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Jerry M. Conley, Director

Job Performance Report

Project F-71-R-14

REGIONAL FISHERIES MANAGEMENT INVESTIGATIONS

Job No. 6 SAL -a.	Salmon Subregion Mountain Lakes Investigations
Job No. 6 SAL)-b.	Salmon Subregion Lake and Reservoir Investigations
Job No. 6 SAL)-c[1].	Salmon Subregion Rivers and Streams Investigations Salmon and Middle Fork Salmon Rivers Snorkeling Transects
Job No. 6(SAL)-c[2].	Salmon Subregion Rivers and Streams Investigations Lemhi River Survey
Job No. 6(SAL)-d.	Salmon Subregion Technical Guidance
Job No. 6(SAL)-e.	Salmon Subregion Salmon Steelhead Trout Investigations– Steelhead Trout Run Timing Evaluatkm-Pahsimeroi Fish Hatchery

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JOB PERFORMANCE REPORT

State of: **Idaho**

Name: **Regional Fishery Management Investigations**

Project No.: **F-71-R-14**

Title: **Salmon Subregion Mountain Lakes Investigations**

Job No: **6(SAL)-a**

Period Covered: **July 1, 1989 to June 30, 1990**

ABSTRACT

No mountain lakes were surveyed this year. We stocked 68 mountain lakes in the Salmon National Forest (Table 1). The areas stocked included: Big Horn Crags, Continental Divide, Lemhi Range, and Hat Creek drainage. A Bell 206-B helicopter was used to stock the lakes at a cost of $62.95 per lake ($4,280.60 total cost). A total of 58,000 fry were released: 2,000 grayling, 2,000 golden trout, and 54,000 westslope cutthroat trout.

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Table 1. Mountain lakes stocked in the Salmon National Forest in 1989.

Lake name	Species	Number of fish
Lemhi and Hat Creek lakes		
M.F. Little Timber Creek #1	Cutthroat	1,000
Devils Lake	Cutthroat	1,000
Big Eight Mile Lake	Cutthroat	500
Dairy Lake	Cutthroat	500
Everson Lake	Cutthroat	1,500
Patterson Lake	Cutthroat	250
Mill Lake	Cutthroat	1,500
Bray #2	Cutthroat	500
W.F. Hayden #2	Cutthroat	250
Wright Lake	Cutthroat	250
Upper Buck Lake	Cutthroat	250
Bear Valley #1	Cutthroat	1,500
Bear Valley #2	Cutthroat	1,000
Bear Valley #3	Cutthroat	250
McNutt #4	Cutthroat	500
Basin #5	Cutthroat	1,000
N.F. Hat Creek Lake	Cutthroat	250
Hat Creek #2	Grayling	500
Hat Creek #3	Cutthroat	1,000
Hat Creek #4	Cutthroat	500
Hat Creek #5	Cutthroat	1,000
S.F. Moyer Creek Lake	Grayling	500
Little Iron Lake	Cutthroat	1,000
Continental Divide Lakes		
Lost Packer Lake	Cutthroat	1,000
Bronco Lake	Cutthroat	1,000
Hidden Lake	Cutthroat	2,000
Helen Lake	Cutthroat	1,000
N.F. E.F. Reynolds #2	Cutthroat	1,000
N.F. E.F. Reynolds #4	Cutthroat	1,000
Line Lake	Cutthroat	500
Geertson (Starr) Lake	Cutthroat	1,000
Geertson (Starr) Lake	Grayling	500
Bohannon Lake	Cutthroat	500
UP Lake	Cutthroat	1,000
Pony Lake	Cutthroat	500

Table 1. Continued.

Lake name	Species	Number of fish
Big Horn Crags Lakes		
Glacier Lake	Golden Trout	500
Pot Hole Lake	Cutthroat	500
Big Clear Lae	Golden Trout	500
Gooseneck Lake	Golden Trout	500
Crater Lake	Golden Trout	500
Gentian Lake	Cutthroat	500
Birdbill Lake	Cutthroat	500
Sheepeater Lake	Cutthroat	1,000
Shoban Lake	Cutthroat	1,000
Airplane Lake	Cutthroat	1,000
Ship Island #2	Cutthroat	1,000
Ship Island #4	Grayling	500
Harbor Lake	Cutthroat	3,000
Wilson Lake	Cutthroat	1,000
Heart Lake	Cutthroat	2,000
Welcome Lake	Cutthroat	3,000
Terrace #4	Cutthroat	500
Terrace #3	Cutthroat	500
Terrace #2	Cutthroat	500
Terrace #1	Cutthroat	1,000
Skyhigh Lake	Cutthroat	1,000
Lost Lake Lake	Cutthroat	1,000
Turquoise Lake	Cutthroat	1,000
Echo Lake	Cutthroat	1,000
Reflection Lake	Cutthroat	1,000
Twin Cove Lake	Cutthroat	1,000
Doe Lake	Cutthroat	500
Buck Lake	Cutthroat	500
Ramshorn Lake	Cutthroat	1,000
Paragon Lake	Cutthroat	1,000
Plateau Lake	Cutthroat	500
South Fork Lake	Cutthroat	500
Golden Trout Lake	Cutthroat	1,500
Total	Cutthroat	54,000
	Golden Trout	2,000
	Grayling	2,000
Grand Total		58,000

JOB PERFORMANCE REPORT

State of: **Idaho**

Name: **Regional Fishery Management Investigations**

Project No.: **F-71-R-14**

Title: **Salmon Subregion Lake and Reservoir Investigations**

JOB NO: **6(SAL)-b**

Period Covered: **July 1, 1989 to June 30, 1990**

ABSTRACT

No specific lake or reservoir studies were conducted in the Salmon Subregion in 1989-90.

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JOB PERFORMANCE REPORT

State of: Idaho

Name: Regional Fishery Management Investigations

Project No.: F-71-R-14

Title: Salmon Subregion Rivers and Streams Investigations -- Salmon & Middle Fork Salmon Rivers Snorkeling Transects

Job No.: 6(SAL)-c[1]

Period Covered: July 1, 1989 to June 30, 1990

ABSTRACT

The total numbers of cutthroat trout, juvenile rainbow/steelhead trout, and chinook salmon counted in Middle Fork Salmon River transects were 244, 53, and 340 fish, respectively. Mean densities were 0.4, 3.6, and 5.4 fish/100 m^2, respectively. Since 1988, cutthroat trout and chinook salmon densities increased while steelhead decreased.

In Middle Fork Salmon River tributary transects, steelhead and cutthroat trout densities decreased while chinook salmon increased from 1988 to 1989.

In Salmon River tributary transects, juvenile rainbow/steelhead densities increased in the Pahsimeroi River and generally decreased slightly in the canyon tributaries from 1988 to 1989.

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INTRODUCTION

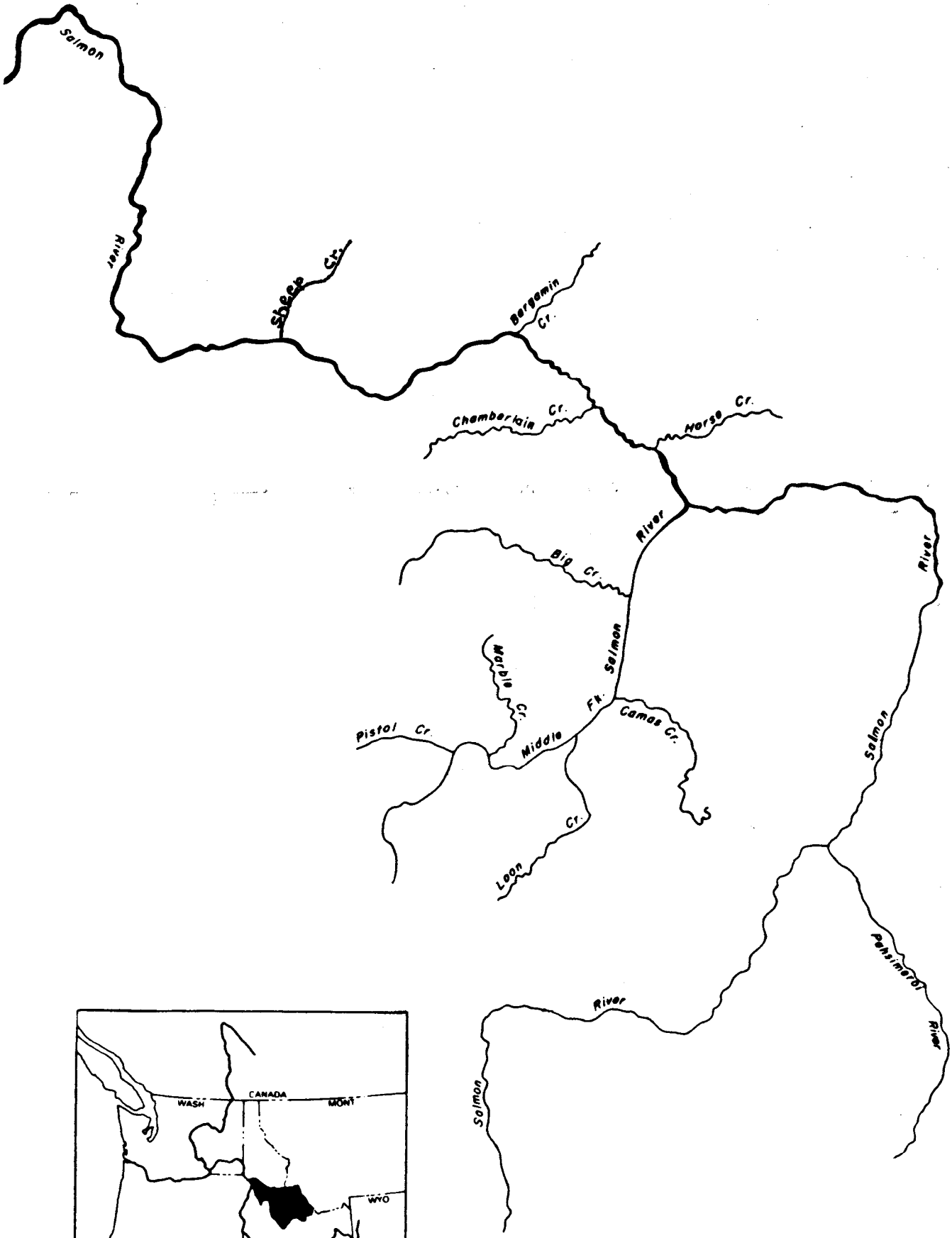
The Middle Fork Salmon River (MFSR), part of the Wild and Scenic Rivers System, flows through a remote area in central Idaho. Most of it is within the Frank Church River of No Return Wilderness Area. The Middle Fork originates at the confluence of Bear Valley and Marsh creeks near Cape Horn Mountain. The river flows 171 km to its confluence with the main Salmon River 92 km below Salmon, Idaho (Figure 1).

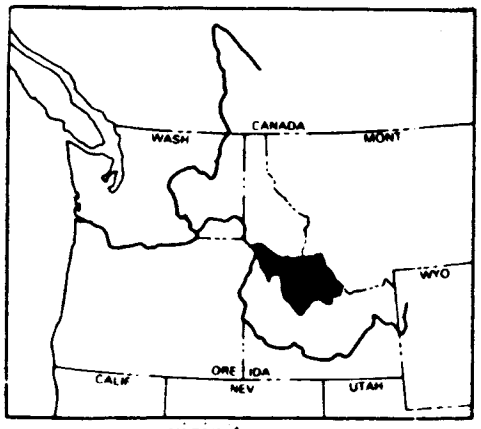
Road access exists to Dagger Falls and the Salmon River confluence. Headwaters of some tributaries are accessible via primitive roads. The lower 156 km of the Middle Fork is accessible only by aircraft, float boats, or horse/foot trails. The MFSR is a major recreational river that offers a wide variety of outdoor and backcountry opportunities. The number of people floating the river has increased 187% since 1973 (8,900 in 1989).

The earliest MFSR study was conducted in 1959 and 1960 and evaluated westslope cutthroat trout Oncorhynchus clarki lewisi life history and seasonal movements (Mallet 1963). In 1971, additional studies were initiated to monitor MFSR cutthroat trout abundance and to evaluate catch-and-release regulations which were established in 1972. Similar regulations were adopted for major tributaries in the early and mid-1980s.

Part of the studies initiated in 1971 included establishment of snorkeling transects which were surveyed periodically (Corley 1972; Jeppson and Ball 1977, 1979). In 1981, a project was initiated on the Middle Fork to evaluate wild steelhead trout 0 mykiss (Thurow 1982, 1983, 1985). In 1985, another study was initiated to determine juvenile steelhead, chinook salmon 0 tshawytscha and cutthroat trout densities in the Middle Fork and its tributaries (Reingold and Davis 1987a, 1987b, 1988; Lukens and Davis 1989).

This report is a continuation of the 1985 study and presents data collected in July and August 1989 pertaining to cutthroat trout, juvenile steelhead, and chinook salmon densities in the MFSR and five Salmon River tributaries.





vicinity map

Figure 1. Map of the MFSR, main Salmon River and tributaries where snorkeling surveys are conducted.

OBJECTIVES

1. To monitor juvenile steelhead trout and chinook salmon densities within the Middle Fork, its tributaries, and Salmon River tributaries.

2. To monitor the effects of catch-and-release regulations on resident fish populations in the MFSR drainage, particularly cutthroat trout.

METHODS

In 1989, 28 of 29 Middle Fork Salmon River transects (Table 1), 7 tributary transects (Table 2) and 10 Salmon River tributary transects (Table 3) were surveyed via snorkeling. The MFSR and tributary transects were snorkeled August 16 to 24. The Salmon River tributary transects including Horse, Chamberlain, Bargamin and Sheep creeks were surveyed July 18 to 21. The Pahsimeroi River transects were counted on July 31.

The techniques used to survey these transects are described by Reingold and Davis (1987a, 1987b).

This data was compared to previous data to identify trends.

RESULTS

Middle Fork Salmon River Transects

The total number of cutthroat trout, juvenile rainbow/steelhead trout, and juvenile chinook salmon counted in MFSR transects was 244, 53, and 340, respectively (Table 4). Mean densities were 1.8, 0.4, and 3.4 fish/100 m^2 for cutthroat trout, juvenile rainbow/steelhead trout, and juvenile chinook salmon, respectively (Table 5).

Middle Fork Salmon River Tributary Transects

Juvenile rainbow/steelhead trout densities ranged from 0.2 to 8.8 fish/100 m^2 and averaged 3.6 fish/100 m^2 (Table 6). Mean juvenile chinook salmon densities was 5.4 fish/100 m^2, and mean cutthroat trout densities was 0.4 fish/100 m^2.

Table 1. Locations and dimensions of MFSR snorkeling transects, August 1989.

Fish type[a]	Location (river km)[b]	Transect name	Length (m)	Visibility (m)	Visible corridor (m)	Area (m^2)	Passes
SH	0.3	Boundary	55	3.6	7.3	402	1
Ct/Ck	4.3	Gardell's Hole	77	4.1	8.2	633	1
Ct/Ck	8.8	Velvet	61	4.1	8.2	501	1
SH	13.6	Elkhorn	30	4.0	8.0	242	1
SH	21.3	Sheepeater	30	2.3	4.6	140	1
Ct/Ck	24.5	Greyhound	30	3.3	6.7	204	1
SH	29.6	Rapid River	100	3.8	7.6	760	1
SH	40.0	Indian	160	3.3	6.7	1,072	1
Ct/Ck	44.3	Pungo	70	3.3	6.7	469	1
Ct/Ck	51.0	Marble Pool	181	3.3	6.7	1,213	1
SH	52.3	Ski-jump	--	--	--	--	--
Ct/Ck	60.6	Lower Jackass	252	2.3	4.6	1,159	1
SH	64.6	Cougar	106	2.3	4.6	488	1
Ct/Ck	73.9	Whitey Cox	106	2.1	4.3	456	1
SH	74.1	Rock Island	110	2.1	4.3	473	1
Ct/Ck	82.9	Hospital Pool	135	3.3	6.7	905	1
SH	84.3	Hospital Run	165	3.0	6.1	1,003	1
Ct/Ck	92.6	Tappan Pool	110	2.3	4.6	502	1
SH	92.8	Lower Tappan Run	145	2.3	4.6	661	1
Ct/Ck	106.6	Flying B	130	3.3	6.7	871	1
SH	108.6	Airstrip	91	3.3	6.7	610	1
SH	119.7	Survey	130	3.3	6.7	871	1
Ct/Ck	124.6	Big Creek Bridge	103	2.3	4.6	470	1
SH	127.8	Love Bar	85	3.6	7.3	621	1
Ct/Ck	135.8	Ship Island	130	3.0	6.1	790	1
SH	144.0	Little Ouzel	110	2.3	4.6	502	1
Ct/Ck	144.6	Otter Bar	206	1.5	3.1	626	1
Ct/Ck	151.5	Goat Creek Pool	102	2.7	5.5	559	1
SH	151.8	Goat Creek Run	102	2.7	5.5	559	1

[a]SH-steelhead, Ct-cutthroat, Ck-chinook salmon.
[b]River km starts at Dagger Falls.

