J# 87168

MONTANA DEPARTMENT OF FISH AND GAME
ENVIRONMENT AND INFORMATION DIVISION

JOB PROGRESS REPORT
RESEARCH PROJECT SEGMENT

State Montana Title Beartooth-Absaroka Widlife/Mining

Project Number FW-2-R-4 Research

Job Number 1-b Title Planning Inventory, Fisheries

Period Covered July 1, 1974 to June 30, 1975

ABSTRACT

Chemical and biological investigations were undertaken in streams draining an area of south central Montana where mining development is expected. Water quality was generally good. Waters are mostly soft and low in dissolved materials. Turbidity and suspended solids remained low except for the snow melt period when values reached moderate levels. Data on metals content of stream sediments are included.

Standing crops of stream bottom macroinvertebrates were variable, both in time and location. At most stations organisms considered sensitive to pollution were dominant.

Fish population estimates were made on 21 sections in 15 streams. Standing crops were moderately low in larger streams, but moderately high in some brushy, meandering tributaries. Estimates were made on 13 sections for two or three consecutive years.

Values were mostly similar from one year to the next. Fish tended to remain in the same stream section from one year to the next. Fish growth was somewhat slower than state averages.

Survey electrofishing was done on stream sections where fish population estimates were not made. Fish populations were lacking, except near the mouth, in most small streams and in the upper reaches of almost all streams.

Limited data on fish stomach contents suggest fish cropped a wide variety of aquatic organisms. Survival to hatching of trout eggs placed in artificial redds averaged 41, 83, and 81 percent in 1972, 1973, and 1974, respectively. Differences in water temperature probably caused the differential survival. Limited data are given on spawning trout and egg survival in the Goose Lake inlet stream. Acid mine drainage at the head of the Stillwater River affects the river for several miles downstream.

BACKGROUND

Several thousand acres of mining claims are located along or near the north edge of the Beartooth-Absaroka Mountain Range in south central Montana (Figures 1 and 2). Extensive mining in this area seems likely in the near future. Chemical and biological data on waters draining the area were mostly lacking. The overall goal of protecting aquatic resources was undertaken initially by chemical and biological surveys at stations both upstream and downstream from mining claims. Although separated from the main block of mining claims, information was also collected relative to mining claims bordering Goose Lake and to acid mine drainage entering the Stillwater River near its head in the area of Daisy Pass

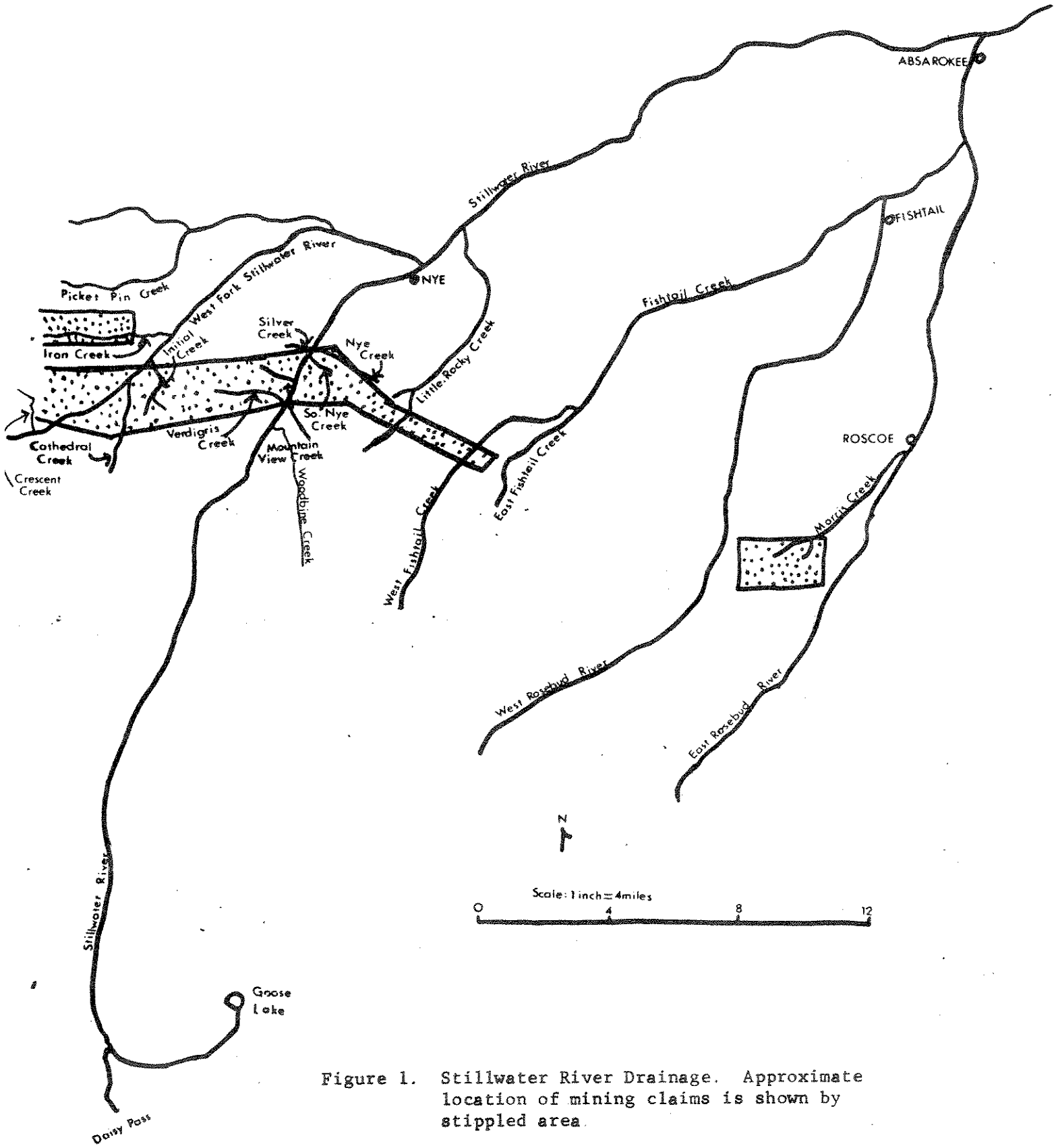

Figure 1. Stillwater River Drainage. Approximate location of mining claims is shown by stippled area.

OBJECTIVES

Job objectives were to obtain the following information at stations upstream and downstream from the complex of mining claims:

1. Basic water quality data
2. Metal concentrations in stream sediment
3. Numbers per square foot and species present in stream bottom fauna samples
4. Fish population estimates and species distributions in streams
5. Metal concentrations in fish tissues
6. Information on organisms present in fish stomachs
7. Survival to hatching of trout eggs placed in artificial redds
8. Limited biological data related to acid mine drainage near the head of the Stillwater River, and to mining claims near Goose Lake.

PROCEDURES

This report includes data collected from the beginning of the project, July 1, 1971 to December 31, 1974, a period of 42 months. A future report will include the remainder of the data.

Sampling Stations

Sampling stations were established at points upstream and downstream from the mining claims complex. Station locations are given in Table 1.

Water and Stream Sediment Quality Sampling

The sampling schedule for general water quality parameters is given in Table 2. Sampling dates for stream sediments and water samples for part-per-billion level metal analysis are shown in Tables 13 and 14.

Values for temperature, turbidity, pH, and dissolved oxygen were obtained in the field. Temperature was measured with a pocket mercury thermometer. Turbidity and pH were measured colorimetrically (Hack Chemical Co. field unit Model DR-EL). Dissolved oxygen was measured by the Winkler method.

Other parameters were analyzed at the Montana Bureau of Mines and Geology laboratory in Butte under contract agreement with the Montana Department of Fish and Game. Field procedures used were suggested by laboratory personnel.

Water samples were collected in plastic bottles after three rinsings with river water at the sampling site. Bottles for non-metals analyses were filled to capacity to prevent air contact. One percent (by volume) of concentrated nitric acid was added in the field to bottles of water for metals analysis. Water samples for part-per-billion level dissolved metals analysis were filtered in the field prior to acidification. Filter pads of 0.45 micron pore size obtained from the Gelman Instrument Company were used for filtration.

Stream sediment samples for metals analysis were collected from the upper inch of sandy or silty deposits at each station. Sediments were transported to the laboratory in cloth bags. Prior to analysis in the laboratory samples were screened through material of 100 meshes per inch (0.0059 inch opening size). Only materials passing through the screening were retained for analysis.

Table 1. Location of water, stream sediment, bottom fauna, and egg bioassay stations.

Station Number	Stream	T	R	S*	Description
001	East Rosebud River	7S	17E	11	Adjacent to Jimmie Joe Campground
002	East Rosebud River	6S	18E	16	At bridge
003	West Rosebud River	6S	17E	28	At Pine Grove Campground
004	West Rosebud River	6S	17E	2	At bridge
005	Stillwater River	5S	15E	32	West channel 200 yards upstream from bridge at Woodbine Campground
006	Stillwater River	5S	15E	15	West channel 1.4 road miles north of the Mouat Mill
007	W. Fork Stillwater River	4S	15E	33	At bridge
008	East Boulder River	3S	13E	29	At Anderson Springs resort
009	East Boulder River	2S	13E	33	At Ewan Campground 200 yards upstream from mouth
010	Boulder River	4S	12E	15	At Falls Creek Campground
011	Boulder River	5S	12E	13	At Flemming Bridge
012	East Fishtail Creek	5S	17E	19	At mouth
013	West Fishtail Creek	5S	17E	19	At mouth
014	Morris Creek	6S	18E	8	200 yards downstream from MacKay Ranch house
015	Little Rocky Creek	5S	16E	21	At road crossing near Little Rocky Campground
016	Nye Creek	5S	15E	15	At road crossing 100 yards upstream from mouth
017	Initial Creek	5S	14E	14	At road crossing
018	Cathedral Creek	5S	14E	14	At road crossing near mouth
019	Iron Creek	5S	14E	12	Near mouth
020	Picket Pin Creek	5S	14E	3	At road crossing
021	Lower Deer Creek	2S	15E	20	At road crossing near National Forest boundary
022	Upper Deer Creek	2S	14E	12	At Rudd Cabin
023	East Chippy Creek	4S	12E	1	At road crossing near mouth
024	Blakely Creek	4S	12E	25	At road crossing near mouth
025	Graham Creek	4S	12E	23	At road crossing near mouth
026	Great Falls Creek	4S	12E	23	At mouth
027	Falls Creek	4S	12E	23	West channel at road crossing
028	East Rosebud River	5S	18E	34	At Roscoe Bridge
029	West Rosebud River	5S	17E	23	At bridge
030	Fishtail Creek	5S	17E	19	At bridge
031	Little Rocky Creek	5S	16E	3	At crossing of Highway 419
032	Stillwater River	4S	16E	32	At USGS station 200 yards below mouth of West Fork
033	Stillwater River	4S	16E	28	At Moraine Fishing Access

* - Township, Range, and Section

Table 1 Continued. Location of water, stream sediment, bottom fauna, and egg bioassay stations.

Station Number	Stream	T	R	S*	Description
034	Stillwater River	4S	17E	18	At Midnight Canyon Bridge
035	Stillwater River	3S	18E	35	At Johnson Bridge
036	West Fork Stillwater	4S	16E	31	At Nye Bridge, south channel
037	West Fork Stillwater	5S	14E	14	At Initial Creek campground
038	East Boulder River	5S	13E	11	0.5 miles upstream from road crossing
039	Boulder River	2S	13E	33	At Ewan Campground 50 yards downstream from bridge
040	Boulder River	2S	13E	1	At bridge
041	West Boulder River	2S	13E	15	At McLeod Bridge
042	Silver Creek	5S	15E	15	At crossing of Highway 419
043	Verdigris Creek	5S	15E	28	At crossing of Highway 419
044	Mountain View Creek	5S	15E	21	At Crossing of Highway 419
045	Fishtail Creek	5S	17E	9	At bridge 100 yards upstream from mouth of Sheep Creek
046	East Rosebud River	5S	18E	15	At bridge
047	South Nye Creek	6S	15E	15	At trail crossing 200 yards upstream from mouth
048	Crescent Creek	5S	14E	29	At trail crossing near mouth
049	East Rosebud River	6S	18E	30	1 road mile downstream from TO Bear Ranch buildings
050	Boulder River	4S	12E	25	At Clydehurst Ranch buildings
051	Forge Creek	5S	13E	2	At road crossings near mouth
053	Brownlee Creek	4S	13E	27	At mouth
054	West Fork Stillwater River	5S	14E	30	Near mouth of Lightning Creek
055	Verdigris Creek	5S	15E	20	At wood culvert
058	Woodbine Creek	5S	15E	32	200 yards upstream from mouth
060	Brownlee Creek	5S	14E	15	50 feet below headwaters confluence

* - Township, Range, and Section

Table 2. Months when water quality stations were sampled for general paramenters.

Station Number	04-71	06-71	07-71	10-71	11-71	12-71	01-72	02-72	03-72	04-72	05-72	06-72	07-72	08-72	09-72	11-72	12-72	05-73	06-73	07-73	09-73	10-73	05-74	07-74	08-74	09-74	10-74
001	X	X	X	X	X				X		X			X		X											
002	X	X	X	X	X			X			X			X		X											
003	X	X	X	X	X			X			X			X			X										
004	X	X	X	X	X			X			X			X		X											
005	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X										
006	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X										
007	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X										
008	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X											
009	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X											
010	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X											
011				X	X	X			X	X	X	X	X	X	X	X											
012											X					X											
013								X			X			X		X											
014								X			X			X		X											
015											X			X		X											
016											X			X		X											
017											X					X											
018											X					X											
019											X					X							X	X		X	X
020											X								X				X	X		X	X
021											X								X		X						
022											X								X		X						
023											X					X											
024											X					X							X	X		X	X
025											X					X							X	X			
026											X					X											
027											X					X											
038			X																	X	X	X		X		X	X
042												X				X											
043												X			X	X			X	X	X	X					
044												X				X											
047												X				X											
048															X			X					X	X			
051																				X	X	X		X		X	X
053																								X	X		X
054																		X		X	X	X	X	X		X	X
055																			X	X	X	X					
058																			X	X							
060																								X	X	X	X

Table 13. Total and dissolved concentrations (parts-per-billion) of metals for samples collected at eleven stations in 1973.

Collection Date	COPPER Total	COPPER Dis.	LEAD Total	LEAD Dis.	NICKEL Total	NICKEL Dis.	CADMIUM Total	CADMIUM Dis.
East Rosebud River-Station 001-Jimmie Joe Campground								
March	7	1	<5	<5	21	<5	<1	<1
May	3	<1	10	<5	<5	<5	<1	<1
July	<2	<2	<5	<5	<5	<5	<1	<1
August	<2	<2	<5	<5	<5	<5	<1	<1
September	4	3	5	2	4	<1	<1	<1
East Rosebud River-Station 002-At Bridge								
March	7	1	5	5	11	<5	<1	<1
May	6	1	6	<5	12	<5	<1	<1
July	6	6	<5	<5	<5	<5	<1	<1
August	<2	<2	<5	<5	<5	<5	<1	<1
September	3	2	10	<1	3	2	<1	<1
West Rosebud River-Station 003-Pine Grove Campground								
March	5	1	<5	<5	24	<5	<1	<1
May	5	<1	<5	<5	<5	<5	<1	<1
July	2	2	<5	<5	<5	<5	<1	<1
August	<2	<2	<5	<5	<5	<5	<1	<1
September	3	3	7	3	5	<1	<1	<1
West Rosebud River-Station 004-First Bridge Below Pine Grove Campground								
March	19	1	<5	<5	11	<5	<1	<1
May	9	1	<5	<5	<5	<5	<1	<1
July	6	4	<5	<5	<5	<5	<1	<1
August	<2	<2	<5	<5	<5	<5	<1	<1
September	9	2	9	1	6	2	<1	<1
Stillwater River-Station 005-Woodbine Campground								
March	4	2	<5	<5	15	<5	<1	<1
May	17	3	<5	<5	<5	<5	<1	<1
July	<2	<2	<5	<5	<5	<5	<1	<1
August	3	3	<5	<5	<5	<5	<1	<1
September	4	4	12	<1	4	2	<1	<1
October	3	1	4	3	<1	<1	<1	<1

Table 13 continued. Total and dissolved concentrations (parts-per billion) of metals for samples collected at eleven stations in 1973.

Collection date	COPPER Total	COPPER Dis.	LEAD Total	LEAD Dis.	NICKEL Total	NICKEL Dis.	CADMIUM Total	CADMIUM Dis.
Stillwater River-Station 006-1.4 miles Below Mouat Mill								
March	3	3	<5	<5	16	<5	<1	<1
May	6	3	<5	<5	7	7	<1	<1
July	7	<2	<5	<5	<5	<5	<1	<1
August	4	2	<5	<5	<5	<5	<1	<1
September	3	3	5	<1	6	2	<1	<1
October	5	<1	5	2	<1	<1	<1	<1
West Fork Stillwater River-Station 007-Henry Grant's Cabin Bridge								
March	2	2	5	5	9	<5	<1	<1
May	3	1	<5	<5	20	<5	<1	<1
July	4	<2	<5	<5	<5	<5	<1	<1
August	2	2	<5	<5	<5	<5	<1	<1
September	4	3	3	<1	<1[a]	2[a]	<1	<1
October	4	<1	11	3	<1	<1	<1	<1
East Boulder River-Station 038-Placer Basin								
September	4	3	5	2	<1[a]	2[a]	<1	<1
October	3	1	5	4	<1	<1	<1	<1
East Boulder River-Station 008-Anderson Springs								
March	4	2	<5	<5	23	<5	<1	<1
May	26	<1	<5	<5	23	<5	<1	<1
July	2	2	<5	<5	<5	<5	<1	<1
August	5	3	<5	<5	<5	<5	<1	<1
September	2	2	8	3	<1	<1	<1	<1
October	4	2	11	5	<1	<1	<1	<1
Boulder River-Station 010-Falls Creek Campground								
March	6	1	<5	<5	9	<5	<1	<1
May	4	<1	<5	<5	<5	<5	<1	<1
July	3	2	<5	<5	10	<5	<1	<1
August	<2	<2	<5	<5	7	<5	<1	<1
September	2	2	8	<1	<1	<1	<1	<1
October	4	<1	4	2	<1	<1	<1	<1

a-Error of unknown source

Table 13 continued. Total and dissolved concentrations (parts-per billion) of metals for samples collected at eleven stations in 1973.

Collection date	COPPER Total	COPPER Dis.	LEAD Total	LEAD Dis.	NICKEL Total	NICKEL Dis.	CADMIUM Total	CADMIUM Dis.
			Boulder River-Station 011-Fleming Bridge					
March	18	2	9	7	18	<5	<1	<1
May	2	1	<5	<5	<5	<5	<1	<1
July	2	2	<5	<5	<5	<5	<1	<1
August	2	2	<5	<5	<5	<5	<1	<1
September	2	1	4	<1	<1	<1	<1	<1
October	2	1	5	3	<1	<1	<1	<1

Table 14. Concentration (parts-per million) of metals in stream sediments, 1973-74[a]

Collection date[b]	Copper	Nickel	Lead	Cadmium	Zinc	Iron ($X10^3$)
East Rosebud River-Station 001						
March, 1973	19	30	15	1	27	15
May, 1973	20	32	16	<1	34	15
July, 1973	24	35	19	1	57	29
August, 1973	20	31	19	<1	36	26
September, 1973	22	35	32	<1	39	33
Range-all samples	13-39.5	21-52.5	15-57	<1-1	27-99.5	15-40
East Rosebud River-Station 002						
March, 1973	20	31	21	<1	33	15
May, 1973	12	21	22	<1	30	14
July, 1973	13	24	13	<1	34	20
August, 1973	11	22	15	<1	33	21
September, 1973	18	36	13	<1	48	26
Range-all samples	11-24	19.5-46	9-22	<1-1	28-55	13-32
West Rosebud River-Station 003						
March, 1973	9	18	12	<1	18	12
May, 1973	9	20	13	<1	22	9
July, 1973	9	20	50	1	29	18
August, 1973	10	19	15	<1	32	17
September, 1973	12	29	12	<1	57	18
Range-all samples	7-16.5	16.5-42	11.5-76	<1-1	18-107.5	9-22
West Rosebud River-Station 004						
March, 1973	9	13	17	<1	18	12
May, 1973	9	16	16	<1	29	11
July, 1973	10	16	13	1	26	19
August, 1973	10	15	14	<1	38	21
September, 1973	8	16	12	<1	30	21
Range-all samples	5.5-13	10-18.5	10-17.5	<1-1	17.5-47	11-23

a-Fractions of field samples passing through 100 mesh per inch screening were retained for analysis.
b-Values for March and May, 1973 are for single samples; the remainder are average for three samples.

Table 14 continued. Concentration (parts-per-million) of metals in stream sediments, 1973-74[a].

Collection date[b]	Copper	Nickel	Lead	Cadmium	Zinc	Iron($X10^3$)
			Stillwater River-Station 005			
March, 1973	72	18	18	1	36	14
May, 1973	65	20	21	<1	46	11
July, 1973	48	16	25	<1	40	18
August, 1973	65	15	18	<1	55	20
September, 1973	56	14	12	<1	36	19
October, 1973	22	48	42	<1	48	25
Range-all samples	12.5-87	11-61	9.5-48.5	<1-1	24-71	11-27

a-Fractions of field samples passing through 100 mesh per inch screening were retained for analysis.
b-Values for March and May, 1973 are for single samples; the remainder are for three samples.

Table 14 continued. Concentration (parts-per million) of metals in stream sediments, 1973-74[a].

Collection date[b]	COPPER	NICKEL	LEAD	CADMIUM	ZINC	IRON(X10^3)
Stillwater River-Station 006						
March, 1973	46	209	19	1	20	15
May, 1973	62	192	20	<1	34	17
July, 1973	101	107	18	2	59	27
August, 1973	70	196	20	1+	50	30
September, 1973	63	209	11	<1	30	28
October, 1973	20	35	52	<1	100	22
Range-all samples	17-110	25.5-330	9.5-57	<1-3.0	20-124.5	15-36
West Fork Stillwater River-Station 054						
May, 1974	49	72	28	<1	54	40
July, 1973	63	77	21	<1	54	41
September, 1974	55	84	16	1	46	40
October, 1974	43	70	16	1	47	39
Range-all samples	36-70.5	87.5-59	13.5-36.5	0.5-1.5	43.5-65.0	37.6-44.5
West Fork Stillwater River-Station 007						
March, 1973	40	85	20	1	27	16
May, 1973	31	68	20	<1	30	18
July, 1973	37	78	16	1.5	34	35
August, 1973	36	77	18	1.4	36	36
September, 1973	97	123	14	<1	104	34
October, 1973	37	91	28	<1	36	32
Range-all samples	28-212	60-193	12-31	<1-1.9	25.5-254.5	16-38
East Boulder River-Station 038						
September, 1973	48	138	17	1	63	61
October, 1973	50	146	38	1.1	77	66
July, 1974	62	141	26	1.5	87	68
September, 1974	45	133	23	<1	61	59
October, 1974	50	157	26	1.8	71	75
Range-all samples	41.5-69	130-168.5	16-55	1-2	49.5-94.0	53.8-77.6
East Boulder River-Station 061						
July, 1974	51	84	21	1	40	43
September, 1974	38	79	19	1	34	44
October, 1974	35	71	20	1.5	56	44
Range-all samples	34-55.5	58.5-86	15.5-22.5	<1-1.5	28.5-72	31.8-45.7

Table 14 continued. Concentration (parts-per million) of metals in stream sediments, 1973-74[a]

Collection date[b]	COPPER	NICKEL	LEAD	CADMIUM	ZINC	IRON(X10^3)
Blakely Creek-Station 024						
May, 1974	65	177	32	1	35	37
July, 1974	69	159	23	<1	36	43
September, 1974	68	161	24	1	26	33
October, 1974	71	176	22	1.2	20	40
Range-all samples	62.5-75	140-196	19-41	0.5-1.5	16-39	28-48
Graham Creek-Station 025						
May, 1974	66	640	29	<1	65	57
July, 1974	71	625	31	1	57	55
Range-all samples	65-74	590-705	25-38	0.5-1	43-81	52-63
Crescent Creek-Station 048						
May, 1974	195	470	21	<1	67	63
July, 1974	233	501	22	1	74	55
Range-all samples	155-235	350-520	19.5-23	1-1	64.5-79	42-66
Forge Creek-Station 051						
July, 1974	143	262	16	1	59	95
September, 1974	145	289	24	2	53	87
October, 1974	148	351	20	2	59	83
Range-all samples	120-168	234-430	12-31.5	1-2.5	43-70	81-103
Brownlee Creek-Station 053						
July,1974	75	137	25	1	55	34
August, 1974	114	145	37	1	53	36
October, 1974	59	137	24	1	40	33
Range-all samples	49-166	128-153	21.5-43.5	1-1.5	37-57	28-41
Brownlee Creek-Station 060						
July, 1974	93	246	23	1	54	40
August, 1974	84	210	28	1	66	38
September, 1974	77	210	24	1	49	45
October, 1974	76	227	21	2	51	38
Range-all samples	72.5-112.5	189.5-309.5	18.5-29.5	1-2	34-67.5	36-48

Table 14 continued. Concentration (parts-per million) of metals in stream sediments, 1973-74[a].

Collection date[b]	COPPER	NICKEL	LEAD	CADMIUM	ZINC	IRON(X10^3)
East Boulder River-Station 008						
March, 1973	46	78	20	1	33	16
May, 1973	33	70	26	<1	38	20
July, 1973	41	76	20	1.7	50	31
August, 1973	36	76	28	1.5	49	32
September, 1973	36	74	17	1.3	34	31
October,1973	38	80	34	<1	47	33
Range-all samples	31-46.5	58-96	14-36	<1-2.0	25.5-54	16-38
Boulder River-Station 011						
March, 1973	21	40	14	1	30	18
May, 1973	26	45	25	<1	48	29
July, 1973	17	27	15	1.3	45	34
August, 1973	17	30	20	1.1	38	35
September, 1973	17	27	12	1.1	37	34
October, 1973	72	101	28	<1	53	35
Range-all samples	13.5-81	23.5-143	9-32.5	<1-2.0	20-72.5	18-43
Boulder River-Station 010						
March, 1973	25	57	19	1	29	18
May, 1973	24	54	20	<1	40	30
July, 1973	20	44	14	1	44	45
August, 1973	19	40	19	1	37	39
September, 1973	22	49	13	1	44	38
October, 1973	126	46	42	<1	90	41
Range-all samples	20-132.5	36-85	10.5-64	<1-1.3	29-141.5	18-50
Iron Creek-Station 019						
May, 1974	45	109	25	1	48	31
July,1974	43	113	24	<1	44	31
September, 1974	45	110	20	1	37	27
October, 1974	39	111	36	1	23	29
Range-all samples	36.5-55	102-126.5	17-72	<1-1.5	21.5-49	26-37

Table 14 continued. Concentration (parts-per million) of metals in stream sediments, 1973-74[a].

Collection date[b]	COPPER	NICKEL	LEAD	CADMIUM	ZINC	IRON(X10^3)
			Picket Pin Creek-Station 020			
May, 1974	57	78	29	1	99	29
July, 1974	53	76	59	1.5	53	22
September, 1974	50	71	23	1	69	26
October, 1974	55	85	24	1	43	27
Range-all samples	44-65	62.5-89.5	19-79.5	1-2	20.5-105	19-30

Stream Bottom Macroinvertebrates

Bottom macroinvertebrates were sampled with a square foot sampler slightly modified from that described by Waters and Knapp (1961). One riffle sample per station was collected in August or October 1970 and in April 1971. Three samples per station were collected at later sampling dates.

Various non-riffle habitat types were sampled with a Needham hand screen to collect species not present in riffle samples. These samples were collected in May and November 1972 from stations on major streams and in August from tributary streams.

Samples were preserved in the field in 10 percent formalin and sorted to order (insects) or other taxonomic group for non-insect organisms at the Department of Fish and Game laboratory in Helena. The number and volume of organisms were obtained for each taxonomic group in each sample. All organisms were preserved for possible future identification to taxa.

Fish Studies

Population estimates were made using methods similar to those described by Vincent (1971). A computer program was used to make the required calculations. The basic technique involves capturing fish by electrofishing in a stream section and marking them in a manner recognizable at a future date, e.g. fin clip. Several days later fish are again captured in the stream section, noting whether or not each fish is marked. Fish in each stream section were given a distinctive mark each year (fins removed are shown in Table 13). They were aged from scale impressions. Fish were weighed to the nearest 0.01 pound and total lengths were taken to the nearest 0.1 inch.

Fish stomachs and fish for metals analysis were collected during the last recapture run with the exception of section F-17 on the West Fork Stillwater River. Fish for metals analysis were collected September 1973 from this section. Fish stomachs were preserved in formalin and stomach contents were identified to order. Fish collected for metals analysis were frozen the day of collection and later shipped on dry ice by air freight to the Environmental Protection Agency in Denver, Colorado where the analysis was performed.

Egg Bioassays

Eggs were buried in artificial redds to determine survival rates during the incubation period. Redds were built by excavating the stream bottom in riffle areas to a depth of 12 to 14 inches, leaving a semi-spherical depression approximately 2.5 feet in diameter. This was filled with clean gravel averaging 0.84 inches in diameter.[1] Redds were allowed to settle and stabilize at least two weeks before egg placement.

Eyed cutthroat trout eggs were obtained from the Montana Department of Fish and Game Yellowstone River Trout Hatchery at Big Timber for egg bioassays in 1972. For 1973 and 1974 bioassays eyed rainbow trout eggs were obtained from Ennis National Fish Hatchery at Ennis. On both occasions eggs were placed in trays, covered with crushed ice, and placed in artificial redds the same day they were taken from the hatcheries.

Two different types of egg containers, both constructed to retain fry after hatching, were used to contain eggs in redds. A few eggs were placed in small perforated vials which were removed periodically to determine when hatching had occurred.

1/ Diameters measured on gravel used in 1973. Gravel used in 1972 and 1974 was of similar size.

Three containers made of plastic screening were filled with 100 eggs each and buried four to six inches deep in each redd. Gravel chips were placed in the screen containers in 1973 and 1974, but not in 1972. The redd at station 007, 1973, was not stable. Most of the gravel washed away between the time the redd was constructed and the day of egg placement. As an emergency measure the screen containers were placed on what little remained of the gravel from which the redd had been built and large (two to four inch) gravel was collected from the stream bank and placed over the containers.

After hatching the screen containers were removed and the number of fry were counted.

Stillwater River Headwaters Area

Fish were seined from the Goose Lake inlet stream in July, 1972. Fish eggs were removed from natural redds by loosening the gravel with a shovel. A hand screen was held downstream from the redd to capture eggs removed. Other procedures in this area were with methods and equipment previously described.

FINDINGS

General Chemical Water Quality

Data for general water quality parameters are shown in Tables 3 through 9. Locations of sampling stations are given in Table 1. Stream locations are indicated in Figures 1 and 2.

Waters are of the calcium bicarbonate type (typical of fresh water), very soft to moderately hard, and generally low in dissolved material. A few streams have moderate levels of dissolved materials, these are: Silver Creek (spring source), Upper and Lower Deer Creeks, and the lower reaches of the East Boulder River. In general, human activities have probably modified water quality very little. Verdigris Creek (Stillwater River tributary) is an exception.

At station 043, near the mouth of Verdigris Creek, nickel and copper were as high as 0.59 and 0.14 mg/liter, respectively (Table 5). However, at station 055, which is approximately one mile upstream, these metals were below detection limits for all samples (Table 5). Between these two stations the stream passes through a gossan (area of decomposed rock of rusty color due to oxidized metal pyrites). One water sample was taken from a spring that emerges from the base of the gossan and enters Verdigris Creek. In this sample nickel and copper values were 0.68 and 0.31 mg/l respectively. The gossan and probably this spring contribute the greatly elevated amounts of metals found in Verdigris Creek near its mouth. This is not a natural chemical situation, but a result of natural and unnatural causes. The gossan surface has undergone considerable disturbance from road building. At any rate, water quality in Verdigris Creek is good upstream from the gossan.

Both Nye and South Nye Creeks are filled with mill tailings which have blown in from the Mouat tailings pond located a few hundred yards upstream. This has had no obvious effect on water chemistry in these two streams, but the natural stream bottoms have been almost completely destroyed in the lower 0.5 to 0.75 miles of these streams.

