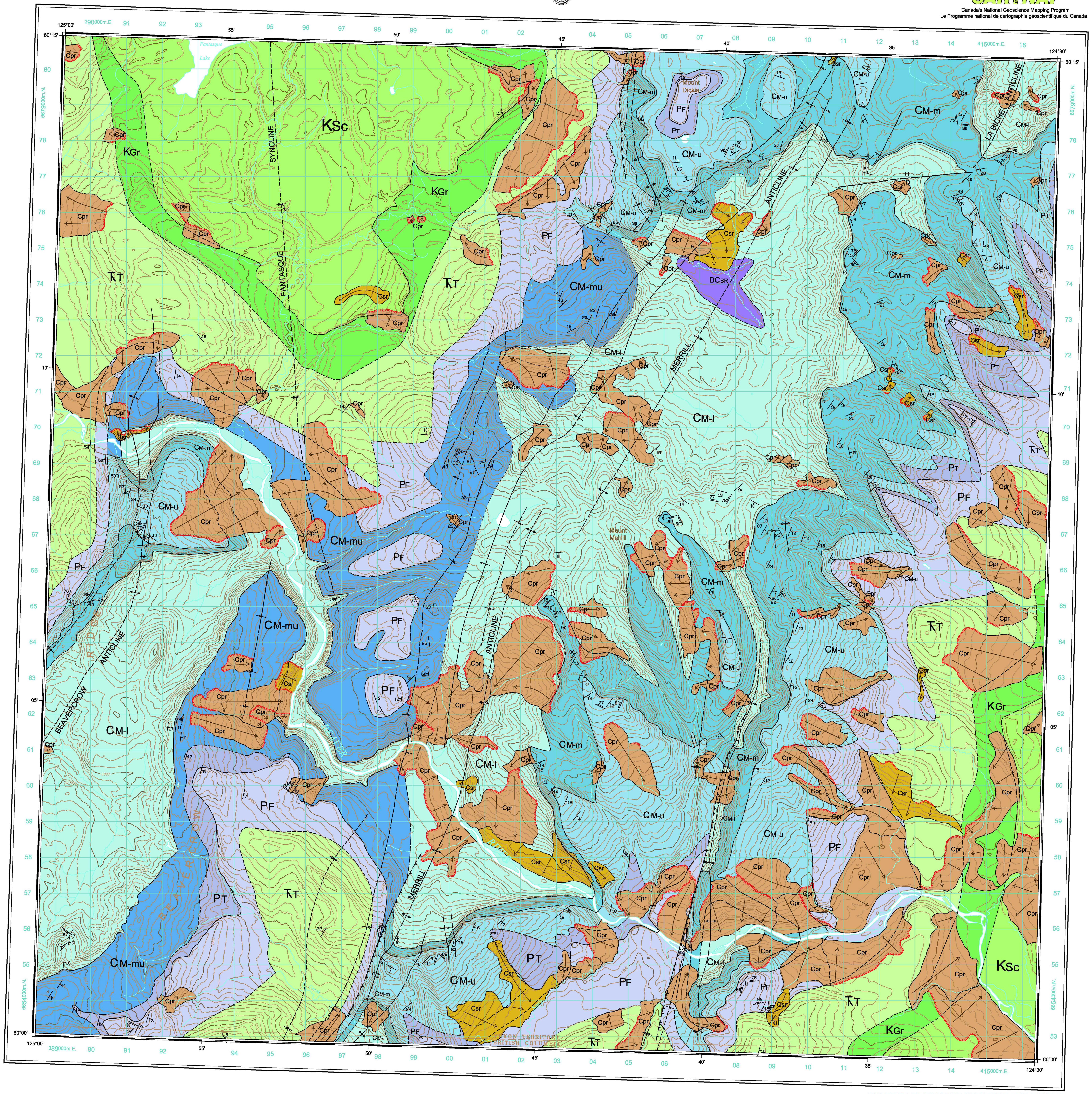
Natural Resources Canada — Ressources naturelles Canada

GEOLOGICAL SURVEY OF CANADA — COMMISSION GÉOLOGIQUE DU CANADA

NATMAP CARTNAT
Canada's National Geoscience Mapping Program
Le Programme national de cartographie géoscientifique du Canada



