Province of Manitoba

DEPARTMENT OF MINES AND NATURAL RESOURCES

MINES BRANCH

PRELIMINARY REPORT AND MAP

48-2

on the

GEOLOGY OF THE

WANIPIGOW LAKE AREA

RICE LAKE DIVISION
Manitoba

by

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Winnipeg

1949

CONTENTS

WANIPIGOW LAKE AREA

INTRODUCTION

LOCATION AND ACCESS

The Wanipigow Lake area, comprising about 185 square miles in the Rice Lake mining division, is approximately 15 miles east of Lake Winnipeg and 6 miles west of the town of Bissett where the San Antonio gold mine is situated. The area is bounded by longitudes 95° 45' and 96° 00' west and latitudes 51° 00' and 51° 15' north. Wanipigow Lake is accessible from Lake Winnipeg by canoe or boat, or from Lac du Bonnet by aircraft. An all-weather road connects Government Landing on the Wanipigow River with Bissett. The Manigotagan River in the south part of the area may be reached by road from Government Landing or from Bissett, or alternatively, by canoe from Lake Winnipeg. The latter route involves a number of portages.

TOPOGRAPHY AND DRAINAGE

The topography of the area resembles that of most Precambrian terrain, consisting of low undulating rock outcrops separated by areas of glacial drift or swamp. Where the region is underlain by volcanic or sedimentary rocks, the outcrops rarely attain a relief of more than 25 feet. In the granite portions of the area the relief is as much as 150 feet, and from the high points the country is visible for many miles around.

Glacial drift covers about 40 per cent of the ground in the volcanic and sedimentary portions of the area, and a much larger percentage in the immediate vicinity of streams, where outcrops are sparse or absent for many feet on both sides of the streams. In the granite country, on the other hand, rock exposures are fairly continuous, being separated only by narrow widths of swamp except in a few spots. Large areas of drift and swamp wherein rock exposures were not found are indicated on the map.

Wanipigow Lake is drained by Wanipigow River which flows west into Lake Winnipeg. The Manigotagan River in the southern part of the area also flows west into Lake Winnipeg. These two streams are readily navigable all summer, the portages on them being well cut out. Within the northern part of the area travel is more difficult. Beaver Creek which flows south into Wanipigow Lake contains a large number of closely spaced rapids in its southern half. In the upper part, after the last portage is passed, the water becomes quite shallow, and was so low during the summer of 1948 that canoes had to be dragged along the stream bed. However, the season was exceptionally dry, even in the early spring, and Beaver Creek is said to be much higher ordinarily than it was in 1948.

Apart from the three streams mentioned, none of the others are at all navigable, leaving large areas accessible only by long treks overland. The paucity of lakes in the northern half of the area adds to the difficulty of travel. Riley Lake may be most easily reached from English Lake about two miles to the west; Ogama Lake is large enough for an aircraft to land on.

Glacial drift consists mostly of silt and clay; very little sand or gravel was noted.

Spruce, jack pine, and poplar, with lesser birch, form most of the large growth; willow and alder most of the underbrush. The evergreen trees are quite small, except south of Wanipigow Lake and Gold Creek where they attain a diameter of two feet or more. Between Wanipigow River and Gold Creek heavy winds have resulted in a tangle of windfall which makes travel slow and difficult.

PREVIOUS WORK

A general description of the rocks of southeastern Manitoba, including the Wanipigow Lake area, may be found in "Geology and Mineral Deposits of a Part of Southeastern Manitoba", by J. F. Wright, Geol. Surv., Canada, Memoir 169, 1932 (re-printed 1938).

A geological reconnaissance of the area was done by A. W. Johnston of the Geological Survey of Canada, (map 428A, 1936, scale one inch to four miles).

A small part of the SE corner of the sheet was mapped by C. H. Stockwell in 1936 as part of the Rice Lake sheet (G.S.C. map 810A, 1944).