Table 2. Middle Fork Salmon River tributary transects.

Transect name	Location
Pistol Creek #1	At mile marker 16
Pistol Creek #2	Above mile marker 16
Marble Creek #1 (mouth)	Above pack bridge
Loon Creek	Below pack bridge
Loon Creek	400 yards above pack bridge
Camas Creek	From pack bridge downstream
Big Creek #1 (mouth)	400 yards above mouth

Table 3. Main Salmon River tributary transects.

Transect name	Location
Horse Creek #1 (bridge)	50 yards above bridge
Horse Creek #2	15 yards above bridge
Chamberlain Creek #1 (mouth)	40 yards above mouth
Chamberlain Creek #2 (run)	50 yards above mouth
Bargamin Creek #1	1/ mile above mouth
Bargamin Creek #2	At trail flat above #1
Sheep Creek #1	Below pack bridge
Sheep Creek #2	300 above pack bridge
Pahsimeroi River #1 (lower)	100 below Dowton Lane Bridge
Pahsimeroi River #2 (Dowton Ln.)	Run + pool below Dowton Bridge

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Table 4. Total number of cutthroat trout, rainbow/steelhead trout, and chinook salmon, by length group (mm), and other fish species counted in MFSR transects, August 1989.

	Cutthroat				Rainbow/steelhead				Age 0	Bull	White-	
Transect	75-150	150-230	230-	>300	75-150	150-230	230-300	>300	chinook	trout	fish	Other[a]
Boundary	0	0	2	1	0	0	0	0	2	0	2	0
Gardell's Hole	0	0	2	0	0	0	0	0	0	0	2	0
Velvet	0	1	2	0	4	3	0	0	3	0	3	0
Elkhorn	0	0	2	1	1	0	0	0	0	0	6	0
Sheepeater	0	0	0	0	2	0	0	0	1	0	3	0
Greyhound	0	25	12	9	0	0	0	0	100	0	5	0
Rapid River	0	15	15	9	8	6	0	0	50	1	10	0
Indian	0	8	17	5	0	0	0	0	0	0	16	0
Pungo	0	6	18	0	0	0	0	0	150	0	13	0
Marble Pool	0	11	6	0	0	0	0	0	0	0	19	0
Ski-jump	--	--	--	--	--	-	--	--	--	--	--	--
Lower Jackass	0	3	5	0	0	0	0	0	0	0	8	1
Cougar	0	1	2	1	0	0	0	0	0	0	4	0
Whitey Cox	0	6	5	0	5	4	0	0	1	1	4	2
Rock Island	0	0	0	0	0	0	0	0	15	0	7	3
Hospital Pool	0	10	5	1	0	3	0	0	15	0	6	3
Hospital Run	0	0	0	0	2	0	0	0	3	0	5	11
Tappan Pool	0	0	3	0	0	0	0	0	0	0	5	1
L. Tappan Run	0	0	0	0	0	0	0	0	0	0	4	0
Flying B	0	1	0	0	0	0	0	0	0	0	0	18
Airstrip	0	10	4	1	0	0	0	0	0	0	15	40
Survey	0	0	2	1	0	0	0	0	0	0	9	35
Big Creek Bridge	0	0	0	0	3	0	0	0	0	0	5	3
Love Bar	0	1	0	0	0	1	0	0	0	0	4	0
Ship Island	0	3	0	1	1	0	0	0	0	0	3	4
Little Ouzel	0	0	0	0	0	0	0	0	0	0	13	7
Otter Bar	0	7	3	1	8	0	0	0	0	0	5	1
Goat Cr. Pool	0	0	0	0	0	0	0	0	0	0	2	0
Goat Cr. Run	0	0	0	0	0	2	0	0	0	0	3	0
Column total	0	108	105	31	34	19	0	0	340	2	181	129
Grand total		244				53						

[a]Suckers and squawfish.

Table 5. Densities of cutthroat trout, rainbow/steelhead trout, and chinook salmon (fish/100 m^2) in MFSR transects, August 1989.

Transect	Cutthroat	Rainbow/ steelhead	Chinook	Total fish[a]
Boundary	0.7	0	0.5	1.7
Gardell's Hole	0.3	0	0	0.6
Velvet	0.6	1.4	0.6	3.2
Elkhorn	1.2	0.4	0	4.1
Sheepeater	0	1.4	0.7	4.3
Greyhound	22.5	0	49.0	74.0
Rapid River	5.1	1.8	6.6	15.0
Indian	2.8	0	0	4.3
Pungo	5.1	0	32.0	39.9
Marble Pool	1.4	0	0	3.0
Ski-jump		--	--	--
Lower Jackass	0.7	0	0	1.5
Cougar	0.8	0	0	1.6
Whitey Cox	2.4	2.0	0.2	6.1
Rock Island	0	0	3.2	5.3
Hospital Pool	1.8	0.3	1.7	4.8
Hospital Run	0	0.2	0.3	2.1
Tappan Pool	0.6	0	0	1.8
L. Tappan Run	0	0	0	0.6
Flying B	0.1	0	0	2.2
Airstrip	2.5	0	0	11.5
Survey	0.3	0	0	5.4
Big Cr. Bridge	0	0.6	0	2.3
Love Bar	0.2	0.2	0	1.0
Ship Island	0.5	0.1	0	1.5
Little Ouzel	0	0	0	4.0
Otter Bar	1.8	1.3	0	4.0
Goat Cr. Pool	0	0	0	0.4
Goat Cr. Run	0	0.4	0	0.9
Average	1.8	0.4	3.4	7.4

[a]Total fish also includes suckers, squawfish, whitefish, and bull trout.

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Table 6. Number of rainbow/steelhead and cutthroat trout by length group (mm), juvenile chinook salmon, and miscellaneous species (Wf=whitefish, Bt=bull trout) counted in MFSR tributary transects, August 1989.

		Rainbow/steelhead							Cutthroat								
Location	Ara (m)	<75	75-150	150-230	230-300	>300		2	75-150	150-230	230-300	>300		2	Age 0 chinook		2	
Pistol Cr. 1 (lower)	162	0	6	3	0	0	5.6	0	0	0	1	1	1.2		30	18.5	6	0
Pistol Cr. #2 (upper)	474	8	7	5	1	0	4.4	0	0	0	0	0	0		25	5.3	8	1
Marble Cr. #1 (lower)	968	2	0	0	0	0	0.2	0	0	0	1	0	0.1		0	0	0	0
Loon Cr. #1 (lower)	182	2	8	6	0	0	8.8	0	0	0	2	0	1.1		15	8.2	8	0
Loon Cr. #2 (upper)	366	1	2	0	0	0	0.8	0	0	0	0	0	0		0	0	3	0
Camas Cr. #1 (lower)	325	0	7	0	0	0	2.2	0	0	0	0	1	0.3		8	2.5	14	0
Big Cr. #1 (lower)	305	4	6	0	0	0	3.3	0	0	0	0	1	0.3		11	3.6	4	0
Mean							3.6						0.4			5.4		
Weighted mean							2.4						0.2			3.2		

Salmon River Tributary Transects

The rainbow/steelhead trout observed in Horse, Chamberlain, Bargamin, and Sheep creeks were predominately juvenile steelhead. These tributaries may provide spawning and rearing habitat for the only significant numbers of wild upper Salmon River A-strain steelhead. The Pahsimeroi River supports rainbow trout and steelhead trout, as evidenced by the presence of larger fish (Table 7). Rainbow/steelhead trout densities were 39.6 and 23.0 fish/100 m^2 in the Pahsimeroi River transects and ranged from 4.8 to 12.9 fish/100 m^2 in the other Salmon River tributary transects.

Large numbers of age I chinook were observed in Pahsimeroi River transects (98.9 and 147.5 fish/100 m^2). Presumably, these fish were the result of releases from Pahsimeroi Hatchery which did not migrate. Chinook densities were low in the remaining tributary transects and ranged from 0 to 2.3 fish/100 m^2.

Few cutthroat trout were observed in any of the Salmon River tributary transects. Densities ranged from 0 to 0.6 fish/100 m^2.

DISCUSSION

Middle Fork Salmon River Transects

Steelhead densities have exhibited a steady downward trend since the mid-1980s (Figure 2). This is undoubtedly due, in part, to poor downstream survival of smolts during recent drought years which resulted in lower subsequent spawning escapement. During most years, steelhead were observed in transects other than those selected specifically for steelhead.

Chinook densities declined from 1986 through 1988 but increased substantially in 1989 (Figure 3). Similar to the situation for steelhead, chinook densities are primarily influenced by adult spawning escapement (Figure 4).

Cutthroat densities have been relatively stable since 1985 but increased dramatically in 1989 (Figure 5). The density of larger fish (>300 mm) increased slightly also.

Prior to the establishment of catch-and-release regulations in 1972, the proportion of cutthroat trout larger than 300 mm in hook-and-line samples was approximately 20% (Figure 6). This proportion has doubled since. Also, mean length has increased approximately 20 mm (Appendix A).

Table 7. Number of rainbow/steelhead and cutthroat trout, by length group (mm), juvenile chinook salmon, and miscellaneous species (Bt=bull trout, Wf=whitefish) counted in Salmon River tributary transects, July 1989.

		Rainbow/steelhead						Cutthroat						Chinook				
Location	Arp$_2$a (m)	<75	75-150	150-230	230-300	>300	Rb/100 m^2	<75	75-150	150-230	230-300	>300	Ct/100 m^2	Age 0	Age I	Ck/100 m^2	Bt	Wf
Horse Cr. #1 (bridge)	264	0	18	12	3	1	12.9	0	0	0	0	1	0.4	0	0	0	**0**	7
Horse Creek #2	532	0	30	20	1	0	9.6	0	0	0	0	1	0.2	0	0	0	**0**	8
Chamberlain Cr. #1 (mouth)	291	3	13	7	2	0	8.6	0	0	1	0	0	0.3	2	0	0.7	0	5
Chamberlain Cr. #2 (run)	396	11	13	5	1	1	7.8	0	0	0	0	0	0	9	0	2.3	0	5
Bargamin Cr. #1	715	0	30	12	1	0	6.0	0	0	0	1	1	0.3	0	0	0	0	3
Bargamin Cr. #2	602	0	21	9	2	0	5.3	0	0	0	0	0	0	0	0	0	1	**3**
Sheep Cr. #1	357	0	10	7	0	0	4.8	0	0	2	0	0	0.6	3	0	0.8	0	5
Sheep Cr. #2	200	0	11	8	3	0	11.0	0	0	0	0	0	0	1	0	0.5	0	**9**
Pahsimeroi River #2 (Dowton Lane)	637	30	112	72	31	7	39.6	0	0	0	0	1	0.2	0	630	**98.9**	**0**	**85**
Pahsimeroi River #1	217	10	17	15	5	3	23.0	0	0	0	0	0	0	0	320	147.5	0	30
Mean							12.9						0.2			25.1		
Mean, excluding Pahsimeroi							8.2						0.2			0.5		
Weighted mean							13.2						0.2			22.9		
Weighted mean, excluding Pahsimeroi							7.6						0.2			0.4		

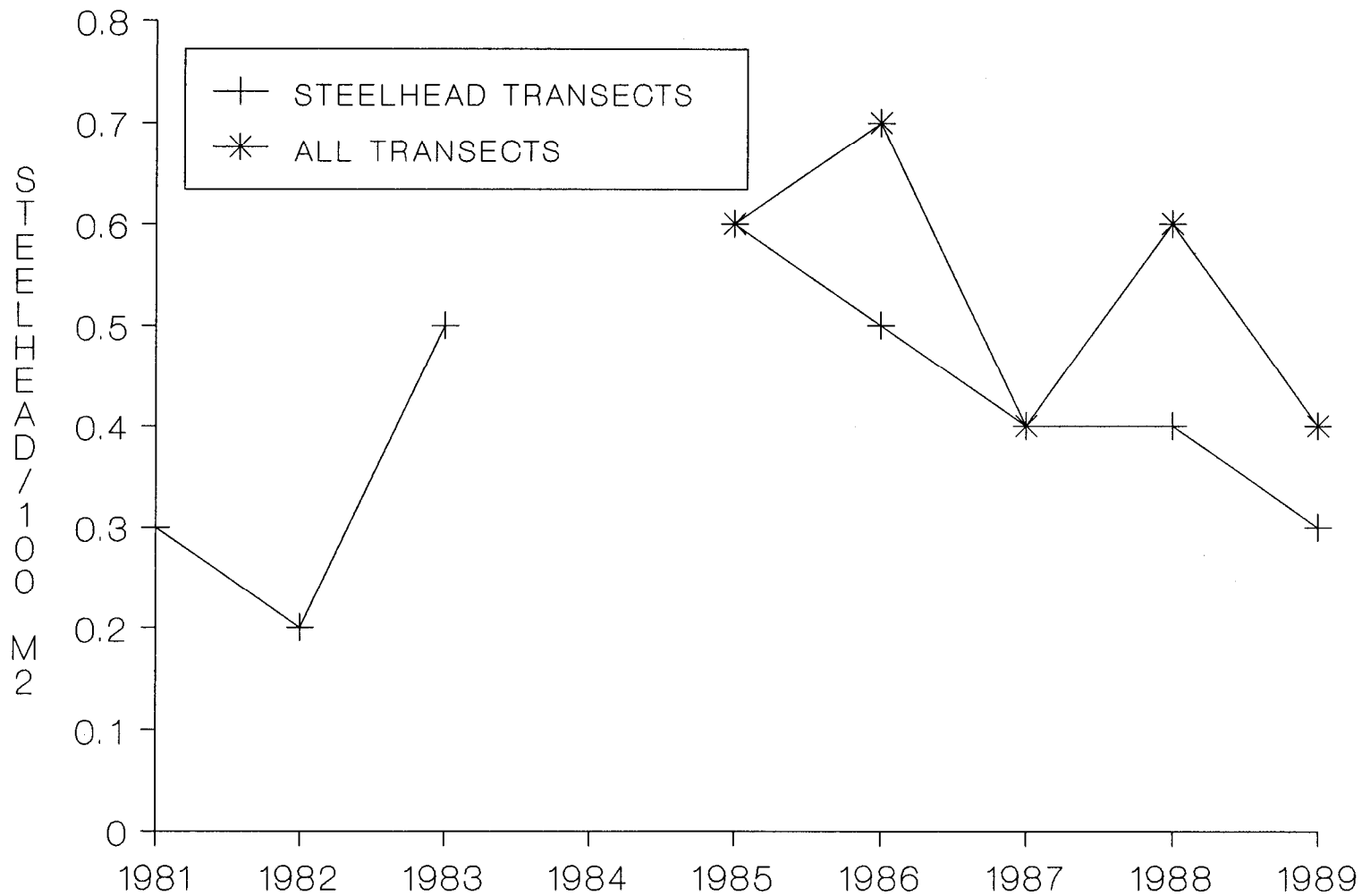

Figure 2. Densities of juvenile steelhead counted in all MFSR snrokeling transects and in steelhead only transects (see Table 1), 1981-89. Data for 1981-83 from Thurow (1982, 1983, 1985).

