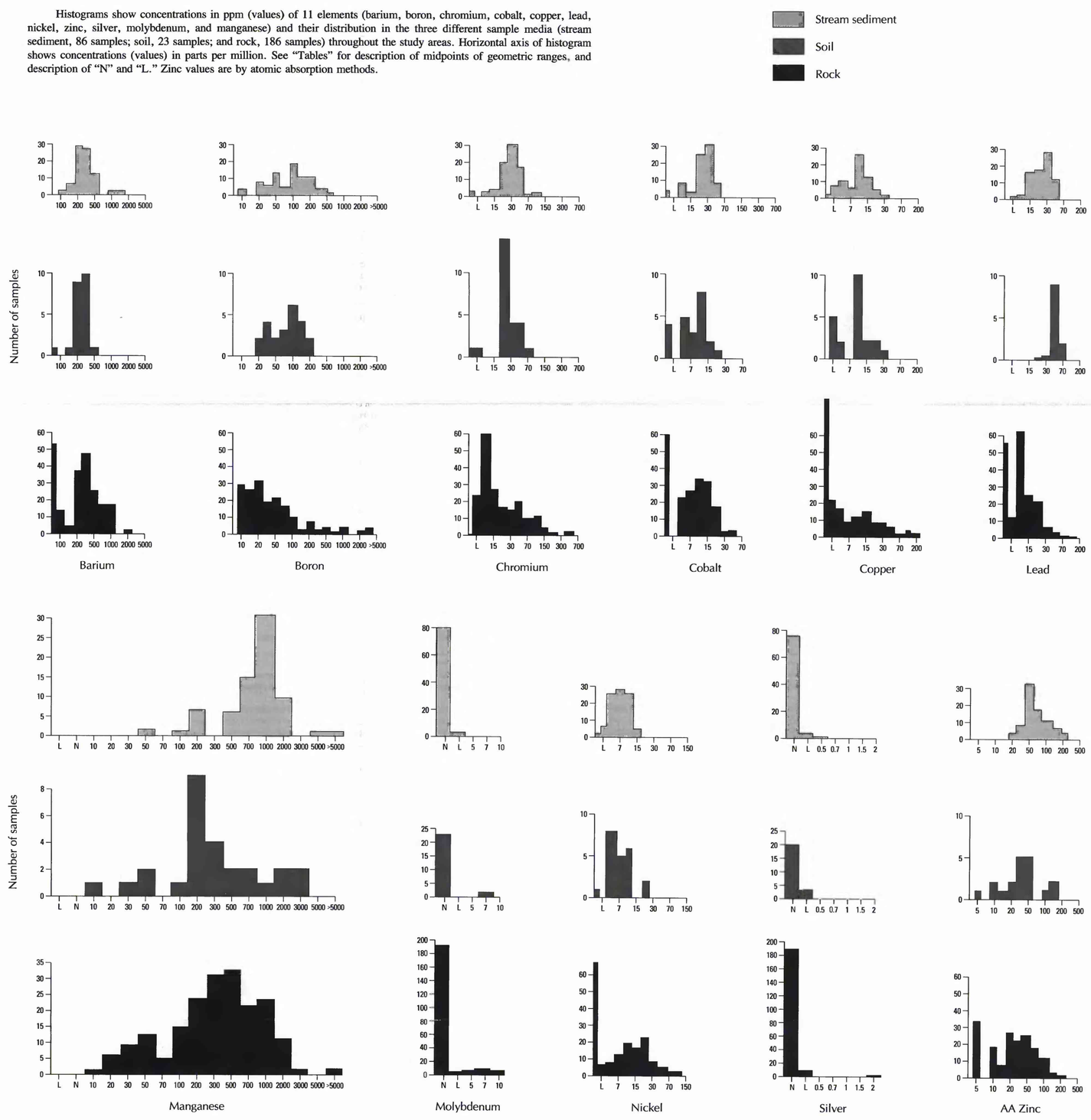
ELEMENT HISTOGRAMS

Histograms show concentrations in ppm (values) of 11 elements (barium, boron, chromium, cobalt, copper, lead, nickel, zinc, silver, molybdenum, and manganese) and their distribution in the three different sample media (stream sediment, 86 samples; soil, 23 samples; and rock, 186 samples) throughout the study areas. Horizontal axis of histogram shows concentrations (values) in parts per million. See "Tables" for description of midpoints of geometric ranges, and description of "N" and "L." Zinc values are by atomic absorption methods.



