EXPLANATION OF LANDFORM UNIT NOTATIONS

aDbl²-R — Compositional-Genetic Category; Age Modifier; Process or Form Modifier; Textural Modifier; Morphologic Modifier(s)

Aa/At — Stratigraphic relationships 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 and organics; mainly Pleistocene; floodplain (Ap) modern.
- C- Colluvial Deposits: various materials, mainly rubble, includes landslides (C_L); undifferentiated age.
- D- Drift: undifferentiated till, sand, and gravel.
- E- Eolian Deposits: fine sand and silt; pre-Wisconsinan (pre-Reid).
- G- Glaciofluvial Deposits: sand and gravel with veneer of fine sediment.
- L- Lacustrine Deposits: mainly silt and clay with little fine sand; Late Wisconsin (McConnell).
- M- Morainal Deposits: till, silty/sandy diamicton; rock glaciers (MR), rubble; modern.
- R- Bedrock: various types; pre-Pleistocene.

Textural Modifiers

- a- sand or gravel
- b- boulders, blocks, bouldery
- f- fine sand, silt and clay; commonly with high organic content
- g- gravel, gravelly
- r- rubble, predominantly sand to boulder-sized fragments

Age Modifiers[2]

- 1- Late Wisconsin (McConnell)
- 2- Early Wisconsin or Illinoian (Reid)
- 2a- Early Wisconsin or Illinoian (Laurentide Glaciation)
- 3- Illinoian or pre-Illinoian (pre-Reid)

Morphologic Modifiers

- a- apron
- b- blanket[3]
- 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[4]
- 1- gentle to moderate slope (5-15°)
- 2- moderate to steep slope (15-35°)

Process or Form Modifiers

- A- active deposition
- R- thermokarst, modified by thermokarst
- R- rilled

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

[2] The age modifier is used only where the deposit can be definitely ascribed to a single age, except for Ap which is modern.

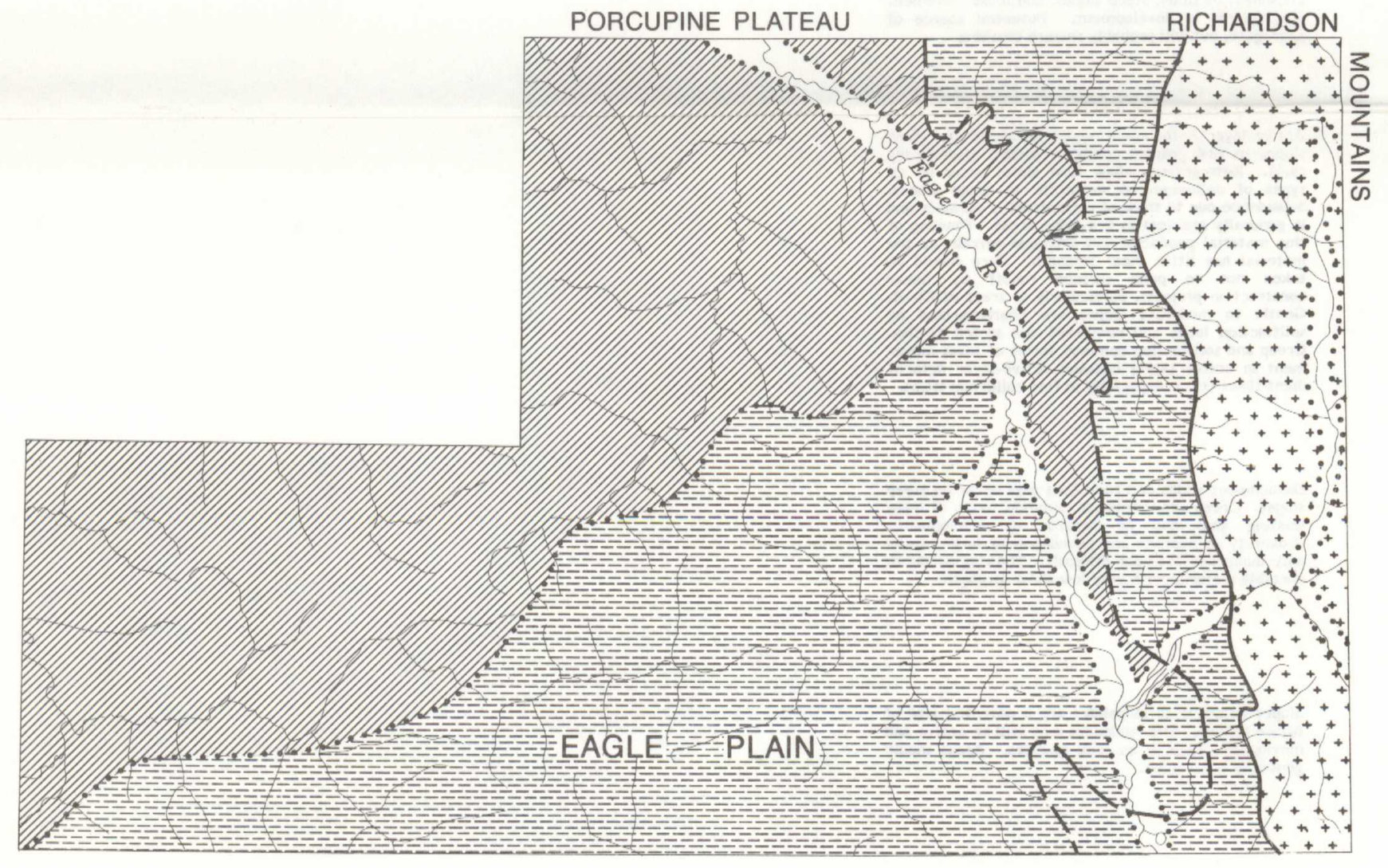
[3] Blanket indicates category forms nearly continuous cover greater than 1 m thick, generally 0.5 to 3 m thick, over a unit, commonly rock.

