Geol. Report
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GEOLOGY AND COAL VALUATION
of
W½ Sec. 9, T. 140 N., R. 102 W., SOUTH ROOSEVELT STATE PARK, NORTH DAKOTA

by

Carroll H. Wegemann

NATIONAL PARK SERVICE
REGION II

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On October 28, 1938 the writer visited South Roosevelt State Park, North Dakota, and in company with Superintendent H. E. Hoyt examined tract #72 being the west half of Sec. 9, T. 140 N., R. 103 W., which lies about three miles northwest of the town of Medora. This tract situated on the west line of the park was purchased from Mr. J. C. Rasmussen, a director of the bank at Medora which recently failed. The title to the tract carries surface right only and does not cover the rights to the coal underlying the tract, these rights being held by the Northwestern Improvement Company.

This general area was examined in 1907 by C. D. Smith and F. H. Kay of the U. S. Geological Survey in cooperation with A. G. Leonard, at that time State Geologist. The results of this examination were published in U. S. Geological Survey Bulletin #341 on the Sentinel Butte coal field. The accompanying map (Plate 1) is reproduced from this report.

The coal bearing beds in this area are classified as the Fort Union formation of the Paleocene. They are comparatively young geologically and the coal which they contain has apparently never been subjected to great pressure and consequently retains much of its original woody character. It is classed as brown lignite. The other beds of the Fort Union consist of shale and sandstone, there being little or no limestone present. The deposits are entirely fresh water in origin and the beds almost horizontal although there is a slight dip to the northeast of about 5 feet per mile. It follows that the lower coal beds are exposed in the southwest part of the area and the higher beds in the northeast.

The brown lignites are high in volatile matter and low in fixed carbon. The heat value is low, being about 8,000 B.T.U. Because of the high volatile content, however, these coals on distillation yield a considerable amount of oil. They constitute the country's greatest potential oil reserve against the time, not many years hence, when our natural crude oil supply will be exhausted. It should be borne in mind that we have only 10 or 12 years' supply of crude oil in sight in this country. New pools will undoubtedly be discovered, but such discoveries will but postpone the time of shortage for a few years.

Lignite slacks on exposure to the air and consequently cannot be stored or shipped without considerable loss. At the present time, therefore, it supplies only local consumption and the vast amounts which are present in the Dakotas have lain practically untouched.

Unless, however, some other supply of energy is found to take the place of crude oil, these great lignite deposits will certainly be worked extensively in a comparatively few years. Coal is found in such great quantities in this region that there should be no occasion to mine beds under park lands unless the operating company does not control other lands or undertakes mining in order to obtain some compromise from the Government.

Due to their high volatile content the lignite coals in this region are subject to spontaneous combustion. Lignite once mined and piled will fire of itself and beds at their outcrop take fire in the same way when masses of coal fall from the face because of undercutting by streams. Beds are easily ignited also by lightning or prairie fires. It follows that over much of this region coal beds sufficiently near the surface to be in contact with oxygen have burned in the ground baking the overlying shales and sandstones and thus producing a red and purple slag resembling that from a brick kiln. These layers of slag lying in beds as did the coal, by the burning of which they were produced, protect the underlying soft shales from erosion and thus form red capped mesas, terraces and conical buttes, the tops of which are all on a level with each other. "The slag hills" will be remembered by every traveller in western North Dakota and eastern Montana and Wyoming.

