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GEOLOGICAL SURVEY

Chemical and statistical analyses from a uranium hydrogeochemical and stream-sediment survey in the North Absaroka study area, Park and Sweet Grass Counties, Montana

Part I: Surface Water

by

Vivian J. Suits and Karen J. Wenrich-Verbeek

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ABSTRACT

Sixty-two surface-water samples collected from a portion of the North Absaroka study area, Montana in July 1977, were analyzed for 52 different variables. Forty-six of these variables are presented in data listings; 27 met the proper statistical criteria and were tested in correlation analysis.

Uranium values ranged from 0.04 to 5.1 µg/ℓ, and an average sample contained 0.59 µg/ℓ. The generally low values of U in the surface water of this area are in contrast with the high values found in sediments collected at the same sites, described in Part II of this report (Suits and Wenrich-Verbeek, 1980). However, the maximum U concentration was observed in the water of Anomaly Creek, from which previous workers had discovered high U values in the stream-sediment samples.

Out of the 27 parameters treated statistically, U correlates only with molybdenum. U does not show correlations with the alkalis or alkaline earths, as was noted in a previous study in New Mexico (Wenrich-Verbeek, 1977b). Arsenic and boron commonly are related to U in surface waters (Wenrich-Verbeek, 1977a). However, arsenic analyzed in this area was never above the detection limit of 1 µg/ℓ, and boron showed no correlation with U.

INTRODUCTION

This report presents the chemical analyses and preliminary statistical evaluation of 62 surface-water samples collected in south-central Montana during July 1977. Sampling covered a part of a proposed primitive area in the northern Absaroka Mountains, referred to as the North Absaroka study area by the U.S. Geological Survey and U.S. Bureau of Mines (USGS and USBM, 1977) and located within Park and Sweet Grass Counties (fig. 1). The Absaroka primitive area is to the south of that area, and the Beartooth primitive area is to the southeast. Analyses of stream-sediment samples taken concurrently with these water samples are reported in Suits and Wenrich-Verbeek (1980).

The North Absaroka study area and vicinity has few known U occurrences and no previous designation of potential U (USGS and USBM, 1977; Simons and others, 1973; and Wedow and others, 1975). Therefore, the discovery of U values in the range 142-427 ppm in stream-sediment samples collected by USGS and USBM (1977), in addition to high U-bearing stream sediments collected by Johns-Manville, Inc. (S. Ellingwood and J. Schutt, oral commun., 1977), elicited further investigation. The present geochemical sampling study was designed to provide a basis for delineating the source for anomalous stream sediments.

GEOLOGIC BACKGROUND

The study area is located in the western part of the Beartooth uplift in the North Absaroka Mountains. The area is sparsely populated and mountainous. Because access to the high country is limited to a few footpaths, the use of a helicopter was necessary for this survey.

Several authors have described the geology near this study area in detail, especially in the vicinity of mining districts just outside the area. Reid and others (1975) and Richards (1957) described the geology of

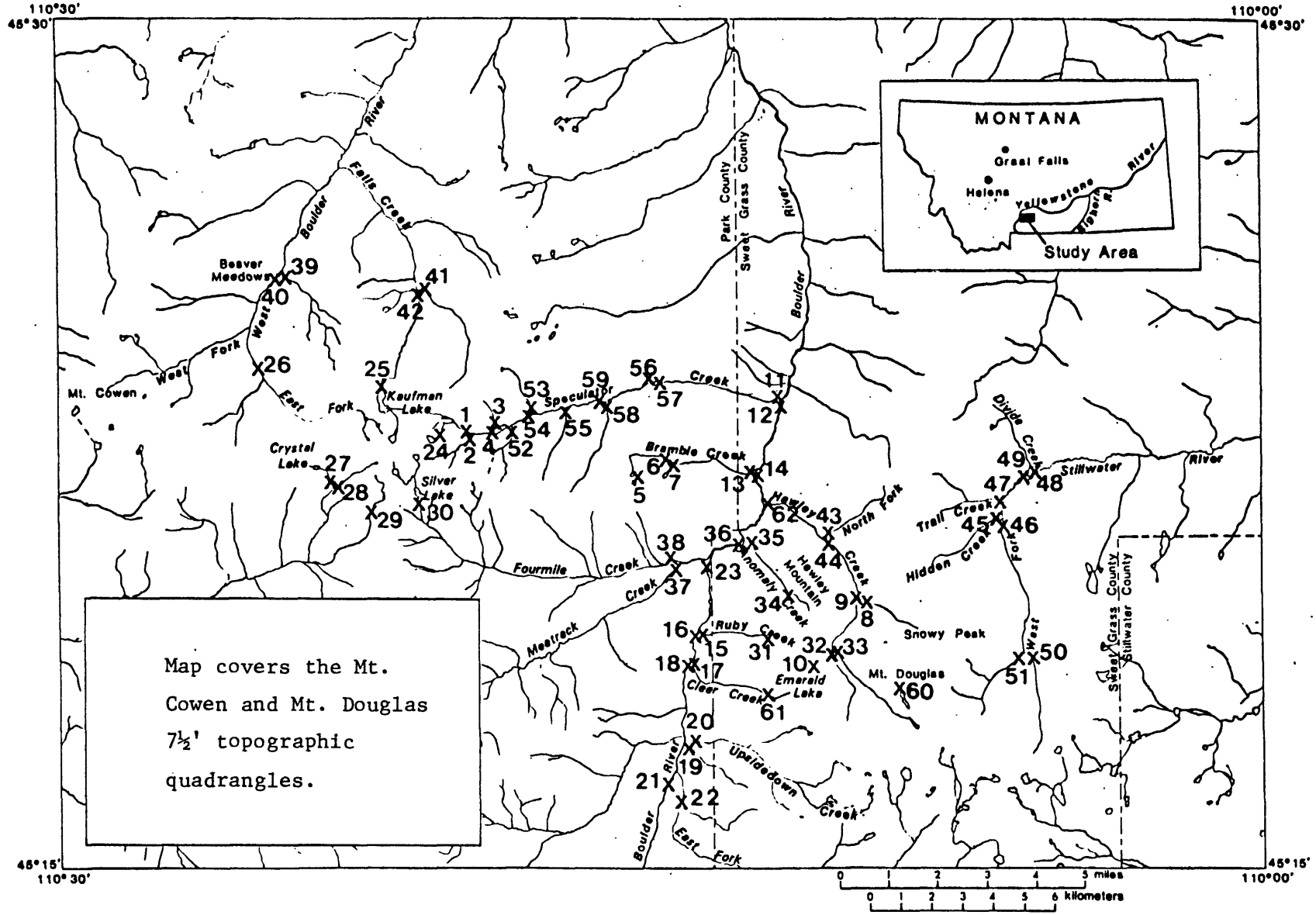

Figure 1.--Map of study area and sample localities.

larger regions which encompass the study area. The most extensive description of the geology as well as economic history and potential of this area was given by USGS and USBM (1977).

The Precambrian gneisses of Falls Creek and Mt. Cowen are the predominant formations in the study area. Small areas of Precambrian metasediments occur in the northwestern and northeastern parts of the area. Tertiary intrusives and volcanics as well as nonextensive Cambrian sediments are present south of Meatrack Creek (fig. 1).

Faults generally follow west-northwest or north-northeast trends. The Mill Creek-Stillwater fault is west-trending near the southern boundary of the study area, and the northeast-trending West Boulder fault is traced by the West Boulder River (Reid and others, 1975).

Southwest of the study area, and associated with the Absaroka-Gallatin volcanic province, are several gold, silver, and copper mining districts: Emigrant-Mill Creek, Boulder, Independence, and Cooke City. Northeast of the area, the Archean Stillwater Complex hosts platinum, chromium, copper, and nickel (USGS and USBM, 1977).

The two Precambrian gneisses are of primary interest with respect to U exploration and to this study. The streams that concentrated the U-rich sediments derive their material from one or both of these gneisses. USGS and USBM (1977) found high U as well as high Th in samples of a dark mineral layer in the gneiss of Falls Creek. Half of the minerals in the zone are biotite and magnetite and half are quartz, feldspar, and accessories. Among the accessories, sphene is the presumed host of the U and Th (USGS and USBM, 1977).

SAMPLING PROCEDURE

High U values were discovered by USGS and USBM (1977) and by Johns-Manville personnel (S. Ellingwood and J. Schutt, oral commun., 1977) in sediments from Speculator Creek and from a previously unnamed creek now known locally as "Anomaly Creek" (fig. 1). Therefore, water and stream-sediment samples for this study were collected near those two drainages, though the Speculator Creek drainage was favored due to easier access. Figure 1 shows the locations of the study area and the sampling sites; table 1 lists the sampling sites by location name.

Water was collected in a flint glass bottle from the thalwegs of streams. The water was then passed through 0.45 μm membrane filters into polyethylene bottles and acidifed with nitric acid (HNO_3) to a pH below 2. These filtered-acidifed samples were analyzed for U and all other elements except bicarbonate, alkalinity, organic and inorganic C, SiO_2, F, Cl, SO_4, PO_4, and NO_2+NO_3. Bicarbonate and alkalinity were determined from a raw sample, SiO_2, F, Cl, and SO_4 from a filtered-unacidified sample, and PO_4, NO_2+NO_3, and inorganic and organic carbon from a filtered-unacidified chilled sample. In situ measurements were made of conductivity, water temperature, pH, and Eh. Further details on sampling procedures were given by Wenrich-Verbeek (1976). Samples were randomized before submittal to the analytical laboratories to preclude any systematic bias in the results.

Table 1.--List of sample localities and dates (1977) of collection.

SAMPLE	LAT	LONG	MO/DAY	LOCATION NAME
1	45°22'48"	110°19'38"	7/7	Westernmost north fork to Speculator Creek
2	45°22'45"	110°19'38"	7/7	Westernmost south fork to Speculator Creek
3	45°22'50"	110°19' 1"	7/7	North trib to Speculator Creek
4	45°22'45"	110°19' 1"	7/7	Speculator Creek
5	45°21'53"	110°15'26"	7/8	Bramble Creek below southernmost glacial lake
6	45°22' 9"	110°14'49"	7/8	Bramble Creek
7	45°22' 6"	110°14'42"	7/8	Trib to Bramble Creek
8	45°19'44"	110°10' 0"	7/8	Trib from Snowy Peak to Hawley Creek
9	45°19'47"	110°10' 3"	7/8	Hawley Creek
10	45°18'29"	110°11'13"	7/8	Stream from lake on west side of Hawley Mountain
11	45°23'21"	110°11'53"	7/9	Speculator Creek at mouth
12	45°23'19"	110°11'53"	7/9	Boulder River above Speculator Creek
13	45°22' 4"	110°12'41"	7/9	Bramble Creek at mouth
14	45°22' 1"	110°12'37"	7/9	Boulder River above mouth Bramble Creek
15	45°19'10"	110°14' 1"	7/9	Ruby Creek at mouth
16	45°19'10"	110°14' 5"	7/9	Boulder River above Ruby Creek
17	45°18'39"	110°14'12"	7/10	Clear Creek at mouth
18	45°18'39"	110°14'16"	7/10	Boulder River above Clear Creek
19	45°17' 9"	110°14'23"	7/10	Creek south of Upsidedown Creek
20	45°17'14"	110°14'23"	7/10	Upsidedown Creek at mouth
21	45°16'22"	110°14'56"	7/10	West fork Boulder River
22	45°16' 7"	110°14'34"	7/10	East Fork Boulder River
23	45°20'20"	110°13'50"	7/10	Boulder River above Fourmile Creek
24	45°22'37"	110°20'26"	7/11	Tarn lake north of head of Speculator Creek
25	45°23'29"	110°21'57"	7/11	Stream from Kaufman Lake
26	45°23'52"	110°25' 0"	7/11	West Boulder River below junction of East Fork & trib
27	45°21'48"	110°23'10"	7/11	Stream draining Crystal Lake above junction with trib
28	45°21'46"	110°23' 3"	7/11	Trib to stream draining Crystal Lake
29	45°21'27"	110°12' 4"	7/11	Stream draining cirque east of Crystal Lake
30	45°21'35"	110°20'59"	7/12	Stream draining Silver Lake
31	45°19' 8"	110°12'23"	7/12	Headwaters of Ruby Creek
32	45°18'45"	110°10'44"	7/12	West fork of Hawley Creek
33	45°18'45"	110°10'40"	7/12	East fork of Hawley Creek
34	45°19'47"	110°11'53"	7/12	Drainage above tarn lake on west side of Hawley Mountain
35	45°20'49"	110°12'52"	7/12	Mouth of "Anomaly Creek"
36	45°20'46"	110°12'55"	7/12	Boulder River above mouth of "Anomaly Creek"
37	45°20'23"	110°14'31"	7/13	Meatrack Creek above junction with Fourmile Creek
38	45°20'28"	110°14'31"	7/13	Fourmile Creek above junction with Meatrack Creek
39	45°25'28"	110°24'20"	7/13	Trib into West Boulder River
40	45°25'28"	110°24'24"	7/13	West Boulder River at Beaver Meadows
41	45°25'12"	110°20'55"	7/13	East fork to Falls Creek
42	45°25'10"	110°20'59"	7/13	Middle fork to Falls Creek
43	45°20'51"	110°10'56"	7/14	North Fork Hawley Creek
44	45°20'49"	110°10'55"	7/14	Hawley Creek above North Fork
45	45°21' 9"	110° 6'28"	7/14	Hidden Creek
46	45°21' 7"	110° 6'24"	7/14	West Fork Stillwater River
47	45°21'27"	110° 6'28"	7/14	Trail Creek at mouth
48	45°21'58"	110° 5'51"	7/14	Divide Creek at mouth
49	45°22' 1"	110° 5'47"	7/14	West Fork Stillwater River above Divide Creek
50	45°18'47"	110° 5'55"	7/15	East fork of West Fork Stillwater River
51	45°18'47"	110° 5'58"	7/15	West fork of West Fork Stillwater River
52	45°22'50"	110°18'40"	7/15	Trib from south to Speculator Creek
53	45°23' 3"	110°18'10"	7/15	Trib from north to Speculator Creek
54	45°22'60"	110°18'10"	7/15	Speculator Creek
55	45°23' 6"	110°17'16"	7/15	Trib from south to Speculator Creek
56	45°23'37"	110°15'18"	7/15	Unmarked trib from north to Speculator Creek
57	45°23'37"	110°15'15"	7/15	Speculator Creek below unmarked trib
58	45°23'13"	110°16'17"	7/15	Trib from south to Speculator Creek
59	45°23'16"	110°16'20"	7/15	Speculator Creek
60	45°18' 7"	110° 8'56"	7/16	Tarn lake south of Mt Douglas
61	45°18' 2"	110°12'19"	7/16	Clear Creek below Emerald Lake
62	45°21'27"	110°12'23"	7/16	Hawley Creek at mouth

*No sediment sample taken.

CHEMICAL ANALYSES

Table 2 lists variables determined in the waters of the study area and shows the analytical method used and the corresponding detection limit. All water samples were analyzed by the U.S. Geological Survey (USGS). Dissolved solid residues obtained by evaporation of water samples were used for emission spectrographic analysis. The detection limits for these elements tend to vary from sample to sample because of their dependence upon the concentration of dissolved solids in the water--the greater the mg/ℓ of dissolved solids, the higher the detection limit. Two methods of fluorimetry were used for U determinations: (1) direct fluorimetry with a detection limit of 0.4 μg/ℓ, and (2) extraction fluorimetry with a detection limit of 0.01 μg/ℓ. The second method was used only on those samples with a U concentration of less than 0.4 μg/ℓ.

PRESENTATION OF CHEMICAL DATA

The results of the chemical analysis of the water samples are shown in table 3. Abbreviations used in table 3 are explained in table 2. The column entitled "U/Cond" in table 3 is the normalized U data: U concentration of each sample was divided by the conductivity at the site where the sample was collected; then this result was multiplied by 100 (for ease of comparison). Conductivity is used as the normalizing factor because it is a relative measure of the total dissolved solids in the water, and therefore, can be used to minimize the effect of dilution by runoff from low to high periods of discharge (Wenrich-Verbeek, 1977a). Because U is the element of principal interest in this study, it is the only element for which normalized data are presented. However, the conductivity was not significantly variable throughout the sampling survey to warrant use of any normalized data in further statistical analyses or interpretations (see fig. 2-1).

Table 2. Abbreviations used in table 3, analytical procedures and detection limits for variables presented in this study.

ABBREV	EXPLANATION	UNITS SYMBOLS	LOWER DETECTION LIMIT	ANALYTICAL PROCEDURE
sample	Sample identification number			
Latt	Latitude of location	deg,min,sec		
Long	Longitude of location	deg,min,sec		
Cond-Fld	Conductivity in micromhos per centimeter	µmhos/cm	--	In situ field measurement, Beckman† conductivity probe
U - F	Dissolved uranium (U) in micrograms per liter	µg/L	.01	Direct and extraction flourimetry (see text)
U/Cond	Uranium/conductivity x 100 to normalize U(see text)		—	
Alk- L	Total alkalinity in milligrams per liter as $CaCO_3$	mg/L	1	Direct titration with hydrochloric acid
Eh-Fld	Eh in millivolts	mv	—	In situ field measurement, Orion† specific ion meter
Hardness	Total hardness in milligrams per liter as $CaCO_3$	mg/L	1	Calculated from Ca, Mg values
HardNonC	Total non-carbonate hardness in milligrams per liter	mg/L	.5	Calculated from hardness, carbonate and bicarbonate values
pH-Fld	pH in standard units	pH units	--	In situ field measurement, Orion† specific ion meter
SAR	Sodium absorption ratio		—	Calculated from Na
H2O temp	Water temperature in degrees centigrade	°C	--	In situ field measurement, thermometer
Ag - S	Dissolved silver (Ag) in micrograms per liter	µg/L	**	Emission spectrographic analysis
*Al - A	Dissolved aluminum (Al) in micrograms per liter	µg/L	30	Atomic absorption and chelation extraction
*As - A	Dissolved arsenic (As) in micrograms per liter	µg/L	1.0	Flameless atomic absorption
B - S	Dissolved boron (B) in micrograms per liter	µg/L	**	Emission spectrographic analysis
Ba - S	Dissolved barium (Ba) in micrograms per liter	µg/L	**	Emission spectrographic analysis
Be - S	Dissolved beryllium (Be) in micrograms per liter	µg/L	**	Emission spectrographic analysis
Bi - S	Dissolved bismuth (Bi) in micrograms per liter	µg/L	**	Emission spectrographic analysis
Bicarb	Bicarbonate ion in milligrams per liter as HCO_3	mg/L	1	Automated titration with sulfuric acid
InorgC	Dissolved inorganic carbon (C) in milligrams per liter	mg/L	1	Persulfate oxidation and IR gas analyzer
Org C	Dissolved organic carbon (C) in milligrams per liter	mg/L	1	Persulfate oxidation and IR gas analyzer
Ca - A	Dissolved calcium (Ca) in milligrams per liter	mg/L	.1	Atomic absorption - direct aspiration with lanthanum chloride matrix
Cd - A	Dissolved cadmium (Cd) in micrograms per liter	µg/L	1.0	Atomic Absorption - direct aspiration or chelation extraction.
Cl - L	Dissolved chloride (Cl) in milligrams per liter	mg/L	.1	Technicon Autoanalyzer†- ferric thiocyanate colormetric
Co - S	Dissolved cobalt (Co) in micrograms per liter	µg/L	**	Emission spectrographic analysis
Cr - S	Dissolved chromium (Cr) in micrograms per liter	µg/L	**	Emission spectrographic analysis
Cu - S	Dissolved copper (Cu) in micrograms per liter	µg/L	**	Emission spectrographic analysis
F - L	Dissolved fluoride (F) in milligrams per liter	mg/L	.1	Technicon Autoanalyzer† - specific ion electrode
Fe - L	Dissolved iron (Fe) in micrograms per liter	µg/L	10	Technicon Autoanalyzer† - 2-2' bypridine colormetric
Ga - S	Dissolved gallium (Ga) in micrograms per liter	µg/L	**	Emission spectrographic analysis
Ge - S	Dissolved germanium (Ge) in micrograms per liter	µg/L	**	Emission spectrographic analysis

*All analytical results are below this detection limit; element is not discussed further in this report.

**Detection limit varies with amount of residue upon evaporation.

†Use of brand names does not imply endorsement by the U.S. Geological Survey.

The letter code scheme for designating method of analyisis is as follows:

- A Atomic absorption
- F Flourimetric method
- Fld Field measurement
- L Unspecified laboratory method
- S Emission spectrographic analysis

Note: Dissolved material is that which is measured after passing through a 0.45 µm membrane filter.
Total material is dissolved + suspended material.

Table 2, continued

ABBREV	EXPLANATION	UNITS SYMBOLS	LOWER DETECTION LIMIT	ANALYTICAL PROCEDURE
*Hg - A	Dissolved mercury (Hg) in micrograms per liter	µg/L	.01	Atomic Absorption - $KMnO_4$ digestion and direct aspiration of cold vapor
K - A	Dissolved potassium (K) in milligrams per liter	mg/L	.1	Atomic Absorption - direct aspiration
*Li - A	Dissolved lithium (Li) in micrograms per liter	µg/L	5	Atomic absorption - air-acetylene flame
Mg - A	Dissolved magnesium (Mg) in milligrams per liter	mg/L	.1	Atomic Absorption - direct aspiration with lanthanum chloride matrix
*Mn - A	Dissolved manganese (Mn) in micrograms per liter	µg/L	.5	Atomic absorption - chelation extraction
Mo - S	Dissolved molybdenum (Mo) in micrograms per liter	µg/L	**	Emission spectrographic analysis
Na - A	Dissolved sodium (Na) in milligrams per liter	mg/L	.1	Atomic absorption - direct aspiration
Na %	Percent sodium of total cations	%	**	Calculated from Na and total cations
Ni - S	Dissolved nickel (Ni) in micrograms per liter	µg/L	**	Emission spectrographic analysis
NO2+ NO3	Total NO_2 + NO_3 in milligrams per liter as N	mg/L	.005	Technicon Autoanalyzer† - Diazo dye-cadmium reduction
P - L	Total phosphorous (P) in milligrams per liter	mg/L	.005	Technicon Autoanalyzer† - persulfate digestion - phosphomolybdate blue reduction
Pb - S	Dissolved lead (Pb) in micrograms per liter	µg/L	**	Emission spectrographic analysis
PO4- L	Total phosphate (PO_4) in milligrams per liter	mg/L	.005	Technicon Autoanalyzer† - persulfate digestion - phosphomolybdate blue reduction
*Se - A	Dissolved selenium (Se) in micrograms per liter	µg/L	2	Flameless atomic absorption
SiO2-L	Dissolved silica (SiO_2) in milligrams per liter	mg/L	.1	Technicon Autoanalyzer†- molybdate blue reduction
Sn - S	Dissolved tin (Sn) in micrograms per liter	µg/L	**	Emission spectrographic analysis
SO4- L	Dissolved sulfate (SO_4) in milligrams per liter	mg/L	1	Technicon Autoanalyzer† - $BaCl_2$ + methythymol blue colormetric complex
Sr - S	Dissolved strontium (Sr) in micrograms per liter	µg/L	**	Emission spectrographic analysis
Ti - S	Dissolved titanium (Ti) in micrograms per liter	µg/L	**	Emission spectrographic analysis
V - S	Dissolved vanadium (V) in micrograms per liter	µg/L	**	Emission spectrographic analysis
Zn - A	Dissolved zinc (Zn) in micrograms per liter	µg/L	20	Atomic absorption - air-acetylene flame
Zr - S	Dissolved zirconium (Zr) in micrograms per liter	µg/L	**	Emission spectrographic analysis

Figures 2-1 through 2-29 are locality maps for water samples and show the data for those elements which have a significant variation through the drainage basin. Because most geochemical data follow lognormal distributions, the data are plotted by approximate geometric intervals based on those established and used by the Geological Survey of Canada for their hydrogeochemical surveys. Explanations on each map show the intervals used. Because pH values are logarithmic, the pH data are plotted as numeric values rather than symbols. Eh values are also plotted directly due to their small variation over the area.

STATISTICAL ANALYSIS

The sequence of statistical treatment followed in this report is based on Meisch (1967, 1976), Cohen (1959), and formulations by the authors. Judgments throughout the sequence were guided by the character of the sample populations.

Character of the data: The following characteristics were assessed from the analytical results of this sampling study:

(1) Histograms of most variables (table 4) exhibited greater unimodal symmetry when the logarithms of the data were used than when they were not. Thus the represented populations were judged to be lognormal, and therefore the logarithms of the data were used in statistical calculations.

(2) Histograms that were more symmetrical and unimodal when the logarithms of the data were not used were deemed to represent a normally distributed population, and so the untransformed data were used in statistical analysis.

(3) Some histograms were asymmetrical and/or multimodal using either the untransformed or the transformed data (e.g., PO_4). These variables were not included in correlation analysis because any test of their statistical significance would be invalid.

(4) The analytical results for some variables included qualified values ("less than" a certain number). There are two types of qualified values in this study: (a) those which represent a fixed limit of the analytical method, i.e., all "less than" values are associated with one number for one variable (singly-censored), or (b) those which represent a limit which changes from sample to sample within the data set for one variable (multiply-censored). Censored data are discussed in the next section.

Problems of censored data: Meisch (1967, 1976) discussed the problem of singly-censored sample populations. In the present study singly-censored variables were treated in the following ways:

(1) Cohen's (1959) method was employed to estimate means and standard deviations from the truncated distributions (Cohen, 1959; Miesch, 1967). Tests conducted during this study on artificially censored data sets verified the accuracy of Cohen's method for sample populations that are approximately unimodal and symmetric. Results from Cohen's method using asymmetric distribution curves (e.g., PO_4) are not reliable, but are better estimates than parameters calculated only from the unqualified data without use of any estimator.

(2) The "replacement" method was employed before correlation analysis. This method assigns an arbitrary (educated guess) number to qualified values. In this report "less than" values are assigned three-fourths of their corresponding detection limits. Although this method is inferior to Cohen's estimation method for means and standard deviations, Cohen's estimation does not apply to calculation of the correlation coefficient. The censoring tests conducted in this study revealed the "replacement" method to be superior to that of omitting all qualified values from the data matrix before parameter calculation. This conclusion was emphasized by Miesch (1976).

(3) Based on skepticism of the reliability of any method that deals with censoring, the authors placed a limit on how many qualified values would be allowed in the data for one variable before the data were considered inadequate for statistical analysis. The arbitrary limit was set at 50-percent qualified values. If more than half the data for one variable were censored, the variable was not used in correlation analysis.

The problem of multiply-censored data has not been greatly discussed. Cohen's estimation method does not apply. The "replacement" method represents an analogy to the solution for singly-censored data, but does not always seem appropriate. The following conclusions were drawn:

(1) Any method of dealing with the multiply-censored data will do little harm on the final statistics if only a small percentage of the data set is censored in this fashion. Therefore any data set which was more than 30-percent multiply-censored was considered unusable data.

(2) The nature and variability of the qualified limits determine whether a specific datum should be assigned to an arbitrary value or deleted from the data set. The data sets for this study which were multiply-censored to a reasonable extent contained "less than" values which, for the most part, maintained upper limits falling within the lower range of the entire data set. Therefore, to be consistent with the singly-censored data sets, three-fourths of the detection limits were assigned to all qualified data from multiply-censored sample populations. These "replaced" data sets were then used to calculate statistical parameters.

Frequency distributions: Histograms of the various parameters determined for the water samples are shown in table 4. Like most geochemical data, the distributions of all parameters in water--except Eh, pH, and Cl--are more closely lognormally distributed than normally distributed (in most cases,

easily determined by visual comparison of the diagrams), so that the frequency diagram of their log-data is presented (shown with a prefix of L- or Log- before the element name), and the log-data were used in the statistical analysis.

The qualified data for each element are described in table 4 (directly beneath the histograms) according to the codes explained at the top of table. The histograms themselves comprise the frequencies of the unqualified data values and the assigned values of the multiply-censored data.

Some of the histograms indicate that the populations from which the data were drawn are definitely not normal (e.g., PO_4). Other histograms are not shown in this section because either (1) analytical results are greater than 50-percent qualified values, such as Bi, or (2) the distributions consist of only a few different values, such as Fe (see table 3).

Table 4 also shows the maximum and minimum values in the data and the means and standard deviations. The latter two parameters were calculated differently depending on (1) the use of the untransformed data or the logarithms of the data, and (2) the presence or absence of singly-censored data.

Variables that remain untransformed had means and standard deviations calculated directly. If singly-censored data were present, Cohen's (1959) equations were used to estimate the arithmetic mean and standard deviation.

The geometric mean and geometric deviation (anti-logs of the arithmetic mean and standard deviation, respectively, of the log-data) were calculated for sample populations approximating a lognormal distribution. When singly-censored data are present, Cohen's equation was used on the logs of the data values to find the estimated arithmetic mean and estimated standard deviation. The anti-logs of these values then gave the geometric mean and

geometric deviation. The qualified values of multiply-censored sample populations were replaced by assigned values before any parameters were calculated when using either untransformed data or log data.

