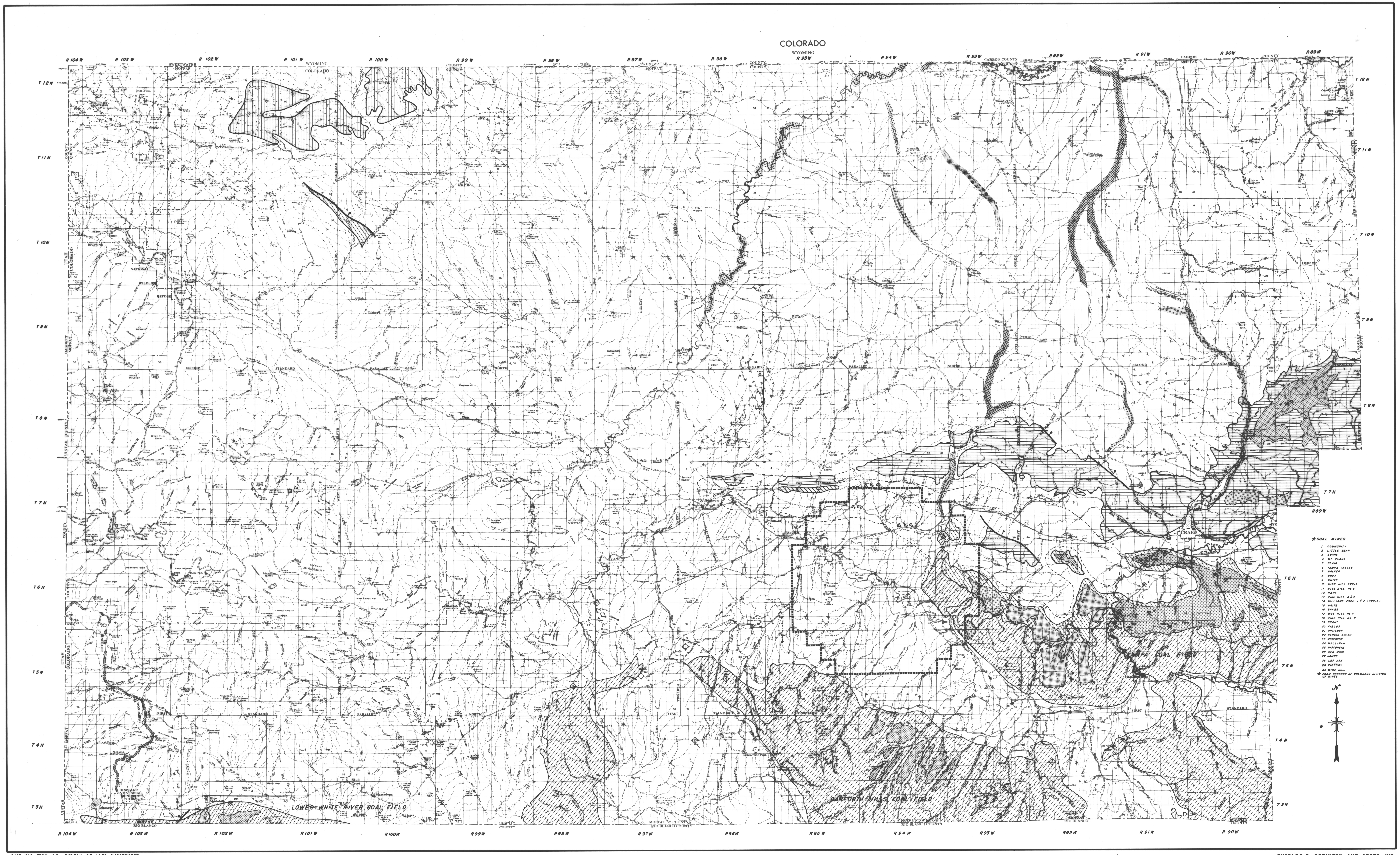


BASE MAP FROM U.S. BUREAU OF LAND MANAGEMENT

EXPLANATION

COAL RESOURCES

CONTACT OF EXPOSED COAL BEARING FORMATION.

FAULTS
BAR AND BALL ON DOWNTHROWN SIDE

BITUMINOUS COAL
LESS THAN 1000 FT. OF OVERBURDEN IN THE ILES AND WILLIAMS FORK FORMATIONS.

SUBBITUMINOUS COAL
LESS THAN 1000 FT. OF OVERBURDEN UNDERLAIN BY BITUMINOUS COAL OF THE MIDDLE AND LOWER COAL GROUPS OF THE ILES AND WILLIAMS FORK FORMATIONS.

SUBBITUMINOUS COAL
LESS THAN 1000 FT. OF OVERBURDEN IN THE LANCE AND FORT UNION FORMATIONS.

STRIPPABLE SUBBITUMINOUS COAL
LESS THAN 1000 FT. OF OVERBURDEN IN THE WASATCH FORMATION. (SPELTZ)[1]

AREA OF STRIPPABLE COAL (SPELTZ)[1]

AREA UNDERLAIN BY COAL BEARING FORMATIONS WITH LESS THAN 1000 FT. OF OVERBURDEN.

ENERGY RESOURCES

U_3O_8

URANIUM, OPEN PIT

GEOTHERMAL RESOURCE

AREA PROSPECTIVELY VALUABLE FOR GEOTHERMAL RESOURCE. (BASS, N.W., PERSONAL COMMUNICATION.)

METALLIC MINERALS

PAST PRODUCTION — POTENTIAL (PROMMEL)[2]

