UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY

A RECONNAISSANCE GEOCHEMICAL SURVEY OF THE CLARION RIVER ROADLESS AREA, ALLEGHENY NATIONAL FOREST, ELK COUNTY, PENNSYLVANIA

By

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This report has not been reviewed
for conformity with
U.S. Geological Survey editorial standards
or stratigraphic nomenclature

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STUDIES RELATED TO WILDERNESS

The Wilderness Act (Public Law 88-557, 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 report presents the results of a geochemical survey of the Clarion River Roadless Area, in the Allegheny National Forest, Elk County, Pennsylvania (fig. 1). The Clarion River 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.

Abstract

Semiquantitative emission spectrographic analyses for 31 elements were determined on 9 stream-sediment samples and 18 bedrock samples from the Clarion River Roadless Area, Elk County, Pennsylvania. All sample localities are given in Universal Transverse Mercator (UTM) coordinates. Brief descriptions of bedrock samples are also included. Rocks analyzed are mostly sandstone, and siltstone. The analytical data do not indicate the presence of mineralized rock in the study area.

Introduction

The U.S. Geological Survey (USGS) made a reconnaissance geochemical survey of the Clarion River Roadless Area, Elk County, Pennsylvania, to test for indistinct or unexposed mineral deposits that might be recognized by their geochemical halos. The analyses presented in this report are for 9 stream-sediment and 18 bedrock samples. These samples were collected by N.L. Hickling and S.P. Schweinfurth in October 1980, in conjunction with geologic field investigations in and near the roadless area (Schweinfurth and others, 1982b). The samples were analyzed by the USGS in Denver, Colorado.

Sampling and Analytical Techniques

Most of the bedrock samples, described briefly below, are composites of chip samples and are representative materials collected from outcrop or roadcut: their locations are shown on figure 2. Some of the bedrock was partially weathered, but generally the freshest material available was sampled. Stream-sediment samples are composites of several handfuls of the finest sediment available near the sample localities shown on fig. 2.

Bedrock samples were crushed to approximately 0.25 in. (6 mm) particle size, and were then pulverized to minus 140 mesh (0.105 mm) by ceramic

