DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

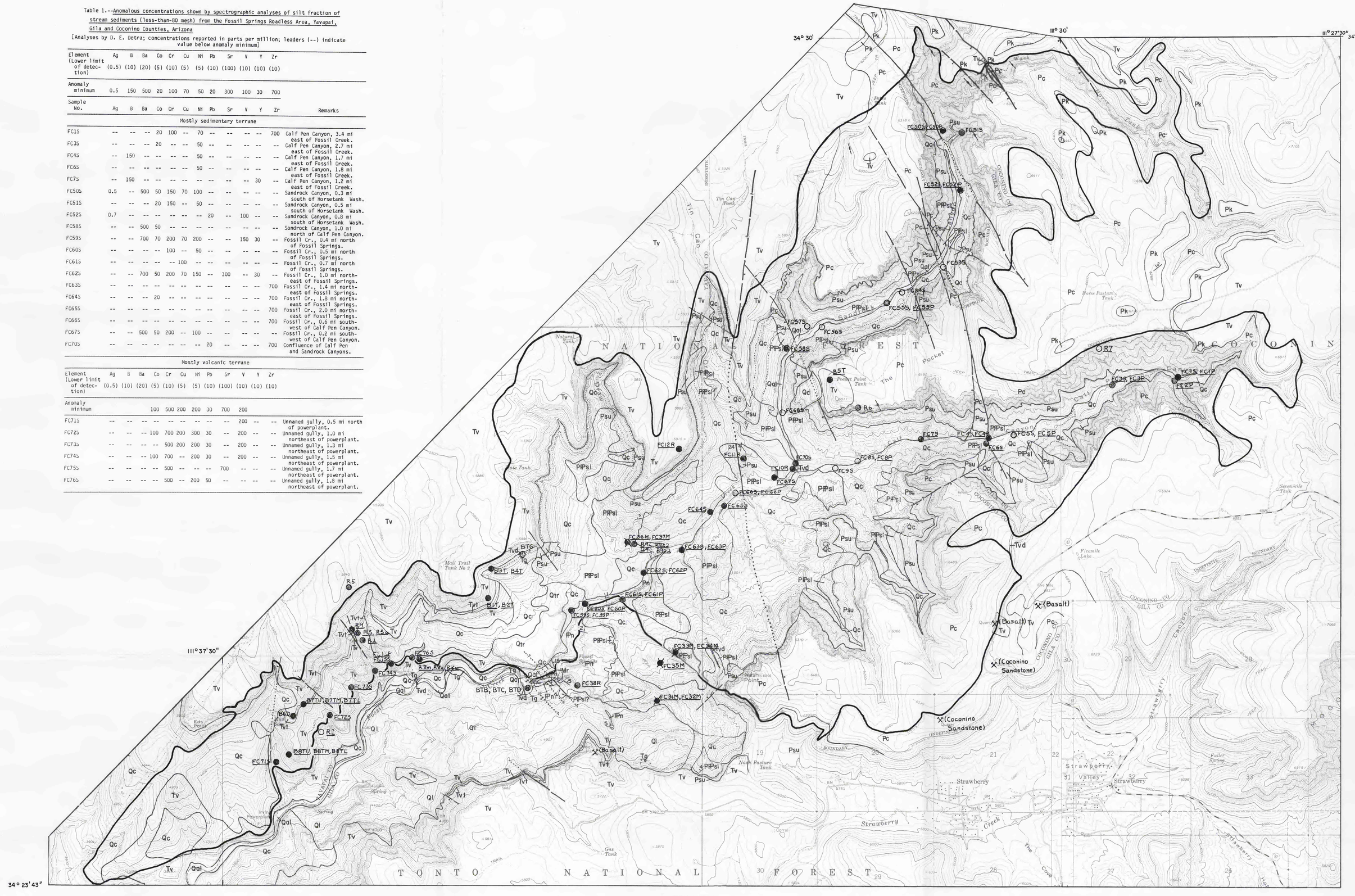
MISCELLANEOUS FIELD STUDIES
MAP MF-1568-A
PAMPHLET ACCOMPANIES MAP

Table 1.--Anomalous concentrations shown by spectrographic analyses of silt fraction of stream sediments (less-than-80 mesh) from the Fossil Springs Roadless Area, Yavapai, Gila and Coconino Counties, Arizona

