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WILD STEELHEAD STUDIES

1993 ANNUAL REPORT

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ABSTRACT

Significant progress was attained in implementing the complex and challenging studies of wild steelhead *Oncorhynchus mykiss* production in Idaho. Study sites were selected and techniques were developed to collect the needed data in remote wilderness locations.

'Cursory examination of existing data provides indication that most wild steelhead stocks are underescaped, especially the Group B stocks. Abundance of wild steelhead is generally declining in recent years.

The portable weir concept and electronic fish counting developed through this project have been well received by land owners and reviewing governmental agencies with less impact to the land, stream, and fishery resources than conventional permanent weirs.

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INTRODUCTION

As early as late 1960, Idaho Department of Fish and Game (IDFG) recognized the importance of preserving wild steelhead *Oncorhynchus mykiss* populations and adopted a policy of managing the major drainages of the Selway River and the Middle Fork Salmon River for wild native stocks only. It was recognized that the genetic characteristics of these unique fish populations should be preserved and that growing hatchery steelhead programs could represent a risk to the future viability of some wild stocks in Idaho. In subsequent years, IDFG's first Anadromous Fish Management Plan, 1985-l 990 (Holubetz and Pollard 1984) contained strong provisions for maintaining genetic integrity and productivity of Idaho's wild steelhead populations. The second IDFG Anadromous Fish Management Plan, 1991-1995 (Kiefer 1990) also maintained a high importance on preserving wild steelhead.

Biological data collected for wild stocks of steelhead in Idaho has been fragmentary and has lacked precision in the past. Dam counts, redd counts, and snorkel counts of parr have generally reflected low levels of abundance for most of Idaho's wild steelhead populations. Idaho fishery managers have been concerned about declines in recent years and the future viability of these valuable fish stocks. This study was initiated in 1992 to gain more precise and stock specific knowledge of the productivity of these fish. A recent petition to list Snake River wild steelhead populations under the Endangered Species Act (ESA) adds importance to the subject studies.

Life history characteristics of Idaho steelhead have been considered to be not conducive to simple and easy studies. Juveniles typically rear for 2 and 3 years in fresh water, migrate to sea in the spring, and spend 1 or 2 years in the ocean returning to fresh water in the summer months. Spawning occurs approximately 9 to 10 months after entering the mouth of the Columbia River. Spawning often occurs in very small tributary streams and is well dispersed throughout drainages. Rearing of parr is highly variable with juvenile steelhead moving upstream and downstream seasonally (Murphy and Metzger 1959). Rearing may occur a considerable distance from spawning areas. Behnke (1992) indicates that there are resident and anadromous populations that co-exist and are not separable by genetic characteristics. Residual males have been observed spawning with anadromous females on rare occasion (Holubetz, unpublished). In high elevation tributaries, steelhead typically spawn in a narrow time frame - April 15 to May 15 (Thurow 1983; Orcutt et. al 1968). Low elevation and intermediate elevation streams have spawning that occurs over a longer time frame including the months of March, April, May, and June (Reingold, personal communication; Holubetz, personal observations).

Much of Idaho's wild steelhead habitat is unaffected by man's activities and is not a constraining factor on production. Most of the mortality that affects adult returns of Idaho's wild steelhead occurs in the migration corridor of the Lower Snake River and Lower Columbia River. Juvenile migrants are affected by turbine mortality at the dams and, more importantly, are subjected to low reservoir velocities that delay or stop downstream migration to the ocean (Chaney and Holubetz 1980; Raymond 1978). Adult migrants are affected by gill net fisheries and reservoir-related water quality problems. Ocean conditions most certainly affect steelhead production, but are generally not factors that can be controlled. High-sea gill net fisheries have been recognized as a significant mortality factor in recent years, and attempts to reduce catch and effort through international forums are underway.

Considering the complexities of Idaho's steelhead life histories and the factors that are most constraining to wild steelhead production, study emphasis has been directed at obtaining precise measures of returning spawners to key production study streams in Idaho. Portable weirs, electronic fish counters, migration barriers, and traps will be employed to obtain total counts, age, size, and sex of migrating spawners that enter key production streams. Juvenile migrants will be aged in key study streams as well. This information will allow the development of spawner recruitment relationships for varying migrant survival conditions similar to the spawner recruitment curves developed for chinook salmon 0. *tshawytscha* by Petrosky (1993) (Figure 1).

Different wild populations will be affected in different ways by the mortality factors in the lower Snake and lower Columbia rivers migration corridor. It is not cost effective or economically feasible to study all populations of wild steelhead. In 1993, IDFG set up the wild steelhead management units displayed in Table 1. This project will research steelhead populations in key production study streams that will be directly representative of a management unit or the results will be extrapolated to the appropriate unit as displayed in Table 1.

Since this type of work is costly, new techniques will have to be developed, and engineering requirements are challenging. Implementation of this program will take several years.

Research activities and time of implementation will vary by key production study stream (Table 2). In order to achieve the intended results, a commitment of the implementing agency and the funding agency to continue these studies through a range of survival conditions and stock productivity will be required. It is estimated that approximately 10 to 15 years of continuous research will be required.

In addition to spawner recruit relationship, studies will document relationships between spawning escapements and resultant juvenile production. Comparisons of index redd counts to actual weir counts will be useful in determining the value of future redd counting in trend areas. Estimates of parr production and juvenile emigration will be compared. Precise objectives for adult spawning escapement for individual streams can be developed from the results of this study. This study should also contribute to better definition of suitable escapement objectives for wild and natural steelhead at Lower Granite Dam.

1993 was a year of feasibility testing, designing, and planning. Implementation will occur over the next three years.

OBJECTIVES

The objectives of this project are:

1. Annually document steelhead spawning escapements (numbers, sex, size, and age) in key production study streams to develop spawner recruit ratios for varying survival conditions. Precisely measure response of representative wild steelhead populations to changing survival conditions.

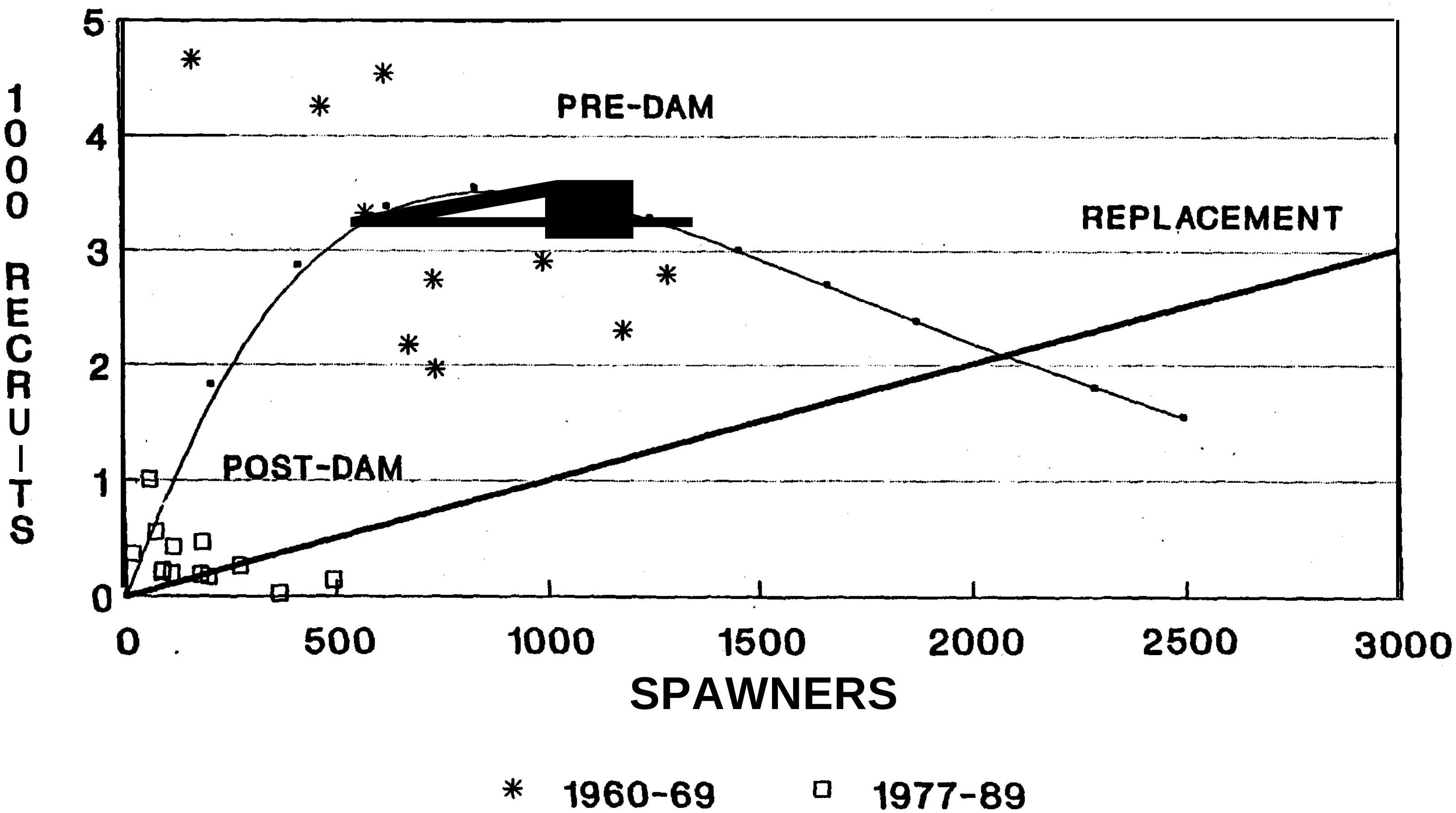

Figure 1. Spawner recruitment curve for Marsh Creek 1960 to 1989 (Petrosky and Schaller 1992).

