Coalfields and Potential Coal Areas of Yukon Territory

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Yukon Territory has an area of approximately 197,000 square miles spread over about 10 degrees of latitude and 17 degrees longitude. It consists largely of rough uninhabited sub-mountainous and mountainous territory. Over much of the area bedrock is concealed by forest growth or muskeg, or by an extensive cover of drift, which makes prospecting most difficult.

Early geological explorations were confined to the navigable streams and the geological mapping more recently done is largely of a reconnaissance character for publication on a series of maps on a scale of 1 inch equals 4 miles. This latter mapping has shown that small basins of lignitic and bituminous coal occur in the southwestern part which is mostly underlain by igneous and metamorphic rocks whereas the northern part has more extensive areas of sedimentary rocks which are known to be coal-bearing.

The coal deposits of the Yukon are of Mesozoic and Tertiary ages. In the southwestern part of the Yukon the Mesozoic coals occur in two formations, the Laberge series and the immediate overlying Tantalus formation. The Laberge series is regarded as Lower Jurassic in age with possibly some Upper Jurassic, and the age of the Tantalus formation is considered to lie between the limits of the Upper Jurassic and Lower Cretaceous. The Mesozoic coals, which are mostly bituminous in rank, occur in the drainage basin of Lewes River in southwestern Yukon and in the northern part of the Yukon, in the Peel River, Old Crow and Arctic coast regions.

The Tertiary coals, which are all lignitic, occur in Yukon and White River drainage areas in the western part of the Yukon, in the Watson Lake area in southeastern Yukon and in the Bonnet Plume area in the northern part.

For purposes of description and easy reference the various coal areas are all numbered on the accompanying map and each area is described separately. The information for each area has been obtained mostly from maps and reports published by the Geological Survey of Canada and from various other papers, letters, and unpublished reports, all of which are contained in the coal files located at the Institute of Sedimentary and Petroleum Geology, Calgary. None of the information is classified. For each area the more recent and comprehensive geological references are listed. A more complete bibliography could be obtained by consulting the references listed.

In this report the descriptions of the coal areas do not include any reference to the economic potential of the coal deposits. The surface geological mapping completed to date has delineated those areas of the Yukon that are known to contain coal or have a very high possibility of containing coal. Such surface mapping does not afford sufficient information upon which to estimate proven reserves or otherwise assess the economic potential of a coal deposit. That detailed information such as thickness, lateral extent, attitude, mineability, quality, rank and other characteristics can only be obtained by undertaking a proper coal exploration program. This program would require a trained crew of geologists, drillers and miners to carry out detailed surface mapping, drilling, trenching, driving of adits and collecting of bulk samples free from the weathered zone. Exploration programs of this nature are currently being undertaken in Alberta by several companies interested in assessing the economic potential of coal deposits in certain parts of the province.

1. Rock Creek Coalfield

A belt of Tertiary coal-bearing beds averaging 5 miles in width extends from Klondike River northwesterly along the base of Ogilvie range to a point beyond Cliff Creek, a distance of 80 miles. The streams draining this portion of Ogilvie Range, namely, Cliff Creek, Coal Creek, Fifteen

