The Smoky River Coal Field

Examination and Comparison with the Kananaskis Area

Looking down Smoky river from mouth of Sulphur river. (Page 14)

CANADA

THE DOMINION FUEL BOARD

IN CO-OPERATION WITH

THE GEOLOGICAL SURVEY, DEPARTMENT OF MINES

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Smoky River Coal Field

EXAMINATION AND COMPARISON WITH THE KANANASKIS AREA

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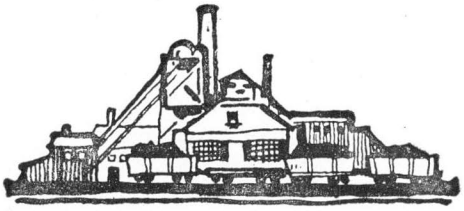


THE Dominion Fuel Board was formally organized on the recommendation of the Minister of Mines under authority of an Order in Council dated November 25, 1922. The personnel was designed to coalesce the facilities of various Federal services in regard to geological, engineering, and economic studies relating to the fuel problem.

Although the formation of the Board was prompted by the acute fuel situation then prevailing, the duties assigned to it were intended to meet the long-recognized need for a standing organization which would be definitely responsible for ensuring that systematic study of the fuel position of the Dominion be not permitted to lapse on the termination of current emergencies.

The Board is spreading a network of investigation to ascertain the economic value of the different suggested alternatives to alleviate our present unsatisfactory fuel position.

Illustrations

SUMMARY OF PRINCIPAL POINTS ABOUT THE QUALITY OF COAL

(1) There is no anthracite in the Sheep River or Smoky River areas.

(2) In one locality on Smoky river there is coal, the analysis of which shows a fuel ratio just within the semi-anthracite class, but physically it has no anthracitic properties.

(3) A large area on Sheep river and Smoky river contains semi-bituminous coal, or, as it is usually called in the west, "high-grade" bituminous coal.

(4) All of the above coals are very good steam coals, and some seams are of excellent quality, but none of them will satisfy the domestic consumer who wants a fuel to take the place of anthracite, as they all have a ragged fracture which makes fine dust when handled, and they will cause a deposit of soot in the flues and chimneys.

(5) The most matured, or "highest-grade" coal for domestic use, so far known in Alberta, is in Bow River valley, along the main line of the Canadian Pacific railway, where there is a considerable area of semi-anthracite with smooth fracture and decided anthracitic structure. In this valley, in one area of limited extent, the coal is of a still higher grade – in fact it comes definitely within the anthracite class.

(6) Bow River valley and Kananaskis River valley (within 15 or 20 miles of the railway) contain a large tonnage of coal, which should satisfy domestic users, even those who have been accustomed to using only Pennsylvania anthracite. It can be definitely stated that these coals will suit the domestic consumer better than any other known high-grade coal in the province of Alberta.

SUMMARY OF POINTS BEARING ON RAILWAY CONSTRUCTION

(1) It is not feasible from a practical point of view to construct and operate a line of railway to Grande Prairie and Peace River country, which would pass through the coal lands of the Smoky and Sheep Rivers country. The only practicable route would pass far to the northeast of these coal lands, and, to gain access to the coal, long branch lines would be necessary. The reason why a through railway cannot traverse the coal lands is that it would have to cross at right angles all the deep drainage valleys of the intervening country.

(2) The development of coal mines which might be reached by long branch lines of railway would not add anything to the total production of coal in the province, as the mines now developed and operating are capable of filling far more than the present demand, and they can easily fill any prospective additional demand.

(3) As the output of the existing developed mines above referred to is all hauled by the Canadian National railway, and as opening new mines cannot increase the total output of the district, there would be no increase in the coal freight business for the national road.

(4) On the other hand, as far as coal freight is concerned, the railway would have to operate hundreds of additional miles of road without getting any additional freight thereby. The country here under consideration is unsuitable for agriculture and has been created a forest reserve, which does not admit either lumbering or agriculture.

(5) The establishment of a Forest Reserve embracing a large area of country lying northwest from Entrance was well conceived, and the reserve is well administered. It will be an asset of great value in the future. The building of a railway through this reserve would subject it to great risk of loss by fire and the operation of such a road would perpetuate that risk.

