TERRITORY OF ALASKA

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PROSPECTING IN ALASKA

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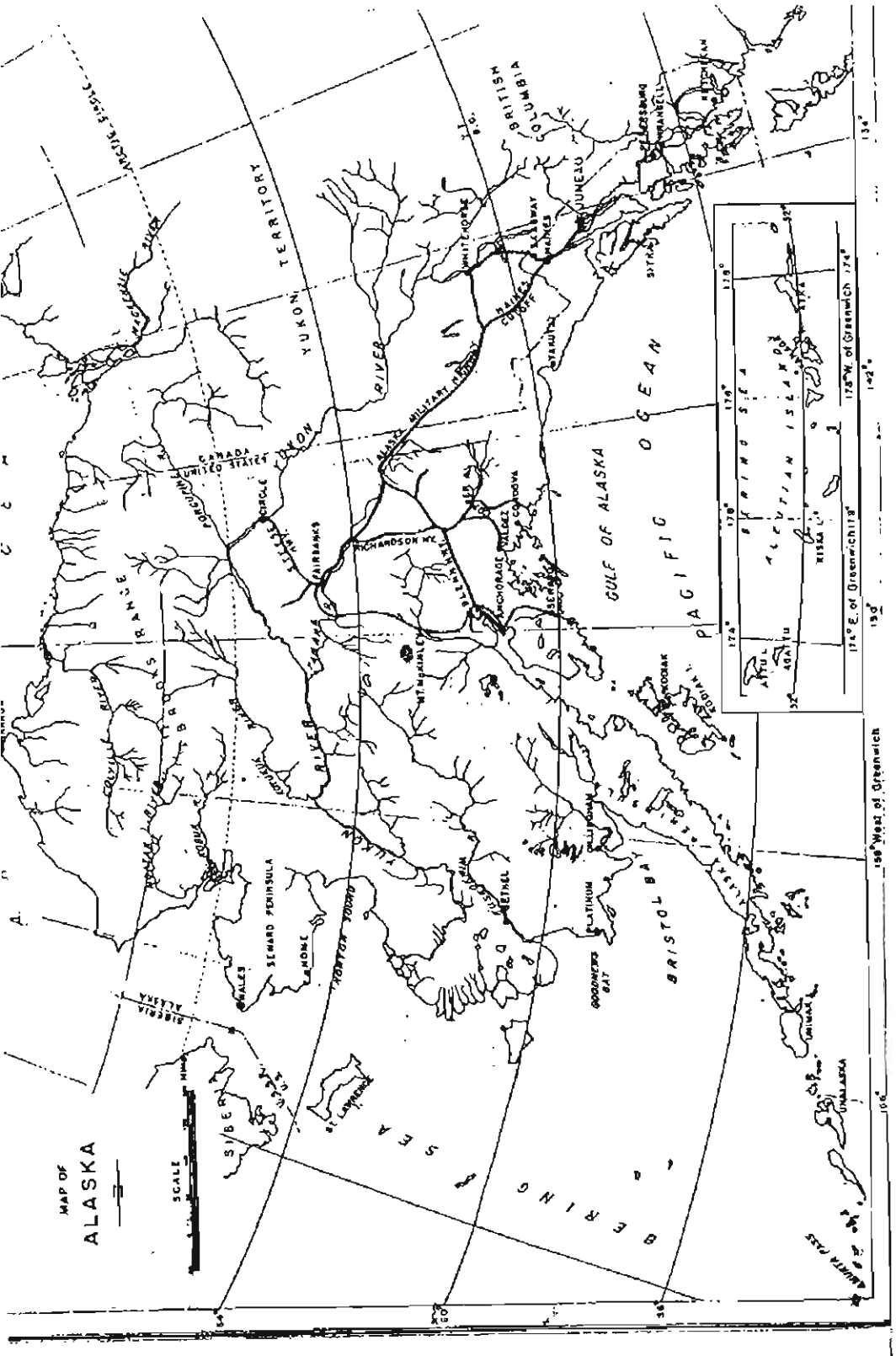

PROSPECTING IN ALASKA

INTRODUCTION

The Territorial Department of Mines receives numerous requests for information on prospecting in Alaska from persons unfamiliar with conditions that would be met in carrying on a search for mineral deposits in the Territory. The object of this paper is to answer as briefly and completely as possible the questions common to such inquiries.

Prospecting is essential to the continued welfare and growth of the mining industry of Alaska. Efforts of the personnel of the Geological Survey assigned to work in Alaska are devoted principally to recognizing and mapping the general geology of an area rather than the location of specific commercial mineral deposits. Engineers, whether they be Government, Territorial or private, examine known mineral occurrences and do not search for new ones, although they may attempt to locate extensions of known bodies. The burden of locating entirely new deposits therefore falls upon the prospector. Prospecting is alluring to the type of individual who loves the rugged life of the open and the gamble at long odds for possible high stakes. There are instances where the discovery of one commercial mineral deposit has resulted in its owner becoming financially independent for life. A person who is unwilling to accept hardships and disappointments should choose some occupation other than prospecting. It is proposed to point out in this paper some of the problems confronting the prospective prospector. A number of important discoveries have seemingly been the result of pure luck, but a knowledge of geology and mineralogy is desirable before taking the field on a prospecting venture. A number of very good non-technical books have been published on the subject, and some of the universities, including the University of Alaska, offer short courses in mining and prospecting.

Free assaying service is available to Alaskan prospectors at the Territorial assay offices, and identifications of rocks and minerals that are not recognized in the field but which may contain something of value, are also made. These offices are located at Ketchikan, Anchorage, College and Nome. The men in charge are familiar with adjacent areas and may be able to offer helpful sug-

gestions. Field examinations of worthy prospects by qualified mining engineers, including mapping and sampling, may be arranged through the Commissioner of Mines.

