RATTLESNAKE CREEK RESEARCH PROJECT

Prepared by

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and
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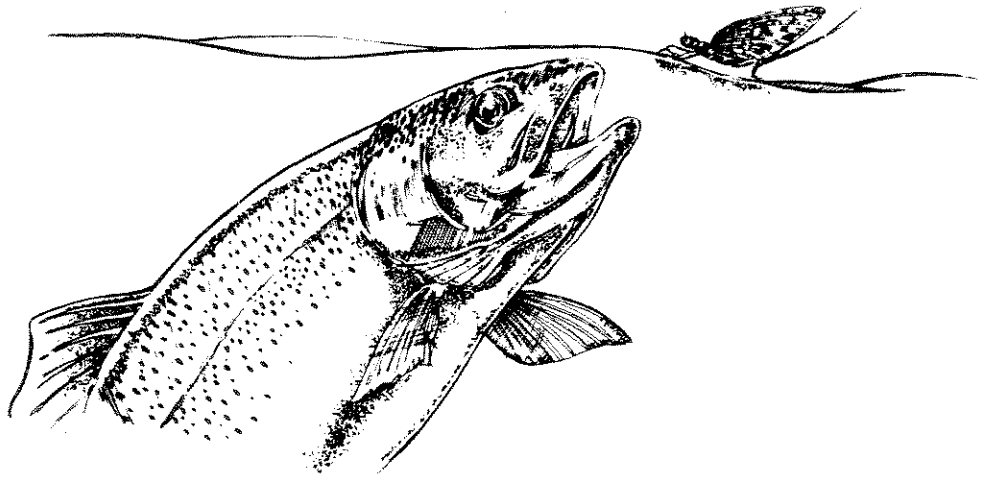

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National Trout Unlimited
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Montana Department of Fish, Wildlife & Parks
Bitterroot Trout Unlimited
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Western Montana Fish and Game Association
Inland Empire Fly Fishing Club

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Abstract

This report documents fishery information collected in 1985 as part of a baseline assessment of Rattlesnake Creek. The study was designed to determine species composition, distribution, size, abundance and age in four sections of Rattlesnake Creek. Two of the study sections were opened to catch and release fishing in the spring of 1985. The remaining two sections are located in an area that has been closed to fishing since 1940. The report focus on cutthroat trout and to a lesser degree bull and brook trout. The Peterson mark and recapture method of estimating populations was applied using hook and line marking runs and snorkel and mask recapture runs. Population estimates in one section varied from as low as 28.3 cutthroat per mile in the spring to 1,335.8 cutthroat per mile in mid-summer, possibly indicating a high degree of migration within the system. Cutthroat trout over 14" were quite common. The oldest trout sampled was an age VII cutthroat.

An intensive creel census was conducted in the newly opened catch and release area to determine angler catch and pressure. The total estimated catch between April and September, 1985, was 3,666.5 cutthroat trout. The total estimated angler hours were 1,028.6 and the total estimated catch rate was 3.6 cutthroat per hour. The estimated catch between Beeskove Creek and Franklin Bridge was 1,493 cutthroat and the expanded population estimate for cutthroat in this area was 1,728.0. Therefore, an estimated 86% of the cutthroat were caught and released.

Spawning activity, habitat survey information and physical data is included and discussed.

Objectives

This one year study was designed to collect baseline data necessary to evaluate the effects of catch and release fishing above Beeskove Creek and the population dynamics of an unfished population of westslope cutthroat trout below Beeskove Creek in western Montana. The objectives for the first year were:

1. Determine wild trout species composition, distribution, size, abundance, and age in four sections of Rattlesnake Creek.

2. Document angler catch and pressure on Rattlesnake Creek upstream of Beeskove Creek.

ACKNOWLEDGEMENTS

The following groups provided funding for this project. Without their assistance this project would never have been started or completed - National Trout Unlimited, National Trout and Salmon Foundation, Bitter Root Trout Unlimited, Westslope Trout Unlimited, Western Montana Fish and Game Association, and Inland Empire Fly Fishing Club. We appreciate their support.

We would like to extend a special thanks to the following individuals for their support, assistance, and encouragement: Don Peters and Dennis Workman of the Dept. of Fish, Wildlife and Parks who were instrumental during all phases of this study. Marshall Bloom, Pete Test, Ray Prill and their Trout Unlimited clubs for volunteered their assistance whenever called upon. Tom Comar from Orvis and Tom Morgan from R. L. Winston Company donated equipment. Greg Munther and Tom Spoiler of the Forest Service reviewed the project and provided access to Rattlesnake Creek. Ginger Thomas, Kenny Gutowski and Ron Snyder provided expertise in statistical analysis, insect identification, editing, and field work techniques.

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Introduction

Rattlesnake Creek is a small wadeable creek which runs through the Rattlesnake Wilderness and Recreation Area for approximately 23 miles and flows into the Clark Fork River in downtown Missoula, Montana. Until 1983, Rattlesnake Creek was used as Missoula's municipal water supply. In 1940 the creek was closed to fishing above the water supply reservoir which is located 2.5 miles upstream from the mouth. Due to an outbreak of giardia in 1983, Missoula began using wells as its sole source of water thus allowing recreational use of the water for the first time in 45 years. In the winter of 1984-85 the Montana Fish and Game Commission opened Rattlesnake Creek to catch and release fishing above Beeskove Creek. Access to the catch and release fishing section is limited by a six mile hike. No vehicle travel is allowed but an old fire road can be used by mountain bikers for easier access.

The current study on Rattlesnake Creek was designed to obtain more intensive data than otherwise possible by state or federal agencies. This report summarizes the results of research initiated in the spring of 1985 to evaluate the population dynamics of the unfished cutthroat fishery below Beeskove Creek and to evaluate the effects of special regulations in the area above Beeskove Creek.

The Study Area

The upper Rattlesnake Creek drainage is located 5.6 miles(8.3 km) north of Missoula in western Montana (Figure 1). The drainage encompasses approximately 81.3 square miles (21,053 ha), most of which is owned by the United States Forest Service.

Rattlesnake Creek originates on the flanks of McLeod and Triangle peaks, flowing south-southwest to its confluence with the Clark Fork of the Columbia River at Missoula (Figure 1). In 23.3 miles (37.0 km), from source to mouth, the creek descends 5291.0 ft. (1613 m) for a mean gradient of 4.3%. Of the nine perennial tributaries, three (Wrangle, Lake, and High Falls creeks) originate from glacial lakes; the remaining 6 (Porcupine, East Fork of Rattlesnake, Beeskove, Pilcher, Fraser and Spring creeks) originate from springs. Numerous intermittent streams also feed Rattlesnake Creek. More than 40 lakes are located in the upper drainage mostly on the west side. Geologic studies indicate that the parent materials include argillites, quartzites, and limestone of the Precambrian Belt series as well as Cambrian shales and limestones (Nelson & Dobell,1961). The watershed is characterized by relatively high peak discharge per unit area, a disportionately large amount from the upper elevations (Van der Poel, 1979).

Rattlesnake Creek is a 3rd order stream which flows through a fairly steep valley. The valley bottom is an open pine-larch forest and cottonwoods and shrubs line the creek. Occassionally the valley bottom opens up into small, grassy meadows. Higher in the drainage the valley is increasingly timbered and steep. A stable natural character generally persists throughout the drainage. The substrate of Rattlesnake Creek is mostly gravel and cobble with a few boulders. The average flow is approximately 45-50 cfs.

Although the creek does not currently supply Missoula with water, it is primarily managed as a watershed and secondarily managed as a recreational area (USFS Management Plan, 1984). The possibility of building a small filtration plant on the creek and again using the water for Missoula's municipal water supply

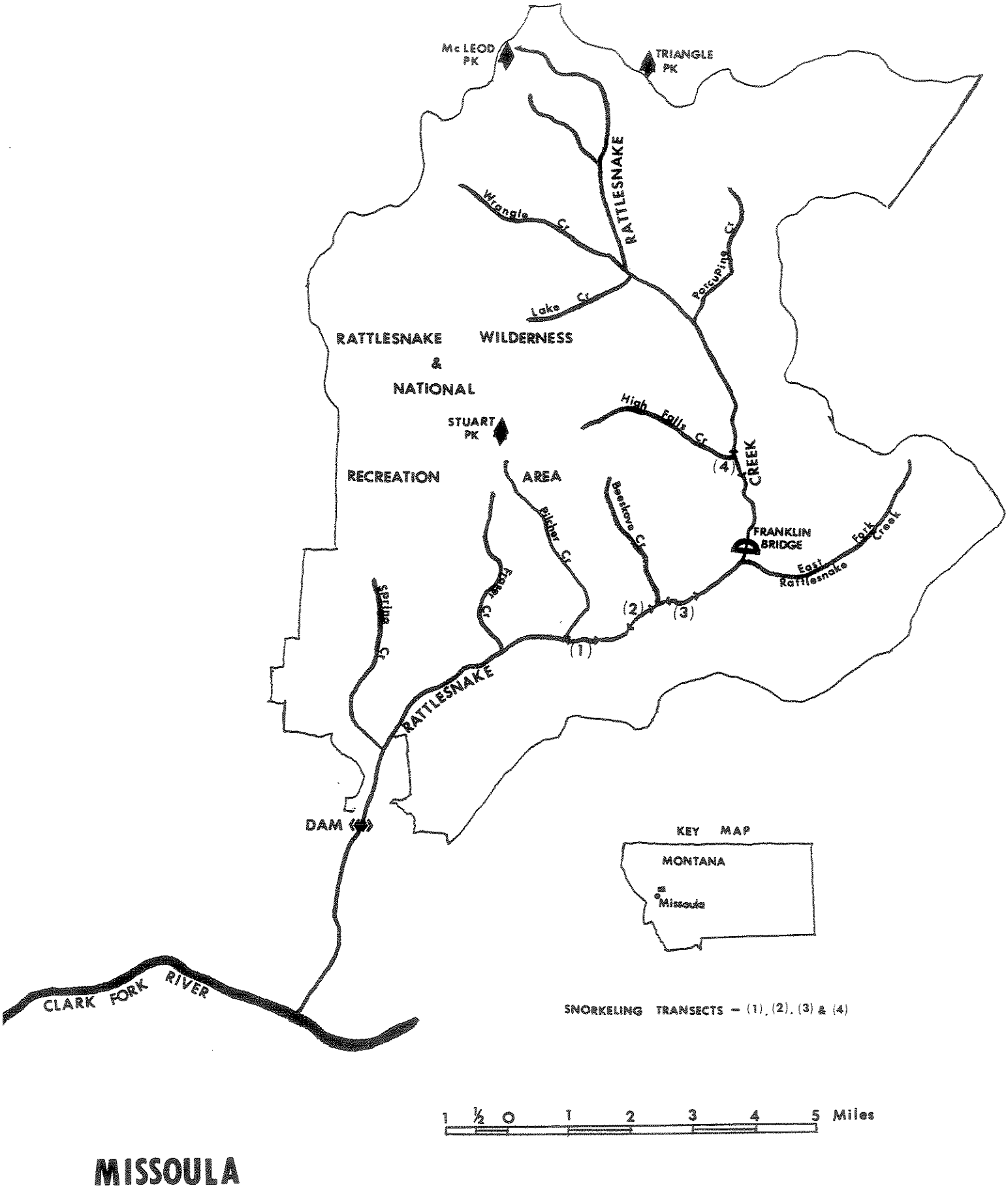


Figure 1. Drainage map of Rattlesnake Creek & study section locations.

is being discussed. A small water company dam already exists 2.5 miles upstream from the mouth of Rattlesnake Creek. This area would be the most probable site for a filtration plant. The water company dam prevents all upstream fish migration from the Clark Fork River.

