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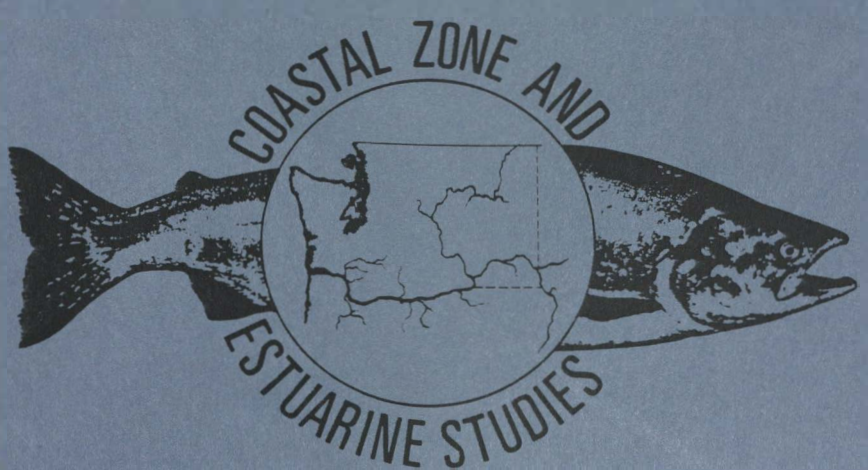

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INTRODUCTION

In 1986, the National Marine Fisheries Service (NMFS), under contract to the U.S. Army Corps of Engineers (COE) continued to evaluate the effects of collection and transportation on juvenile salmonids at dams on the Columbia and Snake Rivers. The major research objectives were: (1) mark transport and control groups of spring chinook salmon, Oncorhynchus tshawytscha, and steelhead, Salmo gairdneri, at Lower Granite Dam and spring and fall chinook salmon at McNary Dam to provide up-to-date information on the benefits of smolt transportation; (2) compare the stress levels of spring chinook salmon smolts sampled from raceways at Lower Granite and Little Goose Dams, after marking at Lower Granite Dam and subsequent transport at low density to Little Goose Dam; (3) continue the recovery of adult fall chinook salmon tagged as juveniles at McNary Dam for transport research purposes and adult spring chinook salmon and steelhead tagged as juveniles at Lower Granite Dam to index the barge transport program; and (4) repeat the extended seawater rearing study on spring chinook salmon sampled from the collection and transport system at Lower Granite Dam.

TRANSPORTATION STUDIES, LOWER GRANITE AND MCNARY DAMS

From 1968 to 1980, numerous smolt transportation studies were conducted at Snake and Columbia River dams (Park 1985). Evaluation of these studies was based primarily on comparisons between recaptured adults which were marked as juveniles and either transported by truck or barge for release below Bonneville Dam or released as controls just below or above the collector dams. Results of these studies were very encouraging for fall chinook salmon

and steelhead, but marginal for spring chinook salmon. Based on these earlier results, mass transportation of smolts around dams has been used in varying degrees as one of the management options to protect downstream migrating salmonids.

During 1983, we began marking smolts to index the relative success of the barge transportation program (no paired control groups were marked). Recent returns (included in this report) of adult spring chinook salmon and steelhead indicate that survival of transported smolts has increased considerably when compared to returns from the 1975-80 studies.

We believe a combination of factors including major improvements incorporated into the transport collection facilities, improved fish quality at release from upstream hatcheries, and greatly improved handling/marking techniques are likely responsible for the observed increase in survival of marked/transported smolts. Beginning in 1986, a 3-year marking study at Lower Granite and McNary Dams was initiated using state-of-the-art collection/transport and handling/marking techniques. This study will provide current information on the effects of collection and transportation on adult returns and short-term delayed mortality.

Methods

Evaluation will be based on comparative rates of return of adults previously marked and either transported by barge to below Bonneville Dam or released as controls below Little Goose or McNary Dams.

Marking of Juvenile Salmonids

Lower Granite Dam.--Smolt marking operations began on 9 April 1986 and continued through 3 June encompassing the majority of the spring chinook

salmon and steelhead smolt outmigrations. Fish were naturally migrating smolts collected from the sample fish tank. All received adipose fin clips (spring chinook salmon) or right ventral fin clips (steelhead), freeze brands, and coded wire tags (CWT).

Transport and control fish were marked separately on an alternating-day basis using pre-anesthesia handling techniques which have been shown to effectively reduce stress associated with handling (Matthews et al. 1985). To provide estimates of variance within and between study years, we marked spring chinook salmon in replicate groups of approximately 5,000 fish each.

With this approach, information can be obtained on differences in rate of return that might exist between years as well as the impact of marking different segments of the population and releasing them at different times into potentially different environmental conditions each year. Similarly, steelhead were marked in replicate groups of approximately 4,250 fish each. Totals of 45,004 test and 45,035 control spring chinook salmon and 30,659 test and 31,646 control steelhead were marked in 1986 (see Appendix Tables 1 and 2 for details on numbers marked for each brand rotation and wire tag code by species). The test groups of both species were transported by barge along with unmarked fish collected each day and released below Bonneville Dam whereas the control groups were transported by truck at very low densities (0.01-0.15 lbs/gal of water) and released below Little Goose Dam. The control groups were treated in this manner to avoid recapture and transport from Little Goose Dam. The impact of this treatment on stress levels in spring chinook salmon smolts was analyzed extensively and will be discussed in a later section of this report.

To evaluate the short-term effects of present handling/marking procedures, samples of both species were taken every other day and held 48 h to determine post-marking delayed mortalities and brand and CWT retention data.

McNary Dam.--Naturally migrating yearling spring and subyearling fall chinook salmon from the sample fish tanks at the collection facility were marked to evaluate the effects of collection and transportation on these populations. Marking spring chinook salmon began on 23 April 1986 and continued through 6 June. Marking subyearling fall chinook salmon began on 11 June and continued through 7 August. All experimental fish received adipose fin clips, freeze brands, and CWTs. We marked 49,274 test and 50,277 control spring chinook salmon smolts in replicate groups of approximately 5,000 fish each and 115,337 test and 116,636 control subyearling fall chinook salmon in replicate groups of approximately 10,000 fish each (see Appendix Tables 3 and 4 for marking details for spring and fall chinook salmon, respectively). Test fish were transported by barge and released below Bonneville Dam. However, since no collector dams are located downstream, the control groups were released in the McNary Dam tailrace. Throughout the marking period, samples of spring chinook salmon were held 48 h to measure post-marking delayed mortality.

Recovery of Adults and Data Analysis

Spring and fall chinook salmon and steelhead will be recovered in each of 3 years following marking as juveniles. Traps in fish ladders (Lower Granite Dam for releases there and Priest Rapids Dam for McNary Dam releases) will be the primary recovery sites for spring chinook salmon and steelhead. Ocean and river commercial fisheries will continue to serve as primary recovery sites

for fall chinook salmon released at McNary Dam. Trapping efficiency will be determined from recoveries of marked fish returning to hatcheries. This is determined by the number of marked fish previously identified at the trap compared to total marks returning to the hatchery. Tributary sport fisheries and natal spawning areas will also be surveyed to provide estimates from these areas.

To analyze results, statistical treatment will be given when returns for a given transport year are complete or when sufficient data are available for analysis. We will use discrete multivariate analysis to compare test (transport) and control treatments (Bishop et al. 1975). In this procedure, the treatments are structured in contingency tables utilizing the G-statistic for significance (Sokal and Rohlf 1981). Significance is desired at $P<0.05$, df = 1 (i.e., adults returning from a barge test group are significantly greater than from the non-transported control).

To provide estimates of variance within years and among years, we will mark treatment subgroups of 5,000 fish each (spring/summer chinook salmon tests). This will enable us to use N = 6 to 10 depending how many subgroups are marked and how the adult return data are combined. We estimated that fish transported in 1971 returned at 0.361%. Since there were several separate subgroups, the confidence interval (CI) could be calculated by using an N of 3 to 14. Using 3, CI was 0.361 ± 0.542; using 14, CI was 0.148. If returns are similar to either 1971 or 1983, the CI should be low because N will be 6 to 10 depending on data treatment.

Additionally, since all tests beginnning in 1986 will be repeated for 3 years, we will use analysis of variance to make comparisons among years. In

the fall chinook salmon tests, we will also use analysis of variance for within years comparisons (i.e., early, middle, and late season).

A confidence interval will be calculated where N = 4. The actual CI may be similar to that noted above since the observed returns to the fisheries ranged from 0.100 to 0.541% in 1981 and 1978, respectively. However, within year variation has not been previously measured.

Results

48-h Delayed Mortality Tests

Appendix Table 5 provides details of 48-h delayed mortality tests by date for both species. For the entire season, delayed mortality averaged 0.3% (n=630) and 0.5% (n=400) for spring chinook salmon and steelhead, respectively. While mortalities for steelhead averaged below 1.0% during similar studies conducted from 1975-80, mortalities for spring chinook salmon ranged from 1.9 to 30.0% with an overall average of 11.4% (Park 1985). Further, this is the first occasion that we have witnessed lower average delayed mortality for spring chinook salmon than for steelhead, regardless of test conditions, facilities, or years. These results undoubtedly reflect the very positive progress realized in recent years from extensive modifications to the collection facility and a very significant innovation incorporated into our handling/marking procedures. In particular, we believe that the debris removal and control program conducted by the COE together with replacement of the "dry-" with a "wet-" type fish and debris separator (Gessel et al. 1985) are the most significant improvements in the collection system. Concurrent with facility improvements, the development and incorporation of the pre-anesthesia concept (Matthews and Achord, manuscript in progress) into our handling/marking procedures has reduced the debilitating stress associated

with this procedure by more than half and virtually eliminated related physical injuries. The value of pre-anesthesia is further demonstrated by results from transportation studies presently being conducted by Grant County Public Utility District (PUD) at Priest Rapids Dam on the Mid-Columbia River. In these studies, the basic concept has been incorporated into their handling/marking procedures. During 1986, a series of four 5-d post-marking delayed mortality tests (n=482) conducted on spring chinook salmon smolts resulted in no mortalities (Achord 1986[1/]). Available information strongly suggests that recent improvements have combined to greatly reduce any adverse impacts of collection and transport or handling/marking on salmonid smolts, particularly spring chinook salmon. We are very optimistic that much improved smolt to adult survival will be realized during these and future collection and transport studies at Lower Granite Dam. Overall, delayed mortality at McNary Dam averaged 3.1% (n=1,354). This value reflects an improvement over levels measured during previous studies. However, it is considerably higher than the values measured this year for the same race of salmon at Lower Granite and Priest Rapids Dams. While poorer fish condition may have been a contributing factor, we attribute the higher mortality levels at McNary Dam primarily to the lack of the pre-anesthesia marking technique. Details by individual test are provided in Appendix Table 6.

Adult Returns

None to date. First returns of jack chinook salmon and 1-ocean steelhead from 1986 marking will occur in 1987.

1/ Stephen Achord, NMFS, Pasco Biological Field Station, Pasco Industrial Park, Bldg 900, Pasco, WA 99301, pers. commun.

STRESS EVALUATION OF TRUCK TRANSPORTED SPRING CHINOOK SALMON CONTROLS

Transportation research programs require marked inriver control groups for proper evaluation. At Lower Granite Dam, these releases present a difficult and controversial problem. Ideally, releases of controls should be made in the tailrace of the dam. However, in so doing, many controls would be recaptured and transported from Little Goose Dam thereby biasing adult returns. There were only three options available to avoid this problem: (1) close down the smolt collection system at Little Goose Dam for the entire 3-year study period, (2) conduct the test at Little Goose Dam, or (3) transport the inriver controls by truck around the Little Goose pool and dam complex. The first two options received little support mainly because of the adverse impact on steelhead populations which have responded very positively to transportation and the generally poor conditions for marking and handling fish at Little Goose Dam. Therefore, the third option was selected as the control release strategy for the present study.

We realize these releases do not represent true controls since they are being transported by truck around one reservoir and dam complex and, conceivably, may incur some additional stress that could adversely influence long-term survival. If, on the other hand, this procedure does not induce additional stress and possible mortality over that incurred from passage through the Little Goose pool, dam, and collection facility, then these fish may return at a higher rate than if they had been released in the Lower Granite Dam tailrace. If there is an additional stress through this transportation, the resulting transport/control benefit ratios may be somewhat inflated; without transportation stress, the ratios may be somewhat conservative.

To examine this question, we conducted a series of stress studies in conjunction with the transport marking program on the Snake River. In these studies, plasma cortisol and glucose levels were isolated at three points during the marking and truck transport operation. These levels were then compared to levels measured in a group sampled at Little Goose Dam. If no significant differences were noted in these stress indices (particularly plasma cortisol) between trucked controls and those sampled at Little Goose Dam, we would assume releases below Little Goose Dam would provide a reasonable control for transport/control benefit comparisons.

Methods

Samples of spring chinook salmon smolts were obtained from four locations on five separate occasions between 13 and 24 April. Fish originating at Lower Granite Dam were sampled from the sample raceway just prior to marking, 1 h post-marking with pre-anesthesia, and after transport by truck to Little Goose Dam. At Little Goose Dam, fish were sampled from the sample raceway 3 d after the corresponding test groups at Lower Granite Dam. This was done in an attempt to obtain samples from the same populations of fish at both dams. During the first test series, 16 fish were sampled from each test area; 30 fish were sampled from each test area during the remaining four test series.

Test fish were sampled by dip-net in groups of four and transferred immediately into 200 ppm MS-222 anesthetic (Strange and Schreck 1978). As soon as fish were immobilized, we blotted them dry; severed their caudal peduncles; and collected blood in 250-microliter, heparinized capillary tubes. Blood samples were centrifuged and the plasma was separated and frozen immediately on dry ice. Plasma cortisol and glucose values were later measured in Dr. Carl Schreck's laboratory at Oregon State University.

A one-way analysis of variance (ANOVA) was used to test for statistical homogeneity within test groups and for statistical differences between test groups. Significance was established at $P<0.05$.

Results and Discussion

Plasma cortisol values varied considerably among individual fish within the same treatment groups (Appendix Table 7). However, the propensity for a high degree of individual variability in the corticoid stress response is typical of chinook salmon juveniles (Strange et al. 1977) and probably of all salmonids. Even with high individual variability, mean values were remarkably consistent within treatment groups during the entire study (Fig. 1). ANOVA indicated statistical homogeneity within all four treatment groups which allowed us to pool all individual tests within each treatment group for final analysis.

Analysis of the pooled data demonstrated that transportation of spring chinook salmon controls by truck from Lower Granite Dam to Little Goose Dam was associated with a significant decrease ($P<0.05$) in plasma cortisol. While the mean plasma cortisol level had increased significantly from 132 to 219 ng/ml ($P<0.05$) after marking at Lower Granite Dam, it was down to the pre-mark level (127 ng/ml) when the fish arrived at Little Goose Dam. In addition, there was virtually no difference in the mean plasma cortisol level in fish sampled from raceways at both dams and from the truck following transport to Little Goose Dam, satisfying a major consideration of the study.

Plasma glucose values showed the same within treatment group statistical homogeneity (ANOVA) as the cortisol values, allowing us to also pool these values for a combined analysis. The mean plasma glucose level increased significantly from 103 to 138 mg/100 ml ($P<0.05$) after marking at Lower

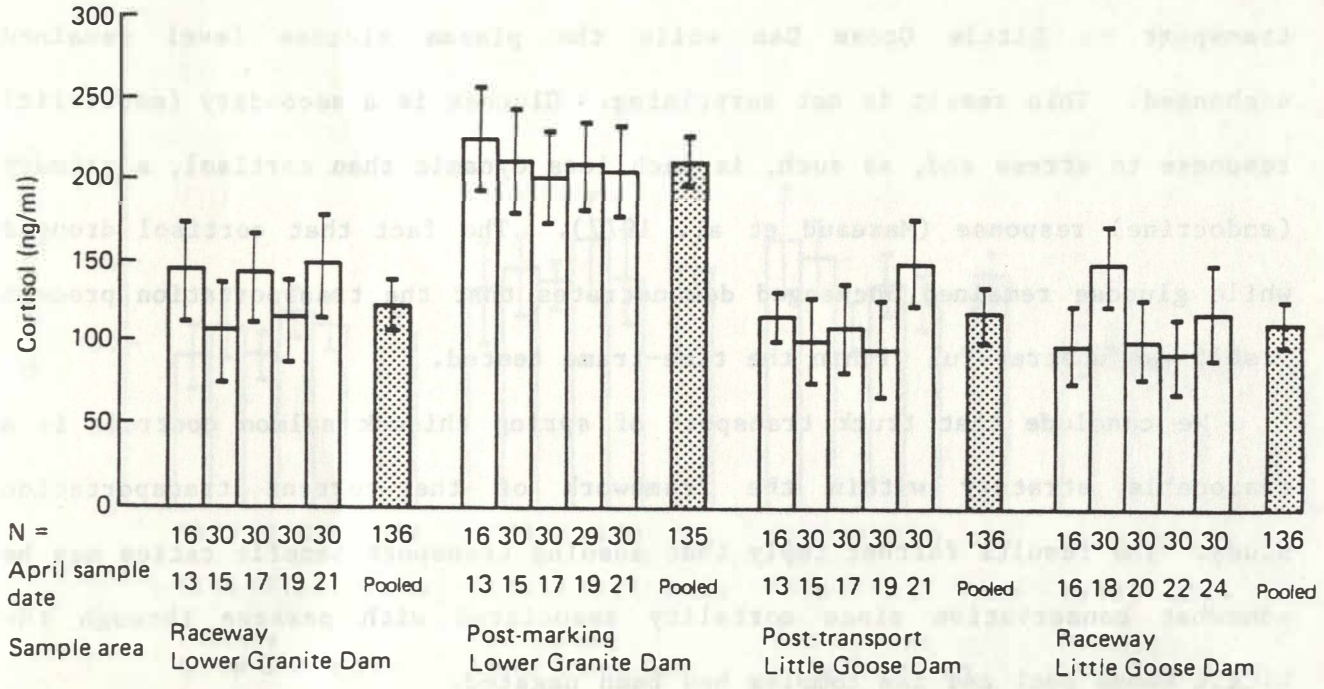

Figure 1.--Plasma cortisol values for evaluation of stress effects of truck transport of spring chinook salmon controls around Little Goose pool and dam. Vertical lines indicate 95% confidence intervals.

Granite Dam and was unchanged upon arrival at Little Goose Dam (Fig. 2). Levels observed in fish from raceways were not significantly different between the two dams.

Both stress indices developed significant elevations due to the handling/marking process although in neither case were they particularly high. The plasma cortisol level dropped to the pre-mark level during transport to Little Goose Dam while the plasma glucose level remained unchanged. This result is not surprising. Glucose is a secondary (metabolic) response to stress and, as such, is much less dynamic than cortisol, a primary (endocrine) response (Mazeaud et al. 1977). The fact that cortisol dropped while glucose remained unchanged demonstrates that the transportation process itself was unstressful within the time-frame tested.

We conclude that truck transport of spring chinook salmon controls is a reasonable strategy within the framework of the current transportation study. The results further imply that ensuing transport benefit ratios may be somewhat conservative since mortality associated with passage through the Little Goose pool and dam complex has been negated.

RECOVERY OF ADULT SALMON AND STEELHEAD

Recovery of adult salmonids previously tagged as juveniles for transport evaluation purposes continued in 1986. Fall chinook salmon originating from studies at McNary Dam in 1982-83 were recovered from the adult trap at Bonneville Dam, from ocean and river fisheries, and at hatcheries. Spring/summer chinook salmon and steelhead originating from barge transport index marking at Lower Granite Dam in 1983-85 and 1984-85, respectively, were

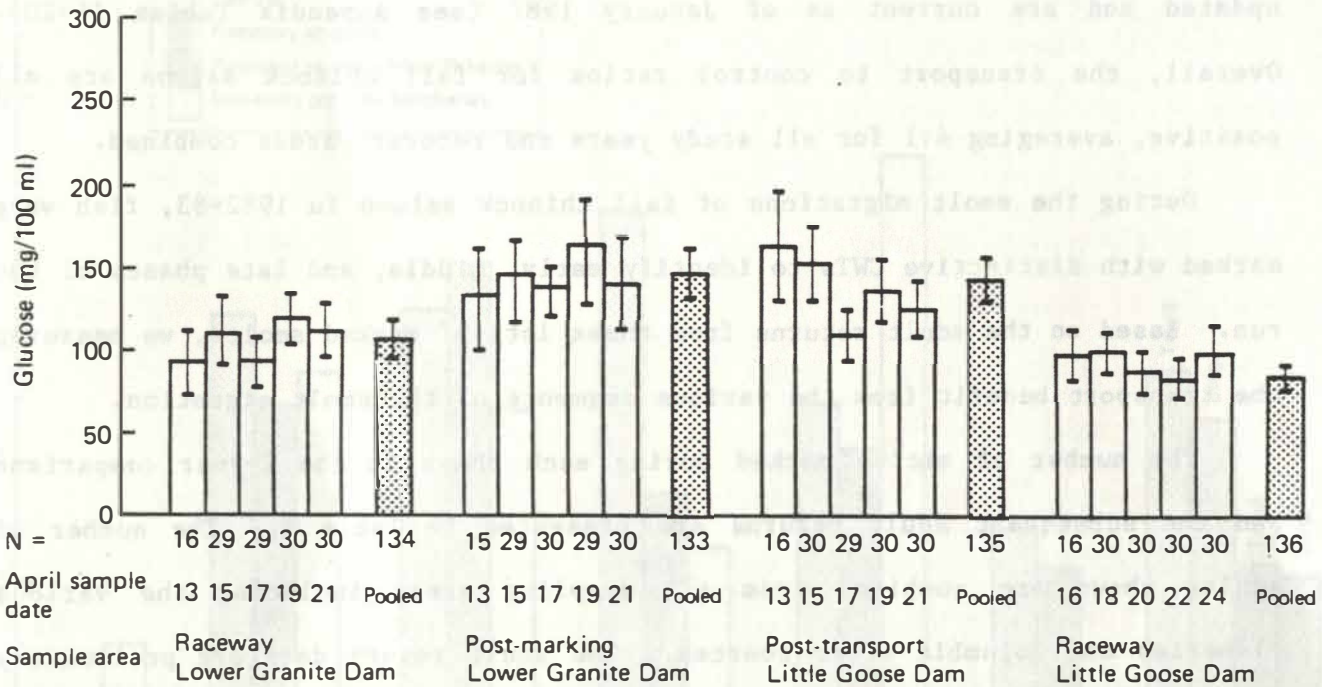

Figure 2.--Plasma glucose values for evaluation of stress effects of truck transport of spring chinook salmon controls around Little Goose pool and dam. Vertical lines indicate 95% confidence intervals.

recovered primarily from the adult trap at Lower Granite Dam and at upstream hatcheries.

Fall Chinook Salmon - McNary Dam

Figure 3 provides a summary of transportation benefits for fall chinook salmon by recovery area for the study years 1978-83. All entries have been updated and are current as of January 1987 (see Appendix Tables 11-20). Overall, the transport to control ratios for fall chinook salmon are all positive, averaging 4:1 for all study years and recovery areas combined.

During the smolt migrations of fall chinook salmon in 1982-83, fish were marked with distinctive CWTs to identify early, middle, and late phases of the run. Based on the adult returns from these lots of marked smolts, we measured the transport benefit from the various segments of the smolt migration.

