CANADA

DEPARTMENT

OF

MINES AND TECHNICAL SURVEYS

GEOLOGICAL SURVEY OF CANADA

PAPER 50-10

SECOND PRELIMINARY MAP

AYLMER LAKE
NORTHWEST TERRITORIES

(MAP AND DESCRIPTIVE NOTES)

By

C. S. Lord and F. Q. Barnes

OTTAWA

1950

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DESCRIPTIVE NOTES FOR AYLMER LAKE MAP, N.W.T.

GENERAL REMARKS

The map-area is in the barrens 210 miles northeast of Yellowknife and 95 miles north of the nearest point on the east arm of Great Slave Lake. Topographic expression is similar to that shown elsewhere in the Canadian Shield. The elevation of the lakes varies from about 1,500 feet in the northwest corner to about 1,100 feet in the Back River drainage system on the east boundary of the area. Local relief may be as much as 250 feet above the surrounding lakes, but is commonly not more than 50 feet.

In general the volcanic rocks show the greatest relief, as well instanced by the belt that extends south from Thistle Lake. The acidic volcanic rocks in the northeast corner of the area rise sharply along the sedimentary-volcanic contact to an elevation of more than 100 feet, and this part of the area is characterized by extremely rugged topography, with high, knobby hills and precipitous cliffs. Areas of granitic rocks stand next in relief, and those underlain by sedimentary strata are least rugged. The metamorphosed sedimentary rocks (4)[1] appear to be more resistant

[1]Numbers in parentheses are those of map-units on accompanying map.

to erosion than the unmetamorphosed greywackes (3). The latter underlie most of the relatively flat areas, though even here rock slabs may be frost-heaved along bedding or schistosity planes to a height of from 1 foot to 10 feet. The diabase dykes and plugs (10) are commonly found in draws and depressions, but a few form discontinuous walls 50 to 70 feet high.

Drainage is controlled by a divide that extends diagonally across the map-area from the south side of Hardy Lake in the northwest to Sandhill Bay (Aylmer Lake) on the east. North of the divide the drainage is by way of Contwoyto and Back Rivers to Bathurst Inlet on the Arctic coast. Water to the south of the divide flows by way of Aylmer Lake and the Lockhart River system to the east arm of Great Slave Lake.

Most of the map-area supports only a tundra growth of mosses,

lichens, and various low shrubs and grasses. A few stunted black spruce trees were noted near Outram Lakes and the west end of Aylmer Lake. Here and there, in sheltered spots and along stream and river channels, are patches of ground birch, willow, and alder, which rarely exceed 2 to 3 feet in height, but where conditions are favourable may reach 8 to 10 feet. Although these might provide emergency fuel, prospectors should carry gasoline or other liquid fuel for heating and cooking. The principle fauna of the area are ptarmigan, caribou, wolves, and white foxes, although Arctic hares, coloured foxes, marten, ground squirrels, wolverines, small rodents, and the occasional grizzly bear and muskox are seen. Caribou form a sufficiently abundant source of food during the late summer. The time of their appearance, however, depends to a large extent upon the flies. In 1948, caribou were first observed on July 26, but in 1949, when the flies were especially troublesome, they had come south in only small numbers by August 18. Messrs. J. Magrum, M.P. Murphy, and S. Otto have trapped parts of the area from cabins situated respectively north of the west end of Aylmer Lake, on the Back River between Muskox and Sussex Lakes, and north of Muskox Lake; only Mr. Murphy has remained in the area throughout the summers.

