Apr24
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DEPARTMENT OF THE INTERIOR
ALBERT B. FALL, Secretary

UNITED STATES GEOLOGICAL SURVEY
GEORGE OTIS SMITH, Director

Bulletin 733

# GEOLOGY OF THE YORK TIN DEPOSITS ALASKA

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BY

EDWARD STEIDTMANN AND S. H. CATHCART

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WASHINGTON
GOVERNMENT PRINTING OFFICE
1922

19252

ed. Rabbits have practically disappeared, and
ptarmigan, with an occasional fox or bear, alo
l, including geese, ducks, sandhill cranes, a
ıl, especially along the coast.
h the exception of some of those flowing throu
ork Mountains, which contain scarcely any veg
y well stocked with grayling and trout.
ey parties working in the region have found
horse feed and advisable to carry oil for fuel.

### ACCESSIBILITY.

ı season, from June to November, one steamsh
rather erratic schedule between Seattle and
'eninsula. Nome is as far north as the passeng
ıt between July 1 and September 30 freight
ent through the straits to Arctic ports. T
; Teller and also discharge cargo at points on t
York district, the freight being transferred fr
on lighters sent out from Teller. Except f
mmunication between Nome and the York regi
small coastwise gas schooners of 20 to 50 t
igation opens about the middle of June and c
ı October. One schooner licensed to carry m
eek schedule, as nearly as the weather conditi
ome and Arctic points, carrying passengers a
ng at several coast points on signal if the wi
ble. Other schooners also carry freight and p
o pretense at maintaining a schedule.
rctic coast of the York district are not easily
wing to the shallow lagoons impounded behi
ich extend along the shore and which are in t
sive tundra marshes. Freight landed at s
ref Inlet must be lightered in shallow-draft bo
schooners to the shore and up the tortuous stre
ndra flats to solid ground, where it can be pick

### HARBOR.

bout 40 miles east of Cape Prince of Wales,
t affords adequate protection to coastwise scho
Nome and the cape. From Port Clarence we
reacherous and subject to frequent storms. La
pted except in favorable weather. Much loss
l uncertainty of coast boat service are occasion



the inadequate harbor facilities. The Arctic coast of the area
s no harbors.

### TRAILS.

During the winter communication between Nome and Teller is
ffected by the overland route by means of dog and sledge. A 10-
ay mail service is maintained. The overland trail used in the
pen season follows the coast from Nome westward to Tisuk River,
p the Tisuk and across the divide to Bluestone River, down the
luestone to Right Fork, and thence by a direct course over tundra-
overed hills to Teller. The trails are everywhere passable to horse
nd wagon, although they do not afford an easy haul. Pack trains
xperience no serious difficulty. Sinuk River is crossed on a Gov-
rnment ferry; all other streams are fordable. There are roadhouses
ffording accommodations on the trail at Sinuk and Gold Run. A
helter cabin has been constructed by the road commission at the
outh of the Tisuk. The journey of about 85 miles is readily made
four days' travel.

From the sand spit north of the entrance to Grantley Harbor all
he known mineral deposits of the region can be reached by light
eams. Where the trails cross the tundra, however, travel is diffi-
ult in the most favorable seasons and almost impossible during wet
easons. Pack trains have been found by Geological Survey parties
o furnish the best means of transportation if it is desired to reach
ll points under adverse climatic conditions.

A trail leads westward along the beach past Teller Mission to the
outh of Lost River, a distance of about 27 miles. Don and Cali-
ornia Rivers, which are crossed on the way, are easily forded, and
he trail as a whole is adapted to a team and light loads. Continu-
ng up Lost River for 7 miles is a good wagon road leading to the
assiterite Creek tin mine. A trail leads from the mouth of Cassit-
rite Creek across the Lost and Mint rivers divide into the Brooks
Mountain country, a distance of 7 miles. Teams can cross by this
oute to reach Potato Mountain from Brooks Mountain, a distance of
8 miles. An easy trail leads from the Mint River valley into the
alley of Skookum Creek, down Skookum Creek to Grouse Creek,
nd thence up Grouse Creek to Buck Creek and up Buck Creek to
otato Mountain. A good wagon road runs from Buck Creek to
ork, a distance of 17 miles. York may be reached from the mouth
f Lost River by way of a trail up Rapid River, across the divide
o the Kanauguk, down the Kanauguk to the point where it turns
bruptly south, thence along the telephone line across the tundra
estward into the Anikovik Valley, and down the Anikovik to York,
distance of 22 miles. This trail is poor most of the way and
dapted only to very light loads. Cape Mountain is easily reached

from York by a trail, which follows the beach the entire distance 12 miles. In general, the valleys of the southward-flowing stream Don and California rivers, Tozer Creek, Lost and Rapid ers, Cassiterite Creek, Kanauguk and Anikovik rivers—are read traversed. So also are the upper reaches of the northward-flow streams, but as they leave the mountains they flow through w valleys and over flat tundra plains and coastal marshes, which o serious impediments to travel.

Ear Mountain, an isolated mass in the northeastern part of area, is about 50 miles from Teller. It is reached by trail fr Teller leading up Bay Creek, across the divide into the Agiap basin, across the Agiapuk and northward into its upper valley, its headwaters to the Nuluk divide, down the Nuluk to East Bran up East Branch to its head, thence on to a tundra plain which tends to the base of Ear Mountain, 20 miles distant. The last miles of this trail offers some difficulties in wet seasons but has b traveled with a light wagon.

## HABITATION.

Tin City, at the base of Cape Mountain, and York, at the mouth Anikovik River, have been centers of population in this reg Tin City is now deserted, and its revival is dependent upon renewal of work on the Cape Mountain lode prospects. York, a flourishing tent town, now consists of half a dozen cabins and permanently inhabited by one family of three persons. A rep sentative of the Bureau of Education at the Cape Mission an missionary family at Teller Mission are the only other perman white inhabitants of the region. Winter prospecting is carried from year to year and engages possibly an additional 15 white m During the summer mining season probably 50 or 60 men are ployed in the placer and lode mines. The Eskimo population, wh centers at Cape Prince of Wales and Teller missions, numbers pr ably 500.

Teller, on the south shore of Grantley Harbor, on the sand separating Grantley Harbor from Port Clarence, is the local p office and supply center for the York district. It contains two g eral stores and road houses and has a population of about 30 wh A lighterage company which transfers freight to points along Bering coast and to points along the inland waters of Gran Harbor, Tuksuk Channel, and Imuruk Basin as far east as Da son's landing, maintains a freight and passenger ferry across Gr ley Harbor.

A telephone line, which for a time connected Tin City with N by way of York and Teller, was put out of commission by st



in 1913. Restoration of the line would be matter, as many of the poles and much of the

## INDUSTRIES.

Mining, reindeer herding, and fishing are f the area.

Gold is mined by placer methods in the Grantley Harbor just east of the area and he vicinity of York. The tin placers of B productive mines of the region. Work is in deposit at Cassiterite Creek and promises fu

Several thousand reindeer, some of which ut most of which are controlled by outsid hroughout the region.

In the summer some fishing is done along nd white whale and in the inland waters for

Walrus, seal, and polar bear are hunted he winter. Some trapping is done. The t ng, hunting, and trapping are small compar n other parts of the peninsula.

The fuel problem of the area is a serious power crude oil, distillate, and gasoline are s used for heating, but the consumption is lim delivered at many localities in this area in 19 on. All fuel is imported, chiefly from Seattl

## PREVIOUS EXPLORAT

Prior to the discovery of gold at Cape Nome f the York region. A mission had been est f years at Cape Nome, where one of the Gov was maintained. After the first rush to Nom xtended their search to all parts of the penins fall of 1899 some placer gold had been found

In September, 1900, A. H. Brooks, during l outhern part of Seward Peninsula, spent 10 d nd made the first topographic and geologic m here was little gold placer mining in the Yor ere much disturbed by some heavy miner luice boxes. A part of this heavy concentrate nd Buhner Creek, one of its tributaries, pr pon his return, Brooks published a brief r

[3] Brooks, A. H., and Schrader, F. C., Preliminary report o laska, with maps and illustrations: U. S. Geol. Survey Sp
[4] Idem.
[5] Science, new ser., vol. 13, p. 593, 1901.

