Research related to transportation of juvenile salmonids on the Columbia and Snake Rivers, 1999

Fish Ecology Division

Northwest Fisheries Science Center

National Marine Fisheries Service

Seattle, Washington

by
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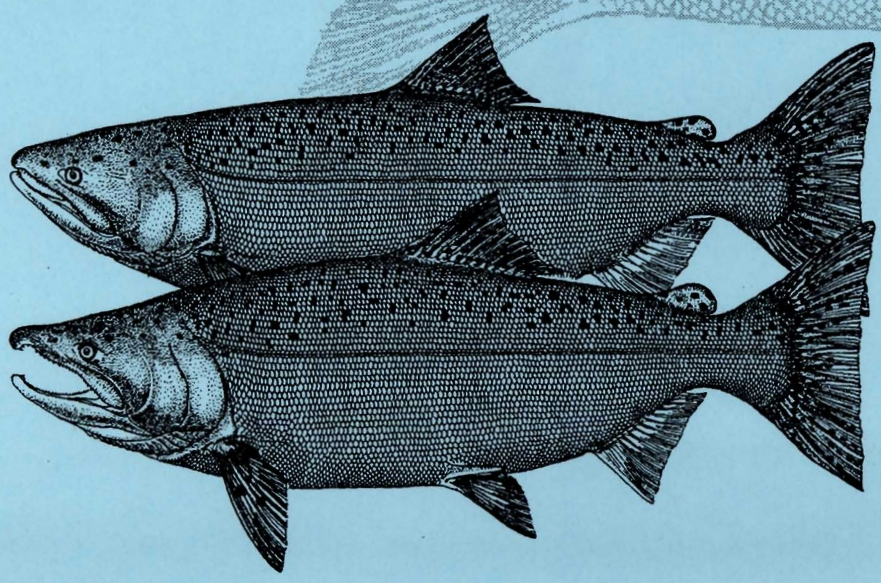

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EXECUTIVE SUMMARY

In 1999 at Lower Granite Dam, the National Marine Fisheries Service (NMFS) continued its evaluation of transportation vs. inriver migration of spring/summer chinook salmon smolts and began a new evaluation of transportation vs. inriver migration of steelhead smolts. The studies were designed to compare survival to adulthood between smolts transported to below Bonneville Dam and those allowed to migrate downstream volitionally from the Lower Granite Dam tailrace under optimized inriver survival conditions. We also continued to monitor the prevalence of marine mammal abrasions on adult spring/summer chinook salmon at Lower Granite Dam.

Transportation Vs. Inriver Migration of Pit-tagged Spring/summer Chinook Salmon and Steelhead Smolts–Lower Granite Dam

In spring 1999, we continued a marking study initiated in 1995 to evaluate transportation vs. inriver migration of spring/summer chinook salmon smolts at Lower Granite Dam. From 30 March through 23 June, we PIT-tagged 127,051 yearling smolts at Lower Granite Dam. Of this total, 52,166 were transported and released below Bonneville Dam, while 73,643 were released into the Lower Granite Dam tailrace. Post-marking delayed mortality (24-hour) averaged 1.4% for the period. Inriver migrating fish collected at downstream dams were returned to the river using PIT-tag diversion systems (slide gates).

We also recovered spring/summer chinook salmon adults from smolts tagged in 1996 and 1998. Of fish from the 1996 tagging season, 63 returning adults had been transported from Lower Granite Dam and 59 had been released into the Lower Granite Dam tailrace. For the 1996

study year, final transport-to-inriver adult return survival ratios (T/I) were 1.6 (95% CI 1.3, 2.0) overall, 1.5 (95% CI 1.1, 2.2) for hatchery fish, and 3.4 (95% CI 1.2, 18.3) for wild fish. When transported adults were compared to inriver adults never detected at a downstream dam after release from Lower Granite Dam, the T/Is changed to 1.0 (95% CI 0.8, 1.6) overall, 1.0 (95% CI 0.7, 1.5) for hatchery fish, and 1.5 (95% CI 0.6 to Infinity) for wild fish. Of jacks from the 1998 tagging season, 34 had been transported from Lower Granite Dam and 33 had been released into the Lower Granite Dam tailrace.

From 30 March through 23 June, we PIT tagged 115,749 steelhead smolts at Lower Granite Dam. Of this total, 47,171 were transported and released below Bonneville Dam, while 68,105 were released into the Lower Granite Dam tailrace. Post-tagging delayed mortality (24 hour) averaged 0.7% for the period. Inriver migrating fish collected at downstream dams were returned to the river using PIT-tag diversion systems (slide gates).

Marine Mammal Abrasions–Lower Granite Dam

We also continued to observe high abrasion levels from marine mammal teeth and claws on adult spring/summer chinook salmon sampled at Lower Granite Dam in 1999. Prevalence of abrasions was 21.3% on adults examined, with open wounds occurring on about 30.6% of the fish with abrasions.

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TRANSPORTATION VS. INRIVER MIGRATION OF PIT-TAGGED SPRING/SUMMER CHINOOK SALMON AND STEELHEAD SMOLTS--LOWER GRANITE DAM

Introduction

Research to evaluate the effects of transporting juvenile salmonids around dams began over 25 years ago. Evaluations of transported spring/summer chinook salmon (*Oncorhynchus tshawytscha*) and steelhead (*O. mykiss*) have been conducted from various Snake River dams from 1968 through 1980. In addition, transportation of summer/fall chinook salmon and steelhead smolts was evaluated at McNary Dam on the Columbia River from 1978 through 1983.

Based upon adult returns, results of these transportation studies have varied by species. For summer/fall chinook salmon (subyearlings) and steelhead, results consistently showed that significantly more marked/transported fish returned to the point of release than did marked fish released to migrate inriver. However, for spring/summer chinook salmon (yearling smolts), results were less consistent. Results from the earliest studies, during 1968-73, demonstrated conclusively that significantly more marked fish that were transported returned to the point of marking than did marked fish released to migrate inriver (Ebel et al. 1973, Slatick et al. 1975, Ebel 1980). However, most studies conducted during 1975-80 yielded inconclusive results because very low numbers of marked adults returned from either group (Park 1985).

Matthews (1992) postulated that severe physical trauma suffered by many smolts during collection and marking was a primary cause of low returns of spring/summer chinook salmon adults during the 1975-80 studies. From 1981 through 1984, the COE and fisheries agencies addressed this problem by improving many features of the smolt collection and bypass systems at dams, particularly at Lower Granite Dam. In addition, the preanesthetic system of handling and

marking smolts (Matthews et al. 1986) was introduced at Lower Granite Dam in 1983. This system virtually eliminated the major physical trauma associated with the handling and marking process. All indications suggest that the modifications and improvements increased survival substantially.

In 1986, a study was initiated at Lower Granite Dam to reevaluate smolt transportation of yearling chinook salmon migrants from the Snake River after substantial modifications were made to collection and bypass facilities. Spring/summer chinook salmon smolts were marked with CWTs and freeze brands in 1986 and 1989 at Lower Granite Dam. Approximately one-half of the marked smolts were placed in barges at Lower Granite Dam, and the remainder were trucked to a release site downstream from Little Goose Dam to continue their inriver migration. Although significantly more barged fish returned as adults than those that migrated inriver, concern was expressed that the studies were compromised by transporting the inriver fish to below Little Goose Dam. The studies were further criticized because a small fraction of inriver migrating fish were inadvertently transported from McNary Dam and because inriver migration conditions at the time of these studies were not considered optimal. Thus, it was argued, the inriver migrating fish were not afforded the full opportunity to remain inriver and survive at the highest rates possible.

Since 1989, a succession of low-flow years and ongoing construction and operation of a new bypass and collection system at Lower Monumental Dam have impeded further attempts to conduct transportation research using CWTs and freeze brands from Lower Granite Dam. However, a major fish-marking technology advance, the passive integrated transponder (PIT) tag (Prentice et al. 1990), along with recently developed PIT-tag diversion systems (Matthews et al.

1990, 1992; Achord et al. 1992; Harmon et al. 1995) installed at collector dams downstream from Lower Granite Dam, now allow transportation studies to be conducted directly from Lower Granite Dam. The combination of these technologies allows release of inriver-migrating study fish directly into the Lower Granite Dam tailrace because a high percentage of the fish collected inadvertently at any downstream dam can now be returned to the river rather than transported. Furthermore, the collection history and final disposition of each inriver migrating fish can now be recorded, so that individual records of fish inadvertently transported from any downstream dam can be eliminated or separated from the analysis.

The primary objective of this study is to compare adult returns to Lower Granite Dam between PIT-tagged spring/summer chinook salmon and steelhead smolts transported from Lower Granite Dam to below Bonneville Dam and those allowed to migrate inriver from the tailrace of the dam under optimal conditions for inriver survival. In addition, the number of PIT-tagged fish released inriver will allow smolt-survival estimations between the Lower Granite and McNary Dam tailraces using the Single-Release Model (Iwamoto et al. 1994). Here we report tagging results and other data from inriver-migrating juvenile study fish released during the 1999 study year, and adult returns from the 1996 and 1998 study years.

Methods

Smolt Sampling and Tagging

During spring 1999, we continued the current transportation study at Lower Granite Dam by tagging spring/summer chinook salmon smolts for the fourth year and steelhead smolts for the first year. Unlike the first two years of marking spring/summer chinook salmon smolts (Marsh et al. 1996, 1997), we marked fish internally with standard PIT tags only (no imbedded coded-wire tag). As in previous years, we loaded some fish onto barges or trucks for transport and release below Bonneville Dam and released others directly into the Lower Granite Dam tailrace to continue their seaward migration.

For the initial tagging year (1995), we designed the study to test a minimum transport-to-inriver adult return survival ratio (T/I) of 1.3. For that year, Muir et al. (1996) estimated inriver survival from Lower Granite Dam tailrace to McNary Dam tailrace to be approximately 70%. If the per-project survival rate remained at this level through the three remaining dams and reservoirs, a T/I of approximately 1.8 would be expected for adults returning to Lower Granite Dam. Based on this information, we adjusted the study design in 1996 to test a minimum T/I of 1.5. In 1999, we again marked fish to test a minimum T/I of 1.5 for both species.

We calculated the numbers of marked fish required in both study groups using the following notation:

N_i = number of tagged inriver migrants

N_t = number of tagged transported fish

n_i = number of inriver migrants recovered as adults

n_t = number of transported fish recovered as adults

$p_i = n_i/N_i$ = proportion of inriver migrants returning as adults

$p_t = n_t/N_t$ = proportion of transported fish returning as adults

The T/I ratio (R) was estimated by

$$R = p_t / p_i ,$$

the variance of R (V(R))was given by

$$V(R) \approx R^2 \left(\frac{1}{n_i} + \frac{1}{n_t}\right) ,$$

and the relative variance (RV) by

$$RV = \frac{V(R)}{R^2} \approx \frac{1}{n_i} + \frac{1}{n_t} .$$

The value for RV is the square of the coefficient of variation (CV). The sample sizes were then calculated by inserting the desired CV into this equation. The CV specifies the standard error as a percent of the ratio itself.

To maximize precision for a given sample size, we calculated the numbers of juveniles required to provide about equal numbers of expected adults returning in the transport and inriver migrant groups (i.e., $n_i = n_t$). By specifying the value of RV, the required number of returning adults was obtained from

$$RV \approx 1/n_i + 1/n_t = 2/n,$$

where $n = n_i = n_t$, and n was estimated from $n \approx 2/RV$. For spring chinook salmon and steelhead, we desired a CV of 15.0% (S.E. = 0.23) , and the number required in each returning group was

$$n \approx 2/RV - 2/(0.15)^2 = 2/0.0225 = 90.$$

We estimated a minimum adult return of transported fish to Lower Granite Dam of 0.2% for the 1999 smolt outmigration; thus the required number of releases in this group was given as

$$N_t \approx n_t/p_t = 90/0.002 = 45{,}000.$$

If R is 1.5, then the number of inriver migrants (N_i) was given as

$$N_i \approx N_t(1.5) = 45{,}000(1.5) = 67{,}500.$$

Thus, the total numbers of PIT-tagged fish of both species required were 45,000 transports and 67,500 inriver migrants. The basic collection and handling methodology followed that described by Marsh et al. (1996).

Inriver Migration

Marsh et al. (1996) provided details on how inriver study fish were tracked as they passed through the collection systems at dams downstream from Lower Granite Dam during this study. Prior to 22 June 1999, all fish (tagged and nontagged) collected at McNary Dam were bypassed to the river after passing through PIT-tag detectors; no fish were transported from McNary Dam during this time. On 22 June, collection and transport operations began at McNary Dam, and the PIT-tag diversion system was used thereafter to return PIT-tagged fish to the river.

We removed records from the inriver data set of fish that were detected at a dam but not detected later on a return-to-the-river detector coil at that dam. At the end of the smolt migration, we obtained information from COE project biologists regarding periods of time when all fish were bypassed to the river from raceways. During these periods, we added back to the inriver data set fish whose final detections were on coils leading to raceways at each dam. At each dam,

any fish detected exiting the fish and debris separator but not detected elsewhere was removed from the inriver data set. Fish whose final detections were on coils leading to sampling rooms were also removed from the inriver data set.

Adult Recoveries and Data Analysis

We will recover adults in each of the 3 years following tagging of juvenile spring/summer chinook salmon and in each of the 4 years following the tagging of steelhead. The procedures for data analysis described by Marsh et al. (1996) were modified as described in Sandford and Smith (In prep.). Their methods adjusted the observed numbers of fish detected and transported or bypassed at downstream dams or not detected at all, for bias associated with estimated mortality between dams. Mathematically, the methods divide the number of fish released at Lower Granite Dam into various downstream detection-history categories based on estimated detection percentages at the downstream dams.

Results and Discussion

Smolt Sampling and Tagging

We PIT-tagged fish from 30 March through 23 June. During this period, we tagged 127,051 yearling spring/summer chinook salmon (Table 1 and Appendix Tables 1.0 and 3.0), or 6.9% of the total number of yearling spring/summer chinook salmon collected at Lower Granite Dam in 1999. The number of fish tagged daily ranged from 26 to 9,266. Of the 127,051 fish tagged, 73,643 were released into the Lower Granite Dam tailrace and 52,166 were transported to below Bonneville Dam. Hatchery and wild fish proportions were nearly identical between the two treatment groups.

Table 1. Numbers and mean fork length of wild and hatchery spring/summer chinook salmon smolts PIT tagged and released inriver at Lower Granite Dam or transported below Bonneville Dam, 1999.

	Hatchery			Wild			
	Number	Percent	Mean fork length (mm)	Number	Percent	Mean fork length (mm)	Totals
Released inriver							
tagged	62,687	83.8	137.9	12,123	16.2	109.4	74,810
released	61,797	83.9	138.0	11,846	16.1	109.4	73,643
Transported							
tagged	43,669	83.6	138.3	8,572	16.4	109.3	52,241
released	43,609	83.6	138.3	8,557	16.4	109.3	52,166

We tagged 115,749 steelhead (Table 2 and Appendix Tables 2.0 and 4.0), or 4.5% of the total steelhead collected at Lower Granite Dam in 1999. The number of fish tagged daily ranged from 58 to 5,895. Of the 115,749 fish tagged, 68,105 were released into the Lower Granite Dam tailrace and 47,171 were transported to below Bonneville Dam. Hatchery and wild fish proportions were nearly identical between the two treatment groups.

Based on mortality counts from the inriver holding tank, post-marking delayed mortality (24-hour) averaged 1.4% for spring/summer chinook salmon and 0.5% for steelhead over the entire tagging season. This value is exceptionally low, considering that we tagged virtually every fish sampled. We rejected only a few fish that were either severely injured or exhibited obvious symptoms of gross bacterial kidney disease. By tracking the unique PIT-tag code of each mortality, we determined the body condition recorded when the fish was still alive during tagging. Unlike in past years, descaling did not appear to have a major impact on post-marking delayed mortality for spring/summer chinook salmon: when tagged, 1.5% of all fish were recorded as descaled; however, only 3.2% of the delayed mortalities were recorded as descaled during tagging (as compared to 14.8% in 1998).

The need to handle all non-fin-clipped smolts twice as much as the rest of the fish seemed to have a major impact on delayed mortality. A very large number of hatchery spring/summer chinook salmon juveniles were released with no external marks, but some of these fish had coded-wire tags (CWT) imbedded in their snouts. To determine whether an unclipped fish was of hatchery or natural origin, we began scanning all unclipped smolts for the presence of a CWT, which increased the amount of handling. Because delayed mortality for wild smolts was averaging 2.8% (delayed mortality for smolts identified as having a CWT was 2.3%), we stopped

Table 2. Numbers and mean fork length of wild and hatchery steelehead smolts PIT tagged and released inriver at Lower Granite Dam or transported below Bonneville Dam, 1999.

	Hatchery			Wild			
	Number	Percent	Mean fork length (mm)	Number	Percent	Mean fork length (mm)	Totals
Released inriver							
tagged	60,146	87.7	218.8	8,407	12.3	186.4	68,553
released	59,745	87.7	218.8	8,360	12.3	186.4	68,105
Transported							
tagged	41,132	87.2	219.6	6,064	12.8	186.7	47,196
released	41,109	87.1	219.6	6,062	12.9	186.7	47,171

scanning for CWTs on 29 April. After that date, delayed mortality for wild smolts decreased to only 1.3%, and overall delayed mortality decreased from 2.0% to 1.2%.

Descaling did not appear to have a major impact on post-tagging delayed mortality in steelhead. The population of steelhead tagged had a descaling rate of 2.2%, while the post-tagging mortalities had a descaling rate of only 2.8%. However, having a body injury at the time of tagging appeared to affect delayed mortality: 7.6% of all steelhead tagged were recorded as injured at the time of tagging, while 16.3% of steelhead post-tagging mortalities were recorded as injured at the time of tagging.

