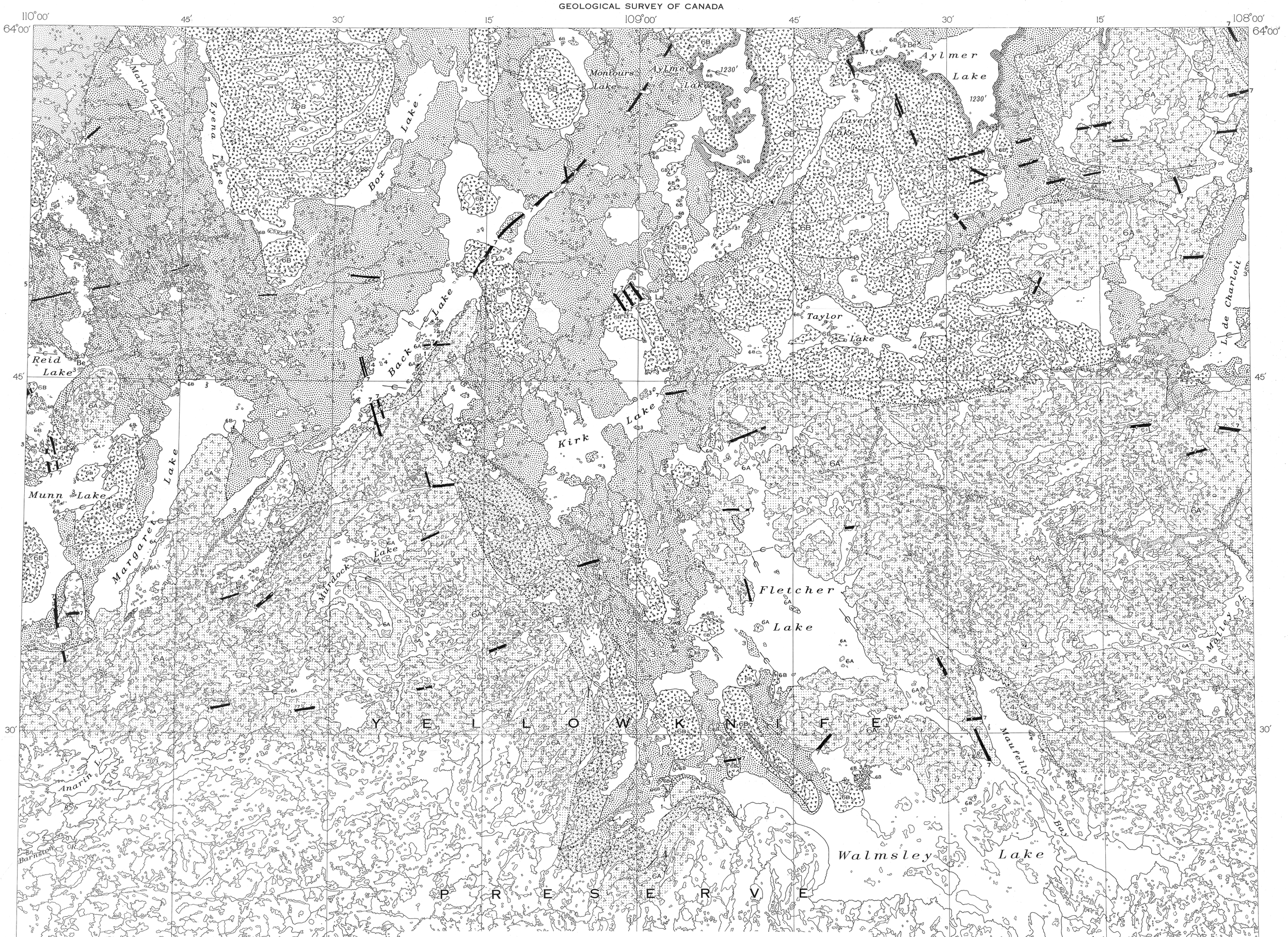
CANADA

DEPARTMENT OF MINES AND TECHNICAL SURVEYS

GEOLOGICAL SURVEY OF CANADA



DESCRIPTIVE NOTES

Walmsley Lake map-area, with an elevation ranging from 1,100 to 1,500 feet above sea-level, lies north of the east arm of Great Slave Lake, on the Precambrian upland. The northern half of the area drains into Aylmer Lake, and lies within barren grounds; the southern half drains into Great Slave Lake, and, with a climate modified by proximity to the lake, is in part well timbered, and has an earlier break-up and later freeze-up. Most of the summer of 1949 was spent in a study of the geology of the northern part of the map-area, and this part only is dealt with in these notes.

