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Possible Mineral Resources University Land Grant, Western Montana College of Education

Eugene S. Perry

STATE OF MONTANA
BUREAU OF MINES AND GEOLOGY
A. E. Adami, Acting Director

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UNIVERSITY LAND GRANT
WESTERN MONTANA COLLEGE OF EDUCATION

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MONTANA SCHOOL OF MINES
BUTTE, MONTANA
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COUNTIES CONTAINING WESTERN MONTANA COLLEGE OF EDUCATION LANDS

INTRODUCTION

The following evaluation of the mineral resources of the University Land-Grant lands has been made from an office study of geologic maps and published reports, and from a rather thorough knowledge of the geology of the state by the writer after 23 years of experience in the state. Practically all the mineral resources of Montana, and the districts in which they occur, are described in reports issued by the United States Geological Survey, the Montana Bureau of Mines and Geology, and other agencies. It is improbable that any mineral resource of considerable importance has been overlooked on the lands in question.

It appears that most of the land-grant lands were chosen mainly for their agricultural or grazing possibilities. Nearly all of the lands in the mountain area lie in or near the large intermontane valleys, partially filled with alluvium and/or the deposits formed in extensive extinct fresh-water lakes which once occupied these valleys. Commonly these deposits are 1,000 feet or more in thickness. Where present, they obscure bedrock. No mineral resource of any considerable economic importance has yet been made known in the lake deposits, although locally deposits of sand and gravel, volcanic ash (pumicite), diatomite, and lignite coal are known to be present. Alluvial deposits in certain streams draining mineralized areas yield placer gold, but there is a definite relationship between the location of such streams and the mineralized areas from which the gold originates.

Coal occurs in certain definite formations. Hence, if these formations are not present, coal is not to be expected. In all cases the geologic formation immediately underlying the various lands is known.

Prediction of occurrence of oil and gas is always accompanied by an element of uncertainty. Foremost in such predictions is the consideration of the presence of certain types of geologic structures, such as anticlines and domes; and most test wells are sunk on geologic structures considered favorable. However, deeply hidden traps of oil or gas, known as stratigraphic traps, make possible the occurrence of oil or gas in localities where favorable structural conditions do not show at the surface. Therefore, in central and eastern Montana any lands directly underlain by Cretaceous or younger strata must be considered as possible oil and gas lands, because geologic formations known to yield oil or gas elsewhere should underlie such lands at depth.

This report consists of (1) a Record Book in which lands listed for each of the land-grant schools are tabulated by township, range, section, and fraction of section, together with township plat showing each tract, and information in its present status (1949). In most cases the type of land is indicated. This information was compiled from the records of the Department of State Lands and Investments at Helena by Mr. Perry Roys. (2) A condensed tabulation of the various lands by counties, with brief descriptions of location, geology, and possible mineral resources. (3) A general description of possible mineral resources, by counties, of lands for the school. These descriptions were prepared by the writer.

It is to be understood that if additional information pertaining to geology or mineral resources of any particular tract is desired, much more information is available, and will be available upon request.

PART 1.--TABULATION OF WESTERN MONTANA COLLEGE OF EDUCATION LANDS

Township and Range	Section or part Sec.	Rec. Book Page	Location and Geology	Possible Mineral Resources.
BEAVERHEAD COUNTY				
2 S., 15 W.	23 and 26 Unsold 34 and 35 Part sold 1910	62	In lake deposits 1 to 3 mi. E. and NE. of Wisdom in upper Big Hole valley.	No known mineral resource, and none probable, except sand and gravel.
3 S., 15 W.	4, 10, 11 12, 13, 14 and 15 Unsold 9 Part sold 1910 23 All sold 1910	65	In lake deposits 1 to 4 mi. SE. of Wisdom in upper Big Hole valley.	(Ditto above)
5 S., 12 W.	19 and 20 Unsold	70	In lake deposits 3 mi. N. of Polaris in upper Grasshopper Creek valley.	(Ditto above)
5 S., 13 W.	24, 25, 35 Unsold	71	In lake deposits and partly in adjacent Belt strata 3 mi. NW. of Polaris in Grasshopper Creek valley.	(Ditto above)
6 S., 9 W.	25 and 26 Unsold	72	In lake deposits 4 mi. NW. of Dillon in Beaverhead River valley.	(Ditto above)
6 S., 13 W.	3, 4, 10 Unsold	73	In lake deposits 3 mi. W. of Polaris in Grasshopper Creek valley.	(Ditto above)

Township and Range	Section or part Sec.	Rec. Book Page	Location and Geology	Possible Mineral Resources.
BEAVERHEAD COUNTY Cont'd				
6 S., 14 W.	13 and 14 Part sold 1946 23, 24, 25 and 35 Unsold	74	In lake deposits 7 to 9 mi. SE. of Jackson in upper Big Hole basin.	No known mineral resource, and none probable, except sand and gravel.
8 S., 9 W.	21 All sold 1901	75	In lake deposits 8 mi. SW. of Dillon in Beaverhead valley.	(Ditto above)
9 S., 6 W.	29, 30, 31 and 32 Unsold	76	In lake deposits 20 mi. SE. of Dillon in upper Blacktail Deer Creek valley.	(Ditto above)
9 S., 7 W.	15 All sold 1907 21 and 22 Unsold	77	Mainly in gneissic complex (some lake deposits) 15 mi. SE. of Dillon in upper Blacktail Deer Creek valley.	(Ditto above)
10 S., 8 W.	28, 32, 33 Unsold	78	In lava area 14 mi. SE. of Armstead on headwaters of Sage Creek.	(Ditto above)
11 S., 8 W.	4 Unsold	79	(Ditto above)	(Ditto above)
11 S.,14 W.	2, 10, 11 And 23 Unsold 14 and 22 Part sold 1910-1916 13, 15, 21 and 24 All sold 1910-1916	80	In lake deposits 22 mi. SW. of Armstead in upper Horse Prairie valley.	No known mineral resource. Possible gold placer.