Tables 3 through 9 indicate discrepancies between field and laboratory pH measurements of 1.0 to 2.0 units. Laboratory values were always lower. Laboratory measurements were made one to two months following sample collection, while field pH was measured with a few minutes after sample collection. To find out which set of pH values was correct, a simultaneous comparison of laboratory and field pH meters was made on water that had been collected the day before (Table 10). Samples were collected January 24, 1973 and measurements

Table 5. Summarization of water quality data for stations on Stillwater River tributaries, 1972 - 1973.[a]

	Little Rocky Creek Station 015[b]			Nye Creek Station 016[b]		
	Mean	Max.	Min.	Mean	Max.	Min.
Ca	14.30	18.20	11.20	9.40	10.40	8.70
Mg	4.50	5.60	3.70	7.60	7.70	7.50
Na	1.90	2.40	1.50	2.00	2.20	1.80
K	0.50	0.60	0.38	0.45	0.60	0.31
SiO_2	10.50	12.80	8.70	17.00	18.00	16.00
HCO_3	67.00	80.00	54.00	67.00	69.00	64.00
CO_3	0.00	0.00	0.00	0.00	0.00	0.00
OH	0.00	0.00	0.00	0.00	0.00	0.00
Cl	0.20	0.40	0.00	0.10	0.10	0.10
SO_4	4.80	7.90	2.00	6.90	7.90	6.40
NO_3	0.40	0.70	0.00	0.70	1.00	0.00
F	0.00	0.00	0.00	0.00	0.00	0.00
pH (lab)	6.73	6.77	6.69	6.97	7.16	6.78
pH (field)	8.30	8.50	8.10	8.50	8.50	8.40
Fo	41.00	54.00	32.00	42.00	51.00	32.00
Dis. Sol.	103.90	128.60	86.30	111.20	115.10	105.10
Hard.	55.00	68.00	44.00	56.00	57.00	53.00
Alk.	55.00	66.00	44.00	55.00	57.00	52.00
D. O.	10.60	12.90	8.20	10.40	12.10	9.20
JTU	2.00	7.00	0.00	2.00	5.00	0.00
Zn	0.01	0.01	<0.01	<0.01	0.01	<0.01
Cd	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Cu	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Ni	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Fe	0.05	0.11	0.00	0.21	0.53	0.00
Mn	0.00	0.01	0.00	0.00	0.01	0.00

a - Units are milligrams per liter except as indicated
b - Three samples except for lab pH which is two.
c - Two samples
d - Two samples except for lab pH which is one.
e - Seven samples except six each for cadmium, nickel, copper and zinc.
f - Four samples except three each for cadmium, nickel, copper, zinc, and temperature.
g - Two samples except silica, which is one.

Table 5 Continued. Summarization of water quality data for stations on Stillwater River tributaries, 1972 - 1973.

	Silver Creek Station 042		Mountain View Creek Station 044[d]		South Nye Creek Station 047[c]	
	Max.	Min.	Max.	Min.	Max.	Min.
Ca	50.00	49.00	17.40	15.00	17.90	8.80
Mg	18.00	17.80	17.90	12.20	9.80	6.80
Na	2.30	1.90	4.00	2.90	3.50	1.80
K	0.70	0.59	0.70	0.70	0.52	0.46
SiO_2	12.80	8.60	17.10	16.00	18.50	16.00
HCO_3	147.00	143.00	136.00	102.00	101.00	58.00
CO_3	0.00	0.00	0.00	0.00	0.00	0.00
OH	0.00	0.00	0.00	0.00	0.00	0.00
Cl	0.40	0.10	2.00	0.00	0.80	0.50
SO_4	74.00	74.00	11.00	7.20	9.00	4.80
NO_3	0.90	0.20	2.20	0.30	0.80	0.00
F	0.20	0.00	0.00	0.00	0.00	0.00
pH (lab)	8.42	7.28	7.00	--	7.64	7.26
pH (field)	8.60	8.60	8.50	8.50	8.40	8.40
F°	60.00	50.00	52.00	36.00	49.00	37.00
Dis. Sol.	304.50	300.60	208.80	157.00	163.10	97.80
Hard.	199.00	195.00	118.00	88.00	85.00	50.00
Alk.	126.00	121.00	112.00	84.00	83.00	48.00
D. O.	9.60	8.60	11.20	9.00	10.80	9.70
JTU	0.00	0.00	10.00	0.00	12.00	5.00
Zn	0.01	0.01	0.01	0.01	0.01	0.01
Cd	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Cu	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Ni	<0.02	<0.02	<0.02	<0.02	0.02	<0.02
Fe	0.04	0.03	0.21	0.16	1.28	0.08
Mn	0.01	0.00	0.00	0.00	0.03	0.00

Table 5 Continued. Summarization of water quality data for station on Stillwater River tributaries, 1972 - 1973.[a]

	Verdigris Creek Station 043			Verdigris Creek Station 055			Woodbine Creek Station 058	
	Mean	Max.	Min.	Mean	Max.	Min.	Max.	Min.
Ca	7.90	11.30	3.40	4.50	6.60	2.30	3.1	2.60
Mg	10.90	16.00	4.30	4.50	5.60	2.70	1.10	0.50
Na	2.30	3.00	1.50	1.80	2.00	1.40	1.20	1.00
K	0.70	1.10	0.50	0.60	0.70	0.40	0.60	0.50
SiO_2	13.80	16.00	11.00	11.20	13.50	9.80	6.00	-
HCO_3	38.00	48.00	21.00	35.00	42.00	25.00	11.00	11.00
CO_3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
OH	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cl	1.10	3.30	0.10	0.20	0.40	0.00	0.20	0.10
SO_4	36.70	61.00	7.20	3.40	4.40	2.40	3.00	2.90
NO_3	0.50	1.00	0.00	1.00	2.40	0.00	0.30	0.10
F	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
pH (lab)	7.24	7.97	6.61	7.52	7.83	6.78	6.89	6.65
pH (field)	8.20	8.50	7.70	8.10	8.50	7.50	8.40	7.50
F°	48.00	59.00	32.00	41.00	47.00	37.00	43.00	42.00
Dis. Sol.	112.80	149.80	49.60	60.00	76.20	45.50	26.10	19.90
Hard.	65.00	93.00	26.00	30.00	37.00	20.00	11.00	10.00
Alk.	31.00	39.00	18.00	29.00	34.00	20.00	9.00	9.00
D. O.	9.60	10.70	8.50	9.80	10.40	8.90	10.60	10.40
JTU	4.00	10.00	0.00	0.00	0.00	0.00	8.00	0.00
Zn	<0.01	0.015	<0.01	<0.01	0.01	<0.01	<0.01	-
Cd	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-
Cu	0.10	0.14	0.05	<0.02	<0.02	<0.02	<0.02	-
Ni	0.40	0.59	0.09	<0.05	<0.05	<0.05	<0.05	-
Fe	0.30	0.58	0.17	0.05	0.10	0.00	0.05	0.00
Mn	0.04	0.06	0.01	0.00	0.00	0.00	0.00	0.00

Table 3. Summarization of water quality of major streams, 1971 - 1972 - 1973 - 1974[a].

	East Rosebud River Station 001				East Rosebud River Station 002			
	Mean	Max.	Min.	No. of Samples	Mean	Max.	Min.	No. of Samples
Ca[b]	4.10	5.70	2.00	9	5.60	8.60	2.60	9
Mg	1.10	1.50	0.60	9	1.40	1.80	0.70	9
Na	0.90	1.30	0.50	9	1.40	2.40	0.60	9
K	0.80	1.40	0.50	9	0.80	1.70	0.60	9
SiO_2	2.20	3.00	1.00	9	3.50	6.00	1.30	9
HCO_3	17.10	24.00	10.00	9	24.00	36.00	11.00	9
CO_3	0.00	0.00	0.00	9	0.00	0.00	0.00	9
OH	0.00	0.00	0.00	9	0.00	0.00	0.00	9
Cl	0.30	1.00	0.00	9	0.50	1.40	0.10	9
SO4	3.60	6.00	1.80	9	3.90	5.60	2.60	9
NO_3	0.30	0.70	0.00	9	0.40	0.90	0.00	9
F	0.00	0.10	0.00	9	0.00	0.10	0.00	9
pH (lab)	6.74	7.15	6.19	9	6.90	7.18	6.33	9
pH (field)	8.30	8.40	8.20	6	8.20	8.40	8.10	6
F°	43.00	57.00	32.00	8	43.00	60.00	32.00	9
Dis. Sol.	30.50	38.40	18.60	9	41.80	59.60	21.70	9
Hard.	14.00	20.00	9.00	9	20.00	28.00	10.00	9
Alk.	14.00	20.00	8.00	9	20.00	30.00	9.00	9
D. O.	11.20	13.00	8.50	5	11.30	13.00	8.50	6
JTU	1.00	4.00	0.00	4	2.00	3.00	0.00	4
Zn	<0.01	0.01	<0.01	9	<0.01	0.01	<0.01	9
Cd	<0.01	<0.01	<0.01	9	<0.01	<0.01	<0.01	9
Cu	<0.01	<0.01	<0.01	9	<0.01	<0.01	<0.01	9
Ni	<0.02	<0.02	<0.01	9	<0.02	<0.02	<0.02	9
Fe	0.02	0.08	0.00	9	0.12	0.41	<0.02	9
Mn	0.00	0.00	0.00	9	0.00	0.01	0.00	9

a - Units are milligrams per liter except as indicated.

b - Standard chemical abbreviations, are as follows:

F° = Temperature, field
Dis. Sol. = Calculated dissolved solids
Hard. = Total hardness as $CaCO_3$
Alk. = Total alkalinity as $CaCO_3$
D. O. = Dissolved oxygen, field
JTU = Turbidity, field

Table 3 Continued. Summarization of water quality of major streams, 1971 - 1972 - 1973 - 1974[a].

	West Rosebud River Station 003				West Rosebud River Station 004			
	Mean	Max.	Min.	No. of Samples	Mean	Max.	Min.	No. of Samples
Ca[b]	4.30	10.50	2.60	9	5.20	8.60	3.30	9
Mg	0.90	1.30	0.40	9	0.90	1.40	0.60	9
Na	1.00	1.30	0.70	9	1.30	1.90	0.80	9
K	0.80	1.10	0.40	9	0.80	1.20	0.60	9
SiO_2	2.50	4.30	0.00	9	3.60	7.00	1.00	9
HCO_3	17.00	34.00	10.00	9	20.00	27.00	15.00	9
CO_3	0.00	0.00	0.00	9	0.10	1.00	0.00	9
OH	0.00	0.00	0.00	9	0.00	0.00	0.00	9
Cl	0.50	1.40	0.10	9	0.40	1.00	0.10	9
SO_4	3.20	6.20	2.00	9	4.40	7.40	2.20	9
NO_3	0.30	0.80	0.00	9	0.20	0.70	0.00	9
F°	0.00	0.10	0.00	9	0.00	0.10	0.00	9
pH (lab)	6.70	7.22	6.24	9	6.91	8.42	6.33	9
pH (field)	8.10	8.30	7.90	6	8.20	8.40	7.90	6
F°	43.00	57.00	32.00	8	44.00	60.00	32.00	8
Dis. Sol.	30.30	57.60	19.60	9	36.80	48.50	28.10	9
Hard.	15.00	31.00	10.00	9	17.00	26.00	12.00	9
Alk.	14.00	28.00	8.00	9	17.00	26.00	12.00	9
D. O.	11.10	12.00	8.60	6	10.90	12.00	8.30	5
JTU	3.00	8.00	0.00	4	2.00	3.00	0.00	4
Zn	<0.01	0.01	<0.01	9	<0.01	0.01	<0.01	9
Cd	<0.01	<0.01	<0.01	9	<0.01	<0.01	<0.01	9
Cu	<0.01	0.01	<0.01	9	<0.01	0.01	<0.01	9
Ni	<0.02	<0.02	<0.01	9	<0.02	<0.02	<0.02	9
Fe	0.02	0.07	0.02	9	0.03	0.12	0.00	9
Mn	0.00	0.01	0.00	9	0.00	0.01	0.00	9

a - Units are milligrams per liter except as indicated.

b - Standard chemical abbreviations, as follows:

F° = Temperature, field
Dis. Sol. = Calculated dissolved solids
Hard. = Total hardness as $CaCO_3$
Alk. = Total Alkalinity as $CaCO_3$
D. O. = Dissolved oxygen, field
JTU = Turbidity, field

Table 3 Continued. Summarization of water quality of major streams, 1971 - 1972 - 1973 - 1974[a].

	Stillwater River Station 005				Stillwater River Station 006			
	Mean	Max.	Min.	No. of Samples	Mean	Max.	Min.	No. of Samples
Ca[b]	4.90	7.10	2.60	16	8.40	16.40	3.60	16
Mg	1.10	1.80	0.60	16	2.00	3.10	0.70	16
Na	1.40	2.50	0.60	16	1.60	2.70	0.60	16
K	0.70	1.60	0.40	16	0.80	1.50	0.40	16
SiO_2	4.60	7.30	1.30	16	5.00	9.00	1.30	16
HCO_3	19.00	26.00	13.00	16	28.00	51.00	13.00	16
CO_3	0.00	0.00	0.00	16	0.00	0.00	0.00	16
OH	0.00	0.00	0.00	16	0.00	0.00	0.00	16
Cl	0.50	1.50	0.20	16	0.50	1.40	0.00	16
SO_4	4.50	7.40	2.00	16	8.30	14.00	2.80	16
NO_3	0.30	1.00	0.00	16	0.30	1.00	0.00	16
F	0.00	0.10	0.00	16	0.00	0.10	0.00	16
pH (lab)	6.81	7.24	6.32	16	6.88	8.12	6.04	16
pH (field)	8.30	8.40	7.80	13	8.20	8.50	7.00	13
Fo	41.00	55.00	32.00	15	43.00	56.00	32.00	15
Dis. Sol.	37.00	48.60	23.40	16	54.30	92.00	26.80	16
Hard.	17.00	21.00	11.00	16	28.00	51.00	12.00	16
Alk	15.00	22.00	10.00	16	23.00	42.00	10.00	16
D. O.	11.40	16.00	9.50	12	10.90	13.40	9.40	13
JTU	2.00	10.00	0.00	9	2.00	8.00	0.00	9
Zn	<0.01	0.01	<0.01	16	<0.01	0.02	<0.01	16
Cd	<0.01	<0.01	<0.01	16	<0.01	<0.01	<0.01	16
Cu	<0.01	0.01	<0.01	16	<0.01	0.02	<0.01	16
Ni	<0.02	<0.02	<0.02	16	<0.02	<0.02	<0.02	16
Fe	0.06	0.20	0.00	16	0.06	0.24	0.00	16
Mn	0.00	0.01	0.00	16	0.00	0.01	0.00	16

Table 3 Continued. Summarization of water quality of major streams, 1971 - 1972 - 1973 - 1974[a].

	West Fork Stillwater River Station 007				West Fork Stillwater River Station 054			
	Mean	Max.	Min.	No. of Samples	Mean	Max.	Min.	No. of Samples
Ca[b]	13.00	21.00	5.00	16	6.50	7.90	3.40	8
Mg	4.00	6.70	0.50	16	2.30	3.80	0.40	8
Na	1.60	2.40	0.80	16	1.20	1.50	0.90	8
K	0.90	1.80	0.50	16	0.80	1.00	0.50	8
SiO_2	6.80	10.00	2.00	16	5.50	7.00	3.00	8
HCO_3	57.00	94.00	22.00	16	26.00	33.00	13.00	8
CO_3	0.00	1.00	0.00	16	0.00	0.00	0.00	8
OH	0.00	0.00	0.00	16	0.00	0.00	0.00	8
Cl	0.40	1.10	0.20	16	0.60	2.00	0.20	8
SO_4	5.90	8.60	2.20	16	6.10	11.40	2.80	8
NO_3	0.20	1.00	0.00	16	0.30	0.70	0.00	8
F	0.00	0.10	0.00	16	0.00	0.00	0.00	8
pH (lab)	7.29	8.32	6.38	16	7.28	7.74	6.73	8
pH (field)	8.30	8.60	6.90	13	8.20	8.60	7.40	8
Fo	42.00	53.00	32.00	15	40.00	47.00	33.00	8
Dis. Sol.	90.10	133.10	40.00	16	49.20	54.60	27.00	8
Hard.	48.00	76.00	21.00	16	25.00	35.00	16.00	8
Alk.	47.00	76.00	21.00	16	21.00	27.00	11.00	8
D. O.	10.80	12.80	9.00	12	10.10	10.90	9.20	8
JTU	0.00	2.00	0.00	10	0.00	2.00	0.00	8
Zn	<0.01	0.02	<0.01	16	<0.01	0.02	<0.01	7
Cd	<0.01	<0.01	<0.01	16	<0.01	<0.01	<0.01	7
Cu	<0.01	0.02	<0.01	16	<0.01	<0.02	<0.01	7
Ni	<0.02	<0.02	<0.02	16	<0.01	<0.05	<0.01	7
Fe	0.10	0.92	0.00	16	0.02	0.10	0.00	8
Mn	0.00	0.01	0.00	16	0.00	0.00	0.00	8

Table 3 Continued. Summarization of water quality of major streams, 1971 - 1972 - 1973 - 1974[a].

	East Boulder River Station 038				East Boulder River Station 008			
	Mean	Max.	Min.	No. of Samples	Mean	Max.	Min.	No. of Samples
Ca[b]	3.40	6.30	2.00	7	23.80	32.00	10.40	16
Mg	1.40	1.70	1.00	7	5.70	6.90	2.00	16
Na	1.50	1.60	1.20	7	1.40	2.00	0.80	16
K	0.60	0.60	0.50	7	0.50	1.00	0.20	16
SiO_2	7.40	9.60	3.80	7	6.70	10.00	2.60	16
HCO_3	16.00	24.00	12.00	7	89.00	122.00	36.00	16
CO_3	0.00	0.00	0.00	7	0.00	2.00	0.00	16
OH	0.00	0.00	0.00	7	0.00	0.00	0.00	16
Cl	0.70	1.30	0.30	7	0.30	1.00	0.00	16
SO_4	2.70	5.60	0.30	7	7.00	12.20	1.80	16
NO_3	0.30	0.80	0.10	7	0.10	0.80	0.00	16
F	0.00	0.00	0.00	6	0.00	0.10	0.00	16
pH (lab)	7.46	8.53	7.12	7	7.65	8.41	6.82	16
pH (field)	8.10	8.60	7.40	6	8.50	8.60	8.00	13
F°	52.00	61.00	42.00	7	40.00	52.00	32.00	16
Dis. Sol.	33.80	43.60	29.60	7	142.00	180.10	63.00	16
Hard.	14.00	21.00	10.00	7	82.00	105.00	35.00	16
Alk.	13.00	21.00	10.00	7	78.00	104.00	29.00	16
D. O.	8.50	9.40	7.30	6	11.00	12.10	9.20	12
JTU	1.00	5.00	0.00	6	1.00	5.00	0.00	10
Zn	<0.01	0.01	<0.01	5	<0.01	0.01	<0.01	16
Cd	<0.01	<0.01	<0.01	5	<0.01	<0.01	<0.01	16
Cu	<0.01	<0.01	<0.01	5	<0.01	<0.01	<0.01	16
Ni	<0.01	<0.05	<0.01	5	<0.02	<0.02	<0.02	16
Fe	0.02	0.10	0.00	7	0.02	0.17	0.00	16
Mn	0.00	0.01	0.00	7	0.00	0.01	0.00	16

Table 3 Continued. Summarization of water quality of major streams, 1971 - 1972 - 1973 - 1974[a].

	East Boulder River Station 009				Boulder River Station 010			
	Mean	Max.	Min.	No. of Samples	Mean	Max.	Min.	No. of Samples
Ca[b]	41.60	55.00	17.90	16	9.00	13.20	4.80	16
Mg	9.50	15.30	3.20	16	2.20	3.50	0.80	16
Na	4.80	12.70	1.60	16	2.00	2.80	1.00	16
K	1.20	2.50	0.50	16	1.20	2.10	0.60	16
SiO_2	7.10	11.00	3.20	16	7.70	11.00	3.00	16
HCO_3	141.00	178.00	59.00	16	37.00	54.00	23.00	16
CO_3	0.00	5.00	0.00	16	0.00	1.00	0.00	16
OH	0.00	0.00	0.00	16	0.00	0.00	0.00	16
Cl	1.40	3.30	0.30	16	0.50	1.50	0.10	16
SO_4	44.00	63.00	9.40	16	6.50	11.40	2.60	16
NO_3	0.30	1.00	0.00	16	0.20	0.80	0.00	16
F	0.00	0.20	0.00	16	0.02	0.13	0.00	16
pH (lab)	7.92	8.48	7.00	16	7.06	8.34	6.53	16
pH (field)	8.40	8.70	7.60	13	8.40	8.70	8.30	13
Fo	42.00	58.00	33.00	16	40.00	54.00	32.00	16
Dis. Sol.	253.20	324.90	97.70	16	69.90	89.90	40.60	16
Hard.	150.00	196.00	57.00	16	31.00	46.00	20.00	16
Alk.	116.00	158.00	48.00	15	30.00	44.00	19.00	16
D. O.	11.10	12.40	9.30	12	11.10	12.00	8.90	13
JTU	4.00	20.00	0.00	10	3.00	8.00	0.00	9
Zn	<0.01	0.015	<0.01	16	<0.01	0.01	<0.01	16
Cd	<0.01	<0.01	<0.01	16	<0.01	<0.01	<0.01	16
Cu	<0.01	<0.01	<0.01	16	<0.01	<0.01	<0.01	16
Ni	<0.02	<0.02	<0.02	16	<0.02	<0.02	<0.02	16
Fe	0.11	0.55	0.00	16	0.10	0.68	0.00	16
Mn	0.00	0.02	0.00	16	0.00	0.03	0.00	16

Table 3 Continued. Summarization of water quality of major streams, 1971 - 1972 - 1973 - 1974[a].

Boulder River Station 011

	Mean	Max.	Min.	No. of Samples
Ca[b]	8.70	14.20	4.80	11
Mg	2.20	2.80	1.40	11
Na	2.00	2.80	1.00	11
K	1.00	1.50	0.60	11
SiO_2	9.00	11.00	3.20	11
HCO_3	36.00	47.00	24.00	11
CO_3	0.00	0.00	0.00	11
OH	0.00	0.00	0.00	11
Cl	0.40	0.60	0.10	11
SO_4	5.80	10.40	2.60	11
NO_3	0.30	0.70	0.00	11
F	0.01	0.12	0.00	11
pH (lab)	7.17	7.94	6.46	11
pH (field)	8.40	8.70	8.20	11
Fo	41.00	52.00	31.00	10
Dis. Sol.	65.30	86.00	44.80	11
Hard.	31.00	44.00	20.00	11
Alk.	30.00	39.00	20.00	11
D. O.	10.70	12.00	9.10	11
JTU	1.00	7.00	0.00	8
Zn	<0.01	0.01	<0.01	11
Cd	<0.01	<0.01	<0.01	11
Cu	<0.01	<0.01	<0.01	11
Ni	<0.02	<0.02	<0.02	11
Fe	0.07	0.27	0.00	11
Mn	0.00	0.01	0.00	11

Table 4. Summarization of water quality data for stations on Rosebud tributaries, 1972.[a]

	East Fishtail Creek Station 012[b]		West Fishtail Creek Station 013[c]			Morris Creek Station 014[c]		
	Max.	Min.	Mean	Max.	Min.	Mean	Max.	Min.
Ca	10.80	10.20	5.10	8.70	3.00	16.50	20.00	10.80
Mg	3.80	3.80	1.10	1.60	0.60	3.60	4.90	2.20
Na	3.70	2.50	1.90	2.50	1.00	12.00	17.00	7.00
K	0.71	0.61	0.69	0.90	0.60	1.00	1.40	0.70
SiO_2	11.40	8.70	7.90	11.00	5.00	16.00	18.00	14.00
HCO_3	55.00	52.00	22.00	32.00	15.00	92.00	115.00	66.00
CO_3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
OH	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cl	0.50	0.40	0.30	0.60	0.10	0.80	1.30	0.30
SO_4	6.00	4.20	4.40	5.60	2.60	6.60	9.60	2.00
NO_3	0.70	0.00	0.40	0.80	0.00	0.40	1.00	0.20
F	0.00	0.00	0.00	0.00	0.00	0.10	0.20	0.00
pH (lab)	6.75	6.65	6.64	7.18	6.40	7.08	7.11	6.90
pH (field)	8.50	8.40	8.30	8.50	8.10	8.40	8.40	8.30
F°	41.00	32.00	40.00	52.00	32.00	45.00	70.00	32.00
Dis. Sol.	89.20	86.00	43.90	61.70	28.30	150.40	187.40	105.80
Hard.	43.00	41.00	17.00	25.00	10.00	56.00	70.00	39.00
Alk.	45.00	43.00	18.00	27.00	12.00	75.00	94.00	54.00
D. O.	11.50	10.40	10.70	11.60	9.60	10.70	12.10	7.10
JTU	12.00	5.00	1.00	5.00	0.00	18.00	35.00	8.00
Zn	0.01	<0.01	<0.01	0.015	<0.01	<0.01	0.01	<0.01
Cd	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Cu	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Ni	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Fe	0.21	0.06	0.02	0.05	0.00	0.71	1.10	0.46
Mn	0.00	0.00	0.00	0.00	0.00	0.10	0.36	0.00

a - Units are milligrams per liter except as indicated.

b - Two samples - mean not calculated.

c - Four samples.

Table 6. Summarization of water quality data for stations on West Fork Stillwater River tributaries, 1972 - 1973 - 1974.[a]

	Initial Creek[b] Station 017		Cathedral Creek[b] Station 018		Iron Creek Station 019			No. of Samples
	Max.	Min.	Max.	Min.	Mean	Max.	Min.	
Ca	34.00	23.00	4.10	3.50	15.70	21.00	10.70	6
Mg	11.30	8.20	2.90	2.80	4.10	5.30	2.90	6
Na	2.10	1.40	2.10	1.60	1.40	1.80	0.80	6
K	0.41	0.33	0.48	0.33	0.36	0.78	0.20	6
SiO_2	11.40	10.00	10.00	8.60	9.70	10.00	8.70	6
HCO_3	154.00	112.00	28.00	27.00	55.00	87.00	48.00	6
CO_3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6
OH	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6
Cl	0.20	0.20	0.30	0.30	0.50	0.90	0.30	6
SO_4	7.80	1.60	3.90	2.40	4.20	5.40	2.60	6
NO_3	0.10	0.00	0.20	0.00	0.10	0.30	0.00	6
F	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6
pH (lab)	7.46	-	6.45	-	7.46	7.93	6.55	5
pH (field)	8.60	8.60	8.30	8.30	8.20	8.60	7.60	6
F°	36.00	32.00	36.00	32.00	41.00	53.00	36.00	6
Dis. Sol.	220.40	156.50	50.40	48.20	101.10	131.10	74.60	6
Hard.	130.00	90.00	22.00	20.00	56.00	70.00	39.00	6
Alk.	126.00	92.00	23.00	22.00	53.00	72.00	36.00	6
D. O.	10.80	9.70	10.80	8.70	9.30	10.80	5.00	6
JTU	4.00	0.00	2.00	0.00	1.00	7.00	0.00	6
Zn	0.01	<0.01	0.01	<0.01	<0.01	0.01	<0.01	6
Cd	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	6
Cu	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	6
Ni	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.01	6
Fe	0.06	0.02	0.06	0.00	0.02	0.06	0.00	6
Mn	0.01	0.01	0.01	0.00	0.01	0.01	0.00	6

Table 6 Continued. Summarization of water quality data for stations on West Fork Stillwater River tributaries, 1972 - 1973 - 1974.[a]

	Picket Pin Creek Station 020				Crescent Creek Station 048			
	Mean	Max.	Min.	No. of Samples	Mean	Max.	Min.	No. of Samples
Ca	14.30	16.20	10.70	6	6.00	6.60	5.10	4
Mg	2.20	3.30	1.20	6	8.40	9.60	6.70	4
Na	1.50	1.70	1.30	6	0.70	1.00	0.50	4
K	0.19	0.20	0.16	6	0.40	0.50	0.29	4
SiO_2	8.80	9.30	8.20	6	14.00	15.00	13.00	4
HCO_3	51.00	57.00	40.00	6	53.00	59.00	45.00	4
CO_3	0.00	0.00	0.00	6	0.00	0.00	0.00	4
OH	0.00	0.00	0.00	6	0.00	0.00	0.00	4
Cl	0.50	0.90	0.20	6	0.50	0.70	0.20	4
SO_4	4.00	6.40	2.00	6	6.20	7.30	3.80	4
NO_3	0.10	0.30	0.00	6	0.20	0.30	0.00	4
F	0.00	0.00	0.00	6	0.00	0.00	0.00	4
pH (lab)	7.28	7.71	6.50	5	7.01	7.21	6.87	4
pH (field)	8.40	8.60	7.90	6	8.10	8.50	7.00	4
F°	40.00	46.00	32.00	6	45.00	54.00	33.00	4
Dis. Sol.	82.90	94.60	64.60	6	89.20	98.50	80.90	4
Hard.	44.00	52.00	32.00	6	49.00	55.00	44.00	4
Alk.	42.00	48.00	33.00	6	43.00	48.00	37.00	4
D. O.	9.60	10.30	8.60	6	8.70	10.40	6.00	4
JTU	1.00	7.00	0.00	6	3.00	6.00	0.00	4
Zn	<0.01	0.015	<0.01	6	<0.01	0.03	<0.01	3
Cd	<0.01	<0.01	<0.01	6	<0.01	<0.01	<0.01	3
Cu	<0.01	<0.01	<0.01	6	<0.01	0.01	<0.01	3
Ni	<0.01	<0.02	<0.01	6	<0.01	0.02	<0.01	3
Fe	0.02	0.05	0.00	6	0.19	0.55	0.00	4
Mn	0.00	0.02	0.00	6	0.01	0.03	0.00	4

Table 7. Summarization of water quality data for stations on East Boulder River tributaries, 1973 - 1974.[a]

	Forge Creek Station 051				Brownlee Creek Station 053				Brownlee Creek Station 060			
	Mean	Max.	Min.	No. of Samples	Mean	Max.	Min.	No. of Samples	Mean	Max.	Min.	No. of Samples
Ca	3.60	4.90	1.30	6	5.10	7.20	3.40	3	5.30	6.90	3.80	4
Mg	3.20	4.10	1.60	6	2.80	3.40	2.20	3	3.10	3.90	1.80	4
Na	0.80	0.90	0.70	6	0.80	1.00	0.60	3	0.70	0.80	0.50	4
K	0.30	0.40	0.20	6	0.10	0.20	0.10	3	0.10	0.10	0.10	4
SiO_2	7.50	9.40	6.20	6	6.60	7.70	5.90	3	6.40	7.30	5.70	4
HCO_3	23.00	27.00	15.00	6	26.00	33.00	19.00	3	29.00	36.00	19.00	4
CO_3	0.00	0.00	0.00	6	0.00	0.00	0.00	3	0.00	0.00	0.00	4
OH	0.00	0.00	0.00	3	0.00	0.00	0.00	3	0.00	0.00	0.00	4
Cl	0.80	1.20	0.20	6	0.60	0.90	0.03	3	0.50	0.70	0.30	4
SO_4	3.70	6.30	0.20	6	4.20	5.20	2.60	3	2.70	6.00	0.60	4
NO_3	0.20	0.50	0.00	6	0.10	0.20	0.00	3	0.30	1.00	0.10	4
F	0.00	0.00	0.00	6	0.00	0.00	0.00	3	0.00	0.00	0.00	4
pH (lab)	7.37	7.69	7.09	6	7.23	7.37	7.09	3	7.35	7.80	6.99	4
pH (field)	8.00	8.60	7.30	6	8.00	8.50	7.50	3	8.20	8.50	7.60	4
F°	48.00	50.00	40.00	5	46.00	50.00	39.00	3	45.00	54.00	38.00	4
Dis. Sol.	42.30	49.10	30.90	6	48.30	62.00	36.90	3	47.60	59.10	32.10	4
Hard.	22.00	27.00	14.00	6	24.00	32.00	18.00	3	25.00	33.00	17.00	4
Alk.	18.00	22.00	12.00	6	22.00	27.00	16.00	3	23.00	30.00	16.00	4
D. O.	8.80	9.60	7.80	6	9.20	10.20	8.50	3	9.30	9.90	8.50	3
JTU	3.00	13.00	0.00	6	0.00	1.00	0.00	3	0.00	1.00	0.00	4
Zn	<0.01	<0.01	<0.01	6	<0.01	0.01	<0.01	3	<0.01	<0.01	<0.01	4
Cd	<0.01	<0.01	<0.01	6	<0.01	<0.01	<0.01	3	<0.01	<0.01	<0.01	4
Cu	<0.01	<0.02	<0.01	6	<0.01	<0.01	<0.01	3	<0.01	<0.01	<0.01	4
Ni	<0.05	<0.05	<0.01	6	<0.01	<0.01	<0.01	3	<0.01	<0.01	<0.01	4
Fe	0.02	0.10	0.00	6	0.01	0.02	0.00	3	0.00	0.00	0.00	4
Mn	0.00	0.00	0.00	6	0.00	0.00	0.00	3	0.00	0.00	0.00	4

a - Units are milligrams per liter except as indicated.

