

*Eug. Toitevin*

CANADA  
DEPARTMENT OF MINES AND RESOURCES  
MINES, FORESTS AND SCIENTIFIC SERVICES BRANCH

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GEOLOGICAL SURVEY OF CANADA

PAPER 49-24

# DEZADEASH MAP-AREA, YUKON

(REPORT AND MAP)

By  
E. D. Kindle



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OTTAWA

1949

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Paper 48-24

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YUKON

(Second Preliminary Account)

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### Illustration

Second preliminary map - Dezadeash, Yukon ..... In envelope

## DEZADEASH MAP-AREA, YUKON

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### INTRODUCTION

#### Summary

Dezadeash map-area occupies an area of about 4,200 square miles in southwest Yukon between latitudes 60 and 61 degrees and longitudes 136 and 138 degrees. It is named after Dezadeash Lake, a body of water 12 miles long and from 1 to 5 miles wide that lies at the centre of the map-area.

This report is based on field work carried out by the writer during the years 1946, 1947, and 1948. Messrs. L.O. Gouin, A.K. Roberts, and D.H. Tait assisted with the field work in 1946; R.B. Scott, J.M. Churchill, and A.K. Roberts in 1947; and C.A. Burns, W.H. Poole, R.G. McCrossan, and W.M. Little during the 1948 field season.

Many of the streams in Dezadeash map-area were tested for placer gold some 50 years ago by miners en route to the Klondike, and small placer operations have been carried out from time to time since then on many of the original discoveries. During recent years placer mining has been confined to Shorty Creek, Beloud Creek, Iron Creek, Squaw Creek, and Silver Creek.

Little prospecting for lode deposits has been attempted in Dezadeash area, and only a few metallic mineral deposits have been discovered to date.

#### Accessibility

The Alaska Highway extends in a westerly direction across the north half of Dezadeash map-area. Mile-post 956 marks the east edge of the area and mile-post 1039 is near the western boundary. The Aishihik airport road extends north from mile-post 995, giving

access to Aishihik Valley and the lake district to the north of the area, whereas the Haines road, 159 miles long, southeast of mile-post 1016, Alaska Highway, gives access to the south and central parts, and connects the highway with the seaport town of Haines, Alaska.

Whitehorse, largest town in, and principal supply centre for, the Yukon, is at mile 919, Alaska Highway, that is, 919 miles northwest from one end of the road at Dawson Creek, British Columbia, and 39 miles by road east of the eastern side of Dezadeash map-area. The town is strategically situated at the northern terminal of the White Pass and Yukon Route railway, which connects with ocean steamships at Skagway, Alaska, and is at the head of river navigation to the mining districts farther north. Provisions may be purchased in the Dezadeash area at trading posts located at Champagne, Canyon, Haines Junction, Bear Creek, and mile 125 Haines road. Horses are available for hire at Champagne.

Kusawa Lake offers a ready base for prospecting the southeast sector of the area. The lake is 45 miles long and has an average width of about 1 mile. A truck road 15 miles long runs south from near mile-post 959, Alaska Highway, to the north end of Kusawa Lake. The lake may also be reached from Whitehorse by descending Lowes River and ascending the Takhini, as the latter is navigable for small steamers and river boats to about 4 miles above Mendenhall Landing. There, progress is impeded by a short rapid obstructed by numerous boulders, but small boats may be lined up or down. From there to the lake the river is swift, with many fast riffles.

Dezadeash River is navigable for shallow-draft river boats and canoes powered by outboard motors, but care must be taken to avoid large boulders that occur at intervals in the stream bed. West of the Haines road the Dezadeash splits into several channels, and

even the main channel may be difficult to navigate. About 2 miles upstream from where it leaves Shakwak Valley the river spreads into four or five channels, and only 12 to 14 inches of water overlay some of the bars in the main channel in July 1946.

Boating conditions are difficult on Alsek River for 6 miles below the mouth of the Dezadeash, due to the maze of channels within a wide gravel plain and to the fact that where the water is deep enough for boats it is quite fast. Farther south, the Alsek is confined to a comparatively narrow channel by steep rock bluffs, and has not yet been investigated by the writer.

Canoes may be used on Dezadeash and Kathleen Lakes, but at some risk as those waters are lashed by frequent and sudden wind storms. The stream channel connecting Louise and Kathleen Lakes is navigable by boats equipped with outboard motors except for a 150-foot stretch where the stream splits into two channels and where the main channel is only 12 to 18 inches deep.

A tractor and truck road that extends west from mile 125, Haines road, gives access to Mush and Bates Lakes, and a branch tractor road at Alder Creek, 3 miles west of mile 125, extends 4 miles north to the Shorty Creek placer property.

The old Dalton trail, used 50 years ago by placer miners en route to the Klondike, crosses the map-area, and is followed for much of the distance between Klukshu and Haines by the present Haines road. From Klukshu the trail leads northeasterly, on the east side of Dezadeash Lake and along Dezadeash River to Champagne. The trail continues due north from Champagne to Hutshi, then northeasterly to Nordenskiöld River Valley, which it descends and connects with the present road to Dawson, 27 miles south of Carmacks, near Montague.

An old pack-horse trail from Champagne to the south end of Tye Lake is in good condition. It continues along the northeast

side of the lake, but is obstructed in places by fallen timber as a result of a bush fire in 1946.

A good trail runs south from Bear Creek to the confluence of Alsek and Dezadeash Rivers, then west to Sugden Creek. The Dezadeash may be forded near its mouth, and from there an old trail leads south for 6 miles along the beaches of Recent Lake Alsek on the east bank of Alsek River. From there the route is southeasterly up the valley of Trout Lake to Cottonwood Creek, then east over the divide to the headwaters of Victoria Creek. The trail continues southeasterly and connects with the Mush Lake tractor road 10 miles west of the south end of Dezadeash Lake. Farther southeast it ascends the valley of Fraser Creek, and then extends easterly and finally south again to connect with the old Dalton trail at Tatshenshini River.

In general the entire area is fairly open, and is well suited for the use of pack-horses in exploration work back from the roads.

#### Natural Resources

All of the valleys in Dezadeash map-area are clothed with abundant forest growth, and the mountain slopes are forested to an elevation of 4,500 feet. White spruce is the most plentiful and most valuable tree. It attains a diameter of 2 feet in favourable localities such as the river flats where water is plentiful. Other native trees include the lodge-pole pine, alpine fir (balsam), paper birch, balsam poplar, and trembling aspen. It is a district of comparatively light snow and rainfall except for the higher mountains where precipitation is heavy. Because of the light snow horses are able to reach food with little effort, and subsist through the winters in Dezadeash and Aishihik River Valleys in spite of low winter temperatures.