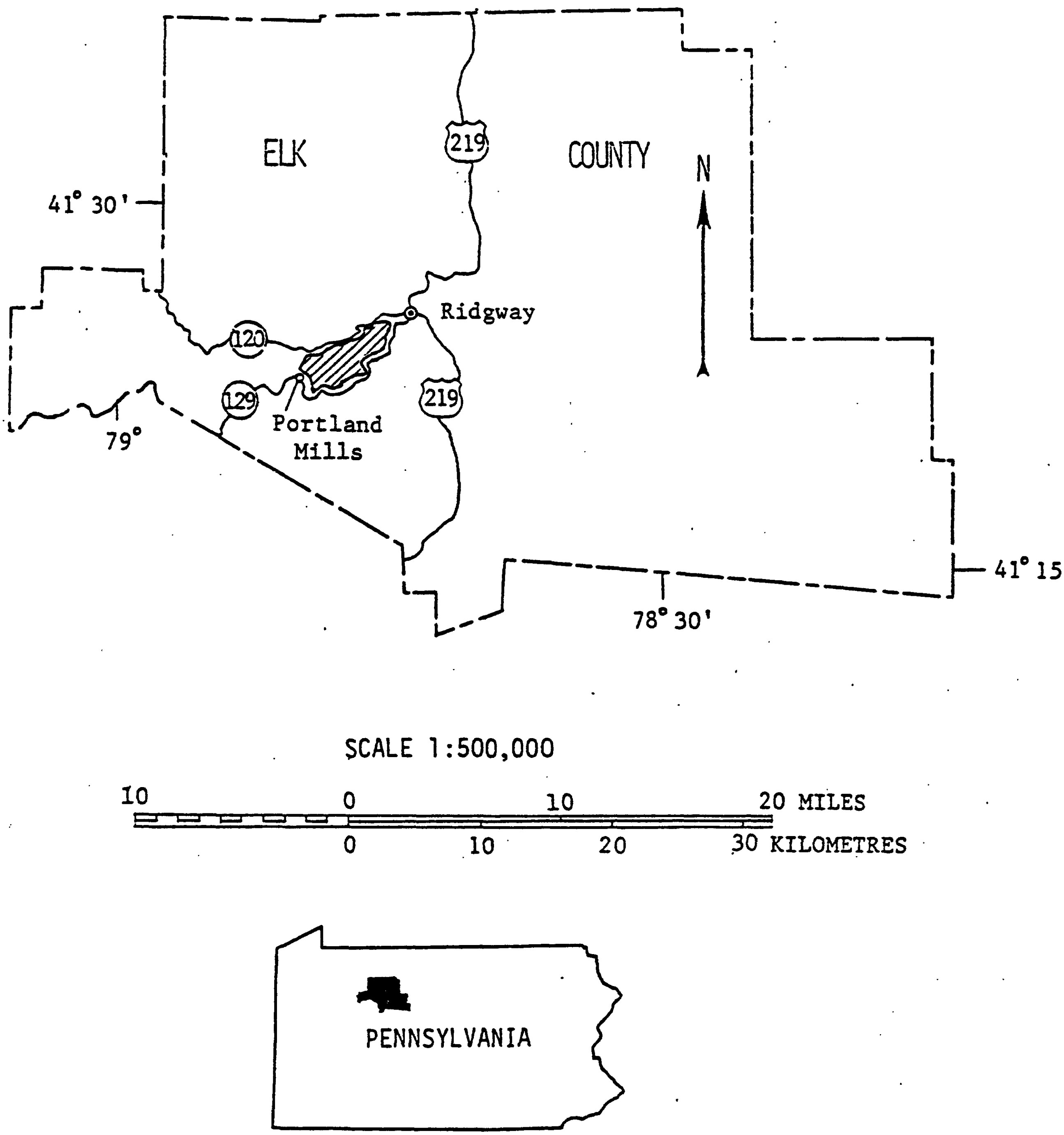


Figure 1.-Index map showing the Clarion River Roadless Area, (shaded), Allegheny National Forest, Elk County, Pennsylvania.

plates in a vertical grinder. Stream sediments were dried and then sieved, and the minus 80 mesh (0.177 mm) fraction was used for the analyses.

Each sample was analyzed semiquantitatively for 31 elements (listed in tables 1 and 2) by Betty M. Adrian, Bernie Zickmund, Gretchen Nelson, and Dean McCullum, USGS, using a six-step, direct-current-arc, optical-emission spectrographic method (Grimes and Marranzino, 1968). In addition, each sample was analyzed for zinc using atomic absorption (Ward and others, 1969, p. 30) and for uranium (none detected) by a fluorometric method (modified from Centanni and others, 1956, p. 1651) by Robert Fairfield, USGS.

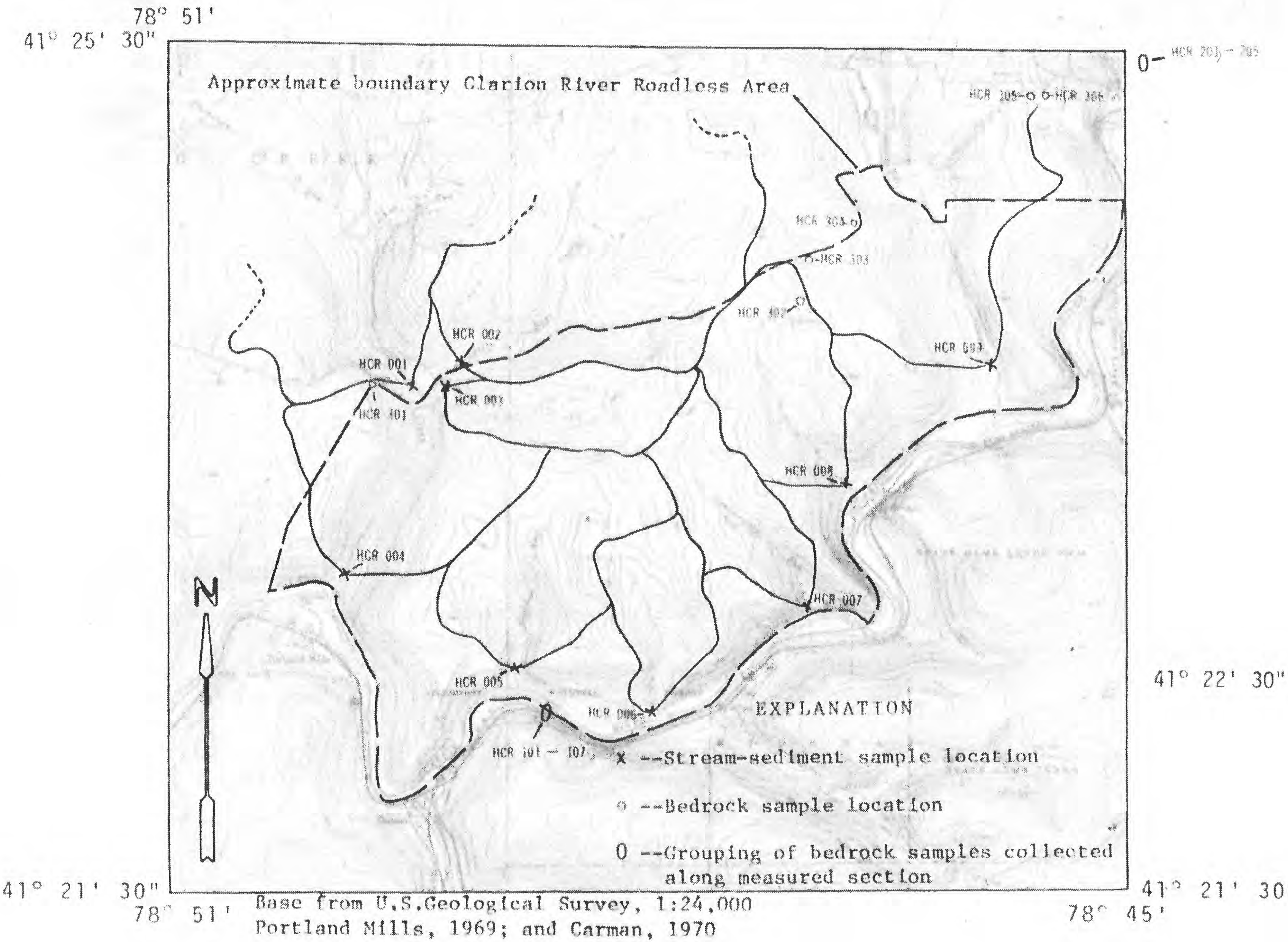
The semiquantitative spectrographic values are reported as six steps per order of magnitude (1, 1.5, 2, 3, 5, 7 or multiples of 10 of these numbers) and are approximate geometric midpoints of the concentration ranges. The precision is shown to be within one adjoining reporting interval on each side of the reported value 83 percent of the time and within two adjoining intervals 96 percent of the the time (Motooka and Grimes, 1976).

