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PAMPHLET

MINERAL RESOURCE POTENTIAL OF THE BOX-DEATH HOLLOW ROADLESS AREA, GARFIELD COUNTY, UTAH

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STUDIES RELATED TO WILDERNESS

Under the provisions of the Wilderness Act (Public Law 88-577, September 3, 1964) and related acts, the U.S. Geological Survey and the U.S. Bureau of Mines have been conducting mineral surveys of wilderness and primitive areas. Areas officially designated as "wilderness," "wild," or "canoe" when the act was passed were incorporated into the National Wilderness Preservation System, and some of them are presently being studied. The act provided that areas under consideration for wilderness designation should be studied for suitability for incorporation into the Wilderness System. The mineral surveys constitute one aspect of the suitability studies. The act directs that the results of such surveys are to be made available to the public and be submitted to the President and the Congress. This report discusses the results of a mineral survey of The Box-Death Hollow Roadless Area, Dixie National Forest, Garfield County, Utah. The Box-Death Hollow Roadless Area (04259) was classified as a further planning area during the Second Roadless Area Review and Evaluation (RARE II) by the U.S. Forest Service, January 1979.

MINERAL RESOURCE POTENTIAL SUMMARY STATEMENT

A geologic and geochemical investigation and a search for prospects and mineralized areas have been conducted to determine the mineral resource potential of The Box-Death Hollow Roadless Area, Garfield County, Utah. The study area includes about 31,000 acres of mesas and canyons in the Dixie National Forest. Paleozoic and Mesozoic sedimentary rocks crop out in an area of gently dipping homoclines associated with broad upwarps and basins.

The mineral resource potential of The Box-Death Hollow Roadless Area is very low. No mineralized rock is known in the study area. The only mining activity in or near The Box-Death Hollow Roadless Area has been the intermittent quarrying of rock for local road metal. Exploration for oil and gas has been limited to a single well. In this well no hydrocarbons were found, and the well was plugged and abandoned. Analyses of samples of stream sediments, rocks, and water in and near the study area do not suggest derivation from mineralized terranes. Triassic rocks underlying The Box-Death Hollow Roadless Area may contain uranium-copper deposits, but no evidence suggests that they may be minable at depths of several thousand feet. A discontinuous seam of clayey coal less than 12 in. thick is found in the western part of the study area, but thicker seams of better quality coal crop out a few miles outside the study area.

INTRODUCTION

During 1979 and 1980 the U.S. Geological Survey and the U.S. Bureau of Mines conducted field studies to evaluate the mineral resource potential of The Box-Death Hollow Roadless Area, Garfield County, Utah. Field studies included geological mapping (Weir and Beard, 1981), geochemical sampling (this report), and a search for prospects and mineralized areas.

The Box-Death Hollow Roadless Area includes about 31,000 acres of mesas and canyons in the Dixie National Forest in central Garfield County, Utah (fig. 1). The study area is bounded approximately on the west, north, and east by an improved road connecting the towns of Escalante and Boulder, and on the south by the boundary of the Dixie National Forest. A few jeep trails penetrate the northeastern part of the study area, but most of the study area is accessible only by foot.

About 20 permanent residents live in ranches along Salt Gulch in or near the eastern part of the study area. Escalante, the nearest town, had a population of 638 in 1970. Total 1970 population of Garfield County was 3,157.

The Box-Death Hollow area lies within the western part of the Canyonlands section of the Colorado Plateau physiographic province (Thornbury, 1965, p. 426-434). Steep-walled canyons, mesas, and

