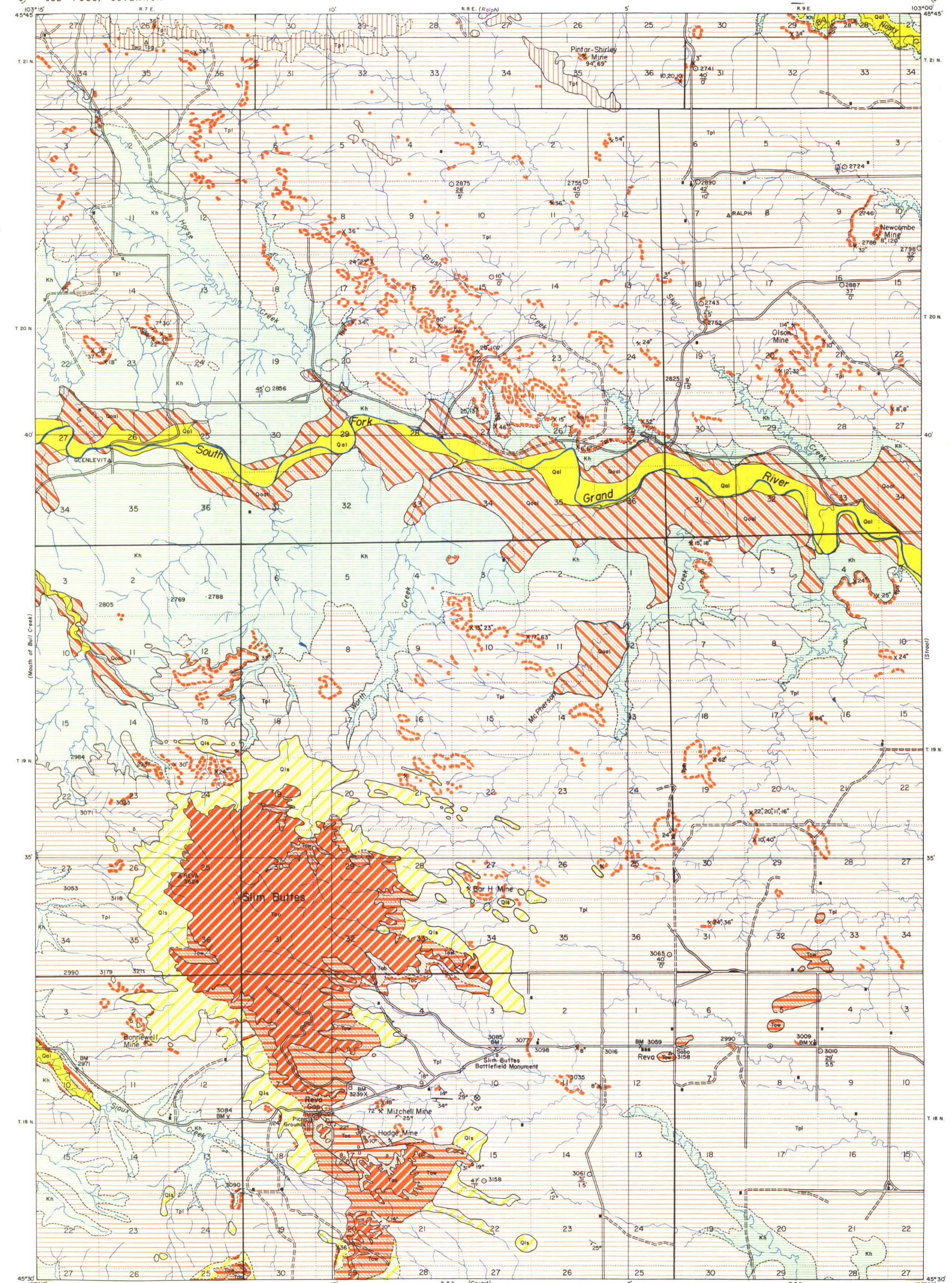


# AREAL GEOLOGY OF THE REVA QUADRANGLE

STATE GEOLOGICAL SURVEY  
E. P. ROTHROCK, STATE GEOLOGIST

STATE OF SOUTH DAKOTA  
JOE FOSS, GOVERNOR

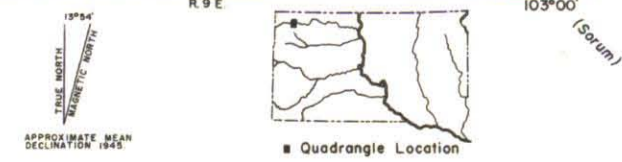


### EXPLANATION SEDIMENTARY ROCKS

- Qal**  
Alluvium  
(Floodplain or valley bottom deposits of clay, silt, and sand in present stream.)
- Qls**  
Landslides  
(Landslide, slump, and cover in material composed of Aniakchik-Ogallala and White River sediments. Topography resembles in part collapsed drift, boulder stream moraine topography, domed valleys.)
- Qol**  
Older Alluvium  
(High floodplain deposits, cut through by present meandering streams.)
- Qol(t)**  
Aniakchik-Ogallala (t)  
(Massive and bedded sandstone with volcanic ash, local limestone, and calcareous sandstone, large and small cross bedding, coarse sandstones common and local conglomerate of the lower Forts Pierre rock and mass of Slim Buttes. Outcrop is usually a vertical cliff. Thickness 260 feet.)
- Qol**  
White River  
Undifferentiated  
(Massive pink clay, white, pale green, pale buff well bedded sandstones, local limestone conglomerate, pale brown clays. White River is undivided where graded over or obscured by landslides. Thickness of least 300 feet.)
- Qol**  
Brule Formation  
(Massive pink clay, pale green to white, generally calcareous well bedded sandstones alternating with clay. Dips south-west 22° in Reva area where it is 73 feet thick.)
- Qol**  
Chadron Formation  
(Very pale brown bentonitic, hard clay with local limestone lenses. Massive dazzling white sandstone with cross-bedded conglomerate, hard bentonitic alternating clay and sandstone with golden yellow limonite staining. Thickness 160 feet. Lies on the Ludlow formation in Slim Buttes.)
- Qol**  
Tongue River Formation  