Township and Range	Section or part Sec.	Rec. Book Page	Location and Geology	Possible Mineral Resources.
BLAINE COUNTY				
32 N.,17 E.	1 and 2 Unsold	29	In alluvium and underlying Judith River formation along Milk River valley 6 to 10 mi. E. of Havre. Boxelder gas field in Sec. 14, 2 mi. south.	No metallic mineralization. Thin (3 to 4 feet) shaly lignite coal in hills at south side of Milk valley, but probably eroded and gone in valley. Possible oil and gas territory but no known favorable structure.
33 N.,17 E.	25, 34, 35 Unsold	30	In drift covered upland underlain by Judith River formation, north of Milk River 7 to 10 mi. E. of Havre.	No metallic resource. Milk River lignite coal bed may underlie area, but obscured by glacial drift. Possible oil and gas territory but type of structure unknown. Probably synclinal(?).
33 N.,18 E.	30 Unsold	31	In drift covered upland underlain by Judith River formation south of Milk River 10 mi. E. of Havre.	(Ditto above)
CARTER COUNTY				
5 S., 56 E.	25 Unsold	86	Small tract in Pierre shale (Eagle horizon?) on upper Boxelder Creek 34 mi. S. of Ekalaka.	No metallic mineralization coal, or other mineral resource known. Possible oil and gas territory, but no known favorable structure. Test well 2 mi. SE. 6462 feet deep, plugged and abandoned.
CASCADE COUNTY				
19 N., 5 E.	1, 2, 3, 10, 11, 15, 33, All sold 1910-1913	6	In outcrop area of Kootenai formation on upland plain 10 mi. SE. of Great Falls.	No metallic mineralization. Possible good brick clay. Sand Coulee coal horizon at depth of 200 or 300 feet. Probable coal.

Township and Range	Section or part Sec.	Rec. Book Page	Location and Geology	Possible Mineral Resources.
CASCADE COUNTY Cont'd				
19 N., 6 E.	6 All sold 1910	7	In outcrop area of Kootenai formation on upland plain 10 mi. SE. of Great Falls.	No metallic mineralization. Possible good brick clay. Sand Coulee coal horizon at depth of 200 or 300 feet. Probable coal.
20 N., 7 E.	11, 12, 13 All sold 1912	8	In outcrop area of Colorado shale on uplands west of Highwood Mts. 6 mi. S. of Highwood station.	No metallic mineralization or coal. Possible oil and gas territory but no known favorable structure, and in general uninviting for prospecting.
21 N., 1 E.	2 Unsold	9	In outcrop area of lower Colorado shale on uplands 3 mi. N. of Vaughn.	(Ditto above) Dry hole (2457) ½ mi. SW.
22 N., 2 E.	4 All sold 1948 10 Unsold	13	In outcrop area of lower Colorado shale on uplands 9 mi. NE. of Vaughn.	(Ditto above) Dry holes 1 mi. NE. and 2½ mi. SE. Possible bentonite deposit.
CHOUTEAU COUNTY				
21 N., 7 E.	35 All sold 1911	10	In outcrop area of Colorado shale on uplands W. of Highwood Mts. 4 mi. S. of Highwood station.	No known mineral resource and none probable. Possible oil and gas territory but no known favorable structure.
21 N., 9 E.	10 Unsold 14, 15, 21 All sold 1912-1915	11	In outcrop area of Colorado shale and overlying Eagle sandstone cut by many igneous dikes on N. slope of Highwood Mts. 4 mi. S. of Shonkin.	(Ditto above)

Township and Range	Section or part Sec.	Rec. Book Page	Location and Geology	Possible Mineral Resources.
CHOUTEAU COUNTY Cont'd				
21 N.,10 E.	20 and 28 Unsold 27 and 29 Part sold 1912	12	In outcrop area of Colorado shale and overlying Eagle sandstone cut by many igneous dikes on N. slope of Highwood Mts. 4 mi. S. of Shonkin. 7 mi. SE. of Shonkin.	No known mineral resource and none probable. Possible oil and gas territory but no known favorable structure.
22 N., 9 E.	6 All sold 1917	14	In glacial drift and in Colorado shale 1 mi. W. of Shonkin Creek. 10 mi. S. of Fort Benton.	(Ditto above)
23 N., 4 E.	25 and 32 Unsold 33 All sold 1912 34 and 35 Part sold 1917	17	In glacial drift and in Colorado shale in uplands 6 mi. W. of Floweree or 12 mi. N. of Great Falls.	(Ditto above)
23 N., 5 E.	4, 8, 11 12, 23, 25, 26 Unsold 17 Part sold 1917 13, 29, 32 All sold 1912-1913	18	Scattered small tracts in glacial drift and Colorado shale near and N. of Floweree.	(Ditto above)
23 N., 6 E.	6 and 7 Unsold 18 All sold 1912	19	In glacial drift and in Colorado shale on uplands 5 mi. NW. of Floweree.	(Ditto above)

Township and Range	Section or part Sec.	Rec. Book Page	Location and Geology	Possible Mineral Resources.
CHOUTEAU COUNTY Cont'd				
23 N., 8 E.	1, 3, 12 Unsold	20	In Colorado shale 4 mi. S. of Fort Benton.	No known mineral resource and none probable. Possible oil and gas territory but no known favorable structure.
24 N., 3 E.	19, 30, 31 and 32 Unsold	21	In glacial drift and in Colorado shale on uplands 16 mi. NW. of Floweree.	(Ditto above)
24 N., 5 E.	32, 33, 34 Unsold	22	In glacial drift and in Colorado shale in uplands 5 mi. NW. of Floweree.	(Ditto above)
24 N., 6 E.	7 All sold 1944 8 and 9 Unsold	23	In Colorado shale near Teton River 9 mi. N. of Floweree.	(Ditto above)
24 N., 8 E.	34 Unsold 35 All sold 1944	24	In Colorado shale near Missouri River 2 mi. S. of Fort Benton.	(Ditto above)
26 N.,15 E.	18, 30 All sold 1916-1918	25	In high-level gravel 13 mi. NE. of Missouri River 18 mi. SE. of Big Sandy.	(Ditto above)
27 N.,14 E.	13, 24, 25, 26, 35 Unsold	26	In high-level gravel, strata of Lance formation and igneous rock. 13 mi. NE. of Missouri River, 12 mi. SE. of Big Sandy.	(Ditto above)
27 N.,15 E.	18, 19, 20, 30, 31 Unsold	27	(Ditto above)	(Ditto above)