METHODS

Study Section Selection

Four 2,000 foot sections of Rattlesnake Creek were selected as study sites. Two sections were selected in the area closed to fishing below Beeskove Creek, one section was selected directly above Beeskove Creek, where fairly heavy fishing pressure was anticipated, and one section was selected above Franklin Bridge. The section above Franklin Bridge takes considerable effort to reach (approximately 9.5 miles in) and because it is higher in elevation than the other sections, its characteristics and habitat varies from the lower three sections. The 2,000 foot length provided adequate data needed for making population estimates and it could be snorkeled without excess fatigue. Our sampling sections were permanently marked with angle iron posts on the lower boundary. The four section locations appear in appendix A-1.

Population Estimates

In the four sections of Rattlesnake Creek, Chapman's modification of the Peterson mark and recapture population estimates were calculated (Ricker, 1975) using hook and line marking runs and snorkel and mask recapture runs. The snorkeling methodology was preferred over electrofishing because of low water conductivity and good water clarity in Rattlesnake Creek. The method has proven quite successful in several other drainages (Northcote and Wilkie 1963, Goldstein 1978, Whitworth & Smith 1980, Schill & Griffith 1984).

Trout were caught with dry or submerged barbless flies, landed using a net, and marked with either a floy or fingerling tag. Trout were then weighed, measured, and checked for sex. Scale samples were taken before release. The site of release was always at, or near, the site of capture. Marking runs were repeated until a reasonable recapture percentage was reached.

Snorkel recapture counts were performed by a 2-person crew; one in the water and one on the bank recording data.

The following conditions were met to assure the most accurate snorkel counts were made:

1. Only fish over 4 inches were counted.
2. Counts were made at mid-day and when skies were clear.
3. Different colored tags were used for each 4" size group to aid the snorkeler in identifying lengths. For example, 4-8 " fish were tagged red, 8-12 " fish were tagged yellow, etc.

4. A ¼" neoprene dry suit was used to extend the amount of time that the snorkeler could comfortably spend in the water under a variety of conditions.

5. Snorkeling was done from downstream up.

6. Water clarity had to be sufficient to see across to the far bank. This condition rarely presented a problem in Rattlesnake Creek.

Cutthroat generally were not disturbed by the presence of a diver.

The snorkeling methodology is limited in its ability to estimate brook trout, bull trout and all <4" trout populations. These trout populations were difficult to catch (mark) and difficult to see during snorkel counts due to their small size or dark coloration. In most cases information was not adequate for us to make these estimates but when it was possible, estimates were calculated.

The Department of Fish, Wildlife and Parks electrofished section I in early July to test the feasibility of making an estimate using their equipment. Although the water did conduct a current, the efficiency (fish marked/ hour) of electrofishing was less than using a hook and line. The only exception was in capturing bull trout and <8" cutthroat trout. We are exploring the idea of using electrofishing equipment next year to supplement our information on bull trout and smaller cutthroat trout.

Creel Census

Creel census data was gathered from April through October 1985 using a volunteer check station, randomized counts and personal interviews. Fishermen counts were stratified for weekends/holidays, weekdays and by two week intervals. An interview day was defined as 7:00 a.m. to 7:00 p.m. Interviews were held on 1/3 of the days in a month and were conducted from a small trailer at Beeskove Creek. Since access to the creek was limited to a six mile trail (or mountain bike ride), we felt confident in obtaining accurate counts.

The catch and release study area was spacially divided into three zones which were easily identifiable to fishermen. Zone 1 extended from Beeskove Creek to Franklin Bridge, zone 2 from Franklin Bridge upstream to Porcupine Creek and zone 3 from Porcupine Creek to the headwaters. Total angler pressure, catch and hours fished were estimated by expansion of the stratified time period counts on a percentage basis.

Small recording booklets were available at Beeskove Creek both at the volunteer creel box and from the creel clerk. Fishermen were encouraged to keep track of species, size, location, and tag numbers of trout caught.

A volunteer creel box was installed in April of 1985 at Beeskove Creek. The data collected from the box was used as supplementary information only and was not used in estimating pressure, catch or hours fished. The data collection forms (Appendix A-2) were designed to encourage participation and accuracy.

Insects

Stream bottom organisms were collected with a Surber square-foot sampler.

One sample per section was collected in a riffle area on September 7, 1985. Samples were preserved in 70% alcohol solution and identification of taxa was taken down to at least the family level. Numbers of insects per family were recorded.

Temperatures

Continuous water temperatures were taken from July through October with a Taylor 7-day recording thermograph installed below Beeskove Creek. Temperatures taken from the chart were read to the nearest 0.5°F. Supplementary water temperatures were measured with a mercury laboratory thermometer.

Discharge

Rattlesnake Creek stream discharge was measured at a site just above Beeskove Creek using the method developed by the United States Geological Survey (Buchanan and Somers, 1969). A price type AA vertical axis current meter was used. Although collection of flow measurements was not initially included as part of this project, we realized in July that due to drought conditions, flow information might later prove to be very important. Flows were taken through October 1985.

Spawning Activity

Westslope cutthroat spawning sites (redds) are generally extremely difficult to identify and enumerate since spawning occurs in the spring during high water. The spring of 1985 proved to be somewhat of an exception due to low spring runoff and short runoff season. Spawning activity was monitored on Rattlesnake Creek from Fraser Creek upstream to the confluence of Rattlesnake Creek and Wrangle Creek. We monitored spawning time and visually identified areas of spawning activity from the bank or during snorkel observations. During marking runs, trout were also manually checked for sex throughout the entire season. At each identified redd a piece of surveyers tape was strung from a nearby tree on which was recorded the location, date, and water temperature. Similar data was recorded in our field book as a more permanent record.

Rattlesnake tributaries (Fraser, Pilcher, Beeskove, Porcupine, the East Fork of Rattlesnake, and Wrangle creeks) were checked periodically throughout the spawning season for activity. The tributaries were too small to snorkel so monitoring was done from the bank, using hook and line, and manual checks.

Movement

Tagged trout were recaptured during hook and line marking runs and sampling outside the sections. Tag numbers, locations and lengths were recorded and movement upstream or downstream was assessed. In the catch and release zones fishermen provided additional tag returns.

Age Data

Scales were obtained from 376 trout. They were mounted and viewed through a microfishe reader. The number of annuli were recorded.

Electrophoresis

Thirty trout were collected from Rattlesnake Creek on October 4, 1985 for electrophoretic analysis. The fish were immediately placed on ice and delivered to the University of Montana genetics laboratory to determine the genetic composition and percentage of hybridization between rainbow and cutthroat trout.

Habitat Composition

Effective comparisons of our habitat data and data collected by the Forest Service (1975) were difficult to make due to different reach locations. In an effort to permanently record the characteristics of each section, we photographed the sections, both from upstream and downstream views, and pool, run, riffle ratios were linearly measured with a tape. Visual estimates of cover availability, and percent of substrate type were also recorded.

RESULTS

Species Composition

Four species of fish were collected from our sections on Rattlesnake Creek. Salmonid species present include: cutthroat trout (Salmo clarki), bull trout (Salvelinus confluentus), and eastern brook trout (Salvelinus fontinalis). The other species observed was the slimy sculpin (Cottus cognatus).

The cutthroat trout have hybridized with rainbow trout. Electrophoretic results from the University of Montana genetics laboratory identified the trout as 94% westslope cutthroat, 4% rainbow, and 2% Yellowstone cutthroat. The hybrids showed very little variability between individuals which indicates that introgression between species has been taking place for some time (Leary, personal communication). The rainbow influence could have come from the Clark Fork River before the water company dam was built or from high mountain lake rainbow plants. Yellowstone cutthroat were also planted in the lakes several years ago. Because this degree of hybridization presents problems of visual recognition (Marnell 1978) and because such a large percentage of their genetic composition is westslope cutthroat trout, the hybrids will simply be referred to as westslope cutthroat trout in the remainder of the report.

The species composition of each of our four sections is shown in Figure 2. The total species composition of these sections was 85% cutthroat, 10% bull trout and 5% brook trout. The cutthroat and bull trout populations dominated the upper drainage; brook trout were never observed in or above section IV. It is interesting to note that although mountain whitefish are native to western Montana and they are present in the Clark Fork River and Rattlesnake Creek below the water company dam, whitefish are not present in Rattlesnake Creek above the dam. Although we did not study the fishery below the water company dam, data collected by the Department of Fish, Wildlife and Parks indicates that rainbow, brown, bull,brook,cutthroat,and mountain whitefish are either residents or use the lower Rattlesnake as a spawning tributary.

Rattlesnake Creek tributaries were visually checked for presence of absence of trout populations. In the lower reaches of Pilcher, Beeskove, HighFalls, Porcupine, and Wrangle creeks cutthroat trout were observed. Trout were not observed in Fraser, Lake or the East Fork of Rattlesnake creeks.

