MINERAL OCCURRENCES in the YUKON-TANANA REGION, ALASKA

SR 2

BY R. H. SAUNDERS

DIVISION OF MINES and MINERALS
DEPARTMENT OF NATURAL RESOURCES
STATE OF ALASKA

APRIL 1967

STATE OF ALASKA

Walter J. Hickel - Governor

DEPARTMENT OF NATURAL RESOURCES

Phil R. Holdsworth - Commissioner

DIVISION OF MINES AND MINERALS

James A. Williams - Director

MINERAL OCCURRENCES IN THE YUKON-TANANA REGION

By

R.H. Saunders

Juneau, Alaska
April, 1967

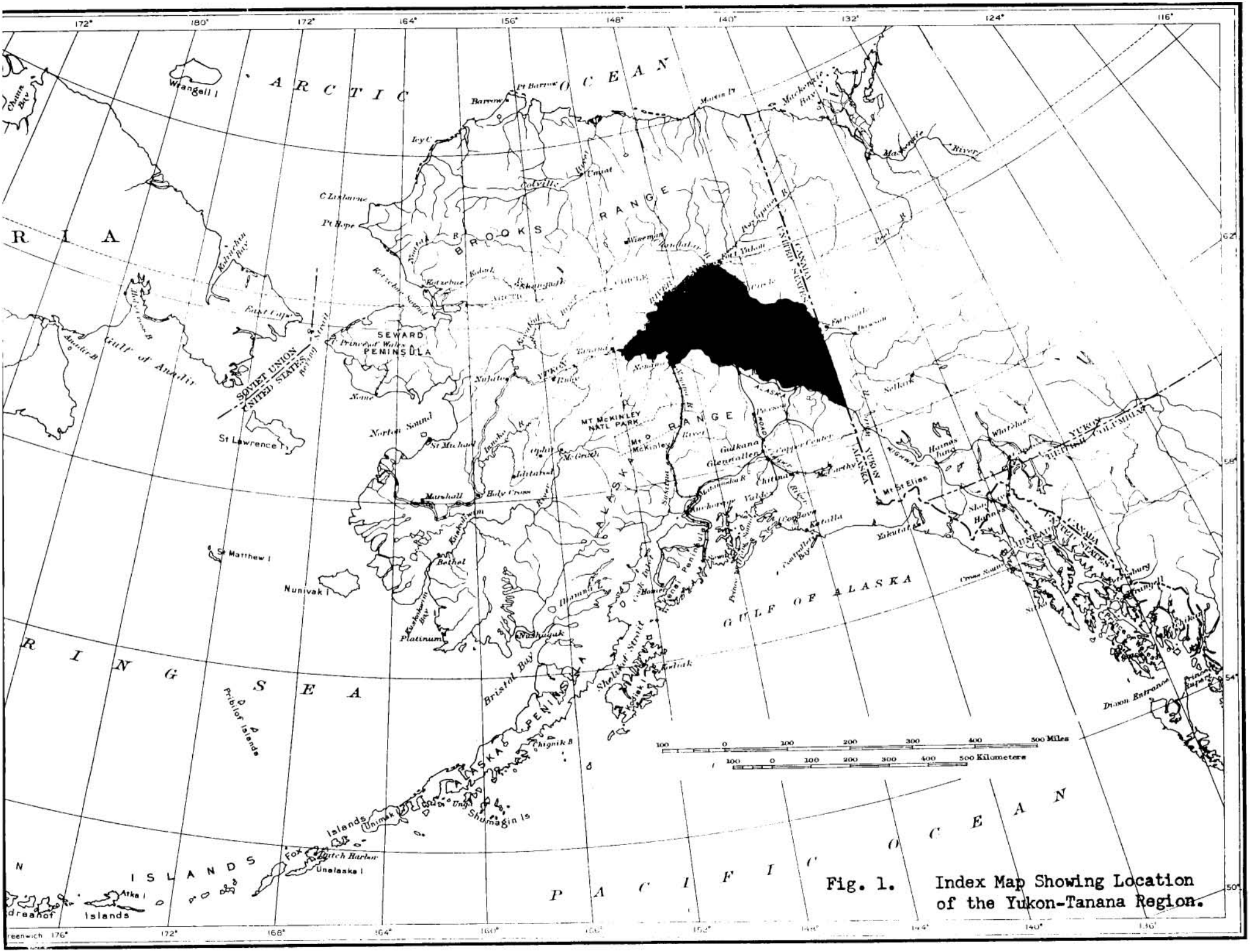


Fig. 1. Index Map Showing Location of the Yukon-Tanana Region.

TABLE OF CONTENTS

ILLUSTRATIONS

MINERAL OCCURRENCES IN THE YUKON-TANANA REGION

By

R.H. Saunders

INTRODUCTION

This report describes the Yukon-Tanana region with emphasis on those factors that pertain to mining and prospecting. It includes a tabulation of known mineral occurrences in the region. Only those occurrences that have been mentioned or described in literature are listed; although, in a few instances, the written sources are based solely on oral communication. Brief descriptions are given, where possible, so that the reader may know the general nature of each occurrence, and references are given for those who wish to obtain the more detailed information in the literature.

The mineral occurrences tabulated in this publication range in economic importance from particles that have been found in placer concentrates to deposits that have supported mines. The occurrences that appear to be economically unimportant may be important as indicators of the nature and areal distribution of different kinds of mineralization. Each mineral deposit listed in the tabulation has been known by at least one prospector or geologist. Those of apparent economic importance have been explored to some degree; a few have been mined; many have been worked on and abandoned.

Most of the references cited in the tabulation are publications of the United States Geological Survey. Many of these are now out of print, but offices of the Geological Survey and of the Division of Mines and Minerals have nearly complete collections that are available for public use. Some of the references cited are publications of the United States Bureau of Mines; some of these are also out of print, but may be available for public use at offices of the Bureau of Mines and of the Division of Mines and Minerals. Some of the out-of-print publications may be found in public libraries. Other references are published and unpublished reports of the Division of Mines and Minerals and its precedent agency, the Territorial Department of Mines. These reports may be inspected at offices of the Division. Still other references are unpublished theses at the University of Alaska; these are available for public inspection at the University.

PHYSICAL FEATURES

The Yukon-Tanana region comprises 38,000 square miles in east-central Alaska It is bounded on the northeast and northwest by the Yukon River, on the south by the Tanana River, and on the east by the International Boundary between the United States and Canada. The distance eastward across the region from the confluence of the two rivers to the International Boundary is 320 miles, and the greatest north-south width is 170 miles. Altitudes in the region range from about 200 feet above sea level at the mouth of the Tanana River to more than 6500 feet at the top of Mt. Harper, about 250 miles to the east. The uplands consist of rounded hills and ridges of nearly uniform height with a few discontinuous groups of mountains that rise above the ridge crests and hilltops. The uplands are higher in the eastern part of the region than in the western part; the valley floors are also higher; and the relief from east to

west is about the same. Stream valleys are of diverse forms; some of the streams meander through broad valleys, and others are incised in gorges.

Three-fifths of the region is drained by the Yukon River and the remainder by the Tanana. The tributaries that drain the region are clear at normal water stages, but the Tanana River is heavily laden with silt from its glacier-fed tributaries that head in the Alaska Range. The Yukon River also receives some glacial debris from rivers that empty into it in Canada, but it normally carries less silt than the Tanana. The Yukon and Tanana are both navigable, the Tanana being more difficult to navigate because of its somewhat swifter current and its profusion of sand bars. The tributary rivers are also navigable, at least for small riverboats, through their lower courses.

The drainage history of the region is complex and is not yet well understood. In some districts remnants of ancient stream channels on ridgetops show the former existence of a drainage system of a different pattern from the present one. Backhand drainage in several places - Seventymile River, for example - also indicates that major changes have taken place in the drainage of the region. Great depths of alluvium underlying some streams show that the base level of erosion for part of the region has been elevated. Many valleys are abnormally large for the streams that flow through them - an indication that in some formertime the climate was less arid than it is now. Moraines and glacier-carved land forms at a few places in the higher country show the former presence of Alpine glaciers. There is no indication that a continental ice sheet ever covered the region.

The most abundant trees in the region are spruce, cottonwood, and birch; aspen and tamarack are common in some localities. In swampy areas and near timberline the spruce trees are small and scrubby, but in the lower valleys some are as large as two feet in diameter. Timberline is at 2500 to 3500 feet altitude. At the higher altitudes many of the steep slopes are covered by blocky talus. A variety of grasses and brush grows throughout the region, and in most places the cover of vegetation extends well above timberline.

CLIMATE

The Yukon-Tanana region has a sub-Arctic climate; the winters are long and cold, and the summers short and warm. Daylight is nearly continuous for about three months during late spring and early summer, and it lasts for only about two hours per day in late December. The region is semi-arid, having an average annual precipitation of about 11 inches; most of the rain falls during late summer. The average annual snowfall is about 50 inches, and about 13 1/2 inches of snow in the region is equivalent to one inch of water. The lowest temperatures recorded have been about minus 70 degrees and the highest about 100 degrees Fahrenheit. The streams begin to freeze over in October, and the ice remains until late April or early May. Sluicing at placer mines can be done during about 120 days of the year. Seasonal frost in the ground can be expected to interfere with excavating until mid-July; much of the ground is permanently frozen. The higher parts of the region have fewer frost-free days than the lower areas, and high, north-facing slopes may be partly snow-covered until late summer.

In addition to the variation in daylight throughout the year, the climate has other features that may seem unusual to the newcomer. During a prolonged period of cold weather, a temperature inversion may make temperatures on hills and ridges higher than those on the adjacent valley floors. A hilltop dweller, therefore, escapes much of the extreme cold that the town residents in the lower valleys must endure. If a wind begins to blow, it upsets the inversion and brings warmer weather to the lower valleys. In the Fairbanks area, largely because of the concentration of fuel-burning equipment,

ice fog accumulates during prolonged cold periods, limiting visibility, blocking whatever sunshine there may be, and, as a recent study has shown, creating a problem in air pollution. Winter temperatures vary widely; the highest temperature ever recorded for any given day of a winter month may be 100 degrees or more higher than the lowest temperature recorded for that day of the month. Summer temperatures also are subject to wide variation; the prospector planning a summer trip in the region should be prepared for temperatures ranging from 30 to 90 degrees.

POPULATION AND ACCESS

Fairbanks, with a population of about 14,000, is the largest community in the Yukon-Tanana region. Suburbs and military bases near Fairbanks bring the total population of the Fairbanks district to about 44,000. Outside the Fairbanks district about 3000 people live in the region; most of them are along the roads and rivers in communities numbering fewer than 200 people in each.

The Richardson Highway links Fairbanks with Valdez, a year around port on the Gulf of Alaska. The highway is paved throughout its length of 364 miles, and it is open all year, except for short periods during wind or snow storms in the winter. One hundred fifteen miles from Valdez the Richardson Highway is joined by the Glenn Highway from Anchorage. The Glenn and Richardson Highways provide a route 438 miles long between Fairbanks and Anchorage. The Glenn Highway is paved and is open the year around, except possibly during winter storms. At Delta Junction, about 100 miles from Fairbanks, the Richardson Highway is joined by the Alaska Highway. This highway links the road net of Alaska with that of western Canada and provides the only overland route between Alaska and the conterminous states. It enters Alaska in the upper Tanana valley and approximately parallels the Tanana River to Delta Junction. The Alaska Highway is open the year around, and the part within Alaska is paved. The distance by road from Dawson Creek, B.C., to Fairbanks is 1520 miles,and from Seattle to Fairbanks, 2360 miles.

Some of the settlements within the Yukon-Tanana region are connected by roads. The Fairbanks-Nenana road, a partly paved road 60 miles long, is open all year. This road, within a few years, will be part of a new highway link between Fairbanks and Anchorage that will be about 100 miles shorter than the route over the Glenn and Richardson Highways. The Steese Highway goes from Fairbanks to Circle (162 miles), and a branch road from it links Fairbanks with Circle Hot Springs (136 miles from Fairbanks). The Steese Highway is paved from Fairbanks to Fox (11 miles). In the winter only the 30-mile length of the highway at the Fairbanks end is maintained. The Elliot Highway goes from Fox to Livengood (74 miles) and Manley Hot Springs (149 miles). It is a gravel road, and it is not maintained in the winter. The Taylor Highway goes from Tetlin Junction on the Alaska Highway to Eagle on the Yukon River (158 miles). A branch from this highway goes to Dawson, Yukon Territory. The Taylor Highway is a gravel road, and it is not maintained in the winter. Another road, now under construction, will extend from the Steese Highway near Fairbanks up the Chena River valley to Chena Hot Springs (about 60 miles from Fairbanks). A few other short roads have been built in the Fairbanks district to provide access to areas where people have settled. The roads in the Yukon-Tanana region that are not passable the year around are open to travel from early June to mid-October.

The Alaska Railroad provides rail transportation between the Yukon-Tanana region and seaports at Anchorage and Seward. Fairbanks is the northern terminus of the railroad. The distance by rail from Fairbanks to Nenana is 58 miles; to Anchorage, 358 miles and to Seward, 470 miles.

A hydrotrain and other unitized cargo equipment have been in service to and within Alaska during the past few years. Freight rates for carload lots from Seattle to Fairbanks range from $1.63 per hundred pounds for groceries in 50-ton lots to $3.08 per hundred pounds for petroleum products in 30-ton lots. Ores and concentrates can be shipped from Fairbanks to Seattle for as little as $1.23 per hundred pounds; the rates vary depending upon the amount shipped and the value of the ore or concentrate. Higher rates are charged for less-than-carload lots.

Fairbanks has two airports: the Fairbanks International Airport, which is large enough for long-range aircraft, and Phillips Field, which is used by small aircraft. Small airfields in the region are at Manley Hot Springs, Rampart, Circle, Central, Circle Hot Springs, Eagle, Chicken, Eureka, and Livengood. Other landing strips have been built at various places, but some of them have become unusable because of erosion or the growth of brush or trees. Commercial pilots who fly to the outlying districts are usually the best sources of information on the condition of the "bush" airstrips.

The rivers provide routes for freighting to some of the outlying communities. The freight goes by rail or truck to Nenana or Fairbanks, where it is transferred to boats or barges. In former years many passengers traveled by riverboat, but now the only passenger travel is on local pleasure cruises that start from, and return to, Fairbanks. Small riverboats are commonly used by prospectors, hunters, and fishermen; most of these are flat-bottomed boats up to 35 feet long propelled by outboard motors. They are used in the tributary streams as well as in the Yukon and Tanana Rivers.

Prospectors necessarily must be concerned with cross-country travel away from roads, rivers, and airfields. In many instances helicopters provide the most satisfactory means of transporting prospectors and their supplies. The cost per hour of helicopter charter is high, but the saving in time and trouble can be well worth the cost. Ordinarily, Fairbanks is the only place in the region where helicopters can be chartered. Four-wheel-drive vehicles can be used to good advantage, but their use generally must be restricted to roads, trails, and the crests of some ridges. Recently, motorcycle-type trail machines have been used in the region. Their use, too, is limited, but they can travel some terrain not passable for four-wheel-drive vehicles. In the winter, wheeled vehicles can be used only on maintained roads.

Crawler-mounted equipment of various types has been used for cross-country travel in both summer and winter. These machines can travel most of the terrain, but the routes of travel must be selected carefully. If heavy freighting is to be done, it can best be done in late winter and early spring with sleds and crawler-type tractors. In a few instances temporary winter roads have been built with tractors; and conventiona two-wheel-drive trucks have been driven over them.

Dog teams and sleds have been the traditional means of winter travel in the North. Dogs also have been used for packing in the summer, but they are unable to carry loads as large as those they can pull on sleds. Recently, snow mobiles have become popular in the region; so far, most of them have been used for recreation, but they, too, may be useful to the prospector. Supplies for a summer's prospecting may be freighted during the preceding winter and stored in caches. If no better means of travel can be arranged, the prospector can resort to back-packing. For most back-packers, the enjoyment to be derived from a long trip will be greater if periodic air-drops along the route can be arranged.