The number of smolts marked during each phase in the 2-year comparison and the subsequent adult returns are presented in Table 1. The number of adults shown are combined from all sampling areas including the various fisheries and Columbia River sources. The adult return data are preliminary but nearly complete. In 1982, there was no benefit in the early phase, a minor benefit in the middle phase, and a major benefit of 4.89:1 (T/C ratio) in the late phase. The combined transport benefit ratio for the year was 2.33:1. However, we should point out that river flow was very high during the early phase (409,000 cfs daily average)--the period when a large segment of the smolts was passing over the spill and not available for collection and transportation at McNary Dam. Since there was little, if any, transport benefit during the early phase when a large portion of the run passed the dam, the run in 1982 received a relatively small benefit from transportation. We should point out that high flows early limited our marking (daily collection

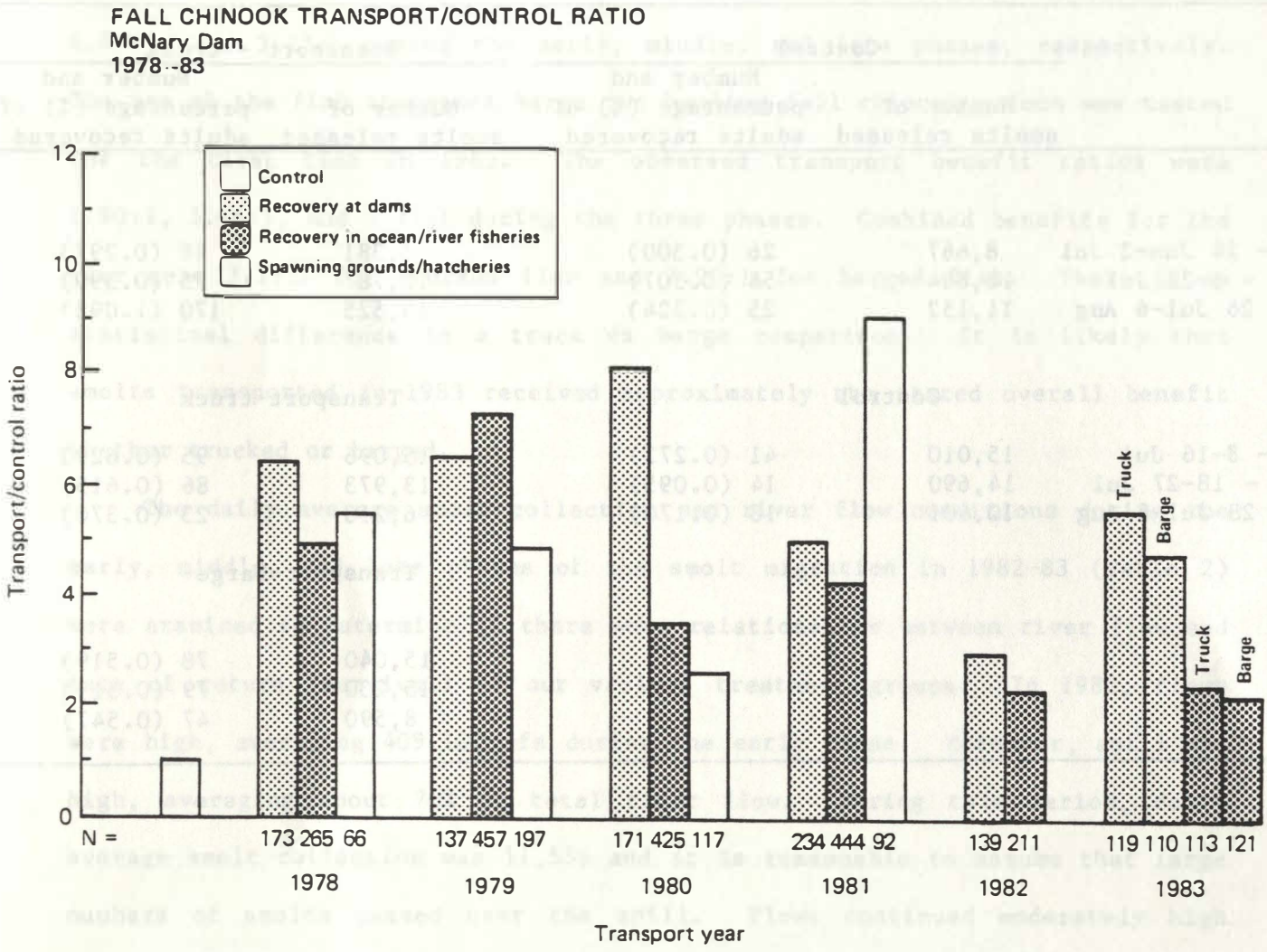

Figure 3.--Transport/control ratios for McNary Dam truck transportation tests with fall chinook salmon, 1978-1983 (includes barge test group for 1983).

Table 1.--Number of fall chinook salmon smolts released as controls or transported in 1982-83 during early, middle, and late phase of their seaward migration at McNary Dam. Adults were recovered from all sampling sources in 1982-1986.

	Control		Transport - truck	
	Number of smolts released	Number and percentage (%) of adults recovered	Number of smolts released	Number and percentage (%) of adults recovered
1982				
Early - 24 Jun-2 Jul	8,667	26 (0.300)	5,381	16 (0.297)
Middle - 6-22 Jul	18,864	58 (0.307)	18,787	75 (0.399)
Late - 26 Jul-6 Aug	11,152	25 (0.224)	15,525	170 (1.095)
1983	Control		Transport-truck	
Early - 8-16 Jul	15,010	41 (0.273)	15,096	95 (0.629)
Middle - 18-27 Jul	14,690	14 (0.095)	13,973	86 (0.615)
Late - 28 Jul-8 Aug	10,601	18 (0.170)	6,210	23 (0.370)
			Transport-barge	
			15,040	78 (0.519)
			15,230	79 (0.519)
			8,590	47 (0.547)

was low--Table 2); hence, the treatment group sample size was smaller than desired.

In 1983, the transport benefit ratios for trucked fish were 2.30:1, 6.47:1, and 2.17:1 during the early, middle, and late phases, respectively. The use of the fish transport barge for hauling fall chinook salmon was tested for the first time in 1983. The observed transport benefit ratios were 1.90:1, 5.46:1, and 3.22:1 during the three phases. Combined benefits for the year were 3.19:1 for trucked fish and 2.90:1 for barged fish. There is no statistical difference in a truck vs barge comparison. It is likely that smolts transported in 1983 received approximately the stated overall benefit whether trucked or barged.

The daily average smolt collection and river flow conditions during the early, middle, and late phases of the smolt migration in 1982-83 (Table 2) were examined to determine if there were relationships between river flow and rate of return (survival) of our various treatment groups. In 1982, flows were high, averaging 409,100 cfs during the early phase. Moreover, spill was high, averaging about 70% of total river flow. During this period, daily average smolt collection was 11,536 and it is reasonable to assume that large numbers of smolts passed over the spill. Flows continued moderately high through the middle portion of the run with spill volume averaging about 20% of the total flow. There was no spill during the late phase. Throughout 1983, there was no spill. In our comparative years (1982-83), high flows with spill did not appear to result in higher survival of controls from our tests. The highest rate of return of controls was 0.3% during high flow in 1982; this was nearly the same as the 0.27% return observed during the lowest average flow in 1983. During 1983, percentage return of controls was lowest (0.095) during

Table 2.--Average daily collection of fall chinook salmon and daily average river flow at McNary Dam in 1982-1983 during early, middle, and late phase of the juvenile fish migration.

Year	Phase	Daily average collection	Average river flow - cfs
1982	Early	11,536	409,100
	Middle	23,286	282,000
	Late	20,706	194,900
1983	Early	140,000	175,000
	Middle	62,378	213,500
	Late	12,026	193,500

the highest flow period (213,500 cfs). Sims et al. (in progress) report that during 1981-83, the rate of downstream movement of subyearling chinook salmon in John Day Reservoir did not appear to be significantly affected by the level of instream river flows. Thus, other factors such as water temperature, migrational characteristics of different stocks, or predation appear to govern the survival of juvenile fall chinook salmon migrating inriver below McNary Dam.

The survival of all transported groups was highest during low flow situations, ranging from 0.5 to 1.1% in six of seven groups. Survival was lower (0.3 and 0.4%) during high and moderate flows, respectively. Any impact of flow on survival must be occurring downstream from Bonneville Dam where transported migrants are released. Why this might be occurring is unknown.

In summary, the return of transported fish was about double and triple that of controls in 1982 and 1983, respectively. Positive transport benefits were measured during the middle and late phases of the migration in 1982 and throughout all phases in 1983. These data, combined with previous transportation test results in 1978-81, support our recommendations to continue transporting fall chinook salmon from McNary Dam.

Spring/Summer Chinook Salmon and Steelhead - Lower Granite Dam

Table 3 summarizes and Appendix Tables 21-25 list total-to-date returns of spring/summer chinook salmon and steelhead tagged in 1983-85 and 1984-85, respectively, to index the relative success of the barge transportation program at Lower Granite Dam. Transport benefit ratios cannot be calculated since no inriver controls of either species were marked.

Returns of spring/summer chinook salmon tagged in 1983 are complete. A total of 124 adults (0.28% of release) was observed at Lower Granite Dam between 1984 and 1986. Estimated (expanded) returns for this group will not

Table 3.--Numbers of adult spring/summer chinook salmon and steelhead returning to Lower Granite Dam from barge transport index groups 1983-1985.

Release year	No. released	Observed return			
		1-ocean	2-ocean	3-ocean	Total
		Spring/summer chinook salmon			
1983	44,648	10	99	15	124
1984	46,173	11	40	-	51
1985	45,727	11	-	-	11
		Steelhead			
1984	33,529	262	359	-	621
1985	30,518	204	-	-	204

be possible due to errors in data or fish handling in Idaho hatcheries in 1985 (Park et al. 1986). While still poor, the observed return for this group is 7 times higher than the average observed return for all transported groups of this species since 1975 (Park 1985).

Observed returns of 2-ocean age spring/summer chinook salmon marked at Lower Granite Dam in 1984 were lower than anticipated from jack returns the previous year. However, of 11 adults recovered at upstream hatcheries, only 3 were previously observed at Lower Granite Dam. While these recoveries are insufficient for accurate expansion estimates, they do suggest that the lower than expected observed return to Lower Granite Dam could have been an artifact of poorer than normal trapping efficiency at the dam. Returns of 3-ocean age fish from this release group may provide additional information to resolve this question. It should be noted that the smaller than expected observed return of 40 fish is still much better than the average returns for the study years 1976-80.

Observed returns to Lower Granite Dam of steelhead tagged in 1984-85 continue to be very strong. To date, we have recovered 621 adults (1.85% of release) from the 1984 study year. When all returns are complete in spring 1988, we expect in excess of a 2% observed return for this release group. This return is the highest we have witnessed for any transport group at Lower Granite Dam and is considerably higher than the average observed returns for the study years 1975-1980 (Park 1985). Observed returns of 1-ocean age steelhead tagged in 1985 indicate this trend will continue.

The much improved returns of transport index fish of both species since 1983 are very encouraging. We do not believe that the substantial improvements in both adult returns and post-marking delayed mortality are simply coincidental. Delarm et al. (1984) noted that the 1983 transport

season was preceded by major modifications to the Lower Granite Dam fingerling collection system including a temporary trash and debris boom to prevent debris from entering the system, improvements to the wet separator, increased raceway capacity, and direct barge loading from the separator. Furthermore, releases of steelhead smolts from Dworshak National Fish Hatchery was delayed to prevent the presence of large numbers of this species at the collection facilities during the major portion of the spring chinook salmon outmigration. Finally, 1983 was the first year that we used the pre-anesthesia technique during our marking operations. We are highly optimistic that credible and accurate data will be provided by the current transportation research studies.

EXTENDED SEAWATER HOLDING STUDY, LOWER GRANITE DAM

"Upriver bright" fall chinook salmon and steelhead populations have responded very positively to recent enhancement techniques, particularly the smolt collection and transportation program (Park 1985). In contrast, upriver spring chinook salmon populations have failed to respond similarly despite recent enhancement efforts including smolt collection and transportation. Although the exact reason for this failure is not yet known conclusively, indirect evidence implicating bacterial kidney disease (BKD) as the underlying cause is gradually accumulating (Banner et al. 1983; Congleton et al. 1985; Park et al. 1986).

Another area of concern is the effect of collection and transportation stress on the long-term survival of spring chinook salmon. While much has been learned in recent years about where stresses occur in these systems, information on the delayed effects of these stresses inclusive or exclusive of BKD is wanting. In 1984, the NMFS initiated a study of this question. To

conduct the study, we designed and built a completely closed artificial seawater recirculation system for use on site at Lower Granite Dam. In this way, we could avoid introducing any extraneous stresses involved in the process of transferring treatment groups of smolts 300+ miles to the sea. Naturally-migrating spring chinook salmon smolts were sampled from several areas of the collection and transport system and held in the recirculation system for 43 d. The test was intended to extend at least 120 d, but was involuntarily terminated when a main water valve was inexplicably closed. Limited information from this initial study suggested that collection and transport stresses and BKD do impact the relative survival of the treatment groups but to an undetermined extent (Matthews et al. 1985). In spring 1985, we repeated the study and successfully held test fish in the system for 140+ d. Information from this effort strongly implied that collection and transport stresses exacerbate sub-clinical BKD infections early, but are of relatively minor importance compared to similar effects caused by seawater adaptation stress (Park et al. 1986).

This past spring (1986) we attempted to repeat the study to confirm the previous findings. Again, spring chinook salmon smolts were sampled from several areas of the smolt collection and transport system and placed in the recirculation system for long-term observations.

Methods

The artificial seawater recirculation system was described by Matthews et al. (1985). Artificial seawater was recirculated sequentially through a series of devices to purify, filter, chill, and re-aerate the water. Water quality variables including temperature, oxygen, pH, salinity, and un-ionized ammonia (NH_3) were measured daily.

On 23-24 April, near the peak of the outmigration, we placed in the holding tanks three randomized replicates of approximately 100 spring chinook salmon smolts each from the areas described below:

1. C-slot Gatewell Group (control). This group represented smolts that volitionally entered these gatewells and, therefore, were exposed to minimal stresses (Park et al. 1983).

2. Pre-separator Group. This group represented smolts that were exposed to stresses involved in passing from the gatewells through the bypass gallery, downwell, and pipe areas.

3. Marked + Transported Group. This group represented smolts that were exposed to the same stresses as the previous groups. In addition, they were handled and marked utilizing the pre-anesthesia concept (Park et al. 1983, 1984), and subsequently transported for 8 h in a small, experimental tanker (Achord et al. 1984) at 0.5 lb fish/gal water.

The nine test replicates of smolts were transferred to the fish holding tanks utilizing water-to-water transfer techniques developed previously for short-term seawater challenge stress tests (Matthews et al. 1986). The fish were held in fresh water for 2 d before salinity was gradually increased by 1.5 to 3.0 ppt daily over a 27-d period until full-strength seawater (28-30 ppt) was reached. Thereafter, we replaced approximately 2% of the artificial seawater daily throughout the study.

All test fish were fed to satiation three times daily with Oregon Moist Pellet (OMP) fish formula. Excess food along with fish excrement was vacuumed from the tank bottoms every third day.

Mortalities were removed daily, weighed, measured to fork length, checked for external abnormalities, and frozen. Later, each fish was necropsied and

critically examined for the presence of BKD lesions and other abnormalities. The indirect fluorescent antibody technique (IFAT) (Novotny and Zaugg 1979) was used to confirm the presence of BKD organisms in the mortalities. In addition, we used a system described by Park et al. (1986) based upon numbers of BKD organisms per microscopic field for estimating the relative intensity or severity of the infections. This method provided an incidence level and a rough estimate of the likelihood that the disease was responsible for individual deaths.

When the study was involuntarily terminated on 4 June, all fish in the system were weighed and measured to fork length. In addition, 30 fish from each test replicate were randomly sampled for IFAT analysis.

At the end of the study, statistical differences in mortality were determined by discrete multivariate analysis (Bishop et al. 1975). In this procedure, live and dead fish counts were structured as contingency tables and significance ($P<0.05$) was determined by the G-statistic (Sokal and Rohlf 1981).

Results and Discussion

Unfortunately, the study was terminated on Day 43 when one of the refrigeration units malfunctioned internally, releasing lethal refrigerant materials into the holding water. As in the previous study years, all critical water quality variables that we measured stayed within the desired ranges up to this date (Appendix Table 8), demonstrating that the design of the system is satisfactory for the intended purpose.

The 43-d mortality for the same treatment groups for all three study years is presented in Table 4. In all 3 years, the average percent mortality was significantly higher in the pre-separator groups than in the C-slot

Table 4.--The average 43-d mortality and percentage of mortalities with BKD lesions in spring chinook salmon smolts during extended seawater rearing, 1984-1986.

Treatment group	43-d mortality (%)		
	1984	1985	1986
C-slot gatewell (control)	1.0	7.9	3.1
Pre-separator	8.6	12.3	8.2
Marked + transported	9.3	11.0	4.7
% mortalities with BKD lesions	19.3	68.7	63.3

gatewell groups (1984 and 1986, $P < 0.05$; 1985, $P < 0.10$). In contrast, there was no significant difference in mortality between the pre-separator groups and the marked/transported groups in all 3 years. These findings imply that the types of stresses associated with smolt movement through the bypass area of the collection and transport system are the most important stresses currently affecting short-term survival of collected and transported or simply bypassed spring chinook salmon smolts at Lower Granite Dam. In particular, we believe that swimming fatigue or exhaustion caused by delay in passage through the downwell portion of the bypass system may be the stress that is reflected in these short-term mortality data (Matthews et al. 1985). It should be emphasized that the differences in these short-term mortalities, while consistently significant, are not alarmingly high. It is possible that only a portion of the smolts delay in this area of the system. Obviously, additional study is necessary to more precisely isolate and characterize the bypass stress at this and other dams.

In the 1986 study, the 43-d mortalities in all test groups were overwhelmingly associated with BKD (Table 5). IFAT analysis demonstrated BKD organisms in 93.9% of all mortalities. Based upon bacterial counts, we estimated that between 67.3 and 75.5% of the mortalities in all test groups were likely attributable to the disease. These values are very similar to those reported for the 1985 study after 140+ d of holding (Park et al. 1986). We found visible BKD lesions in 63.3% of the mortalities which is also very comparable to the 68.7% found in mortalities during the 1985 study for the same time period (Table 4). In addition, we observed BKD in most of the fish that survived the 43-d holding period as well. IFAT analysis indicated 95.9% were infected. This level of infection in the survivors is almost

Table 5.--The association of BKD with mortalities during the extended seawater holding study as determined by IFAT analysis.

	C-slot	Pre-separator	Mark + transport	Grand average
Incidence (%)[a/]	100.0	91.6	92.9	93.9
Probable cause of death (%)				
maximum[b/]	81.8	70.8	78.6	75.5
minimum[c/]	63.7	70.8	64.3	67.3

a/ Minimum of 1 BKD organism/300 microscopic fields.

b/ 1-300 BKD organisms/microscopic field.

c/ 10-300 BKD organisms/microsopic field.

identical to the level reported for the 1985 study after 140+ d of holding (Park et al. 1986). In total, these data are suggestive at least that this year's study had the potential to produce similar final results as last year's study had it not been terminated prematurely.

The ultimate effect of BKD on a population of salmonids in their natural environment is basically dependent upon the interaction of three major factors: (1) the infection level in the population, (2) the susceptibility or sensitivity of a particular species to the disease, and (3) the complex interaction of various types of stress on the ability of the fish to cope with the bacteria. It is becoming increasingly apparent that a very high percentage of hatchery spring chinook salmon in the Snake River basin contain BKD at sub-clinical as well as clinical levels at the time of release. While the exact carrier rate is impossible to determine definitively at present, at least one authority believes the infection rate is greater than 90% (Mulcahy 1986[2/]). Futhermore, spring chinook salmon are the most susceptible or sensitive of the salmonids to BKD (Bullock and Wolf 1986). Finally, anadromous salmonids experience a wide variety of stresses throughout their life cycle, ranging from the chronic, physiological stresses associated with hatchery rearing, smoltification, and seawater adaptation to the acute, physical stresses associated with collection and bypass or passage through dams and impoundments. Results of the 1985 study indicated that seawater adaptation is by far the most important stress associated with exacerbation of sub-clinical infections (Park et al. 1986). Clearly, direct and indirect

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evidence strongly suggests that BKD plays the dominant role in the survival of Snake River spring chinook salmon regardless of management strategy.

SUMMARY AND CONCLUSIONS

1. Totals of 45,004 test and 45,035 control spring chinook salmon and 30,659 test and 31,646 control steelhead were marked to provide current information on the benefits of transporting these species from Lower Granite Dam. Similarly, totals of 49,274 test and 50,277 control spring chinook salmon and 115,337 test and 116,636 control fall chinook salmon were marked at McNary Dam for the same purpose.

2. Delayed mortality indicated that recent facility improvements together with incorporation of the new pre-anesthesia marking technique have combined to greatly enhance post-collection and marking survival of spring chinook salmon smolts at Lower Granite Dam.

3. Plasma cortisol and glucose measurements demonstrated that truck transport of spring chinook salmon around the Little Goose pool and dam complex does not result in an increase in stress.

4. Recent returns of adult fall chinook salmon previously marked at McNary Dam continued to indicate that transportation provides enhanced survival for this species. Returns of both spring chinook salmon and steelhead adults previously marked at Lower Granite Dam to index barge transportation are much improved over most returns for similar groups marked during the 1975-1980 study years. However, spring chinook salmon returns continued to be relatively poor.

5. The 43-d mortality of spring chinook salmon in all 3 years of the extended seawater rearing study at Lower Granite Dam suggested that bypass stress alone is the major influence on short-term survival of collected and

transported smolts. Direct and indirect evidence strongly implicates BKD as the major impediment to restoration of Snake River spring chinook salmon hatchery stocks.

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APPENDIX

Data Tables

Appendix Table 1.--Summary of the spring chinook salmon marking program by replicate at Lower Granite Dam during 1986 including dates marked, brand positions, symbols, and orientations, wire tag codes, and numbers of fish marked for both control and test groups.

Replicate no.	Marking period	Brand position,[a] symbol, and orientation[b]	Wire tag code	No. released
		Control (Little Goose Dam tailrace)		
1	09-11 Apr	LA-P,1	23-19-2	5,000
2	11-15 Apr	LA-P,2	23-19-3	5,000
3	15-17 Apr	LA-P,3	23-19-4	5,104
4	17-21 Apr	LA-P,4	23-19-5	5,000
5	21-23 Apr	LA-W,1	23-19-6	5,000
6	23-27 Apr	LA-W,2	23-19-7	5,000
7	29 Apr-03 May	LA-W,3	23-19-8	5,000
8	03-15 May	LA-W,4	23-19-9	4,998
9	15-31 May	LA-L,1	23-18-63	4,993
			Total	45,035
		Test (barge transport below Bonneville Dam)		
1	10-12 Apr	RA-L,1	23-19-10	5,000
2	12-16 Apr	RA-L,2	23-19-11	5,001
3	16 Apr	RA-L,3	23-19-12	5,000
4	18-20 Apr	RA-L,4	23-19-13	5,000
5	20-22 Apr	RA-V,1	23-19-14	5,000
6	24-28 Apr	RA-V,2	23-19-15	5,000
7	28-Apr-02 May	RA-V,3	23-19-16	5,000
8	05-14 May	RA-V,4	23-19-17	5,000
9	14 May-03 Jun	RA-P,1	23-19-18	5,003
			Total	45,004

[a] Position-LA and RA indicate left and right anterior sides of fish, respectively.

[b] Orientation-refers to rotation of brand around its centerpoint (i.e.,1 corresponds to the normal orientation, A; 2 to ⋗ ; 3 to ⋎ ; 4 to ⋖).

Appendix Table 2.--Summary of the steelhead marking program by replicate at Lower Granite Dam during 1986 including dates marked, brand positions, symbols, orientations, and wire tag codes, and numbers of fish marked for both control and test groups.

Replicate no.	Marking period	Brand position,[a] symbol, and orientation[b]	Wire tag code	No. released Hatchery	Wild	Total
		Control (Little Goose tailrace)				
1	15-27 Apr	LA-P,1	23-19-2	-	4,319	4,319
2	29 Apr-01 May	LA-P,2	23-19-3	2,568	1,608	4,176
3	01-08 May	LA-P,3	23-19-4	3,781	1,185	4,966
4	08-13 May	LA-P,4	23-19-15	3,345	805	4,150
5	13-17 May	LA-W,1	23-19-5	3,632	617	4,249
6	17-22 May	LA-W,2	23-19-6	3,168	1,082	4,250
7	22-27 May	LA-W,3	23-19-7	2,832	1,418	4,250
8	27 May	LA-W,4	23-19-8	1,054	232	1,286
			Totals	20,380	11,266	31,646
		Test (barge transport below Bonneville Dam)				
1	16-28 Apr	RA-L,1	23-19-10	765	4,139	4,904
2	28-30 Apr	RA-L,2	23-19-11	2,400	1,850	4,250
3	02-09 May	RA-L,3	23-19-12	3,001	1,246	4,247
4	09-14 May	RA-L,4	23-19-13	3,361	889	4,250
5	14-19 May	RA-V,1	23-19-14	3,583	661	4,244
6	19-23 May	RA-V,2	23-19-16	3,014	1,500	4,514
7	23 May-03 Jun	RA-V,3	23-19-17	3,404	846	4,250
			Totals	19,528	11,131	30,659

[a] Position-LA and RA indicate left and right anterior sides of fish, respectively.

