UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY

A Hydrogeochemical Survey in Clover, Delamar, Meadow Valley, and Mormon Mountains, Lincoln County, Nevada

By

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INTRODUCTION

The Federal Land Policy and Management Act (Public Law 94-579, October 21, 1976) requires the U.S. Geological Survey and the U.S. Bureau of Mines to conduct mineral surveys on certain areas to determine their mineral resource potential. Results must be made available to the public and be submitted to the President and the Congress. This report presents the results of a hydrogeochemical survey in Clover Mountains (GRA NV-23), Delamar Mountains (GRA NV-25), Meadow Valley Mountains (GRA NV-26), and Mormon Mountains (GRA NV-27) Geology Energy Mineral Resource Areas all situated in Lincoln County, Nevada.

Forty water samples were collected in these four resource areas from thirty-eight springs, one well, and one lake during June 1983. The analytical results for these samples and a discussion of the thirty-one samples collected from the Clover Mountains are given in this report.

Due to the arid nature of the Delamar, Meadow Valley, and Mormon Mountains Resource Areas only nine water samples were collected from these areas. Only the analytical results and a sample locality map are given in this report for these nine samples.

The usefulness of water for geochemical exploration will vary, depending on the geological and geochemical environment, climates, and types of expected mineralization. Review papers that describe the use of water for geochemical exploration include Boyle and others (1971), Cameron (1978), Dyck (1979), Miller (1979). A hydrogeochemical survey paper (McHugh and others, 1983) was published on a nearby area similar to this report.

STUDY AREA

The Clover Mountains are located in southeastern Nevada. The area is in the southern part of the Great Basin section of the Basin and Range physiographic province. A geologic map of the study area with explanations (Ekren and others, 1977) is shown in figure 1. The Clover Mountains are predominantly Tertiary volcanic rocks, with some sedimentary rocks of Paleozoic and Tertiary age. Moderate to intense hydrothermal alteration is present in parts of the study area (fig. 1).

The flow of most ground water and surface water within the study area is generally toward the north to Clover Creek, and toward the south to Meadow Valley Wash, which flow into the Colorado River. All of the thirty-one samples are from springs, which at times dry up in the summer.

Elevation of the Clover Mountains ranges from 4,000 feet to 7,500 feet, with an average annual precipitation of 8 to 16 inches.

The Delamar, Meadow Valley, and Mormon Mountains Resource Areas lie to the south and southwest of the Clover Mountains. The elevation of these areas range from 3,000 feet to 7,500 feet, with an average annual precipitation of 4 to 8 inches.

SAMPLE COLLECTION AND ANALYTICAL METHODS

Water samples were collected from forty localities within the four Resource Study Areas, thirty-eight from springs, one from a well, and one from Delamar Lake. Sample source for these forty samples are shown in table 1. At each locality, a 60-mL sample was collected and filtered through a 0.45-μm membrane filter and acidified with reagent-grade concentrated nitric acid to pH <2. An untreated 500-mL sample was also collected. The samples were stored in acid-rinsed polyethylene bottles.

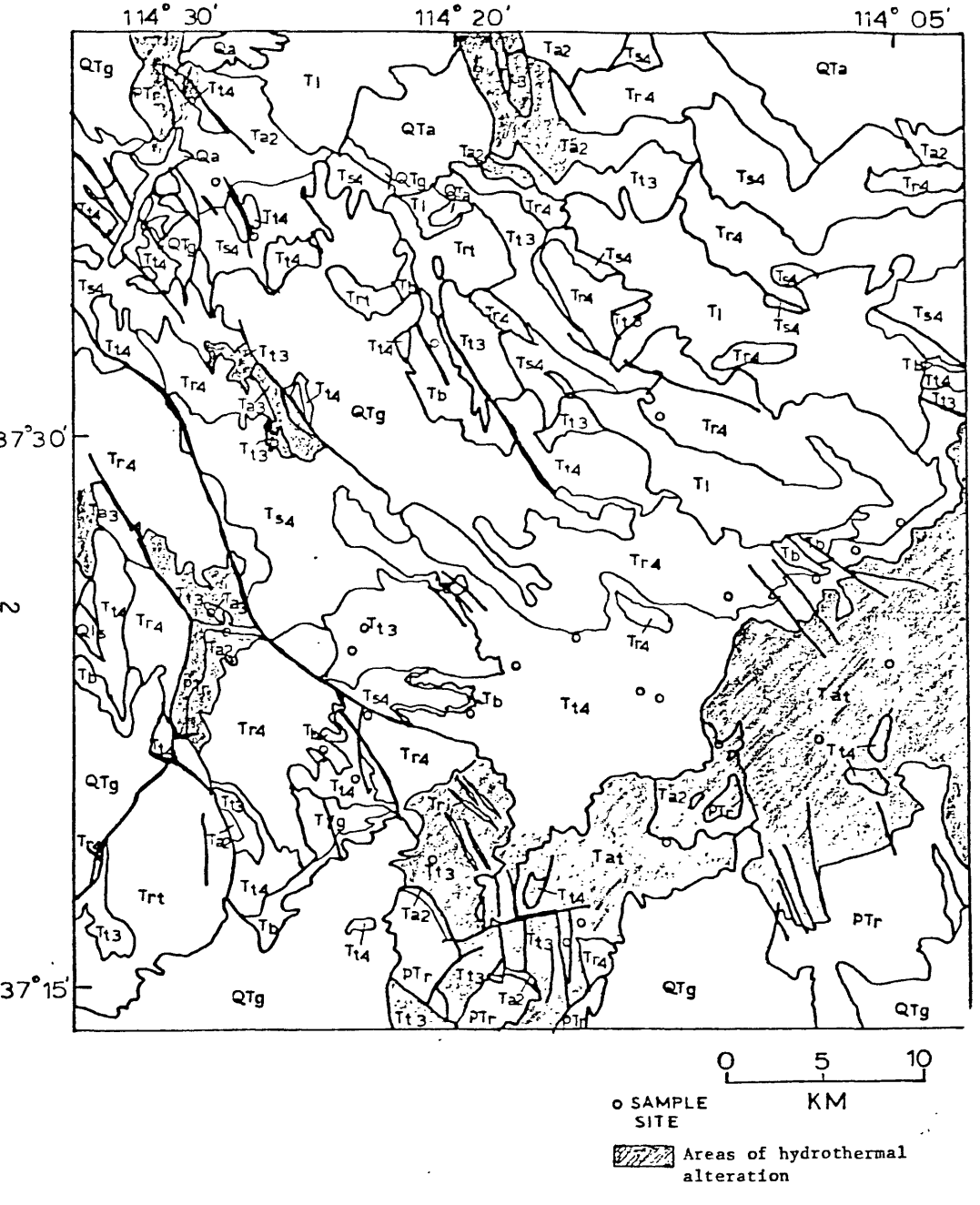

Figure 1. Map explanation

Symbol	Age	Description
Qa	Quaternary	Alluvium, stream sands and gravels, including lake bed deposits
Qls	Quaternary	Landslide blocks, rotated and broken masses of tuff
QTa	Quaternary and Pliocene	Alluvium and colluvium, older stream sands and gravels
QTg	Quaternary and Miocene	Weakly cemented older gravels
Tfg	Pliocene	Coarse older fanglomerate and sandstone
Tl	Pliocene and Miocene	Older lake-bed deposits, siltstone, sandsands, and mudstones
Tb	Miocene	Basalt flows
Tt4	Miocene	Youngest ash-flow tuffs
Tt3	Miocene	Middle ash-flow tuff
Tr4	Miocene	Younger rhyolite lavas
Trt	Miocene	Rhyolite lava and tuff undivided
Tat	Miocene and Oligocene	Altered intermediate lavas and tuffs undivided
Ta3	Miocene	Intermediate lavas ranging from basaltic andesite to quartz latite
Ta2	Oligocene	Altered andesite and dacite lava
Ts4	Miocene	Bedded tuff and tuffaceous sandstone and siltstone
Tri	Miocene to Oligocene	Rhyolite plugs and dikes
pTr	Pre-Tertiary	Sedimentary rocks, limestone, dolomite, shale, and siltstone

Figure 1. Geologic map of study area.

Water temperature was measured at each sample site. The pH was measured at the sample site or within a few hours of sample collection. The chemical analyses were completed at the U.S. Geological Survey laboratory in Denver, Colorado. Alkalinity, specific conductance, sulfate, chloride, fluoride, nitrate, and uranium were determined using the untreated samples. Calcium, magnesium, sodium, potassium, silica, lithium, zinc, copper, molybdenum, silver, arsenic, iron, manganese, and aluminum were determined using the 0.45-μm filtered and acidified samples. The analytical methods used for these determinations are shown in table 2.

