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Ontario

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Ontario Geological Survey
MAP P.3043
Geological Series-Preliminary Map

QUATERNARY GEOLOGY

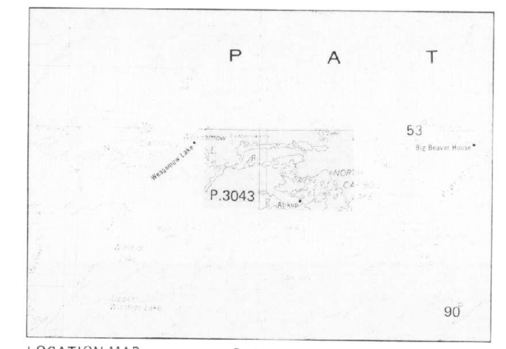
North Caribou Lake-Weagamow Lake Area

DISTRICT OF KENORA
(Patricia Portion)

Scale 1:50 000

Metres 1000 — 0 — 1 Kilometre
Mile 1 — 0 — 1 Mile

NTS Reference: 53 B/14E,15
ODM-GSC Aeromagnetic Maps: 909G, 919G
ODM Geological Compilation Map: 2218



LOCATION MAP Scale 1:1 548 000 or 1 inch to 25 miles

LEGEND

PHANEROZOIC
CENOZOIC
QUATERNARY
RECENT

9		Organic deposits: peat, muck
8		Alluvium: unsubdivided-silt, sand, minor gravel; contains some organic material
	8a	Mainly sand occurring in alluvial fans
7*		Eolian deposits: mainly fine sand

PLEISTOCENE

6		Glaciolacustrine deposits: sand, silt, clay
	6a	Mainly sand, minor pebble gravel
	6b	Silt and clay, minor sand
5		Glaciofluvial outwash and deltaic deposits: sand, gravel
	5a	Outwash sand and gravel and sandy gravel
	5b	Deltaic sand, gravel, minor silt
4		Glaciofluvial ice-contact stratified drift: sand, pebble to boulder gravel, minor silt, clay; may contain local bodies of till
	4a	Mainly sand and gravel
3		Till: stony silty sand, may contain minor substratified sediments
	3a	Very bouldery silty sand till, may contain local bodies of stratified drift
2		Bedrock-drift complex: discontinuous drift; in places, the drift is sufficiently thick (greater than 1 m) to subdue the bedrock topography

UNCONFORMITY

PRECAMBRIAN

1		Bedrock: exposed or very thin drift cover (less than 1 m).

* Not present in the map area

SYMBOLS

- Geological boundary; observed or interpreted
- Small bedrock outcrop
- Glacial striae; numbered in order of decreasing age
- Esker ridge, direction of flow known or assumed
- Kettle
- Trend of minor (DeGeer) moraine ridge
- Trend of major moraine ridge
- Small meltwater channel
- Shorebluff or scarp
- Beach ridge or bar
- Drumlins, drumlinoid ridges
- Flutings
- Circular features in organic terrains

MARGINAL NOTES

INTRODUCTION

The North Caribou Lake-Weagamow Lake area is part of the Opapimiskan Lake Project area that lies within Latitudes 52°15' and 53°00'N, and Longitudes 90°15' and 91°15'W. The Opapimiskan Lake Project is a three-year integrated geoscience survey of the North Caribou Lake greenstone belt and surrounding areas. The Quaternary component of this project includes Quaternary geological mapping and bedrock dispersion studies. The North Caribou Lake map area (NTS 53 B/15) and the eastern half of the Weagamow Lake map area (NTS 53 B/14), were mapped during the summer of 1984. Competent field assistance was provided by B. Carswell and S. Hamilton. Additional field assistance was provided by G. Jones (Resource Geologist, Aggregate Assessment Office) and D. Jenkins.

Float-equipped aircraft provided access to the map area. Most of the canoe routes and portages described by Satterly (1941) along the numerous interconnecting water systems provided access within the map area.

Field work involved the examination of Quaternary sediments to a depth of at least 1 m to determine the parent material. Most data were acquired from man-made exposures such as test pits, hand auger holes, and soil probe holes.

Air photographs, at a scale of 1:63 360, were used extensively to delineate the map units.

