**Methane in Cretaceous and Paleocene coals of western Colorado**


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INTRODUCTION
Western Colorado is the site of coal, oil, and natural gas development in three principal areas: the San Juan River, the Uinta, and the Green River Regions (fig. 1). Evidence is accumulating that some of the coals in these regions both act as a source and potential reservoir for natural gas (methane). This paper details some of the evidence and describes work being done by the Colorado Geological Survey (CGS) to estimate the methane resources of these regions.

PROCEDURES
Only areas considered to have a high methane potential are included in this paper. These areas contained thick, high ranking coals at depth (Goolsby and others, 1981). Net coal thicknesses were determined from the following logs: natural gamma, caliper, sonic or acoustic, neutron, and density. SP-resistivity logs were used only to pick formation tops or verify the presence of coals seen on the other logs or sample logs. The minimum seam thickness used in determining net coal thicknesses is 0.6 m (2 ft) for the San Juan Region, 1 m (3 ft) for the Uinta Region, and 1.2 m (4 ft) for the Green River Region.

SAN JUAN RIVER REGION

The San Juan River Coal Region of southwestern Colorado is that area underlain by the coal-bearing Dakota Formation (Goolsby and others, 1979, p. 38). Within this region, the San Juan Basin offers the greatest methane potential. The basin, a deep asymmetrical syncline, is approximately 160 km in diameter (fig. 1). Its arcuate axis lies just south of the Colorado-New Mexico border. The steeply dipping,

Figure 1. The coal regions of Colorado.
U-shaped Hogback Monocline forms the northern rim of the basin. To the east, the Gallina-Archuleta Arch and the Nacimiento Uplift bound the basin. To the south, the basin grades into the Chaco Slope. The southwestern boundary of the basin is formed by the Defiance Monocline (Woodward and Callender, 1977, p. 210). En echelon northwesterly trending folds and northeasterly trending high-angle faults occur along the basin's eastern boundary. Around the basin's perimeter are radial folds plunging towards the basin's center and minor folds parallel to the basin's margins. These structures formed principally during Late Cretaceous Laramide times. The entire area was then epeirogenically uplifted. Igneous intrusions were emplaced along the basin's margins during Tertiary times.

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The Lower Cretaceous sediments contain all of the coal-bearing formations in the basin (fig. 2). These sediments are a series of intertonguing marine and nonmarine deposits which resulted from three transgressive-regressive cycles of the Cretaceous epeicontinental sea (Fassett and Hinds, 1971, p. 4). The final regression of the sea is represented by the Pictured Cliffs Sandstone.

The marine sediments are pro-delta and interdeltaic deposits of shoreline marine sands, offshore sandy silts, and deep water muds. The nonmarine deposits are lower delta or coastal-plain deposits, and upper delta or alluvial-plain deposits (Molenaar, 1977, p. 159). It is predominantly in these nonmarine, coastal-plain and alluvial-plain facies that coal sequences are found.

The coal-bearing formations of the San Juan Basin, in ascending order, are the Dakota, the Meneelee (Mesaverde Group), and the Fruitland formations (fig. 2). The Dakota has coal seams ranging in thickness from 0.6 m to 2.4 m. All seams are discontinuous and grade laterally into carbonaceous shales. The coals were probably deposited in a flood-plain/braided stream environment. The Meneelee coals, like the Dakota coals, are extremely lenticular and also range from 0.6 m to 2.4 m thick. It appears these coals were deposited on a delta plain between distributary channels.

The Fruitland Formation, which averages 122 m in thickness, has the thickest and most continuous coal seams in the region. Coals throughout the formation range from less than 0.3 m to 22 m. Thickest and most continuous seams in the Fruitland are found in the lowermost 21 m. These seams formed from peat deposited in brackish to fresh-water lagoons and marshes, behind a barrier coastline. The thinner seams in the Fruitland probably formed on upper coastal plains (alluvial plains).

Historically, the Fruitland Formation has been broken into three coal zones (Boreck and Murray, 1979, p. 56). The upper zone (Shamrock zone) may reach 6 m in thickness and is found near the middle of the formation. The middle zone (commonly called the Carbonera or Peacock zone) is located in the basal 21 m of the formation. The third zone (Fruitland tongue) is a shale and coal deposit which intertongues with the Pictured Cliffs Sandstone. This zone is not continuous throughout the basin and is difficult to locate on geophysical logs.

