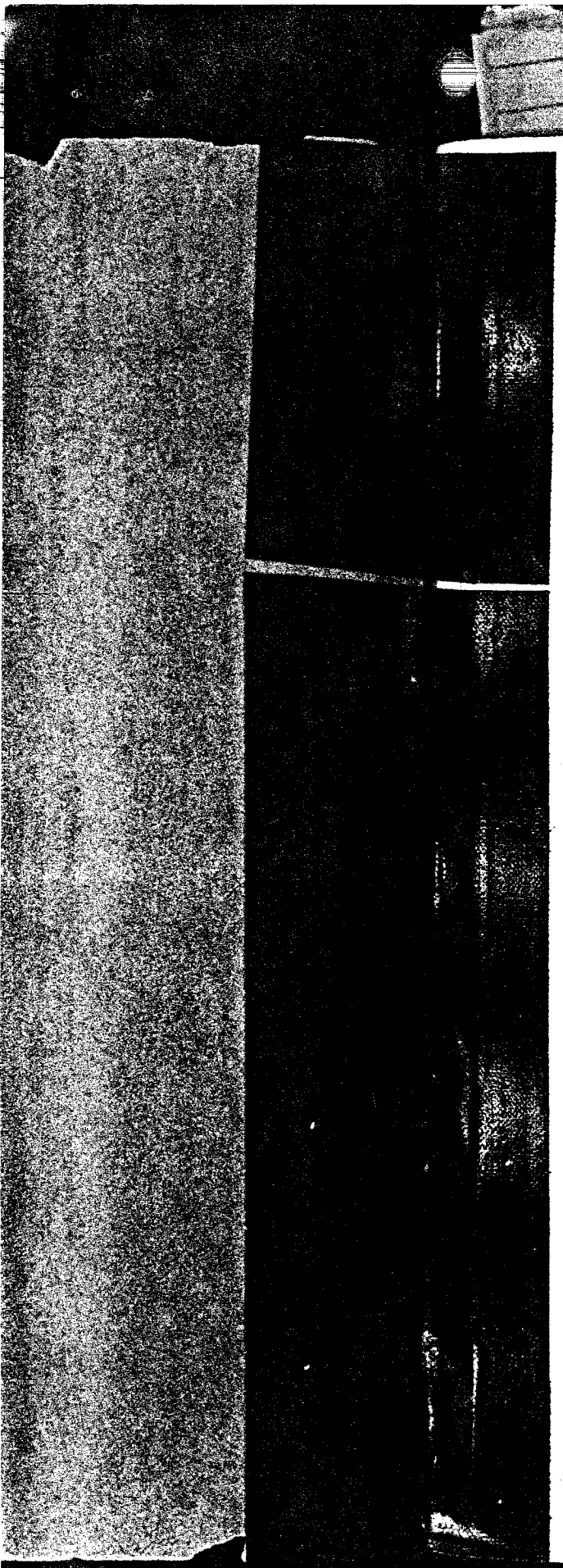


UNITED STATES DEPARTMENT OF THE INTERIOR
Ray Lyman Wilbur, Secretary
GEOLOGICAL SURVEY
W. C. Mendenhall, Director

Bulletin 824

MINERAL RESOURCES OF ALASKA

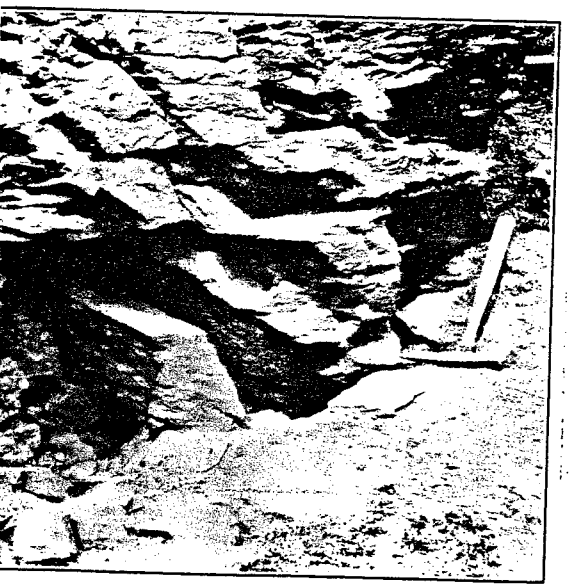
REPORT ON PROGRESS OF INVESTIGATIONS IN 1929

BY

PHILIP S. SMITH AND OTHERS

UNITED STATES
GOVERNMENT PRINTING OFFICE
WASHINGTON : 1932

FELDSPATHIC QUARTZITE IN BIRCH CREEK SCHIST



GNEISS INTRUSIVE INTO BIRCH CREEK SCHIST

Circle by way of Chatanika, and this road should be of great benefit to the Circle district, but no steps have yet been taken to connect the Fortymile district with the Tanana Valley.

CLIMATE

The climate of the Yukon-Tanana region as a whole is characterized by long, cold winters and short, relatively warm summers. The extremes of temperature are from 80° below zero in winter to 90° above zero or perhaps higher in summer, with an annual mean temperature of about 24°. At Eagle, according to the United States Weather Bureau,[10] there are on the average 56 days during the year when the maximum temperature exceeds 70°, 255 days when the minimum temperature is less than 32°, and 120 days when the minimum temperature is less than zero.

The mean maximum temperature from May 15 to September 15 is about 65° and the mean minimum about 40°; the mean maximum from November 1 to April 1 is about 10° and the mean minimum for the same period about −15°. Commonly, the alluvial deposits are permanently frozen to great depths and thaw only a few feet at the top during the summer. A marked exception to this condition exists along the banks of the larger streams, where circulating ground water has in places thawed the ground for several hundred feet back from the river banks. In winter ice freezes on the lakes and quiet ponds to a depth of 5 feet or more. The permanently frozen ground is believed to be evidence of a previous geological epoch, in part Pleistocene, during which the regional climate was even more frigid than at present. This deep frost may, therefore, be regarded as an inorganic fossil record of a preexisting climatic condition.

The larger streams, such as the Yukon, usually begin to freeze over about the middle of October, and the ice breaks up about the middle of May. The smaller streams freeze earlier in the fall and open later in the spring. In the higher country killing frosts are rare in midsummer but begin in the middle of August and sometimes continue throughout May. In the lower country, as along the Yukon, the season free of frost is somewhat longer.

The average annual precipitation at Eagle, based on observations made over a period of 18 years, is 10.4 inches. The average winter snowfall, based on observations over a period of 12 years, is 51 inches. Without doubt, both rainfall and snowfall are somewhat greater in the mountains away from the Yukon, but the region as a whole is semiarid. On account of the frozen substrata, the circulation of

[10] Summary of the climatological data for Alaska, by sections: U. S. Weather Bureau Bull. W, 2d ed., vol. 3, 1926.

M 1

UNITED STATES DEPARTMENT OF THE INTERIOR
Ray Lyman Wilbur, Secretary

GEOLOGICAL SURVEY
George Otis Smith, Director

Bulletin 816

GEOLOGY OF THE EAGLE-CIRCLE DISTRICT, ALASKA

BY

J. B. MERTIE, JR.

UNITED STATES
GOVERNMENT PRINTING OFFICE
WASHINGTON : 1930

For sale by the Superintendent of Documents, Washington, D. C. Price 50 cents

THE SLANA DISTRICT, UPPER COPPER RIVER REGION

By FRED H. MOFFIT

INTRODUCTION

This paper is a brief preliminary statement about the geology and mineral resources of an area north of the Wrangell Mountains which includes a small part of the drainage basins of the Copper and Tanana Rivers. The area comprises the valleys of Indian Creek and the Slana River and parts of the Chistochina and Tok Valleys. Mentasta Pass, which lies between the Slana River and the Little Tok and is an Alaskan landmark, is in the eastern part of it. (See pl. 1.)

Topographic maps on which most of this area appears were based on surveys made by T. G. Gerdine and D. C. Witherspoon in 1902. Hasty geologic reconnaissances of the area were made by W. C. Mendenhall and F. C. Schrader at the same time. The economic results of these surveys were printed shortly afterwards,[1] but only a part of the geologic observations appear on published maps.

The writer spent the summer of 1929 in this district in order to extend the earlier geologic observations and examine such mineral deposits as are known. An area of about 800 square miles was covered, and the principal results of the work are presented here, although it is expected that the field work will be continued and a more comprehensive report will be made at a later time.

DRAINAGE AND RELIEF

The area considered includes a small part of the east end of the Alaska Range. It is crossed in an east-southeasterly direction by the axis of the range, which extends across the northern portion, marking the divide that separates waters flowing to the Pacific Ocean from those flowing to Bering Sea. The highest point of the divide is Mount Kimball (9,680 feet) on the west side of the area, where the mountains are rugged, snow covered, and seamed by numerous glaciers. Toward the east the altitudes are less and in the vicinity of the Little Tok River average not far from 6,000 feet. Moreover, the mountains of this part of the range are less jagged and have no glaciers. The south-central part of the area, between the main range and the Copper River, includes a separate group of mountains, which

[1] Mendenhall, W. C., and Schrader, F. C., The mineral resources of the Mount Wrangell district, Alaska: U. S. Geol. Survey Prof. Paper 15, 1903. Mendenhall, W. C., Geology of the central Copper River region, Alaska: U. S. Geol. Survey Prof. Paper 41, 1905.

are somewhat less rugged than the Alaska Range on the north and are markedly lower and of smoother contour on the south and west.

The area is drained by several small tributaries of the Copper River, the chief of which are the Slana River, Ahtell Creek, and the Chistochina River, and by the headwater tributaries of the Big Tok River,[2] which flows into the Tanana. The Slana River rises in a glacial source near Mount Kimball and flows southeastward through the center of the area but finally swings to the southwest and joins the Copper River at the northernmost point of the big bend of that stream, where it turns to the west in its sweep around the Wrangell Mountains. For much of the distance between the east end of Mankomen Valley and Burnt Creek the Slana flows through a narrow canyonlike valley, but below Burnt Creek it is less confined and in some places meanders widely. This is especially true near the mouth, where the current is sluggish, the course winding, and the banks soft so that fording with horses is not always easy. The valley of the Slana River separates the main part of the Alaska Range from the isolated group of mountains on the south. This group is drained for the most part by Ahtell and Indian Creeks and the East Fork of the Chistochina River.

The head of the Big Tok River receives most of its water from glaciers on the north side of the Alaska Range, opposite the head of the Slana. Like the Slana, it flows southeastward at first, but after joining with the Little Tok, which comes in from the south or southeast, it turns northeastward and flows into the Tanana. The largest western tributary of the Big Tok River is known to the few who visit it as the Dry Tok. Its headwaters are easily reached from the head of the Slana River by Gillett Pass, a low pass slightly above timber line and only a few hundred feet higher than the Slana. The Dry Tok flows nearly due east and joins the Big Tok about 12 miles from the mouth of the Little Tok River. Gillett Pass, the Dry Tok, and the upper valley of the Big Tok provide the easiest route from the Copper River side of the range to the head of the Robertson River, one of the tributaries of the Tanana River which has received some attention from prospectors. Another route between the Slana and Big Tok Rivers is afforded by Sikonsina Pass, in which Burnt Lake lies. It is used by the Indians and white trappers in winter but has never been used much in summer by the whites, as it is not the most direct route to the Robertson and has a good deal of soft ground.

Mentasta Pass is the best-known pass through the Alaska Range west of the Richardson Highway and the Delta River. The broad

[2] The name "Tok" is an abbreviation of the Indian name, which is said to mean timber. It was given as "Tokai" by Lieut. (now Gen.) Henry T. Allen, who crossed the Little Tok in 1885. The stream is sometimes called "Tokio" by the prospectors.

low summit of the pass is below timber li
east of Mentasta Lake, at the west end of
tracks from the Slana River to the Little T
the old military telegraph line and mail
Prince William Sound, and Eagle, on t
summit, and the creek that comes down
the north and formerly flowed eastward tl
Little Tok was named Station Creek for
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was before this diversion the lower part
meanders eastward in its former course thr
and small lakes to the Little Tok. The w
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due to landslides and the movement of grave
in 1929 were greater than in many years pre

Numerous ponds and small lakes are scatt
largest are Mankomen Lake, at the head o
Chistochina River; Mentasta Lake, betwee
Mentasta Pass; and the Cobb Lakes, near th
Copper River. Most of these bodies of sta
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TIMBER

Practically all of the district is covered w
limit of about 3,000 feet. In sheltered valle
trees may grow at somewhat higher altitudes
are usually scattered and small. Spruce is
both in the valley bottoms and on the hill
the stream courses it is intergrown with
timber suited for many purposes grows in
but unfortunately for those who may need i
it has already been destroyed by fire. The h
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Traveling in the valley bottoms, where the
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summit of the pass is below timber line and little over a mile
of Mentasta Lake, at the west end of the east-west valley that
ds from the Slana River to the Little Tok. Mentasta station of
old military telegraph line and mail trail between Valdez, on
nce William Sound, and Eagle, on the Yukon, was on this
mit, and the creek that comes down out of the mountains on
north and formerly flowed eastward through the valley to the
tle Tok was named Station Creek for this reason. This creek,
wever, is no longer tributary to the Little Tok, for immense
ntities of gravel brought down by the high waters of 1929
med the stream at the point where it emerges from its narrow
untain valley and diverted the waters to Mentasta Lake. What
before this diversion the lower part of Station Creek still
nders eastward in its former course through a chain of swamps
small lakes to the Little Tok. The winter of 1928–29 in this
trict was marked by exceptionally heavy snows and a late spring
d was followed by a summer of unusual rain, including a fall
snow on July 29 that was more than a foot deep at the head of
Slana River. It is probable that the changes in the landscape
to landslides and the movement of gravel deposits by high water
1929 were greater than in many years previously.