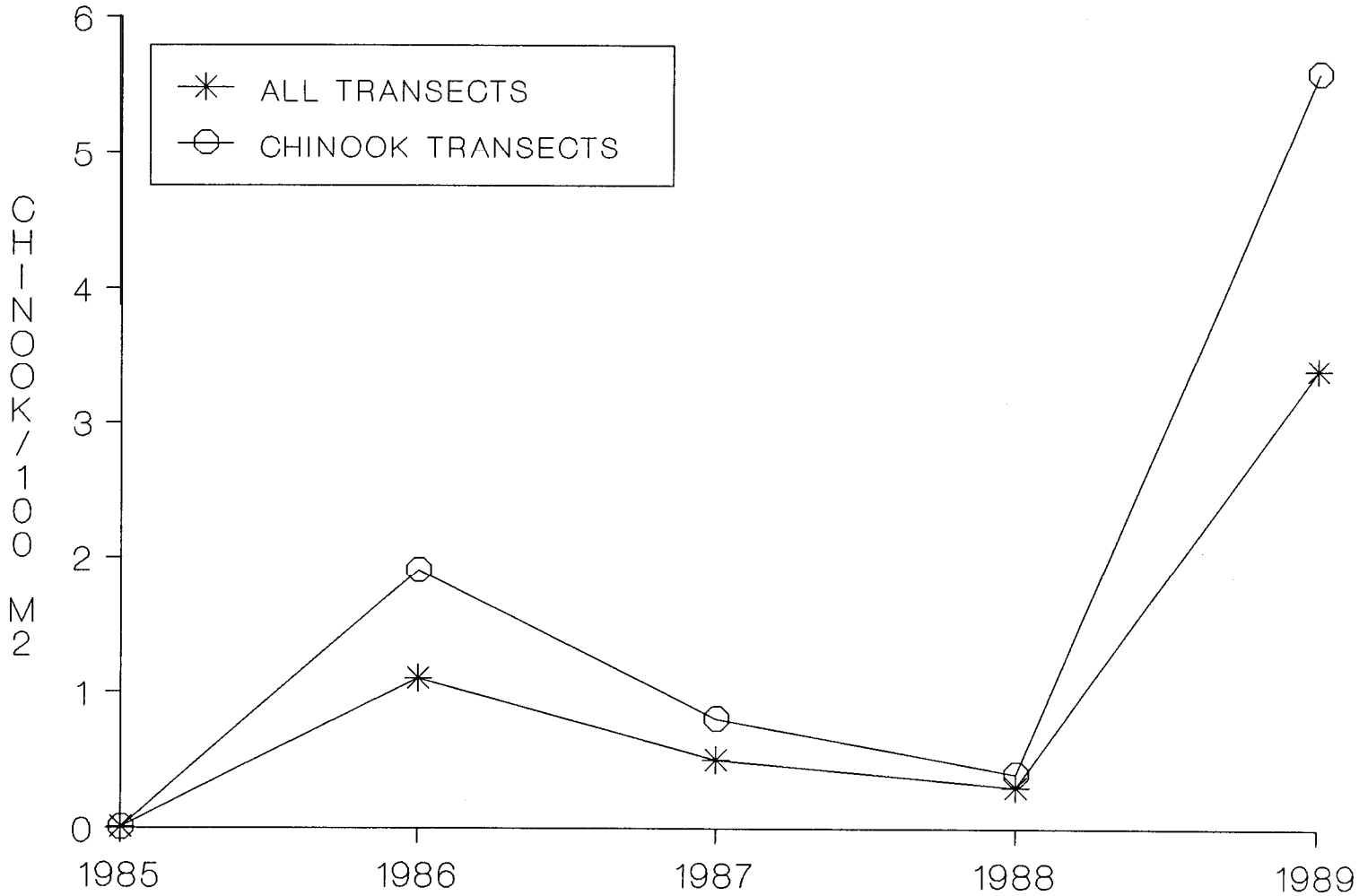

Figure 3. Densities of chinook salmon counted in all MFSR snorkeling transects and in chinook/cutthroat only transects (see Table 1), 1985-89.

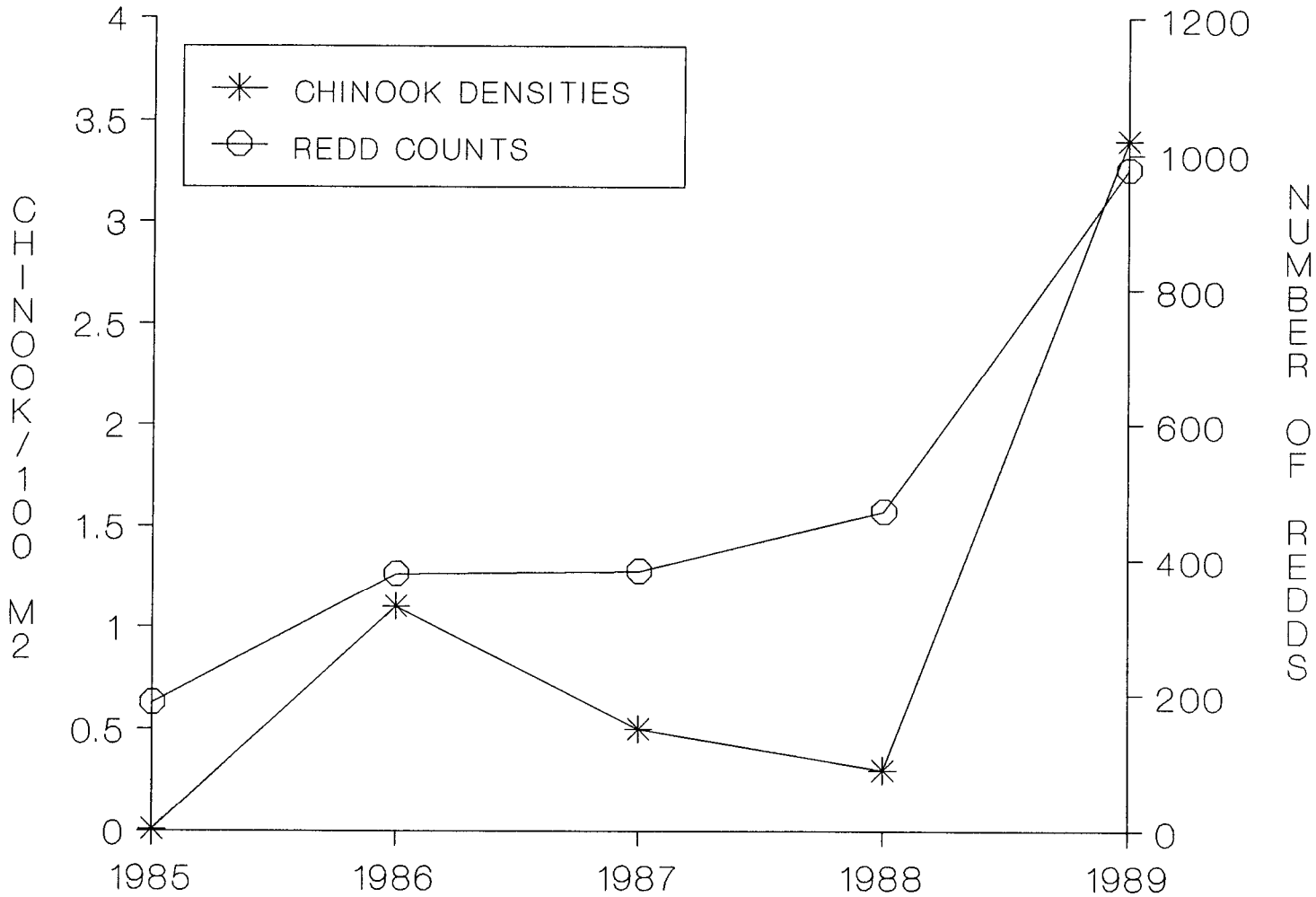

Figure 4. Densities of chinook salmon counted in all MFSR transects, 1985-89, and chinook redd counts for corresponding year classes in MFSR index areas (White and Cochnauer 1989).

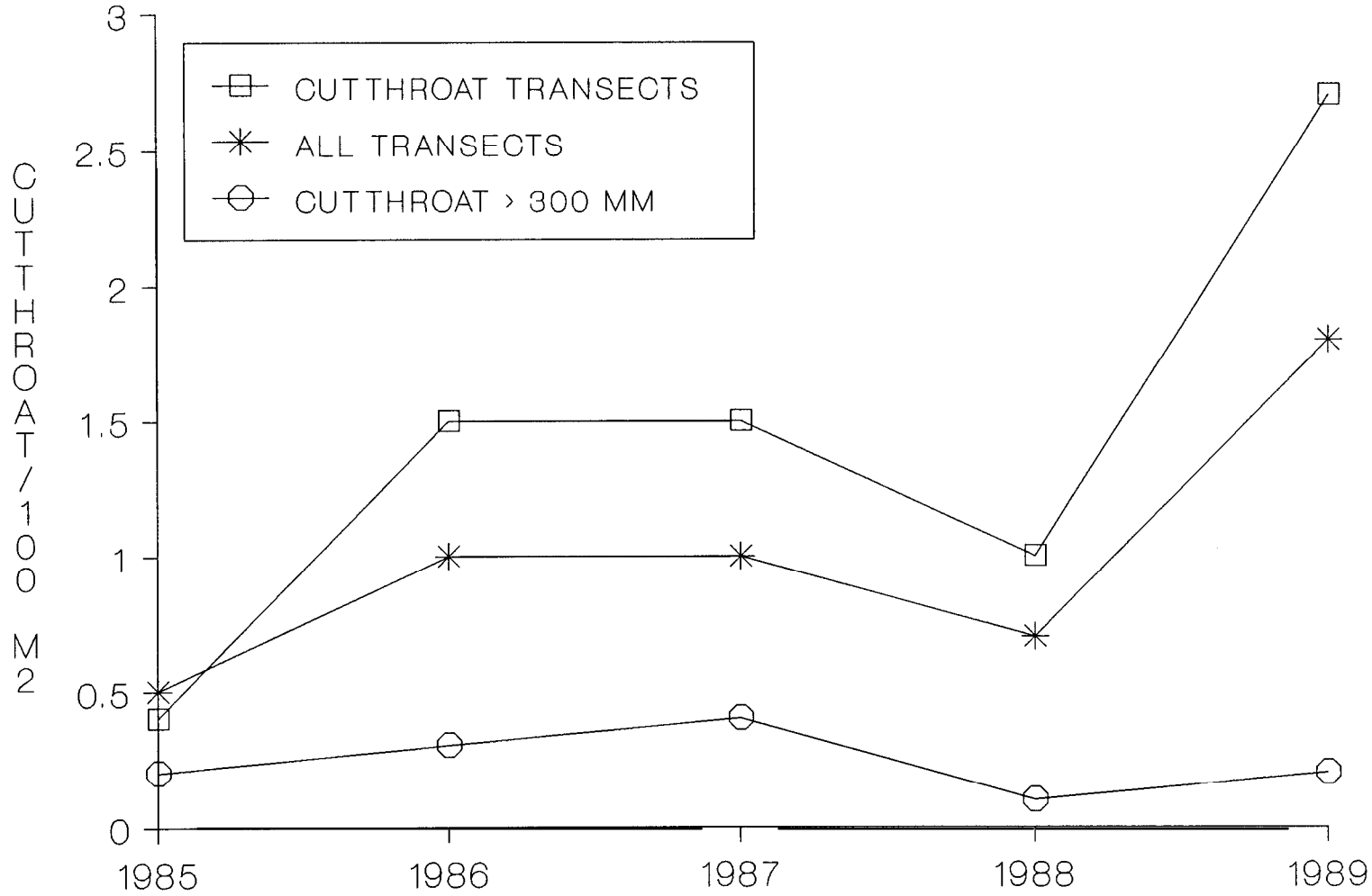

Figure 5. Densities of cutthroat trout counted in all MFSR transects, in cutthroat/chinook only transects, (see Table 1) and densities of fish larger than 300 mm, 1985-89.

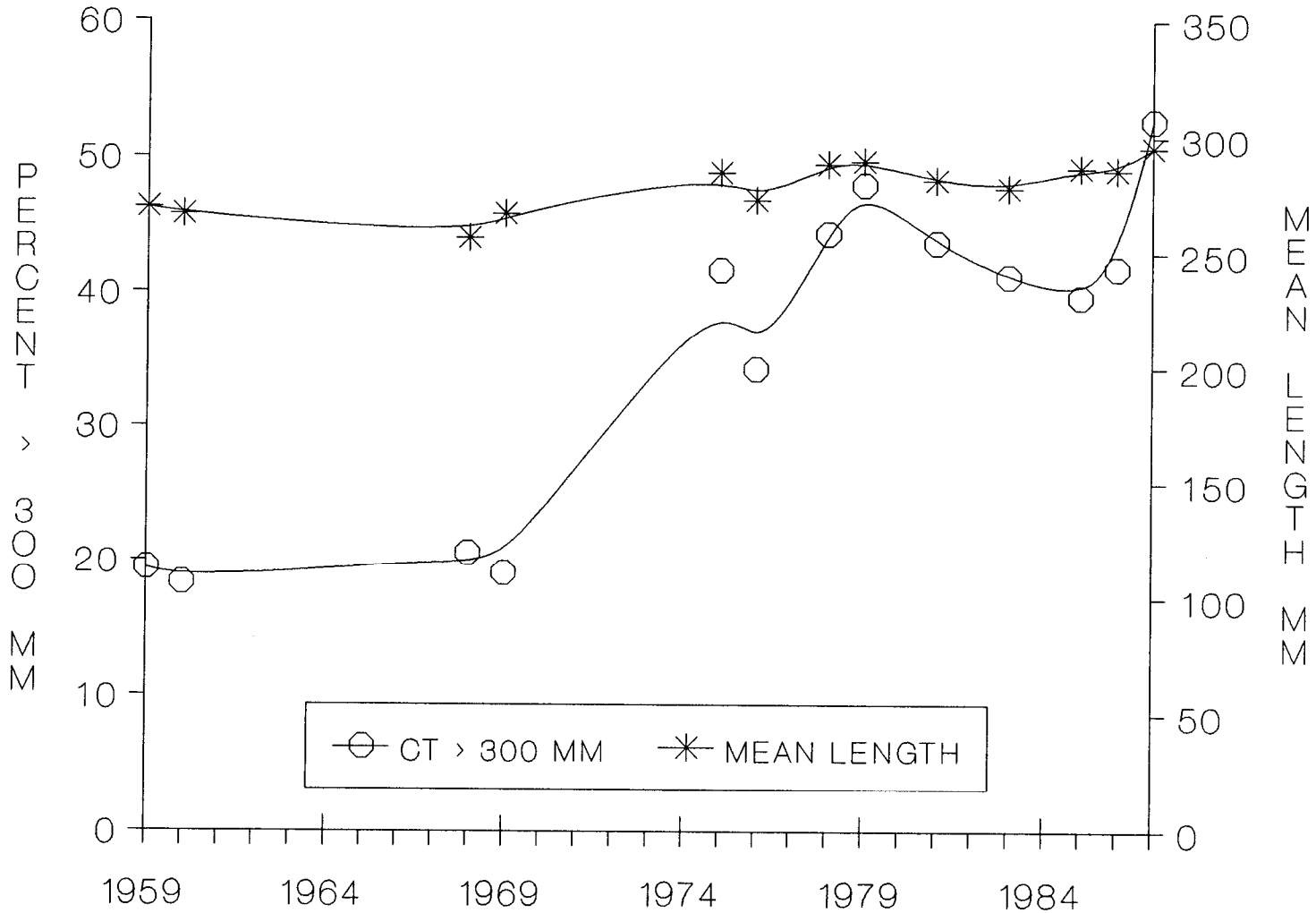

Figure 6. Mean length and proportion of cutthroat trout larger than 300 mm sampled by angling in the MFSR, 1959-87.

Abundance of cutthroat trout, just prior to and since establishment of catch-and-release regulations, peaked in the early 1980's, declined through the mid-1980s, and is currently less than full potential (Figure 7). Possible reasons might include increased hooking mortality due to additional catch-and-release fishing pressure in the MFSR, increased harvest from MFSR tributaries, or increased mortality in the main Salmon River between Horse Creek and North Fork where MFSR cutthroat trout overwinter and are subject to intense catch-and-release pressure by steelhead anglers. All of these potential mortality factors need to be evaluated.

Angler success rates and satisfaction with the fishery should be evaluated and monitored.

Compared to other healthy riverine populations of westslope cutthroat trout in Idaho, abundance in the MFSR is less than the St. Joe River, similar to the Selway River, and greater than the Lochsa and Little North Fork Clearwater rivers (Figure 8). Abundance in MFSR tributaries is similar to Big Creek (another MFSR tributary) and considerably less than in Cayuse Creek.

Middle Fork Salmon River Tributary Transects

Densities of chinook and steelhead in MFSR tributary transects exhibited the same trends observed in main MFSR transects (Figure 9). Cutthroat densities, however, declined in all five tributaries from 1988 to 1989. Possible explanations for this apparent anomaly could have been earlier emigration to the main river or a weak year class.

Cutthroat densities in Pistol Creek continued a precipitous decline. Overharvest is the presumed cause due to road and trail access in the upper drainage.

Salmon River Tributary Transects

The Salmon River tributary snorkeling transects were established primarily to monitor juvenile steelhead densities. Densities in the Pahsimeroi River have fluctuated since 1985 with a general downward trend (Figure 10). Fish numbers are quite large, however, and are strongly influenced by resident rainbow trout.

Rainbow/steelhead densities in the canyon tributaries (Horse, Chamberlain, Bargamin, and Sheep creeks) have also shown a slightly downward trend since 1985. Counts in all tributaries except Sheep Creek were slightly lower in 1989 than 1988. The rainbow/steelhead counted in these transects are predominantly steelhead.

