MARGINAL NOTES

PHYSIOGRAPHY AND DRAINAGE

The Apex Mountain map area is located in the central part of the Dawson Range. Apex Mountain is the highest summit reaching an elevation of 2000 m. Most of the summits in the map area are below 1600 m a.s.l. Upland topography changes from rounded summits throughout much of the southern half of the map area to more rugged terrain in the north part of the map area where the Dawson Range divide is located. Most of the map area is drained by the Klotassin River and Somme Creek (Fig. 1). A cluster of streams near Apex Mountain drain northward into the Selwyn River or Hayes Creek.

SURFICIAL GEOLOGY

The Apex Mountain map area is predominantly unglaciated with the exception of alpine glacier landforms that originated in the north-facing cirques of the Apex Mountain upland. The unglaciated surficial deposits consist of weathered bedrock colluvium, fluvial deposits, loess, and organic material. At the highest elevations, on summits and ridge tops, the surficial deposits consist of locally weathered bedrock that has undergone minimal gravitational transport. Eroded bedrock landforms, such as tors, are common, and cryoplanation terraces were observed in the central part of the map area (Fig. 2). Slope deposits consist of colluviated weathered bedrock veneers and blankets exhibiting textural properties reflecting the local bedrock lithologies. Valleys draining the uplands tend to be narrow and steep and contain coarse-grained fluvial deposits (Fig. 3). Aprons of colluviated loess may overlie floodplain deposits. The valleys of Klotassin River and Somme Creek are wider and contain meandering stream channels that are constricted by frozen tributary fluvial fans, colluvial aprons, and organic deposits (Fig. 1).

Alpine glacial deposits were mapped on the Apex Mountain upland in the northeast corner of the map area. The cirques are all north-facing and exhibit steep slopes that are mantled by blocky weathered bedrock (Fig. 4). Rolling moraine surfaces and outwash from at least three glaciations were mapped in the valleys downstream of the cirques (Fig. 5). The late Wisconsin McConnell advance was the least extensive glaciation and no Holocene glacial deposits were observed.

PERMAFROST

Evidence of permafrost was found at all elevations in the map area. Sorted stone polygons were identified on stable landscape on ridge tops, solifluction lobes were identified on the frozen colluviated loess way documented on the valley bottoms. Pingos were mapped at the headwaters of Somme Creek (Fig. 6).

DATA SOURCES

This surficial geology map was interpreted from high resolution digital stereo imagery (2.5 m panchromatic CartoSat-1 satellite data captured in 2007) and hard copy 1:40 000 scale aerial photographs flown in 1987 and 1989. Selective field checking was performed in June 2007 and July 2010.

Figure 1. A view to the west down the Klotassin River. Note how the tributary fluvial fans and colluvial aprons control the position of the modern river. The vegetation productivity is controlled by permafrost in the valley bottom. Well-drained permafrost-free areas near the active river channels support while spruce forests whereas the permafrost affected soils support minimal tree growth on the valley bottom (light green areas).

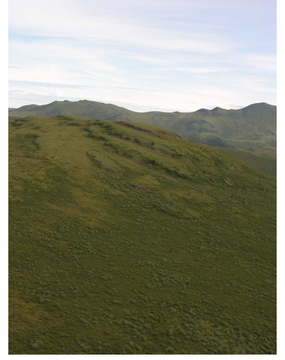

Figure 2. Cryoplanation terraces form by periglacial weathering along joints, beds, and/or contacts in the bedrock. These landforms are indicative of unglaciated terrain.

Figure 3. Coarse-grained fluvial deposits, like these shown in upper Somme Creek, are common in many of the headwater streams within the map area. The view is to the north.

Figure 4. An oblique aerial view of a McConnell cirque on Apex Mountain. The walls of the cirque are mantled by coarse weathered bedrock, which contrast with the moraine deposits in valley bottom that contain a sandy matrix. A tarn is present within the cirque.

