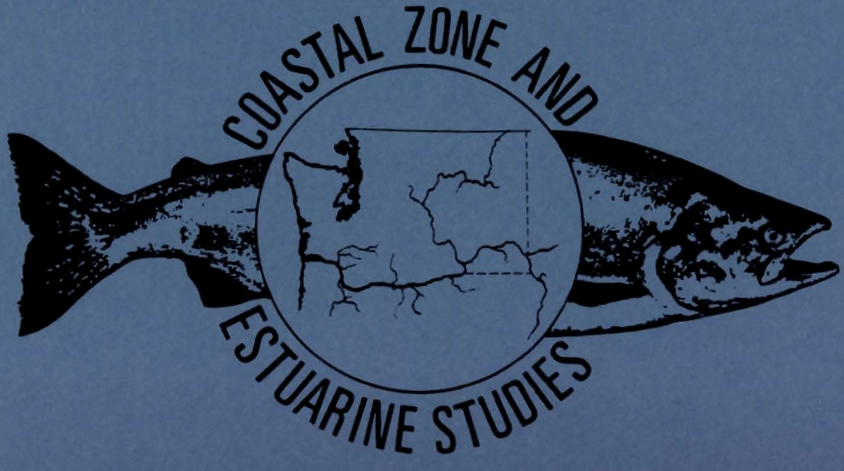
# Evaluation of Transportation of Juvenile Salmonids and Related Research on the Columbia and Snake Rivers—1986

by
Gene M. Matthews,
Donn L. Park,
Jerrel R. Harmon,
C. Scott McCutcheon,
and
Anthony J. Novotny

May 1987



# EVALUATION OF TRANSPORTATION OF JUVENILE SALMONIDS AND RELATED RESEARCH ON THE COLUMBIA AND SNAKE RIVERS, 1986

by
Gene M. Matthews
Donn L. Park
Jerrel R. Harmon
C. Scott McCutcheon
and
Anthony J. Novotny

Annual Report of Research
Financed by
U.S. Army Corps of Engineers
Contract DACW68-84-H-0034

and

Coastal Zone and Estuarine Studies Division
Northwest and Alaska Fisheries Center
National Marine Fisheries Service
National Oceanic and Atmospheric Administration
2725 Montlake Boulevard East
Seattle, Washington 98112

