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COASTAL ZONE AND ESTUARINE STUDIES

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EXECUTIVE SUMMARY

In 1992, National Marine Fisheries Service (NMFS) research addressed two areas related to smolt transportation. The first was completion of a 3-year marking program to evaluate barge transport of smolts from Lower Granite and McNary Dams to a release site below Bonneville Dam; the second was an estuarine release-site study on barged steelhead (*Oncorhynchus mykiss*) smolts.

Barge Transportation Studies

Drought conditions in the Snake River Basin again precluded marking of spring/summer chinook salmon (*O. tshawytscha*) and steelhead smolts for the final year of a 3-year reevaluation of transportation from Lower Granite Dam. A similar 3-year study marking juvenile fall and spring/summer chinook salmon at McNary Dam was completed in 1988.

Adult recoveries continued for these studies and for a group of spring/summer chinook salmon smolts marked for transport at Lower Granite Dam during the 1990 drought year. Adult recoveries from transport and control groups of spring/summer chinook salmon smolts marked at Lower Granite Dam in 1989 are complete, but are much lower than expected. Nevertheless, significantly more transports than controls were recovered, with a transport to control ratio (T/C) of 2.4 and a 95% confidence interval (CI) of 1.4 to 4.3. Adult recoveries of spring/summer chinook salmon smolts marked for barge transport in 1990 are incomplete. So

far, this group is returning at a higher rate than any group we have marked since 1983. Adult recoveries of steelhead smolts, marked as transports and controls and released in 1989, are also incomplete but, like adult returns of spring/summer chinook salmon marked in that year, are much lower than expected. The preliminary T/C is 2.1 at Lower Granite Dam.

We continued to observe high abrasion levels from marine mammal teeth and claws on adult spring/summer chinook salmon. Prevalence of abrasions in 1992 was 15%, with open wounds occurring on about one-third of the fish with abrasions.

For the McNary Dam studies, adult returns from transport and control groups of spring/summer chinook salmon smolts marked in 1988 are complete. The T/C was 1.6 with a 95% CI for combined recoveries between 1.0 and 2.6. For fall chinook salmon, adult returns for juveniles marked as transports and controls in 1986 are complete. Significantly more fall chinook salmon transports than controls were recovered from all locations, with a T/C of 3.0 in the ocean fisheries. Adult returns for the 1987 and 1988 study years are incomplete; however, recoveries from all areas continue to strongly favor the transported groups.

Steelhead Release-Site Study

In 1992, we began a 3-year marking study to compare adult returns of barged steelhead smolts, released in the upper Columbia River estuary at Tongue Point (River kilometer [Rkm] 29.3), with those released at the traditional site just

downstream from Bonneville Dam near Skamania Light (Rkm 224.0). Between 1 and 20 May, we marked seven release lots of approximately 9,000 steelhead each for the Tongue Point releases, and seven lots of 10,000 steelhead each for the Skamania Light releases. Overall post-marking delayed mortality and tag loss were low, averaging 0.7 and 0.5%, respectively.

TRANSPORTATION STUDIES: LOWER GRANITE AND MCNARY DAMS

Introduction

The U.S. Army Corps of Engineers (COE) has conducted the barge transportation program annually since 1981. To index its relative success, the National Marine Fisheries Service (NMFS) marked spring/summer chinook salmon (*Oncorhynchus tshawyscha*) smolts at Lower Granite Dam in 1983, 1984, and 1985, and steelhead (*O. mykiss*) smolts in 1984 and 1985. No paired control groups of either species were marked during any of the above years. The 1985 smolt-marking operations were conducted by the Fish Passage Center (formerly the Water Budget Center). Therefore, data on these releases were not included in any of the NMFS annual reports. Final adult returns for the 1983 and 1984 release groups were reported by Harmon et al. (1989), and final adult returns for the 1985 releases were reported by Matthews et al. (1990).

By 1985, preliminary adult returns from these marking efforts indicated that survival of marked, transported smolts had improved considerably compared to returns from the 1976-80 study years (Park et al. 1986). We believe a combination of factors was responsible for the observed increase in smolt-to-adult survival. These factors included, but were not necessarily limited to, the following: major improvements in transport and collection facilities, improved fish quality, and greatly improved fish handling/marking techniques.

In 1986, a new 3-year transportation study 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 was to reevaluate transportation of smolts around dams, utilizing state-of-the-art collection/transport and handling/marking techniques. At McNary Dam, we marked transport and control groups of spring/summer and fall chinook salmon for three consecutive years (1986-88). At Lower Granite Dam, we marked transport and control groups of spring/summer chinook salmon and steelhead in 1986. However, drought conditions caused low river flows and no inriver control releases were marked in 1987, 1988, 1990, 1991, and 1992. We marked transport and control groups of both species in 1986 and 1989. In 1987 and 1990, we marked barge transport groups for indexing of both species. No marking was done in 1988, 1991, and 1992 due to the prolonged drought.

While recovery of adults for some of these marking efforts is complete, other recovery efforts are ongoing. Completed studies previously reported for Lower Granite Dam include results from both spring/summer chinook salmon and steelhead released in 1986 (Matthews et al. 1992), and spring/summer chinook salmon released in 1987 (Achord et al. 1992). For McNary Dam studies, complete returns include those for spring/summer chinook salmon released in 1986 (Matthews et al. 1992) and 1987 (Achord et al. 1992). Here we report the results from complete adult returns of fall chinook salmon marked at McNary Dam in 1986 and

spring/summer chinook salmon marked at McNary Dam in 1988 and at Lower Granite Dam in 1989.

To determine the hatchery/wild composition of the Snake River spring/summer chinook salmon population, NMFS and the Oregon Department of Fish and Wildlife began a study in 1991 to examine scales on smolts and returning adults (Achord et al. 1992). In particular, the study was intended to examine the hatchery/wild composition of each marked group of smolts for the transportation study and subsequently, to examine the scales of those returning as adults. Since drought conditions precluded marking of smolts for the 1991 and 1992 study years, we sampled scales from adults returning from previous marking efforts and from the general population. Results of the 1992 effort are reported in Appendix B of this report.

Methods

General

Smolts at both dams were marked with CWTs and freeze brands during the smolt outmigration each year, and either transported by barge for release below Bonneville Dam or released as controls below Little Goose or McNary Dams. Smolts were marked according to the procedures described by Matthews et al. (1987).

Recovery of Adults and Data Analysis

Adults were recovered from 3 to 6 years (depending upon species and study site) after their release as juveniles. Traps in fish ladders at Lower Granite and Priest Rapids Dams (for

McNary Dam releases) were the primary recovery sites for spring/summer chinook salmon and steelhead. Ocean and river commercial fisheries were primary recovery sites for fall chinook salmon marked at McNary Dam. If recoveries were sufficient, trapping efficiencies were estimated for individual release lots by comparing the number of marked trap recoveries to the total number of marked fish returning to the hatcheries and, when available, to tributary sport fisheries and natal spawning areas.

Evaluation of transportation was based upon recovery rates of adults and associated transport/control ratios (T/C) from fish marked as juveniles. A 95% confidence interval (CI) was used to test the null hypothesis: That the true transport to control ratio was equal to one (1). If the 95% CI did not include a ratio equal to one (1), then the null hypothesis was rejected. Beginning at Lower Granite Dam in 1989, the study design was adjusted to test a T/C of 1.5 with a coefficient of variation of 10% for spring/summer chinook salmon and 7.5% for steelhead.

To normalize the distribution, the ratios were log transformed prior to CI construction. The endpoints of the CI were then back transformed to provide a nonsymmetric CI on the original scale. For analysis of total recoveries, the CI was calculated using both theoretical and empirical estimates of variance. The CI employing the empirical variance estimate was preferred.

The 95% CI using transformed data based on theoretical variance was derived by the following term:

$$\ln(T/C) \pm 1.96\sqrt{\frac{1}{n_t}+\frac{1}{n_c}-\frac{1}{N_t}-\frac{1}{N_c}}$$

The 95% CI was back-transformed to its original scale using the following term:

$$\left(e^{\ln(T/C) - 1.96\sqrt{\frac{1}{n_t}+\frac{1}{n_c}-\frac{1}{N_t}-\frac{1}{N_c}}} , e^{\ln(T/C) + 1.96\sqrt{\frac{1}{n_t}+\frac{1}{n_c}-\frac{1}{N_t}-\frac{1}{N_c}}} \right)$$

The 95% CI using transformed data based on empirical variance was derived by the following term:

$$\ln(T/C) \pm t_{0.05}{}^{n-1}\, S.E.(\ln(T/C))$$

The 95% CI back transformed to the original scale was derived by the following term:

$$\left(e^{\ln(T/C) - t_{0.05}{}^{n-1}\, S.E.(\ln(T/C))} , e^{\ln(T/C) + t_{0.05}{}^{n-1}\, S.E.(\ln(T/C))} \right)$$

where,

T/C = overall transport recovery percentage divided by overall control recovery percentage

$S.E.$ = standard deviation of the r replicate ln(T/C)'s divided by $r^{1/2}$

n_t = total of transport recoveries

n_c = total of control recoveries

N_t = total of transport releases

N_c = total of control releases

t = the t probability for a two-sided significance level $\alpha = 0.05$ and n-1 degrees of freedom

1.96 = the normal probability for a two-sided $\alpha = 0.05$

Results and Discussion

Adult Recoveries for Lower Granite Dam Studies

Spring/summer chinook salmon--Adult recoveries from transport and control groups of naturally migrating smolts marked at Lower Granite Dam in 1989 are complete (Appendix Tables 1.0 through 2.12 and Table 1). Lower Granite Dam was used as the principal evaluation point for adult recoveries because the entire adult migration can be systematically sampled as it passes over the dam. In addition, we were only capable of marking the numbers of juveniles required for a precise evaluation of adult returns back to this point. Sites further upstream also were sampled for recoveries; however, these sites were not relied upon for precise results due to the extremely large numbers of marked juveniles that would have been required to provide credible results. In addition, we did not compute a T/C for total adult returns because this sample included hatchery recoveries that we strongly suspect were not obtained systematically.

At Lower Granite Dam, we recovered 46 transports (0.06% of the release) and 28 controls (0.02% of the release). Using emperical standard errors, we calculated the T/C at 2.4, with a 95% CI between 1.4 and 4.3. The 95% CI was wider than desired because adult returns of study fish in both test groups were about three times lower than expected, as were the adult returns

Table 1.--Summary of recovered adult spring/summer chinook salmon marked at Lower Granite Dam in 1989 (recoveries through February 1993). Numbers in parentheses represent fish that were jaw tagged at the dams and subsequently recovered upstream.

			Observed adult returns										
							L. Granite Dam					Total	
Groups	Number released	Ocean-age	Ocean fishery	Bonneville Dam	River fishery	Indian fishery	N	%	Hatcheries	Priest Rapids Dam	Stream surveys	N	%
Transport	75,295	1	0	0	0	0	3	0.00	1	0	0	4	0.01
		2	0	2	0	1	24 (6)	0.03	15	0	1	37	0.05
		3	0	0	0	0	19 (3)	0.03	7	0	0	23	0.03
		Total	0	2	0	1	46 (9)	0.06	23	0	1	64*	0.08
Control	107,176	1	0	1	0	0	2 (2)	0.00	2	0	0	3	0.00
		2	0	1 (2)	0	1	15 (4)	0.01	8	2	0	23	0.02
		3	0	0	1	2	11 (4)	0.01	3	0	1	13	0.01
		Total	0	2 (2)	1	3	28 (10)	0.02	13	2	1	38*	0.04

* Fish captured more than once were only counted once in totals.

of the general population from the 1989 smolt outmigration. The same pattern is noted below for adult steelhead returns from the 1989 smolt outmigration.

During spring 1990, we marked a barge index group of spring/summer chinook salmon smolts at Lower Granite Dam. Observed recoveries of age-1-ocean and age-2-ocean adults at Lower Granite Dam totaled 79 or 0.18% of the release (Appendix Tables 3.0 through 3.7 and Table 2). Returns of these age-classes to all other recovery sites are incomplete. We will continue to monitor adult recoveries from this group. When complete, we expect adult returns of this marked group to be the highest since returns from the transport group marked in 1975.

We continued monitoring the prevalence of marine mammal tooth and claw abrasions on adult spring/summer chinook salmon during 1992 (Table 3). Overall, prevalence averaged 15.0%, with open wounds noted on approximately one-third of the fish with abrasions. As in past years, the prevalence of abrasions was generally higher during the earliest portion of the run (Matthews et al. 1992). Average abrasion prevalence for 1992 was similar to that of 1991 (Achord et al. 1992) and slightly lower than for 1990 (Matthews et al. 1992). Our concern about the potential negative effects of marine mammals on the depressed runs of wild Snake River spring/summer chinook salmon continues.

Steelhead--Adult recoveries of steelhead smolts marked in 1989 are ongoing and are much lower than expected. Age-2-ocean adults returned during fall 1991 and spring 1992 (Appendix Tables

Table 2.--Preliminary summary of recovered adult spring/summer chinook salmon marked at Lower Granite Dam in 1990 (recoveries through February 1993). Numbers in parentheses represent fish that were jaw-tagged at the dams and subsequently recovered upstream.

Group	Number released	Ocean-age	Observed adult returns									
			Ocean fishery	Bonneville Dam	River fishery	Indian fishery	L. Granite Dam		Hatcheries	Stream surveys	Total	
							N	%			N	%
Transport	44,708	1	0	0	0	0	8 (1)	0.02	7	0	14	0.03
		2	0	4 (3)	1	0	71 (14)	0.16	31	0	90	0.20
		Total	0	4 (3)	1	0	79 (15)	0.18	38	0	104*	0.23

* Fish captured more than once were only counted once in totals.

Table 3.--Weekly prevalence (9 April to 26 June) of marine mammal tooth and claw abrasions on adult spring/summer chinook salmon at Lower Granite Dam in 1992.

Date	Sample size	Incidence (%)
9-11 Apr	5	0.0
12-18 Apr	63	21.0
19-25 Apr	333	14.0
26 Apr-2 May	498	19.0
3-9 May	405	19.0
10-16 May	438	19.0
17-23 May	428	15.0
24-30 May	209	15.0
31 May-6 June	323	13.0
7-13 June	228	4.0
14-20 June	237	6.0
21-26 June	88	3.0
Total and average	3,255	15.0*

* Open wounds were associated with 36.4% of the abrasions.

4.0 through 5.6 and Table 4), and few age-3-ocean adult returns are expected in 1992-93. Total adult recoveries to Lower Granite Dam for transport and control groups were 163 (0.5% of the release) and 108 (0.3% of the release), respectively, for a preliminary T/C of 2.1. Adult returns to all recovery sites combined were 194 transports (0.54% of the release) and 123 controls (0.26% of the release). So far, return rates of marked adult steelhead in both test groups have been about one-third of the rate expected, as were the adult returns in general for steelhead smolts that outmigrated in spring 1989. As previously noted, the same pattern was apparent for the 1989 smolt outmigration of spring/summer chinook salmon. Achord et al. (1992) suggested that poor estuary/ocean survival of smolts likely accounted for the low adult returns from the 1989 outmigration.

Adult Recoveries for McNary Dam Studies

Spring chinook salmon--Adult recoveries of spring chinook salmon marked as smolts at McNary Dam in 1986-88 are complete. Final returns for study years 1986 and 1987 were reported previously (Achord et al. 1992, Matthews et al. 1992). Adult recoveries of 1986 releases were insufficient for analysis. While results of the 1987 study suggested a survival benefit from transportation of spring chinook salmon smolts at McNary Dam, T/Cs varied greatly among recovery sites, and theoretical 95% CIs overlapped one (1) in most cases.

Adult recoveries from the 1988 study year are presented in

Table 4.--Preliminary summary of recovered adult steelhead marked at Lower Granite Dam in 1989 (recoveries through February 1993). Numbers in parentheses represent fish that were jaw tagged at the dam and subsequently recovered upstream.

			Observed adult returns							
						Lower Granite Dam			Total	
Groups	Number released	Ocean-age	Bonneville Dam	Indian fishery	River fishery	N	%	Hatcheries	N	%
Transport	30,116	1	0	2	5	33 (8)	0.11	8	40	0.13
		2	0	16	38	129 (44)	0.43	13	152	0.50
		3	0	1	1	1 (1)	0.00	0	2	0.01
		Total	0	19	44	163 (53)	0.54	21	194*	0.64
Control	42,259	1	1	2	9	33 (14)	0.08	5	36	0.09
		2	0	5	22	71 (23)	0.17	7	82	0.19
		3	0	1	0	4	0.01	0	5	0.01
		Total	1	8	31	108 (37)	0.26	12	123*	0.29

* Fish captured more than once were only counted once in totals.

Appendix Tables 6.0 through 7.10 and Table 5. An empirical CI was constructed for total combined recoveries. The combined 1.6 T/C, with an empirical 95% CI between 1.0 and 2.6, suggests a benefit from transporting smolts from McNary Dam in 1988.

In summary, although 95% CI values were wide and overlapped one and the number of recoveries from a variety of locations was small, the T/C estimates for the 1987 and 1988 study years suggested a survival benefit from transportation of spring chinook salmon smolts from McNary Dam. Further testing will be required if finer statistical resolution is desired. Future testing should include greatly increased numbers of marked smolts and establish a systematic adult recovery plan.

Fall chinook salmon--Adult returns of fall chinook salmon released as juvenile transport and control groups from McNary Dam in 1986 are complete (Appendix Tables 8.0 through 9.12 and Table 6). A total of 444 transports and 165 controls were recovered from all sites combined. We constructed 95% CIs using empirical standard errors (Table 7). The data showed significant transport benefits and very similar T/Cs at all recovery sites except the combined hatcheries. However, the combined CWT hatchery recoveries were predominated by recoveries from Priest Rapids Hatchery. The overall recoveries from this hatchery were further predominated by recoveries from the first five replicates of juveniles marked from 11 June to 15 July at McNary Dam. The T/Cs in the ocean fisheries were low and similar to the T/Cs at Priest Rapids Hatchery for these early replicates. We also examined the

Table 5.--Summary of recovered adult spring/summer chinook salmon marked at McNary Dam in 1988 (recoveries through February 1993). Numbers in parentheses represent fish that were jaw-tagged at the dams and subsequently recovered upstream.

Groups	Number released	Ocean-age	Observed adult returns: Ocean fishery	Bonneville Dam	River fishery	Indian fishery	Priest R. Dam	L.Granite Dam	Hatcheries	Stream surveys	Total N	Total %
Transport	50,028	1	0	2	0	0	0	3	1	0	6	0.01
		2	1	17 (3)	6	3	10 (2)	5 (3)	12	5	51	0.10
		3	1	3 (1)	2	3	0	2	0	0	10	0.02
		Total	2	22 (4)	8	6	10 (2)	10 (3)	13	5	67*	0.13
Control	75,036	1	0	1 (2)*	0	0	1	1	1	0	2	0.00
		2	0	23 (3)	5	4	14 (2)	6 (1)	7	2	56	0.07
		3	0	5	1	2	0	1	0	1	10	0.01
		Total	0	29 (5)	6	6	15 (2)	8 (1)	8	3	68*	0.09

* Fish captured more than once were only counted once in totals.

Table 6.--Summary of recovered adult fall chinook salmon marked at McNary Dam in 1986 (recoveries through February 1993). Numbers in parentheses represent fish that were jaw-tagged at the dam and subsequently recovered upstream.

Groups	Number released	Ocean-age	Observed adult returns: Ocean fishery	Bonneville Dam		River fishery	Indian fishery	Priest R. Dam	L. Granite Dam	Hatcheries	Stream surveys	Total N	Total %
Transport	114,653	1	2	0		6	0	0	0	8	0	16	0.01
		2	28	4		2	0	0	0	9	0	43	0.04
		3	42	0		17	36	0	0	27	4	126	0.11
		4	84	56	(16)	22	69	0	1	15	5	236	0.21
		5	9	4	(2)	6	2	0	0	3	1	23	0.02
		Total	165	64	(18)	53	107	0	1	62	10	444*	0.39
Control	115,991	1	1	0		1	0	0	0	3	1	6	0.01
		2	11	4		0	0	0	0	8	0	23	0.02
		3	24	0		9	16	0	0	18	0	67	0.06
		4	19	11	(3)	5	19	0	0	12	2	65	0.06
		5	0	2	(1)	1	0	1	0	1	0	4	0.00
		Total	55	17	(4)	16	35	1	0	42	3	165*	0.14

* Fish captured more than once were only counted once in totals.

Table 7.--Summary of T/Cs and 95% CIs for adult recoveries of fall chinook salmon marked as smolts at McNary Dam in 1986.

Recovery site	T/C	Empirical 95% CI
Ocean fishery	3.0	(1.7, 5.4)
River fishery	3.4	(1.8, 6.2)
Bonneville Dam	3.8	(1.3, 11.1)
Indian fishery	3.1	(1.2, 7.8)
Hatcheries	1.5	(0.4, 5.9)
Spawning grounds	3.3	(---, ---)*
Combined	2.8	(1.4, 5.6)

* Insufficient adult recoveries to estimate.

1986 study results using expanded catch data provided by the Pacific States Marine Fisheries Commission. The effect of expansion on data symmetry was trivial. This is not surprising since both test groups represented the same population, and considering the nature of subyearling salmon migrations, their time of ocean entry was likely similar.

Adult recoveries of fall chinook salmon released in 1987 total 371 transports (0.5% of the release) and 101 controls (0.2% of the release) (Appendix Tables 10.0 through 11.7 and Table 8). These preliminary data indicate a substantial survival benefit for transported fish. When recoveries of age-5-ocean adults and other late-arriving data are processed, we will provide a statistical analysis of the results.

There are only a few returns from the 1988 study year, with 52 transport and 12 control fish recaptured (Appendix Tables 12.0 through 13.6 and Table 8). We expect to receive many more CWT recoveries from this study within the next 2 to 3 years.

STEELHEAD RELEASE-SITE STUDY

Introduction

There is a growing body of evidence suggesting that survival of juvenile salmonids can be enhanced by releasing them into upper areas of estuaries rather than farther upstream in freshwater areas. In Scandanavian countries, releases of hatchery-reared Atlantic salmon (*Salmo salar*) smolts directly into estuarine waters have resulted in increased survival

Table 8.--Preliminary summary of recovered adult fall chinook salmon marked at McNary Dam in 1987 and 1988 (recoveries through February 1993). Numbers in parentheses represent fish that were jaw-tagged at the dam and subsequently recovered upstream.

Groups	Number released	Ocean-age	Observed adult returns: Ocean fishery	Bonneville Dam	River fishery	Indian fishery	Priest Rapids Dam	Hatcheries	Stream surveys	Total N	Total %
1987 Transport	68,376	1	8	24	1	0	0	6	2	41	0.06
		2	12	0	6	7	0	8	4	37	0.05
		3	65	38 (12)	12	49	0	8	9	169	0.25
		4	46	23 (6)	22	31	1	4	0	121	0.18
		5	0	2	0	1	0	0	0	3	0.00
		Total	131	87 (18)	41	88	1	26	15	371*	0.54
1987 Control	68,291	1	4	8	1	0	0	4	0	17	0.02
		2	2	0	0	1	0	4	0	7	0.01
		3	17	17 (7)	3	14	0	6	0	50	0.07
		4	6	5 (3)	6	5	0	4	4	27	0.04
		5	0	0	0	0	0	0	0	0	0.00
		Total	29	30 (10)	10	20	0	18	4	101*	0.15
1988 Transport	60,013	1	1	0	1	0	0	1	0	3	0.00
		2	5	3 (2)	1	1	0	1	0	9	0.01
		3	9	4	6	5	0	3	1	28	0.04
		4	0	4	4	4	0	0	0	12	0.02
		Total	15	11 (2)	12	10	0	5	1	52*	0.09
1988 Control	60,010	1	0	0	0	0	0	1	0	1	0.00
		2	2	2	1	2	0	0	0	7	0.01
		3	0	1	0	1	0	0	1	3	0.00
		4	0	1	0	0	0	0	0	1	0.00
		Total	2	4	1	3	0	1	1	12*	0.02

* Fish captured more than once were only counted once in totals.

compared to similar releases in fresh water (Gunnerod et al. 1988). Macdonald et al. (1988) and Levings et al. (1989) speculated that increased survival of salmonid juveniles released into estuarine areas was related to decreased predation and stress, increased food availability, and ease of osmoregulation in the estuary. In a 5-year study, Solazzi et al. (1991) released hatchery-reared coho salmon (*O. kisutch*) immediately below Bonneville Dam (control), at Tongue Point (upper intrusion of salt water in the estuary), and at several locations farther into the Columbia River plume. They reported a survival rate 1.6 times higher for fish released at Tongue Point than for the control group.

After release at the site immediately below Bonneville Dam, smolts transported from the Snake River must migrate approximately 150 km through the lower Columbia River before arriving at the estuary. Although the river is free-flowing in this reach, the area is known to harbor large numbers of predators, primarily northern squawfish (*Ptychocheilus oregonensis*) and various avian species. The studies mentioned above suggest that mortality from predation alone may be of sufficient magnitude to warrant the additional transport distance.

In spring 1992, we began a study to determine if steelhead smolts transported by barge and released in the upper estuary at Tongue Point will return as adults to Lower Granite Dam in significantly greater numbers than those transported by barge and

released at the traditional site near Skamania Light just downstream from Bonneville Dam. Spring/summer chinook salmon were not included in the present study because excessively large numbers of marked smolts are required to detect small differences in survival for this species. Depending upon the results of the study for steelhead, spring/summer chinook salmon may be tested in the future. Results of the first year of marking and release are reported here.

Methods

All sampling and marking was conducted using a new fish-handling system that we designed and installed adjacent to the upstream (new) raceways at Lower Granite Dam. The system included a preanesthesia handling method (Matthews et al.1986). With the new facilities, the large numbers of smolts required for transportation research were sorted and marked without impacting other sampling and fish-handling activities at the collection facility. Fish used in the study were systematically sampled from the population passing from the fish and debris separator at the juvenile fish collection and handling facility. Two of the upstream raceways were used to collect and hold sampled fish prior to marking.

Much of the basic marking methodology was the same as previously described (Matthews et al. 1987). Sufficient numbers of smolts were marked to test a T/C of 1.1 with a coefficient of variation of 5.0%. For this study, the Tongue Point releases

were considered test groups and Skamania Light releases were considered control groups. Fish for each release lot were marked and transferred into a raceway during one day, and loaded onto a barge the next day. For the Tongue Point releases, additional fish were loaded onto the 2000-series barges so that hauling densities approached those on the barge used for the Skamania Light releases. Samples of marked smolts were held periodically for 24 hours to measure post-marking delayed mortality and tag loss.

Both older, 2000-series barges pmus an additional tugboat were required for this study. Each of the 2000-series barges was used in tandem with a larger barge for the trip from Lower Granite Dam to Bonneville Dam. Once at Bonneville Dam, the additional tugboat moved each 2000-series barge, with the test group (Tongue Point release), downstream to the release site. The tug returned the empty barge to Bonneville Dam for reattachment to a larger barge returning to Lower Granite Dam. The 2000-series barges were used only for the Tongue Point releases because their compartments cannot be emptied independently. The Skamania Light releases were transported in and released from barges used during normal transport operations. The marking was scheduled so that 2000-series barges were at opposite ends of the transport cycle at any given time.

Adults will be recovered in each of 3 years following the juvenile releases. Lower Granite Dam will be the primary evaluation point. Statistical analysis of the results will be

the same as previously described for the other transportation studies.

Results and Discussion

Between 1 and 20 May, we marked 7 release lots of approximately 19,000 steelhead each with CWTs, freeze brands, and left ventral fin clips, for a total of 135,661 marked fish (Appendix Table 14.0). Lots consisted of approximately 10,000 steelhead smolts each for release at Skamania Light and 9,000 steelhead smolts each for release in the upper estuary near Tongue Point. Both test groups of fish marked on 3 May were released at Skamania Light in order to expedite the return of both barges to Lower Granite Dam. The barges were needed for mass transport of an unexpectedly large number of smolts that had arrived at the dam. Therefore, adult returns from the 3 May releases will not be used to calaculate survival ratios. To satisfy the experimental design, an additional release lot of each group was subsequently marked and released.