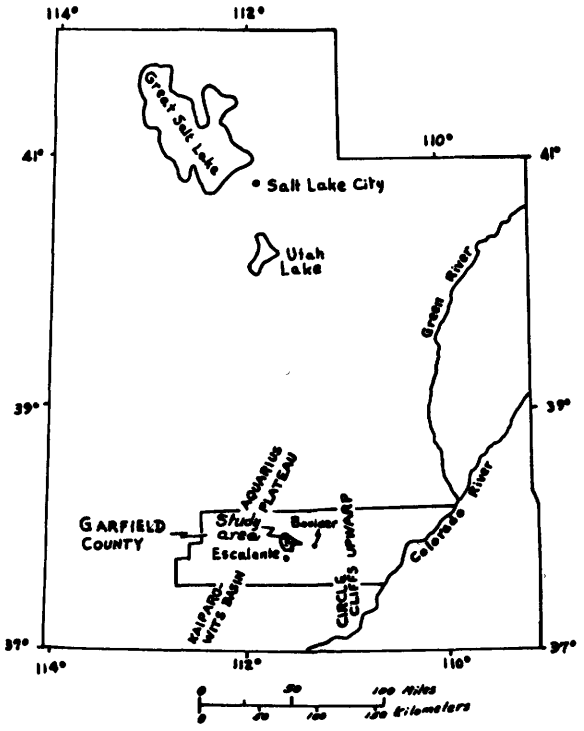


Figure 1.--Index map of Utah showing location of The Box-Death Hollow Roadless Area (04259).

plateaus formed in Paleozoic and Mesozoic sedimentary rocks are the major landforms in this section. The dominant structures are gently dipping homoclines associated with broad upwarps and basins. The study area lies west of the Circle Cliffs Upwarp and northeast of the Kaiparowits Basin. It is a few miles south of the southern edge of the basalt-capped Aquarius Plateau.

GEOLOGY

Rocks of Mesozoic age, totaling about 2,000 ft in thickness, and thin deposits of Quaternary age crop out in the area (Weir and Beard, 1981). More than 4,000 ft of buried Mesozoic and Paleozoic rocks are known from subsurface tests. The rock units are described briefly in table 1.

Navajo Sandstone (Jurassic and Triassic(?), grayish-orange, crossbedded sandstone) forms the most extensive outcrops in the study area (fig. 2). Formations of Jurassic age are exposed along the western, northern, and eastern fringes of the study area. Cretaceous rocks crop out in a narrow band near the western border of the study area.

In most of the study area the rocks dip gently to the southeast. The major folds are the Sand Creek syncline and the Escalante anticline, whose southwestern flank is the steeply dipping Escalante monocline (Weir and Beard, 1981). A high-angle normal fault, having a maximum displacement of about 200 ft, cuts the eastern flank of the Escalante anticline.

GEOCHEMISTRY

Sampling and Analytical Techniques

A total of 54 samples from within and near The Box-Death Hollow Roadless Area was collected in 1980 by J. C. Antweiler, L. S. Beard, and G. W. Weir; assisted by Eileen Simmons, M. K. Weisman, and C. A. Worrell. Thirty-two stream-sediment samples were collected along generally south-flowing streams that empty into the Escalante River a few miles south of the study area. Six rock samples were taken as representative of major formations. Panned concentrates of five samples of stream sediments and two of sedimentary rocks were made by J. C. Antweiler. In addition, Antweiler collected nine water samples from streams and springs. Geochemical surveys of adjoining areas on the south and southeast have also been completed (Weir and Lane, 1981a, b).

Semiquantitative spectrographic analyses of the silt fraction (less than 80 mesh) of the stream sediments and rocks were made by D. E. Detra and R. T. Hopkins using the six-step method for 30 elements (Au, Ag, As, B, Ba, Be, Bi, Ca, Cd, Co, Cr, Cu, Fe, La, Mg, Mn, Mo, Nb, Ni, Pb, Sb, Sc, Sn, Sr, Ti, V, W, Y, Zn, and Zr). The spectrographic data are reported to the nearest number in the series 1, 0.7, 0.5, 0.3, 0.2, 0.15, or multiples of 10 of those numbers, which represent approximate midpoints of grouped data on a geometric scale. The panned concentrates of heavy minerals were analyzed for gold by W. L. Campbell using atomic-absorption techniques. The water samples were analyzed for uranium by J. B. McHugh and W. L. Campbell using atomic-absorption and liquid-chromatograph techniques. The data for all samples are stored in the RASS (Rock Analysis and Storage System) files. Only those samples containing anomalous values are shown in tables 2 and 3.

Evaluation of Analytical Data

The spectrographic analyses of sediments and rocks from in and near The Box-Death Hollow Roadless Area do not suggest derivation from mineralized terranes. They appear characteristic of the country rock, mostly sandstone and shale of Jurassic and Triassic age (Weir and Beard, 1981). Similar conclusions were reached in the geochemical surveys of adjoining areas on the south and southeast (Weir and Lane, 1981a, b).