Figure 5. A view to the northwest across the late Wisconsin McConnell terminal moraine. The moraine texture consists of 30% coarse silty sand matrix and 70% pebbles and cobbles. The isolated nature of this former glacial advance is apparent by the presence of tors on nearby ridges.

Figure 6. An open-system pingo at the headwaters of Somme Creek valley (10PL066). A person is circled for scale.

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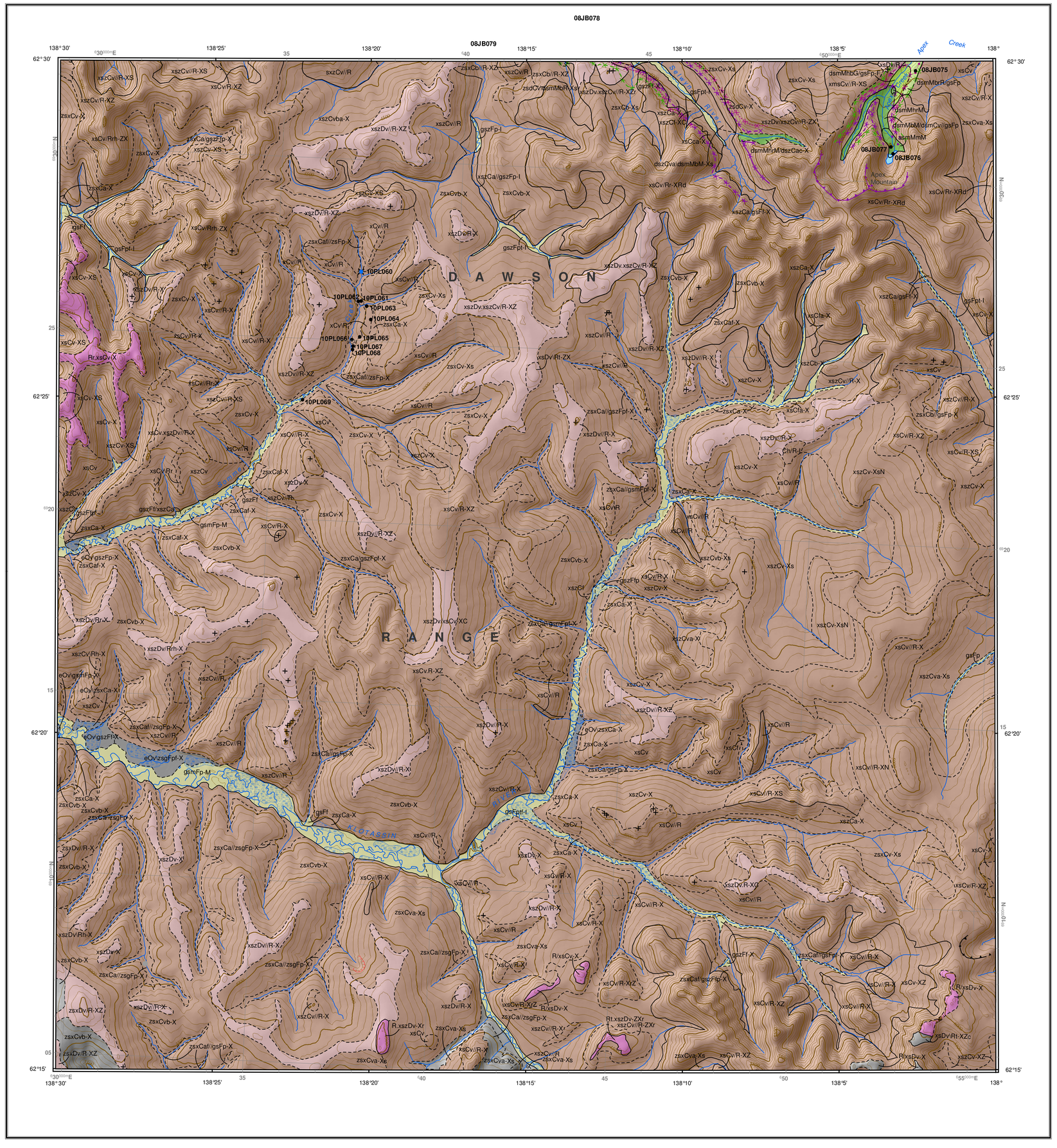