May 1987

CONTENTS

# 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

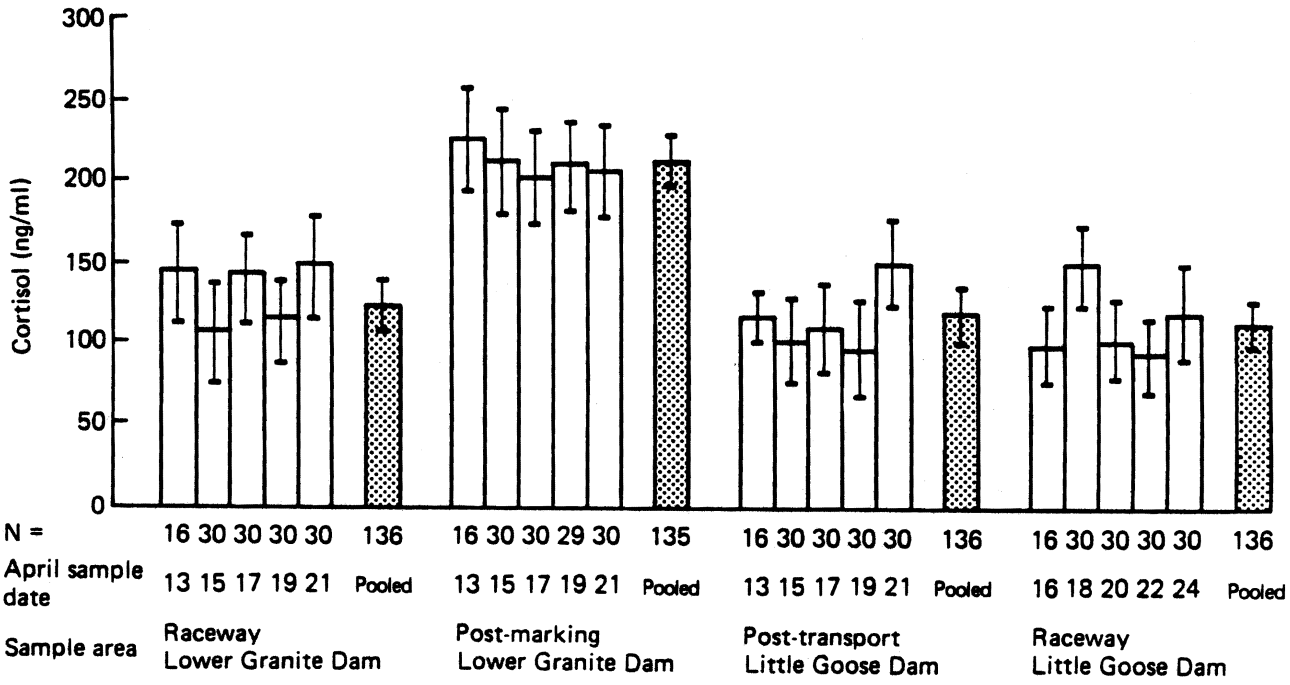



Figure 1.--Plasma cortisol values for evaluation of stress effects of truck transport of spring chinook salmon controls around Little Goose pool and dam. Vertical lines indicate 95% confidence intervals.

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

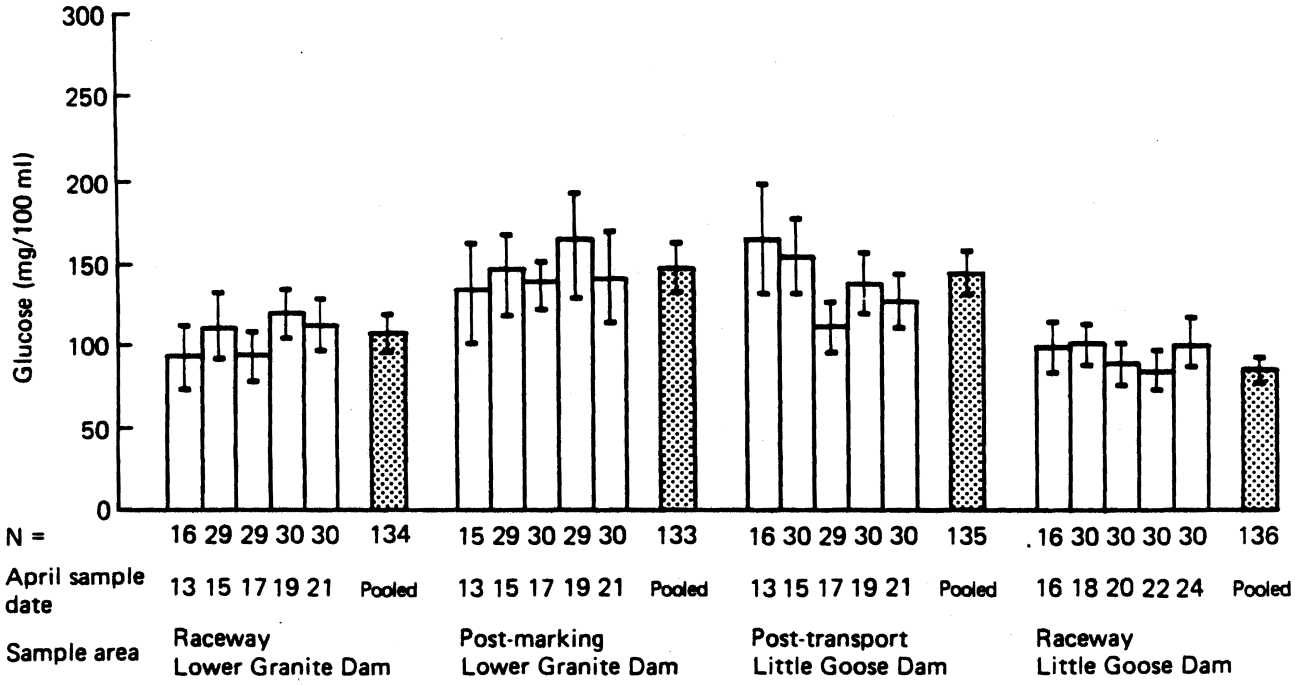



Figure 2.--Plasma glucose values for evaluation of stress effects of truck transport of spring chinook salmon controls around Little Goose pool and dam. Vertical lines indicate 95% confidence intervals.

