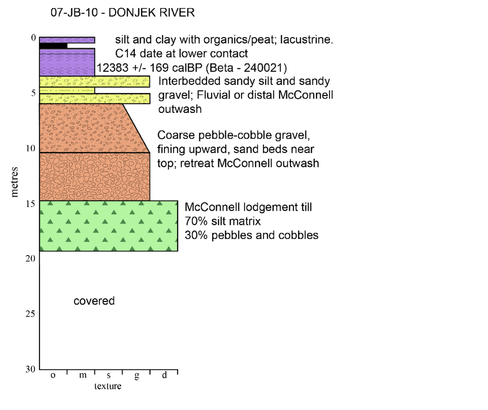

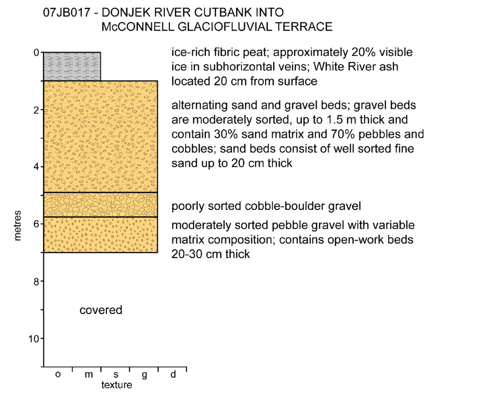

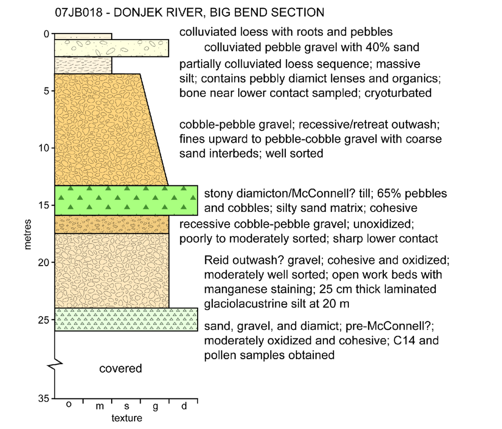

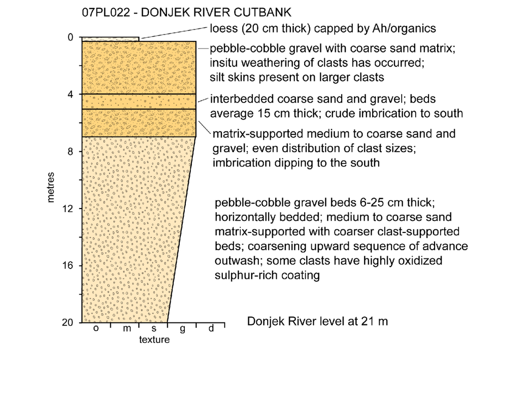

MARGINAL NOTES

PHYSIOGRAPHY AND DRAINAGE

Mackinnon Creek map area lies at the northwest end of the Nisling Range and is a glacially dissected upland interspersed with broad valleys. The highest summit in the map area is an unnamed mountain in the southeast (1550 m elevation). The lowest elevation, 609 m, occurs near the north of the map area on the Donjek River. Drainage in the map area is controlled by the Donjek River that flows northward through the western half of the map area. Small tributaries, including Mackinnon Creek, drain into the Donjek River from adjoining glaciated valleys and slopes. Grayling Creek is a large creek that flows along the eastern edge of the map area through an area of unglaciated terrain. Numerous small lakes are present in the map area in ice stagnation terrain adjacent to the Donjek River.

SURFICIAL GEOLOGY

Mackinnon Creek map area was predominantly glaciated with the exception of unglaciated terrain along the eastern margin. The unglaciated surficial deposits consist of weathered bedrock colluvium, fluvial deposits, aeolian deposits, 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. Slope deposits consist of colluviated weathered bedrock veneers and blankets that have textural properties reflecting the local bedrock lithologies. Aeolian additions into the soil profiles may be significant because of the areas proximity to the Donjek River floodplain.