[Analyses by D. E. Detra; concentrations reported in parts per million; leaders (--) indicate value below anomaly minimum]

Element (Lower limit of detection)	Ag (0.5)	B (10)	Ba (20)	Co (5)	Cr (10)	Cu (5)	Ni (5)	Pb (10)	Sr (100)	V (10)	Y (10)	Zr (10)
Anomaly minimum	0.5	150	500	20	100	70	50	20	300	100	30	700

Sample No.	Ag	B	Ba	Co	Cr	Cu	Ni	Pb	Sr	V	Y	Zr	Remarks
Mostly sedimentary terrane													
FC1S	--	--	--	20	100	--	70	--	--	--	--	700	Calf Pen Canyon, 3.4 mi east of Fossil Creek.
FC3S	--	--	--	20	--	--	50	--	--	--	--	--	Calf Pen Canyon, 2.7 mi east of Fossil Creek.
FC4S	--	150	--	--	--	--	50	--	--	--	--	--	Calf Pen Canyon, 1.7 mi east of Fossil Creek.
FC6S	--	--	--	--	--	--	50	--	--	--	--	--	Calf Pen Canyon, 1.8 mi east of Fossil Creek.
FC7S	--	150	--	--	--	--	--	--	--	--	30	--	Calf Pen Canyon, 1.2 mi east of Fossil Creek.
FC50S	0.5	--	500	50	150	70	100	--	--	--	--	--	Sandrock Canyon, 0.3 mi south of Horsetank Wash.
FC51S	--	--	--	20	150	--	50	--	--	--	--	--	Sandrock Canyon, 0.5 mi south of Horsetank Wash.
FC52S	0.7	--	--	--	--	--	--	20	--	100	--	--	Sandrock Canyon, 0.8 mi south of Horsetank Wash.
FC58S	--	--	500	50	--	--	--	--	--	--	--	--	Sandrock Canyon, 1.0 mi north of Calf Pen Canyon.
FC59S	--	--	700	70	200	70	200	--	--	150	30	--	Fossil Cr., 0.4 mi north of Fossil Springs.
FC60S	--	--	--	--	100	--	50	--	--	--	--	--	Fossil Cr., 0.5 mi north of Fossil Springs.
FC61S	--	--	--	--	--	--	100	--	--	--	--	--	Fossil Cr., 0.7 mi north of Fossil Springs.
FC62S	--	--	--	700	50	200	70	150	--	300	--	30	Fossil Cr., 1.0 mi north-east of Fossil Springs.
FC63S	--	--	--	--	--	--	--	--	--	--	--	700	Fossil Cr., 1.4 mi north-east of Fossil Springs.
FC64S	--	--	--	20	--	--	--	--	--	--	--	700	Fossil Cr., 1.8 mi north-east of Fossil Springs.
FC65S	--	--	--	--	--	--	--	--	--	--	--	700	Fossil Cr., 2.0 mi north-east of Fossil Springs.
FC66S	--	--	--	--	--	--	--	--	--	--	--	700	Fossil Cr., 0.6 mi south-west of Calf Pen Canyon.
FC67S	--	--	500	50	200	--	100	--	--	--	--	--	Fossil Cr., 0.2 mi south-west of Calf Pen Canyon.
FC70S	--	--	--	--	--	--	--	20	--	--	--	700	Confluence of Calf Pen and Sandrock Canyons.
Mostly volcanic terrane													
Element (Lower limit of detection)	**Ag (0.5)**	**B (10)**	**Ba (20)**	**Co (5)**	**Cr (10)**	**Cu (5)**	**Ni (5)**	**Pb (10)**	**Sr (100)**	**V (10)**	**Y (10)**	**Zr (10)**	
Anomaly minimum				100	500	200	200	30	700	200			
FC71S	--	--	--	--	--	--	--	--	--	200	--	--	Unnamed gully, 0.5 mi north of powerplant.
FC72S	--	--	--	100	700	200	300	30	--	200	--	--	Unnamed gully, 1.0 mi northeast of powerplant.
FC73S	--	--	--	--	500	200	200	30	--	200	--	--	Unnamed gully, 1.3 mi northeast of powerplant.
FC74S	--	--	--	100	700	--	200	30	--	200	--	--	Unnamed gully, 1.5 mi northeast of powerplant.
FC75S	--	--	--	--	500	--	--	--	700	--	--	--	Unnamed gully, 1.7 mi northeast of powerplant.
FC76S	--	--	--	--	500	--	200	50	--	--	--	--	Unnamed gully, 1.8 mi northeast of powerplant.



