

AN GEOLOGY, 1908.

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DEPARTMENT OF THE INTERIOR  
UNITED STATES GEOLOGICAL SURVEY

GEORGE OTIS SMITH, DIRECTOR

BULLETIN 410

THE  
INNOKO GOLD-PLACER DISTRICT  
ALASKA

WITH ACCOUNTS OF THE

CENTRAL KUSKOKWIM VALLEY AND THE RUBY  
CREEK AND GOLD HILL PLACERS

BY

A. G. MADDREN



WASHINGTON  
GOVERNMENT PRINTING OFFICE  
1910

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## TRANSPORTATION.

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some means of land transportation for distances from 1 to 30 miles, or possibly more. The means of carrying adopted varies according to the magnitude of the operations being conducted. In the summer season the most primitive method is that of men carrying loads on their backs. A stage in advance of this consists of packing on horses. If the country is not too rugged and operations are to be conducted in a larger manner, roads are built so that wagons may be used. In the better-developed districts operations may become sufficiently extensive to justify the construction of railways, supplemented by wagon roads and trails. During the winter hauling supplies on sleds is the universal method. Its efficiency varies with the form of motive power employed, the range being from small sleds drawn by men or teams of dogs to larger ones hauled by one or more horses.

As the primary reason for writing this paper is to give an idea of the present commercial condition of the Innoko-Kuskokwim country from the miner's standpoint, and as the Innoko placer-gold district is now the center of mining development, the account of transportation routes and their possibilities will be given, with special reference to the ways and means of reaching the upper Innoko Valley. This involves a description of the trunk routes by which all other parts of this region may be reached, as the headwater region of the Innoko happens to be its most inaccessible part.

### SUMMER ROUTES.

There are two principal summer routes by which the Innoko placer district may be approached. These are determined by the geographic position of the Innoko Valley between the easily navigable portions of the two largest rivers in Alaska—the Yukon and the Kuskokwim.

### YUKON RIVER.

By way of Yukon and Innoko rivers it is about 244 miles from Anvik to Dishkakat, and about 190 miles farther upstream to Ophir, or 434 miles by the summer water route from Anvik to the diggings. As already stated, small river steamboats can deliver freight as far up the Innoko as Dishkakat throughout the season of navigation, from June to October. In early June and at other uncertain times of high water these boats can occasionally ascend the main river to points within 55 to 75 miles of Ophir.

As the summer of 1907 was one of much rainfall and a consequent high stage of water in the streams, and that of 1908 was one of very scanty rainfall with a low stage of water, a comparison of the navigation limits reached in these two years probably represents the maximum and minimum availability of the Innoko as a route for transporting supplies into the country with steamboats of the size and type

Grayling and trout abound in the clear streams of the upper parts of the valleys.

### ROUTES OF TRAVEL AND TRANSPORTATION.

#### GENERAL STATEMENT.

The Yukon and its larger tributaries are the chief means of transportation for the vast area of country within its basin. From June to October practically all supplies consumed by the population of the interior of Alaska within the Yukon Valley are taken into that country by water transportation over the routes afforded by the navigable streams and distributed at points where they may be used or obtained for places not located directly on these routes. A number of large stern-wheel river steamboats, together with freight barges, carry the freight to points along the main course of the Yukon and up Tanana River to Fairbanks. Most of this freight is taken up the Yukon from St. Michael, near the river's mouth on Bering Sea, after it is delivered there by ocean steamships from Seattle and San Francisco during the summer, as this part of Bering Sea is closed by ice from November until June. Some supplies, mostly perishable, are brought down the Yukon from the head of navigation on that river at White Horse, in Canadian territory, where connection is made with the White Pass and Yukon Railway. This railway extends for 111 miles across the Coast Range from White Horse to Skagway, on the Pacific coast of Alaska, where ocean navigation is open for the whole year to Seattle and San Francisco. Freight for the Alaska Yukon brought in by this route is bonded through Canadian territory and transferred from Canadian to American carriers at Dawson. Supplies shipped in the spring by this route reach destinations on the Yukon earlier in the summer than if sent by way of St. Michael, as the upper Yukon is open to navigation at an earlier date.

From various points on this trunk route of transportation through the center of the country smaller steamboats extend the distribution of supplies up all the important tributaries of the Yukon for greater or less distances, as occasion may warrant, and when these boats reach the limits of navigation to which they may proceed the supplies are distributed still farther by employing shallow-draft scows of 5 to 10 tons capacity, towed by horses, or light-draft poling boats, that carry from 1 to 2 tons, propelled by men. By a successive combination of these methods supplies can be carried to the headwater districts of the whole Yukon basin region. As a rule, supplies can be conveyed during the summer by some method of boat transportation within comparatively short distances of the places where they are to be used. For the final distribution to the camps on the individual creeks where mining is being conducted it generally becomes necessary to employ

some means of land transport or possibly more. The magnitude of the season the most primitive their backs. A stage in If the country is not too a larger manner, roads better-developed districts to justify the construction of roads and trails. During universal method. Its power employed, the teams of dogs to larger

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During a period of high water, a steamboat  
 inches when loaded reached a point on the  
 55 miles below the present town of Ophir. A  
 tons of freight might be landed at this distance below  
 such conditions of high water.

Probably always be necessary to transport freight from this  
 to Ophir in small lots of 3 or 4 tons by light-draft, flat-bottomed  
 rafts, or in 1 to 2 ton lots by still smaller poling boats. In 1908 con-  
 ditions were not so favorable. Even at the time of the early summer  
 high water the same steamboat could get only within 70 miles of  
 Ophir, and during July and August this boat found it difficult to  
 ascend the Innoko to the village of Dishkakak and was obliged to  
 discharge its freight there, being unable to go farther upstream.

Most of the freight shipped into the Innoko has been brought from  
 Fairbanks, the largest town in the Yukon Valley, situated on Tanana  
 River, 770 miles above Anvik and about 1,014 miles from Dishkakak  
 by the rivers. The freight charge from Fairbanks to Dishkakak has  
 been \$80 a ton. The transportation companies operating large  
 steamboats on the Yukon from St. Michael, where they connect with  
 ocean steamers, have quoted a rate of \$38 a ton from Seattle or San  
 Francisco to Anvik or near-by points on the Yukon. One of these  
 companies has also published a through rate of \$70 a ton to Dishkakak  
 from Seattle or San Francisco, and a local rate of \$35 a ton to Dish-  
 kakak from Anvik, but the company did not offer a regular service on  
 Innoko River and reserved the right to operate steamers thereon only  
 when business warranted. These rates expired on September 1, 1908,  
 and were somewhat reduced in 1909. No attempt has yet been made  
 to ship freight direct from the United States to the Innoko. The ocean  
 distance from San Francisco to St. Michael is 2,846 miles, and from  
 Seattle to St. Michael 2,487 miles. If the traffic should amount to  
 much, probably a lower freight charge would be quoted. This route  
 has a further advantage over that by way of Fairbanks in the much  
 lower original cost of supplies in the United States.

A few individual outfits have been purchased at Nome and shipped  
 a distance of 115 miles by ocean vessels to St. Michael, there reshipped  
 on Yukon River boats to Anvik, 405 miles from St. Michael, and there  
 again transferred to the smaller boats which ascend the Innoko.  
 The distance from Nome to Dishkakak by this route is about 764  
 miles, and it appears that if a reliable line of transportation was estab-  
 lished between Nome and Dishkakak by way of the lower Yukon the  
 merchants of Nome, enjoying a comparatively low freight tariff  
 afforded by direct ocean communication with the Pacific ports of the  
 United States, should be able to bid successfully for the Innoko  
 trade in competition with the merchants of Fairbanks. It is doubtful,

however, whether the  
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however, whether the Innoko route is as good as that by way of Kuskokwim River if an equally reliable line of communication should be established from Nome to Bethel.

#### KUSKOKWIM RIVER.

The Kuskokwim is the second largest stream in Alaska and is perhaps the best river for steamboating in that country, with the possible exception of the Yukon. Steamboats of large size can ascend the river about 650 miles to the confluence of its two principal headwater branches, the East and South forks, and smaller steamboats have been up the South Fork about 40 miles above this junction and no doubt could also ascend the East Fork for some distance. Boats with a draft of 2 feet have ascended Takotna River, a large tributary of the Kuskokwim that heads against the sources of the Innoko, for a distance of about 60 miles to a point within 25 miles of Ganes Creek, whence supplies may be forwarded 30 miles farther up the Takotna to the mouth of Big Creek, which is only about 12 miles from Ganes Creek.

The Kuskokwim has not been used to any great extent as a route for the transportation of supplies, because the country within its watershed has not been prospected or developed, as has the territory within the Yukon basin. Another reason is that Kuskokwim Bay and the estuary or tidal portion of the river's mouth has been considered a hazardous locality in which to navigate ocean vessels, but this opinion appears to be due more to the fact that this part of the Alaskan coast is mapped only in rough outline, and is not known in a detailed way, even by the very few who have some personal knowledge of these waters, rather than to the presence of any real dangers to navigation other than those caused by lack of acquaintance and proper charts for guidance. When accurate surveys of Kuskokwim Bay and the mouth of the river are made and the channels that run through its extensive shoals are properly marked, ocean vessels with a draft of 12 feet may enter and ascend it to Bethel with safety and dispatch. In fact, even without these aids to navigation, vessels with a greater draft than 12 feet have entered this river and departed from it successfully. The United States Fish Commission steamer *Albatross*, of 636 tons and a draft of 13 feet, ascended the Kuskokwim about 40 miles in 1889. A few years ago another ocean steamer of good size, the *Leelanaw*, of 1,923 tons, went up the river to the second island in the channel 40 miles below Bethel. This point has since been known as Leelanaw Anchorage. In 1908 the *Charles Hanson*, of 192 tons and 12 feet draft, ascended the Kuskokwim with several hundred tons of freight to Bethel. Thus it may be seen that the importance of this river as a route of transportation has not been

fully realized, although it enjoys the advantage of being one of the two rivers in Alaska which can be entered by ocean vessels of commercial size. The other is the Nushagak, emptying into Bristol Bay.

Before the gold excitement of 1898 the only white people within the Kuskokwim Valley were a few missionaries whose headquarters have been maintained for a number of years at Bethel, about 60 miles above the river's mouth. Their supplies have been brought each year from the United States by ocean sailing vessels that have delivered their freight at the mouth of the Kuskokwim, to be taken up to Bethel in small boats. During the last ten years several parties have established Indian trading stations at various points on the river, and within the last five years a few prospectors have gone into that country each year. Several stern-wheel river steamboats have been brought to the river from St. Michael and Nome and used to make irregular trips up the river with small amounts of supplies. Since Nome and St. Michael have become well-supplied places, the traders and prospectors on the Kuskokwim have had most of their supplies brought from those settlements by small craft plying in the coastwise trade on Bering Sea during the summer.

The Kuskokwim route was traveled by many of the people who went to the Innoko from Nome in 1907. The passengers and their supplies were taken across Bering Sea from Nome to the mouth of the Kuskokwim, a distance of 480 miles, by various small unseaworthy craft. Thence they were taken up the river on several steamboats to Takotna River and up the very winding course of that stream to points 12 to 20 miles from Ganes Creek, which was reached by several trails across a low mountain range over which supplies can be packed by men or horses during the summer or hauled on sleds during the winter.

In the spring of 1908 a company with trading interests on Kuskokwim River brought several hundred tons of freight direct from San Francisco to Bethel on a large two-masted ocean schooner equipped with auxiliary gasoline power. During the summer this company sent about 40 tons of supplies up the Kuskokwim and Takotna to Joaquin, at the mouth of Big Creek, about 90 miles above McGrath, which is on the Kuskokwim at the mouth of the Takotna. This freight was taken up the Takotna about 60 miles by a small stern-wheel boat which could go no farther owing to the unusually low water. From this point the goods were taken in scows and poling boats the remaining 30 miles to Joaquin, where a log store has been built. From Joaquin it is about 12½ miles to the settlement called Moore City. on

Ganes Creek, half a mile used by pack horses in Creek for 9 miles to its which is gradual except trail rises more steeply divide to the head of Ganes Creek, with an particular difficulties to wagon road or permanent drainage area to the select a somewhat longer lower Takotna more direct Creek, 10 miles below is more central to the advantage on the Kuskokwim on the lower Takotna can boats plying direct from made with ocean vessels route it may be possible distributing point in the consequently a lower trail other route into the head wagon road, or at least point on Takotna River Kuskokwim to the upper Creek, or about 5 miles would not be over 30 miles from the Kuskokwim to would probably not be Ganes Creek and Glacier Gulch a suitable central distribution 1908 an auxiliary gasoline draft of 4 feet. made at Takotna 30 miles above shows the advantages if proceeded farther than even if successful in reaching the winter trail from Ganes Kuskokwim to a point within 35 miles of the over the Yukon-Innokokakat, 55 miles from G

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Ganes Creek, half a mile below Glacier Gulch. A trail that may be used by pack horses in summer and sleds during winter follows Big Creek for 9 miles to its head, with an ascent of about 900 feet, all of which is gradual except in the upper quarter of a mile, where the trail rises more steeply for 200 feet. This trail passes over a saddle divide to the head of Glacier Gulch, down which it goes for 3 miles to Ganes Creek, with an even descent of 600 feet. This route offers no particular difficulties to the construction of a wagon road. If a wagon road or permanent winter trail is to be built from the Kuskokwim drainage area to the Innoko Valley, however, it appears best to select a somewhat longer route which would connect a point on the lower Takotna more directly with the Innoko at the mouth of Ganes Creek, 10 miles below Moore City. This point on the Innoko side is more central to the placer-gold area, as it is now known, and the advantage on the Kuskokwim side lies in the fact that some point on the lower Takotna can be reached at all stages of water by steamboats plying direct from Bethel, where direct connection can be made with ocean vessels from Seattle or San Francisco. By such a route it may be possible to deliver freight at a centrally located distributing point in the mining region with fewer transfers, and consequently a lower transportation charge, than is possible by any other route into the headwater portion of the Innoko Valley. A wagon road, or at least a good winter sled trail, could be built from a point on Takotna River 15 to 25 miles above its confluence with the Kuskokwim to the upper Innoko Valley near the mouth of Ganes Creek, or about 5 miles farther to the town of Ophir. Such a road would not be over 30 or 35 miles long, and the divide to be crossed from the Kuskokwim to the Innoko is not high nor rugged. The road would probably not be as high nor present as steep grades as the Big Creek and Glacier Gulch trail does, and it would lead more directly to a suitable central distributing point for the placer region. In the fall of 1908 an auxiliary gasoline schooner of about 15 tons burden, with a draft of 4 feet, made a continuous trip from Nome to a point on the Takotna 30 miles above its mouth, without any difficulty. This trip shows the advantages of this route, for the same boat could not have proceeded farther than Dishkakat by the Yukon-Innoko route, and even if successful in reaching that place it would still be 55 miles by the winter trail from Ophir. The distance from Nome by way of the Kuskokwim to a point on the Takotna 25 miles above its mouth and within 35 miles of the Innoko diggings is 1,170 miles. The distance over the Yukon-Innoko summer water route from Nome to Dishkakat, 55 miles from Ophir by winter trail, is about 764 miles.