[4] Veneer indicates category forms broken thin cover, generally less than 1 m thick, but averaging 0.5 m thick, over a unit, commonly rock.

Geological boundary (defined, approximate, assumed)
Fault scarp, postglacial
Fluted bedrock
Fluted till
Morainic ridge (age as given by modifier)
Meltwater channel (age as given by modifier)
Nivation terrace
Pingo
Thermokarst depression
Landslide scar
Stream-trimmed scarp (unconsolidated material, bedrock in part)
Stream-cut ravines and canyons (unconsolidated material, bedrock in part)
Limit of mapping

Note: Not all units and symbols shown in the legend necessarily appear on this map.

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

66° 30′ 137° 45′ — 136° 00′ 66° 30′

66° 00′ 137° 45′ — 136° 00′ 66° 00′

Copies of this map may be obtained from the Geological Survey of Canada:
601 Booth Street, Ottawa, Ontario K1A 0E8
3303-33rd Street, N.W., Calgary, Alberta T2L 2A7
100 West Pender Street, Vancouver, B.C. V6B 1R8

The actual route of Dempster Highway is located up to 3 km west of that shown on the map.

MAP 10-1982

SURFICIAL GEOLOGY AND GEOMORPHOLOGY

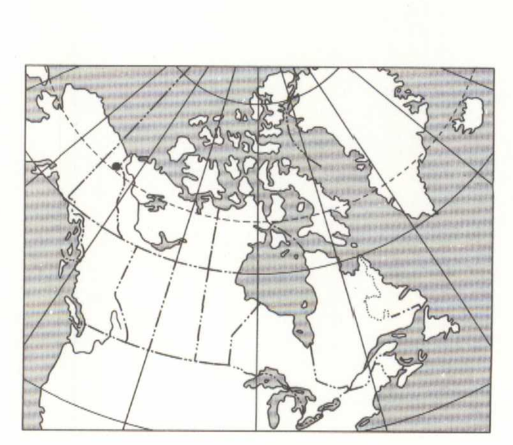
MOOSE LAKE

YUKON TERRITORY

Scale 1:100 000

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

Universal Transverse Mercator Projection



INDEX MAP

Canada

DESCRIPTIVE NOTES

Porcupine Plateau comprises Eagle Plain and an unnamed area to the east between Eagle Plain and the Richardson Mountains.[1]

