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COAL RESOURCE OCCURRENCE AND COAL DEVELOPMENT POTENTIAL OF THE NORTHWEST QUARTER OF THE KEMMERER 15-MINUTE QUADRANGLE, LINCOLN COUNTY, WYOMING

Prepared for

UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY

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Purpose

This report was compiled to support the land planning work of the Bureau of Land Management (BLM) to provide a systematic coal resource inventory of Federal coal lands in Known Recoverable Coal Resource Areas (KRCRA's) in the western United States. This investigation was undertaken by Dames & Moore, Denver, Colorado, at the request of the U.S. Geological Survey under contract number 14-08-0001-17104. The resource information gathered for this report is in response to the Federal Coal Leasing Amendments Act of 1975 (P.L. 94-377). Published and unpublished public information available through April, 1978, was used as the data base for this study. No new drilling or field mapping was performed, nor was any confidential data used.

Location

In this report, the term "quadrangle" refers only to the northwest quarter of the Kemmerer 15-minute quadrangle which is located in central Lincoln County, Wyoming, approximately 8 miles (13 km) northwest of the town of Kemmerer and 12 miles (19 km) northeast of the town of Sage, Wyoming. The quadrangle is unpopulated (U.S. Bureau of Land Management, 1971; Wyoming State Highway Commission, 1978).

Accessibility

Wyoming Highway 233, an improved light-duty road, crosses northerly through the Hams Fork valley in the northeastern part of the quadrangle, connecting the towns of Frontier and Kemmerer to the southwest of the quadrangle boundary with the Bridger-Teton National Forest and the town of Cokeville, Wyoming to the northwest. A second light-duty road follows the Colorado River-Great Basin Divide northwesterly across the southern half of the quadrangle. A branch of the historical Oregon Trail, the Sublette Cutoff, crosses westerly through the central part of the quadrangle. Numerous dirt roads and trails provide access through the remainder of the quadrangle (U.S. Bureau of Land Management, 1971; Wyoming State Highway Commission, 1978).

Physiography

The northwest quarter of the Kemmerer 15-minute quadrangle lies within the Wyoming Overthrust Belt. The landscape within the quadrangle is characterized by the relatively flat-topped ridges of the Hams Fork Plateau through the central and western parts of the quadrangle and by the Hams Fork valley along the eastern side of the quadrangle. The Hams Fork Plateau is cut by numerous ravines and canyons. The Schuster Basin lies in the west-central part of the quadrangle at the head of the North Fork of Twin Creek. Altitudes in the quadrangle range from approximately 6,840 feet (2,085 m) on the south-central edge of the quadrangle to over 7,820 feet (2,384 m) on the west-central edge of the quadrangle.

The Colorado River-Great Basin Divide trends northwesterly across the southern half of the quadrangle. The Hams Fork and its tributaries, Camp Creek, Trail Creek, Dempsey Creek, Fish Creek, Robinson Creek and Quakenasp Canyon, drain the quadrangle northeast of the Divide. Hams Fork flows southeasterly into the Green River, a part of the Colorado River drainage system. The North Fork, a tributary of Twin Creek south of the quadrangle, drains the quadrangle southwest of the Divide. Twin Creek flows west into the Bear River, a part of the Great Basin drainage system. The Kemmerer Reservoir lies in the east-central part of the quadrangle on the Hams Fork (Rubey and others, 1975).

Climate and Vegetation

The climate of southwestern Wyoming is semiarid, characterized by low precipitation, rapid evaporation, and large daily temperature variations. Summers are usually dry and mild, and winters are cold. The annual precipitation averages approximately 10 inches (25 cm) and is fairly evenly distributed throughout the year (Wyoming Natural Resources Board, 1966).

The average annual temperature of the area is 39° F (4° C). The temperature during January averages 17° F (-8° C) and typically ranges from 4° F (-16° C) to 30° F (-1° C). During July, the average temperature is 62° F (17° C), and the temperature typically ranges from 43° F

(6° C) to 82° F (28° C) (Wyoming Natural Resources Board, 1966; U.S. Bureau of Land Management, 1978).