Post-marking delayed mortality and tag loss were low, averaging 0.7% and 0.5%, respectively (Appendix Table 15.0). The delayed mortality value is one of the lowest we have measured for handled/marked steelhead smolts. The new, temporary handling/marking system at Lower Granite Dam performed exceptionally well, giving us the capability of safely handling and marking very large numbers of smolts.

To complete the study, we need to mark steelhead smolts from

at least two additional outmigrations. Assuming no delays or other complications, complete adult returns for the 3-year study would be available in spring 1998.

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Appendix A

Data Tables

Appendix Table 1.0.--Summary of all recoveries of adult spring chinook salmon released as juveniles below Little Goose Dam in 1989.

Master File Date : 22 February 1993
RELEASE GROUPS INCLUDED: 8907A 8907B 8907C 8907D 8907E 8907F 8907G 8907H 8907I 8907J 8907K 8907L

1989 L.GRANITE TRANS CONTROL BELOW L.GOOSE

SPRING CHINOOK

Brands Used: LA2 1 LA2 2 LA2 3 LA2 4 LART1 LART2 LART3 LART4 LA3 1 LA3 2 LA3 3 LA3 4
Wire Codes Used: 232256 232258 232349 232350 232351 232352 232411 232412 232413 232414 232415 232415

NUMBER RELEASED: 107176

RECOVERY AREA	YEAR OF RETURN 1989	1990	1991	1992	1993	TOTAL	% RETURN
RIVER SYSTEM TRAPS							
BONNEVILLE TRAP	0	1	1	0	0	2	0.002
LOWER GRANITE TRAP	0	2	15	11	0	28	0.026
PRIEST RAPIDS TRAP	0	0	2	0	0	2	0.002
OCEAN FISHERIES	0	0	0	0	0	0	0.000
RIVER SPORT							
SNAKE R.	0	0	0	1	0	1	0.001
RIVER COMMERCIAL	0	0	0	0	0	0	0.000
INDIAN FISHERIES							
INDIAN CEREMONIAL	0	0	1	2	0	3	0.003
HATCHERIES							
DWORSHAK H.	0	1	1	0	0	2	0.002
PAHSIMEROI H.	0	0	3	0	0	3	0.003
RAPID RIVER H.	0	1	2	3	0	6	0.006
SAWTOOTH H. AND TRAP	0	0	1	0	0	1	0.001
SOUTH FORK SALMON TRAP	0	0	1	0	0	1	0.001
STREAM SURVEY	0	0	0	1	0	1	0.001
TOTALS	0	5	27	18	0	50	0.047
PERCENT OF RECOVERY %	0.0	10.0	54.0	36.0	0.0		

Appendix Table 1.1.--Recoveries of adult spring chinook salmon released as juveniles below Little Goose Dam from 7 to 14 April 1989.

Master File Date : 22 February 1993
RELEASE GROUPS INCLUDED: 8907A

1989 L.GRANITE TRANS CONTROL BELOW L.GOOSE

SPRING CHINOOK

Brands Used: LA2 1
Wire Codes Used: 232256

NUMBER RELEASED: 10016

RECOVERY AREA		YEAR OF RETURN 1989	1990	1991	1992	1993	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
LOWER GRANITE TRAP		0	1	1	0	0	2	0.020
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 FISHERIES								
INDIAN CEREMONIAL		0	0	1	0	0	1	0.010
HATCHERIES								
DWORSHAK H.		0	1	0	0	0	1	0.010
RAPID RIVER H.		0	0	1	0	0	1	0.010
STREAM SURVEY		0	0	0	0	0	0	0.000
TOTALS		0	2	3	0	0	5	0.050
PERCENT OF RECOVERY	%	0.0	40.0	60.0	0.0	0.0		

Appendix Table 1.2.--Recoveries of adult spring chinook salmon released as juveniles below Little Goose Dam from 14 to 16 April 1989.

Master File Date : 22 February 1993
RELEASE GROUPS INCLUDED: 8907B

1989 L.GRANITE TRANS CONTROL BELOW L.GOOSE

SPRING CHINOOK

Brands Used: LA2 2
Wire Codes Used: 232258

NUMBER RELEASED: 10085

RECOVERY AREA		YEAR OF RETURN 1989	1990	1991	1992	1993	TOTAL	% RETURN
RIVER SYSTEM TRAPS PRIEST RAPIDS TRAP		0	0	1	0	0	1	0.010
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 FISHERIES		0	0	0	0	0	0	0.000
HATCHERIES		0	0	0	0	0	0	0.000
STREAM SURVEY		0	0	0	0	0	0	0.000
TOTALS		0	0	1	0	0	1	0.010
PERCENT OF RECOVERY	%	0.0	0.0	100.0	0.0	0.0		

Appendix Table 1.3.--Recoveries of adult spring chinook salmon released as juveniles below Little Goose Dam from 17 to 18 April 1989.

Master File Date : 22 February 1993
RELEASE GROUPS INCLUDED: 8907C

1989 L.GRANITE TRANS CONTROL BELOW L.GOOSE

SPRING CHINOOK

Brands Used: LA2 3
Wire Codes Used: 232349

NUMBER RELEASED: 9831

RECOVERY AREA		YEAR OF RETURN 1989	1990	1991	1992	1993	TOTAL	% RETURN
RIVER SYSTEM TRAPS LOWER GRANITE TRAP		0	0	2	1	0	3	0.031
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 FISHERIES		0	0	0	0	0	0	0.000
HATCHERIES		0	0	0	0	0	0	0.000
STREAM SURVEY		0	0	0	0	0	0	0.000
TOTALS		0	0	2	1	0	3	0.031
PERCENT OF RECOVERY	%	0.0	0.0	66.7	33.3	0.0		

Appendix Table 1.4.--Recoveries of adult spring chinook salmon released as juveniles below Little Goose Dam from 20 to 21 April 1989.

Master File Date : 22 February 1993
RELEASE GROUPS INCLUDED: 8907D

1989 L.GRANITE TRANS CONTROL BELOW L.GOOSE

SPRING CHINOOK

Brands Used: LA2 4
Wire Codes Used: 232350

NUMBER RELEASED: 10043

RECOVERY AREA		YEAR OF RETURN 1989	1990	1991	1992	1993	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
LOWER GRANITE TRAP		0	0	6	4	0	10	0.100
OCEAN FISHERIES		0	0	0	0	0	0	0.000
RIVER SPORT								
SNAKE R.		0	0	0	1	0	1	0.010
RIVER COMMERCIAL		0	0	0	0	0	0	0.000
INDIAN FISHERIES		0	0	0	0	0	0	0.000
HATCHERIES								
DWORSHAK H.		0	0	1	0	0	1	0.010
RAPID RIVER H.		0	0	1	2	0	3	0.030
SANTOOTH H. AND TRAP		0	0	1	0	0	1	0.010
STREAM SURVEY		0	0	0	1	0	1	0.010
TOTALS		0	0	9	8	0	17	0.169
PERCENT OF RECOVERY	%	0.0	0.0	52.9	47.1	0.0		

Appendix Table 1.5.--Recoveries of adult spring chinook salmon released as juveniles below Little Goose Dam from 21 to 22 April 1989.

Master File Date : 22 February 1993
RELEASE GROUPS INCLUDED: 8907E

1989 L.GRANITE TRANS CONTROL BELOW L.GOOSE

SPRING CHINOOK

Brands Used: LART1
Wire Codes Used: 232351

NUMBER RELEASED: 10184

RECOVERY AREA		YEAR OF RETURN 1989	1990	1991	1992	1993	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
LOWER GRANITE TRAP		0	1	2	0	0	3	0.029
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 FISHERIES		0	0	0	0	0	0	0.000
HATCHERIES								
PAHSIMEROI H.		0	0	1	0	0	1	0.010
RAPID RIVER H.		0	1	0	0	0	1	0.010
STREAM SURVEY		0	0	0	0	0	0	0.000
TOTALS		0	2	3	0	0	5	0.049
PERCENT OF RECOVERY	%	0.0	40.0	60.0	0.0	0.0		

Appendix Table 1.6.--Recoveries of adult spring chinook salmon released as juveniles below Little Goose Dam on 24 April 1989.

Master File Date : 22 February 1993
RELEASE GROUPS INCLUDED: 8907G

1989 L.GRANITE TRANS CONTROL BELOW L.GOOSE

SPRING CHINOOK

Brands Used: LART3
Wire Codes Used: 232411

NUMBER RELEASED: 10123

RECOVERY AREA	YEAR OF RETURN 1989	1990	1991	1992	1993	TOTAL	% RETURN
RIVER SYSTEM TRAPS							
LOWER GRANITE TRAP	0	0	1	1	0	2	0.020
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 FISHERIES	0	0	0	0	0	0	0.000
HATCHERIES							
PAHSIMEROI H.	0	0	1	0	0	1	0.010
STREAM SURVEY	0	0	0	0	0	0	0.000
TOTALS	0	0	2	1	0	3	0.030
PERCENT OF RECOVERY %	0.0	0.0	66.7	33.3	0.0		

Appendix Table 1.7.--Recoveries of adult spring chinook salmon released as juveniles below Little Goose Dam from 25 to 26 April 1989.

Master File Date : 22 February 1993
RELEASE GROUPS INCLUDED: 8907H

1989 L.GRANITE TRANS CONTROL BELOW L.GOOSE

SPRING CHINOOK

Brands Used: LART4
Wire Codes Used: 232412

NUMBER RELEASED: 10005

RECOVERY AREA		YEAR OF RETURN 1989	1990	1991	1992	1993	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
LOWER GRANITE TRAP		0	0	0	1	0	1	0.010
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 FISHERIES								
INDIAN CEREMONIAL		0	0	0	2	0	2	0.020
HATCHERIES								
RAPID RIVER H.		0	0	0	1	0	1	0.010
STREAM SURVEY		0	0	0	0	0	0	0.000
TOTALS		0	0	0	4	0	4	0.040
PERCENT OF RECOVERY	%	0.0	0.0	0.0	100.0	0.0		

Appendix Table 1.8.--Recoveries of adult spring chinook salmon released as juveniles below Little Goose Dam from 26 to 28 April 1989.

Master File Date : 22 February 1993
RELEASE GROUPS INCLUDED: 89071

1989 L.GRANITE TRANS CONTROL BELOW L.GOOSE

SPRING CHINOOK

Brands Used: LA3 1
Wire Codes Used: 232413

NUMBER RELEASED: 10058

RECOVERY AREA	YEAR OF RETURN 1989	1990	1991	1992	1993	TOTAL	% RETURN
RIVER SYSTEM TRAPS							
BONNEVILLE TRAP	0	0	1	0	0	1	0.010
LOWER GRANITE TRAP	0	0	1	3	0	4	0.040
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 FISHERIES	0	0	0	0	0	0	0.000
HATCHERIES							
PAHSIMEROI H.	0	0	1	0	0	1	0.010
SOUTH FORK SALMON TRAP	0	0	1	0	0	1	0.010
STREAM SURVEY	0	0	0	0	0	0	0.000
TOTALS	0	0	4	3	0	7	0.070
PERCENT OF RECOVERY %	0.0	0.0	57.1	42.9	0.0		

Appendix Table 1.9.--Recoveries of adult spring chinook salmon released as juveniles below Little Goose Dam from 28 April to 11 May 1989.

Master File Date : 22 February 1993
RELEASE GROUPS INCLUDED: 8907J

1989 L.GRANITE TRANS CONTROL BELOW L.GOOSE

SPRING CHINOOK

Brands Used: LA3 2
Wire Codes Used: 232414

NUMBER RELEASED: 10213

RECOVERY AREA		YEAR OF RETURN 1989	1990	1991	1992	1993	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
LOWER GRANITE TRAP		0	0	2	0	0	2	0.020
PRIEST RAPIDS TRAP		0	0	1	0	0	1	0.010
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 FISHERIES		0	0	0	0	0	0	0.000
HATCHERIES		0	0	0	0	0	0	0.000
STREAM SURVEY		0	0	0	0	0	0	0.000
TOTALS		0	0	3	0	0	3	0.029
PERCENT OF RECOVERY	%	0.0	0.0	100.0	0.0	0.0		

Appendix Table 1.10.--Recoveries of adult spring chinook salmon released as juveniles below Little Goose Dam on 27 May 1989.

Master File Date : 22 February 1993
RELEASE GROUPS INCLUDED: 8907L

1989 L.GRANITE TRANS CONTROL BELOW L.GOOSE

SPRING CHINOOK

Brands Used: LA3 4
Wire Codes Used: 232415

NUMBER RELEASED: 1129

RECOVERY AREA		YEAR OF RETURN 1989	1990	1991	1992	1993	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
BONNEVILLE TRAP		0	1	0	0	0	1	0.089
LOWER GRANITE TRAP		0	0	0	1	0	1	0.089
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 FISHERIES		0	0	0	0	0	0	0.000
HATCHERIES		0	0	0	0	0	0	0.000
STREAM SURVEY		0	0	0	0	0	0	0.000
TOTALS		0	1	0	1	0	2	0.177
PERCENT OF RECOVERY	%	0.0	50.0	0.0	50.0	0.0		

Appendix Table 2.0.--Summary of all recoveries of adult spring chinook salmon transported as juveniles from Lower Granite Dam to below Bonneville Dam in 1989.

Master File Date : 22 February 1993
RELEASE GROUPS INCLUDED: 8908A 8908B 8908C 8908D 8908E 8908F 8908G 8908H 8908I 8908J 8908K 8908L

1989 L.GRANITE TRANS BARGE BELOW BONNEVILLE

SPRING CHINOOK

Brands Used: RAF 1 RAF 2 RAF 3 RAF 4 RA9 1 RA9 2 RA9 3 RA9 4 RASU1 RASU2 RASU3 RASU4
Wire Codes Used: 232252 232259 232262 232309 232310 232311 232312 232313 232340 232354 232251 232251

NUMBER RELEASED: 75295

RECOVERY AREA	YEAR OF RETURN 1989	1990	1991	1992	1993	TOTAL	% RETURN
RIVER SYSTEM TRAPS							
BONNEVILLE TRAP	0	0	2	0	0	2	0.003
LOWER GRANITE TRAP	0	3	24	19	0	46	0.061
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 FISHERIES							
INDIAN CEREMONIAL	0	0	1	0	0	1	0.001
HATCHERIES							
DWORSHAK H.	0	0	0	1	0	1	0.001
RAPID RIVER H.	0	1	12	5	0	18	0.024
LOOKINGGLASS H.	0	0	1	0	0	1	0.001
SAWTOOTH H. AND TRAP	0	0	2	1	0	3	0.004
STREAM SURVEY	0	0	1	0	0	1	0.001
TOTALS	0	4	43	26	0	73	0.097
PERCENT OF RECOVERY %	0.0	5.5	58.9	35.6	0.0		

Appendix Table 2.1.--Recoveries of adult spring chinook salmon transported as juveniles from Lower Granite Dam to below Bonneville Dam from 11 to 13 April 1989.

Master File Date : 22 February 1993
RELEASE GROUPS INCLUDED: 8908A

1989 L.GRANITE TRANS BARGE BELOW BONNEVILLE

SPRING CHINOOK

Brands Used: RAF 1
Wire Codes Used: 232252

NUMBER RELEASED: 7083

RECOVERY AREA		YEAR OF RETURN 1989	1990	1991	1992	1993	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
LOWER GRANITE TRAP		0	0	0	1	0	1	0.014
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 FISHERIES		0	0	0	0	0	0	0.000
HATCHERIES								
DWORSHAK H.		0	0	0	1	0	1	0.014
RAPID RIVER H.		0	1	0	0	0	1	0.014
STREAM SURVEY		0	0	0	0	0	0	0.000
TOTALS		0	1	0	2	0	3	0.042
PERCENT OF RECOVERY	%	0.0	33.3	0.0	66.7	0.0		

Appendix Table 2.2.--Recoveries of adult spring chinook salmon transported as juveniles from Lower Granite Dam to below Bonneville Dam from 15 to 17 April 1989.

Master File Date : 22 February 1993
RELEASE GROUPS INCLUDED: 8908B

1989 L.GRANITE TRANS BARGE BELOW BONNEVILLE

SPRING CHINOOK

Brands Used: RAF 2
Wire Codes Used: 232259

NUMBER RELEASED: 7439

RECOVERY AREA		YEAR OF RETURN 1989	1990	1991	1992	1993	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
LOWER GRANITE TRAP		0	0	3	4	0	7	0.094
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 FISHERIES								
INDIAN CEREMONIAL		0	0	1	0	0	1	0.013
HATCHERIES								
RAPID RIVER H.		0	0	2	1	0	3	0.040
STREAM SURVEY		0	0	0	0	0	0	0.000
TOTALS		0	0	6	5	0	11	0.148
PERCENT OF RECOVERY	%	0.0	0.0	54.5	45.5	0.0		

Appendix Table 2.3.--Recoveries of adult spring chinook salmon transported as juveniles from Lower Granite Dam to below Bonneville Dam on 18 April 1989.

Master File Date : 22 February 1993
RELEASE GROUPS INCLUDED: 8908C

1989 L.GRANITE TRANS BARGE BELOW BONNEVILLE

SPRING CHINOOK

Brands Used: RAF 3
Wire Codes Used: 232262

NUMBER RELEASED: 7057

RECOVERY AREA	YEAR OF RETURN 1989	1990	1991	1992	1993	TOTAL	% RETURN
RIVER SYSTEM TRAPS							
LOWER GRANITE TRAP	0	1	1	4	0	6	0.085
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 FISHERIES	0	0	0	0	0	0	0.000
HATCHERIES							
RAPID RIVER H.	0	0	1	0	0	1	0.014
STREAM SURVEY	0	0	0	0	0	0	0.000
TOTALS	0	1	2	4	0	7	0.099
PERCENT OF RECOVERY %	0.0	14.3	28.6	57.1	0.0		

Appendix Table 2.4.--Recoveries of adult spring chinook salmon transported as juveniles from Lower Granite Dam to below Bonneville Dam from 19 to 22 April 1989.

Master File Date : 22 February 1993
RELEASE GROUPS INCLUDED: 8908D

1989 L.GRANITE TRANS BARGE BELOW BONNEVILLE

SPRING CHINOOK

Brands Used: RAF 4
Wire Codes Used: 232309

NUMBER RELEASED: 7003

RECOVERY AREA	YEAR OF RETURN 1989	1990	1991	1992	1993	TOTAL	% RETURN
RIVER SYSTEM TRAPS							
BONNEVILLE TRAP	0	0	2	0	0	2	0.029
LOWER GRANITE TRAP	0	1	8	4	0	13	0.186
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 FISHERIES	0	0	0	0	0	0	0.000
HATCHERIES							
RAPID RIVER H.	0	0	3	1	0	4	0.057
SANTOOTH H. AND TRAP	0	0	2	0	0	2	0.029
STREAM SURVEY	0	0	1	0	0	1	0.014
TOTALS	0	1	16	5	0	22	0.314
PERCENT OF RECOVERY %	0.0	4.5	72.7	22.7	0.0		

Appendix Table 2.5.--Recoveries of adult spring chinook salmon transported as juveniles from Lower Granite Dam to below Bonneville Dam on 22 April 1989.

Master File Date : 22 February 1993
RELEASE GROUPS INCLUDED: 8908E

1989 L.GRANITE TRANS BARGE BELOW BONNEVILLE

SPRING CHINOOK

Brands Used: RA9 1
Wire Codes Used: 232310

NUMBER RELEASED: 7019

RECOVERY AREA		YEAR OF RETURN 1989	1990	1991	1992	1993	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
LOWER GRANITE TRAP		0	0	2	1	0	3	0.043
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 FISHERIES		0	0	0	0	0	0	0.000
HATCHERIES								
RAPID RIVER H.		0	0	1	1	0	2	0.028
STREAM SURVEY		0	0	0	0	0	0	0.000
TOTALS		0	0	3	2	0	5	0.071
PERCENT OF RECOVERY	%	0.0	0.0	60.0	40.0	0.0		

Appendix Table 2.6.--Recoveries of adult spring chinook salmon transported as juveniles from Lower Granite Dam to below Bonneville Dam on 23 April 1989.

Master File Date : 22 February 1993
RELEASE GROUPS INCLUDED: 8908P

1989 L.GRANITE TRANS BARGE BELOW BONNEVILLE

SPRING CHINOOK

Brands Used: RA9 2
Wire Codes Used: 232311

NUMBER RELEASED: 7155

RECOVERY AREA		YEAR OF RETURN 1989	1990	1991	1992	1993	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
LOWER GRANITE TRAP		0	0	3	2	0	5	0.070
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 FISHERIES		0	0	0	0	0	0	0.000
HATCHERIES								
RAPID RIVER H.		0	0	1	0	0	1	0.014
STREAM SURVEY		0	0	0	0	0	0	0.000
TOTALS		0	0	4	2	0	6	0.084
PERCENT OF RECOVERY	%	0.0	0.0	66.7	33.3	0.0		

Appendix Table 2.7.--Recoveries of adult spring chinook salmon transported as juveniles from Lower Granite Dam to below Bonneville Dam from 24 to 25 April 1989.

Master File Date : 22 February 1993
RELEASE GROUPS INCLUDED: 8908G

1989 L.GRANITE TRANS BARGE BELOW BONNEVILLE

SPRING CHINOOK

Brands Used: RA9 3
Wire Codes Used: 232312

NUMBER RELEASED: 7100

RECOVERY AREA		YEAR OF RETURN 1989	1990	1991	1992	1993	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
LOWER GRANITE TRAP		0	0	2	1	0	3	0.042
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 FISHERIES		0	0	0	0	0	0	0.000
HATCHERIES								
RAPID RIVER H.		0	0	2	1	0	3	0.042
STREAM SURVEY		0	0	0	0	0	0	0.000
TOTALS		0	0	4	2	0	6	0.085
PERCENT OF RECOVERY	%	0.0	0.0	66.7	33.3	0.0		

Appendix Table 2.8.--Recoveries of adult spring chinook salmon transported as juveniles from Lower Granite Dam to below Bonneville Dam from 25 to 26 April 1989.

Master File Date : 22 February 1993
RELEASE GROUPS INCLUDED: 8908H

1989 L.GRANITE TRANS BARGE BELOW BONNEVILLE

SPRING CHINOOK

Brands Used: RA9 4
Wire Codes Used: 232313

NUMBER RELEASED: 7000

RECOVERY AREA	YEAR OF RETURN 1989	1990	1991	1992	1993	TOTAL	% RETURN
RIVER SYSTEM TRAPS							
LOWER GRANITE TRAP	0	0	2	0	0	2	0.029
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 FISHERIES	0	0	0	0	0	0	0.000
HATCHERIES							
RAPID RIVER H.	0	0	2	0	0	2	0.029
LOOKINGGLASS H.	0	0	1	0	0	1	0.014
STREAM SURVEY	0	0	0	0	0	0	0.000
TOTALS	0	0	5	0	0	5	0.071
PERCENT OF RECOVERY %	0.0	0.0	100.0	0.0	0.0		

Appendix Table 2.9.--Recoveries of adult spring chinook salmon transported as juveniles from Lower Granite Dam to below Bonneville Dam from 26 to 27 April 1989.

Master File Date : 22 February 1993
RELEASE GROUPS INCLUDED: 89081

1989 L.GRANITE TRANS BARGE BELOW BONNEVILLE

SPRING CHINOOK

Brands Used: RASU1
Wire Codes Used: 232340

NUMBER RELEASED: 7095

RECOVERY AREA		YEAR OF RETURN 1989	1990	1991	1992	1993	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
LOWER GRANITE TRAP		0	0	1	1	0	2	0.028
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 FISHERIES		0	0	0	0	0	0	0.000
HATCHERIES								
RAPID RIVER H.		0	0	0	1	0	1	0.014
STREAM SURVEY		0	0	0	0	0	0	0.000
TOTALS		0	0	1	2	0	3	0.042
PERCENT OF RECOVERY	%	0.0	0.0	33.3	66.7	0.0		

Appendix Table 2.10.--Recoveries of adult spring chinook salmon transported as juveniles from Lower Granite Dam to below Bonneville Dam from 1 to 10 May 1989.

Master File Date : 22 February 1993
RELEASE GROUPS INCLUDED: 8908J

1989 L.GRANITE TRANS BARGE BELOW BONNEVILLE

SPRING CHINOOK

Brands Used: RAS02
Wire Codes Used: 232354

NUMBER RELEASED: 7000

RECOVERY AREA		YEAR OF RETURN 1989	1990	1991	1992	1993	TOTAL	% RETURN
RIVER SYSTEM TRAPS LOWER GRANITE TRAP		0	0	1	0	0	1	0.014
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 FISHERIES		0	0	0	0	0	0	0.000
HATCHERIES		0	0	0	0	0	0	0.000
STREAM SURVEY		0	0	0	0	0	0	0.000
TOTALS		0	0	1	0	0	1	0.014
PERCENT OF RECOVERY	%	0.0	0.0	100.0	0.0	0.0		

Appendix Table 2.11.--Recoveries of adult spring chinook salmon transported as juveniles from Lower Granite Dam to below Bonneville Dam from 10 to 25 May 1989.

Master File Date : 22 February 1993
RELEASE GROUPS INCLUDED: 8908K

1989 L.GRANITE TRANS BARGE BELOW BONNEVILLE

SPRING CHINOOK

Brands Used: RASU3
Wire Codes Used: 232251

NUMBER RELEASED: 3435

RECOVERY AREA		YEAR OF RETURN 1989	1990	1991	1992	1993	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
LOWER GRANITE TRAP		0	0	1	0	0	1	0.029
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 FISHERIES		0	0	0	0	0	0	0.000
HATCHERIES								
SANTOOTH H. AND TRAP		0	0	0	1	0	1	0.029
STREAM SURVEY		0	0	0	0	0	0	0.000
TOTALS		0	0	1	1	0	2	0.058
PERCENT OF RECOVERY	%	0.0	0.0	50.0	50.0	0.0		

Appendix Table 2.12.--Recoveries of adult spring chinook salmon transported as juveniles from Lower Granite Dam to below Bonneville Dam on 30 May 1989.

Master File Date : 22 February 1993
RELEASE GROUPS INCLUDED: 8908L

1989 L.GRANITE TRANS BARGE BELOW BONNEVILLE

SPRING CHINOOK

Brands Used: RAS04
Wire Codes Used: 232251

NUMBER RELEASED: 909

RECOVERY AREA		YEAR OF RETURN 1989	1990	1991	1992	1993	TOTAL	% RETURN
RIVER SYSTEM TRAPS LOWER GRANITE TRAP		0	1	0	1	0	2	0.220
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 FISHERIES		0	0	0	0	0	0	0.000
HATCHERIES		0	0	0	0	0	0	0.000
STREAM SURVEY		0	0	0	0	0	0	0.000
TOTALS		0	1	0	1	0	2	0.220
PERCENT OF RECOVERY	%	0.0	50.0	0.0	50.0	0.0		

Appendix Table 3.0.--Summary of all recoveries of adult spring chinook salmon transported as juveniles from Lower Granite Dam to below Bonneville Dam in 1990.

Master File Date : 22 February 1993
RELEASE GROUPS INCLUDED: 9006A 9006B 9006C 9006D 9006E 9006F 9006G

1990 L.GRANITE TRANS BARGE BELOW BONNEVILLE

SPRING CHINOOK

Brands Used: RAL 1 RAL 4 RAL 2 RAV 1 RAV 2 RAV 3 RAV 4
Wire Codes Used: 232429 232430 232431 232432 232433 232434 232435

NUMBER RELEASED: 44708

RECOVERY AREA	YEAR OF RETURN 1990	1991	1992	1993	TOTAL	% RETURN
RIVER SYSTEM TRAPS						
BONNEVILLE TRAP	0	0	4	0	4	0.009
LOWER GRANITE TRAP	0	8	71	0	79	0.177
OCEAN FISHERIES	0	0	0	0	0	0.000
RIVER SPORT						
SNAKE R.	0	0	1	0	1	0.002
RIVER COMMERCIAL	0	0	0	0	0	0.000
INDIAN FISHERIES	0	0	0	0	0	0.000
HATCHERIES						
PAHSIMEROI H.	0	0	1	0	1	0.002
RAPID RIVER H.	0	0	4	0	4	0.009
HELLS CANYON (OXBOW) H.	0	0	3	0	3	0.007
SAWTOOTH H. AND TRAP	0	0	1	0	1	0.002
SOUTH FORK SALMON TRAP	0	7	21	0	28	0.063
IMNAHA RIVER TRAP	0	0	1	0	1	0.002
STREAM SURVEY	0	0	0	0	0	0.000
TOTALS	0	15	107	0	122	0.273
PERCENT OF RECOVERY %	0.0	12.3	87.7	0.0		

Appendix Table 3.1.--Recoveries of adult spring chinook salmon transported as juveniles by barge from Lower Granite Dam to below Bonneville Dam from 13 to 18 April 1990.