(Yellow-brown, porous, fluffy, calcareous clay, yellow massive unconsolidated sandstones and shales, cross-bedding. Hard to stuff gray to brown shale, occasional massive concretions, pale clay and muddy lignite. Lies on the Ludlow formation in the north part of quadrangle. Thickness about 180 feet.)
- Qol**  
Ludlow Formation  
(Buff and gray fine sands and silts, some and adglomerates, alternating with gray clays, numerous lignite beds and associated peat clays, carbonaceous shale, gypsum, phosphate and/or magnetite, random concretion concretions. Like the conglomerates are common. Pseudoscorpia and clinker give rise to large masses of fused red rock. Silt, thin coal seams, thin, sheet-coal lenses is at base of formation. Thickness 369 feet.)
- Kh**  
Hell Creek Formation  
(“Sander Beds” gray and dark bentonitic clay or mudstone. Numerous manganese-iron concretions. Sandstone concretions. Clay surfaces show “top-kent” appearance, occasional lignite beds, and carbonaceous shale. Generally forms bedded topography. Thickness at least 50 feet exposed.)
- Kh**  
Clinker and/or burned city pseudoscorpia.
- DRAINAGE**  
Intermittent Streams
- CULTURE**  
Buildings  
(House, church and school)
- Roads and Trails**
- Altitudes**  
(In feet above sea level)
- Bench Marks**  
(Monuments marking points of known altitude)
- Triangulation Stations**  
(U.S. Coast & Geodetic Survey monuments marking points of exact geographic location)
- Operating**  
 **Abandoned**  
Coal mines
- Drill Holes**
- Coal Thickness**  
(Exposed)

Geology by B. C. Petsch  
Assisted by W. L. Foley, J. J. Kalkman, W. Matousek  
Surveyed in 1954. Drafted by P. Rist.  
Coal-test Holes Drilled in 1955.

Scale = 1/25000  
Vermillion, South Dakota  
1955



Quadrangle Location



# AREAL GEOLOGY OF THE REVA QUADRANGLE

By  
Bruno C. Petsch

## INTRODUCTION

THIS QUADRANGLE WAS MAPPED IN THE SUMMER OF 1954 AS A PART OF THE STATE GEOLOGICAL SURVEY COAL RESOURCES PROGRAM. EXPLORATORY DRILLING FOR SUBSURFACE COAL WAS DONE IN 1955.

