

the moraine-covered portion of the glacier, winding back and forth over its irregular surface. (See Pl. VII.) Although the melting of the glacier affects the trail somewhat, rendering certain spots impassable from time to time so that short detours are necessary, the crossing of the glacier is not difficult and requires only 5 to 6 hours for pack horses. From the head of White River to the placer mines various routes may be followed through a rolling country with many low passes, no difficulties being encountered other than some soft ground. One of these routes leaves White River near the mouth of Lime Creek and proceeds in a northwesterly direction across a high flat to the head of Gehoenda or Trail Creek and down that stream to Chisana River at the town of Chisana. A branch of this trail leaves it near the head of Solo Creek and runs northward past Beaver Lake to the town of Bonanza.

There seems to be no good reason why a better route than any now used for both summer and winter travel could not be established by way of Nizina River, Skolai Creek, and White River. It is known that at times Nizina Glacier is impassable for horses, but the glacier can be entirely avoided by a detour around its eastern edge, and horses have been taken that way on a number of occasions. With a moderate amount of work a good trail around the glacier could be constructed. Russell Glacier can now be crossed, both in summer and winter, but the present trail over it is tortuous, being about 14 miles long to cover an air-line distance of 7 miles. It is reported that a route along the west side of the glacier, which almost entirely avoids the ice and which is many miles shorter than the present route, can now be used by one familiar with it, and by means of a little trail building this route could be made much easier than the route now traveled.

COPPER-NABESNA RIVER ROUTE.

The Copper-Nabesna River route starts at the town of Chitina, on the Copper River & Northwestern Railway, 131 miles from Cordova. It follows the Government military road from Chitina up Copper River to Gulkana. From Gulkana a trail parallels the north bank of Copper River to the Indian village of Batzulnetas, whence it takes an eastward direction to the head of Platinum Creek and follows Cooper and Notch creeks to Chisana River, 8 miles below the town of Chisana. By this trail the distance from Chitina to Chisana is about 235 miles, and the route is little used for summer travel. In winter, however, the greater distance is largely offset by the gentle gradient, the avoidance of glaciers, and the abundance of timber for fuel along the entire route. The only high pass to be crossed is Cooper Pass, an ice-free divide at an elevation of about 6,000 feet, approached by moderate grades. Considerable freight was taken

over this route in the winter of 1913-14 in competition with the much shorter Nizina-Chisana route, although the sledding distance is nearly three times as great, and many freighters are said to contemplate a change from that route to this one for future freighting.

DAWSON-WHITE RIVER ROUTE.

Many of the gold seekers in this district came from Dawson by way of White River. Freight may be taken by steamer up the Yukon to White River, a distance of about 70 miles, and by poling boats or shallow-draft power boats up White River as far as the mouth of Donjek River, or even in favorable stages of water to the mouth of Beaver Creek, and poling boats can be used to Canyon City, a village on White River a few miles east of the international boundary. From White River freight is taken in winter by sled to the placer mines. A winter trail has now been cut from the mouth of Beaver Creek to the point where that stream finally crosses the boundary into Alaska, and this route is said to offer no great difficulties, although the distance from Dawson is about 175 miles by boat to the mouth of Beaver Creek and about 85 miles overland from that point to the placer mines.

COFFEE CREEK ROUTE.

From the mouth of Coffee Creek, which joins the Yukon from the south 110 miles above Dawson, a good trail has been built to the junction of Beaver Creek with White River, a distance of about 80 miles, and another branch leads to Canyon City, 120 miles by trail from the Yukon. From the mouth of Beaver Creek the trail to the Chisana placer mines again reaches Beaver Creek at the international boundary, and thence proceeds up the creek to its head. The total distance by this trail from the Yukon to the town of Bonanza is about 160 miles.

WHITEHORSE-KLUANE LAKE ROUTE.

The route from Whitehorse, at the terminus of the White Pass & Yukon Route, to Canyon City, by way of Lake Kluane, is available for travel both in summer and winter, though the winter trail is shorter, as it crosses some bodies of water which the summer trail skirts. A wagon road has been built from Whitehorse to Lake Kluane, a distance of 143 miles, and a trail extends about 170 miles from the upper end of the lake to Canyon City, on White River, and thence 55 miles farther up Beaver Creek to the placer mines. The total overland distance by this route is about 368 miles in summer and perhaps 20 miles less in winter.

On the circulation of the report made in the Chisana basin made their way up Tanana and small boats. Under favorable conditions these rivers as far as the north and boats were lined or poled Chathenda Creek. The route is, however, long and difficult and not an economical route for bringing many persons availed themselves of which they rowed downstream.

ACCOMMODATION

Along all the most used trails in 1913 and 1914, road houses at intervals and lodging could be provided. On the Nizina-Chisana and Nizina-Chisana routes travel from one road house to the next is a distance of about 10 miles. On the Copper-Nabesna route along the Government military trail the Whitehorse-Kluane Lake route and the Whitehorse and Kluane Lake route by trail. The rates charged at these road houses and with the distance from the Yukon range from a minimum of \$1.00 to \$2.00 a meal in the more remote places.

COST OF TRAVEL

The cost of travel by trail from the Yukon to the placer mines varies so greatly with the method of travel used that no comparison can be made here. For his own bed and simple and comfortable food and sleeps out, the cost is little more than on the way. For the man who stays at the road houses, the expense is much greater. The time spent in reaching his destination by pack train, carrying their own supplies, is much the same as for the other Alaska trail. The regular fares on the steamship lines from Seattle to Cordova \$30 and to Cordova \$45. By rail

13-14 in competition with the much although the sledding distance is any freighters are said to contemplate this one for future freighting.

WHITE RIVER ROUTE.

This district came from Dawson by may be taken by steamer up the of about 70 miles, and by poling ts up White River as far as the n favorable stages of water to the ing boats can be used to Canyon ew miles east of the international ight is taken in winter by sled to has now been cut from the mouth re that stream finally crosses the ute is said to offer no great diffi- n Dawson is about 175 miles by and about 85 miles overland from

BEAVER CREEK ROUTE.

which joins the Yukon from the good trail has been built to the White River, a distance of about 80 Canyon City, 120 miles by trail of Beaver Creek the trail to the es Beaver Creek at the interna- ds up the creek to its head. The e Yukon to the town of Bonanza

WHITEHORSE LAKE ROUTE.

The terminus of the White Pass & way of Lake Kluane, is available winter, though the winter trail is of water which the summer trail built from Whitehorse to Lake l a trail extends about 170 miles anyon City, on White River, and Creek to the placer mines. The te is about 368 miles in summer

TANANA-CHISANA ROUTE.

On the circulation of the report that rich placer discoveries had been made in the Chisana basin, a considerable number of men made their way up Tanana and Chisana rivers by launches and small boats. Under favorable conditions launches may be taken up these rivers as far as the north front of the Nutzotin Mountains, and boats were lined or poled all the way up to the mouth of Chathenda Creek. The route from Fairbanks, the base of supplies, is, however, long and difficult and, although possible, will never be an economical route for bringing in supplies. In the fall of 1914 many persons availed themselves of this water route, and built boats in which they rowed downstream to Fairbanks.

ACCOMMODATIONS ON THE TRAILS.

Along all the most used trails to the gold fields there were, in 1913 and 1914, road houses at intervals of 15 to 30 miles, at which meals and lodging could be procured by the traveler. Thus along the Nizina-Chisana and Nizina-White River routes it was possible to travel from one road house to the next each day for the entire distance. On the Copper-Nabesna River route there are road houses along the Government military road as far as Gulkana. On the Whitehorse-Kluane Lake route road houses are maintained between Whitehorse and Kluane Lake, but none west of that portion of the trail. The rates charged at these road houses vary on the different routes and with the distance from established lines of transportation, but range from a minimum of \$1 a meal and \$1 for lodging to \$1.50 and \$2 a meal in the more remote parts of the region.

COST OF TRANSPORTATION.

The cost of travel by trail from steamship or railroad points to the placer mines varies so greatly with the route traveled and the method of travel used that no comprehensive statement of the expense involved can be made here. For the man who travels afoot, carries his own bed and simple and compact food, prepares his own meals, and sleeps out, the cost is little more than the value of his time while on the way. For the man who rents or purchases a horse and stops at the road houses, the expense depends to a great degree on the time spent in reaching his destination. For parties that travel by pack train, carrying their own camping outfit and provisions, the cost is much the same as for the same length of time spent on any other Alaska trail. The regular scheduled rates for first-class passengers on the steamship lines from Seattle to Skagway in 1914 was \$30 and to Cordova \$45. By rail from Skagway to Whitehorse the

DEPARTMENT OF THE INTERIOR
FRANKLIN K. LANE, Secretary

UNITED STATES GEOLOGICAL SURVEY
GEORGE OTIS SMITH, Director

Bulletin 631

THE YUKON-KOYUKUK REGION
ALASKA

BY

HENRY M. EAKIN

PROPERTY OF
*The Alaska Agricultural College
and School of Mines*



WASHINGTON
GOVERNMENT PRINTING OFFICE
1916

5727

Geese, ducks, cranes, and other waterfowl in large numbers breed in the great lowlands of the region. In the journey along the divide westward from the Ray Mountains, when the landscape was obscured by smoke, the constant clamor of these birds indicated the nearness of the lowlands on the south.

The mountain streams are well stocked with brook trout and grayling, and the latter are abundant also in the lower and larger streams. Salmon run up all the larger streams annually and support a considerable industry along the Yukon, where they are taken as food for both man and beast.

POPULATION.

The population of the region is chiefly localized in settlements on the banks of Yukon and Koyukuk rivers. The white settlements include Rampart (population in 1913 about 50), Tanana (300), and Ruby (1,000), on Yukon River, and Hughes (75), on Koyukuk River. Minor settlements along the rivers, including telegraph stations, road houses, and the like, have a total population of about 50 individuals. About a score of prospectors spend more or less time in the interior of the region.

The natives in this region number about 300. They live in camps and villages on the banks of Yukon and Koyukuk rivers, usually near the mouths of the larger tributary streams. The two largest settlements are probably those near Rampart and Tanana.

COMMUNICATION.

Steamboats ply on the Yukon and Koyukuk during the open season and furnish a ready means of reaching the borders of the region. The larger tributaries of these rivers are generally navigable for poling boats for considerable distances, but much of the region is inaccessible in this manner. The Melozitna Canyon is considered impassable for craft of any sort. Above the canyon this stream is ideal for poling boats and furnishes a possible route through a large territory. Very little boating is actually done on the smaller streams, inland travel being confined mostly to the winter, when dogs and sleds can be used.

Mail service on a weekly schedule is maintained along the Yukon in summer and at longer intervals along the Koyukuk. In winter the mail is carried by dog sledge, the Koyukuk route leading from Tanana across the Tozitna and upper Melozitna basins to the river above the mouth of the Kanuti. The winter service is said to be generally more regular and satisfactory than the summer service. The Government telegraph is available at all the important Yukon settlements.

The industries pursued by numerous, but all are related to transportation, and the Government considerable revenue is derived from and dried for dog feed. Large annually for the military post-tities of cordwood from local settlements and mining can the larger Yukon settlements, supplying saw logs to the mill done, and at Rampart an agr-tained under Government ausp have been grown successfully, of expanding the agricultural much greater population for v-tain grains, and dairy products.

DESCRIP

GENERAL

The areal distribution of the Koyukuk region is indicated of geologic boundaries within the have been generally determine-sions of boundaries beyond the on general geologic structure ar-known areas. Boundaries hav-observation only where a fair

The boundaries of the Qua-general character of their distr-which could be delineated only-is possible in a hasty reconnaiss-It is intended only to show ap-flood plains and the line of d-alluvial deposits and the talus-are not indicated on the map-forms has been followed, and-are not expressed topographica-

A broad zone lying along the-pied predominantly by metam-zone is a metamorphic complex-greenstones whose structural-and obscure to permit subdivis-

waterfowl in large numbers breed in the journey along the divide basins, when the landscape was obliterated by these birds indicated the south.

stocked with brook trout and grayling also in the lower and larger streams. Streams annually and support a concentration, where they are taken as food.

