Geology

The Henrieville quadrangle lies in Garfield and Kane Counties in southern Utah and was mapped in 1968 and 1969 as part of the U.S. Geological Survey's program of classifying and evaluating Federal lands withdrawn for coal. Mapping was done on U.S. Geological Survey topographic maps at a scale of 1:24,000 with the aid of aerial photographs of about 1:49,000 scale.

Geography

The quadrangle is named for the town of Henrieville in the west-central part of the area, about 8 miles (13 km) southeast of Tropic, Utah, and 9 miles (14 km) east of Bryce Canyon National Park. Altitudes range from about 5,800 feet (1,768 m) in the southwest to about 7,800 feet (2,377 m) in the eastern part of the quadrangle.

The quadrangle is drained by creeks or dry wash tributaries of the southward flowing Paria River, which lies about 3 miles (5 km) west of the town of Henrieville. Most of the eastern part of the quadrangle is an area of steep, narrow, rocky canyons largely accessible only on foot or horseback. Utah Highway 54, paved between Henrieville and Escalante, follows the canyon of Henrieville Creek through the northeastern part of the quadrangle.

Big Dry Valley, a broad alluvial valley in the southern part of the quadrangle, is rimmed on the north and east by a sinuous escarpment 400-600 feet (122-183 m) high which is breached to the northeast by Dry Valley Creek. Just to the west of Big Dry Valley is Kodachrome Flat, part of a colorful scenic area being developed by the State of Utah as Kodachrome Basin State Park.

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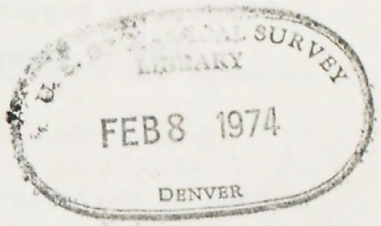
UNITED STATES
DEPARTMENT OF THE INTERIOR
Geological Survey
Reston, Virginia 22092



For release February 11, 1974

The U. S. Geological Survey is releasing in open files the following report. Copies are available for consultation in the following U. S. Geological Survey Libraries: 1033 GSA Building, Washington, D. C. 20244; Building 25, Denver Federal Center, Denver, Colorado 80225; and 345 Middlefield Road, Menlo Park, California 94025; and at the Geological Survey Public Inquiries Offices, 1012 Federal Building, Denver, Colorado 80202, and 8102 Federal Office Building, Salt Lake City, Utah 84111. Sepia copy that can be reproduced at private expense is available at the Denver and Salt Lake City Public Inquiries Offices.

Preliminary geologic map and coal resources of the Henrieville quadrangle, Garfield and Kane Counties, Utah, by W. E. Bowers. Three sheets and brief text: Sheets 1 and 2-- a 1:24,000-scale geologic map, cross section, a generalized columnar section with description, and an explanation of the map units and symbols; sheet 3 includes measured coal sections of the area.

IN REPLY REFER TO:

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
FEDERAL CENTER, DENVER, COLORADO 80225

February 7, 1974

Memorandum

To: Librarian, U.S. Geological Survey, 345 Middlefield Road, Menlo Park, Calif. 94025
Librarian, U.S. Geological Survey, Federal Center, Denver, Colo.

From: Central Region Publications Unit, Conservation Division

Subject: Open-file release

On February 11, 1974, the U.S. Geological Survey will release to open file the following report:

"Preliminary geologic map and coal resources of the Henrieville quadrangle, Garfield and Kane Counties, Utah," by W. E. Bowers.

One copy each of the report and press release are enclosed.

Virginia L. Bechtold

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837-4751

Enclosures 2

The central part of the quadrangle north of the Big Dry Valley escarpment is a low tableland or benchland, partly capped by pediment deposits, and marked by short, rocky canyon tributaries to the alluvial valleys of Dry, Henrieville, and Little Creeks which head in high terrain east of the quadrangle and cut through the tableland to depths of 300-400 feet (91-122 m).

Climate in the region is semiarid, and vegetation consists mainly of scattered pinon and juniper trees--particularly over higher altitudes --and sage and grass in alluvial valleys. Henrieville Creek provides irrigation water for farms near Henrieville, which produce mostly livestock feed or fruit and vegetables for local use.

