GEOLOGICAL SURVEY OF CANADA
DEPARTMENT OF ENERGY, MINES AND RESOURCES

EXPLANATION OF LANDFORM UNIT NOTATIONS

Compositional-Genetic Category — Age Modifier; Process or Form Modifier; Textural Modifier — Morphologic Modifier(s)

Stratigraphic relationship given where thickness of upper unit is irregular and where underlying unit is a known compositional-genetic unit other than bedrock.

Compositional-Genetic Categories[1]

A- Alluvial Deposits: sand and gravel with veneer of fine sediment; Postglacial, rarely older; floodplain (Ap), modern.

C- Colluvium: various materials, mainly rubble, includes landslides (L); undifferentiated Pleistocene in age; talus aprons (Ca), Neoglacial, mainly modern.

D- Drift: undifferentiated till, sand, gravel, and lacustrine sediment; Late Wisconsinan (Macauley).

E- Eolian Deposits: sand, silt; Postglacial.

G- Glaciofluvial Deposits: sand and gravel with veneer of fine sediment; Late Wisconsinan (Macauley).

I- Ice; snow and firn veneer; Neoglacial.

L- Lacustrine Deposits: mainly silt and clay with little fine sand; Late Wisconsinan (Macauley).

M- Morainal Deposits: till, silty/sandy, Late Wisconsinan (Macauley); ice-cored moraines and debris-covered glaciers (M/I) and rock glaciers, rubble, Neoglacial.

O- Organic Deposits: peat, muck, organic silt; Postglacial

R- Bedrock: various types; pre-Pleistocene.

Age Modifier

A- Modern
N- Neoglacial
P- Postglacial
L- Late Wisconsinan (Macauley)
2- Early Wisconsinan or Illinoian (Mirror Creek)

CHRONOLOGY

MODERN
NEOGLACIAL
2800 years B.P. _____ POSTGLACIAL
HYPSITHERMAL
8700 years B.P. _____
EARLY POSTGLACIAL
12 500 years B.P. _____
MACAULEY GLACIATION — LATE WISCONSINAN
29 500 years B.P. _____
NONGLACIAL INTERVAL(S) — EARLY WISCONSINAN or ILLINOIAN
MIRROR CREEK GLACIATION

Textural Modifiers

a- sand or gravel; a*- till containing a high proportion of sand, gravel, rubble, or boulders
b- boulders, blocks, bouldery
c- clay, clayey
f- silt, clay, and fine sand; commonly with high organic content
g- gravel, gravelly
r- rubble; predominantly sand to boulder-sized fragments
s- sand, sandy
t- till, compact; low stone content (clasts greater than 2.5 cm diameter)
x- interbedded coarse textured and fine textured material

Process or Form Modifiers

A- active alluviation
G- channelled by meltwater
P- pitted (kettle holes)
T- thermokarst
V- gullied

Morphologic Modifiers

a- apron
b- blanket[2]
c- castled outcrop
d- delta
f- fan
h- hummocky
m- undulating, rolling
n- nondescript slope, bedrock controlled
p- plain, floodplain
r- ridge, ridged
s- steep slope (greater than 35°), cliff
t- terrace, terraced
v- veneer[3]
1- gentle to moderate slope (5–15°)
2- moderate to steep slope (15–30°)

[1] General descriptions of texture and age are given for each category; only where texture and age differ from the general description are texture and age modifiers used.

[2] Blanket indicates category forms nearly continuous cover greater than 1 m thick, generally 0.5 to 3 m thick, over underlying unit.

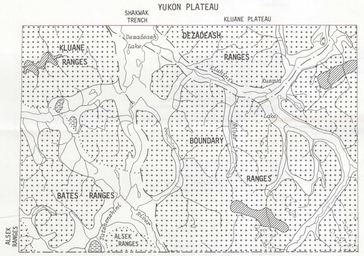
[3] Veneer indicates category forms broken thin cover, usually less than 1 m thick, but averaging 0.5 m thick, over underlying unit.

