

APPENDIX No. 1

The deposits of the Montana group indicate marine conditions; but its inception shows shallow water along the western margin. In the east, deeper water prevailed throughout. A shallowing of the western part occurred about the middle of this period, and land conditions are there apparent. Land plants appear—preserved in coal seams. This area was again invaded by the sea, and these sandy deposits were covered by marine shales. The close of the Cretaceous is marked by an emergence from the sea; but during the periods of oscillation between land and shallow water conditions—when the surface remained near sea level—an abundant flora appears along with brackish water forms of animal life. The coal-bearing beds of this phase of the retreat of the sea have been called the Edmonton formation in northern Alberta; the St. Mary River series in southern Alberta; and the lower part of the Laramie in Saskatchewan.

Toward the close of the Laramie period the transfer of the great mass of deposits that has proceeded through Cretaceous times, began to unsettle the equilibrium of the area from which they had been derived, and the crustal movements which ended in the forcing up of the Rocky mountains, then commenced.

This movement seems to have been caused by a great lateral force shoving the crust from the southwest, and anticlinal ridges no doubt appeared, but soon developed into fault lines along which the Palæozoic floor was pushed up from the west, to form the mountain ridges. The amount of this displacement decreases in the ranges toward the east, and in the foothills brings only the middle Cretaceous beds to the surface.

The erosion of the ridges thus formed supplied much of the material found in the Miocene beds. Conglomerates of the upper portions are apparently derived from the quartzites of the mountains.

ECONOMIC GEOLOGY.

GENERAL STATEMENT.

The economic value of the rocks of the Cretaceous, exposed as they are over an enormous area, lies chiefly in their coal-bearing beds. Although mainly sea deposits there are three horizons which show land conditions and evidences of plant life, and in these beds coal seams have been found.

A marine invasion of the central part of the continent during Cretaceous time was preceded in the then existing low trough of the present Rocky Mountain area by an abundant flora, so that the early Cretaceous was coal-bearing.

These beds—known as the Kootanie series—were subsequently covered with a series of marine shales deposited by an invasion of the sea; but a shallowing of this sea over the western part also brought about land conditions again in later Cretaceous times, and vegetation spread eastward; which was in turn buried by shales in the last invasion by the sea.

This second flora is preserved in the beds of the Belly River formation, and in places forms important coal deposits.

At the close of Cretaceous times, when the continent finally emerged from this sea invasion, and while the land surface oscillated slightly at or near sea level, another mantle of vegetation covered the low ground. Coal seams were then formed, and in the rocks which succeed these coal beds, impressions of leaves, stems, and petrified wood, show an increasingly changeable climate, and probably an increasing altitude.

The last deposits of the Cretaceous and the early ones of the Tertiary form the third coal horizon, and include the Edmonton and the lower Laramie.

The three coal horizons thus found are:—

Edmonton-Laramie formations.

Belly River formation.

Kootanie formation.