GOLD, PLACER

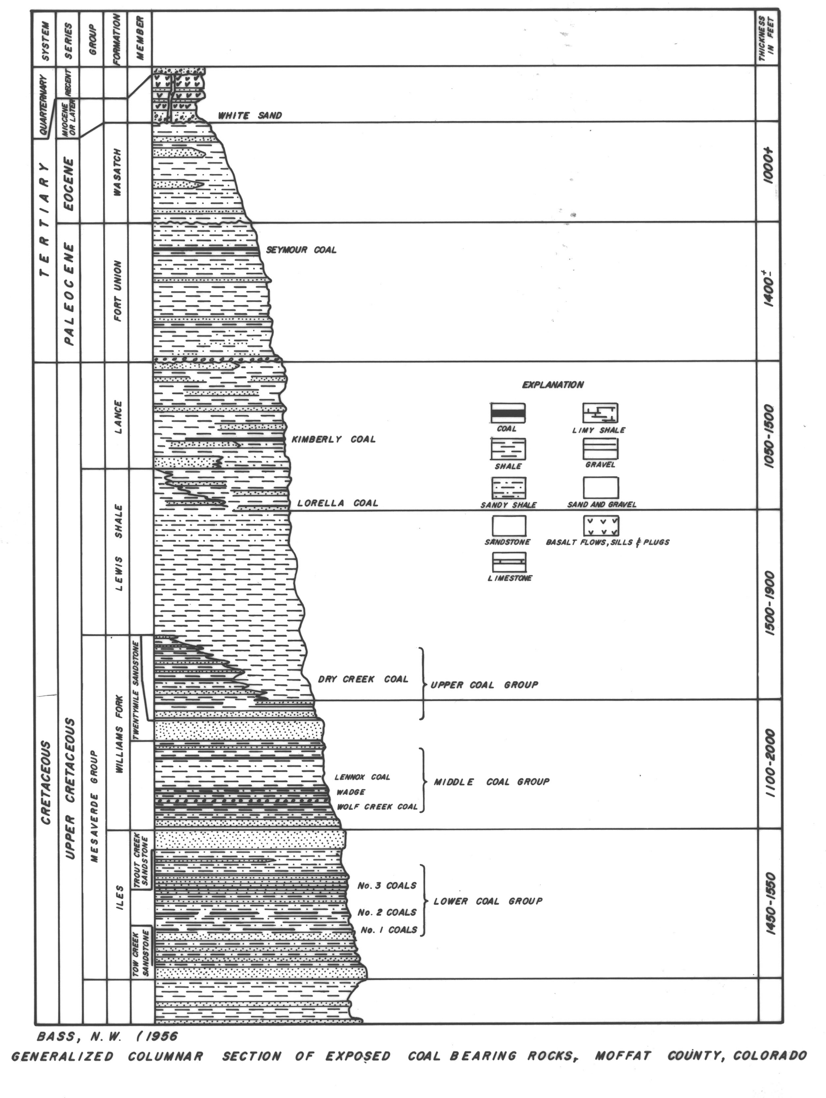
Cu

COPPER - SILVER PROSPECT

SOURCES OF DATA

[1] SPELTZ, CHARLES N., 1974, STRIPPLE COAL RESOURCES OF COLORADO, U.S. BUREAU OF MINES PRELIMINARY REPORT 195, pp. 13-17

[2] PROMMEL, N.C. AND HOPKINS, P.M., 1968, PLACER GOLD IN MINERAL AND WATER RESOURCES OF COLORADO COMPILED BY THE U.S. GEOLOGICAL SURVEY IN COLLABORATION WITH COLORADO MINING INDUSTRIAL DEVELOPMENT BOARD FOR THE U.S. SENATE COMMITTEE ON INTERIOR AND INSULAR AFFAIRS pp. 85-93



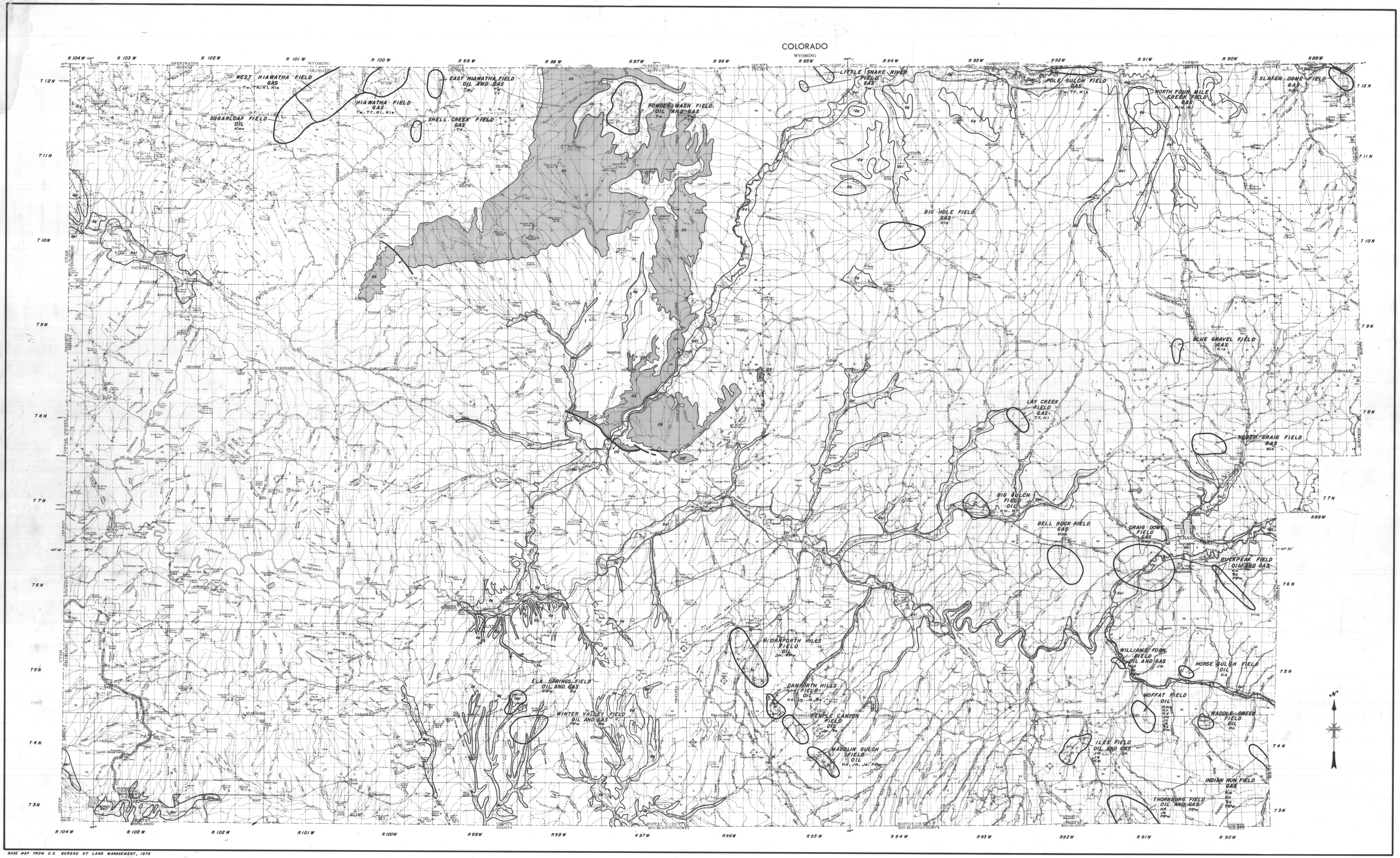
BASS, N.W. (1956

GENERALIZED COLUMNAR SECTION OF EXPOSED COAL BEARING ROCKS, MOFFAT COUNTY, COLORADO

CHARLES S. ROBINSON AND ASSOC., INC.
GOLDEN, COLORADO DEC., 1975
COMPILED BY CLYDE R. BOYLE, P.E.

MINERAL RESOURCE MAPS, MOFFAT COUNTY, COLORADO
SHEET 1 OF 3 SHEETS
COAL, URANIUM, GEOTHERMAL RESOURCES, AND METALLIC MINERALS

SCALE
0 2 4 MILES



BASE MAP FROM U.S. BUREAU OF LAND MANAGEMENT, 1975

EXPLANATION

OIL AND GAS

DANFORTH HILLS FIELD
OIL
Jm, PIPm

APPROXIMATE OIL FIELD BOUNDARIES WITH FIELD NAME AND MAJOR PRODUCING FORMATIONS.

