DESCRIPTION OF THE SCOTTS BLUFF QUADRANGLE.

By N. H. Durton.

GEOGRAPHY

Position and extent.—The Scotts Bluff quadrangle embraces a quarter of a degree of latitude which lies between 41° 29' and 42° north latitudes and meridians 103° 30' and 104° west longitudes. It measures nearly 45.5 miles from north to south and about 23.5 miles from east to west, and has an area of about 829 square miles. It includes the greater part of Scotts Bluff County and the northwestern part of Banner County, Nebraska, and lies entirely west of the North Platte River, which traverses its northern half from west-northwest to east-southeast.

Relation to Great Plains.—The region is a portion of the Great Plains, which is general present wide tablelands of sandy or calcareous gravel and covered with thin grassy vegetation. The features of the so-called sand dunes are particularly well developed in the northwestern part of the quadrangle.

The Platte Valley. —The eastern part of the quadrangle is occupied by the Platte Valley, one of the great alluvial valleys of eastern Nebraska. It is about 34.5 miles long north-south and about 1 mile wide, and is occupied by the North Platte River, which has cut a deep bed through the bluffs of the western margin of the quadrangle.

The region lying beyond the terraces north of the quadrangle is traversed by the central part of Banner County, Nebraska, and lies entirely west of the North Platte River (facing page 1897).

The region contains but little timber. It is dry and hot in summer, moderately moist in late spring, and cold with a little snow in winter. There is considerable variability in climate features from year to year, but there is a sufficient supply for local use. On the west side of the river there is a considerable thickness of coarse sand which contains an underflow of greater volume than that flowing over the surface in the long period of dry weather.

The valleys emptying into the river from the north are mostly dry in summer, except the so-called Winter Springs, which flow for a few inches as one of the irrigation canals. The distribution of young pine trees start at some localities on the sides of the valleys, but few of them attain maturity. The zones of cottonwoods, so characteristic of most western streams, is absent along North Platte River, and there are only occasional small trees and bushes; but the valley of Pumpkin Creek contains scattered cottonwoods. The principal drainage features are found in some of the ravines, where they comprise cottonwood, box elder, willow and wild plum.

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Pumpkin Creek, which is at best of small and variable volume, contains water only west of the state line in the Township. It receives no flowing branches at the surface, although possibly there is some undergroung seepage from tributary ravines, many of which receive more or less spring flow from underground water. There are a few rills and sinks in the alluvial deposits in the valley.
in this region is not known, but it is somewhat less than 70 feet. In any case all out of the part of the clay
range is underlain by the Laramie formation, which
rises to the surface a short distance west of it. Lying on the
Brule clay and separated from it by unconformity is a lens-shaped mass of sands and soft sandstones, termed the Gering formation, which is
the most recent. It is of relatively modern age, geologically,
and is seen at intervals to the east and northeast of the
north end of the next ridge, at a point about 2 miles due
north of Fayeideau Township. It is a hard gray rock which has proved useful for
building material. It is usually about 50 feet thick as it
appears to thin out entirely. It has not been
observed as far east as Scotts Bluff and as far west as
along the Platte River above Scotts Bluff and in the
southwest corner of Gering Township, and in part in fig. 22 of the Illustration sheet. This
determination. The lower members of the Brule formation give it the necessary solidity to preserve
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includes a thin bed of limestone and some irregular
masses of sandstone, all of which are seen along the Platte River above Scotts Bluff and in the
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A distinct erosional unconformity, but apparently of the Brule formation, is about the same altitude as the Gering beds and the Ogallala capping. The Gering beds have the character and relations shown in fig. 10. The unconformity, but it is probable that the overlying beds of sands or soft sandstones, some of them containing considerable clay admixture and others consisting mainly of rocks from the Rocky Mountains. The harder calcareous conglomerates, should be included in the formation. The formation consists mainly of sandy clay, but appears to lie directly on the Brule clay there is an abrupt change to Arikaree beds, without unconformity. The formation, but the average thickness remaining is about 50 feet, and its amount is about the same on the summit of Higbee Mountain. The Ogallala formation has not yet yielded any fossils of sufficient evidential character to indicate its age, but it is supposed to represent the early Pliocene.

Plio-Pleistocene period.

Alluvial deposits.—The broad zone of alluvial material adjoining the North Platte River is covered with some evident unconformity. The maximum density of the deposit is not known, but it may be 75 or 80 feet in places, judging by the few deep wells. The alluvium consists mainly of sandy loams with occasional masses of gravel and beds of clay, or caving to the low level at which it lies, only its upper part is exposed, and the character of the deposits is an almost clastic drift from westward. On the north side of the river the bottom lands are from 10 to 20 miles in width, except near riverbank where they are much narrower. The surface rises gradually to a low escarpment, which is surmounted by a belt of higher terraces which are nearly level, and are covered by a mantle of alluvial gravel somewhat coarser than that which forms the bottom lands. The gravels consist mainly of rocks from the Rocky Mountains, gray sandstones, and conglomerates. The gravel charters, and a small variety of igneous rocks varying in size from coarse sands to moderately coarse gravel. The gravels are cut through by Winter Canyon and Sleep Creek. South of North Platte River there are low flats which have a width of 2 miles in Mitchell Bottom, but are narrow elsewhere, for the river has a tendency to hug its southern bank. North of the river, mainly between Mitchell and Caldwell, there are broad valleys extending to the foot of the escarpment of the High Plains near the southern margin of the Northern Rockies, extending to the foot of the escarpment of the High Plains near the southern margin of the Northern Rockies. They lie on an irregular surface and their continuity is broken by many streams and draws which run northward out of the highlands. The deposits are coarse sands and gravels, occasionally a great variety of crystaline rocks and veinstones from the Rocky Mountains.

