

**EVALUATION OF TRANSPORTATION OF JUVENILE SALMONIDS AND RELATED  
RESEARCH ON THE COLUMBIA AND SNAKE RIVERS, 1989**

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From 1968 to 1980, the National Marine Fisheries Service (NMFS) conducted numerous smolt transportation studies at Snake and Columbia River dams operated by the U.S. Army Corps of Engineers (COE) (Park 1985). Results of these studies were very encouraging for fall (subyearling) chinook salmon (Oncorhynchus tshawytscha) and steelhead (O. mykiss) in all study years, but marginal at best for yearling spring/summer chinook salmon since 1975. Based on results from 1968 to 1975, mass transportation of smolts around dams has been used in each subsequent year in varying degrees, depending upon environmental conditions, as a management option to enhance survival of downstream migrating juvenile salmonids.

In 1989, NMFS and COE continued to evaluate the effects of collection and transportation on juvenile salmonids from dams on the Columbia and Snake Rivers. This evaluation included the following objectives: 1) to mark the transport and control groups of spring/summer chinook salmon and steelhead at Lower Granite Dam, 2) to continue the recovery of adult salmonids tagged as juveniles at Lower Granite and McNary Dams for transport research and index purposes, 3) to conduct a pilot study of the feasibility of utilizing passive integrated transponder (PIT) tags to evaluate transportation of wild spring/summer chinook salmon, and 4) to develop and evaluate a system to efficiently divert PIT-tagged smolts from the collection system back to the river at Lower Granite Dam.

## **TRANSPORTATION STUDIES, LOWER GRANITE AND MCNARY DAMS**

### **Introduction**

From 1983 to 1985, smolts were marked with coded wire tags (CWT) and freeze brands to index the relative success of the barge transportation program conducted annually by COE (no paired control groups were marked). Spring/summer chinook salmon smolts were marked in 1983, 1984, and 1985 and steelhead smolts were marked in 1984 and 1985 for this purpose. The 1985 smolt marking operations were conducted

by the Fish Passage Center (formerly the Water Budget Center) and, therefore, were not included in any of the NMFS annual reports. Final returns for the 1983 and 1984 study years were reported in Harmon et al. (1989); final returns for the 1985 study year are included in this report. In 1985, preliminary returns of adults from these marking efforts indicated that survival of transported smolts improved considerably compared to returns from the 1976-80 study years (Park et al. 1986). We believe a combination of factors including, but possibly not limited to, major improvements in the transport collection facilities, improved fish quality from hatcheries, and greatly improved fish handling/marketing techniques were likely responsible for the observed increase in smolt to adult survival of marked/transported fish.

In 1986, a new 3-year smolt marking study (including control releases) was initiated on spring/summer chinook salmon and steelhead at Lower Granite Dam and spring/summer and fall chinook salmon at McNary Dam. The primary goal of the study is to re-evaluate transportation of smolts around dams utilizing state-of-the-art collection/transport and handling/marketing techniques. At McNary Dam, we marked test and control groups of both races of salmon for three consecutive years finishing in 1988. However, at Lower Granite Dam, persistent drought conditions in 1987-88 interrupted the marking schedule. We marked transport and control groups of both species in 1986. In 1987, we marked barge transport index groups only, and no marking occurred at the dam in 1988. The study continued at Lower Granite Dam in spring 1989 for the second year of the 3-year study.

### Methods

Smolts at both dams were marked with CWTs and freeze brands during each year's outmigration, and either transported by barge for release below Bonneville Dam or released as controls below Little Goose or McNary Dams as appropriate. Evaluation is based on comparative rates of returns of adults and associated

transport/control ratios (T/C) from these marking efforts (see Matthews et al. 1987 for details on juvenile marking procedures). Beginning at Lower Granite Dam in 1989, the study design was adjusted to test a 1.5 to 1 T/C with a coefficient of variation of 10.0% for spring/summer chinook salmon and 7.5% for steelhead. This precision level required marking 70,000 transport and 100,000 control spring/summer chinook salmon and 30,000 transport and 42,000 control steelhead.

#### Marking, Delayed Mortality, and CWT Retention

Lower Granite Dam --Throughout the spring of 1989, we marked naturally migrating spring/summer chinook salmon and steelhead smolts for the transportation study. To mark the large number of spring/summer chinook salmon required by the study design during the short time fish were available, we installed two temporary marking stations in the fish handling building at the dam increasing the number of available marking stations to five. We marked only during the morning hours to accommodate the daily barging schedules and, at times, required up to 30% of the daily collection to be sampled to fulfill our marking requirements. All study fish were marked from the fish facility sample tank with pre-anesthesia techniques (Matthews et al. 1986) and within guidelines established by the Fish Transportation Oversight Team. Fish were given adipose fin clips (spring/summer chinook salmon) or left ventral fin clips (steelhead), freeze brands, and CWTs.

Marking of spring/summer chinook salmon began on 7 April and continued through 30 May; steelhead were marked from 21 April through 25 May. Appendix Tables 1 and 2 provide marking details for each release lot of study fish. We marked 75,295 test and 107,176 control spring/summer chinook salmon in release lots of approximately 7,000 and 10,000 fish each, respectively. Likewise, we marked 30,116 test and 42,259 control steelhead in release lots of approximately 5,000 and 7,000 fish each, respectively. After marking, test fish were transported by barge and released

near Beacon Rock below Bonneville Dam whereas control fish were transported for approximately 2 hours by truck and released about 3 miles below Little Goose Dam.

To measure the short-term effects of our handling/marketing procedures and CWT retention, we held samples of approximately 50 fish of both species for 48 hours. These bioassays were conducted nearly every other day throughout the marking period.

McNary Dam --As previously mentioned, we completed marking at this dam for the 3-year evaluation in 1988. Therefore, no marking occurred at McNary Dam during the spring of 1989.

#### Recovery of Adults and Data Analysis

Adults are recovered in each of the 3 years following marking as juveniles. Traps in fish ladders (Lower Granite Dam for releases there, and Priest Rapids Dam for McNary Dam releases) are the primary recovery sites for spring/summer chinook salmon and steelhead. Ocean and river commercial fisheries are primary recovery sites for fall chinook salmon marked at McNary Dam. Trapping efficiencies are estimated for individual release lots by the number of marked fish previously identified at a river trap compared to the total marks returning to the hatcheries. Tributary sports fisheries and natal spawning areas are also surveyed in an attempt to provide similar estimates from these areas.

To analyze results, statistical treatments will be applied when returns for a given study year are complete. Confidence intervals for the T/Cs will be calculated using the ratio (survival) estimates (Burnam et al. 1987) and their associated empirical variance. Contingency table analysis may be used if appropriate, as well as analysis of variance for comparisons among years in studies conducted identically for 3 years.

## Results and Discussion

### Delayed Mortality and CWT Retention

Post-marking delayed mortality and CWT retention bioassay data for spring/summer chinook salmon and steelhead are listed in Appendix Tables 3 and 4, respectively. Delayed mortality was low for both species, averaging 1.1% for spring/summer chinook salmon and 1.8% for steelhead. Overall, tag loss averaged 2.2% for spring/summer chinook salmon and 2.0% for steelhead.

While delayed mortality and tag loss were both low overall, we do not believe they reflect only the consequences of our handling/marketing operations. We believe less than desirable holding conditions (small circular tanks) contributed to inflated delayed mortalities and tag loss during some bioassays. Heavily smolted salmonids held in small, restrictive containers even at low densities exhibit frenzied behavior and attempt to escape by persistent jumping. Over 48 hours, this can cause severe head injuries that likely contribute to higher mortality and tag loss than would be attributable to the handling/marketing procedures alone. For example, much of the delayed mortality and tag loss for the entire season for both species occurred during one bioassay on 10 May. By this time, both species were exhibiting signs of advanced smoltification and were virtually impossible to hold for extended times in the small tanks. Thereafter, we shortened the holding period of our bioassays to 24 hours for the remainder of the marking season, to reduce the adverse effects of extended holding in small tanks. This action resulted in delayed mortality and tag loss values in subsequent bioassays similar to those measured before the problem became apparent on 10 May.

### Adult Recoveries for Lower Granite Dam Studies

Spring/summer chinook salmon --Appendix Tables 5.0 through 8.11 list total-to-date returns of spring/summer chinook salmon tagged as juveniles at Lower Granite

Dam from 1985 through 1987. In-river control releases were made below Little Goose Dam in 1986 but not in 1985 or 1987.

Adult returns of spring/summer chinook salmon marked as juveniles at Lower Granite Dam in 1985 for barge transport index purposes are complete (Table 1). A total of 192 fish (0.43% of the release) was observed at all recovery sites combined, while 101 fish (0.21% of the release) were observed at the primary recovery site, Lower Granite Dam. Although the observed recovery percentages were low, they were approximately 6 times higher than the average percent observed recoveries for transported study fish from 1976 through 1980 (Park 1985) and are similar to recoveries for the 1983 and 1984 barge transport index releases from this dam (Matthews et al. 1988).

In 1986, marked groups of juvenile spring/summer chinook salmon were released from barges below Bonneville Dam and as in-river controls below Little Goose Dam. Table 2 summarizes all observed adult recoveries that were entered into the computer database by 1 July 1989. One- and 2-ocean age observed recoveries are complete; 3-ocean age observed recoveries are incomplete. So far, more transports than controls have been recorded from all recovery areas. We have recovered 0.16% of the barge transport release and 0.10% of the in-river control release at the primary recovery site, Lower Granite Dam. Appropriate statistical treatments will be applied to these data when returns are complete.

The downstream migration of smolts in 1987 was associated with severe drought conditions in the Snake River. As a result, we marked only barge transport index groups of smolts that year at Lower Granite Dam. Adult recoveries for this marking effort are preliminary. To date at Lower Granite Dam, we have observed 0.02% of the 1987 release as jacks (1-ocean) and 0.13% of the release as 2-ocean age fish (Table 2). The jack returns are identical for transported fish in the 1985, 1986, and 1987 study

Table 1.--Summary of adult recoveries of spring/summer chinook salmon marked by the Fish Passage Center at Lower Granite Dam in 1985 and transported to below Bonneville Dam by barge.

Group	Number released	Ocean-age	Observed adult returns by recovery site							Stream surveys		Total	
			Ocean fishery	Bonneville Dam	Indian fishery	River fishery	Lower Granite Dam		Hatcheries	N	%	N	%
1985													
Transport	45,420	1-ocean	0	2	0	0	11	0.02	3	0	16	0.04	
		2-ocean	0	19	2	2	52	0.11	24	0	99	0.22	
		3-ocean	0	9	11	1	38	0.08	17	1	77	0.17	
		Total	0	30	13	3	101	0.21	44	1	192	0.43	

Table 2.--Preliminary summary of adult recoveries of spring/summer chinook salmon marked at Lower Granite Dam in 1986 and 1987 (recoveries through July 1989).

Groups	Number released	Ocean-age	Observed adult returns by recovery site								Total	
			Ocean fishery	Bonneville Dam	Indian fishery	River fishery	Lower Granite Dam		Hatcheries	Stream surveys	N	%
<b>1986</b>												
Transport	45,004	1-ocean	1	0	0	0	7	0.02	1	0	9	0.02
		2-ocean	5	7	6	1	41	0.09	23	1	84	0.19
		<u>3-ocean</u>	<u>0</u>	<u>6</u>	<u>0</u>	<u>0</u>	<u>24</u>	<u>0.05</u>	<u>0</u>	<u>0</u>	<u>30</u>	<u>0.07</u>
		Total	6	13	6	1	72	0.16	24	1	123	0.28
<b>1986</b>												
Control*	45,035	1-ocean	0	0	0	0	2	0.00	2	0	4	0.01
		2-ocean	0	1	0	0	27	0.06	18	0	46	0.10
		<u>3-ocean</u>	<u>0</u>	<u>2</u>	<u>0</u>	<u>0</u>	<u>17</u>	<u>0.04</u>	<u>0</u>	<u>0</u>	<u>19</u>	<u>0.04</u>
		Total	0	3	0	0	46	0.10	20	0	69	0.15
<b>1987</b>												
Transport	50,207	1-ocean	2	0	0	1	12	0.02	0	0	15	0.03
		<u>2-ocean</u>	<u>0</u>	<u>9</u>	<u>0</u>	<u>0</u>	<u>63</u>	<u>0.13</u>	<u>0</u>	<u>0</u>	<u>72</u>	<u>0.14</u>
		Total	2	9	0	1	75	0.15	0	0	87	0.17

\* Control released below Little Goose Dam.

years. The 2-ocean age returns are somewhat higher from 1987 than for the 1985 and 1986 study years.

Steelhead --Appendix Tables 9.0 through 12.7 detail total-to-date returns of steelhead marked as juveniles at Lower Granite Dam from 1985 through 1987. As with spring/summer chinook salmon, in-river control releases were made below Little Goose Dam in 1986 but not in 1985 or 1987.

Returns of adult steelhead from smolts marked in 1985 for barge transport index purposes are complete (Table 3). We recovered 568 adults (1.89% of the release) from all sources. Most of the recoveries (1.22% of the release) were observed at the adult collection facility in the fish ladder at Lower Granite Dam. The adult return was much lower than for barge transport index fish marked at the dam in 1984 (Matthews et al. 1987). Also, the return to the dam was composed of 1.4 times as many 1- than 2-ocean age fish. Normally, we would expect just the opposite. One-ocean age return rates were similar to those reported for the 1984 study year while 2-ocean age return rates were much lower. This implies that juvenile survival was probably not a factor. However, environmental conditions encountered by the adult migrations of the two age classes may have been much different. The 1-ocean age class migrated upstream in the Columbia and Snake Rivers during the summer/fall of 1986 under relatively normal environmental conditions. On the other hand, the 2-ocean age class migrated upstream during the summer/fall of 1987 under drought conditions. We believe adverse migrational conditions (unusually low flows and warm water) were likely responsible for the lower than expected return of 2-ocean age adults to Lower Granite Dam in 1987; hence, the lower overall observed return for 1985 study fish. For example, flows and water temperatures in 1985, 1986, and 1989 averaged 29,900 cfs and 64.0°F during September and October at Ice Harbor Dam on the lower Snake River. In 1987 and 1988, flows averaged 19,750 cfs, and water temperatures averaged 66.1°F during the same period.

Table 3.—Summary of adult steelhead recoveries marked as juveniles by the Fish Passage Center at Lower Granite Dam in 1985 and transported to below Bonneville Dam by barge.

Number released	Ocean-age	Observed adult returns						Total	
		Bonneville Dam	Indian fishery	River fishery	Lower Granite Dam		Hatcheries	N	%
30,041	1-ocean	49	8	31	216	0.72	12	315	1.05
	2-ocean	29	14	14	142	0.47	40	240	0.80
	3-ocean	<u>0</u>	<u>0</u>	<u>1</u>	<u>7</u>	<u>0.02</u>	<u>5</u>	<u>13</u>	<u>0.04</u>
	Total	78	22	46	365	1.22	57	568	1.89

Returns of adult steelhead marked as juveniles for transport research in 1986 are nearly complete (Table 4). One- and 2-ocean age returns are complete with 3-ocean age fish yet to be recovered in fall 1989 and spring 1990. So far, 306 adults (0.99% of the release) which were transported as juveniles and 168 adults (0.53% of the release) which were released as in-river controls have been observed at Lower Granite Dam. Returns to hatcheries upstream from the dam showed similar recovery proportions-- 29 transports (0.09% of the release) and 16 in-river controls (0.05% of the release). Statistical tests will be applied to these data when returns are complete next year. However, it appears that transportation of steelhead smolts around dams continues to provide considerable protection for this species.

Although the transport to control ratio was favorable for the 1986 study year, the return rates for both transport and in-river control groups by year class were lower than expected. Only 0.28 and 0.71% of the smolts marked and transported from Lower Granite Dam in 1986 were observed at the dam as 1- and 2-ocean age adults, respectively. One- and 2-ocean age observed returns of 0.80 and 1.10%, respectively, were documented for steelhead transported from the dam in 1984 (Matthews et al. 1987). Furthermore, returns to Lower Granite Dam of 1-ocean age adults for smolts transported in 1985 were similar (0.72%) to those transported in 1984 (Harmon et al. 1989), but returns of 2-ocean age fish were much lower (0.47%). As previously mentioned, this age class migrated upstream during the drought in the summer/fall of 1987. Both age classes of returning adults for the 1986 study year migrated upstream during droughts--1-ocean age fish in summer/fall of 1987 and 2-ocean age fish in summer/fall of 1988. These results imply that environmental conditions associated with or coincidental to these droughts impacted the survival of adult steelhead substantially during their summer/fall migrations in the Columbia and Snake Rivers.

Returns of 1-ocean age adults from smolts marked at the dam for barge transport index purposes in 1987 are complete (Table 4) with 2- and 3-ocean age fish

**Table 4.--Preliminary summary of adult steelhead recoveries marked as juveniles at Lower Granite Dam in 1986 and 1987 (recoveries through July 1989).**

Groups	Number released	Ocean-age	Observed adult returns by recovery site							
			Bonneville Dam	Indian fishery	River fishery	Lower Granite Dam		Hatcheries	Total	
						N	%		N	%
<b>1986</b>										
Transport	30,659	1-ocean	10	1	4	87	0.28	3	105	0.34
		<u>2-ocean</u>	<u>4</u>	<u>0</u>	<u>35</u>	<u>219</u>	<u>0.71</u>	<u>26</u>	<u>284</u>	<u>0.93</u>
		<b>Total</b>	<b>14</b>	<b>1</b>	<b>39</b>	<b>306</b>	<b>0.99</b>	<b>29</b>	<b>389</b>	<b>1.27</b>
<b>1986</b>										
Control*	31,646	1-ocean	2	0	1	60	0.19	6	69	0.22
		<u>2-ocean</u>	<u>2</u>	<u>0</u>	<u>21</u>	<u>108</u>	<u>0.34</u>	<u>10</u>	<u>141</u>	<u>0.44</u>
		<b>Total</b>	<b>4</b>	<b>0</b>	<b>22</b>	<b>168</b>	<b>0.53</b>	<b>16</b>	<b>210</b>	<b>0.66</b>
<b>1987</b>										
Transport	27,544	1-ocean	10	0	14	98	0.36	2	124	0.45

\* Controls released below Little Goose Dam.

yet to be recovered. At Lower Granite Dam, we observed 98 1-ocean age adults (0.36% of the release) from this marking effort. This age class of adults migrated upstream during drought conditions in the summer/fall of 1988. The observed return of this age class is only about one-half the observed return for 1-ocean age fish marked and transported in 1984 and 1985, but nearly identical to the observed return for 1-ocean age fish marked and transported in 1986, further implicating drought conditions as a factor affecting adult steelhead migrants. If environmental conditions return to normal for adult steelhead migrants in the summer/fall of 1989, we expect observed adult return rates to Lower Granite Dam in excess of 1.0% for 2-ocean age adults of this marked group.

The annual outmigration of steelhead smolts is a composite of hatchery-reared and wild fish. Beginning in 1986, the adipose fin was excised from all hatchery-reared fish prior to release to differentiate them from wild fish for management purposes. During our marking operations at Lower Granite Dam in 1986 and 1987, we documented the numbers of hatchery-reared and wild fish included in our marked release lots. When we examined marked adults returning to the dam, we again documented their origin using the adipose fin clip. We have complete recoveries for 1- and 2-ocean age fish from the 1986 study year and 1-ocean age fish for the 1987 study year. Wild fish have returned at a considerably higher rate than hatchery-reared fish (Table 5). For the 1986 study year, we have recovered 1.50% of the wild and 0.81% of the hatchery-reared release groups that were transported and 0.81% of the wild and 0.37% of the hatchery-reared release groups that were released as in-river controls. For the 1987 study year, we have recovered 0.46% of the wild and 0.34% of the hatchery-reared release groups that were transported (no in-river control groups were released in 1987). These data, while preliminary, indicate that wild steelhead smolts survive particularly well if they are transported.

Table 5.--Hatchery-reared and wild adult steelhead returns to Lower Granite Dam from smolts marked at the dam in 1986 and 1987 (recoveries through July 1989).

Groups	Number released	Observed adult returns	
		N	%
<b><u>1986 Transport<sup>a</sup></u></b>			
Hatchery	19,528	158	0.81
Wild	11,131	167	1.50
<b><u>1986 Control<sup>a</sup></u></b>			
Hatchery	20,380	76	0.37
Wild	11,266	91	0.81
<b><u>1987 Transport<sup>b</sup></u></b>			
Hatchery	20,257	68	0.34
Wild	7,126	33	0.46

<sup>a</sup> 1- and 2-ocean returns.

<sup>b</sup> 1-ocean returns.

Wild steelhead smolts are in relatively large numbers at the dams early in spring coincidental with peak movements of hatchery-reared spring chinook salmon. In general, they are much smaller than their hatchery-reared counterparts; hence, many are included in raceways with spring chinook salmon at collector dams with size separators (Little Goose and McNary Dams). During periods of average to high flows, many wild steelhead smolts are returned to the river along with spring chinook salmon at these dams. Our data indicate that this practice may not be the best for wild steelhead.

#### Adult Recoveries for McNary Dam Studies

Spring chinook salmon --Appendix Tables 13.0 through 18.4 list and Table 6 summarizes total-to-date adult recoveries for spring chinook salmon tagged as juveniles at McNary Dam from 1986 through 1988. In-river control groups were released below the dam during all 3 study years.

Adult recoveries for the 1986 study year are nearly complete and very poor. Only 10 returns from smolts transported and 14 returns from smolts released as in-river controls have been recorded at all recovery sites. We expect few, if any, additional recoveries. These returns will not provide sufficient data for statistical analysis when complete next year. It should be noted that the juvenile fish facility at McNary Dam was not equipped to accommodate pre-anesthesia handling/markings procedures until spring 1987.

Adult recoveries for the 1987 study year are preliminary. Returns to date, while still low, indicated a considerable improvement over returns for the 1986 study year. We have recorded 36 transports (0.10% of the release) and 35 in-river controls (0.06% of the release) from all adult recovery areas. When complete, however, these returns may also be insufficient for statistical analysis at any particular recovery site.

Table 6.--Preliminary summary of adult recoveries of spring/summer chinook salmon marked as juveniles at McNary Dam from 1986 to 1988 (recoveries through July 1989).

Groups	Number released	Ocean-age	Observed adult returns						Total	
			Ocean-fishery	Bonneville Dam	River fishery	L. Granite Dam	Priest Rapids Dam	Hatcheries	N	%
<b>1986</b>										
Transport	49,274	1-ocean	0	0	0	0	1	1	2	0.00
		2-ocean	0	2	0	1	2	2	7	0.01
		<u>3-ocean</u>	<u>0</u>	<u>1</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>1</u>	<u>0.00</u>
		<b>Total</b>	<b>0</b>	<b>3</b>	<b>0</b>	<b>1</b>	<b>3</b>	<b>3</b>	<b>10</b>	<b>0.01</b>
Control	50,273	1-ocean	0	0	1	0	1	0	2	0.00
		2-ocean	1	0	0	2	3	5	11	0.02
		<u>3-ocean</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>1</u>	<u>0</u>	<u>0</u>	<u>1</u>	<u>0.00</u>
		<b>Total</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>14</b>	<b>0.02</b>
<b>1987</b>										
Transport	38,487	1-ocean	1	1	0	0	0	1	3	0.01
		<u>2-ocean</u>	<u>0</u>	<u>11</u>	<u>0</u>	<u>5</u>	<u>17</u>	<u>0</u>	<u>33</u>	<u>0.09</u>
		<b>Total</b>	<b>1</b>	<b>12</b>	<b>0</b>	<b>5</b>	<b>17</b>	<b>1</b>	<b>36</b>	<b>0.10</b>
Control	57,902	1-ocean	0	1	0	0	0	0	1	0.00
		<u>2-ocean</u>	<u>0</u>	<u>17</u>	<u>0</u>	<u>6</u>	<u>11</u>	<u>0</u>	<u>34</u>	<u>0.06</u>
		<b>Total</b>	<b>0</b>	<b>18</b>	<b>0</b>	<b>6</b>	<b>11</b>	<b>0</b>	<b>35</b>	<b>0.06</b>
<b>1988</b>										
Transport	50,028	1-ocean	0	2	0	3	0	0	5	0.01
Control	75,036	1-ocean	0	1	0	1	1	0	3	0.00

Recoveries for the 1988 study year are just beginning. We have recovered five transports and three in-river controls as jacks from all recovery areas. Three of the transports and one of the in-river controls were recovered at Lower Granite Dam. This is noteworthy only because they are the only jacks that have ever been recovered at Lower Granite Dam from spring chinook salmon smolts marked for studies at McNary Dam.

Overall, the recovery rates of adult spring chinook salmon originating from studies at McNary Dam are poorer than for those originating from studies at Lower Granite Dam. Some of the problem was due to sampling effort at dams. Most of the smolts marked at McNary Dam likely originate in the upper Columbia River. Therefore, the primary adult recovery sites for this study are at Bonneville and Priest Rapids Dams. Only a portion of the adult runs passing over these dams was exposed to CWT detectors, resulting in reduced sampling rates. The studies conducted at Lower Granite Dam were not encumbered by this problem as all of the adults ascending the fish ladder were subjected to CWT detection.

Fall chinook salmon --Total-to-date recoveries of fall chinook salmon marked as juveniles at McNary Dam in 1986 and 1987 are detailed in Appendix Tables 19.0 through 22.6 and summarized in Table 7. Adult recoveries for the 1988 study year will begin in fall 1989. As with spring chinook salmon, in-river control groups were released directly below the dam during all three study years.

Adult recoveries for this study are still few. To date, we have recovered 49 transports and 20 in-river controls as 1- and 2-ocean age adults from the 1986 study year. One-ocean age adult recoveries for the 1987 study year total 32 transports and 12 in-river controls. A higher recovery of 1-ocean age fish from both release groups for the 1987 study year in the ocean fisheries and at Bonneville Dam is encouraging. While still preliminary, it suggests that survival was higher for 1987 than 1986

**Table 7.--Preliminary summary of adult recoveries of fall chinook salmon marked as juveniles at McNary Dam in 1986 to 1987 (recoveries through July 1989).**

Groups	Number released	Ocean-age	Observed adult returns					Total	
			Ocean-fishery	Bonneville Dam	River fishery	Priest Rapids Dam	Stream surveys	N	%
<b>1986</b>									
Transport	114,653	1-ocean	2	0	6	8	0	16	0.01
		<u>2-ocean</u>	<u>27</u>	<u>4</u>	<u>2</u>	<u>0</u>	<u>0</u>	<u>33</u>	<u>0.03</u>
		Total	29	4	8	8	0	49	0.04
Control	115,991	1-ocean	1	0	1	3	1	6	0.01
		<u>2-ocean</u>	<u>10</u>	<u>4</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>14</u>	<u>0.01</u>
		Total	11	4	1	3	1	20	0.02
<b>1987</b>									
Transport	68,376	1-ocean	8	24	0	0	0	32	0.05
Control	68,291	1-ocean	3	8	1	0	0	12	0.02

releases. As previously mentioned, the pre-anesthesia handling/marking technique was first used at this dam in 1987. Differential ocean survival may also be a factor.

Ultimately, most adult return data for fall chinook salmon marked as juveniles at McNary Dam will be from CWT recoveries from the ocean fisheries. Most of the CWTs are recovered by other agencies and we normally do not receive them until a year or more later. Once received, we verify the code on each tag before it is entered into our computer database. We expect adult recoveries recorded for the 1986 and 1987 study years to increase considerably next year.

## **PILOT STUDY TO EXAMINE THE FEASIBILITY OF USING PIT TAGS TO EVALUATE TRANSPORTATION OF WILD SPRING CHINOOK SALMON**

### **Introduction**

Since the early 1970s, studies conducted to evaluate transportation of spring chinook salmon have yielded inconclusive data (Park 1985). These studies relied upon CWTs and freeze brands to mark juveniles that were intercepted during smolt migrations at collector dams. Why these recent studies provided inadequate and inconsistent data, whereas a few earlier studies provided adequate and consistent data, is of interest and concern. The underlying cause has been the recent very low returns of study fish. New research must consider this factor and design a more productive approach.

There is considerable evidence that low returns in recent years were largely due to a substantial decline in abundance of wild fish coupled with a substantial increase in abundance and low survival rate of hatchery fish. We believe this situation was exacerbated by problems in the smolt collection facilities at dams rather than by changes in transport effectiveness or methodology. Since the smolt to adult survival of wild fish has been estimated to be from 2 to 15 times higher than hatchery fish (Raymond 1988), it would seem necessary to include known wild stocks in future

studies. Until now, this has not been possible because hatchery and wild spring/summer chinook salmon are indistinguishable when marked as smolts at dams. However, the advent of the PIT tag (Prentice et al. 1987) provided an opportunity to explore a different study approach that involves tagging fish prior to the smolt outmigration and automatically separating them into test groups as they pass through the smolt collection systems at dams. Since each fish has a unique tag code, the exact source and disposition of each fish will be known. Use of the PIT tag to mark parr in advance of the smolt outmigration has other potential advantages over conventional marking techniques. To name a few, use of the tag will 1) eliminate the requirement of physically handling smolts for marking and adults for data recovery, 2) provide total recoveries for all test groups at any dam where detectors are installed (approximately triple the current level of recoveries with conventional marks), 3) eliminate potential sources of error associated with brand reading even though these error levels are currently very low, and 4) provide valuable and precise information related to delay or indications of homing impairment as adults return to upriver areas.

The NMFS and the COE initiated a pilot study in the summer of 1988 with the primary objective of examining the feasibility of using the PIT tag to evaluate transportation of spring chinook salmon. Both wild and hatchery-reared fish were included in this study. The pilot study was intended to provide knowledge in advance of a full-scale study primarily in the following areas: 1) effort and techniques required to capture and mark (with minimal impact) large numbers of wild parr in their natural environment, 2) recovery rates for all tagged fish upon their arrival the following spring at the three collector dams, and 3) logistics for establishing and managing a highly complex computer database system. The results of this initial effort are reported here.

## Methods

### Wild Fish

During August and September 1988, we collected and PIT tagged wild spring/summer chinook salmon parr in nine streams in Idaho and two streams in Oregon (Fig. 1). Specifically, the streams chosen for tagging spring chinook salmon were the Crooked River, Red River, East Fork Salmon River, upper Salmon River, Alturas Lake Creek, and Valley Creek in Idaho and the Grande Ronde River in Oregon. Streams chosen for tagging summer chinook salmon were the Secesh River, Lake Creek, and South Fork Salmon River in Idaho and the Imnaha River in Oregon. At the request of the Idaho Department of Fish and Game (IDFG), we did not tag any wild fish in the Middle Fork of the Salmon River drainage--a primary production area for wild spring chinook salmon in Idaho.

Fish were collected and tagged from various reaches of each stream. Our primary collection objective was to collect maximum numbers of parr with minimal effort and minimal impact to the fish. High concentrations of parr were located by snorkeling in advance of collection. In this way, we could concentrate our collection and marking efforts in areas within each stream where parr abundance was high.

Two primary methods were used to collect fish for tagging--electro-shocking and a seining method that we developed specifically for this application. The seining method proved by far the most efficient and least harmful to the fish. We termed this method the "two-seine driving technique." One seine was positioned securely across the lower end of a run or pool. A second, usually shorter, seine was then placed across the river upstream from the sample area and moved quickly downstream, crowding fish toward the lower seine. As the lead line of the upstream seine crossed the lead line of the downstream seine, the lead line of the latter was pulled up out of the water trapping the fish in this seine. The captured fish were maintained in water by



allowing the center of the seine to sag into the river (Fig. 2). The fish were then transferred in a water-tight sanctuary dip net (Matthews et al. 1986) to a 20-liter plastic bucket and portaged to live cages to await tagging. To maintain minimum collection stress, all activities were terminated when water temperatures reached 15°C or when any other occurrences suggested fish were being unduly impacted.

Electro-shocking was only used as a collection method when absolutely necessary. The technique was used only in the East Fork of the Salmon River where only 3.2% of the fish for the study were collected. Electro-shockers were Smith-Root<sup>1</sup> Model 12 units. Techniques and settings used were those recommended by the manufacturer. Stunned fish were collected from the river with standard dip nets and placed in plastic buckets for portaging to the live cages.

Tagging operations were conducted using two portable PIT-tagging stations designed and constructed by NMFS specifically for use beside streams (Fig. 3). Components of each station included an electronic balance, digitizer, tag detector, and automatic tag injector. A multi-port controller electronically directed the flow of information between the computer and other components of the station. A small 12-V battery provided power for the entire station except for the balance which was powered by another small external battery. The automatic tag injector utilized a push-rod system activated by high pressure CO<sub>2</sub> to inject tags into the fish. Each injector was fed by clips containing approximately 150 PIT tags each. Prentice et al. (1987) provide more detailed information on the electronic components and automatic tag injectors used with this system.

To prepare the system to mark fish, two "floppy" discs were inserted into the computer, and the file name and extension were designated to receive data. Header

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<sup>1</sup> Mention of trade names does not imply endorsement by National Marine Fisheries Service.



**Figure 2.--The final step in the "two-seine driving technique" for sampling fish in a wild river; the bag of the downstream net is allowed to sag into the river, providing a water sanctuary for captured fish which are then removed with a sanctuary dip net.**



**Figure 3.—A portable PIT-tagging station in use beside a wild stream in Idaho.**

information was entered onto the discs including file title, creation date and time, tagger, species, rearing type, brood year, tag site, transect, capture method, water temperature, tagging method, and agency. The tagging station was then ready to mark fish.

To initiate the marking process, a measured volume of concentrated MS-222 anesthetic was added to a plastic pan. The fish were dipped from a live cage with a sanctuary dip net and the water and fish were carefully poured into the pan bringing the anesthetic solution to 40-50 ppm immediately. After anesthesia, all other species and chinook salmon parr that were injured, descaled, or less than 55-mm fork length were rejected (a few chinook salmon less than 55 mm were inadvertently tagged during the season). Each remaining chinook salmon parr was injected with a PIT tag using the technique described by Prentice et al. (1987). The tagged fish was then passed through the detector loop to enter the tag code onto the computer. The tag code appeared on the computer screen and an audible tone was emitted by the data scanner indicating that the tag code had been accepted by the computer. Next, the fish was placed on the electronic balance and the weight in grams was automatically entered onto the computer and appeared on the screen. Finally, the fish was laid on the digitizing board, an electronic stylus was activated at the fork of the tail, and the length in millimeters was recorded on the computer and appeared on the screen. The digitizer assembly also included a grid or menu of individual comments or commands that could be activated by the stylus for any fish. The pre-programmed comment would be entered into the data set for that individual fish. Other comments could be added to the data sets of individual fish using the computer keyboard. After tagging, fish were allowed to recover in a plastic bucket of fresh water, transferred back to a live cage in the stream, and held for a minimum of one-half hour before release back into the stream. Tagged fish were released back to the stream as near as possible to the exact location from which they were collected. Approximately 8-10% of the tagged fish

from most streams were held in a live cage in the stream for 24 hours to evaluate tag loss and delayed mortality.

At the end of each day, data discs were taken to the main camp and the data transferred to a larger computer. The day's files were then edited, copied to the hard disc, and a printout was generated. A gas-powered generator powered the larger computers and charged batteries in the small computers and tagging stations.

### Hatchery Fish

To provide comparative data on hatchery-reared fish, we PIT tagged spring chinook salmon parr at Sawtooth Hatchery in Idaho and Lookingglass Creek Hatchery in Oregon (Fig. 1). These fish were tagged in February 1989 and released with normal production fish in the spring. In addition, IDFG PIT tagged an additional group of spring chinook salmon parr at Sawtooth Hatchery that were released in October 1988 and a group of summer chinook salmon at McCall Fish Hatchery that were released with normal production fish in spring 1989. We included both of these additional releases in our study.

At the hatcheries, fish for tagging were obtained from normal production lots. Raceways were crowded and fish removed with standard dip nets. Thereafter, all tagging and data storage procedures were basically the same as previously described for wild fish. All mortalities in the raceways containing tagged fish were scanned for PIT tags until the release date. Those containing PIT tags were subtracted from the release files.

### Monitoring PIT Tags at Dams

During spring 1989, spring/summer chinook salmon PIT tagged for this study migrated downstream volitionally through the hydroelectric complex on the Snake and Columbia Rivers. Of the eight dams the smolts passed, three were equipped with complete smolt collection and PIT tag monitoring systems. These were Lower Granite

and Little Goose Dams on the Snake River and McNary Dam on the Columbia River (Fig. 1). These dams also served as the collection points for the smolt transportation program.

At these facilities, all collected smolts that passed through the outlet orifices of the fish and debris separators and through the distribution flumes were electronically interrogated for PIT tags. The PIT tag detector systems have been described by Prentice et al. (In press). Dates and times to the nearest second were recorded on a computer as PIT-tagged fish passed through the numbered detector coils in the fish distribution flumes. All recovery data were transferred once each day to the main frame computer operated by NMFS in Seattle, Washington.

## Results

### Collection and Tagging

Results of collection and tagging of wild and hatchery-reared spring/summer chinook salmon are detailed in Appendix Table 23 and summarized in Table 8. During 26 working days in August and September, we collected 22,929 wild spring/summer chinook salmon in Idaho and Oregon. Of these, 20,341 were PIT tagged and released back into the streams. Numbers tagged and released per stream ranged from 415 in Alturas Lake Creek to 2,984 in the Grande Ronde River. However, we PIT tagged and released less than 2,000 fish in 3 of the 11 streams. To provide comparative data, 25,127 PIT-tagged fish were released from hatcheries. At Sawtooth Hatchery, 2,062 and 10,073 PIT tagged fish were released in October 1988 and March 1989, respectively. Also in March 1989, 10,012 PIT-tagged fish were released from Lookingglass Creek Hatchery and 2,980 PIT-tagged summer chinook salmon were released into the South Fork of the Salmon River from McCall Hatchery.

Wild fish were smaller than their hatchery-reared counterparts at tagging (Appendix Table 23 and Table 8). In Idaho streams, the fork length of wild fish ranged

Table 8.—Summary of the numbers collected, numbers PIT tagged and released, and average lengths and weights of wild and hatchery-reared spring/summer chinook salmon in 1988-89.

Tagging location	Number collected	Number PIT tagged and released	Average fork length of tagged fish (mm)	Average weight of tagged fish (g)
<b>Idaho wild</b>				
Crooked River	2,479	2,464	69	3.8
Red River	3,602	2,532	75	5.0
East Fork Salmon River	745	742	74	5.6
Upper Salmon River	2,789	2,720	75	5.1
Alturas Lake Creek	415	415	83	7.0
Valley Creek	2,521	2,251	66	3.5
Secesh River	2,349	2,178	69	4.1
Lake Creek	678	664	66	3.6
South Fork Salmon River	<u>2,968</u>	<u>2,184</u>	<u>63</u>	<u>3.4</u>
Totals or averages	18,546	16,150	70	4.3
<b>Oregon wild</b>				
Grande Ronde River	3,044	2,984	68	3.6
Imnaha River	<u>1,339</u>	<u>1,207</u>	<u>70</u>	<u>3.4</u>
Totals or averages	4,383	4,191	69	3.5
<b>Hatcheries</b>				
Lookingglass Creek Hatchery	-	10,012	127	-
Sawtooth Hatchery (fall release)	-	2,062	-	-
(spring release)	-	10,073	117	-
McCall Hatchery	<u>-</u>	<u>2,980</u>	<u>-</u>	<u>-</u>
Totals or averages	-	25,127	122	-

from 50 to 119 mm with an overall average of 70 mm. The weight ranged from 0.6 to 24.0 g with an overall average of 4.3 g. In Oregon streams, the fish were slightly smaller with an average fork length of 69 mm (range 49-106 mm) and an average weight of 3.5 g (range 1.2-13.8 g). In contrast, the fork length of Sawtooth Hatchery fish averaged 117 mm (range 86-191 mm) while the fork length of Lookingglass Creek Hatchery fish averaged 127 mm (range 92-192 mm).

Mortality and tag loss for wild fish were very low (Appendix Table 24 and Table 9). The overall collection mortality was 0.5 and 0.1% for Idaho and Oregon streams, respectively. The collection mortality using the seining technique was 0.4 and 0.1% for Idaho and Oregon streams, respectively. Not surprisingly, the collection mortality using electro-shockers was higher (2.9%); however, this technique was used only in the East Fork of the Salmon River in Idaho where we collected only 3.2% of the fish for this study. The tagging mortality was 0.8 and 0.5% and the 24-hour post-tagging delayed mortality measured 1.5 and 0.0% for Idaho and Oregon streams, respectively. The combined collection, tagging, and 24-hour delayed mortality was 1.3% for Idaho streams and 0.5% for Oregon streams. Loss of tags (24-hour) was negligible, averaging 0.1% after tagging in Idaho streams and 0.4% after tagging in Oregon streams.

#### Recovery of Test Fish at Dams

Recovery totals and percentages were based on first-time detections of PIT tags at the three collector dams. That is, PIT tags detected at Little Goose and McNary Dams that were previously detected at an upstream dam were subtracted from the total recoveries for those two dams.

A total of 9,482 PIT tags were detected (first-time detections) at the three collector dams combined, during spring 1989 (Appendix Tables 25 through 39). Of these, 1,549 originated from wild releases and 7,933 were from hatchery releases. For wild fish, 59.3% of the total were detected at Lower Granite Dam, 29.0% at Little

Table 9.--Mortality and tag loss for wild spring/summer chinook salmon collected and PIT tagged in Idaho and Oregon in summer 1988.