A few spectrographically determined values appear anomalous because they are high relative to the whole set of analyses (table 2). Most relatively high values in stream sediments are probably caused by contamination by debris from volcanic rocks that crop out north of the study area. Anomalous values in samples from the Wasatch Formation (which occurs north of the study area) are probably related to volcanic material in the matrix of the sedimentary rocks. None of the anomalies are more than an order of magnitude higher than the lower limit of spectrographic detection, and they do not form a pattern suggesting the need for more sampling.

Gold values detected in a few panned concentrates (table 3) are very low. None of the water samples showed a uranium content of more than 1.5 parts per billion.

MINING DISTRICTS AND MINERALIZED AREAS

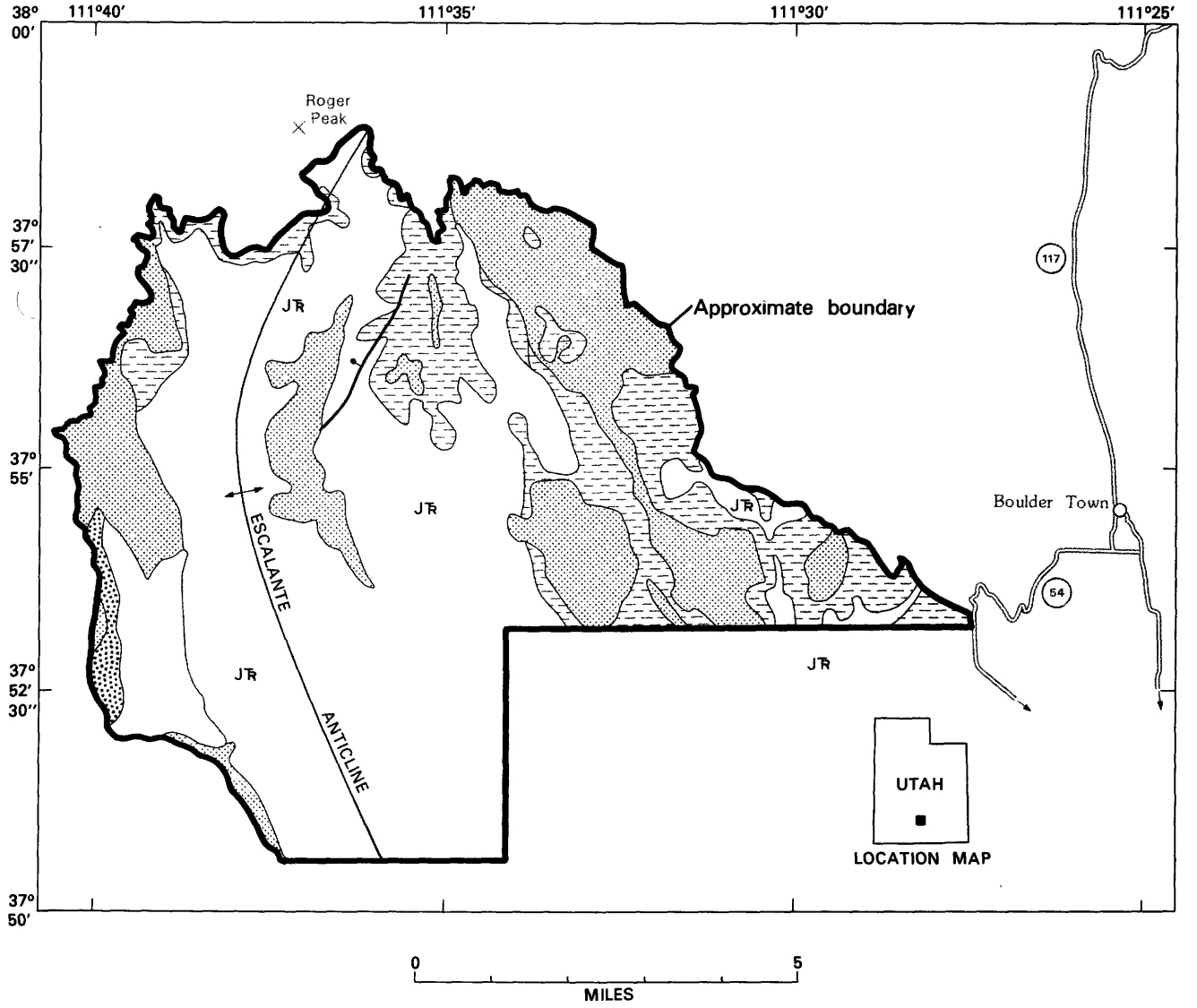
The Box-Death Hollow Roadless Area does not lie within an organized mining district. Mining claim records at the office of the Garfield County Recorder in Panguitch, Utah, and U.S. Bureau of Land Management files were examined. No claims are known to have been located within the study area.

