



**Evaluation of Transplanting Snake River
Steelhead Trout to the Pahsimeroi River, 1982**

**Performed for Idaho Power Company
Project IPC-26
Period Covered: 1 July 1981 to 30, June 1982**



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ABSTRACT

Previous research experiments have identified mid-April as the optimum time for release of steelhead smolts in the Pahsimeroi River. If the smolts cannot be released at the optimum time, early May releases will return more adults than late March. Smolts released in early May of 1979 returned 53% more adults than smolts released in late March of the same year.

Dorsal fin length is being adopted in management regulations to differentiate wild and hatchery fish in the sport fishery. Of 381 A-stock hatchery steelhead returning to the Pahsimeroi adult collection facility, only 5.5% had dorsal fins longer than 2 1/4 inches. Of 163 B-stock hatchery steelhead that spent two winters **in** the ocean, 45.7% had dorsal fins longer than 2 1/4 inches.

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INTRODUCTION

The Niagara Springs Steelhead Hatchery and Pahsimeroi Steelhead Collection Facility operations are part of Idaho Power Company's program to relocate steelhead and salmon stocks from the Snake River to the Salmon River because of inundation and blockage of their ancestral migration routes and spawning beds by Hells Canyon Dam.

This project was initiated in 1966, with the release of the first steelhead smolts from fish trapped at the base of Hells Canyon Dam. Present project plans are to obtain steelhead eggs from adults returning to the Pahsimeroi station from prior smolt releases, incubate the eggs to the advanced eyed stage and ship them to Niagara Springs Hatchery near Wendell, Idaho, for hatching.

The steelhead fry are placed in raceways at Niagara Springs Hatchery and reared until the following spring when they are trucked back to the Pahsimeroi River and released as seaward-bound smolts.

OPERATIONS AND RESEARCH - 1982

Smolt Delivery

General Production

Approximately 995,200 steelhead juveniles were transported in 44 truck-loads from Niagara Springs Hatchery and released into the Pahsimeroi River between 22 March and 24 April 1982. All fish were released directly into the Pahsimeroi River near the adult weir site. All fish were progeny from adult steelhead that returned to the Pahsimeroi station in the spring of 1981. The average smolt size was 3.4/lb (241 mm total length).

Marked Smolts

On April 7, 8 and 9, 1982, 94,700 smolts were released with the adipose fin excised and coded-wire tags (code 10/24/4) inserted in their snouts. These fish were previously vaccinated with a bivalent Vibrio bacteria containing LS 174 and MSC antigen at approximately 0.5 ml of bacterin media/fish using the spray or shower method described by Garrison (1977).

Along with the vaccinated group, 94,290 smolts were hauled to the Pahsimeroi River and released as controls. These fish also had the adipose fin excised and were carrying coded-wire tags (10/24/50). Both of these groups of fish were raised at Niagara Springs Hatchery. The vaccinated group averaged 233 mm and the controls averaged 244 mm.

These marked groups are the second replicate of an experiment begun in 1981 to test the comparative survival of steelhead treated with the Vibrio antigen.

Two additional marked groups of steelhead smolts were released at the Pahsimeroi weir. These fish were reared at Hagerman National Fish Hatchery as part of an experiment to test the relative return of A-strain versus B-strain steelhead. This experiment began in 1981 with A-strain fish from the Pahsimeroi Hatchery and B-strain fish from Dworshak National Fish Hatchery. In 1982, both strains were from adults returning to the Pahsimeroi weir. The B-strain were second generation returnees from the fish that originally came from Dworshak Hatchery.

Both groups were hauled to the Pahsimeroi weir simultaneously between March 30 and April 7, 1982. The 60,784 A-strain fish averaged 267 mm and were marked with an adipose fin clip and coded-wire tag code 5/10/20. The 58,281 B-strain fish averaged 225 mm and were marked with an adipose fin clip and coded-wire tag code 5/10/21.

Marked Adult Recoveries

Time of Release Experiment

Marked groups of steelhead were released in 1979 to test the relative success of March and May smolt releases. One group of 56,000 fish was adipose clipped, coded-wire tagged with code 10/3/43 and released on 19 and 20 March. A second group of 60,100 fish was adipose clipped, coded-wire tagged with code 10/3/44 and released between 30 April and 4 May. The March release averaged 195 mm and the May release 224 mm total length when released into the Pahsimeroi River.

Coded-wire tag recoveries of these marked fish were reported by Duke (1982). I compiled the data by major fishery and hatchery return for two fish-years and summarized the results in Table 1. Smolts released in early May returned 53% better than those released in March.