Discussion of Results

Summaries of the results of the analyses described above are presented in tables 1 and 2. The detailed analyses (data for each sample) summarized in table 1 are listed in table 3, those for table 2 are listed in table 4.

Table 1 is a summary of the results of the analyses of stream-sediment samples (column 1) and includes a summary of the analytical results for samples collected in the Allegheny Front and Hickory Creek Roadless Areas (columns 2 & 3) for comparison. The Allegheny Front and Hickory Creek Roadless Areas lie about 35 miles to the northwest of the area discussed in this report and are covered in separate reports, (Hickling and others, 1983; Schweinfurth and others, 1982a). However, the geochemical data for the combined Allegheny Front/Hickory Creek Roadless Areas are included here because those areas are also within the Allegheny National Forest and because there are enough similarities in the geology of the two areas to make the comparison of geologic significance. A summary of data on the elemental composition of surficial materials in the conterminous United States, consisting of the high and low values for elements in soils and other surficial materials, (Shacklette and others, 1971) is also included (column 4) for comparison. The values given are the limits of two geometric deviations on either side of the geometric means of the elemental compositions. These ranges include about 95 percent of the values for each element (Shacklette and others, 1971, p. D5). The elemental compositions reported in column 4 were obtained by semiquantitative spectrographic methods, except for zinc which was analyzed by the colorimetric method (Shacklette and others, 1971, table 2).

The elemental values for the stream-sediment samples from the study area may be compared with the elemental values given in column 4 of table



Base from U.S.Geological Survey, 1:24,000
Portland Mills, 1969; and Carman, 1970

Figure 2.--Location of bedrock and stream-sediment samples collected in and near the Clarion River Roadless Area. Solid black lines outline drainage basins.

Table 1. Range and median values for 23 elements in stream-sediment samples from in and near the Clarion River Roadless Area, Elk County, Pennsylvania. Analyses of samples from in and near the Allegheny Front and Hickory Creek Roadless Areas, Warren County, Pennsylvania are included for comparison. All analyses are by semiquantitative spectrographic methods by B. M. Adrian, B. Zickmund, G. Nelson, and D. McCullum, except zinc which are by atomic absorption by R. Fairfield. Spectrographic analyses are reported as six steps per order of magnitude (1, 1.5, 2, 3, 5, 7, or multiples of 10 of these numbers) and are approximate geometric midpoints of the concentration ranges. The precision is shown to be within one adjoining interval on each side of the reported value 83 percent of the time and within two adjoining intervals on each side of the reported value 96 percent of the time (Motooka and Grimes, 1976). Letter symbols: L, detected but below limit of determination (value shown in parenthesis after element symbol); N, not detected; >, greater than. Elements analyzed for specrographically but not detected and their lower limits of detection: As(200), Au(10), Bi(10), Cd(20), Mo (5), Sb(100), Th(100), and W(50).