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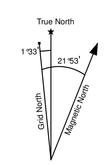
FIVE THOUSAND METRE GRID
Universal Transverse Mercator Projection
North American Datum 1983
Zone 7

CONTOUR INTERVAL 100 FEET
Elevations in feet above Mean Sea Level

SURFICIAL GEOLOGY
APEX MOUNTAIN
YUKON 115J/08

SCALE 1:50 000

0 1 2 3 4 5
kilometres



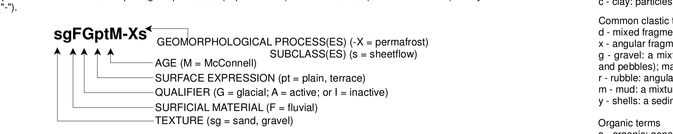
Use diagram only to obtain numerical values
APPROXIMATE MEAN DECLINATION NOVEMBER 2011
FOR CENTRE OF MAP

115J/10 COLORADO CREEK open file 2012-2	115J/09 SELWYN RIVER open file 2012-1	115I/12 WOLVERINE CREEK GSC map 1877A
115J/07 MOUNT PATTISON open file 2013-11	115J/08 APEX MOUNTAIN open file 2013-12 MAP LOCATION	115I/05 PROSPECTOR MOUNTAIN GSC map 1876A
115J/02 ONION CREEK open file 2013-8	115J/01 KLAZA RIVER open file 2013-7	115I/04 FALSE TEETH CREEK GSC map 1876A

TERRAIN CLASSIFICATION SYSTEM

This surficial geology map was classified using the Terrain Classification System for British Columbia (Howes and Kenk, 1997), with minor modification to meet standards set by the Yukon Geological Survey. For example, we have added some permafrost process subclasses to accommodate the wider variety of permafrost features found in Yukon. We have also added an age classification to distinguish materials deposited during different Pleistocene glaciations.

A sample map unit label is shown below to illustrate the terrain classification system. Surficial materials form the core of the polygon map unit labels and are symbolized with a single upper case letter. Lower case textures are written to the left of the surficial material, and lower case surface expressions are written to the right. An upper case activity qualifier (A = active; I = inactive) may be shown immediately following the surficial material designator. The glacial qualifier "G" may alternatively be written immediately following the surficial material to indicate glacially modified materials. Age is indicated by a capital letter that follows the surface expression but precedes the process modifiers. Geomorphological processes (capital letters) and subclasses (lower case letters) always follow a dash symbol ("-").



COMPOSITE SYMBOL DELIMITERS:

Due to scale limitations, up to 4 terrain units may be included in a single map unit label (e.g. sgFGptM,dsmMbMlxsCv/czLGpM-XsV). Each component is separated by a delimiter that indicates relative proportions between the components (".", "/", "//") or a stratigraphic relationship ("\").

"." - terrain units on either side of the symbol are of approximately equal proportion
"/" - terrain unit(s) before the symbol is more extensive than the one(s) following
"//" - terrain unit(s) before the symbol is considerably more extensive than the one(s) following
"\" - terrain unit(s) before the "\" symbol stratigraphically overlies the one(s) following

1st terrain unit >50% of map unit / 2nd terrain unit 20-49% of map unit // 3rd terrain unit 10-19% of map unit \ Underlying terrain unit

SURFICIAL MATERIALS

Surficial materials are non-lithified, unconsolidated sediments. They are produced by weathering, sediment deposition, biological accumulation, human and volcanic activity. In general, surficial materials are of relatively young geological age and they constitute the parent material of most (pedological) soils. Note that a single polygon will be coloured only by the dominant surficial material, but other materials may exist in that unit.