Numerous ponds and small lakes are scattered over the area. The
rgest are Mankomen Lake, at the head of the East Fork of the
istochina River; Mentasta Lake, between the Slana River and
entasta Pass; and the Cobb Lakes, near the westward bend of the
pper River. Most of these bodies of standing water are due to
action of glaciers in this region. They belong to a topography
which the drainage lines are not yet thoroughly established.

TIMBER

Practically all of the district is covered with timber up to an alti-
de of about 3,000 feet. In sheltered valleys and on sunny slopes
es may grow at somewhat higher altitudes, but in such places they
usually scattered and small. Spruce is the most common tree,
th in the valley bottoms and on the hill slopes. Along many of
stream courses it is intergrown with cottonwood. Excellent
mber suited for many purposes grows in some parts of the area,
unfortunately for those who may need it in the future much of
has already been destroyed by fire. The heavy, wet snow of July,
29, came at a time when the deciduous trees were in full leaf, and
damage from breaking and overturning was far greater than
kes place in winter. Even the conifers suffered much injury.
raveling in the valley bottoms, where the alders and small trees
ere bent down by the snow, was for this reason even more difficult
an is usual in this district.

TRAILS

The area has few trails and in recent years has had few travelers. The trails most in use at present are the trail up the west side of the Chistochina River to the gold placers of Slate Creek and that part of the old military trail between the Chistochina and the mouth of the Slana. This section of the military trail is part of the present trail to the Nabesna and Chisana Rivers and is used more than the Chistochina trail, chiefly because mail for the placer miners in the Chisana district passes over it twice a month. The military trail and telegraph line between Valdez and Eagle, often called the Eagle Trail, was established by the United States Army in the early days of Alaskan exploration, but the part of it in the upper Copper River Valley above Gulkana was abandoned after the Richardson Highway was established. From Chistochina station, on the Copper River a mile west of the mouth of the Chistochina River, it traversed the swampy lowland north of the Copper to the Cobb Lakes, then swung north across Ahtell Creek and through a high valley to the crossing of the Slana River near Mentasta Lake. Passing along the foot of the steep mountain east of this lake, it turned east, traversed the valley of Station Creek to the Little Tok, which it followed northward to the Big Tok and eventually reached the Tanana River at Tanana Crossing. The part of the military trail north of Ahtell Creek is now almost unused except by a few Indians and trappers who travel it occasionally on foot in summer or by dog sled in winter. Many miles of the old telegraph wire remain, although most of the poles are down. The horses used by the writer in 1929 were the only horses that have been over Mentasta Pass in several years.

This description of trails would not be complete without some mention of the work of the Alaska Road Commission. A branch of the Richardson Highway which has been named the Abercrombie Trail is being extended up the Copper River as rapidly as money is available for the work. This road is designed for automobile use and in 1929 was open for travel between Gakona and a point on the Copper River 8 miles below Chistochina. By using the bars of the Copper River it was possible to drive a truck with a moderate load as far as the Chistochina River during the middle and later part of the summer. A camp for a crew of men and a portable sawmill were erected on the Chistochina River in the fall of 1929 to get out timbers for a pile bridge over the river. It is expected that the road will be opened for use as far as the Chistochina by the end of 1930 and that eventually it will connect with an international highway by which automobile travel between the United States and points in Alaska will be possible.

POPULATION

In the summer of 1929 the population of the Slate Creek district, was three white There is a white trader at Chistochina, an Slana River, and a trapper at Mentasta La settlements of natives at each of these p their living almost wholly by fishing, hunti get work from the Alaska Road Commiss and if they wish it. Their numbers appear

GEOLOGY

Only a brief, imperfect account of the ge given, for it is not possible in reconnaissan than the most outstanding geologic feature like this part of the Alaska Range.

The accompanying sketch map (pl. 1) and igneous rocks, together with large a gravel and morainal deposits. In general the Mankomen Valley, between the Chisto are made up of igneous rocks, which inc mafic rocks, dark fine-grained lava flows, i They also include beds of limestone in a some other sediments. The mountains no are composed dominantly of sedimentary ro small amounts of dark fine-grained igneous rocks. Near the axis of the range most o altered to schist.

The age of most of the formations has n consequently they will be described by grou than strictly in the order of age.

BEDROCK FORMATIO

The mountains of the group between the Rivers, south of the Mankomen Valley, hav raphy, but within the group itself they are ragged on the east than in the area betwee and Indian Creek, where they appear as isc masses. So far as they have been examined gneous rocks which Mendenhall [3] described Ahtell diorite. These rocks show wide variat and possibly differ considerably in age. neous rocks appear to include both lava fl They are black or dark gray and show va

[3] Mendenhall, W. C., Geology of the central Copper Riv Survey Prof. Paper 41, pp. 36, 38, 1905.

of trees become more scattered, and the A
trof Lake southward is timberless.
Mulchatna region trees of sufficient size to
long the shores of Lake Clark and in the lo
na River. The commonest tree is the spru
s a diameter of 18 inches to 2 feet, but there
pruce of that size. Cottonwood trees as mu
were seen in the lowlands bordering Lake Clark
er. In the same areas birch trees as much as a
o be found on well-drained slopes. Elsewhere
ber consists mainly of small spruce trees that
ocal uses.

ge of brushy plants occurs throughout the tim
alders, willows, cranberry and currant bushes
bs, but in most places pack horses can be taken
mount of trail cutting. Willows large enough
he camp fire can be found in many places for
bove the last timber, but the upper valleys of
the Mulchatna lack even brush sufficient for

forage for horses is fairly well distributed
though it is necessary to have the question of
hoosing a camp site, as there are considerable
nty or lacking. The most abundant grass is a
p, which in places grows luxuriantly. There is
and some vetch, which horses eat eagerly. All
plants will maintain horses in working condi-
summer months, but after heavy frosts in the
heir nourishing qualities, and horses will lose
ed hay and grain.

WILD ANIMALS

chatna region was the natural range of a mod-
, but the natives keep them reduced in num-
back from the shores of Iliamna and Clark
ribou were seen during the summer of 1929.
n sheep in the high country around the upper
probably also in the rough country at the
of the Mulchatna River. One band of sheep
of Telaquana Lake.
bears are present, and some of the grizzlies
erience of the Geological Survey parties dur-
29 in this general part of Alaska, bears are
r basins of the Mulchatna and Stony Rivers

than farther north in the range. Moose may be found throughout this region, but are more abundant in the valleys of the northern tributaries of the Mulchatna and in the Stony Basin than farther south.

The fur-bearing animals that are most abundant in this area are beaver, fox, otter, lynx, mink, and muskrat. From time to time restrictions are placed upon the trapping of beaver, and in the 1929–30 season no trapping for them was permitted. As beaver are the most abundant and easily taken fur bearers of the region, restrictions on beaver trapping have an important influence on the value of the annual catch of furs, and as most prospectors depend upon trapping as their main source of income restrictions on trapping are reflected in the decreased number of prospectors in the country.

Small game animals and birds were notably scarce in the Lake Clark-Mulchatna region in 1929. It is a well-recognized fact that in any part of Alaska the abundance of rabbits and of ptarmigan varies greatly from year to year, and the rabbits in particular seem to have a cycle of six to eight years, during which from a small number they increase to astonishing numbers and then decline rapidly. The ptarmigan similarly may be present in tremendous numbers in one year and almost completely absent the next. As many of the carnivorous fur-bearing animals depend largely upon rabbits and ptarmigan for their food supply, the abundance of the fur bearers depends closely upon the presence or absence of these small animals. In 1929 rabbits were almost completely absent in this region, not one being seen by any member of the Geological Survey party. Ptarmigan and spruce grouse also were scarce.

This region as a whole is exceptionally well supplied with fish. Lakes Iliamna and Clark and their larger tributaries being notable spawning grounds for red salmon, which come up in the early summer in large numbers. This fish furnishes the main item of food for the natives. These two lakes, as well as the many other lakes of the region, contain lake, rainbow, and dolly varden trout, whitefish, and pickerel, all in sufficient abundance to form a reliable food supply and to make a paradise for the angler. The smaller streams of the region are also stocked with trout and grayling, except in those upper reaches of the creeks that are obstructed by beaver dams.

ROUTES OF TRAVEL

So few white men have visited the region between Lake Clark and the Stony River that there are no established routes of travel in it. The Geological Survey party in 1929 approached the region from Iliamna Bay, between which and Iliamna Village, on the Iliamna River 4 miles above the mouth of that stream, an old native trail

has long existed. This trail has been improved during recent years by the Alaska Road Commission, and parts of it have been widened and graded to form a passable wagon road. Plans are under way to continue this improvement, and it was expected that by the end of 1930 a light wagon could be taken across the entire 12 miles of this route from Cook Inlet to the navigable waters of the Iliamna Lake-Kvichak River drainage basin. During 1929 a gasoline launch made calls at intervals of about two weeks at Iliamna Bay, landing mail, perishable goods, and light freight, and a small pack train was operated between Iliamna Bay and Iliamna Village. From Iliamna Village westward practically all summer travel goes by boat and winter travel by dog sled, so that only faint trails or none lead overland. Pack horses, however, can be taken along the north shore of Iliamna Lake at least as far west as the foot of the Newhalen portage, at Severson's trading post, though the trail is poor and travel slow. In summer power launches are able to ply between Iliamna Lake and Bristol Bay by way of the Kvichak River, and most of the supplies for this region come in by that route. A trading post with a small stock of goods is operated at Iliamna Village, and a larger trading post, at which supplies of all kinds can be purchased, is maintained on the north shore of Iliamna Lake about 4 miles northeast of the mouth of the Newhalen River. From that point an old portage trail leads northwestward to a point above the upper rapids of the Newhalen. This portage trail is soft for a mile or so from Iliamna Lake but is hard and well worn beyond. From the head of this portage the Newhalen River is navigable to Sixmile Lake and Lake Clark, and the Chulitna River, tributary to Lake Clark from the west, is also navigable by small boats for many miles above its mouth. There were in 1929 no work animals other than dogs in the region except the three or four horses used between Iliamna Bay and Iliamna Village. As a consequence all materials that pass back and forth between Iliamna Lake and Lake Clark are taken across the Newhalen portage mostly on men's backs, though in lesser part by dog sled in winter. In this way are carried all the supplies for the Indian village of Nondalton and for the white trappers and prospectors on Lake Clark, including such heavy materials as gasoline and dried salmon.

North of Lake Clark the region is almost devoid of well-marked trails. A faint Indian trail leads from Nondalton in a northwesterly direction to a ford across the Chulitna River, and another dim trail leads northeastward from that village along the shore of Lake Clark. This trail follows the lake beach much of the way but is plain across most of those places where rock cliffs along the lake shore make beach travel impossible.

An old Indian trail, known as the Telaqu
of Lake Clark at the site of an abandoned i
of the Kijik River and leads northward ac
o Telaquana Lake, where there was forn
This was a well-traveled native trail and
difficulty for the first 20 miles or so, but in t
River it is indistinct in many places. A
it ascends from the valley of the Kijik R
into the Mulchatna Basin and somewhat
throughout most of its length it is entirely
footing for horses.

With the exception of the primitive nat
there are no established routes of travel in
Nevertheless the country is open and fairly
timber, and except in certain marshy areas
the more rugged mountains of the main r
taken almost anywhere without more difficu
in any unsettled part of Alaska.

POPULATION

Except for one white man on the north sl
5 miles above the mouth of the Kijik River
inhabitants in the region described in this
merly native villages at the foot of Telaqua
of the Kijik River, and a few native house
Lake Clark, but all of these are now aban
ment of any size is Nondalton, on the w
where some 60 or 80 natives and one white
haps half a dozen white men prospecting o
Although most of the natives of this reg
Nondalton, many of them visit different pa
during the midwinter months and move to
in the summer, so that the inhabitants of
present there at the same time.