POPULATION.

settlements are chiefly localized in settlements on the Koyukuk and Tanana rivers. The white settlements include (1913 about 50), Tanana (300), and Fairbanks (75), on Koyukuk and Tanana rivers, including telegraph stations. The total population of about 500. Prospectors spend more or less time

over about 300. They live in camps on the Koyukuk and Tanana rivers, usually near the larger streams. The two largest settlements are Fairbanks and Tanana.

NAVIGATION.

and Koyukuk during the open season reaching the borders of the region. Rivers are generally navigable for small craft, but much of the region is inaccessible. The Melozitna Canyon is considered a possible route through a large area. Work has been done on the smaller streams, especially in the winter, when dogs and sleds are used.

is maintained along the Yukon and Koyukuk. In winter the Koyukuk route leading from Fairbanks to the river is used. The winter service is said to be generally better than the summer service. The Yukon is one of the important Yukon

INDUSTRIES.

The industries pursued by the inhabitants of this region are numerous, but all are related more or less directly to mining, transportation, and the Government military and signal service. Considerable revenue is derived from the salmon taken from the Yukon and dried for dog feed. Large contracts for this product are filled annually for the military post and mail contractors. Large quantities of cordwood from local sources are used by steamboats and in the settlements and mining camps. Lumber for local use is sawed in the larger Yukon settlements, and many persons find employment in supplying saw logs to the mills. A little gardening and trucking is done, and at Rampart an agricultural experiment station is maintained under Government auspices. Here a great variety of products have been grown successfully, a fact which suggests the possibility of expanding the agricultural industry to meet the demands of a much greater population for vegetable and root products, hay, certain grains, and dairy products.

DESCRIPTIVE GEOLOGY.

GENERAL FEATURES.

The areal distribution of the major geologic units of the Yukon-Koyukuk region is indicated on the map (Pl. II, in pocket). The geologic boundaries within the areas that are mapped topographically have been generally determined by actual observation. The extensions of boundaries beyond these areas are hypothetical, being based on general geologic structure and relations observed within the better-known areas. Boundaries have been extended beyond the field of observation only where a fair degree of accuracy seemed assured.

The boundaries of the Quaternary formations indicate only the general character of their distribution and not their absolute margins, which could be delineated only by a far greater amount of work than is possible in a hasty reconnaissance or is merited by their importance. It is intended only to show approximately the width of the present flood plains and the line of demarcation between the more general alluvial deposits and the talus deposits of the upland slopes which are not indicated on the map. The general guidance of topographic forms has been followed, and it is obvious that where these deposits are not expressed topographically error in detail must occur.

A broad zone lying along the Yukon upstream from Ruby is occupied predominantly by metamorphic rocks. The central part of this zone is a metamorphic complex of schists, limestones, quartzites, and greenstones whose structural and areal relations are too intricate and obscure to permit subdivision, except on the basis of much more

DEPARTMENT OF THE INTERIOR
FRANKLIN K. LANE, Secretary

UNITED STATES GEOLOGICAL SURVEY
GEORGE OTIS SMITH, Director

Bulletin 655

THE
LAKE CLARK-CENTRAL KUSKOKWIM REGION
ALASKA

BY

PHILIP S. SMITH

Property of the
University of Alaska



WASHINGTON
GOVERNMENT PRINTING OFFICE
1917

11477

PRECIPITATION.

Winter. Few instrumental observations of the various months have been made so that our knowledge of the amount and precipitation is based mainly on indefinite records. Eakin, quotes instrumental observations made on the shores of Iliamna Lake from December, 1907, to May, 1908, which show an average mean temperature for these months of 16° to 18° F. The temperature is probably modified by the influence of the near-by bodies of water higher than that of regions in Alaska that lie farther inland. Furthermore, these observations were made at a place south of most of the Lake Clark-Central Kuskokwim

region of 1914 seems to have been exceptionally cold; few months were so cold as to permit members of the party to work in the open without jackets. On July 6, even at an elevation of more than 1,000 feet above the sea, the temperature at the precipitation was in the form of snow, and on the shores of Iliamna Lake formed on water buckets and shallow puddles in the Stony River, at an elevation of about 1,000 feet. Even in the winter, therefore, killing frosts may occur in almost any month. The cold, however, is seldom intense enough to interfere with the melting of ice until the middle of September, and most of the snow remains on the ground until the end of May. The regular passenger boats usually reach Iditarod by the middle of June, and the first boat to Iditarod in 1914 started on September 25. Near Iditarod the temperature is somewhat higher and the streams are longer. Martin and Katz¹ give records of observations in the region as follows:

In 1905, ice began to form on Iliamna Lake; January 12, 1906, ice was thick on Iliamna Lake; February 12, 1906, ice in Iliamna Lake; 1906, ground began to become bare; January 17, 1908, Iliamna Lake opened; June 2, 1909, ice out of upper Iliamna Lake; June 20, 1909, ice all gone from Iliamna Lake.

The prospectors reported that the temperature in winter in the valley bottoms than on the adjacent higher land. It has been reported also from other parts of central Alaska apparently due to the fact that the heavy cold air settles in the lowlands. This condition was observed late in the winter at Sleitmut, where small vegetable gardens in the flats had been badly frostbitten, whereas the plants on the hills a few score feet higher had not been affected.

¹ Martin, G. C., and Katz, F. J., op. cit., p. 16.

The prevailing winds in summer appear to come from the west and south and are usually attended by considerable precipitation. The northerly winds generally bring cold, dry weather. In 1914 the streams were at a high stage, and Kuskokwim River was said to be more than 10 feet above its normal summer level. The observations made in 1914 by the Survey party, which record rainfall on 60 out of 99 days in the summer of that year, therefore leave an impression of heavier precipitation than is perhaps justified, and do not necessarily indicate the average summer rainfall. Eakin,¹ however, states that when he visited the Innoko-Iditarod region in 1912 the rainfall was also exceptionally heavy, and that between July 17 and September 3, a period of 47 days, only 5 days were without rain in some part of the region. Spurr, in his report on his trip to the region in 1898, states that "the whole Kuskokwim River * * * was, during the time that we were on it—that is, about five weeks, from the middle of July till the latter part of August—a very rainy country, showers falling nearly every day and continuous rains being frequent."² According to local reports the precipitation in summer is two to three times as great as in winter, so that, although summer travelers report a large number of rainy days, the annual precipitation is low—probably only about 20 inches a year.

From May to September most of the precipitation is in the form of rain, but even during that period, as has already been noted, snow sometimes falls at low altitudes, and snow, sleet, or hail is not at all uncommon on the high hills. Thunderstorms occur frequently in summer in the Mulchatna basin, which has an unenviable reputation on that account. These storms seem to originate near the higher hills and move along the main valleys, and two or three storms may be in sight at the same time. Several thunderstorms occurred in 1914 while the party was working in the valleys of Stony and Kuskokwim rivers.

POPULATION AND SETTLEMENTS.

The region between Lake Clark and Georgetown is so sparsely settled that after leaving Lake Clark the members of the Survey party of 1914 saw no other persons until they reached Stony River, at the camp of August 6. They saw no one in the area west of this camp all the way to the camp of August 21, on the Kuskokwim. Along the divide followed by the party from the crossing of the

¹ Eakin, H. M., The Iditarod-Ruby region, Alaska: U. S. Geol. Survey Bull. 578, p. 16, 1914.

² Spurr, J. E., op. cit., p. 67.

Kuskokwim to Georgetown no persons were seen, yet this region does not impress the traveler as uninhabited, for in the distance at many places along the Kuskokwim the party saw cabins and noted at several places indications of the former presence of travelers. Between Georgetown and Iditarod a well-beaten trail and numerous old camp sites and pieces of discarded camp equipment showed that the region was by no means unfrequented.

The settlements of the region may be roughly arranged into two main groups, one including the villages on Kuskokwim River and the other those in the Kvichak basin. Between these two main groups there are practically no settlements.

The largest town on the Kuskokwim, Bethel, is described by Maddren¹ as follows:

The native settlement of Bethel, on the tidal portion of Kuskokwim River, about 100 miles above its entrance into Bering Sea, is the most important supply station for this region, and probably it will always be of commercial importance because of its natural location as a port of entry for ocean-borne traffic to the extensive region drained by Kuskokwim River. Bethel was established in 1886 as the local headquarters of a Moravian missionary society, and since that time has served more or less as a trading center for the native population and a place of supply for prospectors within reach of it. Shallow-draft sea-going power vessels can reach Bethel during the season of open navigation—from June to October—and for the last five or six years a somewhat irregular trade has been carried on between Bethel and Seattle, Wash. Kuskokwim River is navigable for stern-wheel steamboats for fully 500 miles above Bethel. Consequently this place is a logical point for the discharge of ocean traffic and its transshipment up the river. Without doubt the greater part of all supplies for the Kuskokwim region will be brought to it by this water route, no matter where future developments in the valley may take place.

Several river steamboats have been operated on Kuskokwim River each summer since about 1907, when the miners came from Nome to the Innoko district by way of this river. The trade of these boats increased until 1911, when several additional boats were placed upon the river, but since then it has fallen off, and in 1914 only one large river boat was required to carry all the freight offered. At its maximum the freight carried on the river each summer amounted to about 2,500 tons, but in 1914 it had dwindled to about 500 tons.

The main post on upper Kuskokwim River is Takotna, which is near the former settlement called McGrath. This place was practically the only one on the Kuskokwim above Bethel where any supplies could be bought in 1914. It was established as a distributing center for the placer region of Takotna River and is not more than 35 miles in an air line from the placer camp of Ophir, on Innoko River. The winter trail used by the mail carriers and by foot travelers from Iditarod to Cook Inlet passes through this settlement. During the summer Takotna is reached by a moderate-sized river

¹Maddren, A. G., Gold placers of the lower Kuskokwim, with a note on copper in the Russian Mountains: U. S. Geol. Survey Bull. 622, pp. 302-303, 1915.

steamboat that brings freight upstream from tidewater \$30 a ton, but the service is very irregular and uncertain.

Both Bethel and Takotna, however, lie outside the region. The only two settlements on the Kuskokwim seen by the party were Georgetown and Sleitmut. Georgetown, on the Kuskokwim River, and its continuation, Lousetown, east of it, form a small village consisting of not more than a score of buildings, a store, and a now deserted roadhouse. It has a population of about 20 white persons. As already stated, this place was for many years a trading post, conducted by George Fredericks, from whom the name of Georgetown is derived. In 1910, on the discovery of placer gold in some of the streams in the neighborhood, a stampede took place and a boom town sprang up. Not so much gold was found as was expected, however, so the prospectors struck out for more fields and the place dwindled to its present size.

Sleitmut consists of several native shacks and a store kept by one white man in the village. It is on the north bank of Kuskokwim, a short distance below the mouth of the Holitna. The name "sleit" means whetstone and "mut" means people. The place is named for the contact-metamorphosed sandstone that outcrops near the Holitna.

Here and there along the Kuskokwim are cabins, many of which are occupied by prospectors and trappers, and several natives have permanent homes along the river. The natives are mainly in hunting and fishing, but all of them do more or less for the white people and so earn money to buy tea, flour, and other goods which they crave. Many of the natives have a considerable admixture of Russian blood, and the leaders are usually half-breeds.

Several native villages have been reported by prospectors in the headwater part of the basin, but no information about them could be obtained from the Kuskokwim region. A trading post, called Kongollon, patronized mainly by natives, is said to be situated on Stony River, nearly north of Whitson, which is at the head of the Hoholitna. This post is in charge of a half-breed, who gets most of his supplies from the white people at Sleitmut. Kongollon is visited by natives from Lake Clark, and goods are there exchanged. In 1914, however, supplies at Kongollon were almost entirely exhausted and probably could not be obtained until very late in the season, so that some of the natives migrate from Kongollon to Lake Clark. Several deserted cabins were passed on the lower part of Stony River, near the mouth of the Stink River. From these cabins Kongollon was said to be a 3-day journey upstream.

to Georgetown no persons were seen, yet this region impress the traveler as uninhabited, for in the distance at as along the Kuskokwim the party saw cabins and noted places indications of the former presence of travelers. Georgetown and Iditarod a well-beaten trail and numerous sites and pieces of discarded camp equipment showed that was by no means unfrequented.