[b] Orientation-refers to rotation of brand around its centerpoint (i.e.,1 corresponds to the normal orientation, A; 2 to ⋗ ; 3 to ∀ ; 4 to ≮).

Appendix Table 3.--Summary of the spring chinook salmon marking program by replicate at McNary Dam during 1986 including dates marked, brand positions, symbols, and orientations, wire tag codes, and numbers of fish marked for both control and test groups.

Replicate no.	Marking period	Brand position, symbol, and orientation[a/][b/]	Wire tag code	No. released
		Control (McNary Dam tailrace)		
1	23 Apr-05 May	LA-15,3	23-17-29	5,620
2	06-07 May	LA-IV,3	23-18-45	5,054
3	07-09 May	LA-1Δ,3	23-18-47	5,168
4	10-11 May	LA-1M,3	23-18-49	5,243
5	11-12 May	LA-1F,3	23-18-51	5,329
6	12-14 May	LA-15,1	23-18-53	5,158
7	14-17 May	LA-1V,1	23-18-55	5,043
8	17-20 May	LA-1Δ,1	23-18-57	5,111
9	20-24 May	LA-1M,1	23-18-59	5,079
10	27 May-06 Jun	LA-1F,1	23-19-19	3,472
			Total	50,277
		Test (barge transport below Bonneville Dam)		
1	23 Apr-06 May	RA-1V,1	23-18-46	5,235
2	06-07 May	RA-1C,3	23-18-48	4,936
3	07-09 May	RA-1F,1	23-18-50	5,209
4	10-11 May	RA-1Δ,1	23-18-52	5,014
5	11-12 May	RA-1M,1	23-18-54	5,119
6	12-14 May	RA-1V,3	23-18-56	5,106
7	14-17 May	RA-1C,1	23-18-58	5,011
8	17-20 May	RA-1F,3	23-18-60	5,099
9	20-24 May	RA-1Δ,3	23-18-61	5,032
10	27 May-06 Jun	RA-1M,3	23-19-20	3,513
			Total	49,274

[a/] Position-LA and RA indicate left and right anterior sides of fish, respectively.

[b/] Orientation-refers to rotation of brand around its centerpoint (i.e.,1 corresponds to the normal orientation, A; 2 to ▶ ; 3 to ▼ ; 4 to ◀).

Appendix Table 4.--Summary of the fall chinook salmon marking program by replicate at McNary dam during 1986 including dates marked, brand positions, symbols, orientations, and wire tag codes, and numbers of fish marked for both control and test groups.

Replicate no.	Marking period	Brand position,[a] symbol, and orientation[b]	Wire tag code	No. released
		Control (McNary Dam tailrace)		
1	11-18 Jun	LA-17,3	23-19-21	10,000
2	18-21 Jun	LA-3X,3	23-19-23	10,000
3	21-27 Jun	LA-3J,3	23-18-25	10,000
4	27 Jun-08 Jul	LA-3C,3	28-19-27	10,810
5	09-15 Jul	LA-3L,3	23-19-29	10,000
6	15-19 Jul	LA-7H,3	23-19-31	10,000
7	19-21 Jul	LA-10,3	23-19-33	10,000
8	21-22 Jul	LA-7H,1	23-19-35	10,000
9	22-23 Jul	LA-10,1	23-19-37	10,000
10	23-28 Jul	LA-17,1	23-19-39	10,000
11	29 Jul-01 Aug	LA-3X,1	23-19-41	10,000
12	01 Aug-07 Aug	LA-3L,1	23-18-44	5,826[c]
			Total	116,636
		Test (barge transport below Bonneville Dam)		
1	11-18 Jun	RA-17,1	23-19-22	10,000
2	18-21 Jun	RA-3X,1	23-19-24	10,000
3	21-27 Jun	RA-3J,1	23-19-26	10,000
4	27 Jun-08 Jul	RA-3C,1	23-19-28	10,000
5	09-15 Jul	RA-3L,1	23-19-30	10,000
6	15-19 Jul	RA-7H,1	23-19-32	10,000
7	19-21 Jul	RA-10,1	23-19-34	10,000
8	21-22 Jul	RA-7H,3	23-19-36	10,000
9	22-23 Jul	RA-10,3	23-19-38	10,000
10	23-28 Jul	RA-17,3	23-19-40	10,000
11	29 Jul-01 Aug	RA-3J,3	23-19-42	10,000
12	01-07 Aug	RA-3L,3	23-18-32	4,557
			Total	115,337

[a] Position-LA and RA indicate left and right anterior sides of fish, respectively.

[b] Orientation-refers to rotation of brand around its centerpoint (i.e.,1 corresponds to the normal orientation, A; 2 to ⋗ ; 3 to ∀ ; 4 to ≺).

[c] Four hundred fish accidently branded on right anterior side and released.

Appendix Table 5.--Number held, 48 h delayed mortality, tag loss, and brand condition by date of juvenile spring chinook salmon and steelhead after marking at Lower Granite Dam, 1986.

Spring chinook salmon							Steelhead						
Date	Number held	48 h delayed mortalities	Lost tags	Brand condition Good	Fair	Poor	Date	Number held	48 h delayed mortalities	Lost tags	Brand condition Good	Fair	Poor
13 Apr	24	0	0	23	1	0	03 May	50	0	0	50	0	0
15 Apr	54	0	5	52	2	0	06 May	50	1	0	50	0	0
19 Apr	52	0	0	52	0	0	08 May	50	0	0	50	0	0
21 Apr	50	0	0	49	1	0	10 May	50	1	1	50	0	0
23 Apr	50	0	0	50	0	0	13 May	50	0	1	50	0	0
25 Apr[a/]	-	-	-	-	-	-	17 May	50	0	1	50	0	0
26 Apr[a/]	-	-	-	-	-	-	20 May	50	0	1	50	0	0
06 May	50	2	0	50	0	0	22 May	50	0	0	50	0	0
08 May	50	0	0	50	0	0	Totals	400	2	3	400	0	0
10 May	50	0	1	50	0	0							
13 May	50	0	0	50	0	0							
15 May	50	0	0	50	0	0							
17 May	50	0	0	50	0	0							
20 May	50	0	0	50	0	0							
22 May	50	0	1	50	0	0							
Totals	630	2	7	626	4	0							

[a/] Test initiated on this date was terminated prematurely due to high levels of atmospheric gas supersaturation in the water supply.

Appendix Table 6.--Spring chinook salmon delayed mortality (48 h) following marking for each replicate at McNary Dam during 1986.

Replicate number	Number fish held	Mortality	Percent mortality
1	298	17	5.7
2	89	3	3.4
3	99	3	3.0
4	153	5	3.3
5	99	4	4.0
6	124	3	2.4
7	171	3	1.8
8	69	2	2.9
9	252	2	0.8
Totals	1,354	42	3.1

Appendix Table 7.--Individual fork length, plasma cortisol, and plasma glucose values by date and test group for spring chinook salmon smolts sampled for trucked control stress analysis at Lower Granite and Little Goose Dams, 1986.

Fork length (mm)	Cortisol (ng/ml)	Glucose (mg/100 ml)	Fork length (mm)	Cortisol (ng/ml)	Glucose (mg/100 ml)
Lower Granite Raceway (pre-mark) 13 April 1983			135	51.7	75.6
			125	128.2	78.9
			119	20.9	68.1
164	35.3	127.6	112	17.9	111.9
152	114.3	81.4	147	121.2	128.5
115	158.0	86.3	145	51.7	92.1
115	39.6	78.9	155	134.0	102.8
133	129.0	102.8	127	144.1	88.0
114	198.6	65.6	136	152.1	93.7
120	132.9	96.2	138	139.0	71.4
120	112.5	69.8	130	125.0	76.4
130	228.6	110.3	122	136.1	61.1
131	219.0	119.4	132	160.5	134.5
133	195.4	91.3	120	55.1	140.1
120	175.5	81.4	130	96.8	144.2
135	177.9	65.6	125	63.6	75.6
124	184.0	84.7	125	91.5	88.5
121	96.5	87.1	125	113.7	77.2
127	157.4	105.3	135	150.6	174.8
			123	123.4	59.5
Lower Granite Raceway (pre-mark) 15 April 1986			Lower Granite Raceway (pre-mark) 17 April 1986		
131	67.2	95.8	123	336.7	151.6
135	236.7	229.6	127	55.4	51.6
140	108.3	109.5	130	32.6	69.8
125	110.4	85.3	117	60.7	100.4
129	146.7	233.7	154	128.0	97.1
155	77.4	87.7	145	103.1	53.3
127	74.8	-	125	98.4	103.7
112	39.2	55.5	123	111.0	73.1
143	63.1	69.2	137	148.8	78.0
142	128.2	152.2	132	144.2	89.6

Appendix Table 7.--continued.

Fork length (mm)	Cortisol (ng/ml)	Glucose (mg/100 ml)	Fork length (mm)	Cortisol (ng/ml)	Glucose (mg/100 ml)
127	140.5	69.0	130	176.3	151.9
135	94.0	83.8	125	120.0	169.9
121	128.2	78.0	110	75.8	106.4
123	173.2	102.0	130	128.4	102.6
127	158.9	68.1	141	77.3	90.2
138	133.4	123.5	118	142.2	96.9
114	174.0	74.7	139	108.5	114.9
133	115.4	79.7	127	116.4	79.8
134	138.0	69.8	127	98.1	86.4
125	179.9	170.6	120	112.8	120.6
122	122.6	78.0	116	98.0	58.9
132	243.1	210.3	128	12.8	112.0
131	158.1	90.4	160	178.0	181.3
130	109.0	63.2	140	99.5	212.6
123	167.9	85.5	122	133.1	83.6
128	205.5	94.6	123	179.7	144.3
115	202.9	94.6	125	132.5	86.4
141	141.8	74.7	131	131.2	69.4
150	137.0	69.0			
Lower Granite Raceway (pre-mark) 19 April 1986			Lower Granite Raceway (pre-mark) 21 April 1986		
			119	178.1	130.1
118	168.3	61.8	135	68.0	78.8
138	51.0	76.0	123	100.7	97.8
152	90.5	157.6	128	256.9	182.2
135	87.8	109.2	137	126.1	85.5
131	290.9	306.5	133	98.9	73.2
113	21.6	126.3	124	87.3	73.2
135	158.4	183.2	121	107.5	71.3
128	94.4	92.1	130	136.3	78.8
122	152.2	97.8	131	151.8	100.7
130	51.6	75.1	127	108.3	108.2
173	112.4	116.8	116	35.1	109.2
137	62.9	63.7	112	111.4	65.6

Appendix Table 7.--continued.

Fork length (mm)	Cortisol (ng/ml)	Glucose (mg/100 ml)
126	173.8	102.6
128	313.8	326.4
133	171.0	75.1
105	104.5	85.5
135	178.5	101.6
130	108.0	65.6
115	141.2	65.6
115	111.7	94.0
126	247.7	261.9
128	208.7	118.7
136	242.7	134.8
124	29.1	60.8
131	225.7	127.2
122	234.6	143.3
138	161.8	63.7
134	171.0	126.3
116	94.6	50.4
Post-marking Lower Granite Dam 13 April 1986		
122	278.2	119.4
145	271.9	208.6
116	220.1	93.7
112	261.1	112.8
145	199.0	134.2
136	207.6	132.6
130	221.1	110.3
109	263.6	-
125	198.7	91.3
108	249.8	116.1
122	278.5	243.3
140	230.8	56.6
142	278.9	176.4
115	156.1	91.3
115	197.3	111.9
121	269.9	145.0
Post-marking Lower Granite Dam 15 April 1986		
156	159.3	71.4
125	257.3	115.2
132	221.4	81.4
110	175.7	91.3
122	249.9	169.8
144	251.0	136.7
145	228.6	166.5
119	205.9	92.1
110	221.4	125.1
113	251.3	74.7
125	279.9	222.4
115	188.7	85.3
140	215.8	121.6
134	254.9	220.0
125	271.2	166.7
119	266.5	212.7
135	243.4	131.3
130	204.4	104.6
115	301.7	186.1
111	162.6	221.6
124	214.7	145.0
128	168.8	-
116	215.7	149.8
113	205.0	217.5
132	272.9	148.2
133	162.6	129.6
105	112.2	91.7
135	209.4	233.7
115	243.4	99.0
125	174.9	65.9

Appendix Table 7.--continued.

Fork length (mm)	Cortisol (ng/ml)	Glucose (mg/100 ml)
Post-marking Lower Granite Dam		
123	175.2	73.1
130	213.6	298.7
127	303.0	186.3
135	138.5	79.7
127	237.3	86.3
125	181.0	75.6
131	133.1	64.0
130	168.6	57.4
138	213.1	135.9
133	176.5	135.9
132	232.0	159.0
125	137.8	194.6
127	198.7	122.7
131	206.7	88.8
120	192.7	163.2
127	164.0	104.5
122	222.3	183.0
131	195.9	156.5
133	177.7	75.6
112	191.1	63.2
139	166.9	65.1
150	161.5	116.7
122	213.7	191.7
123	410.1	263.5
129	224.2	170.8
145	292.1	197.4
137	178.8	187.7
114	201.5	70.8
162	190.1	147.4
127	167.9	82.9
Post-marking Lower Granite Dam 19 April 1986		
121	176.6	81.7
115	266.5	103.5
130	191.8	307.4
125	267.4	290.3
144	213.5	89.3
125	325.6	251.5
123	171.7	106.4
135	188.1	318.8
142	187.6	112.0
140	127.6	153.8
116	252.7	156.3
118	342.1	159.5
128	185.0	68.4
141	169.9	74.0
129	239.9	99.8
115	253.5	109.5
119	249.7	74.8
138	241.0	272.4
131	202.1	142.5
115	174.2	161.1
134	289.0	156.6
130	302.2	350.1
119	173.0	56.1
122	236.7	223.0
130	187.5	70.3
135	257.1	177.5
134	153.3	94.0
141	157.8	79.8
136	257.5	206.9
Post-marking Lower Granite Dam 21 April 1986		
123	237.6	175.6
126	212.9	73.2
141	305.5	141.4
130	190.5	94.0
130	230.9	120.6

Appendix Table 7.--continued.

Fork length (mm)	Cortisol (ng/ml)	Glucose (mg/100 ml)
130	172.1	69.4
124	218.8	152.8
124	172.7	110.1
129	193.3	156.6
135	132.2	163.3
133	209.8	298.2
126	308.7	137.7
130	181.7	82.9
127	342.3	185.3
125	261.3	140.9
130	261.4	122.4
130	202.7	124.8
130	122.4	136.9
122	216.1	374.0
115	153.8	90.9
133	260.5	78.0
138	183.7	64.3
130	218.7	58.7
127	175.2	85.3
138	258.2	110.3
134	183.1	96.6
117	198.8	103.0
132	202.3	98.2
142	200.6	81.3
131	200.5	169.2
Post-transport Little Goose Dam 13 April 1986		
150	106.5	151.6
126	142.5	169.8
137	105.3	97.9
115	156.2	91.3
130	78.0	166.5
124	149.8	108.6
125	102.2	87.1
124	126.8	145.0
137	172.9	231.7
137	142.7	204.5
127	126.1	154.1
127	146.9	131.8
114	234.8	314.4
125	167.9	203.7
126	103.4	150.8
130	117.5	107.0
Post-transport Little Goose Dam 15 April 1986		
135	119.4	62.3
115	74.0	107.8
117	108.6	89.6
120	87.3	103.7
124	157.7	134.2
140	157.6	131.8
136	179.0	117.7
121	148.1	110.3
128	123.5	116.1
135	223.3	120.2
130	218.5	325.1
130	113.2	157.4
135	213.4	294.6
148	149.9	140.8
140	111.4	197.9
138	196.8	199.5
127	88.4	172.3
159	39.1	171.4
135	177.7	287.1
122	18.0	88.8
127	46.5	121.6
142	84.9	143.4
130	66.1	92.6
130	86.4	190.9

Appendix Table 7.--continued.

Fork length (mm)	Cortisol (ng/ml)	Glucose (mg/100 ml)
170	100.2	106.3
138	33.9	120.0
120	137.8	315.9
123	118.1	107.9
140	107.4	82.1
138	62.2	100.6
Post-transport Little Goose Dam 17 April 1986		
131	281.3	159.5
121	80.3	122.4
123	142.0	59.5
117	145.8	91.7
169	170.1	64.3
127	134.7	114.3
137	262.2	240.9
124	64.3	77.2
128	80.1	83.7
118	92.5	80.5
123	299.4	135.3
114	199.8	114.3
134	243.8	126.4
134	122.6	134.5
125	40.1	127.2
124	127.9	133.7
129	119.6	159.5
127	60.1	81.3
126	71.3	129.6
118	48.2	61.9
131	170.0	143.4
127	48.6	123.2
126	35.6	74.0
125	49.2	95.0
131	75.0	104.6
138	290.7	202.2
111	42.8	73.2
108	36.5	-
142	112.6	80.5
127	78.8	193.4
Post-transport Little Goose Dam 19 April 1986		
98	191.4	146.2
140	49.8	86.4
160	6.8	122.5
119	78.4	96.9
116	186.3	238.2
115	87.0	84.5
120	170.9	269.5
132	205.3	152.8
121	252.0	298,9
145	106.8	118.7
118	255.0	389.9
138	168.5	185,1
116	49.5	126.3
125	73.6	78.8
136	83.6	181.3
115	62.6	98.8
130	60.0	58.9
127	77.9	60.8
135	81.0	81.7
135	115.6	175.6
112	56.6	67.6
125	214.2	172.4
127	193.5	118.4
120	64.7	131.3
128	136.8	83.7
140	86.6	168.4
141	125.5	122.4
124	51.9	74.0

Appendix Table 7.--continued.

Fork length (mm)	Cortisol (ng/ml)	Glucose (mg/100 ml)	Fork length (mm)	Cortisol (ng/ml)	Glucose (mg/100 ml)
			Little Goose Raceway		
134	137.3	96.6	16 April 1986		
140	47.1	75.6	135	83.3	167.5
Post Transport Little Goose Dam			142	61.3	87.7
21 April 1986			135	115.6	153.8
			128	183.4	117.6
124	178.1	145.2	132	116.5	107.1
115	319.9	147.1	131	170.9	103.0
126	301.4	184.1	125	166.8	65.9
119	135.9	95.0	124	179.6	100.6
118	261.8	133.9	139	91.8	117.6
120	266.3	158.5	123	76.3	110.3
132	274.0	168.0	126	145.3	68.1
124	172.8	162.3	123	112.0	74.7
136	84.2	209.7	135	133.0	69.0
126	112.9	58.9	143	13.3	69.0
137	118.7	90.9	180	52.4	92.9
138	353.1	411.1	123	164.1	91.3
121	45.2	45.0	Little Goose Raceway		
146	342.3	181.3	18 April 1986		
122	102.7	65.1			
113	65.1	65.9	121	206.6	78.0
136	66.6	102.2	126	304.1	161.1
123	135.2	101.4	138	261.8	110.3
128	118.8	83.7	114	100.0	59.5
116	70.2	120.8	139	198.1	74.0
119	158.2	118.4	123	221.6	132.1
125	123.3	92.6	125	167.2	77.2
124	70.9	65.1	121	144.8	82.1
105	43.8	65.9	145	133.5	73.2
131	82.1	85.3	130	121.0	63.5
133	103.4	101.4	127	99.0	375.7
121	123.8	189.3	132	109.5	114.9
128	100.1	65.9	136	108.2	95.0
129	97.3	90.1	123	208.4	75.1
127	208.6	148.2	135	133.7	127.2

Appendix Table 7.--continued.

Fork length (mm)	Cortisol (ng/ml)	Glucose (mg/100 ml)	Fork length (mm)	Cortisol (ng/ml)	Glucose (mg/100 ml)
127	103.9	67.5	112	63.7	67.6
130	119.3	69.4	141	119.1	78.0
121	107.7	83.6	127	155.8	80.5
135	132.2	64.6	175	122.2	57.9
125	128.0	61.8	122	151.9	43.4
132	193.7	80.7	138	96.5	63.5
138	147.2	84.5	117	170.6	90.1
117	131.1	82.6	138	302.2	122.4
131	133.9	60.8	124	291.9	76.4
138	135.3	82.6	119	58.1	123.2
153	194.9	138.6	127	58.2	57.9
129	171.7	98.8	140	233.8	70.0
123	38.1	72.2	145	163.2	62.7
126	207.0	234.3	Little Goose Raceway		
132	135.5	74.1	22 April 1986		
Little Goose Raceway			134	48.9	58.7
20 April 1986			136	7.0	58.7
125	70.1	95.9	133	86.6	65.1
130	21.7	132.0	126	36.6	78.0
156	17.7	126.3	163	37.3	62.7
130	3.5	77.9	130	85.7	76.4
143	195.7	91.2	134	92.9	59.5
126	109.3	146.2	135	22.1	86.1
132	109.1	73.2	164	102.5	101.4
120	17.8	128.2	129	95.1	67.6
151	36.7	65.6	135	88.1	70.8
135	101.0	77.9	129	98.8	71.6
125	140.2	78.8	134	142.1	78.0
130	190.8	103.0	140	163.5	81.3
164	186.6	99.0	123	93.8	52.2
125	194.7	45.0	118	70.2	66.7
158	104.1	88.5	142	145.5	61.9
127	111.7	62.7	134	96.1	124.0
123	60.7	78.8	137	136.8	171.6

Appendix Table 7.--continued.

Fork length (mm)	Cortisol (ng/ml)	Glucose (mg/100 ml)	Fork length (mm)	Cortisol (ng/ml)	Glucose (mg/100 ml)
123	144.8	57.9	121	218.4	91.7
154	137.0	105.5	118	271.5	74.0
137	146.5	62.7	119	93.4	51.4
112	199.5	159.5	153	45.2	87.7
126	68.7	61.9	135	165.5	90.9
137	211.2	117.6	132	118.5	164.3
140	167.5	66.7	138	60.3	69.2
135	137.4	73.2	132	108.4	74.0
133	152.5	67.6	112	277.3	404.6
120	169.7	78.8			
110	163.4	80.5			
Little Goose Raceway 24 April 1986					
121	136.5	118.7			
135	147.7	89.3			
134	111.9	90.2			
123	285.5	142.4			
131	130.8	139.5			
115	128.0	99.7			
114	137.7	58.9			
120	87.4	94.0			
165	82.5	99.7			
124	143.1	83.6			
127	86.8	62.7			
136	74.0	91.7			
133	173.7	93.4			
132	64.8	66.7			
128	44.8	65.1			
123	106.5	86.9			
134	208.1	103.0			
128	4.0	70.0			
124	141.6	83.7			
124	189.7	53.0			
115	119.6	65.9			

Appendix Table 8.--Temperature, oxygen, pH, salinity, and ammonia (NH_3) levels by date in extended seawater holding study at Lower Granite Dam, 1986.

Date	Temperature (°C) Tank	Head box	O_2(ppm)	pH	Salinity (ppt)	NH_3(ppm)
25 Apr	11.5	11.5	10.0	7.22	-	-
26	11.5	11.5	9.0	7.37	1.8	-
27	12.0	11.5	10.0	7.64	4.0	-
28	12.0	12.0	9.0	7.71	4.0	-
29	11.0	11.5	9.0	7.77	5.8	-
30	11.5	12.0	10.0	8.19	7.0	-
01 May	11.5	12.0	11.0	7.83	8.0	0.0044
02	12.0	12.0	10.0	7.83	9.2	-
03	12.9	11.0	9.0	7.95	11.0	-
04	11.0	11.0	11.0	7.85	11.5	-
05	11.0	12.0	9.0	7.80	15.0	-
06	12.0	12.0	9.0	7.89	16.0	-
07	12.0	12.0	10.0	7.79	16.0	0.0065
08	11.5	12.0	9.0	7.71	17.0	-
09	12.0	12.0	9.0	7.71	19.0	-
10	12.0	12.0	9.0	-	19.3	-
11	12.0	12.0	8.0	-	19.5	-
12	13.0	12.0	9.0	-	20.3	-
13	12.0	12.0	7.0	7.80	20.0	-
14	12.5	11.5	9.0	7.79	21.5	-
15	10.5	11.0	9.0	7.79	21.5	-
16	12.2	12.2	9.0	7.86	22.5	-
17	11.0	11.0	9.0	7.83	23.7	-
18	11.0	11.0	9.0	7.83	24.0	0.0047
19	11.5	11.0	9.0	8.07	24.5	-
20	12.0	12.0	9.0	7.83	25.2	-
21	11.0	11.0	9.0	7.75	26.0	-
22	11.5	11.5	8.0	7.77	28.0	-
23	11.0	11.0	8.0	7.70	28.0	-
24	11.5	12.0	8.0	7.78	29.0	-
25	12.0	12.0	8.0	7.62	28.9	-
26	12.0	12.0	8.0	7.68	29.0	-
27	12.0	12.0	8.0	7.52	28.7	-
28	12.0	12.0	8.0	7.50	28.8	0.0042
29	12.0	12.0	8.0	7.50	28.1	-
30	12.0	12.0	8.0	-	28.9	-
31	12.0	10.0	8.0	-	29.1	-
01 Jun	12.0	12.0	8.0	-	28.3	-
02	12.0	12.0	8.0	7.52	28.1	-
03	12.0	12.0	8.0	7.70	29.5	-
04	12.0	12.0	8.0	-	28.1	-

Appendix Table 9.--Fork lengths, weights, BKD lesions, IFAT rankings and pinheads by date, tank number, and test group of individual mortalities during extended artificial seawater holding study at Lower Granite Dam, 1985.