GLACIATION

Glacial drift covers about 80 per cent of the surface area. The glacial material is mostly till, and commonly gives an indication of the bedrock. Many erratics have a diameter of as much as 15 feet. Clay and sand deposits have been formed in post-glacial lakes and outwash deltas. A thick belt of glacial material 15 miles wide crosses the area parallel with the watershed, from the north end of Carpenter Bay (Aylmer Lake) to Lac du Sauvage. This drift-belt conceals almost 100 per cent of the bedrock along its course, and is typified by rounded hills about 150 feet high and $\frac{1}{4}$ to $\frac{1}{2}$ mile long. Glacial erosion has rounded, polished, and grooved the bedrock. The ice moved southwesterly and, later, west and northwesterly. Glacial striae of the earlier ice movement are preserved along the more

protected sides of outcrops, whereas later striae predominate over most of the rock surface. Eskar ridges, some 150 feet high and more than 100 feet wide, parallel the later ice movement. Drumlins and drumlinoid features are common, and generally also parallel the later movement.

Well-scoured outcrops, eskers, and scattered sand and gravel deposits interspersed with numerous small rounded lakes mark the Pleistocene drainage routes. Good examples of these routes may be seen extending northwesterly from the eastern boundary of the map-area at latitude 64° 15' through the head of Carpenter Bay and westerly from near the mouth of Thonokied River to the north shore of MacKay Lake at longitude 110°. Another ancient drainage route, within the drift-belt mentioned above, extended southeasterly just west of the north end of Savannah Lake. The old river channel is still preserved, and at places is 50 feet deep, 100 feet wide, and filled with water-smoothed boulders. Relict lakes associated with this system show raised beaches of at least one higher level.

GENERAL GEOLOGY

Wherever age relations could be determined, it was found that the volcanic rocks and associated tuffs were the oldest members of the Yellowknife group. The relative ages of the acidic (2) and basic (1) members are not known, although these rock types are in part contemporaneous. Minor acidic porphyry flows are intercalated with the Yellowknife sedimentary rocks (3, 4) in the northeast section of the map-area. A little greywacke material is also intercalated with the acidic volcanic rocks. So far as could be ascertained, both flows and sedimentary strata are conformable.

The volcanic rocks of basaltic composition (1) are fine- to medium-grained, chloritized and recrystallized lavas. Pillows and ropy lava structures, as well as amygdules and vesicles, are well preserved within some of the flows. Most of the lavas are completely recrystallized to shiny black amphibolites, which only rarely show orientation of the fresh hornblende needles and become hornblende schists. In thin section these amphibolites vary slightly in their mineral composition. Magnetite, commonly

titaniferous, forms 1 to 7 per cent of the rock; fresh, green hornblende, which seldom shows alteration, comprises 80 to 90 per cent; and a fine mosaic of quartz and plagioclase (andesine-labradorite) fills the interstices in the mat of hornblende needles, and forms from 5 to 20 per cent. Some of the volcanic rocks are green, chloritized lavas, of which 70 per cent consists of a mixture of chlorite, hornblende, epidote, and clinozoisite; 25 per cent is a fine-grained quartz-plagioclase mosaic; and about 5 per cent is magnetite. Some of the outcrops are carbonatized and garnetiferous. Considerable thicknesses of thinly bedded, intercalated tuffs characterize the basalts on the south side of Aylmer Lake, and appear to predominate in the later stages of volcanic activity.

Acidic volcanic rocks (2), consisting of rhyolites, rhyo-dacites, and dacites, outcrop in the northeast corner of the map-area. Texturally they vary from compact devitrified glasses, with conchoidal fracture, to medium-grained equigranular and porphyritic rocks; phenocrysts are of quartz, feldspar, and hornblende. The rocks are of various colours - pink, green, buff, white, grey, and black. Flow lines and flow contacts were seen, and, here and there, small vesicles and round pillows, but little structural information could be obtained from them. The rhyolitic flows are commonly massive and featureless. Most of the lavas are felsic, but some carry a low percentage of dark minerals. In thin section, the rhyolites show quartz phenocrysts and a composite groundmass of sericite, chlorite, magnetite, quartz, and feldspar. Small veinlets of quartz and calcite may be present; the calcite veinlets formed later than those of quartz. Some of the dacitic flows carry hornblende and andesine phenocrysts. Other mineral constituents are chlorite epidote, clinozoisite, sericite, tremolite, magnetite, sphene, apatite, and a fine-grained mosaic of quartz and feldspar. A considerable amount of flow breccia, tuff, and agglomerate is interstratified with the flows, and the agglomeratic fragments resemble the lavas. These fragmental zones are generally porous, and thereby facilitated carbonatization and mineral deposition. The close of vulcanism is marked, on the west side of the acidic

volcanic belt, by an assemblage of interstratified greywackes, tuffs, and porphyritic flows.