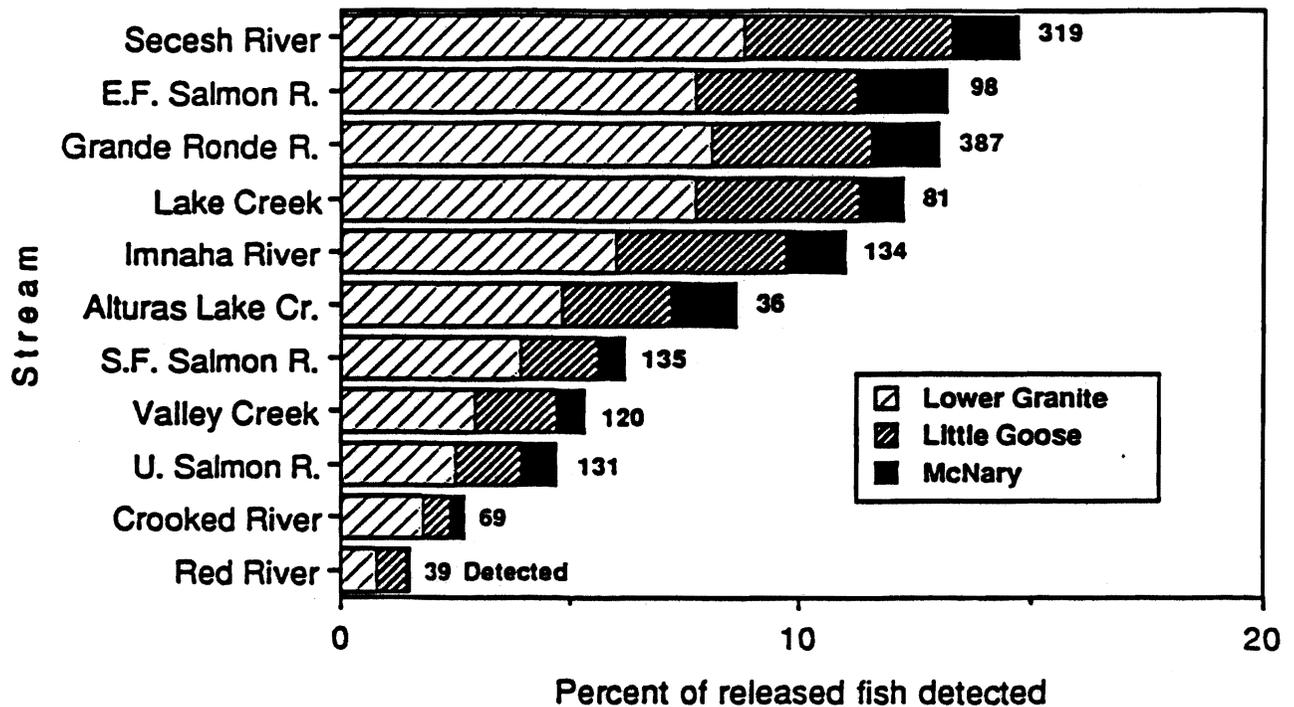
	Mortality (%)				Tag loss after 24 hours (%)
	Collection	Tagging	24-hour	Overall	
<b>Idaho</b>					
Crooked River	0.0	0.4	1.4	0.6	0.3
Red River	1.0	1.5	1.0	2.1	0.0
East Fork Salmon River	2.9*	0.4	1.0	3.4	0.0
Upper Salmon River	0.0	0.1	0.0	0.1	0.0
Alturas Lake Creek	0.0	0.0	-	0.0	-
Valley Creek	0.1	0.7	2.6	0.9	0.0
Secesh River	0.3	0.8	1.9	1.5	0.2
Lake Creek	0.1	0.2	-	0.3	-
South Fork Salmon River	<u>0.7</u>	<u>1.7</u>	<u>2.6</u>	<u>2.2</u>	<u>0.0</u>
Average	0.5	0.8	1.5	1.3	0.1
<b>Oregon</b>					
Grande Ronde River	0.1	0.3	0.0	0.4	0.4
Imnaha River	-	<u>0.7</u>	-	<u>0.7</u>	-
Average	0.1	0.5	0.0	0.5	0.4

\* This group was collected entirely with electro-shockers.

Goose Dam, and 11.7% at McNary Dam. For hatchery-reared fish, 45.0, 38.3, and 16.7% of the total were detected at the three dams, respectively.

The recovery rates of wild fish at the three collector dams are illustrated by stream of origin in Figure 4. We detected 7.6% of the wild fish tagged for this study at the three collector dams combined. Recovery rates ranged from a low of 1.5% for fish originating in the Red River to a high of 14.6% for fish originating in the Secesh River. At Lower Granite Dam, we recovered 4.5% of the wild fish. Recovery rates at this dam ranged from a low of 0.8% for fish originating in the Red River to a high of 8.8% for fish originating in the Secesh River. At Little Goose Dam, recovery rates by stream were approximately one-half of those measured at Lower Granite Dam, but the low to high recovery rate trends by stream were nearly the same. Finally, at McNary Dam, recovery rates were about one-third as high as at Little Goose Dam with similar low to high recovery rate trends by stream.

Figure 5 shows the recovery rates of the four releases of hatchery-reared fish at the three collector dams. We detected 31.6% of the release of all hatchery-reared fish at the three collector dams combined. The overall recovery rates ranged from a low of 5.1% for fish released from the Sawtooth Hatchery in the fall to a high of 50.9% for fish released from Lookingglass Creek Hatchery in the spring. At Lower Granite Dam, we detected 14.2% of the hatchery-reared fish released ranging from a low of 3.1% for the Sawtooth Hatchery fall release to a high of 19.1% for the spring release of Lookingglass Creek Hatchery fish. Recovery rates at Little Goose Dam were about one-half those at Lower Granite Dam except for the Lookingglass Creek Hatchery release. Slightly more fish from this hatchery were recovered at Little Goose Dam (21.9%) than at Lower Granite Dam (19.2%). Low to high recovery rate trends by hatchery were the same for the two dams. In general, recovery rates at McNary Dam were about one-third those at Little Goose Dam with the same low to high recovery rate trends by hatchery.



**Figure 4.--Percent recoveries of wild spring/summer chinook salmon at Lower Granite, Little Goose, and McNary Dams in spring 1989. The Secesh, South Fork Salmon, and Imnaha Rivers and Lake Creek are considered summer chinook salmon streams.**

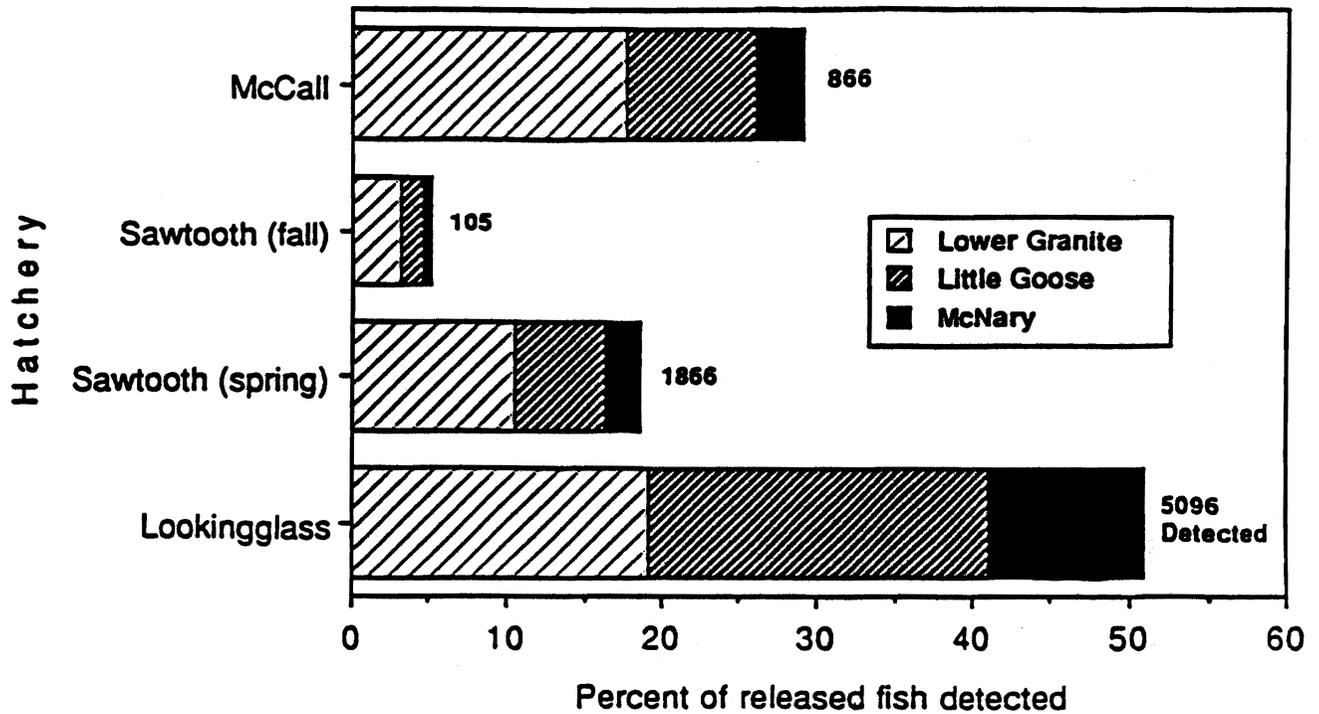


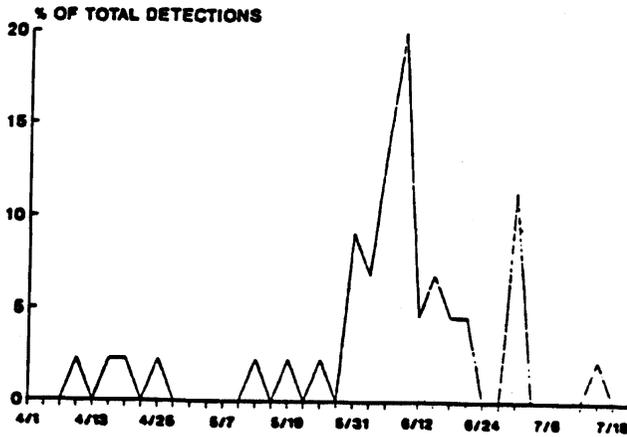
Figure 5.--Percent recoveries of hatchery-reared spring/summer chinook salmon at Lower Granite, Little Goose, and McNary Dams in spring 1989. McCall Hatchery is a summer chinook salmon rearing facility.

### Outmigration Timing at Lower Granite Dam

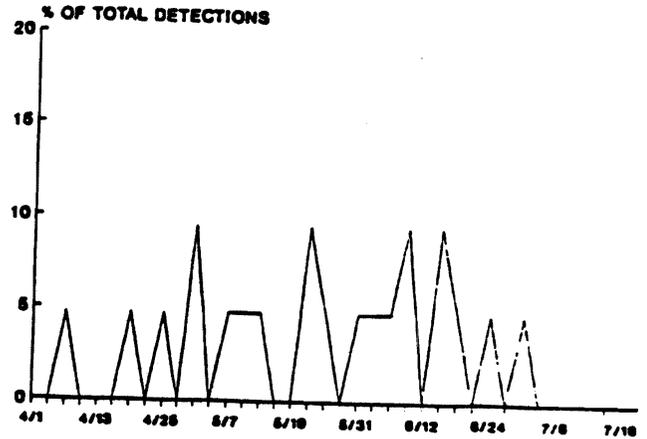
Timing of outmigrations for individual stream and hatchery populations passing Lower Granite Dam was calculated from 1 April to 22 July by dividing the total recoveries in 3-day intervals at the dam by the total recovered during the season per stream or hatchery. Similarly, timing for combined populations was calculated by totaling the recoveries of groups in 3-day intervals and dividing by the total recovered during the season for the same groups.

Spring chinook salmon --Timing at Lower Granite Dam of the outmigrations of spring chinook salmon smolts for individual streams and hatcheries is presented in Figure 6. For wild fish, the outmigration timing varied greatly among individual streams and was generally protracted. Most peaks did not occur until after 1 May. Fish originating in the upper Salmon River, East Fork of the Salmon River, and Valley Creek (a tributary of the upper Salmon River) in Idaho tended to be in relatively good numbers by late April and peaked generally between 25 April and 16 May. These streams are among the farthest upstream from the dam. Fish originating in the Crooked River (a tributary of the Clearwater River in Idaho) and the Grande Ronde River in Oregon tended to arrive in relative abundance later in the outmigration. These fish were present between 7 May and 24 June and generally peaked after 1 June. These streams are among the closest to the dam. Red River fish were in very small numbers throughout the outmigration. Hatchery-reared fish were in abundance early in the outmigration, and their timing was much more compressed. Lookingglass Creek Hatchery fish were in abundance by 13 April and peaked on 22 April. Few fish from this hatchery were detected after 10 May. Both releases of Sawtooth Hatchery fish arrived in abundance about 19 April and also peaked on 22 April. Fish from this hatchery were present until early June, although in very small numbers.

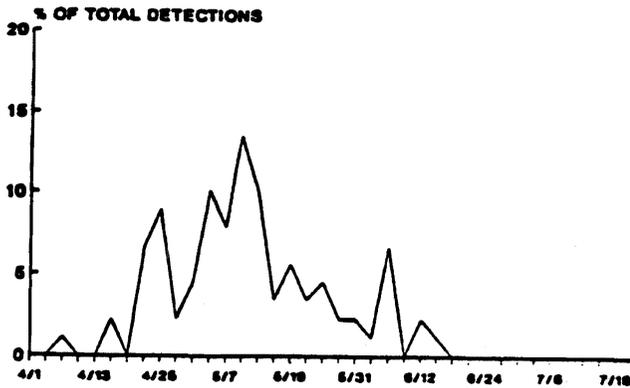
CROOKED RIVER



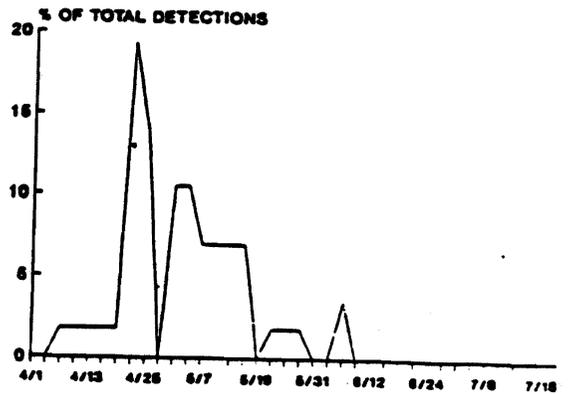
RED RIVER



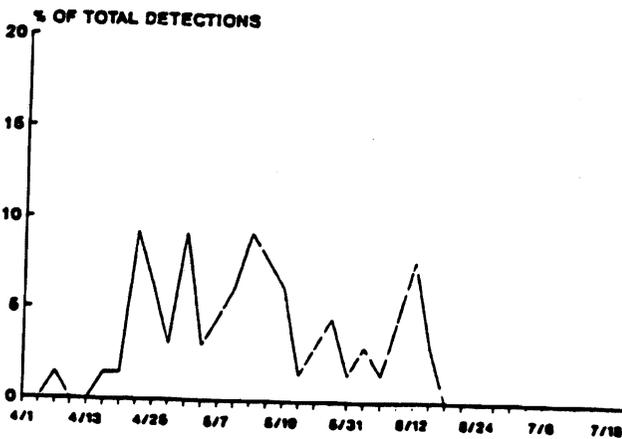
UPPER SALMON RIVER  
(INCLUDES ALTURAS LAKE CR.)



EAST FORK SALMON RIVER



VALLEY CREEK



GRANDE RONDE RIVER

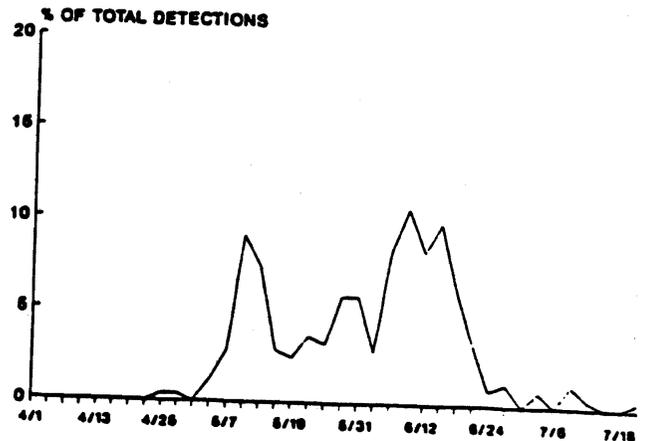
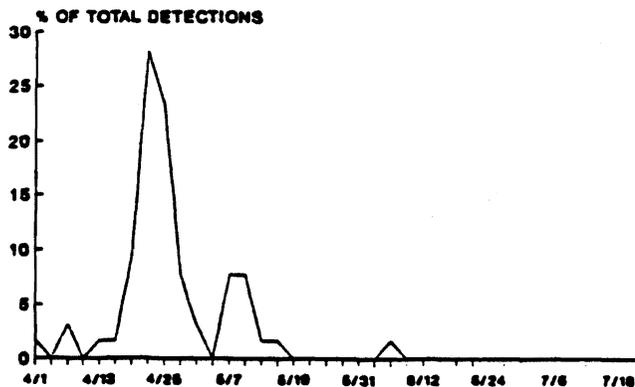
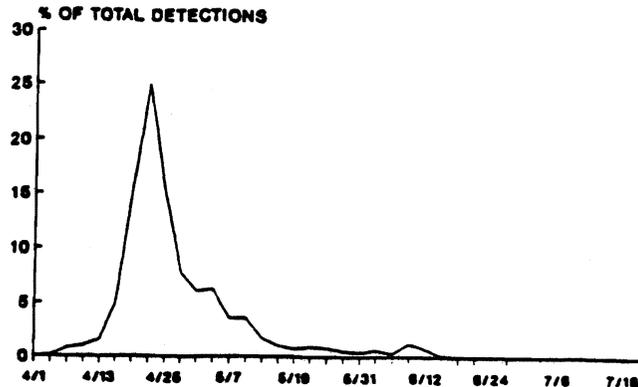


Figure 6.--The outmigration timing of spring chinook salmon smolts at Lower Granite Dam in 1989 by individual streams and hatcheries.

### SAWTOOTH HATCHERY FALL RELEASE



### SAWTOOTH HATCHERY SPRING RELEASE



### LOOKINGGLASS HATCHERY

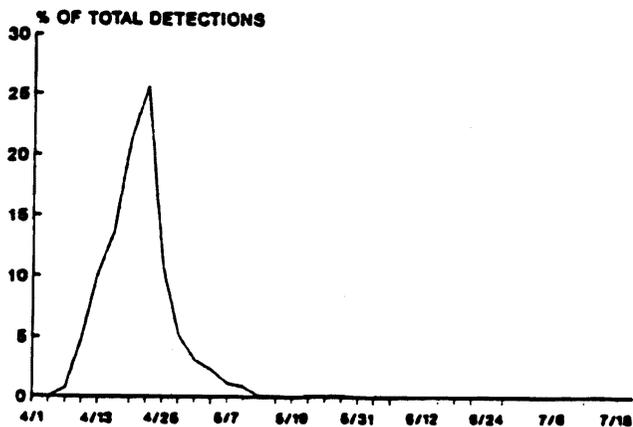


Figure 6.--Continued.

To illustrate the overall difference in timing between wild and hatchery-reared fish, we combined all wild and hatchery-reared recoveries into the two groups (Fig. 7). The combined wild fish outmigration was characterized by two peaks occurring around 10 May and 9 June. The 50th percentile of these fish passed the dam on 23 May, and the 90th percentile passed on 15 June. The combined hatchery-reared fish outmigration peaked on 22 April with the 50th percentile passing the dam the same date. The 90th percentile of these fish passed the dam on 4 May. In general, high detection rates of spring chinook salmon smolts at Lower Granite Dam were associated with higher river discharge (Fig. 7). Peak movements of both wild and hatchery-reared fish coincided with peak periods of flow. The earliest peak in flow occurred about 22 April coincidental with the major peak of hatchery-reared fish and a small, early peak of wild fish. This period of flow appeared to move most of the hatchery-reared fish past the dam. Flows peaked twice later, about 10 May and 8 June, coincidental with the two major peaks of wild fish. However, these later peaks of wild fish could have been related simply to the arrival of different groups of fish at the dam.

Summer chinook salmon --Figure 8 illustrates the outmigration timing of summer chinook salmon smolts for individual wild streams and McCall Hatchery. These stocks of wild fish tended to be in abundance at Lower Granite Dam much earlier than their spring chinook salmon counterparts. Fish from the Innaha River in Oregon were present by 3 April and continued to be detected at relatively abundant levels until peaking on 4 May. Fish originating in the Secesh and South Fork Salmon Rivers in Idaho began arriving by 10-16 April and both peaked on 25 April. McCall Hatchery fish began arriving at the dam by 16 April and peaked 10 May, somewhat later than their wild counterparts. With the exception of wild fish originating in the Innaha River, wild and hatchery-reared summer chinook salmon were detected in small numbers well into June.

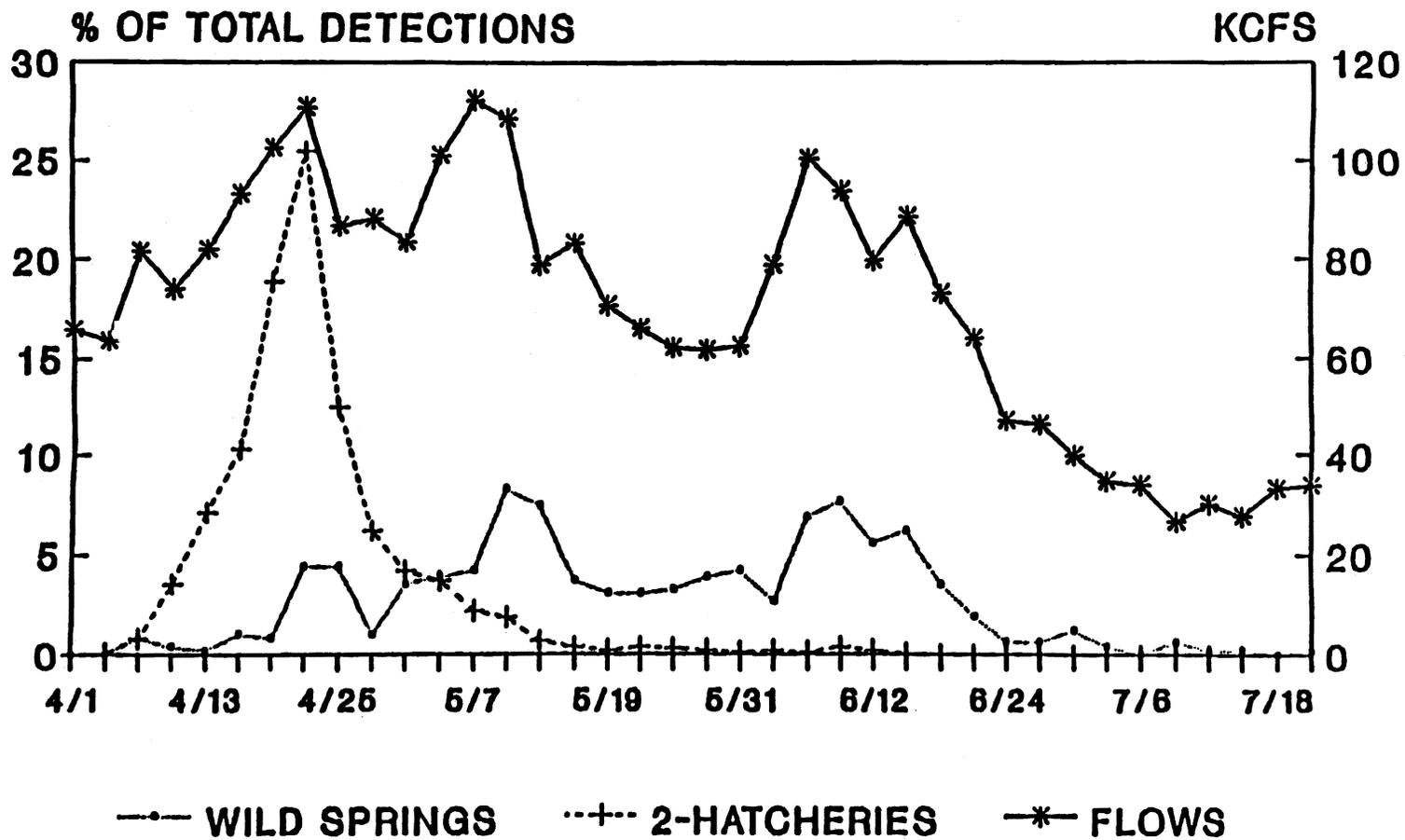
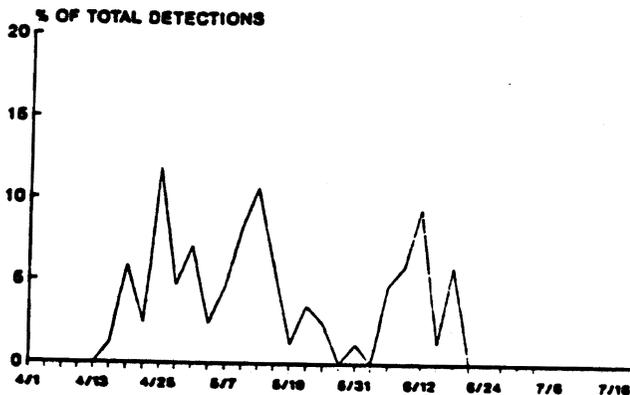
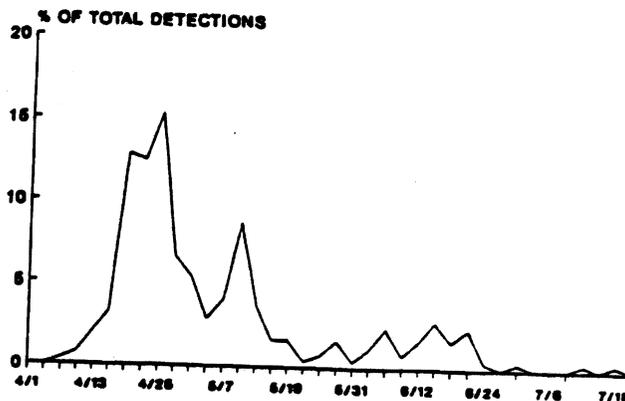


Figure 7.—The outmigration timing of wild and hatchery-reared spring chinook salmon at Lower Granite Dam in 1989. Data represent recoveries from all wild streams combined and Lookingglass Creek and Sawtooth Hatcheries combined.

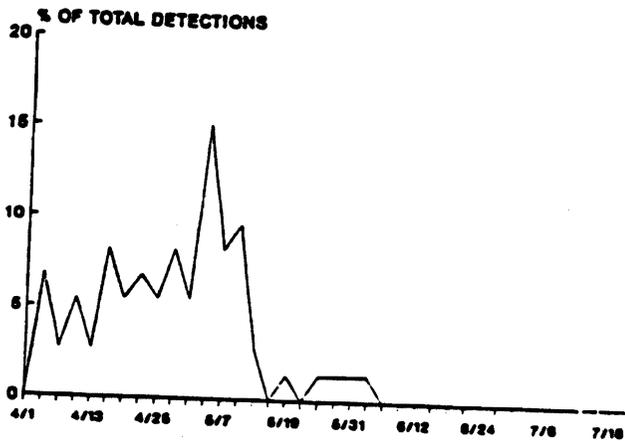
### SOUTH FORK SALMON RIVER



### SECESH RIVER (INCLUDES LAKE CR.)



### IMNAHA RIVER



### McCALL HATCHERY

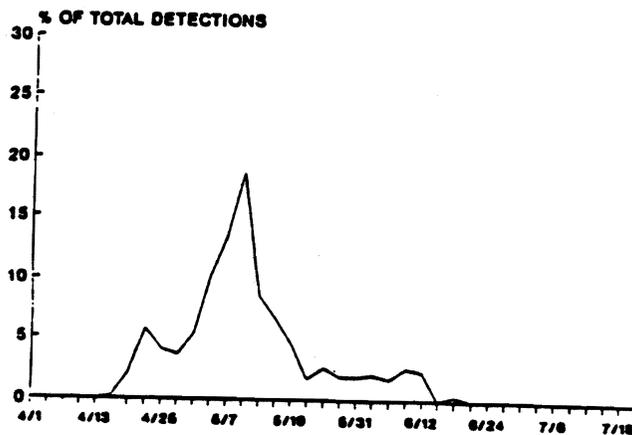


Figure 8.--The outmigration timing of summer chinook salmon smolts at Lower Granite Dam in 1989 by individual streams and McCall Hatchery.

The combined outmigration timing of all wild summer chinook salmon compared to McCall Hatchery fish is depicted in Figure 9. The wild fish peaked on 25 April with a smaller peak occurring on 10 May. The 50th and 90th percentiles passed the dam on 2 May and 9 June, respectively. As previously mentioned, McCall Hatchery fish peaked on 10 May with the 50th and 90th percentiles passing the dam on 11 May and 2 June, respectively.

As with spring chinook salmon, higher recoveries of summer chinook salmon appeared to coincide with higher flows (Fig. 9). The largest peak of wild fish and a smaller peak of hatchery-reared fish occurred during the highest flow period in late April. Conversely, the largest peak of hatchery-reared fish and a smaller peak of wild fish occurred simultaneously with the second period of peak flows about 10 May.

#### Discussion

The collection and tagging methods that we developed for wild streams were highly successful and encouraging. As previously mentioned, our primary objective was to capture and tag maximum numbers of parr with minimal effort and impact to the fish. The "two-seine driving technique" with water-to-water transfer capabilities proved highly effective in capturing large numbers of parr in minimal time. The low mortalities recorded during collection and after tagging provided strong evidence that the fish were impacted little, if any, by this procedure. Moreover, we occasionally witnessed tagged fish feeding in pools shortly after release. With the present equipment, an additional collection crew, and adequate fish available, we feel it would be possible to capture and tag up to 80,000 wild fish during the August-September tagging window.

Recovery rates of wild fish at the collector dams in spring 1989 were much lower than expected. The combined recovery rate for wild fish at Lower Granite Dam was about 7 times lower than we had originally anticipated. Part of this was because

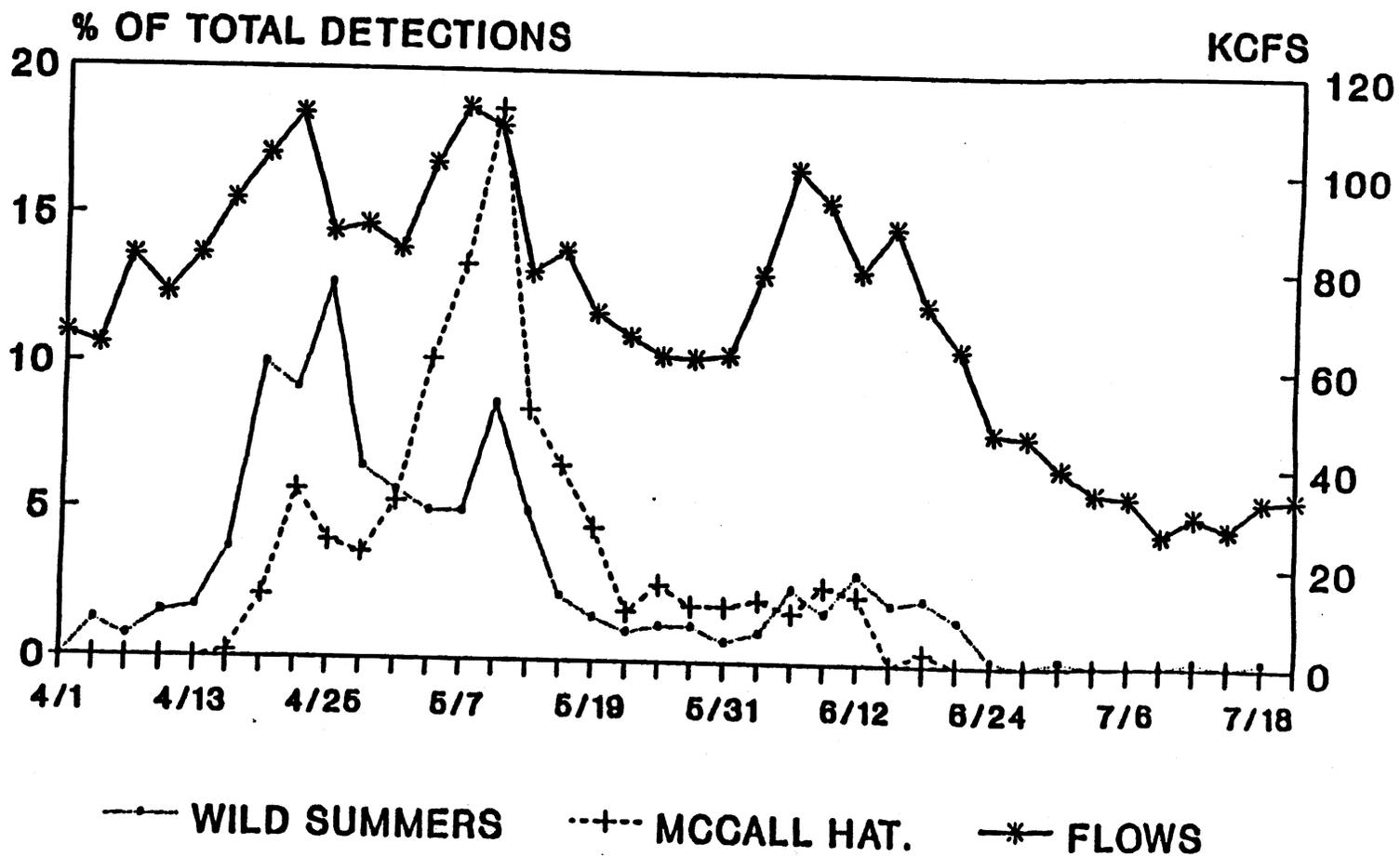


Figure 9.--The outmigration timing of wild and hatchery-reared summer chinook salmon at Lower Granite Dam in 1989. Data represent recoveries from all wild streams combined and McCall Hatchery.

we may have overestimated over-winter survival for most years. Part of it was also because fish in a few streams such as Crooked and Red Rivers, where we had large groups tagged, survived poorly to an extreme. Even so, we feel recovery rates for the other streams should have been at least 2-3 times higher. Even though other factors may have been involved, we suspect the major factor contributing to the considerably lower than expected recoveries was unusually low over-winter survival caused by a succession of extreme environmental conditions over a 2-year period beginning with the drought of 1987. This drought cycle was followed immediately by another in 1988--the year the fish were tagged. The back-to-back droughts resulted in very low stream discharge in the study streams and elsewhere during summer, fall, and winter 1988. Normally, large numbers of parr migrate downstream out of the upper tributaries in the fall (Edmunson et al. 1968, Bjornn 1971, Raymond 1979). The magnitude of these migrations varies annually and can result in many fish moving far down into the larger streams where quality over-winter habitat is more abundant. It is believed, generally, that the dynamics of these migrations are dependent upon such things as stream discharge, temperature, turbidity, and habitat availability (Bjornn 1971). Since fall 1988 was characterized by low stream discharge and minimal precipitation, we believe that the fall outmigrations were impeded; hence, more fish than normal remained upstream in the tributaries where quality over-winter habitat is limited. The ensuing winter was characterized by a reduced early snowpack in most areas and extremely low temperatures during mid-winter. These conditions coupled with low stream discharge would likely result in excessive ice formation deep into the substrate ("anchor" ice) and large amounts of ice crystals ("frazzle" ice) suspended in the water column. This could impact survival of salmon parr that are burrowed into the substrate during winter (Edmunson et al. 1968).

Results of a study conducted by IDFG from 1987 through 1989 support the above conclusion. In that study, spring chinook salmon juveniles were PIT tagged in

the upper Salmon River during the summers of 1987 and 1988 (the same time fish for this study were tagged) and early the following springs. Fish tagged during the summers were exposed to subsequent over-wintering conditions each year prior to recovery at Lower Granite Dam whereas those tagged in the early spring were not. At Lower Granite Dam, fish tagged in summer 1987 were recovered the following spring at nearly 3 times the rate as those tagged in summer 1988 whereas those tagged during both early springs were recovered at identical rates (R. Kiefer)<sup>2</sup>. These results strongly imply that over-winter survival was substantially lower for fish that were tagged during summer 1988 than for those tagged the previous year.

The recovery rates of hatchery-reared fish were higher overall than for wild fish, but low in a relative sense. Possibly, hatchery-reared fish would have higher recovery rates than wild fish since the former have the considerable advantage of a protected environment, particularly during winter. With this considered, the recovery rates measured at Lower Granite Dam ranging from 10.5 to 19.1% for hatchery-reared fish released in spring were, in our opinion, poor. This result was not unexpected since we have known in general for several years that a high percentage of these fish never arrive at the first dam.

The consistency in recovery proportions measured among the three collector dams for individual groups of both wild and hatchery-reared fish was surprising, particularly since the timing of the groups differed so greatly. The only exception was for fish from Lookingglass Creek Hatchery. Slightly more fish from this hatchery were recovered at Little Goose Dam than at Lower Granite Dam. For all other groups, roughly twice as many fish were detected at Lower Granite Dam than at Little Goose Dam. It was discovered in late April that the juvenile collection system at Lower

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<sup>2</sup> Russell B. Kiefer, Idaho Department of Fish and Game, 600 S. Walnut St., Boise, ID 83707. Pers. commun., January 1990.

Granite Dam had been operating with the large bypass gate partially open in the upwell. This allowed access back to the river for an unknown portion of the smolts collected prior to that time. We speculate that more Lookingglass Creek Hatchery fish than other fish escaped to the river through this route at Lower Granite Dam since they were the most abundant group at the dam during that time. Another possibility is that guidance efficiency may have been lower at Lower Granite Dam for this early arriving group than for the other groups. In either case, proportionally more fish from Lookingglass Creek Hatchery were available for collection at Little Goose Dam.

The timing of the different components of the spring/summer chinook salmon smolt migrations varied greatly at Lower Granite Dam and encompassed virtually the entire spring and early summer migration period. Wild summer chinook salmon were present early and peaked with hatchery-reared spring chinook salmon in late April. The early abundance of these wild stocks suggests they may have a propensity to migrate farther in larger numbers in fall than wild spring chinook salmon. Hatchery-reared summer chinook salmon were present in good numbers during the mid-migration period in early May. The latest and most protracted outmigrations were of wild spring chinook salmon. Although they were present in small numbers throughout the outmigration, most were detected from mid-May to mid-June. It should be noted that not all wild and hatchery-reared components were represented in this study. Most notably, wild fish originating in the Middle Fork of the Salmon River drainage were not included. These fish represent a large segment of the wild fish production in Idaho and could exert a strong influence on the overall outmigration timing of wild fish. Also missing were hatchery-reared fish from Dworshak National Fish Hatchery and Rapid River Hatchery. While these fish represent large segments of the hatchery production, their outmigration timing is known to be very similar to the hatcheries represented in this study. We believe their exclusion had little influence on the overall outmigration timing of hatchery-reared fish as depicted in this study. We also caution that the data

represent only 1 year of study. Migrational dynamics and survival rates could vary considerably under different environmental conditions, particularly for wild fish.

The major obstacles to a strong recovery of wild spring/summer chinook salmon runs are likely associated with the smolt migration phase of their life cycle in most years. More information of the type provided by this pilot study will be critical for making appropriate decisions on behalf of these fish in the future.

## ASSESSMENT OF A PIT-TAG DETECTION/DIVERSION SYSTEM AT LOWER GRANITE DAM

### Introduction

To conduct a full-scale transportation study utilizing PIT tags requires a method of automatically detecting, recording, and diverting a portion of tagged fish collected at dams back to the river to serve as experimental controls. Moreover, other important studies may have similar requirements in the future. The technology required to efficiently detect and record PIT-tagged fish within these systems has been developed and is in use (Prentice et al. In press). Presently, however, the ability to efficiently divert PIT-tagged fish back to the river or elsewhere as they are detected and recorded is lacking.

To be efficient and effective, a system to accomplish this task must be capable of operating in fractions of a second in water velocities ranging from 6 to 9 fps. Simultaneously, the system must not adversely impact fish. With these goals in mind, NMFS built and tested several prototype systems in spring and summer 1988 at its field station in Pasco, Washington. One of the systems, which incorporated a sliding gate in the bottom of a flume, showed great potential and was chosen for installation and field testing at Lower Granite Dam in spring 1989. The primary objectives of the field tests were to determine the following under actual conditions: 1) numbers of untagged fish diverted during each PIT-tag diversion cycle at different levels of fish

abundance, 2) descaling/injury and mortality rates for diverted fish, and 3) recovery rates at Little Goose and McNary Dams for PIT-tagged fish diverted to the river with this system over long time periods. This final objective was dropped at the beginning of testing at the request of the fisheries agencies and tribes and with agreement of the COE.

### Methods

A dual-flume PIT-tag detection/diversion system was installed just beyond the exit ports of the fish and debris separator within the fish collection facility at Lower Granite Dam in winter 1989 (Fig. 10). Each flume was equipped with a bottom-mounted sliding gate panel (slide-gate) and with a PIT-tag detector for activation of the slide-gate located just upstream. An additional slide-gate was installed in each flume just upstream from the PIT-tag detectors. These slide-gates were used to obtain the juvenile fish facility sample from which estimates of hourly fish counts (abundance) were obtained. The system was designed so that fish leaving the separator via one of the two flumes would first pass over the facility sample slide-gate, then through the PIT-tag detector (activator), and then over the PIT-tag diverter slide-gate. When the PIT-tag detector was activated by a tagged fish, the slide-gate opened against the water flow and the tagged fish dropped into a PIT-tag head box. The slide-gate then closed with the water flow. From the head box, the PIT-tagged and untagged fish moved in clear plastic pipes through Smith-Root electronic counters, a second set of PIT-tag detectors, and into a partitioned collection tank for inspection. The length of time the slide-gate remained open and the speed that it moved was set according to the velocity of water in the flume; this was measured by a hand-held flow meter. After the set time, the slide-gate closed in the same direction and at the same velocity as the water flow. This simple action is key to the success of the system in terms of both speed of operation and impact on fish. If the water and slide-gate

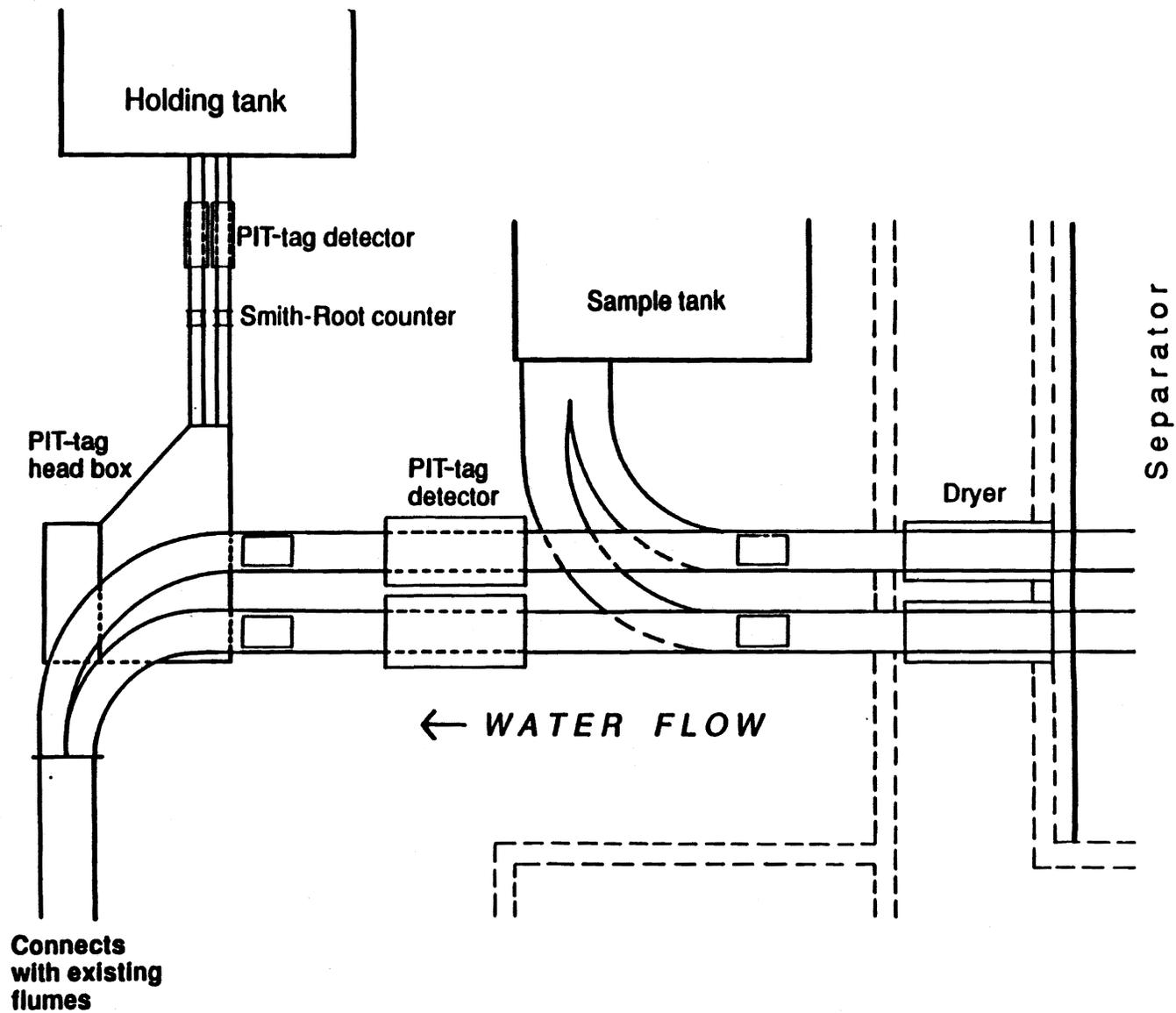


Figure 10.--Schematic of the dual-flume PIT-tag detection/diversion system installed at Lower Granite Dam in winter 1989 and tested in spring 1989.

velocities are about the same, fish arriving at the edge of the slide-gate as it begins to close will be carried across the opening unharmed. Therefore, the slide-gate is essentially closed when it begins to close.

