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Evaluation of Transplanting Snake River
Steelhead Trout to the Pahsimeroi River, 1971

By

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EVALUATION OF TRANSPLANTING SNAKE RIVER STEELHEAD TROUT TO THE PAHSIMEROI RIVER, 1971

ABSTRACT:

In the spring of 1971, a total of 713 adult steelhead trout from 1968 and 1969 smolt releases returned to the Pahsimeroi River steelhead collection station. These fish yielded some 1,758,000 eggs for hatching and rearing for the 1972 program.

Returns of fin—clipped fish indicate higher smolt to adult survival for smolts released directly in the river versus those held in acclimation ponds prior to release.

Approximately 61 percent of the steelhead caught in the fall of 1971 in the Salmon River above the South Fork were hatchery reared fish as compared to about 20 percent for the prior three years. It appears that the smolt to adult survival of the first second generation adult returnees of transplanted hatchery stocks exceeds that of their parents.

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RECOMMENDATIONS:

Diligent inspection of returning adults in the sport catch and at weirs should continue to aid in the proper evaluation of mark and release programs.

Eggs and progeny from steelhead adults that return to the Pahsimeroi River from prior smolt releases should receive priority over Hells Canyon stock at Niagara Springs for replanting in the Pahsimeroi River.

Deliver smolts from Niagara Springs to the Pahsimeroi between April 1 and May 15 if transportation equipment is available.

OBJECTIVES:

To monitor the behavior, migration, and adult returns of steelhead reared at Niagara Springs Hatchery and released in the Pahsimeroi River.

To evaluate returns to the Pahsimeroi River of transplanted Snake River stocks of steelhead trout.

INTRODUCTION:

The Pahsimeroi facilities and the background on the project are described in previous project reports (Reingold 1968, 1969, 1970, 1971).

Briefly, Snake River race steelhead eggs are obtained from adult steelhead returning to the Pahsimeroi River (from prior smolt releases) or at Idaho Power Company's Hells Canyon Dam fish facilities. The young are hatched and reared for one year to "smolt size" at Niagara Springs Hatchery. Smolts are then trucked to and released in the Pahsimeroi River near Challis, Idaho. This is 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 the construction of Hells Canyon Dam.

TECHNIQUES USED:

Enumeration Facilities - Adult

The adult steelhead trapping and spawning facilities remain basically the same as described in previous project reports (Reingold 1969, 1970, 1971).

Adult steelhead arriving at the weir were held in concrete pens until ripe. Project personnel took the spawn, incubated the eggs to the advanced-eyed stage and shipped the eggs to Niagara Springs for hatching and rearing. Approximately one year later the "smolts" were trucked back to the Pahsimeroi River and released to begin their sea-ward migration.

We collected adult length data by sex, took scale samples and recorded fin marks immediately after the fish were spawned. Personnel noted arrival dates of fish entering the facilities. Spawned-out steelhead carcasses were given to the public on a first-come-first-served basis.

Enumeration Facilities - Juveniles

The downstream migrant enumeration facilities remained unchanged from past years. I used the same trap, located on an irrigation screen bypass pipe at Burstedt Lane, approximately 11 river miles downstream from the release site near the acclimation ponds. A local resident serviced the trap at least once every day.

Delivery of Fish

Approximately 1,630,000 steelhead juveniles were hauled to the Pahsimeroi River from Niagara Springs Hatchery in 41 truck loads between March 8 and April 28, 1971. Some 1,376,500 smolts were released near the acclimation ponds 15 river miles above the mouth of the Pahsimeroi (Figure 1). This group included 50,000 fish marked with right-ventral, adipose fin clips.

Some 66,000 smolts were released near the adult trapping facilities about three and one-half river miles upstream from the mouth of the Pahsimeroi. This group included 50,000 fish marked with a right-ventral fin clip (Figure 2).

The remaining 187,500 steelhead juveniles were placed in the north acclimation pond at the upper station. The average size of these fish at delivery time was 23 per pound and 131 millimeters total length. Previous studies on the Pahsimeroi show that most actively migrating smolts exceed 170 millimeters and we felt these smaller fish would not leave the Pahsimeroi if released in the stream. We decided to rear the fish for an additional year in one of the acclimation ponds on an experimental basis, and release them in the spring of 1972. Some 50,000 of these fish were marked with a left-ventral adipose fin clip.