DEPARTMENT OF THE INTERIOR
HUBERT WORK, Secretary

UNITED STATES GEOLOGICAL SURVEY
GEORGE OTIS SMITH, Director

Bulletin 745

# THE KOTSINA-KUSKULANA DISTRICT ALASKA

BY

FRED H. MOFFIT

AND

J. B. MERTIE, JR.

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WASHINGTON
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1923

19265

## TRAILS AND TRANSPORTATION.

Since the Copper River & Northwestern Railway was compl
the problem of reaching the Kotsina-Kuskulana district and
transporting supplies to it has been much simplified. The nea
station on the railroad is Strelna, on Strelna Creek, 4 or 5 m
from the boundary of this district. Strelna is 146 miles f
Cordova. The next near point is Chitina, 131 miles from Cord
Chitina is about 1 mile from the point where Kotsina River j
Copper River and is about 12 miles from the nearest point in
Kotsina-Kuskulana district.

All summer travel to Kuskulana River and Elliott Creek and m
of that to Kotsina River now goes through Strelna. A wagon r
leads from Strelna up Kuskulana River to Nugget Creek. F
this road a horse trail branches off to Elliott Creek and another
the upper Strelna Valley, whence other trails lead to Rock Cr
Pass Creek, and Elliott Creek.

The Kuskulana road follows Strelna Creek northward for abo
miles, then turns eastward and crosses 3 or 4 miles of flat swa
country, covered with the scrubby spruce, to the Kuskulana Val
This road is suitable for automobile trucks and was used a great d
in 1918 and 1919. The distance from Strelna to Clear Creek by
road is between 11 and 12 miles. A good trail leads up Clear Cr
Another ascends Nugget Creek above the camp on that stream, f
which it is possible to cross over the high divide to Roaring Cr
The old trail to the Nizina follows Trail Creek to Kuskulana P
Other trails lead up Porcupine Creek, up both sides of Kuskul
Glacier, up Slatka Creek, and to the different mining properties.

All the trails in the Strelna Creek valley afford firm footing
horses but have a few steep places. The three passes leading to R
Pass, and Elliott creeks have altitudes of 5,100 to 5,200 feet. They
difficult early in summer, on account of the snow on the steep sl
below them.

The trail to Elliott Creek leaves Strelna Creek 2½ miles f
Strelna and takes a northwesterly course to Cow Creek, whence,
tinuing northwestward, it gradually climbs the southwest slope
the mountain south of Elliott Creek and crosses the northwest
of the ridge at an elevation of 3,500 feet. Thence it turns dire
east and reaches Elliott Creek by a steep descent which ends
above the mouth of Five Sheep Creek. The distance by direct
is about 14 miles, but the distance covered by the traveler is con
erably greater owing to crooks in the trail. Parts of the trail
hard to travel in wet weather, although they offer little diffic
during much of the summer. This trail is used regularly by p
horses carrying supplies to Elliott Creek but is not suitable for tru
or automobiles.



trail follows the north side
to the Copper River valley
and Adolph Ammann, who
River. Since Mr. Crawford
the bridge and trail in repair.
River and the Kotsina, and from
all the streams where copper p
on Fall, Copper, Rock, Roar
A wagon road leads from the
ent Co. on Kotsina River to the
trails that have been mentioned
and are unsuited for wagon
made into roads without great
the Copper River & Northweste
ies used by prospectors in this
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brought from Chitina rather tha
the Kotsina Valley in winter i
Strelna, for, although the dis
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freighting to Elliott Creek. S
kulana Valley at any season, fo
may be reached either by wagon o
Copper mining becomes established
railroad will doubtless be built to
Four roads have already been surv
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The other branches from the r
kulana Valley. The latter offers
and can be built with comparativ
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native means of transporting ore
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Valley would probably requi
Aside from this the engineeri
same order as those on a road i
Kotsina Valley from some poi
benefit to the prospectors now a

## POPULATION.

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AND TRANSPORTATION.

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ner. This trail is used regularly by pac
Elliott Creek but is not suitable for truc



good trail follows the north side of Kotsina River from Klu-
na River to the Copper River valley. It was laid out by A. K.
awford and Adolph Ammann, who also built the bridge over
avesna River. Since Mr. Crawford's death Mr. Ammann has
pt both the bridge and trail in repair. Branch trails lead up Klu-
na River and the Kotsina, and from them other trails have been
ilt up all the streams where copper prospects are situated. There
e trails on Fall, Copper, Rock, Roaring, Peacock, and Surprise
eeks. A wagon road leads from the camp of the Great Northern
evelopment Co. on Kotsina River to the upper camp on Amy Gulch.
The trails that have been mentioned were nearly all intended for
ck trails and are unsuited for wagons. Some of them, however,
uld be made into roads without great difficulty.

Until the Copper River & Northwestern Railway was put through
e supplies used by prospectors in this district were brought to the
mps in winter. Part of the supplies used on Kotsina River in
914 were freighted from Valdez, but doubtless in future supplies
ill be brought from Chitina rather than Valdez. Freighting from
hitina to the Kotsina Valley in winter is less expensive than freight-
ng from Strelna, for, although the distance is a little greater, the
e of Kotsina River furnishes a better sled road. The same is true
f winter freighting to Elliott Creek. Supplies may now be obtained
n Kuskulana Valley at any season, for all the main distributing
amps may be reached either by wagon or by automobile.

If copper mining becomes established in this district, spurs from
he railroad will doubtless be built to several of the creeks. Two
uch spur roads have already been surveyed. One leads to Elliott
Creek from a point on the railroad between Strelna and Copper
River. The other branches from the railroad at Strelna and runs
up Kuskulana Valley. The latter offers no unusual engineering diffi-
culties and can be built with comparatively small cost. The branch
to Elliott Creek has less favorable grades and would require more
rock work, so that the average cost per mile would be greater. As
an alternative means of transporting ore to the present line of rail-
road, the Hubbard-Elliott Co. has proposed constructing a tramway
over the mountain from Elliott Creek to Strelna. A railroad into
Kotsina Valley would probably require one or more expensive
bridges. Aside from this the engineering difficulties would be of
about the same order as those on a road into Elliott Creek. A wagon
road into Kotsina Valley from some point on the railroad would be
of great benefit to the prospectors now at work there.

## POPULATION.

The population of the Kotsina-Kuskulana district in the summer
of 1914 was about 60, all but two of whom were men. Not more than
half a dozen of these men remain in the district during the winter;

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DEPARTMENT OF THE INTERIOR
HUBERT WORK, Secretary

UNITED STATES GEOLOGICAL SURVEY
GEORGE OTIS SMITH, Director

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Bulletin 755

# MINERAL RESOURCES OF ALASKA

## REPORT ON PROGRESS OF INVESTIGATIONS IN

## 1922

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B7

BY

A. H. BROOKS AND OTHERS

University of the
Territory of Alaska

WASHINGTON
GOVERNMENT PRINTING OFFICE
1924

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lack muck and silt. Much of the
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was removed by ground sluicing.
on there.

# THE COLD BAY–CHIGNIK DISTRICT.

By W. R. Smith and Arthur A. Baker.