## LOCATION

THE QUADRANGLE IS IN EAST CENTRAL HARDING COUNTY ABOUT 14 MILES EAST OF BUFFALO, THE COUNTY SEAT.

## GEOGRAPHY

THE AREA IS SPARSELY POPULATED, THERE ARE NO TOWNS OR VILLAGES, EXCEPT FOR A STORE AND DANCE-HALL AT REVA. STATE HIGHWAY NO. 8 CROSSES THE SOUTHERN PORTION OF THE QUADRANGLE THROUGH REVA GAP. ACCESS TO OTHER PARTS OF THE AREA IS BY DIRT ROADS AND DIM TRAILS. ROADS OR TRAILS FOLLOW SECTION LINES IN THE NW, NE AND SE CORNERS OF THE QUADRANGLE. THERE IS NO RAILROAD IN THE AREA. THE MAXIMUM RELIEF OF THE TOPOGRAPHY IS ABOUT 600 FEET. THE MAJOR TOPOGRAPHIC FEATURE IS A HIGH STEEP SIDED, FLAT TOPPED MESA KNOWN AS SLIM BUTTES, ABOUT THE NORTHERN ONE FOURTH OF THE BUTTES EXTEND INTO THE SOUTHWEST PORTION OF THE QUADRANGLE. THE HIGHEST ALTITUDE IN THE QUADRANGLE IS 3624 FEET ABOVE SEA LEVEL ON GOVERNMENT HILL WHICH IS PART OF SLIM BUTTES.

THE SOUTH FORK OF THE GRAND RIVER MEANDERS WEST TO EAST ACROSS THE CENTER OF THE AREA, AN ESCARPMENT ABOUT 300 FEET HIGH FACES THE RIVER ON THE NORTH. SOUTH OF THE RIVER THE SURFACE IS LOW AND FLAT, AND RISES SOUTHWARD AS A GENTLE PIEDMONT TYPE SLOPE OFF OF THE SLIM BUTTES HIGHLAND. IN THIS AREA ARE OCCASIONAL "BADLANDS".

THE NORTH PORTION OF THE QUADRANGLE CONTAINS SEVERAL HIGH BUTTES, THE LARGEST IS IN THE NORTHWEST CORNER KNOWN AS TWO TOP AND RISES ABOUT 200 FEET ABOVE THE SURROUNDING HIGHLAND.

## STRATIGRAPHY

THE SURFACE FORMATIONS RANGE FROM THE VERY UPPER CRETACEOUS, THROUGH TERTIARY TO RECENT, AND ARE CORRELATED WITH THE TERTIARY STRATA OF THE WHITE RIVER BADLANDS.

**ARIKAREE (?) FORMATION** (DARTON 1899), **OGALLALA (?) FORMATION** (DARTON 1898). THE WRITER FOUND NO FOSSIL EVIDENCE TO ESTABLISH THE EXACT AGE OF THE ROCK UNIT OR UNITS. THE LOUP FORK BEDS OF MEEK AND HAYDEN, 1862, INCLUDES THE ARIKAREE (?) AND OGALLALA (?) FORMATIONS.

THIS FORMATION IS THE RIM ROCK AND FORMS THE PLATEAU OF THE SLIM BUTTES, STEEP CLIFFS AT LEAST 100 FEET HIGH ARE THE RULE WHERE THE FORMATION IS PRESENT. AN OBVIOUS FEATURE IS THE FACT THAT THE FORMATION LIES HORIZONTAL ON A GENERALLY PENEPLAINED SURFACE OF THE UNDERLYING WHITE RIVER GROUP. THE FORMATION RANGES FROM MASSIVE TO BEDDED. THE LOWER PORTION IS BUFF TO GREENISH COARSE SANDSTONE WITH LOCAL CONGLOMERATE AT THE BASE WHICH IS SOMETIMES CROSS-BEDDED. THE UPPER PORTION IS A HARD, MASSIVE, CARVED SANDSTONE WITH STALACTITIC CONCRETIONS. THE FORMATION CONTAINS CONSIDERABLE TUFFACEOUS MATERIAL, WHICH ON WEATHERING GIVES THE VERTICAL CLIFF A TANNISH-BROWN APPEARANCE. THE FORMATION IS AT LEAST 260 FEET THICK.