Settlements of the region may be roughly arranged into two groups, one including the villages on Kuskokwim River and the other in the Kvichak basin. Between these two main groups practically no settlements.

The largest town on the Kuskokwim, Bethel, is described by Madril as follows:

The settlement of Bethel, on the tidal portion of Kuskokwim River, lies above its entrance into Bering Sea, is the most important supply point in this region, and probably it will always be of commercial importance as its natural location as a port of entry for ocean-borne traffic to the region drained by Kuskokwim River. Bethel was established in 1880 as local headquarters of a Moravian missionary society, and since then has served more or less as a trading center for the native population of supply for prospectors within reach of it. Shallow-draft sea-vessels can reach Bethel during the season of open navigation—usually from October—and for the last five or six years a somewhat irregular trade has been carried on between Bethel and Seattle, Wash. Kuskokwim River is navigable for stern-wheel steamboats for fully 500 miles above Bethel. By this place is a logical point for the discharge of ocean traffic and the movement up the river. Without doubt the greater part of all supplies for the Kuskokwim region will be brought to it by this water route, no matter what developments in the valley may take place.

River steamboats have been operated on Kuskokwim River each year since about 1907, when the miners came from Nome to the Innoko headway of this river. The trade of these boats increased until 1911, when several additional boats were placed upon the river, but since then it has declined, and in 1914 only one large river boat was required to carry all the freight offered. At its maximum the freight carried on the river each year is estimated to about 2,500 tons, but in 1914 it had dwindled to about 1,000 tons.

A trading post on upper Kuskokwim River is Takotna, which is the former settlement called McGrath. This place was practically the only one on the Kuskokwim above Bethel where any supplies could be bought in 1914. It was established as a distributing point for the placer region of Takotna River and is not more than 100 miles from an air line from the placer camp of Ophir, on Innoko River. The winter trail used by the mail carriers and by foot travelers from Iditarod to Cook Inlet passes through this settlement. The summer Takotna is reached by a moderate-sized river

Madril, A. G., Gold placers of the lower Kuskokwim, with a note on copper in the region. U. S. Geol. Survey Bull. 622, pp. 302-303, 1915.

steamboat that brings freight upstream from tidewater for about \$30 a ton, but the service is very irregular and uncertain.

Both Bethel and Takotna, however, lie outside the region visited. The only two settlements on the Kuskokwim seen by the writer were Georgetown and Sleitmut. Georgetown, on the Kuskokwim, west of George River, and its continuation, Lousetown, east of that stream, form a small village consisting of not more than a score of cabins, one store, and a now deserted roadhouse. It has a population of 4 or 5 white persons. As already stated, this place was for many years a trading post, conducted by George Fredericks, from whose name Georgetown is derived. In 1910, on the discovery of placer gold on some of the streams in the neighborhood, a stampede took place and a boom town sprang up. Not so much gold was found as had been expected, however, so the prospectors struck out for more promising fields and the place dwindled to its present size.

Sleitmut consists of several native shacks and a store run by the only white man in the village. It is on the north bank of the Kuskokwim, a short distance below the mouth of the Holitna. It is said that "sleit" means whetstone and "mut" means people. The whetstones, for which this place was named, apparently came from the contact-metamorphosed sandstone that outcrops near the mouth of the Holitna.

Here and there along the Kuskokwim are cabins, many of which are occupied by prospectors and trappers, and several native families have permanent homes along the river. The natives are employed mainly in hunting and fishing, but all of them do more or less work for the white people and so earn money to buy tea, flour, and sugar, which they crave. Many of the natives have a considerable admixture of Russian blood, and the leaders are usually half-breeds.

Several native villages have been reported by prospectors on the Holitna, mainly in the headwater part of the basin, but little information about them could be obtained from the Kuskokwim natives. A trading post, called Kongollon, patronized mainly by natives, is said to be situated on Stony River, nearly north of Whitefish Lake, which is at the head of the Hoholitna. This post is in charge of a half-breed, who gets most of his supplies from the white trader at Sleitmut. Kongollon is visited by natives from Lake Clark and goods are there exchanged. In 1914, however, supplies at Kongollon were almost entirely exhausted and probably could not be replenished until very late in the season, so that some of the natives planned to migrate from Kongollon to Lake Clark. Several deserted cabins were passed on the lower part of Stony River, near the mouth of Stink River. From these cabins Kongollon was said to be about two days' journey upstream.

On Big Bonanza Creek, a tributary of the Mulchatna, supposed to enter its northern branch about 3 miles above the camp of July 12, some placer mining has been done, and four to six persons are said to be living on the creek. The settlement was not visited but is reported to consist of only a few cabins. Some old caches below it on the Mulchatna indicate that supplies are brought up the river by poling boat, but most prospectors that come to this place from Lake Clark go across the country by a route not far from that traversed by the Survey expedition of 1914. So few people have used this route, however, that the trail is not marked on the ground.

Nondalton is the main settlement in the vicinity of Lake Clark. It is on the northwest shore of Sixmile Lake. A store, in charge of a white trader, and a score of cabins of natives are the only buildings. The population consists almost entirely of natives. At the time Nondalton was visited in 1914 the town was deserted and all the people were living in tents and in rough shelters at a fishing village at the outlet of Sixmile Lake. Most of the supplies for Nondalton are brought in boats up Kvichak River and along Iliamna Lake and are back-packed across the Newhalen Portage and thence taken up Newhalen River and Sixmile Lake in boats.

About 40 miles in an air line southeast of Sixmile Lake is Iliamna, the chief trading point for the southern part of the district. It is on Iliamna River, about 12 miles from Iliamna Bay, the port on Cook Inlet. Steamers from Seattle call at Iliamna Bay about once a month during the summer and leave mail and supplies at a deserted cabin at a place locally known as AC Point. North of AC Point the head of Iliamna Bay is very shallow and at low tide is a mud flat impossible to traverse in a skiff. Another group of cabins has been built at the head of the bay, but none of them is permanently occupied. A well-beaten trail leads from these upper cabins through a pass about 900 feet high, 3 miles distant from salt water, and thence follows Chinkelyes Creek down to Iliamna, at the junction of that creek with Iliamna River. At Iliamna are a store and more than a score of cabins, as well as a Government school and a United States commissioner. The population in 1909, as estimated by Martin,¹ consisted of about 15 whites and 40 natives.

ANIMALS.

For an area so sparsely inhabited and so seldom traversed the Lake Clark-Central Kuskokwim region has a surprisingly small amount of game. The only report on the animals of the region made by a trained biologist is that given by Osgood,² who describes

¹ Martin, G. C., and Katz, F. J., op. cit., p. 20.

² Osgood, W. H., op. cit.

GEOGRAPHY.

the animals in the southern part of the area. The following aim only to set forth incidental observations on the distribution of the animals. Caribou and bear were the animals seen at close range. The greatest number of caribou were found in the morainic country in the basin of Koksetna of the camp of June 29. Others were seen near the camps of July 21, 26, and 31. According to the accounts of natives caribou were much more numerous in the Lake Clark-Central Kuskokwim region. On almost all the more continuous ridges and beaten game trails, some of them worn 2 feet below the surface. None of these trails shows much recent use, and many of them are almost entirely obliterated by the growth of brush. Trails of this sort were especially strongly marked on the ridges south of the camp of July 3, near the low hills of July 5, and on the Kuskokwim-George river divide.

Bears are reported to be numerous in the Mulchatna Valley. Only one was seen in this basin, and few trails or other signs of animals were noted except in the vicinity of Halfway Mountain. The Mulchatna-Hoholitna divide, north of the camp of July 3, where brown and black bears are found, but none of the very large bears similar to those on Kodiak Island are reported. A black bear was seen near the camp of July 5, and one was seen near the camp of August 6, and a large black bear was seen at close range near the camp of August 16. Bear is an important part of their food supply, but it is becoming increasingly difficult to obtain.

Signs of moose were particularly noticeable in the vicinity of lakes in the valley of the stream tributary to Gnat Creek. The camp of July 17 was situated, and in the lowland of the Kuskokwim near the camp of August 14. The natives near Lake had moose meat which they said was killed in the basin of Chulitna. No signs of sheep or goats were observed in the region visited by the expedition of 1914, but in the high hills north of the east end of Lake Clark sheep are reported to be fairly numerous.

The smaller animals—foxes, beavers, squirrels, porcupines, and rabbits—were seen at several places. The only foxes seen were tawny and black cross-fox. Several holes made by foxes were seen in the gravel ridges near the lowland with lakes south of the camp of August 3, and a trapper evidently had made this place his quarters during the preceding winter. A pair of beavers was seen in the small lake near the camp of July 24. They had made runways on the shore for getting out sticks for their hot

