GEOLOGICAL SURVEY OF CANADA COMMISSION GÉOLOGIQUE DU CANADA

DEPARTMENT OF ENERGY, MINES AND RESOURCES
MINISTÈRE DE L'ÉNERGIE, DES MINES ET DES RESSOURCES

EXPLANATION OF LANDFORM UNIT NOTATIONS

Compositional-Genetic Category — N — Age Modifier
gAp-A — 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 (Ls); 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 (Mi) and rock glaciers, rubble, Neoglacial.

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

R- Bedrock: various types; pre-Pleistocene.

Textural Modifiers

a- sand or gravel; aM- 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)

K- thermokarst

V- gullied

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

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 (15-35°)

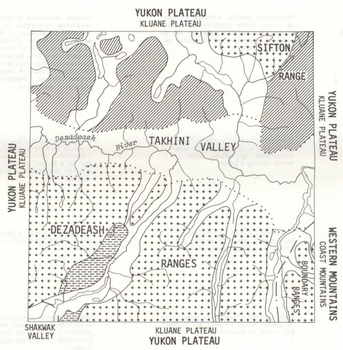
[1] General descriptions of texture and age are given for each category; only where texture and age differ from the general description are texture and age modifiers used.

[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)
Morainic 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



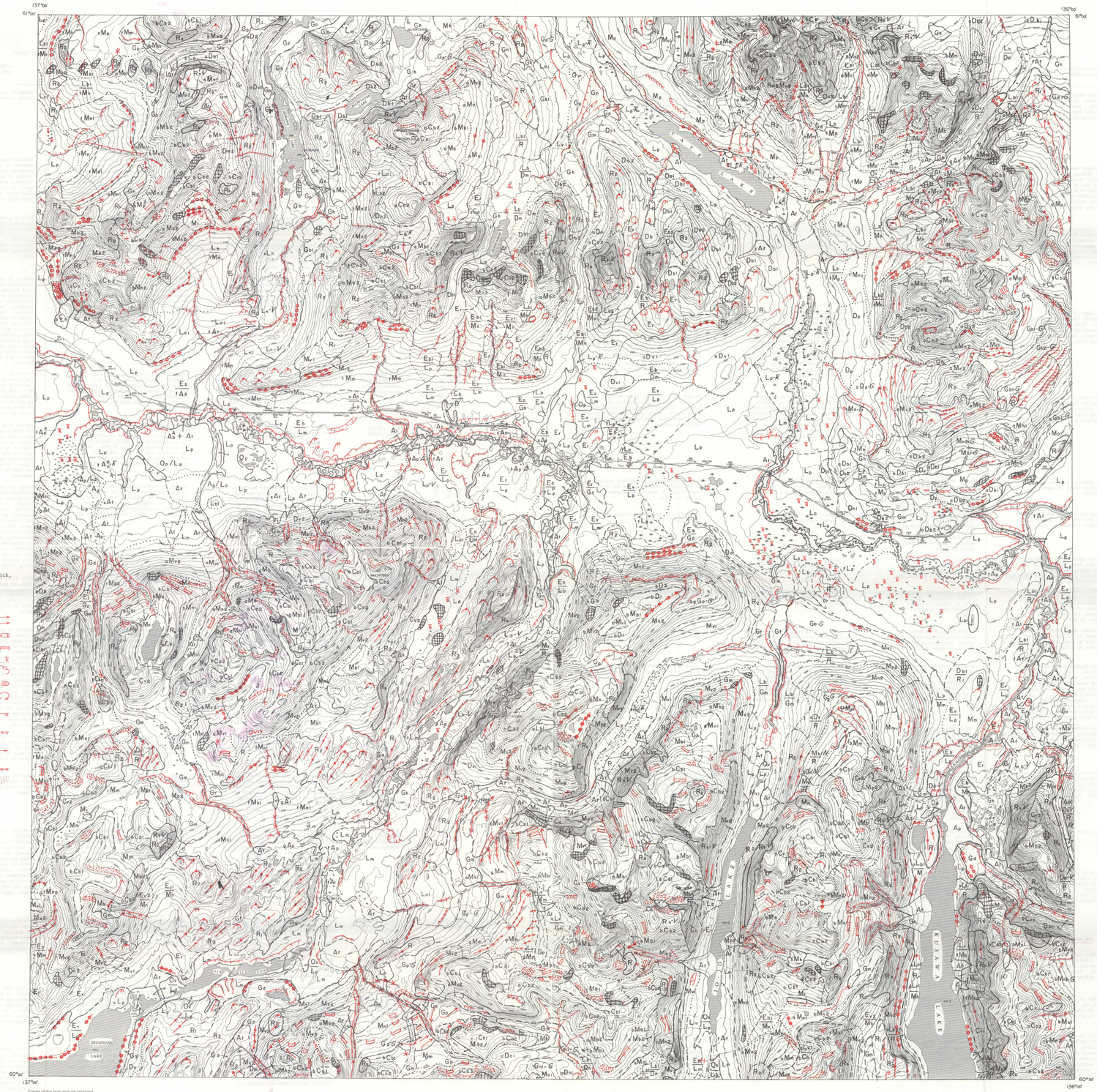
VALLEY or BASIN (DEPRESSION) - Low-lying land bordered by higher ground; flat, smooth, or gently undulating terrain with few surface irregularities.