The map area lies at the northern limit of glaciation by the Cordilleran Ice Sheet. Three glacial limits have been mapped and are correlated with the Reid (120 ka), Gladstone (60 ka) and McConnell (15 ka) glaciations. The ice extent was greatest during the Reid glaciation and least extensive during the McConnell glaciation. In the MacKinnon Creek valley, approximately 5 km separates the Reid and McConnell glacial limits. The St. Elias lobe of the Cordilleran Ice Sheet entered the map area from the south through the Donjek River valley. The terminus of the ice sheet is located just north of the map area and therefore the ice sheet was relatively thin and topographically controlled. Based on cosmogenic dates on erratics, to the southeast of the map area, McConnell deglaciation was initiated between 13,740 ± 500 years B.P. and 14,620 ± 800 years B.P (Bond and Lipovsky, 2009). An exposure on the Donjek River (07-JB-10) provided additional chronological control on deglaciation (see stratigraphic log above) where post-glacial outwash gravel and sand, deposited by the retreating ice sheet is capped by silt-rich early Holocene organics. A date from the organic – sand content yielded an age of 12,383 ±169 cal B.P. (Beta – 240021). This indicates that the ice had retreated and importantly, post-glacial revegetation of the floodplain had started by this time.

Glacial deposits such as moraine and glaciofluvial gravel are widespread within the limits of glaciation. Good exposures of till and outwash gravel are exposed along in the Donjek River valley (Fig. 1) and are described in the stratigraphic logs above. In addition to deposition, erosional features from the ice sheet and its meltwater are common. Glacially sculpted bedrock is present on the low upland that separates the Donjek River and Mackinnon Creek. Significant meltwater erosion also occurred when ice in the Donjek River valley disrupted drainages entering the map area from the east. Prior to the Reid glaciation, Grayling creek drained east and into the Donjek River. These drainages were diverted northward during the Reid glaciation and were forced to cut new channels through the unglaciated upland on the east side of the map area. The resulting channel is an impressive example of glaciofluvial erosion caused by ice diversion (Fig. 2). Reconnaissance placer exploration was completed in the diversion channel and is discussed below.

Drainage obstructions also occurred in the Donjek River valley. A belt of hummocky stagnation moraine is present in the southwest corner of the map area near the confluence of Mackinnon Creek and the Donjek River. The moraine caused the Donjek River to swing northeastward around the relatively high valley bottom moraine-related topography. This landform indicates there was a stand-still in the recession and therefore active frontal retreat of the ice sheet. Glaciolacustrine sediments were mapped on the west-bank of the Donjek River upstream of the moraine, which suggests a temporary sediment dammed lake existed after the ice retreated from the stand-still location.

Holocene and modern sedimentation is primarily associated with fluvial sedimentation in creeks and rivers. Colluviation is also on-going on slopes and is expedited by permafrost processes such as cryoturbation and solifluction.

PERMAFROST

Evidence of permafrost is found at all elevations in the map area. Periglacial features such as frost boils and solifluction is noted above tree-line whereas frozen ground is noted in morainal and glaciofluvial sediments near the valley bottoms.

PLACER POTENTIAL

The placer potential of the area is associated with Grayling Creek (Bond *et al*., 2008). Potential Tertiary or early Pleistocene benches were mapped to the east. While these deposits have not been sampled directly, the modern floodplain, which is eroded into the benches does contain placer gold. In Mackinnon Creek map area however, Grayling Creek is not in its ancestral channel. The ancestral channel was either eroded or buried by ice flowing east up Mackinnon Creek during all three of the glaciations. It is unknown whether the ancestral channel is preserved or can be found near surface in the map area.

The glacially diverted portion of Grayling Creek is a placer prospect. The placer gold could be sourced from three different areas: 1) fluvial/glaciofluvial erosion of the upstream (Tertiary?) benches; 2) glacial transport of ancestral channel sediments into the diversion channel by ice or meltwater processes; and 3) erosion of local gold-bearing rock within the diversion channel. The eroded rocks within the channel consist of Cretaceous to Tertiary Donjek volcanics, which are considered prospective gold-bearing rock (Murphy *et al*., 2007). Gold colours were panned from the diversion channel and it is expected that certain reaches of the channel are relatively shallow to bedrock.

HEAVY MINERAL SAMPLES - GOLD RESULTS

Site Number	Location (UTM Zone 7, NAD 83)	Type	Results
08JB088	576276 E / 6895462 N	sluice (7.5 gallons)	3 small gold colours
08JB089	575472 E / 6886297 N	sluice (7.5 gallons)	no gold observed
08JB090	576123 E / 6890615 N	sluice (7.5 gallons)	6 gold colours
08JB095	576587 E / 6890376 N	sluice (7.5 gallons)	no gold observed

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 1989.* Selective field checking was performed in June 2007 and July 2008.