Table 1. Display of Idaho’s wild steelhead management units and representative key study streams.

Wild steelhead management units	Key production study streams	
Snake River	Direct	Captain John Creek
Lower Clearwater River	Extrapolate	Captain John Creek
Upper Clearwater River	Extrapolate	Running Creek
Lower South Fork Clearwater River [a]	Extrapolate	Captain John Creek
Upper South Fork Clearwater River [a]	Extrapolate	Running Creek
Lower Selway River	Extrapolate	Rapid River
Upper Selway. River	Direct	Running Creek
Lower Lochsa River	Extrapolate	Rapid River
Upper Lochsa River	Extrapolate	Running Creek
Lower Salmon River	Extrapolate	Captain John Creek
Mid Salmon Canyon	Direct	Chamberlain Creek and Rapid River
Upper Salmon River’	Extrapolate	Chamberlain Creek
South Fork Salmon River	Direct	Johnson Creek
Middle Fork Salmon River	Direct	Marsh Creek and Rush Creek

[a] Units with substantial hatchery influence and weirs that monitor hatchery supplemented populations.

Table 2. Schedule of activities for key production study streams.

Study stream	First year full research	Adult weir count	Adult redd count	Juvenile migrant sample	Parr estimate	Wild salmon studies
Rapid River	1995	X		X	X	
Marsh Creek	1994	X	X	X	X	X
Chamberlain Creek	1994	X	X		X	X
Rush Creek	1995	X				
Johnson Creek	1996	X	X	X	X	X
Running Creek	1995	X		X	X	X
Captain John Creek	1995	X			X	

0 BJECTIVES (Continued)

2. Assess the status and viability of Idaho's wild steelhead stocks.

3. Develop techniques to enumerate and classify adult spawners without stressing or injuring the fish.

4. Obtain information on life history and migration timing for representative stocks of wild steelhead.

DESCRIPTION OF STUDY AREA

Wild steelhead populations are present in Idaho in the Salmon River drainage Clearwater River drainage, and the Snake River tributaries from Lewiston to Hells Canyon Dam. Steelhead habitat is found at elevations of less than 300 m to over 2,000 m. Geology varies greatly with the lower elevations being primarily volcanic basalt in origin and the higher elevations are primarily granite type soils. Pristine water quality and an abundance of high quality spawning and rearing habitat is characteristic of the upper portions of each of the major drainage areas. Some water quantity and water quality problems are present in the lower portions of the major drainages where agricultural activities, timbering, and development have adversely affected some of these habitats.

The smaller group A steelhead are distributed primarily in the lower elevation basalt geologic regions where water temperatures are warmer and freshwater growth is faster. The larger group B wild steelhead are generally located in the intermediate to high elevation granitic geologic areas where water temperatures are cooler and freshwater growth is slower. Other salmonids found in these drainages include native resident rainbow trout, westslope cutthroat trout 0. *clarki lewisi,* bull trout *Salvelinus confluentus,* mountain whitefish *Prosopium williamsoni,* and non-native brook trout *S. fontinalis* (Mallet 1974).

Much of the wild steelhead refugium is located within the Frank Church River of No Return Wilderness Area and the Selway-Bitterroot Wilderness Area. These designations have preserved large areas of habitat in pristine condition and also require research techniques that are compatible with wilderness management and values.

METHODS .

Parr Abundance

In 1993, emphasis was placed on the development of sites on study streams where adult enumeration could occur. Intensive parr abundance studies were confined to study streams where adult enumeration was ongoing or anticipated in the very near future.

Snorkel counts of all fish observed and physical habitat measures in representative sample stations located throughout the study stream drainage where steelhead and salmon are distributed were completed as described in Petrosky and Holubetz (1987). All sample sections were marked on a topographic map, and Polaroid pictures were taken of the upstream and downstream limits of the station. The stations encompassed several habitat types and were usually between 50 and 150 m in length. Sufficient samples are obtained in each stream reach and channel type to estimate total standing crop of parr in the subject study stream.

Juvenile Emigration

Fry, parr, and smolt will be emigrating from the study streams at various times of the year. A wide variety of sampling gear for downstream migrant salmonids was investigated for each study stream, and it was determined that the most appropriate method for sampling was the screw trap supported by overhead cable. The traps will be operated from April 1 to October 30 in selected study streams.

Temperature Monitoring

A HOBO electronic recording thermometer was installed in Chamberlain Creek in late spring 1993 and removed the following fall to obtain thermal conditions during the growing season. Temperature recording equipment will be installed at future sites as studies are implemented.

Redd Counts

Annual trend counts have been conducted on selected steelhead production streams by the author since 1988 using the standardized techniques outlined in the Idaho Redd Count Manual (Hassemer 1993). A single helicopter count of trend areas is annually done near the peak spawning period (May 8 to 101, and on selected streams, multiple ground counts are also conducted in trend areas to better define timing of spawning. Where weirs are present, adult counts at weirs will be compared to redd counts upstream from the weir.

Adult Spawner Enumeration and Classification

Adult steelhead enfering key study streams on their spawning migration will be intercepted by a weir or migration barrier and diverted into an electronic/video counting chamber or a trap. The counting chamber will record each fish's volitional passage upstream, record overhead video images of the fish from which a trained observer can discern species, size, and sex of the fish when viewing the images on a video monitor. Fish entering a trap will be classified by an attendant for species, size, and sex and released upstream. Where velocity barriers are used, adult steelhead will be anesthetized, marked, and scales taken before they are released upstream to facilitate identifying fall back. Where weirs are used, scales will be taken from adults as they drift downstream after spawning and impinge on the upstream face of the weir. Sex, age, and length will be determined for each spawned adult.

PIT Tagging

Steelhead parr were captured with a Smith-Root backpack electrofishing unit, anesthetized, and Passive Integrated Transponder (PIT) tagged in rearing areas of Chamberlain Creek and Running Creek. Defining juvenile steelhead downstream migration timing was the objective of this fish tagging operation. The Destron Tag Reader and data recorder provided was inoperable and Destron could not repair it until after the field season. After determining that no other Destron unit was available, an Avid Tag Reader without data storage and computer interface capability was rented from Biomark and the tag data was hand recorded. After the field season, the PIT tag data was entered into the PTAGIS Database.

Electrofishing was conducted in areas where no chinook salmon were present. National Marine Fisheries Services (NMFS) assisted in PIT tagging steelhead parr in Chamberlain and Rush creeks in conjunction with their chinook salmon parr tagging efforts.

Wild Steelhead Production Relationships

To analyze the value of using wild and natural steelhead escapement objectives at Lower Granite Dam, recent estimations for wild and natural steelhead escapement at Lower Granite are compared to actual study stream spawning escapement and abundance of parr in study streams.

A comparison of trend area redd counts and weir counts to resultant juvenile production can provide some insight into how many redds are needed to properly seed the rearing environment.

Actual adult escapements will be compared to redd counts in trend areas to determine if the redd counts are representative.

RESULTS

Parr Abundance

In 1993, intensive parr snorkel counts were conducted in Rapid River, Marsh Creek, Sulphur Creek, and Chamberlain Creek.

Parr abundance trends over recent years can be assessed by comparing the yearly parr monitoring results for these streams, and this data illustrates that wild group B steelhead are generally declining in abundance and wild group A steelhead are stable (Table 3). The seeding levels for steelhead parr in group A streams are much higher than the parr density for group B streams.

Project personnel intensively snorkeled the entire Chamberlain Creek drainage above McCalla Creek in 1993 and found only 8% of the preferred B channel habitat capacity (Rosgren 1985) was occupied by steelhead parr. Only 3% of the preferred C channel habitat capacity was occupied by chinook salmon parr. Intensive snorkel studies were not conducted in McCalla Creek and Chamberlain Creek downstream from the mouth of McCalla Creek as planned by regional personnel. Results of the 1993 snorkel counts in Chamberlain Creek are displayed in Table 4.

Intensive snorkel counts were conducted in Rapid River, Marsh Creek, and Sulphur Creek by chinook salmon supplementation researchers and regional personnel and are summarized in Table 5.

Juvenile Emigration

Feasibility and practicality of installing downstream migration traps were investigated at Rapid River, Sulphur, Chamberlain, Johnson, Captain John, Running, and Rush creeks. Marsh Creek has a screw trap that is being operated by chinook salmon supplementation researchers and the number and length frequency of steelhead emigrant samples for the spring and fall of 1993 is contained in Table 6.