## APPROXIMATE DISTANCES.

A comparative table of approximate distances by the various summer water routes is given below:

*Approximate distances to Innoko region.*

	Miles.
On Pacific Ocean and Bering Sea:	
San Francisco to Nome.....	2,730
San Francisco to St. Michael.....	2,800
San Francisco to Goodnews Bay.....	2,440
Seattle to Nome.....	2,370
Seattle to St. Michael.....	2,450
Seattle to Goodnews Bay.....	2,090
Nome to St. Michael.....	115
Nome to Goodnews Bay.....	480
St. Michael to Goodnews Bay.....	480
On Yukon and Innoko rivers from St. Michael:	
St. Michael to Anvik.....	405
Anvik to Dishkakat.....	240
Dishkakat to Ophir, by Innoko River.....	190
Dishkakat to Ophir, overland, about.....	55
St. Michael to Ophir, by water route.....	840
On Kuskokwim River from Goodnews Bay:	
Goodnews Bay to Leelanaw Anchorage.....	110
Leelanaw Anchorage to Bethel.....	40
Goodnews Bay to Bethel.....	150
Bethel to McGrath at the mouth of Takotna River.....	475
McGrath to forks of the Takotna.....	15
Forks of Takotna to Ophir, overland, about.....	35
McGrath to Joaquin on Takotna at Big Creek.....	90
Joaquin to Ganes Creek, overland.....	13
Bethel to Joaquin, by water route.....	575
Nome to Ophir, by way of Yukon-Innoko.....	955
Nome to Ophir, by way of the Kuskokwim.....	1,200
Seattle to Ophir, by way of ocean vessel to St. Michael, 2,447 miles; river steamboats on Yukon and Innoko to Dishkakat, 649 miles; and small boats from Dishkakat to Ophir, 190 miles—total distance.....	3,280
Or by overland winter trail from Dishkakat to Ophir, 55 miles—total distance.....	3,150
Seattle to Ophir, by way of ocean vessel to Bethel, 2,235 miles; river steamboat on Kuskokwim to forks of the Takotna, 488 miles; and overland trail or road from Takotna to Ophir, 35 miles—total distance.....	2,760
Difference in favor of Kuskokwim route.....	390

## ADVANTAGES OF KUSKOKWIM ROUTE.

The advantage of the Kuskokwim route lies not only in the shorter distance of its terminus from the diggings, but also in the smaller number of transfers of freight necessary. At St. Michael, which is a shallow, open roadstead rather than a protected harbor, it is necessary to lighter all cargo from ocean vessels to the shore and then reload the freight into the river boats at the docks or warehouses. More-

over, it is often necessary even a week, after being during which to make to the mouth of the Yukon steamboats that can make it advisable to send steamboats and to transport trip up the Innoko. starting point and de other hand, only one can be made directly safe port.

During 1907-8 supply diggings in a rather un steamboats to the he towed by horses and p settlement has never b In fact, many of the ne shortage of provisions throughout the last became necessary for country to journey ov Nulato, on the lower dog sleds the bare need in unprofitable labor.

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.....	405
.....	240
.....	190
.....	55
.....	840
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.....	40
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.....	1,200
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o Ophir, 190	
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to Ophir, 55	
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 warehouses. More-

over, it is often necessary for the river boats to wait several days or even a week, after being loaded, for calm weather on Norton Sound during which to make the passage of 60 miles around the shoal coast to the mouth of the Yukon. This passage is hazardous for the small steamboats that can ascend the Innoko. Consequently, safety will make it advisable to send freight from St. Michael to Anvik on large steamboats and to transfer it again at Anvik to smaller boats for the trip up the Innoko. Thus three transfers are necessary between starting point and destination. By the Kuskokwim route, on the other hand, only one transfer is necessary—that at Bethel—and it can be made directly from the ocean vessel to the river boat in a safe port.

During 1907-8 supplies have been transported to the Innoko gold diggings in a rather unsatisfactory manner by means of small river steamboats to the head of navigation, and thence by small scows towed by horses and poling boats propelled by men to Ophir. This settlement has never been a well-stocked distributing point, however. In fact, many of the necessities have often been entirely lacking, and a shortage of provisions in the whole Innoko Valley has prevailed throughout the last two years. During the winter of 1907-8 it became necessary for many of those who wished to remain in the country to journey over difficult winter trails to Anvik, Kaltag, and Nulato, on the lower Yukon, and haul back with them on hand and dog sleds the bare necessities for existence, thus expending much time in unprofitable labor.

The cost of transporting freight from points on Innoko River where the steamboats may be able to land it to Ophir by means of man-propelled boats varies from 10 to 20 cents a pound, according to the distance it must be carried. At present it costs from \$280 to \$480 a ton for freight charges alone to have supplies brought to the Innoko diggings from the larger centers of supply on the Yukon. Besides this heavy freight toll, the initial cost of provisions in Fairbanks is much higher than at the ocean ports of Nome or St. Michael. By establishing reliable communication with St. Michael the freight charge from Seattle may probably be reduced to about \$70 a ton for goods delivered at Dishkakat, but the difficulty of carrying them from that place to Ophir will still remain. The writer was told that the charge for hauling freight with horses and sleds over the 55 miles of winter trail from Dishkakat to Ophir was about 7 or 8 cents a pound, so that the lowest estimate it is now possible to make with the figures at hand is a freight cost of \$210 a ton for delivering supplies at Ophir from Seattle by way of St. Michael and the Yukon. This figure is based on the current freight tariffs, but there appears to be no reason why this cost might not be materially reduced by an organized and well-regulated effort.

There is no doubt that freight can be brought from San Francisco or Seattle to Bethel fully as cheaply as to St. Michael. At Bethel the river boats can be loaded directly from the ocean vessel, only one handling being necessary. The river boats can ascend the Kuskokwim and the Takotna to its forks without any difficulty, and from this vicinity the overland haul of about 35 miles to Ophir can easily be made by summer wagon road or winter sled trail, or by a light railroad if developments should warrant. There appears to be no question that the Kuskokwim route to the Innoko placer camp affords the most expeditious and satisfactory solution of the transportation problem, that even under present conditions there is no reason why supplies from Seattle may not be delivered at Ophir for \$100 a ton, and that with good management the actual freight cost over this route may be reduced considerably below that figure.

#### WINTER ROUTES.

Distances by the winter routes from the lower Yukon to the Innoko are much shorter than by the summer water routes. The wide extent of flat, swampy country of the lower Innoko Valley is then frozen over, so that more direct courses may be followed from one place to another. It is about 57 miles by sled trail from Kaltag to Dishkakat, and about 55 miles from Dishkakat to Ophir, or 112 miles altogether. This trail is for the most part over flat-lying country, but between Dishna and upper Innoko rivers it crosses a low mountain range at an elevation of about 1,300 feet above sea level by way of a low, wide pass, with easy grades approaching it from either side. Kaltag is a military telegraph station and a regular post-office on the winter mail route from Fairbanks to Nome. During the winter of 1907-8 a moderate amount of freight was hauled over this trail by dog teams from Kaltag and Nulato to Ophir for 50 cents a pound. A number of personal outfits were hauled over it by means of hand sleds, and some new arrivals even hauled their provisions from Nome. A herd of reindeer of about 30 head was driven from Unalaklik to the Innoko and sold for the meat.

Another winter route to the Innoko leaves Yukon River at a small trading station called Lewis, which is located on the north bank of the Yukon, about 15 miles below the United States military telegraph station called Melozi. The trail goes south from the Yukon up the valley of Yuko River, crosses the wide, flat pass at its head into the valley of the North Fork of the Innoko, and continues southward down this valley to a point on the Innoko 65 miles below Ophir. The route then follows Innoko River to its headwaters. Several parties traveled over this route during the winter of 1907-8, and a few dog-team loads of freight were hauled over it. The distance is estimated to be about 100 miles, and it is by far the shortest winter route for those who wish to go from Ophir to upper-central Yukon

points such as Tanana. Under these conditions this route would be a good mail service to Ophir. The trail passes down the Yukon to the Innoko, yet been established.

During the winter of 1907-8 a party, in charge of a mail trail, was sent to the Pacific coast of Alaska, and the object of this trip was to establish a winter mail service. The trail followed the valleys of Yentna and Skwentna rivers, descended the South Fork of the Yukon to the mouth of the Takotna River, followed the route up Bethel on Ganes Creek. From Bethel, as described, by way of the Yukon the regular mail route was found to be a line mail trail across the mountains. A road commission will be organized in this region will be situated at Seward to Nome. The trail is about 100 miles, and from Ophir to Seward is about 65 miles from Seward to Nome is carried from Valdez and Yukon rivers to the mouth of the Yukon across Norton Bay, the route from Seward to Nome followed from Valdez to Nome, besides being a much shorter route to the Innoko Valley directly.

Seward to end of railway  
Crow Creek Pass.....  
Old Knik.....  
New Knik.....  
Susitna Station.....  
Mouth of Yentna River.....  
Mouth of Skwentna River.....  
Mouth of Happy River.....  
Mouth of Pass Creek.....  
Summit of Rainy Pass.....  
Mouth of Dalzell Creek.....  
Mouth of Rohn River.....  
Mouth of Takotna River.....  
Mouth of Big Creek (John)

from San Francisco  
At Bethel the  
vessel, only one  
end the Kuskok-  
wim difficulty, and from  
Ophir can easily  
be reached by rail, or by a light  
trail, and it appears to be no  
more difficult than the  
Innoko placer camp  
and the transition of the trans-  
itions there is no  
difficulty at Ophir for  
actual freight cost  
that figure.

Yukon to the Innoko  
The wide extent  
of the valley is then frozen  
from one place to  
Kaltag to Dishkakat,  
12 miles altogether.  
The country, but between  
mountain range at an  
elevation of a low, wide  
valley side. Kaltag is a  
port on the winter mail  
trail of 1907-8 a  
mail trail by dog teams  
is found. A number  
of hand sleds, and  
from Nome. A herd  
of reindeer to the Innoko

Yukon River at a small  
port on the north bank  
of the Yukon. It  
facilitates military tele-  
graph communication  
from the Yukon  
at its head  
and continues south-  
ward 100 miles below Ophir.  
The waters. Several  
times of 1907-8, and a  
The distance is  
the shortest winter  
route to central Yukon

points such as Tanana, Rampart, or Fairbanks. Under present conditions this route would be the shortest and most direct for a winter mail service to Ophir, as all the winter mail for western Alaska now passes down the Yukon from Fairbanks; but no service to Ophir has yet been established.

During the winter of 1907-8 the Alaska Road Commission sent a party, in charge of one of its engineers, to make a reconnaissance of a winter mail trail from Seward to Nome. Seward is a port on the Pacific coast of Alaska open to ocean navigation throughout the year, and the object of this survey was to traverse the most feasible route under actual winter conditions so as to test its practicability for winter mail service. The party crossed Kenai Peninsula and ascended the valleys of Yentna and Skwentna rivers to Rainy Pass. Thence it descended the South Fork of the Kuskokwim to McGrath, at the mouth of the Takotna; ascended the Takotna to Big Creek; and followed the route up Big Creek and down Glacier Gulch to Moore City, on Ganes Creek. From Ganes Creek it followed the route already described, by way of Ophir and Dishkakat to Kaltag, and from the Yukon the regular mail trail now used from Kaltag to Nome. This route was found to be an entirely satisfactory one for a winter trunk-line mail trail across this part of Alaska, and it is announced that the road commission will open this route. When this is done the Innoko region will be situated about midway on a trunk-line mail trail from Seward to Nome. The distance from Seward to Ophir is about 465 miles, and from Ophir to Nome it is about 424 miles, or about 889 miles from Seward to Nome. At present the winter mail for Nome is carried from Valdez to Fairbanks, 373 miles; thence down Tanana and Yukon rivers to Kaltag, 550 miles; and from Kaltag to Nome across Norton Bay, 312 miles, a total distance of 1,235 miles. Thus, the route from Seward to Nome saves about 346 miles over that now followed from Valdez to Nome by way of Fairbanks and Kaltag, and besides being a much shorter route to Nome it may serve the Innoko Valley directly.

*Distances from Seward to Nome.*

	Miles.
Seward to end of railway.....	72
Crow Creek Pass.....	86
Old Knik.....	123
New Knik.....	148
Susitna Station.....	180
Mouth of Yentna River.....	183
Mouth of Skwentna River.....	222
Mouth of Happy River.....	266
Mouth of Pass Creek.....	291
Summit of Rainy Pass.....	298
Mouth of Dalzell Creek.....	307
Mouth of Rohn River.....	310
Mouth of Takotna River (McGrath).....	418
Mouth of Big Creek (Joaquin).....	442

	Miles.
Big Creek summit.....	451
Moore City on Ganes Creek.....	454
Ophir.....	465
Dishkakat.....	520
Kaltag.....	577
Unalaklik.....	667
Seward to Nome.....	889

#### MAIL SERVICE TO THE INNOKO.

Up to 1908 the Innoko Valley has not been provided with contract mail service, although there has been a postmaster in the precinct for the preceding two years. Two men have held this appointment and, owing to the unsettled conditions, each has been vested with the authority to maintain a post-office wherever his personal inclination might dictate. The post-office for the valley has been located first at Dishkakat, then at Innoko City, and again at Dishkakat, where it is at latest reports.

#### EFFECT OF HIGH TRANSPORTATION RATES.

It appears that the transportation of supplies to the Innoko placer district for a reasonable cost has not been accomplished, and that the exorbitant operating expenses in this district are the direct result of poor and inadequate transportation. For this reason the present conditions and possibilities have been described in detail, as the transportation problem is of vital importance and its solution as soon as possible is imperative to the success of the Innoko placer district as a mining community.

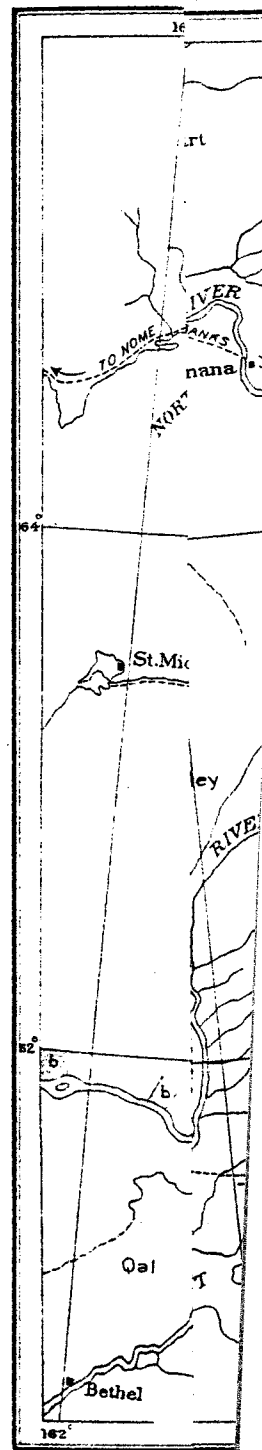
During 1907-8 the prices of staple provisions at Ophir were as follows:

Flour.....per pound..	\$0.30	Bacon.....per pound..	\$0.65
Corn meal.....do....	.50	Ham.....do....	.65
Rice.....do....	.50	Butter.....do....	1.00
Rolled oats.....do....	.45	Cheese.....do....	.75
Beans.....do....	.50	Dried fruit.....do....	.55
Coffee.....do....	1.00	Canned fruit.....per can..	1.00
Tea.....do....	1.00	Canned vegetables.....do....	.75
Sugar.....do....	.50	Canned milk.....do....	.50

#### GEOLOGIC SKETCH OF THE INNOKO-KUSKOKWIM REGION.

##### INTRODUCTION.

The bed rock of the Innoko-Kuskokwim region is for the most part primarily of sedimentary origin, although the original condition of the older rocks has been greatly changed by metamorphic alteration, so that now they are mostly in the form of schists and slates, with some cherts and crystalline limestones, especially throughout the Kaiyuh Mountains and the Innoko Valley (Pl. II). Associated with these metamorphosed sediments, more particularly with the



DEPARTMENT OF THE INTERIOR  
UNITED STATES GEOLOGICAL SURVEY  
GEORGE OTIS SMITH, DIRECTOR

BULLETIN 417 ✓

MINERAL RESOURCES  
OF THE  
NABESNA-WHITE RIVER DISTRICT  
ALASKA

BY  
F. H. MOFFIT AND ADOLPH KNOPF

WITH  
A SECTION ON THE QUATERNARY

BY  
S. R. CAPPS



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UNIVERSITY OF ALASKA-FAIRBANKS

WASHINGTON  
GOVERNMENT PRINTING OFFICE

1910

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## TRANSPORTATION.

tion may be approached from any direction, northwest, the east, or the south-

Rivers usually follow a trail that leaves Valdez to Eagle near the mouth of the Copper River to Batzulnetas, and to the heads of Jack and Platinum Creeks. This leads directly to Nabesna River, which is the better route for summer travel. The trail bears to the east and traverses the

This portion of it may be hard to follow, but can be followed with scarcely any difficulty, though portions are exceedingly swampy, though portions of the military trail between the Gakona and Chitochina. The trail to "Sargent's cabin," on Nabesna River, is approximately 40 miles by way of Jack Creek. It is 10 miles farther by way of Jack Creek. It is for prospectors entering the White River territory from the Yukon or from the Chitina Valley on the Canadian routes, depending on the desired to use. One may either go by boat or follow the overland trail to White Horse Lake. The trail from White Horse to the best way of reaching either end of the lake in summer if ease of traveling is desired extends from White Horse to Canyon City, on the north side of the boundary line. Many prospectors come from Dawson in small boats, by boat or by raft in the fall, since this is the method of reaching the Yukon. The method of reaching the Yukon by river is approxi-

The Chitina Valley is difficult for travel. It is used by a few prospectors in the Chitina and White valleys, and who are engaged in prospecting work. During the earlier years this trail crossed Nizina Glacier about 10 miles above the head of Nizina River, whose north bank it followed

eastward to the pass. The trail along Skolai Creek is not now used, for Nizina Glacier is so traversed by crevasses as to be practically impassable, and though horses have been taken high on the mountain around the east side of the small lake formed by the damming of Skolai Creek by Nizina Glacier, the climb is so difficult that it has been undertaken but a few times.