The agricultural possibilities in this area are being investigated by the Dominion Experimental Farm. Several acres have been cleared at Pine Creek, at mile 1019, Alaska Highway, and field crops have been successfully grown there since 1945. Garden produce such as peas, beans, carrots, and cabbage have been grown for many years at Bear Creek trading post, the long summer days being responsible for very rapid growth.

Moose, black bear, grizzly bear, wolves, sheep, and mountain goats inhabit the district and, according to Mr. Davis at Champagne, the area yields substantial numbers of the smaller fur-bearing animals to Indian trappers. A list of the animals and birds found in Dezadeash and neighbouring areas has been published by Clarke (1946)<sup>1</sup>, and persons interested in the wild

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<sup>1</sup>Dates, in parentheses, refer to those under author's name in Bibliography at end of this report.

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life of the district should consult his paper. In addition, Rand (1945) has listed all of the mammals known to occur in Yukon, and his report gives considerable detailed information on this subject.

#### Previous Explorations

In 1882, Arthur Krause made explorations, on behalf of the Bremen Geographical Society, of Chilkoot and Chilkat Passes, at which time he reached nearly to the south end of Kusawa Lake, which he named "West Kussowa Lake". In 1890, Messrs. S.J. Wells, A.B. Schanz, E.J. Glave, and Jack Dalton ascended Chilkat River, crossed the Coast Mountains, and explored the length of Kusawa Lake<sup>2</sup>.

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<sup>2</sup>Report on the Population and Resources of Alaska, 1891; Eleventh Census, p.9.

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In 1892, E. J. Glave (1892) and Jack Dalton made an overland trip from Chilkat River to Kluane Lake with four pack-horses, this being heralded as the first time that horses had been used in the district. The Chilkat River Indians had for many years used a footpath by which they travelled between the coast and the interior to trade with the more remote tribes living inland. This trail was made use of by Dalton, who established trading posts at Pleasant Camp on Klehini River and at Dalton House on the Tatshenshini. During the next few years Jack Dalton cut out and improved the old trail, and by 1896 it had been established as far north as the mouth of Nordenskiöld River and had become known as 'the Dalton trail'. J.J. McArthur made a survey of this trail in 1897, and the following year J.B. Tyrrell (1898) made a rapid geological reconnaissance along this route in addition to exploratory work north of the map-area.

Large numbers of prospectors made their way to the Klondike placer fields over the Dalton trail between 1896 and 1899, and some prospecting for placer gold was undertaken in the Dezadeash area at that time, as Tyrrell (1898) states that "Specimens of coarse gold were shown to the writer as having been taken from Alder Creek". During the summer of 1899, W.J. Peters and Alfred H. Brooks (1900) made an overland trip from Pyramid Harbour, on Lynn Canal, to Eagle City in Alaska for the United States Geological Survey. The route followed was via the Dalton trail to Dalton Post and then northwesterly to Kluane Lake by way of the valleys of Fraser and Cottonwood Creeks.

Brook's map (1900) of the region records the occurrence of placer gold on Shorty Creek. R.G. McConnell (1905) visited the Kluane Lake area in 1904 to report on the geology and placer deposits of the district for the Canadian Geological Survey. His geological map, No. 894, covers the northwest corner of Dezadeash map-area, and his report mentions the existence of a wagon road between Whitehorse

and Kluane Lake to serve the newly discovered Kluane and Ruby placer camps. Ten years later Cairnes (1915) made a traverse along the road from Whitehorse to Kluane and reported on placer mining developments in the Kluane, Ruby, and Nansen districts. His explorations are recorded on Geological Survey Maps 152A and 154A.

W.E. Cockfield carried out geological exploration in the Aishihik Lake area in 1926. His report (1927) and map (No. 192A, Geol. Surv., Canada) cover the area between Aishihik Lake on the north and Dezadeash River on the south; and from Canyon on the west to Mendenhall River and Sifton Mountains on the east. The following year Cockfield (1928) mapped the rocks along the Dalton trail from Champagne to the British Columbia boundary and explored the shores of Kusawa Lake (See Map 205A, Geol. Surv., Canada).

Claims were first staked on copper deposits along the valleys of Lewes River near Whitehorse in 1899, and about the same time quartz veins carrying gold, silver, and antimony were discovered in the Wheaton district some 25 miles east of Kusawa Lake. The latter deposits have been described by Cairnes (1912 and 1915).

R.G. McConnell examined the copper deposits near Whitehorse in 1907 and his report (1909) includes geological maps of the larger mines. The Whitehorse map-area was covered by Cockfield and Bell between 1922 and 1924, and their report (1926) includes a compilation of the work of the earlier investigators. A revision of the geology of the Whitehorse map-area is currently under way by J.O. Wheeler.

Some work was done by H.S. Bostock of the Geological Survey in 1945 along the Alaska Highway, mostly in the vicinity of Kluane Lake and westerly to the Alaskan boundary.

#### PHYSICAL FEATURES

Dezadeash map-area is characterized by high, rugged mountains and low, broad valleys. Shaskwak Valley, which runs north-westerly from Dezadeash Lake to Kluane Lake and beyond, is the

largest valley in the district. A much narrower valley extends farther southeastward from Dezadeash Lake to Kusawa Lake along the course of Klukshu River and Frederick Lake. All of the country to the northeast of this valley is part of the Yukon Plateau. It is an upland area of interlocking valleys enclosing mountain groups and ridges, few of which rise more than 3,500 feet above the valley bottoms. Dezadeash Valley, which runs east from Shakwak Valley at Pine Lake, is the second largest valley in the area. Dezadeash River follows it for 40 miles in a westerly direction from Champagne, and after crossing Shakwak Valley turns abruptly south through a narrow gap to join the Alsek, which drains south to the Pacific. Mendenhall River, which occupies Dezadeash Valley a few miles east of Champagne, flows easterly into Takhini River and so drains northwesterly via Yukon River to the sea.

The divide between Dezadeash and Mendenhall Rivers is a low, sand- and silt-covered plain. Another low divide occurs at the south end of Dezadeash Lake; Klukshu Lake, 2 miles south of the divide, drains southerly by way of Unahini and Tatshenshini Rivers. Alder Creek, 3 miles west of the south end of Dezadeash Lake, drains westerly by way of Mush Lake, Bates Lake, and Bates River to reach the Alsek. Dezadeash River flows northeasterly from Dezadeash Lake for 23 miles to Champagne before turning westerly along the course of Dezadeash Valley. Kusawa Lake, near the east border of the map-area, trends northerly, but is of zigzag shape. It is the largest lake in the area, having a length of 45 miles and an average width of about a mile. The waters of the lake drain north and east via Takhini River to reach the Lewes.