Township and Range	Section or part Sec.	Rec. Book Page	Location and Geology	Possible Mineral Resources.
FLATHEAD COUNTY				
27 N.,19 W.	7, 8, 21 29 and 33 All sold 1902-1907	50	In alluvium and lake deposits in Swan River valley 2 to 4 mi. E. of Big Fork.	No known mineral resource and none probable.
28 N.,26 W.	8, 10, 14, 24, 26, 28, 30, 32, 34, All sold 1907 18 and 20 Unsold	51	In alluvium and in strata of Belt series 1 to 6 mi. eastward from Pleasant valley P. O. or 25 mi. W. of Kalispell.	No coal, oil, or gas. No known metallic mineralization of commercial importance. Metalliferous veins occur 20 mi. SW. and 30 mi. W. but none have been reported near Pleasant Valley.
30 N.,21 W.	1, 2, 3,4 5, 30, 33 All sold 1901-1925 31 and 32 Part sold 1904	52	In alluvium and lake deposits 2 to 6 mi. SE. of Whitefish.	No known mineral resource and prospects unfavorable.
30 N.,22 W.	5, 15, 29 Unsold 6 and 7 Part sold 1904-1948 10, 17, 23 And 33 All sold 1903-1909	53	In alluvium and lake deposits, and in island-like area of Belt strata in valley 3 to 8 mi. S. and SW. of Whitefish.	(Ditto above)
31 N.,20 W.	28 All sold 1908	54	In alluvium and lake deposits 3 mi. E. of Whitefish.	(Ditto above)
31 N.,21 W.	25 All sold 1907-1908	55	In alluvium and lake deposits 6 mi. E. of Whitefish.	(Ditto above)

Township and Range	Section or part Sec.	Rec. Book Page	Location and Geology	Possible Mineral Resources.
FLATHEAD COUNTY Cont'd				
31 N.,22 W.	6, 7, 8 And 21 Unsold 31 and 35 All sold 1901-1907	56	In alluvium and lake deposits, and in adjacent Belt strata 1 to 6 mi. W. and NW. of Whitefish.	No known mineral resource and prospects unfavorable.
31 N.,23 W.	3, 9, 15 25 All sold 1907	57	In alluvium and lake deposits, and in adjacent Belt strata 6 to 10 mi. W. and NW. of Whitefish.	(Ditto above)
32 N.,22 W.	7 Unsold	58	In alluvium and lake deposits 10 mi. NW. of Whitefish.	(Ditto above)
32 N.,23 W.	4, 10, 25 All sold 1908 17, 21, 29 and 33 Unsold	59	Mainly in alluvium and lake deposits, also in adjacent Belt strata 8 to 14 mi. NW. of Whitefish.	No known mineral resources, and prospects unfavorable.
34 N.,20 W.	11 and 13 Unsold	60	In alluvium and lake deposits 3 mi. E. of Flathead River 23 mi. N. of Columbia Falls near Logging Lake.	No known mineral resource. Coal in lake deposits near mouth of Coal Creek 5 mi. W. and oil seeps 15 mi. NW. but apparently of no significance to these lands.
34 N.,21 W.	3, 4, 18 19, 26, 30 Unsold	61	In alluvium and lake deposits, and in Belt strata near Coal Creek and Flathead River 20 to 25 mi. N. of Columbia Falls.	No known mineral resource. Coal in lake deposits near mouth of Coal Creek, and oil seeps 10 mi. N. but apparently of no significance to these lands.

Township and Range	Section or part Sec.	Rec. Book Page	Location and Geology	Possible Mineral Resources.
GALLATIN COUNTY				
1 N., 3 E.	18, 20, 30, 32, All sold 1910-1915	1	In large area of lake deposits 3 to 6 mi. S. of Logan.	No known mineral resource, and none to be expected.
2 S., 2 E.	18 and 22 Unsold 26 and 28 Part sold 1912	81	In pre-Cambrian gneiss in low hills adjacent to lake deposits 15 mi. S. of Logan.	No known commercial metallic mineralization. No coal, oil or gas.
2 S., 3 E.	4 and 6 All sold 1908-1912	82	In lake deposits 12 mi. S. of Logan.	No known mineral resource and none to be expected.
2 S., 4 E.	20 and 32 Unsold 22 and 24 All sold 1905-1927	83	In lake deposits and adjacent gneiss 6 to 10 mi. W. of Bozeman.	No known mineral resource. Corundum 1 mi. away but not reported on these lands.
2 S., 6 E.	21, 27, 28 All sold 1903-1927	84	In lake deposits 1 to 3 mi. SE. of Bozeman.	No known mineral resource, and, other than sand and gravel, none probable.
3 S., 6 E.	1 Unsold	85	In outcrop area of intensely deformed Cretaceous strata 6 mi. SE. of Bozeman on Bear Creek.	No known metallic mineralization, or oil or gas. Possible but improbable coal.
HILL COUNTY				
32 N.,15 E.	1, 2, 3, Unsold	28	In alluvium of Milk River valley and adjacent areas of faulted synclinal strata of Upper Cretaceous 2 to 3 mi. W. of Havre.	No metallic mineralization. Possible coal at depth. Possible oil and gas territory but in a synclinal area which is unfavorable.

Township and Range	Section or part Sec.	Rec. Book Page	Location and Geology	Possible Mineral Resources.
HILL COUNTY Cont'd				
32 N.,17 E.	3 and 4 Unsold	29	In alluvium of Milk River valley and adjacent Upper Cretaceous strata 6 to 10 mi. E. of Havre.	No metallic mineralization. Probable coal. Possible oil and gas territory, but apparently in an unfavorable synclinal area north of Boxelder anticline.
33 N.,17 E.	21 All sold 1916 32 Unsold	30	On drift covered upland underlain by Judith River formation, N. of Milk River 7 to 10 mi. E. of Havre.	No metallic resource. Milk River lignite coal bed may underlie area, but obscured by drift. Possible oil and gas territory but type of structure unknown, probably synclinal (?).
JUDITH BASIN COUNTY				
17 N., 9 E.	1 and 12 All sold 1912	3	Small tract in Kootenai formation (Lower Cretaceous) 1 mi. W. of Geyser.	No metallic mineralization. No probable coal. Oil and gas territory but no known favorable structure. Good brick and terra cotta shales probable.
17 N.,10 E.	12 Unsold	4	Small tract in lower Colorado shale 5 mi. E. of Geyser.	No known mineral resource.
18 N.,10 E.	11 All sold 1911	5	Small tract in Colorado shale 6 mi. NE. of Geyser.	(Ditto above)
LAKE COUNTY				
26 N.,18 W.	18 Part sold 1904	48	In alluvium and lake deposits of Swan River valley 7 mi. SE. of Big Fork.	No known mineral resource and none probable.

