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PRELIMINARY REPORT

MacKAY LAKE AREA, NORTHWEST TERRITORIES

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Illustration

MacKay Lake Area, Northwest Territories

INTRODUCTION

MacKay Lake area (longitude 110-112 degrees, latitude 63-64 degrees) lies 4 miles north of the east arm of Great Slave Lake and about 85 miles northeast of the town of Yellowknife. Geological mapping of the area was commenced in June 1940. This report and the accompanying map present the results of the first season's work.

The many large lakes make all parts of the area easily accessible by canoe. Barnston River flows south through the area to the east arm of Great Slave Lake. It affords a possible canoe route into the area, but a drop of several hundred feet over a series of rapids and falls in the lower few miles makes travel difficult. All parts of the area may be reached by aircraft in 1 to 2 hours, from the air base at Yellowknife.

The lakes and rivers in the southern part of the area are sufficiently free of ice to permit travel by canoe or seaplane from about June 20 to the last week in September. The larger lakes in the treeless area to the north are much later in breaking up. In 1940 MacKay Lake was not free of ice until the end of the first week in July.

The country is nearly flat, with rocky ridges or boulder hills rising 50 to 100 feet above the general level of the lakes and areas of muskeg. In the northeastern part of the area the relief is more pronounced and the higher granite hills attain elevations of 200 feet or more. Large areas consist of rolling boulder plains with local relief of less than 40 feet and with isolated, rocky ridges rising to 80 feet above them. Such heavily drift-covered country is general around and south of Warburton Bay on MacKay Lake and in the northeastern corner of the map-area. Between Warburton Bay and Old Canoe and Fat Lakes rugged boulder hills cover much of the country. They range from irregular ridges and knobs to rounded hills of oval or drumlinoid shape and their long axes have a northeasterly elongation parallel to the direction of glaciation. The hills are 50 to 100 feet high and are composed of large, angular, granitic boulders or blocks and some coarse gravel. The material seems to have been dumped by the melting ice-sheet with no sorting or reworking. Areas characterized by these rugged boulder hills are irregularly distributed, but commonly occur within boulder plain areas. An extensive deposit of this type lies northwest of Athenia Lake and extends southwest beyond the borders of the area. In other parts of the area, such as northeast of Athenia Lake and Camsell Lake, and to the north and west of Lake of the Enemy, drift is scarce and bedrock areas extensive. Eskers composed of sand and gravel form ridges up to 40 feet in height that run for miles across the country. They trend from south 55 degrees west to west and closely parallel the glacial striæ on

nearby bedrock. In general the eskers are confined to areas where the drift cover is heavy and they rarely extend far into areas of abundant rock outcrop.

The country north of MacKay Lake is barren of trees except for willows and small shrubs. Near Lake of the Enemy, King Lake, and Camsell Lake a few, small, isolated groves of spruce grow in valleys along stream beds, but most of the country is barren of trees. Some good stands of spruce, with trees up to 2 feet in diameter at the base, grow along the esker at the extreme southwest end of Warburton Bay. To the south and southwest of this esker small, scattered spruce trees are fairly numerous. The country around and to the south of Lac sans-Disant and Rivett Lake is timbered almost continuously along valleys and low muskeg areas with spruce and some birch.

Trout and other fish are plentiful in the larger lakes and streams. Game is scarce in the late spring and early summer. No barren ground caribou were seen until the second week in August. From then on herds of a few to one hundred and twenty-five or more were seen daily, but up to September 12 they had not come south of Camsell Lake. A few black bear were seen in and near the wooded part of the area, and ptarmigan were plentiful in the late summer and autumn. Several wolves and fox were seen after the arrival of the caribou in August.

North of MacKay Lake a stove burning artificial fuel is almost a necessity. South of MacKay Lake it would be possible, but difficult and most inconvenient, to pick camp-sites near the rare groves of trees. South and west of Warburton Bay and Camsell Lake there is an ample supply of firewood. Our party used two-burner gasoline stoves for cooking throughout the field season. A two-man party using one of these stoves does not need more than 1 gallon of gasoline a week and can get along with considerably less.

GENERAL GEOLOGY

Table of Formations

Diorite, gabbro (dykes).
Granite, granodiorite, and allied rocks.
Quartz diorite.

Yellowknife group.
Quartz-mica schist, knotted andalusite, and cordierite quartz-mica schists derived from and grading into greywacke and slate.
Andesite, dacite, basalt, rhyolite, tuff, and agglomerate.