The mountains in the southeast part of the area are typical of the Coast Mountains. The granitic terrain is developed

into high, precipitous slopes with jagged, knife-edge ridges and pointed peaks that reach an elevation of 7,500 feet. Dezadeash Mountains on the southwest side of Shakwak Valley, although composed largely of folded Mesozoic sedimentary rocks, are equally as high, and carry numerous alpine glaciers on the north sides of all of the higher peaks. St. Elias Mountains, which lie west of the north part of Alsek River, are much higher than the Dezadeash or Coast Mountains, many of their peaks exceeding 10,000 feet above sea-level. The central area of St. Elias Mountains is covered by almost continuous snowfields, broken only by occasional projecting points of rock. Farther south, near the mouth of Bates River, these mountains swing southeasterly across the path of Alsek River, which chisels a passage through them to reach the Pacific.

During the Pleistocene or Glacial period great quantities of ice accumulated in St. Elias Mountains and moved westerly towards the Pacific Ocean on the Pacific slope and towards the north and east on the interior side of the range. In Dezadeash map-area, glacial striae and grooves trend north to northeasterly, and together with quantities of boulder clay in all of the valleys are evidence that the ice flowed down from St. Elias Mountain and moved up all of the northerly trending valleys, over-riding the lower mountains. Many of the mountains in the plateau area north of Dezadeash Lake show evidence of glaciation up to elevations of about 5,500 feet. All of the larger valleys are floored with abundant deposits of stratified sand, gravel, and silt that overlie boulder clay, the latter being exposed in the deep cuts along the rivers. The stratified silts may well have been deposited in lakes that formed along the receding ice-front towards the close of the Glacial period. In this connection it is to be noted that all eskers found in the area occur near elevations of 2,500 feet, those that formed in lower ground having been covered subsequently by the younger blanket of silts.

In comparatively recent time, possibly 175 years ago, Alsek River was dammed by the extension of Lowell Glacier across its path. This glacier forms the west bank of the Alsek for 3 or 4 miles, commencing about 25 miles south of the mouth of Dezadeash River, and originates some 40 miles to the west near 14,500-foot Mount Alverstone. Freshly cut lake beaches are exposed all along Alsek River above the big glacier, and they extend some distance up both Kaskawulsh and Dezadeash River Valleys. The beaches are comparatively devoid of forest growth, though a few scattered spruce up to 6 inches in diameter grow there. About 210 feet above the present river level, normal, heavy forest growth marks the upper limit of the recent lake. The level of the lake appears to have receded very gradually, judging from the numerous beach levels. One beach, 50 feet above the river, is lined in places with accumulations of driftwood that have not been disturbed since the recession of the water. The driftwood is fairly well rotted, but as deadwood lasts a long time in the frigid Yukon climate it seems probable that it has lain there 100 years or more.

#### GENERAL GEOLOGY

##### Summary

The east half of Dezadeash map-area is underlain by part of the northern end of the Coast Range batholith. In the north half of the area, intrusive granitic stocks are numerous as far west as Shakwak Valley. Large areas of older metamorphic rocks of the Yukon group are also found in those parts of the map-area. They include a variety of schists and gneisses of sedimentary origin, and crystalline limestone, slate, and quartzite. The east front of Dezadeash Mountains on the southwest side of Shakwak Valley is composed of sedimentary rocks that range in age from Upper Jurassic to Lower

Cretaceous. These rocks are underlain several miles farther west by andesite, basalt, dacite, rhyolite, and volcanic breccias, with intercalated beds of crystalline limestone. This series of volcanic and sedimentary rocks is thought to be largely Jurassic, but is possibly in part of Triassic age.

At the top of the volcanic series are some beds of conglomerate, argillite, slate, and tuff in which thin coal seams are found. Large bodies of crystalline limestone with intercalated quartzites and black and brown slates, which underlie the Jurassic volcanic series between Kaskawulsh River and Kimberley Creek and between Alsek River and Sockeye Lake, are of Carboniferous or Permian age. Sifton Mountains, northeast of Tase Lake, consist mostly of dacite, latite, andesite, and rhyolite flows and flow breccias, with some tuff. These volcanic rocks resemble, and are probably of the same age as, the Jurassic volcanic rocks in the Dezadeash Mountains. In the mountains west and southwest of Bear Creek, the Upper Jurassic or Lower Cretaceous sedimentary succession is intruded by thick stocks and dykes of peridotite and serpentine. The Coast intrusions invade both Jurassic and Lower Cretaceous volcanic and sedimentary rocks in several places in Dezadeash Mountains between Dezadeash Lake and Alsek River. Flat-lying and gently folded conglomerate, sandstone, and shale beds of Paleocene age overlie older strata on the east side of Bates Lake and at the west end of Mush Lake. The Paleocene strata are intruded by a stock of white weathering soda syenite to the east and southeast of Bates Lake. The youngest rocks in the area are comparatively flat-lying or gently folded volcanic flows, flow breccias, volcanic breccias, and tuffs of Tertiary age that blanket several mountains and fill some of the valley bottoms along Alsek River. Five miles northwest of Mush Lake, the Tertiary volcanic rocks overlie Paleocene conglomerates and grits.

Table of Formations

Age	Name	Lithology
Pleistocene and Recent		Silt, sand, clay, gravel, boulder clay
Unconformity		
Tertiary		Volcanic breccia, tuff, rhyolite dacite, andesite, basalt
Unconformity		
Paleocene or later		Soda syenite
Paleocene		Conglomerate, sandstone, shale, coal
Unconformity		
Cretaceous  and ? earlier		Granite porphyry, quartz porphyry
	Coast intrusions	Granite, granodiorite, diorite, porphyritic granite, augon-gneiss, gabbro
		Peridotite, serpentine, dunite
Upper Jurassic and Lower Cretaceous		Sandstone, slate, greywacke, argillite, quartzite, chert, tuff, conglomerate
Jurassic and ? earlier		Andesite, basalt, tuff, dacite, rhyolite, volcanic breccia, crystall- ine limestone, slate, greywacke, argillite, coal
Carboniferous or Permian		Limestone, marble, slate, quartzite, schist
Unconformity		
Precambrian and later	Yukon group	Quartz-mica schists, gneiss, slate, quartzite, crystalline limestone, greenstone; hornblende, chlorite, and garnetiferous schists



Yukon Group

The rocks mapped as Yukon group consist largely of quartz-mica schists, quartz-biotite-feldspar gneisses, crystalline limestone, and quartzite, with minor areas of quartz-sericite-andalusite schist, hornblende schist, sericite-cordierite schist, garnetiferous schist, and gneiss, and some chlorite schist and andesite. Great thicknesses of these rocks are exposed on the northeast side of Shakwak Valley and north from Dezadeash Lake, where they are widely invaded by granitic rocks and in many places form roof pendants surrounded by granite. The schists and gneisses are commonly interbanded with limestone and quartzite, and are obviously derived from the intense alteration of sedimentary rocks. As they are not known to carry fossil remains they are thought to be of Precambrian age. The group may, however, include some areas of highly altered Palaeozoic or younger strata.

