

# **IDAHO**

## **FISH & GAME DEPARTMENT**

Joseph C. Greenley, Director

Federal Aid in Fish and Wildlife Restoration Job Progress Report

Project DJ-49-R-II



### **SALMON AND STEELHEAD INVESTIGATIONS**

Job No. III-a. Evaluation of Pond Rearing Fish Culture Methods  
Job No. III-b. Evaluation of Survival of Pond Reared Chinook Salmon

Period Covered: March 1, 1972 to February 28, 1973 by  
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January, 1973

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JOB PROGRESS REPORT

RESEARCH PROJECT STATEMENT

State of Idaho Name: SALMON AND STEELHEAD INVESTIGATIONS  
Project No. F-49-R-11 Title: Evaluation of Pond Rearing Fish  
Job Nos. III-a III-b Culture Methods  
Evaluation of Survival of Pond  
Reared Chinook Salmon

Period Covered: March 1, 1972 to February 28, 1973

ABSTRACT:

In mid-June, 1972, the Salmon River broke flood records of 30 years standing. Decker Pond suffered severe damage which delayed the 1972 rearing cycle until repairs were complete the first part of August.

We reared 400,000 1971 brood-year Rapid River chinook through August and September and released them in the fall of 1972 at 85-90 mm fork length and 56 per pound.

Spawning ground survey crews found 2 fin clipped, 2 ocean adults from smolts that left Decker Pond in the fall of 1969.

We will restock the pond with 400,000 Rapid River chinook fry in the spring of 1973 for release as smolts in the fall of 1973.

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Senior Fishery Research Biologist

#### RECOMMENDATIONS:

We recommend continuance of this project on an experimental (rather than production) basis until we can evaluate the return and contribution to the fishery of third generation adult returnees.

We recommend a trapping and marking program on adult salmon returning to the spawning grounds in the pond area to determine the total spawning escapement and contribution of pond reared salmon.

We recommend that basic project operations consist of a summer rearing program and fall release of the chinook salmon juveniles.

We recommend installation of a temporary weir in the main Salmon River near Decker Pond to trap a portion (200-300) of the upriver spawning run, and mark and release them without delay and with a minimum of handling.

#### OBJECTIVES:

To maintain a pond and related water control structures for experimental rearing of chinook salmon.

To determine growth and survival of fed chinook salmon in the pond.

To develop rearing techniques that promote maximum smolt survival and adult returns.

To determine the contribution of pond reared chinook salmon to runs entering the Columbia River and Salmon River fisheries and spawning escapements.

#### TECHNIQUES USED:

##### Facilities

We modified portions of the pond rearing facilities after spring, floods damaged the pond system. Crews installed a 24-inch culvert and valve near the outlet structure to facilitate pond draining, widened the inlet velocity barrier to 14 feet, added fish ladders and flow control structures in the outlet channel and cleaned out the inlet and outlet channels. Heavier boards were placed on several of the feeder walkways that had been damaged



Figure 1. The Salmon River completely covered the inlet screen, washed out the dike and flooded over the meadow in the background, June, 1972.



Figure 2. The mouth of the inlet channel into the pond was washed out by the spring, 1972, flood. One feeder platform was left stranded when the river washed away the bank.

by weather and shifting ice.

### Methods

The automatic feeders dispensed feed at two hour intervals from 8:00 a.m. to 6:00 p.m. The amount of feed fed was a function of fish size and water temperatures determined from standard hatchery feeding tables.

We sampled fish from the pond periodically to collect weight and length data to monitor growth rate and determine feeder settings.

### FINDINGS:

#### 1970 Brood-Year Chinook Salmon

Detailed background on the 1970 brood year chinook appears in the 1971-72 progress report (Reingold, 1972). Briefly, we stocked approximately 350,000 juvenile chinook averaging 207 per pound from Rapid River Hatchery in the pond in early June, 1971.

We reared the fish in Decker Pond through the summer and released most of them during the first part of October, 1971. Prior to release, we marked 66,000 with a one-half anal, one-half dorsal fin clip. At release time the fish averaged 95 mm fork length and 44 per pound. We left an estimated 20,000 fish in the pond to over-winter on an experimental basis.

Throughout the winter of 1971-72, we maintained the water depth at about six feet. We operated the aeration-ice melting system throughout the winter. The system consisted of two air compressors hooked to some 300 feet of weighted perforated hose as described in detail in the 1970-71 progress report (Reingold, 1971).