YELLOWKNIFE GROUP

Volcanic Rock

A belt of volcanic rocks extends from the western border of the area near Rivett Lake, northeast along the southern shores of Old Canoe and Camsell Lakes. The belt forms a rather prominent range of hills, rising 50 to 100 feet above the general level of the country. For the most part the flows are dark to light green, fine-grained andesites, dacites, and some basalts. They are composed of dark green amphibole, chlorite, and plagioclase. Pillows and ropy flow structure are well developed, and many of the flows contain amygdules and vesicles. In places, particularly to the north

and west of Rivett Lake, bodies of medium-grained, dioritic rocks composed of about equal parts of dark amphibole and greenish grey feldspar occur within pillowed lavas. Some of these bodies cut the fine-grained lavas as sills and dykes, but others seem to grade into well-pillowed flows. The dioritic rocks are probably closely related to the flows; some may be feeder dykes and others the more coarsely grained, massive parts of flows. Towards the contact with sedimentary schists along Beaulieu River and Old Canoe Lake the flows change in composition from predominantly dark green andesites and dacites to light grey to white weathering rhyolites with associated tuffs and agglomerates. The rhyolites are light grey, hard, flinty rocks that contain small eyes or phenocrysts of quartz. The sedimentary and volcanic rocks, along the contact have a steep to vertical dip. At the south end of Lac du Rocher and the southwest end of Camsell Lake the tops of several sedimentary beds face west and northwest a few feet from the contact with pillowed flows, thus indicating that the sedimentary schists are younger than the volcanic rocks. The parallel dip and strike and the interbanding of flow and sediments along the contact near the south end of Lac du Rocher and along Camsell Lake suggest that in these areas the change from vulcanism to sedimentation was marked by no great lapse of time or structural disturbance.

Small areas of volcanic rocks separated by granitic intrusives occur southwest of Warburton Bay, north of Lake Athenia, and at Nodinka Narrows, and probably represent remnants of a once continuous band. They are composed mostly of dark green to black andesites, dacites, and basalts that are now largely recrystallized to dark, fine-grained, amphibolitic rocks. In the Nodinka Narrows area some rocks show well-preserved pillow and flow structures, and near the overlying sediments to the east the flows consist largely of grey to white weathering rhyolite with interbanded fragmental rocks. These three areas of volcanic rocks trend northeasterly except at the north end at Nodinka Narrows where the strike swings to slightly west of north. Each is bordered on the southeast and east by sedimentary schists that in the Nodinka Narrows area are known to be younger. Probably these three areas are the remains of the north limb of a major synclinal structure, the other limbs being represented by the Rivett Lake-Camsell Lake volcanic band that lies 10 to 15 miles to the south. The intervening area was originally underlain by sedimentary rocks that have been now largely replaced by granitic intrusives.

Two isolated, narrow bands of volcanic rocks occur on Lake of the Enemy. That to the north outcrops on an island and on the mainland to the west and consists of dark green, fine-grained, amphibolitic rocks, originally of andesitic composition. At the south end of the lake a second narrow band consists of basic flows recrystallized to glistening black amphibole schists.

Sedimentary Rocks

The sedimentary rocks of the Yellowknife group are mainly well-bedded greywackes and slates that in most places have been altered to quartz-mica schists. The least altered greywackes and slates outcrop on the islands of Camsell Lake and east of MacKay Lake, in the extreme

northeast corner of the map-area. The greywacke beds average 1 to 2 feet in thickness and the slaty beds a fraction of an inch to 6 inches. On clean, weathered surfaces the greywackes appear as grey, sandy textured rocks with subangular grains of quartz and some feldspar from $\frac{1}{32}$ to $\frac{1}{16}$ inch in diameter, in a fine-grained, dark grey matrix. Many beds grade from greywacke at the base to slate at the top. The greywackes consist mainly of quartz, chlorite, and biotite, with some plagioclase and white mica. The slates are much finer grained and contain a higher proportion of chlorite and mica.

Throughout most of the area the greywackes and slates are altered to knotted quartz-mica schists. Alteration of the greywackes and slates is marked by the development of biotite at the expense of the chlorite. The mica flakes develop along the cleavage planes of the rocks, and these planes acquire glistening micaceous surfaces. A higher degree of metamorphism results in the development of spherical or ovoid knots or aggregates of cordierite, andalusite, and other minerals. The knots stand out conspicuously on weathered surfaces and may be very small or up to 2 inches in length, but the average is $\frac{1}{4}$ to $\frac{1}{2}$ inch. The knots range from indefinite, shadowy, micaceous aggregates to well-formed crystals of andalusite and cordierite. Despite the high degree of alteration the bedding is perfectly preserved, and apart from the plentiful development of mica and the knotted structure the rocks are very similar in appearance to the original greywackes and slates from which they were derived.

The beds dip at angles of 65 degrees or more in most parts of the area, and in many places are overturned. Although no attempt was made to work out the structure in detail, sufficient structural determinations were obtained to show that the beds lie in a series of closely spaced, isoclinal folds. The trend of the axes of the folds varies in direction in different parts of the area, but the general trend is northeast parallel to the main belt of volcanic rocks. In the northeastern part of the area this general trend is disturbed by a number of granitic intrusions and the beds strike parallel to the borders of these bodies.