OIL SHALE

OS

OUTCROP OF THE LANEY SHALE MEMBER, GREEN RIVER FORMATION.

SAND AND GRAVEL

ALLUVUIM

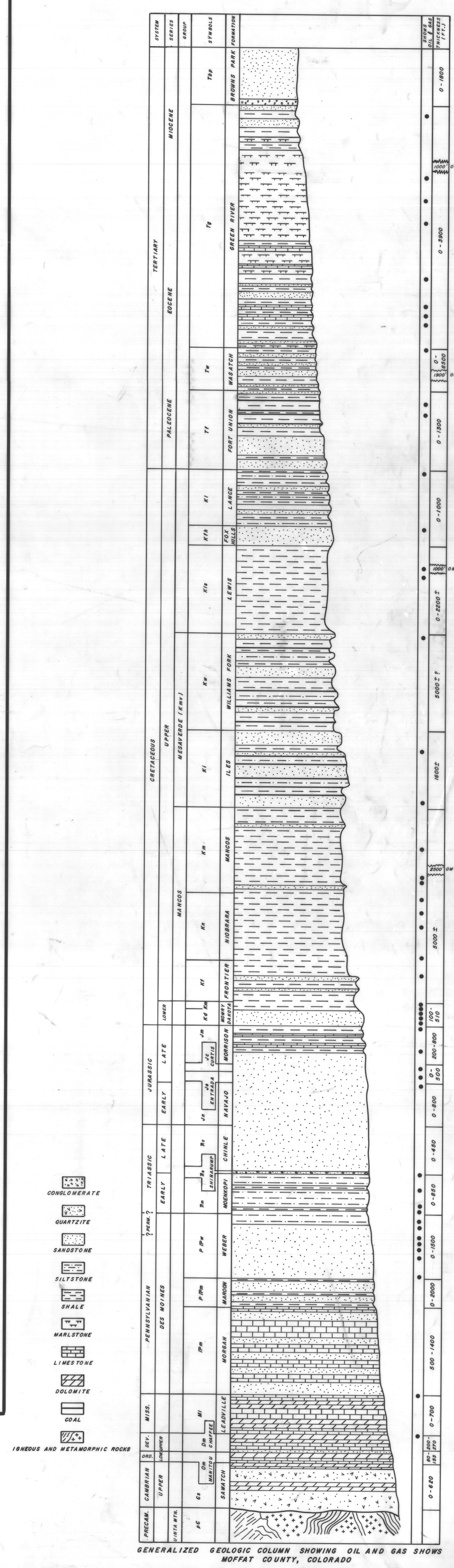
Qal

SILT, SAND, GRAVEL AND BOULDERS DEPOSITED BY MAJOR TRIBUTARIES, PROBABLE RESOURCE AREA.

SURFICIAL DEPOSITS

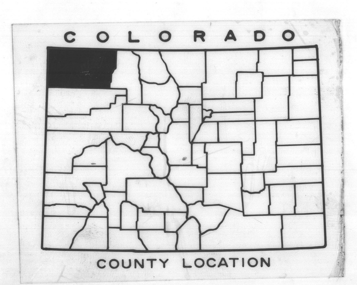
Qg

SILT, SAND, GRAVEL AND BOULDERS THAT MAY BE A RESOURCE.



GENERALIZED GEOLOGIC COLUMN SHOWING OIL AND GAS SHOWS
MOFFAT COUNTY, COLORADO

REVISED FROM COMPOSITE LOG, NORTHWEST COLORADO IN AMUEDO, C.L. AND MOTT, M.R., 1962 EXPLORATION FOR OIL AND GAS IN NORTHWESTERN COLORADO, ROCKY MTN. ASSOC. OF GEOLOGISTS.



COUNTY LOCATION

SCALE
0 2 4 MILES
1:126,720

MINERAL RESOURCE MAPS, MOFFAT COUNTY, COLORADO
SHEET 2 OF 3 SHEETS
OIL & GAS, OIL SHALE, SAND & GRAVEL

CHARLES S. ROBINSON AND ASSOC., INC.
GOLDEN, COLORADO DEC., 1975
OIL AND GAS COMPILED BY WALLACE H. COCHRANE
OIL SHALE COMPILED BY CLYDE R. BOYLE

MINERAL RESOURCES OF MOFFAT COUNTY, COLORADO

INTRODUCTION

The Mineral Resources Study of Moffat County was made by Charles S. Robinson and Associates, Inc., under the direction of the Moffat County Planning Commission in cooperation with the Colorado Geological Survey under a contract with the Moffat County Commissioners. The program was conducted in partial fulfillment of the requirements for the identification of mineral resources under House Bill 1041 (1974).

The data were obtained chiefly from published reports of the U.S. Geological Survey, the Colorado Geological Survey, the U.S. Bureau of Mines, and the Colorado Bureau of Mines. A series of unpublished reports on mineral resources of Planning Units by the U.S. Bureau of Land Management were of particular value. The data on oil and gas were compiled by W. H. Cochrane. The data on coal, uranium and the metallic and non-metallic resources were compiled by C. R. Boyle. A list of selected references is appended.

The data are presented on three sheets: Sheet 1 is entitled "Coal, Uranium, Geothermal and Metallic Minerals"; Sheet 2 is entitled "Oil, Gas and Oil Shale"; and Sheet 3, which contains a brief description of the mineral resources and their occurrance.

MINERAL RESOURCES

MINERAL FUELS AND ENERGY RESOURCES

Coal:

Coal is by far the most abundant mineral resource in Moffat County. Landis, 1959, estimates the original reserves of bituminous and subbituminous coal, under less than 3,000 feet of overburden, in Moffat County amounted to 20,172 millions of short tons. This is approximately one-fourth (24.7%) of the estimated total original reserves of similar coal within the State of Colorado.

The coal occurs in the Iles and Williams Fork formations of the Mesa Verde group and in the Lance, Fort Union and Wasatch formation. The bituminous coal occurs in multiple beds in the Iles formation, and in the lower half of the Williams Fork formation. The stratigraphic occurrance of the coal is shown on the columnar section on Sheet 1. The beds in the Iles formation are known as the Lower Coal Group. Those in the lower half of the Williams Fork formation are called the Middle Coal Group. These groups contain approximately 75% of the estimated reserves in Moffat County. The bituminous coal, for the most part, is high volatile C in rank. On an "as received" basis the heating value will average 11,000 to 12,000 btu. The sulfur content will range from 0.6% to 1.0%.

The subbituminous coal beds occur in the upper half of the Williams Fork formation and in the younger Lance, Fort Union and Wasatch formations. With the exception of the coal in the Wasatch formation, the subbituminous coal will range from subbituminous B to C in rank. The heating value, "as received", will range from 9,000 to 10,000 btu; The sulfur content ranges from 0.3% to 1.0%. No analyses are available for the Wasatch coal. It has been termed "lignitic", which indicates a heating value of less than 8,300 btu.

