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GEOLOGICAL SURVEY OF CANADA | COMMISSION GÉOLOGIQUE DU CANADA

DESCRIPTIVE NOTES

INTRODUCTION

This map was produced as part of the Southwest Baffin Integrated Geoscience Project (SWBIG), a joint effort between the Canada-Nunavut Geoscience Office and the Geological Survey of Canada.

This map represents the first published surficial geology map for the area. Earlier Quaternary geology research was published by Blake (1966) and Boulton (1978), including a surficial geology compilation by the latter author. Initial ice flow interpretations were presented by Utting et al. (2007) and results from a till geochemistry survey are given by Utting and Brown (2007).

PHYSIOGRAPHY

The Bluegoose Prairie region is located in southwest Baffin Island, Nunavut, Canada. The area is characterized by low relief and is part of the Foxe Basin lowlands (Bird 1967). The only notable topographic feature is a long limestone ridge (Tb) that forms the Quoich Lake peninsula in the northeast. The ridge is part of the Foxe Fold Belt and trends westerly. Rivers in the area, the largest of which is the Aulapar River, drain northward into Bowman Bay and Foxe Basin.

BEDROCK

The bedrock of Bluegoose Prairie can be divided into two general types: limestone and Shield bedrock (Figure 1; St-Onge et al. 2007). Most of the area is Ordovician limestone, a continuation of rocks forming Foxe Basin (Wheeler et al. 1997). The west side of the map area is primarily Proterozoic granitic rocks of the Churchill Province (St-Onge et al. 2007). The map contact between the two rock types is a narrow fault, which runs parallel to the Aulapar River and then displays itself as the north-facing scarp of the Putnam Highlands. Isolated relicts of limestone bedrock occur in the northeast corner of the map area. Presumably the rest of the easily eroded limestone was removed during glaciation.

DISTRIBUTION OF SURFICIAL SEDIMENTS

Extensive areas of exposed bedrock occur in the southwest corner of the map area and below marine limit, where limestone bedrock forms the Foxe Basin lowlands and Churchill Province rocks, with the exception of limestone exposed along the steep cliff face of the Putnam Highlands.

Till is the most common material type, having been deposited nearly continuously over the entire map area. Two types of till occur, based on the composition of the matrix. Till labelled Tb^{LS} has a limestone matrix, and till labelled simply "Tb" has a matrix derived from primarily Shield rocks. The limestone domed till is easily distinguished as it has a pale grey colour and forms a hummocky surface. Most of the till is 1–5 m thick (till veneer) and has a streamlined bedrock ice flow direction. Most of the till is 1–5 m thick (till blanket). It is < 1 m thick (till veneer) where it has been washed by sea or runoff, or where the terrain is steep. Hummocky till occurs in two main areas: on the highlands and in the northeast corner (Th, Th^{LS}). In both cases, moraines and drumlins occur. Hummocky till was likely deposited during retreat of Laurentide Ice.

Glaciofluvial sediments occur as eskers, which flow parallel to late ice flow. The largest esker is in the far southeast corner of the map area. It is a complex esker system that is continuous for 30 km. Another esker is in the far southeast channel that ends in a fan at marine limit. Other outwash fans are common in the map area. Large mounds of glaciofluvial material occur on the highlands in the center of the map area. These mounds have relief up to 50 m and their origin is unknown.

Modern marine sediments and extensive beach ridges occur below marine limit. These marine sediments are commonly deposited above till. Till is exposed infrequently below marine limit and is washed.