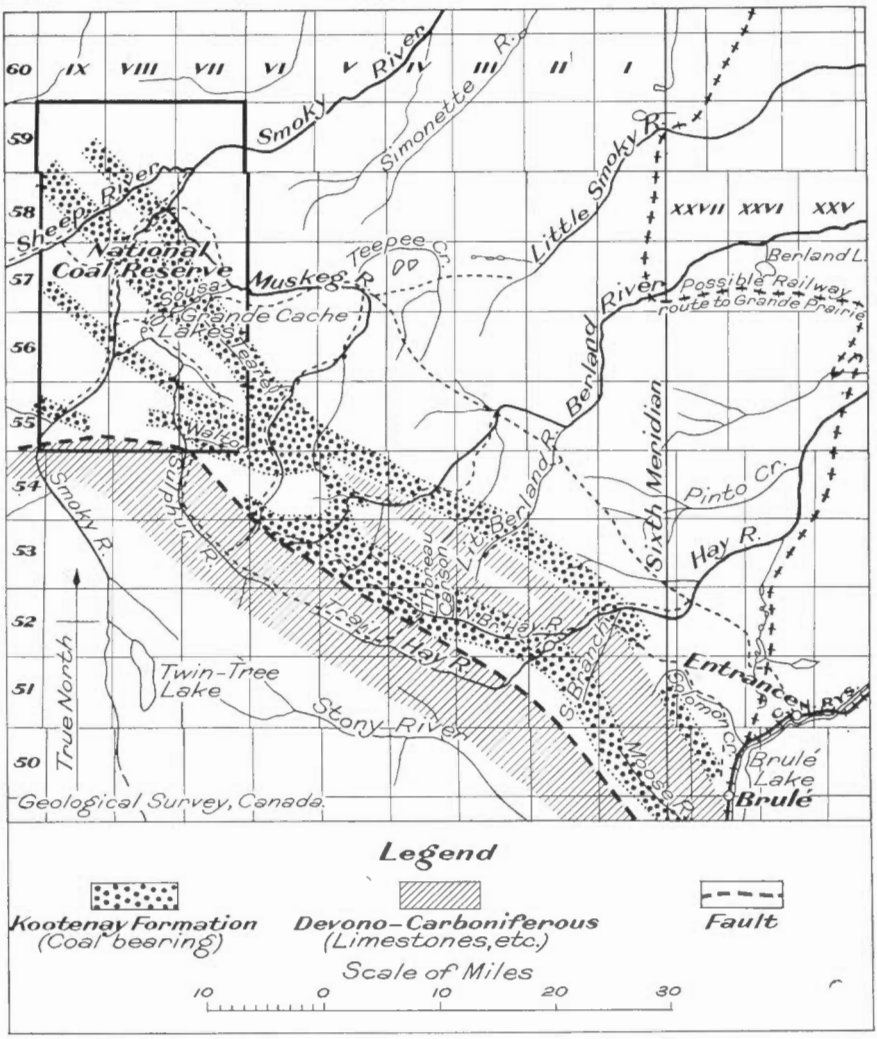


Figure 1. Sketch Map of Brûlé lake to Smoky river

(From map by John McVicar)

SMOKY RIVER COAL FIELD

Structural and Economic Examination, and Comparison with Kananaskis Area

This report is principally about the coal deposits in the neighbourhood of Smoky river and Peace river, included in the National Coal Reserve in Alberta, but it also refers to the deposits in the area lying between the reserve and the Canadian National railway at Brûlé lake, where that railway enters Rocky mountains. A part of the report is devoted, by way of comparison, to a discussion of coals from the same formation (Kootenay), in the southern part of the province.

The country between the National railway and Sheep river, a distance of 125 miles, is well described by Mr. John McVicar, in the Summary Report of the Geological Survey, 1923, Part B, and consequently there is no need for any detailed general description herein, excepting that as this country would have to be traversed by a railway to bring out the coal to market, some details as to the feasibility of railway construction will be given.

The Kootenay formation which contains the high-grade bituminous coal in Alberta outcrops at Athabaska river outside the first limestone range of Rocky mountains, and also in a parallel belt in the valley inside the first range (See accompanying sketch map, Figure 1). Both of these outcrops, the outer and the inner belt of the Kootenay, run continuously on each side of the first limestone range in a northwesterly direction to the end of the range, a distance of 50 miles. It should be mentioned that there is a gap in the outcrop of the outer belt for 5 or 6 miles, between Solomon creek and Hay river, where the Kootenay has not been recognized probably because it is covered by overthrust faulting.

The coal contained in these two belts does not differ to any notable extent from that found in the same formation farther to the southeast in the province, on McLeod river and elsewhere. There has been more or less fracturing and squeezing throughout the area, but the greater part of it will have fairly good mining

conditions, as compared with the average mining conditions throughout the foothills of the Rockies. In the outer belt, except in the vicinity of the Athabaska at Brûlé lake, there has not been much prospecting work done, although the coal outcrops have been seen in many places, and the continuity of the measures, except for the one gap mentioned, is determined. Apart from the vicinity of Brûlé lake, only two claims both located on the north side of Hay river—have been leased in the outer belt.

In the inner belt, again omitting the part near Athabaska river, there are seven claims leased. The rocks in the valley of the north branch of Hay river, where these claims are located, have a general strike of north 60 degrees west, which is within 10 degrees of the general course of the valley itself, and the dips are vertical, almost. The bed of the valley is flat, and, southeast of Thoreau creek, its sides rise quite gently, and the strike is nearly parallel to the valley. Evidently, therefore, the amount of coal "to the rise" southeast of Thoreau creek will be only moderate; on the other hand, conditions west of the creek are favourable for a good "lift" of coal above drainage level.

In a low bank half a mile up a stream opposite Carson creek, a seam is exposed as follows:

Feet	
20	clean coal
4	mixed coal and shale.
6	coal.
8	shaly coal, probably hard, bony at depth.
16	very soft surface coal, apparently clean, but undetermined, as solid seam not reached.

About 1½ miles up Thoreau creek, a tributary on the north side, 2 miles above the last-mentioned exposure, is a seam:

Feet	Inches	
8	6	Coal with 1½ inches bony
	10	Brown shale
4	9	Coal
	3	Bony
	6	Coal
1	0	Brown shale
5	0	Coal
	1½	Grey shale
4	0	Coal
	1	Shale
13	6	Coal

A sample from this seam gave the following assay[1]:

——	As received	Dried
Moisture	4·9	
Ash	14·0	14·7
Volatile matter	25·7	27·0
Fixed carbon	55·4	58·3
Sulphur	0·3	0·3
B.T.U.	11,200	11,780
Fuel ratio	2·16	

The sample was taken only a few feet below the surface, and probably gives more ash and moisture than would a sample at depth, where the moisture is not likely to exceed 0·5 per cent. If all the shale were included in the output, it would increase the ash $6\frac{2}{3}$ per cent.

The coal in the above two seams is quite soft, and although that may be expected in any surface coal of this class, the indications are that it will be soft at depth also. It has slickensided, diagonal jointage in the firmer parts. The dips are steep—70 degrees to vertical—so that the angle system of mining can be used and the cost will be low. There will be a high percentage of slack and fines.

The sample is noted in the analytical test as non-coking, but the reduced moisture should render it a coking coal, and if mined so as to keep out impurities it will make a good steam coal.

The next section of country to the northwest, called here the Middle section, extends from where the first limestone range dips under and disappears, to Grande Cache lakes, a distance of 20 miles. It is characterized by repeated foldings of the Lower Cretaceous rocks. There are, apparently, three main folds that bring the Kootenay formation to the surface. There is also a fourth partial elevation of these rocks along the edge of the second limestone range, but it is not continuous to the surface. This section, away from the immediate vicinity of the mountains of the second range, has been eroded and worn down to comparatively easy-sloping hills, with flat-bottomed valleys between.

