

LEGEND

- QUATERNARY**
PLEISTOCENE AND RECENT
- 11 Recent alluvium
 - 10 Moraine, rock glaciers
 - 9 Undifferentiated drift: till, glaciofluvial deposits, alluvium, silt, loess, and volcanic ash
- TERTIARY**
PALEOCENE AND LATER
- 8 Basalt, trachyte, rhyolite, felsite flows, agglomerate, and tuff, conglomerate and sandstone
 - 7 Trachyte, porphyritic trachyte
- CRETACEOUS**
LOWER CRETACEOUS AND LATER
- 6 Undifferentiated granitic rocks; 6a, hornblende-biotite granodiorite; 6b, porphyritic granodiorite; 6c, biotite granodiorite; 6d, hornblende-biotite quartz diorite; 6e, hornblende diorite complex; 6f, porphyritic granite
- LOWER CRETACEOUS**
- 5 Greywacke, slate, argillite, conglomerate, minor limestone and coal
- TRIASSIC AND JURASSIC (?)**
- 4 Sausuritized andesite and basalt; flows, pillow lava, and volcanic breccia
- TRIASSIC**
UPPER TRIASSIC
- 3 Limestone
- CARBONIFEROUS AND PERMIAN**
- 2 Slate, chert, limestone, greenstone, and greywacke
- DEVONIAN AND LATER**
- 1A Limestone, dolomite, and limestone breccia
 - 1B Slate, greywacke, conglomerate
 - 1C Greenstone
- A** Micaceous quartzite, quartz-mica schist, chlorite schist, graphitic schist, amphibolite, lit-par-lit gneiss; A₁, marble
- B** Serpentinized peridotite, serpentinite
- C** Gypsum

- Bedding, tops known (horizontal, inclined, overturned) +
- Bedding, tops unknown (inclined, vertical, dip unknown) -
- Schistosity (inclined, vertical) -
- Cleavage (inclined, vertical) -
- Primary layering in igneous rocks (inclined, vertical) -
- Lamination (inclined) -
- Fault (defined, approximate, assumed) -
- Thrust fault (teeth in direction of dip; defined, approximate) -
- Anticline (approximate, overturned) -
- Syncline (approximate) -
- Fossil locality -
- Volcanic neck -

Geology by J. Q. Wheeler, 1953-1955

Glacier

Horizontal control point -

Stream (position approximate) -

Intermittent stream -

Contours (interval 500 feet) -

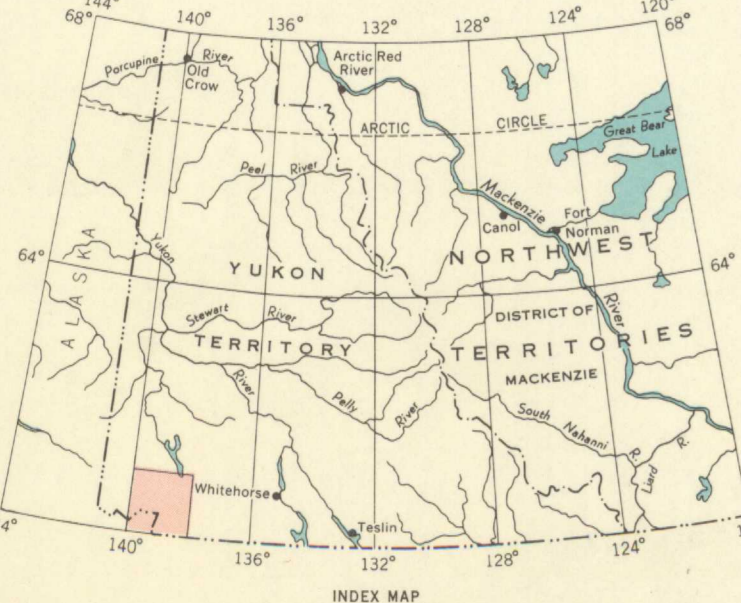
Contours (position approximate) -

Height in feet above mean sea-level -

Cartography by the Geological Survey of Canada, 1952

Base-map by the Surveys and Mapping Branch, 1951

Mean magnetic declination, 29° 31' East, decreasing 3.5 annually. Readings vary from 29° 00' in the S.W. corner to 30° 12' in the N.E. corner of the map-area



