

The Fort Union group (first examined by Hayden in 1860) also was placed in this connection by Meek, on the ground of its fresh-water shells and lignite. The group was estimated by Hayden to have a thickness of 2000'. He reported it (1871) as extending southward from Fort Union, across the Yellowstone between the Black Hills and Big Horn Mountains, and northward into British America; but the conclusions were not based on a full study of the region. The 150 feet of deposits exposed near Fort Union include three beds of impure "lignite," 1', 1.5', and 4 inches thick, alternating with beds of indurated clay and clayey sands, 20' to 70' thick containing occasionally land shells and some leaves. The age of the Fort Union beds has remained doubtful. Newberry (1890) separated it from the Laramie on the ground of differences in the plants; L. F. Ward refers it on the same ground to the Upper Laramie.

The beds in Middle Park, Col., referred to the Denver horizon by Cross, consist largely of andesytic breccia, sand-beds and conglomerates, and are 800'-900' in thickness (Marvine). They rest on upturned Cretaceous strata.

Underneath the Fort Pierre group in the *Belly River* district, Canada, fresh-water beds occur containing fossil leaves, which have been called the *Belly River group*. The plants are in part identical with the Laramie (Dawson, 1886). The Dunvegan beds, on Peace River, are supposed to be of the same age. A large area has been referred to the Laramie in British America extending from the United States boundary to the 55th parallel, and eastward to 111° W.; in it have been recognized a Lower Laramie or St. Mary River series; a Middle, the Willow Creek beds; an Upper, or Porcupine Hills beds, which correspond in fossils to the Souris River beds, just north of the United States boundary. A more eastern area extends from 49° N. to 51° N., between 102° and 109° W.

In Manitoba, Central North America, the Cretaceous formation is nearly 2000' thick; and the Montana group contains in its lower part many Rhizopod shells with some Radiolarians. The thickness of the Dakota beds in this region is 13' to 200'; of the Colorado beds, 200' to 700'; and of the Montana, over 1000'. The Cretaceous rests unconformably on the Devonian (J. B. Tyrrell, 1892). Fossil plants from Laramie beds in the Mackenzie River have been described by Dawson (1882 to 1889) and identified with others from Alaska.

### *Pacific Border.*

On the Pacific Border, the Upper Cretaceous, or the Chico beds, occupies a broad belt extending originally from Lower California northward beyond the Queen Charlotte Islands. It formerly covered the region of the Coast and Cascade ranges, reaching the western base of the Sierra Nevada in California, and of the Blue Mountains in Oregon. Its eastern limit is indicated upon the map on page 813.

The Upper Cretaceous of California includes only the Chico beds of the Shasta-Chico series. The Tejon, which Gabb considered Cretaceous, has been shown by Conrad, Heilprin, and White to be Eocene. The Wallala beds of White and Becker (1885), according to Dall and Fairbanks (1893), are only a phase of the Chico. The Chico beds are exposed upon both sides of the Sacramento valley. Thence they extend southward near the coast to Lower California, according to Lindgren and Fairbanks, and northward, with local interruptions, to Jacksonville, and Riddles, Oregon; and beneath the covering of later lavas they are supposed to connect with the Chico of eastern Oregon (Diller). The lower portion of the Chico beds consists chiefly of sandstone and conglomerate, and ranges from 900' to 1400' in thickness. In the upper portion shale predominates, excepting near the shore line where the sediments are generally coarse. The greatest thickness of the Chico, according to Diller, is nearly 4000' in Tehama County, Cal.; it thins out northward and