The land area of Alaska is about one-fifth that of continental United States or 586,400 square miles. The 1940 census shows a total population of 72,524. The principal towns are Ketchikan, Wrangell, Petersburg, Juneau, Skagway, Sitka, Cordova, Valdez, Seward, Kodiak, Anchorage, Fairbanks and Nome. Approximately half the area of Alaska has been mapped by the Geological Survey, of which only a small percentage was in detail. Geologic maps and reports on areas selected for prospecting should be obtained if available. Some of the bulletins on individual districts contain suggestions for prospecting and indicate the formations most likely to contain mineral deposits. The Geological Survey has issued an index map of Alaska showing the areas covered by maps and bulletins that are available, on the back of which is a list of these maps and bulletins. It is obtainable free of charge from the Director, Geological Survey, Washington 25, D. C. All of the producing districts have been visited by engineers of the Territorial Department of Mines and many reports on individual properties and small areas are on file at the headquarters office at Juneau. Most of the reports are as yet unpublished, but such information as it is possible to release is available upon request.

Minerals having a total value of over $950,000,000 had been mined in Alaska from 1880 through 1948. Record production for a single year was in 1916 when the value of all minerals recovered was over $48,000,000. Value of minerals produced in 1940, the most recent year in which the mining industry was not adversely affected by preparation for war, amounted to $28,470,000. Value of minerals mined during the war period reached its lowest level in 1944 when it was only $6,900,000. Mineral production increased in value to over $18,000,000 in 1947 but dropped to $15,000,000 in 1948. Conditions that arose during the war period, such as greatly increased cost of operation with no comparative raise in the price of gold, have remained to prevent the mining industry from reaching its pre-war level.

FINANCING

Financing necessary to carry on prospecting during the open season in Alaska varies with the individual and with the accessi-

blity of the area selected. Probably the minimum amount required for ordinary pick, shovel and pan methods of prospecting in the more accessible regions would be from $750 to $1,000, which would include transportation and supplies for a period of approximately six months. A reserve fund should be available from which to draw in case no employment is obtainable at the close of the season. Fortunate indeed would be the prospector who could in one season locate a deposit sufficiently rich to yield returns that would finance future work. Transportation alone into the more remote and isolated sections of the Territory might reach near the amounts mentioned above. No Government or Territorial financial assistance is at present available for prospecting in Alaska. Reconstruction Finance Corporation loans may be obtained under certain conditions for developing prospects already located. The requirements for obtaining one of these loans are difficult to fulfill and in only a few instances have Alaskan prospectors been able to obtain them. It is desirable for a prospector to have sufficient funds of his own to carry on his work in that he will have full control of any claims that he may locate. Many chances for sale or lease of property under favorable terms have been lost on account of disagreement among partners or stockholders. Other methods of financing include grubstaking whereby one or a group of persons furnish funds for the venture, usually for a 50 per cent interest in any mining property that may be acquired. Mining companies will in certain cases finance prospecting, usually in areas chosen by the company. The latter method is used more extentively in Canada than in the United States.

EQUIPMENT AND SUPPLIES

Ordinary equipment and supplies may be purchased in Alaska at any of the larger towns and at many of the smaller towns and trading posts scattered through the Territory. Heavier equipment, such as drills and pumps, may be ordered from mine supply companies through representatives stationed in the Territory. The most satisfactory procedure is to obtain equipment and supplies as near as possible to the district chosen. The dealers through years of experience have learned to stock those items best suited to the district and in most cases their prices compare favorably with outside prices plus freight. Game and fish are available in many

sections of Alaska to augment or vary the food supply of the prospector.

TRANSPORTATION

Steamer transportation is maintained to the principal towns along the coast of Alaska and is generally cheaper than airplane transportation, which is also available. Travel by small boat may be arranged to adjacent areas along the coast. Railway or automobile transportation is available from the coast to Fairbanks and way points. The road system of the interior is connected with the United States proper by the Alaska Highway. River steamers ply the Yukon during the open season and points on some of its tributaries may be reached by smaller boats. Similar transportation is availble on the Kuskokwim. Many landing fields are scattered through the Territory and probably the most satisfactory and often the cheaper method of interior travel is by airplane. In many sections where there are no fields landings may be made by ski-equipped planes while there is a snow cover. Planes are either stationed at or include in their routes of travel all the principal towns of the Territory.

LOCATING CLAIMS

Unclaimed mineral lands in Alaska are subject to location under the United States Mining Laws, supplemented by the Territorial laws. Briefly, the law requires the discovery of a vein or lode in place prior to locating a lode claim, and the discovery of mineral within its boundaries before locating a placer claim The dimensions of a lode claim are 1500 feet along the course of the vein by 300 feet on either side of the middle of the vein at the surface. There is no limit to the number of lode claims that may be located. Territorial laws limit the length of an individual placer claim to 1320 feet, and the area to 20 acres, which would limit the width to 660 feet. They also provide that not more than two individual placer claims may be located by the same person in the same recording district in any calendar month. However, two additional placer claims may also be located in each month on behalf of each of two other persons whose powers of attorney are held by the locator, provided such powers of attorney have previously been recorded in the mining precinct where the locations are to be made. Copies of the Territorial laws governing the

location and holding of mining claims may be obtained from the office of the Commissioner of Mines at Juneau. There are approximately 47 recording precincts, but it is impracticable to publish a map showing them because the boundaries are changed by the judges of the four judicial divisions as conditions warrant. A prospector should therefore through inquiry learn the location of the recording office for the precinct within which he expects to work.

Coal lands are subject to permit and lease from the Secretary of the Interior on a royalty and rental basis. Leases may be had on oil and gas lands. The maximum area that may be held under coal permit or lease is 2560 acres. Provision is also made for the issuance by the Registers of the General Land Office of free-use licenses on 10-acre tracts from which coal may be mined for the use of the licensee without payment of royalty.