PRESENT WORK

The present work was done in the period May 10 to September 8, 1948. The geology was mapped on a scale of one inch to one-half mile using mineral claim maps NW and SW 4, 52-M of the area, obtainable at the Mines Branch, Winnipeg. These maps were improved in accuracy from surveys of the Seventh Base Line, the road from Government Landing to Bissett, the south shore of Wanipigow Lake, and from vertical aerial photographs of a small part of the area. A few other alterations were made in the field.

New base maps prepared from the vertical aerial photographs were received from the Topographical Survey, Ottawa, after the geological map had been prepared. The geology was transferred to the new base, but as this base was not available at the time of the field work, some points may not be quite accurately located.

Vertical aerial photographs of the area were taken during the summer of 1948, and may be purchased from the National Air Photographic Library, Ottawa. Persons planning to prospect in the area are advised to obtain the vertical photographs as they are of great assistance in locating points on the ground. The centre points of the vertical photographs are shown on the geological map.

Control for mapping was by pace and compass from lakes, streams, roads, and base and range lines.

Areas of drift and swamp are shown on the map and geologic contacts extrapolated through these. Except for the granite portions of the area, positions of outcrops are approximately indicated.

Efficient and capable assistance was rendered by S. N. Scott, R. Calich, and G. Macauley, of the University of Manitoba.

GENERAL GEOLOGY

GENERAL STATEMENT

All the rocks of the area are Precambrian in age and consist of interbanded volcanic and sedimentary rocks intruded by large masses of granites and more basic intrusives. The volcanic and sedimentary rocks, older than the intrusives, have been called the Rice Lake group, thus conforming to already well established terminology for this area.

The Rice Lake group has been divided into three main divisions dependent on lithologic differences:

i. Volcanic division.
ii. Sedimentary division.
iii. Metamorphic division, representing altered equivalents of i and ii, and injection gneiss.

The granitic intrusives have been differentiated largely on the basis of lithologic distinctions, although it is probable that they are all closely related in age and origin.

Two ages of basic intrusives are recognized, one younger than the Rice Lake group but older than the granites, and one younger than the granites.

A younger formation of sediments, the San Antonio formation, lies unconformably on the Rice Lake group and granitic intrusives.

The rocks of the area are conveniently tabulated in the following table of formations.

TABLE OF FORMATIONS

ARCHAEAN OR PROTEROZOIC	San Antonio Formation	Feldspathic quartzite, conglomerate
	Unconformity	
	Intrusive Rocks	Peridotite, gabbro, lamprophyre
		Intrusive Contact
		Quartz diorite, diorite
		Intrusive Contact
		Granite, granodiorite, quartz diorite; hybrid and gneissoid equivalents; quartz-feldspar porphyry; pegmatite, aplite
		Intrusive Contact
		Gabbro, quartz gabbro, diorite
	Intrusive Contact	
ARCHAEAN	Rice Lake Group	Metamorphic division; quartz-biotite-feldspar gneiss, quartz-hornblende gneiss, hornblende-plagioclase gneiss, chlorite schist; injection gneiss
		Sedimentary division: quartzite, tuff, slate; minor conglomerate, arkose, chert
		Volcanic division: rhyolite, dacite, andesite, basalt; porphyritic, ellipsoidal, and amygdaloidal equivalents; agglomerate and breccia; altered coarse basalt flows (pseudogabbro); iron formation; minor chert and tuff

RICE LAKE GROUP

The divisions of the Rice Lake group have already been mentioned.

Volcanic Division (1)[1]

The members of this division are of diverse natures, ranging from light green rhyolite and dacite to andesite and dark green basalt. For the most part the volcanic rocks are quite schistose. Fragmental rocks are widespread.

Probably the most abundant types are fine grained, schistose, greyish-green andesites and dacites. These rocks are seen to be composed dominantly of plagioclase feldspar, chlorite, epidote, and magnetite, with variable quantities of quartz. The feldspar is almost invariably altered to saussurite, and in some specimens sericite is quite abundant. Carbonate is almost always present, sometimes in considerable amounts.