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

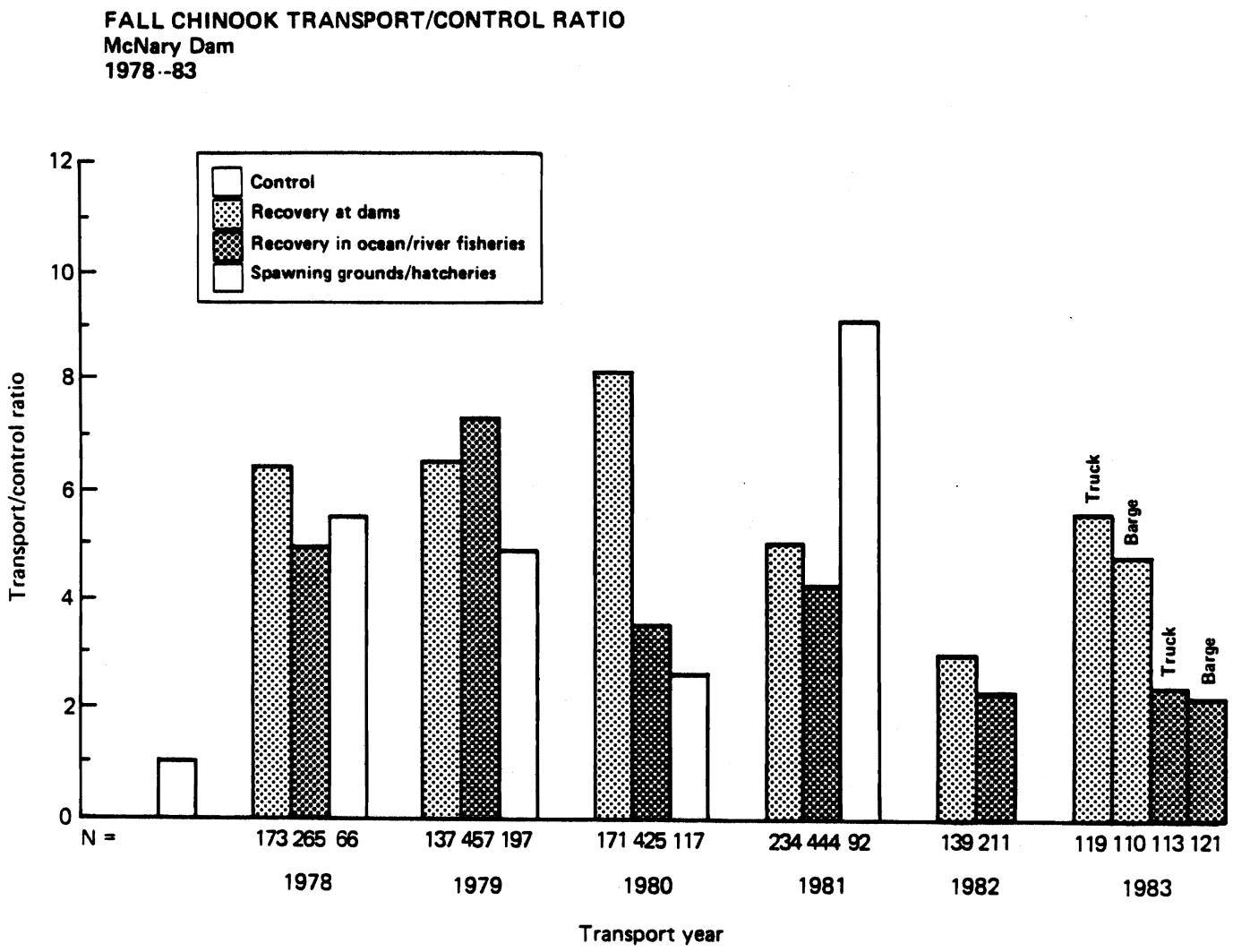



Figure 3.--Transport/control ratios for McNary Dam truck transportation tests with fall chinook salmon, 1978-1983 (includes barge test group for 1983).