Master File Date : 22 February 1993
RELEASE GROUPS INCLUDED: 9006A

1990 L.GRANITE TRANS BARGE BELOW BONNEVILLE

SPRING CHINOOK

Brands Used: RAL 1
Wire Codes Used: 232429

NUMBER RELEASED: 7000

RECOVERY AREA	YEAR OF RETURN 1990	1991	1992	1993	TOTAL	% RETURN
RIVER SYSTEM TRAPS						
LOWER GRANITE TRAP	0	0	9	0	9	0.129
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 FISHERIES	0	0	0	0	0	0.000
HATCHERIES						
RAPID RIVER H.	0	0	1	0	1	0.014
HELLS CANYON (OXBOW) H.	0	0	1	0	1	0.014
STREAM SURVEY	0	0	0	0	0	0.000
TOTALS	0	0	11	0	11	0.157
PERCENT OF RECOVERY %	0.0	0.0	100.0	0.0		

Appendix Table 3.2.--Recoveries of adult spring chinook salmon transported as juveniles by barge from Lower Granite Dam to below Bonneville Dam from 17 to 21 April 1990.

Master File Date : 22 February 1993
RELEASE GROUPS INCLUDED: 9006B

1990 L.GRANITE TRANS BARGE BELOW BONNEVILLE

SPRING CHINOOK

Brands Used: RAL 4
Wire Codes Used: 232430

NUMBER RELEASED: 7000

RECOVERY AREA	YEAR OF RETURN 1990	1991	1992	1993	TOTAL	% RETURN
RIVER SYSTEM TRAPS						
BONNEVILLE TRAP	0	0	1	0	1	0.014
LOWER GRANITE TRAP	0	0	6	0	6	0.086
OCEAN FISHERIES	0	0	0	0	0	0.000
RIVER SPORT						
SNAKE R.	0	0	1	0	1	0.014
RIVER COMMERCIAL	0	0	0	0	0	0.000
INDIAN FISHERIES	0	0	0	0	0	0.000
HATCHERIES						
RAPID RIVER H.	0	0	2	0	2	0.029
STREAM SURVEY	0	0	0	0	0	0.000
TOTALS	0	0	10	0	10	0.143
PERCENT OF RECOVERY %	0.0	0.0	100.0	0.0		

Appendix Table 3.3.--Recoveries of adult spring chinook salmon transported as juveniles by barge from Lower Granite Dam to below Bonneville Dam from 21 to 25 April 1990.

Master File Date : 22 February 1993
RELEASE GROUPS INCLUDED: 9006C

1990 L.GRANITE TRANS BARGE BELOW BONNEVILLE

SPRING CHINOOK

Brands Used: RAL 2
Wire Codes Used: 232431

NUMBER RELEASED: 7000

RECOVERY AREA	YEAR OF RETURN 1990	1991	1992	1993	TOTAL	% RETURN
RIVER SYSTEM TRAPS						
LOWER GRANITE TRAP	0	4	8	0	12	0.171
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 FISHERIES	0	0	0	0	0	0.000
HATCHERIES						
SOUTH FORK SALMON TRAP	0	1	0	0	1	0.014
IMNAHA RIVER TRAP	0	0	1	0	1	0.014
STREAM SURVEY	0	0	0	0	0	0.000
TOTALS	0	5	9	0	14	0.200
PERCENT OF RECOVERY %	0.0	35.7	64.3	0.0		

Appendix Table 3.4.--Recoveries of adult spring chinook salmon transported as juveniles by barge from Lower Granite Dam to below Bonneville Dam from 25 April to 2 May 1990.

Master File Date : 22 February 1993
RELEASE GROUPS INCLUDED: 9006D

1990 L.GRANITE TRANS BARGE BELOW BONNEVILLE

SPRING CHINOOK

Brands Used: RAV 1
Wire Codes Used: 232432

NUMBER RELEASED: 7000

RECOVERY AREA	YEAR OF RETURN 1990	1991	1992	1993	TOTAL	% RETURN
RIVER SYSTEM TRAPS						
BONNEVILLE TRAP	0	0	1	0	1	0.014
LOWER GRANITE TRAP	0	0	10	0	10	0.143
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 FISHERIES	0	0	0	0	0	0.000
HATCHERIES						
RAPID RIVER H.	0	0	1	0	1	0.014
HELLS CANYON (OXBOW) H.	0	0	1	0	1	0.014
SOUTH FORK SALMON TRAP	0	0	2	0	2	0.029
STREAM SURVEY	0	0	0	0	0	0.000
TOTALS	0	0	15	0	15	0.214
PERCENT OF RECOVERY %	0.0	0.0	100.0	0.0		

Appendix Table 3.5.--Recoveries of adult spring chinook salmon transported as juveniles by barge from Lower Granite Dam to below Bonneville Dam from 2 to 14 May 1990.

Master File Date : 22 February 1993
RELEASE GROUPS INCLUDED: 9006E

1990 L.GRANITE TRANS BARGE BELOW BONNEVILLE

SPRING CHINOOK

Brands Used: RAV 2
Wire Codes Used: 232433

NUMBER RELEASED: 7000

RECOVERY AREA		YEAR OF RETURN 1990	1991	1992	1993	TOTAL	% RETURN
RIVER SYSTEM TRAPS							
BONNEVILLE TRAP		0	0	2	0	2	0.029
LOWER GRANITE TRAP		0	1	10	0	11	0.157
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 FISHERIES		0	0	0	0	0	0.000
HATCHERIES							
PAHSIMEROI H.		0	0	1	0	1	0.014
SOUTH FORK SALMON TRAP		0	0	4	0	4	0.057
STREAM SURVEY		0	0	0	0	0	0.000
TOTALS		0	1	17	0	18	0.257
PERCENT OF RECOVERY	%	0.0	5.6	94.4	0.0		

Appendix Table 3.6.--Recoveries of adult spring chinook salmon transported as juveniles by barge from Lower Granite Dam to below Bonneville Dam from 14 to 29 May 1990.

Master File Date : 22 February 1993
RELEASE GROUPS INCLUDED: 9006F

1990 L.GRANITE TRANS BARGE BELOW BONNEVILLE

SPRING CHINOOK

Brands Used: RAV 3
Wire Codes Used: 232434

NUMBER RELEASED: 7000

RECOVERY AREA	YEAR OF RETURN 1990	1991	1992	1993	TOTAL	% RETURN
RIVER SYSTEM TRAPS						
LOWER GRANITE TRAP	0	3	19	0	22	0.314
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 FISHERIES	0	0	0	0	0	0.000
HATCHERIES						
HELLS CANYON (OXBOW) H.	0	0	1	0	1	0.014
SAWTOOTH H. AND TRAP	0	0	1	0	1	0.014
SOUTH FORK SALMON TRAP	0	6	13	0	19	0.271
STREAM SURVEY	0	0	0	0	0	0.000
TOTALS	0	9	34	0	43	0.614
PERCENT OF RECOVERY %	0.0	20.9	79.1	0.0		

Appendix Table 3.7.--Recoveries of adult spring chinook salmon transported as juveniles by barge from Lower Granite Dam to below Bonneville Dam from 29 May to 8 June 1990.

Master File Date : 22 February 1993
RELEASE GROUPS INCLUDED: 9006G

1990 L.GRANITE TRANS BARGE BELOW BONNEVILLE

SPRING CHINOOK

Brands Used: RAV 4
Wire Codes Used: 232435

NUMBER RELEASED: 2708

RECOVERY AREA	YEAR OF RETURN 1990	1991	1992	1993	TOTAL	% RETURN
RIVER SYSTEM TRAPS						
LOWER GRANITE TRAP	0	0	9	0	9	0.332
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 FISHERIES	0	0	0	0	0	0.000
HATCHERIES						
SOUTH FORK SALMON TRAP	0	0	2	0	2	0.074
STREAM SURVEY	0	0	0	0	0	0.000
TOTALS	0	0	11	0	11	0.406
PERCENT OF RECOVERY %	0.0	0.0	100.0	0.0		

Appendix Table 4.0.--Summary of all recoveries of adult steelhead released as juveniles below Little Goose Dam in 1989.

Master File Date : 22 February 1993
RELEASE GROUPS INCLUDED: 8909A 8909B 8909C 8909D 8909E 8909F

1989 L.GRANITE TRANS CONTROL BELOW L.GOOSE

STEELHEAD

Brands Used: LA3 1 LA3 2 LA3 3 LA3 4 LA2 1 LA2 2
Wire Codes Used: 232343 232345 232346 232347 232353 232028

NUMBER RELEASED: 42259

RECOVERY AREA	YEAR OF RETURN 1989	1990	1991	1992	1993	TOTAL	% RETURN
RIVER SYSTEM TRAPS							
BONNEVILLE TRAP	0	1	0	0	0	1	0.002
LOWER GRANITE TRAP	0	33	71	4	0	108	0.256
OCEAN FISHERIES	0	0	0	0	0	0	0.000
RIVER SPORT							
COLUMBIA R. BELOW SNAKE R.	0	0	1	0	0	1	0.002
SNAKE R.	0	8	7	0	0	15	0.035
CLEARWATER R.	0	1	13	0	0	14	0.033
OTHER RIVERS	0	0	1	0	0	1	0.002
RIVER COMMERCIAL	0	0	0	0	0	0	0.000
INDIAN FISHERIES							
FALL INDIAN NET	0	2	5	1	0	8	0.019
HATCHERIES							
DWORSHAK H.	0	1	3	0	0	4	0.009
PAHSIMEROI H.	0	1	0	0	0	1	0.002
RAPID RIVER H.	0	0	1	0	0	1	0.002
HELLS CANYON (OXBOW) H.	0	1	2	0	0	3	0.007
WALLOWA H.	0	2	1	0	0	3	0.007
STREAM SURVEY	0	0	0	0	0	0	0.000
OTHER	0	0	1	0	0	1	0.002
TOTALS	0	50	106	5	0	161	0.381
PERCENT OF RECOVERY %	0.0	31.1	65.8	3.1	0.0		

Appendix Table 4.1.--Recoveries of adult steelhead released as juveniles below Little Goose Dam from 21 April to 2 May 1989.

Master File Date : 22 February 1993
RELEASE GROUPS INCLUDED: 8909A

1989 L.GRANITE TRANS CONTROL BELOW L.GOOSE

STEELHEAD

Brands Used: LA3 1
Wire Codes Used: 232343

NUMBER RELEASED: 7003

RECOVERY AREA		YEAR OF RETURN 1989	1990	1991	1992	1993	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
LOWER GRANITE TRAP		0	16	27	3	0	46	0.657
OCEAN FISHERIES		0	0	0	0	0	0	0.000
RIVER SPORT								
SNAKE R.		0	5	2	0	0	7	0.100
CLEARWATER R.		0	0	1	0	0	1	0.014
RIVER COMMERCIAL		0	0	0	0	0	0	0.000
INDIAN FISHERIES								
FALL INDIAN NET		0	1	2	0	0	3	0.043
HATCHERIES								
WALLOWA H.		0	1	0	0	0	1	0.014
STREAM SURVEY		0	0	0	0	0	0	0.000
TOTALS		0	23	32	3	0	58	0.828
PERCENT OF RECOVERY	%	0.0	39.7	55.2	5.2	0.0		

Appendix Table 4.2.--Recoveries of adult steelhead released as juveniles below Little Goose Dam from 4 to 6 May 1989.

Master File Date : 22 February 1993
RELEASE GROUPS INCLUDED: 8909B

1989 L.GRANITE TRANS CONTROL BELOW L.GOOSE

STEELHEAD

Brands Used: LA3 2
Wire Codes Used: 232345

NUMBER RELEASED: 7049

RECOVERY AREA	1989	YEAR OF RETURN 1990	1991	1992	1993	TOTAL	% RETURN
RIVER SYSTEM TRAPS							
LOWER GRANITE TRAP	0	10	21	0	0	31	0.440
OCEAN FISHERIES	0	0	0	0	0	0	0.000
RIVER SPORT							
SNAKE R.	0	2	4	0	0	6	0.085
CLEARWATER R.	0	1	3	0	0	4	0.057
RIVER COMMERCIAL	0	0	0	0	0	0	0.000
INDIAN FISHERIES							
FALL INDIAN NET	0	0	1	1	0	2	0.028
HATCHERIES							
DWORSHAK H.	0	1	1	0	0	2	0.028
PAHSIMEROI H.	0	1	0	0	0	1	0.014
RAPID RIVER H.	0	0	1	0	0	1	0.014
HELLS CANYON (OXBOW) H.	0	0	1	0	0	1	0.014
STREAM SURVEY	0	0	0	0	0	0	0.000
OTHER	0	0	1	0	0	1	0.014
TOTALS	0	15	33	1	0	49	0.695
PERCENT OF RECOVERY %	0.0	30.6	67.3	2.0	0.0		

Appendix Table 4.3.--Recoveries of adult steelhead released as juveniles below Little Goose Dam from 9 to 11 May 1989.

Master File Date : 22 February 1993
RELEASE GROUPS INCLUDED: 8909C

1989 L.GRANITE TRANS CONTROL BELOW L.GOOSE

STEELHEAD

Brands Used: LA3 3
Wire Codes Used: 232346

NUMBER RELEASED: 7088

RECOVERY AREA	YEAR OF RETURN 1989	1990	1991	1992	1993	TOTAL	% RETURN
RIVER SYSTEM TRAPS							
BONNEVILLE TRAP	0	1	0	0	0	1	0.014
LOWER GRANITE TRAP	0	4	11	1	0	16	0.226
OCEAN FISHERIES	0	0	0	0	0	0	0.000
RIVER SPORT							
COLUMBIA R. BELOW SNAKE R.	0	0	1	0	0	1	0.014
SNAKE R.	0	0	1	0	0	1	0.014
CLEARWATER R.	0	0	8	0	0	8	0.113
OTHER RIVERS	0	0	1	0	0	1	0.014
RIVER COMMERCIAL	0	0	0	0	0	0	0.000
INDIAN FISHERIES							
FALL INDIAN NET	0	1	1	0	0	2	0.028
HATCHERIES							
DWORSHAK H.	0	0	2	0	0	2	0.028
HELLS CANYON (OXBOW) H.	0	1	1	0	0	2	0.028
WALLOWA H.	0	1	1	0	0	2	0.028
STREAM SURVEY	0	0	0	0	0	0	0.000
TOTALS	0	8	27	1	0	36	0.508
PERCENT OF RECOVERY %	0.0	22.2	75.0	2.8	0.0		

Appendix Table 4.4.--Recoveries of adult steelhead released as juveniles below Little Goose Dam from 13 to 16 May 1989.

Master File Date : 22 February 1993
RELEASE GROUPS INCLUDED: 8909D

1989 L.GRANITE TRANS CONTROL BELOW L.GOOSE

STEELHEAD

Brands Used: LA3 4
Wire Codes Used: 232347

NUMBER RELEASED: 7000

RECOVERY AREA	YEAR OF RETURN 1989	1990	1991	1992	1993	TOTAL	% RETURN
RIVER SYSTEM TRAPS							
LOWER GRANITE TRAP	0	2	9	0	0	11	0.157
OCEAN FISHERIES	0	0	0	0	0	0	0.000
RIVER SPORT							
SNAKE R.	0	1	0	0	0	1	0.014
CLEARWATER R.	0	0	1	0	0	1	0.014
RIVER COMMERCIAL	0	0	0	0	0	0	0.000
INDIAN FISHERIES							
FALL INDIAN NET	0	0	1	0	0	1	0.014
HATCHERIES	0	0	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0	0	0.000
TOTALS	0	3	11	0	0	14	0.200
PERCENT OF RECOVERY %	0.0	21.4	78.6	0.0	0.0		

Appendix Table 4.5.--Recoveries of adult steelhead released as juveniles below Little Goose Dam from 18 to 20 May 1989.

Master File Date : 22 February 1993
RELEASE GROUPS INCLUDED: 8909E

1989 L.GRANITE TRANS CONTROL BELOW L.GOOSE

STEELHEAD

Brands Used: LA2 1
Wire Codes Used: 232353

NUMBER RELEASED: 7005

RECOVERY AREA		YEAR OF RETURN 1989	1990	1991	1992	1993	TOTAL	% RETURN
RIVER SYSTEM TRAPS LOWER GRANITE TRAP		0	1	3	0	0	4	0.057
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 FISHERIES		0	0	0	0	0	0	0.000
HATCHERIES		0	0	0	0	0	0	0.000
STREAM SURVEY		0	0	0	0	0	0	0.000
TOTALS		0	1	3	0	0	4	0.057
PERCENT OF RECOVERY	%	0.0	25.0	75.0	0.0	0.0		

Appendix Table 5.0.--Summary of all recoveries of adult steelhead transported as juveniles by barge from Lower Granite Dam to below Bonneville Dam in 1989.

Master File Date : 22 February 1993
RELEASE GROUPS INCLUDED: 8910A 8910B 8910C 8910D 8910E 8910F

1989 L.GRANITE TRANS BARGE BELOW BONNEVILLE

STEELHEAD

Brands Used: RASU1 RASU2 RASU3 RASU4 RAF 1 RAF 2
Wire Codes Used: 232020 232021 232024 232026 232027 232355

NUMBER RELEASED: 30116

RECOVERY AREA	YEAR OF RETURN 1989	1990	1991	1992	1993	TOTAL	% RETURN
RIVER SYSTEM TRAPS							
LOWER GRANITE TRAP	0	33	129	1	0	163	0.541
OCEAN FISHERIES	0	0	0	0	0	0	0.000
RIVER SPORT							
COLUMBIA R. BELOW SNAKE R.	0	0	3	0	0	3	0.010
SNAKE R.	0	4	22	0	0	26	0.086
CLEARWATER R.	0	1	12	1	0	14	0.046
OTHER RIVERS	0	0	1	0	0	1	0.003
RIVER COMMERCIAL	0	0	0	0	0	0	0.000
INDIAN FISHERIES							
FALL INDIAN NET	0	2	14	1	0	17	0.056
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	10	0	0	10	0.033
PAHSIMEROI H.	0	1	1	0	0	2	0.007
HELLS CANYON (OXBOW) H.	0	2	0	0	0	2	0.007
DESCHUTES R. HATCHERIES	0	1	0	0	0	1	0.003
WALLOWA H.	0	2	2	0	0	4	0.013
BIG SHEEP CR. TRAP	0	1	0	0	0	1	0.003
BIG CANYON TRAP	0	1	0	0	0	1	0.003
STREAM SURVEY	0	0	0	0	0	0	0.000
TOTALS	0	48	197	3	0	248	0.823
PERCENT OF RECOVERY %	0.0	19.4	79.4	1.2	0.0		

Appendix Table 5.1.--Recoveries of adult steelhead transported as juveniles by barge from Lower Granite Dam to below Bonneville Dam from 25 April to 3 May 1989.

Master File Date : 22 February 1993
RELEASE GROUPS INCLUDED: 8910A

1989 L.GRANITE TRANS BARGE BELOW BONNEVILLE

STEELHEAD

Brands Used: RASU1
Wire Codes Used: 232020

NUMBER RELEASED: 5000

RECOVERY AREA	YEAR OF RETURN 1989	1990	1991	1992	1993	TOTAL	% RETURN
RIVER SYSTEM TRAPS							
LOWER GRANITE TRAP	0	16	36	0	0	52	1.040
OCEAN FISHERIES	0	0	0	0	0	0	0.000
RIVER SPORT							
COLUMBIA R. BELOW SNAKE R.	0	0	1	0	0	1	0.020
SNAKE R.	0	3	4	0	0	7	0.140
CLEARWATER R.	0	0	1	0	0	1	0.020
RIVER COMMERCIAL	0	0	0	0	0	0	0.000
INDIAN FISHERIES							
FALL INDIAN NET	0	0	3	0	0	3	0.060
WINTER INDIAN NET	0	0	1	0	0	1	0.020
HATCHERIES							
DWORSHAK H.	0	0	1	0	0	1	0.020
STREAM SURVEY	0	0	0	0	0	0	0.000
TOTALS	0	19	47	0	0	66	1.320
PERCENT OF RECOVERY %	0.0	28.8	71.2	0.0	0.0		

Appendix Table 5.2.--Recoveries of adult steelhead transported as juveniles by barge from Lower Granite Dam to below Bonneville Dam from 3 to 5 May 1989.

Master File Date : 22 February 1993
RELEASE GROUPS INCLUDED: 8910B

1989 L.GRANITE TRANS BARGE BELOW BONNEVILLE

STEELHEAD

Brands Used: RASU2
Wire Codes Used: 232021

NUMBER RELEASED: 5020

RECOVERY AREA	YEAR OF RETURN 1989	1990	1991	1992	1993	TOTAL	% RETURN
RIVER SYSTEM TRAPS							
LOWER GRANITE TRAP	0	5	37	0	0	42	0.837
OCEAN FISHERIES	0	0	0	0	0	0	0.000
RIVER SPORT							
SNAKE R.	0	0	7	0	0	7	0.139
CLEARWATER R.	0	0	7	0	0	7	0.139
OTHER RIVERS	0	0	1	0	0	1	0.020
RIVER COMMERCIAL	0	0	0	0	0	0	0.000
INDIAN FISHERIES							
FALL INDIAN NET	0	1	6	1	0	8	0.159
CLEARWATER INDIAN	0	0	1	0	0	1	0.020
HATCHERIES							
DWORSHAK H.	0	0	2	0	0	2	0.040
HELLS CANYON (OXBOW) H.	0	1	0	0	0	1	0.020
BIG SHEEP CR. TRAP	0	1	0	0	0	1	0.020
STREAM SURVEY	0	0	0	0	0	0	0.000
TOTALS	0	8	61	1	0	70	1.394
PERCENT OF RECOVERY %	0.0	11.4	87.1	1.4	0.0		

Appendix Table 5.3.--Recoveries of adult steelhead transported as juveniles by barge from Lower Granite Dam to below Bonneville Dam from 8 to 10 May 1989.

Master File Date : 22 February 1993
RELEASE GROUPS INCLUDED: 8910C

1989 L.GRANITE TRANS BARGE BELOW BONNEVILLE

STEELHEAD

Brands Used: RASU3
Wire Codes Used: 232024

NUMBER RELEASED: 5034

RECOVERY AREA	YEAR OF RETURN 1989	1990	1991	1992	1993	TOTAL	% RETURN
RIVER SYSTEM TRAPS							
LOWER GRANITE TRAP	0	5	31	0	0	36	0.715
OCEAN FISHERIES	0	0	0	0	0	0	0.000
RIVER SPORT							
COLUMBIA R. BELOW SNAKE R.	0	0	1	0	0	1	0.020
SNAKE R.	0	1	3	0	0	4	0.079
CLEARWATER R.	0	1	3	0	0	4	0.079
RIVER COMMERCIAL	0	0	0	0	0	0	0.000
INDIAN FISHERIES							
FALL INDIAN NET	0	1	4	0	0	5	0.099
CLEARWATER INDIAN	0	0	1	0	0	1	0.020
HATCHERIES							
DWORSHAK H.	0	0	5	0	0	5	0.099
PAHSIMEROI H.	0	1	1	0	0	2	0.040
HELLS CANYON (OXBOW) H.	0	1	0	0	0	1	0.020
WALLOWA H.	0	0	1	0	0	1	0.020
STREAM SURVEY	0	0	0	0	0	0	0.000
TOTALS	0	10	50	0	0	60	1.192
PERCENT OF RECOVERY %	0.0	16.7	83.3	0.0	0.0		

Appendix Table 5.4.--Recoveries of adult steelhead transported as juveniles by barge from Lower Granite Dam to below Bonneville Dam from 12 to 15 May 1989.

Master File Date : 22 February 1993
RELEASE GROUPS INCLUDED: 8910D

1989 L.GRANITE TRANS BARGE BELOW BONNEVILLE

STEELHEAD

Brands Used: RASU4
Wire Codes Used: 232026

NUMBER RELEASED: 5024

RECOVERY AREA	YEAR OF RETURN 1989	1990	1991	1992	1993	TOTAL	% RETURN
RIVER SYSTEM TRAPS							
LOWER GRANITE TRAP	0	4	13	0	0	17	0.338
OCEAN FISHERIES	0	0	0	0	0	0	0.000
RIVER SPORT							
SNAKE R.	0	0	4	0	0	4	0.080
CLEARWATER R.	0	0	1	0	0	1	0.020
RIVER COMMERCIAL	0	0	0	0	0	0	0.000
INDIAN FISHERIES							
FALL INDIAN NET	0	0	1	0	0	1	0.020
HATCHERIES							
DWORSHAK H.	0	0	2	0	0	2	0.040
DESCHUTES R. HATCHERIES	0	1	0	0	0	1	0.020
WALLOWA H.	0	1	1	0	0	2	0.040
STREAM SURVEY	0	0	0	0	0	0	0.000
TOTALS	0	6	22	0	0	28	0.557
PERCENT OF RECOVERY %	0.0	21.4	78.6	0.0	0.0		

Appendix Table 5.5.--Recoveries of adult steelhead transported as juveniles by barge from Lower Granite Dam to below Bonneville Dam from 17 to 19 May 1989.

Master File Date : 22 February 1993
RELEASE GROUPS INCLUDED: 8910E

1989 L.GRANITE TRANS BARGE BELOW BONNEVILLE

STEELHEAD

Brands Used: RAF 1
Wire Codes Used: 232027

NUMBER RELEASED: 5014

RECOVERY AREA	YEAR OF RETURN 1989	1990	1991	1992	1993	TOTAL	% RETURN
RIVER SYSTEM TRAPS							
LOWER GRANITE TRAP	0	3	9	0	0	12	0.239
OCEAN FISHERIES	0	0	0	0	0	0	0.000
RIVER SPORT							
COLUMBIA R. BELOW SNAKE R.	0	0	1	0	0	1	0.020
SNAKE R.	0	0	4	0	0	4	0.080
RIVER COMMERCIAL	0	0	0	0	0	0	0.000
INDIAN FISHERIES	0	0	0	0	0	0	0.000
HATCHERIES							
WALLOWA H.	0	1	0	0	0	1	0.020
BIG CANYON TRAP	0	1	0	0	0	1	0.020
STREAM SURVEY	0	0	0	0	0	0	0.000
TOTALS	0	5	14	0	0	19	0.379
PERCENT OF RECOVERY %	0.0	26.3	73.7	0.0	0.0		

Appendix Table 5.6.--Recoveries of adult steelhead transported as juveniles by barge from Lower Granite Dam to below Bonneville Dam from 23 to 25 May 1989.

Master File Date : 22 February 1993
RELEASE GROUPS INCLUDED: 8910P

1989 L.GRANITE TRANS BARGE BELOW BONNEVILLE

STEELHEAD

Brands Used: RAF 2
Wire Codes Used: 232355

NUMBER RELEASED: 5024

RECOVERY AREA		YEAR OF RETURN 1989	1990	1991	1992	1993	TOTAL	% RETURN
RIVER SYSTEM TRAPS LOWER GRANITE TRAP		0	0	3	1	0	4	0.080
OCEAN FISHERIES		0	0	0	0	0	0	0.000
RIVER SPORT CLEARWATER R.		0	0	0	1	0	1	0.020
RIVER COMMERCIAL		0	0	0	0	0	0	0.000
INDIAN FISHERIES		0	0	0	0	0	0	0.000
HATCHERIES		0	0	0	0	0	0	0.000
STREAM SURVEY		0	0	0	0	0	0	0.000
TOTALS		0	0	3	2	0	5	0.100
PERCENT OF RECOVERY	%	0.0	0.0	60.0	40.0	0.0		

Appendix Table 6.0.--Summary of recoveries of all adult spring chinook salmon released as juveniles below McNary Dam in 1988.