ICE FLOW AND DEGLACIATION

Bluegoose Prairie was covered by the Foxe Sector of the Laurentide Ice Sheet. Ice flow in the area was controlled over time by three major features: the Foxe Dome centered over Foxe Basin to the northwest, the Hudson Strait ice stream to the south, and the Amadjuak Divide to the east (Dyke and Prest 1987). Utting et al. (2007) present six stages of ice flow in the area, which are summarized briefly here. Stage 1 is the oldest and is characterized by a northeast ice flow configuration until ca. 10 ka ^{14}C BP (Dyke et al. 2003). During that time, ice in Bluegoose Prairie flowed from the Foxe Dome and funnelled into Hudson Strait to join ice flowing rapidly seaward (Figure 2a). Southeastward flow is apparent in streamlined bedrock and till. Stage 2 is characterized by a southward ice flow direction in the area of Bluegoose Prairie and Hoadley Lake, which radiate toward ~ 210° in the southwest through to just over 180° in the southeast. Deglaciation of Hudson Strait occurred ca. 8.0 ka ^{14}C BP (Dyke et al. 2003), after which the ice margin retreated north. Collapse of the Foxe Dome occurred between ca. 8.0 and 7.0 ka ^{14}C BP (Stage 3). Stage 4 is characterized by ice flow from Foxe Basin dome ice that flowed northeastward from Amadjuak Divide into Foxe Basin (Figure 2b). Till lineations and flutings in the northeast portion of the map clearly show this direction of ice flow, as does the pattern of limestone till. Stage 5 is characterized by ice flow from Amadjuak Divide to the northwest. Ice flowed over the Putnam Highlands, fast flowing ice and the lee to the west. Ice in south-west Bluegoose Prairie was deglacial during the Highlands, depositing hummocky till and glaciofluvial sediments during retreat (Figure 2b). Final deglaciation of Amadjuak Lake, directly east of the map area, occurred by 4.5 ka ^{14}C BP (Blake 1966).

SEA LEVEL HISTORY

Radiocarbon dates were obtained from raised marine deposits (Table 1). Marine limit is ~ 100 m. A relative sea level curve was constructed for the Foxe Basin area (Figure 3) using data from Utting et al. (2007) and Blake (1966). All dates contain both terrestrial organic material and marine bivalves, indicating a protracted environmental storm after deglaciation and allow the calculation of a local reservoir effect of 1000 ± 20 ^{14}C years.

REFERENCES

Bird, J.B., 1967. The physiography of Arctic Canada (with special reference to the area south of Ferry Channel). The Johns Hopkins Press, Baltimore, Maryland. 336 p.

Blake, W. Jr., 1966. End moraines and deglaciation chronology in northern Canada, with special reference to southern Baffin Island. Geological Survey of Canada, Paper 66-26. 27 p.

Dyke, A.S., Moore, A., Robertson, L., 2003. Deglaciation of North America. Geological Survey of Canada, Open File 1574. 2 sheets.

Dyke, A.S. and Prest, V.K., 1987. Late Wisconsinan and Holocene history of the Laurentide Ice Sheet. Geographie Physique et Quaternaire, 41: 237-263.

Hodgson, D.A., 1982. Quaternary geology of western Meta Incognita Peninsula and Ippiutit area, Baffin Island, Nunavut. Geological Survey of Canada, Bulletin 697. 72 p.

St-Onge, M.R., Searcken Bertie, M., and Young, M.D., 2007. Geology, Mingo Lake, Baffin Island, Nunavut. Geological Survey of Canada, Open File 5514. 1 sheet, 1:250 000 scale.

Utting, D.J. and Brown, D., 2007. Till survey results and ice-transport interpretations, Foxe Peninsula, southwest Baffin Island, Nunavut. Geological Survey of Canada, Open File 5614. 112 p.

Utting, D.J., Dyke, A.S., Hodgson, D.A., Thorsteinsson, R.S., Vickers, K.J., Netley, S.E., Weir, B., 2007. Report on Ice flow history, deglacial chronology, and surficial geology, Foxe Peninsula, southwest Baffin Island, Nunavut. Geological Survey of Canada, Open File 5615. 1 sheet, 1:100 000 scale.

Wheeler, J.O., Hoffman, P.F., Card, K.D., Davidson, A., Sanford, B.V., Okulitch, A.V., Roest, W.R., 1997. Geological map of Canada. Geological Survey of Canada, Map D1860A.

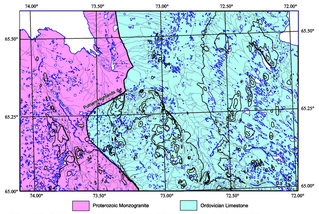


Figure 1. General bedrock map showing distribution of Shield and limestone bedrock (modified from St-Onge et al. 2007).

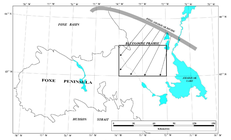


Figure 2a. Ice flow towards the southwest from Foxe-Amadjuak divide from Last Glacial Maximum to ca. 8 ka ^{14}C BP (modified from Utting et al. 2007).

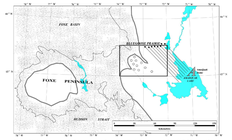


Figure 2b. Ice flow towards the northwest from Amadjuak Dome, ca. 6.5 ka ^{14}C BP, (modified from Utting et al. 2007).

