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CANADA

DEPARTMENT

OF

MINES AND TECHNICAL SURVEYS

GEOLOGICAL SURVEY OF CANADA

PAPER 50-28

PRELIMINARY MAP

FORT RESOLUTION NORTHWEST TERRITORIES

(MAP AND DESCRIPTIVE NOTES)

Compiled by

I. C. Brown

See Also:
Paper 51-25 G.M. Wright
Map 377A Shekaree C.H.
378A

OTTAWA

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DESCRIPTIVE NOTES FOR FORT RESOLUTION MAP, N.W.T.

PHYSICAL FEATURES

The main body of Great Slave Lake crosses the boundary between the Canadian Shield and the bordering area of Palaeozoic rocks, and the east arm of the lake extends at right angles to the contact for 175 miles into Precambrian formations. The basin of the arm owes its existence to deep erosion of a belt of mixed hard and soft rocks bordered on three sides by uniformly more resistant formations, mainly granitic. Within the map-area, which covers the western end of the east arm, the general level of bordering lands and of numerous islands within the lake is 50 to 200 feet above the lake. The granitic uplands bordering the lake basin present a monotonous succession of low rocky hills and ridges, with local relief rarely exceeding 100 feet, and contrast sharply with the picturesque, rocky islands within the lake basin and the flat alluvial plain on either side of Slave River. With the exception of Slave and Taltson Rivers, the streams entering the lake follow poorly defined valleys and are navigable only by canoe. Taltson River is navigable for small boats as far as Ruis. Pierrot, and Slave River is navigable by shallow draught vessels as far as Fort Smith, 80 miles to the south.

Glacial boulders are widely scattered over much of the map-area, but thick morainal deposits are scarce. Since the retreat of the continental ice-sheet, widespread alluvial deposits have accumulated along the lower valley of Slave River, and along with some other lowlands and islands are well timbered with spruce, birch, pine, tamarack, poplar, and willow. Spruce trees are the most abundant and are up to 18 inches in diameter.

The lakes and streams abound in fish. Northern pike, suckers, and, in the larger lakes, trout, whitefish, and inconnu are the most common varieties. The fur-bearing animals of the district include the otter, beaver, lynx, wolverine, mink, fox, and marten.

GENERAL GEOLOGY

Two major unconformities are easily recognized within the succession of Precambrian rocks in the map-area, and these divide the formations naturally into three main groups. Surficial rocks of each group were invaded by igneous intrusions, and those of the older two groups were steeply folded, were probably mountain built, and were deeply eroded to a nearly level plain before formations of the youngest group were deposited.

YELLOWKNIFE GROUP

The Yellowknife group (1) of sedimentary rocks is the oldest recognized. These rocks were originally named the Point Lake-Wilson Island group by Stockwell[1] and were divided on the

[1]Stockwell, C. H.: Eastern Portion of Great Slave Lake (west half); Geol. Surv., Canada, Map 377A, 1936.

basis of a marked difference in lithological character into the Point Lake phase, largely sedimentary gneiss and schist and basic volcanic rocks, and the Wilson Island phase, largely quartzite and schist, acidic volcanic rocks, conglomerate, arkose, iron formation, and dolomite. On more recent maps, the Archaean rocks corresponding to the Point Lake phase have been called the Yellowknife group, and this terminology is used on the accompanying map. The rocks included in the Wilson Island phase are not in contact with the typical Yellowknife group rocks, from which they differ markedly in lithological character and degree of metamorphism,

but they are older than the surrounding Proterozoic rocks, and, therefore, are referred to in this report as the Wilson Island group.

Within the map-area, the Yellowknife sedimentary rocks (1) occur only in the bay 4 miles east of Gros Cap. They consist of knotted quartz-mica schist and hornfels.