**WHITE RIVER GROUP** (MEEK AND HAYDEN 1858). THIS GROUP IS DIVIDED INTO TWO PARTS, THE UPPER, BRULE, AND THE LOWER, CHADRON. THE CHARACTER OF THE WHITE RIVER IN SLIM BUTTES IS ALMOST IDENTICAL TO THE SAME FORMATION IN THE BADLANDS NATIONAL MONUMENT 140 MILES TO THE SOUTHEAST. ON THE WEST, NORTH, AND EAST SIDES OF SLIM BUTTES, THE FORMATION IS GENERALLY DISTORTED BY LANDSLIDES OR SLUMPING; SOME AREAS ARE GRASSED OVER. THE TYPE SECTION CAN BE SEEN IN REVA GAP SOUTH OF THE HIGHWAY.

**BRULE FORMATION** (DARTON 1898). THE MEMBER IS COMPOSED OF MASSIVE PINK CLAY, (UPPER BRULE) (TOEPELMAN 1923), EXPOSED IN THE BADLANDS JUST SOUTHEAST OF REVA GAP, WELL-BEDDED, HARD, FINE, PALE GREEN SANDSTONES ALTERNATING WITH VERY PALE BROWNISH GRAY CLAY. WEATHERING CAUSES A TREAD AND RISER EFFECT. BOTH THE SANDSTONE AND CLAY ARE GENERALLY CALCAREOUS AND BENTONITIC. THE LOWER PORTION OF THE VERTICAL CLIFFS IN SLIM BUTTES IS GENERALLY BRULE. AN UNCONFORMITY IS PRESENT BETWEEN THE BRULE AND THE OVERLYING ARIKAREE (?) OGALLALA. IN REVA GAP THERE IS A PRONOUNCED ANGULAR UNCONFORMITY AT THE CONTACT OF THE TWO BEDS.

**CHADRON FORMATION** (DARTON 1899). THIS MEMBER CAN BE ROUGHLY DIVIDED INTO THREE PARTS; THE UPPER PART IS A MASSIVE, BENTONITIC PALE BROWN CLAY, NEAR THE TOP ARE LENSES OF VUGGY LIMESTONE AND NUMEROUS HARD SILICEOUS BEDS. AN OUTCROP IS A LOW "HAYSTACK" HILL OR GENTLE SLOPE, WITH A CRUST THAT RESEMBLES "POPCORN". THE MIDDLE PORTION IS A DAZZLING (TOEPELMAN 1923) WHITE COARSE SANDSTONE WITH LENSES OF COARSE CONGLOMERATE, GENERALLY STANDING VERTICAL WHEN EXPOSED. THE LOWER PORTION GRAY AND TAN CLAYS, RUSTY IRON CONCRETIONS, AND IRON STONE STREAKS GIVE THE OUTCROP A GOLDEN BROWN COLOR. OCCASIONALLY A THIN BLACK CARBONACEOUS STREAK LIES AT THE BASE. THE CHADRON CAN BE 160 FEET THICK.

**TONGUE RIVER FORMATION** (TAFF 1909). THIS FORMATION IS EXPOSED ON THE HIGHER ALTITUDES IN THE NORTHERN PORTION OF THE QUADRANGLE. IT IS RECOGNIZED BY ITS GENERALLY BRIGHT BUFF CAPPING OF SEVERAL BUTTES. TWO PROMINENT BUTTES ARE SQUARE TOP BUTTE IN SEC 35, T21N, R7E, AND TWO TOP BUTTE IN SEC 31, T21N, R8E. THE U.S.C. & G. TRIANGULATION STATION (TWO TOP) IS ON SQUARE TOP BUTTE.

