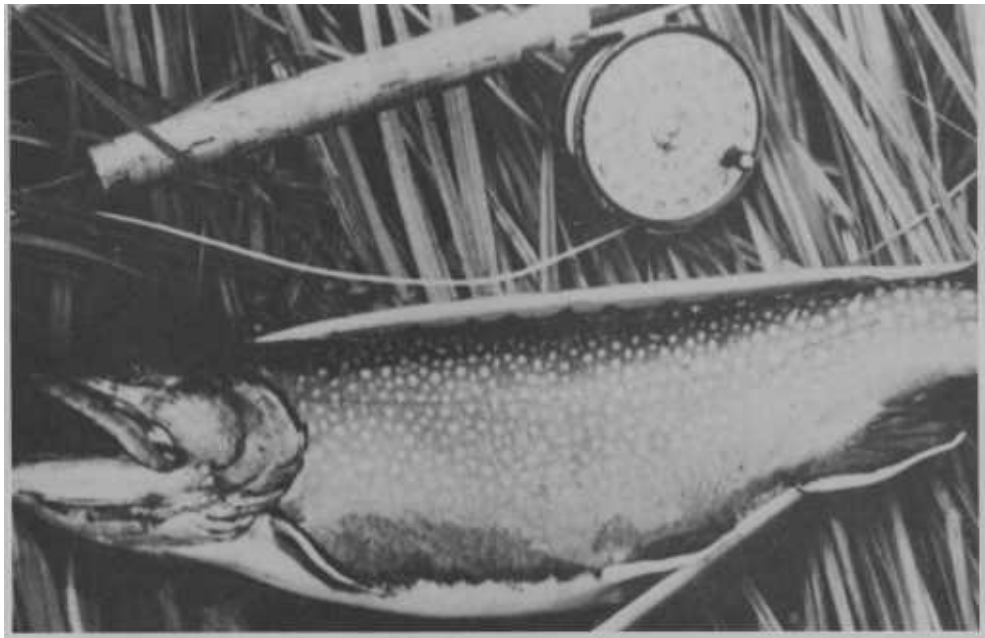


FEDERAL AID IN FISH RESTORATION

Job Performance Report, Project F-73-R-7
Subproject III: Lake and Reservoir Investigations
Study IV: Evaluation of Henrys Lake Management Programs
Job 1: Evaluation of Henrys Lake Trout Stocking Program



Frederick L. Greider
Fish and Wildlife Technician

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JOB PERFORMANCE REPORT

State of:	Idaho	Name:	LAKE AND RESERVOIR INVESTIGATIONS
Project No.:	E-73-R-7	Title:	Evaluation of Henrys Lake Trout Stocking Program
Subproject No.:	III		
Study No.:	IV		
Job No.:	1		

Period Covered: March 1, 1984 to February 28, 1985

ABSTRACT

The trout fishery of Henrys Lake, Idaho, was surveyed in 1984 as part of a continuing evaluation of management practices. The catch rate for all trout species was 1.7 fish per hour compared to the management objective of 0.7 fish per hour. Species composition of the harvest was 92% cutthroat trout (*Salmo clarki*), 5% hybrid trout (cutthroat x rainbow), and 3% brook trout (*Salvelinus fontinalis*) compared to management objectives of 65% cutthroat trout, 20% hybrid trout, and 15% brook trout.

Estimated angler effort increased from 96,000 hours in 1983 to 163,000 hours in 1984.

Mean length of creel cutthroat was 388 mm with only 0.5% larger than 510 mm (trophy criterion). Scale analysis indicates reduced growth rates for cutthroat sampled in 1984 versus growth analysis in prior years. Increased cutthroat stocking levels since 1981 are probably a factor in the reduced growth observed.

Hatchery spawning operations provided 7,249,544 eggs in 1984, including 716,456 hybrid eggs. Survival of hybrid eggs to eye-up was very low for late spawned cutthroat females.

Author:

Frederick L. Greider
Fish and Wildlife Technician

INTRODUCTION

In 1976, the Henrys Lake management program was implemented with a goal to produce a trophy trout fishery. The plan has since been modified due to drought conditions from 1977 through 1981. The cutthroat trout stocking was increased from 800,000 to 2,000,000 fish to compensate for lost natural recruitment, and currently, the hatchery program is largely supporting the fishery.

Two strains of Canadian brook trout (Assinica and Temiscamie) were introduced in Henrys Lake in 1980 (Assinica strain) and 1981 (Temiscamie strain). These populations have since been monitored.

In 1981, experiments to produce sterile hybrid (cutthroat x rainbow) trout were initiated (Rohrer 1982). Evaluation of this program is continuing.

This report summarizes the research completed at Henrys Lake in 1984 to monitor and evaluate the various programs and management goals.

OBJECTIVES

Describe and compare the performance in survival, growth, and return to creel of the trout species in Henrys Lake.

Evaluate "scatter planting" as an improved cutthroat trout stocking technique.

investigate the methodology- for mass-producing sterile hybrid trout.

Describe the impact of increased stocking levels of cutthroat on relative survival and growth and angler success and harvest in Henrys Lake.

RECOMMENDATIONS

Continue the trophy trout regulations (two fish limit).

Reduce present stocking rates of cutthroat from 2,000,000 to 1,000,000 fry. Emphasize hybrid stocking program to guarantee a minimum of 200,000 fry release. Take eggs for hybrids first within the spawning season to increase size of fry release. Obtain Canadian brook trout (Temiscamie strain) eggs to provide for a release of 100,000 fingerlings.

Release brook trout into Hatchery Creek for imprinting to develop hatchery brood stock.

Monitor the fishery to evaluate stocking plan.

Experiment with mass production of sterile hybrid production through heat treatment methodology.

Stock hybrid trout via Hatchery Creek for imprinting as an added protection for the natural cutthroat trout gene pool.

Design and implement Targhee Creek culvert modifications necessary to provide upstream fish passage.

METHODS

Hatchery Creek Spawning Run

From March 8 through May 25, 1984, all cutthroat and cutthroat x rainbow hybrid trout which entered the fish ladder into the Hatchery Creek spawn house were counted. A sample of every tenth fish was measured to the nearest 5 mm total length. All cutthroat from which spawn was taken were released back into Henrys Lake. The egg taking operation was terminated when the egg quota for the statewide requirement was reached.

Sport Fishery

Creel census interviews during the 1984 fishing season at Henrys Lake were conducted from May 26 through October 31 using previously described procedures (Coon 1978; Rohrer 1981). Angler counts were made four times daily by boat or truck on 20% of the weekdays, 50% of the weekend days, and on all holidays during each of the eleven bi-weekly census intervals. Angler interviews and creel checks were conducted as time permitted.

Harvested trout sampled during creel checks were examined for specific marks and measured to the nearest 5 mm total length. Scale samples from cutthroat trout and brook trout were taken from the caudal peduncle between the adipose fin and the lateral line on the left side of each fish.

Scale Analysis

Scale samples collected from cutthroat trout during angler creel checks and trap netting operations in 1984 were analyzed for age structure of the population and growth relationship comparisons. Brook trout scale analysis has been omitted from this year's report due to the small number of marked fish sampled and an inadequate size distribution for proper analysis.

Scale samples for cutthroat trout used for analysis (N=115) were chosen from a total length distribution of the entire sample which ranged from 160 mm to 525 mm. Within each 10 mm size class, 10 scale samples (when available) were used to ensure an equal distribution of all lengths.

Scales were viewed at 93x magnification using a Bausch & Lomb microprojector. Dry mounts of 10 to 20 scales each were scanned, and complete, non-regenerated or retarded scales were analyzed. Measurements from scale focus to each annulus observed and to the scale margin were recorded. Body:scale relationships were determined using linear regression and third degree polynomial expansion (Zar 1984). Back-calculated total lengths were done using the direct proportion formula (Fraser 1916; Lee 1920):

$$l_n - a = \frac{S_n}{S} (l - a)$$

Where: l_n = length of fish when annulus n was formed,
 l = length of fish when scale sample was obtained,
 S_n = radius of annulus n,
 S = total scale radius, and
 a = correction factor (fish length when scales begin to grow.

The correction factor of 45 mm was used for this analysis (Laakso 1956).

One-way analysis of variance was performed on back-calculated lengths for:

1. The first year of growth between the 1981, 1982, and 1983 year classes.
2. The second year growth increment between the 1981 and 1982 year classes.
3. The third year growth increment between the 1980 and 1981 year classes.

The level of significance for all statistical tests was $P \leq 0.05$, unless stated otherwise.

Tributary Evaluations

Tributaries of Henrys Lake were visually inspected on five separate days in late May and early June in 1984 for the presence of spawning cutthroat trout and identifiable redds. For all tributaries that are crossed by Highway 87, this inspection was conducted above and below the highway culverts to ensure that the upstream migration of spawning fish was not impeded.

Stocking Program

In 1984, a total of 2.035 million cutthroat fry and fingerlings were released in Henrys Lake. Approximately 1.5 million fingerlings reared at Ashton and McCall hatcheries were released at accessible locations, while 575,000 fry and fingerling cutthroat trout were released from Henrys Lake Hatchery.

The release of cutthroat x rainbow hybrid trout in 1984 equaled 135,000 fry and fingerlings. All hybrids were hatched and reared at Grace Hatchery. The redband and McConahay strains were released at the county boat docks and the Erwin strain was released from Henrys Lake Hatchery.

The cutthroat trout reared at Ashton and Henrys Lake were fed TM-50 for marking purposes. The fluorescent TM-50 vertebrae mark was administered for future wild versus hatchery identification in adult fish.

In 1984, 207 cutthroat trout sampled in creel checks were examined under an ultraviolet light in an attempt to detect a fluorescent pigment used as a mass marking technique for the 1981 cutthroat trout stocked at Henrys Lake.

Population Sampling

Trap nets were used to sample selected areas of Henrys Lake in the fall of 1984 (Fig. 1). Descriptions of these nets and their use are found in Rohrer (1982) and Spateholts (1984). All trout captured were examined for marks and measured to the nearest 5 mm total length. Scale samples were taken from cutthroat trout and brook trout using the previously described procedure.