The results of this experiment supports conclusions from earlier research on time of release. In order to maximize return rate it is necessary to release the smolts during April. Further, if the smolts cannot be released during this optimum time frame, early May is a better alternative than late March.

Final Diet Experiment

In 1980, two marked groups of steelhead smolts were released to test the efficacy of feeding Oregon Moist Pellet (OMP) for 30 days prior to release. One group was representative of the standard hatchery product at Niagara Springs Hatchery. They were reared on the standard dry diet and released at an average size of 234 mm carrying coded-wire tags (10/21/57). The second group was fed the standard dry diet until 30 days prior to delivery when they were switched to OMP. This group averaged 226 mm when released and also carried coded-wire tags (10/21/56).

National Marine Fisheries Service personnel monitored the smolt out-migration in 1980 and estimated the number of fish that arrived at Lower

Table 1. Summary of coded-wire tag recoveries from steel head released in the Pahsimeroi River, March (10/3/43) and May (10/3/44), 1979.

Fishery	Data Code	1980/81		1981/82		Total	
		10/3/43	10/3/44	10/3/43	10/3/44	10/3/43	10/3/44
Columbia R. sport		2	4	1	3	3	7
Columbia R. gill		1				1	
Columbia R. Indian		10	9	6	23	16	32
Ocean			1				1
Idaho Sport		16	37	14	11	30	48
Misc.		1	1		1	1	2
Hatchery return		55	102	64	84	119	186
Total		85	154	85	122	170	276
No. smolts released						56,000	60,100
return						0.30	0.46

Granite Dam and ultimately survived to the lower Columbia River. Based upon their estimates, a slightly larger proportion of fish fed OMP as a final diet reached Lower Granite Dam and the lower Columbia River (Table 2). Subsequently, a similar ratio of tags were recovered in the 1981-82 fishery and hatchery return (Table 3).

As with many previous experiments, survival differences between groups of marked fish usually show up between the time the fish are released and their arrival at Lower Granite Dam. Results of this experiment will not be complete until the recoveries from the 1982-83 fishery are compiled. But, it appears from results so far that feeding Oregon Moist Pellet for the final 30 days of rearing does not contribute significantly more adult returns.

Table 2. Estimated number of steelhead smolts that arrived at Lower Granite Dam and the lower Columbia River, 1980.^a

<u>Group</u>	<u>Mark</u>	<u>Number released</u>	<u>Est. No. and % to L. Granite Dam</u>	<u>Est. No. and % to lower Columbia R.</u>
OMP-30 days	10/23/56	49,900	26,957 (54.0)	23,503 (47.1)
Control	10/23/57	50,325	23,984 (47.2)	21,271 (42.3)

^aUnpublished NMFS data.

Table 3. Summary of 1981-82 tag recoveries from steelhead released for a 30 day final diet experiment in 1980.

<u>Mark</u>	<u>Columbia R. sport</u>	<u>Columbia R. Indian</u>	<u>Ocean</u>	<u>Idaho Hatchery sport</u>	<u>Hatchery return</u>	<u>Total</u>	<u>%</u>
10/23/56 ^a	1	2	2	29	33	67	0.13
10/23/57 ^b		7	2	19	27	55	0.11

^aOMP final diet.

^bStandard dry diet.

Dorsal Fin Deformity Recognition

The degree of dorsal fin deformity at the Pahsimeroi Hatchery has been monitored since 1972. After spawning, the adult steelhead are inspected and

classified into three categories: -Class I - severely deformed and easily recognizable; Class II - moderately deformed and recognizable by someone knowledgeable; and Class III - slightly deformed or showing no deformities.

Dorsal fin deformity has been a reliable technique for assessing the contribution of hatchery fish in the Salmon River fishery. Most local anglers are able to correctly identify hatchery fish (Class I and II) in their creels.

The 10 year average proportion of fish in Class I and II at the hatchery is 93% and the average has been quite stable. In 1982, we classified 526 adults as:

Class	I	-	85.6%
Class	II	-	9.3%
Class	III	-	5.1%

Although dorsal fin deformity has been very useful in recognition of hatchery fish, it is based upon a subjective evaluation. Recent emphasis on wild fish management necessitated an enforceable nonsubjective means of hatchery fish recognition.

