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FORGET LAKE MAP-AREA, SASKATCHEWAN

(REPORT AND MAP)

By

Donald A. W. Blake

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Illustration

Forget Lake Map-area, Saskatchewan

INTRODUCTION

Forget Lake map-area and a small area lying between it and the north shore of Lake Athabasca were mapped by the writer during the field season of 1950. Together they comprise an area of about 175 square miles lying between longitudes 108°15' and 108° and between latitude 59°45' and the north shore of Lake Athabasca. Goldfields, situated on the lake shore 9½ miles west of the map-area, is readily accessible by aeroplane from Fort McMurray, Alberta, Fort Smith, N.W.T., and Prince Albert, Saskatchewan, and by boat from Waterways, Alberta. The chief canoe route through the area follows Oldman River, but travel on it is made difficult by the small size of the river and by numerous rapids and falls. The many lakes of sufficient size to land small, float-equipped aircraft, however, render all parts of the area easily accessible.

The only previous geological investigation of the area mapped was of a reconnaissance nature, undertaken by F. J. Alcock[1] in 1934. In 1947-48 A. M. Christie[2] mapped the adjacent Goldfields and Martin Lake map-areas to the west on a scale of 1 inch to ½ mile. The present study is a continuation of Christie's work, made desirable by the many discoveries of uranium deposits in the Goldfields region. Relatively few uranium discoveries have so far been made in the area covered by the present report, but it includes the continuation of one of the most important structures with which uranium deposits are associated in the adjoining Martin Lake map-area.

[1] Alcock, F. J.: Geology of Lake Athabaska Region, Saskatchewan; Geol. Surv., Canada, Mem. 196, 1936.

[2] Christie, A. M., and Kesten, S. N.: Goldfields and Martin Lake Map-areas, Sask.; Geol. Surv., Canada, Paper 49-17, 1949.

Gerald L. Colborne, Thomas G. Wong, and Kenneth N. Beckie rendered efficient service as student assistants, and James R. Digby and A. W. Lewis carried out their duties in a satisfactory manner as canoeman and cook respectively. The writer is particularly indebted to Dr. A. H. Lang of the Geological Survey of Canada under whose guidance the work was carried out. Kenneth A. Morgan, who mapped in detail the M M concession of Goldfields Uranium Company, supplied considerable geological information while in the field, which is gratefully acknowledged.

The writer has been able to devote only a limited time to the preparation of this report. It represents merely a brief summary of the geology and mineral deposits of the area, prepared without the benefit of microscopic study of specimens. The petrographic names are, therefore, based only on an examination of hand specimens.

TOPOGRAPHY

The southern two-thirds of the area mapped is characterized by northeast-trending ridges, which lend the country a decidedly rugged appearance. Local relief in this part is commonly as much as 700 feet. In the northern third, however, the relief is considerably less, and the ridges more subdued. The valleys are filled with boulder drift, and the many irregularly shaped lakes and swamps attest to the poorly drained character of the region. More than 50 per cent of the bedrock is exposed throughout most of the area, but in the north as little as 15 per cent of the country is free from overburden.

GENERAL GEOLOGY

GENERAL STATEMENT

The oldest rocks of Forget Lake map-area -- the Tazin group of metamorphosed sedimentary rocks, basic sills, and possibly lava flows -- have been intruded and in part replaced by granite and

granite-gneiss. Deep-seated, contemporaneous folding has produced a series of north-northeast trending anticlines and synclines.

The following table indicates the probable geological succession within the area mapped.

TABLE OF FORMATIONS

Era	Formations and lithology
Proterozoic	Diabase dykes
	Intrusive contact
Archaean or Proterozoic	Lamprophyre dykes Granite, granite-gneiss, and pegmatite
	Intrusive contact
	Tazin group: Mafic rocks (Amphibolite; Fine-grained mafic rocks; Granitized mafic rocks); Metamorphosed and granitized sedimentary rocks; Quartzite, impure quartzite, granitized quartzite, iron formation; minor chert