The map area includes the southeastern extremity of Eagle Plain, which has up to 450 m relief and reaches 900 m elevation in the area southeast of the Dempster Highway. The area northwest of the highway is more typical of Eagle Plain, having almost accordant crests of interfluves, less than 300 m relief, and an average elevation of 450 m. The well integrated dendritic drainage pattern is formed by streams flowing in broad valleys separated by long broad rounded ridges. Only Eagle River exhibits a flat-floored valley with steep terraced sides, unlike the broad V-shaped valleys of the other streams. The area is underlain by Cretaceous sandstones, shales, and limestones, and by Devonian sandstones and shales.[2]

The unnamed unit between Eagle Plain and Richardson Mountains is a broad low-lying area with north-south oriented, elongated ridges, 200 m relief, and 600 m maximum elevation. Streams flow from the Richardson Mountains westward in a trellis drainage pattern. The underlying bedrock marks the first exposed belt of folded and faulted rocks of the Richardson Mountains[1] and comprises Devonian shales, sandstones, and siltstones.[2]

Only the westernmost range of the Richardson Mountains occurs in the map area, reaching 1175 m elevation but becoming lower (950 m) towards the south. Drainage is away from the central ridge to the sides in a trellis pattern; only one stream, Canyon Creek, crosses the axis of the mountains. The mountain tops are broad and flat to rounded, slopes are steep, and gullies are narrow. The valley to the east of the main ridge is broad. The mountains are formed of Upper Cambrian to Lower Devonian (Road River Formation) shale.[2]

The map area lies within the zone of widespread discontinuous permafrost.[3,4] Permafrost is probably 100 m to 200 m thick throughout the area,[5,6] with taliks present beneath Eagle River and large lakes. Ground ice occurs as ice-wedge polygons in moderately to poorly drained, fine grained sediments; small ice wedges and ice lenses in peat; several metres of massive ice on parts of the bedrock surface in low-lying areas, particularly at the base of slopes; well bonded, nonvisible ice in the top few metres of bedrock, although in places small veins and lenses may occur.[7,8] Most small lakes have a thermokarst origin.

Colluviation and alluviation have shaped the landscape since tectonism (Laramide Orogeny[9]) folded the rocks to their present structure. Weathering products and depth of weathering vary significantly and depend on the parent lithology. Up to 10 to 15 m of silty clay with pebble-sized shards overlies shale lithologies whereas 2 m of silty sand with abundant angular pebbles and cobbles overlies sandstone units; conglomerate units weather to silty clay with rounded pebbles. The mechanical properties of the unfrozen colluvium are also variable; the sandstone-derived colluvium is stable with significant strength; the shale-derived colluvium is unstable and has very low shear strength as is indicated by the numerous landslides.[10] Ice contents of the colluvial deposits are variable depending on slope and lithology. Many winter roads, airstrips, drilling sites, and seismic lines used for petroleum exploration during the 1950s are still visible today and for the most part show very little degradation of permafrost or ground subsidence, except along roads in low-lying areas where the surface peat was disturbed or stripped; in such disturbed areas the road may have subsided 1 to 2 m. Thermal degradation or stripping of peat may also lead to channelling of surface runoff and development of 1 to 2 m-deep gullies. Subsidence on upland drill sites, airstrips, and seismic lines is generally minimal.