In the spring of 1979, Reingold (1980) measured a sample of dorsal fin lengths by fin erosion class. He found that 96% of the hatchery steelhead had dorsal fins less than 2 1/4 inches in height. Fishing regulations requiring release of fish having dorsal fins 2 1/4 inches or longer would result in releasing most wild fish caught. Although regulations of this type will work on A-stock steelhead returning to the Pahsimeroi Hatchery, preliminary indications were that most B-stock hatchery fish had dorsal fins longer than 2 1/4 inches and would have to be released.

We measured dorsal fins on both A-stock and B-stock steelhead at the Pahsimeroi Hatchery during the 1982 spawning run. Of 381 A-stock fish, only 5.5% had dorsal fins longer than 2 1/4 inches. On B-stock fish, 45.7% of the fins on the 163 fish we measured had dorsal fins longer than 2 1/4 inches.

Most of the dorsal fins on A-stock steelhead (regardless of ocean age) could be easily recognized as being less than 2 1/4 inches long and very few were even close to that size. Anglers would have to measure very few of these fish to determine if the dorsal fin exceeded 2 1/4 inches.

In addition to the 45.7% of the B-stock steelhead with fins longer than 2 1/4 inches, there were many fish near enough to that size to require anglers to measure the fins in order to determine the accurate fin length.

Adult Returns

1979 Release - 1978 Brood Year

In the spring of 1979, 1,373,000 smolts from Niagara Springs Steelhead Hatchery were delivered to the Pahsimeroi River. From this release, 2,967

I-ocean fish and 2,081 II-ocean fish returned to the adult collection facility in 1981 and 1982 respectively (Table 4). The 5,048 fish returning to the hatchery from the 1979 release is the second largest return in numbers, and the largest percentage return (0.37%). From the 1970 release, 5,216 fish returned to the hatchery (0.32%) (Reingold 1974).

Hatchery returns are "after the fact" enumerations and are radically affected by downstream fisheries. However, the percentage return to the Salmon River (0.71%) is also the highest in recent years; therefore, the downstream survival of these fish in 1979 and upstream survival through the Columbia and Snake rivers in 1980 and 1981 was substantially better than the four previous release years (Table 5).

There were 352 B-stock steelhead that returned to the adult collection facility in the spring of 1982. These II-ocean adults were returns from 157,000 smolts released into the old acclimation ponds in 1979. They were reared at Hagerman National Fish Hatchery for cold conditioning research by personnel from the University of Idaho Cooperative Fishery Unit.

1980 Release - 1979 Brood Year

In the spring of 1980, 1,098,000 smolts reared at Niagara Springs were released into the Pahsimeroi River. In 1982, 1,011 adults returned to the adult collection facility after one year in the ocean (Table 4). Two-ocean fish will return to the facility in 1983.

Salmon River Harvest Estimates

1980-1981

Using statewide harvest estimates for the fall of 1980 and check station results, Reingold (1982) projected the estimated harvest of hatchery steelhead from the Salmon River. For the 1980-81 run, he calculated an estimated hatchery fish harvest of 4,730. Following the completion of the statewide harvest survey for 1981, I recalculated the estimated harvest for the spring of 1981 using the proportion of hatchery fish harvest from the North Fork check station for river sections four and above. For river sections one through three, no creel information is available. However, since we have observed that in other years the proportion of hatchery fish in the spring harvest from sections one through three was about 50%, I applied that estimate. The estimate using this method for the spring, 1981, hatchery fish harvest is 1,427 which agreed with Reingold's (1982) estimated 1,430, so the total estimated harvest of hatchery steelhead from the Salmon River in 1980-81 was about 4,730 and the harvest rate on hatchery fish was 58%.

1981-1982

Pollard (1982) reported an estimated harvest of 8,001 steelhead from the Salmon River in the fall of 1981. In order to estimate the harvest for the spring, 1982 season, projections are necessary. Preliminary estimates will be refined when more data becomes available and the results included in next year's report.

Table 4. Releases, returns, marks used, and harvest of the Niagara Springs-Pahsimeroi River steelhead relocation program, 1974-1982.