Winds are usually from the west and west-southwest with an average annual velocity of 11 miles per hour (18 km per hr) (U.S. Bureau of Land Management, 1978).

Principal types of vegetation in the quadrangle include grasses, sagebrush, rabbitbrush, aspen, willow, and cottonwood (U.S. Bureau of Land Management, 1978).

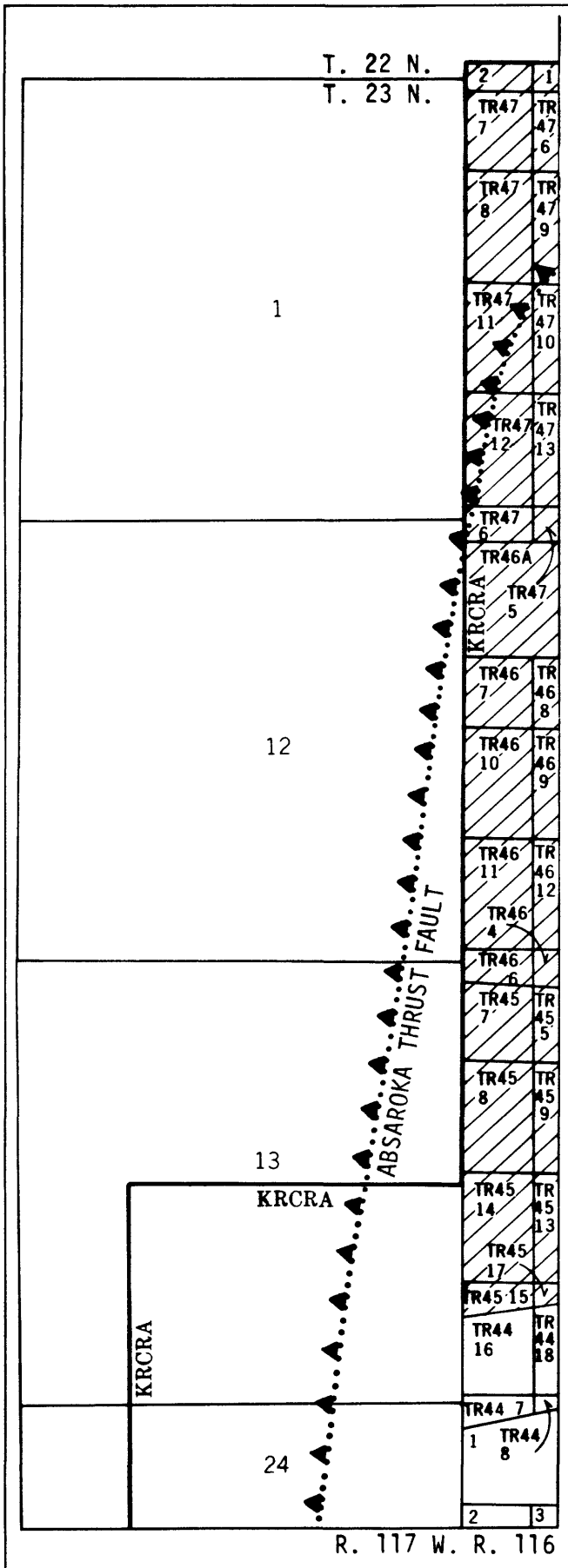
Land Status

The northwest quarter of the Kemmerer 15-minute quadrangle lies on the northwestern edge of the Kemmerer Known Recoverable Coal Resources Area (KRCRA). Only a small area in the southeastern corner of the quadrangle, approximately 2 percent of the quadrangle's total area, lies within the KRCRA boundary. The Federal government owns the coal rights for approximately half of this area as shown in figure 1. No outstanding Federal coal leases, prospecting permits or licenses occur within the KRCRA boundary in this quadrangle.

