

COAL RESOURCES OF COWLITZ RIVER VALLEY, COWLITZ AND LEWIS COUNTIES, WASHINGTON.

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INTRODUCTION.

The paper here presented contains the results of a brief investigation of the coal resources of the southern part of the Cowlitz River valley in Washington. The character of the examination was such that no adequate treatment of the stratigraphy and structure of the rocks of the area can be presented. Indeed, these could not be determined, because the surface of the region is covered by timber and the stratified rocks are concealed by lava flows or intruded by dikes and broken by faults. Therefore in this report the geology is discussed in a general way only, each prospect examined being described without an attempt to trace or correlate the coal beds.

Along Cowlitz River northward from its junction with the Columbia lies an area of coal land 30 miles long and 15 miles wide. Probably a large part of this area is not underlain by coal, but beds are exposed at so many places in the field that all of it is considered possible coal land. This field is probably continuous with that about Centralia and Chehalis, although for a few miles south from Chehalis no outcrops of coal have been found. The topography is marked by rather low, rounded hills, with streams flowing in comparatively narrow valleys. The whole region was formerly covered by forest, and, although much of it has been logged off, the surface is still strewn with material left by the rank growth. The prevailing rocks are soft sandstones, which lie approximately horizontal and which locally contain beds of coal. Fossils of Eocene age are found in the sandstones. Besides the sedimentary rocks there are a great many bodies of igneous rocks, some of which are known to be of the same age as the sedimentary beds, whereas others are of later intrusion or extrusion. For example, a few miles north of Castlerock an old lava flow, overlain by the later Eocene sediments, outcrops. Near Kelso there are several masses of rock, which cut through the sedimentary formation in the form of dikes, and on the east side the coal field is limited by later eruptive rocks, presumably of the Miocene series, which forms a large part of the Cascade Mountains farther south.

The structure of the sedimentary rocks consists of open folds, in which the dips are low. Faults do not appear on the surface, but they have been encountered in some mines, causing abandonment. The structure in this field appears to be decidedly different from that about Chehalis and Centralia. In that field the coal beds dip as high as 70°, whereas in this field the beds nowhere dip more than 25°.

The evidence of coal in this region is found in natural outcrops in prospects and in mines. The material is lignite except at a few places where it has been improved by intrusions of igneous rock. It invariably shows some woody texture, and on weathering it disintegrates into small fragments. Near the old openings are commonly found fragments of coal that consist of more or less flexible and elastic laminae and that appear to be merely fragments of wood. In one locality lignite was found which had only a slight change of color from the initial wood. In general appearance the better grades resemble the coal at Centralia and Chehalis, but contain a larger percentage of sulphur.

Some of the coal has been improved by the intrusion of igneous rock. In fact, some of the mines have produced a coal that was approximately bituminous, but such deposits are not extensive and were soon exhausted.

EXPOSURES OF COAL BEDS.

COWEMAN RIVER.

The most southern point at which coal was seen by the writer is at location 1 (Pl. XXIV), in sec. 31, T. 8 N., R. 1 W., on Coweman River, which enters the Cowlitz from the east at Kelso, Wash. Three miles above Kelso igneous rocks are exposed and are said to occur along the river for at least 16 miles. They are probably a part of the great mass of volcanic rocks which makes up the Cascade Mountains farther south in Oregon. Near the contact of the sedimentary with the igneous rocks, as exposed in the bank of the river, lies a small bed of dirty coal, about 2 feet thick, overlain by a sill of basalt. Several feet below the coal bed there is a second sill of igneous rock. The coal is affected by the heat of the igneous rock and the purer parts show a bituminous character. This bed of coal has no value on account of its impurity, but in its outcrop near the contact of the igneous rocks it gives an illustration of what may be expected in any coal bed along the extreme east side of the field.

A short distance below this locality, on the right bank of the river, there is a bluff in which three beds of coal appear, all of which, however, are too small to be of any value. A section of the rocks exposed at this point is as follows:

Section of coal beds exposed in sec. 31, T. 8 N., R. 1 W.

	Ft.	in.
Sandstone.....	20	
Coal.....	1	
Sandstone.....	3	
Coal.....	1	
Shale.....	4	
Coal.....	6	
	29	6.