The coals in this Middle section are apparently similar in quality to those of Hay river, but they are firmer and have been less squeezed and slickensided. They are high-grade bituminous coals.

[1]All the assays given in this report were made by the Mines Branch, Department of Mines, Ottawa.

The adjoining section of the country to the northwest includes the National Coal Reserve on Smoky and Sheep rivers, where these are crossed by the Kootenay formation. It is the section with which this report principally deals. It exhibits a topographical feature which has a direct bearing on the economic geology, namely, the reappearance of the mountain building movement, similar to that which built up the outer or first range of limestone. Figure 1 shows that if a line drawn along the general direction of the outer limestone range be extended northwestward, it will pass through this Smoky-Sheep Rivers section.

The Middle section, 20 miles southeast from Grande Cache lakes, does not show the same mountain building, but this is partly because much of the lateral contraction which had to be accomplished is taken up by the pronounced overthrust at the edge of the second limestone range opposite the Middle section.

This mountain-building movement on Smoky-Sheep Rivers area has folded the Kootenay formation and lifted it into a moderate-sized mountain range. These rocks were not so strong and massive as the limestones, and being relatively far more friable, and not being kept to an even line of strike by the pressure of a uniform body of massive limestone, they not only yielded more readily to the pressure, but were folded and in some places broken, in an unexpected manner.

Although the general strike of these folded rocks continues uniform at north 60 degrees west to north 80 degrees west, there are instances of cross-faulting, and other departures from this general attitude. This cross-faulting and change of attitude were noted in the valley of Sheep river, and also along the valley of Smoky river. A good example is on the west side of Smoky river, 2 or 3 miles above the mouth of Muskeg river, where nearly vertical seams outcrop, three-quarters of a mile back from the valley, and 900 feet higher than the river level. Between these outcrops and the river, however, the rocks lie almost horizontally, thus presenting a condition disadvantageous to mining operations.

The slopes of both valleys, although steep, are nevertheless well covered with gravel and talus, and exposures are few, so that the structure cannot be easily determined; in fact, to ascertain the complete structure, it will be necessary to plot in detail observations made in all the draws and tributary valleys. It will probably take two years' field work to make such a geological survey of the area covered by the National Coal Reserve.

From what could be seen in a mere reconnaissance, the area, although intricately folded, contains seams of workable size, where the rocks are regular or have only waving variations from regularity. An accompanying running sketch (Figure 2) of the hills on the east side of Smoky river, covering a distance of 6 miles, and

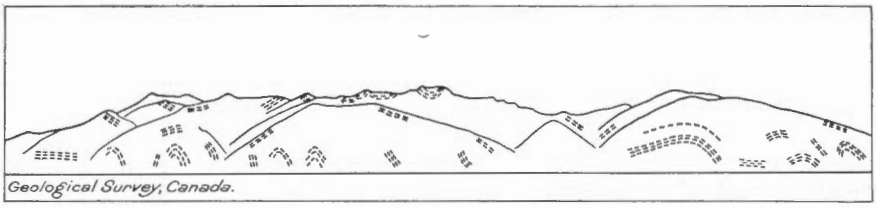


Figure 2. RUNNING SKETCH OF HILLS ON EAST SIDE OF SMOKY RIVER.

Beginning 1 mile above mouth of Muskeg river and extending upstream for 6 miles. Dotted lines show attitude of visible outcrops of rocks.

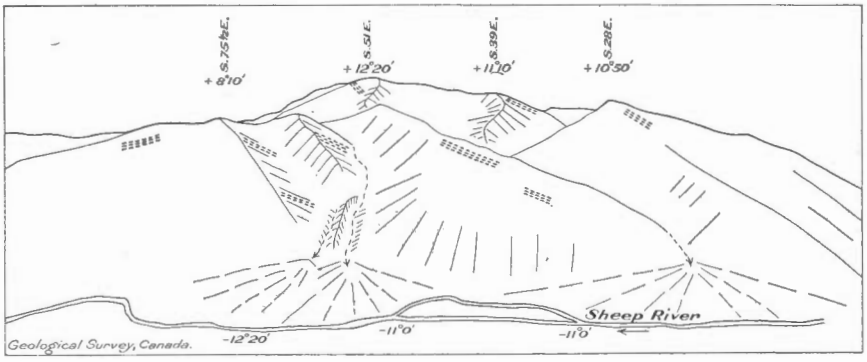


Figure 3. LOCAL SKETCH OF HILLS SOUTHEASTWARD ACROSS SHEEP RIVER VALLEY.

From point 300 feet above river on Campbell claim, showing mountainous character of country and the general uniformity of dips in this place.

showing the visible outcrops, will illustrate the above statements. Another local sketch (Figure 3) on a larger scale and in more detail, shows one of the areas with a uniform trend of strike, or, in other words, conditions suitable for mining.

No complete section of the Kootenay formation in this district has been compiled, and the relative position of some of the beds is in doubt, on account of the high dips and frequent occurrence of overturned beds. A partial section of what appears to be the upper part of the formation was seen on the east side of Smoky river, about a mile above the mouth of Muskeg river. It showed, in descending order, as follows:

	Feet	Inches	
Sandstone	80	0	
Black shale	20	0	
Sandstone	50	0	
Shale	1	6	
Coal and shale	1	6	
Coal	5	0	Seam A
Shale	2	6	
Coal, bony	1	0	
Coal	4	0	Seam B
Sandstone	40	0	
Shale, grey and black	20	0	
Sandstone	10	0	
Black shale with several bands of coal	18	0	
Shaly coal	4	..	
Coal	9	0	Seam C
Shale with bands of sandstone	80	0	
Coal	5	6	Seam D
Shale	8	0	
Coal	8	1	Seam E

Seam A. Hard coal, bedding planes preserved, diagonal jointage, and slickensiding.