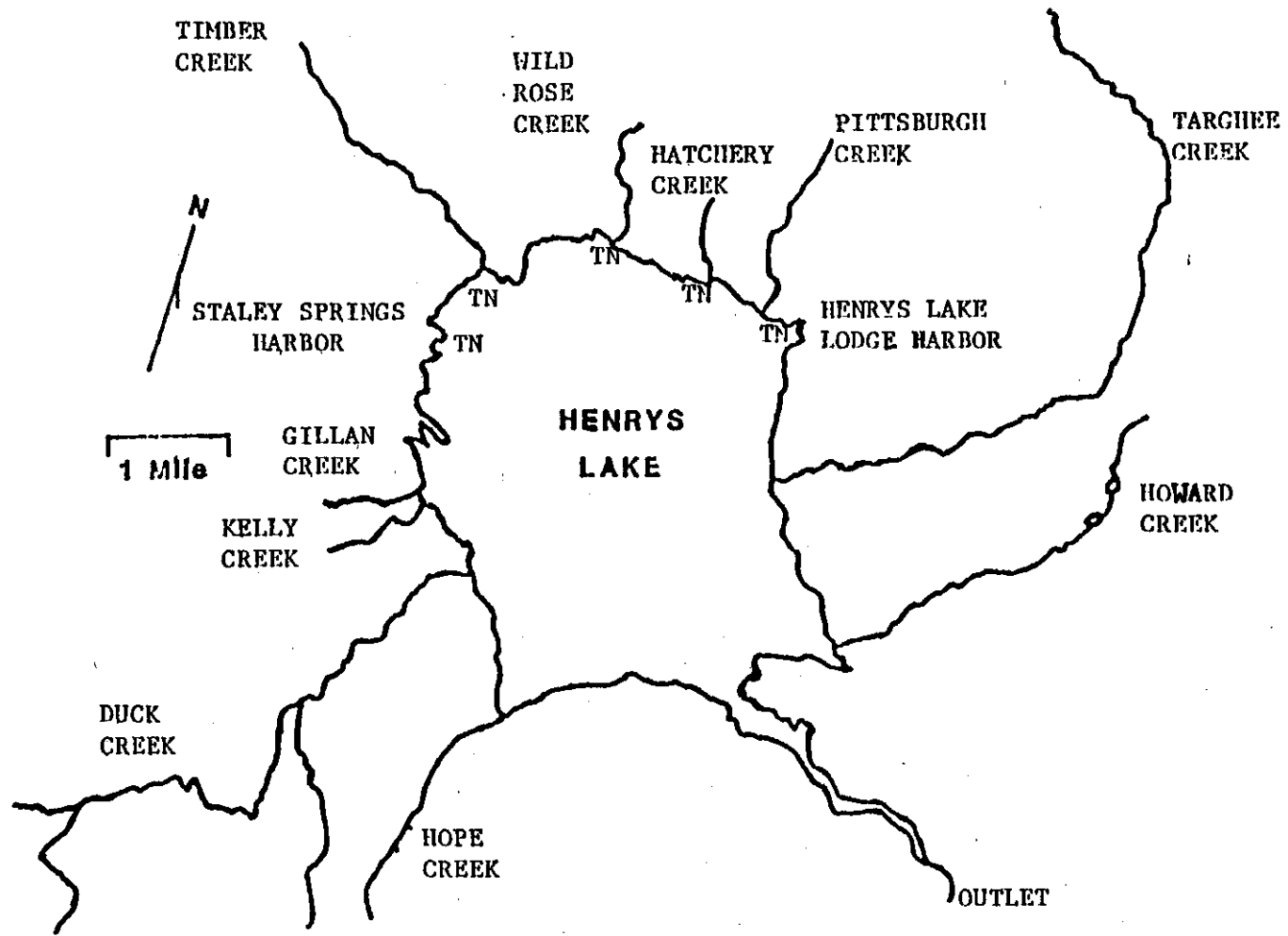


Figure 1. Map of Henrys Lake showing tributaries and areas sampled by trap netting (TN) in 1984.

Sterile Hybrid Experiments

Sterile hybrid experiments were performed at Henrys Lake on March 26, 1984. Techniques have been developed to practically and effectively produce sterile salmonids. Thorgaard et al. (1981) used heat shock techniques to experimentally treat a small number of rainbow trout (*Salmo gairdneri*) eggs and produced triploids. Triploid trout have been shown to be sterile in a number of studies (Thorgaard and Gall 1979; Allen and Stanley 1978).

Small groups of cutthroat trout eggs were heat shocked for varying times (10 minutes or 25 minutes) at 10 minutes or 25 minutes, respectively, after fertilization with rainbow trout sperm. Treatment temperatures during immersion of eggs ranged from 25 C to 30 C and were maintained within 0.2 C by heating the water as needed.

Data on eye-up rates and survival to hatching were monitored closely by the hatchery staff. After eye-up, samples of eggs were sent to Paul Scheerer (Washington State University) for chromosome counts.

FINDINGS

Hatchery Creek Spawning Run

From March 8 through May 25, 1984, all cutthroat and hybrid trout entering the fish ladder into the Hatchery Creek spawn house were counted. A total of 17,950 cutthroat trout and 720 hybrid trout comprised the 1984 spawning run. The cutthroat run at Hatchery Creek in 1984 was the largest recorded at Henrys Lake (Table 1) and was four times greater than the 1983 spawning run.

A total of 1,795 cutthroat trout were measured during the 1984 spawning run. Male cutthroat (N=1,381) comprised 77% of the total run. The mean total length for male cutthroat trout was 388 mm (range 300 mm to 540 mm) (Fig. 2). Female cutthroat (N=420) had a mean total length of 420 mm (range 330 mm to 530 mm) (Fig. 3).

Males comprised 71% of the hybrid spawning run in 1984. The mean total length of males measured (N=51) was 402 mm and ranged in length from 330 mm to 570 mm (Fig. 4). The female hybrid trout sampled (N=21) had a mean total length of 425 mm (range 280 mm to 570 mm) (Fig. 5). The largest female and male hybrid trout observed, but not included in the measured sample, were 780 mm and 640 mm, respectively.

The total cutthroat trout egg take at Henrys Lake in 1984 amounted to 7,249,544. The eye-up of cutthroat trout eggs was 95% (Table 2).

Three strains of preserved rainbow trout sperm obtained from a certified disease-free source (Ennis NFH) were crossed with Henrys Lake cutthroat trout eggs. The survival to eye-up of the cutthroat x rainbow hybrids was lower for each of the three strains than eye-up

Table 1. Yearly numbers , cutthroat and hybrid trout in the Hatchery Creek spawning run at Henrys Lake.

Year	Number of cutthroat trout	Number of hybrid trout
1950	-	10,000
1954	11,577	
1955	8,804	
1956	7,651	
1976	12,190	4 ^a
1977	9,628	5 ^a
1978	6,600	123 ^b
1979	4,625	621
1980	2,774	2,196
1981	2,932	2,315
1982	3,625	923
1983	4,362	438
1984	17,950	720

^aJudged naturally-produced hybrids.

^bEstimated 113 of these were first-generation fish (92.9% male) planted in 1976.

Table 2. Henrys Lake cutthroat trout spawning summary, 1984; total egg take and percent survival to eye-up.

Species	Number of green eggs	Number of eyed eggs	Percent to eye-up
Cutthroat	6,533,088	6,232,038	95
Ct x Rb (redband)	78,000	64,420	85
Ct x Rb (McConahay)	419,000	71,604	17
Ct x Rb (Erwin)	219,456	80,000	36
Total	7,249,544	6,450,062	89

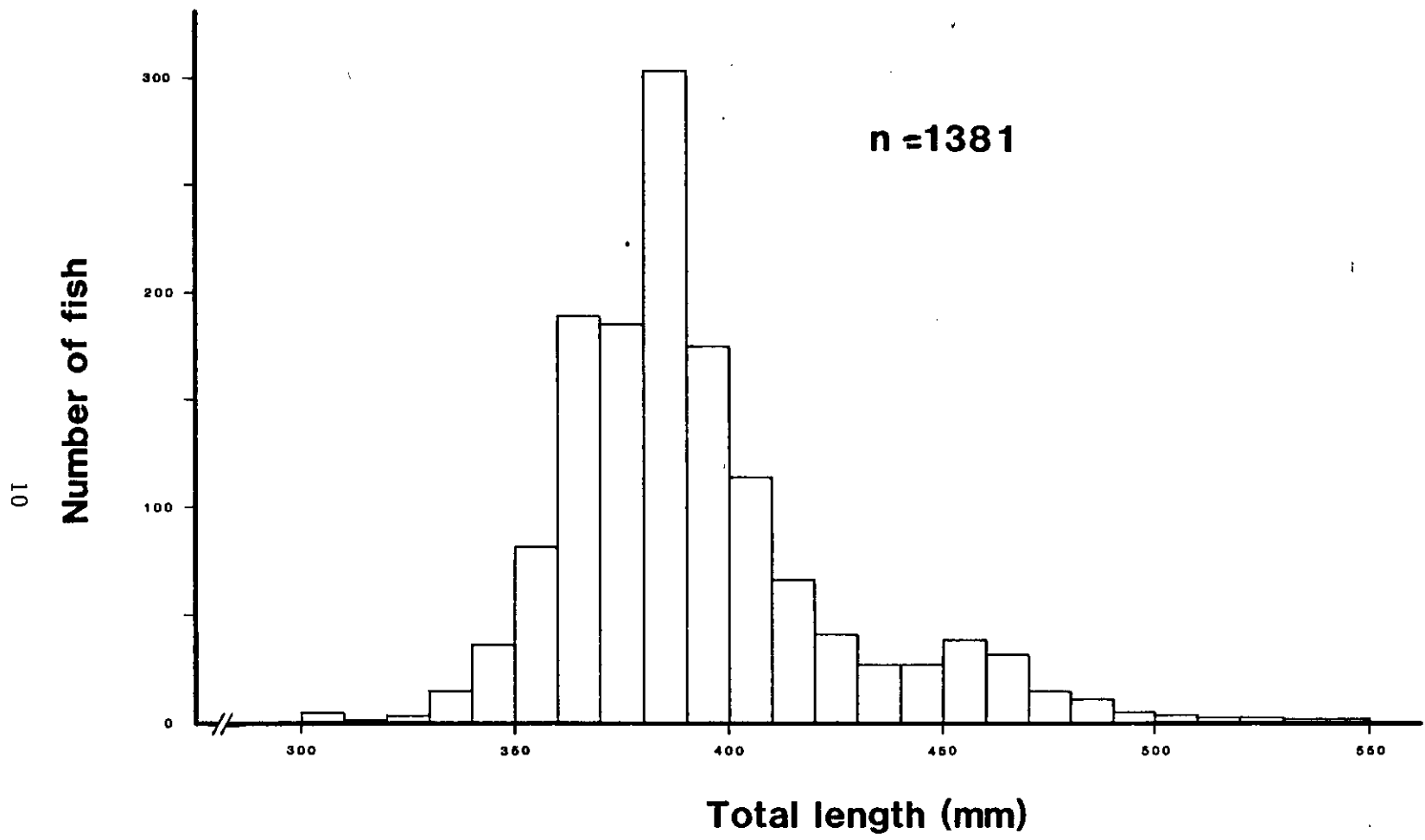


Figure 2. Length-frequency distribution of male cutthroat trout sampled in the 1984 spawning run at Henrys Lake Hatchery Creek spawn house.