Table 8. Summarization of water quality data for stations on Boulder River tributaries, 1972 and 1974.[a]

	East Chippy Creek Station 023[b]		Great Falls Creek Station 026[b]		Falls Creek Station 027[b]	
	Max.	Min.	Max.	Min.	Max	Min.
Ca	10.80	8.30	6.40	4.20	7.90	4.60
Mg	4.10	3.00	0.80	0.00	1.20	1.00
Na	0.83	0.83	2.10	1.10	3.00	1.10
K	0.67	0.64	0.90	0.90	1.00	0.90
SiO_2	10.00	9.50	8.60	5.90	7.10	5.90
HCO_3	42.00	33.00	16.00	14.00	22.00	17.00
CO_3	0.00	0.00	0.00	0.00	0.00	0.00
OH	0.00	0.00	0.00	0.00	0.00	0.00
Cl	0.40	0.30	0.30	0.20	1.50	0.02
SO4	14.30	6.80	11.60	6.60	12.00	4.00
NO_3	0.80	0.10	0.60	0.00	0.80	0.20
F	0.00	0.00	0.00	0.00	0.00	0.00
pH (lab)	6.82	-	6.66	6.37	7.17	6.37
pH (field)	8.50	8.20	8.40	7.80	8.40	8.40
F°	40.00	32.00	40.00	32.00	40.00	33.00
Dis. Sol.	84.00	53.90	46.90	33.80	56.20	35.40
Hard.	44.00	33.00	16.00	14.00	24.00	15.00
Alk.	34.00	27.00	13.00	11.00	18.00	14.00
D. O.	12.10	10.50	10.60	10.10	11.80	10.50
JTU	1.00	0.00	2.00	0.00	2.00	0.00
Zn	0.015	<0.01	0.01	<0.01	0.01	<0.01
Cd	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Cu	0.01	<0.01	<0.01	<0.01	0.01	<0.01
Ni	<0.02	<0.01	<0.02	<0.02	<0.02	<0.02
Fe	0.02	0.02	0.08	0.02	0.09	0.02
Mn	0.00	0.00	0.00	0.00	0.00	0.00

a - Units are milligrams per liter except as indicated.

b - Two samples per station except for lab pH, which is one at station 023.

Table 8 Continued. Summarization of water quality data for stations on Boulder River Tributaries[a].

	Blakely Creek Station 024				Graham Creek Station 025			
	Mean	Max.	Min.	No. of Samples	Mean	Max.	Min.	No. of Samples
Ca	12.5	13.8	9.9	6	12.7	15.2	9.9	4
Mg	7.5	8.8	4.9	6	3.6	4.5	1.9	4
Na	1.3	1.4	0.97	6	1.8	2.2	1.3	4
K	0.36	0.4	0.26	6	0.22	0.3	0.18	4
SiO_2	10.1	11.4	9.2	6	10.0	11.4	8.3	4
HCO_3	69	78	50	6	53	63	38	4
CO_2	0	0	0	6	0	0	0	4
OH	0	0	0	6	0	0	0	4
Cl	0.7	0.9	0.4	6	0.6	0.7	0.5	4
SO_4	5.9	9.2	4.4	6	6.0	10.6	3.2	4
NO_3	0.1	0.2	0.0	6	0.2	0.4	0.0	4
F	0.0	0.0	0.0	6	0.0	0.0	0.0	4
Ph (lab)	7.72	7.95	7.08	5	7.45	7.85	6.79	3
pH (field)	8.4	8.6	8.1	6	8.4	8.7	8.1	4
FO	41	46	32	6	39	48	32	4
Dis. Sol.	107.8	118.4	80.7	6	88.4	100.6	64.0	4
Hard.	62.5	70	45	6	46	55	32	4
Alk.	57	64	41	6	43	51	31	4
D. O.	10.6	11.9	9.6	6	10.8	11.6	9.6	4
JTU	0	2	0	6	0	1	0	4
Zn	<0.01	0.01	<0.01	6	<0.01	0.01	<0.01	4
Cd	<0.01	<0.01	<0.01	6	<0.01	<0.01	<0.01	4
Cu	<0.01	0.01	<0.01	6	<0.01	<0.01	<0.01	4
Ni	<0.01	<0.02	<0.01	6	<0.01	<0.02	<0.01	4
Fe	0.01	0.02	0.00	6	0.13	0.50	0.00	4
Mn	0.00	0.01	0.00	6	0.00	0.01	0.00	4

Table 9. Summarization of water quality data for stations on the Deer Creeks, 1972 - 1973.[a]

	Upper Deer Creek[b] Station 022			Lower Deer Creek[b] Station 021		
	Mean	Max.	Min.	Mean	Max.	Min.
Ca	34.00	42.00	28.00	27.00	35.00	23.00
Mg	5.20	6.30	4.30	4.10	5.00	3.40
Na	4.80	6.80	3.40	4.00	5.80	3.00
K	0.41	0.45	0.39	0.34	0.40	0.28
SiO_2	12.60	13.70	12.00	13.60	14.00	13.00
HCO_3	120.00	149.00	100.00	91.00	123.00	84.00
CO_3	0.00	0.00	0.00	0.00	0.00	0.00
OH	0.00	0.00	0.00	0.00	0.00	0.00
Cl	0.40	0.60	0.30	0.70	1.60	0.20
SO_4	16.70	24.00	12.20	13.30	19.00	9.50
NO_3	0.10	0.20	0.00	0.30	0.70	0.00
F	0.00	0.00	0.00	0.00	0.00	0.00
pH (lab)	7.62	8.20	7.13	7.59	7.98	7.34
pH (field)	8.50	8.60	8.30	8.40	8.50	8.40
FO	47.00	49.00	43.00	45.00	48.00	42.00
Dis. Sol.	195.00	243.50	160.90	161.50	204.60	137.20
Hard.	106.00	123.00	87.00	85.00	107.00	71.00
Alk.	99.00	123.00	82.00	80.00	101.00	69.00
D. O.	10.00	10.30	9.80	10.20	10.50	9.80
JTU	8.00	13.00	5.00	3.00	5.00	0.00
Zn	-	<0.01	<0.01	-	<0.02	<0.01
Cd	-	<0.01	<0.01	-	<0.01	<0.01
Cu	-	<0.02	<0.01	-	<0.02	<0.01
Ni	-	<0.05	<0.02	-	<0.05	<0.02
Fe	0.17	0.37	0.01	0.06	0.10	0.02
Mn	0.00	0.01	0.00	0.00	0.01	0.00

a - Units are milligrams per liter except as indicated.

b - Samples except two for zinc, cadmium, copper, and nickel.

Table 10. Comparison of pH measurements made simultaneously with laboratory and field instruments.

Stream	Station	Field Instrument	Laboratory Instrument	Difference
West Rosebud	004	7.98	7.91	+0.07
Stillwater	006	8.12	8.13	-0.01
West Fork Stillwater	007	8.45	8.24	+0.21
East Boulder	009	8.53	8.46	+0.07
Boulder	010	8.05	8.11	-0.06

made on January 25, 1973. There was good agreement between the two meters when measurements were made at the same time and soon after sample collection. Values of pH were in the range 7.9 - 8.5, agreeing with previous field measurements. Apparently pH value decreased consederably between time of collection and time of laboratory measurements. The conclusion is that of the pH values in Tables 3 through 9, the field measurements rather than the laboratory measurements indicate true pH values in streams.

Turbidity and Suspended Solids

Turbidity and suspended solids (sediments) were measured on a rather intensive basis in 1974 (Tables 11 and 12). Both parameters varied directly with water flow rates. Even the higher values during runoff in May and June are moderate. High values for turbidity in South Nye Creek in March and April were caused by mill tailings freshly blown into the stream. Values for both turbidity and suspended solids increased in a downstream direction.

Volatile suspended solids (Table 12) are particulate organic materials suspended in water. They constituted a major fraction of the total suspended solids only when total suspended solids were low. For example when total suspended solids were less than one milligram per liter, volatile suspended solids averaged 75 percent of the total. For all total suspended solids values over 15 milligrams per liter, volatile suspended solids averaged 11 percent of the total.

Dissolved and Suspended Metal Concentrations

Part-per-billion level analysis was done for dissolved and total (suspended plus dissolved) metal concentrations at stations on major streams (Table 13). Even with the low detection limits, many samples did not contain detectable concentrations of some metals. For all stations and metals the relative proportions of dissolved and suspended were variable. For the higher values, most of the total was in the suspended rather than the dissolved fraction. Even the higher values in Table 13 are relatively low and indicative of clean, unmodified water quality.

Stream Sediment Quality

Concentrations of metals in stream sediments (Table 14) are surprisingly similar to values for the Earth's crust. These values as given by Wolfe and Rice (1972) are (in parts per million): Copper, 45; Nickel, 80; Lead, 15; Cadmium, 0.2; Zinc, 65; Iron, 50,000. The similarity of these values to those in Table 14 suggests a relatively unmodified condition in the study streams. The values for nickel at station 006 on the Stillwater River seem to be an exception. The probable sources of apparently elevated nickel concentrations are Verdigris Creek, a small tributary carrying high nickel concentrations, and mill tailings, both a short distance upstream from station 006. High values for nickel on some tributary streams have no obvious explanation other than mineralization in the watershed.

In general, values for all metals are somewhat lower at stations on the East and West Rosebud Rivers.

Stream Bottom Fauna

Seasonal means for macroinvertebrates at stations on larger streams are given in Table 15. Complete data can be found in Appendix A. Macroinvertebrate data for tributary streams is found in Table 16. Data is included through May 1974 for stations on larger streams. Additional samples not yet sorted were collected in summer and fall, 1974 at stations on larger streams and summer, 1974 on tributary streams. This data will be included in a future report.

Table 11. Mean turbidity[a] and number of samples (in parentheses) by months for various stations, 1974.

Station	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Larger streams										
Stillwater River										
005	3(2)	1(2)	8(4)	14(6)	1(2)	0(2)	0(3)	0(1)	0(2)	0(1)
006	3(2)	2(2)	8(4)	18(6)	1(2)	0(2)	0(2)	0(1)	0(1)	0(1)
032	3(2)	3(2)	8(4)	22(6)	1(2)	0(2)	0(2)	0(1)	0(1)	0(1)
034	5(2)	5(2)	9(4)	29(6)	0(2)	0(2)	0(2)	0(1)	0(2)	0(1)
West Fork Stillwater River										
037	--	--	5(4)	13(6)	0(2)	0(2)	0(2)	2(1)	0(1)	2(1)
007	0(2)	1(2)	6(4)	15(6)	0(2)	0(2)	1(2)	0(1)	0(2)	0(1)
East Boulder River										
061	--	--	10(1)	12(6)	0(2)	0(2)	0(2)	0(1)	--	--
008	3(2)	3(2)	6(4)	13(6)	0(2)	0(2)	0(2)	0(1)	0(2)	0(1)
009	4(2)	9(2)	16(4)	41(6)	0(2)	2(2)	3(2)	0(1)	3(2)	--
Boulder River										
011	5(1)	3(2)	7(4)	17(6)	0(2)	0(2)	1(2)	0(1)	0(2)	0(1)
010	3(2)	3(2)	7(4)	20(6)	0(2)	0(2)	1(2)	0(1)	0(2)	0(1)
039	--	15(1)	19(4)	35(6)	1(2)	0(2)	1(2)	0(1)	3(2)	--
Tributary Streams										
Nye Creek - 016	35(1)	21(2)	5(3)	14(6)	0(2)	0(2)	0(2)	0(1)	1(2)	--
South Nye Creek - 047	250(1)	140 (2)	11(3)	16(6)	1(2)	0(2)	0(2)	1(1)	9(2)	--
Silver Creek - 042	5(1)	1(2)	7(3)	8(6)	2(2)	0(2)	0(2)	0(1)	4(2)	--
Mountain View Creek - 044	2(1)	1(2)	9(3)	25(6)	3(2)	0(2)	0(2)	0(1)	4(2)	--
Verdigris Creek - 043	0(1)	1(2)	8(3)	23(6)	1(2)	0(2)	0(2)	0(1)	8(2)	--
Initial Creek - 017	--	--	8(3)	29(6)	0(2)	0(2)	0(2)	0(1)	0(1)	--
Cathedral Creek - 018	--	--	7(2)	11(6)	1(2)	0(2)	0(1)	2(1)	0(1)	--
Little Rocky Creek - 031	5(2)	9(2)	22(4)	40(6)	5(2)	5(2)	0(2)	1(1)	5(2)	--
Little Rocky Creek - 015	--	--	12(1)	21(6)	0(2)	0(2)	0(2)	0(1)	0(2)	--
Fishtail Creek - 030	2(2)	1(2)	12(4)	15(6)	1(2)	5(2)	0(2)	0(1)	1(1)	--
East Fishtail Creek - 012	1(1)	1(2)	16(3)	13(6)	1(2)	0(2)	0(2)	0(1)	0(2)	--
West Fishtail Creek - 013	2(1)	0(2)	7(3)	12(6)	1(2)	0(2)	0(2)	0(1)	0(2)	--
Picket Pin Creek - 020	--	--	1(2)	10(5)	0(2)	0(2)	0(2)	0(1)	--	0(1)
Falls Creek - 027	--	--	4(1)	9(6)	1(2)	0(2)	0(2)	0(1)	0(2)	--
Graham Creek - 025	--	0(1)	2(5)	9(6)	0(2)	0(2)	--	--	--	--
Blakely Creek - 024	5(1)	3(2)	2(4)	8(6)	0(2)	0(2)	1(2)	0(1)	0(2)	--
East Chippy Creek - 023	--	--	7(1)	11(6)	1(2)	.0(2)	1(2)	0(1)	0(2)	--

a - Turbidity expressed in Jackson Turbidity Units

Table 12. Suspended solids data for stations on major streams, 1974.[a]

Stillwater River

	Station 034			Station 006			Station 005		
	Total	Volatile	% Volatile	Total	Volatile	% Volatile	Total	Volatile	% Volatile
March	0.59	0.27	45.8	0.52	0.30	57.7	0.94	0.35	37.2
April	0.95	0.47	49.5	0.97	0.41	42.3	0.68	0.24	35.3
May(early)	2.96	1.22	41.2	2.15	1.13	52.6	0.90	0.90	100.0
May(late)	18.17	3.08	17.0	9.90	2.30	23.2	7.52	2.31	30.7
June(early)	9.90	1.80	18.2	5.10	1.10	21.6	4.41	0.90	20.4
June(mid)	106.74	10.46	9.8	32.72	5.15	15.7	82.51	11.36	13.8
June(late)	20.30	1.71	8.4	7.98	1.40	17.5	7.74	0.90	11.6
July	3.6	1.8	50.0	2.0	0.8	40.0	1.4	0.6	42.9
August	1.9	0.5	26.3	1.9	0.8	42.1	0.7	0.6	85.7
September	0.10	0.10	100.0	0.10	0.10	100.0	0.6	0.5	83.3
October	0.30	0.30	100.0	0.70	0.40	57.1	0.10	0.10	----
November	1.10	0.40	36.4	0.70	0.40	57.1	0.30	0.10	33.3
December	0.80	0.50	62.5	0.50	0.50	100.0	0.70	0.30	42.9

West Fork Stillwater River

	Station 007			Station 037		
	Total	Volatile	% Volatile	Total	Volatile	% Volatile
March	0.24	0.16	66.7			
April	0.20	0.18	90.0			
May(early)	0.51	0.41	80.4			
May(late)	5.27	1.10	20.9	5.96	1.29	21.6
June(early)	2.59	0.70	27.0	3.21	0.60	18.7
June(mid)	59.81	6.75	11.3	53.46	5.02	9.4
June(late)	14.10	1.30	9.2	19.10	2.00	10.5
July	1.1	0.4	36.4	1.0	0.4	40.0
August	0.9	0.6	66.7	0.5	0.4	80.0
September	0.40	0.20	50.0	0.4	0.3	75.0
October	0.20	0.20	100.0	0.50	0.20	40.0
November	0.40	0.40	100.0	0.20	0.20	100.0
December	0.60	0.60	100.0	0.30	0.20	66.7

a-Units are milligrams per liter.

Table 12. (Continued)

East Boulder River

	Station 008			Station 061		
	Total	Volatile	% Volatile	Total	Volatile	% Volatile
March	0.35	0.29	82.9			
April	0.22	0.17	77.3			
May(early)	1.01	0.91	90.0			
May(late)	6.81	2.10	30.8	4.17	1.49	35.7
June(early)	5.80	3.30	56.9	9.40	1.20	12.8
June(mid)	33.63	4.82	14.3	47.84	5.96	12.5
June(late)	4.51	1.00	22.2	4.50	0.90	20.0
July	0.5	0.3	60.0			
August	1.1	1.0	90.9	0.6	0.4	66.7
September	0.10	0.10	100.0	0.30	0.30	100.0
October	0.20	0.20	100.0	0.20	0.20	100.0
November	0.30	0.30	100.0			
December	0.30	0.30	100.0			

Boulder River

	Station 010			Station 011		
	Total	Volatile	% Volatile	Total	Volatile	% Volatile
March	0.53	0.29	54.7	0.44	0.29	65.9
April	0.31	0.27	87.1	0.31	0.29	93.5
May(early)	5.96	1.52	25.5	3.01	1.10	36.5
May(late)	22.35	3.11	13.9	18.14	2.71	14.9
June(early)	14.2	2.3	16.2	2.60	1.00	38.4
June(mid)	192.16	11.36	5.9	142.67	9.83	6.9
June(late)	30.70	2.40	7.8	30.20	2.10	6.9
July	1.3	0.7	53.8	0.9	0.4	44.4
August	0.5	0.4	80.0	0.8	0.5	62.5
September	0.5	0.4	80.0	0.10	0.10	100.0
October	0.6	0.2	33.3	0.40	0.30	75.0
November	0.3	0.3	100.0	0.10	0.10	100.0
December	0.5	0.3	60.0	0.50	0.30	60.0

Table 15. Mean and Range (in parentheses) of macroinvertebrates collected in one square foot stream bottom samples for stations on larger streams, 1970-74.

Season-N[a]	Plecoptera	Tricoptera	Ephemeroptera	Diptera	Coleoptera	Annelida	Other[b]	Total
East Rosebud River-Station 001								
Winter-03	79 (52-102)	15 (4-24)	311 (260-377)	26 (13-38)	2 (0-4)	1 (0-2)	1 (0-2)	435 (331-531)
Spring-07	35 (3-66)	3 (1-11)	120 (22-228)	14 (7-26)	<1 (0-2)	0 (0-0)	3 (0-8)	176 (37-316)
Summer-07	35 (18-53)	12 (3-22)	100 (53-190)	18 (6-32)	0 (0-0)	9 (0-62)	<1 (0-2)	174 (81-359)
Fall- 06	39 (8-72)	3 (0-8)	131 (43-188)	12 (1-24)	0 (0-0)	0 (0-0)	1 (0-3)	187 (60-278)
East Rosebud River-Station 028								
Winter-06	21 (6-30)	94 (33-136)	215 (172-286)	19 (2-39)	2 (0-4)	29 (1-62)	<1 (0-1)	379 (233-477)
Spring-03	6 (0-14)	44 (12-103)	58 (26-78)	4 (3-5)	2 (0-4)	<1 (0-1)	<1 (0-1)	114 (97-140)
Summer-03	5 (1-12)	10 (5-17)	55 (32-90)	18 (9-28)	1 (1-1)	3 (0-8)	<1 (0-1)	93 (65-138)
East Rosebud River-Station 046								
Winter-06	21 (9-36)	42 (15-71)	187 (86-272)	21 (1-52)	<1 (0-1)	8 (0-37)	<1 (0-3)	279 (126-352)
Spring-06	10 (5-24)	83 (32-159)	110 (44-169)	21 (5-43)	3 (1-7)	79 (0-278)	0 (0-0)	305 (178-558)
Summer-06	17 (4-34)	41 (19-95)	112 (63-153)	51 (28-62)	3 (0-7)	9 (1-21)	0 (0-0)	228 (138-346)
Fall -06	27 (17-38)	104 (62-177)	130 (87-182)	17 (10-21)	9 (3-15)	70 (0-158)	16 (1-35)	373 (210-553)
West Rosebud River-Station 003								
Winter-06	79 (24-163)	31 (14-66)	309 (87-577)	27 (4-46)	7 (4-10)	56 (3-149)	<1 (0-4)	510 (168-1011)
Spring-07	31 (8-99)	32 (10-95)	135 (55-311)	25 (13-45)	5 (0-13)	55 (0-116)	10 (0-63)	294 (201-618)
Summer-07	46 (23-94)	3 (1-6)	86 (29-162)	12 (5-31)	3 (0-6)	41 (1-95)	<1 (0-2)	192 (75-328)
Fall -06	75 (37-112)	33 (8-60)	193 (106-260)	8 (4-16)	4 (1-7)	38 (15-71)	<1 (0-4)	352 (176-426)

a-Number of square foot samples.
b-Includes Hydracarina, Hemiptera, Nematoda, and Turbellaria

Table 15. (continued) Mean and Range (in parentheses) of Macroinvertebrates collected in one square foot stream bottom samples for stations on larger streams, 1970-74.

Season-N[a]	Plecoptera	Tricoptera	Ephemeroptera	Diptera	Coleoptera	Annelida	Other[b]	Total
West Rosebud River-Station 029								
Winter-06	19 (8-27)	60 (18-152)	77 (42-117)	17 (5-36)	3 (0-7)	9 (1-16)	<1 (0-1)	186 (109-310)
Spring-07	16 (5-29)	74 (15-192)	111 (22-190)	52 (22-105)	10 (5-19)	65 (1-141)	7 (0-44)	335 (188-446)
Summer-07	11 (1-32)	31 (9-94)	140 (49-290)	47 (21-66)	10 (3-21)	41 (0-164)	1 (0-3)	283 (122-531)
Fall -06	29 (6-52)	74 (57-101)	138 (87-172)	33 (17-51)	5 (1-7)	24 (4-51)	0 (0-0)	305 (226-384)
Fishtail Creek-Station 030								
Winter-07	57 (12-144)	130 (69-250)	261 (96-528)	36 (4-97)	8 (3-12)	135 (18-289)	77 (16-188)	705 (270-1380)
Spring-09	14 (3-47)	88 (36-203)	123 (31-396)	35 (12-69)	8 (1-24)	60 (6-151)	45 (0-142)	374 (139-959)
Summer-06	20 (8-27)	37 (27-56)	57 (33-80)	40 (7-93)	5 (3-8)	79 (3-223)	33 (15-58)	270 (126-448)
Fall -06	57 (27-96)	65 (44-90)	152 (96-170)	14 (5-25)	6 (1-11)	133 (75-261)	38 (16-49)	465 (308-643)
Fishtail Creek-Station 045								
Winter-06	49 (6-108)	144 (34-233)	272 (62-623)	49 (9-80)	12 (6-22)	48 (16-97)	<1 (0-1)	575 (133-1020)
Spring-09	8 (2-23)	67 (39-118)	99 (60-257)	37 (7-100)	10 (3-19)	21 (6-39)	2 (0-6)	245 (180-525)
Summer-06	15 (6-26)	20 (6-32)	163 (39-264)	33 (17-74)	10 (3-19)	33 (14-99)	7 (4-22)	281 (100-367)
Fall -06	40 (15-52)	114 (68-185)	156 (98-247)	33 (8-78)	17 (4-36)	69 (2-146)	1 (0-4)	432 (210-621)
Little Rocky Creek-Station 031								
Winter-09	21 (5-44)	79 (51-108)	94 (22-148)	292 (55-826)	46 (5-103)	<1 (0-6)	25 (4-52)	558 (231-1140)
Spring-09	6 (1-15)	74 (46-103)	162 (60-331)	111 (49-247)	17 (6-37)	1 (0-6)	13 (4-24)	385 (283-479)
Summer-06	12 (4-20)	43 (21-78)	145 (62-218)	30 (9-74)	23 (2-45)	0 (0-0)	7 (1-12)	260 (123-364)
Fall -06	38 (14-67)	90 (1-233)	74 (19-132)	97 (20-168)	50 (7-148)	3 (2-6)	8 (0-20)	360 (63-700)

Table 15. (continued) Mean and Range (in Parentheses) of macroinvertebrates collected in one square foot stream bottom samples for stations on larger streams, 1970-74.

Season-N[a]	Plecoptera	Tricoptera	Ephemeroptera	Diptera	Coleoptera	Annelida	Other[b]	Total
Stillwater River-Station 005								
Winter-09	43 (19-69)	16 (2-36)	329 (158-403)	19 (5-49)	<1 (0-2)	<1 (0-5)	1 (0-3)	410 (242-733)
Spring-10	19 (0-114)	4 (0-13)	120 (48-270)	32 (1-162)	2 (0-6)	11 (0-64)	3 (0-12)	190 (64-644)
Summer-07	16 (5-43)	7 (0-18)	36 (12-74)	45 (12-168)	2 (0-5)	<1 (0-2)	0 (0-0)	107 (32-309)
Fall -06	43 (5-86)	23 (0-48)	97 (48-141)	163 (3-852)	2 (0-3)	12 (0-39)	4 (0-21)	345 (67-1066)
Stillwater River-Station 006								
Winter-09	91 (29-186)	53 (17-98)	398 (195-726)	82 (20-188)	<1 (0-2)	14 (0-46)	<1 (0-2)	639 (297-1222)
Spring-10	29 (13-92)	21 (0-83)	187 (84-399)	21 (6-65)	<1 (0-1)	10 (0-41)	<1 (0-1)	269 (141-540)
Summer-07	18 (3-35)	13 (0-37)	134 (70-201)	29 (10-45)	1 (0-2)	5 (0-15)	<1 (0-2)	201 (83-279)
Fall -06	31 (10-88)	25 (2-52)	175 (71-331)	22 (5-63)	1 (0-1)	2 (0-6)	<1 (0-2)	254 (107-512)
Stillwater River-Station 032								
Winter-09	48 (30-103)	98 (18-232)	161 (81-269)	50 (28-80)	2 (0-4)	42 (9-133)	2 (0-6)	404 (252-705)
Spring-10	31 (3-71)	37 (3-116)	270 (139-546)	41 (4-120)	4 (0-21)	22 (0-163)	1 (0-6)	406 (164-790)
Summer-06	23 (12-38)	5 (0-13)	136 (75-206)	36 (21-58)	<1 (0-3)	1 (0-6)	<1 (0-2)	204 (136-307)
Fall -06	72 (20-214)	93 (4-198)	156 (57-411)	30 (1-60)	5 (0-14)	3 (0-8)	2 (0-10)	361 (90-915)
Stillwater River-Station 033								
Winter-09	105 (34-236)	113 (3-158)	297 (162-465)	109 (11-323)	5 (0-18)	67 (6-118)	2 (0-7)	697 (272-921)
Spring-10	37 (13-88)	82 (6-211)	275 (80-801)	51 (3-123)	5 (0-14)	32 (0-106)	1 (0-5)	483 (129-1272)
Summer-07	51 (14-73)	11 (2-31)	168 (80-253)	31 (5-57)	8 (2-30)	10 (0-37)	2 (0-6)	281 (140-345)
Fall -06	71 (39-107)	121 (63-179)	260 (177-388)	237 (39-378)	3 (1-6)	31 (2-94)	3 (0-10)	727 (491-1050)

Table 15. (continued) Mean and Range (in parentheses) of macroinvertebrates collected in one square foot stream bottom samples for stations on larger streams, 1970-74.

Season-N[a]	Plecoptera	Tricoptera	Ephemeroptera	Diptera	Coleoptera	Annelida	Other[b]	Total
Stillwater River-Station 035								
Winter-09	40 (22-66)	285 (82-499)	250 (112-500)	69 (10-156)	13 (3-31)	22 (0-59)	1 (0-2)	680 (240-1233)
Spring-06[c]	21 (7-57)	153 (20-320)	196 (110-386)	95 (55-190)	10 (3-21)	5 (0-13)	3 (0-8)	481 (237-880)
Summer-07	11 (5-29)	66 (21-174)	77 (41-105)	258 (110-326)	6 (0-19)	<1 (0-2)	1 (0-3)	420 (240-710)
Fall -06	48 (32-61)	371 (214-533)	147 (109-205)	42 (19-60)	15 (7-24)	1 (0-6)	15 (2-30)	639 (448-797)
West Fork Stillwater River-Station 037[d]								
Spring-09	19 (1-49)	33 (3-98)	106 (6-215)	11 (1-22)	<1 (0-2)	42 (5-140)	4 (1-10)	215 (47-354)
Summer-07	29 (13-64)	9 (3-18)	138 (44-208)	13 (4-21)	<1 (0-1)	65 (0-146)	<1 (0-2)	255 (128-387)
Fall -06	49 (16-78)	29 (14-47)	99 (58-137)	6 (3-11)	1 (0-2)	18 (1-39)	<1 (0-2)	203 (100-281)
West Fork Stillwater River-Station 007								
Winter-09	131 (17-277)	36 (14-73)	152 (64-265)	29 (5-64)	4 (0-15)	81 (0-333)	11 (3-28)	445 (162-822)
Spring-10	53 (21-86)	20 (6-48)	200 (107-366)	31 (5-104)	7 (0-34)	68 (0-254)	9 (0-27)	387 (184-624)
Summer-07	26 (6-76)	9 (1-20)	111 (29-224)	21 (2-59)	1 (0-4)	48 (0-186)	1 (0-3)	217 (43-434)
Fall -06	120 (71-250)	26 (13-36)	111 (64-170)	9 (2-18)	11 (0-36)	39 (3-99)	6 (0-20)	320 (223-502)
West Fork Stillwater River-Station 038								
Winter-09	121 (36-239)	39 (15-67)	281 (121-441)	78 (26-180)	7 (2-13)	158 (52-308)	3 (1-9)	688 (292-1059)
Spring-09	30 (12-49)	37 (0-88)	186 (28-426)	49 (0-114)	4 (0-10)	45 (0-187)	3 (0-9)	354 (43-823)
Summer-07	40 (26-86)	24 (7-49)	216 (79-561)	58 (16-151)	5 (3-8)	58 (11-134)	5 (1-10)	408 (201-995)
Fall -06	72 (26-111)	46 (17-65)	206 (93-378)	36 (11-82)	9 (5-15)	27 (0-81)	13 (1-34)	409 (223-660)

c-Three samples from May, 1972 not included because they were taken from newly inundated

d- No winter samples collected.

Table 15. (continued) Mean and Range (in parentheses) of macroinvertebrates collected in one square foot stream bottom samples for stations on larger streams, 1970-74.

Season-N [a]	Plecoptera	Tricoptera	Ephemeroptera	Diptera	Coleoptera	Annelida	Other [b]	Total
East Boulder River-Station 008								
Winter-09	75 (37-131)	17 (8-36)	161 (107-243)	11 (4-20)	11 (2-25)	28 (7-59)	4 (1-7)	308 (192-514)
Spring-10	41 (20-60)	25 (8-56)	140 (79-292)	7 (1-12)	10 (4-17)	59 (0-216)	10 (0-25)	293 (151-524)
Summer-06	25 (2-43)	28 (13-55)	97 (28-169)	15 (4-39)	5 (0-15)	21 (0-53)	6 (0-11)	197 (50-340)
Fall -07	108 (12-208)	55 (8-138)	174 (55-245)	23 (0-64)	13 (5-24)	18 (0-67)	10 (2-18)	400 (85-653)
East Boulder River-Station 009								
Winter-09	162 (33-324)	542 (104-2025)	262 (69-621)	764 (161-1585)	42 (4-195)	85 (0-269)	10 (2-64)	1866 (854-4970)
Spring-10	67 (7-268)	395 (13-1137)	312 (39-752)	438 (63-790)	21 (0-47)	35 (0-96)	12 (2-35)	1280 (171-2571)
Summer-06	72 (27-154)	31 (14-55)	249 (84-342)	123 (66-180)	7 (2-10)	20 (8-38)	6 (1-14)	507 (307-636)
Fall -07	103 (44-173)	370 (162-753)	141 (66-216)	492 (124-1701)	7 (2-21)	18 (0-107)	23 (0-51)	1155 (644-2442)
Boulder River-Station 011								
Winter-03	26 (10-56)	61 (43-93)	259 (237-310)	5 (2-10)	<1 (0-1)	8 (4-15)	2 (1-3)	361 (295-406)
Spring-10	37 (16-127)	15 (0-42)	69 (11-131)	22 (2-66)	0 (0-0)	7 (0-50)	10 (0-37)	161 (35-358)
Summer-06	26 (4-50)	32 (5-78)	169 (98-364)	15 (5-41)	<1 (0-2)	21 (0-59)	4 (0-8)	269 (166-493)
Fall -07	48 (17-98)	49 (18-129)	170 (39-292)	6 (0-10)	<1 (0-2)	25 (0-107)	10 (0-34)	308 (120-627)

Table 15. (continued) Mean and Range (in parentheses) of macroinvertebrates collected in one square foot stream bottom samples for stations on larger streams, 1970-74.

Season-N[a]	Plecoptera	Tricoptera	Ephemeroptera	Diptera	Coleoptera	Annelida	Other[b]	Total
Boulder River-Station 010								
Winter-09	45 (13-77)	53 (2-123)	164 (44-266)	10 (3-13)	2 (0-4)	30 (2-69)	<1 (0-2)	303 (78-446)
Spring-07[c]	35 (8-56)	9 (1-32)	119 (93-165)	6 (0-14)	2 (0-10)	10 (0-33)	12 (0-74)	193 (118-269)
Summer-06	29 (9-64)	25 (1-74)	103 (69-141)	14 (11-19)	2 (0-6)	21 (1-55)	<1 (0-2)	195 (110-305)
Fall -07	69 (42-116)	73 (29-159)	170 (99-243)	8 (4-11)	1 (0-5)	24 (3-70)	<1 (0-3)	345 (198-452)
Boulder River-Station 039								
Winter-09	26 (3-73)	99 (31-171)	89 (36-180)	168 (3-969)	2 (0-4)	19 (0-57)	6 (1-22)	410 (135-1270)
Spring-10	18 (7-48)	137 (5-361)	151 (12-337)	69 (11-271)	4 (0-9)	13 (0-34)	3 (0-9)	395 (55-953)
Summer-06	11 (3-20)	19 (8-30)	136 (39-195)	54 (26-107)	5 (2-10)	3 (0-11)	1 (0-4)	230 (104-300)
Fall -07	13 (1-42)	170 (23-403)	75 (33-148)	41 (11-120)	4 (1-15)	9 (0-41)	3 (0-8)	307 (84-768)
Boulder River-Station 040								
Winter-09	52 (7-158)	344 (120-641)	319 (34-651)	119 (29-244)	10 (4-24)	281 (2-855)	2 (0-18)	1128 (249-1984)
Spring-09	36 (7-83)	255 (55-538)	486 (146-1343)	121 (11-332)	11 (1-32)	62 (4-112)	2 (0-5)	973 (238-2197)
Summer-06	26 (8-46)	35 (21-54)	213 (146-406)	220 (68-402)	10 (6-15)	30 (8-65)	3 (0-8)	537 (291-820)
Fall -06	16 (5-28)	159 (66-349)	60 (6-101)	23 (3-60)	5 (1-12)	28 (0-78)	3 (0-9)	294 (97-550)

c-Three samples from May, 1972 not included because they were taken from newly inundated stream bottom.