Seam B. Fairly hard, firm coal, with bedding planes preserved, also diagonal slickensided jointage.

Seam C. Fairly strong coal, bedding planes distinct, with slickensided jointage.

Seam D. Firm coal.

Seam E. Upper 2 feet 7 inches strong, hard coal, remainder soft and slickensided.

Where the above section was measured, there is a considerable area of regular measures, quite ample to warrant a plant for mining operations. The measures bend gradually from a dip of south 45 degrees east, at a point one mile upstream from where the section was measured, to south 10 degrees west, a short distance to the north, or downstream side, with angles of dip from 25 degrees to 40 degrees, thus forming what miners call a "spoon of a basin."

On the opposite or west side of Smoky river, and about half a mile upstream from where the section given above was measured, an additional section was seen and is given as follows, in descending order:

	Feet	Inches	
Sandstone with two bands of shale about 20 feet each	150	0	
Shale	8	0	
Coal	0	1	
Shale	0	2½	
Coal	0	5	Seam F
Shale	0	1	
Coal	0	10	
Shale	0	2	
Coal	0	5	
Shale	0	1½	
Coal	2	0	
Shale	1	4	
Coal	0	6	
Shale	0	1½	
Coal	0	5	
Bony coal	0	1½	
Coal	0	2	
Shale	0	1	
Coal	0	7	
Shale	0	1½	
Coal	0	4	
Sandstone	60	0	
Shale	20	0	
Coal	1	10	
Shale	2	10	
Coal	0	6	
Shale	0	3	
Coal	0	5	
Shale	0	3	
Coal	0	10	
Shale	0	1½	
Coal	1	3	
Shale and bony coal	0	5	
Coal	0	5	
Shale	0	3	
Coal	3	7	
Shale	0	1½	
Coal	0	9	
Shale	0	1	
Coal	1	6	Seam G
Shale	0	1½	
Coal	0	9	
Shale	0	1	
Coal	0	4	
Shale	3	0	

Then sandstones and shales of undetermined thickness on account of faulting, possibly 300 feet, succeeded by:

	Feet	Inches	
Sandstones	10	0	
Shale	5	0	
Black shale and bony coal	2	4	
Coal, clean	18	0	Seam H
Shale and bony coal	5	5	
Coal	1	6	
Sandstones			

Seam F. Very hard, strong coal, bedding planes well preserved, no cross or diagonal jointage, no shearing or slickensiding. This seam is lying nearly horizontal, actual dip north 70 degrees west, angle of 10 degrees at an elevation of 1,750 feet above the valley. The 3 feet 6 inches of coal available makes it a possible workable seam, though not an attractive one, especially on account of $4\frac{1}{2}$ inches of interbedded shale, which, if included in the output, would increase the ash 10 per cent. The mining cost would be high.

Seam G. Coal similar to Seam F, but not quite so strong; 6 feet 11 inches of coal, with 5 inches of interbedded shale, or a proportion of 6 per cent. Seam nearly horizontal at elevation of 1,660 feet above the river level.

Seam H. Firm, well set up coal, very hard in places, with bedding planes preserved, and diagonal jointage planes, 1 to 2 feet apart. There are no shale partings. A high pitching seam dips south 20 degrees west, angle of 70 degrees.

There is not sufficient evidence to warrant a correlation of the last section with the preceding one. It is true that the overlying and interbedded sandstones in the two sections are remarkably alike, but this similarity is not alone sufficient to warrant the conclusion that they are of the same horizon, especially as the coal seams in the two sections have no resemblance to each other, either in quality or thickness, and the thickness of the intervening sandstones does not correspond. The places where the sections were observed are only about $1\frac{1}{2}$ miles apart, and consequently it is impossible that there could be such a decided difference in so many respects if they were of the same horizon. The probabilities, therefore, are that the second section is not a repetition, but rather a downward extension, of the first.

About a mile from the last section, farther up the valley, in a narrow gulch on the west side of Smoky river, another seam is exposed as follows:

	Feet	Inches	
Sandstones and shales	50	0	
Coal banded with sandy shales	1	6	
Coal, hard	13	0	Seam I
Coal, softer	3	10	

Seam I. Coal very hard, bedding planes well preserved, breaks with ragged fracture, considerable development of brightly crystalline, cross-grained brittle structure in narrow bands between bedding planes. This latter is friable and easily rubbed off. There is no shearing nor slickensiding. Only two shaly bands, one inch and one-quarter inch respectively, are found in the 13 feet of coal. The seam dips north 30 degrees east, angle of 55 degrees.

Seam I was also seen on the Campbell claim, L 1674, on the west side of Sheep river, where it showed:

	Feet	Inches	
Coal, hard	10	6	Seam I
Coal, softer	3	6	

It is here dipping south 30 degrees west, angle of 40 degrees. The coal is identical in physical properties with that of the outcrop of this seam given in the preceding paragraph, except that the bright crystalline bands are absent.

Seam I was again seen on the Moyes claim, L 917, at a point $1\frac{1}{2}$ miles upstream from the Campbell claim, and showed a section as follows:

	Feet	Inches
Coal, soft	0	10
Coal, hard	12	6
Bony	0	8

The seam dips south 33 degrees west, angle of 70 degrees. Coal identical in physical properties with that of the last-mentioned occurrence.

Seam J, 3 feet 10 inches thick with included bands of shale amounting to 4 inches, was uncovered about 300 or 400 feet below Seam I on the Moyes claim. This seam is unfit for mining.

No other outcrops of coal were observed in the National Coal Reserve, which could be added to the number of actually known seams given above, so that there are seven known seams

of workable quality and thickness, and probably two other seams of doubtful commercial value, as follows:

	Feet	Inches	
Seam A, of workable quality and thickness...	5	0	
B " " ...	4	0	
C " " ...	9	0	
D " " ...	5	6	
E " " ...	8	1	
H " " ...	18	0	
I " " ...	13	0	(to 14 ft.)
Total coal.....	62	7	
Seam F, of doubtful commercial value.....	3	6	
G " "	6	11	
Total.....	10	5	

or a grand total of 73 feet of coal.