DEPARTMENT OF THE INTERIOR
FRANKLIN K. LANE, Secretary

UNITED STATES GEOLOGICAL SURVEY
GEORGE OTIS SMITH, Director

Bulletin 662

M 2
JUN 11 1935

MINERAL RESOURCES OF ALASKA

REPORT ON PROGRESS OF
INVESTIGATIONS IN

1916

BY

ALFRED H. BROOKS AND OTHERS



PROPERTY OF
UNIV. OF ALASKA LIBRARY

RASMUSON LIBRARY
WASHINGTON
UNIVERSITY OF ALASKA-FAIRBANKS
GOVERNMENT PRINTING OFFICE

58

DEPARTMENT OF THE INTERIOR
FRANKLIN K. LANE, Secretary

UNITED STATES GEOLOGICAL SURVEY
GEORGE OTIS SMITH, Director

Bulletin 692—A

THE ALASKAN MINING INDUSTRY
IN 1917

BY

G. C. MARTIN

Mineral resources of Alaska, 1917—A

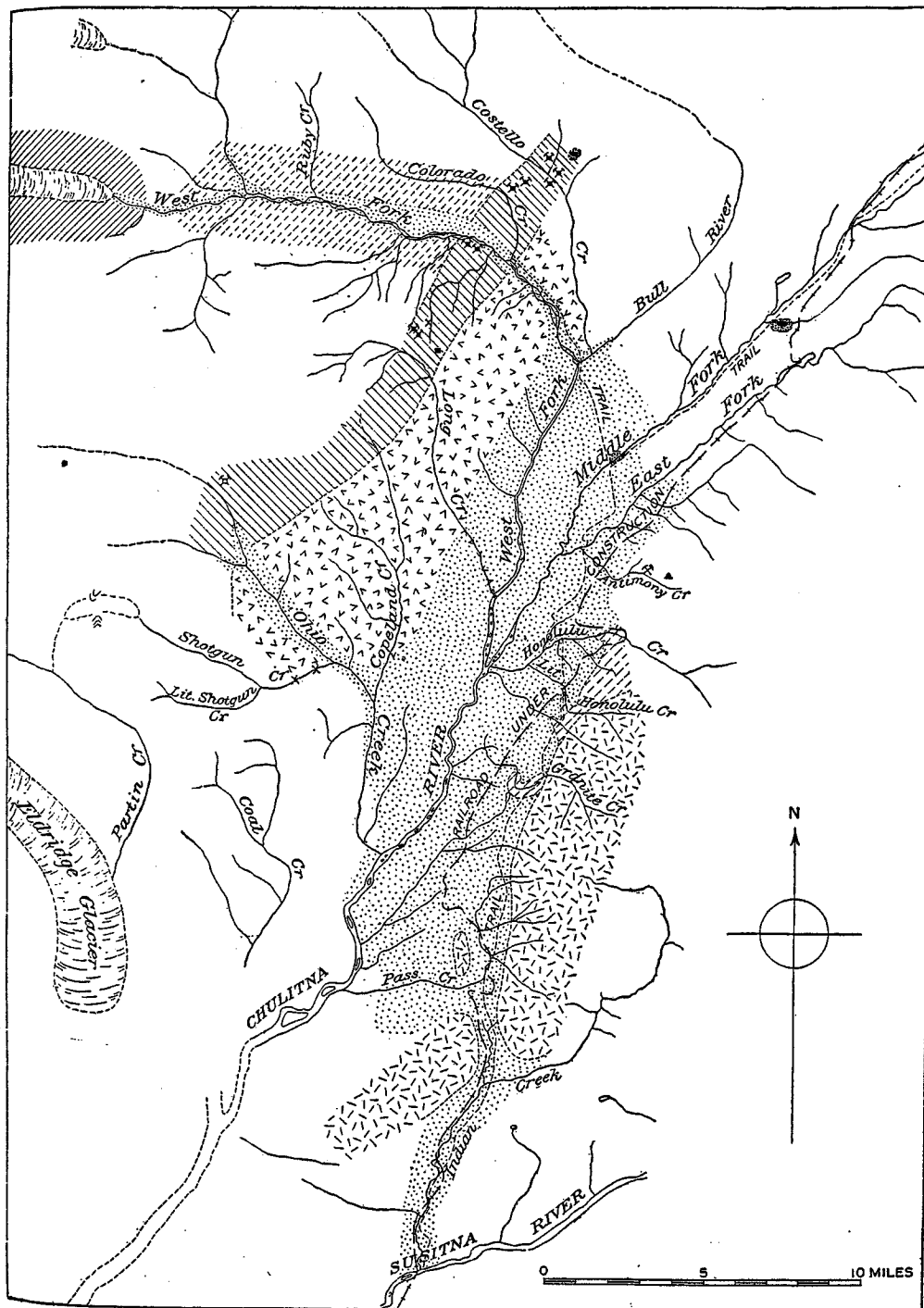


WASHINGTON
GOVERNMENT PRINTING OFFICE
1919

ourney is not clear, can be determined klanika River and ed that the first dis- John Coffee in 1907 staked in the basin 2 a mountaineering l Belmore Browne, is now called Ohio s to the West Fork glacier penetrated Alaska Range. The lished record of the ge. In 1913 F. H. rvey, mapped both g from Broad Pass and in 1914 D. L. sion,² mapped the oad survey between

n done on a num- t, and encouraging bodies of gold ore re readily accessible now in progress of and Fairbanks, on ble to make at least ermine the geologic of the development rance of the United of the topographers litary work, and no aphic survey of the g Commission along which foot traverse ward. Plans were his area during the to carry them into estigations in other short time could be geologist and three rge by railroad on ere driven over the

Mar. 12, 1914, to Dec. 31, 1914



EXPLANATION

- Quaternary**
 - Unconsolidated deposits. Glacial morainal materials and gravels, bench gravels, and deposits of present streams
- Tertiary**
 - Eocene**
 - Partly consolidated sand, mud, and gravel, locally containing lignitic coal
 - Cantwell formation. Shale, argillite, and conglomerate with intrusives
 - Post-Triassic**
 - Predominantly argillite and slate, with some graywacke and conglomerate, cut by dikes
 - Conglomerate, tuff, greenstone, limestone, and shale, locally intimately intruded by dikes and sills
 - Triassic**
 - Greenstone, tuff, chert, and metamorphosed sediments
 - Pre-Triassic**
 - Granitic intrusives with some sediments
- Mineral Resources**
 - Gold lode
 - Gold-silver lode
 - Gold-silver-copper lode
 - Copper lode
 - Antimony lode
 - Gold placer prospect
 - Lignitic coal

GEOLOGIC SKETCH MAP OF THE UPPER CHULITNA REGION.

DEPARTMENT OF THE INTERIOR

FRANKLIN K. LANE, Secretary

UNITED STATES GEOLOGICAL SURVEY

GEORGE OTIS SMITH, Director

Bulletin 699

THE PORCUPINE GOLD PLACER DISTRICT
ALASKA

BY

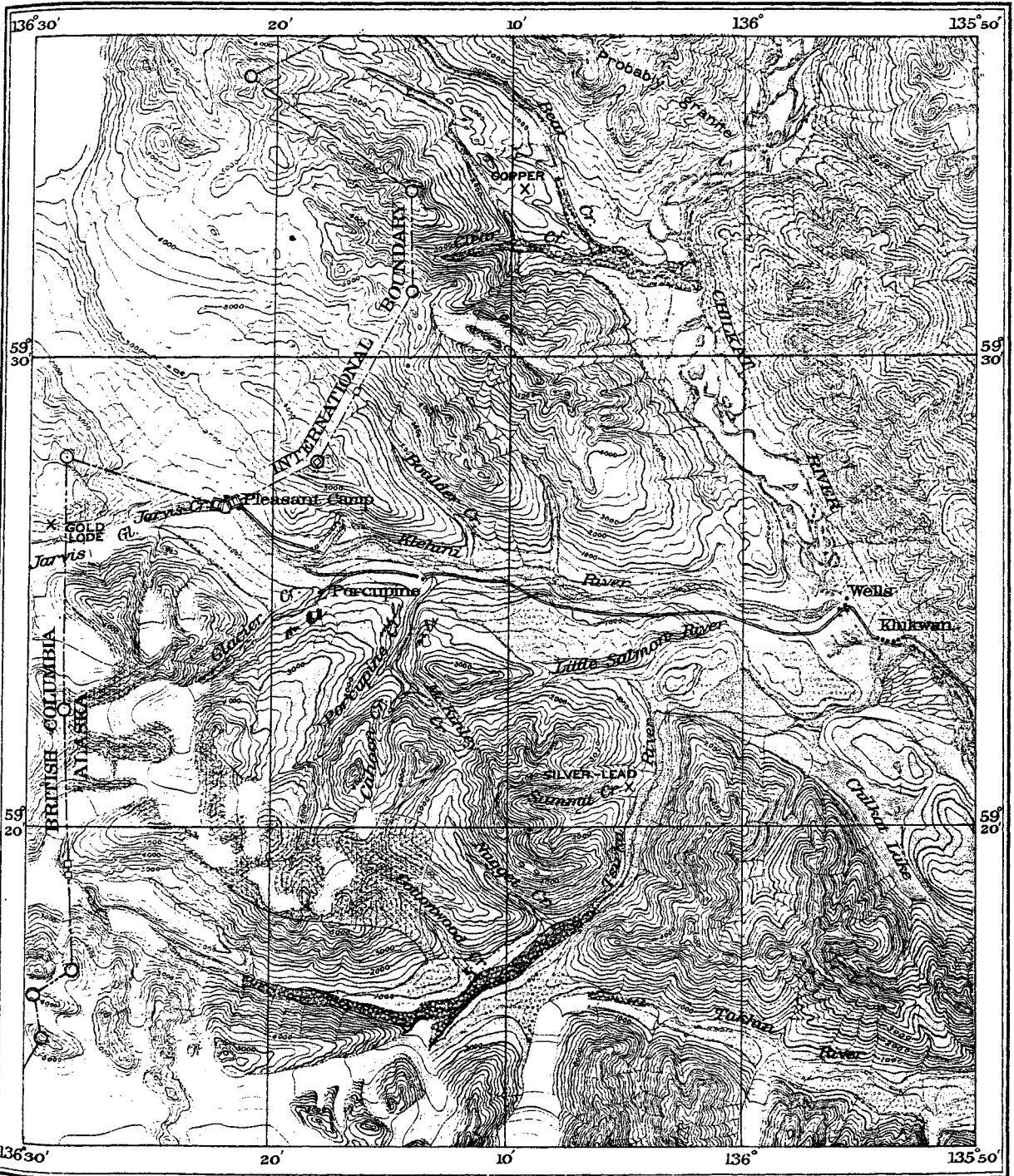
HENRY M. EAKIN



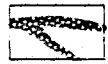
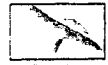


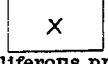


Property of the
University of Alaska

WASHINGTON
GOVERNMENT PRINTING OFFICE
1919

20631



- EXPLANATION**
-  Stream gravels
 -  Bench gravels including glacial deposits
 -  Auriferous gravels
 -  Gold placers
 -  Diorite
 -  Shale and limestone (Carboniferous)
 -  Metalliferous prospect

Base from map by International Boundary Commission

Scale 1:250,000

10 Miles

Geology by C. W. Wright, 1904 and H. M. Eakin, 1916

GEOLOGIC RECONNAISSANCE MAP OF PORCUPINE DISTRICT, ALASKA

in all directions. Glacial ice is most abundantly developed on the southeast slope of the range, as the precipitation is heavier on that side than in the Tanana Basin, and the glaciers that drain to the Pacific are thus much larger than those whose waters flow to Yukon and Kuskokwim rivers. In the area here described there are no large glaciers, but the streams that cross it are fed from the melting ice fields and carry abundant débris supplied by the ice tongues. The present glaciers are, however, of small size compared to the ice streams that in times past flowed northward from the range far out into the foothills. That greater glaciers were formerly present is now to be recognized by the shape into which they eroded their beds and by the deposits of glacial débris they laid down in moraines and as glacial outwash gravel. The influence of the ice advance was thus felt far beyond the borders of the glaciers themselves, for the turbid streams built up valley deposits of glacial gravels that extend many miles north of the area that was actually covered by ice.

ROUTES OF TRAVEL.

The remoteness of the Kantishna region from established lines of transportation has made travel to it difficult and the transportation of supplies expensive. Even the mail arrives at very irregular intervals, for no mail route to the mining district has been established and mail is brought in only by courtesy of the chance traveler. Often the camp is isolated from communication with the outside world for weeks or months at a stretch. During the season of surface mining in summer the miners are busily engaged in working their ground and rarely make trips to Tanana River, the nearest line of communication.

Fairbanks has, until 1916, been the center of supplies for the Kantishna district, and most of the supplies taken to the mines have been hauled in from Fairbanks in the winter by dog sleds. The customary route followed Tanana River down to the mouth of the Nenana, ascended that stream to the base of the foothills, a distance of 30 miles, and thence proceeded westward along the base of the foothills to Knight's roadhouse on Toklat River, north of Chitsia Mountain. The trail then followed up the Toklat and its tributary Clearwater Fork to Myrtle Creek, up Myrtle Creek and across a low divide to Spruce Creek, and down that stream and Moose Creek to the mines on Moose Creek and its tributaries. The total distance by this route from Fairbanks to Moose Creek at the mouth of Eureka Creek is about 165 miles. Now that the town of Nenana has been established at the mouth of Nenana River it is likely that many of the supplies for the mines will be purchased at Nenana and the sled haul shortened by 55 miles.

Summer travel to the Kantishna region goes almost exclusively by boat. The regular river steamboats run to the mouth of Kantishna River, and shallow-draft launches may be used to ascend that stream and its tributary, Bearpaw River, to the head of navigation at Diamond. From Diamond it is necessary in summer to go afoot to the mining claims, and in winter dog sleds are used. It is also possible to take launches up Kantishna River to McKinley River, and up that stream to the abandoned town of Roosevelt, which is about as distant as Diamond from the mines on Eureka Creek. The route overland from Roosevelt lies through a country that is swampy in the summer, and this route has been little used in recent years.

It has been the prevailing custom for each miner to bring in his own supplies early in the spring by dog sled, so that no commercial rate for winter freighting is definitely established. Some provisions, especially those of the kind that are damaged by freezing, have been brought from Fairbanks to Diamond by launch in summer at a freight charge of 4 to 6 cents a pound.

Summer travel to the parts of this area other than the immediate vicinity of the mines is negligible. During the season's field work between Nenana River and the Kantishna mining district the Survey parties encountered no one and found no evidence that anyone had been there recently. No summer trails were seen, although a number of trappers' cabins and tents indicate that a few men spend their winters in trapping and hunting within the area. The country is, however, easily passable in summer for pack horses. The gravel bars of the larger streams afford firm footing for horses, and there are many low divides through the north-south ridges, so that it is easy to pass from one stream basin to the next. To one who is familiar with the difficulties of summer travel in many other parts of Alaska this region offers a pleasant relief from hoggy ground and brush.

VEGETATION.