REGIONS

Choice of a district for prospecting is often difficult for one unfamiliar with the Territory and yet it is deemed inadvisable to recommend particular areas. The choice would depend on the individual—whether he is interested in lode or placer, the amount of funds at his disposal, his experience, and preference for a more or less settled district or one that is wild and unexplored. Probably the best procedure would be to spend some time in the Territory, meeting and obtaining suggestions from as many mining men and prospectors as possible, before finally deciding on a locality. It should be borne in mind that the prospector who roamed Alaska in the early days knew his business and probably discovered most of the surface or easily found deposits in the areas prospected. On the other hand, most of these old-timers were interested in gold and may have overlooked deposits of other minerals that might be equally as important. There are a number of areas not reached by these early-day prospectors that are now accessible by modern methods of transportation. Some of the more complex or low-grade ores that were of no interest at that time may well be of interest at the present time because of improvement in mining and milling practices. In the search for placer deposits it should be remembered that the early prospecting was along the creeks where water was available for sluicing. Pumps are now available for raising water to the elevated benches and particular attention

should be given them in the older producing districts where they may been overlooked. There is also the possibility that recent recession of glaciers, snow and land slides, floods and other agents of erosion have disclosed outcrops previously undiscovered. Below is given a brief outline of some of the noteworthy features of the various sections of Alaska.

SOUTHEAST ALASKA

Southeastern Alaska, including the numerous islands, is generally mountainous and rugged. Nearly all sections are heavily covered by timber, brush and overburden up to timberline which is from 2,000 to 3,000 feet in elevation. Prospecting is therefore difficult on the lowlands and has been confined principally to the streams, beaches and ridges above timberline. Much of the inland country remains practically unprospected, but there is a reason, as it is rough and precipitous, with glaciers occupying many of the valleys. A person would have to possess some of the characteristics of the mountain goat to reach some sections. Rainfall is generally heavy, ranging from about 30 inches annually in the drier parts up to 150 inches in others. Temperatures are moderate along the coast with no extremes of either hot or cold weather. Bays, inlets, channels, etc., remain ice free the entire year, with the exception of a few that are entered by large volumes of fresh water.

Approximately $2,500,000 in placer gold was recovered in the early days from the Juneau and Porcupine districts. Nevertheless, southeastern Alaska is considered by geologists to be not favorable to the occurrence of placer deposits. Much of it was recently glaciated and erosion has not proceeded to the extent necessary for the deposition and concentration of large deposits such as those of the interior.

The Hyder district contains deposits of silver, lead, gold, copper and tungsten ores. Considerable development work has been done on several of the showings and some production has resulted from milling operations and shipments of ore to smelters. Attempts have been made to develop placer gold deposits in the vicinity, but no production has as yet been reported. Ore containing scheelite has been mined and shipped. The country is mountainous, with some of the higher peaks rising to 7,000 feet above sea level. Many of the higher sections are covered by ice and snow fields. The snowfall is heavy in winter. Adjacent to this

district is the Premier mine in British Columbia, which has been one of the most important producers of silver and gold in Canada.

The Ketchikan district has produced copper, gold, silver, lead, zinc, palladium, platinum, marble and limestone. It is also known to contain chromium, iron, antimony and molybdenum. Government geologists and engineers have investigated the extensive magnetite deposits on Prince of Wales Island as a potential source of iron ore for a proposed steel industry on the Pacific Coast. The magnetite contains a small percentage of chalcopyrite and considerable ore was mined years ago for the copper content. The district as a whole is well mineralized and much development work has been done over a period of years. Considerable mining property is being held at the present time, but it seems likely that additional discoveries will be made and some of the known deposits that are at present open for location might well be of interest under improved conditions.

Gold and garnets have been produced in the Wrangell district. Occurrences of zinc, silver, lead, pyrite, barite, graphite, marble, limestone and fluorite are known to exist. Development on some of the showings has indicated ore of commercial grade and production is to be expected in the future. The district probably deserves more attention from prospectors than has heretofore been given it.

No productive mining has been carried on in the Petersburg district, but discoveries of lead, zinc, silver, gold, copper, chromite, manganese, barite, witherite, gem materials such as agate and jasper, and coal have been reported. The district has not been intensively prospected.

The Sitka district includes Baranof and Chichagof islands. Ore produced at the mines on Chichagof Island has been relatively high grade and has probably averaged an ounce or more of gold to the ton. Gold and silver to the value of around $20,000,000 has been recovered. Gypsum has also been mined on Chichagof Island. Considerable development of gold lodes has been carried on in the vicinity of Sitka on Baranof Island but little production has resulted. Scheelite occurs in conjunction with gold lodes at a mine on Lisianski Inlet. Large low-grade copper-nickel deposits have long been known to exist on Baranof, Chichagof and Yakobi islands. More or less intensive studies have been made of these deposits by Government agencies to determine grade and extent, but there has as yet been no production from them. Most of the

beaches of the district have at least been cursorily examined, but much of the interior of the islands remains practically unexplored and is difficult of access. It seems reasonable to believe that additional discoveries will eventually be made.

One of the well known lode mining districts of the United States is the so-called "Juneau Gold Belt." It has produced gold, silver and lead with a total value in the neighborhood of $150,000,000 and none of the ore bodies from which this production came is as yet exhausted. The famous Treadwell mine on Douglas Island was still in the ore in 1917 when a cave-in closed it. Up to that time it had produced over $60,000,000. The major production has been from large-scale operations on low grade ores. However, some high-grade also occurs such as pockets of veritable "picture rock" found at the Comet mine in the Berners Bay area where some of the miners claimed that the quartz was hard to break down on account of the gold content. More recently small high-grade veins have been worked in the Glacier Bay area which are said to carry several ounces of gold to the ton. The mainland deposits are for the most part stringer lodes, whereas on the north end of Admiralty Island there are massive veins of gold-bearing quartz. Outside of the producing areas, several more mineralized zones are known to exist that will under favorable conditions undoubtedly be mined. Minerals known to occur in the district, in additon to those mentioned above, include zinc, copper, antimony, nickel, molybdenite, manganese, iron, coal and tremolite asbestos. Some placer gold was produced in the early days in the vicinity of Juneau and at Windham Bay south of Juneau. More prospecting has been done in the district than in most sections of Alaska. However, the chances for additional discoveries in the almost inaccessible back country are considered good. The Glacier Bay National Monument has recently been thrown open to prospecting and some sections of it are known to be well mineralized.