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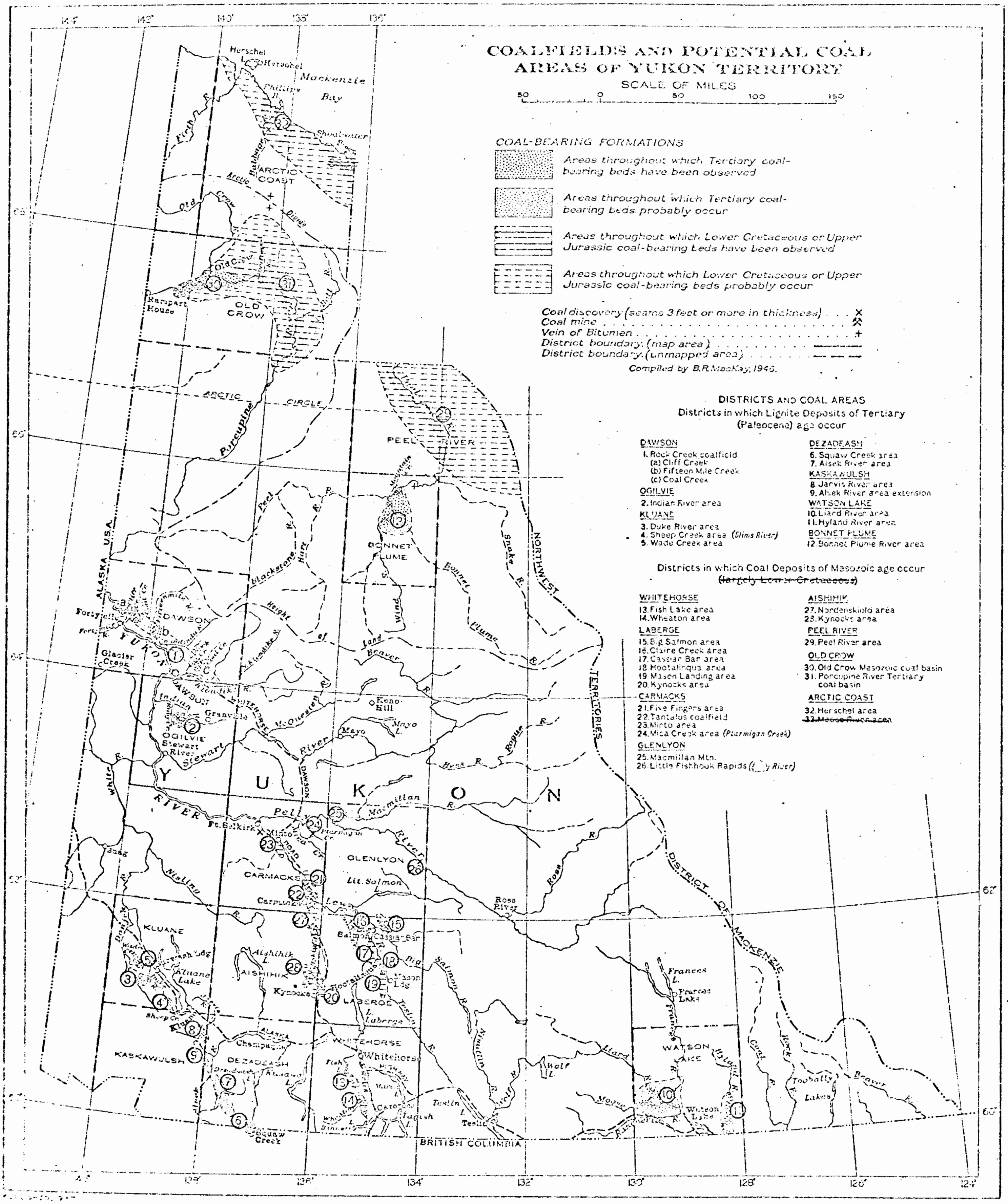

Mile Creek, and Rock Creek cross this Tertiary belt and outcrops of lignitic coal occur in the creek beds within the belt. The total area underlain by lignite is estimated to considerably exceed 200 square miles. However, coal exposures are not known to occur in the intervening areas between the creeks and information pertaining to the coal is available only from the few exposures in the creek beds.

Mining operations on the outcrops have been carried out intermittently since 1899 and it is reported that all the easily accessible coal has been extracted. A mine on Rock Creek is reported to have worked a seam consisting of two benches, an upper bench 3 feet thick and the lower bench 2-3 feet thick, and the two benches separated by a layer of clay about 1 foot in thickness. At Coal Creek a mine operated on a seam that varied from 4 to 11 feet in thickness. An average proximate analysis for this coal is shown below:

	As received
Moisture %	29.3
Ash %	11.4
Volatile Matter %	28.1
Fixed Carbon (by difference)	31.2
Calorific Value	7,430 B.T.U. per lb. gross.

