GEOLOGICAL SURVEY OF CANADA
DEPARTMENT OF ENERGY, MINES AND RESOURCES

LEGEND

PROTEROZOIC

6 — *Diabase*

5 — *Massive granite and allied rocks;* **5a**, *porphyritic quartz monzonite;* **5b**, *quartz monzonite, granodiorite;* **5c**, *muscovite granite;* **5d**, *quartz diorite, diorite;* **5e**, *granitic rocks with inclusions of amphibolite and biotite-quartz schist*

4 — *Gneissic and massive granite, granodiorite, and allied rocks;* **4a**, *granite-gneiss with inclusions of amphibolite and biotite-quartz schist,* **4b**, *migmatite including lit-par-lit gneiss*

ARCHEAN

YELLOWKNIFE GROUP (1-3)

2 | 3 — **2**. *Conglomerate; minor greywacke*
3. *Greywacke; biotite-quartz schist and derived nodular mica-quartz schist; minor hornblende schist*

1 — *Amphibolite and hornblende schist derived from intermediate to basic volcanic rocks*

Rock outcrop (mylonite, breccia, **mb**; *pegmatite,* **p**) . . . . . mb ×
Geological boundary (defined, approximate, gradational or assumed)
Approximate northern limit of area in which geology is based on field data by J. C. G. Moore, 1950
Bedding, tops known (vertical, dip unknown)
Bedding, tops unknown (inclined)
Schistosity, gneissosity, foliation (inclined, vertical, dip unknown)
Lineation (inclined)
Fault or shear zone (assumed)
Structural trend from air photographs
Glacial striae
Esker
Gossan . . . . . G

Geology by J. A. Fraser, 1957, 1958

Geological cartography by the Geological Survey of Canada, 1968

Portage . . . . . P
Rapids . . . . . R
Marsh
Contours (interval 100 feet) 1500
Height in feet above mean sea-level 1265

Base-map (Winter Lake) compiled and drawn by the Army Survey Establishment, R.C.E., 1958-1962

Magnetic declination 1968 varies from 33°00' easterly at centre of east edge to 34°20' easterly at centre of west edge. Mean annual change decreasing 8.1'

DESCRIPTIVE NOTES

Stockwell[1] has described the geology of the region along Yellowknife River to Point Lake by way of Winter, Little Marten, and Starvation Lakes. Unpublished data collected by J. C. G. Moore in 1950 in the Roundrock Lake — Yellowknife River area and in the area between Tsan and Mohawk Lakes is also used in these notes.

Regions underlain by granitic rocks are characteristically of low relief with broad drift-filled valleys and bedrock hills that are mostly less than 200 feet high. Ridges of volcanic rocks, however, may stand more than 300 feet above the surrounding terrain. A westerly movement of glacial ice can be inferred from striated and polished bedrock surfaces and from the many eskers and drumlinoid ridges. Except in the vicinity of Little Marten and Credit Lakes, and along the Winter River system, rock exposures are, in general, plentiful. Boulders and erratic blocks from 1 foot to 3 feet in diameter are especially abundant at Winter and Greenstockings Lakes. Eskers and glacial striae, whose orientation is at variance with the regional pattern of glacial movement, may indicate — as suggested by Folinsbee[2] for the Lac de Gras map-area to the east — late movement and tributary drainage toward a sector of thinning ice. The axis of this is marked approximately by a discontinuous esker that runs westward from Eda Lake to Starvation Lake. Eskers with a westerly trend are the most prominent, and in some places reach a height of more than 60 feet and a maximum width of several hundred feet; they are composed of sand, gravel, and boulders.

Abandoned beaches south of Winter Lake are up to 110 feet above the present lake level, and small gravel bars southwest of Point Lake, possibly beach remnants, are more than 100 feet above Point Lake. Sparse growth of spruce and some birch may be found south and west of Winter Lake. Except for a few small isolated stands of stunted spruce, the rest of the map-area is barren of trees.