Much of this region lies above timber line. The Tanana lowland is dotted with marshes, interspersed with patches of small timber, including spruce, birch, tamarack, and cottonwood; the spruce greatly predominates over the other varieties. The heaviest stands of timber appear in the better-drained areas, particularly along the banks of the streams and on the lower slopes of the hills. Along the larger valleys the timber reaches farther south into the mountains. Thus in the Nenana Valley timber extends southward beyond the area included in this report. Savage River has spruce as far south as the head of its upper canyon. The valleys of Sanctuary River and the Teklanika have some timber within 10 or 15 miles of

their heads, and Toklat River and its East Fork have lower flanks of the mountains equally far south. Spruce is timbered to the mouth of Boundary Creek, and Mooses to the mouth of Willow Creek. In general, timber extends to elevations between 2,500 and 3,000 feet, though stunted spruce trees may be found at an elevation of more. In practically all the valleys willow bushes of to furnish tent poles and firewood may be found at timber.

Grass for forage is generally obtainable in all parts where timber or brush for camping purposes are to be had. A certain variety of vetch that grows on the stream gravel is eagerly eaten by horses after the seed pods have formed in the summer, therefore, horses will do well if allowed such for grazing and unless the work required of them is too severe. At the advent of heavy frosts in the fall, however, the vetch loses its nutritive qualities, and horses must be supplied with grain if they have to do heavy work. In other parts of Alaska where climatic conditions appear to be equally severe, horses have passed the winter successfully without being fed in any way. Although the experiment has not been tried in this area, it seems likely that in the more favorable places horses would winter if they were turned out in good condition.

GAME.

The north side of the Alaska Range west of Nenana is remarkable for the abundance and variety of its big game. No other area in Alaska is so well stocked with sheep, caribou, and moose. The white mountain sheep are confined to the more rugged foothills, but within their chosen areas are seen daily in large bands. Caribou are present both in the foothills and in the Toklat basin a few miles east of the main Toklat and westward to the Glacier they were especially abundant, in herds some of which contained hundreds of individuals. Moose are present in a few scattered areas, and their range thus lies north of the principal grounds of the sheep and caribou. Black bears are also present throughout the timbered districts, and grizzly bears range above timber line. Rabbits and ptarmigan are abundant in the lowlands, but few were seen during the summer of 1916. A considerable number of fur-bearing animals, notably fox, lynx, mink, and weasel, are captured each winter. Beaver are especially numerous in the lowlands.

DEPARTMENT OF THE INTERIOR

FRANKLIN K. LANE, Secretary

UNITED STATES GEOLOGICAL SURVEY

GEORGE OTIS SMITH, Director

Bulletin 667

THE COSNA-NOWITNA REGION,
ALASKA

BY

HENRY M. EAKIN



DOCUMENTS
COLLECTION

UNIV OF ALASKA LIBRARY

WASHINGTON

GOVERNMENT PRINTING OFFICE

1918

860

drained and on the whole would seem to afford as favorable conditions for agriculture as any part of interior Alaska. The soils are exceedingly friable, however, and might be drifted by the wind if the vegetation was generally removed. The dune topography of large areas indicates the action of wind prior to the growth of the present vegetal covering.

INHABITANTS.

The region is practically uninhabited during the summer, but in winter half a dozen white prospectors and trappers and a few natives sojourn within it for a longer or shorter period. The nearest native settlement is Cosna, on Tanana River, which consists of but a few families. Formerly there was a considerable native population in the region of North Fork and Lake Minchumina, but it has been so depleted by measles and other diseases that there are now said to be scarcely 50 persons left. Parts of the region serve as hunting grounds for the natives of both Tanana and Kuskokwim tribes, but large areas are apparently seldom, if ever, visited by either natives or whites.

ROUTES OF TRAVEL.

The most available routes of travel in summer are those furnished by the principal streams of the region. See (pp. 11-14.)

Winter travel from the vicinity of Lake Minchumina to settlements on Yukon and Tanana rivers follows mainly two principal routes, marked by more or less definite trails, which appear to be very old. At present, however, they are somewhat overgrown and in disrepair.

The route from Cosna to Lake Minchumina leads up Cosna River for about 25 miles, thence eastward across a low divide to the headwaters of the Zitziana, and thence around the east margin of the uplands through another low pass into the valley of a stream flowing southwestward into the lake. The other winter route from the lake to the Yukon leads northwestward across the upper basin of North Fork of Kuskokwim River, across a low divide to the Titna, down the Titna to a point below the mouth of the Sethkokna, and thence northward across the low country to the Yukon above Ruby.

A number of other trails, chiefly those made by trappers for short distances along their trap lines, follow the crests of many of the timbered ridges in the eastern part of the region. Farther west, where the upland ridges and divides are more uneven and without timber, the trails lead chiefly along the streams in the valley bottoms.

The trappers and prospectors who frequent the region generally outfit at Tanana or Ruby and get their supplies to their base camps during the open season by poling boat up Nowitna River. They bring out their furs in the spring by the same means after the break-up of ice on the navigable streams.

The region is stratigraphically a classified according to their lithology fall into eleven separate groups (and relations illuminate many phases of history. The age of the rocks of known from the fossils they contain other groups may be inferred from even the general position in the geological groups can not yet be positively determined.

Fossils were collected from limestones of the collections represent a Middle Ordovician horizon. The Ordovician fossils within thick limestone series that occupies part of the region. One of the Devonian headwaters of Chitanana River and of the Kuskokwim due west of Lake Minchumina rocks include, besides the fossiliferous carbonaceous slates, which outcrop between the two fossil localities.

The Ordovician limestones are a metamorphic series, which is separated from a group composed chiefly of schists and gneisses composed chiefly of limestones and gneisses rocks extend northward from the coast margin of the silt plains.

The eastern part of the region is composed of sedimentary rocks that are separated into a group composed dominantly of banded middle group of grits, sheared sandstones and a group of cherts and slates.

Two groups of volcanic rocks are present. The older consists of more or less altered rocks that form the highest part of the Cosna locality where Devonian fossils were found. An assemblage of lavas, tuffs, and other areas in the same general belt that includes two other small areas of rocks of the Telsitna River, where they cover the area between the Ordovician limestones and the igneous rocks.

Intrusive igneous rocks occur in localities indicated on the map (Pl. II) and are too small to be shown on a map of the region.

/

DEPARTMENT OF THE INTERIOR
FRANKLIN K. LANE, Secretary

UNITED STATES GEOLOGICAL SURVEY
GEORGE OTIS SMITH, Director

Bulletin 668

THE NELCHINA-SUSITNA REGION
ALASKA

BY

THEODORE CHAPIN



WASHINGTON
GOVERNMENT PRINTING OFFICE

1918
861.

willow grow along stream
a slightly higher elevation
the only available firewood.
is not abundant except in a
row along stream courses.

GAME.

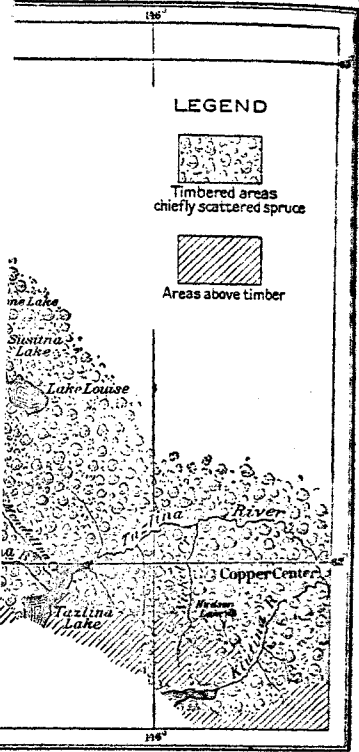
The most plentiful large game animal of the Susitna region is the caribou. These animals, which are found on both sides of Susitna River, are tame and are easily taken. They range from the river to the high ridges and are often seen in large herds. Moose also may be found in the Susitna region but are more abundant in the low country to the east and around Klutina and Tazlina lakes. A few sheep live in the Talkeetna Mountains and in the mountains north of Susitna River. Brown bears are plentiful but are not desirable game. Other fur-bearing animals are foxes, rabbits, squirrels, marmots, martens, wolverines, muskrats, and weasles. Ptarmigan are plentiful throughout the region, and spruce hens are found at some places. Ducks, geese, and other waterfowl spend the summer in the streams and lakes but leave in the fall. The clear-water streams in the Susitna basin abound in grayling and contain also several kinds of trout. A very large trout is found in some of the lakes. Salmon are plentiful along Copper River but are not found in the upper Susitna.

ROUTES OF TRAVEL.

The Nelchina region may be reached either by way of Knik or from Cordova or Valdez by way of Copper Center. The route from Copper Center follows the wagon road for 10 miles to a point half a mile north of Simpson's road house, and thence goes by a trail along the north bank of Tazlina River and Tazlina Lake to the mouth of Mendeltna Creek. From this point the trail takes a northwesterly direction to Little Nelchina River and thence follows that stream to Nelchina, at the mouth of Crooked Creek. This is a winter trail and has been laid out in a winding course in order to cross the ice of several large lakes. It is in places very swampy for use in summer, but with caution it may then be traveled by pack horses. The distance from Copper Center to Nelchina is about 90 miles.

The Knik route goes by trail up the Matanuska Valley to Chickaloon, from which several possible routes lead to the Nelchina-Susitna region. One route follows the Matanuska around the east end of Sheep Mountain, goes up Squaw Creek, and crosses a low divide to the head of Crooked Creek. Another route is the Hicks Creek trail, by way of Billy Creek to the head of Little Nelchina River, or by way of Alfred Creek to the head of Albert Creek. Susitna River may be reached by way of Chickaloon and Talkeetna rivers through low passes at the headwaters of Kosina Creek, a tributary to the Susitna.

Supplies for this region are taken in during the winter from both Knik and Copper Center, but as Knik is not an open port during the



Timbered areas in the Nelchina-Susitna

for horse feed. The most
se grasses grow luxuriantly
it is not always easy for the
these grasses is a rank black-
at, though they do not relish
of June, but grass can not
middle of June. Horse feed
e heavy frosts, which varies
October, depending on the
er grasses are gone a "pea
l dry benches, is sometimes

winter, freight from the outside usually goes by way of Copper Center from either Chitina or Valdez. The distance from Albert Creek to Knik is about 106 miles.

Before the Valdez-Fairbanks wagon road was built this region was crossed by the winter trail from Valdez to Valdez Creek by way of Valdez, Glacier, Klutina Lake, St. Anne River, Tazlina Lake, Tyone Lake, Tyone Creek, and Susitna River. The region will be more accessible when the Government railroad is constructed along Susitna River through Broad Pass to the Tanana and the branch line is built up the Matanuska to the coal field. When the coal-field branch is built to Chickaloon, Albert Creek may be reached by an overland journey of 50 miles.

POPULATION.

Copper Center, the principal settlement of this region, stands at the confluence of Copper and Klutina rivers, 101 miles north of Valdez, on the Fairbanks-Valdez Government road, and may be reached from Cordova by rail to Chitina, a distance of 131 miles, and thence by wagon for 50 miles, or by wagon road direct from Valdez. Copper Center is a distributing point for the Nelchina, Upper Susitna, Gulkana, and Chistochina regions. A post office, United States commissioner, Government telegraph station, and a Government school for the natives are located here.

Nelchina is a small village at the mouth of Crooked Creek. It is the seat of the Nelchina recording precinct and the general headquarters of the neighboring region. Aside from these two settlements the white population is confined to the road houses along the Government road and the transient prospectors and miners.

The Indian population is small. Cabins and camps on Klutina and Tazlina lakes, on Susitna River, and at other places are used temporarily by natives on hunting and fishing expeditions, but aside from a few natives scattered over the region the permanent Indian population is confined to Copper Center.

DESCRIPTIVE GEOLOGY.

GENERAL FEATURES.

The general distribution and probable extension of the geologic formations of the Nelchina-Susitna region are shown on the geologic map (Pl. II, in pocket). They represent a variety of types, including rocks of sedimentary and of igneous origin and their metamorphic derivatives.

The oldest rocks of the region include gneisses, greenstones, and associated limestones, tuff, schist, and other altered sediments, evi-

DESCRIP

dently of Paleozoic age. The Formations regarded as Triassic and andesitic lavas and a sedimentary and graywacke, with which Jurassic stratified rocks including lavas and associated tuffaceous stone, and a number of sedimentary glomerate, sandstone, and shale.