On January 13, 1972, dissolved oxygen tests showed 8 p.p.m. at the outlet and 5 p.p.m. in the southeast corner of the pond under a 23-inch ice cover. Pre-iceup D.O. levels were 9 to 10 p.p.m. at both stations. The aerator bubbles maintained small ice-free holes above the hose.

On the 15th of February, there were 30 inches of ice and water layers on the pond and an 18-inch snow cover. The aerator bubbles no longer maintained ice free

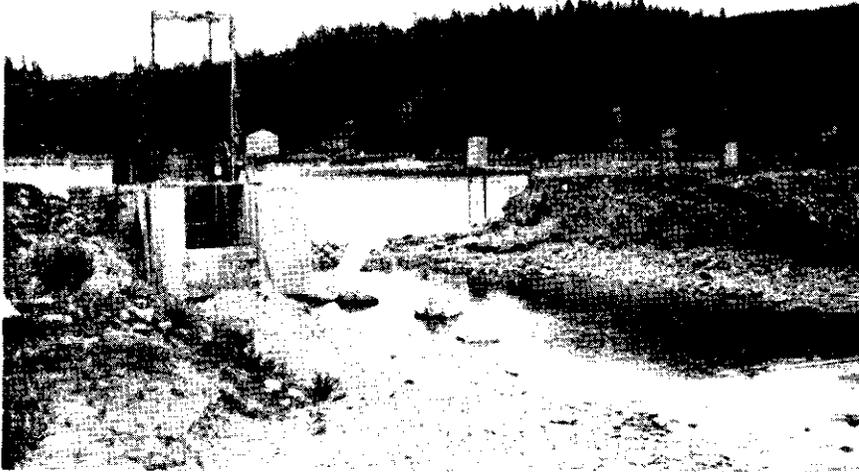


Figure 3. The Salmon River filled the pond, flowed over the top of the dike and washed out the pond near the outlet structure. River flows broke 30-year records.



Figure 4. The pond was cleaned and repaired during July and the inlet velocity barrier was widened to 14 feet.

areas. Dissolved oxygen levels at both the outlet and southeast corner test sites measured 10 p.p.m. Apparently some decomposition and B.O.D. occurred sometime between January 1 and February 15. This is **about** the same date when we apparently suffered a total fish kill in 1970 (Reingold, 1971).

On April 24, 1972, I opened the 12-inch outlet valve to allow the slow draining of the pond. The pond had about a 60 percent ice cover. Inspection of the open areas by canoe revealed no live fish.

On May 4, a survey of the drained pond showed no live or dead fish in the residual pond water or outlet channel. The 10-20,000 fish test group either perished sometime during the winter or escaped prior to ice-up. The presence of large numbers of wading birds at the pond may account for the lack of carcasses. However, past experience and the lack of lethal dissolved oxygen depletion levels indicates that the fish escaped over the drum screen in late fall 1971.

Future operations will consist of summer rearing and fall release, and we will no longer attempt to hold fish over winter in the pond.

#### Emigration 1970 Brood-Year

In the fall of 1971 and the spring of 1972, National Marine Fisheries Service personnel operated downstream migrant traps on the Salmon River near Riggins, Idaho, and at Little Goose and Ice Harbor Dams on the lower Snake River.

Recovery data for marked fall released chinook salmon from three rearing ponds on the upper Salmon River appears in Table 1.

Table 1. Recovery of marked fall released chinook salmon from three rearing ponds on the upper Salmon River, fall 1971 and spring, 1972.

Rearing Pond	Number Released Marked	Release Time	Number collected at Trapping Sites		
			Riggins	Little Goose	Ice Harbor
Pahsimeroi	40,000	Fall 1971	129	5	14
Hayden Creek	52,000	Fall 1971	565	40	22
Decker Pond	66,000	Fall 1971	0	0	0



Figure 5. Three fish-ladder-water-control structures were added to the cleaned outlet channel during July, 1972.



Figure 6. A 24-inch culvert and valve was installed during repairs in July, 1972, to facilitate draining the pond.

Hayden Creek and the Pahsimeroi release areas are 75 to 100 miles downstream from Decker Pond.