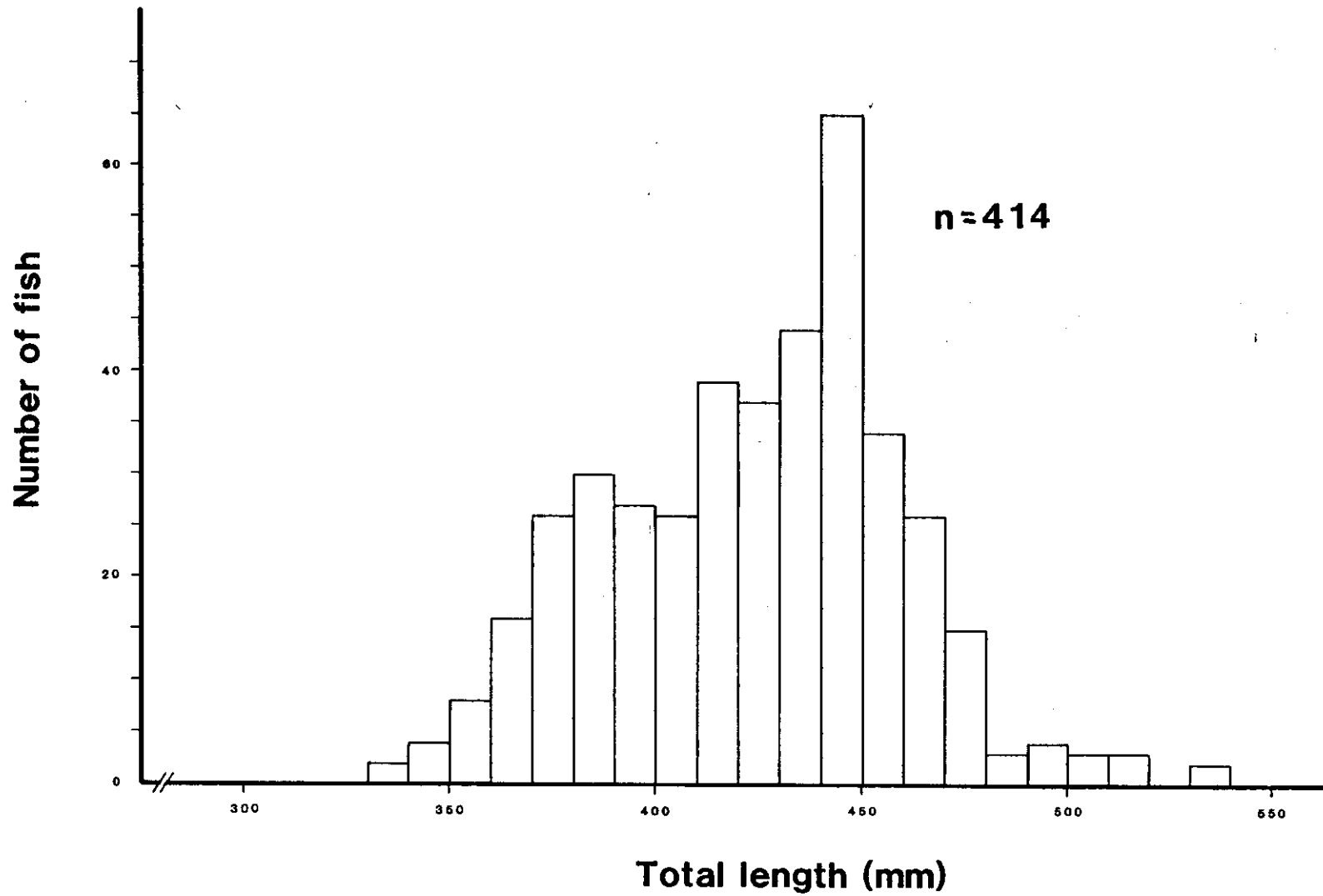


Figure 3. Length-frequency distribution of female cutthroat trout sampled in the 1984 spawning run at Henrys Lake Hatchery Creek spawn house.

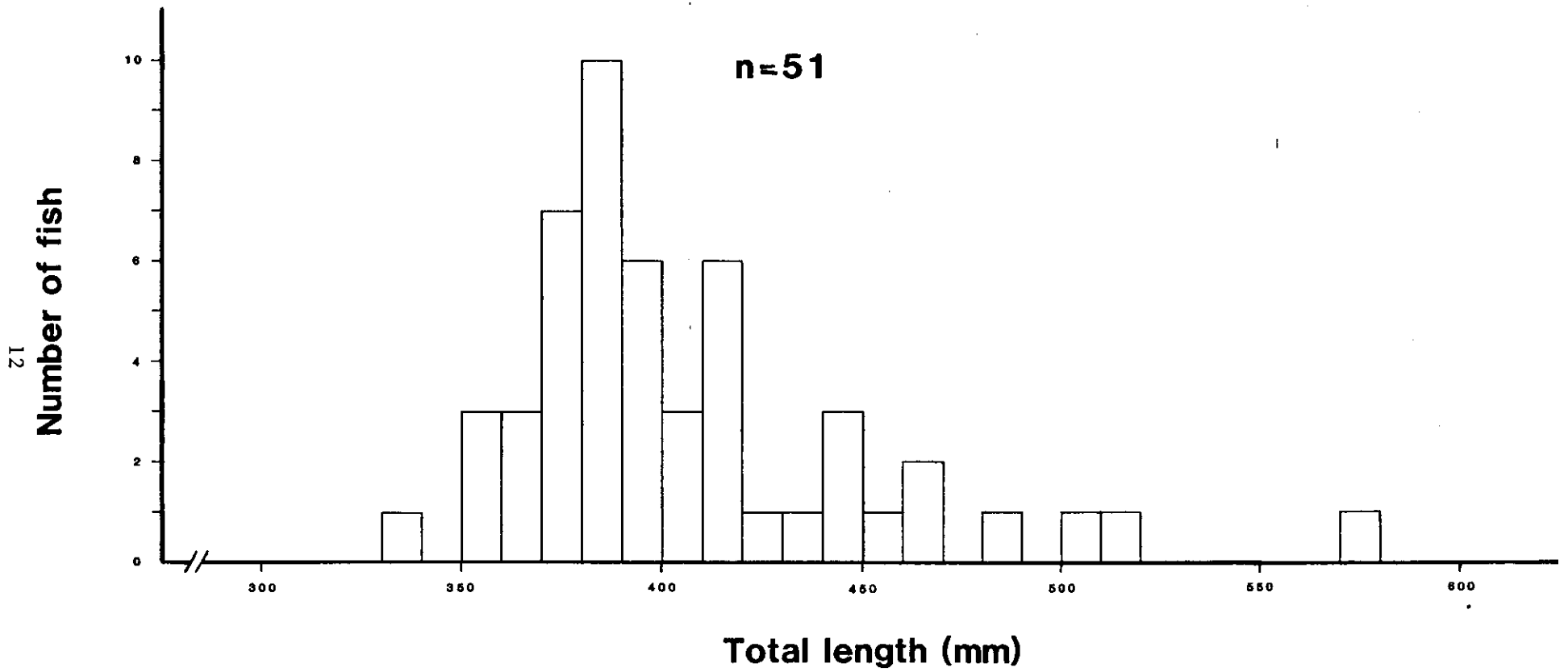


Figure 4. Length-frequency distribution of male cutthroat x rainbow hybrid trout sampled in the 1984 spawning run at Henrys Lake Hatchery Creek spawn house.