Mortality no.	Tank no.	Date	Test group	Fork length (mm)	Weight (g)	BKD lesions[a]	BKD IFAT[b]	Pinheads
1	6	27 Apr	C-slot	120	21.7	1	4	No
3	11	30 Apr	Pre-separator	139	29.4	1	4	No
4	12	30 Apr	C-slot	124	17.4	1	4	No
5	4	30 Apr	Pre-separator	118	17.8	1	4	No
6	10	01 May	C-slot	132	25.3	3	3	No
7	12	02 May	C-slot	122	19.9	3	-1	No
8	11	02 May	Pre-separator	126	21.9	2	0	No
9	11	02 May	Pre-separator	125	21.7	1	3	No
10	4	04 May	Pre-separator	111	14.2	1	3	No
11	3	08 May	Mark + transport	125	20.8	1	2	No
12	3	10 May	Mark + transport	133	27.4	1	3	No
13	1	11 May	Pre-separator	140	40.0	1	4	No
14	4	11 May	Pre-separator	125	15.6	1	4	No
15	1	13 May	Pre-separator	124	18.1	4	4	No
16	9	16 May	Mark + transport	112	12.1	1	4	No
17	8	20 May	Mark + transport	126	17.6	1	4	No
18	12	22 May	C-slot	130	19.4	3	4	No
19	6	22 May	C-slot	105	10.1	3	-1	No
20	4	23 May	Pre-separator	122	11.5	1	4	Yes
21	12	26 May	C-slot	136	20.7	1	2	No
22	11	26 May	Pre-separator	140	26.5	1	4	No
23	11	26 May	Pre-separator	94	5.6	3	-1	Yes
24	3	26 May	Mark + transport	123	17.9	1	4	No
25	3	26 May	Mark + transport	153	31.0	1	4	No
26	6	27 May	C-slot	121	12.0	3	1	No
27	12	28 May	C-slot	127	17.8	1	4	No
28	9	28 May	Mark + transport	100	6.0	3	0	Yes
29	1	28 May	Pre-separator	136	21.4	1	4	No
30	4	28 May	Pre-separator	131	29.6	1	4	No
31	1	29 May	Pre-separator	95	5.9	3	-1	Yes
32	12	29 May	C-slot	101	6.4	3	1	Yes
33	11	29 May	Pre-separator	130	16.8	2	4	No
34	10	31 May	C-slot	137	22.8	1	4	No

Appendix Table 9.--continued.

Mortality no.	Tank no.	Date	Test group	Fork length (mm)	Weight (g)	BKD lesions[a]	BKD IFAT[b]	Pinheads
35	11	31 May	Pre-separator	90	5.5	3	-1	Yes
36	11	01 Jun	Pre-separator	147	28.3	1	4	No
37	3	01 Jun	Mark + transport	125	19.0	1	3	No
38	3	01 Jun	Mark + transport	119	8.3	3	-1	Yes
39	11	02 Jun	Pre-separator	135	21.1	1	2	No
40	11	02 Jun	Pre-separator	98	6.6	3	-1	Yes
41	8	02 Jun	Mark + transport	110	7.9	3	1	Yes
42	3	02 Jun	Mark + transport	100	5.4	3	-1	Yes
43	4	02 Jun	Pre-separator	145	28.2	1	4	No
44	4	02 Jun	Pre-separator	145	24.8	1	4	No
45	11	03 Jun	Pre-separator	170	40.7	1	2	No
46	3	03 Jun	Mark + transport	145	37.9	1	3	No
47	3	03 Jun	Mark + transport	100	5.6	3	1	Yes
48	3	03 Jun	Mark + transport	145	31.4	1	4	No
49	4	04 Jun	Pre-separator	161	52.7	3	0	No
50	4	04 Jun	Pre-separator	159	54.0	3	-1	No

[a] BKD lesion markings
1 = visible lesions present
2 = possible lesions present (questionable)
3 = no visible lesions present

[b] BKD IFAT rankings
0 = no BKD organisms present in 300 microscopic fields
-1 = less than 1 BKD organism per microscopic field
1 = 1-10 BKD organism per microscopic field
2 = 10-100 BKD organism per microscopic field
3 = 100-300 BKD organism per microscopic field
4 = 300+ BKD organism per microscopic field

Appendix Table 10.--Fork lengths weights, BKD lesion rankings, and BKD IFAT rankings by test group and tank number for fish when the extended artificial seawater holding study was terminated on 4 June 1986.

Tank number	Test group	Fork length (mm)	Weight (g)	BKD lesions[a/]	BKD IFAT[b/]
1	Pre-separator	160	55.2	-	-
		140	27.2	-	-
		155	42.1	-	-
		150	43.1	-	-
		160	57.8	-	-
		150	42.7	-	-
		160	49.2	-	-
		130	29.3	-	-
		175	66.4	-	-
		170	60.3	-	-
		140	40.3	-	-
		155	48.7	-	-
		140	38.3	-	-
		150	38.9	-	-
		130	25.7	-	-
		155	49.5	-	-
		185	76.8	-	-
		180	61.0	-	-
		155	45.3	-	-
		150	43.5	-	-
		150	41.1	-	-
		145	34.0	-	-
		135	37.6	-	-
		160	52.1	-	-
		180	74.3	-	-
		165	56.1	-	-
		180	71.6	-	-
		140	37.0	-	-
		165	46.6	-	-
		145	36.4	-	-
		140	39.7	-	-
		140	39.4	-	-
		160	51.5	-	-
		155	46.5	-	-
		110	8.8	-	-
		135	38.3	-	-
		145	43.8	-	-
		145	35.0	-	-
		150	40.8	-	-

Appendix Table 10.--continued

Tank number	Test group	Fork length (mm)	Weight (g)	BKD lesions[a/]	BKD IFAT[b/]
1	Pre-separator	160	48.8	-	-
		150	46.9	-	-
		165	58.2	-	-
		150	43.7	-	-
		185	73.2	-	-
		150	37.9	-	-
		165	55.7	-	-
		150	41.5	-	-
		160	42.3	-	-
		180	70.9	-	-
		135	29.4	-	-
		155	45.3	-	-
		155	47.1	-	-
		125	22.7	-	-
		145	36.0	-	-
		155	47.0	3	-1
		165	53.3	3	-1
		190	77.7	3	-1
		135	29.3	1	4
		135	25.4	2	4
		135	34.5	3	-1
		150	39.5	2	-1
		160	51.2	3	-1
		145	43.1	3	-1
		145	36.1	3	-1
		155	45.5	3	-1
		165	53.7	3	-1
		150	47.5	3	-1
		145	37.0	3	-1
		135	33.6	3	3
		145	41.0	3	-1
		160	59.5	3	-1
		140	31.9	3	-1
		140	34.7	3	-1
		180	59.8	3	-1
		145	40.1	3	-1
		155	44.8	3	-1
		165	56.3	3	-1
		135	30.5	3	-1
		145	40.4	3	-1
		160	50.0	3	-1
		135	34.6	3	-1
		160	51.7	3	-1
		130	26.6	3	-1
		145	35.4	3	-1
		150	48.1	3	-1

Appendix Table 10.--continued

Tank number	Test group	Fork length (mm)	Weight (g)	BKD lesions[a]	BKD IFAT[b]
3	Mark + transport	155	45.6	-	-
		155	45.5	-	-
		145	36.8	-	-
		130	27.8	-	-
		135	29.7	-	-
		145	36.5	-	-
		105	12.9	-	-
		135	36.2	-	-
		160	42.2	-	-
		140	37.7	-	-
		195	84.2	-	-
		135	29.1	-	-
		150	44.6	-	-
		150	35.8	-	-
		155	42.9	-	-
		150	32.6	-	-
		105	11.8	-	-
		155	45.7	-	-
		100	12.6	-	-
		140	36.6	-	-
		150	42.1	-	-
		140	32.1	-	-
		150	48.3	-	-
		155	42.8	-	-
		155	52.0	-	-
		140	36.8	-	-
		135	33.3	-	-
		125	22.6	-	-
		125	26.5	-	-
		115	20.7	-	-
		175	66.5	-	-
		150	43.9	-	-
		135	28.7	-	-
		150	41.6	-	-
		135	31.8	-	-
		135	29.6	-	-
		115	20.1	-	-
		145	33.6	-	-
		165	52.3	-	-
		130	28.5	-	-
		140	35.1	-	-
		135	30.2	-	-
		165	51.8	-	-

Appendix Table 10.--continued

Tank number	Test group	Fork length (mm)	Weight (g)	BKD lesions[a]	BKD IFAT[b]
3	Mark + transport	140	32.5	-	-
		140	34.9	-	-
		110	17.5	-	-
		115	17.3	-	-
		145	41.8	-	-
		155	49.5	-	-
		125	13.4	-	-
		130	29.9	-	-
		150	40.5	-	-
		145	33.2	-	-
		105	11.8	-	-
		150	40.0	-	-
		150	44.4	-	-
		125	14.2	-	-
		145	38.7	-	-
		150	47.9	3	-1
		150	40.2	3	-1
		180	67.8	3	0
		145	38.0	3	-1
		135	30.3	3	0
		155	48.3	3	-1
		145	42.9	3	-1
		150	37.4	3	0
		165	54.6	3	0
		135	29.2	3	-1
		155	39.3	2	-1
		135	27.5	3	0
		135	27.0	2	3
		160	46.5	3	-1
		145	33.1	3	-1
		145	37.8	3	-1
		160	52.0	3	-1
		165	51.2	3	-1
		150	43.6	3	-1
		150	39.4	1	4
		150	39.9	3	-1
		145	38.8	3	-1
		145	38.2	3	-1
		130	27.3	3	-1
		140	33.7	3	0
		145	37.5	3	-1
		140	32.8	3	-1
		125	24.7	3	0
		135	27.9	3	-1
		120	12.5	3	-1
		115	12.6	-	-
		110	12.5	-	-

Appendix Table 10.--continued

Tank number	Test group	Fork length (mm)	Weight (g)	BKD lesions[a]	BKD IFAT[b]
4	Pre-separator	145	37.7	-	-
		150	40.6	-	-
		145	40.6	-	-
		150	40.4	-	-
		150	43.7	-	-
		135	33.2	-	-
		150	41.3	-	-
		140	31.2	-	-
		150	41.1	-	-
		145	39.9	-	-
		130	30.0	-	-
		150	41.2	-	-
		155	47.0	-	-
		150	44.1	-	-
		140	32.9	-	-
		130	25.2	-	-
		165	55.5	-	-
		170	60.7	-	-
		145	40.4	-	-
		155	42.7	-	-
		160	47.0	-	-
		140	31.1	-	-
		150	36.8	-	-
		170	61.0	-	-
		150	47.0	-	-
		165	60.8	-	-
		145	35.2	-	-
		155	50.9	-	-
		135	43.3	-	-
		150	42.8	-	-
		135	35.4	-	-
		140	28.5	-	-
		165	55.4	-	-
		120	21.3	-	-
		165	51.3	-	-
		150	45.4	-	-
		155	50.0	-	-
		125	23.3	-	-
		145	35.2	-	-
		145	39.8	-	-
		150	46.6	-	-
		150	43.1	-	-
		115	18.3	-	-

Appendix Table 10.--continued

Tank number	Test group	Fork length (mm)	Weight (g)	BKD lesions[a/]	BKD IFAT[b/]
4	Pre-separator	140	37.9	-	-
		175	59.5	-	-
		145	38.5	-	-
		150	41.0	-	-
		160	50.1	-	-
		135	33.2	-	-
		150	39.8	-	-
		145	36.6	-	-
		140	39.8	-	-
		145	39.4	-	-
		150	50.8	3	-1
		135	32.4	3	-1
		135	30.6	3	-1
		135	32.0	2	1
		150	41.9	3	-1
		145	41.8	3	-1
		155	45.6	3	-1
		140	31.6	3	-1
		135	32.2	3	-1
		145	38.5	1	4
		135	33.9	3	1
		170	73.4	3	-1
		145	39.1	3	-1
		140	34.2	3	-1
		145	39.8	3	-1
		140	34.8	3	-1
		170	56.0	1	4
		135	29.5	3	1
		130	29.2	3	-1
		155	43.9	3	-1
		160	56.9	3	-1
		145	42.1	3	-1
		150	42.8	3	-1
		165	54.0	3	-1
		135	31.9	3	-1
		170	56.0	3	-1
		130	29.3	3	-1
		135	33.8	3	-1
		150	36.8	3	-1
		140	31.1	3	-1
		145	41.0	-	-
		155	50.2	-	-
		150	39.2	-	-
		145	40.6	-	-

Appendix Table 10.--continued

Tank number	Test group	Fork length (mm)	Weight (g)	BKD lesions[a]	BKD IFAT[b]
6	C-slot	155	44.2	-	-
		145	39.6	-	-
		145	38.8	-	-
		155	49.5	-	-
		145	34.2	-	-
		170	65.3	-	-
		155	50.9	-	-
		150	37.5	-	-
		145	36.7	-	-
		155	49.9	-	-
		145	36.4	-	-
		135	33.9	-	-
		155	42.6	-	-
		150	46.9	-	-
		155	48.0	-	-
		145	37.7	-	-
		135	32.1	-	-
		155	47.1	-	-
		145	40.0	-	-
		160	43.2	-	-
		155	48.5	-	-
		150	35.7	-	-
		135	35.3	-	-
		165	52.9	-	-
		145	37.2	-	-
		145	35.9	-	-
		145	36.4	-	-
		160	51.8	-	-
		140	34.2	-	-
		145	42.3	-	-
		155	51.4	-	-
		140	32.4	-	-
		125	21.1	-	-
		140	34.6	-	-
		140	34.8	-	-
		145	33.5	-	-
		115	17.4	-	-
		145	39.1	-	-
		150	43.2	-	-
		115	15.3	-	-
		145	39.8	-	-
		140	33.0	-	-
		145	34.0	-	-
		130	22.8	-	-
		150	45.5	-	-

Appendix Table 10.--continued

Tank number	Test group	Fork length (mm)	Weight (g)	BKD lesions[a]	BKD IFAT[b]
6	C-slot	145	38.9	-	-
		150	46.5	-	-
		150	40.4	-	-
		150	33.9	-	-
		140	32.2	-	-
		150	38.3	-	-
		150	32.6	-	-
		155	45.5	-	-
		120	19.0	-	-
		150	41.5	-	-
		145	35.2	-	-
		140	33.3	-	-
		155	47.3	-	-
		160	48.8	-	-
		170	61.1	-	-
		145	37.5	-	-
		145	35.6	-	-
		150	43.5	-	-
		135	27.2	-	-
		150	35.4	-	-
		145	36.2	-	-
		145	38.3	-	-
		140	34.4	-	-
		160	38.7	-	-
		150	42.5	-	-
		140	32.8	-	-
		155	50.6	3	-1
		145	36.9	3	-1
		165	51.0	3	-1
		155	47.9	3	-1
		155	47.3	3	-1
		165	52.2	3	-1
		155	49.1	3	-1
		135	21.1	1	4
		155	49.8	3	-1
		150	47.4	3	0
		170	66.1	3	-1
		150	41.7	3	-1
		145	38.8	3	-1
		130	23.3	1	4
		140	43.7	3	-1
		145	35.9	3	-1
		145	38.4	3	-1
		140	37.2	2	2
		185	82.3	3	1
		155	47.3	3	-1
		145	37.5	3	-1

Appendix Table 10.--continued

Tank number	Test group	Fork length (mm)	Weight (g)	BKD lesions[a]	BKD IFAT[b]
6	C-slot	150	43.1	3	-1
		140	33.8	3	1
		140	33.1	3	1
		150	42.0	3	1
		140	33.7	3	1
		155	44.5	3	-1
		145	36.7	3	1
		115	18.5	3	-1
		140	34.2	3	1
		150	47.2	-	-
		120	15.9	-	-
8	Mark + Transport	105	5.9	-	-
		140	34.1	-	-
		150	43.9	-	-
		145	39.2	-	-
		145	34.4	-	-
		145	41.8	-	-
		120	12.4	-	-
		140	31.1	-	-
		160	48.2	-	-
		145	37.5	-	-
		150	41.5	-	-
		145	33.8	-	-
		140	33.5	-	-
		145	37.9	-	-
		130	28.3	-	-
		110	9.2	-	-
		160	50.7	-	-
		90	4.3	-	-
		135	31.8	-	-
		135	28.3	-	-
		150	44.3	-	-
		145	40.4	-	-
		145	39.2	-	-
		160	40.9	-	-
		145	34.2	-	-
		95	7.9	-	-
		135	27.4	-	-
		135	30.8	-	-
		155	48.1	-	-

Appendix Table 10.--continued

Tank number	Test group	Fork length (mm)	Weight (g)	BKD lesions[a/]	BKD IFAT[b/]
8	Mark + Transport	160	47.9	-	-
		115	20.2	-	-
		150	41.6	-	-
		150	40.0	-	-
		150	42.9	-	-
		155	49.6	-	-
		135	31.2	-	-
		140	31.8	-	-
		140	35.1	-	-
		150	48.5	-	-
		155	45.9	-	-
		130	29.0	-	-
		155	44.7	-	-
		150	46.4	-	-
		150	43.8	-	-
		100	8.8	-	-
		150	40.5	-	-
		140	41.7	-	-
		145	38.5	-	-
		135	36.2	-	-
		140	34.5	-	-
		130	27.7	-	-
		120	19.8	-	-
		135	34.4	-	-
		135	29.8	-	-
		115	19.7	-	-
		175	58.2	-	-
		150	45.1	-	-
		145	38.4	-	-
		155	48.4	-	-
		160	48.5	-	-
		145	43.5	-	-
		140	33.5	-	-
		155	47.8	-	-
		140	35.4	-	-
		145	35.0	-	-
		135	29.4	-	-
		120	20.1	-	-
		145	35.8	-	-
		150	39.5	3	-1
		145	33.4	1	3
		105	12.7	3	-1
		150	36.4	3	-1
		155	55.7	3	-1
		130	25.1	1	4
		125	26.9	3	-1
		140	38.0	3	-1

Appendix Table 10.--continued

Tank number	Test group	Fork length (mm)	Weight (g)	BKD lesions[a]	BKD IFAT[b]
8	Mark + Transport	140	35.8	3	-1
		150	48.5	3	-1
		145	41.3	3	-1
		145	35.3	3	-1
		145	33.7	3	0
		140	34.8	3	-1
		150	40.5	3	-1
		150	42.9	3	1
		135	34.6	3	-1
		135	30.0	3	-1
		135	31.4	3	-1
		150	42.2	3	-1
		155	46.3	3	-1
		140	36.0	3	-1
		105	8.7	3	-1
		145	38.7	3	-1
		160	49.8	3	-1
		135	28.8	3	-1
		155	42.1	1	4
		130	29.5	3	-1
		145	35.9	3	-1
		140	43.7	3	-1
9	Mark + transport	135	35.3	-	-
		150	39.2	-	-
		170	67.1	-	-
		170	61.1	-	-
		95	8.8	-	-
		180	77.3	-	-
		140	34.9	-	-
		135	28.4	-	-
		155	46.3	-	-
		140	37.0	-	-
		125	26.2	-	-
		145	37.1	-	-
		160	47.8	-	-
		170	63.6	-	-
		140	33.2	-	-
		145	38.0	-	-
		145	39.4	-	-
		120	16.3	-	-
		150	39.9	-	-
		145	31.1	-	-
		115	17.5	-	-
		150	30.3	-	-
		125	25,6	-	-
		160	45,6	-	-

Appendix Table 10.--continued

Tank number	Test group	Fork length (mm)	Weight (g)	BKD lesions[a]	BKD IFAT[b]
9	Mark + transport	135	34.2	-	-
		165	56.3	-	-
		135	30.9	-	-
		140	36.7	-	-
		150	38.3	-	-
		155	42.9	-	-
		120	20.6	-	-
		115	18.5	-	-
		145	38.1	-	-
		140	35.8	-	-
		160	50.2	-	-
		145	38.1	-	-
		130	29.1	-	-
		150	41.6	-	-
		145	34.6	-	-
		155	48.2	-	-
		145	40.2	-	-
		1150	44.8	-	-
		150	50.2	-	-
		140	36.0	-	-
		115	17.9	-	-
		135	29.3	-	-
		145	42.0	-	-
		100	8.7	-	-
		140	27.7	-	-
		140	38.9	-	-
		155	47.6	-	-
		125	26.2	-	-
		135	31.9	-	-
		145	40.2	-	-
		140	35.1	-	-
		125	23.8	-	-
		150	42.8	-	-
		150	43.3	-	-
		150	41.1	-	-
		115	15.3	-	-
		125	18.9	-	-
		145	41.5	-	-
		140	33.9	-	-
		130	26.3	-	-
		145	37.0	-	-
		155	41.1	3	-1
		145	34.5	1	4
		140	35.6	3	-1

Appendix Table 10.--continued

Tank number	Test group	Fork length (mm)	Weight (g)	BKD lesions[a]	BKD IFAT[b]
9	Mark + transport	145	34.9	3	-1
		140	31.9	1	4
		135	31.0	3	-1
		160	49.7	3	-1
		150	39.7	3	-1
		140	37.2	3	-1
		150	40.8	3	-1
		135	31.7	3	-1
		135	30.4	3	-1
		140	34.3	3	-1
		135	30.1	3	-1
		130	28.3	3	-1
		140	33.8	3	-1
		170	52.3	3	-1
		155	47.7	3	-1
		155	48.5	3	-1
		115	19.6	3	-1
		150	44.7	3	-1
		170	60.9	3	-1
		140	37.9	3	-1
		120	11.5	3	-1
		160	49.2	3	-1
		175	65.5	3	-1
		155	46.7	3	-1
		135	28.9	3	-1
		130	31.2	3	-1
		115	20.0	3	-1
		125	16.2	-	-
		95	9.8	-	-
		140	38.1	-	-
10	C-slot	145	37.4	-	-
		135	32.7	-	-
		145	37.5	-	-
		145	35.0	-	-
		180	65.4	-	-
		135	30.3	-	-
		115	20.6	-	-
		140	32.5	-	-
		145	37.4	-	-
		155	45.8	-	-
		155	43.6	-	-
		145	37.7	-	-
		150	37.3	-	-
		155	48.8	-	-

Appendix Table 10.--continued

Tank number	Test group	Fork length (mm)	Weight (g)	BKD lesions[a/]	BKD IFAT[b/]
10	C-slot	150	45.2	-	-
		165	51.0	-	-
		170	65.4	-	-
		160	42.9	-	-
		150	41.6	-	-
		165	50.8	-	-
		145	44.1	-	-
		150	38.8	-	-
		160	53.8	-	-
		150	47.9	-	-
		140	38.9	-	-
		140	37.2	-	-
		145	39.4	-	-
		140	34.7	-	-
		155	54.7	-	-
		155	46.1	-	-
		140	34.5	-	-
		120	24.4	-	-
		120	12.1	-	-
		140	32.8	-	-
		150	41.3	-	-
		150	44.5	-	-
		155	48.8	-	-
		140	39.6	-	-
		150	47.1	-	-
		130	26.3	-	-
		135	30.5	-	-
		155	44.5	-	-
		145	34.8	-	-
		150	40.5	-	-
		135	30.2	-	-
		160	50.7	-	-
		145	40.5	-	-
		150	40.5	-	-
		135	32.1	-	-
		150	39.8	-	-
		140	34.5	-	-
		150	36.5	-	-
		145	39.8	-	-
		145	40.9	-	-
		135	32.8	-	-
		140	33.1	-	-
		140	34.0	-	-
		140	39.1	-	-
		145	34.5	-	-
		120	20.6	-	-
		170	60.8	-	-
		155	52.3	-	-
		145	44.6	-	-
		145	37.8	-	-