Geological boundary (defined, approximate, assumed)
Bedrock outcrop
Castled bedrock outcrop
Fault scarp, postglacial
Rock drumlin, crag and tail, fluted bedrock
Glacially scoured bedrock hillock
Drumlin, fluted till
Esker
Kame
Kame terrace
Pits (kettle holes)
Moranic ridges — Late Wisconsinan; Neoglacial
Lake strandline — Late Wisconsinan; Neoglacial

Meltwater channel — Late Wisconsinan; Neoglacial
Altiplanation terrace
Nivation terrace
Thermokarst depression
Landslide scar
Rock glacier
Dunes (inactive; active, blowout)
Stream-trimmed scarp, postglacial (unconsolidated material, bedrock in part)
Stream-trimmed scarp, modern (unconsolidated material, bedrock in part)
Stream-cut ravines and canyons, postglacial (unconsolidated material, bedrock in part)
Stream-cut ravines and canyons, modern (unconsolidated material, bedrock in part)
Areas where snow patches common

PHYSIOGRAPHY

YUKON PLATEAU



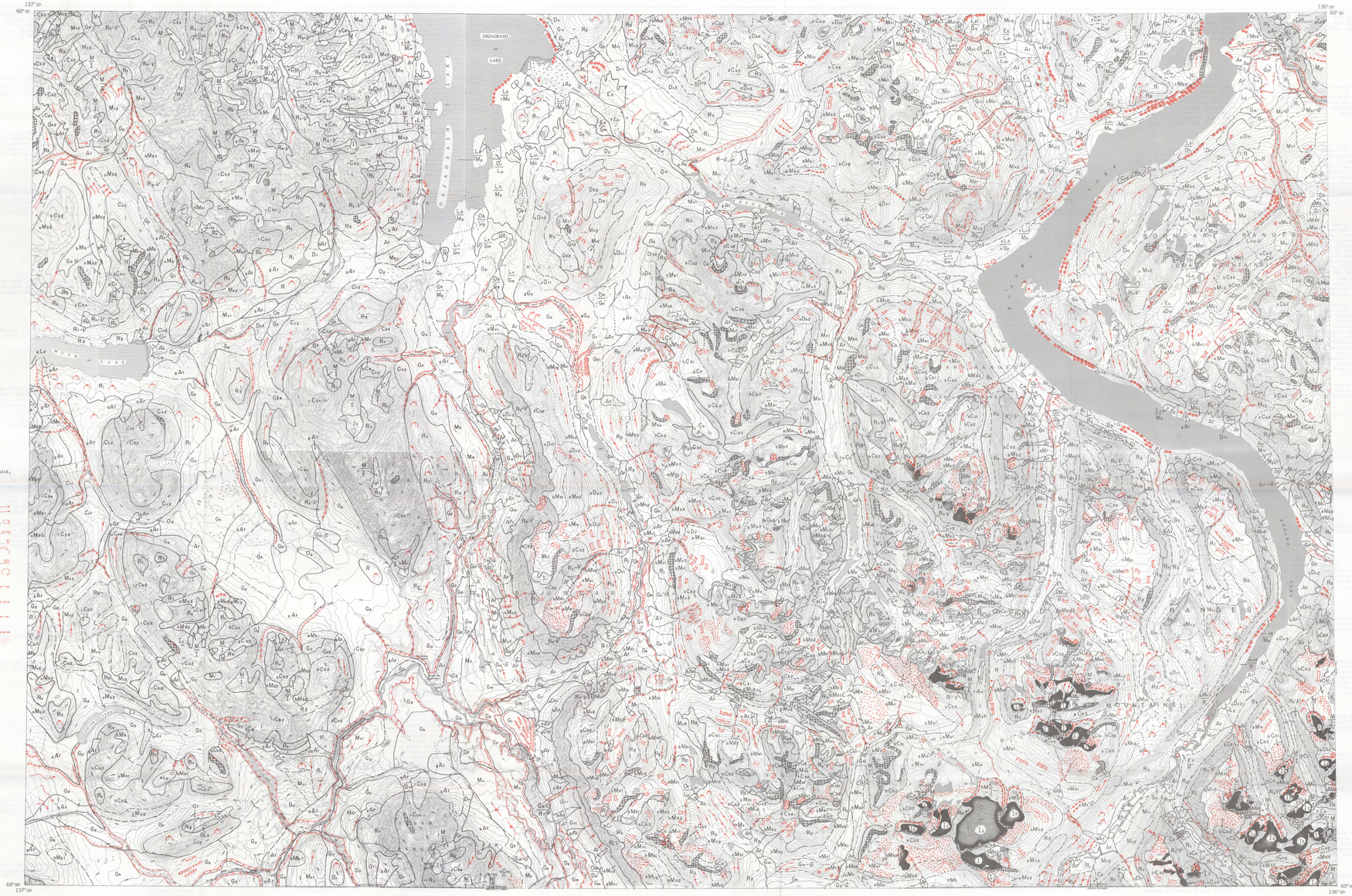
VALLEY or BASIN (DEPRESSION) - Low-lying land bordered by higher ground; flat, smooth, or gently undulating terrain with few surface irregularities.