The Skagway precinct includes the Porcupine placer district from which over $1,000,000 in gold has been mined. Most of the production was made years ago and it seems probable that the richer and more easily mined ground has been worked out. The possibility remains of working on a large scale lower grade gravels with modern machinery. Little prospecting for lodes has been done in the vicinity of the placers, although ledges carrying low values in gold, silver, lead and copper are known to occur. High-grade specimens of quartz containing gold and bornite, said to have been found in the region east of the Chilkat valley, have been brought in to Haines at various times. Development work has been done on deposits containing zinc, lead and silver near Skagway, and molybdenite occurs north of the town near the boundary. There is a magnetite occurrence in the vicinity of Haines.

SOUTH CENTRAL COASTAL REGION

The coastal region from Cape Spencer to the mouth of Copper River is exposed to the open water of the Gulf of Alaska and there are few sheltered bays. Much of the inland country is covered by glaciers which in a few places protrude to the sea. The lowland is generally covered by timber and brush through which travel is exceedingly difficult. High mountains parallel the coast-line only a few miles from the beach. The climate is similar to that of southeastern Alaska.

Intermittent, small-scale placer mining has been carried on for many years along the beaches near Lituya Bay, but the total production of gold has probably amounted to less than $100,000. A small amount of platinum was recovered with the gold. Practically all the mining has been done on material recently concentrated by wave action. The benches have not as yet been thoroughly prospected, and there is the possibility that some of them might be suitable for low-grade, large-scale operations. Little prospecting for lodes has been done in the vicinity due in part to difficult travel inland from the beach. A large basic intrusive that apparently warrants prospecting has been reported by the Geological Survey on the west slope of Mount Crillon (Bull. 947-D). Mineralization observed in the area included copper, graphite, iron, ilmenite and chromite. The suggestion has been made that the intrusive may be the source of platinum on the beaches in the vicinity of Lituya Bay.

The area adjacent to Yakutat Bay is similar to that at Lituya Bay. Considerable prospecting has been carried on in the vicinity, but only a small production of placer gold has resulted. Colors may be panned from most of the sands and gravels, although few pay streaks have been found that were sufficiently rich to work by the small-scale methods heretofore used. Some small beds of lignitic coal are known to exist and copper mineralization has been noted.

Placer gold has long been known along the beaches and in some of the streams near Yakataga. At the present time a few families make a living by working the beaches after the storms have concentrated the values, supplemented by fishing during the summer. The total production of placer gold from the district has been a little over $300,000. There are several known petroleum seepages and beds of coal of unknown extent are said to occur in the mountainous region several miles inland from the beach. The coast affords no shelter and travel by small boat is at times dangerous.

The important mineral resources of the Controller Bay region are coal and petroleum. From the Katalla field has come the only Alaska production of oil in commercial quantity. For many years a small output of paraffin-base oil with very high content of gasoline and other volatile fractions was maintained by pumping from a group of shallow wells. The production was treated in a small refinery that burned several years ago. The district as a whole has not been thoroughly explored.

The Bering River field contains extensive beds of high-grade coal ranging from semi-bituminous to anthracite, some of which is coking quality. Due to lack of transportation, and excessive costs of reaching markets, the field remains undeveloped. At such time as the manufacture of iron and steel is established on the Pacific Coast this field may prove to be an important source of coking coal.

COPPER RIVER REGION

An area of several thousand square miles in south central Alaska is drained by Copper River and its tributaries. Elevations range from sea level at the mouth of the river to a maximum of about 16,000 feet in the high mountains of the Wrangell and Nutzotin ranges in the interior. There is a wide range of climate from that of the temperate, humid coastal region to the extreme temperatures and moderate rainfall of the interior. Glaciers cover parts of the mountainous sections of the region. Some sections are traversed by swift, treacherous glacier streams that render traveling difficult and hazardous. Transportation along the lower reaches of the river has been rendered difficult by the abandonment of the southerly section of the Copper River and Northwestern Railway, although river boats may be used to some extent.

The upper region may be reached via highway from Valdez or Anchorage and the Nizina district by plane from Chitina.

Intermittent development has been carried on for a period of years on gold lodes in the McKinley Lake area between the mouth of the river and Cordova. Some placer gold was produced in the Bremner River area and in recent years promising gold lodes have been under development.

Nickel-bearing lodes are known to occur near the head of Canyon Creek which enters Copper River about eight miles below the mouth of the Chitina.

The Kennecott or Nizina district is noted for its high-grade lodes from which over $200,000,000 in copper has been produced. The known deposits were worked out and the mines finally abandoned in 1938. Much of the silver that has been produced in Alaska was a by-product of these copper deposits. The district has long been a producer of placer gold. Native copper and silver have also been recovered from the placers. A small amount of lode gold has been produced. The district as a whole is well mineralized and it seems probable that additional commercial mineral deposits will be found.

The upper White River district is on the Yukon River slope opposite the Nizina district. The mineralization there is similar to that of the Nizina district, but lack of transportation facilities has prevented productive mining of the copper deposits. Placer gold was discovered in the area during the early days, but the deposits were considered of too low grade to be mined at that time. Some of the deposits of the district might be successfully worked if more favorable transportation facilities were available.

Placer gold for many years has been produced in the Chistochina district. The known high-grade deposits are now worked out, but mining still is being conducted by means of hydraulic and mechanical methods. Platinum is associated with the placer gold. The bedrock source of neither of these minerals has been found. Most of the mining has been done above timberline where the open season is short.