As of December 31, 1971, these steelhead averaged 4.4 per pound and 202 millimeters total length.

FINDINGS:

Downstream Migration

We marked steelhead smolts collected in the Burstedt Lane trap with an opercle punch and released them two river miles back upstream as in past years. We changed the location and/or pattern of the marks weekly. We marked and released 4,141 steelhead and recaptured 125.

Since 1967, recapture rates for the Burstedt Lane trap have ranged from 1.31 to 1.68 percent. In 1971, the average recapture rate of the trap jumped to 3.04 percent, about double that of previous years.

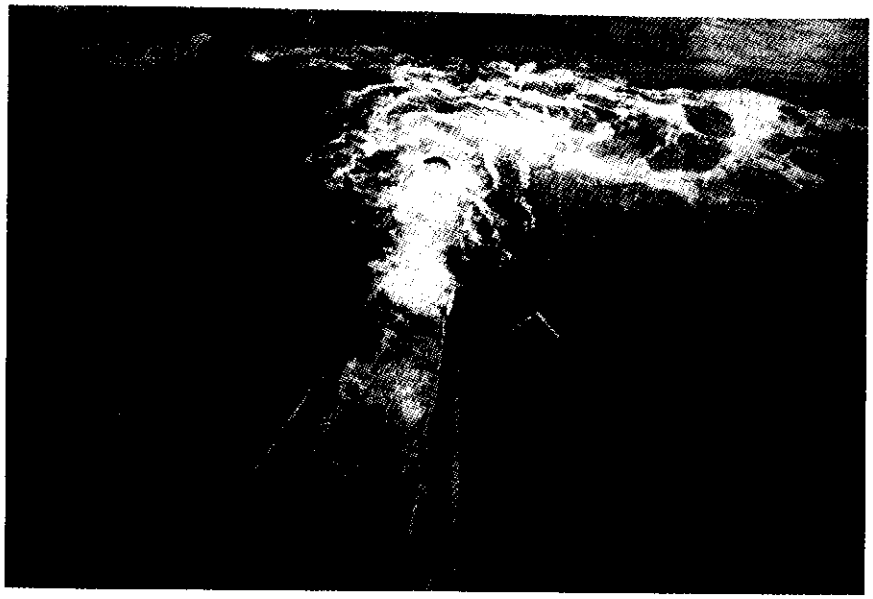

Figure 1. The majority of the smolts were released directly in the Pahsimeroi River some 15 miles above the mouth in the spring of 1971.

Figure 2. Approximately 50,000 of each group of smolts were fin clipped to facilitate identification as adults.

Total numbers of fish collected at the trap in 1971, however, remained close to 1970 figures. In 1971, there was 13,100 compared to 13,281 in 1970.

In 1970, over 80 percent of the smolts delivered were progeny from adults that returned to the station in 1969. The remainder originated as eggs taken at Hells Canyon Dam. In 1971, only 68 percent of the hatchery smolts were Pahsimeroi-origin fish. In 1970, trap estimates of total emigrants were 75 percent of total delivery. In 1971, based on the 1971 recapture rate (3.04 percent), I estimated that 39 percent of the smolts emigrated. Based on the past four years' average 9f.1.57 percent recapture, I computed an emigration percentage of 57 percent for 1971. Considering other evidence, however, this figure still appears low.

In the early years of the project, when eggs from Hells Canyon provided the only source of smolts, summer holdover and fall emigration ranged from 7 to 29 percent of the delivery. Evidence from prior years' studies indicate that only the spring migrating smolts survive to return as adult steelhead. We would, therefore, expect a strong trend toward spring emigrating progeny from Pahsimeroi returnee adults. This showed up dramatically in 1970 when only two percent of the total emigration occurred in the fall. Again in 1971 only 3.3 percent of the total trap catches occurred after September 1 (68 percent of the smolts were Pahsimeroi returnee progeny versus 81 percent in 1970).

Field reconnaissance work by canoe in the summer of 1971 disclosed a considerably reduced number of readily observable over-summering smolts as compared to past years, other than 1970. Although there appeared to be more over-summering juveniles than the observers noted in 1970, the increase was judged "slightly more".