Table 15 Continued. Mean and range (in parentheses) of macroinvertebrates collected in one square foot stream bottom samples for station on larger streams, 1970-1974.

Season-N[a]	Plecoptera	Tricoptera	Ephemeroptera	Diptera	Coleoptera	Annelida	Other	Total
Stillwater River - Station 034								
Winter-09	86 (26-185)	170 (62-276)	239 (169-329)	121 (54-228)	7 (3-11)	69 (22-167)	6 (0-16)	695 (386-1081
Spring-10	36 (12-68)	111 (1-293)	368 (108-577)	153 (4-339)	17 (0-48)	31 (0-128)	7 (0-26)	722 (158-1232
Summer-07	40 (17-66)	47 (28-103)	209 (95-348)	59 (22-95)	11 (5-24)	30 (0-109)	4 (0-9)	399 (194-634)
Fall -06	50 (36-86)	225 (51-425)	143 (110-191)	85 (46-121)	10 (1-19)	27 (0-67)	5 (0-13)	545 (291-785)
West Rosebud River - Station 004								
Winter-06	22 (14-50)	49 (23-108)	148 (34-214)	3 (2-5)	1 (0-4)	22 (11-31)	<1 (0-1)	246 (124-376)
Spring-10	21 (4-40)	58 (5-162)	109 (12-219)	13 (6-20)	2 (0-8)	102 (0-259)	10 (0-62)	315 (72-627)
Summer-07	14 (3-28)	14 (1-64)	27 (9-62)	13 (5-49)	2 (0-4)	41 (1-102)	<1 (0-2)	112 (31-224)
Fall -06	13 (6-34)	29 (12-62)	92 (36-164)	7 (3-16)	2 (0-4)	25 (4-81)	1 (0-3)	170 (66-340)

Table 16. Number and volume (in parentheses) of macroinvertebrates collected in square foot stream bottom samples for stations on tributary streams, summer, 1972-73.

Date	Plecoptera	Tricoptera	Ephemeroptera	Diptera	Coleoptera	Annelida	Other	Total
			Morris Creek-Station 014					
8-72	3(T)	121(.2)	62(.1)	25(.1)	29(.1)	3(T)	0	243(.5)
8-72	35(T)	62(.1)	95(.2)	25(.1)	21(T)	3(T)	0	241(.4)
8-72	12(T)	28(.1)	23(.1)	14(.1)	11(.1)	1(T)	0	89(.4)
			East Fishtail Creek-Station 012					
8-72	58(.2)	61(.3)	53(.1)	46(T)	5(T)	301(T)	62(.1)	586(.7)
8-72	31(T)	62(.2)	14(.1)	34(T)	4(T)	65(T)	21(.1)	231(.3)
8-72	56(T)	50(.1)	68(.1)	108(T)	19(T)	215(T)	97(.2)	613(.4)
8-73	19(.2)	27(T)	119(.2)	6(T)	7(T)	81(T)	50(.2)	309(.6)
8-73	18(.1)	27(T)	120(.1)	27(T)	38(.1)	49(T)	55(.2)	334(.5)
8-73	29(T)	28(.2)	102(.1)	19(T)	5(T)	29(T)	15(.1)	227(.4)
			West Fishtail Creek-Station 013					
8-72	43(T)	61(.3)	59(.1)	168(T)	1(T)	43(T)	47(T)	422(.4)
8-72	33(.1)	23(.1)	32(T)	23(T)	4(T)	103(T)	6(T)	224(.2)
8-72	37(.3)	50(.1)	44(.2)	29(.1)	2(T)	97(T)	32(T)	291(.7)
8-73	63(.2)	66(.1)	109(.4)	92(T)	4(T)	96(T)	39(.1)	469(.8)
8-73	53(.7)	74(.3)	112(.4)	86(T)	5(T)	129(.1)	44(.1)	503(1.6)
8-73	25(.1)	19(.1)	28(.3)	18(T)	3(T)	131(.1)	26(.1)	250(.7)
			Little Rocky Creek-Station 015					
8-72	41(.1)	60(.7)	129(.5)	22(.1)	2(T)	167(.1)	14(.1)	435(1.6)
8-72	17(.1)	11(.1)	47(.4)	3(T)	4(T)	10(T)	0	92(.6)
8-72	62(.1)	27(.1)	74(.4)	10(T)	6(T)	127(T)	4(T)	310(.6)
7-73	26(T)	29(.4)	42(1.1)	0	7(T)	32(T)	7(T)	143(1.5)
7-73	29(T)	20(.2)	29(1.3)	1(T)	4(T)	29(T)	4(.1)	116(1.6)
7-73	59(.1)	52(.8)	53(.5)	21(T)	5(T)	58(T)	11(T)	259(1.4)
			Verdigris Creek-Station 043					
8-72	0	0	0	1(T)	0	0	0	1(T)
8-72	0	2(T)	0	1(T)	0	0	0	3(T)
8-72	1(T)	0	0	0	0	0	0	1(T)
			Mountain View Creek-Station 044					
8-72	3(T)	7(.2)	23(.1)	16(T)	2(T)	4(.1)	0	55(.4)
8-72	21(T)	6(T)	27(.1)	4(T)	0	0	0	58(.1)
8-72	10(T)	5(.2)	27(T)	2(T)	0	0	0	44(.2)
7-73	0	10(.2)	30(.3)	10(T)	0	0	1(T)	51(.5)
7-73	10(T)	9(.2)	46(.3)	1(T)	1(T)	0	0	67(.5)
7-73	9(T)	14(T)	26(.1)	10(T)	0	2(T)	0	61(.1)

Table 16 continued. Number and volume (in parentheses) of macroinvertebrates collected in one square foot stream bottom samples for stations on tributary streams, summer, 1972-73.

Date	Plecoptera	Tricoptera	Ephemeroptera	Diptera	Coleoptera	Annelida	Other	Total
			Silver Creek-Station 042					
8-72	0	1(T)	8(T)	1(T)	5(T)	1(.1)	2(T)	18(.1)
8-72	15(.1)	16(.1)	134(.2)	28(.1)	37(T)	2(T)	2(T)	234(.5)
8-72	5(T)	15(.1)	132(.3)	7(.1)	17(T)	3(.1)	4(T)	183(.6)
7-73	10(T)	7(.1)	58(.1)	26(T)	100(T)	1(.1)	0	202(.3)
7-73	24(.1)	23(.1)	60(.1)	34(T)	82(T)	4(.1)	0	227(.4)
7-73	30(T)	34(.1)	168(.1)	86(.8)	99(T)	5(.3)	1(.8)	423(2.1)
			Nye Creek-Station 016					
8-72	4(T)	2(T)	6(T)	24(T)	1(T)	5(T)	1(T)	43(T)
8-72	0	1(T)	8(T)	8(T)	1(T)	0	2(T)	20(T)
8-72	0	1(T)	3(T)	0	0	0	3(T)	7(T)
7-73	0	12(.2)	66(.1)	12(T)	0	0	5(T)	95(.3)
7-73	0	0	14(T)	5(T)	0	0	2(T)	21(T)
7-73	1(T)	4(T)	34(.1)	4(T)	0	0	8(T)	51(.1)
			Cathedral Creek-Station 018					
8-72	23(.1)	5(T)	14(.1)	102(.1)	0	1(T)	1(T)	146(.3)
8-72	21(T)	18(.1)	33(.1)	18(T)	0	0	0	90(.2)
8-72	9(T)	7(.2)	15(.2)	37(.1)	0	0	0	68(.5)
7-73	10(T)	4(.1)	3(T)	22(T)	0	11(T)	1(T)	51(.1)
7-73	22(.1)	8(.2)	7(.1)	28(T)	0	9(T)	0	74(.4)
7-73	48(.1)	6(.1)	8(T)	99(T)	0	65(.1)	2(T)	228(.3)
			Initial Creek-Station 017					
8-72	5(T)	1(T)	6(T)	7(T)	0	10(T)	0	29(T)
8-72	5(T)	0	6(T)	24(T)	0	6(T)	0	41(T)
8-72	6(T)	3(.1)	8(.1)	223(.2)	1(T)	17(T)	0	258(.4)
7-73	3(.1)	3(.1)	25(.1)	26(T)	1(T)	1(T)	0	59(.3)
7-73	5(T)	5(.1)	25(.1)	4(T)	0	0	2(.1)	41(.3)
7-73	63(.1)	2(.1)	38(.1)	42(T)	0	0	0	145(.3)
			Iron Creek-Station 019					
8-72	5(T)	0	16(T)	0	0	58(T)	11(T)	80(T)
8-72	9(T)	0	30(T)	3(T)	0	1(T)	0	43(T)
8-72	4(.1)	3(.1)	31(T)	12(T)	0	112(T)	1(T)	163(.2)
7-73	32(T)	7(.1)	58(.1)	14(T)	0	1(T)	2(T)	114(.2)
7-73	6(.1)	1(T)	14(T)	10(T)	0	1(T)	2(T)	34(.1)
7-73	34(.2)	10(.2)	58(.1)	18(T)	0	0	6(T)	126(.5)

Table 16 continued. Number and volume (in parentheses) of macroinvertebrates collected in one square foot stream bottom samples for stations on tributary streams, summer, 1972-73.

Date	Plecoptera	Tricoptera	Ephemeroptera	Diptera	Coleoptera	Annelida	Other	Total
			Picket Pin Creek-Station 020					
8-72	38(T)	4(.1)	127(.3)	88(T)	2(T)	8(T)	58(.1)	325(.5)
8-72	32(.1)	6(T)	295(.7)	118(.1)	8(T)	33(T)	102(.2)	594(1.1)
8-72	58(.1)	6(T)	303(.7)	87(.1)	10(T)	35(T)	90(.1)	589(1.0)
7-72	31(T)	6(.1)	68(.2)	26(.1)	3(T)	110(T)	22(.1)	266(.5)
7-72	20(.1)	5(.1)	169(.5)	12(T)	0	46(T)	38(.1)	290(.8)
7-72	107(.3)	4(.1)	122(.3)	66(T)	2(T)	333(.1)	86(.3)	720(1.1)
			Lower Deer Creek-Station 021					
8-72	4(T)	14(T)	50(.1)	5(T)	5(T)	5(T)	5(T)	88(.1)
8-72	13(T)	11(T)	57(.1)	1(T)	3(T)	2(T)	4(T)	91(.1)
8-72	33(T)	8(.1)	80(.1)	7(.2)	18(T)	10(T)	10(T)	166(.5)
			Upper Deer Creek-Station 022					
8-72	42(.2)	62(.3)	97(.3)	71(.2)	37(T)	57(T)	3(T)	369(1.0)
8-72	23(.1)	128(.4)	175(.4)	73(.8)	39(T)	47(T)	5(T)	490(1.7)
8-72	26(.1)	130(.2)	131(.4)	53(.3)	43(.1)	23(T)	6(T)	412(1.1)
			East Chippy Creek-Station 027					
8-72	20(T)	5(T)	75(.1)	4(T)	0	27(T)	0	131(.1)
8-72	22(T)	5(.1)	160(.1)	6(T)	0	1(T)	2(T)	196(.2)
8-72	45(T)	8(.1)	168(.1)	10(T)	0	89(T)	2(T)	322(.2)
8-73	163(.1)	8(.2)	94(.3)	13(T)	0	140(T)	6(T)	424(.6)
8-73	27(T)	7(.1)	48(.2)	4(T)	0	23(T)	2(T)	111(.3)
8-73	12(T)	3(T)	69(.2)	3(T)	0	27(T)	0	114(.2)
			Blakely Creek-Station 024					
8-72	2(T)	1(T)	10(.1)	1(T)	0	0	7(.1)	21(.2)
8-72	0	0	36(.1)	5(T)	0	0	3(T)	44(.1)
8-72	24(.1)	5(.1)	26(.1)	18(T)	0	0	42(.4)	115(.7)
8-73	119(.2)	13(.1)	156(.5)	47(.2)	0	23(T)	36(.2)	394(1.2)
8-73	125(.2)	15(.2)	181(.6)	15(T)	0	7(T)	51(.3)	394(1.3)
8-73	148(.1)	12(.1)	113(.5)	30(T)	0	3(T)	26(.1)	332(.8)
			Great Falls Creek-Station 026					
8-72	6(T)	4(.4)	91(.2)	1(T)	0	0	0	102(.6)
8-72	8(.1)	5(.3)	67(.3)	3(T)	0	0	1(T)	84(.7)
8-72	18(.1)	2(.1)	119(.7)	4(T)	0	1(T)	1(T)	145(.9)
8-73	12(T)	1(T)	121(.2)	2(T)	0	14(T)	0	151(.2)
8-73	5(T)	1(T)	73(.1)	7(T)	0	0	5(T)	91(.1)
8-73	10(T)	6(.1)	57(.2)	8(.1)	0	5(T)	5(T)	91(.4)

Table 16 continued. Number and volume (in parentheses) of macroinvertebrates collected in one square foot stream bottom samples for stations on tributary streams, summer, 1972-73.

Date	Plecoptera	Tricoptera	Ephemeroptera	Diptera	Coleoptera	Annetera	Other	Total
			Falls Creek-Station 027					
8-72	6(T)	22(.1)	97(.8)	9(.1)	0	8(T)	0	142(1.0)
8-72	13(T)	16(T)	52(.3)	7(T)	0	1(T)	0	89(.3)
8-72	31(.1)	15(.2)	118(1.0)	20(T)	5(T)	6(T)	0	195(1.4)
8-73	23(.1)	2(T)	62(.1)	27(.1)	0	25(T)	0	139(.3)
8-73	18(.1)	2(.1)	45(.1)	3(T)	0	3(T)	1(T)	72(.3)
8-73	11(T)	3(.1)	40(.2)	8(T)	0	2(T)	0	64(.3)

The generally pollution sensitive orders, Plecoptera, Tricoptera, and Ephemeroptera typically constituted the bulk of organisms in bottom fauna samples (Tables 15 and 16). These three orders usually made up 60 to 90 percent of organisms in samples.

Variability in numbers and volume of bottom fauna was high at most stations, but probably no more so than is characteristic of these organisms. Needham and Usinger (1956) took 100 one-square-foot samples from a single riffle. Numbers of organisms per sample ranged from 2 to 198. Data of the study are probably less variable than that reported by Needham and Usinger (1956). Overall numbers of organisms per square foot tended to reach highest levels in winter and lowest levels in summer (Table 15).

Dent (1971) has also sampled bottom fauna in the same streams and at some of the same stations reported in this study. He used a Surber sampler and reported consistently fewer numbers of organisms per square foot than found in this study. For comparison, the following are average number of organisms per square foot in October 1971 for stations on nearby portions of the Stillwater, West Fork Stillwater, East Boulder, and Boulder Rivers, respectively (data of Dent, 1971, given first): 83 and 267, 84 and 246, 91 and 739, 106 and 402. At the same station (031) on Little Rocky Creek, the corresponding numbers are 36 and 156. Dent's (1971) data are similar to that of this study in proportions of insect orders present in the various samples.

In personal correspondence with Mr. Dent, he stated that he had begun using a sampler similar to that used in the study, and that the number of organisms in samples was considerably larger than the number in samples taken with the Surber sampler.

Low numbers of organisms in May 1972 for some station on the Boulder River, and for station 035 on the Stillwater River (Appendix A) were probably caused by sampling on newly flooded stream bottom. Streams were rising rapidly at the time May 1972 samples were collected.

Almost complete absence of organisms in samples from station 043 on Verdigris Creek (Table 16) is likely due to previously discussed adverse chemical conditions.

A limited amount of invertibrate identification has been done for samples from the West Fork Stillwater and East Boulder Rivers by Department of Fish and Game personnel and a consultant. Most insects could be identified only to genus. Non-insect organisms generally could be identified only to family or order. Hopefully, additional work on identification will be done and presented in a future report.

Fish Populations

Table 17 is a summary of physical characteristics, fish species captured, and fin clips made on fish in stream sections. These sections were used for estimation of fish population parameters.

Fish population data are given in Tables 18 and 19. Estimates for some species shown in a previous report (Stewart, 1973) are not shown in these tables because reexamination of the data indicated that the number of recaptured fish was not sufficient for a reliable estimate. Some estimates made in 1971 and 1972 differ slightly form a previous report (Stewart, 1973). These differences are due to recalculation of the estimates using a slightly refined computer program.

Hatchery fish were captured in small numbers in only two locations despite the fact that they are stocked in all of the larger streams. A few hatchery rainbow trout were noted in section F-2, Stillwater River in 1973, but not in 1974. Hatchery cutthroat trout are present in the upper reaches of the East Boulder River where fish were not present before these were stocked.

Table 17. Physical data for electrofishing sections and fish species captured.

Stream	Stream Number	Location T	R	S	Length (feet)	Mean Width (feet)	Species[a] present	Fin clip 1971or72[b]	1973	1974
East Rosebud	F-14	6S	18E	19,20	6283	77.6	Rb,LL,Wf Catostomus sp.	temporary	---	---
Morris Creek	F-12	6S	18E	8	1347	8.4	Eb,LL,Ct LNd	left pelvic	adipose	---
West Fishtail	F-10	5S	17E	19	2270	20.3	Rb,Eb,LL	right pelvic	right pectoral plus adipose	---
East Fishtail	F-9	5S	17E	19	2073	14.8	Rb,Eb,LL	right pectoral	left pelvic	---
Fishtail	F-11	5S	17E	8,17,18	3948	27.5	Rb,Eb,LL,Wf	adipose	left pectoral	---
Stillwater	F-1	5S	15E	28	2986	109.5	Rb,Eb,LL,Wf LNSu,LNd,MSu	right pelvic	adipose	---
Stillwater	F-2	5S	15E	10,11,15	6710	91.6	Rb,Eb,LL,Wf LNSu,MSu,LNd	adipose	left pelvic	temporary
Stillwater	F-3	5S	15E	1,2	5578	82.5	Rb,Eb,LL Wf,LNSu	temporary	---	---
Stillwater	F-19	4S	16E	23	1982	124.0	Rb,Eb,LL,Ct Wf,LNSu,MSu,LNd	---	---	adipose
Silver Creek	F-7	5S	15E	15	1289	6.4	Rb,Eb,LL	left pectoral	adipose plus left pelvic	temporary
Nye Creek	F-6	5S	15E	15	1453	5.0	Rb,Eg,LL	right pectoral	adipose plus right pectoral	temporary
Mountain View	F-5	5S	15E	21	2589	4.8	Rb,Eb,LL LNd,LNSu	adipose plus left pelvic	right pelvic	temporary

a - Abbreviations are: Rb = Rainbow Trout; Ct = Cutthroat Trout; Eb = Brook Trout, LL = Brown trout; Wf = Mountain Whitefis
LNSu = Longnose Sucker; LNd = Longnose Dace

b - 1971 for sections F-3 and F-14; others are 1972.

Table 17 continued. Physical data for electrofishing sections and fish species captured.

Stream	Section Number	Location T	R	S	Length (feet)	Mean Width (feet)	Species[a] present	Fin clip 1971or72[b]	1973	1974
Little Rocky	F-8	5S	16E	3,4	2590	13.9	Rb,LL,Ct	adipose plus right pelvic	right pectoral	temporary
Picket Pin	F-16	4S	14E	25	2059	13.5	Ct,Eb,LL,Rb	adipose	left pelvic	---
West Fork Stillwater	F-17	4S	15E	33	2293	41.2	Rb,LL,Wf	---	adipose	left pelvic
West Fork Stillwater	F-22	5S	14E	30	4404	29.2	Rb	---	---	adipose
Lower Deer	F-18	2S	15E	16,17,20	6160	25.2	Rb-Ct hybrid Eb,LL	---	adipose	---
Boulder	F-4	3S	12E	26,35	5236	81.4	Rb,Eb unidentified cyprinid	adipose	left pelvic	temporary
Boulder	F-21	5S	12E	13,24	3329	58.8	Rb,Eb,Ct,LNd Ct-Rb hybrid	---	---	adipose
East Boulder	F-13	4S	13E	2,11	2410	28.2	Rb,Ct,LL	adipose	right pelvic	---
East Boulder	F-20	3S	13E	29	2823	37.8	Rb,Eb,LL	---	---	left pelvic

a-Abbreviations are: Rb=Rainbow Trout; Ct=Cutthroat Trout; Eb=Brook Trout; LL=Brown Trout; Wf=Mountain Whitefish LNSu=Longnose Sucker; MSu=Mountain Sucker; LNd=Longnose Dace.

b-1971 for sections F-3 and F-14; others are 1972.

able 18. Fish population estimates for stream sections where estimates were made in 1972, 1973 and 1974.

ge lass	Mean length (inches)			Mean weight (lbs.)			Estimated number			Estimated weight (lbs.)			Pounds per acre			Mortality rate (%	
	1972	1973	1974	1972	1973	1974	1972	1973	1974	1972	1973	1974	1972	1973	1974	1972 -73	1973 -74
Stillwater River - Section F-2 - March, April																	
Brown Trout																	
0	---	3.5	3.6	---	0.01	0.01	---	1208	1012	---	16.8	14.1					
I	6.0	5.9	5.9	0.08	0.08	0.08	377	462	327	30.4	35.3	25.4					73
II	9.1	9.5	9.0	0.26	0.29	0.25	258	96	99	67.3	27.6	24.6				75	79
II	11.9	12.6	12.1	0.55	0.65	0.57	187	109	57	103.2	70.7	32.8				58	40
IVand older	15.0	15.3	15.2	1.14	1.18	1.10	79	50	23	90.1	59.4	25.8				81	85
						Totals	901 (±172)[a]	1927 (±597)	1518 (±278)	290 (±33)	209 (±23)	122 (±11)	20.6	15	8.7		
Brook Trout																	
0	4.2	4.0	3.9	0.02	0.02	0.02	134	1296	88	3.4	28.5	1.6					
I	6.8	6.6	6.6	0.11	0.10	0.10	128	81	69	14.0	8.1	6.8				40	95
II	9.5	9.0	8.5	0.28	0.23	0.20	53	9	12	14.7	2.1	2.5				93	85
						Totals	315 (±147)	1386 (±831)	169 (±45)	32.1 (±16)	38.7 (±19)	10.9 (±3)	2.3	2.7	0.9		
Silver Creek - Section F-7 - Brown Trout - June																	
0	2.6	2.4	2.5	0.01	0.01	0.01	192	1036	697	2.0	10.4	7.0					
I	5.0	5.0	4.7	0.05	0.05	0.04	106	258	254	5.0	12.7	10.2					75
II[b]	7.1	7.0	7.4	0.14	0.13	0.15	78	57	70	10.6	7.4	10.6				46	79
III	9.2	8.9	---	0.27	0.24	----	24	19	---	6.5	4.7	----				75	
						Totals	390 (±140)	1370 (±262)	1020 (±128)	24.1 (±5)	35.2 (±3)	27.8 (±3)	127	185	148.		

a-95% confidence interval in parentheses b-Age group II and older in 1974

ıble 18 continued. Fish population estimates for stream sections where estimates were made in 1972, 1973 and 1974.

ıge lass	Mean length (inches)			Mean weight (lbs.)			Estimated number			Estimated weight (lbs.)			Pounds per acre			Mortality rate (%)	
	1972	1973	1974	1972	1973	1974	1972	1973	1974	1972	1973	1974	1972	1973	1974	1972-73	1973-74
Little Rocky Creek - Section F-8 - Brown Trout - June, July																	
I	----	3.8	4.5	----	0.01	0.03	----	70	411	----	1.0	13.8					62
II	6.7	7.1	7.8	0.13	0.14	0.20	76	30	26	9.8	4.4	5.4				48	62
IIand lder	11.2	10.7	11.2	0.62	0.53	0.63	65	73	40	39.8	38.3	24.8					
						Totals	141 (±17)	173 (±33)	477 (±151)	49.6 (±6)	43.7 (±12)	44.0 (±14)	59.3	53	52		
Boulder River - Section F-4 - March, April																	
Rainbow Trout																	
0	----	2.5	2.7	----	0.01	0.01	----	957	2306		9.5	23.1					85
I	5.5	5.0	5.4	0.07	0.05	0.06	98	139	142	6.5	7.0	8.0				11	63
II	9.0	8.8	9.4	0.26	0.23	0.29	91	88	52	23.8	20.6	15.0					
II	12.9	12.0	11.9	0.79	0.63	0.58	68	242	49	53.7	151.1	28.1				21	39
IV	16.8	16.1	15.7	1.67	1.50	1.35	249	250	299	415.3	374.3	404.1					
						Totals	506 (±192)	1676 (±465)	2848 (±663)	499.3 (±253)	562.5 (±173)	478.3 (±131)	51.0	58.0	49.0		
Brook Trout																	
0	3.5	3.2	3.5	0.01	0.01	0.01	1787	6927	2023	22.6	74.3	25.3				24	89
I	6.0	5.6	5.6	0.08	0.06	0.06	955	1361	737	73.8	86.0	44.1				47	97
II[b]	8.6	9.1	9.4	0.20	0.25	0.31	124	511	49	25.0	126.9	15.0				66	
III	12.7	12.3	----	0.66	0.62	----	12	43	---	8.2	26.5	---					
						Totals	2878 (±937)	8842 (±2221)	2809 (±563)	129.6 (±25)	313.7 (±90)	84.4 (±14)	13.3	32.0	8.6		

a-95% confidence interval in parentheses b-Age group II and older in 1974

able 19. Fish population estimates for stream sections where estimates were made once or twice.

ge lass	Mean length (inches)		Mean weight (lbs.)		Estimated number		Estimated weight (lbs.)		Pounds per acre		Mortality rate (%)
	1st year	2nd year	1st year	2nd year	1st year	2nd year	1st year	2nd year	1st year	2nd year	1972 to 1973 or 1973 to 1974
					East Rosebud River - Section F-14 - Brown Trout - November - 1971						
I	5.8		0.06		135		8.7				
II	9.1		0.25		159		39.7				
II	12.1		0.57		113		65.1				
IV	16.6		1.49		53		79.3				
				Totals	460 (±105)[a]		192.8 (±55)		17.2		
					Morris Creek - Section F-12 - Brook Trout - June 1972, 1973						
I	5.0	4.4	0.05	0.03	465	758	23.4	20.8			
II	7.6	6.9	0.17	0.12	105	142	18.3	16.9			69
II	9.0	9.2	0.28	0.27	78	25	22.0	6.8			76
				Totals	648 (±87)	925 (±189)	63.7 (±6)	44.5 (±6)	242	173	
					West Fishtail Creek - Section F-10 - Brook Trout - July 1972, 1973						
I	4.6	4.6	0.04	0.04	118	93	4.4	3.6			
II and lder	7.7	7.2	0.19	0.16	28	57	5.5	9.1			61
				Totals	146 (±70)	150 (±42)	9.9 (±5)	12.7 (±5)	9.4	12.0	

- 95% confidence interval in parentheses

Table 19 continued. Fish population estimates for stream sections where estimates were made once or twice.

Age class	Mean length (inches)		Mean weight (lbs.)		Estimated number		Estimated weight (lbs)		Pounds per acre		Mortality rate (%)
	1st year	2nd year	1st year	2nd year	1st year	2nd year	1st year	2nd year	1st year	2nd year	1972 to 1973 or 1973 to 1974
East Fishtail Creek - Section F-9 - Rainbow Trout - July 1972, 1973											
I	---	2.8	---	0.01	---	113	---	1.2			
II	4.9	4.7	0.05	0.04	16	69	0.7	2.9			
IIIand older	8.3	7.8	0.28	0.22	10	24	2.7	5.2			9
				Totals	26	206	3.4	9.3	4.3	13	
					(±11)	(±84)	(±2)	(±3)			
Fishtail Creek - Section F-11 - July, 1972, August, 1973											
Rainbow Trout											
I	---	3.7	---	0.01	---	1002	---	14.4			
II	5.5	6.0	0.08	0.09	174	158	13.3	14.7			
III	8.0	8.0	0.22	0.21	41	86	9.0	18.1			51
IVand older	10.8	10.8	0.52	0.50	29	34	14.9	17.0			51
				Totals	244	1280	37.2	64.2	15.7	27.0	
					(±101)	(±270)	(±12)	(±8)			
Brown Trout											
I	---	4.8	---	0.04	---	330	---	14.3			
II	6.9	7.3	0.14	0.17	94	84	13.1	13.9			
III	9.8	10.4	0.39	0.46	56	90	21.5	41.7			4
IVand older	12.7	13.5	0.83	0.96	49	67	41.1	63.8			37
				Totals	199	571	75.7	133.7	30.5		
					(±46)	(±84)	(±18)	(±19)			

a- 95% confidence interval in parentheses.

able 19 continued. Fish population estimates for stream where estimates were once or twice.

ge lass	Mean length (inches)		Mean weight (lbs.)		Estimated number		Estimated weight (lbs.)		Pounds per acre		Mortality rate (%)
	1st year	2nd year	1st year	2nd year	1st year	2nd year	1st year	2nd year	1st year	2nd year	1972 to 1973 or 1973 to 1974
Stillwater River - Section F-1 - May 1972; April, May 1973											
Brook Trout											
0	3.9	3.6	0.02	0.01	233	494	4.0	6.6			
I	5.6	6.0	0.06	0.08	151	296	9.5	22.4			
II	8.2	9.6	0.19	0.28	38	10	7.0	2.9			93
					Totals 422 (±190)	800 (±203)	20.5 (±8)	31.9 (±8)	2.7	4.1	
Rainbow Trout											
0	---	2.4	---	0.01	---	481	---	4.8			
I	---	4.2	---	0.03	---	357	---	9.6			
II	---	6.9	---	0.12	---	54	---	6.3			
[IIand older	---	11.7	---	0.62	---	43	---	26.9		6.3	
					Totals	935 (±346)		47.6 (±19)			
Stillwater River - Section F-3 - Brown Trout - November 1971											
I	6.0	---	0.06	---	604	---	38.7				
II	8.9	---	0.25	---	544	---	135.2				
[II	12.3	---	0.65	---	224	---	145.2				
IVand older	15.3	---	1.24	---	149	---	186.1				
					Totals 1521 (±460)		505.2 (±101)		47.8		

a- 95% confidence interval in parentheses.

Table 19 continued. Fish population estimates for stream sections where estimates were made once or twice.

Age class	Mean length (inches)		Mean weight (lbs.)			Estimated number		Estimated weight (lbs.)		Pounds per acre		Mortality rate (%)
	1st year	2nd year	1st year	2nd year		1st year	2nd year	1st year	2nd year	1st year	2nd year	1972 to 1973 or 1973 to 1974
Stillwater River - Section F-19 - Brown Trout - March, April - 1974												
0	3.9	---	0.02	---		1031	---	18.9	---			
I	6.9	---	0.12	---		590	---	68.7	---			
II	9.8	---	0.35	---		233	---	80.5	---			
IIIand older	13.0	---	0.74	---		134	---	99.2	---	47.5		
					Totals	1988 (±334)		267.3 (±30)				
Nye Creek - Section F-6 - Brook Trout - June 1973												
I	4.1	---	0.02	---		3	---	0.06	---			
IIand older	6.3	---	0.10	---		10	---	0.99	---			
					Totals	13 (±5)		1.05 (± 1)		6.0		
Mountain View Creek - Section F-5 - Brook Trout - June 1972, 1973												
I	4.5	4.6	0.04	0.04		100	84	4.1	3.1			
II	8.7	6.7	0.26	0.12		11	15	2.9	1.9			
					Totals	111 (±64)	99 (±23)	7.0 (±5)	4.0 (±2)	24.6	14.0	85
Picket Pin Creek - Section F-16 - August, September, 1972; September, 1973												
Brook Trout												
I	5.3	5.4	0.06	0.06		49	241	3.0	14.1			
IIand older	8.8	8.1	0.30	0.24		47	38	14.0	9.3			60
					Totals	96 (±13)	279 (±34)	17.0 (±1)	23.4 (±3)	26.6	38.0	

a- 95% confidence interval in parentheses

Table 19 continued. Fish population estimates for stream sections where estimates were made once or twice.