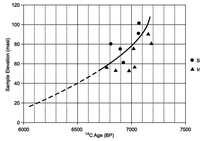


Figure 3. Relative Sea Level Curve, showing rapid uplift following deglaciation of Foxe Basin ca. 6.1 ka ^{14}C BP.

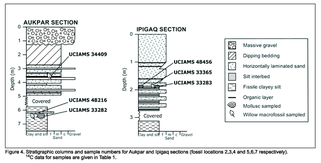
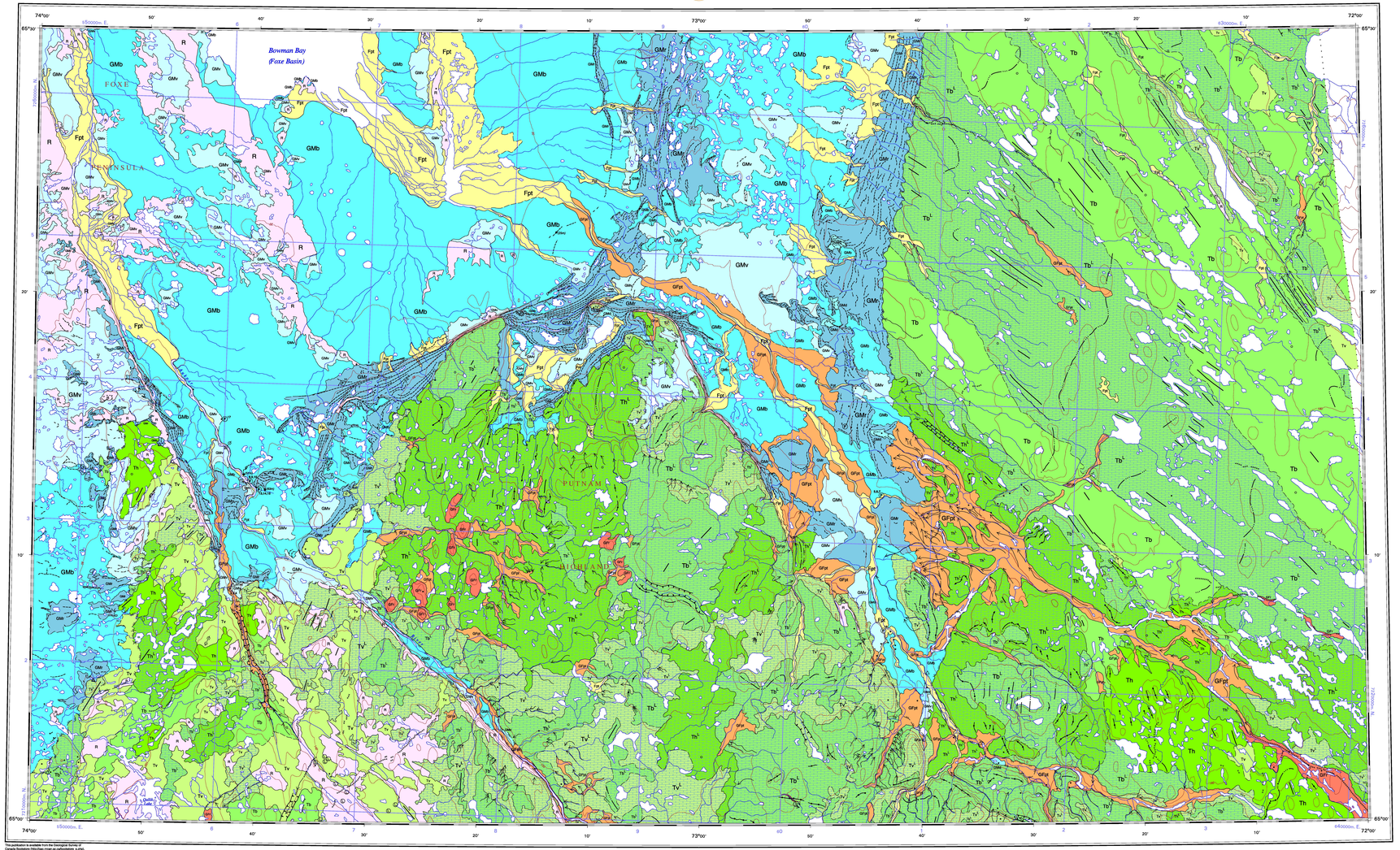


Figure 4. Stratigraphic columns and sample numbers for Aukpar and Ipigaq sections (fossil locations 2,3,4 and 5,6,7 respectively). ^{14}C data for samples are given in Table 1.