Correlation analysis: Table 5 shows a correlation matrix for variables determined in water. Only variables listed in table 4 with approximate normal or lognormal distributions were used in the correlation analysis. Qualified data were treated by the "replacement" method, as described previously.

Scatter diagrams: Scatter digrams were plotted for the variables appearing in table 5 against U concentration. Only molybdenum correlated significantly with U; the corresponding scatter diagram appears in figure 3. No qualified values are plotted. The correlation coefficient, r, from table 5 and the corresponding number of data pairs (n) appear on figure 3 along with a linear regression line. Statistical significance of correlation at the 99-percent confidence level is indicated by two asterisks next to the value of r. An r^2 value of 0.34 indicates that approximately 34 percent of the variation seen in U is due to a direct relationship with molybdenum.

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REFERENCES CITED

Cohen, A. C., Jr., 1959, Simplified estimators for normal distribution when samples are singly censored or truncated: Technometrics, v. 1, no. 3, p. 217-237.

Miesch, A. T., 1967, Methods of computation for estimating geochemical abundance: U.S. Geological Survey Professional Paper 574-B, 15 p.

_____1976, Sampling designs for geochemical surveys--syllabus for a short course: U.S. Geological Survey Open-File Report 76-772, 128 p.

Reid, R. R., McMannis, W. J., and Palmquist, J. C., 1975, Precambrian geology of North Snowy block, Beartooth Mountains, Montana: Geological Society of America Special Paper 157, 135 p.

Richards, P. W., 1957, Geology of the area east and southeast of Livingston, Park County, Montana: U.S. Geological Survey Bulletin 1021-L, p. 385-438.

Simons, F. S., Armbrustmacher, T. J., VanNoy, R. M., Zilka, N. T., Federspiel, F. E., and Ridenour, James, 1973, Mineral resources of the Beartooth primitive area and vicinity, Carbon, Park, Stillwater, and Sweet Grass Counties, Montana and Park County, Wyoming, with a section on Interpretation of aeromagnetic data, by L. A. Anderson: U.S. Geological Survey Bulletin 1391-F, 125 p.

Suits, V. J., and Wenrich-Verbeek, K. J., 1980, Chemical analyses and minor statistics from a uranium hydrogeochemical survey in the North Absaroka study area, Park and Sweet Grass Counties, Montana, Part II: Stream sediments: U.S. Geological Survey Open-File Report 80-1091, 101 p.

U.S. Geological Survey and U.S. Bureau of Mines, 1977, Mineral resources of the North Absaroka Study Area, Park and Sweet Grass Counties, Montana; Chapter A: Geological, geochemical, and geophysical investigations of the

North Absaroka Study Area, Park and Sweet Grass Counties, Montana: U.S. Geological Survey Open-File Report 77-700, U.S. Geological Survey Bulletin, in press.

Wedow, Helmuth, Jr., Gaskill, D. L., Banister, D. P., and Patte, E. C., 1975, Mineral resources of the Absaroka primitive area and vicinity, Park and Sweet Grass Counties, Montana, with a section on Interpretation of geophysical data by D. L. Peterson: U.S. Geological Survey Bulletin 1391-B, 115 p.

Wenrich-Verbeek, K. J., 1976, Water and stream-sediment sampling techniques for use in uranium exploration: U.S. Geological Survey Open-File Report 76-77, 30 p.

_____1977a, Uranium and co-existing element behavior in surface waters and associated sediments with varied sampling techniques used for uranium exploration: Journal of Geochemical Exploration, v. 8, p. 337-355.

_____1977b, Anomalous uranium in waters of the Rio Ojo Caliente, New Mexico, in Campbell, J. A., ed., Short papers of the U.S. Geological Survey uranium-thorium symposium, 1977: U.S. Geological Survey Circular 753, p. 73-75.

Table 3.--Chemical analyses of surface-water samples*

sample**	Latt	Long	Cond-Fld µmhos/cm	U - F µg/l	U/Cond	Alk- L mg/l	Eh-Fld mv	Hardness mg/l	HardNonC mg/l	pH-Fld units	SAR	H20 Temp oC	Ag - S µg/l
1-D77	45°22'48"	110°19'38"	11	.70	6.3636	8	85	8	<.5	7.45	.1	7.0	<.0024
2-D77	45°22'45"	110°19'38"	11	.59	5.3636	11	95	5	<.5	7.50	.1	5.0	<.0024
3-D77	45°22'50"	110°19' 0"	32	.31	.9687	67	75	30	<.5	7.50	.1	10.0	<.0024
4-D77	45°22'45"	110°19' 0"	13	.92	7.0769	14	115	7	<.5	7.05	.1	9.0	<.0018
5-D77	45°21'53"	110°15'26"	15	.08	.5333	3	45	5	2.0	6.75	.1	6.0	<.0012
6-D77	45°22' 9"	110°14'48"	16	.57	3.5625	9	100	11	2.0	6.65	.1	9.5	<.0021
7-D77	45°22' 5"	110°14'42"	20	.36	1.8000	2	100	10	7.0	6.85	.1	8.5	<.0021
8-D77	45°19'44"	110°10' 0"	14	1.00	7.1429	26	110	9	<.5	6.15	.1	2.5	<.0017
9-D77	45°19'47"	110°10' 3"	25	1.00	4.0000	8	115	12	4.0	6.75	.1	5.0	<.0024
10-D77	45°18'29"	110°11'12"	44	1.53	3.4773	9	125	19	10.0	7.45	.1	11.0	.0045
11-D77	45°23'21"	110°11'53"	33	1.10	3.3333	6	75	13	7.0	7.30	.1	10.0	<.0040
12-D77	45°23'19"	110°11'53"	58	.38	.6552	11	165	25	14.0	7.75	.1	11.0	<.0060
13-D77	45°22' 4"	110°12'41"	26	.64	2.4615	15	105	10	<.5	7.00	.2	11.0	<.0038
14-D77	45°22' 0"	110°12'37"	59	.36	.6102	10	115	26	16.0	7.70	.1	12.5	<.0076
15-D77	45°19' 9"	110°14' 1"	31	1.20	3.8710	4	105	12	8.0	6.90	.2	9.5	<.0034
16-D77	45°19' 9"	110°14' 5"	58	.21	.3621	14	100	27	13.0	7.50	.2	12.5	<.0075
17-D77	45°18'36"	110°14'12"	22	.44	2.0000	6	65	8	2.0	6.60	.2	8.0	<.0031
18-D77	45°18'38"	110°14'16"	57	.20	.3509	48	80	--	--	7.50	--	8.0	<.0055
19-D77	45°17' 8"	110°14'23"	87	1.00	1.1494	7	115	42	35.0	7.60	.2	7.0	<.0079
20-D77	45°17'14"	110°14'23"	35	.49	1.4000	11	120	12	1.0	7.00	.1	8.5	<.0041
21-D77	45°16'22"	110°14'56"	90	.13	.1444	7	145	43	37.0	8.00	.2	10.5	<.0110
22-D77	45°16' 7"	110°14'34"	38	.20	.5263	26	150	20	<.5	7.60	.1	9.5	<.0026
23-D77	45°20'29"	110°13'50"	59	.18	.3051	21	135	--	--	7.80	--	11.0	<.0077
24-D77	45°22'36"	110°20'26"	10	.43	4.3000	11	45	4	<.5	7.60	.1	7.5	<.0009
25-D77	45°23'29"	110°21'56"	17	.88	5.1765	8	105	7	<.5	8.00	.1	10.0	<.0020
26-D77	45°23'52"	110°25' 0"	30	.48	1.6000	13	130	--	--	8.05	--	6.5	<.0031
27-D77	45°21'47"	110°23'10"	16	.23	1.4375	9	80	12	3.0	7.90	.1	11.5	<.0016
28-D77	45°21'46"	110°23' 3"	21	.84	4.0000	30	75	13	<.5	7.85	.1	9.5	<.0014
29-D77	45°21'27"	110°12' 4"	14	.25	1.7857	7	100	16	9.0	8.05	--	10.5	--
30-D77	45°21'35"	110°20'59"	11	.28	2.5455	11	95	4	<.5	7.50	.1	12.0	--
31-D77	45°19' 8"	110°12' 2"	15	.12	.8000	82	14	4	<.5	7.30	.3	3.5	<.0005
32-D77	45°18'45"	110°10'44"	36	.53	1.4722	11	100	13	2.0	7.45	.1	5.0	<.0022
33-D77	45°18'45"	110°10'40"	26	1.10	4.2308	14	100	10	<.5	7.50	.1	5.0	<.0022
34-D77	45°19'47"	110°11'53"	38	5.10	13.4211	25	100	19	<.5	7.25	.1	2.5	<.0052
35-D77	45°20'48"	110°12'51"	36	1.40	3.6842	3	105	15	12.0	6.80	.1	7.5	<.0038
36-D77	45°20'46"	110°12'55"	67	.34	.5075	5	100	29	24.0	7.55	.1	9.0	.0130
37-D77	45°20'23"	110°14'30"	100	.10	.1000	11	80	46	34.0	7.65	.1	8.5	<.0120
38-D77	45°20'23"	110°14'30"	37	.28	.7568	7	70	15	8.0	7.10	.1	9.5	<.0052
39-D77	45°25'27"	110°24'20"	26	.63	3.1923	7	60	9	2.0	6.70	.1	5.0	<.0021
40-D77	45°25'27"	110°24'24"	26	.39	1.3929	34	70	22	<.5	6.75	.1	5.0	<.0035

*The symbol "--" indicates the sample was not analyzed for the appropriate variable, and "<" indicates the value was reported as less than the adjacent value. See table 2 for an explanation of abbreviations, analytical methods, and detection limits.

**The first two digits of the sample number describe the sample location number (see table 1); the last three characters refer to the study code and year of collection.

Table 3--continued

sample	Latt	Long	Cond-Fld	U - F	U/Cond	Alk- L	Eh-Fld	Hardness	HardNonC	pH-Fld	SAR	h20 Temp	Ag - S
41-D77	45°25'12"	110°20'55"	37	3.40	9.1892	6	115	13	8.0	6.85	.1	5.0	<.0021
42-D77	45°25' 9"	110°20'59"	30	2.80	9.3333	3	105	16	13.0	7.00	.1	5.5	<.0020
43-D77	45°20'51"	110°10'56"	190	.70	.3684	13	95	90	77.0	8.20	.1	8.0	<.0200
44-D77	45°20'48"	110°10'54"	39	.92	2.3590	16	75	19	2.0	7.25	.1	8.0	<.0043
45-D77	45°21' 9"	110° 6'28"	11	.14	1.2727	27	40	5	<.5	6.55	.2	6.0	--
46-D77	45°21' 6"	110° 6'24"	26	1.50	5.7692	4	55	11	7.0	6.90	.1	4.5	<.0032
47-D77	45°21'27"	110° 6'28"	145	.49	.3379	9	145	72	63.0	8.10	.1	7.5	<.0150
48-D77	45°21'58"	110° 5'51"	32	.04	.1250	7	150	10	2.0	6.80	.2	8.0	<.0037
49-D77	45°22' 0"	110° 5'47"	36	1.30	3.6111	2	150	16	13.0	7.45	.1	7.0	<.0035
50-D77	45°18'47"	110° 5'55"	36	2.10	5.8333	6	90	14	8.0	7.35	.1	9.0	<.0035
51-D77	45°18'47"	110° 5'57"	19	.78	4.1053	3	80	9	5.0	7.05	.1	9.0	--
52-D77	45°22'50"	110°18'40"	20	.44	2.2000	27	20	6	<.5	6.75	.1	4.5	<.0019
53-D77	45°23' 3"	110°18'10"	43	3.80	8.8372	10	60	19	9.0	7.50	.1	7.5	<.0047
54-D77	45°22'59"	110°18'10"	26	.74	2.8462	14	60	11	<.5	7.30	.1	7.5	<.0017
55-D77	45°23' 6"	110°17'16"	26	.54	2.0769	7	85	10	2.0	7.10	.1	6.0	<.0013
56-D77	45°23'37"	110°15'18"	58	2.60	4.4828	12	80	21	9.0	7.45	.1	9.0	<.0018
57-D77	45°23'37"	110°15'15"	34	1.36	4.0000	16	75	13	<.5	7.50	.2	10.5	<.0026
58-D77	45°23'12"	110°16'17"	34	1.00	2.9412	7	120	22	15.0	7.30	.1	8.0	<.0030
59-D77	45°23'16"	110°16'20"	34	1.30	3.8235	11	115	13	2.0	7.40	.1	11.5	<.0023
60-D77	45°18' 6"	110° 8'56"	25	1.90	7.6000	44	65	11	<.5	7.65	.1	9.0	.0034
61-D77	45°18' 2"	110°12'19"	24	.43	1.7917	12	210	8	<.5	7.45	.1	11.5	<.0027
62-D77	45°21'27"	110°12'23"	43	1.00	2.3256	11	245	17	6.0	7.65	.1	10.0	<.0035

Table 3--continued

sample	B - S µg/L	Ba - S µg/L	Be - S µg/L	Bi - S µg/L	bicarb mg/L	InorgC mg/L	Org C mg/L	Ca - A mg/L	Cd - A µg/L	Cl - L mg/L	Co - S µg/L	Cr - S µg/L
1-D77	2.70	6.60	<.0240	<.350	10	1.5	1.50	2.8	<1.0	.20	<.0240	.160
2-D77	6.20	12.00	<.0240	<.360	13	1.9	.10	1.5	<1.0	.20	<.0240	.130
3-D77	1.30	7.70	<.0240	<.350	82	4.2	.50	11.0	<1.0	.40	<.0240	.055
4-D77	1.70	6.70	<.0180	<.270	17	2.2	.80	2.1	<1.0	.30	<.0180	.053
5-D77	1.00	4.90	<.0120	<.180	4	2.1	.40	1.6	<1.0	.20	<.0120	.014
6-D77	1.20	4.10	<.0210	<.310	11	2.9	.90	3.9	<1.0	.40	<.0210	.040
7-D77	.93	3.90	<.0210	<.310	3	2.6	.40	3.5	<1.0	.20	<.0210	.066
8-D77	1.60	3.30	<.0170	<.250	32	1.5	.30	3.1	<1.0	.30	<.0170	.066
9-D77	2.60	12.00	<.0240	<.350	10	2.8	.50	3.4	<1.0	.30	<.0240	.130
10-D77	1.30	12.00	<.0310	<.450	11	4.1	.40	5.1	<1.0	.10	<.0310	.072
11-D77	3.00	10.00	<.0400	<.590	7	3.0	.70	3.9	<1.0	.50	<.0400	.090
12-D77	1.60	17.00	<.0600	<.880	14	6.4	.70	6.8	<1.0	.10	<.0600	.093
13-D77	2.00	8.80	<.0380	<.550	18	2.8	.80	3.4	<1.0	.30	<.0380	.060
14- 77	1.40	20.00	<.0760	<1.100	12	6.1	.70	6.9	1.5	.10	<.0760	.100
15-D77	2.10	2.90	<.0340	<.490	5	--	--	3.8	<1.0	.20	<.0340	.050
16-D77	1.70	23.00	<.0750	<1.100	17	7.1	.50	7.1	<1.0	.20	<.0750	.090
17- 77	1.40	5.40	<.0310	<.450	7	2.6	1.00	2.2	1.3	.20	<.0310	.053
18-D77	2.30	21.00	<.0550	<.810	58	6.3	.40	--	1.3	.10	<.0550	.130
19- 77	2.30	32.00	<.0790	<1.200	8	8.3	1.20	12.0	<1.0	<.05	<.0790	.170
20-D77	1.80	9.10	<.0410	<.600	13	3.4	1.50	3.5	<1.0	.70	<.0410	.220
21-D77	2.90	60.00	<.1100	<1.700	8	11.0	.60	9.4	<1.0	.20	<.1100	.210
22-D77	.34	7.50	<.0260	<.380	32	4.3	.40	5.7	<1.0	.10	<.0260	.026
23-D77	2.80	19.00	<.0770	<1.100	25	6.9	.60	--	<1.0	.30	<.0770	.120
24-D77	.58	1.80	<.0096	<.140	14	1.9	.20	1.3	<1.0	.20	.0280	.028
25-D77	.41	4.80	<.0200	<.300	10	1.8	.80	2.2	<1.0	.30	<.0200	<.020
26-D77	1.70	15.00	<.0310	<.460	16	--	--	--	<1.0	.40	<.0310	.100
27-D77	.61	4.80	<.0160	<.240	11	3.7	.40	2.7	<1.0	.30	<.0160	.046
28-D77	.62	3.90	<.0140	<.200	36	2.8	.50	4.2	<1.0	.20	.0430	.039
29-D77	--	--	--	--	9	.6	.50	6.1	1.3	.40	--	--
30-D77	--	--	--	--	14	1.6	2.70	1.1	<1.0	.10	--	--
31-D77	.83	.95	<.0059	<.087	100	--	--	1.1	<1.0	.20	<.0059	.047
32-D77	1.20	14.00	<.0220	<.320	13	2.2	.20	3.2	<1.0	.30	<.0220	.058
33-D77	.30	1.70	<.0220	<.330	17	--	--	2.9	<1.0	.10	<.0220	.015
34-D77	2.30	17.00	<.0520	<.770	31	3.8	.30	5.8	17.0	.30	<.0520	.150
35-D77	4.20	6.90	<.0380	<.550	4	3.8	2.00	4.3	<1.0	.20	<.0380	.260
36-D77	2.40	25.00	<.0680	<1.000	6	6.4	2.30	7.6	<1.0	.20	<.0680	.120
37-D77	3.60	42.00	<.1200	<1.700	14	11.0	2.00	12.0	<1.0	.30	<.1200	.230
38-D77	2.80	27.00	<.0520	<.760	8	3.5	1.20	4.0	<1.0	.20	<.0520	.099
39-D77	1.30	9.40	<.0210	<.300	9	2.5	.40	3.4	<1.0	.40	<.0210	.120
40-D77	1.80	12.00	<.0350	<.510	41	2.2	.60	8.0	<1.0	.40	<.0350	.130

Table 3--continued

sample	B - S	Ba - S	Be - S	Bi - S	Bicarb	InorgC	Org C	Ca - A	Cd - A	Cl - L	Co - S	Cr - S
41-077	.84	5.70	<.0210	<.320	7	3.2	2.10	4.7	<1.0	.30	<.0210	.098
42-077	1.20	5.50	<.0200	<.300	4	2.9	.60	6.1	<1.0	.30	<.0200	.096
43-077	5.90	63.00	<.2000	<2.900	16	18.0	1.40	27.0	<1.0	.30	<.2000	.530
44-077	1.60	8.30	<.0430	<.640	20	4.4	.60	5.3	<1.0	.30	<.0430	.730
45-077	--	--	--	--	33	--	1.40	1.9	<1.0	.20	--	--
46-077	1.80	7.80	<.0320	<.470	5	3.2	2.00	2.9	<1.0	.20	<.0320	.170
47-077	2.80	60.00	<.1500	<2.200	11	9.4	2.30	23.0	<1.0	.20	<.1500	.600
48-077	.45	5.90	<.0370	<.540	9	2.4	2.10	2.5	<1.0	.10	<.0370	<.037
49-077	1.70	11.00	<.0350	<.520	3	3.1	.70	4.7	<1.0	.30	<.0350	.260
50-077	1.40	4.60	<.0350	<.520	7	2.8	.40	3.2	<1.0	.30	<.0350	.110
51-077	--	--	--	--	4	1.4	.40	2.8	<1.0	.20	--	--
52-077	1.00	7.00	<.0190	<.290	33	1.1	.10	1.9	<1.0	.20	.1900	.057
53-077	1.20	12.00	<.0470	<.690	12	4.1	.50	7.0	<1.0	.40	<.0470	.160
54-077	.55	3.90	<.0170	<.250	17	2.1	1.70	3.6	<1.0	.20	.0240	.068
55-077	.62	7.30	<.0130	<.200	9	2.3	<.05	3.5	<1.0	.10	<.0130	.064
56-077	.93	1.40	<.0180	<.260	15	5.5	1.10	6.7	<1.0	.20	<.0180	.068
57-077	1.00	7.60	<.0260	<.380	20	3.8	.40	4.2	<1.0	.10	<.0260	.150
58-077	1.50	5.50	<.0300	<.450	9	2.0	.80	8.3	<1.0	.20	<.0300	.066
59-077	.82	6.30	<.0230	<.340	13	3.5	.60	4.5	<1.0	.20	<.0230	.044
60-077	1.90	7.20	<.0290	<.430	54	3.0	<.05	3.0	1.8	.20	<.0290	.190
61-077	1.30	2.40	<.0270	<.390	15	1.4	.40	1.6	<1.0	.30	<.0270	.092
62-077	1.40	11.00	<.0350	<.520	13	2.6	12.00	4.5	<1.0	.30	<.0350	.100

Table 3--continued

sample	Cu - S µg/l	F - L mg/l	Fe - L µg/l	Ga - S µg/l	Ge - S µg/l	K - A mg/l	Mg - A mg/l	Mo - S µg/l	Na - A mg/l	Na %	Ni - S µg/l	NO2+ NO3 mg/l
1-D77	.95	.1	<10	<.0350	<.0350	.1	.3	<.051	.6	14	.300	<.005
2-D77	.92	.4	10	<.0360	<.0360	.1	.4	<.053	.5	16	.066	.040
3-D77	.60	<.1	10	<.0350	<.0350	.5	.6	.520	1.4	9	.290	<.005
4-D77	.42	.1	10	<.0270	<.0270	.2	.5	.048	.6	15	.045	<.005
5-D77	.34	.1	<10	<.0180	<.0180	.2	.2	.095	.7	23	.024	.010
6-D77	.53	.4	10	<.0310	<.0310	.3	.3	.180	.9	15	.340	.030
7-D77	.16	<.1	10	<.0310	<.0310	.2	.2	.170	.9	17	.033	<.005
8-D77	.65	<.1	<10	<.0250	<.0250	.4	.3	.079	.8	16	.044	.100
9-D77	.51	.4	<10	<.0350	<.0350	.5	.8	.400	.7	11	.077	.040
10-D77	.76	<.1	10	<.0450	<.0450	.8	1.6	.270	.8	8	.290	.060
11-D77	.61	.3	<10	<.0590	<.0590	.4	.7	1.600	1.0	14	.065	.050
12-D77	1.30	<.1	10	<.0880	<.0880	.8	2.0	.210	1.5	11	1.300	<.005
13-D77	.54	.1	10	<.0550	<.0550	.2	.4	.710	1.2	20	<.055	<.005
14-D77	.65	<.1	10	<.1100	<.1100	.8	2.1	.220	1.6	11	<.110	<.005
15-D77	.41	.1	<10	<.0490	<.0490	.5	.6	2.000	1.4	19	<.049	<.005
16-D77	.61	<.1	10	<.1100	<.1100	.7	2.2	.230	1.9	13	<.110	<.005
17-D77	.39	<.1	10	<.0450	<.0450	.5	.6	.100	1.1	22	.077	<.005
18-D77	1.30	<.1	--	<.0810	<.0810	--	--	.350	--	--	.250	<.005
19-D77	1.20	.1	40	<.1200	<.1200	1.2	2.9	12.000	2.3	10	.170	<.005
20-D77	.43	<.1	10	<.0600	<.0600	.4	.7	.640	1.0	15	<.060	<.005
21-D77	.43	<.1	200	<.1700	<.1700	.7	4.8	<.240	2.5	11	<.170	<.005
22-D77	.24	.1	10	<.0380	<.0380	.4	1.4	<.055	1.2	11	<.038	.010
23-D77	.75	<.1	--	<.1100	<.1100	--	--	.300	--	--	<.110	<.005
24-D77	.12	.4	<10	<.0140	<.0140	.1	.2	<.021	.4	17	.025	.040
25-D77	.17	<.1	10	<.0300	<.0300	.2	.4	<.043	.6	15	<.030	<.005
26-D77	.81	.4	10	<.0460	<.0460	.7	--	.200	--	--	.340	.020
27-D77	.41	<.1	10	<.0240	<.0240	.4	1.3	<.035	.6	9	.100	<.005
28-D77	.33	<.1	10	<.0200	<.0200	.4	.6	<.029	.6	9	.092	<.005
29-D77	--	<.1	10	--	--	.2	.2	--	.4	5	--	<.005
30-D77	--	<.1	10	--	--	.1	.2	--	.4	19	--	<.005
31-D77	.21	.1	10	<.0087	<.0087	.2	.2	.021	1.4	44	.076	<.005
32-D77	.53	.3	10	<.0320	<.0320	.7	1.2	.240	.7	10	.280	.070
33-D77	.23	.2	30	<.0330	<.0330	.5	.6	<.048	.7	13	<.033	.050
34-D77	1.10	.2	<10	<.0770	<.0770	.4	1.2	2.100	1.0	10	.110	.080
35-D77	1.00	<.1	10	<.0550	<.0550	.4	1.1	1.200	1.2	14	.800	<.005
36-D77	.63	<.1	20	<.1000	<.1000	.9	2.5	.310	1.7	11	.350	<.005
37-D77	1.30	.2	<10	<.1700	<.1700	1.4	3.8	<.250	1.4	6	.580	<.005
38-D77	.65	<.1	20	<.0760	<.0760	.7	1.1	.180	1.3	16	.130	<.005
39-D77	.53	.1	10	<.0300	<.0300	.7	.2	.140	.6	11	.220	.050
40-D77	.85	<.1	10	<.0510	<.0510	.7	.6	.150	.6	5	.130	.080

Table 3--continued

sample	Cu - S	F - L	Fe - L	Ga - S	Ge - S	K - A	Mg - A	Mo - S	Na - A	Na %	Ni - S	N02+ N03
41-D77	.42	<.1	20	<.0320	<.0320	.4	.4	2.700	1.0	14	.044	.010
42-D77	.50	<.1	10	<.0300	<.0300	.4	.3	.370	.9	10	.040	.030
43-D77	.80	.2	<10	<.2900	<.2900	1.5	5.4	1.500	1.6	4	1.100	.040
44-D77	.36	<.1	10	<.0640	<.0640	.5	1.3	.200	.9	9	<.064	.050
45-D77	--	<.1	10	--	--	.1	.1	--	.8	25	--	<.005
46-D77	.89	<.1	30	<.0470	<.0470	.5	.9	1.300	.7	12	.860	.060
47-D77	.29	<.1	10	<.2200	<.2200	.5	3.5	.410	1.0	3	<.220	<.005
48-D77	.83	<.1	10	<.0540	<.0540	.5	.8	<.080	1.6	26	.160	.030
49-D77	.45	<.1	10	<.0520	<.0520	.4	1.0	.600	.9	11	<.052	.030
50-D77	.58	<.1	<10	<.0520	<.0520	.6	1.4	.640	.8	11	.065	.040
51-D77	--	<.1	<10	--	--	.3	.4	--	.6	13	--	.040
52-D77	.72	<.1	<10	<.0290	<.0290	.5	.2	.095	.6	17	.640	.080
53-D77	.46	.1	10	<.0690	<.0690	.3	.3	5.900	1.2	12	<.069	.030
54-D77	.28	.1	10	<.0250	<.0250	.3	.4	.069	.8	14	.048	.030
55-D77	.33	<.1	10	<.0200	<.0200	.4	.2	.120	.6	11	.054	.110
56-D77	.16	<.1	10	<.0260	<.0260	.8	1.1	2.500	1.5	13	<.026	<.005
57-D77	1.20	.8	10	<.0380	<.0380	.5	.7	1.700	1.3	17	.850	.030
58-D77	1.10	.2	<10	<.0450	<.0450	.3	.4	1.100	1.2	10	.230	.050
59-D77	.28	<.1	10	<.0340	<.0340	.4	.4	.620	1.0	14	<.034	.020
60-D77	.68	<.1	10	<.0430	<.0430	.5	.8	.540	.7	12	.059	.040
61-D77	.96	<.1	30	<.0390	<.0390	.5	.9	.350	.9	19	1.000	--
62-D77	.79	.3	<10	<.0520	<.0520	.7	1.3	.200	1.0	11	.370	.040