PLATEAU - Land standing well above valleys but below elevation of nearby mountains; flat, smooth, gently sloping to moderately hilly terrain; in places dissected by valleys, but major part of surface is near summit level.

HILLS - Prominences that rise above surrounding terrain; relief less than 350 m; rounded summits.

MOUNTAINS - Prominences that rise above surrounding terrain; relief more than 350 m; have restrictive summit area and steep slopes.

BOUNDARIES
Between physiographic systems.
Between major physiographic subdivisions.
Delineating minor physiographic subdivisions.
Between physiographic elements.



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MAP 15-1981
SURFICIAL GEOLOGY AND GEOMORPHOLOGY
FREDERICK LAKE
YUKON TERRITORY
Scale 1:100 000

Kilometres 2 0 2 4 6 8 Kilometres
Miles 2 0 2 4 Miles

Universal Transverse Mercator Projection
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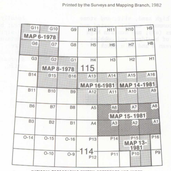

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SURFICIAL GEOLOGY AND GEOMORPHOLOGY

FREDERICK LAKE
(113A-SE/2)

DESCRIPTIVE NOTES

Kluane Plateau consists of an upper surface of rounded peaks connected by broad undulating ridges that are dissected by broad, interconnected valleys[1]. In Dezadeash Ranges the plateau surface is dissected by deep valleys and narrow ridges and peaks. High ground is well drained except for some broad flat alpine valleys. Drainage in major valleys is variable. In this map area the Dezadeash Ranges drain to either Dezadeash or Kusawa lakes. The Dezadeash Ranges are underlain by Mississippian to Permian volcanics and Paleozoic sed- that have been intruded by granitic rocks of Mesozoic age[2].

The Shakwak Valley is a large trench-like valley that separates the St. Elias Mountains from the Yukon Plateau[3,4]. Except for gaps formed by major stream valleys, the southwestern edge of Shakwak Trench is bounded by a linear mountain front[5]. The Kluane Ranges northern edge is marked by a less continuous escarpment that averages about 700 m high and rarely reaches 1550 m. Drainage is moderately good except for most of the trench floor.

"Kluane Ranges are characterized by steep slopes and serrated, sharp crests and peaks, which rise as much as 1000 m above intervening valleys"[6]. The mountains are composed of Paleozoic and Mesozoic rocks. The Kluane Ranges' whose bottom is as much as 1372 m. below nearby peaks, connects Mush and Dezadeash lakes. The Kluane Ranges are well drained by streams tributary to Dezadeash, Kaslo, and Tatshenshini rivers in the map area. Jurassic or Cretaceous sillstones and sandstones form the Kluane Ranges in this area[7,8].

The Bates Ranges are more subdued than the Kluane Ranges. Within the map area they consist of Tong continuous ridges with spurs between the deeply incised valleys. One of these valleys separates the range into separate small groups of mountains[9]. Relief is generally less than 773 m. The ranges drain via Tatshenshini and Bates rivers to Alsek River. The Bates Ranges are made up of Devonian metamorphosed sediments and volcanics of Paleozoic age that have been intruded by Mesozoic granitic and by Tertiary complex- mases, sandstone, and shale intruded by dolite[10,11]. The Denali Fault system along which late Tertiary and probably Pleistocene faulting has occurred is located near the boundary between the Kluane and Bates ranges[12].

Alsek Ranges are precipitous with sharp serrated peaks, rising more than 1000 m above the valley floors. The Alsek Ranges group of peaks is composed of Devonian volcanics intruded by a granitic body[13].

The Boundary Ranges consist of highlands dotted with irregularly scattered groups of peaks and carved into blocks by deep intersected steep-walled U-shaped valleys[1]. Small tributary valleys are commonly hanging with local relief in places as much as 1000 m between valley floor and crests although some undulating plateau-like areas are present. Small glaciers and icefields are scattered throughout the mountains. The Boundary Ranges are generally well drained although some broad, gently sloping valleys are imperfectly drained. The boundary Ranges in the map area either drain to Kusawa Lake, which is part of the Yukon River drainage basin, or to Dezadeash Lake which is part of the Alsek River drainage basin. The Boundary Ranges are composed of metamorphic rocks of Mesozoic age[9].