## INTRODUCTION.

### LOCATION AND AREA.

The area described in this report lies on the southeast side of the Alaska Peninsula west of Kodiak Island and extends from a point 15 miles northeast of Cold Bay for 160 miles southwest along the peninsula to the northeast side of Chignik Bay. This area lies between meridians 155° and 158° west and parallels 56° and 58° north. The northeastern portion of the area includes a part of the Cold Bay district, which has already been described by Capps.[1] Cold Bay lies on the southeast side of the Alaska Peninsula at longitude 155° 30′ west and latitude 57° 45′ north. The mapping by the Geological Survey in 1922 is a continuation of the mapping begun by S. R. Capps and R. K. Lynt in 1921. The geographic boundaries of the area of which a geologic map has now been made are, in the northeastern part, Becharof and Ugashik lakes on the west, the Kejulik Mountains on the north, and the coastal mountains from a point near Mount Katmai to Cold Bay on the east. Between Cold Bay and the southwest end of Wide Bay the mapping has been carried to the shores of Shelikof Strait. Between Wide Bay and Amber Bay the area mapped is about 18 miles wide and lies west of the main crest of the Pacific coastal range and east of a broad expanse of low land bordering Bristol Bay. From Amber Bay to Chignik Bay the mapping has been carried to the coast. The total area mapped geologically in 1922, lying between the head of the Kejulik Valley and the northeast end of Chignik Bay, includes about 2,500 square miles.

### PREVIOUS SURVEYS.

The first extensive charting of the coast line of the peninsula was begun in 1827 by Capt. F. P. Lutke, who was sent out by the authorities at St. Petersburg to make a careful survey of the north coast.

[1] Capps, S. R., The Cold Bay district: U. S. Geol. Survey Bull. 739, p. 77, 1922.

the head of the bay is a reef, seen at low tide, that extends from the northeast shore nearly two-thirds of the distance across the bay. This reef gives some protection to small boats, but there is not enough anchor room for large boats between the gently sloping beach and the reef. There are no wharf or docking facilities at Portage Bay or at any other bay along this part of the coast of the Alaska Peninsula except at the three canneries. At Chignik all freight must be handled off Kanatak by small boats or lighters, which are privately owned. If the Pearl Creek dome proves to be commercially productive, better harbor facilities must be provided.

Most of the freight and passengers for the Cold Bay district are routed through Seward or Kodiak. During the summer there are four passenger boats a month from Seattle to Seward and two a month to Kodiak. During the winter the scheduled number of sailings is less. The trip to Seward requires seven or eight days and to Kodiak eight to twelve days, depending upon the route followed. From Seward a mailboat having accommodations for a few passengers and a small amount of freight sails once a month for Alaska Peninsula ports. From Kodiak small boats can be hired to transfer passengers or freight to Portage Bay, the trip requiring about 24 hours. In the spring of both 1921 and 1922 the Seattle steamer made one trip into Portage Bay, and doubtless the steamer would make Portage Bay a regular port of call if the amount of business warranted it and if some quick and reliable means of unloading were furnished. Two large freight steamers were chartered by the oil companies to deliver the drilling equipment at Portage Bay, and both steamers lay at anchor in the bay for several days and unloaded their freight by lighters, being fortunate in having calm weather. Any large steamer anchored in Portage Bay would be compelled to steam out into open water in the event of a storm, as it could not ride out a severe storm in the shallow water of the unprotected, rock-bound bay.

Travel within the district is fairly easy by foot or with a pack train, as many trails have been beaten out by the numerous parties that have moved around in the district during the last two years. There are numerous easy passes across the mountains into the interior lowland. Kanatak has been the headquarters of all the parties working in the district, and the trails radiate from that point. The wagon road under construction from Kanatak to the well sites will make the country around Mount Peulik easily accessible from Kanatak. A good trail for pack horses can be followed from Kanatak to Cold Bay, the last 7 or 8 miles being over the wagon road that was built in 1903 but is no longer suitable for the use of wagons. From the head of Cold Bay there is an easy pass into the Kejulik Valley, but at high tide a bold headland on the west shore of Cold Bay ex-



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dangerous to take pack anima
the headland is a large creek
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The country northwest of the
chak bays had not been traveled
1922. The best route of entranc
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at the southwest end of Wide
reached by means of small boa
Bay. The route followed by t
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main range toward the west ar
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could not always be avoided, a
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of trail had to be cut through t
leads up the valley of Lee Creek
to the Ugashik Lake anticline.
the oil field. At Aniakchak the
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tends into the water and at low tide large boulders make it very dangerous to take pack animals around the point. Just south of the headland is a large creek known as Teresa Creek or Schooner Creek, and near the head of its valley an easy trail may be followed into the Kejulik Valley. The Kejulik Valley may also be entered through one or two low passes from small bays northeast of Cold Bay, but most of these bays are too shallow even for small boats at low tide. Within the Kejulik Valley itself travel is not so easy unless the foothills are followed closely, and even then swampy ground will give some difficulty. A short distance away from the foothills swamps are the rule, and travel with a pack train is extremely difficult. Kejulik River is a glacial stream that is somewhat difficult to cross, as it is cold, swift, and deep. In its lower reaches it is too deep for a horse to wade, but in its upper part many places can be found where a man can wade it. Over a large part of the valley moss grows luxuriantly, making travel both slow and tiresome.

The country northwest of the mountains between Wide and Aniakchak bays had not been traveled by pack train before the summer of 1922. The best route of entrance to the district from the east, so far as known, is either by the Aniakchak River valley or by the valley at the southwest end of Wide Bay. The country could easily be reached by means of small boats going up the rivers from Bristol Bay. The route followed by the Geological Survey party lies between the main range along the coast and the lower range to the northwest. Only slight difficulties for traveling by pack train were encountered, although several detours in the valleys were necessary to avoid swampy areas. The ridges or spurs extending from the main range toward the west are rarely more than 1,000 feet above the valleys at the most favorable points of crossing. Steep slopes could not always be avoided, and as they were often obscured by fog traveling was slow and uncertain. Occasionally short stretches of trail had to be cut through the alders and cottonwoods. A trail leads up the valley of Lee Creek at Wide Bay and across the divide to the Ugashik Lake anticline. This is one of the best routes to the oil field. At Aniakchak the best route for travel by pack train is along the beach, as the area between the beach and the hills to the west is swampy; but at Kujulik Bay the best route is on the benches back of the beach. Near the southwest end of Kujulik Bay a trail leads across the mountains toward the west. At low tide the beach at Chignik Bay, except at a few places, can be traversed. A wagon road has been graded from the coal mines on Thompson Creek, Chignik Bay, to the little bunker on the beach, but it is seldom used. A footpath follows the benches above the beach from the bunker to the sand pit.

Geol.

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DEPARTMENT OF THE INTERIOR
Hubert Work, Secretary

U. S. GEOLOGICAL SURVEY
George Otis Smith, Director

Bulletin 773—D

# PETROLEUM ON ALASKA PENINSULA

PAPERS BY

KIRTLEY F. MATHER, WALTER R. SMITH
AND GEORGE C. MARTIN

Mineral resources of Alaska, 1923—D

WASHINGTON
GOVERNMENT PRINTING OFFICE
1925

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and very few of them have been
s. In the area covered by ashes
principally of grass and fish, has
l trails made by bears cross the
westward limit of the range of
ported to have been killed recently
tracks and a single large moose
by members of the party of 1923.
the Alaska Peninsula 30 or 40
very few have been seen. About
f a United States Geological Sur-
ay, but only a few tracks were
ion.
n the district. The red fox is most
d otter, wolverine, and lynx are
not found farther south than the
er few there except during certain
ly plentiful in the Savonoski Val-
und in the vicinity of Cold Bay;
n, but small rabbits are very nu-
environment in the spruce forest,
an are plentiful on the mountains
ea around the lakes in the north-
ll birds are common and include
eckers. These birds were not seen
d sparrows, water wrens, magpies,
w-plumed bird belonging to the
n abundance of waterfowl, includ-
as geese and swans, find favorable
swampy areas west of the moun-
ulls, shags, and sea parrots—breed
slands along the Pacific coast and
eninsula.
in to Bering Sea are the spawning
n. Each year countless thousands
ter to the bodies of fresh water in
n and die. Along the larger rivers
stol Bay an extensive canning in-
everal valuable species of salmon
e red or sockeye salmon is not as
coast. Large trout are found in
ict, and grayling were caught in a



## POPULATION

The country between Cold Bay and Naknek Lake, a distance of about 60 miles, is not inhabited except by one white man living on Cape Kubugakli. Formerly Katmai village, near the head of Katmai Bay, was one of the largest native villages along the southern coast of the peninsula, but it is now entirely abandoned. Other villages close to Naknek Lake have also been abandoned since the Katmai eruption in 1912. Savonoski, near the mouth of Savonoski River, was the largest of the inland villages.