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

---

2/ Dr. Dan Mulcahy, USFWS, National Wildlife Health Laboratory, 6006 Schroeder Rd., Madison, Wisconsin 53711, pers. commun.

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.

## ACKNOWLEDGMENTS

We acknowledge the efforts of the COE regarding incorporation of improvements into the fingerling collection facility at Lower Granite Dam since 1981. In particular, we believe John Ferguson (now with the Bonneville Power Administration) and members of his staff including Joel King, Ron Zorza, Ike Fackenthal, William Pich, Dave Guse, and others deserve special acknowledgment of their talent and hard work. Many of the improvements and modifications were conceived, designed, constructed, and installed by this staff. The excellent improvements in delayed mortality and adult returns documented in this report are, to a large degree, a reflection of their efforts.

We thank Dr. Carl Schreck and his staff for analyzing the plasma cortisol and glucose samples.

# LITERATURE CITED

Achord, S., J. R. Smith, and G. M. Matthews.
1984. Experimental tanker used to study transportation of juvenile salmonids. Progr. Fish. Cult., 46(3):206-208.

Banner, C. R., J. S. Rohovec, and J. L. Fryer.
1983. Renibacterium salmoninarum as a cause of mortality among chinook salmon in salt water. J. World Maricult. Soc., 14:236-239.

Bishop, G. M. M., S. E. Fienberg, and P. W. Holland.
1975. Discrete multivariate analysis. MIT Press, Cambridge, MA. 557 p.

Bullock, G. L. and K. Wolf.
1986. Infectious diseases of cultured fishes: current perspectives. U.S. Fish and Wildlife Service, Fish and Wildlife Leaflet, 5:1-13. D.C. 13 p.

Congleton, J. L., T. C. Bjornn, B. H. Burton, B. D. Watson, J. I. Irving, and R. R. Ringe.
1985. Effects of handling and crowding on the stress response and viability of chinook salmon parr and smolts. Idaho Cooperative Fisheries Research Unit, College of Forestry, Wildlife and Range Sciences, University of Idaho, Moscow, 151 p. (Completion Report 1984 to the Bonneville Power Administration, Project 82-5, Contract DE-A179-83BP11196.)

Delarm, M. R., L. R. Basham, S. W. Pettit, J. B. Athearn, and J. V. Baker.
1984. Fish transportation oversight team annual report--FY 1983, transport operations on the Snake and Columbia Rivers. NOAA Technical Memorandum, NMFS F/NWR-7:1-88, appendix.

Gessel, M. H., W. E. Farr, and C. W. Long.
1985. Underwater separation of juvenile salmonids by size. Mar. Fish. Rev., 47(3):38-42.

Matthews, G. M., and S. Achord.
In progress. Pre-anesthesia--A method to reduce stress and injury during handling and marking of spring chinook salmon smolts.

Matthews, G. M., D. L. Park, S. Achord, and T. E. Ruehle.
1986. Static seawater challenge test to measure relative stress levels in spring chinook salmon smolts. Trans. Am. Fish. Soc., 115(20):236-244.

Matthews, G. M., D. L. Park, T. E. Ruehle, and J. R. Harmon.
1985. Evaluation of transportation of juvenile salmonids and related research on the Columbia and Snake Rivers, 1984. U.S. Dep. of Commer., Natl. Oceanic Atmos. Admin., Natl. Mar. Fish. Serv., Northwest and Alaska Fish. Cent., Seattle, WA. 27 p. plus Appendix (Report to U.S. Army Corps of Engineers, Contract DACW68-84-H-0034).

Mazeaud, M. M., F. Mazeaud, and E. M. Donaldson.
1977. Primary and secondary effects of stress in fish: some new data with a general review. Trans. Am. Fish. Soc., 106(3):201-212.

Novotny, A. J., and W. S. Zaugg.
1979. Study of disease and physiology in the 1978 homing study hatchery stocks--a supplement to: "Imprinting salmon and steelhead trout for homing: by E. Slatick, A. Novotny, and L. Gilbreath, 1979. U.S. Dept. Commer., Natl. Oceanic Atmos. Admin., Natl. Mar. Fish. Serv., Northwest and Alaska Fish. Cent., Seattle, WA., 51 p. plus Appendix (Report to Bonneville Power Administration).