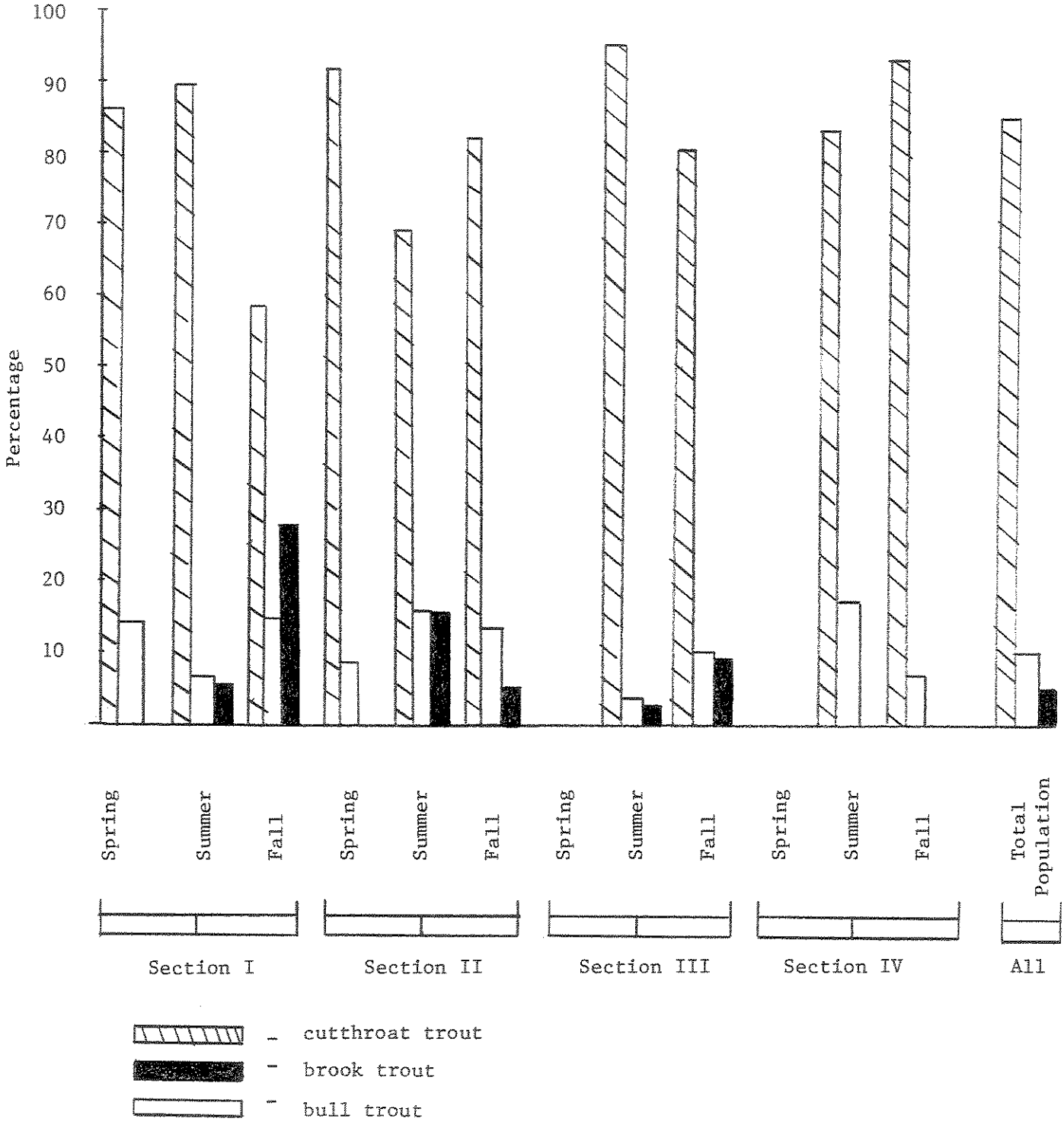


Figure 2. Spring, summer, and fall species composition and distribution in the four study sections of Rattlesnake Creek, 1985.

Size

Numbers of trout sampled, mean lengths and weights, and population estimates for all sections and seasons are summarized in Table 1. A total of 418 cutthroat were measured within our four sections ranging in length from 3.2 inches to 17.8 inches (average 10.1 inches). Larger cutthroat trout, up to 18.4 inches, were measured and observed outside of our sections during drainage surveys. Forty-six brook trout were measured ranging in length from 3.6 inches to 10.4 inches (average 6.7 inches). Only 28 bull trout were collected with lengths ranging from 4.1 inches to 18.4 inches (average 8.2 inches). The brook trout measurements are representative of what we observed during snorkeling, however several larger bull trout (to 28 inches) were viewed.

Abundance

Fish population estimates were made in four sections of Rattlesnake Creek. In the two closed fo fishing sections (I&II) spring, summer, and fall estimates were made. In addition, a winter snorkel count was taken in December 1985. In section III, summer and fall estimates were completed but due to snow accumulation and early freezing, only a summer estimate was possible in section IV. A supplemental fall snorkel count was also taken in section IV.

A comparison of population densities by section was prepared (Table 2). Section I is difficult to compare due to the influx of small fish during the summer estimate (see below), but sections II, III, and IV correlate well. Cutthroat densities in section II and III were very similar. The summer estimate for section II was 365.4 fish per mile while the section III estimate was 396.7 fish per mile. The fall estimates correlate in a similar manner with 187.4 fish per mile in section II and 164.7 fish per mile in section III. The likeness between these two sections may become important later in study when comparisons of the newly opened catch and release area (section III) and the closed to fishing area (section II) are made.

Section IV is located approximately three miles above Beeskove Creek. The trout are comparatively small and more abundant here than in the other three sections. We estimated 988.2 fish per mile on August 25,1985.

Population estimates varied substantially between seasons. The most dramatic example of seasonal variability occurred in section I. In the spring of 1985, the population estimate for section I was 28.3 fish per mile. The summer estimate increased to 1,576.1 fish per mile and in the fall the population estimate dropped back to 115.1 fish per mile (Table 2). These trout may be exibiting some migration tendencies, especially within the 4 to 8 inch size grout (age I & II). Similar but less dramatic trends were apparent in sections II and III.

Winter snorkel counts were taken in the lower two study sections (I & II) in December 1985 to obtain overwintering data (Table 2). The lower creek was frozen over but sections I and II were virtually free of ice except for periodic shelf ice and some remaining ice cover over a couple of log jams. On dive days the air temperature ranged from 4° to 11° F, water temperature was 34°F.

Bull trout were particularly difficult to catch (mark) with a hook and line and often they were hard to observe with a mask and snorkel. In section I, we

Table 1. Comparisons of trout lengths and weights by stream section in Rattlesnake Creek, 1985.

Section	Date	Species	Number	Length (in.) (range)	Weight(lbs.)	Pop. estimates (fish-mile)
I	4-6-85	cutthroat	4	15.3 (14.1-17.1)	1.40	28.25
I	7-4-85	cutthroat	78	8.3 (3.2-17.8)	.35	1,576.08
		brook	33	6.3 (3.6-10.4)	.12	354.80
		bull	27	7.6 (4.1-18.4)	.31	480.50
I	9-25-85	cutthroat	12	13.7 (6.5-17.0)	.96	115.10
		brook	1	7.4 -	.09	-
II	4-7-85	cutthroat	10	14.4 (12.2-17.5)	1.09	96.89
		bull	1	17.5 -	1.45	-
II	6-26-85	cutthroat	59	10.6 (4.7-16.4)	.51	365.40
		brook	9	7.1 (5.1- 9.2)	.15	147.10
II	9-21-85	cutthroat	26	13.3 (8.4-17.7	.90	187.40
III	6-17-85	cutthroat	54	11.8 (5.9-17.0)	.75	396.70
		brook	3	5.7 (5.2- 6.0)	.05	-
III	9-10-85	cutthroat	25	12.7 (8.2-16.4)	.64	164.70
IV	7-24-85	cutthroat	150	8.8 (5.0-13.0)	.25	988.15
TOTAL		cutthroat	418	10.1 (3.2-17.8)		
		brook	46	6.7 (3.6-10.4)		
		bull	28	8.2 (4.1-18.4)		

Table 2. Trout population estimates for Rattlesnake Creek, 1985.

Section	Date	Species	Size(in.)	M	C	R	N	(+) 95%CI	(+) 80%CI	Number/ mile	(lb./mi.) biomass
Pilcher I	4/9/85	WSCt*	All	4	6	2	10.7	7.9	5.2	28.25	39.4
	8/4/85	WSCt	All	71	348	41	597	167.4	109.5	1576.1	551.63
			4-7.9	37	306	22	506	194.7	127.4	1335.8	101.24
			8-11.9	18	19	6	53.3	29.8	19.5	140.7	40.24
			12-15.9	12	19	11	20.7	7.1	4.7	54.65	58.93
			16+	4	4	2	7.3	4.5	3.0	19.27	31.07
		DV	All	27	25	3	182	146.7	96.0	480.5	148.96
		EB	All	31	20	4	134.4	93.9	61.4	354.8	41.16
	10/29/85	WSCt	All	12	23	6	43.6	25.4	16.6	115.1	110.5
			4-7.9	1	3	0	7	8.4	5.5	18.5	1.48
			8-11.9	1	9	1	9	9.11	6.0	23.8	2.88
			12-15.9	9	8	4	17	8.9	5.8	44.9	47.65
			16+	1	3	1	3	2.4	1.6	7.9	13.0
winter count	12/10/85	WSCt	All		28	8					
			4-7.9		5	0					
			8-11.9		7	2					
			12-15.9		13	6					
			16+		2	1					
Below Beeskove II	4/9/85	WSCt	All	10	23	6	36.7	21.4	14.0	96.9	109.05
	7/10/85	WSCt	All	59	71	30	138.4	36.1	23.6	365.4	186.34
			4-7.9	16	24	5	69.8	44.6	29.0	184.3	17.97
			8-11.9	20	22	8	52.7	25.5	16.7	139.1	41.67
			12-15.9	18	22	12	32.6	13.3	7.4	86.1	70.84
			16+	5	9	5	9	4.2	2.8	23.8	36.35
		EB	All	9	16	2	55.7	49.5	32.4	147.1	21.4
	10/17/85	WSCt	All	26	31	11	71	35.5	20.0	187.4	168.66
			4-7.9	0	0	0					
			8-11.9	9	5	0	59	74.7	48.8	155.8	64.41
			12-15.9	10	19	7	26.5	13.4	8.8	70.0	58.45
			16+	7	7	4	11.8	5.8	3.8	31.2	48.41
Winter count	12/11/85	WSCt	All		59	19					
			4-7.9		17	0					
			8-11.9		7	4					
			12-15.9		25	10					
			16+		10	5					
Above Beeskove Section III	6/20/85	WSCt	All	54	54	19	150.3	51.26	33.5	396.7	297.5
			4-7.9	6	11	3	20	14.3	9.4	52.8	5.49
			8-11.9	19	26	6	76.1	45.4	29.7	200.9	92.84
			12-15.9	25	13	8	39.4	14.6	9.6	104.0	97.93
			16+	4	4	2	7.3	4.6	2.97	19.27	30.78

Table 2. Cont'd.

Section	Date	Species	Size(in.)	M	C	R	N	(±) 95%CI	(±) 80%CI	Number mile	(lb./mi.) biomass
Above Beeskove Section III-cont.	10/18/85	WSCt	All	25	38	15	62.4	22.8	14.9	164.7	105.41
			4-7.9"	0	0	0					
			8-11.9	11	13	3	41	30.4	19.9	108.24	34.83
			12-15.9	12	21	10	25	10.0	6.5	66.0	54.4
			16+	2	4	2	4	2.5	1.6	10.6	13.4
High Falls Section IV	8/25/85	WSCt	All	150	168	67	374.3	68.3	44.7	988.2	247.04
			4-7.9	52	80	16	251.5	103.3	67.6	663.96	73.82
			8-11.9	93	80	45	161	29.5	19.3	425.0	127.97
			12-15.9	5	8	5	8	3.5	2.3	21.12	13.73
			16+	0	0	0					
		DV	All	2	23	2	2	21.08	13.8	60.7	
Count only	10/29/85	WSCt	All		234	39					
			4-7.9		74	4					
			8-11.9		147	31					
			12-15.9		13	1					
			16+		0	0					
1986 Winter Snorkel Counts											
Pilcher I	2/11/86 Day	WSCt	All		46	7					
			4-7.9		16	1					
			8-11.9		16	1					
			12-15.9		10	2					
			16+		4	3					
Below Beeskove II	2/10/86 Day	WSCt	All		46	17					
			4-7.9		16	2					
			8-11.9		10	3					
			12-15.9		16	10					
			16+		4	2					
	2/10/86 Night	WSCt	All		88	18					
			4-7.9		35	0					
			8-11.9		18	4					
			12-15.9		24	8					
			16+		11	6					

* WSCt = westslope cutthroat trout
DV = bull trout
EB = eastern brook trout

made a single electrofishing marking run to test the efficiency of the shocking equipment. Although the efficiency of shocking was low for cutthroat,it was slightly higher for bull trout. Enough fish were marked to calculate an estimate (480.5 fish per mile), but the estimate was based on a fairly small sample size.

