

(200)  
R290  
no. 79-675



✓ UNITED STATES (DEPARTMENT OF THE INTERIOR)  
GEOLOGICAL SURVEY,

*TM*  
*am*  
*Twanalce*

Uranium Results for 147 Water Samples  
from the Elkhorn Wilderness Study Area,  
Montana

By

John B. McHugh and William R. Miller  
U.S. Geological Survey

Open-File Report 79-675  
1979



297235

This report is preliminary and has not been  
edited or reviewed for conformity with U.S.  
Geological Survey standards and nomenclature.

Uranium results for 147 water samples from the  
Elkhorn Wilderness Study Area, Montana

By John B. McHugh and William R. Miller

Abstract

One hundred forty seven water samples were collected from the Elkhorn Wilderness during the summer of 1977 as a part of a mineral resource assessment study. Each sample was analyzed for uranium. Specific conductance and pH were also measured. Sample analyses and site locations are presented in this report.

Introduction

One hundred forty seven water samples were collected from surface streams, springs, and mine drainages during the summer of 1977 in conjunction with a mineral resource assessment of the Elkhorn Wilderness Study Area, Montana (fig. 1).

The samples were analyzed for uranium by fluorometry; specific conductance and pH was also measured in the field at the end of each day.

Results of analysis for uranium, specific conductance, and pH for each sample, as well as the sample locality are given in table 1.

## Sample collection technique

Two water samples were collected at each locality and placed in acid-rinsed polyethylene bottles. A 60-ml sample was collected and filtered through a 0.45- $\mu$ m membrane filter. Four drops (0.2 ml) of concentrated nitric acid was added to each filtered sample. An untreated one-liter sample was also taken. The filtered sample is for uranium analysis and the unfiltered sample is for specific conductance and pH measurements.

These samples were promptly shipped to the U.S. Geological Survey laboratory in Denver, Colo., for analysis. The analytical work was done by Walter H. Ficklin and John B. McHugh.

Samples were collected by William R. Miller, William R. Greenwood, Steve Ludington, David Thompson, Enid Bittner, Judy M. Allen, and Mike Garbarini.

## Analytical techniques and results

The acidified filtered water samples were analyzed for uranium by placing twenty milliliters of sample into a platinum dish and evaporating on an electric hot plate to dryness. The evaporite was ignited to red heat and cooled; 2.0 grams of a carbonate-sodium fluoride flux was added to the sample and fused for three minutes at 900°C. The sample was cooled and the resulting disc measured against standards in a fluorometer. The method is an adaptation of Grimaldi, Ward and Fuyat in Grimaldi (1954, p. 69). Precision for uranium was approximately 5 percent relative standard deviation.

Specific conductance and pH of the untreated samples were measured using standard instrumental methods. The pH measurements were performed in the field at the end of each day.

Analytical results for the water samples are listed in table 1. Where a dashed line appears in the table no data was available for that parameter.

#### Statistical data

The frequency distribution for uranium of the 147 water samples taken from the Elkhorn Wilderness Study Area is shown in figure 2. The range, mean, and standard deviation for each species (uranium, specific conductance, and pH) are listed in table 2. Correlation coefficient of the variables, uranium versus pH, uranium versus specific conductance, and pH versus specific conductance are shown in table 3. For statistical purposes all uranium values <0.2 ppb in this report were treated as having a value of 0.1 ppb.