Age class	Mean length (inches)		Mean weight (lbs.)		Estimated number		Estimated weight (lbs.)		Pounds per acre		Mortality rate(%)
	1st year	2nd year	1st year	2nd year	1st year	2nd year	1st year	2nd year	1st year	2nd year	1972 to 1973 or 1973 to 1974
Picket Pin Creek - Section F-16 - Continued											
Brown Trout											
I	4.4	4.2	0.03	0.02	22	70	0.6	1.5			
II	6.4	6.3	0.09	0.09	42	14	3.9	1.2			37
III	9.4	8.3	0.35	0.23	33	12	11.6	2.9			70
IV and older	11.3	12.0	0.59	0.69	8	7	4.9	4.9			83
					Totals 105 (±14)	103 (±27)	21.0 (±3)	10.5 (±2)	34.0	19.0	
Cutthroat Trout											
I	5.1	5.2	0.05	0.05	27	23	1.3	1.2			
II	7.3	7.6	0.16	0.16	13	10	2.1	1.7			61
III and older	9.5	9.4	0.34	0.33	8	14	2.8	4.5			37
					Totals 48 (±12)	47 (±12)	6.2 (±2)	7.4 (±2)	9.4	11.0	
West Fork Stillwater River - Section F-17 - April, May 1973, 1974											
Rainbow Trout											
I	4.3	4.4	0.03	0.03	359	489	10.4	14.8			
II	6.3	6.5	0.09	0.10	93	194	8.4	19.8			46
III	---	8.4	---	0.23	---	73	---	16.7			21
III and IV older	8.4	10.0	0.23	0.39	177	59	40.5	23.1			67
					Totals 629 (±108)	815 (±106)	59.3 (±9)	74.4 (±16)	27.7	35.1	

a- 95% confidence interval in parentheses

Table 19 continued. Fish population estimates for stream sections where estimates were made once or twice.

Age class	Mean length (inches)		Mean weight (lbs.)		Estimated number		Estimated weight (lbs.)		Pounds per acre		Mortality rate(%)
	1st year	2nd year	1st year	2nd year	1st year	2nd year	1st year	2nd year	1st year	2nd year	1972 to 1973 or 1973 to 1974
West Fork Stillwater River - Section F-17 - Continued											
Brown Trout											
I	4.8	5.1	0.04	0.05	34	102	1.5	5.2			
II	7.3	7.2	0.16	0.15	20	25	3.2	3.6			27
III and older	10.5	11.0	0.48	0.56	27	15	13.0	8.2			69
					Totals 81 (±30)	142 (±23)	17.7 (±6)	17.0 (±3)	8.3	7.8	
West Fork Stillwater River - Section F-22 - Rainbow Trout - October, 1974											
I	5.3	---	0.06	---	27	---	1.5	---			
II	6.6	---	0.13	---	22	---	2.8	---			
III	8.1	---	0.23	---	46	---	10.4	---			
IV and older	9.8	---	0.40	---	82	---	33.0	---			
					Totals 177 (±56)		47.7 (±17)		16.2		
Lower Deer Creek - Section F-18 - Brown Trout - June, July 1973											
I	4.4	---	0.03	---	197	---	5.6	---			
II	7.5	---	0.17	---	44	---	7.4	---			
III	11.2	---	0.50	---	58	---	28.9	---			
IV and older	14.1	---	0.88	---	38	---	33.8	---			
					Totals 337 (±76)		75.7 (±11)		21.3		

a- 95% confidence interval in parentheses.

Table 19 continued. Fish population estimates for stream sections where estimates were made once or twice.

Age class	Mean length (inches)		Mean weight (lbs.)		Estimated number		Estimated weight (lbs.)		Pounds per acre		Mortality rate(%)
	1st year	2nd year	1st year	2nd year	1st year	2nd year	1st year	2nd year	1st year	2nd year	1972 to 1973 or 1973 to 1974
Boulder River - Section F-21 - Rainbow Trout - September 1974											
0	3.3	---	0.01	---	34	---	0.3	---			
I	5.2	---	0.06	---	304	---	18.2	---			
II	8.0	---	0.22	---	170	---	37.0	---			
III	10.2	---	0.44	---	77	---	34.2	---			
IVand older	12.7	---	0.87	---	80	---	70.4	---			
				Totals	665 (±178)		160.1 (±58)		35.6		
East Boulder River - Section F-13 - July, August 1972; August 1973											
Rainbow Trout											
I	4.0	3.9	0.02	0.02	37	116	0.9	2.4			
II	5.1	5.2	0.05	0.05	145	41	7.5	2.1			
III	6.2	6.3	0.09	0.10	252	63	22.5	6.4			56
IV	8.2	7.3	0.21	0.15	62	203	12.9	30.7			19
Vand older	10.3	8.9	0.35	0.27	6	43	2.0	11.4			36
				Totals	502 (±80)	466 (±70)	45.8 (±6)	53.0 (±6)	28.8	35.0	
Brown Trout											
II	4.1	4.7	0.02	0.04	11	46	0.3	1.8			
III	6.2	6.1	0.09	0.09	49	30	4.3	2.6			
IV	7.5	7.7	0.16	0.18	15	33	2.5	5.9			32
Vand older	10.9	9.2	0.51	0.32	7	21	3.8	6.8	7.1	11.0	7
				Totals	82 (±25)	130 (±26)	10.9 (±3)	17.1 (±5)			

a-95% confidence interval in parantheses.

Table 19 continued. Fish population estimates for stream sections where estimates were made once or twice.

Age class	Mean length (inches)		Mean weight (lbs.)		Estimated number		Estimated weight (lbs.)		Pounds per acre		Mortality rate(%)
	1st year	2nd year	1st year	2nd year	1st year	2nd year	1st year	2nd year	1st year	2nd year	1972 to 1973 or 1973 to1974
East Boulder River - Section F-20 - September 1974											
Rainbow Trout											
I	3.5	---	0.01	---	297	---	3.6	---			
II	5.5	---	0.06	---	177	---	10.9	---			
III	7.4	---	0.16	---	160	---	25.0	---			
IVand older	9.5	---	0.35	---	86	---	30.0	---			
				Totals	720 (±120)		69.5 (±8)		28.7		
Brown Trout											
I	4.1	---	0.02	---	98	---	2.1	---			
II	6.2	---	0.09	---	70	---	6.0	---			
III	8.0	---	0.20	---	88	---	17.4	---			
IVand older	11.6	---	0.63	---	38	---	24.2	---	20.1		
				Totals	294 (±48)		49.7 (±6)				

a- 95% confidence interval in parantheses.

Estimates were not made for species captured infrequently. Underyearling and yearling fish were always present in the stream sections, but electrofishing gear samples there fish very inefficiently. For this reason estimates were often not made for underyearling fish. Estimates are not shown in some cases for yearling fish for this same reason (Tables 18 and 19).

Fish ages shown in Tables 18 and 19 are equal to numbers of annuli on scales. Except for fish captured in June when annuli were formed, fish had experienced some portion of a growing season beyond the indicated age. Growth rates, while generally slightly slower than state averages reported by Brown (1971), are commensurate with the relatively low summer water temperatures and short growing seasons.

Standing crops of trout in pounds per acre (Tables 18 and 19) on larger streams are somewhat lower than those reported by Vincent (1969) for rivers in southwestern Montana. Some of the tributary streams had moderately high trout standing crops. Carlander (1953) reports standing crop values for trout streams in North America to be largely in the range of 10 to 150 pounds per acre, with an approximate median of 60. Compared to Carlander's (1953) data, standing crops of trout in streams of this study range from moderately low to high.

Total estimates in Tables 18 and 19 suggest considerable variation in standing crops of trout from year to year in many of the stream sections. This may be misleading. In 1973 and 1974 an estimate for yearling or underyearling fish was added in the total estimate, if adequate numbers of fish were sampled. In 1972 an estimate for these younger fish was often lacking in the total estimate, because adequate numbers were not sampled. Also, a consideration of confidence limits minimizes apparent differences in standing crops between years. For example, on Section F-1, Stillwater River, the mean total estimates of brook trout for 1972 and 1973 were 422 and 800. However, by considering the highest probably value in the 1972 estimate (612), and the lowest probable value in the 1973 estimate (597), it is evident that there is overlap in the ranges of probable fish numbers for the two years. However, even with these considerations there are definite differences between the two years in some stream sections for numbers of underyearling and yearling fish.

There was generally good agreement between average lengths of year classes from year to year (Tables 18 and 19). For the few cases where differences were relatively large, average sizes were calculated from very small samples of fish.

Age structures in Tables 18 and 19 were mostly typical. Some of the small imbalances can be explained on the basis of confidence intervals, but larger imbalances are probably real. These imbalances can occur by differential year class survival and migration, but no certain explanation can be confidently advanced.

Almost no movement was noted from one stream section to another from year to year. Minor exchange of fish occurred only between sections on Fishtail Creek (F-11), East Fishtail Creek (F-9), and West Fishtail Creek (F-10). These sections are close together. East and West Fishtail Creek sections are spearated by only about 500 yards. The Fishtail Creek section is approximately 1.5 stream miles from the other two.

A complicating factor has been introduced on Section F-2 of the Stillwater River. In March 1973 over one-third of the length of this section was modified by adjacent landowners, largely by pushing streambed gravel onto streambanks. Part of this modification occurred a few days prior to the 1973 fish population estimate, and part of it while the estimate was being made. From 1972 to 1974 pounds per acre of brown trout has gone from 20.6 to 15 to 8.7; the corresponding figures for brook trout are 2.3, 2.7, and 0.9 (Table 18). Numbers of older fish show the greatest decrease.

Fish populations were also investigated where estimates were not made (Table 20). This work was done to determine species present and to get rough information on fish numbers. In the smaller tributary streams fish tend to be present in small numbers only near the mouth, if they are present at all. Silver Creek is the exception. Here fish are present from the mouth upstream to springs which are the source of the stream. Upper reaches of most smaller streams are extremely steep, becoming a series of cascades and plunge pools. Some of the small streams accessible during winter were checked for water flow near the mouth following severe weather. Verdigris and Initial Creeks were dry. Cathedral and Falls Creeks had water flow.

Cutthroat trout were stocked in upper Iron Creek and the East Boulder River in Placer Basin in 1971, when other Fish and Game Department personnel found that fish were not present. Considerable electrofishing in Iron Creek in 1974 did not recapture any of these fish or their offspring. A few of the fish planted in the Upper East Boulder River are still present, but their numbers seem to be decreasing and no evidence of reproduction has been found (Table 20). A single hatchery cutthroat trout found in the mouth of Forge Creek was from the plant made in the Upper East Boulder River.

Fish Population Stability

Stability (defined in Table 21) percentages for nine stream sections where data were sufficient to make the appropriate calculations are given in Table 21. Stability for all stream sections and species averaged 55 percent for 1972 to 1973 and 59 percent for 1973 to 1974. These percentages indicate that the majority of fish in stream sections are resident fish and not merely passing through the sections at the time of electrofishing. Precision of the stability estimates is similar to the precision of population estimates (Tables 18 and 19) which were used in the calculation of stability.

Metals Concentrations in Fish Muscle Tissue

Concentrations of various metals in fish muscle tissue are shown in Table 22. In general the precision of the determinations is plus and minus the detection limit. The mercury concentrations are mostly low and probably represent natural background levels in fish muscle for this area. A comprehensive examination of literature concerning natural levels of metals in fish tissue has not yet been made. However, it was the opinion of Environmental Protection Agency personnel that the levels of metals were well below values that could be hazardous to humans consuming the fish.

Additional samples of fish for metals analysis have been collected from three locations on the West Fork Stillwater River, and one location each from the Stillwater, Boulder, and East Boulder Rivers. The analysis of these fish has not been done. Results will be included in a future report.

Trout Egg Bioassays

Overall average survival of eyed trout eggs placed in artificial redds (Table 23) was considerably higher in 1973 and 1974 (83 and 81 percent) than in 1972 (45 percent). Differences in conditions and procedures between the years were: rainbow trout eggs used in 1973 and 1974 and cutthroat trout eggs in 1972; gravel chips placed in egg containers in 1973 and 1974, but not in 1972; September - October incubation in 1973 and 1974 and April - May incubation in 1972. The second factor may have had some importance, but the last seems most significant.

Water temperatures were probably more favorable during the September - October period. Although maximum-minimum thermometers were used at some of the stations only in 1974, spot measurements with a pocket thermometer in 1972 and 1973 showed considerable periods of water temperatures in the suboptimal range of 32°F to 39°F in 1972. In 1973 no

Table 20. Results of survey electrofishing.

Stream and location description	T	R	S	Stream section length (feet)	Species	Number caught	Length range (inches)	Fish age(s)	Date
East Fishtail Creek									
West fork near mouth	5S	16E	26	1000	Eb[a]	9	3.7-7.8	1,2	7-09-74
					LL	1	3.4	1	
West fork of West Fork near mouth	5S	16E	35	500	Eb	1	3.8	-	7-10-74
0.5 miles above mouth	5S	16E	35	500	-	0	-	-	7-10-74
East fork of west fork near mouth	5S	16E	35	500	Eb	3	4.0-6.3	1,2	7-10-74
West Fishtail Creek									
near ditch headgate	5S	16E	27	500	Eb	11	3.6-8.5	1,2,3	8-12-74
3.5 miles above mouth	5S	16E	27	400	-	0	-	-	8-12-74
Little Rocky Creek									
near mouth	4S	16E	28	700	LL	43	4.9-12.7	1,2,3,4	7-19-74
					Rb	2	6.5-8.7	-	
					LnSu	1	16.2	-	
					Lnd	4	4.0-5.5	-	
at Forest Service Camp	5S	16E	21	500	-	0	-	-	7-18-74
West fork near mouth	5S	16E	29	500	-	0	-	-	7-11-74
West fork above Benbow Mine	5S	16E	31	500	-	0	-	-	7-18-74
East fork near mouth	5S	16E	29	500	-	0	-	-	7-11-74
East fork near road crossing	5S	16E	32	500	-	0	-	-	7-11-74
South Nye Creek-near mouth	5S	15E	15	1850	-	0	-	-	6-08-74
Nye Creek-lower Nye basin	5S	15E	22,23	1000	-	0	-	-	6-11-74
Vedigris Creek									
near mouth	5S	15E	28	1520	-	0	-	-	6-13-72
near wood culvert above gossan	5S	15E	20	500	-	0	-	-	7-19-74
Mountain View Creek									
0.75 miles above mouth	5S	15E	21	500	-	0	-	-	6-12-74
outlet of Mountain View Lake	5S	15E	20	640	Lake Chub	1	3.5	-	6-12-74

a- Abbreviations are: Rb=Rainbow Trout; Ct=Cutthroat Trout; Eb=Brook Trout; LL=Brown Trout; LNSu=Longnose Sucker; Lnd=Longnose Dace

Table 20 continued. Results of survey electrofishing.

Stream and location description	T	R	S	Stream section length (feet)	Species	Number caught	Length range (inches)	Fish age(s)	Date
Silver Creek									
just below east and west forks	5S	15E	16	450	LL	31	2.3-9.8	-	6-13-74
					Eb	2	3.3-3.9	-	
South fork 0.25 miles above mouth	5S	15E	16	250	LL	17	2.1-6.9	-	6-13-74
North fork 0.25 miles above mouth	5S	15E	16	200	LL	4	5.0-6.8	-	6-13-74
					Eb	1	4.2	-	
Iron Creek									
0.5 miles above mouth	5S	14E	11	1600	Rb	32	3.6-11.2	1,2,3,4	9-6,7,17-73
one mile above mouth	5S	14E	11	500	-	0	-	-	8-16-74
meadow 2 miles east of Iron Mountain	5S	14E	8	1000	-	0	-	-	7-31-74
South fork near mouth	5S	14E	7	500	-	0	-	-	7-31-74
North fork near mouth	5S	14E	7	500	-	0	-	-	7-31-74
Initial Creek near mouth	5S	14E	13,14	900	-	0	-	-	7-12-72
Cathedral Creek near mouth	5S	14E	14	900	Rb	1	5.5	-	7-12-72
Picket Pin Creek									
near Bear Pen Creek	4S	14E	36	500	Ct-Rb hybrid	1	12.1	4	7-30-74
					Eb	1	8.4	2	
1.5 miles below old sawmill	5S	14E	2	500	Rb	3	7.3-10.5	3,4	8-28-72
near road crossing	5S	14E	3	250	Rb	3	7.2-9.4	3,4	8-28-72
South fork near mouth	5S	14E	3	500	-	0	-	-	7-30-74
North fork near mouth	5S	14E	3	500	-	0	-	-	7-30-74
outlet of South Picket Pin Lake	5S	14E	6	500	-	0	-	-	7-30-74
West Fork Stillwater River									
1.5 miles below Initial Creek	5S	14E	12	500	Rb	29	3.7-10.8	1,2,3,4	5-15-74
just above bridge	5S	14E	14	500	Rb	27	3.5-11.5	1,2,3,4	5-15-74
East Boulder River									
near Canyon Creek	4S	13E	14	700	Rb	9	3.8-8.7	1,2,3,4	8-5-74
					Rb-Ct hybrid	5	4.2-11.3	1,2,4	
					LL	1	10.2	5+	
near Brownlee Creek	4S	13E	26	500	-	0	-	-	8-6-74
one mile above Brownlee Creek	4S	13E	35	1500	-	0	-	-	8-9-74
one mile below road crossing	4S	13E	35	500	-	0	-	-	8-9-74

b-Fish of hatchery origin.

Table 20 continued. Results of survey electrofishing.

Stream and location description	T	R	S	Stream section length (feet)	Species	Number caught	Length range (inches)	Fish age(s)	Date
East Boulder River continued									
Placer Basin road crossing	5S	13E	11	1500	Ct[b]	4	6.3-7.5	-	8-24-72
Placer Basin road crossing	5S	13E	11	1500	Ct[b]	1	10.8	-	8-01-74
one mile above road crossing	5S	13E	11,14	500	-	0	-	-	8-20-74
East fork near mouth	5S	13E	14	500	-	0	-	-	8-20-74
West fork near mouth	5S	13E	14	500	-	0	-	-	8-20-74
Forge Creek									
near mouth	5S	13E	2	500	Ct[b]	1	10.1	-	8-01-74
North fork near mouth	5S	13E	2	500	-	0	-	-	8-19-74
South fork near mouth	5S	13E	2	500	-	0	-	-	8-19-74
Brownlee Creek									
near mouth	4S	13E	26	500	Ct	1	9.6	-	8-06-74
one mile above mouth	4S	13E	27	500	-	0	-	-	8-08-74
two miles above mouth	4S	13E	27	500	-	0	-	-	8-08-74
East Chippy Creek									
near mouth	5S	12E	1	400	-	0	-	-	5-16-74
1.5 miles above mouth	5S	13E	6	500	-	0	-	-	8-19-74
Blakely Creek									
near mouth	4S	12E	26	500	Rb	20	1.7-9.9	0,1,2,3	6-21-73
					Eb	1	3.8	1	
1000 feet above mouth	4S	12E	25	400	-	0	-	-	6-21-73
2 miles above mouth	4S	13E	30	500	-	0	-	-	8-15-74
Graham Creek									
near mouth	4S	12E	14	1000	-	0	-	-	6-21-73
trail crossing 1.5 miles above mouth	4S	12E	24	500	-	0	-	-	8-13-74
Falls Creek-near mouth	14S	12E	15	500	Eb	1	6.2	-	5-16-74
Great Falls Creek	4S	12E	23	900	Rb	6	5.1-8.0	1,2,3	5-16-74
					Eb	4	5.6-8.7	1,2	

b- Fish of hatchery origin.

Table 21. Number of fish marked in 1972 or 1973, number of recaptures one year later, and stability[a] of fish populations in stream sections.

Stream	Section code	Species	Age 1973	Age 1974	Number marked 1972	Number marked 1973	Recaptures of fish marked one year previous 1973	Recaptures of fish marked one year previous 1974	Stability (percent) 1973	Stability (percent) 1974
Morris Creek	F-12	Brook trout	II		176		29		42	
			III		60		21		87	
Fishtail Creek	F-11	Rainbow trout	III		51		33		81	
			IV and older		31		19		95	
		Brown trout	III		40		34		68	
			IV and older		52		27		66	
Little Rocky Creek	F-8	Brown trout	-	II	-	29	-	1	11	
			III and older	III and older	104	50	34	5	46	30
Stillwater River	F-2	Brown trout	II	II	91	174	12	12	32	27
			III	III	124	81	29	25	42	34
			IV and older	IV and older	142	115	21	14	66	62
Silver Creek	F7	Brown trout		I	-	202	-	36	-	59
			II	II and older	82	220	13	72	18	≈100
			III		50		13		70	
Picket Pin Creek	F-16	Brook trout	II	and older	77		31		54	
		Brown trout	II		16		11		65	
			III		34		15		70	
			IV and older		37		5		50	
		Cutthroat trout	II		15		13		≈100	
			III and older		20		17		86	
West fork Stillwater River	F-17	Rainbow trout		II		106		43		85
				III		43		27		83
				IV and older		87		19		91
		Brown trout		II		15		8		58
				III and older		22		8		80
East Boulder River	F-13	Rainbow trout	III		55		26		91	
			IV		115		93		81	
			V and older		44		13		41	
		Brown trout	IV		24		16		92	
			V and older		13		12		92	

a- Stability, as used here, indicates the percentage of fish present in the stream section in year X that remained in the section in year X+1, with mortality calculations for that period considered.

Table 21 continued. Number of fish marked in 1972 or 1973, number of recaptures one year later, and stability[a] of fish populations in stream sections.

Stream	Section code	Species	Age 1973	Age 1974	Number marked 1972	Number marked 1973	Recaptures of fish marked one year previous 1973	Recaptures of fish marked one year previous 1974	Stability (percent) 1973	Stability (percent) 1974
Boulder River	F-4	Rainbow trout	II		27		1		8	
			III	III	25	17	5	1	24	20
			IV and older	IV and older	61	164	7	31	24	43
		Brook trout	I	-	185	-	10	-	23	-
			II	-	274	-	9	-	12	-
			III	-	52	-	1	-	8	-

a- Stability, as used here, indicates the percentage of fish present in the stream section in year X that remained in the section in year X+1, with mortality calculations for that period considered.

Table 22. Concentration (Mg/gram wet weight) of metals in fish muscle tissue.

Species[a]	Length (inches)	Weight (pounds)	Mercury	Copper	Nickel	Cadmium	Lead
			Fishtail Creek-Section F-11 - July 1972				
Rb[b]	4-5	-	<0.05	0.4	2.4	0.1	<1
Rb	6.5	0.10	<0.05	0.4	3.5	0.2	<1
Rb	6.5	0.14	<0.05	0.2	1.0	<0.1	<1
Rb	6.8	0.12	<0.05	0.2	1.0	0.1	<1
Rb	8.0	0.20	<0.05	0.2	<0.5	<0.1	<1
Rb	8.0	0.19	<0.05	-	<0.5	<0.1	<1
Rb	9.6	0.32	<0.05	0.1	1.5	<0.1	<1
Rb	10.0	0.38	<0.05	0.2	1.0	0.1	<1
Rb	11.8	0.65	<0.05	0.1	1.0	0.1	<1
Rb	13.0	0.78	<0.05	0.4	<0.5	<0.1	<1
LL[b]	4-5	-	<0.05	0.1	<0.5	<0.1	<1
LL[b]	4-5	-	<0.05	0.2	1.0	0.2	<1
LL	6.5	0.10	<0.05	0.1	1.0	0.2	-
LL	6.6	0.10	<0.05	0.2	1.0	<0.1	<1
LL	7.0	0.11	<0.05	0.4	1.5	0.2	<1
LL	7.4	0.16	<0.05	-	<0.5	0.1	<1
LL	8.8	0.22	<0.05	0.2	<0.5	0.2	<1
LL	9.3	0.32	<0.05	0.3	<0.5	<0.1	<1
LL	9.7	0.34	<0.05	0.1	1.0	<0.1	<1
LL	9.9	0.38	-	0.2	<0.5	<0.1	<1
LL	12.0	0.64	-	0.4	<0.5	<0.1	<1
LL	12.2	0.72	<0.05	0.2	<0.5	<0.1	<1
LL	12.5	0.80	<0.05	0.1	<0.5	<0.1	<1
LL	15.3	1.47	<0.05	0.1	<0.5	0.1	<1
Eb	7.5	0.20	<0.05	0.1	<0.5	<0.1	<1
Eb	7.7	0.20	<0.05	<0.1	<0.5	0.1	<1
Eb	10.7	0.50	<0.05	0.5	1.0	0.2	<1
Wf	15.0	1.30	<0.05	0.1	<0.5	<0.1	<1
			Stillwater River-Section F-1 - May 1972				
Rb[b]	<5.0	-	<0.05	<0.5	<0.5	0.2	<1
Rb	7.4	0.12	<0.05	0.5	1.5	0.2	<1
Rb	7.8	0.14	<0.05	0.5	1.0	0.1	<1
Rb	7.8	-	<0.05	<0.5	1.0	0.1	<1
Rb	11.1	0.51	0.15	<0.5	0.5	0.6	<1
Rb	13.3	0.81	0.45	<0.5	0.5	0.6	<1
LL	6.8	0.11	<0.05	<0.5	<0.5	0.2	<1
LL	7.1	0.13	<0.05	<0.5	0.5	0.2	<1
LL	8.1	0.21	<0.05	0.6	<0.5	0.5	<1
LL	13.3	0.64	0.20	<0.5	<0.5	0.5	<1
LL	13.5	0.86	<0.05	0.5	3.5	<0.1	<1

a- Abbreviations are: Rb=Rainbow Trout; Eb=Brook Trout; LL=Brown Trout; Wf=Mountain Whitefish

b- Composite of several fish

Table 22 continued. Concentration (Mg/gram wet weight) of metals in fish muscle tissue.

Species[a]	Length (inches)	Weight (pounds)	Mercury	Copper	Nickel	Cadmium	Lead	Zinc
			Stillwater River-Section F-2 - April, 1972					
Rb[b]	<6.0	-	<0.05	1.1	1.6	0.6	<2	28
Rb	7.5	0.15	<0.05	<0.5	4.2	<0.5	<2	9.0
Rb	9.0	0.28	<0.05	0.9	1.4	<0.5	<2	9.5
Rb	9.1	0.30	<0.05	0.9	2.4	0.6	<2	7.5
Rb	9.7	0.38	<0.05	0.7	1.6	0.6	<2	5.0
Rb	10.6	0.40	<0.05	1.1	2.6	0.7	<2	12
Rb	12.5	0.60	<0.05	<0.5	2.0	1.0	<2	4.5
Rb	14.8	1.00	<0.05	0.9	<1.0	<0.5	<2	7.5
Rb	15.3	1.22	<0.05	1.0	1.6	1.0	<2	7.0
Rb	15.4	1.30	<0.05	<0.5	<1.0	0.6	<2	4.5
Rb	17.4	2.16	<0.05	1.4	<1.0	<0.5	<2	7.0
Eb[b]	<6.0	-	<0.05	0.6	<1.0	<0.5	<2	13
Eb	6.3	0.12	<0.05	<0.5	1.4	<0.5	<2	7.0
Eb	6.4	0.08	<0.05	0.8	2.0	0.6	<2	16
Eb	6.8	0.09	<0.05	0.7	<1.0	<0.5	<2	13
Eb	7.1	0.10	<0.05	1.5	1.0	<0.5	<2	15
Eb	8.5	0.18	<0.05	0.6	1.8	<0.5	<2	8.5
Eb	8.8	0.25	<0.05	0.7	1.4	0.6	<2	14
Eb	9.3	0.26	<0.05	0.7	3.4	<0.5	<2	4.5
Eb	11.1	0.40	<0.05	<0.5	2.8	<0.5	<2	16
LL[b]	<6.0	-	<0.05	1.3	1.2	0.8	<2	10
LL	6.4	0.13	<0.05	1.3	1.1	<0.5	<2	17
LL	6.4	0.08	<0.05	0.6	<1.0	<0.5	<2	12
LL	7.8	0.20	<0.05	0.6	<1.0	<0.5	<2	5.5
LL	7.8	0.18	<0.05	1.4	1.2	<0.5	<2	16
LL	10.3	0.34	<0.05	<0.5	3.5	0.6	<2	14
LL	10.3	0.35	<0.05	<0.5	4.0	0.6	<2	8.0
LL	10.8	0.44	<0.05	0.6	1.1	<0.5	<2	4.5
LL	12.9	0.71	<0.05	<0.5	2.8	1.0	<2	16
LL	15.5	1.30	<0.05	0.7	1.3	<0.5	<2	4.0
LL	15.6	1.05	<0.05	0.9	<1.0	0.6	3	7.5
LL	15.7	1.22	<0.05	0.7	1.1	<0.5	<2	4.0
LL	15.7	1.28	<0.05	1.2	<1.0	0.6	<2	22

a- Abbreviations are: Rb=Rainbow Trout; Eb=Brook Trout; LL=Brown Trout; Wf=Mountain Whitefish

b- Composite of several fish

Table 22 continued. Concentration (Mg/gram wet weight) of metals in fish muscle tissue.

Species[a]	Length (inches)	Weight (pounds)	Mercury	Copper	Nickel	Cadmium	Lead
			Stillwater River- Section F-1 (con'd)				
Eb[b]	<5.0	-	<0.05	<0.5	0.5	0.2	<1
Eb	6.6	0.10	0.4	<0.5	<0.5	0.5	<1
Eb	7.3	0.12	<0.05	<0.5	0.5	0.2	<1
Eb	7.8	0.14	<0.05	-	-	-	-
Eb	8.3	0.18	<0.05	3.4	1.0	0.3	<1
Eb	8.5	0.21	<0.05	<0.5	<0.5	0.3	<1
Eb	8.6	0.20	<0.05	-	1.0	-	<1
Wf[b]	<6.0	-	<0.05	<0.5	0.5	0.3	<1
Wf	9.8	0.40	<0.05	0.5	0.5	0.6	<1
Wf	10.1	0.34	<0.05	0.6	1.0	0.5	<1
Wf	10.9	0.40	<0.05	<0.5	<0.5	0.5	<1
Wf	11.3	0.38	<0.05	0.8	1.5	0.1	<1
Wf	12.6	0.59	<0.05	<0.5	0.5	0.9	-
Wf	13.7	0.68	<0.05	0.7	0.5	0.3	<1
Wf	13.7	0.70	<0.05	<0.5	1.5	0.7	<1
			Boulder River-Section F-4 - April, 1972				
Rb[b]	5.0	-	<0.05	0.5	0.5	0.3	<1
Rb	5.6	0.05	0.11	0.5	<0.5	0.7	1.5
Rb	7.0	0.15	<0.05	0.5	0.5	0.2	<1
Rb	7.1	0.15	<0.05	0.5	1.0	0.5	<1
Rb	8.3	0.21	<0.05	<0.5	1.0	0.3	<1
Rb	8.7	0.23	<0.05	<0.5	<0.5	0.1	<1
Rb	8.7	0.22	<0.05	<0.5	0.5	0.2	<1
Rb	12.4	0.72	<0.05	<0.5	<0.5	0.3	<1
Rb	13.4	0.88	<0.05	<0.5	0.5	0.2	<1
Rb	15.4	1.35	<0.05	-	-	-	-
Rb	17.5	2.05	<0.05	0.5	1.0	0.5	1
Rb	17.7	1.96	<0.05	<0.5	<0.5	0.1	<1
Rb	18.0	1.80	<0.05	<0.5	<0.5	<0.1	<1
Rb	21.6	3.18	<0.05	<0.5	<0.5	0.1	<1
Eb[b]	<5.0	-	<0.05	0.5	<0.5	0.3	<1
Eb	5.8	.07	0.05	<0.5	<0.5	0.1	<1
Eb	6.0	.07	<0.05	<0.5	<0.5	-	<1
Eb	6.1	.08	<0.05	<0.5	<0.5	<0.1	<1
Eb	7.6	.13	<0.05	<0.5	<0.5	<0.1	<1
Eb	8.1	.14	<0.05	<0.5	<0.5	<0.1	<1
Eb	8.7	.19	<0.05	<0.5	<0.5	0.1	<1
Eb	9.2	.22	<0.05	<0.5	0.5	0.4	1
Eb	9.8	.30	<0.05	<0.5	<0.5	<0.1	<1

a- Abbreviations are; Rb=Rainbow Trout: Eb=Brook Trout; LL=Brown Trout; Wf=Mountain Whitefish.

b- Composite of several fish.

Table 23. Percentage survival to hatching of eyed cutthroat (1972) and eyed rainbow (1973,1974) trout eggs placed in artificial redds.

Station number	Date eggs placed in redds	Date eggs removed from redds	Percentage survival in egg containers 1	2	3	Mean Survival
East Rosebud River						
001	4-20-72	5-15-72	51	39	33	41
001	9-19-73	10-04-73	96	91	81	89
028	4-20-72	5-15-72	43	-	-	-
028	9-19-73	10-03-73	80	98	73	84
West Rosebud River						
003	4-20-72	5-15-72	27	34	34	32
003	9-19-73	10-04-73	84	76	79	80
004	4-20-72	5-15-72	69	63	62	65
004	9-19-73	10-03-73	97	90	89	92
Stillwater River						
005	4-19-72	5-16-72	42	47	51	47
005	9-19-73	10-03-73	92	88	89	90
005	9-14-74	10-05-74	91	94	93	93
006	4-19-72	5-16-72	7	-	-	-
006	9-19-73	10-03-73	85	86	89	87
006	9-14-74	10-03-74	85	90	96	90
West Fork Stillwater River						
037	9-14-74	10-18-74	87	89	92	89
007	4-19-72	5-16-72	50	59	51	53
007	9-19-73	10-11-73	66	85	78	76
007	9-14-74	10-10-74	81	74	81	79
036	9-14-74	10-03-74	82	87	70	80
East Boulder River						
038	9-14-74	10-23-74	83	57	61	67
061	9-13-74	10-17-74	73	68	57	66
008	4-19-72	5-17-72	40	-	-	-
008	9-18-73	10-08-73	66	78	85	76
008	9-13-74	10-14-74	82	86	75	81
Boulder River						
010	9-18-73	10-05-73	79	70	75	75
010	9-13-74	10-09-74	85	84	81	83
011	9-18-73	10-12-73	90	73	81	81
011	9-13-74	10-14-74	87	81	78	82

water temperatures below 40° F were observed, although they probably occurred for short periods.