Development of mineral resources in and near The Box-Death Hollow Roadless Area has been limited to the quarrying of road material from Tertiary and Cretaceous conglomerate and from Tertiary volcanic rocks. None of the quarried material has been trucked more than a few miles. No mineralized rock is known within the study area. Exploration in the study area has been limited to a single well drilled for oil and gas in 1969. No hydrocarbons were found and the well was plugged and abandoned.

MINERAL RESOURCE POTENTIAL

The mineral resource potential of The Box-Death Hollow Roadless Area is very low. No metallic-mineral deposits are known in the study area. Analyses of samples of stream sediments, rocks, and water from springs and streams in and near the study area do not suggest derivation from mineralized terranes (Weir and Lane, 1981). Gold values detected in a few samples (table 3) are low.

Uranium-copper deposits are in Triassic rocks in the Circle Cliffs about 15 mi east of the study area. These deposits are generally small and weakly mineralized; only a few have been mined (Davidson,



EXPLANATION

- Alluvium, colluvium, and pediment deposits, Quaternary
- Shale, sandstone, and conglomerate, Cretaceous
- Shale, sandstone, and minor limestone and gypsum, Jurassic
- JTR — Sandstone, Jurassic and Triassic
- Contact
- Fault--Bar and ball on downthrown side

Figure 2.--Generalized geologic map of The Box-Death Hollow Roadless Area. Simplified from Hackman and Wyant (1973) and Weir and Beard (1981).

Table 1.--Generalized stratigraphic section of The Box-Death Hollow Roadless Area, Utah

[Data on most units below Navajo Sandstone are based on wells in and near the Upper Valley oil field about 18 mi south of the study area (Zeller, 1973; Peterson, 1973). Data on Chinle Formation from outcrops in the Circle Cliffs about 15 mi east of the study area (Davidson, 1967). Repetition of some stratigraphic units reflects intertonguing]

System	Series	Formation	Member	Thickness (feet)	Description
Quaternary---	Pleistocene and Holocene.	Alluvial, colluvial, and eolian deposits.		0- 40	Clay, silt, sand, and gravel along streams; silt and sand on mesas; pediment gravels consist chiefly of pebbles to boulders of basalt. Colluvium consists chiefly of slopewash aprons and lobate masses of basalt gravel.
			Unconformity		
Cretaceous---	Upper-------	Tropic Shale.		100+	Shale, dark-greenish-gray, poorly exposed; only lower part present in area; about 800 ft thick in adjoining Wide Hollow Reservoir Quadrangle (Stephens, 1973).
Cretaceous---	Upper-------	Dakota Formation.		150	Sandstone, grayish-orange, commonly conglomeratic at base; interbedded with gray carbonaceous shale and siltstone and thin lensing beds of coal; top poorly exposed.
			Unconformity		
Cretaceous---	Lower-------	Cedar Mountain Formation.		0- 50	Conglomerate and sandstone, light-gray, cobbles and pebbles of chert and quartz and quartzite; irregularly lenticular.
			Unconformity		
Jurassic-----	Upper-------	Morrison Formation.		50- 150	Sandstone, light-gray, fine- to coarse-grained, interbedded with shale and siltstone, moderate-red. Conglomerate, dark-gray; pebbles of red, green, and gray chert at top of unit; cut out locally; includes sandstone and shale assigned to Summerville(?) Formation by Stephens (1973).
			Unconformity		
Jurassic-----	Middle------	Entrada Sandstone.		750	Sandstone, grayish-orange, crossbedded at top, alternating beds of very light gray and reddish-brown mudstone in middle part; reddish-brown silty sandstone in lower part.
Jurassic-----	Middle------	Carmel Formation.	Upper member.	260	Mudstone and minor fine-grained sandstone, chiefly reddish-brown; light-gray gypsum in irregular lenses; thin-bedded yellowish-gray limestone near base.
Jurassic-----	Middle------	Page Sandstone.	Thousand Pockets Tongue.	10- 60	Sandstone, chiefly yellowish-gray, fine-grained; crossbedded, locally contorted. Contains layer of reddish-brown mudstone near middle of unit.
Jurassic-----	Middle------	Carmel Formation.	Judd Hollow Tongue.	10- 40	Mudstone, reddish-brown; sandstone, limonite-stained, fine-grained, 2-10 ft thick at base.
Jurassic-----	Middle------	Page Sandstone.	Harris Wash Tongue.	10- 40	Sandstone, grayish-orange, crossbedded; contains chert pebbles at base.