The Yellowknife sedimentary rocks (3, 4) are particularly well represented in this map-area. They comprise well-bedded greywackes, slates, impure sandstones, and minor arkose beds. Bedding is easily discernible in the unmetamorphosed rocks (3), and particularly so on lichen-free surfaces such as water-washed outcrops. The greywacke beds vary in thickness from 1 inch to 2 feet, and commonly show a gradation from a sandy base to a slaty top. They consist of quartz and feldspar grains about 1 mm. in diameter embedded in a fine-grained matrix of quartz, feldspar, and chlorite. The slate beds are dark and not more than 2 inches thick. The impure sandstones consist of quartz, feldspar, and a little chlorite; they form massive, featureless beds as much as 5 or 6 feet thick. All of these sedimentary types show pronounced metamorphic effects from neighbouring granitic intrusions. The sandstones become quartzites, and may contain small, indistinct and impure andalusite metacrysts. Towards the granitic contacts the greywackes and slates show progressive metamorphism from phyllites to nodular quartz-biotite schists, the nodules being more concentrated in the slates and slaty tops of the greywacke beds. The metacrysts, or nodules, consist of violet andalusite, chiastolite, and cordierite, and increase in size and purity according to the degree of metamorphism. Metacrysts, varying from impure mineral aggregates $\frac{1}{4}$ inch in length to pure violet andalusite prisms more than 2 feet long, are well displayed along the shores of Aylmer Lake. They lie in a matrix of granular quartz and feldspar grains and biotite flakes. Sillimanite is another important constituent found here and there in the schists throughout the area.

Quartz diorite (5) is the oldest intrusive rock cutting the Yellowknife group. It occurs throughout the map-area, in small stocks and as part of a composite batholith (7) on the east side of the area. It is a holocrystalline, mesocratic rock, with weathered appearance, and consists mainly of grey and pink feldspar, quartz, biotite, hornblende, and epidote.

In thin sections, the abundant feldspar is plagioclase, about oligoclase-andesine, but a little microcline occurs in a few of the stocks. Hornblende and greenish brown primary biotite alter to epidote and chlorite. Quartz, apatite, and sphene make up the rest of the rock. Two varieties of sphene characterize the quartz diorite: one is clear and colourless, and is an alteration product of the biotite; the other is a primary, euhedral, accessory, dark brown mineral. The percentage of mafic constituents varies from 10 to 35 per cent. A few biotite-hornblende lamprophyre dykes were observed to cut the quartz diorite, but are also older than the granite and quartz monzonite (7). In the composite batholith on the east side of the map-area, outcrops consisting of 25 to 75 per cent quartz diorite (5) and the remainder granite or pegmatite have been mapped separately (6).

Granite and quartz monzonite, with associated pegmatite dykes, form a major map-unit (7) in Aylmer Lake map-area. They are holocrystalline, leucocratic, granular rocks consisting of microcline, honey-coloured quartz, plagioclase, apatite (which is discernible in hand specimens), biotite, muscovite, and minor hornblende and epidote. As a result of variations in mineral composition from place to place the intrusions comprise muscovite, muscovite-biotite, biotite, and biotite-hornblende granites and quartz monzonites. The hornblende-biotite phase, with minor epidote, is restricted in extent, but is represented by a small body northeast of Savannah Lake. All phases are gradational one to the other. In thin section, plagioclase feldspar varies from almost pure albite to oligoclase-andesine. Microcline is present in appreciable amounts. Muscovite occurs as a primary constituent and as an alteration product of microcline, and may itself be altered to sillimanite. Reddish brown biotite, with inclusions of systematically arranged rutile needles, shows alteration to chlorite, epidote, and hematite. Apatite, sphene, and zircon are minor accessory minerals. The mafic constituents comprise 2 to 10 per cent of the rock.