Placer gold is widely distributed in the Nelchina district, but in only a small area has it been found sufficiently concentrated to be of economic importance under existing transportation difficulties. This district has recently been rendered more accessible by a highway connecting the Matanuska valley with the Richardson

Highway. Further investigation might reveal that some of the deposits heretofore unprofitable to mine may be worked under the improved transportation conditions.

PRINCE WILLIAM SOUND

The Prince William Sound region includes many islands, inlets or fiords and bays. There are extensive glaciers in the surrounding country, tongues from which in some instances extend to sea level. Winter temperatures seldom fall below zero and the summers are cool. Precipitation in the form of rain and snow is heavy. Timber is plentiful and there is a thick growth of underbrush. Conditions for travel by boat are favorable during the entire year, but most of the inland sections lack roads and trails and are difficult of access.

Extensive copper deposits occur in the Ellamar district from which considerable ore was shipped in the early days. Some of the ore shipped contained appreciable amounts of gold. Other minerals found in the district include silver, lead, zinc and iron. A few gold quartz claims were located that failed to be of economic importance at the time of location. Improved mining and milling methods now available might justify reexamination of some of these deposits.

The Valdez district has been an important producer of lode gold from the small high-grade veins that are typical of the district. Gold was first discovered in the gravels of several of the streams in the vicinity, but the placers were not workable with the simple methods then used. Most of the streams are small and contain only limited amounts of gravel. Silver, lead and copper are present in some of the ore. Considerable development work has been done for a period of years on several properties that have not yet been brought into production.

Small gold-bearing veins, similar to those in the vicinity of Valdez, have been under development in the Tiekel district which is approximately 35 miles in an airline northeast of Valdez. Little if any production from these lodes has resulted, although high assays in gold have been reported from some of the ore. Most of the claims are at high elevations and the cost of transportation from the highway by trail probably accounts for the lack of production. Silver, lead and copper are included among the other minerals associated with the gold. A small amount of placer gold was produced from the district.

Veins containing gold, silver, lead, zinc and copper have been developed to some extent near Unakwik Inlet. A number of gold lodes have been located in the Port Wells area, development of some of which has reached the productive stage. Silver, lead, zinc and copper are associated with the gold. Small veins carrying good values in gold and some silver, lead, zinc and copper have recently been located in the Passage Canal area, the geology in the vicinity of which is said to be favorable to the deposition of gold. The outcrops were discovered after they were exposed by the receding glacier. A small vein was discovered at Jackpot Bay many years ago, some of the better ore from which is said to have assayed as high as 2.5 ounces of gold per ton and also contained silver, lead and zinc.

Extensive copper deposits have been developed on Knight and Latouche islands. The larger part of the copper produced in the Prince William Sound region has been from the mines of the Kennecott Copper Corporation on Latouche Island that were worked out and abandoned several years ago. Some production resulted from operations at the numerous properties on Knight Island, but no important mines have yet been developed there.

ALASKA RAILROAD REGION

The region adjacent to the Alaska Railroad is well covered by available reports and maps of the Geological Survey on individual areas. Also available is a late generalized report on the whole area, including geologic maps, contained in U. S. Geological Survey bulletin No. 907, "Geology of the Alaska Railroad Region," copy of which may be obtained at a price of $1.25 from the Superintendent of Documents. Probably in no other part of Alaska have there been more intensive investigations of mineral resources than in this section.

On the southern end of Kenai Peninsula are chromite deposits from which considerable high-grade ore has been mined. The western part of the peninsula is underlain by extensive beds of lignite coal from which the first coal in Alaska, and probably on the Pacific Coast, was mined by the Russians in 1885. A small amount of gold has also been mined over a period of many years from the beach placers of the west coast. At Nuka Bay, on the southeast coast of the peninsula, a number of gold lodes, some of which are comparatively high-grade, have been developed and brought into

production. Adjacent to the railroad north of Seward production of placer and lode gold has proceeded on a small scale for many years. In the upper Matanuska valley are extensive beds of high-grade coal that supply the lower rail belt with fuel, and which is also used in the operation of the Alaska Railroad. The Willow Creek district is an important producer of lode gold and is second only to the Juneau district in that respect. A small production of placer gold was made during the early days of this camp. The Yentna or Cache Creek district is one of the important gold placer camps of the Territory and also contains coal deposits that have furnished some fuel for local consumption. Gold lodes are under development in the Broad Pass district and other lodes carrying gold, silver, lead and zinc also occur in the upper Chulitna River area. There are numerous deposits of coal in the district, some of which have been developed to a limited extent, two having produced coal in commercial quantities. Placer gold has been mined for many years in the Valdez Creek district and some promising gold lodes have been discovered and partially developed. The Bonnifield region has long been an important placer gold camp, and gold, silver and lead lodes have been developed to some extent. A substantial amount of placer gold has been mined in the Kantishna district and the lodes have yielded silver, lead, gold and antimony. Fuel for domestic use and for the generation of power in the northern part of the rail belt is mined from the extensive beds of sub-bituminous coal in the Healy River field. The Fairbanks district is well named the "Golden Heart" of Alaska, as it is the principal producer of placer gold in the Territory. It has also produced substantial amounts of lode gold and some antimony and tungsten ore.

SOUTHWESTERN ALASKA

No productive mining has been carried on in southwestern Alaska for a number of years, with the exception of desultory, small-scale mining of the beach placers on Kodiak Island. Most of this section is accessible to boat transportation, but care must be exercised in traveling by small boat during stormy periods. Climatic conditions are not severe except in the northern part. Annual rainfall varies in different sections from about 100 inches to 20 inches. Fog is common, especially on the western end of the Alaska Peninsula and the Aleutian Islands. Timber becomes sparse

and gives way, west of Naknek Lake, to alder and willow brush with a luxuriant growth of grass over much of the area. A little timber is found in certain sections of Kodiak Island. The region has not been intensively prospected although some sections are known to be well mineralized.