Table 3--continued

sample	P - L mg/L	Pb - S µg/L	PO4- L mg/L	SiO2-L mg/L	Sn - S µg/L	SO4- L mg/L	Sr - S µg/L	Ti - S µg/L	V - S µg/L	Zn - A µg/L	Zr - S µg/L
1-D77	<.005	2.400	<.005	7.3	<.0350	1.0	3.8	<1.60	.069	46	<.110
2-D77	.010	1.300	.030	4.3	<.0360	1.8	10.0	<1.70	.110	<20	<.110
3-D77	.010	.340	.030	4.6	<.0350	3.7	9.5	<1.60	.100	<20	<.110
4-D77	<.005	.160	<.005	3.8	<.0270	4.8	4.3	<1.20	.087	<20	<.064
5-D77	<.005	<.084	<.005	3.1	<.0180	1.4	7.9	<.84	.019	46	<.058
6-D77	.010	.160	.030	4.8	<.0310	2.0	5.4	<1.40	.022	<20	<.097
7-D77	.010	<.150	.030	1.7	<.0310	<1.0	6.9	<1.50	.026	<20	<.099
8-D77	.010	<.120	.030	9.0	<.0250	2.9	5.8	<1.20	.069	<20	<.078
9-D77	<.005	1.200	<.005	3.4	<.0350	1.2	6.6	<1.60	.050	<20	<.110
10-D77	.020	.320	.060	3.0	<.0450	1.5	14.0	<2.10	.054	<20	<.140
11-D77	.010	.360	.030	4.2	<.0590	1.8	15.0	<2.70	<.040	40	<.190
12-D77	.010	.450	.030	2.0	<.0880	.8	26.0	<4.10	.220	<20	<.280
13-D77	<.005	.290	<.005	4.3	<.0550	2.4	16.0	<2.60	.045	<20	<.170
14-D77	.020	<.520	.060	3.2	<.1100	1.8	27.0	<5.20	.240	<20	<.350
15-D77	<.005	.260	<.005	6.4	<.0490	.8	4.5	<2.30	.072	<20	<.160
16-D77	.020	<.510	.060	4.1	<.1100	3.2	35.0	<5.10	.350	<20	<.350
17-D77	<.005	<.210	<.005	2.5	<.0450	.6	7.0	<2.10	.046	22	<.140
18-D77	.020	<.380	.060	14.0	<.0810	1.9	32.0	<3.80	.380	<20	<.260
19-D77	.020	.590	.060	2.6	<.0012	2.2	110.0	<5.40	.120	<20	<.370
20-D77	<.005	<.280	<.005	4.8	<.0600	1.4	19.0	<2.80	.053	<20	<.190
21-D77	.020	<.760	.060	1.6	<.1700	.6	160.0	<7.60	.820	<20	<.520
22-D77	.020	<.170	.060	9.1	<.0380	1.9	11.0	<1.70	.038	<20	<.120
23-D77	.010	1.600	.030	8.8	<.1100	1.1	27.0	<5.20	.270	<20	<.360
24-D77	.050	.570	.150	9.0	<.0140	1.9	2.6	<.65	.039	<20	<.045
25-D77	.010	.210	.030	1.9	<.0300	.9	6.9	<1.40	<.020	<20	<.093
26-D77	.010	.840	.030	5.7	<.0460	1.4	14.0	<2.10	.063	<20	<.140
27-D77	.020	.310	.060	3.0	<.0240	3.7	5.1	<1.10	.033	<20	<.076
28-D77	.010	1.900	.030	10.0	<.0200	2.1	4.3	<.93	.025	<20	<.063
29-D77	.010	--	.030	3.3	--	1.4	--	--	--	<20	--
30-D77	.020	--	.060	3.3	--	2.0	--	--	--	<20	--
31-D77	.020	.480	.060	6.8	<.0087	7.4	.9	<.40	.023	<20	<.027
32-D77	.090	.310	.280	3.8	<.0320	1.9	12.0	<1.50	.031	<20	<.100
33-D77	.010	<.150	.030	6.2	<.0330	.8	2.8	<1.50	<.022	<20	<.100
34-D77	.010	<.360	.030	8.9	<.0770	2.0	10.0	<3.60	.065	<20	<.240
35-D77	.030	.330	.090	3.2	<.0550	.8	12.0	<2.60	.130	<20	<.170
36-D77	.020	<.460	.060	2.3	<.1000	.8	34.0	<4.60	.390	<20	<.320
37-D77	.020	<.790	.060	4.1	<.1700	1.4	67.0	<7.90	.600	<20	<.540
38-D77	<.005	<.350	<.005	2.8	<.0760	.9	14.0	<3.50	.150	29	<.240
39-D77	.010	.170	.030	5.9	<.0300	1.2	15.0	<1.40	.082	22	<.096
40-D77	.010	<.240	.030	8.5	<.0510	7.8	13.0	<2.40	.084	<20	<.160

Table 3--continued

samcle	P - L	Pb - S	P04- L	Si02-L	Sn - S	S04- L	Sr - S	Ti - S	V - S	Zn - A	Zr - S
41-077	<.005	.380	<.005	5.1	<.0320	2.2	20.0	<1.50	.078	<20	<.099
42-077	.020	<.140	.060	4.3	<.0300	.7	12.0	<1.40	.027	<20	<.094
43-077	.010	<1.400	.030	4.8	<.2900	2.9	150.0	<14.00	.750	29	.950
44-077	.010	.890	.030	5.5	<.0640	1.1	11.0	<2.90	.057	<20	<.200
45-077	.010	--	.030	9.0	--	1.5	--	--	--	<20	--
46-077	<.005	1.100	<.005	1.9	<.0470	1.8	13.0	<2.20	.059	29	<.150
47-077	.010	2.200	.030	2.9	<.2200	1.4	200.0	<10.00	.390	<20	<.690
48-077	<.005	<.250	<.005	2.2	<.0540	.8	1.0	<2.50	.065	<20	<.170
49-077	.010	<.240	.030	1.9	<.0520	1.2	9.2	<2.40	.059	<20	<.160
50-077	.010	.260	.030	2.2	<.0520	1.0	7.8	<2.40	.100	<20	<.160
51-077	.010	--	.030	1.3	--	.3	--	--	--	<20	--
52-077	.010	<.130	.030	9.0	<.0290	2.0	10.0	<1.30	.069	<20	<.090
53-077	.010	<.320	.030	9.8	<.0690	1.5	24.0	<3.20	.082	<20	<.220
54-077	.010	.370	.030	7.8	<.0250	2.5	7.5	<1.10	.043	<20	<.078
55-077	.020	<.091	.060	2.6	<.0200	2.3	9.3	<.91	.044	<20	<.062
56-077	<.005	<.120	<.005	3.8	<.0260	1.5	5.6	<1.20	.068	<20	<.083
57-077	.020	<.170	.060	4.8	<.0380	1.4	9.9	<1.70	.056	<20	<.120
58-077	.010	<.210	.030	3.9	<.0450	1.0	18.0	<2.10	.037	22	<.140
59-077	.010	.180	.030	3.3	<.0340	1.2	12.0	<1.60	.052	<20	<.110
60-077	.020	<.200	.060	11.0	<.0430	2.1	13.0	<2.00	.076	<20	<.140
61-077	--	<.160	--	3.3	<.0390	1.0	1.8	<1.80	.048	<20	<.120
62-077	.010	<.240	.030	4.5	<.0520	1.3	12.0	<2.40	.052	<20	<.160

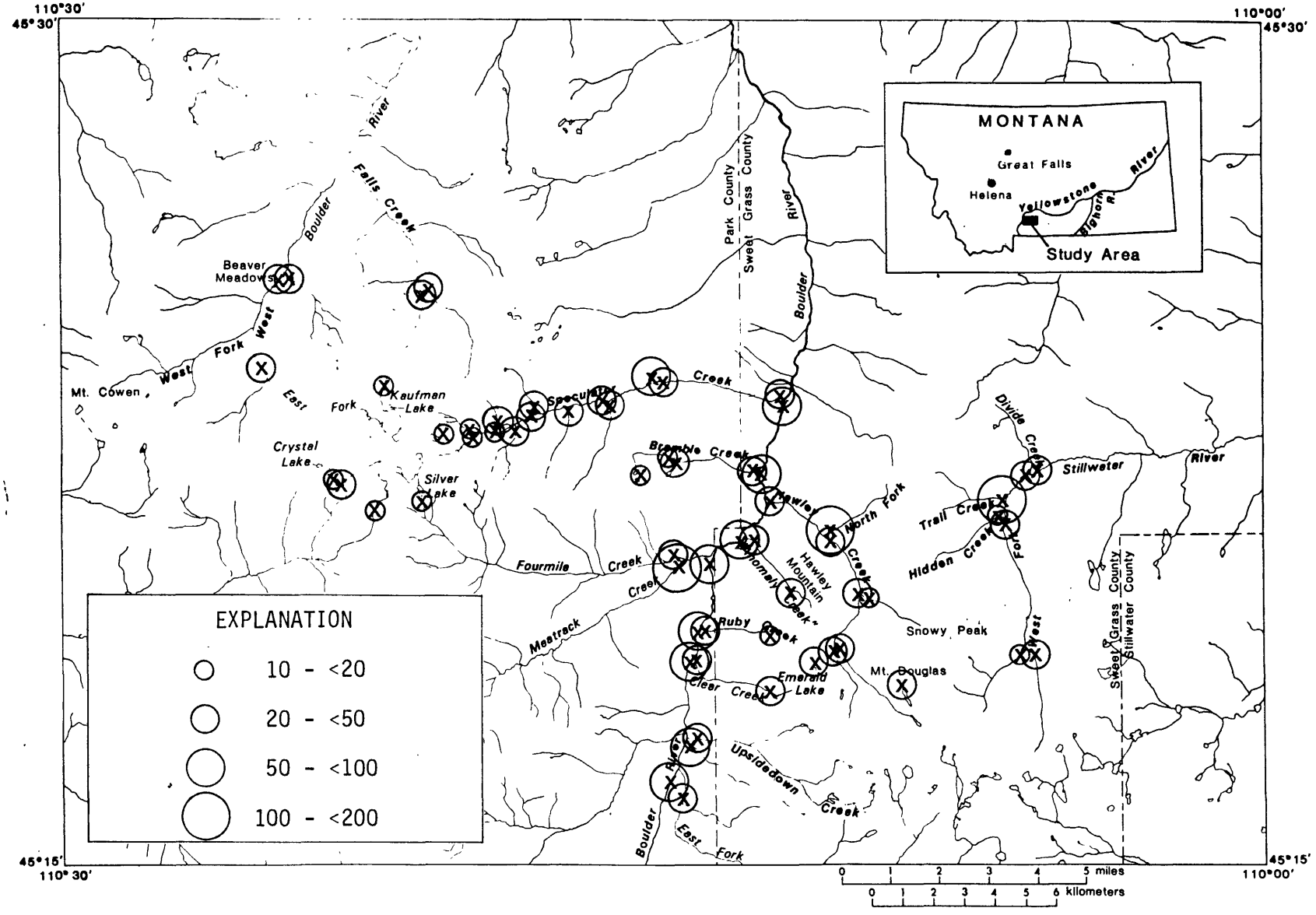

Figure 2-1.--Conductivity data (μmhos/cm) at sample sites ("X").

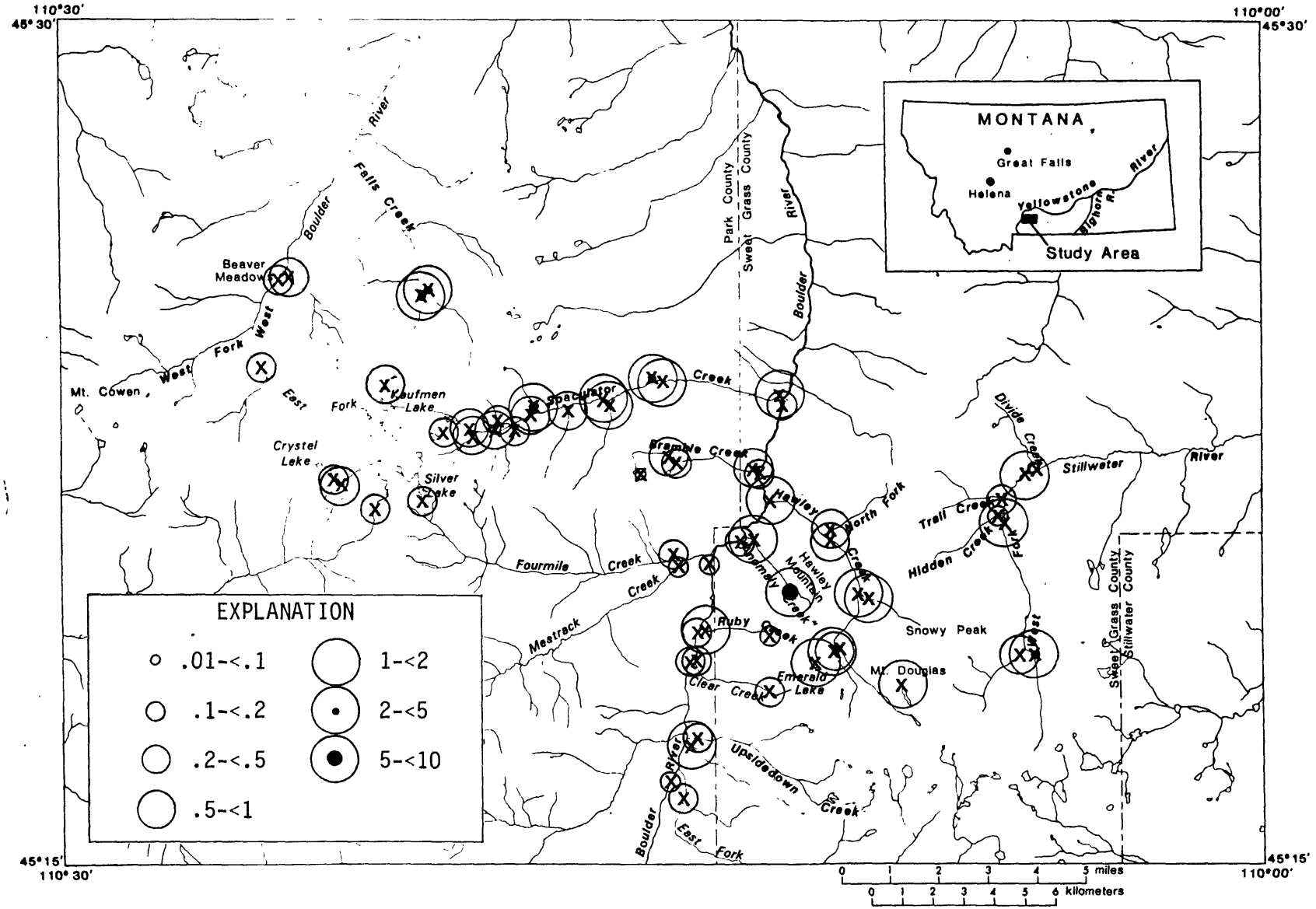

Figure 2-2.--Uranium data (μg/ℓ) at sample sites ("X").

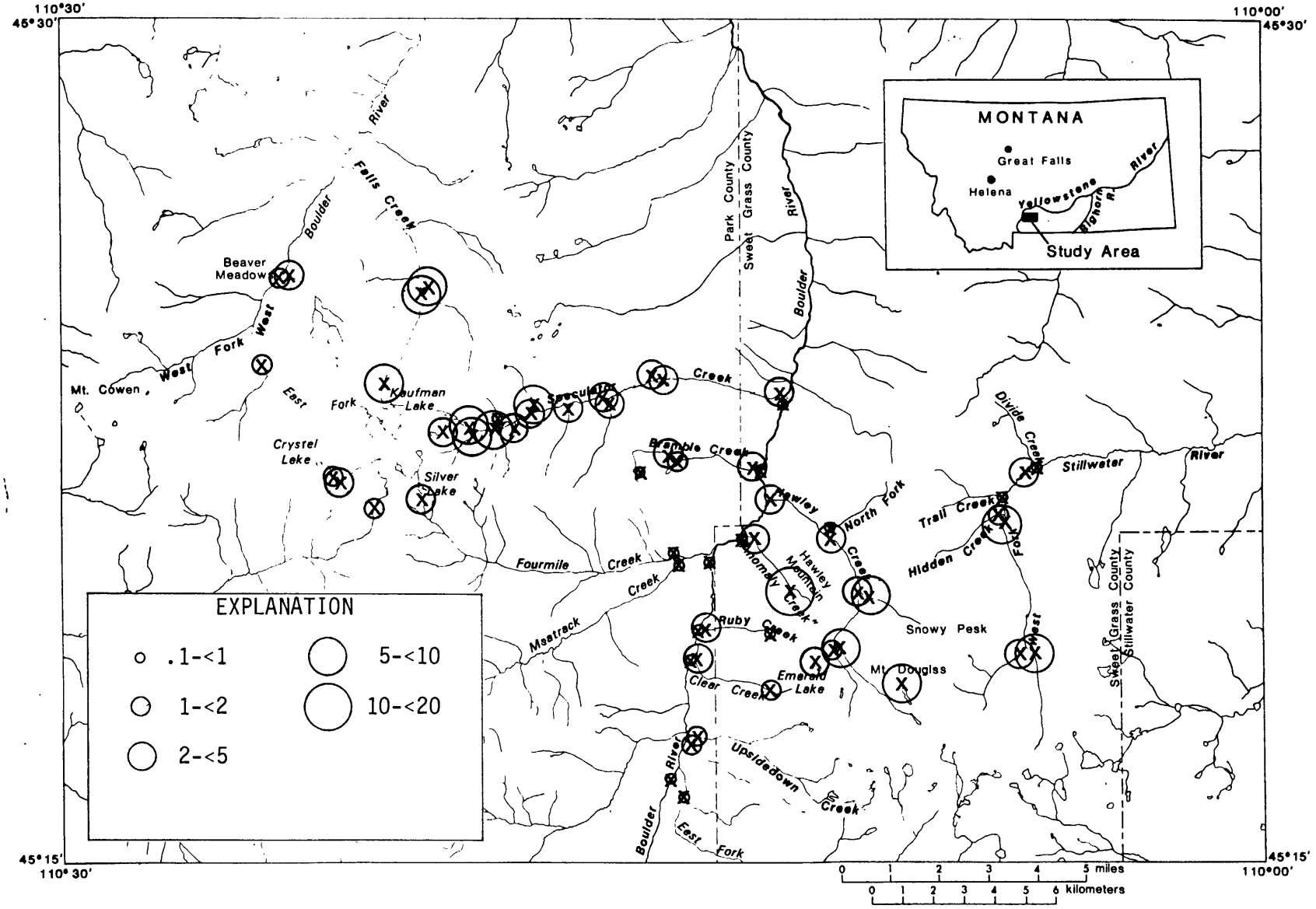

Figure 2-3.--Normalized uranium data (µgcm/ℓµmhos) at sample sites ("X").

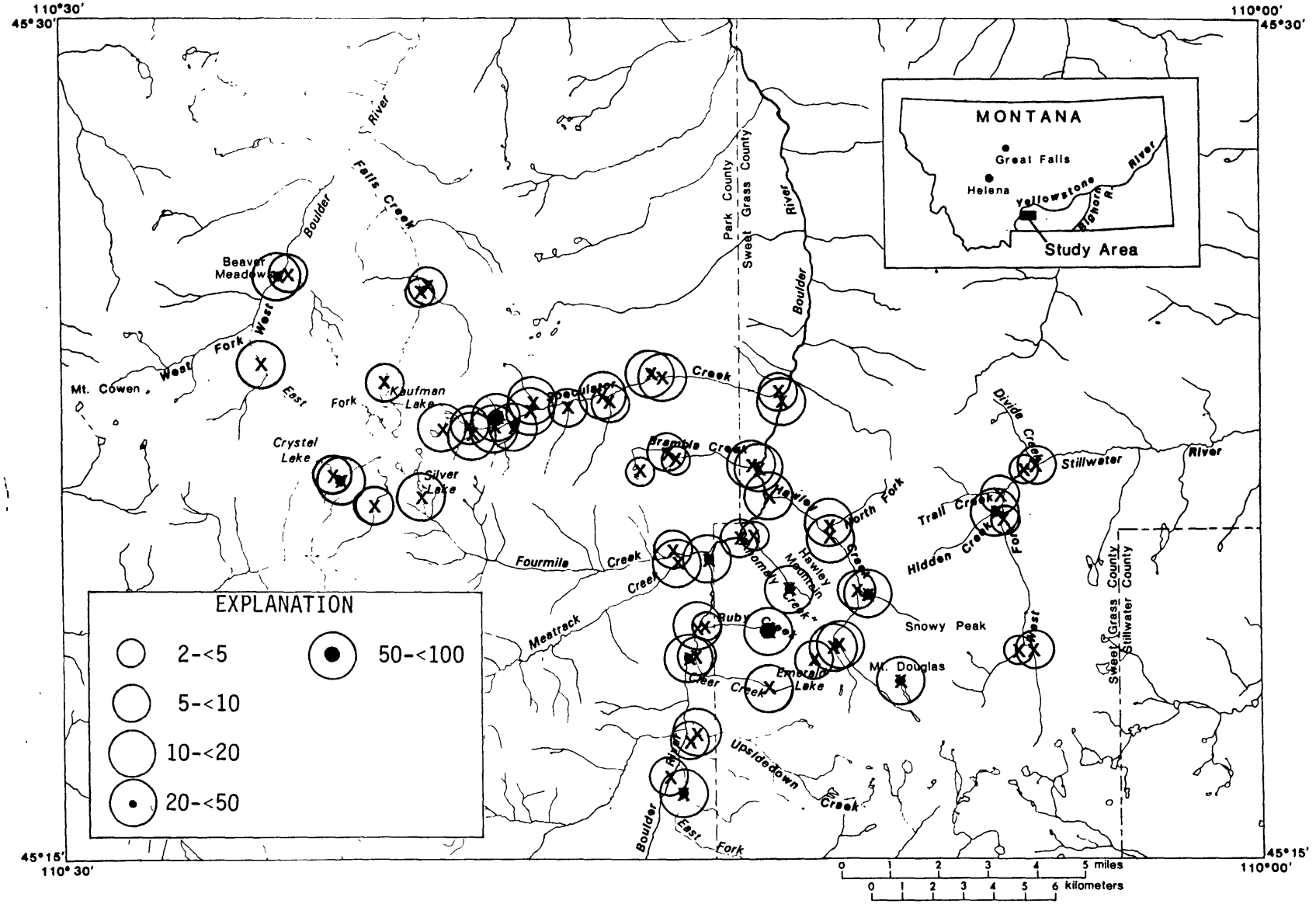

Figure 2-4.--Alkalinity data (mg/ℓ) at sample sites ("X").

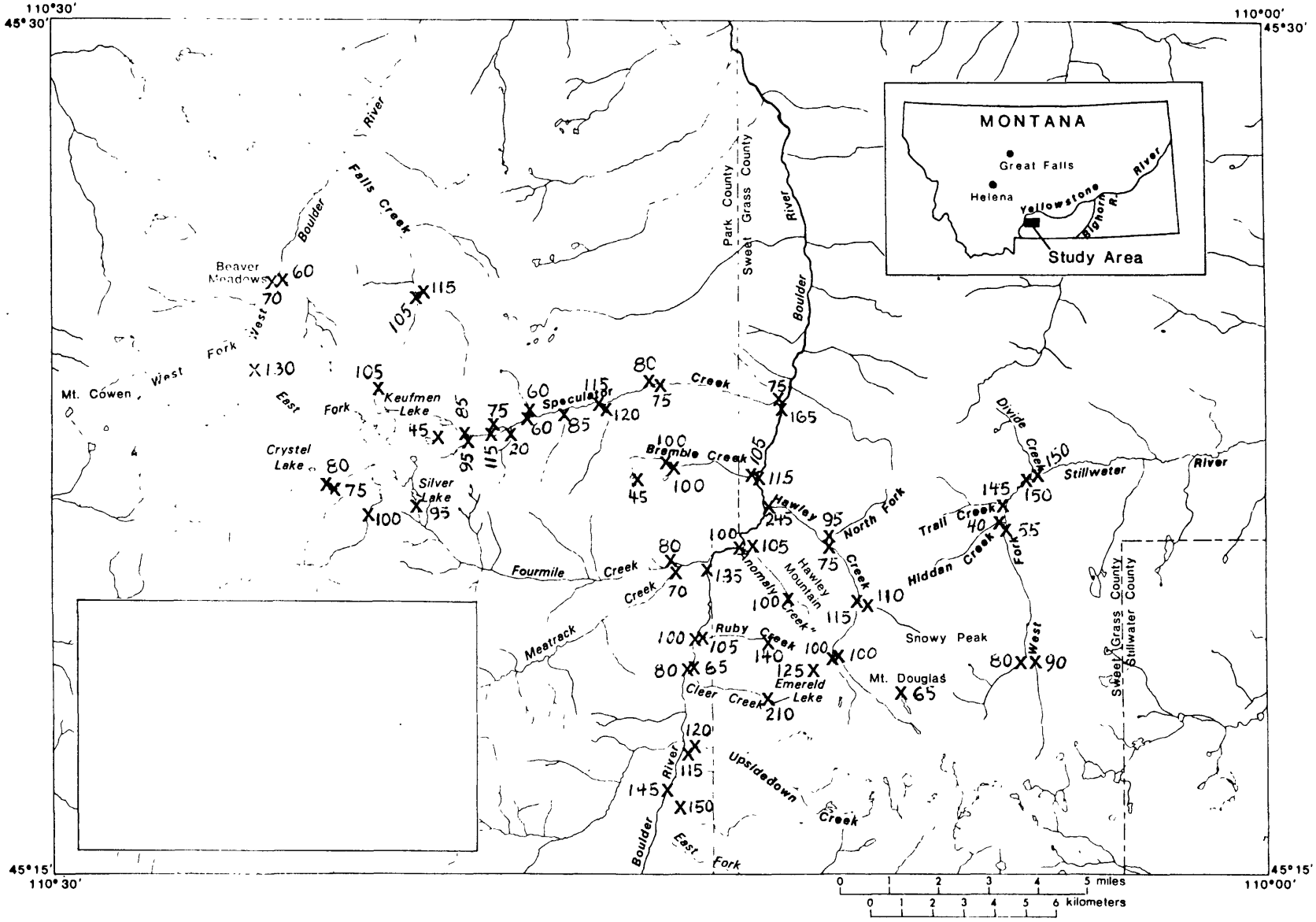

Figure 2-5.--Eh data (mv) at sample sites ("X").

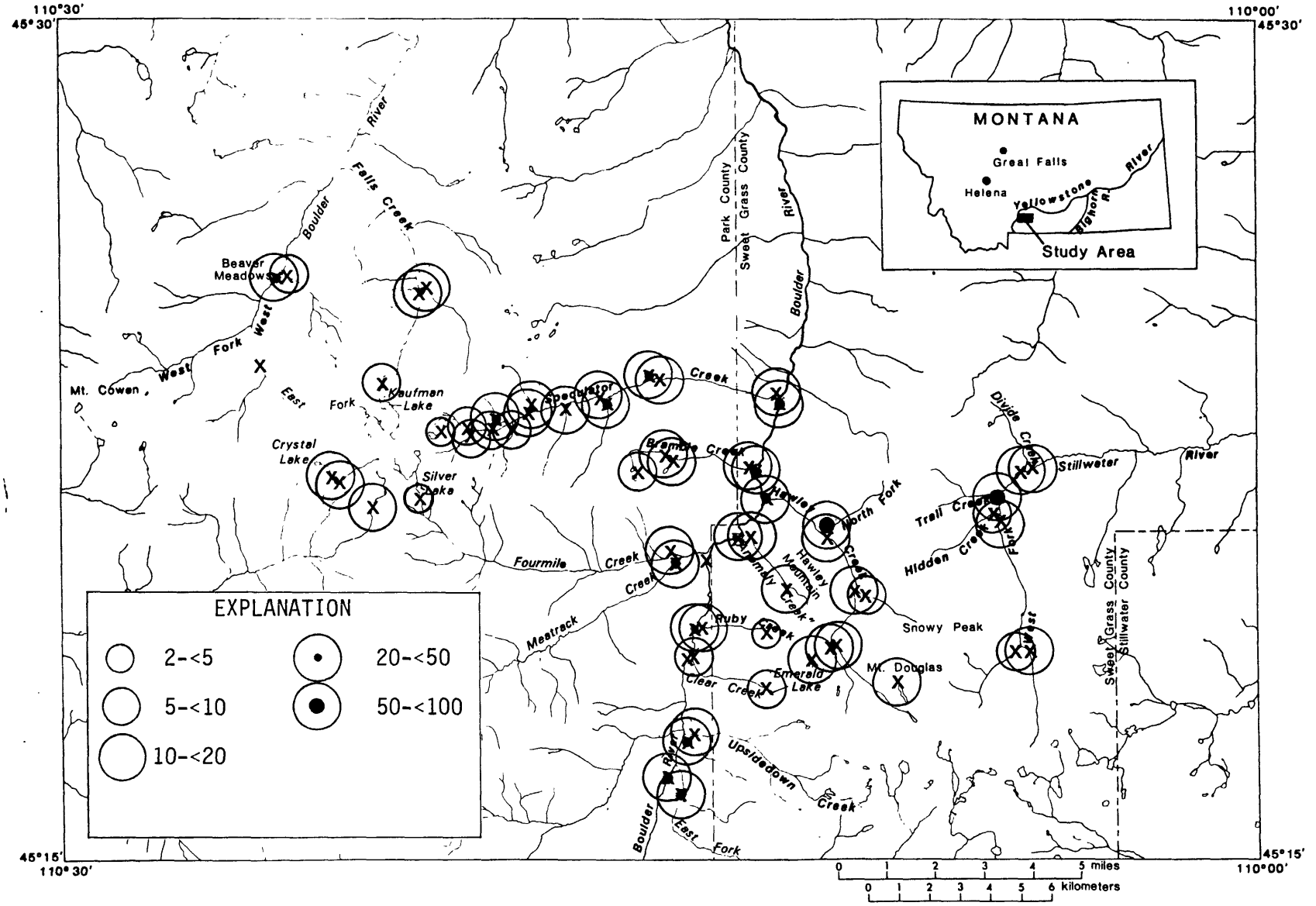

Figure 2-6.--Hardness data (mg/ℓ) at sample sites ("X").

