GEOLOGICAL SURVEY OF CANADA
DEPARTMENT OF MINES AND TECHNICAL SURVEYS

PRELIMINARY SERIES

SHEET 64 M

PHELPS LAKE
SASKATCHEWAN

MAP 5-1960
GEOLOGY

Scale: One Inch to Four Miles = 1/253,440

Miles: 4 2 0 4 8 12

LEGEND

ARCHAEAN

6 — Grey metasomatic granite, somewhat impure; includes remnants of 3 and 4; 6a, red granite; 6b, includes remnants of 5a; 6c, includes remnants of 4a

4 5 — 4. Medium- to coarse-grained, foliated, quartz-feldspar-biotite gneiss probably derived from interbedded sedimentary rocks similar to 1; minor masses of 5a; a highly granitized rock, irregularly to regularly banded; 4a, strikingly foliated and highly granitoid; 4b, similar to 4a, but garnetiferous; 4c, coarse-grained, quartz-biotite schist, in part granitized; 4d, includes small granite masses
5. Recrystallized impure carbonate rocks (skarn-type); 5a, fine- to coarse-grained, massive to banded, quartz-feldspar-hornblende gneiss and schist, similar to 2, probably derived from limy sedimentary rocks; 5b, includes quartz-biotite schist; 5c, includes small granite masses

3 — Fine- to medium-grained, granular, massive to foliated, quartz-feldspar-biotite gneiss, derived from interlayered sedimentary rocks similar to 1; a nonfoliated granitized rock; 3a, quartz-rich, probably derived from quartzitic rock; 3b, includes small granite masses

2 — Massive to well-bedded hornblende-feldspar gneiss and schist, probably of sedimentary and tuffaceous origin; minor nodular quartz-biotite schist; 2a, mainly well-bedded; 2b, quartzite; 2c, impure carbonate rock; 2d, minor nodular quartz-biotite schist

1 — Argillite, greywacke, impure quartzite; minor white quartzite; 1a, fine and coarse, crystalline limestone, dolomite

Rock outcrop visited . . . . 1 mile thick, is a dirty white to black-weathering rock, grey to white on fresh surfaces, and fine to coarse grained. It commonly encloses short and narrow lenses or pods of a glassy white quartz, which stand in relief on weathered surfaces. Locally, the limestone and argillaceous rocks are thinly interbedded.

Geological boundary (approximate or assumed)

Limit of geological mapping

Bedding (inclined, vertical, dip unknown; top probably as indicated by dip)

Schistosity (inclined, vertical, dip unknown)

Foliation, banding (inclined, vertical, dip unknown)

Lineation (plunge known, unknown)

Anticline (approximate)

Syncline (approximate)

Glacial striae

Geology by L.P. Tremblay, 1959

Building

Interprovincial boundary

Portage

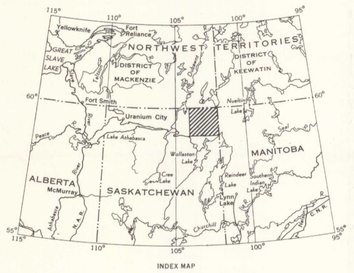
Rapids

Cartography by the Geological Survey of Canada, 1960

Approximate magnetic declination, 19° 24' East

Air photographs covering this area may be obtained through the National Air Photographic Library, Topographical Survey, Ottawa

In response to public demand for earlier publication, Preliminary Series maps are issued in this simplified form and will be clearer to read if all or some of the map-units are hand-coloured



INDEX MAP

PUBLISHED, 1960
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DESCRIPTIVE NOTES

The area is best reached by chartered aircraft from Stony Rapids, about 60 miles west of its western boundary. Transportation within the area is best by aircraft from lake to lake; the connecting rivers are commonly too shallow or too small to be safe and efficient for boats or canoes.

The area is thickly wooded but most of the trees are small. Occasional trees as large as 22 inches in diameter were noted in valley bottoms, particularly east of **Misaw Lake** and around Wapiyao Lake. Spruce, tamarack, and birch are most abundant but a few jack pine and poplar were seen around Many Islands Lake and south of Ochak Lake.

