Province of Manitoba

DEPARTMENT OF MINES AND NATURAL RESOURCES

MINES BRANCH

PUBLICATION 52-2

A Geological Reconnaissance

of the

WOLVERINE and CARIBOU RIVERS

Cross Lake Mining Division

Northern Manitoba

by

G. A. Russell

Winnipeg

1953

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A GEOLOGICAL RECONNAISSANCE OF THE WOLVERINE AND CARIBOU RIVERS, NORTHERN MANITOBA

INTRODUCTION

LOCATION AND ACCESS

The Wolverine and Caribou Rivers are located in the northern part of Manitoba between latitudes 59 degrees north and 60 degrees north. The Wolverine River is a tributary of the Seal River. The Caribou River empties into Hudson Bay at Hubbart Point.

Two base camps were used during the season. The first camp was located at the Hudson's Bay Company post at Little Duck Lake, 136 miles west-northwest of Churchill, Manitoba. The second camp was located at the abandoned Hudson's Bay Company post, 84 miles northwest of Churchill.

The best available topographic maps of the area were the Churchill Sheet and Seal River Sheet of the National Topographic Series, on a scale of eight miles to one inch.

The rivers may be reached from Churchill by canoe or by commercial aircraft based at Churchill. A winter road has been broken from Churchill to Nueltin Lake via Caribou and Little Duck Lakes. Dog teams are commonly used during the winter months.

PREVIOUS WORK

The first recorded geological observations are those of J. B. Tyrrell[1], who noted granitic rocks along the west coast of Hudson Bay near Hubbart Point. Samuel Hearne traversed the Seal and Wolverine Rivers in 1690 but did not describe the geology.

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[1] Tyrrell, J. B.: Report on the Dubawnt, Kazan and Ferguson Rivers; Geol. Surv., Canada, Ann. Rept., new series, vol. 9, 1896, pp. 23F and 90F.

The first geological survey in the area was a reconnaissance of the Seal River by A. W. Johnston[1]. Johnston reported prospecting in the area in 1925, when a group of claims was staked on Great Island in Seal River. A group of claims at this locality is held by a Winnipeg syndicate at present and were being explored during the summer of 1952.

ACKNOWLEDGMENTS

Excellent field assistance was rendered by Mr. Henry Mallett, full blooded Cree Indian from Wabowden, Manitoba. Mr. J. H. A. Wilmot and other gentlemen at Hudson's Bay House, Winnipeg, contributed greatly to the survey by their intimate knowledge of the country and by services rendered. Mr. H. G. Flett, post manager at Little Duck Lake, rendered service and made accommodation available to the party.

GENERAL DESCRIPTION OF THE AREA

TOPOGRAPHY

The area is extensively covered by glacial drift with intervening swamps and lakes. The most prominent features are broad, rolling hills of boulder till which are believed to have cores of solid bedrock. Superimposed on the drift hills are eskers and crevasse fillings composed of pure sand, a mixture of sand and gravel, or entirely of gravel. A few isolated kames were seen. Some short, discontinuous ridges of angular to sub-rounded boulders occur in the lee of outcrop hills.

A marked topographic feature is an abandoned shoreline of Hudson Bay which trends due south from the rapids at Long Lake. Altimeter readings indicate that this beach lies from 275 to 325 feet above the present level of Hudson Bay. Small areas of fossil-bearing marine clays were seen along the course of this old beach. Fossils noted were Saxicava rugosa, Mya graenlandica and Pecten icelandicus.

Frozen ground was found at a depth of from 12 to 18 inches throughout the entire area during the whole season.

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[1] Johnston, A. W.: Geological Survey of Canada, Maps 345A and 346A, 1935.

DRAINAGE

West of the abandoned beach at Long Lake, the area shows a well developed drainage pattern with relief of up to 200 feet. East of Long Lake the area is poorly drained with closely spaced small lakes and ponds and intervening swamps.

The headwaters of the Wolverine River are in the Northwest Territories. The geology was mapped along the river from the north boundary of the province to its junction with the Seal River. Along Duffin River, a tributary flowing in from the west, the geology was mapped as far west as Duffin Lakes.

The headwaters of the Caribou River are near Baralzon Lake. The present survey covers its course from Round Sand Lake to Long Lake.

All streams are characterized by numerous, shallow rapids. Portages are rare as most of the rapids can be lined or waded.