	1 CLARION RIVER STREAM SEDIMENT 9 SAMPLES			2 ALLEGHENY FRONT a/ STREAM SEDIMENT 21 SAMPLES			3 HICKORY CREEK a/ STREAM SEDIMENT 23 SAMPLES			4 ELEMENTAL COMP. b/ SURFICIAL MATERIALS CONTERMINOUS U.S.	
Elements	LOW	HIGH	MEDIAN	LOW	HIGH	MEDIAN	LOW	HIGH	MEDIAN	LOW c/	HIGH c/
PERCENT											
Ca(0.05)	L	0.1	0.05	0.05	0.2	0.07	L	0.1	0.05	0.06	13.5
Fe(0.05)	1	5	3	1.5	5	3	1.5	5	2	0.3	9.5
Mg(0.02)	0.1	0.3	0.2	0.2	0.7	0.3	0.1	0.5	0.2	0.05	4.8
Ti(0.002)	0.5	1	0.7	0.5	0.7	0.7	0.3	0.5	0.5	0.07	0.87
PARTS PER MILLION											
Ag(0.5)	N	N	N	N	.7	N	N	N	N	na	na
B(10)	50	150	100	70	150	100	50	150	100	6.2	109
Ba(20)	300	1000	700	300	1000	700	200	500	300	101	1825
Be(1)	1	2	1.5	1	5	1.5	1	2	1.5	0.1	3.7
Co(5)	15	30	15	10	30	15	7	20	15	1.4	34.2
Cr(10)	70	150	100	70	200	100	50	150	70	6.9	199
Cu(5)	10	30	20	10	30	20	7	20	15	3.5	93.6
La(20)	N	100	N	N	70	N	N	50	N	9.9	116
Mn(10)	1500	5000	5000	1500	5000	2000	200	3000	1000	46.6	2478
Nb(20)	N	L	N	N	L	N	N	L	N	4.3	33
Ni(5)	7	70	30	10	100	30	15	50	30	2.7	88
Pb(10)	20	50	30	20	70	30	15	50	30	4.2	61
Sc(5)	10	20	15	7	20	15	5	15	10	2.5	25.6
Sn(10)	N	N	N	N	N	N	N	15	N	na	na
Sr(100)	L	100	L	N	100	L	N	100	L	10.4	1379
V(10)	70	100	100	70	150	100	50	150	70	12	261
Y(10)	20	100	30	20	70	30	15	50	20	8.3	69
Zn(5)	70	160	90	70	300	100	25	120	60	12.7	152
Zr(10)	300	>1000	1000	500	>1000	700	150	700	500	55	722

na-no data available
a/Hickling and others (1983).
b/Shacklette and others (1971).
c/About 95 percent of values reported fall between these ranges which include 2 geometric deviations on either side of the geometric mean.

1 because stream sediments are derived from the soils which develop on local bedrock as well as from the mechanical breakdown of exposed bedrock and float blocks of detached bedrock. Consequently, if the elemental values reported for the streamsediment samples from the study area compare favorably with the normal distribution of those same elements in surficial materials of the United States it may be concluded, when taken in context with the geology of the region, that the chemistry of the stream sediments probably does not reflect the presence of unusual accumulations of valuable minerals at or near the surface in the study area. The high and low values for the majority of the elements in column 1 of table 1 compare favorably with those in column 4. Minor differences may be attributed to margins of error inherent in the analytical method employed as explained in table 1. The median values for boron in column 1 (also columns 2 and 3 as discussed in Hickling and others, 1983) are very near the upper limits for boron in surficial materials (column 4). The high values for manganese, and zirconium in column 1 appear to be excessive when compared to the high values for those elements given in column 4. The apparent high values for these three elements can be explained as a result of weathering of bedrock in and around the study area and do not indicate unusual accumulations of valuable metals or ore-bearing minerals.

High levels of boron in stream sediments of the study area (100 ppm median value in column 1 versus a 109 ppm high value in column 4) may be attributed to high levels of boron in the bedrock as indicated by some of the bedrock samples (table 2, columns 1, 2, and 5). Median levels of manganese are not unusually high in the bedrock samples (table 2), but manganese may concentrate in stream sediments in its relatively insoluble oxide form (Dorr and others, 1973, p. 388) so that manganese may be expected to be more abundant in stream sediments than in soils. Zirconium occurs in the resistant heavy mineral zircon which is present as a minor constituent of sandstone and siltstone (see table 2, column 4). Weathering releases the zircon which concentrates in stream sediments because of its resistance and density. This results in higher values for zirconium in stream sediments than would normally be found in soils.