Table 1.--Generalized stratigraphic section of The Box-Death Hollow Roadless Area, Utah--Continued

System	Series	Formation	Member	Thickness (feet)	Description
			Unconformity		
Jurassic and Triassic(?).		Navajo Sandstone.		1,300-1,500	Sandstone, grayish-orange, crossbedded, in part contorted; contains sparse thin lenses of limestone and reddish-brown siltstone, mostly near base. Base not exposed; about 1,200 ft exposed in The Box near south edge of study area; ranges in thickness from about 1,100 ft in the Circle Cliffs, about 10 mi east of the study area (Miller and Cadigan, 1958) to about 1,700 ft in the Upper Valley oil field about 18 mi southwest of study area (Peterson, 1973).
Triassic(?)--		Kayenta Formation.		200- 320	Sandstone interbedded with siltstone, reddish-brown.
Triassic(?)--		Wingate Formation.		200- 260	Sandstone, light-reddish-orange to reddish-brown, fine-grained, crossbedded.
			Unconformity		
			Church Rock Member.	0- 25	Sandstone, brown, fine- to medium-grained.
			Owl Rock Member.	150- 250	Sandstone and mudstone, red, brown, and greenish-gray; limestone, greenish-gray, in thin lenses.
Triassic-----	Upper-------	Chinle Formation.	Petrified Forest Member.	150- 350	Mudstone, bentonitic, variegated, and sandstone; contains silicified wood.
			Monitor Butte Member.	100- 200	Mudstone, bentonitic, green and grayish-red; sandstone, light-brown, micaceous, ripple-laminated.
			Shinarump Member.	0- 60	Sandstone, conglomeratic, yellowish-gray, crossbedded; mudstone, greenish-gray, in thin lenses.
			Unconformity		
			Mottled siltstone unit.	0- 50	Siltstone and minor sandstone, mottled red and white; generally absent where Shinarump Member is present.
			Unconformity		
Triassic-----	Middle(?) and Lower.	Moenkopi Formation.		800- 880	Sandstone, shale, and siltstone, reddish-brown; minor limestone.
			Timpoweap Member.	60- 70	Dolomite, light-brown to light-yellowish-red.
			Unconformity		
Permian------	Lower-------	Kaibab Limestone.		140- 200	Dolomite, light-gray to light-brown; contains abundant chert.
Permian------	Lower-------	Cutler Formation.	White Rim Sandstone Member.	140- 170	Sandstone, dolomitic, light-gray; some interbedded light-brown dolomite.
Permian------	Lower-------	Toroweap Formation.		360- 420	Dolomite, light-brown, dense; interbedded light-gray sandstone and anhydrite.
Permian------	Lower-------	Coconino Sandstone.		50	Sandstone, light-gray.

Table 1.--Generalized stratigraphic section of The Box-Death Hollow Roadless Area, Utah--Continued

System	Series	Formation	Member	Thickness (feet)	Description
Permian------	Lower--------	Cutler Formation.	Organ Rock Member.	140- 160	Siltstone, light-gray to light-red, some brown sandstone.
			Cedar Mesa Sandstone Member.	1,350-1,400	Sandstone, light-gray to light-yellowish-red, fine- to medium-grained; lower one-third contains interbedded light-brown to light-yellowish-red limestone and dolomite.
			Unconformity		
Pennsylvanian	Upper and Middle.	Hermosa Formation.		340	Sandstone, light-gray; interbedded light-yellowish-red dolomite and reddish- and purplish-gray siltstone.
Pennsylvanian	Middle------	Molas Formation.		40- 70	Shale, reddish-gray, some limestone concretions and sandstone.
			Unconformity		
Mississippian	Upper and Lower.	Redwall Limestone.		900	Limestone and dolomite, light-gray to light-yellowish-red; extensive karst surface at top; in part cavernous.
Devonian-----	Upper-------	Ouray Limestone.		160	Limestone, light-yellowish-red, dense.
Devonian-----	Upper-------	Unnamed-----		230	Dolomite, light-yellowish-red, some interbedded sandstone and greenish-gray shale.
			Unconformity		
Cambrian-----		Unnamed-----		100	Dolomite, light-yellowish-red and interbedded greenish- and reddish-gray shale.