Travelers from the Chitina Valley now ascend Chitistone River to its head and go over a broad, high pass with abrupt northern descent to the foot of Russell Glacier, which occupies Skolai Pass and must be crossed in order to reach the White.

In 1891, when Hayes and Schwatka crossed Skolai Pass, the surface of Russell Glacier sloped smoothly down to the gravel flats of Skolai Creek, and no difficulty was encountered in leaving the ice, but in 1908 the glacier's edge was a wall of ice not less than 25 feet high at its lowest point, and two or three times that in many places. (See Pl. IV, B.) From six to eight hours' time is required to cross the glacier, and the whole distance from Chitistone River to White River can be traversed in one day by those familiar with the route. Ordinarily, however, the greater part of two days' time is required to make the trip. The Chitistone trail should not be attempted with heavily loaded horses.

The trail from Nabesna River to White River, whose course will be clearly understood on reference to the map (Pl. I or II), lies in the depression between the Wrangell and Nutzotin mountains and follows the valleys of Cooper, Notch (or Trail), Gehoenda, and Solo creeks. The distance is about 60 miles, and no great obstacles to travel are encountered. Beyond Solo Creek the gravel bars south of White River afford an easy means of travel between Solo cabin and the boundary line. During August, 1908, no difficulty was experienced in fording the river with horses at any point that looked favorable, but there are times when crossing is difficult and dangerous, if not impossible.

Supplies required for use in the Nabesna-White River region should be taken in over the snow in winter unless it is intended to ship them up White River in boats. Supplies used on Nabesna River are brought from Valdez, but most of the prospectors on the White buy their provisions and equipment in Dawson and bring them up the river in the spring. The cost of winter freighting (1908) either from Valdez to Nabesna River or from White Horse to Canyon City is probably not less than 35 cents a pound under favorable conditions, and may be considerably higher.

## CLIMATE.

Climatic conditions in the Nabesna-White River region are those of central Alaska as modified by the altitude and the mountainous nature of the country. The region is separated from the Pacific by a

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DEPARTMENT OF THE INTERIOR  
UNITED STATES GEOLOGICAL SURVEY  
GEORGE OTIS SMITH, DIRECTOR

BULLETIN 498



HEADWATER REGIONS OF <sup>92</sup>  
GULKANA AND SUSITNA RIVERS  
ALASKA

WITH ACCOUNTS OF THE VALDEZ CREEK AND  
CHISTOCHINA PLACER DISTRICTS

Property of the  
State of Alaska  
BY

FRED H. MOFFIT



WASHINGTON  
GOVERNMENT PRINTING OFFICE  
1912

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ever, are of great importance to the  
s scarce in the lowland district; al-  
e of the lakes and in places along the  
g the military road between Gulkana  
h grass for horses, so that travelers  
plies for their animals are obliged  
to the distribution of the grass and  
strength of the stock. On the other  
e timber line in the mountain region,  
on the hill slopes. In places the  
igh as a man's shoulder was seen on  
ad been burned off several years ago.  
on for many of the miners who use  
vere frosts, because the horses are  
ore the feed gives out. Most of the  
s soon as frost strikes it. Although  
uting it lose strength rapidly unless  
ne. According to Mr. A. J. Paxson,  
not be depended on earlier than June  
the vicinity of Gulkana and Summit  
t earlier in the spring or live longer  
e the limit of safety in that locality.  
an in the lowland, where grass comes  
s about as much longer. The supply  
y road is less important now than  
sed at nearly all the road houses.

#### RELATION.

is small. The white population is  
o a few localities along or near the  
military telegraph stations and nine  
iver and Canwell Glacier. At the  
n all about a dozen soldiers, includ-  
ing to the Signal Corps. The num-  
ients, who live at each of the road  
in summer, but is perhaps a little  
nd 25 men were mining on Valdez  
e were either prospecting or mining  
ars that the white population in the  
5 in all.

population, but no estimate of its  
of the Indian families have their  
others near Susitna River and the  
on Valdez Creek. These families  
er at the fishing stations along the

rivers and later in the season in the hunting grounds. It is there-  
fore difficult to get a correct idea of their number at these times,  
when little is seen of them on the regular lines of travel.

#### TRAILS AND TRANSPORTATION.

Transportation in this district, as in almost every other part of  
Alaska, is one of the most serious difficulties connected with mining.

In the early days supplies for use on Valdez Creek were freighted  
across Valdez Glacier to Klutina Lake and from there to Susitna  
River at the mouth of Tyone Creek, from which place they were  
taken over the river ice to their destination without serious diffi-  
culties. The most objectionable part of this route is Valdez Glacier;  
where the obstacles to be overcome are so serious that the route was  
given up as soon as the military trail was well established. The  
trail ascended St. Ann River, on the north side of Klutina Lake,  
crossed Lake Hudson, Taslina Lake, and the Susitna Lakes, and then  
descended Tyone Creek to Susitna River. The grades after cross-  
ing Valdez Glacier are not heavy.

Nearly all the supplies used on Valdez Creek for the last five or six  
years have been freighted over the military trail from Valdez to  
Gulkana, and thence to Valdez Creek by way of the west fork of  
Gulkana River and Maclaren and Susitna rivers. The difficulty of  
crossing the coast range by this route, as by the other, is serious  
and is one of the principal causes of the high cost of freighting  
into the Copper River basin, but improvements made from year to  
year on the military trail, which was at first suitable only for pack  
horses and narrow sleds, have transformed it into a road, which is  
practically ready for travel with wagons throughout its full length  
from Valdez to Fairbanks. A few large bridges and a number of  
culverts still remain to be completed, but doubtless most of them will  
be in place before the end of 1911. Ditching and grading will also  
be required on some stretches, but even in its present condition the  
road represents a great improvement over the old trail and reflects  
much credit on Col. Richardson and his associates of the Alaska  
Road Commission. During the summer of 1910 a new road was cut  
through from the military road to Chitina, the new town on the  
Copper River & Northwestern Railway, on the west side of Copper  
River, opposite the mouth of Chitina River. The new road branches  
off the old road at Willow Creek, about halfway between Tonsina  
and Copper Center. It runs east-southeast to Copper River and fol-  
lows its west bank to the railroad. A bridge over Tonsina River,  
which was necessary to make this road available for general use, was  
completed in the winter of 1910-11.

The winter trail from Gulkana to Valdez Creek, as previously  
stated, follows Gulkana River to the head of its west fork, then

passes the round-topped hill on the north by way of a low divide and comes out on Maclaren River about 7 miles from the Susitna. From the mouth of Maclaren River it follows the Susitna to Valdez Creek. The distance from Valdez to Gulkana is 128 miles, and from Gulkana to Valdez Creek approximately 125 miles. This trail, after the coast range is passed, offers very favorable grades for freighting. From Gulkana travel is almost continuously on the river ice, snowplows being used to break the trail ahead of the sleds. In favorable seasons travel is attended with little difficulty, but an effort is always made to reach Valdez Creek before the heavy snows of the late winter. This is accomplished more easily now than in former years, because the road through Keystone Canyon makes it possible to start from Valdez with freight before the river freezes in the canyon, thus saving a month or more at the beginning of the trip.

The cost of freighting from Valdez to Valdez Creek averages about 30 cents per pound. Under the most favorable circumstances it might be reduced to 20 cents, but the experience of several years has shown that 30 cents is not far from the average cost. It seems likely that the cost of freighting may be somewhat reduced with the opening for business of the Copper River & Northwestern Railway, but this will depend, of course, on the rates established.

Summer travel between Valdez Creek and the military road is over a somewhat different route from that followed in winter. The trail leaves the road at Bear Creek, about 1 mile south of Gulkana, and runs northwest to Maclaren River. It keeps to the east of the round-topped mountain between Maclaren River and Clearwater Creek, and leads to Valdez Creek by way of the Roosevelt Lakes pass. This trail is indicated on the map (Pl. I, pocket). Much of it is over wet ground, and travel with horses is so difficult that there has been a desire since the military road was put through from Gulkana to Fairbanks to find some shorter and better route connecting with it.

Two other routes have been tried. The more northern one is by way of Eureka Creek to the east fork of Maclaren River and thence across Maclaren River and its west fork to Roosevelt Lakes, west of Clearwater Creek. The other trail starts at Paxson and passes through the northern part of the Tangle Lakes district to the west fork of Maclaren River, from which point the trail is practically the same as the one just described. The distance is about 65 miles. The Eureka Creek trail is slightly shorter and crosses fewer ridges than that from Paxson; but it has the disadvantage of considerably increasing the total distance between Gulkana and Valdez Creek. Both trails are above timber line and the supply of firewood is limited to willows, so that neither route would be practicable for winter travel under present conditions, even if they afforded as favorable grades as the one now used. Either, however, would be a practicable summer mail route.

An attempt was made several years ago to find a practicable mail route between Valdez Creek and Fairbanks but it was not found practicable and no further attempt since then to renew it. A mail route is maintained from Fairbanks each winter by way of the coast range.

## GENERAL

### STRATIGRAPHY

#### INTRODUCTION

The hard-rock formations of the Alaska Range are complicated in structure and a detailed study of their geographic relations and areal distribution is beyond the time available for study in the field. The rocks are igneous and metamorphic, and range in age from the Eocene schist, through Carboniferous and Permian, to the Eocene.

#### GULKANA AND SUSITNA RIVERS

In summarizing the general geology of the Alaska Range (Pl. II, in pocket) it may be said that the rocks of this region which are composed of greenstones, slates, tuffs, conglomerates, and shales, together with a minor amount of limestone, are of greater or less degree and locally of different character, which are probably of Carboniferous age. In the east and west along the southern part of the Alaska Range. (See Pl. I, pocket) differentiated from the massive rocks of the Alaska Range these sediments is a belt of heavy igneous rocks consisting largely of amygdaloidal lavas and tuffs with a minor amount of tuffs and tuffaceous shales. This succession of flows and tuffs is probably younger than the Carboniferous rocks of the Alaska Range older than the Upper Triassic rocks of the Alaska Range. The schistosity of the lavas there was laid down in shales, and limestone that contained fossils determined to be of Upper Triassic age and is now known.

The formations enumerated, which are older than Eocene, are cut by granitic rocks which are to be of Jurassic or later age. The igneous rocks are diorites or quartz diorites and gabbros. They occupy a considerable area and are especially abundant in the Alaska Range.

## GULKANA AND SUSITNA RIVERS.

l on the north by way of a low divide and er about 7 miles from the Susitna. From er it follows the Susitna to Valdez Creek. o Gulkana is 128 miles, and from Gulkana ately 125 miles. This trail, after the coast y favorable grades for freighting. From continuously on the river ice, snowplows il ahead of the sleds. In favorable seasons le difficulty, but an effort is always made efore the heavy snows of the late winter. e easily now than in former years, because e Canyon makes it possible to start from re the river freezes in the canyon, thus e the beginning of the trip.

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An attempt was made several years ago to establish a winter freighting route between Valdez Creek and Indian Creek, on Susitna River, but it was not found practicable at that time and there has been no attempt since then to renew it. A small amount of freight is brought from Fairbanks each winter by way of Nenana River.

## GENERAL GEOLOGY.

## STRATIGRAPHY.

## INTRODUCTION.

The hard-rock formations of the region under discussion are complicated in structure and a clear understanding of their stratigraphic relations and areal distribution was not gained in the short time available for study in the field. They include both sedimentary and igneous rocks, and range in age from pre-Ordovician (?) Birch Creek schist, through Carboniferous or possibly earlier to upper Eocene.

## GULKANA AND SUSITNA RIVER REGION.

In summarizing the general geology represented on the map (Pl. II, in pocket) it may be said that, aside from the Birch Creek schist, the rocks of this region which are thought to be oldest consist of greenstones, slates, tuffs, conglomerates, and quartzitic beds, together with a minor amount of limestone, all metamorphosed to a greater or less degree and locally changed into schists. These sediments, which are probably of Carboniferous age, form a belt extending east and west along the south flank of the high central part of the Alaska Range. (See Pl. II.) They were not fully differentiated from the massive rocks to be mentioned later. South of these sediments is a belt of heavy dark-colored, igneous rocks, consisting largely of amygdaloidal lava flows, with which is associated a minor amount of tuffs and tuffaceous conglomerates. The age of this succession of flows and tuffs is in doubt, but they are thought to be younger than the Carboniferous rocks previously referred to and older than the Upper Triassic rocks. Somewhat later than the extrusion of the lavas there was laid down a succession of slates, sandy shales, and limestone that contain fossils and are definitely determined to be of Upper Triassic age. Their distribution is only partly known.

The formations enumerated, which include everything in the region older than Eocene, are cut by granular intrusives, which are believed to be of Jurassic or later age. The most common and notable of these are diorites or quartz diorites and related granular and porphyritic rocks. They occupy a considerable proportion of the mapped area and are especially abundant in the vicinity of upper Susitna River.

## CHISTOCHINA DISTRICT.

## INTRODUCTION.

This district is here used to include the gold field of Chistochina River (Pls. III and IV). The most important are Slate Creek, its tributary, Middle Fork, and Ruby Creek. Lime Creek or Lake Creek flows north of Slate Creek, on the mountain side of the glacier, complete the list of localities in the district. In 1910 contributed more than a nominal amount to the district.

It was first visited by Mendenhall in 1902, and the following locations were made.<sup>1</sup> The present name is based on his report and contributes little to the account of the development up to the present. "Geography and drainage" and "history" are given without change.

## GEOGRAPHY AND DRAINAGE.

The Alaska Range proper, but in a group of mountains forming the main chain by a conspicuous piedmont range east of the head of Chistochina River and Middle Fork, and the upper courses of Middle Fork, the mountain passes which connect these streams.

