THE ECONOMIC POSSIBILITIES OF YUKON[1]

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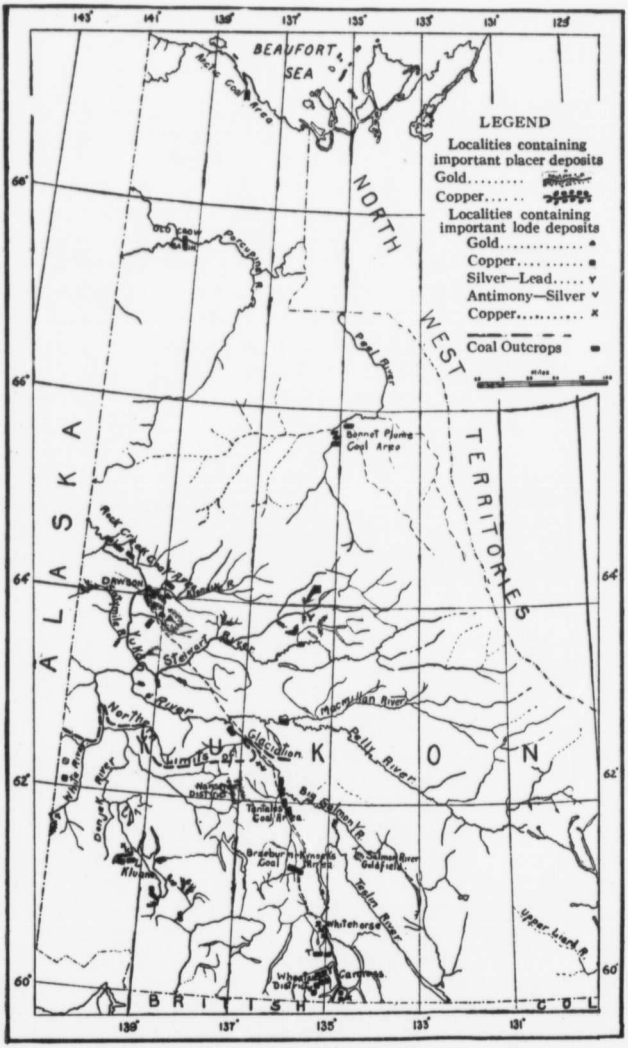
Yukon Territory contains an area of 196,976 square miles. Thus it is considerably more extensive than the United Kingdom of Great Britain and Ireland, and is almost as large as the entire German Empire. The greater part of this great region is still practically unknown, even to the prospector, trapper or hunter: in fact almost all exploration within the territory has been restricted to areas readily accessible from the main waterways. A glance at the accompanying sketch map makes this apparent. The map shows the approximate positions of the various localities in which the more important deposits of economically valuable minerals have been found, and these are seen to be almost without exception readily accessible from the larger lakes or streams, and are in most cases in their immediate vicinity.

The writer has estimated that only about 32 per cent, or less than one-third of Yukon has been at all explored; concerning the remaining 68 per cent, or about 134,000 square miles of territory, almost nothing is known even of a general topographical or geographical nature. Also, of the 32 per cent of partly explored territory only about one half, or approximately 17 per cent of the entire Yukon, has been prospected, and of this 17 per cent, only a relatively small part has been at all closely investigated.

Up to the present, Yukon has been generally known mainly on account of its mineral resources, and particularly on account of its placer gold deposits. In addition, however, this territory has proved to be one of the most important of the fur producing sections of Canada; also agriculture is bound some day to develop into a prosperous industry. To the close of last year (1914), the placer gold production, alone, of Yukon is known to have amounted to $157,475,908 and probably considerably exceeded

[1]By permission of the Director of the Canadian Geological Survey.



Sketch Map of Yukon, showing distribution of Mineral Resources.

this amount, and all the important deposits of economic minerals, including the known valuable gold-bearing gravels, have been found within the 17 per cent of Yukon Territory that has been more or less prospected. It is thus only to be hoped that the remaining unprospected 83 per cent will prove to be relatively as valuable as the better known areas which are situated along the main waterways. This hope is strengthened when it is remembered that the discoveries so far made, dominantly occur along the main waterways, as before mentioned, and it is scarcely to be supposed that the streams of the territory in originally choosing their courses, were able to select the only areas possessing mineral wealth, and thus traverse them with a view to enabling the future prospector of to-day to make his discoveries the more readily. It must be borne in mind, however, that the prospected portion of Yukon—the 17 per cent—embraces the famous Klondike district which includes the richest gravels ever discovered in the world, and it is quite possible that no other area of similar extent may ever be found to contain gold in such phenomenal abundance. Nevertheless, the remaining portions of Yukon also contain valuable deposits of placer gold as well as other minerals, in fact, certain somewhat extensive belts are known to be quite highly mineralized. There thus seems no reason to suppose that the extensive, unexplored, interstream portions of Yukon, may not yet prove to be of great economic importance.

The principal natural resources of Yukon Territory, according to existing knowledge, include mainly mineral deposits and land suitable for agricultural and grazing purposes. In addition, the fur industry is one of considerable importance, and the forests, fish, and game are assets which must be considered. The mineral deposits are, however, of much the greatest present value; these include, chiefly, gravels containing placer gold, various types of lode deposits, and coal, as well as some native placer copper. The forest growth, though nowhere dense, is of considerable local value. The fur, fish, and game are of relatively slight importance when compared with the mineral resources, but are sufficient to largely, at least, support for many years to come, the few hundred natives in the territory, and a limited number of white men.

PLACER GOLD

The total gold production of Yukon from 1885 until the close of 1913, as shown by the statistical report of the Mines Branch of the Department of Mines, Ottawa,[1] amounts to $152,350,512, and the production for 1914 was $5,125,396, making a total of $157,475,908 to the close of 1914. This vast amount of gold has been nearly all derived from the gold-bearing gravels of the territory. A few thousand dollars has been obtained from various lode deposits, but when compared with the millions of placer gold, the lode production becomes practically negligible, particularly from a statistical point of view. Further, statistics of gold production in Yukon during the years between 1898 and 1906 are based primarily on the receipts of gold at the United States mints, and receiving offices credited to the Canadian Yukon. Thus, although a royalty was exacted on the gold output, it seems certain that considerable amounts of gold were produced which escaped royalty payment, especially during the years of high production. Since 1906, the statistics have been based on a royalty of 2½ per cent which is collected by the Department of the Interior. It would seem very probable therefore that the total gold production of Yukon has considerably exceeded the estimated $157,475,908.

Of this gold output, the Klondike district has yielded by far the greater part and Sixtymile district, Duncan Creek Mining district, or as it is more generally termed, Stewart River district, Kluane district, Salmon River goldfield, and Nansen district have contributed important amounts.

Coarse gold was discovered in Sixtymile district[2] in 1893, and from that time until the discovery of the Klondike creeks in 1896, this was the principal producing camp of Yukon Territory. It was practically abandoned in 1897 but, later, a number of miners returned and the district has each year since produced a small amount of placer gold. The total amount of gold derived from Sixtymile district is somewhat uncertain, but after visiting

[1]Cartwright, Cosmo T., "The production of copper, gold, lead, nickel, silver, zinc, and other metals in Canada, during the calendar year 1913": Mines branch, Dept. of Mines, Can., 1914, pp. 27-29.