Appendix Table 10.--continued

Tank number	Test group	Fork length (mm)	Weight (g)	BKD lesions[a/]	BKD IFAT[b/]
10	C-slot	135	30.7	-	-
		145	40.1	-	-
		145	37.5	-	-
		135	31.0	-	-
		150	42.7	-	-
		150	43.6	-	-
		155	47.4	-	-
		175	60.5	-	-
		150	45.3	-	-
		145	41.5	-	-
		155	46.9	-	-
		145	41.0	-	-
		145	41.2	-	-
		145	38.5	-	-
		135	30.9	-	-
		145	38.5	-	-
		155	41.8	-	-
		150	43.7	-	-
		135	24.3	-	-
		115	17.8	-	-
		115	16.9	-	-
		150	44.5	3	1
		155	45.6	3	-1
		155	49.2	3	-1
		145	39.0	3	-1
		165	52.4	3	-1
		155	45.1	3	-1
		140	33.4	3	-1
		145	39.2	3	-1
		140	33.7	3	-1
		135	35.8	3	-1
		140	37.3	3	-1
		145	35.8	3	-1
		160	54.5	3	-1
		140	36.8	3	-1
		145	39.1	3	-1
		140	34.5	3	-1
		150	44.2	3	-1
		155	47.8	3	-1
		145	39.3	3	-1
		160	50.3	3	-1
		140	37.7	3	-1
		170	52.1	3	-1
		185	74.4	3	-1
		150	40.2	3	-1
		145	42.0	3	-1
		135	32.3	3	-1

Appendix Table 10.--continued

Tank number	Test group	Fork length (mm)	Weight (g)	BKD lesions[a]	BKD IFAT[b]
10	C-slot	145	40.6	3	-1
		145	36.3	3	-1
		140	34.7	3	-1
		130	29.1	3	-1
11	Pre-separator	155	47.2	-	-
		160	53.4	-	-
		160	52.1	-	-
		135	28.7	-	-
		110	15.4	-	-
		155	44.3	-	-
		145	39.8	-	-
		145	37.4	-	-
		145	36.8	-	-
		160	52.9	-	-
		160	51.7	-	-
		140	28.3	-	-
		135	30.6	-	-
		150	33.9	-	-
		145	34.8	-	-
		180	64.0	-	-
		150	43.7	-	-
		170	53.8	-	-
		145	39.2	-	-
		160	50.0	-	-
		145	34.9	-	-
		130	25.9	-	-
		150	47.0	-	-
		155	40.5	-	-
		135	29.9	-	-
		150	41.1	-	-
		145	37.4	-	-
		100	7.4	-	-
		145	40.2	-	-
		185	73.6	-	-
		110	14.4	-	-
		150	45.3	-	-
		155	41.3	-	-
		130	27.2	-	-
		145	30.7	-	-
		140	36.5	-	-
		135	31.3	-	-
		145	37.4	-	-
		180	69.4	-	-
		140	37.1	-	-
		150	40.0	-	-
		150	40.3	-	-

Appendix Table 10.--continued

Tank number	Test group	Fork length (mm)	Weight (g)	BKD lesions[a/]	BKD IFAT[b/]
11	Pre-separator	160	49.4	-	-
		180	70.9	-	-
		135	30.5	-	-
		140	33.5	-	-
		150	38.1	-	-
		155	35.3	-	-
		150	43.2	-	-
		150	40.8	-	-
		160	56.4	-	-
		140	33.7	-	-
		150	47.5	-	-
		160	52.6	-	-
		115	20.2	-	-
		155	49.0	-	-
		145	38.2	-	-
		155	37.6	-	-
		140	32.4	-	-
		145	39.7	-	-
		155	47.7	-	-
		180	62.8	-	-
		145	35.4	3	-1
		180	74.5	3	-1
		150	42.3	1	4
		145	40.9	3	-1
		145	38.0	3	-1
		175	71.7	3	-1
		150	38.8	3	-1
		150	42.3	3	-1
		130	30.1	3	-1
		140	31.8	2	3
		145	36.0	1	4
		150	48.5	3	-1
		140	35.9	3	-1
		165	57.7	1	4
		135	29.8	1	4
		95	9.7	3	-1
		165	50.2	3	-1
		175	60.0	3	-1
		165	57.3	3	-1
		155	49.5	3	-1
		165	55.4	3	-1
		145	38.2	3	-1
		155	42.5	3	-1
		140	35.8	3	-1
		120	20.3	3	-1

Appendix Table 10.--continued

Tank number	Test group	Fork length (mm)	Weight (g)	BKD lesions[a/]	BKD IFAT[b/]
11	Pre-separator	155	47.1	3	-1
		110	12.2	3	0
		130	28.2	3	-1
		135	33.4	3	0
		110	9.8	-	-
		140	31.2	-	-
		135	38.8	-	-
12	C-slot	155	49.2	-	-
		150	40.8	-	-
		170	59.1	-	-
		145	46.9	-	-
		155	48.9	-	-
		145	40.5	-	-
		145	40.6	-	-
		150	45.6	-	-
		145	38.0	-	-
		100	9.1	-	-
		135	29.8	-	-
		160	51.5	-	-
		150	42.7	-	-
		145	36.4	-	-
		145	35.6	-	-
		160	53.3	-	-
		150	39.2	-	-
		145	35.5	-	-
		150	39.2	-	-
		145	35.1	-	-
		155	43.9	-	-
		140	34.2	-	-
		150	42.7	-	-
		155	47.5	-	-
		155	48.5	-	-
		145	40.1	-	-
		150	42.2	-	-
		155	49.7	-	-
		155	46.9	-	-
		140	43.3	-	-
		170	61.7	-	-
		145	40.4	-	-
		130	27.6	-	-
		145	40.9	-	-
		155	45.3	-	-
		175	69.5	-	-
		145	29.4	-	-

Appendix Table 10.--continued

Tank number	Test group	Fork length (mm)	Weight (g)	BKD lesions[a]	BKD IFAT[b]
12	C-slot	150	41.0	-	-
		100	12.7	-	-
		160	49.1	-	-
		150	39.5	-	-
		155	52.8	-	-
		135	24.5	-	-
		150	39.0	-	-
		115	18.1	-	-
		155	46.2	-	-
		95	6.1	-	-
		150	44.3	-	-
		160	48.5	-	-
		145	38.5	-	-
		155	45.5	-	-
		140	35.0	-	-
		145	38.3	-	-
		145	39.5	-	-
		140	32.9	-	-
		120	10.9	-	-
		150	42.6	-	-
		145	37.4	-	-
		150	45.8	-	-
		145	39.6	-	-
		110	18.0	-	-
		150	41.6	-	-
		150	46.4	3	-1
		165	51.7	1	4
		165	51.4	3	-1
		160	55.2	3	-1
		155	49.3	3	-1
		160	50.1	3	-1
		145	39.7	3	-1
		150	42.9	3	-1
		155	48.7	3	-1
		110	16.0	3	-1
		150	42.4	3	-1
		150	42.8	3	-1
		150	39.8	3	-1
		160	51.4	3	1
		150	38.3	3	1
		155	39.9	3	-1
		140	40.2	3	-1

Appendix Table 10.--continued

Tank number	Test group	Fork length (mm)	Weight (g)	BKD lesions[a/]	BKD IFAT[b/]
12	C-Slot	140	34.6	3	-1
		140	32.0	1	4
		150	39.2	3	-1
		150	47.4	3	-1
		145	36.5	3	-1
		135	28.1	1	4
		150	47.5	3	-1
		150	40.9	3	-1
		155	45.1	3	-1
		140	34.2	3	-1
		165	59.4	3	-1
		135	30.0	3	-1
		140	29.6	3	-1

a/ BKD lesion rankings.
1 = visible lesions present
2 = possible lesions present (questionable)
3 = no visible lesions present

b/ BKD IFAT rankings
0 = no BKD organisms present in 300 microscopic fields
-1 = less than 1 BKD organism per miscroscopic field
1 = 1-10 BKD organism per miscroscopic field
2 = 10 -100 BKD organism per miscroscopic field
3 = 100-300 BKD organism per miscroscopic field
4 = 300 +BKD organism per miscroscopic field

Appendix Table 11.0.--Summary of all recoveries of adult fall chinook salmon released as controls below McNary Dam in 1979.

Report Date: 1/30/1987
RELEASE GROUPS INCLUDED: 7922A 7922B 7922C 7922E 7922F

1979 MCNARY TRANS CONTROL BELOW MCNARY

FALL CHINOOK

Brands Used: LA5 1 LA5 2 LA5 3 LAIM1 LAIM3 LAIM2 LAIM4
Wire Codes Used: PR RDLGYW RDLGYW RDYWPK RDYWPK LBYWLB RDLBPK

NUMBER RELEASED: 112718

RECOVERY AREA	YEAR OF RETURN 1979	1980	1981	1982	1983	1984	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
BONNEVILLE TRAP	0	4	0	5	1	0	10	0.009
MCNARY TRAP	0	2	0	1	0	0	3	0.003
LOWER GRANITE TRAP	0	0	0	0	0	0	0	0.000
PRIEST RAPIDS TRAP	0	0	0	3	0	0	3	0.003
OCEAN FISHERIES								
ALASKA	0	0	3	16	10	0	29	0.026
BRITISH COLUMBIA	0	1	2	5	0	0	8	0.007
WASHINGTON	0	0	0	1	0	0	1	0.001
OREGON	0	0	0	0	0	0	0	0.000
CALIFORNIA	0	0	0	0	0	0	0	0.000
OTHER	0	0	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	3	4	0	0	7	0.006
INDIAN FISHERY								
FALL INDIAN NET	0	0	2	1	2	0	5	0.004
HATCHERIES								
DWORSHAK H.	0	0	1	0	0	0	1	0.001
WELLS H.	0	0	1	3	0	0	4	0.004
PRIEST RAPIDS H.	0	0	8	7	2	0	17	0.015
RINGOLD H.	0	0	0	1E	0	0	1	0.001
STREAM SURVEY								
OTHER STREAMS	0	0	0	2	0	0	2	0.002
TOTALS	0	7	20	49	15	0	91	0.081
PERCENT OF RECOVERY %	0.0	7.7	22.0	53.8	16.5	0.0		

Appendix Table 12.0.--Summary of all recoveries of adult fall chinook salmon transported by truck from McNary Dam to below Bonneville Dam in 1979.

Report Date: 1/30/1987
RELEASE GROUPS INCLUDED: 7908A 7908B 7908C 7908D 7908E 7908F

1979 MCNARY TRANS TRUCK BELOW BONNEVILLE

FALL CHINOOK

Brands Used:	RA3 1	RA3 2	RA3 3	RA+I1	LAIM3	RA+I4
Wire Codes Used:	SM	RDLGPK	RDLGPK	RDPKOR	RDPKOR	LBYWLG

RA+I2	RA+I3				
RDLBYW	RDPKLB				

NUMBER RELEASED: 132919

RECOVERY AREA	YEAR OF RETURN 1979	1980	1981	1982	1983	1984	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
BONNEVILLE TRAP	0	27	9	25	6	0	67	0.050
MCNARY TRAP	0	34	5	4	0	0	43	0.032
LOWER GRANITE TRAP	0	0	0	0	0	0	0	0.000
PRIEST RAPIDS TRAP	0	0	0	11	0	0	11	0.008
OCEAN FISHERIES								
ALASKA	0	0	11	157	76	0	244	0.184
BRITISH COLUMBIA	0	16	31	46	11	0	104	0.078
WASHINGTON	0	0	5	4	1	0	10	0.008
OREGON	0	0	0	1	0	0	1	0.001E
CALIFORNIA	0	0	0	0	0	0	0	0.000
OTHER	0	0	0	0	0	0	0	0.000
RIVER SPORT								
COLUMBIA R. BELOW SNAKE R.	0	1	0	0	0	0	1	0.001
COLUMBIA R. ABOVE SNAKE R.	0	2	0	0	0	0	2	0.002
WENATCHEE R.	0	0	0	0	0	0	0	0.000
SNAKE R.	0	0	0	0	0	0	0	0.000
RIVER COMMERCIAL								
YOUNGS BAY	0	1	1	0	0	0	2	0.002
INDIAN FISHERY								
FALL INDIAN NET	0	1	9	21	12	0	43	0.032
HATCHERIES								
DWORSHAK H.	0	0	1	0	0	0	1	0.001
BONNEVILLE H.	0	0	0	2	0	0	2	0.002
WELLS H.	0	0	5	17	0	0	22	0.017
PRIEST RAPIDS H.	0	0	21	35	2	0	58	0.044
STREAM SURVEY								
OTHER STREAMS	0	0	1	38	7	0	46	0.035
TOTALS	0	83	103	376	118	0	680	0.512
PERCENT OF RECOVERY %	0.0	12.2	15.1E	55.3	17.4	0.0		

Appendix Table 13.0.--Summary of all recoveries of adult fall chinook salmon released as controls below McNary Dam in 1980.

Report Date: 1/30/1987
RELEASE GROUPS INCLUDED: 8020A 8020B

1980 MCNARY TRANS CONTROL BELOW MCNARY

FALL CHINOOK

Brands Used: LAIF1 LAIF3
Wire Codes Used: CE CEDY

NUMBER RELEASED: 84567

RECOVERY AREA	YEAR OF RETURN 1980	1981	1982	1983	1984	1985	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
BONNEVILLE TRAP	0	4	1	7	4	0	16	0.019
MCNARY TRAP	0	0	1	0	0	0	1	0.001
ICE HARBOR TRAP	0	1	0	0	0	0	1	0.001
LOWER GRANITE TRAP	0	1	0	0	0	0	1	0.001
PRIEST RAPIDS TRAP	0	0	0	0	0	0	0	0.000
OCEAN FISHERIES								
ALASKA	0	0	6	27	4	0	37	0.044
BRITISH COLUMBIA	0	0	13	10	6	0	29	0.034
WASHINGTON	0	0	0	3	0	0	3	0.004
OREGON	0	0	1	0	0	0	1	0.001
CALIFORNIA	0	0	0	0	0	0	0	0.000
OTHER	0	0	0	0	1	0	1	0.001
RIVER SPORT	0	0	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	2	1	0	3	0.004
INDIAN FISHERY								
FALL INDIAN NET	0	1	2	17	5	0	25	0.030
HATCHERIES								
PRIEST RAPIDS H.	0	4	6	12	0	0	22	0.026
STREAM SURVEY								
OTHER STREAMS	0	0	5	8	1	0	14	0.017
TOTALS	0	11	35	86	22	0	154	0.182
PERCENT OF RECOVERY %	0.0	7.1	22.7	55.8	14.3	0.0		

Appendix Table 14.0.--Summary of all recoveries of adult fall chinook salmon transported by truck from McNary Dam to below Bonneville Dam in 1980.

Report Date: 1/30/1987
RELEASE GROUPS INCLUDED: 8011A 8011B

1980 MCNARY TRANS TRUCK DALTON POINT

FALL CHINOOK

Brands Used: RAIC1 RAIC3
Wire Codes Used: LA HO

NUMBER RELEASED: 80204

RECOVERY AREA		YEAR OF RETURN 1980	1981	1982	1983	1984	1985	TOTAL	%RETURN
RIVER SYSTEM TRAPS									
BONNEVILLE TRAP		0	20	8	27	25	0	80	0.100
MCNARY TRAP		0	12	19	24	13	1	69	0.086
LOWER GRANITE TRAP		0	0	1	2	0	0	3	0.004
PRIEST RAPIDS TRAP		0	0	0	0	0	0	0	0.000
OCEAN FISHERIES									
ALASKA		0	0	10	120	28	0	158	0.197
BRITISH COLUMBIA		0	2	34	35	13	0	84	0.105
WASHINGTON		0	1	5	6	0	0	12	0.015
OREGON		0	0	0	0	0	0	0	0.000
CALIFORNIA		0	0	0	0	0	0	0	0.000
OTHER		0	0	0	0	0	0	0	0.000
RIVER SPORT		0	0	0	0	0	0	0	0.000
RIVER COMMERCIAL									
COL. R. TEST FSHRY (ORE)		0	0	0	1	0	0	1	0.001
YOUNGS BAY		0	0	0	3	0	0	3	0.004
INDIAN FISHERY									
FALL INDIAN NET		0	4	8	35	20	0	67	0.084
INDIAN CEREMONIAL		0	0	0	1	0	0	1	0.001
HATCHERIES									
WELLS H.		0	2	0	3	0	0	5	0.006
PRIEST RAPIDS H.		0	4	16	17	0	0	37	0.046
RINGOLD H.		0	0	0	2	0	0	2	0.002
STREAM SURVEY									
OTHER STREAMS		0	0	10	17	10	0	37	0.046
TOTALS		0	46	113	301	118	1	579	0.722
PERCENT OF RECOVERY	%	0.0	7.9	19.5	52.0	20.4	0.2		

Appendix Table 15.0.--Summary of all recoveries of adult fall chinook salmon released as controls below McNary Dam in 1981.

Report Date: 1/30/1987
RELEASE GROUPS INCLUDED: 8101A

1981 MCNARY TRANS CONTROL BELOW MCNARY

FALL CHINOOK

Brands Used: LAIM1 LAIM3 LAIM2 LAIM4 LAIM3 LAIM2 LAIM4
Wire Codes Used: 031732 031732 031732 031732 031732 031732 031732E

NUMBER RELEASED: 42580

RECOVERY AREA	YEAR OF RETURN 1981	1982	1983	1984	1985E	1986	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
BONNEVILLE TRAP	0	1	0	23	9	0	33	0.078
MCNARY TRAP	0	4	0	1	0	0	5	0.012
LOWER GRANITE TRAP	0	1	0	0	0	0	1	0.002
PRIEST RAPIDS TRAP	0	0	0	0	0	0	0	0.000
OCEAN FISHERIES								
ALASKA	0	0	3	20	5	0	28	0.066
BRITISH COLUMBIA	0	1	5	6	8	0	20	0.047
WASHINGTON	0	0	0	1	0	0	1	0.002
OREGON	0	0	0	1	0	0	1	0.002
CALIFORNIA	0	0	0	0	0	0	0	0.000
OTHER	0	0	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0	0	0.000E
RIVER COMMERCIAL	0	0	0	9	1	0	10	0.023
INDIAN FISHERYE								
FALL INDIAN NETE	0	0	5	13	11	2	31	0.073
HATCHERIESE								
RAPID RIVER H.	0	0	0	6	0	0	6	0.014
BONNEVILLE H.	0	0	0	1	0	0	1	0.002
PRIEST RAPIDS H.	0	1	0	0	1	0	2	0.005
STREAM SURVEY								
OTHER STREAMS	0	1	2	2	1	0	6	0.014
TOTALS	0	9	15	83	36	2	145	0.341
PERCENT OF RECOVERY %	0.0	6.2	10.3	57.2	24.8	1.BE		

Appendix Table 16.0.--Summary of all recoveries of adult fall chinook salmon transported by truck from McNary Dam to below Bonneville Dam in 1981.

Report Date: 1/30/1987
RELEASE GROUPS INCLUDED: 8102A

1981 MCNARY TRANS TRUCK BELOW BONNEVILLE

FALL CHINOOK

Brands Used: RA+I1 RA+I4 RA+I2 RA+I2
Wire Codes Used: 031733 031733 031733 031733

NUMBER RELEASED: 42924

RECOVERY AREA	YEAR OF RETURN 1981	1982	1983	1984	1985	1986	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
BONNEVILLE TRAP	0	2	12	84	17	0	115	0.268
MCNARY TRAP	0	38	15	19	6	0	78	0.182
LOWER GRANITE TRAP	0	1	1	0	0	0	2	0.005
PRIEST RAPIDS TRAP	0	0	0	0	0	0	0	0.000
OCEAN FISHERIES								
ALASKA	0	2	8	75	43	0	128	0.298
BRITISH COLUMBIA	0	7	22	54	23	0	106	0.247
WASHINGTON	0	0	0	2	0	0	2	0.005
OREGON	1	0	0	0	0	0	1	0.002
CALIFORNIA	0	0	0	0	0	0	0	0.000
OTHER	0	0	0	0	0	0	0	0.000
RIVER SPORT								
COLUMBIA R. BELOW SNAKE R.	0	0	0	1	0	0	1	0.002
COLUMBIA R. ABOVE SNAKE R.	0	0	2	0	0	0	2	0.005
WENATCHEE R.	0	0	0	0	0	0	0	0.000
SNAKE R.	0	0	0	0	0	0	0	0.000
OTHER RIVERS	0	0	0	1	0	0	1	0.002
RIVER COMMERCIAL	0	0	2	27	18	1	48	0.112
INDIAN FISHERY								
INDIAN FISHERY	0	0	0	1	0	0	1	0.002
FALL INDIAN NET	0	0	7	26	29	1	63	0.147
HATCHERIES								
RAPID RIVER H.	0	0	1	21	0	0	22	0.051
LYONS FERRY H.	0	0	0	3	0	0	3	0.007
WELLS H.	0	0	1	2	1	0	4	0.009
PRIEST RAPIDS H.	0	2	12	1	10	0	25	0.058
STREAM SURVEY								
OTHER STREAMS	0	1	5	13	4	0	23	0.054
TOTALS	1	53	88	330	151	2	625	1.456
PERCENT OF RECOVERY %	0.2	8.5	14.1	52.8	24.2	0.3		

Appendix Table 17.0.--Summary of all recoveries of adult fall chinook salmon released as controls below McNary Dam in 1982.

Report Date: 1/30/1987
RELEASE GROUPS INCLUDED: 8205A 8205B 8205C

1982 MCNARY TRANS CONTROL BELOW MCNARY

FALL CHINOOK

Brands Used:	LAH 1	LAH 2	LAIF1	LAIF3	LAIC1	LAIC3	LAIM1	LAIM3	LAIF2	LAIF4	LAIC2	LAIC4	LAIM2	LAIM4
Wire Codes Used:	231609	231609	231609	231609	231611	231611	231611	231611	231611	231611	231613	231613	231613	231613

NUMBER RELEASED: 38083

RECOVERY AREAE	YEAR OF RETURN 1982	1983	1984	1985	1986E	TOTAL	% RETURN
RIVER SYSTEM TRAPSE							
BONNEVILLE TRAP	0	5	17	6	6	34	0.088
MCNARY TRAP	0	1	1	0	0	2	0.005
LOWER GRANITE TRAP	0	1	0	0	0	1	0.003
PRIEST RAPIDS TRAP	0	0	0	0	0	0	0.000
OCEAN FISHERIES							
ALASKA	0	1	0	15	0	16	0.041
BRITISH COLUMBIA	0	1	4	8	0	13	0.034
WASHINGTON	0	0	0	1	0	1	0.003
OREGON	0	0	0	0	0	0	0.000
CALIFORNIA	0	0	0	1	0	1	0.003
OTHER	0	0	0	0	0	0	0.000
RIVER SPORT							
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	0	0	1	2	3	0.008
WENATCHEE R.	0	0	0	0	0	0	0.000
SNAKE R.	0	0	0	0	0	0	0.000
OTHER RIVERS	0	0	0	1	0	1	0.003
RIVER COMMERCIAL	0	0	2	8	0	10	0.026
INDIAN FISHERY							
FALL INDIAN NET	0	0	1	13	6	20	0.052
HATCHERIES							
RAPID RIVER H.	0	0	2	0	0	2	0.005
PRIEST RAPIDS H.	0	0	0	3	0	3	0.008
STREAM SURVEY							
OTHER STREAMS	0	0	1	1	0	2	0.005
TOTALS	0	9	28	58	14	109	0.282
PERCENT OF RECOVERY %	0.0	8.3	25.7	53.2	12.8		

Appendix Table 17.1.--Recoveries of adult fall chinook salmon released as controls below McNary Dam from 6-22 July, 1982.