Some varieties are porphyritic, others amygdaloidal. In the amygdaloidal varieties, the amygdules, filled with quartz, carbonate, and feldspars, have been flattened and squeezed giving the rock a pebbly appearance.

Light grey and green rhyolite is interbanded with the andesite flows. This interbanding is seen on the south shore of Wanipigow Lake near the west edge of the map area. Most of the rhyolite is fine grained, almost cherty in places. Some flows are finely porphyritic, and these may alternate with the cherty rhyolite flows. Thin sections reveal that the rhyolite is composed of very fine-grained quartz and sericite or sericitized feldspar; chlorite and apatite are generally present in subordinate amounts. Secondary tourmaline, carbonate, and pyrite were seen in many sections. Most of the rhyolite exhibits excellent flow banding. This may appear either as alignment of minute feldspar phenocrysts in the finely porphyritic variety or as an alternation of thin cherty and porphyritic flows.

Fragmental lavas are extensively developed in the eastern part of the main lava belt. Fragments of rhyolite and dacite, or their porphyritic equivalents, are embedded in a fine andesitic groundmass of chlorite, andesine and epidote. Like the amygdules, the fragments have been squeezed and are now lenticular, some attaining lengths of several inches. However, most of the fragments measure about one and one-half inch by half an inch.

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1 Numbers in parenthesis are those of the map units used on accompanying map.

Dark- green to black basalt is a widespread member of the volcanic division, and may be fine, medium, or coarse grained. The coarse-grained basalt closely resembles intrusive gabbro. However, it was seen to grade both across and along the strike into fine-grained basalt; in one place it graded into pillowed basalt. This coarse basalt has been termed pseudogabbro. The composition of the basalt and pseudogabbro is much the same, the minerals consisting of green hornblende and pyroxene, largely altered to chlorite, and highly saussuritized feldspar. Abundant discrete grains of epidote are characteristic of the basalts, and magnetite and leucoxene are present in most specimens.

The alteration products, ragged chlorite, saussurite, and epidote, common to both the fine basalt and the pseudogabbro, are not well developed in most of the intrusive gabbro of the area. Another rather distinctive property of the pseudogabbro is the so-called "knobby" appearance shown by much of it. This is caused by large crystals of hornblende in a finer doleritic groundmass.

Pillowed lavas are not at all common, and where seen appear to be best developed in the basalts.

Banded, cherty iron formation of sedimentary origin was observed at several spots on the north shore of Wanipigow Lake, and further east along the strike, north of Wanipigow River. Layers of fine chert, most of which contain numerous small grains of carbonate, alternate with layers rich in magnetite. Strong magnetic disturbances were noted in numerous drift-covered spots along the projected strike of the iron formation, and the band is presumably continuous across the map area.

Sedimentary Division (2).

Sediments of the Rice Lake group are nowhere well exposed in the area. Several outcrops were observed along Wanipigow River in the eastern part of the area, on the extreme northeast shore of Wanipigow Lake, and on several small islands near the east end of the lake.

Included in the division are thinly laminated tuffs, quartzite, and slates with minor arkose and conglomerate. Much of the tuff, originally greenish, has been altered to a bleached talc-carbonate schist, especially on the islands in Wanipigow Lake.

The quartzites are fine to medium grained, some with small pebbles of quartz in a fine quartzose groundmass; abundant small grains of carbonate are present in some of the beds. The arkose is very similar to the quartzite except that it contains considerable feldspar and sericite.

Numerous bands of thinly bedded dark-grey to black slate were found interbedded with the quartzites at Silver Falls on the eastern part of Wanipigow River.

An outcrop of conglomerate half a mile southeast of Silver Falls contained large pebbles of quartz in a medium-grained quartz-feldspar groundmass.

Metamorphic Division (3,4)

Between Saxton and Ogama Lakes and around the lower part of Beaver Creek, andesite and basalt is present in various stages of recrystallization to fine- or medium-grained well-foliated needly hornblende-plagioclase gneiss (3). Gradations through chlorite schist back to normal basalt are found within the main mass. The gneiss and schist have been injected by much granitic material, which accentuates the gneissic structure.