LEGEND

Coloured legend blocks indicate map units that appear on this map

QUATERNARY

SURFICIAL DEPOSITS

Csr — *Rock slide deposits: chaotic landscape of irregular and stacked bedrock blocks.*

Cpr — *Rock slump deposits: large rotational blocks in bedrock, shallow to 10's of metres thick; internal structure of material may be retained; often traceable upslope to active scarps; where sufficient moisture is present the slump may produce a flow at its base, forming a characteristic spatulate form.*

MESOZOIC

CRETACEOUS

LOWER CRETACEOUS

FORT ST JOHN GROUP

KSc — ***SCATTER FORMATION**: Resistant, greenish-grey, glauconitic, laminated sandstone; medium- to thick-bedded; silty, concretionary mudstone common in middle part of unit.*

KGr — ***GARBUTT FORMATION:** Grey shale and siltstone with sideritic concretions; minor thin-bedded, finely laminated sandstone; may include the Chinkeh Formation if present in the map area.*

TRIASSIC

DIABER GROUP

TrT — ***TOAD FORMATION:** Grey, red, and green shale interbedded with thin- to thick-bedded brown sandstone; locally calcareous or phosphatic; may include Grayling Formation if present in the map area.*

PALEOZOIC

PERMIAN

ISHBEL GROUP

PF — ***FANTASQUE FORMATION:** Dark grey to white, well bedded, spiculitic chert; rhythmically interbedded with minor shale and siliceous siltstone; basal phosphatic breccia or sandstone.*

PT — *Tika map unit: Buff weathering, light to medium brown, silty or sandy limestone or dolostone grading into calcareous siltstone and sandstone; subordinate lithoclast breccia and shale; medium-bedded, massive to crosslaminated; sparsely fossiliferous; rectilinear fracture pattern characteristic.*

CARBONIFEROUS

LOWER CARBONIFEROUS

MATTSON FORMATION

CM-mu — *MIDDLE AND UPPER MEMBERS UNDIVIDED*

CM-u — ***UPPER MEMBER:** Light to medium grey, fine- to coarse-grained, locally calcareous or dolomitic quartz arenite and sub-chert-arenite; subordinate fossiliferous limestone, and grey to green shale; sandstone commonly shows large-scale crossbedding; fossils in the limestone are commonly silicified; may include Tika map unit.*

CM-m — ***MIDDLE MEMBER:** Grey to buff to brown, poorly- to well-indurated, fine-grained quartz arenite with subordinate siltstone and dark shale; minor coal and sandy dolostone; sandstone shows fine- to large-scale crossbedding; typically forms sharp-based, thick-bedded, fining-up sequences.*

CM-l — ***LOWER MEMBER:** Greyish orange weathering, light grey or buff, well-indurated, fine- to very fine-grained quartz arenite interbedded with siltstone and dark grey shale; minor coal, dolostone, and lithoclast breccia; crosslaminae and trace fossils common, typically thin- to medium-bedded with coarsening-up sequences.*

DEVONIAN AND CARBONIFEROUS

DCBR — ***BESA RIVER FORMATION:** Dark grey to black shale, locally weathers buff; sparsely fossiliferous; minor interbedded greyish-orange weathering sandstone, siltstone, lithoclast breccia, and scattered sideritic nodules.*

NOTE:

***Mass Wasting** is the collective term given to the range of processes and resultant landforms that relate to the gravitational downslope movement of rock and/or unconsolidated material without the direct conveyance by water, air or ice. Water and ice are, however, often key components in initiating and perpetuating mass wasting by reducing the strength of materials and in their plastic and fluid behaviour.*

Different types of mass wasting are distinguished by the type of materials involved (e.g., bedrock, talus, till), the mode of deformation (e.g., creep, slide, slump, flow), speed of movement, morphology of the moving mass, and water content.

While different earth surface materials and geological settings are often strongly associated with various types of mass wasting, predicting their occurrence, magnitude and rate of deformation is often not possible. Some areas that are prone to mass wasting in the Mount Merrill region include areas of steeply dipping bedrock, poorly indurated and shale-rich bedrock, and along stream courses and meandering river channels. Human activities such as road building, pipeline trenching, logging and seismic exploration can also initiate mass wasting, particularly where they undercut slopes, or act to destabilize surficial materials.