Township and Range	Section or part Sec.	Rec. Book Page	Location and Geology	Possible Mineral Resources.
LAKE COUNTY Cont'd				
26 N.,19 W.	4, 9, 10 Unsold	49	In alluvium and lake deposits in Swan River valley 3 to 5 mi. SE. of Big Fork.	No known mineral resource
LEWIS AND CLARK COUNTY				
19 N., 7 W.	2, 3, 4, 9, 15, Unsold 10 All sold 1915	42	In high level gravel underlain by upper Cretaceous Two Medicine formation 4 to 6 mi. SW. of Augusta.	No metallic mineralization. No known commercial coal. Possible oil and gas territory, but type of geologic structure not known
20 N., 7 W.	33 Unsold	43	In high level gravel underlain by upper Cretaceous Two Medicine formation 4 to 6 mi. SW. of Augusta.	No metallic mineralization. No known commercial coal. Possible oil and gas territory, but type of geologic structure not known.
MADISON COUNTY				
3 S., 5 W.	6 All sold 1942 30 and 32 Unsold	63	In lake deposits in Jefferson Valley 1 to 5 mi. E. and NE. of Twin Bridges.	No known mineral resource, and none probable.
3 S., 6 W.	2, 12, 19, 24, 26, 29, 30, 31, Unsold	64	In lake deposits and alluvium in Jefferson Valley within 5 mi. of Twin Bridges.	(Ditto above)
4 S., 5 W.	6 and 8 Unsold	66	In lake deposits 3 to 4 mi. SE. of Twin Bridges.	(Ditto above)
5 S., 4 W.	31 Unsold	67	In lake deposits and alluvium 1 mi. W. of Laurin in Ruby River valley.	(Ditto above)

Township and Range	Section or part Sec.	Rec. Book Page	Location and Geology	Possible Mineral Resources.
MADISON COUNTY Cont'd				
5 S., 5 W.	12 Part sold 1912	68	In lake deposits 3 mi. S. of Sheridan.	No known mineral resource, and none probable.
5 S., 6 W.	7 to 25 Except 16 Unsold	69	In lake deposits on bench land 4 to 10 mi. SW. of Sheridan.	(Ditto above)
2 S., 2 E.	18, 22, 26, 28, Unsold	81	In pre-Cambrian gneiss near lake deposits 15 mi. S. of Logan or 10 mi. NE. of Norris.	No known commercial mineral resource.
MINERAL COUNTY				
14 N.,25 W.	2 Unsold	35	Small tract in alluvium underlain by Belt strata along Clark Fork 13 mi. SE. of Superior near Rivulet.	No known mineral resource except sand and gravel.
15 N.,25 W.	4 Unsold 14 and 26 Part sold 1903-1907 22 and 34 All sold 1906-1912	36	In alluvium and adjacent Belt strata 7 to 12 mi. SE. of Superior along Clark Fork and Nemote Creek.	No known mineral resource except sand and gravel. Gold placer near mouth of Quartz Creek on opposite side of river from sec. 22.
16 N.,25 W.	18, 20, 28, 32, Unsold	37	In alluvium underlain by Belt strata 5 to 7 mi. SE. of Superior along Clark Fork near Lozeau.	No known mineral resource except sand and gravel.
16 N.,26 W.	2 and 12 Unsold	38	In alluvium underlain by Belt strata 1 to 4 mi. SE. of Superior along Clark Fork.	(Ditto above)

Township and Range	Section or part Sec.	Rec. Book Page	Location and Geology	Possible Mineral Resources.
MINERAL COUNTY Cont'd				
17 N.,27 W.	4, 8, 10 Unsold	39	In alluvium and adjacent Belt strata 6 to 8 mi. NW. of Superior along Clark Fork.	No known mineral resource except sand and gravel.
18 N.,27 W.	12, 28, 32, 34, Unsold	40	In alluvium and adjacent Belt strata E. and NE. of St. Regis in Clark Fork valley.	(Ditto above)
18 N.,28 W.	24 Part sold 1909	41	In alluvium 1 mi. NW. St. Regis near Clark Fork.	(Ditto above)
POWDER RIVER COUNTY				
8 S., 48 E.	8 (lien land, coal reserved) Unsold	87	In outcrop area of Fort Union formation (coal measures) 30 mi. SW. of Broadus and 2 mi. W. of Powder River. 6 mi. N. of Moorhead.	No metallic mineralization. Commercial beds of lignite coal present (coal reserved). Possible oil and gas territory in Powder River structural basin, but no known favorable geologic structure.
9 S., 48 E.	18 (lien land, coal reserved) Unsold	88	Small tract in outcrop area of Fort Union formation 2 mi. S. of Moorhead on Powder River.	(Ditto above)
RAVALLI COUNTY				
7 N., 20 W.	2, 11, 12, 14, 15, 23 26 All sold 1907	32	In alluvium and lake deposits (sec. 26 in Belt strata) 7 to 9 mi. NE. of Hamilton.	No known mineral resource.

Township and Range	Section or part Sec.	Rec. Book Page	Location and Geology	Possible Mineral Resources.
RAVALLI COUNTY Cont'd				
9 N., 19 W.	20 All sold 1908 29 Unsold	33	In lake deposits 5 mi. E. of Stevensville.	No known mineral resource.
10 N.,19 W.	4, 9, 30, 31, 32, All sold 1907-1908	34	In alluvium and lake deposits 6 to 10 mi. NE. of Stevensville.	(Ditto above)
TETON COUNTY				
23 N., 1 E.	25, 28, 29 and 32 Unsold 26 and 35 All sold 1929-1942	15	In outcrop area of middle Colorado shale 2 to 6 mi. E. of Power.	No metallic mineralization or coal. Possible oil and gas territory on top of Sweetgrass arch. Five or more abandoned test wells within 6 mi.
23 N., 2 E.	19 All sold 1929 20, 29, 30 32 and 33 Unsold	16	In outcrop area of middle Colorado shale 7 to 9 mi. E. of Power.	(Ditto above)
22 N., 1 W.	2 Part sold 1919-1920 3 and 9 All sold 1920-1941 11 and 13 Unsold	44	In outcrop area of middle Colorado shale 1 to 3 mi. S. of Power.	No metallic mineralization or coal. Possible oil and gas territory slightly west of top of Sweetgrass arch. Dry hole on sec. 12 and 4 mi. E.