For the purpose of this study, the efficiency of the PIT-tag detection/diversion system is defined as the ratio of untagged to tagged fish diverted per PIT-tag diversion cycle. This efficiency is primarily a function of the number of fish per hour in the flume and the amount of time the slide-gate remains open to divert a PIT-tagged fish, which is dictated by the water velocity. That is, the higher the water velocity in the flume, the less time the gate needs to remain open to divert the PIT-tagged fish; hence, fewer untagged fish will also be diverted per cycle at any given number of fish per hour in the flume.

A theoretical efficiency for the dual flume system can be calculated for different water velocities and gate opening times by assuming that fish exiting the fish and debris separator are equally spaced at given rates of fish abundance. The calculations also assume that equal numbers of fish use each flume. The higher the abundance, the closer together the fish are spaced and a higher ratio of untagged to tagged fish will be diverted per cycle. For example, for a dual flume system, the theoretical efficiency calculated at a water velocity of 9 fps and 0.5-second gate opening ranges from 0.007 untagged fish diverted per diversion cycle at 100 fish per hour passage rate to 3.5 untagged fish diverted per diversion cycle at 50,000 fish per hour passage rate. These calculations indicate the maximum efficiencies possible for any set of water velocity and gate opening parameters. They are not obtainable under actual field conditions because fish are not equally spaced through the system. However, the calculations provide useful baselines for comparisons of actual results.

The actual efficiency of the system was determined by conducting a series of hourly tests at different rates of fish movement. Most tests were conducted during evening hours when fish abundance was increasing to maximum levels. The rate of

fish movement for each test was not known in advance, but was calculated from the facility sample after a test was completed. Likewise, the number of PIT-tag diversion cycles per test was not known in advance, but was dependent upon the abundance of PIT-tagged fish exiting the fish and debris separator during a test. Water velocities in the flume were measured just prior to starting an hourly test; the time the slide-gate remained open during each PIT-tag diversion cycle was set according to these measurements for each hourly test. At the end of each hourly test, fish were removed from the collection tank with a sanctuary dip net and anesthetized. Anesthetized fish were scanned for PIT tags, counted, identified to species, and observed for descaling/injury. After data collection, fish were allowed to recover from the anesthesia and returned to the flume system for inclusion in the transport barges.

### Results and Discussion

When testing began in early April, a water-flow problem was readily apparent in the newly installed system. It was discovered that the flume bottom sloped slightly uphill just below the curves where the dual flumes join to form a single flume. This caused slack water over the slide-gates when both flumes were operating. With this constraint, the system could not be tested as designed. With one flume operating, the water backed up only to the curve just below the slide-gate in that flume. This allowed for testing of a single flume for most of the season instead of the double flume as planned. At the end of April, the installation flaw was corrected and we were able to conduct some tests using the double flume as designed, before increased steelhead abundance dictated that we discontinue testing.

During the season, we conducted 24 successful hourly tests using a single flume and 9 successful hourly tests using the double flume system (Appendix Tables 40 through 47 and Table 10). Additional tests were conducted during the season but were aborted for various reasons. The highest hourly facility count tested was 12,184 fish.

Table 10.--The average number  $\pm$  SD of untagged fish diverted per PIT-tag detection during single- and double-flume testing at Lower Granite Dam, 1989. Results are grouped by hourly fish facility counts and by the percentage of untagged steelhead diverted per test.

	<u>Single flume</u>		<u>Double flume</u>	
	Number of tests	Untagged fish diverted per PIT-tag detection	Number of tests	Untagged fish diverted per PIT-tag detection
<b>Hourly fish facility count</b>				
<5,000	16	1.3 $\pm$ 0.4	6	0.7 $\pm$ 0.3
5,001-10,000	5	2.2 $\pm$ 0.3	2	2.2 $\pm$ 0.3
10,0001-15,000	3	4.3 $\pm$ 0.2	1	2.5
<b>Percent of untagged steelhead in population diverted</b>				
0.0	13	0.2 $\pm$ 0.6	1	0.1
0.0-50.0	6	2.1 $\pm$ 0.4	3	1.7 $\pm$ 0.6
>50.0	5	3.0 $\pm$ 0.7	5	1.1 $\pm$ 0.3

Theoretically, the efficiency of the system decreases proportionally and gradually as fish abundance increases. Therefore, we bracketed and averaged the results of individual tests within 5,000 fish increments of abundance. As predicted by the theoretical calculations, the efficiency of the system decreased as fish abundance increased in the hourly tests. With the single flume, the average number of untagged fish diverted per cycle increased from 1.3 when the hourly facility count was less than or equal to 5,000 fish to 4.3 when the hourly facility count was greater than 10,000 fish. As expected, the double flume was about twice as efficient as the single flume, averaging 0.7 and 2.5 untagged fish diverted at the lower and higher levels of fish abundance, respectively. This finding supports the assumption that fish exit the fish and debris separator through both flumes in nearly equal numbers.

In the single flume tests, the efficiency decreased substantially as steelhead abundance increased (Table 10). The average number of untagged fish diverted per diversion cycle increased 15-fold when untagged steelhead abundance increased from zero to 50% or more of the diverted fish in the hourly tests. Steelhead were able to maintain a position in the single flume directly above or in the curves just downstream from the slide-gate. Thus, they were often diverted in numbers out of proportion to their actual abundance in the facility. Similar results were not as apparent in later tests with the double flume because the downward slope of the flume had been increased. This action increased the water velocity in the area of the slide-gate and made it more difficult for steelhead to maintain a position in the immediate vicinity of the gate.

Descaling/injury and mortality rates were somewhat higher overall than expected (Appendix Tables 42-43 and 46-47). In the single flume tests, descaling/injury averaged 9.5% for spring/summer chinook salmon and 8.5% for steelhead; mortality averaged 1.7 and 3.8% for both species, respectively. In the double flume tests, both values were lower for both species with descaling/injury averaging 5.9% for spring/summer chinook

salmon and 2.7% for steelhead; mortality averaged 0.1 and 3.2% for both species, respectively. We believe the tests conducted with the double flume provided the most representative data since the system was designed to operate in this manner. Even so, the values were higher than we expected. Descaling/injury values were likely inflated by the procedures required for collection and handling of test fish for data retrieval even though water-to-water transfer techniques were used. Virtually all mortalities were caused by the slide-gate. However, the device was not designed to operate with high numbers of fish capable of maintaining positions close to it. The other slide-gate, used for obtaining the facility sample, was located much closer to the exit orifices of the fish and debris separator. Fish could not maintain positions in this area and moved across this slide-gate at a consistent pace matching the velocity of the water. No mortalities attributable to this slide-gate were reported or noted during the entire fish collection season.

In addition to the ability of steelhead to maintain position in the area of the slide-gate, two other problems were identified that substantially influenced the efficiency of the system. First, we found that the hourly counts derived from the facility samples often grossly underestimated the actual numbers of fish exiting the fish and debris separator. Since the rates of fish movement in our hourly tests were derived from this source by necessity, they were also often low estimates. The net effect was a false reduction in the measured efficiency of the detection/diversion system because more fish actually moved past the slide-gate than were estimated in any given hour. The primary cause of this problem was a relationship between the timing of the facility sample cycles and the timing of the removal of steelhead kelts from the fish and debris separator. Removal of steelhead kelts causes an acute disturbance that results in a heavy exodus of fish from the fish and debris separator. Facility personnel were properly instructed to remove kelts only during periods when the hourly facility samples were not being taken. Therefore, the high rates of fish movement that

occurred during kelt removal were not represented in the facility samples or, ultimately, in the hourly counts.

The other problem that reduced efficiency involved periods of high variability in the velocity of water in the flumes, caused by inconsistent water levels in the fish and debris separator. Occasionally, we were forced to set the time the slide-gate remained open longer than desirable to assure diverting PIT-tagged fish when water velocities were uncharacteristically low. We believe the system can operate effectively with variable water velocities if they are not extreme.

The initial testing of the PIT-tag detection/diversion system in 1989 was hampered by some rather severe design, mechanical, and procedural flaws. Even so, we estimate the overall efficiency of the system was about half the theoretical efficiency using data from both single and double flume testing. This estimate assumes that the double flume system is twice as efficient as the single flume system. The limited testing in 1989 suggested this assumption is valid. With a few changes and adjustments, we believe the system has great potential for efficiently diverting PIT-tagged fish for future studies.

## SUMMARY

1. At Lower Granite Dam, we completed marking for the second year of a 3-year transportation study. We marked with CWTs and freeze brands 75,295 transport and 107,176 control spring chinook salmon smolts and 30,116 transport and 42,259 control steelhead smolts. No juvenile smolt marking occurred at McNary Dam in 1989, since marking for the 3-year study at this dam was completed in 1988.
2. At Lower Granite Dam, post-marking delayed mortality was low for both species, averaging 1.1% for spring chinook salmon smolts and 1.8% for steelhead smolts.
3. Adult returns for spring chinook salmon and steelhead marked as juveniles for transport index purposes at Lower Granite Dam in 1985 are complete. The observed adult return rate back to the dam was 0.22% for spring chinook salmon and 1.22% for steelhead.
4. Returns of transport and control groups of adult spring chinook salmon and steelhead marked as smolts at Lower Granite Dam in 1986 are nearly complete. At the dam, we have observed 0.16% of the barge transport group and 0.10% of the control group for spring chinook salmon and 1.0% of the barge transport group and 0.53% of the control group for steelhead.
5. Environmental conditions encountered by adult steelhead migrants in the Columbia and Snake Rivers during summers/falls of 1987 and 1988 appeared to severely impact their survival.
6. Both transport and control groups of wild steelhead are returning to Lower Granite Dam at up to twice the rate of their hatchery-reared counterparts.
7. Adult returns of spring chinook salmon marked as smolts at McNary Dam for transport research purposes in 1986 were very poor. However, preliminary adult returns of smolts marked in 1987 and 1988 have been much higher.

8. Adult recoveries of fall chinook salmon marked for transport research purposes in 1986 through 1988 are preliminary. Overall, we have recovered over twice as many transports as controls. Recoveries of these fish should increase considerably next year.
9. An effective and efficient method of collecting wild spring/summer chinook salmon parr for PIT tagging was developed. We PIT tagged 20,511 wild spring/summer chinook salmon parr in Idaho and Oregon in August and September 1988. In addition, 25,127 fish were PIT tagged and released from hatcheries.
10. For wild fish, mortalities and tag losses associated with the PIT-tag study were exceptionally low.
11. Recoveries at dams of PIT-tagged wild spring/summer chinook salmon were much lower than expected.
12. The outmigration timing of wild spring chinook salmon smolts through Lower Granite Dam was much later and more protracted than for their hatchery-reared counterparts.
13. The outmigration timing of wild summer chinook salmon through Lower Granite Dam was earlier than for their hatchery-reared counterparts.
14. Peak outmigration periods for both wild and hatchery-reared fish at Lower Granite Dam were coincidental with peak flows.
15. The initial testing of a PIT-tag detection/diversion system at Lower Granite Dam was plagued by design, mechanical, and procedural problems. Even so, we estimated the efficiency of the system was half the theoretical (maximum) efficiency.

## RECOMMENDATIONS

1. Studies of the outmigration timing of wild spring/summer chinook salmon using PIT tags should continue, even if they are not associated with transportation research.
2. With respect to the system to divert PIT-tagged fish back into the river, we feel as follows:
  - a) A single slide-gate should be used for both the PIT-tag diversion and facility sample. To improve efficiency and virtually eliminate mortality, the slide-gate should be as close to the exit port of the fish and debris separator as possible.
  - b) The downward slope of the flumes should be increased to increase and maintain water velocity to further improve efficiency.
  - c) A small facility sample be taken every 2 to 5 minutes and the fish and debris separator should be treated the same as when the sample is off. This pertains to steelhead kelt removal in particular. Kelts should be removed from the fish and debris separator regardless of the status of the facility sample cycle. This action should provide considerably more accurate fish counts for the facility and for the slide-gate tests.
  - d) To stabilize water velocities in the flumes and improve efficiency, a staff gauge should be installed in the fish and debris separator so operators can maintain more constant water levels.

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**APPENDIX**

**Data Tables**

**Appendix Table 1.--Summary of spring/summer chinook salmon marked at Lower Granite Dam in 1989 including dates, brands, wire tag codes, and numbers marked.**

Replicate number	Marking period	Brand position, <sup>a</sup> symbol, and orientation <sup>b</sup>	Wire tag code	Number released
<u>Control (below Little Goose Dam)</u>				
1	7-14 Apr	LA2-1	23-22-56	10,016
2	14-16 Apr	LA2-2	23-22-58	10,085
3	17-18 Apr	LA2-3 <sup>c</sup>	23-23-49	9,831
4	20-21 Apr	LA2-4	23-23-50	10,043
5	21-22 Apr	LART-1	23-23-51	10,184
6	22-24 Apr	LART-2	23-23-52	10,000
7	24 Apr	LART-3	23-24-11	10,123
8	25-26 Apr	LART-4	23-24-12	10,005
9	26-28 Apr	LA3-1	23-24-13	10,058
10	28 Apr-11 May	LA3-2	23-24-14	10,213
11	11-26 May	LA3-3	23-24-15	5,489
11	27 May	LA3-4	23-24-15	1,129
Total				107,176
<u>Test (barge transport below Bonneville Dam)</u>				
1	11-13 Apr	RAF-1	23-22-52	7,083
2	15-17 Apr	RAF-2	23-22-59	7,439
3	18 Apr	RAF-3	23-22-62	7,057
4	19-22 Apr	RAF-4	23-23-09	7,003
5	22 Apr	RA9-1	23-23-10	7,019
6	23 Apr	RA9-2	23-23-11	7,155
7	24-25 Apr	RA9-3	23-23-12	7,100
8	25-26 Apr	RA9-4	23-23-13	7,000
9	26-27 Apr	RASU-1	23-23-40	7,095
10	1-10 May	RASU-2 <sup>d</sup>	23-23-54	7,000
11	10-25 May	RASU-3	23-22-51	3,435
11	30 May	RASU-4	23-22-51	909
Total				75,295

<sup>a</sup> LA and RA (position) indicate left and right anterior sides of fish, respectively.

<sup>b</sup> Orientation refers to rotation of brand around its centerpoint.

<sup>c</sup> Inadvertently branded 837 fish on RA2-3.

<sup>d</sup> Inadvertently branded 437 fish on RA9-4.

Appendix Table 2.--Summary of steelhead marked at Lower Granite Dam in 1989 including dates, brands, wire tag codes, and numbers marked.

Replicate number	Marking period	Brand position, <sup>a</sup> symbol, and orientation <sup>b</sup>	Wire tag code	Number released		
				Hatchery	Wild	Total
<u>Control (below Little Goose Dam)</u>						
1	21 Apr-2 May	LA3-1	23-23-43	4,594	2,409	7,003
2	4-6 May	LA3-2	23-23-45	6,745	304	7,049
3	9-11 May	LA3-3	23-23-46	6,590	498	7,088
4	13-16 May	LA3-4	23-23-47	6,535	465	7,000
5	18-20 May	LA2-1	23-23-53	6,279	726	7,005
6	22-24 May	LA2-2	23-20-28	6,197	917	7,114
			Total	36,940	5,319	42,259
<u>Test (barge transport below Bonneville Dam)</u>						
1	25 Apr-3 May	RASU-1	23-20-20	3,579	1,421	5,000
2	3-5 May	RASU-2	23-20-21	4,701	319	5,020
3	8-10 May	RASU-3	23-20-24	4,607	427	5,034
4	12-15 May	RASU-4	23-20-26	4,520	504	5,024
5	17-19 May	RAF-1	23-20-27	4,553	461	5,014
6	23-25 May	RAF-2	23-23-55	4,317	707	5,024
				26,277	3,839	30,116

<sup>a</sup> LA and RA (position) indicate left and right anterior sides of fish, respectively.

<sup>b</sup> Orientation refers to rotation of brand around its centerpoint.

Appendix Table 3.--Tag loss and mortality from tagged spring/summer chinook salmon that were held 24 or 48 hours after marking at Lower Granite Dam in 1989.

Date	CWT	Number held	Mortality	Lost tags
8 Apr	23-22-56	50	0	1
11 Apr	23-23-52	50	1	3
13 Apr	23-22-56	50	0	0
15 Apr	23-22-59	51	0	1
17 Apr	23-23-49	50	1	2
19 Apr	23-23-09	50	0	0
23 Apr	23-23-52	50	0	0
25 Apr	23-23-12	51	1	0
28 Apr	23-24-14	50	0	2
2 May	23-24-14	50	1	0
4 May	23-24-14	50	1	0
10 May	23-23-54	50	1	7
12 May	23-22-51	47	1	1
15 May	23-22-51	50	0	0
17 May	23-22-51	50	0	2
19 May	23-22-51	51	0	1
23 May	23-22-51	50	2	0
30 May	23-22-51	<u>50</u>	<u>1</u>	<u>0</u>
		900	10	20
	% mortality and tag loss		1.1	2.2

Appendix Table 4.--Tag loss and mortality from tagged steelhead that were held 24 or 48 hours after marking at Lower Granite Dam in 1989.

Date	CWT	Number held	Mortality	Lost tags
28 Apr	23-23-43	53	2	2
2 May	23-23-43	48	1	0
4 May	23-23-45	50	0	0
10 May	23-20-24	51	4	3
13 May	23-23-47	50	0	0
15 May	23-20-26	50	0	2
17 May	23-20-27	50	1	1
19 May	23-20-27	51	0	1
23 May	23-20-28	<u>52</u>	<u>0</u>	<u>0</u>
		455	8	9
			% mortality and tag loss	
			1.8	2.0

Appendix Table 5.0.--Summary of all recoveries of adult spring chinook salmon transported by barge from Lower Granite Dam to below Bonneville Dam in 1985.

Master File Date : 26 July 1989

RELEASE GROUPS INCLUDED: 8510A 8510B 8510C 8510D 8510E

1985 L.GRANITE TRANS BARGE  
SPRING CHINOOK

BELOW BONNEVILLE

Brands Used: RAPI1 RAPI2 RAPI2 RAPI3 RAPI4 LAPI1  
Wire Codes Used: 231807 231808 231809 231814 231815 231816

NUMBER RELEASED: 45420

RECOVERY AREA	YEAR OF RETURN					TOTAL	% RETURN
	1985	1986	1987	1988	1989		
RIVER SYSTEM TRAPS							
BONNEVILLE TRAP	0	2	19	9	0	30	0.066
MCNARY TRAP	0	0	0	0	0	0	0.000
LOWER GRANITE TRAP	0	11	52	38	0	101	0.222
PRIEST RAPIDS TRAP	0	0	0	0	0	0	0.000
OCEAN FISHERIES	0	0	0	0	0	0	0.000
RIVER SPORT							
COLUMBIA R. BELOW SNAKE R.	0	0	0	1	0	1	0.002
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	0	0	0.000
WENATCHEE R.	0	0	0	0	0	0	0.000
SNAKE R.	0	0	1	0	0	1	0.002
RIVER COMMERCIAL							
COL. R. TEST FSHRY (ORE)	0	0	1	0	0	1	0.002
INDIAN FISHERY							
INDIAN FISHERY	0	0	1	2	0	3	0.007
WINTER INDIAN NET	0	0	0	2	0	2	0.004
INDIAN CEREMONIAL	0	0	1	7	0	8	0.018
HATCHERIES							
DWORSHAK H.	0	0	5	1	0	6	0.013
PAHSIMEROI H.	0	0	1	0	0	1	0.002
RAPID RIVER H.	0	1	6	8	0	15	0.033
MCCALL H.	0	1	3	0	0	4	0.009
HELLS CANYON (OXBOW) H.	0	0	1	1	0	2	0.004
DESCHUTES R. HATCHERIES	0	0	1	0	0	1	0.002
HATCHERIES (GENERAL)	0	1	6	2	0	9	0.020
HATCHERIES (GENERAL)	0	0	1	5	0	6	0.013
STREAM SURVEY							
OTHER STREAMS	0	0	0	1	0	1	0.002
OTHER	0	0	0	1	1	2	0.004
TOTALS	0	17	102	79	1	199	0.438
PERCENT OF RECOVERY	%	0.0	8.5	51.3	39.7	0.5	

Appendix Table 5.1.--Recoveries of adult spring chinook salmon transported by barge  
from Lower Granite Dam to below Bonneville Dam from 12-18 April 1985.

Master File Date : 26 July 1989  
RELEASE GROUPS INCLUDED: 8510A

1985 L.GRANITE TRANS BARGE  
SPRING CHINOOK

BELOW BONNEVILLE

Brands Used: RAPII  
Wire Codes Used: 231807

NUMBER RELEASED: 9893

RECOVERY AREA	1985	YEAR OF RETURN		1988	1989	TOTAL	% RETURN
		1986	1987				
RIVER SYSTEM TRAPS							
BONNEVILLE TRAP	0	0	2	3	0	5	0.051
MCNARY TRAP	0	0	0	0	0	0	0.000
LOWER GRANITE TRAP	0	0	6	3	0	9	0.091
PRIEST RAPIDS TRAP	0	0	0	0	0	0	0.000
OCEAN FISHERIES	0	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0	0.000
INDIAN FISHERY	0	0	0	0	0	0	0.000
HATCHERIES							
RAPID RIVER H.	0	0	1	0	0	1	0.010
MCCALL H.	0	1	1	0	0	2	0.020
STREAM SURVEY	0	0	0	0	0	0	0.000
TOTALS	0	1	10	6	0	17	0.172
PERCENT OF RECOVERY	%	0.0	5.9	58.8	35.3	0.0	

Appendix Table 5.2.--Recoveries of adult spring chinook salmon transported by barge from Lower Granite Dam to below Bonneville Dam from 19-26 April 1985.

Master File Date : 26 July 1989  
 RELEASE GROUPS INCLUDED: 8510B

1985 L.GRANITE TRANS BARGE BELOW BONNEVILLE  
 SPRING CHINOOK

Brands Used: RAPI2 RAPI2  
 Wire Codes Used: 231808 231809

NUMBER RELEASED: 17414

RECOVERY AREA	YEAR OF RETURN					TOTAL	% RETURN
	1985	1986	1987	1988	1989		
RIVER SYSTEM TRAPS							
BONNEVILLE TRAP	0	0	9	3	0	12	0.069
MCNARY TRAP	0	0	0	0	0	0	0.000
LOWER GRANITE TRAP	0	3	19	12	0	34	0.195
PRIEST RAPIDS TRAP	0	0	0	0	0	0	0.000
OCEAN FISHERIES	0	0	0	0	0	0	0.000
RIVER SPORT							
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	0	0	0.000
WENATCHEE R.	0	0	0	0	0	0	0.000
SNAKE R.	0	0	1	0	0	1	0.006
RIVER COMMERCIAL							
COL. R. TEST FSHRY (ORE)	0	0	1	0	0	1	0.006
INDIAN FISHERY							
INDIAN FISHERY	0	0	1	0	0	1	0.006
WINTER INDIAN NET	0	0	0	1	0	1	0.006
INDIAN CEREMONIAL	0	0	0	4	0	4	0.023
HATCHERIES							
DWORSHAK H.	0	0	3	0	0	3	0.017
RAPID RIVER H.	0	0	4	4	0	8	0.046
HELLS CANYON (OXBOW) H.	0	0	0	1	0	1	0.006
DESCHUTES R. HATCHERIES	0	0	1	0	0	1	0.006
HATCHERIES (GENERAL)	0	1	3	1	0	5	0.029
HATCHERIES (GENERAL)	0	0	0	1	0	1	0.006
STREAM SURVEY							
OTHER STREAMS	0	0	0	1	0	1	0.006
OTHER	0	0	0	0	1	1	0.006
TOTALS	0	5	42	29	1	77	0.442
PERCENT OF RECOVERY	%	0.0	6.5	54.5	37.7	1.3	

Appendix Table 5.3.--Recoveries of adult spring chinook salmon transported by barge  
from Lower Granite Dam to below Bonneville Dam from 29 Apr-3 May 1985.

Master File Date : 26 July 1989  
RELEASE GROUPS INCLUDED: 8510C

1985 L.GRANITE TRANS BARGE  
SPRING CHINOOK

BELOW BONNEVILLE

Brands Used: RAPI3  
Wire Codes Used: 231B14

RECOVERY AREA	1985	YEAR OF RETURN		1988	1989	NUMBER RELEASED: 9539	
		1986	1987			TOTAL	% RETURN
RIVER SYSTEM TRAPS							
BONNEVILLE TRAP	0	0	5	1	0	6	0.063
MCNARY TRAP	0	0	0	0	0	0	0.000
LOWER GRANITE TRAP	0	2	9	7	0	18	0.189
PRIEST RAPIDS TRAP	0	0	0	0	0	0	0.000
OCEAN FISHERIES	0	0	0	0	0	0	0.000
RIVER SPORT							
COLUMBIA R. BELOW SNAKE R.	0	0	0	1	0	1	0.010
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	0	0	0.000
WENATCHEE R.	0	0	0	0	0	0	0.000
SNAKE R.	0	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0	0.000
INDIAN FISHERY							
INDIAN FISHERY	0	0	0	1	0	1	0.010
INDIAN CEREMONIAL	0	0	1	2	0	3	0.031
HATCHERIES							
DWORSHAK H.	0	0	2	0	0	2	0.021
RAPID RIVER H.	0	0	1	3	0	4	0.042
HATCHERIES (GENERAL)	0	0	2	1	0	3	0.031
HATCHERIES (GENERAL)	0	0	0	3	0	3	0.031
STREAM SURVEY	0	0	1	0	0	1	0.010
TOTALS	0	2	21	19	0	42	0.440
PERCENT OF RECOVERY	%	0.0	4.8	50.0	45.2	0.0	

Appendix Table 5.4.--Recoveries of adult spring chinook salmon transported by barge from Lower Granite Dam to below Bonneville Dam from 6-14 May 1985.

Master File Date : 26 July 1989  
 RELEASE GROUPS INCLUDED: 8510D

1985 L.GRANITE TRANS BARGE  
 SPRING CHINOOK

BELOW BONNEVILLE

Brands Used: RAPI4  
 Wire Codes Used: 231815

NUMBER RELEASED: 3724

RECOVERY AREA	1985	YEAR OF RETURN		1988	1989	TOTAL	% RETURN
		1986	1987				
RIVER SYSTEM TRAPS							
BONNEVILLE TRAP	0	0	2	1	0	3	0.081
MCNARY TRAP	0	0	0	0	0	0	0.000
LOWER GRANITE TRAP	0	1	8	10	0	19	0.510
PRIEST RAPIDS TRAP	0	0	0	0	0	0	0.000
OCEAN FISHERIES	0	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0	0.000
INDIAN FISHERY							
INDIAN FISHERY	0	0	0	1	0	1	0.027
WINTER INDIAN NET	0	0	0	1	0	1	0.027
INDIAN CEREMONIAL	0	0	0	1	0	1	0.027
HATCHERIES							
DWRSHAK H.	0	0	0	1	0	1	0.027
HELLS CANYON (OXBOW) H.	0	0	1	0	0	1	0.027
HELLS CANYON (OXBOW) H.	0	0	1	0	0	1	0.027
STREAM SURVEY	0	0	2	0	0	2	0.054
OTHER	0	0	0	1	0	1	0.027
TOTALS	0	1	14	16	0	31	0.832
PERCENT OF RECOVERY	%	0.0	3.2	45.2	51.6	0.0	

Appendix Table 5.5.--Recoveries of adult spring chinook salmon transported by barge from Lower Granite Dam to below Bonneville Dam from 15-22 May 1985.

Master File Date : 26 July 1989  
 RELEASE GROUPS INCLUDED: 8510E

1985 L.GRANITE TRANS BARGE  
 SPRING CHINOOK

BELOW BONNEVILLE

Brands Used: LAP11  
 Wire Codes Used: 231816

NUMBER RELEASED: 4850

RECOVERY AREA	1985	YEAR OF RETURN			1988	1989	TOTAL	% RETURN
		1986	1987					
RIVER SYSTEM TRAPS								
BONNEVILLE TRAP	0	2	1	1	0	4	0.082	
MCNARY TRAP	0	0	0	0	0	0	0.000	
LOWER GRANITE TRAP	0	5	10	6	0	21	0.433	
PRIEST RAPIDS TRAP	0	0	0	0	0	0	0.000	
OCEAN FISHERIES	0	0	0	0	0	0	0.000	
RIVER SPORT	0	0	0	0	0	0	0.000	
RIVER COMMERCIAL	0	0	0	0	0	0	0.000	
INDIAN FISHERY	0	0	0	0	0	0	0.000	
HATCHERIES								
PAHSIMEROI H.	0	0	1	0	0	1	0.021	
RAPID RIVER H.	0	1	0	1	0	2	0.041	
MCCALL H.	0	0	2	0	0	2	0.041	
HATCHERIES (GENERAL)	0	0	1	1	0	2	0.041	
STREAM SURVEY	0	0	0	0	0	0	0.000	
TOTALS	0	8	15	9	0	32	0.660	
PERCENT OF RECOVERY	%	0.0	25.0	46.9	28.1	0.0		

Appendix Table 6.0.--Summary of all recoveries of adult spring chinook salmon released as controls below Little Goose Dam in 1986.

Master File Date : 26 July 1989

RELEASE GROUPS INCLUDED: 8614A 8614B 8614C 8614D 8614E 8614F 8614G 8614H 8614I

1986 L.GRANITE TRANS CONTROL  
 SPRING CHINOOK

BELOW L.GOOSE

Brands Used: LAP 1 LAP 2 LAP 3 LAP 4 LAW 1 LAW 2 LAW 3 LAW 4 LAL 1  
 Wire Codes Used: 231902 231903 231904 231905 231906 231907 231908 231909 231863

NUMBER RELEASED: 45035

RECOVERY AREA	1986	YEAR OF RETURN		1989	TOTAL	% RETURN
		1987	1988			
RIVER SYSTEM TRAPS						
BONNEVILLE TRAP	0	0	1	2	3	0.007
MCNARY TRAP	0	0	0	0	0	0.000
LOWER GRANITE TRAP	0	2	27	17	46	0.102
PRIEST RAPIDS TRAP	0	0	0	1	1	0.002
OCEAN FISHERIES	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0.000
INDIAN FISHERY	0	0	0	0	0	0.000
HATCHERIES						
DWORSHAK H.	0	0	2	0	2	0.004
RAPID RIVER H.	0	2	6	0	8	0.018
HATCHERIES (GENERAL)	0	0	2	0	2	0.004
HATCHERIES (GENERAL)	0	0	8	0	8	0.018
STREAM SURVEY	0	0	0	0	0	0.000
TOTALS	0	4	46	20	70	0.155
PERCENT OF RECOVERY	%	0.0	5.7	65.7	28.6	

Appendix Table 6.1.--Recoveries of adult spring chinook salmon released as juveniles below Little Goose Dam from 9-11 April 1986.

Master File Date : 26 July 1989  
 RELEASE GROUPS INCLUDED: 8614A

1986 L.GRANITE TRANS CONTROL                      BELOW L.GOOSE  
 SPRING CHINOOK

Brands Used: LAP 1  
 Wire Codes Used: 231902

NUMBER RELEASED: 5000

RECOVERY AREA	1986	YEAR OF RETURN			TOTAL	% RETURN
		1987	1988	1989		
RIVER SYSTEM TRAPS						
BONNEVILLE TRAP	0	0	0	0	0	0.000
MCNARY TRAP	0	0	0	0	0	0.000
LOWER GRANITE TRAP	0	1	2	2	5	0.100
PRIEST RAPIDS TRAP	0	0	0	0	0	0.000
OCEAN FISHERIES	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0.000
INDIAN FISHERY	0	0	0	0	0	0.000
HATCHERIES						
RAPID RIVER H.	0	1	0	0	1	0.020
STREAM SURVEY	0	0	0	0	0	0.000
TOTALS	0	2	2	2	6	0.120
PERCENT OF RECOVERY	%	0.0	33.3	33.3	33.3	

Appendix Table 6.2.--Recoveries of adult spring chinook salmon released as juveniles below Little Goose Dam from 11-15 April 1986.

Master File Date : 26 July 1989  
 RELEASE GROUPS INCLUDED: 86148

1986 L.GRANITE TRANS CONTROL                      BELOW L.GOOSE  
 SPRING CHINOOK

Brands Used: LAP 2  
 Wire Codes Used: 231903

NUMBER RELEASED: 5000

RECOVERY AREA	1986	YEAR OF RETURN			TOTAL	% RETURN
		1987	1988	1989		
RIVER SYSTEM TRAPS						
BONNEVILLE TRAP	0	0	0	0	0	0.000
MCNARY TRAP	0	0	0	0	0	0.000
LOWER GRANITE TRAP	0	1	3	1	5	0.100
PRIEST RAPIDS TRAP	0	0	0	0	0	0.000
OCEAN FISHERIES	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0.000
INDIAN FISHERY	0	0	0	0	0	0.000
HATCHERIES	0	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0	0.000
TOTALS	0	1	3	1	5	0.100
PERCENT OF RECOVERY	%	0.0	20.0	60.0	20.0	

Appendix Table 6.3.--Recoveries of adult spring chinook salmon released as juveniles below Little Goose Dam from 15-17 April 1986.

Master File Date : 26 July 1989  
 RELEASE GROUPS INCLUDED: 8614C

1986 L.GRANITE TRANS CONTROL                      BELOW L.GOOSE  
 SPRING CHINOOK

Brands Used: LAP 3  
 Wire Codes Used: 231904

NUMBER RELEASED:     5104

RECOVERY AREA	1986	YEAR OF RETURN		1989	TOTAL	% RETURN
		1987	1988			
RIVER SYSTEM TRAPS						
BONNEVILLE TRAP	0	0	0	0	0	0.000
MCNARY TRAP	0	0	0	0	0	0.000
LOWER GRANITE TRAP	0	0	1	1	2	0.039
PRIEST RAPIDS TRAP	0	0	0	0	0	0.000
OCEAN FISHERIES	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0.000
INDIAN FISHERY	0	0	0	0	0	0.000
HATCHERIES	0	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0	0.000
TOTALS	0	0	1	1	2	0.039
PERCENT OF RECOVERY	%	0.0	0.0	50.0	50.0	

Appendix Table 6.4.--Recoveries of adult spring chinook salmon released as juveniles below Little Goose Dam from 17-21 April 1986.

Master File Date : 26 July 1989  
 RELEASE GROUPS INCLUDED: 86140

1986 L.GRANITE TRANS CONTROL                      BELOW L.GOOSE  
 SPRING CHINOOK

Brands Used: LAP 4  
 Wire Codes Used: 231905

NUMBER RELEASED: 5000

RECOVERY AREA	1986	YEAR OF RETURN		1989	TOTAL	% RETURN
		1987	1988			
RIVER SYSTEM TRAPS						
BONNEVILLE TRAP	0	0	0	0	0	0.000
MCNARY TRAP	0	0	0	0	0	0.000
LOWER GRANITE TRAP	0	0	1	1	2	0.040
PRIEST RAPIDS TRAP	0	0	0	1	1	0.020
OCEAN FISHERIES	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0.000
INDIAN FISHERY	0	0	0	0	0	0.000
HATCHERIES						
RAPID RIVER H.	0	0	1	0	1	0.020
STREAM SURVEY	0	0	0	0	0	0.000
TOTALS	0	0	2	2	4	0.080
PERCENT OF RECOVERY	%	0.0	0.0	50.0	50.0	

Appendix Table 6.5.--Recoveries of adult spring chinook salmon released as juveniles below Little Goose Dam from 21-23 April 1986.

Master File Date : 26 July 1989  
 RELEASE GROUPS INCLUDED: 8614E

1986 L.GRANITE TRANS CONTROL                      BELOW L.GOOSE  
 SPRING CHINOOK

Brands Used: LAW 1  
 Wire Codes Used: 231906

NUMBER RELEASED: 5000

RECOVERY AREA	1986	YEAR OF RETURN			TOTAL	% RETURN
		1987	1988	1989		
RIVER SYSTEM TRAPS						
BONNEVILLE TRAP	0	0	0	0	0	0.000
MCNARY TRAP	0	0	0	0	0	0.000
LOWER GRANITE TRAP	0	0	7	3	10	0.200
PRIEST RAPIDS TRAP	0	0	0	0	0	0.000
OCEAN FISHERIES	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0.000
INDIAN FISHERY	0	0	0	0	0	0.000
HATCHERIES						
DWRSHAK H.	0	0	1	0	1	0.020
RAPID RIVER H.	0	0	2	0	2	0.040
HATCHERIES (GENERAL)	0	0	2	0	2	0.040
STREAM SURVEY	0	0	0	0	0	0.000
TOTALS	0	0	12	3	15	0.300
PERCENT OF RECOVERY	%	0.0	0.0	80.0	20.0	

Appendix Table 6.6.--Recoveries of adult spring chinook salmon released as juveniles below Little Goose Dam from 23-27 April 1986.

Master File Date : 26 July 1989  
 RELEASE GROUPS INCLUDED: 8614F

1986 L.GRANITE TRANS CONTROL                      BELOW L.GOOSE  
 SPRING CHINOOK

Brands Used: LAW 2  
 Wire Codes Used: 231907

NUMBER RELEASED: 5000

RECOVERY AREA	1986	YEAR OF RETURN		1989	TOTAL	% RETURN
		1987	1988			
RIVER SYSTEM TRAPS						
BONNEVILLE TRAP	0	0	0	0	0	0.000
MCNARY TRAP	0	0	0	0	0	0.000
LOWER GRANITE TRAP	0	0	2	1	3	0.060
PRIEST RAPIDS TRAP	0	0	0	0	0	0.000
OCEAN FISHERIES	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0.000
INDIAN FISHERY	0	0	0	0	0	0.000
HATCHERIES						
RAPID RIVER H.	0	0	1	0	1	0.020
HATCHERIES (GENERAL)	0	0	2	0	2	0.040
STREAM SURVEY	0	0	0	0	0	0.000
TOTALS	0	0	5	1	6	0.120
PERCENT OF RECOVERY	%	0.0	0.0	83.3	16.7	

Appendix Table 6.7.--Recoveries of adult spring chinook salmon released as juveniles below Little Goose Dam from 29 April to 3 May 1986.

Master File Date : 26 July 1989  
 RELEASE GROUPS INCLUDED: 86146

1986 L.GRANITE TRANS CONTROL                      BELOW L.GOOSE  
 SPRING CHINOOK

Brands Used: LAW 3  
 Wire Codes Used: 231908

RECOVERY AREA	1986	YEAR OF RETURN		1989	TOTAL	% RETURN	NUMBER RELEASED:
		1987	1988				5000
RIVER SYSTEM TRAPS							
BONNEVILLE TRAP	0	0	1	1	2	0.040	
MCNARY TRAP	0	0	0	0	0	0.000	
LOWER GRANITE TRAP	0	0	6	2	8	0.160	
PRIEST RAPIDS TRAP	0	0	0	0	0	0.000	
OCEAN FISHERIES	0	0	0	0	0	0.000	
RIVER SPORT	0	0	0	0	0	0.000	
RIVER COMMERCIAL	0	0	0	0	0	0.000	
INDIAN FISHERY	0	0	0	0	0	0.000	
HATCHERIES							
DWORSHAK H.	0	0	1	0	1	0.020	
RAPID RIVER H.	0	1	2	0	3	0.060	
STREAM SURVEY	0	0	0	0	0	0.000	
TOTALS	0	1	10	3	14	0.280	
PERCENT OF RECOVERY	%	0.0	71.4	21.4			

Appendix Table 6.8.--Recoveries of adult spring chinook salmon released as juveniles below Little Goose Dam from 3-15 May 1986.

Master File Date : 26 July 1989  
 RELEASE GROUPS INCLUDED: 8614H

1986 L.GRANITE TRANS CONTROL                      BELOW L.GOOSE  
 SPRING CHINOOK

Brands Used: LAW 4  
 Wire Codes Used: 231909

NUMBER RELEASED: 4998

RECOVERY AREA	1986	YEAR OF RETURN		1989	TOTAL	% RETURN
		1987	1988			
RIVER SYSTEM TRAPS						
BONNEVILLE TRAP	0	0	0	0	0	0.000
MCNARY TRAP	0	0	0	0	0	0.000
LOWER GRANITE TRAP	0	0	3	1	4	0.080
PRIEST RAPIDS TRAP	0	0	0	0	0	0.000
OCEAN FISHERIES	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0.000
INDIAN FISHERY	0	0	0	0	0	0.000
HATCHERIES						
HATCHERIES (GENERAL)	0	0	2	0	2	0.040
STREAM SURVEY	0	0	0	0	0	0.000
TOTALS	0	0	5	1	6	0.120
PERCENT OF RECOVERY	%	0.0	0.0	83.3	16.7	

Appendix Table 6.9.--Recoveries of adult spring chinook salmon released as juveniles below Little Goose Dam from 15-31 May, 1986.