Our inability to efficiently recover post-tagging mortalities from the transport holding raceways introduced a small bias into the study. We collected and removed from the inriver data set the records from virtually all mortalities in fish tagged for the inriver releases, but only an unknown fraction of those from mortalities in fish tagged for transport. Assuming that tagged transport fish experienced the same delayed mortality rate prior to release as tagged inriver fish, approximately 731 (1.4%) spring/summer chinook salmon and 236 (0.5%) steelhead transport fish that we recorded as released alive were actually released postmortem. This bias will slightly skew the adult return T/I downward.

We recorded fork lengths of all of the fish during tagging. During the course of tagging, we encountered spring/summer chinook salmon that were obviously of hatchery origin, but had partial or no fin clips. In 1996, we had also observed this problem and had investigated whether fork length could be used as an indicator of whether a fish was of wild or hatchery origin. The resulting analysis, described by Marsh et al. (1997), showed that a fork length of 123-mm could

be used as a maximum length for wild fish. Therefore, we classified any spring/summer chinook salmon that was unclipped and greater than 123-mm as of hatchery origin.

Inriver Migration

As inriver study fish continued their seaward migration, some were re-collected at dams downstream from Lower Granite Dam.

Of the 73,643 inriver spring/summer chinook salmon released, 57,421 (78.0%) were detected at least once at a downstream collector dam (Table 3 and Appendix Table 5.0). Of the 68,105 inriver steelhead released, 51,482 (75.6%) were detected at least once at a downstream collector dam (Table 4 and Appendix Table 6.0). As expected, the largest number of first-time detections occurred at Little Goose Dam.

Tables 5 and 6 (Appendix Tables 7.0 through 9.0 and Appendix Tables 10.0 through 12.0) show total numbers and ultimate dispositions of inriver spring/summer chinook salmon and steelhead, respectively, detected at each dam.

In sharp contrast to its performance in past years, the PIT-tag diversion system at Lower Monumental Dam returned PIT-tagged fish to the river with the lowest efficiency of the three diversion systems downstream from Lower Granite Dam. By comparing total facility detections with post-diversion detections on coils leading to the river, we determined that 11.3% of the spring/summer chinook salmon and 6.9% of the steelhead collected at Lower Monumental Dam were not diverted back to the river, and we removed records of these fish from the inriver data set. Using the same method at Little Goose Dam, we determined that 1.7% of the spring/summer chinook salmon and 3.1% of the steelhead collected fell into this category.

Table 3. Numbers and percentages of spring/summer chinook salmon smolts PIT tagged and released at Lower Granite Dam in spring 1999 and subsequently detected at Little Goose, Lower Monumental, and McNary Dams. Percentages are based on the total numbers of inriver fish released.

Dam	First detections	Second detections	Third detections
Little Goose Dam			
Number detected	39,088		
% of release	53.1		
Lower Monumental Dam			
Number detected	13,151	17,321	
% of release	17.9	23.5	
McNary Dam			
Number detected	5,182	10,268	5,523
% of release	7.0	13.9	7.5
Totals			
Number detected	57,421	27,589	5,523
% of release	78.0	37.5	7.5

Table 4. Numbers and percentages of steelhead smolts PIT tagged and released at Lower Granite Dam in spring 1999 and subsequently detected at Little Goose, Lower Monumental, and McNary Dams. Percentages are based on the total numbers of inriver fish released.

Dam	First detections	Second detections	Third detections
Little Goose Dam			
Number detected	36,564		
% of release	53.7		
Lower Monumental Dam			
Number detected	13,120	19,157	
% of release	19.3	28.1	
McNary Dam			
Number detected	1,798	4,346	3,409
% of release	2.6	6.4	5.0
Totals			
Number detected	51,482	23,503	3,409
% of release	75.6	34.5	5.0

Table 5. Final disposition of PIT-tagged spring/summer chinook salmon smolts released at Lower Granite Dam in spring 1999 and subsequently detected at Little Goose, Lower Monumental, and McNary Dams (includes definitions for final dispositions).

Final disposition*	Number of smolts Little Goose Dam	Lower Monumental Dam	McNary Dam
River	38,435	27,036	19,860
Bypassed	0	0	1,112
Sample	264	1,907	1
Transported	353	1,436	0
Unknown	36	93	0
Totals			
Observed	39,088	30,472	20,973
Removed from study	653	3,436	1
% removed from study	1.7	11.3	< 0.1
To river	38,435	27,036	20,972

* Definitions:

Disposition	Last coil observation	Special circumstances	Ultimate destination	Study status
River	Diversion or river return		River	Retained
Bypassed	Raceway	Raceway emptied to river	River	Retained
Sample	Sample		Unknown	Removed
Transported	Raceway		Barge/Truck	Removed
Unknown	Separator		Unknown	Removed

Table 6. Final disposition of PIT-tagged steelhead smolts released at Lower Granite Dam in spring 1999 and subsequently detected at Little Goose, Lower Monumental, and McNary Dams (includes definitions for final dispositions).

Final disposition*	Number of smolts Little Goose Dam	Lower Monumental Dam	McNary Dam
River	35,457	30,053	9,105
Bypassed	0	4	448
Sample	333	1,207	0
Transported	743	969	0
Unknown	31	44	0
Totals			
Observed	36,564	32,277	9,553
Removed from study	1,107	2,220	0
% removed from study	3.1	6.9	0
To river	35,457	30,057	9,553

* Definitions:

Disposition	Last coil observation	Special circumstances	Ultimate destination	Study status
River	Diversion or river return		River	Retained
Bypassed	Raceway	Raceway emptied to river	River	Retained
Sample	Sample		Unknown	Removed
Transported	Raceway		Barge/Truck	Removed
Unknown	Separator		Unknown	Removed

We added back to the inriver data set records of fish detected on coils leading to raceways during periods when all fish were returned to the river at both dams. No spring/summer chinook salmon were returned to the river from the raceways at Little Goose and Lower Monumental Dams. No steelhead were returned to the river from the Little Goose Dam raceways, and four steelhead were returned to the river from the Lower Monumental Dam raceways. Since all fish were returned to the river at McNary Dam prior to 22 June, only one inriver study fish (a spring/summer chinook salmon) collected at this dam required removal from the inriver data set.

Based upon detections at John Day and Bonneville Dams, we made preliminary estimates of approximately 79.7% survival of spring/summer chinook salmon smolts (hatchery and wild combined) to McNary Dam tailrace. Preliminary estimates of survival rates to McNary Dam tailrace for hatchery and wild spring/summer chinook salmon were 80.1% and 78.3%, respectively. We also estimated survival from Lower Granite Dam tailrace to below Bonneville Dam. Our survival estimate for combined hatchery and wild spring/summer chinook salmon was 53.5% for this river reach. If no delayed mortality occurs to transported fish compared to inriver fish, the adult return T/I should approximate the inverse of inriver survival ($1/\hat{S}$). Based on a survival estimate to below Bonneville Dam of 53.5%, the adult return T/I for spring/summer chinook salmon released in 1999 should approximate 1.9.

Based on detections at John Day and Bonneville Dams, we made preliminary estimates of approximately 68.3% survival of the steelhead smolts to McNary Dam tailrace. Survival rates to McNary Dam tailrace for hatchery and wild steelhead were 67.3% and 73.4%, respectively. We also estimated survival from Lower Granite Dam tailrace to below Bonneville Dam. Our survival estimate for combined hatchery and wild fish was 48.0% for this river reach. If no

delayed mortality occurs to transported fish compared to inriver fish, the adult return T/I should approximate the inverse of inriver survival ($1/\hat{S}$). Assuming proportional survival through the remaining three dams and reservoirs, the adult return T/I for steelhead released in 1999 should approximate 2.1.

Adult Recoveries and Data Analysis

1996 Study Year--At Lower Granite Dam, we recovered age-3-ocean adult spring/summer chinook salmon from the 1996 study year (Table 7 and Appendix Tables 13.0 through 14.2). The first adult arrived at the dam on 30 April and the last arrived on 1 August.

In total, we recovered 33 age-3-ocean adults during 1999, bringing the total number of jacks and adults recovered for this study to 123. However, we eliminated 9 fish from the analysis for a variety of reasons including PIT tags that had not been recorded during smolt tagging, identification of adults that was restricted to the freeze brand, and inriver study fish that had been transported at dams downstream from Lower Granite Dam. Also, as noted in Marsh et. al 1997, fish marked on 25 April required removal from the study because an undetermined number of fish marked for transport were inadvertently released to the river during barge-loading on the morning of 26 April. This resulted in the removal of an additional 5 adults from the total returns.

Of the remaining 109 adults in the study, 58 and 51 were from the transport and inriver releases, respectively. Overall smolt-to-adult return rates (SARs) to Lower Granite Dam were 0.13% for the transported group and 0.08% for all inriver fish (including those bypassed once or more than once downstream from Lower Granite Dam), for an overall T/I of 1.6 (95% CI 1.3, 2.0). When we compared the transport SAR to the SAR of inriver fish never again detected at a

Table 7. Preliminary summary of recovered adult spring/summer chinook salmon marked at Lower Granite Dam in 1996 for the transportation study (recoveries through 17 August 1999). Jaw tag recoveries above Lower Granite Dam are listed (recoveries reported through 28 October 1999).

Group[a]	Number released	Adult returns at Lower Granite Dam		Jaw tag recoveries			
		Number	%	Hatcheries	Sports fishery	Spawning grounds	Traps
1996[b]							
Transport							
Hatchery	35,632	49	0.14	9	0	0	9
Wild	7,949	9	0.11	0	0	0	0
Unknown	32	0	0	0	0	0	0
Total	43,613	58	0.13	9	0	0	9
Inriver[c]							
Hatchery	50,552	47	0.09	4	2	1	5
Wild	12,536	4	0.03	1	0	0	0
Unknown	83	0	0	0	0	0	0
Total	63,171	51	0.08	5	2	1	5
Transported inrivers[c]							
Hatchery	1,867	2	0.11	1	0	0	0
Wild	560	0	0	0	0	0	0
Unknown	7	0	0	0	0	0	0
Total	2,434	2	0.08	1	0	0	0

[a] Based upon fin clips, fish were classified as hatchery, wild, or unknown when tagged as juveniles. However, many fish were likely mis-classified because high numbers of hatchery fish were poorly fin clipped or received no fin clips (see Marsh et al. 1997).

[b] Five adults (3 inriver and 2 transports) returned from the 25 April tagging but are not counted here. All fish marked on that day were removed from the study due to barge loading problems (see Marsh et al. 1997).

[c] Adjusted as described in Sandford and Smith (In prep.)

downstream dam after release from Lower Granite Dam, the overall T/I dropped to 1.0 (95% CI 0.8, 1.6).

Hatchery and wild fish accounted for 88.3% and 11.7% of the returning adults, respectively. When tagged as smolts, the percentages of hatchery and wild fish tagged was 80.5 and 19.5%, respectively (Marsh et al. 1997), although the wild fraction was bolstered to some extent because some hatchery fish were not adipose-fin-clipped. Transport SARs were 0.14% for hatchery fish and 0.11% for wild fish while SARs for all inriver fish were 0.09% for hatchery fish and 0.03% for wild fish. The respective overall T/Is for hatchery and wild fish were 1.5 (95% CI 1.1, 2.2) and 3.4 (95% CI 1.2, 18.3). When we compared transport SARs to inriver SARs of fish that were never again detected at a downstream dam after release from Lower Granite Dam, the T/Is dropped to 1.0 (95% CI 0.7, 1.5) and 1.5 (95% CI 0.6 to infinity) for hatchery and wild fish, respectively.

The 95% confidence intervals for our 1996 T/I estimates were much wider than those for our 1995 estimates (Marsh et al. In prep). This difference in precision was primarily due to much lower SARs for the 1996 marking. From the approximately 110,000 smolts marked in 1996, only 109 adults returned (SAR of approximately 0.10%), compared to over 900 adult returns from the approximately 242,000 smolts marked in 1995 (SAR of approximately 0.37%).

Because of the poor adult return from 1996, analyses fo the relationships between T/Is and SARs versus flows and 1996 spill conditions were meaningless. We also could not examine temporal trends in SARs and T/Is from the 1996 outmigration.

The modified PIT tag (containing a blank CWT) (Marsh et al. 1996) performed well. All of the 123 adults passing through the CWT detectors were diverted into the adult trap located in

the Lower Granite Dam fish ladder. Also, the PIT tag and the in-ladder adult PIT-tag detection system were highly efficient. Of the 119 returning adults with functioning PIT tags, 112 (94.1%) were detected by both the in-ladder PIT-tag detectors in the trap and with a hand-held detector during a later physical examination of the fish. The remaining seven fish were detected only by the hand-held detector.

Prior to release back to the ladder, we examined each adult for marks and injuries, recorded its fork length, and applied a numbered jaw tag. We are beginning to receive information regarding upstream recoveries of the jaw-tagged fish. Information on these recoveries through 28 October 1999 is included in Appendix Tables 13.0 through 14.2.

1998 Study Year--At Lower Granite Dam in 1999, we recovered spring/summer chinook salmon jacks tagged as smolts in 1998 (Table 8 and Appendix Tables 15.0 and 16.2). The first jack was observed on 15 May and the last on 26 July.

We recovered 67 jacks during 1999. Of the 67, 66 were detected on both the in-ladder PIT-tag detectors and with a hand-held detector during a later physical inspection, and 1 was detected only with the hand-held detector.

Of the 67 jacks, 2 hatchery jacks were removed from analysis because they had been transported at dams downstream from Lower Granite Dam. Of the remaining 65 jacks, 34 and 31 were from the transport and inriver releases, respectively. Overall smolt-to-adult return rates (SAR) to Lower Granite Dam were 0.08% for the transported group and 0.05% for all inriver fish (including those bypassed once or more than once downstream from Lower Granite Dam), for an overall T/I of 1.6. A 95% confidence interval will be determined when all adult returns are in.

Table 8. Preliminary summary of recovered adult spring/summer chinook salmon marked at Lower Granite Dam in 1998 for the transportation study (recoveries through 17 August 1999). Jaw tag recoveries above Lower Granite Dam are listed (recoveries reported through 28 October 1999).

Group[a]	Number released	Adult returns at Lower Granite Dam		Jaw tag recoveries			
		Number	%	Hatcheries	Sports fishery	Spawning grounds	Traps
1998							
Transport							
Hatchery	38,600	29	0.07	7	0	0	4
Wild	6,665	5	0.08	0	0	0	0
Total	45,265	34	0.08	7	0	0	4
Inriver[b]							
Hatchery	57,558	30	0.05	10	0	0	6
Wild	9,574	1	0.01	0	0	0	0
Total	67,137	31	0.05	10	0	0	6
Transported inrivers[b]							
Hatchery	2,945	2	0.07	0	0	0	0
Wild	451	0	0.00	0	0	0	0
Total	3,396	2	0.06	0	0	0	0

[a] Based upon fin clips, fish were classified as hatchery, wild, or unknown when tagged as juveniles. However, many fish were likely mis-classified because high numbers of hatchery fish were poorly fin clipped or received no fin clips (see Marsh et al. 1997).

[b] Adjusted as described in Sandford and Smith (In prep.)

When we compared the transport SAR to the SAR of inriver fish never detected at a downstream dam after release from Lower Granite Dam, the overall T/I dropped to 1.0. A 95% confidence interval will be determined when all adult returns are in.

Hatchery and wild fish accounted for 90.8% and 9.2% of the returning spring/summer chinook salmon jacks, respectively. When tagged as smolts, the percentages of hatchery and wild fish tagged were 85.5 and 14.5%, respectively (Marsh et al. In prep.), although the wild fraction was bolstered to some extent because some hatchery fish were not adipose-fin-clipped. Transport SARs were 0.07% for hatchery fish and 0.08% for wild fish while SARs for all inriver fish were 0.05% for hatchery fish and 0.01% for wild fish. The respective overall T/Is for hatchery and wild fish were 1.4 and 7.2. When we compared transport SARs to inriver SARs of fish that were never detected at a downstream dam after release from Lower Granite Dam, the hatchery T/I dropped to 1.0: no wild fish returned from this particular inriver group.

We compared spring/summer chinook salmon jack returns from 1998 with those from 1995. For the 1995 marking year, inriver jacks that had been tagged in April represented 72% of all the inriver jacks, while transported jacks that had been tagged in April represented only 22% of all the transported jacks (Marsh et al. 1997). For the 1998 marking year, virtually all spring/summer chinook salmon jacks, whether inriver or transported, had been tagged in April (85% and 88%, respectively).

The total number of jacks recovered from the 1998 marking (67) was greater than the number of jacks from the 1995 marking (59), even though we marked twice as many fish in 1995. Also, SARs from fish tagged in 1998 are already more than half the final SARs from fish

tagged in 1996. Based on the strength of this year's jack return, we expect that SARs for the 1998 marking year will be considerably higher than those of the 1995 marking year.

MARINE MAMMAL ABRASIONS-LOWER GRANITE DAM

We continued to monitor the prevalence of marine mammal tooth and claw abrasions on adult spring/summer chinook salmon at Lower Granite Dam during 1999. Prevalence averaged 21.3% on adults examined, with 30.6% of the abrasions consisting of open wounds of varying severity (Table 9). As in the past, abrasion prevalence was generally higher during the early portion of the adult run (Matthews et al. 1992; Achord et al. 1992; Harmon et al. 1993, 1995, 1996; Marsh et al. 1996, 1997, 1998). With the levels of abrasions observed, it is quite likely that marine mammals continue to negatively affect depressed runs of Snake River spring/summer chinook salmon.

Table 9. Weekly prevalence (14 April to 17 August) of marine mammal abrasions on adult spring/summer chinook salmon at Lower Granite Dam in 1999.

Date	Sample size	Incidence (%)
14-18 April	2	0.0
19-25 April	1	0.0
26 April - 2 May	28	46.4
3-9 May	91	40.7
10-16 May	216	32.9
17-23 May	636	27.4
24-30 May	419	20.3
31 May - 6 June	295	22.4
7-13 June	360	23.1
14-20 June	382	25.1
21-27 June	407	19.7
28 June - 4 July	398	14.6
5-11 July	308	9.4
12-18 July	163	6.7
19-25 July	79	7.6
26 July - 1 August	41	19.5
2-8 August	10	20.0
9-16 August	9	11.1
16-17 August	2	50.0
	Total 3,847	Average 21.3*

*Open wounds were associated with 30.6% of the abrasions.