There may be other workable seams in the reserve, but this thickness of 73 feet is all that can now be counted on in estimating tonnage.

There are four separate outcrops of the Kootenay formation in the reserve, and in at least one of these the coal seams outcrop twice, that is, come to the surface on the two limbs of an anticline, so that there are at least five outcrops of the coal. The linear extent of these outcrops is 92 miles. The lateral extent of the seams in each outcrop, with mining to a vertical depth of 2,000 feet below access level, would be 2,000 feet, plus an average of, say, 600 feet available above access level, and plus 400 feet estimated additional extent of seam, due to average inclination, or a total of 3,000 feet.

On the basis of 73 feet thickness, the tonnage in the reserve would be 3,424,363,000 tons. But it is necessary to take into consideration the inaccessibility of some parts of the seams; the probability that some of the lower seams may not reach the surface; and the inevitable loss in extraction. It is, therefore, considered advisable to count upon only 25 feet as actually extractable. On this basis there is extractable coal amounting to 1,172,727,000 tons. The tonnage of coal to the rise, that is, above the level of the access point, which can be mined without pumping or hoisting, is one-fifth of the above, or about 234,000,000 tons.

In the area covered by the seven leases which were in good standing when the reservation was made, and which are still valid, the calculation is somewhat different, as a great part of the lease-

holds lie under the valley bottoms, and there is only an inconsiderable amount of coal to the rise. The lateral extent of the seams down to a level of 2,000 feet below the access, would only average about 2,200 feet. The amount of extractable coal in these leaseholds, with their combined length of 12 miles, would be 120,000,000 tons.

The amount of coal to the rise on these seven claims cannot be determined without detailed surveys, but it is relatively very small.

The merits of the seams from the point of view of commercial production are as follows:

Seam I, 13 to 14 feet thick, is an excellent steam coal, unrivalled in Canada. This does not necessarily mean that it has higher B.T.U., but that under ordinary working conditions it will evaporate more pounds of water per pound of coal than any other, which is the supreme test. The average ash in samples taken from three different localities was only 5·2 per cent. It will probably be non-coking commercially. It will yield a very high percentage of lump if properly mined, that is, if cut by machines and broken by slow explosives. As the coal in this seam is so strong that it will not run by its own gravity, the angle system cannot be used to advantage, and the cost will be fairly high. In furnace or stove it will make a lasting fire, but accompanied by a considerable amount of black dust, and, probably, deposition of soot in the flues and chimneys.

Seam H, 18 feet thick, is a clean, high-grade bituminous coal, probably coking. Very good for steam purposes, easily mined without explosives, well suited to angle system of mining. The mining cost should be low. This coal, like all the other high-grade bituminous coal of this country, is really a good coal for domestic use, has high heating values, and gives a lasting fire, but it would not be popular with domestic consumers, on account of the amount of fines and black dust, and also because of the amount of soot which it would deposit.

Seam C, 9 feet, and Seam E, 8 feet, are somewhat stronger coals than Seam H, but probably can be mined without explosives at moderate cost. They are probably coking, and have the same general qualities as Seam H. They should yield a fairly high percentage of lump.

Seam A, 5 feet, Seam B, 4 feet, and Seam D, 5 feet, are stronger coals than the last two seams. They will yield high-grade bituminous coals, very good for steam purposes. The mining cost will be fairly high, as they will require undercutting and explosives. They will give a high percentage of lumps.

The following analyses are of samples taken from depths of 5 to 10 feet. In the case of Seam I, several shots of blasting powder were used in two places, to observe how the coal would be affected by this method of breaking.

	Thickness in feet	Moisture	Ash	Volatile matter	Fixed carbon	Sulphur	B.T.U. dry basis	Fuel ratio
Seam C	9	3·1	7·9	20·8	68·2	0·3	13,650	3·28
Seam D	5½	1·4	8·8	19·3	70·5	0·4	13,910	3·65
Seam H	18	2·4	11·9	19·0	66·7	0·3	13,040	3·50
Seam I on Camp-Upper bell claim	10½	1·5	5·4	17·0	76·1	0·4	14,520	4·47
Seam I on Camp-lower.	3½	1·3	5·0	17·4	76·3	0·5	14,660	4·37
Seam I on Moyes claim	13½	2·1	4·6	18·5	74·8	0·5	14,390	4·04
Seam I on Smoky river	13	1·4	5·5	19·3	73·8	0·4	14,720	3·82

All these coals come within the American classification of semi-bituminous, or, as they are usually called in western Canada, "high-grade bituminous." In connexion with this, it should be remembered that Mr. John McVicar collected two samples on the west side of Smoky river, which had a fuel ratio of a little over 6. These would be, as far as analysis can determine, semi-anthracite, but his notation that the bedding planes were preserved, would indicate the same class of coals as above described, which physically show no anthracitic structure.

Between Smoky river and the valley of Grande Cache lakes and Sousa creek, the rocks show more uniformity than they do along Smoky river itself, and this tract of country will, in all probability, afford good mining areas.

Southeast of Sousa creek, and along the valley of Teare creek, there are some breaks in the measures, indicated by sudden alternation of northeasterly and southwesterly dips of about 40 degrees, but there is no evidence of cross-faulting, and the strike is regular at about north 57 degrees west. In this part of the reserve, the character of the coal is different from that found on Smoky river.

It has 6 per cent to 7 per cent more volatile matter, and may be classed as good, high-grade bituminous coking coal, similar to a good grade of bituminous coal from the Crowsnest field.

Similarly, the coal in the outcrop of the Kootenay formation, which crosses Smoky river at the mouth of Sulphur river, above the area previously described, has 8 per cent to 9 per cent more volatile than the coal lower down the river. This coal resembles that on Teare creek, and both of them are higher in volatile, because both localities were far from the heavy mountain-building movement.