The area lies within the southern fringe of the continuous permafrost zone[14,15]. Permafrost is absent over broad areas under south-facing slopes and valley bottoms. It is probably still prevalent under many north-facing slopes and at high altitudes. In a few locations active thermokarst and thermokarst depressions indicate where ground ice, in the form of lenses and layers, is present.

During the Pleistocene, periglacial processes have affected the terrain at high elevations. Solifluction lobes and sorted stripes, steps, and polygons are present at high elevations and indicate frost creep and sporadic active solifluction[16,17]. The origin of nivation terraces and hollows, which are common in the Boundary Ranges, is related to the presence of snowbanks that persist during the summer; nivation terraces commonly form on moderately sloping valley walls, along benches formed by meltwater channels, and along moranic ridges.

The area has been subjected to a number of late Pleistocene glaciations with high land standing as nunatals above the ice. Most glacial deposits in the area are related to late Wisconsinan glaciations. During this glaciation, ice originating in the Icefield Ranges flowed east along Mush Lake valley towards Dezadeash Lake to coalesce with ice flowing north from the Alsek and Boundary ranges along Dezadeash Lake valley and with ice from local mountain systems. This ice then coalesced with ice flowing northeast along Shakwak Trench from the Kusawa Lake area and continued on in a northwest direction. The limits of distribution of erratics and upper limits of glacially scoured bedrock indicate that ice surfaces were as much as about 1700 m near the southern edge of the map area to between 1550 and 1980 m at Dezadeash Lake. Ice originating from an ice cap in the Boundary Ranges just south of the map area flowed north along Kusawa Lake and parallel valleys, and ice surfaces were as much as about 1700 m and about 1750 m at the juncture of Shakwak Trench and Kusawa Lake. These major glaciers were joined by local valley glaciers originating in the Boundary Ranges and high parts of the Dezadeash Ranges. Glacially scoured rock also indicates the presence of a few local ice caps in the Boundary Ranges.

The presence of moranic ridges and kames in local valleys in the Dezadeash and Boundary ranges indicates that these were deglaciated more quickly than the trunk valleys, probably because of the relatively small size of tributary valleys to the north impounded glacial lakes in tributary valleys and along the west margin of Kusawa Lake near the north end of the map area. As glacier ice retreated south in the Tatshenshini River area, meltwater was forced to flow into tributaries of Alsek River and the west end of Kusawa drainage course of Tatshenshini valley was completely deglaciated.

Upon deglaciation of the Kusawa and Dezadeash Lake areas, they were inundated to about 760 m elevation by glacial Lake Champagne[18]. Lake level slowly dropped to about 715 m - the elevation of low beaches around Dezadeash Lake - as ice in the Yukon Provonse River. At this time, modern drainage courses were deglaciated and established and the lake was drained.

Varved silt and clay are present throughout most of the glacial Lake Champagne basin, but thick silty sands were deposited in areas adjacent to the retreating ice fronts. Following drainage of the glacial lake, strong winds scoured the silty and sandy surfaces, forming dune fields that have migrated up valley walls to a northeast of Dezadeash Lakes.

At present, a readvance, from about 3000 years ago to present, is evident. Most of major glacier readvances has occurred in the last 750 years, and most of the activity has been restricted to the last 500 years. Neoglacial moraines adjacent to small icefields west of Kusawa Lake at the southern edge of the map area show various stages of retreat. Local, evidence suggests that these readvances are **geographically** is usually absent on young moraines and other Neoglacial morainal systems the diameters of **Rhizocarpon geographicum** range from 8 mm. on young moraines to about 40 mm on the oldest identified Neoglacial moraines. Lichenometric dating suggests that these are about 250 years ago. The largest icefield in the map area has retracted significantly since 1947 when the aerial photographs were taken. During the Neoglacial the persistence of snowbanks in summer has also become common and has probably accelerated the formation of nivation terraces.

The area lies within a zone of high seismic activity, and evidence of postglacial faulting is present in areas to the northwest[19]. North of Tatshenshini River are "backing"-like features that resemble recently developed "backing"[20] east north of Mush Lake.

*Mountainside scarps and trenches formed by gravitational spreading and subsidence[21].

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Elevations in feet above mean sea level

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