BEDROCK GEOLOGY

The bedrock geology of the North Caribou Lake-Weagamow Lake area was first mapped by Satterly (1941) at a scale of 1:63 360. The emphasis of his work was placed on mapping the North Caribou Lake greenstone belt. Satterly's work was later included in a regional reconnaissance geological mapping program of the Winisk Lake area (Thurston *et al.* 1979). Geological compilation maps at a scale of 1:253 400 accompany that report. In 1984, the Ontario Geological Survey began detailed mapping of the North Caribou Lake greenstone belt at a scale of 1:15 840. Preliminary maps for portions of the belt have already been published (Bartlett *et al.* 1985; Breaks *et al.* 1986).

The above studies suggest that the North Caribou Lake Belt comprises a thick metasedimentary sequence consisting of conglomerates, arenites, wacke-mudstone, and chemical metasediments which, in turn, are flanked on both sides by predominantly mafic metavolcanic sequences. Gold has been found to be associated with chemical metasediments, especially banded iron formation. The metasediments presumably overlie the metavolcanics, thus forming a large syncline. These supracrustal rocks are bounded to the north and east by migmatized rocks, mainly sedimentary in origin, and to the south by felsic intrusive rocks.

QUATERNARY GEOLOGY

A Quaternary geology reconnaissance-level study of this region was undertaken by Prest in 1963 with the resulting publication of a report and a map at a scale of 1:506 880 (1 inch to 8 miles). Prior to the initiation of the Opapimiskan Lake Project in 1984, the study area had received little further attention. Preliminary accounts of the Quaternary geology in the Opapimiskan Lake Project area were reported by Breaks *et al.* (1984, 1985).

The map area contains a variety of Quaternary deposits that represent the last major ice advance and its subsequent recession during the Wisconsinan. The last and most dominant ice movement to affect the study area was from the northeast, as indicated by glacial striae. The striae suggest a radial pattern of ice movement trending 205° azimuth in the east, to 250° azimuth in the western portion of the map area. Older west-trending striae were also found preserved on the lee sides of bedrock outcrops near Doubtful and Lundmark Lakes, east of North Caribou Lake. These may be related to older northwest-trending striae reported by Prest (1963) east of the study area.

Till, mainly lodgement till, was deposited during the advance of glacial ice. As the ice front melted back to the north, a variety of ablation sediments were deposited. These include till deposited by processes of flow and/or melt-out, as well as ice-contact stratified drift, glaciofluvial, and glaciolacustrine deposits.

Approximately one half of the map area is characterized by bedrock which is either exposed or covered with thin drift (map unit 1), and bedrock with a discontinuous cover of drift (map unit 2) that, in places, is sufficiently thick to subdue the bedrock topography.

TILL

Till (map unit 3) is the most widespread Quaternary deposit in the map area. The surface of most till deposits is boulder-mantled, reflecting either depositional processes and/or modification by wave action in glacial Lake Agassiz. Some till deposits are characterized by an almost continuous cover of boulders (map unit 3a), a common occurrence in areas of hummocky terrain.

Texturally, the till is a stony and gritty, silty, fine sand. Its colour varies from yellowish brown to brown (Munsell soil color 10YR 4/4) near the surface, to olive or olive grey (5Y5/3) at depth. The till is usually moderately compact, fissile, and massive.

Where examined, the till contains a significant proportion (45±30%) of locally derived greenstone clasts, suggesting that it is of subglacial origin. However, not all till components are locally derived. For example, geochemical analyses of the till matrix (silt-clay fraction) indicate that in certain areas, high concentrations of carbonate (between 20% and 40%) are present. The source of the carbonate is believed to be Paleozic rocks of the Hudson Bay Lowland, approximately 200 km to the northeast. This significant, non-local, carbonate component is thought to be related to the regional dynamics of glacial ice flow, i.e., extended flow of glacial ice into topographic lows.

Mappable till deposits commonly occur as streamlined molded forms, morainic ridges, and hummocks. Deposits of till that lack the above features are commonly thin and somewhat rolling, strongly reflecting the underlying bedrock surface.