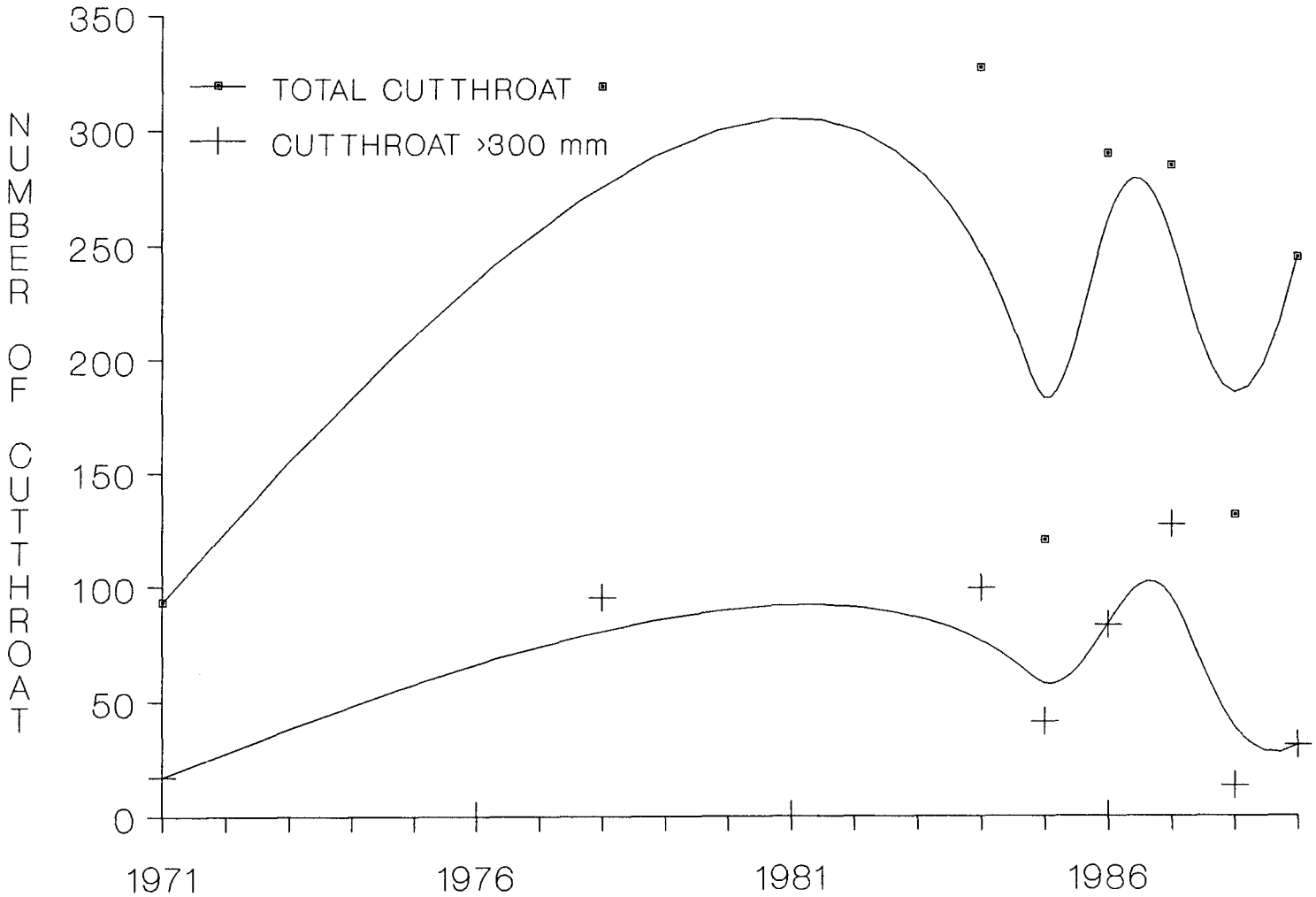

Figure 7. Numbers of cutthroat trout counted in traditional MFSR snorkeling transects, 1971-89.

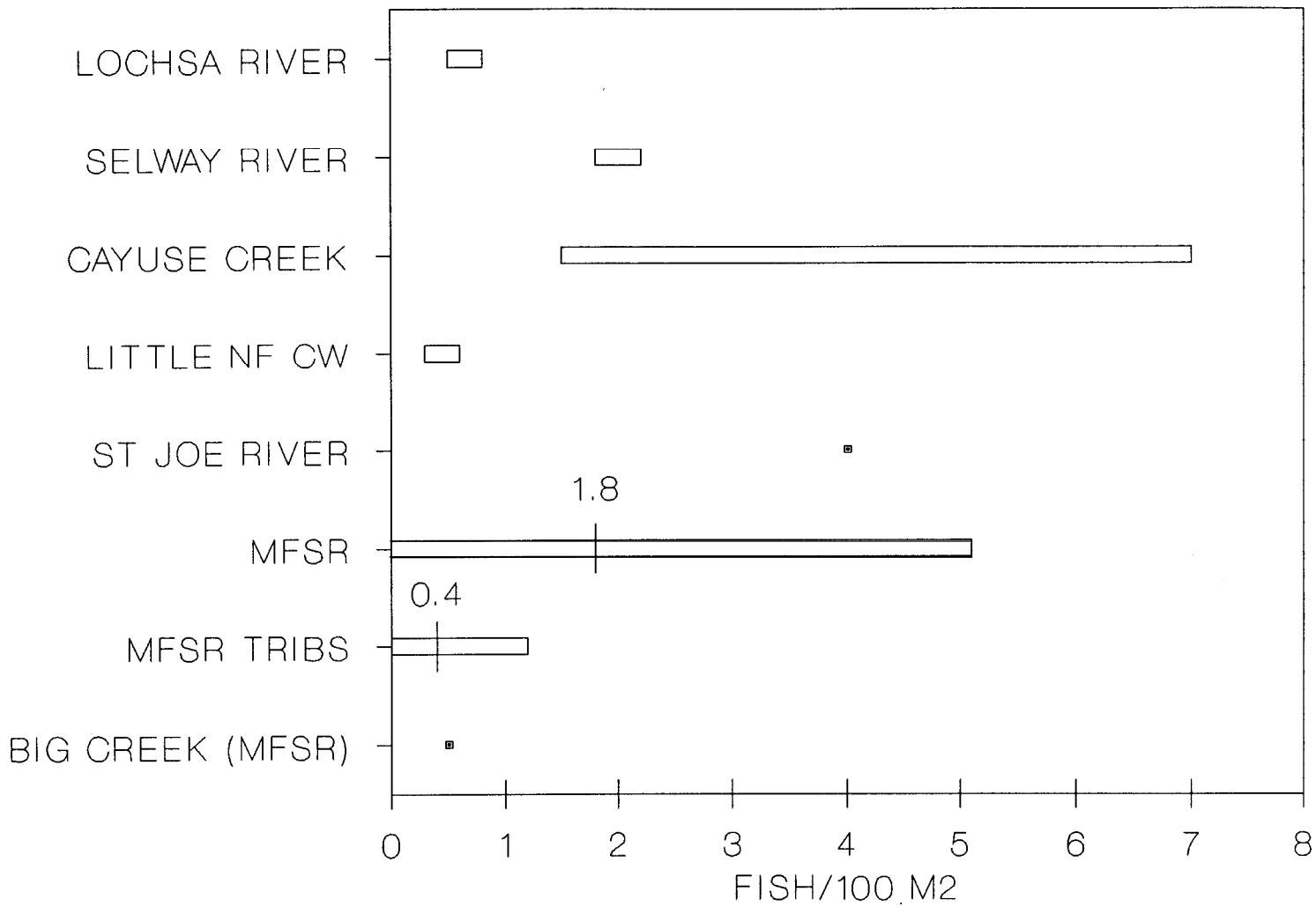

Figure 8. Densities of westslope cutthroat trout from various streams in Idaho. Data for streams other than MFSR and MFSR tributaries from Rieman and Apperson (1989).

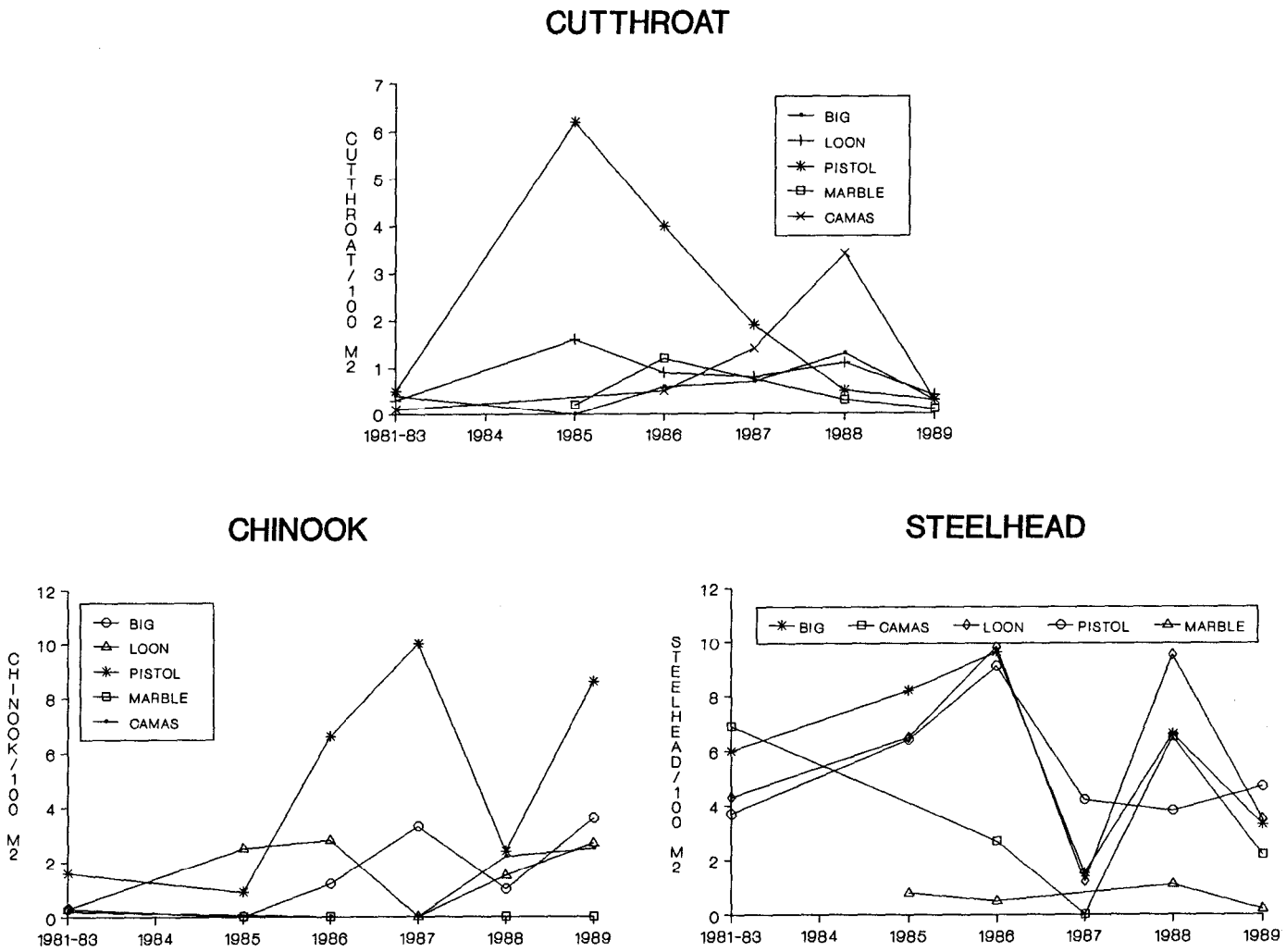

Figure 9. Densities of cutthroat trout, chinook salmon, and steelhead trout in MFSR tributary snorkeling transects, 1981-89. Data for 1981-83 from Thurow (1982, 1983, 1985).

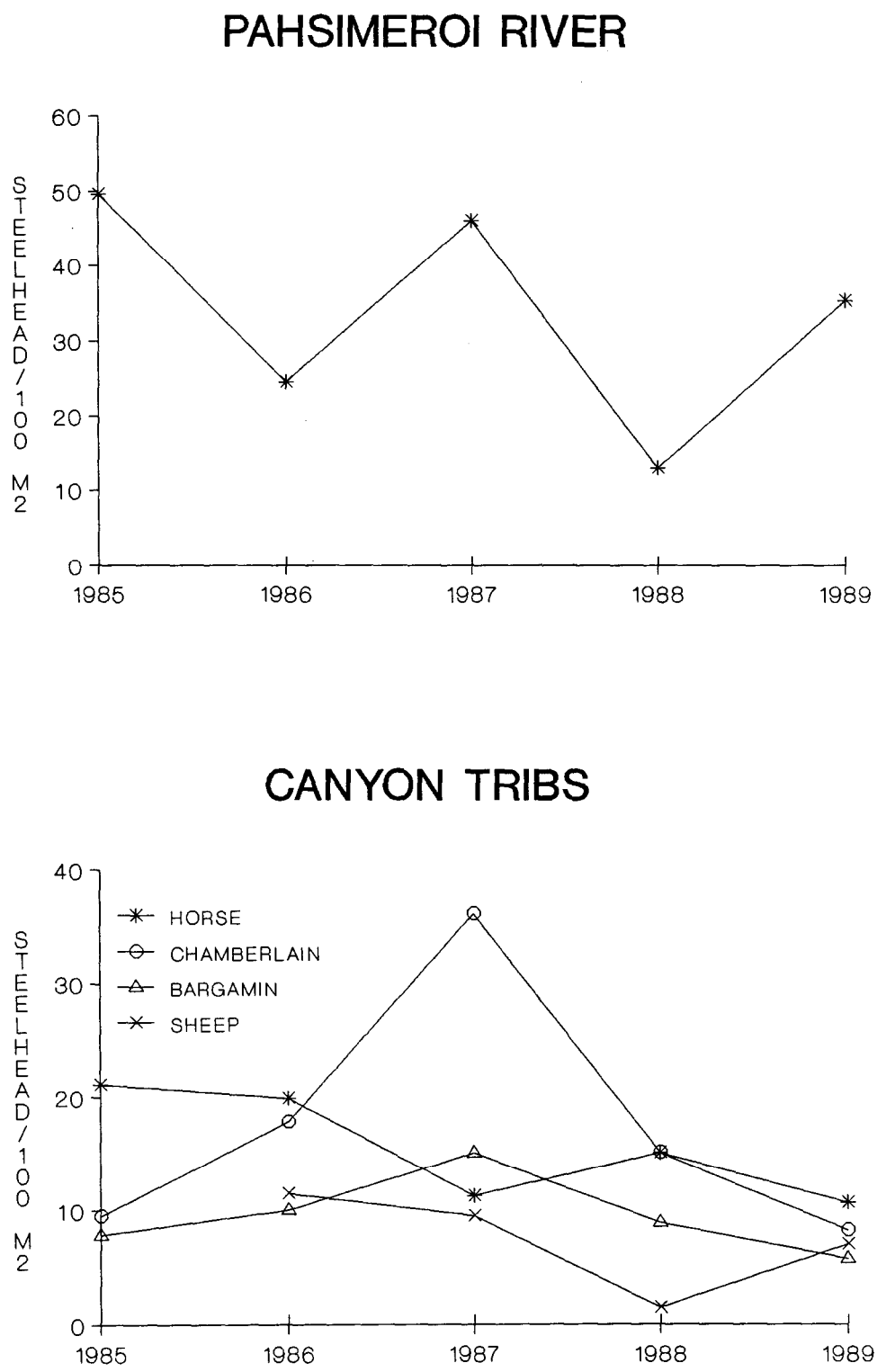

Figure 10. Steelhead densities in Salmon River tributary snorkeling transects, 1985-89.

RECOMMENDATIONS

1. Monitor densities of juvenile steelhead/cutthroat trout and chinook salmon in the MFSR via snorkeling between the second week of July and the third week of August.