In 1974 max-min thermometers were used at some of the stations during egg incubation. Also, eggs were placed at some higher elevation stations that were not used in 1973. For 1974 at two stations where minimum temperatures did not go below 40° F, survival averaged 91.5 percent. For three stations where a minimum temperature of 36° F was recorded survival averaged 81 percent. For one station where the minimum temperature was 32° survival was 67 percent. In conclusion, temperatures above 39° F seemed quite important to survival to hatching.

Effect of egg transport from hatchery to artificial redds was negligible. Over 96 percent of control eggs, transported to the field but subsequently returned to the hatchery for incubation, survived to hatching all three years.

Eggs in 1974 required several more days of incubation in artificial redds to reach hatching than did eggs in 1973. This was due to the fact that 1974 eggs were taken from the hatchery immediately after reaching the eyed stage, while those in 1973 were not placed in artificial redds until three or four days after eyeing.

In 1972 spring runoff began the last few days that eggs were in redds. This caused complete loss of eggs and fry at stations 010 and 011, and partial loss at stations 006, 008, and 028. In 1973 the small numbers of eggs (10 or 20) used in vials was not sufficient to indicate complete hatching of eggs in screen containers. Consequently, although all eggs had hatched in vials, some screen containers were removed from redds before all eggs had hatched. Had these eggs been left in redds until hatching, average survival at stations 005, 008, and 010 would have been 3 percent, 8 percent, and 6 percent higher, respectively, than shown in Table 18. This problem was largely solved in 1974 by leaving screen containers in redds for two or three days after all eggs were hatched in vials.

Fish Stomach Contents

Approximately 12 fish stomachs per stream section were examined from sections of the Stillwater, Boulder and East Boulder Rivers. This analysis was made to determine organisms which may be of special importance as fish food. A wide variety of organisms was found in stomachs. No particular bottom fauna species appeared to be of great significance as fish food. In stomachs containing several organisms two or more species were always present. Many more fish stomachs would have to be examined to reach any firm conclusion concerning fish foods.

Stillwater River Headwaters Area

On July 27, 1972 cutthroat trout spawners were sampled with a seine in the inlet stream to Goose Lake (Figure 1). This stream is approximately 1000 feet long and connects Goose Lake with Little Goose Lake. Eighty fish were captured. This number appeared to be about half the fish present in the stream on that day. Fish ranged in length from 6.9 to 16.2 inches and from 0.11 to 1.35 pounds. Most females were ripe and some were spawned out. Scales were collected, but could not be aged with any confidence because scale circuli did not form recognizable annuli in many instances.

Redds in the inlet stream were sampled on September 6, 1972. All live eggs had hatched but fry were still in the gravel. No redds were found in the lower half of the stream. Drainage from a pit dug on an adjacent mining claim had contributed silt to the lower portion of the stream, but fine material was also present in gravels in the upper portion. A total of 1168 dead eggs and live sac fry were removed from three redds. Overall survival to hatching was 54 percent and varied from 1 percent to 84 percent for the three redds. No reason for the large variability in survival was apparent.

Acidic mine drainage originates from Daisy Pass area (FIgure 1). Water from many seeps and springs in the disturbed area has pH values of approximately 2.5 to 4.0, with some concentrations of over one hundred milligrams per liter of metals such as aluminum, copper, iron, and zinc (unpublished data, Custer National Forest, U. S. Forest Service). Little or no data was available, however, on affects of acid drainage on the upper Stillwater River.

Results of work done in this area in August 1972 are shown in Table 19. The pH had reached 5.6 at the mouth of the unnamed creek (here called Daisy Creek) which drains the area disturbed by mining activities. Values of pH in the Stillwater downstream from this point were above 8.0 (Table 19). Metal concentrations had dropped to values probably not accutely toxic to organisms at a distance of 0.4 stream miles below Daisy Creek.

Bottom fauna is depressed severely for at least 1.5 miles below the mouth of Daisy Creek. The population recovers below the confluence of Goose Creek and the Stillwater River (Table 24). Iron precipitate and other metals in the stream are the apparent causes of depressed bottom fauna populations.

Fish were not found in the Stillwater River upstream from the acid drainage, nor in Goose Creek before it empties into the Stillwater River. This apparent lack of fish cannot be explained. The only fish captured in this area of the Stillwater was 6.5 stream miles below the mouth of Daisy Creek (Table 24). Fish may be present farther up the Stillwater River, but numbers are probably extremely low. Fish may not survive in many streams in this area because of the high elevation, severe winter conditions, and unknown put possibly very low water flow rates in winter.

RECOMMENDATIONS

General chemical and biological survey work over the whole mining claims complex is largely completed. Recent developments by the Johns-Manville Company, including a 3,000 feet exploration adit on the West Fork Stillwater River and their purchase of a near-by ranch,which could ultimately serve as a mill and tailings pond location, indicate that work in 1975/1976 should center on the West Fork Stillwater River and its tributaries passing through the ranch.

This work should include detailed sampling at less widely separated stations than have been used in the past. Chemical factors to be measured should include major ions, dissolved and suspended metals, pH, turbidity, suspended solids, dissolved oxygen, and metals in stream sediments. Biological work should include fish population estimates, macroinvertebrate sampling, metals analysis of fish tissue and egg bioassays. Any work needed to make recommendations for minimum flows to protect aquatic life should also be done. A few max-min thermometer stations should be established and read weekly.

New mining claims were established in 1974. Some of these claims are on drainages where no work has been done. A minimum amount of work should be done on these streams to complete the general chemical-biological survey of the mining claims complex.

Additional identification of stream macroinvertebrates should be done.

Table 24. Summary of physical, chemical, and biological conditions in the Stillwater River downstream from the Daisy Pass headwaters area, 1972.

Distance from mouth of acid stream	pH	Cu (mg/liter)	Mn (mg/liter)	Zn (mg/liter)	Condition of stream bottom	Bottom fauna	Fish
50 feet upstream	8.5	--	--	--	Clean gravel	Plentiful, diverse	None captured
150 feet downstream	8.1	--	--	--	Heavy iron precipitate	Few present; probably maintained by drift from upstream; obviously depressed	None captured
0.4 miles downstream	8.4	0.05[a]	0.16[a]	0.02[a]	Iron precipitate	Very few present; obviously depressed	None captured
1.5 miles downstream	8.5	--	--	--	Iron precipitate	Few present; mostly diptera; obviously affected	None captured
2.7 miles downstream above Goose Creek	8.5	0.07	0.06	0.015	Iron precipitate	Recovering; diptera still dominant	None captured
below Goose Creek	8.4	0.02	0.02	0.015	Faint iron precipitate	Present, largely recovered; numbers low, but diverse forms present	None captured
6.5 miles downstream	--	--	--	--	--	--	One Brook trout captured by hook and line
8.5 miles downstream	--	--	--	--	--	--	Several fish seen in river

a- unpublished data - Custer National Forest, U. S. Forest Service.

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Appendix A. Number and volume (in parentheses) of macroinvertebrates collected in one square foot stream bottom samples for stations on larger streams, 1970-74.

Date	Plecoptera	Tricoptera	Ephemeroptera	Diptera	Coleoptera	Annelida	Other[a]	Total
			East Rosebud River-Station 001					
08-70	46	17	93	29	0	0	0	185
04-71	66(.5)	2 (T)[b]	143(.2)	7 (T)	0	0	0	218 (.7)
10-71	39(.2)	1 (T)	132(.5)	9 (.1)	0	0	1(T)	182 (.8)
10-71	8(.4)	8(.2)	43(.1)	1 (T)	0	0	0	60 (.7)
10-71	72(.2)	3(.1)	141(.6)	4 (T)	0	0	0	220 (.9)
05-72	11 (T)	2 (T)	81(.3)	12 (.1)	0	0	3(T)	109 (.4)
05-72	15 (T)	1 (T)	27(.1)	7 (.3)	0	0	5(T)	55 (.4)
05-72	3 (T)	2 (T)	22(.1)	8 (.2)	0	0	2(T)	37 (.3)
08-72	20(.2)	3 (T)	94(.2)	6 (T)	0	0	0	123 (.4)
08-72	21(.3)	9(.2)	105(.2)	18 (.3)	0	0	0	153(1.0)
08-72	55(.3)	20(.1)	190(.1)	32 (.1)	0	62(T)	0	359 (.6)
02-73	83(.4)	24(.2)	297(.9)	38(1.4)	0	0	2(T)	444(2.9)
02-73	102(.6)	18(.2)	377(.6)	28 (T)	4(T)	2(T)	0	531(1.4)
02-73	52(.1)	4(.1)	260(.8)	13 (T)	2(T)	0	0	331(1.0)
05-73	34(.1)	11 (T)	139(.4)	26 (.2)	2(T)	0	1(T)	213 (.7)
05-73	57(.2)	4 (T)	198(.8)	22 (.1)	1(T)	0	4(T)	286(1.1)
05-73	59(.5)	2(.1)	228(.9)	19 (.7)	0	0	8(T)	316(2.2)
07-73	18 (T)	4 (T)	53(.3)	6 (T)	0	0	0	81 (.3)
07-73	29(.4)	22 (T)	64(.7)	18 (.1)	0	0	2(T)	135(1.2)
07-73	53(.1)	11 (T)	103(.6)	17 (T)	0	0	0	184 (.7)
10-73	26(.1)	0	122(.2)	10 (T)	0	0	3(T)	161 (.3)
10-73	61(.1)	3 (T)	188(.2)	24 (.8)	0	0	2(T)	278(1.1)
10-73	33(.1)	6(.1)	161(.2)	22 (.2)	0	0	0	222(0.6)
			East Rosebud River-Station 049					
08-70	47	0	95	17	0	0	0	159
04-71	23(.3)	57(.2)	149(.5)	12 (T)	2(T)	0	0	243(1.0)
10-71	5(.1)	16 (T)	83(.2)	5 (T)	0	0	0	109 (.3)
10-71	9(.2)	10 (T)	189(.5)	1 (T)	2(T)	0	1(T)	212 (.7)
10-71	18(.5)	12(.1)	106(.3)	6 (T)	0	0	1(T)	143 (.9)

a-Includes Hydracarina, Hemiptera, Nematoda, and Turbellaria.
b-Trace.

Appendix A. (continued) Number and volume (in parentheses) of macroinvertebrates collected in one square foot stream bottom samples for stations on larger streams, 1970-74.

Date	Plecoptera	Trichoptera	Ephemeroptera	Diptera	Coleoptera	Annelida	Other[a]	Total
			East Rosebud River-Station 028					
02-72	20(.2)	100 (.7)	187 (.7)	39 (.2)	2 (T)	9 (T)	0	357(1.8)
02-72	30(.1)	92(1.0)	172(2.0)	11 (.2)	1 (T)	10 (T)	1(T)	317(3.3)
02-72	6 (T)	33 (.5)	191 (.4)	2 (T)	0	1 (T)	0	233 (.9)
05-72	3 (T)	12 (.1)	78 (.2)	3 (T)	1 (T)	0	0	97 (.3)
05-72	0	103 (.1)	26 (.1)	5 (T)	4 (T)	1 (T)	1(T)	140 (.2)
05-72	14(.1)	17 (.1)	71 (.6)	3 (T)	0	1 (T)	0	106 (.8)
08-72	12(.1)	17 (.2)	90 (.2)	18 (T)	1 (T)	0	0	138 (.5)
08-72	3 (T)	5 (T)	32 (T)	28 (.1)	1 (T)	8 (T)	0	77 (.1)
08-72	1 (T)	8 (T)	43 (.1)	9 (T)	1 (T)	2 (T)	1(T)	65 (.1)
02-73	26(.4)	98(1.2)	286(1.4)	12 (.2)	4 (T)	47 (T)	0	473(3.2)
02-73	19(.2)	104 (.4)	239(1.3)	14 (.2)	1 (T)	42 (T)	0	419(2.1)
02-73	28(.1)	136(1.8)	212(1.3)	37 (.6)	2 (T)	62 (T)	0	477(3.8)
			East Rosebud River-Station 046					
10-71	17(.1)	62 (.2)	87 (.3)	10 (.1)	8 (T)	0	26(T)	210 (.7)
10-71	14(.3)	67 (.7)	94 (.2)	17 (.2)	10 (T)	0	35(T)	237(1.4)
10-71	25(.2)	99(1.1)	137 (.5)	16 (.2)	8 (T)	0	29(T)	314(2.0)
02-72	13(.1)	25 (.1)	86 (.5)	2 (.1)	0	0	0	126 (.8)
02-72	28(.1)	50 (.2)	272(1.1)	2 (T)	0	0	0	352(1.4)
02-72	14 (T)	71 (.3)	229 (.7)	1 (T)	0	0	0	315(1.0)
05-72	6(.4)	159 (.5)	141 (.5)	5 (T)	2 (T)	4(.8)	0	317(2.2)
05-72	8 (T)	92 (.1)	44 (.4)	17 (.1)	2 (T)	15 (T)	0	178 (.6)
05-72	12(.1)	36 (.3)	169 (.6)	8 (T)	1 (T)	0	0	226(1.0)
08-72	4 (T)	23 (.1)	76 (T)	46 (T)	1 (T)	3 (T)	0	153 (.1)
08-72	17 (T)	56 (.2)	153 (T)	61 (.1)	1 (T)	6 (T)	0	294 (.3)
08-72	23 (T)	30 (.1)	136 (.1)	28 (.2)	6 (T)	2 (T)	2(T)	227 (.4)
02-73	36(.2)	48 (.2)	205(1.0)	20 (.8)	0	37 (T)	1(T)	347(2.2)
02-73	9 (T)	15 (.1)	195 (.8)	52(1.7)	0	0	0	271(2.6)
02-73	25(.4)	45 (.3)	134 (.7)	46(1.3)	1 (T)	9 (T)	3(T)	263(2.7)
05-73	5(.1)	87 (.7)	74 (.3)	43 (.2)	1 (T)	148 (T)	0	358(1.3)
05-73	7(.1)	90 (T)	146 (.2)	30 (.1)	7 (T)	278(.1)	0	558 (.5)
05-73	24(.4)	32 (T)	84 (.2)	21 (.1)	5 (T)	28 (T)	0	194 (.7)
08-73	8 (T)	19 (.1)	63 (.1)	47 (T)	0	1 (T)	0	138 (.2)
08-73	7 (T)	21 (.1)	95 (.2)	62 (.1)	4 (T)	21 (T)	0	210 (.4)
08-73	18(.4)	95 (.5)	148(1.4)	59 (.2)	7(.1)	19 (T)	0	346(2.6)
10-73	34(.1)	177 (.7)	154 (.1)	21 (.7)	7 (T)	158 (T)	2(T)	553(1.6)
10-73	38(.4)	145 (.6)	182 (.1)	18 (.1)	3 (T)	153(.1)	2(T)	541(1.3)
10-73	33(.1)	72 (.1)	130 (.1)	20 (.1)	15 (T)	113 (T)	1(T)	384 (.4)

a-Includes Hydracarina, Hemiptera, Nematoda, and Turbellaria.

Appendix A. (continued) Number and volume (in parentheses) of macroinvertebrates collected in one square foot stream bottom samples for stations on larger streams, 1970-74.

Date	Plecoptera	Tricoptera	Ephemeroptera	Diptera	Coleoptera	Annelida	Other[a]	Total
				West Rosebud River-Station 003				
08-70	50	3	102	31	4	5	2	197
04-71	18(.1)	17 (.3)	103(.3)	13 (T)	2 (T)	0	63(T)	216 (.7)
10-71	37(.1)	8 (.1)	106(.3)	4 (T)	3 (T)	18 (T)	0	176 (.5)
10-71	59(.4)	16 (.1)	260(.2)	9 (.1)	5 (T)	71 (T)	0	420 (.8)
10-71	62(.3)	27 (.2)	249(.3)	5 (.1)	1(.1)	15 (T)	0	359(1.0)
02-72	60(.7)	41 (.7)	288(.7)	15 (T)	4(.1)	20 (T)	4(T)	432(2.2)
02-72	155(.3)	32 (.4)	400(.8)	49 (.1)	7 (T)	54 (T)	0	697(1.6)
02-72	24(.2)	23 (.3)	350(.6)	4 (.1)	5 (T)	3 (T)	0	409(1.2)
05-72	8 (T)	11 (T)	55(.1)	23 (.1)	13 (T)	98 (T)	0	208 (.2)
05-72	20(.1)	10 (T)	146(.3)	24 (.4)	0	26 (T)	0	226 (.8)
05-72	19(.1)	10 (T)	110(.6)	18 (.1)	8 (T)	116 (T)	0	281 (.8)
08-72	94(.1)	2 (T)	59 (T)	16 (.6)	3 (T)	91 (T)	0	265 (.7)
08-72	28(.1)	1 (.1)	86(.1)	5 (T)	0	1 (T)	0	121 (.3)
08-72	60(.2)	5 (T)	162(.1)	6 (.1)	0	95(.1)	0	328 (.5)
02-73	33(.1)	14 (.2)	87(.3)	8 (.1)	5 (T)	21 (T)	0	168 (.7)
02-73	41(.3)	14 (.2)	152(.5)	37 (.4)	14 (T)	90 (T)	0	348(1.4)
02-73	163(1.1)	66(1.7)	577(1.9)	46 (.2)	10(.1)	149 (T)	0	1011(5.0)
05-73	17(.2)	20 (.3)	89(.4)	18 (T)	2 (T)	50 (T)	5(T)	201 (.9)
05-73	99(1.4)	95(3.2)	311(.6)	45 (.2)	7 (T)	61 (T)	0	618(5.4)
05-73	36(.4)	62(1.2)	136(.8)	32 (T)	6 (T)	33 (T)	3(T)	308(2.4)
07-73	40(.5)	6 (T)	111(.2)	11 (.2)	6 (T)	19 (T)	0	193 (.9)
07-73	23(.1)	2 (T)	29(.2)	6 (T)	1 (T)	13 (T)	1(T)	75 (.3)
07-73	26(.3)	2 (T)	57(.6)	9 (.1)	4 (T)	66 (T)	0	164(1.0)
10-73	70(.1)	49 (.5)	201(.2)	4 (.2)	5 (T)	32 (T)	0	361(1.0)
10-73	110(1.1)	38 (.4)	207(.1)	16 (.3)	3 (T)	48 (T)	4(T)	426(1.9)
10-73	112(.3)	60 (.3)	135(.1)	9 (.1)	7(.1)	45 (T)	1(T)	369 (.9)

Appendix A. (continued) Number and volume (in parentheses) of macroinvertebrates collected in one square foot stream bottom samples for stations on larger streams, 1970-74.

Date	Plecoptera	Tricoptera	Ephemeroptera	Diptera	Coleoptera	Annelida	Other[a]	Total
				West Rosebud River-Station 004				
08-70	28	64	62	49	4	16	1	224
04-71	39(.4)	123(1.0)	219 (.7)	6 (T)	4 (T)	0	62(T)	453(1.2)
10-71	6(.1)	12 (.1)	48 (.1)	3 (T)	1 (T)	11 (T)	0	81 (.3)
10-71	7 (T)	14 (.1)	36 (.1)	5 (T)	0	4 (T)	0	66 (.2)
10-71	34 (T)	20 (.2)	97 (.2)	10(.1)	3(.1)	9 (T)	0	173 (.6)
02-72	14(.1)	23 (.1)	162 (.5)	2 (T)	4 (T)	29 (T)	0	234 (.7)
02-72	18(.1)	28 (.2)	107 (.5)	2 (T)	2 (T)	25 (T)	0	182 (.8)
02-72	16(.2)	108 (.5)	214 (.8)	2(.1)	1 (T)	11 (T)	0	352(1.6)
05-72	4 (T)	6 (.1)	14 (.1)	11(.1)	1 (T)	35 (T)	1(T)	72 (.3)
05-72	7 (T)	5 (.1)	45 (.3)	20(.2)	0	19(.5)	0	96(1.2)
05-72	5 (T)	8 (T)	12 (.1)	17(.4)	1 (T)	52 (T)	2(T)	97 (.5)
08-72	21 (T)	1 (T)	30 (T)	6 (T)	4 (T)	71 (T)	0	133 (.1)
08-72	17 (T)	3 (T)	38 (T)	7 (T)	1 (T)	102 (T)	0	168 (T)
08-72	16 (T)	7 (.1)	21 (.1)	6(.1)	1 (T)	75 (T)	0	126 (.3)
02-73	22 (T)	43 (.1)	107 (.4)	5(.1)	0	31 (T)	1(T)	209 (.6)
02-73	50(.1)	35 (.1)	266 (.9)	3 (T)	2 (T)	20 (T)	0	376(1.1)
02-73	14 (T)	54 (.1)	34 (.2)	5(.3)	0	17 (T)	0	124 (.6)
05-73	10(.2)	45 (.6)	137 (.3)	11(.1)	8 (T)	106 (T)	0	317(1.2)
05-73	40(.1)	162 (.2)	151 (.7)	9(.4)	2 (T)	259(.1)	4(T)	627(1.5)
05-73	40 (T)	57 (.1)	182 (.6)	18(.1)	2 (T)	241 (T)	2(T)	542 (.8)
08-73	4 (T)	3 (T)	13 (.1)	5 (T)	0	23 (T)	2(T)	50 (.1)
08-73	3 (T)	6 (T)	9 (.1)	9(.1)	3 (T)	1 (T)	0	31 (.2)
08-73	8 (T)	16 (.1)	18 (.1)	8(.1)	2 (T)	2 (T)	0	54 (.3)
10-73	12 (T)	62 (.2)	164 (.2)	16(.2)	2 (T)	81(.1)	3(T)	340 (.7)
10-73	12(.1)	37 (.1)	91 (.2)	7 (T)	4 (T)	15 (T)	1(T)	167 (.4)
10-73	10(.1)	28 (.1)	117 (.2)	1 (T)	3 (T)	29 (T)	2(T)	190 (.4)

Appendix A. Continued. Number and volume (in parentheses)of macroinvertebrates collected in one square foot stream bottom samples for stations on larger streams, 1970-74.

Date	Plecoptera	Tricoptera	Ephemeroptera	Diptera	Coleoptera	Annelida	Other[a]	Total
				West Rosebud River-Station 029				
08-70	5	18	127	59	10	0	0	219
04-71	29(.1)	53 (.3)	190 (.4)	22 (T)	11 (T)	1 (T)	44(T)	350 (.8)
10-71	52(.4)	76(2.0)	167 (.7)	43 (.1)	5 (T)	41 (T)	0	384(3.2)
10-71	27(.3)	101 (.4)	134 (.3)	38 (T)	7 (T)	35 (T)	0	342(1.0)
10-71	43(.2)	57 (.5)	172 (.4)	29 (.1)	6 (T)	51 (T)	0	358(1.2)
02-72	27(.2)	152(1.1)	117 (.4)	5 (.1)	2 (T)	7 (T)	0	310(1.8)
02-72	25 (T)	59 (.5)	76 (.2)	19 (T)	3 (T)	13 (T)	1(T)	196 (.7)
02-72	24(.4)	82 (.2)	98 (.5)	20 (.1)	7 (T)	1 (T)	1(T)	233(1.2)
05-72	18(.5)	192(1.0)	96(1.0)	34 (.1)	10 (T)	77 (T)	1(T)	428(2.6)
05-72	21(.3)	82 (.6)	123 (.2)	39 (.2)	13(.1)	52(.1)	0	330(1.5)
05-72	5(.3)	108 (.5)	22 (.3)	22 (.1)	19 (T)	9 (T)	3(T)	188(1.2)
08-72	20(.5)	94 (.2)	290 (.2)	66 (T)	12 (T)	49 (T)	0	531 (.9)
08-72	1 (T)	9 (T)	57 (T)	21 (T)	11 (T)	42 (T)	3(T)	144 (T)
08-72	32 (T)	29 (.1)	150 (.1)	46 (T)	21 (T)	164 (T)	3(T)	445 (.2)
02-73	12 (T)	22 (T)	80 (.6)	10 (T)	5 (T)	16 (T)	0	145 (.6)
02-73	8 (T)	28 (.4)	51 (.3)	32 (.2)	0	5 (T)	0	124 (.9)
02-73	21(.3)	18 (.2)	43 (.2)	16 (T)	1 (T)	9 (T)	1(T)	109 (.7)
05-73	14(.1)	17 (.1)	53 (.1)	64 (.7)	5 (T)	141 (T)	1(T)	295(1.0)
05-73	6 (T)	15 (.1)	109 (.2)	105 (.1)	5 (T)	74(.1)	0	314 (.5)
05-73	21(.2)	49 (.1)	186 (.3)	82 (.1)	6 (T)	102(.1)	0	446 (.8)
08-73	8 (T)	15 (.2)	131 (.2)	36 (.2)	7(.1)	14 (T)	0	211 (.7)
08-73	5 (T)	23 (.2)	49 (.1)	35 (T)	3 (T)	6 (T)	1(T)	122 (.3)
08-73	10 (T)	32 (.1)	174(1.1)	66 (.1)	3 (T)	14 (T)	1(T)	300(1.3)
10-73	9 (T)	87 (.8)	118 (.2)	17 (.1)	6 (T)	10 (T)	0	247(1.1)
10-73	34(.3)	58 (.4)	153 (.1)	23 (T)	5 (T)	5 (T)	0	278 (.8)
10-73	6 (T)	67 (.1)	87 (.1)	51 (.1)	11 (T)	4 (T)	0	226 (.3)

Appendix A. Continued. Number and volume (in parentheses) of macroinvertebrates collected in one square foot stream bottom samples for stations on larger streams, 1970-74.

Date	Plecoptera	Tricoptera	Ephemeroptera	Diptera	Coleoptera	Annelida	Other[a]	Total
				Fishtail Creek-Station 030				
10-71	48(.4)	90(1.3)	155 (.5)	5 (T)	1 (T)	104 (T)	49(.2)	452(2.4)
10-71	41(.1)	50 (.1)	96 (.2)	21 (T)	9 (T)	75 (T)	16(.1)	308 (.5)
10-71	27(.2)	44 (.2)	166 (.2)	8 (T)	8 (T)	91 (T)	29(.1)	373 (.7)
02-72	20(.7)	189 (.4)	211 (.5)	18 (T)	3 (T)	18 (T)	16 (T)	475(1.6)
02-72	12(.1)	250 (.7)	103 (.2)	4(.1)	11(.1)	92(.1)	34(.1)	506(1.4)
02-72	29(.1)	76 (.2)	96 (.3)	4 (T)	7(.1)	45 (T)	13 (T)	270 (.7)
05-72	18(.1)	203(1.1)	103 (.4)	46(.1)	5 (T)	91(.1)	36(.1)	502(1.9)
05-72	6(.1)	36 (.4)	42 (.2)	23 (T)	1 (T)	31 (T)	0	139 (.7)
05-72	7 (T)	50 (.1)	184 (.8)	12 (T)	5 (T)	109(.1)	31(.1)	398(1.1)
08-72	8 (T)	56 (.2)	80 (.2)	36 (T)	4(.1)	8 (T)	17(.1)	209 (.6)
08-72	14(.1)	30 (.1)	49 (.1)	7 (T)	8 (T)	3 (T)	15(.1)	126 (.4)
08-72	23 (T)	38 (T)	68 (.1)	39(.7)	5 (T)	30 (T)	50(.1)	253 (.9)
02-73	54(.1)	69 (.2)	359 (.7)	32 (T)	9 (T)	125 (T)	54(.1)	702(1.1)
02-73	144(.7)	122(1.5)	528(1.2)	97(.1)	12 (T)	289 (T)	188(.5)	1380(4.0)
02-73	49(.1)	73 (.5)	269 (.4)	35(.1)	10 (T)	98(.1)	85(.2)	619(1.4)
05-73	3 (T)	36 (.2)	31 (.2)	27 (T)	6 (T)	6 (T)	44(.1)	153 (.5)
05-73	10(.1)	64 (.2)	36 (.1)	60(.1)	24 (T)	11 (T)	43(.1)	248 (.6)
05-73	14 (T)	79 (.3)	54 (.2)	60(.1)	18 (T)	106 (T)	53(.1)	384 (.7)
08-73	27 (T)	34 (.2)	33 (.1)	93 (T)	3 (T)	71 (T)	58(.2)	319 (.5)
08-73	26(.8)	40 (.1)	74 (.3)	47 (T)	5 (T)	223 (T)	33(.1)	448(1.3)
08-73	20(.1)	27 (.2)	38 (.1)	17 (T)	6 (T)	136 (T)	25(.1)	269 (.5)
10-73	54(1.4)	73 (.3)	170 (.2)	25 (T)	11 (T)	261(.1)	49(.1)	643(2.0)
10-73	96(.2)	85 (.4)	169 (.1)	5(.1)	3 (T)	95 (T)	40(.1)	493 (.9)
10-73	77(.2)	47 (.3)	155 (.2)	19 (T)	5 (T)	172(.1)	43(.1)	518 (.9)
02-74	94(.6)	133 (.3)	263 (.6)	60(.1)	5 (T)	277(.1)	150(.2)	982(1.9)
05-74	4(.1)	92 (.2)	57 (.1)	4 (T)	1 (T)	8 (T)	14 (T)	180 (.4)
05-74	20(.2)	92 (.3)	206 (.5)	10 (T)	5 (T)	31 (T)	40(.1)	404(1.1)
05-74	47(.3)	147 (.5)	396 (.9)	69(.1)	7 (T)	151 (T)	142(.2)	959(2.0)

Appendix A. Continued. Number and volume (in parentheses) of macroinvertebrates collected in one square foot stream bottom samples for stations on larger streams, 1970-74.

Date	Plecoptera	Tricoptera	Ephemeroptera	Diptera	Coleoptera	Annelida	Other[a]	Total
				Fishtail Creek-Station 045				
10-71	54 (.6)	120(1.2)	140 (.3)	27 (.3)	11(.1)	94(.1)	2 (T)	448(2.5)
10-71	28 (.1)	111(1.1)	139 (.2)	78 (.1)	15 (T)	146(.1)	1 (T)	518(1.6)
10-71	41 (.8)	102(1.1)	111 (.2)	23 (.1)	10 (T)	88 (T)	0	375(2.2)
02-72	35 (.5)	233 (.5)	222 (.6)	80 (.1)	15(.1)	97(.1)	0	682(1.9)
02-72	33 (.3)	215 (.4)	172 (.5)	21 (T)	8(.1)	46 (T)	0	495(1.3)
02-72	6 (.1)	34 (.2)	62 (.2)	9 (.1)	6 (T)	16 (T)	0	133 (.6)
05-72	11 (.4)	58 (.3)	61 (.4)	40 (.1)	19(.1)	24 (T)	3 (T)	216(1.3)
05-72	6 (.1)	118 (.5)	47 (.2)	28 (.1)	15 (T)	39 (T)	3 (T)	256 (.9)
05-72	5 (.1)	45 (.1)	57 (.4)	34 (.2)	17 (T)	19 (T)	3 (T)	180 (.8)
08-72	16 (.3)	14 (.1)	191 (.5)	24 (.3)	19 (T)	16 (T)	4 (T)	284(1.2)
08-72	22 (.5)	31 (.4)	161(1.2)	22 (.1)	17(.1)	17 (T)	5 (T)	275(2.3)
08-72	6 (.2)	6 (T)	39 (.5)	26 (.1)	3 (T)	16 (T)	4 (T)	100 (.8)
02-73	75 (.2)	109(1.0)	328 (.5)	91 (.1)	9 (T)	28 (T)	0	640(1.8)
02-73	34(1.7)	144 (.6)	229 (.3)	29 (T)	22 (T)	20 (T)	1 (T)	479(2.6)
02-73	108 (.4)	130 (.8)	623(1.2)	63 (.2)	12 (T)	83 (T)	1 (T)	1020(2.6)
05-73	23 (.1)	100 (.3)	257 (.5)	100(1.4)	13 (T)	29 (T)	3 (T)	525(2.3)
05-73	5 (.3)	67 (.1)	60 (.2)	40 (.2)	7 (T)	23 (T)	6 (T)	208 (.8)
05-73	12 (T)	53 (.1)	66 (.2)	32 (.9)	4 (T)	28 (T)	0	195(1.2)
08-73	26 (.3)	26 (.2)	180(2.5)	74 (.2)	4 (T)	99(.1)	22(.1)	431(3.4)
08-73	9 (.2)	9 (.1)	147 (.4)	17 (.1)	5 (T)	37 (T)	5 (T)	229 (.8)
08-73	12 (T)	32 (.4)	264 (.7)	33 (.1)	10(.1)	14 (T)	2 (T)	367(1.3)
10-73	52 (.4)	185(1.1)	247 (.1)	36 (.2)	29 (T)	68 (T)	4 (T)	621(1.8)
10-73	15 (.1)	68 (.3)	98 (.1)	8 (.6)	4 (T)	17 (T)	0	210(1.1)
10-73	51 (.3)	100(1.1)	201 (.2)	28 (.2)	36(.1)	2 (T)	2 (T)	420(1.9)
05-74	2 (T)	39 (.7)	120 (.4)	12 (.1)	7 (T)	7 (T)	2 (T)	189(1.2)
05-74	4 (.5)	67 (.5)	103 (.2)	7 (T)	3 (T)	11 (T)	1 (T)	196(1.2)
05-74	7 (T)	60 (.6)	119 (.3)	41 (.1)	6 (T)	6 (T)	0	239(1.0)

Appendix A. Continued. Number and volume (in parentheses) of macroinvertebrates collected in one square foot stream bottom samples for stations on larger streams, 1970-74.

