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SURFICIAL GEOLOGY AND GEOMORPHOLOGY PINE LAKE

## **DESCRIPTIVE NOTES**

(115A-NW)

Kluane Plateau consists of an upper surface of rounded near its headwaters. During late Wisconsinan glaciation peaks connected by broad, undulating ridges that are dissected by wide, interconnected valleys<sup>1,2</sup>. The sharpcirques on the northern flanks of high peaks in the Dezadeash crested peaks and ridges of Ruby Range rise above the general surface level of Kluane Plateau. In the Dezadeash Ranges the undulating landscape is locally marked by sharpcrested ridges and peaks. Dissecting valleys in the Dezadeash Ranges are narrower than those in the rest of the Kluane Plateau to the north. Takhini Valley, which separates the Dezadeash Ranges from the main part of the Kluane Plateau, is a broad, gently sloping valley at about 730 m elevation. High ground in the Kluane Plateau is well drained except for some broad, flat alpine valleys. Drainage in major alleys is variable; most are moderately well drained, but a few are imperfectly drained. The part of Kluane Plateau within the map area is drained primarily by Dezadeash River. Cluane Plateau is underlain by metamorphic rocks of

"The Shakwak Valley is a large trench-like valley that separates the St. Elias Mountains from the Yukon iPlateau" 2. Except for gaps formed by major stream valleys, the southwestern edge of Shakwak Trench is bounded by steep escarpments up to 1200 m high. The northeastern edge is marked by a less continuous escarpment that averages about 700 m high and rarely reaches 1050 m. Most of the trench floor is moderately well drained. Shakwak Trench is a physiographic expression of the Denali Fault system along which Late Tertiary, and probably Pleistocene, faulting has

Precambrian or Paleozoic age that have been intruded by

granitic rocks of Mesozoic age3.

"Kluane Ranges are characterized by steep slopes and serrated, narrow ridges and peaks, which rise as much as 1000 m above intervening valleys". The Kluane Ranges are transversed in the map area by two major valleys: one occupied by Dezadeash River and the other occupied by Kathleen Lakes. The valley bottoms are as much as 1375 m below nearby peaks. The ranges are well drained with most streams tributary to Dezadeash or Alsek rivers. Northwest of the Dezadeash, the Kluane Ranges are bisected by a major fault that superimposes Silurian or Devonian carbonates, slates, greywackes, and volcanics on its southwest side against Jurassic or Cretaceous siltstone and sandstone on its northeast side. Southeast of Dezadeash River only the Jurassic/Cretaceous sequence is present<sup>3,4,5,7</sup> The Icefield Ranges are characterized by sharp-crested

ridges and peaks rising to 3000 m, many glaciers, and good drainage. Only the northeastern corner of the ranges, which consists of one ridge standing above broad glacierized alleys, lies in this map area. This area is underlain by volcanic rocks of Tertiary or Quaternary age. The area lies within the southern fringe of the

entinuous permafrost zone 9,9 and much of the area at high altitude must be underlain by permafrost. Permafrost is absent over large areas under south-facing slopes, broad valley bottoms, lakes, and stream channels; it is present 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. Active thermokarst and thermokarst depressions indicate where ground ice is

During the Pleistocene, periglacial processes have affected terrain at high elevations. A few tors are present on ridge tops in the Ruby Range. Solifluction lobes and sorted stripes, steps, and polygons occur at high elevations and indicate frost creep and sporadic active solifluction 10,11. The origin of nivation terraces and hollows, which are common in the Dezadeash Ranges, is related to the presence of snowbanks that persist through the summer; nivation terraces commonly form on moderately sloping valley walls, along benches formed by meltwater channels, and along

The area has been subjected to a number of late Pleistocene glaciations with high parts standing as nunataks above ice. Erratics, namely rounded exotic rock types, on high surfaces, such as the ridge northeast of Canyon where erratics are found associated with small tors, are probably pre-Wisconsinan in age. Their provenance is not clear, but their presence north of the study area (O.L. Hughes, personal communication, 1978) and general absence northwest of the study area suggest eastern or southeastern provenance. Most glacial landforms in the area are attributed to

late Wisconsinan glaciation. Early Wisconsinan(?) (Mirror Creek<sup>2,12</sup> or Reid<sup>13</sup>) and late Wisconsinan (Macauley<sup>2,12</sup> or McConnell<sup>13</sup>) glacial limits converge in this area, making it difficult to identify a unique early Wisconsinan(?) glacial llimit. During the late Wisconsinan glaciation, ice flowed out of the Icefield Ranges north along Alsek valley and through the Dezadeash valley and Kathleen Lakes gaps in the Kluane Ranges<sup>6</sup>. Ice from these glaciers joined ice flowing northwest along Shakwak Trench; part of this large glacier then flowed west and north along Shakwak Trench and Kloo Lake valley. At Haines Junction this large glacier coalesced with ice in Takhini Valley. Some of Takhini valley ice moved north in Aishihik valley; ice also moved up Marshall Creek to

and Ruby ranges supported small glaciers; scoured rock on some mountain ridges and cols attests to the presence of small ice caps. Many glaciers in the Kluane Ranges expanded and coalesced with trunk glaciers, although the trunk glaciers map area and adjacent areas appear anomalously low compared to those of areas to the northwest<sup>2</sup>; indeed in some