2. When possible conduct two counts; one in July and one in August. Compare steelhead numbers between counts.

3. Evaluate fishing effort in the MFSR drainage and compare to earlier findings to determine if effort is increasing.

4. Determine total annual mortality and compare to other similar westslope cutthroat trout populations.

5. Establish program to monitor angler catch rates.

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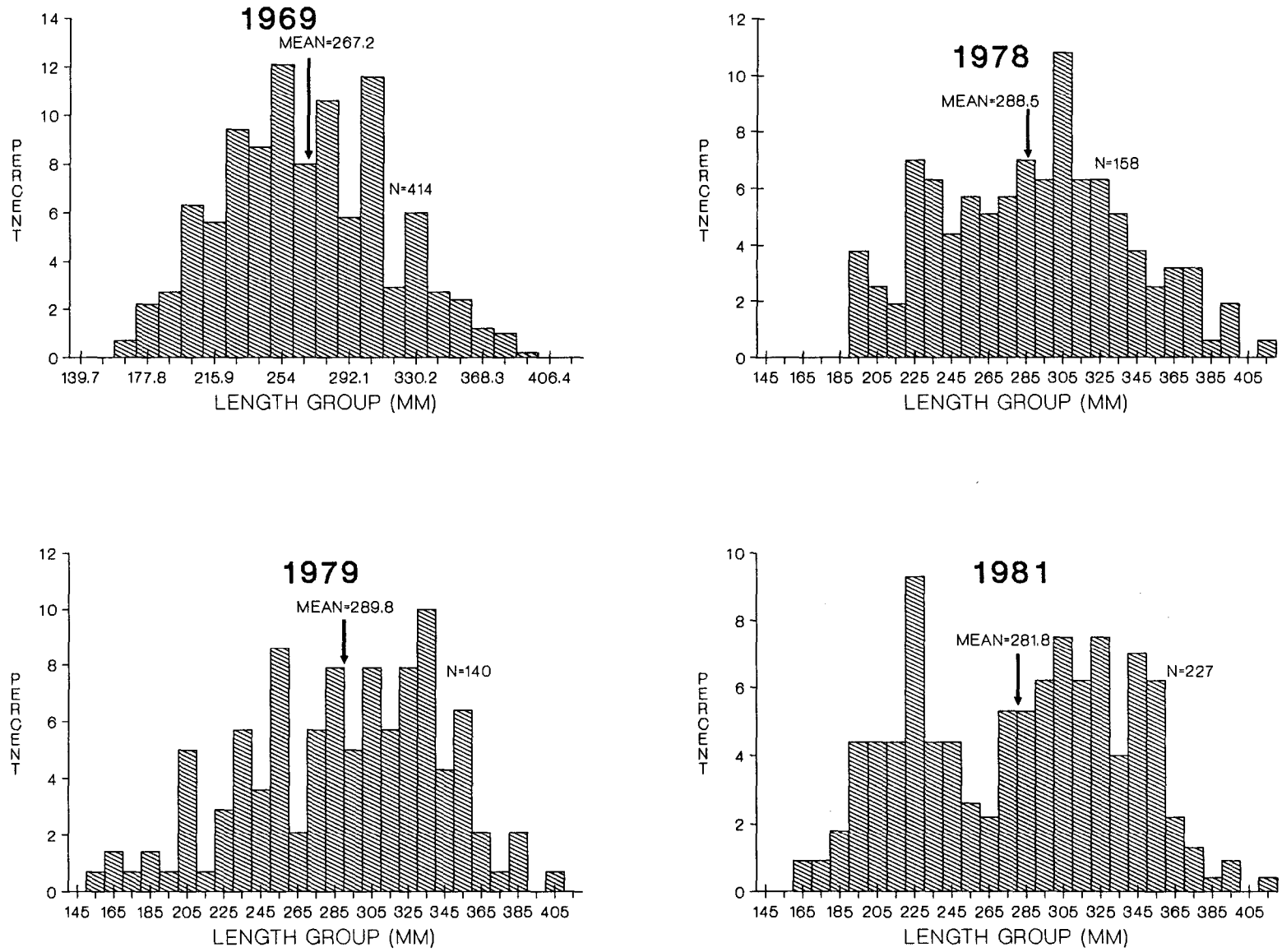
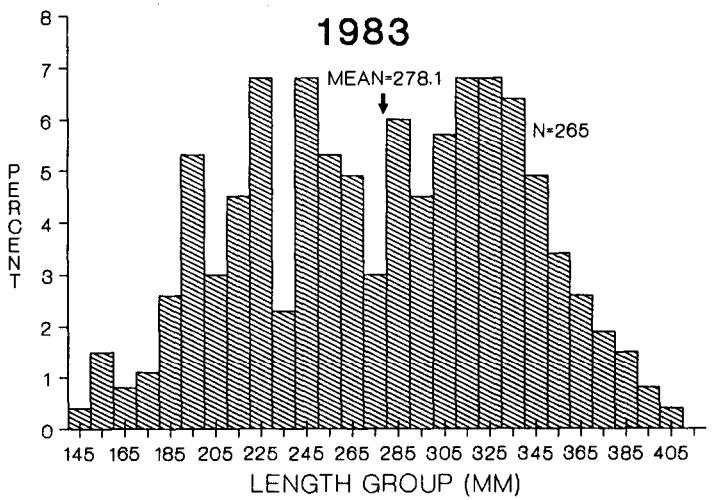
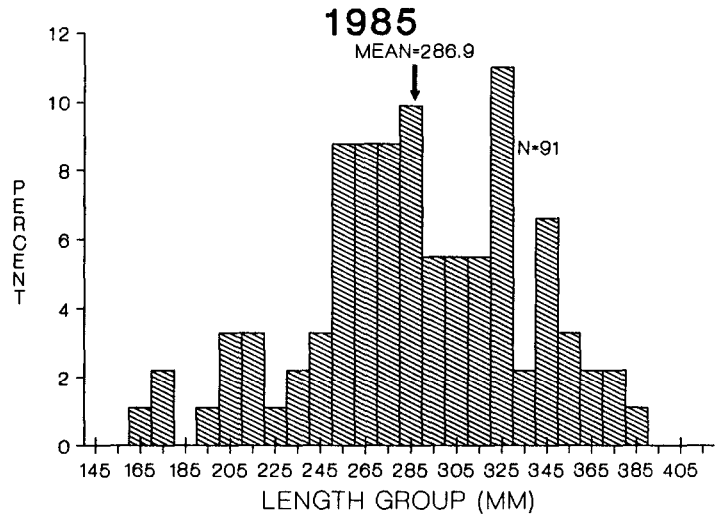
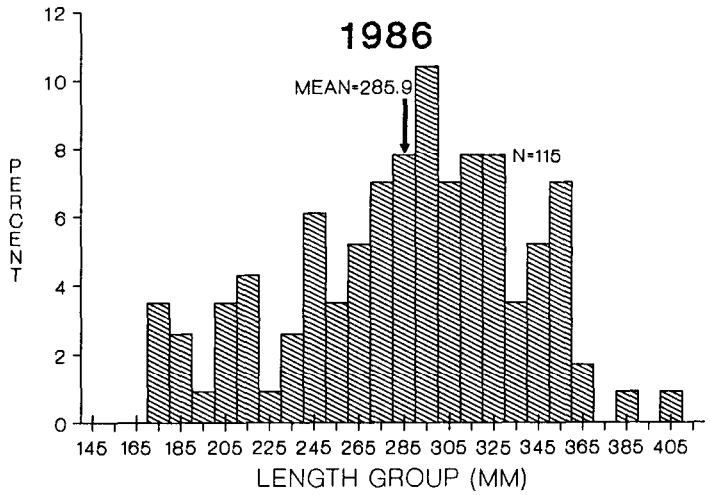
A P P E N D I X

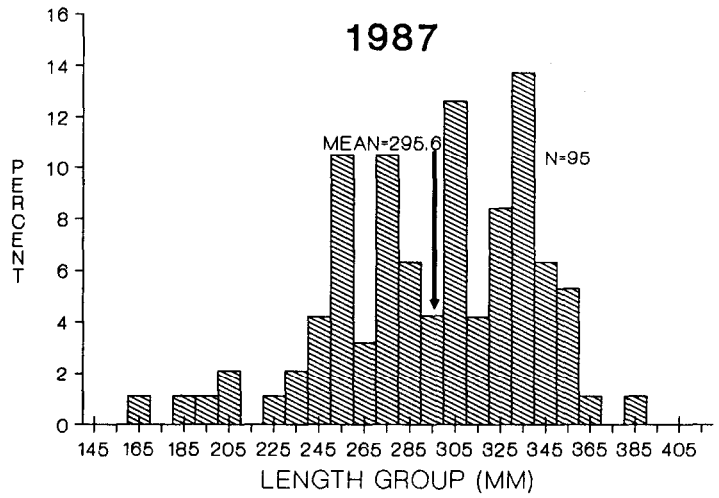


Appendix A. Length frequency of cutthroat trout sampled by angling from the MFSR, 1969-87.









Appendix A. Continued.

JOB PERFORMANCE REPORT

State of: **Idaho**

NAME: **Regional Fishery Management Investigations**

Project No.: **F-71-R-14**

Title: **Salmon Subregion Rivers and Streams Investigations -- Lemhi River Survey**

Job No.: **6(SAL)-c^2**

Period Covered: **July 1, 1989 to June 30, 1990**

ABSTRACT

We surveyed the mainstem Lemhi River and 24 of its tributaries during 1989 to assess resident wild trout populations, angler use and harvest, and habitat conditions. In the mainstem, estimated annual fishing mortality for large (>225 mm) rainbow trout was at least 11%. We estimated annual survival for all ages to be 0.49. Although movements of tagged rainbow trout were minimal (<8 mm), one tagged bull trout moved at least 13 km to spawn. A large proportion of the sampled rainbow/steelhead trout was >300 mm in length, and the largest fish captured was 575 mm. Average length was 261 mm ($\bar{n}$=222). Wild rainbow/steelhead and cutthroat were the predominant trout species found during electrofishing (98X), but bull trout (1%) and brook trout (1%) were also present. We did not enumerate nongame fish.

We interviewed 145 anglers during the summer, and they had fished an average 1.2 h, caught 1.8 fish, and kept 0.7 fish. The estimated harvest rate (0.6 fish/h) was less than half of the estimated catch rate (1.5 fish/h). Our partial creel survey also revealed that most fish kept were wild rainbow/steelhead and cutthroat trout (96%); no angler kept mountain whitefish.

In the tributaries, estimated wild trout densities ranged from 2.0 to 46.5 fish/100 m^2 for 18 streams surveyed. Valid estimates could not be made for six other streams due to low capture probabilities ($p<0.30$). Species captured by electrofishing included rainbow, cutthroat, brook, and bull trout. Although we observed rainbow x cutthroat hybrids, we suspect some of the tributaries may have pure

westslope cutthroat trout. Nongame fish were not enumerated. Mean lengths of trout ranged from 109 to 202 mm; no wild trout captured was >300 mm. Water temperatures ranged from 5 to 23°C, pool habitat from 0 to 40X, riffle habitat from 0 to 50%, and sand/silt substrate from 2 to 45%.

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R9R7038DK

INTRODUCTION

The Lemhi River has been the subject of at least a dozen fishery investigations in the past. Many of these were in response to major problems in the drainage, and most concerned only anadromous fish. Few studies have examined its resident fishery.

After the June 1957 flood and during construction of Highway 28, considerable amounts of river channel (21%) and associated riparian areas were altered by bulldozing (Gebhards 1958). At least 121 of the principal spawning areas for chinook salmon Oncorhynchus tshawytscha were estimated to have been lost; rearing areas were also adversely effected. No attempt was made to evaluate effects on trout and mountain whitefish Prosopium williamsoni, but the author felt that it was substantial.

Gebhards (1959a) also examined the effects of irrigation diversions on the production of chinook salmon. At that time, 90 irrigation diversions were located on the river, and almost one-half million fingerlings were estimated to be lost in them annually. Most of these ditches are screened today. Gebhards also estimated availability and use of spawning areas in the river and its tributaries, 1954 to 1958.

Perhaps the most intensive studies of the river and one of its tributaries, Big Springs Creek, have been conducted by Bjornn and Goodnight (Bjornn 1966, 1971, 1978; Goodnight 1970; Goodnight and Bjornn 1971). These studies were concerned with survival, production, yield, and movements of anadromous and non-anadromous salmonids.

Gebhards (1959b) and Dorratcaque (1986) provide a thorough description of the basin and the history of its fishery. In addition, Dorratcaque reports on the feasibility of enhancing salmon and steelhead Oncorhynchus mykiss stocks which have declined significantly over the last 80 years. The reasons for these declines are many, but passage flows for upstream and downstream migration appear to be the primary factor limiting anadromous fish production at this time. Irrigation diversions have completely dewatered lower sections of the river in 1977, 1978, 1987, 1988, and 1989. Another potential problem is migration delay at fish screens in irrigation ditches.

OBJECTIVES

1. To estimate trout population parameters in the mainstem Lemhi River, particularly exploitation and movement, but also age and size structure, species composition, and relative abundance.

2. To estimate catch and harvest rates of trout in the mainstem Lemhi River.

3. To estimate trout population parameters in tributaries of the Lemhi River, specifically density, mean and range of fish sizes, species composition, and relative abundance.

4. To estimate available habitat in tributaries of the Lemhi River.

METHODS

Mainstem Trout Populations

To estimate trout population parameters in the mainstem Lemhi River, we electrofished six different stations at four locations (Figure 1) immediately before the start of the 1989 fishing season (May 27). The first two stations sampled (Powers Ranch and Cottom Lane) are located just below the confluence of Big Eightmile Creek; they were sampled May 9, 1989. The next station (McFarland) was sampled May 10, 1989 and is located at the mouth of Reese Creek. The next two stations (Lemhi Store and Weir) are located just above the confluence of Hayden Creek at the town of Lemhi; they were sampled May 12 and May 23, 1989. The last station is located near the Quality Beam Plant between the towns of Tendoy and Baker. It was sampled May 24, 1989. We chose stations based on ease of access and potential angler use.

Fish were captured using direct-current electrofishing equipment (Coffelt VVP-15 powered by a 3,500-watt Honda generator) mounted in an aluminum canoe. We electrofished going upstream and did not attempt to capture nongame fish. Our primary objective was to tag wild rainbow trout to estimate exploitation and movement.

After capture, trout were anesthetized with tricaine methane-sulfonate (MS-222), identified, weighed to the nearest gram, and measured to the nearest millimeter (TL). We attached $5 reward tags (Monel sizes 8 to 16) to the dentary of rainbow and bull trout *Salvelinus confluentus* >225 mm. Each tag had a unique number. We also collected scales for aging. Fish were allowed to recover in holding pens before being released.

Scales were mounted and aged in the lab. We used a 12-ton Carver Laboratory Press (Model C) to make permanent scale impressions on laminate slides. We used 20,000 lbs/inch^2 for 10 to 20 seconds without heat. Slides were read using a Ken-A-Vision microprojector. Age validation was not attempted this year.

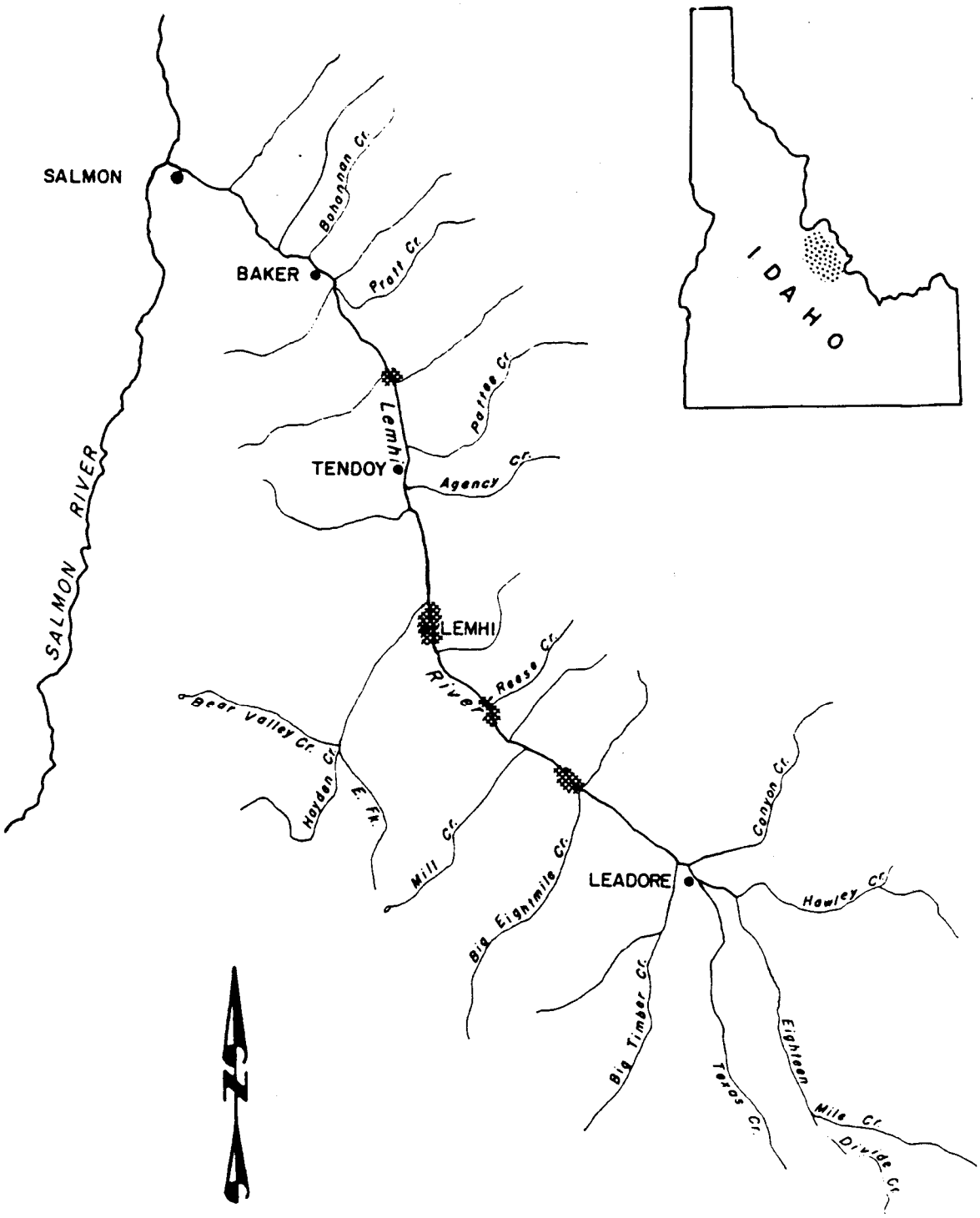


Figure 1. Location of the mainstem Lemhi River and some of its tributaries. Mainstem stations that were electrofished during 1989 are shaded and are described in the text.