Details are not available concerning the coal outcrops on the other creeks.

The area was mapped geologically in 1961: Green, L.H. and Roddick, J.A., 1962, Dawson, Larsen Creek, and Nash Creek Map-Areas, Yukon Territory; Geol. Surv. Can., Paper 62-7.

2. Indian River Area

Thin seams of lignitic coal are reported to occur in Tertiary rocks along Indian River. One such seam located on Ruby Creek, a tributary of Indian River, was worked to some extent during the winter of 1902.

The area has been mapped geologically: Bostock, H.S., 1942, Ogilvie, Yukon Territory; Geol. Surv. Can., Map 711 A.

3. Duke River Area

Seams of lignitic coal occur in the Tertiary sediments on Amphitheatre Mountains in the Duke River area. Early reports indicated that in a section of 1,200 to 1,500 feet of sediments twelve seams of lignite of good quality, more than 12 inches thick and with aggregate thickness of 30 to 50 feet were exposed. Subsequent investigation has shown much of the coal to be shaly and of poor quality, thus making the early reports appear to be too optimistic.

The coal occurs in a folded belt of soft, partly frozen sand and gravels which is in a high area with much relief. These factors would make very difficult mining conditions.

A typical proximate analysis of this coal is as follows:

	As Received
Moisture %	22.3
Ash %	13.7
Volatile Matter %	32.3
Fixed Carbon (by difference)	31.7
Sulphur %	trace
Calorific Value	7,485 B.T.U. per lb. gross.

The area has been mapped geologically:

Cairnes, D.D., 1917b, Kluane Lake, Yukon Territory; Geol. Surv. Can.; Map 152 A.

Muller, J.E., 1967, Kluane Lake Map-Area, Yukon Territory; Geol. Surv. Can.; Memoir 340

4. Sheep Creek Area

A small area to the west of Sheep Creek is underlain by Tertiary coal-bearing sediments. These beds include several seams of lignitic coal, one of which is at least 6 feet in thickness. A sample from this seam gave the following analysis:

	As Received
Moisture %	21.8
Ash %	7.8
Volatile Matter %	36.7
Fixed carbon (by difference)	33.7

The area has been mapped geologically:

Cairnes, D.D., 1915, Exploration in southwestern Yukon; Geol. Surv. Can., Sum. Rept. 1914, pp. 10-33.

Muller, J.E., 1967, Kluane Lake Map-Area, Yukon Territory; Geol. Surv. Can., Mem. 340.

5. Wade Creek Area

A small basin of Tertiary coal-bearing strata occurs at the headwaters of Wade Creek, but only very thin, lignitic coal seams have been reported.

The area has been mapped geologically, the references being the same as for the Sheep Creek area above.

6. Squaw Creek Area, 7. Alsek River Area, 8. Jarvis River Area, and 9. Alsek River Extension Area.

These four areas are known to be underlain by Tertiary sediments that in other areas are known to contain lignitic coal. Coal has not been reported in the Squaw Creek area but the presence of lignite has been noted in the other three areas. There are no details available concerning these occurrences but their coal-bearing potential is not considered great.

The four coal areas are located within areas that have been mapped geologically:

Kindle, E.D., 1953, Dezadeash Map-Area, Yukon Territory; Geol. Surv. Can., Mem. 268

10. Liard River Area

Tertiary shales and clays with thin seams of lignitic coal outcrop at several localities in the drainage basin of Upper Liard River and its tributaries Frances and Rancheria Rivers. The best exposed coal seam about 4 feet thick, occurs in steeply dipping sediments along Liard River near the mouth of Rancheria River.

The area has been mapped geologically:

Gabrielse, H., 1967, Watson Lake, Yukon Territory; Geol. Surv. Can., Map 19-1966.

11. Hyland River Area

Early reports made mention of thin seams of lignite occurring in a few localities in Hyland River drainage basin to the east of Watson Lake. However, recent mapping by the Geological Survey does not indicate the presence of coal-bearing strata in this area.