Master File Date : 22 February 1993
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	YEAR OF RETURN 1988	1989	1990	1991	1992	1993	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
BONNEVILLE TRAP	0	1	23	5	0	0	29	0.039
LOWER GRANITE TRAP	0	1	6	1	0	0	8	0.011
PRIEST RAPIDS TRAP	0	1	14	0	0	0	15	0.020
OCEAN FISHERIES	0	0	0	0	0	0	0	0.000
RIVER SPORT								
WENATCHEE R.	0	0	5	1	0	0	6	0.008
RIVER COMMERCIAL	0	0	0	0	0	0	0	0.000
INDIAN FISHERIES								
WINTER INDIAN NET	0	0	0	1	0	0	1	0.001
INDIAN CEREMONIAL	0	0	4	1	0	0	5	0.007
HATCHERIES								
RAPID RIVER H.	0	1	1	0	0	0	2	0.003
TUCANNON H.	0	0	1	0	0	0	1	0.001
LEAVENWORTH H.	0	0	5	0	0	0	5	0.007
STREAM SURVEY	0	0	2	1	0	0	3	0.004
TOTALS	0	4	61	10	0	0	75	0.100
PERCENT OF RECOVERY %	0.0	5.3	81.3	13.3	0.0	0.0		

Appendix Table 6.1.--Recoveries of adult spring chinook salmon released as juveniles below McNary Dam from 8 to 16 April 1988.

Master File Date : 22 February 1993
RELEASE GROUPS INCLUDED: 8802A

1988 MCNARY TRANS CONTROL BELOW MCNARY

SPRING CHINOOK

Brands Used: LAW 1
Wire Codes Used: 232226

NUMBER RELEASED: 7504

RECOVERY AREA	YEAR OF RETURN 1988	1989	1990	1991	1992	1993	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
BONNEVILLE TRAP	0	0	7	5	0	0	12	0.160
PRIEST RAPIDS TRAP	0	0	5	0	0	0	5	0.067
OCEAN FISHERIES	0	0	0	0	0	0	0	0.000
RIVER SPORT								
WENATCHEE R.	0	0	1	0	0	0	1	0.013
RIVER COMMERCIAL	0	0	0	0	0	0	0	0.000
INDIAN FISHERIES								
INDIAN CEREMONIAL	0	0	1	1	0	0	2	0.027
HATCHERIES	0	0	0	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0	0	0	0.000
TOTALS	0	0	14	6	0	0	20	0.267
PERCENT OF RECOVERY %	0.0	0.0	70.0	30.0	0.0	0.0		

Appendix Table 6.2.--Recoveries of adult spring chinook salmon released as juveniles below McNary Dam from 16 April to 1 May 1988.

Master File Date : 22 February 1993
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		YEAR OF RETURN 1988	1989	1990	1991	1992	1993	TOTAL	% RETURN
RIVER SYSTEM TRAPS									
BONNEVILLE TRAP		0	1	10	0	0	0	11	0.147
LOWER GRANITE TRAP		0	1	1	0	0	0	2	0.027
PRIEST RAPIDS TRAP		0	0	4	0	0	0	4	0.053
OCEAN FISHERIES		0	0	0	0	0	0	0	0.000
RIVER SPORT									
WENATCHEE R.		0	0	1	0	0	0	1	0.013
RIVER COMMERCIAL		0	0	0	0	0	0	0	0.000
INDIAN FISHERIES		0	0	0	0	0	0	0	0.000
HATCHERIES									
RAPID RIVER H.		0	1	0	0	0	0	1	0.013
TUCANNON H.		0	0	1	0	0	0	1	0.013
STREAM SURVEY		0	0	1	1	0	0	2	0.027
TOTALS		0	3	18	1	0	0	22	0.293
PERCENT OF RECOVERY	%	0.0	13.6	81.8	4.5	0.0	0.0		

Appendix Table 6.3.--Recoveries of adult spring chinook salmon released as juveniles below McNary Dam from 1 to 6 May 1988.

Master File Date : 22 February 1993
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		YEAR OF RETURN 1988	1989	1990	1991	1992	1993	TOTAL	% RETURN
RIVER SYSTEM TRAPS									
BONNEVILLE TRAP		0	0	3	0	0	0	3	0.040
LOWER GRANITE TRAP		0	0	2	0	0	0	2	0.027
PRIEST RAPIDS TRAP		0	1	1	0	0	0	2	0.027
OCEAN FISHERIES		0	0	0	0	0	0	0	0.000
RIVER SPORT		0	0	0	0	0	0	0	0.000
RIVER COMMERCIAL		0	0	0	0	0	0	0	0.000
INDIAN FISHERIES									
INDIAN CEREMONIAL		0	0	1	0	0	0	1	0.013
HATCHERIES									
RAPID RIVER H.		0	0	1	0	0	0	1	0.013
STREAM SURVEY		0	0	1	0	0	0	1	0.013
TOTALS		0	1	9	0	0	0	10	0.133
PERCENT OF RECOVERY	%	0.0	10.0	90.0	0.0	0.0	0.0		

Appendix Table 6.4.--Recoveries of adult spring chinook salmon released as juveniles below McNary Dam from 6 to 8 May 1988.

Master File Date : 22 February 1993
RELEASE GROUPS INCLUDED: 8802D

1988 MCNARY TRANS CONTROL BELOW MCNARY

SPRING CHINOOK

Brands Used: LAW 4
Wire Codes Used: 232229

NUMBER RELEASED: 7534

RECOVERY AREA		YEAR OF RETURN 1988	1989	1990	1991	1992	1993	TOTAL	% RETURN
RIVER SYSTEM TRAPS									
BONNEVILLE TRAP		0	0	1	0	0	0	1	0.013
LOWER GRANITE TRAP		0	0	2	1	0	0	3	0.040
PRIEST RAPIDS TRAP		0	0	1	0	0	0	1	0.013
OCEAN FISHERIES		0	0	0	0	0	0	0	0.000
RIVER SPORT		0	0	0	0	0	0	0	0.000
RIVER COMMERCIAL		0	0	0	0	0	0	0	0.000
INDIAN FISHERIES		0	0	0	0	0	0	0	0.000
HATCHERIES									
LEAVENWORTH H.		0	0	3	0	0	0	3	0.040
STREAM SURVEY		0	0	0	0	0	0	0	0.000
TOTALS		0	0	7	1	0	0	8	0.106
PERCENT OF RECOVERY	%	0.0	0.0	87.5	12.5	0.0	0.0		

Appendix Table 6.5.--Recoveries of adult spring chinook salmon released as juveniles below McNary Dam from 8 to 10 May 1988.

Master File Date : 22 February 1993
RELEASE GROUPS INCLUDED: 8802R

1988 MCNARY TRANS CONTROL BELOW MCNARY

SPRING CHINOOK

Brands Used: LAP 1
Wire Codes Used: 232230

NUMBER RELEASED: 7503

RECOVERY AREA		YEAR OF RETURN 1988	1989	1990	1991	1992	1993	TOTAL	% RETURN
RIVER SYSTEM TRAPS									
BONNEVILLE TRAP		0	0	1	0	0	0	1	0.013
PRIEST RAPIDS TRAP		0	0	1	0	0	0	1	0.013
OCEAN FISHERIES		0	0	0	0	0	0	0	0.000
RIVER SPORT									
WENATCHEE R.		0	0	2	1	0	0	3	0.040
RIVER COMMERCIAL		0	0	0	0	0	0	0	0.000
INDIAN FISHERIES		0	0	0	0	0	0	0	0.000
HATCHERIES									
LEAVENWORTH H.		0	0	1	0	0	0	1	0.013
STREAM SURVEY		0	0	0	0	0	0	0	0.000
TOTALS		0	0	5	1	0	0	6	0.080
PERCENT OF RECOVERY	%	0.0	0.0	83.3	16.7	0.0	0.0		

Appendix Table 6.6.--Recoveries of adult spring chinook salmon released as juveniles below McNary Dam from 10 to 12 May 1988.

Master File Date : 22 February 1993
RELEASE GROUPS INCLUDED: 8802F

1988 MCNARY TRANS CONTROL BELOW MCNARY

SPRING CHINOOK

Brands Used: LAP 2
Wire Codes Used: 232231

NUMBER RELEASED: 7482

RECOVERY AREA		YEAR OF RETURN 1988	1989	1990	1991	1992	1993	TOTAL	% RETURN
RIVER SYSTEM TRAPS		0	0	0	0	0	0	0	0.000
OCEAN FISHERIES		0	0	0	0	0	0	0	0.000
RIVER SPORT		0	0	0	0	0	0	0	0.000
RIVER COMMERCIAL		0	0	0	0	0	0	0	0.000
INDIAN FISHERIES									
INDIAN CEREMONIAL		0	0	1	0	0	0	1	0.013
HATCHERIES									
LEAVENWORTH H.		0	0	1	0	0	0	1	0.013
STREAM SURVEY		0	0	0	0	0	0	0	0.000
TOTALS		0	0	2	0	0	0	2	0.027
PERCENT OF RECOVERY	%	0.0	0.0	100.0	0.0	0.0	0.0		

Appendix Table 6.7.--Recoveries of adult spring chinook salmon released as juveniles below McNary Dam from 15 to 19 May 1988.

Master File Date : 22 February 1993
RELEASE GROUPS INCLUDED: 8802H

1988 MCNARY TRANS CONTROL BELOW MCNARY

SPRING CHINOOK

Brands Used: LAP 4
Wire Codes Used: 232233

NUMBER RELEASED: 7505

RECOVERY AREA		YEAR OF RETURN 1988	1989	1990	1991	1992	1993	TOTAL	% RETURN
RIVER SYSTEM TRAPS									
BONNEVILLE TRAP		0	0	1	0	0	0	1	0.013
OCEAN FISHERIES		0	0	0	0	0	0	0	0.000
RIVER SPORT		0	0	0	0	0	0	0	0.000
RIVER COMMERCIAL		0	0	0	0	0	0	0	0.000
INDIAN FISHERIES									
INDIAN CEREMONIAL		0	0	1	0	0	0	1	0.013
HATCHERIES		0	0	0	0	0	0	0	0.000
STREAM SURVEY		0	0	0	0	0	0	0	0.000
TOTALS		0	0	2	0	0	0	2	0.027
PERCENT OF RECOVERY	%	0.0	0.0	100.0	0.0	0.0	0.0		

Appendix Table 6.8.--Recoveries of adult spring chinook salmon released as juveniles below McNary Dam from 19 to 24 May 1988.

Master File Date : 22 February 1993
RELEASE GROUPS INCLUDED: 88021

1988 MCNARY TRANS CONTROL BELOW MCNARY

SPRING CHINOOK

Brands Used: LAR 1
Wire Codes Used: 232234

NUMBER RELEASED: 7502

RECOVERY AREA	YEAR OF RETURN 1988	1989	1990	1991	1992	1993	TOTAL	% RETURN
RIVER SYSTEM TRAPS PRIEST RAPIDS TRAP	0	0	1	0	0	0	1	0.013
OCEAN FISHERIES	0	0	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0	0	0.000
INDIAN FISHERIES	0	0	0	0	0	0	0	0.000
HATCHERIES	0	0	0	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0	0	0	0.000
TOTALS	0	0	1	0	0	0	1	0.013
PERCENT OF RECOVERY %	0.0	0.0	100.0	0.0	0.0	0.0		

Appendix Table 6.9.--Recoveries of adult spring chinook salmon released as juveniles below McNary Dam from 25 May to 2 June 1988.

Master File Date : 22 February 1993
RELEASE GROUPS INCLUDED: 8802J

1988 MCNARY TRANS CONTROL BELOW MCNARY

SPRING CHINOOK

Brands Used: LAE 2
Wire Codes Used: 232235

NUMBER RELEASED: 7502

RECOVERY AREA	YEAR OF RETURN 1988	1989	1990	1991	1992	1993	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
LOWER GRANITE TRAP	0	0	1	0	0	0	1	0.013
PRIEST RAPIDS TRAP	0	0	1	0	0	0	1	0.013
OCEAN FISHERIES	0	0	0	0	0	0	0	0.000
RIVER SPORT								
WENATCHEE R.	0	0	1	0	0	0	1	0.013
RIVER COMMERCIAL	0	0	0	0	0	0	0	0.000
INDIAN FISHERIES								
WINTER INDIAN NET	0	0	0	1	0	0	1	0.013
HATCHERIES	0	0	0	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0	0	0	0.000
TOTALS	0	0	3	1	0	0	4	0.053
PERCENT OF RECOVERY %	0.0	0.0	75.0	25.0	0.0	0.0		

Appendix Table 7.0.--Summary of all recoveries of adult spring chinook salmon transported by barge from McNary Dam to below Bonneville Dam in 1988.

Master File Date : 22 February 1993
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	YEAR OF RETURN 1988	1989	1990	1991	1992	1993	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
BONNEVILLE TRAP	0	2	17	3	0	0	22	0.044
LOWER GRANITE TRAP	0	3	5	2	0	0	10	0.020
PRIEST RAPIDS TRAP	0	0	10	0	0	0	10	0.020
OCEAN FISHERIES								
BRITISH COLUMBIA	0	0	1	0	0	0	1	0.002
OREGON	0	0	0	1	0	0	1	0.002
RIVER SPORT								
COLUMBIA R. ABOVE SNAKE R.	0	0	2	0	0	0	2	0.004
WENATCHEE R.	0	0	4	2	0	0	6	0.012
RIVER COMMERCIAL	0	0	0	0	0	0	0	0.000
INDIAN FISHERIES								
INDIAN GENERAL	0	0	0	1	0	0	1	0.002
INDIAN CEREMONIAL	0	0	3	2	0	0	5	0.010
HATCHERIES								
DWORSHAK H.	0	0	3	0	0	0	3	0.006
RAPID RIVER H.	0	0	1	0	0	0	1	0.002
DESCHUTES R. HATCHERIES	0	0	1	0	0	0	1	0.002
LEAVENWORTH H.	0	1	6	0	0	0	7	0.014
ENTIAT H.	0	0	1	0	0	0	1	0.002
STREAM SURVEY								
GENERAL	0	0	5	0	0	0	5	0.010
OTHER	0	0	1	0	0	0	1	0.002
TOTALS	0	6	60	11	0	0	77	0.154
PERCENT OF RECOVERY %	0.0	7.8	77.9	14.3	0.0	0.0		

Appendix Table 7.1.--Recoveries of adult spring chinook salmon transported as juvenile by barge from McNary Dam to below Bonneville Dam from 8 to 16 April 1988.

Master File Date : 22 February 1993
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	YEAR OF RETURN 1988	1989	1990	1991	1992	1993	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
BONNEVILLE TRAP	0	1	7	1	0	0	9	0.180
PRIEST RAPIDS TRAP	0	0	2	0	0	0	2	0.040
OCEAN FISHERIES								
BRITISH COLUMBIA	0	0	1	0	0	0	1	0.020
OREGON	0	0	0	1	0	0	1	0.020
RIVER SPORT								
COLUMBIA R. ABOVE SNAKE R.	0	0	2	0	0	0	2	0.040
RIVER COMMERCIAL	0	0	0	0	0	0	0	0.000
INDIAN FISHERIES	0	0	0	0	0	0	0	0.000
HATCHERIES	0	0	0	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0	0	0	0.000
TOTALS	0	1	12	2	0	0	15	0.300
PERCENT OF RECOVERY %	0.0	6.7	80.0	13.3	0.0	0.0		

Appendix Table 7.2.--Recoveries of adult spring chinook salmon transported as juveniles by barge from McNary Dam to below Bonneville Dam from 16 April to 1 May 1988.

Master File Date : 22 February 1993
RELEASE GROUPS INCLUDED: 8801B

1988 MCNARY TRANS BARGE BELOW BONNEVILLE

SPRING CHINOOK

Brands Used: RAL 2
Wire Codes Used: 232237

NUMBER RELEASED: 5002

RECOVERY AREA	YEAR OF RETURN 1988	1989	1990	1991	1992	1993	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
BONNEVILLE TRAP	0	0	6	0	0	0	6	0.120
LOWER GRANITE TRAP	0	0	2	0	0	0	2	0.040
PRIEST RAPIDS TRAP	0	0	5	0	0	0	5	0.100
OCEAN FISHERIES	0	0	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0	0	0.000
INDIAN FISHERIES	0	0	0	0	0	0	0	0.000
HATCHERIES								
DWORSHAK H.	0	0	2	0	0	0	2	0.040
DESCHUTES R. HATCHERIES	0	0	1	0	0	0	1	0.020
STREAM SURVEY								
GENERAL	0	0	3	0	0	0	3	0.060
TOTALS	0	0	19	0	0	0	19	0.380
PERCENT OF RECOVERY %	0.0	0.0	100.0	0.0	0.0	0.0		

Appendix Table 7.3.--Recoveries of adult spring chinook salmon transported as juveniles by barge from McNary Dam to below Bonneville Dam from 1 to 6 May 1988.

Master File Date : 22 February 1993
RELEASE GROUPS INCLUDED: 8801C

1988 MCNARY TRANS BARGE BELOW BONNEVILLE

SPRING CHINOOK

Brands Used: RAL 3
Wire Codes Used: 232238

NUMBER RELEASED: 5002

RECOVERY AREA		YEAR OF RETURN 1988	1989	1990	1991	1992	1993	TOTAL	% RETURN
RIVER SYSTEM TRAPS									
BONNEVILLE TRAP		0	0	0	1	0	0	1	0.020
PRIEST RAPIDS TRAP		0	0	1	0	0	0	1	0.020
OCEAN FISHERIES		0	0	0	0	0	0	0	0.000
RIVER SPORT									
WENATCHEE R.		0	0	1	0	0	0	1	0.020
RIVER COMMERCIAL		0	0	0	0	0	0	0	0.000
INDIAN FISHERIES									
INDIAN CEREMONIAL		0	0	2	0	0	0	2	0.040
HATCHERIES									
RAPID RIVER H.		0	0	1	0	0	0	1	0.020
STREAM SURVEY									
GENERAL		0	0	1	0	0	0	1	0.020
TOTALS		0	0	6	1	0	0	7	0.140
PERCENT OF RECOVERY	%	0.0	0.0	85.7	14.3	0.0	0.0		

Appendix Table 7.4.--Recoveries of adult spring chinook salmon transported as juveniles by barge from McNary Dam to below Bonneville Dam from 6 to 8 May 1988.

Master File Date : 22 February 1993
RELEASE GROUPS INCLUDED: 8801D

1988 MCNARY TRANS BARGE BELOW BONNEVILLE

SPRING CHINOOK

Brands Used: RAL 4
Wire Codes Used: 232239

NUMBER RELEASED: 5011

RECOVERY AREA	YEAR OF RETURN 1988	1989	1990	1991	1992	1993	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
BONNEVILLE TRAP	0	0	1	0	0	0	1	0.020
LOWER GRANITE TRAP	0	0	1	0	0	0	1	0.020
OCEAN FISHERIES	0	0	0	0	0	0	0	0.000
RIVER SPORT								
WENATCHEE R.	0	0	1	0	0	0	1	0.020
RIVER COMMERCIAL	0	0	0	0	0	0	0	0.000
INDIAN FISHERIES	0	0	0	0	0	0	0	0.000
HATCHERIES								
LEAVENWORTH H.	0	0	1	0	0	0	1	0.020
ENTIAT H.	0	0	1	0	0	0	1	0.020
STREAM SURVEY	0	0	0	0	0	0	0	0.000
TOTALS	0	0	5	0	0	0	5	0.100
PERCENT OF RECOVERY %	0.0	0.0	100.0	0.0	0.0	0.0		

Appendix Table 7.5.--Recoveries of adult spring chinook salmon transported as juveniles by barge from McNary Dam to below Bonneville Dam from 8 to 10 May 1988.

Master File Date : 22 February 1993
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		YEAR OF RETURN 1988	1989	1990	1991	1992	1993	TOTAL	% RETURN
RIVER SYSTEM TRAPS									
LOWER GRANITE TRAP		0	2	1	1	0	0	4	0.080
OCEAN FISHERIES		0	0	0	0	0	0	0	0.000
RIVER SPORT									
WENATCHEE R.		0	0	0	1	0	0	1	0.020
RIVER COMMERCIAL		0	0	0	0	0	0	0	0.000
INDIAN FISHERIES									
INDIAN GENERAL		0	0	0	1	0	0	1	0.020
INDIAN CEREMONIAL		0	0	0	1	0	0	1	0.020
HATCHERIES									
DWORSHAK H.		0	0	1	0	0	0	1	0.020
LEAVENWORTH H.		0	0	2	0	0	0	2	0.040
STREAM SURVEY		0	0	0	0	0	0	0	0.000
TOTALS		0	2	4	4	0	0	10	0.200
PERCENT OF RECOVERY	%	0.0	20.0	40.0	40.0	0.0	0.0		

Appendix Table 7.6.--Recoveries of adult spring chinook salmon transported as juveniles by barge from McNary Dam to below Bonneville Dan from 10 to 12 May 1988.

Master File Date : 22 February 1993
RELEASE GROUPS INCLUDED: 8801F

1988 MCNARY TRANS BARGE BELOW BONNEVILLE

SPRING CHINOOK

Brands Used: RAY 2
Wire Codes Used: 232241

NUMBER RELEASED: 5002

RECOVERY AREA		YEAR OF RETURN 1988	1989	1990	1991	1992	1993	TOTAL	% RETURN
RIVER SYSTEM TRAPS									
LOWER GRANITE TRAP		0	0	1	0	0	0	1	0.020
PRIEST RAPIDS TRAP		0	0	1	0	0	0	1	0.020
OCEAN FISHERIES		0	0	0	0	0	0	0	0.000
RIVER SPORT		0	0	0	0	0	0	0	0.000
RIVER COMMERCIAL		0	0	0	0	0	0	0	0.000
INDIAN FISHERIES		0	0	0	0	0	0	0	0.000
HATCHERIES		0	0	0	0	0	0	0	0.000
STREAM SURVEY		0	0	0	0	0	0	0	0.000
OTHER		0	0	1	0	0	0	1	0.020
TOTALS		0	0	3	0	0	0	3	0.060
PERCENT OF RECOVERY	%	0.0	0.0	100.0	0.0	0.0	0.0		

Appendix Table 7.7.--Recoveries of adult spring chinook salmon transported as juveniles by barge from McNary Dam to below Bonneville Dam from 12 to 15 May 1988.

Master File Date : 22 February 1993
RELEASE GROUPS INCLUDED: 8801G

1988 MCNARY TRANS BARGE BELOW BONNEVILLE

SPRING CHINOOK

Brands Used: RAV 3
Wire Codes Used: 232242

NUMBER RELEASED: 5001

RECOVERY AREA		YEAR OF RETURN 1988	1989	1990	1991	1992	1993	TOTAL	% RETURN
RIVER SYSTEM TRAPS		0	0	0	0	0	0	0	0.000
OCEAN FISHERIES		0	0	0	0	0	0	0	0.000
RIVER SPORT		0	0	0	0	0	0	0	0.000
RIVER COMMERCIAL		0	0	0	0	0	0	0	0.000
INDIAN FISHERIES INDIAN CEREMONIAL		0	0	1	0	0	0	1	0.020
HATCHERIES LEAVENWORTH H.		0	1	2	0	0	0	3	0.060
STREAM SURVEY		0	0	0	0	0	0	0	0.000
TOTALS		0	1	3	0	0	0	4	0.080
PERCENT OF RECOVERY	%	0.0	25.0	75.0	0.0	0.0	0.0		

Appendix Table 7.8.--Recoveries of adult spring chinook salmon transported as juveniles by barge from McNary Dam to below Bonneville Dam from 15 to 19 May 1988.

Master File Date : 22 February 1993
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		YEAR OF RETURN 1988	1989	1990	1991	1992	1993	TOTAL	% RETURN
RIVER SYSTEM TRAPS									
BONNEVILLE TRAP		0	0	1	0	0	0	1	0.020
LOWER GRANITE TRAP		0	1	0	0	0	0	1	0.020
OCEAN FISHERIES		0	0	0	0	0	0	0	0.000
RIVER SPORT		0	0	0	0	0	0	0	0.000
RIVER COMMERCIAL		0	0	0	0	0	0	0	0.000
INDIAN FISHERIES		0	0	0	0	0	0	0	0.000
HATCHERIES		0	0	0	0	0	0	0	0.000
STREAM SURVEY		0	0	0	0	0	0	0	0.000
TOTALS		0	1	1	0	0	0	2	0.040
PERCENT OF RECOVERY	%	0.0	50.0	50.0	0.0	0.0	0.0		

Appendix Table 7.9.--Recoveries of adult spring chinook salmon transported as juveniles by barge from McNary Dam to below Bonneville Dam from 19 to 25 May 1988.

Master File Date : 22 February 1993
RELEASE GROUPS INCLUDED: 88011

1988 MCNARY TRANS BARGE BELOW BONNEVILLE

SPRING CHINOOK

Brands Used: RAS 1
Wire Codes Used: 232244

NUMBER RELEASED: 5002

RECOVERY AREA		YEAR OF RETURN 1988	1989	1990	1991	1992	1993	TOTAL	% RETURN
RIVER SYSTEM TRAPS									
BONNEVILLE TRAP		0	0	2	1	0	0	3	0.060
LOWER GRANITE TRAP		0	0	0	1	0	0	1	0.020
OCEAN FISHERIES		0	0	0	0	0	0	0	0.000
RIVER SPORT									
WENATCHEE R.		0	0	0	1	0	0	1	0.020
RIVER COMMERCIAL		0	0	0	0	0	0	0	0.000
INDIAN FISHERIES		0	0	0	0	0	0	0	0.000
HATCHERIES									
LEAVENWORTH H.		0	0	1	0	0	0	1	0.020
STREAM SURVEY									
GENERAL		0	0	1	0	0	0	1	0.020
TOTALS		0	0	4	3	0	0	7	0.140
PERCENT OF RECOVERY	%	0.0	0.0	57.1	42.9	0.0	0.0		

Appendix Table 7.10.--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 : 22 February 1993
RELEASE GROUPS INCLUDED: 88013

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	1990	1991	1992	1993	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
BONNEVILLE TRAP	0	1	0	0	0	0	1	0.020
PRIEST RAPIDS TRAP	0	0	1	0	0	0	1	0.020
OCEAN FISHERIES	0	0	0	0	0	0	0	0.000
RIVER SPORT								
WENATCHEE R.	0	0	2	0	0	0	2	0.040
RIVER COMMERCIAL	0	0	0	0	0	0	0	0.000
INDIAN FISHERIES								
INDIAN CEREMONIAL	0	0	0	1	0	0	1	0.020
HATCHERIES	0	0	0	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0	0	0	0.000
TOTALS	0	1	3	1	0	0	5	0.100
PERCENT OF RECOVERY %	0.0	20.0	60.0	20.0	0.0	0.0		

Appendix Table 8.0.--Summary of all recoveries of adult fall chinook salmon released as juveniles below McNary Dam in 1986.

Master File Date : 22 February 1993
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	YEAR OF RETURN 1986	1987	1988	1989	1990	1991	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
BONNEVILLE TRAP	0	0	4	0	11	2	17	0.015
PRIEST RAPIDS TRAP	0	0	0	0	0	1	1	0.001
OCEAN FISHERIES								
ALASKA	0	0	1	11	13	0	25	0.022
BRITISH COLUMBIA	0	1	3	11	4	0	19	0.016
WASHINGTON	0	0	2	2	2	0	6	0.005
OREGON	0	0	5	0	0	0	5	0.004
RIVER SPORT								
COLUMBIA R. BELOW SNAKE R.	0	0	0	1	1	0	2	0.002
COLUMBIA R. ABOVE SNAKE R.	0	1	0	0	1	0	2	0.002
RIVER COMMERCIAL								
COMMERCIAL NET	0	0	0	7	3	1	11	0.009
COL. R. TEST FSHRY (ORE)	0	0	0	1	0	0	1	0.001
INDIAN FISHERIES								
INDIAN GENERAL	0	0	0	0	2	0	2	0.002
FALL INDIAN NET	0	0	0	16	17	0	33	0.028
HATCHERIES								
LYONS FERRY H.	0	0	0	1	0	0	1	0.001
WELLS H.	0	0	0	1	2	0	3	0.003
PRIEST RAPIDS H.	0	3	8	16	10	1	38	0.033
STREAM SURVEY								
GENERAL	0	1	0	0	2	0	3	0.003
TOTALS	0	6	23	67	68	5	169	0.146
PERCENT OF RECOVERY %	0.0	3.6	13.6	39.6	40.2	3.0		

Appendix Table 8.1.--Recoveries of adult fall chinook salmon released as juveniles below McNary Dam from 11 to 18 June 1986.