DESCRIPTION OF ROCK TYPES

Tazin Group

Quartzite

Within the area mapped, the quartzite, though locally nearly pure and well bedded, generally contains various impurities and is poorly bedded. Zones extremely rich in wine-coloured garnet porphyroblasts, which are surrounded by haloes of biotite, are found in the quartzite outcropping at Hayter Bay and in the southwest corner

of the map-area. There, garnet commonly makes up 60 per cent of the rock. Magnetite and hematite occur along fractures and as fine disseminations along bedding planes, and give the quartzite in many places a typical reddish purple colour. The quartzite, which extends southward along Oldman River from MacRae Lake, contains iron formation not more than 30 feet thick, composed of layers extremely rich in magnetite and hematite interbedded with layers of quartz. Feldspar porphyroblasts, indicative of partial granitization, are found in much of the quartzite that outcrops in the northern part of the area. A little calcite occurs in some of the quartzite, and in a few places narrow, irregular beds composed mainly of calcite and pyroxene. South of Prince Lake, a narrow band of finely laminated chert occurs in highly granitized mafic rocks.

Metamorphosed Sedimentary Rocks

Metamorphosed and granitized rocks, dominantly of sedimentary origin, are found along the shore of Lake Athabasca and extend northward as irregularly shaped belts. Wherever observed they exhibit features in common, but marked differences in the degree of metamorphism warrant an arbitrary division into two types. The metamorphosed sedimentary rocks in the southwestern part of the area are, in general, fine grained and less metamorphosed than those that outcrop along and east of Oldman River, and have been mapped separately.

In the southwestern corner of the area mapped, the altered sedimentary strata are mainly grey, quartz-rich, medium-grained biotite gneisses, with minor amounts of sericite and graphite schists, and original bedding structures are preserved as bands differing in colour and chemical composition. In the Oldman River area, coarse-grained, garnetiferous, quartz-rich biotite gneisses are characteristic. There, although the bedding is generally not as well preserved,

the high proportion of quartz, abundant garnet porphyroblasts, and compositional variations indicate a sedimentary origin for most of the gneisses. In both areas the gneisses are commonly highly contorted and are injected by granitic material.

Mafic Rocks

The term 'mafic rocks', as used by Christie, includes all dark-coloured rocks composed dominantly of ferromagnesian minerals. In the present map-area they consist mainly of amphibolite (A)[1], fine-grained mafic rocks (M), and granitized mafic rocks (G), with minor amounts of biotite and chlorite schists and gneisses.

[1] Letters in parentheses are those used on the accompanying map to designate occurrences of these rocks.

The amphibolite occurs as large and small inclusions and roof pendants throughout most of the area mapped, but only the largest bodies are outlined. In general, the amphibolite is a dark weathering, medium-grained, slightly gneissic rock, composed of recrystallized hornblende and feldspar. It is invariably intruded by irregularly shaped stringers and dykes of quartz-rich granite. In most instances it was impossible to determine the origin of the amphibolite masses, though the large body lying between Oldman River and Reed Bay is thought to be a folded composite sill.

The fine-grained mafic rocks and granitized mafic rocks, which occur mainly in the Prince Lake-Alces Lake area, may be in part of sedimentary origin. They are dark green weathering, commonly massive, but occasionally finely layered rocks. Augen-shaped quartz and feldspar porphyroblasts are usually present, and in places comprise more of the rock than the fine-grained groundmass in which they are embedded. Like the amphibolite, the finer grained mafic rocks are invariably intimately injected by granite.

Granite and Granite-Gneiss

By far the largest part of the area mapped is underlain by granite and granite-gneiss. Various phases were noted, but whether they represent more than one major intrusive cycle is uncertain. Nearly all parts of the area contain elongated inclusions of amphibolite and other members of the Tazin group, and commonly in such abundance as to make mapping difficult. In the southeast part of the map-area it is difficult to separate intrusive gneisses from the granitized sedimentary rocks or paragneisses, and it is possible that a large part of the gneisses mapped as granite-gneiss are in reality completely granitized sedimentary rocks.

About 3 miles southwest of MacRae Lake, a large area of rocks not differentiated on the map is underlain by coarse-grained hornblende-biotite granite-gneiss. The same rock is found in the area northwest of Felix Lake. The gneiss is typically porphyroblastic, containing augen and phenocrysts up to 3 inches in length. A few amphibolite bodies lie parallel with the gneissic bands, and both are cut by granite and pegmatite dykes. It is possible that this gneiss is the result of complete granitization.