Within this northern part of the area are connected systems of large lakes, which make excellent canoe routes. There is sufficient wood for prospecting activities, except in the extreme northeast and northwest parts of the map-area, which are the most favourable areas for prospecting. In 1949, break-up occurred during the first week in July; prior to that date pontoon flying was not practicable; some of the larger lakes remained ice-choked for about 3 weeks after that date.

Local relief varies with the rock type. The area underlain by sedimentary rocks, northwest of Zyena Lake, has a bedrock relief of only 20 feet. Nodular sedimentary schists show slight to moderate relief; areas underlain by volcanic rocks and granite have marked relief, with an average elevation 100 feet above that of the surrounding sedimentary terrain.

Glaciers moved west and northwest, polishing and scouring the rock outcrops, and moulding the thick ground moraine into swarms of drumlin hills. In the closing stages of glaciation, fluvioglacial esker ridges composed of sand, gravel, and boulders were formed in under-ice streams that flowed parallel with the latest glacial striae in the area. With the melting of the stagnant ice-sheet, esker ridge deposits were left in topographic relief, and formed prominent landmarks.

Percentage outcrop varies with rock type and locality; much less bedrock is exposed in the northern, barren lands of the map-area than elsewhere. It has long been noted that at the edge of the barrens in the Northwest Territories there is a marked increase in amount of glacial drift. The present edge marks an existing climatic boundary - the normal southwestern front of the polar air mass. Perhaps this condition has held since Glacial time, and if so this front would be the logical place for a thick recessional moraine to accumulate, as seems to have been the case. In general, less than 10 per cent of the area underlain by sedimentary rocks and their metamorphosed equivalents is exposed bedrock, whereas 25 per cent of the area of volcanic rocks and granitic intrusions is exposed. Certain areas near esker ridges have been washed free of drift by fluvioglacial stream action; percentage outcrop along esker routes is somewhat higher than average for the area.

The oldest rocks of the map-area are those of the Yellowknife group. They comprise an early series of volcanic rocks (1), now highly altered, and a sedimentary series (2) now largely altered to sedimentary schist (3) or injection gneiss (4). Most of the volcanic rocks are in the northeastern corner of the map-area. They were originally pillowed and massive basalts, and pillow structure and attitude can be observed in the basal flows. The upper flows were more acidic and tuffaceous in character. The basalts have been altered to fine-grained, dark hornblende schists, and the upper flows and tuffs to banded, light to dark green, hornblende-biotite schists. In the northwest corner of the map-area is a poorly exposed area of argillite, slate, and greywacke (2). Elsewhere the sedimentary rocks have been thermally metamorphosed to nodular quartz-mica schists (3). Bundles of white, fibrous sillimanite; square, purple prisms of andalusite; oval lumps of grey cordierite; and oblique-angled, brown crystals of staurolite; all one half to one inch in size, commonly weather in relief on outcrops of these metamorphosed rocks. Small red garnets occur in a few places in the schists. Sillimanite is the most common of the minerals forming metacrysts; it indicates extreme conditions of thermal metamorphism.

The sedimentary schists (3) preserve bedding, a primary sedimentary feature, up to the sillimanite schist zone of metamorphism. In the sillimanite schists, structures such as folds can be detected on air photographs, but bedding is no longer evident in the outcrops, for schistosity has completely obscured it. The sillimanite schists grade into injection gneisses (4). At the injection-gneiss stage, the sedimentary schists begin to deform plastically, and are intruded *lit-par-lit* to produce a banded, twisted, lense-like gneiss. The darker bands of relict sediment are rich in biotite; the lighter bands, representing igneous additions, are rich in feldspar.

The intrusive rocks include a wide variety of granitic types, ranging from hornblende diorite to muscovite pegmatite. Three types have been distinguished in mapping. Three small bodies of hornblende diorite and hornblende-quartz diorite (5), believed to be the oldest intrusive rocks, intrude nodular sedimentary schist (3) in the western part of the map-area. These dioritic intrusions have pitted, decomposed, weathered surfaces. Microscopic examination shows the rock to consist of 50 per cent andesine feldspar, 40 per cent hornblende, and 5 to 10 per cent quartz. The quartz diorite bodies are cut by dykes of younger granodiorite (6A) and muscovite pegmatite (6B).