An entry was driven into the river bank below this section, but at the time of the writer's visit it was not visible, probably being covered by a landslide. This entry is said to have shown a somewhat larger bed of coal than those noted, but it has been long abandoned.

NORTHEAST OF KELSO.

A short distance beyond the graveyard northeast of Kelso, at location 2 (Pl. XXIV), sec. 24, T. 8 N., R. 2 W., there is an old abandoned shaft, around which considerable coal is strewn. This shaft was sunk several years ago by some Portland capitalists, who report that they found considerable coal but that samples taken to Portland air-slacked badly. The prospect was abandoned.

ANCHOR MINE.

The Anchor mine is situated in sec. 13, T. 8 N., R. 2 W., at location 3 (Pl. XXIV), about $3\frac{1}{2}$ miles north of Kelso. Operations have been suspended for several years. Several beds of coal, the upper one apparently being the best, are exposed. Two thin beds lie near the foot of the coal chute and a larger bed, developed by two entries, about 100 feet higher, near the top of the chute. The coal bed is well exposed at the mouth of one of the entries, which descends along the dip, approximately 5° S. One bench of this bed is approximately 5 feet thick, but it contains some dirt.

About the old chute there is a quantity of coal that was mined during the last days of operation, much of it still in large pieces, but all showing the tendency of the coal to disintegrate when exposed to the weather.

It is reported around Kelso that this mine was operated for the purpose of selling stock.

COAL CREEK MINE.

The Coal Creek mine, location 4 (Pl. XXIV), sec. 27, T. 9 N., R. 3 W., mentioned by Landes,¹ is described as having the following section:

¹ Landes, Henry, Coal deposits of Washington: Ann. Rept. Washington Geol. Survey, 1902, vol. 2, 1903, p. 256.

Section of strata exposed at Coal Creek mine.

Sandstone.	Feet.
Coal.....	3
Shale.....	2
Coal.....	4
Sandstone.	9

The locality was again visited in 1904 by Diller, who collected samples which gave the following analyses:¹

Analyses of coal from Coal Creek, Wash.

	No. 6760.		No. 6761.
	Finely ground.	Coarsely ground.	Finely ground.
Moisture.....	15.24	22.22	16.26
Volatile matter.....	36.28	33.30	36.33
Fixed carbon.....	29.54	27.11	30.05
Ash.....	18.94	17.37	17.36
	100.00	100.00	100.00
Sulphur.....	4.39	4.03	4.61

NOTE.—Color of ash, light red-brown; noncoking.

The coal bed is reported by Diller to have shown at the time of his examination a thickness of 6 to 7 feet, with two small partings of sand. The upper bench had 12 to 18 inches of bony coal, the middle bench 2½ feet of coal of better quality, and the lower bench some good coal. The coal looks bright in the mine, but on exposure it loses its luster somewhat and partly slacks. A slope, with short entries on both sides, extending S. 60° W. at an angle of 8°, followed the coal downward about 400 feet. The pit cars were drawn to the surface by a small stationary engine. At the time of the writer's visit the mine had evidently been abandoned for a long time. The old bunkers were still standing but evidently had not been in use for several years and the underground workings were full of water, so that the coal bed could not be seen there. About a quarter of a mile N. 60° W. from the old workings an exposure of the bed in a small branch on the north side of Coal Creek was estimated to contain about 8 feet of coal in several benches. The coal outcrops along this small branch of Coal Creek for some distance. When exposed to the weather it breaks into thin flat flakes. Down Coal Creek, about a mile from the exposure noted above, a small coal bed dips northward immediately above a waterfall about 10 feet high over a rather hard sandstone layer. Apparently there is a coal bed also below this sandstone, but at the time of the writer's examination it was not accessible. The small coal bed above the falls is approximately 2 feet thick. At this point the sandstone contains fossils, but they are not in a good state of preservation.

¹ Bull. U. S. Geol. Survey No. 260, 1905, p. 412.

BUDD PROSPECT.