HISTORY AND ECONOMIC DEVLEOPMENT

The earliest explorations of the Yukon-Tanana region were made by officials of the Hudson Bay Company, who entered the region by way of the Yukon and Porcupine Rivers as early as 1842. In 1847 the Hudson Bay Company established a trading post at Fort Yukon not realizing that the site was in Alaska, which, of course, was then owned by Russia. The first authentic report of a gold discovery in the region was that of a discovery made by a missionary in the Circle district in 1863. No attempt was made to mine the gold. Many years later prospectors applied the name "Preacher Creek" to a tributary of Birch Creek in the belief that the discovery was made there; the name is still in use. In 1866 an expedition of the Western Union Telegraph Company traveled by boat from the mouth of the Yukon River to Fort Yukon, and two members of the expedition continued on to Fort Selkirk in Canada. In 1869 an expedition led by Captain Charles Raymond, U.S. Army, traveled up the Yukon River and determined the geographic position of Fort Yukon; whereupon the Hudson Bay Company abandoned its post there and established another trading post on the upper Porcupine River. In the early 1870's a few prospectors and traders entered the region from the Yukon Territory and, during the next 25 years, made exploring trips into various parts of the region. The best known men in this group were Arthur Harper and Jack McQuesten. In 1882 the Schiefflin brothers of San Francisco, who where the discoverers of ore deposits at Tombstone, Arizona, traveled up the Yukon in a small steamboat and discovered gold about 80 miles above Tanana. They returned to San Francisco in 1883 and did not follow up their discoveries. In 1883 a U.S. Army expedition led by Lieutenant Frederick Schwatka crossed Chilkoot Pass and rafted from the headwaters of the Yukon to its mouth; this party made the first actual survey of the Yukon River.

In 1886 gold was discovered in the Fortymile district on Franklin Creek, and this was the first discovery in the region to lead to the establishment of a mining camp. Discoveries were made at Rampart and Circle in 1893 and on American Creek in the Eagle district in 1895. Small mining camps grew in each of these places, and, when gold was discovered in 1896 in the Klondike district in Canada, about 1000 men already were engaged in mining in Alaska. Many of them joined the rush to the Klondike when news of that discovery spread through the Alaskan camps. The Klondike discovery attracted thousands of gold seekers; some of the later arrivals, unable to acquire rich ground in the Klondike moved into Alaska to prospect. Several important discoveries were made, and some of these led to the development of more mining camps in the Yukon-Tanana region: Manley Hot Springs in 1898, Fairbanks in 1902, Richardson in 1905, and Livengood in 1914.

Placer mining flourished until 1916. By that time the richest of the easily worked placers were exhausted, and the inflated wartime prices discouraged gold mining ventures. Military service and other wartime activities caused an exodus of men from Alaska. During the war scheelite and stibnite were mined from a few properties in the Fairbanks district, and tin was recovered as a by-product of gold mining in the Manley Hot Springs district.

After World War I, gold production continued to decline until the late 1920's, when a large dredging operation in the Fairbanks district become productive. During the depression years gold mining expanded rapidly, and the resurgence of mining activity continued until World War II. Prior to World War II, gold mining and the fur trade provided the economic base for the Yukon-Tanana region. Other types of business ventures grew to satisfy local demands, but the money that circulated in the region came in only through the export and sale of gold and fur. During World War II gold mining and trapping declined sharply. In spite of this decrease in its former economic base, the region grew rapidly in both population and overall economic activity. The construction and operation of military bases and other government-financed facilities became the new economic base for the region.

Between World War II and the Korean War, mining revived to a small degree, partly because war surplus equipment that could be adapted to placer mining became available at moderate prices. Lode-gold mining remained almost totally inactive. Since the Korean War placer mining has declined continually, and mining now accounts for only a small part of the economic activity in the region.

One of the striking changes that came with the new economy was a shift of opportuniti for employment from outlying areas to the Fairbanks area. While Fairbanks grew from a mining town to a modern city, several outlying settlements were abandoned. In some of the old recording districts the duties of recorder passed from person to person until no one qualified and willing to do the work remained. Recording offices at Livengood, Circle and Eagle were closed; the records were sent to Fairbanks; and the old recording districts became a part of the Fairbanks Recording District. Few opportunities for employment now exist in the region outside the Fairbanks area, and the concentration of the region's economic activity in that area is reflected in the distribution of the population. The present economy of the Yukon-Tanana region is essentially the economy of the Fairbanks area.

In 1964 more than 40 percent of the total number of persons employed in the Fairbanks area were employed by federal, state, and local government agencies.* More than 30 percent were employed by construction, trade, and service industries,* which, directly or indirectly, were also largely dependent upon government spending. Placer mines in the region employ 60 to 70 men each summer, and 5 to 10 men are employed in lode mining or lod mine development. Records of the Division of Mines and Minerals list 20 active prospector in the region in 1965; however, not all prospectors are included in any official listing.

Government activities in the Fairbanks area are of various types. Military bases, missile detection facilities, arctic and space research installations, and the University o Alaska all play an important part in the economy. Tourism also accounts for part of the economic activity, and its importance is increasing. Fairbanks, being the trading center for much of northern Alaska and all of Interior Alaska, derives some economic gain from activities outside the Yukon-Tanana region. Currently, a large amount of freight is being moved each year from Fairbanks to sites of oil exploration activity on the north coast.

GEOLOGY

Several bulletins describing the geology of parts of the Yukon-Tanana region have bee published by the United States Geological Survey. The titles of these are included herein in the list of references following the tabulation of mineral occurrences. U.S. Geological Survey Bulletin 872, THE YUKON-TANANA REGION, ALASKA, by J.B. Mertie, Jr., 1937, summarize the information contained in earlier reports. It describes the general rock types present and it includes a map of the region that shows the distribution of the major geologic units. Bulletin 872 gives the most nearly complete description of the geology of the Yukon Tanana region that has been published. It is now out of print; however, anyone planning to prospect in the region should obtain a copy, if it is at all possible to do so.

*REVIEW OF BUSINESS AND ECONOMIC CONDITIONS, University of Alaska, Institute of Business, Economic, and Government Research. July, 1965.

Most of the geologic mapping that has been done in the region was done before aerial photographs and helicopters were available to geologists. Even if the region were re-mapped with the most modern equipment, the heavy cover over most of the country would necessitate a good deal of inference and extrapolation. Therefore, it is to be expected that many details of the geology are not shown on the published maps.

Much of the Yukon-Tanana region is underlain by crystalline schists (the Birch Creek schist formation), which Mertie considered to be of pre-Cambrian age. There is doubt now as to the age of this formation, and it may be, at least in part, younger than pre-Cambrian.

Any attempt here to describe the geology of the region necessarily would be a repetition of what already has been published in Bulletin 872. Figure 3 is a generalized geologic map adapted from maps published by the United States Geological Survey.

SELECTED MINERAL COMMODITIES

Antimony. Stibnite (a sulfide of antimony) is widespread throughout the Yukon-Tanana region. It is a constituent of most of the gold-bearing quartz veins in the Fairbanks district, and it also has been found in veins and shear zones that carry little or no gold. It occurs disseminated through the veins and shear zones and also in the form of lenses, kidneys, and irregular masses. About 2500 tons of stibnite has been produced in the Fairbanks district - most of it was mined from the Scrafford property (Map No. 135). About 500 tons has been mined from a deposit on Sawtooth Mountain in the Rampart district (Map No. 19). Most of the deposits that have been mined have been small, and all of them have been high enough in grade to permit shipping of the ore with no concentrating other than hand-sorting. The mining has been done during periods of exceptionally high prices - usually in wartime. A few instances have been reported in which prospectors have found stibnite but have not staked or worked on the deposits, because the market was unfavorable when the finds were made.

Bismuth. No important deposits of bismuth are known in the Yukon-Tanana region. Native bismuth has been reported on No Grub and Caribou Creeks, tributaries to Salcha River. Native bismuth and bismuthinite have been found in gold-quartz in the headwaters of Fish Creek in the Fairbanks district. Native bismuth also has been identified in placer concentrate from Ruby Creek in the Rampart district.

Chromium. In the Tolovana district and in the Salcha River drainage, chromium has been found disseminated through ultramafic rocks. It also has been detected in placer concentrates from streams draining areas where ultramafic rocks are known. During periods of national emergency, the United States government has purchased chromium ores at incentive prices from domestic producers. Usually, however, the United States imports nearly all the chromium it uses. Prices of chromium ores landed at east coast ports from foreign sources currently range from $18 to $33.50 per long ton. Its low price would preclude the mining of chromium in the Yukon-Tanana region under usual market conditions.

Cobalt. Cobalt has been reported in two places in the Yukon-Tanana region: at the Barrett prospect in the Manley Hot Springs district, where it is in a complex assemblage of metallic sulfides, and at the Jenkins prospect near Eagle, where it accompanies nickel and copper sulfides.

Copper. Several copper prospects are known in the Fortymile and Eagle district. Few of them appear to have much promise, but some of the better ones are in remote areas where exploration costs would be high, and they have had little or no work done on them. Copper minerals are a part of the mineral assemblage at the Barrett prospect in the Manley Hot Springs district. Native copper nuggets have been found on several creeks in the Rampart district and on Sullivan Creek in the Manley Hot Springs district. Chalcopyrite has been found in placer concentrate from Portage Creek in the Circle district, and trace amounts of copper have been detected in gold-quartz veins in the Fairbanks district.

Gold. The Yukon-Tanana region includes eight well known placer-mining districts. The total production of placer gold in the region has been about ten million ounces, and the production of the various districts through 1960 was:

Fairbanks	-	7,500,000 ounces
Circle	-	730,000
Manley Hot Springs		450,000
Fortymile		410,000
Tolovana		380,000
Rampart, Eagle, and Richardson	-	170,000

The trend of gold production in the region since World War II has been the same as in other gold-producing areas in the United States. After the war gold mining was resumed, and by 1950 Alaska's annual production had increased to equal 40 percent of the pre-war rate. Since then, however, production has declined almost continuously, and the current rate of production is equivalent to about six percent of the pre-war rate. This drastic reduction has not been caused by the exhaustion of gold deposits; it is instead the result of maintaining a fixed price for gold during a period of continual monetary inflation. The decline can be expected to continue unless a major change occurs in the relationship between the price of gold and the purchasing power of the currency.

The areas in the region that have been placer mined are shown in red on the accompanying maps. The gold mineralization is considered to have been associated with the intrusion of granitic rocks, and the sites of mineral deposition were near the peripheries of the smaller intrusions. In some areas tiny veinlets, too narrow and too widely spaced to be minable, appear to have been the bedrock source of gold in the placers.

In most placer deposits the main concentration of gold is in the gravel immediately overlying bedrock. The first discoveries in the region were made where bedrock was either exposed or near the surface, and the earliest mining was done in shallow open cuts by shovelinginto sluice boxes. Steam-powered excavators and equipment for hydraulickingsoon were brought in, and more efficient methods that had been developed in other gold fields were adapted to the Alaskan placers. In some districts, notably at Fairbanks and Livengood, paystreaks were found in deep ground, where open-cut mining was not feasible; there, shafts were sunk to bedrock, and the placers were mined by an underground method known as "drift mining." Horizontal workings (drifts) were driven from the bottom of each shaft along the top of bedrock, and rooms were excavated starting at the ends of the drifts and retreating toward the shaft; the method used was somewhat

similar to the coal miner's method of "longwall retreating." As mining progressed the workings usually filled in behind the miners through settling, caving, or sloughing of the overlying gravel. Picks and shovels were used for digging and loading, and wheelbarrows were used for transporting the gravel to the bottom of the shaft, where it was dumped into a bucket to be hoisted, usually by a steam-powered hoist. At the surface the gravel was dumped directly into a sluice or into a storage pile (winter dump) depending upon the time of year. Winter dumps were sluiced during the spring run-off, and many drift mines were operated all year.

Most of the placers were permanently frozen. This was an advantage in that it enabled the miners to drive underground workings with little or no timbering, but it was a disadvantage in that it necessitated thawing the gravel in order to mine it. In the earliest drift mining in the North, thawing was done with wood fires. Not only was this inefficient, but the smoke in poorly ventilated underground workings was hazardous. A method of putting stream or hot water into the ground through pipes called "points" was devised; the first "points" are reported to have been fashioned from rifle barrels.

Dredging was introduced in Alaska shortly after the first gold discoveries were made. Attempts to dredge permanently frozen ground without first thawing it were failures, but some of the early dredging ventures in ground free, or partly free, from permafrost were successful. At a few of the early dredging operations frozen ground was thawed with steam, but the cost of steam thawing was too high to permit the practice to become widespread. Where the gravel to be dredged was not too thick, the ground would thaw naturally if stripped of silt and moss and left exposed for two or three years. The success of dredging in deep frozen ground required the development of a more economical method of thawing, and a suitable method using unheated water as a thawing medium was developed by 1920. In 1941 sixteen dredges were digging in the Yukon-Tanana region - one at Livengood, two in the Fortymile district, three in the Circle district, and ten in the Fairbanks district. Small-scale placer mining in the region also increased during the two decades preceding World War II; the first part of the increase came as bulldozers and draglines were applied to small open-pit mines, and a further increase in activity came when the price of gold was raised in 1934.

The first lode claim in the region was staked in the Fairbanks district in 1903, and the district underwent a flurry of interest in lode-gold prospecting and mining during 1908 to 1913. A second period of intense interest in lodes in the Fairbanks district came in 1923, after the completion of the Alaska Railroad; and a third period followed the increase in the price of gold in 1934. Other placer districts in the region have been subjected to some lode prospecting, but they have not been prospected for lodes as intensely as has the Fairbanks district.

Lode-gold production in the Yukon-Tanana region has been about $7 million, and nearly all of it has come from the Fairbanks district. Prior to World War II the rate of lode-gold production in the district reached nearly a half million dollars per year. Most of the productive veins were only 10 to 18 inches wide, and, in mining such narrow veins, it was necessary to break barren wallrock in order to have working room in the stopes. The lode mines were not mechanized to any great degree - most mechanical equipment cannot be adapted to mining in narrow underground workings as readily as in wider workings. Although mechanical loaders have been used in some exploration work since the war, in pre-war years ore was shovelled by hand into chutes and mine cars. The mining method most commonly used was a form of cut-and-fill stoping known as "resuing." Open stopes with irregularly spaced stulls for wall support were worked on a few of the wider veins; in most places, however, the schist wallrock did not stand well enough to permit any form of open stoping.

In the veins that have been mined for gold, metallic sulfides have constituted less than two percent of the vein material in most places; but irregular masses of metallic sulfides, some large enough to contain several tons, have been encountered. The most common sulfides are arsenopyrite, jamesonite, stibnite, pyrite, galena, and sphalerite. Arsenopyrite and jamesonite are fairly reliable indicators of gold mineralization. Where exposed in outcrops or excavations the gold-bearing veins ordinarily can be recognized by a characteristic staining of yellow, green, red, and brown from the oxidation of sulfides containing arsenic, antimony, and iron. The staining, however, does not necessarily indicate that the veins contain enough gold to be minable. The gangue is almost entirely quartz; calcite has been found in some veins, but it is rare. The wallrock of most of the veins is the Birch Creek schist formation, but a few veins in intrusive rocks are known. Quartzitic members of the Birch Creek formation are generally better host rocks for veins than the softer micaceous members, because the veins tend to finger out in the softer rock. Folds apparently provided structural control for the mineralization; most of the veins are near the crests of anticlines, and they tend to parallel the anticlinal axes. Numerous post-ore faults add to the uncertainties of mining. Some of the veins were mined over distances of a few thousands of feet along the strike and a few hundreds of feet down the dip.

Development work was done on one promising lode deposit reported to have a minable width of more than 20 feet, but the development was still in progress when World War II began, and the property was not put into production. Other wide lodes are known; a few were mined over widths reported to be as much as 12 feet, but most were too low-grade to be mined, even under pre-war conditions. The lodes are fracture zones in which closely spaced quartz veinlets are separated by silicified schist.

More than a dozen mills have been built in the Fairbanks district, but probably not all were in use at any one time. The largest had a capacity of only 20 tons per day. Primary crushing was done in jaw crushers; stamps were used for fine grinding at most of the mills, but Chilean-type mills, ball mills, and rod mills also were used. Most of the ores that have been mined have been 80 to 85 percent free-milling. Most of the mills relied entirely on amalgamation for recovery, but at two of the most productive properties gold was recovered by both amalgamation and flotation.

In recent years no lode mines have operated continuously, but a small amount of gold has been produced by small-scale, intermittent, lode operations.

Lead. Galena (lead sulfide) has been reported in placer concentrates from several places in the region. It breaks into fine particles readily when subjected to abrasion in streams, and it decomposes readily into earthy secondary minerals in weathering processes. It therefore may be more abundant and more widespread than the placer concentrates indicate. The unit value of lead is too low to permit the mining in the region of galena with no silver. Much of the galena that has been found, however, has carried appreciable amounts of silver.

Mercury. Mercury in the form of cinnabar has been found in placer concentrates in the Manley Hot Springs, Rampart, Tolovana, Fortymile, and Eagle districts. It is particularly abundant in placers on Olive Creek in the Tolovana district, and some work has been done on a lode prospect near the head of that creek. It is also abundant in placers on Canyon Creek, tributary to Seventymile River, but no bedrock source has been found in the Canyon Creek drainage.