Master File Date : 26 July 1989  
 RELEASE GROUPS INCLUDED: 86141

1986 L.GRANITE TRANS CONTROL                      BELOW L.GOOSE  
 SPRING CHINOOK

Brands Used: LAL 1  
 Wire Codes Used: 231863

NUMBER RELEASED: 4933

RECOVERY AREA	1986	YEAR OF RETURN			TOTAL	% RETURN
		1987	1988	1989		
RIVER SYSTEM TRAPS						
BONNEVILLE TRAP	0	0	0	1	1	0.020
MCNARY TRAP	0	0	0	0	0	0.000
LOWER GRANITE TRAP	0	0	2	5	7	0.142
PRIEST RAPIDS TRAP	0	0	0	0	0	0.000
OCEAN FISHERIES	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0.000
INDIAN FISHERY	0	0	0	0	0	0.000
HATCHERIES						
HATCHERIES (GENERAL)	0	0	2	0	2	0.041
HATCHERIES (GENERAL)	0	0	2	0	2	0.041
STREAM SURVEY	0	0	0	0	0	0.000
TOTALS	0	0	6	6	12	0.243
PERCENT OF RECOVERY	%	0.0	0.0	50.0	50.0	

Appendix Table 7.0.--Summary of all recoveries of adult spring chinook salmon transported as juveniles by barge from Lower Granite Dam to below Bonneville Dam in 1986

Master File Date : 26 July 1989

RELEASE GROUPS INCLUDED: 8612A 8612B 8612C 8612D 8612E 8612F 8612G 8612H 8612I

1986 L.GRANITE TRANS BARGE

BELOW BONNEVILLE

SPRING CHINOOK

Brands Used: RAL 1 RAL 2 RAL 3 RAL 4 RAV 1 RAV 2 RAV 3 RAV 4 RAP 1  
 Wire Codes Used: 231910 231911 231912 231913 231914 231915 231916 231917 231918

NUMBER RELEASED: 45004

RECOVERY AREA	1986	YEAR OF RETURN		1989	TOTAL	% RETURN
		1987	1988			
RIVER SYSTEM TRAPS						
BONNEVILLE TRAP	0	0	7	6	13	0.029
MCNARY TRAP	0	0	0	0	0	0.000
LOWER GRANITE TRAP	0	7	41	24	72	0.160
PRIEST RAPIDS TRAP	0	0	0	0	0	0.000
OCEAN FISHERIES						
ALASKA	0	0	0	0	0	0.000
BRITISH COLUMBIA	0	0	0	0	0	0.000
WASHINGTON	0	0	0	0	0	0.000
OREGON	0	1	5	0	6	0.013
CALIFORNIA	0	0	0	0	0	0.000
OTHER	0	0	0	0	0	0.000
RIVER SPORT						
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	0	0.000
WENATCHEE R.	0	0	0	0	0	0.000
SNAKE R.	0	0	1	0	1	0.002
RIVER COMMERCIAL	0	0	0	0	0	0.000
INDIAN FISHERY						
INDIAN FISHERY	0	0	2	0	2	0.004
INDIAN CEREMONIAL	0	0	4	0	4	0.009
HATCHERIES						
DWORSHAK H.	0	0	1	0	1	0.002
RAPID RIVER H.	0	1	15	0	16	0.036
	0	0	4	0	4	0.009
HATCHERIES (GENERAL)	0	0	3	0	3	0.007
STREAM SURVEY	0	0	1	0	1	0.002
TOTALS	0	9	84	30	123	0.273
PERCENT OF RECOVERY	%	0.0	7.3	24.4		

Appendix Table 7.1.--Recoveries of adult spring chinook salmon transported as juveniles by barge from Lower Granite Dam to below Bonneville Dam from 10-12 April 1986.

Master File Date : 26 July 1989  
 RELEASE GROUPS INCLUDED: 8612A

1986 L.GRANITE TRANS BARGE                      BELOW BONNEVILLE  
 SPRING CHINOOK

Brands Used: RAL 1  
 Wire Codes Used: 231910

NUMBER RELEASED: 5000

RECOVERY AREA	1986	YEAR OF RETURN			TOTAL	% RETURN
		1987	1988	1989		
RIVER SYSTEM TRAPS						
BONNEVILLE TRAP	0	0	0	0	0	0.000
MCNARY TRAP	0	0	0	0	0	0.000
LOWER GRANITE TRAP	0	2	1	0	3	0.060
PRIEST RAPIDS TRAP	0	0	0	0	0	0.000
OCEAN FISHERIES						
ALASKA	0	0	0	0	0	0.000
BRITISH COLUMBIA	0	0	0	0	0	0.000
WASHINGTON	0	0	0	0	0	0.000
OREGON	0	0	2	0	2	0.040
CALIFORNIA	0	0	0	0	0	0.000
OTHER	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0.000
INDIAN FISHERY	0	0	0	0	0	0.000
HATCHERIES						
RAPID RIVER H.	0	0	1	0	1	0.020
STREAM SURVEY	0	0	0	0	0	0.000
TOTALS	0	2	4	0	6	0.120
PERCENT OF RECOVERY	%	0.0	33.3	66.7	0.0	

Appendix Table 7.2.--Recoveries of adult spring chinook salmon transported as juveniles by barge from Lower Granite Dam to below Bonneville Dam from 12-16 April 1986.

Master File Date : 26 July 1989  
 RELEASE GROUPS INCLUDED: 86128

1986 L.GRANITE TRANS BARGE  
 SPRING CHINOOK

BELOW BONNEVILLE

Brands Used: RAL 2  
 Wire Codes Used: 231911

NUMBER RELEASED: 5001

RECOVERY AREA	YEAR OF RETURN				TOTAL	% RETURN
	1986	1987	1988	1989		
RIVER SYSTEM TRAPS						
BONNEVILLE TRAP	0	0	2	0	2	0.040
MCNARY TRAP	0	0	0	0	0	0.000
LOWER GRANITE TRAP	0	1	5	2	8	0.160
PRIEST RAPIDS TRAP	0	0	0	0	0	0.000
OCEAN FISHERIES	0	0	0	0	0	0.000
RIVER SPORT						
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	0	0.000
WENATCHEE R.	0	0	0	0	0	0.000
SNAKE R.	0	0	1	0	1	0.020
RIVER COMMERCIAL	0	0	0	0	0	0.000
INDIAN FISHERY						
INDIAN CEREMONIAL	0	0	2	0	2	0.040
HATCHERIES						
RAPID RIVER H.	0	0	1	0	1	0.020
STREAM SURVEY	0	0	0	0	0	0.000
TOTALS	0	1	11	2	14	0.280
PERCENT OF RECOVERY	%	0.0	7.1	78.6	14.3	

Appendix Table 7.3.--Recoveries of adult spring chinook salmon transported as juveniles by barge from Lower Granite Dam to below Bonneville Dam on 16 April 1986.

Master File Date : 26 July 1989  
 RELEASE GROUPS INCLUDED: 8612C

1986 L.GRANITE TRANS BARGE BELOW BONNEVILLE  
 SPRING CHINOOK

Brands Used: RAL 3  
 Wire Codes Used: 231912

NUMBER RELEASED: 5000

RECOVERY AREA	1986	YEAR OF RETURN			TOTAL	% RETURN
		1987	1988	1989		
RIVER SYSTEM TRAPS						
BONNEVILLE TRAP	0	0	2	1	3	0.060
MCNARY TRAP	0	0	0	0	0	0.000
LOWER GRANITE TRAP	0	2	2	2	6	0.120
PRIEST RAPIDS TRAP	0	0	0	0	0	0.000
OCEAN FISHERIES						
ALASKA	0	0	0	0	0	0.000
BRITISH COLUMBIA	0	0	0	0	0	0.000
WASHINGTON	0	0	0	0	0	0.000
OREGON	0	0	1	0	1	0.020
CALIFORNIA	0	0	0	0	0	0.000
OTHER	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0.000
INDIAN FISHERY	0	0	0	0	0	0.000
HATCHERIES						
DWORSHAK H.	0	0	1	0	1	0.020
RAPID RIVER H.	0	0	1	0	1	0.020
STREAM SURVEY	0	0	1	0	1	0.020
TOTALS	0	2	8	3	13	0.260
PERCENT OF RECOVERY	%	0.0	15.4	61.5	23.1	

Appendix Table 7.4.--Recoveries of adult spring chinook salmon transported as juveniles by barge from Lower Granite Dam to below Bonneville Dam from 18-20 April 1986.

Master File Date : 26 July 1989  
 RELEASE GROUPS INCLUDED: 8612D

1986 L.GRANITE TRANS BARGE  
 SPRING CHINOOK

BELOW BONNEVILLE

Brands Used: RAL 4  
 Wire Codes Used: 231913

NUMBER RELEASED: 5000

RECOVERY AREA	1986	YEAR OF RETURN		1989	TOTAL	% RETURN
		1987	1988			
RIVER SYSTEM TRAPS						
BONNEVILLE TRAP	0	0	0	0	0	0.000
MCNARY TRAP	0	0	0	0	0	0.000
LOWER GRANITE TRAP	0	0	1	4	5	0.100
PRIEST RAPIDS TRAP	0	0	0	0	0	0.000
OCEAN FISHERIES	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0.000
INDIAN FISHERY	0	0	0	0	0	0.000
HATCHERIES						
RAPID RIVER H.	0	0	2	0	2	0.040
STREAM SURVEY	0	0	0	0	0	0.000
TOTALS	0	0	3	4	7	0.140
PERCENT OF RECOVERY	%	0.0	0.0	42.9	57.1	

Appendix Table 7.5.--Recoveries of adult spring chinook salmon transported as juveniles by barge from Lower Granite Dam to below Bonneville Dam from 20-22 April 1986.

Master File Date : 26 July 1989  
 RELEASE GROUPS INCLUDED: 8612E

1986 L.GRANITE TRANS BARGE  
 SPRING CHINOOK

BELOW BONNEVILLE

Brands Used: RAV 1  
 Wire Codes Used: 231914

NUMBER RELEASED: 5000

RECOVERY AREA	YEAR OF RETURN				TOTAL	% RETURN
	1986	1987	1988	1989		
RIVER SYSTEM TRAPS						
BONNEVILLE TRAP	0	0	3	2	5	0.100
MCNARY TRAP	0	0	0	0	0	0.000
LOWER GRANITE TRAP	0	2	8	3	13	0.260
PRIEST RAPIDS TRAP	0	0	0	0	0	0.000
OCEAN FISHERIES						
ALASKA	0	0	0	0	0	0.000
BRITISH COLUMBIA	0	0	0	0	0	0.000
WASHINGTON	0	0	0	0	0	0.000
OREGON	0	0	1	0	1	0.020
CALIFORNIA	0	0	0	0	0	0.000
OTHER	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0.000
INDIAN FISHERY						
INDIAN FISHERY	0	0	1	0	1	0.020
HATCHERIES						
RAPID RIVER H.	0	1	3	0	4	0.080
HATCHERIES (GENERAL)	0	0	1	0	1	0.020
STREAM SURVEY	0	0	0	0	0	0.000
TOTALS	0	3	17	5	25	0.500
PERCENT OF RECOVERY	%	0.0	12.0	68.0	20.0	

Appendix Table 7.6.--Recoveries of adult spring chinook salmon transported as juveniles by barge from Lower Granite Dam to below Bonneville Dam from 24-28 April 1986.

Master File Date : 26 July 1989  
 RELEASE GROUPS INCLUDED: 8612F

1986 L.GRANITE TRANS BARGE  
 SPRING CHINOOK

BELOW BONNEVILLE

Brands Used: RAV 2  
 Wire Codes Used: 231915

NUMBER RELEASED: 5000

RECOVERY AREA	1986	YEAR OF RETURN			TOTAL	% RETURN
		1987	1988	1989		
RIVER SYSTEM TRAPS						
BONNEVILLE TRAP	0	0	0	2	2	0.040
MCHARY TRAP	0	0	0	0	0	0.000
LOWER GRANITE TRAP	0	0	8	5	13	0.260
PRIEST RAPIDS TRAP	0	0	0	0	0	0.000
OCEAN FISHERIES	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0.000
INDIAN FISHERY	0	0	0	0	0	0.000
HATCHERIES						
RAPID RIVER H.	0	0	3	0	3	0.060
	0	0	2	0	2	0.040
STREAM SURVEY	0	0	0	0	0	0.000
TOTALS	0	0	13	7	20	0.400
PERCENT OF RECOVERY	%	0.0	0.0	65.0	35.0	

Appendix Table 7.7.--Recoveries of adult spring chinook salmon transported as juveniles by barge from Lower Granite Dam to below Bonneville Dam from 28 April to 2 May 1986.

Master File Date : 26 July 1989  
 RELEASE GROUPS INCLUDED: 86126

1986 L.GRANITE TRANS BARGE  
 SPRING CHINOOK

BELOW BONNEVILLE

Brands Used: RAV 3  
 Wire Codes Used: 231916

NUMBER RELEASED: 5000

RECOVERY AREA	1986	YEAR OF RETURN		1989	TOTAL	% RETURN
		1987	1988			
RIVER SYSTEM TRAPS						
BONNEVILLE TRAP	0	0	0	1	1	0.020
MCNARY TRAP	0	0	0	0	0	0.000
LOWER GRANITE TRAP	0	0	5	3	8	0.160
PRIEST RAPIDS TRAP	0	0	0	0	0	0.000
OCEAN FISHERIES						
ALASKA	0	0	0	0	0	0.000
BRITISH COLUMBIA	0	0	0	0	0	0.000
WASHINGTON	0	0	0	0	0	0.000
OREGON	0	0	1	0	1	0.020
CALIFORNIA	0	0	0	0	0	0.000
OTHER	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0.000
INDIAN FISHERY						
INDIAN CEREMONIAL	0	0	1	0	1	0.020
HATCHERIES						
RAPID RIVER H.	0	0	3	0	3	0.060
STREAM SURVEY	0	0	0	0	0	0.000
TOTALS	0	0	10	4	14	0.280
PERCENT OF RECOVERY	%	0.0	0.0	71.4	28.6	

Appendix Table 7.8.--Recoveries of adult spring chinook salmon transported as juveniles by barge from Lower Granite Dam to below Bonneville Dam from 5-14 May 1986.

Master File Date : 26 July 1989  
 RELEASE GROUPS INCLUDED: 8612H

1986 L.GRANITE TRANS BARGE  
 SPRING CHINOOK

BELOW BONNEVILLE

Brands Used: RAV 4  
 Wire Codes Used: 231917

NUMBER RELEASED: 5000

RECOVERY AREA	1986	YEAR OF RETURN			TOTAL	% RETURN
		1987	1988	1989		
RIVER SYSTEM TRAPS						
BONNEVILLE TRAP	0	0	0	0	0	0.000
MCNARY TRAP	0	0	0	0	0	0.000
LOWER GRANITE TRAP	0	0	3	1	4	0.080
PRIEST RAPIDS TRAP	0	0	0	0	0	0.000
OCEAN FISHERIES	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0.000
INDIAN FISHERY						
INDIAN FISHERY	0	0	1	0	1	0.020
HATCHERIES						
RAPID RIVER H.	0	0	1	0	1	0.020
STREAM SURVEY	0	0	0	0	0	0.000
TOTALS	0	0	5	1	6	0.120
PERCENT OF RECOVERY	%	0.0	0.0	83.3	16.7	

Appendix Table 7.9.--Recoveries of adult spring chinook salmon transported as juveniles by barge from Lower Granite Dam to below Bonneville Dam from 14 May to 3 June 1986.

Master File Date : 26 July 1989  
 RELEASE GROUPS INCLUDED: 8612I

1986 L.GRANITE TRANS BARGE BELOW BONNEVILLE  
 SPRING CHINOOK

Brands Used: RAP 1  
 Wire Codes Used: 231918

NUMBER RELEASED: 5003

RECOVERY AREA	1986	YEAR OF RETURN			TOTAL	% RETURN
		1987	1988	1989		
RIVER SYSTEM TRAPS						
BONNEVILLE TRAP	0	0	0	0	0	0.000
MCNARY TRAP	0	0	0	0	0	0.000
LOWER GRANITE TRAP	0	0	8	4	12	0.240
PRIEST RAPIDS TRAP	0	0	0	0	0	0.000
OCEAN FISHERIES						
ALASKA	0	0	0	0	0	0.000
BRITISH COLUMBIA	0	0	0	0	0	0.000
WASHINGTON	0	0	0	0	0	0.000
OREGON	0	1	0	0	1	0.020
CALIFORNIA	0	0	0	0	0	0.000
OTHER	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0.000
INDIAN FISHERY						
INDIAN CEREMONIAL	0	0	1	0	1	0.020
HATCHERIES						
HATCHERIES (GENERAL)	0	0	2	0	2	0.040
HATCHERIES (GENERAL)	0	0	2	0	2	0.040
STREAM SURVEY	0	0	0	0	0	0.000
TOTALS	0	1	13	4	18	0.360
PERCENT OF RECOVERY	%	0.0	5.6	72.2	22.2	

Appendix Table 8.0.--Summary of all recoveries of adult spring chinook salmon transported by barge from Lower Granite Dam to below Bonneville Dam in 1987.

Master File Date : 26 July 1989

RELEASE GROUPS INCLUDED: 8706A 8706B 8706C 8706D 8706E 8706F 8706G 8706H 8706I 8706J 8706K

**1987 L.GRANITE BARGE INDEX                      BELOW BONNEVILLE  
SPRING CHINOOK**

Brands Used: RA2 1 RA2 2 RA2 3 RA2 4 RA9 3 RA9 4 RASU1 RASU3 RASU2 RA9 1 RA9 2  
Wire Codes Used: 231943 231944 231945 231946 232018 232019 232022 232029 232023 231947 231948

NUMBER RELEASED: 50207

RECOVERY AREA	1987	YEAR OF RETURN		TOTAL	% RETURN
		1988	1989		
RIVER SYSTEM TRAPS					
BONNEVILLE TRAP	0	0	9	9	0.018
MCNARY TRAP	0	0	0	0	0.000
LOWER GRANITE TRAP	0	12	63	75	0.149
PRIEST RAPIDS TRAP	0	0	0	0	0.000
OCEAN FISHERIES					
ALASKA	0	0	0	0	0.000
BRITISH COLUMBIA	0	0	0	0	0.000
WASHINGTON	0	0	0	0	0.000
OREGON	0	2	0	2	0.004
CALIFORNIA	0	0	0	0	0.000
OTHER	0	0	0	0	0.000
RIVER SPORT					
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	0.000
WENATCHEE R.	0	0	0	0	0.000
SNAKE R.	0	1	0	1	0.002
RIVER COMMERCIAL	0	0	0	0	0.000
INDIAN FISHERY	0	0	0	0	0.000
HATCHERIES	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0.000
TOTALS	0	15	72	87	0.173
PERCENT OF RECOVERY	%	0.0	17.2	82.8	

Appendix Table 8.1.--Recoveries of adult spring chinook salmon transported by barge from Lower Granite Dam to below Bonneville Dam from 10-16 April 1987.

Master File Date : 26 July 1989  
 RELEASE GROUPS INCLUDED: 8706A

1987 L.GRANITE BARGE INDEX  
 SPRING CHINOOK

BELOW BONNEVILLE

Brands Used: RA2 1  
 Wire Codes Used: 231943

NUMBER RELEASED: 4226

RECOVERY AREA	1987	YEAR OF RETURN		TOTAL	% RETURN
		1988	1989		
RIVER SYSTEM TRAPS					
BONNEVILLE TRAP	0	0	2	2	0.047
MCNARY TRAP	0	0	0	0	0.000
LOWER GRANITE TRAP	0	0	4	4	0.095
PRIEST RAPIDS TRAP	0	0	0	0	0.000
OCEAN FISHERIES					
ALASKA	0	0	0	0	0.000
BRITISH COLUMBIA	0	0	0	0	0.000
WASHINGTON	0	0	0	0	0.000
OREGON	0	1	0	1	0.024
CALIFORNIA	0	0	0	0	0.000
OTHER	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0.000
INDIAN FISHERY	0	0	0	0	0.000
HATCHERIES	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0.000
TOTALS	0	1	6	7	0.166
PERCENT OF RECOVERY	%	0.0	14.3	85.7	

Appendix Table 8.2.--Recoveries of adult spring chinook salmon transported by barge from Lower Granite Dam to below Bonneville Dam from 16-18 April 1987.

Master File Date : 26 July 1989  
 RELEASE GROUPS INCLUDED: 8706B

1987 L.GRANITE BARGE INDEX  
 SPRING CHINOOK

BELOW BONNEVILLE

Brands Used: RA2 2  
 Wire Codes Used: 231944

NUMBER RELEASED: 5136

RECOVERY AREA	1987	YEAR OF RETURN		TOTAL	% RETURN
		1988	1989		
RIVER SYSTEM TRAPS					
BONNEVILLE TRAP	0	0	0	0	0.000
MCNARY TRAP	0	0	0	0	0.000
LOWER GRANITE TRAP	0	2	6	8	0.156
PRIEST RAPIDS TRAP	0	0	0	0	0.000
OCEAN FISHERIES	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0.000
INDIAN FISHERY	0	0	0	0	0.000
HATCHERIES	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0.000
TOTALS	0	2	6	8	0.156
PERCENT OF RECOVERY	%	0.0	25.0	75.0	

Appendix Table 8.3.--Recoveries of adult spring chinook salmon transported by barge from Lower Granite Dam to below Bonneville Dam from 18-20 April 1987.

Master File Date : 26 July 1989  
 RELEASE GROUPS INCLUDED: 8706C

1987 L.GRANITE BARGE INDEX                      BELOW BONNEVILLE  
 SPRING CHINOOK

Brands Used: RA2 3  
 Wire Codes Used: 231945

NUMBER RELEASED: 4636

RECOVERY AREA	1987	YEAR OF RETURN		TOTAL	% RETURN
		1988	1989		
RIVER SYSTEM TRAPS					
BONNEVILLE TRAP	0	0	1	1	0.022
MCNARY TRAP	0	0	0	0	0.000
LOWER GRANITE TRAP	0	2	13	15	0.324
PRIEST RAPIDS TRAP	0	0	0	0	0.000
OCEAN FISHERIES					
ALASKA	0	0	0	0	0.000
BRITISH COLUMBIA	0	0	0	0	0.000
WASHINGTON	0	0	0	0	0.000
OREGON	0	1	0	1	0.022
CALIFORNIA	0	0	0	0	0.000
OTHER	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0.000
INDIAN FISHERY	0	0	0	0	0.000
HATCHERIES	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0.000
TOTALS	0	3	14	17	0.367
PERCENT OF RECOVERY	%	0.0	17.6	82.4	

Appendix Table 8.4.--Recoveries of adult spring chinook salmon transported by barge  
from Lower Granite Dam to below Bonneville Dam from 20-22 April 1987.

Master File Date : 26 July 1989  
RELEASE GROUPS INCLUDED: 8706D

1987 L.GRANITE BARGE INDEX  
SPRING CHINOOK

BELOW BONNEVILLE

Brands Used: RA2 4  
Wire Codes Used: 231946

NUMBER RELEASED: 4929

RECOVERY AREA	1987	YEAR OF RETURN		TOTAL	% RETURN
		1988	1989		
RIVER SYSTEM TRAPS					
BONNEVILLE TRAP	0	0	1	1	0.020
MCMARY TRAP	0	0	0	0	0.000
LOWER GRANITE TRAP	0	1	7	8	0.162
PRIEST RAPIDS TRAP	0	0	0	0	0.000
OCEAN FISHERIES	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0.000
INDIAN FISHERY	0	0	0	0	0.000
HATCHERIES	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0.000
TOTALS	0	1	8	9	0.183
PERCENT OF RECOVERY	%	0.0	11.1	88.9	

Appendix Table 8.5.--Recoveries of adult spring chinook salmon transported by barge  
from Lower Granite Dam to below Bonneville Dam from 24-26 April 1987.

Master File Date : 26 July 1989  
RELEASE GROUPS INCLUDED: 8706J

1987 L.GRANITE BARGE INDEX  
SPRING CHINOOK

BELOW BONNEVILLE

Brands Used: RA9 1  
Wire Codes Used: 231947

NUMBER RELEASED: 5070

RECOVERY AREA	1987	YEAR OF RETURN		TOTAL	% RETURN
		1988	1989		
RIVER SYSTEM TRAPS					
BONNEVILLE TRAP	0	0	0	0	0.000
MCNARY TRAP	0	0	0	0	0.000
LOWER GRANITE TRAP	0	3	9	12	0.237
PRIEST RAPIDS TRAP	0	0	0	0	0.000
OCEAN FISHERIES	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0.000
INDIAN FISHERY	0	0	0	0	0.000
HATCHERIES	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0.000
TOTALS	0	3	9	12	0.237
PERCENT OF RECOVERY	%	0.0	25.0	75.0	

Appendix Table 8.6.--Recoveries of adult spring chinook salmon transported by barge  
from Lower Granite Dam to below Bonneville Dam from 26-28 April 1987.

Master File Date : 26 July 1989  
RELEASE GROUPS INCLUDED: 8706K

1987 L.GRANITE BARGE INDEX                      BELOW BONNEVILLE  
SPRING CHINOOK

Brands Used: RA9 2  
Wire Codes Used: 231948

NUMBER RELEASED: 4366

RECOVERY AREA	1987	YEAR OF RETURN		TOTAL	% RETURN
		1988	1989		
RIVER SYSTEM TRAPS					
BONNEVILLE TRAP	0	0	0	0	0.000
MCNARY TRAP	0	0	0	0	0.000
LOWER GRANITE TRAP	0	0	5	5	0.115
PRIEST RAPIDS TRAP	0	0	0	0	0.000
OCEAN FISHERIES	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0.000
INDIAN FISHERY	0	0	0	0	0.000
HATCHERIES	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0.000
TOTALS	0	0	5	5	0.115
PERCENT OF RECOVERY	%	0.0	0.0	100.0	

Appendix Table 8.7.--Recoveries of adult spring chinook salmon transported by barge from Lower Grnaite Dam to below Bonneville Dam from 30 April to 1 May 1987.

Master File Date : 26 July 1989  
 RELEASE GROUPS INCLUDED: 8706E

1987 L.GRANITE BARGE INDEX  
 SPRING CHINOOK

BELOW BONNEVILLE

Brands Used: RA9 3  
 Wire Codes Used: 23201B

NUMBER RELEASED: 4446

RECOVERY AREA	YEAR OF RETURN			TOTAL	% RETURN
	1987	1988	1989		
RIVER SYSTEM TRAPS					
BONNEVILLE TRAP	0	0	0	0	0.000
MCNARY TRAP	0	0	0	0	0.000
LOWER GRANITE TRAP	0	0	2	2	0.045
PRIEST RAPIDS TRAP	0	0	0	0	0.000
OCEAN FISHERIES	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0.000
INDIAN FISHERY	0	0	0	0	0.000
HATCHERIES	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0.000
TOTALS	0	0	2	2	0.045
PERCENT OF RECOVERY	%	0.0	0.0	100.0	

Appendix Table 8.8.--Recoveries of adult spring chinook salmon transported by barge from Lower Granite Dam to below Bonneville Dam from 1-4 May 1987.

Master File Date : 26 July 1989  
 RELEASE GROUPS INCLUDED: 8706F

1987 L.GRANITE BARGE INDEX  
 SPRING CHINOOK

BELOW BONNEVILLE

Brands Used: RA9 4  
 Wire Codes Used: 232019

NUMBER RELEASED: 4843

RECOVERY AREA	1987	YEAR OF RETURN		TOTAL	% RETURN
		1988	1989		
RIVER SYSTEM TRAPS					
BONNEVILLE TRAP	0	0	0	0	0.000
MCNARY TRAP	0	0	0	0	0.000
LOWER GRANITE TRAP	0	0	1	1	0.021
PRIEST RAPIDS TRAP	0	0	0	0	0.000
OCEAN FISHERIES	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0.000
INDIAN FISHERY	0	0	0	0	0.000
HATCHERIES	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0.000
TOTALS	0	0	1	1	0.021
PERCENT OF RECOVERY	%	0.0	0.0	100.0	

Appendix Table 8.9.--Recoveries of adult spring chinook salmon transported by barge from Lower Granite Dam to below Bonneville Dam from 4-12 May 1987.

Master File Date : 26 July 1989  
 RELEASE GROUPS INCLUDED: 87066

1987 L.GRANITE BARGE INDEX                      BELOW BONNEVILLE  
 SPRING CHINOOK

Brands Used: RASU1  
 Wire Codes Used: 232022

NUMBER RELEASED: 4815

RECOVERY AREA	1987	YEAR OF RETURN		TOTAL	% RETURN
		1988	1989		
RIVER SYSTEM TRAPS					
BONNEVILLE TRAP	0	0	0	0	0.000
MCNARY TRAP	0	0	0	0	0.000
LOWER GRANITE TRAP	0	1	3	4	0.083
PRIEST RAPIDS TRAP	0	0	0	0	0.000
OCEAN FISHERIES	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0.000
INDIAN FISHERY	0	0	0	0	0.000
HATCHERIES	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0.000
TOTALS	0	1	3	4	0.083
PERCENT OF RECOVERY	%	0.0	25.0	75.0	

Appendix Table 8.10.--Recoveries of adult spring chinook salmon transported by barge from Lower Granite Dam to below Bonneville Dam from 12-13 May 1987.

Master File Date : 26 July 1989  
 RELEASE GROUPS INCLUDED: 8706H

1987 L.GRANITE BARGE INDEX  
 SPRING CHINOOK

BELOW BONNEVILLE

Brands Used: RASU3  
 Wire Codes Used: 232029

NUMBER RELEASED: 5059

RECOVERY AREA	1987	YEAR OF RETURN		TOTAL	% RETURN
		1988	1989		
RIVER SYSTEM TRAPS					
BONNEVILLE TRAP	0	0	0	0	0.000
MCNARY TRAP	0	0	0	0	0.000
LOWER GRANITE TRAP	0	3	6	9	0.178
PRIEST RAPIDS TRAP	0	0	0	0	0.000
OCEAN FISHERIES	0	0	0	0	0.000
RIVER SPORT					
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	0.000
WENATCHEE R.	0	0	0	0	0.000
SNAKE R.	0	1	0	1	0.020
RIVER COMMERCIAL	0	0	0	0	0.000
INDIAN FISHERY	0	0	0	0	0.000
HATCHERIES	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0.000
TOTALS	0	4	6	10	0.198
PERCENT OF RECOVERY	%	0.0	40.0	60.0	

Appendix Table 8.11.--Recoveries of adult spring chinook salmon transported by barge  
from Lower Granite Dam to below Bonneville Dam from 15-27 May 1987.

Master File Date : 26 July 1989  
RELEASE GROUPS INCLUDED: 8706I

1987 L.GRANITE BARGE INDEX  
SPRING CHINOOK

BELOW BONNEVILLE

Brands Used: RASU2  
Wire Codes Used: 232023

NUMBER RELEASED: 2681

RECOVERY AREA	1987	YEAR OF RETURN		TOTAL	% RETURN
		1988	1989		
RIVER SYSTEM TRAPS					
BONNEVILLE TRAP	0	0	5	5	0.186
MCNARY TRAP	0	0	0	0	0.000
LOWER GRANITE TRAP	0	0	7	7	0.261
PRIEST RAPIDS TRAP	0	0	0	0	0.000
OCEAN FISHERIES	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0.000
INDIAN FISHERY	0	0	0	0	0.000
HATCHERIES	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0.000
TOTALS	0	0	12	12	0.448
PERCENT OF RECOVERY	%	0.0	0.0	100.0	

Appendix Table 9.0.--Summary of all recoveries of adult steelhead transported by barge from Lower Granite Dam to below Bonneville Dam in 1985.

Master File Date : 26 July 1989  
 RELEASE GROUPS INCLUDED: 8509A 8509B 8509C 8509D 8509E

1985 L.GRANITE TRANS BARGE BELOW BONNEVILLE  
 STEELHEAD

Brands Used: RAPI1 RAPI2 RAPI3 RAPI4 LAPI1  
 Wire Codes Used: 231817 231810 231811 231812 231813

NUMBER RELEASED: 30041

RECOVERY AREA	1985	YEAR OF RETURN		1988	1989	TOTAL	% RETURN
		1986	1987				
RIVER SYSTEM TRAPS							
BONNEVILLE TRAP	0	49	29	0	0	78	0.260
MCHARY TRAP	0	0	0	0	0	0	0.000
LOWER GRANITE TRAP	0	216	142	7	0	365	1.215
PRIEST RAPIDS TRAP	0	0	1	0	0	1	0.003
OCEAN FISHERIES	0	0	0	0	0	0	0.000
RIVER SPORT							
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	0	0	0.000
WENATCHEE R.	0	0	0	0	0	0	0.000
SNAKE R.	0	29	9	0	0	38	0.126
CLEARWATER R.	0	1	4	1	0	6	0.020
OTHER RIVERS	0	1	1	0	0	2	0.007
RIVER COMMERCIAL	0	0	0	0	0	0	0.000
INDIAN FISHERY							
FALL INDIAN NET	0	8	11	0	0	19	0.063
WINTER INDIAN NET	0	0	1	0	0	1	0.003
CLEARWATER INDIAN	0	0	2	0	0	2	0.007
HATCHERIES							
DWORSHAK H.	0	0	26	5	0	31	0.103
PAHSIMEROI H.	0	6	5	0	0	11	0.037
HELLS CANYON (OXBOW) H.	0	6	8	0	0	14	0.047
	0	0	1	0	0	1	0.003
STREAM SURVEY	0	0	0	0	0	0	0.000
TOTALS	0	316	240	13	0	569	1.894
PERCENT OF RECOVERY	%	0.0	55.5	42.2	2.3	0.0	

Appendix Table 9.1.--Recoveries of adult steelhead transported by barge from Lower Granite Dam to below Bonneville Dam from 20-26 April 1985.

Master File Date : 26 July 1989  
 RELEASE GROUPS INCLUDED: 8509A

1985 L.GRANITE TRANS BARGE BELOW BONNEVILLE  
 STEELHEAD

Brands Used: RAPI1  
 Wire Codes Used: 231817

NUMBER RELEASED: 1635

RECOVERY AREA	1985	YEAR OF RETURN		1988	1989	TOTAL	% RETURN
		1986	1987				
RIVER SYSTEM TRAPS							
BONNEVILLE TRAP	0	4	3	0	0	7	0.428
MCNARY TRAP	0	0	0	0	0	0	0.000
LOWER GRANITE TRAP	0	14	12	0	0	26	1.590
PRIEST RAPIDS TRAP	0	0	0	0	0	0	0.000
OCEAN FISHERIES	0	0	0	0	0	0	0.000
RIVER SPORT							
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	0	0	0.000
WENATCHEE R.	0	0	0	0	0	0	0.000
SNAKE R.	0	1	1	0	0	2	0.122
RIVER COMMERCIAL	0	0	0	0	0	0	0.000
INDIAN FISHERY							
FALL INDIAN NET	0	0	1	0	0	1	0.061
HATCHERIES							
PAHSIMEROI H.	0	1	0	0	0	1	0.061
STREAM SURVEY	0	0	0	0	0	0	0.000
TOTALS	0	20	17	0	0	37	2.263
PERCENT OF RECOVERY	%	0.0	54.1	45.9	0.0	0.0	

Appendix Table 9.2.--Recoveries of adult steelhead transported by barge from Lower Granite Dam to below Bonneville Dam from 29 April to 3 May 1985.

Master File Date : 26 July 1989  
 RELEASE GROUPS INCLUDED: 8509B

1985 L.GRANITE TRANS BARGE BELOW BONNEVILLE  
 STEELHEAD

Brands Used: RAPI2  
 Wire Codes Used: 231810

NUMBER RELEASED: 3084

RECOVERY AREA	1985	YEAR OF RETURN		1988	1989	TOTAL	% RETURN
		1986	1987				
RIVER SYSTEM TRAPS							
BONNEVILLE TRAP	0	1	1	0	0	2	0.065
MCNARY TRAP	0	0	0	0	0	0	0.000
LOWER GRANITE TRAP	0	41	26	2	0	69	2.237
PRIEST RAPIDS TRAP	0	0	0	0	0	0	0.000
OCEAN FISHERIES	0	0	0	0	0	0	0.000
RIVER SPORT							
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	0	0	0.000
WENATCHEE R.	0	0	0	0	0	0	0.000
SNAKE R.	0	4	3	0	0	7	0.227
RIVER COMMERCIAL	0	0	0	0	0	0	0.000
INDIAN FISHERY							
FALL INDIAN NET	0	1	1	0	0	2	0.065
WINTER INDIAN NET	0	0	1	0	0	1	0.032
CLEARWATER INDIAN	0	0	2	0	0	2	0.065
HATCHERIES							
DWORSHAK H.	0	0	3	1	0	4	0.130
PAHSIMEROI H.	0	2	0	0	0	2	0.065
STREAM SURVEY	0	0	0	0	0	0	0.000
TOTALS	0	49	37	3	0	89	2.886
PERCENT OF RECOVERY	%	0.0	55.1	41.6	3.4	0.0	

Appendix Table 9.3.--Recoveries of adult steelhead transported by barge from Lower Granite Dam to below Bonneville Dam from 6-10 May 1985.

Master File Date : 26 July 1989  
 RELEASE GROUPS INCLUDED: 8509C

1985 L.GRANITE TRANS BARGE BELOW BONNEVILLE  
 STEELHEAD

Brands Used: RAPI3  
 Wire Codes Used: 231811

NUMBER RELEASED: 7640

RECOVERY AREA	1985	YEAR OF RETURN		1988	1989	TOTAL	% RETURN
		1986	1987				
RIVER SYSTEM TRAPS							
BONNEVILLE TRAP	0	21	4	0	0	25	0.327
MCNARY TRAP	0	0	0	0	0	0	0.000
LOWER GRANITE TRAP	0	52	45	4	0	101	1.322
PRIEST RAPIDS TRAP	0	0	0	0	0	0	0.000
OCEAN FISHERIES	0	0	0	0	0	0	0.000
RIVER SPORT							
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	0	0	0.000
WENATCHEE R.	0	0	0	0	0	0	0.000
SNAKE R.	0	9	3	0	0	12	0.157
CLEARWATER R.	0	1	0	1	0	2	0.026
OTHER RIVERS	0	0	1	0	0	1	0.013
RIVER COMMERCIAL	0	0	0	0	0	0	0.000
INDIAN FISHERY							
FALL INDIAN NET	0	2	3	0	0	5	0.065
HATCHERIES							
DWORSHAK H.	0	0	16	3	0	19	0.249
FAHSIMEROI H.	0	1	2	0	0	3	0.039
HELLS CANYON (DXBOW) H.	0	2	2	0	0	4	0.052
STREAM SURVEY	0	0	0	0	0	0	0.000
TOTALS	0	88	76	8	0	172	2.251
PERCENT OF RECOVERY	%	0.0	51.2	44.2	4.7	0.0	

Appendix Tabale 9.4.--Recoveries of adult steelhead transported by barge from Lower Granite Dam to below Bonneville Dam from 13-17 May 1985.

Master File Date : 26 July 1989  
 RELEASE GROUPS INCLUDED: 8509D

1985 L.GRANITE TRANS BARGE BELOW BONNEVILLE  
 STEELHEAD

Brands Used: RAPI4  
 Wire Codes Used: 231812

NUMBER RELEASED: 8855

RECOVERY AREA	1985	YEAR OF RETURN		1988	1989	TOTAL	% RETURN
		1986	1987				
RIVER SYSTEM TRAPS							
BONNEVILLE TRAP	0	13	10	0	0	23	0.260
MCNARY TRAP	0	0	0	0	0	0	0.000
LOWER GRANITE TRAP	0	60	38	1	0	99	1.118
PRIEST RAPIDS TRAP	0	0	0	0	0	0	0.000
OCEAN FISHERIES	0	0	0	0	0	0	0.000
RIVER SPORT							
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	0	0	0.000
WENATCHEE R.	0	0	0	0	0	0	0.000
SNAKE R.	0	6	2	0	0	8	0.090
CLEARWATER R.	0	0	3	0	0	3	0.034
RIVER COMMERCIAL	0	0	0	0	0	0	0.000
INDIAN FISHERY							
FALL INDIAN NET	0	3	4	0	0	7	0.079
HATCHERIES							
DWORSHAK H.	0	0	6	1	0	7	0.079
PAHSIMEROI H.	0	1	1	0	0	2	0.023
HELLS CANYON (OXBOW) H.	0	1	6	0	0	7	0.079
	0	0	1	0	0	1	0.011
STREAM SURVEY	0	0	0	0	0	0	0.000
TOTALS	0	84	71	2	0	157	1.773
PERCENT OF RECOVERY	%	0.0	53.5	45.2	1.3	0.0	

Appendix Table 9.5.--Recoveries of adult steelhead transported by barge from Lower Granite Dam to below Bonneville Dam from 18-25 May 1985.

Master File Date : 26 July 1989  
 RELEASE GROUPS INCLUDED: 8509E

1985 L.GRANITE TRANS BARGE  
 STEELHEAD

BELOW BONNEVILLE

Brands Used: LAP11  
 Wire Codes Used: 231813

NUMBER RELEASED: 8827

RECOVERY AREA	1985	YEAR OF RETURN		1988	1989	TOTAL	% RETURN
		1986	1987				
RIVER SYSTEM TRAPS							
BONNEVILLE TRAP	0	10	11	0	0	21	0.238
MCNARY TRAP	0	0	0	0	0	0	0.000
LOWER GRANITE TRAP	0	49	21	0	0	70	0.793
PRIEST RAPIDS TRAP	0	0	1	0	0	1	0.011
OCEAN FISHERIES	0	0	0	0	0	0	0.000
RIVER SPORT							
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	0	0	0.000
WENATCHEE R.	0	0	0	0	0	0	0.000
SNAKE R.	0	9	0	0	0	9	0.102
CLEARWATER R.	0	0	1	0	0	1	0.011
OTHER RIVERS	0	1	0	0	0	1	0.011
RIVER COMMERCIAL	0	0	0	0	0	0	0.000
INDIAN FISHERY							
FALL INDIAN NET	0	2	2	0	0	4	0.045
HATCHERIES							
DWORSHAK H.	0	0	1	0	0	1	0.011
PAHSIMEROI H.	0	1	2	0	0	3	0.034
HELLS CANYON (OXBOW) H.	0	3	0	0	0	3	0.034
STREAM SURVEY	0	0	0	0	0	0	0.000
TOTALS	0	75	39	0	0	114	1.291
PERCENT OF RECOVERY	%	0.0	65.8	34.2	0.0	0.0	

Appendix Table 10.0.--Summary of all recoveries of adult steelhead released as juveniles below Little Goose Dam in 1986.

Master File Date : 26 July 1989

RELEASE GROUPS INCLUDED: 8611A 8611B 8611C 8611D 8611E 8611F 8611G 8611H

1986 L.GRANITE TRANS CONTROL BELOW L.GOOSE  
STEELHEAD

Brands Used: LAP 1 LAP 2 LAP 3 LAP 4 LAW 1 LAW 2 LAW 3 LAW 4  
Wire Codes Used: 231902 231903 231904 231915 231905 231906 231907 231908

NUMBER RELEASED: 31646

RECOVERY AREA	1986	YEAR OF RETURN			TOTAL	% RETURN
		1987	1988	1989		
RIVER SYSTEM TRAPS						
BONNEVILLE TRAP	0	2	2	0	4	0.013
MCNARY TRAP	0	0	0	0	0	0.000
LOWER GRANITE TRAP	0	60	108	0	168	0.531
PRIEST RAPIDS TRAP	0	0	0	0	0	0.000
OCEAN FISHERIES	0	0	0	0	0	0.000
RIVER SPORT						
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	0	0.000
WENATCHEE R.	0	0	0	0	0	0.000
SNAKE R.	0	1	6	0	7	0.022
CLEARWATER R.	0	0	15	0	15	0.047
RIVER COMMERCIAL	0	0	0	0	0	0.000
INDIAN FISHERY	0	0	0	0	0	0.000
HATCHERIES						
DWORSHAK H.	0	0	10	0	10	0.032
PAHSIMEROI H.	0	3	0	0	3	0.009
	0	3	0	0	3	0.009
STREAM SURVEY	0	0	0	0	0	0.000
TOTALS	0	69	141	0	210	0.664
PERCENT OF RECOVERY	%	0.0	32.9	67.1	0.0	

Appendix Table 10.1.--Recoveries of adult steelhead released as juveniles below Little Goose Dam from 15-27 April 1986.