Volcanic rocks (1) are mainly green to black amphibolites and hornblende schists that have probably been derived from andesite or basalt. Individual flow layers are characterized by pillows, carbonate lenses, or vesicles, or, more commonly, by an alternation of light and dark green laminae that range from a fraction of an inch to a few inches thick. Pillow structures, although abundant, are nearly everywhere stretched and flattened parallel with the foliation so that their original attitudes are impossible to determine. Some of the flow layers weather with irregular subparallel pits up to 12 inches long that mark the presence of carbonate-rich lenses. Vesicular flows are comparatively rare.

The volcanic rocks are composed chiefly of hornblende and plagioclase in various proportions, with lesser amounts of quartz. Andesine was identified in most of the thin sections examined; in a few the feldspar is albite associated with epidote. Within a few feet of granite contacts, hornblende is coarser grained, and in some of these exposures are red garnet euhedra. In general, amphibole prisms are parallel or subparallel with foliation planes, and linear orientation appears to be lacking. Within the flows and, to a lesser extent, in granitic rocks and sediments adjacent to flows, are massive, sill-like bodies that consist mainly of medium-grained, equigranular, plagioclase and hornblende in roughly equal proportions. They may be more than 60 feet wide with fine-grained margins that are more or less parallel with those of the flows, although the dark-green-weathered surfaces are so like those of the flows that boundaries between the two rocks are difficult to follow. The bodies are cut here and there by veinlets of quartz and stringers of granite. The spatial distribution and modal composition of these rocks suggest a genetic relationship to the Yellowknife flows (1).

Layers of conglomerate (2) are interstratified locally with sediments and metasediments (3) of the Yellowknife Group. West of Newbigging Lake, well-exposed conglomerate is in conformable contact with older andesitic flows (1). Within a few feet of the contact, rounded boulders of fine- to medium-grained amphibolite and medium-grained, grey granite-gneiss up to 2 feet in diameter are found in a dark green to grey, fine-grained matrix. Farther from the contact, bedding is defined by layers of well-rounded cobbles and pebbles of quartz, rhyolite, medium-grained, siliceous, grey granite-gneiss, and amphibolite, in a quartzose, arenaceous matrix. These are mostly from 1 inch to 3 inches in diameter and, like the pebbles in conglomerate east of Starvation Lake, are flattened parallel with the foliation or bedding and are elongated in a vertical direction with a ratio of vertical diameter to minor horizontal diameter of about 4:1. Conglomerate typically grades stratigraphically upward into light grey greywacke that contains thin beds of grit.

Sediments and metasediments (3) of the Yellowknife Group, comprising light to dark grey and brownish greywacke, and fine- to medium-grained biotite-quartz schist, appear to be conformable with the older volcanic rocks (1) and the lens-like layers of conglomerate (2) with which they are locally interbedded. They consist chiefly of quartz, with up to 20% biotite and 15% feldspar. Excellent graded bedding was observed in a few exposures. Compositional differences in the massive sediments may be reflected by the development in some laminae of metamorphic minerals such as biotite, sillimanite, andalusite, and cordierite, in knots or metacrysts from ¼ to ½ inch and, rarely, up to 2 inches in diameter. Small garnet euhedra and less commonly hypersthene, have been identified in sediments adjacent to granite contacts. Greywacke with thin carbonate interbeds and partly silicated carbonate rock containing diopside, carbonate minerals, and quartz occur in the sediments near Snare River.

Map-unit 4 comprises a heterogeneous assemblage of predominantly gneissic rocks but includes some in which gneissosity is obscure or lacking as well as some undifferentiated granitic rocks. Mixed gneisses or migmatites (4b) and lit-par-lit gneisses are especially characteristic of granitic rocks bordering on units of the Yellowknife Group. Foliation in the gneisses is defined by the alternation of mafic and felsic layers, which may be regular and distinct or irregular and discontinuous. The mafic layers are from 2 to 6 inches thick and make up as much as 50% of the rock; they are rich in hornblende, biotite, and plagioclase. Felsic layers consist chiefly of medium- to coarse-grained quartz with pink or grey feldspar. Quartz in the gneiss ranges from 10 to 55%; plagioclase, commonly oligoclase or andesine, ranges from 20 to 70%. Potassic feldspar which is almost exclusively orthoclase, unlike that of the massive granites (5), is generally less than 25%.