Stratigraphy

Sedimentary rocks exposed in the quadrangle total about 5,200 feet (1,585 m) in thickness and range in age from Middle Jurassic to Late Cretaceous. The sedimentary rocks present in the subsurface are about 10,000 feet (3,048 m) thick and range in age from Cambrian to Middle Jurassic. The oldest formation penetrated by drilling in the quadrangle is the Cedar Mesa Sandstone Member of the Cutler Formation of Permian age. Lithology and thickness of surface and subsurface stratigraphic units are shown in the generalized columnar section.

The Straight Cliffs Formation (Upper Cretaceous), about 1,400 feet (427 m) thick, contains the major coal resources of the area. The formation was divided into a lower and an upper part with the contact at the top of a marker bed composed of white, fine- to coarse-grained, partly conglomeratic sandstone which occurs about 200-400 feet (61-122 m) above the base of the formation. The white sandstone marker bed is from 25 to 90 feet (8-27 m) thick and is believed to be equivalent to the Calico bed (Peterson, 1969, p. J7-J9), an informal unit at the top of the Smoky Hollow Member of the Straight Cliffs Formation in the southeastern Kaiparowits Plateau region. The Smoky Hollow Member is overlain unconformably by the John Henry Member in the southeastern Kaiparowits region. The upper part of the Straight Cliffs Formation in the Henrieville quadrangle is probably equivalent to the Drip Tank and John Henry Members, and the lower part is probably equivalent to the Smoky Hollow and Tibbet Canyon Members in the eastern Kaiparowits Plateau.

The Dakota Formation (Upper and Lower(?) Cretaceous), ranging from 200 to 350 feet (61-91 m) thick, is widely exposed in the western half of the quadrangle and contains coal beds generally thinner and more lenticular than the coal beds in the Straight Cliffs Formation.

Structure

The major structural feature in the quadrangle is a south-southeast-trending homocline dipping 5^{o}-20^{o} eastward in the eastern half of the quadrangle. In the northern part of the area the homocline is broken by several faults as much as 3 miles (5 km) long and with a maximum throw of about 300 feet (91 m). Most of the faults roughly parallel the trend of the homocline.

West of the homocline the rocks are warped into several broad, gentle folds with dips mostly 5^{o} or less. A few north-northwest-trending faults with displacements of 50 feet (15 m) or less are present in the west-central part of the area.

Structure contours for the eastern part of the quadrangle are drawn on the top of the white conglomeratic sandstone marker bed at the top of the lower part of the Straight Cliffs Formation. In the western part of the quadrangle, the structure contours are drawn on the base of the Dakota Formation.

Economic Geology

Coal

Straight Cliffs coal.--The thickest coal beds in the quadrangle occur in the upper part of the Straight Cliffs Formation. The only coal beds meeting present classification standards (Bass, Smith, and Horn, 1970) occur in the Henderson coal zone, a relatively continuous coal-bearing interval 65-110 feet (20-34 m) above the base of the upper part of the formation. The Henderson coal crops out along the eastward-dipping homocline in the eastern part of the quadrangle and probably is present in the subsurface east of the outcrop belt.

The Henderson coal is thinner and more lenticular than in the adjacent Pine Lake quadrangle to the north. The thickest individual coal bed measured in outcrop is about 10 feet (3 m) thick. Locally the coal may contain shaly partings and pinch out or grade laterally into carbonaceous mudstone.

The Henderson coal varies in thickness southward from about 7 feet (2 m) at the north edge of the quadrangle to a pinchout near Henrieville Creek. South of Henrieville Creek the coal is discontinuous, thin, and of poor quality. Near Little Creek the thickest coal bed is about 4 feet (1 m). Southward across Dry Valley Creek for about 2 miles (3 km) the coal increases to about 10 feet (3 m) in thickness and again thins abruptly, splitting into several 1-foot-thick (0.3 m) beds on the east side of Horse Valley. Just northwest of Wiggler Wash the Henderson coal increases to about 5 feet (1.5 m) in thickness.