Reference to the accompanying map (Plate 1) will show that the west half of Sec. 9, T. 140 N., R. 102 W., lies on the north side of the divide between Knutson and Andrews Creeks. The flat top of the divide is underlain by coal bed "F" which touches only the south side of the tract in question. Its outcrop is partly burned and badly weathered and as far as this appraisal is concerned, the bed may be disregarded. Bed "E" as shown in the section on the map lies about 138 feet below bed "F". Its burned outcrop may be seen in the panorama Plate 2, where it caps the pine covered terrace in the center of the picture and forms the dark line 125 feet below the upland surface at the right. The thickness of bed "E" was not measured on the tract, but is reported by Smith in the report above mentioned, to be 5 feet 6 inches in the NW¼, Sec. 11, near the mouth of Knutson Creek. Plate 2a shows this bed in the northwest of the southwest of Sec. 2, T. 140 N., R. 102 W., some 2 miles northeast of the tract in Sec. 9 and half a mile north of the outcrop measured by Smith. In the picture the upper thinner bed is bed "D" and the bed 25 feet below it bed "C". The slag from burned bed "D" caps the flat topped mesa on the skyline 135 feet above bed "D".

Due to the steep fall of Knutson Creek, bed "C" passes under the valley floor east of the west half of Sec. 9 and consequently underlies this entire half section. Bed "D" also underlies most, if not all, of this tract. Bed "D" is more variable in thickness than is bed "C" and its thickness and quality is, therefore, in question under the tract. Bed "C" however, 25 feet below bed "D" outcrops both northeast and southwest of the tract in question and can be counted on to underlie the entire tract as a valuable bed. At the outcrop of Knutson Creek, its section as reported by Smith as follows:

Section near mouth of Knutson Creek, in the NW¼ Sec. 11, T. 140 N., R. 103 W.

	Ft.	in.
Bed D: Lignite	5	6 in.
Clay, sandy	25	
Bed C: Lignite	9	
Concealed to river level	20	
Total lignite	14	6

In the northeast quarter of Sec. 20 of the same township, the bed is well exposed and measures over 6 feet of clean coal as shown on Plate 3b. The same bed is exposed in the southeast quarter of Sec. 16 of the same township and there measures 8 feet. The same bed is mined in the southwest quarter of Sec. 22 as shown in Plate 4b.

Coal bed "B" probably underlies the tract, but is not exposed near it.

Coal "A" known as the Harmon bed outcrops on the Little Missouri 10 miles south of Medora. This outcrop is shown in Plate 5a in which is also seen coal bed "B" near the top of the cliff. The Harmon bed is reported by Smith to have a section as follows:

Section of Harmon lignite one-half mile south of south boundary of Sentinel Butte field, on Little Missouri River.

	Ft.	in.
Clay, sandy		
Lignite		4
Clay, sandy		5
Lignite (with four thin shale partings)	4	3
Lignite	7	6
Lignite (with three thin shale partings)	1	
Lignite (base concealed by water)	2	6
Total lignite	15	6

In the deep well drilled by the Northern Pacific Railway Company at Medora, 23½ feet of coal was encountered 123 feet below the surface. This doubtless represents the Harmon bed. The log does not indicate how much of this thickness is pure coal. If the Harmon bed is continuous over this area as indicated by the log it underlies the west half of Sec. 9, T. 140 N., R. 102 W.

In considering the value of the above tract, if we disregard beds "E" and "D" as variable in thickness and consider only beds "A" and "C", our estimate will be extremely conservative. In bed "A" the total lignite recorded by Smith 10 miles south of Medora is 15 feet and 6 inches. In the Northern Pacific well the thickness of the entire bed is given as 23½ feet. It would seem that an estimate of 10 feet of workable lignite represents a conservative average under the west half of Sec. 9. Lignite runs about 1800 tons per acre foot, but in making its coal valuations the U. S. Geological Survey has estimated 1000 tons recoverable coal per acre foot. Applying this figure to the 160 acres in question on a thickness of 10 feet, we have 1,600,000 tons of coal under this tract in the Harmon bed alone. Considering bed "C" and assuming a thickness of 6 feet for this bed we have 960,000 tons in bed "C" under the tract in question or a total tonnage of coal in the two beds of 2,560,000 tons.