Table 3. Steelhead parr (fish/100 m^2, age 1 and 2) 1993 in monitoring stations of key study streams.

	1985	1986	1987	1988	1989	1990	1991	1992	1993
Group A streams									
Rapid River	6.9	8.9	‘11.2	18.0	9.6	8.5	5.9	13.9	7.8
Captain John Creek	a	a	a	a	3.3	9.5	7.3	a	11.0
Johnson Creek	·	·	a	1.8	2.7	.7	.9	.7	1.2
Group B streams									
Marsh Creek	1.4	0.9	0.7	0.7	2.3	1.8	0.9	0.4	0.03
Sulphur Creek	?	1.3	2.6	2.2	3.5	3.4	0.4	0.3	0.4
Running Creek	·	·	a	3.7	1.9	0.7	1.2	2.1	2.6
Chamberlain Creek	6.5	10.0	5.1	9.4	9.4	7.2	5.5	5.1	3.5

[a] Data not available for that year.

Table 4. Steelhead trout and chinook salmon densities (fish/l00 m^2) for sections snorkeled in the Chamberlain Creek drainage in the summer 1993: STH1&2 = age 1 and 2 steelhead combined, CHNO = young of the year chinook parr, CHN1 = yearling chinook.

Section	STH 1&2	CHN 0	CHN 1
		Mainstem	
Forks	0.00	0.00	0.00
Upper Redtop	0.90	0.00	0.00
Fish Mouth	3.60	0.00	0.00
Lower Redtop	1.27	0.00	0.00
Smokehouse	1.57	0.00	0.00
Aspen Grove	2.37	0.00	0.00
No Name Mouth	2.06	0.00	0.00
CHA-4	2.67	7.04	0.60
Upper Hotzel	1.09	1.95	0.00
Hotzel	0.16	.08	0.00
Below Hotzel Fence	0.55	0.00	0.00
West Fork Mouth	0.34	.56	0.00
Below West Fork Confluence	0.51	0.25	0.00
CHA-1	3.43	2.64	0.00
Deer Creek	4.64	3.06	0.10
McCall Cutoff	3.67	0.22	0.00
Cut Bank	1.51	0.20	0.00
Lodgepole Camp	1.40	.08	0.00
Dog Mouth	2.01	1.73	0.07
Queen Creek	5.95	0.96	0.19
Mean (n = 20)	1.99	0.94	0.04
		Tributaries	
Flossie Creek			
Old Beaer Dam	6.37	0.00	0.00
Trail Crossing	5.17	0.00	0.00
Fish Creek			
Trail Crossing	2.33	0.00	0.00
Moose Creek			
Mouth of Moose Jaw	3.99	0.00	0.00
Upper'	0.68	0.00	0.00
Mouth	2.95	0.00	0.00
3-Balze Trail Crossing	4.34	0.00	0.00
Rim Creek			
Mouth	0.00	0.00	0.00
South Fork Chamberlain Creek			
Mouth	0.00	0.00	0.00

Table 4. Continued.

Section	STH 1&2	CHN 0	CHN 1
West Fork Chamberlain Creek			
Tumbledown Bridge	1.31	0.00	0.00
Old Pack Bridge	2.46	0.00	0.00
Spring	0.00	0.00	0.00
1 st Crossing	2.57	0.00	0.00
Beaver Stump	3.53	3.53	1.32
CHA-3	1.67	3.82	0.48
CHA-2	5.09	4.04	1.30
Stonebraker Airstrip	11.26 .	10.78	1.92
Sagebrush Fence	2.79	16.46	0.44
Beal Cabin Fence	2.00	3.00	0.00
Bottom of Beal Meadow	0.21	0.00	0.00
Mouth	0.61	0.91	0.00
Game Creek			
Twin Bluffs	0.82	0.00	0.00
Diversion Ditch	0.53	0.53	0.00
Trail Crossing	1.83	0.00	0.00
Lodgepole Creek			
Rock Slide	0.78	0.00	0.00
Little Lodgepole Mouth	4.45	0.00	0.00
Upper Clearing	2.81	0.00	0.00
Mean (n = 27)	2.61	1.60	0.20

Table 5. Juvenile salmon and steelhead parr densities (fish/100 m^2) in three Idaho streams, 1993: CHNOD = density of zero age chinook, STH1&2D = density of age one and two steelhead combined.

Stream	Channel Type	# of Sections	CHNOD	STH1&2D
Marsh Creek	c	21	18.41	0.21
Sulphur Creek	C	14	0.02	---
Sulphur Creek	B	10	---	0.39
Rapid River	B	11	---	5.95

Table 6. Marsh Creek screw trap records for juvenile steelhead outmigration, April 8 to June 6, 1993.

Length Class (mm)	Number of steelhead PIT-tagged	Number of steelhead not PIT-tagged	Total
< 63	0	100	100
64-l 39	62	395	457
140-215	35	2	37
		0	
215-317 > 318	4	0	4
Total	99	497	596

A total of 596 juvenile steelhead were trapped from April 8 to June 6. The majority (83%) of the outmigrants were fry and one year old fish that will not be migrating to the ocean in 1993. The predominant low gradient C channel present in Marsh Creek upstream of the trap does not provide good overwintering habitat for juvenile steelhead. It is suspected that the majority of juvenile steelhead will overwinter in larger water downstream. This is supported by the low numbers of two and three year old juvenile steelhead trapped during the spring outmigration. Trap efficiency for the Marsh Creek trap was not determined for steelhead in the 1993 trapping season. Chinook Supplementation Project staff will collect the necessary data to determine trap efficiency and estimated emigration for the 1994 outmigrants.

Project staff determined that installation of a screw trap with a 5-ft diameter cone was the most feasible means of sampling emigrant steelhead in Rapid River, Johnson Creek, and Running Creek, and it was also determined that no emigrant sampling would be conducted in Chamberlain, Rush, and Captain John creeks. Running Creek juvenile emigrant sampling wilt start in the summer of 1994. Rapid River emigrant sampling will start in the spring of 1995. Johnson Creek emigrant sampling will start in the spring of 1996. The landowner on Sulphur Creek decided that he preferred not to have the research activity on his property, and no further consideration will be given to studies at the Morgan Ranch on Sulphur Creek.

Temperature Recording

The temperature record for the summer and fall of 1993 for Chamberlain creek near the Hotzel Ranch is displayed in Figure 2.

Redd Counts

Helicopter redd counts were conducted by the author in 1993. Illness forced the counts to be a few days later than usual, and record high warm weather caused the streams to rise dramatically on the second day of redd counting and some of the streams could not be surveyed. The results of the 1993 helicopter redd count are displayed in Table 7.