[2]McConnell, R. G., "Sixtymile district": Geol. Surv., Can., Sum. Report. for 1901, Vol. XIV, pp. 33A-38A.

the district in 1901, Mr. McConnell writes: "The total production of the Sixtymile creeks is difficult to estimate at this late date, but was probably less than half a million dollars."[1]

The production since 1901 has been small.

Duncan Creek Mining district was examined by Mr. Joseph Keele of this Department in 1904,[2] and the principal available information of value, concerning this portion of Yukon is largely that derived from his map and report. This district has been producing placer gold since 1898, and from all available information it would appear to have yielded this precious metal to the value of between six and seven hundred thousand dollars. Mr. George P. Mackenzie, Gold Commissioner of Yukon Territory, has estimated that to the close of 1914 the district has produced about $658,000 and states that "this estimate is within $25,000 of actual production."[3]

The Salmon River goldfield has been described by Mr. McConnell[4] and was also afterwards visited by the writer.[5]

The producing creeks in this area are tributaries of the South fork of Big Salmon river, the most important of these being Livingstone creek. The total production of this area to the close of 1914, is estimated by Mr. R. C. Miller, Assistant Gold Commissioner, Whitehorse, Yukon, to have been between $750,000 and $800,000.[6]

Other authorities are of the opinion that it may have slightly exceeded this amount. In all probability the gravels of this area have yielded approximately $800,000.

Kluane district has produced a small amount of placer gold each year since 1903, but in all has yielded less than $100,000, and probably not more than $70,000. This district has also been reported upon by both Mr. McConnell[7] and the writer.[8]

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[1]Idem, p. 35A.

[2]Keele, Joseph, "The Duncan Creek Mining district": Geol. Survey, Can., Ann. Report, Vol. XVI, 1904, pp. 18A-42A.

[3]Personal communication.

[4]McConnell, R. G., "Salmon River goldfield": Geol. Surv., Can., Sum. report for 1901, pp. 25A-30A.

[5]Cairnes, D. D., "Livingstone creek": Geol. Surv., Can., Sum. report for 1907, p. 14.

[6]Personal communication.

[7]McConnell, R. G., "The Kluane Mining district": Geol. Surv., Can., Sum. report for 1904, pp. 1A-18A.

[8]Cairnes, D. D., "Exploration in southwestern Yukon": Geol. Surv., Can., Sum. report for 1904; Section on Kluane district.

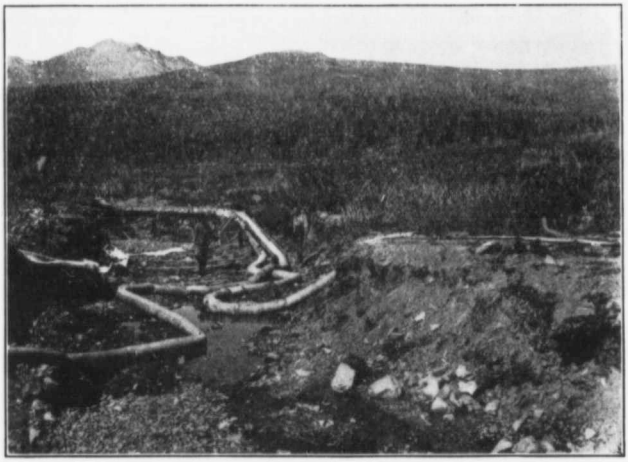

Plate II.—Sluicing operations on East Fork of Nansen creek, during the summer of 1914.

The production of Nansen district has probably amounted to between $5,000 and $7,000.

The total placer gold production of Yukon, excluding Klondike district, has thus probably not exceeded $2,000,000 to $2,400,000 leaving the Klondike[1] credited with between $155,000,000 and $155,500,000. Mr. McConnell spent several seasons in Klondike district[2] and his reports furnish a great part of the authentic information available concerning this portion of Yukon. He states that to the close of 1906 $119,000,000 in placer gold has been produced from the Klondike.[3]

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[1]Cairnes, D. D., "Excursions in Northern British Columbia and Yukon Territory": Guide Book No. 10, Geol. Surv., Can., 1913, pp. 95-118.

[2]McConnell, R. G., "Report on the Klondike goldfields": Geol. Surv., Can., Pt. B., Ann. Rept., Vol. XIV, 1905.

Report on the gold values in the Klondike high level gravels": Geol. Surv., Can., 1907.

[3]Idem, p. 34.

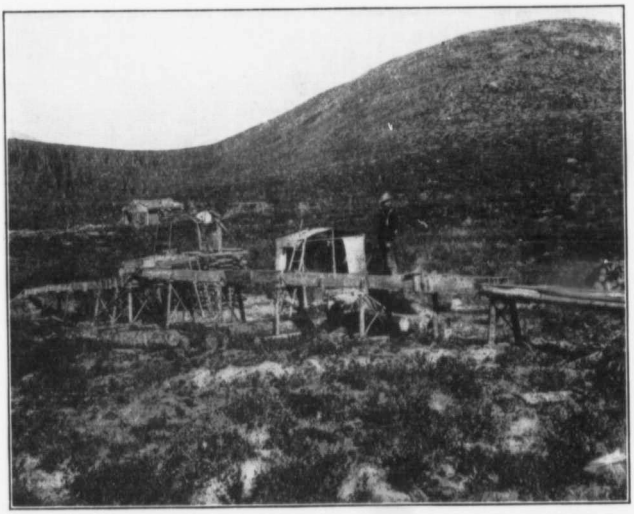

Plate III.—Placer mining on South fork of East fork of Nansen creek by underground drifting and sluicing, summer of 1914. The gravels are hoisted to surface by windlass summer and winter, and sluiced during summer months.

Between 1906 and the close of last year (1914) about $36,000,000 or slightly more than this amount was obtained from the Klondike gravels, making a total of $155,000,000 which corresponds with the writer's estimate.

The time required to deplete the Klondike gravels of their gold involves a number of questions, and is thus only very approximately known. It would seem probable, however, if the present policies and methods of the various operators be continued, that the bulk of these gravels will become exhausted as far as this can be accomplished by the most up-to-date mining methods of the present day, in 9 or 10 years: but in places where exceptionally large amounts of low-grade gravels have to be handled, as in the valley of Klondike river, possibly as much

Plate IV.—Working high level old channel gravels on Burwash creek, Klaune district, summer of 1914. Gravels cleaned off bedrock are wheeled in barrows to tipple and dumped into sluice boxes below.

as 10 years more may be required, but just how far the operators there can go with their present equipment is problematical, depending largely on the amount of thawed ground remaining unworked. It is to be expected that the mining operations and production throughout the district will gradually diminish in extent and amount as the task of exhausting the gravels of their gold content nears completion. New discoveries of more or less importance may be made, however, which will tend to somewhat lengthen the productive life of the district.

The question as to the amount of gold that will still be produced from the known gold-bearing gravels of Yukon is largely a matter of costs, and is thus also problematical. At the close of the season of 1906, Mr. McConnell estimated the future output of Klondike district, not including the Indian River

creeks to be $53,642,620, and stated that an additional production of from eight to ten million dollars might be expected from the creeks draining into Indian river, making a total from Klondike district of between sixty-one and sixty-four million dollars.[1] Since that time the district has produced approximately $36,000,000 and from all available data it would now appear that the Klondike will still produce between thirty and forty-five millions of dollars. The thirty millions checks very closely with Mr. McConnell's estimate made nine years ago. In a district as large as the Klondike, however, new methods and new developments, as well as new discoveries are always possible, and the forty-five millions is intended by the writer to cover such possibilities. These estimates as to future production have been made partly from the results of the operations and prospecting of the various mining companies, and partly from other data, all available information being employed. Since, however, the data upon which to base such an estimate is of necessity very incomplete, the estimate is consequently to be regarded as only approximate.