Coal now retails in Medora at from $1.50 to $2.00 per ton. Were we to give it a valuation in the ground of only one cent per ton, the value of the coal rights under the 160 acres would be $25,600 or a value of $160 per acre. The attached letter from Director W. C. Mendenhall of the U. S. Geological Survey shows that in valuing lignite lands for sale by the Government the Survey set a maximum valuation of $20 per acre. There is also attached a letter from Mr. H. H. Allport, District Mining Supervisor, Geological Survey, Federal Building, Billings, Montana in which he quotes the figure of $20 per acre unless the coal is to be mined immediately in which case a valuation of $50 per acre is placed upon it.

As to the accessibility of the west half of Sec. 9, a fair road is already built up Knutson Creek and from this valley the tract is easily accessible on the north. It is by this route ½ miles distant from the railroad and about 5½ miles from Medora. As indicated on Plate 5b, bed "C" is exposed in the NE¼ of Sec. 20 on highway #10, which lies next to the main line of the Northern Pacific Railroad and about 1½ miles from the west half of Sec. 9. The bed is also exposed across the east half of Sec. 16 and from these exposures the west half of Sec. 9 is only a half mile distant. Sec. 16 is State owned and,

therefore, protected but it is not impossible that were intensive mining undertaken in this area an opening could be made on bed "C" along the railroad in Sec. 20 and mining continued northward until the west half of Sec. 9 were reached. The tract is, therefore, fairly accessible for mining operations. Almost any coal mining in this general region would have to overcome the difficulties of transportation over rough topography for much of the coal lies in badland areas. In classification by the Geological Survey, coal lands within 15 miles of a railroad were considered accessible and given a higher value than those at a greater distance from transportation.

As to the depth at which the coal lies beneath the surface. Bed "C" outcrops at the surface and is overlain by a bed of sandstone. Conditions of mining are, therefore, excellent. Bed "A", the Harmon coal, lies about 130 feet below coal bed "C" and is, therefore, considered by the U. S. Geological Survey as within moderate mining depth. (See U. S. Geological Survey Bulletin 537, the classification of the public lands by G. O. Smith and others.)

In view of the great quantities of coal underlying the tract and the estimates of its value already made by the U. S. Geological Survey, the Park Service cannot reasonably hope to acquire the mineral rights under the property at less than $20 per acre even were condemnation proceedings inaugurated. The writer is inclined to agree in the suggestion of Project Superintendent H. S. Hoyt as expressed in his letters of May 3 and June 6, 1938, that as the tract lies on the park line and is not essential to park development, surface rights be accepted.

In view of the fact that a number of other tracts, titles to which carry surface rights only, have already been accepted within the boundaries of South Roosevelt State Park, the writer suggests that it would be wise to endeavor to make some arrangement whereby mineral rights still held by the Government under all park lands be withdrawn from sale and thus retained under Government control.

The question of price of the W½, Sec. 9, T. 140 N., R. 102 W., has been discussed in Regional Director Allen's Memorandum to the Director under date of November 4, 1938.

Carroll H. Wegemann

CHW/mmm

C O P Y

UNITED STATES
DEPARTMENT OF THE INTERIOR
Geological Survey
Washington

October 7, 1938

Mr. Thos. J. Allen, Jr.,
Regional Director, National Park Service,
300 Keeline Building,
Omaha, Nebraska.

My dear Mr. Allen:

In reply to your letter of October 1, 1938, requesting information relative to the value of lignite coal in the W½ Sec. 9, T. 140 N., R. 102 W., 5th P. M., North Dakota.

The records of the Geological Survey show that the W½ Sec. 9, T. 140 N., R. 102 W., 5th P. M., North Dakota, was classified coal land and valued at $20 an acre, the maximum for lignite under regulations then in effect, by letter of June 5, 1907, to the Commissioner of the General Land Office.

Information relative to the occurrence and character of the coal may be found in Survey Bulletin No. 451 (this should be 341e) page 16, which is now out of print and no longer available for distribution but can probably be consulted in the public library of your city.

Information relative to the current value per ton of coal in the ground in the general region involved may be available in the office of E. H. Allport, District Mining Supervisor, Geological Survey, Federal Building, Billings, Montana, or obtainable from the Assessor of Taxes, Billings County, Medora, North Dakota.