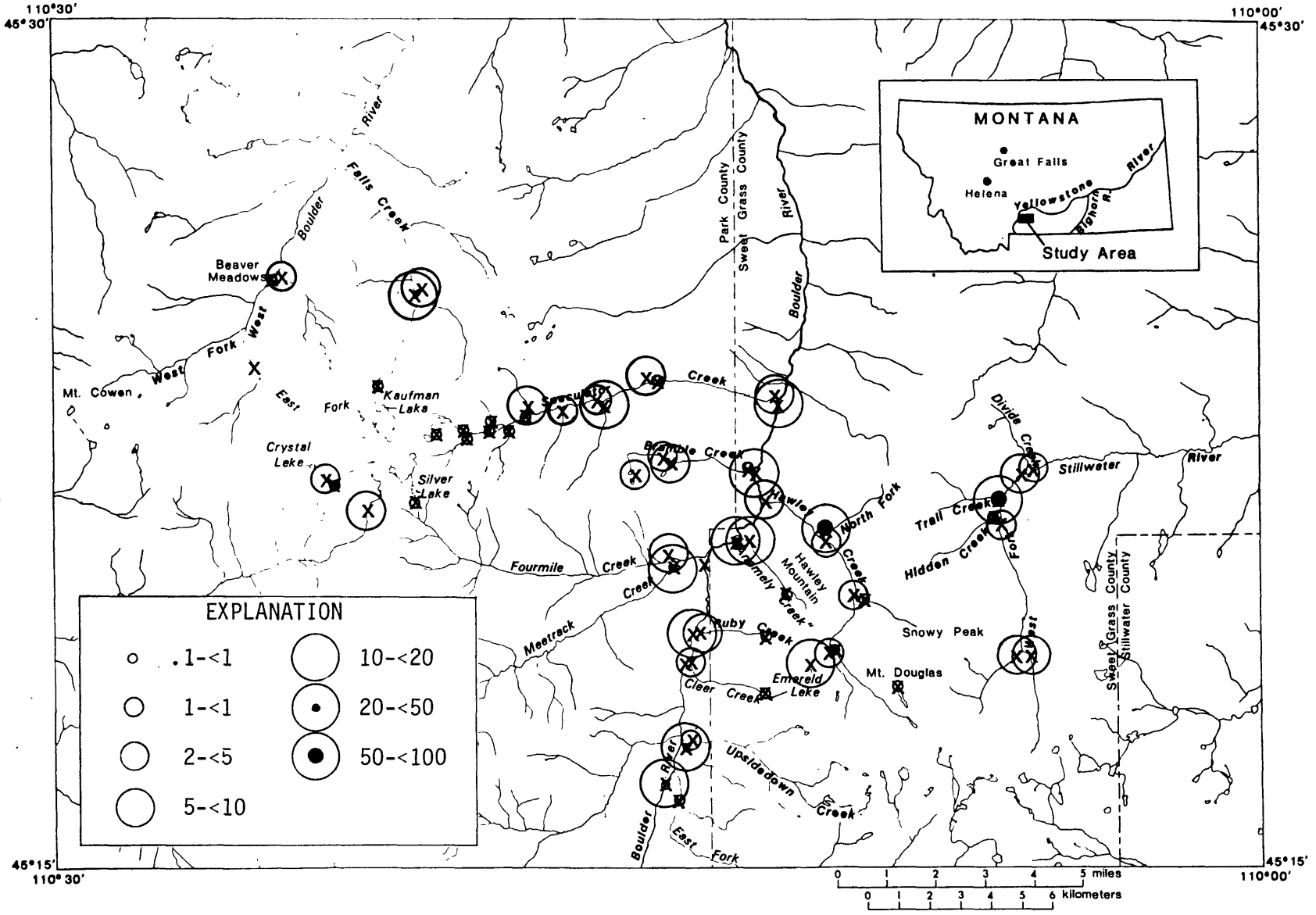

Figure 2-7.--Hardness noncarbonate data (mg/ℓ) at sample sites ("X").

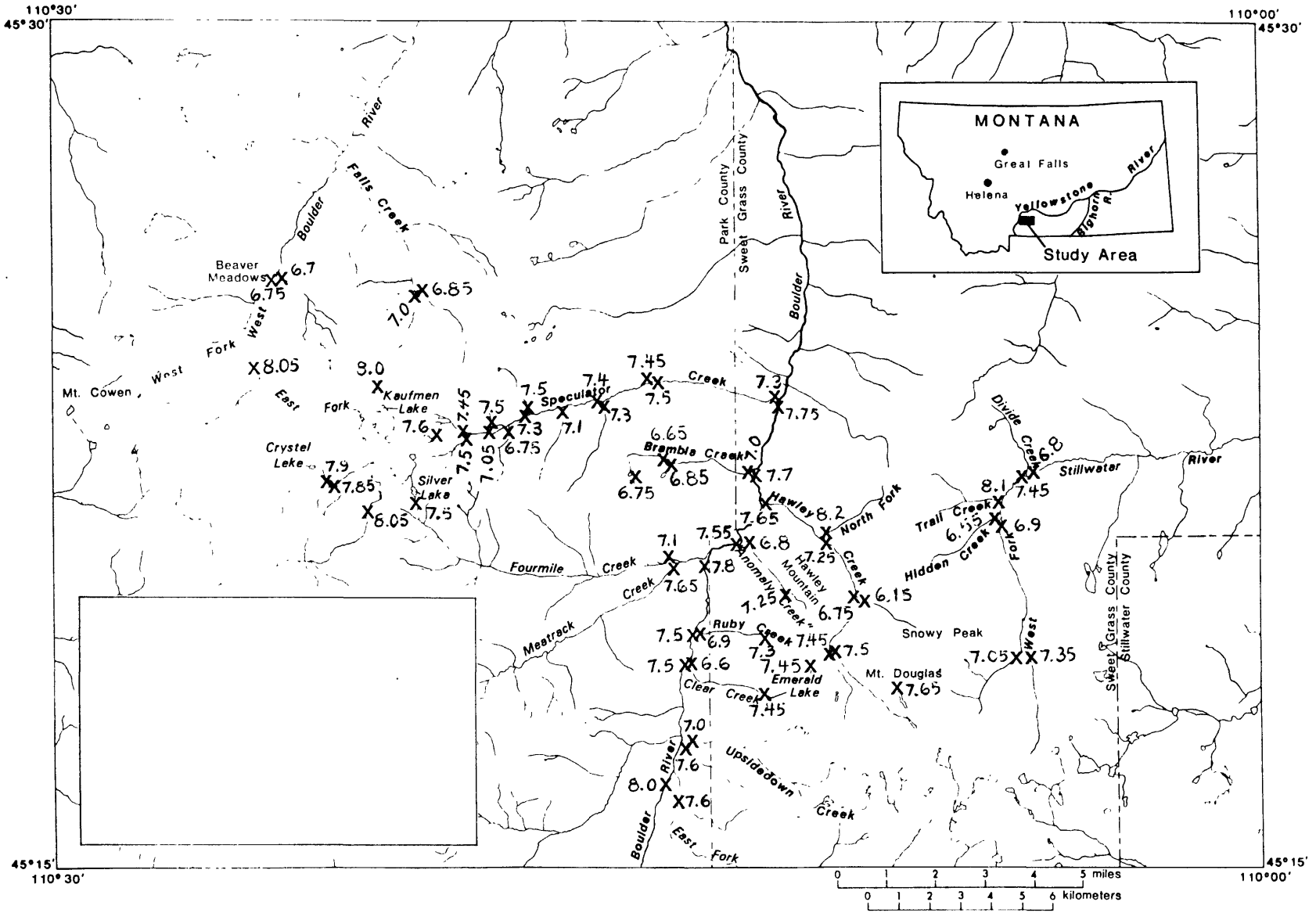

Figure 2-8. --pH data (standard units) at sample sites ("X").

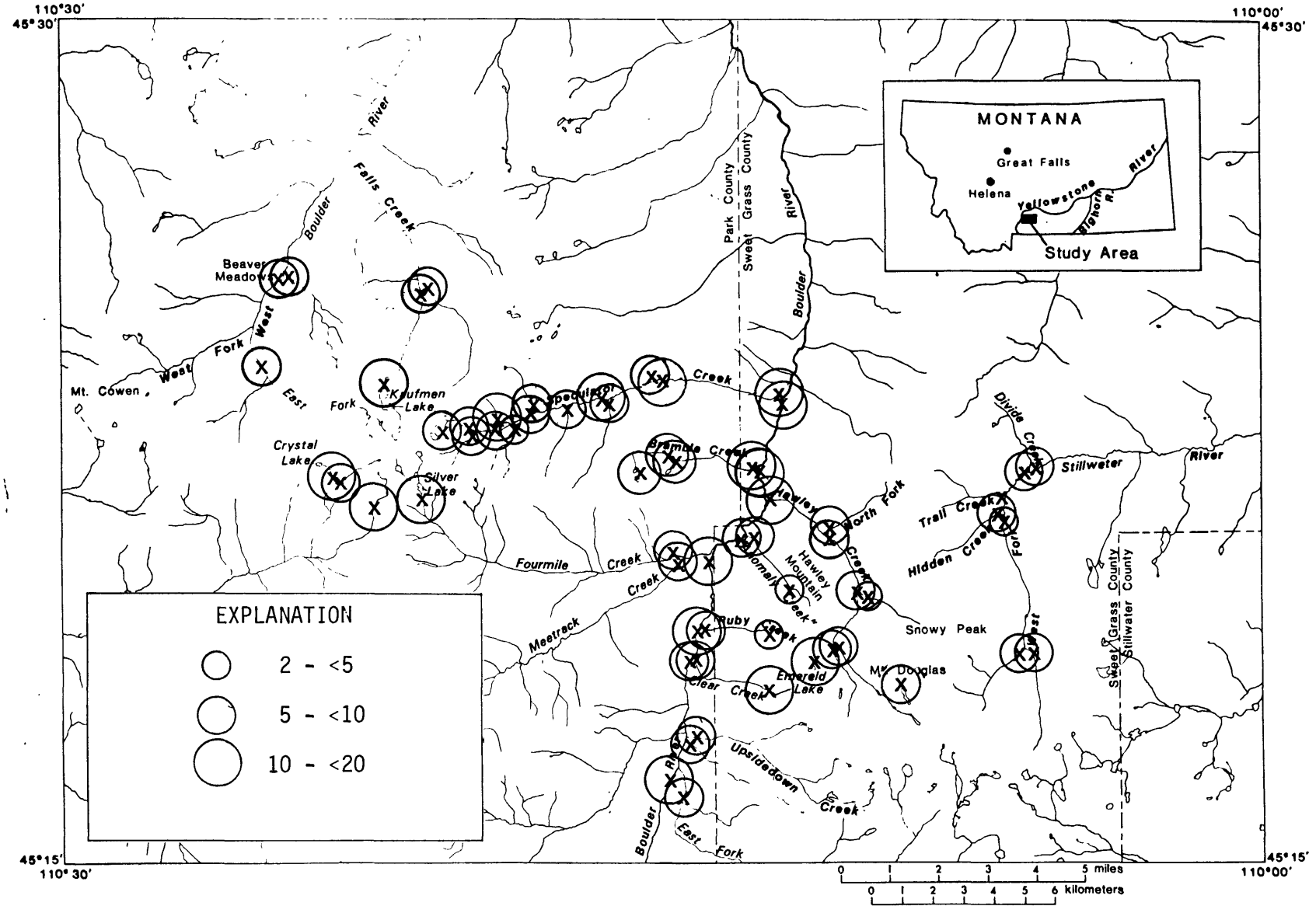

Figure 2-9.--Water temperature data (°C) at sample sites ("X").

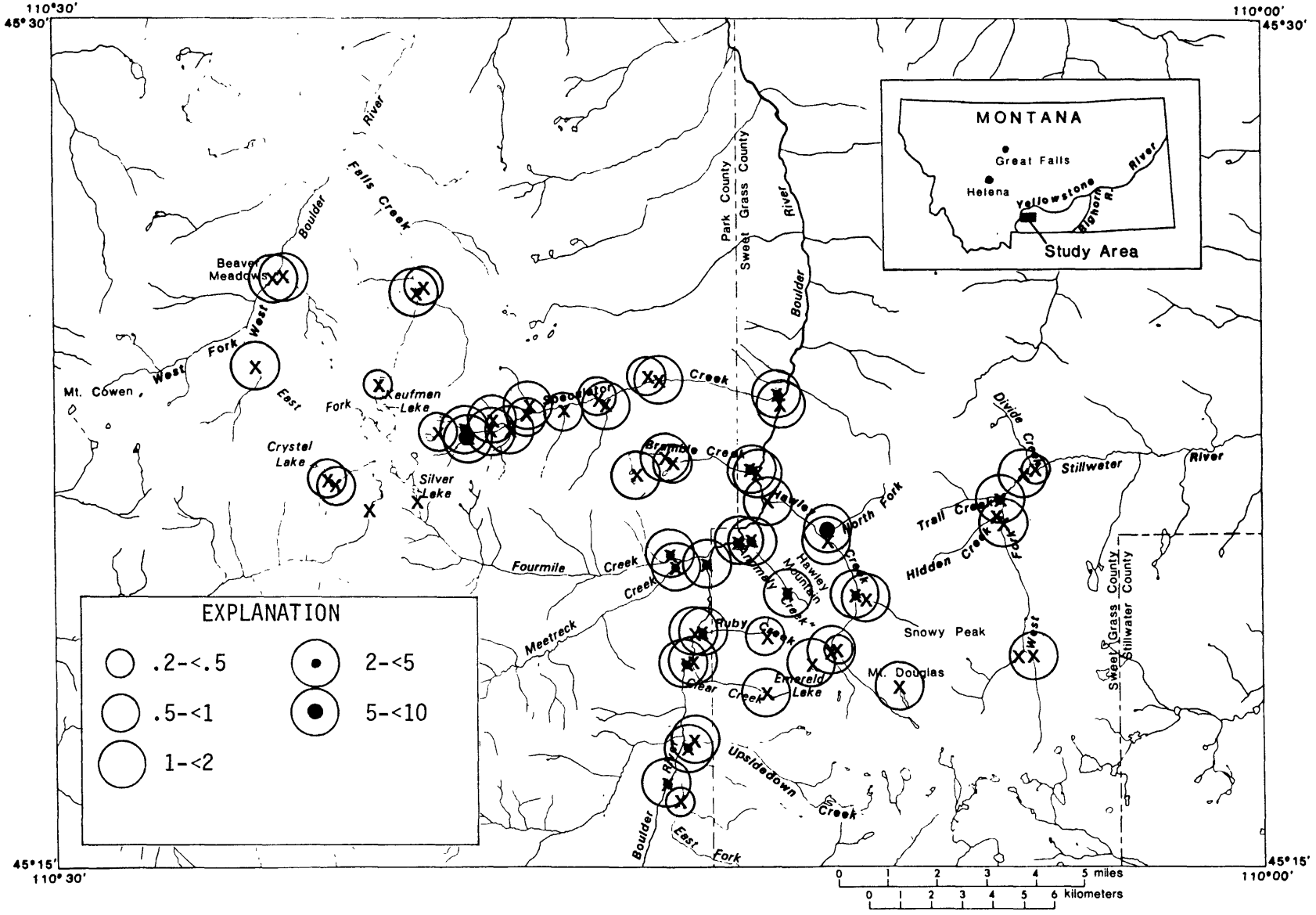

Figure 2-10.--Boron data (µg/ℓ) at sample sites ("X").

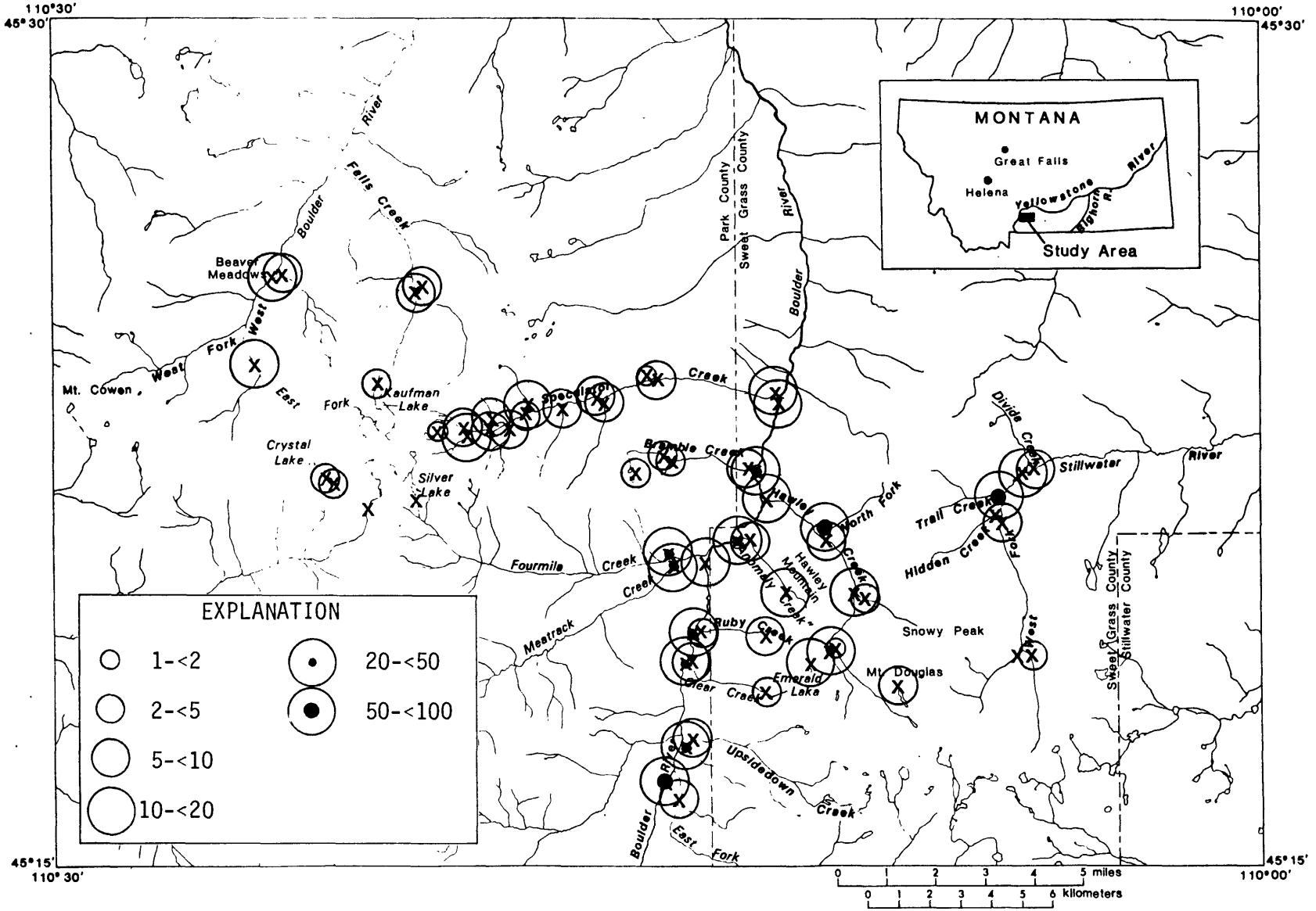

Figure 2-11.--Barium data (µg/ℓ) at sample sites ("X").

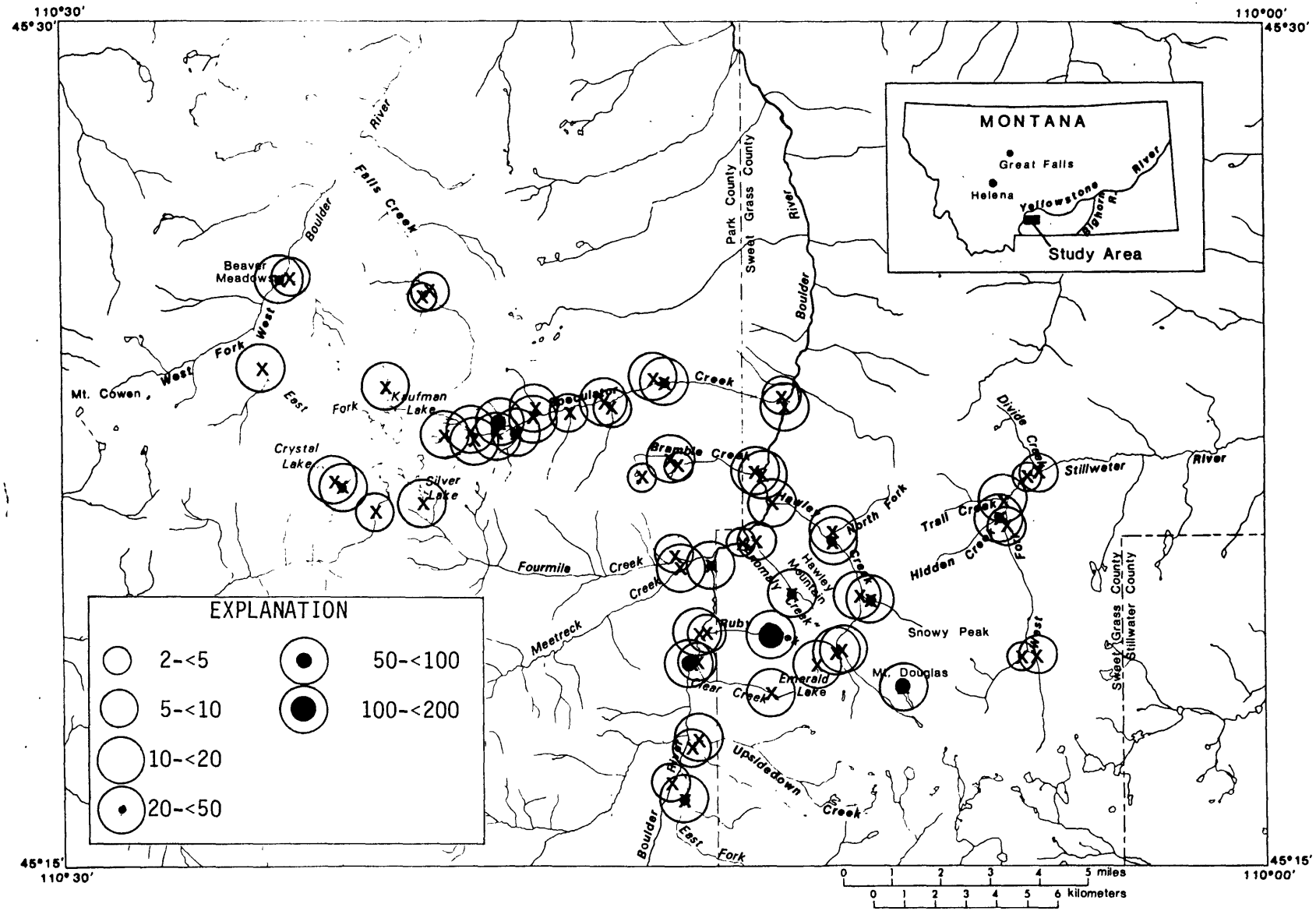

Figure 2-12. --Bicarbonate data (mg/ℓ) at sample sites.("X").

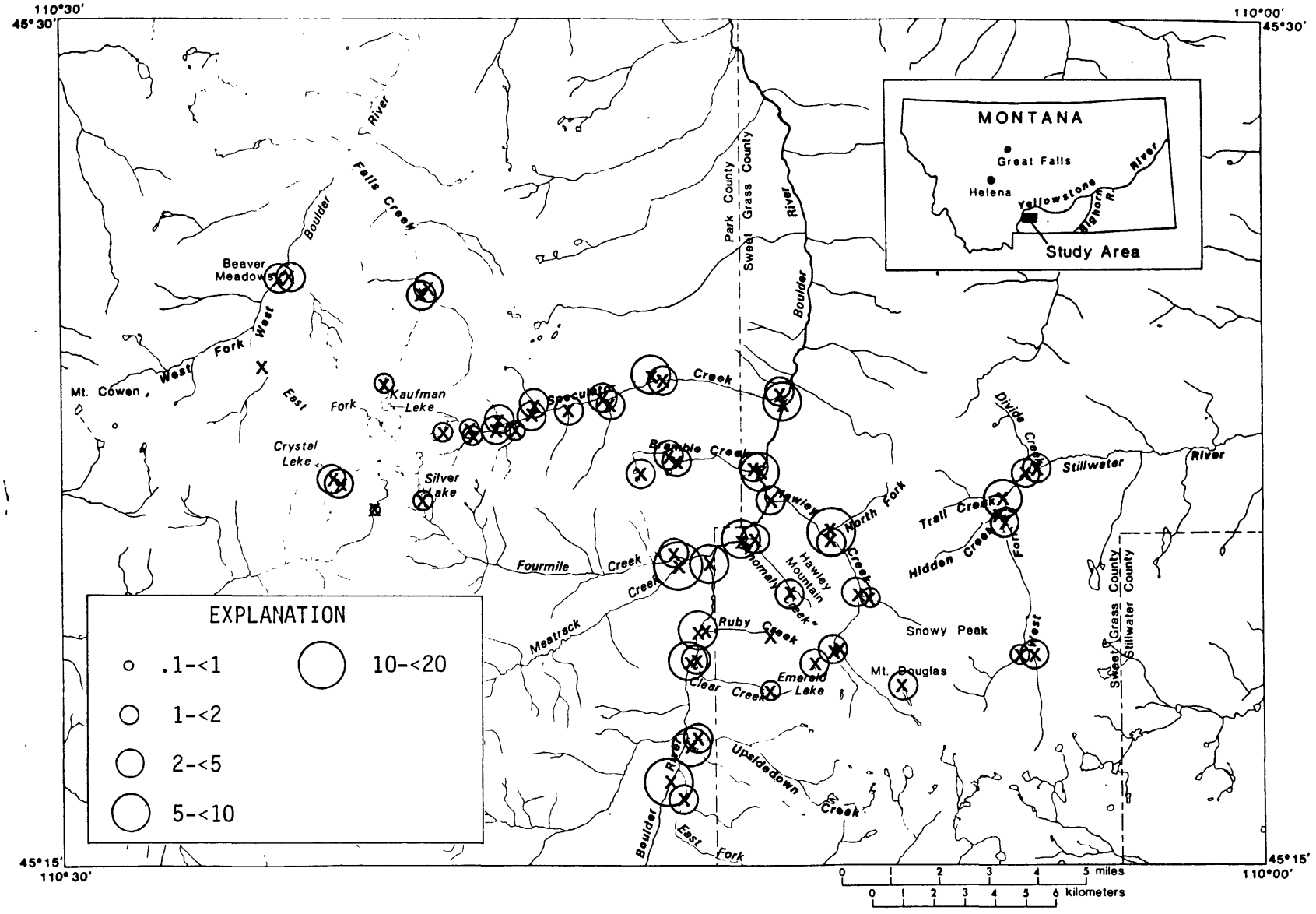

Figure 2-13. --Inorganic carbon data (mg/ℓ) at sample sites ("X").