THE FORMATION CONSISTS OF YELLOW-BROWN, POROUS, FLUFFY, CALCAREOUS CLAY AT THE TOP OF SQUARE TOP BUTTE. BENEATH THIS, THE FORMATION CONTAINS MASSIVE BUFF AND TAN SILT AND SAND, GENERALLY UNCEMENTED BUT STANDS IN A VERTICAL CLIFF, COMMONLY CROSS-BEDDED AND HAS HARD CALCAREOUS CEMENTATIONS WHICH ARE SOMETIMES LEDGEMAKERS. ALTERNATING WITH THE SANDS ARE HARD TO SOFT, GRAY TO BROWN, THICK SHALE BEDS, WITH OCCASIONAL IRON STONE CONCRETIONS, PEAT CLAY, AND WOODY LIGNITE.

**LUDLOW FORMATION** (LLOYD AND HARES 1915). THE FORMATION IS SEPARATED FROM OVERLYING WHITE RIVER GROUP BY A COMPLETE COLOR CHANGE FROM WHITE TO TAN, BUFF AND GRAYS AND AN UNCONFORMITY IN THE SLIM BUTTES. IT IS ALSO SEPARATED FROM THE OVERLYING FORT UNION TONGUE RIVER FORMATION BY A DISTINCT COLOR CHANGE FROM BRIGHT YELLOW TO TAN, BUFF AND GRAYS. THE FORMATION CONTAINS NUMEROUS LIGNITE BEDS, PEAT CLAY CARBONACEOUS SHALES AND PSEUDOSCORIA. BESIDES THE CHARACTERISTIC LAYERS MENTIONED, THEY ALTERNATE WITH TAN AND BUFF LEDGEMAKING SANDSTONE LENSES, SOFT SANDSTONE AND DARKER CLAYS AND SHALES. THE LIGNITE BEDS VARY IN THICKNESS FROM A FEW INCHES TO AS MUCH AS 10 FEET, THOSE THAT CAN BE TRACED CERTAIN DISTANCES AND ARE MINABLE ARE KNOWN LOCALLY AS THE GIANNONATTI 8 FEET, BELL 4 FEET, BOND 2 TO 7 FEET, WIDOW CLARK 2 TO 9 FEET, AND SHADEHILL 0 TO 3 FEET. IN THE TWO TOP BUTTE AREA IN THE NORTHWEST PART OF THE QUADRANGLE, THE COMPLETE LUDLOW FORMATION IS 369 FEET THICK. THE ESCARPMENT ALONG THE NORTH SIDE OF THE GRAND RIVER CONTAINS 8 LIGNITE BEDS IN 210 FEET OF LUDLOW SECTION, AT THE TOP IS THE GIANNONATTI WHICH IS PSEUDOSCORIA. THE SHADEHILL FACIES IS AT THE BASE OF THE FORMATION.

**HELL CREEK FORMATION** (BROWN 1907). THE OLDEST FORMATION IN THE QUADRANGLE IS THE UPPER PORTION OF THE HELL CREEK. IT CONSISTS OF LIGHT TO DARK GRAY BENTONITIC CLAYS OR MUDSTONE, INTERBEDDED WITH GRAYISH YELLOW SILTS AND FINE SAND. THEY ARE KNOWN AS THE "SOMBER BEDS". BEDS OF LIGNITE, DARK GRAY CARBONACEOUS SHALE AND PEAT CLAY ARE PRESENT. CLAY SURFACES ALWAYS HAVE A "POPCORN" APPEARANCE, WHICH RESULTS FROM DRYING AND SHRINKAGE. DARK BROWN IRONSTONE CONCRETION LAYERS ARE COMMON. WHERE THERE ARE FLAT SURFACES, PIECES OF CONCRETIONS ARE SPRINKLED ABOUT ABUNDANTLY. BROAD OUTCROP AREAS ARE GENERALLY BADLAND TOPOGRAPHY.