PUBLISHED, 1963
COPIES OF THIS MAP MAY BE OBTAINED FROM THE DIRECTOR, GEOLOGICAL SURVEY OF CANADA, OTTAWA

MAP 1134A
GEOLOGY
KASKAWULSH
(Mount St. Elias, East Half)
YUKON TERRITORY

Scale: One Inch to Four Miles = 1/253,440
Miles 4 2 0 4 8 12

PRINTED BY THE SURVEYS AND MAPPING BRANCH

DEC 17 1963

Library
Geological Survey of Canada

DESCRIPTIVE NOTES

The Alaska Highway follows Shikwak Valley across the map-area. Pack-horses may be used along the valleys of Slims, Kaskawulsh, Dusky, and Jarvis Rivers, but feed is scarce. Travel on Kaskawulsh Glacier and its tributaries is relatively easy when the glaciers are free of snow, but at other times roped parties, preferably of three or more individuals, are advisable. In August the lower limit of permanent snow on the glaciers is about 7,000 feet above sea-level. Glacier-fed streams rise and fall rapidly in response to the rate at which the ice and snow melt and are sometimes hazardous or even impossible to ford on foot. Most of the area is composed of rugged mountains, many of which can only be ascended by using mountaineering techniques.

In Pleistocene time much of the area was overridden by at least two ice-sheets, the earlier being the more extensive. Limestone-breccia and greenstone erratics left by the earlier ice-sheet lie at an elevation of 7,200 feet on weathered and castellated outcrops of quartz diorite on the broad summit of Outpost Mountain. Fresh granodiorite erratics of the later ice-sheet occur at elevations up to 6,100 feet along the southwest wall of Shikwak Valley, up to 6,900 feet on Observation Mountain, and at 6,600 feet on the ridge between Maxwell Creek and Kaskawulsh Glacier. Ice from the last major glaciation moved northward from the region between Dusky River and South Arm, and northeastward from the area to the west. It escaped through the Klunane Ranges by Slims and Jarvis Valleys. In Shikwak Valley the ice moved northwestward.

During deglaciation pro-glacial lakes formed in several places. Interbedded silt and poorly sorted gravel, between elevations of 3,200 and 4,550 feet in Bullion Creek valley, indicate that pro-glacial lakes existed from time to time, trapped between a glacier down Bullion Creek to the northwest and ice in Slims River valley. Silt along Jarvis River, above the mouth of Kimberley Creek and along lower Sulphur Creek were probably deposited in Glacial Lake Kloo. This pro-glacial lake, which extended eastward into Dezadeash map-area, apparently rose to an elevation of about 3,000 feet near the mouth of Kimberley Creek. Recent Lake Alek, which existed between the years 1700 to 1850 and whose beaches lie between 2,300 and 2,800 feet in Dezadeash map-area, probably extended some distance up Kaskawulsh and Dusky River valleys. Terraces at an elevation of 2,550 feet about 2 miles northwest of the mouth of Jarvis River were probably formed by this lake.

After the close of the last major glaciation the snout of Kaskawulsh Glacier receded some distance above its present position, and Klunane Lake probably drained southward through Slims and Kaskawulsh Valleys to Alsea River. Within the last 500 years Kaskawulsh Glacier advanced to dam Slims Valley and raise the level of Klunane Lake. Readvances of Kaskawulsh Glacier are inferred to have taken place between 1730 and 1770 and between 1820 and 1865. This is based on evidence from the tree rings of trees on the outermost and moraine of Kaskawulsh Glacier and trees in the nearest stand of mature timber, and from the age of Recent Lake Alek. The same number of recessional moraines at the ends of Klunane and Dusky Glaciers as at the end of Kaskawulsh Glacier suggests that all three glaciers had similar histories.

