

COLUMNAR SECTION

GENERALIZED SECTION FOR THE NEWCASTLE QUADRANGLE.
SCALE: 1 INCH = 500 FEET.

SYSTEM.	FORMATION NAME.	SYMBOL.	THICKNESS IN FEET.	COLUMNAR SECTION.	DEPTH BELOW TOP OF PIERRE SHALE.	CHARACTER OF ROCKS.	CHARACTER OF TOPOGRAPHY AND SOILS.		
QUATERNARY	Alluvium.	Qal	20-25			Sands, gravels, and loams.	Flats and lower terraces along streams. Good soil.		
	Older terrace deposits.	Qt	5-25			Gravels and loams.	High terraces, deeply dissected.		
CRETACEOUS	Laramie formation.	Kl	800+				Massive, soft, buff sandstone with concretions and carbonaceous shales.	Rolling plains, with buttes capped by sandstone, and low cliffs. Thin sandy soils.	
					Fox Hills formation.	Kfh	75-150	Water. 0	Thin, hard sandstone in sandy shale, and soft clayey sandstone below.
	Pierre shale.	Kp	1250		200		Principal horizon of limestone lenses, giving rise to "tepee buttes."	Small sharp hills, "tepee buttes."	
					400				
					600		Dark gray shale or clay with concretions containing many fossils.	Wide plains with shallow valleys and low ridges. Soil thin, clayey, and not very fertile. Supports fair growth of grass.	
					800				
	Niobrara formation.	Kn	200		1200		Gray calcareous shale and impure chalk, which weathers bright yellow, containing many <i>Ostrea congesta</i> near the top.	Valleys or flats. Fertile soil.	
	Carlile formation.	Kcr	700		1400		Light colored shale with large oval concretions.		
					1600		Gray shale.		
					1800		Gray sandy shale.	Low rocky ridges and bare shale slopes.	
	Greenhorn limestone.	Kg	50		2000		Dark shale with thin beds of brown sandstone.		
					2200		Thin-bedded, hard, gray limestone filled with <i>Inoceramus labiatus</i> .	Small bare ridges.	
	Graneros formation.	Kgs	1000		2400		Dark shale.	Wide valleys. Thin sterile soil, except where covered by alluvium. Some trees on its lower beds.	
					2600				
2800					Hard, light-colored sandy shale.	Prominent ridges.			
3000					Buff to gray sandstone; "oil sand." Dark shale with hard oval concretions.	Narrow valleys and bare shale slopes.			
Dakota sandstone.	Kd	50-100	3200		Gray to buff sandstone, mostly very massive; weathers reddish brown.	Canyons and high cliffs with rocky slopes. Thin sandy soil.			
Fuson formation.	Kf	15-30	Water.		Gray to red shales with thin sandstones.	Steep slopes below cliffs of Dakota sandstone.			
Lakota sandstone.	Klk	150-200	Water.	3400	Massive, cross bedded, coarse, gray to buff sandstone with local coal beds and conglomerate.	Canyons and wooded rocky ridges. Thin sandy soil.			
Morrison shale.	Km	150	Water.	3600	Massive sandy shale and fine-grained sandstone of gray, buff, pale-green, and maroon tints.	Steep slopes below cliffs of Lakota sandstone.			
UNCONFORMITY									
JURASSIC	Sundance formation.	Jsd	350	3800		Greenish-gray shale with thin limestone layers.	Slopes, mostly bare of soil.		
	UNCONFORMITY								
TRIASSIC ?	Spearfish formation. ("Red Beds.")	Ts	500	Water.	4000	Reddish sandy shale. Massive buff sandstone. Dark gray shale.	Wide valley. Sterile soil except where covered by alluvium.		
CARBONIFEROUS	Minnekahta limestone.	Cmk	40			Thin-bedded gray limestone.	Bare rocky slopes and cliffs along canyons.		
	Opeche formation.	Co	75			Red sandy shale and red sandstone.	Steep slopes beneath cliffs of Minnekahta limestone.		
	Minnelusa sandstone.	Cml	600+			Hard white sandstone including brecciated red sandstone.	Rocky slopes and rolling mountain summits.		
						Buff and gray limy sandstone.	Sandy soil, mostly covered by forest.		
	Pahasa limestone.	Cp	700+			Red shale with oval concretions. Massive light-gray limestone.	Canyon walls.		
MISSISSIPPIAN									
				Water.					