Reference - Gabrielse, H., 1967, Watson Lake, Yukon Territory; Geol. Surv. Can., Map 19-1966.

12. Bonnet Plume Area

This basin of Tertiary sediments contains at least two seams, 8 feet and 30 feet thick, of lignitic coal. The seams are reported to have been burned over large areas along the lower reaches of Bonnet Plume River.

Reference - Norris, D.K., Price, R.A., and Mountjoy, E.W., 1963, Northern Yukon Territory and Northwestern District of Mackenzie. Geol. Surv. Can., Map 10-1963.

13. Fish Lake Area

At least three coal seams are known to occur in the Tantalus formation on Mount Granger west of Coal Lake. In 1906 a tunnel about 60 feet long was driven on one of the seams and several trenches were dug but all these are now caved and no work has been done since. The three seams are 9' 8", 10' 4" and 2' 6" in thickness and the coal ranges in rank from low volatile bituminous to anthracite. Proximate analyses follows:

	Samples			
	A (%)	B (%)	C (%)	D (%)
Moisture	2.15	3.76	3.78	2.35
Volatile Matter	6.10	8.34	10.06	6.65
Ash	21.98	25.40	47.78	48.73
Fixed Carbon	69.86	62.50	38.38	42.27

Sample A is from the 9-foot-8-inch seam
Sample B is from the 2-foot-6-inch seam
Sample C is from the 10-foot-4-inch seam
Sample D is from a seam in the creek below the workings and may be one of the other three.

The area has been mapped geologically:

Cairnes, D.D., 1908, Report on a Portion of Conrad and Whitehorse Mining Districts, Yukon; Geol. Surv. Can., Pub. 982.

Cockfield, W.E., and Bell, A.H., 1926, Whitehorse District, Yukon; Geol. Surv. Can., Mem. 150

Wheeler, J.O., 1961, Whitehorse Map-Area, Yukon Territory; Geol. Surv. Can., Mem. 312

14. Wheaton Area

Three seams of low volatile bituminous coal, measuring at least 6' 3" and 18", occur west of the summit of Mount Bush. The seams are cut by dykes of igneous rocks and the strata are highly distorted and disturbed. West of the coal exposures the coal-bearing formation is terminated by a fault which would cut off the seams about 2,000 feet down their dip.

A proximate analysis of a sample from the outcrop of the 6-foot seam is as follows:

	Per Cent
Moisture	4.78
Volatile Matter	8.62
Ash	30.10
Fixed Carbon	56.50

The area has been mapped geologically:

Cairnes, D.D., 1912, Wheaton District, Yukon Territory; Geol. Surv. Can., Mem. 31

Cockfield, W.E., and Bell, A.H., 1926, Whitehorse District, Yukon; Geol. Surv. Can., Mem. 150.

Wheeler, J.O., 1961, Whitehorse Map-Area, Yukon Territory; Geol. Surv. Can., Mem. 312.

15. Big Salmon Area, 16. Claire Creek Area, 17. Cassiar Bar Area, 18. Hootalinqua Area and 19. Mason Landing Area.

These five areas in the Laberge district are underlain by the Tantalus

formation which in other parts of Yukon Territory is known to contain coal. However, coal seams have not been observed in any of these areas. Coal float is abundant in the lower part of Big Salmon River and Walsh Creek of the Big Salmon Area and a coal seam is reported by trappers to occur in the Claire Creek Area. These five areas must be regarded as potential coal areas rather than areas in which coal deposits are known to be present. The areas have been mapped geologically:

Bostock, H.S. and Lees, E.J., 1938, Laberge Map-Area, Yukon; Geol. Surv. Can., Mem. 217.

20. Kynocks Area

This area lies on the western border of Laberge district. Coal seams outcrop along the northeast face of Red Ridge and are well exposed along a small creek on the northeast side of Division Mountain. In the latter locality one seam is 7 to 8 feet, one is 4 feet, and several are from 6 to 18 inches thick. Proximate analyses of samples from these seams are as follows:

	Sample 1 (%)	Sample 2 (%)
Moisture	8.98	12.02
Volatile Matter	29.62	34.28
Ash	13.10	11.14
Fixed Carbon	48.30	42.56

The area has been mapped geologically:

Cairnes, D.D., 1910, Lewes and Nordenskiold Rivers Coal District, Yukon Territory; Geol. Surv. Can., Mem. 5.