*National Air Photo Library photographs A27479: 57-65, 75-82, 128-136, 171-179.

Figure 1. An exposure on the Donjek River showing distal McConnell glaciofluvial gravel (see 07PL022). This gravel unit overlies a higher energy gravel containing rounded cobbles and boulders that were likely deposited by a proximal ice sheet.

Figure 2. A view upstream of Grayling Creek. This channel was eroded during the Reid glaciation when ice forced Mackinnon Creek to cut a new channel through the upland. The narrow channel and steep slopes are indicative of an immature valley. Gold grains were panned in this section of Grayling Creek and were probably transported to this reach from the unglaciated upper portions of the drainage.

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Howes, D.E. and Kenk, E., 1997. Terrain classification system for British Columbia, Version 2. B.C. Ministry of Environment and BC Ministry of Crown Lands, Victoria, BC.

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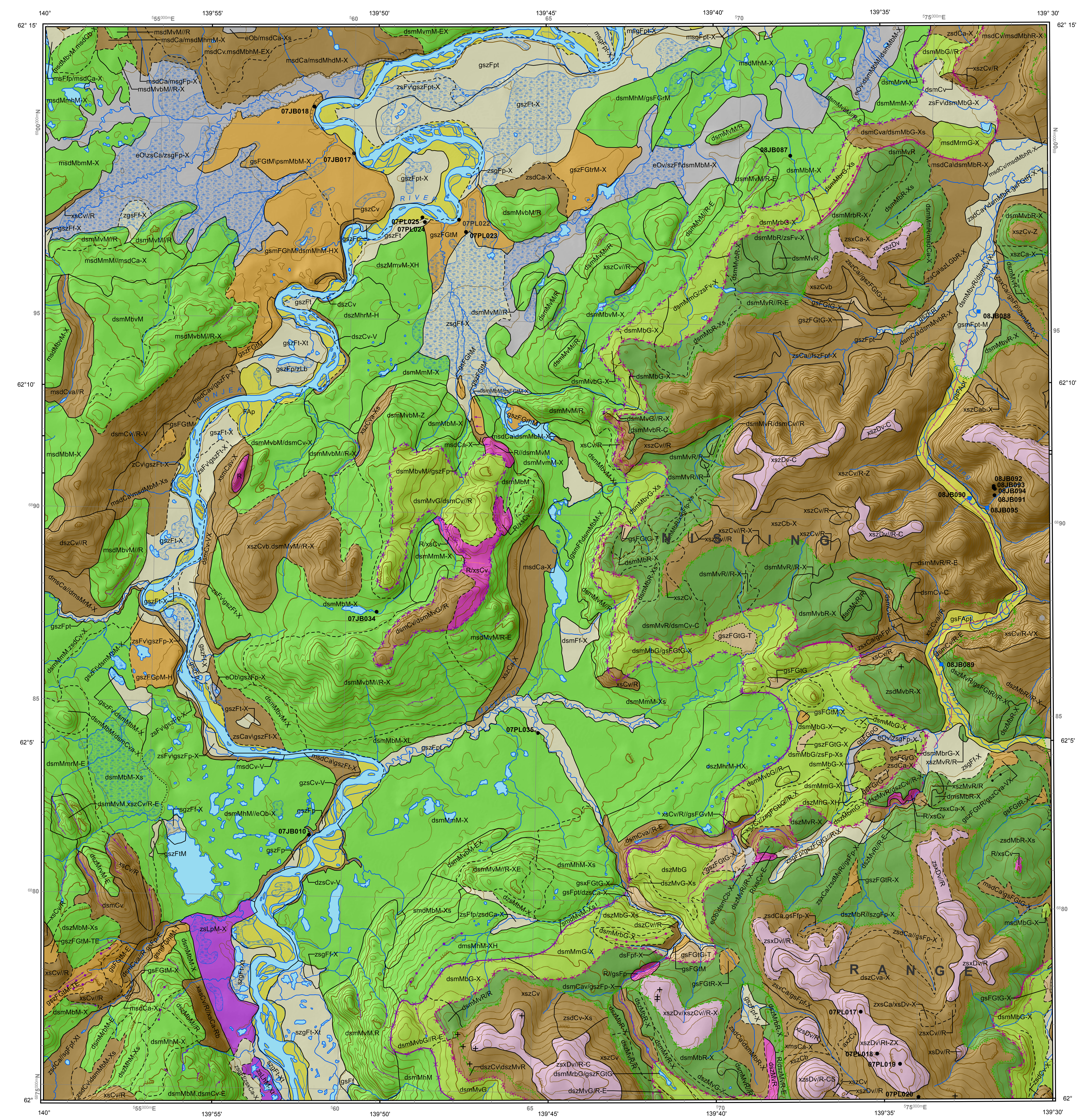
Murphy, D.C., van Staal, C. and Mortensen, J.K., 2008. Windy McKinley terrane, Stevenson Ridge area (115JK), western Yukon: composition and proposed correlations, with implications for mineral potential. *In*: Yukon Exploration and Geology 2007, D.S. Emond, L.R., Blackburn, R.P. Hill and L.H. Weston (eds.), Yukon Geological Survey, p. 225-235.