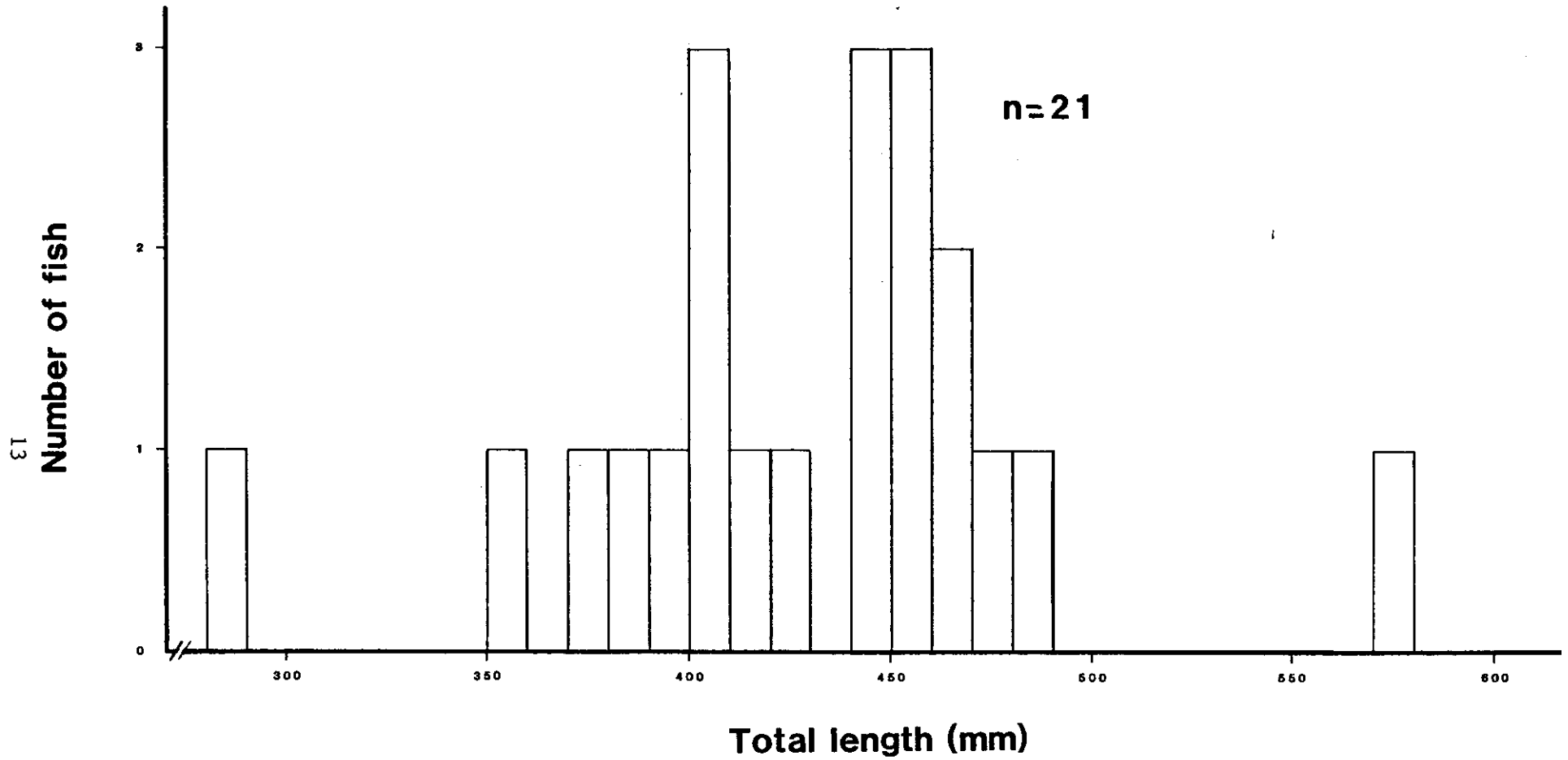


Figure 5. Length-frequency distribution of female cutthroat x rainbow hybrid trout sampled in the 1984 spawning run at Henrys Lake Hatchery Creek spawn house.

survival of cutthroat trout eggs; the McConahay cross, 17%; the Erwin cross, 36%; and the redband cross, 85%.

More than 5.5 million cutthroat trout eggs were shipped to Ashton, McCall and Mackay hatcheries in 1984. The redband and McConahay strain of cutthroat x rainbow hybrid eggs were shipped to Grace Hatchery. The Erwin strain hybrids were reared at Henrys Lake Hatchery (Table 3).

Unspawned cutthroat trout were still returning to the fish ladder after the statewide egg take requirement was reached and the spawn house operation was terminated. The ripe cutthroat spawners were collected and transported on June 1, 1984 to two major tributaries of Henrys Lake. A total of 4,399 were released in Targhee Creek, and 1,407 were transported to Howard Creek by the hatchery crew. All fish transported were included in the 1984 spawning run totals.

Sport Fishery

Angling Effort and Catch Rate

The estimated angling effort at Henrys Lake in 1984 was nearly 163,000 hours (Table 4). This is a 70% increase over the total estimated hours fished in 1983. The effort was greatest during the first half of the fishing season. The two-week interval that included the Independence Day holiday had the largest estimated number of hours fished during the 1984 fishing season at Henrys Lake.

Resident anglers comprised 64% of the angling effort at Henrys Lake in 1984 (Table 5). There was greatest resident effort during the early and late intervals of the season.

The angler profile at Henrys Lake in 1984 was similar to that of previous years (Table 6). The majority of the anglers (77.5%) fished from boats (Appendix A). An estimated 13.1% of the total anglers interviewed fished from the bank (Appendix B), and 9.4% used float tubes (Appendix C). Trolling, as in previous years, was the most popular method of fishing in 1984 (Table 6).

The estimated catch rate at Henrys Lake during the 1984 fishing season was 1.7 trout per hour (Table 7). The 1984 catch rate was 30% greater than that of 1983 and shows a continued increase from the low rates recorded in 1980 and 1981 (Fig. 6).

Trout Harvest

The total estimated trout harvest at Henrys Lake in 1984 (N=46,816) is slightly less than twice the estimated harvest for 1983 (Cole 1984). Cutthroat trout (N=42,868) comprised 91.6% of the total trout harvest (Table 8). There was a 5% increase in the estimated number of cutthroat x rainbow hybrid trout (N=2,488) and a 15% decrease in the

Table 3. Eyed egg shipments from Henrys Lake in 1984.

Species	Hatchery			
	Grace	Ashton	McCall	Mackay
Cutthroat	--	4,284,695	1,067,958	176,904
Ct x Rb (redband)	- 66,420	--	--	--
C t x R b (McConahay)	71,604	--	--	--

Table 4. Estimated total angler hours, harvest, and catch rates at Henrys Lake, 1984.

Census interval	Angler hours	Trout harvested						Total	Trout released	Total trout hour
		Cutthroat	Hybrid	Brook						
				RV ^a	AD ₁ ^b	AD ₂ ^c	NM ^d			
05/26-06/08	29,358	9,552	338	26	26	26	175	10,143	34,378	1.52
06/09-06/22	16,416	4,823	160		0	27	89	5,099	16,266	1.42
06/23-07/06	35,540	13,608	608	61	0	0	185	14,473	59,848	2.09
07/07-07/20	23,144	4,310	280	69	69	0	36	4,784	28,531	1.44
07/21-08/03	14,060	2,917	205	23	71	35	199	3,450	14,400	1.27
08/04-08/17	12,472	1,186	35	0	0	0	70	1,291	14,065	1.23
08/18-08/31	5,538	535	30	0	0	0	30	595	10,022	1.92
08/01-09/14	8,382	1,598	432	0	0	0	64	2,094	13,151	1.82
08/15-08/28	6,864	1,713	107	0	0	0	58	1,876	13,279	2.21
08/29/10/12	9,155	1,905	250	0	0	0	92	2,247	16,302	2.03
10/13-10/31	1,949	721	42	0	0	0	21	784	1,927	1.39
Totals	162,878	42,888	2,488	179	166	88	1,027	46,616	224,169	1.66

^a RV=Right ventral fin clip, domestic Ford Hatchery (N=2,110) planted in 1980 or Temiscamie strain (N=20,930) planted in 1981.

^b AD₁=Adipose clip, Temiscamie strain (N=18,448) planted in 1982.

^c AD₂=Adipose clip, Ford stock from Sandpoint Hatchery (N=82,503) planted in 1980.

^d NM=No mark, naturalized population of brook trout.

Table 5. Estimated angler profile, percent of hours, at Henrys Lake, 1984

Census Interval	Resident	Nonresident	Fishing from		
			Boat	Bank	Tube
	71.6	28.4	83.5	11.4	5.1
05/26-06/08					
06/09-06/22	80.0	20.0	81.5	11.5	7.0
06/23-07/06	63.0	37.0	75.0	11.9	13.1
07/07-07/20	54.2	45.8	66.2	19.4	14.4
07/21-08/03	35.0	65.0	73.4	12.6	14.0
08/04-08/17	48.9	51.1	79.8	7.2	13.0
08/18-08/31	42.2	57.8	69.3	12.5	18.2
09/01-09/14	60.1	39.9	76.6	15.1	8.3
09/15-09/28	61.4	38.6	67.8	18.3	13.9
09/29-10/12	76.5	23.5	75.9	16.8	7.3
10/13-10/31	85.1	24.9	73.4	23.4	3.2
Totals ^a	64.3	35.7	77.5	13.1	9.4

^aWeighted by angler hours for each interval.

Table 6. Estimated angler profile at Henrys Lake, 1976 through 1984.

Year	Percent of anglers								
	Resident	Fishing from				Trolling	Casting		
		Boat	Bank	Tube	Bait		Lures	Flies	
1976	50	93	5	2	49	11	8	32	
1977	49	95	4	1	48	10	8	34	
1978	51	92	6	2	52	13	5	31	
1979	53	91	6	3	50	13	5	32	
1980	67	92	4	4	67	11	3	19	
1981	54	87	5	8	57	15	6	22	
1982	51	91	2	7	51	9	5	35	
1983	64	86	7	7	54	11	10	26	
1984	64	78	13	9	45	16	14	25	

Table 7. Estimated total angler hours, harvest, and catch rates at Henrys Lake, 1976 through 1984.

Year	Angler hours	Trout harvested	Trout released	Total trout/hour
1976	68,109 -	18,650	17,997	0.54
1977	66,369	16,474	12,693	0.44
1978	85,304	25,510	15,019	0.48
1979	93,921	18,754	10,997	0.32
1980	68,446	9,262	5,335	0.21
1981	65,918	7,504	6,650	0.21
1982	63,273	7,082	21,610	0.45
1983	95,996	25,453	96,520	1.27
1984	162,878	46,816	224,169	1.66

Table 8. Species composition of trout harvested from Henrys Lake, 1976 through 1984.