Geology from Weir and Beard (in press)

SCALE 1:24 000
1 0 1 MILE
1 0 1 KILOMETER
CONTOUR INTERVAL 40 FEET
DOTTED LINES REPRESENT 20-FOOT CONTOURS

EXPLANATION

SAMPLE LOCALITY

BTC No anomaly

B8T Underlined sample number indicates sample showing anomalous value given in tables 1-4; may coincide with prospect

PROSPECT--Copper-uranium, near top of lower third of Supai Formation (Permian and Pennsylvanian)

(BASALT) QUARRY--Quarried unit named in parentheses

APPROXIMATE BOUNDARY OF FOSSIL SPRINGS ROADLESS AREA

(NOTE: The following symbols, list of map units, and correlation are for the screened geologic base.)

CORRELATION OF MAP UNITS

Qal, Qc	Holocene	QUATERNARY
Ql, Qtr	Holocene and Pleistocene	
UNCONFORMITY		
Tv, Tvt, Tvd	Pliocene(?) and Miocene	TERTIARY
UNCONFORMITY		
Tg	Miocene or older	
UNCONFORMITY		
Pk	Lower Permian	PERMIAN
Pc		
Psu		
PPsl	Lower Permian and Upper and Middle Pennsylvanian	PERMIAN AND PENNSYLVANIAN
IPn	Middle Pennsylvanian	PENNSYLVANIAN
UNCONFORMITY		
Mr	Lower Mississippian	MISSISSIPPIAN

LIST OF MAP UNITS

Qal	ALLUVIAL DEPOSITS (QUATERNARY)
Qc	COLLUVIAL DEPOSITS (QUATERNARY)
Ql	LANDSLIDE DEPOSITS (QUATERNARY)
Qtr	TRAVERTINE DEPOSIT (QUATERNARY)
Tv	VOLCANIC ROCKS (TERTIARY)--Mafic and intermediate flows and ash deposits
Tvt	LITHIC TUFF (TERTIARY)--Marker unit
Tvd	BASALT DIKE (TERTIARY)
Tg	GRAVEL (TERTIARY)
Pk	KAIBAB LIMESTONE (PERMIAN)--Limestone, dolomite, and sandstone
Pc	COCONINO SANDSTONE (PERMIAN)--Sandstone
Psu	SUPAI FORMATION, UPPER (PERMIAN)--Siltstone, shale, sandstone, and limestone
PPsl	SUPAI FORMATION, LOWER (PERMIAN AND PENNSYLVANIAN)--Siltstone, shale, sandstone, conglomerate, and dolomite
IPn	NACO FORMATION (PENNSYLVANIAN)--Limestone, dolomite, siltstone, shale, sandstone, and conglomerate
Mr	REDWALL LIMESTONE (MISSIPPIAN)--Limestone

CONTACT--Dotted where concealed; queried where doubtful

FAULT--Dashed where approximately located; queried where doubtful; dotted where concealed; bar and ball on downthrown side

STRIKE AND DIP OF BEDS

Inclined

Approximate

STRIKE OF SETS OF VERTICAL JOINTS

STUDIES RELATED TO WILDERNESS

The Wilderness Act (Public Law 88-577, September 3, 1964) and related acts require the U.S. Geological Survey and the U.S. Bureau of Mines to survey certain areas on Federal lands to determine their mineral resource potential. Results must be made available to the public and be submitted to the President and the Congress. This map presents the results of a mineral survey of the Fossil Springs Roadless Area (U.S. Forest Service number 03046) in the Coconino National Forest, Yavapai, Gila, and Coconino Counties, Ariz. The Fossil Springs Roadless Area 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