Brook trout estimates were made in two sections but once again the sample size and methodology were somewhat inadequete (Table 2).

Angler Effort and Harvest

Between April and September of 1985, an estimated 361.9 fisherman caught an estimated 3,666.5 cutthroat trout on Rattlesnake Creek (Table 3). The total estimated man hours fished was 1,028.6 for a total estimated catch rate of 3.6 fish per hour. The most intensive use period occurred in July with 4.3 fisherman per weekend day. Weekends generally received 3 to 4 times as much pressure as the weekdays.

The catch and release area just above Beeskove Creek and below Franklin Bridge received most of the fishing pressure with an estimated 221.6 total fishermen. This area is the easiest of the three fishing areas to reach and generally supports the largest sized cutthroat trout. The population estimate for section III was expanded assuming that the population density of the area between Beeskove Creek and Franklin Bridge was equal to the density of section III. The population estimate for the lower catch and release area was 1,728.0 cutthroat trout. The estimated catch was 1,493.0 cutthroat trout therefore, an estimated 86% of the cutthroat were caught and released. Several tagged cutthroat were caught multiple times including one cutthroat over 16 inches which was caught and released nine times in seven months.

The section above Franklin Bridge and below Porcupine Creek received less pressure with 125 total fishermen and 1,949.5 cutthroat caught and released. The most difficult section to reach (10+ mile hike), the area above Porcupine Creek, produces many small cutthroat with very few reaching a length over 8 inches total length. This section received very little pressure, 15.3 fishermen estimated for the season, but had the highest estimated catch rate (7.3 fish per hour).

Stream Discharge

Stream discharge was monitered from July 19th through October 19, 1985. Five flows were taken at an appropriate site on Rattlesnake Creek just above the confluence of Beeskove Creek. Discharge ranged from 13.9 cfs. to 113.0 cfs. (Table 4). The summer of 1985 was considered a drought year therefore the mid-summer flows may be considered lower than normal. Late summer rains alleviated the drought conditions and increased flows.

Temperatures

Temperatures were monitered from July 7th through October 26, 1985 with a Taylor 7-day recording thermograph and with a pocket thermometer from March 28th through October 29, 1985 (Appendix A-3 & A-4). The highest temperature was recorded at 59.5^{o}F in early July. A United States Geological Survey gaging station located ½ mile up from the mouth of Rattlesnake Creek from 1958 through 1965 reveals only one higher temperature recording on July 19, 1960 (62^{o}F) (Aagaard 1969). The lowest temperature was recorded on October 9, 1985 as 25^{o}F. This recording is

Table 3. Estimated angler effort, catch, and man hours on Rattlesnake Creek above Beeskove Creek between April and September, 1985.

Creel Sections	Weekend vs weekdays	Total estimated fisherman trips	95% C.I.	Total estimated hours fished	95% C.I.	Total estimated cutthroat caught & released	95% C.I.	Total estimated cutthroat per hour
Beeskove Cr to Franklin Bridge	Weekdays	102.1	30.3	241.7	73.9	606.7	32.2	2.5
	Weekends	119.5	32.7	317.6	97.3	886.3	129.5	2.7
Franklin Bridge to Porcupine Creek	Weekdays	76.5	20.4	282.9	85.0	1267.6	66.2	4.5
	Weekends	48.5	20.3	155.6	75.3	681.9	79.4	4.5
Above Porcupine Creek	Weekdays	0	0	0	0	0	0	0
	Weekends	15.3	14.4	30.8	22.5	224	24.5	7.27
Total	Total	361.9	118.1	1,028.6	354.0	3666.5	331.8	3.6

Table 4. Stream discharge measurements and temperatures taken on Rattlesnake Creek below Beeskove Creek between July 19 through October 19, 1985.

Date	Flow (cfs)	Temperature (°F)
7-19-85	21.23	52
8-11-85	33.61	46
9-2-85	13.85	45
9-22-85	113.04	43
10-19-85	63.00	35

lower than any recorded by the USGS. Generally low water temperatures bottom out at 32°F. Cross checks between thermometer readings and thermograph readings confirm that the thermograph was calibrated correctly. This descrepency remains unexplained.

Spawning

Cutthroat trout spawning areas and time of spawning were monitered from Fraser Creek up to the confluence of Rattlesnake Creek and Wrangle Creek. The tributaries (Fraser, Pilcher, East Fork of Rattlesnake, High Falls, Porcupine, Lake, and Wrangle creeks) were also surveyed. No immigration from the Clark Fork River for spawning is possible due to the small water company dam located 2.5 miles up from the mouth of Rattlesnake Creek.

Spawning activity was observed in section I, II, III, and IV of Rattlesnake Creek, in Porcupine Creek, and in Wrangle Creek. Numbers of available spawning sites appeared adequete in all of these areas except in section I where sufficient spawning gravel is limited. Fraser, Pilcher, Beeskove, East Fork of Rattlesnake, Lake, and High Falls Creeks, either because of impassible falls, very high gradient, or lack of spawning gravel, showed no signs or likelihood of spawning activity in their lower reaches. Upper reaches were not monitered.

Ripe male cutthroat trout were observed from April 7th through August 22, 1985. The smallest ripe male was 4.0 inches (age II). Ripe female cutthroat trout were seen from June 4th through June 22, 1985 (Appendix A-5). The average water temperature while the female cutthroat trout were spawning was 46°F.

On July 7th, we attempted to install a fry trap over a redd in section I. Spawners were observed over the redd on June 9th. Unfortunately it appeared that fry emergence had already occurred; fry were observed swimming directly over the redd. Nevertheless, we installed the trap but no fry were ever captured.

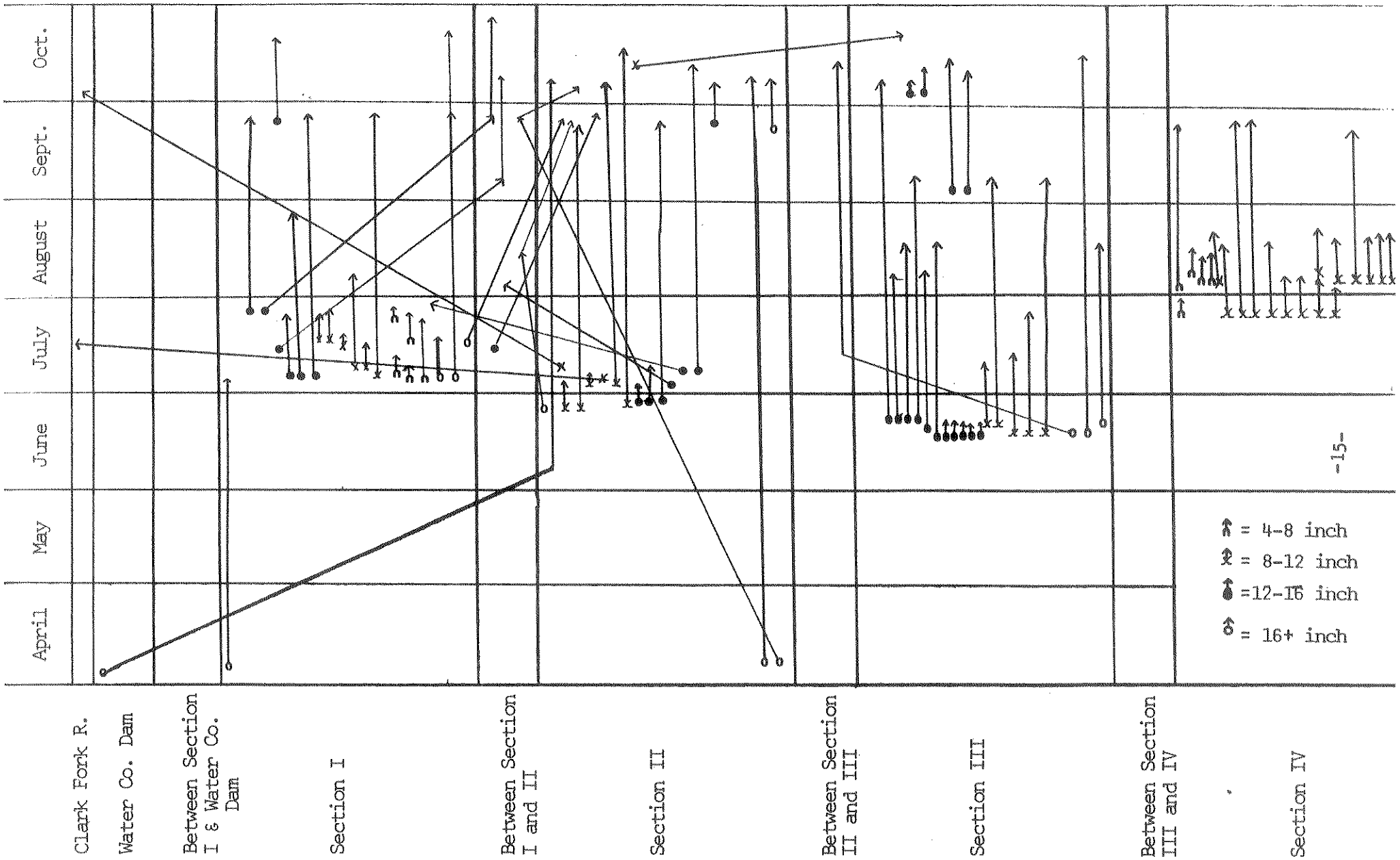
Very little bull trout and brook trout spawning activity was observed. A bull trout redd was seen in section IV on September 26, 1985. Spawning brook trout were observed during fall snorkeling in section III on October 13, 1985.

Movement

Both natural and man-made barriers exist in the Rattlesnake drainage area. Glaciation has left most of the Rattlesnake tributaries "hanging" above the valley floor creating naturalfish barriers. These barriers prevent upstream migration and in some cases may even limit successful downstream movement. There are two barriers on Rattlesnake Creek. One is a natural 15 foot falls located above High Falls Creek and the other is the water company dam, 2.5 miles upstream from the mouth. Both of these barriers prevent upstream migration.

A total of 494 cutthroat were tagged in our four study sections. Eighty-eight recaptures were reported for an 18% recapture rate. Movement out of the section of tagging did not occur in 75 of the 88 recaptures (Figure 3). Of the 13 trout that did move out of the sections, 5 moved upstream and 8 moved downstream. Movement of a significant distance (2+ miles), only occurred in three of the thirteen cases. Two 8-12 inch cutthroat moved downstream into the Clark Fork River (10+ miles). The remaining cutthroat was a 16+ inch trout tagged just upstream of the water company dam. It migrated upstream 8.3 miles to spawn in section II. After the spawning season, this cutthroat remained in section II throughout the summer, fall, and into the winter (last sited on 12-11-85).

Figure 3. Movement of tagged cutthroat trout between April and October, 1985.



All areas in Figure 3 were not sampled equally therefore, comparisons of movement by section may be misleading. For example, it appears that no movement was observed out of section IV yet the sampling time spent just above and below section IV was far less than the sampling time spent between section I and II. Comparisons between sections will be more feasible later in the study.