Fine- to medium-grained grey or brown, bedded sedimentary gneisses (4), composed of quartz, feldspar, biotite, and some hornblende are abundant along the Manigotagan River. In some places small pink garnets are developed in these gneisses. From their relationship with the lavas which they appear to conformably overlie, they are believed to represent recrystallized equivalents of the sediments to the north. Most of these gneisses are well foliated, and in part, are injected with large quantities of granite and pegmatite. Impregnation of granitic material in varying quantities results in gradations towards granitoid gneiss. Similar sedimentary gneisses are developed between Ogama and Saxton Lakes in association with the hornblende gneiss and chlorite schist.

INTRUSIVE ROCKS

A large part of the map area is underlain by granitic rocks which intrude the Rice Lake group. These intrusives include granite, quartz diorite, granodiorite, and related hybrid types. Basic rocks both younger and older than the granitic rocks occur in the area.

Older gabbro, diorite (5)

North of Beaver Creek, near the west boundary of the sheet, a large body of gabbro and diorite is exposed. The borders of this mass are not clean-cut but have been intruded by considerable granite and pegmatite, as has the interior of the mass itself.

The gabbro is dark green, medium to coarse grained, and massive. It is composed of large grains of green hornblende, lesser pyroxene, andesine-labradorite feldspar, and smaller amounts of epidote, clinozoisite and magnetite; some specimens contain secondary blue quartz "eyes". Unlike the pseudogabbro of the Rice Lake group, the minerals of this rock are not extensively altered, nor does it have the peculiar knobby appearance of the pseudogabbro.

Granite (7), granitoid gneiss (6), porphyry (8)

The larger part of the area is underlain by coarse-grained buff massive to faintly gneissoid granite (7), its hybrid derivative, granitoid gneiss (6), and quartz-feldspar porphyry related to the granite.

The granite (7) is superficially massive but close inspection reveals a faint parallel linear structure characterized by oriented ferromagnesian minerals and flat aligned quartz grains. The more equant feldspar grains are randomly oriented. The granite in many places contains inclusions of older rocks and these tend to be aligned with their longer axes parallel to the linear structure. Examination on two surfaces reveals that the linear structure is but one component of a planar flow structure. The linear and platy flow structures have been indicated on the accompanying map by a special symbol for foliation distinct from that used for gneissosity. In the granite body south of the Wanipigow River, foliation is more pronounced to the west, and it is clearly seen in aerial photographs of the west edge of the area.

Examination of thin sections shows that the granite is composed of albite, saussurite, quartz, and hornblende; some specimens contain subordinate orthoclase. Biotite is present in many sections but never to the exclusion of hornblende. The feldspar grains are intensely altered to sausserite, much of the dark minerals to chlorite, and epidote is present in many sections. Some of these rocks should be specifically designated as albitized granodiorite and quartz diorite.

Parts of this granite and of related rocks characteristically contain quartz in the form of ellipsoidal blue "eyes".

The granitoid gneiss (6) is characterized by a fine stratiform structure which becomes more pronounced towards the sedimentary gneisses and less so towards the granite (7). This gneiss represents extremely granitized sediments. Inclusions of sediments in all stages of digestion are found within the granitoid gneiss. In addition, numerous dykes and irregular masses of granite (7) and pegmatite cut the granitoid gneiss; most are too small to map. Larger masses of granite and pegmatite have been mapped within the granitoid gneiss, but owing to the great variability in degrees of granitization, the contacts of these masses are at best approximate. Small masses of fresh massive pink granite and related pegmatite, which may be younger than the buff granite (7) also cut the granitoid gneiss.

The granitoid gneiss differs in composition from the less contaminated granite (7) in that it has abundant microcline and more biotite.

On the south shore of Wanipigow Lake a large mass of albitized quartz-feldspar porphyry (8) intrudes the Rice Lake group. Many dykes of the same porphyry intrude the granite in the southeast quarter of the map area. Apart from its porphyritic texture this rock closely resembles the granite (7), and is believed to have been derived from it. The dykes, especially, have blue quartz "eyes" as does some of the granite.