RESULTS AND DISCUSSION

The sample localities for thirty-one spring samples collected from the Clover Mountains study area are shown in figure 2. The analytical results are shown in table 3. A summary of statistical parameters for the chemical analyses for these samples is shown in table 4. Correlation coefficients of the logarithm (base 10) of concentration of ions are shown in table 5. Many pairs of significant correlations are present.

The sample localities for nine water samples collected from the Delamar, Meadow Valley, and Mormon Mountains Resource Areas are shown in figure 3. The analytical results are shown in table 3.

The results of the charge balance of the cations and anions for the forty samples are shown in table 3. Ionic solutions are electrically neutral. Therefore, accuracy of analyses can be checked by comparing the sums of the charges for cations against anions. Twenty-one of the samples are within 5 percent, 12 within 10 percent, and the remaining 7 within 15 percent of electrical neutrality.

The waters from the Clover Mountains may be classified according to the dominant cation and anion, which are $Ca\text{-}HCO_3$ (17 samples), $Ca\text{-}SO_4$ (5 samples), $Ca\text{-}Na\text{-}HCO_3$ (7 samples), Ca-Cl (1 sample), and $Na\text{-}HCO_3$ (1 sample). The distribution of these types is shown in figure 4. Calcium sulfate type waters occur in the south and southeastern section of the study area.

Waters containing the highest concentration of dissolved solids in the study area, as measured by specific conductance at 25°C, also occur in the south and southeastern part of the study area (fig. 5). Samples 20, 19, 23, 17, and 18 show conductance values of 1,400, 1,100, 1,010, 1,000, and 980 , respectively.

The concentration of sulfate in waters in the study area ranges from 2.0 to 660 mg/L (table 4) and has a geometric mean of 22.8 mg/L. The highest concentrations of sulfate are in the south and southeastern part of the study area (fig. 6). Samples 20, 23, 17, and 18 have 660, 435, 284, and 253 mg/L sulfate, respectively.

High-sulfate values can indicate evaporite deposits or areas of weathering sulfides, particularly areas of oxidizing pyrite and hydrothermal alteration (Hem, 1970). In this case these sample sites are in an area of intensive hydrothermal alteration (fig. 1).

The concentration of fluoride in waters in the study area ranges from 0.10 to 6.30 mg/L (table 4) and has a geometric mean of 0.770 mg/L. Generally the highest concentrations of fluoride are in the southern part of the study area (fig. 7) close to areas of fluorspar mining (Papke, 1979). Sample 18 has the highest fluoride concentration with 6.30 mg/L.

Arsenic values range from 1.0 to 25 μg/L (table 4) and has a geometric mean of 2.07 μg/L. High-arsenic values are mostly concentrated in the northwestern section of the study area (fig. 8). Oak Spring with 25 μg/L has the highest concentration of arsenic.

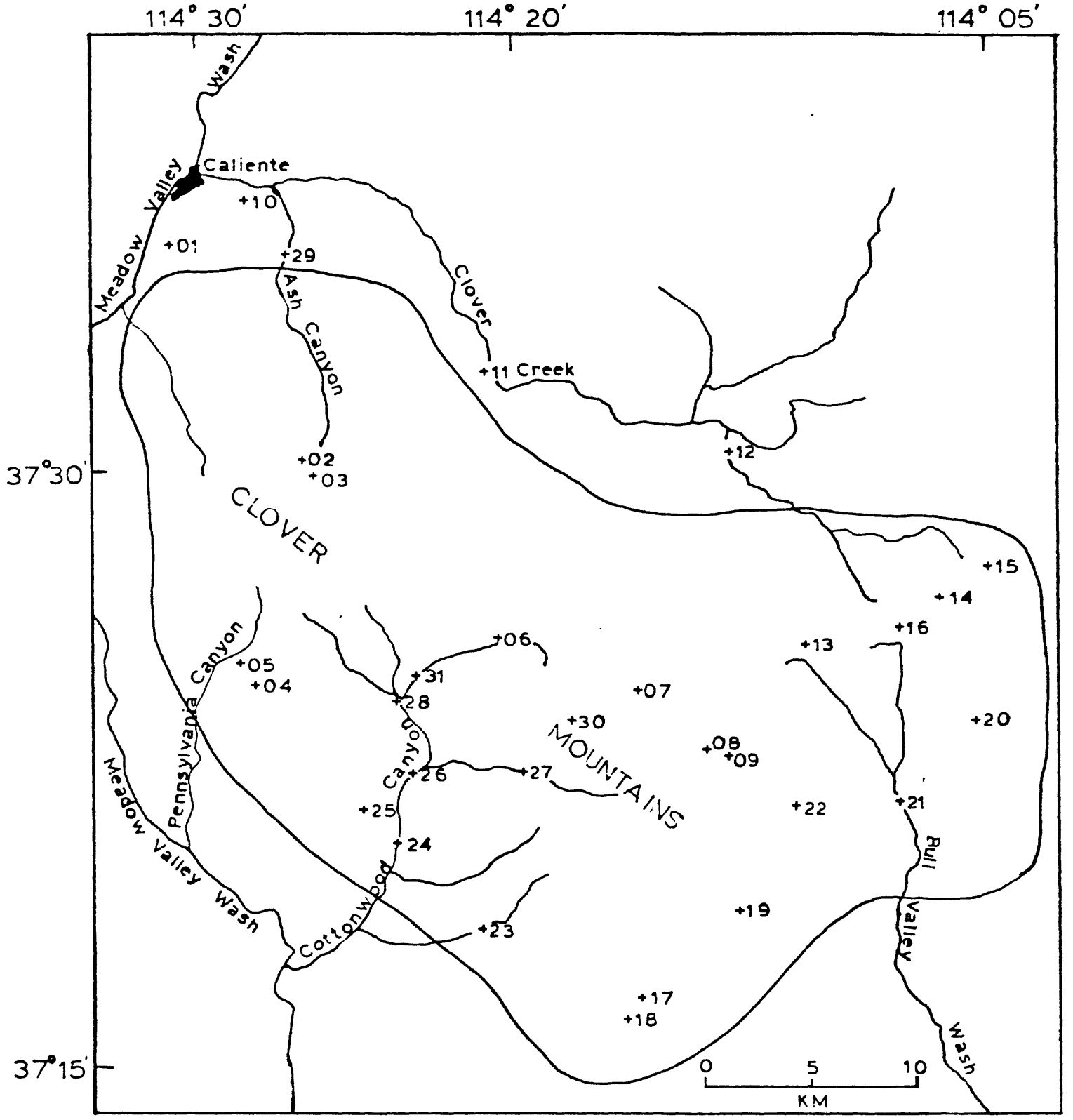

Figure 2. Sample location map, Clover Mountains, Nevada (prefix CM omitted)