Speltz (1974) gives estimates of strippable coal resources by coalfields. Applying the data applicable to Moffat County, the strippable coal resources are:

Yampa Coalfield	445,200,000 tons
Danforth Hills Coalfield	147,450,000 "
Lower White River Coalfield	8,800,000 "
Total	601,450,000 tons

The above total includes bituminous and subbituminous coal occurring in the Iles, Williams Fork, Lance and Fort Union formations. In addition, an estimate is given for strippable coal occurring in the Wasatch formation. This area includes portions of T. 8, 11 and 12 N., R. 89 to 102 W. The estimate states there are 90,000,000 tons identified and a potential (undiscovered) volume of 109,000,000 tons.

The criteria used in defining strippable coal resources were a minimum coalbed thickness of two feet and a maximum overburden thickness of 150 feet, except where the coalbeds are of exceptional thickness.

Coal Production:

Records at the Colorado Bureau of Mines show that a total of 6,120,419 tons of coal were mined in Moffat County during the years 1917 through 1974. This production is valued at $21,004,417. which is an average of $3.43 per ton. Historically this was a reasonable price but since 1973 coal prices have increased remarkably. Future contracts will probably be based on a value of 50 to 60 cents per million btu. This will give the bituminous coal in Moffat County a value of $11.00 to $13.00 per ton.

At the present time one coal mine is operating in Moffat County. This is the Wise Hill #5, an underground mine operated by Empire Energy Corporation. Two new operations are planned. Utah International, Inc. is developing a surface mine in T. 5 and 6 N., R. 90 and 91 W., about 4 miles south of Craig. The planned production will be 2.5 million tons per year, beginning in 1978. The coal will be used to feed two 380 MW power plants presently under construction by Colorado-Ute Electric Association.

W. R. Grace has announced plans for a surface mine development at the old Red Wing mine 25 miles south of Craig. The planned production is for 3 million tons per year by 1979. The coal will be sold to eastern power plants.

The coal reserves of Moffat County are impressive. Even the planned increase in production from 200,000 tons per year to 7.5 million tons per year will do little to deplete the reserves. Much of the coal is presently without access to market but the increasing requirements for electric energy will no doubt produce incentive to make the better coal deposits available.

Oil and Gas:

Four main structural features control the exploration for oil and gas in Moffat County: the east-west trending Uinta Mountain uplift, the northwest-southeast trending Axial Basin uplift, and the Sand Wash structural basin and the easterly bifurcation of the Piceance basin known as Coyote Basin. (see fig. 2, sheet 3).

Stratigraphically there are possible oil and gas reservoirs from the Upper Devonian through the Tertiary in both continental and marine sediments. Variations in the stratigraphy and the nomenclature are shown on the Stratigraphic Nomenclature chart. (see fig. 1, sheet 3).

Oil and Gas Possibilities:

Most of the discoveries of oil and gas to date have been made in the topographic Vermilion Basin on the northwest flank of the Sand Wash basin, the area along the Wyoming-Colorado State line south of the Baggs Arch-Cherokee Ridge fault zone, and on the Axial Basin uplift. Table 1 (sheet 3) shows the formations that have been productive and that had shows of oil or gas. The type of structure is also indicated. It will be noted that only on the Axial Basin uplift and the Uinta Mountain uplift that production is from structure alone, and even on the Axial Basin uplift some of the production is from stratigraphic traps. Production in the Sand Wash Basin is primarily from sand lenses on the flanks of structures.

No production has been established in the formations of the Upper Devonian or Mississippian age, although shows have been encountered and suitable reservoirs do exist. These reservoirs appear to have been flushed, possibly before the formation of the structure. There is a possibility that not all of them have been flushed or that later fracturing or faulting may have allowed oil to migrate to the reservoir. These formations do produce oil and gas in southwestern Colorado.

In the Permo-Pennsylvanian aged section, the well-known Weber Sandstone produces from the Schoolhouse Tongue in southeastern Moffat County. As is the Weber Sandstone at the Rangely field, it is a very fine grained sandstone with poor permeability, and produces only when fracturing is present.

Production from the Eagle Valley Evaporite Member of the Minturn Formation is at the present time only from the Moffat dome. This unit, however, should prove more productive in the southeast corner of the County. The Shinarump and the Moenkopi formations of the Triassic age have carried shows on the Axial Basin uplift, but there is no production from these formations to date.

The Morrison and Entrada formations of Jurassic age are the main producing formations on the southwest flank of the Axial Basin uplift. Continuing search for stratigraphic traps on the flanks of structures should result in new fields.

Production from the Dakota Group, of Lower Cretaceous age, is found in several fields on the Axial Basin uplift in both structural and stratigraphic traps. The formations of Upper Cretaceous age - Fort Union, Lance, Lewis and Mesa Verde formations are productive in the Sand Wash basin. There is also some production from the sands in the Mancos Shale.

The formations of Tertiary age are the major producers of oil and gas in the Sand Wash basin, with many more fields to be discovered. The map of Sand Wash basin indicates vast areas that have yet to be explored.

Continued exploration in Moffat County will require detailed subsurface work, a reworking of seismic records, and a continuing program of geophysical surface work. Repeated fluctuations of the shorelines as shown by the sedimentary record provide abundant stratigraphic traps in the marine deposits, the river and stream (fluviatile) deposits, the swamp and marsh (paludal) deposits, and the lake (lacustrine) deposits of Tertiary age.

Oil Shale:

Oil shale occurs in the Laney Shale Member of the Green River Formation. The Laney Shale Member crops out over a large area in Moffat County in T. 8 - 12 N., R. 96 - 100 W. McKay and Bergin, (1974) report there are several zones of oil shale 50 - 100 feet thick present in the Laney Shale Member of the Little Snake River area. Samples of the weathered oil shale yield 0.3 to 16.6 gallons of oil per ton.

Any production of oil from oil shales in Moffat County is remote at the present time. The well known, favorably economic deposits in the Piceance Creek basin are extensive enough to absorb all of the interest of the industry for the foreseeable future.

Uranium:

Several hundred thousand tons of uranium ore in the Browns Park Formation was produced by Union Carbide Corp. during the 1950's from the Marge and Gertrude open-pit mines in Sec. 24, T. 8 N., R. 95 W. No other production from uranium deposits has been reported although exploration drilling has been done over large areas of the County. There are known deposits of low grade mineralization, also in the Browns Park Formation that may become economically workable due to the recent increase in the demand for uranium as a nuclear power plant fuel. In 1973 and 1974, deep drilling was done to explore the feasibility of solution mining the lower grade uranium deposits. The results of this work are not known, but the possible economic advantages of solution mining are attractive.

Geothermal Energy:

An area (see sheet 1) containing 83,876 acres has been designated as the Juniper Hot Springs Area by the U.S. Geological Survey (N. W. Bass, Oral communication). The area is considered to be valuable prospectively for geothermal resources.