On Iliamna Lake and on the lower Iliam
a dozen white men and two native villag
Iliamna River, 4 miles above its mouth, i
natives of the Kenai tribe. Another villag
mouth of the Newhalen River is occupied
about 500 reindeer has been maintained b
years near the south end of the Newhalen p

It will thus be seen that although the Ili
has been known to white men for many ye
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An old Indian trail, known as the Telaquana trail, leaves the shore of Lake Clark at the site of an abandoned native village at the mouth of the Kijik River and leads northward across several stream valleys to Telaquana Lake, where there was formerly a native settlement. This was a well-traveled native trail and can be followed without difficulty for the first 20 miles or so, but in the basin of the Mulchatna River it is indistinct in many places. Although very steep where it ascends from the valley of the Kijik River to the divide leading into the Mulchatna Basin and somewhat marshy in a few places, throughout most of its length it is entirely feasible and affords good footing for horses.

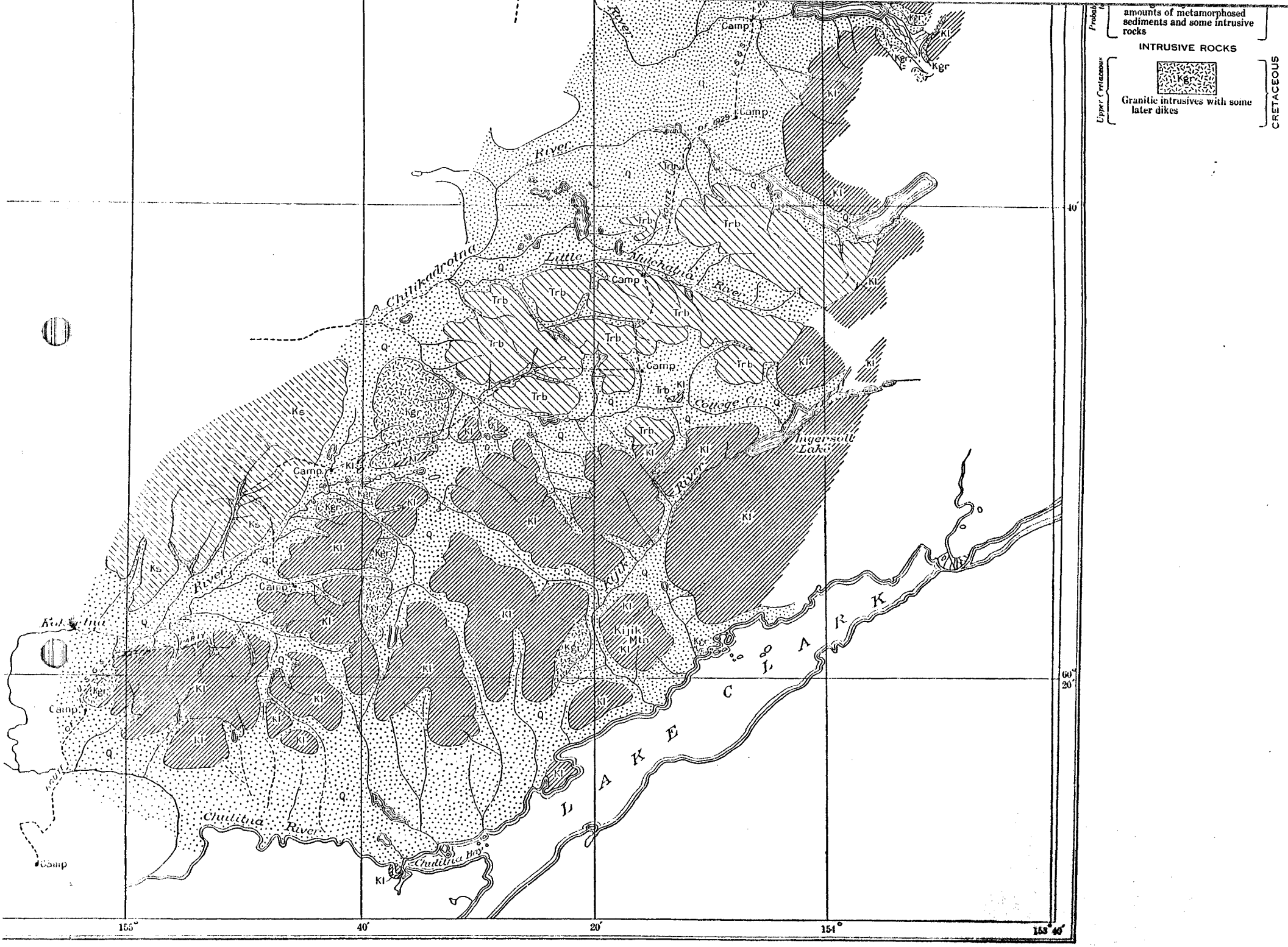
With the exception of the primitive native trails described above, there are no established routes of travel in this little-visited region. Nevertheless the country is open and fairly free from brush and thick timber, and except in certain marshy areas in the stream valleys and the more rugged mountains of the main range a pack train can be taken almost anywhere without more difficulty than is to be expected in any unsettled part of Alaska.

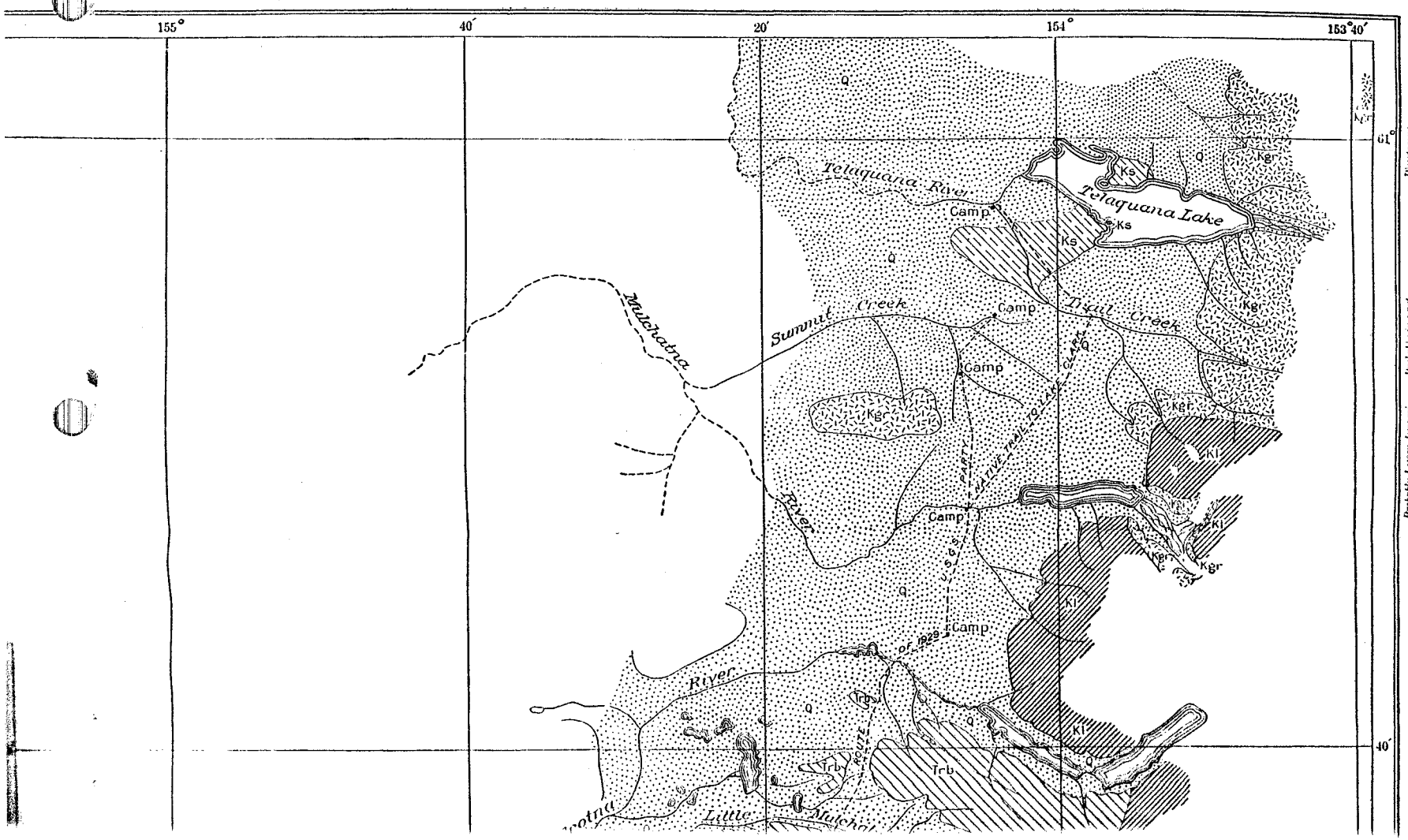
POPULATION

Except for one white man on the north shore of Lake Clark, about 5 miles above the mouth of the Kijik River, there are no permanent inhabitants in the region described in this report. There were formerly native villages at the foot of Telaquana Lake and at the mouth of the Kijik River, and a few native houses along the north shore of Lake Clark, but all of these are now abandoned. The nearest settlement of any size is Nondalton, on the west shore of Sixmile Lake, where some 60 or 80 natives and one white man live. There are perhaps half a dozen white men prospecting or trapping on Lake Clark. Although most of the natives of this region have their homes at Nondalton, many of them visit different parts of this region to trap during the midwinter months and move to temporary fishing camps in the summer, so that the inhabitants of the village are rarely all present there at the same time.

On Iliamna Lake and on the lower Iliamna River there are about a dozen white men and two native villages. Iliamna Village, on Iliamna River, 4 miles above its mouth, is inhabited by 60 or 70 natives of the Kenai tribe. Another village a few miles below the mouth of the Newhalen River is occupied by Aleuts. A herd of about 500 reindeer has been maintained by the natives for many years near the south end of the Newhalen portage.

It will thus be seen that although the Iliamna-Lake Clark region has been known to white men for many years and is fairly easy of access both from Cook Inlet and from Bristol Bay, its development


Probably
amounts of metamorphosed sediments and some intrusive rocks
INTRUSIVE ROCKS
Upper Cretaceous
Kgr
Granitic intrusives with some later dikes
CRETACEOUS
Camp
Kgr
Kl
River
Trb
Q
Little Muchalata River
Chilikadrotna
Ks
College Ck.
Ingersoll Lake
Kijik Mtn
LAKE CLARK
Chuitina River
Chuitina Bay
155°
40'
20'
154°
153° 40'
60° 20'
5 0 5 10 Miles



EXPLANATION

BEDDED ROCKS

Pleistocene and Recent	Q	Sand, gravel, and silt of present streams; glacial morainal material and outwash gravel; terrace gravel, alluvial fans, and talus	QUATERNARY
	Trb	Rhyolite and basalt	TERTIARY
Probably in part Upper Cretaceous	Ks	Mainly black argillite, shale, slate, and graywacke with minor amounts of intrusive material	MESOZOIC
Probably Lower Jurassic to Cretaceous	Kl	Undifferentiated complex consisting mainly of medium basic to basic lava and tuff, but containing locally considerable amounts of metamorphosed sediments and some intrusive rocks	MESOZOIC

INTRUSIVE ROCKS

Upper Cretaceous	Kgr	Granitic intrusives with some later dikes	CRETACEOUS

71st Congress, 3d Session - - - - - - House Document No. 612

UNITED STATES DEPARTMENT OF THE INTERIOR
Ray Lyman Wilbur, Secretary
GEOLOGICAL SURVEY
Director

Bulletin 827

A GEOLOGIC RECONNAISSANCE OF THE DENNISON FORK DISTRICT ALASKA

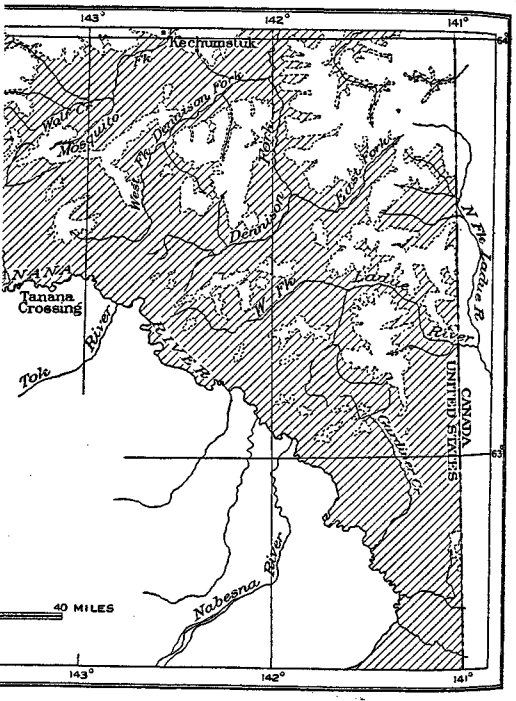
BY

J. B. MERTIE, JR.

UNITED STATES
GOVERNMENT PRINTING OFFICE
WASHINGTON : 1931

For sale by the Superintendent of Documents, Washington, D. C. - - - - Price 45 cents

ars to be in fact far from the truth. No
by the destruction of forests by fire.
› common, of which the blueberry is perhaps
ires about July 20 and serves as fresh fruit
ix weeks. Low-bush cranberries also are
, maturing the last of August, are more in
ruit. At some places, mainly in the vicinity
erries are found. Small gardens are raised
ist, and potatoes, turnips, cabbage, lettuce,
and radishes are grown without difficulty.



g distribution of timber in the Dennison Fork district.
of the Tanana River unmapped

s are also raised in a little hothouse at

ANIMAL LIFE

ar are the more common of the larger game
and the caribou and moose constitute an
l for the residents. Sheep appear to be
caribou assemble in large bands in August
untry in herds of thousands, and the spec-
and is one of the impressive sights of the
d mainly in the large valleys, where the

ground is swampy and lakes are abundant. Black bears are fairly numerous everywhere, and in the higher hills the great grizzly bear is found.