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Appendix

Data Tables

Appendix Table 1.0. Total spring/summer chinook salmon collected and tagged at Lower Granite Dam in spring 1999.

	Collection			Tagged								Post-tagging mortality					
				In-river			Transports					In-river			Transports		
Date	H	W	T	H	W	T	H	W	T	Total tagged	Total percentage tagged*	H	W	T	H	W	T
30-Mar	1,008	3,006	4,014	112	120	232	51	89	140	372	9.3%	0	0	0	0	0	0
31-Mar	1,389	2,991	4,380	123	132	255	61	93	154	409	9.3%	0	2	2	0	0	0
1-Apr	1,237	4,233	5,470	63	110	173	47	88	135	308	5.6%	0	1	1	0	0	0
2-Apr	809	2,244	3,053	41	63	104	22	62	84	188	6.2%	0	0	0	0	0	0
3-Apr	808	2,530	3,338	38	78	116	24	53	77	193	5.8%	0	0	0	0	0	0
5-Apr	316	1,438	1,754	21	46	67	12	26	38	105	6.0%	0	1	1	0	1	1
6-Apr	91	999	1,090	5	38	43	5	22	27	70	6.4%	0	0	0	0	0	0
7-Apr	391	1,602	1,993	46	120	166	23	71	94	260	13.0%	0	3	3	0	1	1
8-Apr	313	1,314	1,627	38	78	116	21	41	62	178	10.9%	0	0	0	0	0	0
9-Apr	392	1,414	1,806	41	66	107	26	38	64	171	9.5%	0	0	0	0	0	0
10-Apr	535	1,430	1,965	48	68	116	24	41	65	181	9.2%	0	0	0	0	0	0
12-Apr	582	1,627	2,209	26	49	75	29	18	47	122	5.5%	0	1	1	0	0	0
13-Apr	729	1,342	2,071	24	45	69	27	16	43	112	5.4%	0	0	0	0	0	0
14-Apr	1,589	2,106	3,695	62	59	121	45	32	77	198	5.4%	0	1	1	0	0	0
15-Apr	2,052	2,941	4,993	70	67	137	51	33	84	221	4.4%	0	0	0	0	1	1
16-Apr	3,008	2,264	5,272	230	134	364	148	158	306	670	12.7%	20	22	42	0	0	0
17-Apr	2,152	1,740	3,892	277	111	388	134	78	212	600	15.4%	4	2	6	0	0	0
19-Apr	11,764	4,258	16,022	657	228	885	238	154	392	1,277	8.0%	3	2	5	0	0	0
20-Apr	26,707	10,793	37,500	1,290	755	2,045	1,043	371	1,414	3,459	9.2%	7	11	18	0	0	0
21-Apr	48,200	11,900	60,100	1,615	601	2,216	1,393	201	1,594	3,810	6.3%	19	12	31	0	0	0
22-Apr	64,800	10,950	75,750	2,453	617	3,070	1,474	442	1,916	4,986	6.6%	23	19	42	3	1	4
23-Apr	47,400	17,100	64,500	2,175	568	2,743	1,170	390	1,560	4,303	6.7%	82	60	142	14	4	18
24-Apr	39,300	13,950	53,250	2,201	365	2,566	1,436	403	1,839	4,405	8.3%	16	4	20	4	0	4
25-Apr	36,300	11,400	47,700	1,660	463	2,123	993	390	1,383	3,506	7.4%	25	8	33	0	0	0
26-Apr	29,250	9,750	39,000	2,813	518	3,331	1,972	631	2,603	5,934	15.2%	51	11	62	1	0	1
27-Apr	59,250	20,850	80,100	4,595	928	5,523	2,870	873	3,743	9,266	11.6%	56	14	70	1	0	1
28-Apr	46,050	12,450	58,500	3,890	783	4,673	2,558	572	3,130	7,803	13.3%	103	36	139	12	1	13
29-Apr	48,000	13,200	61,200	2,371	457	2,828	1,830	432	2,262	5,090	8.3%	9	5	14	0	0	0
30-Apr	57,450	13,950	71,400	3,225	451	3,676	1,705	245	1,950	5,626	7.9%	39	5	44	1	1	2
1-May	46,050	7,050	53,100	1,871	280	2,151	1,217	211	1,428	3,579	6.7%	38	5	43	0	0	0
2-May	69,450	13,350	82,800	3,298	469	3,767	1,578	197	1,775	5,542	6.7%	26	6	32	0	0	0
3-May	75,900	13,050	88,950	3,183	424	3,607	2,859	371	3,230	6,837	7.7%	58	10	68	0	0	0
4-May	69,600	12,000	81,600	5,152	649	5,801	2,782	247	3,029	8,830	10.8%	56	11	67	3	2	5
5-May	46,800	6,900	53,700	2,523	210	2,733	2,700	158	2,858	5,591	10.4%	5	1	6	1	0	1
6-May	41,850	6,300	48,150	1,195	109	1,304	1,184	87	1,271	2,575	5.3%	17	2	19	1	0	1
7-May	53,550	2,400	55,950	2,388	221	2,609	1,659	115	1,774	4,383	7.8%	33	3	36	7	3	10
8-May	67,800	5,850	73,650	2,672	204	2,876	1,884	161	2,045	4,921	6.7%	24	0	24	0	0	0
10-May	82,650	7,050	89,700	1,500	126	1,626	1,309	129	1,438	3,064	3.4%	12	3	15	1	0	1
11-May	42,450	3,150	45,600	675	99	774	625	48	673	1,447	3.2%	5	0	5	1	0	1
12-May	31,350	2,250	33,600	892	42	934	799	41	840	1,774	5.3%	12	1	13	1	0	1
13-May	35,200	4,100	39,300	1,317	80	1,397	903	40	943	2,340	6.0%	6	0	6	0	0	0

Appendix Table 1.0. Continued.

Date	Collection			Tagged						Total tagged	Total percentage tagged*	Post-tagging mortality					
				In-river			Transports					In-river			Transports		
	H	W	T	H	W	T	H	W	T			H	W	T	H	W	T
14-May	43,500	4,000	47,500	839	30	869	633	29	662	1,531	3.2%	2	0	2	0	0	0
17-May	42,600	3,300	45,900	1,442	57	1,499	1,354	45	1,399	2,898	6.3%	30	1	31	1	0	1
18-May	40,400	2,900	43,300	740	41	781	573	40	613	1,394	3.2%	3	0	3	0	0	0
19-May	33,800	2,700	36,500	619	52	671	379	25	404	1,075	2.9%	5	0	5	0	0	0
20-May	31,500	2,400	33,900	358	19	377	292	15	307	684	2.0%	1	0	1	0	0	0
21-May	29,700	3,300	33,000	365	29	394	309	20	329	723	2.2%	2	0	2	0	0	0
24-May	34,050	6,000	40,050	281	50	331	285	27	312	643	1.6%	3	2	5	2	0	2
25-May	27,750	5,100	32,850	438	66	504	392	41	433	937	2.9%	3	1	4	6	0	6
26-May	24,450	9,900	34,350	243	66	309	194	36	230	539	1.6%	0	1	1	0	0	0
4-Jun	1,150	1,650	2,800	7	18	25	12	10	22	47	1.7%	0	0	0	0	0	0
5-Jun	1,267	1,883	3,150	45	60	105	32	30	62	167	5.3%	0	1	1	0	0	0
7-Jun	1,450	3,817	5,267	70	106	176	39	46	85	261	5.0%	0	0	0	0	0	0
8-Jun	2,267	5,467	7,734	99	178	277	79	115	194	471	6.1%	0	1	1	0	0	0
9-Jun	717	1,567	2,284	35	34	69	17	31	48	117	5.1%	0	0	0	0	0	0
10-Jun	350	1,133	1,483	15	24	39	16	21	37	76	5.1%	0	0	0	0	0	0
11-Jun	533	1,217	1,750	22	32	54	11	22	33	87	5.0%	0	0	0	0	0	0
14-Jun	300	850	1,150	8	9	17	3	7	10	27	2.3%	0	0	0	0	0	0
15-Jun	133	400	533	18	19	37	12	14	26	63	11.8%	0	0	0	0	0	0
16-Jun	720	2,130	2,850	58	86	144	45	46	91	235	8.2%	0	0	0	0	0	0
17-Jun	650	1,583	2,233	36	38	74	18	22	40	114	5.1%	0	0	0	0	0	0
18-Jun	917	2,400	3,317	45	49	94	29	44	73	167	5.0%	0	0	0	0	0	0
21-Jun	233	1,133	1,366	12	7	19	8	2	10	29	2.1%	0	0	0	0	0	0
22-Jun	167	517	684	10	12	22	4	8	12	34	5.0%	0	0	0	0	0	0
23-Jun	67	567	634	6	10	16	2	8	10	26	4.1%	0	0	0	0	0	0
	1,513,193	335,136	1,848,329	62,687	12,123	74,810	43,669	8,572	52,241	127,051	6.9%	798	269	1,067	60	15	75

Appendix Table 2.0. Total steelhead collected and tagged at Lower Granite Dam in spring 1999.

	Collection			Tagged							Total	Post-tagging mortality					
				In-river			Transports			Total	percentage	In-river			Transports		
Date	H	W	T	H	W	T	H	W	T	tagged	tagged*	H	W	T	H	W	T
30-Mar	1,385	1,289	2,674	79	65	144	70	55	125	269	10.1%	0	0	0	0	0	0
31-Mar	1,846	1,083	2,929	74	47	121	47	50	97	218	7.4%	0	1	1	0	0	0
1-Apr	1,723	1,235	2,958	38	27	65	37	26	63	128	4.3%	0	0	0	0	0	0
2-Apr	1,991	1,723	3,714	47	22	69	38	20	58	127	3.4%	0	0	0	0	0	0
3-Apr	2,701	1,242	3,943	62	33	95	60	24	84	179	4.5%	0	0	0	0	0	0
5-Apr	866	317	1,183	22	9	31	22	5	27	58	4.9%	0	0	0	0	0	0
6-Apr	1,324	866	2,190	45	16	61	29	5	34	95	4.3%	0	0	0	0	0	0
7-Apr	3,127	427	3,554	225	35	260	139	26	165	425	12.0%	1	0	1	0	0	0
8-Apr	1,442	145	1,587	72	13	85	47	6	53	138	8.7%	0	0	0	0	0	0
9-Apr	2,335	277	2,612	113	17	130	82	13	95	225	8.6%	0	0	0	0	0	0
10-Apr	5,882	672	6,554	260	42	302	187	36	223	525	8.0%	0	0	0	0	0	0
12-Apr	4,127	283	4,410	123	10	133	71	8	79	212	4.8%	0	0	0	0	0	0
13-Apr	3,786	331	4,117	97	9	106	76	7	83	189	4.6%	0	0	0	0	0	0
14-Apr	8,901	708	9,609	307	26	333	126	16	142	475	4.9%	0	0	0	0	0	0
15-Apr	7,530	434	7,964	230	15	245	100	12	112	357	4.5%	0	0	0	0	0	0
16-Apr	8,545	424	8,969	831	38	869	388	29	417	1,286	14.3%	0	0	0	0	0	0
17-Apr	4,725	302	5,027	587	44	631	275	22	297	928	18.5%	2	0	2	0	0	0
19-Apr	7,817	840	8,657	655	67	722	481	52	533	1,255	14.5%	1	0	1	0	0	0
20-Apr	11,633	2,900	14,533	374	85	459	230	74	304	763	5.3%	0	0	0	0	0	0
21-Apr	32,700	8,400	41,100	655	275	930	574	179	753	1,683	4.1%	3	3	6	0	0	0
22-Apr	48,600	9,150	57,750	996	472	1,468	809	334	1,143	2,611	4.5%	3	3	6	1	0	1
23-Apr	7,500	18,150	25,650	1,200	604	1,804	681	323	1,004	2,808	10.9%	4	1	5	0	0	0
24-Apr	86,850	18,150	105,000	1,289	637	1,926	745	399	1,144	3,070	2.9%	0	1	1	0	0	0
25-Apr	40,800	7,050	47,850	802	312	1,114	600	234	834	1,948	4.1%	0	0	0	1	0	1
26-Apr	33,000	6,750	39,750	1,400	324	1,724	936	221	1,157	2,881	7.2%	8	1	9	0	0	0
27-Apr	63,150	5,400	68,550	1,874	341	2,215	1,475	205	1,680	3,895	5.7%	6	4	10	1	0	1
28-Apr	57,300	4,350	61,650	1,682	293	1,975	1,174	182	1,356	3,331	5.4%	13	1	14	1	0	1
29-Apr	73,200	6,750	79,950	1,367	199	1,566	1,133	174	1,307	2,873	3.6%	0	0	0	0	0	0
30-Apr	88,650	6,450	95,100	1,841	263	2,104	1,443	206	1,649	3,753	3.9%	0	0	0	0	0	0
1-May	89,250	6,750	96,000	1,496	188	1,684	1,414	123	1,537	3,221	3.4%	20	3	23	0	0	0
2-May	134,400	10,500	144,900	1,178	145	1,323	1,073	122	1,195	2,518	1.7%	1	0	1	0	0	0
3-May	105,750	6,300	112,050	1,615	97	1,712	1,284	64	1,348	3,060	2.7%	25	0	25	0	0	0
4-May	96,750	4,350	101,100	1,928	158	2,086	1,795	132	1,927	4,013	4.0%	2	0	2	1	0	1
5-May	291,750	7,350	299,100	3,713	243	3,956	1,813	126	1,939	5,895	2.0%	19	0	19	0	0	0
6-May	63,600	2,850	66,450	1,754	133	1,887	1,036	63	1,099	2,986	4.5%	22	1	23	0	0	0
7-May	53,550	2,400	55,950	2,307	158	2,465	1,790	150	1,940	4,405	7.9%	10	1	11	15	2	17
8-May	64,500	4,200	68,700	1,353	98	1,451	834	91	925	2,376	3.5%	3	0	3	0	0	0
10-May	43,500	3,450	46,950	2,382	123	2,505	1,405	90	1,495	4,000	8.5%	28	4	32	0	0	0
11-May	31,950	3,000	34,950	1,539	126	1,665	1,044	89	1,133	2,798	8.0%	12	3	15	0	0	0
12-May	28,650	3,000	31,650	1,488	109	1,597	942	82	1,024	2,621	8.3%	2	0	2	0	0	0
13-May	36,100	3,800	39,900	1,927	185	2,112	1,274	124	1,398	3,510	8.8%	7	2	9	0	0	0

Appendix Table 2.0. Continued.

Date	Collection			Tagged						Total tagged	Total percentage tagged*	Post-tagging mortality					
				In-river			Transports					In-river			Transports		
	H	W	T	H	W	T	H	W	T			H	W	T	H	W	T
14-May	47,300	3,400	50,700	2,391	187	2,578	1,486	117	1,603	4,181	8.2%	73	4	77	0	0	0
17-May	28,400	2,800	31,200	2,674	192	2,866	1,550	125	1,675	4,541	14.6%	0	0	0	1	0	1
18-May	21,800	1,700	23,500	1,527	144	1,671	1,201	133	1,334	3,005	12.8%	1	0	1	1	0	1
19-May	27,900	2,200	30,100	1,714	158	1,872	1,274	139	1,413	3,285	10.9%	0	0	0	0	0	0
20-May	20,700	2,900	23,600	1,746	157	1,903	1,242	122	1,364	3,267	13.8%	1	1	2	0	0	0
21-May	38,200	3,600	41,800	2,130	199	2,329	1,286	117	1,403	3,732	8.9%	3	0	3	0	0	0
24-May	119,700	11,850	131,550	1,425	288	1,713	1,103	263	1,366	3,079	2.3%	2	3	5	1	0	1
25-May	114,300	16,200	130,500	1,746	285	2,031	1,241	287	1,528	3,559	2.7%	5	2	7	0	0	0
26-May	193,950	19,050	213,000	2,604	318	2,922	1,547	293	1,840	4,762	2.2%	6	0	6	0	0	0
4-Jun	8,700	1,400	10,100	68	18	86	66	10	76	162	1.6%	0	0	0	0	0	0
5-Jun	13,417	3,283	16,700	347	97	444	234	82	316	760	4.6%	1	0	1	0	0	0
7-Jun	8,383	1,433	9,816	205	45	250	148	24	172	422	4.3%	3	0	3	0	0	0
8-Jun	7,683	1,383	9,066	220	37	257	126	36	162	419	4.6%	0	0	0	0	0	0
9-Jun	3,283	633	3,916	101	19	120	61	16	77	197	5.0%	0	0	0	0	0	0
10-Jun	2,383	367	2,750	71	14	85	48	7	55	140	5.1%	0	0	0	0	0	0
11-Jun	2,967	483	3,450	86	18	104	54	13	67	171	5.0%	0	0	0	0	0	0
14-Jun	1,200	133	1,333	33	5	38	25	2	27	65	4.9%	0	0	0	0	0	0
15-Jun	2,067	350	2,417	61	11	72	43	9	52	124	5.1%	0	0	0	0	0	0
16-Jun	4,440	680	5,120	235	35	270	137	32	169	439	8.6%	0	0	0	0	0	0
17-Jun	8,400	617	9,017	232	22	254	159	12	171	425	4.7%	0	0	0	0	0	0
18-Jun	12,917	1,150	14,067	359	38	397	231	12	243	640	4.5%	0	0	0	0	0	0
21-Jun	3,967	300	4,267	50	5	55	36	6	42	97	2.3%	0	0	0	0	0	0
22-Jun	1,483	300	1,783	44	8	52	27	6	33	85	4.8%	0	0	0	0	0	0
23-Jun	1,500	117	1,617	50	4	54	28	2	30	84	5.2%	0	0	0	0	0	0
	2,348,226	240,377	2,588,603	60,146	8,407	68,553	41,132	6,064	47,196	115,749	4.5%	287	39	326	23	2	25

Appendix Table 3.0. Release numbers by date for yearling spring/summer chinook salmon tagged at Lower Granite Dam, 1999.