Molybdenum. Except for small amounts of molybdenum in tungsten prospects in the Fairbanks district, the only known occurrences of molybdenum in the Yukon-Tanana region are in the vicinity of Mt. Harper at the head of Goodpaster River. High-grade specimens of molybdenum were reported to have come from the vicinity of Tanacross, but the exact location where they were found is not known.

Nickel. A few nickel prospects have been found in the Yukon-Tanana region. They are in or near ultramafic rocks. Two bands of rock that include ultramafics of Devonian age cross parts of the region. One band extends northeasterly across the Livengood quadrangle from the West Fork of Tolovana River to Beaver Creek, north of the White Mountains. The other band trends easterly across the Salcha River drainage; it is cut off by the "Charley River batholith" (a large granitic intrusion), but on the east side of the batholith small disconnected bodies of the same type of rock are scattered down the south side of Seventymile River and across the Yukon River at Eagle. Some of the Paleozoic map units include ultramafic intrusives that have not been mapped separately. So far, the known prospects appear to be below minable grade.

Platinum. The only reported occurrences of platinum in the Yukon-Tanana region are on Lucky Gulch, tributary to Seventymile River, Eagle district, where it has been found in small amounts in placer concentrate, and in the Salcha River drainage, where it has been reported in trace amounts in serpentine.

Silver. Most of the silver that has been produced in the Yukon-Tanana region has been a by-product of gold mining. A small amount, however, has been produced from deposits of silver-bearing galena in the Fairbanks district, and silver-bearing galena has been reported in other districts. The galena deposits that have been mined have been small lenses, pods, or kidneys. The ores have been hand-sorted, and most of the galena that has been shipped has contained 50 ounces or more of silver per ton. During most of the years since mining began in the region, the price of silver has not been high enough to provide much incentive for prospectors to search for silver-lead deposits. Silver now commands a high price, and most authorities are predicting that the price will go higher.

Tin. Tin in the form of cassiterite has been identified in placer concentrates in all the mining districts in the Yukon-Tanana region. It is particularly abundant in a twelve-mile-long belt in the Manley Hot Springs district commonly called the Tofty tin belt. The belt is about one mile wide, and it extends northeasterly from lower Woodchopper Creek across the drainage basin of Patterson Creek into the upper drainage of Baker Creek. It includes all or part of the valleys of twelve streams or gulches (from Woodchopper Creek to Killarney Creek) that are tributary to either Patterson Creek or Baker Creek. Placer mines in the belt have produced 470,157 pounds of cassiterite as a by-product of gold mining. Sluicing practice at these mining operations has been better for the recovery of gold than for the recovery of cassiterite. The U.S. Bureau of Mines has estimated that tailing piles along the belt contain 733,000 pounds of tin.* Cassiterite also is abundant in placer concentrates from several creeks in the Circle district. Cassiterite in gold-quartz veins has been reported in the Circle and Fairbanks districts, but none of the known lode occurrences appear to be economically important.

Tungsten. Tungsten minerals have been found in placer concentrates throughout the region. Both scheelite and wolframite have been identified, scheelite being more common and more widespread than wolframite. The most important lode prospects that

*Thomas, Bruce I., 1957, TIN BEARING PLACER DEPOSITS NEAR TOFTY, HOT SPRINGS DISTRICT CENTRAL ALASKA: U.S. Bureau of Mines Rept. Inv. 5373, 56 pp.

have been found are replacement deposits in limestone or lime-rich rocks near granitic intrusives. Scheelite also has been found in some gold-quartz veins in the Fairbanks district. During the two World Wars 4000 units of tungsten trioxide (20 pounds per unit) were produced from the Stepovich lode on Gilmore Dome in the Fairbanks district.

Zinc. In the Yukon-Tanana region no deposits are known that are valuable chiefly for their zinc content. The low unit value of zinc would preclude the mining of zinc deposits in the region, unless they contained other more valuable metals. Sphalerite (zinc sulfide) accompanies other metallic sulfides in a limestone replacement deposit at the Westonvitch prospect (Map No. 190) in the Fairbanks district. Sphalterite also is common in gold-quartz veins in the Fairbanks district, but in such fine particles that it seldom can be recognized without a microscope. Because of its common association with other metals, its mobility in the zone of weathering, and its easy detection in geochemical tests, zinc may prove to be important in the region as an indicator of valuable mineral deposits.

Nonmetallic minerals. A few nonmetallic minerals are mined in the Yukon-Tanana region for local use - mostly in the Fairbanks area. Peat is used as a soil additive for lawns and gardens. A small amount of stone is quarried from time to time for decorative facing in the construction of homes and buildings. Sand and gravel have been used in large amounts since construction became a major part of the region's economy. Dredge tailings have been a source of some of the sand and gravel used in the Fairbanks district.

The recent discovery and development of an asbestos deposit in Canada a short distance east of the Fortymile district caused some interest in searching for asbestos on the Alaskan side of the boundary, but so far only tiny veinlets of asbestos too narrow to be mined have been found in the Fortymile district. A few asbestos fibers were found in limestone rubble near Fox in the Fairbanks district.

PROSPECTING

The favorability of any region for prospecting depends partlyon how thoroughly that region has already been prospected. In regard to prospecting for placer gold in the Yukon-Tanana region, Mertie, in 1937, wrote:

> "A great deal of placer prospecting has been done in the Yukon-Tanana region in the last 40 years, but when the amount of such work is considered in relation to the great area of the region, it ceases to be so significant. It is probably true that no new placer-mining areas as large as the Fairbanks district are likely to be discovered in this region, because even the amount of prospecting so far done has probably sufficed to locate these major areas of mineralization. But the writer is firmly convinced that smaller mining areas, where the gold placers are localized mainly in one valley, are likely to be discovered from time to time as prospecting continues."*

Since 1937 little prospecting has been done in the region. Because mining costs have increased, some placer-gold deposits that would have been minable in 1937 might not be minable now. Mertie's opinion is still valid, provided that allowances are made for the change in economic conditions. Obviously, most of the prospecting that has been done in the region has been placer prospecting. With the exception of a small area near the head of Goodpaster River, the Fairbanks district is the only part of the region that has been subjected to much lode prospecting.

*Mertie, J.B., Jr., 1937, THE YUKON-TANANA REGION, ALASKA: U.S. Geological Survey Bulletin 872; pg. 267.

Although the early-day prospectors were interested primarily in placer-gold deposits, it should not be assumed that they were completely unaware of the potential value of lode deposits of gold and other minerals. Most of the information available today about mineral occurrences of various kinds in the region was obtained by the early-day prospectors and miners. In the areas where placer mining was carried on, the placer concentrates provided clues to the nature of mineralization in the head-waters of the streams being mined. All the placer-mining districts were visited by geologists of the U.S.Geological Survey, and they would have been able to identify any minerals present in the concentrates, if the miners themselves could not identify them.

The prospecting that has been done probably has been sufficient to rule out the likelihood that large deposits containing obviously valuable amounts of the common metals crop out in the region. Except where recent landslides or caving banks have exposed fresh rock, probably all the outcrops have been seen. Some may not have been examined carefully. If any minable deposits are yet to be found in outcrops, they most likely are deposits of such nature as to have escaped the attention of the traveler who, although perhaps not an experienced lode prospector, had some knowledge of minerals from working in placers. The part of the region that is below timberline is almost completely covered by soil and vegetation, and much of the part above timberline is also covered. Most of whatever remains to be discovered must be well hidden.

In the past few decades, new methods of geochemical and geophysical prospecting have been developed that can help the prospector to find deposits that are hidden under soil and vegetation. The supplies and equipment for some of these methods are moderate in cost and can be afforded by the independent prospector. Courses in geochemical and geophysical prospecting are offered for prospectors at the University of Alaska.

Some geophysical methods of exploration require equipment that can be afforded only by well financed companies. Exploration by these methods frequently begins with a study of all available information on the area to be explored, followed by aerial surveys with several kinds of airborne geophysical equipment. From the results of the aerial surveys, areas are selected for geophysical and geochemical surveys on the ground, and from the ground surveys sites are selected for additional work, such as drilling and trenching. These methods have not yet been applied to the Yukon-Tanana region to any appreciable degree. During the past ten years several mining companies have shown interest in the region, but their work for the most part has been limited to the examination of known prospects found by independent prospectors. Probably each of the known deposits in the region that appears to have any promise has been examined by at least one mining company.

In 1964 the Division of Mines and Minerals began a program of geochemical investigations in Alaska. These investigations have consisted of collecting samples of stream sediments and having the samples analyzed for trace amounts of metals. Areas in which the stream sediments carry higher-than-normal amounts of metal are considered to be favorable areas in which to prospect. Results of the investigations in the Yukon-Tanana region have been published in the following Geochemical Reports, which are sold at offices of the Division for one dollar per copy:

No. 3: A Geochemical Investigation in the Richardson Area, Alaska;

No. 5: A Geochemical Investigation between Chatanika and Circle Hot Springs, Alaska;

No. 9: A Geochemical Investigation along the Taylor Highway, East-Central Alaska;

No. 10: A Geochemical Investigation of the Nenana Highway Area, Alaska;

No. 11: A Geochemical Investigation of Stream Sediments in the Elliott Highway Area, Alaska; and

No. 12: A Geochemical Investigation of Minook Creek, Rampart District, Alaska.

Stream sediment surveys were made in 1966 on the upper Tolovana River, in the Porcupine Dome - Mastodon Dome area in the Circle district, in the Pedro Dome - Coffee Dome area in the Fairbanks district, and on Columia Creek in the Fortymile district. Reports of these investigations are now in preparation and will be available in 1967.

The geologic mapping that has been done has demonstrated that mineralization in the region has been closely related to the igneous rocks. Chromium, nickel, and copper have been found in mafic rocks. Tungsten has been found in calcareous rocks near the margins of porphyritic granites. Gold, silver-bearing galena, tin, cinnabar, and copper have been found in lodes in the areas in which small granitic intrusions have been mapped, and in placers in streams draining such areas. The most favorable granitic intrusions are those less than 3 or 4 miles in diameter. Many of these small intrusions are shown on published geologic maps of the region; probably many more are covered and have not been mapped, but their presence may be indicated by granitic float in streams and on hillsides.

Most of the mineral occurrences shown on the accompanying maps are in the Fairbanks district. The apparent preponderance of mineral deposits in that district may give a distorted impression of the true distribution of mineral deposits throughout the region. Most of the known deposits have been found where most of the lode prospecting has been done.

Part of the land in the Yukon-Tanana region has been withdrawn from mineral entry. Boundaries of the withdrawals and boundaries of patented land are shown on maps in the offices of the U.S. Bureau of Land Management. Unpatented mining claims ordinarily are not shown on the Bureau of Land Management plats, but verbal descriptions of unpatented claims are recorded in the recording offices of the region. These plats and records will help the prospector to determine what ground has been staked, but he must continually be on the lookout in the field for location notices, claim corners, discovery monuments, and claim lines. The U.S. Bureau of Land Management maintains an office in Fairbanks. Recording offices in the region are at Fairbanks, Rampart, and Manley Hot Springs.

Of the land in the region that is open to mineral entry, some is federal public domain and some is state-selected land.Here again, the records of the U.S. Bureau of Land Management show the boundaries of land that has been selected or applied for by the State. State land, generally, is open to mineral entry under the state's "Mining Rights Regulations", copies of which may be obtained from the State Division of Lands; this Division maintains an office in Fairbanks. The laws and regulations that pertain to claim staking are summarized in Information Circular No. 1, PROPER CLAIM STAKING IN ALASKA, which is available at offices of the Division of Mines and Minerals.

MINERAL OCCURRENCES

At the end of the following tabulation of mineral occurrences is a list of the abbreviations used for the references cited and the corresponding full titles of those references. In the tabulation, page numbers are not given for unpublished reports of the Division of Mines and Minerals and the Territorial Department of Mines, because most of these reports are only a few pages long and pertain to only one prospect or occurrence. Where occurrences are closely spaced, a single map number may represent more than one occurrence. Dollar values marked by an asterisk (*) were taken from reports publisned before 1934, and, therefore, are based on $20.67 per ounce for gold rather than the present price of $35 per ounce.

AP O.	NAME OF MINE, CLAIM, OR PROSPECT	LOCATION	NATURE OF OCCURRENCE	REMARKS AND REFERENCES
.		Tanana quadrangle, Manley Hot Springs district. American Cr., trib. to Fish Lake.	Chromium in placer concentrate	B.844D; 214
.		Tanana quadrangle, Manley Hot Springs district. North side of Deep Cr., trib. to Woodchopper Cr.	Cassiterite in placer concentrate.	B.844D; 238. TDM 1: 34.
		Tanana quadrangle, Manley Hot Springs district. Innesvale Gulch, trib. to Deep Cr.	Cassiterite in placer concentrate	Large amounts recovered in gold mining. B.844D; 211
		Tanana quadrangle, Manley Hot Springs district. East bench of Sullivan Cr., trib. to Patterson Cr.	Cassiterite abundant in placer concentrate.	Some production as a by-product of gold mining. B.844D; 210, 239. TDM 1; 34.
			Native copper in placer concentrate	B.844D; 210, 239.
		Tanana quadrangle, Manley Hot Springs district. Cache Cr., trib. to Patterson Cr.	Cassiterite in placer concentrate.	B.844D; 212
	Tofty tin belt	Tanana quadrangle, Manley Hot Springs district. From Woodchopper Cr. to Killarney Cr.	Cassiterite in placers.	125 long tons produced. Reserves in tailing piles 733,000 pounds in 1,259,000 cu yds. R.I.5373; 7, 8, 55.

MAP NO.	NAME OF MINE, CLAIM, OR PROSPECT	LOCATION	NATURE OF OCCURRENCE	REMARKS AND REFERENCES
7	Barrett prospect.	Tanana quadrangle, Manley Hot Springs district. On the summit of Hot Springs Dome	Lode 20 to 35 ft wide with complex sulfide mineralization. Copper, lead and cobalt present.	Forty-ft shaft and short ad Sampling indicates $1* to $ per ton of gold and 5 to 8 of silver. B844D; 215-216
8		Tanana quadrangle, Manley Hot Springs district. Omega Cr. at the mouth of Chicago Cr.	Scheelite in placer concentrate. Cinnabar in placer concentrate.	B844D; 204, 235 B844D; 204
9		Tanana quadrangle, Manley Hot Springs district. On Shirley Bar between Rhode Island and Eureka Crs.	Cinnabar in placer concentrate. Galena in placer concentrate.	B844D; 199, 202 B.844D; 202
10		Tanana quadrangle, Manley Hot Springs district. On McCaskey Bar between Pioneer and Kentucky Crs.	Cinnabar in placer concentrate.	B844D; 199.
11		Tanana quadrangle, Manley Hot Springs district. On Pioneer Cr., trib. to Eureka Cr.	Scheelite in placer concentrate. Cinnabar in placer concentrate.	TDM1; 39. B.844D; 197.
		On Seattle Bar between Seattle Jr. Cr., and Skookum Cr., tribs to Pioneer Cr.	Scheelite in placer concentrate.	B.844D; 197.
12		Tanana quadrangle, Rampart district. On the ridge between Granite Cr. and upper Minook Cr.	Stibnite float found by U.S. Geological Survey party.	B844D; 217.

Gill prospect.	Tanana quadrangle, Manley Hot Springs district. Location indefinite, near Pioneer and Eureka Crs.	Silver-bearing galena float.	Two assays reported at 100 oz per ton of silver and 70% lead. B.844D; 217.
	Tanana quadrangle, Rampart district. On Ruby Cr., trib. to Minook Cr.	Bismuth in placer concentrate.	Geochem Rept 12; 5.
	Tanana quadrangle, Rampart district. On Hoosier Cr., trib. to Minook Cr.	Scheelite, cinnabar, and native copper in placer concentrate.	B.844D; 187, 197, 234.
	Tanana quadrangle, Rampart district. On Little Minook Cr., trib. to Minook Cr.	Scheelite, cinnabar (?), native copper, chromium, and galena in placer concentrate.	B.844D; 182-183, 232-234.
	Little Minook Jr. Cr., trib. to Minook Cr.	Galena in placer concentrate.	B.844D; 185, 234.
	Livengood quadrangle, Rampart district. On Hunter Cr. above the mouth of Dawson Cr.	Cassiterite in placer concentrate.	B.844D; 180.
	On Hunter Creek opposite the mouth of Dawson Cr.	Galena and native copper in placer concentrate.	B.844D; 180, 232.
	Livengood quadrangle, Rampart district. On Quail Cr., trib. to Troublesome Cr.	Mineralized dikes cutting sedimentary rock.	One assay - 52 oz per ton of Silver. B.525; 146.
		Cassiterite common in placer concentrate.	TDM 1; 34.