***Rock Slides** are the rapid, downslope movement of bedrock. Failure occurs along bedding and/or joint planes. Slides can be initiated at shallow or considerable depths. Rock slides cover only **11.2 km²** (~1.4% of the total map area). They are found principally within the Mattson Formation, but also occur in the Toad Formation and the Tika unit. Their occurrence does not reflect any single structural control, and form both perpendicular and oblique to strike. Several rock slides have occurred where shallow-dipping (<20°) bedrock has been undercut by the Beaver River and other streams.*

***Rock Slumps** involve the rotational movement of bedrock along failure planes. Slumps may occur as individual blocks or amorphous masses (reflecting water content and structural integrity of the failing material). Slumps often extend progressively up-slope through time, and can be associated with active scarp or headwall retreat. Slumps can be initiated by failure along bedding or joint planes, by infiltration of surface water, through lateral incision and undercutting of slopes by streams, or excavation activities. Rock slumps cover **107.4 km²** (~13.9% of the total map area) and are the most extensive form of mass wasting in the map area (see Smith, 2002). Found in all of the different rock formations present in the 95C/02 map, they are particularly prominent in the upper Lower Mattson, lower Middle Mattson, upper Upper Mattson, and Toad Formation strata. Many slumps are clearly aligned perpendicular to strike, suggesting that they are generated by failure along bedding planes, possibly within shale or other poorly indurated beds. Elsewhere, slumps have, and continue to be generated by the undercutting of slopes by rivers. This is particularly evident along the Beaver River where many relict and active slumps are found. Diversion and/or temporary damming of the Beaver River by large slumps generated along the valley sides represents a considerable, albeit rare, hazard in this region.*

In attempting to discern where exactly slumps were initiated, it is important to recognize that the location of scarps does not neccessarily coincide with the geological/structural failure surface. Many of the slumps seen in this map involve considerable depths of material, indicating that the slumps are being triggered in strata underlying that exposed at the surface. This is well illustrated in the northwest sector of the map where slumps that extend upslope into the Scatter Formation were initiated by failure within the Garbutt Formation, and similarly, many slumps which extend upslope into the Toad Formation were likely generated by failure within the Fantasque Formation (or possibly within shales of the Grayling Formation, which if present in the map area, would be found immediately beneath the Toad Formation). The same type of associations are found throughout the Mattson Formation strata.

Scarps/headwalls bounding the lateral and upper margins of slumps within the Mattson Formation often display a marked orthogonal and/or rectilinear pattern. These patterns are strongly correlative with measured strike and joint orientations. Since jointing is particularly well-developed in sandstone beds of the Mattson Formation (as well as sandstone beds in other Formations), these structural associations likely contribute to regional mass wasting trends and the block-failure of bedrock. Retrogressive landslides which propagate upslope after initial bedrock failure, or when slumps are reactivated, are also likely to be strongly correlated with these structural associations.

Many bedrock slumps in the map area are classified as rotational-slumps and have a longitudinal profile which shows a steep slope in the upper third to two-thirds, an inflection, and then a more gentle slope through the lower reaches. This morphology reflects the failure of bedrock at depth, the backward and down-slope rotation of bedrock above the failure surface, and the run-out of slumped material downslope. In these cases, the inflection can be used to estimate where the bedrock failure surface was located. On a regional scale, in areas where bed strike and dip remain relatively constant, it may be possible to infer areas of potential future failure (and apply this to possible development considerations). An example of this would be in the upper Mattson Formation, in the southeast corner of the map, where a series of six different bedrock slumps are aligned roughly parallel to strike, with inflection points ranging from ~2800-3300 ft. above sea level. Intervening areas between the six existing slumps, aligned with this inflection trend, could be classified as having a higher risk of failure. Clearly, such a scheme is dependent on several assumptions including those of lateral bed continuity and compositional homogeneity. Regional drilling activities may ultimately be able to resolve these, by specifically identifying which bed is responsible for triggering the failures. This knowledge could then be applied to larger regional studies, tracing the same bed, and assessing the potential for failure for a given stratigraphic and topographic locale.