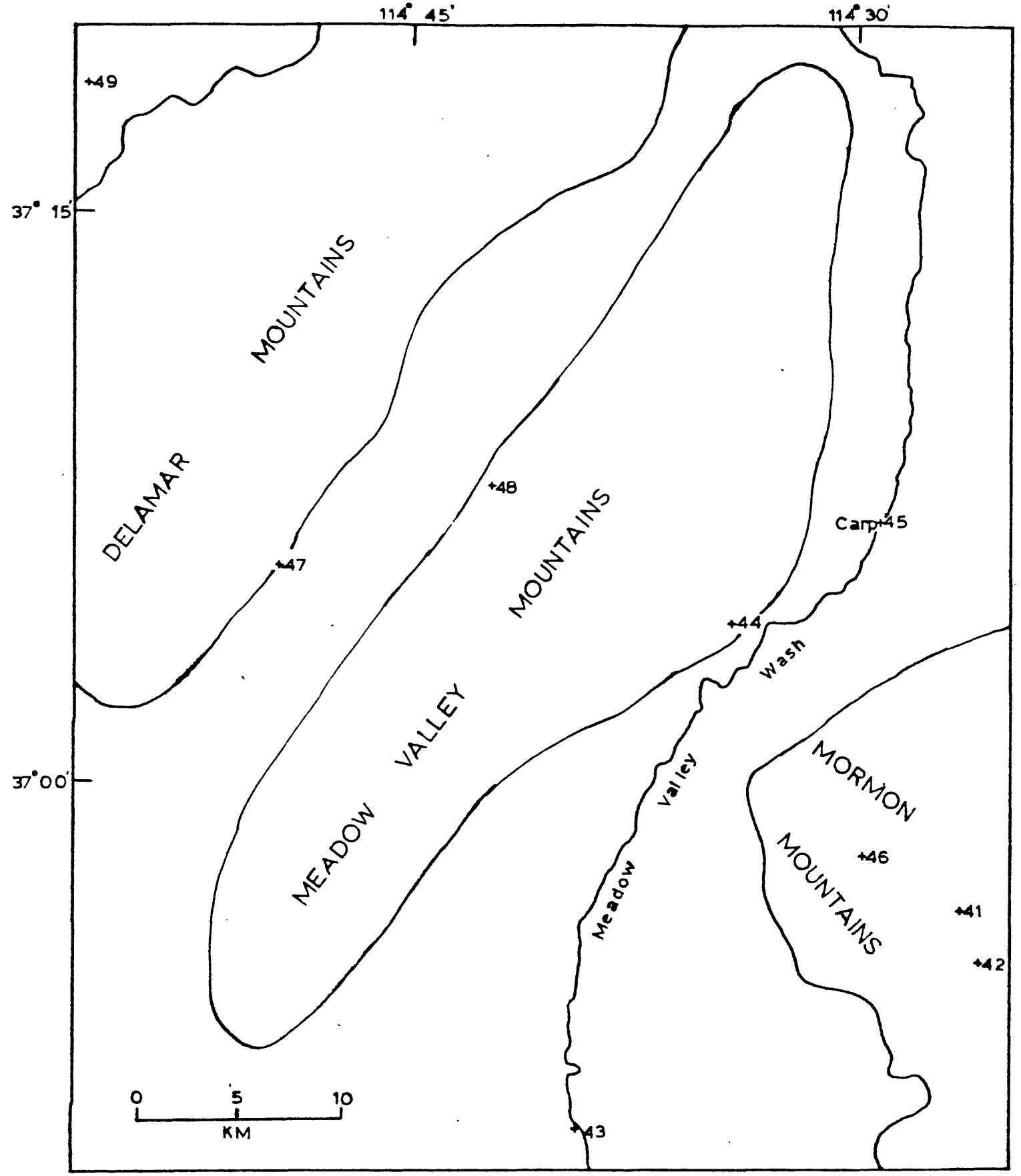

Figure 3. Sample location map- Delamar, Meadow Valley, Mormon Mountains, Nevada (prefix DM,MV,MM omitted)

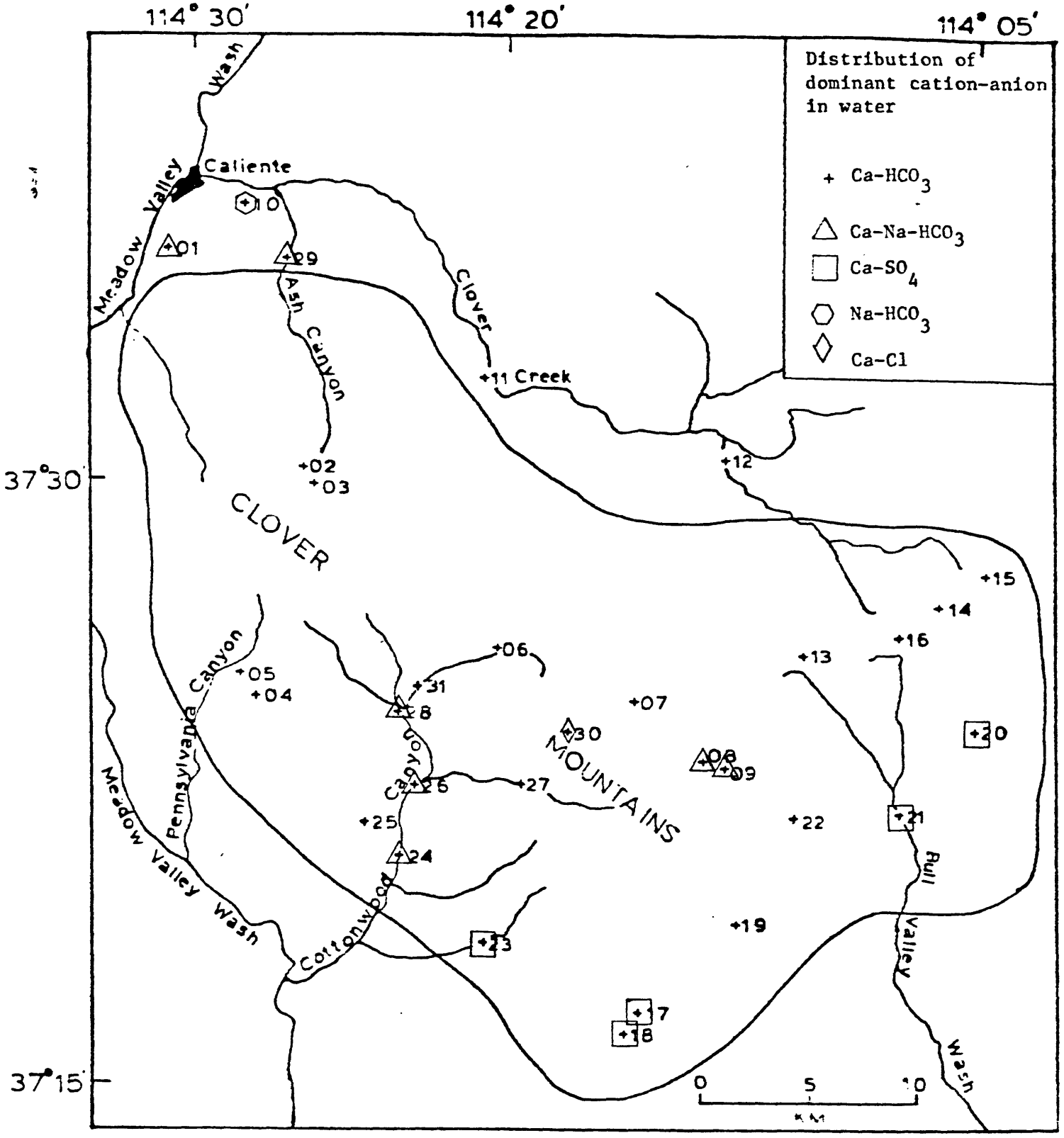

Figure 4. Distribution of dominant cation - anion in water (prefix CM omitted)