Township and Range	Section or part Sec.	Rec. Book Page	Location and Geology	Possible Mineral Resources.
TETON COUNTY Cont'd				
23 N., 1 W.	14, 15, 20, 23, 27, 29, 32, 33 and 34 All sold 1919-1947 30 Part sold 1920 17, 19, 35 Unsold	45	In outcrop area of middle Colorado shale 1 to 5 mi. S., W., and N. of Power.	No metallic mineralization or coal. Possible oil and gas territory on top of Sweetgrass arch. Three abandoned wells on sections 4, 6, and 8, and one well 2 mi. S.
23 N., 2 W.	25 Part sold 1929 34 All sold 1916 26 and 35 Unsold	46	In outcrop area of middle Colorado shale 5 to 8 mi. W. of Power.	No metallic mineralization or coal. Possible oil and gas territory west of top of Sweetgrass arch. Four abandoned wells within 5 mi.
24 N., 7 W.	22, 23, 26, 27, Unsold	47	In outcrop area of upper Cretaceous strata (Two Medicine formation) near Willow Creek 13 mi. W. of Choteau.	No metallic mineralization or commercial coal. Possible oil and gas territory but 1 to 2 mi. W. of Willow Creek anticline far down on flank. Dry hole on top of anticline in sec. 13 and another 3 mi. E.
WHEATLAND COUNTY				
8 N., 13 E.	12 and 14 Unsold	2	In outcrop area of Colorado shale in places covered with terrace gravel. 1 to 2 mi. NE. of Two Dot.	No metalliferous mineralization or coal. Possible oil and gas territory, but no known favorable structure. Maps show land in a syncline.

PART 2

DESCRIPTION OF POSSIBLE MINERAL RESOURCES OF WESTERN MONTANA COLLEGE OF EDUCATION LANDS

General Statement

The land-grant lands listed for Western Montana College of Education (listed in Record Book under the heading Montana State Normal College) lie in 17 counties, or in 90 townships about one-half in the western mountainous one-third of the state, and about one-half in the plains of central Montana. Only agricultural and grazing lands appear to have been chosen. None are close to important mining districts, or oil and gas fields.

Several localities should receive special attention, however, because of possible mineral resources. They lie in Beaverhead, Blaine, Cascade, Flathead, and Hill counties.

Lands in Beaverhead County in T. 11 S., R. 14 W. lie near Jeff Davis Gulch where placer gold is reported to have been mined, and gulches on these lands might possibly contain gold-bearing gravel. Lands in Blaine and Hill counties lie in the Milk River coal field, and some of them may be underlain by the Milk River coal bed. Land in Cascade County southwest of Great Falls is probably underlain by a minable thickness of the Sand Coulee coal. In Flathead County land lying along or near the North Fork of Flathead River are near an area underlain by lignite coal, and also some oxidized copper ore was shipped in 1950 from the area northwest of Whitefish.

All lands in central and eastern Montana directly underlain by Cretaceous strata should be considered possible oil and gas lands, and most of Western Montana College of Education land east of the mountains falls into this classification. However, the most important consideration in oil and gas lands is the geologic structure, and, excepting in Teton County, no favorable structure is known to be on or near the lands in question. For further discussion see Teton County on following pages.

Beaverhead County

Lands in Beaverhead County listed for Western Montana College of Education lie widely scattered mainly in Big Hole Basin near Wisdom and Jackson, in upper Grasshopper Creek valley near Polaris, in upper Blacktail Deer Creek valley 15 to 20 miles southeast of Dillon, and in upper Horse Prairie Creek valley 22 miles southwest of Armstead. One tract is in upper Sage Creek valley 14 miles southeast of Armstead.

With two exceptions mentioned later, all of these lands lie in areas of lake deposits and alluvium partially filling these major valleys. Metalliferous mineralization is not known to have occurred in the lake deposits, and it is indeed doubtful if any is present. Likewise, the lake deposits are unfavorable

for oil or gas occurrence. In some places in southwestern Montana lake deposits contain high-ash lignite coal, but so far as known, no coal is present under or near the lands in question.

The alluvium of many creeks in Beaverhead County has been successfully mined for placer gold, particularly in those creeks draining mineralized areas. Western College lands in T. 11 S., 14 W. in upper Horse Prairie Creek valley lie near Jeff Davis Gulch where placer gold has been mined (Montana Bureau of Mines and Geology Memoir 26, p. 9). It is quite possible that land in this township may contain placer gold in some of its gulches. No other tract in Beaverhead County appears favorably located for the occurrence placer gold.

Land listed in T. 9 S., R. 7 W. on Blacktail Deer Creek lies in schist and gneiss adjacent to lake deposits at the southern end of the Ruby Range. Other tracts lie in volcanic rocks in T. 10 S., R. 8 W. and T. 9 S., R. 9 W. Although these types of rocks are known to be mineralized in southwestern Montana, no mineralization of economic value is known on these Western College lands.

Blaine County

Montana Western College of Education lands (mostly unsold) in Blaine County lie along Milk River valley, and in the low bench-lands north and south of this valley about 6 to 10 miles east of Havre. Alluvium lies in the valley, and glacial drift blankets the uplands. In the hills along the south margin of the valley are exposures of strata of the Judith River formation, and coal is present in some of the exposures. (U. S. Geological Survey Bull. 681-A, p. 91). The coal (lignite) ranges up to 5 feet in thickness including shale partings, but it "is not persistently clean even for short distances along the outcrop". Due to covering of alluvium and drift, the coal is obscured on the lands in question, it is probably eroded and gone in the valley lands, but it may be present beneath the bench lands. Commercially, this coal is relatively unimportant, and it is worked only for local consumption.

No metallic mineralization is known in this part of Montana, and it is unlikely that any commercial metallic deposits are present.