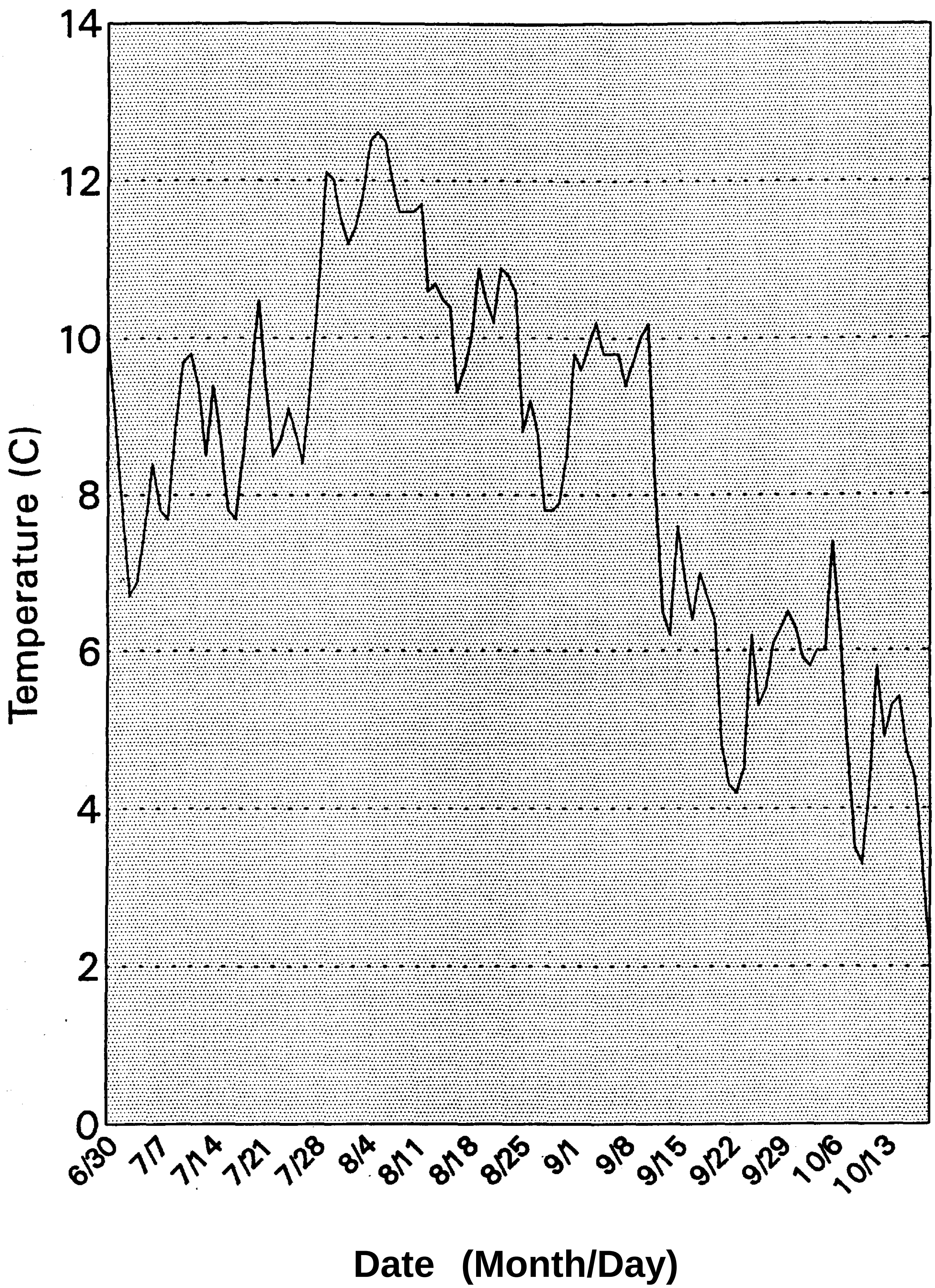

Figure 2. Chamberlain Creek thermograph (°C), June 30, 1993 - October 20, 1993.

Table 7. Idaho steelhead redd count helicopter survey, 1993.

Date	Stream	Sector	Redds	Fish > 77 cm	Fish > 77 cm	Comments
05/10/93	South Fork Salmon	Poverty Flat	75	20	6	Light Brown
05/10/93	South Fork Salmon	Darling Cabin	49	8	0	Light Brown
05/10/93	South Fork Salmon	Reed Ranch	8	5	0	Light Brown
05/10/93	South Fork Salmon	Oxbow	34	3	0	Light Brown
05/10/93	South Fork Salmon	Krassel	23	5	1	Light Brown
05/10/93	Johnson Creek	Ice Hole to Wapiti Ranch	66	14	1	Clear
05/10193	Sulphur Creek	Slide to Ranch	18	4	0	Clear
05/10/93	Sulphur Creek	Ranch to Trail	0	0	0	Clear
05/10/93	Bear Valley Creek	Fir Creek Bridge to Packer Bridge	10	0	0	Brown
05/10/93	Bear Valley Creek	Poker Bridge to Elk Creek	18	0	0	Brown
05/10/93	Marsh Creek	Bridge to Weir	0	0	0	Tea
05/10/93	Marsh Creek	Weir to Knapp Creek	7	5	2	Tea
05/10/93	Valley Creek	Stanley Creek to Mouth	9	0	1	Tea
05/10/93	Upper Salmon	Redfish Lake Creek to Weir	79	0	2	Clear
05/10/93	Upper Salmon	Weir to Hellroaring Creek Bridge	21	0	7	Tea
05/10/93	Upper Salmon	Hellroaring Creek to Alturas Lake Creek	3	0	0	Tea
05/10193	Upper Salmon	Alturas Lake Creek to Pole Creek	12	0	0	Tea
05/10/93	East Fork Salmon		NC	NC	NC	Clear/poor light
05/11/93	Warm Springs Creek		NC	NC	NC	Turbid
05/11193	Loon Creek		NC	NC	NC	Turbid
05/11/93	Camas Creek		NC	NC	NC	Turbid
05/11193	South Fork Camas	Mouth to 1st Creek on West Side	3	5	0	Clear
05/11/93	Big Creek		NC	NC	NC	Turbid
05/11193	Chamberlain Creek	West Fork to Flossie Creek	1	1	2	Clear
05/11193	West Fork Chamberlain Creek	Mouth to Game Creek	5	3	0	Clear
05/11/93	Red River	Lower Meadow	5	4	0	Light Brown
05/11/93	Red River	Fir Strip to Weir	0	0	0	Tea
05/11/93	Red River	Weir to Hot Springs Bridge	0	0	0	Tea
05/11/93	Crooked River	Weir to Top of Meadows	1	0	0	Tea
05/11/93	Crooked River	Upper Meadow to Bridge	1	1	0	Light Brown
05/11/93	Crooked River	Bridge to Orogrande	2	1	0	Light Brown

Redd count trends for recent years in selected study streams are generally declining (Table 8). Multiple redd counts for Chamberlain and Sulphur creeks have assisted in defining timing of spawning for these streams. In mid to high elevation steelhead spawning streams, spawning generally occurs over a relatively short time frame after bank ice and snow cover have melted and prior to the major runoff. This time period usually occurs in the early part of May in central Idaho. Observations and multiple counts from previous years also provide definition of spawning time (Table 9).

Adult Spawner Enumeration and Classification

Wild steelhead were captured at the migration barrier on Rapid River and classified by sex, measured, and released upstream to spawn. In addition, a scale sample was removed from each wild adult prior to releasing it. The recent trend of Rapid River wild steelhead escapements is shown in Figure 3. Age and freshwater/saltwater duration tables will be developed for 1993 and the 1994 scale samples in 1994. Steelhead escapement into Rapid River in recent years has been stable, with the 1993 run providing the best escapement in the last 8 years. The length-frequency distribution of returning adult steelhead to Rapid River has varied greatly over the years and was skewed towards larger 2 ocean fish in 1993 (Figure 4). The sex ratio in 1993 was also heavily skewed to females with 116 wild females and 46 wild male returning to the Rapid River barrier. The timing of the wild fish passing over the barrier was similar to previous years with most of the fish arriving prior to peak runoff periods (Figure 5). Rapid River is the only stream in Idaho that has a historical record of wild steelhead escapement and, therefore, has great potential for production research.

The weir at Marsh Creek was installed to enumerate steelhead, but because the trap was constructed on the downstream face of the weir and the trap entrance was not easily located by migrant steelhead, the weir was removed. Modifications were made to the trap and weir in preparation for the 1994 season.

Weirs and electronic/video fish counting facilities were designed and constructed for installation in Chamberlain and West Fork Chamberlain creeks. Permits were obtained for operating the weirs in Chamberlain Creek. Coordination with the U.S. Forest Service was accomplished prior to construction.

Design for the Running Creek weir and adult counting facility was completed and the permit applications were submitted to regulatory agencies. An agreement was formulated and signed to operate Running Creek weir on private property. The Running Creek weir proposal was fully coordinated with the U.S. Forest Service.

Negotiations with the owners of Morgan Creek Ranch led to the determination that this location was not an acceptable site for a research weir. Feasibility studies and preliminary design were completed on Captain John Creek. Feasibility and design work are ongoing on Johnson Creek. Feasibility and preliminary design are complete on Rush Creek weir site, and a proposal has been submitted to the University of Idaho (U of I) to construct the portable weir on U of I property on Lower Rush Creek.

Table 8. Steelhead redd count trends for recent years in selected study streams in Idaho.

Location	1987	1988	1989	1990	1991	1992	1993
South Fork Salmon River							
Johnson Creek	12	23	NC	23	64	27	66
South Fork-Poverty				62	76	31	75
South Fork Darling Cabin				25	39	17	49
South Fork-Oxbow				37	31	26	34
South Fork-Krassel					38	8	23
Middle Fork Salmon River							
Bear Valley Creek		27	11	62	32	26	28
Marsh Creek				23	1	10	7
Sulphur Creek		17	7	14	6	5	18
Loon Creek				38	17	8	NC
Camas Creek	27			55	26	3	NC
Big Creek				44	25	NC	NC
South Fork Camas				6	1	4	3
Salmon River							
Valley Creek				8	6	26	9
Alturas				6	NC	3	NC
Upper Salmon							
-Pole to Busterback				6	0	0	0
Busterback to Alturas Lake Creek				1	0	0	12
-Alturas Lake to Hell Roaring Bridge				16	2	17	3
-Hell Roaring Bridge to weir				33	13	12	21
-Weir to Redfish Lake				101	24	26	79
East Fork Salmon River							
-Germania to weir				9	- 3	0	NC
-Weir to Herd Creek				NC	15	10	NC
Chamberlain Creek				6	1	0	1
West Fork Chamberlain Creek				5	0	3	5
South Fork Clearwater River							
Crooked River							
-Mouth to Weir			NC	NC	1	2	NC
-Weir to Meanders			NC	NC	9	8	0
-Meanders			NC	NC	25	5	1
-Meanders to Canyon			NC	NC	6	1	0
-Canyon to Bridge				128	4	3	1
-Bridge to Orogrande				91	5	1	2
Lochsa River							
White Sand Creek			NC	10	7	20	NC
Storm Creek				11	0	3	NC
Crooked Fork				33	7	10	NC
Fish Creek				9	0	3	NC
Selway River							
Bear Creek				15	2	4	NC
East Fork Moose						NC	3

Table 9. Multiple redd count examples for Chamberlain and Sulphur Creek.

1993 Chamberlain Creek	April 16	April 28	May 11	May 13'
Redds	0	1	6	2
Fish	1	3	6	0
1992 Sulphur Creek		**April 23**	**May 10**	**May 14**
Redds		0	5	5
Fish		3	1	0

[a] Poor observing conditions.