Report Date: 1/30/1987
RELEASE GROUPS INCLUDED: 8205A

1982 MCNARY TRANS CONTROL BELOW MCNARY

FALL CHINOOK

Brands Used: LAH 1 LAH 2 LAIF1 LAIF3
Wire Codes Used: 231609 231609 231609 231609

NUMBER RELEASED: 8667

RECOVERY AREA	YEAR OF RETURN 1982	1983	1984	1985	1986	TOTAL	% RETURN
RIVER SYSTEM TRAPS							
BONNEVILLE TRAP	0	0	0	2	2	4	0.046
MCNARY TRAP	0	1	0	0	0	1	0.012
LOWER GRANITE TRAP	0	1	0	0	0	1	0.012
PRIEST RAPIDS TRAP	0	0	0	0	0	0	0.000
OCEAN FISHERIES							
ALASKA	0	0	0	4	0	4	0.046
BRITISH COLUMBIA	0	1	2	2	0	5	0.058
WASHINGTON	0	0	0	0	0	0	0.000
OREGON	0	0	0	0	0	0	0.000
CALIFORNIA	0	0	0	0	0	0	0.000
OTHER	0	0	0	0	0	0	0.000
RIVER SPORT							
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	0	0	1	0	1	0.012
WENATCHEE R.	0	0	0	0	0	0	0.000
SNAKE R.	0	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	1	1	0	2	0.023
INDIAN FISHERY							
FALL INDIAN NET	0	0	0	2	3	5	0.058
HATCHERIES							
RAPID RIVER H.	0	0	1	0	0	1	0.012
PRIEST RAPIDS H.	0	0	0	1	0	1	0.012
STREAM SURVEY							
OTHER STREAMS	0	0	0	1	0	1	0.012
TOTALS	0	3	4	14	5	26	0.300
PERCENT OF RECOVERY %	0.0	11.5	15.4	53.8	19.2		

Appendix Table 17.2--Recoveries of adult fall chinook salmon released as controls below McNary Dam from 6-22 July 1982.

Report Date: 1/30/1987
RELEASE GROUPS INCLUDED: 8205B

1982 MCNARY TRANS CONTROL BELOW MCNARY

FALL CHINOOK

Brands Used: LAIC1 LAIC3 LAIM1 LAIM3 LAIF2 LAIF4
Wire Codes Used: 231611 231611 231611 231611 231611 231611

NUMBER RELEASED: 18864

RECOVERY AREA	YEAR OF RETURN 1982	1983	1984	1985	1986	TOTAL	% RETURN
RIVER SYSTEM TRAPS							
BONNEVILLE TRAP	0	4	13	3	4	24	0.127
MCNARY TRAP	0	0	1	0	0	1	0.005
LOWER GRANITE TRAP	0	0	0	0	0	0	0.000
PRIEST RAPIDS TRAP	0	0	0	0	0	0	0.000
OCEAN FISHERIES							
ALASKA	0	1	0	6	0	7	0.037
BRITISH COLUMBIA	0	0	2	3	0	5	0.027
WASHINGTON	0	0	0	0	0	0	0.000
OREGON	0	0	0	0	0	0	0.000
CALIFORNIA	0	0	0	1	0	1	0.005
OTHER	0	0	0	0	0	0	0.000
RIVER SPORT							
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	2	2	0.011
WENATCHEE R.	0	0	0	0	0	0	0.000
SNAKE R.	0	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	4	0	4	0.021
INDIAN FISHERY							
FALL INDIAN NET	0	0	0	8	3	11	0.058
HATCHERIES							
RAPID RIVER H.	0	0	1	0	0	1	0.005
PRIEST RAPIDS H.	0	0	0	2	0	2	0.011
STREAM SURVEY	0	0	0	0	0	0	0.000
TOTALS	0	5	17	27	9	58	0.307
PERCENT OF RECOVERY %	0.0	8.6	29.3	46.6	15.5		

Appendix Table 17.3.--Recoveries of adult fall chinook salmon released as controls below McNary Dam from 27 July to 5 August 1982.

Report Date: 1/30/1987
RELEASE GROUPS INCLUDED: 8205C

1982 MCNARY TRANS CONTROL BELOW MCNARY

FALL CHINOOK

Brands Used: LAIC2 LAIC4 LAIM2 LAIM4
Wire Codes Used: 231613 231613 231613 231613

NUMBER RELEASED: 11152

RECOVERY AREA	YEAR OF RETURN 1982	1983	1984	1985	1986	TOTAL	% RETURN
RIVER SYSTEM TRAPS							
BONNEVILLE TRAP	0	1	4	1	0	6	0.054
MCNARY TRAP	0	0	0	0	0	0	0.000
LOWER GRANITE TRAP	0	0	0	0	0	0	0.000
PRIEST RAPIDS TRAP	0	0	0	0	0	0	0.000
OCEAN FISHERIES							
ALASKA	0	0	0	5	0	5	0.045
BRITISH COLUMBIA	0	0	0	3	0	3	0.027
WASHINGTON	0	0	0	1	0	1	0.009
OREGON	0	0	0	0	0	0	0.000
CALIFORNIA	0	0	0	0	0	0	0.000
OTHER	0	0	0	0	0	0	0.000
RIVER SPORT							
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	0	0	0.000
WENATCHEE R.	0	0	0	0	0	0	0.000
SNAKE R.	0	0	0	0	0	0	0.000
OTHER RIVERS	0	0	0	1	0	1	0.009
RIVER COMMERCIAL	0	0	1	3	0	4	0.036
INDIAN FISHERY							
FALL INDIAN NET	0	0	1	3	0	4	0.036
HATCHERIES	0	0	0	0	0	0	0.000
STREAM SURVEY							
OTHER STREAMS	0	0	1	0	0	1	0.009
TOTALS	0	1	7	17	0	25	0.224
PERCENT OF RECOVERY %	0.0	4.0	28.0	68.0	0.0		

Appendix Table 18.0.--Summary of all recoveries of adult fall chinook salmon transported by truck from McNary Dam to below Bonneville Dam in 1982.

Report Date: 1/30/1987
RELEASE GROUPS INCLUDED: 8204A 8204B 8204C

1982 MCNARY TRANS TRUCK BELOW BONNEVILLE

FALL CHINOOK

Brands Used: RAV 1 RAV 2 RAV 3
Wire Codes Used: 231610 231612 231614

NUMBER RELEASED: 39693

RECOVERY AREA	YEAR OF RETURN 1982	1983	1984	1985	1986	TOTAL	% RETURN
RIVER SYSTEM TRAPS							
BONNEVILLE TRAP	0	15	19	16	7	57	0.144
MCNARY TRAP	0	11	17	12	0	40	0.101
LOWER GRANITE TRAP	0	1	1	0	0	2	0.005
PRIEST RAPIDS TRAP	0	0	0	0	3	3	0.008
OCEAN FISHERIES							
ALASKA	0	0	6	24	0	30	0.076
BRITISH COLUMBIA	0	2	8	19	1	30	0.076
WASHINGTON	0	0	0	1	0	1	0.003
OREGON	0	0	0	0	0	0	0.000
CALIFORNIA	0	0	0	0	0	0	0.000
OTHER	0	0	0	0	0	0	0.000
RIVER SPORT							
COLUMBIA R. BELOW SNAKE R.	0	1	0	0	0	1	0.003
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	0	0	0.000
WENATCHEE R.	0	0	0	0	0	0	0.000
SNAKE R.	0	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	12	14	1	27	0.068
INDIAN FISHERY							
FALL INDIAN NET	0	2	5	27	23	57	0.144
HATCHERIES							
RAPID RIVER H.	0	1	1	0	0	2	0.005
LYONS FERRY H.	0	0	1	0	0	1	0.003
PRIEST RAPIDS H.	0	0	0	2	0	2	0.005
STREAM SURVEY							
OTHER STREAMS	0	0	2	4	2	8	0.020
TOTALS	0	33	72	119	37	261	0.658
PERCENT OF RECOVERY %	0.0	12.6	27.6	45.6	14.2		

Appendix Table 18.1.--Recoveries of adult fall chinook salmon transported by truck from McNary Dam to below Bonneville Dam from 25 June to 2 July 1982.

Report Date: 1/30/1987
RELEASE GROUPS INCLUDED: 8204A

1982 MCNARY TRANS TRUCK BELOW BONNEVILLE

FALL CHINOOK

Brands Used: RAV 1
Wire Codes Used: 231610

NUMBER RELEASED: 5381

RECOVERY AREA		YEAR OF RETURN 1982	1983	1984	1985	1986	TOTAL	% RETURN
RIVER SYSTEM TRAPS								
BONNEVILLE TRAP		0	1	3	0	1	5	0.093
MCNARY TRAP		0	0	0	1	0	1	0.019
LOWER GRANITE TRAP		0	0	1	0	0	1	0.019
PRIEST RAPIDS TRAP		0	0	0	0	0	0	0.000
OCEAN FISHERIES								
ALASKA		0	0	0	1	0	1	0.019
BRITISH COLUMBIA		0	1	0	2	0	3	0.056
WASHINGTON		0	0	0	0	0	0	0.000
OREGON		0	0	0	0	0	0	0.000
CALIFORNIA		0	0	0	0	0	0	0.000
OTHER		0	0	0	0	0	0	0.000
RIVER SPORT		0	0	0	0	0	0	0.000
RIVER COMMERCIAL		0	0	1	0	0	1	0.019
INDIAN FISHERY								
FALL INDIAN NET		0	0	0	0	2	2	0.037
HATCHERIES								
PRIEST RAPIDS H.		0	0	0	1	0	1	0.019
STREAM SURVEY								
OTHER STREAMS		0	0	0	1	0	1	0.019
TOTALS		0	2	5	6	3	16	0.297
PERCENT OF RECOVERY	%	0.0	12.5	31.3	37.5	18.8		

Appendix Table 18.2.--Recoveries of adult fall chinook salmon transported by truck from McNary Dam to below Bonneville Dam from 12-21 July 1982.

Report Date: 1/30/1987
RELEASE GROUPS INCLUDED: 82048

1982 MCNARY TRANS TRUCK BELOW BONNEVILLE

FALL CHINOOK

Brands Used: RAV 2
Wire Codes Used: 231612

NUMBER RELEASED: 18787

RECOVERY AREA	YEAR OF RETURN 1982	1983	1984	1985	1986	TOTAL	% RETURN
RIVER SYSTEM TRAPS							
BONNEVILLE TRAP	0	4	2	4	2	12	0.064
MCNARY TRAP	0	2	4	4	0	10	0.053
LOWER GRANITE TRAP	0	0	0	0	0	0	0.000
PRIEST RAPIDS TRAP	0	0	0	0	0	0	0.000
OCEAN FISHERIES							
ALASKA	0	0	0	7	0	7	0.037
BRITISH COLUMBIA	0	0	4	8	1	13	0.069
WASHINGTON	0	0	0	0	0	0	0.000
OREGON	0	0	0	0	0	0	0.000
CALIFORNIA	0	0	0	0	0	0	0.000
OTHER	0	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	3	5	1	9	0.048
INDIAN FISHERY							
FALL INDIAN NET	0	2	3	7	10	22	0.117
HATCHERIES							
PRIEST RAPIDS H.	0	0	0	1	0	1	0.005
STREAM SURVEY							
OTHER STREAMS	0	0	0	1	0	1	0.005
TOTALS	0	8	16	37	14	75	0.399
PERCENT OF RECOVERY %	0.0	10.7	21.3	49.3	18.7		

Appendix Table 18.3.--Recoveries of adult fall chinook salmon transported by truck from McNary Dam to below Bonneville Dam from 26 July to 6 August 1982.

Report Date: 1/30/1987
RELEASE GROUPS INCLUDED: 8204C

1982 MCNARY TRANS TRUCK BELOW BONNEVILLE

FALL CHINOOK

Brands Used: RAV 3
Wire Codes Used: 231614

NUMBER RELEASED: 15525

RECOVERY AREA	YEAR OF RETURN 1982	1983	1984	1985	1986	TOTAL	% RETURN
RIVER SYSTEM TRAPS							
BONNEVILLE TRAP	0	10	14	12	4	40	0.258
MCNARY TRAP	0	9	13	7	0	29	0.187
LOWER GRANITE TRAP	0	1	0	0	0	1	0.006
PRIEST RAPIDS TRAP	0	0	0	00	3	3	0.019
OCEAN FISHERIES							
ALASKA	0	0	6	16	0	22	0.142
BRITISH COLUMBIA	0	1	4	9	0	14	0.090
WASHINGTON	0	0	0	1	0	1	0.006
OREGON	0	0	0	0	0	0	0.000
CALIFORNIA	0	0	0	0	0	0	0.000
OTHER	0	0	0	0	0	0	0.000
RIVER SPORT							
COLUMBIA R. BELOW SNAKE R.	0	1	0	0	0	1	0.006
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	0	0	0.000
WENATCHEE R.	0	0	0	0	0	0	0.000
SNAKE R.	0	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	8	9	0	17	0.110
INDIAN FISHERY							
FALL INDIAN NET	0	0	2	20	11	33	0.213
HATCHERIES							
RAPID RIVER H.	0	1	1	0	0	2	0.013
LYONS FERRY H.	0	0	1	0	0	1	0.006
STREAM SURVEY							
OTHER STREAMS	0	0	2	2	2	6	0.039
TOTALS	0	23	51	76	20	170	1.0950
PERCENT OF RECOVERY %	0.0	13.5	30.0	44.7	11.8		

Appendix Table 19.0.--Summary of all recoveries of adult fall chinook salmon released as controls below McNary Dam in 1983.

Report Date: 1/30/1987
RELEASE GROUPS INCLUDED: 8304A 8304B 8304C

1983 MCNARY TRANS CONTROL BELOW MCNARY

FALL CHINOOK

Brands Used: LA2L1 LA2L3 LD2L1 LA2T1 LA2T3 LD2T1 LA2X1 LA2X3
Wire Codes Used: 231627 231627 231627 231630 231630 231630 231633 231633

NUMBER RELEASED: 40301

RECOVERY AREA	YEAR OF RETURN 1983	1984	1985	1986	TOTAL	% RETURN
RIVER SYSTEM TRAPS						
BONNEVILLE TRAP	0	7	3	4	14	0.035
MCNARY TRAP	0	5	0	0	5	0.012
LOWER GRANITE TRAP	0	0	0	0	0	0.000
PRIEST RAPIDS TRAP	0	2	0	0	2	0.005
OCEAN FISHERIES						
ALASKA	0	0	0	0	0	0.000
BRITISH COLUMBIA	0	2	5	2	9	0.022
WASHINGTON	0	0	1	1	2	0.005
OREGON	0	0	1	1	2	0.005
CALIFORNIA	0	0	0	0	0	0.000
OTHER	0	1	0	0	1	0.002
RIVER SPORT						
COLUMBIA R. BELOW SNAKE R.	0	0	0	1	1	0.002
COLUMBIA R. ABOVE SNAKE R.	0	0	2	0	2	0.005
WENATCHEE R.	0	0	0	0	0	0.000
SNAKE R.	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	4	0	4	0.010
INDIAN FISHERY						
FALL INDIAN NET	0	0	5	18	23	0.057
HATCHERIES						
RAPID RIVER H.	0	1	0	0	1	0.002
PRIEST RAPIDS H.	0	0	6	0	6	0.015
STREAM SURVEY						
OTHER STREAMS	0	0	1	0	1	0.002
TOTALS	0	18	28	27	73	0.181
PERCENT OF RECOVERY %	0.0	24.7	38.4	37.0		

Appendix Table 19.1.--Recoveries of adult fall chinook salmon released as controls below McNary Dam from 8-15 July 1983.

Report Date: 1/30/1987
RELEASE GROUPS INCLUDED: 8304A

1983 MCNARY TRANS CONTROL BELOW MCNARY

FALL CHINOOK

Brands Used: LA2L1 LA2L3 LD2L1
Wire Codes Used: 231627 231627 231627

NUMBER RELEASED: 15010

RECOVERY AREA	YEAR OF RETURN 1983	1984	1985	1986	TOTAL	% RETURN
RIVER SYSTEM TRAPS						
BONNEVILLE TRAP	0	3	1	3	7	0.047
MCNARY TRAP	0	1	0	0	1	0.007
LOWER GRANITE TRAP	0	0	0	0	0	0.000
PRIEST RAPIDS TRAP	0	2	0	0	2	0.013
OCEAN FISHERIES						
ALASKA	0	0	0	0	0	0.000
BRITISH COLUMBIA	0	1	4	1	6	0.040
WASHINGTON	0	0	0	1	1	0.007
OREGON	0	0	1	1	2	0.013
CALIFORNIA	0	0	0	0	0	0.000
OTHER	0	1	0	0	1	0.007
RIVER SPORT						
COLUMBIA R. BELOW SNAKE R.	0	0	0	1	1	0.007
COLUMBIA R. ABOVE SNAKE R.	0	0	1	0	1	0.007
WENATCHEE R.	0	0	0	0	0	0.000
SNAKE R.	0	0	0	0	0	0.0000
RIVER COMMERCIAL	0	0	3	0	3	0.020
INDIAN FISHERY						
FALL INDIAN NET	0	0	5	6	11	0.073
HATCHERIES						
RAPID RIVER H.	0	1	0	0	1	0.007
PRIEST RAPIDS H.	0	0	3	0	3	0.020
STREAM SURVEY						
OTHER STREAMS	0	0	1	0	1	0.007
TOTALS	0	9	19	13	41	0.273
PERCENT OF RECOVERY %	0.0	22.0	46.3	31.7		

Appendix Table 19.2.--Recoveries of adult fall chinook salmon released as controls below McNary Dam from 20-27 July 1983.

Report Date: 1/30/1987
RELEASE GROUPS INCLUDED: 83048

1983 MCNARY TRANS CONTROL BELOW MCNARY

FALL CHINOOK

Brands Used: LA2T1 LA2T3 LD2T1
Wire Codes Used: 231630 231630 231630

NUMBER RELEASED: 14690

RECOVERY AREA	YEAR OF RETURN 1983	1984	1985	1986	TOTAL	% RETURN
RIVER SYSTEM TRAPS						
BONNEVILLE TRAP	0	1	1	0	2	0.014
MCNARY TRAP	0	1	0	0	1	0.007
LOWER GRANITE TRAP	0	0	0	0	0	0.000
PRIEST RAPIDS TRAP	0	0	0	0	0	0.000
OCEAN FISHERIES						
ALASKA	0	0	0	0	0	0.000
BRITISH COLUMBIA	0	1	0	1	2	0.014
WASHINGTON	0	0	0	0	0	0.000
OREGON	0	0	0	0	0	0.000
CALIFORNIA	0	0	0	0	0	0.000
OTHER	0	0	0	0	0	0.000
RIVER SPORT						
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	0	1	0	1	0.007
WENATCHEE R.	0	0	0	0	0	0.000
SNAKE R.	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0	0.000
INDIAN FISHERY						
FALL INDIAN NET	0	0	0	6	6	0.041
HATCHERIES						
PRIEST RAPIDS H.	0	0	2	0	2	0.014
STREAM SURVEY	0	0	0	0	0	0.000
TOTALS	0	3	4	7	14	0.095
PERCENT OF RECOVERY %	0.0	21.4	28.6	50.0		

Appendix Table 19.3.--Recoveries of adult fall chinook salmon released as controls below McNary Dam from 29 July to 5 August 1983.

Report Date: 1/30/1987
RELEASE GROUPS INCLUDED: 8304C

1983 MCNARY TRANS CONTROL BELOW MCNARY

FALL CHINOOK

Brands Used: LA2X1 LA2X3
Wire Codes Used: 231633 231633

NUMBER RELEASED: 10001

RECOVERY AREA		YEAR OF RETURN 1983	1984	1985	1986	TOTAL	% RETURN
RIVER SYSTEM TRAPS							
BONNEVILLE TRAP		0	3	1	1	5	0.047
MCNARY TRAP		0	3	0	0	3	0.028
LOWER GRANITE TRAP		0	0	0	0	0	0.000
PRIEST RAPIDS TRAP		0	0	0	0	0	0.000
OCEAN FISHERIES							
ALASKA		0	0	0	0	0	0.000
BRITISH COLUMBIA		0	0	1	0	1	0.009
WASHINGTON		0	0	1	0	1	0.009
OREGON		0	0	0	0	0	0.000
CALIFORNIA		0	0	0	0	0	0.000
OTHER		0	0	0	0	0	0.000
RIVER SPORT		0	0	0	0	0	0.000
RIVER COMMERCIAL		0	0	1	0	1	0.009
INDIAN FISHERY							
FALL INDIAN NET		0	0	0	6	6	0.057
HATCHERIES							
PRIEST RAPIDS H.		0	0	1	0	1	0.009
STREAM SURVEY		0	0	0	0	0	0.000
TOTALS		0	6	5	7	18	0.170
PERCENT OF RECOVERY	%	0.0	33.3	27.8	38.9		

Appendix Table 20.0.--Summary of all recoveries of adult fall chinook salmon transported by barge from McNary to below Bonneville Dam in 1983.

Report Date: 1/30/1987
RELEASE GROUPS INCLUDED: 8303A 8303B 8303C

1983 MCNARY TRANS BARGE BELOW BONNEVILLE

FALL CHINOOK

Brands Used: RAJ 1 RA3 3 RA3 2
Wire Codes Used: 231626 231629 231632

NUMBER RELEASED: 38860

RECOVERY AREA	YEAR OF RETURN 1983	1984	1985	1986	TOTAL	% RETURN
RIVER SYSTEM TRAPS						
BONNEVILLE TRAP	0	35	9	12	56	0.144
MCNARY TRAP	0	27	3	0	30	0.077
LOWER GRANITE TRAP	0	1	0	0	1	0.003
PRIEST RAPIDS TRAP	0	2	0	0	2	0.005
OCEAN FISHERIES						
ALASKA	0	1	0	0	1	0.003
BRITISH COLUMBIA	0	1	8	1	10	0.026
WASHINGTON	0	0	1	1	2	0.005
OREGON	0	0	0	0	0	0.000
CALIFORNIA	0	0	0	0	0	0.000
OTHER	0	1	0	0	1	0.003
RIVER SPORT						
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	1	1	1	3	0.008
WENATCHEE R.	0	0	0	0	0	0.000
SNAKE R.	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	14	0	14	0.036
INDIAN FISHERY						
FALL INDIAN NET	0	2	16	51	69	0.178
HATCHERIES						
RAPID RIVER H.	0	2	0	0	2	0.005
DESCHUTES R. HATCHERIES	0	0	1	0	1	0.003
PRIEST RAPIDS H.	0	0	11	0	11	0.028
STREAM SURVEY						
OTHER STREAMS	0	0	0	1	1	0.003
TOTALS	0	73	64	67	204	0.525
PERCENT OF RECOVERY %	0.0	35.8	31.4	32.8		

Appendix Table 20.1.--Recoveries of adult fall chinook salmon transported by barge from McNary Dam to below Bonneville Dam from 10-16 July 1983.

Report Date: 1/30/1987
RELEASE GROUPS INCLUDED: 8303A

1983 MCNARY TRANS BARGE BELOW BONNEVILLE

FALL CHINOOK

Brands Used: RA3 1
Wire Codes Used: 231626

NUMBER RELEASED: 15040

RECOVERY AREA	YEAR OF RETURN 1983	1984	1985	1986	TOTAL	% RETURN
RIVER SYSTEM TRAPS						
BONNEVILLE TRAP	0	12	4	3	19	0.126
MCNARY TRAP	0	7	1	0	8	0.053
LOWER GRANITE TRAP	0	0	0	0	0	0.000
PRIEST RAPIDS TRAP	0	1	0	0	1	0.007
OCEAN FISHERIES						
ALASKA	0	1	0	0	1	0.007
BRITISH COLUMBIA	0	0	4	1	5	0.033
WASHINGTON	0	0	0	1	1	0.007
OREGON	0	0	0	0	0	0.000
CALIFORNIA	0	0	0	0	0	0.000
OTHER	0	1	0	0	1	0.007
RIVER SPORT						
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	0	0	1	1	0.007
WENATCHEE R.	0	0	0	0	0	0.000
SNAKE R.	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	5	0	5	0.033
INDIAN FISHERY						
FALL INDIAN NET	0	0	5	23	28	0.186
HATCHERIES						
RAPID RIVER H.	0	1	0	0	1	0.007
PRIEST RAPIDS H.	0	0	7	0	7	0.047
STREAM SURVEY	0	0	0	0	0	0.000
TOTALS	0	23	26	29	78	0.519
PERCENT OF RECOVERY %	0.0	29.5	33.3	37.2		

Appendix Table 20.2.--Recoveries of adult fall chinook salmon transported by barge from McNary Dam to below Bonneville Dam from 19-25 July 1983.