The mineral resource potential of the Fossil Springs Roadless Area, central Arizona, is low. Light-gray conglomerate and carbonaceous shale in the Supai Formation, near the central part of the roadless area, contain discontinuous, spotty copper mineralization, and coaly layers within the shale are radioactive. Analyses obtained during the study show unresolved geochemical anomalies in the area; the anomaly suites suggest possible barite vein deposits and contamination from an unknown ultramafic source. Construction materials present within the roadless area--chiefly basalt, sandstone, limestone, and dolomite--are readily available in abundance in adjacent areas. The oil and gas potential is low; the only producing wells in Arizona tap formations not present in the Fossil Springs Roadless Area.

INTRODUCTION

During 1980 and 1981 the U.S. Geological Survey and the U.S. Bureau of Mines conducted field studies to evaluate the mineral resource potential of the Fossil Springs Roadless Area. The roadless area includes about 14,000 acres of mesas and canyons in the Coconino National Forest, on the edge of the Mogollon Rim in central Arizona (see index map).

Field studies included geological mapping (Weir and Beard, in press), geophysical studies (Davis and Weir, in press), geochemical sampling (Beard and Weir, in press), and a search for mines, prospects, and mineralized areas. M. K. Watson assisted the authors in sample collection. T. G. Lovering provided valuable assistance in the evaluation of analytical data.

GEOLOGIC SETTING

The Fossil Springs Roadless Area is near the southern boundary of the Colorado Plateaus (the Mogollon Rim), which in this vicinity is characterized by steep-walled canyons cut into a high tableland of relatively flat-lying Paleozoic sedimentary rocks, veneered locally with Tertiary volcanic rocks. Immediately south of Fossil Springs the volcanic rocks thicken abruptly against an ancestral Mogollon Rim (Twenter, 1962) cut into the Paleozoic section by prevolcanic erosion. A large travertine deposit forms a conspicuous bench above Fossil Springs. Highangle normal faults that cut Paleozoic strata also offset the volcanic rocks, but with less displacement.

AEROMAGNETICS

The aeromagnetic map (Davis and Weir, in press) of the Fossil Springs Roadless Area shows no evidence of subsurface metallic mineral deposits. The variations in total magnetic intensity of the roadless area are related to magnetic property contrasts in the volcanic rocks and to magnetic contrasts between the basalts and the sedimentary rocks. There is no evidence of any magnetic lows that represent zones of alteration in which metallic mineral deposits may occur along fault zones, and the low amplitude of the anomalies argues against a large deposit of magnetite lying at shallow depths.

GEOCHEMISTRY

A total of 94 samples of stream sediments, panned concentrates of stream sediments, and rocks from within and near the Fossil Springs Roadless Area was collected in 1980-82.

Geochemical analyses of the stream-sediment and rock samples yielded two separate anomaly suites that remain geologically unresolved (tables 1-4). One suite of anomalies, concentrated in the central part of the area about a mile upstream from Fossil Springs, is found in panned concentrates containing levels of chromium, cobalt, and nickel expected in ultramafic rocks. The chromium, cobalt, and nickel anomalies are perhaps related to a thin mafic dike or flow with an ultramafic component that was not observed in the field. A possible alternative is that leakage along a fault zone has concentrated elements from a source in basement rocks, but this possibility is unlikely because ultramafic bodies are not known to occur in the region. The other suite comprises barium, beryllium, and copper anomalies in panned concentrates from the upper reaches of Calf Pen Canyon. The second suite suggests possible hydrothermal barite vein deposits. Although no hydrothermal barite deposits were found within the roadless area, they occur south of it along Tertiary fault zones (C. H. Conway, oral commun., 1982). The geochemical anomalies have potentially important geologic implications, but are not considered indicative of probable mineral potential within the roadless area.

ASSESSMENT OF MINERAL RESOURCE POTENTIAL

The mineral resource potential of the Fossil Springs Roadless Area is low. The resources assessed include construction materials, copper and uranium, and oil and gas.

Flagstone and basalt have been quarried from small workings in the Coconino Sandstone (Permian) near the east and south edges of the roadless area (Keith, 1969, p. 444). In 1980 and early 1981 all quarries in or near the roadless area were inactive. Adequate supplies of the construction materials listed are readily accessible in nearby locations.