Several substantial frame buildings were constructed on the west shore of Cold Bay near its entrance in 1902, when the first oil developments were under way. These buildings are still in good condition and formed the principal trading post for many years but were unoccupied in 1923. A trapper's cabin at the head of the bay is the base of several trappers during the winter. The lone white inhabitant of Cape Kubugakli operates several trap lines during the fur season; otherwise the district has not been visited by trappers since the natives were driven out in 1912. Many of the natives have settled on Bristol Bay near the large salmon canneries. The transient population at the canneries during the canning season amounts to several thousand people. A few tourists visit the Katmai National Monument each year, but until the region is made more accessible by roads and roadhouses, few travelers will brave the hardships of the trip.

The nearest white settlement to the district is Kanatak, on Portage Bay, 30 miles south of Cold Bay. This town is the base of supplies and center of activity of the present oil developments on the Alaska Peninsula.

## ROUTES OF TRAVEL

Parts of the Cold Bay-Katmai district are rather inaccessible at present. This is especially true of the Valley of Ten Thousand Smokes, which lies about 25 miles inland from the Pacific coast. No provision has yet been made to facilitate the trip over the rough country that lies between the coast and the valley. Formerly Katmai Pass, across the mountains between Katmai Bay and Naknek Lake, afforded an important means of going from the Pacific coast to Bristol Bay. This trail was a tribal highway for centuries before the arrival of white men. Petrof[8] gives the following account of Katmai village and the pass:

> The settlement of Katmai, in this vicinity, was once the central point of transit for travel and traffic across the peninsula. Three different routes converged here and made the station a point of some importance; now

[8] Petrof, Ivan, Report on the population, industries, and resources of Alaska in the Tenth Census, reprinted in Compilations of narratives of explorations in Alaska, 1869–1900, p. 84, Committee on Military Affairs, U. S. Congress, 1900.

Katmai's commercial glory has departed, and its population, consisting of less than 200 Creoles and Innuits, depend upon the sea otter alone for existence.

The people of two villages across the divide, in the vicinity of Lake Walker (Naknek Lake), come down to Katmai to do their shopping and to dispose of their furs, undertaking a very fatiguing tramp over mountains and glaciers and across deep and dangerous streams in preference to the canoe journey to the Bristol Bay stations. On the eastern side of the peninsula the mountains rise abruptly from the sea, a short day's climbing transplanting the traveler from tidewater into the midst of glaciers and eternal snows and scenes of alpine grandeur and solitude.

During the gold excitement at Nome Katmai again became an important point in the long and weary journey to the site of the new discovery. Hundreds of prospectors preferred the rough trail and the fury of the winds in the pass to the long and hazardous ocean trip of 300 miles around the end of the peninsula. A bunk house was constructed at Katmai, and small boats plied Naknek Lake and Naknek River to accommodate the travelers. During the winter the Nome mail was carried over this route by dog sled for many years. A very low divide exists between the head of Cold Bay and Becharof Lake. The route by this divide was never extensively used, however, probably on account of the difficulty of landing and the swampy areas along the way. In the period from 1902 to 1904 a wagon road was constructed from Cold Bay to the headwaters of Becharof Creek. The road is in poor condition at present but was used for several years by the Bristol Bay mail carriers. Although there are many bays along the coast protected harbors are not plentiful, and for this reason the problem of constructing a road into the Valley of Ten Thousand Smokes is more difficult. Three possible routes into the valley could be used. The route that has received the most consideration is by way of Geographic Harbor, the upper part of Katmai Valley and Katmai Pass. Although Geographic Harbor affords good anchorage, it is surrounded by lofty mountains which must be crossed in order to reach the Valley of Ten Thousand Smokes. The construction of a road or even a trail over these mountains would require a considerable expenditure of money. Nevertheless it is the shortest route into the valley, although by no means the easiest. Another possible way of entering the valley is by Cold Bay and the Kejulik River valley. The Kejulik Mountains would have to be crossed near the head of the valley, and this can be accomplished only by pack train. The traveler would enter the valley at its west end by taking this route. A third route is by Kanatak, Becharof Lake, and Yori Pass to the west of the valley. A wagon road has been built from Kanatak to the upper arm of Becharof Lake. Thence a four hours' boat ride would land the traveler on the north side of the lake, west of the Kejulik Mountains. From this point a journey of 35 miles over moderately level country would place him at the west entrance of the valley. This route,



although indirect, presents the fewest
most feasible of the three ways of ent
cific side of the peninsula. The most
lack of a safe harbor at Kanatak.

## GEOLOG

### GENERAL FEA

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of Mageik and several other volcanoes i
considerable amounts of material at thei

although indirect, presents the fewest difficulties and is probably the most feasible of the three ways of entering the valley from the Pacific side of the peninsula. The most serious objection to it is the lack of a safe harbor at Kanatak.

## GEOLOGY

### GENERAL FEATURES

The investigation of the area between Cold Bay and Naknek Lake was a reconnaissance survey, and only the principal geologic features were noted. (See Pl. IV.) The time spent in any one locality did not permit a detailed study of the geology, and frequently the inclemency of the weather interfered with work. The district is occupied chiefly by sedimentary rocks, which are gently folded, faulted in places, and intruded by igneous rocks. All the sedimentary rocks, except the unconsolidated alluvium and glacial débris, are of Mesozoic age, and the greater part are Upper Jurassic. Therefore, aside from several faulted areas and the problems concerning the volcanoes, the geology of the district is not complicated.

The oldest sedimentary rocks exposed in the district are of Upper Triassic age and occur on Cape Kekurnoi. Above the Upper Triassic beds are several thousand feet of sandstone, shale, and conglomerate, which have been referred to the Lower (?) and Middle Jurassic. Upon these beds a great thickness of Upper Jurassic strata rests unconformably. The Upper Jurassic sequence is divided into the Shelikof and Naknek formations. The Naknek forms the surface rock over the greater part of the district.

Igneous rocks occur in several areas and vary greatly in character. The largest mass extends southwestward from Naknek Lake and consists of coarsely crystalline granite and gabbro. The rugged crest of the Kejulik Mountains is formed by lava flows over the Naknek formation. Andesite intrusions occur in a number of mountains north and south of the Valley of Ten Thousand Smokes, and the valley itself is filled with andesitic volcanic ash and pumice to a depth of 100 feet or more. Thick sills and dikes are exposed on Mount Kubugakli, and older flows and intrusive rocks are interbedded with the Triassic limestone on Cape Kekurnoi.

All the larger valleys, the lowlands at the heads of bays, and the broad area west of the mountains are covered with alluvium or glacial detritus. The most extensive areas covered by glacial moraines are the valley of Angle Creek and adjacent area and the immediate vicinity of Naknek Lake. Active glaciers on the flanks of Mageik and several other volcanoes in the district are depositing considerable amounts of material at their terminals.

