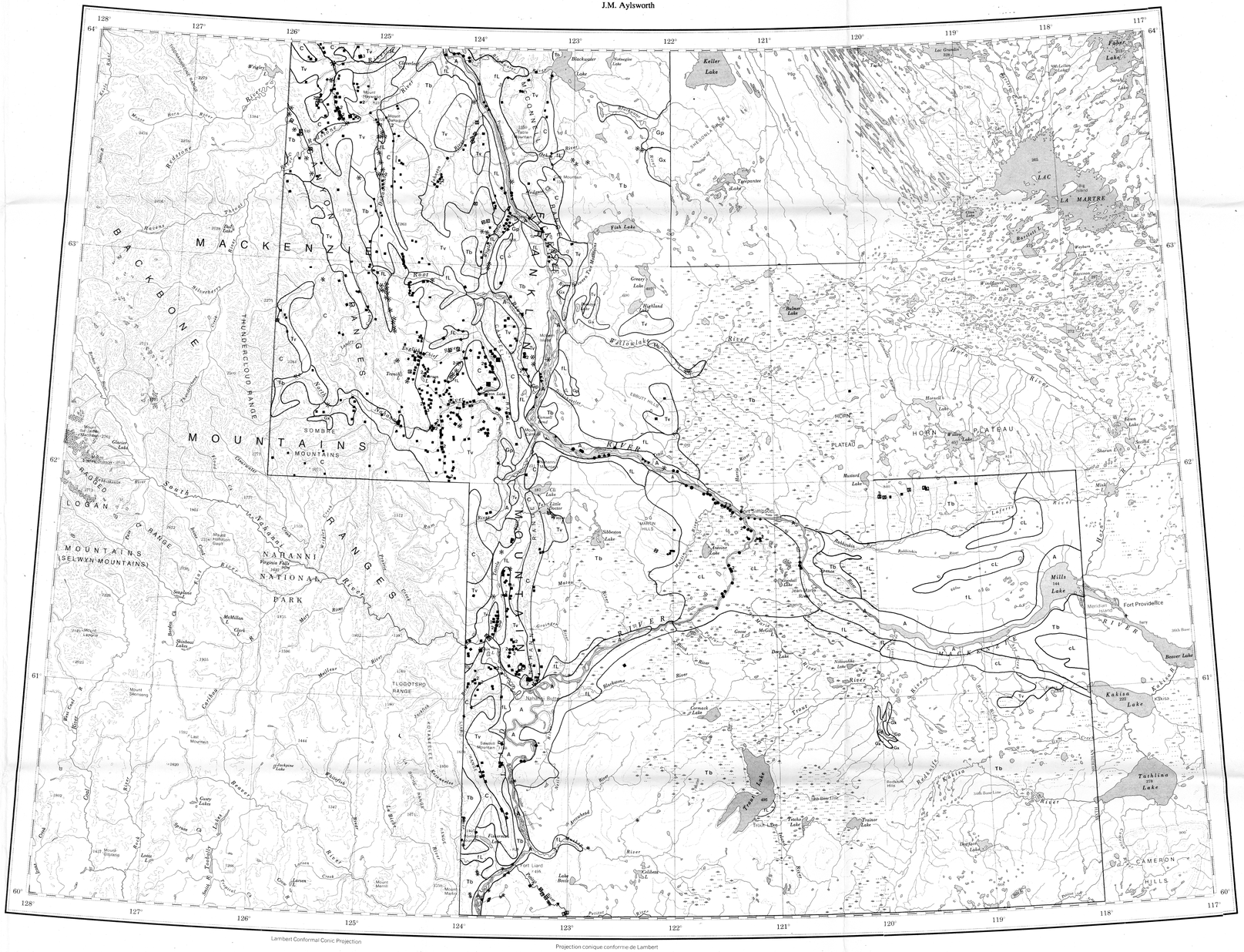
LANDSLIDES, DISTRIBUTION AND CLASSIFICATION, 60°N to 64°N, MACKENZIE VALLEY, N.W.T.

1:1 000 000 Scale

J.M. Aylsworth



REFERENCE MAPS

NTS

85D Boydell, A.N. and Rutter, N.W.
1980: Surficial geology and geomorphology of Kakisa River, District of Mackenzie, Northwest Territories; Geological Survey of Canada, Map **14-1978**; 1: 125 000.

85E Rutter, N.W., Minning, G.V., and Netterville, J.A.
1980: Surficial geology and geomorphology, Mills Lake, District of Mackenzie, Northwest Territories; Geological Survey of Canada, Map **15-1978**; 1: 125 000.