Report Date: 1/30/1987
RELEASE GROUPS INCLUDED: 83038

1983 MCNARY TRANS BARGE BELOW BONNEVILLE

FALL CHINOOK

Brands Used: RA3 3
Wire Codes Used: 231629

NUMBER RELEASED: 15230

RECOVERY AREA		YEAR OF RETURN 1983	1984	1985	1986	TOTAL	% RETURN
RIVER SYSTEM TRAPS							
BONNEVILLE TRAP		0	14	4	6	24	0.158
MCNARY TRAP		0	14	1	0	15	0.098
LOWER GRANITE TRAP		0	1	0	0	1	0.007
PRIEST RAPIDS TRAP		0	1	0	0	1	0.007
OCEAN FISHERIES							
ALASKA		0	0	0	0	0	0.000
BRITISH COLUMBIA		0	0	2	0	2	0.013
WASHINGTON		0	0	0	0	0	0.000
OREGON		0	0	0	0	0	0.000
CALIFORNIA		0	0	0	0	0	0.000
OTHER		0	0	0	0	0	0.000
RIVER SPORT							
COLUMBIA R. BELOW SNAKE R.		0	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.		0	1	1	0	2	0.013
WENATCHEE R.		0	0	0	0	0	0.000
SNAKE R.		0	0	0	0	0	0.000
RIVER COMMERCIAL		0	0	6	0	6	0.039
INDIAN FISHERY							
FALL INDIAN NET		0	2	6	16	24	0.158
HATCHERIES							
RAPID RIVER H.		0	1	0	0	1	0.007
PRIEST RAPIDS H.		0	0	2	0	2	0.013
STREAM SURVEY							
OTHER STREAMS		0	0	0	1	1	0.007
TOTALS		0	34	22	23	79	0.519
PERCENT OF RECOVERY	%	0.0	43.0	27.8	29.1		

Appendix Table 20.3.--Recoveries of adult fall chinook salmon transported by barge from McNary Dam to below Bonneville from 30 July to 2 August 1983.

Report Date: 1/30/1987
RELEASE GROUPS INCLUDED: 9303C

1983 MCNARY TRANS BARGE BELOW BONNEVILLE

FALL CHINOOK

Brands Used: RA3 2
Wire Codes Used: 231632

NUMBER RELEASED: 8590

RECOVERY AREA		YEAR OF RETURN 1983	1984	1985	1986	TOTAL	% RETURN
RIVER SYSTEM TRAPS							
BONNEVILLE TRAP		0	9	1	3	13	0.151
MCNARY TRAP		0	6	1	0	7	0.081
LOWER GRANITE TRAP		0	0	0	0	0	0.000
PRIEST RAPIDS TRAP		0	0	0	0	0	0.000
OCEAN FISHERIES							
ALASKA		0	0	0	0	0	0.000
BRITISH COLUMBIA		0	1	2	0	3	0.035
WASHINGTON		0	0	1	0	1	0.012
OREGON		0	0	0	0	0	0.000
CALIFORNIA		0	0	0	0	0	0.000
OTHER		0	0	0	0	0	0.000
RIVER SPORT		0	0	0	0	0	0.000
RIVER COMMERCIAL		0	0	3	0	3	0.035
INDIAN FISHERY							
FALL INDIAN NET		0	0	5	12	17	0.198
HATCHERIES							
DESCHUTES R. HATCHERIES		0	0	1	0	1	0.012
PRIEST RAPIDS H.		0	0	2	0	2	0.023
STREAM SURVEY		0	0	0	0	0	0.000
TOTALS		0	16	16	15	47	0.547
PERCENT OF RECOVERY	%	0.0	34.0	34.0	31.9		

Appendix Table 21.0.--Summary of all recoveries of adult fall chinook salmon transportec by truck from McNary Dam to below Bonneville Dam in 1983.

Recort Date: 1/30/1987
RELEASE GROUPS INCLUDED: 8302A 8302B 8302C

1983 MCNARY TRANS TRUCK BELOW BONNEVILLE

FALL CHINOOK

Brands Used: RAIJ1 RAIJ3 RAIJ2
Wire Codes Used: 231625 231628 231631

NUMBER RELEASED: 35275

RECOVERY AREA		YEAR OF RETURN 1983	1984	1985	1986	TOTAL	% RETURN
RIVER SYSTEM TRAPS							
BONNEVILLE TRAP		0	31	9	10	50	0.142
MCNARY TRAP		0	37	8	1	46	0.130
LOWER GRANITE TRAP		0	0	0	0	0	0.000
PRIEST RAPIDS TRAP		0	2	0	0	2	0.006
OCEAN FISHERIES							
ALASKA		0	1	0	0	1	0.003
BRITISH COLUMBIA		0	3	10	1	14	0.040
WASHINGTON		0	0	1	1	2	0.006
OREGON		0	0	1	0	1	0.003
CALIFORNIA		0	0	0	0	0	0.000
OTHER		0	0	0	0	0	0.000
RIVER SPORT							
COLUMBIA R. BELOW SNAKE R.		0	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.		0	1	0	1	2	0.006
WENATCHEE R.		0	0	0	0	0	0.000
SNAKE R.		0	0	0	0	0	0.000
RIVER COMMERCIAL		0	0	20	0	20	0.057
INDIAN FISHERY							
FALL INDIAN NET		0	3	13	36	52	0.147
HATCHERIES							
RAPID RIVER H.		0	2	0	0	2	0.006
WELLS H.		0	0	1	0	1	0.003E
PRIEST RAPIDS H.		0	0	9	0	9	0.026
STREAM SURVEY							
OTHER STREAMS		0	1	1	0	2	0.006
TOTALS		0	81	73	50	204	0.578
PERCENT OF RECOVERY	%	0.0	39.7	35.8	24.5		

Appendix Table 21.1.--Recoveries of adult fall chinook salmon transported by truck from McNary Dam to below Bonneville Dam from 7-14 July 1983.

Report Date: 1/30/1987
RELEASE GROUPS INCLUDED: 8302A

1983 MCNARY TRANS TRUCK BELOW BONNEVILLE

FALL CHINOOK

Brands Used: RAIJ1
Wire Codes Used: 231625

NUMBER RELEASED: 15096

RECOVERY AREA		YEAR OF RETURN 1983	1984	1985	1986	TOTAL	% RETURN
RIVER SYSTEM TRAPS							
BONNEVILLE TRAP		0	11	2	4	17	0.113
MCNARY TRAP		0	23	5	1	29	0.192
LOWER GRANITE TRAP		0	0	0	0	0	0.000
PRIEST RAPIDS TRAP		0	0	0	0	0	0.000
OCEAN FISHERIES							
ALASKA		0	0	0	0	0	0.000
BRITISH COLUMBIA		0	1	6	1	8	0.053
WASHINGTON		0	0	0	0	0	0.000
OREGON		0	0	0	0	0	0.000
CALIFORNIA		0	0	0	0	0	0.000
OTHER		0	0	0	0	0	0.000
RIVER SPORT		0	0	0	0	0	0.000
RIVER COMMERCIAL		0	0	6	0	6	0.040
INDIAN FISHERY							
FALL INDIAN NET		0	1	7	19	27	0.179
HATCHERIES							
RAPID RIVER H.		0	1	0	0	1	0.007
PRIEST RAPIDS H.		0	0	5	0	5	0.033
STREAM SURVEY							
OTHER STREAMS		0	1	1	0	2	0.013
TOTALS		0	38	32	25	95	0.629
PERCENT OF RECOVERY	%	0.0	40.0	33.7	26.3		

Appendix Table 21.2.--Recoveries of adult fall chinook salmon transported by truck from McNary Dam to below Bonneville Dam from 19-25 July 1983.

Report Date: 1/30/1987
RELEASE GROUPS INCLUDED: 8302B

1983 MCNARY TRANS TRUCK BELOW BONNEVILLE

FALL CHINOOK

Brands Used: RAIJ3
Wire Codes Used: 231628

NUMBER RELEASED: 13973

RECOVERY AREA		YEAR OF RETURN 1983	1984	1985	1986	TOTAL	% RETURN
RIVER SYSTEM TRAPS							
BONNEVILLE TRAP		0	18	7	6	31	0.222
MCNARY TRAP		0	10	2	0	12	0.086
LOWER GRANITE TRAP		0	0	0	0	0	0.000
PRIEST RAPIDS TRAP		0	2	0	0	2	0.014
OCEAN FISHERIES							
ALASKA		0	1	0	0	1	0.007
BRITISH COLUMBIA		0	2	3	0	5	0.036
WASHINGTON		0	0	1	0	1	0.007
OREGON		0	0	0	0	0	0.000
CALIFORNIA		0	0	0	0	0	0.000
OTHER		0	0	0	0	0	0.000
RIVER SPORT							
COLUMBIA R. BELOW SNAKE R.		0	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.		0	1	0	1	2	0.014
WENATCHEE R.		0	0	0	0	0	0.000
SNAKE R.		0	0	0	0	0	0.000
RIVER COMMERCIAL		0	0	11	0	11	0.079
INDIAN FISHERY							
FALL INDIAN NET		0	1	5	11	17	0.122
HATCHERIES							
RAPID RIVER H.		0	1	0	0	1	0.007
PRIEST RAPIDS H.		0	0	3	0	3	0.021
STREAM SURVEY		0	0	0	0	0	0.000
TOTALS		0	36	32	18	86	0.615
PERCENT OF RECOVERY	%	0.0	41.9	37.2	20.9		

Appendix Table 21.3.--Recoveries of adult fall chinook salmon transported by truck from McNary Dam to below Bonneville Dam from 30 July to 2 August 1983.

Report Date: 1/30/1987
RELEASE GROUPS INCLUDED: 83020

1983 MCNARY TRANS TRUCK BELOW BONNEVILLE

FALL CHINOOK

Brands Used: RAIJ2
Wire Codes Used: 231631

NUMBER RELEASED: 6210

RECOVERY AREA	YEAR OF RETURN 1983	1984	1985	1986	TOTAL	% RETURN
RIVER SYSTEM TRAPS						
BONNEVILLE TRAP	0	2	0	0	2	0.032
MCNARY TRAP	0	4	1	0	5	0.081
LOWER GRANITE TRAP	0	0	0	0	0	0.000
PRIEST RAPIDS TRAP	0	0	0	0	0	0.000
OCEAN FISHERIES						
ALASKA	0	0	0	0	0	0.000
BRITISH COLUMBIA	0	0	1	0	1	0.016
WASHINGTON	0	0	0	1	1	0.016
OREGON	0	0	1	0	1	0.016
CALIFORNIA	0	0	0	0	0	0.000
OTHER	0	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	3	0	3	0.048
INDIAN FISHERY						
FALL INDIAN NET	0	1	1	6	8	0.129
HATCHERIES						
WELLS H.	0	0	1	0	1	0.016
PRIEST RAPIDS H.	0	0	1	0	1	0.016
STREAM SURVEY	0	0	0	0	0	0.000
TOTALS	0	7	9	7	23	0.370
PERCENT OF RECOVERY %	0.0	30.4	39.1	30.4		

Appendix Table 22.0.--Summary of all recoveries of adult spring chinook salmon transporte by barge from Lower Granite Dam to below Bonneville Dam in 1983.

Report Date: 1/30/1987
RELEASE GROUPS INCLUDED: 8301A 8301B

1983 L.GRANITE TRANS BARGE BELOW BONNEVILLE

SPRING CHINOOK

Brands Used: RAF 1 RAF 2 RAF 3 RAF 4
Wire Codes Used: 231621 231621 231622 231622

NUMBER RELEASED: 44648

RECOVERY AREA	YEAR OF RETURN 1983	1984	1985	1986	TOTAL	% RETURN
RIVER SYSTEM TRAPS						
BONNEVILLE TRAP	0	1	3	4	8	0.018
MCNARY TRAP	0	0	0	3	3	0.007
LOWER GRANITE TRAP	0	10	99	15	124	0.278
PRIEST RAPIDS TRAP	0	0	0	0	0	0.000
OCEAN FISHERIES	0	0	0	0	0	0.000
RIVER SPORT						
COLUMBIA R. BELOW SNAKE R.	0	0	1	0	1	0.002
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	0	0.000
WENATCHEE R.	0	0	0	0	0	0.000
SNAKE R.	0	1	8	0	9	0.020
RIVER COMMERCIAL						
COL. R. TEST FSHRY (ORE)	0	0	1	0	1	0.002
INDIAN FISHERY						
INDIAN TERMINAL	0	0	4	0	4	0.009
INDIAN CEREMONIAL	0	0	1	0	1	0.002
HATCHERIES						
DWORSHAK H.	0	0	1	2	3	0.007
PAHSIMEROI H.	0	0	2	0	2	0.004
RAPID RIVER H.	0	5	15	2	22	0.049
HELLS CANYON (OXBOW) H.	0	0	1	0	1	0.002
LITTLE WHITE H.	0	0	0	1	1	0.002
DESCHUTES R. HATCHERIES	0	0	4	0	4	0.009
HATCHERIES (GENERAL)	0	0	3	0	3	0.007
STREAM SURVEY						
OTHER STREAMS	0	0	1	0	1	0.002
TOTALS	0	17	144	27	188	0.421
PERCENT OF RECOVERY %	0.0	9.0	76.6	14.4		

Appendix Table 22.1.--Recoveries of adult spring chinook salmon transported by barge from Lower Granite Dam to below Bonneville Dam from 21-27 April 1983.

Report Date: 1/30/1987
RELEASE GROUPS INCLUDED: 8301A

1983 L.GRANITE TRANS BARGE BELOW BONNEVILLE

SPRING CHINOOK

Brands Used: RAF 1 RAF 2
Wire Codes Used: 231621 231621

NUMBER RELEASED: 24792

RECOVERY AREA	YEAR OF RETURN 1983	1984	1985	1986	TOTAL	% RETURN
RIVER SYSTEM TRAPS						
BONNEVILLE TRAP	0	0	1	2	3	0.012
MCNARY TRAP	0	0	0	0	0	0.000
LOWER GRANITE TRAP	0	4	52	6	62	0.250
PRIEST RAPIDS TRAP	0	0	0	0	0	0.000
OCEAN FISHERIES	0	0	0	0	0	0.000
RIVER SPORT						
COLUMBIA R. BELOW SNAKE R.	0	0	1	0	1	0.004
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	0	0.000
WENATCHEE R.	0	0	0	0	0	0.000
SNAKE R.	0	1	6	0	7	0.028
RIVER COMMERCIAL						
COL. R. TEST FSHRY (ORE)	0	0	1	0	1	0.004
INDIAN FISHERY						
INDIAN TERMINAL	0	0	4	0	4	0.016
HATCHERIES						
DWORSHAK H.	0	0	0	2	2	0.008
PAHSIMEROI H.	0	0	1	0	1	0.004
RAPID RIVER H.	0	4	11	2	17	0.069
HELLS CANYON (OXBOW) H.	0	0	1	0	1	0.004
LITTLE WHITE H.	0	0	0	1	1	0.004
DESCHUTES R. HATCHERIES	0	0	2	0	2	0.008
HATCHERIES (GENERAL)	0	0	2	0	2	0.008
STREAM SURVEY	0	0	0	0	0	0.000
TOTALS	0	9	82	13	104	0.419
PERCENT OF RECOVERY %	0.0	8.7	78.8	12.5		

Appendix Table 22.2.--Recoveries of adult spring chinook salmon transported by barge from Lower Granite Dam to below Bonneville Dam from 29 April to 25 May 1983.

Report Date: 1/30/1987
RELEASE GROUPS INCLUDED: 8301B

1983 L.GRANITE TRANS BARGE BELOW BONNEVILLE

SPRING CHINOOK

Brands Used: RAF 3 RAF 4
Wire Codes Used: 231622 231622

NUMBER RELEASED: 19856

RECOVERY AREA	YEAR OF RETURN 1983	1984	1985	1986	TOTAL	% RETURN
RIVER SYSTEM TRAPS						
BONNEVILLE TRAP	0	1	2	2	5	0.025
MCNARY TRAP	0	0	0	3	3	0.015
LOWER GRANITE TRAP	0	6	47	9	62	0.312
PRIEST RAPIDS TRAP	0	0	0	0	0	0.000
OCEAN FISHERIES	0	0	0	0	0	0.000
RIVER SPORT						
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	0	0.000
WENATCHEE R.	0	0	0	0	0	0.000
SNAKE R.	0	0	2	0	2	0.010
RIVER COMMERCIAL	0	0	0	0	0	0.000
INDIAN FISHERY						
INDIAN CEREMONIAL	0	0	1	0	1	0.005
HATCHERIES						
DWORSHAK H.	0	0	1	0	1	0.005
PAHSIMEROI H.	0	0	1	0	1	0.005
RAPID RIVER H.	0	1	4	0	5	0.025
DESCHUTES R. HATCHERIES	0	0	2	0	2	0.010
HATCHERIES (GENERAL)	0	0	1	0	1	0.005
STREAM SURVEY						
OTHER STREAMS	0	0	1	0	1	0.005
TOTALS	0	8	62	14	84	0.423
PERCENT OF RECOVERY %	0.0	9.5	73.8	16.7		

Appendix Table 23.0.--Summary of all recoveries of adult spring chinook salmon transported by barge from Lower Granite Dam to below Bonneville Dam in 1984.

Report Date: 1/30/1987
RELEASE GROUPS INCLUDED: 8410A 8410B 8410C 8410D

1984 L.GRANITE TRANS BARGE BELOW BONNEVILLE

SPRING CHINOOK

Brands Used:	RAL 1	RAL 1	RAL 1	RAL 2	RAL 2	RAL 3	RAL 4
Wire Codes Used:	231641	231642	231643	231649	231650	231648	231647

NUMBER RELEASED: 51604

RECOVERY AREA	YEAR OF RETURN 1984	1985	1986	TOTAL	% RETURN
RIVER SYSTEM TRAPS					
BONNEVILLE TRAP	0	1	5	6	0.012
MCNARY TRAP	0	0	6	6	0.012
LOWER GRANITE TRAP	0	11	40	51	0.099
PRIEST RAPIDS TRAP	0	0	0	0	0.000
OCEAN FISHERIES	0	0	0	0	0.000
RIVER SPORT					
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	0.000
WENATCHEE R.	0	0	0	0	0.000
SNAKE R.	0	0	4	4	0.008
RIVER COMMERCIAL					
COL. R. TEST FSHRY (ORE)	0	0	1	1	0.002
INDIAN FISHERY					
INDIAN CEREMONIAL	0	0	2	2	0.004
HATCHERIES					
PAHSIMEROI H.	0	0	1	1	0.002
RAPID RIVER H.	0	1	5	6	0.012
MCCALL H.	0	0	1	1	0.002
DESCHUTES R. HATCHERIES	0	0	2	2	0.004
LEAVENWORTH H.	0	0	1	1	0.002
STREAM SURVEY					
OTHER STREAMS	0	0	1	1	0.002
TOTALS	0	13	69	82	0.159
PERCENT OF RECOVERY %	0.0	15.9	84.1		

Appendix Table 23.1.--Recoveries of adult spring chinook salmon transported by barge from Lower Granite Dam to below Bonneville Dam from 16-21 April 1984.

Report Date: 1/30/1987
RELEASE GROUPS INCLUDED: 8410A

1984 L.GRANITE TRANS BARGE BELOW BONNEVILLE

SPRING CHINOOK

Brands Used: RAL 1 RAL 1 RAL 1
Wire Codes Used: 231641 231642 231643

NUMBER RELEASED: 15586

RECOVERY AREA		YEAR OF RETURN 1984	1985	1986	TOTAL	% RETURN
RIVER SYSTEM TRAPS						
BONNEVILLE TRAP		0	0	1	1	0.006
MCNARY TRAP		0	0	1	1	0.006
LOWER GRANITE TRAP		0	0	1	1	0.006
PRIEST RAPIDS TRAP		0	0	0	0	0.000
OCEAN FISHERIES		0	0	0	0	0.000
RIVER SPORT		0	0	0	0	0.000
RIVER COMMERCIAL		0	0	0	0	0.000
INDIAN FISHERY		0	0	0	0	0.000
HATCHERIES		0	0	0	0	0.000
STREAM SURVEY		0	0	0	0	0.000
TOTALS		0	0	3	3	0.019
PERCENT OF RECOVERY	%	0.0	0.0	100.0		

Appendix Table 23.2.--Recoveries of adult spring chinook salmon transported by barge from Lower Granite Dam to below Bonneville Dam from 23-28 April 1984.

Report Date: 1/30/1987
RELEASE GROUPS INCLUDED: 84108

1984 L.0GRANITE TRANS BARGE BELOW BONNEVILLE

SPRING CHINOOK

Brands Used: RAL 2 RAL 2
Wire Codes Used: 231649 2316500

NUMBER RELEASED: 27713

RECOVERY AREA		YEAR OF RETURN 1984	1985	1986	TOTAL	%0RETURN0
RIVER SYSTEM TRAPS						
BONNEVILLE TRAP		0	0	2	2	0.007
MCNARY TRAP		0	0	4	4	0.014
LOWER GRANITE TRAP		0	7	23	30	0.108
PRIEST RAPIDS TRAP		0	0	0	0	0.0000
OCEAN FISHERIES		0	0	0	0	0.000
RIVER SPORT						
COLUMBIA R. BELOW SNAKE R.		0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.		0	0	0	0	0.000
WENATCHEE R.		0	0	0	0	0.000
SNAKE R.		0	0	1	1	0.004
RIVER COMMERCIAL						
COL. R. TEST FSHRY (ORE)		0	0	1	1	0.004
INDIAN FISHERY						
INDIAN CEREMONIAL		0	0	1	1	0.004
HATCHERIES						
PAHSIMEROI H.		0	0	1	1	0.004
RAPID RIVER H.		0	0	4	4	0.014
LEAVENWORTH H.		0	0	1	1	0.004
STREAM SURVEY						
OTHER STREAMS		0	0	1	1	0.004
TOTALS		0	7	39	46	0.166
PERCENT OF RECOVERY	%	0.0	15.2	84.8		

Appendix Table 23.3.--Recoveries of adult spring chinook salmon transported by barge from Lower Granite Dam to below Bonneville Dam from 29 April to 3 May 1983.

Report Date: 1/30/1987
RELEASE GROUPS INCLUDED: 8410C

1984 L.GRANITE TRANS BARGE BELOW BONNEVILLE

SPRING CHINOOK

Brands Used: RAL 3
Wire Codes Used: 231648

NUMBER RELEASED: 5193

RECOVERY AREA	YEAR OF RETURN 1984	1985	1986	TOTAL	% RETURN
RIVER SYSTEM TRAPS					
BONNEVILLE TRAP	0	0	1	1	0.019
MCNARY TRAP	0	0	1	1	0.019
LOWER GRANITE TRAP	0	1	8	9	0.173
PRIEST RAPIDS TRAP	0	0	0	0	0.000
OCEAN FISHERIES	0	0	0	0	0.000
RIVER SPORT					
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	0.000
WENATCHEE R.	0	0	0	0	0.000
SNAKE R.	0	0	3	3	0.058
RIVER COMMERCIAL	0	0	0	0	0.000
INDIAN FISHERY					
INDIAN CEREMONIAL	0	0	1	1	0.019
HATCHERIES					
RAPID RIVER H.	0	0	1	1	0.019
DESCHUTES R. HATCHERIES	0	0	1	1	0.019
STREAM SURVEY	0	0	0	0	0.000
TOTALS	0	1	16	17	0.327
PERCENT OF RECOVERY %	0.0	5.9	94.1		

Appendix Table 23.4.--Recoveries of adult spring chinook salmon transported by barge from Lower Granite Dam to below Bonneville Dam from 5-15 May 1984.

Report Date: 1/30/1987
RELEASE GROUPS INCLUDED: 8410D

1984 L.GRANITE TRANS BARGE BELOW BONNEVILLE

SPRING CHINOOK

Brands Used: RAL 4
Wire Codes Used: 231647

NUMBER RELEASED: 3112

RECOVERY AREA	YEAR OF RETURN 1984	1985	1986	TOTAL	% RETURN
RIVER SYSTEM TRAPS					
BONNEVILLE TRAP	0	1	1	2	0.064
MCNARY TRAP	0	0	0	0	0.000
LOWER GRANITE TRAP	0	3	8	11	0.353
PRIEST RAPIDS TRAP	0	0	0	0	0.000
OCEAN FISHERIES	0	0	0	0	0.000
RIVER SPORT	0	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0	0.000
INDIAN FISHERY	0	0	0	0	0.000
HATCHERIES					
RAPID RIVER H.	0	1	0	1	0.032
MCCALL H.	0	0	1	1	0.032
DESCHUTES R. HATCHERIES	0	0	1	1	0.032
STREAM SURVEY	0	0	0	0	0.000
TOTALS	0	5	11	16	0.514
PERCENT OF RECOVERY %	0.0	31.3	68.8		

Appendix Table 24.0.--Summary of all recoveries of adult spring chinook salmon transported by barge from Lower Granite Dam to below Bonneville Dam in 1985.