The Fruitland coals in the San Juan River Region vary in rank from subbituminous B (sub B) at the basin's perimeter, to medium volatile (my) in the deeper parts of the basin. The medium volatile ranking coals may be due to local upgrading. The deepest Fruitland coals in the basin have overburdens of up to 1,200 m.

Methane

Evidence from mine data, oil and gas exploration, and desorption of coal cores and cuttings samples indicates that gas is present in the coals of the San Juan Basin.

Fender and Murray (1978, p. 8) reported three gassy mines in the San Juan region. The Burnwel I No. 1 and the Hesperus (old) mines were sites of mine fires. The Champion was the site of a gas explosion.

A large number of wells had gas shows in coal zones or were tested and/or producing from Fruitland coal intervals. One well, T.32N., R.7W., recorded a gas “kick” over a 6.4 m interval, containing a 1.5 m coal at its base. A second well (T.33N, R.6W.) was drillstem tested over a 49 m Fruitland interval containing three coal beds totaling 17 m. The interval tested 5,664 m³ per day (200 MCFD) with a flow pressure of 96 pounds in a 1 hour test. Well completion included 2.4 m of coal (Goolsby and others, 1981, Appendix B).

Lent (1980) gives the results of 10 desorption measurements (using the U.S. Bureau of Mines "direct method") from the San Juan River Coal Region of Colorado and New Mexico. The gas contents

Figure 2. Log showing Cretaceous coal-bearing formations (Dakota, Meneelee, and Fruitland) in the San Juan Basin.
range from 0.16 cubic centimeters per gram (cm/g) [5.3 cubic feet per ton (ft/0] of coal to 4.2 cm/g (134 ft/t). The coals rank from high volatile C bituminous (hvC) to high volatile A bituminous (hvA). However, these data do not reflect the high methane potential of the region, since the samples were not from the highest ranking Fruitland seams.

Goolsby and others (1981) reported on an area in the Colorado part of the San Juan Basin characterized by thick, continuous, and high ranking Fruitland coals under sufficient overburden to prevent gas loss. This area covers 1,528 km in T.32N.-T.34N. and R.5W.-R.11 W. Figure 3 is a net coal thickness map and Figure 4 is a structure map of this area.

The authors believe the gas contents of the coals in the study area are similar to those of coals in the Raton Mesa Coal Region. This belief is based on similarities in rank, overburden depths, stratigraphic position, and localized upgrading (Goolsby and others, 1981, p. 25; and Tremain, 1981, p. 34). The gas contents of the Raton Mesa region ranged from 2.25 cm/g (72 ft/t) in a high volatile B bituminous (hvB) sample to 16.0 cm/g (514 ft/t) in a medium volatile bituminous (mv) sample.

A coal resource estimate of 19.7 billion short tons was obtained for the study area by planimetering the net coal thickness isopach (fig. 3). Multiplying this tonnage by the low and high gas contents stated above, gives a total coal bed methane resource estimate ranging from 40 billion m (1.4 trillion ft) to 283 billion m (10.0 trillion ft).

**UINTA REGION**

The Unita Coal Region (fig. 1) is the area in west-central Colorado and eastern Utah bordered by the base of the Mesaverde Group. The Colorado portion of the region covers 18,648 km (Murray, 1980, p. 214).

The Piceance Basin, in the Colorado portion of the Unita Region, has excellent methane potential. This basin is defined by the Cretaceous-Tertiary outcrop and covers approximately 10,360 km (Dunn, 1974, p. 217). The basin is bounded by: the Axial Basin Uplift in the north; the Grand Hogback Monocline in the east; the Elk and West Elk mountains and the Gunnison Uplift in the south; the Uncompahgre Uplift in the southwest; and the Douglas Creek Arch in the west.

The basin itself is asymmetrical with a steeply-dipping eastern and northeastern flank and a gentle western and southwestern flank.
The axis of the basin trends northwesterly and parallels the Grand Hogback Monocline on the eastern side of the basin. This axis is split by basinward plunging anticlines on its north and south ends (Dunn, 1974, p. 217). Other northwest-southwest trending anticlines dot the interior of the basin. Gas and locally oil is produced from a number of these anticlines and from structures in the adjoining Douglas Creek Arch.