Gravel, sand, and boulder fields form a thick and widespread mantle over most of the area. The gravel occurs mainly as a blanket-like mass but it is abundant as eskers, drumlins, kames, and ridge-like moraines. The sand occurs mainly as sand bars near lake shores and in valley bottoms. Rock exposures are rare and generally small, some only a few feet across. Less than 1% of the bedrock is exposed. The best rock exposures are in the western half of the area and on or near the shores of lakes. It is believed that most outcrops are parts of the bedrock that have been cleared of drift by rivers, and by waves when the area was covered by much larger lakes during the deglaciation. Sand bars were noted at the mouths of a few bays in several lakes; in all instances their occurrence suggests that they were formed when the water level on the lakes was much higher than it is now. In some parts of the area outcrops are scarce even on the shores of the lakes; apparently these areas were highlands or still covered by the ice when the other parts were being denuded. The area as a whole is flat. The most rugged terrain is in the northwest and southeast corners where the relief is about 200 feet.

All the rocks of this area are probably of Archaean age. The sandstone of the Athabasca formation, which occurs over a large region outside the area to the southwest, may extend into the southwest corner of the area. However, a traverse, which reached to within 6 miles of the southwest corner of the area, encountered only granite and no unusual abundance of sandstone float was observed. It is believed that the whole area was once covered by sedimentary formations and that these are now recrystallized or granitized to rocks grading from practically unmetamorphosed argillite and quartzite, to granite, passing through a wide range of fine- to coarse-grained gneisses.

The succession of formations shown in the legend is based on the intensity of metamorphism or granitization. A rough stratigraphic succession somewhat different from the one above is suggested by a few structural features; it would have at the bottom the quartzitic rocks around **Bonokoski L.** and at the top the rocks near the east boundary of the area.

Fairly fresh sedimentary rocks (1) observed in the northeast quarter of the area are composed mainly of well-bedded argillite, argillaceous quartzite, and greywacke, with some limestone (1a). These rocks are similar to those occurring west of Kasba Lake in Snowbird Lake area and described by Taylor[3] (unit 7) as Precambrian but younger than most of the other sedimentary rocks of that area. They are probably also similar to those outcropping between Nueltin and Kasba Lake in southern District of Keewatin where they have been mapped by Lord[1] as early Proterozoic. Rocks of unit 1 are regarded here as the relatively unmetamorphosed or ungranitized parts of the Archaean succession.

The argillite, quartzite, and greywacke (1) are dense and fine grained to sandy looking, grey to black in colour. They are in well-developed thin beds to massive. Locally they carry numerous lenses, pods, and seams of white quartz. A few beds are of white quartzite, others are rich in green amphibole, and some are calcareous. The limestone (1a), which is locally at least 2 miles thick, is a dirty white to black-weathering rock, grey to white on fresh surfaces, and fine to coarse grained. It commonly encloses short and narrow lenses or pods of a glassy white quartz, which stand in relief on weathered surfaces. Locally, the limestone and argillaceous rocks are thinly interbedded.

The hornblende schist and gneiss (2) in the northwest quarter of the area are dark to brownish green on weathered surfaces, and dark green where fresh. They are fine to coarse grained, massive to distinctly bedded, and in general, uniform in composition along strike. They are commonly criss-crossed by a network of tiny seams of a pink, dense, glassy mineral, and many outcrops are traversed by numerous lenses, pods, and pockets of white quartz. Rare beds of nodular quartz-biotite schist (2d) and a few thick beds that may be white quartzite (2b) occur interbedded with the main mass of schists and gneisses. The bedded appearance of much of these gneisses and schists, their occurrence with nodular quartz-biotite schist, impure carbonate rock, and quartzite, and their uniform composition along strike suggest that they are of clastic or pyroclastic origin and were once either impure calcareous sediments, true greywacke, or basaltic pyroclastic rocks. The massive members may have been flows although no pillows, flow structures, or amygdules were noted. Near the west granite contact, these gneisses seem to become more siliceous and to be interbanded with a larger amount of quartzose feldspathic bands, suggesting that the basic sediments grade into the more quartzose type represented by the gneisses of units 3 and 4.

The small masses of hornblende schist and gneiss (5a), occurring at many places throughout the gneisses of units 3 and 4 and the granite (6), are similar in appearance and composition to the main schist and gneiss (2) described above, and probably have a similar origin. They were probably calcareous rocks but not like the impure calcareous rocks of unit 5 and 2c. The latter are medium to coarse grained, massive, light green to greenish white, and composed mainly of carbonate, pyroxene, quartz, micas, and, locally, feldspar, amphibole, epidote, and serpentine. They show much variation of composition throughout the mass and from mass to mass.