Measurements taken between 1953 and 1955 indicate that the ice on the south side of the central ice stream of Kaskawulsh Glacier, north of Mount Maxwell, was moving at about 700 feet per year. Estimates from aerial photographs show that between 1949 and 1955, the ice at the southern edge of the southern ice stream of Kaskawulsh Glacier, just west of the mouth of Cascade Glacier, was moving at about 450 feet per year.

Limestone and dolomite of unit 1 contain, in many places, fossils of probable Devonian age. Fossil collections 3, 14, and 15 are possibly Middle Devonian and collections 2, 5, and 9 are possibly Upper Devonian. In Klunane Ranges unit 1 is characterized by rapid facies changes and discontinuity of beds along strike. Grey limestone, buff or pale-brown dolomite, and grey or locally rusty limestone-breccia (1A) all form topographically rugged masses. Of the clastic sediments (1B) slate predominates over greywacke and conglomerate. The slates are black, grey, and green. Rusty-grey greywacke consists of fragments of quartz, chert, plagioclase, volcanic and granitic rocks, slate, and greywacke. Green greywacke, most abundant west of Bullion Creek and Slims River, is a saussuritized rock composed of volcanic fragments. Conglomerate is scarce; it is composed of pebbles of limestone, quartz, chert, and slate in a limy greywacke matrix. Greenstone (1C) is generally massive but is sheared locally. It forms the higher summits of the Klunane Ranges. It is a saussuritized augite andesite or basalt. In places it is porphyritic with phenocrysts of augite; in others it has a diabasic texture; and in still others it is fragmental. In two localities it shows pillow structure, in part it may be intrusive and in part it may be equivalent to volcanic rocks of unit 4. Slate and grey, green, sheared, limy greywacke with graded bedding around the headwaters of Duke River and Canada Creek are lithologically similar to the Lower Cretaceous Dezadeash Group in the map-area to the east and may be of the same age.

No fossils were found in unit 1B east of Jarvis River. There, unit 1B is continuous with the unfossiliferous Kaskawulsh Group of the Dezadeash map-area. This group, however, contains Carboniferous or Permian fossils south of Dezadeash area. Judging from the numerous Devonian fossils west of Jarvis River the Kaskawulsh Group may also contain strata of Devonian age.

In the Icefield Ranges unit 1 is composed of grey limestone, buff dolomite, grey, green, and black slate, limy greywacke, and minor greenstone. These rocks are cut by numerous dark brown and green mafic dykes that have been twisted and pulled apart during the deformation of the incompetent host rocks.

Unit 2 outcrops in three areas. Limestone and slate between Sheep and Bullion Creeks are contiguous with similar rocks mapped as Lower Permian (?) in the area to the north. Grey, green, and black slates, grey chert, greywacke, greenstone, and limestone occur in the lower part of Vulcan Creek. The limestone contains fossils, probably of late Carboniferous age. Grey limestone near the floor of Kaskawulsh Valley, opposite the mouth of Disappointment River, contains fossils of Carboniferous or Permian age.

Fugged limestone (3) adjacent to the large gypsum body east of Bullion Creek is the continuation of a bed considered as Upper Triassic in age in Klunane Lake map-area. Next to the gypsum the limestone is rusty and brecciated.

Sausuritized andesite and basalt and minor intercalated sediments (4) east of Jarvis River are an extension of the Mush Lake Group of Triassic and Jurassic (?) age in Dezadeash map-area. Most of the volcanic rocks are massive but a few show fragmental texture and others are sheared. Those near the southern contact of the unit are pillow lavas that appear to be structurally conformable with rocks of unit 1. Greenstone at the base of the mountain front probably belongs to unit 4.

Grey-green, sheared greywacke and subordinate slate and conglomerate (5) east of Kimberley Creek are continuous with the fossiliferous Dezadeash Group of Lower Cretaceous age in the area to the east. There the group lies unconformably on the continuation of unit 4. Conglomerate, which is sheared locally, occurs at the base of the unit along the east side of Kimberley Creek. Its pebbles are chiefly green and maroon andesites and subordinately chert, clastic sediments, and granitic rocks. Some massed beds of slate and coal lie near the top of the conglomerate. Interbedded, unshaded, current-bedded greywacke and argillite crossing Silver Creek is increasingly limy southeast of the creek. Interbedded, sheared, graded-bedded greywacke and slate, mapped with unit 1 near the headwaters of Duke River and Canada Creek, and conglomerate and limestone unconformably overlying Devonian rocks east of Lost Cache Creek, may possibly belong to unit 5.