Movement may have occurred within the 4 to 8 inch size class of cutthroat trout in section I (see population estimates). No 4 to 8 inch size class cutthroat trout were observed in section I on April 9, 1985. In contrast, we estimated 1,335.8 4-8 inch cutthroat trout per mile on August 4, 1985. In the fall, the estimate for the smaller size class fish dropped back to 18.5 cutthroat per mile.

Age and Growth

Summer scale samples were taken from 305 cutthroat trout. The total number, average length, and length ranges for each age group was:

Age	Number	Average length (in.)	Length range (in.)
0	2	3.35	3.2 - 3.5
1	18	5.37	4.7 - 6.5
2	52	6.74	5.0 - 8.8
3	129	8.92	6.7 - 14.5
4+	104	12.36	8.0 - 18.4

Age data, broken down by section, is graphed in Appendix A-6, A-7, A-8, & A-9. Section I, II, and III exhibited similar growth patterns. Growth in section IV appeared slower. The oldest scale analyzed was from a 7+ year old, 18.0 inch cutthroat.

Habitat Analysis

Comparisons of habitat by sections indicate similarities between section I, II, and lII, with section IV exhibiting the most variability (Table 5). Section IV is located higher in the drainage where the channel is more restricted and there is a greater amount of surface and subsurface cover. Sections I, II, and III flow through a wider, open valley bottom.

Microhabitat

Some distinct differences in species microhabitat selection were observed. During both snorkeling and rod and reel surveys it was not uncommon to find cutthroat trout out in open shallow runs, pool tailouts, and exposed riffle areas where little or no cover was available. It appeared that surface turbulence and camoflage blending with the mosaic rock bottom provided adequete cover. Where surface turbulence was not available (pools, low water,etc.), debris cover was sought. In contrast, the bull trout were always observed in close proximity to heavy overhead cover. Only juvenile bull trout were seen in open areas but they

Table 5. Comparisons of habitat variables by section.

HABITAT TABLE

	Section I	Section II	Section III	Section IV
Cover Availability				
Subsurface	low	low	low	moderate
Overhanging	low	low	low	low
Canapy	low	moderate	low	moderate
Features [1]				
% Pool	16%	11%	14%	13%
% Run	25%	19%	21%	42%
% Riffle	58%	70%	65%	45%
Bed Material [2]				
% organic	5%	5%	5%	5%
% fines	5%	5%	5%	10%
% gravel	10%	15%	10%	35%
% cobbles	75%	60%	65%	45%
% boulders	5%	15%	15%	5%
Valley Width	1,320'	960'	1,220'	660'
Channel Width [3]	31'	30'	27'	17'
Stream Order	3	3	3	2
Beaver Activity	moderate	moderate	low	low

1. measured
2. estimated
3. low flow

were small enough to seek cover in the substrate. Brook trout showed a preference for areas of reduced current. They were commonly sighted in side channel and beaver pond areas.

Benthic Insect Samples

A total of 1,552 organisms were collected from the four study sections on September 7, 1985. Mayflies made up 38% of the sample, dipteras made up 38%, and stoneflies made up 15%. Small percentages of caddisflies (7%) and beetles (2%) were also found (Table 6). Section II had the greatest abundance with 567 organisms and section I had the fewest with 265 organisms.

DISCUSSION

The unique characteristics of the Rattlesnake Creek fishery can be partially attributed to the creeks closure to fishing 45 years ago. At that time, Rattlesnake Creek was established as Missoula's municipal water supply. In 1985, Rattlesnake Creek above Beeskove Creek, was opened to catch and release fishing and now represents the only catch and release stream in western Montana.

The stream flows 23.3 miles through the Rattlesnake Wilderness and Recreation Area and descends 5,291 feet to its confluence with the Clark Fork River in Missoula (3,300 ft.). The stream is small (approximately 45 cfs.), the gradient is moderate (1.5% at Beeskove Creek), and the temperatures are low.

Rattlesnake Creek appears similar to many small streams of the region in most areas but one - the resident fishery has proven unique. We estimated 102.3 cutthroat trout >12 inches per mile. According to the Montana Department of Fish, Wildlife, and Parks electrofishing records, there are no characteristically similar streams in this region that produces densities of cutthroat trout >12 inches as high as those found in Rattlesnake Creek. In fact, in streams such as Daly Creek, Moose Creek, Sleeping Child Creek, and the Ross' Fork of Rock Creek, not a single cutthroat over 12 inches was reported in their surveys. Rattlesnake Creek is the only stream in this region to offer the high quality recreational experience of catching large cutthroat trout from a small pristine stream.

Population Dynamics

The snorkeling Peterson methodology worked effectively for estimating cutthroat trout populations in Rattlesnake Creek. ~~Electrofishing~~ proved more effective only in capturing bull trout and fry cutthroat trout.

Trout population estimates were calculated for the spring, summer, and fall. Summer estimates in all sections were at least double the spring and fall estimates indicating either migration, refuge seeking, movement, or mortality is occurring. The fluctuation in estimates occurred in all size classes but most noticeably in the 4-8 inch size class.

Table 6. Benthic insect sample results taken from four sections of Rattlesnake Creek in September, 1985.

Organism	Section I	Section II	Section III	Section IV	Total
Trichoptera (caddisflies)					
Polycentropodidae	4	4	0	7	15
Limnephilldae	4	8	23	0	35
Hydropsychidae	1	26	9	6	42
Rhyacophilidae	0	6	2	2	10
Glossasomatidae	0	1	3	4	8
				Subtotal	110
Ephemeroptera (mayflies)					
Siphlonuridae	4	3	6	2	15
Baetidae	18	32	72	24	146
Ephemerellidae	9	97	21	15	142
Heptageniidae	76	43	74	96	289
Leptophlebiidae	3	0	0	0	3
				Subtotal	595
Plecoptera (stoneflies)					
Chloroperlidae	42	34	43	69	188
Perlodidae	7	5	6	21	39
Nemouridae	0	1	0	0	1
Capniidae	0	3	1	0	4
Perlidae	0	0	0	1	1
				Subtotal	233
Diptera (true flies, midges, etc.)					
Chironomidae	80	292	138	53	563
Tipulidae	9	5	1	1	16
Simuliidae	0	1	0	0	1
				Subtotal	580
Coleoptera (beetles)					
Elmidae	8	6	9	10	33
Isotomidae	0	0	1	0	1
				Subtotal	34
Total	265	567	409	311	1552

To assess movement, 494 cutthroat trout were tagged. We received 88 tag returns which represented 18% of all tagged fish. Only three of the 88 tag returns showed movement of two miles or more. Although these results indicate that movement is not the major cause of the population shifts which we observed, the number of tag returns from cutthroat trout under 8 inches were very low (6.5%). Further tagging and possible trapping are planned for next year. Collection of this data may lead us to more definite conclusions.

Winter refuge in the substrate has been reported for brown trout, rainbow trout, and chinook salmon by Giger, 1973. Campbell and Neuner, 1985, reported that rainbow trout in Cascade mountain streams shifted from a focus on feeding in the summer, to shelter seeking in the winter. They also reported that few, if any, fish could be located during winter day dives but night dives at the same location revealed relatively large populations of trout (similar to summer night dives). In an effort to understand the large population changes in Rattlesnake Creek, a winter day and night snorkel count was performed in section II on February 10, 1986. Our winter day counts revealed 46 cutthroat trout. Using an underwater flashlight during night dives, 91 cutthroat trout were observed (similar to summer day counts of 71 cutthroat per mile). Counts within all size groups except the 4-8 inch size class , were comparable ($\pm$ 4). In the 4-8 inch size class eleven more cutthroat trout were seen during the winter night dive than the summer day dive. This data suggests that some of the cutthroat trout are seeking cover during winter days. This may also account for our low spring and fall estimates.

Since data was collected late in the field season and only one section was snorkeled at night, further snorkeling results and analysis of data will be presented in next years report. The effect of mortality was not assessed.

Pressure and Catch

Cutthroat trout vulnerability to angling pressure is well documented on other western streams (Griffith, 1972, Mac Phee, 1966). In a northern Idaho stream, Mac Phee found that experimental angling captured 50% of the 138 cutthroat trout present, but only 25% of the 316 similar sized brook trout present before all fish were killed with rotenone.

The creel data collected on Rattlesnake Creek supports these findings. The fishing pressure between Beeskove Creek and Franklin Bridge (1.8 miles) was not especially high with 221 total fishermen from May through October 1985. The estimated catch for this area was 1,493 cutthroat trout. The total estimated population was 1,728 cutthroat trout therefore an estimated 86% of the estimated population was caught and released.

Based on tag return data, the larger cutthroat trout are more vulnerable than the smaller cutthroat trout. The 16+ inch size class trout showed a 40.6% recapture rate while the smaller 4-8 inch size class trout had the lowest recapture rate at 6.5%. One large 17.4 inch cutthroat trout was caught and released nine times in seven months.

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Appendix A-1. Location of study sections and landmarks in the Rattlesnake drainage.

Area	Road Mile	Legal Description
Spring Creek	0	
Fraser Creek	3.1	
Bottom of section I	4.1	
Top of section I	4.5	T 14 N, R 18 W, Section 20 ac
Old sign hole	5.1	
Bottom of section II	5.3	
Top of section II	5.7	T 14 N, R 18 W, Section 21 aa
Beeskove Creek	5.9	
Bottom of section III	6.0	
Top of section III	6.4	T 14 N, R 22 W, Section 15 cd
Franklin Bridge	7.7	
Bottom section IV	9.5	
Top of section IV	9.8	T 14 N R 22 W, Section 2 bd

Appendix A-2. Sample creel census form used for fishermen interviews in 1985.