Considered as a new source of coal supply the principal fact about the Smoky-Sheep Rivers area is that it contains a large tonnage of very high-grade bituminous coal, one notable 14-foot seam grading in places, by analysis, as semi-anthracite. This seam will give a superior steam coal, but it is not notably better than the other high-grade bituminous coals already developed in Alberta in the qualities which domestic users require, namely, freedom from dirt, smoke, and soot. It has no anthracitic structure and breaks with a ragged fracture, from which a good deal of fine dust will be ground off in handling.

The other seams in the National Coal Reserve contain high-grade bituminous steam coals, probably equal to, if not a little better than, the best bituminous coals mined in Alberta. *The reserve will be a very valuable asset in the future, but there is no need for its development for many years to come.*

Railway Connexions

It would be quite practicable to build and operate a railway, from a point on the Canadian National railway near Solomon creek or Brûlé, to reach the coal lands on Hay river, and its north branch. But it would not be practicable to extend such a line to Smoky River area, on account of the high summits and deep intervening valleys which would have to be crossed. The summit between the north branch of Hay river and the east branch of Berland river is about 6,100 feet above sea-level, a height unsuitable for railway operation in that latitude, whereas the valley of the east branch of Berland river, 2 miles from this summit, is only 5,300 feet above sea-level, a drop of 600 feet, which could be negotiated only by a lengthy detour, up Little Berland river.

Farther to the northwest, along the same route, the summit between Berland river and Muskeg river is about 400 feet higher

than the Hay River summit, and the corresponding drop on the far side is also greater and more abrupt. It may, therefore, be taken as definite, that this is not a feasible railway route.

A route up the main stream of Hay river, which cuts through the second limestone range, and heads with Sulphur river, which flows into the Smoky, must also be declared impracticable on account of the high elevation of the summit. In order to find a route suitable for transportation at a reasonable cost, it would be necessary, on reaching Hay river, to turn downstream instead of up. It would not be advisable to proceed northwestward, for although it would be possible to build a line in that direction, crossing Berland river at its forks and reaching Muskeg river at the mouth of Teepee creek, there would be heavy grades both ways, so that freight operating costs would be high.

The most suitable way to extend the line to Grande Prairie and Peace River would be to continue northward, down Hay river, and turn northwestward by way of Berland lake.

Bow River and Kananaskis

For the sake of comparison, another undeveloped area of coal-bearing Kootenay formation was visited. It is on Kananaskis river, south of the main line of the Canadian Pacific railway, and its access points are 15 to 18 miles by easy grade, from the main line of that railway. Part of this area was investigated some years ago, for private interests, and one section measured on Ribbon creek, a tributary of the Kananaskis, showed an aggregate thickness of 49 feet of coal in seven seams, all over 4 feet in thickness.

Samples were obtained this season, through the kindness of Mr. John Shanks, from two seams which were being opened up by him: (a) from a $5\frac{1}{2}$-foot seam, $5\frac{1}{2}$ miles above Ribbon creek; and (b) from a 14-foot seam on Ribbon creek. The coal in these seams has diagonal jointage with slickensiding, with bedding planes almost obliterated. It will make a fairly high percentage of lump.

The assays of these samples were:

	Thickness in feet	Moisture	Ash	Volatile matter	Fixed carbon	Sulphur	B.T.U. dry basis	Fuel ratio
No. (a)	$5\frac{1}{2}$	0·8	16·3	16·1	66·8	1·17	12,960	4·15
No. (b)	14	1·7	12·6	12·6	73·1	0·5	13,220	5·79

The fuel ratio shows both these samples are in the semi-bituminous class.

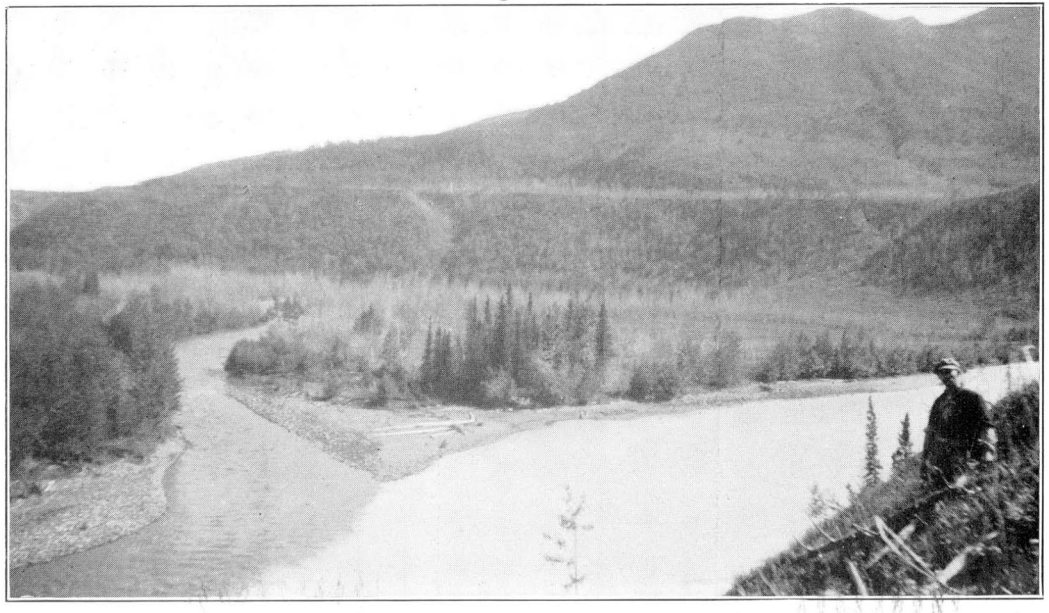
In Bow River valley and along the line of the railway, the Kootenay formation contains the most highly matured coal known in Alberta. Much of the coal is semi-anthracite, and most of the remainder is semi-bituminous. There is also an area in this valley worthy of special note. This is at Anthracite station, east of Banff, where the coal comes definitely within the anthracite classification.

