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THE GRAND COULEE

In the arid section of east-central Washington, in what has long been known as the "Big Bend Country," there are many narrow but steep-walled valleys commonly called coulees. They all extend in a general direction from northeast to southwest and lie approximately parallel, with variable distances between them. All of them indicate by their appearances that they have been carved out by running water, and yet but rarely does one now find a perennial stream occupying a coulee. The streams that eroded these peculiar valleys have vanished, and clearly belong to a day when a great volume of water swept across the plateau, and wherever it was localized along linear lines, the coulees were made.

Grand Coulee is by long odds the widest and longest and deepest of all the coulees of Washington. It has a length of nearly fifty miles, extending from the south wall of the Columbia to the Quincy basin, near Soap Lake. At its northern end, it has a width of about three miles, which narrows to two miles or less in a few places. The floor of the Coulee is sunk below the neighboring plateau level for a maximum distance of 1000 feet, and at only one point is an east and west crossing of the coulee possible. At Coulee City, both the east and west walls of Grand Coulee are low and gently sloping, and with gentle gradients the Sunset Highway has an easy crossing.

The bed rock exposed in the floor and walls of Grand Coulee is all basalt, except for outcrops of granite and gneiss which are found at the northern end, near the Columbia. The basalt occurs in towering cliffs, made up of flat-lying lava flows, the central part of each sheet or bed usually composed of vertical columns standing out like huge palisades. At the foot of the more conspicuous cliffs the great piles of broken rock, or talus, formed since the making of the coulee, give a hint of the long lapse of time since the trench was last occupied by a master stream.

At the north end of Grand Coulee, its floor has an elevation

of about 550 feet above the level of the Columbia. There is a slight rise in the floor for about two miles and then a gradual descent until the old waterfalls, one and one-half miles south of Coulee City, are reached. At this point there is a perpendicular drop of 405 feet with a width along the crest of the falls of over a mile. The ancient falls had the typical horseshoe outlines, indicating that the maximum cutting power was at points of maximum water and swiftest erosion. At the foot of the falls there are characteristic pot holes or depressions made by the sheer force of the falling water in conjunction with the abrasive action of boulders carried about in the great whirlpools.

Below the falls the coulee takes on a truly canyon-like character. How far the ancient waterfall receded is a matter of debate. The question as to where the waterfall actually began must be determined before the amount of recession in miles can be known. The coulee today, below the falls, is occupied by a chain of small lakes, some fresh and some alkali.

It has been determined by Bretz and others that the coulees noted above owe their origin to two or more glaciers of the continental type that swept down from the north and stopped in large irregular lobes about the general latitude of Spokane. The two ice advances best known have been designated as the Spokane and the Wisconsin, the former being the older, and with a considerable time interval between the two. The ice of the Spokane glaciation advanced southward to the northern ends of the coulees, and the latter were produced by the enormous streams that were necessary to carry away the great volume of water produced by the melting ice. The continental glacier remained more or less stationary in position for a sufficient length of time for the coulees to be fashioned much as we now find them. When the ice front finally receded to the northward, the discharge of glacial waters was by way of the Columbia, and the coulees ceased to be active stream channels.

Grand Coulee, according to Bretz, was almost wholly excavated by the waters flowing away from the melting front of the Spokane ice sheet. From a good many miles along the ice margin the drainage aggregated and, uniting in one master stream, carved out Grand Coulee to its present approximate size. The stream at its best was two or three miles wide, and very deep. It had a sufficient gradient to erode the basalt with great rapidity, and accomplish its results in a very brief space of time when measured

by geological standards. When this great mass of water tumbled over the perpendicular wall of 405 feet, near the present site of Coulee City, it made a cataract rarely or never equaled in the earth's history.

When the continental ice mass of the Wisconsin epoch arrived, its maximum outline was somewhat different from that of the Spokane advance. The drainage from the Wisconsin ice seems not to have affected the easternmost coulees, but only those farther west. In Grand Coulee the drainage line was already established, and the amount of cutting far less than in the Spokane glacial epoch. The great waterfall came into existence again, with a consequent recession which has not been definitely determined. When the Wisconsin ice front receded to a position north of the Columbia, all of the glacial waters went down that stream, and once more Grand Coulee became waterless, except for a few small and isolated lakes or ponds along its floor.

Since the making of the series of coulees, by the drainage waters of the continental glaciers, but little has happened to modify them in any way. The dust storms characteristic of the country have made shallow deposits of wind-blown soil over their floors. Occasionally during the spring run-off, following the rapid melting of the snow, small streams may be in existence for a few days. Small lakes of shallow depths characterize most of the coulees, and around these ponds a scant vegetation grows. The surroundings are yet sufficiently untamed by man for the coulees to be the favorite haunts of many species of wild fowl as well as the last rendezvous for the four-footed animals indigenous to the country.

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