Province of Manitoba

DEPARTMENT OF MINES AND NATURAL RESOURCES

MINES BRANCH

PRELIMINARY REPORT 47-2

on the

GEOLOGY OF THE

CAT LAKE-MASKWA LAKE AREA

LAC DU BONNET DIVISION
Manitoba

by

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(Preliminary Map 47-2 in pocket)

Winnipeg
1948

GEOLOGY OF THE

CAT LAKE - MASKWA LAKE AREA

INTRODUCTION

LOCATION

The Cat Lake-Maskwa Lake Sheet comprises an area bounded on the east by longitude 95° 15' W, on the west by longitude 95° 42' 30" W, on the south by latitude 50° 27' N and on the north by latitude 50° 41' 30" N. However, only that portion lying between Rabbit River and Bird Lake on the east and Cat Creek and Maskwa Lake on the north, was surveyed.

ACCESS

The northwestern part of the area was first reached by canoe by way of Winnipeg River and Maskwa River to Maskwa Lake. This route has not been travelled for a good many years and the upper reaches of Maskwa River are obstructed by many log jams. The Maskwa Lake copper-nickel deposits are connected to Great Falls by a winter road. A trail leads north from Bird River P. O. to Maskwa Lake and the deposits are about four miles north of this point by trail.

Access to Cat Lake is generally by air. It can be reached by following a canoe route from Maskwa Lake to Undertaker Lake, and thence by a long portage northeast. An all-weather road from Bird River to the lithium deposits at Cat Lake has been surveyed.

The area between Cat Lake and Bird Lake is also relatively inaccessible except by air since there are no continuous stream channels for canoe travel.

The eastern part of the area may be reached easily by canoe from Lac du Bonnet by way of Bird River, Bird Lake and Elbow Lake. This has always been a much used route and all portages are in good condition.

At present, the best method of entering the area north of Bird River is by airplane from the base at Lac du Bonnet.

PHYSICAL FEATURES

The Cat Lake-Maskwa Lake district is not unusual topographically from other parts of the Canadian Shield. Rock outcrops are abundant and are separated by small muskegs. The relief is generally low but in many places the topography is rolling due to the presence of prominent granite ridges. Many of the larger lakes

occupy fairly deep depressions with precipitous sides. With the exception of Bird River, canoe travel is necessarily cut to a minimum by the absence of navigable streams. The northern part of the area is drained by Cat Creek and Maskwa River, the southern part by Bird River and the area between is poorly drained.

The district north of Maskwa Lake contains stands of poplar, spruce and jackpine which are larger than average. Logging operations have been carried on here in the past. Timber in the remainder of the area is of the usual smaller quality. Large forest fires have burned over extensive areas, especially west and north of Cat Lake. Scattered sand ridges near Cat Creek are covered with dense growth of young pine as an aftermath of these fires.

HISTORY AND PREVIOUS INVESTIGATIONS

Copper- and nickel-bearing sulphide deposits were discovered in the area north of Maskwa Lake in 1917 and subsequently in 1920 along the Bird River. An investigation of the geology of the area was commenced by the Geological Survey of Canada under W.S. McCann[1] in 1920 and H.C. Cooke[2] in 1921. R.J. Colony[3] was also an early contributor to the knowledge of the district. The area received intensive prospecting for copper-nickel deposits until 1929. During these years the Geological Survey of Canada continued its investigations of the area under J.F. Wright[4]. After 1929 interest in the area waned until the war years when extensive deposits of chromite were discovered in 1942. These deposits were studied during the next few years by A. Koffman, J.C. Drybrough, G.M. Brownell, J.D. Bateman[5] and others. The low chrome-iron ratio of the chromite, however, discouraged their immediate development.

Though interest in the copper-nickel and chromite deposits has revived to some extent in recent years, due to the high prices and shortages of these metals, chief interest is now focused on the lithium deposits at Cat Lake, presently being diamond-drilled.

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1 McCann, W.S., The Maskwa River Copper-Nickel Deposit, Southeastern Man.; Geol. Surv. Can., Summary Report 1920 pt.C, pp.19-29.