Some andesite is interbedded with quartz-mica schists at the north end of Kusawa Lake on the west side, and a mountain top consisting largely of andesite and chlorite schist lies 2 miles east of the north end of the lake. A few stringers containing copper minerals were noted in the latter, which is a roof pendant enclosed in granite. Andesite and chlorite schist associated with greywacke and quartz-mica schists outcrop about Klukshu Lake. At an elevation of 3,800 feet on the mountain east of the south end of Klukshu Lake, chlorite schist is converted to coarsely crystalline amphibolite, which exhibits a few copper stains.

Crystalline limestone exposed on the east slope of the mountain 8 miles northwest of Champagne has a thickness of well over 1,000 feet. It is a white, coarsely crystalline rock, greatly silicified at its contacts with the granite, near which also garnetiferous zones are plentiful. Crystalline limestone outcrops on the mountain 2 miles east of the north end of Sixmile Lake as

bands up to 20 feet wide interbedded with wider zones of quartz-biotite and quartz-biotite-garnet gneiss, the whole about 600 feet thick. The beds are severely contorted. Two bands of white crystalline limestone, each more than 200 feet wide and separated by 1,000 feet of quartz-mica schist and gneiss, outcrop on a low ridge 2 miles north of Tay Lake. Limestone also outcrops in some abundance northeast of this lake. It is present in thin bands on the east side of Kusawa Lake, and, as noted by Cockfield (1928), is fairly common on the hills east of Frederick Creek.

The schists and gneisses are cut in many places by small quartz veins and by granite and pegmatite dykes. Small quartz veins containing tourmaline were noted in several places on the ridge 2 miles northwest of Canyon (at intersection of highway and Aishihik River), and several small shear zones impregnated with finely crystalline pyrite were seen a mile west of Aishihik River and a mile south of the north edge of the map-area in quartz-biotite-plagioclase gneiss.

#### Carboniferous or Permian Limestone

Sedimentary rocks composed largely of crystalline limestone, but with intercalated zones of black and brown slates, quartzites, and argillites, form rugged mountain slopes 2 miles north of the mouth of Kaskawulsh River. These rocks extend northwesterly to beyond Jarvis River. They also outcrop for 8 or 9 miles along or near the east side of Alsek River, commencing 7 miles below the mouth of the Dezadeash.

The crystalline limestone ranges from grey to white and from finely crystalline to coarse. In places it is finely laminated, but more generally the beds are thick and massive. A band of limestone breccia consisting of angular and rounded limestone fragments

and blocks lies near the contact with overlying andesites a mile south of Kimberley Creek on the west border of the map-area. The breccia zone is at least 25 feet wide, and probably marks the locus of a strong fault. Both limestone and breccia zones strike northwest and dip about vertically. About 2,000 feet farther southwest, the limestone gives place in part to zones of thin-bedded, platy, black and brown slates, with some thin beds of dark argillite and cherty quartzite. The slate and argillite zones alternate with bands of crystalline limestone, which are generally more than 100 feet wide. The base of the series has not yet been seen.

The crystalline limestone described by Watson (1948) in the Squaw Creek-Rainy Hollow area, under the heading of Permian-Carboniferous rocks, is believed to be of the same age as the limestone formation described above. It is on the line of strike of the beds described above, but lies 35 miles southeast of them. At both places the limestone is overlain by volcanic rocks considered to be of Jurassic age or older. A few fossils collected from it by Watson on Scottie Mountain were reported, by W. L. Bell of the Geological Survey, to contain an unidentifiable productid (?), which indicates only Carboniferous or Permian time.

#### Jurassic and ? Earlier Volcanic and Sedimentary Rocks

A belt of volcanic and sedimentary rocks about 6,000 feet thick extends for 66 miles southeasterly across the map-area from Kimberley Creek on the north to a point 3 miles west of the Haines road along the British Columbia-Yukon boundary. Between Jarvis and Alsek Rivers, these rocks are steeply dipping, and their stratigraphic position between the older Permian-Carboniferous limestone and the younger Upper Jurassic or Lower Cretaceous sedimentary succession is readily apparent. The age of these rocks is undoubtedly Triassic or Jurassic or both.

Due to anticlinal folding, the volcanic rocks occupy wide areas in the vicinity of Mush Lake and south and west of Bates Lake. They are dominantly andesites, and range from finely crystalline to porphyritic and amygdaloidal. The andesites are generally green, but in places are purple and red. Some flows are a light pale green, and have compositions ranging from rhyolite to latite and dacite; others, in darker shades, are basaltic.

The lavas are interlayered with zones of sedimentary rocks that include crystalline limestone, graywacke, tuff, slate, and quartzite. Many of these are only 100 or 200 feet thick, but some exceed 1,000 feet; a band of crystalline limestone interbedded with andesite flows on the mountain west of the south end of Bates Lake is about 1,500 feet thick.

The andesites are known to contain some copper. On the mountain top 2 miles northeast of Mush Lake, andesites are traversed by small epidote veinlets with which are associated a little native copper and chalcocite. A mile east of Mush Lake, several specimens of basalt containing small amounts of grey copper were seen on the roadside 30 feet above Alder Creek. Copper nuggets, which were unearthed during placer mining operations on Beloud Creek, are thought to have originated from veins in the andesite south or upstream from the workings. Some chalcopyrite was observed 6 miles south of Mush Lake in altered volcanic rocks at the north end of a large stock of granodiorite, near the pass between Mush Creek and Fraser Creek Valleys, and a small silver-lead vein occurs in andesite on the west side of Iron Creek Glacier a mile south of the ice-front.