Rattlesnake Creek Creel Census

Date_____ Day of Week M Tu W Th F Sat Sun (circle) Time_____ (start) To_____ (finish) Checker_____

Name:_____

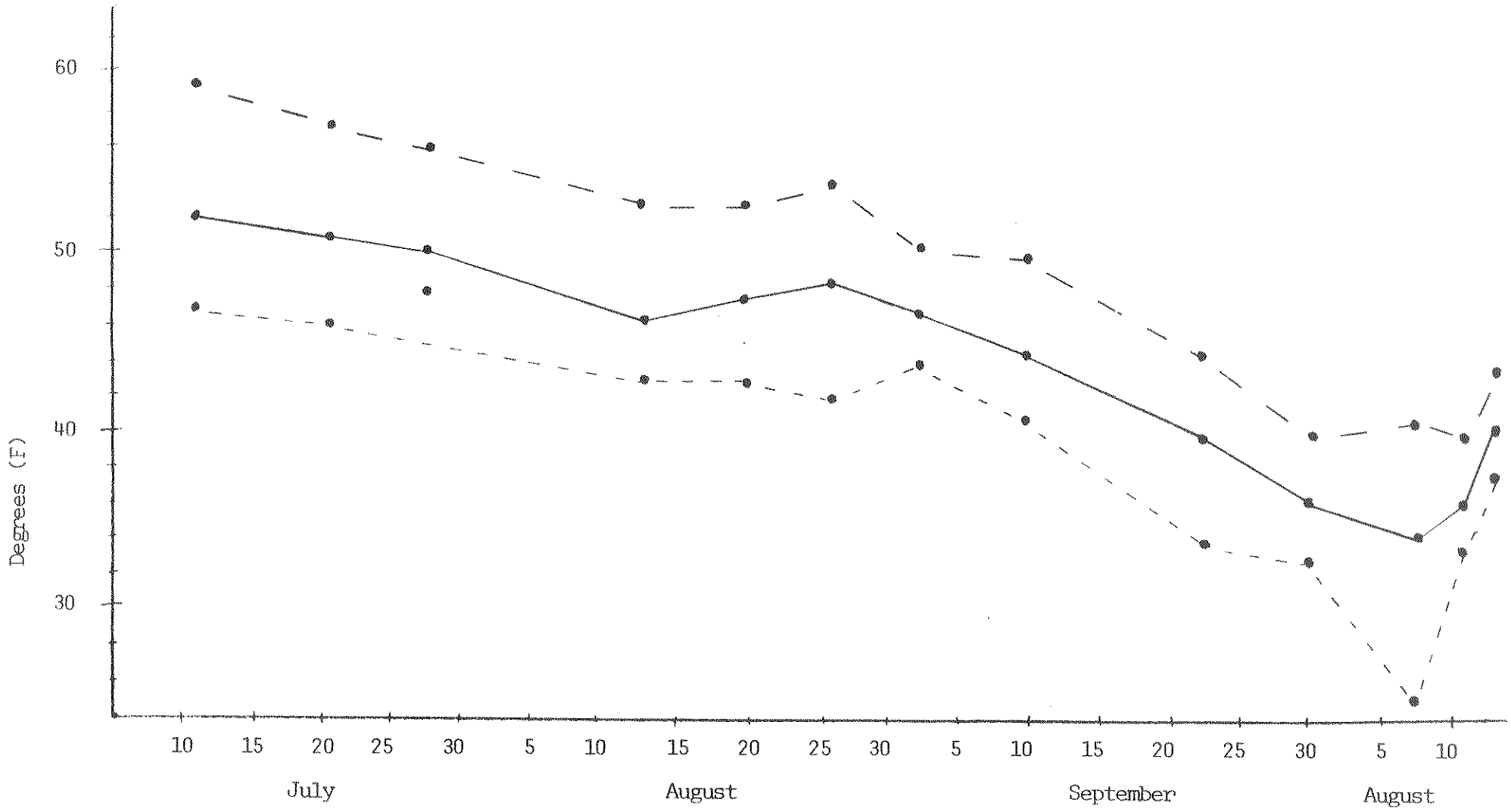
Comments:

In	Out	Other dates fished?	Stay overnight Yes	Stay overnight No	Hours fished	Resident? Yes	Resident? No	Flies	Lures	No. fish stressed	Section: Bees C. to Frank. Brg.	Section: Frank. Br. to Porcupine Gr.	Section: Above Porcupine Creek

Number of Fish Caught: Rainbow	Cutthroat	Hybrid	E. Brook	Bull	Other

Activities: Hunt	Bike	Fish	Camp	Horseback	Hike	Lakes

Appendix A-3. Temperatures recorded in Rattlesnake Creek below Beeskove Creek from July through August with a Taylor 7-day recorking thermograph.



Appendix A-4. Temperatures recorded on Rattkesnake Creek from March 28 through October 29, 1985, with a pocket thermometer.

Date	Time	°F Temp.	Location
3-28-85	3:00 PM	39.5	Section I
4-1-85	3:45 PM	40.0	Water Co. Dam
4-2-85	8:30 AM	40.0	Water Co. Dam
4-4-85	-	41.0	Water Co. Creek
4-6-85	9:30 AM	39.0	Section I
4-7-85	9:20 AM	39.0	Section I
4-8-85	10:00 AM	41.0	Section I
4-17-85	2:30 PM	40.0	Beaver ponds above Franklin Br.
5-25-85	-	46.0	Section II
6-4-85	5:30 PM	46.0	Section II
6-9-85	8:00 AM	42.0	At Beeskove Cr.
	12:00 PM	43.0	Lower Wrangle Cr.
	4:00 PM	44.0	Porcupine Cr.
6-10-85	1:00 PM	46.0	Section II
6-14-85	-	51.0	Section III meadow
	-	50.0	Rattlesnake at Franklin Br.
6-17-85	2:00 PM	52.0	Section III
6-18-85	8:30 AM	46.0	Section III
	12:00 PM	50.0	Section III
	1:30 PM	52.0	Section III
6-19-85	1:00 PM	52.0	Section II
6-20-85	9:20 AM	49.0	Section III
	3:00 PM	55.0	Section III
6-22-85	-	54.0	Section II
6-26-85	12:30 PM	48.0	Section II
	2:00 PM	51.0	
6-29-85	11:00 PM	58.0	Above Fraser Cr.
7-2-85	4:30 PM	56.0	Beeskove Cr.
7-3-85	10:30 AM	52.0	Section II
7-4-85	11:30 AM	56.0	Section I
	8:00 PM	56.0	Section II
	1:00 PM	57.0	Between I & II
7-6-85	11:45 AM	54.0	Section II
	6:00 PM	59.0	Section II
	9:00 PM	55.0	Section II
7-7-85	11:45 AM	56.0	Section I
7-7-85 Placed thermograph in Rattlesnake Cr. Below Beeskove Cr. 9:00 PM 54°F			
7-10-85	3:30 PM	60.0	Section II
7-11-85	2:00 PM	58.0	Section I
7-18-85	10:05 AM	52.0	Section I
7-23-85	6:00 PM	60.0	Section I
7-24-85	10:45 AM	53.0	Section I
7-24-85	4:30 PM	59.0	Section IV
7-25-85	10:00 AM	49.0	Section IV
	3:00 PM	60.0	Section IV
9-22-85	-	43.0	Just below Beeskove Cr.
10-4-85	11:10 AM	37.0	Section IV
10-6-85	2:00 PM	40.0	Old Sign hole
10-19-85	11:30 AM	35.0	Just below Beeskove Cr.
10-29-85	1:30 PM	37.0	Section IV

Appendix A-5. Time and location of spawning activity in Rattlesnake Creek in 1985. Stage and length of spawning cutthroat trout and water temperatures taken during the survey are also included.

Spawning							
Date	Location/Description	Sex	Length (in.)	Wt. (lbs)	Redds	°F Water Temp.	Misc.
4-7-85	Section II (lower end)	M	15.5	1.44	X	39	5+
4-7-85	Section II (lower end)	M	16.3	1.46	X	39	3
4-7-85	Section II	M	14.2	1.02	X	39	5+
4-7-85	Section II	M	16.1	1.39	X	39	5
4-8-85	Section II	M	15.6	1.44	X	41	
4-17-85	Beaver Ponds above Franklin Br.	M	~8.0	-		40	
6-4-85	Section II Killer hole	M	~16.0	-	X	46	
6-4-85	Section II Killer hole	F gravid	~16.5	-	X	46	Old yeller
6-5-85	Above Franklin Br., above confluence w/High Falls Cr. at pool below falls near rd. -The Dalles	M	~12	-	X	-	
6-5-85	Below High Falls Cr. in Rattle.	F ripe	~ 8	-	X	-	
6-5-85	Below High Falls Cr. in Rattle.	F eggs in skein but well developed	~ 9	-	X	-	
6-8-85	Above Franklin Br.-Beaver ponds	F gravid	-	-		-	
6-8-85	Above Franklin Br.-Beaver ponds	F gravid	-	-		-	
6-8-85	Above Franklin Br.	F gravid				46	
6-8-85	Above Franklin Br.	F gravid				46	
6-8-85	Above Franklin Br.	F spent				46	
6-8-85	Above Franklin Br.	F spent				46	
6-8-85	Above Franklin Br.	F spent				46	
6-8-85	Above Franklin Br.	M RM				46	
6-8-85	Above Franklin Br.	M RM				46	
6-8-85	Above Franklin Br.	M RM				46	
6-8-85	Above Franklin Br.	M RM				46	
6-9-85	Wrangle Cr. ¼ mi. above confluence with Rattle. Cr.	F gravid 164 eggs eggs well developed but still in skeins	7.2	-		43	
6-9-85	Wrangle Cr. ¼ mi. above confluence with Rattle. Cr.	M RM	-	-		43	~75 cfs
6-9-85	Wrangle Cr. ¼ mi. above confluence with Rattle. Cr.	M RM	-	-		43	~75 cfs
6-9-85	Wrangle Cr. ¼ mi. above confluence with Rattle. Cr.	F gravid	-	-		43	
6-9-85	Wrangle Cr. ¼ mi. above confluence with Rattle. Cr.	F gravid	-	-		43	
6-9-85	Wrangle Cr. ¼ mi. above confluence with Rattle. Cr.	F gravid	-	-		43	
6-9-85	Wrangle Cr. ¼ mi. above confluence with Rattle Cr.	M RM	-	-		43	
6-9-85	Wrangle Cr. ¼ mi. above confluence with Rattle Cr.	M RM	-	-		43	
6-9-85	Wrangle Cr. ¼ mi. above confluence with Rattle Cr.	M RM	-	-		43	

Appendix A-5. Cont'd.