VEGETATION, GAME AND FISH

Well developed forest cover, similar to that in Precambrian areas farther south in the province, thins out rapidly in the vicinity of MacLeod Lake (see Map 52-2). Northward from here the spruce trees become smaller and are found only along the shores of lakes and rivers. At Boundary Lake, only a few stunted spruce were seen although tamarack trees were still fairly abundant and much larger than the spruce. Scrubby willows line the banks of many streams. Most of the drift hills are covered only by a sparse growth of short grass and moss.

Game is very scarce in the area. Wolves appeared to be the most common mammals. Ptarmigan are quite plentiful in places. Trout are abundant in the Wolverine River. A few jackfish were caught in the Caribou River. Seal were seen at a point 100 miles from Hudson Bay on the Caribou River.

GENERAL GEOLOGY

THE NATURE OF BEDROCK OCCURRENCES

Except in certain areas, outcrops of bedrock are rare. However, the bedrock surface may not be at great depth throughout most of the region as most of the drift hills probably

have bedrock cores covered by the layer of drift which was molded to them.

An important feature relating to the occurrence of bedrock was recognition of the fact that in many places along the shores of rivers and lakes, intense frost action has heaved up angular blocks and slabs of bedrock, twisting and turning them, the result being a jumbled mass of sharp-cornered and sharp-edged blocks which are practically in place and which show uniform lithologic composition.

Another important factor which supplies evidence of the nature of the bedrock which is covered by water is the action of lake ice. It has acted in two ways. First, it has shoved the previously existing drift cover into five- to twenty-foot ridges bordering the widest parts of the lakes, thus exposing bedrock along the shore. Second, it has in several instances, actually frozen to blocks of bedrock lying below the surface of the lake and has pushed them up to the shore. Here again the blocks had to show uniform lithologic composition and marked lack of evidence of transportation before they were accepted as evidence of the nature of the bedrock underlying the lake.

Finally, it was noted that bedrock was much more abundantly exposed in the vicinity of sand, gravel and boulder ridges, particularly the ridges with a high percentage of clean washed sand. This relationship developed into an infallible rule and was a valuable aid in finding outcrop areas. The reasons for the relationship are believed to be as follows: First, sub-glacial streams, which built eskers, formed in the low spots under the ice and stream action washed away much of the drift covering along the sides of the esker while it was being formed. Second, in the case of crevasse fillings, it seems likely that crevasses would be formed most frequently where the ice was deformed over rock hills from which most of the drift had been removed.

The only other place where bedrock could be expected consistently was along the course of the two main rivers. Apparently the tributary streams have not had time to cut their valleys down to bedrock.

East of Long Lake there is a rapid decrease in the relative abundance of bedrock exposures. This decrease is clearly associated with the increase in flatness of the terrain and the number of lakes and swamps. During an aerial reconnaissance of the Caribou River east of Long Lake, only one outcrop of bedrock was seen.

TABLE OF FORMATIONS

QUATERNARY	Recent - Sand bars, lacustrine deltas Pleistocene - Fossiliferous marine clays (6) - Glacial drift, boulder till, sand, gravel and boulder ridges, sand plains
PRECAMBRIAN	? Quartz-rich zones (4) Younger pink granite (5) ? Quartz-rich zones (4) Grey granite and granite gneiss (3) Diorite, amphibolite (2), zones of inclusions of diorite and amphibolite in grey gneiss (2A) Micaceous quarzite, mica- and garnet-mica schist (1), grey gneiss (granitized sedimentary rocks)(1A)

DESCRIPTION OF ROCK UNITS

The oldest rocks are sedimentary and include micaceous quartzite (1), mica- and garnet-mica schists (1A), and a few thin beds of greywacke. These rocks are not extensive, occurring only as narrow bands in the granitic complex. The widest band occurs in the vicinity of Duffin River and MacLeod Lake. The second widest band is along the Caribou River in the vicinity of Mink Rapids. A third band was noted near the northeast side of Round Sand Lake but is very poorly exposed. Smaller bands were noted at the following places:

1. At the mouth of West River (mostly mica-schist).
2. At the mouth of Ice River (mostly mica-schist).
3. At a point about ten miles west of the west end of Nejanilini Lake.
4. At a point about half way between Granite Lake and Caribou Lake.

The latter band (4 above) was marked by the presence of a persistent, rusty-weathering bed containing pyrrhotite and some chalcopyrite. Nearly all of the sedimentary rocks carried garnets, the band near Mink Rapids having large numbers of these arranged in bands or disseminated through the rock.