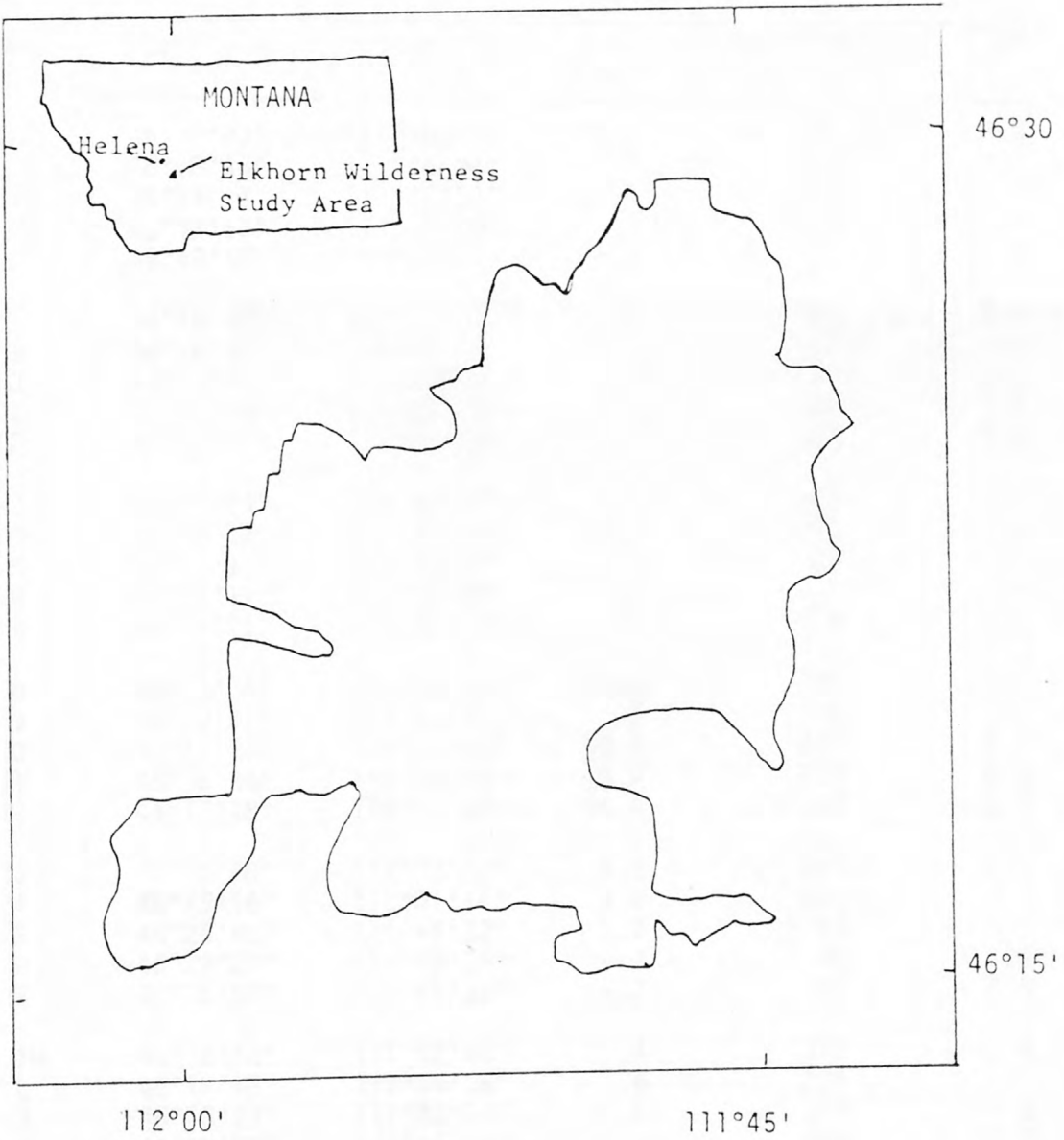


Figure 1. Elkhorn Wilderness Study Area, Montana. From Greenwood and others (1978).

Table 1.--Analytical results and sample locality for 147 water samples from the Elkhorn Wilderness Study Area, Montana  
[Leaders (---) indicate no data]