2 Cooke, H.C., Geology and Mineral Resources of Rice Lake and Oiseau River Areas, Manitoba; Geol. Surv. Can., Summary Report, 1921 pt.C.

3 Colony, R.J., A Norite of the Sudbury Type in Manitoba; Can. Inst. Min. Met. Bull., November, 1920, pp. 862-872.

4 Wright, J.F., Geology and Mineral Deposits of Oiseau River Map-Area; Geol. Surv. Can., Summary Report, 1924, pt. B, pp 51-104 Maps 274A (Oiseau Sheet) and 275A (Lac du Bonnet Sheet), G.S.C. 1932.

5 Bateman, J.D.; Bird River Chromite Deposits, Manitoba; C.I.M.M. Transactions, Volume XLVI, 1943, pp. 154-183.

The first discoveries of lithium in the area were made during the years 1924 to 1926. Lack of adequate markets for lithium products has delayed development of the deposits.

GENERAL GEOLOGY

All consolidated rocks in the map-area are of Precambrian age. They can be divided into two broad divisions. One is a group of metamorphosed volcanics and sediments, and the other is composed of the granitic rocks which underlie the greater part of the area. The following table summarizes the geological formations of the region.

TABLE OF FORMATIONS

Precambrian	Intrusives	Lamprophyre dykes Quartz porphyry, pegmatite, aplite and vein quartz. Pink and pinkish-grey biotite and hornblende granite, in part porphyritic. Grey biotite and hornblende granite, in part gneissic, and granodiorite.
	Intrusive Contact	
	Bird River Sill	Gabbro and peridotite. Diabase sills.
	Intrusive Contact	
	Rice Lake Series	Quartz-biotite and quartz-hornblende gneiss and schist, in part garnetiferous; quartzite, greywacke. Andesite, basalt, partly pillowed, related schists.

VOLCANIC GROUP OF RICE LAKE SERIES

This is the oldest group of rocks in the area. They vary from fine-grained, dark grey and dark green to medium-grained green and black rocks. The finer grained grey facies is probably of andesitic composition, whereas the green and coarser phases are basalts and diabases. Also included in this group are pillow lavas. Hornblende and chlorite schists are prominent derivatives of the volcanics.

These rocks are typically exposed north of Maskwa Lake, along the axis of Cat Lake and Euclid Lake and west of Bird Lake. The Maskwa Lake exposures show more pillow structure than any other locality. In the Cat Lake vicinity the volcanics are either massive or schistose with slight changes in appearance and grain from place to place.

In addition to the volcanics of this period there were short intervals of sedimentation during which minor amounts of quartzose sediments were deposited.

SEDIMENTARY GROUP OF RICE LAKE SERIES

This group includes sedimentary gneiss and schist, quartzite and greywacke. At the time these rocks were being deposited the volcanism of the previous period appears to have been completed.

A small area north of the lavas in the Maskwa Lake district is underlain by thin-bedded, fine-grained, dark sediments. Near the east end of Euclid Lake the volcanics give way to quartz-hornblende gneiss and quartz-biotite gneiss and schist. These sediments are extremely garnetiferous in places and they were traced continuously from Euclid Lake to Tulabi Lake.

The formations on the south shore of Bird Lake are of somewhat different character, being composed mainly of light to dark grey quartzite and greywacke. This band of sediments joins the more northerly band some distance east of the map-area. A long tongue of granite separates the two bands between Bird Lake and Tulabi Lake.

INJECTION GNEISS

A long band of biotite schist, which has been injected by white to pink pegmatitic and granitic rocks, was traced along Rabbit River from a point east of Shoe Lake to Elbow Lake. The biotite schist is a metamorphosed sediment belonging to the Rice Lake series.

A small area of similar rocks was noted on Cat Creek where some north-facing pillow lavas are interbedded with the sediments.

DIABASE SILLS

South of Cat Lake there occurs a large number of fine- to medium-grained diabasic bodies which were intruded as sills. They vary in width up to about thirty feet. Many of the sills have been brecciated and the fragments are surrounded by granite.