## STRUCTURE

THE REGIONAL DIP IS TO THE NORTHEAST ABOUT 20 FEET PER MILE, INTO THE DAKOTA (WILLISTON) BASIN. THE AXIS OF THE SLIM BUTTES ANTICLINE STRIKES NORTHWARD FROM ABOUT SEC 6, T19N, R8E, A DISTANCE OF AT LEAST 8 MILES. IN THE SOUTHEAST CORNER OF SEC 14 AND THE NORTHWEST PART OF SEC 23, T20N, R7E, THE LUDLOW FORMATION DIPS 7½ AND 6 DEGREES RESPECTIVELY TO THE WEST-SOUTHWEST. A DIP IS PRESENT IN AN OUTLIER OF TONGUE RIVER ON TWO TOP BUTTE IN SEC 35, T21N, R7E, WHERE THE BEDS ARE TILTED WEST, 8 FEET IN 400 FEET HORIZONTALLY. THE ABOVE DIPS ARE CRITICAL FORMING THE ANTICLINE. THE HELL CREEK FORMATION HAS A BROAD OUTCROP ALONG THE HORSE CREEK IN T20N, R8 AND 7E, OVER THE STRUCTURE.

ANOTHER ANTICLINE STRIKING NW-SE IS PRESENT JUST EAST OF REVA GAP LOCATED IN THE NORTH CENTRAL PART OF T18N, R8E. REVERSE DIPS ARE OBVIOUS IN SECS 8, 9, 10, AND 17. THESE DIPS ARE FROM 6 TO 29 DEGREES, GENERALLY SOUTHWEST. TODD (1895), RUSSELL (1927), (UNPUBLISHED) MAINTAIN THESE DIPS TO BE DIASTROPHISM, REFUTED BY WINCHESTER 1916 AND TOEPELMAN 1923.

SEVERAL FAULTS ARE PRESENT IN THE WHITE RIVER FORMATION IN REVA GAP IN SECS 16 AND 17, AND SOUTHEASTERN PART OF SEC 9.

A SYNCLINE STRIKING NW-SE IS PRESENT IN SECS 15 AND 21, T8N, R8E. A SERIES OF DIKE-LIKE CEMENTATIONS OF SANDSTONE TREND EN ECHELON FASHION SOUTHERLY IN SEC 4 AND TURNING EASTWARD IN SEC 10, T20N, R8E. THIS IS A TYPICAL OUTCROP PATTERN ON FOLDED STRUCTURE. THIS FEATURE IS STRIKINGLY DISPLAYED ON AIR-PHOTOS.

## ECONOMIC GEOLOGY

THE QUADRANGLE CONTAINS A VARIETY OF MINERAL RESOURCES BOTH OF PRESENT-DAY AND POTENTIAL VALUE. **LIGNITE COAL** IS THE MOST WIDE SPREAD, **CARNOTITE** HAS RECENTLY BEEN DISCOVERED AND **LIGNITE BURNS** WITH THE ADJOINING BAKED CLAYS ARE FOUND.

## LIGNITE COAL

**AREAL EXTENT AND THICKNESS.** OUTCROPS OF COAL CAN BE FOUND ALONG THE SIDES OF MOST STREAM VALLEYS. HOWEVER, THE BEST REPRESENTATION OF THE COAL RESOURCES IS IN THE ESCARPMENT NORTH OF THE GRAND RIVER, THE ESCARPMENT DIAGONALS NORTHWESTWARD ACROSS T20N, R8E, AND IN IT ARE AT LEAST EIGHT COAL BEDS, ONE OF THEM THE WIDOW CLARK IS 8 FEET THICK. THE SHADEHILL FACIES AT THE BASE OF THE LUDLOW HAS COAL RANGING FROM 1 TO 3 FEET THICK AND CAN BE TRACED SEVERAL MILES. OTHER COALS RANGE FROM 6 TO 120 INCHES IN THICKNESS. BEFORE THE ADVENT OF FUEL OIL AND BOTTLED GAS, LIGNITE MINING WAS A THRIVING INDUSTRY, SIX LARGE WELL EQUIPPED MINES WERE IN OPERATION, THE PINTAR MINE, CENTER SEC 35, T21N, R8E, WAS FORMERLY THE SHIRLEY MINE DESCRIBED IN THE OLD REPORTS (WINCHESTER 1916). THIS LIGNITE BED WAS CALLED GIANNONATTI AND IS ABOUT THE UPPER MOST LIGNITE IN THE LUDLOW FORMATION. THE BED CONTAINS 7 FEET 3 INCHES LIGNITE, 10 INCHES SHALE, 5 FEET 9 INCHES LIGNITE. AN ADIT GOES INTO THE OUTCROP OF THE LIGNITE AND BEING SHUT DOWN FOR SEVERAL YEARS IT IS STILL PARTLY OPEN. THE BAR-H MINE, SW SEC 27, T19N, R8E, WAS BOTH A STRIP MINE AT FIRST, THEN AN ADIT, WHICH IS NOW COVERED. IT HAS 5 FEET 2 INCHES LIGNITE, 11 INCHES CLAY, 7 FEET 6 INCHES LIGNITE. THE HODGE MINE NE SEC 16, T18N, R8E, WAS A STRIP MINE. THE LIGNITE IS 12 FEET THICK. THE MITCHELL MINE, SE SEC 8, T18N, R8E, HAS 6 FEET OF LIGNITE EXPOSED IN THE CREEK BANK AND THE STREAM FLOWS ON LIGNITE FOR AT LEAST 300 FEET. THE MINE WAS OPERATED IN THE WINTER OF 1953-54. THE NEWCOMBE MINE, SW SEC 10, T20N, R7E, WAS A STRIP MINE. IT HAS 8 INCHES LIGNITE, 2 INCHES SHALE, 10 FEET LIGNITE. THE BONNEWELL MINE, SEC 12, T18N, R7E, HAS 10 FEET 9 INCHES OF LIGNITE. SMALL UNNAMED OLD MINES DOT THE AREA.