Bostock, H.S. and Lees, E.J., 1938, Laberge Map-Area, Yukon; Geol. Surv. Can., Mem. 217

21. Five Finger Area

Thin coal seams contained in the Laberge series are exposed on the east side of Lewes River about 5 miles about Five-finger rapid. Mining was begun on these seams at the Five Finger Mine about 1905 and continued to 1908. The workings were on two seams, one of which varied from 6 to

to 46 inches and the other, so far as exposed, was uniform at 54 inches.

Reference: Bostock, H.S., 1956, Carmacks District, Yukon; Geol. Surv. Can., Mem. 189.

22. Tantalus Area

Along Lewes River, near Carmacks, two small areas are underlain by the Tantalus formation containing several coal seams. The area to the south of the river is known as Tantalus area and that to the north as Tantalus Butte area. The seams here have been more extensively mined than anywhere else in Yukon Territory. In both areas the Tantalus formation is partly overlain by volcanic rocks and the extent to which the coal seams may be present under these volcanic rocks is not known.

In the Tantalus area the Tantalus formation extends south of the river about 4 miles over a width of about 2 miles and disappears to the south and west under the volcanic rocks. A mine, known as the Tantalus Mine, was opened in 1905 and worked on three seams, 3 feet, 6 feet and 7 feet in thickness in order from top to bottom. Proximate analyses of samples taken at the face of the adits are as follows:

	3-foot seam %	6-foot seam %	7-foot seam %
Moisture	0.75	0.76	0.82
Volatile Matter	23.61	24.74	25.12
Ash	20.43	15.90	8.03
Fixed Carbon	55.21	58.60	66.03

It is reported that all these samples showed a good quality of coke in the laboratory tests.

In the Tantalus Butte area the Tantalus formation extends north of the river for about 3 miles over a width of one mile and disappears to the northwest under the volcanic rocks. Surface prospecting at the south end of the area has revealed three seams, a top seam about 8 feet thick separated by 100 feet from a middle seam 9 feet thick, which is 115 feet above a 7-foot thick bottom seam.

A mine was opened at Tantalus Butte in 1923 and operated until 1938 during which time total production was 12,000 tons at the most. The mine was reopened in 1948 and has produced continuously through to the present at a rate varying from 3,800 tons to 14,000 tons annually. The mine has intersected three seams, 9 feet, 2 feet and 4 feet from bottom to top separated by 24 feet and 150 feet of shale respectively but is operative only on the 9-foot seam. The average analyses of 14 mine run and face samples from this mine are as follows:

		As Received
Moisture	%	4.0
Volatile Matter	%	31.7
Ash	%	13.5
Fixed Carbon	%	50.8
Calorific value	B.T.U./lb.	11,445

The area has been mapped geologically:

Bostock, H.S., 1956, Carmacks District, Yukon; Geol. Surv. Can., Mem. 189

Cairnes, D.D., 1910, Lewes and Nordenskiold Rivers Coal District, Yukon Territory; Geol. Surv. Can., Mem. 5.

Swartzman, E., 1953, Analysis Directory of Canadian Coals; Mines Branch, Pub. No. 836.

23. Minto Area

There are a number of small outcrops of Tantalus formation which indicates an area of about three square miles to be underlain by this coal-bearing formation. The area is extensively drift covered and no coal has been reported in it, but the fact that elsewhere the Tantalus formation does contain coal gives this area some potential.

Bostock, H.S., 1956, Carmacks District, Yukon; Geol. Surv. Can., Mem. 189.