The future output of the other producing placer gold districts in Yukon is relatively even less definitely known than that of the Klondike, as in most localities comparatively little exploration has been conducted. The development and prospecting to date, however, would scarcely justify expectations from the explored gravels of these other now producing areas of more than from one to two millions of dollars. In case, however, certain of the old pre-Glacial channels of Kluane district and elsewhere are discovered and prove to be exploitable, the gold from this source may add greatly to this estimate.

In addition to the areas that have produced, and are still yielding placer gold, encouraging prospects are believed to have been found along the streams of a number of other localities. Among the more promising of these streams, that have so far been found, are certain of the creeks of Upper White River district,[2] as well as various tributaries of Nisling, Kluane,[3] and

[1]McConnell, R. G., "Report on the gold values in the Klondike high level gravels": Geol. Surv., Can., 1907, pp. 33, 34.

[2]Cairnes, D. D., "Upper White River district, Yukon": Geol. Surv., Can., Memoir No. 50, 1915, pp. 124-126.

[3]Cairnes, D. D., "Exploration in Southwestern Yukon": Geol. Surv., Can., Sum. report for 1914. See section on placer gold.

White rivers. Gold is also reported to have been found on Albert creek which drains into Sekulmun lake, as well as along various streams draining into Teslin lake and river, also along Big Salmon river, and on a number of the smaller tributaries of the Upper Yukon.

As concerns the future of the placer mining industry of Yukon, much is still to be expected from the as yet unprospected areas included in the vast unknown 83 per cent of the territory. Of this 134,000 square miles, certain areas or belts are especially promising from a geological point of view. In the Klondike, two main conditions appear to account for the extreme richness of the placer deposits. In the first place, the country rock or general bedrock consists dominantly of the old, probably Pre-Cambrian schists, which are much metamorphosed and highly mineralized; and secondly the district has not been glaciated, consequently whatever gold became concentrated in the stream gravels, whether old or recent, remained there until the miner arrived, and was neither swept away and scattered by glacial ice, nor became buried under boulder clay or other glacial accumulations. The old schistose rocks contain a great amount of irregularly distributed quartz, either in masses, veins, or lenses of all shapes and ranging from microscopic to several feet in thickness; and the placer gold of the Klondike originally occurred in these old schistose rocks, associated largely with the quartz. As the hills and valley walls became worn down by subaerial destructive processes, the gold originally contained in the disintegrated rock material became gradually concentrated by the streams, and was accumulated in the gravels which are being mined to-day.

In various parts of Yukon where glaciation has been effective, including Kluane and other well known districts, the valleys have been invaded by vast masses of glacial ice which has scoured the sides and floors of these depressions, and in some cases has transported and scattered the stream gravels with their gold content. Also whether or not the old gold-bearing gravels have been disturbed, the former channels with whatever of the original gravels and gold they may still have contained, became buried under vast quantities, often hundreds of feet in thickness, of boulder clay and other glacial accumulations. Thus even

where gold still remains in the various old stream channels, it is in most places difficult to find, and if discovered, may prove very expensive to mine. Thus, although the gravels of such districts may have originally been, and in places still are rich, and a certain amount of gold can even be profitably produced, still the effects of glaciation are everywhere greatly detrimental to the economic development of these areas.

On the accompanying map a line is shown marking the approximate edge of the glaciated zone. Thus, all areas outside this zone in which the older schistose rocks occur, should afford geological conditions quite similar to those existing in the Klondike, and with no more difficulties to be met in connection with the various prospecting and mining operations. There still remains to-day hundreds or even thousands of square miles of practically unprospected territory where these conditions exist. These areas are therefore considered the most promising for the occurrence of placer deposits of economic importance, and certainly warrant careful exploration.

PLACER COPPER

Native copper is found in the gravels of many of the streams distributed throughout various districts in Yukon, but Kletsan creek is the only stream along which it is known to occur in economically important amounts.[1] Kletsan creek is a small tributary of White river, which heads in Natazhat glacier in the vicinity of the 141st meridian—the Yukon-Alaska International Boundary line. The first definite information concerning this occurrence is contained in Hayes' report of a trip he made from Selkirk to Skolai pass in 1891 in company with Lieutenant Schwatka.[2]

Previous to this time the Indians had carried on quite a traffic in native copper obtained chiefly or entirely from Kletsan creek, this metal being used for arrow heads, knives, cooking utensils, and also for bullets, where lead could not be obtained.

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[1]Cairnes, D. D., "Upper White River district, Yukon": Geol. Surv., Can., Memoir 50, 1915, pp. 133-135.

[2]Hayes, C. W., "An expedition through Yukon district": Nat. Geog. Mag., Vol. IV, 1892, pp. 143-145.

In 1902, an attempt was made to test the placer copper possibilities of this locality, but on account of glacial ice and snow on the high ranges at the head of the creek, and a number of other adverse conditions, unfavourable conclusions were reached. There is undoubtedly, however, a considerable amount of native copper not only along Kletsan creek but in the gravels of a number of neighbouring streams, which may yet prove to be exploitable, when transportation facilities are improved.

LODE DEPOSITS

General Statement.—Lode deposits are widely distributed throughout the explored portions of Yukon, and embrace a considerable variety of types including gold quartz veins, gold-tellurium quartz veins, gold-silver quartz veins, antimony-silver veins, silver-lead veins, copper veins, and contact-metamorphic deposits which are mainly of importance for the copper ores they include.

The principal areas in which lode deposits of importance occur, include the following, which are mentioned in order commencing at the north and proceeding southward:—Klondike district, Stewart River district, Williams and Merritt Creeks area, Upper White River district, Kluane district, Aishihik Lake district, Whitehorse copper belt, Wheaton district, and Windy Arm district. Of these, the Klondike, Stewart River district, Aishihik Lake district, and Whitehorse copper belt, are somewhat widely separated, and are distributed throughout the Yukon plateau. Upper White River, Kluane, Wheaton, and Windy Arm districts, however, are situated along the eastern edge of the mountains of the Coastal system, and constitute portions of a well mineralized belt which appears to follow all along the inland boundary of this mountain terrane, at least throughout Northern British Columbia and Yukon. Of these numerous districts in which lode deposits are known to occur, only the Klondike, Whitehorse copper belt, and Windy Arm district have been or are producers, ore having been shipped from Whitehorse copper belt and from Windy Arm district, and a limited amount of quartz has been mined in Klondike district. As an indication of the extent of the lode mining industry in Yukon,

the number of quartz claims in good standing during the fiscal year ending March 31, 1914 aggregated 908, of which 151 were crown granted.

Klondike District.[1]—In Klondike district, quartz occurs very plentifully distributed throughout the schistose rocks which are there so extensively developed, and although the greater number of the deposits are small and non-persistent, the aggregate amount of quartz is very great. Occasional very encouraging assays are also obtained, but the average returns from all the deposits so far sampled, have been low. The quartz is practically all free-milling, and is very slightly mineralized, the only metallic constitutents apparent, being pyrite, and rare particles of magnetite, chalcopyrite, galena, and native gold.