The strike of the sills varies from N 55° E to N 55° W and the dips are high angle to vertical. The sills are most abundant for a distance of one mile south of Cat Lake and one-half mile south of the west end of Euclid Lake.

PERIDOTITE

This rock forms the lower part of the Bird River sill and is one of the economically important host rocks of the region. The peridotite is a coarse, dark green to black rock and often has a rough schistose character. Some of the outcrops are rusty-weathering and fresh surfaces usually show red iron stain.

Chromite, both as dense and disseminated ore, is found associated with the peridotite. Time was not available for more than a cursory examination of the Bird River deposits, but here the chromite bands are extremely regular, except where disturbed by faulting, and must apparently have been formed by a process of igneous sedimentation. The total width of the chromite zone in the Bird River area may be as much as fifty feet. A few scattered outcrops of peridotite occur just west of Bird Lake but the chromite segregations are not visible.

Spotty outcrops of peridotite, belonging to the north limb, were found in the Maskwa Lake regions and southeast of Euclid Lake.

GABBRO

Hornblende gabbro forms the upper part of the Bird River sill. In the area studied, outcrops of this portion of the sill are much more abundant than the peridotite.

The gabbro exhibits similar characteristics both on the north and south limbs of the sill. It is composed of a coarsely crystalline aggregate of grey feldspar and dark green to black hornblende. In places the rock is fine-grained but this type does

not appear to have any relation to contacts. The percentage of plagioclase usually exceeds that of the hornblende. Some outcrops have plagioclase developed almost to the exclusion of hornblende, so that the composition of the rock approaches anorthosite. Other outcrops show small segregations of hornblende.

The plagioclase and hornblende of the gabbro are always fresh whereas the peridotite is much altered. The gabbro is always massive except where it has been rendered schistose by shearing movements.

A large area of gabbro intruded between volcanics and sediments outcrops north of Maskwa Lake, and there are a few smaller outcrops southeast of Euclid Lake.

The most easterly gabbroic outcrop of the Bird River sill begins near the middle of the north shore of Bird Lake and continues to the west following the lake shore.

PINK, PINKISH-GREY AND GREY GRANITE

These types must, for the present, be discussed under one heading since some difficulty has been encountered in distinguishing them readily in the field. The granites are fine- to medium-grained and partly porphyritic with biotite as the dominant ferromagnesian, although hornblende may be present also. At places the rock could be classed as granodiorite.

By far the greater percentage of the granites are massive. The grey granite is gneissic especially in the district north of Cat Lake, the gneissosity following the trend of the older rocks.

An examination of the phases revealed that the pink granite is younger than the grey granite at localities in the Cat Lake region, but generally the different types grade into one another.

Some of the granites are definitely younger than the rocks previously described. Chilled contacts of granite against gabbro were noted at Maskwa Lake and Bird Lake. The granites contain abundant inclusions of volcanic and sedimentary rocks near their contacts. It is possible, however, that the granites exposed in the area may belong to two separate periods of igneous intrusion.

ACID DYKES

Dykes of quartz porphyry are scarce and small. They do not appear to be of economic importance.

Aplites are present but pegmatites comprise the most abundant dyke rocks. The pegmatites are important where they carry appreciable quantities of rare minerals, notably spodumene, as at Cat Lake. They are composed predominantly of fine- and medium- to coarse-grained mixtures of feldspar, quartz, spodumene and some beryl.

BASIC DYKES

Narrow, lamprophyric dykes are fairly common, mainly in the region east of Maskwa Lake. The dykes average about four feet in width. They are fine-grained and may be porphyritic or schistose. Mineralization is not noteworthy unless they are cut by later quartz veins.

STRUCTURAL GEOLOGY

The Volcanic-Sedimentary series, together with the gabbro and peridotite, are the rocks from which most structural information can be obtained. The volcanics were extruded and the sediments were deposited on the lavas or interfingered with them. The Bird River complex was intruded, as an essentially flat-lying body, into the older rocks and differentiated while in this position.

Subsequently, folding took place. The folding is considered to be pre-granite in age since the granite and the older rocks closely parallel one another, and small areas of the Rice Lake series included within the granite generally follow the dip and strike of the main bodies.