DEPARTMENT OF THE INTERIOR
Hubert Work, Secretary

U. S. GEOLOGICAL SURVEY
George Otis Smith, Director

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Bulletin 789

# THE INISKIN-CHINITNA PENINSULA AND THE SNUG HARBOR DISTRICT, ALASKA

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BY

FRED H. MOFFIT

University of Alaska

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GOVERNMENT PRINTING OFFICE
WASHINGTON
1927

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The ridge on the west side of the peninsula is straight and not so high as that along Cook Inlet. Its highest point is 2,442 feet above sea level, and its summits are smoother and more rounded. Between the two ridges, in the central and northern part of the peninsula, stand lower smooth-topped hills (pls. 5, *A*, and 6, *A*), which occupy only a small portion of the whole area.

The principal valleys are the straight, narrow valley leading from Right Arm to Chinitna Bay, the similar valleys of Fitz and Bowser Creeks, parallel to the first, and the transverse valleys of Brown and Bow Creeks. A shorter transverse valley connects the Bowser Creek Valley with Right Arm.

## DRAINAGE

Bowser, Brown, and Fitz Creeks are the principal streams of the district. They head near together in almost the exact center of the peninsula and with their branches drain most of it. Bowser and Fitz Creeks flow in opposite directions, the first into Oil Bay and the second into Chinitna Bay, but are in almost direct alignment and occupy valleys whose positions coincide with an anticlinal fold in the Tuxedni sandstone. Another smaller stream, Bow Creek, whose valley is parallel to that of Brown Creek, drains a considerable area east of Brown Creek. None of these creeks are glacial streams, but they are fed during spring and early summer by melting snows on the mountains and at that time carry much more water than later in the summer. Bowser and Fitz Creeks and the two smaller parallel creeks on the west that flow into Right Arm and Chinitna Bay occupy valleys whose direction and position are dependent on the principal lines of geologic structure in the district. The transverse valley between Bowser Creek and Right Arm, the valley of Brown Creek, and the parallel valley of Bow Creek are apparently determined by a system of jointing and faulting that has the same direction as the valleys.

These streams occupy rather wide, open valleys without canyons and with only minor exposures of bedrock. Their smaller tributaries, on the other hand, are cutting narrow V-shaped valleys in the soft shales and in many places have developed falls and cascades on the hard conglomerate and sandstone beds interstratified with the shales.

## ROUTES AND TRAILS

Travel to Chinitna and Iniskin Bays is more or less inconvenient and at times is difficult, for no boats call at ports on the west side of Cook Inlet except during the summer, when the cannery on Chisik Island in Tuxedni Bay is in operation. The nearest regular stopping place for Alaska steamers is at Seldovia, near the mouth

of Kachemak Bay, on the east side of Cook Inlet. This town is almost 65 miles from Iniskin Bay and is the nearest post office. The cannery on Chisik Island is about 60 miles by sea from Iniskin Bay and 26 miles from Chinitna Bay. It has no post office, and there are no accommodations for travelers except such as are furnished through the courtesy of the cannery people.

Iniskin Bay has deep water and furnishes shelter for large boats. The anchorage, however, is nearer the west shore than the east shore and freight under present conditions must be discharged by lighter. This bay was formerly used at times by boats seeking shelter from storms while discharging freight in Iliamna Bay, but has not been entered by the larger boats in recent years. Chinitna Bay is shallow in its upper sheltered part and is not used by large boats.

The district under consideration is without trails. When drilling was in progress at Oil and Dry Bays a wagon road was built between Iniskin and Oil Bays for transporting supplies and equipment to the wells. There was also a trail from Oil Bay to Right Arm and another to Dry Bay. These trails have not been used in recent years and are now grown up with alders and willows, so that in most places they are difficult to find. Where they ran through the timber and were blazed, or where they were graded or had bridges built over the gulches, they can be followed, but for the most part they furnish slight assistance, and in many places there is no advantage in trying to use them.

The wagon road followed a creek from Iniskin Bay to the summit of the ridge between Iniskin and Oil Bays. This part of the road has been entirely washed out, but the remainder, from the summit of the ridge to the cabin on Oil Bay, could be put in usable condition without great expense. A trail from Right Arm to Chinitna Bay was originally used by the natives and doubtless was known to them long before white men came to this country. Evidently it was never used much by white men, for almost no traces of it are left. It is said that there was once a trail from Oil Bay or Dry Bay to Chinitna Bay. Traces of such a trail were found on Fitz Creek, but it is doubtful if this trail was ever used much.

None of these old trails except the wagon road from Oil Bay to Iniskin Bay and part of the trail to Right Arm in the valley between Right Arm and Bowser Creek were of particular assistance to the surveying parties in 1921. In most places the parties found it quicker and better to wade the streams and to cut trail only where that work was unavoidable. This plan was open to the objection that in early summer and after heavy rains the streams were high and difficult, if not dangerous, to follow. In the later part of August, however, the larger streams were so low that they offered no



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difficulty whatever, except where driftwood had lodged or where they were overgrown by brush. All the streams are remarkably free from quicksand. In fact, soft ground, difficult for horses to travel, was much less common throughout the district than had been expected, for in most places the sand and fine material derived from the weathering of the sedimentary formations was packed firmly.

## TIMBER AND VEGETATION

An open stand of spruce and cottonwood timber covers the valley floors and the lower hill slopes of the interior of the peninsula, but is absent from the mountain slopes that face Cook Inlet. (See pl. 7.) In addition to spruce and cottonwood there is a growth of alder and willow, either of which may be found in the lower lands or on the hill slopes above timber line. As a rule the heaviest growth of willow is on the valley bottoms near the streams or wet ground, for the willow requires much water. The densest growth of alder, on the other hand, is near timber line on the hill slopes. This vegetation, however, is not considered timber.

Spruce and cottonwood are not uniformly distributed over the area in which they grow and are commonly more or less separated from each other. The timbered areas are interspersed with parks overgrown by willow and alder or with tall grass, giving a most pleasing aspect to the landscape. (Pl. 5, *A*.) Cottonwood thrives along the stream courses, where it reaches a large size and forms extensive groves, yet many lone trees are scattered along gulches above the valley bottoms. Seemingly the cottonwood is also able either to establish itself earlier or to maintain itself better in many exposed, wind-swept places than the spruce.

Spruce timber is present in all the larger valleys but is larger and better in the valleys of Bowser and Brown Creeks than elsewhere. In the vicinity of Oil Bay (pls. 5, *B*, and 8, *B*) there are many fine, straight spruces suitable for almost any use for which timber is likely to be needed in this vicinity. Timber line in no place reaches an altitude of 1,000 feet and in only a few places is as high as 750 feet. Good timber grows also on the north shore of Chinitna Bay in a place convenient for transportation, and for several years this area has furnished piling for fish traps and the cannery pier in Snug Harbor.

Grass of the variety commonly called "redtop" by Alaskan prospectors grows luxuriantly on the better-drained land throughout the district and furnishes abundant feed for stock. It covers the "parks" (pl. 9, *B*) where it is not crowded out by the willow or prevented from growing by wet ground and extends up the hill slopes (pl. 5, *A*) to the limit of alders, making it difficult to climb the hills in the later

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DEPARTMENT OF THE INTERIOR
Hubert Work, Secretary

U. S. GEOLOGICAL SURVEY
George Otis Smith, Director

OCT 24 1927

Bulletin 791

# GEOLOGY OF THE UPPER MATANUSKA VALLEY, ALASKA

BY
STEPHEN R. CAPPS

WITH A SECTION ON THE IGNEOUS ROCKS

BY
J. B. MERTIE, JR.

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WASHINGTON
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1927

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smaller mammals are squirrels, rabbits, and conies. The fur-bearing animals were formerly abundant but are now found in only moderate numbers. The abundant game birds are chiefly grouse and ptarmigan, but ducks may be found on some of the small lakes. Trout are present in many of the streams and lakes, but they are not notably abundant. Some salmon run up Matanuska River but not in sufficient numbers to be industrially valuable, and they have been little used even as a local food supply.