Emigration of chinook out of the Decker Pond area was strong when we re-released the fish in the fall of 1971, and there is no readily apparent reason for the lack of recovery at the lower traps. The 95 mm average size of the smolts was comparable or larger than wild, fall migrating Salmon River smolts measured during previous years trapping work.

### 1971 Brood-Year Chinook Salmon

Project plans for the 1972 rearing cycle called for delivery of chinook fry to the pond from Rapid River Hatchery in early June for rearing through the summer and eventual release in the fall. However, during June, 1972, the Salmon River broke high water records of 30 years standing. Decker Pond suffered extensive damages (Figures 1, 2 and 3).

In July, we repaired the pond and added a 24-inch culvert and valve, widened the inlet velocity barrier and added ladder-control structures in the outlet channel (Figures 4, 5 and 6).

Repairs were completed in late July, and the fish were delivered to the pond from Rapid River between August 2 and 4, 1972. At delivery time the fish averaged 85 per pound and 70-75 mm fork length.

We reared the fish in the pond until mid-September. During the week of September 18-22, we marked 60,000 fish at the pond. We applied a right ventral-adipose-3/4 anal clip to one group of 30,000 fish and released them directly into the outlet channel to the Salmon River. We applied a left ventral-adipose-3/4 anal clip to another group of 30,000 fish and returned them to the pond. The fish averaged 80-85 mm and 57 per pound when released (Table 2).

Table 2. Size of 1971 brood-year chinook salmon in Decker Pond at various sampling dates - 1972.

Date	Length	No./lb.
Aug. 4	70-75 mm	85
Aug. 17	75-80	83
Sept. 6	75-80	75
Sept. 20	80-85	57
Oct. 18	85-90	56

On October 17, 1972, I opened the outlet structures and released all the chinook in the pond, including the 30,000 marked fish. This marking project tested early fall release versus late fall release smolt survival. The fish averaged 85-90 mm and 56 per pound (Table 3).

Table 3. Length frequency of chinook salmon smolts collected from Decker Pond at release - 1972.

Fork Length (Millimeters)	Number of Fish
70	39
80	280
90	291
100	29
110	0
$\bar{F}$ = 85-90 mm	N = 639

National Marine Fisheries Service personnel, operating a scoop trap near Riggins, Idaho (some 200 miles downriver from the pond), reported no marked fish from either group collected by mid-November, 1972.

I attempted underwater observations in the main Salmon River below the pond release site on September 20, 1972, but turbidity from a land slump upriver reduced visibility to less than 18 inches. In early November, I fished several large pools in the river for several miles below the pond and caught or observed no chinook salmon.

Table 4. Summary of chinook salmon stocks reared and released at the Decker Flat Experimental Rearing Pond since initiation of the project.

Brood Year Release Yr.	Brood Source	Number Released	Release Area	Number Stocked	Number Marked	Mark Used	No. Adults Seen in Sport Catch or as Spawners as:		
							1-Ocean	2-Ocean	3-Ocean
1966 '68 spr.	Salmon River	*7,800	Decker Pond	12,000	7,500	RV	1969 (0)	1970** (3)	1971 (0)
1967 '69 spr.	Marion Forks, Oregon	*26,000	Decker Pond	180,000	18,500	RV	1970 (0)	1971 (1)	1972 (0)
1968 '70 spr.	Salmon River	*0	100% Pond Loss	160,000	160,000	RV	1971 (0)	1972 (2)	1973 ( )
1969 '70 fall	Lemhi River	50,000	Upper Salmon River	50,000	25,000	RVAd	1972 (0)	1973 ( )	1974 ( )
1969 '71 spr.	Lemhi River	*50,000	Decker Pond	50,000	50,000	RV	1972 (0)	1973 ( )	1974 ( )
1970 '71 fall	Rapid River	*330,000	Decker Pond	350,000	66,000	1/2An1/2Dor	1973 ( )	1974 ( )	1975 ( )
1971 '72 fall	Rapid River	400,000	Decker Pond	400,000	30,000 30,000	Ad1/4AnRV Ad1/4AnLV	1974 ( )	1975 ( )	1976 ( )

\* Later evidence revealed that large numbers of chinook escaped from the pond, over the outlet drum screen, in the fall months. Actual numbers released are probably closer to actual numbers planted in the pond than spring release figures indicate. Note two adults found on spawning grounds from 1968 brood-year smolts.