Although the granite (7) shows intrusive relations with the quartz diorite (5), the variations in composition within the two map-units

strongly suggest that all of the granitic rocks of the area are genetically related, and that the intrusion of granite closely followed that of the quartz diorite. The pegmatites contained within the granite mass and intruding the sedimentary rocks (3, 4) and the quartz diorite, are extremely numerous. Although they show sharp intrusive relations with the sedimentary beds and quartz-diorite their contacts with the granite (7) are gradational, suggesting that they are related to it in origin. Areas within which the pegmatites form the bulk of the bedrock have been mapped separately (8). The pegmatites consist mainly of microcline, plagioclase, quartz, muscovite, and biotite, but also contain many rare-element minerals, among which tourmaline, beryl, spodumene, lazulite, and tantalite-columbite were recognized.

Contacts between the granitic and sedimentary rocks are generally concordant, and in many places the two rock types are intimately mixed. Small bands of sedimentary rocks, as for example those north of Sandhill Bay (Aylmer Lake), become diluted along their strike with granitic and pegmatitic material, and eventually only traces of schlieren are evidence of their former presence. These sediment-granite complexes (9) represent paragneisses, injection gneisses, and mixtures of granitic rocks with from 25 to 50 per cent sedimentary schist.

Dykes of medium- to fine-grained, dark green, brown weathering diabase and gabbro (10) are the youngest rocks recognized. They are nearly vertical, and outcrop in troughs more commonly than in ridges. Many are between 100 and 250 feet in width, and most of those mapped exceed 50 feet. Most of the dykes strike north 10 to 40 degrees west, but a few strike northeasterly and east. The mafic minerals comprise 45 to 65 per cent of the rock, of which 10 to 100 per cent is monoclinic pyroxene, depending upon the extent of deuteric alteration. Reaction rims about the pyroxene consist of hornblende, biotite, and chlorite. The plagioclase is about labradorite in composition, and quartz, commonly as much as 10 per cent of the rock, forms myrmekitic intergrowths with the feldspar. Magnetite, ilmenite, and sphene are significant accessory minerals,

The pyroxenite (A) south of Savannah Lake is a medium-grained, black, magnetic rock, about 85 per cent of which consists of dark green pyroxene and 10 per cent of amphibole.

Folding of the Yellowknife strata was accompanied by the intrusion of quartz diorite (5) and granite (7). The folds, as indicated by the fold axes, strike north-south, and in the southern part of the map-area around Aylmer Lake, plunge strongly to the north. The Yellowknife sedimentary rocks are isoclinally and intricately folded, and the folds are commonly overturned. Bedding is well displayed within the greywackes (3), but in their metamorphosed equivalents (4) it may be partly or completely obliterated.

ECONOMIC POSSIBILITIES

Little prospecting has been done in the map-area, and no commercial mineral deposits have been found. In other areas, however, gold deposits genetically related to granitic rocks very similar to those in this map-area occur in quartz veins in nodular Yellowknife strata. It is, therefore, not unreasonable to suppose that gold occurs here. Quartz veins are fairly common in the sedimentary rocks (4), particularly along the shores of Aylmer Lake. Most of the veins parallel the bedding and cleavage and contain a little chalky white feldspar and mica. On the east side of the map-area, within the volcanic rocks, are numerous and extensive gossan zones that contain oxidized sulphides. Most of these zones occur in the vicinity of Muskox Rapids and along the contact of the acidic volcanic rocks (2) with the greywackes (3). Assay reports on samples from these zones, however, have shown only traces of gold and a little silver. The many pegmatite dykes should be carefully scrutinized for minerals containing such elements as beryllium, lithium, tantalum, and tin. Spodumene (a lithium-bearing mineral) has been found in three dykes and beryl in one. The tantalite-columbite occurrence west of Muskox Rapids has a low uranium content.