MAP SYMBOLS

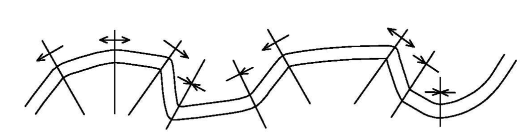
- *Landslide boundary*
- *Scarp*
- *Flowline*
- Geological boundary (defined, approximate, assumed)
- Nomenclature change
- Bedding (inclined, overturned); 60 60
- Joints 60
- Anticline (defined, approximate, assumed)
- Syncline (defined, approximate, assumed)
- Anticlinal kink fold (defined, approximate, assumed) (See diagram below)
- Synclinal kink fold (defined, approximate, assumed) (See diagram below)
- Overturned anticline (defined)
- Fault, thrust (known, approximate)
- Fault, unknown type (approximate) (U on upthrown side, D on downthrown side) D U

References:

Fallas, K.M., and Evenchick, C.A.
2002: Preliminary Geology of Mount Merrill (95C/02), Yukon Territory and British Columbia; Geological Survey of Canada, Open File 4264, scale 1:50 000.

Smith, I.R.
2002: Surficial Geology, Mount Merrill (95C/02), Yukon Territory - British Columbia; Geological Survey of Canada, Open File 4324, 1 map, scale 1:50 000.

FOLD SYMBOLOGY



Double arrows are used to indicate folds where the dip direction changes across the hinge, and single arrows are used where the dip direction remains the same across a hinge

Compilation by I.R. Smith, K.M. Fallas and C.A. Evenchick based on fieldwork and studies of vertical air photographs 1999, 2000, 2001.
THIS IS A PRODUCT OF THE CENTRAL FORELAND NATMAP PROJECT

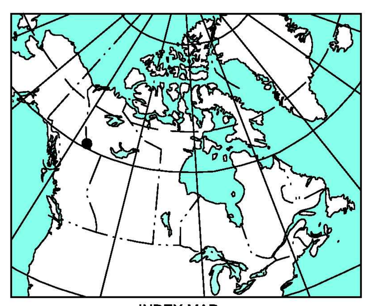
Surficial geology from field work by I.R. Smith 1999, 2000, 2001.

Bedrock geology from field work by K.M. Fallas and C. Evenchick 2001, with contributions from: A. Khudoley, R. Moore, P. Mortensen and A. Yanko.

Digital cartography by I.R. Smith, K.M. Fallas and S.J. Hinds.

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

Base map at the same scale published by Surveys and Mapping Branch in 1971.



INDEX MAP

CONTOUR INTERVAL 100 FEET
Elevations in Feet above Mean Sea Level
North American Datum 1983

OPEN FILE 4328

LANDSLIDES AND BEDROCK GEOLOGY ASSOCIATIONS
MOUNT MERRILL
YUKON TERRITORY - BRITISH COLUMBIA

Scale 1:50 000/Échelle 1/50 000

Kilometres 1 0 1 2 3 Kilomètres

Universal Transverse Mercator Projection — Projection transverse universelle de Mercator

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OPEN FILE
DOSSIER PUBLIC
4328
GEOLOGICAL SURVEY OF CANADA
COMMISSION GÉOLOGIQUE DU CANADA
2002

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Les dossiers publics sont des produits qui n'ont pas été soumis au processus officiel de publication de la CGC.

95C/06 Gold Pay Creek	95C/07 Brown Lake	95C/08 Babiche Mountain
95C/03 Mooney Creek	95C/02 Mount Merrill GSC OF 4328	95C/01 Mount Martin GSC OF 4335
94N/14 Beavercrow Mountain	94N/15 Crow River	94N/16 Beaver River

NATIONAL TOPOGRAPHIC SYSTEM REFERENCE AND INDEX TO ADJOINING GEOLOGICAL SURVEY OF CANADA OPEN FILE MAPS

Recommended citation:
Smith, I.R., Fallas, K.M., and Evenchick, C.A.
2002: Landslides and Bedrock Geology Associations, Mount Merrill (95C/02), Yukon Territory - British Columbia; Geological Survey of Canada, Open File 4328, 1 map, scale 1:50 000.

Canada