Granular intrusive rocks, including gneisses, and granites, are widespread and in the unnamed mountains fall naturally into two groups and apparently in age, although that were formed during a period older igneous rocks are dominant and younger ones are granites and associated various lavas, including altered igneous rocks range from gneissic rocks are associated with them.

All the hard-rock formations and deposits of glacial gravel and sand are summarized below:

Stratigraphic sequence.

Age.	Formations.
Quaternary.	* Unconformity -
Tertiary.	Unconformity - Nasnek formation
Upper Jurassic.	
	Unconformity - Chitina formation
Middle Jurassic.	Tuxedni sandstone Unconformity -
Lower Jurassic.	Unconformity -
Upper Triassic (?).	
Triassic (?).	
Carboniferous or older.	Klutina group.

DEPARTMENT OF THE INTERIOR
FRANKLIN K. LANE, Secretary

UNITED STATES GEOLOGICAL SURVEY
GEORGE OTIS SMITH, Director

Bulletin 675

THE
UPPER CHITINA VALLEY, ALASKA

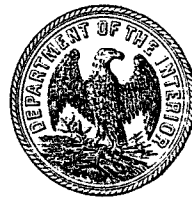
BY

FRED H. MOFFIT

WITH A DESCRIPTION OF
THE IGNEOUS ROCKS

BY

R. M. OVERBECK



WASHINGTON
GOVERNMENT PRINTING OFFICE

1918

862.

it is difficult to ford except at its mouth, where it spreads out over gravel bars just before joining the Chitina.

Streams emerge from beneath Hawkins and Barnard glaciers (Pl. X, *A*, p. 30) at points at or within the margin of Chitina Valley. Both of the extensive valleys drained by these streams are occupied completely by ice (Pl. V, *B*, p. 10), which pushes out on the floor of the main valley. The stream from Hawkins Glacier joins a stream that flows from the north side of the Barnard Glacier. It is a little more than 2 miles long, and although it is swift and carries considerable water it is easily forded, for it breaks up into numerous channels and spreads out over the gravels of its broad delta.

Two streams flow from Barnard Glacier, which moves out from its own valley and down that of the Chitina to a point within about a mile of Hawkins Glacier. The smaller of these two streams comes from its northern margin and flows westward along the north side of Gibraltar after joining the stream from Hawkins Glacier. The main drainage of Barnard Glacier is discharged by Short River, a swift, short stream that is confined to one channel and is less than a mile long. Short River can neither be forded by horses nor swum safely at times of high water like those in July and early in August, 1915, and it is then necessary to climb over the glacier itself to reach the head of the Chitina. At low water the stream can be crossed without much difficulty. The western branches of the glacier from which Short River flows come from the slopes of the high mountains south of Skolai Pass, but the main ice stream heads in the ice fields south of Mount Natazhat, near the international boundary. The full extent of this drainage basin is not known. It includes probably not less than 500 square miles.

The ice of Chitina Glacier represents the drainage of a very much larger area, much of which lies in Canadian territory and probably at least 1,000 square miles in Alaska. Chitina Glacier has two principal branches and is fed by many large tributary glaciers. The larger branch extends far to the southeast, toward Mount Logan, and receives drainage from the area north of Mount St. Elias; the other branch extends northeastward into the area southeast of Mount Natazhat, east of the boundary line. Nearly all the drainage of this great area between Mounts Logan and St. Elias finds its way to the Pacific through Chitina and Copper rivers.

ROUTES AND TRAILS.

The only practicable line of approach to the upper Chitina Valley is the valley itself. The Copper River & Northwestern Railway lands the traveler at McCarthy, near the foot of Kennicott Glacier, from which place two trails lead to Nizina River. One of them, known as

the Sour Dough Hill trail, crosses the high ridge between McCarthy Creek and Nizina River. This trail is very steep on the Nizina side of Sour Dough Hill and its use necessitates a climb of over 2,300 feet, but it offers firm footing much of the way. The other trail swings around the west end of Sour Dough Hill without making the high climb, but it is always wet and often nearly impassable, repeated detours through the brush and timber being necessary to avoid deep mud holes; yet most of the travel from McCarthy to Nizina River is over this trail. The two trails meet opposite the mouth of Young Creek. Here Nizina River must be forded, a task that is always dangerous at times of high water and that may be dangerous for those who are unfamiliar with the stream even when the water is not high. Several years ago a bridge was built across the Nizina about 6 miles below Young Creek, but it was washed away before it had been used.

From Nizina River two trails lead to Chitina River. One, 20 miles long, ascends Young Creek for a number of miles and then crosses a low, flat, timbered ridge to the Chitina. This trail has been used principally by prospectors traveling to and from the Kiagna. Although no well-defined trail ascends Chitina River from the point where this trail comes out on the river bars, one could be made without great labor and doubtless will be if the travel to the upper Chitina shall justify its construction.

The second trail ascends May and Chititu creeks to Blei Gulch, crosses the ridge between Chititu Creek and Young Creek, ascends Young Creek to the big bend, and finally crosses another ridge to the Chitina, coming down on the river bars at a point about 3 miles below Canyon Creek. The distance from McCarthy to Chitina River is about 37 miles, 2 miles less than the distance to the same point by the trail from lower Young Creek and the bars of the river. When the water is not too high the hill between Chititu and Young creeks may be avoided by ascending Young Creek from its mouth to the big bend, but this route requires repeated crossings of the creek and is not used frequently. Below Calamity Gulch the creek swings from side to side against the wall of a canyon, in most places leaving exposed only a narrow strip of low, timbered gravel bar on one side.

All travel along Chitina River above the Kiagna has been on the north side, for the stream keeps to the south side of the valley and at many places runs against high perpendicular rock walls. The gravel bars and low benches on the north side offer good footing and easy travel for horses as far as Chitina Glacier, beyond the western end of which horses may be taken for 7 or 8 miles farther by crossing a glacier stream and traveling part of the distance on the moraine.

A trail suitable for travel with pack horses ascends Kiagna Valley on the south side from the Chitina to Granite Creek, against which

the Kiagna heads. This trail has been little traveled by horses but is said to be in fair condition. No other trails, except one or two short ones leading to mining claims, have been made in the upper Chitina Valley.

Kiagna River was first explored by men who crossed the ice fields from Yakataga Beach, hauling their supplies on sleds or packing them, but this route is scarcely practicable for extensive prospecting and probably will not be used in the future.

CLIMATE.

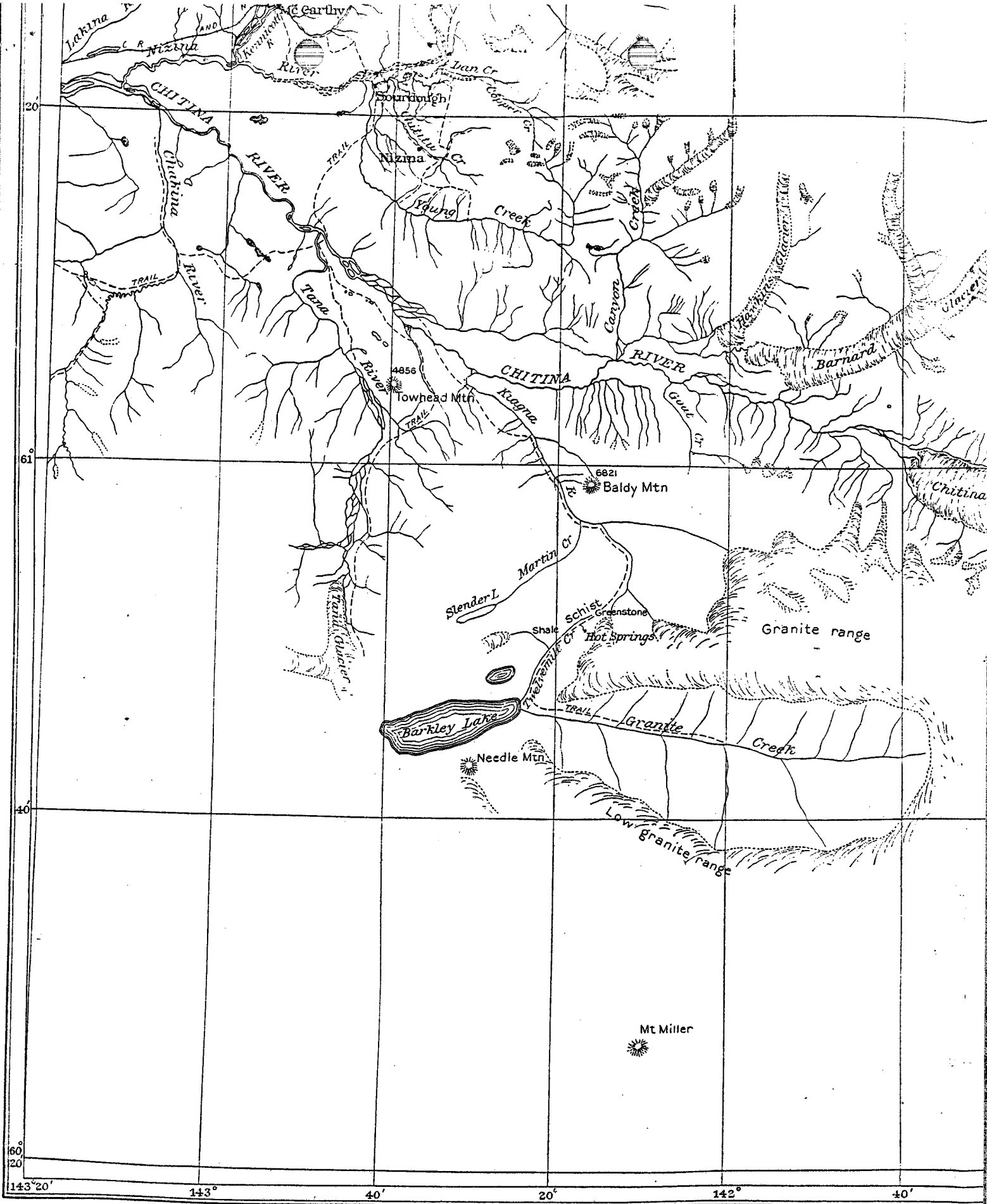
If the summer of 1915 was normal the summers of the upper Chitina Valley are dry and hot, for practically no rain fell from early in June until late in August, and for a week or more in midsummer the thermometer stood near 85° each day. It may be that these conditions were exceptional, but the precipitation in this part of the valley is certainly light, both in summer and in winter. Very little snow fell in Chitina Valley in the winter of 1914-15, and the vegetation in the upper valley indicates that the snowfall there is not heavy. The upper valley is a basin that is broken through on the west and shut in on the other sides by high mountains, which probably precipitate most of the moisture carried by the clouds before they reach the valley. The vast snow fields and the great glaciers that descend from the mountains seem to bear out this conclusion; yet, although there was little precipitation during the summer, there was no lack of water in the river.

In this protected valley the snow goes early in spring and comes late in autumn, so that summer is comparatively long. The vegetation, particularly the timber, indicates that in general the winds are not so strong as those on the lower river and on the Copper. The trees grow tall and straight; windfalls are not conspicuous; no severe dust storms like those on Copper River were experienced during the summer in 1915; and the coating of wind-blown dust on the trees and brush is much less than that along the Copper. The upper Chitina Valley is not without strong winds, however, for such, especially in spring and early in summer, were reported by the International Boundary Survey party.

VEGETATION.

The prospector's chief interest in the vegetation of this district is concerned with the amount and quality of the timber available for use in mining and with the abundance and distribution of forage.

Spruce is the only timber of economic value in the district. Its distribution is shown on the map (Pl. VII). Spruce timber extends in Chitina Valley for 8 to 10 miles above the lower end of the glacier and



SKETCH MAP OF UPPER CHITINA RIVER DRAINAGE BASIN.



in the fall of that year several thousand persons rushed in to share in the prosperity of the new camp. Many new log-cabin towns were built, among which the most important were Diamond, at the head of navigation on Bearpaw River; Glacier, on the same stream, at the mouth of Glacier Creek; and Roosevelt, on Kantishna River, 18 miles below the mouth of McKinley Fork. Each of these towns had at one time a population of several hundred, and from them the miners and prospectors traveled to the numerous creeks. During the winter of 1905 and the spring of 1906 it became apparent that the deposits of gold-bearing gravel were neither so widespread nor so rich as the prospectors had hoped, and most of them left the district. Some 40 or 50 men, however, including those who had obtained promising claims and those who believed that further prospecting was warranted, stayed in the district, and the population has remained rather constant ever since. Of the 36 people in the district during the summer of 1916 over half came to this camp during the first two years after its discovery.