Release date	Number released					
	In-River			Transport		
	H	W	Total	H	W	Total
31-Mar	112	120	232	112	182	294
1-Apr	123	130	253	---	---	---
2-Apr	63	109	172	69	150	219
3-Apr	41	63	104	---	---	---
4-Apr	38	78	116	24	53	77
6-Apr	21	45	66	17	47	64
7-Apr	5	38	43	---	---	---
8-Apr	46	117	163	44	111	155
9-Apr	38	78	116	---	---	---
10-Apr	41	66	107	50	79	129
11-Apr	48	68	116	---	---	---
12-Apr	---	---	---	29	18	47
13-Apr	26	48	74	---	---	---
14-Apr	24	45	69	72	48	120
15-Apr	62	58	120	---	---	---
16-Apr	70	67	137	51	32	83
17-Apr	210	112	322	---	---	---
18-Apr	272	109	381	282	236	518
20-Apr	652	226	878	238	154	392
21-Apr	1,279	743	2,022	---	---	---
22-Apr	1,593	589	2,182	2,436	572	3,008
23-Apr	2,429	597	3,026	1,471	441	1,912
24-Apr	2,090	508	2,598	1,156	386	1,542
25-Apr	2,182	361	2,543	1,432	403	1,835
26-Apr	1,633	454	2,087	993	390	1,383
27-Apr	2,758	507	3,265	1,971	631	2,602
28-Apr	4,533	913	5,446	2,869	873	3,742
29-Apr	3,787	747	4,534	2,546	571	3,117
30-Apr	2,361	452	2,813	1,830	432	2,262
1-May	3,186	444	3,630	1,704	244	1,948
2-May	1,830	275	2,105	1,217	211	1,428
3-May	3,270	463	3,733	1,578	197	1,775
4-May	3,121	414	3,535	2,859	371	3,230
5-May	5,096	638	5,734	2,779	245	3,024
6-May	2,496	209	2,705	2,699	158	2,857
7-May	1,174	106	1,280	1,183	87	1,270

Appendix Table 3.0. Continued.

Release date	Number released					
	In-River			Transport		
	H	W	Total	H	W	Total
8-May	2,352	218	2,570	1,652	112	1,764
9-May	2,643	204	2,847	1,884	161	2,045
11-May	1,487	123	1,610	1,308	129	1,437
12-May	669	99	768	624	48	672
13-May	879	41	920	798	41	839
14-May	1,308	80	1,388	903	40	943
15-May	837	30	867	633	29	662
18-May	1,408	56	1,464	1,353	45	1,398
19-May	733	40	773	573	40	613
20-May	609	52	661	379	25	404
21-May	357	19	376	292	15	307
22-May	363	29	392	309	20	329
25-May	278	48	326	---	---	---
26-May	435	65	500	669	68	737
27-May	243	65	308	194	36	230
5-Jun	7	18	25	44	40	84
6-Jun	45	59	104	---	---	---
7-Jun	---	---	---	39	46	85
8-Jun	70	106	176	79	115	194
9-Jun	99	177	276	17	31	48
10-Jun	35	34	69	---	---	—v
11-Jun	15	24	39	27	43	70
12-Jun	22	32	54	---	---	---
15-Jun	8	9	17	15	21	36
16-Jun	18	19	37	---	---	---
17-Jun	58	86	144	63	68	131
18-Jun	36	38	74	---	---	---
19-Jun	45	49	94	29	44	73
21-Jun	---	---	---	8	2	10
22-Jun	12	7	19	---	---	---
23-Jun	10	12	22	6	16	22
24-Jun	6	10	16	---	---	---
	61,797	11,846	73,643	43,609	8,557	52,166

Appendix Table 4.0. Release numbers by date for steelhead tagged at Lower Granite Dam, 1999.

Release date	Number released					
	In-River			Transport		
	H	W	Total	H	W	Total
31-Mar	79	65	144	117	105	222
1-Apr	74	46	120	---	---	---
2-Apr	38	27	65	75	46	121
3-Apr	47	22	69	---	---	---
4-Apr	62	33	95	60	24	84
6-Apr	22	9	31	51	10	61
7-Apr	45	16	61	---	---	---
8-Apr	224	35	259	186	32	218
9-Apr	72	13	85	---	---	---
10-Apr	113	17	130	269	49	318
11-Apr	260	42	302	---	---	---
12-Apr	---	---	---	71	8	79
13-Apr	123	10	133	---	---	---
14-Apr	97	9	106	202	23	225
15-Apr	306	26	332	---	---	---
16-Apr	230	15	245	100	12	112
17-Apr	830	38	868	---	---	---
18-Apr	583	44	627	663	51	714
20-Apr	652	67	719	481	52	533
21-Apr	373	85	458	---	---	---
22-Apr	652	272	924	804	253	1,057
23-Apr	996	471	1,467	809	334	1,143
24-Apr	1,193	599	1,792	680	323	1,003
25-Apr	1,278	635	1,913	745	399	1,144
26-Apr	800	311	1,111	600	234	834
27-Apr	1,399	324	1,723	935	221	1,156
28-Apr	1,864	340	2,204	1,475	205	1,680
29-Apr	1,673	289	1,962	1,173	182	1,355
30-Apr	1,350	197	1,547	1,132	174	1,306
1-May	1,839	263	2,102	1,443	206	1,649
2-May	1,475	184	1,659	1,414	123	1,537
3-May	1,176	145	1,321	1,073	122	1,195
4-May	1,590	96	1,686	1,284	64	1,348
5-May	1,924	158	2,082	1,794	132	1,926
6-May	3,686	243	3,929	1,813	126	1,939
7-May	1,729	131	1,860	1,036	63	1,099

Appendix Table 4.0. Continued.

Release date	Number released					
	In-River			Transport		
	H	W	Total	H	W	Total
8-May	2,290	157	2,447	1,775	148	1,923
9-May	1,337	98	1,435	834	91	925
11-May	2,343	119	2,462	1,405	90	1,495
12-May	1,523	123	1,646	1,044	89	1,133
13-May	1,485	109	1,594	942	82	1,024
14-May	1,917	183	2,100	1,274	124	1,398
15-May	2,317	183	2,500	1,486	117	1,603
18-May	2,673	192	2,865	1,549	125	1,674
19-May	1,524	144	1,668	1,200	133	1,333
20-May	1,713	158	1,871	1,274	139	1,413
21-May	1,738	156	1,894	1,242	122	1,364
22-May	2,118	199	2,317	1,286	117	1,403
25-May	1,422	285	1,707	---	---	---
26-May	1,739	283	2,022	2,343	550	2,893
27-May	2,596	318	2,914	1,547	293	1,840
5-Jun	68	18	86	300	92	392
6-Jun	346	97	443	---	---	---
7-Jun	---	---	---	148	24	172
8-Jun	202	45	247	126	36	162
9-Jun	220	37	257	61	16	77
10-Jun	99	19	118	---	---	---
11-Jun	71	14	85	102	20	122
12-Jun	86	18	104	---	---	---
15-Jun	33	5	38	68	11	79
16-Jun	61	11	72	---	---	---
17-Jun	235	35	270	296	44	340
18-Jun	232	22	254	---	---	---
19-Jun	359	38	397	231	12	243
21-Jun	---	---	---	36	6	42
22-Jun	50	5	55	---	---	---
23-Jun	44	8	52	55	8	63
24-Jun	50	4	54	---	---	---
	59,745	8,360	68,105	41,109	6,062	47,171

Appendix Table 5.0 Observations (detections) of yearling spring/summer chinook salmon released into the Lower Granite Dam tailrace, 1999.

	Little Goose	Lower Monumental		McNary			Total			Total	Total
	1st Obs	1st Obs	2nd Obs	1st Obs	2nd Obs	3rd Obs	1st Obs	2nd Obs	3rd Obs	obs	released
DMM99089.IR1	85	55	35	27	37	18	167	72	18	257	232
DMM99090.IR1	103	52	39	23	51	15	178	90	15	283	253
DMM99091.IR1	78	32	40	19	19	10	129	59	10	198	276
DMM99092.IR1	44	25	21	11	20	7	80	41	7	128	104
DMM99093.IR1	50	30	23	6	25	11	86	48	11	145	116
DMM99095.IR1	16	24	8	10	11	2	50	19	2	71	66
DMM99096.IR1	25	11	11	4	8	4	40	19	4	63	43
DMM99097.IR1	76	36	35	16	32	16	128	67	16	211	163
DMM99098.IR1	53	29	29	10	15	14	92	44	14	150	116
DMM99099.IR1	52	29	25	4	16	12	85	41	12	138	107
DMM99100.IR1	42	42	20	3	25	4	87	45	4	136	116
DMM99102.IR1	39	19	21	3	4	7	61	25	7	93	74
DMM99103.IR1	41	16	28	3	7	5	60	35	5	100	69
DMM99104.IR1	79	29	51	2	15	17	110	66	17	193	120
DMM99105.IR1	88	17	57	6	12	21	111	69	21	201	137
DMM99106.IR1	202	51	131	14	20	43	267	151	43	461	321
DMM99107.IR1	176	43	102	15	25	28	234	127	28	389	274
DMM99107.IR2	60	23	31	4	12	12	87	43	12	142	106
DMM99107.IR3	-	1	-	-	-	-	1	-	-	1	1
DMM99109.IR1	310	107	152	26	61	44	443	213	44	700	559
DMM99109.IR2	174	75	91	13	39	23	262	130	23	415	319
DMM99110.IR1	776	255	420	39	161	132	1,070	581	132	1,783	1,318
DMM99110.IR2	456	123	260	23	75	74	602	335	74	1,011	703
DMM99110.IR3	-	1	-	-	-	-	1	-	-	1	1
DMM99111.IR1	1,008	307	558	49	206	174	1,364	764	174	2,302	1,624
DMM99111.IR2	357	97	180	16	67	60	470	247	60	777	554
DMM99111.IR3	2	1	-	-	-	-	3	-	-	3	4
DMM99112.IR1	1,085	277	572	57	219	179	1,419	791	179	2,389	1,701
DMM99112.IR2	886	208	467	45	188	148	1,139	655	148	1,942	1,325
DMM99113.IR1	988	264	492	63	215	156	1,315	707	156	2,178	1,618
DMM99113.IR2	579	178	294	60	140	92	817	434	92	1,343	980
DMM99114.IR1	1,118	298	522	115	256	165	1,531	778	165	2,474	1,834
DMM99114.IR2	452	120	206	39	112	58	611	318	58	987	709
DMM99115.IR1	796	253	368	87	219	124	1,136	587	124	1,847	1,395
DMM99115.IR2	389	123	199	46	85	69	558	284	69	911	692
DMM99116.IR1	1,456	553	712	203	368	210	2,212	1,080	210	3,502	2,744
DMM99116.IR2	280	126	135	34	89	38	440	224	38	702	521
DMM99117.IR1	1,592	753	806	251	502	251	2,596	1,308	251	4,155	3,263
DMM99117.IR2	1,085	427	547	181	324	190	1,693	871	190	2,754	2,084
DMM99117.IR3	37	32	23	8	12	10	77	35	10	122	99
DMM99118.IR1	1,617	430	803	186	428	289	2,233	1,231	289	3,753	2,686
DMM99118.IR2	1,118	312	565	100	303	211	1,530	868	211	2,609	1,784
DMM99118.IR3	40	10	17	5	14	6	55	31	6	92	64
DMM99119.IR1	1,530	373	704	158	433	248	2,061	1,137	248	3,446	2,413
DMM99119.IR2	248	64	107	26	76	35	338	183	35	556	398
DMM99119.IR3	2	-	1	-	-	-	2	1	-	3	2
DMM99120.IR1	1,528	380	665	138	386	229	2,046	1,051	229	3,326	2,392
DMM99120.IR2	727	223	330	69	192	120	1,019	522	120	1,661	1,218
DMM99120.IR3	12	2	7	4	4	2	18	11	2	31	20
DMM99121.IR1	851	246	381	103	217	121	1,200	598	121	1,919	1,449
DMM99121.IR2	328	101	149	38	90	45	467	239	45	751	571
DMM99121.IR3	49	14	24	2	16	9	65	40	9	114	85
DMM99122.IR1	1,171	383	486	139	338	161	1,693	824	161	2,678	2,081
DMM99122.IR2	843	306	378	136	236	121	1,285	614	121	2,020	1,568
DMM99122.IR3	38	14	14	9	15	5	61	29	5	95	84
DMM99123.IR1	1,470	448	582	196	439	179	2,114	1,021	179	3,314	2,669
DMM99123.IR2	457	135	170	66	135	68	658	305	68	1,031	821
DMM99123.IR3	27	7	10	2	6	2	36	16	2	54	45
DMM99124.IR1	1,809	571	732	259	549	260	2,639	1,281	260	4,180	3,336

Appendix Table 5.0 Continued.

	Little Goose	Lower Monumental		McNary			Total			Total obs	Total released
	1st Obs	1st Obs	2nd Obs	1st Obs	2nd Obs	3rd Obs	1st Obs	2nd Obs	3rd Obs		
DMM99124.IR2	1,223	393	498	172	364	186	1,788	862	186	2,836	2,281
DMM99124.IR3	65	26	29	7	18	11	98	47	11	156	117
DMM99125.IR1	1,128	473	440	206	382	142	1,807	822	142	2,771	2,386
DMM99125.IR2	146	66	45	23	44	16	235	89	16	340	306
DMM99125.IR3	5	1	2	-	-	2	6	2	2	10	11
DMM99125.IR4	2	-	1	-	-	-	2	1	-	3	2
DMM99126.IR1	572	262	232	108	189	69	942	421	69	1,432	1,280
DMM99127.IR1	963	373	339	174	269	92	1,510	608	92	2,210	2,051
DMM99127.IR2	227	87	91	40	61	30	354	152	30	536	512
DMM99127.IR3	1	-	1	-	-	-	1	1	-	2	4
DMM99127.IR4	-	1	-	-	-	-	1	-	-	1	3
DMM99128.IR1	889	299	283	194	230	85	1,382	513	85	1,980	1,991
DMM99128.IR2	392	139	127	73	120	34	604	247	34	885	843
DMM99128.IR3	3	1	1	3	1	-	7	2	-	9	13
DMM99130.IR1	624	280	191	160	160	56	1,064	351	56	1,471	1,610
DMM99131.IR1	304	143	97	84	96	36	531	193	36	760	768
DMM99132.IR1	373	164	105	87	126	35	624	231	35	890	920
DMM99133.IR1	549	202	122	128	156	36	879	278	36	1,193	1,302
DMM99133.IR2	33	14	11	10	11	3	57	22	3	82	86
DMM99134.IR1	307	122	73	92	82	18	521	155	18	694	830
DMM99134.IR2	13	2	7	5	1	3	20	8	3	31	37
DMM99137.IR1	568	176	119	192	161	37	936	280	37	1,253	1,463
DMM99138.IR1	260	98	52	86	79	8	444	131	8	583	773
DMM99139.IR1	257	82	73	46	36	13	385	109	13	507	661
DMM99140.IR1	149	49	50	12	14	5	210	64	5	279	376
DMM99141.IR1	130	62	42	17	11	6	209	53	6	268	392
DMM99144.IR1	35	55	15	45	16	-	135	31	-	166	326
DMM99145.IR1	146	122	55	18	14	4	286	69	4	359	499
DMM99146.IR2	152	49	70	9	17	14	210	87	14	311	305
DMM99146.IR3	1	-	-	-	-	-	1	-	-	1	2
DMM99146.IR4	1	-	1	-	-	-	1	1	-	2	1
DMM99155.IR1	19	2	11	1	3	1	22	14	1	37	25
DMM99156.IR1	52	21	28	5	3	5	78	31	5	114	104
DMM99158.IR1	82	39	45	3	11	3	124	56	3	183	176
DMM99159.IR1	122	67	68	2	6	2	191	74	2	267	276
DMM99160.IR1	27	25	16	-	2	1	52	18	1	71	69
DMM99161.IR1	16	11	8	-	2	-	27	10	-	37	39
DMM99162.IR1	33	10	16	-	1	3	43	17	3	63	54
DMM99165.IR1	6	4	3	2	2	-	12	5	-	17	17
DMM99166.IR1	14	8	7	-	3	1	22	10	1	33	37
DMM99167.IR1	65	22	33	6	4	3	93	37	3	133	144
DMM99168.IR1	36	14	21	1	-	3	51	21	3	75	74
DMM99169.IR1	58	18	36	-	1	4	76	37	4	117	94
DMM99172.IR1	11	5	5	-	1	-	16	6	-	22	19
DMM99173.IR1	20	-	11	-	1	2	20	12	2	34	22
DMM99174.IR1	9	3	5	-	1	-	12	6	-	18	16
Totals	39,088	13,151	17,321	5,182	10,268	5,523	57,421	27,589	5,523	90,533	73,641

Appendix Table 6.0 Observations (detections) of yearling steelhead released into the Lower Granite Dam tailrace, 1999.