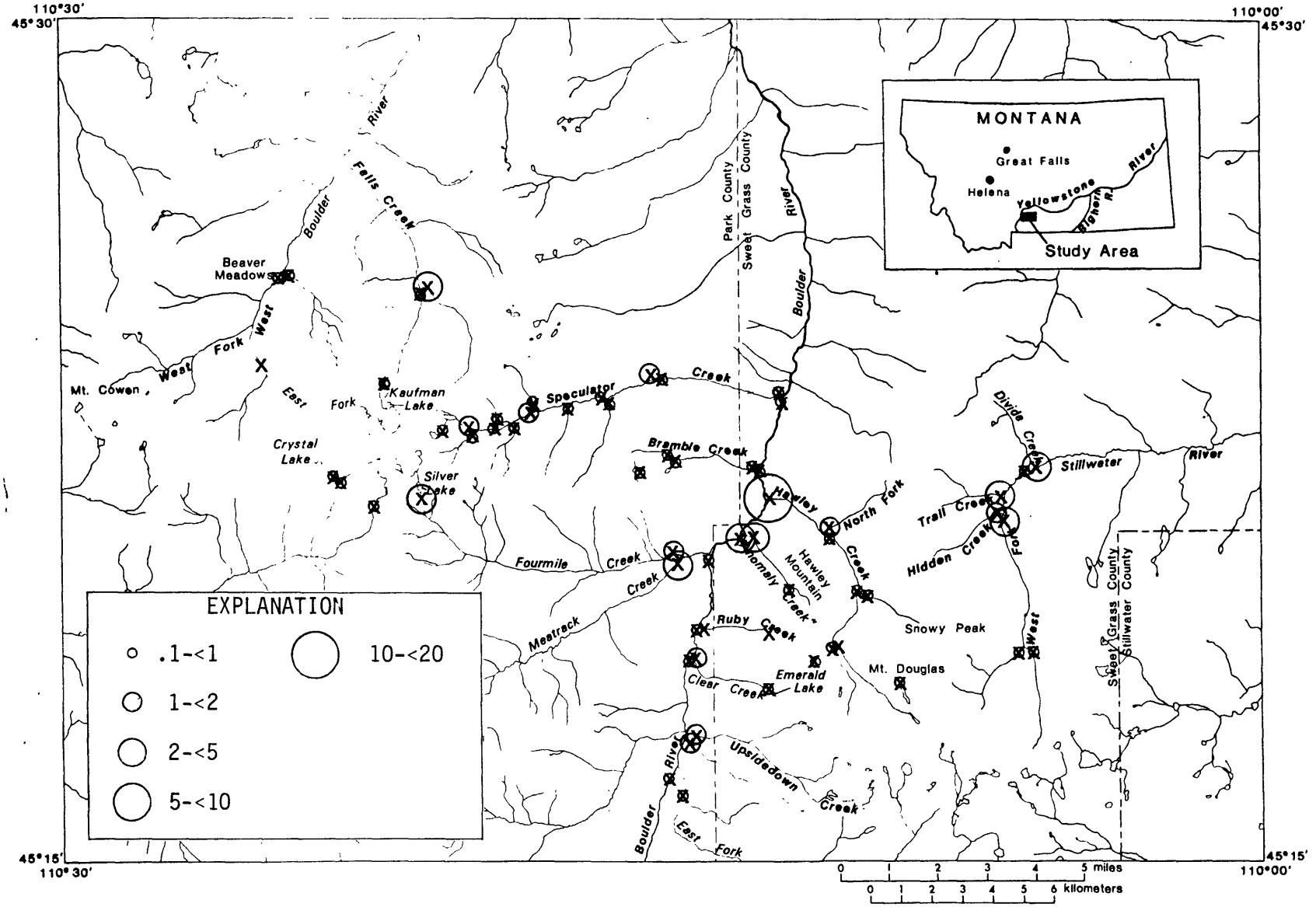

Figure 2-14. --Organic carbon data (mg/ℓ) at sample sites ("X").

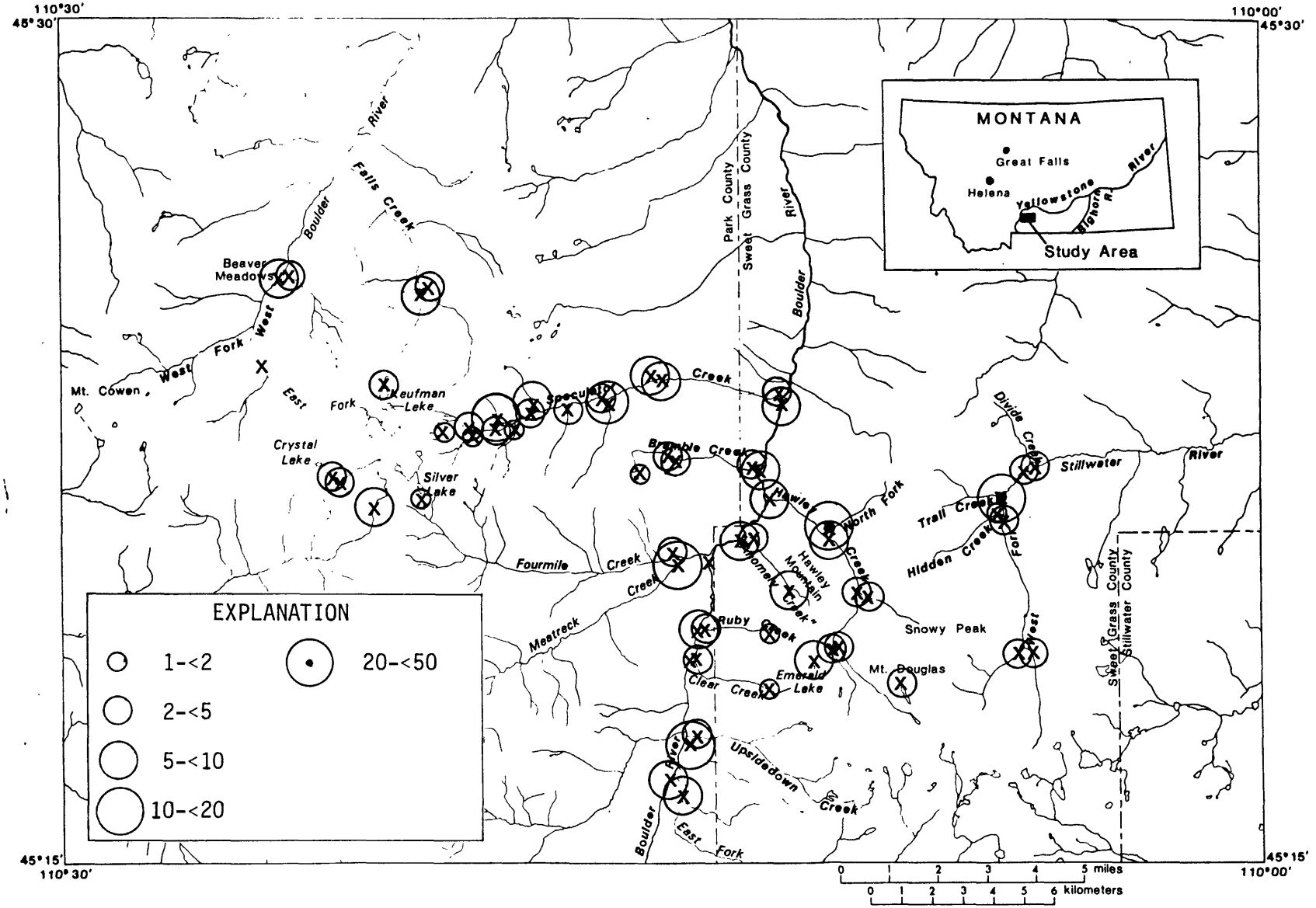

Figure 2-15.--Calcium data (mg/ℓ) at sample sites ("X").

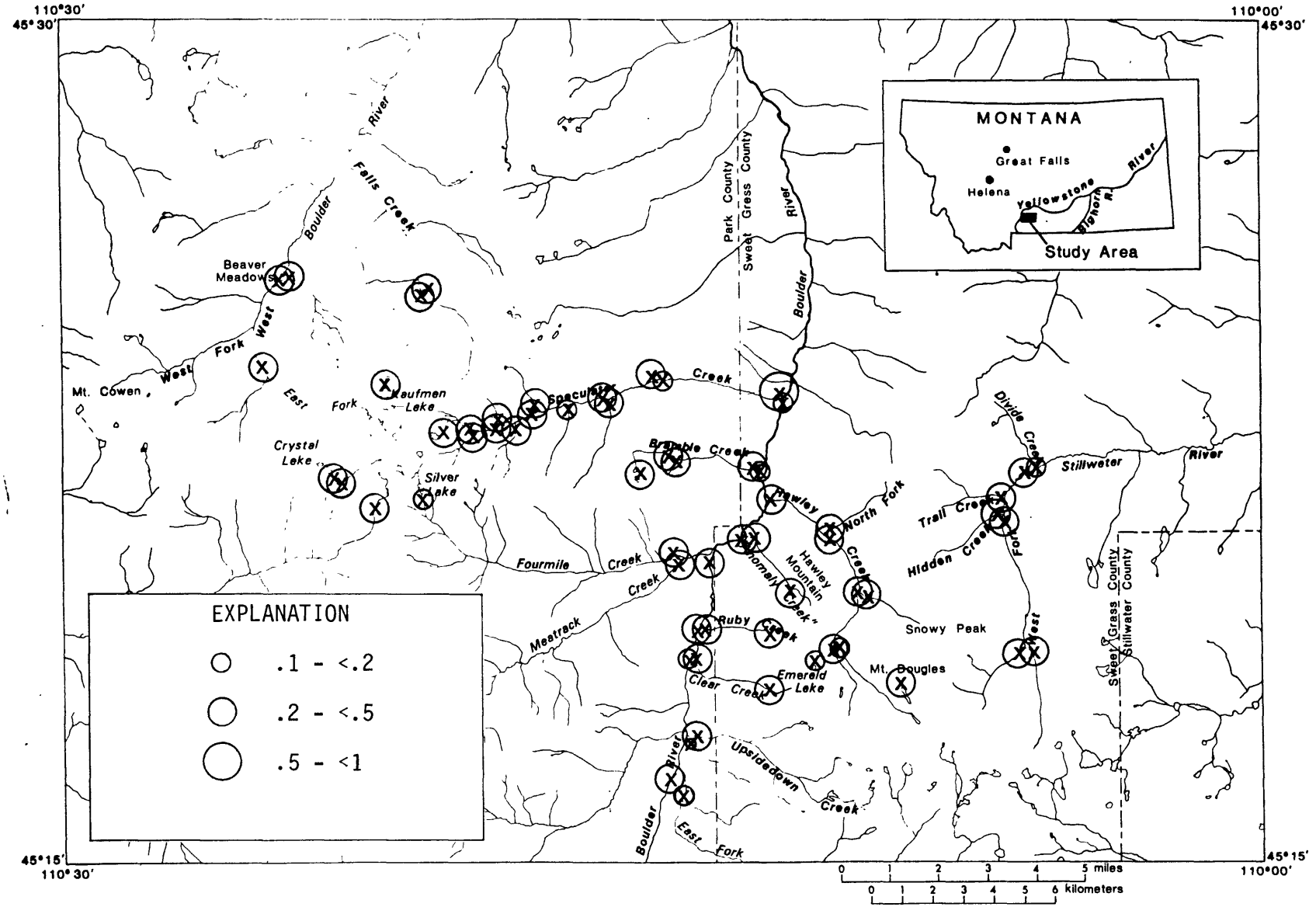

Figure 2-16.--Chloride data (mg/ℓ) at sample sites ("X").

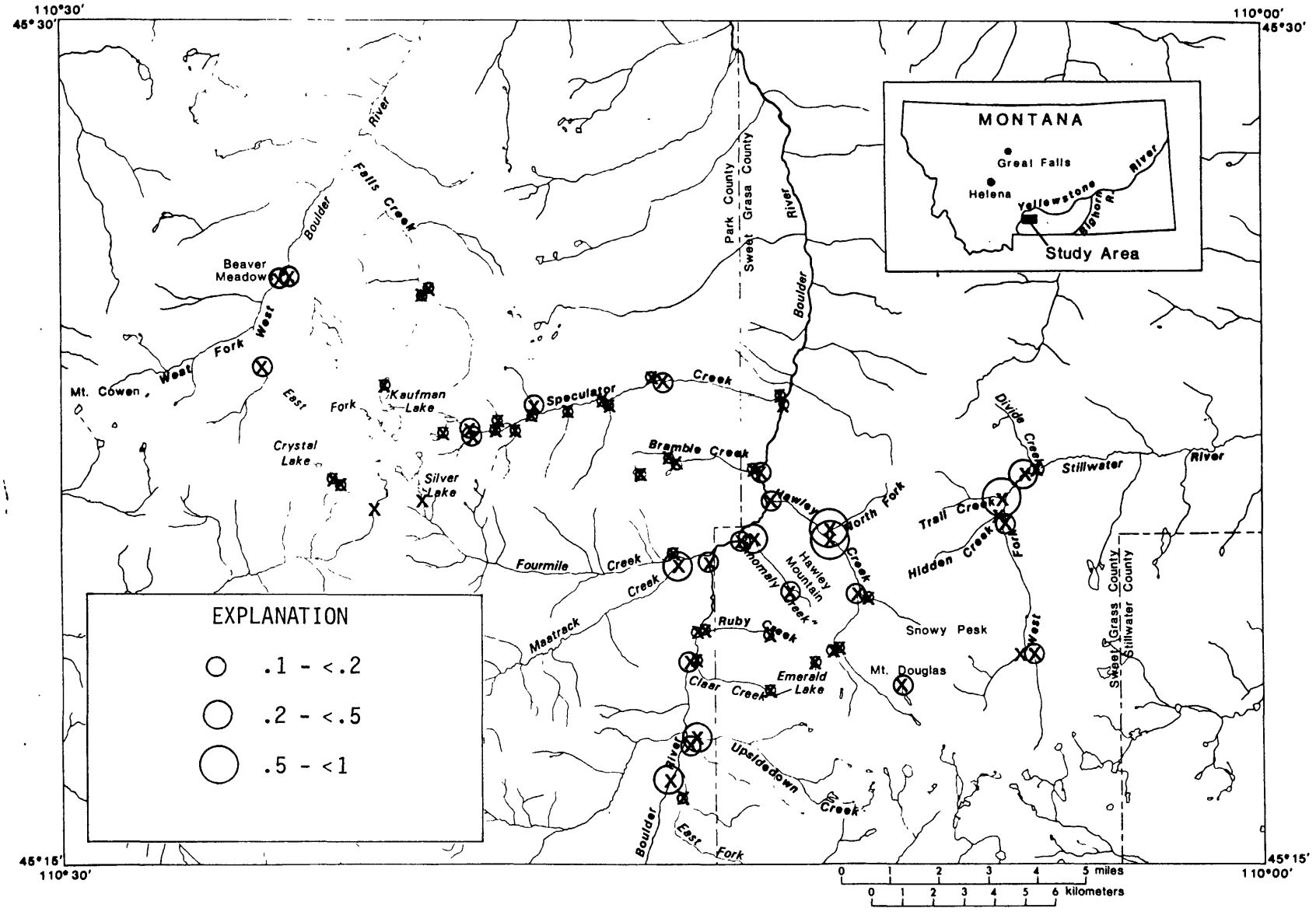

Figure 2-17.--Chromium data (µg/ℓ) at sample sites ("X").

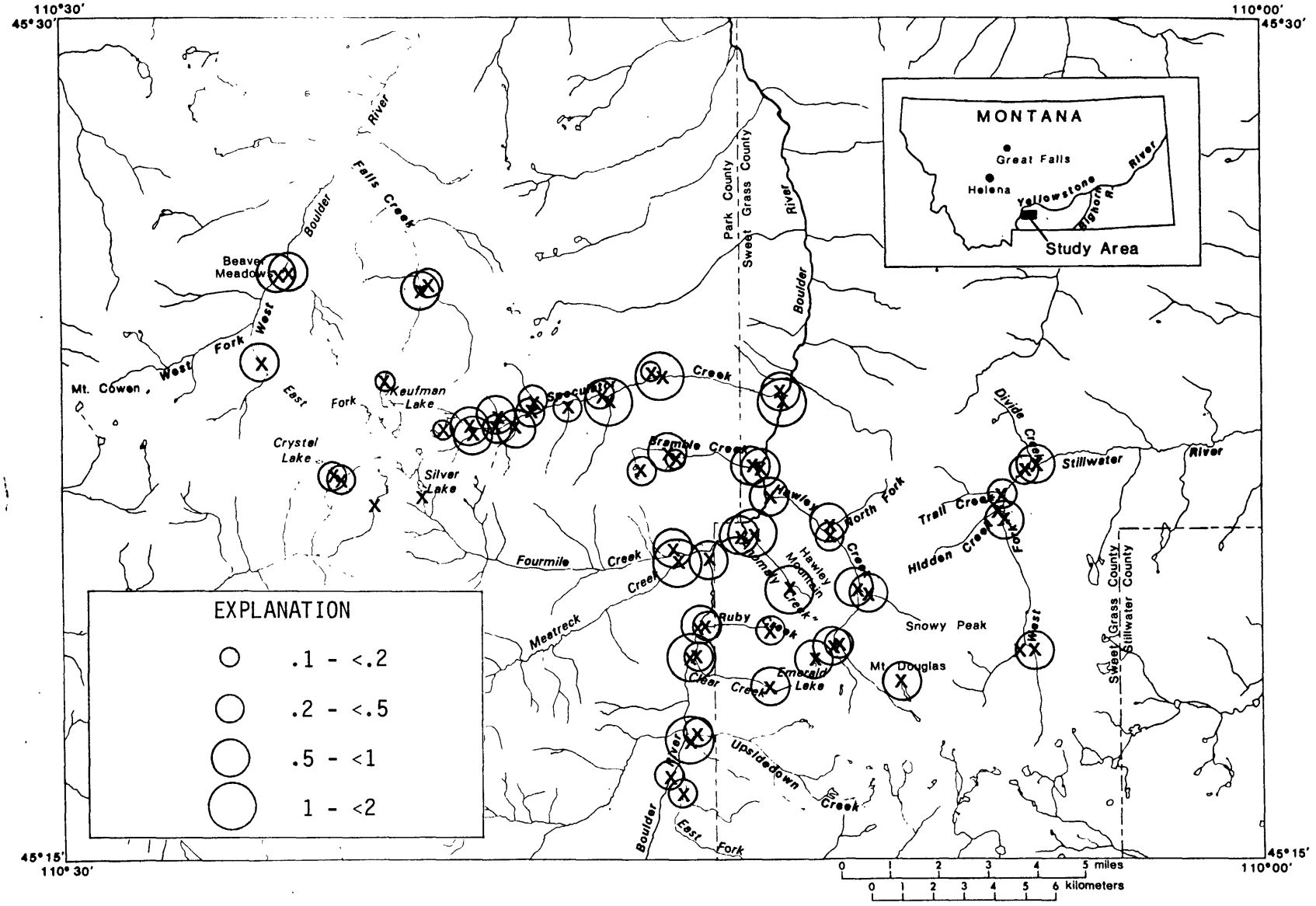

Figure 2-18.--Copper data (µg/ℓ) at sample sites ("X").

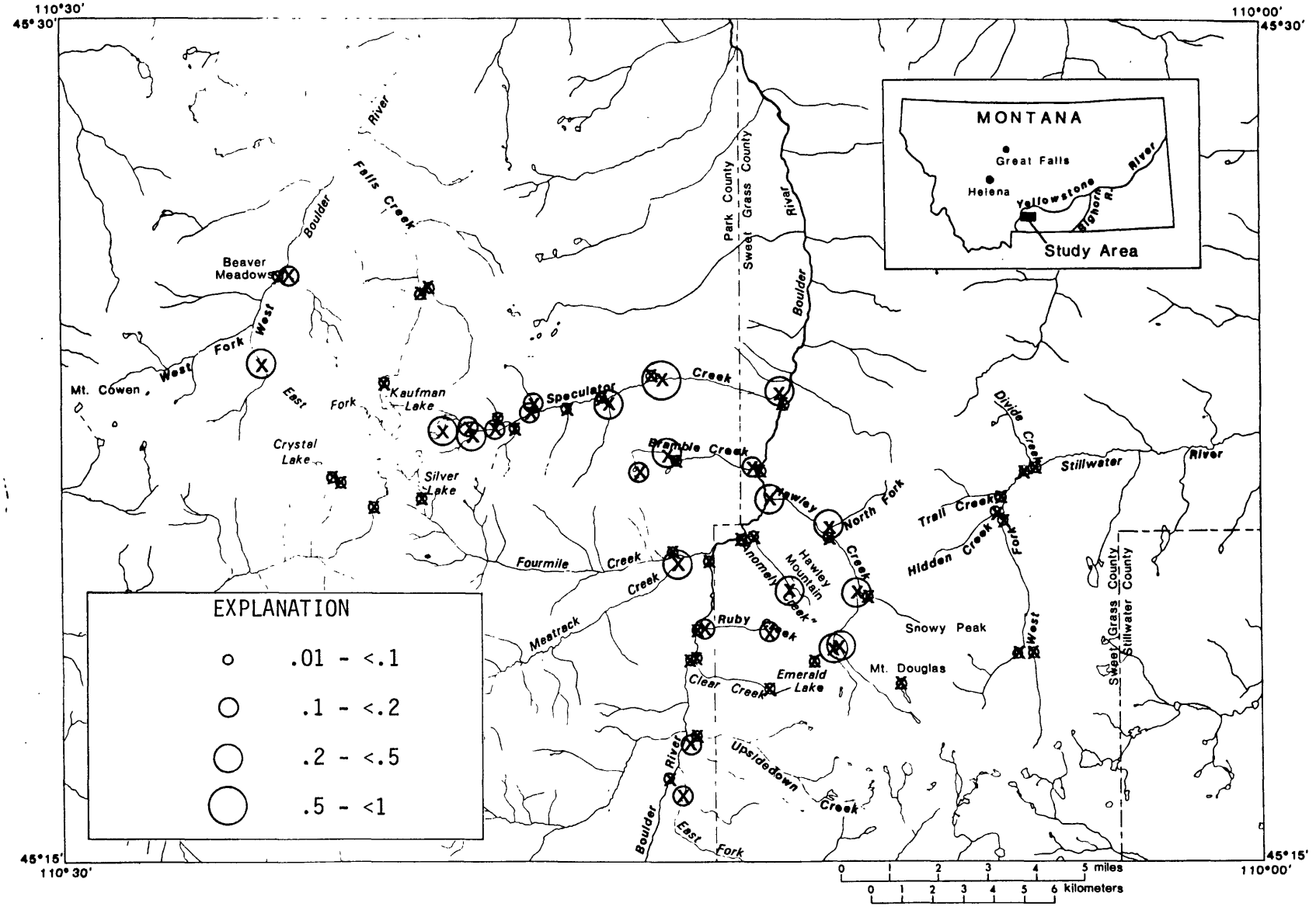

Figure 2-19.--Fluoride data (mg/ℓ) at sample sites ("X").

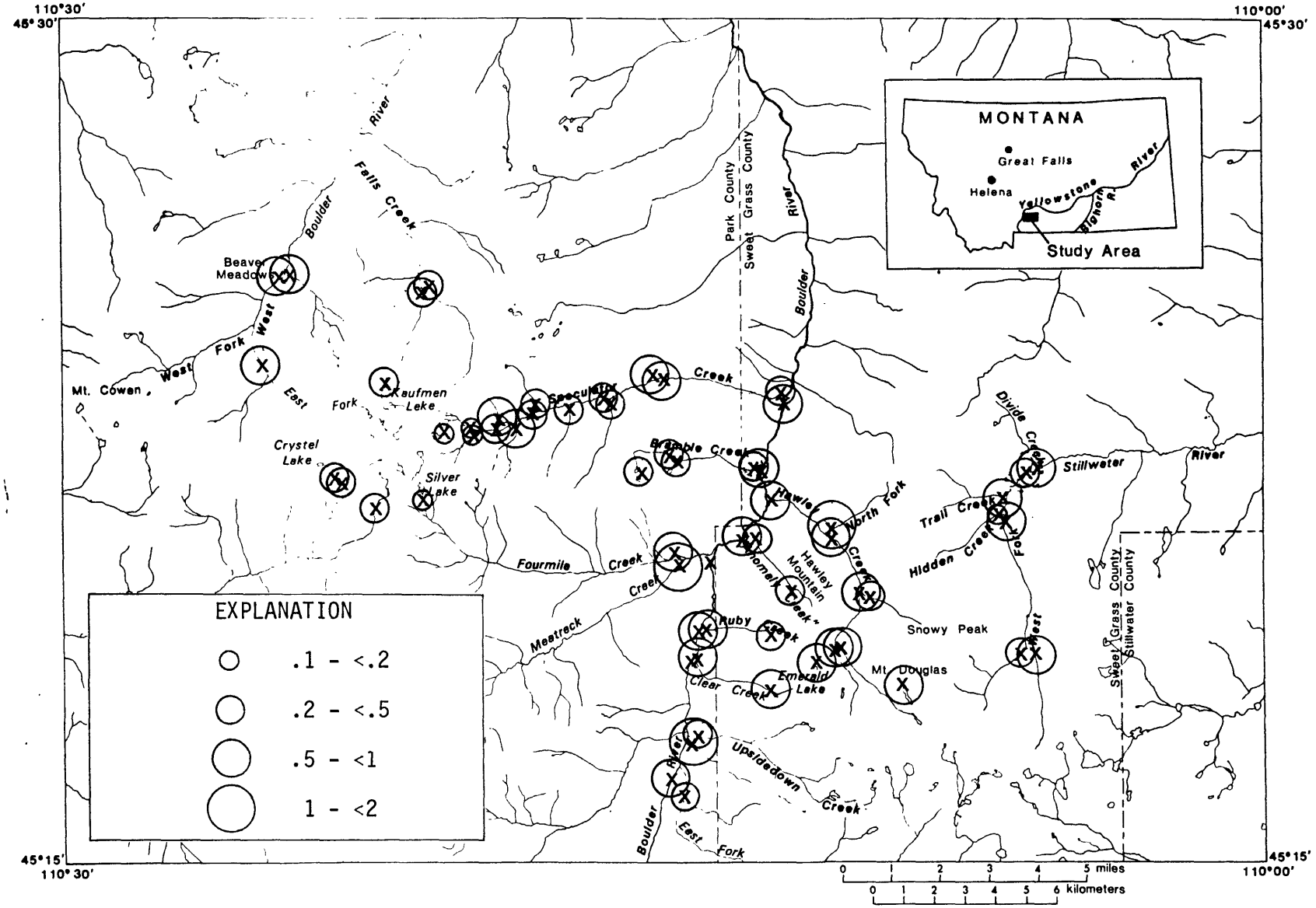

Figure 2-20.--Potassium data (mg/ℓ) at sample sites ("X").

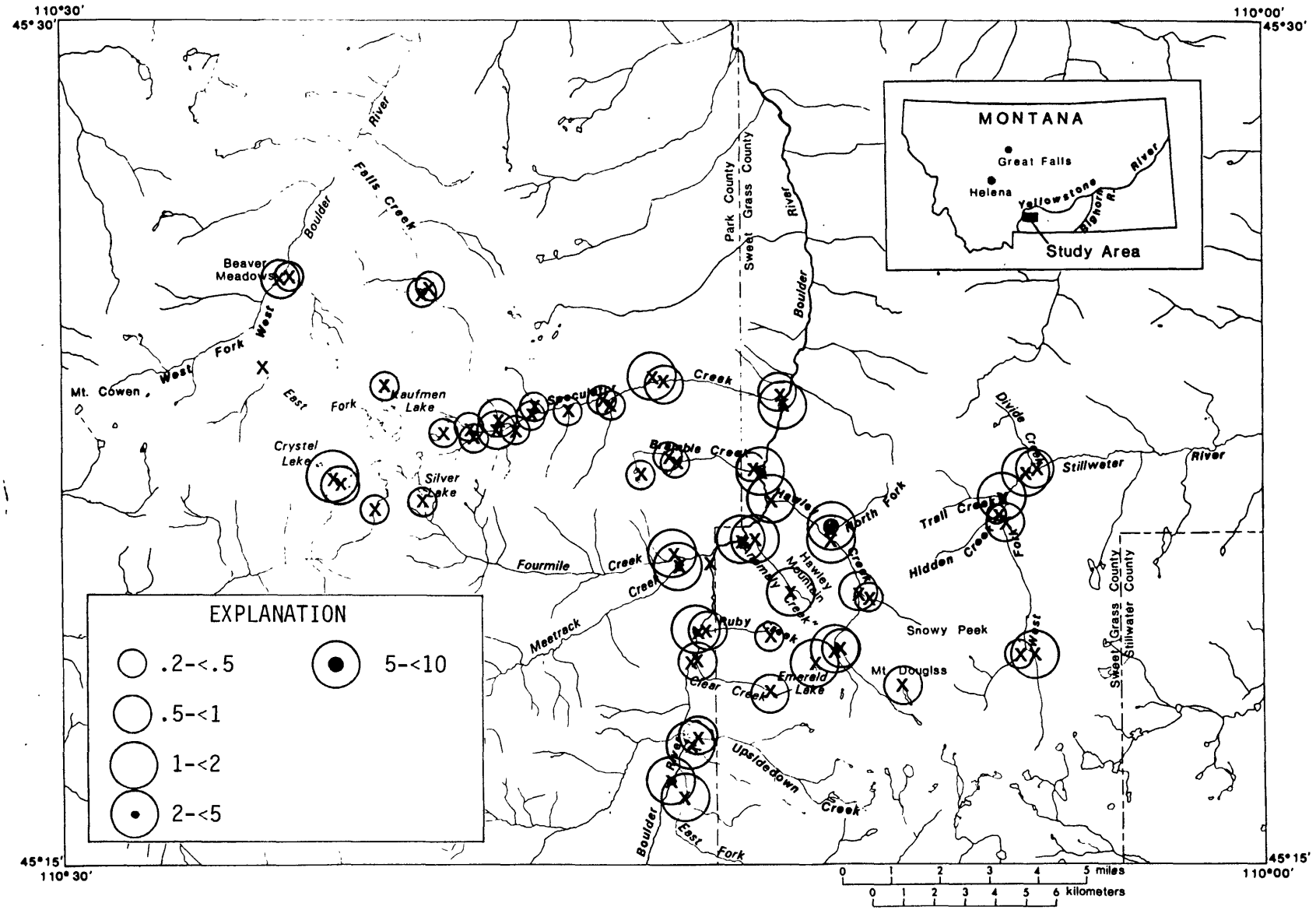

Figure 2-21. --Magnesium data (mg/ℓ) at sample sites ("X").