Copper-uranium occurrences are near the central part of the roadless area in a discontinuous zone, a few tens of feet thick, within the Supai Formation. Four prospects are in or near the roadless area, three on the south side of Fossil Creek below Nash Point, and one on the north side of Fossil Creek near the mouth of Mud Tanks Draw. The anomalous radioactivity is generally confined to thin coaly layers within carbonaceous shale, and most of the copper minerals occur in carbonaceous shale or in gray sandstone and conglomerate interlayered with carbonaceous shale. Mineralization was sporadic and not concentrated; the mineralized rock, occupying only a small part of the zone, is commonly only a few inches to a few feet thick and extends a few feet to several tens of feet along the outcrop.

Because mineralization was spotty and discontinuous, and the rugged terrain and small areal extent of the roadless area are not conducive to exploitation, the mineral potential is deemed low.

The oil and gas potential of the Fossil Springs area is low. Formations not breached by Fossil Creek are mostly clastic and carbonate rocks of Devonian and Mississippian age. These subsurface formations are potentially petroliferous but have not yielded oil in central Arizona (Peirce and others, 1970, p. 53-56). The only productive wells in Arizona are in the northeast corner of the State and tap units not present near Fossil Springs. Only four test wells have been drilled within 20 mi of the roadless area. All were dry and have been plugged and abandoned.

REFERENCES

Beard, L. S., and Weir, G. W., in press, Geochemical data for the Fossil Springs Roadless Area, Yavapai, Gila and Coconino Counties, Arizona: U.S. Geological Survey Open-File Report.

Davis, W. E., and Weir, G. W., in press, Map showing aeromagnetic survey of the Fossil Springs Roadless Area, Yavapai, Gila, and Coconino Counties, Arizona: U.S. Geological Survey Miscellaneous Field Studies Map, scale 1:24,000.

Keith, S. B., 1969, Sandstone, in Mineral and water resources of Arizona: Arizona Bureau of Mines Bulletin 180, p. 441-448.

Peirce, H. W., Keith, S. B., and Wilt, J. C., 1970, Coal, oil, natural gas, and uranium in Arizona: Arizona Bureau of Mines Bulletin 182, 289 p.

Twenter, F. R., 1962, The significance of the volcanic rocks in the Fossil Creek area, Arizona, in Guidebook of the Mogollon Rim region, east-Central Arizona, New Mexico Geological Society, 13th Annual Field Conference, 1962: Socorro, New Mexico Bureau of Mines and Mineral Resources, p. 107-108.

Weir, G. W., and Beard, L. S., in press, Geologic map of the Fossil Springs Roadless Area, Yavapai, Gila, and Coconino Counties, Arizona: U.S. Geological Survey Miscellaneous Field Studies Map, scale 1:24:000.

Table 2.--Anomalous concentrations shown by spectrographic analyses of panned concentrates (nonmagnetic fraction) of stream sediments from the Fossil Springs Roadless Area, Yavapai, Gila, and Coconino Counties, Arizona

[Analyses by D. E. Detra; concentrations reported in parts per million; > = greater than concentration shown; leaders (--) indicate value below anomaly minimum]

Element (Limit of detection)	Ag (1)	B (10)	Ba (20)	Be (1)	Co (5)	Cr (20)	Cu (10)	La (20)	Mo (5)	Ni (5)	Pb (10)	Sc (5)	Sn (10)	Sr (200)	Y (10)	Y (10)	Zr (10)
Anomaly minimum	0.5	1,000	10,000	30	100	2,000	300	300	5	150	150	100	10	1,000	500	1,000	2,000