	Little Goose	Lower Monumental		McNary			Total			Total	Total
	1st Obs	1st Obs	2nd Obs	1st Obs	2nd Obs	3rd Obs	1st Obs	2nd Obs	3rd Obs	obs	released
DMM99089.IR1	80	28	33	12	25	14	120	58	14	192	144
DMM99090.IR1	75	21	23	11	30	11	107	53	11	171	120
DMM99091.IR1	32	15	12	7	16	7	54	28	7	89	134
DMM99092.IR1	31	14	13	8	20	2	53	33	2	88	69
DMM99093.IR1	44	26	22	10	28	12	80	50	12	142	95
DMM99095.IR1	11	10	7	3	7	3	24	14	3	41	31
DMM99096.IR1	29	15	13	10	12	6	54	25	6	85	61
DMM99097.IR1	105	67	56	40	45	22	212	101	22	335	259
DMM99098.IR1	38	16	19	10	13	8	64	32	8	104	85
DMM99099.IR1	53	37	22	10	14	5	100	36	5	141	130
DMM99100.IR1	147	79	90	18	28	24	244	118	24	386	302
DMM99102.IR1	64	36	41	4	16	9	104	57	9	170	133
DMM99103.IR1	45	38	31	4	14	6	87	45	6	138	106
DMM99104.IR1	153	114	95	4	29	17	271	124	17	412	332
DMM99105.IR1	133	66	81	8	20	18	207	101	18	326	245
DMM99106.IR3	254	113	168	7	38	36	374	206	36	616	448
DMM99106.IR4	242	106	157	7	38	23	355	195	23	573	420
DMM99107.IR3	201	101	118	8	32	22	310	150	22	482	370
DMM99107.IR4	132	72	92	6	16	17	210	108	17	335	257
DMM99109.IR3	317	166	212	9	45	50	492	257	50	799	583
DMM99109.IR4	77	30	52	1	5	7	108	57	7	172	136
DMM99110.IR3	232	89	141	10	30	19	331	171	19	521	413
DMM99110.IR4	19	18	13	1	3	2	38	16	2	56	45
DMM99111.IR3	610	146	385	13	43	73	769	428	73	1,270	884
DMM99111.IR4	28	9	18		2	4	37	20	4	61	40
DMM99112.IR3	978	286	634	13	68	109	1,277	702	109	2,088	1,467
DMM99113.IR3	1,157	338	744	24	84	128	1,519	828	128	2,475	1,792
DMM99114.IR3	1,124	436	683	29	123	128	1,589	806	128	2,523	1,913
DMM99115.IR3	635	236	340	18	86	67	889	426	67	1,382	1,111
DMM99116.IR3	930	365	528	51	127	111	1,346	655	111	2,112	1,723
DMM99117.IR3	995	593	610	83	161	125	1,671	771	125	2,567	2,204
DMM99118.IR3	1,185	368	680	43	153	135	1,596	833	135	2,564	1,962
DMM99119.IR3	1,032	210	570	36	103	129	1,278	673	129	2,080	1,547
DMM99120.IR1	2	1	-	-	1	-	3	1	-	4	3
DMM99120.IR3	1,519	254	835	24	134	157	1,797	969	157	2,923	2,099
DMM99121.IR2	19	3	8	1	1	2	23	9	2	34	27
DMM99121.IR3	1,093	209	537	25	116	91	1,327	653	91	2,071	1,632
DMM99122.IR2	30	11	12		7	4	41	19	4	64	53
DMM99122.IR3	682	237	331	35	96	53	954	427	53	1,434	1,268
DMM99123.IR3	834	330	434	39	106	75	1,203	540	75	1,818	1,686
DMM99124.IR2	106	30	51	4	9	7	140	60	7	207	172
DMM99124.IR3	1,148	299	581	31	103	105	1,478	684	105	2,267	1,910
DMM99125.IR2	8	2	1	1	-	-	11	1	-	12	13
DMM99125.IR3	1,349	373	657	47	143	119	1,769	800	119	2,688	2,329
DMM99125.IR4	859	285	422	37	93	74	1,181	515	74	1,770	1,585
DMM99126.IR2	9	2	3	1	2	2	12	5	2	19	14
DMM99126.IR3	592	182	279	25	64	56	799	343	56	1,198	1,108
DMM99126.IR4	389	119	178	12	39	39	520	217	39	776	738
DMM99127.IR2	2	1	-	-	-	-	3	-	-	3	3
DMM99127.IR3	920	325	416	43	113	70	1,288	529	70	1,887	1,800
DMM99127.IR4	339	79	140	12	31	20	430	171	20	621	644
DMM99128.IR2	6	-	4	1	-	1	7	4	1	12	11
DMM99128.IR3	728	206	305	29	77	57	963	382	57	1,402	1,371
DMM99128.IR4	32	10	17	-	2	2	42	19	2	63	53
DMM99130.IR3	754	203	299	30	89	70	987	388	70	1,445	1,483
DMM99130.IR4	491	133	189	25	58	40	649	247	40	936	979
DMM99131.IR3	449	165	192	36	67	41	650	259	41	950	988
DMM99131.IR4	293	101	104	25	38	19	419	142	19	580	658
DMM99132.IR3	603	197	249	42	98	52	842	347	52	1,241	1,282

Appendix Table 6.0 Continued.

	Little Goose	Lower Monumental		McNary			Total			Total obs	Total released
	1st Obs	1st Obs	2nd Obs	1st Obs	2nd Obs	3rd Obs	1st Obs	2nd Obs	3rd Obs		
DMM99132.IR4	139	50	47	16	28	11	205	75	11	291	312
DMM99133.IR3	533	196	228	49	71	48	778	299	48	1,125	1,260
DMM99133.IR4	359	142	140	24	55	26	525	195	26	746	840
DMM99134.IR3	575	259	265	63	80	62	897	345	62	1,304	1,383
DMM99134.IR4	451	206	189	50	66	42	707	255	42	1,004	1,116
DMM99137.IR3	703	337	324	62	121	64	1,102	445	64	1,611	1,538
DMM99137.IR4	611	285	286	54	86	58	950	372	58	1,380	1,327
DMM99138.IR3	403	196	197	39	58	36	638	255	36	929	888
DMM99138.IR4	365	193	194	20	60	27	578	254	27	859	780
DMM99139.IR3	487	216	271	30	56	42	733	327	42	1,102	982
DMM99139.IR4	465	190	253	25	50	45	680	303	45	1,028	889
DMM99140.IR3	512	226	277	18	47	27	756	324	27	1,107	1,011
DMM99140.IR4	435	217	246	16	44	37	668	290	37	995	883
DMM99141.IR3	632	324	360	25	56	42	981	416	42	1,439	1,299
DMM99141.IR4	478	269	254	7	58	36	754	312	36	1,102	1,018
DMM99144.IR3	175	291	87	103	92	17	569	179	17	765	982
DMM99144.IR4	102	194	60	63	52	13	359	112	13	484	725
DMM99145.IR3	561	318	312	30	70	46	909	382	46	1,337	1,154
DMM99145.IR4	421	253	223	23	58	28	697	281	28	1,006	868
DMM99146.IR3	1,241	149	652	13	65	68	1,403	717	68	2,188	1,596
DMM99146.IR4	1,051	108	552	9	57	59	1,168	609	59	1,836	1,318
DMM99155.IR1	59	9	35	-	1	5	68	36	5	109	86
DMM99156.IR1	297	82	187	4	16	28	383	203	28	614	443
DMM99158.IR1	155	32	71	2	8	8	189	79	8	276	247
DMM99159.IR1	176	24	81	1	6	4	201	87	4	292	257
DMM99160.IR1	48	17	22	1	2	3	66	24	3	93	118
DMM99161.IR1	40	16	17	-	1		56	18	-	74	85
DMM99162.IR1	52	26	26	-	-	2	78	26	2	106	104
DMM99165.IR1	20	9	14	-	-	-	29	14	-	43	38
DMM99166.IR1	14	31	6	-	1	-	45	7	-	52	72
DMM99167.IR1	108	63	49	5	9	3	176	58	3	237	270
DMM99168.IR1	131	52	74	2	5	6	185	79	6	270	254
DMM99169.IR1	188	112	130	1	3	4	301	133	4	438	397
DMM99172.IR1	43	6	28	-	1	3	49	29	3	81	55
DMM99173.IR1	47		28	-	-	3	47	28	3	78	52
DMM99174.IR1	43	1	25	-	2	1	44	27	1	72	54
Totals	36,564	13,120	19,157	1,798	4,346	3,409	51,482	23,503	3,409	78,394	68,105

Appendix Table 7.0 Locations of observations (detections) of PIT-tagged spring/summer chinook salmon within the Little Goose Dam juvenile fish facility, 1999.

Obsdate	SepDiv	Div	Sep	SepSamp	Samp	SepRace	Race	Total obs
02-Apr	1	-	-	-	-	-	-	1
03-Apr	6	-	-	-	-	-	-	6
04-Apr	3	-	-	-	-	2	-	5
05-Apr	1	-	-	2	-	1	-	4
06-Apr	6	-	-	1	-	-	-	7
07-Apr	6	-	-	2	-	-	-	8
08-Apr	11	-	-	-	-	-	-	11
09-Apr	18	-	-	9	-	-	-	27
10-Apr	30	-	-	3	-	-	-	33
11-Apr	28	-	-	1	-	-	-	29
12-Apr	31	-	-	1	-	-	-	32
13-Apr	52	-	-	6	-	1	-	59
14-Apr	62	-	-	2	-	-	-	64
15-Apr	45	-	-	3	-	-	2	50
16-Apr	41	-	-	-	-	1	-	42
17-Apr	45	1	-	4	-	1	-	51
18-Apr	51	-	-	2	-	-	-	53
19-Apr	112	-	-	4	1	-	1	118
20-Apr	182	-	-	3	-	2	-	187
21-Apr	188	-	-	1	-	-	2	191
22-Apr	313	-	2	-	-	-	-	315
23-Apr	595	1	-	2	-	1	1	600
24-Apr	529	-	2	3	-	2	-	536
25-Apr	831	-	1	6	-	4	2	844
26-Apr	1,710	6	5	14	-	6	8	1,749
27-Apr	2,089	8	3	9	-	8	5	2,122
28-Apr	1,555	2	4	4	-	40	6	1,611
29-Apr	1,540	2	3	13	-	28	10	1,596
30-Apr	1,355	8	-	6	-	8	5	1,382
01-May	1,638	4	2	10	-	10	4	1,668
02-May	2,001	2	3	7	-	8	8	2,029
03-May	2,053	5	1	8	-	22	11	2,100
04-May	2,186	5	-	13	-	7	10	2,221
05-May	1,496	5	1	9	-	2	4	1,517
06-May	1,748	2	-	11	-	2	1	1,764
07-May	2,081	3	1	12	-	11	7	2,115
08-May	2,850	16	3	13	-	6	4	2,892
09-May	1,840	1	2	10	-	8	9	1,870
10-May	1,339	-	2	5	-	4	4	1,354
11-May	1,204	1	-	8	-	2	7	1,222
12-May	896	-	-	4	-	-	3	903
13-May	641	-	-	-	-	3	2	646
14-May	515	-	-	6	-	3	1	525
15-May	464	-	-	2	-	3	2	471
16-May	365	-	-	4	-	2	1	372

Appendix Table 7.0 Continued.

Obsdate	SepDiv	Div	Sep	SepSamp	Samp	SepRace	Race	Total obs
17-May	576	1	-	3	-	3	-	583
18-May	475	-	-	1	-	2	2	480
19-May	230	-	-	2	-	1	-	233
20-May	277	-	-	3	-	-	-	280
21-May	299	1	-	2	-	2	-	304
22-May	351	-	-	1	-	1	3	356
23-May	352	-	-	3	-	1	1	357
24-May	131	-	-	2	-	2	2	137
25-May	35	-	-	-	-	1	-	36
26-May	24	-	-	-	-	-	-	24
27-May	85	-	-	1	-	-	-	86
28-May	126	1	-	-	-	-	2	129
29-May	80	-	-	1	-	1	-	82
30-May	24	-	-	-	-	-	-	24
31-May	9	-	-	-	-	-	-	9
01-Jun	1	-	-	-	-	-	-	1
02-Jun	2	-	-	-	-	-	-	2
05-Jun	2	-	-	-	-	-	-	2
07-Jun	6	-	-	-	-	-	-	6
08-Jun	24	-	-	-	-	-	-	24
09-Jun	24	-	-	-	-	-	-	24
10-Jun	39	-	-	1	-	3	-	43
11-Jun	49	-	-	4	-	-	-	53
12-Jun	88	-	-	2	-	-	1	91
13-Jun	36	-	1	-	-	-	-	37
14-Jun	19	-	-	1	-	-	-	20
15-Jun	18	-	-	3	-	-	-	21
16-Jun	24	-	-	-	-	-	-	24
17-Jun	10	-	-	-	-	-	-	10
18-Jun	9	-	-	1	-	-	-	10
19-Jun	37	-	1	2	-	-	-	40
20-Jun	38	-	-	1	-	1	-	40
21-Jun	43	-	-	4	-	-	1	48
22-Jun	19	-	-	5	-	-	-	24
23-Jun	9	-	-	-	-	-	-	9
24-Jun	8	-	-	-	-	-	-	8
25-Jun	6	-	-	-	-	-	-	6
26-Jun	8	-	-	-	-	-	-	8
27-Jun	10	-	-	1	-	-	-	11
28-Jun	4	-	-	-	-	-	-	4
29-Jun	4	-	-	1	-	-	-	5
01-Jul	1	-	-	-	-	-	-	1
02-Jul	1	-	-	-	-	-	-	1
03-Jul	1	-	-	-	-	-	-	1
16-Jul	1	-	-	-	-	-	-	1
03-Aug	1	-	-	-	-	-	-	1

Appendix Table 8.0 Locations of observations (detections) of PIT-tagged spring/summer chinook salmon within the Lower Monumental Dam juvenile fish facility, 1999.

Obsdate	SepDiv	Div	Sep	SepSamp	Samp	SepRace	Race	Total obs
04-Apr	1	-	-	-	-	-	-	1
05-Apr	4	-	-	-	-	-	-	4
06-Apr	1	-	-	-	-	-	-	1
07-Apr	5	-	-	-	-	-	-	5
08-Apr	7	-	-	-	-	-	-	7
09-Apr	11	-	-	-	-	-	-	11
10-Apr	22	-	-	-	-	-	-	22
11-Apr	7	-	-	-	-	1	-	8
12-Apr	21	-	-	-	-	-	-	21
13-Apr	37	-	-	-	-	1	-	38
14-Apr	43	-	-	-	-	1	-	44
15-Apr	38	-	-	-	-	1	1	40
16-Apr	64	-	-	3	-	1	-	68
17-Apr	50	-	-	2	-	1	-	53
18-Apr	52	-	-	2	-	-	-	54
19-Apr	60	-	-	2	-	-	-	62
20-Apr	80	-	-	2	-	1	-	83
21-Apr	151	-	-	4	-	2	1	158
22-Apr	164	-	-	5	-	1	-	170
23-Apr	185	-	-	1	-	2	1	189
24-Apr	240	-	-	2	-	2	1	245
25-Apr	394	-	1	3	-	1	-	399
26-Apr	621	-	1	5	-	5	3	635
27-Apr	932	2	2	9	-	7	1	953
28-Apr	1,566	2	3	6	-	10	3	1,590
29-Apr	1,215	-	2	5	-	7	4	1,233
30-Apr	820	2	1	-	-	5	3	831
01-May	1,072	1	-	8	-	205	3	1,289
02-May	1,068	1	3	104	-	495	4	1,675
03-May	1,319	1	5	97	-	16	1	1,439
04-May	1,361	2	12	183	1	4	4	1,567
05-May	1,306	1	3	108	1	7	4	1,430
06-May	1,138	1	5	209	-	31	8	1,392
07-May	974	-	12	129	-	25	5	1,145
08-May	1,192	-	6	148	1	91	3	1,441
09-May	1,367	3	12	197	-	156	1	1,736
10-May	1,511	2	8	161	-	13	5	1,700
11-May	1,247	1	7	115	1	193	3	1,567
12-May	1,298	1	2	89	1	4	-	1,395
13-May	742	-	1	38	-	12	3	796
14-May	519	-	2	77	-	8	3	609
15-May	495	-	-	46	-	2	1	544
16-May	305	-	-	42	-	1	2	350
17-May	324	-	3	51	-	7	2	387
18-May	467	-	-	-	-	2	1	470

Appendix Table 8.0 Continued.

Obsdate	SepDiv	Div	Sep	SepSamp	Samp	SepRace	Race	Total obs
19-May	296	-	-	1	-	1	-	298
20-May	224	-	-	2	-	5	-	231
21-May	160	-	-	1	-	2	1	164
22-May	185	-	-	-	-	1	-	186
23-May	243	-	-	1	-	10	-	254
24-May	181	-	-	-	-	-	2	183
25-May	240	-	-	1	-	1	1	243
26-May	93	-	-	2	-	-	-	95
27-May	58	-	-	1	-	-	-	59
28-May	119	-	-	2	-	-	-	121
29-May	88	-	-	1	-	1	-	90
30-May	81	-	-	-	-	-	2	83
31-May	23	-	-	-	-	-	-	23
01-Jun	11	-	-	-	-	-	-	11
02-Jun	5	-	-	-	-	-	-	5
03-Jun	1	-	-	-	-	-	-	1
04-Jun	3	-	-	-	-	-	-	3
05-Jun	1	-	-	-	-	-	-	1
06-Jun	2	-	-	-	-	-	-	2
07-Jun	1	-	-	-	-	-	-	1
08-Jun	1	-	-	-	-	-	-	1
09-Jun	8	-	-	-	-	-	-	8
10-Jun	12	-	-	-	-	-	-	12
11-Jun	23	-	-	3	-	-	-	26
12-Jun	34	-	-	2	-	-	-	36
13-Jun	31	-	-	1	-	2	-	34
14-Jun	47	-	1	7	-	-	-	55
15-Jun	51	-	-	8	-	1	-	60
16-Jun	55	-	-	2	-	-	1	58
17-Jun	36	-	-	-	-	8	-	44
18-Jun	16	-	1	2	-	-	-	19
19-Jun	13	-	-	1	-	-	-	14
20-Jun	21	-	-	2	-	-	-	23
21-Jun	33	-	-	2	-	1	-	36
22-Jun	46	-	-	3	-	-	-	49
23-Jun	25	-	-	1	-	-	-	26
24-Jun	14	-	-	2	-	-	-	16
25-Jun	12	-	-	-	-	-	-	12
26-Jun	7	-	-	-	-	1	-	8
27-Jun	5	-	-	2	-	-	-	7
28-Jun	-	-	-	-	-	-	1	1
29-Jun	3	-	-	-	-	1	-	4
30-Jun	5	-	-	-	-	-	-	5
01-Jul	5	-	-	-	-	-	-	5
02-Jul	1	-	-	-	-	-	-	1
03-Jul	2	-	-	-	-	-	-	2

Appendix Table 8.0 Continued.