Report Date: 1/30/1987
RELEASE GROUPS INCLUDED: 8510A 8510B 8510C 8510D 8510E

1985 L.GRANITE TRANS BARGE BELOW BONNEVILLE

SPRING CHINOOK

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

NUMBER RELEASED: 45420

RECOVERY AREA	YEAR OF RETURN 1985	1986	TOTAL	% RETURN
RIVER SYSTEM TRAPS				
BONNEVILLE TRAP	0	1	1	0.002
MCNARY TRAP	0	0	0	0.000
LOWER GRANITE TRAP	0	11	11	0.024
PRIEST RAPIDS TRAP	0	0	0	0.000
OCEAN FISHERIES	0	0	0	0.000
RIVER SPORT	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0.000
INDIAN FISHERY	0	0	0	0.000
HATCHERIES				
RAPID RIVER H.	0	1	1	0.002
MCCALL H.	0	1	1	0.002
STREAM SURVEY	0	0	0	0.000
TOTALS	0	14	14	0.031
PERCENT OF RECOVERY %	0.0	100.0		

Appendix Table 24.1.--Recoveries of adult spring chinook salmon transported by barge from Lower Granite Dam to below Bonneville Dam from 12-18 April 1985.

Report Date: 1/30/1987
RELEASE GROUPS INCLUDED: 8510A

1985 L.0GRANITE TRANS BARGE BELOW BONNEVILLE

SPRING CHINOOK

Brands Used: RAP11
Wire Codes Used: 231807

NUMBER RELEASED: 9893

RECOVERY AREA		YEAR OF RETURN 1985	1986	TOTAL	%0RETURN0
RIVER SYSTEM TRAPS					
BONNEVILLE TRAP		0	0	0	0.000
MCNARY TRAP		0	0	0	0.000
LOWER GRANITE TRAP		0	0	0	0.000
PRIEST RAPIDS TRAP		0	0	0	0.000
OCEAN FISHERIES		0	0	0	0.000
RIVER SPORT		0	0	0	0.000
RIVER COMMERCIAL		0	0	0	0.000
INDIAN FISHERY		0	0	0	0.000
HATCHERIES					
MCCALL H.		0	1	1	0.010
STREAM SURVEY		0	0	0	0.000
TOTALS		0	1	1	0.010
PERCENT OF RECOVERY	%0	0.0	100.0		

Appendix Table 24.2.--Recoveries of adult spring chinook salmon transported by barge from Lower Granite Dam to below Bonneville Dam from 19-26 April 1985.

Report Date: 1/30/1987
RELEASE GROUPS INCLUDED: 85108

1985 L.GRANITE TRANS BARGE BELOW BONNEVILLE

SPRING CHINOOK

Brands Used: RAFI2 RAPI2
Wire Codes Used: 231808 231809

NUMBER RELEASED: 17414

RECOVERY AREA		YEAR OF RETURN 1985	1986	TOTAL	% RETURN
RIVER SYSTEM TRAPS					
BONNEVILLE TRAP		0	0	0	0.000
MCNARY TRAP		0	0	0	0.000
LOWER GRANITE TRAP		0	3	3	0.017
PRIEST RAPIDS TRAP		0	0	0	0.000
OCEAN FISHERIES		0	0	0	0.000
RIVER SPORT		0	0	0	0.000
RIVER COMMERCIAL		0	0	0	0.000
INDIAN FISHERY		0	0	0	0.000
HATCHERIES		0	0	0	0.000
STREAM SURVEY		0	0	0	0.000
TOTALS		0	3	3	0.017
PERCENT OF RECOVERY	%	0.0	100.0		

Appendix Table 24.3.--Recoveries of adult spring chinook salmon transported by barge from Lower Granite Dam to below Bonneville Dam from 29 April to 3 May 1985.

Report Date: 1/30/1987
RELEASE GROUPS INCLUDED: 8510C

1985 L.GRANITE TRANS BARGE BELOW BONNEVILLE
SPRING CHINOOK

Brands Used: RAPI3
Wire Codes Used: 231814

NUMBER RELEASED: 9539

RECOVERY AREA		YEAR OF RETURN 1985	1986	TOTAL	% RETURN
RIVER SYSTEM TRAPS					
BONNEVILLE TRAP		0	0	0	0.000
MCNARY TRAP		0	0	0	0.000
LOWER GRANITE TRAP		0	2	2	0.021
PRIEST RAPIDS TRAP		0	0	0	0.000
OCEAN FISHERIES		0	0	0	0.000
RIVER SPORT		0	0	0	0.000
RIVER COMMERCIAL		0	0	0	0.000
INDIAN FISHERY		0	0	0	0.000
HATCHERIES		0	0	0	0.000
STREAM SURVEY		0	0	0	0.000
TOTALS		0	2	2	0.021
PERCENT OF RECOVERY	%	0.0	100.0		

Appendix Table 24.4.--Recoveries of adult spring chinook salmon transported by barge from Lower Granite Dam to below Bonneville Dam from 6-14 May 1985.

Report Date: 1/30/1987
RELEASE GROUPS INCLUDED: 8510D

1985 L.GRANITE TRANS BARGE BELOW BONNEVILLE

SPRING CHINOOK

Brands Used: RAP14
Wire Codes Used: 231815

NUMBER RELEASED: 3724

RECOVERY AREA		YEAR OF RETURN 1985	1986	TOTAL	% RETURN
RIVER SYSTEM TRAPS					
BONNEVILLE TRAP		0	0	0	0.000
MCNARY TRAP		0	0	0	0.000
LOWER GRANITE TRAP		0	1	1	0.027
PRIEST RAPIDS TRAP		0	0	0	0.000
OCEAN FISHERIES		0	0	0	0.000
RIVER SPORT		0	0	0	0.000
RIVER COMMERCIAL		0	0	0	0.000
INDIAN FISHERY		0	0	0	0.000
HATCHERIES		0	0	0	0.000
STREAM SURVEY		0	0	0	0.000
TOTALS		0	1	1	0.027
PERCENT OF RECOVERY	%	0.0	100.0		

Appendix Table 24.5.--Recoveries of adult spring chinook salmon transported by barge from Lower Granite Dam to below Bonneville Dam from 15-22 May 1985.

Report Date: 1/30/1987
RELEASE GROUPS INCLUDED: 8510E

1985 L.GRANITE TRANS BARGE BELOW BONNEVILLE

SPRING CHINOOK

Brands Used: LAP11
Wire Codes Used: 231816

NUMBER RELEASED: 4850

RECOVERY AREA	YEAR OF RETURN 1985	1986	TOTAL	% RETURN
RIVER SYSTEM TRAPS				
BONNEVILLE TRAP	0	1	1	0.021
MCNARY TRAP	0	0	0	0.000
LOWER GRANITE TRAP	0	5	5	0.103
PRIEST RAPIDS TRAP	0	0	0	0.000
OCEAN FISHERIES	0	0	0	0.000
RIVER SPORT	0	0	0	0.000
RIVER COMMERCIAL	0	0	0	0.000
INDIAN FISHERY	0	0	0	0.000
HATCHERIES				
RAPID RIVER H.	0	1	1	0.021
STREAM SURVEY	0	0	0	0.000
TOTALS	0	7	7	0.144
PERCENT OF RECOVERY %	0.0	100.0		

Appendix Table 25.0.--Summary of all recoveries of adult steelhead transported by barge from Lower Granite Dam to below Bonneville Dam in 1984.

Report Date: 1/30/1987
RELEASE GROUPS INCLUDED: 8405A 8405B 8405C 8405D

1984 L.GRANITE TRANS BARGE BELOW BONNEVILLE

STEELHEAD

Brands Used: RAL 1 RAL 1 RAL 2 RAL 3 RAL 4 RA7F1
Wire Codes Used: 231644 231645 231646 231651 231652 2316520

NUMBER RELEASED: 33529

RECOVERY AREA	YEAR OF RETURN 1984	1985	1986	TOTAL	%RETURN
RIVER SYSTEM TRAPS					
BONNEVILLE TRAP	0	23	90	113	0.337
MCNARY TRAP	0	2	3	5	0.015
LOWER GRANITE TRAP	0	262	359	621	1.852
PRIEST RAPIDS TRAP	0	0	1	1	0.003
OCEAN FISHERIES	0	0	0	0	0.000
RIVER SPORT					
COLUMBIA R. BELOW SNAKE R.	0	1	0	1	0.003
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	0.000
WENATCHEE R.	0	0	0	0	0.000
SNAKE R.	0	39	9	48	0.1430
CLEARWATER R.	0	11	3	14	0.042
OTHER RIVERS	0	4	0	4	0.0120
RIVER COMMERCIAL	0	0	0	0	0.000
INDIAN FISHERY					
INDIAN FISHERY	0	1	0	1	0.003
FALL INDIAN NET	0	13	33	46	0.137
SUMMER INDIAN NET	0	1	1	2	0.006
CLEARWATER INDIAN	1	0	0	1	0.003
HATCHERIES					
DWORSHAK H.	0	11	0	11	0.033
PAHSIMEROI H.	0	16	0	16	0.048
HELLS CANYON (OXBOW) H.	0	2	1	3	0.009
KOOSKIA H.	0	1	0	1	0.003
STREAM SURVEY	0	0	0	0	0.000
TOTALS	1	387	500	888	2.648
PERCENT OF RECOVERY %	0.1	43.60	56.3		

Appendix Table 25.1.--Recoveries of adult steelhead transported by barge from Lower Granite Dam to below Bonneville Dam from 23-29 April 1984.

Report Date: 1/30/1987
RELEASE GROUPS INCLUDED: 8405A

1984 L.GRANITE TRANS BARGE BELOW BONNEVILLE

STEELHEAD

Brands Used: RAL 1 RAL 1
Wire Codes Used: 231644 231645

NUMBER RELEASED: 8607

RECOVERY AREA	YEAR OF RETURN 1984	1985	1986	TOTAL	% RETURN
RIVER SYSTEM TRAPS					
BONNEVILLE TRAP	0	7	23	30	0.349
MCNARY TRAP	0	0	2	2	0.023
LOWER GRANITE TRAP	0	62	74	136	1.580
PRIEST RAPIDS TRAP	0	0	0	0	0.000
OCEAN FISHERIES	0	0	0	0	0.000
RIVER SPORT					
COLUMBIA R. BELOW SNAKE R.	0	1	0	1	0.012
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	0.000
WENATCHEE R.	0	0	0	0	0.000
SNAKE R.	0	10	2	12	0.139
CLEARWATER R.	0	3	3	6	0.070
OTHER RIVERS	0	1	0	1	0.012
RIVER COMMERCIAL	0	0	0	0	0.000
INDIAN FISHERY					
FALL INDIAN NET	0	2	7	9	0.105
HATCHERIES					
DWORSHAK H.	0	1	0	1	0.012
PAHSIMEROI H.	0	4	0	4	0.046
STREAM SURVEY	0	0	0	0	0.000
TOTALS	0	91	111	202	2.347
PERCENT OF RECOVERY %	0.0	45.0	55.0		

Appendix Table 25.2.--Recoveries of adult steelhead transported by barge from Lower Granite Dam to below Bonneville Dam from 30 April to 5 May 1984.

Report Date: 1/30/1987
RELEASE GROUPS INCLUDED: B405B

1984 L.GRANITE TRANS BARGE BELOW BONNEVILLE

STEELHEAD

Brands Used: RAL 2
Wire Codes Used: 231646

NUMBER RELEASED: 5185

RECOVERY AREA	YEAR OF RETURN 1984	1985	1986	TOTAL	% RETURN
RIVER SYSTEM TRAPS					
BONNEVILLE TRAP	0	3	14	17	0.328
MCNARY TRAP	0	1	0	1	0.019
LOWER GRANITE TRAP	0	42	65	107	2.064
PRIEST RAPIDS TRAP	0	0	1	1	0.019
OCEAN FISHERIES	0	0	0	0	0.000
RIVER SPORT					
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	0.000
WENATCHEE R.	0	0	0	0	0.000
SNAKE R.	0	3	2	5	0.096
CLEARWATER R.	0	2	0	2	0.039
OTHER RIVERS	0	1	0	1	0.019
RIVER COMMERCIAL	0	0	0	0	0.000
INDIAN FISHERY					
INDIAN FISHERY	0	1	0	1	0.019
FALL INDIAN NET	0	2	4	6	0.116
SUMMER INDIAN NET	0	1	0	1	0.019
CLEARWATER INDIAN	1	0	0	1	0.019
HATCHERIES					
DWORSHAK H.	0	3	0	3	0.058
PAHSIMEROI H.	0	2	0	2	0.039
HELLS CANYON (OXBOW) H.	0	0	1	1	0.019
STREAM SURVEY	0	0	0	0	0.000
TOTALS	1	61	87	149	2.874
PERCENT OF RECOVERY %	0.7	40.9	58.4		

Appendix Table 25.3.--Recoveries of adult steelhead transported by barge from Lower Granite Dam to below Bonneville Dam from 6-12 May 1984.

Report Date: 1/30/1987
RELEASE GROUPS INCLUDED: 340SC

1984 L.GRANITE TRANS BARGE BELOW BONNEVILLE

STEELHEAD

Brands Used: RAL 3
Wire Codes Used: 231651

NUMBER RELEASED: 7795

RECOVERY AREA	YEAR OF RETURN 1984	1985	1986	TOTAL	% RETURN
RIVER SYSTEM TRAPS					
BONNEVILLE TRAP	0	8	19	27	0.346
MCNARY TRAP	0	0	0	0	0.000
LOWER GRANITE TRAP	0	46	88	134	1.719
PRIEST RAPIDS TRAP	0	0	0	0	0.000
OCEAN FISHERIES	0	0	0	0	0.000
RIVER SPORT					
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	0.000
WENATCHEE R.	0	0	0	0	0.000
SNAKE R.	0	5	1	6	0.077
CLEARWATER R.	0	2.	0	2	0.026
OTHER RIVERS	0	1	0	1	0.013
RIVER COMMERCIAL	0	0	0	0	0.000
INDIAN FISHERY					
FALL INDIAN NET	0	3	6	9	0.115
HATCHERIES					
DWORSHAK H.	0	4	0	4	0.051
PAHSIMEROI H.	0	1	0	1	0.013
HELLS CANYON (OXBOW) H.	0	2	0	2	0.026
KOOSKIA H.	0	1	0	1	0.013
STREAM SURVEY	0	0	0	0	0.000
TOTALS	0	73	114	187	2.399
PERCENT OF RECOVERY %	0.0	39.0	61.0		

Appendix Table 25.4--Recoveries of adult steelhead transported by barge from Lower Granite Dam to below Bonneville Dam from 14-27 May 1984.

Report Date: 1/30/1987
RELEASE GROUPS INCLUDED: 84050

1984 L.GRANITE TRANS BARGE BELOW BONNEVILLE

STEELHEAD

Brands Used: RAL 4 RA7F1
Wire Codes Used: 231632 231652

NUMBER RELEASED: 11942

RECOVERY AREA	YEAR OF RETURN 1984	1985	1986	TOTAL	% RETURN
RIVER SYSTEM TRAPS					
BONNEVILLE TRAP	0	5	34	39	0.327
MCNARY TRAP	0	1	1	2	0.017
LOWER GRANITE TRAP	0	112	132	244	2.043
PRIEST RAPIDS TRAP	0	0	0	0	0.000
OCEAN FISHERIES	0	0	0	0	0.000
RIVER SPORT					
COLUMBIA R. BELOW SNAKE R.	0	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0	0.000
WENATCHEE R.	0	0	0	0	0.000
SNAKE R.	0	21	4	25	0.209
CLEARWATER R.	0	4	0	4	0.033
OTHER RIVERS	0	1	0	1	0.008
RIVER COMMERCIAL	0	0	0	0	0.000
INDIAN FISHERY					
FALL INDIAN NET	0	6	16	22	0.184
SUMMER INDIAN NET	0	0	1	1	0.008
HATCHERIES					
DWORSHAK H.	0	3	0	3	0.025
PAHSIMEROI H.	0	9	0	9	0.075
STREAM SURVEY	0	0	0	0	0.000
TOTALS	0	162	188	350	2.931
PERCENT OF RECOVERY %	0.0	46.3	53.7		

Appendix Table 26.0.--Summary of all recoveries of adult steelhead transported by barge from Lower Granite Dam to below Bonneville Dam in 1985.

Report Date: 1/30/1987
RELEASE GROUPS INCLUDED: 8509A 8509B 8509C 8509D 8509E

1985 L.GRANITEE TRANS BARGE BELOW BONNEVILLE

STEELHEAD

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

NUMBER RELEASED: 30041

RECOVERY AREA	YEAR OF RETURN 1985	1986	TOTAL	%ERETURNE
RIVER SYSTEM TRAPS				
BONNEVILLE TRAP	0	48	48	0.160
MCNARY TRAP	0	0	0	0.000
LOWER GRANITE TRAP	0	204	204	0.679
PRIEST RAPIDS TRAP	0	0	0	0.000
OCEAN FISHERIES	0	0	0	0.000
RIVER SPORT				
COLUMBIA R. BELOW SNAKE R.	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0.000
WENATCHEE R.	0	0	0	0.000
SNAKE R.	0	6	6	0.020
RIVER COMMERCIAL	0	0	0	0.000
INDIAN FISHERY				
FALL INDIAN NET	0	8	8	0.027
HATCHERIES	0	0	0	0.000
STREAM SURVEY	0	0	0	0.000
TOTALS	0	266	266	0.885
PERCENT OF RECOVERY %	0.0	100.0		

Appendix Table 26.1.--Recoveries of adult steelhead transported by barge from Lower Granite Dam to below Bonneville Dam from 20-26 April 1985.

Report Date: 1/30/1987
RELEASE GROUPS INCLUDED: 8509A

1985 L.GRANITE TRANS BARGE BELOW BONNEVILLE

STEELHEAD

Brands Used: RAP11
Wire Codes Used: 231817

NUMBER RELEASED: 1635

RECOVERY AREA		YEAR OF RETURN 1985	1986	TOTAL	% RETURN
RIVER SYSTEM TRAPS					
BONNEVILLE TRAP		0	4	4	0.245
MCNARY TRAP		0	0	0	0.000
LOWER GRANITE TRAP		0	14	14	0.856
PRIEST RAPIDS TRAP		0	0	0	0.000
OCEAN FISHERIES		0	0	0	0.000
RIVER SPORT		0	0	0	0.000
RIVER COMMERCIAL		0	0	0	0.000
INDIAN FISHERY		0	0	0	0.000
HATCHERIES		0	0	0	0.000
STREAM SURVEY		0	0	0	0.000
TOTALS		0	18	18	1.101
PERCENT OF RECOVERY	%	0.0	100.0		

Appendix Table 26.2.--Recoveries of adult steelhead transported by barge from Lower Granite Dam to below Bonneville Dam from 29 April to 3 May 1985.

Report Date: 1/30/1987
RELEASE GROUPS INCLUDED: 85078

1985 L.GRANITE TRANS BARGE BELOW BONNEVILLE

STEELHEAD

Brands Used: RAP12
Wire Codes Used: 231810

NUMBER RELEASED: 3084

RECOVERY AREA		YEAR OF RETURN 1985	1986	TOTAL	% RETURN
RIVER SYSTEM TRAPS					
BONNEVILLE TRAP		0	1	1	0.032
MCNARY TRAP		0	0	0	0.000
LOWER GRANITE TRAP		0	38	38	1.232
PRIEST RAPIDS TRAP		0	0	0	0.000
OCEAN FISHERIES		0	0	0	0.000
RIVER SPORT		0	0	0	0.000
RIVER COMMERCIAL		0	0	0	0.000
INDIAN FISHERY					
FALL INDIAN NET		0	1	1	0.032
HATCHERIES		0	0	0	0.000
STREAM SURVEY		0	0	0	0.000
TOTALS		0	40	40	1.297
PERCENT OF RECOVERY	%	0.0	100.0		

Appendix Table 26.3.--Recoveries of adult steelhead transported by barge from Lower Granite Dam to below Bonneville Dam from 6-10 May 1985.

Report Date: 1/30/1987
RELEASE GROUPS INCLUDED: 8509C

1985 L.GRANITE TRANS BARGE BELOW BONNEVILLE

STEELHEAD

Brands Used: RAFI3
Wire Codes Used: 231811

NUMBER RELEASED: 7640

RECOVERY AREA		YEAR OF RETURN 1985	1986	TOTAL	% RETURN
RIVER SYSTEM TRAPS					
BONNEVILLE TRAP		0	21	21	0.275
MCNARY TRAP		0	0	0	0.000
LOWER GRANITE TRAP		0	49	49	0.641
PRIEST RAPIDS TRAP		0	0	0	0.000
OCEAN FISHERIES		0	0	0	0.000
RIVER SPORT					
COLUMBIA R. BELOW SNAKE R.		0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.		0	0	0	0.000
WENATCHEE R.		0	0	0	0.000
SNAKE R.		0	2	2	0.026
RIVER COMMERCIAL		0	0	0	0.000
INDIAN FISHERY					
FALL INDIAN NET		0	2	2	0.026
HATCHERIES		0	0	0	0.000
STREAM SURVEY		0	0	0	0.000
TOTALS		0	74	74	0.969
PERCENT OF RECOVERY	%	0.0	100.0		

Appendix Table 26.4.--Recoveries of adult steelhead transported by barge from Lower Granite Dam to below Bonneville Dam from 13-17 May 1985.

Report Date: 1/30/1987
RELEASE GROUPS INCLUDED: 85090

1985 L.GRANITE TRANS BARGE BELOW BONNEVILLE

STEELHEAD

Brands Used: RAPI4
Wire Codes Used: 231812

NUMBER RELEASED: 8855

RECOVERY AREA	YEAR OF RETURN 1985	1986	TOTAL	% RETURN
RIVER SYSTEM TRAPS				
BONNEVILLE TRAP	0	13	13	0.147
MCNARY TRAP	0	0	0	0.000
LOWER GRANITE TRAP	0	56	56	0.632
PRIEST RAPIDS TRAP	0	0	0	0.000
OCEAN FISHERIES	0	0	0	0.000
RIVER SPORT				
COLUMBIA R. BELOW SNAKE R.	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0.000
WENATCHEE R.	0	0	0	0.000
SNAKE R.	0	2	2	0.023
RIVER COMMERCIAL	0	0	0	0.000
INDIAN FISHERY				
FALL INDIAN NET	0	3	3	0.034
HATCHERIES	0	0	0	0.000
STREAM SURVEY	0	0	0	0.000
TOTALS	0	74	74	0.836
PERCENT OF RECOVERY %	0.0	100.0		

Appendix Table 26.5.--Recoveries of adult steelhead transported by barge from Lower Granite Dam to below Bonneville Dam from 18-25 May 1985.

Report Date: 1/30/1987
RELEASE GROUPS INCLUDED: 3509E

1985 L.GRANITE TRANS BARGE BELOW BONNEVILLE

STEELHEAD

Brands Used: LAP11
Wire Codes Used: 231813

NUMBER RELEASED: 8827

RECOVERY AREA	YEAR OF RETURN 1985	1986	TOTAL	% RETURN
RIVER SYSTEM TRAPS				
BONNEVILLE TRAP	0	9	9	0.102
MCNARY TRAP	0	0	0	0.000
LOWER GRANITE TRAP	0	47	47	0.532
PRIEST RAPIDS TRAP	0	0	0	0.000
OCEAN FISHERIES	0	0	0	0.000
RIVER SPORT				
COLUMBIA R. BELOW SNAKE R.	0	0	0	0.000
COLUMBIA R. ABOVE SNAKE R.	0	0	0	0.000
WENATCHEE R.	0	0	0	0.000
SNAKE R.	0	2	2	0.023
RIVER COMMERCIAL	0	0	0	0.000
INDIAN FISHERY				
FALL INDIAN NET	0	2	2	0.023
HATCHERIES	0	0	0	0.000
STREAM SURVEY	0	0	0	0.000
TOTALS	0	60	60	0.680
PERCENT OF RECOVERY %	0.0	100.0		