This area is prospective oil and gas territory. The Boxelder gas field (sec. 14, T. 32 N., R. 17 E.) lies 2 to 3 miles south of some of the land in question, and the Bowes gas (and oil) field lies about 12 miles southeastward. Sharp anticlinal structure is responsible for gas accumulation in these fields. No favorable structure is known on the lands in question; but on most of these lands, particularly the uplands away from the river, bedrock is obscured by alluvium or drift, and character of structure cannot be observed. However, no suggestion of anticlinal structure shows on published maps. Depth to the gas-bearing horizon should be about 1200 to 1500 feet.

Clay (or shale) of ordinary grade, taken from an outcrop of the Judith River formation, has been used for manufacture of brick at Havre. Sand and gravel may be present in some of the deposits of glacial drift.

Carter County

One small tract in Carter County (unsold) listed for Montana Western College of Education lies on Boxelder Creek near its headwaters 34 miles south of Ekalaka. It is underlain by strata in the Pierre shale formation.

No metallic minerals or coal are known or to be expected, and Pierre shale in itself is of no value.

This is possible oil and gas territory, but no favorable structure is known to be present. A test well 6462 feet deep, drilled 2 miles south, was plugged and abandoned in July, 1950.

Cascade County

Lands listed for Western Montana College of Education in Cascade County lie (1) on the upland plain 10 miles southeast of Great Falls in the outcrop area of the Kootenai formation (Lower Cretaceous in age) (sold 1910-1913), (2) on the uplands east of Belt Creek and 6 miles south of Highwood in the outcrop area of the Colorado shale formation (Upper Cretaceous) (sold 1912), and on the uplands 3 to 9 miles north of Vaughn in the outcrop area of the lower part of the Colorado shale.

No metallic mineralization is known or to be expected on any of these lands.

The coal horizon at the base of the Kootenai, from which much coal has been mined near Sand Coulee and Belt, underlies those lands southeast of Great Falls probably at a depth of about 200 to 300 feet. Information is not at hand as to how thick the coal is beneath the lands in question, but some coal should be present. The coal seam is known to become thinner northward from Sand Coulee, and is reported to be "only a few inches thick" at the north line of T. 19 N., R. 4 E. (U. S. Geological Survey Bull. 356, p. 52). The lands in question lie 1 to 3 miles south of this township line. At Sand Coulee 4 miles west of some of these lands, the coal is reported to be from 5 to 10 feet thick, and is ranked as "medium grade bituminous" (U. S. Geological Survey Bull. 356, p. 81).

The Sand Coulee-Belt coal is believed not to be present beneath the lands south of Highwood or north of Vaughn.

A deposit of bentonite occurs in the lower part of the Colorado shale north of Vaughn, and a thin impure coal bed (commercially unimportant) in the lower part of the Colorado formation is reported in this area also. Relationship of these deposits to the lands in question is not at hand, but they may underlie some of the lands north of Vaughn.

All lands in central Montana underlain by Cretaceous strata must be considered possible oil and gas lands, because strata known to yield oil or gas elsewhere in Montana will be present at depth. Western Montana College of Education lands in Cascade County fall into this class. However, absence of geologic structure favorable for oil and gas occurrence greatly detracts from

their possibilities as oil and gas lands. Those tracts southeast of Great Falls and south of Highwood are not known to have favorable structure present. Those tracts north of Vaughn lie near the top of the broad Sweetgrass arch, and hence are somewhat more favorable; however dry holes have been drilled within one-half mile of each of these tracts, and eight or more dry holes have been drilled in this general area.

Chouteau County

Lands listed for Western Montana College of Education in Chouteau County consist of a large number of sections and fractions of sections (partly sold) widely scattered (1) in foot-hills north and west of the Highwood Mountains, (2) on the upland plain west and north of Floweree or north of Great Falls, and (3) on uplands between Missouri River and the Bearpaw Mountains, or 12 to 18 miles southeast of Big Sandy.

Almost all of these lands lie in the outcrop area of the Colorado shale. A few small tracts are underlain by sandstones of the Eagle and Lance formations, and some land southwest of the Bearpaw Mountains is underlain by igneous rock. Glacial drift in the form of soil, sand, and gravel is scattered over much of the uplands. Lands lying between Missouri River and the Bearpaw Mountains are in an area of "high-level" gravel which was deposited on the upland plain prior to glaciation.

No metallic mineralization is known in this part of Montana, and because of geologic conditions it is most improbable that any metallic deposits are present. Likewise strata beneath these lands are not known to contain commercial beds of coal. The rocks underlying these lands are of no commercial value in themselves.

All lands in Montana underlain by Cretaceous strata must be considered possible oil and gas lands, because formations which yield oil or gas elsewhere in Montana are present at depth. However, none of the Western Montana College of Education lands in Chouteau County is known to have geologic structure such as is favorable for oil or gas accumulation. Seven or more unsuccessful test wells for oil and gas have been sunk in western Chouteau County. In general this part of Montana is not particularly attractive for oil or gas prospecting.

Flathead County

Lands listed for Western Montana College of Education in Flathead County lie (1) in lower Swan River valley 3 to 10 miles eastward from Big Fork, (2) near Pleasant Valley about 25 miles west of Kalispell, (3) in the valleys of Stillwater River and Whitefish Creek and the adjacent hills 3 to 14 miles north, west and south of Whitefish, and (4) near the North Fork of Flathead River about 23 miles north of Columbia Falls, or 2 to 8 miles south of Pole Bridge.

Those lands in Swan River valley all lie in alluvium and lake deposits. No mineral resource is known in this type of material in Swan River valley, and likewise strata of the pre-Cambrian Belt series which underlies the lake deposits are not known to be mineralized in this locality.

The several sections near Pleasant Valley lie partly in alluvium, and partly in Belt strata nearby. No coal, oil, or gas is to be expected. The Belt strata are mineralized with metalliferous veins in Sanders County about 25 miles southwestward, and in Lincoln County about 35 miles westward, but commercial metalliferous deposits are not known near Pleasant Valley. The once very productive Flathead mine in the Hog Heaven district about 20 miles southeastward occurs in relatively recent lava, none of which is known near Pleasant Valley.

The many tracts of land listed for Western Montana College of Education northwest, west, south, and east of Whitefish lie mainly in alluvium and lake deposits, but several lie in outcrops of adjacent Belt strata which form an island-like area west of Whitefish, in the valley surrounded by lake deposits. No mineral resource or oil or gas is to be expected in the alluvium and lake deposits. A small amount of copper ore was shipped about 1930 from prospects 5 to 10 miles west of Whitefish (U. S. Geological Survey, Mineral Resources, 1930 and 1931), but no mention of mining activity in this locality has been made in publish reports for the past 19 years. Since this region is easily accessible and well populated, it would seem probable that if valuable ore deposits were present at or near the surface, they would have been found and exploited.