HOLOCENE

O — Organic: Organic deposits are accumulations of vegetative matter thicker than 1 m. They are commonly found in floodplains, areas of near-surface permafrost such as north-facing slopes, and locations where there is poor drainage. Thin veneers of organic material are widespread and generally unmapped. Organic material in the map area commonly consists of peat with fibric to mesic decomposition.

E — Eolian: Sediment transported and deposited by wind. The dominant eolian sediment in the map area is loess, which is predominantly silty in texture with a smaller fraction of fine sand. Loess veneers and blankets were deposited over the landscape during the last (McConnell) glaciation. On stable sites, the loess is intact, whereas in cryoturbated or colluviated areas, the loess is reworked into the soil profile and its presence is indicated by the "z" textural symbol. Resedimented loess is a major component of colluvial aprons in the area. Ice-rich permafrost is common within low-lying eolian sediments.

C — Colluvium: Material transported and deposited by down-slope, gravity-driven processes such as creep, solifluction, landslides and snow avalanches. Colluvium is the dominant surficial material in the region as most of the area escaped Pleistocene glaciation. It commonly has a stratified structure with a highly variable texture and composition controlled by the parent material, transport mechanism and travel distance. Colluvium on uplands and slopes is generally derived from weathered bedrock and loess, resulting in a silt-rich diamicton containing angular, local bedrock clasts. On steeper slopes colluvium is generally coarser grained, as it has been deposited by rapid mass wasting processes such as rock fall, debris flows and avalanches. Slower processes such as sheetwash, solifluction and creep occur on gentler slopes and produce finer grained colluvium. Colluvial aprons found on lower slopes are commonly ice-rich and are primarily composed of resedimented loess and peat.

F — Fluvial: Sediments transported and deposited by modern streams and rivers, found in floodplains, fans and terraces. Fluvial deposits typically consist of well-sorted stratified sand and gravel comprising sub-angular to rounded clasts. In unglaciated regions, low order streams are confined to very narrow V-shaped valleys and their fluvial deposits are generally not mapped due to scale limitations; their sediments, however, are more coarse grained and more locally derived than in higher order streams. Active fluvial (FA) materials are subject to regular flooding.

FA — Glaciofluvial: Sediments transported and deposited by glacial meltwater above, in, below, or adjacent to a glacier. Glaciofluvial materials are deposited in meltwater channels, eskers, plains, terraces, kames and deltas. Sediments consist of moderately to well-sorted, rounded, stratified sand and gravel, although the nature and texture may vary locally depending on transport distance. Near surface ground ice is generally absent in glaciofluvial deposits unless there is a poorly drained underlying unit present.

FG^{M} — LATE WISCONSIN - MCCONNELL (*M*)

FG^{LM} — PRE-LATE WISCONSIN - MCCONNELL (>*M*)

FG^{I} — ILLINOIAN - REID (*R*)

FG^{IR} — EARLY PLEISTOCENE - PRE-REID (>*R*)

Morainal: Morainal (till) materials are diamicts deposited by either: primary glacial processes such as lodgement, deformation and melt-out (ablation); or secondary glacial processes caused by gravity and water. Therefore, this term applies to all types of till including flow tills, which are not directly deposited by glacial ice. Ablation tills are relatively coarse grained and tend to have a hummocky or rolling surface expression; lodgement tills typically have a finer grained matrix with fewer clasts and a smoother surface expression. Tills are generally colluviated when found on slopes. Permafrost is widespread within morainal deposits. As most of the region is unglaciated, morainal sediments are rare in the map area. Even in upland areas that show evidence of alpine glaciation, no morainal sediments remain as they have likely been buried in colluvium and/or modified by intense periglacial and colluvial processes.