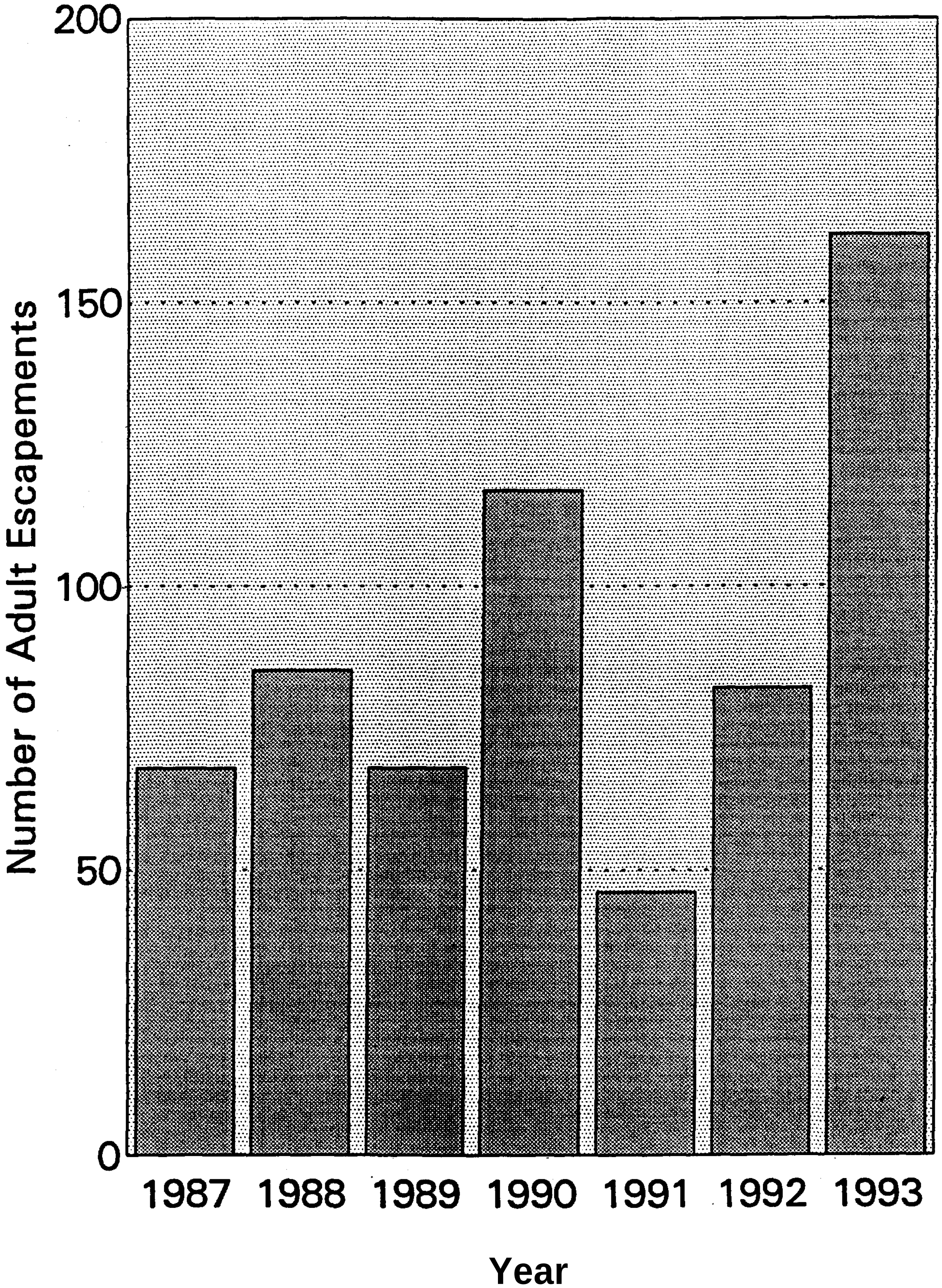

Figure 3. Rapid River adult wild steelhead escapement, 1987-l 993.

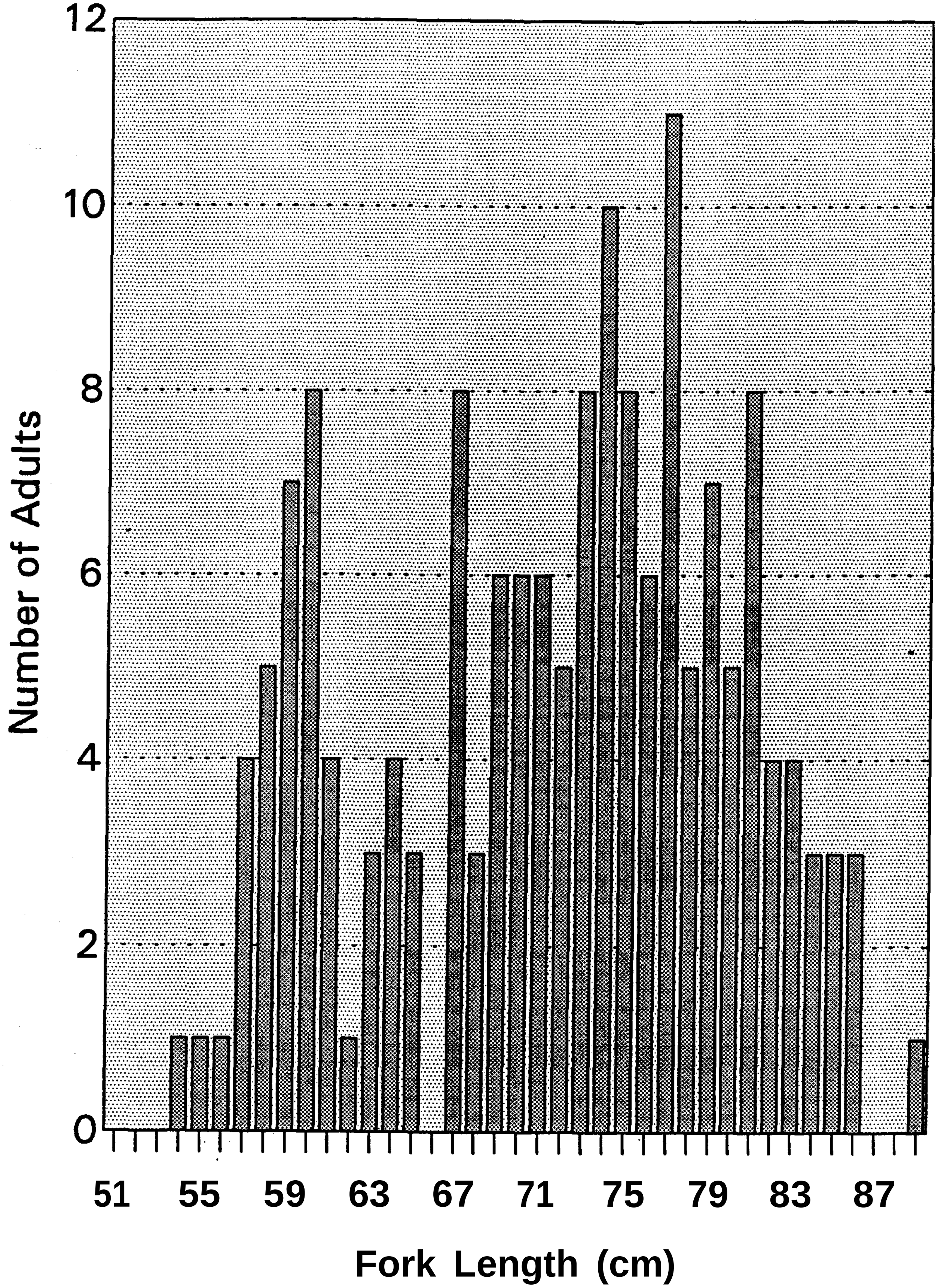

Figure 4. Length frequency distribution for wild steelhead trout in Rapid River, 1993.