Very truly yours,

(sgnd) W. C. Mendenhall

Director

COPY

UNITED STATES
DEPARTMENT OF THE INTERIOR
Geological Survey

October 14, 1938

Mr. Donald B. Alexander
Acting Regional Director
National Park Service
Omaha, Nebraska

Dear Mr. Alexander:

With reference to your letter of October 11, no examination has been made of the land in T. 140 N., R. 102 W., 5th P. M., North Dakota, since Bulletin No. 401 (this should be 341a) has been published; and there are no tonnage figures available for this particular tract mentioned by you.

If the lignite on the land in question is to be mined immediately, the lignite in place would have a value not to exceed $80.00 an acre; that is, provided that entire extraction of the known bed could be made within the next twenty years. If it is not to be mined immediately, the value would be much lower and in no case would it exceed $30.00 per acre, which is the maximum set when the land was classified.

Very truly yours,

R. W. Allport

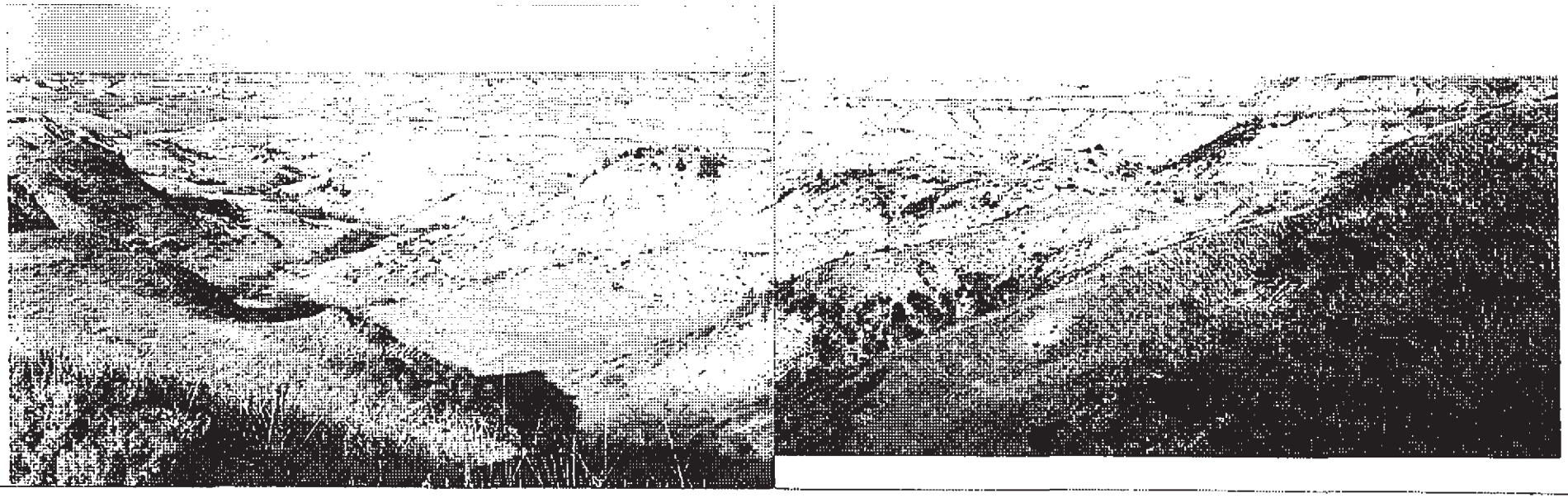

Plate 8 Looking north and east down a tributary of Knutson Creek from a point 400 feet northwest of the southwest corner of Sec. 9, T. 140 N., R. 102 W. The fence marks the west line of Sec. 9. The south line of mine is outside the picture on the right. The slag from coal Bed "F" caps the upland plain on the right. The slag of Bed "E" forms the pine covered terrace in the middle of the panorama and also the dark streak which follows around the bluffs on the right.