METALLIC MINERALS

Gold:

Gold has been produced from placer deposits located in gravel benches and stream terraces along gulches tributary to the Little Snake River, Four Mile Creek, and Timberlake Creek. There has also been production from similar deposits along Lay Creek south of the Iron Springs Divide, and from gravel bars in the Yampa River below Craig.

The deposits in the Four Mile Creek area were worked as early as 1892. In May, 1897, the Engineering and Mining Journal published a geologic report on the Four Mile Placer District, written by Herbert Hoover. The report was detailed but not optimistic. Two items were of interest. One is the statement that the area staked as placer claims exceeded 100,000 acres. The second item concerns the small size of the gold particles. The report states that about 1,000 "colors" were required to equal a value of one cent (gold at $20.00 per ounce). A "color" is an independent and visible particle of gold. Later reports indicate that this excessive fineness of the gold particles was the primary reason for the abandonment of the placer operations.

Records at the Colorado Bureau of Mines show the gold production from Moffat County as follows:

Up to 1930	$ 8,772.00
1936	7,658.00
1937	32,634.00
1938	22,421.00
1960	350.00
Total	$71,835.00

Prommel and Hopkins (1968, p. 92) gives the total production of placer gold from Moffat County as about $206,000.00.

The recent increase in the price of gold has stimulated new interest in the placer deposit areas but there is no record of new production.

Copper-Silver:

The only reported production of copper and silver from Moffat County is from the Bromide Mine located in the Douglas Mountain district about 10 miles southwest of Graystone. There are other mine workings in the district but no records of any production.

Vanderwilt (1947, p. 144) states the mineralization (at the Bromide Mine) is in a small fissure vein in sedimentary beds of Mississippian or Pennsylvanian age. The ore consists of chalcocite with some silver and galena. It is generally high grade but irregular in occurrence. U.S.B.L.M. (1967) states the mine is near the base of undifferentiated Mississippian limestones and dolomites. The ore occurred in pockets of limited extent that were worked out rapidly. Analyses of past production figures indicate that the ore was relatively high grade, averaging about 18 1/2% copper, and two ounces of silver.

U.S.B.L.M. also gives the following record of production from the Bromide Mine:

Years	Tons	Ag.Ozs.	Cu.lbs.	Gross Value
*1882-1908	20	39	7,823	$ 1,275.
1912	64	124	25,085	4,088.
1916	25	38	9,033	2,464.
1917	15	23	4,326	1,187.
1924-1931	112	227	44,000	5,856.
1933-5-1937	25	53	7,100	671.
	261	504	97,367	$15,541.

*May include production from Routt County. USBLM (1972) reported additional production, made in 1972, of 59 tons of ore containing 12,390 lbs. of copper and 66 ounces of silver that yields a gross value of $6,293.00.

There is no record of production since 1972, although the price of copper had increased steadily until June, 1974, at which time it was 85 cents per pound. Equipment was being moved in to the Bromide Mine during the summer of 1975 for the purpose of leaching the waste dumps. The results of this venture are not known (Brownfield, M.E., Oral communication).

Iron:

There is no record of iron production from Moffat County. U.S.B.L.M. (1967) lists mining claims patented to the Douglas Mountain Iron Mining Co. in 1908. Brown and Reeves (1968, p. 96) list an occurrence of iron in the Douglas Mountain district and describe it as hematite and limonite replacing limestone. Hansen, W.R. (Oral communication) describes the mineralization as small, podlike deposits of fairly high grade limonite occurring in the limestone and in an overlying sandstone member called the Humbug Formation. The deposits are too small to provide the volume required for an iron mining operation.

Platinum:

In 1966 there was a frenzied staking of platinum claims northwest of the Little Snake River. No occurrence of the mineral has been verified.

Rare Earth Minerals:

Monazite has been reported as occurring in the black sands produced from the gold placer operations. The mineral, which is radioactive, is a complex association of rare earth metals among which is Thorium. Thorium is presently used in the television industry and has a potential use in the nuclear power industry. The amount of monazite present in the black sands is not known. Gale (1907) reporting on gold placer tests made in the Iron Springs district, stated the average amount of black sand present was one ton in 368 tons of gravel. Monazite is usually a very minor constituent of the black sands so it is believed the amount present is of very low concentration.

NON-METALLIC MINERALS

Sand and Gravel:

Sand and gravel have been produced from the floodplain of the Yampa River both to the east and southwest of Craig, and from Pleistocene terrace deposits adjacent to the Yampa River and Snake River valleys. Minor production has been made from numerous deposits throughout the County from floodplain and terrace deposits. An additional source of gravel is the basal conglomerate of the Browns Park Formation. This material has been mined from two locations near Elk Springs. The product is considered to be suitable for fill, road construction and hot mix aggregate. The reserves are large.

Records at the Colorado Bureau of Mines show the value of sand and gravel produced in Moffat County to be $3,645,218 through the year 1974. New construction at the proposed power plant and the coal mines should increase the production for the next few years.

Other non-metallic Minerals:

Pumicite is known to occur in beds of volcanic ash in the Browns Park Formation, but there is no report of its utilization. Clinker, "Red Dog", "Cinders", occur in numerous locations along the outcrop of the Mesa Verde Formation. The clinkers are a slag-like material formed by the natural burning of the coal bed outcrop and the baking of overlying formations. The material is used as a road metal and occasionally as a light-weight aggregate.

SELECTED REFERENCES

Amuedo, C.L., and Mott, M.R., 1962, Exploration for oil and gas in northwestern Colorado: Rocky Mtn. Assoc. Geol., Denver, Co.

Bass, N. W., Eby, J. B., and Campbell, M. R., 1956, Geology and mineral fuels of parts of Routt and Moffat Counties, Colorado: U.S. Geol. Surv. Bull. 1027-D, p. 143-250.

Bradley, W. H., 1964, Geology of Green River formation and associated Eocene rocks in southwestern Wyoming and adjacent parts of Colorado and Utah: U.S. Geol. Surv. Prof. Paper 496-A, map Plate 1, 1:250,000.

Brown, W. M., and Reeves, R. G., 1968, Ferrous metals (in Colorado): in Mineral and Water Resources of Colorado, Senate Document No. 115, 90th Congress. 2nd Session.

Colorado Division of Mines, Annual Reports, inc. Coal, 1889-1974.

Del Rio, S.M., 1960, Mineral resources of Colorado, First Sequel: Denver, Colorado. Publishers Press.

Dyni, John R., 1968, Geologic map of the Elk Springs quadrangle, Moffat County, Colorado: U.S. Geol. Surv. map GQ-702, 1:62,500.

Fenneman, N. M., Gale, H. S., and Campbell, M. R., 1906, The Yampa coal field: U.S. Geol. Surv. Bull. 279, 96 p.

Gale, H. S., 1907, Coal fields of the Danforth Hills and Grand Hogback in northwestern Colorado: U.S. Geol. Surv. Bull. 316, p. 264-301.