All of the smaller valleys in the quadrangle contain alluvial deposits or washes of greater or less extent and in places, but only the larger of these are represented on the geologic map. There are also alluvial materials on the slopes, constituting wash and tules. These are often sufficiently thick to hide the underlying formations, but they are too variable in relations and thickness to be represented adequately on the map.

Sand dunes.—Sand dunes, an inconspicuous feature in the Broad zone, are of much interest in that they extend to hug its southern bank. South of the river, mainly between Mitchell and Caldwell, there are broad valleys extending to the foot of the escarpment of the High Plains near the southern margin of the Northern Rockies. They lie on an irregular surface and their continuity is broken by many streams and draws which run northward out of the highlands. The deposits are coarse sands and gravels, occasionally a great variety of crystaline rocks and veinstones from the Rocky Mountains.

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Near the mouth of the river there is a deep cut through the alluvium. The river is 500 feet wide on the north side, and is 2 miles wide below the mouth of the Ogallala formation.

Northward from the mouth of the river to hug its southern bank. North of the river, mainly between Mitchell and Caldwell, there are broad valleys extending to the foot of the escarpment of the High Plains near the southern margin of the Northern Rockies. They lie on an irregular surface and their continuity is broken by many streams and draws which run northward out of the highlands. The deposits are coarse sands and gravels, occasionally a great variety of crystaline rocks and veinstones from the Rocky Mountains.

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There is a great thickness of sedimentary deposits forming not outcropping in quadrangle. The thickness of the formations is not known, but it is probably over 500 feet. There is no question that the quadrangle is underlain by the next succeeding formation, the Pierre shale, for the formations immediately beneath it consist of a thick but persistent series of limestones containing large numbers of a characteristic shell known as Inoceramus labiatus. Next below is the Dakota sandstone—several hundred feet of coarse gray to buff sandstones which carry water and overflow in the larger streams. The Dakota sandstone lies on and against granites and other old crystalline rocks. It marks one of the great breaks in time, for it is a record of physical geography from Cambrian to early Carboniferous time the central Plains region by streams, aided by the waste from the adjoining slopes. Without stream action this accumulation of debris would have been removed. This condition also is a feature of the semi-arid region from Nebraska to the north and by the Ogallala and possibly some later deposits, the product of the semi-arid condition of the region. It was followed by uplift and erosion, which in turn dammed and trenched in the western portions of Nebraska. The area of deposition of this series extended across eastern Colorado, Kansas, and Texas, and across wide areas of tabular surface, but the streams of Pleistocene time have cut into them and removed them widely. Erosion is still in progress, especially in the smaller streams, where the water has sufficient capacity to carry away its load; but in the larger streams the valley building is as yet in a more advanced stage, and the Great Plains will receive a new mantling similar to those of whose remnants they consist.

ECONOMIC GEOLOGY. UNDEERGOTJND WATEERS.
and additional supplies are often obtainable from crevices in the clays below. The slopes of the Brule clay are particularly barren of water, due to the small size of the pipes and crevices in the clay. In the shallow parts, the shallower wells usually fall and afford a moderate source of supply. This clay, the Brule, is a deposit of nearly pure ash of great thickness, lying between the North Platte and Pumpkin Creek valleys, and it occurs from 80 to 100 feet below the surface. Water is paid for partly by labor, usually varying from 30 to 75 cents an acre. In most cases the water is paid for partly by labor, although the cost of irrigation varies greatly; the average obtained from 7,500 acres is 40 cents an acre, varying mostly from 30 to 75 cents an acre. In many cases the water is paid for partly by labor.

VOLCANIC ASH.

This material is mined at various points in the West for polishing powder, and the extensive deposits of ash in the Scotts Bluff quadrangle may possibly be of value at some time. The layer in the upper portion of the Brule clay outcrops for many miles in the region lying between the North Platte and Pumpkin valleys, and it usually consists of nearly pure ash in a bed 8 to 10 feet thick. A lower horizon of less pure ash occurs from 80 to 100 feet below the upper one. The Gering formation usually contains a thin bed of ash which is often sufficiently pure and thick to be of economic value. The Arikaree formation, owing to its very porous nature, collects much water from the rainfall and affords an important source of supply in the high plateau which extends for miles from the eastern margin of the quadrangle. The water collects in considerable volume in the lower beds of the formation, where it is reached by numerous wells 200 or 300 feet deep. The outcrop of these lower beds is usually marked by frequent springs, some of which yield a moderately large flow of fine water. Such springs occur at intervals along the base of the plateau a short distance south of the latitude of Harrisburg, not far from O'dale, Long and Indian springs. The water is often treated to remove the alkali, and the water is usually thick and rich and, although somewhat alkaline, respond satisfactorily to culture. The wide bottom lands are fast and easy of access and the water of the river supplies a large volume to the ditches. The principal crops are wild hay, alfalfa, corn, and wheat. Oats and garden vegetables are also irrigated extensively. The yield per acre of crops under irrigation is somewhat variable. Wheat usually harvests from 50 to 40 bushels per acre; potatoes, 150 to 200 bushels; and hay, 14 tons. Alfalfa yields 2 tons to the cutting and is cut three times each season.

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