Diorite, quartz diorite (9)

The age relationship of this rock with the granite (7) is not clear, but on the basis of its fresh and massive appearance it is considered to be younger. It is quite possible that it is another differentiate of the same magma that produced the granite.

The quartz diorite is typically coarse grained, massive, grey, and fresh appearing. It is composed of white oligoclase-andesine feldspar, green hornblende, quartz, and lesser biotite, pyroxene, magnetite, titanite, and apatite. The primary minerals are distinctly unaltered. Numerous lamprophyre dykes cut the grey quartz diorite.

Peridotite, gabbro (10)

A few small outcrops of serpentinized peridotite are exposed between Saxton and West Gold Lakes and along the south shore of Woods Lake.

The peridotite, a medium-grained dark rock, has been altered to a mass of felted serpentine which contains small residual grains of olivine and pyroxene. Some specimens contain disseminated grains of chromite and magnetite. Other specimens have been carbonatized, in some places so extremely that only a few fibres of serpentine and grains of chromite remain in a mass of carbonate.

No economic significance can be attached to either the serpentine or chromite here. The possible westward extension of this mass is covered by drift.

Lamprophyre (11)

Numerous steeply dipping dykes of lamprophyre, rarely more than 100 feet wide, intrude the granite and quartz diorite (9). Most are confined to the latter rock and follow a NNE fracture system. The borders of most of the dykes are sheared and altered to a carbonate-chlorite schist carrying vein quartz.

SAN ANTONIO FORMATION (12)

Feldspathic quartzite and conglomerate unconformably overlie the granite (7) and younger rocks. The conglomerate, composed of large boulders and pebbles of the granite and Rice Lake volcanics, lies at the base of the formation; the unconformable relation with the granite was clearly observed in one spot. The contact between the Rice Lake volcanics and the San Antonio formation was only seen in one place; it was heavily sheared.

The quartzite is generally medium grained, grey to buff, and not very clearly bedded. It is composed of medium-sized quartz grains, either angular or rounded, and lesser quantities of microcline, plagioclase, and sericite.

It is not known certainly that the San Antonio formation is younger than the quartz diorite (9) and younger basic rocks. Consequently, the origin of stringers of vein quartz in the quartzite is unknown.

STRUCTURE

Within the area there is a pronounced NW-SE regional structure which applies to all formations. In the southern part of the area, schistosity, gneissosity, bedding, and flow structures, and one set of shears all trend in this direction.

In the Rice Lake group the sedimentary rocks are conformable with the underlying volcanics. Within the volcanics the attitude of the various flows is shown by the trend of the pseudogabbro and fragmental rocks. Also, on the north shore of Wanipigow Lake the band of iron formation serves as a structural marker. On the south shore at the west end, flow banding in the rhyolite is present. All the above features strike about north 60 degrees west.

Secondary foliation or schistosity is well developed in most of the lavas and parallels the strike of the flows. Most dips are steep, varying from 50° to vertical.

Bedding within the sediments of the Rice Lake group parallels the flow structures and schistosity of the lavas. Secondary foliation in the quartz-biotite gneiss is parallel to the bedding in these same rocks. Tops of beds in the Rice Lake group were only observed at one or two places and there the beds faced north and dipped steeply north.

Several large drag folds are developed in the Rice Lake group. Two are located at the contact of the granite and lavas south of Wanipigow Lake, another in the quartzite south of Wanipigow River east. Subsidiary drag folds in the lavas indicate a gentle plunge towards the east. It is noted that this plunge is about the same as that shown by the linear elements in the granite in the same vicinity.

Gneissosity in the unit mapped as granitoid gneiss generally conforms to that in the quartz-biotite and hornblende-plagioclase gneisses. Folds in this unit can be seen in the aerial photographs of the southwest and northwest corners of the area, and are indicated on the map by the strike of the gneissosity.

Notwithstanding the more obvious features, the structure of the Rice Lake series has not been defined in detail. Steeply dipping isoclinal folds may be present but this was not definitely ascertained.