GENERAL GEOLOGY

Previous Work

Veatch (1907) mapped the geology and economic resources of a large part of Lincoln and Uinta counties in southwestern Wyoming including this quadrangle. Schultz investigated the geology and coal resources in the northern part of the Kemmerer coal field in 1914. Oriel and Tracey (1970) described the stratigraphy of the Evanston, Wasatch, and Green River Formations in the Kemmerer area, and Rubey and others (1975) reported on the stratigraphy and structure in the Kemmerer and Sage 15-minute quadrangles. Glass (1977) described the coal-bearing formations and reported chemical analyses of the coal beds present in the Hams Fork coal region. The geology and coal resources of the Hams Fork coal region, including the Kemmerer coal field, were also investigated by Roehler and others (1977).



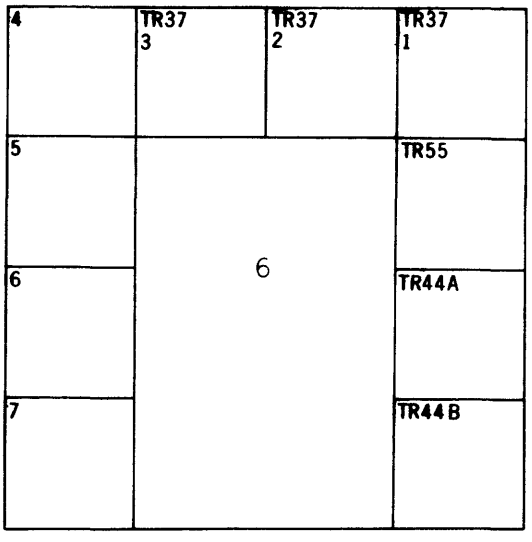
EXPLANATION

KRCRA

KRCRA BOUNDARY - Label within KRCRA boundary.

NON-FEDERAL COAL LAND - Land within the KRCRA boundary for which the Federal Government does not own the coal rights.

TRACE OF FAULT - Symbols designate direction of movement; sawteeth on upper plate of thrust fault. Dotted where concealed.



SECTION OF LAND - Showing lots and lot numbers, and tracts and tract numbers.

NOTE: BLM Coal Ownership Data current as of August 1, 1977.

REFERENCE

Rubey, W. W., Oriel, S. S., and Tracey, J. I., Jr., 1975, Geology of the Sage and Kemmerer 15-minute quadrangles, Lincoln County, Wyoming: U.S. Geol. Survey Prof. Paper 855, 18 p.

FIGURE 1. — Boundary data map.

Stratigraphy

Formations cropping out in the northwest quarter of the Kemmerer 15-minute quadrangle range in age from Late Cretaceous to Eocene. The coal-bearing Adaville Formation occurs only in the subsurface in this quadrangle. A generalized composite columnar section is shown in figure 2.

The Adaville Formation of Late Cretaceous age consists of approximately 2,900 feet (884 m) of interbedded gray sandstone, siltstone, carbonaceous clay and coal. The sandstone is calcareous, fine to coarse grained, thin bedded to massive, and is partly conglomeratic in the upper part of the formation (Rubey and others, 1975). Numerous thick coal beds usually occur in the lower 1,200 feet (366 m) of the formation (Glass, 1977).

The Evanston Formation unconformably overlies the Adaville Formation and crops out in a small area in the southeastern corner and along the eastern edge of the quadrangle. The main body of the Evanston Formation is underlain by the Hams Fork Conglomerate Member of latest Cretaceous age which consists of up to 1,000 feet (305 m) of boulder-conglomerate beds, gray to brown cross-bedded sandstone and gray mudstone. The main body of the Evanston Formation, which is Paleocene in age, consists of gray carbonaceous sandy to clayey siltstone interbedded with sandstone, claystone, ironstone, lignite, and thin coal. The main body may be more than 1,000 feet (305 m) thick locally (Oriel and Tracey, 1970; Rubey and others, 1975).