The Precambrian basement is 5,500 m below sea level at the deepest point in the basin. There are over 7,620 m of Cambrian through Quaternary sediments at this point (Murray, 1980, p. 214). Cretaceous sediments constitute over 3,000 m of this sequence (Murray and Haun, 1974, p. 31). These sediments were deposited as the Cretaceous sea slowly and episodically regressed to the east. The marine Mancos Shale comprises the major portion of the lower Cretaceous sediments. Upper Cretaceous sediments are predominantly the non-marine sandstones, shales, and coals of the Mesaverde Group (see fig. 5).

The Mesaverde coals occur as discontinuous beds throughout the formation. They show great variations in thickness and rank. In an outcrop at Newcastle, the total coal thickness reaches 33 m; an individual bed is reported as 15 m (Gale, 1910, p. 111). Subsurface data in the south central part of the basin show a maximum of 24 m of coal present in beds up to 9 m thick. The coals range from subbituminous B (sub B to anthracite (anth) in rank. Figure 6 is an isopach and rank map of Mesaverde coals. Figure 7 is a structure map of the Cozette Sandstone near the base of the Mesaverde Group.

**Methane**

Fender and Murray (1978) listed 47 coal mines in the region that reported gas occurrences. The gassiest mines are in the Carbondale coal field (T.7-10S., R.89W.) where the coal ranks medium volatile (mv). In this field, the L. S. Wood mine emitted 61,454 m³ per day (2,170 MCFD); the Dutch Creek #1 mine emitted 37,892 WA (1,338 MCFD); and the Dutch Creek #2 mine emitted 40,384 m³/d (1,426 MCFD) for the period 1974 through 1976. At least two wells have produced methane from coal in the Piceance Basin area. A well on the Douglas Creek Arch produced an average of 283 m³/d (10 MCFD) for several months from a shallow coal bed. A well in the south-central part of the basin had an initial production of 12,461 m³/c (440 MCFD) and 17 m³/c (109 barrels) of water from perforations in three deep, medium volatile coals.

The gas contents of the 80 samples collected by the CGS from the region have ranged from 0 to 13.7 cm³/g (0 to 438 Wt) (Table 1). The quality of the gas of seven of these samples has ranged from 3,583 to 8,534 kcal/m³ (403 to 960 BTU/ft³). These and other samples taken by the U.S. Bureau of Mines and the CGS show an increase in gas contents with increasing rank and depth. Therefore, those areas with thick, high ranking coals at depths sufficient to prevent gas loss would be likely methane prospects. Study of coal rank, isopach, structure, and topographic maps should reveal such areas.

By planimetering the coal isopach map (fig. 6) and using gas contents averaged from Table 1, the CGS has estimated a coal bed methane resource of 878 billion m³ (31 trillion ft³) in the southern half of the Piceance Basin. The CGS is currently revising this map in order to estimate the methane resources for the entire basin.

**GREEN RIVER COAL REGION**

The Green River Coal Region in northwestern Colorado (fig. 1) is defined as the area bounded by the basal contact of the Upper Cretaceous Mesaverde Group (Murray, 1980, p. 211).

The main structure within the region is the Sand Wash Basin. The basin is bordered by the Cherokee Ridge to the north, the Sierra Madre Uplift to the east, the Axial Basin Arch to the south, and the Uinta Uplift to the west and southwest.

The basin’s axis trends west-northwest. Depth to the top of the Precambrian rocks in the deepest part of the basin is approximately 5,300 m below sea level (Haun, 1962, p. 11). Folding and faulting is common in the basin. The major structures are usually found along the periphery. Upper Triassic intrusives occur in the eastern part of the basin.

Sedimentary rocks in the Sand Wash Basin-Green River Region range from Upper Cambrian to Tertiary in age. Coal-bearing rocks in the Green River Region are: the Upper Cretaceous Iles and Williams Fork formations (or Rock Springs and Almond formations) of the Mesaverde Group, the Upper Cretaceous Lance Formation, the Upper Cretaceous-Paleocene Fort Union Formation, and the Paleocene-Eocene Wasatch Formation (fig. 8).

The Iles and Williams Fork formations (Mesaverde Group) were deposited in a marginal marine environment bordering the Late Cretaceous epeirogenic sea. The formations are predominantly white to light brown sandstones, gray shales, and coals. The coals are found throughout the Mesaverde Group. Most individual coal beds are less than 3 m thick, although coals up to 7 m have been recorded. Net coal thicknesses for the Iles and Williams Fork formations range from 6 to 41 m.