19	Sawtooth Mt. prospect.	Livengood quadrangle, Rampart district. Near the top of Sawtooth Mt.	Lens of stibnite discovered in 1942.	80-ft shaft; about 500 tons mined. TDM 1958. TDM 2; 16.
20		Livengood quadrangle, Rampart district. On Troublesome Cr.	Cassiterite and scheelite in placer concentrate.	B.844D; 192, 235, 236.
21		Livengood quadrangle, Rampart district. On Gunnison Cr., trib. to Troublesome Cr.	Scheelite in placer concentrate.	B.844D; 235.
22		Livengood quadrangle, Rampart district. On Troublesome Cr. below the mouth of Union Cr.	Cinnabar in placer concentrate. Galena in placer concentrate.	B.844D; 192. B.844D; 236.
23		Livengood quadrangle, Tolovana district. Livengood Cr.	Cassiterite rare in placer concentrate.	TDM 1; 34, 39.
		Livengood Cr. and its tribs.	Chromium in placers, probably derived from ultramafic rocks.	C.335; 3. TDM 1; 17, 18.
24		Livengood quadrangle, Tolovana district. On Lillian Cr., trib. to Livengood Cr.	Scheelite in placer concentrate.	B.662; 270-271. B.712; 183. TDM 1; 39.
		On Ruth Cr., trib. to Livengood Cr.	Scheelite in placer concentrate.	B.712; 183.
		On Olive Cr., trib. to Tolovana River.	Scheelite in placer concentrate.	B.712; 183. TDM 1; 39.
		On Olive, Ruth, and Lillian Crs.	Cinnabar in placer concentrates.	B.662; 270-271. TDM 1; 26.

24		On Ruth Cr.	Stibnite in place in bottom of placer cut.	Covered by tailing. B.662; 271. TDM 2; 16.
		North side of Lillian Cr.	Stibnite and cinnabar in thin seams exposed in cut bank.	TDM 1; 14.
		On the ridge east of Livengood Cr.	Nickel in rock specimens from ridge and from Gertrude Cr.	B.712; 183.
		At the heads of Ruth, Lillian, and Olive Crs.	Numerous quartz veinlets up to 3 inches wide, carrying pyrite, arsenopyrite, and gold.	Reported to carry up to $1 per ton in gold and $2 per ton in silver (1916 price. B.662; 273-274.
		At the heads of Ruth, Lillian, and Olive Crs.	Chromite exposed in a small excavation.	B.662; 274.
	Hudson cinnabar prospect.	On upper Olive Cr.	Cinnabar in small amounts in narrow veinlets.	TDM 1; 26.
	Griffin prospect.	At the head of Lillian Cr.	Quartz vein.	Shaft and adit of unknown length. Two grab samples 0.14 and 0.74 oz of gold pe ton, also traces of nickel. TDM 1955.
25		Livengood quadrangle, Tolovana district. On Lucky (or Goodluck) Cr., trib. to Livengood Cr.	Cassiterite in placer concentrate.	C.335; 3.
		At the head of Livengood Cr.	Stibnite in place on placer bench claim.	B.712;183.
26		Circle quadrangle, Fairbanks district. On Nome Cr., trib. to Beaver Cr.	Cassiterite in placer concentrate.	C.331; 8. TDM 1; 32.

27	Sourdough Cr. prospect.	Circle quadrangle, Fairbanks district. On Dempsey Pup, trib. to Sourdough Cr.	Lenses of stibnite up to 1 ft. thick reported.	TDM 2; 11.
28		Circle quadrangle, Fairbanks district. Sourdough Cr., trib. to Chatanika River.	Cassiterite scarce in placer concentrate.	TDM 1; 32.
29		Circle quadrangle, Fairbanks district. At the heads of Sourdough and American Crs.	Stibnite in heavy mineral fractions from granitic rocks.	C.348; 10-11.
30		Circle quadrangle, Fairbanks district. On Hope Cr., trib. to Faith Cr.	Stibnite deposit reported uncovered in 1926 in digging a bedrock drain for placer mining.	Covered by tailing. TDM 2; 12.
31		Circle quadrangle, Circle district. On Eagle Cr.	Gold-quartz vein 4 ft wide reported to have been uncovered in placer mining and later covered again.	B.314; 189-190.
32		Circle quadrangle, Circle district. At the head of Dome Cr. west of Porcupine Dome.	Gold lode.	Undeveloped prospect. B.897C; 225-226.
33		Circle quadrangle, Circle district. On Porcupine Cr. trib. to Crooked Cr.	Cassiterite in placer concentrate.	B.897C; 226.
34		Circle quadrangle, Circle district. On Mastodon Cr., trib. to Mammoth Cr.	Cassiterite in small amounts in placer concentrate.	TDM 1; 32.

;	Circle quadrangle, Circle district. North Fork of Harrison Cr. 3/4 mile above its junction with the South Fork.	Gold-quartz float.	B.314; 189-190.
5	Circle quadrangle, Circle district. On the North Fork of Harrison Cr.	Cassiterite in small amounts in placer concentrate.	TDM 1; 32.
7	Circle quadrangle, Circle district. On upper Deadwood Cr.	Mineralized fracture zone 8 inches wide with pyrite and galena. Schist country rock.	Reported to carry $6* per ton in gold and $8 in silver (1907 price). B.314; 189-190.
	On upper Deadwood Cr.	Galena with pyrite in mineralized fracture zones.	B.897C; 237.
3	Circle quadrangle, Circle district. On the west side of Deadwood Cr. near Discovery Gulch.	Small vein of wolframite reported found in 1908.	B.897C; 237.
9	Circle quadrangle, Circle district. On Deadwood Cr.	Cassiterite and wolframite in placer concentrate.	C.335; 5. B.897C; 237. TDM 1; 32, 37.
	Discovery placer claim on Deadwood Cr.	Wolframite, cassiterite, and scheelite in placer concentrate.	Principal site of mineralization believed to be south of Discovery Gulch. TDM 1; 41.
	On Deadwood Cr. 1/2 mile below the mouth of Switch Cr.	Heavy-mineral fraction of granite contained 10% galena.	C.348; 13.
	On Deadwood Cr.	Galena in placer concentrate.	B.824; 162.
0	Circle quadrangle, Circle district. Miller House-Circle Hot Springs area.	Cassiterite, wolframite, and scheelite in veins and placer concentrates.	C.348; 11-13

41	Circle quadrangle, Circle district. On Switch Cr., trib. to Deadwood Cr.	Cassiterite in small amounts in placer concentrate.	TDM 1; 37.
42	Circle quadrangle, Circle district. On Hot Springs and Ketchem Crs.	Scheelite in placer concentrate.	C.335; 5.
43	Circle quadrangle, Circle district. On Portage Cr., trib. to Medicine Lake.	Cassiterite in placer concentrate. Traces of chalcopyrite in placer concentrate.	C.335; 5. TDM 1; 32. C.335; 5.
44	Circle quadrangle, Circle district. On Half Dollar Cr., trib. to Bottom Dollar Cr., trib. to Birch Cr.	Cassiterite abundant in placer concentrate.	TDM 2; 19.
45	Circle quadrangle, Fairbanks district. On Palmer Cr., trib. to Chena River.	Scheelite abundant in placer concentrate.	TDM 1; 39.
46	Big Delta quadrangle, Fairbanks district. On Pine Cr., trib. to Beaver Cr., trib. to South Fork of Chena River.	Cassiterite scarce in placer concentrate.	TDM 1; 34.
47	Big Delta quadrangle, Fairbanks district. On Caribou Cr., trib. to Salcha River.	Cassiterite and scheelite in small amounts in placer concentrate.	TDM 1; 34.39.
	On No Grub and Caribou Crs.	Bismuth and bismuthinite reported in veins.	MWRA; 98.

3		Big Delta quadrangle, Fairbanks district. Northeast of "The Splits" in the Salcha River.	Chromium in dunite or peridotite.	Mostly less than 1% chromium. TDM 1; 16.
9	Ricks nickel prospect.	Big Delta quadrangle, Fairbanks district. At the head of Ricks Cr., trib. to North Fork of Salcha River.	Nickel in dolomite.	TDM. 1954 B.
0		Big Delta quadrangle, Fairbanks district. Location indefinite.	Considerable areas of serpentine contain up to 0.6% nickel, traces of platinum, and small amounts of chromium.	TDM 1; 18,20.
1	Democrat lode	Big Delta quadrangle, Richardson district. North side of Democrat Cr., trib to Banner Cr.	Gold lode in rhyolite.	Adit of unknown length driven prior to 1921. B.739; 33. Geochem Report 3; 2.
2		Big Delta quadrangle, Richardson district. On Buckeye Cr., trib. to Banner Cr.	Galena, scheelite, and probably cassiterite in placer concentrate.	C.331; 13.
3		Big Delta quadrangle, Richardson district. On Tenderfoot Cr., trib. to Tanana River.	Gold-bearing galena float found in placer mining.	B.525; 141.
4	Blue lead.	Big Delta quadrangle, Goodpaster district. At the head of Summit Cr., trib. to Boulder Cr.	Gold-quartz vein 2 1/2 ft wide with Jamesonite and a small amount of pyrite. Schist country rock with granitic intrusions.	More than 100 tons mined and milled in 1938. More than 700 ft of underground workings on the Blue lead and Blue lead extension. B.917A; 30. TDM 1937. TDM; 1938A. TDM 1941.

54	Grizzly Bear lead.	Big Delta quadrangle, Goodpaster district. At the head of Johnson Cr. trib. to Tibbs Cr.	Gold-quartz vein 1 1/2 to 2 ft wide. Similar to the Blue lead.	Over 350 tons mined and mill More than 300 ft of underground workings. TDM 1937. TDM 1938A.
55	Gray lead.	Big Delta quadrangle, Goodpaster district. At the head of Tibbs Cr., west of Black Mountain.	Gold-quartz vein 2 ft wide. Similar to the Blue lead.	Vein traced more than 300 ft by surface pits. TDM 1938A. TDM 1941
		At the head of Tibbs Cr.	Jamesonite in gold-quartz veins.	TDM 1; 14.
56		Big Delta quadrangle, Goodpaster district. At the head of Boulder Cr., trib. to South Fork of Goodpaster River.	Molybdenite in small quartz veins in granite.	No high-grade ore found. TDM 1; 29.
57		Big Delta quadrangle, Goodpaster district. At the heads of Healy, Volkmar, and South Fork of Goodpaster Rivers.	Gold-quartz veins.	Undeveloped prospects. TDM 1938A.
58		Eagle quadrangle, Goodpaster district. At the head of the South Fork of Goodpaster River. Location indefinite.	Molybdenite float.	TDM 1938A.
59	Johnson prospect.	Eagle quadrangle, Goodpaster district. On the the south side of Mt. Harper at the head of Goodpaster River.	Molybdenite-bearing quartz vein in granite.	Reported to be 3 claims long B.692; 329. B.926C; 194.
60	My Creek prospect	Eagle quadrangle, Fortymile district. On My Cr., trib. to Molly Cr., trib. to Middle Fork of Fortymile R.	High-grade stibnite float over large area.	R.I.4173; 28-29. TDM 2; 15. TDM 1942

61	Ruby Silver claim.	Eagle quadrangle, Fortymile district. On My Cr., trib. to Molly Cr.	Silver-bearing galena in a calcite vein.	Undeveloped prospect. DM&M 1962B. C.335; 18.
		In the My Cr. drainage 1 1/2 miles south of the Ruby Silver claim.	Silver-bearing galena in a calcite vein with a small amount of copper.	Undeveloped prospect. DM&M 1962B.
62		Eagle quadrangle, Fortymile district. In the headwaters of Our Cr., trib. to Molly Cr.	Silver reported in a 15-ft wide band of magnetite	Undeveloped prospect. DM&M 1962B.
63	Hajdukovich molybdenum prospect.	Tanacross quadrangle. Vicinity of Tetlin - location indefinite.	High-grade specimens of molybdenum obtained.	TDM 1; 29.
64	Mitchell copper prospect.	Eagle quadrangle, Fortymile district. On Ketchumstuk Cr., trib. to Mosquito Fork.	Narrow, copper-bearing vein in schist.	Open pits only. B.520; 213. B.542; 214. DM&M 1962C. Ann. Rept. 1962; 85-88.
65		Eagle quadrangle, Fortymile district. On upper Ketchumstuk Cr.	Stibnite prospect.	B.872; 245. TDM 1; 13.
66		Eagle quadrangle, Fortymile district. On Mt. Veta.	Stibnite deposit reported in 1935.	B880A; 87.
67		Eagle quadrangle, Fortymile district. In the Middle Fork drainage 8 miles from the head of Ketchumstuk Cr. Location indefinite.	Scattered copper float.	B.542; 214.

68		Eagle quadrangle, Fortymile district. On the Middle Fork of Fortymile River 12 miles below Joseph village.	Discovery of stibnite reported in 1917.	B.692; 36.
69	Tweeden prospect.	Eagle quadrangle, Fortymile district. At the mouth of Gold Cr., trib. to Mosquito Fork.	Gold-quartz veins and stringers in greenstone.	Adit 40-ft long. An unsuccessful attempt was made in 1911 to recover the gold in a crude arrastre powered by a waterwheel. B.520; 213.
70		Eagle quadrangle, Fortymile district. On Lilliwig Cr., trib. to Ingle Cr.	Lode 40 to 50 ft wide consisting of quartz with pyrite and chalcopyrite in sericitized diorite.	Sulfides from the lode assayed 1.87 oz. of gold, 2.05 oz of silver, and 0.76 copper. B.813; 141.
71	Purdy prospect.	Eagle quadrangle, Fortymile district. At the head of Myers Fork, trib. to Chicken Cr.	Narrow veinlet of quartz and calcite carrying gold. Schist wallrock.	Small production from hand-dug open pits. DM&M 1960A.
72		Eagle quadrangle, Fortymile district. On Forty-five Pup. trib. to Buckskin Cr.	Scheelite abundant in placer concentrate.	TDM 2; 28.
73		Eagle quadrangle, Fortymile district. On Buckskin Cr., trib. to South Fork of Fortymile River.	Cassiterite in placer concentrate.	TDM 2; 19.
74		Eagle quadrangle, Fortymile district. On Franklin Cr., trib. to South Fork of Fortymile River.	Cinnabar in placer concentrate.	TDM 1; 18.

75		Eagle quadrangle, Fortymile district. On Stonehouse Cr., trib. to Chicken Cr.	Cinnabar in placer concentrate.	B.813; 138.
76	Norvill property.	Eagle quadrangle Fortymile district. On Chicken Cr., trib. to Mosquito Fork.	Stibnite lode.	Development work reported in 1920. B.722; 24.
		On a small, un-named stream west of Chicken Cr.	Montmorillonite-type clay carries traces of goethite, covellite, and chalcopyrite.	C.335; 21.
77	LaFlamme copper prospect.	Eagle quadrangle, Fortymile district. On Slide Cr., trib. to Mosquito Fork near Chicken.	Narrow, low-grade vein carrying some copper.	Exposed in road cut. TDM 1957E.
78		Eagle quadrangle, Fortymile district. At Atwater Bar on South Fork of Fortymile River.	Cassiterite and scheelite in placer concentrate.	C.335; 11.
79		Eagle quadrangle, Fortymile district. On Napoleon Cr., trib. to South Fork of Fortymile R.	Cinnabar in placer concentrate.	B.897C; 183.
80		Eagle quadrangle, Fortymile district. On Wade Cr., trib. to Walker Fork.	Cinnabar and cassiterite in placer concentrate.	B.897C; 166. TDM 1; 27, 32.
81		Eagle quadrangle, Fortymile district. At "The Kink" on the North Fork of Fortymile River.	Cassiterite in placer concentrate.	B.872; 245. TDM 2; 19.

82	Weston prospect.	Eagle quadrangle, Fortymile district. On the Fortymile River below the mouth of O'Brien Cr.	Veinlets carrying scheelite uncovered in placer cut.	TDM 1957C.
83		Eagle quadrangle, Fortymile district. On Dome Cr., trib. to O'Brien Cr.	Galena and cinnabar in placer concentrate.	B.897C; 190.
84		Eagle quadrangle, Fortymile district. On Fourth of July Cr., trib. to Slate Cr., trib. to North Fork of Fortymile R.	Large pieces of galena float found in gravel	C.335; 19.
85	Copper Creek prospect.	Eagle quadrangle, Eagle district. On Copper Cr., trib. to Charley River.	Lode carrying copper, lead, gold, silver and tungsten.	114-ft adit. C.335; 7. TDM 1956B. Ann. Rept. 1961; 64-65.
86		Eagle quadrangle, Eagle district. On Flume Cr., trib. to Seventymile R.	Wide, low-grade mineralized zone carrying gold, pyrite, and arseno-pyrite.	Adit 60 ft long. TDM 1956A.
87		Eagle quadrangle, Eagle district. On Canyon Cr., trib. to Seventymile R.	Cinnabar in placers.	B.872; 245. TDM 1; 27. TDM 1956B.
88		Eagle quadrangle, Eagle district. On Fox Cr., trib. to Seventymile R.	Cassiterite scarce in placer concentrate.	TDM 1; 32.
		On Lucky Gulch, trib. to Fox Cr.	Small amount of platinum in placers.	TDM 1; 2Q.
89	Jenkins prospect.	Eagle quadrangle, Eagle district. On Eagle Bluff near the town of Eagle.	Copper, nickel, and cobalt minerals in ultramafic rocks.	C.316; 3. TDM 1953.