Park, D. L.
1985. A review of smolt transportation to bypass dams on the Snake and Columbia Rivers. Part II of comprehensive report of juvenile salmonid transportation . U.S. Army Corps of Engineers, Walla Walla District, Walla Walla, WA., p. 2-1 to 2-65.

Park, D. L., G. M. Matthews, T. E. Ruehle, J. R. Harmon, E. Slatick, and F. J. Ossiander.
1986. Evaluation of transportation of juvenile salmonids and related research on the Columbia and Snake Rivers, 1985. U.S. Dep. of Commer., Natl. Oceanic Atmos. Admin., Natl. Mar. Fish. Serv., Northwest and Alaska Fish. Cent., Seattle, WA. 26 p. plus Appendix (Report to U.S. Army Corps of Engineers, Contract DACW68-84-H-0034).

Park, D. L., G. M. Matthews, T. E. Ruehle, J. R. Smith, J. R. Harmon, B. H. Monk, and S. Achord.
1983. Evaluation of transportation and related research on the Columbia and Snake Rivers, 1982. U.S. Dep. of Commer., Natl. Oceanic Atmos. Admin., Natl. Mar. Fish. Serv., Northwest and Alaska Fish. Cent., Seattle, WA. 47 p. plus Appendix (Report to U.S. Army Corps of Engineers, Contract DACW68-78-C-0051).

Park, D. L., G. M. Matthews, J. R. Smith, T. E. Ruehle, J. R. Harmon, and S. Achord.
1984. Evaluation of transportation and related research on Columbia and Snake Rivers, 1983. U.S. Dep. of Commer., Natl. Oceanic Atmos. Admin., Natl. Mar. Fish. Serv., Northwest and Alaska Fish. Cent., Seattle, WA. 58 p. plus Appendix (Report to U.S. Army Corps of Engineers, Contract DACW68-78-C-0051).

Sims, C. W., D. R. Miller, and J. W. Wilson.
In progress. Effects of instream river flow on the migratory behavior of subyearling chinook salmon Oncorhynchus tshawytscha in John Day Reservoir.

Sokal, R. R., and F. J. Rohlf.
1981. Biometry. W. H. Freeman and Company, San Francisco, CA. 859 p.

Strange, R. J. and C. B. Schreck.
1978. Anesthetic and handling stress on survival and cortisol concentration in yearling chinook salmon (Oncorhynchus tshawytscha). J. Fish. Res. Board Can., 35:345-349.

Strange, R. J., C. B. Schreck, and J. T. Golden.
1977. Corticoid stress responses to handling and temperature in salmonids. Trans. Am. Fish. Soc., 106(3):213-217.