Obsdate	SepDiv	Div	Sep	SepSamp	Samp	SepRace	Race	Total obs
05-Jul	1	-	-	-	-	-	-	1
06-Jul	1	-	-	-	-	-	-	1
25-Jul	1	-	-	-	-	-	-	1
26-Aug	1	-	-	-	-	-	-	1

Appendix Table 9.0 Locations of observations (detections) of PIT-tagged spring/summer chinook salmon within the McNary Dam juvenile fish facility, 1999.

Obsdate	SepDiv	Div	Sep*	SepSamp*	SepSampDiv*	SampDiv*	SepRace*	Total obs
08-Apr	3	-	-	-	-	-	-	3
09-Apr	3	-	-	-	-	-	-	3
10-Apr	1	-	-	-	1	-	-	2
11-Apr	2	-	-	-	-	-	-	2
12-Apr	4	-	-	-	2	-	-	6
13-Apr	8	-	-	-	-	-	-	8
14-Apr	7	-	-	-	-	-	-	7
15-Apr	13	-	-	-	-	-	-	13
16-Apr	23	-	-	-	1	-	-	24
17-Apr	25	-	-	-	1	-	-	26
18-Apr	33	-	-	-	-	-	-	33
19-Apr	31	-	-	-	-	-	-	31
20-Apr	29	-	-	-	-	-	-	29
21-Apr	30	-	-	1	-	-	-	31
22-Apr	79	-	-	2	-	-	-	81
23-Apr	49	-	-	-	1	-	-	50
24-Apr	43	-	-	-	-	-	-	43
25-Apr	38	-	-	-	1	-	-	39
26-Apr	46	-	-	1	-	-	-	47
27-Apr	81	1	2	1	-	-	-	85
28-Apr	145	-	-	1	-	-	-	146
29-Apr	170	1	1	-	6	-	-	178
30-Apr	205	-	-	-	3	2	-	210
01-May	310	-	36	-	12	-	-	358
02-May	481	1	-	-	8	-	-	490
03-May	794	2	-	-	14	-	-	810
04-May	868	2	1	1	8	-	-	880
05-May	756	-	-	3	4	-	-	763
06-May	787	2	1	1	11	-	-	802
07-May	1,106	-	7	-	11	-	-	1,124
08-May	911	1	6	-	10	-	-	928
09-May	1,012	4	70	3	3	-	-	1,092
10-May	401	2	616	1	10	-	33	1,063
11-May	718	1	252	12	2	-	-	985
12-May	1,050	-	6	10	-	-	-	1,066
13-May	1,254	1	2	4	6	-	-	1,267
14-May	1,607	-	7	-	11	-	-	1,625
15-May	1,366	1	3	-	7	-	-	1,377
16-May	835	-	1	-	2	-	-	838
17-May	687	1	2	-	6	-	-	696
18-May	485	-	1	-	4	-	-	490
19-May	438	1	3	-	6	-	-	448
20-May	366	1	2	-	1	-	-	370
21-May	498	-	1	-	5	-	-	504
22-May	255	-	1	-	2	-	-	258

Appendix Table 9.0 Continued.

Obsdate	SepDiv	Div	Sep*	SepSamp*	SepSampDiv*	SampDiv*	SepRace*	Total obs
23-May	302	1	3	-	2	-	-	308
24-May	253	-	1	-	-	-	-	254
25-May	415	1	5	-	3	-	-	424
26-May	243	-	1	-	1	-	-	245
27-May	86	-	-	-	1	-	-	87
28-May	39	-	-	-	1	-	-	40
29-May	46	-	1	-	-	-	-	47
30-May	43	1	-	-	1	-	-	45
31-May	32	-	-	-	-	-	-	32
01-Jun	30	-	1	-	1	-	-	32
02-Jun	21	-	-	-	-	-	-	21
03-Jun	8	-	-	-	-	-	-	8
04-Jun	4	-	-	-	-	-	-	4
05-Jun	3	-	-	-	-	-	-	3
07-Jun	2	-	-	-	-	-	-	2
11-Jun	1	-	-	-	-	-	-	1
12-Jun	2	-	-	-	-	-	-	2
13-Jun	3	-	-	-	-	-	-	3
14-Jun	2	-	-	-	-	-	-	2
15-Jun	9	-	-	-	-	-	-	9
16-Jun	13	-	-	-	-	-	-	13
17-Jun	5	-	-	-	-	-	-	5
18-Jun	5	-	-	-	-	-	-	5
19-Jun	3	-	1	-	-	-	-	4
20-Jun	1	-	-	-	-	-	-	1
21-Jun	3	-	-	-	-	-	-	3
22-Jun	14	-	-	1	-	-	-	15
23-Jun	9	-	-	-	-	-	-	9
25-Jun	4	-	-	-	-	-	-	4
26-Jun	1	-	-	-	-	-	-	1
27-Jun	2	-	-	-	-	-	-	2
28-Jun	4	-	-	-	-	-	-	4
01-Jul	1	-	-	-	-	-	-	1
02-Jul	1	-	-	-	-	-	-	1
03-Jul	1	-	-	-	-	-	-	1
04-Jul	1	-	-	-	-	-	-	1
05-Jul	2	-	-	-	-	-	-	2
06-Jul	1	-	-	-	-	-	-	1
10-Jul	-	-	-	1	-	-	-	1
11-Jul	1	-	-	-	-	-	-	1
14-Jul	-	-	-	1	-	-	-	1
21-Jul	2	-	-	-	-	-	-	2

*Note: Prior to 22 June 1999, all fish entering the McNary Dam juvenile fish facility were bypassed to the river. Transportation from McNary Dam began on 22 June.

Appendix Table 10.0 Locations of observations (detections) of PIT-tagged steelhead within the Little Goose Dam juvenile fish facility, 1999.

Obsdate	SepDiv	Div	Sep	SepSamp	Samp	SepRace	Race	Total obs
02-Apr	7	-	-	1	-	-	-	8
03-Apr	2	-	-	2	-	-	-	4
04-Apr	9	-	-	4	-	2	-	15
05-Apr	12	-	1	2	-	6	-	21
06-Apr	23	-	1	9	-	1	-	34
07-Apr	29	-	1	6	-	5	-	41
08-Apr	12	-	-	8	-	-	-	20
09-Apr	28	1	-	6	-	2	1	38
10-Apr	33	-	-	5	-	-	-	38
11-Apr	44	-	-	3	-	-	-	47
12-Apr	41	-	-	4	-	1	-	46
13-Apr	49	-	-	1	-	3	2	55
14-Apr	55	-	-	2	-	3	-	60
15-Apr	53	-	-	1	-	-	-	54
16-Apr	50	-	1	4	-	4	-	59
17-Apr	62	-	-	-	-	-	-	62
18-Apr	66	-	-	-	-	1	-	67
19-Apr	131	-	1	1	-	1	2	136
20-Apr	338	-	-	4	-	5	1	348
21-Apr	301	-	-	3	-	7	-	311
22-Apr	326	-	1	1	-	7	1	336
23-Apr	303	1	1	2	-	3	3	313
24-Apr	373	-	-	3	-	3	-	379
25-Apr	767	1	1	2	-	3	3	777
26-Apr	1,153	2	-	8	-	5	4	1,172
27-Apr	1,027	1	-	6	-	11	7	1,052
28-Apr	785	1	-	4	-	67	10	867
29-Apr	734	1	-	2	-	34	5	776
30-Apr	683	-	-	4	-	7	9	703
01-May	907	2	-	7	-	6	5	927
02-May	1,162	4	1	13	-	8	11	1,199
03-May	1,600	3	2	7	-	49	9	1,670
04-May	1,404	-	1	12	-	6	10	1,433
05-May	605	2	-	1	-	5	3	616
06-May	653	-	1	8	-	5	3	670
07-May	894	-	-	5	-	3	6	908
08-May	1,853	5	4	13	-	19	17	1,911
09-May	1,280	2	-	7	-	13	7	1,309
10-May	1,040	3	1	3	-	12	10	1,069
11-May	798	1	1	5	1	5	6	817
12-May	454	1	-	2	-	2	1	460
13-May	634	-	1	1	-	4	4	644
14-May	915	2	-	8	-	5	10	940
15-May	780	1	-	2	-	8	11	802
16-May	542	1	1	5	-	9	3	561

Appendix Table 10.0 Continued.

Obsdate	SepDiv	Div	Sep	SepSamp	Samp	SepRace	Race	Total obs
17-May	461	-	-	4	-	2	6	473
18-May	388	-	-	1	-	3	2	394
19-May	375	1	-	2	-	-	7	385
20-May	573	1	1	4	-	8	6	593
21-May	835	1	-	7	-	8	7	858
22-May	1,082	-	-	7	-	10	16	1,115
23-May	1,750	4	2	9	1	8	21	1,795
24-May	1,306	3	1	11	1	12	18	1,352
25-May	513	-	-	3	-	4	6	526
26-May	294	-	-	2	-	1	-	297
27-May	784	2	-	5	1	3	1	796
28-May	1,655	4	-	10	-	11	20	1,700
29-May	645	3	1	3	-	4	11	667
30-May	200	-	-	1	-	4	4	209
31-May	93	-	-	-	-	-	1	94
01-Jun	43	-	1	-	-	-	-	44
02-Jun	23	-	-	-	1	-	-	24
03-Jun	22	-	-	2	-	-	-	24
04-Jun	14	-	1	-	-	-	-	15
05-Jun	6	-	-	-	-	1	-	7
06-Jun	27	-	-	1	-	-	1	29
07-Jun	163	1	-	4	-	2	-	170
08-Jun	124	-	-	2	-	4	1	131
09-Jun	95	-	-	2	-	4	-	101
10-Jun	112	1	1	6	1	8	1	130
11-Jun	107	-	-	2	-	-	-	109
12-Jun	60	-	-	1	-	2	1	64
13-Jun	37	-	-	2	-	-	1	40
14-Jun	26	-	-	4	-	1	-	31
15-Jun	20	-	-	3	-	-	-	23
16-Jun	12	-	-	1	-	1	-	14
17-Jun	22	-	-	1	-	-	1	24
18-Jun	41	-	-	8	-	-	-	49
19-Jun	121	1	-	8	-	-	1	131
20-Jun	149	-	-	9	-	1	-	159
21-Jun	72	-	2	2	-	1	-	77
22-Jun	12	-	-	-	-	-	-	12
23-Jun	26	-	-	3	-	-	-	29
24-Jun	27	-	-	1	-	-	-	28
25-Jun	37	-	-	1	-	-	1	39
26-Jun	34	-	-	1	-	-	-	35
27-Jun	5	-	-	-	-	-	-	5
28-Jun	6	-	-	-	-	-	-	6
30-Jun	2	-	-	-	-	-	-	2
04-Jul	1	-	-	-	-	-	-	1

Appendix Table 11.0 Locations of observations (detections) of PIT-tagged steelhead within the Lower Monumental Dam juvenile fish facility, 1999.

Obsdate	SepDiv	Div	Sep	SepSamp	Samp	SepRace	Race	Total obs
03-Apr	1	-	-	-	-	-	-	1
04-Apr	6	-	-	-	-	-	-	6
05-Apr	5	-	-	-	-	-	-	5
06-Apr	11	-	-	-	-	-	-	11
07-Apr	11	-	-	-	-	-	-	11
08-Apr	14	-	-	-	-	-	-	14
09-Apr	19	-	-	1	-	-	-	20
10-Apr	42	-	-	-	-	4	-	46
11-Apr	11	-	-	-	-	3	-	14
12-Apr	18	-	-	-	-	1	-	19
13-Apr	36	-	-	-	-	1	-	37
14-Apr	33	-	-	-	-	-	-	33
15-Apr	46	-	-	2	-	2	-	50
16-Apr	32	-	-	2	-	-	-	34
17-Apr	46	-	-	1	-	-	-	47
18-Apr	42	-	-	-	-	-	-	42
19-Apr	65	-	-	4	-	1	-	70
20-Apr	112	-	-	3	-	-	-	115
21-Apr	173	-	-	3	-	3	2	181
22-Apr	241	-	-	1	-	2	-	244
23-Apr	253	-	-	2	-	3	-	258
24-Apr	225	-	-	-	-	4	-	229
25-Apr	310	-	-	3	-	3	1	317
26-Apr	447	-	-	-	-	16	1	464
27-Apr	773	-	2	6	1	9	2	793
28-Apr	903	2	2	7	-	6	-	920
29-Apr	741	1	-	6	-	9	1	758
30-Apr	560	-	-	3	-	4	-	567
01-May	634	-	1	5	-	117	-	757
02-May	533	1	2	35	-	238	-	809
03-May	751	-	3	70	-	6	2	832
04-May	1,238	-	4	178	1	16	2	1,439
05-May	881	1	3	66	-	13	2	966
06-May	652	-	2	120	1	12	-	787
07-May	568	-	1	62	-	20	-	651
08-May	513	-	6	54	-	12	-	585
09-May	664	2	1	78	-	38	1	784
10-May	903	1	4	79	-	9	-	996
11-May	815	-	3	45	-	79	3	945
12-May	871	2	-	31	-	6	2	912
13-May	636	-	-	26	-	7	-	669
14-May	431	-	1	35	-	8	1	476
15-May	550	-	2	49	-	5	-	606
16-May	452	-	3	43	-	11	-	509
17-May	405	1	-	56	-	5	-	467

Appendix Table 11.0 Continued.

Obsdate	SepDiv	Div	Sep	SepSamp	Samp	SepRace	Race	Total obs
18-May	424	1	-	1	-	5	1	432
19-May	401	-	-	-	-	7	2	410
20-May	522	-	-	2	-	15	-	539
21-May	333	-	-	3	-	8	-	344
22-May	631	-	-	2	-	12	2	647
23-May	976	-	-	4	-	39	3	1,022
24-May	1,483	-	-	4	-	21	-	1,508
25-May	1,927	1	-	8	1	20	6	1,963
26-May	1,435	1	-	4	-	19	2	1,461
27-May	750	-	-	3	-	6	2	761
28-May	886	1	-	2	-	9	1	899
29-May	919	-	1	2	-	11	1	934
30-May	560	-	-	3	2	8	-	573
31-May	300	-	-	-	-	3	1	304
01-Jun	229	-	-	-	-	6	-	235
02-Jun	102	-	1	1	-	13	-	117
03-Jun	81	-	-	-	-	7	-	88
04-Jun	60	-	-	1	-	1	-	62
05-Jun	56	-	-	-	-	-	-	56
06-Jun	35	-	-	1	-	3	-	39
07-Jun	41	-	-	2	-	1	-	44
08-Jun	64	-	-	6	-	-	-	70
09-Jun	108	-	1	9	-	4	-	122
10-Jun	76	-	-	5	-	4	-	85
11-Jun	81	-	-	3	-	2	-	86
12-Jun	68	-	-	7	-	3	-	78
13-Jun	63	-	-	3	-	2	-	68
14-Jun	56	-	-	4	-	3	-	63
15-Jun	38	-	-	5	-	2	1	46
16-Jun	35	-	-	4	-	2	-	41
17-Jun	27	-	-	-	-	3	-	30
18-Jun	31	-	-	1	-	-	-	32
19-Jun	62	-	-	3	-	2	-	67
20-Jun	75	-	-	6	-	-	1	82
21-Jun	132	-	-	13	-	4	-	149
22-Jun	131	-	-	2	-	2	-	135
23-Jun	51	-	-	3	-	3	-	57
24-Jun	30	-	-	4	-	-	-	34
25-Jun	17	-	-	2	-	-	-	19
26-Jun	30	-	-	-	-	1	-	31
27-Jun	17	-	-	1	-	2	-	20
28-Jun	12	-	-	-	-	2	-	14
29-Jun	3	-	-	-	-	-	-	3
30-Jun	5	-	-	1	-	-	-	6
01-Jul	4	-	-	-	-	2	-	6
02-Jul	2	-	-	-	-	-	-	2

Appendix Table 11.0 Continued.

Obsdate	SepDiv	Div	Sep	SepSamp	Samp	SepRace	Race	Total obs
03-Jul	-	-	1	-	-	-	-	1
04-Jul	1	-	-	-	-	-	-	1
05-Jul	1	-	-	-	-	-	-	1
06-Jul	2	-	-	-	-	-	-	2
16-Jul	1	-	-	-	-	-	-	1
10-Aug	1	-	-	-	-	-	-	1

Appendix Table 12.0 Locations of observations (detections) of PIT-tagged steelhead within the McNary Dam juvenile fish facility, 1999.

Obsdate	SepDiv	Div	Sep*	SepSamp*	SepSampDiv*	SampDiv*	SepRace*	Total obs
07-Apr	1	-	-	-	-	-	-	1
08-Apr	2	-	-	-	-	-	-	2
09-Apr	6	1	-	-	-	-	-	7
10-Apr	8	-	-	-	1	-	-	9
11-Apr	11	-	-	-	1	-	-	12
12-Apr	17	-	-	-	-	-	-	17
13-Apr	26	-	-	-	-	-	-	26
14-Apr	29	-	-	-	3	-	-	32
15-Apr	30	-	-	-	-	-	-	30
16-Apr	27	-	-	-	-	-	-	27
17-Apr	35	-	-	-	2	-	-	37
18-Apr	57	-	-	-	1	-	-	58
19-Apr	51	-	-	-	-	-	-	51
20-Apr	56	-	-	-	-	-	-	56
21-Apr	24	-	-	-	-	-	-	24
22-Apr	34	-	-	3	1	-	-	38
23-Apr	34	-	-	-	-	-	-	34
24-Apr	29	-	-	-	2	-	-	31
25-Apr	52	-	-	-	-	-	-	52
26-Apr	55	-	-	4	-	-	-	59
27-Apr	94	-	3	1	2	-	-	100
28-Apr	70	-	1	2	2	-	-	75
29-Apr	75	1	1	1	1	-	-	79
30-Apr	100	-	-	-	-	1	-	101
01-May	90	-	10	-	2	-	-	102
02-May	146	-	-	-	2	-	-	148
03-May	209	1	-	-	4	-	-	214
04-May	316	-	-	-	1	-	-	317
05-May	299	-	-	-	1	-	-	300
06-May	238	1	-	-	2	-	-	241
07-May	237	-	2	-	-	-	-	239
08-May	310	-	-	-	6	-	-	316
09-May	254	-	34	1	-	-	-	289
10-May	33	-	247	1	1	-	8	290
11-May	103	-	105	1	1	-	-	210
12-May	145	-	-	-	-	-	-	145
13-May	178	-	2	-	1	-	-	181
14-May	283	1	1	1	3	-	-	289
15-May	300	-	-	-	5	-	-	305
16-May	222	-	-	-	3	-	-	225
17-May	167	-	-	-	1	-	-	168
18-May	101	1	-	-	-	-	-	102
19-May	145	-	-	-	2	-	-	147
20-May	181	-	-	-	2	-	-	183
21-May	192	-	-	-	4	-	-	196

Appendix Table 12.0 Continued.