The Wilson Island group(A) is typically developed on Wilson Island and on nearby small islands to the southwest and northeast. Here the strata are, probably, considerably more than 11,000 feet thick, and comprise acidic lava flows interlayered with conglomerate and arkose, overlain by crossbedded, ripple-marked quartzite, with dolomite and schist, which in turn are succeeded by phyllite and schist interlayered with a few beds of quartzite. The beds generally strike slightly north of east, and dips are steep or even overturned. Similar beds are found on Îles du Large, Stony Island, and other localities. On Îles du Large, light-coloured quartzites contain a few beds of dolomite, sedimentary gneiss, and specularite iron formation. The strike of the strata varies greatly, and dips are from 20 to 70 degrees. On Stony Island, east of the mouth of Slave River, light grey, pebbly quartzite is interbedded with arkose and sheared conglomerate. East of Taltson River, quartzite, quartzose gneiss, and schist are interlayered with laminated, grey and reddish, porphyritic rhyolite. Small amounts of laminated rhyolite, quartzite, and schist occur on small islands west of Preble Island.

GRANITIC ROCKS

Granitic rocks are widespread on uplands bordering Great Slave Lake, and underlie large areas on islands in the western part of the east arm of the lake. They are light grey to pink, of medium to coarse grain, and are composed of quartz, plagioclase

feldspar, microcline, and biotite, muscovite, or hornblende. Biotite granite and granodiorite(3) are the most common types. So far as known, all the granite throughout the area intrudes the rocks of the Yellowknife and Wilson Island groups, but granite of more than one age may be represented. On Simpson Island and many small islands to the west, the granitic rocks(3a) hold numerous inclusions of garnetiferous, sedimentary gneiss, cut by dykes of granite. A pale to dark green rock, probably a chloritized granite(2), occurs on small islands west of Preble Island and at intervals along the south shore of Great Slave Lake for 35 miles east of Taltson River. It is cut by red granite dykes, and its age relations to the Archaean sedimentary and volcanic rocks are unknown.

In the adjoining map-area to the east[1] granitic rocks

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[1]Henderson, J. F.: Taltson Lake; Geol. Surv., Canada, Map 525A, 1939.

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of Proterozoic age are known. These cannot be separated from the Archaean granitic rocks except where their relations to Proterozoic sediments are proved. For this reason it is quite possible that some of the granitic rocks within the present map-area may be of Proterozoic age.

GREAT SLAVE GROUP

The Great Slave group of sedimentary and volcanic rocks(4-7) was deposited on an old erosion surface developed on granitic intrusions and the upturned edges of Yellowknife and Wilson Island sedimentary and volcanic rocks. For the most part the younger rocks occupy a canoe-shaped synclinorium 150 miles long. The synclinorium is narrow at the west end, about Caribou and Blanchet Islands, and widens to the east of the map-area to a maximum breadth of 40 miles. The beds on the north limb commonly dip

gently south, whereas those on the south limb are closely folded, dips of from 30 to 70 degrees being common. Rocks of the Great Slave group not forming part of the synclinorium outcrop at several localities in the central part of the map-area. The group is divided into a lower and an upper part, which may be separated by an erosional unconformity.

The lower part of the Great Slave group comprises three formations, named, in ascending order, the Sosan, Kahochella, and Pethei. The Sosan formation(4) is perhaps 3,000 feet thick, and consists of beds of sandstone and quartzite, with partings of shale and with from 1 foot to 10 feet of arkose and conglomerate at the base. Where observed, the basal members rest on granite and are composed largely of detrital material derived from the granite. The Kahochella formation(5) consists of about 1,000 feet of shaly sediments, with some laminated, argillaceous limestone, jasper, and oolitic iron formation. There are also minor, interbedded lava flows, tuff, volcanic breccia, and agglomerate. The Pethei formation(6) comprises about 1,500 feet of limestone and dolomite characterized by algal structures in some beds. On the south limb of the synclinorium, the Pethei is generally missing, and the rocks of the upper part of the Great Slave group apparently rest on the Kahochella formation, suggesting that the two parts may be separated by an erosional unconformity.

The upper part of the Great Slave group occupies the central part of the synclinorium, and is incompletely represented in the map-area. In ascending order are: the Stark formation(7) consisting of possibly 1,000 feet of interbedded, varicoloured dolomite, red shale, and limestone, including some layers that are much brecciated; the Tochatwi formation comprising a thick assemblage of shaly sediments and sandstone; and the Pearson formation of lava flows. The last two formations do not occur within the map-area.