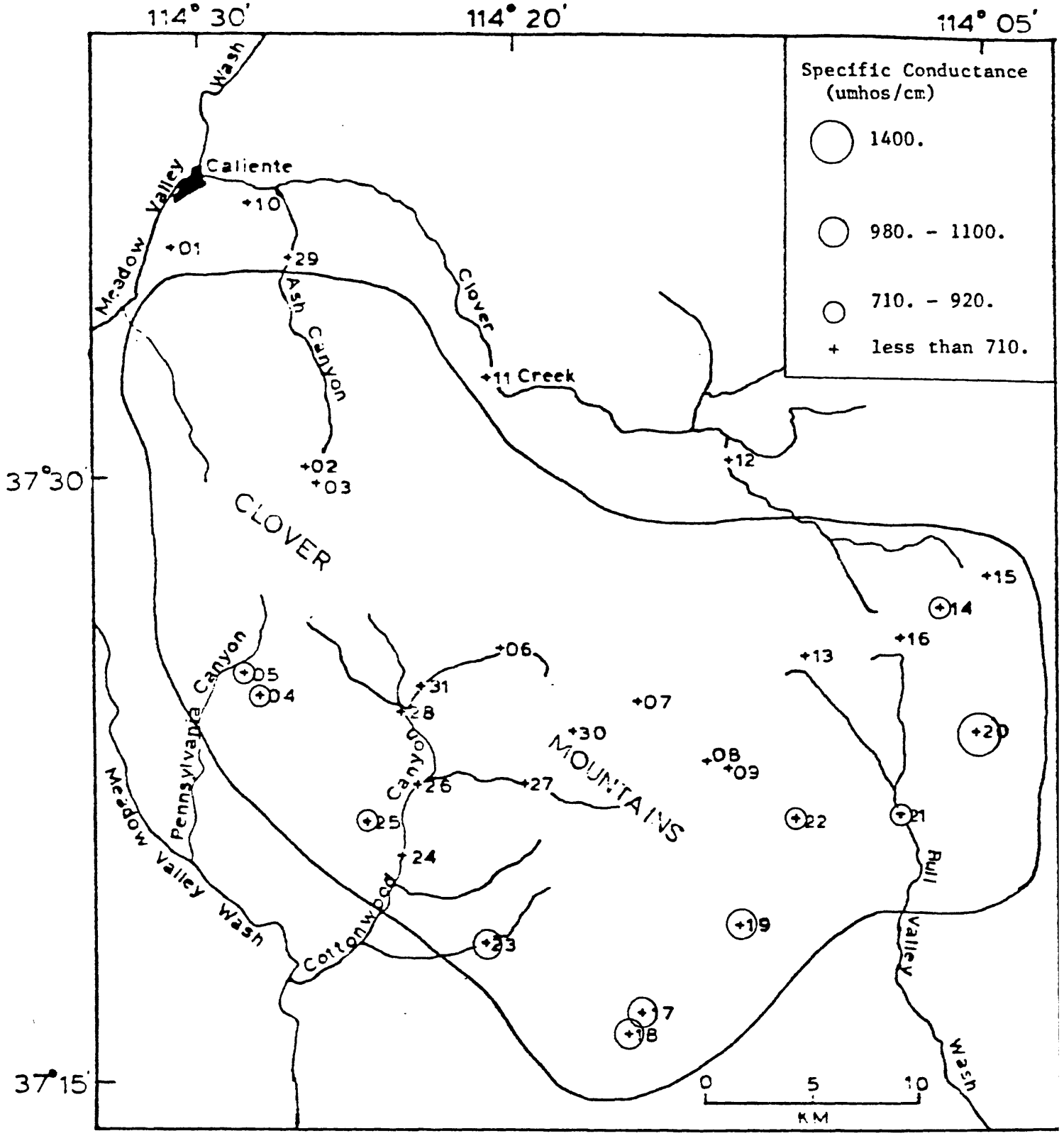

Figure 5. Distribution of specific conductance (prefix CM omitted)

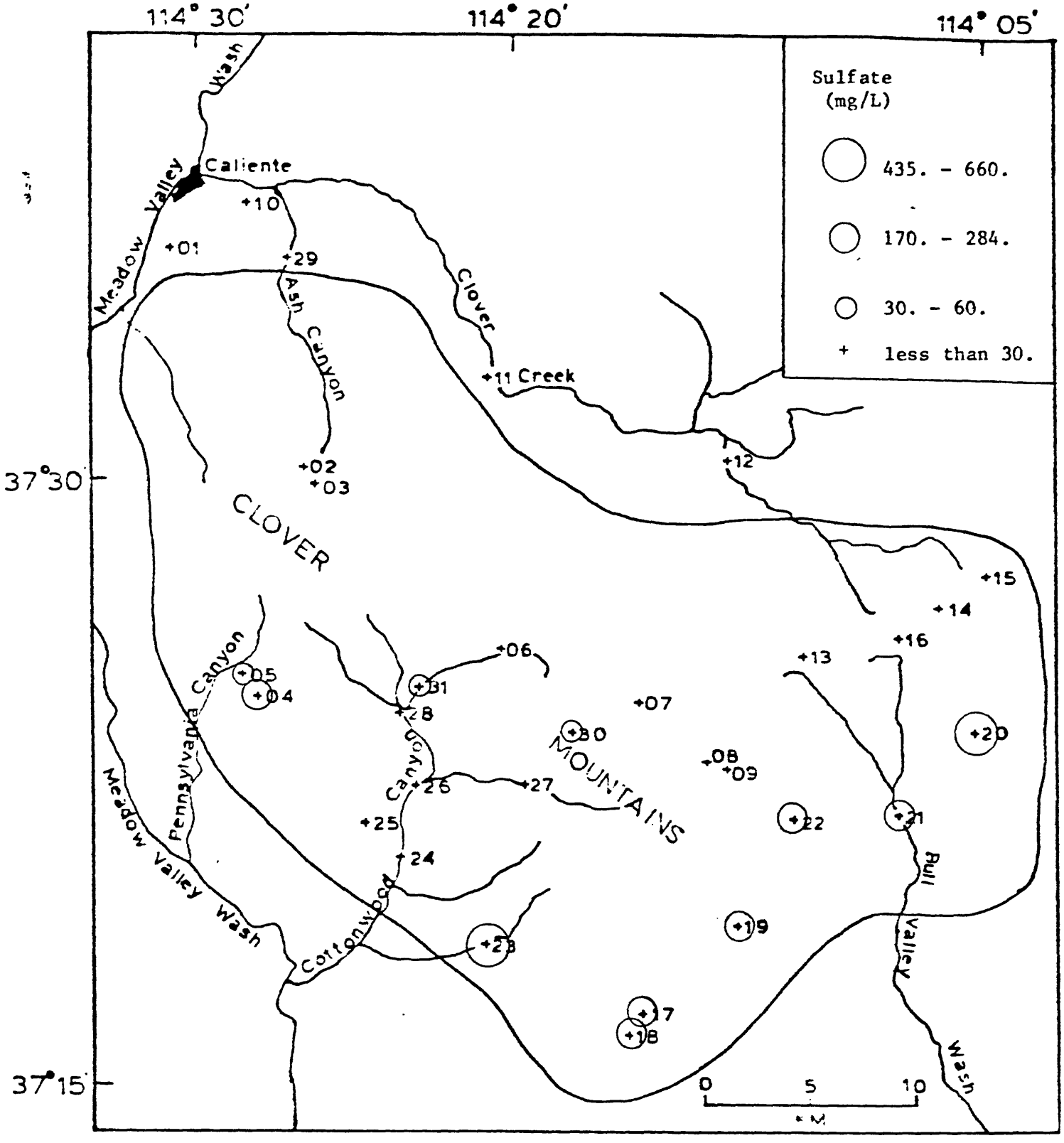

Figure 6. Distribution of sulfate (prefix CM omitted)

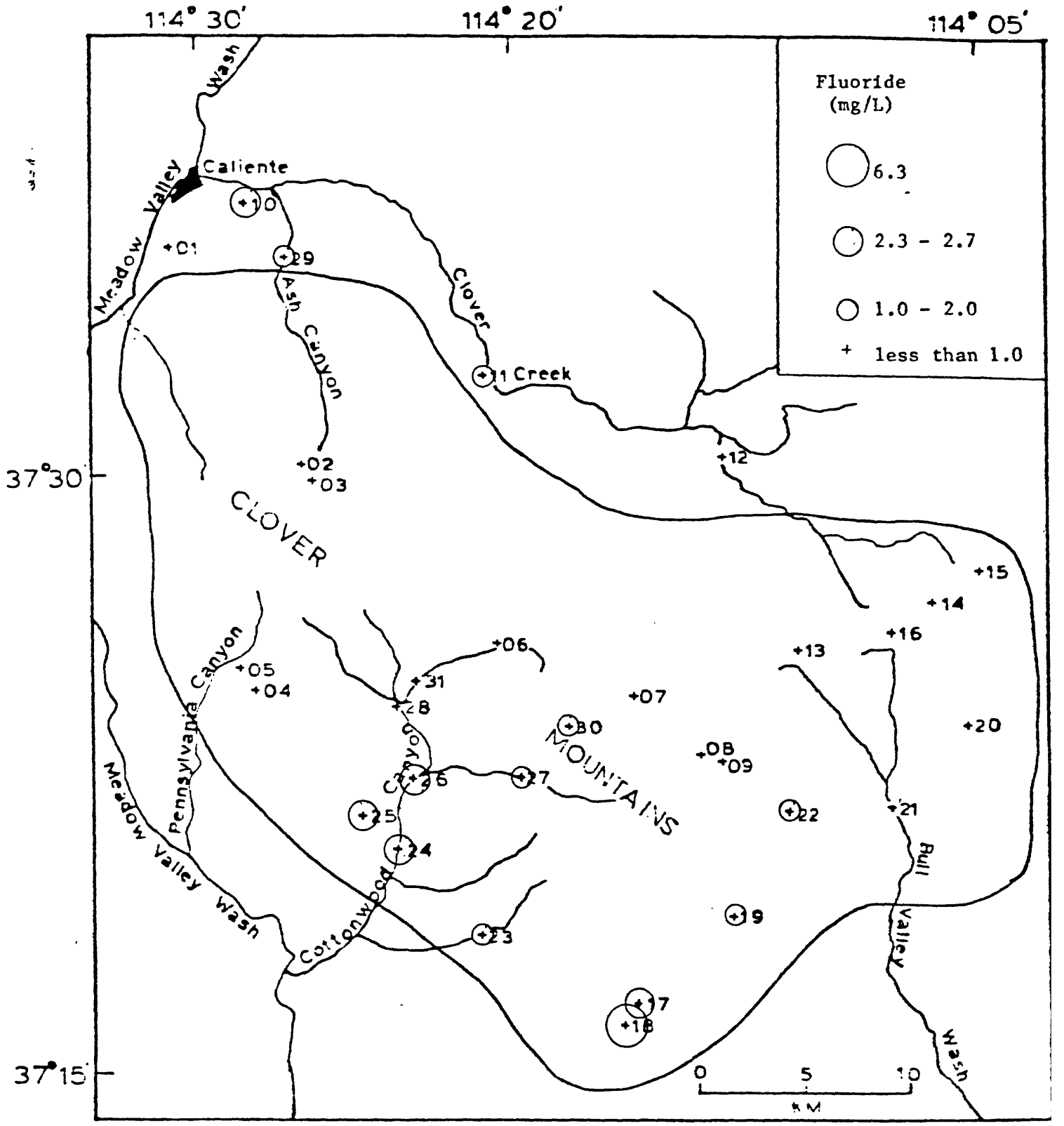

Figure 7. Distribution of fluoride (prefix CM omitted)