COMPARATIVE TABLES

Tables 1–7 show the range and median concentrations of 20 elements in stream-sediment, soil, and rock samples from the Big Branch and Peru Peak Wildernesses and the Wilder Mountain Roadless Area. These data are compared with the mean or median concentrations in similar samples from the Lye Brook Wilderness (LB), Bennington and Windham Counties, Vt., the Devils Den Roadless Area (DD), Rutland and Windsor Counties, Vt., and the the Bristol Cliffs Wilderness (BC), Vt. In addition, the analytical values for metamorphic rocks from the three study areas are compared with those for reasonable protoliths. With the exception of zinc, which was analyzed by atomic absorption, all analyses of samples from areas studied for this report are by optical emission spectrographic methods and are semiquantitative in nature. Analyses were done in USGS laboratories in Denver, Colo.; spectrographic analyses were by D.E. Detra, and atomic-absorption analyses were by Thomas Huyck, D.L. Kelley, L.S. Laudon and R.J. Fairfield, L.S. Laudon, E.P. Welsch, and M.A. Porkony. Spectrographic analyses are reported as six steps per order of magnitude (1, 0.7, 0.5, 0.3, 0.2, 0.15, or multiples of 10 of these numbers) and are the approximate midpoints of geometric ranges whose boundaries are 1.2, 0.83, 0.56, 0.38, 0.26, 0.18, 0.12, and so forth (see element histograms). The expected precision is within one adjoining reporting interval on each side of the reported value 83 percent of the time, and within two adjoining reporting intervals 96 percent of the time (Motooka and Grimes, 1976). Detection limits for samples are shown after each element. The number of samples that constituted a study group from the study areas are shown in parentheses in the column heads. Complete analytical data are given in Detra and others (1990).

Symbols used are as follows: L, amount determined to be below the lower limit of detection; N, was not detected at the lower limit of detection, which is the number shown in parentheses after the element; +, amount is greater than the number shown; —, no data. Values given for Ca, Fe, Mg, and Ti are in percent; all other values are in parts per million.

Table 1. Range and median concentration of 20 elements in 86 stream-sediment samples from the Big Branch and Peru Peak Wildernesses and the Wilder Mountain Roadless Area

Element	(Lower limit of detection)	Big Branch, Peru Peak, and Wilder Mountain (86)[4]			DD[1] (22)[4]	LB[2] (70)[4]	BC[3] (10)[4]
		Low	High	Median			
Ca	(0.05)	L	5	1	1.5	0.7	0.15
Fe	(.05)	.5	5	2	5	2	1.5
Mg	(.02)	L	2	.5	.7	.5	.2
Ti	(.002)	.7	+1	.5	.7	.2	.7
B	(10)	10	500	70	70	30	100
Ba	(20)	100	1,500	300	500	200	700
Be	(1)	1	3	1.5	1.5	—	2.0
Co	(5)	N	30	10	20	10	10
Cr	(10)	10	100	30	70	20	50
Cu	(5)	N	30	10	30	10	10
La	(20)	N	500	20	N	30	20
Mn	(10)	50	+5,000	1,000	1,500	—	1,000
Ni	(5)	N	15	5	30	5	15
Pb	(10)	L	50	20	50	10	30
Sc	(5)	L	30	10	20	7	7
Sr	(100)	N	500	200	200	300	400
V	(10)	20	150	100	100	50	50
Y	(10)	10	50	20	30	30	20
Zr	(10)	20	1,000	500	700	1,000	1,000
Zn[5]	(0.05)	20	230	45	50	5	65

[1]Median value for stream-sediment samples from the Devils Den Roadless Area (Slack and others, 1985).
[2]Approximate mean value for stream-sediment samples from the Lye Brook Wilderness (Ayuso and Day, 1985).
[3]Median value for stream-sediment samples from the Bristol Cliffs Wilderness (Slack and others, 1988).
[4]Number in parentheses shows number of samples in group.
[5]Zinc values determined by atomic absorption.

Table 2. Range and median concentration of 20 elements in 23 soil samples from the Big Branch and Peru Peak Wildernesses and the Wilder Mountain Roadless Area

Element	(Lower limit of detection)	Big Branch, Peru Peak, and Wilder Mountain (23)[2]			LB[1] (42)[2]
		Low	High	Median	
Ca	(0.05)	L	3	0.3	0.2
Fe	(.05)	.2	5	1.5	1.2
Mg	(.02)	.03	2	.3	.4
Ti	(.002)	.15	1	.5	.3
B	(10)	20	200	100	30
Ba	(20)	50	500	300	200
Be	(1)	L	1.5	1	1
Co	(5)	N	20	10	5
Cr	(10)	20	70	20	20
Cu	(5)	L	30	10	5
La	(20)	N	20	100	20
Mn	(10)	15	3,000	300	200
Ni	(5)	N	20	7	5
Pb	(10)	15	50	20	5
Sc	(5)	N	20	7	10
Sr	(100)	N	300	N	100
V	(10)	20	200	7	30
Y	(10)	10	100	30	30
Zr	(10)	100	+1,000	500	300
Zn[3]	(0.05)	5	130	45	5

[1]Approximate mean value for soil samples from the Lye Brook Wilderness (Ayuso and Day, 1985).
[2]Number in parentheses shows number of samples in group.
[3]Zinc values determined by atomic absorption.