GRANITE, GRANODIORITE, AND ALLIED ROCKS

The greater part of the area is underlain by acidic intrusives that are classed as granite, granodiorite, and allied rocks. So far as is known all these intrusives are younger than the Yellowknife group of volcanic and sedimentary rocks. In addition to Archæan (early Precambrian) granitic intrusives, there may be some that are of Proterozoic (late Precambrian) age, as Proterozoic granites have been identified both south and west of the map-area.

The granitic intrusives include a wide variety of types, but in general they are all characterized by light grey to pink colour and medium to coarse grain, and are composed of quartz, and feldspar with one or more of biotite, muscovite, and hornblende. In composition they range from granite to quartz diorite, but the most widespread type is probably a granodiorite.

The granitic rocks to the south and east of Athenia Lake are pink to grey and rather coarse-grained, and are composed of 50 to 60 per cent plagioclase (oligoclase to andesine) and 10 to 20 per cent of each of

quartz, microcline, and hornblende-biotite. Dykes of fine-grained, sugary textured, pink, quartz-rich granite with small content of biotite cut the coarse-grained granodiorite, and in places this rock occurs in large bodies. Although the finer grained granite of the dykes is younger than the granodiorite, there are places where one type appears to grade into the other and phases of intermediate character are common. This suggests that the different types are probably phases of the one granitic intrusion. Dykes and irregular masses of coarse pink pegmatite are also common. Particularly near contacts with sedimentary rocks, the granitic rocks contain bands of partly assimilated sedimentary material, but such zones of mixed rocks are not widespread.

North of MacKay Lake the granitic rocks are similar, but hornblende-bearing members are less common and in general the quartz content is higher. Granitic rocks containing muscovite are fairly common, particularly near and to the southwest of Lake of the Enemy. They appear to grade into other granitic types carrying biotite with or without hornblende.

In places, commonly along and near contacts of granitic and sedimentary rocks, basic, amphibolitic, intrusive rocks occur. Good exposures of these rocks are to be found along the shores of the bays of MacKay Lake 7 miles southeast of Nodinka Narrows. No body of this type is more than 1 mile in width, and on the accompanying map they are not differentiated from the granitic rocks. Such rocks vary in both texture and composition, but in general are medium- to coarse-grained and composed of about 50 to 60 per cent dark green amphibole and 20 to 30 per cent of both biotite and plagioclase. Contacts with the sedimentary schists are sharp and dykes of the intrusive cut the schists. Although granitic and aplitic dykes cut the amphibolitic intrusive, there appears to be a gradation from the latter to normal granodiorite. This suggests that the amphibolitic intrusives are genetically related to the granitic intrusives.

QUARTZ DIORITE

Two small bodies of quartz diorite intrude the sedimentary schists northeast of Lake of the Enemy. They are cut by pegmatite dykes associated with granitic intrusives to the west. The quartz diorite is, therefore, older than the granitic intrusives, but may be an early phase of the granitic rocks and belong to the same general period of intrusion.

The typical quartz diorite is a rusty grey weathering, medium-grained rock consisting of 50 to 60 per cent andesine, 35 to 45 per cent hornblende and biotite, and 5 to 10 per cent quartz. The feldspar crystals tend to occur as blocky individuals that stand out on the weathered surface. The rock has a somewhat rotted surface, which crumbles when struck with a hammer. On a fresh fracture it is green-grey, and the plagioclase has a waxy appearance. Elongated inclusions of partly assimilated sedimentary schist are abundant near the borders of the intrusive.

DIORITE AND GABBRO

Dykes of medium-grained, rusty brown weathering diorite and gabbro are the youngest rocks in the area. They form two well-defined sets, one

striking about north 20 degrees west and the other north 60 degrees east. A few of the dykes are more than 200 feet wide, but most of them are less than 100 feet. All of them have sharp, chilled contacts against the rocks they intrude. They are composed of about equal parts of dark grey, basic plagioclase and dark green pyroxene. Some of the smaller dykes have a diabase texture.

PROSPECTING NOTES

No mineral deposits have so far been found in the area. However, this is not surprising, as no part of the area has been thoroughly prospected and the greater part has not been prospected at all. The most favourable prospecting ground in the area so far mapped is less than 40 miles from the east arm of Great Slave Lake and is readily accessible by aeroplane.

In the MacKay Lake area the volcanic and sedimentary rocks of the Yellowknife group are similar to those of the Beaulieu River and Yellowknife Bay areas, where many gold deposits and several base metal deposits have been found. The most attractive prospecting area is probably the belt of volcanic and sedimentary rocks extending northeast from Rivett Lake along the shores of Lac du Rocher and Camsell Lakes. This belt was discovered by the geological work of 1940, has not yet been completely mapped, and has never been prospected. Quartz veins are known to be present, and sulphide mineralization is fairly plentiful along and near contacts of the sedimentary and volcanic rocks. The belt is of sufficient size and accessibility to warrant the careful attention of the prospector.

Areas of sedimentary schist in the northeast quarter of the area and the Nodinka Narrows greenstone belt may contain gold-bearing veins. They are less attractive to the prospector because of relative inaccessibility and the lack of timber in that part of the area.