At the foot of the great range rise abruptly to elevations of 6,000 or 6,500 feet the nearest foothills are 6,000 or 6,500 feet as their distance from the axis of the range. Isolated groups, which, near the main range, are separated by valley lowlands separating them occupying a considerable area is in a measure reversed along the lower part of the foothills are often small islands rising above the Copper Valley.

These are found all of the producing claims in the Chistochina and Middle Fork and south of the west fork. It has been described. It is drained by tributaries of the Chistochina, the largest of these tributaries is the Chistochina River rises in a cirque 3 or 4 miles south of the glacier. It flows north of west for 2 miles or more leading to Slate Creek, then turns abruptly southward for 7 or 8 miles below the mouth of West Fork for 13 miles. Slate Creek lies west of the

Chistochina River region, Alaska: Prof. Paper U. S. Geol.

upper Chisna, its lower course occupying the western end of the same depression which has controlled the upper course of the larger stream. Before entering this cross valley it flows southward for a little more than 1½ miles from the two small glacial remnants in which it rises, and after entering it follows it westward for 2 miles to the Chistochina, which it joins just at the foot of the glacier. Its total length, therefore, is not over 4 miles. Miller Gulch, the most important producer of the district, is a small northern tributary of Slate Creek, less than a mile long.

## HISTORY.

The first locations in the Chistochina gold field were made by Hazelet and Meals, in the summer of 1899. These gentlemen were among the army of argonauts who crossed the Valdez Glacier in the spring of 1898 with the idea of prospecting within the Copper River basin. Building a boat on the Klutina, they descended that stream and ascended the Copper and the Chistochina, reaching the present location of Chisna post office in early July. They found encouraging prospects here, but their provisions becoming exhausted, they returned to Copper Center for a larger supply, reaching the Chisna again in August of the same year. In September they returned to Copper Center and during the following winter sledged supplies to a point on the Chistochina near the mouth of the East Fork, and from this base continued their work on the lower Chisna throughout the summer of 1899. Coarse gold was discovered at this time, and several locations were made.

In the spring of 1900 these operators, together with a number of the present Miller Gulch and Slate Creek claim owners, returned to the Chistochina with a good stock of supplies, a sawmill, and some hydraulic machinery. During this summer gold was discovered on Slate Creek and Miller Gulch by Coles, Jacobson, Kramer, and Levell, the ground staked at that time having since proved to be much the richest in the district.

## TRAILS.

The regularly used winter trail from Gulkana to Chisna River and Slate Creek follows Copper River to Chistochina and ascends the stream of that name. All freight is taken in during the winter months by this route, and until recently most of the summer travel followed it also. Since the military trail was turned into a road there has been a tendency to make use of it in the summer months and thus avoid the exceedingly bad, swampy trail along Copper River. It is approximately 25 miles from Paxson on the military road to Slate Creek. The trail offers good footing for horses most of the way and presents no serious obstacles to travel, its most objectionable points being at two crossings of West Fork of Chistochina River in the canyon, where the water is confined to a single channel. Like all glacial streams, this one is subject to quick changes in the amount of water discharged from the glacier and may be impassable to-day where yesterday it afforded an easy crossing. The stream is a small one and is not hard to cross where it spreads out, but when confined to one channel it often presents difficulties. Doubtless these can be avoided when better trails are made and more favorable crossings are chosen.

## MAIL AND TELEGRAPH FACILITIES.

A post office established at Dempsey, on the west side of Chistochina River near the mouth of the Chisna, has a regular bimonthly service in summer and a monthly service in winter. The mail route follows Copper and Chistochina rivers, thus serving Gakona and the telegraph station at Chistochina as well as Dempsey.

The military telegraph station at Chistochina is 35 miles from Dempsey and 45 from Slate Creek. Slate Creek, as already indicated, is about 25 miles from Paxson, the nearest telegraph station on the military road.

## GOLD PLACERS.

## OUTPUT.

Mining began in the Chistochina district in 1899 and continued with a steadily increasing gold production for several years until, as in all placer districts, the richest and more easily mined gravels approached exhaustion. It is estimated that the total gold production of the Chistochina district, including the year 1910, has been a little more than \$1,500,000, of which Miller Gulch has produced a large proportion.

Between 40 and 50 men were employed in the Chistochina district in 1910, most of them on Slate Creek. The population is much less than it was two or three years ago, the decrease corresponding approximately to the falling off in gold production.

## DETAILED DESCRIPTIONS.

## MILLER GULCH.

Miller Gulch is a deep, narrow depression cut in the slates north of Slate Creek by a little stream less than a mile long. The ground was not staked till after Slate Creek was taken up, for no one suspected that its gold-bearing gravels were more valuable than those of the main stream, as later turned out to be true. There were originally eight 600-foot claims on the stream, but only seven are now held. As described by Mendenhall:

The bedrock floor of the gulch is sheeted with coarse gravel to a depth of from 4 to 8 feet. This gravel is derived principally from the slate country rock and its diabasic and "bird's-eye porphyry" intrusives, but contains also noticeable percentages of granitic cobbles derived from the "round wash" which covers the surrounding hills. The gold is reputed to be generally distributed horizontally across the gulch, without definite pay streaks, but vertically it exhibits the usual concentration near bedrock. Ill-defined benches exist on either side of Miller Gulch at 100 or 200 feet above creek level. They are reported to prospect well, but are not now (1902) worked for lack of water. Their origin is probably connected with the glacial history of the region.

The gold of the gulch is usually flat and is attached to quartz or country rock. It occurs in nuggets, the largest of these reported so far being 1 ounce. One ounce nuggets are not at all rare. The gold is found toward the head of the gulch, whence most of it is derived. Its assay value is said to be about \$18 per ounce.

Small copper nuggets, bits of cinnabar, magenta and silver-white fragment of osmiridium are found in sluice boxes.

Less mining was carried on in Miller Gulch the previous year since work began there. The cause was the exhaustion of gold-bearing gravels, but the lack of work in order to avoid covering unworked gravels with tailings. The water supply of Miller Gulch operations is small, so that it has been necessary for the principal claim owners to use it in alternate years. The bed of the gulch has been worked on benches and bench gravels that will be exploited as long as they can be used for dumping.

## SLATE CREEK.

Slate Creek, as previously stated, joins the main stream a distance below the glacier and is approximated by the channel marks the boundary between the older and younger formations, but the bedrock also includes the beds with which coal is associated. The older formations of Slate Creek are to a considerable extent intimately connected with the glaciation to which the region has been subjected.

During the recent glaciation of the region the channel was disturbed, and in this disturbance the channel was modified. Two shafts sunk during the last two years on Slate Creek, opposite Chisna Pass, reached rock at a distance that is, at from 40 to 55 feet below bedrock level. At a distance of 100 yards away, a difference probably attributable to the filling of the creek during the late occupancy of the valley.

It is to be noted in this connection that if the waters of Slate Creek would advance slightly the waters of Slate Creek would flow over the Chisna divide, thus reproducing a condition which prevailed in the recent geologic past.

Difficulty is also encountered in the attempt to mine immediately above the mouth of Miller Gulch. This is due more to the filling from a tributary stream which flows into the Slate Creek bottoms than to any extensive erosion action.

In that part of the upper Slate Creek channel where the gravels are from 4 to 10 feet in depth the average value of the district, \$10 to \$15 per day, is obtained on one or two of the claims just below Miller Gulch. These claims are worked at a profit, but the other workings of the district, like those on the upper, are erratic. \* \* \*

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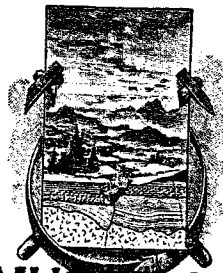
BULLETIN 417

MINERAL RESOURCES  
OF THE  
NABESNA-WHITE RIVER DISTRICT  
ALASKA

BY  
F. H. MOFFIT AND ADOLPH KNOPF

WITH  
A SECTION ON THE QUATERNARY

BY  
S. R. CAPPS



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## TRAILS AND TRANSPORTATION.

The Nabesna-White River region may be approached from any one of three directions—from the northwest, the east, or the southwest. (See fig. 1.)

Travelers bound for Nabesna River usually follow a trail that leaves the government military trail from Valdez to Eagle near the mouth of Slana River. This trail ascends Copper River to Batzulnetas, whence it continues southeastward to the heads of Jack and Platinum creeks, either of which streams leads directly to Nabesna River, although Platinum Creek offers the better route for summer travel. After leaving Batzulnetas the trail bears to the east and traverses the ridge northeast of Tanada Creek. This portion of it may be hard to pick up, but when once found it can be followed with scarcely any difficulty except that in places it is exceedingly swampy, though possibly no worse than some stretches of the military trail between Tonsina and Copper Center or between the Gakona and Chistochina. The distance from Slana River to "Sargent's cabin," on Nabesna River at the mouth of Camp Creek, is approximately 40 miles by way of Platinum Creek and a few miles farther by way Jack Creek.

The customary route of travel for prospectors entering the White River Valley is either through Canadian territory from the Yukon or, less commonly, over Skolai Pass from the Chitina Valley on the southwest. There is a choice of two Canadian routes, depending on the means of transportation it is desired to use. One may either ascend White River in a small boat or follow the overland trail from White Horse, by way of Kluane Lake. The trail from White Horse is probably the easiest and best way of reaching either the White or the Nabesna with stock in summer if ease of traveling only is considered. A wagon road extends from White Horse to Kluane Lake, a distance of 142 miles, and thence a good trail, approximately 120 miles long, leads to Canyon City, on the north side of White River a few miles below the boundary line. Many prospectors bring supplies up White River from Dawson in small boats, and most of them leave the country by boat or by raft in the fall, since it affords them an easy and quick method of reaching the Yukon. The distance from Canyon City to the Yukon by river is approximately 150 miles.

The route over Skolai Pass from the Chitina Valley is difficult for horses and is not frequently traveled. It is used by a few prospectors who have claims in both the Chitina and White valleys, and who cross over from the south to do assessment work. During the earlier days of its use the western end of this trail crossed Nizina Glacier from a point on the west side about 4 miles above the head of Nizina River to the mouth of Skolai Creek, whose north bank it followed

eastward to the pass. The trail for Nizina Glacier is so trail impassable, and though horses can be taken around the east side of the glacier by Nizina Glacier. It has been undertaken but a few times.

Travelers from the Chitina Valley to its head and go over a broad plateau to the foot of Russell Glacier. It can be crossed in order to reach the head of the river.

In 1891, when Hayes and his party crossed the face of Russell Glacier slope to the west of Skolai Creek, and no difficulty was experienced, but in 1908 the glacier's edge was high at its lowest point, and it was impossible to cross. (See Pl. IV, B.) From six miles above the glacier, and the whole of the river can be traversed in one day. Ordinarily, however, the glacier makes the trip. The Chitina is a heavily loaded horses.

The trail from Nabesna River to the Yukon is clearly understood on reference to the depression between the White River and the valleys of Cooper and Platinum creeks. The distance is about 40 miles. Travelers are encountered. Both the valleys of White River afford an easy and the boundary line. It is experienced in fording the river is favorable, but there are times when it is dangerous, if not impossible.

Supplies required for use of the river should be taken in over the trail and shipped them up White River. Supplies for White River are brought from Valdez. White buy their provisions from Dawson. They then up the river in the spring either from Valdez to Nabesna. Canyon City is probably not less difficult conditions, and may be crossed.

Climatic conditions in the interior of central Alaska as modified by the nature of the country. The

## SPORTATION.

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eastward to the pass. The trail along Skolai Creek is not now used, for Nizina Glacier is so traversed by crevasses as to be practically impassable, and though horses have been taken high on the mountain around the east side of the small lake formed by the damming of Skolai Creek by Nizina Glacier, the climb is so difficult that it has been undertaken but a few times.

Travelers from the Chitina Valley now ascend Chitistone River to its head and go over a broad, high pass with abrupt northern descent to the foot of Russell Glacier, which occupies Skolai Pass and must be crossed in order to reach the White.

In 1891, when Hayes and Schwatka crossed Skolai Pass, the surface of Russell Glacier sloped smoothly down to the gravel flats of Skolai Creek, and no difficulty was encountered in leaving the ice, but in 1908 the glacier's edge was a wall of ice not less than 25 feet high at its lowest point, and two or three times that in many places. (See Pl. IV, B.) From six to eight hours' time is required to cross the glacier, and the whole distance from Chitistone River to White River can be traversed in one day by those familiar with the route. Ordinarily, however, the greater part of two days' time is required to make the trip. The Chitistone trail should not be attempted with heavily loaded horses.

The trail from Nabesna River to White River, whose course will be clearly understood on reference to the map (Pl. I or II), lies in the depression between the Wrangell and Nutzotin mountains and follows the valleys of Cooper, Notch (or Trail), Gehoenda, and Solo creeks. The distance is about 60 miles, and no great obstacles to travel are encountered. Beyond Solo Creek the gravel bars south of White River afford an easy means of travel between Solo cabin and the boundary line. During August, 1908, no difficulty was experienced in fording the river with horses at any point that looked favorable, but there are times when crossing is difficult and dangerous, if not impossible.

Supplies required for use in the Nabesna-White River region should be taken in over the snow in winter unless it is intended to ship them up White River in boats. Supplies used on Nabesna River are brought from Valdez, but most of the prospectors on the White buy their provisions and equipment in Dawson and bring them up the river in the spring. The cost of winter freighting (1908) either from Valdez to Nabesna River or from White Horse to Canyon City is probably not less than 35 cents a pound under favorable conditions, and may be considerably higher.

## CLIMATE.

Climatic conditions in the Nabesna-White River region are those of central Alaska as modified by the altitude and the mountainous nature of the country. The region is separated from the Pacific by a



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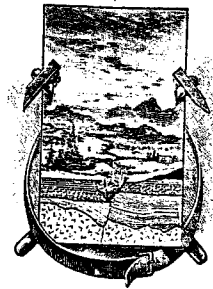
GEOLOGY AND MINERAL RESOURCES  
OF THE  
NIZINA DISTRICT, ALASKA

*Property of the  
University of Alaska*

BY

FRED H. MOFFIT  
AND  
STEPHEN R. CAPPS

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1911

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little value for lumber. A heavy growth of alders is usually found about timber line. Willows are present in the valleys, but are far less abundant in variety and amount than in northern Alaska. The "devilclub," so troublesome in the coast region, is found occasionally in the Nizina district also.

#### POPULATION.

During the early days of the Nizina gold excitement the white population of the district amounted to several hundred persons, but this number quickly decreased, as is usual in such stampedes. There are no accurate records of the number of early comers. Some of them were of the "hanger-on" class and stayed only long enough to learn that the district had little to offer them. The later population has been a variable one, but for the last two or three years it probably has not been far from 100. Most of this number were employed in the gold placers of Chititu and Dan creeks and the rest were prospecting for copper. With the completion of the railroad and the beginning of mining at Kennicott and the increased activity in the gold-producing streams that will come with better transportation the white population will increase. There is no permanent native population. Nizina River valley was the hunting ground of Chief Nikolai, and his house was near the mouth of Dan Creek, but since his death several years ago superstition has kept his followers from returning there until within the last two summers. The permanent dwellings of the Indians are on Copper River, where they spend most of the winter and where they fish in summer. It seems to have been the custom of many to leave the fishing ground only during the time of the fall hunting or in the trapping season.