Drumlins are the most common streamlined forms in the North Caribou Lake basin and they usually exhibit steep stoss and gentle lee slopes. The orientation of these features closely corresponds to the orientation of bedrock striae, ranging between 200° and 250° azimuth, from east to west. Some drumlins in the map area resemble the "spindle, parabolic, and transverse asymmetrical" forms, described by Shaw and Kvill (1984) in the Livingstone Lake area of Saskatchewan. Unlike the composition of the Saskatchewan drumlins which contain primary water-sorted sediments at shallow depths, test pits to a depth of 1.5 m in the North Caribou Lake drumlins usually expose massive till. However, the composition of North Caribou Lake drumlins at depth remains uncertain.

Throughout the map area, particularly west of Eyapamikama and North Caribou Lakes, there are a number of small irregular ridges oriented transverse to the regional ice flow. They range from 1 to 15 m in height, 10 to 50 m in width, and are up to 1.2 km in length. These ridges are considered to be DeGeer moraines, deposited near the grounding line of an ice front in standing water (presumably glacial Lake Agassiz). Some of the larger moraine ridges mapped west of Eyapamikama Lake may be exceptional DeGeer moraines as well.

GLACIOFLUVIAL DEPOSITS

Glaciofluvial ice-contact deposits (map unit 4), consisting of sand and gravel, occur as eskers, kames, and other stagnant ice features. Eskers are commonly discontinuous and/or compound, forming braided systems that usually occupy regional topographic lows. One such esker system, referred to as the North Caribou Lake esker, begins near the northeastern shore of Eyapamikama Lake and extends discontinuously towards the southwest corner of the map area. Kame complexes and subaqueous fans are associated with this esker system. Smaller esker systems have also been identified in the study area, reflecting widespread ice-stagnation conditions when they were deposited. The overall orientation of most esker systems closely corresponds to the orientation of glacial striae and drumlins.

GLACIOLACUSTRINE DEPOSITS

Glaciolacustrine deep water sediments (map unit 6b) range from massive silt to rythmically bedded (or varved) silt and clay. They seldom exceed 1 to 2 m in thickness and commonly occupy low ground, between bedrock knobs and ridges.

Glaciolacustrine deposits of sand (map unit 6a) are more widespread in the map area. These sediments are the result of falling water levels and subsequent wave action of glacial Lake Agassiz, as older deposits (mainly till) became exposed. For example, swales between drumlins in the North Caribou Lake basin contain fine to medium-grained sand, presumably derived from nearby drumlins.

Abandoned shoreline features are present in the study area and they occur in the form of beach ridges, wave-cut notches, and boulder lag concentrations. Beach ridges occur near Doubtful Lake, in the eastern part of the map area, at approximate elevations of 325 m and 305 m (above sea-level). Wave-cut notches associated with a lag deposit of boulders are commonly developed on glacial features that projected above the water planes of glacial Lake Agassiz.

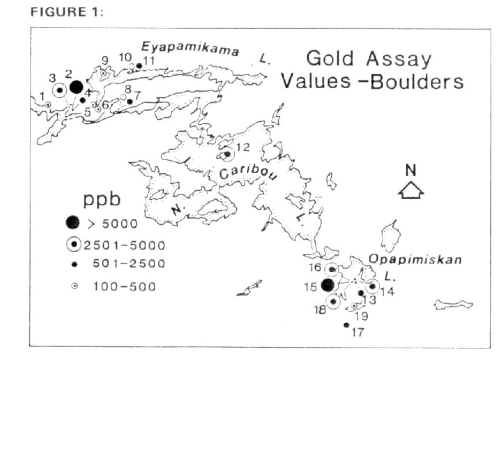
RECENT DEPOSITS

Recent alluvial deposits (map unit 8) consisting of sand, silt, and some organic material, occur sporadically along the margins of most watercourses in the map area. Most are of limited thickness (less than 1 m) and areal extent and thus, are seldom mappable.

Deposits of peat and organic muck (map unit 9) are found in bogs and swamps extensively throughout the map area. They commonly occur in bedrock depressions and along the numerous bedrock-controlled streams and rivers. Large deposits also occur in swales between drumlins.

Small roundish pockets of fen have been noted in a few large bogs (e.g. bog southeast of Hodgson Lake). These features are probably relict collapse scars that may have formed in former thermokarst peat plateaus (Mollard and Janes 1984).

FIGURE 1:



ECONOMIC GEOLOGY

BEDROCK DISPERSION STUDIES

The North Caribou Lake greenstone belt has received considerable attention since 1982 when gold was discovered at Opapimiskan Lake in highly deformed banded iron formation (Thurston *et al.* 1979). Since that time, several other portions of the belt have been, or continue to be, assessed primarily for their gold potential.