Table 3. Range and median concentration of 20 elements in 69 quartzite samples from the Big Branch and Peru Peak Wildernesses and the Wilder Mountain Roadless Area

Element	(Lower limit of detection)	Cheshire Quartzite quartzite (30)[6]			Dalton Formation quartzite and micaceous quartzite (14)[6]			Mount Holly Complex quartzite unit quartzite and micaceous quartzite (15)[6]			Mount Holly Complex schist unit quartzite and micaceous quartzite (10)[6]			Average[1,2] sandstone	LB[3] (48)[6]	BC[4] (31)[6]	DD[5] (15)[6]
		Low	High	Median	Low	High	Median	Low	High	Median	Low	High	Median				
Ca	(0.05)	N	1	L	N	1	L	N	2	N	N	2	N	3.9	0.2	0.05	0.2
Fe	(.05)	.2	2	.3	.1	1	.5	.3	5	2	.1	3	.7	.98	.7	1.5	2
Mg	(.02)	L	.7	.05	N	1	.07	.7	1.5	.1	.2	1.5	.5	.7	.3	.3	.2
Ti	(.002)	.1	1.5	.2	.01	.1	.07	.5	1	.3	.5	.7	.2	.15	.1	.7	.2
B	(10)	10	300	50	10	100	20	10	+2,000	30	10	1,000	15	35	16	100	15
Ba	(20)	150	1,000	300	50	700	200	100	700	200	50	700	300	300	248	1,000	1,000
Be	(1)	L	3	1	L	2	L	L	1.5	1	L	2	L	2	1	1.5	2
Co	(5)	N	7	N	N	15	N	N	20	5	N	10	L	0.3	0.4	5	N
Cr	(10)	L	100	10	L	30	10	10	70	15	10	150	10	35	15	30	L
Cu	(5)	N	50	N	N	15	N	L	15	L	N	30	N	10–20	2	5	7
La	(20)	N	50	N	N	30	N	N	200	20	N	70	N	7	16	N	N
Mn	(10)	10	700	100	50	+5,000	300	—	—	—	30	500	100	500	44	300	150
Ni	(5)	N	10	N	N	20	N	N	20	5	N	20	N	2.0	.4	5	5
Pb	(10)	N	15	N	N	20	10	N	50	N	N	10	N	7.0	3	15	10
Sc	(5)	N	10	N	N	7	N	N	20	N	N	15	N	1.0	2	7	7
Sr	(100)	N	300	N	N	150	N	N	200	N	N	20	N	20	53	100	L
V	(10)	15	70	20	L	50	10	20	100	30	10	100	15	20	12	50	L
Y	(10)	10	50	15	N	70	L	L	70	15	N	50	15	10	16	20	50
Zr	(10)	50	+1,000	700	50	+1,000	300	100	+1,000	300	70	+1,000	1,000	220	211	1,000	300
Zn[7]	(0.05)	N	20	N	N	10	5	N	90	L	N	10	N	16	1	20	25

[1]Data from Turekian (1977, p. 629) and Turekian and Wedepohl (1961).
[2]Data from Pettijohn (1963, p. S11).
[3]Approximate mean value for Cheshire Quartzite samples from the Lye Brook Wilderness (Ayuso and Day, 1985).
[4]Median value for Cheshire Quartzite samples from the Bristol Cliffs Wilderness (Slack and others, 1988).
[5]Median value for samples of quartzite from the Mount Holly Complex in the Devils Den Roadless Area. Selected from Slack and others (1985, table 1).
[6]Number in parentheses shows number of samples in group.
[7]Zinc values determined by atomic absorption.