During the period March 8 through June. 30, 1971, the Butstedt trap collected 876 steelhead with right-ventral adipose fin clips. We released 50,000 of these fish above the trap near the acclimation ponds. Applying the weekly trap capture rates established for 1971, I estimated that 47,650 of these fish passed the trap. This represents some 95 percent of the total delivery of these fish. These were all progeny from prior returning adults. If 95 percent of the total delivery of unmarked Pahsimeroi progeny emigrated in the same ratio, then some 932,000 fish passed the trap or 65 percent of the total delivery.

Due to the extremely small sample we collected at the Burstedt trap (less than one percent of the total delivery), the statistical confidence limits of projected emigration figures are extremely wide. We have viewed these trap estimates as more or less one piece of evidence in a total picture of the general emigration, coupled with stream observations, fall emigration numbers, and observations by various project personnel and anglers.

For 1971, our mark and recovery study indicates a rather low emigration figure. Other evidence, however, indicates a higher emigration figure, perhaps in the area of 65 percent. Viewing the evidence, I am inclined to accept the 65 percent figure as the more realistic indicator of emigration rate.

National Marine Fisheries Service biologists estimate that only 5 percent of Pahsimeroi Hatchery steelhead survived to Ice Harbor Dam in the spring of 1971 (Howard Raymond, personal communication).

Adult Returns - 1971 1968 Release:

Information from past years' returns indicate that Pahsimeroi steelhead 26 inches or less are mainly one-ocean fish and fish 27 inches or larger spent two growing seasons in the ocean (Reingold, 1971). In 1971, we counted 66 adults from the 1968 smolt release (27 inches or larger) at the trap (Figure 3).

The 1968 release of 1,484,000 smolts resulted in a total return (1970 and 1971) to the station of 467 adults. The contribution of hatchery fish to the sport catch is discussed later.

1969 Release:

In 1971, some 647 one-ocean adult steelhead returned to the Pahsimeroi facilities. These were from the 1969 release of 1,645,000 smolts in the Pahsimeroi River (Table 1).

Marked Adult Returnees

1968 Release:

We recorded a combined 1970 and 1971 total of 15 right-ventral adipose and 15 right-ventral clipped adults at the weir from the 1968 smolt release. These fin clips were applied to two test lots of 25,000 smolts released in 1968.

We held the 25,000 RVAD clipped group in one acclimation pond for 26 days prior to release into the Pahsimeroi and released the 25,000 RV clipped smolts directly into the river near the pond upon delivery. We hoped to determine if the difference in holding time in Pahsimeroi River water would reflect in numbers of adults returning to the station. The total return count of one-ocean (1970) and two-ocean (1971) adults to the station was 15 from each group, however, 5 and 2 of each group were seen in the sport fishery. For the 1968 release, holding smolts in the acclimation ponds prior to release yielded no greater returns than delivering smolts directly to the river (Table 1).

1969 Release:

In 1971, station personnel recorded 43 right ventral and 20 right ventral adipose clipped one-ocean adults returning to the station and we saw 6 and 7 respectively in the sport fishery. In 1969, we held 25, 000 RVAD clipped smolts in one acclimation pond for 30 days and released 25,000 RV clipped smolts directly **in** the river adjacent to the acclimation pond. This was a repeat of the 1968