M^{M} — LATE WISCONSIN - MCCONNELL (*M*)

M^{LM} — PRE-LATE WISCONSIN - MCCONNELL (>*M*)

M^{G} — EARLY WISCONSIN - GLADSTONE (*G*)

M^{I} — ILLINOIAN - REID (*R*)

M^{IR} — EARLY PLEISTOCENE - PRE-REID (>*R*)

LG — Glaciolacustrine: Stratified sand, silt and clay deposited in a lake that formed on, in, under or beside a glacier; may contain dropstones (ice-rafted clasts). Ice-rich permafrost and thermokarst erosion is widespread in these deposits as they are generally poorly drained with high *in situ* moisture contents that promote the growth of massive ice lenses. Glaciolacustrine sediments are rarely exposed in the region.

PRE-QUATERNARY

R — Bedrock: This portion of the Dawson Range is primarily composed of upper Cretaceous volcanic lithologies (Carmacks Group and Open Creek Volcanics), including tuff, porphyry, breccia, dacite and/or basalt. Early Jurassic Aishihik Suite plutons occur in the southern portion of the map sheet, while Lower Eocene Skukum volcanics occur south of Somme Creek. Mid-Cretaceous Dawson Batholith granodiorite (Whitehorse Suite) is also extensive in the southwest and northeast corners of the map sheet (Gordey and Makepeace, 2003).

D — Weathered bedrock: bedrock decomposed or disintegrated *in situ* by processes of chemical and/or mechanical weathering, such as freeze-thaw. Weathered bedrock is common on unglaciated uplands, especially along ridge tops and near tors. The material texture is coarse grained and sandy where derived from plutonic bedrock, although a silty component may be present due to incorporation of loess by cryoturbation.

SYMBOLS

GEOLOGICAL BOUNDARIES:
- defined
- approximate
- assumed

AGE OF GLACIAL FEATURES:
- McConnell (M) - late Wisconsin
- Gladstone (G) - early Wisconsin
- Reid (R) - Illinoian
- Pre-Reid (>R) - early to middle Pleistocene
- age unspecified

GLACIAL FEATURES:
- moraine ridge
- meltwater channel
- cirque
- arete

GLACIAL LIMITS:
- defined
- approximate
- assumed

OTHER LINEAR FEATURES:
- escarpment
- lineation (fault, joint, tension crack)
- sand dunes
- strandline

TOPOGRAPHIC FEATURES:
- contours
- streams
- trails
- wetlands

GROUND OBSERVATION SITES:
(labelled with site number, e.g. 10JB004)
- field station
- stratigraphic section
- radiocarbon sample
- cosmogenic sample
- heavy mineral sample
- erratic, unspecified age
- erratic, Gladstone
- erratic, Reid
- no erratics found

OTHER SURFACE FEATURES:
- open system pingo; uncollapsed, collapsed
- tor
- drumlin (coloured by glacial age)
- cryoplanation terrace
- kettle
- landslide, active layer detachment
- palsa
- thermokarst pond
- placer mine
- Yukon mineral occurrence

TEXTURE

Texture refers to the size, shape and sorting of particles in clastic sediments, and the proportion and degree of decomposition of plant fibre in organic sediments. Texture is indicated by up to three lower case letters, placed immediately before the surficial material designator, listed in order of decreasing abundance.