Brood year Year released	Number steelhead released	Number marked	Marks used	No. adults returned to weir as:			Total brood year to weir	Marked adult returns	Total weir count (year)	Est. sport harvest (fish year)
				1-year ocean	2-year ocean	3-year ocean				
1974 1975	1,331,000	20,000 20,000 20,000	LVAd(Mar) RVAd(Apr) RV (May)	(72%) 1,395 (1977)	(28%) 533 (1978)	0 (1979)	1,928	LVAd 10 RVAd 17 RV 30	2,803 (1978)	(est) 4,200-60% (77-78)
1975 1976	1,610,000	25,000 25,000 25,000 25,000	LVAd(OMP) RVAd(dry) RV(OMP/dry) LV (large)	(49%) 2,242 (1978)	(51%) 2,306 (1979)	0 (1980)	4,548	LVAd 118 RVAd 60 RV 72 LV 303	2,501 (1979)	(est) 450-15% (spring 1979)
1976 1977	1,448,000	54,000 52,000 51,000 15,000	CWT(OMP-14) CWT(OMP-30) CWT(dry) CWT(Trans)	(67%) 195 (1979)	(33%) 97 (1980)	0 (1981)	292	OMP-14 8 OMP-30 15 Dry 7 Trans 0	1,620 (1980)	(est) 1,911-54% (79-80)
1977 1978	1,266,000	24,300 20,900 31,300 34,200	CWT(D. eggs) CWT(D. fry) CWT(Control) CWT(D. smolts)	(74%) 1,523 (1980)	(26%) 524 (1981)	0 (1982)	2,047	D. eggs 0 D. fry 4 Control 4 D. smolts 70	3,491 (1981)	(est) 4,730-58% (80-81)
1978 1979	1,372,000	57,500 61,700	CWT(March) CWT(May)	2,967 59% (1981)	2,081 41% (1982)	(1983)	5,048	March rel 119 May rel 186	3,444 (1982)	(est) 6712-66% (81-82)
1979 1980	1,098,000	52,600 52,500	CWT(OMP-30) CWT(Control)	1,011 (1982)	(1983)	(1984)		OMP-30 33 Control 27	(1983)	
1980 1981	862,500	37,550 37,950 38,400	CWT(Vibrio) CWT(Placebo) CWT(Control)	(1983)	(1984)	(1985)				
1981 1982	995,200	94,700 94,290	CWT(Vibrio) CWT(Control)	(1984)	(1985)	(1986)				

Table 5. Adult/smolt returns to the Pahsimeroi Hatchery and to the Salmon River and estimated sport harvest, 1975-1979 year classes.

Release year	No. of smolts released	Adult hatchery returns				%	Estimated Salmon River sport harvest	Estimated total return to Salmon R.	Smolt to adult percent to Sal.
		1-ocean	2-ocean	Total					
1975	1,331,000	1,395	533	1,928	0.14	2,320 (55%)	4,258	0.32	
1976	1,610,000	2,242	2,306	4,548	0.28	3,816 (46%)	8,364	0.52	
1977	1,448,000	195	97 ^a	292	0.02	151 (34%)	443	0.03	
1978	1,266,000	1,523	524	2,047	0.16	2,140 (51%)	4,187	0.33	
1979	1,372,000	2,967	2,081	5,048	0.37	4,730 (48%)	9,778	0.71	

^a/High 2-ocean returns due to closed fishing season in fall 1978.

^b/Extreme loss of 1977 outmigrants (99%) due to severe drought.

The catch of hatchery fish in the fall season was calculated by using Pollard's (1982) reported harvest by river section and the proportion of hatchery fish observed in angler's creels. Lindland and Bowler (1982) reported 61% and 83% hatchery in sections 2 and 3 of the Salmon River. North Fork check station results were used for sections 4 and 5. The total estimated harvest of hatchery fish during the fall season in the Salmon River is 5,705.

Water conditions in the spring of 1982 were marginal for steelhead fishing except for two weeks in March. Only about 15% of the fish-year harvest occurred during the spring season. The estimated total spring harvest is 1,411 of which 1,039 were of hatchery origin.

The total estimated harvest from the Salmon River for the 1981-82 seasons is 9,412 of which 6,712 (71%) were of hatchery origin. In the spring of 1982, 3,444 hatchery fish returned to the rack at the Pahsimeroi Hatchery. The total estimated return of hatchery fish to the Salmon River is 10,156 and the exploitation rate was 66%.

Salmon River Fishery, Sections 4 and 5

1981-1982

We operated the steelhead check station at North Fork to monitor the fishery in sections 4 and 5 of the Salmon River (Figure 1). This check station is operated in the same way every year. Check station operators run the check station on Saturdays and Sundays from about noon to dark. We collected information on number of anglers, hours fished, fish caught and kept or released and we inspected the catch to determine those of hatchery origin (Table 6).

In addition to the check station, we attempted to increase our knowledge of the fishery in Salmon River section four by using a jet boat to travel the unroaded area and interview anglers. The results of these interviews are listed in Table 7.

