accumulation of vegetation in poorly drained depressions (swamps and bogs); usually forms flat terrain*

COLLUVIAL DEPOSITS: *block accumulations and mass wasting debris, 1-50 m thick*

Ca — *Talus (scree): accumulations of blocks; commonly exceeding 2 m in diameter; as much as 50 m thick; forming aprons and fans below cliffs*

CRG — *Rock Glaciers (relict): rock debris deformed by the down-slope flow of buried or interstitial ice, forming pronounced transverse and longitudinal ridges and furrows*

Cpd — *Debris slump deposits: unconsolidated material; generally smaller blocks or more localized masses, but may include larger masses (>10 m thick) where associated with thick till, glaciolacustrine or glaciofluvial deposits; internal structure of material may be retained; commonly traceable upslope to active scarps; where sufficient moisture is present the slump can become a flow, producing characteristic levees along its lateral margins and a spatulate form at the base of slope.*

Cpr — *Bedrock slump deposits: large rotational blocks in bedrock, shallow to 10's of metres thick; internal structure of material may be retained; commonly traceable upslope to active scarps; where sufficient moisture is present the slump may produce a flow at its base, forming a characteristic spatulate form; prominent in areas underlain by shale, siltstone and sandstone beds of the Cretaceous Fort St. John Group; associated with the largest mass movements in the region*

Csr — *Rock slide deposits: chaotic landscape of irregular and stacked bedrock blocks; associated with moderately dipping, poorly-indurated sandstone and shale-rich beds in the Mattson Formation*

ALLUVIAL DEPOSITS: *gravel, sand, and organic detritus; >1 m thick*

A — *Fluvial deposits: well sorted gravel and sand with detrital organic beds, including concentrations of logs;* **Ap**, *floodplains and mantling valley floors, forming meander scars and point bars;* **At**, *terraces along valley wall sides*

Af — *Alluvial fan: poorly sorted gravel and sand with organic detritus and buried soils; fans are commonly crossed by debris flow channels and levees and subject to shifting stream courses*

E — ***EOLIAN DEPOSITS:*** *wind deposited sand and silt, forming small dune ridges, locally associated with reworking of extensive glaciolacustrine sediment; veneer, <1 m thick,* **Ev**

POSTGLACIAL OR LATE WISCONSINAN

PROGLACIAL AND GLACIAL ENVIRONMENTS

L — ***GLACIOLACUSTRINE DEPOSITS:*** *coarse to fine sand, silt and clay, with gravel debris flow layers and dropstones; deposited in glacier-dammed lakes; level topography;* **Lp**, *thin discontinous veneers, <1 m thick;* **Lt**, *forming terraces, commonly deeply dissected by postglacial erosion where thick*

GLACIOFLUVIAL DEPOSITS: *gravel, sand, minor sandy diamict, usually >1 m thick; deposited on, beneath, or in front of glacier margins*

G — *Proglacial outwash:* **Gf**, *fans;* **Gp**, *outwash plains and mantling valley floors;* **Gt**, *level outwash terraces*

I — *Ice contact stratified drift: deposited behind or at the ice magin; topography is undulating, irregular, or ridged;* **It**, *lateral kame terraces;* **Ik**, *kettle holes;* **Ih**, *hummocky moulin kame fields, or ice block disintegration terrain*

TILL: *nonsorted diamict deposited directly by glacial ice; matrix is sandy to clayey and contains striated clasts of various lithologies*

Tb — *Till blanket: > 2 m thick; forming undulating topography that obscures underlying bedrock structure*

Tv — *Till veneer: < 2 m thick and discontinuous; surface mimics underlying bedrock structure*