The Tunp Member and the main body of the Wasatch Formation, both of Eocene age, unconformably overlie the Evanston Formation in this quadrangle. The Tunp Member crops out along the northeastern edge of the quadrangle and consists chiefly of a dark- to medium-red conglomeratic mudstone and a rubbly or blocky breccia in a mudstone matrix. It is poorly stratified and extremely variable in thickness, ranging from 100 to 200 feet (30 to 61 m), but exceeding 500 feet (152 m) locally. The Tunp Member grades laterally into and intertongues with other members of the Wasatch Formation (Oriel and Tracey, 1970; Rubey and others, 1975).

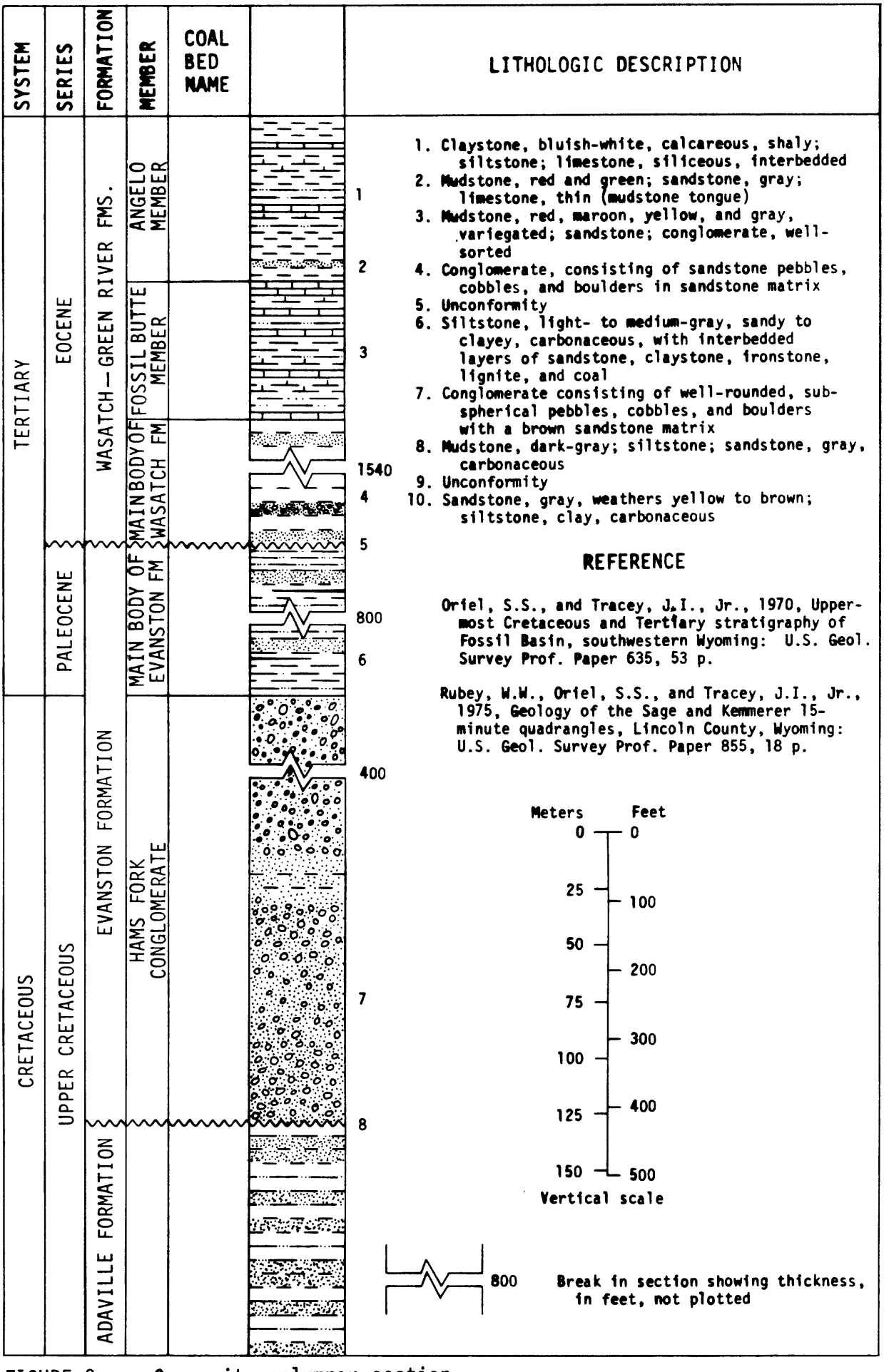


FIGURE 2. — Composite columnar section.

The main body of the Wasatch Formation unconformably overlies the Evanston Formation in the southeastern corner of the quadrangle and crops out over much of the western two thirds of the quadrangle. It is composed of approximately 1,700 feet (518 m) of red, maroon, gray, and yellow variegated mudstone containing layers of fine- to coarse-grained brown, yellow and gray sandstone and well-sorted conglomerate (Oriel and Tracey, 1970; Rubey and others, 1975). The middle and upper parts of the Wasatch intertongue with units of the Green River Formation over much of the quadrangle.

The mudstone tongue of the Wasatch Formation crops out in the western two thirds of the quadrangle where it conformably separates the Fossil Butte and Angelo Members of the Green River Formation. It is approximately 60 feet (18 m) thick in the northern part of the quadrangle, thinning to the south and eventually pinching out south of the quadrangle boundary. The unit consists of red and green mudstone, gray and brown sandstone, and thin beds of limestone (Oriel and Tracey, 1970; Rubey and others, 1975).