The Aleutian Islands have not been mapped geologically and little is known of the mineral resources. An attempt was made many years ago to develop gold lodes on Unalaska Island, but no production was reported. More recently a sample of apparently high-grade zinc ore (sphalerite) was received by the Department of Mines from a prospector who stated that it was obtained from the eastern end of Unalaska Island, and later a sample of similar material was received that was said to have been obtained on Sedanka Island. Investigations in the area by the U. S. Bureau of Mines indicate the possibility that additional exploratory work might reveal a new source of zinc, as well as minor amounts of lead, copper, gold and silver. Native sulphur has been reported on Akun Island and at other localities in the vicinity of volcanoes on the islands and on the peninsula. Between two and three million dollars in gold was recovered at the turn of the century from the Apollo mine on Unga Island. The ore also contained lead, silver, zinc and copper. Other lodes in the vicinity were under development at the same time, but it is believed that no production resulted. Some of these deposits might be worthy of additional investigation in view of improved mining and milling methods now available. There are also beds of lignite coal on Unga Island. A small amount of gold was mined from the beach placers on the west end of Popof Island and some development work was done on gold lodes in the vicinity.

The beds of bituminous coal at Herendeen Bay produced some high grade fuel during the early days and the lower grade beds at Chignik Bay were also mined to some extent. Other coal deposits occur at scattered localities on the Alaska Peninsula. Undeveloped gold, copper and zinc prospects have been reported at Balboa Bay. Petroleum seepages have been found at various localities along the southeast shore of the Alaska Peninsula extending from Chignik Bay to Tuxedni Bay. A few exploratory wells have been drilled without productive results. It seems reasonable to believe that at least some future production may be expected from this large area. Pumice occurs in the Valley of Ten Thousand Smokes and

at other places near volcanoes. A small amount of placer gold was mined about 1915 near Cape Kubugakli. High grade copper float has been found near Cape Douglas.

Small-scale, intermittent placer mining has been carried on for over 40 years on the beaches of the west coast of Kodiak Island, the total production from which has probably amounted to something over $100,000 in gold and a minor amount of platinum metals. Prospecting and development work have been carried on intermittently for a period of years on gold lodes on the island, but only a small production has resulted. Some of the showings are considered to be worthy of additional development work to determine their commercial possibilities. Other minerals contained in the lodes include copper, zinc, lead and silver and the presence of tin in at least one of the lodes has been reported, but not verified. Geological Survey bulletin No. 880-C, "Kodiak and Adjacent Islands," is available for distribution by the Superintendent of Documents at a price of 50 cents.

In the vicinity of Iliamna Lake promising copper lodes, from which a few tons of high-grade ore was shipped, have been known for years. These deposits will probably be developed and mined at such time as the demand for copper warrants, and prospecting in the area might possibly reveal hitherto undiscovered bodies. A small amount of placer gold has been mined on streams that flow into Lake Clark and Lake Iliamna.

Cinnabar has recently been discovered on Wood River in the Bristol Bay area. Placer gold was discovered a number of years ago on the upper Mulchatna River and some of the higher grade gravel yielded a small production. Lower grade ground is said to have possibilities for working on a large scale. Several years ago a story was circulated regarding the discovery of high-grade placer gold deposits near the head of the Tikchik River. The authenticity of this story was never verified. The headwaters of the Nushagak and its tributaries, and the region over the divide into the Kuskokwim drainage, have not been thoroughly prospected.

KUSKOKWIM RIVER REGION

The climate of this region ranges from a comparatively mild one in the Kuskokwim Bay district near the mouth of the river to sub-arctic in the interior where there are long, cold winters and

short, but rather warm summers. In the coastal area, fog, mist and wind are disagreeably frequent. During the summer months ocean-going steamers reach Bethel on the lower river, and transportation by river steamer is available to McGrath. River boats are used on the large tributaries. Landing fields are located at strategic points and the airplane is a favored mode of travel. There is no timber in the coastal area, but proceeding inland alder, willow and cottonwood are found. The upper river is sparsely timbered with spruce and in certain localities with birch and tamarack.

Important to the lower river area was the discovery in 1926 of high-grade platinum placer deposits near Goodnews Bay. Production was begun by small-scale hand methods shortly thereafter. In 1934 machinery was installed and mining on a large scale was begun. Since that time this district has become the principal producer of platinum metals in the United States and its possessions. For many years placer gold has been mined on a small scale in this area. Later development in the Goodnews-Arolic region has been directed toward large-scale methods with correspondingly increased production of gold. Placer gold also occurs in varying amounts in the gravels of the upper Togiak, Kanektok and Eek rivers. Because of the thawed, wet ground in this region some difficulty has been experienced by prospectors in sinking shafts to bedrock. With the renewed interest of recent years the introduction of pumps and drills has overcome this handicap to some extent.

For several years the Tuluksak-Aniak region has contributed substantially to the gold output of the Territory by large-scale placer mining operations and recent developments indicate that an increase in production may be expected from the lower Kuskokwim. A large, unmapped, and only superficially prospected area extends from the Stony River southwestward in the general direction of Goodnews Bay across the Hoholitna, Holitna and upper Aniak rivers. Reports have been circulated from time to time of placer gold prospects being found in some of the streams, but no productive mining has resulted. It is probable that the area is worthy of a great deal more prospecting than has been done.

Cinnabar lodes have long been known in the vicinity of the old village of Kolmakof, near Sleitmut, and at the head of Crooked Creek south of Flat. Small intermittent operations on the lodes

near Sleitmut have been carried on for a number of years and the few flasks of mercury produced have been sold to local placer miners. During the war both the Sleitmut and Crooked Creek deposits were worked on a larger scale that resulted in substantial production. Stibnite accompanies the cinnabar in most of the deposits. The possibilities of discovering additional commercial bodies of cinnabar, and of placer gold, in the vicinity of the intrusives in this general area are said to have been by no means exhausted. A lode deposit of gold-bearing antimony, and others containing copper, gold and silver occur in the Russian Mountains. Development work has been done on several of the latter, but no production has been recorded.