This publication is available from the Geological Survey of Canada Bookstore (http://gsc.nrcan.gc.ca/bookstore_e.php). It can also be downloaded free of charge from GeoPub (http://geopub.nrcan.gc.ca).

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Fieldwork conducted during the 2006 and 2007 summer seasons.

Geology by K. Vickers, 2008

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OPEN FILE 6176

SURFICIAL GEOLOGY

BLUEGOOSE RIVER (SOUTH)

BAFFIN ISLAND

NUNAVUT

Scale 1:100 000/Echelle 1/100 000

Kilometres 0 1 2 3 4 5 Kilometres

Universal Transverse Mercator Projection
North American Datum 1983
© Her Majesty the Queen in Right of Canada 2011

Projection transverse universelle de Mercator
Système de référence géodésique nord-américain, 1983
© Sa Majesté la Reine du chef du Canada 2011

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Any revisions or additional geological information known to the user would be welcomed by the Geological Survey of Canada

Digital base map from data compiled by Geomatics Canada, modified by DDD

Mean magnetic declination 2011, 30°03' W, decreasing 27.4' annually
Readings vary from 30°03' W, in the SW corner
to 31°39' W, in the NE corner of the map

Elevations in metres above mean sea level

LEGEND

SURFICIAL DEPOSITS

QUATERNARY

HOLOCENE

Fpt — *Fluvial Deposits (nonglacial alluvial floodplain, terrace, fan, and delta topsets):* sand, gravel, boulders, and minor silt; 1- 10 m thick.

GLACIOMARINE AND MARINE DEPOSITS: *Sediments deposited during postglacial regression of a high sea level. Typically fine sand, silt, clay and stoney mud; rhythmically stratified in many places. Beach sediments are typically composed of gravel and sand. Deltas are composed of cross-stratified sand and gravels, and may include lenses of finer material. Low-lying, fine-grained sediment supports vegetation cover.*

GMr — *Glaciomarine/marine littoral sediments:* Sand and gravel, generally well sorted material that locally includes pockets of washed till. Commonly strewn with boulder lags. Usually forms flights of beach ridges (raised beaches), bars, spits, terraces and deltas. Commonly reworked by wave action and shifting of pack ice during low sea level, and/or during regression; commonly occurs on the slopes of topographic highs. *Thickness ranges from 1 to 5 m.*

GMd — *Glaciomarine delta:* sand, silt, boulders, and gravel; 2- 20 m thick; massive to crossbedded sediments that coarsen upwards, associated with ice-contact deposits or at termination of outwash trains or meltwater channels.

GMb — *Glaciomarine/marine blanket:* clay, silt, sand, minor gravel, and dropstones; 1- 30 m thick; deposited from suspension and iceberg rafting; locally capped by holocene marine regression sediments. *Dominated by fines in offshore deposits and by sand in estuarine and tidal deposits.*

GMv — *Glaciomarine/marine veneer:* silt, sand, and gravel; 0.5- 1 m thick; discontinuous veneer of littoral and offshore sediment including beach ridges and sea-ice-rafted debris; mimics surface of underlying till or rock.

GLACIOFLUVIAL DEPOSITS: *deposited by meltwater behind, at, and in front of ice margins.*

GFpt — *Glaciofluvial outwash:* stratified sand and gravel; 1- 30 m thick; proglacial floodplains, terraces, and fans; includes kame terraces, minor subglacial and subaquatic deposits; locally kettled; may include washed till surfaces with few lines.

GFr — *Glaciofluvial ice-contact (eskers and kames):* poorly stratified to sorted sand, gravel, and boulders; 2- 20 m thick; forming ridges and hummocks; locally kettled.