The Lance Formation was deposited in a marginal marine to fluvial environment. The formation is made up of gray shales, light brown sandstones and coals. Lance coals are not as thick and well

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**Figure 5. Type log for the southern Piceance Basin. Coals are shown in black.**
Figure 6. Net coal isopach and coal rank map of the Cretaceous Mesaverde coals, southern Piceance Basin (after Fender and Murray, 1978; Freeman, 1979). Isopachs in feet.

Figure 7. Structure on the top of the Cretaceous Cozzette Sandstone in the southern Piceance Basin (after Fender and Murray, 1978). Contours in feet.
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<th>% methane in gas</th>
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**SAN JUAN RIVER COAL REGION**

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**UNITA RIVER COAL REGION**

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**UNITA COAL REGION**

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1. blanks indicate gas analyses not run
2. NC = not calculated
3. mgm samples; gas contents probably higher
4. Gp. = group
5. heating value not measured if methane percentage in parentheses
6. the following blank spaces indicate data not yet available
developed as the Mesaverde coals. Net coal thicknesses range from 0 to 7.3 m, with the thickest individual coal bed attaining 3.6 m.

The Fort Union Formation rests unconformably on the Lance. It was deposited in a fluvial environment and is predominantly drab brown and gray sandstones, shales, and coals. Fort Union coals are the thickest reported in the five coal bearing formations. Individual coals are up to 15 m thick. Net coal thicknesses range from 0 to 33.5 m.

The Wasatch Formation overlies the Fort Union and consists of fluvial gray and pink arkosic sandstones, mudstones, conglomerates, and coals. Coals found in the Wasatch are, as a rule, thin and sparse.

Figure 9 is a net coal isopach map combining coal thicknesses from the Lance and Fort Union formations. Mesaverde coals were not included in the isopach due to scarcity of well log data and the Wasatch coals due to their sparseness. The mapped area is marked by the basal contact of the Wasatch Formation and by the Colorado state line. The isopach map should not be used to interpret specific depositional trends as the map is a composite of two formations deposited in two different environments.

Methane

Evidence for the presence of coal bed methane is found in both coal mine records and oil and gas data within the Green River Region—Sand Wash Basin. Coal mine records report the following: The Wedge No. 1, No. 2 mine complex (T.6N., R.97W.) was rocked by a gas explosion in 1942. Another mine, the Apex No. 2 Mine (T.4N., R.86W.), recorded an average gas emission of 322 m³/d (11.4 MCFD) in 1974 (Fender and Murray, 1978, table 1).

Well records obtained during oil and gas exploration offer conclusive evidence of the presence of coal bed methane at depths greater than 900 m. At these depths, mudlogs show gas kicks from coals; these kicks generally increase in strength with increasing depth. Gas buildups are often reported when drilling through coal sections. Coal cores bleeding gas have also been recovered.

Coal cores from four coal exploratory and one oil and gas test in the Green River Region have been desorbed (Table 1). The coal exploration core samples taken at depths of 53-427 m in T.5N., R.86-87W. yielded from 0 to 0.50 cm³/ton (0-16 ft³/t). Core samples taken from the oil and gas test (T.7N., R.90W.) at depths of between 1,097 to 1,440 m, contained from 0.58 to 11.76 cm³/ton (18 to 376 ft³/t).

The Sand Wash Basin of the Green River Region is believed to have a high potential as:

1) The amount of gas in the coals increases with increasing depth, and
2) Many of the thick coal sequences shown in Figure 9 occur under sufficient overburden to retain this gas.

The CGS will be calculating methane resources for the Sand Wash Basin in the near future.

CONCLUSIONS

The three regions of western Colorado contain basins with high methane potential. These areas may be found using coal rank,
depth, and desorption data obtained at little cost when drilling for coal reserve information or oil and gas. Potential coal reservoirs should be considered during all such exploration so they can be quickly developed when the economics so justify.

ACKNOWLEDGMENTS

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REFERENCES

Molenaar, C. M., 1977, Stratigraphy and depositional history of Upper Cretaceous rocks of the San Juan Basin area, New Mexico and Colorado, with a note on economic resources: New Mexico Geological Society Guidebook 20, p. 159-166.
Rocky Mountain Association of Geologists, 1975, Subsurface cross-sections of Colorado: Rocky Mountain Association of Geologists Special Publication No. 2, p. 27-31, Fig. 20.