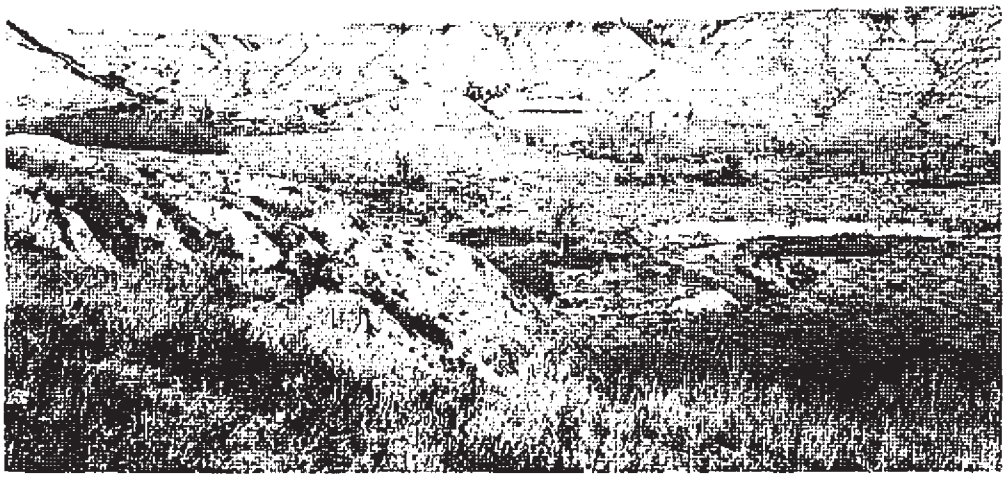

Plate 3a Bed "C" with bed "D" above it on the north side of Knutson Creek in the NW-SW Sec. 2, and one and one-half miles northeast of the west half of Sec. 9. The red slag formed by the burning of Bed "F" caps the top of the bluff. Knutson Creek flows to the right and due to the fall of the stream, Bed "C" passes below the flood plain east of the west half of Sec. 9 and consequently underlies that tract. Bed "D" underlies most if not all of the same tract.

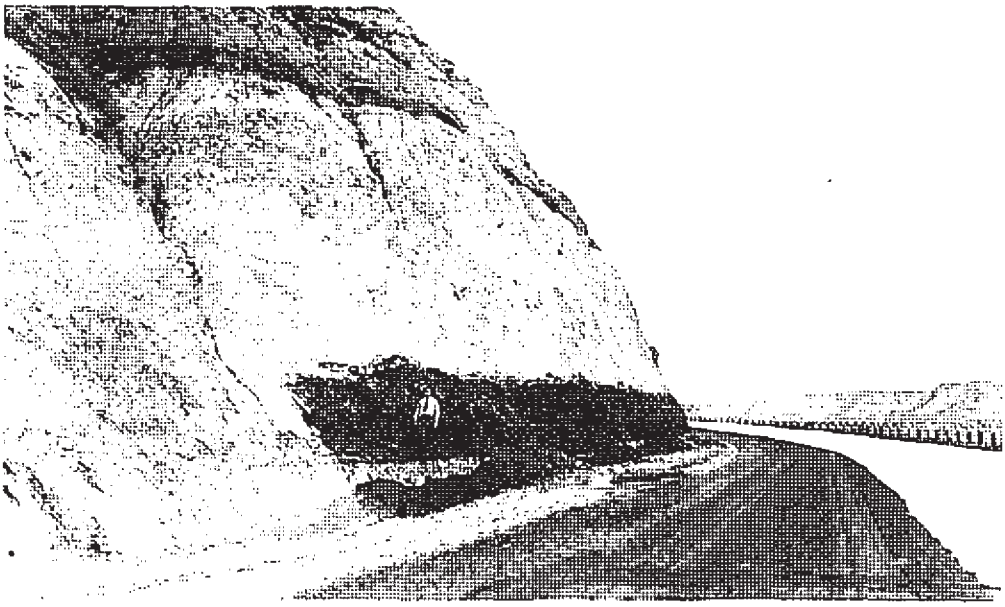

Plate 3b Coal Bed "C" exposed on highway #10 (NE¼, Sec. 20) two miles northwest of Medora and one and one-fourth miles south of the southwest corner of Sec. 9. Bed "D" appears near the top of the picture.