These pre-granite rocks can be traced from the junction of Maskwa River and Cat Creek southeast to Tulabi Lake and thence westward along Bird Lake.

Sediments lie north of the volcanics in the northern part of the area and south of the volcanics at Bird River. Dips are to the north at high angles between Cat Lake and Tulabi Lake and to the south at high angles at Bird Lake. There is a possibility of some overturning in the northwestern part of the area.

The results of the investigation would lead to the conclusion that the dominant structure is anticlinal with the aforementioned older rocks forming the limbs of the anticline. Generally, massive granite lies between these limbs and so contributes little to our structural knowledge.

No major faults of large displacement have been recognized in the area. It is true that lineaments are in evidence on the map but these are a result of the lakes and streams following

the bands of older rocks. Faults with moderate displacements cut the Bird River sill and a few small ones are known in the granite.

Known shear zones are also small and unimportant except in the Little Bear Lake region. This area remains to be studied.

ECONOMIC GEOLOGY

There are three classes of mineral deposits in the area, as follows: (1) chromite deposits, (2) sulphide deposits and (3) lithium deposits.

CHROMITE DEPOSITS

Chromite is associated with the lower part of the Bird River sill. Whether or not the gabbro and peridotite resulted from one intrusion, the fact remains that the peridotite carries the chromite. Banded chromite can be traced for long distances in the Bird River district.

The chromite occurs as tiny octahedrons in a chlorite groundmass. The crystals are usually black and metallic or sometimes brown with a resinous lustre. Magnetite and chromite are found together and the two may be confused if only a casual inspection is made. In dense ore the gangue may comprise less than 25 per cent. The Euclid Lake deposit is composed partly of resinous ore with the crystals so loosely bonded that they can be rubbed off the specimen with the fingers.

Chromite is sporadic in occurrence north of Maskwa Lake and is found mainly on Pronto and Colossus claims. Here the ore appears to be closely associated with gabbro though the matrix is similar to peridotite. On Colossus No. 22 there is a zone of dense ore 150 feet long and 12 feet wide. The contact with gabbro is sharp and the country rock is schistose for a few inches from the contact. Occurrences of this nature may be explained as due to the ore being squeezed into the gabbro after the rock had progressed well on its way to consolidation.

SULPHIDE DEPOSITS

Deposits of disseminated sulphides occur in the members of the Rice Lake series near their contacts with later intrusives. The main minerals are chalcopyrite, pyrrhotite, pentlandite and pyrite.

In the Maskwa Lake district, a good deal of trenching and diamond-drilling was done on the Mayville claim where a sulphide body lies in andesite and gabbro. Trenching has exposed the body for a distance of 200 feet. Other sulphide bodies are known in the lavas on the south side of the gabbro. In places the gabbro itself is mineralized.

Sulphides are found in diabase a little over a mile west of Cat Lake and also on the north side of the west arm of Euclid Lake.

Narrow, but very heavily mineralized zones are known on the north side of the finger-like lake southwest of Johnson Lake where they are associated with quartz veins.

LITHIUM DEPOSITS

A number of lithium-bearing dykes have been found at Cat Lake. One of the best of these, at the west end of the lake on the Eagle claims, has been well exposed for a distance of 1,750 feet by trenching and stripping, and more poorly exposed for an additional 1,000 feet farther west. The dyke strikes S 75° W and changes in width from 5 feet up to 24 feet. Large feldspar and spodumene crystals ranging to several inches across, but averaging about one inch, lie in a finer grained mixture of quartz, feldspar and spodumene with some beryl, muscovite and garnet.

Another spodumene dyke occurs on the Irgon claim on the north side of Cat Lake. It has an exposed length of 1,100 feet and varies in width from 15 feet to 60 feet. It also consists of large crystals of feldspar and spodumene with smaller crystals of quartz, feldspar, spodumene, muscovite and garnet. The average grain size is approximately one-half inch across.

A few other smaller dykes have been intruded on both sides of the lake.

A dyke carrying spodumene has been located on the Spot group of claims north of Maskwa Lake. The dyke strikes N 60° E and cuts basalt and granite. It has been irregularly exposed across one claim.