### ACCESSIBILITY

The upper Matanuska Valley is easily accessible as far as Chickaloon by the Chickaloon branch of the Alaska Railroad, which leaves the main line at Matanuska and has its eastern terminus at Chickaloon. As no active mining was in progress at Chickaloon in 1924, only a single train each week was scheduled, although two regular trains were run from Anchorage to Jonesville and Sutton, some 18 miles west of Chickaloon. Before the completion of the railroad the only established route into the upper Matanuska Valley was by wagon road from Knik, on Knik Arm, to Little Susitna River, and thence by pack trail up Matanuska Valley. Part of that old trail between Moose Creek and Chickaloon is still open, but in places fires have burned the timber, and fallen trees have made the trail impassable. Practically all travel to Chickaloon now goes over the railroad. From Chickaloon eastward only trails are available. The only wagon roads in the district here under discussion are a short stretch a mile or so long that leads from the railroad station at Chickaloon to the buildings on the terrace above the town and a stretch about 2 miles long on the south side of Matanuska River from the tramway across the river to the coal workings on Coal Creek.

### TRAILS

The main trail from Chickaloon to the Nelchina district crosses Chickaloon River at a ford a mile above the town and leads thence northeastward along a course roughly parallel to Boulder Creek, which it crosses some 10 miles out, at the Boulder Creek Flats. Another route to upper Boulder Creek follows the west bank of Chickaloon River northward for 6 miles to a bridge across the Chickaloon, now in bad repair, and thence extends eastward to Boulder Creek, where it joins the trail described above. This route is now little used. From the Boulder Creek Flats the Nelchina district may be reached by one of three routes—by the old Matanuska



trail around Sheep Mountain.
of Boulder Creek. Most of t
trail.

The old Matanuska trail ext
of Anthracite Ridge to the fo
Lake, a distance of 11 miles.
the trail lies through a burne
obliterated it and made trave
trail turns southeastward at
two lakes, and crosses Hicks C
ceeds thence northeastward u
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along the north shore of Inde
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northward toward Caribou Cr

The trails described above
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### HISTORY

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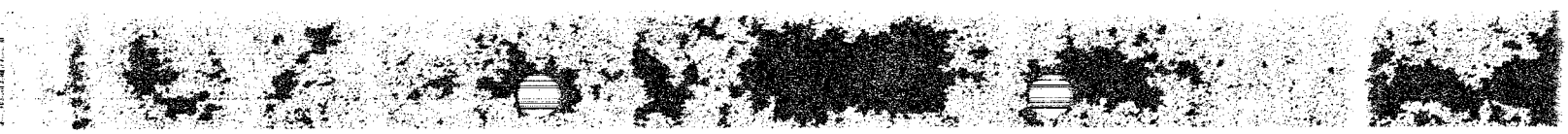

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WASHINGTON, D.C.

Bulletin 792—B

# GEOLOGY OF THE KNIK-MATANUSKA DISTRICT ALASKA

BY

KENNETH K. LANDES

Mineral resources of Alaska, 1925—B

UNITED STATES
GOVERNMENT PRINTING OFFICE
WASHINGTON
1927

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CONTENTS



ILLUSTRATION



# GEOLOGY OF THE KNIK-MATANUSKA DISTRICT

By KENNETH K. LANDES

## INTRODUCTION

*Location and area.*—The area described in this report lies between Knik and Matanuska Rivers in south-central Alaska. These rivers flow westward and converge as they enter Knik Arm, a branch of Cook Inlet. Owing to this convergence the region studied has a triangular outline. It is bounded on the east by a line drawn from Kings Mountain, on the south bank of Matanuska River, to the Knik Glacier. Each leg of the triangle is approximately 25 miles in length, and the area included within it is about 335 square miles. (See pl. 1.)

Most of the region is mountainous, and only the edges are readily accessible. The Alaska Railroad crosses the extreme western apex, and a branch line runs from Matanuska station eastward along the north bank of Matanuska River to Chickaloon. Both rivers are difficult to ford. Cables span the Matanuska at Palmer and at the mouth of Chickaloon River. It is quite possible to line a boat up Knik River from the railroad bridge. A trail leads across the flat from the Palmer cable crossing to the north bank of the Knik and up that river to Metal Creek. Save for a few ranchers close by the Palmer cable crossing and a placer miner here and there on Metal Creek the region is uninhabited.

*Earlier surveys and present investigation.*—The area covered by the present investigation had not been geologically explored. Some earlier surveys in regions to the south, north, and northeast crossed the border of the area for short distances. In 1906 Paige and Knopf[1] mapped the geology of portions of the Knik and Matanuska Valleys on a reconnaissance scale. Topographers in the same party mapped as much of the drainage into the two rivers as was visible from the valley floor.

In 1910 Martin and Katz[2] mapped in detail the geology of the lower Matanuska Valley. Their investigation was almost entirely

[1] Paige, Sidney, and Knopf, Adolph, Geologic reconnaissance in the Matanuska and Talkeetna basins, Alaska: U. S. Geol. Survey Bull. 327, 1907.

[2] Martin, G. C., and Katz, F. J., Geology and coal fields of the lower Matanuska Valley, Alaska: U. S. Geol. Survey Bull. 500, 1912.

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George Otis Smith, Director

y of the University of Alaska

Bulletin 792—C

# THE TOKLAT-TONZONA REGION

BY

STEPHEN R. CAPPS

5-57
U
B. 792-C

# GEOLOGIC INVESTIGATIONS IN NORTHERN ALASKA

BY

PHILIP S. SMITH

Mineral resources of Alaska, 1925—C

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1927

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nber is abundant. Small cottonwood trees are ushes generally to be found above the highest ny mining operations that may be undertaken nge it will be necessary to haul wood for fuel s for some distance.

erally throughout the region, though the trav- it necessary to select his camp site with the ed in mind, for there are considerable areas ce. The principal forage plants are redtop, t a few places "pea vine," a vetch that grows bars of the streams. Stock can subsist on the between June 1 and September 15, for after the grasses lose most of their nutritive value. several wild edible berries, including currants, berries. The blueberries are especially abun- above timber line at altitudes of 2,000 to 2,800

as been attempted in the region here described. d on Friday Creek, in the Kantishna mining e been cultivated successfully at altitudes of No doubt similar success with quickly maturing ned elsewhere in equally favorable places, but ltural possibilities of the area along the foot e are small, though no doubt stock could be the summer.

### GAME

of the Alaska Range from Nenana River west- the abundance of big game. From McKinley Alaska Railroad to Muldrow Glacier the white d, and hundreds may be counted on a single row Glacier and Tonzona River they are much uthwest of the Tonzona they are again plenti- on is a summer feeding ground for great herds n hot days climb high on the mountains and e heat and the insects. Moose are much less quently seen in the timbered and brushy valleys. throughout the mountains, and black bears in ds. Rabbits and ptarmigan are at times very ary in abundance from year to year. Some fur- r, notably fox, lynx, mink, and marten. Much scribed lies within the limits of the Mount Park, where hunting and trapping are forbidden.



This part of Alaska is poorly supplied with fish. Most of the streams, being glacier-fed, are turbid in the summer, and fish avoid them. Streams that are clear contain grayling but not in great abundance. Wonder Lake contains trout, but that is the only locality in this area where trout are known to occur. So far as known, the salmon, which each year migrate up Kuskokwim and Tanana Rivers to spawn, do not come to the headward reaches of these streams.