Portions of the North Caribou Lake greenstone belt are heavily drift-covered. The masking effect of the overburden limits conventional mineral exploration methods. For this reason, bedrock dispersion studies were undertaken, in conjunction with Quaternary geological mapping, in order to establish the usefulness/limitations of the drift cover for mineral exploration purposes. Data presently available suggest that drift prospecting would be a suitable exploration tool in this area.

Bedrock dispersion studies involved the examination of two till components, i.e., bedrock clasts and till matrix. Bedrock clasts includes pebbles in the till and boulders exposed by wave action in glacial Lake Agassiz.

Boulder-size clasts were examined and documented along present shorelines and near known or suspected sources of iron formation bedrock. This method of analysis provides a rapid and inexpensive means of assessing the regional distribution of locally derived economic rock types. Mineralized boulders were sampled where encountered and those that exceeded 100 ppb gold are listed in Table 1, and their locations are shown on Figure 1.

Pebble-size clasts and till matrix samples were also collected, and should provide important information regarding the mechanics and nature of bedrock dispersion by glaciation in this area. This work is in progress and will be included in a future geological report for the entire Opapimiskan Lake Project area.

AGGREGATE RESOURCES

Aggregate resources are limited to the esker systems (map unit 4) which trend northeast-southwest over much of the map area. As mentioned earlier, many of these are small and discontinuous with the exception of the North Caribou Lake Esker which contains a large volume of sand and gravel suitable for a variety of aggregate products. Access roads, etc. requiring aggregate and fill for construction should, of necessity, be located as close as possible to the material source. Nevertheless, care should be exercised so that the siting of such facilities does not prevent the future use of other aggregate not immediately required.

Glaciolacustrine sands (map unit 6a) may be useful locally as fine aggregate or fill. These sediments are associated with a drumlinized till plain in the eastern portion of the area. They are frequently mantled by thin organic deposits.

Till (map unit 3), up to 20 m thick, is concentrated within the North Caribou Lake drumlin field. Smaller and thinner till deposits are scattered throughout the remainder of the map area. These areas of thick till may provide suitable back fill and borrow material for general construction purposes. Boulder lags, which mantle many of these areas, will present some construction difficulties unless avoided.

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TABLE 1:

SELECTED BOULDER SAMPLES (>100 PPB Au)

rock type	site	Au (ppb)	Ag (ppm)	As (ppm)	Sb (ppm)	Cu (ppm)	Pb (ppm)	Zn (ppm)
quartzite	1	75, 145, 40	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2040
quartz vein	2	23.0, 23.6ppm*	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	30
quartz vein	3	6400, 4280	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	210
chemical metasediment	4	340, 480	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	37
banded iron formation	5	100	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
banded iron formation	6	195, 215	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	48
quartz vein	7	1090, 870	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	87
quartzite	8	240, 260	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	36
mafic metavolcanic	9	140, 118	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	44
chemical metasediment	10	90, 138	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	24
chemical metasediment	11	1100, 1070	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	20
mafic gabbro	12	1930, 2020, 2920	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	320
clastic metasediment	13	670	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	42
chemical metasediment	14	2750	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	118
chemical metasediment	15	5590	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	88
felsic volcanic	16	3070	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	11
chemical metasediment	17	2205	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	46
banded iron formation	18	2780	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	78
chemical metasediment	19	100	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	175

*fire assay; all other analyses by atomic absorption

SOURCES OF INFORMATION

Base map and topography from maps 53 B/14 (east half) and 53 B/15 of the National Topographic Series.

Aerial Photographs: National Airphoto Library, Ottawa.

Contour interval: 10 m.

Magnetic declination approximately 0°33'W, 1984.

CREDITS

Geology by P.F. Finamore and assistants, 1984, 1985.

Issued 1986.

Information from this publication may be quoted if credit is given. It is recommended that reference be made in the following form:

Finamore, P.F.
1986: Quaternary Geology of the North Caribou Lake-Weagamow Lake Area, Kenora District (Patricia Portion); Ontario Geological Survey, Map P.3043, Geological Series-Preliminary Map, scale 1:50 000. Geology 1984, 1985.