PRE-QUATERNARY BEDROCK

R — *Sedimentary bedrock, undifferentiated. The Fantasque Syncline dominates the southwest sector of this map, and is comprised of generally shallow-dipping (<10°) Cretaceous Scatter and Garbutt formations (sandstone, shale and mudstone) and Triassic Toad Formation (shale and sandstone) strata. The axis of an unnamed syncline extends northward up the La Biche River valley where shallow-dipping (<10°) Cretaceous Chinkeh Formation (chert-pebble conglomerate, quartz arenite and siltstone) and Permian Fantasque Formation (chert with minor shale and siltstone) outcrop along river and stream valleys which dissect flat-topped bedrock terraces. The eastern margin of the map comprises a southwest extension of the La Biche Anticline. Steep to moderate, west dipping (52-36°) Devonian and Carboniferous Besa River Formation and Carboniferous Lower Mattson strata (shale, sandstone and siltstone) give way to moderate to very shallow dipping Carboniferous Middle and Upper Mattson (quartz arenite, sandstone and shale), Permian Fantasque Formation and Tika strata (limestone, siltstone and sandstone). The northwest sector of the map is the southern extension of an unnamed ridge, comprised of moderate to shallow, southeast dipping(<25°) strata of the Fantasque, Middle-Upper and Lower Mattson formations. [see Khudoley, 2003]*

NOTE: *In areas where the surficial cover forms a complex mosaic, the area is coloured according to the predominant unit and labelled with hyphenated letters in descending order of cover*

MAP SYMBOLS

Geological boundary (defined, gradational)

Scarp

Cirque; peaks and sharp ridges formed by glacial erosion

Moraine

Fluting or drumlinoid ridge parallel to ice flow (direction of flow known, unknown)

Proglacial meltwater channel; abandoned or occupied by small underfit stream (wide, narrow with direction of flow inferred)

Lateral meltwater channel (barb points upslope and down flow)

Kettle hole

Observation

Drift geochemistry sample site

Canadian Shield erratic

NOTE:

Mass Wasting *is the collective term given to the range of processes and resultant landforms that relate to the gravitational downslope movement of rock and/or unconsolidated material without direct conveyance by water, air or ice. Water and ice are, however, often key components in initiating and perpetuating mass wasting by reducing the strength of materials and in their plastic and fluid behaviour.*

Different types of mass wasting are distinguished by the type of materials involved (e.g., bedrock, talus, till), the mode of deformation (e.g., creep, slide, slump, flow), speed of movement, morphology of the moving mass, and water content.

Creep is the slow (mm's to cm's per year), often imperceptible, downslope movement of soil, talus or other unconsolidated material. Creep occurs episodically in response to solutional weathering, seasonal wetting and drying, or freeze-thaw cycles and may include the plastic deformation of clay-rich soils. While more prevalent on steep slopes, creep can occur on slopes <5°. Evidence of creep is seen where tree trunks or structures (e.g., hydro poles) are tilted downslope, soil accumulates upslope of retaining walls, and cracks develop in the soil perpendicular to the dip of the slope. Creep is also responsible for the formation of gelifluction lobes, prominent, small-scale (metres in length, centimetres thick), periglacial landforms found along the upper reaches of local mountain ranges (but not included in the regional surficial geology mapping).

Slides are rapid, downslope movements of bedrock or unconsolidated material. Failure occurs along bedding and/or fracture planes in bedrock, and along bedrock contacts, or structural and sedimentological boundaries within unconsolidated material. Slides can be initiated at shallow or considerable depths.

Slumps involve the rotational movement of bedrock and/or unconsolidated material along failure planes. Slumps may occur as individual blocks or amorphous masses (reflecting water content and structural integrity of the failing material). Slumps commonly extend progressively up-slope through time, and can be associated with active scarp or headwall retreat. Slumps can be initiated by failure along bedding, fracture, or sedimentological planes, by infiltration of surface water, through lateral incision and undercutting of slopes by streams or excavation activities (e.g., road building, pipeline trenching). Slumps are prominent along river and stream courses incised in moderate to shallow dipping shale, siltstone and sandstone strata of the Fort St. John Group and Toad and Fantasque formations. Slumps are associated with the largest mass movements in the map area.

While different earth surface materials and geological settings are often strongly associated with various types of mass wasting, predicting their occurrence, magnitude and rate of deformation is often not possible. Some areas that are prone to mass wasting include regions of steeply dipping bedrock, poorly indurated and shale-rich bedrock, and along stream courses and meandering river channels. Human activities such as road building, pipeline trenching, logging and seismic exploration can also initiate mass wasting, particularly where they undercut slopes, or act to destabilize surficial materials.