Table 2 summarizes the results of the analyses of bedrock samples (column 1) for the study area and includes a summary of the analytical results of bedrock samples from the Allegheny Front and Hickory Creek Roadless Areas (columns 2, 3, and 5) for comparison. Averages for the global abundances of elements in sandstone (column 4) and shale (column 6) are also included for comparison. Comparison of the bedrock-sample analyses with these global averages serves the same purpose as described above for comparing the results of the stream-sediment analyses with the elemental composition of surficial materials in the United States. The results of the analyses of sandstone and siltstone samples are combined in column 1. Samples of shale were not taken because shale was not exposed within the roadless area and the shale exposed near the area was deeply weathered. The results of the sandstone and siltstone analyses are combined because sandstone and siltstone are mineralogically similar to one another.

Inspection of table 2, with respect to the median values of the elements found in the bedrock samples for the study area (column 1) indicates that the median values for most elements are consistent with the global averages for sandstones (column 4) within the limits of error of the analytical method. However, some median values appear to be somewhat higher than the average values in column 4 even after errors in the analytical method are taken into consideration. It is believed that these high values may be explained by the general geology of the region and, therefore, they do not reflect local concentrations of valuable minerals in or near the study area. Those elements having high median values in column 1 relative to column 4 are barium, boron, cobalt, chromium, iron, nickel, lead, scandium, titanium, vanadium, and zinc. Most of these high medin levels may be attributed to the inclusion of varying amounts of shale in some of the samples, particularly the siltstone samples because siltstone contains relatively larger amounts of shale than than sandstone does and consequently contains higher levels of the elements reported in table 2 than sandstone does (compare columns 4 and 6, and see HCR-104, or -306 in table 4). Also, some samples characterized as sandstone, HCR-105, or -203 (pg. 14, and table 4) for example, contain moderate amounts of shaly (argillaceous) material and consequently contain higher than average amounts of most of the elements given in table 2. Those elements having higher than average median values which may be attributed to shale in the rock matrix are barium, cobalt, nickel, lead, and zinc. Relatively pure sandstone samples such as HCR-301 and -302 (table 4) contain much lower levels of all the elements reported. The median value for barium in column 1 is higher than might be expected from the inclusion of shale alone in the samples (column 1 versus column 6), but barium levels in shales (column 5) are higher than average throughout this part of the stratigraphic column in the northern Appalachians (J. D. Pepper, USGS, written communication, 1964) and this probably accounts for the higher than average levels of barium in study area samples.

Of the remaining elements that have higher than average median values boron, chromium, scandium, titanium, and vanadium appear to occur in higher than average amounts in shales and shaly rocks throughout the general region of the study area (see also columns 2 and 5): this may reflect a provenance for these rocks that was slightly enriched in these elements. The higher than average value for iron may be attributed to the concentration of this element on outcrop surfaces where iron in solution in the groundwater has become oxidized and deposited.

In conclusion, anomalous elemental values in the geochemical data for the Clarion River Roadless Area may be explained by normal geologic conditions and they do not reflect any unusual concentrations of valuable minerals in the strata exposed at or near the surface in the study area.

Summary

The geochemical data developed as the result of a reconnaissance survey of the Clarion River Roadless Area do not indicate anomalous chemical-element concentrations related to mineralized rock. Seemingly anomalous values for some elements may be explained as the result of local bedrock composition, normal geologic processes, and/or human activities (forestry, petroleum) in and near the study area.

Table 2. Range and median values for 23 elements in sandstone, siltstone, and shale bedrock samples from in and near the Clarion River Roadless Area, Elk County, Pennsylvania. Analyses of samples from in and near the Allegheny Front and Hickory Creek Roadless Areas, Warren County, Pennsylvania are included for comparison. All analyses are by semiquantitative spectrographic methods by B. M. Adrian, B. Zickmund, G. Nelson, and D. McCullum, except zinc which are by atomic absorption by R. Fairfield. Spectrographic analyses are reported as six steps per order of magnitude (1, 1.5, 2, 3, 5, 7, or multiples of 10 of these numbers) and are approximate geometric midpoints of the concentration ranges. The precision is shown to be within one adjoining interval on each side of the reported value 83 percent of the time and within two adjoining intervals on each side of the reported value 96 percent of the time (Motooka and Grimes, 1976). Letter symbols: L, detected but below limit of determination (value shown in parenthesis after element symbol); N, not detected; >, greater than. Elements analyzed for specrographically but not detected and their lower limits of detection: As(200), Au(10), Bi(10), Cd(20), Sb(100), Sn(10), Th(100), and W(50).