Date	Plecoptera	Tricoptera	Ephemeroptera	Diptera	Coleoptera	Annelida	Other[a]	Total
				Little Rocky Creek-Station 031				
10-71	34 (T)	4 (T)	71 (.1)	72(1.1)	12 (T)	3(T)	0	196(1.2)
10-71	14 (T)	1 (T)	19 (.1)	20(2.1)	7 (T)	2(T)	0	63(2.2)
10-71	38 (.1)	15 (.1)	85 (.1)	59(1.3)	11(.1)	2(T)	0	210(1.7)
2-72	17 (.3)	51 (T)	119 (.3)	322(1.9)	40 (T)	1(T)	52(.1)	602(2.6)
2-72	26 (T)	78 (.1)	126 (.2)	424(3.5)	103(.1)	0	26 (T)	783(3.9)
2-72	8 (T)	78 (.1)	113 (.2)	826 (.4)	80 (T)	0	31 (T)	1140 (.7)
5-72	1 (T)	67 (.4)	92 (.5)	247(4.3)	22(.1)	1(T)	16 (T)	446(5.3)
5-72	5 (.1)	103 (.3)	60 (.1)	164 (.5)	12 (T)	2(T)	14(.1)	360(1.1)
5-72	5 (.1)	65 (.3)	117 (.7)	170(1.5)	7 (T)	6(T)	18(.1)	388(2.7)
8-72	14 (T)	56 (.6)	218 (.5)	15 (.1)	24 (T)	0	12(.1)	339(1.3)
8-72	8 (T)	46 (.4)	89 (.4)	9 (T)	2 (T)	0	1 (T)	155 (.8)
8-72	17 (T)	28 (.2)	157 (.2)	20 (T)	19(.1)	0	5 (T)	246 (.5)
2-73	28 (.4)	101 (.6)	113 (.5)	171 (.4)	48(.1)	0	40(.1)	501(2.1)
2-73	16 (.1)	93 (.5)	51 (.3)	172(1.0)	65(.1)	6(T)	28 (T)	431(2.0)
2-73	44 (.1)	62 (.1)	148 (.2)	432(2.3)	46 (T)	0	31 (T)	763(2.7)
5-73	8 (T)	44 (.2)	130 (.7)	50 (.2)	27 (T)	0	24 (T)	283(1.1)
5-73	4 (T)	101 (.5)	137 (.3)	77(2.8)	18 (T)	0	14 (T)	351(3.6)
5-73	4 (T)	81 (.5)	71 (.4)	130 (.5)	37 (T)	0	15 (T)	338(1.4)
7-73	20 (T)	78 (.3)	153 (.5)	44 (.1)	32 (T)	0	4 (T)	331 (.9)
7-73	4 (T)	21 (.2)	62 (.1)	15 (T)	13 (T)	0	8 (T)	123 (.3)
7-73	7 (T)	30 (.2)	196 (.2)	74 (.1)	45 (T)	0	12(.1)	364 (.6)
10-73	21 (T)	157 (.8)	86 (.2)	168 (.3)	148(.1)	6(T)	18(.1)	604(1.5)
10-73	67 (.8)	129 (.2)	52 (.1)	85 (.1)	41(.1)	3(T)	11 (T)	388(1.3)
10-73	54 (.1)	233 (.6)	132 (.1)	176 (.7)	83(.1)	2(T)	20 (T)	700(1.6)
2-74	17 (.1)	108 (.4)	75 (.3)	106 (.4)	18 (T)	0	9 (T)	333(1.2)
2-74	25 (.3)	77 (.4)	76 (.1)	55 (.1)	5 (T)	0	4 (T)	242 (.9)
2-74	5 (T)	63 (.2)	22 (.2)	121 (.2)	14 (T)	0	6 (T)	231 (.6)
5-74	2 (T)	77 (.5)	331 (.5)	57 (.1)	6 (T)	2(T)	4 (T)	479(1.1)
5-74	6 (.1)	85 (.5)	209 (.4)	49 (.1)	9 (T)	1(T)	9 (T)	368(1.1)
5-74	15 (.2)	46 (.2)	314 (.6)	57(1.3)	13 (T)	0	6 (T)	451(2.3)
				Stillwater River-Station 006[d]				
8-70	11	4	145	41	2	0	0	203
4-71	92 (.4)	83 (.3)	300 (.1)	65 (T)	0	0	0	540 (.8)
10-71	30 (.3)	52 (.6)	254 (.3)	63 (.2)	0	1(T)	0	400(1.4)
10-71	10 (.1)	2 (.4)	135 (.3)	8 (.4)	0	4(T)	0	159(1.2)
10-71	19 (.1)	12 (.3)	71 (.2)	5 (.1)	0	0	0	107 (.7)
2-72	126 (.3)	51 (.9)	409 (.9)	105 (.1)	1 (T)	23(T)	1 (T)	716(2.2)
2-72	29 (T)	26 (.2)	339 (.8)	41 (.1)	0	2(T)	1 (T)	438(1.1)
2-72	100 (.6)	39 (.4)	456 (.8)	45 (T)	0	7(T)	1 (T)	648(1.8)
5-72	41 (.7)	5 (T)	152 (.2)	29 (.2)	0	2(T)	0	229(1.1)
5-72	17 (.2)	0	84 (.3)	13 (T)	0	27(T)	0	141 (.5)
5-72	14 (.1)	1 (T)	98 (.2)	6 (T)	0	6(T)	0	125 (.3)

d-Stillwater River - Station 005 follows West Boulder River - Station 041.

Appendix A. Continued. Number and volume (in parentheses) of macroinvertebrates collected in one square foot stream bottom samples for stations on larger streams, 1970-74.

Date	Plecoptera	Tricoptera	Ephemeroptera	Diptera	Coleoptera	Annelida	Other[a]	Total
				Stillwater River-Station 006 (cont'd)				
8-72	13 (.2)	4 (T)	86 (.1)	28 (.2)	1 (T)	9(T)	1 (T)	142 (.5)
8-72	19 (T)	3 (.1)	110 (.2)	17 (T)	2 (T)	15(T)	1 (T)	167 (.3)
8-72	3 (T)	0	70 (.2)	10 (.1)	0	0	0	83 (.3)
2-73	55 (.2)	17 (.1)	195 (.2)	28 (T)	1 (T)	0	1 (T)	297 (.5)
2-73	130 (.9)	97 (.9)	461 (.9)	120 (.4)	0	23(T)	1 (T)	832(2.7)
2-73	47 (.1)	35 (.5)	241 (.8)	20 (T)	1 (T)	0	1 (T)	345(1.4)
5-73	19 (.1)	22 (.3)	399 (.8)	26 (.4)	1 (T)	41(T)	1 (T)	509(1.6)
5-73	21 (.2)	38 (.7)	221 (.7)	21 (.1)	0	11(T)	1 (T)	313(1.7)
5-73	28 (.1)	4 (.1)	129 (.2)	15 (T)	1 (T)	2(T)	0	179 (.4)
7-73	31 (T)	13 (.5)	178 (.2)	29 (.1)	1 (T)	0	1 (T)	253 (.8)
7-73	13 (T)	27(1.0)	201 (.5)	35 (T)	1 (T)	0	1 (T)	278(1.5)
7-73	35 (.1)	37(1.5)	147 (.5)	45 (.2)	0	13(T)	2 (T)	279(2.3)
10-73	13 (.2)	15 (.2)	125 (.1)	11 (.4)	1 (T)	1(T)	0	166 (.9)
10-73	88 (.4)	49 (.8)	331 (.2)	37 (.2)	0	6(T)	1 (T)	512(1.6)
10-73	24 (.1)	18 (.2)	132 (.2)	6 (T)	0	0	2 (T)	182 (.5)
2-74	186 (.5)	98(1.1)	726(1.0)	188 (.2)	2 (T)	20(T)	2 (T)	1222(2.8)
2-74	102 (.3)	96(1.3)	383 (.7)	168 (.4)	0	2(T)	0	751(2.7)
2-74	41 (.2)	20 (.1)	376 (.7)	21 (.1)	1 (T)	46(T)	0	505(1.1)
5-74	19 (.3)	13 (.8)	111 (.7)	7 (.3)	1 (T)	2(T)	0	153(2.1)
5-74	13 (.8)	25 (.5)	109 (.5)	12 (.1)	1 (T)	3(T)	1 (T)	164(1.9)
5-74	21 (.1)	24 (.3)	268 (.4)	20 (.6)	1 (T)	5(T)	0	339(1.4)
				Stillwater River-Station 032				
4-71	31 (.1)	131(1.5)	505 (.7)	120 (.1)	3(.1)	0	0	790(2.5)
10-71	30 (.2)	13 (.1)	89 (.2)	13 (.1)	2 (T)	0	0	147 (.6)
10-71	20 (.1)	15 (.1)	57 (.3)	20 (.1)	2 (T)	3(T)	2 (T)	119 (.2)
10-71	24 (T)	4 (T)	61 (.2)	1 (T)	0	0	0	90 (.2)
12-72	30 (.2)	58 (.3)	225 (.8)	47 (.3)	4 (T)	24(T)	0	388(1.6)
2-72	44 (.1)	86 (.8)	201(1.0)	32 (.3)	0	25(T)	0	388(2.2)
2-72	32 (.1)	18 (.1)	125 (.5)	28 (.1)	3 (T)	46(T)	0	252 (.8)
5-72	18 (.2)	3 (T)	161 (.4)	5 (T)	0	0	0	187 (.6)
5-72	14 (.1)	5 (.1)	139 (.3)	4 (T)	0	2(T)	0	164 (.5)
5-72	24 (.3)	9 (.1)	223 (.5)	5 (T)	0	0	0	261 (.9)
8-72	32 (.1)	3 (T)	206 (.3)	32 (T)	0	0	0	273 (.4)
8-72	38 (T)	0	111 (.1)	21 (T)	0	0	0	170 (.1)
8-72	13 (.1)	3 (T)	120 (.2)	21 (T)	1 (T)	0	0	158 (.3)
2-73	14 (.1)	80 (.5)	81 (.5)	64 (.3)	3 (T)	19(T)	0	261(1.4)
2-73	36 (.4)	107 (.4)	140 (.8)	80 (.3)	2 (T)	33(T)	4 (T)	402(1.9)
2-73	103 (.2)	94 (.2)	180 (.9)	78 (.4)	4 (T)	133(T)	1 (T)	593(1.7)
5-73	71 (.5)	116 (.8)	181 (.8)	54 (.4)	7 (T)	34(T)	1 (T)	464(2.5)
5-73	32 (.1)	10 (.1)	345(1.0)	93 (.1)	1 (T)	7(T)	1 (T)	489(1.3)
5-73	37 (.3)	45 (.2)	546 (.7)	50 (.6)	21(.1)	163(T)	6 (T)	868(1.9)
7-73	27 (T)	13 (.6)	204 (.2)	58 (T)	3 (T)	2(T)	0	307 (.8)
7-73	17 (.4)	3 (T)	102 (.2)	54 (.1)	0	0	2 (T)	178 (.7)
7-73	12 (.1)	9 (.1)	75 (.1)	32 (T)	1 (T)	6(T)	1 (T)	136 (.3)

Appendix A. Continued. Number and volume (in parentheses) of macroinvertebrates collected in one square foot stream bottom samples for stations on larger streams, 1970-74.

Date	Plecoptera	Tricoptera	Ephemeroptera	Diptera	Coleoptera	Annelida	Other[a]	Total
Stillwater River-Station 032 (cont'd)								
10-73	61 (.1)	135 (.6)	183 (.4)	34 (.3)	5 (T)	5(T)	1 (T)	424(1.4)
10-73	84 (.2)	194(1.3)	135 (.3)	51 (.3)	4 (T)	3(T)	0	471(2.1)
10-73	214 (.8)	198(1.1)	411 (.8)	60 (.5)	14 (T)	8(T)	10 (T)	915(3.2)
2-74	84 (.3)	232(3.2)	269 (.9)	47 (.7)	2 (T)	70(T)	1 (T)	705(5.1)
2-74	42 (.2)	136(1.5)	102 (.5)	47 (.8)	3 (T)	9(T)	5 (T)	344(3.0)
2-74	49 (.4)	72 (.6)	129 (.5)	29 (.3)	1 (T)	16(T)	6 (T)	302(1.8)
5-74	44 (.2)	32 (.3)	275 (.6)	36 (.1)	0	10(T)	4 (T)	401(1.2)
5-74	3 (T)	9 (.1)	146 (.2)	18 (.2)	1 (T)	0	1 (T)	178 (.5)
5-74	35 (.1)	12 (.1)	171 (.3)	27 (.1)	3 (T)	9(T)	1 (T)	258 (.6)
Stillwater River-Station 033								
8-70	47	31	163	26	3	3	2	275
4-71	25 (.1)	101 (.9)	154 (.6)	3 (T)	3(.1)	18(.5)	0	304(2.2)
10-71	91 (.5)	105(1.1)	388(1.3)	64 (.3)	1 (T)	2(T)	0	651(3.2)
10-71	67 (.2)	179(1.0)	197 (.7)	39 (.6)	1 (T)	8(T)	0	491(2.5)
10-71	57 (.3)	91(1.0)	177 (.9)	229 (.5)	4 (T)	23(T)	1 (T)	582(2.7)
2-72	89 (.5)	156(1.8)	401 (.9)	185 (.4)	18(.1)	70(T)	2 (T)	921(3.7)
2-72	93(1.1)	125 (.8)	465(1.5)	99 (.4)	5 (T)	114(.1)	2 (T)	903(3.9)
2-72	68 (.7)	122 (.7)	297(2.2)	65 (.3)	3 (T)	54(T)	1 (T)	610(3.9)
5-72	34 (.2)	25 (.1)	215(1.0)	11 (.1)	2 (T)	2(T)	0	289(1.4)
5-72	13 (.5)	6 (.2)	105 (.7)	3 (.1)	2 (T)	0	0	129(1.5)
5-72	24 (.2)	17 (.3)	82 (.5)	14 (T)	0	72(T)	0	209(1.0)
8-72	57 (.1)	6 (T)	188 (.2)	35 (T)	9 (T)	4(T)	1 (T)	300 (.3)
8-72	73 (T)	2 (T)	180 (.3)	37 (.2)	30 (T)	9(T)	0	331 (.5)
8-72	37 (.4)	4 (T)	253 (.5)	25 (.2)	2 (T)	0	0	321(1.1)
2-73	141(2.8)	158(1.6)	225(1.8)	323 (.2)	3 (T)	35(T)	3 (T)	888(6.4)
2-73	124 (.7)	143(1.0)	204(1.1)	100(1.0)	8 (T)	118(T)	7 (T)	704(3.8)
2-73	48(1.5)	70(1.0)	203(1.4)	134 (.4)	5 (T)	62(T)	3 (T)	525(4.3)
5-73	37(1.5)	81(1.7)	122(1.4)	38 (.2)	1 (T)	0	2 (T)	281(4.8)
5-73	15 (.1)	30 (.1)	80 (.8)	65 (.6)	14 (T)	0	2 (T)	206(1.6)
5-73	20 (T)	29 (.5)	271 (.5)	123 (.8)	9 (T)	59(T)	2 (T)	513(1.8)
8-73	61 (.1)	25 (.1)	202 (.5)	35 (.1)	4 (T)	12(T)	6 (T)	345 (.8)
8-73	71 (.1)	5 (T)	80 (.2)	57 (.1)	2 (T)	37(T)	5 (T)	257 (.4)
8-73	14 (T)	3 (T)	108 (.2)	5 (.2)	3 (T)	4(T)	3 (T)	140 (.4)
10-73	39 (.5)	63 (.2)	134 (.2)	337 (.3)	6 (T)	24(T)	3 (T)	606(1.2)
10-73	66 (.2)	141(1.1)	290 (.6)	378 (.6)	4 (T)	94(.1)	10 (T)	983(2.6)
10-73	107 (.4)	150 (.8)	374(1.0)	374(1.0)	4 (T)	37(T)	4 (T)	1050(3.2)
2-74	77 (.3)	103 (.5)	319(1.3)	30 (.7)	2 (T)	51(T)	4 (T)	586(2.8)
2-74	65 (.2)	28 (.1)	162 (.8)	11 (.2)	0	6(T)	0	272(1.3)
2-74	236(1.5)	111 (.8)	396(1.9)	33 (.7)	1 (T)	91(T)	0	868(4.9)
5-74	52 (.3)	211(2.5)	801(2.3)	89 (.4)	8 (T)	106(T)	5 (T)	1272(5.5)
5-74	63(1.0)	160(2.3)	461(1.2)	69 (.4)	5 (T)	30(T)	2 (T)	790(4.9)
5-74	88 (.5)	158(3.2)	457(2.0)	94 (.5)	3 (T)	34(T)	1 (T)	835(6.2)

Appendix A Continued. Number and volume (in parentheses) of macroinvertebrates collected in one square foot stream bottom samples for stations on larger streams, 1970-74.

Date	Plecoptera	Trichoptera	Ephemeroptera	Diptera	Coleoptera	Annelida	Other[a]	Total
			Stillwater River - Station 034					
08-70	21	41	159	30	7	0	0	258
04-71	45(.3)	198(.7)	577(1.0)	48(.2)	10(T)	0	0	878(2.2)
10-71	41(.6)	51(.2)	112(.8)	121(.4)	13(T)	0	0	338(1.8)
10-71	47(1.6)	425(2.1)	191(.5)	46(.3)	9(T)	67(T)	0	785(4.5)
10-71	36(1.5)	197(3.3)	151(.7)	101(.4)	19(T)	0	9(T)	513(5.9)
02-72	156(.6)	216(.6)	320(1.3)	228(.7)	7(T)	84(T)	16(.1)	1027(3.3)
02-72	66(.6)	168(.7)	210(.3)	142(.5	6(T)	22(T)	0	614(2.1)
02-72	112(.7)	276(1.0)	238(.6)	167(.4)	10(.1)	98(T)	4(T)	905(2.8)
05-72	15(.1)	2(T)	188(1.2)	4(T)	0	2(T)	0	211(1.3)
05-72	12(T)	1(T)	345(1.7)	135(.1)	1(T)	7(T)	0	501(1.8)
05-72	16(.1)	3(T)	108(.3)	20(.1)	1(T)	10(T)	0	158(.5)
08-72	61(.2)	103(.2)	348(.5)	75(.3)	10(T)	32(T)	4(T)	634(1.2)
08-72	43(.1)	45(.1)	293(.3)	74(.3)	7(T)	33(T)	2(T)	497(.8)
08-72	21(.1)	34(.2)	112(.2)	22(T)	5(T)	0	0	194(.5)
02-73	185(1.5)	234(1.9)	325(1.6)	163(1.3)	3(T)	167(T)	1(T)	1081(6.3)
02-73	28(.7)	95(.7)	169(.8)	108(.3)	11(T)	68(T)	4(T)	483(2.5)
02-73	26(1.5)	56(.3)	171(1.1)	69(.5)	5(T)	57(T)	2(T)	386(3.4)
05-73	51(.4)	156(.5)	465(1.7)	305(.7)	9(T)	0	2(T)	988(3.3)
05-73	28(.5)	45(.3)	482(.5)	339(1.3)	43(.1)	32(T)	0	969(2.7)
05-73	60(1.8)	171(1.2)	258(.4)	336(.9)	33(T)	0	14(T)	872(4.3)
08-73	66(.2)	37(.1)	199(.4)	60(.3)	16(T)	109(T)	9(T)	496(1.0)
08-73	17(T)	28(.1)	95(.2)	95(.3)	11(T)	10(T)	8(T)	264(.6)
08-73	48(.1)	38(.1)	257(.4)	58(.2)	24(T)	23(T)	2(T)	450(.8)
10-73	43(.1)	84(.3)	110(.2)	46(.3)	1(T)	6(T)	1(T)	291(.9)
10-73	47(1.6)	330(2.4)	133(.3)	95(.4)	3(T)	8(T)	4(T)	620(4.7)
10-73	86(.2)	266(1.2)	163(.4)	98(.5)	13(T)	83(T)	13(T)	722(2.3)
02-74	64(.5)	213(1.0)	167(.6)	54(.8)	5(T)	39(T)	5(T)	547(2.9)
02-74	64(.7)	62(.1)	329(.6)	98(.2)	10(T)	56(T)	7(T)	626(1.6)
02-74	73(.4)	182(.9)	221(1.1)	60(.3)	4(T)	31(T)	16(T)	587(2.7)
05-74	68(.6)	293(1.1)	482(.8)	197(1.2)	48(T)	119(T)	25(.1)	1232(3.8)
05-74	49(1.3)	126(.5)	470(.8)	105(.3)	16(T)	128(.1)	26(.1)	920(3.1)
05-74	16(.2)	111(.4)	304(.5)	40(.3)	7(T)	11(T)	3(T)	492(1.4)
			Stillwater River - Station 035					
08-70	29	74	64	324	1	2	0	494
10-71	41(.4)	524(8.8)	156(.2)	28(T)	19(T)	0	29(T)	797(9.4)
10-71	39(.2)	533(9.1)	109(.5)	42(.3)	24(T)	0	20(T)	767(10.1)
10-71	32(.1)	242(3.1)	205(.4)	60(.6)	14(T)	0	30(T)	583(4.2)
02-72	51(.5)	190(1.3)	119(.8)	13(.2)	17(T)	18(T)	1(T)	409(2.8)
02-72	22(.4)	82(.7)	112(.3)	10(T)	5(T)	9(T)	0	240(1.4)
02-72	26(.7)	248(1.7)	162(.2)	31(.5)	19(.1)	41(T)	2(T)	529(2.7)
05-72	3(.1)	3(T)	9(.1)	30(.1)	0	1(T)	0	46(.3)
05-72	2(T)	0	4(.1)	35(.1)	0	7(T)	0	48(.2)

Appendix A Continued. Number and volume (in parentheses) of macroinvertebrates collected in one square foot stream bottom samples for stations on larger streams, 1970-74.

Date	Plecoptera	Tricoptera	Ephemeroptera	Diptera	Coleoptera	Annelida	Other[a]	Total
			Stillwater River - Station 035 continued					
05-72	7(T)	28(.2)	106(.7)	258(1.1)	10(T)	7(T)	1[c]	417(2.0)
08-72	7(T)	80(.3)	50(.2)	137(.1)	0	0	0	274(.6)
08-72	5(T)	174(1.2)	41(.2)	136(.1)	6(T)	0	3(T)	365(1.5)
08-72	5(T)	38(.1)	81(.3)	110(.1)	5(T)	0	1(T)	240(.5)
02-73	42(.7)	338(2.8)	328(.5)	117(.6)	15(T)	40(T)	0	880(4.6)
02-73	26(.6)	345(3.8)	500(.8)	165(.5)	9(T)	28(T)	1(T)	1074(5.7)
02-73	66(1.5)	499(5.7)	421(.7)	156(1.0)	31(.1)	59(T)	1(T)	1233(9.0)
05-73	21(.6)	94(1.1)	184(.5)	190(.2)	5(.1)	0	0	494(2.5)
05-73	14(T)	20(.1)	110(.4)	90(.1)	3(T)	0	0	237(.6)
05-73	16(.1)	35(.2)	149(.6)	96(1.8)	6(T)	1(T)	1(T)	304(2.7)
08-73	14(.1)	21(.1)	96(.1)	559(.8)	19(T)	0	1(T)	710(1.1)
08-73	11(.1)	38(.3)	103(.2)	213(.4)	4(T)	0	3(T)	372(1.0)
08-73	9(T)	34(.1)	105(.3)	326(.4)	10(T)	0	0	484(.8)
10-73	57(.4)	491(5.6)	112(.2)	50(.5)	13(T)	0	2(T)	725(6.7)
10-73	58(.1)	214(1.0)	141(.3)	19(.2)	7(T)	6(T)	3(T)	448(1.6)
10-73	61(.4)	220(1.3)	160(.5)	55(.5)	12(T)	1(T)	4(T)	513(2.7)
02-74	28(.3)	281(2.4)	212(.9)	37(.1)	10(T)	0	2(T)	570(3.7)
02-74	44(.5)	442(4.4)	175(.3)	58(.2)	9(T)	1(T)	1(T)	730(5.4)
02-74	54(.2)	137(.4)	221(1.4)	34(1.0)	3(T)	3(T)	1(T)	453(3.0)
05-74	57(.7)	320(1.4)	386(1.6)	75(.1)	21(T)	13(T)	8(.2)	880(4.0)
05-74	7(.1)	241(1.1)	195(.6)	55(.9)	12(T)	8(T)	3(T)	521(2.7)
05-74	11(.2)	208(1.4)	151(.6)	63(.1)	12(T)	5(T)	2(T)	452(2.3)
			West Fork Stillwater River - Station 037					
08-70	19	18	208	20	0	0	0	265
10-71	53(.1)	47(.1)	94(.4)	3(T)	0	24(T)	0	221(.6)
10-71	65(T)	35(.2)	137(.4)	3(T)	2(T)	39(T)	0	281(.6)
10-71	43(T)	28(.1)	74(.2)	7(.4)	1(T)	17(T)	0	170(.7)
05-72	1(T)	6(T)	6(.1)	1(T)	0	33(.1)	0	47(.2)
05-72	4(T)	3(T)	7(.1)	4(T)	0	46(T)	0	64(.1)
05-72	9(T)	11(.1)	48(.2)	19(.1)	0	140(.1)	1	228(.5)
08-72	24(T)	12(T)	66(.3)	5(.1)	0	67(T)	0	174(.4)
08-72	21(T)	6(T)	44(.2)	11(T)	0	50(T)	0	132(.2)
08-72	13(T)	6(T)	71(.2)	4(.1)	0	34(T)	0	128(.3)
05-73	11(.1)	23(.2)	86(.5)	4(T)	0	33(T)	5(T)	162(.8)
05-73	22(T)	36(.4)	215(1.4)	13(T)	0	13(T)	10(T)	309(1.8)
05-73	16(T)	29(.4)	161(1.2)	3(.1)	1(T)	48(T)	8(.1)	266(1.8)

c-Snail - no volume taken.

Appendix A Continued. Number and volume (in parentheses) of macroinvertebrates collected in one square foot stream bottom samples for stations on larger streams, 1970-74.

Date	Plecoptera	Trichoptera	Ephemeroptera	Diptera	Coleoptera	Annelida	Other[a]	Total
			West Fork Stillwater River - Station 037 continued					
07-73	64(.1)	3(T)	188(.4)	21(.2)	0	39(T)	1(T)	316(.7)
07-73	32(T)	7(T)	207(.4)	17(.4)	0	122(T)	1(T)	386(.8)
07-73	33(T)	10(.1)	181(.4)	14(.1)	1(T)	146(T)	2(T)	387(.6)
10-73	78(.1)	20(T)	125(.2)	4(T)	2(T)	13(T)	2(T)	244(.3)
10-73	41(.1)	28(.2)	104(.2)	11(T)	1(T)	15(T)	1(T)	201(.5)
10-73	16(T)	14(.2)	58(.1)	7(.3)	1(T)	1(T)	1(T)	100(.6)
05-74	49(T)	45(.6)	132(1.1)	19(T)	1(T)	10(T)	2(T)	258(1.7)
05-74	10(T)	98(.2)	117(.8)	15(.2)	0	5(T)	1(T)	246(1.2)
05-74	45(.1)	49(.3)	181(1.1)	22(.1)	2(T)	48(T)	7(T)	354(1.6)
			West Fork Stillwater River - Station 007					
08-70	18	15	224	8	4	3	0	272
04-71	69(.1)	14(.1)	228(1.2)	5(T)	8(T)	0	23(T)	347(1.4)
10-71	90(.2)	13(T)	64(.1)	3(.3)	36(T)	99(T)	0	305(.6)
10-71	71(.4)	25(.1)	138(.3)	18(.3)	11(T)	3(T)	0	266(1.1)
10-71	103(.2)	20(.4)	70(.3)	2(.4)	1(T)	27(T)	0	223(1.3)
02-72	186(.2)	22(.2)	89(.5)	13(.3)	0	17(T)	7(T)	334(1.2)
02-72	170(.4)	37(.2)	115(.6)	64(2.5)	0	36(T)	4(T)	426(3.7)
02-72	230(.5)	25(.2)	196(1.1)	59(2.5)	2(T)	13(T)	3(T)	528(4.3)
05-72	48(.1)	6(.1)	366(.9)	10(T)	0	31(T)	0	461(1.1)
05-72	54(.1)	9(T)	260(.6)	104(.2)	3(T)	19(T)	1(T)	450(.9)
05-72	61(.1)	31(.2)	283(1.1)	24(.2)	6(T)	38(T)	1(T)	444(1.6)
08-72	76(.2)	6(T)	97(.3)	59(.1)	1(T)	62(T)	1(T)	302(.6)
08-72	6(T)	3(T)	29(.1)	2(T)	1(T)	2(T)	0	43(.1)
08-72	25(.1)	1(T)	39(.2)	11(.7)	1(T)	0	2(T)	79(1.0)
02-73	277(.4)	46(.4)	265(1.3)	26(.3)	3(T)	195(T)	10(T)	822(2.4)
02-73	71(.2)	55(.4)	251(1.5)	20(.1)	4(T)	108(T)	14(T)	523(2.2)
02-73	100(.6)	73(.5)	214(1.4)	41(.7)	15(T)	333(.1)	28(T)	804(3.3)
05-73	61(.2)	24(.1)	123(.5)	86(.5)	34(.1)	12(T)	27(.1)	367(1.5)
05-73	21(.3)	15(.1)	124(.8)	24(.1)	4(T)	254(.1)	5(T)	447(1.4)
05-73	56(.8)	48(.4)	208(.5)	38(.2)	12(T)	247(.1)	15(T)	624(2.0)
07-73	29(.5)	9(T)	169(.4)	36(T)	2(T)	186(.1)	3(T)	434(1.0)
07-73	13(T)	11(T)	54(.4)	11(T)	0	38(T)	3(T)	130(.4)
07-73	12(.1)	20(.2)	162(.2)	23(T)	1(T)	43(T)	1(T)	262(.5)
10-73	121(.2)	36(.1)	131(.3)	10(.4)	6(T)	39(T)	8(.1)	351(1.1)
10-73	250(.3)	32(.2)	170(.5)	12(.1)	9(T)	9(T)	20(.1)	502(1.2)
10-73	83(.3)	31(.1)	90(.2)	10(.3)	0	54(T)	7(T)	275(.9)
02-74	105(.2)	22(.1)	64(.2)	12(T)	0	11(T)	6(T)	220(.5)
02-74	27(.2)	31(.1)	88(.7)	5(T)	8(T)	0	3(T)	162(1.0)
02-74	17(T)	14(.1)	90(.3)	17(.1)	5(T)	17(T)	22(T)	182(.5)
05-74	31(.1)	20(.1)	136(.6)	5(T)	0	8(T)	2(T)	202(.8)
05-74	47(.1)	10(.1)	107(.2)	7(.1)	1(T)	8(T)	4(T)	184(.5)
05-74	86(.1)	22(.2)	156(.9)	7(T)	1(T)	61(T)	13(T)	346(1.2)

Appendix A Continued. Number and volume (in parentheses) of macroinvertebrates collected in one square foot stream bottom samples for stations on larger streams, 1970-74.