We used the $5 reward tags to estimate the rate of exploitation of wild rainbow trout and the movements of wild rainbow and bull trout. We tagged and released a total of 126 wild trout (124 rainbow and 2 bull). Tagged rainbow trout ranged in length from 229 to 575 mm, and tagged bull trout ranged from 362 to 446 mm. Signs (Figure 2) posted along the river alerted anglers to the presence of tagged fish and provided instructions for reporting information. Anglers were required to mail tags to IDFG to receive the reward.

The rate of exploitation (u) is the annual fishing mortality rate (Ricker 1975). Recaptures of tagged rainbow trout throughout the 1989 fishing season (R) were compared to the number tagged and released before the season (M) to estimate this parameter (u = R/M). We assumed equal catchability of tagged versus untagged fish, a 100% reporting rate for the tags, and that mortality associated with the tagging process was insignificant (Everhart and Youngs 1981).

Although capture probabilities are known to vary with fish size, and, hence, age, size, and age structures were estimated using length frequency and age frequency distributions of all rainbow/steelhead trout captured. A catch curve (Ricker 1975) was constructed to estimate total instantaneous mortality (Z). We used simple linear regression to estimate Z for ages 4 to 6 on the descending limb of the curve. Annual survival (S) and total annual mortality (A) were calculated as:

$$S = e^{-Z}$$
$$A = 1 - S$$

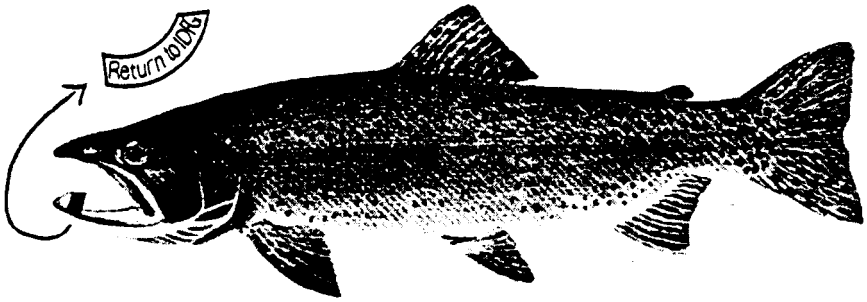
The expectation of natural death (v) was calculated by subtracting the rate of exploitation (u) from total annual mortality (A).

We assumed capture probabilities did not vary with species, and we estimated relative abundance using proportions of all trout captured. As mentioned, only game fish (rainbow/steelhead trout, bull trout, brook trout, and chinook salmon) were netted. Also, we did not attempt to distinguish smaller (<225 mm) wild rainbow from steelhead trout.

Mainstem Catch and Harvest Rates

We used a partial creel survey to estimate catch and harvest rates of wild trout in the mainstem Lemhi River. Anglers were interviewed four weekend days and four weekdays during the summer (May to August 1989). The opening day of fishing season was included (May 27). Because we did not attempt to count all anglers, estimates of total effort and harvest were not made. Angler interviews were conducted on the streambank. We asked them how many hours they fished and how many fish they released and kept. We also examined fish in their creel for species composition.

ANGLERS



TAGGED TROUT IN THESE WATERS

PLEASE RETURN TAGS AND RECOVERY INFORMATION (date, location) FOR ANY TAGGED FISH CREELED TO:

IDAHO DEPARTMENT OF FISH AND GAME
P.O. Box 1336
Salmon, Idaho 83467
Phone: (208) 756-2271

TAG INFORMATION TO ANGLERS:
A brief history of the tagged fish can be furnished to those anglers providing name and mailing address.

IDAHO FISH & GAME

03-2/89

Figure 2. Sign used for tagged trout in the Lemhi River, 1989.

Tributary Trout Populations

We collected trout population information for 26 tributary streams of the Lemhi River by electrofishing during July and August 1989 (Figure 1). Game fish were captured using backpack direct-current electrofishing equipment (Coffelt BP-1C powered by a 120-watt generator). Electrofishing passes were made going upstream, and the second pass was made immediately after and with the same effort as the first. Though stations were not blocked at each end, we assumed fish would not move beyond natural habitat boundaries. Stations varied in length from 65 to 123 m.

After capture, trout were anesthetized with tricaine methane-sulfonate (MS-222), identified, weighed to the nearest gram, and measured to the nearest millimeter (TL). Fish from each electrofishing pass were allowed to recover in separate holding pens until capture probabilities were calculated. Fish were not fin-clipped or tagged.

Several parameters were used to describe each trout population. We assumed capture probabilities did not vary with species, and we estimated relative abundance using proportions of all trout captured. Although capture probabilities are known to vary with fish size, average length and length ranges were estimated using all fish captured. We used the two-pass Seber-LeCren formulas to estimate abundance and probability of capture (Seber and LeCren 1967; Seber 1973):

$$N = \frac{(n_1)^2}{n_1 - n_2} \qquad p = \frac{n_1 - n_2}{n_1} \qquad SE(N) = \frac{n_1 n_2 (n_1 + n_2)^{1/2}}{(n_1 - n_2)^2}$$

Where N = estimated number of fish (>7 cm); p = estimated probability of capture; SE(N) = standard error; n_1 = number of fish (>7 cm) captured on the first pass; n2 = number of fish (>7 cm) captured on the second pass. Estimates of density were derived from estimates of abundance by using water surface area of each station. Because fish 7 cm and smaller were not efficiently sampled, only fish >7 cm were used in the calculations. Also, all trout species were combined to make each estimate.

Tributary Habitat

Trout habitat information was collected in the same 26 tributary streams that we electrofished. Habitat parameters were generally measured the same day the stream was electrofished.

Five transects were located within a station, were perpendicular to the thalweg, and were generally 20 m apart. Each transect was divided into 1/4, 1/2, and 3/4 intervals. We measured water depth, habitat type (Bisson et al. 1981), and substrate type (Platts et al. 1983) at each interval. Wetted width of the transect, and channel center length, slope, and water temperature of the station were also measured.

RESULTS AND DISCUSSION

Mainstem Trout Populations

Of 124 wild rainbow trout tagged and released in the mainstem Lemhi River, 14 were caught and the information returned. Nine tagged fish were caught during summer (May to August), whereas five were caught in the fall (September to November). Two tag returns were from anglers interviewed during the summer.

The rate of exploitation (u) for these larger (>225 mm) fish was estimated to be at least 11% during 1989. We believe this rate reflects annual fishing mortality on large (>225 mm) wild rainbow trout stocks, as steelhead generally migrate before they reach 225 mm. The total instantaneous mortality rate (Z) was estimated at 0.71 (r=-0.99) for ages 4 to 6 (Figure 3). Annual survival (S) was estimated at 0.49, and total annual mortality (A) was calculated to be 0.51. The expectation of natural death (v) was estimated to be 0.40.

Based on locations of tag returns, movements of wild rainbow trout were minimal. All tagged fish were caught within 8 km of their release site. Some fish were probably tagged prior to spawning, however. Fish were not checked for sexual maturity.

One male bull trout (446 mm, age 4) was tagged on May 23, 1989 at the Lemhi River Weir just above the mouth of Hayden Creek. He was caught in Bear Valley Creek on October 1, 1989, at least 13 km from the release site. We suspect he was spawning there, and we suggest that bull trout might overwinter in the mainstem Lemhi River or farther downstream.

Rainbow/steelhead adults in the mainstem Lemhi River spawn in the spring and fry emerge in late spring to early summer. From January to May there are no age 0 (sub-yearling) rainbow/steelhead trout in the river. We did sample three sub-yearling chinook salmon, however, and their total lengths ranged from 80 to 100 mm. Sub-yearlings were present because adults spawn in the fall and fry emerge at an earlier date than rainbow/steelhead trout.

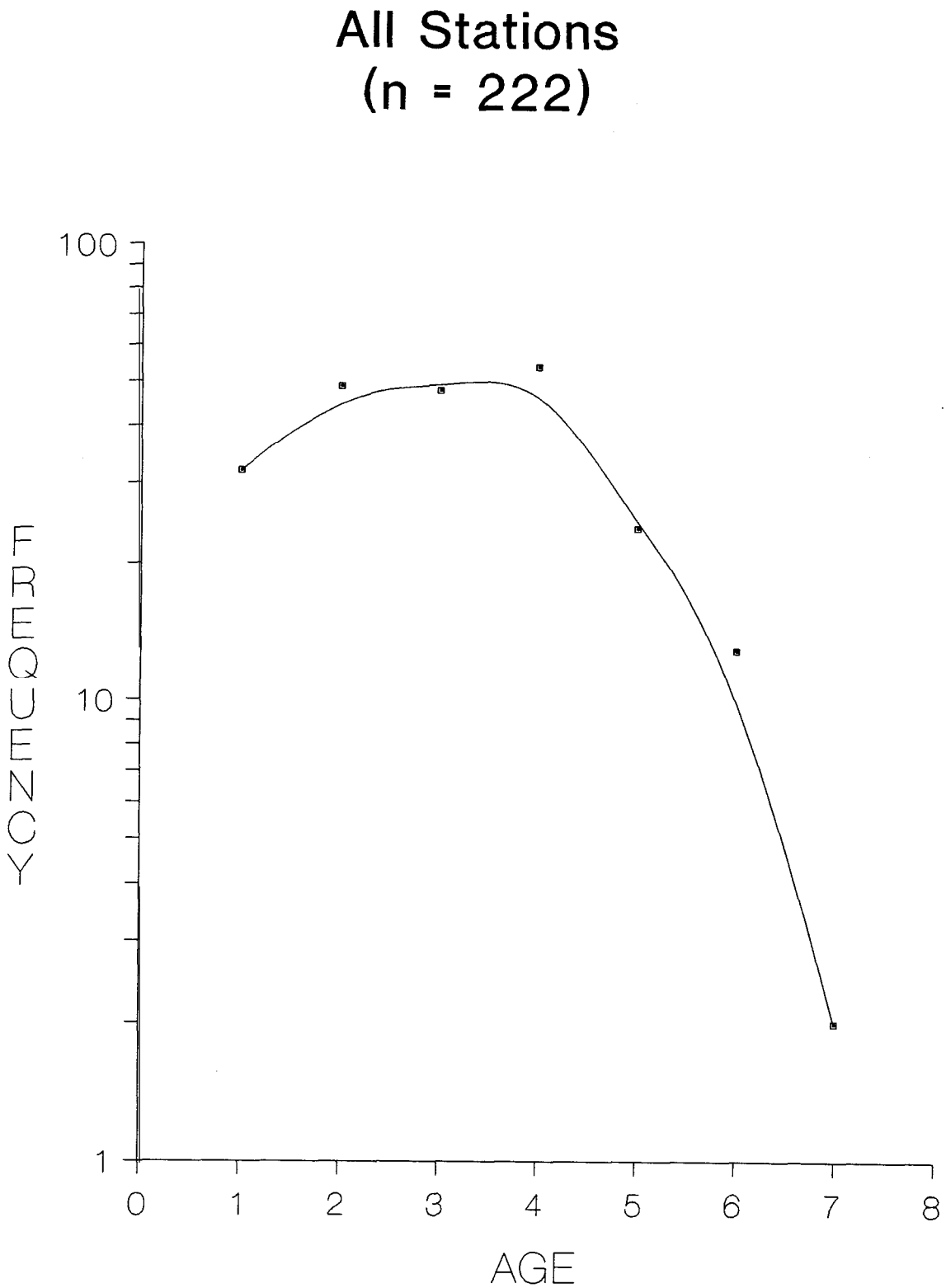


Figure 3. Catch curve for wild rainbow/steelhead trout sampled in the mainstem Lemhi River, May 1989.

Age I rainbow/steelhead trout ranged in length from 80 to 160 mm (mean = 110 mm, Table 1), age II from 120 to 220 mm (mean = 167 mm), age III from 180 to 320 (mean = 239 mm), age IV from 230 to >500 mm (mean = 337 mm), age V from 340 to >500 mm (mean = 406 mm), and age VI from 380 to >500 mm (mean = 442 mm). The two age VII fish were 422 and 548 mm.

Modes in length frequency distributions (Figure 4) tend to validate this age structure. However, the consistent 185 mm mode suggests that ages II and III may not have been accurately separated. Age validation by recapturing tagged fish will be attempted next year.

In contrast to tributary streams, rainbow/steelhead trout <80 mm were not observed in the mainstem during May (Figure 4). Further, a large proportion of the sample (almost half) was >300 mm and the largest fish captured was 575 mm. The average fish length was 261 mm and the average weight was 297 g (n=222, Table 1).

These age and size data confirm the high productivity of the mainstem Lemhi River. In contrast, less than 2Z of the rainbow or brook trout in South Willow Creek, Montana, exceeded 300 mm (Schrader 1989). South Willow Creek is a mountain stream that is not stocked and is lightly fished. Average size of yearling rainbow trout in the spring was estimated at 65 mm; age II fish were estimated at 115 mm, and age III+ at 165 mm. We suggest electrofishing in the fall, concentrating on small fish when streamflow is low.

Wild rainbow/steelhead were the predominant trout species captured in the mainstem Lemhi River. Overall, about 98Z of the trout sampled (n=243) were rainbow/steelhead, 1Z were bull, and 1Z were brook. Only three bull and two brook trout were captured. Three sub-yearling chinook salmon were also captured. No cutthroat trout were observed, although hybridization with rainbow/steelhead trout was apparent.

Mountain whitefish, sculpins *Cottus spp.*, and dace *Rhinichthys spp.* also occur in the river, but their relative abundance is unknown. Goodnight (personal communication to Don Corley 2/3/70) estimated that 80Z of the fish biomass above the Lemhi Weir consisted of mountain whitefish, 14% of rainbow/steelhead trout, 3% of sculpins, 2% of chinook salmon, <1% brook trout, and <1% dace. We are unsure why bull trout were not reported.

Mainstem Catch and Harvest Rates

Anglers that were interviewed during the summer (May to August) revealed that they fished an average 1.2 h, caught 1.8 fish, and kept 0.7 fish (Table 2). We interviewed 145 anglers, and they fished a total 178 h and caught 266 fish. The estimated harvest rate (0.6 fish/h) was less than half of the estimated catch rate (1.5 fish/h). This is because catch statistics reflect all sizes and species of fish caught, released or kept, whereas harvest statistics reflect only legal-sized fish (generally trout) that were kept.

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Table 1. Age frequency distributions and mean lengths and weights at age of wild rainbow/steelhead trout. Fish were sampled in the mainstem Lemhi River, May 1989.

	Frequency				Mean	
Age	Lemhi Store and Weir	McFarland	Cottom Lane and Powers Ranch	Combined	total length (mm)	Mean weight (g)
1	2	0	30	32	110.3	16.1
2	15	25	9	49	167.1	48.8
3	21	21	6	48	238.9	164.7
4	34	12	8	54	337.3	435.3
5	10	3	11	24	406.5	725.0
6	4	2	7	13	441.6	928.5
7	0	1	1	2	485.0	1,065.0
Total	86	64	72	222	260.7	296.9

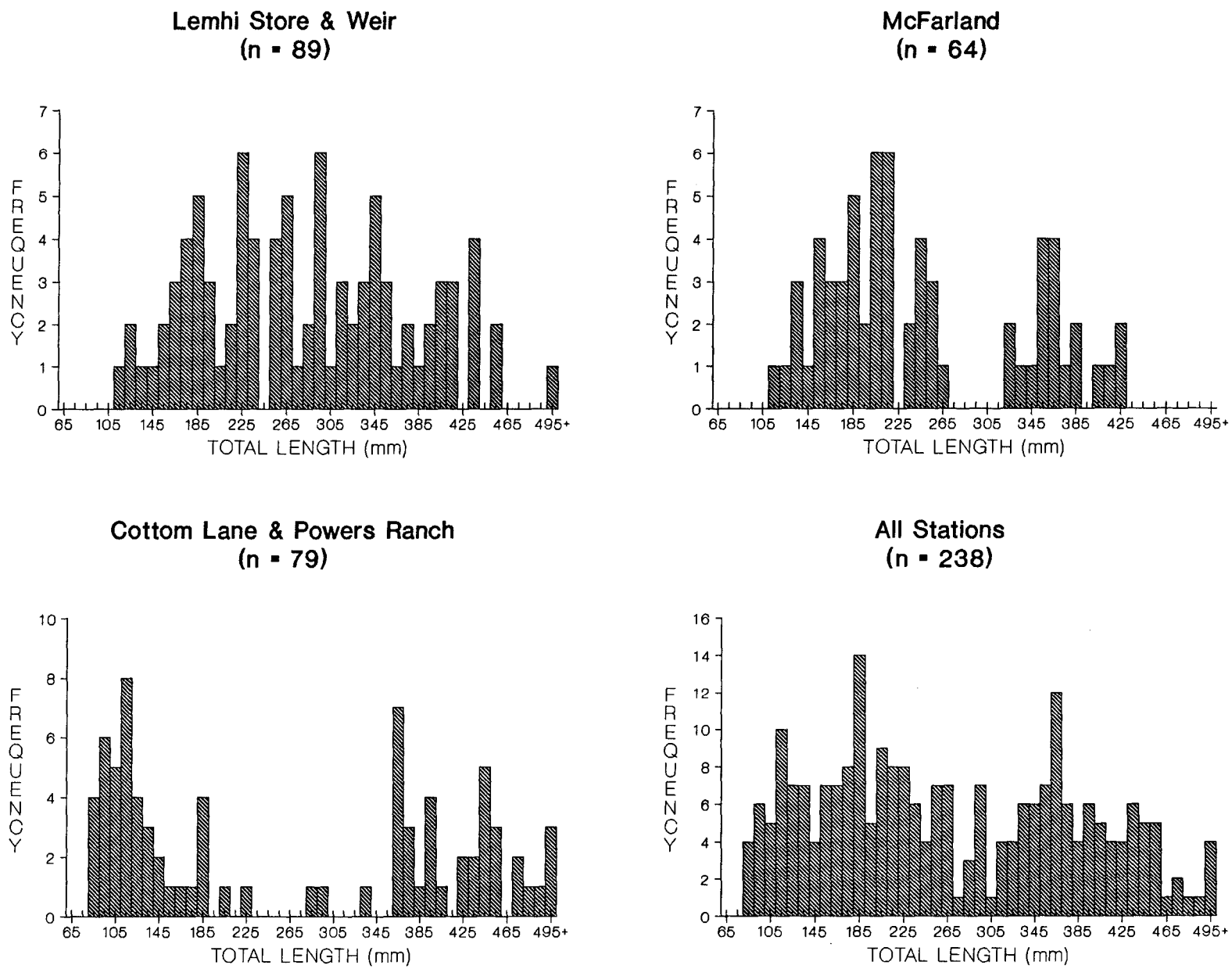

Figure 4. Length frequency distributions of rainbow/steelhead trout sampled in the mainstem Lemhi River, May 1989. Sample size = n. "All Sections" includes the Quality Beam section (n=6).