Table 4. Range and median concentrations of 20 elements in 69 samples of schist from the Big Branch and Peru Peak Wildernesses and the Wilder Mountain Roadless Area

Element	(Lower limit of detection)	Dalton Formation schist and feldspathic schist (13)[6]			Mount Holly Complex quartzite unit (Yq) schist (5)[6]			Mount Holly Complex schist unit (Yss) muscovite-chlorite schists (51)[6]			LB[1] (34)[6]	BC[2] (5)[6]	Average sandstone[3,4]	Average shale[3]	Average intermediate rocks[5]
		Low	High	Median	Low	High	Median	Low	High	Median					
Ca	(0.05)	L	10	1	N	0.3	1	L	10	0.7	0.1	0.1	3.9	2.2	4.7
Fe	(.05)	.5	3	1	1.5	3	2	.7	15	3	1	7	.98	4.7	5.8
Mg	(.02)	.05	5	1.5	.02	.1	.15	.1	10	1	.3	.7	.7	1.5	2.1
Ti	(.002)	.07	1	1	.2	.7	.2	.1	+1	.5	.2	1.0	.15	.46	.8
B	(10)	10	1,000	50	10	70	30	L	2,000	20	24	70	35	100	15
Ba	(20)	100	2,000	500	50	1,000	200	100	1,000	300	228	1,000	300	580	650
Be	(1)	1	7	2	L	1.5	L	N	5	1.5	2	2	2	3	1.8
Co	(5)	N	10	7	5	15	5	N	50	15	2	15	0.3	19	10
Cr	(10)	7	50	20	10	70	15	L	200	20	25	70	35	90	50
Cu	(5)	N	50	N	N	15	10	N	200	7	4	7	10–20	45	35
La	(20)	20	70	30	N	70	N	N	100	20	20	N	7	39	—
Mn	(10)	20	500	200	—	—	—	30	2,000	500	96	300	500	850	1,200
Ni	(5)	N	20	5	5	20	5	N	70	15	68	5	2	68	55
Pb	(10)	N	30	10	N	100	15	N	70	10	20	15	7	20	1.5
Sc	(5)	N	15	7	L	15	5	N	100	15	13	15	1	13	2.5
Sr	(100)	N	500	150	L	150	150	N	500	150	67	100	20	300	800
V	(10)	20	100	50	30	70	50	N	300	100	38	100	20	130	100
Y	(10)	10	50	20	10	50	20	10	70	30	19	50	10	35	—
Zr	(10)	30	+1,000	100	200	+1,000	200	15	+1,000	200	230	1,000	220	160	260
Zn[7]	(0.05)	5	60	10	N	100	30	L	230	45	60	35	16	95	72

[1]Approximate mean value for rock samples from the Mendon Formation in the Lye Brook Wilderness. Selected from Ayuso and Day (1985, table 2).
[2]Mean value for samples of schist and phyllite from the Fairfield Pond Member (Dennis, 1964) of the Underhill Formation and from the Pinnacle Formation in the Bristol Cliffs Wilderness. Selected from Slack and others (1988).
[3]Data from Turekian (1977, p. 629).
[4]Data from Pettijohn (1963, p. S11).
[5]Values for andesites and dacites from Vinogradov (1962), as reported by Parker (1964, p. D13).
[6]Number in parentheses shows number of samples in group.
[7]Zinc values determined by atomic absorption.

Table 5. Range and median concentrations of 20 elements in 19 samples of mafic rock from the Big Branch and Peru Peak Wildernesses and the Wilder Mountain Roadless Area

Element	(Limit of detection)	Mount Holly Complex schist unit (Ys) amphibolite and hornblende schist (11)[3]			Mount Holly Complex hornblende gneiss unit (Yhb) amphibolite (8)[3]			Average basalt[1]	Average intermediate rocks[2]
		Low	High	Median	Low	High	Median		
Ca	(0.05)	0.5	2	0.5	0.07	5	3	7.6	4.7
Fe	(.05)	.7	15	7	2	15	3	8.7	5.8
Mg	(.02)	.15	7	2	.3	5	1.5	4.6	2.1
Ti	(.002)	.1	+1	1	.1	1	.5	1.4	.8
B	(10)	L	50	15	10	50	20	5	15
Ba	(20)	20	2,000	200	200	1,000	300	330	650
Be	(1)	N	3	L	L	3	1.5	1	1.8
Co	(5)	N	50	15	10	20	15	48	10
Cr	(10)	L	150	70	10	500	50	170	50
Cu	(5)	N	100	50	N	70	30	87	35
La	(20)	N	300	100	N	20	N	17	—
Mn	(10)	70	2,000	500	—	—	—	1,500	1,200
Ni	(5)	N	50	20	5	100	7	130	55
Pb	(10)	N	15	10	N	50	10	6	1.5
Sc	(5)	L	50	20	7	30	10	30	2.5
Sr	(100)	N	300	150	N	700	200	465	800
V	(10)	10	100	100	70	200	70	250	100
Y	(10)	20	70	30	10	50	20	25	—
Zn[4]	(0.05)	L	60	30	L	85	40	105	72

[1]Data from Turekian (1977, p. 629).
[2]Values for andesites and dacites from Vinogradov (1962), as reported by Parker (1964, p. D13).
[3]Number in parentheses shows number of samples in group.
[4]Zinc values determined by atomic absorption.