Plate 4a Bed "C", six feet of clean coal as exposed west of the road in the SE¼ of Sec. 13, T. 140 N., R. 102 W., about 65 feet above the level of the Little Missouri. The bed is overlain by a bed of white sandstone about 25 feet thick above which is the thinner Bed "D". For the location of this picture see Plate 5b.

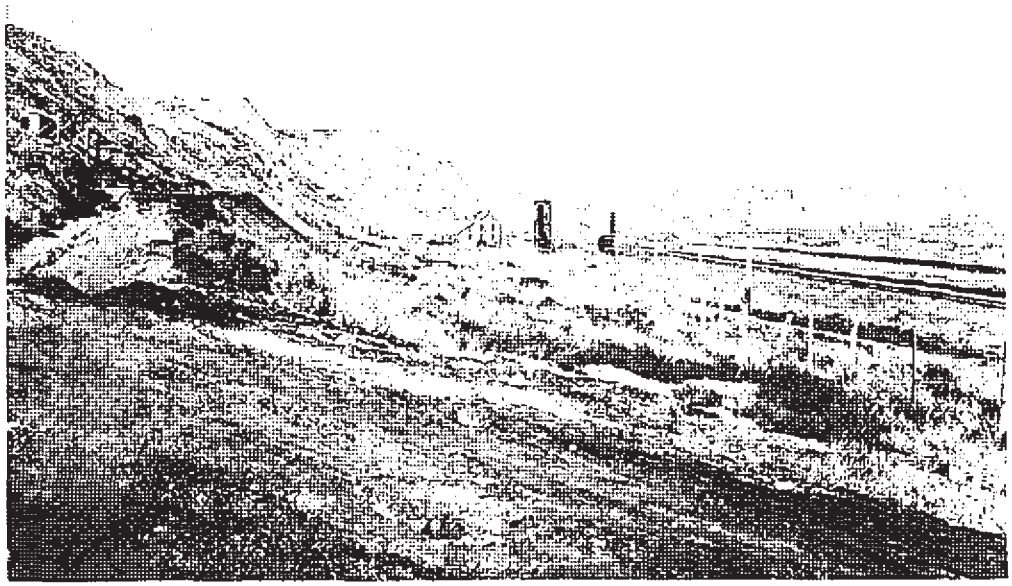

Plate 4b Coal mine on Bed "C" southwest of highway #10 and the Northern Pacific Railroad and just northwest of the river bridge west of Medora. The bed is about six feet thick. The west half of Sec. 9 lies just across the divide which forms the skyline in the distance and in line with the smoke stack. See Plate 5b.