1:50 000 scale topographic base data produced by CENTRE FOR TOPOGRAPHIC INFORMATION, NATURAL RESOURCES CANADA

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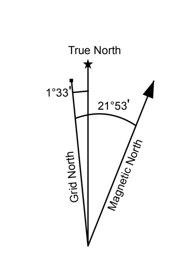
FIVE THOUSAND METRE GRID
Universal Transverse Mercator Projection
North American Datum 1983
Zone 7

CONTOUR INTERVAL 100 FEET
Elevations in feet above Mean Sea Level

SURFICIAL GEOLOGY
MACKINNON CREEK
YUKON 115J/04

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

115K/08 SNAG CREEK GSC map 5-1978	115J/05 WELLESLEY LAKE open file 2013-9	115J/06 open file 2013-10
115K/01 SANPETE CREEK GSC map 5-1978	115J/04 MACKINNON CREEK open file 2015-4 MAP LOCATION	115J/03 open file 2015-5
115F/16 KOIDERN GSC map 7-1978	115G/13 TOM MURRAY CREEK GSC map 7-1978	115G/14 TOSHINGERMANN LAKES open file 2009-45

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 accomodate 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 ("-").

sgFGptM-Xs

- GEOMORPHOLOGICAL PROCESS(ES) (-X = permafrost)
- SUBCLASS(ES) (s = sheetflow)
- AGE (M = McConnell)
- SURFACE EXPRESSION (pt = plain, terrace)
- QUALIFIER (G = glacial; A = active; or I = inactive)
- SURFICIAL MATERIAL (F = fluvial)
- TEXTURE (sg = sand, gravel)

COMPOSITE SYMBOL DELIMITERS:

Due to scale limitations, up to 4 terrain units may be included in a single map unit label (e.g. sgFGptM.dsmMbM/xsCv\zcLGpM-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 (30-49% of map unit) // 3rd terrain unit (10-29% 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, FA — 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.

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)
- $FG^{>M}$ — PRE-LATE WISCONSIN - MCCONNELL (>M)
- FG^{R} — ILLINOIAN - REID (R)
- $FG^{>R}$ — 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. Widespread moraine is present in the Donjek River valley. Permafrost is common in silt-rich morainal deposits.

- M^{M} — LATE WISCONSIN - MCCONNELL (M)
- $M^{>M}$ — PRE-LATE WISCONSIN - MCCONNELL (>M)
- M^{G} — EARLY WISCONSIN - GLADSTONE (G)
- M^{R} — ILLINOIAN - REID (R)
- $M^{>R}$ — 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 exposed along the Donjek River in the southwest corner of the map.

PRE-QUATERNARY

R — Bedrock: The northern portion of this map sheet is underlain by Cretaceous-Tertiary Donjek volcanics (dacite). Devonian-Mississippian carbonaceous muscovite-quartz phyllite or schist and quartzite of the Yukon-Tanana terrane occur in the headwaters of Grayling Creek and near the mouth of Mackinnon Creek. Bedrock in the southern portion of the map sheet is comprised of Devonian-Mississippian Yukon- Tanana terrane psammitic schist and early Cretaceous biotite granite (Murphy *et al*., 2007, 2008).

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
- 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; longtitudinal 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 - 1 m 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	60 000 years ago	4
R - Reid	Illinoian	120 000 years ago	6
>R - Pre-Reid	early to Middle Pleistocene	2.6 million to 200 000 years ago	8-102

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