Of the fish creeled, the majority were rainbow/steelhead trout (96X) followed by bull trout (42) (Table 2). Anglers that were interviewed did not keep brook trout or mountain whitefish. We recogize that these anglers probably caught numerous whitefish and other smaller trout, but we were skeptical of their reports of species of fish released and relied on creel information.

The last formal creel survey conducted on the mainstem Lemhi River was in 1965 (Corley 1965). Thirty-two anglers were interviewed from May to July, and they fished a total 55 h and caught 55 fish. The catch rate was 1.0 fish/h and was similar to rates estimated for 1989. Anglers in 1965 fished an average 1.7 h to catch 1.7 fish. The majority of fish caught (96%) were wild and hatchery rainbow/steelhead trout; the remainder (4%, or 2 fish) were brook trout. These data were similar to data collected in 1989 and suggest, with the exception of stocking hatchery fish, that the fishery has not changed much over the years.

Tributary Trout Populations

Estimated wild trout (>7 cm) densities in 18 tributaries of the Lemhi River ranged from 2.0 to 46.5 fish/100 m^2 (Table 3). One of these tributaries was sampled at two different locations (Hawley Creek), but densities were not significantly different. Capture probabilities (p) ranged from 0.45 to 0.89. We expected higher densities in streams with sympatric populations of trout (e.g. Kirtley Creek), but this was not the case.

Valid estimates could not be made for six other streams due to low capture probabilities ($p<0.30$, Table 3). Two of these streams (Middle Fork Little Timber and Eighteenmile creeks) were sampled at two different locations. We could make a valid estimate for one of the Eighteenmile Creek stations ($p=0.60$), but only seven fish were captured and the density estimate was the lowest observed.

We observed four trout species in the tributaries: rainbow, cutthroat *Oncorhynchus clarki*, brook, and bull. Brook trout were found in only one stream (Kirtley), and they were sympatric with cutthroat and bull trout. We also observed rainbow x cutthroat hybrids. No brown *Salmo trutta* trout or chinook salmon were observed. Nongame fish were not recorded, but mountain whitefish, sculpin, and dace are known to occur in the drainage.

Several streams were recorded as having cutthroat and hybrids, but not rainbow trout (Table 3). We suspect that some, if not all, of these streams contain pure cutthroat trout. These include Kirtley, Geertson, Pratt, McDevitt, Reese, and Quaking Aspen. Many of these tributaries are dewatered before reaching the Lemhi River and were not stocked with hatchery fish in the past.

Table 2. Angler interview data from the mainstem Lemhi River, May to August, 1989.

Date	Week day	Anglers interviewed	Fishing effort (h)	Fish released	Fish kept	Total catch[a]	Catch rate (fish/h)	Harvest rate (fish/h)
5/27	Sat.	54	98	-[b]	49	49	0.5	0.5
6/26	Mon.	12	8	1	8	9	1.1	1.0
7/7	Fri.	20	17	33	10	43	2.5	0.6
7/8	Sat.	6	4	11	4	15	3.8	1.0
7/21	Fri.	13	16	76	15	91	5.7	0.9
7/22	Sat.	20	15	12	5	17	1.1	0.3
7/26	Wed.	11	14	32	8	40	2.9	0.6
8/5	Sat.	9	6	2	0	2	0.3	0.0
Total		145	178	167	99	266	1.5	0.6

Date	Mean effort/ angler (h)	Mean catch/ angler	Mean harvest/ angler	Species composition of creel(%)			
				Rainbow	Bull	Brook	Whitefish
5/27	1.8	0.9	0.9	96	4	0	0
6/26	0.7	0.8	0.7	100	0	0	0
7/7	0.9	2.2	0.5	100	0	0	0
7/8	0.7	2.5	0.7	100	0	0	0
7/21	1.2	7.0	1.2	-[c]		-	-
7/22	0.8	0.9	0.3	80	20	0	0
7/26	1.3	3.6	0.7	100	0	0	0
8/5	0.7	0.2	0.0	0	0	0	0
Total	1.2	1.8	0.7	96	4	0	0

[a]lncludes all sizes and species, released or kept.
[b]Number of fish released is unknown.
[c]Species of fish creeled is unknown.

Table 3. Estimates of wild trout (>7 cm) density, capture probability, and species composition in tributary streams that were surveyed in the Lemhi River drainage, 1989.

Stream	Date surveyed	Trout density (fish/ 100 m²)	95% CI	Capture probability (p)	Total number captured	Species composition (%) Rainbow	Cutthroat	Hybrid	Brook	Bull
Kirtley	08/11	7.1	1.4	0.68	37	0	5	16	59	19
Geertson	08/10	8.3	1.1	0.76	36	0	42	25	0	33
E. Fk. Bohannon	08/10	7.9	0.4	0.89	21	100	0	0	0	0
Withington	08/11	43.5	5.0	0.70	91	1	65	34	0	0
Pratt	08/14	2.5	0.3	0.86	8	0	0	100	0	0
Haynes	08/31	39.5	4.2	0.71	97	100	0	0	0	0
Kenney	08/10	10.8	2.4	0.68	29	7	41	31	0	21
Pattee	08/09	46.5	18.8	0.45	87	100	0	0	0	0
Agency	08/09	33.7	6.6	0.58	108	100	0	0	0	0
McDevitt	08/30	13.0	0.8	0.88	27	0	56	44	0	0
Reese	08/09	21.4	15.3	0.47	23	0	61	39	0	0
Big Eightmile	08/24	5.7	1.4	0.68	25	0	0	0	0	100
Dairy	08/25	7.5	2.1	0.69	17	0	0	0	0	100
Jakes Canyon	08/03	[a]	--	--	41	100	0	0	0	0
M. Fk. Little Timber #1	07/20	a	--	--	8	0	100	0	0	0
M. Fk. Little Timber #2	07/20	a	--	--	35	0	23	0	0	77
Canyon	07/25	21.1	6.5	0.59	38	95	0	5	0	0
Cruikshank	07/13	16.0	1.5	0.79	41	100	0	0	0	0
Frank Hall	07/13	32.7	19.2	0.46	37	0	100	0	0	0
Hawley #1	07/12	12.3	1.0	0.80	48	90	4	6	0	0
Hawley #2	07/12	19.4	9.1	0.45	62	55	3	42	0	0
Quaking Aspen	08/01	a	--	--	16	0	25	75	0	0
Resrvoir	07/11	a	--	--	18	-	100	0	0	0
Big Bear	07/11	a	--	--	9	0	100	0	0	0
Eighteenmi #1	07/19	2.0	1.4	0.60	7	86	0	0	0	14
Eighteenmile #2	07/19	a	--	--	12	B	--	--	--	--

[a]Valid estimates could not be made as p<0.30.

[b]Species not recorded on field forms.

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Mean total lengths of trout ranged from 109 20 202 mm (Table 4. Although the largest fish was 320 mm, it was a hatchery rainbow trout captured in Hawley Creek, the only stream in the drainage that is currently stocked. (Meadow Lake, in the headwaters of Texas Creek, is also stocked with catchables). Excluding this fish, no other trout captured was larger than 300 mm. In contract, over half the wild rainbow/steelhead trout captured in the Lemhi River were larger than 300 mm.

Tributary Trout Habitat

Slopes of tributaries surveyed ranged from 1.0 to 4.9% (Table 5). Mean wetted widths ranged from 1.6 to 4.7 m, and mean water depths from 6 to 36 cm. Water temperatures in July and August ranged from 5°C in Dairy Creek (a high-elevation tributary of Big Eightmile Creek) to 23°C in Eighteenmile Creek. Not surprisingly, the lowest density observed during 1989 was in this portion of Eighteenmile Creek. Most stream temperatures, however, ranged between 10 and 20°C during the summer.

Pool habitat ranged from 0 to 40% of the stations surveyed, whereas riffles ranged from 0 to 50X (Table 6). No backwater was observed. Sand/silt substrate ranged from 2 to 45% and gravel from 22 to 73%. Canyon Creek had a large amount (682) of aquatic vegetation.

RECOMMENDATIONS

1. Continue to manage the mainstem Lemhi River and all its tributaries except Hawley Creek for naturally-produced wild trout.

2. Continue to stock Hawley Creek with 1,000 catchable rainbow trout during the summer.

3. Evaluate extent of cutthroat trout hybridization in Kirtley, Geertson, Pratt, McDevitt, Reese, Middle Fork Little Timber, Quaking Aspen, Reservoir, and Big Bear creeks.

4. Improve angler access to the mainstem Lemhi River.

5. Encourage harvest of mountain whitefish in the mainstem Lemhi River.

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Table 4. Minimum, maximum, and mean total lengths (TL) of wild trout (>7 cm) captured in Lemhi River tributaries, 1989. Note that fish <7 cm were often captured but were not included.

Stream	Date surveyed	Min TL (mm)	Max TL (mm)	Mean TL (mm)
Kirtley	08/11	110	230	156
Geertson	08/10	80	240	**166**
E. Fk. Bohannon	08/10	100	240	151
Withington	08/11	80	270	134
Pratt	08/14	110	200	154
Haynes	08/31	76	274	129
Kenney	08/10	90	300	202
Pattee	08/09	80	300	127
Agency	08/09	80	190	112
McDevitt	08/30	82	208	133
Reese	08/09	100	200	145
Big Eightmile	08/24	85	231	159
Dairy	08/25	107	168	137
Jakes Canyon	08/03	80	230	130
M. Fk. Little Timber #1	07/20	155	195	166
M. Fk. Little Timber #2	07/20	110	300	173
Canyon	07/25	78	217	148
Cruikshank	07/13	80	210	125
Frank Hall	07/13	80	190	122
Hawley #1	07/12	90	270	160
Hawley #2	07/12	100	320	169
Quaking Aspen	08/01	80	190	123
Reservoir	07/11	80	210	134
Big Bear	07/11	90	230	144
Eighteenmile #1	07/19	90	170	109
Eighteenmile #2	07/19	100	195	136

Table 5. General physical characteristics of tributary streams that were surveyed in the Lemhi River drainage, 1989.

Stream	Date surveyed	IDFG catalog number[a]	Slope (%)	Channel center length (m)	Mean wetted width (m)	Surface area (m^2)[b]	Mean water depth (cm)	Water temperature (C)
Kirtley	8/11	07-43-01-0000	3.3	123	4.7	578	14	13
Geertson	8/10	07-43-03-0000	2.2	100	4.6	460	10	12
E. Fk. Bohannon	8/10	07-43-04-0001	4.1	100	2.7	270	11	11
Withington	8/14	07-43-06	4.3	100	2.3	230	10	15
Pratt	8/08	07-43-07-0000	2.6	100	3.3	330	14	9
Haynes	8/31	07-43-10	4.3	112	2.4	269	15	13
Kenney	8/08	07-43-11-0000	3.5	100	3.0	300	15	14
Pattee	8/04	07-43-12-0000	2.2	100	2.7	270	7	18
Agency	8/04	07-43-13-0000	1.2	100	3.9	390	14	17
McDevitt	8/30	07-43-14	3.1	96	2.2	211	6	14
Reese	8/09		3.1	94	1.6	150	9	14
Big Eightmile	8/24	07-43-20	2.9	110	4.4	484	19	9
Dairy	8/25	07-43-20-0001	3.0	105	2.4	252	11	5
Jakes Canyon	7/03		2.6	90	2.4	216	12	14
M. Fk. Little Timber #1	7/20	07-43-21-0001	1.6	100	3.5	350	9	19
M. Fk. Little Timber #2	7/20	07-43-21-0001	2.9	100	3.7	370	15	14
Canyon	7/25	07-43-22	3.4	108	2.0	216	13	17
Cruikshank	7/13	07-43-22-0001	1.7	86	3.1	267	14	15
Frank Hall	7/13	07-43-22-0002	2.4	80	2.0	160	12	10
Hawley #1	7/12	07-43-23-0001	1.7	110	3.7	407	15	12
Hawley #2	7/12	07-43-23-0001	1.2	102	4.5	459	16	11
Quaking Aspen	8/01		4.9	65	2.1	136	9	15
Reservoir	7/11		1.0	110	2.2	242	32	20
Big Bear	7/11		2.2	100	2.1	210	36	10
Eighteenmile #1	7/19	07-43-23	3.3	117	3.6	421	12	23
Eighteenmile #2	7/19	07-43-23	4.0	96	3.0	288	15	15

[a]From IDFG Catalog of the Streams and Lakes of Idaho, 1987.
[b]Product of channel center length and mean wetted width.

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Table 6. Estimates of habitat and substrate types available in tributary streams that were surveyed in the Lemhi River drainage, 1989.

		Habitat type (%)						Substrate type (%)			
Stream	Date surveyed	Pool	Run	Pocket water	Riffle	Back water	Sand/ silt	Gravel	Cobble	Boulder	Plants
Kirtley	8/11	0	66	7	27	0	6	29	56	9	0
Geertson	8/10	13	60	20	7	0	2	28	49	21	0
E. Fk. Bohannon	8/10	20	73	7	0	0	6	37	44	13	0
Withington	8/14	20	60	0	20	0	19	40	39	2	0
Pratt	8/08	20	80	0	0	0	4	29	35	32	0
Haynes	8/31	0	66	7	27	0	21	44	35	0	0
Kenney	8/08	0	80	0	20	0	13	33	34	20	0
Pattee	8/04	0	80	0	20	0	3	60	37	0	0
Agency	8/04	20	80	0	0	0	28	46	20	5	1
McDevitt	8/30	20	27	7	46	0	17	30	44	9	0
Reese	8/09	20	80	0	0	0	44	41	13	2	0
Big Eightmile	8/24	20	60	20	0	0	16	23	41	20	0
Dairy	8/25	33	67	0	0	0	11	22	40	27	0
Jakes Canyon	7/03	0	100	0	0	0	13	67	20	0	0
M.F. Little Timber #1	7/20	0	60	0	40	0	30	33	31	6	0
M.F. Little Timber #2	7/20	15	85	0	0	0	9	53	34	4	0
Canyon	7/25	0	80	0	20	0	10	22	0	0	68
Cruikshank	7/13	40	20	0	40	0	15	53	32	0	0
Frank Hall	7/13	40	60	0	0	0	15	73	12	0	0
Hawley #1	7/12	5	57	22	16	0	29	35	24	12	0
Hawley #2	7/12	15	42	8	35	0	12	29	46	13	0
Quaking Aspen	8/01	0	50	0	50	0	45	25	18	12	0
Reservoir	7/11	40	40	0	20	0	28	43	29	0	0
Big Bear	7/11	33	34	0	33	0	36	41	20	3	0
Eighteenmile #1	7/19	20	40	0	40	0	13	35	35	16	0
Eighteenmile #2	7/19	20	60	0	20	0	40	46	14	0	0

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JOB PERFORMANCE REPORT

STATE OF: **Idaho** **NAME:** **Regional Fishery Management Investigations**

PROJECT NO: **F-71-R-14** **TITLE:** **Salmon Subregion Technical Guidance**

JOB NO.: **6(SAL)-d**

PERIOD COVERED: **July 1, 1989 to June 30, 1990**

ABSTRACT

During 1989, technical assistance was provided to all state and federal agencies upon request. Comments were submitted to various agencies and private entities concerning stream alterations, bank stabilizations, mining operations and reclamation plans, fish rearing proposals, private ponds, water withdrawal applications, gravel removal projects, highway reconstruction, bridge replacement and hydropower related matters. On-site inspections of proposed, on-going, and completed projects were conducted.