Table 6. Range and median concentration of 20 elements in 13 samples of felsic gneiss from the Big Branch and Peru Peak Wildernesses and the Wilder Mountain Roadless Area

Element	(Limit of detection)	Mount Holly Complex hornblende gneiss unit (Yhb) felsic gneiss (7)[4]			Mount Holly Complex granite gneiss unit (Yg) granite gneiss (6)[4]			LB[1] (34)[4]	High-calcium granite[2]	Low-calcium granite[2]	Average intermediate rocks[3]
		Low	High	Median	Low	High	Median				
Ca	(0.05)	0.05	1.5	0.2	L	0.7	0.2	2	2.5	0.5	4.7
Fe	(.05)	1	3	2	.5	5	1.5	2	2.96	1.4	5.8
Mg	(.02)	.15	1.5	.5	L	1	.5	1	.9	.2	2.1
Ti	(.002)	.2	.5	.3	.07	.5	.1	.2	.5	.4	.8
B	(10)	L	100	20	10	50	20	2	9.0	10	15
Ba	(20)	N	1,000	300	100	1,000	300	180	420	840	650
Be	(1)	L	2	1	L	3	2	1	2	3	1.8
Co	(5)	5	15	10	N	7	N	10	7	1	10
Cr	(10)	7	100	10	L	20	L	27	22	4.1	50
Cu	(5)	N	15	10	N	30	N	30	30	10	35
La	(20)	N	50	20	N	70	50	7	55	45	—
Mn	(10)	100	700	300	200	2,000	500	600	540	390	1,200
Ni	(5)	N	10	5	N	5	N	15	15	4.5	55
Pb	(10)	N	20	10	N	20	15	7	15	15	1.5
Sc	(5)	N	30	5	N	20	5	7	14	7	2.5
Sr	(100)	N	300	N	N	300	200	370	440	100	800
V	(10)	10	150	50	10	30	15	80	88	44	100
Y	(10)	L	50	20	L	20	15	20	35	41	—
Zr	(10)	N	500	150	N	700	500	100	1,400	175	260
Zn[5]	(0.05)	L	105	50	N	20	10	30	60	39	72

[1]Approximate mean value of 34 samples of Mount Holly Complex gneiss from the Lye Brook Wilderness (Ayuso and Day, 1985).
[2]Turekian and Wedepohl (1961).
[3]Values for andesites and dacites from Vinogradov (1962), as reported by Parker (1964, p. D13)
[4]Number in parentheses shows number of samples in group.
[5]Zinc values determined by atomic absorption.

Table 7. Range and median concentration of 20 elements in 5 samples of calc-silicate gneiss and marble from the Big Branch and Peru Peak Wildernesses and the Wilder Mountain Roadless Area

Element	(Limit of detection)	Mount Holly Complex gneiss and marble unit (Ym) calc-silicate gneiss and impure marble (5)			Average carbonate[1]	Average carbonate (Deep-sea core)[1]
		Low	High	Median		
Ca	(0.05)	5	+20	7	30.2	31.2
Fe	(.05)	2	7	5	.38	.9
Mg	(.02)	3	+10	7	4.7	4.0
Ti	(.002)	.05	+1	.07	.4	.77
B	(10)	N	200	15	20	30
Ba	(20)	N	1,000	70	10	120
Be	(1)	L	1	.5	.x[2]	0.[2]
Co	(5)	5	20	7	0.1	3
Cr	(10)	L	100	5	11	11
Cu	(5)	N	100	N	4	15
La	(20)	N	20	10	3.7	11
Mn	(10)	500	1,000	700	1,100	1,000
Ni	(5)	N	30	10	20	15
Pb	(10)	N	N	N	9	3
Sc	(5)	N	50	N	1	3
Sr	(100)	100	200	150	610	2,000
V	(10)	10	200	30	20	10
Y	(10)	10	50	10	4.3	15
Zn[3]	(0.05)	N	40	10	16	20

[1]Data from Turekian and Wedepohl (1961).
[2]Order of magnitude abundance.
[3]Zinc values determined by atomic absorption.