Table 2.--Anomalous values shown by semiquantitative spectrographic analyses of stream sediments and rocks from in and near The Box-Death Hollow Roadless Area, Utah

[Samples analyzed by D. E. Detra and R. T. Hopkins using the six-step method for 30 elements. Values reported in parts per million (ppm)]

Element---------- (Lower limit of detection).	Ag (0.5)	Cr (10)	Cu (5)	Sr (100)	V (100)	Remarks
Anomaly minimum---	.5	100	100	500	200	
Sample No.						
BT32S----------	---	100	---	500	300	Stream sediment, tributary to Boulder Creek.
E70S----------	.5	---	---	500	---	Stream sediment, tributary to Death Hollow.
E72S----------	---	---	---	---	200	Stream sediment, tributary to Lake Creek.
RP108R----------	---	---	150	1,000	100	Tuffaceous sandstone, Wasatch Formation.
RP109B----------	.7	---	---	---	---	Matrix of weathered conglomerate, Wasatch Formation.

Table 3.--Anomalous values of gold shown by chemical analyses of panned concentrates of heavy minerals from stream sediments and sedimentary rocks in and near The Box-Death Hollow Roadless Area, Utah

[Samples analyzed by W. L. Campbell using atomic-absorption techniques. Values reported in parts per million (ppm). L, indicates detected, but below limit of determination (in parentheses)]

Sample No.	Au	Remarks
B1P----------	0.09	Conglomerate, base of Cedar Mountain Formation (Lower Cretaceous).
B2P----------	.05	Do.
B3P----------	L(.02)	Stream sediment, Pine Creek, about 50 ft north of Hells Backbone Road.
DH1P----------	.25	Stream sediment, Pine Creek, mouth of The Box.

Table 4.--Record of exploratory wells drilled in and near The Box-Death Hollow Roadless Area, Utah

[Wells drilled are as of 1979. All wells are abandoned. Sources of data: Heylmun and others (1965), McFall and Peterson (1971), drill-pipe inscriptions, and records of the U.S. Geological Survey]

Section	Operator	Well	Total depth (feet)	Year completed	Oldest formation (or age of rocks) penetrated	Remarks
			T. 32 S., R. 3 E.			
29	Phillips Petroleum.	2 Escalante Anticline.	6,062	1961; re-entered 1980.	Ouray Limestone (Devonian-Mississippian).	Yielded more than 8 MMCFG/D of non-flammable gas (probably mostly CO_2) from Triassic and Permian rocks.
32	Phillips Petroleum.	1 Escalante Anticline.	3,384	1961	Kaibab Limestone (Permian).	Dry hole.
			T. 33 S., R. 2 E.			
12	Skyline Oil Co.	Escalante Federal 1.	4,166	1969	Toroweap Formation (Permian).	Yielded more than 10 MMCFG/D of non-flammable gas (more than 98 percent CO_2).

1967, p. 65-91; Doelling, 1975, p. 107-109, 131-135). In 1979 and 1980 all mines and prospects in the Circle Cliffs area appeared inactive. The Triassic rocks underlying The Box-Death Hollow Roadless Area may contain similar uranium-copper deposits, but no evidence suggests that they might be of sufficient size and grade to be minable at depths of several thousand feet. Uranium-vanadium deposits are in the Morrison Formation in eastern Garfield County about 50 mi east of the wilderness (Doelling, 1975, p. 102-107), but similar deposits are not known in the Morrison of central Garfield County.

The oil and gas potential of The Box-Death Hollow Roadless Area appears low. One well in the study area and two wells within a mile north of the study area have been drilled on the Escalante anticline without commercial success (table 4). A fourth well on this structure, about 6 mi south of the study area was also dry.

A discontinuous seam of clayey coal, averaging less than 12 in. thick, is in the upper part of the Dakota Formation in the western part of the study area. This seam has not been developed, because thick seams of good-quality coal crop out in younger formations a few miles outside the study area.

Potential construction materials within the study area include stone for road metal in Cretaceous conglomerate and Tertiary basalt, gravel in alluvial and colluvial deposits, and gypsum and limestone in the Carmel Formation. However, ample supplies of these materials are readily available at nearby localities outside the study area.

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