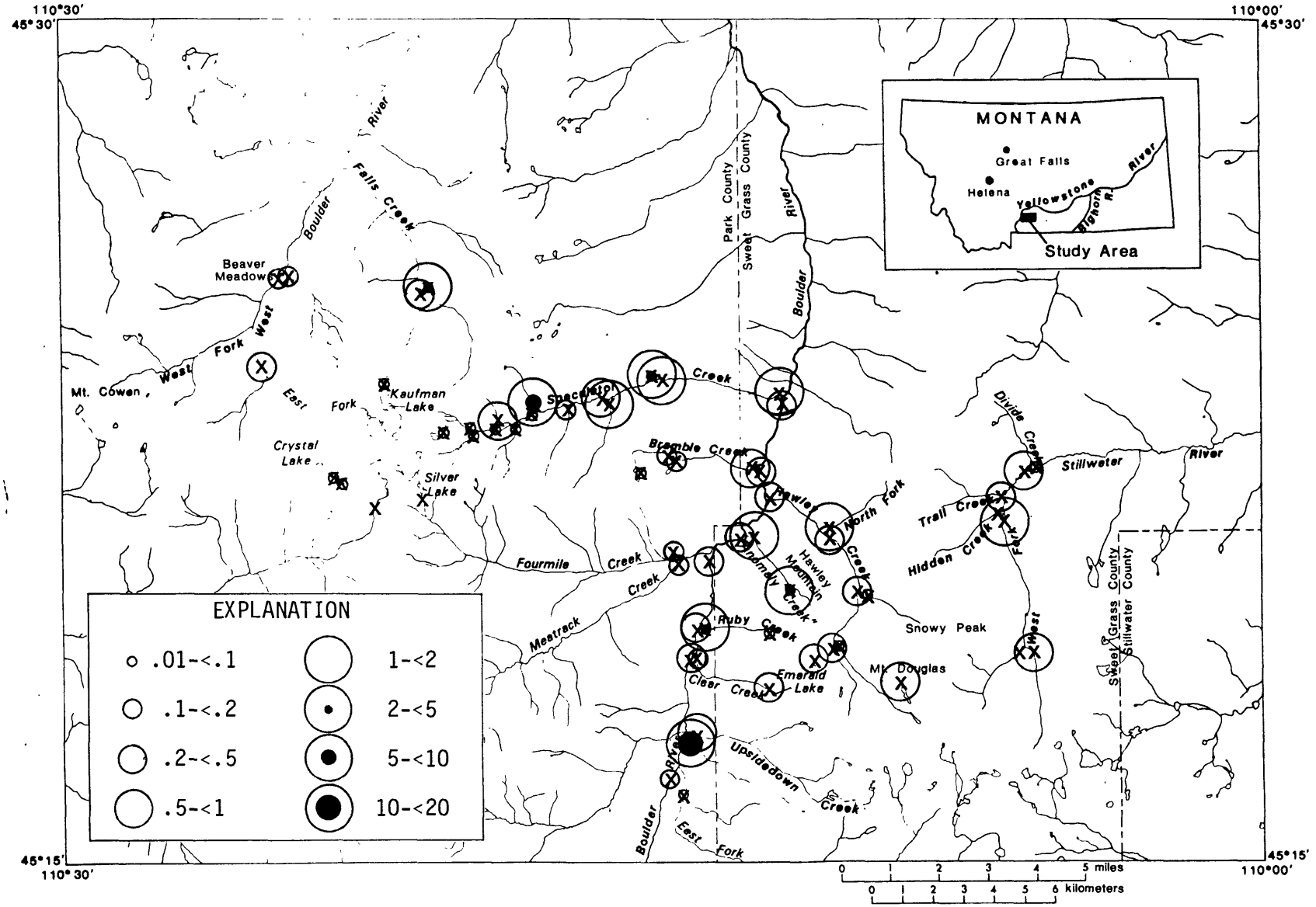

Figure 2-22.--Molybdenum data (µg/ℓ) at sample sites ("X").

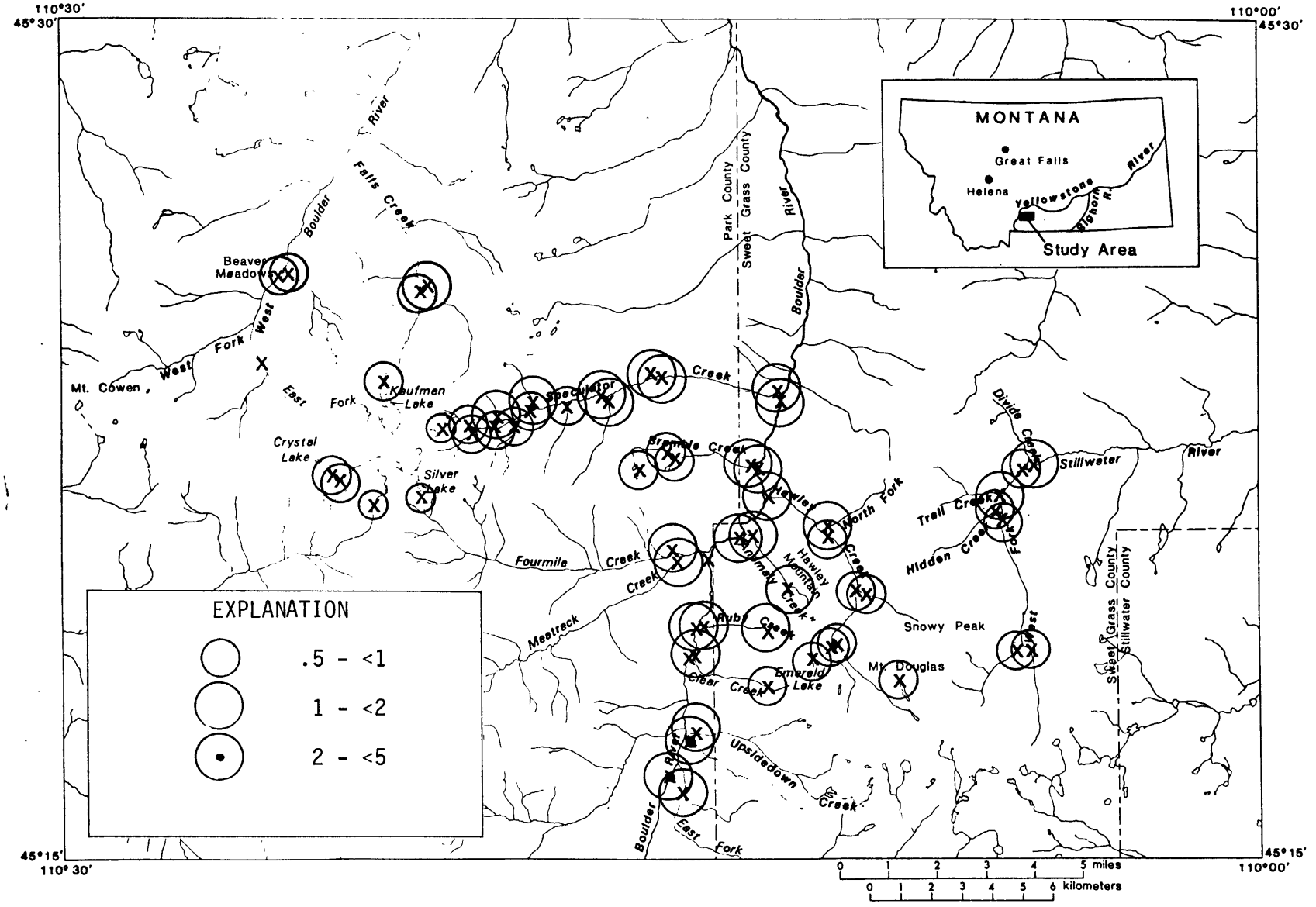

Figure 2-23.--Sodium data (mg/ℓ) at sample sites ("X").

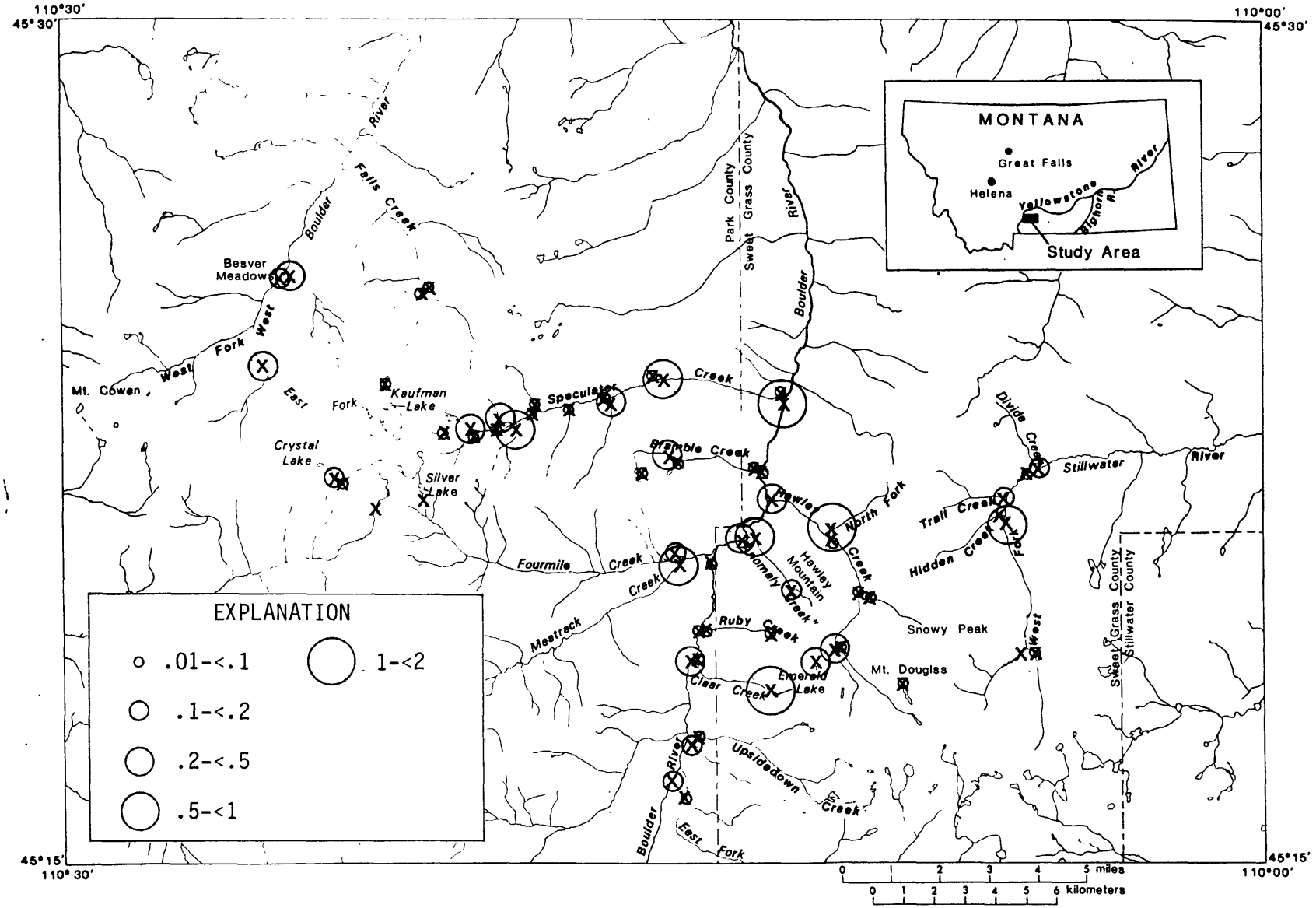

Figure 2-24.--Nickel data (µg/ℓ) at sample sites ("X").

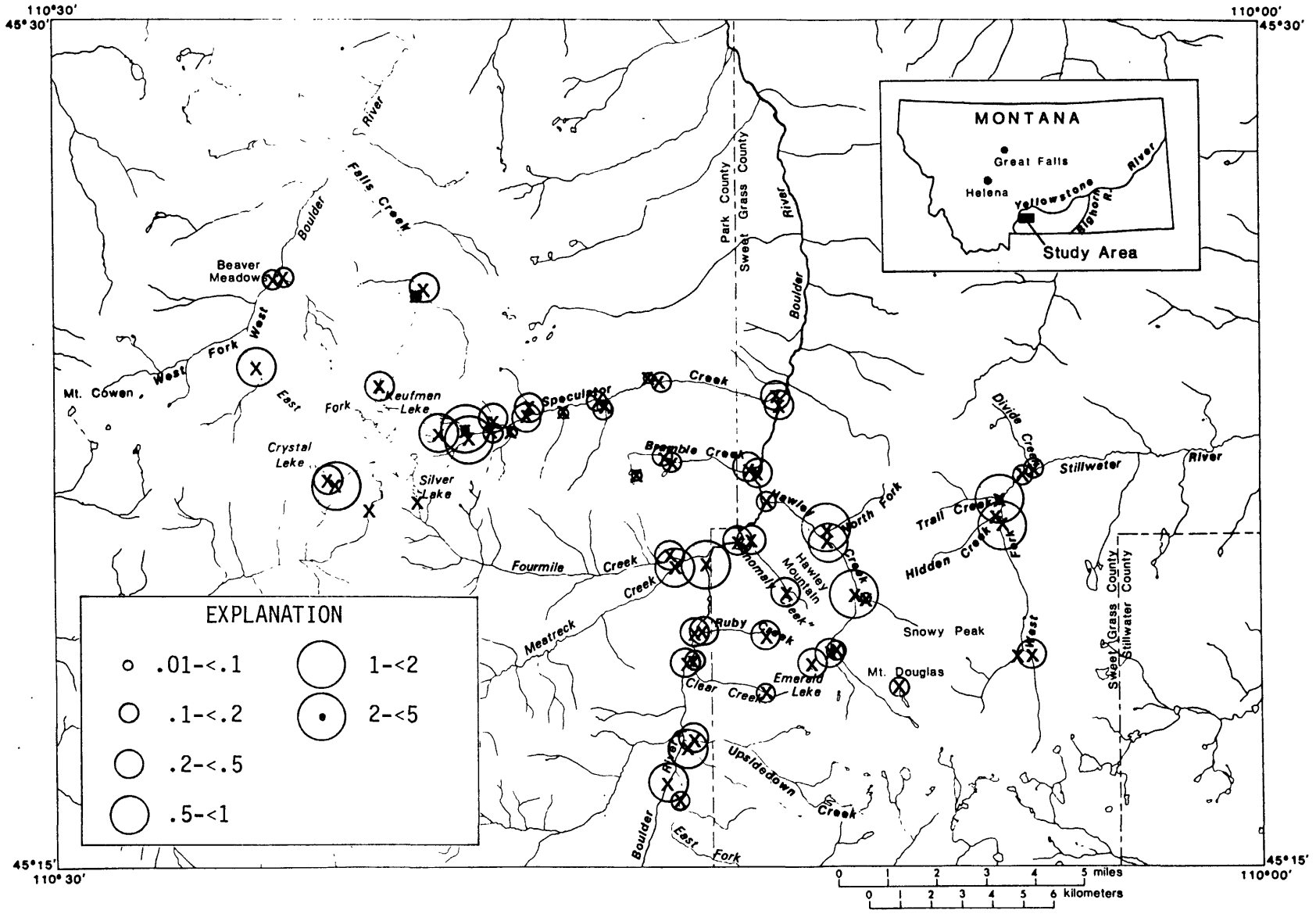

Figure 2-25.--Lead data (µg/ℓ) at sample sites ("X").

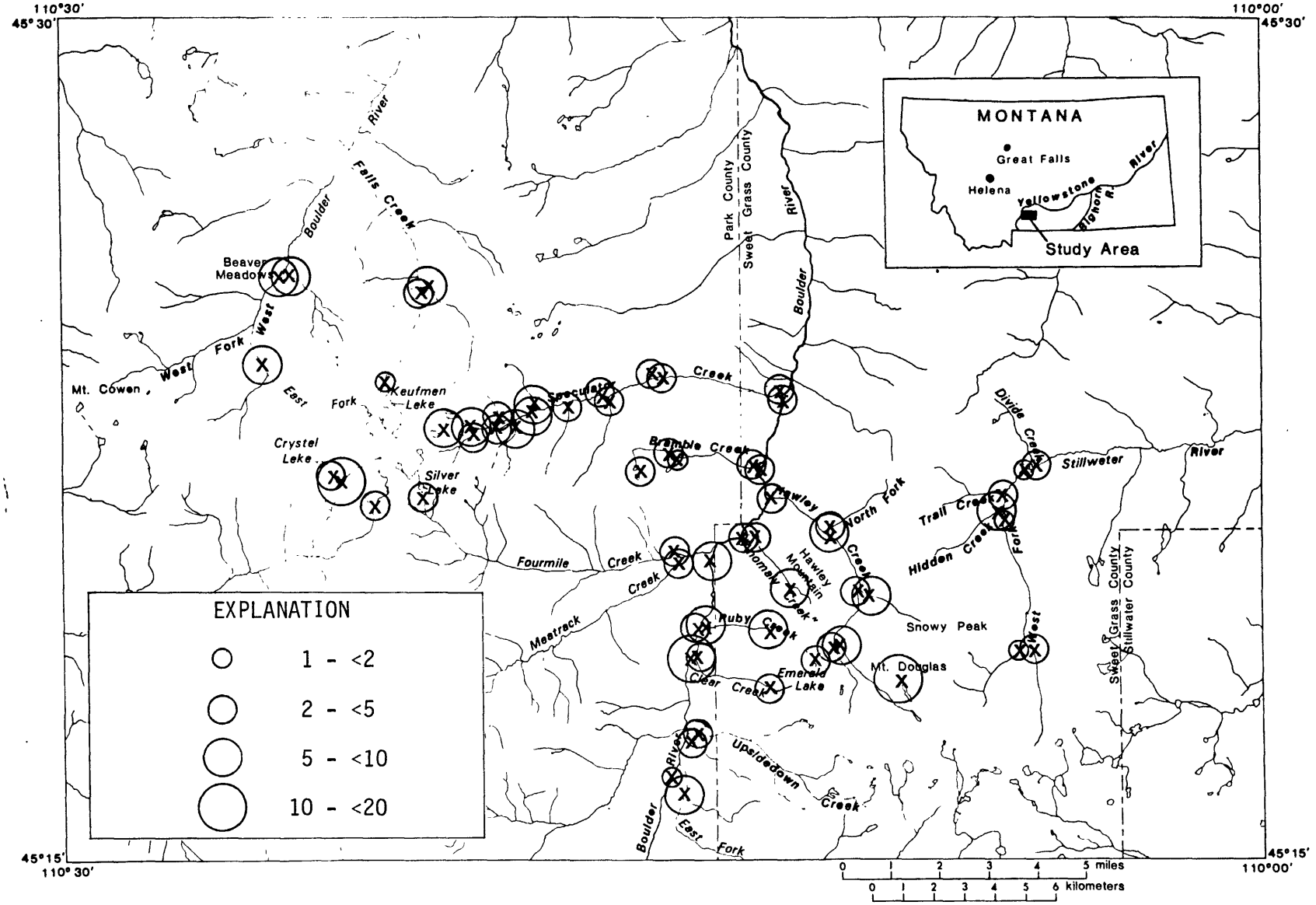

Figure 2-26.--Silica data (mg/ℓ) at sample sites ("X").

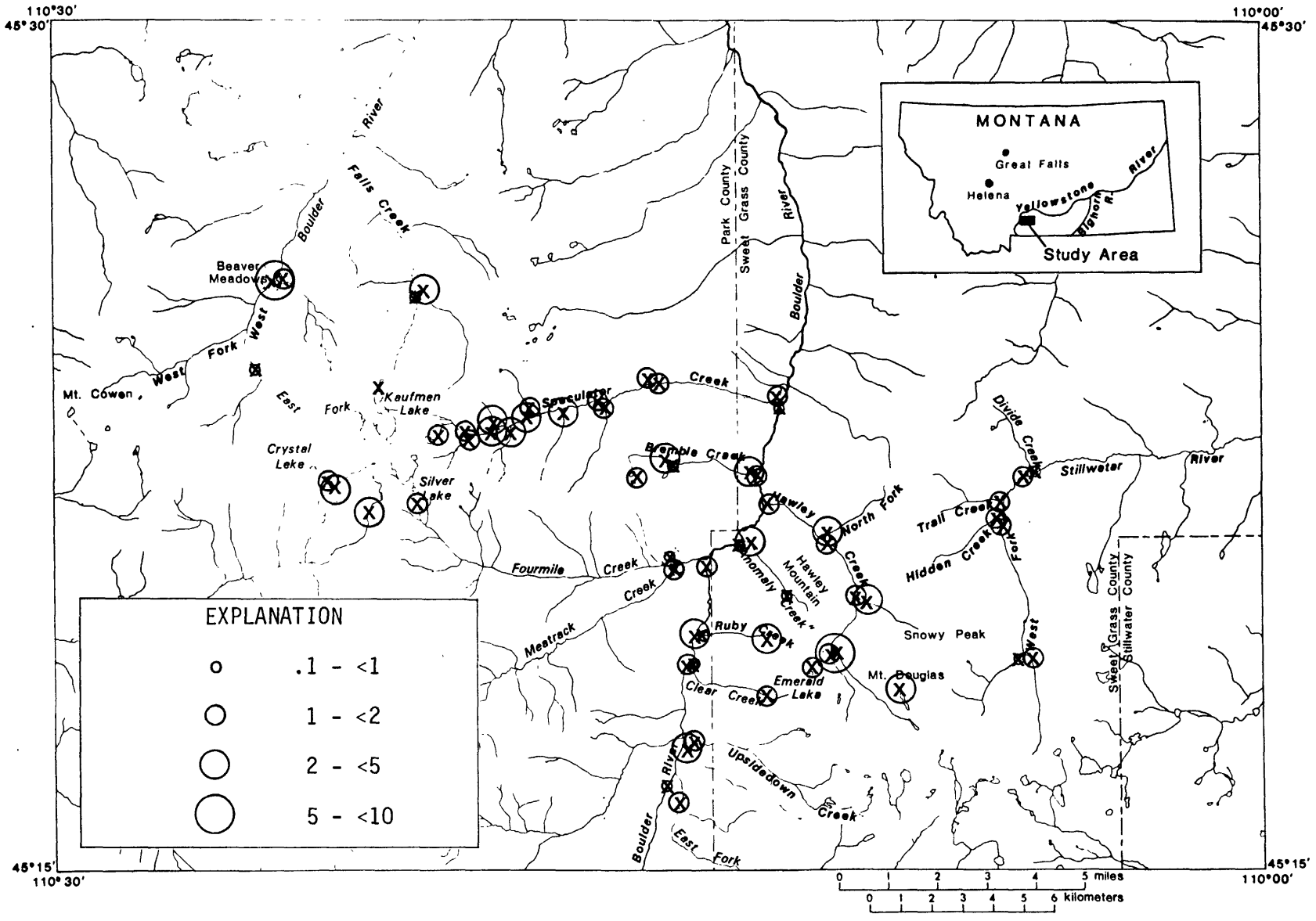

Figure 2-27.--Sulfate data (mg/ℓ) at sample sites ("X").

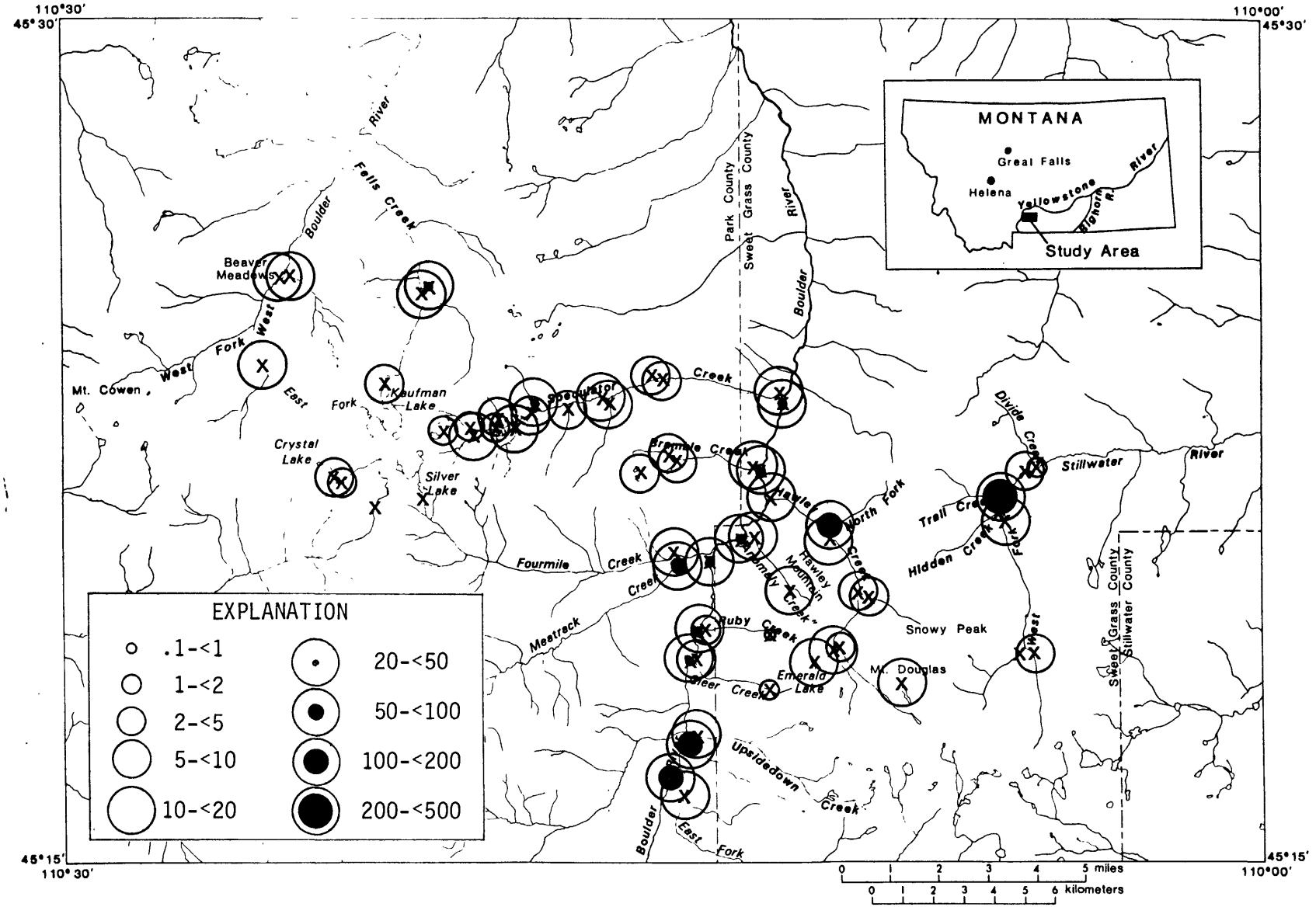

Figure 2-28.--Strontium data (µg/ℓ) at sample sites ("X").