95A Rutter, N.W., Minning, G.V., and Netterville, J.A.
1980: Surficial geology and geomorphology, Trout Lake, District of Mackenzie, Northwest Territories; Geological Survey of Canada, Map **16-1978**; 1: 125 000.

95B Hawes, R.J.
1980: Surficial geology and geomorphology, Fort Liard, District of Mackenzie, Northwest Territories; Geological Survey of Canada, Map **11-1979**; 1: 125 000.

95G Rutter, N.W. and Boydell, A.N.
1981: Surficial geology and geomorphology, Sibbeston Lake, District of Mackenzie, Northwest Territories; Geological Survey of Canada, Map **10-1979**; 1: 125 000.

95H Minning, G.V., Netterville, J.A., and Rutter, N.W.
1980: Surficial geology and geomorphology of Fort Simpson, District of Mackenzie, Northwest Territories; Geological Survey of Canada, Map **3-1978**; 1: 125 000.

95I Hawes, R.J.
1980: Surficial geology and geomorphology of Bulmer Lake, District of Mackenzie, Northwest Territories; Geological Survey of Canada, Map **10-1978**; 1: 125 000.

95J Hawes, R.J.
1980: Surficial geology and geomorphology of Camsell Bend, District of Mackenzie, Northwest Territories; Geological Survey of Canada, Map **9-1978**; 1: 125 000.

95K Boydell, A.N. and Rutter, N.W.
1980: Surficial geology and geomorphology, Root River, District of Mackenzie, Northwest Territories; Geological Survey of Canada, Map **12-1979**; 1: 125 000.

95N Rutter, N.W., Minning, G.V., and Netterville, J.A.
1980: Surficial geology and geomorphology, Dahadinni River, District of Mackenzie, Northwest Territories; Geological Survey of Canada, Map **18-1979**; 1: 125 000.

95O Rutter, N.W. and Boydell, A.N.
1980: Surficial geology and geomorphology, Wrigley Lake, District of Mackenzie, Northwest Territories; Geological Survey of Canada, Map **13-1978**; 1: 125 000.

LEGEND

Rocksides

- Rockslide
- Rockslide incorporating Quaternary sediments

Landslides in Quaternary sediments

- Flow (includes bimodal flows, multiple retrogressive flows, and skin flows)
- Slide (includes block slides, multiple retrogressive slides, and rotational slumps)
- Unclassified (landslide type not determined or uncertain)

Number associated with symbol refers to number of separate landslides represented by that symbol.

SURFICIAL GEOLOGY LEGEND

Note: The surficial geology base is derived from unpublished 1:1 000 000 manuscript maps, compiled by R.J.Fulton and L. Maurice as a stage in production of the Surficial Geology Map of Canada. These manuscript maps were compiled from 1:125 000 scale maps. (see Reference Maps, below)

C **Colluvial Deposits:** sandy, silty and clay diamicton; generally thin over bedrock and largely reflects nature of underlying rock.

A **Alluvial Deposits:** silt, sand, clay and gravel; includes floodplains, low terraces and deltas.

Lacustrine and Glaciolacustrine Deposits:

fL Glaciolacustrine and Lacustrine Silt and Clay; includes flat to gently rolling plains.

cL Glaciolacustrine and Lacustrine Sand; includes spits, bars, beaches, deltas and sheet sands.

Glaciofluvial Deposits:

Gp Glaciofluvial Outwash; sand and gravel; includes valley trains, and channel bottom sediments, fans and deltas of spillways and meltwater channels.

Gx Ice-contact Stratified Drift; sand and gravel; includes kame complexes, compound eskers, end moraines and interlobate moraines.

Tb **Till:** silty, sandy and clayey diamicton; includes thick till and continuous till

Tv blanket (Tb) and discontinuous or thin till veneer (Tv).

Lambert Conformal Conic Projection

Projection conique conforme de Lambert

SCALE 1:1,000,000 ÉCHELLE

Kilometres 10 5 0 10 20 30 40 50 60 70 80 90 100 110 Kilometres
1 Millimetre = 1 Kilometre — 1 Millimètre = 1 Kilomètre

Statute Miles 10 5 0 10 20 30 40 50 60 70 Miles terrestres
1 Inch = 15.78 Statute miles — 1 Pouce = 15.78 Miles terrestres

Nautical miles 10 5 0 10 20 30 40 50 60 70 Miles marins
1 Inch = 13.71 Nautical miles — 1 Pouce = 13.71 Miles marins

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Notes:

1) **Source of Landslide Information:** All landslides shown on published surficial geology maps have been included. For this investigation a corridor was established along the Mackenzie and Liard rivers, extending ~3 km on either side of the river. (For the most part, the Fort Liard and Mackenzie highways and the Norman Wells to Zama Pipeline are contained within the corridor.) Those landslides occurring within this corridor have been re-examined and classified by means of airphoto interpretation. As well, within the corridor, newer landslides found on recent airphotos have been added. Beyond this corridor, some new slides have been added but the region has not been systematically re-examined.