90		Charley River quadrangle, Eagle district. On Fourth of July Creek, trib. to Yukon River.	Large pieces of galena reported in gravel.	C.335; 19.
92	Lookout Mine.	Fairbanks quadrangle, Fairbanks district. On the north side of Emma Cr., trib. to Cripple Cr.	Gold-quartz vein about 10 inches wide.	225 ft of underground workings. 30 tons reporte to have milled $17 to $18 per ton. TDM 1938B.
93	Social Security.	Fairbanks quadrangle, Fairbanks district. On the south side of Ester Cr., one mile southwest of the Ready Bullion mine.	Gold prospect.	Shaft 85 ft deep and 90 ft of other underground workings. TDM 1938B.
94		Fairbanks quadrangle, Fairbanks district. On Cripple Cr., trib. to Chena River.	Cassiterite and scheelite in placer concentrate.	TDM 1; 32, 39.
95		Fairbanks quadrangle, Fairbanks district. On Ester Cr., trib. to Cripple Cr.	Cassiterite and scheelite in placer concentrate.	TDM 1; 32, 39.
96	Maloney prospect.	Fairbanks quadrangle, Fairbanks district. North of Ester Cr. east of Willow Cr.	Quartz vein carrying stibnite and arsenopyrite, reported to be 12 to 14 ft wide. Schist wallrock.	90-ft shaft. B.849B; 123.
97	Ready Bullion group- includes properties sometimes called the Hudson Mine and Eva Quartz Mining Co.	Fairbanks quadrangle, Fairbanks district. At the head of Ready Bullion Cr., trib. to Ester Cr.	Several gold-quartz veins.	Vein system is about 5000 f long. About 2000 ft of unde ground workings. Productive from 1926 to 1932. 18 clai in the group. B.525; 203-206. B.592; 350 352. B.849B; 123-127.

	Ready Bullion group (cont.)			MIMI 1933; 141-142. TDM 1938B. TDM 1951 TDM 1957B. ARMI 1922; 109. U of A 1931; 45.
			Stibnite present in some of the veins.	B.849B; 127. TDM 1951
98	Silver Dollar group- also called the Makaich or Radovich group.	Fairbanks quadrangle, Fairbanks district. On the west side of Ready Bullion Cr. 1 1/2 miles north of Ester Cr.	5-ft-wide vein of quartz and altered schist. Schist country rock.	2 adits, several hundred feet of workings. Some ore milled; said to have been low-grade. MIMI 1933; 142-143. B.849B; 127-128. TDM 1938B.
99	Cotton Blossom claim.	Fairbanks quadrangle, Fairbanks district. On the west side of Ready Bullion Cr., trib. to Ester Cr.	Stibnite in bunches and scattered sparingly through quartz stringers.	B.525; 209.
100	St. Jude	Fairbanks quadrangle, Fairbanks district. On the ridge west of Ready Bullion Cr.	Quartz with gold and sulfides.	2 shafts, one probably deeper than 75 ft. B.849B; 123.
101	M'Queen property.	Fairbanks quadrangle, Fairbanks district. On the ridge 1/4 mile west of Ester Dome.	Stibnite lode.	Production of 100 tons reported during 1916 to 1918. B.849B; 157.
102	Ready Bullion prospect. (not to be confused with the Ready Bullion group).	Fairbanks quadrangle, Fairbanks district. At the head of Ready Bullion Cr.	Gold prospect. No definite vein. Schist country rock.	Several hundred tons of high-grade ore mined from vein segments and bunches of quartz. About 2700 ft of underground workings. TDM 1938B.

103	Mother group - also known as the Murphy mine.	Fairbanks quadrangle, Fairbanks district. On the west fork of Nugget Cr., trib. to Goldstream Cr.	Gold lode of quartz and silicified schist. Schist country rock.	20-ft-wide lode. Several open pits and 3 adits. Small amount of ore reported to have averaged $20* per ton. B.849B; 120-122.
104	Farmer.	Fairbanks quadrangle, Fairbanks district. At the head of the west fork of Ready Bullion Cr.	4-ft-wide lode of gold-quartz and brecciated wallrock. Country rock is schist.	2 adits of unknown length. Small production. One sample $7.06* per ton. B.592; 352. B849B; 122-123. TDM 1938B.
105	Vuyovich prospect.	Fairbanks quadrangle, Fairbanks district. On the north side of Ester Cr. below the mouth of Ready Bullion Cr.	At least 3 gold-quartz veins ranging in width from 2 inches to 4 feet.	4 adits totalling about 400 ft and several open pits. Small production. B662; 409. B.849B; 128. TDM 1954A. TDM 1957A. DM&M 1963B.
			Stibnite and arsenopyrite in lenses in quartz.	B.849B; 128.
106	Stay	Fairbanks quadrangle, Fairbanks district. East of lower Eva Cr., trib. to Ester Cr.	Gold-quartz vein 6 to 18 inches wide.	Several shafts, winzes, and adits. 700 tons of ore milled $16,000*. B.849B; 129-133. U of A 1931; 28-30.
106	Little Eva.	Claims apparently were included in the Stay.	Gold-quartz vein 1 1/2 to 2 ft wide.	35-ft shaft and 30-ft drift. MIMI 1933; 138. TDM 1938B.
107	Hegan and Lefebre.	Claims apparently were included in the Bluebird (109).	Narrow gold-quartz vein and numerous flat-lying lenses.	Adit driven in 1912. B.525; 206-208.
108	Camp Bird.	Fairbanks quadrangle, Fairbanks district. On the west side of Eva Cr., trib. to Ester Cr.	Gold-quartz vein 3 ft wide.	Shafts, drift, and winze totalling 200 ft. TDM 1938B.

109	Bluebird - also known as the McDonald.	Fairbanks quadrangle, Fairbanks district. On the east side of Eva Cr., trib. to Ester Cr.	Gold-quartz vein from a fraction of an inch to 4 ft wide.	Shaft and other workings. 240 tons milled $19* per to B.849B; 133-135. MIMI 1933; 138-140. U of A 1931; 30-32. TDM 1938B.
	Combination claim & Combination shaft.	Claims have been included in the Bluebird.	Stibnite and arsenopyrite in boulders on the dump at the shaft.	B.849B; 134-135.
110	Little Flower.	Fairbanks quadrangle, Fairbanks district. On the east side of upper Eva Cr., trib. to Ester Cr.	Gold-quartz vein 2 ft wide.	450-ft adit and 50-ft winze 680 tons reported to have milled $25 per ton. TDM 1938B.
111	Billy Sunday.	Fairbanks quadrangle, Fairbanks district. At the head of the south fork of St. Patrick Cr.	Gold-bearing vein of crushed quartz with some schist, 12 to 14 inches wide. Schist wallrock.	120-ft shaft and other workings. 1900 tons mille $26* per ton. B.849B; 139-142. ARMI 1922; 106-107.
			Stibnite and arsenopyrite in the Billy Sunday vein.	B.849B; 142.
112	Ryan lode.	Fairbanks quadrangle, Fairbanks district. On St. Patrick Cr. east of Ester Dome.	Gold lode 40 to 70 ft wide with most of the mineralization in a band 9 to 20 ft wide. Schist wallrock.	Several shafts and rather extensive underground workings. B.525; 209. B.662; 413 B.849B; 135-138. TDM 1938E ARMI 1922; 106-107.
			Stibnite and arsenopyrite in the Ryan lode.	B.849B; 136.
113	Mohawk mine.	Fairbanks quadrangle, Fairbanks district. On St. Patrick Cr. below the Ryan lode.	Gold-quartz vein 9 inches to 6 ft wide, averaging 3 ft. Schist wallrock.	2900 ft of drifts and more than 1800 ft of raises and winzes. Production reporte at more than $200,000*. $2 per ton average.

	Mohawk mine (Cont.)			B.849B; 147-148. B783; 8. U of A 1931; 41-42 MIMI 1933; 145.
			Stibnite present in the vein at the Mohawk mine but is scarce and erratic.	B.849B; 145. B.783; 8.
	Bondholder group - also known as the Tyndall and Finn property.	Claims have been included in the Mohawk mine.		U of A 1931; 40. B.849B; 146.
114	Fair Chance	Fairbanks quadrangle, Fairbanks district. On St. Patrick Cr. near the Ryan lode.	Mineralized zone consisting of gouge, schist, and quartz, carrying gold. Schist wallrock.	3 shafts. Grab sample $5.95* per ton. Small production. B.849B; 139.
115	Wandering Jew.	Fairbanks quadrangle, Fairbanks district. Between St. Patrick and Eva Crs.	Gold-quartz vein 4 to 18 inches wide with sulfides.	50-ft shaft and other workings. Small productior $10* to $20* per ton. B.849B; 147. TDM 1938B. U of A 1931; 42-43.
116	Clipper.	Fairbanks quadrangle, Fairbanks district. On the east fork of Eva Cr., trib. to Ester Cr.	Vein 1 to 8 inches wide carrying sulfides and free gold. Schist Wallrock.	237-ft adit. Samples reported to have assayed about $12* per ton. B.849B; 152. MIMI 1933; 14 TDM 1938B.
117	St. Paul.	Fairbanks quadrangle, Fairbanks district. On the west fork of Eva Cr. southeast of Ester Dome.	Gold-quartz vein 3 to 4 ft wide. Schist wallrock.	300-ft adit and other workings. 1000 tons of ore milled $30* per ton. B.849B; 128-129. ARMI 1922; 108-109. TDM 1938B.
			Stibnite and arsenopyrite in the vein.	B.849B; 129.

118		Fairbanks quadrangle, Fairbanks district. At the head of Eva Cr., trib. to Ester Cr.	Lenses or kidneys of stibnite in a shear zone. Schist wallrock.	Production of 100 tons reported during 1915 and 1916 ARMI 1922; 110-111.
119	Big Blue.	Fairbanks quadrangle, Fairbanks district. At the head of St. Patrick Cr. west of the Prometheus.	Gold-bearing zone consisting of crushed quartz, schist, and gouge. Schist wallrock.	Shallow shafts and open pit B.849B; 148.
120	Prometheus.	Fairbanks quadrangle, Fairbanks district. At the head of St. Patrick Cr. between the Wandering Jew and the top of Ester Dome.	Gold, silver, and sulfides in a quartz vein.	60-ft shaft. One grab sampl assayed $9.52* per ton, including 6.4 oz of silver per ton. B.849B; 148. U of A 1931; 39.
			Jamesonite and covellite present in the vein.	B.849B; 148.
121	First Chance.	Fairbanks quadrangle, Fairbanks district. At the head of St. Patrick Cr.	Gold-quartz vein 6 inches to 4 feet wide, averaging 12 inches.	120-ft shaft and other workings. $26,000* produce from 520 tons of ore. B.849B; 147-148. U of A 1931; 41-42 MIMI 1933; 145.
122	Last Chance.	Fairbanks quadrangle, Fairbanks district. At the head of St. Patrick Cr. northwest of the Mohawk.	Gold-quartz vein with sulfides, 2 ft wide.	60-ft shaft and other workings. 125 tons reported to have milled $30* per ton. ARMI 1922; 108.
123	Macomb.	Fairbanks quadrangle, Fairbanks district. On the ridge north of St. Patrick Cr. between the Mohawk and Grant mines.	Gold-bearing vein of crushed schist, gouge, and quartz.	Two shafts 30 to 50 ft deep B.849B; 152.

124	Grant mine.	Fairbanks quadrangle, Fairbanks district. On the ridge north of St. Patrick Cr.	Gold-quartz vein 2 to 4 ft wide.	240-ft shaft and other workings. Several hundred tons reported to have milled $15* to $20*.per ton. B849B; 150. MIMI 1933; 144. U of A 1931; 37-39. U of A 1951; 1-26.
125	Elmes.	Fairbanks quadrangle Fairbanks district. On Happy Cr. east of Ester Dome.	Gold-quartz vein. Schist wallrock.	100-ft shaft and other workings. One grab sample assayed $8.64* per ton. Some production. B849B; 150. TDM 1938B.
126	Cosgrove and Krutsch.	Fairbanks quadrangle, Fairbanks district. On the south side of Happy Cr., trib. to Chena R.	Large pieces of stibnite float found.	TDM 1; 11.
127	Lincoln.	Fairbanks quadrangle, Fairbanks district. At the head of Happy Cr. east of Ester Dome.	Gold-quartz vein 9 inches wide.	37-ft shaft. Grab sample $160 per ton. TDM 1938B.
128.	Royal Flush.	Fairbanks quadrangle, Fairbanks district. On the ridge between Happy and Sheep Crs.	Gold-quartz vein 3 ft wide. Faulted a short distance down-dip from the surface.	85-ft shaft. 300 ft of drifts and cross-cuts. 208 tons averaged $47.50 per ton. TDM 1938B.
129	Sanford. Also known as the Lone Tree mine.	Fairbanks quadrangle, Fairbanks district. On the summit of the ridge between Sheep and Happy Crs.	Two gold-quartz veins; one 10 to 12 inches wide and one 4 to 12 inches wide.	105-ft shaft and a few hundred ft of drifts. 150 tons milled $6,700. U of A 1931; 43-45. B.849B; 149. MIMI 1933; 145. TDM 1938B.

130	Michley.	Fairbanks quadrangle, Fairbanks district. Head of Sheep Cr. Northeast of Ester Dome.	Gold-quartz vein with gouge. Vein is 2 to 12 inches wide. Wallrock is mica schist.	2 adits - 200 ft and 150 ft Some ore reported to have milled $10* per ton. 849B; 149.
131	Parker.	Fairbanks quadrangle, Fairbanks district. On the ridge between Sheep and Nugget Crs.	Gold-quartz vein with small amount of sulfides, 1 to 6 inches wide.	70-ft shaft. Small tonnage reported to have milled mor than $80 per ton. MIMI 1933; 145.
132.	Grant.	Fairbanks quadrangle, Fairbanks district. On the divide between Sheep and Nugget Crs.	Gold-quartz vein 5 to 6 inches wide with small amounts of arseno-pyrite and stibnite. Quartzite schist wallrock.	60-ft shaft and some addi-tional workings. Grab sample $9.22* per ton. B849B; 122.
133	Blue Bonanza.	Fairbanks quadrangle Fairbanks district. At the head of the west fork of Sheep Cr.	Quartz vein 18 inches wide at the surface; narrower in depth. Silver present in tetrahedrite; also stibnite and galena present.	130 ft shaft. B.525; 197. B.592; 353.
134.	Lepsoe.	Fairbanks quadrangle, Fairbanks district. On the ridge east of Nugget Cr., 2 miles northwest of Ester Dome.	20-ft wide gold-quartz vein. Granite porphyry dike parallels vein.	Small amount of development B.849B; 152.
135	Scrafford mine.	Livengood quadrangle, Fairbanks district. On Eagle Cr., trib. to Treasure Cr.	Stibnite lode with lenses up to 9 ft wide reported.	Production during World War I. Exploration work in 1964. B.649; 17-41. B849B; 156-1 TDM 2; 10.
136		Livengood quadrangle, Fairbanks district. On the east side of Eagle Cr., trib. to Treasure Cr.	Stibnite lenses 3 to 4 feet wide. Probably the extension of the Scrafford mineralized zone.	90-ft shaft. TDM 2; 10-11

137	Bunker Hill.	Fairbanks quadrangle, Fairbanks district. On the ridge north of Big Eldorado Cr., 2 1/2 miles west of Elliott Highway.	Two prospects: a gold-quartz vein that averages 12 inches wide, and a 50-ft wide mineralized zone in schist.	Adit 75 ft vertically below the summit of the ridge cut the mineralized zone; grab sample $0.23* per ton. Shaft 102 ft deep on gold-quartz vein; 8 tons reported to have milled 13 oz of gold; grab sample $24.07* per ton. B.849B; 153-154.
138	Fredericks.	Livengood quadrangle, Fairbanks district. On the west side of the ridge between Vault and Dome Crs.	Vein up to 3 1/2 ft wide with fault zone along hanging wall. Arsenopyrite, pyrite, and stibnite present in addition to gold and silver. Wallrock is quartzite schist. A 7-ft-wide granitic dike is present.	One shaft 300 ft deep; one shaft 100 ft deep. Grab samples from dump assayed $1.46* and $2.83* per ton. No work done since 1912. B.525; 194-196. B.542; 181-182. B849B; 80-81. ARMI 1922; 103.
139	Gilmer lode.	Livengood quadrangle, Fairbanks district. On Vault Cr., trib. to Chatanika River.	Stibnite body; 38 to 42 percent antimony.	TDM 1; 10.
140	McGrath prospect.	Fairbanks quadrangle, Fairbanks district. On the ridge south of Engineer Cr.	Gold-quartz vein 7 inches wide.	Low-grade vein. DM&M 1963D
141	Engineer.	Fairbanks quadrangle, Fairbanks district. On the point of the ridge one-eighth mile south of Engineer Cr.	Two parallel gold-quartz veins with arsenopyrite.	Grab sample from dump assayed $2.86* per ton. B.849B; 153.
142	Ridge claim.	Fairbanks quadrangle, Fairbanks district. On the ridge south of Engineer Cr.	Gold-quartz vein 14 inches wide.	Grab sample from dump assayed $15.96* per ton. B.849B; 153.