Master File Date : 22 February 1993
RELEASE GROUPS INCLUDED: 8615A

1986 MCNARY TRANS CONTROL BELOW MCNARY

FALL CHINOOK

Brands Used: LA173
Wire Codes Used: 231921

NUMBER RELEASED: 9969

RECOVERY AREA		YEAR OF RETURN 1986	1987	1988	1989	1990	1991	TOTAL	% RETURN
RIVER SYSTEM TRAPS		0	0	0	0	0	0	0	0.000
OCEAN FISHERIES									
ALASKA		0	0	0	1	1	0	2	0.020
BRITISH COLUMBIA		0	0	0	0	1	0	1	0.010
WASHINGTON		0	0	0	0	1	0	1	0.010
RIVER SPORT		0	0	0	0	0	0	0	0.000
RIVER COMMERCIAL									
COMMERCIAL NET		0	0	0	2	0	0	2	0.020
INDIAN FISHERIES									
FALL INDIAN NET		0	0	0	3	1	0	4	0.040
HATCHERIES									
PRIEST RAPIDS H.		0	1	0	1	2	0	4	0.040
STREAM SURVEY		0	0	0	0	0	0	0	0.000
TOTALS		0	1	0	7	6	0	14	0.140
PERCENT OF RECOVERY	%	0.0	7.1	0.0	50.0	42.9	0.0		

Appendix Table 8.2.--Recoveries of adult fall chinook salmon released as juveniles below McNary Dam from 18 to 21 June 1986.

Master File Date : 22 February 1993
RELEASE GROUPS INCLUDED: 8615B

1986 MCNARY TRANS CONTROL BELOW MCNARY

FALL CHINOOK

Brands Used: LA3X3
Wire Codes Used: 231923

NUMBER RELEASED: 9982

RECOVERY AREA	YEAR OF RETURN 1986	1987	1988	1989	1990	1991	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
BONNEVILLE TRAP	0	0	1	0	1	0	2	0.020
OCEAN FISHERIES								
ALASKA	0	0	0	1	1	0	2	0.020
BRITISH COLUMBIA	0	0	0	1	0	0	1	0.010
RIVER SPORT	0	0	0	0	0	0	0	0.000
RIVER COMMERCIAL								
COMMERCIAL NET	0	0	0	0	1	0	1	0.010
INDIAN FISHERIES								
INDIAN GENERAL	0	0	0	0	1	0	1	0.010
FALL INDIAN NET	0	0	0	2	2	0	4	0.040
HATCHERIES								
WELLS H.	0	0	0	0	1	0	1	0.010
PRIEST RAPIDS H.	0	0	2	2	2	0	6	0.060
STREAM SURVEY	0	0	0	0	0	0	0	0.000
TOTALS	0	0	3	6	9	0	18	0.180
PERCENT OF RECOVERY %	0.0	0.0	16.7	33.3	50.0	0.0		

Appendix table 8.3.--Recoveries of adult fall chinook salmon released as juveniles below McNary Dam from 21 to 27 June 1986.

Master File Date : 22 February 1993
RELEASE GROUPS INCLUDED: 8615C

1986 MCNARY TRANS CONTROL BELOW MCNARY

FALL CHINOOK

Brands Used: LA3J3
Wire Codes Used: 231925

NUMBER RELEASED: 9972

RECOVERY AREA		YEAR OF RETURN 1986	1987	1988	1989	1990	1991	TOTAL	% RETURN
RIVER SYSTEM TRAPS									
BONNEVILLE TRAP		0	0	1	0	1	0	2	0.020
OCEAN FISHERIES									
ALASKA		0	0	0	2	2	0	4	0.040
BRITISH COLUMBIA		0	0	0	3	0	0	3	0.030
WASHINGTON		0	0	1	0	0	0	1	0.010
OREGON		0	0	1	0	0	0	1	0.010
RIVER SPORT		0	0	0	0	0	0	0	0.000
RIVER COMMERCIAL									
COMMERCIAL NET		0	0	0	1	0	0	1	0.010
INDIAN FISHERIES									
FALL INDIAN NET		0	0	0	2	1	0	3	0.030
HATCHERIES									
WELLS H.		0	0	0	1	0	0	1	0.010
PRIEST RAPIDS H.		0	1	1	1	1	0	4	0.040
STREAM SURVEY		0	0	0	0	0	0	0	0.000
TOTALS		0	1	4	10	5	0	20	0.201
PERCENT OF RECOVERY	%	0.0	5.0	20.0	50.0	25.0	0.0		

Appendix Table 8.4.--Recoveries of adult fall chinook salmon released as juveniles below McNary Dam from 27 June to 8 July 1986.

Master File Date : 22 February 1993
RELEASE GROUPS INCLUDED: 8615D

1986 MCNARY TRANS CONTROL BELOW MCNARY

FALL CHINOOK

Brands Used: LA3C3
Wire Codes Used: 231927

NUMBER RELEASED: 10745

RECOVERY AREA	YEAR OF RETURN 1986	1987	1988	1989	1990	1991	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
BONNEVILLE TRAP	0	0	0	0	2	1	3	0.028
OCEAN FISHERIES								
ALASKA	0	0	0	2	1	0	3	0.028
BRITISH COLUMBIA	0	0	1	3	0	0	4	0.037
WASHINGTON	0	0	0	1	0	0	1	0.009
OREGON	0	0	3	0	0	0	3	0.028
RIVER SPORT	0	0	0	0	0	0	0	0.000
RIVER COMMERCIAL								
COMMERCIAL NET	0	0	0	0	1	0	1	0.009
INDIAN FISHERIES	0	0	0	0	0	0	0	0.000
HATCHERIES								
LYONS FERRY H.	0	0	0	1	0	0	1	0.009
PRIEST RAPIDS H.	0	1	3	6	2	0	12	0.112
STREAM SURVEY	0	0	0	0	0	0	0	0.000
TOTALS	0	1	7	13	6	1	28	0.261
PERCENT OF RECOVERY %	0.0	3.6	25.0	46.4	21.4	3.6		

Appendix Table 8.5.--Recoveries of adult fall chinook salmon released as juveniles below McNary Dam from 9 to 15 July 1986.

Master File Date : 22 February 1993
RELEASE GROUPS INCLUDED: 8615E

1986 MCNARY TRANS CONTROL BELOW MCNARY

FALL CHINOOK

Brands Used: LA3L3
Wire Codes Used: 231929

NUMBER RELEASED: 9937

RECOVERY AREA	YEAR OF RETURN 1986	1987	1988	1989	1990	1991	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
BONNEVILLE TRAP	0	0	0	0	1	1	2	0.020
PRIEST RAPIDS TRAP	0	0	0	0	0	1	1	0.010
OCEAN FISHERIES								
ALASKA	0	0	0	1	1	0	2	0.020
BRITISH COLUMBIA	0	0	1	0	0	0	1	0.010
WASHINGTON	0	0	0	0	1	0	1	0.010
RIVER SPORT								
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	1	0	1	0.010
RIVER COMMERCIAL								
COMMERCIAL NET	0	0	0	1	0	0	1	0.010
INDIAN FISHERIES								
INDIAN GENERAL	0	0	0	0	1	0	1	0.010
FALL INDIAN NET	0	0	0	1	5	0	6	0.060
HATCHERIES								
PRIEST RAPIDS H.	0	0	1	1	2	1	5	0.050
STREAM SURVEY	0	0	0	0	0	0	0	0.000
TOTALS	0	0	2	4	12	3	21	0.211
PERCENT OF RECOVERY %	0.0	0.0	9.5	19.0	57.1	14.3		

Appendix Table 8.6.--Recoveries of adult fall chinook salmon released as juveniles below McNary Dam from 15 to 19 July 1986.

Master File Date : 22 February 1993
RELEASE GROUPS INCLUDED: 8615F

1986 MCNARY TRANS CONTROL BELOW MCNARY

FALL CHINOOK

Brands Used: LA7H3
Wire Codes Used: 231931

NUMBER RELEASED: 9949

RECOVERY AREA	YEAR OF RETURN 1986	1987	1988	1989	1990	1991	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
BONNEVILLE TRAP	0	0	1	0	2	0	3	0.030
OCEAN FISHERIES								
ALASKA	0	0	0	1	0	0	1	0.010
BRITISH COLUMBIA	0	1	0	1	0	0	2	0.020
WASHINGTON	0	0	1	0	0	0	1	0.010
RIVER SPORT								
COLUMBIA R. BELOW SNAKE R.	0	0	0	1	0	0	1	0.010
RIVER COMMERCIAL	0	0	0	0	0	0	0	0.000
INDIAN FISHERIES								
FALL INDIAN NET	0	0	0	1	4	0	5	0.050
HATCHERIES								
WELLS H.	0	0	0	0	1	0	1	0.010
PRIEST RAPIDS H.	0	0	1	5	0	0	6	0.060
STREAM SURVEY	0	0	0	0	0	0	0	0.000
TOTALS	0	1	3	9	7	0	20	0.201
PERCENT OF RECOVERY %	0.0	5.0	15.0	45.0	35.0	0.0		

Appendix Table 8.7.--Recoveries of adult fall chinook salmon released as juveniles below McNary Dam from 19 to 21 July 1986.

Master File Date : 22 February 1993
RELEASE GROUPS INCLUDED: 8615G

1986 MCNARY TRANS CONTROL BELOW MCNARY

FALL CHINOOK

Brands Used: LA103
Wire Codes Used: 231933

NUMBER RELEASED: 9968

RECOVERY AREA	YEAR OF RETURN 1986	1987	1988	1989	1990	1991	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
BONNEVILLE TRAP	0	0	1	0	2	0	3	0.030
OCEAN FISHERIES								
ALASKA	0	0	0	1	2	0	3	0.030
BRITISH COLUMBIA	0	0	1	0	1	0	2	0.020
OREGON	0	0	1	0	0	0	1	0.010
RIVER SPORT								
COLUMBIA R. ABOVE SNAKE R.	0	1	0	0	0	0	1	0.010
RIVER COMMERCIAL	0	0	0	0	0	0	0	0.000
INDIAN FISHERIES								
FALL INDIAN NET	0	0	0	1	0	0	1	0.010
HATCHERIES								
PRIEST RAPIDS H.	0	0	0	0	1	0	1	0.010
STREAM SURVEY								
GENERAL	0	1	0	0	0	0	1	0.010
TOTALS	0	2	3	2	6	0	13	0.130
PERCENT OF RECOVERY %	0.0	15.4	23.1	15.4	46.2	0.0		

Appendix Table 8.8.--Recoveries of adult fall chinook salmon released as juveniles below McNary Dam from 21 to 22 July 1986.

Master File Date : 22 February 1993
RELEASE GROUPS INCLUDED: 8615H

1986 MCNARY TRANS CONTROL BELOW MCNARY

FALL CHINOOK

Brands Used: LA7H1
Wire Codes Used: 231935

NUMBER RELEASED: 9850

RECOVERY AREA	YEAR OF RETURN 1986	1987	1988	1989	1990	1991	TOTAL	% RETURN
RIVER SYSTEM TRAPS	0	0	0	0	0	0	0	0.000
OCEAN FISHERIES								
ALASKA	0	0	0	1	0	0	1	0.010
BRITISH COLUMBIA	0	0	0	1	1	0	2	0.020
RIVER SPORT								
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	1	0	1	0.010
RIVER COMMERCIAL								
COL. R. TEST FSHRY (ORE)	0	0	0	1	0	0	1	0.010
INDIAN FISHERIES								
FALL INDIAN NET	0	0	0	1	1	0	2	0.020
HATCHERIES	0	0	0	0	0	0	0	0.000
STREAM SURVEY								
GENERAL	0	0	0	0	1	0	1	0.010
TOTALS	0	0	0	4	4	0	8	0.081
PERCENT OF RECOVERY %	0.0	0.0	0.0	50.0	50.0	0.0		

Appendix Table 8.9.--Recoveries of adult fall chinook salmon released as juveniles below McNary Dam from 22 to 23 July 1986.

Master File Date : 22 February 1993
RELEASE GROUPS INCLUDED: 86151

1986 MCNARY TRANS CONTROL BELOW MCNARY

FALL CHINOOK

Brands Used: LA101
Wire Codes Used: 231937

NUMBER RELEASED: 9867

RECOVERY AREA		YEAR OF RETURN 1986	1987	1988	1989	1990	1991	TOTAL	% RETURN
RIVER SYSTEM TRAPS									
BONNEVILLE TRAP		0	0	0	0	1	0	1	0.010
OCEAN FISHERIES									
ALASKA		0	0	0	0	3	0	3	0.030
BRITISH COLUMBIA		0	0	0	0	1	0	1	0.010
RIVER SPORT		0	0	0	0	0	0	0	0.000
RIVER COMMERCIAL									
COMMERCIAL NET		0	0	0	1	0	0	1	0.010
INDIAN FISHERIES									
FALL INDIAN NET		0	0	0	2	1	0	3	0.030
HATCHERIES		0	0	0	0	0	0	0	0.000
STREAM SURVEY		0	0	0	0	0	0	0	0.000
TOTALS		0	0	0	3	6	0	9	0.091
PERCENT OF RECOVERY	%	0.0	0.0	0.0	33.3	66.7	0.0		

Appendix Table 8.10.--Recoveries of adult fall chinook salmon released as juveniles below McNary Dam from 23 to 28 July 1986.

Master File Date : 22 February 1993
RELEASE GROUPS INCLUDED: 8615J

1986 MCNARY TRANS CONTROL BELOW MCNARY

FALL CHINOOK

Brands Used: LA171
Wire Codes Used: 231939

NUMBER RELEASED: 9978

RECOVERY AREA	YEAR OF RETURN 1986	1987	1988	1989	1990	1991	TOTAL	% RETURN
RIVER SYSTEM TRAPS	0	0	0	0	0	0	0	0.000
OCEAN FISHERIES WASHINGTON	0	0	0	1	0	0	1	0.010
RIVER SPORT	0	0	0	0	0	0	0	0.000
RIVER COMMERCIAL COMMERCIAL NET	0	0	0	2	0	0	2	0.020
INDIAN FISHERIES FALL INDIAN NET	0	0	0	1	1	0	2	0.020
HATCHERIES	0	0	0	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0	0	0	0.000
TOTALS	0	0	0	4	1	0	5	0.050
PERCENT OF RECOVERY %	0.0	0.0	0.0	80.0	20.0	0.0		

Appendix Table 8.11.--Recoveries of adult fall chinook salmon released as juveniles below McNary Dam from 29 July to 1 August 1986.

Master File Date : 22 February 1993
RELEASE GROUPS INCLUDED: 8615K

1986 MCNARY TRANS CONTROL BELOW MCNARY

FALL CHINOOK

Brands Used: LA3X1
Wire Codes Used: 231941

NUMBER RELEASED: 9976

RECOVERY AREA		YEAR OF RETURN 1986	1987	1988	1989	1990	1991	TOTAL	% RETURN
RIVER SYSTEM TRAPS									
BONNEVILLE TRAP		0	0	0	0	1	0	1	0.010
OCEAN FISHERIES									
ALASKA		0	0	1	0	2	0	3	0.030
BRITISH COLUMBIA		0	0	0	1	0	0	1	0.010
RIVER SPORT		0	0	0	0	0	0	0	0.000
RIVER COMMERCIAL									
COMMERCIAL NET		0	0	0	0	1	0	1	0.010
INDIAN FISHERIES									
FALL INDIAN NET		0	0	0	2	1	0	3	0.030
HATCHERIES		0	0	0	0	0	0	0	0.000
STREAM SURVEY									
GENERAL		0	0	0	0	1	0	1	0.010
TOTALS		0	0	1	3	6	0	10	0.100
PERCENT OF RECOVERY	%	0.0	0.0	10.0	30.0	60.0	0.0		

Appendix Table 8.12.--Recoveries of adult fall chinook salmon released as juveniles below McNary Dam from 1 to 7 August 1986.

Master File Date : 22 February 1993
RELEASE GROUPS INCLUDED: 8615L

1986 MCNARY TRANS CONTROL BELOW MCNARY

FALL CHINOOK

Brands Used: LA3L1
Wire Codes Used: 231844

NUMBER RELEASED: 5798

RECOVERY AREA	YEAR OF RETURN 1986	1987	1988	1989	1990	1991	TOTAL	% RETURN
RIVER SYSTEM TRAPS	0	0	0	0	0	0	0	0.000
OCEAN FISHERIES								
ALASKA	0	0	0	1	0	0	1	0.017
BRITISH COLUMBIA	0	0	0	1	0	0	1	0.017
RIVER SPORT	0	0	0	0	0	0	0	0.000
RIVER COMMERCIAL								
COMMERCIAL NET	0	0	0	0	0	1	1	0.017
INDIAN FISHERIES	0	0	0	0	0	0	0	0.000
HATCHERIES	0	0	0	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0	0	0	0.000
TOTALS	0	0	0	2	0	1	3	0.052
PERCENT OF RECOVERY %	0.0	0.0	0.0	66.7	0.0	33.3		

Appendix Table 9.0.--Summary of all recoveries of adult fall chinook salmon transported as juveniles by barge from McNary Dam to below Bonneville Dam in 1986.

Master File Date : 22 February 1993
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	YEAR OF RETURN 1986	1987	1988	1989	1990	1991	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
BONNEVILLE TRAP	0	0	4	0	56	4	64	0.056
LOWER GRANITE TRAP	0	0	0	0	1	0	1	0.001
OCEAN FISHERIES								
ALASKA	0	0	2	18	42	3	65	0.057
BRITISH COLUMBIA	0	2	6	22	38	5	73	0.064
WASHINGTON	0	0	5	2	4	0	11	0.010
OREGON	0	0	15	0	0	0	15	0.013
OTHER	0	0	0	0	0	1	1	0.001
RIVER SPORT								
COLUMBIA R. BELOW SNAKE R.	0	0	2	0	0	0	2	0.002
COLUMBIA R. ABOVE SNAKE R.	0	3	0	0	5	2	10	0.009
RIVER COMMERCIAL								
COMMERCIAL NET	0	3	0	17	17	4	41	0.036
INDIAN FISHERIES								
INDIAN GENERAL	0	0	0	0	7	0	7	0.006
FALL INDIAN NET	0	0	0	36	62	2	100	0.087
HATCHERIES								
LYONS FERRY H.	0	0	0	3	1	0	4	0.003
WELLS H.	0	0	1	2	3	0	6	0.005
PRIEST RAPIDS H.	0	8	8	22	11	3	52	0.045
STREAM SURVEY								
GENERAL	0	0	0	4	5	1	10	0.009
TOTALS	0	16	43	126	252	25	462	0.403
PERCENT OF RECOVERY %	0.0	3.5	9.3	27.3	54.5	5.4		

Appendix Table 9.1.--Recoveries of adult fall chinook salmon transported as juveniles by barge from McNary Dam to below Bonneville Dam from 11 to 18 June 1986.

Master File Date : 22 February 1993
RELEASE GROUPS INCLUDED: 8616A

1986 MCNARY TRANS BARGE BELOW BONNEVILLE

FALL CHINOOK

Brands Used: RA171
Wire Codes Used: 231922

NUMBER RELEASED: 9974

RECOVERY AREA		YEAR OF RETURN 1986	1987	1988	1989	1990	1991	TOTAL	% RETURN
RIVER SYSTEM TRAPS									
BONNEVILLE TRAP		0	0	0	0	3	0	3	0.030
OCEAN FISHERIES									
ALASKA		0	0	0	1	0	0	1	0.010
BRITISH COLUMBIA		0	0	0	3	1	0	4	0.040
WASHINGTON		0	0	0	0	1	0	1	0.010
OREGON		0	0	1	0	0	0	1	0.010
RIVER SPORT		0	0	0	0	0	0	0	0.000
RIVER COMMERCIAL		0	0	0	0	0	0	0	0.000
INDIAN FISHERIES									
FALL INDIAN NET		0	0	0	3	1	0	4	0.040
HATCHERIES									
PRIEST RAPIDS H.		0	1	0	0	1	0	2	0.020
STREAM SURVEY		0	0	0	0	0	0	0	0.000
TOTALS		0	1	1	7	7	0	16	0.160
PERCENT OF RECOVERY	%	0.0	6.3	6.3	43.8	43.8	0.0		

Appendix Table 9.2.--Recoveries of adult fall chinook salmon transported as juveniles by barge from McNary Dam to below Bonneville dam from 18 to 21 June 1986.

Master File Date : 22 February 1993
RELEASE GROUPS INCLUDED: 8616B

1986 MCNARY TRANS BARGE BELOW BONNEVILLE

FALL CHINOOK

Brands Used: RA3X1
Wire Codes Used: 231924

NUMBER RELEASED: 9981

RECOVERY AREA		YEAR OF RETURN 1986	1987	1988	1989	1990	1991	TOTAL	% RETURN
RIVER SYSTEM TRAPS		0	0	0	0	0	0	0	0.000
OCEAN FISHERIES									
BRITISH COLUMBIA		0	0	0	2	0	0	2	0.020
OREGON		0	0	1	0	0	0	1	0.010
RIVER SPORT		0	0	0	0	0	0	0	0.000
RIVER COMMERCIAL		0	0	0	0	0	0	0	0.000
INDIAN FISHERIES		0	0	0	0	0	0	0	0.000
HATCHERIES									
PRIEST RAPIDS H.		0	0	1	0	0	0	1	0.010
STREAM SURVEY		0	0	0	0	0	0	0	0.000
TOTALS		0	0	2	2	0	0	4	0.040
PERCENT OF RECOVERY	%	0.0	0.0	50.0	50.0	0.0	0.0		

Appendix Table 9.3.--Recoveries of adult fall chinook salmon transported as juveniles by barge from McNary Dam to below Bonneville Dam from 21 to 27 June 1986.

Master File Date : 22 February 1993
RELEASE GROUPS INCLUDED: 8616C

1986 MCNARY TRANS BARGE BELOW BONNEVILLE

FALL CHINOOK

Brands Used: RA3J1
Wire Codes Used: 231926

NUMBER RELEASED: 9971

RECOVERY AREA		YEAR OF RETURN 1986	1987	1988	1989	1990	1991	TOTAL	% RETURN
RIVER SYSTEM TRAPS		0	0	0	0	0	0	0	0.000
OCEAN FISHERIES									
ALASKA		0	0	0	1	0	0	1	0.010
BRITISH COLUMBIA		0	0	0	0	3	0	3	0.030
WASHINGTON		0	0	0	1	0	0	1	0.010
OREGON		0	0	2	0	0	0	2	0.020
RIVER SPORT		0	0	0	0	0	0	0	0.000
RIVER COMMERCIAL		0	0	0	0	0	0	0	0.000
INDIAN FISHERIES									
FALL INDIAN NET		0	0	0	1	1	0	2	0.020
HATCHERIES									
WELLS H.		0	0	0	1	1	0	2	0.020
PRIEST RAPIDS H.		0	0	2	1	0	0	3	0.030
STREAM SURVEY		0	0	0	0	0	0	0	0.000
TOTALS		0	0	4	5	5	0	14	0.140
PERCENT OF RECOVERY	%	0.0	0.0	28.6	35.7	35.7	0.0		

Appendix Table 9.4.--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 : 22 February 1993
RELEASE GROUPS INCLUDED: 8616D

1986 MCNARY TRANS BARGE BELOW BONNEVILLE

FALL CHINOOK

Brands Used: RA3C1
Wire Codes Used: 231928

NUMBER RELEASED: 10745

RECOVERY AREA	YEAR OF RETURN 1986	1987	1988	1989	1990	1991	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
BONNEVILLE TRAP	0	0	0	0	6	0	6	0.056
OCEAN FISHERIES								
ALASKA	0	0	0	0	4	0	4	0.037
BRITISH COLUMBIA	0	0	0	1	2	0	3	0.028
OREGON	0	0	3	0	0	0	3	0.028
RIVER SPORT								
COLUMBIA R. BELOW SNAKE R.	0	0	1	0	0	0	1	0.009
RIVER COMMERCIAL								
COMMERCIAL NET	0	0	0	2	0	0	2	0.019
INDIAN FISHERIES								
INDIAN GENERAL	0	0	0	0	2	0	2	0.019
FALL INDIAN NET	0	0	0	3	7	1	11	0.102
HATCHERIES								
LYONS FERRY H.	0	0	0	3	0	0	3	0.028
PRIEST RAPIDS H.	0	1	1	5	5	0	12	0.112
STREAM SURVEY	0	0	0	0	0	0	0	0.000
TOTALS	0	1	5	14	26	1	47	0.437
PERCENT OF RECOVERY %	0.0	2.1	10.6	29.8	55.3	2.1		

Appendix Table 9.5.--Recoveries of adult fall chinook salmon transported as juveniles by barge from McNary Dam to below Bonneville Dam from 9 to 15 July 1986.

Master File Date : 22 February 1993
RELEASE GROUPS INCLUDED: 8616E

1986 MCNARY TRANS BARGE BELOW BONNEVILLE

FALL CHINOOK

Brands Used: RA3L1
Wire Codes Used: 231930

NUMBER RELEASED: 9959

RECOVERY AREA	YEAR OF RETURN 1986	1987	1988	1989	1990	1991	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
BONNEVILLE TRAP	0	0	0	0	2	0	2	0.020
LOWER GRANITE TRAP	0	0	0	0	1	0	1	0.010
OCEAN FISHERIES								
ALASKA	0	0	1	2	2	0	5	0.050
BRITISH COLUMBIA	0	0	0	2	6	0	8	0.080
OREGON	0	0	4	0	0	0	4	0.040
RIVER SPORT								
COLUMBIA R. ABOVE SNAKE R.	0	1	0	0	0	0	1	0.010
RIVER COMMERCIAL								
COMMERCIAL NET	0	1	0	2	1	0	4	0.040
INDIAN FISHERIES								
INDIAN GENERAL	0	0	0	0	1	0	1	0.010
FALL INDIAN NET	0	0	0	8	3	0	11	0.110
HATCHERIES								
LYONS FERRY H.	0	0	0	0	1	0	1	0.010
WELLS H.	0	0	0	0	1	0	1	0.010
PRIEST RAPIDS H.	0	2	0	7	1	2	12	0.120
STREAM SURVEY								
GENERAL	0	0	0	0	1	0	1	0.010
TOTALS	0	4	5	21	20	2	52	0.522
PERCENT OF RECOVERY %	0.0	7.7	9.6	40.4	38.5	3.8		

Appendix Table 9.6.--Recoveries of adult fall chinook salmon transported as juveniles by barge from McNary Dam to below Bonneville Dam from 15 to 19 July 1986.

Master File Date : 22 February 1993
RELEASE GROUPS INCLUDED: 8616F

1986 MCNARY TRANS BARGE BELOW BONNEVILLE

FALL CHINOOK

Brands Used: RA7H1
Wire Codes Used: 231932

NUMBER RELEASED: 9972

RECOVERY AREA		YEAR OF RETURN 1986	1987	1988	1989	1990	1991	TOTAL	% RETURN
RIVER SYSTEM TRAPS									
BONNEVILLE TRAP		0	0	2	0	3	1	6	0.060
OCEAN FISHERIES									
ALASKA		0	0	1	0	3	0	4	0.040
BRITISH COLUMBIA		0	1	2	7	6	0	16	0.160
WASHINGTON		0	0	2	0	0	0	2	0.020
RIVER SPORT		0	0	0	0	0	0	0	0.000
RIVER COMMERCIAL									
COMMERCIAL NET		0	0	0	3	1	0	4	0.040
INDIAN FISHERIES									
FALL INDIAN NET		0	0	0	1	3	0	4	0.040
HATCHERIES									
WELLS H.		0	0	0	0	1	0	1	0.010
PRIEST RAPIDS H.		0	1	0	2	2	0	5	0.050
STREAM SURVEY									
GENERAL		0	0	0	2	1	0	3	0.030
TOTALS		0	2	7	15	20	1	45	0.451
PERCENT OF RECOVERY	%	0.0	4.4	15.6	33.3	44.4	2.2		

Appendix Table 9.7.--Recoveries of adult fall chinook salmon transported as juveniles by barge from McNary Dam to below Bonneville Dam from 19 to 21 July 1986.