__________, 1908, Gold placer deposits near Lay, Routt (Moffat) County, Colorado: U.S. Geol. Surv. Bull. 340, p. 84-95.

__________, 1910, Coal fields of northwestern Colorado and northeastern Utah: U.S. Geol. Surv. Bull. 415, 265 p.

Hancock, E. T., 1925, Geology and coal resources of the Axial and Monument Butte quadrangles, Moffat County, Colorado: U.S. Geol. Surv. Bull. 757, 134 p.

__________, and Eby, J. B., 1929, Geology and coal resources of the Meeker quadrangle, Moffat and Rio Blanco Counties, Colorado: U.S. Geol. Surv. Bull. 812-C, p. 191-242.

Henderson, Charles W., 1926, Mining in Colorado: U.S. Geol. Surv. Prof. Paper 138, p. 24, 206.

Holt, R. D., 1972, Bibliography, Coal resources in Colorado: Colo. Geol. Surv. Bull. 34-A, pl-21, 27.

Hoover, H. C., 1897, Geology of the Four Mile placer mining district, Colorado: Eng. and Min. Jour., vol. 63, p. 510.

Jensen, F. S., Sharkey, H. R., and Turner, P. S., (eds) 1954, The Oil and gas fields of Colorado; A Symposium: Rocky Mtn. Assoc. Geol. 301 p.

Landis, E. R., 1959, Coal resources of Colorado: U.S. Geol. Surv. Bull. 1072-C, pl. 142-143 & 183-227.

__________, and Cone, G. C., 1971, Coal resources of Colorado tabulated by bed: U.S. Geol. Surv. open-file rept., 515 p. of tables.

McKay, E. J., 1974, Geologic map of the Lone Mountain quadrangle, Moffat County, Colorado: U.S. Geol. Surv. map GQ-1144, 1:62,500.

__________, and Bergin, M. J., 1974, Geologic map of the Maybell quadrangle, Moffat County, Colorado: U.S. Geol. Surv. map GQ-1145, 1:62,500.

Murray, D. Keith, (ed) 1974, Guidebook to the energy resources of the Piceance Creek basin: 25th Field Conf., Rocky Mtn. Assoc. Geol.

Prommel, H. C., and Hopkins, P. M., 1968, Placer gold (in Colorado): in Mineral and Water Resources of Colorado, Senate Document No. 115, 90th Congress, 2nd Session.

Ritzma, H. R., and Oriel, S. S., (ed) 1955, Guidebook to the geology of northwest Colorado: Intermtn. Assoc. Pet. Geol., RMAG Field Conf.

Rocky Mountain Assoc. of Geologists, 1961, Oil and gas field volume, Colorado-Nebraska.

Sears, J. D., 1925, Geology and oil and gas prospects of part of Moffat County, Colorado, and southern Sweetwater County, Wyoming: U.S. Geol. Surv. Bull. 751-G.

Speltz, Charles N., 1974, Strippable coal resources of Colorado: U.S. Bur. Mines, Prelim. Rept. 195, p. 14-17.

Snow, E. P., 1895, The Fourmile placer fields of Colorado and Wyoming: Eng. & Min. Jour., vol. 60, p. 102-104.

Tweto, Ogden, 1975, Preliminary geologic map of the Craig 1° x 2° quadrangle, northwestern Colorado: U.S. Geol. Surv. map MF-666, 1:250,000.

__________, 1975, Preliminary geologic map of the east half of the Vernal 1° x 2° quadrangle, northwestern Colorado: U.S. Geol. Surv. open file map.

U.S. Bureau of Land Management, 1967-1973, Geology and mineral resources of the Axial, Browns Park, Cold Spring, Cross Mountain, Godive, Great Divide, Nipple Rim, and Williams Fork Planning Units: unpub.

Vanderwilt, John W., 1947, Mineral resources of Colorado: State of Colo. Min. Res. Bd., 547 p., 34 pls.

Yingst, P.O., 1960, Coal, in Mineral Resources of Colorado, First Sequel, p. 464-467.