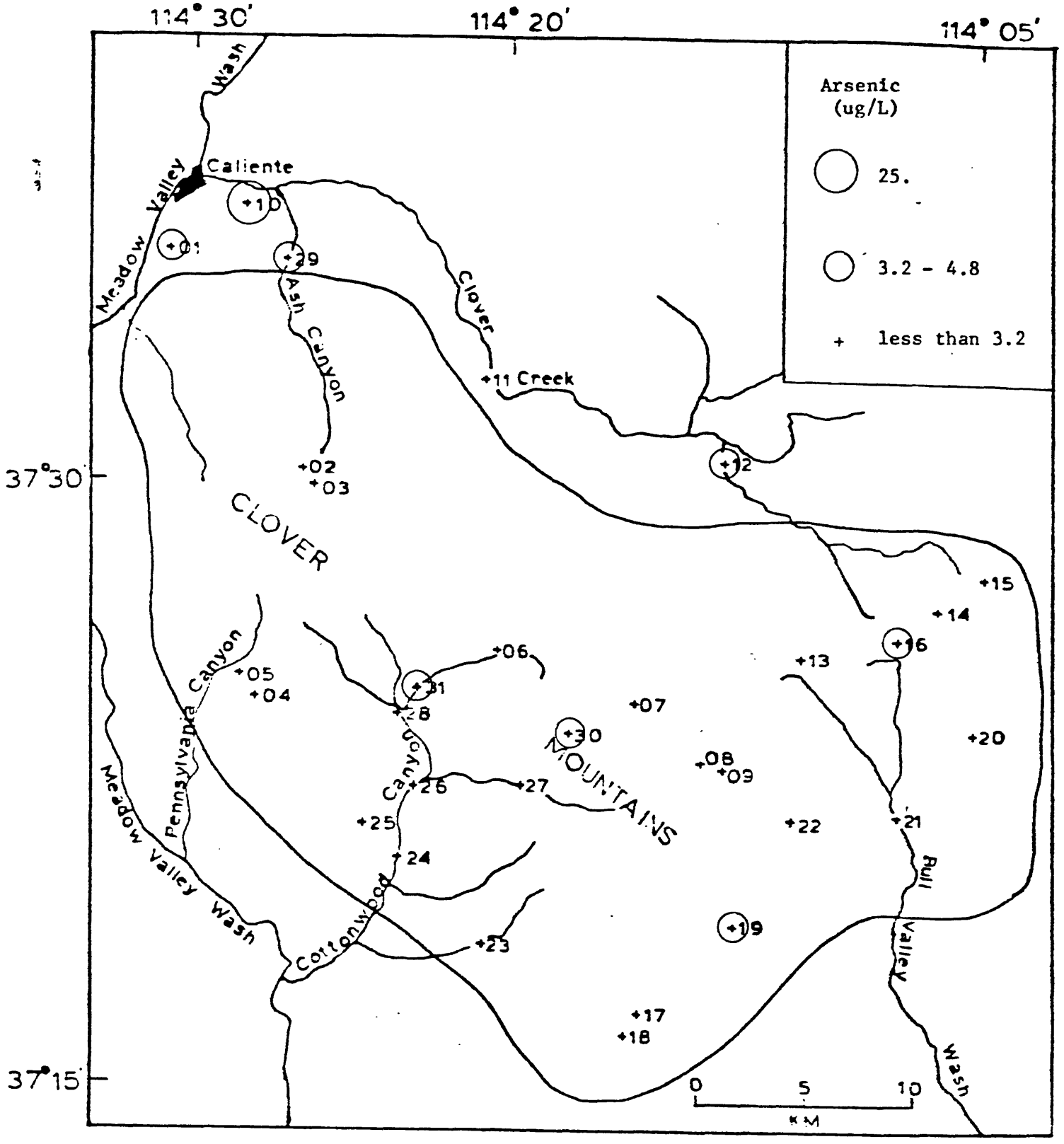

Figure 8. Distribution of arsenic (prefix CM omitted)

Uranium concentration in waters in the study area ranges from <0.10 to 8.4 µg/L (table 4) with geometric mean of 1.03 µg/L. Samples 25, 5, 12, and 24 with 8.4, 6.2, 6.0, and 5.0 µg/L, respectively, have the highest values for uranium in the study area. The concentration of lithium in water in the study area ranges from <4.0 to 55 µg/L (table 4) with geometric mean of 12.7 µg/L. Figure 9 shows the distribution of uranium and lithium.

No anomalous concentration of zinc, copper, or molybdenum, except for molybdenum in sample 4, occurs in waters in the study area. The concentration for zinc in water in the study area ranges from 4 to 18 g/L (table 4) with geometric mean of 7.35 µg/L. Samples 1 and 8 with 18 and 15 µg/L zinc probably has zinc contamination because the sample was obtained from a galvanized pipe. Samples 4 and 5 with 12, and 10 µg/L zinc were obtained near an abandoned mine area, which could account for the high zinc concentration. The concentration for copper in water in the study area ranges from <1.0 to 2.1 µg/L (table 4) with geometric mean of 0.959 µg/L. The concentration for molybdenum in water in the study area ranges from >1.0 to 5.0 µg/L (table 4) with geometric mean of 1.66 µg/L. Sample 4, which is from an abandoned mine area, has the highest concentration of molybdenum with 5.0 µg/L.

Samples 8 and 9 are high in aluminum with concentrations of 1.1 and 0.8 mg/L, respectively. The high iron and low pH at these sites suggest peraluminous rocks, leached by acidic waters, may be the source of the high amount of aluminum.

The pH of water from the study area ranges from 5.95 to 8.44 (table 4) with a mean value of 7.05. Figure 10 shows the acidic waters (pH below 7.00) and the alkaline waters (pH greater than 7.00).

CONCLUSION

A hydrogeochemical survey was conducted in the Clover Mountains, Nevada. Areas of hydrothermal alteration contain waters with the most dissolved solids; these areas also contain waters high in sulfate. None of the trace elements commonly associated with mineralization, such as copper, molybdenum, arsenic, and zinc were found to be highly anomalous, except for a weak arsenic anomaly found southeast of Caliente. Moderate fluoride and aluminum anomalies were found in the south and east-central sections of the study area, respectively.