Numerous fur-bearing animals also live in this district, including the wolf, coyote, fox, lynx, marten, squirrel, weasel, beaver, and mink. Other animals, such as porcupines, rabbits, and mice, are also found. The winter of 1927–28 was a particularly good one for trappers of lynx.

The native game birds are ptarmigan and grouse, but in summer migratory game birds, such as ducks and geese, also visit the country. Many other varieties of birds have been recognized in this district. Grayling, or Arctic trout, are the principal fish that inhabit the streams.

SETTLEMENTS AND COMMUNICATION

The only settlement of white people in the Dennison Fork district is at Tanana Crossing, on the north side of the Tanana about 20 miles in an air line below the mouth of the Tok River. An Episcopal mission was formerly located at Tanana Crossing, but now this settlement consists only of a few traders. Chicken, one of the mining communities of the Fortymile district, lies just north of the Dennison Fork district and at the present time is the nearest white settlement of any size to this district. About 50 people live at and about Chicken. Plate 6, *A*, is a view of Chicken from the east.

There are two native villages in this district. One of them, Mansfield, is about 4 miles north of Tanana Crossing, at the north edge of the Tanana Valley floor. As a matter of fact, most of the Mansfield natives now live at or near Tanana Crossing, but in their hunting season they go back and forth to Mansfield and to Mansfield Lake. The other native village is Kechumstuk, on Kechumstuk Creek near its junction with the Mosquito Fork of the Fortymile. One white man also has a cabin at Kechumstuk and a homestead farther up the Mosquito Fork where he puts up hay in summer for the use of his own and other stock at Chicken during the winter.

The Dennison Fork district at present may be approached by trail from Eagle; by boat from Fortymile, Y. T., to Steel Creek and thence southward by trail; or by boat up the Tanana to Tanana Crossing. The district is practically without any white settlements and is inhabited only by a few natives and in winter by a few white trappers. The mail for Tanana Crossing was formerly distributed from Eagle and carried through this district by way of the Mosquito Fork and the head of the West Fork of the Dennison Fork, but this service has been discontinued for several years.

Although this district is practically unpopulated, it is nevertheless of interest to record the conditions of transportation at Chicken, the

nearest settlement of any size. The winter freight rate from Eagle to Chicken is from 6 to 7 cents a pound, and the summer rate 25 cents a pound. From Fortymile, Y. T., to Chicken by way of the Fortymile River and Steel Creek the winter rate is 5 cents a pound, and much of the freight for Chicken enters by this route. Neither of these two routes is particularly suitable, either for Chicken or for the Dennison Fork district. The Eagle-Chicken trail crosses several drainage systems and has a number of hard climbs, so that it is a difficult trail both in summer and in winter. The Fortymile-Steel Creek route, or any other route from Fortymile, Y. T., has disadvantages caused by the detention of goods for inspection or payment of duty before crossing the international boundary. Two airplane landing fields are now available at and near Chicken, and it would seem that a part of the freight for this district might economically be transported by this method. Plate 6, *C*, with Taylor Mountain in the background, also shows the site of the new airplane landing field at Chicken. If the Fortymile district in general is to have a revival of mining on a large scale, similar to the Fairbanks district, a good truck road should be built to connect with Grundler, the nearest point on the Richardson Highway, thus establishing connection with the Alaska Railroad.

GEOLOGY

SEDIMENTARY ROCKS

BIRCH CREEK SCHIST AND ASSOCIATED IGNEOUS ROCKS

DISTRIBUTION

The Birch Creek schist and associated metamorphic rocks of igneous origin form much of the bedrock in the eastern part of the Dennison Fork district, in the basins of the East Fork of the Dennison Fork of the Fortymile and the Ladue and Sixtymile Rivers. Connecting with this main area, a smaller belt extends westward across the valleys of the West Fork of the Dennison Fork and the Mosquito Fork of the Fortymile and thence across Mansfield, George, and Sand Creeks to the Healy and Tanana Rivers. Two smaller outlying masses lie to the north, one centering around Kechumstuk Mountain and the other at the head of a northwest tributary of Wolf Creek.

The exact boundaries of the Birch Creek schist have been inferred rather than accurately drawn at many places and therefore are to some extent diagrammatic. This is unavoidable where geologic mapping is based upon two or three linear traverses in an area as large as this. The contact lines between the Birch Creek schist and adjoining formations are particularly weak at the south and west

from Kay Kennedy 1983

UNITED STATES DEPARTMENT OF THE INTERIOR
Ray Lyman Wilbur, Secretary
GEOLOGICAL SURVEY
W. C. Mendenhall, Director

Bulletin 836

MINERAL RESOURCES OF ALASKA

REPORT ON PROGRESS OF INVESTIGATIONS IN 1930

BY
PHILIP S. SMITH AND OTHERS

UNITED STATES
GOVERNMENT PRINTING OFFICE
WASHINGTON : 1933

For sale by the Superintendent of Documents, Washington, D. C. - - - - - - Price 75 cents

a gold lode prospect on Eva Creek is under development, and another on Little Moose Creek is reported to have had work done on it. About 25 men were engaged in various mining enterprises in the district in 1930.

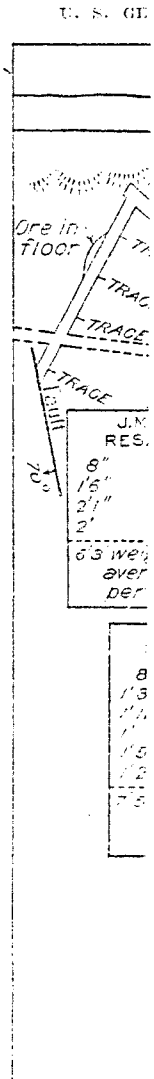
In the early days of mining in the Bonnifield district Fairbanks was the point of distribution for supplies, and the district was reached by trail directly from the Tanana River. In the last year or two a growing tendency to make Ferry, on the Alaska Railroad, the point of entry, even for the most distant points on the Wood River and Tatlanika Creek, has been evident. A wagon road 11 miles long was constructed several years ago by the Alaska Road Commission from Ferry, on the east side of the Nenana River at the railroad crossing, to the lode prospect near the head of Eva Creek. This road was never completed, owing to the temporary suspension of mining developments. However, even in its present state it is usable, except for short stretches during wet weather, and has been a great benefit to the men who have resumed operations on Eva Creek and to those who are interested in placer mining on creeks to the east.

EVA CREEK

A group of gold lode claims including several fractions has been located on Eva Creek 3 miles from its head. The claims (fig. 10) cover ground which lies chiefly on the south side of Eva Creek, and most of the development work done on them is near the creek level.

The country rock is schist of several aspects, including silvery-white siliceous schist with good cleavage, soft gray schist, and dark graphitic schist. These rocks appear to be altered sedimentary beds that probably include some calcareous members, and although they are much changed by recrystallization and the development of cleavage, the beds are not closely folded at this place but the cleavage is contorted locally. Strikes of the bedding range from N. 15° W. to N. 15° E., and the highest dip observed was 45°. The schist is cut by faults and is much sheared and decomposed, so that it caves badly in the tunnels and makes timbering necessary. At one point on the Irene claim the dump from a tunnel shows a sheared and much altered rock of light color that suggests a metamorphosed granite or related igneous rock.

The rusty color of the weathered schist is due to the iron sulphide disseminated through it. In places the mineralization has been intense, and the chief sulphide is arsenopyrite, which is associated with a little pyrite, chalcopyrite, and bismuthinite. Free gold is present. Gangue minerals are inconspicuous, though quartz accompanies the sulphides and in places forms aggregates of long, slender crystals with sulphide minerals filling the spaces between them.



ely sketched, and their positions are
presented.
'atonduk-Nation district is character-
great relief. This part of the dis-
ad of the Ogilvie Range, a group of
d from Yukon Territory into Alaska
vest of the international boundary.
des of 5,000 feet or more above sea
tween 2,500 and 3,000 feet, their tops
for the most part above timber line.
ilvie Range consists of limestone and
he subarctic climate of this region,
st line. The general aspect of the
at of bare light-colored mountains,
ous slopes, and deeply dissected nar-
into the timbered zone. The Yukon
boundary at 879 feet above sea level,
ade of about 835 feet at the mouth of
on station "Skook," on the interna-
ade of 5,083 feet and is the highest
"Skook" is 9 miles from the mouth of
he maximum relief for the district is

s in the Ogilvie Range have received
it the members of the International
ield designations to many prominent
y occupied as triangulation stations.
ween the Nation and Yukon Rivers, 62
een designated. Of these, Casca, Na-
hief, Crow, Hug, and Strata, named
are shown on the accompanying geo-
called McCann Hill by Cairnes,[12] after
logic assistants of the boundary party
iangulation station at the summit of
Another hill, between Waterfall and
rly designated by the writer as "Little
ere applied only for purposes of geo-
tion.
rom the Ogilvie Range, the relief grad-
es become lower and more rounded in
timbered country also becomes greater,
he boundary and the Nation River, in
eek, timber covers all but the highest

A.

points, giving an entirely different aspect to the country. Likewise the Yukon Valley, between the mouths of the Tatonduk and Nation Rivers and on down the Yukon to Circle, is largely a timbered country and therefore more difficult for geologic work than the Ogilvie Range.

SETTLEMENTS AND POPULATION

Eagle, the principal settlement of this district, is an incorporated town on the west bank of the Yukon, about 6 miles below the international boundary. The town site of Eagle is the best along the upper Yukon in Alaska, and as early as 1883, when Schwatka [13] made his trip down the Yukon, a white trader named F. Mercier had a trading post at this site, which was known as Belle-Isle. As this bluff was believed by Schwatka to mark the international boundary, he named it Boundary Butte, but it is now known as Eagle Bluff. At that time an Indian village called Klat-ol-klin, or Johns Village, was located on the same bank of the river, upstream from Belle-Isle.

From Belle-Isle grew the town of Eagle, and the Indian village still persists. Eagle is now the supply point for the Fortymile, Seventymile, and American Creek districts and for local points down the Yukon as far as Nation. The population of Eagle, according to the Fifteenth Census, is 54, but the population varies seasonally, as miners and trappers, whose homes are really in Eagle, come from and go to outlying districts in connection with their work. According to the same authority, the population of the Indian village upstream from Eagle is 78.

The only other settlement in this district is at Nation, which is on the south bank of the Yukon, about 3 miles below the mouth of the Nation River. Summer placer mining is in progress on Fourth of July Creek, south of Nation, and a few miners and trappers are permanently located at this point.

TRAILS AND TRANSPORTATION

The Yukon River is the principal avenue of transportation for this region. In summer the Pacific & Arctic Railway & Navigation Co. maintains a fortnightly steamboat schedule on the river, from the head of navigation at Whitehorse, Yukon Territory, to Tanana, and thence up the Tanana River to the crossing of the Alaska Railroad at Nenana. Most of the supplies and mail for Eagle and its vicinity come by steamship from Seattle to Skagway, thence over the railroad of the White Pass & Yukon Route to Whitehorse, and down the Yukon. The Alaska Railroad does not serve this section of Alaska, and charges for freight and passenger transportation

[13] Schwatka, Frederick, op. cit., p. 41.

from Seattle to Eagle, though reasonable for the haul, are nevertheless high. Thus, for carload lots, the freight rate on different commodities in 1930 ranged from $53 to $92 a ton, or from 2.6 to 4.6 cents a pound, with rates 12 to 14 per cent higher on less-than-carload lots.

In winter the mail is carried on horse and dog sleds on the Yukon River, and, as in summer, Eagle receives its mail from upstream.

No settlements have been established north of the Yukon, in the area under consideration, and therefore no roads or winter trails have been built. A summer trail, however, was built and used by the members of the International Boundary Commission from the mouth of the Tatonduk River into the boundary strip and thence northward. This trail follows up the Tatonduk River to a point about 2 miles west of the boundary, crosses northward over a low timber-covered saddle into Funnel Creek, and ascends Funnel Creek to its head, thence drops down into Hard Luck Creek and continues down that stream for a mile and a half. At this point the boundary trail goes northeastward up a tributary valley, called Pleasant Creek, and crosses the hills into Cathedral Creek Valley a short distance west of the boundary. An alternative and better route follows on down Hard Luck Creek to its junction with Cathedral Creek and up Cathedral Creek to the other trail. After proceeding up a steep spur out of Cathedral Creek, the trail next drops over into a small tributary of Cathedral Creek, from the head of which it follows over the hills around the head of Waterfall Creek—goes down Tindir Creek into the valley of the Nation River, and thence ascends that valley to the boundary. A branch trail, which is equally satisfactory, goes down Waterfall Creek for 5 or 6 miles, crosses thence through a low-timber-covered saddle into Tindir Creek, and joins the main trail.