2) **Landslide Type:** Landslide type is based on the classification established by McRoberts and Morgenstern (1973). Landslides are divided into two classes; *slides* and *flows*, on the basis of morphology. *Slides* show evidence of more rigid movement in that components of the slide move downslope in a more or less intact manner. *Slides* include the single block slide and the multiple retrogressive slide, which is a stepped series of block slides with some backtilting. *Flows* have a more fluid character, showing evidence of mobility throughout the failure. *Flows* include bimodal flows with a steep head scarp and low angle tongue, and multiple retrogressive flows in which a series of arcuate ridges are preserved but the deposits exhibit overall flow characteristics. In a number of cases the multiple retrogressive flows exhibit characteristics that are gradational between those of *slides* and those of *flows* and are difficult to assign to one category.

Reference:
McRoberts,E.C. and Morgenstern,N.R.,
1973: A study of landslides in the vicinity of the Mackenzie River Mile 205 to 660; Environmental-Social Committee, Northern Pipelines, Task Force on Northern Oil Development, Report No. 73-35, 96p.

3) **Discussion:** Over the map area as a whole, the great majority of rockslides occur in steep terrain (over 140 m local relief) underlain by formations containing shale. Landslides in Quaternary sediments most commonly occur in frozen lacustrine deposits where the movement is generally within or on silt, silty clays, and clays or on a till bed. Landslides also occur in till, particularly where the till forms a veneer over shale. Less commonly they may be found in glaciofluvial or fluvial deposits. Landslides have been more closely examined within the 6 km wide corridor centred on the Mackenzie and Liard rivers. A brief summary, beginning in the north, follows.

Mackenzie River, progressing upstream:

64°00' to 63°40'N: Several flows occur in the fine lacustrine sediments near the northern border of the area.

63°46' to 63°43'N: Three wide, but inactive, block slides in fine lacustrine sediments occur opposite the mouth of the Johnson River. Till as well as silt is included in the slide.

63°43' to 63°20'N: No mappable landslides were observed along the next 35 km of river. Coarse alluvial deposits line much of this stretch.

63°20' to 63°00'N: Most landslides are block and multiple retrogressive slides. Many lie in glaciofluvial sediments; others in lacustrine sediments and a few in till. Most are inactive. A very large, hummocky, bimodal flow, now inactive, occurred in lacustrine sediments at Wrigley. Along Wrigley Creek a series of small flows lie in glaciofluvial sediments and till.

63°00' to 62°40'N: **No landslides observed. This stretch of river does not lend itself to landslide activity.**

62°40' to 62°13'N: South from McGern Island to past Camsell Bend, several multiple retrogressive slides and a block slide occur in glaciofluvial and lacustrine sediments.

62°10' to 61°57'N: The river is lined by a series of active multiple retrogressive flows and stable multiple retrogressive slides in sandy silty lacustrine deposits overlying finer lacustrine sediments. The two classes have many common characteristics and the multiple retrogressive flow may be considered a gradational stage from true slide to flow.

61°57' to 61°35'N: In the vicinity of Fort Simpson all landslides are bimodal flows associated with sandy silty lacustrine deposits overlying finer lacustrine sediments. Most are active.

61°35' to Mills Lake: No landslides observed. The low floodplain of this segment of the Mackenzie is not suitable for landslide activity.

Landslides have not been previously mapped and are not visible on the airphotos along the section of the pipeline that departs from the corridor of detailed study and heads south to the territorial border.

Liard River

Bimodal flows in sandy silty lacustrine sediments are common along the lower reaches of the Liard river. The lacustrine deposit overlays till along much of this segment and till is a major component of many of the slides. Beyond the vicinity of Fort Simpson long stretches of the Liard River are free of landslides. Block and multiple retrogressive slides occur in till near the upstream end of the Liard corridor.

4) **Further Information:** This Open File map is a preliminary release. The final map will be available as a GSC Paper, entitled Landslides, Mackenzie Valley, N.W.T., by J.M.Aylsworth, A. Duk-Rodkin, P.A. Eggington and others. It will be released in greater detail, in colour, with discussion, and accompanied by spreadsheets of landslide location, type, characteristics and material association.