FIGURE 1

STRATIGRAPHIC NOMENCLATURE OF GEOLOGIC FORMATIONS MOFFAT COUNTY, COLORADO

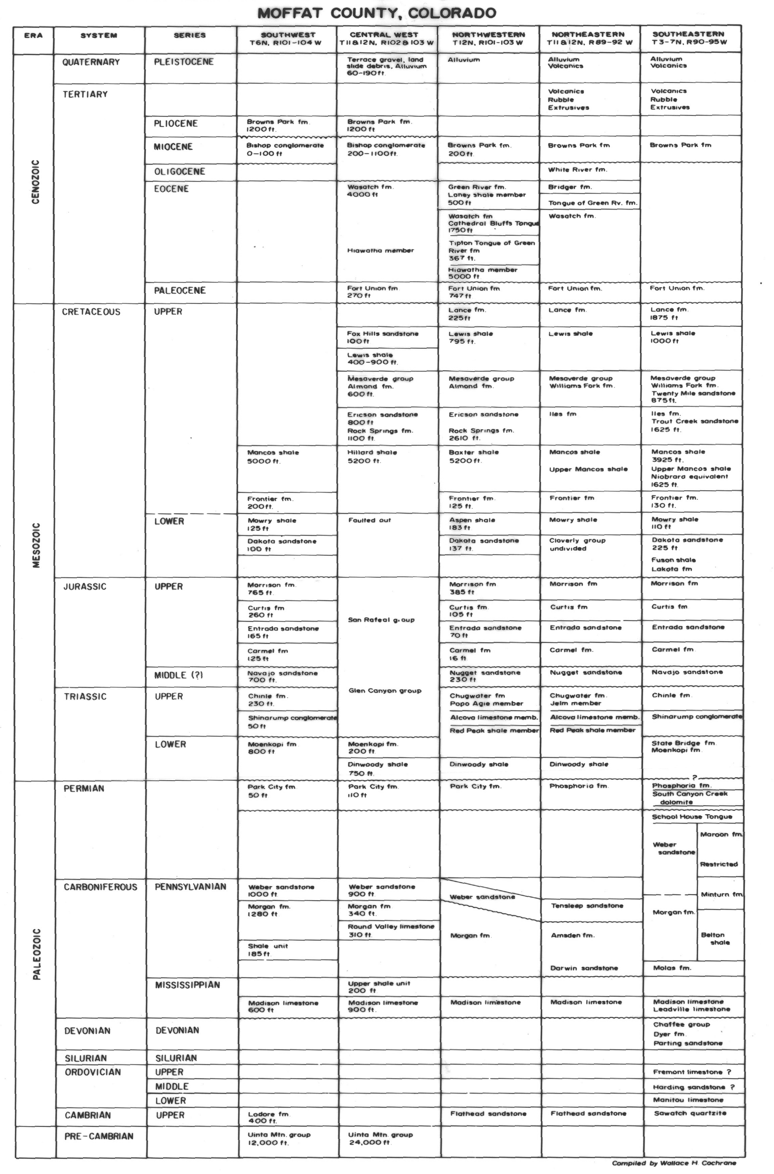
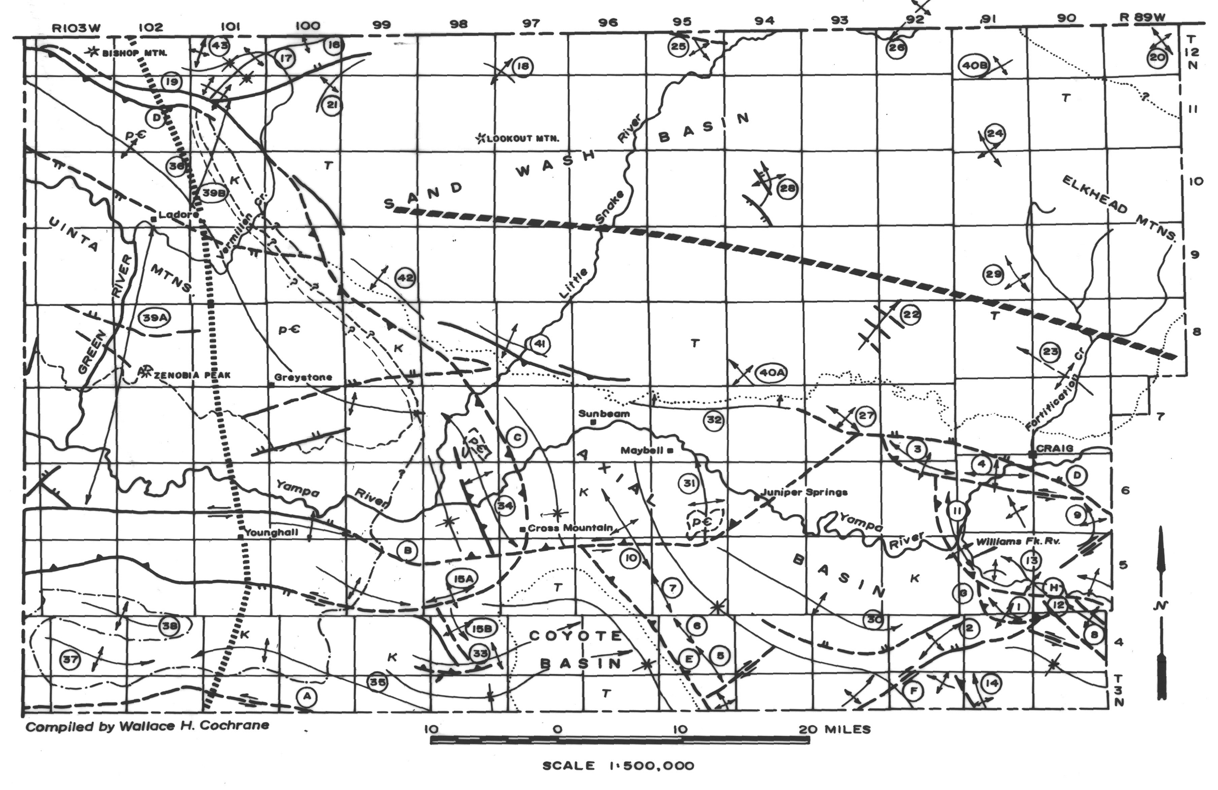


FIGURE 2



Compiled by Wallace H. Cochrane

SCALE 1:500,000

TECTONIC MAP OF MOFFAT COUNTY, COLORADO

EXPLANATION

PREPARED BY WALLACE H. COCHRANE, FROM GENERALIZED GEOLOGY MAP RMAG & IAPG 1955 GUIDEBOOK AND ALL AVAILABLE PUBLISHED SOURCES, FOR CHARLES S. ROBINSON & ASSOCIATES, INC.

ANTICLINES AND DOME UNLESS OTHERWISE NOTED. NAME GIVEN FEATURE, NUMBER GIVEN ACCORDING TO YEAR OF DISCOVERY WITHIN TABLES OF OIL AND GAS FIELDS ON STRUCTURAL FEATURES. OTHER FEATURES FOLLOW AN EAST TO WEST, NORTH TO SOUTH SEQUENCE.

KEY TO STRUCTURAL FEATURES

ALPHABETICAL

Axial Basin	30
Bell Rock	3
Big Gulch (Lay Creek)	27
Big Hole	28
Blue Gravel	29
Blue Mountain (Willow Creek)	37
Buck Peak	9
Craig	4
Cross Mountain Uplift	34
Danforth Hills	7
Danforth Hills, North	10
Dry Mountain	42
East Hiawatha	16
Elk Springs	15A
Four Mile Creek	24
Haymower	43
Horse Creek	13
Iles	2
Indian Run (Beaver Creek)	8
Juniper Mountain Uplift	31
Lay Creek, North	22
Little Snake River (State Line)	25
Maudlin Gulch	5
Maybell Monocline	32
Moffat (Hamilton)	1
Mud Springs T 8 N, R 94 W	40A
Mud Springs T12N, R91 W	40B
Pinyon Ridge (Coyote Basin)	33
Pole Gulch (Baggs South, Westside Canal)	26
Powder Wash-Ace	18
Shell Creek	21
Skull Creek (Blue Mountain)	35
Slater Creek	20
Split Mountain	38
Sugar Loaf	19
Temple Canyon	6
Thornburg	14
Two Bar	41
Uinta Arch	36
Uinta Graben (Main segment)	39A
Uinta Graben (North segment)	39B
Waddle Creek (Indian Run)	12
West Hiawatha	17
Williams Fork	11
Winter Valley	15B

NUMERICAL

Table 1-A	
Moffat (Hamilton)	1
Iles	2
Bell Rock	3
Craig	4
Maudlin Gulch	5
Temple Canyon	6
Danforth Hills	7
Indian Run (Beaver Creek)	8
Buck Peak	9
Danforth Hills, North	10
Williams Fork	11
Waddle Creek (Indian Run)	12
Horse Gulch	13
Thornburg	14
Table 1-B	
Elk Springs	15A
Winter Valley	15B
Table 1-C	
East Hiawatha	16
West Hiawatha	17
Powder Wash-Ace	18
Sugar Loaf	19
Slater Creek	20
Shell Creek	21
Lay Creek, North	22
North Craig	23
Four Mile Creek	24
Little Snake River (State Line)	25
Pole Gulch (Baggs South, Westside Canal)	26
Big Gulch (Lay Creek)	27
Big Hole	28
Blue Gravel	29
Other	
Axial Basin	30
Juniper Mountain Uplift	31
Maybell Monocline	32
Pinyon Ridge (Coyote Basin)	33
Cross Mountain Uplift	34
Skull Creek (Blue Mountain)	35
Uinta Arch	36
Blue Mountain	37
Split Mountain	38
Uinta Graben (Main segment)	39A
Uinta Graben (North segment)	39B
Mud Springs T8N, R94W	40A
Mud Springs T12N, R91W	40B
Two Bar	41
Dry Mountain	42
Haymower	43