The following assays taken from reports by Mr. D. B. Dowling will illustrate:

	Moisture	Ash	Volatile matter	Fixed carbon	Sulphur	B.T.U. dry basis	Fuel ratio
Cairnes gully	6·7	11·3	9·4	72·6	0·7	13,66(	7·72
Wind Mountain creek	7·4	9·2	10·2	73·2	0·9	13,78(	7·06
Old anthracite mine	.....	3·63	7·65	88·72	.....	.....	11·6
Panther creek	0·93	4·94	10·58	83·55	.....	.....	7·89

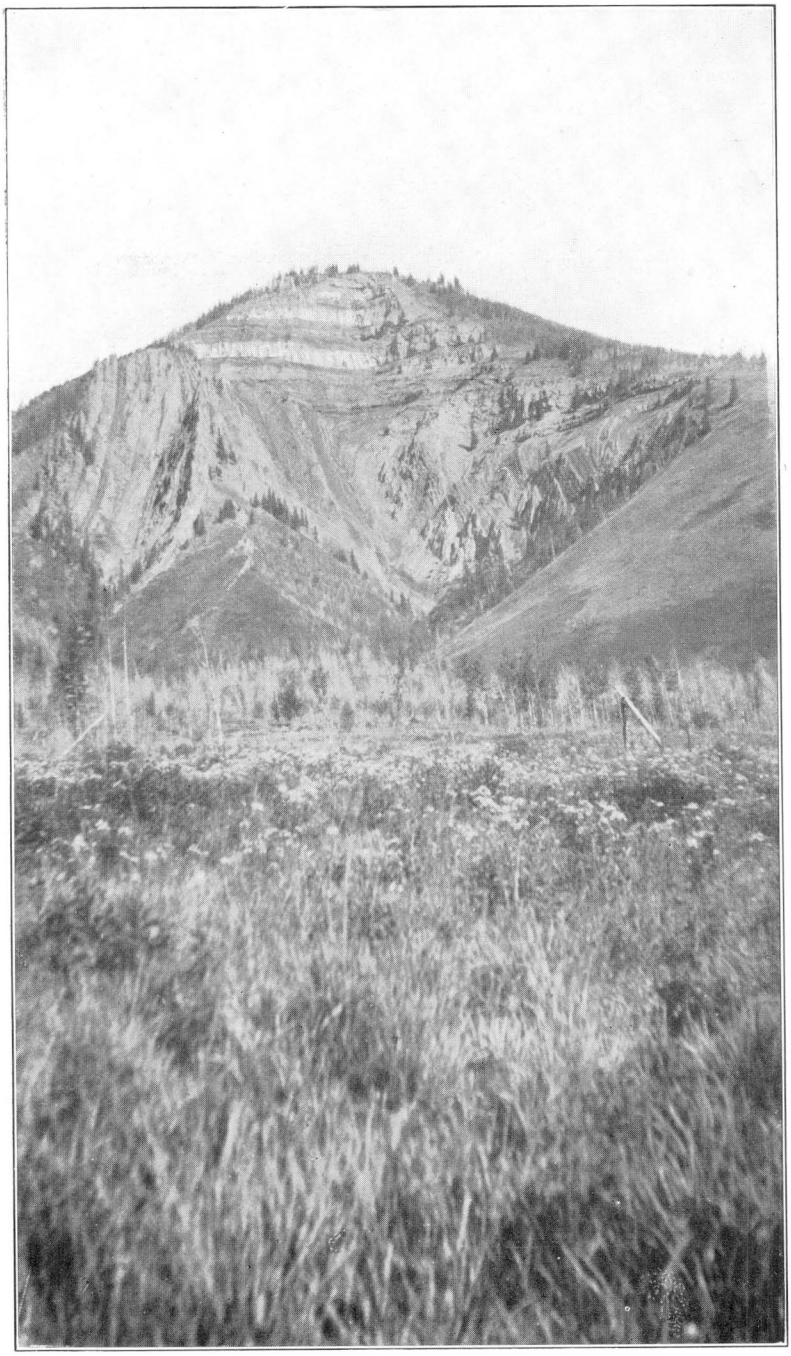
In general, these coals have a well-developed diagonal jointage, the same as that seen in anthracite when viewed in place in the mine, or when seen in large lumps, and the bedding planes are obliterated. They are, however, fairly friable or brittle, and make a good deal of fines and smaller sizes. They are non-coking, very good steam coals, excellent for furnace and stove use. Their low volatile which, in a considerable part of the area, is under 10 per cent, is a guarantee against smoke muisance, and any undue accumulation of soot. They will make a lasting fire, and give a steady uniform heat. In other words, these coals, if screened for domestic use, should satisfy even those consumers who have been accustomed to anthracite only. Excepting their higher percentage of ash, they are similar to the Welsh coals that are now filling a considerable part of the market in Canada.

PLATE II

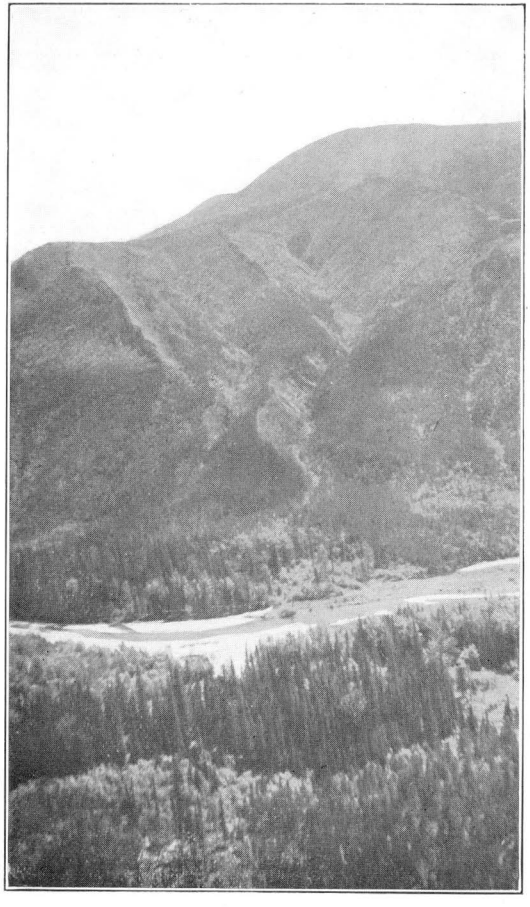


Junction of Muskeg and Smoky rivers. (Page 7)