Coal is known to occur near the mouth of Coal Creek about 22 miles north of Columbia Falls in what apparently are lake sediments. Several Western Montana College of Education tracts lie in this locality. However as interpreted from maps, those tracts underlain by lake deposits do not lie in the coal-bearing area, but lie in the hilly area 2 to 6 miles west of the coal-bearing area. Sections 11 and 13, T. 34 N., R. 20 W. may possibly be underlain by coal. The North Fork Coal Company of Columbia Falls is reported to have mined 30 tons of coal per day in 1940, but this mine is not listed as operating in 1950.

Seepages of oil have been reported near Kintla about 15 miles north of Coal Creek, the oil according to reports coming out of Belt strata. This is a most unusual occurrence, and is not fully understood. The seeps have been known for about 50 years, and although wells were drilled nearby, nothing of economic significance has resulted. No seeps are known near the lands in question.

Gallatin County

Western Montana College of Education lands in Gallatin County (mostly sold) lie mainly in the benchland south of Logan and west of Bozeman, and partly along Bear Creek southeast of Bozeman. Most of the lands are immediately underlain by lake deposits, but several tracts west of Bozeman are underlain by pre-Cambrian gneiss. One tract (unsold) 6 miles southeast of Bozeman is in the outcrop area of Cretaceous strata.

No mineral resource, other than sand and gravel, is known to occur in the lake deposits of this area. The gneiss west of Bozeman locally contains deposits of corundum, but maps of this area issued by the U. S. Geological Survey in 1948 after intensive studies of the corundum deposits indicate that no corundum lies on the lands in question. No economic metallic deposits are known in this general locality, and conditions are unfavorable for coal, oil, or gas.

Section 1, T. 3 S., R. 6 E. is underlain by intensely deformed strata of Cretaceous age. Coal occurs in Cretaceous strata near Bozeman, but maps indicate that the coal-bearing horizon (Eagle formation) is not present on section 1. No other mineral resource is known to be present, and this region is unfavorable for oil or gas occurrence.

Hill County

Lands listed for Western Montana College of Education in Hill County lie along and close to Milk River valley 2 to 10 miles west and east of Havre. Lands in the valley are underlain by alluvium, and lands in the uplands are blanketed by glacial drift. Beneath alluvium and drift are strata of Upper Cretaceous age (mainly Judith River formation). (See U. S. Geological Survey, Bull. 641-C and 381-A).

No metalliferous mineralization is known in this part of Montana and it is most unlikely that any such deposits are present.

The Milk River lignite coal seam occurring in the upper part of the Judith River formation is present locally throughout this area. Thickness of coal ranges from 3 to 6 feet including shale partings, and it is "not persistently clean for even short distances". The coal has been mined locally and intermittently for local consumption. It is probable that this coal underlies some of the lands in question, particularly those lands in T. 33 N., R. 17 E., but information on its thickness (or presence) is not at hand. (See Blaine County.)

This area is possible oil and gas territory. Natural gas has been produced (1) along the Havre anticline about one mile north of that city (wells now abandoned), (2) on the Boxelder anticline about 10 miles southeast of Havre, and (3) on the Bowes anticline 20 miles southeast of Havre. Producing horizon is the Eagle sandstone at depths of about 1000 feet. In 1949 oil was discovered in the Bowes field at a depth of 3360 feet in the lower part of the Ellis formation (Jurassic). These occurrences enhance the oil and gas possibilities of Western Montana College of Education lands in this area; but on the other hand these occurrences are on pronounced anticlinal structure, and such structure is not known to be present on the lands in question. In fact, available information indicates that structure on at least some of the lands is synclinal, which is unfavorable.

The Havre Brick Company successfully manufactured common brick in the 1930's from a dark shale occurring in the Judith River formation, which is exposed near Havre and on some of the lands in question.

It is probable that deposits of sand and gravel are present in this general area.

Judith Basin County

Three small tracts of land assigned to Western Montana College of Education in Judith Basin County lie 1 to 6 miles west, east, and northeast of Geyser. That tract one mile west of Geyser is underlain by strata in the upper part of the Kootenai formation (Lower Cretaceous age), the others are underlain by Colorado shale (Upper Cretaceous age).

No metallic mineralization or metallic deposits are known or to be expected in this part of Montana.

The Great Falls-Lewistown coal horizon is at the base of the Kootenai (about 400 feet deep at Geyser), but information available is that this coal is not developed in this locality.

The shales of the Kootenai are well suited for manufacture of face brick and similar ceramic products, and such shale may be present on the tract one mile west of Geyser.

This region is possible oil and gas territory, however no favorable geologic structure is known to be present on any of these lands.

Lake County

Several tracts of land (partly sold) listed for Western Montana College of Education in Lake County lie in Swan River valley 3 to 7 miles southeast of Big Fork. They are underlain by alluvium and lake deposits which partially fill this valley. Beneath the lake deposits are quartzite and argillite of the Belt series.

No mineral resource is known in this part of Montana, and it is improbable that any is present.

Lewis and Clark County

Western Montana College of Education lands in Lewis and Clark County (mostly unsold) consist of one large tract about 5 miles south west of Augusta along the valley of South Fork of Sun River. It lies just east of the mountain front on an area blanketed by alluvium and glacial drift. Shales and sandstones of the Two Medicine Formation (Upper Cretaceous) underlie this unconsolidated material.

No metallic mineralization is known in this part of Montana, and it is improbable that any metallic deposits are present. No coal of commercial importance is known in this locality. This is possible oil and gas territory lying in the intensely deformed zone immediately east of the main ranges, but information is not at hand regarding the details of geologic structure on the land in question. This area in general has not received much attention by the major oil companies, which suggests that they are not interested in it.

Madison County

Western Montana College of Education lands in Madison County (mostly unsold) lie mainly in Jefferson River valley 1 to 10 miles north, south, east and west of Twin Bridges in the widespread area underlain by alluvium and lake deposits. Two tracts lie in the area of gneissic rocks 15 miles south of Logan or 12 miles northeast of Norris.