Most of the clastic strata of the Great Slave group are red or brown, and many beds show ripple-marks, crossbedding, and mud-cracks. Concretions occur locally in shale and argillite. The group resembles the limestones and associated strata on Belcher Islands in Hudson Bay, and may be of about the same age as the Animikie rocks of the Lake Superior region.

The Union Island group(B), which occurs only in the northeast corner of the map-area, is of unknown age relative to the Great Slave group, but like it was deposited during the interval that followed the erosion of the granite and preceded the deposition of the Et-Then group. It consists of dolomite, stratigraphically overlain by interbedded, varicoloured dolomite, red argillite, and black slate.

DIORITIC INTRUSIONS

Dykes, sills, and stock-like bodies of dioritic and syenitic rocks(8) are exposed on Caribou and Blanchet Islands, and Îles Basses, and on Simpson Islands. They intrude all members of the Great Slave group and older rocks. These intrusions are massive, fine- to medium-grained rocks, which vary from light grey to dark grey and from dark red to bright red. The grey rocks grade into the red types and are cut by stringers of the red rocks, which hold inclusions of the grey rocks.

ET-THEN GROUP

The Et-Then group of coarse, clastic, sedimentary strata was deposited on an erosion surface developed on the dioritic and older rocks. It occurs on Wilson, Preble, and Union Islands and adjoining small islands. The Murky formation(9) of conglomerate forms the base of the group and carries closely packed, round boulders of a great variety of rocks representing almost every member of the older groups. The conglomerate varies greatly in

thickness up to, probably, several thousand feet, and is locally missing. The sandstone and quartzite of the succeeding Preble formation(10) are coarse, feldspathic rocks, exhibiting excellent crossbedding and ripple-marks. The Et-Then may be correlated with the Athabaska series of Lake Athabasca region, and may be of Keweenawan age. The conglomerate and sandstone are nearly flat lying except in the vicinity of faults, where dips are up to 70 degrees. These faults are of great magnitude, commonly strike northeasterly, and are confined to the southern, more complexely folded part of the lake basin. They have displaced the Et-Then and all older rocks.

DEVONIAN

Limestone(11) containing Middle Devonian[1] fossils outcrops

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[1] Cameron, A. E.: Reconnaissance on Great Slave Lake, N.W.T.; Geol. Surv., Canada, Sum. Rept. 1916, p. 67 (1917).

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near Fort Resolution.

ECONOMIC GEOLOGY

Quartz veins are widely distributed in rocks of the Wilson Island group. Many of these carry specularite and orthoclase, and a few carry carbonate, chlorite, pyrite, galena, and chalcopyrite. On Outpost Islands, sheared and silicified zones with disseminated metallic minerals occur in quartz-mica schist and gneiss and lie parallel with the bedding. Some of these zones contain gold, tungsten, and tin, and considerable underground work has been done on them. A little galena, pyrite, and chalcopyrite was observed in quartz stringers on an island ½ mile north of Wilson Island and 12 miles from its east end. Some disseminated chalcopyrite is associated with fluorite and carbonate in quartz stringers near the first portage on Thubun River. On the south shore of Great Slave Lake,

at a point 17 miles east of the mouth of Taltson River, many quartz stringers occur in schist and contain disseminated pyrite and a little chalcopyrite. To the east of Snuff Channel, about 10 miles from the mouth of Taltson River, quartz veins containing galena, buff carbonate, and small amounts of sphalerite, fluorite, and calcite occur in low granite hills.

Specularite iron deposits occur on the Iron Islands. These islands consist chiefly of quartzite, which generally strikes slightly north of east and dips southerly at about 30 degrees. Within the quartzites are beds of specularite composed chiefly of quartz and micaceous specularite and commonly containing sparsely disseminated flakes of chlorite. A chip sample across one bed 35 feet thick yielded 29.66 per cent Fe_2O_3.

Gold is reported from veins in rocks of the Sosan group on Simpson Island. Elsewhere, veins of quartz cut the Great Slave group, the diorite intrusions, and the Et-Then group, but are not known to carry gold or more than a trace of silver.