Considerable development work has been performed in places, but only one property, the Lone Star, can in any sense be considered a producing mine. Since 1909 more or less mining and development work has been in progress on this property, and a certain amount of ore material has been treated in a small stamp mill belonging to the Lone Star Company, as a result of which, gold to the value of a few thousand dollars has been recovered. The gold obtained would not nearly pay the total cost of the mining operations and equipment to date, nevertheless it has now been demonstrated that portions of the quartz and adjoining wall rock on this property contain sufficient gold to pay for treatment. It is consequently hoped that a great amount of the similar appearing material which occurs not only on this property, but which is so extensively developed throughout the Klondike, may yet prove to be profitably exploitable. At present, however, it is uncertain whether or not any considerable tonnage of gold-bearing quartz occurs in the Klondike which can be treated at a profit under existing conditions.

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[1]Brock, R. W., "Yukon": Geol. Surv., Can., Sum. report for 1909, pp. 16-23.

Cairnes, D. D., "Quartz mining in the Klondike district": Geol. Surv. Can., Sum. report for 1911, pp. 33-40.

McLean, T. A.—"Lode mining in Yukon": Mines branch, Dept. of Mines, Can., 1914, pp. 17-127.

Stewart River District.[1]—In Stewart River district, a number of promising lode deposits have been discovered on Dublin gulch, on Galena creek, and elsewhere, the more promising of which are veins of the arsenical gold-quartz, gold-silver, or silver-lead types. These veins are in places highly mineralized, and are reported to contain considerable amounts of valuable ore. Very little definite information concerning these deposits is, however, available.

Williams and Merritt Creeks.[2]—Merritt creek empties into Lewes river on its left limit, five miles below Yukon Crossing, while Williams creek joins the river one mile farther downstream. In the vicinity of these creeks, there occur a considerable number of veins of quartz impregnated with copper minerals, chiefly bornite and chalcopyrite. The veins range in thickness from a few inches or less, to five or six feet or even slightly more in thickness, and in places appear to be fairly persistent. Average samples of these veins show them to contain from less than one per cent to over four per cent copper, as well as small amounts of gold and silver, generally amounting to less than one dollar in the combined value of these two metals.

Bedrock in this locality is in most places obscured by superficial deposits, so that the discoveries that have been made are more or less accidental, and due to the overburden having been removed by some fortunate natural cause. Since so much mineralized quartz has already been found in this vicinity with so little of the rock formation exposed to view, it seems probable that were the superficial deposits removed a great amount of quartz would be revealed, and as mineralization is here so general, it is quite possible that some of the quartz found, would carry sufficient amounts of ore minerals to make it profitably exploitable.

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[1]Keele, Joseph, "The Duncan Creek Mining district": Geol. Surv., Can., Sum. report for 1904, Vol. XVI, pp. 38A-40A.

McLean, T. A., "Lode Mining in Yukon": Mines branch, Dept. of Mines, Can., 1914, pp. 127-159.

[2]Cairnes, D. D., "Williams and Merritt creeks": Geol. Surv., Can., Sum. report for 1909, pp. 57-60.

Upper White River District.[1]—Upper White River district constitutes a portion of a well mineralized general region, and possesses itself a considerable degree of mineralization. The more promising of the lode deposits that have been there discovered are gold-quartz veins, and veins and associated irregular deposits containing or consisting entirely of copper minerals mainly native copper. The individual quartz veins and masses that have been found, although in places quite large and persistent, are nevertheless only sparsely mineralized. It is quite possible, however, that deposits of similar extent and size may yet be discovered containing gold either alone or associated with other minerals, in sufficient amounts to allow of their being worked at a profit. Native copper has long been known to occur in White River basin; this metal, however, has been found in Upper White River district in economically important quantities on only one property which is known as Discovery Copper Grant. The native copper on this property is an oxidation product of chalcocite which in turn may with depth give place to chalcopyrite.

Thus the native metal cannot be expected to extend far below the surface, and it is to the primary sulphides that we must look for any extensive or persistent ore bodies. Sufficient development has not yet been performed to determine whether or not these sulphides are sufficiently concentrated to constitute economically valuable ore bodies.

Kluane District.[2]—Throughout Kluane district, lode deposits have a somewhat wide distribution, veins in which copper minerals are conspicuous, predominating. Nowhere, however, have deposits as yet been found which, under existing conditions, can be profitably exploited. It is quite possible, nevertheless, considering that the district is in general well mineralized, and has as yet been only slightly prospected, that deposits will yet be found that can be worked at a profit.

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[1]Cairnes, D. D., "Upper White River district, Yukon": Geol. Surv., Can., Memoir 50, 1915, pp. 120-126, 135-139.

[2]McConnell, R. G., "The Kluane mining district": Geol. Surv., Can., Sum. report for 1904, pp. 17A, 18A.

Cairnes, D. D., "Exploration in Southwestern Yukon": Geol. Surv., Can., Sum. report for 1914. Section on copper deposits.

Aishihik Lake District.[1]—A number of copper deposits which are generally designated as the Aishihik Lake deposits, occur in the vicinity of Giltana lake, a small body of water situated near Aishihik lake. The country rock in this vicinity is dominantly mica schist which includes in places mineralized bands, the ore minerals being chiefly magnetite and chalcopyrite. The more important of these ore bands or bodies range in thickness from 6 to 20 feet, and are exposed along the surface in places for as much as 200 feet or even greater distances. The average copper content of the deposits sampled, runs from 1.35 to 9 per cent. The deposits constitute a valuable future asset to the country, but under present conditions, could not be worked at a profit.

Whitehorse Copper Belt.[2]—Whitehorse Copper Belt is situated in the southern part of Yukon about 45 miles north of the British Columbia boundary, and extends along the western side of Lewes river for a distance of about 12 miles. Most of the important mining properties are within 4 to 7 miles of Whitehorse, the terminus of the White Pass and Yukon railway. This area has been carefully described in detail by Mr. McConnell and others so will be only briefly mentioned here.

The ore bodies are all of the contact-metamorphic type and fall into two classes:—those in which the copper minerals are associated with magnetite and hematite; and those in which the various silicates, principally garnet, augite, and tremolite are the chief gangue minerals.

The magnetite ore bodies are numerous, and occur either enclosed completely in altered limestone, along a lime-granite contact, or, in a few instances, in areas of altered granite. The largest bodies so far discovered are from 100 to 360 feet in length. These magnetite masses are sprinkled more or less plentifully throughout with grains and small masses of bornite and chalco-

[1]Cairnes, D. D., "The Giltana Lake claims": Geol. Surv., Can., Sum. report for 1908, pp. 30, 31.

[2]McConnell, R. G., "The Whitehorse Copper belt, Yukon Territory": Geol. Surv., Can., 1909.
Cairnes, D. D., "Whitehorse Copper Belt": "Excursions in Northern British Columbia and Yukon Territory": Guide Book No. 10, Geol. Surv., Can., 1913.
McLean, T. A., "Lode Mining in Yukon": Mines Branch, Dept. of Mines, Can., 1914, pp. 159-165.