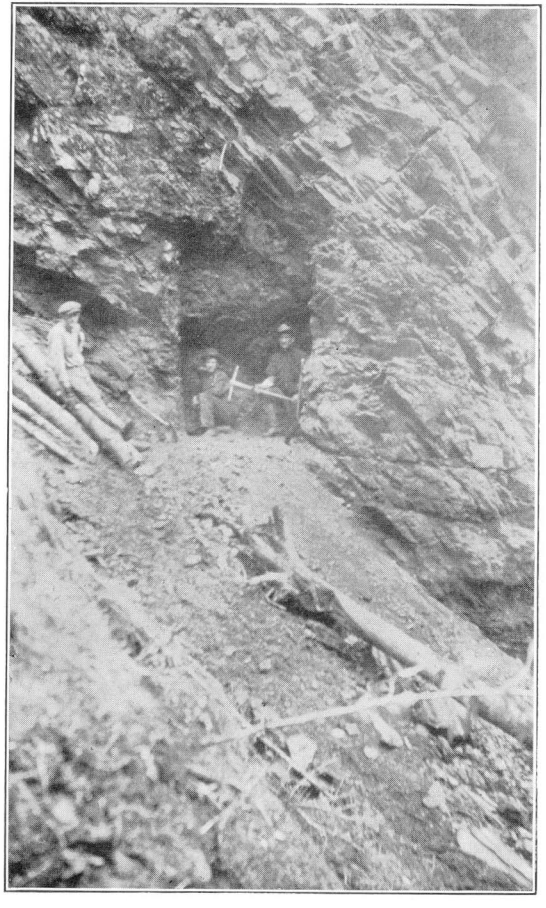
PLATE III



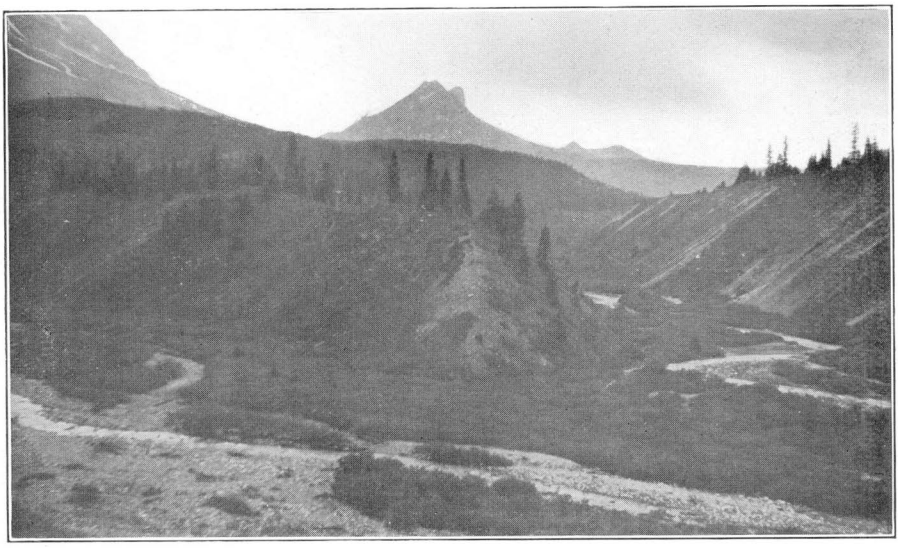
Gulch on west side of Smoky river, 1½ miles above Muskeg river. (Page 7)



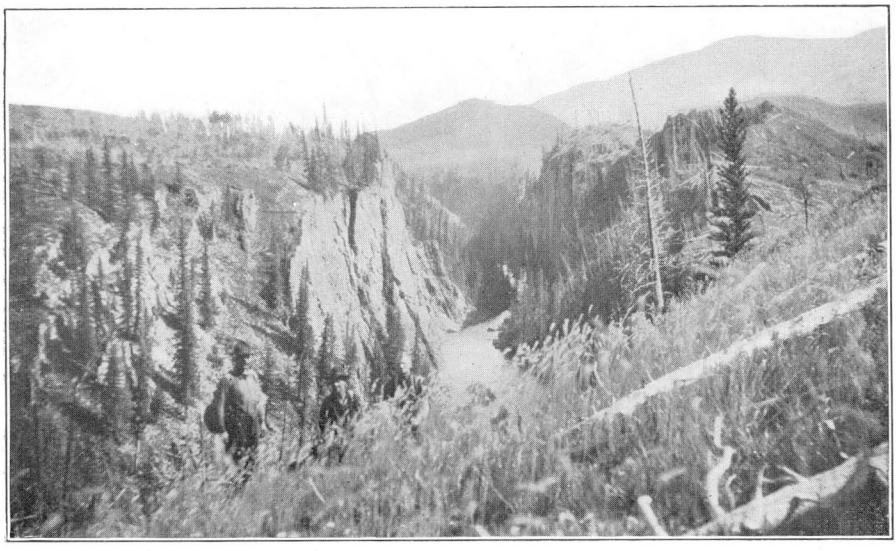
A. Looking east across Sheep river from Campbell claim. (Page 10)



B. Campbell claim, Sheep river, 14-foot seam. (Page 10)



A. Junction east branch of Berland river and Persimmon creek. (Page 14)



B. Sulphur River canyon, near mouth. (Page 15)

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