Sample No.	Ag	B	Ba	Be	Co	Cr	Cu	La	Mo	Ni	Pb	Sc	Sn	Sr	Y	Y	Zr	Remarks
FC1P	--	--	>10,000	50	100	2,000	1,000	500	--	150	--	--	--	--	--	--	>2,000	Calf Pen Canyon, 3.4 mi east of Fossil Creek.
FC2P	--	--	>10,000	70	--	--	300	--	--	--	--	--	--	--	--	--	>2,000	Calf Pen Canyon, 3.3 mi east of Fossil Creek.
FC3P	--	--	--	50	--	--	--	--	--	--	--	--	--	--	--	--	>2,000	Calf Pen Canyon, 2.7 mi east of Fossil Creek.
FC4P	--	--	>10,000	50	--	--	2,000	--	--	--	--	20	--	--	--	--	>2,000	Calf Pen Canyon, 2.7 mi east of Fossil Creek.
FC5P	--	--	>10,000	70	--	2,000	--	--	15	--	--	--	--	--	--	1,000	>2,000	Calf Pen Canyon, 2.9 mi east of Fossil Creek.
FC8P	--	--	10,000	30	150	5,000	5,000	--	--	300	--	100	--	--	--	--	>2,000	Calf Pen Canyon, 0.5 mi east of Fossil Creek.
FC13P	--	--	--	--	--	--	--	--	--	150	--	--	--	--	--	--	>2,000	Unnamed gully, 1.5 mi northeast of powerplant.
FC50P	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	>2,000	Sandrock Canyon, 0.3 mi south of Horsetank Wash.
FC52P	--	2,000	--	--	--	--	1,000	--	10	--	200	--	--	--	500	--	>2,000	Sandrock Canyon, 0.8 mi south of Horsetank Wash.
FC55P	--	--	--	50	--	--	--	--	--	--	--	--	--	--	--	--	--	Sandrock Canyon, 2.0 mi north of Calf Pen Canyon.
FC59P	--	--	--	--	200	5,000	--	--	--	300	--	100	--	--	500	--	>2,000	Fossil Creek, 0.4 mi north of Fossil Springs.
FC60P	--	--	>10,000	--	100	3,000	--	--	--	150	--	--	--	1,000	--	--	>2,000	Fossil Creek, 0.5 mi north of Fossil Springs.
FC61P	--	--	>10,000	--	100	3,000	15,000	--	--	150	--	--	--	--	--	--	--	Fossil Creek, 0.7 mi northeast of Fossil Springs.
FC62P	--	--	--	--	150	7,000	500	--	--	300	--	100	--	--	--	--	>2,000	Fossil Creek, 1.0 mi northeast of Fossil Springs.
FC63P	10	--	>10,000	30	150	3,000	--	--	--	300	--	100	--	--	--	--	>2,000	Fossil Creek, 1.4 mi northeast of Fossil Springs.
FC66P	--	1,000	>10,000	100	--	--	--	--	--	--	--	--	--	--	1,000	--	>2,000	Fossil Creek, 0.6 mi southwest of Calf Pen Canyon.

Table 3.--Anomalous concentrations shown by spectrographic and radiometric analyses of rock samples from outcrops in and near the Fossil Springs Roadless Area, Yavapai, Gila, and Coconino Counties, Arizona

[Spectrographic analyses by D. E. Detra; radiometric analyses by J. C. Negri; concentrations reported in parts per million; and leaders (--) indicate value below anomaly minimum]

Element (Limit of detection)		Mn (10)	Ag (0.5)	B (10)	Ba (20)	Be (1)	Cd (2)	Co (5)	Cr (10)	Cu (5)	La (20)	Mo (5)	Nb (20)	Ni (5)	Pb (10)	Sc (5)	Sr (100)	Y (10)	Zn (200)	Zr (10)	eU (20)
Anomaly minimum	Limestone	*	*	*	*	*	1.0	10	30	10	*	*	*	*	20	*	*	*	200	*	*
	Sandstone	10	0.1	*	300	*	*	*	*	*	*	*	*	5	*	*	*	*	*	*	*
	Intermediate volcanics	*	*	30	1,000	5	10	50	100	200	100	5	50	100	30	30	1,000	50	*	100	20
	Basalt	*	*	20	3,000	*	*	100	700	200	50	*	50	300	20	100	1,000	50	*	200	20
	Precambrian clasts	*	*	*	1,500	*	*	*	*	*	*	*	*	50	*	*	*	*	*	*	*