Plate V.—Pueblo mine, Whitehorse Copper camp, showing surface equipment and buildings.

pyrite. The copper percentage varies greatly in different parts of each deposit, but the general average is between 3 and 4 per cent. The gold and silver are negligible in some of the ore bodies and important in others. Hematite masses are much less common than the magnetite bodies, the deposits on the Pueblo property being the only large bodies so far discovered. (Plates V, VI.) These differ from the magnetite ore bodies principally in the greater oxidation of the copper minerals. Deposits characterized by the garnet-augite-tremolite gangue are numerous wherever the lime-granite contact is exposed. They vary from low grade deposits containing only a sprinkling of copper minerals to considerable lenses of valuable ore. The valuable minerals are similar to those in the iron masses and consist mainly of bornite and chalcopyrite. On one property, bornite is absent however, and chalcopyrite is associated with mispickel. The siliceous ores contain, as a rule, a higher percentage of copper than the iron ores, those shipped up to the present time averaging probably over 8 per cent. The precious metal contents are moderate, seldom exceeding $3 per ton.

Plate VI.—Pueblo mine, Whitehorse copper belt, showing face of huge open cut, from which was obtained the ore of the first important shipments from this property.

Considerable development has been performed on a number of properties within this belt, but owing to the very low prices of copper during the last few years, the only property that has recently been worked or has shipped any ore is the Pueblo, which also closed at the commencement of the war. During the past three years the Altas Mining Company shipped about 90,000 tons of ore from their properties, all or nearly all of which came from the Pueblo. This is believed to have averaged 3.73%, 2.71%, and 3.80% copper from 1912, 1913 and 1914 respectively and to have contained averages for each year of from .60 to .81 ozs. in silver.

During the summer of 1907 Mr. McConnell estimated that probably half a million tons of ore was in sight in the Whitehorse copper belt as a result of the development then performed.[1] Since 1907 not over 100,000 tons of ore have been shipped out of the camp and important bodies of ore then unknown have been discovered. Thus undoubtedly when the war is over and the money stringency is less severe, and particularly if the prices of copper should rise slightly, there may be expected an important tonnage from this camp.

Wheaton District.[2]—In Wheaton district, a number of promising ore bodies occur. These include mainly gold-silver, antimony-silver, and silver-lead veins. No ore other than small test lots have been shipped from this district, but in most places very little development work has been performed. As a result of the prospecting and exploratory work to date, however, it is evident that there occurs within the district a number of ore-bodies which will some day be developed, and which could now be profitably exploited were conditions of transportation more favourable.

Windy Arm District.[3]—The area generally known as Windy Arm district extends northward from the 60th parallel, the

[1]McConnell, R. G., Op. cit., p. 3.

[2]Cairnes, D. D., "Wheaton district, Yukon Territory": Geol. Surv., Can. Memoir No. 31, 1912, pp. 85-145.

[3]McConnell, R. G., "Windy Arm district": Geol. Surv., Can., Sum. report for 1905, pp. 26-32.

Cairnes, D. D., "Report on a portion of Conrad and Whitehorse mining districts, Yukon": Geol. Survey, Can., 1908, pp. 14-18.

McLean, T. A., "Lode Mining in Yukon": Mines Branch, Dept. of Mines, Can., 1914, pp. 171-201.

British Columbia boundary, to Nares and Tagish lakes, a distance of from 10 to 12 miles, and reaches from Lake Bennett east to Windy Arm, a distance of about 10 miles. Throughout this area, a large number of quartz veins occur, which range from a few inches or less to 10 feet or even more in thickness. These occur mainly in a group of semi-basic rocks which are dominantly andesitic in character, but one vein—that on the Big Thing property—occurs in a granitic rock. These veins are composed mainly of quartz which carries quite a variety of ore minerals the chief of which is, in most places, argentiferous galena. In addition to galena, there also occur argentite, Freibergite, pyrargyrite, stephanite, tetrahedrite, native silver, native copper, lead carbonate, pyrite, arsenopyrite, chalcopyrite, zinc blende, and Jamesonite.

It is estimated that over a million dollars has been expended in this district by Col. J. H. Conrad and associates. Several long aerial tramways were constructed, a number of long cross-cut tunnels were driven, a concentrating mill was erected on Windy arm, a power house was constructed on Lake Bennett, and a certain amount of actual development work was performed.

A number of promising bodies of ore occur in Windy Arm district, which will doubtless some day be exploited. In fact, except for the depressing financial circumstances due to the war, there would appear to be no reason why, even under present conditions, certain of these ore veins could not be worked, if the mining operations were conducted under skilled and careful management. There is every reason to believe that at least hundreds of thousands of tons of gold-silver ore will yet be mined in this district, and it is hoped this will be realized in the somewhat near future.

COAL[1]

The coal-bearing formations of Yukon are all of either Tertiary or Jura-Cretaceous age,—the mineral fuels in the Tertiary beds throughout the territory being lignites characterized in most places by containing considerable fossil resin or

[1]Cairnes, D. D., "The Yukon Coalfields": Trans. Can. Min. Inst., Vol. XV, 1912, pp. 364-396.

amber, while those of Jura-Cretaceous age range in character from high grade lignites to anthracites.

Tertiary coal-bearing beds do not cover very extensive areas in Yukon, but have a somewhat wide distribution, and in places, apparently, constitute remnants of once larger areas now infolded with older terranes; in most cases, however, they represent deposits laid down in separate basins of deposition. The fossil plant remains found in these beds, show that most of them at least, are of fresh water origin. These lignite-bearing Tertiary beds appear to all belong to the Kenai series[1] which is the oldest known Tertiary in Yukon and Alaska, and is generally referred to the Upper Eocene. There rocks are, in most places, but little disturbed, although locally they have suffered considerable deformation. They consist, typically of light-coloured, slightly coherent, conglomerates and sandstones and dark to light coloured, soft shales and clays. In places volcanic materials occur associated with these slightly consolidated sediments (Plate VII).

The Jura-Cretaceous sediments[2] consist mainly of conglomerates, quartzites, sandstones, graywackes, arkoses, tuffs, shales, and slates, having a wide range of colour and differing greatly in the amount of metamorphism they have suffered. In general they are considerably more indurated, and the beds have been much more disturbed than those of Tertiary age. The Jura-Cretaceous beds appear to be remnants of once more extensive areas which were originally all connected but have been reduced by erosion to their present proportion. In Southern Yukon where these beds have been most studied the uppermost member, the Tantalus conglomerate, is composed dominantly of cherty conglomerate beds which have an aggregate thickness of at least

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[1]Collier, A. J., "The coal resources of the Yukon, Alaska": Bull. U.S. Geol. Surv., No. 218, 1903, pp. 17-19.

Brooks, Alfred H., "The geography and geology of Alaska": U.S. Geol. Surv., Prof. paper No. 45, 1906, pp. 237-244.

Cairnes, D. D., "The Yukon Coalfields": Trans. Can. Min. Inst., Vol. XV, 1912, pp. 365-367.

"Exploration in Southwestern Yukon": Geol. Surv., Can., Sum. report for 1914. Section on Coal.

[2]Cairnes, D. D., "Preliminary memoir on the Lewes and Nordenskiöld Rivers coal district": Geol. Surv., Can., Memoir No. 5, 1910, pp. 30-38.

"Wheaton district, Yukon Territory": Geol. Survey, Can., Memoir No. 31, 1912, pp. 53-59.