**ESTIMATED COAL RESERVES.** THE TOTAL ESTIMATED COAL TONNAGE FOR THE REVA QUADRANGLE IS 58,404,000. THE COAL RESERVES ARE LOCATED WITHIN ½ MILE FROM OUTCROPS AND MINES, AND ARE UNDER REASONABLE OVERBURDEN WHICH ARE MINEABLE. 26,340,000 TONS ARE MORE THAN 8 FEET THICK, 32,064,000 TONS ARE 3 FEET OR MORE IN THICKNESS.

**POTENTIAL MINING AREAS.** THE MOST FAVORABLE MINING AREA IS THE HIGH ESCARPMENT THAT LIES NORTH OF THE SOUTH FORK OF THE GRAND RIVER IN T20N, R8E. IT DIAGONALS NW-SE ACROSS THE TOWNSHIP FOR ABOUT 6 MILES. OTHER FAVORABLE MINING AREAS ARE IN THE VICINITY OF THE OLD MINES MENTIONED ABOVE. A PROXIMATE ANALYSIS OF LIGNITES IS GIVEN IN THE FOLLOWING TABLE:

TABLE

COAL	LOCATION	MOISTURE	VOLATILE	CARBON	ASH	SULFUR	B.T.U.
LUDLOW <sup>1*</sup>	Sec 10, T20N, R8E	37.7%	27.2%	29.0%	9.1%	0.95%	6,250
LUDLOW <sup>2**</sup>	Sec 22, T20N, R8E	38.35%	32.67%	19.95%	9.03	0.39%	5,401
LUDLOW <sup>3**</sup>	Sec 9, T18N, R8E	40.00%	33.17%	19.14%	7.69	0.29%	5,281
LUDLOW <sup>4*</sup>	Sec 16, T18N, R8E	40.01%	23.56%	30.08%	6.35	0.42%	6,150
LUDLOW <sup>5*</sup>	Sec 10, T20N, R7E	34.70%	27.2%	29.0%	9.1	0.95%	6,250
LUDLOW <sup>6*</sup>	Sec 27, T19N, R8E	37.1%	27.2%	24.3%	11.4	0.9%	5,020
HELL CREEK <sup>7**</sup>	Sec 12, T19N, R7E	39.94%	33.68%	16.16%	10.22	1.40%	4,897

1, GIANNONATTI LIGNITE, PINTAR MINE (SHIRLEY); 2, WIDOW CLARK LIGNITE OUTCROP; 3, OUTCROP; 4, HODGE MINE; 5, NEWCOMBE MINE; 6, BAR-H MINE; 7, OUTCROP.