Obsdate	SepDiv	Div	Sep*	SepSamp*	SepSampDiv*	SampDiv*	SepRace*	Total obs
22-May	145	-	-	-	2	-	-	147
23-May	236	-	1	-	3	-	-	240
24-May	308	-	4	-	2	-	-	314
25-May	597	-	3	-	6	-	2	608
26-May	626	-	1	-	7	-	-	634
27-May	348	1	-	-	3	-	-	352
28-May	269	-	3	-	10	-	-	282
29-May	312	-	1	-	4	-	-	317
30-May	306	-	1	-	5	-	-	312
31-May	186	-	1	-	4	-	-	191
01-Jun	172	-	-	-	1	-	-	173
02-Jun	102	-	-	-	1	-	-	103
03-Jun	49	1	1	-	1	-	-	52
04-Jun	40	-	-	-	-	-	-	40
05-Jun	22	-	-	-	-	-	-	22
06-Jun	18	-	-	-	-	-	-	18
07-Jun	19	1	-	-	1	-	-	21
08-Jun	4	-	-	-	-	-	-	4
10-Jun	5	-	-	-	-	-	-	5
11-Jun	17	-	-	-	1	-	-	18
12-Jun	24	-	-	-	3	-	-	27
13-Jun	18	-	-	-	-	-	-	18
14-Jun	14	-	-	-	1	-	-	15
15-Jun	13	-	-	-	2	-	-	15
16-Jun	6	-	-	-	1	-	-	7
17-Jun	3	-	-	-	1	-	-	4
18-Jun	2	-	-	-	-	-	-	2
19-Jun	2	-	-	-	-	-	-	2
21-Jun	2	-	-	1	-	-	-	3
22-Jun	16	-	-	-	-	-	-	16
23-Jun	10	-	-	-	-	-	-	10
24-Jun	2	-	-	-	-	-	-	2
25-Jun	3	-	-	-	-	-	-	3
26-Jun	5	-	-	-	-	-	-	5
27-Jun	2	-	-	-	-	-	-	2
28-Jun	1	-	-	-	-	-	-	1
29-Jun	2	-	-	-	-	-	-	2
01-Jul	1	-	-	-	-	-	-	1
02-Jul	1	-	-	-	-	-	-	1
05-Jul	4	-	-	-	-	-	-	4
09-Jul	1	-	-	-	-	-	-	1

*Note: Prior to 22 June 1999, all fish entering the McNary Dam juvenile fish facility were bypassed to the river. Transportation from McNary Dam began on 22 June.

Appendix Table 13.0 Total adult returns to Lower Granite Dam from spring/summer chinook salmon smolts tagged as inriver fish at Lower Granite Dam in spring 1996. Total returns by age class are provided at the end of the table. Also shown in the table are adults detected at Bonneville Dam.

Smolt release date	Adult return date		Pit-tag code	Jaw tag number	Length		Upstream adult recovery[a]	
	Bonn	LGR			At smolt tagging (mm)	At adult return (mm)	Date	Location[b]
13-Apr-96		25-Jun-98	41657E3F2A	C3299	122	860		NR
16-Apr-96		05-May-98	41674A2B4E	C2322	147	770		NR
		15-May-98	413174512B	C1035	140	680		NR
18-Apr-96		11-May-98	41685C4104	C3279	178	760		DWOR
		13-May-98	416B0A286E	C2336	136	760		NR
19-Apr-96		31-May-98	416A315851	C2344	137	690		NR
		19-Jun-98	4167134605	C3296	139	770		NR
21-Apr-96		22-Apr-98	416A34465F	C3258	148	710	12-Jun-98	LSALR
		16-Jun-98	4168320D6B	C3292	157	790		NR
22-Apr-96	29-Apr-98	11-May-98	416A175B3A	C0003	133	610		NR
		13-May-98	416A2C680F	C1030	128	690		NR
		07-Jun-98	416A684330	C2351	110	750		NR
24-Apr-96		21-Jun-97	4169642718	C0004	115	460		NR
	26-May-99	26-Jun-99	4168444525	C4178	128	880		NR
25-Apr-96	27-Apr-98	16-May-98	41692A4428[c]	C1038	136	710		NR
		17-Jun-99	416A092732[c]	C5057	110	940		NR
		21-Jun-99	4151490E79[c]	C5063	119	950	30-Aug-99	SAWT
26-Apr-96		14-May-98	41682F127D	C1033	111	690		NR
	02-Sep-98	14-Sep-98	416B147465	-LYFE-	170	660		NR
27-Apr-96		05-May-98	416B3D6B04	C2323	122	680		NR
		10-May-98	4168554822	C1026	148	730	20-Jun-98	LSALR
		11-May-98	4166671670	-LGH-	141	660		NR
28-Apr-96		04-Jun-98	4152610355	-LGH-	141	630		NR
29-Apr-96		14-Jun-97	4152534861	C1016	156	550		NR
		13-May-98	41657E464B	C2335	151	690		NR
		17-Jul-98	4152796003	C2360	139	780		NR
30-Apr-96		12-May-98	416572320E	C2334	147	760	25-Jun-98	POWW
		12-May-98	416940712A	C1027	154	720		NR
		09-May-99	4169506138	C4164	127	900		RAPH
01-May-96		26-May-98	4167120C1A	C1043	138	730		NR
03-May-96		10-Jun-98	413146182B	C1044	148	740		NR
04-May-96		12-May-99	4167784774	C5053	139	940		NR
05-May-96		30-Apr-99	4167241A5A	C5051	144	890		NR
06-May-96		14-May-98	41317B7100	C2337	145	730		NR
		22-May-98	4166363E2C	C2342	166	780		NR
07-May-96		05-May-98	4166326D30	C1022	138	720		NR
11-May-96		15-May-98	416A042836	C2338	136	780	18-Jun-98	KOOS
12-May-96		22-May-99	4168365F54	C5055	139	960		NR
13-May-96		15-May-98	414C020274	C1036	148	690	20-Aug-98	KOOS
14-May-96		14-Jun-99	416717581F	C4173	139	920	24-Jul-99	SALSFW
15-May-96		18-May-98	41314D3664	C1039	186	780		NR
		19-Jun-98	4151346D41	C4143	141	790		NR
		21-Jun-99	4169541855	C4175	142	950		NR
16-May-96		16-Jun-98	4150696C44	C2348	146	840		NR
19-May-96		06-May-98	41520D1857	C2325	139	690	18-Jun-98	POWW
		27-Jun-98	4153166B68	C4152	150	830	30-Sep-98	SALRSF
		27-Jun-98	4152476A36	C3302	148	860		NR
20-May-96		03-Jul-98	4169556845	C2357	140	770		NR
	19-Jun-98	03-Jul-98	41515A512A	C4155	138	890	22-Aug-98	SALSFW
		19-Jun-99	4151135D54	C5060	137	970	25-Jul-99	SALSFW
23-May-96		16-May-98	416B115250	C1037	159	730		NR
24-May-96		09-Jul-99	41526E0767	C5070	145	940		NR
26-May-96		17-May-99	4152062745	C4167	138	880	01-Jul-99	DWOR

Appendix Table 13.0 Continued.

Smolt release date	Adult return date		Pit-tag code	Jaw tag number	Length		Upstream adult recovery[a]	
	Bonn	LGR			At smolt tagging (mm)	At adult return (mm)	Date	Location[b]
29-May-96		21-May-98	4131523F45	C1042	139	730	22-Sep-98	DWOR
		02-Jul-98	41316A360C	C3304	145	820		NR
30-May-96		16-Jun-98	227E642A16	C3291	147	840		NR
06-Jun-96		30-Jun-99	227F0F110C	C5065	160	1010		NR

Total adult returns:

Jacks	2
2-ocean	42
3-ocean	13

[a] Upstream recoveries of adults returning in 1999 were incomplete at the time this document was published.

[b] Recovery location abbreviatons: NR = Not recovered; DWOR = Dworshak Hatchery; KOOS = Kooskia Hatchery; LSALR = Little Salmon River; POWW = Powell Weir; RAPH = Rapid River Hatchery; SALSFW = South Fork Salmon River Weir; SAWT = Sawtooth Hatchery.

[c] All fish released on this day were removed from the adult calculations because of problems encountered during barge loading which allowed an unknown number of transport fish to escape to the river.

Appendix Table 13.1 Total adult returns to Lower Granite Dam from spring/summer hatchery chinook salmon smolts tagged as inriver fish at Lower Granite Dam in spring 1996. Total returns by age class are provided at the end of the table. Also shown in the table are adults detected at Bonneville Dam.

Smolt release date	Adult return date		Pit-tag code	Jaw tag number	Length		Upstream adult recovery[a]	
	Bonn	LGR			At smolt tagging (mm)	At adult return (mm)	Date	Location[b]
16-Apr-96		05-May-98	41674A2B4E	C2322	147	770		NR
		15-May-98	413174512B	C1035	140	680		NR
18-Apr-96		11-May-98	41685C4104	C3279	178	760		DWOR
		13-May-98	416B0A286E	C2336	136	760		NR
19-Apr-96		31-May-98	416A315851	C2344	137	690		NR
		19-Jun-98	4167134605	C3296	139	770		NR
21-Apr-96		22-Apr-98	416A34465F	C3258	148	710	12-Jun-98	LSALR
		16-Jun-98	4168320D6B	C3292	157	790		NR
22-Apr-96	29-Apr-98	11-May-98	416A175B3A	C0003	133	610		NR
		13-May-98	416A2C680F	C1030	128	690		NR
24-Apr-96	26-May-99	26-Jun-99	4168444525	C4178	128	880		NR
25-Apr-96	27-Apr-98	16-May-98	41692A4428[c]	C1038	136	710		NR
26-Apr-96	02-Sep-98	14-Sep-98	416B147465	-LYFE-	170	660		NR
27-Apr-96		05-May-98	416B3D6B04	C2323	122	680		NR
		10-May-98	4168554822	C1026	148	730	20-Jun-98	LSALR
		11-May-98	4166671670	-LGH-	141	660		NR
28-Apr-96		04-Jun-98	4152610355	-LGH-	141	630		NR
29-Apr-96		14-Jun-97	4152534861	C1016	156	550		NR
		13-May-98	41657E464B	C2335	151	690		NR
		17-Jul-98	4152796003	C2360	139	780		NR
30-Apr-96		12-May-98	416940712A	C1027	154	720		NR
		12-May-98	416572320E	C2334	147	760	25-Jun-98	POWW
		09-May-99	4169506138	C4164	127	900		RAPH
01-May-96		26-May-98	4167120C1A	C1043	138	730		NR
03-May-96		10-Jun-98	413146182B	C1044	148	740		NR
04-May-96		12-May-99	4167784774	C5053	139	940		NR
05-May-96		30-Apr-99	4167241A5A	C5051	144	890		NR
06-May-96		14-May-98	41317B7100	C2337	145	730		NR
		22-May-98	4166363E2C	C2342	166	780		NR
07-May-96		05-May-98	4166326D30	C1022	138	720		NR
11-May-96		15-May-98	416A042836	C2338	136	780	18-Jun-98	KOOS
12-May-96		22-May-99	4168365F54	C5055	139	960		NR
13-May-96		15-May-98	414C020274	C1036	148	690	20-Aug-98	KOOS
14-May-96		14-Jun-99	416717581F	C4173	139	920	24-Jul-99	SALSFW
15-May-96		18-May-98	41314D3664	C1039	186	780		NR
		19-Jun-98	4151346D41	C4143	141	790		NR
		21-Jun-99	4169541855	C4175	142	950		NR
16-May-96		16-Jun-98	4150696C44	C2348	146	840		NR
19-May-96		06-May-98	41520D1857	C2325	139	690	18-Jun-98	POWW
		27-Jun-98	4152476A36	C3302	148	860		NR
		27-Jun-98	4153166B68	C4152	150	830	30-Sep-98	SALRSF
20-May-96		03-Jul-98	4169556845	C2357	140	770		NR
	19-Jun-98	03-Jul-98	41515A512A	C4155	138	890	22-Aug-98	SALSFW
		19-Jun-99	4151135D54	C5060	137	970	25-Jul-99	SALSFW
23-May-96		16-May-98	416B115250	C1037	159	730		NR
24-May-96		09-Jul-99	41526E0767	C5070	145	940		NR
26-May-96		17-May-99	4152062745	C4167	138	880	01-Jul-99	DWOR
29-May-96		21-May-98	4131523F45	C1042	139	730	22-Sep-98	DWOR
		02-Jul-98	41316A360C	C3304	145	820		NR

Appendix Table 13.1 Continued.

Smolt release date	Adult return date		Pit-tag code	Jaw tag number	Length		Upstream adult recovery[a]	
	Bonn	LGR			At smolt tagging (mm)	At adult return (mm)	Date	Location[b]
30-May-96		16-Jun-98	227E642A16	C3291	147	840		NR
06-Jun-96		30-Jun-99	227F0F110C	C5065	160	1010		NR

Total adult returns:

Jacks	1
2-ocean	39
3-ocean	11

[a] Upstream recoveries of adults returning in 1999 were incomplete at the time this document was published.

[b] Recovery location abbreviatons: NR = Not recovered; DWOR = Dworshak Hatchery; KOOS = Kooskia Hatchery; LSALR = Little Salmon River; POWW = Powell Weir; RAPH = Rapid River Hatchery; SALSFW = South Fork Salmon River Weir.

[c] All fish released on this day were removed from the adult calculations because of problems encountered during barge loading which allowed an unknown number of transport fish to escape to the river.

Appendix Table 13.2 Total adult returns to Lower Granite Dam from spring/summer wild chinook salmon smolts tagged as inriver fish at Lower Granite Dam in spring 1996. Total returns by age class are provided at the end of the table. Also shown in the table are adults detected at Bonneville Dam.

Smolt release date	Adult return date		Pit-tag code	Jaw tag number	Length		Upstream adult recovery[a]	
	Bonn	LGR			At smolt tagging (mm)	At adult return (mm)	Date	Location[b]
13-Apr-96		25-Jun-98	41657E3F2A	C3299	122	860		NR
22-Apr-96		07-Jun-98	416A684330	C2351	110	750		NR
24-Apr-96		21-Jun-97	4169642718	C0004	115	460		NR
25-Apr-96		17-Jun-99	416A092732[c]	C5057	110	940		NR
		21-Jun-99	4151490E79[c]	C5063	119	950	30-Aug-99	SAWT
26-Apr-96		14-May-98	41682F127D	C1033	111	690		NR

Total adult returns:

Jacks	1
2-ocean	3
3-ocean	2

[a] Upstream recoveries of adults returning in 1999 were incomplete at the time this document was published.

[b] Recovery location abbreviatons: NR = Not recovered; SAWT = Sawtooth Hatchery.

[c] All fish released on this day were removed from the adult calculations because of problems encountered during barge loading which allowed an unknown number of transport fish to escape to the river.

Appendix Table 14.0 Total adult returns to Lower Granite Dam from spring/summer chinook salmon smolts tagged as transport fish at Lower Granite Dam in spring 1996. Total returns by age class are provided at the end of the table. Also shown in the table are adults detected at Bonneville Dam.