The prospect of C. L. Budd, at location 5 (Pl. XXIV), is in sec. 25, T. 9 N., R. 2 W., about 3 miles south of Castlerock, on the east side of Cowlitz River. The beds strike N. 30° W. and dip about 3° E. The section exposed is as follows:

Section of strata exposed at the Budd prospect.

	Ft.	in.
Coal.....	6	
Sandstone.....	2	
Coal.....	2	
Sandstone.....	6	
Coal.....	4	
	9	

The coal is of approximately the same character as that near Coal Creek, although it appears to contain slightly less impure matter. The outcrop could not be traced far from the opening because it is covered by a heavy growth of timber.

CARBONDALE MINE.

The Carbondale mine, location 6 (Pl. XXIV), is situated 2 miles southeast of Castlerock, near the northwest corner of sec. 24, T. 9 N., R. 2 W. It is the only mine in this district which now produces coal. The bed, which dips to the south at an angle not exceeding 5°, has been followed down the slope for a distance of approximately 1,000 feet. A few rooms have been turned off from the main slope, although most of the work has been in the nature of development and prospecting rather than the extraction of coal. The bed has about the same section throughout the length of the slope. It is approximately as follows:

Section of coal bed in Carbondale slope.

	Ft.	in.
Coal.....	2	
Clay, white.....	2	
Coal.....	2	
	4	2

The coal is of approximately the same character as that already described, but the sulphur content is higher. Citizens of Castlerock who have used the coal report that the percentage of sulphur is so high that it is a decided detriment. This mine could be put on a shipping basis at a very small cost by building a tramway to Cowlitz River, a distance of not over half a mile. It has not been able to compete with the coals mined at Chehalis and Centralia, where shipping facilities are good. It is necessary to wash the coal, in order to remove a coating of clay derived from the parting in the center of the bed. Miners report that this bed was not easy to mine on account of the woody character of the coal.

LAVELL MINE.

The Lavell mine, location 7 (Pl. XXIV), in sec. 18, T. 9 N., R. 1 W., is now abandoned. The coal bed is reported to have the following section:

Section of bed in the Lavell mine.

	Ft.	in.	to	Ft.	in.
Coal.....	3	6		4	
Clay, white, sandy.....	1			1	
Coal.....	1	3		1	3
	5	9		6	3

The mine was situated on a branch of an old logging railroad, now abandoned. It is reported that in this mine a fault was encountered, beyond which it was impossible to find the coal. The company which was operating here sunk three diamond drill holes, but, according to the report of the drill men, did not find coal. It is probably near a basalt dike, for between the mine and the river and also east of the mine are large exposures of such rocks. The coal, however, is very interesting on account of its character. Although it is of the same age as the coals which have been described, it is subbituminous, or perhaps as high as bituminous. Its improved quality is in all probability due to the effect of the igneous intrusions near it. Because the coal is especially good, efforts were made before the mine was abandoned to discover more in regard to its extent and thickness, but apparently the attempts were not successful.

IDLEMAN MINE.

The Idleman mine, location 8 (Pl. XXIV), is situated about $1\frac{1}{2}$ miles nearly due east of Castlerock, in sec. 12, T. 9 N., R. 2 W., and about 200 feet in elevation above Cowlitz River. It is developed by about 1,400 feet of entries which show that the bed dips S. 60° E. about 13° at the surface but is nearly level in depth. The bed is approximately 4 feet thick, without partings. The coal is a lignite but of a slightly better grade than that near Kelso. About half a mile west of the Idleman mine an attempt was made to mine coal some years ago. A drift was driven on a nearly horizontal bed of coal, which contains at least 2 feet of very good, clean coal. A short distance from the portal of the mine a fault or dike was encountered and the work abandoned.

RED ASH MINE.¹

The Red Ash mine, location 9 (Pl. XXIV), is situated on the hillside above Arkansas Creek, about 3 miles west of Castlerock, but it has long been abandoned, although formerly coal from it was shipped to Portland, being hauled in wagons to Cowlitz River. The bunkers are still standing, but the underground workings are inaccessible on account of water. The mine was opened by a slope with

¹ Landes, Henry, Ann. Rept. Washington Geol. Survey, 1902, vol. 2, 1903, p. 256.

a dip of approximately 20° NE. The coal bed is said to be about 6 feet thick, but has near the center a 1-foot parting, probably of sandstone. The coal seen on the dump and around the works shows a woody texture. It is said to break into cubical blocks and to be somewhat brighter and harder than the coal of the Idleman mine.