Elsewhere in the area mapped, except for Cameron and adjacent islands, the granite and granite-gneiss are typically pink and white quartz-rich rocks in which biotite is the chief ferromagnesian mineral. Inclusions of amphibolite are numerous. Dykes and irregular masses of pegmatite are invariably associated with the granite and granite-gneiss, and in the area northeast of Zenith Lake they constitute up to 50 per cent of the rock.

The Cameron Island granite is probably part of the Mackintosh Bay stock described by Christie. It is red weathering, coarse-grained, and slightly gneissic, and is characterized by pockets of chlorite, which comprise up to 15 per cent of the rock. Unlike the other granitic rocks of the area it has evidently thrust aside the Tazin formations during its emplacement.

Lamprophyre Dykes

Numerous lamprophyre dykes occur in the southeastern third of the area mapped, and spatially appear to be related to the Mackintosh Bay-Cameron Island granite stock. They range from a few inches up to 100 feet in width, and some of them have been traced for nearly a mile. They have a characteristic chocolate-brown weathered surface, and on fresh surfaces biotite phenocrysts up to $\frac{1}{2}$ inch across are seen to be set in a fine- to medium-grained, reddish brown groundmass.

Diabase Dykes

Three, fine grained, dark green to black dykes were found in the Prince Lake area. They range from 1 foot to 3 feet in width, and are less than 100 feet long. Minute feldspar laths are visible in an aphanitic groundmass, and poorly formed cubes of pyrite up to $\frac{1}{8}$ inch across are locally scattered through the dyke rock. A larger dyke, about 25 feet wide and extending for more than $\frac{1}{2}$ mile, was found north of MacRae Lake. This dyke, though slightly coarser in grain, resembles those found near Prince Lake. Together they are correlated with those mapped by Christie, and are thought to be post-Athabasca series, diabase dykes.

STRUCTURAL GEOLOGY

The Tazin group of rocks has been severely deformed and concordantly intruded by granite and granite-gneiss at very great depth. Together they have been buckled into large, southerly plunging, open folds. The limbs of the major folds have been complexly drag-folded, but everywhere the gneissosity is parallel with the bedding layers. Some of the major fold axes are indicated on the accompanying map.

Though faults are probably common, only four have been mapped. Of these, two are apparently eastward continuations of major breaks in the Martin Lake area. A prominent topographic lineament, which evidently marks the course of a fault or shear zone, extends northeastward from Prince Lake to beyond Alces Lake. The rocks in many localities on either side of the valley or lakes along this lineament are severely mylonitized, and are cut by abundant quartz, hematite, and epidote veins. In one place, hundreds of small, closely spaced faults, oriented parallel with the main lineament, were seen; it seems probable that this lineament represents the northeastward continuation of the St. Louis fault shown on the Martin Lake map.

A second, well-defined topographic lineament, which probably marks the site of a fault, extends eastward from Max Lake, in Martin Lake map-area, almost across Forget Lake map-area. There, again, mylonitized rocks, red alteration products, and abundant quartz veins were seen. In addition, a marked contrast in rock types was observed at the lake south of Viking Lake: north of the deep valley joining this and Max Lakes is a fine-grained, red granite containing many zones of amphibolite, whereas south of the valley a large area is underlain by coarse-grained granite-gneiss.

ECONOMIC GEOLOGY

GENERAL STATEMENT

The limited amount of prospecting to date in Forget Lake map-area has revealed no uranium deposits of more than usual interest. It has been confined mainly to a narrow zone straddling the probable extension of the St. Louis fault and to a strip of land along the north shore of Lake Athabasca. In these and other areas numerous anomalies have been noted, but most of them have seemed of little importance. A few of the deposits, however, may require further investigation.

Most of the uranium deposits, as in the map-areas to the west, appear to be related structurally to either faults or shear zones. It is, therefore, important that future exploration be confined mainly to faults or marked lineaments observable on air photographs, such as the probable fault south of Viking Lake. In these map-areas, as pointed out by Christie and Kesten, pitchblende usually occurs as fracture fillings associated with calcite, comb-quartz, specular hematite, red hematite stain, chlorite, and graphite. In most deposits, too, the pitchblende is found in dark-coloured or mafic rocks, but in the northern part of Forget Lake map-area most of the uranium deposits occur either in, or associated with, pegmatite.