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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INDEX MAP

MAP 14-1981

SURFICIAL GEOLOGY AND GEOMORPHOLOGY

TAYE 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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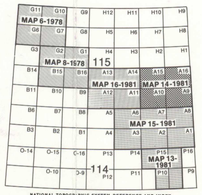

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SURFICIAL GEOLOGY AND GEOMORPHOLOGY

TAYE LAKE

(115A-NE)

DESCRIPTIVE NOTES

Kluane Plateau consists of an upper surface of rounded peaks connected by broad, undulating ridges that are dissected by wide, interconnected valleys[1,2]. Relief generally ranges between 300 and 700 m, but in the sharp-crested Sifton Range and in Dezadeasah Ranges relief locally exceeds 1000 m. The broad undulating ridges that form the Dezadeasah Ranges along the southern end of Kluane Plateau have been locally scalloped by glaciers resulting in sharp-crested ridges and peaks. Valleys within the Dezadeasah Ranges are narrower than those in the rest of the Kluane Plateau to the north. Takhini Valley, which separates Dezadeasah Ranges from the main part of the Kluane Plateau, is a broad, gently sloping valley at about 730 m elevation; its walls are steep with relief to 1250 m along its southern edge and 970 m along its northern edge, except where gaps are formed by tributary valleys. High ground is well drained except for some broad, flat alpine valleys. Drainage in major valleys is variable; most are moderately well drained, but some are imperfectly or poorly drained. The west half of the map area is drained by Dezadeasah River, whereas the east half is drained by the Mendenhall/Takhini river system. Kluane Plateau is underlain by metamorphic rocks of Precambrian or Paleozoic age that have been intruded by granitic rocks of Mesozoic age; Triassic (?) volcanic rocks are present in the Sifton Range[3].

The northern part of the Boundary Ranges of the Coast Mountains lies east of Kusawa Lake; the geomorphic expression and geology here are nearly identical to those of the adjacent Dezadeasah Ranges[1,2].

The map area lies within the southern fringe of the continuous permafrost zone[4,5]. Permafrost is absent under most south-facing slopes, some broad valley bottoms, lakes, and streams. It occurs under most north-facing slopes and poorly drained valley bottoms. Ground ice in the form of ice lenses and layers occurs in frozen fine grained sediments. Extensive areas of active thermokarst and thermokarst depressions indicate where ground ice is common.

During the Pleistocene, periglacial processes have affected the terrain at high elevations. Tors and isolated altiplanation terraces are found on high ridges north of Takhini Valley. Solifluction lobes and sorted stripes, steps, and polygons are common at high elevations and indicate frost creep and sporadic active solifluction[6,7]. The origin of nivation terraces and hollows, which are common in the Dezadeasah and 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 or bedrock structure, and along morainic ridges.

The area has been subjected to a number of late Pleistocene glaciations with high areas standing as nunataks above the ice[8]. Erratics lying at high elevations, such as on the crests of Shaneinbaw Mountain and on mountains north of Undin Creek, are well above Wisconsinan glacial limits. The provenance of these erratics is not clear, but because they occur north of the study area (O.L. Hughes, personal communication, 1978) but not to the west, an eastern or southeastern provenance is indicated. High parts of the Sifton Range may have stood above the glaciers that deposited these high erratics[9].

Most glacial landforms in the area are attributed to late Wisconsinan glaciation. Early Wisconsinan(?) (Mirror Creek[2,8] or Reid[10]) and late Wisconsinan (Macauley[2,8] or McConnell[10]) glacial limits converge in this area, making it difficult to identify a unique early Wisconsinan(?) glacial limit. During late Wisconsinan glaciation, most glaciers had their sources east and south of the map area. Intense glacial scour and fluting in upper Dezadeasah valley and Kusawa Lake valley indicate that these were the main routes for ice moving from the southwest and south into Takhini valley. Fluted rock, kame terraces, and minor moraines on the flanks of the Sifton Range indicate that ice was also moving from the east into the map area. Takhini valley acted as collecting basin with ice exiting to the north through the glacially scoured valleys of Taye and Moraine lakes. High cirques on the northern flanks of peaks in the Dezadeasah Ranges, such as those directly west of Jo-Jo Lake, and in the Sifton Range supported small glaciers. Scoured rock on some ridges and cols in the Dezadeasah Range indicate that small ice caps were present.