It has already been pointed out that the San Antonio formation rests unconformably on the granite (7) and older rocks. However, the structural relation of this formation with the lavas is complicated by strong shearing which may represent a fault. The contact was only observed in one place. The structure is further complicated by the fact that two periods of folding are indicated.

Wherever shearing was observed the shears are developed according to a definite pattern. One set strikes parallel to the regional schistosity, the other set about north 30° east. The latter set is best seen where shearing is developed along the contacts of lamprophyre dykes.

ECONOMIC GEOLOGY

Gold deposits have been known in the region since about 1912 following discoveries in the Rice Lake area. An excellent summary of prospecting activity is contained in Wright's report. (Geol. Surv., Canada, Memoir 169, 1932, pp. 87-89).

On the property of the Grand Central Gold Mines Limited, on the north shore of Wanipigow Lake, a shaft was sunk in 1933 to a depth of 100 feet. It is reported that 300 tons of ore were milled that year and 30 ounces of gold recovered.

North of Wanipigow River and east of Saxton Lake several companies have done exploration work on the Luleo group, which was held until recently by Poundmaker Gold Mines Limited. Prior to the acquisition of the property by that company, the Selkirk Gold Mining Company sunk a two-compartment shaft to 325 feet and a winze to 525 feet. Levels were established at depths of 125, 225, 325, 425, and 525 feet, and lateral work was done on each level. This work was done before 1925. The deposit is a shear zone in granite and granodiorite. Gold values up to $10.00 a ton on milled ore were reported. In 1947, Jacknife Gold Mines Limited did surface work and some diamond drilling on the property, but the results are not known.

On the old Eva property south of Wanipigow river, a shaft was sunk to 58 feet on a quartz body averaging about three feet wide in the granite. A shear zone was traced about 800 feet on the surface. Low gold values were reported.

The work of the summer of 1948 revealed that gold-bearing quartz veins may occur in nearly all the rocks of the area, including the granites (7). Most of the shears observed carried vein quartz and consequently the veins form a definite pattern as do the shears. It is interesting to note that the shear directions correspond approximately to the vein systems in the Rice Lake area.

Specifically, only a few veins were noted in the rocks of the Rice Lake group of volcanic and sedimentary rocks. Nonetheless, careful prospecting of these rocks, especially in the vicinity of drag folds and the large porphyry mass is probably warranted. Further, it is believed that the area of hornblende-plagioclase gneiss and chlorite schist around Beaver Creek has not been adequately investigated for gold-bearing quartz veins.

North of Beaver Creek, the older gabbro (5) is reported to contain a number of quartz veins.

In the grey quartz diorite (9) north of Wanipigow Lake practically all the lamprophyre dykes have been sheared, and lenses of vein quartz have been injected along the shears. Mineralization consists of pyrite, chalcopyrite, and gold. The gold in these veins is erratic, some occurring as visible grains in otherwise barren quartz. It is almost certain that there are a great many more lamprophyre dykes than are indicated on the map. Most of the quartz bodies are lenticular and discontinuous on surface. Considerable carbonate alteration of the lamprophyre accompanies the quartz lenses.

In the granite (7) many quartz veins occur along well-defined shear zones, and there appears to be a close association of veins with dykes of quartz-feldspar porphyry intruding the granite. These veins occur in granitic rocks (albitized granodiorite and quartz diorite) similar to those of the Ogama-Rockland property in the Long Lake area, and are associated with similar porphyries.

Nothing definite can be said about the probable depth continuation of these veins in the granite. It is commonly believed that veins occurring in the large intrusives which gave rise to the mineralizing solutions are not likely to extend far into the intrusives. This may be so in this area; but surface indications might justify further investigations on the larger of these veins.

Only very small stringers of vein quartz were found in the San Antonio formation, and their origin is unknown.

No veins of any importance were noted in the granitoid gneiss. Further, the pegmatite dykes that intrude the gneiss are not known to contain any minerals of commercial importance.