#### TRANSPORTATION.

To provide satisfactory means and routes of transportation has been from the beginning the most serious difficulty the prospectors in Chitina Valley have had to meet. Up to the present time all supplies and equipment for the Nizina district have been brought from Valdez in winter by sled. The route usually followed in freighting is from Valdez to Tonsina over the Government trail, then by way of Tonsina, Copper, Chitina, and Nazina rivers to the destination. Occasionally, however, this route has been varied by crossing Marshall Pass at the head of Lowe River and following Tasnuna and Copper rivers to the mouth of the Chitina; but this latter route was given up because of the difficulties encountered on Tasnuna River and of the fact that the Government trail to Fairbanks is kept open all winter by the regular travel. The great advantage of the route lay in the ability to haul very heavy loads on the

smooth ice of Copper River, thus saving great items of expense, on this probably would have been used exclusively in Chitina Valley if a good trail down Tasnuna River were available for travel.

The time consumed in carrying supplies to the Nizina district is from two to three weeks, depending on the size of the outfit and the weather. A lower figure of cost is an exception, but any other than the most favorable cost of 10 cents per pound is an average cost for a trail that is good.

Summer travel is over a route that is open in winter. The summer trail leaves Tonsina and crosses Copper River at the mouth of the river, there it passes to the north side of Chitina and crosses by way of Kuskalana River and the mouth of July passes to Kennicott Glacier and on the summer trail, but the mail goes

Within the Nizina district trails are not numerous, enable the miners to travel from one place to another, although there is little communication during the working season. The trails are not shown on a map and need not be described in detail, but that over Sourdough Hill from McCook Creek to the mouth of the Chitina is the best. Because it is less swampy, it is the most direct to the lower trail around the west side of the mountain, steep and the climb is hard. One of the greatest necessities of fording Nizina River is at a point several miles below the present trail, which can be carried out in the near future.

It is seen from the figures previously given that transportation is a heavy tax on all work done in the Nizina. This expense has not only hindered the development, but has delayed the installation of placer mining. The expense will be much lightened in a short time when communication with the coast is provided by the construction work on the Copper River and the trail commenced under the present management. Since that time has been pushed as rapidly as possible. In 1908 the tracks were advanced from Fairbanks to miles of Abercrombie Rapids, although the trail on Copper River was not erected till 1909. The piers for a second bridge, at the

growth of alders is usually found present in the valleys, but are far more abundant than in northern Alaska. The coast region, is found occasionally

#### POPULATION.

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#### TRANSPORTATION.

Means and routes of transportation has been the most serious difficulty the prospectors have to meet. Up to the present time all goods in the Nizina district have been brought to the coast. The route usually followed in the Nizina district is over the Government trail, then down the Chitina and Nazina rivers to the destination. This route has been varied by crossing the mouth of Lowe River and following Tasnuna River to the Chitina; but this latter route is abandoned on account of the difficulties encountered on Tasnuna River. The Government trail to Fairbanks is used for regular travel. The great advantage of this route is to haul very heavy loads on the

smooth ice of Copper River, thus saving time and horse feed, the two great items of expense, on this part of the trip. This route probably would have been used exclusively for freighting to Chitina Valley if a good trail down Tasnuna River had been available for travel.

The time consumed in carrying large outfits from Valdez to the Nizina district is from two to three months. The cost of freighting has varied from slightly less than 7 cents to 30 cents per pound, depending on the size of the outfit and the condition of the trail. The lower figure of cost is an exceptional one and is not possible under any other than the most favorable conditions. Probably about 10 cents per pound is an average cost for the larger companies when the trail is good.

Summer travel is over a route different from that followed in winter. The summer trail leaves the Government trail at Tonsina and crosses Copper River at the mouth of Tonsina River. From there it passes to the north side of Chitina Valley, entering the mountains by way of Kuskalana River and crossing Kuskalana and Fourth of July passes to Kennicott Glacier and River. No freighting is done on the summer trail, but the mail goes in over it twice each month.

Within the Nizina district trails connect the various camps and enable the miners to travel from one to another without serious difficulty, although there is little communication between them during the working season. The trails are all shown on the topographic map and need not be described in detail. The one most traveled is that over Sourdough Hill from McCarthy Creek to Chititu and Dan creeks. Because it is less swampy, it is used by many in preference to the lower trail around the west end of the hill, but the hill is steep and the climb is hard. One great difficulty with this trail is the necessity of fording Nizina River. A proposal to bridge the river at a point several miles below the present fording place will probably be carried out in the near future.

It is seen from the figures previously given that the cost of transportation is a heavy tax on all work done in the Nizina district. This expense has not only hindered copper prospecting but has delayed the installation of placer mining machinery also. This burden will be much lightened in a short time, however, for railroad communication with the coast is promised early in 1911. Construction work on the Copper River and Northwestern Railway was commenced under the present management at Cordova in 1908 and since that time has been pushed as rapidly as conditions permitted. In 1908 the tracks were advanced from Cordova to within 10 or 12 miles of Abercrombie Rapids, although the lower steel bridge over Copper River was not erected till the following spring. In 1909 the piers for a second bridge, at the river crossing between Childs

Glacier and Miles Glacier Lake, were built and the tracks were advanced to Tiekel River. With the completion of this part of the road most of the slow and difficult work was ended and there remained only 90 miles of track construction to reach Kennicott. This includes a third bridge over Copper River, between the mouths of Chitina and Kotsina rivers, where it is proposed to place a temporary pile bridge while the construction of piers for the permanent bridge is going on. The building of the railroad has not involved any unusually difficult construction problems for modern railroad engineering, and the greatest obstacles to operation will doubtless arise from weather conditions. Along Copper River the tracks are particularly exposed to obstruction by snowslides, and adequate provision for their protection will have to be made. Above Abercrombie Rapids the tracks follow the river bank on the debris-covered edge of Baird Glacier. The ice is overlain by a thin coating of loose rock and is overgrown with alders. It appears to have no motion, but it is probable that more or less melting goes on and that the tracks will require more attention and repair than in other places. Some have expressed uncertainty concerning the effect of the terrible winter winds that sweep down the lower part of Copper River valley and have even predicted that they would prevent the running of trains, but such difficulties have been overcome elsewhere and probably will be here. Railroad communication with the coast promises greater aid in the development of the Copper River valley than any other single enterprise yet undertaken.

### TOPOGRAPHY.

#### RELIEF.

The Nizina district has been described as situated at the southeastern border of the Wrangell Mountains, in the region where this group merges into the Coast Range Mountains to the east and south. The mapped area does not extend far enough north or east to take in any of the larger snow fields or glaciers or to include the highest mountains of the Wrangell group or Coast Range, although peaks of 7,000 or 8,000 feet are shown. To the southeast is the broad lowland formed by the junction of Chitina and Nizina valleys. The map (Pl. II, in pocket) shows as the major features of relief two mountain areas separated by the valley of Nizina River, but other topographic forms are even as striking as these, particularly the steep, straight valley walls, the deep gulches tributary to Young Creek, and the peculiar wormlike rock glaciers.

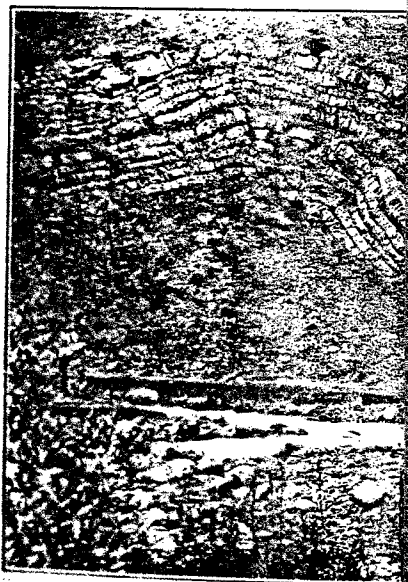
Three geologic elements are involved in the relief—the high mountain masses, the gravel-covered lowlands, and the gravel benches or terraces. Glacial erosion and the character of the rock formation have

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4. TALUS CONES ON EAST SIDE OF McCAR

See p



5. FOLDED TRIASSIC LIMESTONE AND SHALE

See p

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DEPARTMENT OF THE INTERIOR  
UNITED STATES GEOLOGICAL SURVEY

GEORGE OTIS SMITH, DIRECTOR

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BULLETIN 467  
—

GEOLOGY AND MINERAL RESOURCES  
OF PARTS OF THE  
ALASKA PENINSULA

BY

WALLACE W. ATWOOD



WASHINGTON  
GOVERNMENT PRINTING OFFICE

1911

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## TRANSPORTATION.

At present there is but one regular passenger steamer that visits the ports southwest of Cook Inlet and west of Kodiak. This steamer, which makes one trip a month, connects with regular steamers from Seattle at Seward, and on its westward journey calls at Seldovia and Kodiak before leaving for ports on the peninsula. Private yachts or launches may sometimes be chartered at Seward or Kodiak for the journey west to points on the peninsula or neighboring islands. There is occasionally an opportunity to go direct from Seattle to Dutch Harbor or Unalaska on a steamer bound for Nome, and to make connections at either of those ports for points on the peninsula.

Travel from point to point in the western part of the region is most convenient by means of coasting vessels or other small boats. The large bays, several of which reach well into the central portion of the peninsula, make it possible to go by water to within a few miles of almost any point in the western part of the area. In the north-eastern portion the routes of travel are largely determined by the drainage lines, and advantage is usually taken of the large lakes to reach points in this part of the peninsula. It is not difficult to go on foot over the greater part of the peninsula, but a few of the higher peaks are rugged and to climb to their summits would demand some skill. The lower slopes are gentle and their clothing of mosses and grasses helps to make travel over them relatively easy. It would be possible to work with a pack train over much of this country. Horses are now in use over the trail from Balboa to Herendeen Bay, and these horses have traveled over many of the hills in the Herendeen Bay coal field.

There are good harbors at Hook Bay (Pl. XIII, A, p. 108), at Anchorage Bay (Pl. XI, B, p. 86), an arm of Chignik Bay, and in Balboa Bay, near Sand Point. Small harbors are numerous. Prospect Bay, a few miles west of Chignik Bay, offers shelter behind a small hook (fig. 18, p. 129) for a large vessel or for several small boats. Harbor conditions at Unga (Pl. XI, A, p. 86) are favorable except during southeast storms. Baralof and Coal harbors, on Unga Island, furnish good shelter and good anchorage. Herendeen Bay may be entered by small ocean-going vessels, and anchorage conditions near the head of the bay are good. Port Moller is so shallow that most of the bottom is exposed at low tide.

The peninsula is often crossed from Portage Bay to Ugashik, part of the route being by water, and may be crossed from Katmai by way of Naknek Lake to Naknek, or from Cold Bay by way of Becharof Lake to Ugaguk. There is a route across the peninsula from the head of Chignik Bay, by way of the Chignik Lakes and a short portage, to the drainage of the north side of the peninsula. The head of Port

## AGE AND SUCCESSI

Moller is but 8 miles away, and Herendeen Bay by a trail leading to Balboa Bay there is a good trail a distance of 9 miles over a pass above which may be crossed in almost any season. The valleys make travel from one part to another very easy.

## GEOLOGICAL

## GENERAL

## AGE AND SUCCESSI

The geologic history of the Alaska Peninsula is limited to Mesozoic and Cenozoic rocks in the northwestern part of the province. The rocks of the Upper Jurassic age, however, are known to be pre-Triassic in age. Sedimentation has been going on since the beginning of the great geologic epoch of the Pliocene and the Oligocene. There is one locality. Large areas of the province consist of the Middle Jurassic, the Lower Cretaceous and the Upper Cretaceous. There are also Eocene, possibly so. Eocene sediments in the province at present time there have been numerous volcanoes on the peninsula, and a portion of the volcanoes is possibly of Pliocene age. This epoch is represented by morainic clays, sands, clays, and gravels. Since that time there has been an accumulation of alluvium along the shores, and at the heads of the bays. Sedimentation has not, however, taken place on the peninsula from the beginning of the Miocene epoch, nor is it yet known during that time in any one part of the province. The geologic record is broken at many points which record periods when this land was above sea level and was subject to the activities of the agents of weathering. The general succession of rocks is given in the following table:

## TRANSPORTATION.

One regular passenger steamer that visits Hook Inlet and west of Kodiak. This steamer, in the month, connects with regular steamers from the north, and its westward journey calls at Seldovia and other ports on the peninsula. Private yachts may be chartered at Seward or Kodiak for excursions on the peninsula or neighboring islands. There is an opportunity to go direct from Seattle to Seward on a steamer bound for Nome, and to make calls at these ports for points on the peninsula.

A point in the western part of the region is reached by means of coasting vessels or other small boats, which reach well into the central portion of the peninsula. It is possible to go by water to within a few miles of the western part of the area. In the northwestern part of the area, the stages of travel are largely determined by the distance. The stage is usually taken of the large lakes to the west of the peninsula. It is not difficult to go to the west part of the peninsula, but a few of the higher mountains to their summits would demand some effort. The hills are gentle and their clothing of mosses and lichen makes travel over them relatively easy. It would be possible to take a pack train over much of this country. Horses and pack animals can be used from Balboa to Herendeen Bay, and over many of the hills in the Herendeen

Hook Bay (Pl. XIII, A, p. 108), at Anchor Point, in the northern arm of Chignik Bay, and in Balboa Bay, where harbors are numerous. Prospect Bay, a small bay, offers shelter behind a small hook for a vessel or for several small boats. Harbor at Chignik (Pl. I, A, p. 86) are favorable except during winter. Coal harbors, on Unga Island, furnish good anchorage. Herendeen Bay may be used for coasting vessels, and anchorage conditions are good. Port Moller is so shallow that it is unusable at low tide.

It may be crossed from Portage Bay to Ugashik, partly by water, and may be crossed from Katmai by a trail leading over the Chignik, or from Cold Bay by way of Becharof. There is a route across the peninsula from the west to the east of the Chignik Lakes and a short portage, on the west side of the peninsula. The head of Port

Moller is but 8 miles away, and may be reached from a point in Stepovak Bay by a trail leading over a low pass. From the head of Balboa Bay there is a good trail to the head of Herendeen Bay, a distance of 9 miles over a pass about 400 feet above sea level. Unga Island may be crossed in almost any direction on foot. Broad, open valleys make travel from one part of the island to another relatively easy.

## GEOLOGY.

## GENERAL FEATURES.

## AGE AND SUCCESSION OF THE ROCKS.

The geologic history of the Alaska Peninsula, so far as it has been determined, is limited to Mesozoic and Cenozoic times. Some granitic rocks in the northwestern portion of the province are known to be of pre-Upper Jurassic age, but no rocks on the peninsula are definitely known to be pre-Triassic. Since the opening of Mesozoic time sedimentation has been going on in some portion of the peninsula during each of the great geologic epochs, with the possible exception of the Pliocene and the Oligocene. The Triassic is represented in at least one locality. Large areas of Jurassic sediments represent at least portions of the Middle Jurassic and the Upper Jurassic series. The Lower Cretaceous and the Upper Cretaceous are represented. There are also Eocene, possibly some Oligocene, and certainly some Miocene sediments in the province. From the Eocene epoch to the present time there have been numerous volcanic outbursts at various places on the peninsula, and a portion of the material ejected from these volcanoes is possibly of Pliocene age. The Pleistocene or glacial epoch is represented by morainic deposits and some unconsolidated sands, clays, and gravels. Since the close of Pleistocene time there has been an accumulation of alluvial deposits in the valley bottoms, along the shores, and at the heads of the bays.

Sedimentation has not, however, gone on continuously throughout the peninsula from the beginning of the Mesozoic era to the close of the Miocene epoch, nor is it yet known to have gone on continuously during that time in any one portion of the peninsula. The sedimentary record is broken at many places by great unconformities which record periods when this land, or at least a part of it, stood above sea level and was subject to degradation, suffering from the activities of the agents of weathering and erosion just as does the land that rises above the sea level to-day.