Master File Date : 26 July 1989  
 RELEASE GROUPS INCLUDED: 8611A

1986 L.GRANITE TRANS CONTROL BELOW L.GOOSE  
 STEELHEAD

Brands Used: LAP 1  
 Wire Codes Used: 231902

NUMBER RELEASED: 4319

RECOVERY AREA	1986	YEAR OF RETURN		1989	TOTAL	% RETURN
		1987	1988			
RIVER SYSTEM TRAPS						
BONNEVILLE TRAP	0	0	1	0	1	0.023
MCNARY TRAP	0	0	0	0	0	0.000
LOWER GRANITE TRAP	0	25	16	0	41	0.949
PRIEST RAPIDS TRAP	0	0	0	0	0	0.000
OCEAN FISHERIES	0	0	0	0	0	0.000
RIVER SPORT						
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	0	0.000
WENATCHEE R.	0	0	0	0	0	0.000
SNAKE R.	0	1	0	0	1	0.023
RIVER COMMERCIAL	0	0	0	0	0	0.000
INDIAN FISHERY	0	0	0	0	0	0.000
HATCHERIES						
PAHSIMEROI H.	0	2	0	0	2	0.046
STREAM SURVEY	0	0	0	0	0	0.000
TOTALS	0	28	17	0	45	1.042
PERCENT OF RECOVERY	%	0.0	62.2	37.8	0.0	

Appendix Table 10.2.--Recoveries of adult steelhead released as juveniles below Little Goose Dam from 29 April to 1 May 1986.

Master File Date : 26 July 1989  
 RELEASE GROUPS INCLUDED: 8611B

1986 L.GRANITE TRANS CONTROL                      BELOW L.GOOSE  
 STEELHEAD

Brands Used: LAP 2  
 Wire Codes Used: 231903

NUMBER RELEASED: 4176

RECOVERY AREA	1986	YEAR OF RETURN			TOTAL	% RETURN
		1987	1988	1989		
RIVER SYSTEM TRAPS						
BONNEVILLE TRAP	0	0	0	0	0	0.000
MCNARY TRAP	0	0	0	0	0	0.000
LOWER GRANITE TRAP	0	9	9	0	18	0.431
PRIEST RAPIDS TRAP	0	0	0	0	0	0.000
OCEAN FISHERIES	0	0	0	0	0	0.000
RIVER SPORT						
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	0	0.000
WENATCHEE R.	0	0	0	0	0	0.000
SNAKE R.	0	0	1	0	1	0.024
CLEARWATER R.	0	0	1	0	1	0.024
RIVER COMMERCIAL	0	0	0	0	0	0.000
INDIAN FISHERY	0	0	0	0	0	0.000
HATCHERIES						
DWORSHAK H.	0	0	1	0	1	0.024
PAHSIMEROI H.	0	1	0	0	1	0.024
STREAM SURVEY	0	0	0	0	0	0.000
TOTALS	0	10	12	0	22	0.527
PERCENT OF RECOVERY	%	0.0	45.5	54.5	0.0	

Appendix Table 10.3.--Recoveries of adult steelhead released as juveniles below Little Goose Dam from 1-8 May 1986.

Master File Date : 26 July 1989  
 RELEASE GROUPS INCLUDED: 8611C

1986 L.GRANITE TRANS CONTROL                      BELOW L.GOOSE  
 STEELHEAD

Brands Used: LAP 3  
 Wire Codes Used: 231904

NUMBER RELEASED: 4966

RECOVERY AREA	1986	YEAR OF RETURN			TOTAL	% RETURN
		1987	1988	1989		
RIVER SYSTEM TRAPS						
BONNEVILLE TRAP	0	0	1	0	1	0.020
MCNARY TRAP	0	0	0	0	0	0.000
LOWER GRANITE TRAP	0	2	15	0	17	0.342
PRIEST RAPIDS TRAP	0	0	0	0	0	0.000
OCEAN FISHERIES	0	0	0	0	0	0.000
RIVER SPORT						
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	0	0.000
WENATCHEE R.	0	0	0	0	0	0.000
SNAKE R.	0	0	1	0	1	0.020
CLEARWATER R.	0	0	4	0	4	0.081
RIVER COMMERCIAL	0	0	0	0	0	0.000
INDIAN FISHERY	0	0	0	0	0	0.000
HATCHERIES						
DWORSHAK H.	0	0	2	0	2	0.040
STREAM SURVEY	0	0	0	0	0	0.000
TOTALS	0	2	23	0	25	0.503
PERCENT OF RECOVERY	%	0.0	8.0	92.0	0.0	

Appendix Table 10.4.--Recoveries of adult steelhead released as juveniles below Little Goose Dam from 8-13 May 1986.

Master File Date : 26 July 1989  
 RELEASE GROUPS INCLUDED: 8611D

1986 L.GRANITE TRANS CONTROL                      BELOW L.GOOSE  
 STEELHEAD

Brands Used: LAP 4  
 Wire Codes Used: 231915

NUMBER RELEASED: 4150

RECOVERY AREA	YEAR OF RETURN				TOTAL	% RETURN
	1986	1987	1988	1989		
RIVER SYSTEM TRAPS						
BONNEVILLE TRAP	0	2	0	0	2	0.048
MCNARY TRAP	0	0	0	0	0	0.000
LOWER GRANITE TRAP	0	7	15	0	22	0.530
PRIEST RAPIDS TRAP	0	0	0	0	0	0.000
OCEAN FISHERIES	0	0	0	0	0	0.000
RIVER SPORT						
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	0	0.000
WENATCHEE R.	0	0	0	0	0	0.000
SNAKE R.	0	0	2	0	2	0.048
CLEARWATER R.	0	0	4	0	4	0.096
RIVER COMMERCIAL	0	0	0	0	0	0.000
INDIAN FISHERY	0	0	0	0	0	0.000
HATCHERIES						
DWORSHAK H.	0	0	4	0	4	0.096
STREAM SURVEY	0	0	0	0	0	0.000
TOTALS	0	9	25	0	34	0.819
PERCENT OF RECOVERY	%	0.0	26.5	73.5	0.0	

Appendix Table 10.5.--Recoveries of adult steelhead released as juveniles below Little Goose Dam from 13-17 May 1986.

Master File Date : 26 July 1989  
 RELEASE-GROUPS INCLUDED: 8611E

1986 L.GRANITE TRANS CONTROL BELOW L.GOOSE  
 STEELHEAD

Brands Used: LAW 1  
 Wire Codes Used: 231905

NUMBER RELEASED: 4249

RECOVERY AREA	1986	YEAR OF RETURN			TOTAL	% RETURN
		1987	1988	1989		
RIVER SYSTEM TRAPS						
BONNEVILLE TRAP	0	0	0	0	0	0.000
MCHARY TRAP	0	0	0	0	0	0.000
LOWER GRANITE TRAP	0	6	24	0	30	0.706
PRIEST RAPIDS TRAP	0	0	0	0	0	0.000
OCEAN FISHERIES	0	0	0	0	0	0.000
RIVER SPORT						
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	0	0.000
WENATCHEE R.	0	0	0	0	0	0.000
SNAKE R.	0	0	2	0	2	0.047
CLEARWATER R.	0	0	2	0	2	0.047
RIVER COMMERCIAL	0	0	0	0	0	0.000
INDIAN FISHERY	0	0	0	0	0	0.000
HATCHERIES						
DWORSHAK H.	0	0	2	0	2	0.047
	0	3	0	0	3	0.071
STREAM SURVEY	0	0	0	0	0	0.000
TOTALS	0	9	30	0	39	0.918
PERCENT OF RECOVERY	%	0.0	23.1	76.9	0.0	

Appendix Table 10.6.--Recoveries of adult steelhead released as juveniles below Little Goose Dam from 17-22 May 1986.

Master File Date : 26 July 1989  
 RELEASE GROUPS INCLUDED: 8611F

1986 L.GRANITE TRANS CONTROL BELOW L.GOOSE  
 STEELHEAD

Brands Used: LAW 2  
 Wire Codes Used: 231906

NUMBER RELEASED: 4250

RECOVERY AREA	1986	YEAR OF RETURN		1989	TOTAL	% RETURN
		1987	1988			
RIVER SYSTEM TRAPS						
BONNEVILLE TRAP	0	0	0	0	0	0.000
MCNARY TRAP	0	0	0	0	0	0.000
LOWER GRANITE TRAP	0	8	15	0	23	0.541
PRIEST RAPIDS TRAP	0	0	0	0	0	0.000
OCEAN FISHERIES	0	0	0	0	0	0.000
RIVER SPORT						
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	0	0.000
WENATCHEE R.	0	0	0	0	0	0.000
SNAKE R.	0	0	0	0	0	0.000
CLEARWATER R.	0	0	3	0	3	0.071
RIVER COMMERCIAL	0	0	0	0	0	0.000
INDIAN FISHERY	0	0	0	0	0	0.000
HATCHERIES						
DWORSHAK H.	0	0	1	0	1	0.024
STREAM SURVEY	0	0	0	0	0	0.000
TOTALS	0	8	19	0	27	0.635
PERCENT OF RECOVERY	%	0.0	29.6	70.4	0.0	

Appendix Table 10.7.--Recoveries of adult steelhead released as juveniles below Little Goose Dam from 22-27 May 1986.

Master File Date : 26 July 1989  
 RELEASE GROUPS INCLUDED: 86116

1986 L.GRANITE TRANS CONTROL BELOW L.GOOSE  
 STEELHEAD

Brands Used: LAW 3  
 Wire Codes Used: 231907

NUMBER RELEASED: 4250

RECOVERY AREA	1986	YEAR OF RETURN			TOTAL	% RETURN
		1987	1988	1989		
RIVER SYSTEM TRAPS						
BONNEVILLE TRAP	0	0	0	0	0	0.000
MCNARY TRAP	0	0	0	0	0	0.000
LOWER GRANITE TRAP	0	1	12	0	13	0.306
PRIEST RAPIDS TRAP	0	0	0	0	0	0.000
OCEAN FISHERIES	0	0	0	0	0	0.000
RIVER SPORT						
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	0	0.000
WENATCHEE R.	0	0	0	0	0	0.000
SNAKE R.	0	0	0	0	0	0.000
CLEARWATER R.	0	0	1	0	1	0.024
RIVER COMMERCIAL	0	0	0	0	0	0.000
INDIAN FISHERY	0	0	0	0	0	0.000
HATCHERIES	0	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0	0.000
TOTALS	0	1	13	0	14	0.329
PERCENT OF RECOVERY	%	0.0	7.1	92.9	0.0	

Appendix Table 10.8.--Recoveries of adult steelhead released as juveniles below Little Goose Dam on 27 May 1986.

Master File Date : 26 July 1989  
 RELEASE GROUPS INCLUDED: 8611H

1986 L.GRANITE TRANS CONTROL BELOW L.GOOSE  
 STEELHEAD

Brands Used: LAW 4  
 Wire Codes Used: 231908

NUMBER RELEASED: 1286

RECOVERY AREA	1986	YEAR OF RETURN		1989	TOTAL	% RETURN
		1987	1988			
RIVER SYSTEM TRAPS	0	0	0	0	0	0.000
BONNEVILLE TRAP	0	0	0	0	0	0.000
MCNARY TRAP	0	2	2	0	4	0.311
LOWER GRANITE TRAP	0	0	0	0	0	0.000
PRIEST RAPIDS TRAP	0	0	0	0	0	0.000
OCEAN FISHERIES	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0.000
INDIAN FISHERY	0	0	0	0	0	0.000
HATCHERIES	0	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0	0.000
TOTALS	0	2	2	0	4	0.311
PERCENT OF RECOVERY	%	0.0	50.0	50.0	0.0	

Appendix Table 11.0.--Summary of all recoveries of adult steelhead transported as juveniles by barge from Lower Granite Dam to below Bonneville Dam in 1986.

Master File Date : 26 July 1989

RELEASE GROUPS INCLUDED: 8613A 8613B 8613C 8613D 8613E 8613F 8613G

1986 L.GRANITE TRANS BARGE  
STEELHEAD

BELOW BONNEVILLE

Brands Used: RAL 1 RAL 2 RAL 3 RAL 4 RAV 1 RAV 2 RAV 3  
Wire Codes Used: 231910 231911 231912 231913 231914 231916 231917

NUMBER RELEASED: 30659

RECOVERY AREA	1986	YEAR OF RETURN		1989	TOTAL	% RETURN
		1987	1988			
RIVER SYSTEM TRAPS						
BONNEVILLE TRAP	0	10	4	0	14	0.046
MCNARY TRAP	0	0	0	0	0	0.000
LOWER GRANITE TRAP	0	87	219	0	306	0.998
PRIEST RAPIDS TRAP	0	0	0	0	0	0.000
OCEAN FISHERIES	0	0	0	0	0	0.000
RIVER SPORT						
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	0	0.000
WENATCHEE R.	0	0	0	0	0	0.000
SNAKE R.	0	3	9	0	12	0.039
CLEARWATER R.	0	1	26	0	27	0.088
RIVER COMMERCIAL	0	0	0	0	0	0.000
INDIAN FISHERY						
CLEARWATER INDIAN	0	1	0	0	1	0.003
HATCHERIES						
DWORSHAK H.	0	0	26	0	26	0.085
PAHSIMEROI H.	0	3	0	0	3	0.010
STREAM SURVEY	0	0	0	0	0	0.000
OTHER	0	0	0	1	1	0.003
TOTALS	0	105	284	1	390	1.272
PERCENT OF RECOVERY	%	0.0	26.9	72.8	0.3	

Appendix Table 11.1.--Recoveries of adult steelhead transported as juveniles by barge from Lower Granite Dam to below Bonneville Dam from 16-28 April 1986.

Master File Date : 26 July 1989  
 RELEASE GROUPS INCLUDED: 8613A

1986 L.GRANITE TRANS BARGE BELOW BONNEVILLE  
 STEELHEAD

Brands Used: RAL 1  
 Wire Codes Used: 231910

NUMBER RELEASED: 4904

RECOVERY AREA	1986	YEAR OF RETURN			TOTAL	% RETURN
		1987	1988	1989		
RIVER SYSTEM TRAPS						
BONNEVILLE TRAP	0	1	1	0	2	0.041
MCNARY TRAP	0	0	0	0	0	0.000
LOWER GRANITE TRAP	0	33	49	0	82	1.672
PRIEST RAPIDS TRAP	0	0	0	0	0	0.000
OCEAN FISHERIES	0	0	0	0	0	0.000
RIVER SPORT						
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	0	0.000
WENATCHEE R.	0	0	0	0	0	0.000
SNAKE R.	0	0	1	0	1	0.020
CLEARWATER R.	0	0	3	0	3	0.061
RIVER COMMERCIAL	0	0	0	0	0	0.000
INDIAN FISHERY						
CLEARWATER INDIAN	0	1	0	0	1	0.020
HATCHERIES	0	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0	0.000
OTHER	0	0	0	1	1	0.020
TOTALS	0	35	54	1	90	1.835
PERCENT OF RECOVERY	%	0.0	38.9	60.0	1.1	

Appendix Table 11.2.--Recoveries of adult steelhead transported as juveniles from Lower Granite Dam to below Bonneville Dam from 28-30 April 1986.

Master File Date : 26 July 1989  
 RELEASE GROUPS INCLUDED: 8613B

1986 L.GRANITE TRANS BARGE BELOW BONNEVILLE  
 STEELHEAD

Brands Used: RAL 2  
 Wire Codes Used: 231911

NUMBER RELEASED: 4250

RECOVERY AREA	1986	YEAR OF RETURN			TOTAL	% RETURN
		1987	1988	1989		
RIVER SYSTEM TRAPS						
BONNEVILLE TRAP	0	0	1	0	1	0.024
MCNARY TRAP	0	0	0	0	0	0.000
LOWER GRANITE TRAP	0	5	12	0	17	0.400
PRIEST RAPIDS TRAP	0	0	0	0	0	0.000
OCEAN FISHERIES	0	0	0	0	0	0.000
RIVER SPORT						
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	0	0.000
WENATCHEE R.	0	0	0	0	0	0.000
SNAKE R.	0	0	1	0	1	0.024
RIVER COMMERCIAL	0	0	0	0	0	0.000
INDIAN FISHERY	0	0	0	0	0	0.000
HATCHERIES						
DNORSHAK H.	0	0	1	0	1	0.024
PAHSIMEROI H.	0	1	0	0	1	0.024
STREAM SURVEY	0	0	0	0	0	0.000
TOTALS	0	6	15	0	21	0.494
PERCENT OF RECOVERY	%	0.0	28.6	71.4	0.0	

Appendix Table 11.3.--Recoveries of adult steelhead transported as juveniles from Lower Granite Dam to below Bonneville Dam from 2-9 May 1986.

Master File Date : 26 July 1989  
 RELEASE GROUPS INCLUDED: 8613C

1986 L.GRANITE TRANS BARGE BELOW BONNEVILLE  
 STEELHEAD

Brands Used: RAL 3  
 Wire Codes Used: 231912

NUMBER RELEASED: 4247

RECOVERY AREA	1986	YEAR OF RETURN			TOTAL	% RETURN
		1987	1988	1989		
RIVER SYSTEM TRAPS						
BONNEVILLE TRAP	0	3	0	0	3	0.071
MCNARY TRAP	0	0	0	0	0	0.000
LOWER GRANITE TRAP	0	13	17	0	30	0.706
PRIEST RAPIDS TRAP	0	0	0	0	0	0.000
OCEAN FISHERIES	0	0	0	0	0	0.000
RIVER SPORT						
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	0	0.000
WENATCHEE R.	0	0	0	0	0	0.000
SNAKE R.	0	0	1	0	1	0.024
CLEARWATER R.	0	0	1	0	1	0.024
RIVER COMMERCIAL	0	0	0	0	0	0.000
INDIAN FISHERY	0	0	0	0	0	0.000
HATCHERIES						
DWORSHAK H.	0	0	5	0	5	0.118
STREAM SURVEY	0	0	0	0	0	0.000
TOTALS	0	16	24	0	40	0.942
PERCENT OF RECOVERY	%	0.0	40.0	60.0	0.0	

Appendix Table 11.4.--Recoveries of adult steelhead transported as juveniles from Lower Granite Dam to below Bonneville Dam from 9-14 May 1986.

Master File Date : 26 July 1989  
 RELEASE GROUPS INCLUDED: 8613D

1986 L.GRANITE TRANS BARGE BELOW BONNEVILLE  
 STEELHEAD

Brands Used: RAL 4  
 Wire Codes Used: 231913

NUMBER RELEASED: 4250

RECOVERY AREA	1986	YEAR OF RETURN			TOTAL	% RETURN
		1987	1988	1989		
RIVER SYSTEM TRAPS						
BONNEVILLE TRAP	0	2	0	0	2	0.047
MCNARY TRAP	0	0	0	0	0	0.000
LOWER GRANITE TRAP	0	7	36	0	43	1.012
PRIEST RAPIDS TRAP	0	0	0	0	0	0.000
OCEAN FISHERIES	0	0	0	0	0	0.000
RIVER SPORT						
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	0	0.000
WENATCHEE R.	0	0	0	0	0	0.000
SNAKE R.	0	0	0	0	0	0.000
CLEARWATER R.	0	0	8	0	8	0.188
RIVER COMMERCIAL	0	0	0	0	0	0.000
INDIAN FISHERY	0	0	0	0	0	0.000
HATCHERIES						
DWORSHAK H.	0	0	8	0	8	0.188
PAHSINERDI H.	0	2	0	0	2	0.047
STREAM SURVEY	0	0	0	0	0	0.000
TOTALS	0	11	52	0	63	1.482
PERCENT OF RECOVERY	%	0.0	17.5	82.5	0.0	

Appendix Table 11.5.--Recoveries of adult steelhead transported as juveniles from Lower Granite Dam to below Bonneville Dam from 14-19 May 1986.

Master File Date : 26 July 1989  
 RELEASE GROUPS INCLUDED: 8613E

1986 L.GRANITE TRANS BARGE BELOW BONNEVILLE  
 STEELHEAD

Brands Used: RAV 1  
 Wire Codes Used: 231914

NUMBER RELEASED: 4244

RECOVERY AREA	1986	YEAR OF RETURN			TOTAL	% RETURN
		1987	1988	1989		
RIVER SYSTEM TRAPS						
BONNEVILLE TRAP	0	3	0	0	3	0.071
MCNARY TRAP	0	0	0	0	0	0.000
LOWER GRANITE TRAP	0	10	40	0	50	1.178
PRIEST RAPIDS TRAP	0	0	0	0	0	0.000
OCEAN FISHERIES	0	0	0	0	0	0.000
RIVER SPORT						
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	0	0.000
WENATCHEE R.	0	0	0	0	0	0.000
SNAKE R.	0	1	0	0	1	0.024
CLEARWATER R.	0	1	5	0	6	0.141
RIVER COMMERCIAL	0	0	0	0	0	0.000
INDIAN FISHERY	0	0	0	0	0	0.000
HATCHERIES						
DWORSHAK H.	0	0	11	0	11	0.259
STREAM SURVEY	0	0	0	0	0	0.000
TOTALS	0	15	56	0	71	1.673
PERCENT OF RECOVERY	%	0.0	21.1	78.9	0.0	

Appendix Table 11.6.--Recoveries of adult steelhead transported as juveniles from Lower Granite Dam to below Bonneville Dam from 19-23 May 1986.

Master File Date : 26 July 1989  
 RELEASE GROUPS INCLUDED: 8613F

1986 L.GRANITE TRANS BARGE BELOW BONNEVILLE  
 STEELHEAD

Brands Used: RAV 2  
 Wire Codes Used: 231916

NUMBER RELEASED: 4514

RECOVERY AREA	1986	YEAR OF RETURN		1989	TOTAL	% RETURN
		1987	1988			
RIVER SYSTEM TRAPS						
BONNEVILLE TRAP	0	0	2	0	2	0.044
MCNARY TRAP	0	0	0	0	0	0.000
LOWER GRANITE TRAP	0	14	48	0	62	1.374
PRIEST RAPIDS TRAP	0	0	0	0	0	0.000
OCEAN FISHERIES	0	0	0	0	0	0.000
RIVER SPORT						
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	0	0.000
WENATCHEE R.	0	0	0	0	0	0.000
SNAKE R.	0	1	4	0	5	0.111
CLEARWATER R.	0	0	6	0	6	0.133
RIVER COMMERCIAL	0	0	0	0	0	0.000
INDIAN FISHERY	0	0	0	0	0	0.000
HATCHERIES						
DWORSHAK H.	0	0	1	0	1	0.022
STREAM SURVEY	0	0	0	0	0	0.000
TOTALS	0	15	61	0	76	1.684
PERCENT OF RECOVERY	%	0.0	19.7	80.3	0.0	

Appendix Table 11.7.--Recoveries of adult steelhead transported as juveniles from Lower Granite Dam to below Bonneville Dam from 23 May to 3 June 1986.

Master File Date : 26 July 1989  
 RELEASE GROUPS INCLUDED: 86136

1986 L.GRANITE TRANS BARGE  
 STEELHEAD

BELOW BONNEVILLE

Brands Used: RAV 3  
 Wire Codes Used: 231917

NUMBER RELEASED: 4250

RECOVERY AREA	1986	YEAR OF RETURN			TOTAL	% RETURN
		1987	1988	1989		
RIVER SYSTEM TRAPS						
BONNEVILLE TRAP	0	1	0	0	1	0.024
MCNARY TRAP	0	0	0	0	0	0.000
LOWER GRANITE TRAP	0	5	17	0	22	0.518
PRIEST RAPIDS TRAP	0	0	0	0	0	0.000
OCEAN FISHERIES	0	0	0	0	0	0.000
RIVER SPORT						
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	0	0.000
WENATCHEE R.	0	0	0	0	0	0.000
SNAKE R.	0	1	2	0	3	0.071
CLEARWATER R.	0	0	3	0	3	0.071
RIVER COMMERCIAL	0	0	0	0	0	0.000
INDIAN FISHERY	0	0	0	0	0	0.000
HATCHERIES	0	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0	0.000
TOTALS	0	7	22	0	29	0.682
PERCENT OF RECOVERY	%	0.0	24.1	75.9	0.0	

Appendix Table 12.0.--Summary of all recoveries of adult steelhead transported by barge from Lower Granite Dam to below Bonneville Dam in 1987.

Master File Date : 26 July 1989

RELEASE GROUPS INCLUDED: 8707A 8707B 8707C 8707D 8707E 8707F 8707G

1987 L.GRANITE BARGE INDEX  
STEELHEAD

BELOW BONNEVILLE

Brands Used: RA2 1 RA2 2 RA2 3 RA2 4 RASU1 RASU2 RASU3  
Wire Codes Used: 231943 231944 231945 231946 231947 231948 232030

NUMBER RELEASED: 27544

RECOVERY AREA	1987	YEAR OF RETURN		TOTAL	% RETURN
		1988	1989		
RIVER SYSTEM TRAPS					
BONNEVILLE TRAP	0	10	0	10	0.036
MCNARY TRAP	0	0	0	0	0.000
LOWER GRANITE TRAP	0	98	0	98	0.356
PRIEST RAPIDS TRAP	0	0	0	0	0.000
OCEAN FISHERIES	0	0	0	0	0.000
RIVER SPORT					
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	0.000
WENATCHEE R.	0	0	0	0	0.000
SNAKE R.	0	13	0	13	0.047
CLEARWATER R.	0	1	0	1	0.004
RIVER COMMERCIAL	0	0	0	0	0.000
INDIAN FISHERY	0	0	0	0	0.000
HATCHERIES					
DWORSHAK H.	0	2	0	2	0.007
STREAM SURVEY	0	0	0	0	0.000
TOTALS	0	124	0	124	0.450
PERCENT OF RECOVERY	%	0.0	100.0	0.0	

Appendix Table 12.1.--Recoveries of adult steelhead transported by barge from Lower Granite Dam to below Bonneville Dam from 16-30 April 1987.

Master File Date : 26 July 1989  
 RELEASE GROUPS INCLUDED: 8707A

1987 L.GRANITE BARGE INDEX                      BELOW BONNEVILLE  
 STEELHEAD

Brands Used: RA2 1  
 Wire Codes Used: 231943

NUMBER RELEASED: 3869

RECOVERY AREA	1987	YEAR OF RETURN		TOTAL	% RETURN
		1988	1989		
RIVER SYSTEM TRAPS					
BONNEVILLE TRAP	0	1	0	1	0.026
MCNARY TRAP	0	0	0	0	0.000
LOWER GRANITE TRAP	0	14	0	14	0.362
PRIEST RAPIDS TRAP	0	0	0	0	0.000
OCEAN FISHERIES	0	0	0	0	0.000
RIVER SPORT					
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	0.000
WENATCHEE R.	0	0	0	0	0.000
SNAKE R.	0	2	0	2	0.052
RIVER COMMERCIAL	0	0	0	0	0.000
INDIAN FISHERY	0	0	0	0	0.000
HATCHERIES					
DWORSHAK H.	0	1	0	1	0.026
STREAM SURVEY	0	0	0	0	0.000
TOTALS	0	18	0	18	0.465
PERCENT OF RECOVERY	%	0.0	100.0	0.0	

Appendix Table 12.2.-- Recoveries of adult steelhead transported by barge from Lower Granite Dam to below Bonneville Dam from 30 April to 2 May 1987.

Master File Date : 26 July 1989  
 RELEASE GROUPS INCLUDED: 87078

1987 L.GRANITE BARGE INDEX BELOW BONNEVILLE  
 STEELHEAD

Brands Used: RA2 2  
 Wire Codes Used: 231944

NUMBER RELEASED: 3829

RECOVERY AREA	1987	YEAR OF RETURN		TOTAL	% RETURN
		1988	1989		
RIVER SYSTEM TRAPS					
BONNEVILLE TRAP	0	0	0	0	0.000
MCNARY TRAP	0	0	0	0	0.000
LOWER GRANITE TRAP	0	2	0	2	0.052
PRIEST RAPIDS TRAP	0	0	0	0	0.000
OCEAN FISHERIES	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0.000
INDIAN FISHERY	0	0	0	0	0.000
HATCHERIES					
DWORKSHAK H.	0	1	0	1	0.026
STREAM SURVEY	0	0	0	0	0.000
TOTALS	0	3	0	3	0.078
PERCENT OF RECOVERY	%	0.0	100.0	0.0	

Appendix Table 12.3.--Recoveries of adult steelhead transported by barge from Lower Granite Dam to below Bonneville Dam from 2-7 May 1987.

Master File Date : 26 July 1989  
 RELEASE GROUPS INCLUDED: 8707C

1987 L.GRANITE BARGE INDEX BELOW BONNEVILLE  
 STEELHEAD

Brands Used: RA2 3  
 Wire Codes Used: 231945

NUMBER RELEASED: 4168

RECOVERY AREA	1987	YEAR OF RETURN		TOTAL	% RETURN
		1988	1989		
RIVER SYSTEM TRAPS					
BONNEVILLE TRAP	0	0	0	0	0.000
MCNARY TRAP	0	0	0	0	0.000
LOWER GRANITE TRAP	0	18	0	18	0.432
PRIEST RAPIDS TRAP	0	0	0	0	0.000
OCEAN FISHERIES	0	0	0	0	0.000
RIVER SPORT					
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	0.000
WENATCHEE R.	0	0	0	0	0.000
SNAKE R.	0	2	0	2	0.048
RIVER COMMERCIAL	0	0	0	0	0.000
INDIAN FISHERY	0	0	0	0	0.000
HATCHERIES	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0.000
TOTALS	0	20	0	20	0.480
PERCENT OF RECOVERY	%	0.0	100.0	0.0	

Appendix Table 12.4.--Recoveries of adult steelhead transported by barge from Lower Granite Dam to below Bonneville Dam on 7 May 1987.

Master File Date : 26 July 1989  
 RELEASE GROUPS INCLUDED: 8707D

1987 L.GRANITE BARGE INDEX BELOW BONNEVILLE  
 STEELHEAD

Brands Used: RA2 4  
 Wire Codes Used: 231946

NUMBER RELEASED: 2487

RECOVERY AREA	1987	YEAR OF RETURN		TOTAL	% RETURN
		1988	1989		
RIVER SYSTEM TRAPS					
BONNEVILLE TRAP	0	4	0	4	0.161
MCNARY TRAP	0	0	0	0	0.000
LOWER GRANITE TRAP	0	32	0	32	1.287
PRIEST RAPIDS TRAP	0	0	0	0	0.000
OCEAN FISHERIES	0	0	0	0	0.000
RIVER SPORT					
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	0.000
WENATCHEE R.	0	0	0	0	0.000
SNAKE R.	0	4	0	4	0.161
CLEARWATER R.	0	1	0	1	0.040
RIVER COMMERCIAL	0	0	0	0	0.000
INDIAN FISHERY	0	0	0	0	0.000
HATCHERIES	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0.000
TOTALS	0	41	0	41	1.649
PERCENT OF RECOVERY	%	0.0	100.0	0.0	

Appendix Table 12.5.--Recoveries of adult steelhead transported by barge from Lower Granite Dam to below Bonneville Dam from 8-12 May 1987.

Master File Date : 26 July 1989  
 RELEASE GROUPS INCLUDED: 8707E

1987 L.GRANITE BARGE INDEX BELOW BONNEVILLE  
 STEELHEAD

Brands Used: RASU1  
 Wire Codes Used: 231947

NUMBER RELEASED: 4298

RECOVERY AREA	1987	YEAR OF RETURN		TOTAL	% RETURN
		1988	1989		
RIVER SYSTEM TRAPS					
BONNEVILLE TRAP	0	4	0	4	0.093
MCNARY TRAP	0	0	0	0	0.000
LOWER GRANITE TRAP	0	19	0	19	0.442
PRIEST RAPIDS TRAP	0	0	0	0	0.000
OCEAN FISHERIES	0	0	0	0	0.000
RIVER SPORT					
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	0.000
WENATCHEE R.	0	0	0	0	0.000
SNAKE R.	0	3	0	3	0.070
RIVER COMMERCIAL	0	0	0	0	0.000
INDIAN FISHERY	0	0	0	0	0.000
HATCHERIES	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0.000
TOTALS	0	26	0	26	0.605
PERCENT OF RECOVERY	%	0.0	100.0	0.0	

Appendix Table 12.6.--Recoveries of adult steelhead transported by barge from Lower Granite Dam to below Bonneville Dam from 13-14 May 1987.

Master File Date : 26 July 1989  
 RELEASE GROUPS INCLUDED: 8707F

1987 L.GRANITE BARGE INDEX                      BELOW BONNEVILLE  
 STEELHEAD

Brands Used: RASU2  
 Wire Codes Used: 231948

NUMBER RELEASED: 4275

RECOVERY AREA	1987	YEAR OF RETURN		TOTAL	% RETURN
		1988	1989		
RIVER SYSTEM TRAPS					
BONNEVILLE TRAP	0	0	0	0	0.000
MCNARY TRAP	0	0	0	0	0.000
LOWER GRANITE TRAP	0	6	0	6	0.140
PRIEST RAPIDS TRAP	0	0	0	0	0.000
OCEAN FISHERIES	0	0	0	0	0.000
RIVER SPORT					
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	0.000
WENATCHEE R.	0	0	0	0	0.000
SNAKE R.	0	1	0	1	0.023
RIVER COMMERCIAL	0	0	0	0	0.000
INDIAN FISHERY	0	0	0	0	0.000
HATCHERIES	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0.000
TOTALS	0	7	0	7	0.164
PERCENT OF RECOVERY	%	0.0	100.0	0.0	

Appendix Table 12.7.--Recoveries of adult steelhead transported by barge from Lower Granite Dam to below Bonneville Dam from 15-27 May 1987.

Master File Date : 26 July 1989  
 RELEASE GROUPS INCLUDED: 87076

1987 L.GRANITE BARGE INDEX  
 STEELHEAD

BELOW BONNEVILLE

Brands Used: RASU3  
 Wire Codes Used: 232030

NUMBER RELEASED: 4618

RECOVERY AREA	1987	YEAR OF RETURN		TOTAL	% RETURN
		1988	1989		
RIVER SYSTEM TRAPS					
BONNEVILLE TRAP	0	1	0	1	0.022
MCNARY TRAP	0	0	0	0	0.000
LOWER GRANITE TRAP	0	7	0	7	0.152
PRIEST RAPIDS TRAP	0	0	0	0	0.000
OCEAN FISHERIES	0	0	0	0	0.000
RIVER SPORT					
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	0.000
WENATCHEE R.	0	0	0	0	0.000
SNAKE R.	0	1	0	1	0.022
RIVER COMMERCIAL	0	0	0	0	0.000
INDIAN FISHERY	0	0	0	0	0.000
HATCHERIES	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0.000
TOTALS	0	9	0	9	0.195
PERCENT OF RECOVERY	%	0.0	100.0	0.0	

Appendix Table 13.0.--Summary of all recoveries of adult spring chinook salmon released as juveniles below McNary Dam in 1986.

Master File Date : 26 July 1989

RELEASE GROUPS INCLUDED: 8602A 8602B 8602C 8602D 8602E 8602F 8602G 8602H 8602I 8602J

1986 MCNARY                      TRANS CONTROL                      BELOW MCNARY  
 SPRING CHINOOK

Brands Used: LA153 LAIV3 LAID3 LAIM3 LAIF3 LA151 LAIV1 LAID1 LAIM1 LAIF1  
 Wire Codes Used: 231729 231845 231847 231849 231851 231853 231855 231857 231859 231919

NUMBER RELEASED: 50273

RECOVERY AREA	1986	YEAR OF RETURN			TOTAL	% RETURN
		1987	1988	1989		
RIVER SYSTEM TRAPS						
BONNEVILLE TRAP	0	0	0	0	0	0.000
MCNARY TRAP	0	0	0	0	0	0.000
LOWER GRANITE TRAP	0	0	2	1	3	0.006
PRIEST RAPIDS TRAP	0	1	3	0	4	0.008
OCEAN FISHERIES						
ALASKA	0	0	0	0	0	0.000
BRITISH COLUMBIA	0	0	0	0	0	0.000
WASHINGTON	0	0	0	0	0	0.000
OREGON	0	0	1	0	1	0.002
CALIFORNIA	0	0	0	0	0	0.000
OTHER	0	0	0	0	0	0.000
RIVER SPORT						
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	0	0.000
WENATCHEE R.	0	1	0	0	1	0.002
SNAKE R.	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0.000
INDIAN FISHERY	0	0	0	0	0	0.000
HATCHERIES						
RAPID RIVER H.	0	0	2	0	2	0.004
LEAVENWORTH H.	0	0	2	0	2	0.004
ENTIAT H.	0	0	1	0	1	0.002
STREAM SURVEY	0	0	0	0	0	0.000
TOTALS	0	2	11	1	14	0.028
PERCENT OF RECOVERY	%	0.0	14.3	78.6	7.1	

Appendix Table 13.1.--Recoveries of adult spring chinook salmon released as juveniles below McNary Dam from 23 April to 5 May 1986.

Master File Date : 26 July 1989  
 RELEASE GROUPS INCLUDED: 8602A

1986 MCNARY                      TRANS CONTROL                      BELOW MCNARY  
 SPRING CHINOOK

Brands Used: LA153  
 Wire Codes Used: 231729

NUMBER RELEASED: 5620

RECOVERY AREA	1986	YEAR OF RETURN			TOTAL	% RETURN
		1987	1988	1989		
RIVER SYSTEM TRAPS						
BONNEVILLE TRAP	0	0	0	0	0	0.000
MCNARY TRAP	0	0	0	0	0	0.000
LOWER GRANITE TRAP	0	0	1	0	1	0.018
PRIEST RAPIDS TRAP	0	0	0	0	0	0.000
OCEAN FISHERIES	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0.000
INDIAN FISHERY	0	0	0	0	0	0.000
HATCHERIES						
RAPID RIVER H.	0	0	2	0	2	0.036
LEAVENWORTH H.	0	0	1	0	1	0.018
STREAM SURVEY	0	0	0	0	0	0.000
TOTALS	0	0	4	0	4	0.071
PERCENT OF RECOVERY	%	0.0	0.0	100.0	0.0	

Appendix Table 13.2.--Recoveries of adult spring chinook salmon released as juveniles below McNary Dam from 7-9 May 1986.

Master File Date : 26 July 1989  
 RELEASE GROUPS INCLUDED: 8602C

1986 MCNARY                      TRANS CONTROL                      BELOW MCNARY  
 SPRING CHINOOK

Brands Used: LAID3  
 Wire Codes Used: 231847

NUMBER RELEASED: 5168

RECOVERY AREA	1986	YEAR OF RETURN			TOTAL	% RETURN
		1987	1988	1989		
RIVER SYSTEM TRAPS						
BONNEVILLE TRAP	0	0	0	0	0	0.000
MCNARY TRAP	0	0	0	0	0	0.000
LOWER GRANITE TRAP	0	0	0	0	0	0.000
PRIEST RAPIDS TRAP	0	0	1	0	1	0.019
OCEAN FISHERIES	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0.000
INDIAN FISHERY	0	0	0	0	0	0.000
HATCHERIES	0	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0	0.000
TOTALS	0	0	1	0	1	0.019
PERCENT OF RECOVERY	%	0.0	0.0	100.0	0.0	

Appendix Table 13.3.--Recoveries of adult spring chinook salmon released as juveniles below McNary Dam from 11-12 May 1986.

Master File Date : 26 July 1989  
 RELEASE GROUPS INCLUDED: 8602E

1986 MCNARY                      TRANS CONTROL                      BELOW MCNARY  
 SPRING CHINOOK

Brands Used: LAIF3  
 Wire Codes Used: 231851

NUMBER RELEASED: 5329

RECOVERY AREA	1986	YEAR OF RETURN			TOTAL	% RETURN
		1987	1988	1989		
RIVER SYSTEM TRAPS						
BONNEVILLE TRAP	0	0	0	0	0	0.000
MCNARY TRAP	0	0	0	0	0	0.000
LOWER GRANITE TRAP	0	0	0	0	0	0.000
PRIEST RAPIDS TRAP	0	0	0	0	0	0.000
OCEAN FISHERIES	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0.000
INDIAN FISHERY	0	0	0	0	0	0.000
HATCHERIES						
ENTIAT H.	0	0	1	0	1	0.019
STREAM SURVEY	0	0	0	0	0	0.000
TOTALS	0	0	1	0	1	0.019
PERCENT OF RECOVERY	%	0.0	0.0	100.0	0.0	

Appendix Table 13.4.--Recoveries of adult spring chinook salmon released as juveniles below McNary Dam from 12-14 May 1986.

Master File Date : 26 July 1989  
 RELEASE GROUPS INCLUDED: 8602F

1986 MCNARY                      TRANS CONTROL                      BELOW MCNARY  
 SPRING CHINOOK

Brands Used: LA151  
 Wire Codes Used: 231853

NUMBER RELEASED: 5158

RECOVERY AREA	1986	YEAR OF RETURN			TOTAL	% RETURN
		1987	1988	1989		
RIVER SYSTEM TRAPS						
BONNEVILLE TRAP	0	0	0	0	0	0.000
MCNARY TRAP	0	0	0	0	0	0.000
LOWER GRANITE TRAP	0	0	0	0	0	0.000
PRIEST RAPIDS TRAP	0	0	1	0	1	0.019
OCEAN FISHERIES	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0.000
INDIAN FISHERY	0	0	0	0	0	0.000
HATCHERIES	0	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0	0.000
TOTALS	0	0	1	0	1	0.019
PERCENT OF RECOVERY	%	0.0	0.0	100.0	0.0	

Appendix Table 13.5.--Recoveries of adult spring chinook salmon released as juveniles below McNary Dam from 14-17 May 1986.

Master File Date : 26 July 1989  
 RELEASE GROUPS INCLUDED: 86026

1986 MCNARY                      TRANS CONTROL                      BELOW MCNARY  
 SPRING CHINOOK

Brands Used: LAIV1  
 Wire Codes Used: 231855

NUMBER RELEASED: 5043

RECOVERY AREA	1986	YEAR OF RETURN			TOTAL	% RETURN
		1987	1988	1989		
RIVER SYSTEM TRAPS						
BONNEVILLE TRAP	0	0	0	0	0	0.000
MCNARY TRAP	0	0	0	0	0	0.000
LOWER GRANITE TRAP	0	0	0	0	0	0.000
PRIEST RAPIDS TRAP	0	1	0	0	1	0.020
OCEAN FISHERIES	0	0	0	0	0	0.000
RIVER SPORT						
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	0	0.000
WENATCHEE R.	0	1	0	0	1	0.020
SNAKE R.	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0.000
INDIAN FISHERY	0	0	0	0	0	0.000
HATCHERIES	0	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0	0.000
TOTALS	0	2	0	0	2	0.040
PERCENT OF RECOVERY	%	0.0	100.0	0.0	0.0	

Appendix Table 13.6.--Recoveries of adult spring chinook salmon released as juveniles below McNary Dam from 20-24 May 1986.

Master File Date : 26 July 1989  
 RELEASE GROUPS INCLUDED: 86021

1986 MCNARY                      TRANS CONTROL                      BELOW MCNARY  
 SPRING CHINOOK

Brands Used: LAIN1  
 Wire Codes Used: 231859

NUMBER RELEASED: 5079

RECOVERY AREA	1986	YEAR OF RETURN			TOTAL	% RETURN
		1987	1988	1989		
RIVER SYSTEM TRAPS						
BONNEVILLE TRAP	0	0	0	0	0	0.000
MCNARY TRAP	0	0	0	0	0	0.000
LOWER GRANITE TRAP	0	0	0	0	0	0.000
PRIEST RAPIDS TRAP	0	0	1	0	1	0.020
OCEAN FISHERIES						
ALASKA	0	0	0	0	0	0.000
BRITISH COLUMBIA	0	0	0	0	0	0.000
WASHINGTON	0	0	0	0	0	0.000
OREGON	0	0	1	0	1	0.020
CALIFORNIA	0	0	0	0	0	0.000
OTHER	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0.000
INDIAN FISHERY	0	0	0	0	0	0.000
HATCHERIES						
LEAVENWORTH H.	0	0	1	0	1	0.020
STREAM SURVEY	0	0	0	0	0	0.000
TOTALS	0	0	3	0	3	0.059
PERCENT OF RECOVERY	%	0.0	100.0	0.0		

Appendix Table 13.7.--Recoveries of adult spring chinook salmon released as juveniles below McNary Dam from 27 May to 6 June 1986.