# 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, 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,[a] symbol, and orientation[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 | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 48 h | | Brand condition | | | | | 48 h | | Brand condition | | |
| Date | Number held | delayed mortalities | Lost tags | Good | Fair | Poor | Date | Number held | delayed mortalities | Lost tags | 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) | Fork length (mm) | Cortisol (ng/ml) | Glucose (mg/100 ml) |
|---|---|---|---|---|---|
| 130 | 172.1 | 69.4 | 137 | 172.9 | 231.7 |
| 124 | 218.8 | 152.8 | 137 | 142.7 | 204.5 |
| 124 | 172.7 | 110.1 | 127 | 126.1 | 154.1 |
| 129 | 193.3 | 156.6 | 127 | 146.9 | 131.8 |
| 135 | 132.2 | 163.3 | 114 | 234.8 | 314.4 |
| 133 | 209.8 | 298.2 | 125 | 167.9 | 203.7 |
| 126 | 308.7 | 137.7 | 126 | 103.4 | 150.8 |
| 130 | 181.7 | 82.9 | 130 | 117.5 | 107.0 |
| 127 | 342.3 | 185.3 | | | |
| 125 | 261.3 | 140.9 | Post-transport Little Goose Dam | | |
| 130 | 261.4 | 122.4 | 15 April 1986 | | |
| 130 | 202.7 | 124.8 | 135 | 119.4 | 62.3 |
| 130 | 122.4 | 136.9 | 115 | 74.0 | 107.8 |
| 122 | 216.1 | 374.0 | 117 | 108.6 | 89.6 |
| 115 | 153.8 | 90.9 | 120 | 87.3 | 103.7 |
| 133 | 260.5 | 78.0 | 124 | 157.7 | 134.2 |
| 138 | 183.7 | 64.3 | 140 | 157.6 | 131.8 |
| 130 | 218.7 | 58.7 | 136 | 179.0 | 117.7 |
| 127 | 175.2 | 85.3 | 121 | 148.1 | 110.3 |
| 138 | 258.2 | 110.3 | 128 | 123.5 | 116.1 |
| 134 | 183.1 | 96.6 | 135 | 223.3 | 120.2 |
| 117 | 198.8 | 103.0 | 130 | 218.5 | 325.1 |
| 132 | 202.3 | 98.2 | 130 | 113.2 | 157.4 |
| 142 | 200.6 | 81.3 | 135 | 213.4 | 294.6 |
| 131 | 200.5 | 169.2 | 148 | 149.9 | 140.8 |
| Post-transport Little Goose Dam | | | 140 | 111.4 | 197.9 |
| 13 April 1986 | | | 138 | 196.8 | 199.5 |
| 150 | 106.5 | 151.6 | 127 | 88.4 | 172.3 |
| 126 | 142.5 | 169.8 | 159 | 39.1 | 171.4 |
| 137 | 105.3 | 97.9 | 135 | 177.7 | 287.1 |
| 115 | 156.2 | 91.3 | 122 | 18.0 | 88.8 |
| 130 | 78.0 | 166.5 | 127 | 46.5 | 121.6 |
| 124 | 149.8 | 108.6 | 142 | 84.9 | 143.4 |
| 125 | 102.2 | 87.1 | 130 | 66.1 | 92.6 |
| 124 | 126.8 | 145.0 | 130 | 86.4 | 190.9 |

Appendix Table 7.--continued.

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

Appendix Table 7.--continued.

| Fork length (mm) | Cortisol (ng/ml) | Glucose (mg/100 ml) |
|---|---|---|
| 134 | 137.3 | 96.6 |
| 140 | 47.1 | 75.6 |
| Post Transport Little Goose Dam 21 April 1986 | | |
| 124 | 178.1 | 145.2 |
| 115 | 319.9 | 147.1 |
| 126 | 301.4 | 184.1 |
| 119 | 135.9 | 95.0 |
| 118 | 261.8 | 133.9 |
| 120 | 266.3 | 158.5 |
| 132 | 274.0 | 168.0 |
| 124 | 172.8 | 162.3 |
| 136 | 84.2 | 209.7 |
| 126 | 112.9 | 58.9 |
| 137 | 118.7 | 90.9 |
| 138 | 353.1 | 411.1 |
| 121 | 45.2 | 45.0 |
| 146 | 342.3 | 181.3 |
| 122 | 102.7 | 65.1 |
| 113 | 65.1 | 65.9 |
| 136 | 66.6 | 102.2 |
| 123 | 135.2 | 101.4 |
| 128 | 118.8 | 83.7 |
| 116 | 70.2 | 120.8 |
| 119 | 158.2 | 118.4 |
| 125 | 123.3 | 92.6 |
| 124 | 70.9 | 65.1 |
| 105 | 43.8 | 65.9 |
| 131 | 82.1 | 85.3 |
| 133 | 103.4 | 101.4 |
| 121 | 123.8 | 189.3 |
| 128 | 100.1 | 65.9 |
| 129 | 97.3 | 90.1 |
| 127 | 208.6 | 148.2 |
| Little Goose Raceway 16 April 1986 | | |
| 135 | 83.3 | 167.5 |
| 142 | 61.3 | 87.7 |
| 135 | 115.6 | 153.8 |
| 128 | 183.4 | 117.6 |
| 132 | 116.5 | 107.1 |
| 131 | 170.9 | 103.0 |
| 125 | 166.8 | 65.9 |
| 124 | 179.6 | 100.6 |
| 139 | 91.8 | 117.6 |
| 123 | 76.3 | 110.3 |
| 126 | 145.3 | 68.1 |
| 123 | 112.0 | 74.7 |
| 135 | 133.0 | 69.0 |
| 143 | 13.3 | 69.0 |
| 180 | 52.4 | 92.9 |
| 123 | 164.1 | 91.3 |
| Little Goose Raceway 18 April 1986 | | |
| 121 | 206.6 | 78.0 |
| 126 | 304.1 | 161.1 |
| 138 | 261.8 | 110.3 |
| 114 | 100.0 | 59.5 |
| 139 | 198.1 | 74.0 |
| 123 | 221.6 | 132.1 |
| 125 | 167.2 | 77.2 |
| 121 | 144.8 | 82.1 |
| 145 | 133.5 | 73.2 |
| 130 | 121.0 | 63.5 |
| 127 | 99.0 | 375.7 |
| 132 | 109.5 | 114.9 |
| 136 | 108.2 | 95.0 |
| 123 | 208.4 | 75.1 |
| 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 | 1 | 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 |
| | | | | | | |
| Brands Used: | RA+I2 | RA+I3 | | | | |
| Wire Codes Used: | 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 | 0.001 |
| 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 | 15.1 | 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: 84587