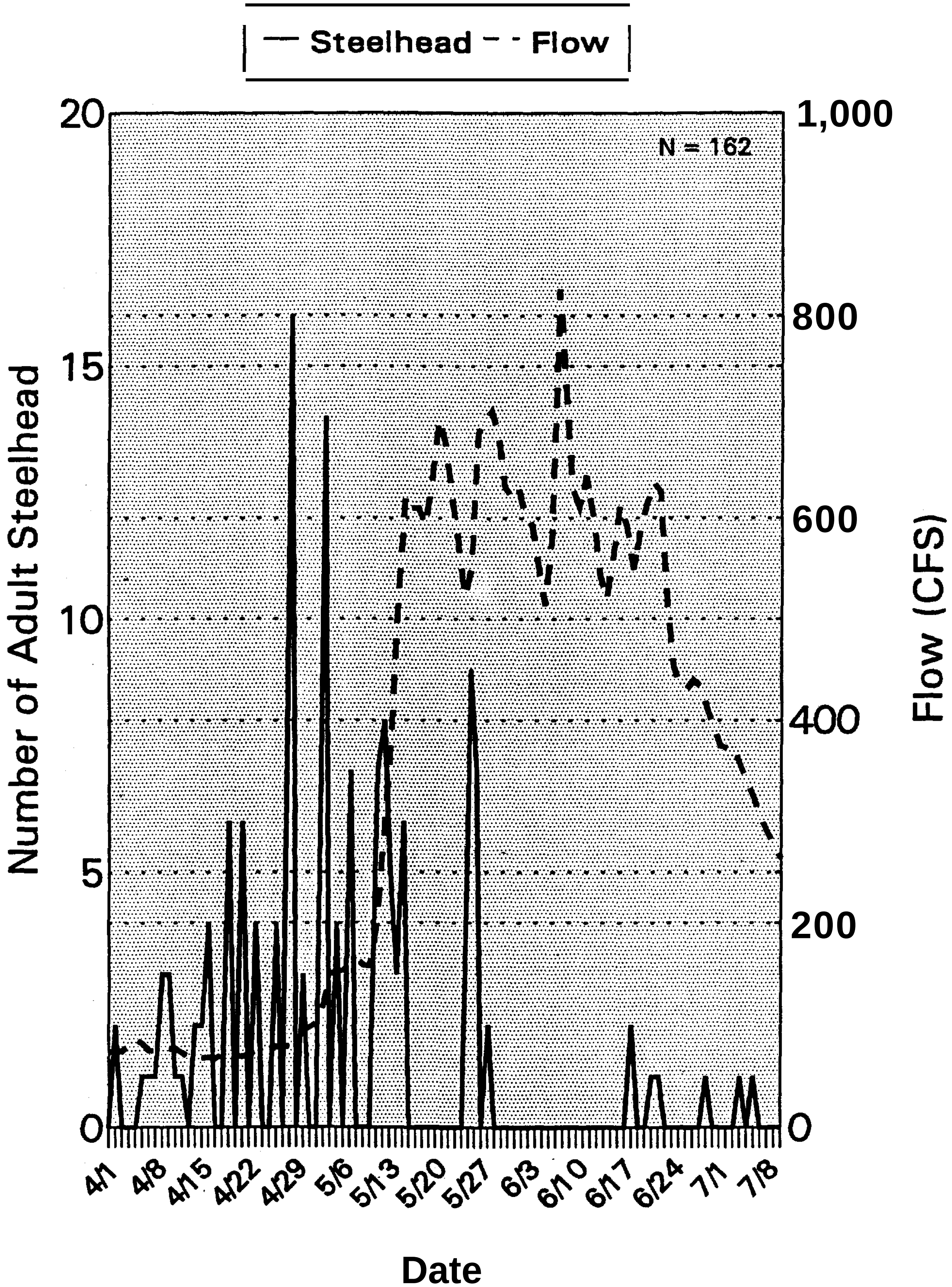

Figure 5. Rapid River adult wild steelhead returns. Weekly trap counts, 1993.

The portable weir concept has been favorably received by land owners and governmental agencies and has less environmental impact than the typical concrete abutment type permanent weir.

PIT Tagging

A cooperative effort with the NMFS crew who were tagging chinook salmon and a separate effort by project personnel resulted in PIT tagging 3 16 steelhead parr in Chamberlain and West Fork Chamberlain creeks upstream from the confluence of the West Fork and Chamberlain Creek in 1993.

Project staff and Tony Wright, manager at Running Creek Ranch, PIT tagged 51 steelhead parr in the lower 3 km of Running Creek and the lower kilometer of Eagle Creek, tributary of Running Creek.

NMFS staff PIT tagged 53 juvenile steelhead in Rush Creek at the request of project staff while collecting and tagging chinook salmon juveniles in Lower Rush Creek.

Interrogation of these tags in future years at downstream facilities will provide needed stock specific migration timing data. PIT tag interrogations for fish outmigrating in the spring of 1994 will be presented in the 1994 annual report.

Wild Steelhead P r' o 'd ' -

Since steelhead have been managed in the past primarily by estimating escapement at dams, comparisons of actual wild steelhead escapements in a study stream to estimated wild steelhead escapement at Lower Granite Dam should be of interest and is displayed for Rapid . River in Figure 6.

Wild group B steelhead escapement as measured by aerial spawning ground counts in trend areas of Johnson Creek, South Fork Salmon River, Bear Valley Creek, Sulphur Creek, and Marsh Creek generally follow the same trend as estimated wild B steelhead escapement at Lower Granite Dam (Figure 7).

When comparing estimated wild steelhead escapement levels at Bonneville and Lower Granite dams with resultant juvenile steelhead production, there is considerable difference in group A and group B performance. The 20,000 group A wild steelhead objective at Lower Granite Dam results in good levels of parr production; however, the 10,000 wild group B escapement objective has resulted in very low levels of juvenile production ranging from 9% to 17% of parr production objectives (Table 10). Resultant parr production objectives are set at 75% of the habitat holding capacity.

Initially, steelhead parr production levels were documented by enumerating parr in representative monitoring sites that were few in number in each production stream with broad coverage of the major anadromous production streams. Each study stream had two to three sample sections designated to be snorkeled each year. This type of monitoring data collected in B-channels, preferred by steelhead parr, was used during the period 1987-l 991 to estimate

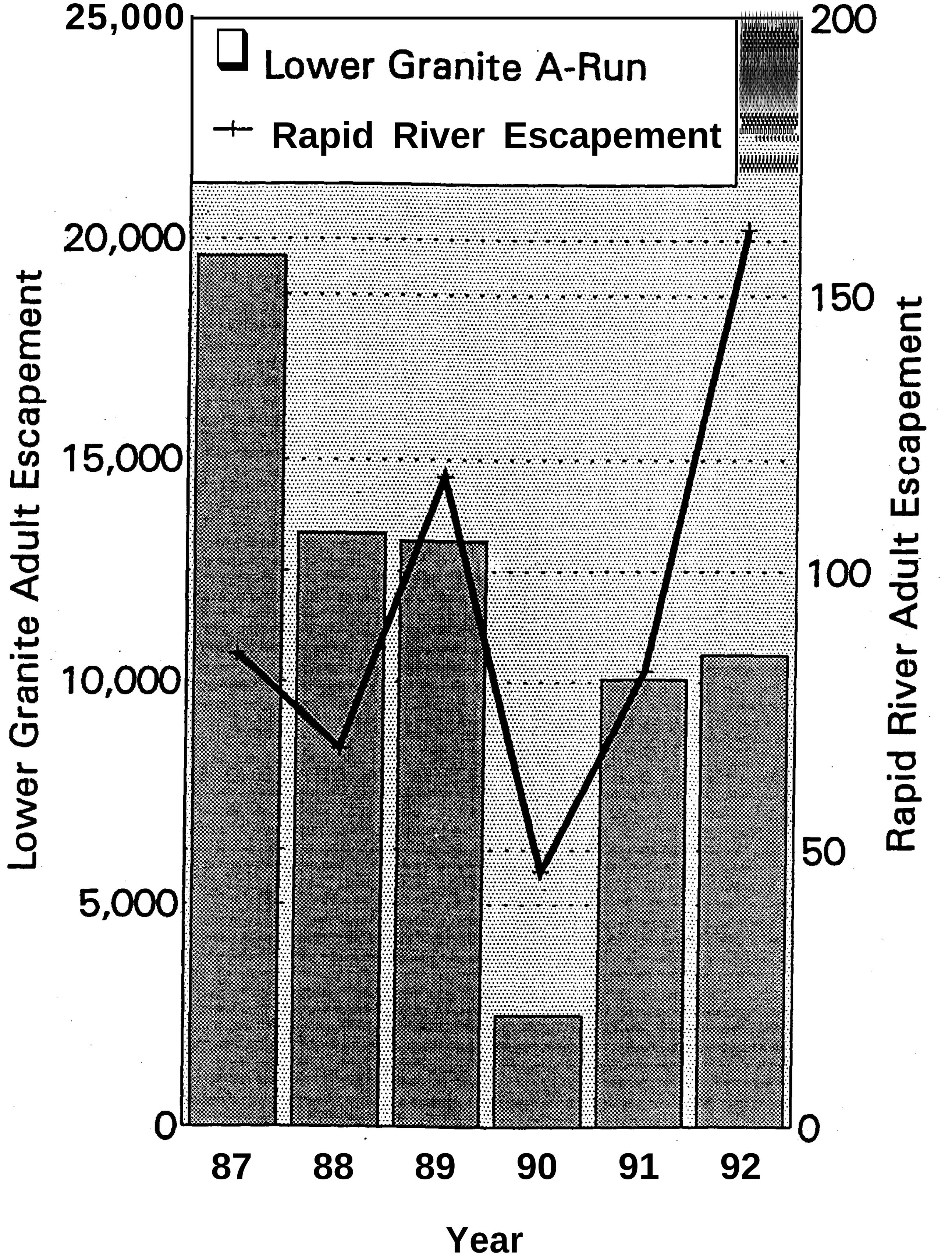

Figure 6. Adult A-run steelhead relationships for Lower Granite Reservoir and Rapid River escapements