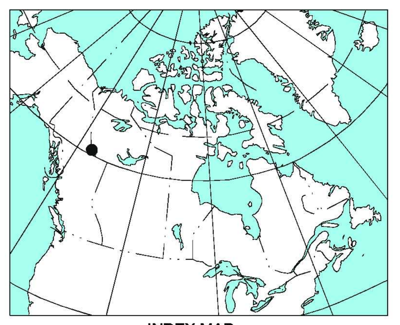
Glacial History: *The Brown Lake map area was glaciated during the last (late Wisconsinan) glaciation (ca. 25-10 000 years ago) by the continental Laurentide Ice Sheet flowing from the northeast (Keewatin Sector) and by the Cordilleran Ice Sheet flowing from the west. The Laurentide Ice Sheet dispersed distinctive granite erratics, originating from the Canadian Shield, that were found along the Whitefish River and other unnamed streams in the southwest sector of the map. Dense forests and extensive (>90 %) vegetation cover limited field access to much of the map area, and generally obscures the surficial geology (and likely any granite erratics). Granite erratics were found atop the La Biche, Kotaneelee and Liard ranges east of the map sheet (up to 1620 m above sea level (asl)), and sandstone erratics of unknown provenance were found at the crest of the Kotaneelee Range (1850 m asl), establishing a minimum upper limit of glaciation for the region. Despite extensive searches, no striae were found in the map area, likely reflecting both the extensive vegetation cover and susceptibility to weathering of the local bedrock. Regional cross-cutting ice flow directional indicators (striae and flutings) demonstrate that glaciers first moved westward across the region. Initially, Laurentide ice appears to have subsumed all but the ridge in the northwest sector of the map. Subsequently, during the Last Glacial Maximum, Cordilleran ice advanced eastward across the Brown Lake map area, displacing the Laurentide ice. Drumlinoid ridges and flutings record a pronounced, radially northward ice flow up the La Biche River valley that is interpreted to reflect the deflection of Cordilleran ice by both Laurentide ice to the east, and an increased topographic constriant on flow during deglaciaton.*

Deglacial landforms associated with the impoundment of regional drainages between the divergently retreating Cordilleran and Laurentide ice sheets are prominent in the map area. Of note is the ice-contact deposits along the north central La Biche River that were deposited by Cordilleran ice blocking southward drainage (resulting in the formation of a large glacial lake directly north of this map sheet). Extensive glaciofluvial erosion and deposition in the southwest also record the glacial impoundment of the La Biche River east of the Brown Lake map area, and diversion of drainage southwestward into the Fantasque Lake and Whitefish River basins.

REFERENCES

Khudoley, A.K.

2002: Preliminary Geology of Brown Lake (95C/7), Yukon Territory; Geological Survey of Canada, Open File map 4267, scale 1:50 000.



INDEX MAP

CONTOUR INTERVAL 100 FEET
Elevations in Feet above Mean Sea Level

OPEN FILE 1771

SURFICIAL GEOLOGY
BROWN LAKE
YUKON TERRITORY

Scale 1:50 000/Échelle 1/50 000

Kilometres 1 0 1 2 3 Kilomètres

Universal Transverse Mercator Projection
North American Datum 1983

Projection transverse universelle de Mercator
Système de référence géodésique nord-américain, 1983

Compilation by I.R. Smith based on fieldwork and studies of vertical air photographs 2000-2002.
THIS MAP IS A PRODUCT OF THE CENTRAL FORELAND NATMAP PROJECT

Surficial geology from field work by I.R. Smith 2000-2002.

Digital cartography by I.R. Smith.

Any revisions or additional geological information known to the user would be welcomed by the Geological Survey of Canada.

Base map at the same scale published by Surveys and Mapping Branch in 1971.

95C/11 Whitefish River	95C/10 Tika Creek	95C/9 Chinkeh Creek GSC OF 1615
95C/6 Gold Pay Creek	95C/7 Brown Lake GSC OF 1771	95C/8 Babiche Mountain GSC OF 1558
95C/3 Mooney Creek	95C/2 Mount Merrill GSC OF 4324	95C/1 Mount Martin GSC OF 4260

NATIONAL TOPOGRAPHIC SYSTEM REFERENCE AND INDEX TO ADJOINING GEOLOGICAL SURVEY OF CANADA MAPS

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2003

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2003: Surficial Geology, Brown Lake (95C/7), Yukon Territory; Geological Survey of Canada, Open File 1771, 1 map, scale 1:50 000.

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