Remnants of the Bullpen Member of the Wasatch (not shown in figure 2) conformably overlie the Angelo Member of the Green River Formation, capping small areas along the ridge crests in the west-central and southwestern parts of the quadrangle. This member ranges in thickness from a few feet to slightly over 100 feet (30 m) and consists of red, gray and green mudstone, tan to brown and gray sandstone, and brown laminated limestone (Oriel and Tracey, 1970; Rubey and others, 1975).

The Fossil Butte Member of the Eocene-age Green River Formation overlies the main body of the Wasatch Formation and is overlain by the mudstone tongue of the Wasatch. It crops out over a wide area in the western two thirds of the quadrangle and consists of tan to buff-colored laminated limestone and marlstone, brown oil-shale, and light gray siltstone, claystone, and mudstone. It ranges from 200 to 280 feet (61 to 85 m) thick in the Kemmerer area (Oriel and Tracey, 1970; Rubey and others, 1975).

Conformably overlying the mudstone tongue of the Wasatch, the Angelo Member of the Green River Formation crops out on the Hams Fork Plateau in the west-central and southwestern parts of the quadrangle. The member consists of bluish-white and white-weathering calcareous shale, siltstone, claystone, siliceous limestone, laminated tan limestone, and brown algal limestone. Its maximum thickness is approximately 200 feet (61 m) (Oriel and Tracey, 1970; Rubey and others, 1975).

Holocene deposits of gravel cover the stream valleys of Hams Fork and terrace-gravel remnants cap hills bordering the Hams Fork velley. Landslide material covers hill slopes in many canyons in the quadrangle.

The Cretaceous formations present in the subsurface in the northwest quarter of the Kemmerer 15-minute quadrangle were deposited in a broad, shallow north-south-trending seaway that extended across central North America. Sediments accumulated near the western edge of the Cretaceous sea and reflect the changing location of the shoreline during several major transgressions and regressions of the sea (Weimer, 1960 and 1961).

The Adaville Formation was deposited in flood plains and swamps along the coastal plain during the final withdrawal of the Cretaceous sea (Roehler and others, 1977).