Year	Cutthroat		Hybrid		Brook trout	
	Number	Percent	Number	Percent	Number	Percent
		81.1		0.1		18.8
1976	15,119		20		3,511	
1977	11,702	71.1	65	0.4	4,699	28.5
1978	12,131	47.5	5,002	19.7	8,377	32.8
1979	6,492	34.6	7,774	41.5	4,462	23.8
1980	2,910	31.4	5,441	58.7	911	9.8
1981	2,283	30.4	4,033	53.7	1,198	15.8
1982	4,346	61.4	1,784	25.2	941	13.3
1983	21,380	84.0	2,356	9.3	1,710	6.7
1984	42,868	91.6	2,488	5.3	1,460	3.1

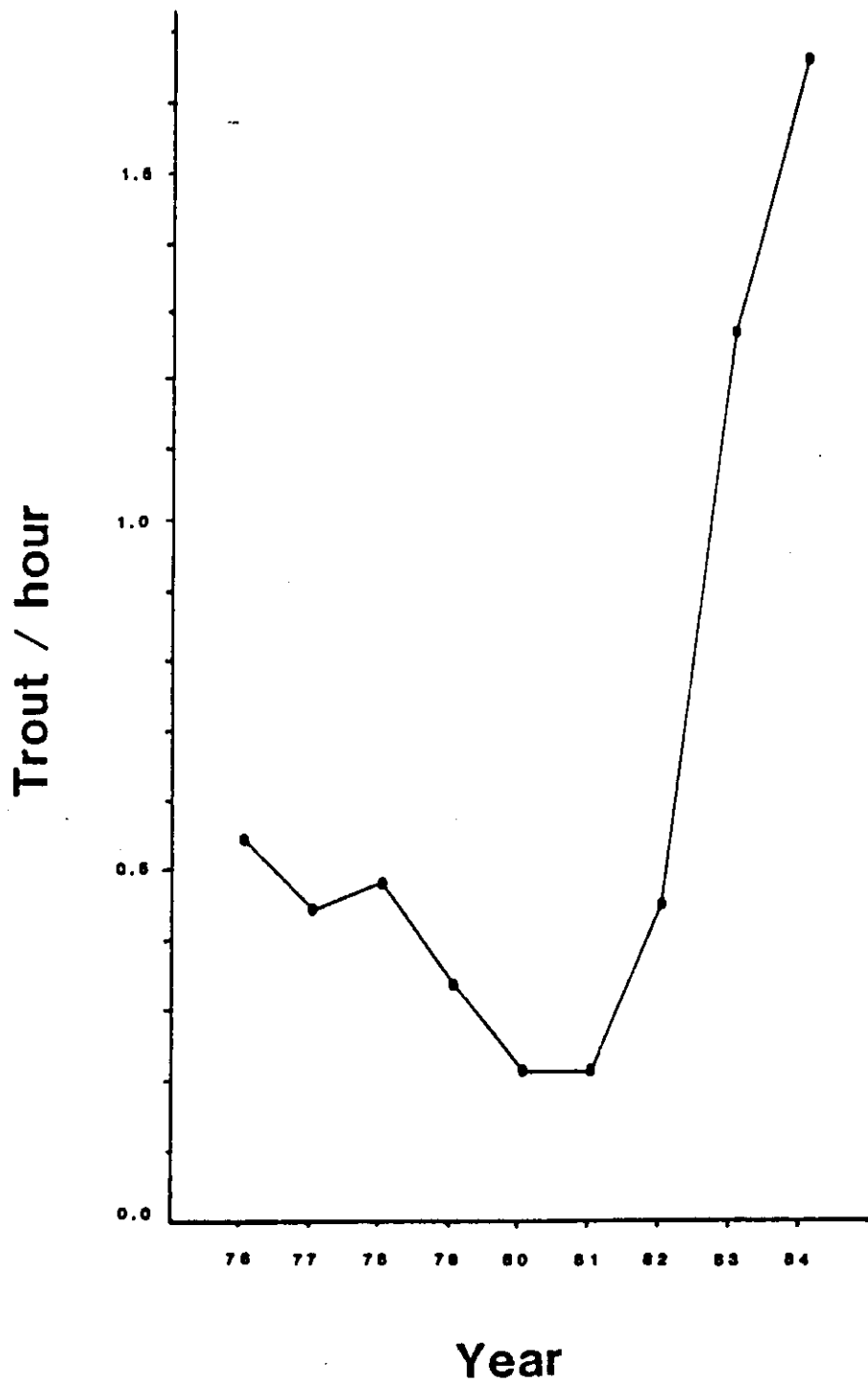


Figure 6. Catch rates at Henrys Lake, 1976 through 1984.

estimated number of brook trout (N=1,460) harvested in 1984 as compared to the 1983 estimates.

The estimated harvest of cutthroat trout in 1984 was more than double the 1983 estimate and is the largest estimated harvest since 1976 (Table 8). The mean total length of cutthroat trout measured in the 1984 creel census interviews (N=645) was 388 mm (Table 9) which is identical to the 1983 mean (Table 10). Cutthroat ranged in length from 230 mm to 530 mm (Fig. 7). The estimated number of cutthroat trout greater than 510 mm total length (trophy criterion) harvested in 1984 is the lowest since 1976 when recording began (Table 11), with only 0.5% of the harvest reaching trophy size.

The total estimated harvest of brook trout at Henrys Lake for 1984 was 1,460 fish (Table 8). Brook trout comprised 3.1% of the total trout harvest in 1984, which is the lowest proportion for this species in the previous 8 years.

The mean total length of brook trout measured in the 1984 creel sample (N=45) was 393 mm (Table 9), which is comparable to the previous years sampled (Table 10). Brook trout ranged from 310 mm to 510 mm. The trophy criterion for brook trout (>450 mm) at Henrys Lake was reached by 13.3% of the estimated total harvest of brook trout in 1984 (Table 12). The percent of trophy brook trout harvested in 1984 was greater than that of cutthroat trout and hybrid trout, but was still lower than the estimated number harvested annually since 1981.

Of the total estimated brook trout harvest in 1984, 70.3% were unmarked fish which are indicative of a naturalized spawning population (Table 13). The domestic Ford stock, from the Sandpoint Hatchery, planted in 1980, comprised 6.0% of the brook trout harvest while 23.7% were of the Canadian stock. All of the Canadian brook trout were of the Temiscamie strain; 12.3% from the 1981 year class, and 11.4% from the 1982 year class. The 1980 year class of the Canadian Assinica strain did not appear in the 1984 creel sample.

The total estimated harvest of cutthroat x rainbow hybrid trout at Henrys Lake in 1984 was 2,488 fish (Table 8). Hybrid trout comprised 5.3% of the total trout harvest which is the lowest percent of composition for this species since 1978.

The mean total length of hybrid trout sampled by creel checks in 1984 (N=55) was 427 mm (Table 9) and was smaller than the last 5-year average (Table 10). Hybrid trout ranged from 360 mm to 630 mm. The trophy criterion for hybrid trout (>550 mm) was reached by 5.4% of the harvest (Table 14). This is the smallest percent and total estimated number (N=134) of trophy-size hybrid trout harvested since these larger fish began to appear in the 1979 creel checks.

Scale Analysis

Scale analysis for cutthroat trout sampled from Henrys Lake in 1984 indicates very good growth (Table 15, Fig. 8).

Table 9. Mean total length of cutthroat, hybrid, and brook trout harvested from Henrys Lake, 1984.

Census interval	Cutthroat		Hybrid		Brook	
	Mean TL mm	(N)	Mean TL mm	(N)	Mean TL mm	(N)
05/26-06/08	396	(183)	496	(9)	434	(15)
06/09-06/22	370	(79)	448	(2)	416	(4)
06/23-07/06	382	(119)	401	(7)	370	(3)
07/07-07/20	394	(45)	395	(4)	385	(3)
07/21-08/03	399	(46)	436	(5)	373	(7)
08/04-08/17	387	(22)	430	(1)	405	(2)
08/18-08/31	415	(7)	—		375	(1)
09/01-09/14	386	(29)	408	(11)	382	(2)
09/15-09/28	399	(45)	477	(5)	392	(3)
09/29-10/12	394	(62)	438	(9)	404	(4)
10/13-10/31	399	(8)	422	(2)	380	(1)
Totals ^a	388	(645)	427	(55)	393	(45)

^aWeighted by the estimated harvest during each interval.

Table 10. Mean total length of cutthroat, hybrid, and brook trout harvested from Henrys Lake, 1976 through 1984.

Year	Cutthroat trout Mean TL (mm) (16.8in)	Hybrid trout Mean TL (mm)	Brook trout Mean TL (mm)
1976	426	NA ^a	371 (14.61n)
1977	420 (16.5in)	339 (13.3in)	362 (14.6in)
1978	429 (16.91n)	389 (15.3in)	381 (15.0in)
1979	452 (17.81n)	456 (18.0in)	378 (14.9in)
1980	429 (16.9in)	459 (18.1in)	391 (15.41n)
1981	445 (17.5ln)	450 (17.7in)	389 (15.31n)
1982	416 (16.41n)	451 (17.81n)	405 (15.91n)
1983	388 (15.31n)	448 (17.6in)	392 (15.4ln)
1984	388 (15.3in)	427 (16.81n)	393 (15.5in)

^aFirst year hybrids planted, no data available.

Table 11. Number of cutthroat trout greater than 510 mm harvested from Henrys Lake, 1976 through 1984.

Year	Number sampled	Number >510	Percent	Estimated harvest	Estimated total >510 mm
			1.8		
1976	1,087	- 20		15,119	272
1977	1,613	62	3.8	11,702	445
1978	1,182	111	9.4	12,131	1,140
1979	636	69	10.8	6,492	701
1980	403	44	10.9	2,910	317
1981	106	14	13.2	2,259	298
1982	218	15	6.9	4,436	300
1983	751	19	2.5	21,380	534
1984	645	3	0.5	42,868	214

Table 12. Number of brook trout greater than 450 mm harvested from Henrys Lake, 1979 through 1984.

Year	Number sampled	Number >450	Percent	Estimated harvest	Estimated total >450 mm
			6.1		
1979	329	- 20		4,462	272
1980	125	6	4.8	911	44
1981	52	10	19.2	1,188	228
1982	59	15	25.4	941	239
1983	98	17	17.3	1,710	296
1984	45	6	13.3	1,460	194

Table 13. Composition of brook trout harvested from Henrys Lake in 1984.

Brook trout strain	Number harvested	Percent of total brook trout harvest
Naturalized population (no mark)	1,027	70.3
Temiscamie - 1981 year class (RV)	179	12.3
1982 year class (AD2)	166	11.4
Domestic - 1980 year class (AD1)	88	6.0
Total Brook Trout Harvest	1,460	

Table 14. Number of hybrid trout greater than 550 mm harvested from Henrys Lake, 1979 through 1984^a.

Year	Number sampled	Number >550	Percent	Estimated harvest	Estimated total >550 mm
			7.7		
1979	779	- 60		7,774	599
1980	750	120	16.0	5,441	870
1981	239	27	11.3	4,033	456
1982	99	17	17.2	1,784	307
1983	95	13	13.7	2,356	323
1984	55	3	5.4	2,488	134

^aIncludes marked hybrids from 1976 and 1977. 28

Table 15. Mean back-calculated total length (mm) at annuli formation of cutthroat trout sampled from Henrys Lake in 1984. ' Standard errors are In parentheses.