Most of the granitic rocks (6) intrude metamorphic rocks of uncertain age (A). Those in the Klunane Ranges cut rocks probably as young as Lower Cretaceous. Granitic rocks are overlain by Paleocene and younger rocks between Dusky and Disappointment Rivers. Grey, foliated granodiorite (6a), with about equal amounts of hornblende and biotite, forms the Mount Maxwell stock and the northern part of the Snowshoe batholith. The latter body is also characterized by elongate dioritic inclusions that plunge steeply southeast, and by a prominent joint set that strikes north-west and dips steeply southwest. The southern part of the batholith is mainly porphyritic (6b), distinguished by grey and pale-pink microcline crystals up to 1 inch long. Buff, biotite granodiorite (6c), at the head of Maxwell Glacier, is locally leucocratic. Hornblende-biotite quartz diorite (6d) forms the eastern part of the body on Outpost Mountain. Complexes of hornblende diorite (6e), of heterogeneous composition and texture, outcrop in several places, notably near the margins of some of the large granodiorite and quartz diorite masses. The texture ranges from fine-grained to pegmatitic; the composition from hornblende-plagioclase assemblage through hornblende diorite to hornblende. Locally the hornblende diorite is foliated. The diorite is commonly cut by irregularly shaped intrusions of granodiorite and aplite. Porphyritic granite (6f) outcrops on the northeast side of Shikwak Valley.

Pale-purple trachyte and porphyritic trachyte stocks (7) occur east of Slims River and at the east edge of the map-area.

Essentially undeformed volcanic rocks of Paleocene and later age (8) underlie much of the area between Dusky and Disappointment Rivers. Grey, felsic volcanic breccia with a platy fracture outcrops in Dusky River valley below an elevation of about 4,500 feet. The succession on both sides of Feliste Creek is as follows: red-brown basalt at the base, overlain by about 1,500 feet of grey and pale grey-green felsic agglomerate and tuff, in turn overlain by about 600 feet of red-brown and black basalt flows, capped north of Feliste Creek, by several hundred feet of pale-purple conglomerate and sandstone. The upper basalt flows were extruded from a vent north marked by the volcanic neck north of Feliste Creek. The succession on Chalcedony Mountain and northeast of Airdrop Lake is as follows: conglomerate and sandstone containing coniferous wood and plants of Paleocene age, overlain by about 800 feet of basalt, in turn overlain by pale-grey, felsic, lithic, and vitric agglomerate and welded tuffs ranging from 150 to 500 feet thick. The felsic rocks are succeeded by several flows of red-brown and grey, vesicular basalt totaling about 200 feet in thickness. The flows become more vesicular from north to south. The initial dip of the flows and the orientation of the vesicles indicate that the lava flowed northeastward on Chalcedony Mountain and northward east of Airdrop Lake. Charred fragments were found between two of the flows. The vesicular basalts are overlain by 250 feet of trachytic agglomerate and conglomerate, and these in turn are capped by a few feet of basalt. Volcanic necks, characterized by sub-horizontal columns of basalt, occur on the north face and west of Chalcedony Mountain. Some conglomerate and cross-bedded sandstone are intercalated with basalt flows and agglomerates south of the mouth of Disappointment River. The volcanic rocks were extruded on a surface having over 2,000 feet of relief as well as being down-faulted into the underlying rocks.

Shattered, brown-weathering basalt and buff rhyolite breccia outcrop in Vulcan Creek. Basalt flows and breccia overlie quartz diorite on the hills to the east. The volcanic rocks in Vulcan Creek appear to be terminated upstream by a fault slice containing Carboniferous rocks.