Master File Date : 22 February 1993
RELEASE GROUPS INCLUDED: 8616G

1986 MCNARY TRANS BARGE BELOW BONNEVILLE

FALL CHINOOK

Brands Used: RA101
Wire Codes Used: 231934

NUMBER RELEASED: 9953

RECOVERY AREA	YEAR OF RETURN 1986	1987	1988	1989	1990	1991	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
BONNEVILLE TRAP	0	0	0	0	11	1	12	0.121
OCEAN FISHERIES								
ALASKA	0	0	0	3	8	0	11	0.111
BRITISH COLUMBIA	0	0	2	3	2	0	7	0.070
WASHINGTON	0	0	1	0	0	0	1	0.010
RIVER SPORT								
COLUMBIA R. ABOVE SNAKE R.	0	1	0	0	0	1	2	0.020
RIVER COMMERCIAL								
COMMERCIAL NET	0	0	0	2	0	0	2	0.020
INDIAN FISHERIES								
INDIAN GENERAL	0	0	0	0	1	0	1	0.010
FALL INDIAN NET	0	0	0	6	13	0	19	0.191
HATCHERIES								
PRIEST RAPIDS H.	0	1	1	2	0	0	4	0.040
STREAM SURVEY								
GENERAL	0	0	0	0	1	0	1	0.010
TOTALS	0	2	4	16	36	2	60	0.603
PERCENT OF RECOVERY %	0.0	3.3	6.7	26.7	60.0	3.3		

Appendix Table 9.8.--Recoveries of adult fall chinook salmon transported as juveniles by barge from McNary Dam to below Bonneville Dam from 21 to 22 July 1986.

Master File Date : 22 February 1993
RELEASE GROUPS INCLUDED: 8616H

1986 MCNARY TRANS BARGE BELOW BONNEVILLE

FALL CHINOOK

Brands Used: RA7H3
Wire Codes Used: 231936

NUMBER RELEASED: 9840

RECOVERY AREA	YEAR OF RETURN 1986	1987	1988	1989	1990	1991	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
BONNEVILLE TRAP	0	0	1	0	7	0	8	0.081
OCEAN FISHERIES								
ALASKA	0	0	0	1	4	1	6	0.061
BRITISH COLUMBIA	0	1	0	0	4	2	7	0.071
OREGON	0	0	2	0	0	0	2	0.020
OTHER	0	0	0	0	0	1	1	0.010
RIVER SPORT								
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	1	0	1	0.010
RIVER COMMERCIAL								
COMMERCIAL NET	0	0	0	2	5	1	8	0.081
INDIAN FISHERIES								
INDIAN GENERAL	0	0	0	0	1	0	1	0.010
FALL INDIAN NET	0	0	0	0	6	0	6	0.061
HATCHERIES								
PRIEST RAPIDS H.	0	0	1	2	0	1	4	0.041
STREAM SURVEY								
GENERAL	0	0	0	0	0	1	1	0.010
TOTALS	0	1	4	5	28	7	45	0.457
PERCENT OF RECOVERY %	0.0	2.2	8.9	11.1	62.2	15.6		

Appendix Table 9.9.--Recoveries of adult fall chinook salmon transported as juveniles by barge from McNary Dam to below Bonneville Dam from 22 to 23 July 1986.

Master File Date : 22 February 1993
RELEASE GROUPS INCLUDED: 86161

1986 MCNARY TRANS BARGE BELOW BONNEVILLE

FALL CHINOOK

Brands Used: RA103
Wire Codes Used: 231938

NUMBER RELEASED: 9906

RECOVERY AREA	YEAR OF RETURN 1986	1987	1988	1989	1990	1991	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
BONNEVILLE TRAP	0	0	0	0	10	1	11	0.111
OCEAN FISHERIES								
ALASKA	0	0	0	5	6	1	12	0.121
BRITISH COLUMBIA	0	0	0	1	4	0	5	0.050
WASHINGTON	0	0	1	0	0	0	1	0.010
RIVER SPORT								
COLUMBIA R. BELOW SNAKE R.	0	0	1	0	0	0	1	0.010
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	3	0	3	0.030
RIVER COMMERCIAL								
COMMERCIAL NET	0	0	0	1	0	3	4	0.040
INDIAN FISHERIES								
INDIAN GENERAL	0	0	0	0	1	0	1	0.010
FALL INDIAN NET	0	0	0	2	4	0	6	0.061
HATCHERIES	0	0	0	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0	0	0	0.000
TOTALS	0	0	2	9	28	5	44	0.444
PERCENT OF RECOVERY %	0.0	0.0	4.5	20.5	63.6	11.4		

Appendix Table 9.10.--Recoveries of adult fall chinook salmon transported as juveniles by barge from McNary Dam to below Bonneville Dam from 23 to 28 July 1986.

Master File Date : 22 February 1993
RELEASE GROUPS INCLUDED: 8616J

1986 MCNARY TRANS BARGE BELOW BONNEVILLE

FALL CHINOOK

Brands Used: RA173
Wire Codes Used: 231940

NUMBER RELEASED: 9938

RECOVERY AREA	YEAR OF RETURN 1986	1987	1988	1989	1990	1991	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
BONNEVILLE TRAP	0	0	0	0	5	0	5	0.050
OCEAN FISHERIES								
ALASKA	0	0	0	4	7	0	11	0.111
BRITISH COLUMBIA	0	0	1	2	1	1	5	0.050
RIVER SPORT								
COLUMBIA R. ABOVE SNAKE R.	0	1	0	0	1	0	2	0.020
RIVER COMMERCIAL								
COMMERCIAL NET	0	1	0	2	4	0	7	0.070
INDIAN FISHERIES								
FALL INDIAN NET	0	0	0	8	9	1	18	0.181
HATCHERIES								
PRIEST RAPIDS H.	0	0	1	0	1	0	2	0.020
STREAM SURVEY								
GENERAL	0	0	0	2	2	0	4	0.040
TOTALS	0	2	2	18	30	2	54	0.543
PERCENT OF RECOVERY %	0.0	3.7	3.7	33.3	55.6	3.7		

Appendix Table 9.11.--Recoveries of adult fall chinook salmon transported as juveniles by barge from McNary Dam to below Bonneville Dam from 29 July to 1 August 1986.

Master File Date : 22 February 1993
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 1987	1988	1989	1990	1991	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
BONNEVILLE TRAP	0	0	0	0	9	0	9	0.091
OCEAN FISHERIES								
ALASKA	0	0	0	0	5	0	5	0.051
BRITISH COLUMBIA	0	0	1	1	8	0	10	0.101
WASHINGTON	0	0	0	1	3	0	4	0.040
OREGON	0	0	2	0	0	0	2	0.020
RIVER SPORT								
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	0	1	1	0.010
RIVER COMMERCIAL								
COMMERCIAL NET	0	1	0	1	6	0	8	0.081
INDIAN FISHERIES								
INDIAN GENERAL	0	0	0	0	1	0	1	0.010
FALL INDIAN NET	0	0	0	3	12	0	15	0.152
HATCHERIES								
WELLS H.	0	0	1	1	0	0	2	0.020
PRIEST RAPIDS H.	0	2	1	3	1	0	7	0.071
STREAM SURVEY	0	0	0	0	0	0	0	0.000
TOTALS	0	3	5	10	45	1	64	0.647
PERCENT OF RECOVERY %	0.0	4.7	7.8	15.6	70.3	1.6		

Appendix Table 9.12.--Recoveries of adult fall chinook salmon transported as juveniles by barge from McNary Dam to below Bonneville Dam from 1 to 7 August 1986.

Master File Date : 22 February 1993
RELEASE GROUPS INCLUDED: 8616L

1986 MCNARY TRANS BARGE BELOW BONNEVILLE

FALL CHINOOK

Brands Used: RA3C3
Wire Codes Used: 231832

NUMBER RELEASED: 4527

RECOVERY AREA		YEAR OF RETURN 1986	1987	1988	1989	1990	1991	TOTAL	% RETURN
RIVER SYSTEM TRAPS									
BONNEVILLE TRAP		0	0	1	0	0	1	2	0.044
OCEAN FISHERIES									
ALASKA		0	0	0	1	3	1	5	0.110
BRITISH COLUMBIA		0	0	0	0	1	2	3	0.066
WASHINGTON		0	0	1	0	0	0	1	0.022
RIVER SPORT		0	0	0	0	0	0	0	0.000
RIVER COMMERCIAL									
COMMERCIAL NET		0	0	0	2	0	0	2	0.044
INDIAN FISHERIES									
FALL INDIAN NET		0	0	0	1	3	0	4	0.088
HATCHERIES		0	0	0	0	0	0	0	0.000
STREAM SURVEY		0	0	0	0	0	0	0	0.000
TOTALS		0	0	2	4	7	4	17	0.376
PERCENT OF RECOVERY	%	0.0	0.0	11.8	23.5	41.2	23.5		

Appendix Table 10.0.--Summary of all recoveries of adult fall chinook salmon released as juveniles below McNary Dam in 1987.

Master File Date : 22 February 1993
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	YEAR OF RETURN 1987	1988	1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
BONNEVILLE TRAP	0	8	0	17	5	0	30	0.044
OCEAN FISHERIES								
ALASKA	0	0	1	8	3	0	12	0.018
BRITISH COLUMBIA	0	1	1	8	2	0	12	0.018
WASHINGTON	0	1	0	1	0	0	2	0.003
OREGON	0	2	0	0	0	0	2	0.003
OTHER	0	0	0	0	1	0	1	0.001
RIVER SPORT								
COLUMBIA R. BELOW SNAKE R.	0	1	0	0	0	0	1	0.001
COLUMBIA R. ABOVE SNAKE R.	0	0	0	1	0	0	1	0.001
RIVER COMMERCIAL								
COMMERCIAL NET	0	0	0	2	6	0	8	0.012
INDIAN FISHERIES								
INDIAN GENERAL	0	0	0	3	0	0	3	0.004
FALL INDIAN NET	0	0	1	11	5	0	17	0.025
HATCHERIES								
LYONS FERRY H.	0	0	0	1	0	0	1	0.001
WELLS H.	0	0	0	0	1	0	1	0.001
PRIEST RAPIDS H.	0	4	4	5	3	0	16	0.023
STREAM SURVEY								
GENERAL	0	0	0	0	4	0	4	0.006
TOTALS	0	17	7	57	30	0	111	0.163
PERCENT OF RECOVERY %	0.0	15.3	6.3	51.4	27.0	0.0		

Appendix Table 10.1.--Recoveries of adult fall chinook salmon released as juveniles below McNary Dam from 18 to 23 June 1987.

Master File Date : 22 February 1993
RELEASE GROUPS INCLUDED: 8708A

1987 MCNARY TRANS CONTROL BELOW MCNARY

FALL CHINOOK

Brands Used: LAIX1
Wire Codes Used: 232002

NUMBER RELEASED: 10000

RECOVERY AREA		YEAR OF RETURN 1987	1988	1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS									
BONNEVILLE TRAP		0	0	0	2	0	0	2	0.020
OCEAN FISHERIES									
ALASKA		0	0	0	1	0	0	1	0.010
BRITISH COLUMBIA		0	0	1	0	1	0	2	0.020
RIVER SPORT		0	0	0	0	0	0	0	0.000
RIVER COMMERCIAL		0	0	0	0	0	0	0	0.000
INDIAN FISHERIES									
FALL INDIAN NET		0	0	0	1	0	0	1	0.010
HATCHERIES									
PRIEST RAPIDS H.		0	0	1	2	1	0	4	0.040
STREAM SURVEY		0	0	0	0	0	0	0	0.000
TOTALS		0	0	2	6	2	0	10	0.100
PERCENT OF RECOVERY	%	0.0	0.0	20.0	60.0	20.0	0.0		

Appendix Table 10.2.--Recoveries of adult fall chinook salmon released as juveniles below McNary Dam from 23 to 25 June 1987.

Master File Date : 22 February 1993
RELEASE GROUPS INCLUDED: 8708B

1987 MCNARY TRANS CONTROL BELOW MCNARY

FALL CHINOOK

Brands Used: LAIX3
Wire Codes Used: 232003

NUMBER RELEASED: 9146

RECOVERY AREA	YEAR OF RETURN 1987	1988	1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
BONNEVILLE TRAP	0	0	0	2	1	0	3	0.033
OCEAN FISHERIES								
BRITISH COLUMBIA	0	0	0	1	0	0	1	0.011
WASHINGTON	0	1	0	0	0	0	1	0.011
OTHER	0	0	0	0	1	0	1	0.011
RIVER SPORT								
COLUMBIA R. ABOVE SNAKE R.	0	0	0	1	0	0	1	0.011
RIVER COMMERCIAL	0	0	0	0	0	0	0	0.000
INDIAN FISHERIES								
INDIAN GENERAL	0	0	0	1	0	0	1	0.011
FALL INDIAN NET	0	0	0	2	0	0	2	0.022
HATCHERIES								
PRIEST RAPIDS H.	0	2	2	0	0	0	4	0.044
STREAM SURVEY	0	0	0	0	0	0	0	0.000
TOTALS	0	3	2	7	2	0	14	0.153
PERCENT OF RECOVERY %	0.0	21.4	14.3	50.0	14.3	0.0		

Appendix Table 10.3.--Recoveries of adult fall chinook salmon released as juveniles below McNary Dam from 25 June to 1 July 1987.

Master File Date : 22 February 1993
RELEASE GROUPS INCLUDED: 8708C

1987 MCNARY TRANS CONTROL BELOW MCNARY

FALL CHINOOK

Brands Used: LA2C1
Wire Codes Used: 232004

NUMBER RELEASED: 9753

RECOVERY AREA		YEAR OF RETURN 1987	1988	1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS									
BONNEVILLE TRAP		0	0	0	1	0	0	1	0.010
OCEAN FISHERIES									
ALASKA		0	0	0	1	1	0	2	0.021
BRITISH COLUMBIA		0	0	0	1	0	0	1	0.010
WASHINGTON		0	0	0	1	0	0	1	0.010
RIVER SPORT		0	0	0	0	0	0	0	0.000
RIVER COMMERCIAL		0	0	0	0	0	0	0	0.000
INDIAN FISHERIES									
INDIAN GENERAL		0	0	0	1	0	0	1	0.010
HATCHERIES									
PRIEST RAPIDS H.		0	0	1	0	0	0	1	0.010
STREAM SURVEY		0	0	0	0	0	0	0	0.000
TOTALS		0	0	1	5	1	0	7	0.072
PERCENT OF RECOVERY	%	0.0	0.0	14.3	71.4	14.3	0.0		

Appendix Table 10.4.--Recoveries of adult fall chinook salmon released as juveniles below McNary Dam from 1 to 8 July 1987.

Master File Date : 22 February 1993
RELEASE GROUPS INCLUDED: 8708D

1987 MCNARY TRANS CONTROL BELOW MCNARY

FALL CHINOOK

Brands Used: LA2C3
Wire Codes Used: 232005

NUMBER RELEASED: 10000

RECOVERY AREA	YEAR OF RETURN 1987	1988	1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
BONNEVILLE TRAP	0	2	0	3	0	0	5	0.050
OCEAN FISHERIES								
ALASKA	0	0	0	1	1	0	2	0.020
BRITISH COLUMBIA	0	1	0	2	0	0	3	0.030
OREGON	0	1	0	0	0	0	1	0.010
RIVER SPORT								
COLUMBIA R. BELOW SNAKE R.	0	1	0	0	0	0	1	0.010
RIVER COMMERCIAL								
COMMERCIAL NET	0	0	0	1	3	0	4	0.040
INDIAN FISHERIES								
INDIAN GENERAL	0	0	0	1	0	0	1	0.010
FALL INDIAN NET	0	0	1	3	1	0	5	0.050
HATCHERIES	0	0	0	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0	0	0	0.000
TOTALS	0	5	1	11	5	0	22	0.220
PERCENT OF RECOVERY %	0.0	22.7	4.5	50.0	22.7	0.0		

Appendix Table 10.5.--Recoveries of adult fall chinook salmon released as juveniles below McNary Dam from 8 to 14 July 1987.

Master File Date : 22 February 1993
RELEASE GROUPS INCLUDED: 8708R

1987 MCNARY TRANS CONTROL BELOW MCNARY

FALL CHINOOK

Brands Used: LA2J1
Wire Codes Used: 232006

NUMBER RELEASED: 10000

RECOVERY AREA	1987	YEAR OF RETURN 1988	1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
BONNEVILLE TRAP	0	1	0	4	2	0	7	0.070
OCEAN FISHERIES								
ALASKA	0	0	1	2	0	0	3	0.030
BRITISH COLUMBIA	0	0	0	1	0	0	1	0.010
RIVER SPORT	0	0	0	0	0	0	0	0.000
RIVER COMMERCIAL								
COMMERCIAL NET	0	0	0	0	2	0	2	0.020
INDIAN FISHERIES								
FALL INDIAN NET	0	0	0	2	1	0	3	0.030
HATCHERIES								
PRIEST RAPIDS H.	0	0	0	1	1	0	2	0.020
STREAM SURVEY								
GENERAL	0	0	0	0	1	0	1	0.010
TOTALS	0	1	1	10	7	0	19	0.190
PERCENT OF RECOVERY %	0.0	5.3	5.3	52.6	36.8	0.0		

Appendix Table 10.6.--Recoveries of adult fall chinook salmon released as juveniles below McNary Dam from 15 to 30 July 1987.

Master File Date : 22 February 1993
RELEASE GROUPS INCLUDED: 8708F

1987 MCNARY TRANS CONTROL BELOW MCNARY

FALL CHINOOK

Brands Used: LA2J3
Wire Codes Used: 232007

NUMBER RELEASED: 9392

RECOVERY AREA	1987	YEAR OF RETURN 1988	1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
BONNEVILLE TRAP	0	0	0	3	1	0	4	0.043
OCEAN FISHERIES								
ALASKA	0	0	0	1	1	0	2	0.021
BRITISH COLUMBIA	0	0	0	2	1	0	3	0.032
OREGON	0	1	0	0	0	0	1	0.011
RIVER SPORT	0	0	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0	0	0.000
INDIAN FISHERIES								
FALL INDIAN NET	0	0	0	3	1	0	4	0.043
HATCHERIES								
WELLS H.	0	0	0	0	1	0	1	0.011
PRIEST RAPIDS H.	0	0	0	1	0	0	1	0.011
STREAM SURVEY								
GENERAL	0	0	0	0	1	0	1	0.011
TOTALS	0	1	0	10	6	0	17	0.181
PERCENT OF RECOVERY %	0.0	5.9	0.0	58.8	35.3	0.0		

Appendix Table 10.7.--Recoveries of adult fall chinook salmon released as juveniles below McNary Dam from 30 July to 13 August 1987.

Master File Date : 22 February 1993
RELEASE GROUPS INCLUDED: 8708G

1987 MCNARY TRANS CONTROL BELOW MCNARY

FALL CHINOOK

Brands Used: LAIJ1
Wire Codes Used: 231957

NUMBER RELEASED: 10000

RECOVERY AREA		YEAR OF RETURN 1987	1988	1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS									
BONNEVILLE TRAP		0	5	0	2	1	0	8	0.080
OCEAN FISHERIES									
ALASKA		0	0	0	2	0	0	2	0.020
BRITISH COLUMBIA		0	0	0	1	0	0	1	0.010
RIVER SPORT		0	0	0	0	0	0	0	0.000
RIVER COMMERCIAL									
COMMERCIAL NET		0	0	0	1	1	0	2	0.020
INDIAN FISHERIES									
FALL INDIAN NET		0	0	0	0	2	0	2	0.020
HATCHERIES									
LYONS FERRY H.		0	0	0	1	0	0	1	0.010
PRIEST RAPIDS H.		0	2	0	1	1	0	4	0.040
STREAM SURVEY									
GENERAL		0	0	0	0	2	0	2	0.020
TOTALS		0	7	0	8	7	0	22	0.220
PERCENT OF RECOVERY	%	0.0	31.8	0.0	36.4	31.8	0.0		

Appendix Table 11.0.--Summary of all recoveries of adult fall chinook salmon transported as juveniles by barge from McNary Dam to below Bonneville Dam in 1987.

Master File Date : 22 February 1993
RELEASE GROUPS INCLUDED: 8709A 8709B 8709C 8709D 8709E 8709F 8709G

1987 MCNARY TRANS TEST/BARGE 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	YEAR OF RETURN 1987	1988	1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
BONNEVILLE TRAP	0	24	0	38	23	2	87	0.127
PRIEST RAPIDS TRAP	0	0	0	0	1	0	1	0.001
OCEAN FISHERIES								
ALASKA	0	1	3	27	22	0	53	0.078
BRITISH COLUMBIA	0	2	7	36	23	0	68	0.099
WASHINGTON	0	4	1	1	1	0	7	0.010
OREGON	0	1	1	1	0	0	3	0.004
RIVER SPORT								
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	1	0	1	0.001
COLUMBIA R. ABOVE SNAKE R.	0	0	0	2	4	0	6	0.009
WENATCHEE R.	0	1	1	0	0	0	2	0.003
RIVER COMMERCIAL								
COMMERCIAL NET	0	0	5	10	17	0	32	0.047
INDIAN FISHERIES								
INDIAN GENERAL	0	0	0	3	0	0	3	0.004
FALL INDIAN NET	0	0	7	46	31	1	85	0.124
HATCHERIES								
LYONS FERRY H.	0	0	1	0	0	0	1	0.001
WELLS H.	0	0	1	0	1	0	2	0.003
PRIEST RAPIDS H.	0	6	6	7	3	0	22	0.032
SPRING CREEK H.	0	0	0	1	0	0	1	0.001
STREAM SURVEY								
GENERAL	0	0	2	4	9	0	15	0.022
OTHER	0	0	0	1	1	0	2	0.003
TOTALS	0	39	35	177	137	3	391	0.572
PERCENT OF RECOVERY %	0.0	10.0	9.0	45.3	35.0	0.8		

Appendix Table 11.1.--Recoveries of adult fall chinook salmon transported as juveniles by barge from McNary Dam to below Bonneville Dam from 18 to 23 June 1987.

Master File Date : 22 February 1993
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 1988	1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
BONNEVILLE TRAP	0	1	0	6	0	0	7	0.070
OCEAN FISHERIES								
ALASKA	0	0	1	3	2	0	6	0.060
BRITISH COLUMBIA	0	1	2	10	3	0	16	0.160
WASHINGTON	0	1	0	0	0	0	1	0.010
RIVER SPORT								
COLUMBIA R. ABOVE SNAKE R.	0	0	0	2	0	0	2	0.020
WENATCHEE R.	0	1	1	0	0	0	2	0.020
RIVER COMMERCIAL	0	0	0	0	0	0	0	0.000
INDIAN FISHERIES								
FALL INDIAN NET	0	0	3	9	2	0	14	0.140
HATCHERIES								
PRIEST RAPIDS H.	0	1	2	2	1	0	6	0.060
STREAM SURVEY								
GENERAL	0	0	0	1	2	0	3	0.030
TOTALS	0	5	9	33	10	0	57	0.570
PERCENT OF RECOVERY %	0.0	8.8	15.8	57.9	17.5	0.0		

Appendix Table 11.2.--Recoveries of adult fall chinook salmon transported as juveniles by barge from McNary Dam to below Bonneville Dam from 23 to 25 June 1987.

Master File Date : 22 February 1993
RELEASE GROUPS INCLUDED: 8709B

1987 MCNARY TRANS TEST/BARGE BELOW BONNEVILLE

FALL CHINOOK

Brands Used: RA143
Wire Codes Used: 231960

NUMBER RELEASED: 9146

RECOVERY AREA	1987	YEAR OF RETURN 1988	1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
BONNEVILLE TRAP	0	0	0	3	3	0	6	0.066
OCEAN FISHERIES								
ALASKA	0	0	0	3	1	0	4	0.044
BRITISH COLUMBIA	0	0	1	2	1	0	4	0.044
RIVER SPORT	0	0	0	0	0	0	0	0.000
RIVER COMMERCIAL								
COMMERCIAL NET	0	0	1	0	0	0	1	0.011
INDIAN FISHERIES								
FALL INDIAN NET	0	0	0	1	1	0	2	0.022
HATCHERIES								
LYONS FERRY H.	0	0	1	0	0	0	1	0.011
STREAM SURVEY	0	0	0	0	0	0	0	0.000
OTHER	0	0	0	1	0	0	1	0.011
TOTALS	0	0	3	10	6	0	19	0.208
PERCENT OF RECOVERY %	0.0	0.0	15.8	52.6	31.6	0.0		

Appendix Table 11.3.--Recoveries of adult fall chinook salmon transported as juveniles by barge from McNary Dam to below Bonneville Dam from 25 June to 1 July 1987.

Master File Date : 22 February 1993
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	YEAR OF RETURN 1987	1988	1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
BONNEVILLE TRAP	0	1	0	3	4	0	8	0.081
OCEAN FISHERIES								
ALASKA	0	0	1	3	1	0	5	0.051
BRITISH COLUMBIA	0	0	1	2	3	0	6	0.061
WASHINGTON	0	0	0	0	1	0	1	0.010
RIVER SPORT								
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	1	0	1	0.010
RIVER COMMERCIAL								
COMMERCIAL NET	0	0	2	1	2	0	5	0.051
INDIAN FISHERIES								
INDIAN GENERAL	0	0	0	1	0	0	1	0.010
FALL INDIAN NET	0	0	0	2	3	0	5	0.051
HATCHERIES								
PRIEST RAPIDS H.	0	0	2	0	0	0	2	0.020
STREAM SURVEY	0	0	0	0	0	0	0	0.000
TOTALS	0	1	6	12	15	0	34	0.346
PERCENT OF RECOVERY %	0.0	2.9	17.6	35.3	44.1	0.0		

Appendix Table 11.4.--Recoveries of adult fall chinook salmon transported as juveniles by barge from McNary Dam to below Bonneville Dam from 1 to 8 July 1987.

Master File Date : 22 February 1993
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	YEAR OF RETURN 1987	1988	1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
BONNEVILLE TRAP	0	2	0	1	2	0	5	0.050
OCEAN FISHERIES								
ALASKA	0	0	0	1	2	0	3	0.030
BRITISH COLUMBIA	0	0	0	2	3	0	5	0.050
OREGON	0	0	0	1	0	0	1	0.010
RIVER SPORT								
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	3	0	3	0.030
RIVER COMMERCIAL								
COMMERCIAL NET	0	0	0	1	3	0	4	0.040
INDIAN FISHERIES								
FALL INDIAN NET	0	0	1	3	1	0	5	0.050
HATCHERIES								
PRIEST RAPIDS H.	0	1	2	2	0	0	5	0.050
STREAM SURVEY	0	0	0	0	0	0	0	0.000
TOTALS	0	3	3	11	14	0	31	0.310
PERCENT OF RECOVERY %	0.0	9.7	9.7	35.5	45.2	0.0		

Appendix Table 11.5.--Recoveries of adult fall chinook salmon transported as juveniles by barge from McNary Dam to below Bonneville Dam from 8 to 14 July 1987.

Master File Date : 22 February 1993
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		YEAR OF RETURN 1987	1988	1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS									
BONNEVILLE TRAP		0	4	0	6	1	0	11	0.110
OCEAN FISHERIES									
ALASKA		0	0	0	4	0	0	4	0.040
BRITISH COLUMBIA		0	1	0	2	3	0	6	0.060
OREGON		0	0	1	0	0	0	1	0.010
RIVER SPORT		0	0	0	0	0	0	0	0.000
RIVER COMMERCIAL									
COMMERCIAL NET		0	0	0	1	4	0	5	0.050
INDIAN FISHERIES									
FALL INDIAN NET		0	0	0	4	2	0	6	0.060
HATCHERIES									
PRIEST RAPIDS H.		0	0	0	1	0	0	1	0.010
STREAM SURVEY									
GENERAL		0	0	0	0	2	0	2	0.020
TOTALS		0	5	1	18	12	0	36	0.360
PERCENT OF RECOVERY	%	0.0	13.9	2.8	50.0	33.3	0.0		

Appendix Table 11.6.--Recoveries of adult fall chinook salmon transported as juveniles by barge from McNary Dam to below Bonneville Dam from 15 to 30 July 1987.