Master File Date : 26 July 1989  
 RELEASE GROUPS INCLUDED: 0602J

1986 MCNARY                      TRANS CONTROL                      BELOW MCNARY  
 SPRING CHINOOK

Brands Used: LAIF1  
 Wire Codes Used: 231919

NUMBER RELEASED: 3472

RECOVERY AREA	1986	YEAR OF RETURN			TOTAL	% RETURN
		1987	1988	1989		
RIVER SYSTEM TRAPS						
BONNEVILLE TRAP	0	0	0	0	0	0.000
MCNARY TRAP	0	0	0	0	0	0.000
LOWER GRANITE TRAP	0	0	1	1	2	0.058
PRIEST RAPIDS TRAP	0	0	0	0	0	0.000
OCEAN FISHERIES	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0.000
INDIAN FISHERY	0	0	0	0	0	0.000
HATCHERIES	0	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0	0.000
TOTALS	0	0	1	1	2	0.058
PERCENT OF RECOVERY	%	0.0	0.0	50.0	50.0	

Appendix Table 14.0.--Summary of all recoveries of adult spring chinook salmon transported as juveniles by barge from McNary Dam to below Bonneville Dam in 1986.

Master File Date : 26 July 1989

RELEASE GROUPS INCLUDED: 8601A 8601B 8601C 8601D 8601E 8601F 8601G 8601H 8601I 8601J

1986 MCNARY                      TRANS BARGE                      BELOW BONNEVILLE  
 SPRING CHINOOK

Brands Used: RAIU1    RAIC3    RAIF1    RAID1    RAIM1    RAIU3    LAIU3    RAIF3    RAID3    RAIM3  
 Wire Codes Used: 231846    231848    231850    231852    231854    231856    231858    231860    231861    231920

NUMBER RELEASED: 49274

RECOVERY AREA	1986	YEAR OF RETURN			TOTAL	% RETURN
		1987	1988	1989		
RIVER SYSTEM TRAPS						
BONNEVILLE TRAP	0	0	2	1	3	0.006
MCNARY TRAP	0	0	0	0	0	0.000
LOWER GRANITE TRAP	0	0	1	0	1	0.002
PRIEST RAPIDS TRAP	0	1	2	0	3	0.006
OCEAN FISHERIES	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0.000
INDIAN FISHERY	0	0	0	0	0	0.000
HATCHERIES						
WINTHROP H.	0	0	1	0	1	0.002
LEAVENWORTH H.	0	1	0	0	1	0.002
	0	0	1	0	1	0.002
STREAM SURVEY	0	0	0	0	0	0.000
TOTALS	0	2	7	1	10	0.020
PERCENT OF RECOVERY	%	0.0	20.0	70.0	10.0	

Appendix Table 14.1.--Recoveries of adult spring chinook salmon transported as juveniles by barge from McNary Dam to below Bonneville Dam from 6-7 May 1986.

Master File Date : 26 July 1989  
 RELEASE GROUPS INCLUDED: 8601B

1986 MCNARY                      TRANS BARGE                      BELOW BONNEVILLE  
 SPRING CHINOOK

Brands Used: RAIC3  
 Wire Codes Used: 231848

NUMBER RELEASED: 4936

RECOVERY AREA	1986	YEAR OF RETURN			TOTAL	% RETURN
		1987	1988	1989		
RIVER SYSTEM TRAPS						
BONNEVILLE TRAP	0	0	0	0	0	0.000
MCNARY TRAP	0	0	0	0	0	0.000
LOWER GRANITE TRAP	0	0	0	0	0	0.000
PRIEST RAPIDS TRAP	0	1	0	0	1	0.020
OCEAN FISHERIES	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0.000
INDIAN FISHERY	0	0	0	0	0	0.000
HATCHERIES	0	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0	0.000
TOTALS	0	1	0	0	1	0.020
PERCENT OF RECOVERY	%	0.0	100.0	0.0	0.0	

Appendix Table 14.2.--Recoveries of adult spring chinook salmon transported as juveniles by barge from McNary Dam to below Bonneville Dam from 20-24 May 1986.

Master File Date : 26 July 1989  
 RELEASE GROUPS INCLUDED: 8601H

1986 MCNARY                      TRANS BARGE                      BELOW BONNEVILLE  
 SPRING CHINOOK

Brands Used: RAIF3  
 Wire Codes Used: 231860

NUMBER RELEASED: 5099

RECOVERY AREA	1986	YEAR OF RETURN			TOTAL	% RETURN
		1987	1988	1989		
RIVER SYSTEM TRAPS						
BONNEVILLE TRAP	0	0	1	0	1	0.020
MCNARY TRAP	0	0	0	0	0	0.000
LOWER GRANITE TRAP	0	0	0	0	0	0.000
PRIEST RAPIDS TRAP	0	0	0	0	0	0.000
OCEAN FISHERIES	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0.000
INDIAN FISHERY	0	0	0	0	0	0.000
HATCHERIES	0	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0	0.000
TOTALS	0	0	1	0	1	0.020
PERCENT OF RECOVERY	%	0.0	0.0	100.0	0.0	

Appendix Table 14.3.--Recoveries of adult spring chinook salmon transported as juveniles by barge from McNary Dam to below Bonneville Dam from 20-24 May 1986.

Master File Date : 26 July 1989  
 RELEASE GROUPS INCLUDED: 8601I

1986 MCNARY                      TRANS BARGE                      BELOW BONNEVILLE  
 SPRING CHINOOK

Brands Used: RAID3  
 Wire Codes Used: 231861

NUMBER RELEASED: 5032

RECOVERY AREA	1986	YEAR OF RETURN			TOTAL	% RETURN
		1987	1988	1989		
RIVER SYSTEM TRAPS						
BONNEVILLE TRAP	0	0	0	0	0	0.000
MCNARY TRAP	0	0	0	0	0	0.000
LOWER GRANITE TRAP	0	0	0	0	0	0.000
PRIEST RAPIDS TRAP	0	0	0	0	0	0.000
OCEAN FISHERIES	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0.000
INDIAN FISHERY	0	0	0	0	0	0.000
HATCHERIES						
LEAVENWORTH H.	0	1	0	0	1	0.020
STREAM SURVEY	0	0	0	0	0	0.000
TOTALS	0	1	0	0	1	0.020
PERCENT OF RECOVERY	%	0.0	100.0	0.0	0.0	

Appendix Table 14.4.--Recoveries of adult spring chinook salmon transported as juveniles by barge from McNary Dam to below Bonneville Dam from 27 May to 6 June 1986.

Master File Date : 26 July 1989  
 RELEASE GROUPS INCLUDED: 8601J

1986 MCNARY                      TRANS BARGE                      BELOW BONNEVILLE  
 SPRING CHINOOK

Brands Used: RAIN3  
 Wire Codes Used: 231920

NUMBER RELEASED: 3513

RECOVERY AREA	1986	YEAR OF RETURN			TOTAL	% RETURN
		1987	1988	1989		
RIVER SYSTEM TRAPS						
BONNEVILLE TRAP	0	0	1	1	2	0.057
MCNARY TRAP	0	0	0	0	0	0.000
LOWER GRANITE TRAP	0	0	1	0	1	0.028
PRIEST RAPIDS TRAP	0	0	2	0	2	0.057
OCEAN FISHERIES	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0.000
INDIAN FISHERY	0	0	0	0	0	0.000
HATCHERIES						
WINTHROP H.	0	0	1	0	1	0.028
	0	0	1	0	1	0.028
STREAM SURVEY	0	0	0	0	0	0.000
TOTALS	0	0	6	1	7	0.199
PERCENT OF RECOVERY	%	0.0	0.0	85.7	14.3	

Appendix Table 15.0.--Summary of all recoveries of adult spring chinook salmon released as juveniles below McNary Dam in 1987.

Master File Date : 26 July 1989

RELEASE GROUPS INCLUDED: 8702A 8702B 8702C 8702D 8702E 8702F 8702G 8702H

1987 MCNARY                      TRANS CONTROL                      BELOW MCNARY  
 SPRING CHINOOK

Brands Used: LAHE1 LAHE2 LAHE3 LAHE4 LAAN1 LAAN2 LART3 LART4  
 Wire Codes Used: 231949 231950 231951 231952 231953 231954 231955 231956

NUMBER RELEASED: 57902

RECOVERY AREA	1987	YEAR OF RETURN		TOTAL	% RETURN
		1988	1989		
RIVER SYSTEM TRAPS					
BONNEVILLE TRAP	0	1	17	18	0.031
MCNARY TRAP	0	0	0	0	0.000
LOWER GRANITE TRAP	0	0	6	6	0.010
PRIEST RAPIDS TRAP	0	0	11	11	0.019
OCEAN FISHERIES	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0.000
INDIAN FISHERY	0	0	0	0	0.000
HATCHERIES	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0.000
TOTALS	0	1	34	35	0.060
PERCENT OF RECOVERY	%	0.0	2.9	97.1	

Appendix Table 15.1.--Recoveries of adult spring chinook salmon released as juveniles below McNary Dam from 21 April to 4 May 1987.

Master File Date : 26 July 1989  
 RELEASE GROUPS INCLUDED: 8702A

1987 MCNARY                      TRANS CONTROL                      BELOW MCNARY  
 SPRING CHINOOK

Brands Used: LAHE1  
 Wire Codes Used: 231949

NUMBER RELEASED: 7365

RECOVERY AREA	1987	YEAR OF RETURN		TOTAL	% RETURN
		1988	1989		
RIVER SYSTEM TRAPS					
BONNEVILLE TRAP	0	0	8	8	0.109
MCNARY TRAP	0	0	0	0	0.000
LOWER GRANITE TRAP	0	0	2	2	0.027
PRIEST RAPIDS TRAP	0	0	1	1	0.014
OCEAN FISHERIES	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0.000
INDIAN FISHERY	0	0	0	0	0.000
HATCHERIES	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0.000
TOTALS	0	0	11	11	0.149
PERCENT OF RECOVERY	%	0.0	0.0	100.0	

Appendix 15.2.--Recoveries of adult spring chinook salmon released as juveniles below McNary Dam from 4-7 May 1987.

Master File Date : 26 July 1989  
 RELEASE GROUPS INCLUDED: 8702B

1987 MCNARY                      TRANS CONTROL                      BELOW MCNARY  
 SPRING CHINOOK

Brands Used: LAHE2  
 Wire Codes Used: 231950

NUMBER RELEASED: 7501

RECOVERY AREA	1987	YEAR OF RETURN		TOTAL	% RETURN
		1988	1989		
RIVER SYSTEM TRAPS					
BONNEVILLE TRAP	0	0	4	4	0.053
MCNARY TRAP	0	0	0	0	0.000
LOWER GRANITE TRAP	0	0	1	1	0.013
PRIEST RAPIDS TRAP	0	0	6	6	0.080
OCEAN FISHERIES	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0.000
INDIAN FISHERY	0	0	0	0	0.000
HATCHERIES	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0.000
TOTALS	0	0	11	11	0.147
PERCENT OF RECOVERY	%	0.0	0.0	100.0	

Appendix Table 15.3.--Recoveries of adult spring chinook salmon released as juveniles below McNary Dam from 7-10 May 1987.

Master File Date : 26 July 1989  
 RELEASE GROUPS INCLUDED: 8702C

1987 MCNARY                      TRANS CONTROL                      BELOW MCNARY  
 SPRING CHINOOK

Brands Used: LAHE3  
 Wire Codes Used: 231951

NUMBER RELEASED: 7500

RECOVERY AREA	1987	YEAR OF RETURN		TOTAL	% RETURN
		1988	1989		
RIVER SYSTEM TRAPS					
BONNEVILLE TRAP	0	0	2	2	0.027
MCNARY TRAP	0	0	0	0	0.000
LOWER GRANITE TRAP	0	0	1	1	0.013
PRIEST RAPIDS TRAP	0	0	0	0	0.000
OCEAN FISHERIES	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0.000
INDIAN FISHERY	0	0	0	0	0.000
HATCHERIES	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0.000
TOTALS	0	0	3	3	0.040
PERCENT OF RECOVERY	%	0.0	0.0	100.0	

Appendix Table 15.4.--Recoveries of adult spring chinook salmon released as juveniles below McNary Dam from 10-13 May 1987.

Master File Date : 26 July 1989  
 RELEASE GROUPS INCLUDED: 8702D

1987 MCNARY                      TRANS CONTROL                      BELOW MCNARY  
 SPRING CHINOOK

Brands Used: LAHE4  
 Wire Codes Used: 231952

NUMBER RELEASED: 7500

RECOVERY AREA	1987	YEAR OF RETURN		TOTAL	% RETURN
		1988	1989		
RIVER SYSTEM TRAPS					
BONNEVILLE TRAP	0	1	0	1	0.013
MCNARY TRAP	0	0	0	0	0.000
LOWER GRANITE TRAP	0	0	2	2	0.027
PRIEST RAPIDS TRAP	0	0	2	2	0.027
OCEAN FISHERIES	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0.000
INDIAN FISHERY	0	0	0	0	0.000
HATCHERIES	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0.000
TOTALS	0	1	4	5	0.067
PERCENT OF RECOVERY	%	0.0	20.0	80.0	

Appendix Table 15.5.--Recoveries of adult spring chinook salmon released as juveniles below McNary Dam from 23-27 May 1987.

Master File Date : 26 July 1989  
 RELEASE GROUPS INCLUDED: 87026

1987 MCNARY                      TRANS CONTROL                      BELOW MCNARY  
 SPRING CHINOOK

Brands Used: LART3  
 Wire Codes Used: 231955

NUMBER RELEASED: 7501

RECOVERY AREA	1987	YEAR OF RETURN		TOTAL	% RETURN
		1988	1989		
RIVER SYSTEM TRAPS					
BONNEVILLE TRAP	0	0	1	1	0.013
MCNARY TRAP	0	0	0	0	0.000
LOWER GRANITE TRAP	0	0	0	0	0.000
PRIEST RAPIDS TRAP	0	0	0	0	0.000
OCEAN FISHERIES	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0.000
INDIAN FISHERY	0	0	0	0	0.000
HATCHERIES	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0.000
TOTALS	0	0	1	1	0.013
PERCENT OF RECOVERY	%	0.0	0.0	100.0	

Appendix Table 15.6.--Recoveries of adult spring chinook salmon released as juveniles below McNary Dam from 27 May to 4 June 1987.

Master File Date : 26 July 1989  
 RELEASE GROUPS INCLUDED: 8702H

1987 MCNARY                      TRANS CONTROL                      BELOW MCNARY  
 SPRING CHINOOK

Brands Used: LART4  
 Wire Codes Used: 231956

NUMBER RELEASED: 5529

RECOVERY AREA	1987	YEAR OF RETURN		TOTAL	% RETURN
		1988	1989		
RIVER SYSTEM TRAPS					
BONNEVILLE TRAP	0	0	2	2	0.036
MCNARY TRAP	0	0	0	0	0.000
LOWER GRANITE TRAP	0	0	0	0	0.000
PRIEST RAPIDS TRAP	0	0	2	2	0.036
OCEAN FISHERIES	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0.000
INDIAN FISHERY	0	0	0	0	0.000
HATCHERIES	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0.000
TOTALS	0	0	4	4	0.072
PERCENT OF RECOVERY	%	0.0	0.0	100.0	

Appendix Table 16.0.--Summary of all recoveries of adult spring chinook salmon transported as juveniles by barge from McNary Dam to below Bonneville Dam in 1987.

Master File Date : 26 July 1989

RELEASE GROUPS INCLUDED: 8701A 8701B 8701C 8701D 8701E 8701F 8701G 8701H

1987 MCNARY TRANS TEST/BARGE BELOW BONNEVILLE  
SPRING CHINOOK

Brands Used: RAPI1 RAPI2 RAPI3 RAPI4 RA3 1 RA3 2 RA3 3 RA3 4  
Wire Codes Used: 232008 232009 232010 232011 232012 232013 232014 232015

NUMBER RELEASED: 38487

RECOVERY AREA	1987	YEAR OF RETURN		TOTAL	% RETURN
		1988	1989		
RIVER SYSTEM TRAPS					
BONNEVILLE TRAP	0	1	11	12	0.031
MCNARY TRAP	0	0	0	0	0.000
LOWER GRANITE TRAP	0	0	5	5	0.013
PRIEST RAPIDS TRAP	0	0	17	17	0.044
OCEAN FISHERIES					
ALASKA	0	0	0	0	0.000
BRITISH COLUMBIA	0	0	0	0	0.000
WASHINGTON	0	0	0	0	0.000
OREGON	0	1	0	1	0.003
CALIFORNIA	0	0	0	0	0.000
OTHER	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0.000
INDIAN FISHERY	0	0	0	0	0.000
HATCHERIES					
DWORSHAK H.	0	1	0	1	0.003
STREAM SURVEY	0	0	0	0	0.000
TOTALS	0	3	33	36	0.094
PERCENT OF RECOVERY	%	0.0	8.3	91.7	

Appendix Table 16.1.--Recoveries of adult spring chinook salmon transported as juveniles by barge from McNary Dam to below Bonneville Dam from 21 April to 4 May 1987.

Master File Date : 26 July 1989  
 RELEASE GROUPS INCLUDED: 8701A

1987 MCNARY                    TRANS TEST/BARGE                    BELOW BONNEVILLE  
 SPRING CHINOOK

Brands Used: RAPI1  
 Wire Codes Used: 232008

NUMBER RELEASED: 4957

RECOVERY AREA	1987	YEAR OF RETURN		TOTAL	% RETURN
		1988	1989		
RIVER SYSTEM TRAPS					
BONNEVILLE TRAP	0	1	2	3	0.061
MCNARY TRAP	0	0	0	0	0.000
LOWER GRANITE TRAP	0	0	0	0	0.000
PRIEST RAPIDS TRAP	0	0	2	2	0.040
OCEAN FISHERIES	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0.000
INDIAN FISHERY	0	0	0	0	0.000
HATCHERIES					
DWORSHAK H.	0	1	0	1	0.020
STREAM SURVEY	0	0	0	0	0.000
TOTALS	0	2	4	6	0.121
PERCENT OF RECOVERY	%	0.0	33.3	66.7	

Appendix Table 16.2.--Recoveries of adult spring chinook salmon transported as juveniles by barge from McNary Dam to below Bonneville Dam from 4-7 May 1987.

Master File Date : 26 July 1989  
 RELEASE GROUPS INCLUDED: 87018

1987 MCNARY                      TRANS TEST/BARGE                      BELOW BONNEVILLE  
 SPRING CHINOOK

Brands Used: RAPI2  
 Wire Codes Used: 232009

NUMBER RELEASED:      5000

RECOVERY AREA	1987	YEAR OF RETURN		TOTAL	% RETURN
		1988	1989		
RIVER SYSTEM TRAPS					
BONNEVILLE TRAP	0	0	1	1	0.020
MCNARY TRAP	0	0	0	0	0.000
LOWER GRANITE TRAP	0	0	1	1	0.020
PRIEST RAPIDS TRAP	0	0	0	0	0.000
OCEAN FISHERIES	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0.000
INDIAN FISHERY	0	0	0	0	0.000
HATCHERIES	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0.000
TOTALS	0	0	2	2	0.040
PERCENT OF RECOVERY	%	0.0	0.0	100.0	

Appendix Table 16.3.--Recoveries of adult chinook salmon transported as juveniles by barge from McNary Dam to below Bonneville Dam from 7-10 May 1987.

Master File Date : 26 July 1989  
 RELEASE GROUPS INCLUDED: 8701C

1987 MCNARY                      TRANS TEST/BARGE                      BELOW BONNEVILLE  
 SPRING CHINOOK

Brands Used: RAPI3  
 Wire Codes Used: 232010

NUMBER RELEASED:      5000

RECOVERY AREA	1987	YEAR OF RETURN		TOTAL	% RETURN
		1988	1989		
RIVER SYSTEM TRAPS					
BONNEVILLE TRAP	0	0	3	3	0.060
MCNARY TRAP	0	0	0	0	0.000
LOWER GRANITE TRAP	0	0	3	3	0.060
PRIEST RAPIDS TRAP	0	0	0	0	0.000
OCEAN FISHERIES	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0.000
INDIAN FISHERY	0	0	0	0	0.000
HATCHERIES	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0.000
TOTALS	0	0	6	6	0.120
PERCENT OF RECOVERY	% 0.0	0.0	100.0		

Appendix Table 16.4.--Recoveries of adult chinook salmon transported as juveniles by barge from McNary Dam to below Bonneville Dam from 10-13 May 1987.

Master File Date : 26 July 1989  
 RELEASE GROUPS INCLUDED: 87010

1987 MCNARY                      TRANS TEST/BARGE                      BELOW BONNEVILLE  
 SPRING CHINOOK

Brands Used: RAPI4  
 Wire Codes Used: 232011

NUMBER RELEASED: 5003

RECOVERY AREA	1987	YEAR OF RETURN		TOTAL	% RETURN
		1988	1989		
RIVER SYSTEM TRAPS					
BONNEVILLE TRAP	0	0	0	0	0.000
MCNARY TRAP	0	0	0	0	0.000
LOWER GRANITE TRAP	0	0	1	1	0.020
PRIEST RAPIDS TRAP	0	0	0	0	0.000
OCEAN FISHERIES	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0.000
INDIAN FISHERY	0	0	0	0	0.000
HATCHERIES	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0.000
<b>TOTALS</b>	0	0	1	1	0.020
PERCENT OF RECOVERY	%	0.0	0.0	100.0	

Appendix Table 16.5.--Recoveries of adult chinook salmon transported as juveniles by barge from McNary Dam to below Bonneville Dam from 13-17 May 1987.

Master File Date : 26 July 1989  
 RELEASE GROUPS INCLUDED: 8701E

1987 MCNARY                      TRANS TEST/BARGE                      BELOW BONNEVILLE  
 SPRING CHINOOK

Brands Used: RA3 1  
 Wire Codes Used: 232012

NUMBER RELEASED: 5000

RECOVERY AREA	1987	YEAR OF RETURN		TOTAL	% RETURN
		1988	1989		
RIVER SYSTEM TRAPS					
BONNEVILLE TRAP	0	0	3	3	0.060
MCNARY TRAP	0	0	0	0	0.000
LOWER GRANITE TRAP	0	0	0	0	0.000
PRIEST RAPIDS TRAP	0	0	9	9	0.180
OCEAN FISHERIES					
ALASKA	0	0	0	0	0.000
BRITISH COLUMBIA	0	0	0	0	0.000
WASHINGTON	0	0	0	0	0.000
OREGON	0	1	0	1	0.020
CALIFORNIA	0	0	0	0	0.000
OTHER	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0.000
INDIAN FISHERY	0	0	0	0	0.000
HATCHERIES	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0.000
TOTALS	0	1	12	13	0.260
PERCENT OF RECOVERY	%	0.0	7.7	92.3	

Appendix Table 16.6.--Recoveries of adult chinook salmon transported as juveniles by barge from McNary Dam to below Bonneville Dam from 17-22 May 1987.

Master File Date : 26 July 1989  
 RELEASE GROUPS INCLUDED: 8701F

1987 MCNARY                      TRANS TEST/BARGE                      BELOW BONNEVILLE  
 SPRING CHINOOK

Brands Used: RA3 2  
 Wire Codes Used: 232013

NUMBER RELEASED: 5002

RECOVERY AREA	1987	YEAR OF RETURN		TOTAL	% RETURN
		1988	1989		
RIVER SYSTEM TRAPS					
BONNEVILLE TRAP	0	0	1	1	0.020
MCNARY TRAP	0	0	0	0	0.000
LOWER GRANITE TRAP	0	0	0	0	0.000
PRIEST RAPIDS TRAP	0	0	2	2	0.040
OCEAN FISHERIES	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0.000
INDIAN FISHERY	0	0	0	0	0.000
HATCHERIES	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0.000
TOTALS	0	0	3	3	0.060
PERCENT OF RECOVERY	%	0.0	0.0	100.0	

Appendix Table 16.7.--Recoveries of adult chinook salmon transported as juveniles by barge from McNary Dam to below Bonneville Dam from 23-27 May 1987.

Master File Date : 26 July 1989  
 RELEASE GROUPS INCLUDED: 87016

1987 MCNARY TRANS TEST/BARGE BELOW BONNEVILLE  
 SPRING CHINOOK

Brands Used: RA3 3  
 Wire Codes Used: 232014

NUMBER RELEASED: 5000

RECOVERY AREA	1987	YEAR OF RETURN		TOTAL	% RETURN
		1988	1989		
RIVER SYSTEM TRAPS					
BONNEVILLE TRAP	0	0	1	1	0.020
MCNARY TRAP	0	0	0	0	0.000
LOWER GRANITE TRAP	0	0	0	0	0.000
PRIEST RAPIDS TRAP	0	0	2	2	0.040
OCEAN FISHERIES	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0.000
INDIAN FISHERY	0	0	0	0	0.000
HATCHERIES	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0.000
TOTALS	0	0	3	3	0.060
PERCENT OF RECOVERY	%	0.0	0.0	100.0	

Appendix Table 16.8.--Recoveries of adult chinook salmon transported as juveniles by barge from McNary Dam to below Bonneville Dam from 27 May to 3 June 1987.

Master File Date : 26 July 1989  
 RELEASE GROUPS INCLUDED: 8701H

1987 MCNARY                      TRANS TEST/BARGE                      BELOW BONNEVILLE  
 SPRING CHINOOK

Brands Used: RA3 4  
 Wire Codes Used: 232015

NUMBER RELEASED: 3525

RECOVERY AREA	1987	YEAR OF RETURN		TOTAL	% RETURN
		1988	1989		
RIVER SYSTEM TRAPS					
BONNEVILLE TRAP	0	0	0	0	0.000
MCNARY TRAP	0	0	0	0	0.000
LOWER GRANITE TRAP	0	0	0	0	0.000
PRIEST RAPIDS TRAP	0	0	2	2	0.057
OCEAN FISHERIES	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0.000
INDIAN FISHERY	0	0	0	0	0.000
HATCHERIES	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0.000
TOTALS	0	0	2	2	0.057
PERCENT OF RECOVERY	%	0.0	0.0	100.0	

Appendix Table 17.0.--Summary of all recoveries of adult spring chinook salmon released as juveniles below McNary Dam in 1988.

Master File Date : 26 July 1989

RELEASE GROUPS INCLUDED: 8802A 8802B 8802C 8802D 8802E 8802F 8802G 8802H 8802I 8802J

1988 MCNARY                      TRANS CONTROL                      BELOW MCNARY  
 SPRING CHINOOK

Brands Used: LAW 1   LAW 2   LAW 3   LAW 4   LAP 1   LAP 2   LAP 3   LAP 4   LAE 1   LAE 2  
 Wire Codes Used: 232226   232227   232228   232229   232230   232231   232232   232233   232234   232235

NUMBER RELEASED: 75036

RECOVERY AREA	1988	YEAR OF RETURN 1989	TOTAL	% RETURN
RIVER SYSTEM TRAPS				
BONNEVILLE TRAP	0	1	1	0.001
MCNARY TRAP	0	0	0	0.000
LOWER GRANITE TRAP	0	1	1	0.001
PRIEST RAPIDS TRAP	0	1	1	0.001
OCEAN FISHERIES	0	0	0	0.000
RIVER SPORT	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0.000
INDIAN FISHERY	0	0	0	0.000
HATCHERIES	0	0	0	0.000
STREAM SURVEY	0	0	0	0.000
<b>TOTALS</b>	0	3	3	0.004
PERCENT OF RECOVERY	%	0.0	100.0	

Appendix Table 17.1.--Recoveries of adult spring chinook salmon released as juveniles below McNary Dam from 16 April to 1 May 1988.

Master File Date : 26 July 1989  
 RELEASE GROUPS INCLUDED: 8802B

1988 MCNARY                      TRANS CONTROL                      BELOW MCNARY  
 SPRING CHINOOK

Brands Used: LAW 2  
 Wire Codes Used: 232227

NUMBER RELEASED: 7500

RECOVERY AREA	1988	YEAR OF RETURN 1989	TOTAL	% RETURN
RIVER SYSTEM TRAPS				
BONNEVILLE TRAP	0	1	1	0.013
MCNARY TRAP	0	0	0	0.000
LOWER GRANITE TRAP	0	1	1	0.013
PRIEST RAPIDS TRAP	0	0	0	0.000
OCEAN FISHERIES	0	0	0	0.000
RIVER SPORT	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0.000
INDIAN FISHERY	0	0	0	0.000
HATCHERIES	0	0	0	0.000
STREAM SURVEY	0	0	0	0.000
TOTALS	0	2	2	0.027
PERCENT OF RECOVERY	%	0.0	100.0	

Appendix Table 17.2.--Recoveries of adult spring chinook salmon released as juveniles below McNary Dam from 1-6 May 1988.

Master File Date : 26 July 1989  
 RELEASE GROUPS INCLUDED: 8802C

1988 MCNARY                      TRANS CONTROL                      BELOW MCNARY  
 SPRING CHINOOK

Brands Used: LAW 3  
 Wire Codes Used: 232228

NUMBER RELEASED:        7503

RECOVERY AREA	1988	YEAR OF RETURN 1989	TOTAL	% RETURN
RIVER SYSTEM TRAPS				
BONNEVILLE TRAP	0	0	0	0.000
MCNARY TRAP	0	0	0	0.000
LOWER GRANITE TRAP	0	0	0	0.000
PRIEST RAPIDS TRAP	0	1	1	0.013
OCEAN FISHERIES	0	0	0	0.000
RIVER SPORT	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0.000
INDIAN FISHERY	0	0	0	0.000
HATCHERIES	0	0	0	0.000
STREAM SURVEY	0	0	0	0.000
TOTALS	0	1	1	0.013
PERCENT OF RECOVERY	%	0.0	100.0	

Appendix Table 18.0.--Summary of all recoveries of adult spring chinook salmon transported as juveniles by barge from McNary Dam to below Bonneville Dam in 1988.

Master File Date : 26 July 1989

RELEASE GROUPS INCLUDED: 8801A 8801B 8801C 8801D 8801E 8801F 8801G 8801H 8801I 8801J

1988 MCNARY TRANS BARGE BELOW BONNEVILLE  
 SPRING CHINOOK

Brands Used: RAL 1 RAL 2 RAL 3 RAL 4 RAV 1 RAV 2 RAV 3 RAV 4 RAS 1 RAS 2  
 Wire Codes Used: 232236 232237 232238 232239 232240 232241 232242 232243 232244 232245

NUMBER RELEASED: 50028

RECOVERY AREA	1988	YEAR OF RETURN 1989	TOTAL	% RETURN
RIVER SYSTEM TRAPS				
BONNEVILLE TRAP	0	2	2	0.004
MCNARY TRAP	0	0	0	0.000
LOWER GRANITE TRAP	0	3	3	0.006
PRIEST RAPIDS TRAP	0	0	0	0.000
OCEAN FISHERIES	0	0	0	0.000
RIVER SPORT	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0.000
INDIAN FISHERY	0	0	0	0.000
HATCHERIES	0	0	0	0.000
STREAM SURVEY	0	0	0	0.000
TOTALS	0	5	5	0.010
PERCENT OF RECOVERY	%	0.0	100.0	

Appendix Table 18.1.--Recoveries of adult spring chinook salmon transported as juveniles by barge from McNary Dam to below Bonneville Dam from 8-16 April 1988.

Master File Date : 26 July 1989  
 RELEASE GROUPS INCLUDED: 8801A

1988 MCNARY                      TRANS BARGE                      BELOW BONNEVILLE  
 SPRING CHINOOK

Brands Used: RAL 1  
 Wire Codes Used: 232236

NUMBER RELEASED: 5001

RECOVERY AREA	1988	YEAR OF RETURN 1989	TOTAL	% RETURN
RIVER SYSTEM TRAPS				
BONNEVILLE TRAP	0	1	1	0.020
MCNARY TRAP	0	0	0	0.000
LOWER GRANITE TRAP	0	0	0	0.000
PRIEST RAPIDS TRAP	0	0	0	0.000
OCEAN FISHERIES	0	0	0	0.000
RIVER SPORT	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0.000
INDIAN FISHERY	0	0	0	0.000
HATCHERIES	0	0	0	0.000
STREAM SURVEY	0	0	0	0.000
TOTALS	0	1	1	0.020
PERCENT OF RECOVERY	% 0.0	100.0		

Appendix Table 18.2.--Recoveries of adult spring chinook salmon transported as juveniles by barge from McNary Dam to below Bonneville Dam from 8-10 May 1988.

Master File Date : 26 July 1989  
 RELEASE GROUPS INCLUDED: 8801E

1988 MCNARY                      TRANS BARGE                      BELOW BONNEVILLE  
 SPRING CHINOOK

Brands Used: RAV 1  
 Wire Codes Used: 232240

NUMBER RELEASED: 5002

RECOVERY AREA	1988	YEAR OF RETURN 1989	TOTAL	% RETURN
RIVER SYSTEM TRAPS				
BONNEVILLE TRAP	0	0	0	0.000
MCNARY TRAP	0	0	0	0.000
LOWER GRANITE TRAP	0	2	2	0.040
PRIEST RAPIDS TRAP	0	0	0	0.000
OCEAN FISHERIES	0	0	0	0.000
RIVER SPORT	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0.000
INDIAN FISHERY	0	0	0	0.000
HATCHERIES	0	0	0	0.000
STREAM SURVEY	0	0	0	0.000
TOTALS	0	2	2	0.040
PERCENT OF RECOVERY	% 0.0	100.0		

Appendix Table 18.3.--Recoveries of adult spring chinook salmon transported as juveniles by barge from McNary Dam to below Bonneville Dam from 15-19 May 1988.

Master File Date : 26 July 1989  
 RELEASE GROUPS INCLUDED: 8801H

1988 MCNARY                      TRANS BARGE                      BELOW BONNEVILLE  
 SPRING CHINOOK

Brands Used: RAV 4  
 Wire Codes Used: 232243

NUMBER RELEASED: 5003

RECOVERY AREA	1988	YEAR OF RETURN 1989	TOTAL	% RETURN
RIVER SYSTEM TRAPS				
BONNEVILLE TRAP	0	0	0	0.000
MCNARY TRAP	0	0	0	0.000
LOWER GRANITE TRAP	0	1	1	0.020
PRIEST RAPIDS TRAP	0	0	0	0.000
OCEAN FISHERIES	0	0	0	0.000
RIVER SPORT	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0.000
INDIAN FISHERY	0	0	0	0.000
HATCHERIES	0	0	0	0.000
STREAM SURVEY	0	0	0	0.000
TOTALS	0	1	1	0.020
PERCENT OF RECOVERY	% 0.0	100.0		

Appendix Table 18.4.--Recoveries of adult spring chinook salmon transported as juveniles by barge from McNary Dam to below Bonneville Dam from 25 May to 2 June 1988.

Master File Date : 26 July 1989  
 RELEASE GROUPS INCLUDED: 8801J

1988 MCNARY                      TRANS BARGE                      BELOW BONNEVILLE  
 SPRING CHINOOK

Brands Used: RAS 2  
 Wire Codes Used: 232245

NUMBER RELEASED: 5002

RECOVERY AREA	1988	YEAR OF RETURN 1989	TOTAL	% RETURN
RIVER SYSTEM TRAPS				
BONNEVILLE TRAP	0	1	1	0.020
MCNARY TRAP	0	0	0	0.000
LOWER GRANITE TRAP	0	0	0	0.000
PRIEST RAPIDS TRAP	0	0	0	0.000
OCEAN FISHERIES	0	0	0	0.000
RIVER SPORT	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0.000
INDIAN FISHERY	0	0	0	0.000
HATCHERIES	0	0	0	0.000
STREAM SURVEY	0	0	0	0.000
TOTALS	0	1	1	0.020
PERCENT OF RECOVERY	%	0.0	100.0	

Appendix Table 19.0.--Summary of all recoveries of adult fall chinook salmon released as juveniles below McNary Dam in 1986.

Master File Date : 26 July 1989

RELEASE GROUPS INCLUDED: 8615A 8615B 8615C 8615D 8615E 8615F 8615G 8615H 8615I 8615J 8615K 8615L

1986 MCNARY                      TRANS CONTROL                      BELOW MCNARY  
FALL CHINOOK

Brands Used: LA173 LA3X3 LA3J3 LA3C3 LA3L3 LA7H3 LA103 LA7H1 LA101 LA171 LA3X1 LA3L1  
Wire Codes Used: 231921 231923 231925 231927 231929 231931 231933 231935 231937 231939 231941 231844

NUMBER RELEASED: 115991

RECOVERY AREA	1986	YEAR OF RETURN		1989	TOTAL	% RETURN
		1987	1988			
RIVER SYSTEM TRAPS						
BONNEVILLE TRAP	0	0	4	0	4	0.003
MCNARY TRAP	0	0	0	0	0	0.000
LOWER GRANITE TRAP	0	0	0	0	0	0.000
PRIEST RAPIDS TRAP	0	3	0	0	3	0.003
OCEAN FISHERIES						
ALASKA	0	0	1	0	1	0.001
BRITISH COLUMBIA	0	1	3	0	4	0.003
WASHINGTON	0	0	1	0	1	0.001
OREGON	0	0	5	0	5	0.004
CALIFORNIA	0	0	0	0	0	0.000
OTHER	0	0	0	0	0	0.000
RIVER SPORT						
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	1	0	0	1	0.001
WENATCHEE R.	0	0	0	0	0	0.000
SNAKE R.	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0.000
INDIAN FISHERY	0	0	0	0	0	0.000
HATCHERIES	0	0	0	0	0	0.000
STREAM SURVEY						
OTHER STREAMS	0	1	0	0	1	0.001
TOTALS	0	6	14	0	20	0.017
PERCENT OF RECOVERY	%	0.0	30.0	70.0	0.0	

Appendix Table 19.1.--Recoveries of adult fall chinook salmon released as juveniles below McNary Dam from 11-18 June 1986.

Master File Date : 26 July 1989  
 RELEASE GROUPS INCLUDED: 8615A

1986 MCNARY                      TRANS CONTROL                      BELOW MCNARY  
 FALL CHINOOK

Brands Used: LA173  
 Wire Codes Used: 231921

NUMBER RELEASED: 9969

RECOVERY AREA	1986	YEAR OF RETURN			TOTAL	% RETURN
		1987	1988	1989		
RIVER SYSTEM TRAPS						
BONNEVILLE TRAP	0	0	0	0	0	0.000
MCNARY TRAP	0	0	0	0	0	0.000
LOWER GRANITE TRAP	0	0	0	0	0	0.000
PRIEST RAPIDS TRAP	0	1	0	0	1	0.010
OCEAN FISHERIES	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0.000
INDIAN FISHERY	0	0	0	0	0	0.000
HATCHERIES	0	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0	0.000
TOTALS	0	1	0	0	1	0.010
PERCENT OF RECOVERY	%	0.0	100.0	0.0	0.0	





Appendix Table 19.4.--Recoveries of adult fall chinook salmon released as juveniles below McNary Dam from 27 June to 8 July 1986.

Master File Date : 26 July 1989  
 RELEASE GROUPS INCLUDED: 8615D

1986 MCNARY                      TRANS CONTROL                      BELOW MCNARY  
 FALL CHINOOK

Brands Used: LA3C3  
 Wire Codes Used: 231927

NUMBER RELEASED: 10745

RECOVERY AREA	1986	YEAR OF RETURN			TOTAL	% RETURN
		1987	1988	1989		
RIVER SYSTEM TRAPS						
BONNEVILLE TRAP	0	0	0	0	0	0.000
MCNARY TRAP	0	0	0	0	0	0.000
LOWER GRANITE TRAP	0	0	0	0	0	0.000
PRIEST RAPIDS TRAP	0	1	0	0	1	0.009
OCEAN FISHERIES						
ALASKA	0	0	0	0	0	0.000
BRITISH COLUMBIA	0	0	1	0	1	0.009
WASHINGTON	0	0	0	0	0	0.000
OREGON	0	0	3	0	3	0.028
CALIFORNIA	0	0	0	0	0	0.000
OTHER	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0.000
INDIAN FISHERY	0	0	0	0	0	0.000
HATCHERIES	0	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0	0.000
TOTALS	0	1	4	0	5	0.047
PERCENT OF RECOVERY	%	0.0	20.0	80.0	0.0	

Appendix Table 19.5.--Recoveries of adult fall chinook salmon released as juveniles below McNary Dam from 9-15 July 1986.

Master File Date : 26 July 1989  
 RELEASE GROUPS INCLUDED: 8615E

1986 MCNARY                      TRANS CONTROL                      BELOW MCNARY  
 FALL CHINOOK

Brands Used: LA3L3  
 Wire Codes Used: 231929

NUMBER RELEASED: 9937

RECOVERY AREA	1986	YEAR OF RETURN			TOTAL	% RETURN
		1987	1988	1989		
RIVER SYSTEM TRAPS						
BONNEVILLE TRAP	0	0	0	0	0	0.000
MCNARY TRAP	0	0	0	0	0	0.000
LOWER GRANITE TRAP	0	0	0	0	0	0.000
PRIEST RAPIDS TRAP	0	0	0	0	0	0.000
OCEAN FISHERIES						
ALASKA	0	0	0	0	0	0.000
BRITISH COLUMBIA	0	0	1	0	1	0.010
WASHINGTON	0	0	0	0	0	0.000
OREGON	0	0	0	0	0	0.000
CALIFORNIA	0	0	0	0	0	0.000
OTHER	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0.000
INDIAN FISHERY	0	0	0	0	0	0.000
HATCHERIES	0	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0	0.000
TOTALS	0	0	1	0	1	0.010
PERCENT OF RECOVERY	%	0.0	0.0	100.0	0.0	

Appendix Table 19.6.--Recoveries of adult fall chinook salmon released as juveniles below McNary Dam from 15-19 July 1986.

Master File Date : 26 July 1989  
 RELEASE GROUPS INCLUDED: 8615F

1986 MCNARY                      TRANS CONTROL                      BELOW MCNARY  
 FALL CHINOOK

Brands Used: LA7H3  
 Wire Codes Used: 231931

NUMBER RELEASED: 9949

RECOVERY AREA	1986	YEAR OF RETURN		1989	TOTAL	% RETURN
		1987	1988			
RIVER SYSTEM TRAPS						
BONNEVILLE TRAP	0	0	1	0	1	0.010
MCNARY TRAP	0	0	0	0	0	0.000
LOWER GRANITE TRAP	0	0	0	0	0	0.000
PRIEST RAPIDS TRAP	0	0	0	0	0	0.000
OCEAN FISHERIES						
ALASKA	0	0	0	0	0	0.000
BRITISH COLUMBIA	0	1	0	0	1	0.010
WASHINGTON	0	0	0	0	0	0.000
OREGON	0	0	0	0	0	0.000
CALIFORNIA	0	0	0	0	0	0.000
OTHER	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0.000
INDIAN FISHERY	0	0	0	0	0	0.000
HATCHERIES	0	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0	0.000
TOTALS	0	1	1	0	2	0.020
PERCENT OF RECOVERY	%	0.0	50.0	50.0	0.0	

Appendix Table 19.7.--Recoveries of adult fall chinook salmon released as juveniles below McNary Dam from 19-21 July 1986.