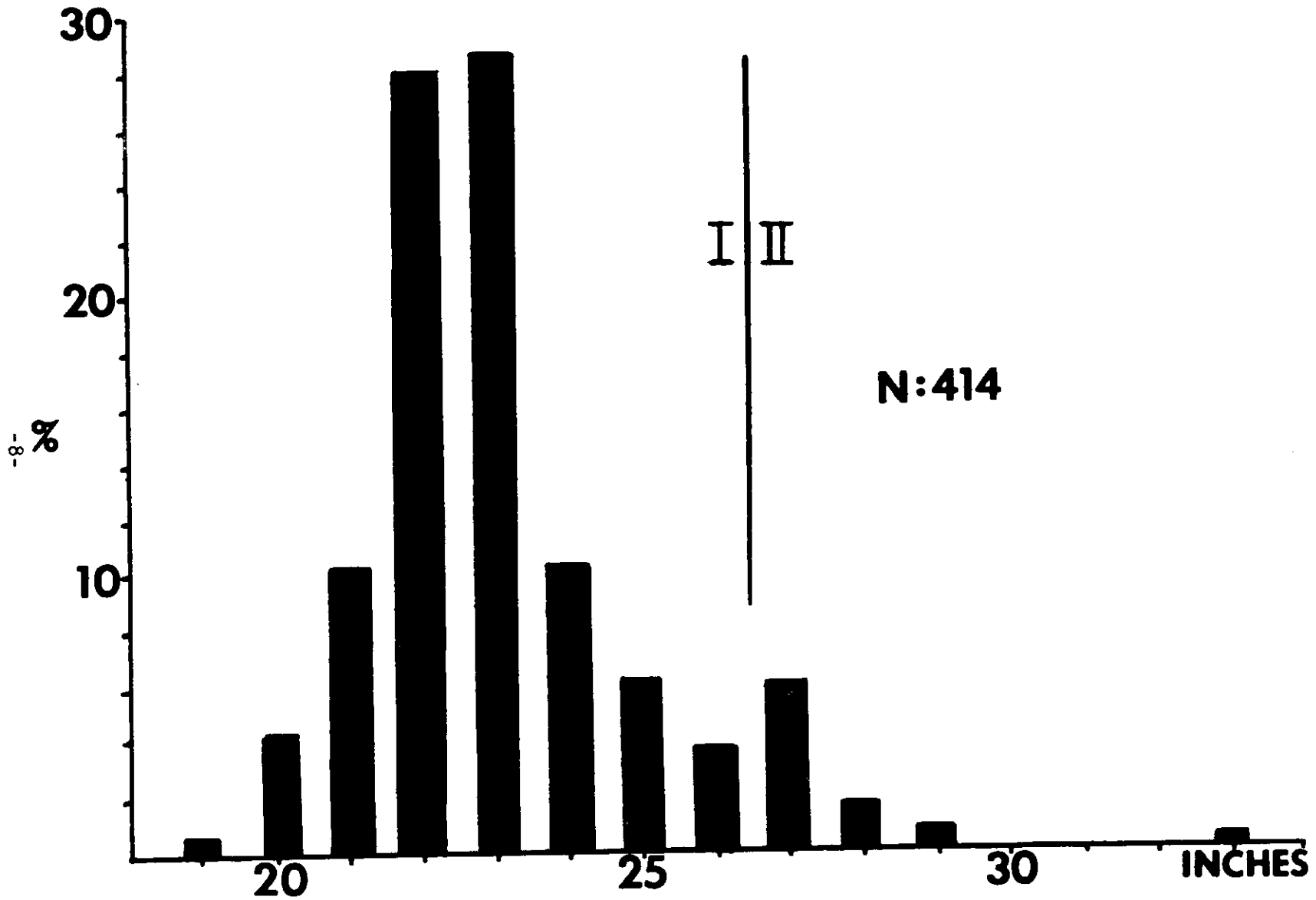

Figure 3. Length frequency and age classification of 414 steelhead from the 1971 hatchery steelhead run returning to the Pahsimeroi facilities. Group one fish (I) represent adults from the 1969 smolt releases. Group two fish (II) represent adults from the 1968 smolt releases.

Table 1. Summary of releases, returns, and egg take of the Pahsimeroi-Snake River steelhead relocation project since its inception in 1965.

Brood Year / Year Released	Number of Fish Released	Number Marked	Mark Used	Number Adults Returned as: One Yr. Ocean	Number Adults Returned as: Two Yr. Ocean	Total Adults to Weir	Total Brood Year to Weir	Est. Sport Catch	Est. Total Run Above S.R. 3	Marked Adults to Weir	Marked Adults in Sport Catch	Number of Eggs Taken at Weir
1965 / 1966	65,500	24,000	RVAD	- (1968)	0 (1969)	-		(brood year)	(brood year)	(brood year)	(brood year)	-
1966 / 1967	1,292,000	97,000	RVAD (Pond)	(89%) 798 (1969)	(11%) 107 (1970)	798 (1969)	(100%) 905 (1966)	593	1,493	39 RVAD	1 RVAD	1,620,000 (1969)
1967 / 1968	1,484,000	25,000	RV (river)	(86%) 401 (1970)	(14%) 66 (1971)	508 (1970)	(100%) 467 (1967)	391	858	15 RV	5 RV	1,662,000 (1970)
		25,000	RVAD (pond)							15 RVAD	2 RVAD	
1968 / 1969	1,645,000	25,000	RV (river)	647 (1971)	(1972)	713 (1971)		550 (1-ocean only)		43 RV	6 RV	1,758,000 (1971)
		25,000	RVAD (pond)							20 RVAD	7 RVAD	
1969 / 1970	1,622,000	25,000	RV (Low. Riv.)	(1972)	(1973)					Fall 1971 → Sport Catch Only	20 RV	
		25,000	RVAD (Up. Riv.)								8 RVAD	
1970 / 1971	1,442,000	50,000	RV (Low. Riv.)	(1973)	(1974)							
		50,000	RVAD (Up. Riv.)									