The gradients of late Wisconsinan glaciers within the late Wisconsinan limit in the Dezadeash Ranges just east o Haines Junction appears to be between 1550 and 1650 m, yet on the uplands just northeast of Canyon the limit is slightly higher (a local ice cap here?). East of Kloo Lake the limit appears to be near 1520 m and in the Marshall Creek headwaters, near 1370 m. It may be that although strong glacial flow occurred in Alsek valley, Shakwak Trench, Kloo ake lowlands, and Aishihik valley during the building and waning stages of late Wisconsinan glaciation, climatic conditions during the late Wisconsinan maximum were such that a broad dome of ice established itself over the lowland 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 1520 m would indicate a firm limit between 1520 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 discontinuou are at different elevations, and do not appear to define any general regional pause or stillstand. Good examples are the large kame terrace flanking the southern edge of Takhini valley at about 980 m and a series of morainic ridges, meltwater channels, and kame terraces defining a limit near 1280 m east of Kloo Lake.

Glacial Lake Kloo3 formed in the early phases of deglaciation of the Kloo Lake area until the present drainage course of Jarvis River was completely deglaciated; in nighest strandlines are near 915 m elevation. Glacial Lake hampagne<sup>3</sup> formed in Takhini valley when most of it was eglaciated; its highest strandlines are near 850 m elevation, out near Haines Junction and Kathleen Lakes they are between 750 and 760 m, suggesting that this area was deglaciated at a slightly later time than Takhini Valley to the east. The level of glacial Lake Champagne fell slowly to about 715 m - the elevation of low beaches around Dezadeash Lake. Modern drainage courses were then deglaciated and Silt and clay are the main sediments in the Lake

Champagne basin. Layers and lenses of silty sand may be responsible for the build up of ground ice in some parts of the sediments as permafrost aggraded during the early postglacial; the sand and silt would recharge lacustrine sediments with groundwater and runoff from surrounding

During the Hypsithermal, climatic warming probably initiated some degradation of permafrost, intense soil development (the Slims Soil<sup>1,3,14,15</sup>), and marl deposition at Pine Lake. Cliff-top dune formation, which began during the early postglacial, continued unabated by climatic change. During the Neoglacial, from about 3000 years ago to the present, a series of major readvances of glaciers has occurred in the Kluane Ranges. These glaciers have been especially active during the last 500 years6. Many large and Haines Junction, originated during this interval. In the Dezadeash Ranges, and to a lesser degree in the Ruby Ranges, the persistence of snowbanks during summer has become prevalent and has probably accelerated the formation

During the Neoglacial, Alsek River, into which Dezadeash River flows, has been dammed periodically by the surging Lowell Glacier to the south. Early advances between 3000 and 1000 years ago caused at least two, if not more, lakes to form in the area; the level of the largest reached about 670 m elevation. Between 350 and 500 years ago, a couple of lakes were formed whose maximum levels were near 640 m; around 250 years ago a lake was formed with a maximum level of 620 m; and between 75 and 150 years ago another lake formed with a maximum elevation of 595 m (1950 ft). The maximum lake levels are marked by beaches, wave-cut benches, and in the case of the young lakes, by strandlines composed of driftwood. In intervals during which these lakes were not present, Dezadeash River continued to flow near its present level.

Stream erosion and thermokarst in areas of icy ediments are presently the dominant active processes in the lowlands. The vulnerability of south-facing stream scarps to wind deflation and of areas underlain by icy sediments to thermokarst are the most serious hinderances to development

REFERENCES

1. Bostock, H.S., 1948: Geological Survey of Canada, 9. Brown, R.J.E., 1967: National Research Council,

2. Rampton, V.N., 1969: unpublished Ph.D. dissertation University of Minnesota, Minneapolis. 3. Kindle, E.D., 1953: Geological Survey of Canada,

4. Campbell, R.B. and Dodds, C.J., 1978: Geological Survey of Canada, in Paper 78-1A, p. 35-41.

6. Rampton, V.N., 1981: Geological Survey of Canada, Paper 79-24.

8. Brown, R.J.E., 1967: Geological Survey of Canada,

Division of Building Research, Technical Paper 10. Price, L.W., 1972: Association of American Geographers, Commission on College Geography, Resource Paper No. 14.

Price, L.W., 1973: in Permafrost, North American Contributions, 2nd International Conference (Yakutsk), National Academy of Sciences, p. 235-245. Eisbacher, G.H., 1976: Canadian Journal of Earth Sciences, v. 13; p. 1495-1513.
 Rampton, V.N., 1971: Arctic, v. 24, p. 277-300. 13. Hughes, O.L., Rampton, V.N., and Rutter, N.W., 1972:

24th International Geological Congress (Montreal), Guidebook, Excursion AII. 7. Campbell, R.B. and Dodds, C.J., 1975: Geological Survey of Canada, in Paper 75-1A, p. 51-53.

14. Day, J.H., 1962: Reconnaissance Soil Survey of the Takhini and Dezadeash valleys; Soil Research Institute, Canada Department of Agriculture.

15. Denton, G.H. and Stuiver, M., 1967: Geological Society of America, Bulletin, v. 78, p. 485-510.

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in the lowlands.

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Elevations in feet above mean sea level

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