143	Peterson.	Fairbanks quadrangle, Fairbanks district. On the knob between Goldstream and Engineer Crs.	Gold-quartz float.	Found in hand-dug open pits B.849B; 153.
144		Fairbanks quadrangle, Fairbanks district. Head of Columbia Cr., trib. to Chena River.	Gold-quartz vein.	100-ft adit. Low-grade vei B.525; 210.
145		Livengood quadrangle, Fairbanks district. On Goldstream Cr., trib.to Chatanika River.	Cassiterite scarce in placer concentrate.	TDM 1; 32.
146		Fairbanks quadrangle, Fairbanks district. On First Chance Cr., trib. to Goldstream Cr.	Cassiterite and scheelite in placer concentrate.	TDM 1; 32, 39, 41.
147	Spruce Hen claim.	Fairbanks quadrangle, Fairbanks district. At the head of First Chance Cr., trib. to Goldstream Cr.	Scheelite with some molybdenite. A replacement deposit in limestone within the Birch Creek schist formation.	60-ft shaft in 1956. B.662; 421-424. B.10241; 201-206. B.926C; 196. R.I. 4174; 23-26. TDM 1957D.
148	Columbia claim.	Fairbanks quadrangle, Fairbanks district. At the head of Steele Cr., near the Spruce Hen claim.	Scheelite with some molybdenite.	Two adits, one 80 ft long. B.692; 326-327.
149		Fairbanks quadrangle, Fairbanks district. On Gilmore Cr., trib. to Goldstream Cr.	Cassiterite and scheelite in placer concentrate.	TDM 1; 32, 39.
150		Fairbanks quadrangle, Fairbanks district. At the head of Rose Cr., trib. to Gilmore Cr.	Small amounts of stibnite in tiny veinlets.	B.592; 346.

151	Green Mountain claim.	Fairbanks quadrangle, Fairbanks district. At the head of Rose Cr., trib. to Gilmore Cr..	Gold-quartz vein 15 ft wide.	Small open cut and adit of unknown length. B.592; 345-346. B.525; 198.
152		Fairbanks quadrangle, Fairbanks district. On the ridge between Steele Cr., trib. to Chena R., and Rex Cr., trib. to Smallwood Cr.	Several wide quartz veins.	Low-grade veins. B.525; 210.
153		Fairbanks quadrangle, Fairbanks district. At the head of Nugget Cr., trib. to Smallwood Cr.	Narrow, gold-bearing, quartz veinlets in granitic rocks.	Exposed in a placer cut. DM&M 1963C.
154	Stepovich lode.	Fairbanks quadrangle, Fairbanks district. At the top of Gilmore Dome.	Scheelite replacement in limestone within the Birch Creek schist formation.	About 2000 ft of underground workings. Production during World Wars I and II. B.692; 325-326. B.10241; 188-201 R.I. 4174; 5-23. TDM 1943. U of A 1948.
155		Fairbanks quadrangle, Fairbanks district. On Monte Cristo Cr., trib. to Fish Cr.	Scheelite in a gold-quartz vein.	B.662; 412.
156	Monte Cristo claim.	Fairbanks quadrangle, Fairbanks district. On the spur between Melba and Monte Cristo Crs., to Fish Cr.	Two narrow, parallel veins separated by 3 ft of granite. Veins consist of quartz containing gold, scheelite, bismuthinite, and tellurium.	Shaft 18 ft deep. B.662; 412. B.592; 325, 330-331.
157		Fairbanks quadrangle, Fairbanks district. On Melba Cr., trib. to Fish Cr.	Gold-quartz vein carrying bismuth and bismuthinite.	Reported to be rich in gold. B.592; 325.

158	American claim.	Livengood quadrangle, Fairbanks district. Between Pearl Cr., trib. to Fish Cr., and Victoria Cr., trib. to Smallwood Cr.	Quartz vein 18 inches to 7 ft wide with gold and scheelite.	70-ft shaft. MIMI 1933; 144-145.
159	Perrault.	Fairbanks quadrangle, Fairbanks district. On the divide between Pearl Cr. and Smallwood Cr.	Three prospects: a gold-quartz vein averaging 2 ft wide, a vein of quartz and brecciated schist averaging 18 inches wide, and a gold-bearing dike of unknown character.	50-ft shaft reported on 2-f vein; vein reported to have milled $24.06* per ton. 60-ft shaft on 18-inch vein, vein reported to carry $25* per ton in gold. Dike reported to carry $15* per ton in gold. B.525; 166. B.542; 151. B.592; 329-330. B.849B; 154.
160		Fairbanks quadrangle, Fairbanks district. On Pearl Cr., trib. to Fish Cr.	Scheelite scarce and wolframite abundant in placer concentrate.	TDM 1; 39.
161		Livengood quadrangle, Fairbanks district. On Fish Cr., trib. to Little Chena River.	Cassiterite rare in placer concentrate.	TDM 1; 32.
162		Livengood quadrangle, Fairbanks district. On Pedro Cr., trib. to Goldstream Cr.	Cassiterite rare in placer concentrate.	TDM 1; 32.
163	Busty Belle mine. Formerly known as the Silvertone prospect and also as the Freeman and Scharf prospect.	Fairbanks quadrangle, Fairbanks district. On the divide between Fox Cr. and Flume Cr., tribs. to Goldstream Cr.	Several veins carrying gold and silver-bearing galena. Diorite wallrock.	Currently under development B.525; 198. TDM 1959. U of A 1962; 121-122.

164	Leslie prospect.	Livengood quadrangle, Fairbanks district. On Seattle Cr., trib. to Dome Cr.	Scheelite in schist near a granodiorite intrusive.	B.10241; 209-210.
165		Livengood quadrangle, Fairbanks district. On Dome Cr., trib. to Chatanika River.	Cassiterite and scheelite scarce in placer concentrate.	TDM 1; 32, 37.
166	Smith-Rowley prospect.	Livengood quadrangle, Fairbanks district. On the north side of upper Steamboat Cr.	Flat-lying vein of silver-bearing galena in quartz-diorite.	Open cuts. 2 small shipments made to smelter. DM&M 1961. DM&M 1962A. DM&M 1963A.
167	Nightingale - may now be included in the Smith-Rowley prospect.	Livengood quadrangle, Fairbanks district. On Steamboat Cr., trib. to Pedro Cr.	Stibnite and galena.	B.525; 198. TDM ; 1959.
168	May Florence and Silver Dollar claims.	Livengood quadrangle, Fairbanks district. On a tributary that enters Steamboat Cr. from the North.	Tiny veinlets of gold-bearing quartz in brecciated schist.	25-ft adit and shallow shaft. B.592; 346.
169	Birch and Anderson.	Livengood quadrangle, Fairbanks district. On Granite Cr., trib. to Pedro Cr., 1/4 mile above the road.	Three parallel, mineralized zones, 18 to 50 ft wide, carrying gold-bearing quartz, stibnite, and other sulfides.	Adit 390 ft long and a shaft. Small amount of ore reported to have milled $8* per ton. B.520; 32. B.592; 347-348. B.849B; 119-120. ARMI 1922; 104-105.
170	Egan prospect.	Livengood quadrangle, Fairbanks district. One mile southeast of Pedro Dome.	Scheelite sparsely distributed in small pegmatite dikes.	B.10241; 210. R.I. 4174; 23-26. U of A 1962; 122.

171	Independence mine - also known as the Twin lode mine and the Woods mine.	Livengood quadrangle, Fairbanks district. On the east side of Twin Cr. below the mouth of Skoogy Gulch.	Gold-quartz vein 8 to 10 inches wide with small amount of galena. Granite porphyry wallrock.	Two adits and other undergroun workings. 870 tons reported to have milled $38 per ton. B.642; 61. B.662; 410-411 B.849B; 114-115. TDM 1938B.
171	Burnet.	Livengood quadrangle, Fairbanks district. On the east side of Twin Cr. below the mouth of Skoogy Gulch.	Flat-lying body of quartz in center of which are lenses of galena said to be rich in silver.	B.592; 349. B.849B; 118. TDM 1959.
172	Moonlight group.	Livengood quadrangle, Fairbanks district. On the south side of Twin Cr. above the mouth of Skoogy Gulch.	Gold-bearing vein of crushed quartz and schist 4 to 6 inches wide. A schist-granite contact crosses the workings.	Three adits and other workings Grab sample $3.26* per ton. B.849B; 114.
173	White Elephant.	Livengood quadrangle, Fairbanks district. On the south side of Twin Cr. east of Pedro Dome.	Flat-lying lenses of silver-bearing galena in schist.	25-ft adit. Small lens of galena mined. B.592; 348. B.849B; 114. TDM 1959.
174		Livengood quadrangle, Fairbanks district. On Twin Cr., trib. to Gold-stream Cr.	Cassiterite common in placer concentrate.	TDM 1; 32.
175	North Star and North Star Extension - also called the Center Star in some older reports.	Livengood quadrangle, Fairbanks district. On Skoogy Gulch, trib. to Twin Cr.	3-inch-wide, high-grade, gold-quartz vein.	45-ft shaft and 175 ft of drifts. $5000* production reported. B.662; 409. B849B; 116-118. MIMI 1933; 135-136.
176	Rainbow mine - also called the Rainbow and David.	Livengood quadrangle, Fairbanks district. On the ridge between Twin Cr. and Skoogy Gulch.	At least 3 veins of gold-bearing quartz 1/2 inch to 22 inches wide. Wallrock is schist and porphyritic granite.	Several shafts, adits, and other workings. No production B.525; 198-200. B.542; 184-186 B.592; 348. B.849B; 115-116. ARMI 1922; 104. TDM 1938B. MIMI 1933; 137-138.
			Galena and sphalerite present.	B.525; 200.

177	Robinson - also known as the Rose, also as the Mohawk.	Livengood quadrangle, Fairbanks district. Between the heads of Dome and Granite Crs. southwest of Pedro Dome.	Three gold-quartz veins; one 4 to 8 ft wide. Wide fault zone. Schist wallrock.	Nearly 100 open cuts and some underground workings. B.525; 190. B.662; 407. B.849B; 81-82.
178	Soo mine.	Livengood quadrangle, Fairbanks district. At the head of Dome Cr. on the west side of Pedro Dome.	Two veins: one 6 to 8 inches wide and one 14 inches wide. Also a mineralized zone 14 ft wide. Schist wallrock; quartz-diorite intrusion nearby.	Numerous shafts and other workings. Production about $150,000. B.525; 190-194. B.542; 176-180. B.592; 342-345. B.849B; 77-80. ARMI 1922; 102-103. MIMI 1933; 133-134. TDM 1938B.
			Stibnite lenses in a gold-quartz vein.	TDM 1; 10.
179	La Rose.	Livengood quadrangle, Fairbanks district. Adjoins the Soo mine on the east.		Shaft was being sunk in 1938 to intersect a vein that was exposed in the Soo mine. TDM 1938B.
180	Dome View.	Livengood quadrangle, Fairbanks district. At the head of the west fork of Last Chance Cr., trib. to Little Eldorado Cr.	Gold-quartz vein 12 to 40 inches wide. Quartz-mica schist wallrock.	145-ft adit. Vein probably averages $5* per ton. B.849B; 83-84.
181		Livengood quadrangle, Fairbanks district. Near the head of Spruce Cr., trib. to Little Eldorado Cr. Location indefinite.		150-ft shaft on lode reported to carry $12* per ton. B.525; 190. B.542; 176.

182	Markovich mine.	Livengood quadrangle, Fairbanks district. At the head of Spruce Cr.	High-grade stibnite found on dump.	16 1/2 tons shipped in 1942. TDM 1; 10. TDM 2; 9.
183	Hindenburg Claim.	Livengood quadrangle, Fairbanks district. Between Spruce and Eldorado Crs.	Stibnite body.	25-ft shaft. 200 tons reported mined in 1916. B.662; 415.
184	Ohio claim.	Livengood quadrangle, Fairbanks district. At the head of Whisky Gulch, trib. to Little Eldorado Cr.	Gold-quartz vein carrying arsenopyrite and stibnite and stained with iron and manganese.	Three shallow shafts, 500-ft adit, and 100 ft of drifts. Grab sample $4.18 per ton. B.849B; 83. TDM 1938B.
185		Livengood quadrangle, Fairbanks district. On Little Eldorado Cr., trib. to Chatanika River.	Cassiterite common, wolframite scarce in placer concentrate.	B.442; 246. B.379; 188. TDM 1; 32, 37.
186	Hidden Treasure - apparently known in 1938 as the New Deal prospect.	Livengood quadrangle, Fairbanks district. At the main fork of Last Chance Cr., trib. to Little Eldorado Cr.	Mineralized fault zone with gold-quartz gash veins. Schist wallrock.	250-ft adit. Samples from a raise averaged $6 per ton. B.849B; 82. B.592; 342. TDM 1938B.
187	Crayton mine - also known as the Franklin mine or the Greenback mine.	Livengood quadrangle, Fairbanks district. At the head of Last Chance Cr. Adjoins the Newsboy on the southwest.	Gold-quartz vein 8 to 30 inches wide. Schist wallrock.	Small production for several years ending in 1954. 100-ft shaft and 500 ft of drifts. TDM 1952.
188	Newsboy mine.	Livenoood quadrangle, Fairbanks district. On the divide between Cleary and Last Chance Crs.	Gold-bearing vein of crushed schist and quartz 4 to 6 ft wide.	350-ft shaft and 4 levels. Some production. B.525; 187-189. B.542; 172-174. B.592; 340-341. B.849B; 85-89. ARMI 1922; 122. MIMI 1933; 132-133.

	Newsboy mine. (cont.)		Stibnite present in the vein.	B.525; 187.
			Small amounts of chalcopyrite and sphalerite present in the vein.	B.525; 187.
189	Newsboy Extension.	Livengood quadrangle, Fairbanks district. Adjoins the Newsboy on the northeast.	Vein with strike different from that of the Newsboy; probably not actually an extension of the Newsboy vein.	115-ft shaft and some drifts. Reported $15* per ton. B.525; 189-190. B.542; 174-1 B.849B; 89.
190	Westonvitch	Livengood quadrangle, Fairbanks district. One-half mile west of the junction of Willow and Cleary Crs.	A replacement deposit in limestone within the Birch Creek schist formation; contains gold, silver, pyrite, sphalerite, galena, and stibnite.	Two adits and three shafts. Mined during World War I by the Eldorado Mining and Milli Co. B662; 416. B.849B; 89-90. ARMI 1922; 101-102. TDM 1959.
191	Steil tunnel.	Livengood quadrangle, Fairbanks district. On the ridge between the headwater branches of Cleary Cr.	Gold-quartz vein with stibnite and other sulfides.	B.525; 187.
192		Livengood quadrangle, Fairbanks district. West of Willow Cr., trib. to Cleary Cr.	Small stringer carrying large amounts of stibnite.	16-ft shaft. B.525; 185.
193	Tolovana mine.	Livengood quadrangle, Fairbanks district. On Willow Cr., trib. to Cleary Cr.	Lode 8 to 12 inches wide consisting of gold-bearing quartz veinlets in schist.	About 1000 ft of underground workings. Some production. B.525; 183-185. B.542; 169-171. B.592; 339-340. B.849B; 91-92. ARMI 1922; 100-101 MIMI 1933; 132. DM&M 1963E.
			Stibnite crystals in quartz; no large masses in main vein but two other veins carry much stibnite.	B.525; 183-184. B.849B; 92.