Field No.	Latitude (°N.)	Longitude (°W.)	U (ppb)	Conductivity (µmhos/cm)	pH
77EB001W	46°19'23"	111°40'00"	<0.2	250	8.0
2	46°18'46"	111°44'04"	.4	370	8.0
3	46°17'17"	111°46'59"	.3	198	7.8
4	46°17'53"	111°46'00"	.3	235	7.9
6	46°19'18"	111°46'19"	<.2	88	7.4
7	46°18'17"	111°47'55"	<.2	165	7.4
9	46°16'54"	111°48'50"	<.2	---	---
10	46°16'05"	111°49'29"	<.2	---	---
11	46°21'29"	111°41'39"	<.2	185	7.3
12	46°21'17"	111°41'48"	<.2	142	7.6
13	46°22'59"	111°42'10"	<.2	165	7.7
14	46°25'18"	111°41'49"	<.2	425	7.6
15	46°21'11"	111°58'28"	.6	71	7.6
16	46°21'11"	111°58'28"	.8	---	---
17	46°21'11"	111°58'22"	.9	79	7.5
18	46°21'56"	111°58'45"	15.4	320	8.2
19	46°20'53"	111°57'11"	.5	58	7.9
20	46°18'24"	112°01'50"	10.8	230	7.9
21	46°18'24"	112°01'58"	10.7	230	8.2
22	46°17'18"	112°01'58"	14.4	225	8.3
23	46°15'48"	112°02'00"	9.2	293	8.1
24	46°15'16"	112°01'14"	3.8	215	7.9
25	46°25'08"	111°46'22"	<.2	43	7.7
26	46°29'27"	111°46'24"	<.2	80	7.4
27	46°28'58"	111°45'39"	<.2	64	7.6
77LA001W	46°18'52"	111°42'46"	.4	318	7.9
2	46°17'48"	111°44'26"	.6	295	7.8
3	46°18'29"	111°43'54"	.5	380	7.8
4	46°18'20"	111°44'49"	.3	260	7.9
5	46°19'04"	111°45'32"	<.2	203	7.6
6	46°18'50"	111°48'11"	<.2	68	7.4
8	46°20'20"	111°40'08"	<.2	---	---
9	46°19'58"	111°46'49"	.5	---	---
10	46°19'59"	111°46'22"	.2	---	---
11	46°20'53"	111°45'50"	<.2	---	---
12	46°21'14"	111°44'44"	<.2	---	---
13	46°28'47"	111°50'04"	<.2	108	7.6
14	46°28'11"	111°49'35"	<.2	77	7.6
15	46°26'44"	111°48'56"	<.2	65	7.5
16	46°26'59"	111°50'09"	<.2	---	---
17	46°25'58"	111°51'34"	<.2	56	7.3
18	46°21'06"	111°59'09"	.3	52	7.3
19	46°21'20"	111°57'07"	.4	60	7.3
20	46°25'31"	111°47'08"	<.2	58	7.3
21	46°16'51"	111°59'03"	3.3	244	8.3

Table 1.--Analytical results and sample locality for 147 water samples from the Elkhorn Wilderness Study Area, Montana--Continued  
[Leaders (---) indicate no data]

Field No.	Latitude (°N.)	Longitude (°W.)	U (ppb)	Conductivity (µmhos/cm)	pH
77DT002W	46°16'33"	111°45'38"	1.1	---	---
3	46°16'47"	111°48'53"	.2	---	---
4	46°28'55"	111°50'12"	<.2	137	7.5
5	46°28'14"	111°49'29"	<.2	94	7.5
6	46°26'48"	111°48'47"	<.2	60	7.1
7	46°25'44"	111°50'41"	<.2	---	---
8	46°24'15"	111°43'45"	.4	74	7.2
9	46°27'20"	111°43'35"	<.2	70	7.3
10	46°18'24"	112°01'37"	1.4	70	7.3
12	46°17'11"	112°01'59"	11.3	271	8.0
13	46°17'07"	112°03'07"	9.7	357	8.0
15	46°16'54"	111°58'05"	1.5	156	8.0
16	46°16'59"	111°58'09"	.2	64	7.6
17	46°14'44"	111°58'19"	1.0	203	7.7
19	46°18'53"	111°58'45"	.4	56	7.5
20	46°18'45"	112°00'24"	.6	110	8.0
21	46°18'35"	112°01'09"	.5	67	7.5
77SL002W	46°19'26"	111°41'52"	<.2	228	7.7
5	46°19'50"	111°45'03"	.6	375	8.0
6	46°20'13"	111°43'51"	<.2	193	7.6
7	46°21'02"	111°45'16"	.2	55	7.5
8	46°21'12"	111°47'50"	<.2	87	7.4
9	46°21'35"	111°46'18"	.6	45	7.5
10	46°20'24"	111°47'47"	<.2	92	7.4
11	46°20'29"	111°47'26"	<.2	108	7.5
12	46°20'22"	111°47'43"	<.2	96	7.6
13	46°19'56"	111°46'59"	<.2	---	---
14	46°21'11"	111°44'43"	<.2	---	---
15	46°21'23"	111°41'08"	<.2	150	7.8
16	46°23'12"	111°41'59"	<.2	88	7.6
17	46°25'20"	111°41'41"	.3	290	7.6
18	46°26'44"	111°43'08"	<.2	103	7.7
19	46°21'23"	111°41'08"	<.2	150	8.0
20	46°24'15"	111°43'50"	<.2	47	7.6
21	46°24'57"	111°44'32"	<.2	39	7.3
22	46°26'03"	111°44'14"	<.2	57	7.7
23	46°28'27"	111°43'27"	<.2	76	7.4
24	46°25'27"	111°47'09"	<.2	42	7.5
25	46°25'33"	111°47'03"	<.2	48	7.5
88	46°18'46"	111°53'20"	<.2	143	8.1
117	46°25'30"	111°52'45"	2.1	116	7.8