Specific clastic textures
a - blocks: angular particles >256 mm in size
b - boulders: rounded particles >256 mm in size
k - cobbles: rounded particles >64 - 256 mm in size
p - pebbles: rounded particles >2 - 64 mm in size
s - sand: particles between >0.0625 - 2 mm in size
z - silt: particles 2 µm - 0.0625 mm in size
c - clay: particles ≤2 µm in size

Common clastic textural groupings
d - mixed fragments: a mixture of rounded and angular particles >2 mm in size
x - angular fragments: a mixture of angular fragments >2 mm in size (*i.e.*, a mixture of blocks and rubble)
g - gravel: a mixture of two or more size ranges of rounded particles >2 mm in size (*e.g.*, a mixture of boulders, cobbles and pebbles); may include interstitial sand
r - rubble: angular particles between 2 and 256 mm; may include interstitial sand
m - mud: a mixture of silt and clay; may also contain a minor fraction of fine sand
y - shells: a sediment consisting dominantly of shells and/or shell fragments

Organic terms
o - organic: general organic materials
e - fibric: the least decomposed of all organic materials; it contains amounts of well-preserved fibre (40% or more) that can be identified as to botanical origin upon rubbing
u - mesic: organic material at a stage of decomposition intermediate between fibric and humic
h - humic: organic material at an advanced stage of decomposition; it has the lowest amount of fibre, the highest bulk density, and the lowest saturated water-holding capacity of the organic materials; fibres that remain after rubbing constitute less than 10% of the volume of the material

SURFACE EXPRESSION

Surface expression refers to the form (assemblage of slopes) and pattern of forms expressed by a surficial material at the land surface. This three-dimensional shape of the material is equivalent to 'landform' used in a non-genetic sense (*e.g.*, ridges, plain). Surface expression symbols also describe the manner in which unconsolidated surficial materials relate to the underlying substrate (*e.g.*, veneer). Surface expression is indicated by up to three lower case letters, placed immediately following the surficial material designator, listed in order of decreasing extent.

a - apron: a wedge-like slope-toe complex of laterally coalescent colluvial fans and blankets. Longitudinal slopes are generally less than 15° (26%) from apex to toe with flat or gently convex/concave profiles

b - blanket: a layer of unconsolidated material thick enough (>1 m) to mask minor irregularities of the surface of the underlying material, but still conforms to the general underlying topography; outcrops of the underlying unit are rare

c - cone: a cone or sector of a cone, mostly steeper than 15° (26%); longitudinal profile is smooth and straight, or slightly concave/convex; typically applied to talus cones

f - fan: sector of a cone with a slope gradient less than 15° (26%) from apex to toe; longitudinal profile is smooth and straight, or slightly concave/convex

h - hummock: steep sided hillock(s) and hollow(s) with multidirectional slopes dominantly between 15-35° (26-70%) if composed of unconsolidated materials, whereas bedrock slopes may be steeper; local relief >1 m; in plan, an assemblage of non-linear, generally chaotic forms that are rounded or irregular in cross-profile; commonly applied to knob-and-kettle glaciofluvial terrain

l - delta: landform created at the mouth of a river or stream where it flows into a body of water; gently sloping surfaces between 0-3° (0-5%), and moderate to steeply sloping fronts between 16-35° (27-70%); glaciofluvial deltas in the map area are typically coarse-grained with steep sides and gently inclined kettled or channeled surfaces

m - rolling: elongate hillock(s); slopes dominantly between 3-15° (5-26%); local relief >1 m; in plan, an assemblage of parallel or sub-parallel linear forms with subdued relief (commonly applied to bedrock ridges and fluted or streamlined till plains)

p - plain: a level or very gently sloping, unidirectional (planar) surface with slopes 0-3° (0-5%); relief of local surface irregularities generally <1 m; applied to (glacio)fluvial floodplains, organic deposits, lacustrine deposits and till plains

r - ridge: elongate hillock(s) with slopes dominantly 15-35° (26-70%) if composed of unconsolidated materials; bedrock slopes may be steeper; local relief is >1 m; in plan, an assemblage of parallel or sub-parallel linear forms; commonly applied to drumlinized till plains, eskers, morainal ridges, crevasse fillings and ridged bedrock

t - terrace: a single or assemblage of step-like forms where each step-like form consists of a scarp face and a horizontal or gently inclined surface above it; applied to fluvial and lacustrine terraces and stepped bedrock topography

v - veneer: a layer of unconsolidated materials too thin to mask the minor irregularities of the surface of the underlying material; 10 cm - 1m thick; commonly applied to eolian/loess veneers and colluvial veneers