The gold placers of the Georgetown, Takotna, McGrath and Nixon Fork districts have been steady producers for a period of years. Operations other than those now successfully established might be undertaken in these districts under the stimulus of improved transportation facilities. The lodes of the Nixon Fork district have been small but steady producers of gold for more than 20 years. Most of the ore contains appreciable amounts of copper that has been discarded because of high transportation costs.

YUKON BASIN

The Yukon Basin contains the most important known placer deposits in the Territory. From them gold to a value of over two hundred million dollars has been mined. The climate of the region is prevailingly semi-arid. Winter temperatures are not much lower than in many parts of the northern states and the region is singularly free from high winds. Transportation by steamer along the entire length of the Yukon River in Alaska is available during the ice-free season. River boats are used on many of the large tributaries and airplane landing fields are located at various settlements in the basin.

The lowland coastal area between the mouths of the Kuskokwim and Yukon rivers has not been geologically mapped and little is known of its mineral resources. Unauthenticated reports have been circulated of petroleum seeps having been found in the area and coal formations have been noted on Nunivak and Nelson islands.

The placers in the vicinity of Marshall were important contributors of gold some 25 years ago. The installation of mechanical equipment during the past few years has again brought this district into substantial production. Intensive prospecting might reveal the presence of other low-grade deposits that could be worked at a profit by large-scale methods. So far as known very little attention has been given to a search for the lode source of the placer gold. Coal seams exist at several localities from which a small amount of fuel has been mined from time to time for local use.

Placer gold and associated platinum were discovered in the unmapped upper Anvik River basin in the early days, but the deposits were evidently of too low grade to mine at a profit by hand methods. Investigations might be warranted to determine whether or not there are deposits in this area that could be mined on a large scale.

The Kaiyuh Hills have not been thoroughly prospected, but some placer gold has been found and a small amount mined. Silver-lead lodes were discovered within the area and some high-grade ore was shipped, but the cost of transportation evidently prevented profitable operations. Geologic conditions are said to indicate the possible presence of mineral deposits other than those heretofore discovered.

The Iditarod, Innoko and Ruby districts have been highly productive placer-gold districts for more than 30 years. Small high-grade gold veins, with associated antimony, copper, lead, zinc and tungsten, occur in the Iditarod district and some development and mining have been done, but the complex nature of the ore and high mining costs have been discouraging factors. Other small veins containing gold, stibnite and cinnabar occur in the district. One of the cinnabar lodes was developed and has produced some mercury. Development work has been done on silver-lead prospects in the Ruby district and some of the placers of the district contain appreciable amounts of tin. The bedrock source of the tin-bearing material has not been discovered. Lode prospecting in the district is difficult on account of heavy overburden and lack of outcrops. Small coal deposits occur in the Iditarod area from which fuel has been mined for local use. It is likely that more intensive prospecting for lodes will follow the depletion of the valuable placers in these well mineralized districts.

The Koyukuk River drains an area many thousand square

miles in extent in the northerly part of the Yukon basin, but the total population of the area is only a few hundred. For several decades the upper Koyukuk region in the vicinity of Wiseman, which is the principal settlement, has been a continuous producer of placer gold, most of which has been recovered by hand methods from shallow deposits . Soon after the discovery of gold in this region the mining population and production were much greater than at present. During the past few years efforts have been directed toward developing by means of mechanical equipment deeper and lower grade blocks of ground than can be successfully worked by hand methods. These efforts seem to be meeting with success and it appears probable that the region offers a favorable field for substantial expansion of mechanized placer mining projects. As is the case in so many remote localities, the great need is for better and cheaper transportation facilities.

So far little attention has been given to lode prospecting in the region, although geologic conditions appear to be favorable.

Mineralization of similar type to that found in the Koyukuk district seems to extend eastward into the Chandalar district, which has produced considerable placer gold. Lodes, some of which carry high values in free gold, have also been under development, and a small production of gold has resulted. Other sulphides contained in the ore include sphalerite, galena and stibnite. Both placer and lode miners have been handicapped by expensive transportation and only the richer ground can be worked under existing conditions.

The country east of the Chandalar to the boundary has been prospected very little. Shale with high oil content has been found on the Christian River. Placer gold is said to have been panned on some of the bars of the Coleen River, and a few miles east of the boundary, at the heads of streams flowing into the Arctic Ocean, rich placer gold prospects are reported to have been discovered several years ago. This suggests that the little-known area across the heads of the Coleen, Old Crow and Firth might have possibilities for a placer camp. This would be no place for the novice, however, and prospecting in the area should be undertaken only by those well equipped and familiar with arctic conditions. Some of the area between the Chandalar, Porcupine and the boundary is said to be well stocked with fur-bearing animals. A combination of prospecting in summer and trapping in winter

should at least be worthy of consideration by a few of the more venturesome and hardy.

The Yukon-Tanana region, which embraces approximately 38,000 square miles lying between the Yukon and Tanana rivers from their junction easterly to the Canadian border, has been and is the principal gold-producing area in Alaska. It includes many well known districts such as Hot Springs, Rampart, Tolovana, Fairbanks, Circle, Eagle and Fortymile. It is well described in U. S. Geological Survey bulletin No. 872, "The Yukon-Tanana Region," copy of which is available at a price of 70 cents from the Superintendent of Documents, Washington 25, D. C. Particular attention is called to the author's suggestions for prospecting that begin at page 264 of the report. In addition to gold and silver, tin, tungsten and antimony have been produced within the region on a commercial scale, and coal has been mined for local use. Deposits of lead, zinc, copper, chromium, iron, cobalt, nickel, platinum, molybdenum and bismuth are known to be present. The Alaska Highway traverses the southeastern part of the region above the upper Tanana River and thus greatly improves transportation to that section, which, heretofore, has been difficult and expensive to reach. A road is nearing completion (1949) that leads from the Alaska Highway near Tok Junction through the Fortymile district to Eagle on the Yukon River.