The general succession of rocks in the province is shown in the following table:

DEPARTMENT OF THE INTERIOR  
UNITED STATES GEOLOGICAL SURVEY  
GEORGE OTIS SMITH, DIRECTOR

BULLETIN 480

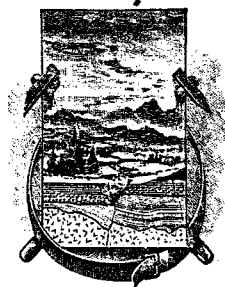
# MINERAL RESOURCES OF ALASKA

REPORT ON PROGRESS OF  
INVESTIGATIONS IN

1910

BY

ALFRED H. BROOKS AND OTHERS



WASHINGTON  
GOVERNMENT PRINTING OFFICE  
1911



## THE UPPER SUSITNA AND CHISTOCHINA DISTRICTS.<sup>1</sup>

By FRED H. MOFFIT.

### INTRODUCTION.

A topographic reconnaissance survey of that part of the south slope of the Alaska Range and the adjacent lowlands between the latitudes of Delta River and a point a few miles west of Mentasta Pass was made by T. G. Gerdine in 1902. At the same time the geology of this region, which includes the placer gold deposits of Chistochina River, was studied by Mendenhall.<sup>2</sup> This paper describes the continuation of that work in 1910. An account of the field work on which it is based is given on page 10.

The descriptions that follow deal principally with the two placer gold fields commonly known in the Copper River region by the names of their most important gold-producing creeks—Valdez Creek and Slate Creek. These two fields lie in the foothills on the south side of the Alaska Range. They are about 75 miles apart and are associated here because of their geographic position and the fact that they were visited in the course of the same summer's work rather than because of similarity or relationship between them. The two districts are represented in Plate VII (p. 114).

Valdez Creek is a tributary of Susitna River from the east and joins it a little more than 15 miles south of the nearest of the several glaciers from which the Susitna rises. Slate Creek, on the other hand, is a tributary of Chistochina River, which in turn is a northern branch of Copper River and is one of the three largest streams draining that part of the Alaska Range included within the Copper River basin. Both districts lie within the foothills of the Alaska Range, and their principal gold-producing streams are just above timber line—that is, between 2,500 and 3,000 feet above sea level. Fortunately, however, they are so near timber that the supply needed for fuel and for mining is procured with little difficulty.

<sup>1</sup> This paper is a preliminary statement of the results of a geologic reconnaissance by the writer and R. L. Johnson in the upper Susitna and Chistochina districts in 1910; it will be followed at a later date by a more extended account of the upper Susitna district.

<sup>2</sup> Mendenhall, W. C., Geology of the central Copper River region, Alaska: Prof. Paper U. S. Geol. Survey No. 41, 1905.

## THE UPPER SUSITNA

The nearest shipping point which is about 130 miles almost between Valdez and Slate creeks. These two districts all supplies brought in over the military trail for both districts passes over the trail but at that point the winter trails of Slate Creek are taken up Gulkana River a low divide leading to Maclaren and the Maclaren to the Susitna and these trails will be described in Slate Creek.

From Gulkana supplies for Slate Creek and the Chistochina to the camp. These two winter trails will be described on map (Pl. VII).

The military trail, which for 12 miles to the Copper River valley, has been possible at the end of the summer through to Fairbanks from Valdez benefit to all the region in touch with the Alaska Road Commission and much credit for what they have done a great deal to be done in the region those who have traveled over the trail fail to appreciate the progress that has been cut through from Willow Center on the military road, to the Northwestern Railway at the mouth of the bridge over Tonsina River is on the coast and the upper Copper River it has been. This road will undoubtedly be away from Valdez but will avoid the Thompson Pass in the region.

In the matter of mail communication the Chistochina region is more fortunate than the last post office south of the Alaska Range out of Valdez, but a second mail route (near the mouth of Chisna River) is in operation in the summer of 1910 had been established. There was a mail route and Valdez Creek. The miners of the region letters and a limited number of private messenger who was paid by private



x Gold placer

Scale  $\frac{1}{750000}$   
 5 0 5 10 15 20 25 Miles

1911

SKETCH MAP OF UPPER SUSITNA AND CHISTOCHINA RIVER BASINS.

## A RECONNAISSANCE OF THE WILLOW CREEK GOLD REGION.

By FRANK J. KATZ.

### INTRODUCTION.

Placer prospects were found in the Willow Creek region in 1898. Up to 1906 efforts seem to have been directed mainly to the development of the placers of Grubstake Gulch and Willow Creek. So far as the writer has been able to find out the first quartz-lode location was made in 1906 on the ridge between Willow Creek and Fishhook Creek. This was followed in 1907 by other locations on Fishhook and Willow creeks. In 1908 the field was extended on the west by locations on Craigie Creek, and in 1909 by locations to the north and east of Fishhook Creek, around the head basins of Archangel Creek, and on the mountain between that creek and Little Susitna River. Altogether some 60 claims are being developed and several other prospects have been located.

In September, 1906, Paige and Sargent, of the Geological Survey, visited Willow Creek in the course of a general reconnaissance of the Talkeetna region. Paige's descriptions of the geology and placer mining were published in 1907.<sup>1</sup> In September, 1910, after finishing the season's work with G. C. Martin in the Matanuska coal field, the writer, accompanied by Theodore Chapin, spent four days in the Willow Creek region. The observations made and the information collected by them are embodied in this report.

### GEOGRAPHY.

*Location and area.*—The Willow Creek gold field is included in an area 10 miles square which lies in about longitude  $149^{\circ} 20'$  west and latitude  $61^{\circ} 50'$  north. It is approximately 20 miles northeast of Knik, a settlement on Knik Arm of Cook Inlet. The field occupies the southwestern part of the Talkeetna Range.

<sup>1</sup> Paige, Sidney, and Knopf, Adolph. Reconnaissance in the Matanuska and Talkeetna basins, with notes on the placers of the adjacent region: Bull. U. S. Geol. Survey No. 314, 1907, pp. 104-125; Geologic reconnaissance in the Matanuska and Talkeetna basins, Alaska: Bull. U. S. Geol. Survey No. 327, 1907.

comprises the divide between Willow Creek and is divided. The northern part is a high, rugged ridge, called Bald Mountain, and is sometimes locally known as Bald Mountain. It radiates the headwaters of Little Susitna River. The southern part is a less rugged ridge, called Fair Angel, and is the source of Willow Creek and

Fishhook Creek, Craigie Creek, and "Wet Gulch" flow west, south of Willow Creek. Fair Angel is a low mountain and flows into Little Susitna River. Little Susitna River flows from the northern part of the region to the base of Bald Mountain. The southern part of the district are Fair Angel Creek, which are tributary to Wet Gulch, tributary to Little Susitna River. The northern part of the river it forks. The southern part of the eastern as Fair Angel Creek, which are tributary to Wet Gulch, tributary to Little Susitna River. The southern part of the river it forks. The southern part of the eastern as Fair Angel Creek, which are tributary to Wet Gulch, tributary to Little Susitna River.

The southern part of the district are Fair Angel Creek, which are tributary to Wet Gulch, tributary to Little Susitna River. The southern part of the river it forks. The southern part of the eastern as Fair Angel Creek, which are tributary to Wet Gulch, tributary to Little Susitna River. The southern part of the river it forks. The southern part of the eastern as Fair Angel Creek, which are tributary to Wet Gulch, tributary to Little Susitna River. The southern part of the river it forks. The southern part of the eastern as Fair Angel Creek, which are tributary to Wet Gulch, tributary to Little Susitna River.

low, high, and rugged, the head cirques are very

important streams besides the in Grubstake Gulch these gulches are gla-

ciated basins about 3 miles long, heading against the north side of the summit of Bald Mountain. There are four minor streams on the north side and a dozen or more small gulches on the south side of this ridge.

*Climate.*—There are no recorded observations on the climate of Willow Creek region. It may be said, however, that conditions are in general the same as in the lower Matanuska<sup>1</sup> and Susitna basins, with perhaps a slightly heavier precipitation and shorter summer. In 1910 snow lay on some of the prospects at high altitudes, delaying development work until August.

*Water supply.*—There is little perennial snow in the district, yet considerable ice persists in the broken rock and talus of the higher mountains. From these sources the streams in the northern part of the region were kept high enough during the dry 1910 season to run such small mills as have been erected. Craigie, Willow, Fishhook, and Fair Angel creeks appear to have during the summer sufficient volume and fall to run prospecting and small development mills for the claims located on them. Large power development is possible at the canyon of Little Susitna River, which is less than 10 miles from the farthest prospect.

For the hydraulic placer mining on Grubstake Gulch the creek has in ordinary years furnished ample water, in rainy years more than could be handled, but in an exceptionally dry season it has failed.

*Timber.*—In the Willow Creek basin there are no trees above the mouth of Grubstake Gulch and no good spruce above the mouth of Wet Gulch. On Little Susitna River good spruce is about a mile below the mouth of Fishhook Creek. The lumber supply is plentiful and good in the lower parts of the Willow Creek and Little Susitna River valleys. The heads of the streams at the prospects are devoid of alders and willows. The gold-quartz prospects are 4 to 8 miles from building and mine timbers, and even brush for fuel must be hauled or packed at least half that distance.

The Matanuska coal field, which is 25 to 50 miles by trail from the Willow Creek prospects, has furnished forge coal and is a prospective source of fuel for the region. Lignite is reported nearer by, on lower Willow Creek.

*Routes.*—There are three routes from Knik to the Willow Creek district. One trail which is used only in the winter goes north from Knik around the western end of Bald Mountain to and up Willow Creek. By this route it is about 30 miles to the mouth of Craigie Creek. The old summer trail to Willow Creek takes a northeasterly direction through Cottonwood to Bald Mountain, crosses Bald Mountain at an altitude of 3,400 feet, and goes down Wet Gulch to Willow

<sup>1</sup> Martin, G. C. Reconnaissance of the Matanuska coal field, Alaska, in 1905: Bull. U. S. Geol. Survey No. 239, 1906, pp. 7-8.

Creek. This route is about 26 miles. The third route is a fair wagon road which can be used throughout the year. It leaves the winter trail near Knik and strikes northeasterly across the lowlands to Little Susitna River. It crosses to the west bank and follows up the river to the mouth of Fishhook Creek. The distance is 28 miles. The usual route traveled from Knik to Fishhook Creek in summer follows the old Willow Creek summer trail to the wagon road and then the wagon road. There are trails from Willow Creek at Wet Gulch to and up Craigie Creek, to Grubstake Gulch, and up to the head of Willow Creek. From the head of Willow Creek a trail crosses the divide between Willow and Fishhook creeks through a saddle somewhat lower than 4,000 feet. From the mouth of Fishhook Creek trails lead up Fishhook and to the head of Fair Angel Creek.

#### GEOLOGY.

The distribution of the rocks, which is shown on the accompanying sketch map (fig. 18), may be summarized as follows:

A line drawn west from the pass between Willow and Fishhook creeks and along the north side of Willow Creek marks the contact of a large area of quartz diorite on the north and mica schists on the south. North of Willow Creek the country rock, which is locally called granite, is light colored, of granitic texture, and composed of feldspar (chiefly plagioclase), quartz, hornblende, and biotite. It is uniform in composition and texture. Quartz diorite is scientifically a more accurate name for the rock than granite. There are a very few basaltic (diabase?) and aplitic dikes of small size cutting the quartz diorite. South of the quartz diorite as far as the summit of Bald Mountain and west of Little Susitna River the rocks are thoroughly foliated mica schists. The schistosity has a prevailingly southward dip. Quartz stringers are commonly seen in these schists. On the south flanks of Bald Mountain and the mountain opposite it east of Little Susitna River are Tertiary arkoses, sandstones, and shales. Along the northern limit of the Tertiary area some of the arkoses, which are sedimentary rocks composed of disintegrated granitic material, so closely resemble the granite or diorite adjacent to them that their differentiation in the field requires considerable care. A narrow tongue of granitic rocks appears to lie along the top of Bald Mountain between the Tertiary sediments and the schists. The Tertiary sediments lie unconformably with southerly dip on the quartz diorite east of Little Susitna River and are probably in like relationship on Bald Mountain. The quartz diorite appears to be intrusive into and largely to surround the schists. A small amount of basalt was noticed on the summit of Bald Mountain west of the head of Wet Gulch.

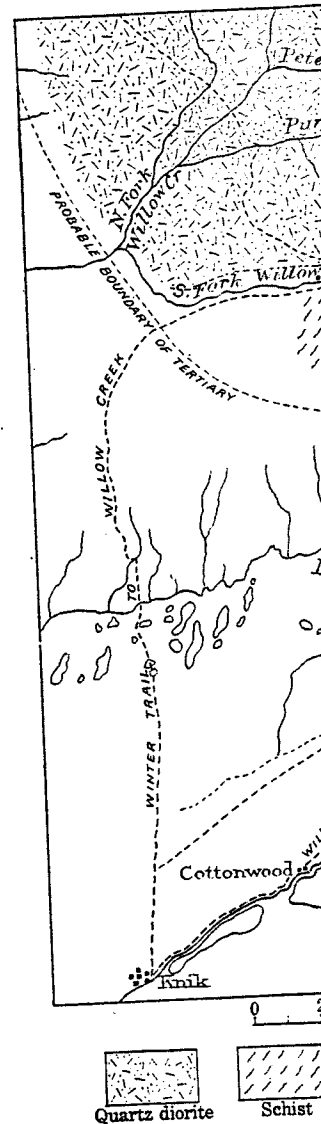


FIGURE 18.—Geol.

1. Gold Bullion Mining Co.
2. Brooklyn Development Co.
3. Gold Quartz Mining Co.
4. Free Gold Mining Co.
5. Matanuska Gold Mining Co.

Recent glacial and stream terraced gravel benches lie along the Little Susitna River.

SKA, 1910.

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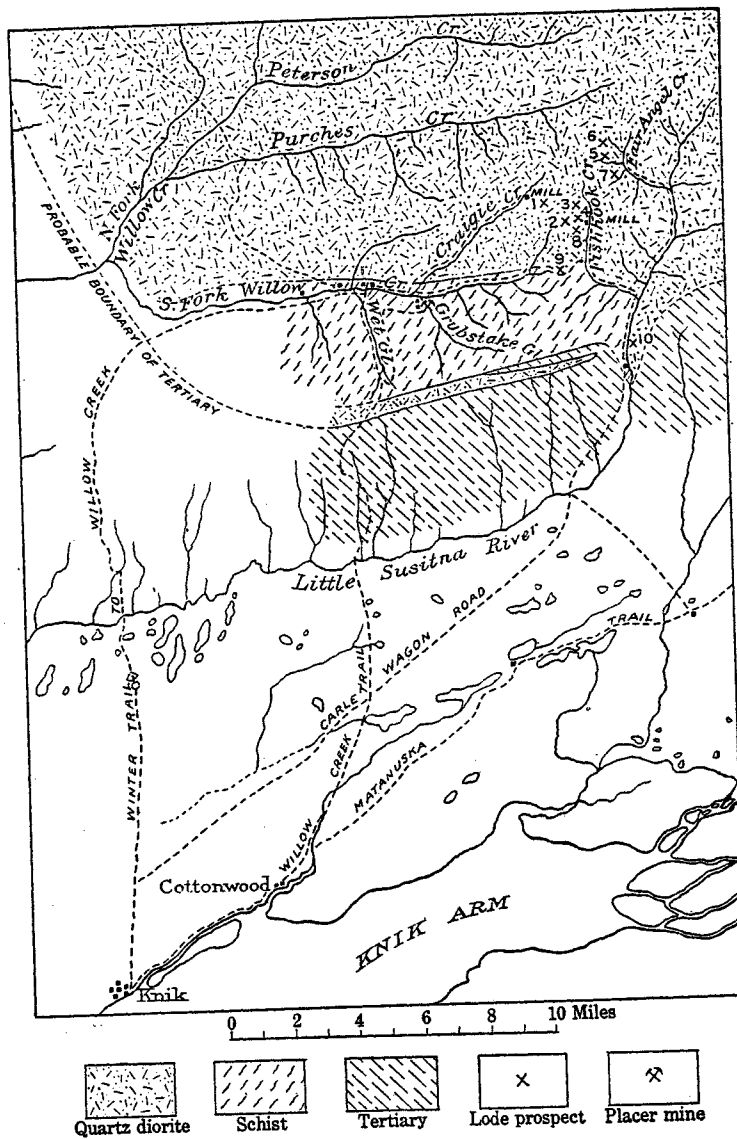


FIGURE 18.—Geologic sketch map of Willow Creek region.