	1			2			3			4	5			6
	CLARION RIVER SANDSTONE AND SILTSTONE 18 SAMPLES			ALLEGHENY FRONT a/ SANDSTONE AND SILTSTONE 18 SAMPLES			HICKORY CREEK a/ SANDSTONE 6 SAMPLES			AVERAGE IN SANDSTONE b,c/	ALLEGHENY FRONT a/ SHALE AND MUDSTONE 13 SAMPLES			AVERAGE IN SHALE b/
Elements	LOW	HIGH	MEDIAN	LOW	HIGH	MEDIAN	LOW	HIGH	MEDIAN		LOW	HIGH	MEDIAN	
					PERCENT									
Ca(0.05)	L	0.07	0.05	L	5	0.05	L	L	L	3.9 b/	L	2	0.07	2.21
Fe(0.05)	N	10	3	1	10	5	0.3	1.5	0.3	0.98 b/	5	10	7	4.72
Mg(0.02)	0.03	1.5	0.5	0.02	1	0.7	0.02	0.03	0.02	0.7 b/	0.7	1.5	1	1.5
Ti(0.002)	0.07	1	1	0.05	0.7	0.5	0.15	0.5	0.3	0.15 c/	0.5	0.7	0.5	0.46
					PARTS PER MILLION									
Ag(0.5)	N	0.7	N	N	N	N	N	N	N	0.0X d/	N	N	N	0.07
B(10)	20	200	100	50	150	100	70	100	70	35 a/	100	200	150	100
Ba(20)	100	1500	700	100	1000	500	70	200	150	300 c/	700	1500	1000	580
Be(1)	N	3	1.5	N	3	1.5	N	N	N	2 c/	1	3	1.5	3
Co(5)	5	20	10	N	30	15	N	N	N	0.3 b/	15	30	20	19
Cr(10)	20	200	100	15	200	100	L	50	10	35 b/	100	200	200	90
Cu(5)	L	100	20	L	200	20	L	5	L	10-20 c/	20	150	70	45
La(20)	N	100	N	N	100	N	N	N	N	30 b/	N	70	50	92
Mn(10)	15	1000	300	150	5000	700	L	1000	50	500 c/	300	2000	1000	850
Mo(5)	N	20	N	N	7	N	N	N	N	0.2 b/	N	5	N	2.6
Nb(20)	N	20	N	N	L	N	N	N	N	0.0X d/	N	L	L	11
Ni(5)	L	70	30	5	70	30	5	5	5	2 b/	30	70	50	68
Pb(10)	N	50	20	N	1500	20	N	N	N	9 c/	15	1000	30	20
Sc(5)	N	50	20	N	30	10	N	N	N	1 b/	20	50	20	13
Sr(100)	N	100	N	N	200	100	N	N	N	35 c/	N	150	100	300
V(10)	10	300	150	15	200	100	20	30	20	20 b/	100	200	150	130
Y(10)	10	70	30	10	100	30	10	10	10	40 b/	30	70	50	26
Zn(5)	5	150	55	15	95	60	L	20	5	16 b/	50	100	70	95
Zr(10)	50	>1000	300	50	1000	500	50	700	200	220 b/	150	500	300	160

a/Hickling and others (1983).
b/Turekian and Wedepohl (1961).
c/Pettijohn (1963, p. S11).
d/Order of magnitude estimated by Turekian and Wedepohl (1961).

Table 3.--Semiquantitative spectrographic analyses of 9 stream-sediment samples from in and near the Clarion River Roadless Area.[a]

Sample	X coor-dinate	Y coor-dinate	Fe-pct. s	Mg-pct. s	Ca-pct. s	Ti-pct. s	Mn-ppm s	B-ppm s	Ba-ppm s	Be-ppm s	Co-ppm s	Cr-ppm s
HCR001	681,900	4,585,020	2	.2	.07	.7	2,000	100	500	1.5	15	70
HCR002	682,290	4,585,290	5	.3	.05	.7	3,000	100	700	1.5	20	100
HCR003	682,150	4,585,080	5	.3	.10	.7	5,000	100	1,000	2.0	15	150
HCR004	681,310	4,583,350	3	.2	.05	1.0	1,500	150	700	2.0	15	150
HCR005	682,840	4,582,620	2	.2	<.05	.7	5,000	100	500	2.0	20	100
HCR006	684,020	4,582,280	1	.1	<.05	.5	3,000	50	300	1.0	15	70
HCR007	685,370	4,583,220	3	.2	.07	1.0	5,000	100	700	2.0	30	100
HCR008	685,660	4,584,320	3	.3	.05	.7	5,000	100	700	1.5	20	100
HCR009	686,880	4,585,360	3	.2	.07	1.0	5,000	100	700	1.5	15	100