The town of Roosevelt is now completely deserted and is seldom visited. Diamond is also deserted, though it is on the route of summer travel to the mines and is used as a storage place for such provisions as are brought in by boat and await freezing weather to be sledged to the mines. Glacier is also deserted in summer, though a number of cabins are kept in repair as winter quarters for miners who prefer to spend the cold months in the shelter of the timber, near their fuel supply.

ROUTES OF TRAVEL.

The Kantishna region lies well away from any commonly used route of travel in Alaska and is therefore visited only by persons whose business takes them to it. The headwater areas of Teklanika and Toklat rivers have no permanent habitations, and are seldom visited except by a few trappers and hunters. Travel in this region is confined almost entirely to routes leading to the mines in the Kantishna Hills. Until the summer of 1916 Fairbanks was the large settlement nearest the mines and was the point from which most of the provisions and equipment for the Kantishna region were obtained.

Two routes of travel from Fairbanks to the Kantishna basin are commonly followed. In summer, when the streams are open to navigation, Tanana River is followed to the mouth of the Kantishna, and small launches are taken up that stream to the mouth of Bearpaw River, and up the Bearpaw to the deserted village of Diamond, at the head of launch navigation, a total distance of 143 miles from Tanana River to Diamond. From Diamond an old trail led overland to the abandoned town of Glacier, but this trail has now become so much obstructed by beaver ponds that it is almost impassable even

by a man on foot, and is entirely impassable. The main route follows Moose Creek up to Fairbanks and thence across dry gravel benches to the mines. Distinct trails lead up Glacier Creek to the mining communities.

For travel in winter, when much of the country is covered with snow, a different route is chosen. From Fairbanks to Nenana, and Nenana River is ascended to the foothills. From that point a trail is followed along the edge of the lowland to Knight's road, and thence west of Mount Chitsia. Thence Toklat River and its water fork are followed to Myrtle Creek, and up Myrtle Creek up to a point near its head, or to the head of Spruce Creek, and descends thence to the vicinity of the mines on Moose Creek. The total distance along this route by land is about 165 miles.

No definite schedule of charges for freight from Fairbanks to the mines has been established. The cost of supplies brought in by the miners through the use of contract freighting has been determined. Freight has been carried for 15 cents a pound but is not used for other purposes. Contracts for the transportation of supplies by dog sled from Fairbanks to the mines on Moose Creek could probably be let at 15 to 20 cents a pound for supplies that must not be frozen have to be carried to Diamond by way of Tanana, Kantishna, and small launches, at a charge of 4 to 6 cents a pound.

On the completion of the Government road through the valley of Nenana River, travel to the mines will be greatly facilitated. It will be possible to reach the region in one day's journey from Fairbanks. From Nenana River a splendid pack trail is now easy, extends from the mouth of the Yanert Fork, west of Fairbanks, through the Toklat basins through a series of lowlands to the head of McKinley River. In this region is the Mount McKinley National Park, which includes an area of about 2,200 square miles. To make this park accessible to visitors from the railroad along the route just mentioned would be of great benefit to the mining industry.

In 1916 the town of Nenana was founded on the Nenana River, and there construction

Several thousand persons rushed in to share the camp. Many new log-cabin towns were established. The most important were Diamond, at the head of the Kantishna River; Glacier, on the same stream, at the head of the Bearpaw River; and Roosevelt, on Kantishna River, 10 miles from McKinley Fork. Each of these towns had a population of several hundred, and from them trails were traveled to the numerous creeks. During the spring of 1906 it became apparent that the trails of gravel were neither so widespread nor so good as had hoped, and most of them left the region. The men, however, including those who had remained, and those who believed that further prospecting was warranted in the district, and the population has not decreased since. Of the 36 people in the district in 1916 over half came to this camp during the winter of its discovery.

The region is now completely deserted and is seldom visited, though it is on the route of summer travel. It is used as a storage place for such provisions as are needed and await freezing weather to be sledded to the coast. It is not deserted in summer, though a number of men are there as winter quarters for miners who prefer to have the shelter of the timber, near their fuel.

WAYS OF TRAVEL.

Farther away from any commonly used route than the region is therefore visited only by persons whose business requires it. The headwater areas of Teklanika and Bearpaw rivers, and are seldom visited by prospectors and hunters. Travel in this region is confined to the trails leading to the mines in the Kantishna region. In 1916 Fairbanks was the large settlement nearest the point from which most of the provisions for the Kantishna region were obtained.

The trails from Fairbanks to the Kantishna basin are used in summer, when the streams are open to navigation. They are traveled to the mouth of the Kantishna, and thence up that stream to the mouth of Bearpaw River, and thence to the deserted village of Diamond, at the head of the Kantishna River, a total distance of 143 miles from Fairbanks. From Diamond an old trail led over the mountains to Glacier, but this trail has now become impassable even

to a man on foot, and is entirely impracticable for horses. A better route follows Moose Creek up to Fish camp, a distance of 7 miles, and thence across dry gravel benches to Glacier. From Glacier indistinct trails lead up Glacier Creek and thence to the small mining communities.

For travel in winter, when much of the freighting to the placer camps is done, a different route is chosen. Tanana River is followed to Nenana, and Nenana River is ascended for 30 miles to the base of the foothills. From that point a trail leads westward along the south edge of the lowland to Knight's roadhouse on Toklat River, northwest of Mount Chitsia. Thence 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.

No definite schedule of charges for winter freighting from Fairbanks to the mines has been established, for most of the supplies have been brought in by the miners themselves, and no large amount of contract freighting has been done. Small lots of freight have been carried for 15 cents a pound but by men who were making the journey for other purposes. Contracts for freighting larger amounts of supplies by dog sled from Fairbanks to the mouth of Eureka Creek could probably be let at 15 to 20 cents a pound. Perishable supplies that must not be frozen have been brought from Fairbanks to Diamond by way of Tanana, Kantishna, and Bearpaw rivers in small launches, at a charge of 4 to 6 cents a pound.

On the completion of the Government railway, which will traverse the valley of Nenana River, travel to the Kantishna region will be greatly facilitated. It will be possible to reach the eastern edge of the region in one day's journey from the coast at all seasons of the year. From Nenana River a splendid route, along which travel by pack train is now easy, extends from the mouth of Hines Creek, opposite the mouth of the Yanert Fork, westward across Teklanika and Toklat basins through a series of low divides that lead in a direct course to the head of McKinley River, at the base of Mount McKinley. In this region is the Mount McKinley National Park, which includes an area of about 2,200 square miles of the Alaska Range. To make this park accessible to visitors a road should be constructed from the railroad along the route just described, and such a road would be of great benefit to the miners of the Kantishna district.

In 1916 the town of Nenana was established at the mouth of Nenana River, and there construction work on the new Government

railroad from Seward to the interior was begun. It seems likely that in the future Nenana, which is 55 miles nearer than Fairbanks, will furnish much of the supplies used in the Kantishna region.

MOUNT MCKINLEY NATIONAL PARK.

The northeastern portion of the Mount McKinley National Park lies within the area here discussed. The act establishing this park is as follows:

[Public, No. 353, Sixty-fourth Congress.]

An act to establish the Mount McKinley National Park, in the Territory of Alaska.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the tract of land in the Territory of Alaska particularly described by and included within the metes and bounds, to wit: Beginning at a point as shown on Plate III, reconnaissance map of the Mount McKinley region, Alaska, prepared in the Geological Survey, edition of nineteen hundred and eleven, said point being at the summit of a hill between two forks of the headwaters of the Toklat River, approximate latitude sixty-three degrees forty-seven minutes, longitude one hundred and fifty degrees twenty minutes; thence south six degrees twenty minutes west nineteen miles; thence south sixty-eight degrees west sixty miles; thence in a southeasterly direction approximately twenty-eight miles to the summit of Mount Russell; thence in a northeasterly direction approximately eighty-nine miles to a point twenty-five miles due south of a point due east of the point of beginning; thence due north twenty-five miles to said point; thence due west twenty-eight and one-half miles to the point of beginning, is hereby reserved and withdrawn from settlement, occupancy, or disposal under the laws of the United States, and said tract is dedicated and set apart as a public park for the benefit and enjoyment of the people, under the name of the Mount McKinley National Park.

SEC. 2. That nothing herein contained shall affect any valid existing claim, location, or entry under the land laws of the United States, whether for homestead, mineral, right of way, or any other purpose whatsoever, or shall affect the rights of any such claimant, locator, or entryman to the full use and enjoyment of his land.

SEC. 3. That whenever consistent with the primary purposes of the park, the act of February fifteenth, nineteen hundred and one, applicable to the location of rights of way in certain national parks and national forests for irrigation and other purposes, shall be and remain applicable to the lands included within the park.

SEC. 4. Nothing in this act shall in any way modify or effect the mineral land laws now applicable to the lands in the said park.

SEC. 5. That the said park shall be under the executive control of the Secretary of the Interior, and it shall be the duty of the said executive authority, as soon as practicable, to make and publish such rules and regulations not inconsistent with the laws of the United States as the said authority may deem necessary or proper for the care, protection, management, and improvement of the same, the said regulations being primarily aimed at the freest use of the said park for recreation purposes by the public and for the preservation of animals, birds, and fish, and for the preservation of the natural curiosities and scenic beauties thereof.

SEC. 6. That the said park shall be a refuge, and no person shall kill any game from the Secretary of the Interior for the prevent the extermination of other animals and miners engaged in prospecting or mining therein so much game or birds as may be when short of food; but in no case shall a for sale or removal therefrom, or wanton

SEC. 7. That the said Secretary of the I leases to parcels of ground not exceeding not to exceed twenty years whenever such of establishments for the accommodation of necessary privileges and concessions as he d visitors; and may likewise arrange for the down timber as he may deem necessary improvement of the park: *Provided*, That of said park in excess of \$10,000 annually have first been expressly authorized by la

SEC. 8. That any person found guilty of act shall be deemed guilty of a misdemeanor not more than \$500 or imprisonment not e adjudged to pay all costs of the proceeding Approved, February 26, 1917.

The areas of outcrop of the rock differentiated in this region are shown on (Pl. I, in pocket). The distribution of this map has been determined only which a large area was visited in a s it was possible to make only an app units. There was not time to trace aries, and when the geologic field wo map available was that prepared by which merely a narrow strip of cou miles to the inch. The geologic note adjusted to the finished topograph (pocket) several months after the field additional difficulty in fixing the a most of the formations arises from t are scarce and unsatisfactory, so tha many of the geologic units depends lar beds in other localities or upon other formations whose age has been some of these formations are assign the future when diagnostic fossils a

in the fall of that year several thousand persons rushed in to share in the prosperity of the new camp. Many new log-cabin towns were built, among which the most important were Diamond, at the head of navigation on Bearpaw River; Glacier, on the same stream, at the mouth of Glacier Creek; and Roosevelt, on Kantishna River, 10 miles below the mouth of McKinley Fork. Each of these towns had at one time a population of several hundred, and from them the miners and prospectors traveled to the numerous creeks. During the winter of 1905 and the spring of 1906 it became apparent that the deposits of gold-bearing gravel were neither so widespread nor so rich as the prospectors had hoped, and most of them left the district. Some 40 or 50 men, however, including those who had obtained promising claims and those who believed that further prospecting was warranted, stayed in the district, and the population has remained rather constant ever since. Of the 36 people in the district during the summer of 1916 over half came to this camp during the first two years after its discovery.

The town of Roosevelt is now completely deserted and is seldom visited. Diamond is also deserted, though it is on the route of summer travel to the mines and is used as a storage place for such provisions as are brought in by boat and await freezing weather to be sledged to the mines. Glacier is also deserted in summer, though a number of cabins are kept in repair as winter quarters for miners who prefer to spend the cold months in the shelter of the timber, near their fuel supply.