- |                              |                            |
|------------------------------|----------------------------|
| 1. Gold Bullion Mining Co.   | 6. Conroy & Marrion group. |
| 2. Brooklyn Development Co.  | 7. Fiske & Reed group.     |
| 3. Gold Quartz Mining Co.    | 8. Bartholf-Isaacs group.  |
| 4. Free Gold Mining Co.      | 9. Lydell prospect.        |
| 5. Matanuska Gold Mining Co. | 10. Miller prospect.       |

Recent glacial and stream deposits are present in all the valleys. Terraced gravel benches line the lower portions of Willow Creek and Little Susitna River.

# MINERAL RESOURCES OF THE BONNIFIELD REGION.

By STEPHEN R. CAPPS.

## INTRODUCTION.

The region covered by this report lies on the north slope of the Alaska Range between Nenana and Delta rivers, and in a general way is limited on the south by the crest of the range and on the north by the Tanana Flats. It therefore forms a belt about 30 miles wide and 110 miles long, extending from Nenana River eastward to the Delta. That portion between Nenana and Little Delta rivers has been widely known as the Bonnifield region, which is here considered to extend eastward to Delta River. Since the establishment of Fairbanks as an important mining camp the area south of the Tanana has been visited by large numbers of prospectors, and although no strikes of exceptional richness have been made placer gold is widely distributed and has been found in paying quantities on a number of creeks. Further attention has been attracted to this region by the extensive fields of lignite, by reports of large bodies of low-grade gold-bearing ore, and by the possibilities of profitably developing some of the great gravel benches which carry a low content of placer gold.

The western border of this area was visited in 1902 by Alfred H. Brooks<sup>1</sup> and L. M. Prindle, the results of their work being embodied in a report now in press. In 1906 Prindle again visited that part of the area lying between Nenana and Wood rivers, and a brief account of his work has been published.<sup>2</sup> The notes, traverses, and manuscript of both of these investigators have been freely drawn upon by the present writer, who has also been greatly aided by them in personal conferences in the office. The organization of the field party and its itinerary are discussed on page 11 of this volume.

## GENERAL DESCRIPTION OF THE REGION.

### GEOGRAPHIC FEATURES.

The region bounded by Nenana, Tanana, and Delta rivers may be divided into three distinct east-west belts of different topographic character. On the north the Tanana Flats extend from Tanana River to the foothills. As Tanana River makes a broad loop north-

<sup>1</sup> Brooks, A. H., and Prindle, L. M., The Mount McKinley region, Alaska: Prof. Paper U. S. Geol. Survey No. 70, 1911.

<sup>2</sup> Prindle, L. M., Bull. U. S. Geol. Survey No. 314, 1907, pp. 205-226.

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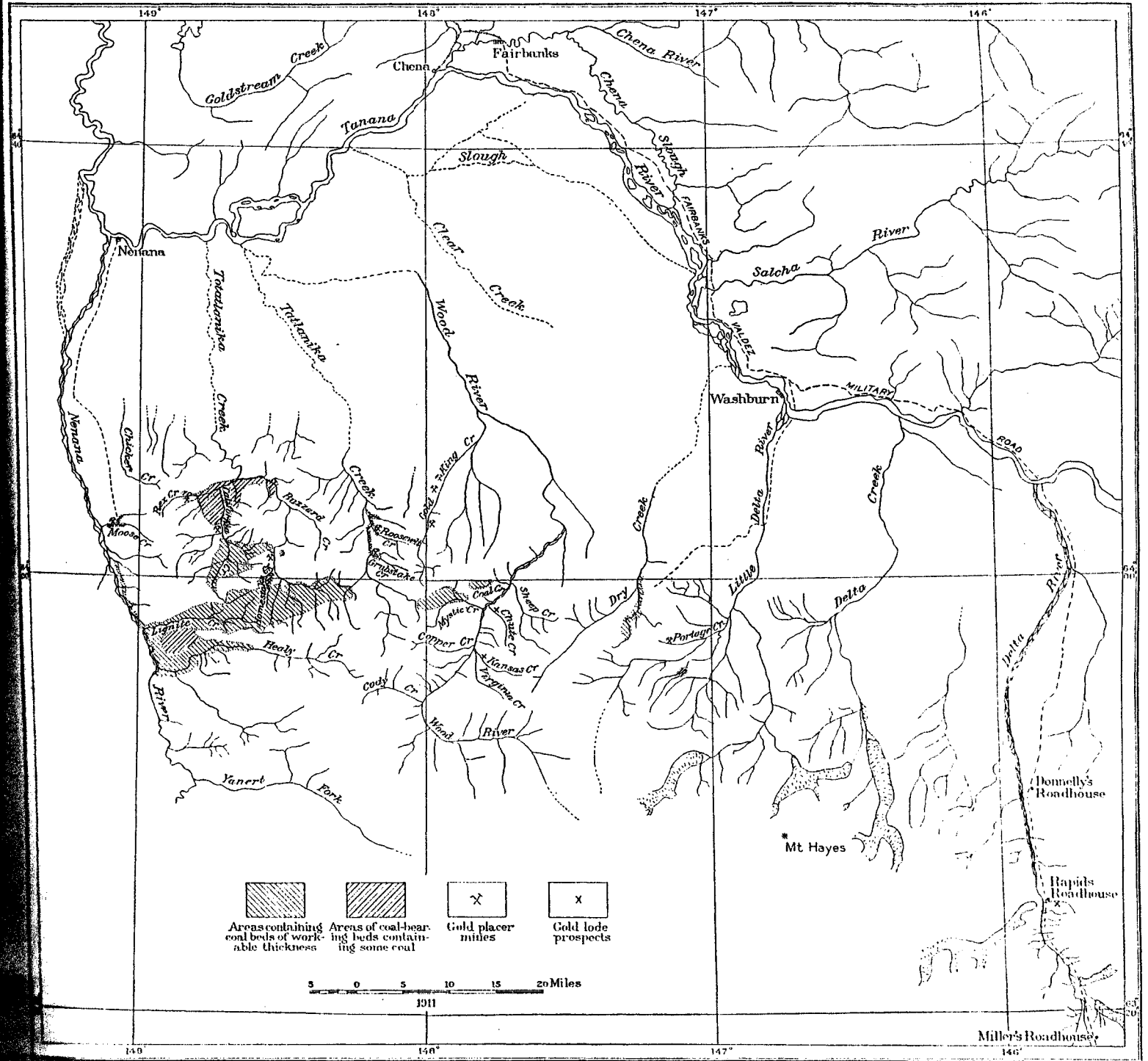
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

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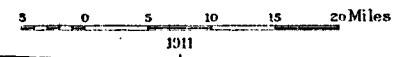
**GEOLOGY.**

nted in the region include an old orphosed sedimentary rocks and hie igneous rocks, both having sives. Each younger deposits of olded beds; high bench gravel ent glacial and alluvial deposits orphosed sediments compose the ntains. They consist for the most rtzites, cherts, and carbonaceous ecks have in places been intruded ties of igneous intrusives have osed with the sediments in an r called the Birch Creek schist. igneous rocks forms the mo. It contains some sedimentary schist series in places show are difficult to establish. Quartz epe, the rock being porphyritic s occurring as conspicuous cr. These spars in places are ov are red with crystals wh

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-   
 Areas containing coal beds of workable thickness
-   
 Areas of coal-bearing beds containing some coal
-   
 Gold placer mines
-   
 Gold lode prospects



Miller's Roadhouse



ALASKA, 1910.

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## THE SHUNGNAC REGION, KOBUK VALLEY.

By PHILIP S. SMITH and HENRY M. EAKIN.

### INTRODUCTION.

In the central part of the Kobuk River basin there is a mineralized area in which placer gold has been mined and copper, gold, lead-silver, and asbestos deposits prospected. These deposits had not been studied by members of the Survey before 1910. The region was the scene of a stampede of gold seekers in 1898, but although a few thousand dollars in gold was produced annually for several years, in 1910 the district was nearly deserted. Many problems of importance both to the prospector and to the geologist still remain to be solved by more careful examination, but until such studies are made it has seemed expedient to set forth the general geologic observations and to point out some of the important subjects that require further investigation.

The region considered in this report lies north of the Arctic Circle, adjacent to the 157th meridian. Particular attention is given to the region between Kogoluktuk River on the east, Shungnak River on the north and west, and the Kobuk on the south. Although this small area is the place where minerals of economic importance have been found and is directly the subject of this report, a somewhat larger region is described in order to show the setting or general relation of this field to the geology and geography of the central part of the Kobuk Valley. A still broader and more comprehensive account of the features of northwestern Alaska is in preparation and will serve to extend the area covered by this more detailed report.<sup>1</sup>

### GEOGRAPHY AND TOPOGRAPHY.

Figure 19 shows the general location of the area, which for convenience will be called the Shungnak region. The settlement from which this name is taken is about 250 miles from the mouth of the Kobuk, measured along the crooked course of the river. Measured

<sup>1</sup> Smith, P. S., Geology and mineral resources of northwestern Alaska: in preparation.



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DEPARTMENT OF THE INTERIOR  
UNITED STATES GEOLOGICAL SURVEY  
GEORGE OTIS SMITH, DIRECTOR

—  
BULLETIN 485  
—

A GEOLOGIC RECONNAISSANCE  
OF THE  
ILIAMNA REGION, ALASKA

BY

G. C. MARTIN AND F. J. KATZ



WASHINGTON  
GOVERNMENT PRINTING OFFICE

1912

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Alaska Expedition, vol. 2, 1902,  
aska Expedition, vol. 2, 1902. pp.  
and Irrigation, vol. 8, No. 2, 1902.  
se of the Alaska Peninsula: North

United States commissioner and a Government school. Three stores are located here. A Government reindeer station has been located at the head of Kakhonak Bay since the spring of 1905. The other villages, which are inhabited permanently only by natives, include Kakhonak, on the south shore of Iliamna Lake 12 miles west of the head of Kakhonak Bay; Newhalen, near the mouth of Newhalen River; Nondalton, on the west shore of Sixmile Lake; and Kaskanak, on Kvichak River, about 10 miles below Iliamna Lake. Iliamna and Nondalton are Kenai villages, the others being Eskimo. The former villages of Chekok and Nihkikak are now abandoned. There are several cabins belonging to prospectors and traders at Iliamna and Cottonwood bays, but these are occupied only when a steamer is expected or when freight is being moved from the coast. Numerous isolated camps and cabins are scattered throughout the district. Most of these were built by prospectors, who have been at work in a small way since 1898 over the greater part of this region and in the adjacent Mulchatna country. The most active of these operations were from 1903 to 1906; they are described under the heading of "Mineral resources."

Dutton post office, which was formerly situated at the head of Cottonwood Bay (the southern arm of Iliamna Bay), is now (1910) abandoned. The entire region is dependent for its summer mail on the accommodation of the postmasters east of Cook Inlet and of the mail clerks and other officers of the steamers calling at Iliamna Bay.<sup>1</sup> Winter mail is received by private delivery from points on the Cold Bay and Nushagak mail route.

The population of the local and neighboring villages according to census reports has been as follows:

Population of native villages.

	Tenth Census, 1880.	Eleventh Census, 1890.
"Chikak" .....	51	Not given.
Iliamna .....	49	76
Kakhonak .....	Not given.	28
Kaskanak .....	119	66
"Kichik" .....	91	Not given.
Koggiung .....	29	133
"Kivichakh" .....	Not given.	37
"Moichatna villages" .....	180	Not given.
"Nihkikak" .....	Not given.	42
"Noghelingamiut" .....	Not given.	16
	519	398

TRANSPORTATION ROUTES.

This region is accessible only by water, there being two well-traveled routes leading to it—one from the east by way of Iliamna Bay and the other from the west by way of Koggiung.

<sup>1</sup> Iliamna post office was established in 1910.

The steamers from Seattle to Prince William Sound and Cook Inlet and also the local steamers from Valdez westward and from Seldovia and Port Graham to the upper Cook Inlet ports will land at Iliamna Bay whenever weather permits and sufficient business warrants it. Iliamna Bay is about a day's sail from Seward or 6 to 12 days from Seattle. There is usually about a boat a month from May to October, inclusive, and occasional boats during the winter.

A good horse trail leads from the head of Iliamna Bay to Iliamna village, a distance of about 12 miles. This trail crosses a 900-foot summit 3 miles west of Iliamna Bay. Another trail leads from the head of Cottonwood Bay to Iliamna village, about 20 miles, crossing three summits at elevations of 1,700, 1,500, and 1,975 feet, at 4, 5½, and 15 miles from Cottonwood Bay, descending to 1,400 and 600 feet between the summits. A good wagon road has been built for the first 2 miles and from the fifth to the fourteenth mile, or as far as the Dutton copper prospects. These trails can usually be used by horses from June 1 to November 1. Dogs are used during the rest of the year.

From Iliamna village all parts of Iliamna Lake and Kvichak River can be reached in boats, there being several large sailboats and a gasoline launch at the village. Horses can also be taken from Iliamna village throughout the greater part of the region, except in the high mountains. The shores of Lake Clark are impassable for horses east of longitude 154° W.

Bristol Bay is visited by cannery vessels about May 1, and by a passenger steamer from Valdez once a month in June, July, August, and September. Part of the supplies for the stores at Iliamna village are brought in by this route, which has the advantage of being all water and avoiding the portage from Iliamna Bay to the village.

Iliamna Lake can also be reached by a portage from the head of Kamishak Bay to the head of Kakhonak Bay. This route is said to be easy, the pass being low. It is, however, not much used except by natives, because of the difficulty of having supplies landed on this uncharted part of the coast.

Many of the supplies for Lake Clark and the Mulchatna country west of it are taken in from Iliamna village by dogs in the winter. Summer transportation to Lake Clark may be accomplished either with horses or by boats to a point on the shore of Iliamna Lake 4 miles east of Newhalen River, by a 5-mile portage from that point to Newhalen River above the lower rapids, and thence by boat up the Newhalen. Native packers are usually available at this portage.

The Mulchatna region can be reached from Lake Clark by boats up Chulitna River to a short portage at the head of Swan River, or up Chulitna and Koksetna rivers to points near the headwaters of other

of the eastern tributaries of the  
It can also be reached by taking l

Railroad surveys for the propo  
made from 1902 to 1908 along a  
Iliamna Bay westward along the t  
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with three Peterborough canoes.  
of Iliamna and Clark lakes, map  
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Comparatively little was kno  
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<sup>1</sup> Petroleum fields of Alaska and the B  
No. 227, 1904, pp. 365-382; The petrolo  
account of the Bering River coal depos  
37-49; Notes on the petroleum fields of  
pp. 128-139.

<sup>2</sup> Mesozoic section on Cook Inlet and  
16, 1905, pp. 291-410.