Master File Date : 22 February 1993
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 1988	1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
BONNEVILLE TRAP	0	5	0	10	6	0	21	0.224
OCEAN FISHERIES								
ALASKA	0	1	1	6	4	0	12	0.128
BRITISH COLUMBIA	0	0	1	7	2	0	10	0.106
WASHINGTON	0	0	1	0	0	0	1	0.011
OREGON	0	1	0	0	0	0	1	0.011
RIVER SPORT								
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	1	0	1	0.011
RIVER COMMERCIAL								
COMMERCIAL NET	0	0	1	1	2	0	4	0.043
INDIAN FISHERIES								
INDIAN GENERAL	0	0	0	1	0	0	1	0.011
FALL INDIAN NET	0	0	1	7	12	1	21	0.224
HATCHERIES								
PRIEST RAPIDS H.	0	1	0	0	0	0	1	0.011
STREAM SURVEY								
GENERAL	0	0	1	1	3	0	5	0.053
OTHER	0	0	0	0	1	0	1	0.011
TOTALS	0	8	6	33	31	1	79	0.841
PERCENT OF RECOVERY %	0.0	10.1	7.6	41.8	39.2	1.3		

Appendix Table 11.7.--Recoveries of adult fall chinook salmon transported as juveniles by barge from McNary Dam to below Bonneville Dam from 30 July to 14 August 1987.

Master File Date : 22 February 1993
RELEASE GROUPS INCLUDED: 8709G

1987 MCNARY TRANS TEST/BARGE BELOW BONNEVILLE

FALL CHINOOK

Brands Used: RAIK1
Wire Codes Used: 232016

NUMBER RELEASED: 10000

RECOVERY AREA		YEAR OF RETURN 1987	1988	1989	1990	1991	1992	TOTAL	% RETURN
RIVER SYSTEM TRAPS									
BONNEVILLE TRAP		0	11	0	9	7	2	29	0.290
PRIEST RAPIDS TRAP		0	0	0	0	1	0	1	0.010
OCEAN FISHERIES									
ALASKA		0	0	0	7	12	0	19	0.190
BRITISH COLUMBIA		0	0	2	11	8	0	21	0.210
WASHINGTON		0	3	0	1	0	0	4	0.040
RIVER SPORT		0	0	0	0	0	0	0	0.000
RIVER COMMERCIAL									
COMMERCIAL NET		0	0	1	6	6	0	13	0.130
INDIAN FISHERIES									
INDIAN GENERAL		0	0	0	1	0	0	1	0.010
FALL INDIAN NET		0	0	2	20	10	0	32	0.320
HATCHERIES									
WELLS H.		0	0	1	0	1	0	2	0.020
PRIEST RAPIDS H.		0	3	0	2	2	0	7	0.070
SPRING CREEK H.		0	0	0	1	0	0	1	0.010
STREAM SURVEY									
GENERAL		0	0	1	2	2	0	5	0.050
TOTALS		0	17	7	60	49	2	135	1.350
PERCENT OF RECOVERY	%	0.0	12.6	5.2	44.4	36.3	1.5		

Appendix Table 12.0.--Summary of all recoveries of adult fall chinook salmon released as juveniles below McNary Dam in 1988.

Master File Date : 22 February 1993
RELEASE GROUPS INCLUDED: 8804A 8804B 8804C 8804D 8804E 8804F 8804G

1988 MCNARY TRANS CONTROL BELOW MCNARY

FALL CHINOOK

Brands Used: LAIT1 LAIT2 LAIT3 LAIT4 LA2X1 LA2X3 LAIC1
Wire Codes Used: 232246 232247 232248 232249 232250 232048 232049

NUMBER RELEASED: 60010

RECOVERY AREA	YEAR OF RETURN 1988	1989	1990	1991	1992	1993	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
BONNEVILLE TRAP	0	0	2	1	1	0	4	0.007
OCEAN FISHERIES								
BRITISH COLUMBIA	0	0	1	0	0	0	1	0.002
OREGON	0	0	1	0	0	0	1	0.002
RIVER SPORT	0	0	0	0	0	0	0	0.000
RIVER COMMERCIAL								
COMMERCIAL NET	0	0	1	0	0	0	1	0.002
INDIAN FISHERIES								
FALL INDIAN NET	0	0	2	1	0	0	3	0.005
HATCHERIES								
PRIEST RAPIDS H.	0	1	0	0	0	0	1	0.002
STREAM SURVEY								
GENERAL	0	0	0	1	0	0	1	0.002
TOTALS	0	1	7	3	1	0	12	0.020
PERCENT OF RECOVERY %	0.0	8.3	58.3	25.0	8.3	0.0		

Appendix Table 12.1.--Recoveries of adult fall chinook salmon released as juveniles below McNary Dam from 13 to 21 June 1988.

Master File Date : 22 February 1993
RELEASE GROUPS INCLUDED: 8804A

1988 MCNARY TRANS CONTROL BELOW MCNARY

FALL CHINOOK

Brands Used: LAIT1
Wire Codes Used: 232246

NUMBER RELEASED: 10002

RECOVERY AREA		YEAR OF RETURN 1988	1989	1990	1991	1992	1993	TOTAL	% RETURN
RIVER SYSTEM TRAPS									
BONNEVILLE TRAP		0	0	1	1	0	0	2	0.020
OCEAN FISHERIES									
OREGON		0	0	1	0	0	0	1	0.010
RIVER SPORT		0	0	0	0	0	0	0	0.000
RIVER COMMERCIAL		0	0	0	0	0	0	0	0.000
INDIAN FISHERIES									
FALL INDIAN NET		0	0	1	0	0	0	1	0.010
HATCHERIES		0	0	0	0	0	0	0	0.000
STREAM SURVEY		0	0	0	0	0	0	0	0.000
TOTALS		0	0	3	1	0	0	4	0.040
PERCENT OF RECOVERY	%	0.0	0.0	75.0	25.0	0.0	0.0		

Appendix Table 12.2.--Recoveries of adult fall chinook salmon released as juveniles below McNary Dam from 23 to 26 June 1988.

Master File Date : 22 February 1993
RELEASE GROUPS INCLUDED: 8804C

1988 MCNARY TRANS CONTROL BELOW MCNARY

FALL CHINOOK

Brands Used: LAIT3
Wire Codes Used: 232248

NUMBER RELEASED: 10002

RECOVERY AREA	YEAR OF RETURN 1988	1989	1990	1991	1992	1993	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
BONNEVILLE TRAP	0	0	1	0	1	0	2	0.020
OCEAN FISHERIES	0	0	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0	0	0.000
INDIAN FISHERIES								
FALL INDIAN NET	0	0	1	0	0	0	1	0.010
HATCHERIES								
PRIEST RAPIDS H.	0	1	0	0	0	0	1	0.010
STREAM SURVEY	0	0	0	0	0	0	0	0.000
TOTALS	0	1	2	0	1	0	4	0.040
PERCENT OF RECOVERY %	0.0	25.0	50.0	0.0	25.0	0.0		

Appendix Table 12.3.--Recoveries of adult fall chinook salmon released as juveniles below McNary Dam from 27 June to 1 July 1988.

Master File Date : 22 February 1993
RELEASE GROUPS INCLUDED: 8804D

1988 MCNARY TRANS CONTROL BELOW MCNARY

FALL CHINOOK

Brands Used: LAIT4
Wire Codes Used: 232249

NUMBER RELEASED: 10002

RECOVERY AREA		YEAR OF RETURN 1988	1989	1990	1991	1992	1993	TOTAL	% RETURN
RIVER SYSTEM TRAPS		0	0	0	0	0	0	0	0.000
OCEAN FISHERIES BRITISH COLUMBIA		0	0	1	0	0	0	1	0.010
RIVER SPORT		0	0	0	0	0	0	0	0.000
RIVER COMMERCIAL		0	0	0	0	0	0	0	0.000
INDIAN FISHERIES		0	0	0	0	0	0	0	0.000
HATCHERIES		0	0	0	0	0	0	0	0.000
STREAM SURVEY		0	0	0	0	0	0	0	0.000
TOTALS		0	0	1	0	0	0	1	0.010
PERCENT OF RECOVERY	%	0.0	0.0	100.0	0.0	0.0	0.0		

Appendix Table 12.4.--Recoveries of adult fall chinook salmon released as juveniles below McNary Dam from 5 to 13 July 1988.

Master File Date : 22 February 1993
RELEASE GROUPS INCLUDED: 8804E

1988 MCNARY TRANS CONTROL BELOW MCNARY

FALL CHINOOK

Brands Used: LA2X1
Wire Codes Used: 232250

NUMBER RELEASED: 10002

RECOVERY AREA		YEAR OF RETURN 1988	1989	1990	1991	1992	1993	TOTAL	% RETURN
RIVER SYSTEM TRAPS		0	0	0	0	0	0	0	0.000
OCEAN FISHERIES		0	0	0	0	0	0	0	0.000
RIVER SPORT		0	0	0	0	0	0	0	0.000
RIVER COMMERCIAL		0	0	0	0	0	0	0	0.000
INDIAN FISHERIES FALL INDIAN NET		0	0	0	1	0	0	1	0.010
HATCHERIES		0	0	0	0	0	0	0	0.000
STREAM SURVEY		0	0	0	0	0	0	0	0.000
TOTALS		0	0	0	1	0	0	1	0.010
PERCENT OF RECOVERY	%	0.0	0.0	0.0	100.0	0.0	0.0		

Appendix Table 12.5.--Recoveries of adult fall chinook salmon released as juveniles below McNary Dam from 13 to 14 July 1988.

Master File Date : 22 February 1993
RELEASE GROUPS INCLUDED: 8804F

1988 MCNARY TRANS CONTROL BELOW MCNARY

FALL CHINOOK

Brands Used: LA2X3
Wire Codes Used: 232048

NUMBER RELEASED: 5008

RECOVERY AREA		YEAR OF RETURN 1988	1989	1990	1991	1992	1993	TOTAL	% RETURN
RIVER SYSTEM TRAPS		0	0	0	0	0	0	0	0.000
OCEAN FISHERIES		0	0	0	0	0	0	0	0.000
RIVER SPORT		0	0	0	0	0	0	0	0.000
RIVER COMMERCIAL COMMERCIAL NET		0	0	1	0	0	0	1	0.020
INDIAN FISHERIES		0	0	0	0	0	0	0	0.000
HATCHERIES		0	0	0	0	0	0	0	0.000
STREAM SURVEY		0	0	0	0	0	0	0	0.000
TOTALS		0	0	1	0	0	0	1	0.020
PERCENT OF RECOVERY	%	0.0	0.0	100.0	0.0	0.0	0.0		

Appendix Table 12.6.--Recoveries of adult fall chinook salmon released as juveniles below McNary Dam from 18 to 21 July 1988.

Master File Date : 22 February 1993
RELEASE GROUPS INCLUDED: 8804G

1988 MCNARY TRANS CONTROL BELOW MCNARY

FALL CHINOOK

Brands Used: LAIC1
Wire Codes Used: 232049

NUMBER RELEASED: 4992

RECOVERY AREA	YEAR OF RETURN 1988	1989	1990	1991	1992	1993	TOTAL	% RETURN
RIVER SYSTEM TRAPS	0	0	0	0	0	0	0	0.000
OCEAN FISHERIES	0	0	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0	0	0.000
INDIAN FISHERIES	0	0	0	0	0	0	0	0.000
HATCHERIES	0	0	0	0	0	0	0	0.000
STREAM SURVEY GENERAL	0	0	0	1	0	0	1	0.020
TOTALS	0	0	0	1	0	0	1	0.020
PERCENT OF RECOVERY %	0.0	0.0	0.0	100.0	0.0	0.0		

Appendix Table 13.0.--Summary of all recoveries of adult fall chinook salmon transported as juveniles by barge from McNary Dam to below Bonneville Dam in 1988.

Master File Date : 22 February 1993
RELEASE GROUPS INCLUDED: 8803A 8803B 8803C 8803D 8803E 8803F

1988 MCNARY TRANS BARGE BELOW BONNEVILLE

FALL CHINOOK

Brands Used: RAIU1 RAIU2 RAIU3 RAIU4 RAID1 RAID3
Wire Codes Used: 232260 232261 232301 232302 232303 232304

NUMBER RELEASED: 60013

RECOVERY AREA	YEAR OF RETURN 1988	1989	1990	1991	1992	1993	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
BONNEVILLE TRAP	0	0	3	4	4	0	11	0.018
OCEAN FISHERIES								
ALASKA	0	0	3	5	0	0	8	0.013
BRITISH COLUMBIA	0	1	1	4	0	0	6	0.010
WASHINGTON	0	0	1	0	0	0	1	0.002
RIVER SPORT								
COLUMBIA R. BELOW SNAKE R.	0	0	1	1	1	0	3	0.005
COLUMBIA R. ABOVE SNAKE R.	0	0	0	1	1	0	2	0.003
RIVER COMMERCIAL								
COMMERCIAL NET	0	1	0	4	2	0	7	0.012
INDIAN FISHERIES								
INDIAN GENERAL	0	0	1	0	0	0	1	0.002
FALL INDIAN NET	0	0	0	5	4	0	9	0.015
HATCHERIES								
PRIEST RAPIDS H.	0	1	1	3	0	0	5	0.008
STREAM SURVEY								
GENERAL	0	0	0	1	0	0	1	0.002
TOTALS	0	3	11	28	12	0	54	0.090
PERCENT OF RECOVERY %	0.0	5.6	20.4	51.9	22.2	0.0		

Appendix Table 13.1.--Recoveries of adult fall chinook salmon transported as juveniles by barge from McNary Dam to below Bonneville Dam from 13 to 21 June 1988.

Master File Date : 22 February 1993
RELEASE GROUPS INCLUDED: 8803A

1988 MCNARY TRANS BARGE BELOW BONNEVILLE

FALL CHINOOK

Brands Used: RAIU1
Wire Codes Used: 232260

NUMBER RELEASED: 10002

RECOVERY AREA	YEAR OF RETURN 1988	1989	1990	1991	1992	1993	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
BONNEVILLE TRAP	0	0	2	0	1	0	3	0.030
OCEAN FISHERIES	0	0	0	0	0	0	0	0.000
RIVER SPORT								
COLUMBIA R. BELOW SNAKE R.	0	0	1	0	1	0	2	0.020
RIVER COMMERCIAL	0	0	0	0	0	0	0	0.000
INDIAN FISHERIES	0	0	0	0	0	0	0	0.000
HATCHERIES								
PRIEST RAPIDS H.	0	0	0	1	0	0	1	0.010
STREAM SURVEY	0	0	0	0	0	0	0	0.000
TOTALS	0	0	3	1	2	0	6	0.060
PERCENT OF RECOVERY %	0.0	0.0	50.0	16.7	33.3	0.0		

Appendix Table 13.2.--Recoveries of adult fall chinook salmon transported as juveniles by barge from McNary Dam to below Bonneville Dam from 21 to 23 June 1988.

Master File Date : 22 February 1993
RELEASE GROUPS INCLUDED: 8803B

1988 MCNARY TRANS BARGE BELOW BONNEVILLE

FALL CHINOOK

Brands Used: RAIU2
Wire Codes Used: 232261

NUMBER RELEASED: 10003

RECOVERY AREA		YEAR OF RETURN 1988	1989	1990	1991	1992	1993	TOTAL	% RETURN
RIVER SYSTEM TRAPS		0	0	0	0	0	0	0	0.000
OCEAN FISHERIES ALASKA		0	0	1	1	0	0	2	0.020
RIVER SPORT		0	0	0	0	0	0	0	0.000
RIVER COMMERCIAL		0	0	0	0	0	0	0	0.000
INDIAN FISHERIES		0	0	0	0	0	0	0	0.000
HATCHERIES PRIEST RAPIDS H.		0	0	1	0	0	0	1	0.010
STREAM SURVEY		0	0	0	0	0	0	0	0.000
TOTALS		0	0	2	1	0	0	3	0.030
PERCENT OF RECOVERY	%	0.0	0.0	66.7	33.3	0.0	0.0		

Appendix Table 13.3.--Recoveries of adult fall chinook salmon transported as juveniles by barge from McNary Dam to below Bonneville Dam from 23 to 26 June 1988.

Master File Date : 22 February 1993
RELEASE GROUPS INCLUDED: 8803C

1988 MCNARY TRANS BARGE BELOW BONNEVILLE

FALL CHINOOK

Brands Used: RAIU3
Wire Codes Used: 232301

NUMBER RELEASED: 10002

RECOVERY AREA		YEAR OF RETURN 1988	1989	1990	1991	1992	1993	TOTAL	% RETURN
RIVER SYSTEM TRAPS									
BONNEVILLE TRAP		0	0	1	2	1	0	4	0.040
OCEAN FISHERIES		0	0	0	0	0	0	0	0.000
RIVER SPORT		0	0	0	0	0	0	0	0.000
RIVER COMMERCIAL		0	0	0	0	0	0	0	0.000
INDIAN FISHERIES									
INDIAN GENERAL		0	0	1	0	0	0	1	0.010
HATCHERIES									
PRIEST RAPIDS H.		0	1	0	0	0	0	1	0.010
STREAM SURVEY		0	0	0	0	0	0	0	0.000
TOTALS		0	1	2	2	1	0	6	0.060
PERCENT OF RECOVERY	%	0.0	16.7	33.3	33.3	16.7	0.0		

Appendix Table 13.4.--Recoveries of adult fall chinook salmon transported as juveniles by barge from McNary Dam to below Bonneville Dam from 27 June to 1 July 1988.

Master File Date : 22 February 1993
RELEASE GROUPS INCLUDED: 8803D

1988 MCNARY TRANS BARGE BELOW BONNEVILLE

FALL CHINOOK

Brands Used: RAIU4
Wire Codes Used: 232302

NUMBER RELEASED: 10002

RECOVERY AREA		YEAR OF RETURN 1988	1989	1990	1991	1992	1993	TOTAL	% RETURN
RIVER SYSTEM TRAPS		0	0	0	0	0	0	0	0.000
OCEAN FISHERIES		0	0	0	0	0	0	0	0.000
RIVER SPORT		0	0	0	0	0	0	0	0.000
RIVER COMMERCIAL COMMERCIAL NET		0	0	0	1	0	0	1	0.010
INDIAN FISHERIES FALL INDIAN NET		0	0	0	3	0	0	3	0.030
HATCHERIES PRIEST RAPIDS H.		0	0	0	2	0	0	2	0.020
STREAM SURVEY		0	0	0	0	0	0	0	0.000
TOTALS		0	0	0	6	0	0	6	0.060
PERCENT OF RECOVERY	%	0.0	0.0	0.0	100.0	0.0	0.0		

Appendix Table 13.5.--Recoveries of adult fall chinook salmon transported as juveniles by barge from McNary Dam to below Bonneville Dam from 5 to 13 July 1988.

Master File Date : 22 February 1993
RELEASE GROUPS INCLUDED: 8803E

1988 MCNARY TRANS BARGE BELOW BONNEVILLE

FALL CHINOOK

Brands Used: RAID1
Wire Codes Used: 232303

NUMBER RELEASED: 10002

RECOVERY AREA	YEAR OF RETURN 1988	1989	1990	1991	1992	1993	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
BONNEVILLE TRAP	0	0	0	2	0	0	2	0.020
OCEAN FISHERIES								
ALASKA	0	0	0	2	0	0	2	0.020
BRITISH COLUMBIA	0	0	1	2	0	0	3	0.030
WASHINGTON	0	0	1	0	0	0	1	0.010
RIVER SPORT								
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	1	0	1	0.010
RIVER COMMERCIAL								
COMMERCIAL NET	0	0	0	3	1	0	4	0.040
INDIAN FISHERIES								
FALL INDIAN NET	0	0	0	0	1	0	1	0.010
HATCHERIES	0	0	0	0	0	0	0	0.000
STREAM SURVEY	0	0	0	0	0	0	0	0.000
TOTALS	0	0	2	9	3	0	14	0.140
PERCENT OF RECOVERY %	0.0	0.0	14.3	64.3	21.4	0.0		

Appendix Table 13.6.--Recoveries of adult fall chinook salmon transported as juveniles by barge from McNary Dam to below Bonneville Dam from 13 to 21 July 1988.

Master File Date : 22 February 1993
RELEASE GROUPS INCLUDED: 8803F

1988 MCNARY TRANS BARGE BELOW BONNEVILLE

FALL CHINOOK

Brands Used: RAID3
Wire Codes Used: 232304

NUMBER RELEASED: 10002

RECOVERY AREA	YEAR OF RETURN 1988	1989	1990	1991	1992	1993	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
BONNEVILLE TRAP	0	0	0	0	2	0	2	0.020
OCEAN FISHERIES								
ALASKA	0	0	2	2	0	0	4	0.040
BRITISH COLUMBIA	0	1	0	2	0	0	3	0.030
RIVER SPORT								
COLUMBIA R. BELOW SNAKE R.	0	0	0	1	0	0	1	0.010
COLUMBIA R. ABOVE SNAKE R.	0	0	0	1	0	0	1	0.010
RIVER COMMERCIAL								
COMMERCIAL NET	0	1	0	0	1	0	2	0.020
INDIAN FISHERIES								
FALL INDIAN NET	0	0	0	2	3	0	5	0.050
HATCHERIES	0	0	0	0	0	0	0	0.000
STREAM SURVEY								
GENERAL	0	0	0	1	0	0	1	0.010
TOTALS	0	2	2	9	6	0	19	0.190
PERCENT OF RECOVERY %	0.0	10.5	10.5	47.4	31.6	0.0		

Appendix Table 14.0.--Summary of steelhead marked at Lower Granite Dam for release site study in 1992.

Replicate number	Release site	Marking period	Release date	Brand position,[a] symbol, and orientation.[b]	Wire-tag code	Number barged		
						Hatchery	Wild	Total
1	Tongue Pt.	1-2 May	4 May	RAL-1	23-24-45	8,400	799	9,199
	Bonneville	1-2 May	4 May	LAF-1	23-24-19	8,527	1,213	9,740
[c]	Bonneville	3 May	6 May	RAL-2	23-24-46	7,128	2,443	9,571
	Bonneville	3 May	6 May	LAF-2	23-24-16	9,613	534	10,147
2	Tongue Pt.	7-8 May	10 May	RAU-1	23-24-47	8,315	1,103	9,418
	Bonneville	7-8 May	10 May	LAF-3	23-24-14	9,259	1,026	10,285
3	Tongue Pt.	9 May	12 May	RAU-2	23-24-48	7,873	1,264	9,137
	Bonneville	9 May	12 May	LAF-4	23-24-18	8,912	1,237	10,149
4	Tongue Pt.	13 May	16 May	RAU-3	23-24-49	8,147	971	9,118
	Bonneville	13 May	16 May	LAV-1	23-24-20	9,084	989	10,073
5	Tongue Pt.	15 May	18 May	RAU-4	23-24-50	7,986	1,234	9,220
	Bonneville	15 May	18 May	LAV-2	23-24-21	8,915	1,197	10,112
6	Tongue Pt.	19-20 May	22 May	RAZ-1	23-24-44	8,738	536	9,274
	Bonneville	19-20 May	22 May	LAV-3	23-24-22	9,547	671	10,218
					Total	120,444	15,217	135,661

[a] RA and LA (position) indicate right and left anterior sides of fish, respectively.

[b] Orientation refers to rotation of brand around its center point.

[c] Both groups were released below Bonneville Dam because of an emergent need for the barges at Lower Granite Dam. Therefore, this release lot will not be used for statistical analysis of adult returns.

Appendix Table 15.0.--Mortality and tag loss of tagged steelhead held 24 hours at Lower Granite Dam in 1992.

Date	Wire-tag code	Number held	Mortality	Lost tags
3 May	23-24-46	48	1	0
3 May	23-24-16	53	0	1
7 May	23-24-47	52	0	1
7 May	23-24-14	48	0	1
9 May	23-24-48	50	1	0
9 May	23-24-18	50	0	0
13 May	23-24-49	52	0	0
13 May	23-24-20	51	0	0
15 May	23-24-50	50	1	0
15 May	23-24-21	49	0	0
20 May	23-24-44	50	0	0
20 May	23-24-22	51	1	0
	Total	604	4	3
	Mortality and tag loss (%)		0.7	0.5

Appendix B

Scale Analysis Report

ANNUAL PROGRESS REPORT

FISH RESEARCH PROJECT
OREGON

PROJECT TITLE: Life History Studies of Spring and Summer Chinook Salmon and Steelhead from the Snake River Using Scale Analysis

CONTRACT NUMBER: 40ABNF201411

PROJECT PERIOD: September 15, 1992 to December 31, 1992.

Prepared by: L.A. Borgerson

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CONTENTS

SUMMARY

Objectives for FY 1992

1. Determine the hatchery:wild ratios of transported and control spring and summer chinook salmon from scales of juveniles and adults sampled at Lower Granite Dam.

2. Determine the effects of transport on age at maturity, growth, migration timing, and other life history characteristics from scales of adult spring and summer chinook salmon and steelhead at Lower Granite Dam.

Accomplishments in FY 1992

We read the scales from 1,660 juvenile chinook salmon, 471 adult spring chinook salmon, and 314 adult summer chinook salmon from the run-at-large and classified their rearing origin as hatchery or wild. We examined scales from 13 spring chinook salmon, 3 summer chinook salmon, and 203 summer steelhead marked for the transportation study and tested for differences in life history and growth characteristics between transport and control groups.

Findings in FY 1992

We estimated that 11.6% (+2.7%) of the juvenile outmigration of spring and summer chinook salmon was wild, while 11.3% (+4.8%) of the spring chinook salmon and 35.8% (+6.3%) of the summer chinook salmon returning past Lower Granite Dam were wild fish. We found no differences in life history, migration timing, or growth between transported and control groups of chinook salmon. We found that transportation or natural migration may have differing effects on hatchery and wild summer steelhead.

INTRODUCTION

Since 1975, run sizes of spring and summer chinook salmon in the Snake River have decreased to historical lows with completion of Ice Harbor, Lower Monumental, Little Goose, and Lower Granite dams. The Columbia Basin Fish and Wildlife Authority has implemented a large-scale transportation program in an effort to eliminate mortality of juvenile salmonids caused by dam passage. Although decisions have been made to implement transport at near maximum levels, definitive data on survival benefits of transporting spring chinook salmon are lacking (Matthews et al. 1990). Transportation benefits for spring chinook salmon have been difficult to evaluate because of inadequate adult returns and unexplained variability in existing return data. This variation may be caused by unknown proportions of hatchery and wild fish in the experimental transport and control samples.

In 1988, the National Marine Fisheries Service (NMFS) began a pilot study to evaluate the feasibility of using PIT tagged wild spring chinook salmon to determine transportation benefits to wild fish. However, the 10% recovery rate for marked fish at Lower Granite Dam (LGD) makes this method

impractical in a large study because of the large volume of wild fish that would have to be tagged and the high cost of PIT tags.

Discriminant analysis (DA) of fish scale patterns is an accepted method of identifying hatchery or wild origins of salmon. Between 1978 and 1987, Oregon Department of Fish and Wildlife (ODFW) used DA to correctly classify 85-95% of hatchery and wild coho salmon caught in ocean fisheries off Oregon (Borgerson 1988). Fryer and Schwartzberg (1990) used DA to correctly classify 84-91% of hatchery and wild spring chinook salmon from the Deschutes, Wenatchee, Grande Ronde, and Imnaha rivers. DA will be used as an alternative method to estimate the wild and hatchery composition of the run-at-large as well as fish in the experimental transport and control groups for the NMFS transportation study.