RADIOACTIVE MINERAL OCCURRENCES

A L Group

The A L group of three claims was staked by J. Lawson and G. Borg in the autumn of 1949 while prospecting for Noracon Exploration Company. The group is located along the west shore of Felix Bay on the north shore of Lake Athabasca, in an area underlain by steeply dipping, granitized and silicified, dark weathering sedimentary rocks cut by conformable masses of granite and pegmatite. A shear zone, 5 feet wide, that roughly parallels the structure contains a fault marked by $\frac{1}{2}$ inch of gouge and horizontal slickensides. Two, closely spaced pits straddling the fault reveal several lenses and veins of pitchblende filling nearly vertical cross-fractures. The pitchblende lenses and veins do not exceed $\frac{5}{8}$ inch in thickness, and none seems to have a length of more than 4 feet. Pyrite occurs in veins and as disseminations in the shear zone, and has weathered to produce a rich limonite capping. Purple hematite stain and disseminated graphite are associated with the pitchblende. Two grab samples taken from the pits by the writer assayed 4.92 per cent and 0.36 per cent U_3O_8 equivalent, and the radioactive mineral

has positively been identified as pitchblende. Five grab samples taken by the prospectors assayed from 1 to 10 per cent U_3O_8 equivalent. A brief Geiger counter survey of the immediate area failed to locate other radioactive deposits.

L and B group

The L and B group of three claims lies at the northeast end of Mackintosh Bay near the western boundary of the map-area. The present ownership is unknown. The rock in the vicinity of the showing is mainly well-bedded, buff weathering quartzite and impure quartzite cut by irregular masses and dykes of pegmatite. On the shore of the extreme northeastern corner of the bay, several closely spaced pits have been dug. There a small, lens-shaped, twisted mass of amphibolite has been sheared, whereas the surrounding, steeply dipping quartzite has been only mildly fractured. Both the shear zone in the amphibolite and some of the fractures in the quartzite contain pitchblende veins, which nowhere appear to exceed 6 feet in length or $\frac{1}{8}$ inch in width. Associated with the pitchblende are yellow and green oxidation products, purple hematite stain, and pyrite, the latter of which is especially prominent in the amphibolite body. Though geiger values fall off rapidly away from the pits, an area within a radius of 30 feet or more averages double the background count.

Dello Group

The Dello group of nine claims, situated northeast of Reed Bay, is held by the Neiman Lake Uranium Prospecting Syndicate. Five closely spaced pits, situated $\frac{3}{4}$ mile north-northeast of Reed Bay, have been dug in line along a 5-foot zone of northwest-striking shears and fractures in a large amphibolite mass. The amphibolite is intersected by small irregular dykes and masses of granite and pegmatite.

Veins of pitchblende, associated with veins of calcite, are visible in three of the pits. One vein of pitchblende can be traced for 8 feet and attains a thickness of $\frac{1}{2}$ inch. A few quartz veins are present, along which the amphibolite has been silicified, and much of the wall-rock bordering the shear zone is heavily pyritized. The pitchblende and calcite veins carry specular hematite and red hematite stain in addition to the usual uranium oxidation products. One grab sample assayed 0.17 per cent U_3O_8 equivalent.

M M Concession

The M M concession of Goldfields Uranium Mines Limited is $2\frac{1}{2}$ miles wide and 12 miles long, and extends along the probable extension of the St. Louis fault northeastward from the west end of Prince Lake to the middle of Alces Lake. The concession was traversed at 200-foot intervals during the summer of 1950 by prospectors under the direction of Technical Mines Consultants, and about thirty anomalies were found. Of these, five were considered worthy of further work. Thirteen grab samples ranged from nil to 2.58 per cent U_3O_8 equivalents. The writer had the opportunity to visit two of the more important radioactive occurrences, one north and the other south of Alces Lake, as shown on the map. The northern anomaly extends easterly for 400 feet. Pegmatite, pegmatitic granite, and leuco-granite are intrusive into highly granitized and silicified mafic rocks, altered quartzites, and gneisses of unknown origin. Most of the high counts along this zone appear to be due to disseminations of radioactive minerals related to weak fractures in the granitized and silicified mafic rocks.

The anomaly south of Alces Lake is found along a narrow shear zone cutting white pegmatite and pegmatitic granite. The major high count is due to disseminated, radioactive minerals in inclusions of chlorite and biotite schist that flank the shear zone. The latter can be traced through the overburden by a Geiger counter for more than 50 feet.