Prince William Sound and Cook Inlet from Valdez westward and from the upper Cook Inlet ports will land wherever permits and sufficient business can be had. It is usually about a day's sail from Seward or 6 to 8 days usually about a boat a month from occasional boats during the winter. From the head of Iliamna Bay to Iliamna Bay. This trail crosses a 900-foot mountain. Another trail leads from the head of Iliamna Bay to the village, about 20 miles, crossing mountains of 700, 1,500, and 1,975 feet, at 4, 5½, 6, and 7 miles, descending to 1,400 and 600 feet. A wagon road has been built for the first 10 to the fourteenth mile, or as far as the horses can usually be used by the trail. Dogs are used during the rest of the trail.

of Iliamna Lake and Kvichak River. There are being several large sailboats and horses can also be taken from the head of Iliamna Bay to the village. The eastern part of the region, except in the head of Lake Clark are impassable for

by vessels about May 1, and by a trail about a month in June, July, August, and September. It lies for the stores at Iliamna village which has the advantage of being close to the head of Iliamna Bay to the village. It is reached by a portage from the head of Iliamna Bay to the village. This route is said to be the best, however, not much used except in the head of Iliamna Bay of having supplies landed on this

Lake Clark and the Mulchatna country. It is reached from the village by dogs in the winter. It may be accomplished either by a trail on the shore of Iliamna Lake 4 miles from that point to the head of Iliamna Bay, and thence by boat up the head of Iliamna Bay. It is available at this portage. It is reached from Lake Clark by boats up the head of Swan River, or up the head of Iliamna Bay near the headwaters of other

of the eastern tributaries of the Mulchatna. (See fig. 20, p. 131.) It can also be reached by taking horses over this same general route.

Railroad surveys for the proposed Alaska Shortline Railway were made from 1902 to 1908 along a route leading from the head of Iliamna Bay westward along the trail to Iliamna village, around the north shore of Iliamna Lake to Chekok Bay, northwestward to the lower end of Lake Clark, up the Chulitna Valley and across the Mulchatna Valley to the Kuskokwim and Yukon. An attempt was made in 1902 to carry mail and passengers over this route by the Trans-Alaska Co. Several miles of trail and a few cabins were built, but the venture was not a success.

ACCOUNT OF INVESTIGATIONS.

The field work on which this report is based was a combined topographic and geologic reconnaissance by a party of 12 men in charge of D. C. Witherspoon, topographer. The party landed and began work at Iliamna Bay, May 16, 1909. After crossing the mountains to Iliamna village two subparties were organized. One of these, in charge of Mr. Witherspoon, consisted of six men and was equipped with a pack train of eight horses. This party traversed the area north of Iliamna Lake and east of Lake Clark. F. J. Katz accompanied this party as geologist. The other party, in charge of G. C. Martin, geologist, likewise consisted of six men and was equipped with three Peterborough canoes. This party traversed the shore lines of Iliamna and Clark lakes, mapping as much of the topography and geology as could be reached from the shore, and made an exploratory trip down Kvichak River to Koggiung. C. E. Giffin accompanied this party as topographer and Theodore Chapin served as geologic field assistant. Field work for both parties ended at Iliamna Bay on September 28.

The results here given include the hitherto partly unpublished results of a geologic and topographic reconnaissance of the supposed oil fields between Iniskin and Chinitna bays made by G. C. Martin<sup>1</sup> in 1903, and of a similar reconnaissance by T. W. Stanton and G. C. Martin<sup>2</sup> in 1904, of the west coast of Cook Inlet from Tuxedni Bay to Cape Douglas and on the southern coast of the Alaska Peninsula.

Comparatively little was known of either the geology or the general features of this region prior to these investigations. The earlier explorations are, however, of interest and are briefly described below.

<sup>1</sup> Petroleum fields of Alaska and the Bering River coal fields: Bull. U. S. Geol. Survey No. 225, 1904, pp. 365-382; The petroleum fields of the Pacific coast of Alaska, with an account of the Bering River coal deposits: Bull. U. S. Geol. Survey No. 250, 1905, pp. 37-49; Notes on the petroleum fields of Alaska: Bull. U. S. Geol. Survey No. 259, 1905, pp. 128-139.

<sup>2</sup> Mesozoic section on Cook Inlet and Alaska Peninsula: Bull. Geol. Soc. America, vol. 16, 1905, pp. 291-410.

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DEPARTMENT OF THE INTERIOR  
UNITED STATES GEOLOGICAL SURVEY  
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BULLETIN 498

HEADWATER REGIONS OF <sup>92</sup>  
GULKANA AND SUSITNA RIVERS  
ALASKA

WITH ACCOUNTS OF THE VALDEZ CREEK AND  
CHISTOCHINA PLACER DISTRICTS

Prepared by the

BY

FRED H. MOFFIT



WASHINGTON  
GOVERNMENT PRINTING OFFICE  
1912

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ever, are of great importance to the district, but are scarce in the lowland district, along the shores of the lakes and in places along the military road between Gulkana and Summit. The grass is high grass for horses, so that travelers and their animals are obliged to depend on the distribution of the grass and the strength of the stock. On the other side of the timber line in the mountain region, the grass is not so good on the hill slopes. In places the grass is as high as a man's shoulder was seen on the hill slopes. It had been burned off several years ago. The reason for many of the miners who use the military trail is severe frosts, because the horses are unable to eat the feed gives out. Most of the horses die as soon as frost strikes it. Although the trail is not so good as the military trail, it is not so bad as the military trail. According to Mr. A. J. Paxson, the military trail can not be depended on earlier than June in the vicinity of Gulkana and Summit. The military trail is not earlier in the spring or live longer in the vicinity of Gulkana and Summit than in the lowland, where grass comes in earlier. The supply road is less important now than it was when it was used at nearly all the road houses.

#### POPULATION.

The population is small. The white population is concentrated in a few localities along or near the military telegraph stations and nine miles from the mouth of the Copper River and Canwell Glacier. At the military trail there are in all about a dozen soldiers, including the Signal Corps. The number of miners, who live at each of the road houses, is small in summer, but is perhaps a little larger in winter. About 10 and 25 men were mining on Valdez Creek in the summer. Some were either prospecting or mining for gold. It appears that the white population in the district is about 65 in all.

There is no estimate of the Indian population, but no estimate of the Indian families have their homes near Gulkana and the others near Susitna River and the military trail on Valdez Creek. These families are found in summer at the fishing stations along the

rivers and later in the season in the hunting grounds. It is therefore difficult to get a correct idea of their number at these times, when little is seen of them on the regular lines of travel.

#### TRAILS AND TRANSPORTATION.

Transportation in this district, as in almost every other part of Alaska, is one of the most serious difficulties connected with mining.

In the early days supplies for use on Valdez Creek were freighted across Valdez Glacier to Klutina Lake and from there to Susitna River at the mouth of Tyone Creek, from which place they were taken over the river ice to their destination without serious difficulties. The most objectionable part of this route is Valdez Glacier, where the obstacles to be overcome are so serious that the route was given up as soon as the military trail was well established. The trail ascended St. Ann River, on the north side of Klutina Lake, crossed Lake Hudson, Taslina Lake, and the Susitna Lakes, and then descended Tyone Creek to Susitna River. The grades after crossing Valdez Glacier are not heavy.

Nearly all the supplies used on Valdez Creek for the last five or six years have been freighted over the military trail from Valdez to Gulkana, and thence to Valdez Creek by way of the west fork of Gulkana River and Maclaren and Susitna rivers. The difficulty of crossing the coast range by this route, as by the other, is serious and is one of the principal causes of the high cost of freighting into the Copper River basin, but improvements made from year to year on the military trail, which was at first suitable only for pack horses and narrow sleds, have transformed it into a road, which is practically ready for travel with wagons throughout its full length from Valdez to Fairbanks. A few large bridges and a number of culverts still remain to be completed, but doubtless most of them will be in place before the end of 1911. Ditching and grading will also be required on some stretches, but even in its present condition the road represents a great improvement over the old trail and reflects much credit on Col. Richardson and his associates of the Alaska Road Commission. During the summer of 1910 a new road was cut through from the military road to Chitina, the new town on the Copper River & Northwestern Railway, on the west side of Copper River, opposite the mouth of Chitina River. The new road branches off the old road at Willow Creek, about halfway between Tonsina and Copper Center. It runs east-southeast to Copper River and follows its west bank to the railroad. A bridge over Tonsina River, which was necessary to make this road available for general use, was completed in the winter of 1910-11.

The winter trail from Gulkana to Valdez Creek, as previously stated, follows Gulkana River to the head of its west fork, then



passes the round-topped hill on the north by way of a low divide and comes out on Maclaren River about 7 miles from the Susitna. From the mouth of Maclaren River it follows the Susitna to Valdez Creek. The distance from Valdez to Gulkana is 128 miles, and from Gulkana to Valdez Creek approximately 125 miles. This trail, after the coast range is passed, offers very favorable grades for freighting. From Gulkana travel is almost continuously on the river ice, snowplows being used to break the trail ahead of the sleds. In favorable seasons travel is attended with little difficulty, but an effort is always made to reach Valdez Creek before the heavy snows of the late winter. This is accomplished more easily now than in former years, because the road through Keystone Canyon makes it possible to start from Valdez with freight before the river freezes in the canyon, thus saving a month or more at the beginning of the trip.

The cost of freighting from Valdez to Valdez Creek averages about 30 cents per pound. Under the most favorable circumstances it might be reduced to 20 cents, but the experience of several years has shown that 30 cents is not far from the average cost. It seems likely that the cost of freighting may be somewhat reduced with the opening for business of the Copper River & Northwestern Railway, but this will depend, of course, on the rates established.

Summer travel between Valdez Creek and the military road is over a somewhat different route from that followed in winter. The trail leaves the road at Bear Creek, about 1 mile south of Gulkana, and runs northwest to Maclaren River. It keeps to the east of the round-topped mountain between Maclaren River and Clearwater Creek, and leads to Valdez Creek by way of the Roosevelt Lakes pass. This trail is indicated on the map (Pl. I, pocket). Much of it is over wet ground, and travel with horses is so difficult that there has been a desire since the military road was put through from Gulkana to Fairbanks to find some shorter and better route connecting with it.

Two other routes have been tried. The more northern one is by way of Eureka Creek to the east fork of Maclaren River and thence across Maclaren River and its west fork to Roosevelt Lakes, west of Clearwater Creek. The other trail starts at Paxson and passes through the northern part of the Tangle Lakes district to the west fork of Maclaren River, from which point the trail is practically the same as the one just described. The distance is about 65 miles. The Eureka Creek trail is slightly shorter and crosses fewer ridges than that from Paxson; but it has the disadvantage of considerably increasing the total distance between Gulkana and Valdez Creek. Both trails are above timber line and the supply of firewood is limited to willows, so that neither route would be practicable for winter travel under present conditions, even if they afforded as favorable grades as the one now used. Either, however, would be a practicable summer mail route.

An attempt was made several years ago to improve the mail carrying route between Valdez Creek and Fairbanks, but it was not found practicable at that time and has not been attempted since then to renew it. A mail route is now run from Fairbanks each winter by way of the military road.

## GENERAL GEOLOGY

## STRATIGRAPHY

## INTRODUCTION

The hard-rock formations of the region are complicated in structure and a clear understanding of their graphic relations and areal distribution requires more time available for study in the field than is now possible. The schist, and igneous rocks, and range in age from the Valdez Creek schist, through Carboniferous to Eocene.

## GULKANA AND SUSITNA RIVERS

In summarizing the general geology of the region (Pl. II, in pocket) it may be said that the rocks of this region which are composed of greenstones, slates, tuffs, conglomerates, and gneisses, together with a minor amount of limestone, are of greater or less degree and locally of different ages, which are probably of Carboniferous age, and west along the south side of the Alaska Range. (See Pl. I, in pocket). Differentiated from the massive rocks to the east, these sediments is a belt of heavy igneous rocks consisting largely of amygdaloidal lavas with a minor amount of tuffs and tuffaceous rocks. This succession of flows and tuffs is probably younger than the Carboniferous rocks, and older than the Upper Triassic rocks. In the region of the lavas there was laid down shales, and limestone that contain fossils which are mined to be of Upper Triassic age. The rocks are known.

The formations enumerated, which are older than Eocene, are cut by granitic rocks which are to be of Jurassic or later age. The rocks are diorites or quartz diorites and gneisses. They occupy a considerable area and are especially abundant in the

north by way of a low divide and 7 miles from the Susitna. From Gulkana to Valdez Creek the distance is 128 miles, and from Gulkana to Fairbanks 150 miles. This trail, after the coast grades for freighting. From Fairbanks to Gulkana, usually on the river ice, snowplows are used for the sleds. In favorable seasons freighting is possible, but an effort is always made to avoid heavy snows of the late winter. It is now more difficult than in former years, because the snow makes it possible to start from Fairbanks, but the river freezes in the canyon, thus making the freighting of the trip.

The trail to Valdez Creek averages about 100 miles. Under favorable circumstances it might be possible to make a freighting experience of several years has shown that the average cost. It seems likely that the cost would be reduced with the opening of the Northwestern Railway, but this will probably not be accomplished.

Valdez Creek and the military road is the one that followed in winter. The trail, about 1 mile south of Gulkana, crosses the Maclaren River and Clearwater River by way of the Roosevelt Lakes pass. (Pl. I, pocket). Much of it is so difficult that there has never been a trail put through from Gulkana to Valdez Creek and a better route connecting with it. The more northern one is by way of the fork of Maclaren River and thence to the fork to Roosevelt Lakes, west of the Roosevelt Lakes district to the west fork of the trail is practically the same distance is about 65 miles. The Eureka trail crosses fewer ridges than that from Fairbanks to Valdez Creek. Both trails are difficult because of firewood is limited to willows, and freighting for winter travel under the conditions afforded as favorable grades as the trail would be a practicable summer mail

An attempt was made several years ago to establish a winter freighting route between Valdez Creek and Indian Creek, on Susitna River, but it was not found practicable at that time and there has been no attempt since then to renew it. A small amount of freight is brought from Fairbanks each winter by way of Nenana River.

## GENERAL GEOLOGY.

### STRATIGRAPHY.

#### INTRODUCTION.

The hard-rock formations of the region under discussion are complicated in structure and a clear understanding of their stratigraphic relations and areal distribution was not gained in the short time available for study in the field. They include both sedimentary and igneous rocks, and range in age from pre-Ordovician (?) Birch Creek schist, through Carboniferous or possibly earlier to upper Eocene.

#### GULKANA AND SUSITNA RIVER REGION.

In summarizing the general geology represented on the map (Pl. II, in pocket) it may be said that, aside from the Birch Creek schist, the rocks of this region which are thought to be oldest consist of greenstones, slates, tuffs, conglomerates, and quartzitic beds, together with a minor amount of limestone, all metamorphosed to a greater or less degree and locally changed into schists. These sediments, which are probably of Carboniferous age, form a belt extending east and west along the south flank of the high central part of the Alaska Range. (See Pl. II.) They were not fully differentiated from the massive rocks to be mentioned later. South of these sediments is a belt of heavy dark-colored, igneous rocks, consisting largely of amygdaloidal lava flows, with which is associated a minor amount of tuffs and tuffaceous conglomerates. The age of this succession of flows and tuffs is in doubt, but they are thought to be younger than the Carboniferous rocks previously referred to and older than the Upper Triassic rocks. Somewhat later than the extrusion of the lavas there was laid down a succession of slates, sandy shales, and limestone that contain fossils and are definitely determined to be of Upper Triassic age. Their distribution is only partly known.

The formations enumerated, which include everything in the region older than Eocene, are cut by granular intrusives, which are believed to be of Jurassic or later age. The most common and notable of these are diorites or quartz diorites and related granular and porphyritic rocks. They occupy a considerable proportion of the mapped area and are especially abundant in the vicinity of upper Susitna River.