Andesites and tuffs that outcrop along the north bank of Alsek River 2 miles northwest of the mouth of the Dezadeash have undergone intense shearing and alteration. They have been converted

in part to carbonate, and are now weathered in dull red and yellow-brown hues. The plagioclase phenocrysts in the andosites are locally altered to a greenish product, and fractures up to 1/8 inch wide in the altered lavas are filled by a pale greenish blue chlorite, which somewhat resembles malachite. -- specimen of this mineral, tested by S.C. Robinson (Mineralogist, Geological Survey of Canada), was identified as penninite (a hydrous magnesium-iron-aluminium silicate). It has no commercial value.

Along a small stream a mile east of Sugden Creek and 2 miles north of Alsek River, reddish hued andesite is overlain by light yellow-brown-stained conglomerate beds some 500 feet thick. At an elevation of 3,550 feet, the conglomerate gives place to about 150 feet of overlying carbonaceous slates and argillites, with which is associated an abundance of thin coal seams very few of which are more than 2 inches thick. The coal-bearing beds are overlain by several hundred feet of altered tuff, which in places has been silicified to a hard and very white rock. This tuff is cut by a 50-foot dyke of quartz diorite. At an elevation of 4,200 feet, the altered tuff gives place to normal sandstones and argillites above a 50-foot-wide andesite sill. The latter marks the top of the volcanic and sedimentary succession mapped as Jurassic and ? earlier.

A spectroscopic examination of a sample of the white altered tuff described above was made by F.J. Fraser of the Geological Survey, who reports as follows:

High.....	Si
Low.....	Al, Mg, Ca, Ba, Sr, Ti
Trace.....	Fe, V, Na, B, Cu?

#### Sifton Mountains

Sifton Mountains are composed mainly of hard, massive, brittle volcanic rocks that stand high above the surrounding country

because they are unusually resistant to weathering processes. They are largely light grey, pale green, and pale purple lavas that include rhyolite, latite, dacite, and andesite, the latter three being most abundant. Small thicknesses of volcanic breccia and tuff are interbedded with the flows. These volcanic rocks are intruded by porphyritic granite, of probable Cretaceous age, on the east and west flanks of Sifton Mountains, and on the southern slopes they are in faulted contact with Yukon group gneisses and schists. The Jurassic volcanic rocks of Dezadeash Mountains much resemble those of Sifton Mountains, and may be of like age.

#### Upper Jurassic and Lower Cretaceous Sedimentary Rocks

The mountain front on the southwest side of Shikwak Valley, from Dezadeash Lake northwest to the edge of the map-area, is composed largely of sedimentary rocks, with minor bodies of peridotite, granite, and serpentine. The sedimentary rocks comprise slate, greywacke, argillite, quartzite, chert, impure limestone, grit, conglomerate, tuffaceous sandstone, and volcanic tuffs. These rocks have been closely folded along northwesterly trending axes and are intersected in the same direction by many faults so that the succession and true thickness of the series are not readily apparent, but the latter probably exceeds 10,000 feet.

The base of the Upper Jurassic-Lower Cretaceous sedimentary series is the uppermost andesite flow of the underlying succession. The series consists of thin- and massive-bedded sandstones, the top of which has not been recognized. The contact with Yukon group rocks along Shikwak Valley is undoubtedly marked by major faulting, indicated in part by strong shearing of the peridotite along a northwesterly course near Jarvis River on the lower northern mountain slopes. Elsewhere the faults underlying Shikwak Valley are concealed

by a heavy drift cover. A parallel fault extends up Alder Creek and is exposed for some distance on the east side of this stream near the mouth of Shorty Creek.

Fossils are sparsely distributed in areas of these rocks so far examined. A few specimens collected on the steep slope at the northwest end of Louise Lake about 11 miles west of the Haines road were identified by F.H. McLearn of the Geological Survey as a species of Astarte? of probable Jurassic or Cretaceous age. Others collected from concretions in tuffaceous sandstones on the north shore of Lake Kathleen were identified by McLearn as Aucella? sp. of probable late Jurassic or early Cretaceous age.

The best collection was made in 1948 on the east side of Alder Creek 1,000 feet north of the south end of the canyon. The lot contained several aucellas, which have been listed as follows by J.A. Jeletzky of the Geological Survey:

Aucella cf. gigas Crickmay  
Aucella cf. terobraturuloides Lahusen  
Aucella crassicolis Keyserling  
Aucella crassicolis Keyserling var. americana Sokolon  
Aucella crassicolis Keyserling cf. var. gracilis Lahusen  
Aucella cf. crassicolis Keyserling  
Aucella sp. indet. (cf. crassicolis Keyserling)  
Aucella ? sp. indet.

According to Jeletzky, the lot was undoubtedly taken "from beds of Neocomian (early Lower Cretaceous) age".

#### Peridotite, Serpentine, and Dunite

A body of partly serpentinized peridotite intrudes sedimentary strata of Upper Jurassic or Lower Cretaceous age along the mountain front on the southwest side of Shakwak Valley between Jarvis and Dezadeash Rivers. The intrusive mass ranges from 1 to 2 miles in width and has been traced northwesterly for 12 miles to Jarvis River and may continue farther. The rock is mainly finely crystalline, and



all gradations between dark peridotite and green serpentine are to be seen. In many places the serpentine has been sheared to form both talc schist and green serpentine schist, the planes of schistosity striking northwesterly and dipping about 75 degrees southwest. Near Jarvis River, shearing appears to have affected the greater part of the peridotite body, but the central core of the intrusion for a width of about 800 feet is massive and more coarsely crystalline. Several small dykes of pyroxenite cut the serpentine on the mountain slope south of Summit Creek. These are partly altered to carbonate. The peridotite is traversed by numerous small calcite veins and by quartz veins.

A second body of peridotite and serpentine a mile wide lies 3 miles farther south on the west side of Dezadeash River. It trends northwesterly parallel with the peridotite belt described above, and is known to be more than 4 miles long. It forms the backbone of mountain peaks that exceed 7,000 feet in elevation. Streams that dissect the peridotite stock have deposited peridotite gravels on a flat bench above Alsek River. A few cobbles of iron-rich material associated with the peridotite cobbles were noted on the flood-plain. An analysis of one of these black, heavy cobbles by the Bureau of Mines, Ottawa, showed: iron, 11.45 per cent; chromium, 19.82 per cent.

There appears to be a third peridotite intrusion on the west side of Alsek River 6 miles south of the mouth of the Dezadeash, but this has not yet been confirmed.