marking experiment. For the 1969 release, however, smolts held in the acclimation pond prior to release returned in 1971 at less than half the number of adult returns of smolts planted directly in the river (Table 1). Returns of two-year adults from the 1969 release in 1972 may change the ratio of return for the two marks released in 1969.

1970 Release:

In 1970, we released one group of 25,000 smolts marked with a right-ventral adipose fin clip in the Pahsimeroi River adjacent to the acclimation ponds about 15 river miles above the mouth. A second group of 25,000 smolts, marked with a right-ventral clip, was released near the adult steelhead trap about 3.5 river miles above the mouth. We hope to determine if the difference in river release area (acclimation time) will reflect in numbers of adults returning to the station.

Releasing the smolts lower in the river may also benefit smolt survival by reducing losses due to irrigation ditches, predation and delay and would reduce concentrations of non-migrants in the Pahsimeroi.

In the fall of 1971, we operated a check station on the main Salmon River road near North Fork, Idaho. Between October 9 and November 21, 1971, we inspected 356 sport-caught steelhead identified as hatchery origin by deformaties of the dorsal fin or fin clips. Of this number, 8 had a right-ventral adipose fin clip and 20 bore a right-ventral clip. All 28 fish were 26 inches or less total length. Assuming both groups were equally susceptible to angling, the number of RV clips over the RVAD clips is significant. (The ratio may change after weir returns are examined.) At this stage it appears that smolts released in the lower river are returning at a rate about twice that of smolts released in the upper river. It appears that the three and one-half mile trip down the Pahsimeroi resulted in adequate acclimation to instill a homing imprint in returning adults. It also appears that steelhead smolts released 15 river miles up the Pahsimeroi have lower survival to the Salmon River than those released closer to the mouth. Irrigation ditch loss, exposure to piscatorial and avian predation, diminishing water flows, competition for food and emigration delay may be major contributing factors.

Estimate of 1971 Run and Sport Harvest

In the fall of 1970 and the spring of 1971, Idaho Fish and Game Department personnel operated a steelhead harvest check station near North Fork, Idaho. Data from this station and the 1970 state-wide steelhead harvest estimates (Keating, 1971) enables me to estimate the total hatchery run and harvest above the South Fork of the Salmon River (Salmon River, section 3). Field checks and lower river check stations showed very little harvest of hatchery origin fish below this point during the 1970-71 steelhead fish year.

An estimated 1,319 hatchery-origin steelhead adults entered Salmon River, section 4. Of this number, an estimated 606 fish (46 percent) were taken by anglers, and 713 (54 percent) returned to the

Pahsimeroi weir. Above the Middle Fork of the Salmon River, the hatchery stock fish provided over 18 percent of the total steelhead harvest. Below the Middle Fork (section 4 only), hatchery fish contributed approximately 16 percent of the sport catch.

Sport Fishery - Fall, 1971

In the fall of 1971, we operated the North Fork check station every Saturday and Sunday from about noon to dark from October 9 through November 21. Of 587 steelhead inspected 356 (61 percent) were of hatchery origin.

Since we began check station operations in the fall of 1969, hatchery-origin steelhead contributed 17 to 22 percent of the inspected sport catch. For fall 1971, however, 61 percent of all steel-head checked through the station were of hatchery origin. The 1969 brood year steelhead now returning are the first adults to return from eggs taken at the Pahsimeroi River. Earlier, eggs were obtained at Hells Canyon. The apparent large run size may reflect an adaptation and subsequent increased survival of second generation steelhead. The third generation progeny (1975) may be even better adapted to the specialized rearing-hauling emigration regimen and provide even greater smolt-adult survival. These earliest returns may be too preliminary to make final judgement on the success of the Snake River-Pahsimeroi River transplant. Several third generation brood years must be evaluated to assess what might be expected in the future.

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