Year class	Sample size	I	II	III	IV	Mean total length
1983	11	- 104(3)				199
1982	37	104(2)	211 (6)			288
1981	61	104(1)	214 (5)	289 (6)		396
1980	6	100(2)	212(14)	303(31)	401(33)	488
Totals	115	104(1)	213 (3)	292 (6)	401(33)	

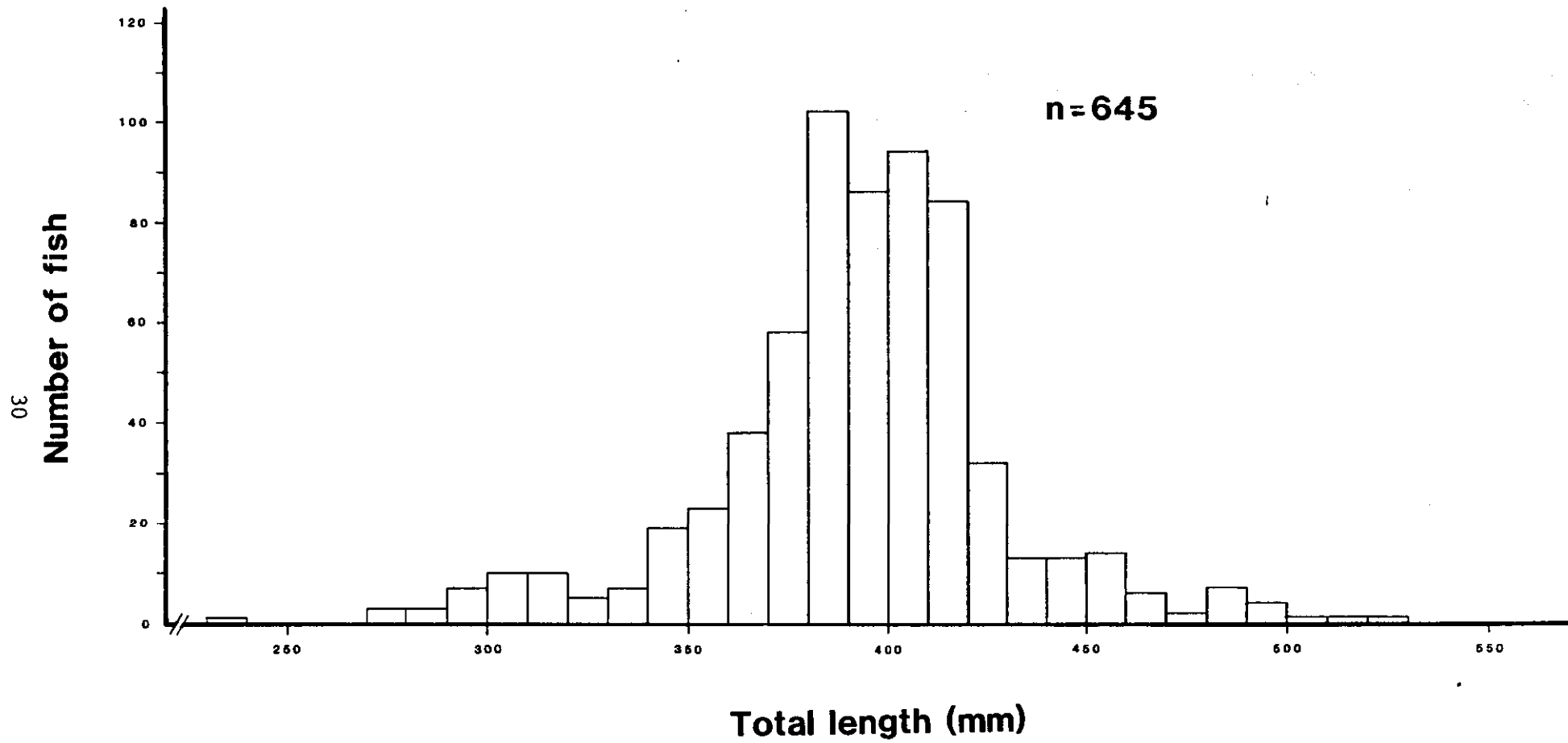


Figure 7. Length-frequency distribution for cutthroat trout sampled during creel census at Henrys Lake in 1984.

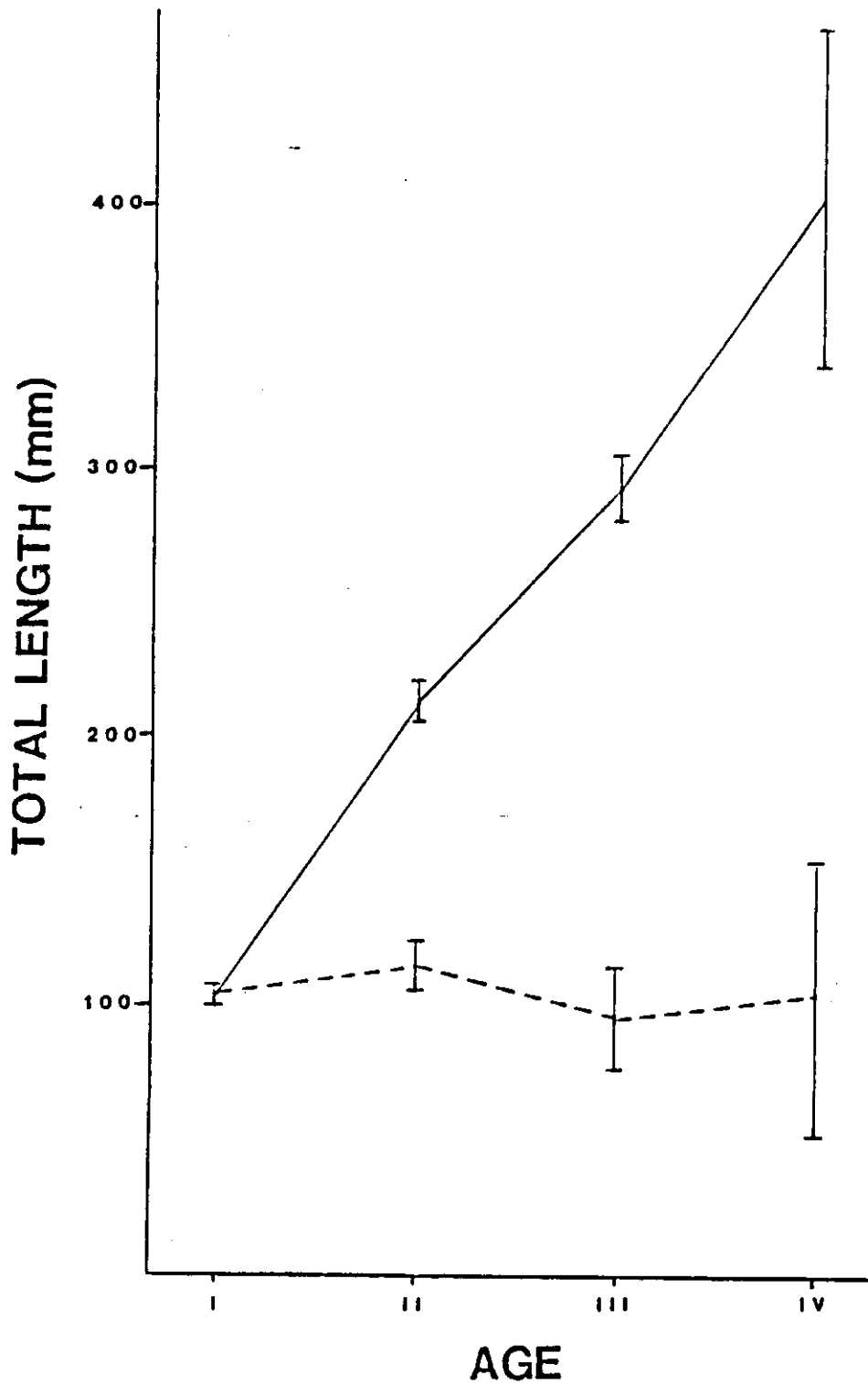


Figure 8. Mean back-calculated total lengths at annuli (solid line) and annual growth increments (broken line) for cutthroat trout sampled in 1984 from Henrys Lake. Error bars indicate 95% confidence intervals.

Back-calculated total lengths are greater for the 1984 cutthroat trout scale analysis at Henrys Lake than the majority of those cited in Carlander (1969) for cutthroat trout in other bodies of water. The back-calculated total lengths for the 1984 sample, however, are less than those reported by Irving (1953), Coon (1978), and Cole (1984) for the Henrys Lake cutthroat trout population (Table 16).

Previously reported back-calculated total length at annuli formation for Henrys Lake cutthroat trout are higher than those reported for the 1984 sample, but the growth has not declined significantly between year classes. The first year growth between the 1981, 1982, and 1983 year classes did not indicate a significant difference ($F=0.41$, $DF 2$, $P 0.05$). The same was true for the second year growth increment between the 1981 and 1982 year classes ($F=1.55e^{-4}$, $DF 1$, $P 0.05$) and the third year growth increment between the 1980 and 1981 year classes ($F=1.56$, $DF 1$, $P 0.05$).

Tributary Evaluations Duck

Creek

On the initial inspection of Duck Creek, May 26, there were no spawning cutthroat trout observed. The highly turbid flow at this time prevented any evaluation of the habitat. Duck Creek was again inspected on June 8 and June 12. At this time, spawners were observed above as well as below the Bootjack Pass Road crossing.

Hope Creek

Hope Creek was inspected once on May 26, and there was no spawning activity observed at the road crossing.

Howard Creek

Inspections at Howard Creek were conducted on May 26, May 31, June 8, and June 12. On each of these dates, there were spawning cutthroat trout observed below the Highway 87 crossing but not above. On May 26, there were large numbers of cutthroat trout observed at the Howard Creek slough, and on June 12, many spawners were visible below Salisbury's irrigation pond.

Kelly Creek

Inspections at Kelly Creek were conducted on May 26, June 8, and June 12. There were numerous spawning cutthroat trout and visible redds noted up to the spring headwaters.

Table 16. Comparison of mean back-calculated total length (mm) at annuli formation of cutthroat trout sampled from Henrys Lake in 1950-51 (Irving 1953), 1977 (Coon 1978), 1983 (Cole 1984), and 1984.