1,000 feet. The underlying Laberge series has an average thickness of about 3,800 feet.

In the Jura-Cretaceous beds, two distinct coal horizons have been recognized. The upper horizon occurs well up in the Tantalus conglomerates, and the lower horizon is in the Laberge rocks within a zone 200 to 300 feet below the Tantalus conglomerates.

The beds found to be coal-bearing in Yukon occur in at least 19 distinct areas. In 14 of these, coal of economic importance

Plate VII.—Huge amphitheatre in Duke River coal area, Kluane district, in which at least twelve seams of coal exceeding one foot in thickness, are exposed.

has been discovered, and in the other areas, may yet be found when these have been prospected.

The following table gives the extent of these rocks:—

Extent of known Tertiary beds in Yukon	2,140	sq. miles
" Jura-Cretaceous beds in Yukon	4,110	"
Total	6,250	sq. miles
Probable extent of Tertiary beds in Yukon	4,500	sq. miles
" Jura-Cretaceous beds in Yukon	19,700	"
Total	24,200	sq. miles

At only five points in Yukon has coal actually been mined, viz.:—On Cliff creek, on Coal creek, (tributary of Yukon river), on Coal creek (tributary of Rock creek), at Five Fingers mine, and at Tantalus mine. The first three of these occur in the Rock Creek Tertiary basin, and the last two are situated within the Tantalus Jura-Cretaceous area. At two or three other points the measures have been somewhat prospected. The only two properties that have been in operation since 1908 are the Sour Dough mine on Coal creek (tributary of the Yukon) and the Tantalus mine situated on Lewes river, about midway between Whitehorse and Dawson. These properties are still operating.

The following table gives the analyses of a number of typical coals from different parts of the territory.

Locality.	Age.	Hygroscopic Water.	Volatile Combustible Matter.	Fixed Carbon.	Ash.
Cliff Creek	Tertiary	8.57	42.04	45.77	3.62
	"	10.58	40.10	46.74	2.58
Sour Dough Mine	"	17.10	34.50	38.40	10.00
	"	14.57	33.11	37.15	15.17
Coal creek (tributary of Rock creek)	"	18.31	34.96	40.88	5.85
	"	19.37	33.85	37.45	9.33
Duke River area, Klu-ane district	"	11.20	40.90	42.50	5.40
	"	9.80	43.90	44.70	1.60
Five Fingers mine	Jura-Cretaceous	5.95	40.46	45.16	8.43
	"	13.64	31.83	51.84	2.69
Tantalus Butte	"	12.87	31.72	49.51	5.90
Braeburn-Kynocks area	"	8.98	29.62	48.30	13.10
	"	12.02	34.28	42.56	11.14
Whitehorse area	"	2.15	6.01	69.86	21.98
	"	3.76	8.34	62.50	25.40

The following table gives the probable amount of coal in Yukon in seams 1 foot or more in thickness.

Field.	Age.	Tons, (2204 lbs.)
Whitehorse area	Jura-Cretaceous	40,000,000
Tantalus area	"	150,000,000
Braeburn-Kynocks area	"	50,000,000
Selkirk area	"	10,000,000
Pelly River areas	"	
Arctic area	"	
Rock Creek area	Tertiary	3,000,000,000
Sheep Creek area, Kluane district	"	40,000,000
Jarvis River area, Kluane district	"	
Duke River area, Kluane district	"	250,000,000
Bonnett Plume area	"	1,500,000,000
Indian River area	"	150,000,000
Old Crow basin	"	
Frances and Liard River basins	"	
Total		5,190,000,000

AGRICULTURE[1]

Grasses of various kinds grow well and even luxuriantly in certain parts of Yukon, particularly throughout the southern portion of the territory. Along many of the main lowland depressions, also, including portions of the valleys of Nordenskiöld, Hutshi, Takhini, Dezadeash, Duke, and Nisling rivers, extensive valuable meadows occurs. In fact, in most places, where the underbrush and moss have been burned off the lower hillsides, and the bottoms of the main valleys, grasses, particularly of the "redtop" varieties, spring up rapidly and thickly, growing in places to a height of over 3 feet. This rapid growth immediately after a fire is partly due to the fact that the grass roots already there remain uninjured by the fire, and furthermore, the grass seeds which may for years have accumulated over the surface, gradually work down through the moss where they are preserved, and wherever the moss is removed by fire or otherwise the grass seeds germinate at once. A luxuriant growth unobstructed by moss and underbrush thus results from both roots and seeds. These "red-top" grasses are not only excellent pasture grasses but in addition furnish a good grade of hay, and are particularly

[1]Macoun, John, "The climate and flora of the Yukon district": Geol. Surv., Can., Ann. Rept., Vol. XV, 1902-3, pp. 38A-54A.

valuable to stock wintering out, as the grass heads retain their seed which remains quite preserved and consequently highly nutritious. Thus animals can readily live on the grain heads where snow is too deep for the grass stocks and blades to be reached.

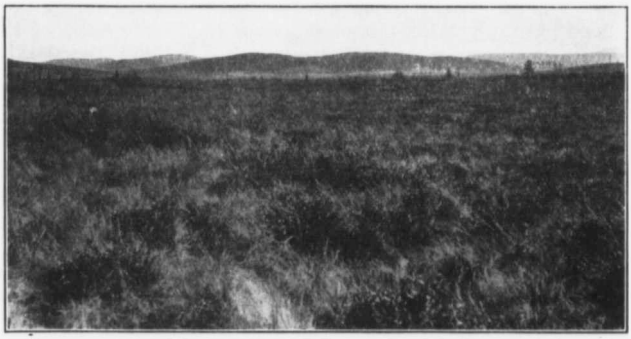

Plate VIII.—Typical stretch of meadow land near head of Nisling river.

These meadows should thus yet prove of considerable value. Nowhere perhaps were most beautiful or attractive stretches of these grass lands noted by the writer than occur along the upper portion of the south branch of Nisling river, where for several miles, a tall, fairly thick growth of grass extends everywhere over the wide valley lowlands of this stream and some of its tributaries in this neighbourhood (Plate VIII).

The following is a list of the characteristic grasses of Southern Yukon, which has been kindly prepared by Mr. J. M. Macoun of the Geological Survey, from specimens collected by the writer:—

Hierochloa alpina R. and G.

Poa crocata Rydb.

A blue grass—is one of the best pasture grasses on the prairie from Manitoba to the mountains, being there very plentiful.

Agropyrum violaceum. Hornm.

The only true "bunch" grass in the region.

Bromus Pumpellianus Scribn.
Arctogrostis latifolia Trin.
Calamagrostis purpurascens R. Br.
Calamagrostis Langsdorfii.
Calamagrostis canadensis Beauv.

The varieties of *Calamagrostis* or blue-top grasses, are the "red-top" grasses of the far northwest, and not only are they good pasture grasses, but they are the chief hay grasses of the northwest, due to their height and nutritious value.

Festuca saximontana Rybd.
Festuca altaica Trin.
Festuca rubra L.

These varieties of *Festuca* are known as the Fescue grasses, and are the most valuable pasture plants when found in sufficient quantity.