No valuable mineral resource is known in the alluvium and lake deposits of Jefferson Valley near Twin Bridges, although, of course, deposits of sand and gravel are present. Bentonite and volcanic ash (pumicite) are known to be present in the lake deposits in some parts of Montana, but it is not known that they are present on the lands in question. Gravel in creeks in the mountains east and west of Twin Bridges has yielded placer gold, but commercial amounts of placer gold are not known to continue into Jefferson Valley near Twin Bridges.

Likewise, no commercial mineral resource is known to be present in the gneissic area 15 miles south of Logan, although small quartz veins are reported to be present. This area south of Logan is easily accessible and fairly well populated, and undoubtedly the gneissic area has been well prospected. If mineral deposits of any consequence were present with even meager surface evidence, it is most probable that they would have been discovered and made known.

Mineral County

Lands listed for Western Montana College of Education in Mineral County (mostly unsold) lie along the valley of Clark Fork near St. Regis and Superior. They are underlain mainly by alluvium of Clark Fork valley, but some extend into the outcrop area of quartzite and argillite of the Belt series adjacent to the alluvium. Belt strata underlies the alluvium.

No mineral resource other than sand and gravel is known on any of these lands. Geologic conditions are adverse for the occurrence of coal, oil, or gas. The Belt strata of this part of Montana are mineralized with metalliferous veins, and mines have been operated in the mountains 4 or 5 miles north of Superior. Since all of the lands in question lie on or close to Clark Fork, and hence are easily accessible, and since this region has been vigorously prospected it would seem probable that if mineral deposits of consequence were present and observable on the lands, they would have been made known. Of course alluvium obscures character of underlying bed rock.

Placer gold has been mined along Quartz Creek down to Clark Fork. Section 22, T. 15 N., R. 25 W. lies on the opposite side of the River from Quartz Creek. It is not known if showings of placer gold have been found on section 22, but, as seen on maps, conditions would appear unfavorable for its occurrence.

Powder River County

Two tracts of land given Western Montana College of Education in Powder River County in lieu by the U. S. Government lie north and south of Moorhead 6 and 2 miles. These tracts are in the outcrop area of the Fort Union formation (Tertiary age), and probably are underlain by commercial beds of lignite coal. The Fort Union formation contains most of the commercial coal beds of eastern Montana. However, the record shows that coal rights have been reserved by the U. S. Government.

No metallic mineralization is known to occur in this part of Montana, and no metallic deposits are to be expected.

This is oil and gas territory in the broad structural feature known as the Powder River Basin. However, no local structure considered favorable for oil or gas occurrence is known to be present on or near these tracts.

Ravalli County

The several tracts of land in Ravalli County listed for Western Montana College of Education have all been sold in 1908 or earlier, excepting one small tract. These lands lie in Bitterroot Valley north of Hamilton and northeast of Stevensville, and most of them are underlain by alluvium and lake deposits. One small tract sold 1907 lies in the outcrop area of Belt strata.

No mineral resource is known to be present on any of these lands.

Teton County

Most of the lands in Teton County (mostly sold) assigned to Western Montana College of Education lie on the plains area north of Great Falls, within a radius of 10 miles of Power. They lie largely along or near the valleys of Muddy Creek and Lake Creek. Bedrock is strata in the middle part of the Colorado shale formation, although alluvium lies along the creek valleys, and glacial drift is present on the higher areas. One tract (unsold) lies 13 miles west of Choteau, or about 8 miles east of the mountain front, along Willow Creek. Underlying strata are in the upper Cretaceous series (Two Medicine formation).

No metallic mineralization is to be expected in these plains areas, and no formations containing commercial beds of coal are known to be present. The Two Medicine formation west of Choteau may contain thin beds of lignite coal, but so far as known they are not of commercial character.

All lands in Montana underlain by Cretaceous strata should be considered as in possible oil and gas territory, because formations known to yield oil or gas elsewhere in Montana should be present at depth. This is the case with the lands in question.

The several tracts near Power lie on the top, or slightly west of the top of that huge structural feature known as the Sweetgrass arch which extends from Great Falls northward for 150 miles into Canada. Width of the top of the arch ranges from 15 to 25 miles. The Kevin-Sunburst and Pondera oil fields lie along the top of this arch, and the Cut Bank field lies on its western flank. More than 100 test wells have been drilled along the top of the arch outside of the known producing areas in search of additional oil and gas fields. Most of these stopped at depths of 1800 to 2500 feet in the Madison limestone which is the deepest producing horizon. Within a radius of 10 miles of Power 16 or more wells have been drilled. Although some are reported to have had "showings" of oil, all were abandoned. This does indeed detract from the favorableness of this area for the occurrence of oil and gas. However, it does not completely condemn the area, because oil in this region may occur in stratigraphic traps (such as local areas of high porosity) which do not give evidence at the surface, and which may lie interspaced between test wells.

Those Western Montana College of Education lands west of Choteau in T. 24 N., R. 7 W. lie in what geologists have called the "disturbed zone", which is a strip 5 to 10 miles wide lying immediately east of the Lewis overthrust faulting, which resulted in the Front Ranges. The Turner Valley oil and gas field in Canada lies in this zone. Strata have been crumpled, cut by faults, and in places actually overturned. The lands in question, lie one to two miles west of the crest of a prominent anticlinal fold, well down on its western flank. (See U. S. Geological Survey, Bull. 691-E). A dry hole was drilled into Colorado strata on top of the anticline, and another dry hole (show of oil reported) was drilled three miles eastward. The absence of favorable structure on the lands in T. 24 N., R. 7 W. greatly detracts from their value for oil and gas prospecting, and without more information than that showing at the surface, it is doubtful if any major oil company would consider drilling on them.

Wheatland County

Two tracts of land (unsold) in Wheatland County listed for Western Montana College of Education lie 1 to 2 miles northeast of Two Dot. They are underlain by shale of the Colorado formation (Cretaceous) and by terrace gravel which blankets the shale.

No metalliferous mineralization is to be expected in this area, and no formations known to contain coal are present.

This is possible oil and gas territory, but no geologic structure such as is considered favorable for oil or gas accumulation is known to be present. In fact a detailed structure contour map issued by the U. S. Geological Survey (Bull. 691-F) shows that the lands in question lie in a synclinal area about 8 miles from the nearest anticline. Hence their oil and gas possibilities would appear to be not good from a structural point of view.