TOUTLE RIVER.

Toutle River enters the Cowlitz from the east side about 3 miles north of Castlerock. In the south bank of this river, near its mouth, the following section is exposed at location 10 (Pl. XXIV):

Section of strata exposed on the south bank of Toutle River near the mouth.

	Feet.
Sandstone.....	30
Coal (in two benches with a small parting between).....	2
Sandstone and conglomerate.....	5
	37

The character of the coal is very much like that near Castlerock.

About half a mile up Toutle River on the north side, in rocks dipping 12° NW., from 8 to 10 inches of coal is exposed in the river bank. The coal does not have a lignitic character, but breaks into columnar pieces at right angles to the bed. In 20 feet of rock exposed above the bed there are three stringers of black bony material. Below the coal there is about 3 feet of sandstone resting on harder rock containing amygdules.

FULLER PROSPECT.

About 2 miles north of Toutle River a prospect entry, location 11 (Pl. XXIV), was found so badly caved that the exact thickness of the bed could not be determined. The coal is of better quality than that near Castlerock. The bed dips N. 30° E. about 10° and presents the following section:

Section of coal bed exposed in Fuller prospect.

	Ft.	in.
Bone.....		6
Coal.....		8
Sandstone.....	1	6
Coal.....		6
	3	2

Half a mile northward from Fuller's place, in a new cut made by the Northern Pacific Railway Co. across the strike of this coal bed, the following section is exposed (location 12, Pl. XXIV):

Section of strata measured in railroad cut one-half mile north of Fuller prospect.

	Ft.	in.
Igneous rock of basaltic character, about.....	60	
Shale and sandstone, approximately.....	20	
Fuller coal bed, as noted above.....	3	2
	83	2

The outcrop of the Fuller coal bed as shown in this cut is buried under 15 feet of residuary soil. One searching the region for coal must expect to find the outcrop covered to this depth.

COALBANK RAPIDS ON TOUTLE RIVER.

About 15 miles up Toutle River from its mouth, in sec. 19, T. 10 N., R. 1 E., at location 13 (Pl. XXIV), coal is exposed on the south bank just below a very extensive outcrop of igneous rock. At this point the bed appears to be in a landslide, but about a quarter of a mile south of the river it is in place.

WALKER COAL MINE.