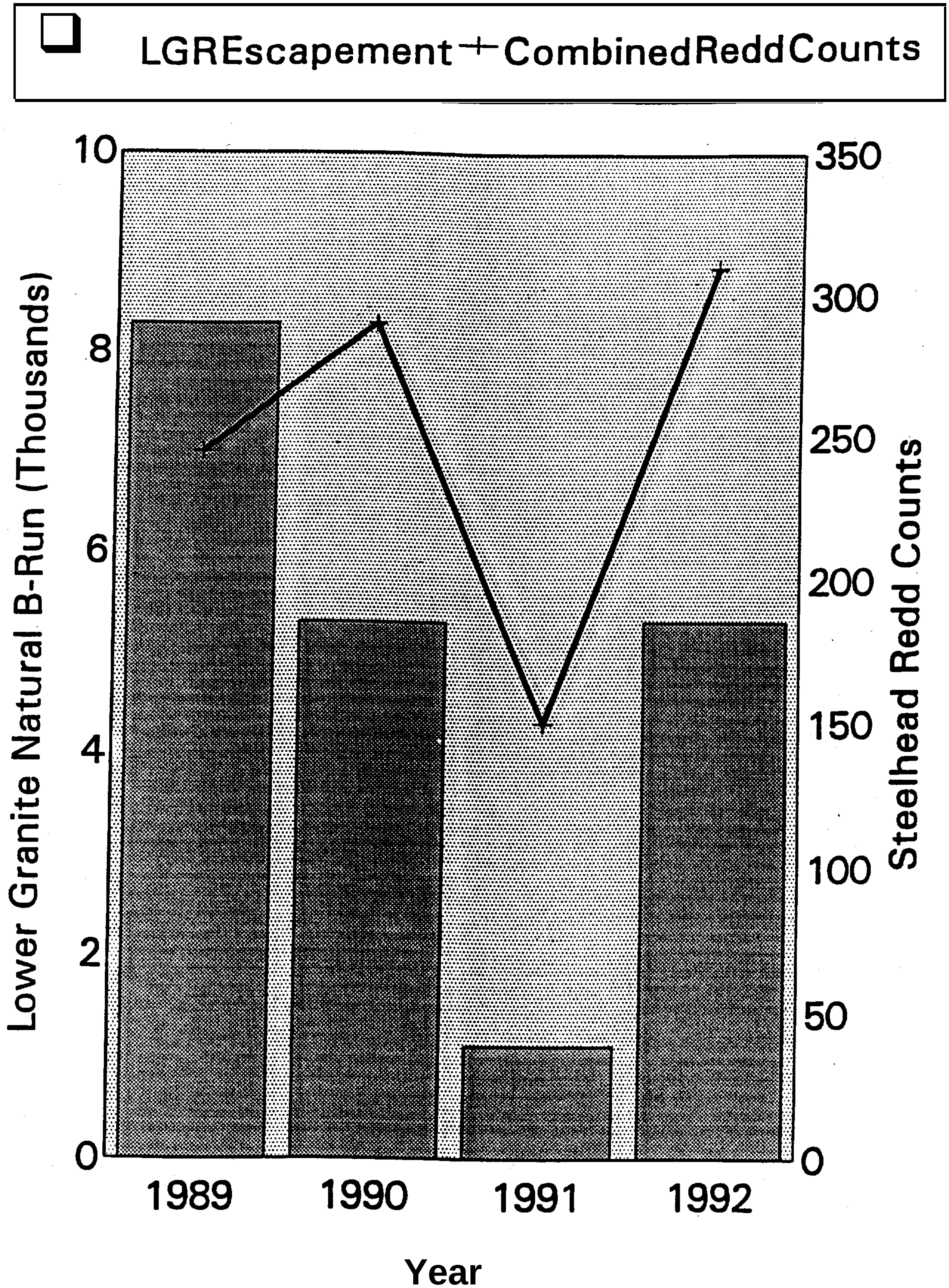

Figure 7. Lower Granite Reservoir adult B-Run steelhead counts compared to combined redd counts at Johnson Creek, South Fork Salmon River, Bear Valley Creek, Sulphur Creek, and Marsh Creek, 1989-l 993.

Table 10. Percent of adult wild steelhead escapement objectives and resultant parr production objectives for Group-A and Group-B steelhead in Idaho, 1985-I 992.

Group A Objectives			Group B Objectives		
General parr monitoring					
Bonneville Dam counts 1985 1989	Lower Granite Dam counts 1985-I 989	Resultant parr production 1987-I 991	Bonneville Dam counts 1985-I 989	Lower Granite Dam counts 1985-I 989	Resultant parr production 1987-I 991
107%	84%	95%	144%	71%	17%
Intensive parr monitoring[a]					
Bonneville Dam counts 1990-I 991	Lower Granite Dam counts 1990-1991	Resultant parr Production 1992-I 993	Bonneville Dam counts 1990-1991	Lower Granite Dam counts 1990-I 991	Resultant parr production 1992-I 993
57%	31%	41%	139%	32%	9%

[a] Rapid River data was used for group-A comparisons. Johnson, Sulphur, and Running Creeks were used for group-B comparisons.

seeding levels for Group-A and Group-B populations in the table above. In 1992 an intensive monitoring (IPM) program began on representative key production streams to more closely evaluate the seeding levels attained in Idaho steelhead production areas. Several new snorkel stations were added to each study stream and its tributaries. Although the number of sample stations is low during the years of general parr monitoring, comparisons of intensive parr monitoring data with general parr monitoring data generally show the same abundance trends.

An examination of redd count trends and resultant fry count trends in Sulphur Creek shows that as more spawners escape proportionate increases in fry production occur (Figure 8).

When attempting to relate spawning escapement levels to parr production, the abundance of yearling parr should correlate with the previous year's spawning escapement. Comparisons of Rapid River, Johnson Creek and Sulphur Creek data indicate that there is no good relationship between measures of spawner escapement and yearling parr abundance for the following summer (Figure 9). The following factors are suspected to be contributory to the lack of a relationship between steelhead spawning escapement and resultant parr production:

1. Inability of researchers to accurately classify parr into age classes.
2. Upstream and downstream seasonal movement of parr.
3. Differences in environmental conditions such as flow and temperature from year to year.
4. Barriers such as the velocity barrier at Rapid River prevent juveniles from returning upstream after drifting downstream in the fall.

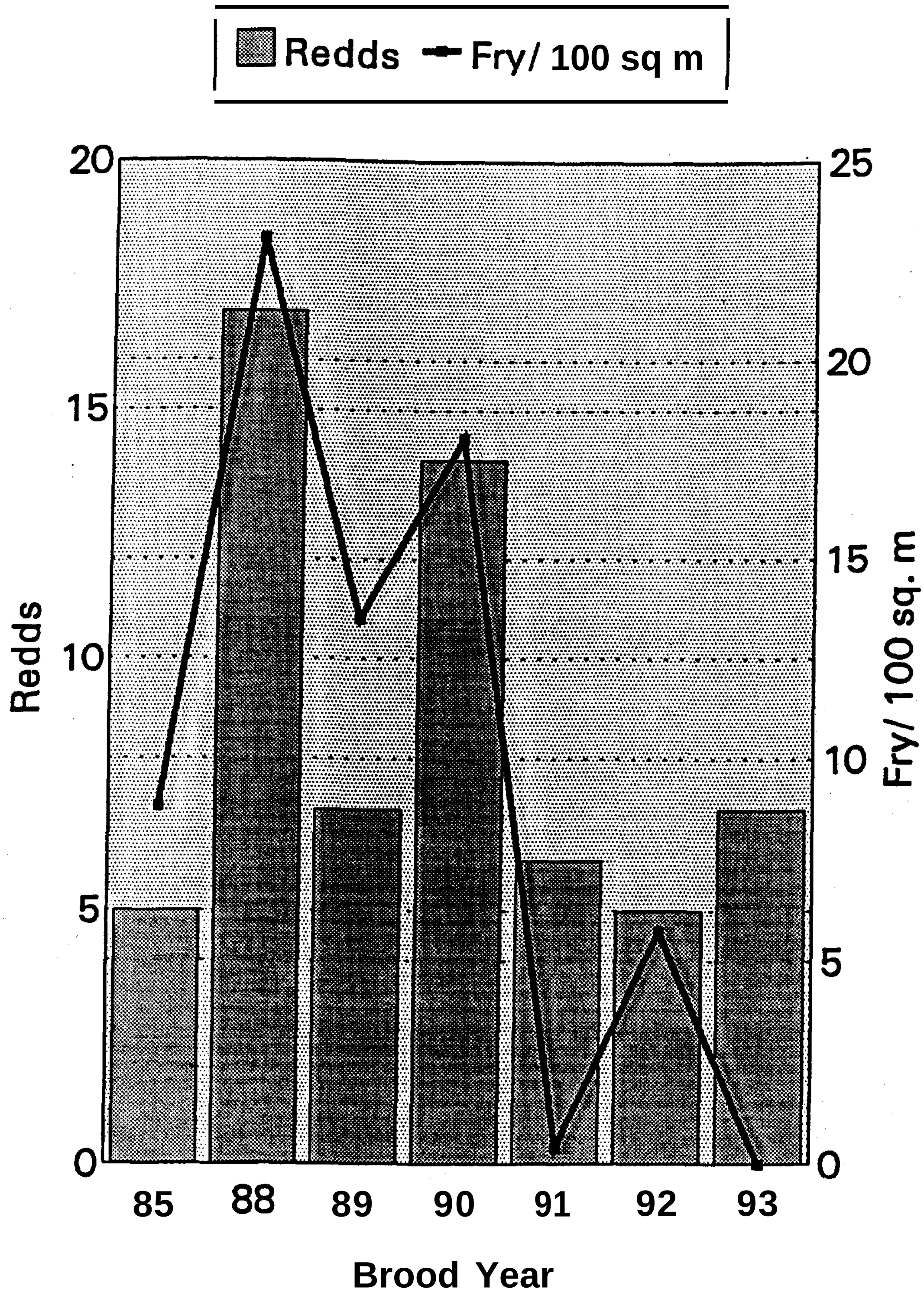

Figure 8. Sulphur Creek redd count and resultant fry production relationship, 1985, 1988-1993.