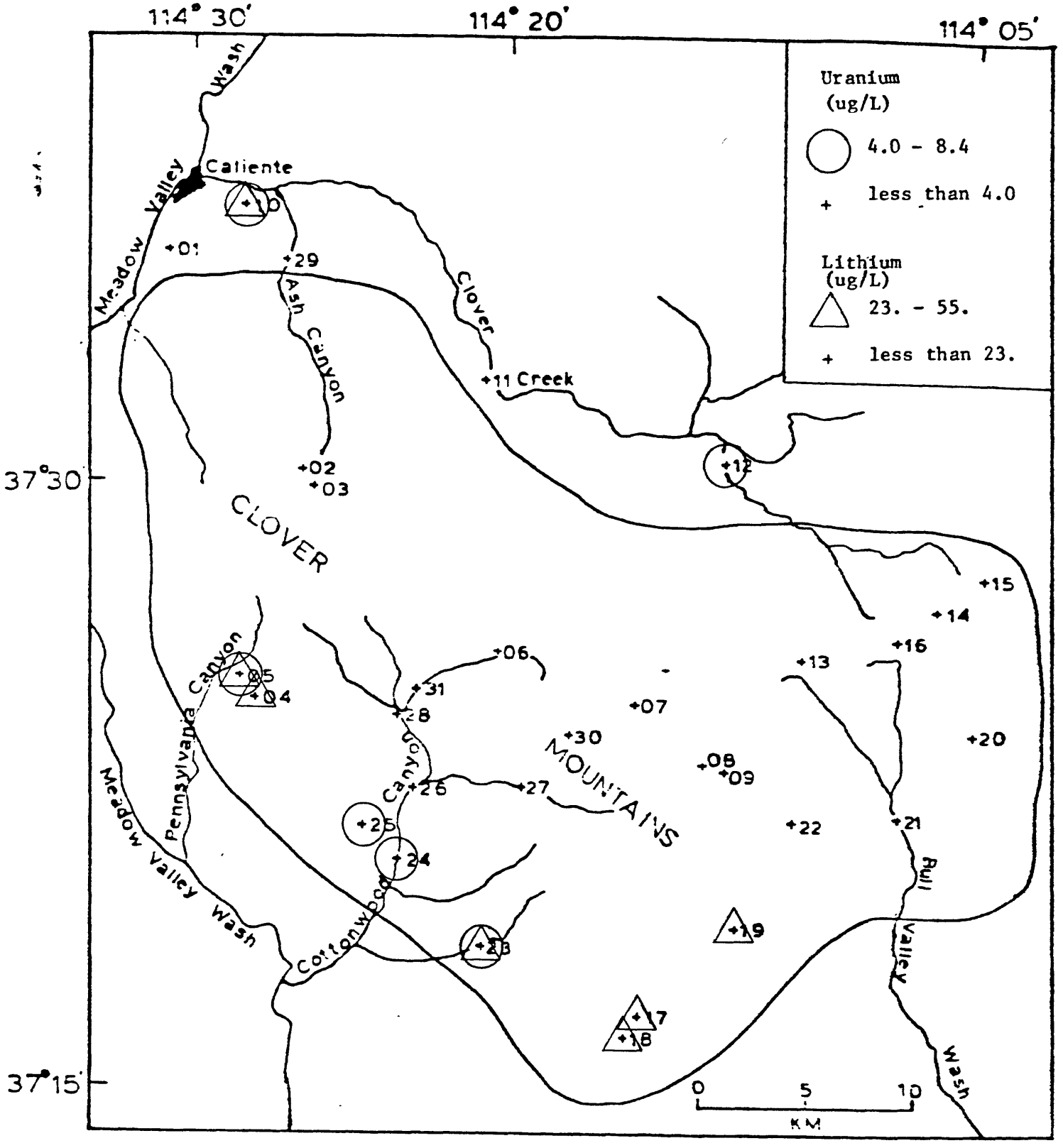

Figure 9. Distribution of uranium and lithium (prefix CM omitted)

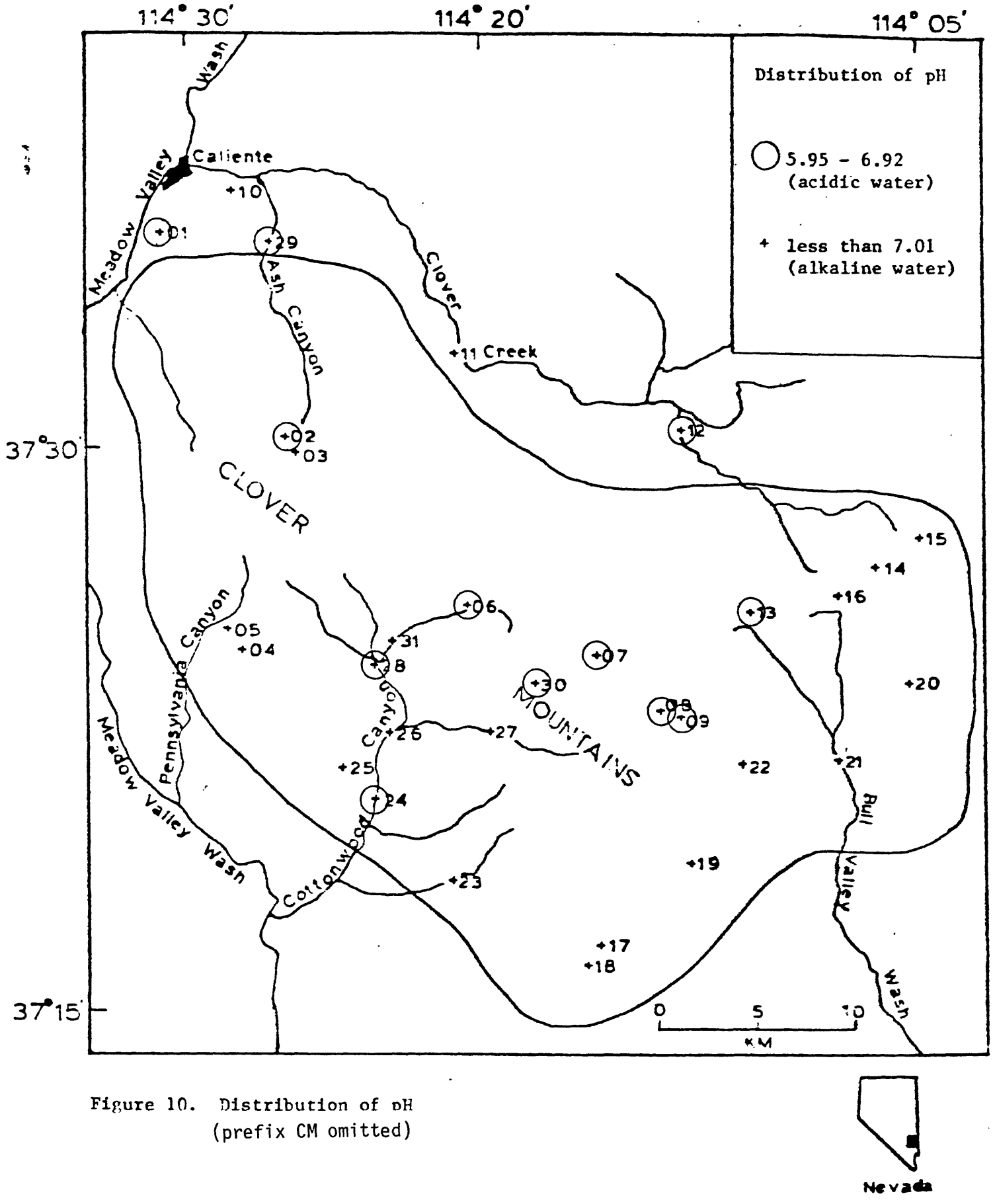

Figure 10. Distribution of pH
(prefix CM omitted)

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Table 1.--Sample source of 40 water samples, Clover, Delamar, Meadow Valley, and Mormon Mountains, Nevada

Sample No.	Source of Sample
CM 01	Kershaw Canyon Spring (Campground)
CM 02	Spring
CM 03	Ella Spring
CM 04	Carson Spring
CM 05	Spring
CM 06	Fife Spring
CM 07	Sheep Spring
CM 08	Quaking Aspen Spring
CM 09	East Setting Spring
CM 10	Oak Spring
CM 11	Little Spring
CM 12	Mathews Spring
CM 13	Mud Spring
CM 14	Middle Pass Spring
CM 15	Docs Spring
CM 16	Bunker Spring
CM 17	Box Spring
CM 18	Garden Spring
CM 19	Spring
CM 20	Ash Spring
CM 21	Kate Spring
CM 22	Shoemaker Spring
CM 23	Horse Springs
CM 24	Fountain of Youth Spring
CM 25	Spring
CM 26	Spring
CM 27	Coldwater Spring
CM 28	Spring
CM 29	Lower Ash Spring
CM 30	Grapevine Spring
CM 31	Spring in Fife Canyon
MM 41	Horse Spring
MM 42	Hackberry Spring
MV 43	Spring
MV 44	Hackberry Spring
MV 45	Well at Carp
MM 46	Davis Spring
DM 47	Willow Spring
MV 48	Grapevine Spring
DM 49	Delamar Lake

Table 2. Analytical methods used for water analysis

Constituent	Method	Reference
Alkalinity	Gran's plot potentiometric titration	Orion Research, Inc. (1978).
Sulfate	Ion chromatography	Fishman and Pyen (1979).
Chloride	---do	Do.
Fluoride	---do	Do.
Nitrate	---do	Do.
Calcium	Flame atomic absorption spectrophotometry	Perkin-Elmer Corp. (1982).
Magnesium	---do	Do.
Sodium	---do	Do.
Potassium	---do	Do.
Lithium	---do	Do.
Silica	---do	Do.
Zinc	---do	Do.
Iron	---do	Do.
Manganese	---do	Do.
Aluminum	---do	Do.
Copper	Flameless atomic-absorption spectrophotometry	Perkin-Elmer Corp. (1977).
Silver	---do	Do.
Molybdenum	---do	Do.
Arsenic	---do	Do.
Uranium	Laser excited fluorescence	Scintrex Corp. (1978).
Specific conductance	Conductivity bridge	Brown, Skougstad, and Fishman (1979) p. 28-29.