Years sampled	Number sampled	Back-calculated total length at annulus				
		I	II	III	IV	V
1950-51	363	132	292	417	500	533
1977	32	148	295	409	466	533
1983	56	121	260	332	415	--
1984	115	104	213	292	401	--

Pittsburgh Creek

There was a high level of spawning activity observed at Pittsburgh Creek in 1984. During visual inspections conducted on May 22, May 26, May 31, June 8, and June 12, there were many cutthroat trout spawners observed utilizing habitat above as well as below the highway culvert.

Targhee Creek

Visual inspections of Targhee Creek were conducted on May 22, May 31, June 8, and June 12. There was spawning activity below the highway culvert on every inspection date. The May 31 inspection was the only date that spawning cutthroat trout were seen utilizing the habitat above the highway culvert. There were many fish seen on the downstream side of the culvert during each inspection and appeared to be congregating in that area.

Timber Creek

On the initial inspection of Timber Creek, May 22, spawning cutthroat trout were observed above the highway crossing. When inspected on June 12, however, there was no spawning activity above the highway, but a high level taking place below the culvert.

Wild Rose Creek

Inspections of Wild Rose Creek were conducted on all five dates in May and June. On each occasion, redds were observed below the highway. Cutthroat trout spawners were observed on May 26 and June 8 only. There appeared to be no spawning activity above the highway culvert.

Stocking Programs

In 1984, cutthroat trout fry and fingerlings reared at Henrys Lake (575,000) and those reared at Ashton Fish Hatchery (661,500) were fed TM—50 as an attempt at mass marking the 1984 stock (Table 17). The fingerlings from Ashton and the McCall Hatchery (798,372) were released in Timber, Duck, Howard, and Targhee creeks and at the state and county boat docks.

The cutthroat x rainbow hybrid strains reared at the Grace Hatchery (redband 24,519 and McConahay 35,000) were released at the county boat docks. The Erwin strain (75,108) reared at Henrys Lake Hatchery were released into Hatchery Creek.

Table 17. Species composition and number of trout stocked at Henrys Lake in the fall, 1984.

Species	Source	Number	Size number/pound	Total
Cutthroat	Ashton ^a	661,500	250	
Cutthroat	McCall	798,372	324	
Cutthroat	Henrys Lake ^a	412,500	275	
		162,495	690	2,034,895
Ct x Rb (redband)	Grace	24,519	487	
Ct x Rb (McConahay)	Grace	35,000	429	
Ct x Rb (Erwin)	Henrys Lake	75,108	1,138	134,627
Brook trout	Cornell, N.Y.		0 ^b	

^aThese fish were fed TM-50 for marking purposes. ^bNo eggs were received from the supplier in 1983.

There were no brook trout eggs received from the supplier at Cornell, New York, in 1983. Consequently, there was no brook trout stocking at Henrys Lake in 1984 (Table 17).

The use of fluorescent pigment as a mass-marking technique was tried in 1981 to mark cutthroat trout stocked in Henrys Lake. In 1984, 207 cutthroat trout (range 350 mm to 430 mm total length) sampled during creel checks were examined under an ultraviolet light to detect the fluorescent pigment. There was no evidence of the pigment in any of the fish checked.

Population Sampling

The trap netting operation at Henrys Lake during the fall of 1984 included 10 trap nights at 5 separate locations (Table 18). A total of 522 trout were captured. Cutthroat trout were the most abundant species (76%) and averaged 40 fish per trap night. Brook trout, 19% of the total sample, averaged 10 fish per trap night, and hybrid trout averaged 3 fish per trap night.

During October and November, brook trout were sampled at the Hatchery Creek spawn house as well as with trap nets. The total fall sample of brook trout (N=162) ranged from 205 mm to 460 mm total length and had a mean total length of 344 mm. Unmarked fish comprised 51% of the brook trout sampled with trap nets (N=71) and had a mean total length of 303 mm (Table 19). The Temiscamie strain (AD marked brook trout) stocked in 1982, comprised 87% of the total spawn house sample and had a mean total length of 356 mm (Table 20).

The Assinica strain (LV marked brook trout) stocked in 1980, which were not found in the creel checks during 1984, comprised 3% of the total fall brook trout sampled with trap nets and at the spawn house. The mean total length of the Assinica strain (N=5) was 344 mm (range 275 mm to 365 mm).

Sterile Hybrid Experiments

The sterile hybrid (cutthroat x rainbow) experiments conducted at Henrys Lake in 1984 showed promising results. The best survival to eye-up was the test group treated at 27 C for 25 minutes at 25 minutes post-fertilization (Table 21). Chromosome analysis of this group showed 17 of 20 eyed eggs to be triploid (Scheerer, pers. comm.). Several treatment groups had 100% triploids produced; the best eye-up survival was at 29.5 C treatment temperature for 10 minutes at 10 minutes post-fertilization.

Table 18. Number of fish sampled by trap netting at Henrys Lake, 1984.

Location	Net nights	Cutthroat	Hybrid	Brook trout				Total trout	Shiner	Sculpin
				AD	LV	RV	NM			
Hatchery Creek	9 Sept	24	1	10	1	0	2	38	0	0
	11 Sept	13	0	8	0	1	6	28	0	0
	20 Oct	68	10	11	3	3	7	102	0	0
	23 Oct	41	3	14	0	1	0	59	0	0
Total	4	146	14	43	4	5	15	227	0	0
Henrys Lake Lodge	23 Oct	3	1	1	0	0	0	5	5	1
Staley Springs Harbor	18 Nov	49	0	0	0	0	0	49	0	0
	19 Nov	27	1	1	0	0	0	29	0	0
	20 Nov	45	0	1	0	0	1	47	0	0
Total	3	121	1		2	0	0	1	125	0
	0									
Timber Creek	27 Oct	1	0	0	1	0	9	11	0	0
Wild Rose Creek	27 Oct	128	9	9	0	1	7	154	0	0
TOTALS	10	399	25	55	5	6	32	522	5	1
Number/ net night		39.9	2.5	5.5	0.5	0.6	3.2	52.2	0.5	0.1

Table 19. Mean total length and size range (mm) of brook trout sampled by trap nets at Henrys Lake, fall 1984.

Mark ^a	Month sampled	Sample size	Mean total length	Sample range
AD	September	18	362	300-405
	October	9	370	300-400
	November	1	370	--
	Subtotal	28	365	
LV	September	1	340	--
	October	3	328	275-365
	Subtotal	4	331	
NM	September	3	288	255-315
	October	32	304	230-460
	November	1	320	--
	Subtotal	36	303	
RV	September	1	420	--
	October	2	408	385-430
	Subtotal	3	412	
	TOTAL	71	334	230-460

^aAD=Adipose clip, Ford stock from Sandpoint Hatchery (N=82,503) planted in 1980 or Temiscamie strain (N=18,448) planted in 1982.

LV=Left ventral fin clip, Assinica strain (N=6,180) planted in 1980.

NM=No mark, naturalized population of brook trout.

RV=Right ventral fin clip, domestic Ford Hatchery (N=2,110) planted in 1980 or Temiscamie strain (N=20,930) planted in 1981.

Table 20. Mean total length and size range (mm) of brook trout sampled at the Hatchery Creek spawn house, fall 1984.

Mark ^a	Month sampled	Sample size	Mean total length	Sample range
AD	October	69	357	270-415
	November	10	354	285-385
	Subtotal	79	356	
LV	November	1	345	--
NM	October	3	310	255-265
	November	2	275	205-345
	Subtotal	5	296	
RV	October	3	388	325-435
	November	3	282	215-400
	Subtotal	6	296	
	TOTAL	91	352	205-415

^aAD=Adipose clip, Ford stock from Sandpoint Hatchery (N=82,503) planted in 1980 or Temiscamie strain (N=18,448) planted in 1982.

LV=Left ventral fin clip, Assinica strain (N=6,180) planted in 1980.

NM=No mark, naturalized population of brook trout.

RV=Right ventral fin clip, domestic Ford Hatchery (N=2,110) planted in 1980 or Temiscamie strain (N=20,930) planted in 1981.

Table 21. Experimental heat shock treatments of cutthroat trout x rainbow trout hybrids at Henrys Lake, 1984.

Treatment temperature (C)	Time after fertilization (min)	Treatment duration (min)	Triploidy % (N)		Survival to eye-up (%)
25	--	25	--	--	70
26		25	0	5	63
27		25	85	20	83
28.5		10	100	5	48
29		10	100	10	55
29.5		10	100	5	64
30		10	ND	ND	31
Control			0	5	92

DISCUSSION

Hatchery Creek Spawning Run

The dramatic increase in the 1984 cutthroat trout spawning run at Hatchery Creek (four times greater than observed in 1983) can be credited to the increased stocking program at Henrys Lake since 1980. The increased number of three- to five-year-old cutthroat spawners should provide another surplus egg take in 1985.

The 1984 hybrid trout spawning run at Hatchery Creek was 64% greater than the 1983 run. This increase is still less than the number of hybrid spawners observed during the three previous years, 1980 through 1982. The increase of hybrid spawners at Hatchery Creek in 1984 may be indicative of a similar increase in hybrid spawning activity in other major spawning tributaries of Henrys Lake. This suggests experimentation to produce sterile hybrid trout be continued at Henrys Lake.

Consideration with respect to where the cutthroat x rainbow hybrid trout are planted could be beneficial to the management of the Henrys Lake cutthroat trout population. Stocking hybrid trout via Hatchery Creek, thereby imprinting these fish at this location, would enhance the evaluation of the sterile hybrid program. Data on the return rate of hybrid spawners and the structure of the hybrid trout population could be collected during the spring spawntaking operation. Imprinting hybrid trout to return to Hatchery Creek would also minimize the number of hybrids spawning with cutthroat trout in the other major tributaries of Henrys Lake.

Sport Fishery

Angler Effort and Harvest

The trophy harvest of cutthroat trout was substantially lower (0.5%) in 1984 compared to previous years since 1976 and well below the 10% goal set by the Fisheries Management Plan for Henrys Lake. The percent of cutthroat trout reaching trophy criterion in 1985 should increase due to the increased stocking rates since 1980. More four- and five-year-old fish should appear in the 1985 creel checks.

Brook trout comprised 3.1% of the total trout harvest, which is considerably lower than the goal of management's 15% for brook trout. The percent of brook trout that reached trophy length (>450 mm) was 13%.