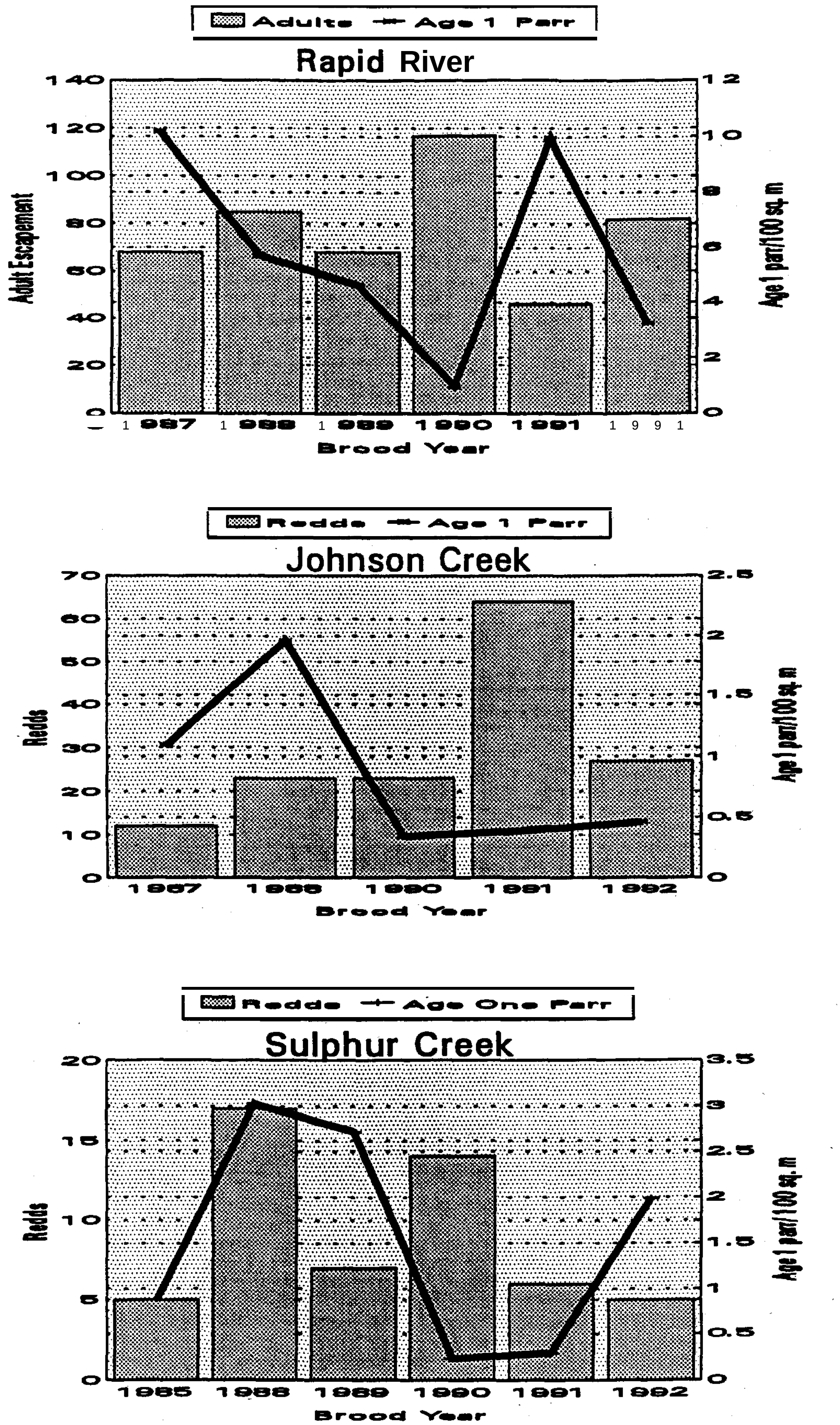

Figure 9. Adult steelhead escapement and resultant age one parr production for Rapid River, Johnson Creek, and Sulphur Creek, 1985-1992.

RECOMMENDATIONS

1. Implement wild steelhead stock recruitment studies in a minimum of three group A streams and four group B streams brood year 1996.

2. Stock recruitment data should be collected annually on key study streams until a full range of survival conditions and full seeding of habitat have been observed.

3. Set a criteria for removal of wild stock to improve or supplement hatchery stock. Populations should be at 50% of parr production capacity and in a stable or improving trend before wild genetic material can be removed to infuse into hatchery populations.

4. Continue to conduct steelhead aerial redd counts in trend areas and refine relationships among Lower Granite Dam counts, tributary weir counts, redd counts, and resultant juvenile production.

5. Obtain scales from adults and parr to better define age at size for key study streams.

6. Test effectiveness of electronic/video fish counting facility.

7. PIT tag an additional 300 parr in Chamberlain and Running creeks to provide migration timing information on these stocks.

8. Set up snorkeling stations to determine abundance and range of steelhead and chinook salmon in McCalla Creek drainage.

9. Collect genetic samples of juvenile rainbow/steelhead in selected areas of Chamberlain Creek to determine extent of resident rainbow trout distribution.

10. Employ extra measures to insure that management of hatchery fish does not impose any additional risk on preservation and perpetuation of wild steelhead stocks.

11. Collect electrofishing data to determine the extent of rainbow trout/cutthroat trout hybridization in Running, Big, Marsh, and Loon creeks.

12. Continue to PIT tag juvenile steelhead in Chamberlain and Rush creeks to assist in classifying the steelhead population as group A or B.

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The assistance of Tony Wright and Jerry Smith in collecting juvenile steelhead for PIT tagging was greatly appreciated. Brian Leth, Biological Aide for the project, worked hard and did an excellent job of snorkeling throughout the summer of 1993. The PIT tagging of juvenile steelhead in Chamberlain and Rush creeks by Steve Achord and the NMFS field crew was greatly appreciated.

LITERATURE CITATION

Behnke, Robert J. 1992. Native Trout of Western North America. Department of Fishery end Wildlife Biology, Colorado State University, Fort Collins, Colorado.

Chaney, E. And T.B. Holubetz. 1980. Framework Plan for Columbia River Anadromous Fish. Columbia River Fisheries Council. Portland, Or.

Corning Raymond. 1957. Clearwater River Fisheries Investigations. Idaho Department of Fish and Game. Boise.

Bell, Robert. 1959. Summary of Trapping of Downstream Migrant Steelhead Trout and Chinook Salmon at Wildhorse River Weir During 1958. Idaho Department of Fish and Game. Boise.

------, 1960. Summary of Trapping of Downstream Migrant Steelhead Trout and Chinook Salmon at Wildhorse River Weir During 1959. Idaho Department of Fish and Game. Boise.

Mallet J. 1974. Long Range Planning for Salmon and Steelhead in Idaho. Job 2: Inventory of Salmon and Steelhead Resources, Habitat, Use, and Demand. Idaho Department of Fish and Game, Project F-58-R-1, Job Performance Report. Boise

Petrosky, C.P. and T.B. Holubetz. 1987. Idaho Habitat Evaluation for Off-site Mitigation Record. Annual Report 1987. Idaho Department of Fish and Game. Boise.

Petrosky, C.P. and H.A. Schalier. 1992. A comparison of productivities for Snake River and lower Columbia River spring and summer chinook stocks. Procedings of Salmon Management in the 21 st Century: Recovering Stocks in Decline. 1992 Northeast Pacific Chinook and Coho Workshop. Idaho Chapter of the American Fisheries Society. Boise.

Raymond, H. L. 1979. Effects of dams and impoundments on migrations of juvenile chinook salmon and steelhead from the Snake River, 1966 to 1975. Trans. American Fisheries Society. 108(6):505-529.

Thurow Russ. 1983. Middle Fork Salmon River Fisheries Investigations. Federal Aid in Fish Restoration. Project F-73-R-5. Job Performance Report. November 1983. Idaho Department of Fish and Game. Boise.

Whitt, Charles R. 1954 The age, growth, and migration of steelhead trout in the Clearwater River, Idaho. Master’s Thesis University of Idaho Moscow, ID.

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