Master File Date : 26 July 1989  
 RELEASE GROUPS INCLUDED: 86156

1986 MCNARY                      TRANS CONTROL                      BELOW MCNARY  
 FALL CHINOOK

Brands Used: LA103  
 Wire Codes Used: 231933

NUMBER RELEASED: 9968

RECOVERY AREA	1986	YEAR OF RETURN		1989	TOTAL	% RETURN
		1987	1988			
RIVER SYSTEM TRAPS						
BONNEVILLE TRAP	0	0	1	0	1	0.010
MCNARY TRAP	0	0	0	0	0	0.000
LOWER GRANITE TRAP	0	0	0	0	0	0.000
PRIEST RAPIDS TRAP	0	0	0	0	0	0.000
OCEAN FISHERIES						
ALASKA	0	0	0	0	0	0.000
BRITISH COLUMBIA	0	0	1	0	1	0.010
WASHINGTON	0	0	0	0	0	0.000
OREGON	0	0	1	0	1	0.010
CALIFORNIA	0	0	0	0	0	0.000
OTHER	0	0	0	0	0	0.000
RIVER SPORT						
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	1	0	0	1	0.010
WENATCHEE R.	0	0	0	0	0	0.000
SNAKE R.	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0.000
INDIAN FISHERY	0	0	0	0	0	0.000
HATCHERIES	0	0	0	0	0	0.000
STREAM SURVEY						
OTHER STREAMS	0	1	0	0	1	0.010
TOTALS	0	2	3	0	5	0.050
PERCENT OF RECOVERY	%	0.0	40.0	60.0	0.0	

Appendix Table 19.8.--Recoveries of adult fall chinook salmon released as juveniles below McNary Dam from 29 July to 1 August 1986.

Master File Date : 26 July 1989  
 RELEASE GROUPS INCLUDED: 8615K

1986 MCNARY                      TRANS CONTROL                      BELOW MCNARY  
 FALL CHINOOK

Brands Used: LA3X1  
 Wire Codes Used: 231941

NUMBER RELEASED: 9976

RECOVERY AREA	1986	YEAR OF RETURN		1989	TOTAL	% RETURN
		1987	1988			
RIVER SYSTEM TRAPS						
BONNEVILLE TRAP	0	0	0	0	0	0.000
MCNARY TRAP	0	0	0	0	0	0.000
LOWER GRANITE TRAP	0	0	0	0	0	0.000
PRIEST RAPIDS TRAP	0	0	0	0	0	0.000
OCEAN FISHERIES						
ALASKA	0	0	1	0	1	0.010
BRITISH COLUMBIA	0	0	0	0	0	0.000
WASHINGTON	0	0	0	0	0	0.000
OREGON	0	0	0	0	0	0.000
CALIFORNIA	0	0	0	0	0	0.000
OTHER	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0.000
INDIAN FISHERY	0	0	0	0	0	0.000
HATCHERIES	0	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0	0.000
TOTALS	0	0	1	0	1	0.010
PERCENT OF RECOVERY	%	0.0	0.0	100.0	0.0	

Appendix Table 20.0.--Summary of all recoveries of adult fall chinook salmon transported as juveniles from McNary Dam to below Bonneville Dam in 1986.

Master File Date : 26 July 1989

RELEASE GROUPS INCLUDED: 8616A 8616B 8616C 8616D 8616E 8616F 8616G 8616H 8616I 8616J 8616K 8616L

1986 MCNARY                      TRANS BARGE                      BELOW BONNEVILLE  
FALL CHINOOK

Brands Used: RA171 RA3X1 RA3J1 RA3C1 RA3L1 RA7H1 RA101 RA7H3 RA103 RA173 RA3J3 RA3C3  
Wire Codes Used: 231922 231924 231926 231928 231930 231932 231934 231936 231938 231940 231942 231832

NUMBER RELEASED: 114653

RECOVERY AREA	1986	YEAR OF RETURN		1989	TOTAL	% RETURN
		1987	1988			
RIVER SYSTEM TRAPS						
BONNEVILLE TRAP	0	0	4	0	4	0.003
MCNARY TRAP	0	0	0	0	0	0.000
LOWER GRANITE TRAP	0	0	0	0	0	0.000
PRIEST RAPIDS TRAP	0	8	0	0	8	0.007
OCEAN FISHERIES						
ALASKA	0	0	2	0	2	0.002
BRITISH COLUMBIA	0	2	6	0	8	0.007
WASHINGTON	0	0	4	0	4	0.003
OREGON	0	0	15	0	15	0.013
CALIFORNIA	0	0	0	0	0	0.000
OTHER	0	0	0	0	0	0.000
RIVER SPORT						
COLUMBIA R. BELOW SNAKE R.	0	0	2	0	2	0.002
COLUMBIA R. ABOVE SNAKE R.	0	3	0	0	3	0.003
WENATCHEE R.	0	0	0	0	0	0.000
SNAKE R.	0	0	0	0	0	0.000
RIVER COMMERCIAL						
COMMERCIAL NET	0	3	0	0	3	0.003
INDIAN FISHERY	0	0	0	0	0	0.000
HATCHERIES	0	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0	0.000
TOTALS	0	16	33	0	49	0.043
PERCENT OF RECOVERY	%	0.0	32.7	67.3	0.0	

Appendix Table 20.1.--Recoveries of adult fall chinook salmon transported as juveniles from McNary Dam to below Bonneville Dam in 1986.

Master File Date : 26 July 1989  
 RELEASE GROUPS INCLUDED: 8616A

1986 MCNARY                      TRANS BARGE                      BELOW BONNEVILLE  
 FALL CHINOOK

Brands Used: RA171  
 Wire Codes Used: 231922

NUMBER RELEASED: 9974

RECOVERY AREA	1986	YEAR OF RETURN		1989	TOTAL	% RETURN
		1987	1988			
RIVER SYSTEM TRAPS						
BONNEVILLE TRAP	0	0	0	0	0	0.000
MCNARY TRAP	0	0	0	0	0	0.000
LOWER GRANITE TRAP	0	0	0	0	0	0.000
PRIEST RAPIDS TRAP	0	1	0	0	1	0.010
OCEAN FISHERIES						
ALASKA	0	0	0	0	0	0.000
BRITISH COLUMBIA	0	0	0	0	0	0.000
WASHINGTON	0	0	0	0	0	0.000
OREGON	0	0	1	0	1	0.010
CALIFORNIA	0	0	0	0	0	0.000
OTHER	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0.000
INDIAN FISHERY	0	0	0	0	0	0.000
HATCHERIES	0	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0	0.000
TOTALS	0	1	1	0	2	0.020
PERCENT OF RECOVERY	%	0.0	50.0	50.0	0.0	

Appendix Table 20.2.--Recoveries of adult fall chinook salmon transported as juveniles by barge from McNary Dam to below Bonneville Dam from 18-21 June 1986.

Master File Date : 26 July 1989  
 RELEASE GROUPS INCLUDED: 8616B

1986 MCNARY                      TRANS BARGE                      BELOW BONNEVILLE  
 FALL CHINOOK

Brands Used: RA3X1  
 Wire Codes Used: 231924

NUMBER RELEASED: 9981

RECOVERY AREA	1986	YEAR OF RETURN			TOTAL	% RETURN
		1987	1988	1989		
RIVER SYSTEM TRAPS						
BONNEVILLE TRAP	0	0	0	0	0	0.000
MCNARY TRAP	0	0	0	0	0	0.000
LOWER GRANITE TRAP	0	0	0	0	0	0.000
PRIEST RAPIDS TRAP	0	0	0	0	0	0.000
OCEAN FISHERIES						
ALASKA	0	0	0	0	0	0.000
BRITISH COLUMBIA	0	0	0	0	0	0.000
WASHINGTON	0	0	0	0	0	0.000
OREGON	0	0	1	0	1	0.010
CALIFORNIA	0	0	0	0	0	0.000
OTHER	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0.000
INDIAN FISHERY	0	0	0	0	0	0.000
HATCHERIES	0	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0	0.000
TOTALS	0	0	1	0	1	0.010
PERCENT OF RECOVERY	%	0.0	100.0	0.0		

Appendix Table 20.3.--Recoveries of adult fall chinook salmon transported as juveniles by barge from McNary Dam to below Bonneville Dam from 21-27 June 1986.

Master File Date : 26 July 1989  
 RELEASE GROUPS INCLUDED: 8616C

RECOVERY AREA	1986 MCNARY TRANS BARGE BELOW BONNEVILLE FALL CHINOOK				NUMBER RELEASED: 9971	
	1986	YEAR OF RETURN		1989	TOTAL	% RETURN
		1987	1988			
RIVER SYSTEM TRAPS						
BONNEVILLE TRAP	0	0	0	0	0	0.000
MCNARY TRAP	0	0	0	0	0	0.000
LOWER GRANITE TRAP	0	0	0	0	0	0.000
PRIEST RAPIDS TRAP	0	0	0	0	0	0.000
OCEAN FISHERIES						
ALASKA	0	0	0	0	0	0.000
BRITISH COLUMBIA	0	0	0	0	0	0.000
WASHINGTON	0	0	0	0	0	0.000
OREGON	0	0	2	0	2	0.020
CALIFORNIA	0	0	0	0	0	0.000
OTHER	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0.000
INDIAN FISHERY	0	0	0	0	0	0.000
HATCHERIES	0	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0	0.000
TOTALS	0	0	2	0	2	0.020
PERCENT OF RECOVERY	%	0.0	100.0	0.0		

Appendix Table 20.4.--Recoveries of adult fall chinook salmon transported as juveniles by barge from McNary Dam to below Bonneville Dam from 27 June to 8 July 1986.

Master File Date : 26 July 1989  
 RELEASE GROUPS INCLUDED: 8616D

1986 MCNARY                      TRANS BARGE                      BELOW BONNEVILLE  
 FALL CHINOOK

Brands Used: RA3C1  
 Wire Codes Used: 231928

NUMBER RELEASED: 10745

RECOVERY AREA	1986	YEAR OF RETURN			TOTAL	% RETURN
		1987	1988	1989		
RIVER SYSTEM TRAPS						
BONNEVILLE TRAP	0	0	0	0	0	0.000
MCNARY TRAP	0	0	0	0	0	0.000
LOWER GRANITE TRAP	0	0	0	0	0	0.000
PRIEST RAPIDS TRAP	0	1	0	0	1	0.009
OCEAN FISHERIES						
ALASKA	0	0	0	0	0	0.000
BRITISH COLUMBIA	0	0	0	0	0	0.000
WASHINGTON	0	0	0	0	0	0.000
OREGON	0	0	3	0	3	0.028
CALIFORNIA	0	0	0	0	0	0.000
OTHER	0	0	0	0	0	0.000
RIVER SPORT						
COLUMBIA R. BELOW SNAKE R.	0	0	1	0	1	0.009
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	0	0.000
WENATCHEE R.	0	0	0	0	0	0.000
SNAKE R.	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0.000
INDIAN FISHERY	0	0	0	0	0	0.000
HATCHERIES	0	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0	0.000
TOTALS	0	1	4	0	5	0.047
PERCENT OF RECOVERY	%	0.0	20.0	80.0	0.0	

Appendix Table 20.5.--Recoveries of adult fall chinook salmon transported as juveniles by barge from McNary Dam to below Bonneville Dam from 9-15 July 1986.

Master File Date : 26 July 1989  
 RELEASE GROUPS INCLUDED: 8616E

1986 MCNARY                      TRANS BARGE                      BELOW BONNEVILLE  
 FALL CHINOOK

Brands Used: RA3L1  
 Wire Codes Used: 231930

NUMBER RELEASED: 9959

RECOVERY AREA	1986	YEAR OF RETURN			TOTAL	% RETURN
		1987	1988	1989		
RIVER SYSTEM TRAPS						
BONNEVILLE TRAP	0	0	0	0	0	0.000
MCNARY TRAP	0	0	0	0	0	0.000
LOWER GRANITE TRAP	0	0	0	0	0	0.000
PRIEST RAPIDS TRAP	0	2	0	0	2	0.020
OCEAN FISHERIES						
ALASKA	0	0	1	0	1	0.010
BRITISH COLUMBIA	0	0	0	0	0	0.000
WASHINGTON	0	0	0	0	0	0.000
OREGON	0	0	4	0	4	0.040
CALIFORNIA	0	0	0	0	0	0.000
OTHER	0	0	0	0	0	0.000
RIVER SPORT						
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	1	0	0	1	0.010
WENATCHEE R.	0	0	0	0	0	0.000
SNAKE R.	0	0	0	0	0	0.000
RIVER COMMERCIAL						
COMMERCIAL NET	0	1	0	0	1	0.010
INDIAN FISHERY	0	0	0	0	0	0.000
HATCHERIES	0	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0	0.000
TOTALS	0	4	5	0	9	0.090
PERCENT OF RECOVERY	%	0.0	44.4	55.6	0.0	

Appendix Table 20.6.--Recoveries of adult fall chinook salmon transported as juveniles by barge from McNary Dam to below Bonneville Dam from 15-19 July 1986.

Master File Date : 26 July 1989  
 RELEASE GROUPS INCLUDED: 8616F

1986 MCNARY                      TRANS BARGE                      BELOW BONNEVILLE  
 FALL CHINOOK

Brands Used: RA7H1  
 Wire Codes Used: 231932

NUMBER RELEASED: 9972

RECOVERY AREA	1986	YEAR OF RETURN			TOTAL	% RETURN
		1987	1988	1989		
RIVER SYSTEM TRAPS						
BONNEVILLE TRAP	0	0	2	0	2	0.020
MCNARY TRAP	0	0	0	0	0	0.000
LOWER GRANITE TRAP	0	0	0	0	0	0.000
PRIEST RAPIDS TRAP	0	1	0	0	1	0.010
OCEAN FISHERIES						
ALASKA	0	0	1	0	1	0.010
BRITISH COLUMBIA	0	1	2	0	3	0.030
WASHINGTON	0	0	2	0	2	0.020
OREGON	0	0	0	0	0	0.000
CALIFORNIA	0	0	0	0	0	0.000
OTHER	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0.000
INDIAN FISHERY	0	0	0	0	0	0.000
HATCHERIES	0	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0	0.000
TOTALS	0	2	7	0	9	0.090
PERCENT OF RECOVERY	%	0.0	22.2	77.8	0.0	

Appendix Table 20.7.--Recoveries of adult fall chinook salmon transported as juveniles by barge from McNary Dam to below Bonneville Dam from 19-21 July 1986.

Master File Date : 26 July 1989  
 RELEASE GROUPS INCLUDED: 86166

1986 MCNARY                      TRANS BARGE                      BELOW BONNEVILLE  
 FALL CHINOOK

Brands Used: RA101  
 Wire Codes Used: 231934

NUMBER RELEASED: 9953

RECOVERY AREA	1986	YEAR OF RETURN			TOTAL	% RETURN
		1987	1988	1989		
RIVER SYSTEM TRAPS						
BONNEVILLE TRAP	0	0	0	0	0	0.000
MCNARY TRAP	0	0	0	0	0	0.000
LOWER GRANITE TRAP	0	0	0	0	0	0.000
PRIEST RAPIDS TRAP	0	1	0	0	1	0.010
OCEAN FISHERIES						
ALASKA	0	0	0	0	0	0.000
BRITISH COLUMBIA	0	0	2	0	2	0.020
WASHINGTON	0	0	1	0	1	0.010
OREGON	0	0	0	0	0	0.000
CALIFORNIA	0	0	0	0	0	0.000
OTHER	0	0	0	0	0	0.000
RIVER SPORT						
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	1	0	0	1	0.010
WENATCHEE R.	0	0	0	0	0	0.000
SNAKE R.	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0.000
INDIAN FISHERY	0	0	0	0	0	0.000
HATCHERIES	0	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0	0.000
TOTALS	0	2	3	0	5	0.050
PERCENT OF RECOVERY	%	0.0	40.0	60.0	0.0	

Appendix Table 20.8.--Recoveries of adult fall chinook salmon transported as juveniles by barge from McNary Dam to below Bonneville Dam from 21-22 July 1986.

Master File Date : 26 July 1989  
 RELEASE GROUPS INCLUDED: 861&H

1986 MCNARY                      TRANS BARGE                      BELOW BONNEVILLE  
 FALL CHINOOK

Brands Used: RA7H3  
 Wire Codes Used: 231936

NUMBER RELEASED: 9840

RECOVERY AREA	1986	YEAR OF RETURN			TOTAL	% RETURN
		1987	1988	1989		
RIVER SYSTEM TRAPS						
BONNEVILLE TRAP	0	0	1	0	1	0.010
MCNARY TRAP	0	0	0	0	0	0.000
LOWER GRANITE TRAP	0	0	0	0	0	0.000
PRIEST RAPIDS TRAP	0	0	0	0	0	0.000
OCEAN FISHERIES						
ALASKA	0	0	0	0	0	0.000
BRITISH COLUMBIA	0	1	0	0	1	0.010
WASHINGTON	0	0	0	0	0	0.000
OREGON	0	0	2	0	2	0.020
CALIFORNIA	0	0	0	0	0	0.000
OTHER	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0.000
INDIAN FISHERY	0	0	0	0	0	0.000
HATCHERIES	0	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0	0.000
TOTALS	0	1	3	0	4	0.041
PERCENT OF RECOVERY	%	0.0	25.0	75.0	0.0	

Appendix Table 20.9.--Recoveries of adult fall chinook salmon transported as juveniles by barge from McNary Dam to below Bonneville Dam from 22-23 July 1986.

Master File Date : 26 July 1989  
 RELEASE GROUPS INCLUDED: 86161

1986 MCNARY                      TRANS BARGE                      BELOW BONNEVILLE  
 FALL CHINOOK

Brands Used: RA103  
 Wire Codes Used: 231938

NUMBER RELEASED: 9906

RECOVERY AREA	1986	YEAR OF RETURN			TOTAL	% RETURN
		1987	1988	1989		
RIVER SYSTEM TRAPS						
BONNEVILLE TRAP	0	0	0	0	0	0.000
MCNARY TRAP	0	0	0	0	0	0.000
LOWER GRANITE TRAP	0	0	0	0	0	0.000
PRIEST RAPIDS TRAP	0	0	0	0	0	0.000
OCEAN FISHERIES	0	0	0	0	0	0.000
RIVER SPORT						
COLUMBIA R. BELOW SNAKE R.	0	0	1	0	1	0.010
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	0	0.000
WENATCHEE R.	0	0	0	0	0	0.000
SNAKE R.	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0.000
INDIAN FISHERY	0	0	0	0	0	0.000
HATCHERIES	0	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0	0.000
TOTALS	0	0	1	0	1	0.010
PERCENT OF RECOVERY	%	0.0	0.0	100.0	0.0	

Appendix Table 20.10.--Recoveries of adult fall chinook salmon transported as juveniles by barge from McNary Dam to below Bonneville Dam from 23-28 July 1986.

Master File Date : 26 July 1989  
 RELEASE GROUPS INCLUDED: 8616J

1986 MCNARY                      TRANS BARGE                      BELOW BONNEVILLE  
 FALL CHINOOK

Brands Used: RA173  
 Wire Codes Used: 231940

NUMBER RELEASED: 9938

RECOVERY AREA	1986	YEAR OF RETURN			TOTAL	% RETURN
		1987	1988	1989		
RIVER SYSTEM TRAPS						
BONNEVILLE TRAP	0	0	0	0	0	0.000
MCNARY TRAP	0	0	0	0	0	0.000
LOWER GRANITE TRAP	0	0	0	0	0	0.000
PRIEST RAPIDS TRAP	0	0	0	0	0	0.000
OCEAN FISHERIES						
ALASKA	0	0	0	0	0	0.000
BRITISH COLUMBIA	0	0	1	0	1	0.010
WASHINGTON	0	0	0	0	0	0.000
OREGON	0	0	0	0	0	0.000
CALIFORNIA	0	0	0	0	0	0.000
OTHER	0	0	0	0	0	0.000
RIVER SPORT						
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	1	0	0	1	0.010
WENATCHEE R.	0	0	0	0	0	0.000
SNAKE R.	0	0	0	0	0	0.000
RIVER COMMERCIAL						
COMMERCIAL NET	0	1	0	0	1	0.010
INDIAN FISHERY	0	0	0	0	0	0.000
HATCHERIES	0	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0	0.000
TOTALS	0	2	1	0	3	0.030
PERCENT OF RECOVERY	%	0.0	66.7	33.3	0.0	

Appendix Table 20.11.--Recoveries of adult fall chinook salmon transported as juveniles by barge from McNary to below Bonneville Dam from 29 July to 1 August 1986.

Master File Date : 26 July 1989  
 RELEASE GROUPS INCLUDED: 8616K

1986 MCNARY                      TRANS BARGE                      BELOW BONNEVILLE  
 FALL CHINOOK

Brands Used: RA3J3  
 Wire Codes Used: 231942

NUMBER RELEASED: 9887

RECOVERY AREA	1986	YEAR OF RETURN			TOTAL	% RETURN
		1987	1988	1989		
RIVER SYSTEM TRAPS						
BONNEVILLE TRAP	0	0	0	0	0	0.000
MCNARY TRAP	0	0	0	0	0	0.000
LOWER GRANITE TRAP	0	0	0	0	0	0.000
PRIEST RAPIDS TRAP	0	2	0	0	2	0.020
OCEAN FISHERIES						
ALASKA	0	0	0	0	0	0.000
BRITISH COLUMBIA	0	0	1	0	1	0.010
WASHINGTON	0	0	0	0	0	0.000
OREGON	0	0	2	0	2	0.020
CALIFORNIA	0	0	0	0	0	0.000
OTHER	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0.000
RIVER COMMERCIAL						
COMMERCIAL NET	0	1	0	0	1	0.010
INDIAN FISHERY	0	0	0	0	0	0.000
HATCHERIES	0	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0	0.000
TOTALS	0	3	3	0	6	0.061
PERCENT OF RECOVERY	%	0.0	50.0	50.0	0.0	

Appendix Table 20.12.--Recoveries of adult fall chinook salmon transported as juveniles by barge from McNary to below Bonneville Dam from 1-7 August 1986.

Master File Date : 26 July 1989  
 RELEASE GROUPS INCLUDED: 8616L

1986 MCNARY                      TRANS BARGE                      BELOW BONNEVILLE  
 FALL CHINOOK

Brands Used: RA3C3  
 Wire Codes Used: 231832

NUMBER RELEASED: 4527

RECOVERY AREA	1986	YEAR OF RETURN			TOTAL	% RETURN
		1987	1988	1989		
RIVER SYSTEM TRAPS						
BONNEVILLE TRAP	0	0	1	0	1	0.022
MCNARY TRAP	0	0	0	0	0	0.000
LOWER GRANITE TRAP	0	0	0	0	0	0.000
PRIEST RAPIDS TRAP	0	0	0	0	0	0.000
OCEAN FISHERIES						
ALASKA	0	0	0	0	0	0.000
BRITISH COLUMBIA	0	0	0	0	0	0.000
WASHINGTON	0	0	1	0	1	0.022
OREGON	0	0	0	0	0	0.000
CALIFORNIA	0	0	0	0	0	0.000
OTHER	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0.000
INDIAN FISHERY	0	0	0	0	0	0.000
HATCHERIES	0	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0	0.000
TOTALS	0	0	2	0	2	0.044
PERCENT OF RECOVERY	%	0.0	0.0	100.0	0.0	

Appendix Table 21.0.--Summary of all recoveries of adult fall chinook salmon released as juveniles below McNary Dam in 1987.

Master File Date : 26 July 1989

RELEASE GROUPS INCLUDED: 8708A 8708B 8708C 8708D 8708E 8708F 8708G

1987 MCNARY TRANS CONTROL BELOW MCNARY  
FALL CHINOOK

Brands Used: LAIX1 LAIX3 LA2C1 LA2C3 LA2J1 LA2J3 LAIJ1  
Wire Codes Used: 232002 232003 232004 232005 232006 232007 231957

NUMBER RELEASED: 68291

RECOVERY AREA	1987	YEAR OF RETURN		TOTAL	% RETURN
		1988	1989		
RIVER SYSTEM TRAPS					
BONNEVILLE TRAP	0	8	0	8	0.012
MCNARY TRAP	0	0	0	0	0.000
LOWER GRANITE TRAP	0	0	0	0	0.000
PRIEST RAPIDS TRAP	0	0	0	0	0.000
OCEAN FISHERIES					
ALASKA	0	0	0	0	0.000
BRITISH COLUMBIA	0	1	0	1	0.001
WASHINGTON	0	0	0	0	0.000
OREGON	0	2	0	2	0.003
CALIFORNIA	0	0	0	0	0.000
OTHER	0	0	0	0	0.000
RIVER SPORT					
COLUMBIA R. BELOW SNAKE R.	0	1	0	1	0.001
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	0.000
WENATCHEE R.	0	0	0	0	0.000
SNAKE R.	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0.000
INDIAN FISHERY	0	0	0	0	0.000
HATCHERIES	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0.000
TOTALS	0	12	0	12	0.018
PERCENT OF RECOVERY	%	0.0	100.0	0.0	

Appendix Table 21.1.--Recoveries of adult fall chinook salmon released as juveniles below McNary Dam from 1-8 July 1987.

Master File Date : 26 July 1989  
 RELEASE GROUPS INCLUDED: 8708D

1987 MCNARY                      TRANS CONTROL                      BELOW MCNARY  
 FALL CHINOOK

Brands Used: LA2C3  
 Wire Codes Used: 232005

NUMBER RELEASED: 10000

RECOVERY AREA	1987	YEAR OF RETURN		TOTAL	% RETURN
		1988	1989		
RIVER SYSTEM TRAPS					
BONNEVILLE TRAP	0	2	0	2	0.020
MCNARY TRAP	0	0	0	0	0.000
LOWER GRANITE TRAP	0	0	0	0	0.000
PRIEST RAPIDS TRAP	0	0	0	0	0.000
OCEAN FISHERIES					
ALASKA	0	0	0	0	0.000
BRITISH COLUMBIA	0	1	0	1	0.010
WASHINGTON	0	0	0	0	0.000
OREGON	0	1	0	1	0.010
CALIFORNIA	0	0	0	0	0.000
OTHER	0	0	0	0	0.000
RIVER SPORT					
COLUMBIA R. BELOW SNAKE R.	0	1	0	1	0.010
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	0.000
WENATCHEE R.	0	0	0	0	0.000
SNAKE R.	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0.000
INDIAN FISHERY	0	0	0	0	0.000
HATCHERIES	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0.000
TOTALS	0	5	0	5	0.050
PERCENT OF RECOVERY	%	0.0	100.0	0.0	

Appendix Table 21.2.--Recoveries of adult fall chinook salmon released as juveniles below McNary Dam from 8-14 July 1987.

Master File Date : 26 July 1989  
 RELEASE GROUPS INCLUDED: 8708E

1987 MCNARY                      TRANS CONTROL                      BELOW MCNARY  
 FALL CHINOOK

Brands Used: LA2J1  
 Wire Codes Used: 232006

NUMBER RELEASED: 10000

RECOVERY AREA	1987	YEAR OF RETURN		TOTAL	% RETURN
		1988	1989		
RIVER SYSTEM TRAPS					
BONNEVILLE TRAP	0	1	0	1	0.010
MCNARY TRAP	0	0	0	0	0.000
LOWER GRANITE TRAP	0	0	0	0	0.000
PRIEST RAPIDS TRAP	0	0	0	0	0.000
OCEAN FISHERIES	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0.000
INDIAN FISHERY	0	0	0	0	0.000
HATCHERIES	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0.000
TOTALS	0	1	0	1	0.010
PERCENT OF RECOVERY	%	0.0	100.0	0.0	



Appendix Table 21.4.--Recoveries of adult fall chinook salmon released as juveniles below McNary Dam from 30 July to 13 August 1987.

Master File Date : 26 July 1989  
 RELEASE GROUPS INCLUDED: 87086

1987 MCNARY                      TRANS CONTROL                      BELOW MCNARY  
 FALL CHINOOK

Brands Used: LAIJ1  
 Wire Codes Used: 231957

NUMBER RELEASED: 10000

RECOVERY AREA	1987	YEAR OF RETURN		TOTAL	% RETURN
		1988	1989		
RIVER SYSTEM TRAPS					
BONNEVILLE TRAP	0	5	0	5	0.050
MCNARY TRAP	0	0	0	0	0.000
LOWER GRANITE TRAP	0	0	0	0	0.000
PRIEST RAPIDS TRAP	0	0	0	0	0.000
OCEAN FISHERIES	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0.000
INDIAN FISHERY	0	0	0	0	0.000
HATCHERIES	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0.000
TOTALS	0	5	0	5	0.050
PERCENT OF RECOVERY	%	0.0	100.0	0.0	

Appendix Table 22.0.--Summary of all recoveries of adult fall chinook salmon transported as juveniles from McNary Dam to below Bonneville Dam in 1987.

Master File Date : 26 July 1989  
 RELEASE GROUPS INCLUDED: 8709A 8709B 8709C 8709D 8709E 8709F 8709G

1987 MCNARY TRANS TEST/TRUCK BELOW BONNEVILLE  
 FALL CHINOOK

Brands Used: RA141 RA143 RAIR1 RAIR3 RAIS1 RAIS3 RAIK1  
 Wire Codes Used: 231959 231960 231961 231962 231963 232001 232016

NUMBER RELEASED: 68376

RECOVERY AREA	1987	YEAR OF RETURN		TOTAL	% RETURN
		1988	1989		
RIVER SYSTEM TRAPS					
BONNEVILLE TRAP	0	24	0	24	0.035
MCNARY TRAP	0	0	0	0	0.000
LOWER GRANITE TRAP	0	0	0	0	0.000
PRIEST RAPIDS TRAP	0	0	0	0	0.000
OCEAN FISHERIES					
ALASKA	0	1	0	1	0.001
BRITISH COLUMBIA	0	2	0	2	0.003
WASHINGTON	0	4	0	4	0.006
OREGON	0	1	0	1	0.001
CALIFORNIA	0	0	0	0	0.000
OTHER	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0.000
INDIAN FISHERY	0	0	0	0	0.000
HATCHERIES	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0.000
TOTALS	0	32	0	32	0.047
PERCENT OF RECOVERY	%	0.0	100.0	0.0	

Appendix Table 22.1.--Recoveries of adult fall chinook salmon transported as juveniles from McNary Dam to below Bonneville Dam from 18-23 June 1987.

Master File Date : 26 July 1989  
 RELEASE GROUPS INCLUDED: 8709A

1987 MCNARY                      TRANS TEST/BARGE                      BELOW BONNEVILLE  
 FALL CHINOOK

Brands Used: RA141  
 Wire Codes Used: 231959

NUMBER RELEASED: 10003

RECOVERY AREA	1987	YEAR OF RETURN		TOTAL	% RETURN
		1988	1989		
RIVER SYSTEM TRAPS					
BONNEVILLE TRAP	0	1	0	1	0.010
MCNARY TRAP	0	0	0	0	0.000
LOWER GRANITE TRAP	0	0	0	0	0.000
PRIEST RAPIDS TRAP	0	0	0	0	0.000
OCEAN FISHERIES					
ALASKA	0	0	0	0	0.000
BRITISH COLUMBIA	0	1	0	1	0.010
WASHINGTON	0	1	0	1	0.010
OREGON	0	0	0	0	0.000
CALIFORNIA	0	0	0	0	0.000
OTHER	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0.000
INDIAN FISHERY	0	0	0	0	0.000
HATCHERIES	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0.000
TOTALS	0	3	0	3	0.030
PERCENT OF RECOVERY	%	0.0	100.0	0.0	

Appendix Table 22.2.--Recoveries of adult fall chinook salmon transported as juveniles from McNary Dam to below Bonneville Dam from 25 June to 1 July 1987.

Master File Date : 26 July 1989  
 RELEASE GROUPS INCLUDED: 8709C

1987 MCNARY                      TRANS TEST/BARGE                      BELOW BONNEVILLE  
 FALL CHINOOK

Brands Used: RAIR1  
 Wire Codes Used: 231961

NUMBER RELEASED: 9834

RECOVERY AREA	1987	YEAR OF RETURN		TOTAL	% RETURN
		1988	1989		
RIVER SYSTEM TRAPS					
BONNEVILLE TRAP	0	1	0	1	0.010
MCNARY TRAP	0	0	0	0	0.000
LOWER GRANITE TRAP	0	0	0	0	0.000
PRIEST RAPIDS TRAP	0	0	0	0	0.000
OCEAN FISHERIES	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0.000
INDIAN FISHERY	0	0	0	0	0.000
HATCHERIES	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0.000
TOTALS	0	1	0	1	0.010
PERCENT OF RECOVERY	%	0.0	100.0	0.0	

Appendix Table 22.3.--Recoveries of adult fall chinook salmon transported as juveniles from McNary Dam to below Bonneville Dam from 1-8 July 1987.

Master File Date : 26 July 1989  
 RELEASE GROUPS INCLUDED: 8709D

1987 MCNARY                      TRANS TEST/BARGE                      BELOW BONNEVILLE  
 FALL CHINOOK

Brands Used: RAIR3  
 Wire Codes Used: 231962

NUMBER RELEASED: 10001

RECOVERY AREA	1987	YEAR OF RETURN		TOTAL	% RETURN
		1988	1989		
RIVER SYSTEM TRAPS					
BONNEVILLE TRAP	0	2	0	2	0.020
MCNARY TRAP	0	0	0	0	0.000
LOWER GRANITE TRAP	0	0	0	0	0.000
PRIEST RAPIDS TRAP	0	0	0	0	0.000
OCEAN FISHERIES	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0.000
INDIAN FISHERY	0	0	0	0	0.000
HATCHERIES	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0.000
TOTALS	0	2	0	2	0.020
PERCENT OF RECOVERY	%	0.0	100.0	0.0	

Appendix Table 22.4.--Recoveries of adult fall chinook salmon transported as juveniles from McNary Dam to below Bonneville Dam from 8-14 July 1987.

Master File Date : 26 July 1989  
 RELEASE GROUPS INCLUDED: 8709E

1987 MCNARY TRANS TEST/BARGE BELOW BONNEVILLE  
 FALL CHINOOK

Brands Used: RAIS1  
 Wire Codes Used: 231963

NUMBER RELEASED: 10000

RECOVERY AREA	1987	YEAR OF RETURN		TOTAL	% RETURN
		1988	1989		
RIVER SYSTEM TRAPS					
BONNEVILLE TRAP	0	4	0	4	0.040
MCNARY TRAP	0	0	0	0	0.000
LOWER GRANITE TRAP	0	0	0	0	0.000
PRIEST RAPIDS TRAP	0	0	0	0	0.000
OCEAN FISHERIES					
ALASKA	0	0	0	0	0.000
BRITISH COLUMBIA	0	1	0	1	0.010
WASHINGTON	0	0	0	0	0.000
OREGON	0	0	0	0	0.000
CALIFORNIA	0	0	0	0	0.000
OTHER	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0.000
INDIAN FISHERY	0	0	0	0	0.000
HATCHERIES	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0.000
TOTALS	0	5	0	5	0.050
PERCENT OF RECOVERY	%	0.0	100.0	0.0	

Appendix Table 22.5.--Recoveries of adult fall chinook salmon transported as juveniles from McNary Dam to below Bonneville Dam from 15-30 July 1987.

Master File Date : 26 July 1989  
 RELEASE GROUPS INCLUDED: 8709F

1987 MCNARY                      TRANS TEST/BARGE                      BELOW BONNEVILLE  
 FALL CHINOOK

Brands Used: RAIS3  
 Wire Codes Used: 232001

NUMBER RELEASED: 9392

RECOVERY AREA	1987	YEAR OF RETURN		TOTAL	% RETURN
		1988	1989		
RIVER SYSTEM TRAPS					
BONNEVILLE TRAP	0	5	0	5	0.053
MCNARY TRAP	0	0	0	0	0.000
LOWER GRANITE TRAP	0	0	0	0	0.000
PRIEST RAPIDS TRAP	0	0	0	0	0.000
OCEAN FISHERIES					
ALASKA	0	1	0	1	0.011
BRITISH COLUMBIA	0	0	0	0	0.000
WASHINGTON	0	0	0	0	0.000
OREGON	0	1	0	1	0.011
CALIFORNIA	0	0	0	0	0.000
OTHER	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0.000
INDIAN FISHERY	0	0	0	0	0.000
HATCHERIES	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0.000
TOTALS	0	7	0	7	0.075
PERCENT OF RECOVERY	%	0.0	100.0	0.0	

Appendix Table 22.6.--Recoveries of adult fall chinook salmon transported as juveniles from McNary Dam to below Bonneville Dam from 30 July to 14 August 1987.

Master File Date : 26 July 1989  
 RELEASE GROUPS INCLUDED: 87096

1987 MCNARY                      TRANS TEST/TRUCK                      BELOW BONNEVILLE  
 FALL CHINOOK

Brands Used: RAIK1  
 Wire Codes Used: 232016

NUMBER RELEASED: 10000

RECOVERY AREA	1987	YEAR OF RETURN		TOTAL	% RETURN
		1988	1989		
RIVER SYSTEM TRAPS					
BONNEVILLE TRAP	0	11	0	11	0.110
MCNARY TRAP	0	0	0	0	0.000
LOWER GRANITE TRAP	0	0	0	0	0.000
PRIEST RAPIDS TRAP	0	0	0	0	0.000
OCEAN FISHERIES					
ALASKA	0	0	0	0	0.000
BRITISH COLUMBIA	0	0	0	0	0.000
WASHINGTON	0	3	0	3	0.030
OREGON	0	0	0	0	0.000
CALIFORNIA	0	0	0	0	0.000
OTHER	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0.000
INDIAN FISHERY	0	0	0	0	0.000
HATCHERIES	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0.000
TOTALS	0	14	0	14	0.140
PERCENT OF RECOVERY	%	0.0	100.0	0.0	

Appendix Table 23.—Summary of tagging dates, numbers collected, numbers tagged and released, and maximum, minimum, and average lengths and weights of wild/natural chinook salmon parr PIT-tagged in various streams of Idaho and Oregon in August - September, 1988.

	IDAHO										OREGON		
	CROOKED RIVER	RED RIVER	EAST FORK SALMON	UPPER SALMON RIVER	ALTURAS LAKE CREEK	VALLEY CREEK	SECESH RIVER	LAKE CREEK	SOUTH FORK SALMON	OVERALL TOTALS AND AVERAGES	GRANDE RONDE RIVER	IMNANA RIVER	OVERALL TOTALS AND AVERAGES
TAGGING DATES	8/2 TO 8/4	8/6 TO 8/8	8/10 TO 8/12	8/15 TO 8/18	8/18	8/20 TO 8/22	8/24 TO 8/25	8/26	8/29 TO 8/31	8/2 TO 8/31	9/20 TO 9/22	9/26	9/20 TO 9/26
TOTAL NUMBER COLLECTED	2479	3602	745	2789	415	2521	2349	678	2968	18546	3044	1339	4383
TOTAL NUMBER TAGGED	2478	2571	745	2723	415	2272	2204	665	2227	16300	2995	1216	4211
TOTAL NUMBER TAGGED FISH RELEASED	2464	2532	742	2720	415	2251	2178	664	2184	16150	2984	1207	4191
MAXIMUM LENGTH OF TAGGED FISH	109	113	103	116	119	99	107	101	93	119	106	93	106
MINIMUM LENGTH OF TAGGED FISH	53	50	52	55	69	52	54	54	52	50	54	49	49
AVERAGE LENGTH OF TAGGED FISH	69	75	74	75	83	66	69	66	63	70	68	70	69
MAXIMUM WEIGHT OF TAGGED FISH	16.4	19.0	15.0	18.4	24.0	10.8	16.2	7.8	10.1	24	13.8	8.0	13.8
MINIMUM WEIGHT OF TAGGED FISH	1.2	1.1	2.0	1.3	3.5	0.6	1.8	1.8	1.1	0.6	1.2	1.5	1.2
AVERAGE WEIGHT OF TAGGED FISH	3.8	5.0	5.6	5.1	7.0	3.5	4.1	3.6	3.4	4.3	3.6	3.4	3.5

Appendix Table 24.—Summary of collecting methods, collecting mortality, post-tagging mortality, 24h post-tagging mortality, tag loss, maximum, minimum and average lengths and weights of tagging mortality of wild/natural chinook salmon parr PIT-tagged in various streams of Idaho and Oregon, August - September, 1988.

COLLECTING METHOD	IDAHO									OREGON			
	CROOKED RIVER	RED RIVER	EAST FORK SALMON R.	UPPER SALMON R.	ALTURAS LAKE CREEK	VALLEY CREEK	SECEESH RIVER	LAKE CREEK	SOUTH FORK SALMON R.	OVERALL TOTALS, TOTAL PERCENTS, AND AVERAGES	GRANDE RONDE R.	IMNAHA RIVER	OVERALL TOTALS, TOTAL PERCENTS, AND AVERAGES
	BEACH SEINE	BEACH SEINE	ELECTRO-SHOCKER	BEACH SEINE	BEACH SEINE	BEACH SEINE	BEACH SEINE	BEACH SEINE	BEACH SEINE		BEACH SEINE	BOX TRAP	
NUMBER COLLECTION MORTALITY	1	36	22	0	0	2	8	1	21	91	3	—	3
PERCENT COLLECTION MORTALITY	0	1.0	2.9	0	0	0.1	0.3	0.1	0.7	0.5	0.1	—	0.1
NUMBER (1/2-3H) POST-TAGGING MORTALITY	10	38	3	3	0	17	18	1	37	127	10	9	19
PERCENT (1/2-3H) POST-TAGGING MORTALITY	0.4	1.5	0.4	0.1	0	0.7	0.8	0.2	1.7	0.8	0.3	0.7	0.5
NUMBER HELD FOR 24H POST-TAGGING MORTALITY AND TAG LOSS	295	100	143	215	—	155	411	—	229	1548	237	—	237
NUMBER 24H POST-TAGGING MORTALITY	4	1	0	0	—	4	8	—	6	23	0	—	0
PERCENT 24H POST-TAGGING MORTALITY	1.4	1.0	0	0	—	2.6	1.9	—	2.6	1.5	0	—	0
NUMBER LOST TAGS FROM 24H HOLD	1	0	0	0	—	0	1	—	0	2	1	—	1
PERCENT LOST TAGS FROM 24H HOLD	0.3	0	0	0	—	0	0.2	—	0	0.1	0.4	—	0.4
MAXIMUM LENGTH OF POST-TAGGING MORTALITY	76	93	80	68	—	65	74	—	68	93	66	73	73
MINIMUM LENGTH OF POST-TAGGING MORTALITY	61	53	66	59	—	54	57	—	52	52	58	61	58
AVERAGE LENGTH OF POST-TAGGING MORTALITY	66	71	71	65	—	59	66	—	61	65	62	66	64
MAXIMUM WEIGHT OF POST-TAGGING MORTALITY	4.8	8.1	5.1	3.8	—	3.3	5.0	—	4.6	8.1	3.3	2.9	3.3
MINIMUM WEIGHT OF POST-TAGGING MORTALITY	2.3	1.9	3.7	1.9	—	1.8	2.6	—	1.2	1.2	2.0	2.0	2.0
AVERAGE WEIGHT OF POST-TAGGING MORTALITY	3.3	4.2	4.4	3.1	—	2.6	3.4	—	2.8	3.3	2.7	2.6	2.6

Appendix Table 25.--Detections of PIT tags by date at three dams for wild spring chinook salmon from Crooked River, 1989.