Medium to basic rocks occur in three places but the occurrences are narrow and poorly defined. The most clearly defined body of these rocks was noted in the vicinity of Nejanilini Lake. At Round Sand Lake only one outcrop was found, at the mouth of the river which flows in from the north. Along the north side of Long Lake, small patches of basic rock, (fifteen to twenty feet long) occur as remnants in the grey granite and grey gneiss. The rocks vary from diorite to amphibolite (2) in composition and usually have linear and platy structures which conform to those in adjoining rocks. At Boundary Lake a few small volcanic bombs were found in narrow bands of sedimentary rock and west of Nejanilini Lake a few thin layers of chloritic material suggest that tuff beds were present.

A complex of granitic rocks (3) forms the bedrock of most of the area. For mapping purposes this complex was divided into three units as follows:

1. Massive, grey, frequently light-brown weathering granite.
2. A gneissic phase of 1.
3. Grey gneiss.

Contacts between the units and between the gray gneiss and sedimentary rocks are all gradational.

The granite is a grey to white, medium- to coarse-grained biotite granite. Pegmatitic and aplitic phases occur as dykes and irregular lenses both in the granite and in the older rocks. Close to areas where bands of sedimentary rocks were found, the granite acquires a pink to reddish colour. In some places the rock weathers to a uniform brown colour and is extremely friable.

The grey gneiss is clearly a hybrid rock which marks the transition from granite gneiss to sedimentary rocks. Numerous linear or lenticular remnants of granitized sediments occur in it and well defined planes in the grey gneiss are seen to be concordant with bedding planes in the adjacent sediments.

Younger pink granite (5) occurs in a well defined mass between Caribou Lake and Long Lake. On the south shore of the river, about half way between Caribou Lake and the big bend west of Mink Rapids, there are broad, dome-shaped hills of this rock. At this point it is a porphyritic granite with phenocrysts of orthoclase feldspar up to one and one-half inches in length. This rock was first noted just east of Caribou Lake where it occurs as a narrow mass, one-half mile wide, of medium- to fine-grained pink granite in the older grey granitic complex. There are pegmatitic and aplitic phases, the former usually containing from 5 to 10 per cent magnetite. Just south of the east end of Long Lake an entire hill is composed of pink pegmatite consisting of orthoclase, quartz, biotite and a small amount of magnetite. A few small zircon crystals were seen in some of the larger biotite crystals.

In the central portion of Nejanilini Lake, just north of Little Duck Lake, an extensive zone of quartz-rich rocks (4) was mapped. The best exposures were found on the long point just south of Ice River. The entire point shows white outcrops of the rock which has a minimum thickness here of about 1500 feet. A few small outcrops of similar rock were found at the extreme western side of the area, west of Nejanilini Lake. The rock is composed almost entirely of silica but a few grains of muscovite mica are uniformly distributed through it. It is believed that this rock represents almost complete silicification of the pre-existing sedimentary rocks and grey gneiss. One or two thin ribbons of partially silicified grey gneiss were noted. The attitude of these ribbons, as well as faint lines and planes in the quartz-rich rock, are conformable with linear and planar structures in the adjacent grey gneiss and bedding planes in the sedimentary rocks which lie just to the north.

GLACIAL DEPOSITS

The glacial drift may be classified into unsorted and sorted material depending whether it was simply dropped by the melting ice or carried and sorted by waters from the melting ice. Identification of water sorted materials was not always certain because, first, there is evidence that parts of the area were submerged by Hudson Bay and in these parts wave and current action have modified what appears to be originally unsorted drift, and second, all the surficial deposits have been worked over by slope wash and stream action, and wave and current action, when lakes were at a generally higher level than at present.

Boulder deposits are abundant throughout the area, occurring either as well-defined, sharp-crested ridges, as irregularly shaped heaps, or as layers on the crests of sand and gravel or bedrock ridges. The boulders are either angular or well-rounded (the former being much larger in size) with scarcely any gradation between the two types. The deposits of angular boulders are closely associated with outcrops of bedrock, occurring either as a mantle over the bedrock surface (frost-heaved or glacier plucked blocks or blocks shoved by lake ice) or as trains on the lee side of prominent high outcrop hills. The deposits of angular boulders always have a uniform lithologic composition and appear to have been moved only a short distance by ice or frost. The deposits of rounded boulders are found everywhere and many different rock types are represented. Most of the deposits of rounded boulders occur near the shores of lakes or streams and represent the portion of the boulder till remaining after the finer constituents have been washed out.