Table 1.--Analytical results and sample locality for 147 water samples from the Elkhorn Wilderness Study Area, Montana--Continued  
[Leaders (---) indicate no data]

Field No.	Latitude (°N.)	Longitude (°W.)	U (ppb)	Conductivity (µmhos/cm)	pH
77BG001W	46°18'50"	111°46'45"	<.2	183	7.6
6	46°26'39"	111°48'50"	<.2	56	7.4
7	46°25'38"	111°50'49"	<.2	77	7.5
8	46°26'21"	111°51'57"	.2	112	7.6
10	46°20'52"	111°57'11"	1.5	61	7.6
11	46°20'52"	111°57'11"	1.3	61	7.5
13	46°16'15"	111°54'20"	<.2	53	7.5
14	46°16'18"	111°54'24"	<.2	52	7.5
77WM003W	46°25'14	111°54'23	.6	65	7.3
4	46°25'09"	111°54'25"	1.3	220	7.6
5	46°24'15"	111°54'24"	2.3	218	7.8
6	46°24'10"	111°53'53"	.8	63	7.8
7	46°24'47"	111°56'36"	1.4	112	7.5
9	46°23'21	111°58'05"	19.6	355	8.4
10	46°23'12"	111°57'15"	.7	72	7.8
11	46°23'12"	111°57'15"	.6	71	7.7
12	46°20'54"	112°00'23"	.6	70	7.3
13	46°16'51"	111°58'50"	.3	100	7.7
14	46°16'26"	111°58'56"	1.5	125	8.0
16	46°15'38"	111°57'46"	.4	195	7.9
22	46°18'52"	111°59'08"	.6	88	7.9
23	46°18'51"	111°59'52"	.3	60	7.5
24	46°18'51"	112°00'07"	1.6	112	7.6
25	46°18'50"	112°00'15"	1.0	102	7.8
26	46°18'39"	112°01'09"	6.6	170	8.1
27	46°18'39"	112°01'09"	7.1	169	8.2
28	46°22'54"	111°49'27"	<.2	47	7.8
29	46°21'53"	111°49'32"	<.2	49	7.5
30	46°22'05"	111°52'59"	<.2	69	7.2
32	46°22'28"	111°49'37"	2.7	157	8.0
34	46°20'34"	111°54'10"	<.2	62	7.7
35	46°20'51"	111°51'30"	<.2	65	7.2
36	46°20'40"	111°51'57"	<.2	43	7.2
37	46°18'38"	111°53'26"	<.2	46	7.2
38	46°18'45"	111°53'12"	<.2	30	7.1
39	46°19'22"	111°52'37"	<.2	41	7.1
94	46°20'38"	111°59'58"	10.2	126	7.3
77MG001W	46°25'29"	111°55'41"	1.6	213	7.9
2	46°24'12"	111°53'52"	.9	62	7.7
3	46°23'14"	111°57'11"	.5	67	7.5
4	46°23'41"	111°58'42"	8.6	310	8.2
5	46°23'17"	111°59'43"	.6	52	7.3



Table 1.--Analytical results and sample locality for 147 water samples from the Elkhorn Wilderness Study Area, Montana--Continued  
 [Leaders (---) indicate no data]