The gradients of late Wisconsinan glaciers within the map area and adjacent areas appear anomalously low compared to those in areas to the northwest[1]; indeed, in some regions gradients are impossible to establish clearly. The late Wisconsinan glacial limit (indicated by glacially scoured rock and minor moraines) lies at about 1680 m at the north end of Kusawa Lake; the same limit on the east flank of the Sifton Range is clearly shown by morainic ridges near 1620 m. Late Wisconsinan moraines, meltwater channels, and upper limits of glacially scoured rock clearly mark a glacial limit of about 1350 m at Red Squirrel and Asumbo creeks along upper Dezadeasah valley. The upper limit of fresh glacially scoured rock north of Takhini valley is generally between 1320 and 1620 m. It may be that, although strong glacial flow occurred in valleys of Dezadeasah River, Kusawa, Taye, and Moraine lakes during the building and waning stages of the late Wisconsinan glaciation, climatic conditions during the late Wisconsinan maximum were such that a broad dome of ice established itself over the lowlands in the Takhini valley area. The dome was nourished in part by glacier flow from the south and east and in part by local snowfall under a cold dry continental climatic regime. The irregular distribution of small ice caps at elevations in excess of 1320 m would indicate a firn limit between 1320 and 1680 m within the area and local accumulation of ice in areas where topographic elements increased local snowfall.

Morainic ridges and kame terraces mark pauses in late Wisconsinan deglaciation. They are laterally discontinuous, are at different elevations, and do not appear to define any major pause or stillstand. Moraines near 1050 m are present along the north edge of Takhini Valley west of Champagne and may well define a minor stillstand in that area. The ridge at Champagne was probably formed as an esker in an interlobate environment between ice from Dezadeasah Valley and ice with a source east of Champagne.

Deglaciation of some tributary valleys in the Dezadeasah Ranges appears to have proceeded before deglaciation of Takhini valley. For example, glacial lakes in the Pond Creek and Jo-Jo valleys (glacial Lake Jo-Jo[2]) are well above 900 m; kame deltas at the headwaters of Moose Creek are between 930 and 1070 m elevation. Strandlines and beaches indicate that small lakes also developed in small tributary valleys north of Takhini Valley at this time.

When most of Takhini Valley was deglaciated, glacial Lake Champagne[2] formed, with water level reaching near 850 m (2800 ft). The outlet appears to have been through the spillway presently occupied by Taye Lake as drainage courses to the east and south were still blocked by glaciers. Kusawa Lake valley was not deglaciated until glacial Lake Champagne had receded to near 760 m as indicated by an unmodified kame and kettle complex above this elevation and beaches on a delta at this elevation near the north end of Kusawa Lake. Beaches at similar elevations at the northern end of Dezadeasah Lake indicate that this area was deglaciated at about the same time. The level of glacial Lake Champagne appears to have slowly lowered to about 713 m - the elevation of low beaches around Dezadeasah Lake and of the probable Taye Lake spillway. Modern drainage courses were then deglaciated and established and the lake was drained.

Varved silt and clay are present throughout much of the glacial Lake Champagne basin, but thick silty sands were deposited in the lake adjacent to ice fronts in Dezadeasah River and Kusawa Lake valleys. After drainage of glacial Lake Champagne, strong winds scoured the silty sand surfaces, creating dune fields that have migrated up the valley walls and into passes north of Champagne. Layers and lenses of silty sand may also be responsible for the build up of ground ice in some parts of the glacial Lake Champagne sediments as permafrost aggraded during the early postglacial; the sand and silt would recharge lacustrine sediments with groundwater and runoff from surrounding uplands.

During the Hypsithermal, climatic warming probably initiated some degradation of permafrost and the development of alkali flats[11] in some depressions. In Dezadeasah River valley near Champagne, marl and silt are present that suggest deposition in a shallow lake, possibly during the Hypsithermal. The sediments overlie sand that appears to be fluvial in nature. This sequence suggests that the lake formed because the narrow, incised Dezadeasah valley was temporarily blocked by landslides to the west. Alternatively, the marl and silt may have been deposited in lakes on a floodplain.

During the Neoglacial, persistence of snowbanks during the summer, especially in the Dezadeasah Ranges, has become prevalent and has probably accelerated the formation of nivation terraces.

Stream erosion, blowouts in sandy terrain, and thermokarst in areas of icy sediments are presently the dominant active processes in the lowlands. The vulnerability of sandy areas to wind deflation and of areas underlain by icy sediments to thermokarst are the most serious hinderances to development in the lowlands.

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MAP 14-1981
TAYE LAKE
YUKON TERRITORY

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