Another trail used by the boundary commission, particularly at times of high water on the Tatonduk River, followed down the banks of the Yukon several miles from the mouth of the Tatonduk River and then crossed northeastward into the valley of Hard Luck Creek. Still another route into Hard Luck Valley was utilized by the Geological Survey party of 1930. Leaving the Tatonduk River halfway between the mouth and the boundary, this route ascends Pass Creek to its head and comes down into the valley of Hard Luck, just above the junction with Cathedral Creek. This is a shorter and less difficult route to Cathedral Creek than the boundary trail up Funnel Creek.

Considerable trapping is done in the valley of the Nation River and its tributaries, and trappers' trails were also noted on lower Hard Luck Creek and at other places. These, however, are for the

most part poorly marked w
country and are not very se
summer.

This district is part of the
its climate is therefore chara
short but often rather warm
1900 to 1929, inclusive, the c
according to the United Stat
the highest temperature 95°
range from winter to summer
ature is 24.2° F. For nearly th
average 55 days during the ye
70° F. or above, 254 days whe
less, and 118 days when the
The following tables give th
annual maximum, minimum, a

Temperatures

	Jan.	Feb.	Mar.	Apr.
1900–1921	41	45	56	6
1922	29	17	36	6
1923	14	33	36	5
1924	16	43	47	6
1925	4	27	37	5
1926	38	21	52	6
1927	27	39	40	4
1928	23	38	30	5
1929	24	34	50	5

1900–1921	−75	−74	−56	−3
1922	−51	−54	−42	−1
1923	−52	−38	−43	
1924	−65	−51	−30	−3
1925	−69	−51	−37	−3
1926	−12	−46	−16	−5
1927	−56	−51	−33	−3
1928	−26	−21	−45	−3
1929	−54	−49	−50	−2

1882				
1883	−4.8	−5.8	14.0	29.
1884				
1885	−16.8	−5.6	14.0	38.
1886			5.8	25.
1899				
1900	−25.0	−6.0	13.1	29.
1901	−17.8	−15.3	5.0	19.

[14] Summary of the climatological dat
Bull. W, 2d ed., vol. 3, 1926.

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ts, the freight rate on different com-
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pers' trails were also noted on lower
er places. These, however, are for the

most part poorly marked winter trails that follow through low country and are not very serviceable for travel by pack horses in summer.

CLIMATE

This district is part of the great interior province of Alaska, and its climate is therefore characterized by long, cold winters and by short but often rather warm summers. For a 30-year period from 1900 to 1929, inclusive, the coldest recorded temperature at Eagle, according to the United States Weather Bureau,[14] is −75° F., and the highest temperature 95° F., thus showing a possible maximum range from winter to summer of 170° F. The mean annual temperature is 24.2° F. For nearly the same 30-year period, there are on the average 55 days during the year when the maximum temperature is 70° F. or above, 254 days when the minimum temperature is 32° F. or less, and 118 days when the minimum temperature is zero or less. The following tables give the available records for monthly and annual maximum, minimum, and mean temperatures at Eagle.

Temperatures at Eagle, Alaska (° F.)

Highest

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
1900–1921	41	45	56	66	84	92	93	87	79	68	48	42	93
1922	29	17	36	60	85	82	78	81	60	53	36	18	85
1923	14	33	36	53	70	91	90	87	72	66	35	3	91
1924	16	43	47	68	72	82	84	83	60	48	43	14	84
1925	4	27	37	50	71	82	95	82	64	56	40	32	95
1926	38	21	52	61	69	85	80	83	62	56	45	35	85
1927	27	39	40	48	69	84	88	85	67	46	30	21	88
1928	23	38	30	58	62	80	78	76	61	42	42	38	80
1929	24	34	50	56	70	80	79	84	70	58	37	29	84

Lowest

1900–1921	−75	−74	−56	−38	7	24	25	18	2	−28	−54	−68	−75
1922	−51	−54	−42	−11	10	30	30	16	14	4	−38	−44	−54
1923	−52	−38	−43	1	4	36	37	32	22	5	−45	−56	−56
1924	−65	−51	−30	−33	24	32	32	23	10	−3	−19	−66	−66
1925	−69	−51	−37	−3	22	36	30	25	23	−4	−20	−49	−69
1926	−12	−46	−16	−5	23	33	31	30	21	6	−30	−53	−53
1927	−56	−51	−33	−37	9	33	38	30	12	−18	−50	−61	−61
1928	−26	−21	−45	−34	21	36	33	30	13	−2	−29	−39	−45
1929	−54	−49	−50	−23	23	32	29	28	22	0	−10	−52	−54

Mean

1882										22.4	1.8	−22.8	
1883	−4.8	−5.8	14.0	29.0									
1884									41.0	9.0	7.6	−7.6	
1885	−16.8	−5.6	14.0	38.2					44.4	27.7	2.0	−14.0	
1886			5.8	25.8									
1899								50.0	41.1	20.5	1.3	−18.9	
1900	−25.0	−6.0	13.1	29.3	42.2	52.7	56.9	49.2	40.5	20.1	−10.0	−7.5	21.3
1901	−17.8	−15.3	5.0	19.0	39.1	52.8	57.6	49.0	42.0	23.6		−7.0	

[14] Summary of the climatological data for Alaska, by sections: U. S. Weather Bureau Bull. W, 2d ed., vol. 3, 1926.

UNITED STATES DEPARTMENT OF THE INTERIOR
Ray Lyman Wilbur, Secretary

GEOLOGICAL SURVEY
W. C. Mendenhall, Director

Bulletin 836—D

THE EASTERN PORTION OF MOUNT McKINLEY NATIONAL PARK

BY

S. R. CAPPS

THE KANTISHNA DISTRICT

AND

MINING DEVELOPMENT IN THE TATLANIKA AND TOTATLANIKA BASINS

BY

FRED H. MOFFIT

Mineral resources of Alaska, 1930

UNITED STATES
GOVERNMENT PRINTING OFFICE
WASHINGTON : 1932

For sale by the Superintendent of Documents, Washington, D. C. . . . . Price 35 cents

leep in the basins of the West Fork of the Chulitna River and the ull River, though there are numbers of them in the Cantwell and Vindy Creek Basins. Caribou, too, though present in scattered nds in the valleys of the south slope, are much fewer there than the interior side of the range. In this part of the park there are few moose, whose range is restricted to the timbered and brushy lleys. Both black and grizzly bears are present, and the smaller imals include lynx, fox, wolverine, beaver, mink, ermine, marten, armot, ground squirrels, rabbits, and mice. Rabbits and ptarmigan rm the main food supply of all the carnivorous fur-bearing ani-als and the birds of prey, and as both rabbits and ptarmigan vary eatly in abundance from year to year, so also do the animals and rds that prey on them. In 1929 and 1930 the rabbits had almost tirely disappeared, and the ptarmigan were scarce, and this scar-ty resulted in a great diminution in the number of fur-bearing imals and of hawks and owls.

POPULATION

Aside from the park officials and rangers and the agents and sec-n men employed on the Alaska Railroad, there are probably no re than a dozen permanent white residents in the region here ler discussion. Small fur farms have been established at Colo-lo and at McKinley Park station, and a few trappers and others e cabins at the railroad at which they spend part of their time. ntwell, the point of departure from the railroad for the placer ies of the Valdez Creek district, has a road house and store at ich staple supplies can be had. McKinley Park station is the nt of entrance for the exploited portion of the park, and its pop-tion varies with the season. In winter it has only a few resi-ts. The park headquarters are just within the eastern border he park, some 2 miles from the railroad. The automobile road under construction from the railroad to the lower end of Mul-w Glacier gives employment to a varying number of men, de-ding on the season. This road and its extension by trail to the ward form the most used summer route to the Kantishna mining rict.

bout 15 years ago vigorous prospecting of gold, copper, and mony lodes was in progress in the basin of the West Fork of Chulitna River, and 30 or 40 men were engaged there. All but or two of these men have abandoned their claims and left.

few natives from the upper Susitna Basin come to Cantwell to e, but there are no permanent native settlements in this area.

though prospecting is authorized by law within the boundaries ount McKinley National Park, and title to mining property can be obtained, so far no mining claims have gone to patent, and no productive mining is now in progress within the park.

ROUTES OF TRAVEL

Before the construction of the Government built and operated Alaska Railroad, which was begun in 1915 and completed in 1924, this region was difficultly accessible and was visited by few persons. Now and then a traveler journeyed by dog sled in winter from the terminus of the old Alaska Northern Railroad, on Cook Inlet, along the general route now followed by the Alaska Railroad to the Tanana Basin, but that travel was over the frozen streams, and no land trail had been established. Most winter travelers to interior points then used the Richardson Highway from Valdez, and later from Chitina, on the Copper River Railroad, to Fairbanks. At that time there were no inhabitants in what is now Mount McKinley Park, and the only visitors were a few prospectors, hunters, or trappers. The only near-by settlements were in the Kantishna mining district, and travelers to the diggings there went either by dog sled, in winter, along a route from the Nenana River north of the foothills, and outside of this region, or by boat, in summer, following the Tanana and Kantishna Rivers.

The completion of the Alaska Railroad entirely changed the whole aspect of travel and freight transportation to this region. Regular passenger and freight train schedules were established along the eastern edge of the park, and comfortable trains deliver passengers at the various railway stations in a little more than a day from Seward. The chief interest in this region now centers about the wonderful mountain scenery and abundant wild life of Mount McKinley Park, and a constantly increasing number of visitors is attracted to the park each summer. No trails have been established and no accommodations for visitors have been provided in that part of the park that lies south of the crest of the range, attention to the development of the park having been confined to the north slope. McKinley Park station is the official entrance to the park. A well-organized company meets all trains with automobile stages during the tourist season and transports visitors to comfortable camps some distance into the park. Construction of a good automobile road westward from McKinley Park station was commenced several years ago, and this work has progressed each year. In 1930 the road was open to the East Fork of the Toklat River, and trucks had been taken over unfinished road as far westward as Stony Creek. By the fall of 1931 the road was completed almost to Thorofare Pass, and it was proposed to extend it still farther westward to a site where a hotel was projected, within view of Mount McKinley. From Thorofare Pass a horse trail follows down the McKinley Fork past Wonder Lake and to the

placer and lode mines and prospects of the Kantishna mining district. This wagon road and the trail above mentioned constitute the only established trails in the region, yet the open valleys, broad gravel flood plains, and many low passes from one valley to the next make travel throughout the region easy, either by dog sled in winter or by horses in summer. On several occasions horses have been taken from the lower end of Muldrow Glacier up its east side to Anderson Pass and thence down the West Fork Glacier to the head of the West Fork of the Chulitna River, but this pass should be attempted with horses only during the late summer, when the snow has largely melted off the surface of the glaciers. This same route has been traveled many times by dog sled in winter. The only other feasible pass across the range in this area, in addition to the route followed by the railroad, is that by way of Windy Creek across the divide into the head of Riley Creek. One mountaineering expedition did succeed in taking horses across the range over the glacier at the head of the Teklanika River and down into the head of the Bull River, but this route was attempted only as a desperate emergency and is both difficult and dangerous. Already the demands of summer visitors have stimulated the development of trails along the main stream valleys, and no doubt within a short time the park will be crisscrossed by a network of foot and horse trails that will make all parts of it easily accessible.

Cantwell station, at the junction of Cantwell Creek and Jack River, is at the west end of a horse trail that leads to the placer diggings of Valdez Creek and of a winter sled route to that camp. Formerly Valdez Creek was generally approached from the Richardson Highway in the Copper River Valley, but since the establishment of service on the Alaska Railroad that route has been little used.

GEOLOGY

PRINCIPAL FEATURES

The areas of outcrop of the rock formations that have been differentiated in this region are shown on Plate 4. The field work on which this map is based has been done through a period of 28 years by different geologists and has all been either of exploratory or reconnaissance character. The object in view during this work has been the procuring of general information concerning the broader facts of structure and of rock distribution, rather than the detailed study of smaller areas, the finer discrimination between rock types, and the final subdivision of rock groups into closely correlated lithologic units. The general studies so far made have been a necessary preliminary to the more detailed studies that will be made later, as time and funds permit. In the early days of exploratory mapping

UNITED STATES DEPARTMENT OF THE INTERIOR
Harold L. Ickes, Secretary

GEOLOGICAL SURVEY
W. C. Mendenhall, Director

Bulletin 849

INVESTIGATIONS IN ALASKA RAILROAD BELT, 1931

BY

PHILIP S. SMITH AND OTHERS

UNITED STATES
GOVERNMENT PRINTING OFFICE
WASHINGTON : 1933

UNITED STATES DEPARTMENT OF THE INTERIOR
Harold L. Ickes, Secretary
GEOLOGICAL SURVEY
W. C. Mendenhall, Director

Bulletin 849—B

LODE DEPOSITS OF THE FAIRBANKS DISTRICT, ALASKA

BY

JAMES M. HILL

Investigations in Alaska Railroad belt, 1931
(Pages 29–163)

UNITED STATES
GOVERNMENT PRINTING OFFICE
WASHINGTON : 1933

For sale by the Superintendent of Documents, Washington, D.C. - - - - - - - Price 35 cents

From 1915 to 1923 lode mining was at a low ebb, the output in none of those years reaching a total of 2,000 tons. It was generally recognized that mining costs were too high, and many projects were postponed pending the completion of the Alaska Railroad.