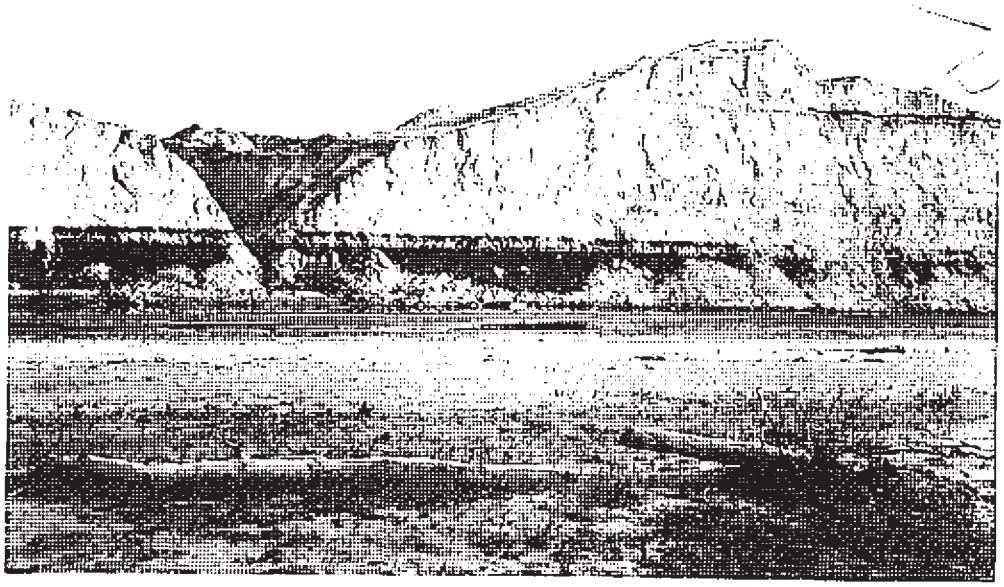

Plate 5a Bed "A", Harmon coal on the Little Missouri ten miles south of Medora. Bed "B" is seen near the top of the cliff. Bed "A" is reported by Smith to contain 15' - 6" of pure lignite at this locality, base not exposed. Coal which is apparently the same bed is reported in the Northern Pacific deep well at Medora at a depth of 125 feet with a thickness of 23' - 6". There is little doubt that Bed "A" is present under the W½, Sec. 9, T. 140 N., R. 102 W.

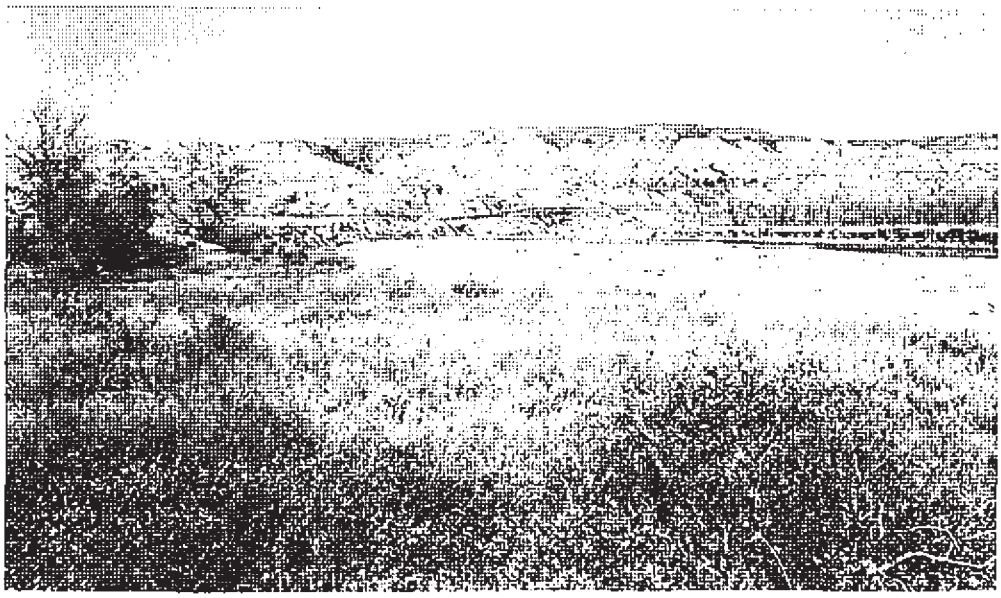

Plate 5b Looking north from the south bank of the Little Missouri in the NW¼, Sec. 22, T. 140 N., R. 102 W. The west half of Sec. 9 lies across the divide and directly over a pile of stones just visible on the skyline, one-half inch left of the center. In line with this pile of stones and just north of the road some 65 feet above the river, Bed "C" is exposed as shown in Plate 4a. That the strata are practically horizontal and that Bed "C", therefore, underlies the west half of Sec. 9 is evident from this picture.