The most abundant unconsolidated unit is boulder till, which forms the surface mantle over most of the drift hills. The components of this till have a heterogeneous lithologic composition and in grain size show a continuous gradation from boulders averaging one or two feet in diameter down to grains of fine sand. From Caribou Lake eastward, silt- and clay-size grains were more abundant. The relative proportions of the various components of till vary considerably but on the average boulders and cobbles make up about 25 per cent, coarse sand and gravel about 50 per cent and fine sand about 25 per cent. Gravel-size fragments in the till (one inch to three inches) include a wide variety of rock types and indicate long distance of transport. In the eastern part of the area (Boundary Lake to Long Lake) the gravel size fragments include numerous pieces of red rocks such as red shaly slate, red vesicular and amygdaloidal lavas and red sandy to quartzitic sedimentary rocks.

The only deposits which could be positively identified with glacial melt waters were the ridges of nearly pure, well-graded sand which have been cut through by rivers so that some sorted layers could be seen. Crossbedding of any kind was not observed, the only evidence of sorting being rare, thin layers of fine pebbles. Gravel-size fragments occur in many of the sand ridges but are uniformly distributed. Occasionally cobbles and even boulders occur within the sand deposits.

Deposits of nearly pure sand also occur as flat plains, as at the west end of Nejanilini Lake along the Wolverine River about eight miles southeast of Baralzon Lake. There is a definite stratification in these deposits (alternate layers of silt and sand) but much of this is probably due to post-glacial redistribution. That all of the stratification cannot be attributed to this is proven by the occurrence of occasional boulders in or on the sand plains. The size of these boulders obviously exceeded the transporting power of local, existing streams and suggests that tney have been dropped from glacial ice.

Deposits of fossil-bearing marine clays were found on the west side of a linear deposit of boulders which extends southward from the rapids near the middle of Long Lake. Immediately west of the occurrence of these clays is another ridge consisting of boulders, sand and gravel. No extensive deposits of these clays were found. Two occurrences were noted each occupying about twenty square feet. One deposit occurs in a slight depression in a field of large, angular boulders. The other deposit occurs as a frost boil in boulder till. In the vicinity of these deposits of clay, numerous scattered pools of water were found among the boulders at an elevation of twenty-five to thirty feet above the level of adjacent lakes. The presence of these small pools in such obviously porous material was explained by the presence of the clays. Subsequent investigation revealed that each pool was perched above a layer of fine clay which filled the spaces between the boulders.

STRUCTURAL GEOLOGY

The scope of the present survey did not permit much structural interpretation. Dips and strikes of bedding planes, gneissosity, and faint linear and planar structures in the granite indicate a general conformability of structure in all rocks. Near the margin of the younger, pink porphyritic granite, phenocrysts are aligned with the regional trend of

gneissosity and bedding planes. The axial plane of a syncline is present near the north side of the band of sedimentary rocks at Duffin River. There is a suggestion of a large dragfold structure at Nejanilini Lake, north of Little Duck Lake, indicating that the rocks were once part of the south limb of regional syncline. The results of the mapping indicate the former existence of folds of sedimentary and volcanic rocks, all but the roots of which have been removed by uplift and erosion.

No major shear zones were found. Any lineaments seen on the maps or aerial photographs were found to be a reflection of bedding planes or joint sets in the sedimentary rocks, or planar structures and joint sets in the igneous and metamorphic rocks. At the point on the Caribou River where it crosses 96° 30' west longitude, a zone of greenish-yellow, waxy, sericitized granite gneiss was noted. This zone strikes north 65° west and dips 40° north. No ore minerals were seen in the zone.

ECONOMIC GEOLOGY

Ore minerals were noted both in place and as components of the glacial drift. In none of the occurrences were ore minerals abundant. Localities where such minerals were seen are noted on the map.

One of the Indians at Little Duck Lake had two or three small pieces of graphite in his possession, reported to have come from somewhere between Little Duck Lake and Caribou Lake.

It should be noted that large areas of bedrock and boulder deposits often have a reddish-brown coating which is apparently the result of previous submergence under stagnant, swampy waters. In the river beds some of the pebbles are coated with a bluish-black material, probably iron oxide. In many of the swamps and along the sluggish creeks which connect them, an iridescent film, also probably iron oxide, was seen to cover the water. This widespread brownish staining should be kept in mind when viewing the country from the air as some of the stained occurrences might resemble gossans.

Prospecting in the area would be expensive because of the scarcity of bedrock, making aerial reconnaissance a necessity. Any plan of prospecting should include close observation of areas immediately adjacent to sand ridges, boulder ridges and lumpy, terminal moraine country because bedrock occurs much more abundantly in these places than elsewhere. Airborne magnetometer surveys would be seriously affected by the widespread distribution of magnetite in the numerous pegmatite veins and dykes.