After the railroad was built, in the summer of 1923, there was a moderate revival in lode mining, and the output has been maintained to the present time at a rate of 2,700 to 6,000 tons of ore a year. The principal producers during recent years have been the Hi-Yu, Mohawk, Rhoads-Hall (later named the Cleary Hill), Wyoming, Tolovana, Henry Ford, Little Eva, and Eva Quartz mines. Considerable prospecting has been done on certain extensive mineralized zones, notably the Ryan lode, on Ester Dome, but no development work has been undertaken on them.

ECONOMIC FACTORS AFFECTING MINING

TRANSPORTATION

The mines of the Fairbanks district are well situated so far as transportation is concerned. Most of them are reached over good to excellent automobile roads leading from the town of Fairbanks, the northern terminus of the Alaska Railroad.

The 470 miles between Seward, the southern coast terminus, and Fairbanks is made in 18 hours actual running time for the mixed passenger and freight train. At present, however, trains are not operated at night, so that an overnight stop is made at Curry, where the Government operates a well-appointed hotel. A train service once a week in each direction is maintained throughout the year, with some extra service during the summer. There are regular freight schedules and such extra freight trains as are required by the traffic.

Passenger fares on the railroad are fixed at the rate of 10 cents a mile, the fare from Seward to Fairbanks being $47.05. Freight rates seem high to one accustomed to rates in the States, but in view of the difficulties of maintenance and operation in this remote region and under such extremes of temperature and precipitation as are found along the Alaska Railroad higher rates than those prevailing in the States are obviously well justified.

The following table gives the freight rates of 1930 and 1931 for certain commodities of particular interest to the mining industry.

Freight rates per ton (2,000 pounds) on car Wash., to Fairbanks, Alaska.

	Ocean rates, Seattle or Tacoma to Seward
Coal, sacked	$5. 0
Automobiles [c]	
General groceries (no high-priced specialties)	
Flour and grain products	12. 0
Hay in bales, 22 pounds or more to a cubic foot	14. 8
High explosives (powder, etc.)	21. 1
Cement	
Lumber, common, not over 32 feet long	15.
Mining machinery, no single piece over 4,000 pounds	13.
Petroleum products	12.
Return freight southbound (containers, empty drums, etc.), 110 gallons to 24 cubic feet	3.
Ore and concentrates, value not over $50 a ton [e]	4.

[a] Ton basis for steamship haul is 2,000 pounds or 40 cubic
[b] Carload lots.
[c] Carload lots, minimum 10,000 pounds.
[d] Less than carload lots.
[e] If declared value is more than $50 a ton, 25 percent addit
of excess.
[f] Carload lots, minimum 15 tons.
[g] Carload lots, minimum 20 tons.
[h] Carload lots, minimum 10 tons.

Fairbanks is also served during the
busses and regular freight truck lines,
Highway between Fairbanks and Va
and over the Steese Highway betwe
Circle, on the Yukon River, a distan
tions are made with the up- and dow
star-route mail bus in operation bet
Ester Creek 12 miles west.

During 1931 the passenger fare
between Fairbanks and Valdez was a
competition, but was usually at leas
charge for passengers between Fai
mouth of Cleary Creek, is $5. "Dr
at Fairbanks at $4 to $12 a day, dep
trip, and character of roads to be d
from April until about the first of th
but the extremely cold weather of t
fortable and somewhat uncertain.

UNITED STATES DEPARTMENT OF THE INTERIOR
Harold L. Ickes, Secretary
GEOLOGICAL SURVEY
W. C. Mendenhall, Director

Harold R. Heer, '09

Bulletin 849—D

THE MOUNT EIELSON DISTRICT ALASKA

BY

JOHN C. REED

Investigations in Alaska Railroad belt, 1931
(Pages 231–237)

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VEGETATION

The Mount Eielson district is entirely above the timber line, which lies at about 2,000 feet in this region. Shrublike forms of the willow and the cottonwood occur along the Thorofare River and on some of the lower slopes. During the summer, in a period usually extending from about the middle of June to about the 1st of September, camp stock can forage on the various grasses native to the region. Horses thrive on a vetch locally called pea vine, which is abundant in some of the valleys. Some of the mountain slopes are covered with thick growths of blueberries, and patches of small palatable cranberries grow locally on the "bars."

WILD ANIMALS

The north slope of the Alaska Range is famous for its wild game[19]—in fact, one of the reasons for the establishment of Mount McKinley National Park was to preserve the game in this great area when it should become easily accessible from the Alaska Railroad.

White mountain sheep (*Ovis dalli*) and caribou abound in the Mount Eielson district. It is doubtful if moose ever come as high as Copper Mountain Bar, as their range is usually confined to timbered country. A few grizzly bears are to be found in the district, and it is reported that the dark glacier grizzly inhabits Muldrow Glacier. In addition to these large animals, the region is inhabited by many smaller ones, including wolves, foxes, hoary marmots, ground squirrels, and wolverines. A few small grayling come as high as Copper Mountain Bar. All wild game is protected within the limits of the park.

POPULATION

There are no permanent residents in the Mount Eielson district. One prospector has a cabin on the north slope of Mount Eielson and occupies it nearly every summer. The National Park Service has built a cabin on Copper Mountain Bar. This cabin is occupied periodically by rangers on patrol work in the park and is also often used by travelers to or from the Kantishna region to the north. Near the ranger's cabin the Mount McKinley Tourist & Transportation Co. has a camp site with a cache and tent frames, which is sometimes used by tourists.

TRANSPORTATION

The various means of reaching the Mount Eielson district have already been mentioned, and in a later section the transportation

[19] Sheldon, Charles, The wilderness of Denali, Charles Scribner's Sons, 1930. Beach, W. N., In the shadow of Mount McKinley, Derrydale Press, 1931.

problem as regards the possible future will be outlined.

At present saddle and pack horse means of transportation within the d leys of the larger streams provide acc mountain fastnesses. The ubiquitous toms also may be easily traversed in t possible to ride across the interstream trails. Much of the higher, rough cessible to horses and must be covere Muldrow Glacier forms a fairly lying west of it. It has been crosse is slow, laborious, and dangerous. difficulty on foot. Probably an e means of reaching the country jus pack train is to follow down the Ka it drops to McKinley Bar, below t Kinley Fork there, cross a low div most tributary of Clearwater Creek

GEOL

GENERAL

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A thick series of limy sedimen stitutes the formation that is und The formation is composed princ thin to medium bedded limestone graywacke and with black fissile been replaced by epidote and to sulphides. No recognizable foss tion in the vicinity of Mount Eiel probably Devonian, because of its ozoic formation farther east in w stone that carries Middle Devoni mation displayed within the M mile thick, and neither the top n

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Charles Scribner's Sons, 1930. Beach
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problem as regards the possible future movement of ore and supplies will be outlined.

At present saddle and pack horses furnish practically the only means of transportation within the district. The gravel-floored valleys of the larger streams provide access to localities deep within the mountain fastnesses. The ubiquitous benches above the valley bottoms also may be easily traversed in the saddle. In many places it is possible to ride across the interstream divides by making use of game trails. Much of the higher, rougher country is practically inaccessible to horses and must be covered on foot.

Muldrow Glacier forms a fairly effective barrier to the country lying west of it. It has been crossed by pack train, but such travel is slow, laborious, and dangerous. It may be crossed without much difficulty on foot. Probably an easier though perhaps a slower means of reaching the country just west of Muldrow Glacier by pack train is to follow down the Kantishna trail to the point where it drops to McKinley Bar, below the end of the glacier, cross McKinley Fork there, cross a low divide, and proceed up the easternmost tributary of Clearwater Creek.

GEOLOGY

GENERAL OUTLINE

The areal distribution of the geologic formations that were recognized in the Mount Eielson district is shown on plate 22.

The relative ages of the various geologic units within the area are fairly well established; but because of the almost complete absence of fossils it is impossible to assign many of the formations to definite geologic ages. Such age assignments as have been made are for the most part dependent on long-range correlations, based on geologic association and lithology, with rocks of known age in other localities.

A thick series of limy sediments is distributed widely and constitutes the formation that is undoubtedly the oldest in the district. The formation is composed principally of light to dark bluish-gray thin to medium bedded limestone, interbedded here and there with graywacke and with black fissile shale. Locally the limestone has been replaced by epidote and to a lesser degree by various metallic sulphides. No recognizable fossils have been found in the formation in the vicinity of Mount Eielson. It is believed to be Paleozoic, probably Devonian, because of its position along the strike of a Paleozoic formation farther east in which occurs a band of massive limestone that carries Middle Devonian fossils. The portion of the formation displayed within the Mount Eielson district is at least a mile thick, and neither the top nor the bottom is exposed.

UNITED STATES DEPARTMENT OF THE INTERIOR
Harold L. Ickes, Secretary

GEOLOGICAL SURVEY
W. C. Mendenhall, Director

Bulletin 849—E

MINERAL DEPOSITS NEAR THE WEST FORK OF THE CHULITNA RIVER ALASKA

BY

CLYDE P. ROSS

Investigations in Alaska Railroad belt, 1931

(Pages 289–333)

UNITED STATES
GOVERNMENT PRINTING OFFICE
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For sale by the Superintendent of Documents, Washington, D.C. - - - - - - Price 15 cents

mapped is below the more rugged mountains, and the locally unsatisfactory exposures and brush cover are the cause of uncertainty as to the precise position of geologic boundaries. This uncertainty is indicated on plate 25 by dashed lines.

The Alaska Range rises on the west to elevations of over 10,000 feet above the sea and is generally rugged. Many of the valleys are glacier-filled, and slopes above an elevation of 6,500 feet have extensive banks of perennial snow.

Timber is absent above an elevation of about 2,700 feet and is poor and scanty above 2,200 feet. Spruce and cottonwood are the only trees of any size and the cottonwood extends somewhat farther up the stream valleys. The timber is of potential value mainly for local use, as trees over 2 feet in diameter are exceptional and, on the average, are neither tall nor straight. For rough mine timbers and similar uses, however, there is a considerable supply.

The valley sides up to elevations locally as high as 3,500 feet are mantled with a thick growth of brush which hampers travel but, on the other hand, is of value for firewood. In most places the country above 2,500 feet is almost devoid of vegetation other than grasses and mosses. Grass suitable for forage grows in favorable places up to 4,500 feet. Most of it, however, is of inferior quality.

MEANS OF ACCESS

The region is now served by the main line of the Alaska Railroad, which in this vicinity follows closely the Chulitna River and after crossing its East Fork proceeds up its Middle Fork. A trail extends westward from Colorado station, on the railroad, with branches to the principal prospects on both sides of the West Fork of the Chulitna. Other trails lead from Honolulu station to points in the Alaska Range. One of these formerly served the prospects on Ohio Creek, but considerable stretches of it are now impassable. Practicable routes of travel for pack horses in summer can be found through most of the country below an elevation of 4,500 feet. Marshes and cliffs cause numerous detours, and it is occasionally necessary to cut a way through brush.

Development of the mineral deposits will require the construction of roads 10 to 15 miles long from points on the railroad. Colorado is the nearest railroad point to many of the existing prospects and can be reached from them by several alternate routes without special difficulty. It will be necessary to bridge the flood plain of the West Fork as well as to throw relatively short bridges across a number of minor streams. A small amount of pack-horse traffic soon reduces sections of existing trails to quagmires, and it is evident that any road in this region that is to be used for truck trans-

portation will require care in dra
surfacing. Locally, aerial tramwa
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Few climatic records are avail
Snow generally covers the ground
until April or May, and many dr
Snowfall is frequent and persister
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GENERAL

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The lowest stratigraphic unit
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portation will require care in draining and local reinforcement or surfacing. Locally, aerial tramways may supplement the roads, but the topography does not readily lend itself to their use.

CLIMATE

Few climatic records are available for this area or its vicinity. Snow generally covers the ground from October or early November until April or May, and many drifts remain until June and later. Snowfall is frequent and persistent but rarely heavy. Winter temperatures are generally not extreme, although they may occasionally range as low as 50° below zero. Summer temperatures may reach 90° but are in general materially lower, and frosts occur at intervals throughout the summer. The annual precipitation may be roughly estimated at 40 to 45 inches. Drizzling rain and dense fog are very frequent, especially in July and August. High winds are common at elevations over 3,000 feet above sea level.