### POPULATION, TRAILS, AND TRANSPORTATION

Except for some 30 miners in the Kantishna district, two prospectors at Copper Mountain, and one on Carlson Creek, this region is unpopulated. A few prospectors visit the area from time to time, and an occasional hunting party crosses it on the way to hunting grounds outside the park. Even the natives rarely visit it, as their villages are in the lowlands along streams from which they can obtain fish. West of Muldrow Glacier and south of McKinley Fork there is a single prospector who may be considered a permanent resident. There are no well-marked trails except those of the wild animals. Travelers to this region in summer come either by trail from the railroad at McKinley Park or up Kantishna River by boat to Roosevelt, some 20 miles north of Kantishna post office, and thence overland. A good wagon road is now under construction westward from McKinley Park station, and some 20 miles was completed by the end of 1925. From the end of the road a good trail for pack horses leads by way of Igloo Creek and Polychrome, Highway, and Thorofare Passes around the end of Muldrow Glacier past Wonder Lake to Kantishna post office. Eventually this trail will be superseded by the extension of the wagon road now being built.

In spite of the entire absence of man-made trails southwest of McKinley Fork, travel by pack train in summer presents no serious difficulties. By following close to the northwest face of the range, generally above timber line, the traveler finds an open country with solid footing for horses and little obstruction from trees or brush. Here, too, the torrential glacier streams, which below unite to form deep rivers, are small enough to be forded on horseback except in flood stages. They are, however, large enough to be difficult and dangerous to cross on foot during the summer.

The Alaska Range itself is high and rugged, and travel into its higher parts and up the glacier-filled valleys, where no fuel for camping is to be found, requires alpine equipment. The lowland below an altitude of 2,000 feet, by contrast, is in general timbered and marshy and is crossed by many rivers too large to ford but too swift and shallow to be navigable except by poling boat or canoe,

so that it is to be avoided in summer. In winter, when the streams and marshes are frozen, travel by dog sled is feasible anywhere except in the higher parts of the range.

## GEOLOGY

### GENERAL OUTLINE

The surface distribution of the rock formations of this area, in so far as they have been differentiated, is shown on the accompanying geologic map. (Pl. 2.) The geologic field work on which this map is based has all been of reconnaissance character, a large area being covered during a short field season, so that it has been possible to outline the geologic units only approximately. Even when the position of the formational boundaries was accurately determined in the field it was often impossible to record the details, for the base map used was made in a hasty exploratory trip in 1902, and no time was available to the topographer for refined mapping of the details of surface form. An additional difficulty confronts the geologist working in this region because of the scarcity of fossils from which the age of the sedimentary beds may be accurately determined, and so likewise the age of the igneous rocks is difficult to determine through their relations to sedimentary beds of known age. The only recognizable organic remains found in any of the rocks during the present investigation were some fragmentary leaf imprints from the Cantwell formation on Tonzona River. No fossil shells were seen. It has therefore been necessary to leave the question of the age of the rocks largely unsettled, though correlations are suggested with beds of similar lithology and known age elsewhere. The tentative age assignments here given are subject to change or modification as fuller information is obtained, and it is certain that some assemblages of beds here grouped together will later be subdivided.

The geologic subdivisions shown on the accompanying map have already been described in reports on this and contiguous areas, and elaborate descriptions are unwarranted here. In the following pages a brief description of each subdivision is given, with reference to more complete published descriptions.

As shown on the geologic map (pl. 2) the pre-Tertiary rocks are divided into eight units, each of which is distinguished by a separate pattern. Each of two of these units is a combination of two others; one is an assemblage in which igneous rocks predominate but which includes also considerable sedimentary material, and the other is a similar assemblage in which the sedimentary beds predominate over igneous rocks. The same sedimentary rocks where comparatively free of intrusive materials are shown by a separate pattern, as are the intrusive rocks where they contain only minor amounts of included sediments.



The oldest formation is undoubtedly th
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their association elsewhere with fossilife
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with a massive limestone that elsewhere has
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and the group probably includes beds som
some younger than the limestone. It is pos
Mesozoic black argillites and slates are also
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Basin and near Hanna Glacier are shown
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In addition to the above-mentioned pre-T
there are in the Toklat Basin certain area
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to separate them on a map of the scale of
they are shown either as areas composed
with some included sediments or as mainly
considerable intrusive material.

[8] Brooks, A. H., The Mount McKinley region, Alaska: U
pp. 73–76, 1911.

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797-B
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DEPARTMENT OF THE INTERIOR
Roy O. West, Secretary

U. S. GEOLOGICAL SURVEY
George Otis Smith, Director

Bulletin 797—B

# THE SKWENTNA REGION, ALASKA

BY

STEPHEN R. CAPPS

Mineral resources of Alaska, 1926—B

UNITED STATES
GOVERNMENT PRINTING OFFICE
WASHINGTON
1929

able winter travel by dog trail between Cook Inlet and the mining camps at Iditarod and Innoko, and roadhouses were maintained at intervals of about 20 miles along this route, but with the establishment of a new winter trail to the lower Yukon and Kuskokwim region from Kobe, on the Alaska Railroad, the Skwentna-Rainy Pass route became little used, and the roadhouses were abandoned. In 1926 the only permanent residents in this entire region were three trappers who occupied the old roadhouse at Skwentna Crossing, some 13 miles above the mouth of the Skwentna.

The nearest permanent settlement of any size is Susitna Station, on Susitna River some 2 miles below the mouth of the Yentna, where 30 or 40 natives and a few whites reside. Occasionally a native family makes a hunting trip up the Skwentna, going up on foot and later descending the river in rough boats covered with the skins of animals killed during the hunt. Even such temporary visits by hunters have been rare of recent years, and in 1926 the members of the Geological Survey party were the only persons in the region west of Skwentna Crossing. The meager evidence of the presence of men indicates that for many years few natives and no white men have visited the Skwentna Valley above Portage Creek.

## ROUTES OF TRAVEL

The old winter dog trail from the Alaska Railroad at Nancy to the Kuskokwim by way of Rainy Pass is still open and may be used during the winter to points on the Skwentna as far west as the mouth of Happy River. This trail, however, is now rarely used and offers no accommodations to travelers. Anyone now using it would be forced to break his own trail the entire way. In summer power boats of light draft can ascend Susitna, Yentna, and Skwentna Rivers to a point some 7 miles above the mouth of the Skwentna. Above that point the swift current and numerous riffles render much of the river unnavigable, even for light boats equipped with outboard motors, and poling and lining must be resorted to. Although it is possible to take light loads as far upstream as Portage Creek and possibly farther by this means, the work is arduous, progress is slow, and the attempt should not be made except by men experienced in this kind of work, for there is constant danger of swamping in the rushing water.

In summer the winter trail from Susitna Station to the Skwentna at Skwentna Crossing is said to be too swampy for travel by loaded pack horses. The Geological Survey expedition landed its horses at a point 2 miles above the mouth of Beluga River, on the west side of Cook Inlet, and with light loads proceeded northward around the head of Talushulitna River, reaching the Skwentna some 4



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## GEOL

### PRINCIPAL

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miles above the mouth of Canyon Creek. Parts of this route are brushy and require considerable trail chopping, and other stretches are difficult as the result of swamps and lakes caused by beaver dams. About 10 days should be allowed for traversing the 70 miles from Beluga to the Skwentna.

Having arrived at the Skwentna, it is necessary to cross that river, which is there too deep to ford. In summer stages of water there are likely to be two or more channels each at least 100 yards wide, and it would be hazardous to have the horses swim with their loads. It is therefore necessary to have a boat at the crossing to transfer the equipment and members of the party. From the north side of the river the winter trail can be followed westward by pack horses, though in places the ground is boggy.

Some 4 miles west of Happy River travelers into the upper Skwentna Basin leave all marked trails behind, but except for some brushy areas, where cutting must be done, pack horses can be taken almost anywhere without unusual difficulty. Frequent and well-traveled game trails are of great assistance and with a moderate amount of cutting can be developed into good trails for horses.