A dunite stock about a mile in diameter is exposed on the west side of Kathleen River 3 miles south of its confluence with the Dezadeash. The dunite is light greenish grey on fresh surfaces, but weathers in dark reddish tones. It contains considerable magnetite, which occurs as small grains scattered throughout the rock, as small

segregations, and, where the rock is sheared, as thin filmy plates that follow the cleavage lines, giving a somewhat bedded appearance. A specimen of iron-rich dunite was tested for chromium and titanium with negative results.

#### Granitic Intrusions

Much of the east half of Dezadeash map-area is underlain by granitic rocks, which form part of the great complex of Coast intrusions that extends south along the entire length of the Coast Mountains of British Columbia. The western contact of these intrusions runs approximately north and south from Dezadeash Lake, but outlying stocks do occur as far west as Alsek River. North of the map-area the contact swings northwest to Kluane Lake via the west fork of Aishihik River. The east boundary of the granitic complex extends northwesterly from Lake Bennett towards the south end of Aishihik Lake. The Whitehorse copper deposits, and the gold-silver, antimony-silver, and silver-lead veins in the Wheaton area lie in this contact zone. Copper deposits also occur near the north border of the complex north of Hutshi, at Giltana Lake, and on the west side of Kluane Lake. South of the map-area, copper and lead ores occur at Rainy Hollow near the western contact. Jurassic volcanic rocks contain small amounts of copper in several places north and south of Mush Lake, and a few quartz veins containing copper minerals have been noted in the granodiorite stock that intrudes Jurassic strata 7 miles south of Mush Lake. The gold of the placer deposits in Dezadeash area and in the Kluane Lake and Kloo Lake placer camps was derived from gold-bearing veins thought to be genetically related to the Coast intrusions.

The granitic areas include rocks of several different varieties, the most common being grey biotite granodiorite and a grey to pink porphyritic granite. Grey, coarsely crystalline, biotite granodiorite forms the bulk of the intrusive rocks in the

northern part of the map-area. This rock is of variable composition, but usually contains from 5 to 10 per cent of both biotite and hornblende, 10 to 20 per cent quartz, 60 to 70 per cent andesine, and from 5 to 15 per cent orthoclase. The rock is mottled by glistening black faces of biotite flakes. Outcrops are generally massive, but in places near its contacts with older rocks the granodiorite has a gneissic structure. Near intruded bodies of limestone the granodiorite approaches a quartz diorite in composition.

The granite body lying between the Aishihik road and Moraine Lake consists largely of grey to pink, porphyritic granite. The principal characteristic of the rock is the presence of plentiful orthoclase phenocrysts up to 1 inch or more in diameter. Microscopic examination of a thin section of a specimen obtained 3 miles northeast of the junction of the Alaska Highway and the Aishihik road disclosed about 35 per cent quartz, 5 per cent biotite, 50 per cent orthoclase, and 10 per cent oligoclase. The intrusive rocks in the mountains to the northeast of Taya Lake are of very similar porphyritic granite, but the ferromagnesian mineral in the one section examined is hornblende.

A stock of light-coloured, coarsely crystalline, acidic granite intrudes the granodiorite mountain on the west side of Kusawa Lake about 4 miles south of the north end of the lake. This stock extends westerly for 4 miles between Kusawa and Jo-Jo Lakes and for 7 miles south to the westerly trending shoreline of Kusawa Lake. On the higher slopes, above 5,000 feet, this granite is deeply weathered, forming thick deposits of coarse, light-coloured sand. The granite consists roughly of 35 per cent quartz, 50 per cent orthoclase, and 10 per cent oligoclase, with about 2 per cent each of hornblende and biotite, and as much as 1 per cent magnetite.

Another body of very similar acidic granite outcrops on both sides of Kusawa Lake, south of the most westerly jog at Frederick Lake Valley.

Stocks of grey granodiorite intrude Upper Jurassic or Lower Cretaceous strata in the mountains west of Dezadeash Lake. As the grey granodiorite is cut elsewhere by both the porphyritic granite and the acidic granite, it follows that the bulk of the granite in this area is of Lower Cretaceous or later age.

Several dykes and stocks of quartz porphyry and granite porphyry intrude the Cretaceous sedimentary strata south and southwest of Kathleen and Louise Lakes and northwest of Louise Lake. These porphyry intrusions are of light colour, but weather rusty as a result of oxidation of their small content of magnetite. They contain variable amounts of oligoclase feldspar and quartz phenocrysts in a finely crystalline groundmass of quartz and feldspar, and from 3 to 5 per cent altered biotite. Several of these dykes are impregnated with pyrite where they cut the granite 6 miles south of the most westerly bay of Kusawa Lake. Their economic significance has not yet been ascertained.

#### Diorite and Gabbro

A stock of hornblende gabbro about 1,000 feet in diameter intrudes Mesozoic sedimentary rocks on the west side of Dezadeash River, 5 miles above its confluence with the Alsek. Half a mile farther east, on the east bank of the river, quartzite, slate, and conglomerate beds are cut by narrow gabbro dykes. The gabbro in both places contains about 1 per cent magnetite, and its oxidation produces some rust on weathered surfaces.

One gabbro dyke that cuts Upper Jurassic-Lower Cretaceous sedimentary rocks 5 miles south of Louise Lake is more than 3 miles long and ranges up to 300 feet in width.

Small, brown weathering diorite porphyry dykes intrude peridotite and sedimentary rocks in the vicinity of Mount Decoeli on the north side of Summit Creek, and a 20-foot dyke of augite porphyry cuts the peridotite on the mountain south of Summit Creek.

Two small stocks of highly fractured and altered diorite intrude Mesozoic slates and gneisses on Shorty Creek. These diorite stocks are impregnated with finely disseminated pyrite that has largely oxidized as a result of deep surface weathering, and outcrops are now covered by thin films of reddish brown limonite.

These intrusions are probably of about the same age as the granitic intrusions previously described. Both bear the same intrusive relationships towards Mesozoic sedimentary rocks, and are generally considered to be of Lower Cretaceous or later age.

#### Paleocene Sedimentary Rocks

Paleocene sedimentary rocks composed of flat-lying and gently dipping beds of conglomerate, sandstone, and shale outcrop between Mush and Bates Lakes and form the mountain ridge that trends southeasterly from the north end of Bates Lake. They have been traced for 12 miles southeast and 10 miles northwest of the stream connecting Bates and Mush Lakes. The belt ranges from 2 to 5 miles in width, and displays a thickness of about 3,500 feet of sedimentary strata. Four miles north of Bates Lake, the basal conglomerate beds are exposed resting unconformably upon porphyritic granite along the canyon walls of Shaft Creek. Eight miles south of Mush Lake, on the east side of the belt of Paleocene strata, the conglomerate beds are in faulted contact with the older Jurassic volcanic rocks. Commencing 6 miles northwest of Mush Lake, the Paleocene succession thins perceptibly towards the

northwest, and is overlain by a thick mantle of Tertiary volcanic strata. On the mountain east and southeast of Bates Lake the Paleocene succession is intruded by a stock of white weathering soda syenite.