Fall, 1982

In order to take adequate steps in preserving wild stocks, steelhead anglers fishing between Vinegar and Long Tom creeks were required to release steelhead with dorsal fins less than 2 1/4 inches long. An exception was included whereby trophy fish longer than 37 inches could be kept. Barbless hooks were required between Vinegar and Long Tom creeks.

We operated the North Fork check station in the standard manner through the fall season. The fall season was opened on 18 September and we began operating the check station on that date.

Record high numbers of anglers, hours fished, and fish caught were recorded in the fall of 1982 (Table 8). Hours fished was 49% higher than

Table 6. Steelhead angler data from the North Fork check station, fall 1981, spring 1982.

Weekend Dates	Fall 1981						
	Anglers	Hours	Steel head			Hrs/fish	Percent hatchery
			Kept	Rel.	Total		
9/19-20	195	943	14	2	16	60	100
9/26-27	174	975	8	3	11	89	63
10/3-4	307	1,561	35	16	51	31	57
10/10-11	327	2,092	45	9	54	39	64
10/17-18	357	2,854	115	18	133	21	68
10/24-25	357	2,713	132	15	147	18	65
10/31-11/1	405	2,551	135	27	162	16	81
11/7-8	451	3,592	185	33	218	16	81
11/14-15	351	2,682	99	22	121	22	88
11/21	166	1,369	54	9	63	22	92
Subtotals	3,090	21,278	822	154	976	22	76%
Spring 1982							
3/20-21	407	3,566	132	48	180	20	77
3/27-28	488	4,129	73	31	104	41	58
Subtotals	895	7,695	205	79	284	27	70%
Totals	3,985	28,973	1,027	233	1,260	23	72%

Table 7. Steelhead catch data collected from jet boat anglers, Salmon River section 4, fall 1981, spring 1982.

Dates	Anglers	Hours	Fall 1981			Hrs/fish	Percent hatchery
			Steelhead				
			Kept	Rel.	Total		
10/2-3	15	163	3	1	4	41	33
10/11-13	98	947	15	0	15	63	60
10/16-18	67	638	34	3	37	17	59
10/23-25	68	589	53	3	56	11	37
10/30-31	53	685	12	0	12	57	43
11/7-3	72	362	22	8	30	12	61
11/15-16	32	311	24	3	27	12	54
11/20	6	36	4	0	4	9	50
Subtotal	411	3,731	167	18	185	20	53%
Spring 1982							
2/10	24	340	7	4	11	31	0
3/13	49	490	7	4	11	45	50
3/21-22	38	429	10	8	18	24	20
Subtotal	111	1,259	24	16	40	32	22%
Totals	522	4,990	191	34	225	22	49%

Table 8. Steelhead angler data collected at the North Fork check station, fall, 1982.

Dates	No. Anglers	No. Hours	No. steelhead			Hrs/fish	Percent hatcher
			Kept	Released	Total		
9/18-19	278	1,616	56	20	76	21	96
9/25-26	328	2,239	65	8	73	31	94
10/2-3	398	2,514	122	36	158	17	96
10/9-10	546	3,642	221	71	292	13	98
10/16-17	466	3,332	108	29	137	24	96
10/23-24	488	4,484	192	51	243	19	97
10/30-31	381	3,848	176	39	215	18	98
11/6-7	470	4,610	266	88	354	13	96
11/13-14	360	3,534	117	48	165	21	97
11/20-21	230	1,947	81	25	106	18	97
Totals & Averages	3,945	31,766	1,404	415	1,819	18	97

**SALMON AND STEELHEAD CATCH LOCATION
Reference Map**

Anglers:

Please use this map and the river section description list on the reverse side to record on your permit your salmon and steelhead catches by designated section. Use the river section or tributary name shown on the map. Examples: "Salmon - 5" for catches from main Salmon River between the Middle Fork and Lemhi River; "Salmon - 3" for main river catches between the Little Salmon and South Fork; "Upper Clearwater" for catches between the North Fork and the South Fork. Use tributary names when applicable.