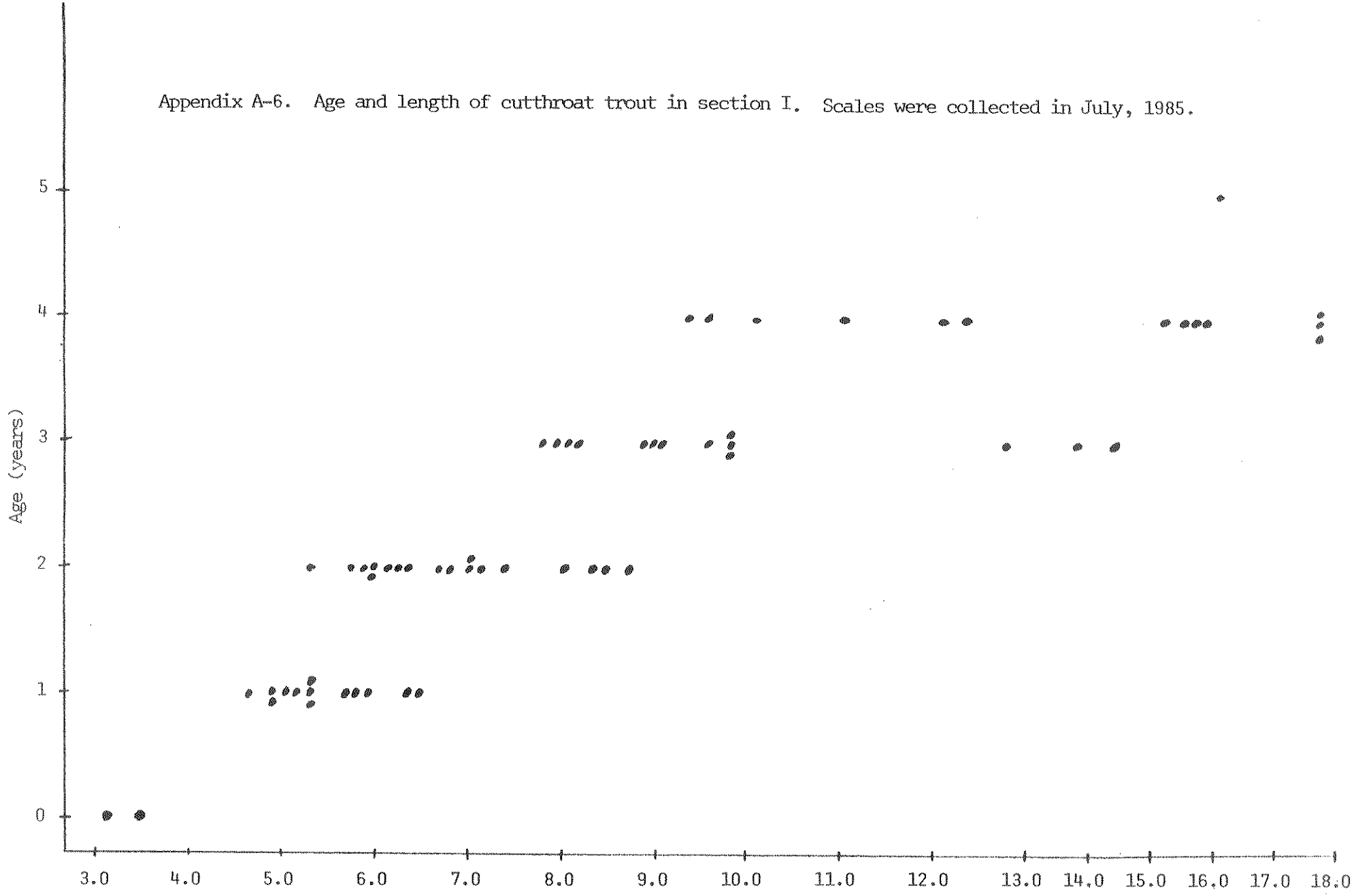
Date	Location/Description	Sex	Spawning (in.) Length	(lbs) Wt.	Redds	°F Water Temp.	Misc.
6-9-85	Rattlesnake Cr.-1/8 mi. above mouth of Wrangle Cr.	M ripe	4.0	-		-	1+
6-9-85	Rattlesnake Cr.-1/8 mi. above mouth of Wrangle Cr.	M ripe	5.5				-
6-9-85	Rattlesnake Cr.-1/8 mi. above mouth of Wrangle Cr.	F ripe	6.0				-
6-9-85	Rattlesnake Cr.-1/8 mi. above mouth of Wrangle Cr.	M ripe	6.0				-
6-9-85	Rattlesnake Cr.-1/8 mi. above mouth of Wrangle Cr.	M ripe	6.5				2+
6-9-85	Rattlesnake Cr.-1/8 mi. above mouth of Wrangle Cr.	M ripe	6.6				-
6-9-85	Rattlesnake Cr.-1/8 mi. above mouth of Wrangle Cr.	M ripe	7.0				reg.
6-9-85	Rattlesnake Cr.-1/8 mi. above mouth of Wrangle Cr.	M ripe	7.0				reg.
6-9-85	Rattlesnake Cr.-1/8 mi. above mouth of Wrangle Cr.	M ripe	7.5				reg.
6-9-85	Rattlesnake Cr.-1/8 mi. above mouth of Wrangle Cr.	M ripe	8.5				2+
6-9-85	Rattlesnake Cr.-1/8 mi. above mouth of Wrangle Cr.	F ripe	9.7				2+
6-10-85	Section II Killer hole	F spent	~14		X	46	
6-10-85	Section II Killer hole	F spent	14.3		X	46	
6-10-85		M ripe	15.2		X	46	
6-9-85	Section I Pilcher Cr. side channel	M RM, G.F. F			X		observation
6-11-85	Section III lg. pool ½ way up section	M spent			X		
6-11-85	Section III lg. pool ½ way up section	M RM			X		
6-11-85	Section III lg. pool ½ way up section	M RM			X		
6-11-85	Section II above Killer hole	F spent					
6-11-85	Section II above Killer hole	F spent			X		Old yeller
6-11-85	Section II above Killer hole	F spent			X		
6-11-85	Section II above Killer hole	F spent			X		
6-11-85	Section II above Killer hole	M spent			X		
6-11-85	Section II above Killer hole	M spent			X		
6-11-85	Section II above Killer hole	F gravid			X		
6-12-85	Rattlesnake Cr. above W. Fork Gold Cr. trail out in meadow	M RM					
6-12-85	Rattlesnake Cr. above W. Fork Gold Cr. trail out in meadow	M RM					
6-12-85	Rattlesnake Cr. above W. Fork Gold Cr. trail out in meadow	M RM					
6-12-85	Rattlesnake Cr. just below Section IV	M RM					
6-12-85	Rattlesnake Cr. just below Section IV	M RM					
6-12-85	Rattlesnake Cr. just below Section IV	M RM					

Appendix A-5.

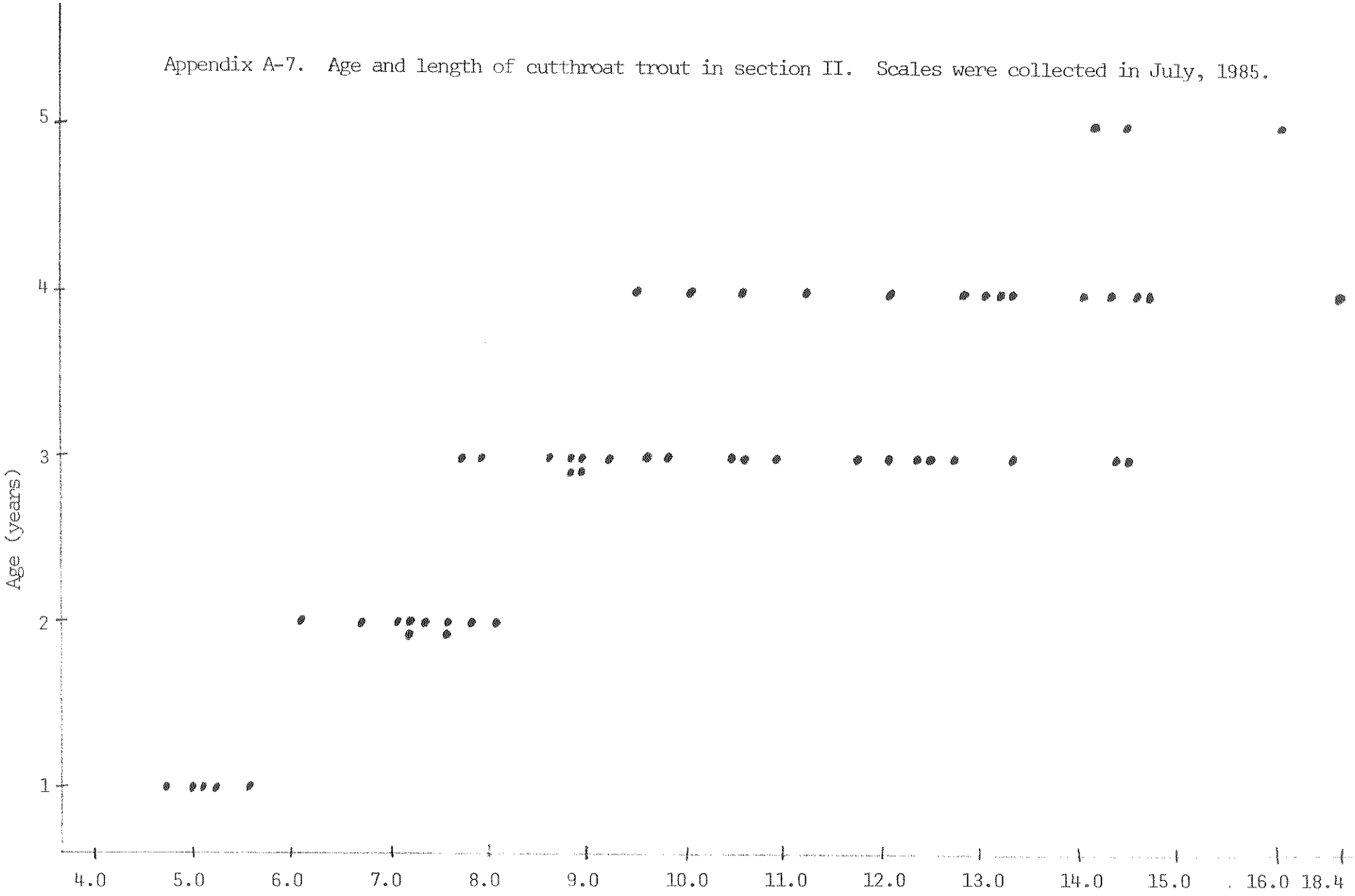
Spawning

Date	Location/Description	Sex	Length	(lbs) Wt.	Redds	°F Water Temp.	Misc.
6-12-85	Section III, Section II holes only	Snorkel observation - Redds easy to distinguish in both sections. Water is beginning to clear and drop.					
6-14-85	Section II Killer hole	F ripe	-	-		51	-
6-17-85	Section III (lower)	M RM	17.0	2.04		52	
6-18-85	Section III	M RM	15.1	1.06		50	5+
6-18-85	Section III	M RM	12.7	.72		50	reg.
6-18-85	Section III	F spent?	12.4	.65		50	4+
6-19-85	Section III	M RM	12.7	.74		52	4+
6-20-85	Section III	M RM	15.1	1.06		49	4+
6-22-85	Section II	F ripe	14.2	-		54	
6-22-85	Section II	M RM	11.5	-		54	
6-22-85	Section II	F spent?	15.1	-		54	
6-22-85	Section II	M RM	16.7			54	
6-22-85	Section II	F ripe	14.2			54	5+
6-26-85	Section II Killer hole	M RM	16.1	1.44		51	
6-26-85	Section II Killer hole	M RM	13.5	.90		51	
6-26-85	Section II Killer Run	M RM	16.1	1.42		51	5+
7-2-85	Section II above Killer Run	M RM	16.4	1.43		56	
7-2-85	Section II above Killer Run	M RM	10.1	.23		56	3+
7-24-85	Section IV	M RM	9.2	.27		59	2+
7-25-85	Section IV	M RM	7.5	.16		-	3+
7-25-85	Section IV	M RM	11.3	.50			4+
8-22-85	Section IV	M RM	8.8	.22			3+
7-7-85	Install fry trap @ 52°F - 27 days 50.5 - 29 days	fry emergence					