Table 3. CHEMICAL ANALYSES OF WATER SAMPLES

Sample	LATITUDE	LONGITUD	CA(mg/L)	MG(mg/L)	NA(mg/L)	K(mg/L)	LI(ug/L)	SIO2(mg/	ALK(mg/L
CM01	37 35 23	114 31 7	26	2.9	24.0	3.80	18	41	134
CM02	37 29 57	114 27 10	38	6.7	8.8	1.90	5	31	147
CM03	37 29 33	114 26 50	57	11.0	16.0	2.00	10	34	254
CM04	37 24 22	114 28 47	150	30.0	33.0	1.30	33	30	253
CM05	37 24 56	114 29 10	90	29.0	35.0	.89	23	22	300
CM06	37 25 26	114 21 5	30	5.6	13.0	1.40	9	49	121
CM07	37 24 3	114 16 37	22	4.4	8.9	1.20	5	33	93
CM08	37 22 33	114 14 30	6	1.5	3.4	1.00	<4	15	20
CM09	37 22 23	114 13 52	8	1.7	3.8	1.80	<4	18	31
CM10	37 36 27	114 28 44	38	4.2	78.0	4.50	55	50	301
CM11	37 32 3	114 21 15	28	4.4	10.0	2.20	8	44	114
CM12	37 29 57	114 13 25	68	10.0	18.0	4.40	5	34	311
CM13	37 25 5	114 11 18	24	5.4	12.0	1.90	5	45	93
CM14	37 26 12	114 6 54	90	42.0	20.0	.12	14	70	350
CM15	37 26 57	114 5 20	26	4.5	12.0	1.10	4	40	114
CM16	37 25 28	114 8 12	65	11.0	25.0	2.20	10	45	210
CM17	37 16 23	114 16 47	123	24.0	46.0	1.90	34	38	204
CM18	37 15 51	114 17 17	100	27.0	47.0	.64	48	32	245
CM19	37 18 30	114 13 37	102	32.0	65.0	1.20	45	33	240
CM20	37 23 7	114 5 53	215	77.0	52.0	2.20	16	32	105
CM21	37 21 7	114 8 21	98	23.0	26.0	2.60	10	30	111
CM22	37 21 5	114 11 46	72	35.0	47.0	1.00	18	29	175
CM23	37 18 11	114 21 52	128	43.0	55.0	2.30	50	28	102
CM24	37 20 23	114 24 26	35	5.7	38.0	1.30	20	44	181
CM25	37 21 14	114 25 31	78	44.0	32.0	2.70	6	64	483
CM26	37 22 6	114 23 51	33	4.5	28.0	.82	15	46	175
CM27	37 22 5	114 20 24	29	5.4	13.0	1.70	7	33	111
CM28	37 23 55	114 24 20	31	5.6	23.0	2.00	14	45	146
CM29	37 35 6	114 27 31	33	3.4	31.0	1.00	21	31	186
CM30	37 23 19	114 18 48	65	13.0	28.0	1.70	17	46	100
CM31	37 24 31	114 23 45	65	13.0	26.0	1.60	16	46	160
MM41	36 56 28	114 26 48	60	31.0	11.0	1.00	12	13	200
MM42	36 55 4	114 26 15	55	40.0	7.0	1.60	7	13	266
MV43	36 50 48	114 39 42	88	54.0	168.0	13.00	155	44	204
MV44	37 4 9	114 34 24	45	14.0	45.0	6.00	30	62	165
MV45	37 6 45	114 29 31	100	25.0	160.0	9.00	64	54	190
MM46	36 57 56	114 30 8	90	26.0	5.1	.71	4	11	295
DM47	37 5 40	114 49 48	18	2.9	58.0	3.40	7	63	129
MV48	37 7 47	114 42 32	73	17.0	17.0	1.80	13	26	293
DM49	37 18 27	114 55 59	22	5.2	86.0	35.00	30	40	276

Table 3. CHEMICAL ANALYSES OF WATER SAMPLES-- continued

Sample	SO4(mg/L	CL(mg/L)	F(mg/L)	NO3(mg/L	ZN(ug/L)	CU(ug/L)	MO(ug/L)	AG(ug/L)	AS(ug/L)
CM01	7.5	7.9	.90	6.2	18	1.3	1.8	<.02	3.2
CM02	5.7	5.4	.25	.6	6	2.1	1.0	.03	2.3
CM03	6.8	5.4	.19	<.1	8	<1.0	<1.0	.05	2.7
CM04	230.0	17.0	.95	.2	12	1.0	5.0	.12	2.4
CM05	49.0	13.0	.70	.2	10	<1.0	2.0	.04	1.3
CM06	6.7	9.5	.78	1.4	9	<1.0	<1.0	<.02	1.9
CM07	4.8	4.7	.59	.2	5	<1.0	<1.0	<.02	1.4
CM08	4.0	1.9	.10	<.1	15	1.4	1.0	<.02	1.0
CM09	2.0	1.9	.13	<.1	8	<1.0	1.1	<.02	1.1
CM10	10.0	11.0	2.70	<.1	7	1.7	2.0	.02	25.0
CM11	3.7	5.6	2.00	2.1	8	<1.0	2.6	.16	1.8
CM12	8.0	4.9	.32	1.6	5	<1.0	4.8	.04	4.3
CM13	7.3	11.0	.25	1.0	7	<1.0	1.7	<.02	1.2
CM14	20.0	11.0	.81	.9	7	<1.0	1.6	.12	1.9
CM15	6.1	7.1	.20	1.0	4	<1.0	1.0	<.02	1.0
CM16	15.0	22.0	.74	.1	13	<1.0	2.3	.03	4.7
CM17	284.0	15.0	2.40	<.1	10	1.2	1.6	.14	1.4
CM18	253.0	21.0	6.30	<.1	9	1.2	1.5	.10	2.1
CM19	188.0	29.0	1.80	<.1	6	1.6	1.0	.11	4.8
CM20	660.0	16.0	.39	1.6	10	2.1	3.8	.15	1.3
CM21	200.0	19.0	.95	1.0	6	<1.0	3.0	.14	1.1
CM22	170.0	17.0	1.00	1.4	8	1.9	1.7	.16	1.0
CM23	435.0	18.0	1.60	.7	7	2.1	1.7	.10	1.1
CM24	14.0	10.0	2.30	.1	7	<1.0	2.1	.03	2.1
CM25	21.0	16.0	2.40	.6	6	1.2	1.5	.06	2.0
CM26	6.6	4.8	2.40	.2	6	1.1	1.0	.02	1.9
CM27	10.0	9.4	1.10	<1.0	4	<1.0	2.1	.10	1.2
CM28	14.0	8.3	.76	<1.0	5	<1.0	2.2	.04	1.5
CM29	5.7	4.9	1.00	.2	6	<1.0	1.8	.11	3.3
CM30	60.0	116.0	1.90	1.9	8	<1.0	1.5	.06	4.2
CM31	30.0	32.0	.10	1.1	4	<1.0	2.0	.06	3.8
MM41	40.0	15.0	.34	2.6	18	1.4	1.6	.08	<1.0
MM42	26.0	7.4	.05	9.8	10	1.1	1.3	.07	1.6
MV43	410.0	80.0	1.90	.8	9	3.8	1.5	.07	10.0
MV44	35.0	21.0	2.70	14.0	7	<1.0	2.9	.04	8.2
MV45	165.0	145.0	2.00	34.0	62	3.6	4.0	.10	12.0
MM46	21.0	9.9	.88	6.3	9	<1.0	1.2	.05	3.3
DM47	30.0	18.0	1.10	3.3	12	<1.0	12.0	<.02	32.0
MV48	38.0	19.0	1.50	8.7	20	<1.0	2.8	.05	11.0
DM49	15.0	7.8	1.00	33.0	16	4.9	4.4	.02	8.0