The pediment that has formed throughout the unglaciated parts of the Yukon[11,12] is extensive and well developed in the map area. It is a gently sloping high bench along valley sides and in places may form tops of ridges. It is overlain by fine grained colluvium and is mantled by up to 1 m of peat. Pediment surfaces in the Old Crow Basin, northwest of the map area, in places have a layer of gravel between the rock surface and the colluvium or peat;[13] this stratigraphy was not exposed in the map area, but exposures of the lower pediment materials are rare. Pediments form in semiarid climates by the parallel retreat of escarpments – a process that involves erosion of the escarpment by weathering, mass movement, and basal sapping, and subsequent transport of the eroded material across the pediment surface by creep and sheetwash. No evidence was found in this or adjacent areas to validate or negate this proposed origin for these pediment surfaces. The pediment probably formed during the late Tertiary as it is formed on Tertiary rocks (Eocene?) south of the map area in Tintina Trench just west of North Klondike valley, and is overlain northwest of Chapman Lake to the south by pre-Reid glacial deposits and near Mount Klotz to the southwest by pre-Classical Wisconsin or older Laurentide glacial deposits.[11] Moreover, meltwater from the earliest glaciation has cut terraces below the pediment surface.

Along many streams, high terraces are present that are just slightly inset into the surface of the pediment; in places it is difficult to separate the two features. The high terraces are characterized by a gently undulating surface, which appears to have been formed by gullying, thermokarst activity, and other periglacial processes. Exotic lithologies do not occur in gravels on the high terraces as they were formed before the maximum extent of Laurentide Glaciation. The high terraces have been incised by diverted streams and meltwater, which flowed down Eagle River and a few of its tributaries when the Laurentide glaciers were at their maximum during the early Wisconsin or Illinoian. The high terraces extend downstream to underlie or merge with glaciolacustrine and nonglacial sediments in Bell Basin; the oldest sediments in this sequence are believed to have been deposited prior to 75 000 years ago.[14,15]

During the early Wisconsin or Illinoian, Laurentide ice flowing down Mackenzie valley to the Beaufort Sea impinged on the eastern side of the Richardson Mountains, flowed westward into Bonnet Plume Basin and dammed Peel River, diverting its water down Eagle River via Canyon Creek, and Palmer, Davis, and Moose Lake valleys. The two low terraces present in most stream valleys within 15 m of stream level are a reflection of this and similar later events. Along Eagle River and some of its tributaries, the upper terrace may be higher than 15 m above stream level because of major stream dissection in late Wisconsin and postglacial time. The upper terrace generally has thick organic silts and peat overlying gravel and bedrock, and its formation and gravel deposition are tentatively correlated with the Reid Glaciation. The lower terrace lies only a few metres above the adjacent floodplain and commonly grades into it. The low terrace generally has much thinner peat and organic silt deposits than the high terraces and probably formed during and immediately following the late Wisconsin – the last major glaciation to affect this area through diversion of meltwater down Eagle River.[13] Along Eagle River, some terraces that formed during the late Wisconsin may stand at higher elevations than would be expected because of rapid postglacial downcutting of Porcupine River and its tributaries shortly after 13 000 years ago.[15]

At present, stream erosion, alluvial fan and apron deposition, thermokarst, and active layer failures are the obvious active processes on the lowlands; solifluction, frost creep, cryoturbation, and isolated rockfalls are continuously affecting the slopes and upland areas.

The main hazards to development are moderate soil creep and solifluction on most steep slopes; active-layer detachment slides and retrogressive-thaw flow slides on steep slopes, particularly in areas of shale bedrock; and thermokarst subsidence in low-lying areas particularly on fine grained material. Channelling of surface runoff by some land use operations has caused melting of ice wedges and the development of deep gullies. Very few sources of granular material other than crushed bedrock are present.