Benefits of transport have been evaluated in terms of smolt-to-adult survival. Transport may have effects on the life history dynamics of the populations that need to be understood to evaluate fully the benefits of transport programs. It is reasonable to expect that fish that are transported 320 miles from LGD to below Bonneville Dam in 1-3 days and control fish that migrate volitionally the same distance in 20-60 days may differ in migration timing, growth, and age at maturity. Park (1985) found that steelhead transported from Little Goose and Lower Granite dams returned to hatcheries later than non-transported fish.

In 1991 we began scale analysis on returning adults and found that wild fish made up 20.1% and 54.3% of the spring and summer chinook salmon runs past LGD (Borgerson 1992), respectively. We also measured scale growth on chinook salmon and steelhead used in the 1989 transport experiment, but found no outstanding differences between control and transport groups. Comparing the wild fish component of the outmigrating juveniles to that of the returning adults from the same brood year will be of particular interest in future scale analyses.

METHODS

Scale Preparation and Reading

Scale collection involved three agencies and two tribes. Personnel from NMFS collected the mixed-stock groups of chinook salmon and steelhead from LGD. Personnel from Idaho Department of Fish and Game, ODFW, and the Nez Perce and Umatilla tribes collected the known origin scales used to develop the discriminant functions. We provided diagrams showing location of the key scale area (Nicholas and Van Dyke 1982) and sample procedures so all collections were sampled by the same methods.

Mixed-stock spring and summer chinook salmon from LGD were collected proportionally throughout the run-at-large. We selected sample sizes for all groups so that the analysis would yield a 95% confidence interval that was ±25% of the point estimate (Worlund and Fredin 1962). Because the percentage of wild fish in the sample affects the size of the confidence interval, we started our study by assuming that wild fish would comprise 5-10% of the juvenile population and 20% of the adult population. Based on these criteria, we set the sample size requirements at 1,750 per group of juveniles and 550

per group of adults. All summer steelhead marked for the transportation study were sampled for scales.

We mounted the scales from LGD on gummed cards and made acetate impressions. Scales collected at other locations were mounted and pressed by the collecting agency. All collectors provided location, length, date, presence or absence of mark, and sex data for each sample.

We used an Apple IIc microcomputer, Altec digitizing board, and Scale Reader Program software (Mullen 1984) to measure and record scale measurements. The scale image was enlarged to 88x magnification using a microfiche reader. Measurements were made along a radius 20o to the anterior-posterior axis on the ventral side of the scale. We made two groups of measurements; one group consisted of extensive measurements in the freshwater zone on all chinook salmon scales used for the hatchery or wild DA (Figure 1). A second set of measurements was made on the portion of the scale that represented juvenile migration and early ocean residence of all chinook salmon and summer steelhead that were marked for the transportation study (Figure 2). After reading the scales, measurement data were transferred from the Apple IIc computer to an IBM-compatible computer for computation of additional variables (Table 1) and final analysis.

Hatchery or Wild Classification of Chinook Salmon

We used discriminant analysis to classify spring and summer chinook salmon by hatchery or wild origin. For discriminant analysis to provide meaningful results, the training populations of known origin samples used to develop the function must be representative of the groups within the unknown sample. We used samples scales from various streams based on the estimated contribution of fish from that stream to the overall population. For example, the wild spring chinook salmon training population was weighted so that 1/4 of the samples were from Oregon tributaries and 3/4 were from Idaho tributaries. The hatchery training populations were composed of scale samples in proportion to the release numbers from each hatchery and the approximate survival of the hatchery group. Appendix Table A contains a list of specific locations where scales used in training populations were collected.

Ideally, the samples making up the training populations would be from the same brood years as the samples in the unknown groups. Since field personnel were unable to collect sufficient known samples from any one year, we used as many known samples from the current brood years as were available and augmented the training populations with fish from previous brood years that were reared most similarly to current production strategies. With each new year of analysis, we add current year scales to the training populations and remove scales that are from the oldest brood years.

We developed three linear discriminant functions using BMDP Statistical Software 88 Release (Dixon et al. 1988). One function classified combined spring and summer chinook salmon juveniles. A second function classified adult spring chinook salmon, while the third was developed for adult summer chinook salmon. All three functions classified the fish according to hatchery or wild origin. Variables were added to or removed from the function in a step-wise method based on their F values. The juvenile chinook salmon

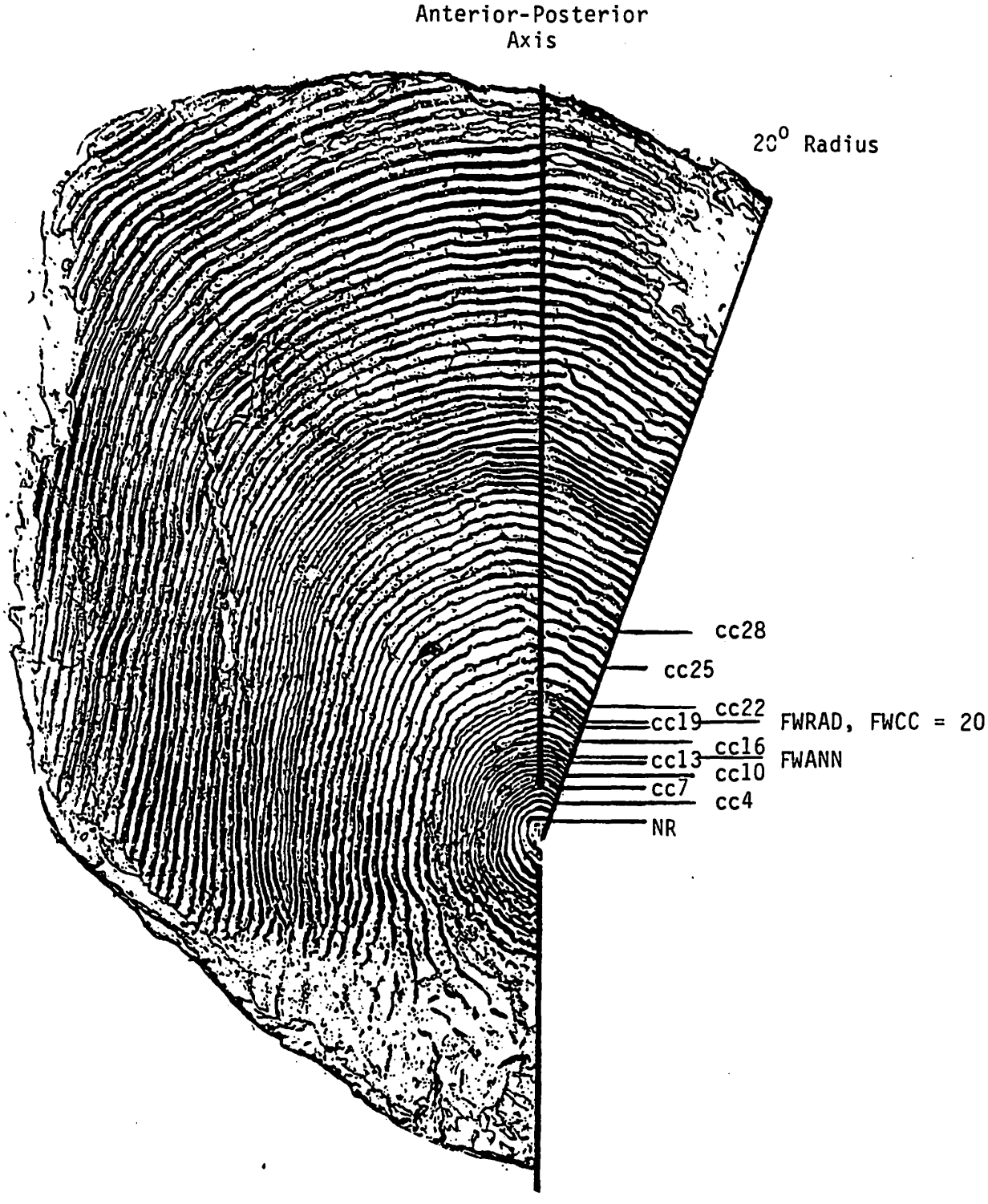

Figure 1. Measurements of scale growth used to discriminate between hatchery and wild chinook salmon. The scale is from a wild spring chinook salmon sampled in Capehorn Creek, tributary to North Fork of the Salmon River. Measurement labels are defined in Table 1.

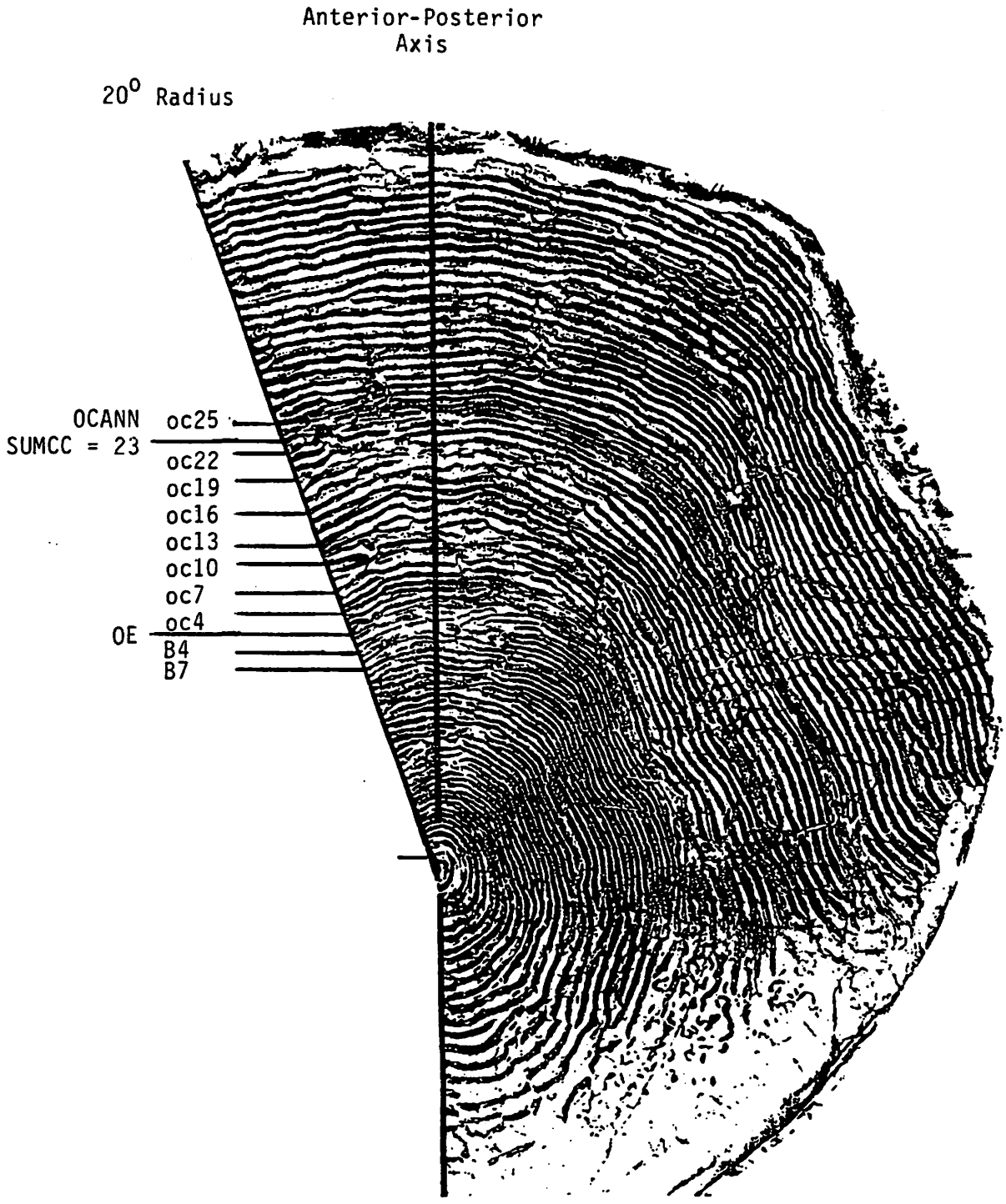

Figure 2. Measurements of scale growth that occurred during juvenile migration and early ocean residence. The scale is from a hatchery reared summer steelhead marked as part of the control group for the transport study. Measurement labels are defined in Table 1.

Table 1. Definition of scale variables read or calculated.

Variable	Definition
Read:	
FWCC	Number of circuli in the freshwater zone.
NR	Radial measurement of the nucleus, also considered circulus 1.
FWANN	Radial measurement to the winter annulus of the freshwater zone.
FWRAD, OE	Radial measurement to the last circulus in the freshwater zone.
CC4-CC28	Radial measurements in 3 circuli increments between the fourth and 28th circuli of the freshwater zone.
SUMCC	Number of circuli between OE and the first annulus formed in the ocean.
OCANN	Radial measurement to the first annulus formed in the ocean.
OC4-OC25	Radial measurements in 3 circuli increments between the fourth and 25th circuli of the ocean zone.
B4	Radial measurement to the fourth circulus counted back into the freshwater zone from OE, inclusive.
B7	Radial measurement to the seventh circulus counted back into the freshwater zone from OE, inclusive.
Calculated:	
BW1	Width of first band of 3 circuli, CC4-NR.
BW2	Width of second band of 3 circuli, CC7 - CC4.
BW123	Bandwidths 1, 2, and 3, CC10 - NR.
BW56	Bandwidths 5 and 6, CC19 - CC13.
FWANN2	FWANN - NR.
FWAVSP	Average circuli spacing in the freshwater zone, (FWRAD-NR)/(FWCC-1).
R1D6	Ratio of bandwidths 1 and 6, (CC4-NR)/(CC19-CC16).
JM1	OE - B4.
JM2	B4 - B7.
OR1	OC4 - OE.
OR2	OC7 - OC4.
OR3	OC10 - OC7.
OR4	OC13 - OC10.
OR5	OC16 - OC13.
OR6	OC19 - OC16.
OR7	OC22 - OC19.
OR8	OC25 - OC22.
OET	OCANN-OE.

function contained four variables (FWANN2, FWAVSP, CC13, and BW123), the adult spring chinook function contained six variables (FWANN, FWAVSP, CC13, CC22, CC25, and BW2), and the summer chinook function contained five variables (FWANN, R12D67, BW1, CC13, and FWAVSP). For all functions, the variable FWANN, representing fish size at the end of the winter in fresh water, was the first variable selected and was the most powerful for discriminating between hatchery and wild fish.

Ideally, we would have tested the classification ability of our functions with additional sets of known origin samples, but that was not possible. Instead, we estimated correct classification using the cross validation method (Table 2). In 1991, we estimated the correct classification of our spring chinook salmon function using the jackknife method, provided by BMDP Statistical Software (Efron 1982), as well as the cross-validation and bootstrap methods (Efron and Tibshirani 1991) and found that cross validation provided the most conservative results.

After the run-at-large samples were classified, we corrected the results for misclassification and calculated confidence intervals using the methods of Worlund and Fredin (1962). A few fish that had been marked for the transportation study were within the run-at-large samples. We noted the percentage of wild fish within the marked transport and control groups, but we did not correct the estimate or calculate confidence intervals for these small subsamples.

Table 2. Two-way classification matrixes for the known hatchery and wild groups of spring and summer chinook salmon used to develop discriminant function in 1992.

	Stock		
	Wild	Hatchery	Composite
Juvenile spring and summer chinook salmon			
% Correct Classification	88.4	86.5	87.5
Sample size	216	215	431
Adult spring chinook salmon			
% Correct Classification	86.9	88.6	87.8
Sample size	160	175	335
Adult summer chinook salmon			
% Correct Classification	91.2	93.3	92.2
Sample size	125	119	244

Differences in Age Composition, Ocean Growth Rate, and Migration Timing Between Hatchery and Wild Fish Belonging to Experimental Transport and Control Groups

We determined the age of each fish by counting winter annuli. We used a contingency table to compare the age compositions of transport and control groups of chinook salmon and summer steelhead.

We used two-way analysis of variance on scale measurements representing ocean entrance timing and growth during juvenile migration and early ocean residence to test for significant differences ($p < .05$) between hatchery and wild fish that were transported or used as controls in the transportation study. Chinook salmon were included in either the hatchery or wild group based on the results of the discriminant analysis. For this analysis, spring and summer run fish were pooled together. Steelhead were identified as hatchery fish by having clipped fins. All steelhead released from hatcheries in the Snake River system are fin clipped; steelhead with no clipped fins were assumed to be wild. Chinook salmon and summer steelhead were identified as belonging to experimental transport and control groups by various freeze brands (Matthews et al. 1991). For this analysis we used all fish that were branded in 1989, including those that were sampled and analyzed in 1991 (Borgerson 1992).

To represent growth that occurred during early ocean residence, we used measurements of five-circuli bands beyond the ocean entrance check. To represent growth that occurred in the Snake and Columbia rivers during migration, we measured two bands of three circuli that immediately preceded the ocean entrance check (Figure 2). Depending on how quickly a fish migrated, these river bands may include growth from freshwater residence as well as migration.

We used the distance between the first winter annulus formed in the ocean and the ocean entrance check to index the time of ocean entrance. We assumed that the winter annulus was formed at the same time of the year for all fish so if the distance between the ocean entrance check and the annulus was large the fish had entered the ocean "early." A small distance would indicate "late" ocean entrance.

RESULTS AND DISCUSSION

Wild or Hatchery Classification of Chinook Salmon

Results from our hatchery or wild discriminant analysis are in Table 3. Juvenile scales were analyzed for the first time in 1992, while adult scales were analyzed in 1991 and 1992. In 1991 we found 20.1% and 54.6% wild fish in the spring and summer runs of adult chinook salmon, respectively. In contrast to the 1991 runs, we found lower percentages of wild fish in both the spring and summer runs of 1992, however, in both years the summer run contained a higher percentage of wild fish than the spring run.

Our estimate in 1992 for wild spring chinook salmon was lower than expected given the estimated run size, hatchery returns, and redd counts. The

Table 3. Percentage of wild fish in the spring and summer chinook salmon populations sampled at Lower Granite Dam in 1992.

Group	Estimate (+ half-width of the 95% confidence interval)
Juvenile spring and summer chinook salmon (Brood year 1990)	11.6% (+ 2.7%)
Adult spring chinook salmon (Brood years 1987-89)	11.3% (+ 4.8%)
Adult summer chinook salmon (Brood years 1987-89)	35.8% (+ 6.3%)

majority of the 1992 return migrated to the ocean in 1990 when it was observed that some wild juveniles migrated earlier and smaller in size than wild fish in other years (personal communication on 19 February 1993 with Gene Matthews, National Marine Fisheries Service, Seattle, Washington.) Given that our discriminant function was developed using wild scale patterns from several "average" years, we acknowledged that our function may not have classified the 1990 outmigrants properly. We ran several simulations using scale patterns that might result from earlier migrating and smaller juveniles to develop alternate discriminant functions, but did not find a significant change in our estimate.

In 1992, 16 fish with readable scales that had been branded in 1989 or 1990 for the transportation study were recovered at LGD. Of these fish, two (12.5%) were classified as wild. Pooling all branded fish recovered in 1991 and 1992 results in 3 fish branded in 1988 at McNary Dam, 43 fish branded in 1989 for transport and control groups at LGD, and 18 fish branded in 1990 for the barge transport index at LGD. The percentage of wild fish in each group is given in Table 4. The number of fish classified as wild for each individual brand applied at LGD is given in Appendix Table B. Branded fish are not separated into spring and summer runs in either table.

To compare branded groups (Table 4) to the run at large, we weighted the data from the spring and summer runs by the counts of fish over LGD (personal communication on 7 December 1992 with Jerrel Harmon, National Marine Fisheries Service, Pomeroy, Washington) and calculated that the combined run contained 33.8% wild fish in 1991 and 18.9% wild fish in 1992 for a two-year weighted average of 23.8% wild fish. The combined run at large contains both barged and naturally migrating fish.

Table 4. Percentage of wild fish in groups of fish branded and coded wire tagged for the transportation study, sampled at Lower Granite Dam in 1991 and 1992.

Dam where marked	Mark year	Group	Percent wild	N
McNary	1988	Control	100	1
McNary	1988	Barge experiment	50.0	2
Lower Granite	1989	Control	21.4	14
Lower Granite	1989	Barge experiment	44.8	29
Lower Granite	1990	Barge index	33.3	18

Differences in Age Composition, Ocean Growth Rate, and Migration Timing Between Hatchery and Wild Fish Belonging to Experimental Transport and Control Groups

We found no significant differences between the age compositions of transport and control groups of chinook salmon ($X2 = 0.904$, $p = 0.6363$) or summer steelhead ($X2 = 7.720$, $p = 0.4553$). Age compositions for fish used in transportation studies at LGD are given in Table 5. For chinook salmon, 3-year-old fish were recovered one year before scale sampling began so the number given in Table 5 for age 3 is taken from Appendix Tables 2.0 and 3.0 by Matthews et al. (1991).

We found no differences ($p < .05$) in any scale parameter between groups of barged and control chinook salmon. Also, there were no differences in scale variables representing early ocean growth and migration timing between hatchery and wild chinook salmon. Means of variables analyzed are in Table 6.

We found significant differences in three variables between groups of barged and control of steelhead (Table 7). The variable OR1 represents growth occurring immediately after ocean entrance and soon after migration or transport. The other two significant variables, OR4 and OR5, occur later in time, probably near the middle of the summer. The two variables, OR2 and OR3, which represent growth during the time between OR1 and OR4, were not significant and cast some doubt as to how transporting could truly influence OR4 and OR5 when it did not influence these two variables. We found significant differences in most variables between hatchery and wild fish. Wild steelhead appeared to enter the ocean earlier than hatchery fish and once in the ocean had better growth rates than hatchery fish.

Table 5. Age composition of spring and summer chinook salmon and summer steelhead marked for the transportation study in 1989 and recovered through November 1992 at Lower Granite Dam.

Total age	Life historya (Freshwater/Ocean)	Transport Number	Transport Percent	Control Number	Control Percent
Spring and summer chinook salmon					
3	1/1	3	9.4	2	11.1
4	1/2	24	75.0	15	83.3
5	1/3	5	15.6	1	5.6
Summer steelhead					
3	1/1	25	17.2	21	24.1
4	2/1	5	3.4	5	5.7
5	3/1	2	1.4	2	2.3
4	1/2	91	62.8	50	57.5
5	2/2	20	13.8	7	8.0
6	3/2	2	1.4	1	1.2
5	1/3	0	--	1	1.2

a Number of freshwater annuli/number of ocean annuli.

Table 6. Two-way analysis of variance and group means for scale variables representing growth during juvenile migration (JM) and early ocean residence (OR), and ocean entrance timing (OET) for adult spring and summer chinook salmon from the transportation study sampled at Lower Granite Dam in 1991.

Variable name	Means: Wild Transport	Means: Wild Control	Means: Hatchery Transport	Means: Hatchery Control
JM1	61.7	59.3	60.2	56.0
JM2	57.1	55.7	55.2	47.8
OR1	84.1	97.0	93.5	99.3
OR2	108.1	106.7	118.6	110.9
OR3	106.3	104.0	112.1	105.7
OR4	104.1	116.7	99.6	107.9
OR5	108.9	118.0	114.0	106.5
OR6	110.7	100.0	109.5	107.8
OET	789.8	763.0	724.9	759.0
Sample size	13	3	16	11

Table 7. Two-way analysis of variance and group means for scale variables representing growth during juvenile migration (JM) and early ocean residence (OR), and ocean entrance timing (OET) for adult summer steelhead from the transportation study sampled at Lower Granite Dam in 1991.

Variable name	Means: Wild Transport	Means: Wild Control	Means: Hatchery Transport	Means: Hatchery Control	Significant differences ($p < .05$): Type	Significant differences ($p < .05$): Origin	Significant differences ($p < .05$): Type x origin interaction
JM1	58.4	60.7	63.2	61.7	-	-	-
JM2	53.8	58.1	35.5	61.5	-	X	-
OR1	83.0	94.0	80.4	87.9	X	-	-
OR2	100.1	99.9	89.6	94.4	-	X	-
OR3	104.7	112.6	89.6	94.2	-	X	-
OR4	100.7	109.7	90.6	98.9	X	X	-
OR5	101.1	111.0	98.3	101.1	X	X	-
OR6	108.3	118.2	103.7	99.1	-	X	X
OR7	112.6	110.7	97.8	90.8	-	X	-
OR8	113.7	113.3	95.1	73.5	-	X	-
OET	747.3	804.9	551.7	515.3	-	X	-
Sample size	28	14	112	72			

PLANS FOR 1993

We will repeat all work accomplished in 1992 with the exception that the hatchery-wild discrimination work on chinook salmon juveniles will be reduced. All chinook salmon juveniles released from hatcheries during the spring of 1993 will be fin clipped. It will not be necessary to use scales to identify hatchery or wild origin. However, we plan to analyze scales from 800 juveniles to test our technique and maintain a continuous data set.

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APPENDIX TABLE A

Stock composition of training populations used to develop discriminant functions for classifying spring and summer chinook salmon of unknown origin.

Appendix Table A. Stock composition of training populations used to develop discriminant functions for classifying spring and summer chinook salmon of unknown origin.

Training population location	Number	Percent
Juvenile Spring and Summer Chinook Salmon		
Hatchery:		
Clearwater	3	1.4
Dworshak	50	23.3
Lookingglass (Imnaha)	11	5.1
Lookingglass (Grande Ronde)	19	8.8
McCall	15	7.0
Pahsimeroi	14	6.5
Powell	6	2.8
Rapid River	42	19.5
Red River	7	3.3
Sawtooth	48	22.3
	215	100.0
Wild:		
Clearwater	4	1.9
Grande Ronde	49	22.7
Imnaha	15	6.9
Middle Fork Salmon	73	33.8
Salmon	34	15.7
South Fork Salmon	41	19.0
	216	100.0
Adult Spring Chinook Salmon		
Hatchery:		
Clearwater	3	1.7
Rapid River	42	24.0
Red River	7	4.0
Powell	6	3.4
Sawtooth	48	27.4
Dworshak	50	28.6
Lookingglass	19	10.9
	175	100.0
Wild:		
Middle Fork Salmon	73	45.6
Clearwater	4	2.5
Salmon	34	21.3
Grande Ronde	49	30.6
	160	100.0

Appendix Table A. Continued.

Training population location	Number	Percent
	Adult Summer Chinook Salmon	
Hatchery:		
McCall	54	45.4
Pahsimeroi	37	31.1
Lookingglass	28	23.5
	119	100.0
Wild:		
South Fork Salmon	85	66.7
Imnaha	40	33.3
	125	100.0

APPENDIX TABLE B

Hatchery or wild classification based on scale analysis of spring and summer chinook salmon marked for the transportation study at Lower Granite Dam in 1989 and recovered at the same dam in 1991 and 1992.

Appendix Table B. Hatchery or wild classification based on scale analysis of spring and summer chinook salmon marked for the transportation study at Lower Granite Dam in 1989 and recovered at the same dam in 1991 and 1992.

Mark Brand	CWT code	Classification Number hatchery	Number wild	Total
		1989 Control		
LA2-1	232256	2	0	2
LA2-2	232258	0	0	0
LA2-3	232349	1	0	1
LA2-4	232350	6	1	7
LART-1	232351	1	1	0
LART-2	232352	0	0	2
LART-3	232411	0	0	0
LART-4	232412	0	0	0
LA3-1	232413	0	0	2
LA3-2	232414	1	1	0
LA3-3	232415	0	0	0
LA3-4	232415	0	0	0
Total		11	3	14
		1989 Barge Experiment		
RAF-1	232252	0	0	0
RAF-2	232259	3	1	4
RAF-3	232262	1	0	1
RAF-4	232309	3	6	9
RA9-1	232310	2	1	3
RA9-2	232311	1	1	2
RA9-3	232312	2	1	3
RA9-4	232313	0	2	2
RASU-1	232340	1	1	2
RASU-2	232354	1	0	1
RASU-3	232251	1	0	1
RASU-4	232251	0	0	0
RASU-?	?	1	0	1
Total		16	13	29

Appendix Table B. Continued.

Mark Brand	CWT code	Classification Number hatchery	Number wild	Total
		1990 Barge Index		
RAL-1	232429	1	0	1
RAL-4	232430	2	0	2
RAL-2	232431	4	2	6
RAV-1	232432	0	0	0
RAV-2	232433	3	0	3
RAV-3	232434	2	4	6
RAV-4	232435	0	0	0