Trisetum spicatum (L) Richter

Grass suitable for horse feed is thus available in favourable localities throughout the entire year, and commencing the latter part of May or early in June becomes quite plentiful, and from then until October, pack-horses, if well cared for and not worked too hard, will in most parts of Southern Yukon, at least, subsist on what natural fodder is available. Horses also will winter out safely without artificial shelter or without being fed, if they are in good condition when winter sets in, and if they are left in suitable localities.

Throughout Southern Yukon, also, where careful gardening has been attempted, such has in most cases been attended with very gratifying results. In the vicinity of Dawson, for instance, vegetables and flowers grow luxuriously, the flower gardens being particularly beautiful and a never ceasing source of surprise to those visiting Yukon for the first time. Also from their gardens the people of Dawson are supplied with celery, rhubarb, radishes, lettuce, onions, turnips, beans ,parsnips, carrots, peas, cabbage, cauliflower, Scotch kale, and many other pot-herbs. These have all passed the experimental stage and compare very favourably with vegetables grown elsewhere, and the celery as well as perhaps other varieties, surpass in quality those from most districts farther south. Nothing is now necessary to success in growing these vegetables but care in cultivation. Potatoes quite compar-

able with those from the "outside," are also grown if care is taken in selecting the seed and if they are planted in suitable ground. At many points along Yukon and Lewes rivers, farther south, gardening is quite as successful as at Dawson, but has not been so extensively practised. Various grasses and hays have also been very successfully grown at a number of points.

During the summer of 1902 Professor John Macoun of the Geological Survey, visited Southern Yukon, and his report contains a great amount of valuable information on the climate and flora of this district.[1] He states, "There is no reason why all the oats, barley and fodder of all kinds with every vegetable required in the home should not be grown around Dawson."[2] He also adds, speaking of Southern Yukon in general: "With the facts learned last season (1902) and my former knowledge of the Peace River country, the Mackenzie River valley, and northern British Columbia, I am quite within the mark when I say that all the land having a suitable soil within this immense area will in the future produce enormous crops of all the cereals, wheat included. It is well within the memory of us all that growing wheat was for many years considered a doubtful matter at Edmonton and Little Slave Lake. These points have passed the experimental stage and now good crops of wheat are secured every year. Two factors combine to make this success. The wheat itself is gradually conforming to its environment and ripening earlier, and local frosts are becoming rarer as the land comes more under the plough. The same changes will take place farther to the north, and when wheat is grown as winter wheat and can start at once after the snow is off, it is hard to state how far this may be, at any rate as far as Dawson in latitude 64°19′ where we know there are three months without frost."[3]

The United States Department of Agriculture, also, has established experimental stations at Fairbanks and Rampart in Central Alaska where the general climatic conditions are very similar to those in portions of Southern Yukon, and at these stations it has been demonstrated beyond a doubt that farming

[1] Macoun, John, "The climate and flora of the Yukon district": Geol. Surv., Can., Ann. Rep., Vol. XV, 1902-3, pp. 38A-54A.

[2] Idem. pp. 48A, 49A.

[3] Idem, p. 53A.

can be made to pay in Alaska.[1] Referring to potatoes grown at the Fairbank station, Professor Georgeson states, "Some of the merchants who have handled the station potatoes stated that their customers would ask for them and take them in preference to potatoes from the States."[2]

Spring wheat also has been completely matured at the Fairbank station, and when spring wheat matured it follows as a matter of course that all varieties of barley and oats also matured. Alfalfa and red, white, and alsike clovers also all made satisfactory growth at Fairbanks, and seed has been matured on certain species of alfalfa, which is considered to be a very important step and of the greatest significance.[3] Among the most important works performed at these stations are the hybridizing or breeding of new varieties of grains, by crossing and selection, and the propagation and cultivation of various hay grasses, fruits and vegetables.

If similar government experimental work could be performed in Yukon it would undoubtedly be of considerable benefit to the territory, but in any case the people of Yukon may greatly profit by the work already done in Alaska, which is sufficient at least to demonstrate that eventually Southern Yukon will be of importance as an agricultural district. In certain localities where a first crop has been more or less a failure, this has unfortunately discouraged future attempts. It is now known, however, that such first crops are very liable to be unsuccessful, as the seed is in many cases unadapted to the climate, and the soil requires cultivation before really satisfactory results are attained. Thus, continued and persistant efforts are warranted, and if properly prosecuted are certain of remunerative returns. It is well known that stock raising, farming, and various agricultural pursuits are successfully conducted in Siberia and other northerly countries where the climate and general conditions are no more favourable and in some cases less so than in Southern Yukon.

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[1] See annual reports of the Alaska Agricultural Experiment stations for past few years, published by the U.S. Dept. of Agriculture, Washington, D.C.

[2] Georgeson, C. C., Ann. Rep., Alaska Agricultural Experiment Station, U.S. Dept. of Agri., Washington, D.C., 1913, p. 14.

[3] Georgeson, C. C., Ann. Rep., Alaska Agricultural Experiment stations, U.S. Dept. of Agri., Washington, D.C., 1913, pp. 17, 18.

At present, however, while there is still considerable free land open to homesteaders in the Northwest territories and in parts of British Columbia, the necessity of settling in Yukon has not yet arisen, but with the ever increasing demand for land and homes, the extensive and beautiful valley tracts of Southern Yukon must eventually be settled, and will undoubtedly some day support an agricultural population. Just how distant this time may be, it is now impossible to predict. In case, however, the mining industry should progress more rapidly, as is quite possible, a greater demand for agricultural products will arise, and the early settlement of the district will follow. Even under present conditions, the stock-raising industry presents a very attractive field for immediate enterprise. Every year many carloads of cattle are shipped into and through Yukon to supply the beef markets of this territory and Alaska. Also there is always a certain demand for horses within these territories. It would thus seem that the many miles of fertile valley tracts in various parts of Southern Yukon could be readily adapted to the raising of the stock at least to supply the local demand. Horses, it is known, can be easily and cheaply raised, and with an abundance of wild hay in places which could be put up for winter use, there would seem to be no reason why cattle raising could not also be made a success, particularly if hardy, northern breeds were selected. As with the agricultural products, however, stock-raising in the near future, will also be largely governed by the demand arising from the development of the mining industry.

FOREST[1]

Yukon as a whole is only sparsely forested, and nowhere do the dense growths of timber occur such as characterize portions of British Columbia and other localities to the south and south-

[1] Macoun, John, "The climate and flora of the Yukon district": Geol. Surv., Can., Ann. Rept., Vol. XV, 1902-3, pp. 38A-54A.
McConnell, R. G., "The Whitehorse Copper belt, Yukon Territory": Geol. Surv., Can., 1909, pp. 5, 6.
Cairnes, D. D., "Wheaton district, Yukon Territory": Geol. Surv., Can., Memoir No. 31, 1912, pp. 27-29.
"The Yukon-Alaska International Boundary, between Porcupine and Yukon rivers": Geol. Surv., Can., Memoir 67, 1914, pp. 10-12.
"Upper White River district, Yukon,": Geol. Surv., Can., Memoir 50, 1915, pp. 28-30.

east. However throughout all the southern portion of the territory, trees grow on mostly all the valley floors up to an elevation ranging in most places from 3,500 to 4,000 feet above sea-level, and on the mountain sides to practically the same height. Timber line is, however, characteristically not so high at the lower as at the upper ends of the valleys, and in places does not reach above 3,000 feet. In the valleys of Yukon, Lewes, White, Donjek, Teslin, Big Salmon and Little Salmon rivers and in the vicinity of Kluane, Sekulmun, Aishihik and other of the larger lakes, as well as at occasional other points, groves occur where the trees are tall and stand close together, but these are the exception. In general about one-third of southern Yukon is forested, the southern and western slopes being much better timbered than the northern and eastern hillsides. In this portion of the territory there is thus sufficient timber in most localities to meet the ordinary requirements of mining and allied industries for many years to come. In the immediate vicinity of Yukon and Lewes rivers, however, wood suitable for fuel is becoming somewhat scarce, due to the fact that the fuel used by the steamers plying between Whitehorse and Dawson, has, in the past, been almost exclusively wood obtained along the river banks. A relatively small amount of coal has, however, also been consumed.