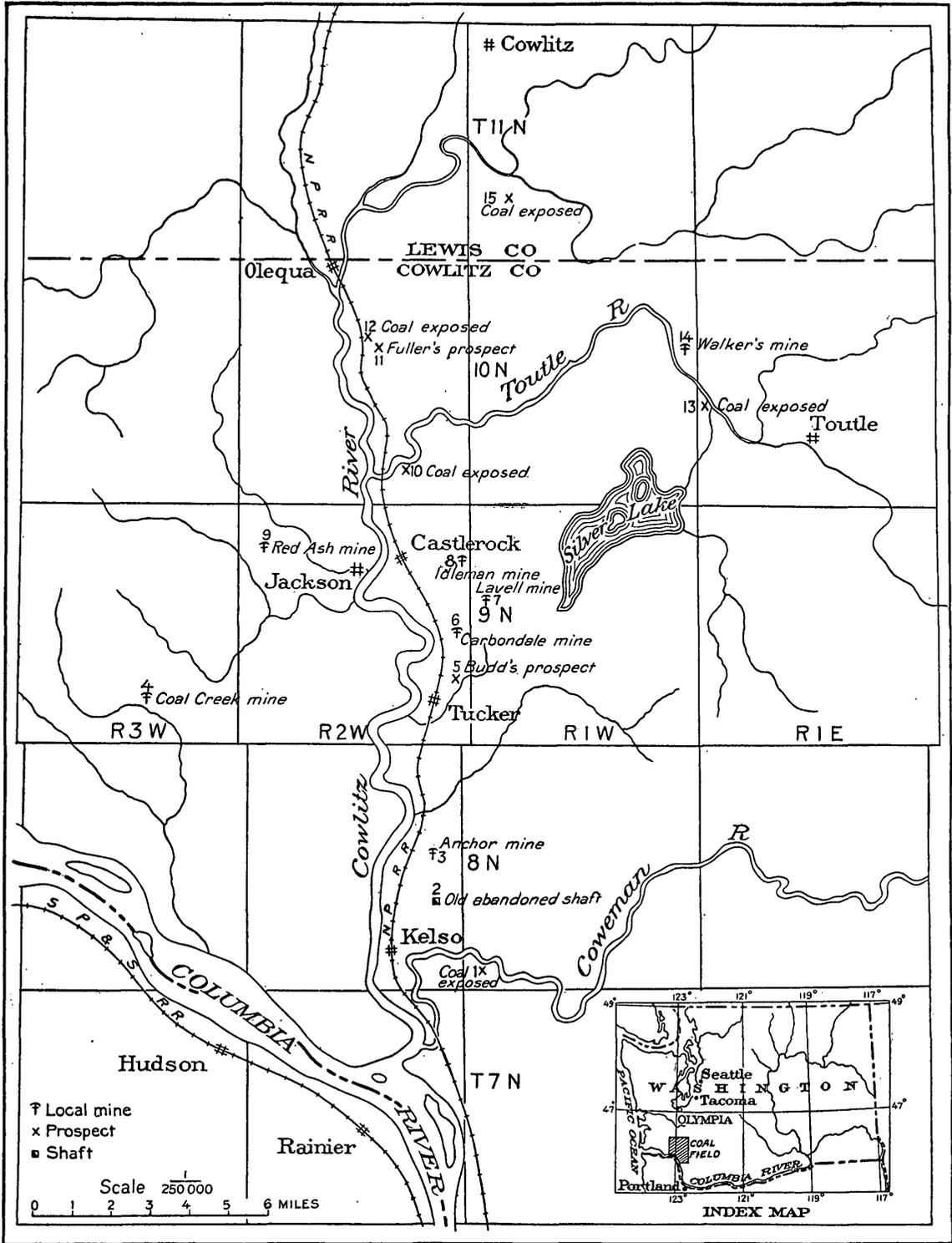
Near G. K. Walker's residence, in sec. 13, T. 10 N., R. 1 W. (location 14, Pl. XXIV), is an exposure of a very thick bed of lignite apparently but little better than peat. The bed has been prospected in two open cuts, where it shows a thickness of at least 20 feet without partings. The bed is horizontal. In the lignite there are many fragments which, though black in color, are flexible and elastic. A large quantity of this material which was piled near by took fire spontaneously and burned, leaving very little ash and indicating a fairly pure quality. The outcrop of the bed could not be traced far, but east of the opening material which resembles slag or scoria from spontaneous combustion of coal was found on the surface for a short distance.

CEDAR CREEK.

Indications of coal were found in sec. 30, T. 11 N., R. 1 W. (location 15, Pl. XXIV), on Cedar Creek, a small tributary of Salmon Creek, which flows into Cowlitz River immediately below Toledo. Along this creek the rocks lie nearly horizontal, although in some places they dip slightly. Blocks of lignite, hardly more than peat, in beds at least 4 feet thick and comparatively pure, are exposed in place. The coal is thought to be of approximately the same age and character as the coals farther south, notably at the Walker place and at Coal Rapids, on Toutle River. Notable features of this material are that it has no joint planes, is only slightly discolored, and affords specimens that are little different from wood. Such material can be bent and whittled with a knife like fragments of wood.

SOUTHWEST OF WINLOCK.

About 3 miles southwest of Winlock there is reported to be a large bed of coal 8 feet or more in thickness. Between Winlock and Chehalis coal has not been discovered, but from the nature of the rock exposed it seems probable that the coal beds are continuous between these places. In the neighborhood of Napavine, north of Winlock, the region is evidently covered to a large extent by transported materials, and outcrops of coal can not be expected.



MAP OF COWLITZ RIVER VALLEY COAL FIELD, COWLITZ AND LEWIS COUNTIES, WASH.