ROUTES OF TRAVEL.

The Kantishna region lies well away from any commonly used route of travel in Alaska and is therefore visited only by persons whose business takes them to it. The headwater areas of Teklanika and Toklat rivers have no permanent habitations, and are seldom visited except by a few trappers and hunters. Travel in this region is confined almost entirely to routes leading to the mines in the Kantishna Hills. Until the summer of 1916 Fairbanks was the large settlement nearest the mines and was the point from which most of the provisions and equipment for the Kantishna region were obtained.

Two routes of travel from Fairbanks to the Kantishna basin are commonly followed. In summer, when the streams are open to navigation, Tanana River is followed to the mouth of the Kantishna, and small launches are taken up that stream to the mouth of Bearpaw River, and up the Bearpaw to the deserted village of Diamond, at the head of launch navigation, a total distance of 143 miles from Tanana River to Diamond. From Diamond an old trail led overland to the abandoned town of Glacier, but this trail has now become so much obstructed by beaver ponds that it is almost impassable even

1545 Bulletin #687
Kantishna Region, Alaska 1919

to a man on foot, and is entirely impracticable for horses. A better route follows Moose Creek up to Fish camp, a distance of 7 miles, and thence across dry gravel benches to Glacier. From Glacier indistinct trails lead up Glacier Creek and thence to the small mining communities.

For travel in winter, when much of the freighting to the placer camps is done, a different route is chosen. Tanana River is followed to Nenana, and Nenana River is ascended for 30 miles to the base of the foothills. From that point a trail leads westward along the south edge of the lowland to Knight's roadhouse on Toklat River, northwest of Mount Chitsia. Thence 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.

No definite schedule of charges for winter freighting from Fairbanks to the mines has been established, for most of the supplies have been brought in by the miners themselves, and no large amount of contract freighting has been done. Small lots of freight have been carried for 15 cents a pound but by men who were making the journey for other purposes. Contracts for freighting larger amounts of supplies by dog sled from Fairbanks to the mouth of Eureka Creek could probably be let at 15 to 20 cents a pound. Perishable supplies that must not be frozen have been brought from Fairbanks to Diamond by way of Tanana, Kantishna, and Bearpaw rivers in small launches, at a charge of 4 to 6 cents a pound.

On the completion of the Government railway, which will traverse the valley of Nenana River, travel to the Kantishna region will be greatly facilitated. It will be possible to reach the eastern edge of the region in one day's journey from the coast at all seasons of the year. From Nenana River a splendid route, along which travel by pack train is now easy, extends from the mouth of Hines Creek, opposite the mouth of the Yanert Fork, westward across Teklanika and Toklat basins through a series of low divides that lead in a direct course to the head of McKinley River, at the base of Mount McKinley. In this region is the Mount McKinley National Park, which includes an area of about 2,200 square miles of the Alaska Range. To make this park accessible to visitors a road should be constructed from the railroad along the route just described, and such a road would be of great benefit to the miners of the Kantishna district.

In 1916 the town of Nenana was established at the mouth of Nenana River, and there construction work on the new Government

railroad from Seward to the interior was begun. It seems likely that in the future Nenana, which is 55 miles nearer than Fairbanks, will furnish much of the supplies used in the Kantishna region.

MOUNT MCKINLEY NATIONAL PARK.

The northeastern portion of the Mount McKinley National Park lies within the area here discussed. The act establishing this park is as follows:

[Public, No. 353, Sixty-fourth Congress.]

An act to establish the Mount McKinley National Park, in the Territory of Alaska.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the tract of land in the Territory of Alaska particularly described by and included within the metes and bounds, to wit: Beginning at a point as shown on Plate III, reconnaissance map of the Mount McKinley region, Alaska, prepared in the Geological Survey, edition of nineteen hundred and eleven, said point being at the summit of a hill between two forks of the headwaters of the Toklat River, approximate latitude sixty-three degrees forty-seven minutes, longitude one hundred and fifty degrees twenty minutes; thence south six degrees twenty minutes west nineteen miles; thence south sixty-eight degrees west sixty miles; thence in a southeasterly direction approximately twenty-eight miles to the summit of Mount Russell; thence in a northeasterly direction approximately eighty-nine miles to a point twenty-five miles due south of a point due east of the point of beginning; thence due north twenty-five miles to said point; thence due west twenty-eight and one-half miles to the point of beginning, is hereby reserved and withdrawn from settlement, occupancy, or disposal under the laws of the United States, and said tract is dedicated and set apart as a public park for the benefit and enjoyment of the people, under the name of the Mount McKinley National Park.

SEC. 2. That nothing herein contained shall affect any valid existing claim, location, or entry under the land laws of the United States, whether for homestead, mineral, right of way, or any other purpose whatsoever, or shall affect the rights of any such claimant, locator, or entryman to the full use and enjoyment of his land.

SEC. 3. That whenever consistent with the primary purposes of the park, the act of February fifteenth, nineteen hundred and one, applicable to the location of rights of way in certain national parks and national forests for irrigation and other purposes, shall be and remain applicable to the lands included within the park.

SEC. 4. Nothing in this act shall in any way modify or effect the mineral land laws now applicable to the lands in the said park.

SEC. 5. That the said park shall be under the executive control of the Secretary of the Interior, and it shall be the duty of the said executive authority, as soon as practicable, to make and publish such rules and regulations not inconsistent with the laws of the United States as the said authority may deem necessary or proper for the care, protection, management, and improvement of the same, the said regulations being primarily aimed at the freest use of the said park for recreation purposes by the public and for the preservation of animals, birds, and fish, and for the preservation of the natural curiosities and scenic beauties thereof.

ECONOMIC GEOLOGY.

HISTORY OF MINING.

The basin of Tanana River first became of interest as a placer-mining region on the discovery of rich placer gravels in the Fairbanks district. Gold seekers, attracted by that discovery, rushed to the Tanana Valley in 1903 and 1904. Most of them went to the new town of Fairbanks or to the creeks in that vicinity, but a few penetrated to the north slope of the Alaska Range and carried on the search for gold there. The discovery of gold in the Kantishna district was an indirect result of the Fairbanks rush. In 1904 Joe Dalton and his partner, Reagan, prospected in the basin of Toklat River, and after having found gold in encouraging amounts returned to Fairbanks that fall. The next spring Dalton and another partner, Stiles, returned to the Toklat and prospected on Crooked Creek, a tributary heading in the Kantishna Hills 16 miles south of Mount Chitsia. In the summer of 1905 two other prospectors, Joe Quigley and his partner, Jack Horn, had been told by some trappers that there was gold in Glacier Creek, and they came in to investigate. They found gold in paying quantities, staked the creek, and in June of that year carried the news of their discovery to Fairbanks and so started the stampede to Kantishna. The stampeders began to arrive at the scene of the discovery about July 15, 1905. Meanwhile Dalton and Stiles, having heard nothing of the Quigley-Horn discovery, had traveled along the southeast side of the Kantishna Hills and arrived at Friday Creek. Prospecting there they found gold, and on July 12 they staked that stream. On July 20 they staked Discovery claim on Eureka Creek, but thinking themselves entirely alone in the country they staked only that claim, having determined to prospect first the upper part of the stream. They went up Eureka Creek, and on their way back to the mouth of that stream they met a man named Cook, who had come in with the rush and had made his way up Moose Creek to the mouth of Eureka Creek. Cook said he had staked claims No. 1 to No. 4 on the Eureka, so Dalton and Stiles returned and staked the rest of the creek above claim No. 4.

Late in the summer and in the fall of 1905 the Kantishna district was the scene of great excitement. Several thousand people then arrived, most of them coming by boat up Kantishna River and its tributaries, Bearpaw and McKinley rivers during the season of open water, and by dog and sled later in the fall after snow had fallen. Practically every creek that heads in the Kantishna Hills was staked from source to mouth, and the benches and intervening ridges were not ignored. Within a few weeks a number of towns were built, the largest of which were Glacier, on Bearpaw River at the mouth of Glacier Creek; Diamond, at the mouth of Moose

Creek; and Roosevelt and Square Deal on Kantishna River. At each of these places log cabins, stores, hotels, and saloons were erected, and between them and the creeks a constant stream of gold seekers traveled back and forth. By midwinter, however, it became generally known that rich, shallow diggings, the eternal hope of the prospector, were restricted to a few short creeks, and an exodus began. The richest ground was mined vigorously during the summer of 1906, but by fall the population had dwindled to about 50, those who remained being the few who had staked paying claims or who were convinced that thorough prospecting held out sufficient promise of new discoveries.

In the winter of 1906 Roosevelt, Square Deal, and Diamond were almost completely deserted. Glacier, being nearest to the creeks, is still used as winter quarters by a number of miners who prefer to spend the cold months in the shelter of the timber, near their fuel supply, rather than to haul wood to their summer camps.

Since 1906 the population of the Kantishna district has remained nearly stationary, ranging from 30 to 50. In 1916 there were 35 persons in the district, and more than half of this number were men who had staked claims during the first stampede and who had worked them more or less continuously since that time. It was placer gold that first attracted attention to this camp, and the only production so far has been made from the placer gravels. In recent years, however, considerable attention has been given to prospecting for lode deposits. Veins carrying gold and silver and the sulphides of lead, zinc, and antimony occur in the district, and a large number of lode claims are now held. No lode mine has yet been brought to the stage of production, but eventually the lodes will probably outstrip the placers in the value of their metal output.

GOLD PLACERS.

GENERAL FEATURES.

The productive gold placer deposits of the Kantishna district are all in the basins of the streams that head in the Kantishna Hills and radiate outward in all directions from the higher peaks. The so-called Kantishna Hills are actually rugged mountains of considerable size and are known as hills only because of their nearness to the towering peaks of the Alaska Range. As each stream basin is separated by high dividing ridges from its neighbors, and as direct travel from one basin to another is difficult, the routes generally used extend around the base of the higher mountains, and the placer workings are therefore much farther apart by trail than their close spacing on the map would indicate. This condition has produced a number of small and rather isolated mining camps between which

there is little travel during the busy summer. In 1905 and 1906 paying deposits of gold placer gravel were found on all the streams that are now productive except Little Moose Creek, and although considerable prospecting has been done during the last 10 years only a small amount of workable ground has been found since the early years of this camp. This may be due in part to the fact that only the richest claims can now be worked, but most of the men in the district own ground from which they are confident they can make a living, and they employ the summer in mining the proved ground rather than in prospecting areas in which there is less certainty of finding valuable placers.

The creeks that have added to the gold production of the district are Moose Creek and its tributaries Glen, Eureka, Friday, and Eldorado; Glacier and Caribou creeks, tributaries of Bearpaw River; and Little Moose Creek, which flows into Clearwater Fork of Toklat River.

MINING CONDITIONS.

All the placer mining that has so far been done in the Kantishna district has been open-cut work, in which the upper gravels are groundsluiced off to within a foot or so of bedrock and the remaining gravels and the necessary amount of bedrock are shoveled into the sluice boxes by hand. Most of the miners plan to complete the season's ground sluicing early in the spring, during the period of greatest stream flow, but a few have built automatic dams and are thus enabled, by alternately storing the water and releasing a large volume for a short time, to groundsluice even at times of low water. The whole operation of open-cut placer mining is, however, definitely limited to the period of stream flow. Nearly all the placer mines in this district lie above timber line, from 1,600 to 3,000 feet above sea level. At such altitudes the streams commonly run free from ice sometime in May and remain open until late in September, and the mining season is therefore limited to a period of about four months. Late in summer, too, some of the smaller streams diminish so much in volume that they do not supply sufficient water for sluicing, this lack of water restricting the mining season still further. The experienced miners in this camp count upon a working season of 100 to 120 days.

Most of the gravel deposits along the streams are in thawed ground, and few miners encounter difficulty with ground frost. Some of the elevated benches, however, in which gold occurs in commercial quantities are permanently frozen, and before the gravels can be sluiced they must be thawed by steam or must be stripped of their insulating cover of surface vegetation and muck to allow the warm air and the direct rays of the sun to thaw out the frost.