Most of the conglomerate occurs in thick massive beds separated by well layered sandstone and shale. The conglomerate cobbles are generally less than 6 inches in diameter and are well rounded. They include a wide variety of rock types such as granite, quartz, greywacke, slate, quartzite, limestone, greenstone, red andesite, and schist. The conglomerate generally breaks around the pebbles in the sandy matrix. The sandstone beds range from grey to brown, and the shales from black to grey or brown. Coal seams less than an inch thick occur in places in this formation.

Fossil plants gathered from brown weathering shales interbedded with grey sandstone and conglomerate beds at an elevation of 4,000 feet, some 5 miles northwest of the north end of Bates Lake, were examined by W.A. Bell, of the Geological Survey, who records the following species:

"Angiosperms

Pterospermites ? auriculacordatus ? Hollick

Acer arcticum Hoer

Dillenites sp. cf. D. ellipticus Hollick

"Although the number of species is few, the age is considered to be probably Paleocene."

Another fossil collection was made near an elevation of 4,000 feet, a mile east of the north end of Bates Lake, from flat-lying sandstone and shale beds. Dr. Bell's identification of this lot follows:

"Conifers

Elatocladus (Cryptomerites?) nordenskioldi (Hoer)

Sequoia langsdorfii (Brongniart) Hoer

"Angiosperms  
Trochodendroides arctica (Heer)  
Corylites ? fosteri ? (Ward)  
Alnus sp.

"The age is considered to be probably Paleocene."

### Soda Syenite

Soda syenite outcrops on the east side of Bates Lake north of the peninsula midway along the east shore of the lake. The outcrops mark the northerly exposures of a stock 1 mile wide, which has been traced southeasterly for 7 miles. On fresh surfaces, the soda syenite is a fine-grained, massive, dull brownish pink rock, which on weathered surfaces is white and marked by small rust-coloured flecks.

A preliminary microscopic study of the soda syenite revealed the following mineral composition: quartz, about 1 per cent; orthoclase, about 20 per cent, as small phenocrysts enclosed within larger oligoclase phenocrysts; oligoclase, about 60 per cent, as phenocrysts averaging 0.1 inch in diameter; groundmass, about 20 per cent, largely cryptocrystalline, but with some small orthoclase laths. Some rust-coloured kaolin, derived from alteration of the feldspars, was also observed.

No actual contacts of Paleocene sedimentary rocks with soda syenite have yet been seen, due to the prevalence of talus or drift cover at the critical points. But as the syenite completely surrounds some of the sedimentary areas and has every appearance of invading the Paleocene strata, it is tentatively dated as of post-Paleocene age.

Another soda syenite stock, about a mile in diameter, intrudes Jurassic volcanic and sedimentary rocks on the west side of Bates Lake, 4 miles northwest of the outlet of the lake. Dykes of soda syenite up to 20 feet wide were seen cutting pink porphyritic



granite on Shaft Creek, the stream flowing southeasterly into the north end of Bates Lake.

### Tertiary Volcanic Rocks

Tertiary volcanic rocks, consisting of agglomerate, volcanic breccia, tuff, rhyolite, dacite, andesite, and basalt overlie the Paleocene sedimentary succession in a prominent mountain 6 miles northwest of Mush Lake. Tuffs and breccias are the most abundant constituents. They are light-coloured rocks, with dull white, pale green, and purple hues predominant. The andesites weather in bright shades of orange, yellow, red, and brown, due to oxidation of contained iron minerals to hematite and limonite. The tuffs and breccias are well bedded, and the succession, although flat lying in many places, also shows dips that range up to 30 degrees. The present dip of the beds may represent the initial dip at the time of deposition.

A section of these rocks at least 3,000 feet thick is displayed in the mountains adjacent to the Alsek. Some of the peaks formed of these rocks west of the Alsek reach to more than 6,500 feet above sea-level, but the cores of these mountains are formed of much older rocks.

At the first narrows on Alsek River, 6 miles south of the mouth of the Dezadeash, the rock bluffs along the river comprise gently dipping beds of volcanic breccia and tuff. A mile farther south these volcanic rocks unconformably overlie folded beds of Palaeozoic crystalline limestone. The Paleocene conglomerate that underlies the Tertiary volcanic rocks 10 miles farther southeast is missing here, suggesting a period of erosion between Paleocene time and the time of deposition of the thick series of later Tertiary

volcanic rocks. The latter are considered to be of about Miocene age.

Paleocene beds were deposited, during an epoch of subsidence, in valleys incised about as deeply as present day drainage. This subsidence was followed by elevation and rapid erosion, during which the Paleocene deposits were ~~attacked~~ and in large part removed. An epoch of volcanism followed, at which time all valleys and mountains in the Alsek River sector were buried beneath 3,000 to 3,500 feet of ash, breccia, and lava. Renewed erosion by water and valley glaciers has developed today's drainage pattern. The chief interest in these volcanic rocks, from an economic viewpoint, is that they may have protected gold-bearing placer gravels from ice erosion during the Glacial period.

#### STRUCTURAL GEOLOGY

The general strike of the Mesozoic and older sedimentary and volcanic rocks is northwest, and beds generally dip at angles greater than 45 degrees to the southwest or northeast. The Mesozoic sedimentary rocks in Dezadeash Mountains west of Dezadeash Lake are overturned in many places as a result of thrusting from the southwest, and they are traversed by many faults that trend north by west. One of these faults is exposed for half a mile along the east side of Alder Creek near the mouth of Shorty Creek. Northwest of Kathleen Lake the beds are less severely folded, but at Quill Creek several thrust faults were observed. Strong shearing of the peridotite in a northwesterly direction at Jarvis River suggests major faulting along the mountain front on the southwest side of Shakwak Valley. The evidence indicates a probable early uplift of the area underlain by Yukon group rocks and Coast intrusions on the northeast side of Shakwak Valley, followed at a much later period by folding, faulting, and overthrusting of the softer Mesozoic beds

on the southwest side of this valley.

Several northeasterly trending faults traverse granodiorite west of Dezadeash River and north of Sixmile Lake, and the narrow, drift-filled Dezadeash River Valley may itself follow such a fault zone between Dezadeash Lake and Mount Bratnobar.