GEOMORPHOLOGICAL PROCESSES

Geomorphological processes are natural mechanisms of weathering, erosion and deposition that result in the modification of the surficial materials and landforms at the earth's surface. Unless a qualifier (A (active) or I (inactive)) is used, all processes are assumed to be active, except for deglacial processes. Up to three upper case letters may be used to indicate processes. These are listed in order of decreasing importance and placed after the surface expression symbol, following a dash (-) symbol.

Subclasses are used to provide more specific information about a general geomorophological process, and are represented by lower case letter(s) placed after the related process designator. Up to two subclasses can be associated with each process. Process subclasses used on this map are defined with the related process below.

EROSIONAL PROCESSES

V - gully erosion: running water, mass movement and/or snow avalanching, resulting in the formation of parallel and sub-parallel, long, narrow ravines

FLUVIAL PROCESSES

B - braiding channel: active floodplain consists of many diverging and converging channels separated by unvegetated bars

I - irregularly sinuous channel: a clearly defined main channel displaying irregular turns and bends without repetition of similar features; backchannels may be common, and minor side channels and a few bars and islands may be present, but regular and irregular meanders are absent

J - anastamosing channel: a channel zone where channels diverge and converge around many islands. The islands are vegetated and have surfaces that are far above mean maximum discharge levels

M - meandering channel: a clearly defined channel characterized by a regular and repeated pattern of bends with relatively uniform amplitude and wave length

MASS MOVEMENT PROCESSES

F - slow mass movements: slow downslope movement of masses of cohesive or non-cohesive surficial material and/or bedrock by creeping, flowing or sliding

L - mass movement with an unspecified rate

R - rapid mass movements: rapid downslope movement by falling, rolling, sliding or flowing of dry, moist or saturated debris derived from surficial material and/or bedrock

Subclasses: (b) rockfall; (d) debris flow; (g) rock creep; (s) debris slide; (u) slump in surficial material

PERIGLACIAL PROCESSES

C - cryoturbation: movement of surficial materials by heaving and/or churning due to frost action (repeated freezing and thawing)

S - solifluction: slow gravitational downslope movement of saturated non-frozen overburden across a frozen or otherwise impermeable substrate

X - permafrost processes: processes controlled by the presence of permafrost, and permafrost aggradation or degradation

Z - general periglacial processes: solifluction, cryoturbation and nivation, possibly occuring in a single polygon

Subclasses: (e) thermokarst erosion; (f) thaw flow slides; (l) segregated ice; (n) pingo; (t) thermokarst subsidence; (r) patterned ground; (s) sheetwash; (w) ice-wedge polygons

DEGLACIAL PROCESSES

E - channeled by meltwater: erosion and channel formation by meltwater alongside, beneath, or in front of a glacier

H - kettled: depressions in surficial materials resulting from the melting of buried glacier ice

T - ice contact: landforms that developed in contact with glacier ice such as kames

SURFICIAL MATERIAL AGE

GLACIATION	TIME PERIOD	APPROXIMATE GLACIAL MAXIMUM	MARINE ISOTOPE STAGE
M - McConnell	late Wisconsin	15 000 years ago	2
G - Gladstone	early Wisconsin	55 000 years ago	4
R - Reid	Illinoian	130 000 years ago	6
>R - Pre-Reid	early to Middle Pleistocene	2.6 million to 200 000 years ago	8-102

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RECOMMENDED CITATION

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

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Yukon Geological Survey
Energy, Mines and Resources
Government of Yukon

Open File 2013-12

Surficial Geology of Apex Mountain (NTS 115J/08) Yukon (1:50 000 scale)

by

Panya S. Lipovsky and Jeffrey D. Bond