| 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 HD

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 031732

NUMBER RELEASED: 42580

| RECOVERY AREA | | YEAR OF RETURN 1981 | 1982 | 1983 | 1984 | 1985 | 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 | 0.000 |
| RIVER COMMERCIAL | | 0 | 0 | 0 | 9 | 1 | 0 | 10 | 0.023 |
| INDIAN FISHERY | | | | | | | | | |
| FALL INDIAN NET | | 0 | 0 | 5 | 13 | 11 | 2 | 31 | 0.073 |
| HATCHERIES | | | | | | | | | |
| 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 | 1.4 | | |

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: 38683

| RECOVERY AREA | YEAR OF RETURN 1982 | 1983 | 1984 | 1985 | 1986 | TOTAL | % RETURN |
|---|---|---|---|---|---|---|---|
| RIVER SYSTEM TRAPS | | | | | | | |
| 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: 82058

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: 8204B

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 | 0 | 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 | 1.095 |
| 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 | 0.000 |
| 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: 10601

| 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: RA3 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: 8303B

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.

Report 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: 35279

| 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 | 0.003 |
| 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: 83028

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: 8302C

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: 83018

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: 8410B

1984 L.GRANITE TRANS BARGE BELOW BONNEVILLE

SPRING CHINOOK

Brands Used: RAL 2 RAL 2
Wire Codes Used: 231649 231650

NUMBER RELEASED: 27713

| RECOVERY AREA | YEAR OF RETURN 1984 | 1985 | 1986 | TOTAL | % RETURN |
|---|---|---|---|---|---|
| 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 | 0.000 |
| 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 | 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 | | | | | |
| PAHSIMERDI 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.GRANITE TRANS BARGE BELOW BONNEVILLE

SPRING CHINOOK

Brands Used: RAP11
Wire Codes Used: 231807

NUMBER RELEASED: 9893

| 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 | 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 | 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: RAPI2 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: RAPI4
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: LAPI1
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 231652

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 | 0.143 |
| CLEARWATER R. | 0 | 11 | 3 | 14 | 0.042 |
| OTHER RIVERS | 0 | 4 | 0 | 4 | 0.012 |
| 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 | 43.6 | 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: 8405B

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: 8405C

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: 8405D

1984 L.GRANITE TRANS BARGE BELOW BONNEVILLE

STEELHEAD

Brands Used: RAL 4 RA7F1
Wire Codes Used: 231652 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.GRANITE TRANS BARGE BELOW BONNEVILLE

STEELHEAD

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

NUMBER RELEASED: 30041

| RECOVERY AREA | YEAR OF RETURN 1985 | 1986 | TOTAL | % RETURN |
|---|---|---|---|---|
| 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: 8509B

1985 L.GRANITE TRANS BARGE BELOW BONNEVILLE

STEELHEAD

Brands Used: RAPI2
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: RAPI3
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: 6855

| 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: 8509E

1985 L.GRANITE TRANS BARGE BELOW BONNEVILLE

STEELHEAD

Brands Used: LAPI1
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 | | |