Sample	Cu-ppm s	La-ppm s	Nb-ppm s	Ni-ppm s	Pb-ppm s	Sc-ppm s	Sr-ppm s	V-ppm s	Y-ppm s	Zn-ppm s	Zr-ppm s	Zn-ppm aa
HCR001	15	100	<20	30	20	10	<100	70	100	N	1,000	130
HCR002	20	70	N	30	50	20	<100	100	30	N	700	70
HCR003	20	100	N	50	50	15	100	100	30	N	500	150
HCR004	30	N	N	20	20	15	<100	100	30	N	1,000	75
HCR005	10	N	N	20	20	15	<100	100	30	N	>1,000	80
HCR006	10	N	N	7	30	10	<100	70	20	N	300	70
HCR007	20	N	N	70	50	15	<100	100	30	N	>1,000	160
HCR008	30	N	N	30	50	15	100	100	30	N	>1,000	90
HCR009	15	N	N	20	20	10	<100	70	30	N	>1,000	90

[a] See p. 11 for footnote.

Table 4.--Semiquantitative spectrographic analyses of 18 bedrock samples from in and near the Clarion River Roadless Area.[a/]

Sample	X coor-dinate	Y coor-dinate	Fe-pct. s	Mg-pct. s	Ca-pct. s	Ti-pct. s	Mn-ppm s	B-ppm s	Ba-ppm s	Be-ppm s	Co-ppm s	Cr-ppm s
HCR101[2]	683,150	4,582,240	2.00	.15	.05	.15	100	30	200	1.0	7	30
HCR102[1]	683,150	4,582,230	5.00	1.00	.05	1.00	700	150	1,000	3.0	15	150
HCR103[2]	683,140	4,582,220	2.00	.50	<.05	.70	150	100	500	1.5	10	70
HCR104[1]	683,140	4,582,210	10.00	1.50	.07	1.00	300	200	1,000	3.0	15	200
HCR105[2]	683,140	4,582,190	7.00	.70	.07	1.00	1,000	100	700	2.0	15	100
HCR106[1]	683,140	4,582,180	7.00	.70	.05	1.00	700	100	700	2.0	15	100
HCR107[2]	683,130	4,582,170	N	.05	<.05	.07	15	20	100	N	7	20
HCR201[1]	688,140	4,587,950	10.00	1.00	.07	1.00	300	200	1,500	2.0	15	200
HCR202[2]	688,140	4,587,960	5.00	.70	.05	.70	1,000	150	1,000	1.5	15	100
HCR203[2]	688,140	4,587,970	2.00	.30	<.05	1.00	200	150	300	1.0	10	50
HCR204[2]	688,140	4,588,000	3.00	.50	<.05	.70	1,000	100	700	1.5	10	70
HCR205[2]	688,140	4,588,030	7.00	.70	.05	1.00	200	200	1,000	2.0	15	100
HCR301[2]	681,560	4,585,090	N	.05	<.05	.10	100	20	500	N	5	20
HCR302[2]	685,260	4,585,890	N	.03	<.05	.30	50	50	150	N	5	70
HCR303[1]	685,290	4,586,270	7.00	1.00	.05	1.00	500	150	1,000	2.0	10	150
HCR304[2]	685,710	4,586,590	.30	.10	<.05	.15	15	20	500	N	5	30
HCR305[1]	687,220	4,587,740	7.00	.70	<.05	1.00	1,000	100	1,000	2.0	20	200
HCR306[1]	687,340	4,587,770	1.00	.50	.05	1.00	300	100	700	1.5	10	200

Sample	Cu-ppm s	La-ppm s	Nb-ppm s	Ni-ppm s	Pb-ppm s	Sc-ppm s	Sr-ppm s	V-ppm s	Y-ppm s	Zn-ppm s	Zr-ppm s	Zn-ppm aa
HCR101[2]	15	N	N	10	15	5	N	70	15	<200	150	20
HCR102[1]	70	100	20	70	30	30	100	300	50	<200	300	55
HCR103[2]	20	50	N	30	30	15	N	100	20	N	700	40
HCR104[1]	70	100	20	70	30	50	100	200	70	200	500	70
HCR105[2]	50	70	N	50	20	20	<100	150	30	<200	300	75
HCR106[1]	70	50	<20	30	20	20	100	150	50	<200	500	60
HCR107[2]	<5	N	N	5	N	N	N	10	10	N	50	5
HCR201[1]	30	N	N	70	20	30	N	150	50	200	300	70
HCR202[2]	70	100	N	50	10	20	N	100	50	200	700	70
HCR203[2]	15	N	N	20	15	15	N	70	15	N	300	30
HCR204[2]	15	N	N	20	15	15	N	70	15	200	200	25
HCR205[2]	100	<20	<20	50	10	20	N	150	20	<200	700	60
HCR301[2]	5	N	N	<5	N	N	N	20	10	N	150	10
HCR302[2]	<5	N	N	<5	N	N	N	20	15	200	>1,000	25
HCR303[1]	50	N	<20	30	30	20	<100	200	50	200	500	55
HCR304[2]	<5	N	N	<5	N	<5	<100	30	10	N	200	10
HCR305[1]	70	50	N	50	50	20	<100	150	50	<200	300	150
HCR306[1]	15	N	20	30	50	20	<100	300	30	N	500	35