Over 90% of the area is underlain by the gneisses of units 3 and 4 and by granite (6). The sedimentary rocks of unit 1 or some slightly more quartzose rocks pass gradually by recrystallization and granitization into the fine- to medium-grained, granular, quartz-feldspar-biotite gneisses of unit 3. These gneisses may be grey, orange, pink, or red, and generally are banded. However, on a few outcrops they are massive, probably because the outcrop is smaller than the thickness of the bed. The banding consists of white to red quartz-feldspathic or quartzose bands alternating with narrower, dark grey to black, biotitic or hornblendic bands. A variety that covers fairly large areas is more quartzose (3a) and is distinguished on the map.

The main distinction between the gneisses of unit 3 and those of unit 4 is that the former are generally fine grained, granular, and sandy looking, somewhat resembling a clastic sedimentary rock, whereas the latter are coarse grained and granitoid although still clearly granular. The gneisses of unit 4 are also well foliated, but, as they are highly granitized rocks and generally are granitoid, they show much more variation of texture than the gneisses of unit 3. In places the banding is as regular as in layered rocks; in other places it is so contorted and irregular that it is impossible to measure the strike. Where banding is lacking, they are not only highly granitoid but may also be porphyroblastic, with red feldspar as metacrysts. Locally the highly granitoid gneiss is in blocks of various sizes, each separated from its neighbors by a zone of various widths of granitic material, producing a rock resembling an agmatite. In places, the banded gneisses have been so intensely granitized as to obscure most banded structures, leaving faint indefinite lines or bands. The rock then looks like a nebulite. All these phases of the gneisses of unit 4 can be found on Phelps Lake or lakes to the west of it.

In composition the two main groups of gneisses are about the same, although the more granitoid type seems to have more feldspar and less quartz.

The gneisses of unit 4 pass gradually into the grey granite (6) or into the red granite (6a) and form a zone of various widths around the granite areas. In many instances the gneisse, of unit 4 occur as large, remnant-like areas within the granite itself.

The grey granite is medium to coarse grained, massive to faintly gneissic, and somewhat granular. It generally has a massive, granitoid, homogeneous appearance although locally it is hybrid looking, with many small remnants of the banded gneiss of unit 4 scattered in a haphazard manner. In places it carries a slightly larger amount of biotite and/or hornblende. The red granite is similar to the grey granite except that it is generally more uniform in composition and appearance, is red in colour, and ordinarily carries fewer schlierens and less mafic minerals. Nor is it as extensive as the grey granite.

Coarse-grained, white to red pegmatites were seen almost everywhere except in the relatively fresh argillite and limestone in the northeast quarter of the area. In general, they are not abundant, and form only a small percentage of the outcrop. In two areas, however, they seem to be more than usually abundant; about Nordbye Lake, and around Hara Lake and for a short distance to the west of it. Black tourmaline was noted in a pegmatite dyke at the north end of **Bonokoski L.** and in a few others west of Hara Lake. In addition, apatite, garnet, epidote, mica, and some amphibole were also recognized in some pegmatite dykes, particularly those near Hara Lake.

Structurally, the area can be divided into two distinct parts. East of **Bonokoski L.**, the formations dip uniformly east, suggesting that they are parts of a single structure. They are probably on the eastern limb of a major anticline whose axis passes through **Bonokoski L.** West of **Bonokoski L.** the formations are closely folded into a series of northeasterly trending anticlines and synclines that plunge northeast or southwest. Although several minor faults were observed, nor major faults were recognized. Jointing affects most outcrops and two principal conjugate sets were measured. They strike at N40°E and N40°W, north and N80°W and their dips are mainly steep.

Rare small grains of pyrite and pyrrhotite were noted, disseminated through most of the hornblende schists and gneisses. Some of the granitic areas (6, 6a) near Milton Lake are locally deep red, and showed slightly more radioactivity than most of the granite areas. As little rock is exposed, and as much of the area is underlain by granitoid gneiss or granite there is very little prospecting in the area.

[1] Lord, C.S.: Geological Notes on Southern District of Keewatin, Northwest Territories; Geol. Surv., Canada, Paper 53-22.
[2] Furnival, G.M.: Map 658A, Porcupine River, Sask.
[3] Taylor, F.C.: Map 7-1956, Snowbird Lake, N.W.T.
[4] Fahrig, W.F.: Map 27-1957, Wollaston Lake, Sask.

5—1960

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PHELPS LAKE
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