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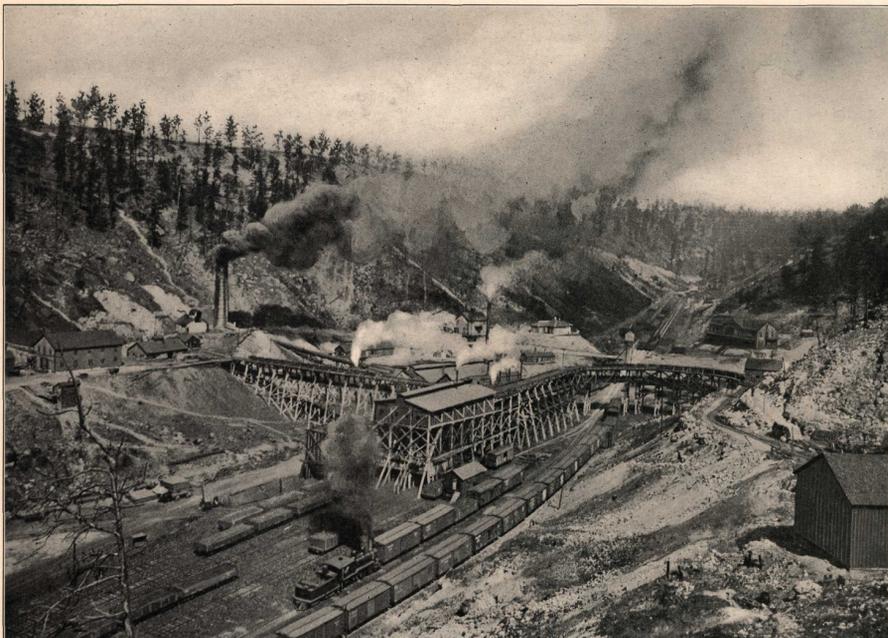


FIG. 7.—CAMBRIA COAL MINE.

The coal bed, which is near the base of the Lakota sandstone, is mined from tunnels extending under the plateau on both sides of the valley shown in this view.



FIG. 8.—WEST SLOPE OF BLACK HILLS ON THE EAST SIDE OF STOCKADE BEAVER VALLEY, EAST OF NEWCASTLE, LOOKING SOUTH.

Shows horizontal Minnekahta limestone in the foreground, sharply upturned along the root of the mountain and underlain by Opeche red shale and steeply dipping Minnelusa sandstone on the mountain side.



FIG. 9.—SPEARFISH, SUNDANCE, AND MORRISON FORMATIONS, WEST SIDE OF STOCKADE BEAVER VALLEY, EAST OF NEWCASTLE.

The lower hard, white bed is gypsum at top of Spearfish formation. The massive bed in middle of slope is sandstone in Sundance formation.



FIG. 10.—LARAMIE FORMATION, 15 MILES SOUTHWEST OF NEWCASTLE.

Showing oval concretions of harder sandstone exposed by weathering.



FIG. 11.—SMALL HOGBACK RIDGES AT RESERVOIR SOUTHWEST OF CLIFTON SIDING.

The ridge at the left is sandstone in the Carlile formation. The Greenhorn limestone forms the ridge opposite the dam.



FIG. 12.—CHARACTERISTIC FOSSILS OF NIOBRARA FORMATION (A) AND GREENHORN LIMESTONE (B), IMPORTANT GUIDES IN WELL BORING.

A, *Ostrea congesta*; B, *Inoceramus labiatus*.



FIG. 13.—TYPICAL CLIFFS AND TALUS OF MASSIVE DAKOTA SANDSTONE ON NORTH SIDE OF GORGE OF SALT CREEK, EAST OF NEWCASTLE.