Metamorphic rocks of uncertain age (A), southwest of Kaskawulsh River and Canada Creek, are principally brown- and grey-weathering micaceous quartzites and quartz schists, and subordinately marbled chlorite schist, graphitic schist, and amphibolite. Some of the quartzites and schists are limy. Hornblende, diopside, and red garnet occur in gneisses near some granitic bodies. Chlorite schist is prevalent above marble beds (A₁) between Maxwell Creek and Disappointment River. Schists between this locality and the mouth of Disappointment River, and the mouth of Cascade Glacier, are overlain by a thin layer of marble. Metamorphosed breccia composed of fragments of marble, quartzite, and hornblende diorite occur south of Feliste Glacier. Unit A₁ is in trend with rocks mapped as Lower Cretaceous in Dezadeash map-area and with rocks of unit 1B that may be of Lower Cretaceous age.

Green schists, epidote amphibolite, garnetiferous quartz-mica schist, and limy gneiss outcrop in Shikwak Valley west of Jarvis River. They may be metamorphic equivalents of Mesozoic rocks along strike or they may be part of the Yukon Group in the adjacent part of Dezadeash map-area.

Serpentinized peridotite and serpentinite (B) occur as small, sheared, lustrous, dark green lenses apparently intrusive into units 1 and 2. They are restricted to the main broad zone of thrust faults along the front of the Klunane Ranges. In Klunane Lake map-area ultramafic rocks cut Lower Permian strata, and in Dezadeash map-area sheared ultramafic rocks cut Lower Cretaceous beds. Ultramafic rocks in Kaskawulsh map-area have been involved in the deformation of the Klunane Ranges so that the original time of intrusion is uncertain.

Numerous grey and white gypsum bodies (C) occur along the zone of thrust faults in the Klunane Ranges. They are commonly intensely deformed internally and are found with limestone, slate, and greenstone. They probably represent bodies that have moved tectonically so that their age as sedimentary rocks is unknown.

The structure in the metamorphic rocks is rarely discernible because of the lack of marker beds. An anticline overturned to the north was observed between Disappointment Glacier and the biotite granodiorite batholith to the west.

The structure of unit 1 in the Icefield Ranges is complex. A syncline that plunges northwest at the head of Disappointment Glacier, is marked by Devonian marble beds on its limbs and by clastic sediments and minor greenstone in its central part. This syncline appears to continue north-west to the head of Atrypa Glacier and there is flanked by an upright anticline to the southwest. The structural trend is disrupted and contorted around Cascade Glacier where marble beds have been twisted and thickened from internal folding. A west-dipping thrust fault occurs west of the head of Cascade Glacier.

The northeast side of the Klunane Ranges contains a broad zone of thrust faults marked by lenses of sheared ultramafic rocks and contorted beds of gypsum. This zone forms the southeastward extension of the Duke River thrust zone from the Klunane Lake area. Carboniferous beds are overthrust by Devonian and later rocks on Vulcan Creek. Southeast of Silver Creek, Devonian beds are apparently thrust onto the Lower Cretaceous.

The structure in unit 1 on the southeast side of Klunane Ranges and west of Slims River is not clear. Folds overturned towards the northeast occur west of Slims River. West-dipping thrust faults and minor folds overturned to the north are found west of the upper part of Vulcan Creek.

A major fault along Shikwak Valley separates rocks of the Klunane Ranges from the Yukon Group metamorphic rocks lying northeast of the map-area.

Sleep faults bound Tertiary volcanic rocks on the west side of Dusky River valley.

Placer gold has been recovered from Bullion Creek for many years. Kimberley and Telluride Creeks received some attention near the turn of the century but since then little work has been done on them.

Nickel-bearing sulphides are reported in diorite west of Vulcan Creek and copper sulphides in coarse float near the head of Telluride Creek.

NOT TO BE TAKEN FROM LIBRARY
NE PAS SORTIR DE LA BIBLIOTHÈQUE

1134A

5.1.11 Kaskawulsh, Y.T. Map 1134A
A. Geol. scale - 4 mi. to 1963
C. 2