Foliation is best developed near remnants of Yellowknife Group strata (1-3) or elsewhere where inclusions of such rocks are most numerous. Inclusions of amphibolite or biotite-quartz schist from a few inches to several feet long are distributed throughout the gneiss, but are more common in some parts than in others. They are commonly rounded and, where elongate, lie along the foliation planes of the gneiss. Lithologically, the amphibolite inclusions are similar to the amphibolitic flow rocks (1) observed near granite contacts. All stages of replacement by granite may be found, even in one outcrop. In places relatively fresh amphibolite is intersected by granite stringers, in others all that is left of the amphibolite are relict structures in the gneiss distinguished from the surrounding gneiss only by their higher hornblende content. Demarcation of migmatites (4b) from sedimentary (3) or volcanic rocks (1) is most difficult in the Lake Providence area where partial granitization has resulted in granitic rocks that represent many transitional stages between the original sedimentary or volcanic rock and granite-gneiss (4). Contorted migmatite south of Winter Lake contains rounded mafic inclusions that appear to have been rotated. Granite-gneiss (4) in the Little Marten Lake area is obscurely foliated and carries numerous red garnets up to 1 inch in diameter. An isolated outcrop of very coarse grained, massive perknite was found at the east end of Akaiyesseh Lake, apparently surrounded by granite-gneiss (4), although no contacts with the gneiss are exposed. Erratic blocks of perknite greater then 6 feet in diameter, that occur 5 miles to the northwest, indicate that perknite may be more common in this region than suggested by its outcrop. The rock consists of about equal amounts of hornblende and pyroxene, including both clino- and orthopyroxene, with minor biotite, olivine, serpentine, and magnetite.

Porphyritic quartz monzonite (5a) — the most widespread of the massive granites (5) — contains phenocrysts of pink microcline or microperthite up to 2 inches long; these constitute from 20 to 50% of the rock. The groundmass consists of medium-grained quartz and oligoclase in approximately equal, although locally widely varying, proportions. Biotite is present in amounts less than 5%, and in some exposures is almost absent. The age of the biotite as determined by the potassium-argon method, is 2,115 million years[3]. The boundary between massive granite (5) and granite-gneiss (4) is largely arbitrary, as gradational relationships prevail where the two are in contact. At the northeast end of Mohawk Lake, however, coarse-grained, equigranular, pale pink biotite granodiorite and quartz monzonite (5b) are in sharp, concordant contact with the surrounding granite-gneiss (4). The potassium-argon age of a composite sample of biotite from this granite is 1,790 million years[3]. Southeast of Winter Lake, grey, medium- to coarse-grained muscovite-albite granite (5c) intrudes rocks of the Yellowknife Group and is intimately intruded by biotite-muscovite pegmatite in which the feldspar is predominantly microperthitic microcline. Muscovite from a composite sample of these rocks has a potassium-argon age of 1,800 million years[3]. Albite pegmatites bearing muscovite and black tourmaline were found at Beauparlant Lake and northeast of Starvation Lake. Pegmatites noted elsewhere are mostly of the simple quartz-feldspar variety. Inclusions of amphibolite or mica-quartz schist similar to those observed in granite-gneiss (4) are known to occur in all the massive granites (5) except that at Mohawk Lake.

Vertical dykes of diabase (6), ranging in width from a few feet to more than 100 feet, intrude all other rocks and are therefore the youngest in the map-area. They are composed of about two-thirds labradorite and one-third clinopyroxene, in medium-grained, diabasic intergrowth, with minor hornblende, magnetite, biotite, and quartz. Diabase weathers reddish brown and exhibits chilled margins against the older wall-rocks.