Field No.	Latitude (°N.)	Longitude (°W.)	U (ppb)	Conductivity (µmhos/cm)	pH
77MG006W	46°20'56"	112°00'34"	2.6	132	7.7
7	46°16'47"	111°56'57"	.4	150	7.9
10	46°22'58"	111°49'32"	<.2	44	7.6
11	46°22'54"	111°49'37"	<.2	38	7.5
12	46°21'47"	111°50'44"	<.2	50	7.2
13	46°21'47"	111°50'44"	<.2	49	7.3
14	46°22'04"	111°51'55"	<.2	50	7.1
16	46°20'35"	111°54'14"	.3	46	7.0
17	46°20'35"	111°54'11"	<.2	58	7.1
18	46°20'35"	111°50'04"	<.2	48	7.2
19	46°19'49"	111°51'29"	<.2	35	7.1
20	46°19'33"	111°51'34"	<.2	30	7.1
21	46°19'08"	111°51'44"	<.2	30	7.0
22	46°19'05"	111°51'28"	<.2	31	7.1
23	46°20'38"	111°50'31"	<.2	47	7.3
24	46°20'57"	111°48'42"	<.2	84	7.5
25	46°22'30"	111°48'05"	<.2	126	7.9
26	46°22'26"	111°47'58"	<.2	72	7.7
27	46°18'38"	111°54'10"	<.2	---	---

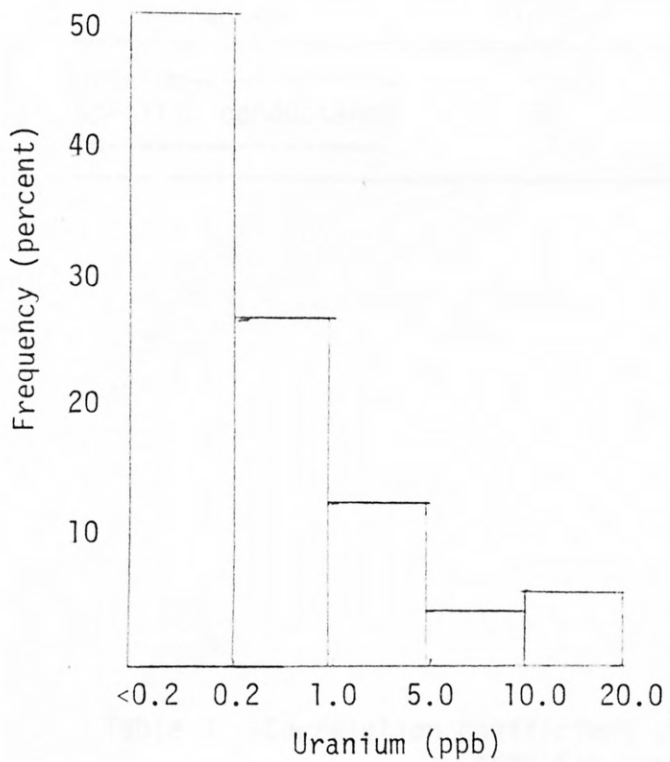


Figure 2.--Frequency distribution of 147 water samples for uranium in the Elkhorn Wilderness Study Area, Montana.

Table 2.--Species range, mean, and standard deviation for 147 water samples taken from Elkhorn Wilderness Study Area, Montana

Species	Range		Mean	Standard deviation
	Minimum	Maximum		
Uranium-----	<0.2	19.6	1.31	3.17
Specific conductance	30	425	124.04	92.30
pH-----	7.0	8.4	7.61	.31

Table 3.--Correlation coefficient of the variables uranium, pH, and specific conductance

Variables	Correlation coefficient	Number of valid pairs
Uranium vs pH-----	0.174	132
Uranium vs specific conductance	.489	132
pH vs specific conductance-----	.668	132

## References

Greenwood, W. R., Ludington, Steve, Miller, W. R., and Hanna, W. F.,  
1978, Mineral resources of the Elkhorn Wilderness Study Area,  
Montana: U.S. Geological Survey Open-File Report 78-325.

Grimaldi, F. S., 1954, Collected papers on methods of analysis for  
uranium and thorium: U.S. Geological Survey Bulletin 1006, 184 p.

USGS LIBRARY-RESTON



3 1818 00073110 7