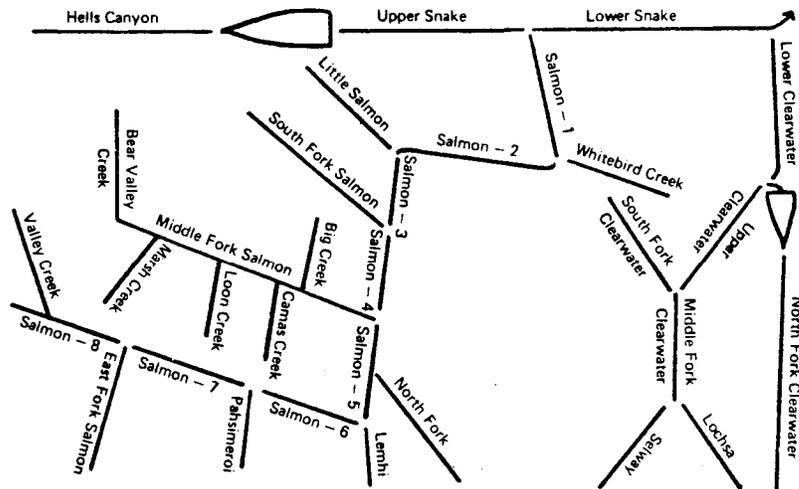


Figure 1. Steelhead catch location map, showing statistical sections for Salmon River.

the fall of 1981 and fish caught was 86% higher. Even though it was legal to keep wild fish upstream from Long Tom Creek, few were caught and most of those were released. The proportion of hatchery fish caught was 97%.

Of the 42 wild steelhead we checked at North Fork, only 3 were trophy-size fish from section 4. On the average, about 16.6% of the fish caught from section 4 are checked at the North Fork check station. Using this proportion yields an estimate of 18 trophy-size wild fish caught from section 4 in the fall season. The special regulations included 22 miles of section 3 as well as the 65 miles of section 4. If the catch rate of trophy size fish from section 3 was the same as in section 4, I estimate the total harvest of 24 wild fish from the river reach with special regulations. This estimate does not include fish taken illegally.

Fall Hatchery Return

Steelhead usually do not enter the adult collection facility in the fall. Since 1969, only two steelhead returned to hatchery in the fall, i.e. in 1976. Four steelhead entered the Pahsimeroi trap in October 1982. They were all II-ocean fish. We jaw-tagged these three females and one male and released them back into the Salmon River at the mouth of Spring Creek on 18 October. One tag was turned in at the North Fork check station the following weekend. No further returns were reported from the fishery or hatchery rack.

Fry Plants

After the amount of eggs were taken to meet the requirements of the hatchery program at Niagara-Pahsimeroi and other commitments, excess adult steelhead were spawned. The resulting eggs were hatched at the Pahsimeroi station and the swim-up fry released in various streams in the upper Salmon River (Table 9). This is part of an attempt to enhance the naturally spawning runs in the area by distributing steelhead in presently under-utilized streams.

Pending Research

The majority of the steelhead that have returned to the Pahsimeroi adult collection facility have spent a single winter in the ocean. Recent returns seem to indicate a shift toward an additional winter of ocean life before returning to spawn. The degree of heritability of ocean age is unknown for upriver summer steelhead. And, we do not know if ocean age is a sex-linked trait.

In the spawning run of 1983, our plans are to conduct test crosses of known-age females with known-age males. Smolts from these test lots will be tagged with coded wires prior to release. Adult returns from the test lots will return in 1986 and 1987.

Table 9. Numbers of fry hatched at the Pahsimeroi Hatchery and released into Salmon River tributary streams, spring, 1982.

Release Stream	Date	Stock	No. Fry Released
East Fork Salmon River	6/7	A	82,560
Pole Creek	6/10	B	104,576
Herd Creek	6/11	B	211,904
S. Fork Iron Creek	6/13	B	41,280
N. Fork Iron Creek	6/13	B	41,280
Lemhi River	5/19	A	164,853
Lemhi Big Springs	5/20 & 21	A	285,007
Bear Valley Creek (Hayden Creek)	5/19	A	91,545
North Fork Salmon River	5/18, 6/3	A	156,696
Moose Creek	6/3	A	24,000
Pine Creek	5/14	A	62,208
Owl Creek	5/14	A	31,968
Spring Creek	5/14	A	72,576
Panther Creek	5/15	A	95,200
Deep Creek	5/15	A	22,848
Squaw Creek	5/14	A	72,576
Hughes Creek	5/24	A	69,120
Sheep Creek	5/11	A	106,624
Indian Creek	5/12	A	118,048
Pahsimeroi River	4/26, 28, 29, 5/14, 24	A	399,872
Total			2,254,741

LITERATURE CITED

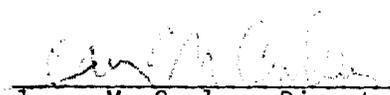
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