Of the 49 days the party was in the field in the summer of 1931, 18 were rainy, 20 showery, 6 cloudy, and 5 fair. Heavy downpours were exceptional, but the frequent wet and foggy weather interfered materially with outdoor work.

GENERAL GEOLOGY

Both stratigraphically and structurally the area has features which distinguish it from others in this part of Alaska. The presence of strata of Carboniferous (probable Permian) age and of thrust faults are among the more striking of these features. Many of the rocks are distinctively colored, permitting subdivision into relatively small stratigraphic units. Fossils at several horizons help to date these units. Faulting, not completely understood, causes minor uncertainties in correlation. In view of the incompleteness of present knowledge regarding the stratigraphy of the region in general and this area in particular it has not seemed wise to assign any formation names. The principal units are designated in accordance with their provisional age assignments, and the minor subdivisions of the Permian (?) rocks are distinguished as unit A, B, etc.

The lowest stratigraphic unit comprises ancient, possibly Devonian, metamorphosed sedimentary rocks in which silicified limestone is prominent. Unconformably above these are tuff, lava, limestone, chert, and argillite of probable Permian age, succeeded, with some unconformity, by Triassic limestone, followed by Triassic argillite with some limestone, pyroclastic rocks, and lava. There are some small dikes and bosses of moderately silicic porphyritic rocks of undetermined, presumably Tertiary age, and Tertiary sediments of late Eocene or later age.

UNITED STATES DEPARTMENT OF THE INTERIOR
Harold L. Ickes, Secretary
GEOLOGICAL SURVEY
W. C. Mendenhall, Director

Bulletin 849—F

LODE DEPOSITS OF EUREKA AND VICINITY KANTISHNA DISTRICT, ALASKA

BY

FRANCIS G. WELLS

Investigations in Alaska Railroad belt, 1931
(Pages 335–379)

UNITED STATES
GOVERNMENT PRINTING OFFICE
WASHINGTON : 1933

For sale by the Superintendent of Documents, Washington, D. C. - - - - - - Price 20 cents

The area shows excellent indications of mineralization, and it is highly probable that other veins not yet mined contain ore of as high grade as that so far discovered. The type of mineralization, the character of the ore, and the absence of appreciable enrichment indicate that the ore extends to considerably greater depths than those so far reached in the area by mining developments.

INTRODUCTION

LOCATION AND MEANS OF ACCESS

The Kantishna region[1] is broadly considered to be bordered on the south by the crest of the Alaska Range, on the north by the Tanana River, on the east by the Nenana River, and on the west by the lower Kantishna River. (See fig. 1.) This report on the lode deposits of Eureka and vicinity, however, treats only a small part of this region, an area 6 miles wide and 13 miles long, comprising the west end of the Kantishna Hills, between longitude 150°40′ and 151°10′ W. and latitude 63°30′ and 63°35′ N. During summer two routes of travel give access to the district—one from McKinley Park station on the Alaska Railroad by the McKinley Park road to Stony Creek and thence by trail to Kantishna, a distance of about 90 miles; the other by boat by the Kantishna and Bearpaw Rivers to Diamond, thence 25 miles by trail to Glacier and Kantishna. In the past the route by way of Diamond was most used, and practically all the freight has been moved over it. As the trail from Diamond to Kantishna is boggy and difficult of travel during summer the practice has been to bring supplies to Diamond by boat in summer and to haul them from Diamond to Kantishna by sled in winter. The cost of freighting by this route, as well as the time required to move materials over it, which is often more than a year, has been a serious obstacle to mining activities.

For winter travel a different route is chosen. This route leaves the Alaska Railroad at Kobe or Lignite, near the base of the foothills. From either of these points a trail leads westward along the south edge of the lowland to Knight's roadhouse, on the Toklat River, northwest of Mount Chitsia. Thence the Toklat River and its tributary Clearwater Fork are followed to Myrtle Creek. The trail follows Myrtle Creek up to a point near its head, crosses a low pass into the head of Spruce Creek, and descends that stream and Moose Creek to the vicinity of the mines on Moose, Eldorado, and Friday Creeks. The total distance along this route by sled from Fairbanks to Eureka Creek is about 165 miles.

The route from McKinley Park station is now being more widely used for travel, and with the completion of the road to Wonder Lake

[1] Capps, S. R., The Kantishna region, Alaska: U.S. Geol. Survey Bull. 687, p. 7, 1919.

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Charles Sheldon[5] passed throug
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gives some additional geographi

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[2] Brooks, A. H., The Mount McKinley
rocks and of the Bonnifield and Kantish
Prof. Paper 70, 1911.
[3] Prindle, L. M., The Bonnifield and Ka
314, pp. 213–221, 1907.
[4] Stuck, Hudson, The ascent of Denali
[5] Sheldon, Charles, The wilderness
Scribner's Sons, 1930.
[6] Capps, S. R., The Kantishna region,

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y the McKinley Park road to Stony
itishna, a distance of about 90 miles;
na and Bearpaw Rivers to Diamond,
er and Kantishna. In the past the
most used, and practically all the
As the trail from Diamond to Kan-
travel during summer the practice
iamond by boat in summer and to
itishna by sled in winter. The cost
ell as the time required to move ma-
ore than a year, has been a serious

route is chosen. This route leaves
Lignite, near the base of the foot-
its a trail leads westward along the
Knight's roadhouse, on the Toklat
sia. Thence the Toklat River and
re followed to Myrtle Creek. The
a point near its head, crosses a low
reek, and descends that stream and
he mines on Moose, Eldorado, and
nce along this route by sled from
out 165 miles.

k station is now being more widely
pletion of the road to Wonder Lake

aska: U.S. Geol. Survey Bull. 687, p. 7, 1919.

it will be, at least during summer, the most rapid and easiest way for both men and materials to reach the Kantishna. In the summer of 1931 the road was complete to the Toklat River and was graded through Thorofare Pass, leaving a distance of about 20 miles to be both graded and graveled.

PREVIOUS SURVEYS

The first accurate survey covering part of the Kantishna region was made in 1902, when a United States Geological Survey party including A. H. Brooks, D. L. Reaburn, and L. M. Prindle left Cook Inlet by pack train, ascended to the head of the Skwentna River, and there crossed the Alaska Range into the Kuskokwim Basin. Proceeding northeastward they traversed the northwest slope of the Alaska Range to the Nenana River and followed that stream to its mouth. The results of this expedition form the first authentic information concerning the geography and geology of the Kantishna region and were published in a professional paper of the Geological Survey.[2] In 1906 Prindle[3] made a hurried visit to the Kantishna placer district, then recently discovered, and wrote a brief account of its geology and gold-placer deposits. Archdeacon Hudson Stuck[4] passed through the Kantishna district in the spring of 1913 on his way to and from Mount McKinley and in his account of this expedition gives some information concerning the region. Likewise Charles Sheldon[5] passed through the Kantishna district in the summer of 1906 and again in the summer of 1907 on his way to the north slope of the Alaska Range, and his book describing his explorations gives some additional geographic information.

The first survey of the area sufficiently thorough to determine the nature and distribution of the geologic formations as well as the character and extent of the economic resources was made in the summer of 1916, by S. R. Capps and C. E. Giffin, of the Geological Survey. Giffin prepared a topographic map of about 4,500 square miles on a field scale of 1 to 180,000, while Capps[6] studied the geology of the area, making a special investigation of the geologic conditions in the vicinity of the placer mines and examining all the placer mines and most of the prospects, including placer gold deposits and the gold, silver, and antimony lodes.

[2] Brooks, A. H., The Mount McKinley region, Alaska, with descriptions of the igneous rocks and of the Bonnifield and Kantishna districts, by L. M. Prindle: U.S. Geol. Survey Prof. Paper 70, 1911.

[3] Prindle, L. M., The Bonnifield and Kantishna regions, Alaska: U.S. Geol. Survey Bull. 314, pp. 213–221, 1907.

[4] Stuck, Hudson, The ascent of Denali, Charles Scribner's Sons, 1914.

[5] Sheldon, Charles, The wilderness of Denali, pp. 3–9, 85–91, 108–112, Charles Scribner's Sons, 1930.

[6] Capps, S. R., The Kantishna region, Alaska: U.S. Geol. Survey Bull. 687, 1919.

UNITED STATES DEPARTMENT OF THE INTERIOR
Harold L. Ickes, Secretary

GEOLOGICAL SURVEY
W. C. Mendenhall, Director

Bulletin 849—G

THE GIRDWOOD DISTRICT, ALASKA

BY

C. F. PARK, JR.

Investigations in Alaska Railroad belt, 1931

(Pages 381–424)

UNITED STATES
GOVERNMENT PRINTING OFFICE
WASHINGTON : 1933

Sale by the Superintendent of Documents, Washington, D.C. - - - - - Price 25 cents

)ped is the main range of the Chugach
accessible and unexplored. This area
r snow and ice. For miles, as far as
)aced bare, jagged peaks and ridges
herwise smooth, wind-swept expanse

) of Turnagain Arm rise to elevations
These coastal mountains have been
'eet [5] and their valleys are broadly
les contain wide longitudinal grooves
:s and otherwise show the effects of

g the Eagle River just south of the
ie river here flows at an elevation of
on each side rise abruptly to crags
e mountains have slopes of less than
erage inclination of the surface for
60°. Many of these mountains are
n be ascended from one side, usually

IMATE

coastal rain belt. The annual pre-
d incomplete records kept by the
s probably about 50 inches. Heavy
e very common during the summer.
v may be expected on the peaks at
ls during the winter, and much of it
n sheltered or protected spots. The
nceal small névé fields and pockets

ds are common. These winds are
nter and at times assume the pro-
rted that the old mail-route trail
reek divide was abandoned on ac-
summer the winds mostly subside.
arts is cool and pleasant.

ATION

ek are thickly wooded and furnish
section of the Territory. Spruce
r of 4 feet, and groves of cotton-
lentiful in many of the valleys.

, Alaska: U.S. Geol. Survey Bull. 642, p.

Timber line ranges from 1,000 to 2,500 feet but averages about 1,500 feet. Alder and willow thickets extend to an elevation of 2,000 feet, or in some places above 2,500 feet. Most of the larger valleys are filled with a tangled mass of fallen trees and underbrush, which includes buck brush, mountain cedar, devilsclub, blueberries, cranberries, currants, raspberries, and many other small plants. Multitudes of wild flowers last throughout the summer. The otherwise bare slopes and ridges are spotted with many different kinds of mosses and grasses. Redtop and bunch grass are abundant and in many places waist-high. They furnish ample food for stock during the summer.

GAME

Mountain goats and sheep and black bear are found in the remote regions. A few moose, brown bear, and fur-bearing animals are present, and wolves and coyotes are occasionally seen. Ptarmigan and grouse, the only game birds seen, were nowhere abundant. Most of the streams are glacier-fed and, owing to the turbid condition of the waters, contain no fish. Trout are found in a few clear streams.

POPULATION

The only people in the district are those near Girdwood and Crow Creek and a few prospectors who roam the hills during the summer. California Creek, near its junction with Glacier Creek, furnishes power for a sawmill, and some timber cutters and prospectors live in the Glacier Creek Valley. Girdwood contains a store-hotel, a forest ranger's cabin, a post office, and a dozen or so other buildings. The permanent population of the entire district probably averages between 25 and 50 people. No signs were seen that would indicate that any native tribes frequent this district.

ROUTES OF TRAVEL

The Girdwood district is served by the Alaska Railroad from the station of Girdwood, on Turnagain Arm. From the railroad a surfaced road extends for about 5 miles along the west side of Glacier Creek to Crow Creek and about 2½ miles up Crow Creek Valley. This road was built and is maintained by the United States Bureau of Public Roads. A tractor road connects the end of the surfaced road with the summit of the divide between Crow and Raven Creeks, from which a trail follows down Raven Creek to the Eagle River. The old trail into the interior of Alaska by way of Old Knik extended down the Eagle River to Knik Arm. This trail has been washed out and overgrown, so that it is inaccessible to summer traffic.

A footbridge crosses Glacier Creek just below the junction with Crow Creek and connects the gravel road with a trail up Winner Creek and also with the Virgin Creek trail down the east bank of Glacier Creek. The well-built trail up Winner Creek was constructed by Axel Linblad. Late in the summer of 1931 the Forest Service undertook to extend this trail across the low divide to the Twentymile River.

GENERAL GEOLOGY

PRINCIPAL FEATURES

The oldest rocks in the Girdwood district (see pl. 33) are a hydrothermally metamorphosed series of clastic sediments, lava flows, and intrusive rocks. This series forms a belt 10 to 12 miles wide along the western border of the mountains.

Unconformably overlying the metamorphosed rocks is the most widespread series of the region, a monotonous succession of argillite and graywacke. These rocks extend along Turnagain Arm from Indian Creek to Portage Glacier and northward to Knik Arm.[6]

In the extreme northwestern part of the area is a series of greenstone tuffs, younger than the argillite-graywacke series. The greenstone tuff has been studied only along the high, almost inaccessible crags south of the Eagle River.