\* SEARIGHT, W.V., A PRELIMINARY REPORT OF THE COAL RESOURCES OF SOUTH DAKOTA, REPORTS OF INVESTIGATIONS NO. 3, STATE GEOLOGICAL SURVEY, VERMILLION, SOUTH DAKOTA.

\*\* ANALYSES BY STATE CHEMICAL LABORATORY, VERMILLION, SOUTH DAKOTA.

## URANIUM

KNOWLEDGE OF URANIFEROUS LIGNITES IN THIS AREA DATES BACK TO 1951. IT IS CONFINED TO THE LIGNITES OF THE LUDLOW FORMATION WHICH OUTCROP AROUND THE SLIM BUTTES, GENERALLY IN THE UPPERMOST LIGNITE BENEATH THE OVERLYING WHITE RIVER GROUP. IT IS ALSO CONCENTRATED IN THE CARBONACEOUS SHALES WHICH ARE IN THE LIGNITE FACIES.

METATYUAMUNITE WAS FOUND IN SANDSTONE OF THE LUDLOW FORMATION IN THE SW¼ OF SEC 10, T18N, R8E, ON THE THYBO RANCH (CURTISS, R. E. 1955). THE WHITE RIVER GROUP CONTAINS RANDOM CONCENTRATIONS OF URANIFEROUS DEPOSITS. NEARLY ALL OF THE CUSTER NATIONAL FOREST WHICH INCLUDES THE SLIM BUTTES HAS BEEN STAKED FOR URANIUM CLAIMS.

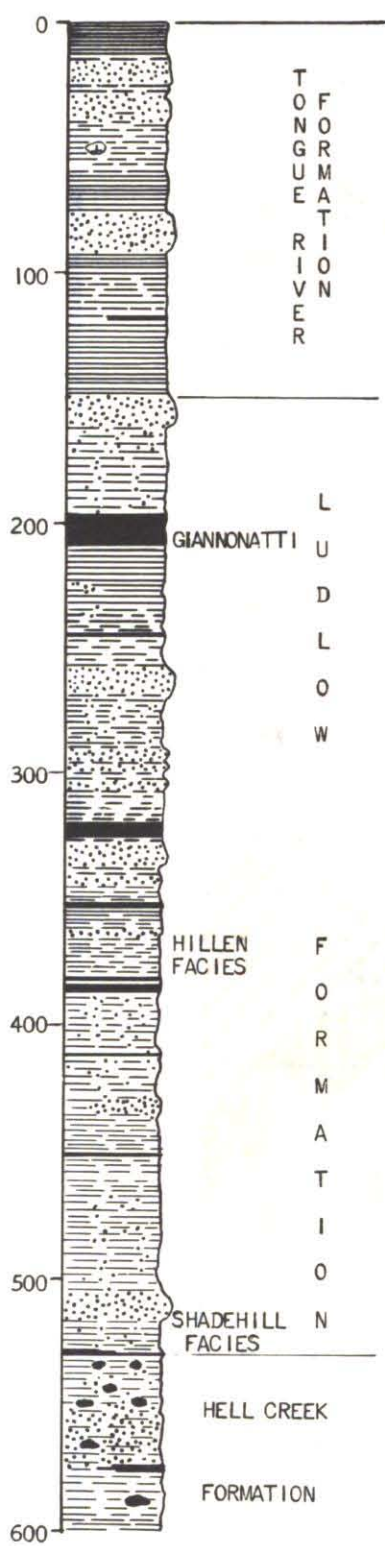
## LIGNITE BURNS

THROUGHOUT THE AREA ARE PLACES WHERE LIGNITE HAD BEEN BURNED AND AS A RESULT THE CLAYS AND SANDS ASSOCIATED WITH IT WERE BAKED OR FIRED. NOW THESE PLACES GIVE RISE TO LARGE THICK MASSES OF BRIGHT RED TO PINK, BRITTLE, HARD ROCK. SOMETIMES THESE BURNED AREAS HAVE LARGE CLINKER. MANY OF THESE BURNS ARE QUARRIED FOR ROAD SURFACING, ESPECIALLY USED FOR DRIVEWAYS INTO RANGES AND GRAVEL FOR ROADS.

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## GENERALIZED COLUMNAR SECTION NORTH PART



## SOUTH PART