a/ See p. 11 for footnote.

1/ Siltstone

2/ Sandstone

[a]/Footnote to tables 3 & 4 (Semiquantitative spectrographic analyses of stream-sediment and bedrock samples, Clarion River Roadless Area)

The X and Y coordinates are Universal Transverse Mercator (UTM) grid values, zone 16. The X-coordinate is the easting value; the Y is the northing. Spectrographic analyses are reported as six steps per order of magnitude (1, 1.5, 2, 3, 5, 7, or multiples of 10 of these numbers) and are approximate geometric midpoints of the concentration ranges. The precision is shown to be within one adjoining interval on each side of the reported value 83 percent of the time and within two adjoining intervals on each side of the reported value 96 percent of the time (Motooka and Grimes, 1976). Symbols used include S, semiquantitative spectrographic analysis; <, less than lower limit of determination; >, greater than upper limit of determination; aa, atomic-absorption determination; N, not detected. The limits apply under ideal conditions, and in some cases interferences will narrow the limits. All data are in parts per million (ppm) except where indicated in percent (pct.). Elements looked for spectrographically but not found and their lower limit of detection: Ag (0.5) except HCR 101, 0.7 ppm; AS (200); Au (10); Bi (10); Cd (20); Mo (5); Sb (100); Sn (10); Th (100); and W (50).

Description of Bedrock Samples

(Locations of samples are shown on fig. 2. Each sample is a composite of chip samples taken over an interval of 5.4 ft.)

Sample No.

Cuyahoga-Knapp Formations, undivided

HCR 101 Sandstone, medium-brown, coarse- to very coarse grained, conglomeratic with quartz pebbles up to 1 inch, massive.

HCR 102 Siltstone, medium-gray, blocky, a few thin shale partings.

HCR 103 Siltstone, medium-gray, weathers medium olive gray, very fine grained, thin-bedded though massive aspect.

HCR 104 Siltstone, medium-gray, a few thin shale partings.

HCR 105 Sandstone, medium-olive-gray, fine- to very fine grained, thin- to medium-bedded, quartzose to moderately argillaceous.

HCR 106 Siltstone, weathers medium olive gray, very thin bedded.

HCR 107 Sandstone, white, medium- to coarse-grained, quartzose, massive.

Cuyahoga Formation

(HCR 201-205 collected along the Ridgway Section: Schweinfurth and others, 1982c, p. 18-19.)

HCR 201 Sitstone, grayish-maroon mottled with green, very fine grained thin shale partings.

HCR 202 Sandstone, light- to medium- olive, weathers dark olive brown, very fine grained, scattered opaque minerals, scattered mica.

HCR 203 Sandstone, light- to medium-grayish tan, fine- to medium-grained, several percent opaque minerals, low quartz content.

HCR 204 Same as above.

HCR 205 Sandstone, light- to medium-olive-tan, weathers dark olive brown, very fine to medium-grained, scattered opaque minerals, low quartz content.

Sample No.

(HCR 301-306 collected along the Carman Section: Schweinfurth and others, 1982c, p. 21-23. Stratigraphic nomenclature after Schweinfurth and others, 1982b)

Pennsylvanian: Lower map unit, member 1

HCR 301 Sandstone, light-buff to light-grayish-white, weathers medium dark gray, medium-grained, quartzose with a few scattered opaque minerals.

Upper map unit, member 5

HCR 302 Sandstone, light-grayish-white to white, very fine grained, quartzose, scattered opaque minerals.

Upper map unit, member 4

HCR 303 Siltstone, light- to medium-gray, thin and even bedded argillaceous.

Upper map unit, member 1

HCR 304 Sandstone, light- to medium-grayish-white, medium-grained, with scattered opaque minerals.

Upper map unit, member 2

HCR 305 Siltstone, medium- to dark-gray, weathers medium brownish gray, thin and irregular bedded.

HCR 306 Siltstone, medium- to dark-gray, weathers light to medium tanish gray, massive.

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