Sample No.	Mn	Ag	B	Ba	Be	Cd	Co	Cr	Cu	La	Mo	Nb	Ni	Pb	Sc	Sr	Y	Zn	Zr	eU	Remarks
3BR	--	--	--	--	--	--	10	70	--	--	--	--	--	--	--	--	--	--	--	--	Limestone, Naco Formation.
11R	--	--	--	--	20	--	--	--	--	--	--	--	50	--	--	--	300	--	--	--	Limestone, upper Supai Formation.
4R	70	--	--	300	--	--	--	--	--	--	--	--	--	10	--	--	--	--	--	--	Coconino Sandstone.
K7	30	1.0	--	--	--	--	--	--	--	--	--	--	--	5	--	--	--	--	--	--	Do.
B1T	--	--	--	--	--	--	70	--	--	--	--	--	150	--	--	1,000	--	--	100	--	Tuff.
B2T	--	--	--	50	--	--	--	--	--	--	--	5	--	30	--	--	--	--	--	--	Do.
B3T	--	--	--	50	--	--	--	--	--	--	--	--	--	30	--	--	--	--	--	--	Do.
B4T	--	--	--	--	--	--	100	--	--	--	--	--	--	50	--	--	--	--	--	--	Tuff, basaltic.
B5T	--	--	--	--	--	--	50	200	--	--	--	--	--	100	--	--	--	--	--	--	Tuff.
B6q	--	--	30	1,000	--	--	--	--	--	100	--	--	--	--	--	1,000	--	--	--	--	Dacite.
B7TU	--	--	--	--	--	--	100	--	--	--	--	--	--	30	--	--	--	--	--	--	Tuff, upper part of layer.
B7TM	--	--	--	--	50	--	150	--	--	--	--	--	100	30	--	--	--	--	--	--	Tuff, middle part of layer.
B7TL	--	--	--	3,000	--	--	--	1,500	200	--	--	--	500	--	50	1,000	--	--	100	--	Tuff, lower part of layer.
B8TU	--	--	--	--	--	--	--	150	--	--	--	--	--	--	--	--	--	--	--	--	Tuff, upper part of layer.
B8TM	--	--	--	50	--	--	--	--	--	--	--	--	--	5	--	--	50	--	--	--	Tuff, middle part of layer.
B8TL	--	--	50	--	--	--	--	200	--	--	--	--	100	30	30	--	--	--	--	--	Tuff, lower part of layer.
K3	--	--	100	--	--	--	--	150	--	--	--	--	--	100	--	--	--	--	--	--	Tuff.
K3a	--	--	100	--	--	--	--	100	--	--	--	--	--	100	--	--	--	--	--	--	Do.
K8a	--	--	100	--	5	--	--	--	--	--	--	--	--	70	--	--	--	--	--	--	Do.
K8m	--	--	100	--	5	--	--	100	--	--	--	--	--	70	--	--	--	--	--	--	Tuff, lithic, matrix.
K8cm	--	--	150	--	5	--	--	--	--	--	--	--	100	--	--	--	--	--	--	--	Tuff, lithic.
FC10R	--	--	20	--	--	--	--	1,000	200	50	--	--	--	--	1,000	--	--	--	--	--	Volcanic breccia from dike.
FC12R	--	--	--	--	--	--	100	1,000	200	50	--	--	300	--	100	--	--	--	--	--	Basalt, Fossil Creek rim.
K1	--	--	20	--	--	--	--	1,000	--	--	--	--	--	--	--	--	--	--	--	--	Basalt, lower.
K2	--	--	--	--	--	--	--	700	--	--	--	--	--	--	50	--	--	--	--	--	Basalt, middle of section.
K4	--	--	20	3,000	--	--	--	700	--	150	--	50	--	30	--	1,000	50	--	200	--	Do.
K5	--	--	--	--	--	--	--	--	--	70	--	50	--	50	--	--	50	--	--	--	Basalt, Fossil Creek rim.
B7U	--	--	--	1,500	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	Precambrian clast from Tertiary gravel.
K8c	--	--	--	1,500	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	Precambrian clast from tuff.

*Where no anomaly minimum is given, no anomalous concentrations were found.