Also, we responded to the general public in person, by telephone and mail to inquiries about fishing opportunities, techniques, regulations and area specifics.

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Regional Fishery Biologist

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OBJECTIVES

1. To assist the Department of Water Resources, the Department of Lands, the U.S. Army Corps of Engineers and other state, federal, local, and private entities in evaluating the effects of habitat manipulation on fish and fish habitat.

2. To recommend procedures that minimize adverse effects of stream course alterations on aquatic habitat and fish.

3. To provide information on all aspects of fisheries and aquatic habitat as requested.

TECHNIQUES

We responded to all requests for data, expertise, and recommendations from individuals, government agencies, and corporations. Meetings were attended, field inspections conducted, and responses generated as appropriate.

RESULTS

During 1989, we responded in writing to requests for technical assistance or comments on various water and fishery-related matters as follows:

Agency	Number of requests
U.S. Forest Service	9
Idaho Department of Water Resources	19
Idaho Department of Lands	3
Private and Miscellaneous	1

Telephone communication was the major mode of inter-agency contact. Commonly, we responded to stream alteration proposals by meeting with the applicant on-site, determining the nature of the situation, and sending written comments to the appropriate agency. Due to the remoteness of the Salmon Subregion, we were often the only agency representatives available to conduct on-site inspections.

We advised three individuals concerning fish pond construction.

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We responded to numerous inquiries from the public (by telephone, letter, and in person) about when, where, and how to participate in various fisheries in the region, ranging from steelhead angling to high mountain lake fishing.

We provided guidance and technical assistance to the development of two major mining operations: 1) Grouse Creek Project in the Jordan Creek drainage, and 2) Beartrack Project near Leesburg in the Napias Creek drainage.

JOB PERFORMANCE REPORT

State of: Idaho

Name: REGIONAL FISHERY MANAGEMENT INVESTIGATIONS

Project No.: F-71-R-14

Title: Salmon Subregion Salmon and Steelhead Trout Investigations -- Steelhead Trout Run Timing Evaluation-Pahsimeroi Fish Hatchery

Job No: 6(SAL)-e

Period Covered: July 1, 1989 to June 30, 1990

ABSTRACT

Adult steelhead trout run timing to the Pahsimeroi Fish Hatchery has become progressively earlier since 1969, the first year adults returned. The mid-point of the run is now approximately three to four weeks earlier, which reduces availability of fish to the spring fishery. The spring fishery is already reduced during normal water years due to runoff. This situation, combined with earlier returns to the hatchery, results in surplus fish.

Female steelhead trout returning to Pahsimeroi Fish Hatchery in 1989 were given differential marks based on arrival time. Marks were recorded as fish were spawned. Spawning time was regressed against arrival time using simple linear regression. The two variables were strongly and positively related (r^2=0.818).

A goal was established to return run timing back to approximate 1969 dates (April 10-23 for half of the run). This would be accomplished by using eggs from the middle and latter portion of the run to produce smolts for release at the hatchery weir.

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INTRODUCTION

The Pahsimeroi-Niagara Springs Hatchery program was initiated by Idaho Power Company (IPC) in 1966 as mitigation for hydroelectric dams constructed on the Snake River in Hells Canyon. As part of the program, IPC relocated upper Snake River steelhead Oncorhynchus mykiss stocks to the Salmon River. The Pahsimeroi Hatchery at Ellis, Idaho was constructed to trap and spawn returning adult steelhead. Eggs are held until the eyed stage and then shipped to IPC's Niagara Springs Hatchery at Wendell, Idaho. Eyed eggs are then hatched and the fry raised to smolt size. Smolts are transported back to the Pahsimeroi Hatchery and released in mid-April as yearlings. Approximately 600,000 smolts are released on-site and 400,000 off-site each year. Although 5 to 6 million eggs are taken annually (returning female fecundity averages 5,000 eggs), 1.2 million is the minimum needed to meet hatchery smolt production goals. The remaining eggs are used for fry and pre-smolt releases.

Adults first returned to the Pahsimeroi Hatchery in 1969 (from the 1967 smolt release). One-half of that run had returned by April 23. Over the years, fish have arrived at earlier dates. By 1986, one-half had arrived by March 23, a full month earlier than 1969.

One major problem with the earlier arrival of adult steelhead is that they are no longer available to the angler. Normally, the majority of steelhead above North Fork, Idaho are available in the spring prior to spawning. Depending on ice and water conditions, effective fishing conditions during the spring steelhead season (January 1 through April 30) vary from 2 to 6 weeks. By moving arrival time back to mid-April, more fish would be available to the angler for a longer period of time.

We designed a simple study to better understand the relationship between arrival time and spawning time. This information would enable the hatchery manager to push back arrival time by selecting later spawners, therefore allowing more steelhead to be available to the angler for a longer period of time.

OBJECTIVES

1. Quantify the relationship between arrival time and spawning time of adult female steelhead trout returning to the Pahsimeroi Hatchery.

2. Develop guidelines for manipulating egg take so that arrival time is delayed.

METHODS

Adult steelhead trout that entered the Pahsimeroi Hatchery trap in 1989 were sorted once or twice a week by hatchery personnel. To identify the arrival date, each female was marked on the opercle or caudal fin with a paper punch (Table 1). Fish were spawned twice a week. Each female spawned was checked for a mark and, if present, was recorded along with the spawning date. Each spawning date was assigned a number (spawning session), with the earliest date starting at one. Average spawning session was calculated as a weighted average for each mark group. The mean spawning session for each marked group was plotted against arrival time. We used linear regression to define the relationship between arrival time and spawning time.

RESULTS

We marked 851 female steelhead trout and spawned 682 (Table 2). Simple linear regression was used to describe the relationship (Figure 1). The relationship was defined by the equation: $Y = 1.320 + (0.823)x$. The coefficient of determination (r^2) was 0.818.

DISCUSSION

The first steelhead adults returned to the Pahsimeroi Hatchery in 1969. The first fish entered the trap during the second week of March 1969, and the last fish was trapped the last week of May. Half of the fish had entered the hatchery by the third week of April (Figure 2). Spawning began the last week of March and continued through mid-June. Half of the fish had been spawned by May 7. During the 20 years of hatchery operation, the timing of the run mid-point has become earlier. By 1976, half of the fish entered the trap during the last week of March, 3 weeks earlier than the 1969 run. This timing has persisted through 1989. Moving this arrival time back, even 2 weeks, could have a significant impact on the spring fishery between Salmon and the Pahsimeroi River.

This study indicated a strong, positive correlation between arrival time and spawning time. Therefore, arrival time could be moved back by selecting fish from the middle and latter portion of the run. To meet the desired goal of returning arrival time for half the run to April 10-23 as it was in 1969, the recommended procedure will be to use the first several egg takes for programs other than smolt production for release at the Pahsimeroi Hatchery weir. These eggs will come from the middle and later portion of the run.

Table 1. Arrival dates and corresponding marks used on female steelhead trout returning to the Pahsimeroi Hatchery, 1989.

Arrival date	Mark [2]	Number marked	Number spawned
February	Right opercle (2)	12	9
March 1-10	Right opercle (1)	100	17
March 11-17	Left opercle	51	31
March 18-24	Upper caudal	116	116
March 25-31	Lower caudal	255	248
April 1-7	Middle caudal	317	261
Total		851	682

[a]Two-hole marks were used in February, one-hole marks were used in March and April.

Table 2. Spawning dates, numbers of marked females spawned during each spawning session, and average spawning time for each mark group, Pahsimeroi Hatchery, 1989.

		Mark					
Spawning session	Date spawned	Right opercle(2)	Right opercle(l)	Left opercle	Upper caudal	Lower caudal	Middle caudal
1	3/17	4	5	7			
2	3/20	1	4	7	19		
3	3/24	2	5	1	54		
4	3/28	1	1	4	23	84	
5	3/31		1	2	10	97	
6	4/4		1	3	7	38	96
7	4/7			1	2	12	99
8	4/11	1		1	1	10	42
9	4/14					4	12
10	4/18			5		1	7
11	4/21					2	3
12	4/25						2
Total		9	17	31	116	248	261
Average (fish/session)		2.7	2.5	4.3	3.5	5.2	7.0

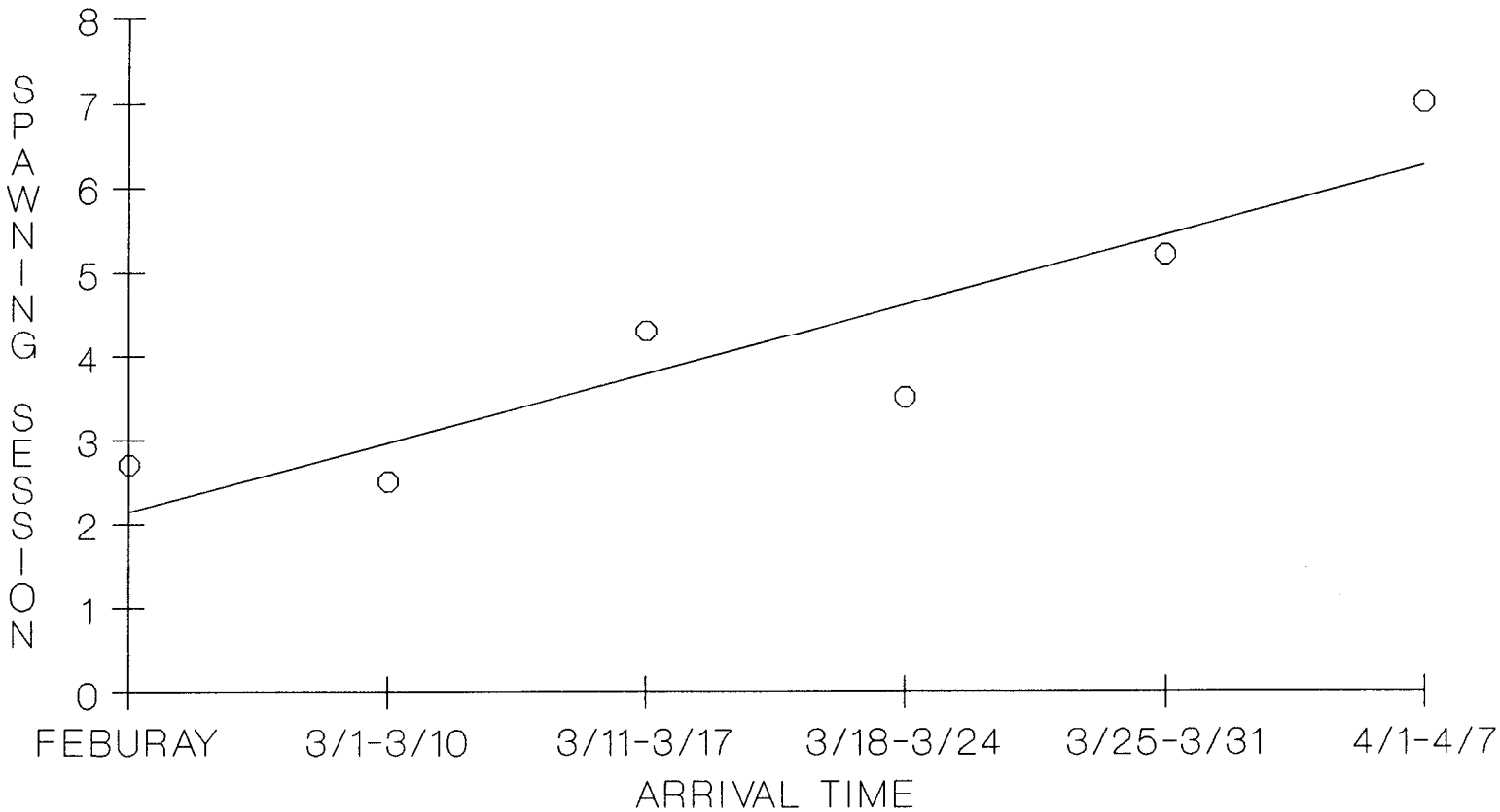

Figure 1. Regression of steelhead spawning time against arrival time to Pahsimeroi Hatchery, 1989.

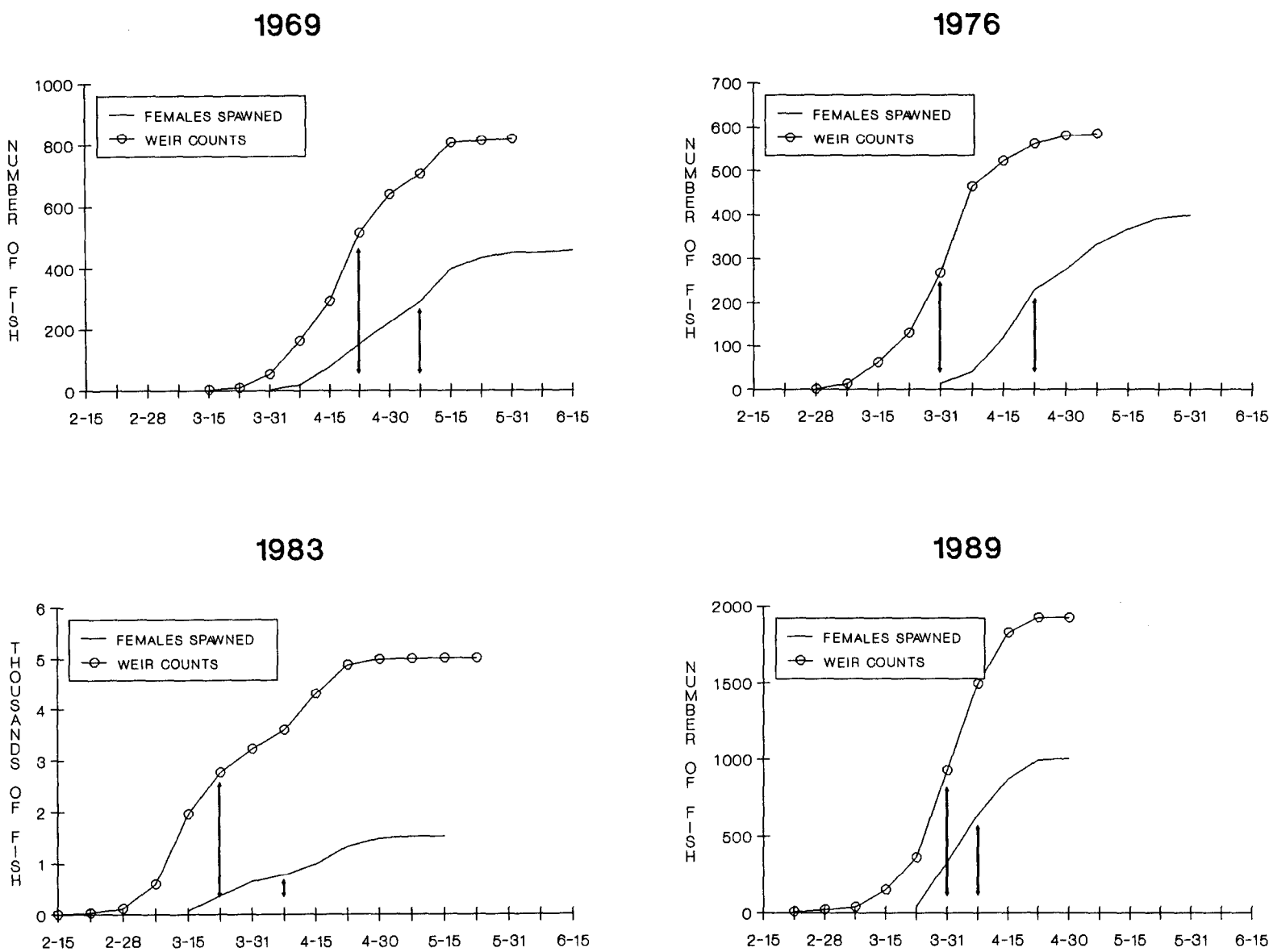

Figure 2. Cumulative weekly counts of adult steelhead trapped and females spawned at the Pahsimeroi Fish Hatchery, 1969, 1976, 1983, and 1989. The vertical arrows represent mid-points.

RECOMMENDATIONS

1. Use eggs from early-spawning females for fry releases and other programs.

2. Use eggs from mid- and late-spawning females for producing smolts which are released at the Pahsimeroi Hatchery weir until arrival time has been returned to April 10-23.

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