Date	Plecoptera	Trichoptera	Ephemeroptera	Diptera	Coleoptera	Annelida	Other[a]	Total
			West Fork Stillwater River - Station 036					
08-70	26	27	207	16	3	18	1	298
10-71	85(.4)	17(.3)	182(1.1)	80(.2)	8(T)	0	34(T)	406(2.0)
10-71	26(.1)	58(.5)	93(.6)	13(T)	9(T)	0	24(T)	223(1.2)
10-71	40(.3)	26(.4)	136(1.1)	82(.3)	5(T)	0	8(T)	297(2.1)
02-72	153(.5)	23(.1)	348(1.6)	180(.3)	8(T)	242(.1)	1(T)	955(2.6)
02-72	161(.7)	38(.6)	441(2.4)	80(.6)	13(T)	187(.1)	3(T)	923(4.4)
02-72	83(.2)	39(.3)	136(.6)	31(.1)	9(.1)	52(T)	1(T)	351(1.3)
05-72	17(.5)	0	88(.4)	11(T)	3(T)	10(T)	2(T)	131(.9)
05-72	22(.1)	2(T)	68(.5)	37(.1)	1(T)	7(T)	0	137(.7)
05-72	12(.5)	3(.1)	28(.7)	0	0	0	0	43(1.3)
08-72	27(T)	7(.1)	79(.3)	32(T)	4(T)	109(T)	8(T)	266(.4)
08-72	29(.1)	5(.3)	124(.1)	25(.2)	6(T)	11(T)	1(T)	201(.7)
08-72	58(.3)	29(.5)	151(.4)	29(T)	4(T)	66(T)	2(T)	339(1.2)
02-73	227(1.6)	47(.6)	419(2.1)	134(.3)	5(T)	142(T)	1(T)	975(4.6)
02-73	89(.5)	27(.2)	324(2.5)	56(1.3)	9(T)	190(.1)	3(T)	698(4.6)
02-73	36(.1)	33(.1)	121(.8)	32(.3)	2(T)	63(T)	5(T)	292(1.3)
05-73	40(.1)	88(.5)	221(.9)	66(.3)	7(.1)	57(T)	3(T)	482(1.9)
05-73	39(.1)	20(.1)	185(.8)	48(.1)	10(T)	68(T)	4(T)	374(1.1)
05-73	39(.5)	71(.1)	426(1.5)	91(.5)	8(T)	187(T)	1(T)	823(2.6)
07-73	29(.1)	27(.3)	182(.5)	37(.4)	8(T)	47(T)	6(T)	336(1.3)
07-73	86(.6)	49(.3)	561(2.6)	151(.2)	8(T)	134(.1)	6(T)	995(3.8)
07-73	28(.1)	24(.4)	213(1.8)	119(.3)	5(T)	22(T)	10(T)	421(2.6)
10-73	111(.2)	65(.1)	378(.5)	13(.7)	9(T)	81(.1)	3(T)	660(1.6)
10-73	67(.1)	52(.1)	218(.3)	11(.1)	15(T)	31(T)	7(T)	401(.6)
10-73	100(.3)	60(.2)	228(.3)	16(.6)	10(T)	49(T)	1(T)	464(1.4)
02-74	239(2.2)	67(.4)	317(1.5)	114(1.2)	9(T)	308(.2)	5(T)	1059(5.5)
02-74	37(.2)	15(.1)	141(.8)	47(.3)	4(T)	113(.1)	1(T)	358(1.5)
02-74	62(.2)	66(.2)	286(1.1)	26(.4)	5(T)	129(.1)	9(T)	583(2.0)
05-74	19(.1)	28(.2)	234(.7)	39(.1)	1(T)	15(T)	1(T)	337(1.1)
05-74	30(.3)	49(.1)	238(.4)	114(.4)	9(T)	42(T)	9(T)	491(1.2)
05-74	49(.2)	72(.2)	190(.8)	39(T)	1(T)	17(T)	4(T)	372(1.2)
			East Boulder River - Station 038					
08-72	15(.1)	14(T)	12(T)	15(.5)	15(T)	1(T)	2(T)	74(.6)
08-72	40(.1)	6(T)	53(.2)	12(T)	10(T)	3(T)	1(T)	125(.3)
08-72	38(.1)	20(.1)	28(.2)	9(.2)	19(T)	0	3(T)	117(.6)
07-73	23(.1)	4(.1)	65(.2)	43(.1)	10(T)	0	2(T)	147(.5)
07-73	25(.1)	2(T)	88(.3)	18(T)	28(.1)	0	3(T)	164(.5)
07-73	30(.1)	5(T)	44(.2)	56(T)	26(.1)	0	2(T)	163(.4)
09-73	18(.1)	9(.1)	62(.2)	14(.3)	31(T)	15(T)	4(T)	153(.7)
09-73	28(.2)	4(T)	72(.1)	26(T)	21(T)	21(T)	0	172(.3)

Appendix A Continued. Number and volume (in parentheses) of macroinvertebrates collected in one square foot stream bottom samples for stations on larger streams, 1970-74.

Date	Plecoptera	Tricoptera	Ephemeroptera	Diptera	Coleoptera	Annelida	Other[a]	Total
			East Boulder River - Station 038 continued					
09-73	39(.3)	8(.1)	74(.1)	16(.1)	44(.1)	1(T)	4(.1)	186(.7)
10-73	14(.1)	7(.1)	25(.1)	6(T)	10(T)	4(T)	3(T)	69(.3)
10-73	36(.2)	7(T)	49(.1)	22(T)	16(T)	5(T)	7(T)	142(.3)
10-73	22(.1)	2(T)	44(.1)	11(T)	21(T)	2(T)	6(T)	108(.2)
			East Boulder River - Station 008					
10-70	63	52	239	64	24	1	7	450
04-71	54(.1)	8(T)	120(.3)	1(T)	12(T)	0	22(T)	217(.4)
10-71	12(T)	8(.2)	55(.3)	0	5(T)	0	5(T)	85(.5)
10-71	83(.3)	43(.3)	135(.8)	13(T)	16(T)	1(T)	18(T)	309(1.4)
10-71	89(1.0)	33(1.2)	118(.6)	9(T)	7(T)	0	2(T)	258(1.8)
02-72	106(.5)	8(.1)	174(1.0)	10(.3)	6(T)	28(T)	7(T)	339(1.9)
02-72	103(.5)	12(.1)	171(.8)	13(.1)	2(T)	11(T)	5(T)	317(1.5)
02-72	107(.5)	11(T)	111(.5)	4(T)	5(T)	10(T)	1(T)	249(1.0)
05-72	27(.5)	12(.1)	137(.7)	4(T)	10(.1)	28(T)	1(T)	219(1.4)
05-72	53(.1)	12(T)	208(.7)	8(.4)	13(.1)	146(.1)	5(T)	445(1.4)
05-72	20(.1)	12(.1)	105(.3)	7(.3)	17(.1)	59(.1)	5(T)	225(1.0)
08-72	2(T)	16(.1)	28(.2)	4(T)	0	0	0	50(.3)
08-72	26(.1)	55(.2)	81(.3)	4(T)	1(T)	1(T)	9(.1)	177(.7)
08-72	36(.1)	24(T)	93(.3)	39(.1)	6(T)	31(T)	5(T)	234(.5)
02-73	43(.2)	26(.4)	166(1.0)	9(T)	25(T)	20(T)	4(T)	293(1.6)
02-73	37(.1)	9(.2)	130(.2)	3(T)	3(T)	7(T)	3(T)	192(.5)
02-73	68(.3)	10(.2)	243(1.8)	14(T)	14(T)	59(T)	7(T)	415(2.3)
05-73	43(.1)	13(.1)	80(.3)	8(T)	4(T)	3(T)	0	151(.5)
05-73	32(.2)	12(.1)	115(.8)	8(T)	11(T)	59(T)	7(T)	244(1.1)
05-73	30(.1)	56(.5)	292(2.0)	12(.1)	15(T)	25(T)	15(T)	445(2.7)
07-73	43(.2)	13(T)	134(.6)	11(T)	7(T)	42(T)	11(T)	261(.8)
07-73	9(T)	25(.3)	75(.8)	6(.1)	3(T)	0	3(T)	121(1.2)
07-73	34(.8)	33(.3)	169(.5)	28(.6)	15(T)	53(T)	8(T)	340(2.2)
10-73	207(.1)	64(.7)	245(.4)	10(T)	15(T)	67(T)	14(T)	622(1.2)
10-73	208(.2)	138(1.6)	220(.5)	40(.1)	13(T)	19(T)	15(.1)	653(2.5)
10-73	94(.2)	45(.4)	206(.2)	24(.1)	11(T)	36(T)	6(T)	422(.9)
02-74	42(1.7)	20(.2)	121(.6)	10(T)	12(T)	23(T)	3(T)	231(2.5)
02-74	131(.2)	36(.2)	225(1.0)	16(.2)	21(T)	83(T)	2(T)	514(1.6)
02-74	42(.2)	20(.2)	107(.7)	20(T)	12(T)	15(T)	2(T)	218(1.1)
05-74	49(.1)	24(.2)	79(.8)	2(T)	0	8(T)	2(T)	164(1.1)
05-74	43(.3)	46(.3)	109(1.2)	8(T)	11(T)	49(T)	25(T)	291(1.8)
05-74	60(.1)	55(.4)	157(.9)	12(.1)	9(T)	216(.1)	15(T)	524(1.6)

Appendix A Continued. Number and volume (in parentheses) of macroinvertebrates collected in one square foot stream bottom samples for stations on larger streams, 1970-74.

Date	Plecoptera	Tricoptera	Ephemeroptera	Diptera	Coleoptera	Annelida	Other[a]	Total
			Boulder River - Station 011 continued					
08-72	28(.8)	12(T)	113(.3)	6(T)	0	3(T)	4(T)	166(1.1)
08-72	15(T)	48(.2)	126(.6)	12(.5)	0	0	1(T)	202(1.3)
08-72	30(1.0)	78(.4)	190(.5)	13(T)	2(T)	6(T)	5(T)	324(1.9)
02-73	11(.2)	47(.5)	230(.8)	2(T)	0	4(T)	1(T)	295(1.5)
02-73	10(.1)	43(.4)	310(1.5)	3(T)	0	15(T)	2(T)	383(2.0)
02-73	56(.2)	93(.3)	237(1.0)	10(T)	1(T)	5(T)	3(T)	406(1.5)
05-73	33(.1)	42(.4)	72(1.1)	13(.2)	0	10(T)	0	174(1.8)
05-73	17(T)	29(.2)	68(.9)	12(.1)	0	50(T)	3(T)	179(1.2)
05-73	39(.5)	33(.6)	89(1.3)	11(T)	0	12(T)	3(T)	187(2.4)
07-73	50(.1)	12(T)	364(1.2)	41(.1)	0	18(T)	8(.1)	493(1.5)
07-73	4(T)	5(T)	98(.3)	15(.2)	0	59(T)	0	181(.5)
07-73	29(T)	37(.3)	126(1.1)	5(.1)	0	42(T)	6(T)	245(1.5)
10-73	17(.4)	52(.1)	136(.3)	3(T)	0	12(T)	0	220(.8)
10-73	98(.1)	129(.7)	273(.4)	7(.1)	2(T)	107(T)	11(T)	627(1.3)
10-73	43(.1)	23(.1)	245(.6)	10(.1)	1(T)	24(T)	8(T)	354(.9)
05-74	21(.2)	13(.2)	84(.8)	12(.7)	0	1(T)	20(.1)	151(2.0)
05-74	51(.3)	2(T)	122(.7)	6(.1)	0	0	33(.1)	214(1.2)
05-74	25(.2)	0	70(.9)	2(T)	0	0	5(T)	102(1.1)
			Boulder River - Station 050					
10-70	35	28	138	5	3	13	0	222
04-71	48(.1)	76(1.0)	118(.3)	31(T)	0	0	0	273(1.4)
10-71	154(.2)	94(.4)	153(.6)	4(T)	2(T)	62(.1)	0	469(1.3)
10-71	77(.2)	66(.3)	130(.5)	4(.1)	1(T)	69(T)	0	347(1.1)
10-71	169(.2)	141(1.1)	255(1.0)	13(.1)	0	24(T)	0	602(2.4)
			Boulder River - Station 010					
10-70	40	29	99	4	5	21	0	198
04-71	38(.2)	14(.1)	93(.8)	7(T)	0	0	74(T)	226(1.1)
10-71	116(.3)	62(.4)	172(.6)	9(.1)	0	3(T)	3(T)	365(1.4)
10-71	50(.1)	55(.3)	121(.4)	11(.2)	0	4(T)	0	241(1.0)
10-71	109(.3)	86(.5)	150(.4)	7(.2)	1(T)	37(T)	0	390(1.4)
02-72	70(.4)	25(.1)	117(.7)	13(T)	4(T)	69(.1)	1(T)	299(1.3)
02-72	73(.6)	12(.2)	136(.9)	9(.1)	2(T)	61(.1)	0	293(1.9)
02-72	17(.1)	2(T)	44(.4)	3(T)	2(T)	10(T)	0	78(.5)
05-72	8(.3)	1(T)	10(T)	3(T)	0	0	0	22(.3)
05-72	19(1.0)	5(T)	40(.2)	22(T)	0	0	0	86(1.2)
05-72	21(.3)	0	39(.2)	16(T)	0	0	0	76(.5)
08-72	12(T)	23(.2)	58(.2)	15(.1)	1(T)	1(T)	0	110(.5)
08-72	9(T)	40(.3)	118(.2)	11(T)	6(T)	2(T)	1(T)	187(.5)
08-72	30(.1)	74(.4)	137(.4)	19(.1)	2(T)	42(T)	1(T)	305(1.0)

Appendix A Continued. Number and volume (in parentheses) of macroinvertebrates collected in one square foot stream bottom samples for stations on larger streams, 1970-74.

Date	Plecoptera	Tricoptera	Ephemeroptera	Diptera	Coleoptera	Annelida	Other[a]	Total
			East Boulder River - Station 009					
10-70	98	162	152	261	4	0	0	677
04-71	82(.1)	217(2.0)	585(1.0)	790(.9)	10(T)	0	10(T)	1694(4.9)
10-71	44(1.1)	279(3.2)	142(1.8)	124(1.7)	4(T)	0	51(T)	644(7.8)
10-71	64(.7)	307(4.1)	146(1.4)	138(.5)	4(T)	0	23(T)	682(6.7)
10-71	76(1.3)	385(5.4)	142(1.0)	236(1.5)	2(T)	0	49(T)	890(9.2)
02-72	226(.6)	353(2.5)	599(.8)	1077(.8)	5(T)	166(T)	4(T)	2430(4.7)
02-72	207(2.5)	104(.4)	320(.4)	1176(.8)	10(T)	269(T)	3(T)	2089(4.1)
02-72	70(.2)	184(.9)	194(.2)	337(.5)	4(T)	102(T)	2(T)	893(1.7)
05-72	8(.2)	13(.1)	39(.2)	63(2.2)	1(T)	41(T)	6(T)	171(2.7)
05-72	10(.1)	54(.4)	200(.8)	193(1.8)	6(T)	74(T)	9(T)	546(3.1)
05-72	7(.1)	34(.1)	169(1.1)	260(2.1)	3(T)	8(T)	7(T)	488(3.4)
08-72	98(.3)	35(.4)	311(.6)	165(.2)	5(T)	17(T)	5(T)	636(1.5)
08-72	154(.5)	14(.1)	224(.6)	135(.7)	10(T)	8(T)	10(.1)	555(2.0)
08-72	34(.1)	41(.4)	84(.2)	122(.2)	2(T)	23(T)	1(T)	307(.9)
02-73	42(1.8)	508(1.8)	145(.3)	161(1.3)	39(T)	18(T)	4(T)	917(5.2)
02-73	268(2.3)	261(1.8)	104(.4)	762(2.4)	31(T)	0	2(T)	1428(6.9)
02-73	170(1.9)	266(1.1)	69(.2)	963(2.9)	47(.1)	0	2(T)	1517(6.2)
05-73	68(1.1)	160(1.6)	255(1.3)	579(.6)	1(T)	357(T)	9(T)	1429(4.6)
05-73	57(1.2)	375(2.1)	163(.4)	353(2.2)	34(T)	0	8(T)	990(5.9)
05-73	38(.2)	555(2.9)	251(1.3)	290(1.7)	44(.1)	268(.1)	23(T)	1469(6.3)
07-73	46(.1)	14(.1)	342(.7)	180(.4)	7(T)	18(T)	4(T)	611(1.3)
07-73	72(.3)	55(.2)	308(1.0)	70(.7)	9(T)	18(.1)	3(T)	535(2.3)
07-73	27(T)	25(.2)	225(.5)	66(.4)	6(T)	38(T)	14(T)	401(1.1)
10-73	173(.6)	211(.4)	216(.7)	170(3.2)	10(T)	107(.1)	24(T)	2442(5.0)
10-73	100(.4)	753(3.5)	66(.2)	128(.9)	21(T)	0	8(T)	1076(5.0)
10-73	168(.7)	496(2.1)	121(.3)	858(1.8)	3(T)	22(T)	5(T)	1673(4.9)
02-74	33(.8)	403(1.4)	108(.1)	266(1.1)	25(T)	17(T)	2(T)	854(3.4)
02-74	117(2.4)	773(4.3)	197(.4)	551(1.6)	23(T)	34(T)	4(T)	1699(8.7)
02-74	324(1.3)	2025(9.3)	621(.8)	1585(3.5)	195(.1)	156(.1)	64(T)	4970(15.1)
05-74	23(.2)	586(1.9)	448(1.1)	323(1.2)	21(T)	96(T)	35(.1)	1532(4.5)
05-74	28(.3)	1137(3.7)	752(1.1)	506(2.2)	31(T)	88(T)	29(.1)	2571(7.4)
05-74	33(.6)	873(5.5)	607(1.6)	363(3.2)	24(T)	23(T)	11(.1)	1934(11.0)
			Boulder River - Station 011					
10-70	31	67	103	16	0	33	0	250
04-71	127(1.2)	29(.4)	131(1.4)	34(T)	0	0	37(T)	358(3.0)
10-71	51(.1)	18(.2)	39(.1)	6(T)	0	0	6(T)	120(.4)
10-71	75(.2)	33(.7)	292(.9)	2(.4)	0	0	34(T)	436(2.2)
10-71	19(.1)	18(.7)	101(.4)	0	0	0	8(T)	146(1.2)
05-72	22(.5)	4(.1)	29(.1)	66(.4)	0	1(T)	2(T)	124(1.1)
05-72	16(.7)	0	11(T)	61(T)	0	0	0	88(.7)
05-72	20(.1)	1(T)	12(.1)	2(T)	0	0	0	35(.2)

Appendix A Continued. Number and volume (in parentheses) of macroinvertebrates collected in one square foot stream bottom samples for stations on larger streams, 1970-74.

Date	Plecoptera	Trichoptera	Ephemeroptera	Diptera	Coleoptera	Annelida	Other[a]	Total
				Boulder River - Station 010 continued				
02-73	38(1.0)	105(1.6)	257(1.6)	19(.3)	4(T)	23(T)	0	446(4.5)
02-73	13(.4)	123(.8)	211(2.0)	11(T)	1(T)	2(T)	0	361(3.2)
02-73	16(.2)	72(.6)	184(1.1)	12(T)	3(T)	69(T)	0	356(1.9)
05-73	47(.3)	5(T)	108(.7)	14(.1)	10(T)	24(T)	1(T)	209(1.1)
05-73	33(.3)	3(T)	119(.7)	8(T)	0	33(T)	0	196(1.0)
05-73	8(T)	9(.2)	95(.9)	0	1(T)	4(T)	1(T)	118(1.1)
07-73	64(.1)	13(T)	141(.8)	11(T)	0	55(T)	0	284(.9)
07-73	29(.1)	2(T)	98(.1)	12(.1)	0	20(T)	2(T)	163(.3)
07-73	31(.1)	1(T)	69(.3)	16(.2)	1(T)	3(T)	0	121(.6)
10-73	61(.3)	46(T)	243(.4)	6(T)	0	70(T)	0	426(.7)
10-73	42(.5)	72(.2)	201(.4)	9(.1)	0	22(T)	0	346(1.2)
10-73	63(.4)	159(1.0)	206(.3)	11(.3)	0	11(T)	2(T)	452(2.0)
02-74	28(.1)	55(.3)	132(.5)	11(.2)	1(T)	8(T)	2(T)	237(1.1)
02-74	70(.3)	44(.3)	130(.4)	2(T)	0	6(T)	1(T)	253(1.0)
02-74	77(.4)	35(.4)	266(1.4)	8(.2)	2(T)	18(T)	2(T)	408(2.4)
05-74	56(.5)	32(.5)	165(.7)	5(.3)	2(T)	6(T)	3(T)	269(2.0)
05-74	36(.5)	1(.2)	115(.4)	3(.3)	0	2(T)	2(T)	159(1.4)
05-74	29(2.1)	1(T)	141(.9)	6(T)	0	1(T)	0	178(3.0)
				Boulder River - Station 039				
10-70	8	84	49	33	1	0	2	177
04-71	48(.2)	288(.3)	337(1.2)	271(.2)	9(.1)	0	0	953(2.0)
10-71	10(T)	129(2.3)	79(.7)	11(.1)	2(T)	0	3(T)	234(3.1)
10-71	4(T)	90(.5)	37(.2)	30(.4)	4(T)	0	2(T)	167(1.1)
10-71	1(T)	23(.1)	42(.3)	17(.2)	1(T)	0	0	84(.6)
02-72	55(.2)	34(.3)	180(.5)	969(.5)	3(T)	25(T)	4(T)	1270(1.5)
02-72	41(.1)	126(.8)	157(.7)	53(3.5)	0	57(T)	9(T)	443(5.1)
02-72	18(.1)	31(.1)	65(.3)	3(T)	0	17(T)	1(T)	135(.5)
05-72	8(.2)	5(T)	53(.2)	29(.7)	1(T)	18(T)	0	114(1.1)
05-72	14(.2)	15(T)	12(.1)	11(.2)	0	3(T)	0	55(.5)
05-72	21(.2)	22(.1)	72(.4)	11(T)	0	15(T)	0	141(.7)
08-72	20(.2)	20(.1)	143(.4)	107(.2)	10(T)	0	0	300(.9)
08-72	15(T)	8(T)	39(.1)	36(.1)	2(T)	2(T)	2(T)	104(.2)
08-72	15(.1)	30(.2)	172(.3)	35(.1)	4(T)	1(T)	2(T)	259(.7)
02-73	3(T)	144(.2)	43(.1)	49(T)	1(T)	0	1(T)	241(.3)
02-73	73(.4)	118(.5)	171(.8)	255(1.1)	4(T)	47(T)	22(T)	690(2.8)
02-73	26(.9)	171(.5)	77(.3)	62(.3)	4(T)	19(T)	13(T)	372(2.0)
05-73	7(T)	247(.4)	212(.3)	53(.2)	5(T)	25(T)	6(T)	555(.9)
05-73	21(.1)	361(1.9)	310(.5)	66(.3)	3(T)	34(T)	9(T)	804(2.8)
05-73	16(T)	206(.8)	215(1.1)	122(.2)	4(T)	26(T)	7(T)	596(2.1)
07-73	7(.1)	30(.2)	122(.1)	26(.1)	3(T)	0	0	188(.5)
07-73	3(T)	13(T)	195(.2)	59(.1)	7(T)	11(T)	4(T)	292(.3)

Appendix A Continued. Number and volume (in parentheses) of macroinvertebrates collected in one square foot stream bottom samples for stations on larger streams, 1970-74.

Date	Plecoptera	Tricoptera	Ephemeroptera	Diptera	Coleoptera	Annelida	Other[a]	Total
			Boulder River - Station 039 continued					
07-73	7(.2)	13(T)	144(.2)	59(.1)	7(T)	7(T)	1(T)	238(.5)
10-73	42(T)	403(.9)	139(.3)	120(.7)	15(T)	41(T)	8(T)	768(1.9)
10-73	25(.1)	166(1.1)	148(.4)	60(.9)	3(T)	19(T)	5(T)	426(2.5)
10-73	2(T)	231(.5)	33(.1)	16(.1)	2(T)	5(T)	3(T)	292(.7)
02-74	8(T)	122(.2)	39(.2)	36(.2)	1(T)	6(T)	4(T)	216(.6)
02-74	3(T)	84(.1)	36(.1)	34(.1)	4(T)	0	2(T)	163(.3)
02-74	4(T)	63(.1)	38(.2)	54(.2)	2(T)	1(T)	1(T)	163(.5)
05-74	19(1.1)	203(.8)	141(.2)	66(1.7)	9(T)	2(T)	0	440(3.8)
05-74	7(.3)	17(.8)	73(.2)	28(.1)	2(T)	3(T)	1(T)	131(1.4)
05-74	22(.2)	9(T)	86(.3)	33(T)	3(T)	0	4(T)	157(.5)
			Boulder River - Station 040					
10-71	17(1.2)	102(.3)	91(.2)	20(T)	4(T)	0	0	234(1.7)
10-71	5(T)	44(.1)	30(.1)	3(.1)	2(T)	13(T)	0	97(.3)
10-71	28(.2)	210(.1)	101(.3)	7(T)	1(T)	19(T)	0	366(1.6)
02-72	84(.4)	282(.9)	461(1.1)	96(2.1)	6(T)	425(.1)	0	1354(4.6)
02-72	74(.6)	375(1.0)	651(1.7)	34(.6)	4(T)	736(.2)	1(T)	1875(4.1)
02-72	158(.3)	290(1.0)	648(2.4)	29(.5)	4(T)	855(.3)	0	1984(4.5)
05-72	20(.7)	55(.1)	146(.4)	11(T)	1(T)	4(.2)	1(T)	238(1.4)
05-72	51(.3)	210(.4)	147(.5)	126(.1)	15(T)	89(T)	0	638(1.3)
05-72	55(1.5)	342(.5)	208(.5)	42(T)	3(T)	18(T)	1(T)	669(2.5)
08-72	13(.3)	38(.2)	152(.3)	68(.6)	6(T)	14(T)	0	291(1.4)
08-72	24(1.0)	37(.2)	164(.2)	140(.3)	8(T)	8(T)	3(T)	384(1.7)
08-72	37(1.1)	54(.4)	153(.3)	144(.5)	13(T)	25(T)	4(T)	430(2.4)
02-73	9(.1)	306(.6)	228(.7)	244(.9)	24(T)	158(T)	0	969(2.3)
02-73	37(2.1)	120(.3)	89(.2)	109(.5)	4(T)	50(T)	0	410(3.1)
02-73	36(1.5)	641(2.5)	365(1.7)	222(1.4)	14(T)	176(.1)	18(T)	1472(7.2)
05-73	15(T)	159(.4)	187(.6)	53(.5)	6(T)	86(T)	5(T)	511(1.5)
05-73	7(.1)	418(1.2)	1343(1.9)	332(.9)	14(T)	81(T)	2(T)	2197(4.1)
05-73	62(.1)	207(.5)	675(1.1)	304(.7)	14(T)	112(T)	4(T)	1378(2.4)
07-73	46(.1)	37(.1)	460(.6)	193(.2)	15(T)	65(T)	4(T)	820(1.0)
07-73	8(.3)	22(.3)	146(.5)	371(.6)	6(T)	9(T)	1(T)	563(1.7)
07-73	28(.1)	21(.1)	203(.5)	402(.9)	13(T)	61(T)	8(T)	736(1.6)
10-73	9(T)	66(T)	6(T)	10(.1)	6(T)	14(T)	2(T)	113(.1)
10-73	17(.1)	349(2.4)	70(.2)	60(.4)	5(T)	42(T)	7(T)	550(3.1)
10-73	22(T)	180(.6)	62(.1)	40(.1)	12(T)	78(.1)	9(T)	403(.9)
02-74	7(T)	160(.8)	34(.2)	40(.4)	6(T)	2(T)	0	249(1.4)
02-74	49(1.8)	360(1.2)	231(.2)	173(.4)	18(T)	29(T)	0	860(3.6)
02-74	18(T)	558(2.7)	165(.4)	120(1.2)	14(T)	101(T)	3(T)	979(4.3)
05-74	7(.1)	225(.3)	479(.9)	83(.6)	32(.1)	11(T)	2(T)	839(2.0)
05-74	83(.3)	140(.5)	371(.9)	33(.1)	0	60(T)	0	687(1.8)
05-74	28(.7)	538(2.0)	818(2.0)	104(.4)	14(T)	94(T)	2(T)	1598(5.1)

Appendix A Continued. Number and volume (in parentheses) of macroinvertebrates collected in one square foot stream bottom samples for stations on larger streams, 1970-74.

Date	Plecoptera	Tricoptera	Ephemeroptera	Diptera	Coleoptera	Annelida	Other[a]	Total
			West Boulder River - Station 041					
10-70	18	10	139	6	5	56	2	236
04-71	7(.1)	5(.1)	55(.2)	21(T)	1(T)	0	1(T)	90(.4)
10-71	29(.2)	21(.4)	178(.6)	10(T)	4(T)	0	18(T)	260(1.2)
10-71	25(.7)	34(.7)	126(.4)	3(T)	2(T)	125(T)	0	315(1.8)
10-71	33(.1)	6(T)	96(.4)	7(T)	1(T)	28(T)	0	171(.5)
02-72	54(.2)	10(T)	91(.2)	4(T)	2(T)	52(T)	2(T)	215(.4)
02-72	75(.2)	10(T)	123(.2)	9(T)	3(T)	0	3(T)	223(.4)
02-72	62(.1)	12(.1)	113(.2)	10(T)	1(T)	30(T)	3(T)	231(.4)
05-72	24(.9)	8(.3)	92(.6)	17(.1)	1(T)	7(.6)	0	149(2.5)
05-72	96(2.1)	12(.1)	389(1.0)	47(.1)	3(T)	1(T)	0	548(3.3)
05-72	13(.1)	0	63(.3)	5(T)	0	0	0	81(.4)
08-72	28(.3)	27(.3)	344(.3)	60(.1)	2(T)	65(T)	3(T)	529(1.0)
08-72	43(.1)	28(.7)	406(.6)	124(.1)	2(T)	18(T)	4(T)	625(1.5)
08-72	19(.1)	19(.1)	521(.8)	157(.1)	2(T)	20(T)	4(T)	742(1.1)
02-73	37(.2)	39(.2)	266(1.1)	20(.1)	1(T)	137(T)	1(T)	501(1.6)
02-73	71(1.1)	61(.2)	338(1.2)	86(1.1)	5(T)	200(T)	4(T)	765(3.6)
02-73	16(.1)	64(.5)	227(1.0)	21(.2)	3(T)	84(T)	0	415(1.8)
05-73	33(.1)	52(.3)	273(1.5)	89(.3)	4(T)	80(T)	0	531(2.2)
05-73	27(.1)	76(.3)	422(.9)	238(.3)	5(T)	295(.1)	0	1063(1.7)
05-73	18(.1)	19(.1)	203(.8)	97(.1)	2(T)	90(T)	1(T)	430(1.1)
07-73	33(.2)	12(.2)	214(.6)	63(.1)	5(T)	69(.1)	5(T)	401(1.2)
07-73	32(.2)	18(.3)	188(1.1)	49(.1)	2(T)	158(.3)	0	447(2.0)
07-73	48(.4)	7(.1)	323(1.3)	86(.1)	2(T)	114(.1)	0	580(2.0)
10-73	59(.2)	41(T)	126(.2)	12(.1)	1(T)	11(T)	0	250(.5)
10-73	77(.2)	31(T)	221(.2)	10(.1)	3(T)	60(T)	1(T)	403(.5)
10-73	82(.3)	40(.1)	224(.3)	11(.1)	1(T)	5(T)	0	363(.8)
			Stillwater River - Station 005					
08-70	43	18	74	168	4	2	0	309
04-71	15(.1)	9(.1)	163(.2)	5(T)	1(T)	0	10(T)	203(.4)
10-71	30(.1)	14(.3)	85(.1)	22(T)	2(T)	27(T)	0	180(.5)
10-71	24(.1)	22(.3)	84(.1)	40(T)	3(T)	39(T)	0	212(.5)
10-71	5(T)	5(T)	48(.1)	3(T)	1(T)	5(T)	0	67(.1)
02-72	61(.2)	14(.2)	329(.5)	7(T)	1(T)	0	1(T)	413(.9)
02-72	39(.1)	11(.2)	344(.7)	5(.1)	0	1(T)	0	400(1.1)
02-72	69(.5)	6(T)	215(.3)	7(T)	1(T)	0	2(T)	300(.8)
05-72	0	0	108(.4)	1(T)	0	0	0	109(.4)
05-72	14(.3)	1(T)	154(.6)	10(.1)	0	0	0	179(1.0)
05-72	12(.1)	2(.1)	97(.5)	7(.1)	3(T)	41(T)	0	162(.8)
08-72	5(T)	1(T)	14(T)	12(T)	0	0	0	32(T)
08-72	10(T)	0	12(T)	16(T)	1(T)	0	0	39(T)
08-72	5(.1)	6(T)	24(.1)	19(T)	0	0	0	54(.2)

Appendix A Continued. Number and volume (in parentheses) of macroinvertebrates collected in one square foot stream bottom samples for stations on larger streams, 1970-74.

Date	Plecoptera	Tricoptera	Ephemeroptera	Diptera	Coleoptera	Annelida	Other[a]	Total
			Stillwater River - Station 005 continued					
02-73	19(.3)	2(T)	360(.5)	8(T)	1(T)	0	1(T)	391(.8)
02-73	30(.1)	5(T)	403(.4)	11(.1)	2(T)	0	0	451(.6)
02-73	47(.2)	26(.3)	366(.7)	29(T)	0	0	3(T)	471(1.2)
05-73	4(T)	5(T)	33(.1)	10(.1)	0	0	0	52(.2)
05-73	7(.1)	2(T)	114(.8)	68(T)	2(T)	0	1(T)	194(.9)
05-73	7(T)	2(T)	72(.4)	23(.2)	3(T)	0	0	107(.6)
07-73	9(.1)	12(.1)	61(.2)	21(.2)	5(T)	0	3(T)	111(.6)
07-73	11(T)	7(.1)	38(.1)	25(T)	4(T)	0	0	85(.2)
07-73	26(T)	5(T)	31(.1)	54(.1)	4(T)	0	0	120(.2)
10-73	51(.4)	48(.4)	94(.2)	852(1.6)	0	0	21(.1)	1066(2.7)
10-73	61(.2)	46(.5)	141(.1)	26(.1)	2(T)	0	2(T)	288(.9)
02-74	38(.4)	28(.3)	158(.2)	15(.1)	0	1(T)	2(T)	242(1.0)
02-74	61(.7)	36(.3)	579(1.1)	49(.1)	0	5(T)	3(T)	733(2.2)
02-74	19(T)	14(T)	213(.5)	38(.1)	1(T)	0	1(T)	286(.6)
05-74	114(.2)	13(.1)	270(.3)	162(.1)	6(T)	64(T)	12(T)	644(.7)
05-74	16(.3)	7(.2)	136(.6)	22(.1)	0	0	6(T)	188(1.2)
05-74	0	3(T)	48(.2)	11(T)	2(T)	0	0	64(.2)
10-73	86(.2)	0	132(.1)	37(.1)	3(T)	0	1(T)	259(.4)