Dakota coal.--In general the coal beds in the Dakota Formation are thin, highly lenticular, and of poorer quality than the Straight Cliffs coal. Coal beds may occur stratigraphically from the bottom to the top of the formation, but individual coal beds seldom can be traced for more than half a mile along the outcrop. The thickest coal bed without significant partings observed in the quadrangle is about 4 feet (1.2 m), and most are less than 3 feet (1 m). Some outcrops that seem to contain thicker coal beds are actually coaly intervals containing black, highly carbonaceous mud stone or shale and thin interbeds of impure coal. These coaly intervals are included with carbonaceous mudstone on measured coal sections.

Mines.--No active mines are present in the quadrangle. The waste dump of a covered coal mine in the Henderson coal was found on the west side of Pardner Canyon. Scattered small coal prospects are found in the Dakota Formation, particularly northeast of the town of Henrieville. A 30-foot (9-m) drift has been driven into a 4-foot (1.2-m) bed of impure coal at the base of the Dakota Formation on the south side of Little C reek in the NW¼ sec. 30, T. 37 S., R. 1 W. East of the highway in the NW¼ sec.14, T. 37 S., R. 2 W., a small waste dump is all that remains of a mine referred to locally as the "burning coal mine." The adit was presumably covered at some time in the past to extinguish a fire.

Quality of coal.--The Straight Cliffs coal of the Kaiparowits region generally falls within the range of high-rank subbituminous to low-rank volatile bituminous, is low to moderate in ash content, and low in sulfur content. No coal analyses from a fresh cut or mine face are available. A few analyses of outcrop samples have been reported by Robison (1966, p. 38, sample SC-54) and by Dooling and Graham (1972, p. 125). A channel sample from the Davies mine, (Robison, 1966, p. 38) 1 mile (1.6 km) north of the quadrangle, had a heat value of 10,126 Btu on an as-received basis, an ash content of 9.5 percent, and a sulfur content of 1 percent.

Resources.--Inferred resources of coal in the Henderson coal zone were calculated only for the area between the coal outcrop and the 6,000-foot (1,829-m) structure contour where an estimated 16 million short tons (15.5 million metric tons) in beds exceeding 4 feet (1.2 m) in thickness are present at depths of less than 1,200 feet (366 m). The coal beds dip from 5^{o} to 20^{o} E. No subsurface data are available for the eastern part of the quadrangle but considerable coal resources probably occur at depths ranging from about 800 to 2,500 feet (244-1,981 m) in the northeastern corner of the quadrangle.

Robison (1966, p. 40) reported indicated reserves of approximately 8 million short tons (7 metric tons), at depths less than 2,000 feet (610 m), for the area north of Henrieville Creek. Modification of Robison's figures by Dooling and Graham (1972, p. 181) to fit the area of the quadrangle for the same depth shows approximately 13 million short tons (12 million metric tons).

No attempt was made to determine coal resources in the Dakota Formation.

Oil and gas

An exploratory well for oil and gas, the Tenneco Oil Company's Tropic 1 completed August 1964, was drilled in the northwestern part of the quadrangle near the south end of Coal Bench. Shows of oil were reported from the Moenkopi, Toroweap, and Cedar Mesa beds. The well was drilled on the Tropic anticline, the crest of which lies just west of the quadrangle boundary.

The Upper Valley oil field operated by Tenneco Oil Company 10 miles (16 km) northeast of the quadrangle has been producing since 1964. Several test wells reporting good oil shows have been drilled on the Johns Valley anticline about 7 miles (11 km) north of the quadrangle.

Bentonite

Lenticular deposits of bentonite occur locally in the Tropic and Dakota Formations and some production is reported from beds near the base of the Dakota west of the quadrangle (Robison, 1966, p. 44). So far as is known, there has been no bentonite mined within the quadrangle. A bed of gray bentonite 10-15 feet (3-5 m) thick occurs near the base of the Dakota at measured section D just southeast of Henrieville but the bed is very lenticular and does not extend more than a few hundred feet along the outcrop. An abandoned bentonite mine now covered by slump material lies just outside the quadrangle about 1 mile (1.6 km) northwest of Henrieville.

Gravel

A large gravel deposit along Henrieville Creek in sec. 3, T. 37 S., R. 1 W., is a source of road metal for the Utah Highway Department, and some gravel has been produced from alluvium near the town of Henrieville. Large quantities of poorly sorted gravel of relatively poor quality are also present in the extensive pediment deposits that occur in the quadrangle.

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