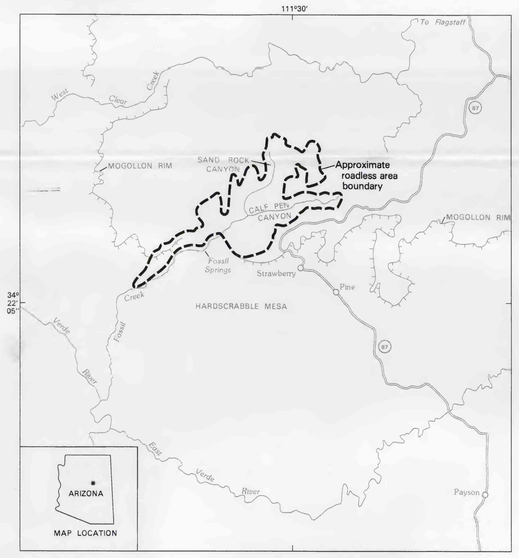
Table 4.--Anomalous concentrations shown by spectrographic and radiometric analyses of mineralized rock from the Supai Formation in and near the Fossil Springs Roadless Area, Yavapai, Gila, and Coconino Counties, Arizona

[Spectrographic analyses by D. E. Detra; radiometric analyses by J. C. Negri; concentrations reported in parts per million, except Fe; Fe concentrations in percent; > = greater than concentrations shown; leaders (--) indicate value below anomaly minimum]

Element (Lower limit of detection)	Fe (0.05)	Mn (10)	Ag (0.5)	As (200)	B (10)	Ba (20)	Be (1)	Cd (2)	Co (5)	Cr (10)	Cu (5)	La (20)	Mo (5)	Ni (5)	Pb (10)	Zn (200)	Zr (10)	eU (20)
Anomaly minimum	Limestone	2	3,000	1.0	*	*	*	*	*	30	10	20	5	*	20	200	70	*
	Sandstone	4	10	1.0	200	*	*	*	*	30	*	30	5	15	*	*	*	20
	Shale	10	2,000	1.0	*	500	1,500	7	20	50	200	100	*	10	*	50	*	300	20

Sample No.	Fe	Mn	Ag	As	B	Ba	Be	Cd	Co	Cr	Cu	La	Mo	Ni	Pb	Zn	Zr	eU	Remarks
FC9R	--	--	--	--	--	--	--	--	--	50	500	--	--	--	100	--	--	--	Limestone, fetid, carbonaceous.
FC9R.2	--	--	--	--	--	--	--	--	--	100	15	--	--	--	--	--	300	--	Limestone, carbonaceous.
FC9RC1	--	--	1.0	--	--	--	--	--	--	200	2,000	--	--	--	--	--	--	--	Shale, carbonaceous, visible copper minerals.
FC31M	--	5,000	--	--	--	--	--	--	100	--	200	70	10	--	--	1,000	--	--	Limestone, radioactivity equals 20 counts per minute (cpm).
FC32M	--	--	--	--	--	--	--	--	--	--	700	--	--	--	--	--	500	--	Shale, carbonaceous, radioactivity equals 29 cpm.
FC33M	10	100	100	200	--	--	--	--	50	--	>20,000	--	50	100	50	--	--	50	Concentrate of sandstone, hand-picked for visible copper oxides, radioactivity equals 15 cpm.
FC34M	--	--	2	--	--	--	--	--	--	--	10,000	--	--	--	--	--	700	--	Shale, carbonaceous.
FC35M	--	--	10	--	500	2,000	10	--	--	--	>20,000	--	100	--	100	--	--	20	Concentrate of shale, carbonaceous, handpicked for visible copper oxides.
FC36M	--	--	1	--	500	--	--	--	50	--	10,000	--	20	--	--	--	500	--	Concentrate of shale, containing copper oxides.
FC37M	--	--	2	--	--	--	--	--	7	--	150	--	>20,000	--	15	300	--	--	--	--	Concentrate of sandstone and shale, handpicked for visible copper oxides.

*Where no anomaly minimum is given, no anomalous concentrations were found.



INDEX MAP SHOWING LOCATION OF THE FOSSIL SPRINGS ROADLESS AREA (U.S. Forest Service number 03046).

MINERAL RESOURCE POTENTIAL MAP OF THE FOSSIL SPRINGS ROADLESS AREA, YAVAPAI, GILA, AND COCONINO COUNTIES, ARIZONA

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