Faults that traverse granitic intrusive rocks east of Moraine Lake near the north edge of the map-area strike only a few degrees west of north. These are clearly defined in air photographs.

## ECONOMIC GEOLOGY

### Placer Deposits

Gold placer mining has been carried on intermittently in Dezadeash area since 1896, when the Dalton trail was first used by miners en route to the Klondike. Small-scale placer operations are known to have been conducted on the following streams: Kimberley Creek, Sugden Creek, Shorty Creek, Goat Creek, Alder Creek, Victoria Creek, Beloud Creek, Mush Creek, Wolverine Creek, Iron Creek, Bates River, Silver Creek, Tatshenshini River, Squaw Creek, Marshal Creek, and Primrose River. The most extensive operations in the area were by Barker and Ray on Shorty Creek, in 1945, 1946 and 1947. Production at Shorty Creek was 738 ounces of gold during 1945 and 1,336 ounces in 1946. J. Urgeleit Bros. constructed a tractor road to their property on Silver Creek in 1948, and laid plans for extensive placer mining.

During the Glacial period all of the main valleys in Dezadeash area were choked with ice that moved northerly away from the gathering grounds of the high St. Elias Mountains. These valley glaciers scoured away what may have been workable gold placer deposits and scattered them widely. Those placer deposits that

remain owe their survival to local physical features that protected the gravel beds from erosion. Thus, short streams that headed in high mountains on the south and flowed northerly were protected from the valley glaciers, which flowed around such obstructions. Gravel deposits along such streams in Dezadeash area are probably all worth testing for placer gold.

Some of the Tertiary gravels along stream beds adjacent to Alsek River were protected from ice scouring by a covering of Tertiary lava flows. Where recent streams have cut through shallow coverings of these flows to reach the older gravels they may have revealed workable grades of placer ground. Sugden Creek, which joins the Alsek 4 miles west of the mouth of Dezadeash River, is such a stream below the first rock canyon, where considerable placer mining was done some 40 or 50 years ago. The production is not known.

Shorty Creek is a short, easterly flowing stream that rises in a high basin in the mountains 5 miles west of Dezadeash Lake. It empties into Alder Creek, which occupies a very narrow and deeply cut valley that trends southerly. Stagnant ice probably occupied Shorty Creek basin during the Glacial period, and as a result its gold-bearing placer gravels were not subjected to scouring action. Alder Creek Valley was undoubtedly choked with ice at that time due to the pressure of ice from the south, but there could have been little or no movement of ice up Alder Creek owing to its steep gradient and very narrow profile. Two small diorite stocks that intrude the Mesozoic sedimentary rocks on Shorty Creek are thought to have provided some of the placer gold. These stocks are highly fractured and contain numerous small quartz stringers. Both altered diorite and quartz stringers are impregnated with a little

pyrite. Some of the gold was probably derived from veins in the granodiorite stock, 2 miles in diameter, at the head of the south fork of Shorty Creek.

### Lode Deposits

#### Iron Creek

A quartz vein on the west side of Iron Creek Glacier, a mile south of the ice-front, contains a little galena and pyrite. The vein ranges from 2 to 4 feet in width, and is well exposed on a steep slope between elevations of 3,600 and 3,800 feet. It occurs along a fault fissure in andesite. The quartz vein contains abundant galena and pyrite in some places, but most of it is sparsely mineralized. A 4-foot channel sample taken across the vein by the writer at an elevation of 3,700 feet, assayed: gold, a trace; silver, 1.03 ounces a ton; lead, 3.10 per cent. Another sample collected 30 feet higher, across 4 feet of quartz and rusty carbonate, assayed: gold, a trace; lead, none.

Pyritized limestone outcrops on the west side of Iron Creek Glacier at the ice-front. One small sample brought in by K. Roberts, assayed: gold, a trace.

#### Mush Creek Pass

In the autumn of 1948, Messrs. C. W. Burns and V. H. Poole brought in a sample of rusty, altered tuff containing chalcopyrite. The sample was collected in a canyon of a north-flowing mountain stream on the south side of the pass between Mush Creek and Fraser Creek Valleys. The mineral is reported to have been found in a faulted zone near the contact of Jurassic volcanic rocks with a large granodiorite stock that forms the bulk of the mountain to the south. The sample assayed: gold, a trace; copper, 3.09 per cent. Another sample collected from a small quartz vein in the nearby

granodiorite, assayed: gold, 0.005 ounce a ton.

#### Coal Deposits

Thin seams of coal occur in conglomerate and its overlying slates and argillites on the north side of Kimberley Creek. They were also seen in the same zone 4 miles northwest of the mouth of Dezadeash River. The beds in which the coal occurs are associated with volcanic rocks that lie just below a thick succession of sandstone, shales, and argillites that contain fossils of Upper Jurassic or Lower Cretaceous age. Although the seams observed are of no value, this zone might be worth exploring farther south on the chance of encountering thicker seams.

#### Prospecting Possibilities

Copper is known to occur in Dezadeash map-area in the Jurassic volcanic and sedimentary rocks north and south of Mush Lake, and in the granodiorite stocks that invade these rocks. Native copper nuggets weighing several pounds are to be found on Beloud Creek, and one weighing 28 pounds was found there by B. Beloud during placer mining operations. Many small epidotized zones in the andesites near Mush Lake contain chalcocite stringers and veinlets, and in one zone a fine impregnation of native copper was noted. Six miles south of Mush Lake, altered tuffs adjacent to the north end of a granodiorite stock are mineralized with chalcopyrite, and quartz stringers within the intrusion contain small amounts of chalcocite and galena. Some copper mineral is also associated with the granitic intrusion on Shorty Creek, judging from small malachite-stained pebbles of quartz and chalcocite found there in the sluice-boxes during placer mining operations. From the foregoing it is evident that none of the Mesozoic and older volcanic and

sedimentary rocks south, west, or northwest of Dezadeash Lake can be overlooked by those searching for copper minerals.

Some black cobbles picked up at the base of the peridotite stock, 4 miles north of the mouth of Dezadeash River, contained about 20 per cent of chromium, which suggests a possibility of finding chromite within the peridotite intrusion west of Dezadeash River.

A specimen of augen-gneiss collected 12 miles north of Champagne and 3 miles west of the Hutshi trail was tested for radioactivity by H.V. Ellsworth of the Geological Survey, who reported its activity as 0.005(5)  $U_3O_8$  equivalent, or somewhat above the average for granites. None of the granites tested showed any activity.

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