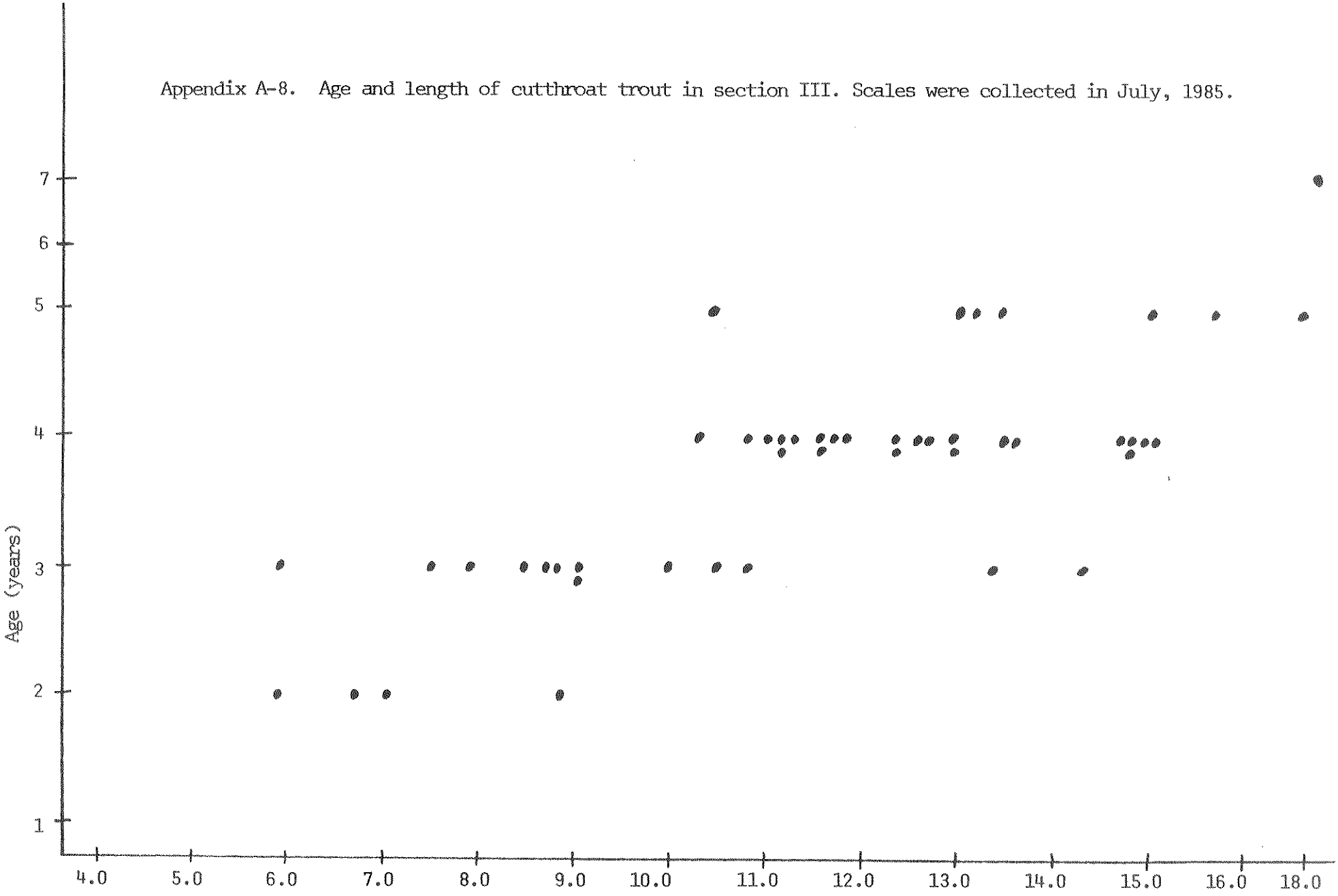
Appendix A-6. Age and length of cutthroat trout in section I. Scales were collected in July, 1985.



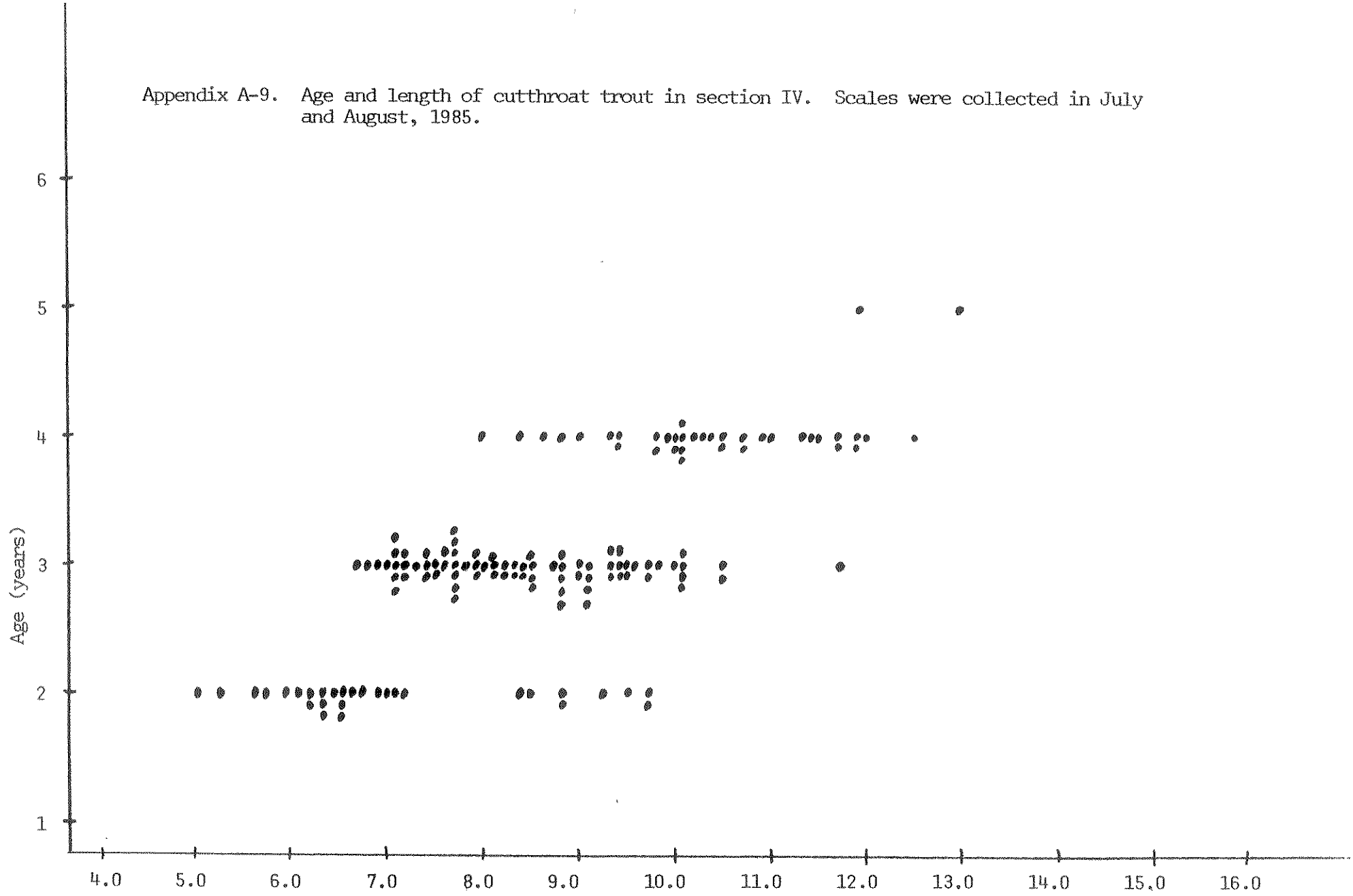
Appendix A-7. Age and length of cutthroat trout in section II. Scales were collected in July, 1985.



Appendix A-8. Age and length of cutthroat trout in section III. Scales were collected in July, 1985.



Appendix A-9. Age and length of cutthroat trout in section IV. Scales were collected in July and August, 1985.



List of 1985 Volunteer Workers

Date	Name	Duties
5/17-18/85	Mike Rooney	Creel census
5/17-18/85	Blair Bennett	Creel census
5/18-19/85	Rick Lloyd	Creel census
6/8-9/85	Ron Snyder	Sampled above Franklin Bridge - beaver ponds, Wrangle Creek & upper Rattlesnake. Spawning activity noted in all areas.
6/8-9/85	Ken Gutowski	
6/15-16/85	Willa Craig	Sampled between Pilcher section I and section II to identify if fish were moving between sections
6/15-16/85	Ellie	
6/28-29-30/85	Don Wilson	Marked section II Surveyed creek below Pilcher Creek
6/28-29-30/85	Dave	Creel Census Documented spawning activity
6/28-29-30/85	Jim Price	
6/28-29-30/85	John Gundal	
6/28/85	Clay Findly	Surveyed creek below Pilcher Creek
6/28/85	Cliff	
7/4-5-6/85	Bill Price	Marked sections I & II Creel census
7/4-5-6/85	Peg	
7/6-7/85	Ken Gutowski	Marked sections I & II
7/8-9-10-11/85	Geoff Richards	Installed thermograph Tagged section II
7/8-9-10-11/85	Billy Gruboski	Snorkeled section II, tagged section I
7/18/85	Bill Thomas	Took photographs, sampled and watched snorkeling
7/20-21/85	Willa Craig	
7/24/85	Bill Thomas	Helped shock section I
7/27/85	Jed & Ginger Thomas	
8/2/85	Bill Thomas	Sampled between sections I & II for moving fish
8/2/85	Jim Olson	

Volunteers (cont.)

Date	Name	Duties
8/24-25-26/85	Kelly Wilson	Creel census Snorkel section IV
8/24-25-26/85	Carla Wilson	Sampled section II
8/24-25-26/85	Scott Wilson	
8/24-25-26/85	Lori Wilson	
8/25/85	Jed Thomas	Sampled section II
8/25/85	Ginger Thomas	Took notes during snorkel
9/1-2-4-5-7-10-11-13-15-17/85	Lori Wilson	Habitat survey, stream discharge creel census, invertebrate samples
9/20-21-22-25-26/85	Dave Blount	Marked sections I & II stream discharge Drove in perm. i.d. stakes, creel census
9/29/85	Jed & Ginger Thomas	Creeled
10/4-5/85	Don Peters	Marked section II & III Collected fish for electrophoresis
10/16/85	Dennis Workman	Marked section II

Rattlesnake Cr. Financial Statement

Date	Item	Cost
3-11-86	Used snorkel	$ 14.50
3-11-85	Mask	45.00
3-11-85	Dry suit, hood, gloves & patch material	684.00
3-13-85	Gas to Portland to purchase dry suit	44.94
3-21-85	Port-a-pot	35.00
3-21-85	Write in the rain fieldbooks	5.80
3-21-85	Tape measure	9.77
3-27-85	600 fingerling tags	171.50
5-24-85	Photo processing	9.70
5-28-85	Phone charges	40.49
6-13-85	Photo processing	14.09
6-24-85	Phone charges	23.13
6-3-85	May wages for Gary Blount	600.00
7-1-85	June wages for Gary Blount	600.00
7-1-85	June wages for Denise Wilson	1,200.00
7-8-85	Photo processing	4.39
7-22-85	Film	8.78
7-29-85	July wages for Gary Blount	600.00
7-29-85	July wages for Denise Wilson	1,200.00
7-29-85	Travel expences	300.00
9-3-85	August wages for Gary Blount	600.00
9-3-85	August wages for Denise Wilson	1,200.00
9-27-85	Sept. wages for Gary Blount	600.00
9-27-85	Sept. wages for Denise Wilson	1,200.00
10-8-85	Slide carousel, slide holders	13.33
10-21-85	Film	10.53
10-28-85	Travel expences	300.00
10-31-85	October wages for Gary Blount	600.00
10-31-85	October wages for Denise Wilson	1,200.00
11-5-85	Film processing & duplication	39.74
12-1-85	Nov. wages for Denise Wilson	1,200.00
12-5-85	Glass viles for insect samples	8.00
12-5-85	Slide duplication	24.71
	Total	$12,607.40