24. Mica Creek Area

In 1902 some prospectors reported that a shaft had passed through several small seams of lignite. Mapping of the district in 1934 (H.S. Bostock)

proved there is an abundance of coal float scattered all through the drift of this area, even high on Ptarmigan Mountain, but no outcrops of coal-bearing formations exist in this area. The old workings, if they ever did exist, had become obliterated. It is possible that a coal area lies here under the drift but it must of necessity be very small and the coal potential, at best, is somewhat dubious.

Bostock, H.S., 1956, Carmacks District, Yukon; Geol. Surv. Can., Mem. 189.

25. MacMillan Mountain Area and 26. Little Fish Hook Rapids Area

Old reports stated that a coal seam several feet thick occurred about 4 miles up MacMillan River from its mouth at the base of MacMillan Mountain and another seam, which was exposed only at extreme low water at Little Fish Hook Rapids. Recent geological mapping failed to find any evidence of these seams. In MacMillan Mountain area pieces of lignite or lignitized wood were found in the glacial silts and clays and this may have given rise to the rumour of coal in the area. At Little Fish Hook Rapids there is an occurrence of sheared, carbonaceous shale that may have been mistaken for coal. If coal-bearing rocks are present in either locality the area underlain by them would be very small as older, non-coal-bearing rocks form the hills close by on all sides.

The areas have been mapped geologically:

Campbell, R.B., 1967, Geology of Glenlyon Map-Area, Yukon Territory; Geol. Surv. Can., Mem. 352

27. Nordenskiold Area

Coal seams occurring in the Tantalus formation outcrop at several localities on the east side of Nordenskiold River valley. These deposits constitute a southeasterly continuation of the Tantalus coalfield as described in Area 22 above. In this area the coal-bearing Tantalus formation is, for the greater part, covered with recent basalts, basalt tuffs and other

volcanic rocks. At some of the exposures, such as on the south side of Porter Mountain, the coal measures are considerably folded and distorted by the intrusion of syenite-porphyry and the rank of the coal could be expected to vary considerably. Such conditions would require careful prospecting to locate areas suitable for economic mining operations.

Reference: Cairnes, D.D., 1910, Lewes and Nordenskiold Rivers Coal District, Yukon Territory; Geol. Surv. Can., Mem. 5.

28. Kynocks Area

This area is a northwestern extension of the deposits as described in Area 20 above. Outcrops of coal are scattered about the upper part of Nordenskiold River the largest of which is reported to be about 18" thick. Thicker coal seams may exist but the measures are covered with a great thickness of superficial deposits thus making prospecting most difficult.

Reference: Cairnes, D.D., 1910, Lewes and Nordenskiold Rivers Coal District, Yukon Territory; Geol. Surv. Can., Mem. 5.

29. Peel River Area, 30. Old Crow Area, and 31 Porcupine River Area

These areas fall in the class of those possessing potential coal possibilities rather than proven deposits, as no coal seams of commercial thickness have been reported from them, but they are known to be underlain by sediments of Lower and Upper Cretaceous and Tertiary ages consisting of shales and sandstones with thin seams of lignitic coal.

Reference: Norris, D.K., Price, R.A., and Mountjoy, E.W., 1963, Northern Yukon Territory and Northwestern District of Mackenzie; Geol. Surv. Can., Map 10-1963.

32. Herschel Area

A belt of coal-bearing Upper Jurassic, Cretaceous, and Tertiary rocks extends along the coast from the Alaskan boundary to that of the Northwest Territories. Within this area scattered outcrops of coal have been reported from time to time and on Moose Channel, about 5 miles east

into the Northwest Territories, Upper Cretaceous sediments contain a 7-foot and a 4-foot seam. In the past a small mining operation was carried out on the 7-foot seam.

The area is considered to have a good potential with respect to coal but rock exposures are scarce and exploration would be difficult.

References: Gabrielse, H., 1957, Geological Reconnaissance in the Northern Richardson Mountains, Yukon and Northwest Territories; Geol. Surv. Can., Paper 56-6.

Norris, D.D., Price, R.A., and Mountjoy, E.W., 1963, Northern Yukon Territory and Northwestern District of Mackenzie; Geol. Surv. Can., Map 10-1963.