## GEOLOGY

### PRINCIPAL FEATURES

The areal distribution of the rock formations that have been differentiated in this region is shown on Plate 1. These formations have been studied only in a reconnaissance manner, during a short summer field season in which a large area was visited, so that it has been possible to outline the rock units only approximately. Furthermore, the topographic map used as a base for plotting the geology was in preparation at the same time that the geologic mapping was in progress and was not available in completed form until after the field season was over. As a consequence, the geologic boundaries as determined in the field were recorded on sketch maps and notebook plats and had to be adjusted to the final topographic map in the office, with a resulting loss of accuracy. On the whole, however, it is believed that the geologic boundaries are sufficiently accurate to show the main features of distribution of the several formations.

Only five assemblages of rocks are here mapped, two of which are of Quaternary age. A third consists of isolated patches of coal-bearing Tertiary (Eocene) beds. The remaining rocks are subdivided into two groups, one of which is dominantly igneous. Even this distinction, however, can not be relied upon consistently, for the sedimentary group contains much tuffaceous material of volcanic origin and is locally so intimately cut by dikes and sills that it is difficult

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DEPARTMENT OF THE INTERIOR
Roy O. West, Secretary

U. S. GEOLOGICAL SURVEY
George Otis Smith, Director

**Bulletin 797—F**

# GEOLOGY AND MINERAL RESOURCES OF THE ANIAKCHAK DISTRICT, ALASKA

BY

RUSSELL S. KNAPPEN

Mineral resources of Alaska, 1926—F

UNITED STATES
GOVERNMENT PRINTING OFFICE
WASHINGTON
1929

started, it may be fed with green wood
y heat. The wood is too small, crooked,
r of any sort. The alders are usually
800 feet above sea level. Willows are
here and there to an altitude of 500
ands they appear as stunted bushlike
t in height or an inch in diameter of
it well-watered locations they attain a
ight of 15 feet. In no place were the
ovide any timber. On the borders of
portions of the lowlands grow salmon-
berries. Devil's club was found only
e Bay. Other bushes are rare.
he southwestern portion of the penin-
iak Island has puzzled many observers
limate is favorable, being milder than
orth and northeast, which are heavily
ertile. Confinement of the outposts of
eys suggests that exposure to severe
e of the controlling features in their

nt and most luxuriant plant in the
aylight during the growing season and
mbine to produce a growth 3 to 6 feet
ces a man on foot can see only a little
is way through it. These grasses are
rye. On the shores of Chignik Bay
it probably the seed had been dropped
and Office party which traversed that
The luxuriant grass furnishes excel-
June 20, when the grass began to grow
nt forage throughout the season. The
g of cattle on this grass are very great,
s of the broad plain northwest of the
10 to 15 miles to the Bering Sea. A
sing in this area is that the frequent
probably make it impracticable to cut
Grass that is not cut does not cure
omes unpalatable, so that horses will
er than eat it. Accordingly the graz-
or four months, except on the sandy
urishes. If this grass is ever to be
y be necessary either to remove the
n them in the spring, or else provide



artificial heat or other satisfactory means of curing hay under cover to subsist the animals for the seven or eight months when they can not provide for themselves in the open. Except for reindeer and a few horses, no livestock is kept in this portion of the peninsula.

The grass becomes less luxuriant as altitude increases, and above 800 feet it is rarely much of an obstacle to walking. On the drier hill sides and above the terrain on which grass and alder flourish moss and heather grow abundantly, forming in many places a cushion a foot or more thick over the underlying rock. This type of vegetation extends up to an altitude of 2,500 or 3,000 feet. Above this tract there is practically no vegetation except in protected coves with a southerly exposure.

Flowering plants are abundant throughout the district and are especially numerous on the drier portions of hillsides. White and yellow blooms are most common, but brilliant reds and blues are also abundant. During the short growing season the blossoms develop in great luxuriance, and at many places one may collect 75 different species in half an hour.

## CULTURE AND TRANSPORTATION

There are few man-made features in the region except the settlements and canneries already mentioned or the few scattered houses and other features, all of which are indicated on the accompanying topographic map. Except for a short road to an old coal mine and the trails made by the Land Office and Geological Survey parties, the only trails marked on the ground are those made by the bear and caribou. These caribou and bear trails are usually beaten hard and have been selected to follow dry ground, so that they furnish the best routes through the district. The principal means of travel used by the natives are the waterways, the light native canoes being adapted to movement along shore during calm weather and to journeys up some of the larger streams. All summer travel across the peninsula, within the area described, follows the canoe route that goes from Chignik Bay through the lagoon, up Chignik Lake and Chignik River to Black Lake, over a portage, through two small unnamed lakes, and finally down a small stream which empties into Bering Sea about 20 miles southwest of Port Heiden. During the winter travel is relatively easy in any direction on the lowlands, because the swamps are frozen and the heavy blanket of hard snow furnishes good footing for snowshoes. In the summer much of the lowland area north of the mountains is an almost impassable marsh in which horses become mired and over which a man can pick a way only with great difficulty. It is necessary to follow the lower slopes of the mountains, where they are free from alders, and to search for

high places such as raised spits and sand bars in the flat, or else to travel above the line of the alders on the mountain slope.

In a district with so scanty a population as that of the Aniakchak district there is little demand for intercommunication, and accordingly no telegraph lines exist within the area, and except along the coast there are no post offices. The steamer *Starr* carries mail from Seward to points along the Pacific coast of the peninsula once a month throughout the year. During the summer it passes into Bering Sea and serves post offices on the north side of the peninsula and at Nushagak. The only post office within the area here discussed is at Chignik. A wireless station operated by and located at one of the canneries at Chignik during the summer handles commercial messages to and from the Government station at Kodiak and so provides good communication with the rest of the world.

The best harbor in the area is Anchorage Bay, where steamers can lie at the cannery docks. Shelter and anchorage for smaller vessels are available in Mud Bay, Chignik Lagoon, and Hook Bay, although a broad bar at the mouth of Chignik Lagoon can be crossed only at high tide. Sitkum Bay is said to offer good anchorage, and a good harbor for small boats is reported in the lagoon at the head of Aniakchak Bay. On the northwest coast only Port Heiden interrupts the smooth curve of the sandy beach. It is reported to be shallow at low tide, and broad areas of exposed mud flats lend confirmation to the report.

## CLIMATE

As the Alaska Peninsula is a comparatively small body of land between two large bodies of water, its climate is much more equable than that of most of the rest of Alaska. From whatever direction the wind may blow it comes from salt water—the ocean or Bering Sea. The summers are short and moderately warm. In the field season of 1925 the temperature rarely exceeded 80°, and only at high altitudes was frost noted. Snow lay on the hills within 400 feet of sea level in the middle of June, but it had largely disappeared from southern slopes by the middle of July, and at the end of the field season in September only the glaciers on the volcanoes and gulches in the mountains southeast of Chignik Lagoon retained large amounts of the previous winter's snow. Until late August, however, snowbanks lay in ravines in the mountains and furnished distinctive landmarks. At times during the summer the winds are violent and during severe blows are estimated by navigators to have a velocity of 80 to 100 miles an hour along the seacoast. In several places it was necessary for men moving along exposed ridges to



crawl on hands and knees because
upright in the terrific wind.

From whatever direction the wi
mountains has its moisture quickly
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The rainfall is variable, being hi
the adjacent plains. The actual a
be inferred, because most of the mo
than large drops, and although the
of wet weather the rainfall seldom
The climate in this area is reported
the Cold Bay region, to the northe
91 days in 1925, there were 33 days
and 42 days that were fair.

The winters are marked by heavy
the fine granular snow before high
It is reported that storms of three
mon. During these storms it is unsafe
because of the swirling and drifting
is said rarely to go much below zero
each member of the party wore heav
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## PHYSIOGRAPHI

The Aniakchak district may conve
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and a third that is less extensive an
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other parts of Alaska.

The lowland near the Pacific coast is
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Mud Bays the mountains rise directly
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In a few places this plain is covered
shore line its surface is formed by ma