TAGGING SITE: CROOKED RIVER  
 RELEASE SITE: CROOKED RIVER

RELEASE DATE : 08/02/88 TO 08/04/88  
 NUMBER RELEASED: 2464

DETECTION DATE	LOWER GRANITE First Detection	LITTLE GOOSE		MCNARY		
		First Detect.	Prev.Detected at 1 Dam	First Detect.	Prev.Detect.at 1 Dam	2 Dams
04/11/89	1					
04/18/89	1	1				
04/21/89	1					
04/27/89	1	1				
05/14/89	1	1		1		
05/15/89		1				
05/19/89	1					
05/21/89		1				
05/24/89				1		
05/25/89	1					
05/27/89		1				
05/31/89	2					
06/01/89	1					
06/02/89	1	1				
06/04/89	1					
06/05/89	2	1				
06/06/89	2					
06/07/89	1					
06/08/89	3					
06/09/89	3					
06/10/89	2					
06/11/89	4	2				
06/12/89	2					
06/15/89	2					
06/16/89	1			1		
06/17/89		1				
06/18/89	1					
06/19/89		1				
06/20/89	1			1		
06/21/89				1		
06/22/89	1	1		2		
06/23/89	1					
06/24/89		1				
06/25/89		1				
06/28/89		1				
06/30/89	4					
07/01/89	1			1		
07/15/89	1					
07/28/89				1		
TOTALS	44	16	0	9	0	0

Appendix Table 26.--Detections of PIT tags by date at three dams for wild spring chinook salmon from Red River, 1989.

TAGGING SITE: RED RIVER  
 RELEASE SITE: RED RIVER

RELEASE DATE : 08/06/88 TO 08/08/88  
 NUMBER RELEASED: 2532

DETECTION DATE	LOWER GRANITE First Detection	LITTLE GOOSE		MCNARY		
		First Detect.	Prev.Detected at 1 Dam	First Detect.	Prev.Detect.at 1 Dam	2 Dams
04/09/89	1					
04/19/89	1					
04/21/89		1				
04/25/89	1					
04/27/89				1		
04/28/89		1			2	
04/30/89		1				
05/02/89				1		
05/03/89	2					
05/04/89		1				
05/09/89	1				1	
05/11/89	1					
05/14/89	1					
05/16/89		1				
05/22/89	1					
05/24/89	1					
05/25/89		1				
05/26/89	1					
05/30/89		1				
06/01/89	1					
06/04/89	1					
06/07/89		1		1		
06/08/89	1					
06/09/89	1	2				
06/10/89	1	1				
06/13/89		1				
06/15/89	1					
06/16/89		1				
06/17/89	1					
06/20/89	1					
06/22/89		1				
06/23/89		1				
06/24/89	1					
06/30/89	1					
TOTALS	21	15	0	3	3	0

Appendix Table 27.--Detections of PIT tags by date at three dams for wild spring chinook salmon from East Fork Salmon River, 1989.

TAGGING SITE: EAST FORK SALMON R.  
 RELEASE SITE: EAST FORK SALMON R.

RELEASE DATE : 08/10/88 TO 08/12/88  
 NUMBER RELEASED: 742

DETECTION DATE	LOWER GRANITE First Detection	LITTLE GOOSE		MCNARY	
		First Detect.	Prev.Detected at 1 Dam	First Detect.	Prev.Detect.at 1 Dam   2 Dams
04/07/89	1				
04/10/89	1				
04/15/89	1				
04/18/89	1				
04/21/89	1				
04/22/89	1			1	
04/23/89	5	3			
04/24/89	5	2			
04/25/89	4	1			
04/26/89	1	2			
04/27/89	3	3			1
04/28/89		1			1
04/29/89		3			
04/30/89				2	
05/01/89		2		1	
05/02/89	2			1	1
05/03/89	4	1			
05/04/89	1	1			1
05/05/89	4	1			1
05/06/89	1				
05/07/89	2				
05/08/89	1				
05/09/89	1	1		1	
05/10/89	2				
05/12/89	2		1	1	
05/13/89				1	
05/14/89	1			1	1
05/15/89	3	1			
05/17/89	1	1			
05/18/89	3				
05/19/89		2			
05/21/89				1	
05/22/89				1	
05/23/89	1	1			
05/24/89				1	
05/26/89	1			1	
05/27/89				1	
05/30/89	1				
06/06/89	1				

Appendix Table 27.--(continued)

DETECTION DATE	LOWER GRANITE First Detection	LITTLE GOOSE		MCNARY		
		First Detect.	Prev.Detected at 1 Dam	First Detect.	Prev.Detect.at 1 Dam	2 Dams
06/08/89	1					
06/13/89				1		
TOTALS	57	26	1	15	6	0

Appendix Table 28.--Detections of PIT tags by date at three dams for wild spring chinook salmon from Upper Salmon River, 1989.

TAGGING SITE: UPPER SALMON R.  
 RELEASE SITE: UPPER SALMON R.

RELEASE DATE : 08/15/88 TO 08/18/88  
 NUMBER RELEASED: 2720

DETECTION DATE	LOWER GRANITE First Detection	LITTLE GOOSE		MCNARY	
		First Detect.	Prev.Detected at 1 Dam	First Detect.	Prev.Detect.at 1 Dam   2 Dams
04/09/89	1				
04/16/89	1				
04/18/89	1				
04/22/89	1	1			
04/23/89	2	2			
04/24/89	2	3			
04/25/89	1	1			
04/26/89	4	1			
04/27/89	1				
04/28/89	2				
04/29/89		3			1
04/30/89		2		1	
05/01/89	2	1			
05/02/89	1				
05/03/89		3		1	
05/04/89	4				
05/05/89	2	1		3	
05/06/89	3			1	
05/07/89	3	1		1	
05/08/89	2				
05/09/89	2			2	
05/10/89	4	2		1	
05/11/89	2	3			
05/12/89	2	1			
05/13/89	4			2	
05/14/89	2				
05/15/89	2	1			
05/16/89				1	2
05/17/89				1	1
05/18/89		3	1		
05/19/89	1	1	1		1
05/20/89	1	1			
05/21/89	2			1	
05/22/89				1	
05/23/89	1	2		1	
05/24/89	1				
05/25/89	1			2	1
05/26/89	1				
05/27/89		1			

Appendix Table 28.--(continued)

DETECTION DATE	LOWER GRANITE First Detection	LITTLE GOOSE		MCNARY		
		First Detect.	Prev.Detected at 1 Dam	First Detect.	Prev.Detect.at 1 Dam	2 Dams
05/28/89				1		
05/29/89	1			1		
05/31/89		1		1		
06/01/89	1				1	
06/02/89	1					
06/04/89	1					
06/06/89	2					
06/08/89	1	1		1		
06/11/89		2				
06/12/89	2	1				
06/17/89	1					
TOTALS	69	39	2	23	7	0

Appendix Table 29.--Detections of PIT tags by date at three dams for wild spring chinook salmon from Alturas Lake Creek, 1989.

TAGGING SITE: ALTURAS LAKE CR.  
 RELEASE SITE: ALTURAS LAKE CR.

RELEASE DATE : 08/18/88  
 NUMBER RELEASED: 415

DETECTION DATE	LOWER GRANITE First Detection	LITTLE GOOSE		MCNARY		
		First Detect.	Prev.Detected at 1 Dam	First Detect.	Prev.Detect.at 1 Dam	2 Dams
04/24/89	1					
04/25/89	1					
04/26/89		1				
04/27/89	1					
05/01/89	1	1				
05/04/89				1		
05/05/89		1				
05/10/89	2					
05/11/89	1	1				
05/12/89	1					
05/13/89		1				
05/14/89	1	1	1			
05/15/89		1				
05/16/89	2					
05/17/89	1					
05/19/89	1					
05/21/89						1
05/22/89	1					
05/23/89		1		1		
05/24/89				1		
05/25/89	1					
05/27/89	1					
05/28/89	1	2				
06/01/89				1		
06/02/89					1	
06/05/89				1		
06/06/89	1					
06/07/89	1					
06/08/89	1					
06/14/89				1		
TOTALS	20	10	1	6	1	1

Appendix Table 30.--Detections of PIT tags by date at three dams for wild spring chinook salmon from Valley Creek, 1989.

TAGGING SITE: VALLEY CREEK  
 RELEASE SITE: VALLEY CREEK

RELEASE DATE : 08/20/88 TO 08/22/88  
 NUMBER RELEASED: 2251

DETECTION DATE	LOWER GRANITE First Detection	LITTLE GOOSE		MCNARY		
		First Detect.	Prev. Detected at 1 Dam	First Detect.	Prev. Detect. at 1 Dam	2 Dams
04/09/89	1					
04/17/89	1					
04/21/89	1					
04/22/89	1					
04/23/89		1				
04/24/89	5	1				
04/25/89	1	2				
04/26/89		2				
04/27/89	3					
04/28/89	2					
04/29/89		2			1	
05/02/89	1	1			1	
05/03/89	5					
05/04/89				2	1	
05/05/89	2					
05/06/89		1		1		
05/07/89	1	2		1		
05/08/89		1				
05/09/89	2	1		1		
05/10/89	3	4				
05/11/89		2				
05/12/89	1			1		
05/13/89	1	1				
05/14/89	2				1	
05/15/89	3					
05/16/89	1				1	
05/17/89	3	1		1		
05/18/89	1	1				
05/19/89	3					
05/20/89		1			1	
05/21/89	1	1	1			
05/22/89		2				
05/23/89	1					
05/24/89				1		
05/25/89	1	1		1		
05/26/89	1	2				
05/27/89				1		
05/28/89	2				1	
05/29/89	1					

Appendix Table 30.--(continued)

DETECTION DATE	LOWER GRANITE First Detection	LITTLE GOOSE		MCNARY		
		First Detect.	Prev.Detected at 1 Dam	First Detect.	Prev.Detect.at 1 Dam	2 Dams
05/30/89		1				
06/01/89	1	1		1		
06/03/89	2	1				
06/05/89		1				
06/07/89		1				
06/08/89	1					
06/09/89	1	2				
06/10/89	1					
06/11/89	1	2				
06/12/89	5			1		
06/16/89	1			1		
06/17/89	1	1				
06/18/89				1		
06/19/89		1				
TOTALS	65	41	1	14	7	0

Appendix Table 31.--Detections of PIT tags by date at three dams for wild summer chinook salmon from Secesh River, 1989.

TAGGING SITE: SECESH RIVER  
 RELEASE SITE: SECESH RIVER

RELEASE DATE : 08/24/88 TO 08/25/88  
 NUMBER RELEASED: 2178

DETECTION DATE	LOWER GRANITE First Detection	LITTLE GOOSE		MCNARY		
		First Detect.	Prev.Detected at 1 Dam	First Detect.	Prev.Detect.at 1 Dam	2 Dams
04/09/89	1					
04/12/89	1					
04/13/89	1					
04/14/89	3					
04/15/89	1					
04/16/89	4					
04/17/89	2					
04/18/89	2	2				
04/19/89	4	5				
04/20/89	10					
04/21/89	13	2		1		
04/22/89	11	7				
04/23/89	7	10		1		
04/24/89	8	8	1	1		
04/25/89	13	8		1		
04/26/89	6	4		2	2	
04/27/89	11	3		1	5	
04/28/89	8	6		1		
04/29/89	1	3		3	1	1
04/30/89	3	4		3	3	
05/01/89	1	2			2	
05/02/89	2	3		2	4	
05/03/89	1	2			1	
05/04/89	2			1	1	
05/05/89	1	4				
05/06/89	1	1		1		
05/07/89				3	1	
05/08/89	2	2				
05/09/89	5	1				
05/10/89	9			1		
05/11/89	7	1				
05/12/89	2	2	1	1		
05/13/89	1	1				
05/14/89	4	2	4		1	
05/15/89	3			1		
05/16/89	2		1		1	
05/17/89	1	1				
05/18/89	1	1				
05/19/89	1			1		

Appendix Table 31.--(continued)

DETECTION DATE	LOWER GRANITE First Detection	LITTLE GOOSE		MCNARY		
		First Detect.	Prev.Detected at 1 Dam	First Detect.	Prev.Detect.at 1 Dam	2 Dams
05/20/89	1	1			3	
05/21/89	1			1	1	2
05/22/89		1				
05/24/89					1	
05/25/89					1	
05/27/89	1				1	
05/28/89	2	1				
05/29/89	2					
06/01/89	1				1	
06/03/89	1			1		
06/05/89	2					
06/06/89	2					
06/08/89	2	2				
06/09/89	1					
06/10/89				1		
06/11/89	1			1		
06/12/89	1					
06/13/89	2					
06/14/89		1		1		
06/15/89	2					
06/17/89	1	2		1		
06/18/89	1	1				
06/19/89	3	1				
06/21/89	2	1				
06/22/89	2					
06/23/89	1					
06/26/89	1					
07/01/89		1				
07/13/89	1					
07/19/89	1					
TOTALS	191	97	7	31	30	3

Appendix Table 32.--Detections of PIT tags by date at three dams for wild summer chinook salmon from Lake Creek, 1989.

TAGGING SITE: LAKE CREEK  
 RELEASE SITE: LAKE CREEK

RELEASE DATE : 08/26/88  
 NUMBER RELEASED: 664

DETECTION DATE	LOWER GRANITE First Detection	LITTLE GOOSE		MCNARY		
		First Detect.	Prev.Detected at 1 Dam	First Detect.	Prev.Detect.at 1 Dam	2 Dams
04/12/89	1					
04/19/89	1					
04/20/89	2					
04/21/89	1					
04/22/89		2				
04/23/89	4	2				
04/25/89	2					
04/26/89	2	2			1	
04/27/89	3	2				
04/28/89	3	3			1	
04/29/89	1	3		1		
04/30/89		1				
05/01/89	5	2				
05/02/89	2	1		1	1	
05/03/89	2	1				
05/04/89	1					
05/05/89	1					
05/06/89	1					
05/07/89	1					
05/08/89	1			2		
05/09/89	1			1		
05/10/89	2	1		1	1	
05/11/89	1					
05/12/89		1	1			
05/13/89	1					
05/15/89		1	1			
05/19/89	1					
05/22/89	1					
05/25/89	1					
06/08/89	2					
06/13/89	1					
06/16/89	2					
06/17/89	2					
06/20/89		1				
06/23/89	1	1				
07/01/89	1					
TOTALS	51	24	2	6	4	0

Appendix Table 33.--Detections of PIT tags by date at three dams for wild summer chinook salmon from South Fork Salmon River, 1989.

TAGGING SITE: SOUTH FORK SALMON R.      RELEASE DATE : 08/29/88 TO 08/31/88  
 RELEASE SITE: SOUTH FORK SALMON R.      NUMBER RELEASED: 2184

DETECTION DATE	LOWER GRANITE First Detection	LITTLE GOOSE		MCNARY		
		First Detect.	Prev.Detected at 1 Dam	First Detect.	Prev.Detect.at 1 Dam	2 Dams
04/16/89	1					
04/19/89	1					
04/20/89	3	1				
04/21/89	1					
04/22/89		2				
04/23/89	1	1				
04/24/89	1	1				
04/25/89	4	2				
04/26/89	2	1				
04/27/89	4	1				
04/28/89	2	3				
04/29/89	2	1		1		
04/30/89		2		1	1	
05/01/89	3	1			1	
05/02/89		1		1		
05/03/89	3					
05/04/89		1			2	
05/05/89	1	2		1		
05/06/89	1					
05/08/89	2					
05/09/89	2	1				
05/10/89	1	2		2		
05/11/89	4					
05/12/89	2	1				
05/13/89	5	1	1			
05/14/89	1		1			
05/15/89	3					
05/16/89	3				1	
05/17/89	1	1			1	
05/18/89	1	1				
05/19/89		1		1	1	1
05/20/89				1		
05/21/89	1					
05/23/89	1					
05/24/89	2					
05/25/89		2				
05/26/89	2					
06/01/89	1			1		
06/06/89	1	1				

Appendix Table 33.--(continued)

DETECTION DATE	LOWER GRANITE First Detection	LITTLE GOOSE		MCNARY		
		First Detect.	Prev.Detected at 1 Dam	First Detect.	Prev.Detect.at 1 Dam	2 Dams
06/07/89	1	1				
06/08/89	2	1				
06/09/89	3					
06/11/89	2					
06/12/89	5			1		
06/14/89	3			1		
06/15/89	1			1		
06/16/89		1				
06/17/89		3				
06/18/89	2					
06/19/89	2					
06/20/89	1					
06/23/89				1		
TOTALS	85	37	2	13	7	1

Appendix Table 34.--Detections of PIT tags at three dams for wild spring chinook salmon from Grande Ronde River, 1989.

TAGGING SITE: GRANDE RONDE R.  
 RELEASE SITE: GRANDE RONDE R.

RELEASE DATE : 09/20/88 TO 09/22/88  
 NUMBER RELEASED: 2984

DETECTION DATE	LOWER GRANITE First Detection	LITTLE GOOSE		MCNARY		
		First Detect.	Prev.Detected at 1 Dam	First Detect.	Prev.Detect.at 1 Dam	2 Dams
04/25/89		1				
04/27/89	1	1				
04/30/89	1					
05/05/89	2					
05/06/89	1					
05/07/89	2					
05/08/89	2					
05/09/89	3					
05/10/89	6					
05/11/89	6	1				
05/12/89	10	2				
05/13/89	8					
05/14/89	7					
05/15/89	3		1			
05/16/89	2	1	1	2	2	
05/17/89	3				1	
05/18/89	2	4				
05/19/89	4	1	1	1		
05/20/89	2	3			1	
05/21/89		3		3		
05/22/89	2				1	
05/23/89	2			1		
05/24/89	5			1	1	
05/25/89	4	3				
05/26/89	1	1				
05/27/89	3	1		2		
05/28/89	3	4				
05/29/89	4	3	1			
05/30/89	7	1		1		
05/31/89	9	2				
06/01/89	3	1		1		
06/02/89	2	1				
06/03/89	2	3		1	1	
06/04/89	1	4				
06/05/89	4	5				
06/06/89	6	1				
06/07/89	5	4		2		
06/08/89	9	6				
06/09/89	12	4		2		

Appendix Table 34.--(continued)

DETECTION DATE	LOWER GRANITE First Detection	LITTLE GOOSE		MCNARY		
		First Detect.	Prev.Detected at 1 Dam	First Detect.	Prev.Detect.at 1 Dam	2 Dams
06/10/89	9	2				
06/11/89	5	5		2		
06/12/89	8	3		2		
06/13/89	7	3		2		
06/14/89	5	3				
06/15/89	11	2		6		
06/16/89	6	2		3		
06/17/89	7	2		1		
06/18/89	3					
06/19/89	8	3				
06/20/89	4	2		1		
06/21/89	3	2				
06/22/89	2	5		2		
06/23/89	3			2		
06/24/89	1			2		
06/25/89	1	3		1		
06/26/89				1		
06/27/89	1			1		
06/28/89	1			1		
06/29/89	1					
06/30/89		1				
07/02/89				1		
07/03/89	1	1				
07/05/89	1					
07/09/89	3					
07/14/89	1					
07/22/89	1					
TOTALS	242	100	4	45	7	0

Appendix Table 35.--Detections of PIT tags by date at three dams for wild summer chinook salmon from Imnaha River, 1989.

TAGGING SITE: IMNAHA RIVER  
 RELEASE SITE: IMNAHA RIVER

RELEASE DATE : 09/26/88  
 NUMBER RELEASED: 1207

DETECTION DATE	LOWER GRANITE First Detection	LITTLE GOOSE		MCNARY		
		First Detect.	Prev.Detected at 1 Dam	First Detect.	Prev.Detect.at 1 Dam	2 Dams
04/04/89	4					
04/05/89	1					
04/07/89	1					
04/08/89	1					
04/11/89	1					
04/12/89	3					
04/13/89	1	1				
04/14/89		1				
04/15/89	1					
04/16/89	2	1				
04/17/89	4	1				
04/18/89		2				
04/20/89	2	2				
04/21/89	2	3			1	
04/22/89	3	1	1			
04/23/89	1	4		1		
04/24/89	1	1	1			
04/25/89	2			1		
04/26/89	1			2	1	
04/27/89	1	1		1		
04/28/89	3				1	
04/29/89	1			1	2	
04/30/89	2	3				
05/01/89	1					
05/02/89		2		2		
05/03/89	3	1		1		
05/04/89	4					
05/05/89	2	3		1		
05/06/89	5	2	1			
05/07/89	2	1		1		
05/08/89	3	2				
05/09/89	1	4				
05/10/89	4	3		1		
05/11/89	3	1	1	1		
05/12/89		1			1	
05/13/89	1	1				
05/14/89	1	2				
05/15/89					2	
05/16/89			1			1

Appendix Table 35.--(continued)

DETECTION DATE	LOWER GRANITE First Detection	LITTLE GOOSE		MCNARY		
		First Detect.	Prev. Detected at 1 Dam	First Detect.	Prev. Detect. at 1 Dam	2 Dams
05/17/89					2	
05/18/89			1			
05/19/89				1	1	
05/20/89	1			1	1	
05/25/89		1		1		
05/27/89	1					
05/28/89	1					
05/31/89					1	
06/02/89	1					
06/05/89	1					
TOTALS	73	45	6	16	13	1

Appendix Table 36.--Detections of PIT tags by date at three dams for hatchery spring chinook salmon from Lookingglass hatchery, 1989.

TAGGING SITE: LOOKINGGLASS HATCHERY  
 RELEASE SITE: LOOKINGGLASS CREEK

RELEASE DATE : 04/03/89  
 NUMBER RELEASED: 10012

DETECTION DATE	LOWER GRANITE First Detection	LITTLE GOOSE		MCNARY		
		First Detect.	Prev. Detected at 1 Dam	First Detect.	Prev. Detect. at 1 Dam	2 Dams
04/08/89	2					
04/09/89	11					
04/10/89	21					
04/11/89	17					
04/12/89	56	3				
04/13/89	53	5				
04/14/89	62	8	1			
04/15/89	82	12				
04/16/89	81	4	1			
04/17/89	90	15				
04/18/89	90	34	4	1		
04/19/89	77	33	5			
04/20/89	123	49	1			
04/21/89	207	89	4	3	1	
04/22/89	242	136	3	6		
04/23/89	127	239	4	1	1	
04/24/89	122	259		14	2	
04/25/89	74	168	3	12	2	
04/26/89	50	128	1	31	1	
04/27/89	83	104	1	31	2	1
04/28/89	48	131	3	63	8	
04/29/89	28	131	1	52	19	
04/30/89	24	132		61	25	1
05/01/89	15	123	1	66	35	
05/02/89	25	58		82	40	
05/03/89	20	50		61	28	2
05/04/89	17	47		43	21	
05/05/89	19	69		82	34	
05/06/89	9	46		46	8	
05/07/89	9	21		60	9	
05/08/89	6	20		50	7	
05/09/89	6	30		49	2	
05/10/89	6	18		38	5	
05/11/89	5	6		41	2	
05/12/89	4	9		24	1	
05/13/89		3	1	19	3	
05/14/89	1	1	1	17	4	
05/15/89				9	4	

Appendix Table 36.--(continued)

DETECTION DATE	LOWER GRANITE First Detection	LITTLE GOOSE		MCNARY		
		First Detect.	Prev.Detected at 1 Dam	First Detect.	Prev.Detect.at 1 Dam	2 Dams
05/16/89		2		11	4	
05/17/89			1	2	2	
05/18/89	1			4	3	
05/19/89				3	2	
05/20/89		1		2		
05/21/89				2		
05/22/89		1				1
05/23/89				1		
05/24/89	1	1		1		
05/25/89					1	
05/26/89	1	1				
05/28/89	1					
05/29/89			1			
05/30/89				1	2	
05/31/89				2		
06/03/89	1					
06/07/89					1	
06/16/89		1				
TOTALS	1917	2188	37	991	279	5

Appendix Table 37.--Detections of PIT tags by date at three dams for hatchery spring chinook salmon from Sawtooth hatchery, 1989.

TAGGING SITE: SAWTOOTH HATCHERY  
 RELEASE SITE: SALMON RIVER

RELEASE DATE : 10/06/88  
 NUMBER RELEASED: 2062

DETECTION DATE	LOWER GRANITE First Detection	LITTLE GOOSE		MCNARY		
		First Detect.	Prev.Detected at 1 Dam	First Detect.	Prev.Detect.at 1 Dam	2 Dams
03/26/89	1					
04/08/89	1					
04/09/89	1					
04/15/89	1					
04/17/89		1				
04/18/89	1					
04/20/89	1					
04/21/89	5	2				
04/22/89	8	2			1	
04/23/89	5	4				
04/24/89	5	5		1		
04/25/89	5	4				
04/26/89	5	1				
04/27/89	5					
04/28/89	1	1			1	
04/29/89	3	3			1	
04/30/89	1	2		1	1	
05/01/89	1				2	
05/02/89		1		1		
05/03/89	1			2	1	
05/04/89		2		2	1	
05/05/89					1	
05/06/89				1		
05/08/89	3					
05/09/89	2	1				
05/10/89	1					
05/11/89	2	1	1			
05/12/89	2					
05/13/89	1					
05/16/89	1					
05/17/89				1		
05/18/89						1
05/24/89				1		
06/06/89		1				
06/08/89	1					
TOTALS	64	31	1	10	9	1

Appendix Table 38.--Detections of PIT tags by date at three dams for hatchery spring chinook salmon from Sawtooth hatchery, 1989.

TAGGING SITE: SAWTOOTH HATCHERY  
 RELEASE SITE: SALMON RIVER

RELEASE DATE : 03/21/89  
 NUMBER RELEASED: 10073

DETECTION DATE	LOWER GRANITE First Detection	LITTLE GOOSE		MCNARY	
		First Detect.	Prev.Detected at 1 Dam	First Detect.	Prev.Detect.at 1 Dam   2 Dams
04/06/89	1				
04/07/89	2				
04/08/89	3				
04/09/89	4				
04/10/89	4				
04/11/89	1				
04/12/89	6	2			
04/13/89	7	1			
04/14/89	5	1	2	1	
04/15/89	5	2			
04/16/89	12	1		1	
04/17/89	17	2		2	
04/18/89	23	5		1	
04/19/89	21	11			
04/20/89	52	5	1		1
04/21/89	89	17		1	
04/22/89	117	22		1	1
04/23/89	71	50	1	1	
04/24/89	77	49		1	
04/25/89	56	45			1
04/26/89	43	32		13	
04/27/89	60	34		5	5
04/28/89	36	29		10	7
04/29/89	19	39		5	15
04/30/89	28	28		10	13
05/01/89	19	19		11	7
05/02/89	26	20		18	13
05/03/89	20	14		13	9
05/04/89	19	14		18	3
05/05/89	29	19	1	17	4
05/06/89	19	10		14	1
05/07/89	10	10		12	
05/08/89	15	6		9	
05/09/89	12	13		15	
05/10/89	23	7		7	
05/11/89	5	5	1	3	
05/12/89	10	12	3	2	
05/13/89	6	6	5		

Appendix Table 38.--(continued)

DETECTION DATE	LOWER GRANITE First Detection	LITTLE GOOSE		MCNARY		
		First Detect.	Prev.Detected at 1 Dam	First Detect.	Prev.Detect.at 1 Dam	2 Dams
05/14/89	7	3	2	5	2	
05/15/89	5	2	1	4	1	
05/16/89	8			2		
05/17/89	2	1	1	3		
05/18/89	1	2			1	1
05/19/89	2	7		2	3	
05/20/89	3	2		1	2	2
05/21/89	2	1	1	5		1
05/22/89	2	2			2	2
05/23/89	3	3				
05/24/89	5	1		1	1	
05/25/89	1	1				
05/26/89	2	1				
05/27/89	5			1		
05/28/89	1	3		1		
05/29/89	2	3				
05/30/89	2					
05/31/89	1	2				
06/01/89	3	3				
06/03/89	2	2				
06/04/89	1	2		1		
06/05/89	2			1		
06/06/89		1				
06/07/89					1	
06/08/89	3	1		1		
06/09/89	5	1		2		
06/10/89	6	1		1		
06/11/89	2	2				
06/12/89	4					
06/13/89	2	2		1		
06/14/89	1	1		2		
06/17/89	1					
06/19/89				1		
06/22/89				2		
TOTALS	1058	580	19	228	93	6

Appendix Table 39.--Detections of PIT tags by date at three dams for hatchery summer chinook salmon from McCall hatchery, 1989.

TAGGING SITE: MCCALL HATCHERY  
 RELEASE SITE: SOUTH FORK SALMON R.

RELEASE DATE : 03/21/89  
 NUMBER RELEASED: 2980

DETECTION DATE	LOWER GRANITE First Detection	LITTLE GOOSE		MCNARY		
		First Detect.	Prev. Detected at 1 Dam	First Detect.	Prev. Detect. at 1 Dam	2 Dams
04/17/89		1				
04/18/89	1					
04/19/89	1					
04/20/89	3					
04/21/89	7	1				
04/22/89	9	2				
04/23/89	9					
04/24/89	12	4				
04/25/89	5	1				
04/26/89	11					
04/27/89	5	5				
04/28/89	10	2				
04/29/89	5	8			1	
04/30/89	4	4		1		
05/01/89	8	4			1	
05/02/89	9	6		2		
05/03/89	11	6				
05/04/89	17	2		1		
05/05/89	22	10		2		
05/06/89	15	10		1		
05/07/89	22	5		3		
05/08/89	22	6		2		
05/09/89	27	11		3		
05/10/89	39	10		1		
05/11/89	35	9	4	4		
05/12/89	25	11	2	2		
05/13/89	20	7	2	1	1	
05/14/89	14	8	6	1	2	
05/15/89	11	6	5	7	3	
05/16/89	9	3	4	4	1	3
05/17/89	15	4		4	2	
05/18/89	11	7	2	5	2	
05/19/89	6	5	1	3	5	
05/20/89	6	6		5	4	
05/21/89	12	4		3	2	1
05/22/89	2	4		4	3	2
05/23/89	1	4		1	2	
05/24/89	6	5		4	3	

Appendix Table 39.--(continued)

DETECTION DATE	LOWER GRANITE First Detection	LITTLE GOOSE		MCNARY		
		First Detect.	Prev.Detected at 1 Dam	First Detect.	Prev.Detect.at 1 Dam	2 Dams
05/25/89	4	5		3	2	
05/26/89	8	4	1		2	
05/27/89	2	4		4		
05/28/89	3	5		2	1	
05/29/89	2	3				
05/30/89	5	4		3		
05/31/89	4	3				
06/01/89	3			2		
06/02/89	3	2		4	1	
06/03/89	5	6				
06/04/89	3	3				
06/05/89	3	4				
06/06/89	1	1		2		
06/07/89	3	1		4		1
06/08/89	5	3				
06/09/89	1	3		1		
06/10/89	5	1		1		
06/11/89	8	4				
06/12/89	6	1		1		
06/13/89	4	2				
06/14/89	2	2				
06/16/89		1				
06/17/89				1		
06/18/89	1					
06/19/89				1		
06/20/89	1					
06/23/89		1				
TOTALS	529	244	27	93	38	7

**Appendix Table 40.--Physical parameters of hourly tests using a single flume. The symbol -0- indicates that the value is unknown.**

Date	Time test started	# of fish put in flume	Smith-Root counter totals	Expanded hourly counts	Slidegate delay time (sec)	Time slide gate was open (sec)	Velocity of water (fps)
4/11/89	17:00:00	15	13	372	0.22	0.60	-0-
4/11/89	18:00:00	15	20	296	0.22	0.60	-0-
4/11/89	19:00:00	14	32	548	0.22	0.60	-0-
4/13/89	17:00:00	15	13	523	0.22	0.60	-0-
4/13/89	18:00:00	14	8	390	0.22	0.60	-0-
4/13/89	19:00:00	15	22	320	0.22	0.60	-0-
4/20/89	21:00:00	0	126	4,930	-0-	0.60	6.00
4/20/89	22:00:00	0	60	5,790	-0-	0.60	-0-
4/20/89	23:00:00	0	137	6,450	-0-	0.60	6.00
4/21/89	17:00:00	80	71	3,289	0.10	0.60	-0-
4/21/89	18:00:00	80	55	2,274	0.10	0.60	-0-
4/21/89	19:00:00	80	66	3,179	0.10	0.60	5.30
4/21/89	20:00:00	80	167	6,647	0.15	0.60	5.30
4/22/89	20:00:00	0	311	10,306	0.20	0.60	5.23
4/28/89	17:00:00	0	20	3,910	0.32	0.60	5.10
4/28/89	18:00:00	0	29	8,120	0.52	0.60	5.10
4/28/89	19:00:00	0	44	5,338	0.52	0.60	5.10
4/28/89	0:00:00	0	134	11,353	0.52	0.60	5.10
4/28/89	21:00:00	0	190	10,376	0.52	0.60	5.10
4/30/89	17:00:00	0	52	4,670	0.32	0.70	0.53
4/30/89	18:00:00	0	6	2,170	0.32	0.70	5.30
4/30/89	19:00:00	0	13	1,160	0.32	0.70	5.30
4/30/89	20:00:00	0	18	4,180	0.32	0.70	5.30
4/30/89	21:00:00	0	55	2,680	0.32	0.70	5.30

Appendix Table 41.--Numbers of PIT-tagged and untagged fish diverted in hourly tests using a single flume.

Date	PIT-tagged fish diverted			Untagged fish diverted			Untagged to tagged ratio	Slide gate openings per test	Average untagged fish diverted per slide gate opening
	Chinook	Steelhead	Total	Chinook	Steelhead	Total			
4/11/89	9	0	9	4	0	4	0.44	10	0.40
4/11/89	9	0	9	1	0	1	0.11	16	0.06
4/11/89	19	0	19	3	0	3	0.16	14	0.21
4/13/89	12	0	12	2	1	3	0.25	15	0.20
4/13/89	7	0	7	1	0	1	0.14	13	0.08
4/13/89	19	0	19	1	0	1	0.05	11	0.09
4/20/89	27	0	27	82	43	125	4.63	29	4.31
4/20/89	23	3	26	30	6	36	1.38	32	1.13
4/20/89	32	4	36	97	26	123	3.42	45	2.73
4/21/89	27	2	29	27	2	29	0.41	32	0.91
4/21/89	19	0	19	28	19	47	2.47	45	1.04
4/21/89	25	0	25	37	11	48	1.92	43	1.12
4/21/89	30	1	31	87	51	138	4.45	53	2.60
4/22/89	22	4	26	182	112	294	11.31	59	4.98
4/28/89	2	0	2	5	17	22	11.00	9	2.44
4/28/89	6	3	9	16	15	31	3.44	16	1.94
4/28/89	8	1	9	14	20	34	3.78	14	2.43
4/28/89	12	4	16	55	65	120	7.50	28	4.29
4/28/89	18	6	24	78	103	181	7.54	39	4.64
4/30/89	8	3	11	10	31	41	3.73	14	2.93
4/30/89	3	0	3	0	3	3	1.00	4	0.75
4/30/89	6	0	6	1	5	6	1.00	9	0.67
4/30/89	5	2	7	2	6	8	1.14	10	0.80
4/30/89	7	2	9	23	26	49	5.44	12	4.08
<b>Sum</b>	<b>355</b>	<b>35</b>	<b>390</b>	<b>786</b>	<b>562</b>	<b>1,348</b>	<b>76.73</b>	<b>572</b>	<b>44.83</b>
<b>Average</b>	<b>15</b>	<b>1</b>	<b>16</b>	<b>33</b>	<b>23</b>	<b>56</b>	<b>3.20</b>	<b>24</b>	<b>1.87</b>

Appendix Table 42.--Descaling and injury data for hourly tests using a single flume. Testing began on 20 April, 1989.

Date	Chinook			Steelhead			Total fish not descaled	Total fish observed	Percent of fish descaled
	Not descaled	Descaled	Injured	Not descaled	Descaled	Injured			
4/20/89	101	9	0	38	4	0	139	114	9
4/20/89	48	6	0	9	0	0	57	54	6
4/20/89	122	9	0	26	2	0	148	133	9
4/21/89	93	5	1	13	2	0	106	102	5
4/21/89	39	5	1	13	3	0	52	49	5
4/21/89	54	4	0	8	1	0	62	59	4
4/21/89	110	4	0	47	2	0	157	116	4
4/22/89	167	31	0	98	17	0	265	215	31
4/28/89	7	0	0	16	1	0	23	8	0
4/28/89	19	2	0	16	2	0	35	23	2
4/28/89	22	0	0	17	3	0	39	25	0
4/28/89	60	7	0	61	4	0	121	71	7
4/28/89	80	15	0	100	8	0	180	103	15
4/30/89	15	2	0	29	5	0	44	22	2
4/30/89	3	0	0	3	0	0	6	3	0
4/30/89	5	2	0	5	0	0	10	7	2
4/30/89	6	1	0	8	0	0	14	7	1
4/30/89	24	6	0	28	0	0	52	30	6
<b>Sum</b>	<b>975</b>	<b>108</b>	<b>2</b>	<b>535</b>	<b>54</b>	<b>0</b>	<b>1510</b>	<b>1141</b>	<b>109</b>
<b>Average</b>	<b>54</b>	<b>6</b>	<b>0</b>	<b>30</b>	<b>3</b>	<b>0</b>	<b>84</b>	<b>63</b>	<b>6</b>

**Appendix Table 43.--Mortality of chinook and steelhead smolts during hourly testing using a single flume.**

Date	Tagged mortalities			Untagged mortalities			Percent mortality per test
	Chinook	Steelhead	Total	Chinook	Steelhead	Total	
4/11/89	0	0	0	0	0	0	0.0
4/11/89	0	0	0	0	0	0	0.0
4/11/89	0	0	0	0	0	0	0.0
4/13/89	0	0	0	0	0	0	0.0
4/13/89	0	0	0	0	0	0	0.0
4/13/89	0	0	0	0	0	0	0.0
4/20/89	0	0	0	0	2	2	1.3
4/20/89	0	0	0	0	0	0	0.0
4/20/89	0	0	0	1	1	2	1.3
4/21/89	1	1	2	0	0	0	2.0
4/21/89	0	0	0	1	3	4	6.1
4/21/89	2	0	2	3	2	5	9.6
4/21/89	2	0	2	1	3	4	3.6
4/22/89	0	1	1	5	2	7	2.5
4/28/89	0	0	0	0	0	0	0.0
4/28/89	0	0	0	0	0	0	0.0
4/28/89	0	0	0	1	1	2	4.7
4/28/89	0	0	0	0	4	4	2.9
4/28/89	1	0	1	0	4	4	2.4
4/30/89	0	0	0	1	0	1	1.9
4/30/89	0	0	0	0	0	0	0.0
4/30/89	0	0	0	0	0	0	0.0
4/30/89	0	0	0	0	0	0	0.0
4/30/89	0	0	0	0	0	0	0.0
<b>Sum</b>	<b>6</b>	<b>2</b>	<b>8</b>	<b>13</b>	<b>22</b>	<b>35</b>	<b>38.2</b>
<b>Average</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1.6</b>

**Appendix Table 44.--Physical parameters of hourly tests using a double flume. The symbol -0- indicates value is unknown.**

<b>Date</b>	<b>Time test started</b>	<b># of test</b>	<b>Smith-Root counter totals</b>	<b>Expanded hourly counts</b>	<b>Slidegate settings</b>	<b>Slidegate delay time</b>	<b>Time slide-gate was open (sec)</b>	<b>Velocity of water (fps)</b>
5/1/89	17:00:00	1	7	5,870	1	0.27	0.70	5.70
5/1/89	18:00:00	2	29	2,660	1	0.27	0.70	-0-
5/1/89	19:00:00	3	6	2,520	1	0.27	0.70	-0-
5/2/89	18:00:00	1	46	2,850	1	0.27	0.70	6.30
5/2/89	19:00:00	2	9	2,475	1	0.32	0.70	6.30
5/3/89	18:00:00	1	6	2,420	1	0.37	0.60	6.00
5/3/89	19:00:00	2	35	2,891	1	0.37	0.70	-0-
5/3/89	20:00:00	3	80	6,253	1	0.37	0.70	-0-
5/3/89	21:00:00	4	92	12,184	1	0.37	0.70	-0-

**Appendix Table 45.--Numbers of PIT tagged and untagged fish diverted in hourly test using adouble flume slide gate.**

Date	PIT-tagged fish diverted			Untagged fish diverted			Untagged to tagged ratio	Slide gate openings per test	Untagged fish diverted per gate opening
	Chinook	Steelhead	Total	Chinook	Steelhead	Total			
5/3/89	3	3	6	1	0	1	0.17	16	0.13
5/2/89	6	5	11	4	12	16	1.45	16	0.70
5/1/89	3	0	3	3	0	3	1.00	6	0.50
5/1/89	9	3	12	6	26	32	2.67	9	2.00
5/2/89	3	1	4	2	3	5	1.25	23	0.56
5/3/89	2	2	4	1	2	3	0.75	8	0.50
5/1/89	7	5	12	18	11	29	2.42	6	1.81
5/3/89	12	8	20	14	48	62	3.10	25	2.48
5/3/89	13	7	20	27	45	72	3.60	29	2.48
<b>Sum</b>	<b>58</b>	<b>34</b>	<b>92</b>	<b>76</b>	<b>147</b>	<b>223</b>	<b>16.40</b>	<b>138</b>	<b>11.15</b>
<b>Average</b>	<b>6</b>	<b>4</b>	<b>10</b>	<b>8</b>	<b>16</b>	<b>25</b>	<b>1.82</b>	<b>15</b>	<b>1.24</b>

Appendix Table 46--Descaling and injury data for hourly tests using a double flume sildegate.

Date	# of test	Chinook		Steelhead		Total fish descaled	Total fish not descaled	Total fish observed	Percent of fish descaled
		Not descaled	Descaled #	Not descaled	Descaled #				
5/1/89	1	24	0	15	0	0	39	39	0.00
5/1/89	2	15	1	28	1	2	43	45	0.01
5/1/89	3	3	0	3	0	0	6	6	0.00
5/2/89	1	5	0	4	0	0	9	9	0.00
5/2/89	2	9	1	16	1	2	25	27	0.01
5/3/89	1	4	0	3	0	0	7	7	0.00
5/3/89	2	3	0	4	0	0	7	7	0.00
5/3/89	3	24	2	54	1	3	78	81	0.01
5/3/89	4	32	4	49	2	6	81	87	0.02
								0	
<b>Sum</b>		119	8	176	5	13	295	308	0.04
<b>Average</b>		13	1	20	1	1	33	34	0.00

• No fish were injured during hourly tests with the double flume.

**Appendix Table 47.--Mortality of chinook and steelhead smolts during hourly testing using a double flume.**

Date	Tagged fish mortalities			Untagged fish mortalities			Percent mortality per test
	Chinook	Steelhead	Total	Chinook	Steelhead	Total	
5/3/89	0	1	1	0	0	0	14.3
5/2/89	0	0	0	0	0	0	0.0
5/1/89	0	0	0	0	0	0	0.0
5/1/89	0	0	0	0	0	0	0.0
5/2/89	0	0	0	0	0	0	0.0
5/3/89	0	1	1	0	0	0	14.3
5/1/89	0	0	0	1	1	2	4.9
5/3/89	0	0	0	0	1	1	1.2
5/3/89	0	1	1	0	1	1	2.2
<b>Sum</b>	0	3	3	1	3	4	36.8
<b>Average</b>	0	0	0	0	0	0	4.1