The estimated number of cutthroat x rainbow hybrid trout harvested in 1984 increased by approximately 100 fish from 1983. Hybrid trout

comprised 5.3% of the total trout harvest, which is well below the goal of 20%. The mean total length (427 mm) remained similar to previous years. The percent of trophy length hybrid trout harvested in 1984 (5%) was at an all-time low and well below the goal of 20%. This is probably due to the reduction of the hybrid trout stocking rate from 1979 through 1981.

The management plan for Henrys Lake set a catch rate goal of 0.70 trout/hour with a species composition of 65% cutthroat trout, 20% hybrid trout, and 15% brook trout. In 1984, the catch rate was 1.7 trout/hour and well above the set goal. However, management plan objectives are not being met regarding species composition and proportion of trophy cutthroat and hybrid trout in the catch. A reduction in cutthroat stocking would appear to be the first action to take to bring the fishery closer to accord with the management plan.

Scale Analysis

Cutthroat trout scale analysis in 1984 indicates a continued decrease in rate of growth in the Henrys Lake cutthroat population. The back-calculated total lengths for each annulus formation was less than previous years.

More than half of the scale samples were found to be from fish in the three-year-old age class, while 37 were from the two-year-old age class, and 6 were classed as four-year-old fish. If this is representative of the total cutthroat trout population in Henrys Lake, the 1985 harvest should reflect this. The mean total length and number of trophy length cutthroat trout should increase due to a greater number of four- to five-year-old fish entering the fishery in 1985.

Tributary Evaluations

Habitat utilization by spawning cutthroat trout above the highway crossing at Howard, Targhee, and Wild Rose creeks appeared to be minimal. The upstream migration of cutthroat spawners at these locations was restricted by the highway culverts.

The 1985 spawning run at Henrys Lake should be larger than the 1984 run. The increased stocking started in 1980, and the 1984 scale analysis of the cutthroat population indicates an increase of three- to five-year-old fish. Effort should be taken in 1985 to enhance the upstream migration at those tributaries in which highway culverts appear as barriers.

A more efficient method of evaluating total numbers of spawning cutthroat trout in the major tributaries of Henrys Lake should be implemented. If the natural recruitment of the cutthroat trout

population is indeed increasing as Indicated, the need for stocking large numbers of cutthroat fry and fingerlings could be reduced in the future.

Stocking Programs

In 1984, 2.035— million cutthroat trout fry and fingerlings were released from hatchery stocks at various locations of Henrys Lake. Since 1980, management recommended stocking 2.0 million cutthroat fry and fingerlings annually to maintain the fishery.

Evaluation of the cutthroat trout population structure at Henrys Lake in 1984 indicates that the number of cutthroat trout spawners should be greater in 1985. The Hatchery Creek spawning run should produce another record breaking number of cutthroat trout returning to the spawn house.

The need for an increase in the stocking of brook trout and hybrid trout is apparent. The low percent of composition of these species needs improvement, and to reach the management goals, increased stocking rates are the only alternative.

Sterile Hybrid Experiments

Research work has shown that triploid salmonids can be mass produced practically and effectively. Survival to eye—up of treated groups is generally lower than control groups, and triploidy obtained varies from about 60% to 100%.

If, as expected, there is a surplus of cutthroat trout eggs collected during the Henrys Lake spawning operation at Hatchery Creek in 1985, sterile hybrid production can be increased. If a 70% triploid success rate can be achieved, some mortality can probably be tolerated as a necessary trade—off for This worthwhile purpose.

By stocking cutthroat x rainbow hybrid trout at Hatchery Creek, thus imprinting them at this location, added protection can be afforded the natural cutthroat trout genetic makeup.

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LITERATURE CITED

- Allen, S.K., Jr., and J.G. Stanley. 1978. Reproductive sterility in polyploid brook trout (Salvelinus fontinalis). *Transactions of the American Fisheries Society* 107:473—478.
- Carlander, K.D. 1969. *Handbook of freshwater fishery biology*, Vol. 1. Iowa State University Press, Ames, Iowa. 752 pp.
- Cole, D.C. 1984. Evaluation of Henrys Lake trout stocking program. Idaho Department of Fish and Game, Job performance report, Project F—73—R—6, Subproject III, Study IV.
- Coon, J.C. 1978. Evaluation of Henrys Lake management program. Idaho Department of Fish and Game, Job performance report, Project F—53—R—12, Job XIV—b.
- Fraser, C.M. 1916. Growth of the spring salmon. *Transactions of the Pacific Fishery Society*. Seattle, WA 1915:29—39.
- Irving, R.B. 1953. Ecology of the cutthroat trout, Salmo clarki Richardson, in Henrys Lake, Idaho. MS Thesis, Utah State Agricultural College.
- Laakso, M. and O.B. Cope. 1956. Age determination in the Yellowstone cutthroat trout by the scale method. *Journal of Wildlife Management* 20:138—153.
- Lee, R.M. 1920. A review of the methods of age and growth determination by means of scales. *Fisheries Investigations*, London. Ser. 11, 4, 2.
- Rohrer, R.L. 1981. Henrys Lake fisheries investigations. Idaho Department of Fish and Game, Job performance report, Project F—73—R—2. 83 pp.
- Rohrer, R.L. 1982. Henrys Lake fisheries investigations. Idaho Department of Fish and Game, Job performance report, Project F—73—R—3. 44 pp.
- Spateholts, R.L. 1984. Ecology of naturalized and introduced stocks of brook trout in Henrys Lake, Idaho. MS Thesis, Idaho State University.
- Thorgaard, G.H. and G.A. Gall. 1979. Adult triploids in a rainbow trout family. *Genetics* 93:963—973.
- Thorgaard, G.H., M.E. Jazwin, and A.R. Stier. 1981. Polyploidy induced by heat shock in rainbow trout. *Transactions of the American Fisheries Society* 110:546—550.
- Zar, J.H. 1984. *Biostatistical analysis*. Prentice—Hall, Inc. Englewood Cliffs, NJ. 718 pp.

A P P E N D I C E S

Appendix A. Estimated total angler hours, harvest, and catch rates by boat anglers at Henrys Lake, 1984.

Census interval	Angler hours	Trout harvested						Total	Trout released	Total trout hour
		Cutthroat	Hybrid	Brook						
				RV ^a	AD ₁ ^b	AD ₂ ^c	NM ^d			
05/26-06/08	25,604	8,628	307	28	26	26	154	9,167	27,576	1.44
06/09-06/22	14,320	4,453	180	0	0	27	80	4,720	16,880	1.51
06/23-07/08	28,154	12,066	609	61	0	0	122	12,858	49,241	2.20
07/07-07/20	18,272	3,404	208	69	69	0	0	3,750	24,046	1.52
07/21-08/03	11,172	2,412	177	0	71	35	142	2,837	10,848	1.22
08/04-08/17	10,180	1,020	35	0	0	0	70	1,125	11,105	1.20
08/18-08/31	3,954	357	30	0	0	0	30	417	7,258	1.84
08/01-09/14	7,080	1,358	432	0	0	0	64	1,855	10,967	1.81
08/15-09/28	5,883	1,584	101	0	0	0	50	1,735	10,685	2.11
09/28-10/12	7,892	1,667	250	0	0	0	83	2,000	15,387	2.20
10/13-10/31	<u>1,436</u>	<u>583</u>	<u>42</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>21</u>	<u>646</u>	<u>1,790</u>	<u>1.70</u>
Totals	139,927	37,533	2,351	156	166	88	816	41,110	185,761	1.89

^a RV=Right ventral fin clip, domestic Ford Hatchery (N=2,110) planted in 1980 or Temiscamie strain (N=20,930) planted in 1981.

^b AD₁=Adipose clip, Temiscamie strain (N=18,448) planted in 1982.

^c AD₂=Adipose clip, Ford stock from Sandpoint Hatchery (N=82,503) planted in 1980.

^d NM^d=No mark, naturalized population of brook trout.

Appendix B. Estimated total angler hours, harvest, and catch rates by bank anglers at Henrys Lake, 1984.

Census interval	Angler hours	Trout harvested				Trout released	Total trout hour
		Cutthroat	Hybrid	Brook ^a NM	Total		
							1.44
05/26-06/08	3,128	854	31	0	885	3,616	
06/09-06/22	1,700	336	0	0	336	336	0.40
06/23-07/06	4,536	1,297	0	73	1,370	649	0.44
07/07-07/20	2,772	721	72	36	829	396	0.44
07/21-08/03	1,536	370	28	57	455	284	0.48
08/04-08/17	1,252	144	0	0	144	96	0.19
08/18-08/31	737	153	0	0	153	31	0.25
09/01-09/14	718	188	0	0	188	51	0.33
09/15-09/28	361	103	6	6	115	178	0.81
09/29-10/12	1,021	211	0	0	211	146	0.35
10/13-10/31	507	138	0	0	138	115	0.50
							0.59
Totals	18,268	4,515	137	172	4,824	5,898	

^aonly unmarked brook trout were present in bank angler sample

Appendix C. Estimated total angler hours, harvest, and catch rates by tube anglers at Henrys Lake, 1984.

Census interval	Angler hours	Trout harvested ^a				Trout released	Total trout hour
		Cutthroat	Brook		Total		
	R		NM				
05/26-06-08	626	70	0	21	91	3,186	5.23
06/09-06/22	396	34	0	9	43	1,050	2.76
06/23-07/06	2,850	245	0	0	245	9,958	3.58
07/07-07/20	2,100	185	0	0	185	4,089	2.04
07/21-08/03	1,352	135	23	0	158	3,268	2.53
08/04—08/17	1,060	22	0	0	22	2,864	2.72
08/18-08/31	847	25	0	0	25	2,735	3.26
09/01-09/14	584	51	0	0	51	2,133	3.74
09/15-09/28	620	26	0	0	26	2,416	3.94
09/29-10/12	242	27	0	9	36	789	3.41
10/13-10/31	6	0	0	0	0	22	3.67
Totals	10,683	820	23	39	882	32,510	3.12

^aHybrid AD1 and AD2 marked brook trout were not present in tube angler sample.

Submitted by:


Frederick L. Greider
Fish and Wildlife Technician

Approved by:

IDAHO DEPARTMENT OF FISH AND GAME


Jerry M. Conley, Director


Monte R. Richards, Chief
Bureau of Fisheries


David W. Ortmann
Fishery Research Supervisor