References

1. Bostock, H.S., 1961: Physiography and resources of the northern Yukon; Canadian Geographical Journal, v. 63, no. 4, p. 112-119.
2. Norris, D.K., 1980: Geology of northern Yukon Territory and northwestern District of Mackenzie; Geological Survey of Canada, Open File 715.
3. Brown, R.J.E., 1967: Permafrost in Canada; Geological Survey of Canada, Map 1246A.
4. Brown, R.J.E., 1967: Permafrost investigations in British Columbia and Yukon Territory; National Research Council of Canada, Division of Building Research, Technical Paper 253.
5. Judge, A., 1973: The prediction of permafrost thickness; Canadian Geotechnical Journal, v. 10, no. 1, p. 1-11.
6. Judge, A., 1973: Deep temperature observations in the Canadian north; in Permafrost, North American Contribution, Second International Conference (Yakutsk, USSR), 1973, National Academy of Sciences, p. 35-40.
7. Foothills Pipeline (Yukon) Ltd., 1979: The Dempster Lateral Gas Pipeline Project; v. 3, Alignment sheets.
8. Public Works Canada, 1980: Unpublished reports on Dempster Highway construction; Whitehorse Office, Yukon.
9. Douglas, R.J.W. (ed.), 1970: Geology and economic minerals of Canada; Geological Survey of Canada, Economic Geology, Report No. 1.
10. Richardson, N.W. and Sauer, E.K., 1975: Terrain evaluation of the Dempster Highway across the Eagle Plain and along the Richardson Mountains, Yukon Territory; Canadian Geotechnical Journal, v. 12, no. 3, p. 296-319.
11. Hughes, O.L., 1972: Surficial geology of northern Yukon Territory and northwestern District of Mackenzie, Northwest Territories; Geological Survey of Canada, Paper 69-36.
12. Cairnes, D.D., 1912: Differential erosion and equiplanation in portions of Yukon and Alaska; Geological Society of America, Bulletin 22, p. 333-348.
13. Hughes, O.L., 1979: Personal communication; Geological Survey of Canada, Calgary.
14. Hughes, O.L., 1969: Pleistocene stratigraphy, Porcupine and Old Crow Rivers, Yukon Territory; in Report of Activities, Part A; Geological Survey of Canada, Paper 69-1, Part A, p. 209-212.
15. Matthews, J.V., Jr., 1980: Personal communication; Geological Survey of Canada, Ottawa.

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Approximate magnetic declination, 1982, 35°03' East decreasing 6.0' annually

Elevations in feet above mean sea level

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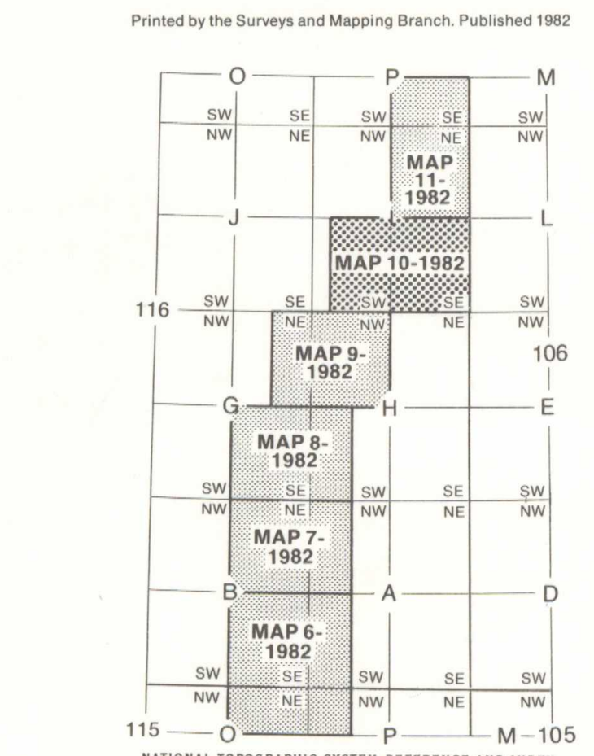

NATIONAL TOPOGRAPHIC SYSTEM REFERENCE AND INDEX TO ADJOINING GEOLOGICAL SURVEY OF CANADA MAPS

MAP 10-1982
MOOSE LAKE
YUKON TERRITORY