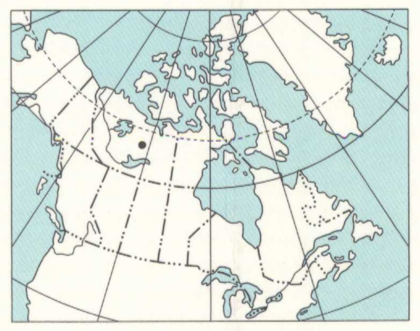
Sedimentary and volcanic rocks in the belt extending from Point Lake to Snare River constitute a conformable sequence of strata which lie in a major fold that plunges almost vertically and is open to the north. Deformation in two or more stages around different axes can be inferred from the steep plunge of the main fold and from the presence of minor cross-folds. The development of migmatite and granite-gneiss from rocks of the Yellowknife Group may have taken place in part contemporaneously with this deformation. The repetition of sedimentary and volcanic strata west of Beauparlant Lake and east of Starvation Lake may be due to some primary interlayering, and to folding around northerly trending axes, possibly associated with faulting. The abrupt change in the configuration of these units along the belt in the region west of Newbigging Lake suggests that the northern part of the belt is separated from the southern part by a fault, along which movement has taken place in a direction parallel or subparallel with the belt trend. Faults are probably more numerous than indicated on the map. In the granites and granite-gneisses, prominent linear depressions, zones of alteration, and bands of mylonite or crushed rock may follow faults or shears.

Small, rusty-weathering zones, or gossans containing pyrite, or, more rarely, pyrrhotite, are found along the contacts of flows with sediments or with granitic rocks. Few are more than 15 feet wide, but in some cases they can be traced along linear belts for more than ½ mile. The most prominent of these occurs at the junction of the main sedimentary-volcanic fold belt with Snare River. It comprises a number of discontinuous sulphide zones that extend for more than a ¼ mile in a northerly direction following the foliation of the host strata. Massive pyrite and pyrrhotite were noted in one test pit in this showing across a width of 5 feet. Wall-rocks are silicified and include banded lime-silicate rocks containing carbonate minerals, pyroxene, amphibole, and quartz, with minor disseminated sulphide minerals.

[1]Stockwell, C. H.: Great Slave Lake — Coppermine River area, Northwest Territories; Geol. Surv. Can., Sum. Rept. 1932, pt. C, pp. 37-63.
[2]Folinsbee, R. E.: Lac de Gras, Northwest Territories; Geol. Surv. Can., Map 977A (1949).
[3]Lowdon, J. A.: Age determinations by the Geological Survey of Canada, Report 1, Isotopic ages; Geol. Surv. Can., Paper 60-17, pp. 10-11 (1960).

Published, 1969
Copies of this map may be obtained from the Geological Survey of Canada, Ottawa

Printed by the Surveys and Mapping Branch



INDEX MAP

MAP 1219A

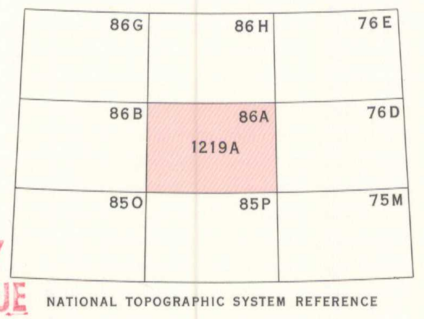
GEOLOGY

WINTER LAKE

DISTRICT OF MACKENZIE

Scale 1:253,440
1 inch to 4 miles

Miles 4 0 4 8 12 Miles
Kilometres 6 0 6 12 18 Kilometres



NATIONAL TOPOGRAPHIC SYSTEM REFERENCE

1219A
WINTER LAKE
DISTRICT OF MACKENZIE

N.W.T. WINTER LAKE
(District of Mackenzie)
1:253,440
1" to 4 miles
MAP 1219A
1970
Geol.

1219A