The youngest sedimentary materials are unconsolidated or partly indurated Quaternary deposits of glacial and stream origin and recent unconsolidated deposits of similar types. No Tertiary beds have been recognized in this district, though sedimentary rocks of Tertiary age occur in a wide belt along the coast near Anchorage, and beds of recognized Eocene age are found in the Chickaloon region and south of Turnagain Arm near Point Possession.

UNDIFFERENTIATED METAMORPHIC ROCKS

Character and distribution.—The hydrothermally metamorphosed rocks comprise a wide variety of materials. They include altered igneous rocks of acidic composition, altered andesite, and, especially, water-laid tuff and agglomerate. They also include altered argillite, graywacke, and chert of sedimentary origin. This whole series has been cut by both basic and acidic dikes.

The study of these rocks has been limited to a section along the Alaska Railroad from Potter to Girdwood and one small area near the head of the North Fork of Ship Creek. The study has yielded little in addition to that already published by Capps.[7]

Structure and thickness.—Owing to the deformed and metamorphosed character of this series of rocks only a vague idea of their

[6] Capps, S. R., op. cit., p. 153.
[7] Idem, pp. 154–155.

tructure has been obtained. Tl
ecause they are generally so gr
erminable specimens are not eas
Along the shore of Turnagain
etween this group of rocks and
ast has been the site of inten
recciation. Bunches of argil
queezed and infolded into the
rrangement of these included
ine of contact. The axes of t
proximately with the axial tren
arallel to the line of contact
This direction is N. 10°–20° I
tively flat angles. Numerous
ypes and with great differen
Most of these faults are parall
transverse east-west fault syste
No information concerning t
tained. Capps considers them
thick, and this estimate appea
made.

Age and correlation.—The a
pre-Cretaceous, although wher
wacke series has been seen de
have been so severe that definite
is impossible from the infor
rock series definitely overlies
are much more intensely defo
graywacke group and are ther
cord with Capps' conclusion.[8]

ARGILLITE-

Character and distribution
derlain by argillite and grayw
locally covered by Pleistocen
truded by igneous masses of
of conglomerate, limestone,
interbedded with the argilli
but distinct lenticular beds.[9]

Thin-banded argillite and
rock types. The bands rang
to more than 100 feet, althou

[8] Capps, S. R., op. cit., p. 155.
[9] Idem, p. 156.

UNITED STATES DEPARTMENT OF THE INTERIOR
Harold L. Ickes, Secretary

GEOLOGICAL SURVEY
W. C. Mendenhall, Director

Bulletin 849—I

THE MOOSE PASS-HOPE DISTRICT KENAI PENINSULA, ALASKA

BY

RALPH TUCK

Investigations in Alaska Railroad belt, 1931
(Pages 469–530)

UNITED STATES
GOVERNMENT PRINTING OFFICE
WASHINGTON : 1933

sale by the Superintendent of Documents, Washington, D.C. Price 15 cents

cKinley expedition in 1932
he mountain in May until
d drifted about 10 feet on
10,000 feet.
1 season occur in May and
usually rainy, with poor
. The weather is particu-
glaciers, and it is probable
climate, because often when
e glaciers it is good a few

AILS

bank of the Susitna River,
ween the railroad and the
l trapper trails can occa-
g between the Susitna and
rail is a short one between
ad [11]) and the top of the
of 4 miles. The trail ends
Curry Lookout. Both the
ve been maintained by the
r on clear days the lookout
ley and the Alaska Range.
he Chulitna River, is much
d only from the north and
'alkeetna (mile 226.7), and
ile 273.8). The route from
River, where it is necessary
f the Susitna a road built
mission leads to the mining
'rom the Peters Creek dis-
p Willow Creek and down
or up Poorman Creek and
Valley. Old trails exist on
uth Rivers must be crossed
en River country, but both
th horses near the glaciers,
igh water. Farther down-
e encountered.
than by the Peters Creek
ank of the Chulitna River
keetna. No trail has been

erminus of the Alaska Railroad.

opened over that route, however, and it is likely that heavy brush, soft ground, and deep streams would offer considerable difficulty to its use.

The route from the north, which was followed by the Geological Survey party of 1932 and over which horses were taken without great difficulty, was to leave the railroad at mile 276.5 and follow the trail westward to the Chulitna River near the mouth of Pass Creek. The trail thence leads down the east bank of the river to a point near the mouth of Coal Creek, where there is a cable crossing. Here it is necessary to swim horses across the river, although it is reported that at some seasons of the year the stream is easily forded. From the western terminal of the cable considerable cutting has been done on a trail that leads west to the front of Eldridge Glacier. Here the Fountain River is easily forded, or it may be avoided by persons on foot, who can cross on the moraine of the glacier. Thence the trail strikes over the low ridge between the Fountain and Hidden Rivers and up the north side of the Hidden River to Swift Creek, where the Boedeker brothers have a short trail leading to their prospect. A tram at this point crosses the river, which is easily forded with horses. From the Hidden River a route to the southwest that runs transverse to the drainage is the only one that can be taken with horses. It follows a narrow belt of metamorphosed sediments that affords several low passes over divides that elsewhere are sharp granitic ridges. The Coffee River and Alder Creek are easily forded, and the route crosses the lower end of Ruth Glacier and thence leads to Talkeetna by way of the Peters Creek trail.

An alternative route from the north is to leave the Alaska Railroad at Honolulu (mile 288.7). Two miles to the south there is a bridge that crosses the Chulitna River. It is reported that from that point a trail leads to the southwest along the high bench ground on the west side of the river.

Spink Lake, 1½ miles in length, a few miles north of the Coffee River, is an ideal landing point for airplanes; from it a large part of the area can easily be reached.

Light power boats can ascend the Chulitna River, and a large part of the district can be reached in that manner. The Tokichitna River is also navigable for about 15 miles. It is probable that prospectors or trappers can reach the district more easily and cheaply by boat from Talkeetna than by any other means.

VEGETATION

As soon as the snow melts in the spring vegetation grows with remarkable rapidity at the lower elevations. Although the growing

UNITED STATES DEPARTMENT OF THE INTERIOR
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Bulletin 857

MINERAL RESOURCES OF ALASKA

REPORT ON PROGRESS OF INVESTIGATIONS IN 1932

BY

PHILIP S. SMITH AND OTHERS

UNITED STATES
GOVERNMENT PRINTING OFFICE
WASHINGTON : 1934

member of the Lindley-Strom Mount McKinley expedition in 1932 states that from the time they climbed the mountain in May until they returned in July, it had snowed and drifted about 10 feet on Muldrow Glacier at an elevation of about 10,000 feet.

Most of the clear days during the open season occur in May and June. July, August, and September are usually rainy, with poor visibility and only occasional clear days. The weather is particularly unfavorable in the vicinity of the glaciers, and it is probable that locally these ice masses influence the climate, because often when the weather is bad in the vicinity of the glaciers it is good a few miles away.

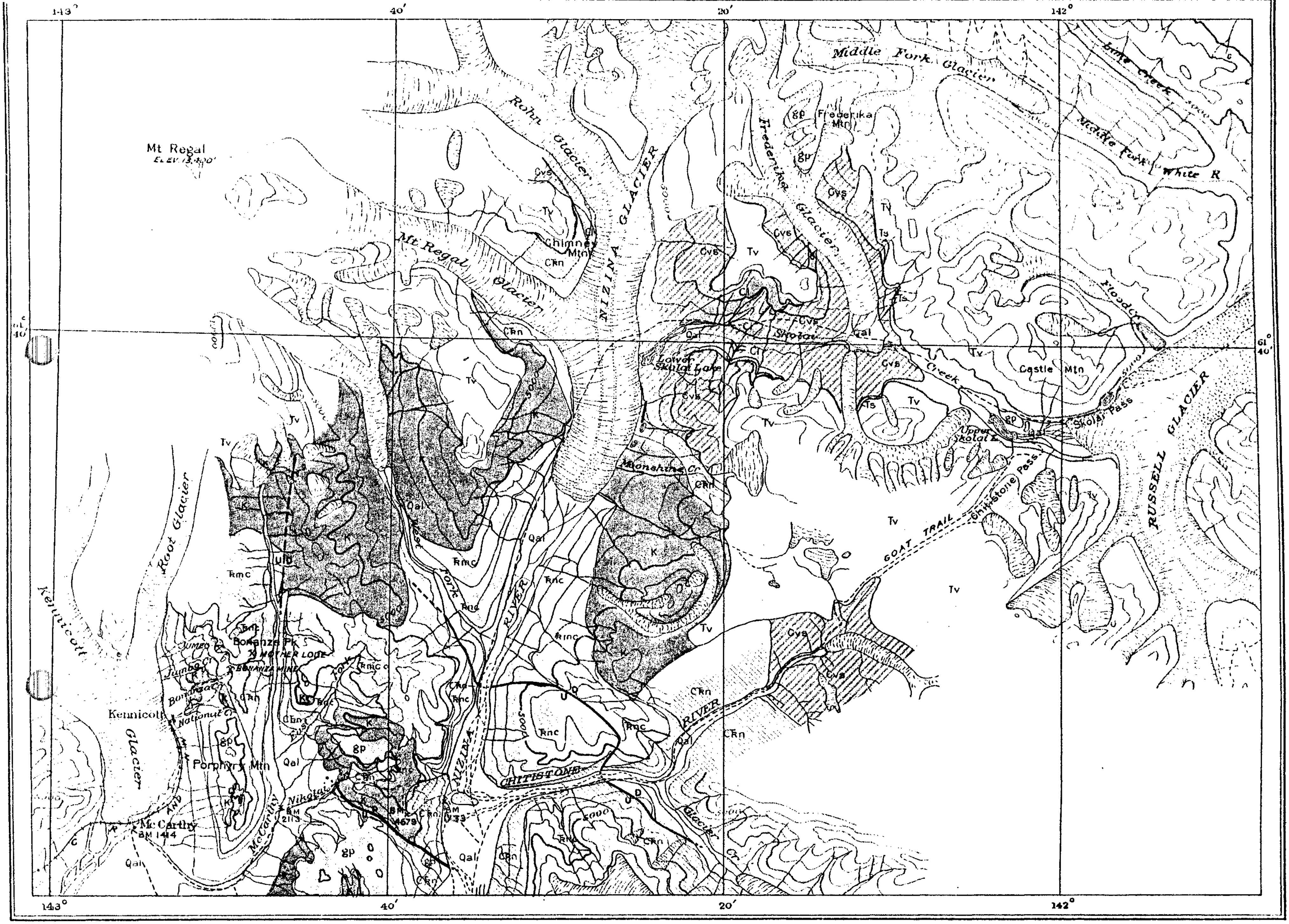
ROUTES AND TRAILS

The Alaska Railroad follows the east bank of the Susitna River, and the part of the district that lies between the railroad and the Chulitna River is easily accessible. Old trapper trails can occasionally be found on the long ridge lying between the Susitna and Chulitna Rivers, but the only developed trail is a short one between Curry (mile 248.5 on the Alaska Railroad [11]) and the top of the ridge between the two rivers, a distance of 4 miles. The trail ends at a shelter or observation house called Curry Lookout. Both the shelter and the trail were built and have been maintained by the Alaska Railroad as a scenic attraction, for on clear days the lookout affords an excellent view of Mount McKinley and the Alaska Range.

The western part of the area, west of the Chulitna River, is much more difficult of access and can be reached only from the north and south. The southern point of entry is Talkeetna (mile 226.7), and the northern point is Chulitna station (mile 273.8). The route from Talkeetna is by boat across the Susitna River, where it is necessary to swim horses. From the west bank of the Susitna a road built and maintained by the Alaska Road Commission leads to the mining districts of Cache and Peters Creeks. From the Peters Creek district two routes are practicable—either up Willow Creek and down Ramadyke Creek to the Tokichitna River or up Poorman Creek and down the south slope of the Tokichitna Valley. Old trails exist on both routes. Both the Tokichitna and Ruth Rivers must be crossed in order to reach the heart of the Hidden River country, but both of these glacial streams can be forded with horses near the glaciers, except during periods of exceptionally high water. Farther downstream difficulty with soft ground may be encountered.

An alternative and more direct route than by the Peters Creek trail would be to proceed up the west bank of the Chulitna River after crossing the Susitna River at Talkeetna. No trail has been

[11] Mileage is measured from Seward, the southern terminus of the Alaska Railroad.



Topography by D. C. Witherspoon, 1908; C. E. Giffin, 1914; and Fred. H. Moffit, 1922-1927

GEOLOGIC SKETCH MAP OF UPPER NIZINA RIVER, ALASKA

Scale $\frac{1}{250,000}$

2 1 0 2 4 6 8 10 Miles

Contour interval 1,000 feet

Datum is mean sea level

Geology by Fred. H. Moffit and S. R. Capps, 1909
Fred. H. Moffit, 1922-1927