The main group of granitic intrusions comprises massive biotite granodiorites and related, subordinate biotite-hornblende granodiorites (6A). The biotite granodiorite is normally a grey weathering rock, reddish weathering along joints and shears, consisting of 15 per cent oligoclase feldspar, 15 to 30 per cent quartz, 15 per cent microcline feldspar, and locally, in place of an equivalent amount of quartz, up to 15 per cent hornblende. This biotite granodiorite division may include intrusions of two ages. The 'older' type is normally in part hornblendic. It appears to have been very deep seated, and is found in contact with basal volcanic rocks of the Yellowknife group (1), or where found in contact with sedimentary rocks has altered them to a granite-like injection gneiss (4). The 'younger' type of intrusive granodiorite is a biotite or biotite-muscovite granodiorite grading along the margins into granite and muscovite pegmatite (6B); related stocks of pegmatitic muscovite granite and muscovite-tourmaline pegmatites intrude Yellowknife group sedimentary schist (3). The Murdock Lake granodiorite is typical of the 'older', biotite-hornblende granodiorite type, and the granodiorite northeast of Fletcher Lake is representative of the 'younger'.

The muscovite granite (6B) is a white weathering rock, showing primary foliation near the border of the intrusions, and consisting of 30 per cent smoky quartz, 60 per cent white to cream-coloured orthoclase and albite feldspar, and 10 per cent mica, mostly muscovite; blue-green apatite is a characteristic accessory mineral. Many of the pegmatites contain 2- to 3-inch books of muscovite, and tourmaline crystals up to 1 inch in cross-section The contact between muscovite granite (6B) and biotite granodiorite (6A), into which it grades, was established in the field at the point where muscovite ceased to be readily observable in the hand specimen, and biotite became the dominant varietal mineral.

Dykes of diabase and gabbro (7), commonly reddish brown weathering, are the youngest rocks in the area. Three dyke sets were observed, one set striking north 80 degrees east, a second set north 20 to 30 degrees west, and the third set trending generally northeast. The dykes are composed of equal parts labradorite feldspar and pyroxene, with accessory magnetite and quartz and small amounts of secondary hornblende, zoisite, and epidote. The northeast-trending dyke on Back Lake was clearly observed to be cut by, and is, therefore, older than, dykes of the other two sets.

Some prospecting was done in 1948 in the sedimentary schists (3) in the northwestern part of the map-area; an occurrence of gold was reported. Elsewhere the favourable rocks, particularly those of the volcanic belt in the northeast corner of the map-area, show no evidence of having been prospected. The sillimanite schists (3), which comprise the bulk of the sedimentary schists, represent an extreme stage of thermal metamorphism. They do not appear to be host to many quartz veins, nor do they show much evidence of action of hydrothermal mineral-bearing solutions.

The most favourable area for prospecting is believed to be that underlain by the belt of volcanic rocks and the volcanic-sedimentary contact in the northeast corner of the map-area. There, quartz veins were observed, though no metallic minerals were noted. This belt appears to be comparable to the Courageous Lake greenstone belt of MacKay and Lac de Gras map-areas, whose contact has disclosed several interesting gold prospects. The volcanic rocks north of Taylor Lake are highly altered, and, because of the thickness of glacial drift in this locality, poorly exposed. The pegmatite dykes related to muscovite granite (6B) contain small quantities of spodumene (a lithium-bearing mineral) and beryl, in addition to abundant tourmaline. No tantalite or cassiterite was observed, though these minerals are known to occur elsewhere in the Northwest Territories in similar pegmatites.

LEGEND

PROTEROZOIC

- 7 — *Diabase, gabbro*
- 6A, 6B — 6A. *Biotite granodiorite, biotite-hornblende granodiorite, and allied rocks*; 6B. *Muscovite-biotite granite, pegmatite*
- 5 — *Hornblende-quartz diorite*
- 4 — *Injection gneiss: sedimentary schist* (3) *injected and assimilated by intrusive rock* (6A)

ARCHAEAN

YELLOWKNIFE GROUP (1-3)

- 2, 3 — 2. *Greywacke, slate, phyllite*; 3. *Nodular quartz-mica schist derived from* 2
- 1 — *Basalt, andesite, minor tuff; derived schists*

Glacial striae ..... G

Mineral occurrence X

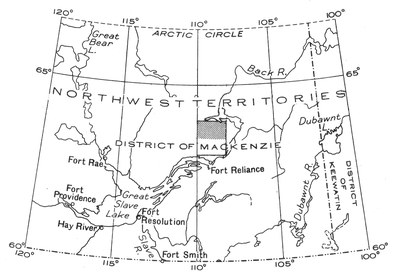
Esker .....

Beryl ..... Be

Spodumene Li

Lazulite ..... La

Geology by R. E. Folinsbee, 1949



Portage ..... P

Preserve boundary .....

Fall and rapid ..... F R

Sand or gravel .....

Base map surveyed by Topographical Survey 1942

Cartography by the Geological Mapping Division 1950

Approximate magnetic declination 33° 23' East

PRELIMINARY MAP 50-4

WALMSLEY LAKE

DISTRICT OF MACKENZIE

NORTHWEST TERRITORIES

Scale 1 Inch to 2 Miles = 1/126,720

2 0 2 4 6 Miles

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