EARLY HOLOCENE AND WISCONSINAN

TILL: *deposited in subglacial and ice-marginal environments of Foxe Ice Dome and Amadjuak Ice Divide. Two types of till are located in the map area, their distribution controlled primarily by bedrock type and ice transport direction.*

T – Shield-derived till: *matrix-supported, silty sand diamicton with dominantly cobble- and boulder-sized clasts of Shield-derived igneous and metamorphic rocks. Locally contains minor pebble-sized limestone clasts.*

T^{L} – Limestone-derived till: *matrix-supported clayey silt diamicton with dominantly pebble- and cobble-sized clasts of Paleozoic limestone. Locally contains minor pebble- to boulder-sized Shield provenance clasts.*

Tv **Tv^{L}** — ***Till veneer:*** *0.5- 1m thick; >40% of area is till, <60% of area is rock ledges and knobs, and rubble; bedrock topography is evident; minor till blanket, minor colluvium, including talus, colluvial fans, solifluction lobes, and unstratified valley-bottom deposits; minor washed till boulder fields where below sea level. Pattern till is used when the till is limestone derived (*Tv^{L}*).*

Tb **Tb^{L}** — ***Till blanket:*** *1- 10 m thick; flat to undulating plain with minor fluted, hummocky, ridged, ribbed, or channeled areas; solifluction lobes on steeper slopes; thick and nonsaline; minor till veneer or glaciofluvial outwash; rare glaciolacustrine fines. Below marine limit, is washed with most fines removed. Pattern till is used when the till is limestone derived (*Tb^{L}*).*

Th **Th^{L}** — ***Hummocky till:*** *non-linear rises and hollows; 1- 20 m thick; rolling to hummocky. Pattern till is used when the till is limestone derived (*Th^{L}*).*

PRE-PLEISTOCENE

R — ***Bedrock and rock weathering products:*** *Intact and fault-riven outcrop, discontinuous cover of rubble, boulders, gravel, sand, and minor till; generally occurred to frost-riven or disaggregated outcrop; >40% till and boulder flakes (including till from which finer fraction was washed by glacial meltwater or a higher sea), and colluvium; very minor fluvial deposits, muck, or raised marine nearshore and shoreline deposits. Topography variable with some major and numerous minor ridges and scarps.*

Geological boundary (defined, approximate, inferred)

Limit of bedwork

Esker (direction known, unknown)

Beach ridge crests; with elevation in metres (25m)

Moraine

Assumed ice margin; thick till on proximal side

Limit of marine inundation (observed, interpolated)

Meltwater channel, large (braidflow direction known, unknown)

Meltwater channel, minor

Streamlined till

Fossil locality with fossil number; (see Table 1) 18

Perched delta (elevation in metres) (158m)

Striation, groove, etc (sense unknown)

Ground observation and sample site

Till Sample

Limestone bedrock relict

Table 1.

Field Number	Station ID	Lab ID	$\delta^{13}C$	^{14}C age [2]	Error (+/-)	Elevation (m)	Material
1	06DJJ2017	UCIAMS 33278	2.1	6925	20	60	Hiatella arctica
2	06DJJ2208-5	UCIAMS 33282	0.9	7185	20	80	Mya truncata
3	06DJJ2208-6	UCIAMS 48216	-26.5	8165	30	80	Salix sp. (lanceolate)
4	06DJJ2208-3	UCIAMS 34409	-27.3	6190	20	80	Salix sp. (lanceolate)
5	06DJJ2218-01	UCIAMS 48456	1.9	7505	20	75	Mya truncata
6	06DJJ2218-1	UCIAMS 33283	2.5	7155	25	75	Mya truncata
7	06DJJ2218-6	UCIAMS 33365	-27.0	6160	20	75	Mollusc fragments
8	KV2330514	UCIAMS 40418	-0.4	6975	20	55	Hiatella arctica
9	KV2330352	UCIAMS 40419	2.1	6855	25	55	Clinocardium ciliatum
10	KV2330353.1	UCIAMS 40550	-14.3	8010	30	55	Plant material (lanceolate)
11	KV2370161	UCIAMS 40420	1.9	39770	380	30	Mollusc fragments
12	KV2370453	UCIAMS 40421	1.9	6990	20	75	Mya truncata
13	KV2992253	UCIAMS 40402	1.6	6770	20	55	Unidentified Mollusc
14	KV2992543	UCIAMS 40403	-28.7	3560	20	55	Plant material (lanceolate)
15	KV2992253	UCIAMS 40403	1.7	7025	20	55	Mya truncata
16	KV2992551	UCIAMS 40424	1.8	7030	20	75	Mya truncata
17	KV2994451	UCIAMS 48247	0.8	6360	20	7	Mollusc fragments

[1] *Reported according to standards outlined by Stuiver and Polach (1977).*
[2] *Conventional ^{14}C age, as defined by Stuiver and Polach (1977).*

NATIONAL TOPOGRAPHIC SYSTEM REFERENCES AND INDEX TO PUBLISHING GEOLOGICAL SURVEY OF CANADA MAPS

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2011

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