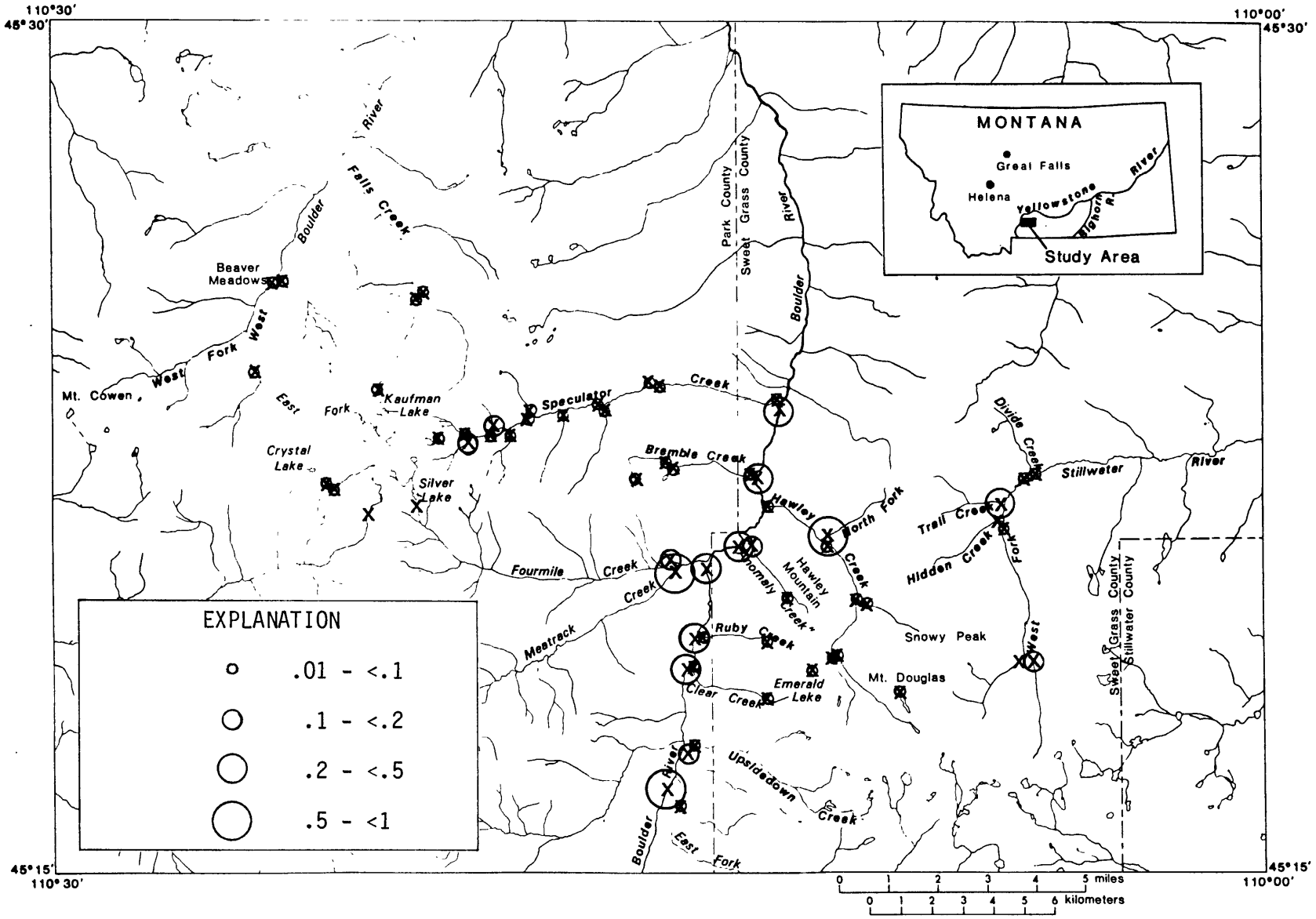

Figure 2-29.--Vanadium data (µg/ℓ) at sample sites ("X").

Table 4.--Frequency distributions and population statistics.

Symbols for Qualified Values

N not detected
L detected, but less than lower detection limit
H no data because of analytical interference
T trace amount present
G greater than upper detection limit
B no analysis performed

See Table 2 for list of elements and symbols.
Elements appearing with a prefix of L- or Log- mean that the log of the data for that element is used in the histogram, because the population was judged to be lognormally distributed.

Frequency Table for: L - Cond

Interval Limits lower	upper	Obs Freq	Cum Freq	Percent Freq	%Freq Cum
1.000E+00 -	1.160E+00	8	8	12.90	12.90
1.160E+00 -	1.320E+00	8	16	12.90	25.81
1.320E+00 -	1.480E+00	14	30	22.58	48.39
1.480E+00 -	1.640E+00	19	49	30.65	79.03
1.640E+00 -	1.800E+00	7	56	11.29	90.32
1.800E+00 -	1.960E+00	3	59	4.84	95.16
1.960E+00 -	2.120E+00	1	60	1.61	96.77
2.120E+00 -	2.280E+00	2	62	3.23	100.00

Histogram for: L - Cond

```
1.080E+00 XXXXXXXXXXXX
1.240E+00 XXXXXXXXXXXX
1.400E+00 XXXXXXXXXXXXXXXXXXXXXX
1.560E+00 XXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
1.720E+00 XXXXXXXXXX
1.880E+00 XXXXX
2.040E+00 XX
2.200E+00 XXX
```

	N	H	L	G	B	T	Unqualified
No. of values:	0	0	0	0	0	0	62

0.00% of total values (62) are qualified

Minimum	=	10.00
Maximum	=	190.00
Geom mean	=	30.62 (µmhos/cm)
Geom dev	=	1.87

Table 4, continued

Frequency Table for: Log - U

Histogram for: Log - U

Interval Limits lower	upper	Obs Freq	Cum Freq	Percent Freq	%Freq Cum	Histogram for: Log - U
-1.398E+00 -	-1.138E+00	1	1	1.61	1.61	-1.268E+00 XX
-1.138E+00 -	-8.779E-01	4	5	6.45	8.06	-1.008E+00 XXXXXX
-8.779E-01 -	-6.179E-01	6	11	9.68	17.74	-7.479E-01 XXXXXXXXXX
-6.179E-01 -	-3.579E-01	11	22	17.74	35.48	-4.879E-01 XXXXXXXXXXXXXXXXXX
-3.579E-01 -	-9.794E-02	14	36	22.58	58.06	-2.279E-01 XXXXXXXXXXXXXXXXXXXXXX
-9.794E-02 -	1.621E-01	17	53	27.42	85.48	3.206E-02 XXXXXXXXXXXXXXXXXXXXXXXXX
1.621E-01 -	4.221E-01	5	58	8.06	93.55	2.921E-01 XXXXXXXX
4.221E-01 -	6.821E-01	3	61	4.84	98.39	5.521E-01 XXXXX
6.821E-01 -	9.421E-01	1	62	1.61	100.00	8.121E-01 XX

	N	H	L	G	B	T	Unqualified	
No. of values:	0	0	0	0	0	0	62	0.00% of total values (62) are qualified

Minimum = 0.04
Maximum = 5.10
Geom mean = 0.59 (µg/L)
Geom dev = 2.65

Frequency Table for: L-Norm U

Histogram for: L-Norm U

Interval Limits lower	upper	Obs Freq	Cum Freq	Percent Freq	%Freq Cum	Histogram for: L-Norm U
-1.000E+00 -	-7.300E-01	3	3	4.84	4.84	-8.650E-01 XXXXX
-7.300E-01 -	-4.600E-01	2	5	3.23	8.06	-5.950E-01 XXX
-4.600E-01 -	-1.900E-01	7	12	11.29	19.35	-3.250E-01 XXXXXXXXXX
-1.900E-01 -	8.000E-02	5	17	8.06	27.42	-5.500E-02 XXXXXXX
8.000E-02 -	3.500E-01	12	29	19.35	46.77	2.150E-01 XXXXXXXXXXXXXXXXXX
3.500E-01 -	6.200E-01	18	47	29.03	75.81	4.850E-01 XXXXXXXXXXXXXXXXXXXXXXXXXX
6.200E-01 -	8.900E-01	11	58	17.74	93.55	7.550E-01 XXXXXXXXXXXXXXXXX
8.900E-01 -	1.160E+00	4	62	6.45	100.00	1.025E+00 XXXXXX

	N	H	L	G	B	T	Unqualified	
No. of values:	0	0	0	0	0	0	62	0.00% of total values (62) are qualified

Minimum = 0.10
Maximum = 13.42
Geom mean = 1.93 ($\frac{\mu g/L}{\mu mhos/cm} \times 10^2$)
Geom dev = 3.11

Table 4, continued

Frequency Table for: L - Alk

Interval Limits lower	upper	Obs Freq	Cum Freq	Percent Freq	%Freq Cum
3.010E-01 -	5.010E-01	6	6	9.68	9.68
5.010E-01 -	7.010E-01	3	9	4.84	14.52
7.010E-01 -	9.010E-01	12	21	19.35	33.87
9.010E-01 -	1.101E+00	20	41	32.26	66.13
1.101E+00 -	1.301E+00	9	50	14.52	80.65
1.301E+00 -	1.501E+00	7	57	11.29	91.94
1.501E+00 -	1.701E+00	3	60	4.84	96.77
1.701E+00 -	1.901E+00	1	61	1.61	98.39
1.901E+00 -	2.101E+00	1	62	1.61	100.00

	N	H	L	G	B	T	Unqualified
No. of values:	0	0	0	0	0	0	62

0.00% of total values (62) are qualified

Minimum	=	2.00	(mg/L)
Maximum	=	82.00	
Geom mean	=	10.47	
Geom dev	=	2.18	

Histogram for: L - Alk

```
4.010E-01 XXXXXXXXXX
6.010E-01 XXXXX
8.010E-01 XXXXXXXXXXXXXXXXXX
1.001E+00 XXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
1.201E+00 XXXXXXXXXXXXXX
1.401E+00 XXXXXXXXXX
1.601E+00 XXXXX
1.801F+00 XX
2.001E+00 XX
```


Frequency Table for: Eh-Fld

Interval Limits lower	upper	Obs Freq	Cum Freq	Percent Freq	%Freq Cum
2.000E+01 -	4.800E+01	4	4	6.45	6.45
4.800E+01 -	7.600E+01	13	17	20.97	27.42
7.600E+01 -	1.040E+02	19	36	30.65	58.06
1.040E+02 -	1.320E+02	16	52	25.81	83.87
1.320E+02 -	1.600E+02	7	59	11.29	95.16
1.600E+02 -	1.880E+02	1	60	1.61	96.77
1.880F+02 -	2.160E+02	1	61	1.61	98.39
2.160E+02 -	2.440E+02	0	61	0.00	98.39
2.440E+02 -	2.720E+02	1	62	1.61	100.00

	N	H	L	G	B	T	Unqualified
No. of values:	0	0	0	0	0	0	62

0.00% of total values (62) are qualified

Minimum	=	20.00	(mv)
Maximum	=	245.00	
Mean	=	100.48	
Std dev	=	38.09	

Histogram for: Eh-Fld

```
3.400E+01 XXXXXX
6.200E+01 XXXXXXXXXXXXXXXXXXX
9.000E+01 XXXXXXXXXXXXXXXXXXXXXXXXXXXXX
1.180E+02 XXXXXXXXXXXXXXXXXXXXXXXX
1.460E+02 XXXXXXXXXX
1.740E+02 XX
2.020E+02 XX
2.300E+02
2.580E+02 XX
```

Table 4, continued

Frequency Table for: L - Hard

Histogram for: L - Hard

Interval Limits lower	upper	Obs Freq	Cum Freq	Percent Freq	%Freq Cum	Histogram
6.021E-01 -	7.721E-01	6	6	10.17	10.17	6.871E-01 XXXXXXXXXX
7.721E-01 -	9.421E-01	6	12	10.17	20.34	8.571E-01 XXXXXXXXXX
9.421E-01 -	1.112E+00	16	28	27.12	47.46	1.027E+00 XXXXXXXXXXXXXXXXXXXXXXXXX
1.112E+00 -	1.282E+00	17	45	28.81	76.27	1.197E+00 XXXXXXXXXXXXXXXXXXXXXXXXXXX
1.282E+00 -	1.452E+00	7	52	11.86	88.14	1.367E+00 XXXXXXXXXXX
1.452E+00 -	1.622E+00	2	54	3.39	91.53	1.537E+00 XXX
1.622E+00 -	1.792E+00	3	57	5.08	96.61	1.707E+00 XXXXX
1.792E+00 -	1.962E+00	2	59	3.39	100.00	1.877E+00 XXX

	N	H	L	G	B	T	Unqualified	
No. of values:	0	0	0	0	3	0	59	0.00% of total values (59) are qualified

Minimum	=	4.00	(mg/L)
Maximum	=	90.00	
Geom mean	=	13.55	
Geom dev	=	1.94	

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Frequency Table for: L-HardNC

Histogram for: L-HardNC

Interval Limits lower	upper	Obs Freq	Cum Freq	Percent Freq	%Freq Cum	Histogram
0.000E+00 -	2.700E-01	1	22	1.69	37.29	1.350E-01 XX
2.700E-01 -	5.400E-01	10	32	16.95	54.24	4.050E-01 XXXXXXXXXXXXXXXX
5.400E-01 -	8.100E-01	3	35	5.08	59.32	6.750E-01 XXXXX
8.100E-01 -	1.080E+00	12	47	20.34	79.66	9.450E-01 XXXXXXXXXXXXXXXXXX
1.080E+00 -	1.350E+00	6	53	10.17	89.83	1.215E+00 XXXXXXXXX
1.350E+00 -	1.620E+00	4	57	6.78	96.61	1.485E+00 XXXXXXX
1.620E+00 -	1.890E+00	2	59	3.39	100.00	1.755E+00 XXX

	N	H	L	G	B	T	Unqualified	
No. of values:	0	0	21	0	3	0	38	35.59% of total values (59) are qualified

Lower limit	=	0.50	(mg/L)
Maximum	=	77.00	
Est geom mean	=	1.71	
Est geom dev	=	9.52	

Table 4, continued

Frequency Table for: pH-Fld

Histogram for: pH-Fld

Interval Limits lower	upper	Obs Freq	Cum Freq	Percent Freq	%Freq Cum	Histogram
6.150E+00 -	6.410E+00	1	1	1.61	1.61	6.280E+00 XX
6.410E+00 -	6.670E+00	3	4	4.84	6.45	6.540E+00 XXXXX
6.670E+00 -	6.930E+00	11	15	17.74	24.19	6.800E+00 XXXXXXXXXXXXXXXXX
6.930E+00 -	7.190E+00	7	22	11.29	35.48	7.060E+00 XXXXXXXXXX
7.190E+00 -	7.450E+00	8	30	12.90	48.39	7.320E+00 XXXXXXXXXXXX
7.450E+00 -	7.710E+00	22	52	35.48	83.87	7.580E+00 XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
7.710E+00 -	7.970E+00	4	56	6.45	90.32	7.840E+00 XXXXXX
7.970E+00 -	8.230E+00	6	62	9.68	100.00	8.100E+00 XXXXXXXXX

	N	H	L	G	B	T	Unqualified	
No. of values:	0	0	0	0	0	0	62	0.00% of total values (62) are qualified

Minimum = 6.15
Maximum = 8.20
Mean = 7.32
Std dev = 0.44
(standard pH units)

Frequency Table for: L-H20Tmp

Histogram for: L-H20Tmp

Interval Limits lower	upper	Obs Freq	Cum Freq	Percent Freq	%Freq Cum	Histogram
3.979E-01 -	4.849E-01	2	2	3.23	3.23	4.414E-01 XXX
4.849E-01 -	5.719E-01	1	3	1.61	4.84	5.284E-01 XX
5.719E-01 -	6.589E-01	2	5	3.23	8.06	6.154E-01 XXX
6.589E-01 -	7.459E-01	8	13	12.90	20.97	7.024E-01 XXXXXXXXXXXX
7.459E-01 -	8.329E-01	4	17	6.45	27.42	7.894E-01 XXXXXX
8.329E-01 -	9.199E-01	14	31	22.58	50.00	8.764E-01 XXXXXXXXXXXXXXXXXXXX
9.199E-01 -	1.007E+00	18	49	29.03	79.03	9.634E-01 XXXXXXXXXXXXXXXXXXXXXXXXXXXX
1.007E+00 -	1.094E+00	11	60	17.74	96.77	1.050E+00 XXXXXXXXXXXXXXXX
1.094E+00 -	1.181E+00	2	62	3.23	100.00	1.137E+00 XXX

	N	H	L	G	B	T	Unqualified	
No. of values:	0	0	0	0	0	0	62	0.00% of total values (62) are qualified

Minimum = 2.50
Maximum = 12.50
Geom mean = 7.67
Geom dev = 1.44
(°C)

Table 4, continued

Frequency Table for: Log - B

Interval Limits lower	upper	Obs Freq	Cum Freq	Percent Freq	%Freq Cum
-5.229E-01 -	-3.629E-01	4	4	6.90	6.90
-3.629E-01 -	-2.029E-01	4	8	6.90	13.79
-2.029E-01 -	-4.288E-02	4	12	6.90	20.69
-4.288E-02 -	1.171E-01	13	25	22.41	43.10
1.171E-01 -	2.771E-01	15	40	25.86	68.97
2.771E-01 -	4.371E-01	9	49	15.52	84.48
4.371E-01 -	5.971E-01	6	55	10.34	94.83
5.971E-01 -	7.571E-01	1	56	1.72	96.55
7.571E-01 -	9.171E-01	2	58	3.45	100.00

	N	H	L	G	B	T	Unqualified
No. of values:	0	0	0	0	4	0	58

0.00% of total values (58) are qualified

Minimum	=	0.30	(µg/L)
Maximum	=	6.20	
Geom mean	=	1.43	
Geom dev	=	1.91	

Histogram for: Log - B

```
-4.429E-01 XXXXXXX
-2.829E-01 XXXXXXX
-1.229E-01 XXXXXXX
 3.712E-02 XXXXXXXXXXXXXXXXXXXX
 1.971E-01 XXXXXXXXXXXXXXXXXXXXXXXX
 3.571E-01 XXXXXXXXXXXXXXX
 5.171E-01 XXXXXXXXXX
 6.771E-01 XX
 8.371E-01 XXX
```

Frequency Table for: Log - Ba

Interval Limits lower	upper	Obs Freq	Cum Freq	Percent Freq	%Freq Cum
-2.228E-02 -	2.077E-01	2	2	3.45	3.45
2.077E-01 -	4.377E-01	3	5	5.17	8.62
4.377E-01 -	6.677E-01	7	12	12.07	20.69
6.677E-01 -	8.977E-01	19	31	32.76	53.45
8.977E-01 -	1.128E+00	13	44	22.41	75.86
1.128E+00 -	1.358E+00	6	50	10.34	86.21
1.358E+00 -	1.588E+00	4	54	6.90	93.10
1.588E+00 -	1.818E+00	4	58	6.90	100.00

	N	H	L	G	B	T	Unqualified
No. of values:	0	0	0	0	4	0	58

0.00% of total values (58) are qualified

Minimum	=	0.95	(µg/L)
Maximum	=	63.00	
Geom mean	=	8.45	
Geom dev	=	2.44	

Histogram for: Log - Ba

```
 9.272E-02 XXX
 3.227E-01 XXXXX
 5.527E-01 XXXXXXXXXXXX
 7.827E-01 XXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
 1.013E+00 XXXXXXXXXXXXXXXXXXXX
 1.243E+00 XXXXXXXXXX
 1.473E+00 XXXXXXX
 1.703E+00 XXXXXXX
```

Table 4, continued

Frequency Table for: L-Bicarb

Histogram for: L-Bicarb

Interval Limits lower	upper	Obs Freq	Cum Freq	Percent Freq	%Freq Cum	Histogram for: L-Bicarb
4.771E-01 -	6.671E-01	6	6	9.68	9.68	5.721E-01 XXXXXXXXXX
6.671E-01 -	8.571E-01	7	13	11.29	20.97	7.621E-01 XXXXXXXXXX
8.571E-01 -	1.047E+00	15	28	24.19	45.16	9.521E-01 XXXXXXXXXXXXXXXXXXXXXXX
1.047E+00 -	1.237E+00	19	47	30.65	75.81	1.142E+00 XXXXXXXXXXXXXXXXXXXXXXXXXXXXX
1.237E+00 -	1.427E+00	4	51	6.45	82.26	1.332E+00 XXXXXX
1.427E+00 -	1.617E+00	7	58	11.29	93.55	1.522E+00 XXXXXXXXXX
1.617E+00 -	1.807E+00	2	60	3.23	96.77	1.712E+00 XXX
1.807E+00 -	1.997E+00	1	61	1.61	98.39	1.902E+00 XX
1.997E+00 -	2.187E+00	1	62	1.61	100.00	2.092E+00 XX

	N	H	L	G	B	T	Unqualified	
No. of values:	0	0	0	0	0	0	62	0.00% of total values (62) are qualified

Minimum	=	3.00	(mg/L)
Maximum	=	100.00	
Geom mean	=	12.94	
Geom dev	=	2.14	

Frequency Table for: L-InorgC

Histogram for: L-InorgC

Interval Limits lower	upper	Obs Freq	Cum Freq	Percent Freq	%Freq Cum	Histogram for: L-InorgC
-2.216E-01 -	-4.185E-02	1	1	1.75	1.75	-1.318E-01 XX
-4.185E-02 -	1.382E-01	1	2	1.75	3.51	4.815E-02 XX
1.382E-01 -	3.182E-01	9	11	15.79	19.30	2.282E-01 XXXXXXXXXXXXXXX
3.182E-01 -	4.982E-01	20	31	35.09	54.39	4.082E-01 XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
4.982E-01 -	6.782E-01	14	45	24.56	78.95	5.882E-01 XXXXXXXXXXXXXXXXXXXXXXX
6.782E-01 -	8.582E-01	7	52	12.28	91.23	7.682E-01 XXXXXXXXXXX
8.582E-01 -	1.038E+00	2	54	3.51	94.74	9.482E-01 XXXX
1.038E+00 -	1.218E+00	2	56	3.51	98.25	1.128E+00 XXXX
1.218E+00 -	1.398E+00	1	57	1.75	100.00	1.308E+00 XX

	N	H	L	G	B	T	Unqualified	
No. of values:	0	0	0	0	5	0	57	0.00% of total values (57) are qualified

Minimum	=	0.60	(mg/L)
Maximum	=	18.00	
Geom mean	=	3.22	
Geom dev	=	1.85	

Table 4, continued

Frequency Table for: L- Org C

Histogram for: L- Org C

Interval Limits lower	upper	Obs Freq	Cum Freq	Percent Freq	%Freq Cum	Histogram for: L- Org C
-1.000E+00 -	-7.400E-01	2	4	3.45	6.90	-8.700E-01 XXX
-7.400E-01 -	-4.800E-01	5	9	8.62	15.52	-6.100E-01 XXXXXXXXX
-4.800E-01 -	-2.200E-01	21	30	36.21	51.72	-3.500E-01 XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
-2.200E-01 -	4.000E-02	11	41	18.97	70.69	-9.000E-02 XXXXXXXXXXXXXXXXXX
4.000E-02 -	3.000E-01	8	49	13.79	84.48	1.700E-01 XXXXXXXXXXXXX
3.000E-01 -	5.600E-01	8	57	13.79	98.28	4.300E-01 XXXXXXXXXXXXX
5.600E-01 -	8.200E-01	0	57	0.00	98.28	6.900E-01
8.200E-01 -	1.080E+00	1	58	1.72	100.00	9.500E-01 XX

	N	H	L	G	B	T	Unqualified	
No. of values:	0	0	2	0	4	0	56	3.45% of total values (58) are qualified

Lower limit	=	0.05	
Maximum	=	12.00	
Est geom mean	=	0.64	(mg/L)
Est geom dev	=	2.70	

Frequency Table for: Log - Ca

Histogram for: Log - Ca

Interval Limits lower	upper	Obs Freq	Cum Freq	Percent Freq	%Freq Cum	Histogram for: Log - Ca
4.139E-02 -	2.114E-01	6	6	10.17	10.17	1.264E-01 XXXXXXXXXX
2.114E-01 -	3.814E-01	5	11	8.47	18.64	2.964E-01 XXXXXXXX
3.814E-01 -	5.514E-01	16	27	27.12	45.76	4.664E-01 XXXXXXXXXXXXXXXXXXXXXXXXXX
5.514E-01 -	7.214E-01	13	40	22.03	67.80	6.364E-01 XXXXXXXXXXXXXXXXXXXX
7.214E-01 -	8.914E-01	11	51	18.64	86.44	8.064E-01 XXXXXXXXXXXXXXXXX
8.914E-01 -	1.061E+00	4	55	6.78	93.22	9.764E-01 XXXXXXX
1.061E+00 -	1.231E+00	2	57	3.39	96.61	1.146E+00 XXX
1.231E+00 -	1.401E+00	1	58	1.69	98.31	1.316E+00 XX
1.401E+00 -	1.571E+00	1	59	1.69	100.00	1.486E+00 XX

	N	H	L	G	B	T	Unqualified	
No. of values:	0	0	0	0	3	0	59	0.00% of total values (59) are qualified

Minimum	=	1.10	
Maximum	=	27.00	(mg/L)
Geom mean	=	4.08	
Geom dev	=	1.94	

Table 4, continued

Frequency Table for: Cl - L

Interval Limits lower	upper	Obs Freq	Cum Freq	Percent Freq	%Freq Cum
1.000E-01 -	1.750E-01	10	11	16.13	17.74
1.750E-01 -	2.500E-01	24	35	38.71	56.45
2.500E-01 -	3.250E-01	18	53	29.03	85.48
3.250E-01 -	4.000E-01	7	60	11.29	96.77
4.000E-01 -	4.750E-01	0	60	0.00	96.77
4.750E-01 -	5.500E-01	1	61	1.61	98.39
5.500E-01 -	6.250E-01	0	61	0.00	98.39
6.250E-01 -	7.000E-01	0	61	0.00	98.39
7.000E-01 -	7.750E-01	1	62	1.61	100.00

Histogram for: Cl - L

```
1.375E-01 XXXXXXXXXXXXXXX
2.125E-01 XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
2.875E-01 XXXXXXXXXXXXXXXXXXXXXXXXXXX
3.625E-01 XXXXXXXXXXX
4.375E-01
5.125E-01 XX
5.875E-01
6.625E-01
7.375E-01 XX
```

	N	H	L	G	B	T	Unqualified
No. of values:	0	0	1	0	0	0	61

1.61% of total values (62) are qualified

Lower limit	=	0.05	(mg/L)
Maximum	=	0.70	
Est mean	=	0.25	
Est std dev	=	0.12	

Frequency Table for: Log - Cr

Interval Limits lower	upper	Obs Freq	Cum Freq	Percent Freq	%Freq Cum
-1.854E+00 -	-1.644E+00	2	4	3.45	6.90
-1.644E+00 -	-1.434E+00	2	6	3.45	10.34
-1.434E+00 -	-1.224E+00	11	17	18.97	29.31
-1.224E+00 -	-1.014E+00	13	30	22.41	51.72
-1.014E+00 -	-8.039E-01	15	45	25.86	77.59
-8.039E-01 -	-5.939E-01	8	53	13.79	91.38
-5.939E-01 -	-3.839E-01	2	55	3.45	94.83
-3.839E-01 -	-1.739E-01	2	57	3.45	98.28
-1.739E-01 -	3.613E-02	1	58	1.72	100.00

Histogram for: Log - Cr

```
-1.749E+00 XXX
-1.539E+00 XXX
-1.329E+00 XXXXXXXXXXXXXXXXXX
-1.119E+00 XXXXXXXXXXXXXXXXXXXX
-9.089E-01 XXXXXXXXXXXXXXXXXXXXXXXX
-6.989E-01 XXXXXXXXXXXXX
-4.889E-01 XXX
-2.789E-01 XXX
-6.887E-02 XX
```

	N	H	L	G	B	T	Unqualified
No. of values:	0	0	0	0	4	0	58

0.00% of total values (58) are qualified,
3.45% are assigned values from variable qualified ranges.