Table 3. CHEMICAL ANALYSES OF WATER SAMPLES -- continued

Sample	FE(mg/L)	MN(mg/L)	AL(mg/L)	U(ug/L)	SP.COND.	pH	TEMP.(C)	CHAR BAL± %
CM01	.02	<.01	<.1	2.40	230	6.85	23	-.80
CM02	.04	.03	<.1	.30	290	6.83	10	3.30
CM03	.03	.03	<.1	.52	420	7.18	15	.48
CM04	.02	.01	<.1	2.00	890	7.42	17	9.50
CM05	.02	<.01	<.1	6.20	810	7.01	17	14.00
CM06	.02	<.01	<.1	.30	240	6.20	16	2.20
CM07	.10	.04	<.1	.16	170	6.10	10	2.50
CM08	.27	<.01	1.1	<.10	66	6.00	7	12.00
CM09	.20	<.01	.8	<.10	73	6.08	12	10.00
CM10	.03	.01	<.1	4.00	530	7.82	15	1.40
CM11	.03	<.01	<.1	.64	250	7.43	17	.29
CM12	.05	.34	<.1	6.00	500	6.76	13	-3.00
CM13	.02	.03	<.1	.16	230	6.15	15	4.80
CM14	.02	.01	<.1	.80	920	7.35	13	15.00
CM15	.02	<.01	<.1	.32	240	7.40	14	.02
CM16	.02	.01	<.1	1.50	580	7.18	15	9.20
CM17	.05	.04	<.1	3.50	1,000	7.28	18	1.90
CM18	.03	<.01	<.1	.40	980	7.61	24	-4.60
CM19	.02	.06	<.1	2.00	1,100	7.44	24	9.60
CM20	.03	.03	<.1	.80	1,400	7.73	17	9.90
CM21	.03	.05	<.1	2.00	710	7.33	23	9.70
CM22	.04	<.01	<.1	.56	750	7.63	18	10.00
CM23	.03	.01	<.1	4.00	1,010	8.44	28	4.60
CM24	.02	.01	<.1	5.00	330	6.92	15	3.20
CM25	.03	.01	<.1	8.40	770	7.31	22	.46
CM26	.03	<.01	<.1	3.00	280	7.70	23	2.00
CM27	.02	.01	<.1	.50	230	7.14	18	3.20
CM28	.08	.02	<.1	1.10	280	6.60	10	1.80
CM29	.02	<.01	<.1	3.60	290	6.62	12	-.84
CM30	.02	<.01	<.1	.28	240	5.95	15	-5.90
CM31	.03	<.01	<.1	3.60	500	7.14	16	14.00
MM41	.04	<.01	<.1	.44	540	6.74	23	14.00
MM42	.03	<.01	<.1	.56	570	7.02	15	9.90
MV43	.03	.04	<.1	5.60	1,380	8.19	26	7.40
MV44	.02	<.01	<.1	7.20	450	6.90	20	11.00
MV45	.03	<.01	<.1	12.00	1,390	6.83	20	12.00
MM46	.02	<.01	<.1	.50	620	6.90	15	9.60
DM47	.02	<.01	<.1	3.60	300	6.42	28	5.50
MV48	.02	<.01	<.1	3.60	550	6.53	29	-4.00
DM49	1.50	.03	5.7	1.20	470	8.25	18	4.30

Table 4.--Summary of chemical analyses of 31 water samples, Clover Mountains, Nevada

[Values qualified with < were replaced with seven-tenths of the qualified value in the determination of means, etc.]

Variable	Minimum	Maximum	Mean	Geometric Mean	Standard Deviation	Geometric Deviation
Ca (mg/L)	6.0	215.	63.7	48.5	46.5	2.24
Mg (mg/L)	1.5	77.	17.1	10.3	17.6	2.86
Na (mg/L)	3.4	78.	28.3	22.3	18.3	2.15
K (mg/L)	0.12	4.5	1.82	1.54	1.00	1.95
Li (µg/L)	<4.0	55.	17.6	12.7	14.8	2.33
SiO_2 (mg/L)	15.0	70.	38.0	36.2	11.8	1.39
Alk. (mg/L)	20.0	483.	180.0	152.	99.1	1.92
SO_4 (mg/L)	2.0	660.	88.3	22.8	152.	5.26
Cl (mg/L)	1.9	116.	15.4	10.5	20.1	2.29
F (mg/L)	0.10	6.3	1.23	0.770	1.24	2.88
NO_3 (mg/L)	<0.10	6.2	0.845	0.398	1.17	3.76
Zn (µg/L)	4.0	18.	7.87	7.35	3.20	1.45
Cu (µg/L)	<1.0	2.1	1.05	0.959	0.490	1.51
Mo (µg/L)	<1.0	5.0	1.89	1.66	1.06	1.66
Ag (µg/L)	<0.02	0.16	0.067	0.048	0.051	2.46
As (µg/L)	1.0	25.	2.90	2.07	4.26	1.97
Fe (mg/L)	0.02	0.27	0.045	0.033	0.055	1.95
Mn (mg/L)	<0.01	0.34	0.027	0.014	0.060	2.52
Al (mg/L)	<0.10	1.1	0.127	0.083	0.223	1.91
U (µg/L)	<0.10	8.4	2.07	1.03	2.17	3.87
Sp. Cond.	66.0	1400.	526.	410.	350.	2.15
pH	5.95	8.44	7.05	--	0.612	--
Temp. (C°)	7.0	2.8	16.5	15.8	4.87	1.36

Table 5.--Matrix of correlation coefficients of the log-transformed original data, Clover Mountains, Nevada

[Number of valid pairs are shown below diagonal]

	Ca	Mg	Na	K	Li	SiO_2	Alk.	SO_4	Cl	F	NO_3	Zn	Cu	Mo	Ag	As	Fe	Mn	U	Cond.	pH	Temp.
Ca	1.00	0.93	0.79	-0.04	0.51	0.25	0.66	0.85	0.71	0.42	0.01	0.02	0.10	0.47	0.49	0.14	-0.54	0.05	0.35	0.96	0.65	0.59
Mg	31	1.00	0.67	-0.19	0.37	0.18	0.55	0.86	0.66	0.33	0.03	0.03	0.18	0.32	0.52	-0.07	-0.39	-0.05	0.22	0.92	0.59	0.54
Na	31	31	1.00	0.06	0.86	0.33	0.67	0.72	0.67	0.66	-0.15	0.02	0.08	0.28	0.09	0.40	-0.57	-0.21	0.59	0.83	0.67	0.65
K	31	31	31	1.00	-0.11	-0.05	-0.07	-0.06	0.01	-0.05	0.29	0.03	0.29	0.33	-0.24	0.30	0.08	0.29	0.23	-0.08	-0.01	0.13
Li	29	29	29	29	1.00	-0.21	0.27	0.62	0.43	0.57	-0.16	0.39	-0.09	-0.01	0.15	0.33	-0.16	-0.31	0.43	0.58	0.48	0.47
SiO_2	31	31	31	31	29	1.00	0.58	-0.07	0.39	0.38	0.16	-0.26	-0.25	0.09	-0.25	0.39	-0.56	-0.39	-0.01	0.27	0.19	0.24
Alk.	31	31	31	31	29	31	1.00	0.27	0.40	0.49	-0.30	-0.16	-0.26	0.30	-0.27	0.47	-0.62	-0.06	0.57	0.72	0.52	0.41
SO_4	31	31	31	31	29	31	31	1.00	0.70	0.40	0.06	0.16	0.15	0.30	0.57	-0.10	-0.27	-0.02	0.28	0.82	0.56	0.58
Cl	31	31	31	31	29	31	31	31	1.00	0.43	0.15	-0.01	0.07	0.19	0.23	0.26	-0.59	-0.32	0.04	0.62	0.28	0.53
F	31	31	31	31	29	31	31	31	31	1.00	-0.21	0.08	-0.37	0.07	0.10	0.25	-0.42	-0.44	0.26	0.46	0.44	0.60
NO_3	22	22	22	22	22	22	22	22	22	22	1.00	0.08	0.39	0.03	0.53	-0.05	0.01	0.53	-0.26	-0.07	-0.04	0.23
Zn	31	31	31	31	29	31	31	31	31	31	22	1.00	-0.29	0.09	0.15	0.02	0.07	-0.28	0.08	0.02	-0.08	0.05
Cu	13	13	13	13	12	13	13	13	13	13	8	13	1.00	-0.06	0.06	-0.03	0.06	0.28	-0.37	0.13	0.22	-0.17
Mo	28	28	28	28	26	28	28	28	28	28	20	28	13	1.00	0.21	0.14	-0.23	0.21	0.25	0.39	0.19	0.11
Ag	24	24	24	24	24	24	24	24	24	24	17	24	11	23	1.00	-0.50	-0.09	0.08	-0.26	0.42	0.23	0.33
As	31	31	31	31	29	31	31	31	31	31	22	31	13	28	24	1.00	-0.29	-0.01	0.30	0.17	0.12	0.05
Fe	31	31	31	31	29	31	31	31	31	31	22	31	13	28	24	31	1.00	0.44	-0.08	-0.52	-0.41	-0.58
Mn	18	18	18	18	18	18	18	18	18	18	12	18	8	16	16	18	18	1.00	-0.04	-0.03	-0.35	-0.15
U	29	29	29	29	29	29	29	29	29	29	22	29	12	26	24	29	29	18	1.00	0.44	0.42	0.35
Cond.	31	31	31	31	29	31	31	31	31	31	22	31	13	28	24	31	31	18	29	1.00	0.75	0.61
pH	31	31	31	31	29	31	31	31	31	31	22	31	13	28	24	31	31	18	29	31	1.00	0.66
Temp.	31	31	31	31	29	31	31	31	31	31	22	31	13	28	24	31	31	18	29	31	31	1.00