As the Arctic ocean is approached, the forest growth becomes gradually less, so that by the time Porcupine river is reached, where crossed by the Yukon-Alaska boundary, at latitude 67°25′, only about one-fourth or less of the district is forested. The growth is there also noticeably more sparse than along the Yukon, and trees seldom occur at an elevation exceeding 2,000 feet above sea-level. Along the Arctic, very little timber of any kind occurs, the forest being represented by rare patches of small trees and shrubs along occasional stream courses.

The forest members of Yukon consists mainly of fourteen species that obtain the dimensions of trees. These include:—

White spruce.—*Picea canadensis* BSP.
Black spruce.—*Picea mariana* BSP.
Alpine fir.—*Abies lasiocarpa* Nutt.
Black pine.—*Pinus contorta*, Loudon.

Tamarack or American larch.—*Larix laricina.*
Balsam poplar.—*Populus balsamifera* L.
Western balsam poplar.—*Populus trichocarpa* T. & G.
Aspen poplar.—*Populus tremuloides* Michx.
Northern canoe birch.—*Betula resinifera* Regel.
or *B. alaskana* Sargt.

In addition a number of shrubs occur including:

Willow, several species.
Alder, two species.
Dwarf birch.—*Betula glandulosa* Michx.
Juniper.—*Juniperus communis* var. *montana* Ait.
Soapollali.—*Sherpherdia canadensis* Nutt.
Wild rose.—*Rosa acicularis* Lindl.

Of these, three species of willows and the two alders become in places small trees, and are thus included in the above mentioned fourteen tree species.

Of the different trees in the district, the white spruce is much the most useful and by far the most widely and extensively distributed, growing at all elevations up to timber line, and constituting in most places about one-half of the entire forest growth. The best groves are generally found on the river flats and in depressions along the lower slopes of ridges, where the trees are straight and well grown. Individuals are not generally more than 12 to 18 inches in diameter 3 feet from the ground, but specimens with 24 to 36-inch stumps were noted in a few places, but anything over 24 inches is exceptional. This tree furnishes a strong, easily worked timber, and is well suited to the usual needs of the miner, and to purposes of construction generally. Black spruce, alpine fir, and black pine, also grow somewhat plentiful in portions of Southern Yukon, but are not nearly so useful or abundant as the white spruce, and are mainly of importance as fuel. The poplars and canoe birch are also of considerable value as fuel in some localities.

TRANSPORTATION

Yukon reaches the coast only at the north where it is bounded by the Arctic ocean. The extreme southwestern corner of the territory, however, extends very close to the Pacific, being separated from this ocean by only a narrow fringe of land including portions of British Columbia and the "pan-handle" portion of Alaska. The most frequented route to Yukon is that via Skagway which is situated at the head of Lynn canal on the Pacific, 870 and 1,000 miles distant respectively from Vancouver and Seattle. From Skagway, the White Pass and Yukon railway passes over the Coast range of mountains, via the White pass, to the town of Whitehorse which is 110 miles distant from Skagway, and is situated at the head of navigation on Lewes river. Another easy, though longer route to Yukon, is that via Bering sea and Yukon river, navigation being open during summer months from Whitehorse to St. Michael and Nome, two points situated on Norton sound near the mouth of Yukon river, 2,310 and 2,360 miles respectively from Seattle and 1,600 and 1,700 miles respectively from Dawson, as measured along Yukon river. A number of other routes are also occasionally followed, the greater number of which head from Haines, Cordova, or Valdez,[1] points on the Pacific coast.

Within Yukon, all points in the vicinity of the White Pass and Yukon railway, as well as along Yukon river and its main tributaries and headwaters are thus readily accessible. Quite a number of roads and trails have also been constructed throughout the southern porton of the territory, which greatly facilitate access to certain localities. In addition, throughout Yukon, there are a number of long, prominent valleys which are more or less connected, and traverse the territory in different directions. These will aorffd excellent routes for railway lines when it is found advantageous to build such. A company has been organized for some years for the purpose of constructing a railroad from Haines on the Pacific coast, to Fairbanks on the Yukon via Chilkat river, Dalton post, Lake Dezadeash, Lake Kluane, Kluane river, Koidern river, Beaver creek, Snag creek, Mirror

[1] Cairnes, D. D., "Upper White River district, Yukon": Geol. Surv., Can., Memoir 50, 1915, pp. 7-22; also see accompanying map 113A.

creek, and Tanana river. This route is quite feasible as far as location, grade, and ordinary problems of construction are concerned. A good grade and suitable location also exists from Whitehorse, the terminus of the White Pass and Yukon railway, westward to Lake Kluane. Also a series of connected valleys or depressions affords an excellent route from White Horse to White and Tanana rivers, via Ibex river, Takhini river, Hutshi lake, Aishihik lake, Nisling river, Wellesley lake, Beaver creek, Snag creek, and Mirror creek.

Thus when the necessity arises, there need be no lack of railway transportation facilities throughout Yukon, and particularly throughout the southern portion of the territory. At present, however, the building of these railroads would not seem to be warranted, but if instead, a number of good, trunk wagon roads were constructed, similar to the Whitehorse-Kluane road, which would crosscut and intersect the more promising portions of Yukon, and thus allow prospectors and others to prosecute their explorations and investigations with reasonable facility, such would be of great and immediate benefit to the territory.

SUMMARY AND CONCLUSIONS

Yukon is thus a vast territory concerning much the greater part of which very little or nothing is known. The prospected and explored areas, however, have proved to be very rich in natural resources. More than $157,000,000 in placer gold has already been produced, and there is estimated to be still between $30,000,000 and $45,000,000 remaining in the explored gravels of the few already producing districts. In addition the writer has estimated that within the explored portions of the territory there are probably 5,190,000,000 tons of coal in seams one foot or more in thickness, and this estimate is so conservative as to practically represent "known" instead of "probable" coal. Further, valuable lode deposits of economically important minerals are widely and extensively distributed throughout the known portions of the territory which undoubtedly constitute an important future asset to the territory. Also there are thousands of square miles of valuable valley lands which are well adapted to various

ranching and agricultural pursuits, and which, it is believed, will some day support an important agricultural population.

Thus with these and numerous other less important natural assets, the territory should have an important future and may be expected to play an important role in the development of Western Canada. Therefore, instead as has been suggested, of having reached an advanced stage in its economic development, due to the now rapidly approaching time when the Klondike placers shall have become exhausted, Yukon is as yet largely virgin territory, and should be considered as having only indicated by the slight development of the more or less prospected 17 per cent, what is yet possible from the remaining 83 per cent of its vast expanse.