Minimum	=	0.01	(µg/L)
Maximum	=	0.73	
Geom mean	=	0.09	
Geom dev	=	2.27	

Table 4, continued

Frequency Table for: Log - Cu

Histogram for: Log - Cu

Interval Limits lower	upper	Obs Freq	Cum Freq	Percent Freq	%Freq Cum	Histogram for: Log - Cu
-9.208E-01 -	-7.908E-01	3	3	5.17	5.17	-8.558E-01 XXXXX
-7.908E-01 -	-6.608E-01	2	5	3.45	8.62	-7.258E-01 XXX
-6.608E-01 -	-5.308E-01	5	10	8.62	17.24	-5.958E-01 XXXXXXXXX
-5.308E-01 -	-4.008E-01	5	15	8.62	25.86	-4.658E-01 XXXXXXXXX
-4.008E-01 -	-2.708E-01	13	28	22.41	48.28	-3.358E-01 XXXXXXXXXXXXXXXXXXXXXX
-2.708E-01 -	-1.408E-01	11	39	18.97	67.24	-2.058E-01 XXXXXXXXXXXXXXXXXX
-1.408E-01 -	-1.082E-02	11	50	18.97	86.21	-7.582E-02 XXXXXXXXXXXXXXXXXX
-1.082E-02 -	1.192E-01	8	58	13.79	100.00	5.418E-02 XXXXXXXXXXXXX

	N	H	L	G	B	T	Unqualified	
No. of values:	0	0	0	0	4	0	58	0.00% of total values (58) are qualified

Minimum	=	0.12	(µg/L)
Maximum	=	1.30	
Geom mean	=	0.53	
Geom dev	=	1.78	

Frequency Table for: Log - K

Histogram for: Log - K

Interval Limits lower	upper	Obs Freq	Cum Freq	Percent Freq	%Freq Cum	Histogram for: Log - K
-1.000E+00 -	-8.500E-01	5	5	8.33	8.33	-9.250E-01 XXXXXXXX
-8.500E-01 -	-7.000E-01	0	5	0.00	8.33	-7.750E-01
-7.000E-01 -	-5.500E-01	7	12	11.67	20.00	-6.250E-01 XXXXXXXXXXX
-5.500E-01 -	-4.000E-01	5	17	8.33	28.33	-4.750E-01 XXXXXXXX
-4.000E-01 -	-2.500E-01	26	43	43.33	71.67	-3.250E-01 XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
-2.500E-01 -	-1.000E-01	9	52	15.00	86.67	-1.750E-01 XXXXXXXXXXXXXX
-1.000E-01 -	5.000E-02	5	57	8.33	95.00	-2.500E-02 XXXXXXXX
5.000E-02 -	2.000E-01	3	60	5.00	100.00	1.250E-01 XXXXX

	N	H	L	G	B	T	Unqualified	
No. of values:	0	0	0	0	2	0	60	0.00% of total values (60) are qualified

Minimum	=	0.10	(mg/L)
Maximum	=	1.50	
Geom mean	=	0.41	
Geom dev	=	1.89	

Table 4, continued

Frequency Table for: Log - Mg

Interval Limits lower	upper	Obs Freq	Cum Freq	Percent Freq	%Freq Cum
-1.000E+00 -	-7.800E-01	1	1	1.69	1.69
-7.800E-01 -	-5.600E-01	9	10	15.25	16.95
-5.600E-01 -	-3.400E-01	13	23	22.03	38.98
-3.400E-01 -	-1.200E-01	10	33	16.95	55.93
-1.200E-01 -	1.000E-01	11	44	18.64	74.58
1.000E-01 -	3.200E-01	7	51	11.86	86.44
3.200E-01 -	5.400E-01	4	55	6.78	93.22
5.400E-01 -	7.600E-01	4	59	6.78	100.00

Histogram for: Log - Mg

```
-8.900E-01 XX
-6.700E-01 XXXXXXXXXXXXXX
-4.500E-01 XXXXXXXXXXXXXXXXXXXX
-2.300E-01 XXXXXXXXXXXXXXXXX
-1.000E-02 XXXXXXXXXXXXXXXXXX
 2.100E-01 XXXXXXXXXXX
 4.300E-01 XXXXXXX
 6.500E-01 XXXXXXX
```

	N	H	L	G	B	T	Unqualified
No. of values:	0	0	0	0	3	0	59

0.00% of total values (59) are qualified

Minimum	=	0.10	(mg/L)
Maximum	=	5.40	
Geom mean	=	0.67	
Geom dev	=	2.51	

Frequency Table for: Log - Mo

Interval Limits lower	upper	Obs Freq	Cum Freq	Percent Freq	%Freq Cum
-1.678E+00 -	-1.338E+00	1	12	1.72	20.69
-1.338E+00 -	-9.978E-01	6	18	10.34	31.03
-9.978E-01 -	-6.578E-01	10	28	17.24	48.28
-6.578E-01 -	-3.178E-01	11	39	18.97	67.24
-3.178E-01 -	2.222E-02	7	46	12.07	79.31
2.222E-02 -	3.622E-01	8	54	13.79	93.10
3.622E-01 -	7.022E-01	2	56	3.45	96.55
7.022E-01 -	1.042E+00	1	57	1.72	98.28
1.042E+00 -	1.382E+00	1	58	1.72	100.00

Histogram for: Log - Mo

```
-1.508E+00 XX
-1.168E+00 XXXXXXXXXX
-8.278E-01 XXXXXXXXXXXXXXXXX
-4.878E-01 XXXXXXXXXXXXXXXXXX
-1.478E-01 XXXXXXXXXXXX
 1.922E-01 XXXXXXXXXXXXXX
 5.322E-01 XXX
 8.722E-01 XX
 1.212E+00 XX
```

	N	H	L	G	B	T	Unqualified
No. of values:	0	0	0	0	4	0	58

0.00% of total values (58) are qualified,
18.97% are assigned values from variable qualified ranges.

Minimum	=	0.02	(µg/L)
Maximum	=	12.00	
Geom mean	=	0.26	
Geom dev	=	4.37	

Table 4, continued

Frequency Table for: Log - Na

Interval Limits lower	upper	Obs Freq	Cum Freq	Percent Freq	%Freq Cum
-3.979E-01 -	-2.989E-01	4	4	6.78	6.78
-2.989E-01 -	-1.999E-01	10	14	16.95	23.73
-1.999E-01 -	-1.009E-01	6	20	10.17	33.90
-1.009E-01 -	-1.940E-03	11	31	18.64	52.54
-1.940E-03 -	9.706E-02	13	44	22.03	74.58
9.706E-02 -	1.961E-01	8	52	13.56	88.14
1.961E-01 -	2.951E-01	5	57	8.47	96.61
2.951E-01 -	3.941E-01	1	58	1.69	98.31
3.941E-01 -	4.931E-01	1	59	1.69	100.00

Histogram for: Log - Na

```
-3.484E-01 XXXXXXX
-2.494E-01 XXXXXXXXXXXXXXXX
-1.504E-01 XXXXXXXXXX
-5.144E-02 XXXXXXXXXXXXXXXXXX
 4.756E-02 XXXXXXXXXXXXXXXXXXXXX
 1.466E-01 XXXXXXXXXXXXX
 2.456E-01 XXXXXXXX
 3.446E-01 XX
 4.436E-01 XX
```

	N	H	L	G	B	T	Unqualified
No. of values:	0	0	0	0	3	0	59

0.00% of total values (59) are qualified

Minimum	=	0.40	(mg/L)
Maximum	=	2.50	
Geom mean	=	0.93	
Geom dev	=	1.53	

Frequency Table for: Log- Na%

Interval Limits lower	upper	Obs Freq	Cum Freq	Percent Freq	%Freq Cum
4.771E-01 -	6.271E-01	2	2	3.39	3.39
6.271E-01 -	7.771E-01	2	4	3.39	6.78
7.771E-01 -	9.271E-01	2	6	3.39	10.17
9.271E-01 -	1.077E+00	20	26	33.90	44.07
1.077E+00 -	1.227E+00	20	46	33.90	77.97
1.227E+00 -	1.377E+00	10	56	16.95	94.92
1.377E+00 -	1.527E+00	2	58	3.39	98.31
1.527E+00 -	1.677E+00	1	59	1.69	100.00

Histogram for: Log- Na%

```
5.521E-01 XXX
7.021E-01 XXX
8.521E-01 XXX
1.002E+00 XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
1.152E+00 XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
1.302E+00 XXXXXXXXXXXXXXXXX
1.452E+00 XXX
1.602E+00 XX
```

	N	H	L	G	B	T	Unqualified
No. of values:	0	0	0	0	3	0	59

0.00% of total values (59) are qualified

Minimum	=	3.00	(%)
Maximum	=	44.00	
Geom mean	=	12.41	
Geom dev	=	1.56	

Table 4, continued

Frequency Table for: Log - Ni

Interval Limits lower	upper	Obs Freq	Cum Freq	Percent Freq	%Freq Cum
-1.620E+00 -	-1.370E+00	4	20	6.90	34.48
-1.370E+00 -	-1.120E+00	9	29	15.52	50.00
-1.120E+00 -	-8.698E-01	8	37	13.79	63.79
-8.698E-01 -	-6.198E-01	4	41	6.90	70.69
-6.198E-01 -	-3.698E-01	9	50	15.52	86.21
-3.698E-01 -	-1.198E-01	2	52	3.45	89.66
-1.198E-01 -	1.302E-01	6	58	10.34	100.00

Histogram for: Log - Ni

```
-1.495E+00 XXXXXXX
-1.245E+00 XXXXXXXXXXXXXXX
-9.948E-01 XXXXXXXXXXXXX
-7.448E-01 XXXXXXX
-4.948E-01 XXXXXXXXXXXXXXX
-2.448E-01 XXX
 5.211E-03 XXXXXXXXXX
```

	N	H	L	G	B	T	Unqualified
No. of values:	0	0	0	0	4	0	58

0.00% of total values (58) are qualified,
27.59% are assigned values from variable qualified ranges.

Minimum	=	0.02	(µg/L)
Maximum	=	1.30	
Geom mean	=	0.11	
Geom dev	=	3.16	

Frequency Table for: L-N02N03

Interval Limits lower	upper	Obs Freq	Cum Freq	Percent Freq	%Freq Cum
-2.000E+00 -	-1.850E+00	3	31	4.92	50.82
-1.850E+00 -	-1.700E+00	0	31	0.00	50.82
-1.700E+00 -	-1.550E+00	2	33	3.28	54.10
-1.550E+00 -	-1.400E+00	7	40	11.48	65.57
-1.400E+00 -	-1.250E+00	13	53	21.31	86.89
-1.250E+00 -	-1.100E+00	3	56	4.92	91.80
-1.100E+00 -	-9.500E-01	5	61	8.20	100.00

Histogram for: L-N02N03

```
-1.925E+00 XXXXX
-1.775E+00
-1.625E+00 XXX
-1.475E+00 XXXXXXXXXXX
-1.325E+00 XXXXXXXXXXXXXXXXXXXX
-1.175E+00 XXXXX
-1.025E+00 XXXXXXXX
```

	N	H	L	G	B	T	Unqualified
No. of values:	0	0	28	0	1	0	33

45.90% of total values (61) are qualified

Lower limit	=	0.01	(mg/L)
Maximum	=	0.11	
Est geom mean	=	0.01	
Est geom dev	=	6.55	

Table 4, continued

Frequency Table for: Log- P04

Histogram for: Log- P04

Interval Limits lower	upper	Obs Freq	Cum Freq	Percent Freq	%Freq Cum	Histogram
-1.523E+00 -	-1.403E+00	29	42	47.54	68.85	-1.463E+00 XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
-1.403E+00 -	-1.283E+00	0	42	0.00	68.85	-1.343E+00
-1.283E+00 -	-1.163E+00	16	58	26.23	95.08	-1.223E+00 XXXXXXXXXXXXXXXXXXXXXXXXXX
-1.163E+00 -	-1.043E+00	1	59	1.64	96.72	-1.103E+00 XX
-1.043E+00 -	-9.229E-01	0	59	0.00	96.72	-9.829E-01
-9.229E-01 -	-8.029E-01	1	60	1.64	98.36	-8.629E-01 XX
-8.029E-01 -	-6.829E-01	0	60	0.00	98.36	-7.429E-01
-6.829E-01 -	-5.629E-01	0	60	0.00	98.36	-6.229E-01
-5.629E-01 -	-4.429E-01	1	61	1.64	100.00	-5.029E-01 XX

	N	H	L	G	B	T	Unqualified	
No. of values:	0	0	13	0	1	0	48	21.31% of total values (61) are qualified

Lower limit	=	0.01	(mg/L)
Maximum	=	0.28	
Est geom mean	=	0.02	
Est geom dev	=	3.35	

Frequency Table for: Log-Si02

Histogram for: Log-Si02

Interval Limits lower	upper	Obs Freq	Cum Freq	Percent Freq	%Freq Cum	Histogram
1.139E-01 -	2.439E-01	3	3	4.84	4.84	1.789E-01 XXXXX
2.439E-01 -	3.739E-01	7	10	11.29	16.13	3.089E-01 XXXXXXXXXXX
3.739E-01 -	5.039E-01	8	18	12.90	29.03	4.389E-01 XXXXXXXXXXXX
5.039E-01 -	6.339E-01	17	35	27.42	56.45	5.689E-01 XXXXXXXXXXXXXXXXXXXXXXXXX
6.339E-01 -	7.639E-01	9	44	14.52	70.97	6.989E-01 XXXXXXXXXXXXX
7.639E-01 -	8.939E-01	6	50	9.68	80.65	8.289E-01 XXXXXXXXX
8.939E-01 -	1.024E+00	10	60	16.13	96.77	9.589E-01 XXXXXXXXXXXXXX
1.024E+00 -	1.154E+00	2	62	3.23	100.00	1.089E+00 XXX

	N	H	L	G	B	T	Unqualified	
No. of values:	0	0	0	0	0	0	62	0.00% of total values (62) are qualified

Minimum	=	1.30	(mg/L)
Maximum	=	14.00	
Geom mean	=	4.25	
Geom dev	=	1.74	

Table 4, continued

Frequency Table for: Log- S04

Interval Limits lower	upper	Obs Freq	Cum Freq	Percent Freq	%Freq Cum
-5.229E-01 -	-3.429E-01	1	2	1.61	3.23
-3.429E-01 -	-1.629E-01	2	4	3.23	6.45
-1.629E-01 -	1.712E-02	13	17	20.97	27.42
1.712E-02 -	1.971E-01	18	35	29.03	56.45
1.971E-01 -	3.771E-01	17	52	27.42	83.87
3.771E-01 -	5.571E-01	5	57	8.06	91.94
5.571E-01 -	7.371E-01	3	60	4.84	96.77
7.371E-01 -	9.171E-01	2	62	3.23	100.00

Histogram for: Log- S04

```
-4.329E-01 XX
-2.529E-01 XXX
-7.288E-02 XXXXXXXXXXXXXXXXXXX
 1.071E-01 XXXXXXXXXXXXXXXXXXXXXXXXXXX
 2.871E-01 XXXXXXXXXXXXXXXXXXXXXXXXXXX
 4.671E-01 XXXXXXXX
 6.471E-01 XXXXX
 8.271E-01 XXX
```

	N	H	L	G	B	T	Unqualified
No. of values:	0	0	1	0	0	0	61

1.61% of total values (62) are qualified

Lower limit	=	1.00	(mg/L)
Maximum	=	7.80	
Est geom mean	=	1.51	
Est geom dev	=	1.80	

Frequency Table for: Log - Sr

Interval Limits lower	upper	Obs Freq	Cum Freq	Percent Freq	%Freq Cum
-4.576E-02 -	2.442E-01	2	2	3.45	3.45
2.442E-01 -	5.342E-01	3	5	5.17	8.62
5.342E-01 -	8.242E-01	9	14	15.52	24.14
8.242E-01 -	1.114E+00	23	37	39.66	63.79
1.114E+00 -	1.404E+00	10	47	17.24	81.03
1.404E+00 -	1.694E+00	6	53	10.34	91.38
1.694E+00 -	1.984E+00	1	54	1.72	93.10
1.984E+00 -	2.274E+00	3	57	5.17	98.28
2.274E+00 -	2.564E+00	1	58	1.72	100.00

Histogram for: Log - Sr

```
9.924E-02 XXX
3.892E-01 XXXXX
6.792E-01 XXXXXXXXXXXXXXXX
9.692E-01 XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
1.259E+00 XXXXXXXXXXXXXXXX
1.549E+00 XXXXXXXXXX
1.839E+00 XX
2.129E+00 XXXXX
2.419E+00 XX
```

	N	H	L	G	B	T	Unqualified
No. of values:	0	0	0	0	4	0	58

0.00% of total values (58) are qualified

Minimum	=	0.90	(µg/L)
Maximum	=	200.00	
Geom mean	=	11.66	
Geom dev	=	2.92	

Table 4, continued

Frequency Table for: Log - V

Interval Limits lower	upper	Obs Freq	Cum Freq	Percent Freq	%Freq Cum
-1.721E+00 -	-1.521E+00	6	9	10.34	15.52
-1.521E+00 -	-1.321E+00	9	18	15.52	31.03
-1.321E+00 -	-1.121E+00	18	36	31.03	62.07
-1.121E+00 -	-9.212E-01	9	45	15.52	77.59
-9.212E-01 -	-7.212E-01	3	48	5.17	82.76
-7.212E-01 -	-5.212E-01	3	51	5.17	87.93
-5.212E-01 -	-3.212E-01	4	55	6.90	94.83
-3.212E-01 -	-1.212E-01	2	57	3.45	98.28
-1.212E-01 -	7.875E-02	1	58	1.72	100.00

Histogram for: Log - V

```
-1.621E+00 XXXXXXXXXX
-1.421E+00 XXXXXXXXXXXXXXX
-1.221E+00 XXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
-1.021E+00 XXXXXXXXXXXXXXX
-8.212E-01 XXXXX
-6.212E-01 XXXXX
-4.212E-01 XXXXXXX
-2.212E-01 XXX
-2.125E-02 XX
```

	N	H	L	G	B	T	Unqualified
No. of values:	0	0	0	0	4	0	58

0.00% of total values (58) are qualified,
5.17% are assigned values from variable qualified ranges.

Minimum	=	0.02	(µg/L)
Maximum	=	0.82	
Geom mean	=	0.07	
Geom dev	=	2.57	

Table 5.--Correlation coefficients, r, and numbers of pairs, (n), of selected elements

	L - Cond	Log - U	L - Alk	Eh-Fld	L - Hard	L-HardNC	pH-Fld	L-H2OTmp	Log - B	Log - Ba
L - Cond		0.05(62)	-0.04(62)	0.29(62)	0.91(59)	0.72(59)	0.42(62)	0.22(62)	0.38(58)	0.72(58)
Log - U			-0.17(62)	-0.06(62)	0.09(59)	0.05(59)	-0.08(62)	-0.22(62)	0.06(58)	-0.17(58)
L - Alk				-0.07(62)	-0.04(59)	-0.59(59)	0.15(62)	-0.14(62)	-0.09(58)	-0.06(58)
Eh-Fld					0.25(59)	0.21(59)	0.29(62)	0.22(62)	0.03(58)	0.11(58)
L - Hard						0.70(59)	0.47(59)	0.24(59)	0.40(55)	0.73(55)
L-HardNC							0.25(59)	0.25(59)	0.42(55)	0.57(55)
pH-Fld								0.47(62)	0.07(58)	0.38(58)
L-H2OTmp									-0.01(58)	0.17(58)
Log - B										0.63(58)
Log - Ba										
L-Bicarb										
L-InorgC										
L- OrgC										
Log - Ca										
Cl - L										
Log - Cr										
Log - Cu										
Log - K										
Log - Mg										
Log - Mo										
Log - Na										
Log- Na%										
Log - Ni										
Log-SiO2										
Log- SO4										
Log - Sr										
Log - V										

Prefix of L- or Log- signifies use of log-data in the calculations.

Table 5, continued

	L-Bicarb	L-InorgC	L- Org C	Log - Ca	Cl - L	Log - Cr	Log - Cu	Log - K	Log - Mg	Log - Mo
L - Cond	-0.05(62)	0.87(57)	0.27(58)	0.85(59)	-0.07(62)	0.56(58)	0.29(58)	0.81(60)	0.84(59)	0.55(58)
Log - U	-0.18(62)	-0.09(57)	-0.10(58)	0.14(59)	0.16(62)	0.23(58)	-0.00(58)	0.09(60)	-0.01(59)	0.53(58)
L - Alk	1.00(62)	0.10(57)	-0.23(58)	-0.03(59)	0.02(62)	-0.05(58)	0.08(58)	-0.00(60)	-0.04(59)	-0.22(58)
Eh-Fld	-0.07(62)	0.15(57)	0.35(58)	0.16(59)	-0.01(62)	0.07(58)	0.14(58)	0.21(60)	0.38(59)	0.03(58)
L - Hard	-0.05(59)	0.80(55)	0.27(56)	0.97(59)	0.03(59)	0.57(55)	0.31(55)	0.74(59)	0.81(59)	0.49(55)
L-HardNC	-0.60(59)	0.60(55)	0.33(56)	0.66(59)	-0.04(59)	0.46(55)	0.19(55)	0.56(59)	0.58(59)	0.50(55)
pH-Fld	0.15(62)	0.41(57)	0.03(58)	0.40(59)	-0.10(62)	0.19(58)	-0.01(58)	0.19(60)	0.51(59)	-0.02(56)
L-H2OTmo	-0.15(62)	0.23(57)	0.21(58)	0.18(59)	-0.08(62)	-0.02(58)	-0.03(58)	0.09(60)	0.29(59)	0.06(58)
Log - B	-0.10(58)	0.41(54)	0.16(54)	0.37(55)	0.22(58)	0.72(58)	0.59(58)	0.21(56)	0.42(55)	0.40(58)
Log - Ba	-0.08(58)	0.73(54)	0.29(54)	0.69(55)	0.01(58)	0.62(58)	0.51(58)	0.51(56)	0.69(55)	0.31(58)
L-Bicarb	.....	0.09(57)	-0.25(58)	-0.04(59)	0.01(62)	-0.06(58)	0.07(58)	-0.02(60)	-0.06(59)	-0.23(58)
L-InorgC	.....	0.25(57)	0.73(55)	-0.15(57)	0.52(54)	0.17(54)	0.66(55)	0.81(55)	0.40(54)
L- Org C	.....	0.26(56)	0.08(58)	0.19(54)	0.11(54)	0.13(56)	0.28(56)	0.18(54)
Log - Ca	.....	0.08(59)	0.55(55)	0.27(55)	0.65(59)	0.66(59)	0.52(55)
Cl - L	.....	0.20(58)	-0.02(58)	-0.00(60)	-0.12(59)	0.14(56)
Log - Cr	.....	0.44(58)	0.36(56)	0.51(55)	0.49(56)
Log - Cu	.....	0.38(56)	0.35(55)	0.36(58)
Log - K	.....	0.76(59)	0.41(56)
Log - Mg	.....	0.29(55)
Log - Mo	.....
Log - Na	.....
Log- Na%	.....
Log - Ni	.....
Log-SiO2	.....
Log- SO4	.....
Log - Sr	.....
Log - V	.....

Table 5, continued

	Log - Na	Log- Na%	Log - Ni	Log-SiO2	Log- SO4	Log - Sr	Log - V
L - Cond	0.73(59)	-0.57(59)	0.32(58)	-0.15(62)	-0.12(62)	0.79(58)	0.72(58)
Log - U	-0.11(59)	-0.19(59)	-0.14(58)	0.09(62)	-0.07(62)	0.01(58)	-0.24(58)
L - Alk	-0.00(59)	0.02(59)	0.08(58)	0.70(62)	0.63(62)	-0.10(58)	0.09(58)
Eh-Fld	0.33(59)	-0.06(59)	0.15(58)	-0.26(62)	-0.15(62)	0.02(58)	0.09(58)
L - Hard	0.63(59)	-0.77(59)	0.34(55)	-0.17(59)	-0.03(59)	0.80(55)	0.70(55)
L-HardNC	0.51(59)	-0.47(59)	0.24(55)	-0.54(59)	-0.35(59)	0.66(55)	0.56(55)
pH-Fld	0.13(59)	-0.50(59)	0.15(58)	-0.06(62)	0.02(62)	0.40(58)	0.35(58)
L-H2OTmp	0.22(59)	-0.10(59)	0.06(58)	-0.31(62)	-0.23(62)	0.19(58)	0.21(58)
Log - B	0.25(55)	-0.32(55)	0.41(58)	-0.05(58)	-0.04(58)	0.55(58)	0.64(58)
Log - Ba	0.40(55)	-0.63(55)	0.41(58)	-0.19(58)	-0.07(58)	0.87(58)	0.77(58)
L-Bicarb	-0.02(59)	0.02(59)	0.08(58)	0.70(62)	0.63(62)	-0.12(58)	0.07(58)
L-InorgC	0.76(55)	-0.41(55)	0.22(54)	-0.05(57)	0.04(57)	0.79(54)	0.75(54)
L- Org C	0.33(56)	-0.07(56)	0.23(54)	-0.22(58)	-0.15(58)	0.19(54)	0.20(54)
Log - Ca	0.57(59)	-0.78(59)	0.27(55)	-0.09(59)	-0.00(59)	0.79(55)	0.64(55)
Cl - L	-0.16(59)	-0.17(59)	-0.07(58)	0.14(62)	0.15(62)	0.02(58)	-0.12(58)
Log - Cr	0.26(55)	-0.54(55)	0.39(58)	-0.03(58)	-0.04(58)	0.61(58)	0.62(58)
Log - Cu	0.25(55)	-0.21(55)	0.73(58)	0.04(58)	-0.01(58)	0.32(58)	0.45(58)
Log - K	0.59(59)	-0.48(59)	0.44(56)	-0.18(60)	-0.05(60)	0.52(56)	0.53(56)
Log - Mg	0.61(59)	-0.53(59)	0.38(55)	-0.30(59)	-0.08(59)	0.62(55)	0.70(55)
Log - Mo	0.49(55)	-0.22(55)	0.17(58)	-0.10(58)	-0.12(58)	0.47(58)	0.27(58)
Log - Na	.....	0.01(59)	0.22(55)	-0.19(59)	-0.11(59)	0.45(55)	0.54(55)
Log- Na%	.....	.....	-0.27(55)	0.05(59)	-0.09(59)	-0.67(55)	-0.48(55)
Log - Ni	.....	.....	.....	-0.10(58)	-0.04(58)	0.27(58)	0.41(58)
Log-SiO2	.....	.....	.....	.....	0.46(62)	-0.15(58)	-0.07(58)
Log- SO4	.....	.....	.....	.....	.....	-0.07(58)	-0.04(58)
Log - Sr	.....	.....	.....	.....	.....	.....	0.73(58)
Log - V	.....	.....	.....	.....	.....	.....	.....

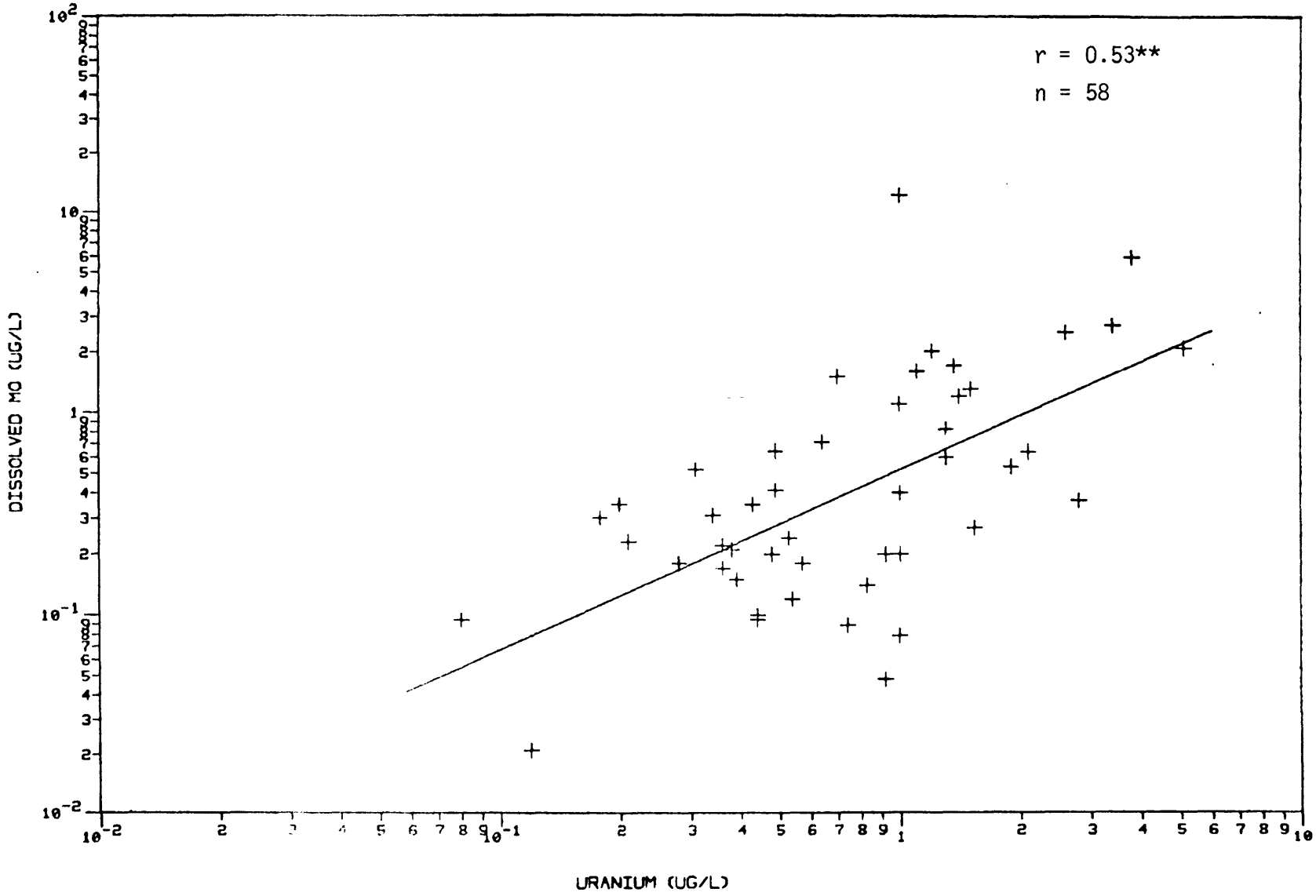

Figure 3.--Scatter diagram of molybdenum versus uranium.
r = correlation coefficient
n = number of sample pairs
** = correlation is significant at the 99-percent confidence level.