The Chisana and Nabesna districts lie south of the upper Tanana region. Productive gold-placer operations have been conducted for many years in the Chisana district and gold lodes have been successfully mined in the Nabesna district. Lodes containing ores of gold and copper that would ordinarily be considered commercial have been discovered in the course of placer-mining operations in the Chisana area, but on account of remotenes of the district little effort has been made to develop them. At some future time, when transportation facilities are improved and hard-rock miners take more interest in the district, the lodes may become more important than the placers.

NORTHWESTERN ALASKA

The temperature ranges and precipitation of Seward Peninsula are intermediate between those of the more southerly coast and the Arctic coast and interior. Constant winds along the coast cause the cold of winter to be more penetrating than the lower

temperatures of the interior. Much of northwestern Alaska lies above the Arctic Circle, but persons properly equipped and clothed carry on their duties as usual in the winter except during short periods of storm and extreme cold. The coastal region in general is tundra-covered, with permanent frozen ground a foot or two under the surface. Spruce trees grow in some of the valleys of the southern part of the region under discussion and willows grow along most of the streams even to within a few miles of the Arctic coast. The coastal settlements are reached by steamer during the summer and river boats are used on the larger streams such as the Kobuk and Noatak. The most common method of passenger travel is by airplane. Seward Peninsula is served by several landing fields and experienced pilots land ski-equipped planes on the snow wherever there is a flat surface of sufficient size.

The area between the mouth of the Yukon and Norton Bay has not been mapped. Placer gold has been mined in a small way on Bonanza Creek, tributary of Ungalik River, since its discovery there in the early days. More recently large-scale mining has been successfully carried on in the main valley near the mouth of Bonanza Creek.

Seward Peninsula is second only to the Yukon-Tanana region in the production of placer gold. The Nome district is by far the most important on the peninsula and has produced steadily since the great rush to the rich Nome beaches in 1900. Other important districts are Solomon, Council, Koyuk, Fairhaven and Port Clarence. All of the richer known deposits have long since been worked out, but the large-scale methods now being employed on lower grade ground account for a substantial percentage of the placer gold produced in the Territory. In spite of the fact that some areas on the peninsula have been intensively prospected and mined over a long period, there are said to be several sections that have not yet been thoroughly prospected and that are considered to be favorable for the occurrence of commercial deposits. Considerable placer tin has been mined in the vicinity of York, lodes containing the metal have been discovered, and attempts made to develop them, but little lode production has resulted. Other minerals found in place on the peninsula include gold, silver, bismuth, antimony, tungstein, copper, iron, mercury, platinum, graphite, mica and coal. Efforts have been made to develop some of the deposits and some

production has resulted, but for various reasons no stabilized lode-mining industry has been established.

Very little prospecting has been done on St. Lawrence Island, which is a reindeer reserve and not open for location under the mining laws. A little prospecting by the natives and by archaeological parties has revealed that parts of the island are mineralized and occurrences of molybdenum, copper, iron, lead, silver and tin have been noted. Quartz containing high values in gold has also been discovered.

A large unmapped and practically unprospected mountainous area lies between the Kobuk and Noatak rivers. The only important mineral production from the district has been from the gold placers of the Squirrel River area and in the vicinityof Shungnak. According to men who have visited this region, it is well mineralized and is probably one of the most favorable areas in the Territory for new discoveries of commercial deposits. Much of it has been glaciated, which is considered to be unfavorable for the deposition of extensive placer deposits such as those in the Yukon valley. However, it is entirely possible that important small hitherto unknown deposits exist. Placer gold prospects have been reported from time to time in creeks of the upper Kobuk, Noatak and Alatna rivers, but transportation handicaps have prevented more than a very small amount of mining. In fact it is said that by old methods of transportation it was possible to spend only a few days in this remote area, as practically the whole open season was spent in reaching it and returning to base of supplies. Prospectors interested in this region should be well financed and equipped and should avail themselves of the quickest means of transportation in order that the maximum amount of time may be spent in the search for minerals. Little effort has been made to locate or develop lodes, although favorable indications have been noted in several localities and their possible presence should not be overlooked by prospectors. Copper, lead, silver, iron, coal, jade, asbestos and quartz crystals occur in the district and specimens containing columbite and tantalite have been obtained north of Kiana. High grade chrysotile and tremolite asbestos occurs in the vicinity of Shungnak. Considerable development work was done on a showing of tremolite which, according to manufacturers, is of chemical-filter grade. Several tons was shipped to market. Jade or nephrite of gem quality has been found in place, and float

from which attractive jewelry was made has been mined in the area between Jade Creek and Kogoluktuk River.

NORTHERN ALASKA

The Arctic slope as far east as the lower Colville River has long been a naval petroleum reserve and not subject to location. More recently the boundaries have been extended to include the remaining part of the slope. Extensive beds of coal, some of which is of high grade, are widely distibuted in this section of the Territory. A small amount has been mined for fuel by natives of the region. It seems improbable that any attempt will be made to exploit these deposits on a commercial basis for a long time to come on account of the distance to markets, although some consideration has been given to possible markets in the Orient. A number of petroleum seepages are known to exist on the Arctic slope and there are probably others as yet undiscovered. Exploratory work is now being conducted by the Government to determine the extent and importance of this potential petroleum producing area. According to newspaper reports, formations containing high-grade petroleum have been cut by test wells, although no commercial pool has as yet been discovered (1949). A commercial flow of gas is said to have been tapped by one of the wells and is being piped to the camp at Point Barrow in sufficient quantity to meet all fuel requirements. Very little prospecting has been done in this section, although placer gold prospects are said to have been panned in the streams of the eastern part, notably the Okpilak River. This fact points to the possibility, as mentioned previously, of as yet undiscovered placer deposits in northeastern Alaska. Prospects of gold and other minerals are also reported to have been found on the north slopes of the Endicott Mountains.