After the final withdrawal of the Cretaceous sea, thick sections of detrital material, eroded from older deposits to the west, were deposited by large streams as the conglomerates of the Hams Fork Conglomerate Member of the Evanston Formation. Environments of deposition for the main body of the Evanston Formation included streams, marshes, and, probably, ponds (Oriel and Tracey, 1970).

The Wasatch Formation is composed of continental sediments. The Tunp Member appears to have formed from mudflows and slides of fresh and weathered rocks on steep slopes. The bright-colored mudstones of the main body of the Wasatch Formation were probably deposited on a flood plain and then cut by stream channels now filled with well-sorted

conglomerate. The mudstone tongue of the Wasatch may have been deposited within the Eocene Fossil Lake as deltas, offshore bars and blanket-bottom deposits. The thin and extensive limestone beds in the Bullpen Member indicate that the flood plains on which the deposits were formed were flooded, at brief intervals, by Fossil Lake (Oriel and Tracey, 1970).

The Green River Formation is of lacustrine origin with the strata deposited in both a near-shore shallow-water environment and in depths up to 100 feet (30 m) within Fossil Lake. The lake existed in a humid subtropical to tropical climate (Oriel and Tracey, 1970).

Structure

The northwest quarter of the Kemmerer 15-minute quadrangle is located on the southeastern part of the structurally complex Wyoming Overthrust Belt. Folded Paleozoic and Mesozoic rocks are thrust eastward over folded Cretaceous-age rocks, with younger rocks of Cretaceous and and Tertiary age resting unconformably on top of the older rocks (Roehler and others, 1977). Folded coal-bearing Cretaceous strata occur in the subsurface in the western limb of the Lazeart Syncline, an asymmetrical fold whose western limb crosses the southeastern corner of the quadrangle. The western limb of the Lazeart Syncline is unconformably overlain by the Upper Cretaceous Hams Fork Conglomerate and younger rocks.

The Absaroka fault, an extensive thrust fault mapped for a linear distance of 205 miles (330 km) in Wyoming and Idaho, crosses the southeastern corner of the quadrangle (figure 1). It has a stratigraphic displacement of approximately 10,000 to 15,000 feet (3,048 to 4,572 m) and a lateral displacement of approximately 3 miles (4.8 km). The major movement along the Absaroka fault occurred in very Late Cretaceous time, with probably minor movement in Paleocene time (Rubey and others, 1975).

COAL GEOLOGY

The Adaville Formation and the Evanston Formation are potentially coal-bearing at depths of less than 3,000 feet (914 m) below the ground

surface. No drill-hole or coal-resources data for either formation is available in this quadrangle.

In the northeast quarter of the Kemmerer 15-minute quadrangle to the east, one Adaville coal bed is reported to be 18 feet (5.5 m) thick at the outcrop (Schultz, 1914), and numerous thick Adaville coal beds are mined in the southeast quarter of the Kemmerer 15-minute quadrangle. However, according to Glass (1977), the coal beds in the Adaville Formation are not persistent over long distances; they thin, thicken, split, and coalesce over very short distances. Because of the nature of these beds, coal data has not been projected from adjacent quadrangles into this quadrangle, and coal resources in the Adaville Formation were not evaluated.

Coal beds in the Evanston Formation were extensively mined in the late 1800's in the Evanston quadrangle, approximately 45 miles (74 km) to the southwest. But, according to Rubey and others (1975), coal beds of the Evanston Formation in this quadrangle are poor in quality, of small areal extent, and too thin to be mined economically.

COAL DEVELOPMENT POTENTIAL

Areas where coal beds of Reserve Base thickness (5 feet or 1.5 meters) are overlain by 200 feet (61 m) or less of overburden are ordinarily considered to have potential for either surface or subsurface mining methods. Coal beds of Reserve Base thickness (5 feet or 1.5 meters) are not known to be within 3,000 feet (914 m) of the ground surface in this quadrangle. Therefore, all Federal lands within the KRCRA boundary have been classified as having an unknown development potential for both surface and subsurface mining methods in this quadrangle.

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