194		Livengood quadrangle, Fairbanks district. On Willow Cr., trib. to Cleary Cr.	Stibnite in a wide quartz zone.	Discovered in 1942 in a placer cut. TDM 2; 7.
195	Emma claim - also called the Catherine	Livengood quadrangle, Fairbanks district. At the head of Willow Cr., trib. to Cleary Cr.	Gold-quartz vein 4 to 12 inches wide.	60-ft shaft and 100 ft of drifts. 10 tons reported to have milled $38* per ton. B.525; 185-186. B.542; 171-172. B.592; 340. B.849B; 90-91.
196	Cornell claim.	Livengood quadrangle, Fairbanks district. At the head of Bedrock Cr. Adjoins the Emma claim.	Unknown. Probably a lode-gold prospect.	Adit and shallow shafts. No recent work has been done on the prospect. B.849B; 91.
197	Polaris - includes some ground formerly covered by the Jackson claims.	Livengood quadrangle Fairbanks district. On the divide between the heads of Bedrock Cr. and Twin Cr.	8-to-12-inch-wide vein of galena, jamesonite, stibnite, and arsenopyrite carrying gold and silver. Also two other veins. Schist wallrock.	Open cuts and some underground workings. About 35 tons mined and shipped during 1952 - 195 B592; 338. B.662; 416-417. B.849B; 92-93. TDM 1959.
198		Livengood quadrangle, Fairbanks district. On Bedrock Cr., trib. to Cleary Cr.	Cassiterite common and scheelite scarce in placer concentrate.	TDM 1; 32, 37.
199	Cleary Hill mine - formerly called the Rhoads-Hall mine.	Livengood quadrangle, Fairbanks district. On the southeast side of Cleary Creek near the mouth of Bedrock Cr.	Gold-quartz vein 4 to 24 inches wide. Schist wallrock.	Extensive underground workings Production more than $1,000,00 B.525; 177-180. B.542; 163-166. B.592; 337-338. B.849B; 93-96. ARMI 1922; 98-100. MIMI 1933; 130-131. TDM 1938B.
			Cassiterite and scheelite in the vein.	B.649; 35. B.10241; 208-209.
			Bunches of stibnite in the vein.	Production of stibnite in 1942 TDM 2; 9.

200	Wyoming mine.	Livengood quadrangle, Fairbanks district. On the east side of Bedrock Cr. Adjoins the Cleary Hill mine on the south.	Three gold-quartz veins 1 to 2 ft wide. One may be the extension of the Cleary Hill vein. Schist wallrock.	About 800 ft of underground workings. Some production. B.525; 181-182. B.542; 166-168. B592; 338. B.849B; 96-98. ARMI 1922; 100.
			Cassiterite and scheelite present in the vein.	B.10241; 206-208.
201	Sunrise claim.	Livengood quadrangle, Fairbanks district. At the junction of Cleary and Chatham Crs.	Gold-quartz vein with stibnite and other sulfides.	B592; 337.
202	B.P. claim.	Livengood quadrangle, Fairbanks district. On the west side of Chatham Cr. 1/2 mile from Cleary Cr.	Shear zone carrying free gold, galena, stibnite, and sphalerite.	90-ft adit and 150-ft winze with short drifts. B.525; 176. B.542; 162-163. B849B; 98. B.649; 35.
203	Union mine.	Livengood quadrangle, Fairbanks district. On Chatham Cr. adjoining the Cleary Hill property.	Unknown.	25 tons selected from dump averaged $22 per ton. TDM 1938B.
204	Scott Reese tunnel - on the Rex claim.	Livengood quadrangle, Fairbanks district. On the west side of Chatham Cr. 200 ft south of the B.P. workings.	Two narrow gold-quartz veins. Schist wallrock.	320-ft adit. B849B; 98-99. MIMI 1933; 137. TDM 1938B.
205	Bobbie claim.	Livengood quadrangle, Fairbanks district. West of the junction of Chatham and Tamarack Crs.	Small vein of nearly pure galena, also a vein consisting of stibnite and galena.	Inclined shaft and open cuts. B525; 177, 182. B.542; 163. B.649; 35. TDM 1959.
206	Colbert and Warmbold.	Livengood quadrangle, Fairbanks district. At the head of Tamarack Cr. trib. to Chatham Cr.	Gold-quartz vein 5 inches wide.	240-ft adit. MIMI 1933; 130.

207	Anna-Mary claims.	Livengood quadrangle, Fairbanks district. Between Chatham and Tamarack Crs.	Two lodes; one 4 to 8 ft wide carries arsenopyrite and silver-bearing galena.	Several shallow shafts. Channel sample $0.46* per ton. B.849B; 100. TDM 1959.
208	Chatham mine.	Livengood quadrangle, Fairbanks district. At the head of Chatham Cr., trib. to Cleary Cr.	Gold and stibnite lode.	Production in 1916 and 1942. B.525; 172. B.542; 158-159. B.592; 335-336. B.662; 415. B.849B; 100-101. TDM 2; 8-9. ARMI 1922; 97-98, 110. MIMI 1933; 129-130. TDM 1938B.
209	Gladstone claim.	Livengood quadrangle, Fairbanks district. On Chatham Cr. between the Pioneer and the Chatham Mine.	Flat-lying, gold-quartz vein.	125-ft shaft and 112 ft of drifts. Small production $30* per ton reported. B.525; 175. B.542; 160. B.592; 337.
210	Pioneer (North Star claim)	Livengood quadrangle, Fairbanks district. On Chatham Cr. 1/4 mile below Tamarack Cr.	Quartz vein 3 ft wide intersected by a smaller vein. Both veins carry free gold; smaller vein also carries stibnite, arsenopyrite and sphalerite.	85-ft shaft and 92-ft shaft $30* to $90* per ton reported from milling. B.525; 173-174. B.542; 159-160. B.592; 336. B.849B; 99. MIMI 1933; 131. ARMI 1922; 98.
211		Livengood quadrangle, Fairbanks district. On Chatham Cr.; location indefinite.	1-ft-wide vein of stibnite.	B.314; 30.
			Stibnite float noted in dredge tailings.	TDM 2; 9.
212	Alaska group - includes part of the Jupiter-Mars workings.	Livengood quadrangle, Fairbanks district. On the east side of Chatham Cr.	One vein 18 inches wide; sample reported $40* per ton. One vein 8 to 10 inches wide; sample reported $16.88* per ton. One vein 3 to 5 ft wide.	125-ft shaft and 112 ft of drifts. B849B; 99-100.

213		Livengood quadrangle, Fairbanks district. On Chatham Cr., trib. to Cleary Cr.	Cassiterite and scheelite common in placer concentrate.	TDM 1; 32, 37.
214		Livengood quadrangle, Fairbanks district. On Cleary Cr., trib. to Chatanika River.	Cassiterite and scheelite common in placer concentrate.	TDM 1; 32, 37.
215	Harris and Brown.	Livengood quadrangle, Fairbanks district. On the ridge between Wolf and Chatham Crs.	Gold-quartz vein with stibnite and other sulfides.	50-ft shaft. B.525; 175-176.
216		Livengood quadrangle, Fairbanks district. On the west slope of Wolf Cr. valley.	3-4-inch quartz vein with large amount of stibnite.	B.525; 171
217	Quemboe.	Livengood quadrangle, Fairbanks district. On the Wolf Cr. side of the Wolf Cr.-Chatham Cr. divide.	Gold-quartz with stibnite, pyrite, and arsenopyrite. Schist wallrock.	60-ft shaft and short drift Samples reported $22.50* pe ton and $32* per ton. B.525; 171-172. B.542; 158
218	Shelden-Vetter.	Livengood quadrangle, Fairbanks district. Adjoins the Homestake on the west.	Gold-quartz vein in schist, also silver-bearing galena.	Shallow shaft and open cuts Production during 1963-1965 TDM 1959. U of A 1962; 117-121.
219	Homestake.	Livengood quadrangle, Fairbanks district. At the head of Wolf Cr.	At least 5 veins. Schist wallrock.	750-ft adit. $60,000* produced. B.525; 168. B.542; 153-155 B.592; 331-334. B.662; 406-407. B.849B; 101-102. ARMI 1922; 96-97.
			Small amounts of chalcocite present.	B.592; 334

219	Homestake (Cont.)		Lenses of stibnite with high lead content.	B.592; 334. B.662; 407. TDM 2;8.
219	Rexall mine. - (now included in the Homestake)	Livengood quadrangle, Fairbanks district. At the head of Wolf Cr., trib. to Cleary Cr.	Two intersecting veins; one 5 ft. wide and one 12 to 18 inches wide.	Adit with about 900 ft of workings. B.525; 168-171. B.542; 155-157. B.592; 334-335. B.849B; 100-101 ARMI 1922; 95-96.
220	Pennsylvania claim - (now part of the McCarty group)	Livengood quadrangle, Fairbanks district. At the crest of the divide between Fairbanks and Wolf Crs.	Gold quartz vein 18 inches wide.	146-ft shaft and drifts. $10,000* production reported B.525; 167. B.542; 151-152. B.592; 331. B.849B; 102-103 ARMI 1922; 97.
220	Pioneer claim - (now part of the McCarty group)	Livengood quadrangle, Fairbanks district. At the crest of the divide between Fairbanks and Wolf Crs.	Gold-quartz vein and stibnite vein in schist.	110-ft shaft, 75-ft shaft, and 38-ft shaft. 107 tons yielded $125* to $172* per ton. B.525; 165. B.542; 150. B.849B; 102-103. DM&M 1960.
221	McCarty mine or group. (includes the Rexall mine, Pioneer claim, Henry Ford group, and War Eagle group)	Livengood quadrangle, Fairbanks district. At the head of Fairbanks Cr.	Several gold-quartz veins in schist.	Shafts and extensive underground workings. Production until 1942. B.592; 326. B.662; 411-412. B.849B; 102-113. MIMI 1933; 135. TDM 1938B.
			Stibnite in the veins.	Production during World War and World War II. B.849B; 102-103. TDM 1; 10. TDM; 7-8. TDM 1960.

222	Kellen's property	Livengood quadrangle, Fairbanks district. On Fairbanks Cr. below the McCarty mine.	Low-grade gold lode consisting of quartz stringers in schistose quartzite.	80-ft adit. B.525; 163, 164.
			Stibnite in irregular patches in quartz stringers.	B.525; 164.
223	Mizpah.	Livengood quadrangle, Fairbanks district. On the ridge 1 mile west-northwest of the mouth of Too Much Gold Cr., trib. to Fairbanks Cr.	Vein of crushed, iron-stained quartz 20 to 24 inches wide, carrying gold and sulfides.	Shaft more than 80 ft deep and at least 170 ft of drift: Production said to have averaged $30* to $40* per to B.525; 162. B.542; 147-148. B.592; 329. B.662; 405-406. B.849B; 107. ARMI 1922, 95.
			Galena and stibnite in the vein.	B.662; 405-406.
224	Ohio group.	Livengood quadrangle, Fairbanks district. West of Too Much Gold Cr. and east of the Mizpah.	Several gold-quartz veins, relationships obscure.	240-ft adit. 350 tons mined. B.525; 162-163. B.542; 148. B.662; 408-409. B.849B; 107-108. ARMI 1922; 94-95.
			Kidney-shaped mass of stibnite 12 to 15 inches wide on the Early Bird claim; also stibnite and galena in other veins.	B.525; 162-163. B.662; 409.
225	Minnie and Aroostook claims.	Livengood quadrangle, Fairbanks district. West of Too Much Gold Cr.	Lode of quartz veinlets carrying gold and silver; some carry stibnite.	Surface pits only. B.592; 329.
226	Black Joe.	Livengood quadrangle, Fairbanks district. North of Fairbanks Cr. and west of Too Much Gold Cr.	Quartz vein 6 inches wide carrying gold and scheelite. Schist wallrock.	Shaft and other workings. B.10241; 208.
227	Excelsior claim.	Livengood quadrangle, Fairbanks district. On Too Much Gold Cr.	Small gold-quartz veins with galena, arsenopyrite, and stibnite. High silver assays reported from graphitic schist.	Two adits. More than 60 ft c workings. B.525; 161.

228		Livengood quadrangle, Fairbanks district. On upper Too Much Gold Cr. above the Excelsior claim.	Vein of unknown width carrying galena, stibnite, and arsenopyrite.	Open pits only. B.525; 161-162.
229	Nars, Anderson, and Gibbs.	Livengood quadrangle, Fairbanks district. At the head of Too Much Gold Cr.	Too gold-quartz veins either the same as, or parallel to, the Hi-Yu veins.	100-ft shaft and 40 ft of drifts. $60* per ton reporte from mill tests. B.525; 159. B.542; 144. B.592; 328-329. B.662; 407-40
230	McNeil shaft.	Livengood quadrangle, Fairbanks district. At the head of the west fork of Too Much Gold Cr.	Gold-quartz vein with sulfides. Schist wallrock. Jamesonite and galena found in sacks near the shaft.	Shaft of unknown depth. B.849B; 104. DM&M 1963F.
231	Governor claim.	Livengood quadrangle, Fairbanks district. Between Too Much Gold and Moose Crs.	Gold-bearing vein. Vein material includes a light-colored, fine-grained rock, probably granite.	70-ft shaft. Reported to carry $10* to $15* per ton in gold. B.525; 160. B.542; 145.
232	Hi-Yu mine - (formerly called the Crites and Feldman mine)	Livengood quadrangle, Fairbanks district. On the ridge between Moose Cr. and Too Much Gold Cr., tribs. to Fairbanks Cr.	Three nearly parallel gold-quartz veins up to 3 ft wide.	Extensive workings for 7000 f along the vein system. Inter mittent production over a 30-yr period ending in 1942. B.525; 156-158. B.542; 142-144. B.592; 327-328. B.662; 404-405. B.849B; 108-113. ARMI 1922; 91-93. MIMI 1933; 134-135. TDM 1938B.
			Small amounts of galena and sphalerite in the veins.	B.525; 158.
			Stibnite in the veins and also a stibnite body discovered in 1941 1/4 mile northwest of the mine portal.	15 tons mined in 1952. B.525; 157-158. TDM 2; 7.

233		Livengood quadrangle, Fairbanks district. On the east side of Too Much Gold Cr.	Brecciated mass of rock cemented by iron, stibnite, and galena.	B.525; 160.
234	Lime-Lemon, North Star, and Eureka claims - also called the McCarthy property.	Livengood quadrangle, Fairbanks district. At the head of Alder Cr. trib. to Fairbanks Cr.	Gold-quartz vein 12 to 13 ft wide.	50-ft shaft. Some productio B.525; 156. B.542; 141-142.
235	Queen claim.	Livengood quadrangle, Fairbanks district. Between Alder and Crane Crs., tribs. to Fairbanks Cr.	Gold-quartz vein 18 inches wide.	100-ft shaft. B.592; 326.
236	Egan prospect.	Livengood quadrangle, Fairbanks district. Between the headwater forks of Kokomo Cr., trib. to Chatanika R.	Four or five gold-bearing veins in biotite schist.	Two shafts 15 ft deep and ope pits. Sample across 20-inch wide vein assayed $7.38 per ton. B.849B; 155. TDM 1938B.
237	Charles claim.	Livengood quadrangle, Fairbanks district. On the southwest side of Coffee Dome at the head of Walnut Cr., trib. to Fairbanks Cr.	Primarily a silver prospect; vein 18 inches wide with sulfides.	50-ft shaft. Some productio B.520; 31. B.542; 141.
238		Livengood quadrangle, Fairbanks district. On Fairbanks Cr.,trib. to Fish Cr.	Cassiterite and scheelite common, wolframite scarce in placer concentrate.	B.442; 246. TDM 1; 32, 37.

B.824 - Mineral Resources of Alaska, Report on Progress of Investigations in 1929, by P.S. Smith and others. 1932. 181 pp.

B.844D - Mineral Deposits of the Rampart and Hot Springs Districts, Alaska, by J.B. Mertie, Jr.; Placer Concentrates of the Rampart and Hot Springs Districts, by A.E. Waters, Jr. 1934. 83 pp.

B.849B - Lode Deposits of the Fairbanks District, Alaska, by J.M. Hill. 1933. 134 pp.

B.872 - The Yukon-Tanana Region, Alaska, by J.B. Mertie, Jr. 1937. 276 pp.

B.880A - Mineral Industry of Alaska in 1935, by P.S. Smith. 1937. 95 pp.

B.897C - Gold Placers of the Fortymile, Eagle, and Circle Districts, Alaska, by J.B. Mertie, Jr. 1938. 128 pp.

B.917A - Mineral Industry of Alaska in 1938, by P.S. Smith, 1939. 113 pp.

B.926C - Occurrences of Molybdenum Minerals in Alaska, by P.S. Smith 1942. 59 pp.

B.1024I- Tungsten Deposits in the Fairbanks District, Alaska, by F.M. Byers,Jr. 1957. 37 pp.

U.S. Geological Survey Circulars

C.331 - Reconnaissance for Radioactive Deposits in Eastern Interior Alaska, 1946, by Helmuth Wedow, Jr., P.L. Killeen, and others. 1954. 36 pp.