FAULTS

Known Inferred Thrust: Hanging wall

Wrench: Barb shows dip direction (After Stone, RMAG 1975 Guidebook

A Blue Mountain
B Yampa
C Sparks
D Uinta Mountain
E Danforth Hills
F Iles
G Moffat
H Horse Gulch

FOLDS

Anticline (Showing direction of plunge) Syncline

OUTCROP PATTERNS

Base of Tertiary
Base of Cretaceous
pre-Cambrian

TRENDS

Trend of pre-Pennsylvanian structural element (Steamboat Arch) (After Crowley, RMAG & IAPG 1955 Guidebook

Trend of pre-Eocene structural element (Douglas Creek Arch – Rock Springs Uplift). (After Ritzma, RMAG & IAPG 1955 Guidebook

TABLE 1-A
OIL AND GAS FIELDS ON THE AXIAL BASIN UPLIFT

DISCOVERY YEAR	FIELD NAME TYPE OF TRAP	LOCATION TECTONIC MAP NO.	PRODUCING FORMATION	OIL	GAS	OTHER SHOWS
1924 1928 1948 1953 1954 1955+ 1955+	Moffat (Hamilton) Dome *Closed anticline*	T4N, R91W 1	Dakota Entrada Morrison Curtiss Mancos Shinarump Minturn Mancos Niobrara	X X X X X X X X		Chinle – O
1924 1927 1927	Iles Dome *Anticline*	T4N, R92W 2	Mancos ?Niobrara Morrison Entrada	X X X	 X	Dakota - G & O Shinarump - O - stn. Weber – O
1931	Bell Rock *Faulted anticline*	T6N, R92W 3	Mesaverde		X	Frontier – O & G Dakota – O & G Entrada – O & G Mancos Rimrock – G
1932	Craig Dome *Faulted anticline* *Stratigraphic*	T6N, R91W 4	Mancos Rimrock Morapos Frontier		X X X	Mesaverde – O Mancos Niobrara – O Shinarump – G
1947 1948 1957 1957+	Maudlin Gulch *Structure & stratigraphic anticline*	T4N, R95W 5	Morrison Entrada Weber Dakota	X X X X		Morrison sands lower than producing – O
1953	Temple Canyon *Stratigraphic anticline*	T4N, R95W 6	Morrison Shinarump	X X		Mancos – O Dakota – O Entrada – O
1954	Danforth Hills *Stratigraphic structural*	T5N, R95W 7	Morrison Dakota Shinarump	X X X		Moenkopi – O
1956	Indian Run (Beaver Creek) *Anticline*	T4N, R90W 8	Dakota		X	Mancos Niobrara Shinarump Weber
1957	Buck Peak *Highly faulted structure*	T6N, R90W 9	Mancos Niobrara Shinarump Weber	 X X X		Mancos Morapos – G
1958	Danforth Hills, North *Anticline*	T6N, R95W 10	Morrison Weber	X X		
1962	Williams Fork *Anticline stratigraphic*	T5N, R91W 11	Dakota Morrison Shinarump Weber	X X X	 X	Mancos Frontier – G
1960	Waddle Creek *Anticline*	T4N, R90W 12	Mancos Niobrara	X		
1966	Horse Gulch *Anticline*	T5N, R91W 13	Dakota	X		
1934 1927 1951 1955	Thornburg *Anticline*	T3N, R91W 14	Dakota Entrada Weber Weber	 X	X X X	Mancos Niobrara – O Frontier – O Shinarump – O

TABLE 1-B
OIL AND GAS FIELDS ON THE UINTA MOUNTAIN UPLIFT

DISCOVERY YEAR	FIELD NAME TYPE OF TRAP	LOCATION TECTONIC MAP NO.	PRODUCING FORMATION	OIL	GAS	OTHER SHOWS
1926	Elk Springs *Anticline*	T5N, R98W 15A	Dakota		X	Mancos – O
1946	Winter Valley *Anticline*	T4N, R98W 15B	Weber	X	X	Moenkopi – O

TABLE 1-C
OIL AND GAS FIELDS IN THE SAND WASH BASIN

DISCOVERY YEAR	FIELD NAME TYPE OF TRAP	LOCATION TECTONIC MAP NO.	PRODUCING FORMATION	OIL	GAS	OTHER SHOWS
1927 1935 1951	East Hiawatha *Anticline with lenticular sands*	T12N, R100W 16	Wasatch Wasatch Ft. Union	 X	X X	Lance – G Lewis – G Mancos – G Nugget – O
1930 1957 1956	West Hiawatha *Anticline with lenticular sands, bar sands*	T12N, R100W & R101W 17	Wasatch Ft. Union Lance Lewis		X X X X	
1931 1936 1949	Powder Wash-Ace *Anticline with lenticular sands*	T11 & 12N, R97W 18	Wasatch Wasatch Ft. Union	 X	X X	
1953	Sugar Loaf *Anticline with lenticular sands*	T11 & 12N, R101W 19	Mesaverde		X	Ft. Union – O & G Mancos – G Dakota – G Nugget – O
1954	Slater Dome *Domal structure with igneous intrusive body in the Mancos*	T12N, R89W 20	Mesaverde		X	Other sands in Mesaverde – G Mancos – G
1955	Shell Creek *Anticline with possible fault closure*	T11N, R100W 21	Ft. Union		X	
1955	Lay Creek, North *Faulted structure with stratigraphic trap*	T8N, R92W & R93W 22	Ft. Union Lance		X X	Mesaverde – G
1956	North Craig *A sand lens on a plunging nose*	T7 & 8N, R90W 23	Lewis		X	Mesaverde – O & G
1958	Four Mile Creek *Structure with sand lenses and faulting*	T11 & 12N, R91W 24	Lance Lewis		X X	Mesaverde – G Mancos – G
1958	Little Snake River (State Line) *Small anticlinal closure modified by stratigraphy and faulting*	T12N, R95W 25	Wasatch		X	Ft. Union – G
1955	Pole Gulch (Baggs, South; Westside Canal) *Faulted structure*	T12N, R92W 26	Wasatch Ft. Union Lewis		X X X	
1960	Big Gulch *Faulted anticline*	T7N, R93W 27	Mancos Frontier Rimrock Mesaverde		 X X X	Mancos Niobrara – O
1968	Big Hole *Seismic structure with stratigraphic trapping*	T10N, R94W 28	Lewis		X	
1968?	Blue Gravel	T9N, R91W 29	Lewis		X	

Compiled by Wallace H. Cochrane

COUNTY LOCATION

MINERAL RESOURCES OF MOFFAT COUNTY, COLORADO
SHEET 3 OF 3 SHEETS

CHARLES S. ROBINSON AND ASSOC., INC.
GOLDEN, COLORADO
DEC., 1975
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