\*\*Year of recovery.

Between August 2 and October 10, 1972, we fed 11,000 pounds of Idaho Dry Diet feed to the fish in the pond, at a cost of \$1,231. Prior to delivery from Rapid River Hatchery, the chinook were fed 8,259 pounds of Oregon Moist Pellets at a cost of \$1,411.

The average final size of the chinook at the time of release was 57 per pound (Table 2). The estimated total poundage released is approximately 7,000 pounds which computes to a food to flesh conversion of 2.75 lbs. and cost (feed only) per pound of \$.38.

Between September 5 and September 15, we fed 2,000 pounds of feed containing 3,500 grams of the antibiotic Terramycin to impart a tetracycline mark within the bones of the fish. Vertebrae will be collected from adults on future spawning ground surveys to identify Decker Pond fish. We collected and froze samples of smolts prior to release from the pond and will inspect them for mark deposition and clarity.

#### Discussion - 1970 and 1971 Brood-Year Chinook

The salmon we released from the pond in the fall of 1971 and 1972 were in good body condition, smolt sized, and left the immediate area of the release site promptly. Although emigration appeared strong and survival probable, no fish were collected at downstream sampling stations either in the fall of 1971 or 1972 or the spring of 1972. Diligent spawning ground surveys for marked returning adults in future years should give us a final assesment of the survival of these year class smolts.

#### Adult Returns - 1972

During the summer of 1972, we inspected 966 salmon carcasses in the upper Salmon River drainage; 422 at angler check stations and 544 on spawning ground surveys. We found two adult chinook salmon bearing right-ventral fin clips on spawning grounds on the upper Salmon River above Decker Pond. These fish were adults returned from smolts emigrating from the pond in the fall of 1969 (Table 4).

An unknown number of smolts escaped from the pond in the fall of 1969 and the remaining fish perished during the winter of 1969-70 when dissolved oxygen dropped to lethal levels (Reingold, 1970).

On August 24, 1972, a spawning ground survey crew cut off the tails of 123 adult salmon kelts between the Breckenridge diversion dam and the Blaine County highway bridge on the upper Salmon River. On a follow-up survey six days later they counted 85 of these marked kelts (69 percent), plus 70 new unmarked kelts.

On September 8, 1972, a spawning ground survey crew removed the tails from 29 kelts between Hell Roaring Creek bridge and Redfish Creek. A follow-up crew five days later found 21 of these carcasses (72 percent), plus 85 new kelts. These findings indicate that around 25-30 percent of the kelts on the spawning beds will disappear within 5-6 days. Surveys should probably be repeated no less than 3-4 days apart to view a major portion of the spawned-out chinook spawners.

A land slump above the spawning areas and consequent loss of visibility shortly after the second survey made further surveys futile during the 1972 season. Visibility into the upper Salmon River was reduced to approximately 18 inches and remained so until early November when land repairs were initiated.

In order to evaluate the contribution of pond reared chinook to the spawning escapement we must know what percent of the total spawning population the spawning ground kelt counts represent. To determine this, I propose that in the summer of 1973, we install a temporary weir in the main Salmon River near Decker Pond, trap a portion (200-300) of the upriver spawning run, and mark and release them without delay and with a minimum of handling. We will then look for these marked fish on our spawning ground surveys and determine the percent of the spawning run we observe on the surveys.

This project should continue for the number of years required to determine the average percent observed; three years at the minimum and more if percentages vary widely.

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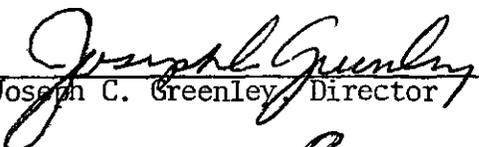
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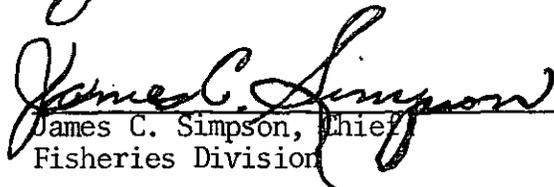
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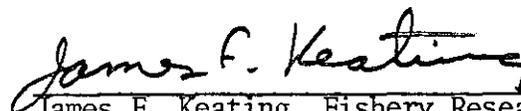
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