C.335 - Reconnaissance for Radioactive Deposits in East-Central Alaska, 1949, by Helmuth Wedow, Jr., M.G. White, and others. 1954. 22 pp.

C.348 - Reconnaissance for Radioactive Deposits in Eastern Alaska, 1952, by A.E. Nelson, W.S. West, and J.J. Matzko. 1954. 21 pp.

U.S. Bureau of Mines Reports of Investigations

R.I.4173 Antimony Deposits in Alaska, by Norman Ebbley, Jr., and W.S. Wright. 1948. 41 pp.

R.I.4174 Tungsten Deposits in Alaska, by Robert L. Thorne, Neal M. Muir, Aner W. Erickson, Bruce I. Thomas, Harold E. Heide, and Wilford S. Wright, 1948. 51 pp.

R.I.5373 Tin-Bearing Placer Deposits near Tofty, Hot Springs District, Central Alaska, by Bruce I. Thomas. 1957. 56 pp.

University of Alaska Theses

U of A 1931 - An Investigation of the Gold-Bearing Quartz Veins of Ester Dome, by Robert James McCombe and Grant Augustine, Jr. 1931.

U of A 1948 - Scheelite Deposits of the Fairbanks District, Alaska, by Stanley Lefond. 1948.

U of A 1951 - Relations of Structure to Mineral Deposition at the Grant Mine, Ester Dome, Alaska, by Peter O. Sandvik and Allan J. Hersey. 1951.

U of A 1962 - Bedrock Geology and Ore Deposits of the Pedro Dome Area, Fairbanks Mining District, Alaska, by Jim M. Brown. 1962.

Published Reports of the Division of Mines and Minerals and its Precedent Agencies.

ARMI 1922 - Annual Report of the Mine Inspector to the Governor of Alaska, 1922, by B.D. Stewart. 175 pp.

MIMI 1933 - Mining Investigations and Mine Inspection in Alaska, Biennium Ending March 31, 1933, by B.D. Stewart. 192 pp.

Geochem. Rept. 3 - A Geochemical Investigation in the Richardson Area, Big Delta Quadrangle, Alaska, by R.H. Saunders. 1965. 12 pp.

Geochem Rept. 12 - A Geochemical Investigation of Minook Creek, Rampart District, Alaska, by W.M. Burand and R.H. Saunders. 1966. 15 pp.

TDM 1 - Pamphlet No. 1, Strategic Mineral Occurrences in Interior Alaska, by H.R. Joesting. 1942. 46 pp.

TDM 2 - Pamphlet No. 2, Supplement to Pamphlet No. 1, Strategic Mineral Occurrences in Interior Alaska, by H.R. Joesting. 1943. 28 pp.

Ann. Rept. 1961 - Report of the Division of Mines and Minerals for the year 1961. 108 pp.

Ann. Rept. 1962 - Report of the Division of Mines and Minerals for the year 1962. 119 pp.

Other Publications

MWRA - Mineral and Water Resources of Alaska, Report Prepared by the United States Geological Survey in Co-operation with the State of Alaska Department of Natural Resources at the Request of Senator Ernest Gruening of Alaska of the Committee on Interior and Insular Affairs, United States Senate. 1964. 179 pp.

Unpublished Reports by the Division of Mines and Minerals and its Precedent Agencies.

TDM 1937 - Brief Report on the Goodpaster Quartz-Lode Mining at the Head of Johnson and Boulder Creeks, by Irving Reed. 1937. 1 p.

TDM 1938A - Mining and Prospecting in the Goodpaster Region, by H.R. Joesting. 1938. 2 pp.

TDM 1938B - Report on Lode Mining and Development in the Year 1938 in the Fairbanks District, Alaska, by Irving Reed. 1939. 27 pp.

TDM 1941 - Mining and Prospecting in the Fairbanks Precinct during 1941, by H.R. Joesting. 1 p.

TDM 1942 - Preliminary Report on the My Creek Stibnite Prospect, Fortymile District, Alaska, by H.R. Joesting. 1942. 2 pp.

TDM 1943 - Preliminary Report on Scheelite Deposits in the Fairbanks District, Alaska, by H.R. Joesting and Eskil Anderson. 1943. 10 pp.

TDM 1951 - Examination of Prospect Trenches on Ready Bullion Lode Property, by James A. Williams. 1951. 4 pp.

TDM 1952 - Electrical Resistivity Survey at the Crayton Mine, Pedro Dome, 1952, by R.H. Saunders. 2 pp.

TDM 1953 - Report on Preliminary Examination of the Fred J. Jenkins Property Near Eagle, Alaska, by R.H. Saunders. 1953. 14 pp.

TDM 1954A - Report on the Vuyovich Gold-Quartz Prospect, Ester, Alaska, by R.H. Saunders. 1954. 7 pp.

TDM 1954B - Report on the Examination of the Ricks Prospect, Big Delta Quadrangle, Alaska, by R.H. Saunders. 1954. 8 pp.

TDM 1955 - Report on the Griffin Nickel Prospect, Livengood Quadrangle, by R.H. Saunders. 1955. 4 pp.

TDM 1956A - Report on the Flume Creek Lode-Gold Prospect, Eagle Quadrangle, by R.H. Saunders. 1956. 6 pp.

TDM 1956B - Report on the Examination of the Copper Creek Copper Prospect, Eagle Quadrangle, by R.H. Saunders. 1956. 6 pp.

TDM 1956C - Notes on the Occurrence of Cinnabar at Canyon Creek, Eagle Quadrangle, Alaska, by R.H. Saunders. 1956. 3 pp.

TDM 1957A - Work Done in 1957 on the Vuyovich Gold-Quartz Prospect, Fairbanks Quadrangle, by R.H. Saunders. 1957. 2 pp.

TDM 1957B - Supplementary Report on the Ready Bullion Lode Prospect, Fairbanks District, by R.H. Saunders. 1957. 2 pp.

TDM 1957C - Report on Scheelite-Bearing Veins at the Weston Placer Mine, Eagle Quadrangle, by R.H. Saunders. 1957. 4 pp.

TDM 1957D - Work Done in 1956-57 on the Spruce Hen Tungsten Prospect, Fairbanks Quadrangle, by R.H. Saunders. 1957. 2 pp.

TDM 1957E - Report on the La Flamme Copper Prospect, Eagle Quadrangle, by R.H. Saunders. 1957. 3 pp.

TDM 1958 - Report on the Sawtooth Mountain Antimony Prospect, Livengood Quadrangle, by R.H. Saunders. 1958. 6 pp.

TDM 1959 - Silver-Lead Occurrences in the Fairbanks District, by R.H. Saunders. 1959. 8 pp.

DM&M 1960A - Report on the Purdy Gold-Quartz Prospect, Eagle Quadrangle, by R.H. Saunders. 1960. 2 pp.

DM&M 1960B-- Notes to Accompany Prospect Map of the Fairbanks-Wolf Creek Divide, by R.H. Saunders. 1960. 3 pp.

DM&M 1961 - Report on the Preliminary Examination of a Prospect on Steamboat Creek, Fairbanks District, Livengood Quadrangle, by R.H. Saunders. 1961. 3 pp.

DM&M 1962A - Sampling and Geochemical Prospecting at Steamboat Creek, Fairbanks District, 1961, by R.H. Saunders. 1962. 5 pp.

DM&M 1962B - My Creek and Our Creek Silver Prospects, Fortymile District, Eagle Quadrangle, by R.H. Saunders. 1962. 7 pp.

DM&M 1962C - Report on the Examination of the Mitchell Copper Prospect, Eagle Quadrangle, by R.H. Saunders. 1962. 4 pp.

DM&M 1963A - Work at the Steamboat Creek Prospect, Fairbanks District, in 1963, by R.H. Saunders. 1964. 6 pp.

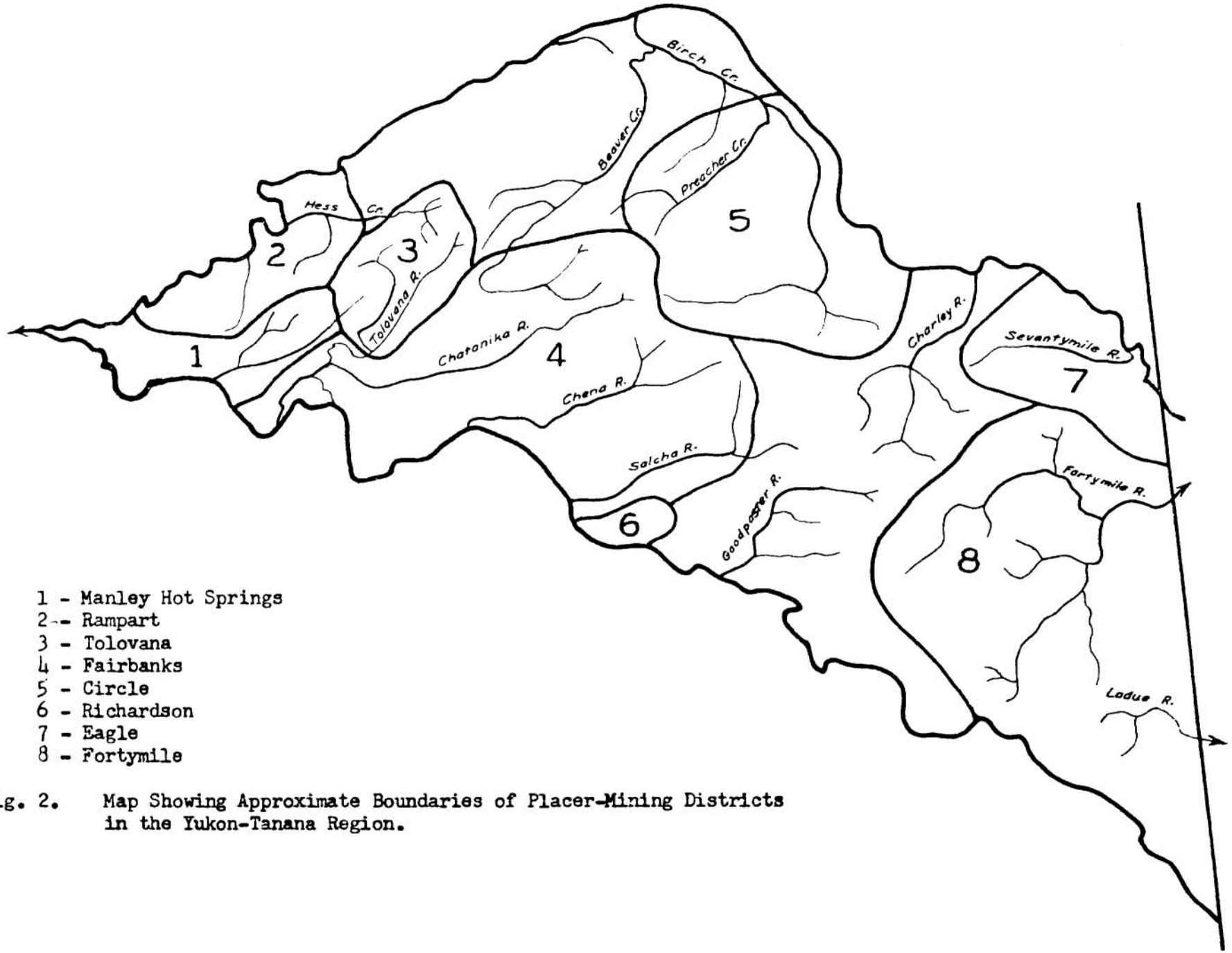
DM&M 1963B - Work at the Vuyovich Prospect, Fairbanks Quadrangle, in 1963, by R.H. Saunders. 1964. 3 pp.

DM&M 1963C - Examination of a Gold Prospect on Nugget Creek, Fairbanks Quadrangle, by R.H. Saunders. 1963. 3 pp.

DM&M 1963D - The McGrath Lode-Gold Prospect, Fairbanks Quadrangle, by R.H. Saunders. 1963. 3 pp.

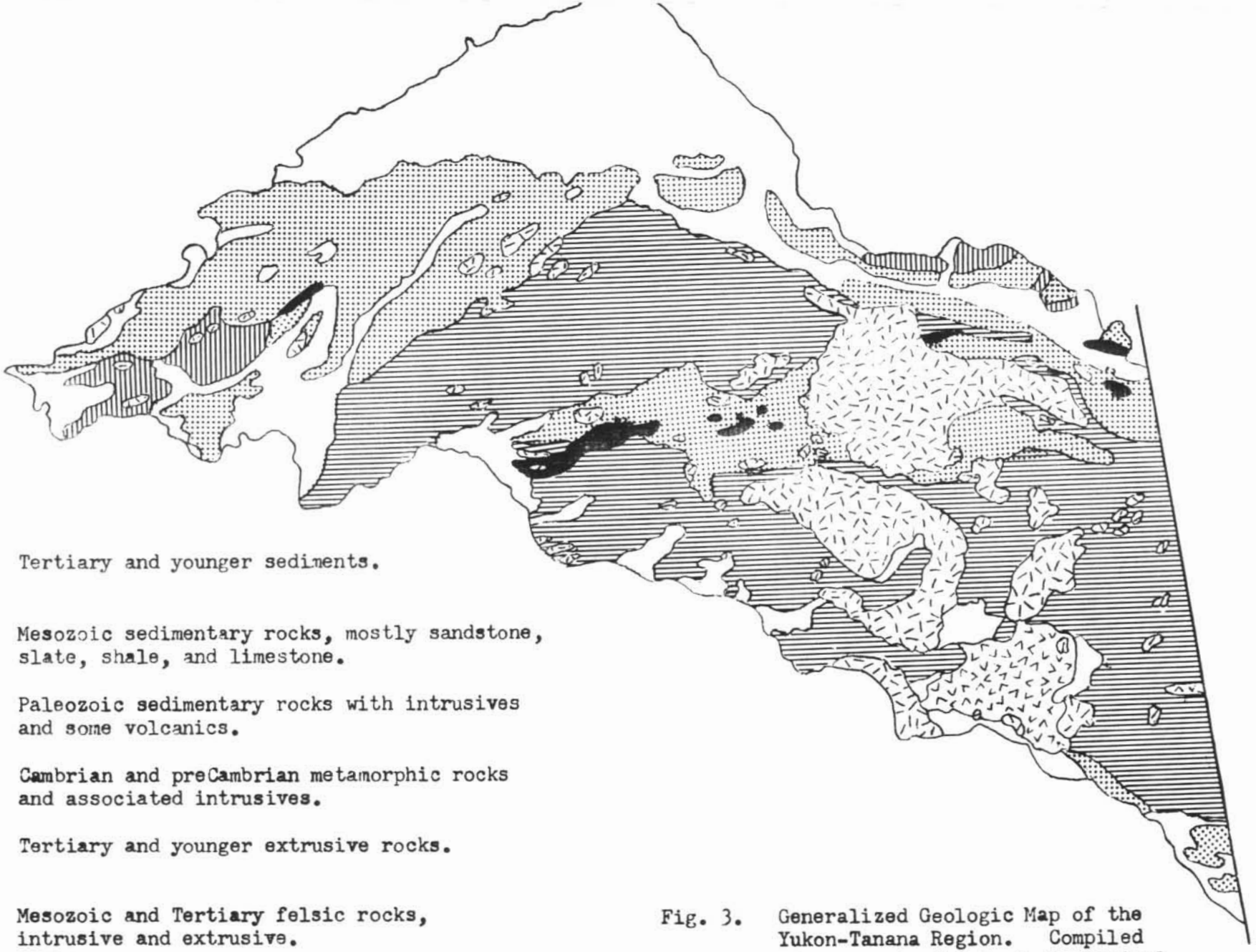
DM&M 1963E - Report on the Examinationof Trenches at the Tolovana Mine, Livengood Quadrangle, by R.H. Saunders. 1963. 3 pp.

DM&M 1963F - Examination of Trenches on the Fairbanks-Wolf Creek Divide, by R.H. Saunders. 1963. 4 pp.



1 - Manley Hot Springs
2 - Rampart
3 - Tolovana
4 - Fairbanks
5 - Circle
6 - Richardson
7 - Eagle
8 - Fortymile

Fig. 2. Map Showing Approximate Boundaries of Placer-Mining Districts in the Yukon-Tanana Region.



Tertiary and younger sediments.

Mesozoic sedimentary rocks, mostly sandstone, slate, shale, and limestone.

Paleozoic sedimentary rocks with intrusives and some volcanics.

Cambrian and preCambrian metamorphic rocks and associated intrusives.

Tertiary and younger extrusive rocks.

Mesozoic and Tertiary felsic rocks, intrusive and extrusive.

Devonian mafic and ultramafic rocks, intrusive and extrusive.

Fig. 3. Generalized Geologic Map of the Yukon-Tanana Region. Compiled from maps by the U. S. Geological Survey.