Smolt release date	Adult return date		Pit-tag code	Jaw tag number	Length		Upstream adult recovery[a]	
	Bonn	LGR			At smolt tagging (mm)	At adult return (mm)	Date	Location[b]
16-Apr-96		04-Jul-99	416A225531	C5067	109	960		NR
18-Apr-96		13-Jun-97	416A400713	C0006	131	440		NR
		05-May-98	4168193C06	C1021	142	690		NR
20-Apr-96		14-May-98	4167363337	C1032	125	710		NR
		19-Jun-98	416850762F	C3295	110	760		NR
		23-Jun-99	4131794500	C5062	109	1020		NR
		01-Aug-99	4168387519	C4180	129	830		NR
22-Apr-96		09-Jun-98	41694E0F7A	C2345	144	760	24-Jun-98	RAPH
		24-Jun-98	4152053045	C4147	139	780		NR
		04-Jul-98	41673A5E69	C2358	120	670		NR
		08-Jul-98	414C03744A	C3305	118	870		NR
		16-Sep-98	41531C6C55	-LYFE-	176	750		NR
		20-May-99	416B1F026B	C3312	177	900	01-Jul-99	DWOR
		13-Jun-99	4152772E2E	C4172	158	890		RAPH
24-Apr-96		03-Jul-97	41511C0B55	C1019	143	570	01-Aug-97	IMNAHW
		09-May-98	41671D6C48	C3273	109	780		NR
	16-May-98	16-Jun-98	41701F5067	C1045	112	660		NR
		25-Jun-98	416A38102D	C3300	124	810		NR
		01-Jul-98	416B271700	C2356	130	790		NR
		17-May-99	416A3A0A46	C4166	125	870		NR
25-Apr-96		21-May-98	416B512122[c]	C1041	108	660		NR
		22-May-98	416621456A[c]	C2341	148	780		NR
28-Apr-96		11-May-98	4152671E3F	C1029	138	690	21-Jul-98	KOOS
29-Apr-96		03-Jun-97	4131401963	C0005	137	410		NR
02-May-96		19-Jun-99	4153120455	C5061	143	960	04-Aug-99	SALSFW
		04-Jul-99	416A6D774F	C5068	140	960		NR
03-May-96		13-Jul-98	4169470072	C2359	149	770		NR
		12-May-99	4131713A18	C5052	140	920		NR
05-May-96		20-Jun-99	41665F7531	C3317	142	790		NR
06-May-96		05-May-98	4151246F19	C3271	119	690		NR
		06-May-98	41507D0967	C2326	166	760	09-Jul-98	DWOR
	12-May-99	16-Jun-99	41667F030C	C4174	141	870		NR
		03-Jul-99	4151320E47	C4179	137	900		NR
07-May-96	08-Jun-98	21-Jun-98	416B455065	C4144	147	860	25-Aug-98	SALSFW
10-May-96		23-Jun-98	4131545B4E	C2350	132	780		NR
		03-Jul-98	4168222655	C4154	150	890		NR
		05-Jul-98	414C234420	C4156	133	820		NR
11-May-96		05-May-98	416A54015D	C1025	181	780		NR
		09-Jul-98	4168373C2D	C4158	195	750	20-Aug-98	KOOS
12-May-96		21-May-98	4169745A0F	C1040	149	710	24-Jul-98	RAPH
		17-Jun-99	416B565159	C5059	116	1000		NR
13-May-96		05-May-98	4152021617	C1023	168	730		NR
		14-May-98	415238465B	C1034	136	690	27-Jun-98	RAPH
		20-Jun-99	41662E5B54	C4177	128	890		NR
14-May-96	02-Jun-98	17-Jun-98	41683B2177	C1046	144	760	14-Jul-98	SALSFW
		29-Jun-98	41520E364F	C2354	141	750	25-Jul-98	SALSFW
		16-May-99	41516B3C40	C4165	143	850		NR
		17-Jun-99	41506F6E1B	C5058	147	1000		NR
15-May-96		16-May-99	41513F113D	C5054	150	950		NR
		26-May-99	4151222B11	C4171	187	920	01-Jul-99	DWOR
		04-Jul-99	41660A4C3C	C5069	185	1010		NR
16-May-96		07-Jul-97	4165700214	C1020	140	580	08-Aug-97	SALSFW
		11-May-98	41681D467C	C1028	145	790	25-Jun-98	POWW
		22-Jun-98	415156133C	C2352	149	770	23-Jul-98	SALSFW
		26-Jun-98	416A7F4951	C2353	139	790		NR
17-May-96		27-Jun-97	41522E7D70	-----	142			NR
		14-Jun-98	416873255B	C4140	142	810	14-Jul-98	SALSFW
18-May-96		27-Jun-99	4152403B6D	C5064	143	1030		NR
		01-Jul-99	4169000A1E	C5066	149	970		NR

Appendix Table 14.0 Continued.

Smolt release date	Adult return date		Pit-tag code	Jaw tag number	Length		Upstream adult recovery[a]	
	Bonn	LGR			At smolt tagging (mm)	At adult return (mm)	Date	Location[b]
19-May-96		12-Jun-98	41514A0141	C2346	120	670		NR
20-May-96		14-Jun-98	416A50496E	C2347	148	760		NR

Total adult returns:

Jacks	5
2-ocean	35
3-ocean	21

[a] Upstream recoveries of adults returning in 1999 were incomplete at the time this document was published.

[b] Recovery location abbreviatons: NR = Not recovered; DWOR = Dworshak Hatchery; IMNAHW = Imnaha Weir; KOOS = Kooskia Hatchery; POWW = Powell Weir; RAPH = Rapid River Hatchery; SALSFW = South Fork Salmon River Weir.

[c] All fish released on this day were removed from the adult calculations because of problems encountered during barge loading which allowed an unknown number of transport fish to escape to the river.

Appendix Table 14.1 Total adult returns to Lower Granite Dam from spring/summer hatchery chinook salmon smolts tagged as transport fish at Lower Granite Dam in spring 1996. Total returns by age class are provided at the end of the table. Also shown in the table are adults detected at Bonneville Dam.

Smolt release date	Adult return date		Pit-tag code	Jaw tag number	Length		Upstream adult recovery[a]	
	Bonn	LGR			At smolt tagging (mm)	At adult return (mm)	Date	Location[b]
18-Apr-96		13-Jun-97	416A400713	C0006	131	440		NR
		05-May-98	4168193C06	C1021	142	690		NR
20-Apr-96		14-May-98	4167363337	C1032	125	710		NR
		01-Aug-99	4168387519	C4180	129	830		NR
22-Apr-96		09-Jun-98	41694E0F7A	C2345	144	760	24-Jun-98	RAPH
		24-Jun-98	4152053045	C4147	139	780		NR
		16-Sep-98	41531C6C55	--LYFE--	176	750		NR
		20-May-99	416B1F026B	C3312	177	900	01-Jul-99	DWOR
		13-Jun-99	4152772E2E	C4172	158	890		RAPH
24-Apr-96		03-Jul-97	41511C0B55	C1019	143	570	01-Aug-97	IMNAHW
		25-Jun-98	416A38102D	C3300	124	810		NR
		01-Jul-98	416B271700	C2356	130	790		NR
		17-May-99	416A3A0A46	C4166	125	870		NR
25-Apr-96		22-May-98	416621456A[c]	C2341	148	780		NR
28-Apr-96		11-May-98	4152671E3F	C1029	138	690	21-Jul-98	KOOS
29-Apr-96		03-Jun-97	4131401963	C0005	137	410		NR
02-May-96		19-Jun-99	4153120455	C5061	143	960	04-Aug-99	SALSFW
		04-Jul-99	416A6D774F	C5068	140	960		NR
03-May-96		13-Jul-98	4169470072	C2359	149	770		NR
		12-May-99	4131713A18	C5052	140	920		NR
05-May-96		20-Jun-99	41665F7531	C3317	142	790		NR
06-May-96		06-May-98	41507D0967	C2326	166	760	09-Jul-98	DWOR
	12-May-99	16-Jun-99	41667F030C	C4174	141	870		NR
		03-Jul-99	4151320E47	C4179	137	900		NR
07-May-96	08-Jun-98	21-Jun-98	416B455065	C4144	147	860	25-Aug-98	SALSFW
10-May-96		23-Jun-98	4131545B4E	C2350	132	780		NR
		03-Jul-98	4168222655	C4154	150	890		NR
		05-Jul-98	414C234420	C4156	133	820		NR
11-May-96		05-May-98	416A54015D	C1025	181	780		NR
		09-Jul-98	4168373C2D	C4158	195	750	20-Aug-98	KOOS
12-May-96		21-May-98	4169745A0F	C1040	149	710	24-Jul-98	RAPH
13-May-96		05-May-98	4152021617	C1023	168	730		NR
		14-May-98	415238465B	C1034	136	690	27-Jun-98	RAPH
		20-Jun-99	41662E5B54	C4177	128	890		NR
14-May-96	02-Jun-98	17-Jun-98	41683B2177	C1046	144	760	14-Jul-98	SALSFW
		29-Jun-98	41520E364F	C2354	141	750	25-Jul-98	SALSFW
		16-May-99	41516B3C40	C4165	143	850		NR
		17-Jun-99	41506F6E1B	C5058	147	1000		NR
15-May-96		16-May-99	41513F113D	C5054	150	950		NR
		26-May-99	4151222B11	C4171	187	920	01-Jul-99	DWOR
		04-Jul-99	41660A4C3C	C5069	185	1010		NR
16-May-96		07-Jul-97	4165700214	C1020	140	580	08-Aug-97	SALSFW
		11-May-98	41681D467C	C1028	145	790	25-Jun-98	POWW
		22-Jun-98	415156133C	C2352	149	770	23-Jul-98	SALSFW
		26-Jun-98	416A7F4951	C2353	139	790		NR
17-May-96		27-Jun-97	41522E7D70	-----	142			NR
		14-Jun-98	416873255B	C4140	142	810	14-Jul-98	SALSFW
18-May-96		27-Jun-99	4152403B6D	C5064	143	1030		NR
		01-Jul-99	4169000A1E	C5066	149	970		NR

Appendix Table 14.1 Continued.

Smolt release date	Adult return date		Pit-tag code	Jaw tag number	Length		Upstream adult recovery[a]	
	Bonn	LGR			At smolt tagging (mm)	At adult return (mm)	Date	Location[b]
19-May-96		12-Jun-98	41514A0141	C2346	120	670		NR
20-May-96		14-Jun-98	416A50496E	C2347	148	760		NR

Total adult returns:

Jacks	5
2-ocean	28
3-ocean	18

[a] Upstream recoveries of adults returning in 1999 were incomplete at the time this document was published.

[b] Recovery location abbreviatons: NR = Not recovered; DWOR = Dworshak Hatchery; IMNAHW = Imnaha Weir; KOOS = Kooskia Hatchery; POWW = Powell Weir; RAPH = Rapid River Hatchery; SALSFW = South Fork Salmon River Weir.

[c] All fish released on this day were removed from the adult calculations because of problems encountered during barge loading which allowed an unknown number of transport fish to escape to the river.

Appendix Table 14.2 Total adult returns to Lower Granite Dam from spring/summer wild chinook salmon smolts tagged as transport fish at Lower Granite Dam in spring 1996. Total returns by age class are provided at the end of the table. Also shown in the table are adults detected at Bonneville Dam.

Smolt release date	Adult return date		Pit-tag code	Jaw tag number	Length		Upstream adult recovery[a]	
	Bonn	LGR			At smolt tagging (mm)	At adult return (mm)	Date	Location[b]
16-Apr-96		04-Jul-99	416A225531	C5067	109	960		NR
20-Apr-96		19-Jun-98	416850762F	C3295	110	760		NR
		23-Jun-99	4131794500	C5062	109	1020		NR
22-Apr-96		04-Jul-98	41673A5E69	C2358	120	670		NR
		08-Jul-98	414C03744A	C3305	118	870		NR
24-Apr-96		09-May-98	41671D6C48	C3273	109	780		NR
	16-May-98	16-Jun-98	41701F5067	C1045	112	660		NR
25-Apr-96		21-May-98	416B512122[c]	C1041	108	660		NR
06-May-96		05-May-98	4151246F19	C3271	119	690		NR
12-May-96		17-Jun-99	416B565159	C5059	116	1000		NR

Total adult returns:

Jacks	0
2-ocean	7
3-ocean	3

[a] Upstream recoveries of adults returning in 1999 were incomplete at the time this document was published.

[b] Recovery location abbreviatons: NR = Not recovered.

[c] All fish released on this day were removed from the adult calculations because of problems encountered during barge loading which allowed an unknown number of transport fish to escape to the river.

Appendix Table 15.0 Total jack returns to Lower Granite Dam from spring/summer chinook salmon smolts tagged as inriver fish at Lower Granite Dam in spring 1998. Also shown in the table are adults detected at Bonneville Dam.

Smolt release date	Adult return date		Pit-tag code	Length		Upstream adult recovery[a]	
	Bonn	LGR		At smolt tagging (mm)	At adult return (mm)	Date	Location[b]
10-Apr-98		02-Jun-99	51163D003C	149	480	01-Jul-99	DWOR
11-Apr-98	28-Jun-99	08-Jul-99	5116380107	126	560		NR
12-Apr-98		04-Jun-99	51120B5A05	130	460	01-Jul-99	DWOR
		07-Jun-99	5100036701	129			NR
	26-May-99	16-Jun-99	510C164F66	129	530		NR
13-Apr-98		26-May-99	510A553133	132	480		NR
		27-May-99	510A532005	133	450		NR
		19-Jul-99	51075D5E67	140	580		NR
14-Apr-98		25-May-99	5119390075	134	510	28-Jun-99	RAPH
		11-Jul-99	511C032960	109			NR
15-Apr-98		16-May-99	511B2A376D	140	480	28-Jun-99	RAPH
		31-May-99	511B296E7C	136			NR
16-Apr-98		23-May-99	511041544B	139	530		NR
18-Apr-98	14-May-99	01-Jun-99	511C0B0A23	133			NR
19-Apr-98		02-Jun-99	5115622530	148	460	04-Jul-99	RAPH
	01-Jul-99	11-Jul-99	5114277130	146			NR
23-Apr-98		31-May-99	5110710B7C	129	490	01-Jul-99	DWOR
24-Apr-98		27-May-99	5105710875	137	450	02-Jul-99	RAPH
25-Apr-98		29-Jun-99	510C0D2A6D	142		28-Jul-99	SALSFW
26-Apr-98		22-May-99	51085D361E	142		24-Jun-99	RAPH
		09-Jun-99	510F697F3A	147			NR
29-Apr-98		25-May-99	51120C4F3D	138			NR
		03-Jun-99	504C3F6926	134			NR
	26-May-99	11-Jun-99	504C492168	149	530	18-Jul-99	SALSFW
		17-Jun-99	504C48526F	150		26-Aug-99	SALSFW
		18-Jul-99	5110170955	149		28-Aug-99	SALSFW
01-May-98		22-May-99	5114763916	139		08-Jul-99	RAPH
02-May-98		13-Jun-99	510F6D7544	141	530	20-Jul-99	SALSFW
		22-Jul-99	51134B396D	144	600		NR
03-May-98		06-Jun-99	5102706305	137	490	02-Jul-99	RAPH
		21-Jun-99	5117142702	148	550	21-Jul-99	SALSFW

Total adult returns:

Jacks	31
2-ocean	NA
3-ocean	NA

[a] Upstream recoveries of jacks returning in 1999 were incomplete at the time this document was published.

[b] Recovery location abbreviatons: NR = Not recovered; CROTRP = Crooked River Trap; DWOR = Dworshak Hatchery; PAHSIW = Pahsimeroi Weir; RAPH = Rapid River Hatchery; SALSFW = South Fork Salmon River Weir.

Appendix Table 15.1 Total jack returns to Lower Granite Dam from hatchery spring/summer chinook salmon smolts tagged as inriver fish at Lower Granite Dam in spring 1998. Also shown in the table are adults detected at Bonneville Dam.

Smolt release date	Adult return date		Pit-tag code	Length		Upstream adult recovery[a]	
	Bonn	LGR		At smolt tagging (mm)	At adult return (mm)	Date	Location[b]
10-Apr-98		02-Jun-99	51163D003C	149	480	01-Jul-99	DWOR
11-Apr-98	28-Jun-99	08-Jul-99	5116380107	126	560		NR
12-Apr-98		04-Jun-99	51120B5A05	130	460	01-Jul-99	DWOR
		07-Jun-99	5100036701	129			NR
	26-May-99	16-Jun-99	510C164F66	129	530		NR
13-Apr-98		26-May-99	510A553133	132	480		NR
		27-May-99	510A532005	133	450		NR
		19-Jul-99	51075D5E67	140	580		NR
14-Apr-98		25-May-99	5119390075	134	510	28-Jun-99	RAPH
15-Apr-98		16-May-99	511B2A376D	140	480	28-Jun-99	RAPH
		31-May-99	511B296E7C	136			NR
16-Apr-98		23-May-99	511041544B	139	530		NR
18-Apr-98	14-May-99	01-Jun-99	511C0B0A23	133			NR
19-Apr-98		02-Jun-99	5115622530	148	460	04-Jul-99	RAPH
	01-Jul-99	11-Jul-99	5114277130	146			NR
23-Apr-98		31-May-99	5110710B7C	129	490	01-Jul-99	DWOR
24-Apr-98		27-May-99	5105710875	137	450	02-Jul-99	RAPH
25-Apr-98		29-Jun-99	510C0D2A6D	142		28-Jul-99	SALSFW
26-Apr-98		22-May-99	51085D361E	142		24-Jun-99	RAPH
		09-Jun-99	510F697F3A	147			NR
29-Apr-98		25-May-99	51120C4F3D	138			NR
		03-Jun-99	504C3F6926	134			NR
	26-May-99	11-Jun-99	504C492168	149	530	18-Jul-99	SALSFW
		17-Jun-99	504C48526F	150		26-Aug-99	SALSFW
		18-Jul-99	5110170955	149		28-Aug-99	SALSFW
01-May-98		22-May-99	5114763916	139		08-Jul-99	RAPH
02-May-98		13-Jun-99	510F6D7544	141	530	20-Jul-99	SALSFW
		22-Jul-99	51134B396D	144	600		NR
03-May-98		06-Jun-99	5102706305	137	490	02-Jul-99	RAPH
		21-Jun-99	5117142702	148	550	21-Jul-99	SALSFW

Total adult returns:

Jacks	30
2-ocean	NA
3-ocean	NA

[a] Upstream recoveries of jacks returning in 1999 were incomplete at the time this document was published.

[b] Recovery location abbreviatons: NR = Not recovered; CROTRP = Crooked River Trap; DWOR = Dworshak Hatchery; PAHSIW = Pahsimeroi Weir; RAPH = Rapid River Hatchery; SALSFW = South Fork Salmon River Weir.

Appendix Table 15.2 Total jack returns to Lower Granite Dam from wild spring/summer chinook salmon smolts tagged as inriver fish at Lower Granite Dam in spring 1998. Also shown in the table are adults detected at Bonneville Dam.

Smolt release date	Adult return date		Pit-tag code	Length		Upstream adult recovery[a]	
	Bonn	LGR		At smolt tagging (mm)	At adult return (mm)	Date	Location[b]
14-Apr-98		11-Jul-99	511C032960	109			NR

Total adult returns:

Jacks	1
2-ocean	NA
3-ocean	NA

[a] Upstream recoveries of jacks returning in 1999 were incomplete at the time this document was published.

[b] Recovery location abbreviatons: NR = Not recovered.

Appendix Table 16.0 Total jack returns to Lower Granite Dam from spring/summer chinook salmon smolts tagged as transport fish at Lower Granite Dam in spring 1998. Also shown in the table are adults detected at Bonneville Dam.

Smolt release date	Adult return date		Pit-tag code	Length		Upstream adult recovery[a]	
	Bonn	LGR		At smolt tagging (mm)	At adult return (mm)	Date	Location[b]
11-Apr-98		18-May-99	507F70304B	131	520		NR
		25-May-99	510612626B	116	500		NR
13-Apr-98		29-May-99	511202627D	132			NR
		02-Jun-99	510C05504C	142		22-Jul-99	DWOR
		07-Jul-99	5106765B09	121			NR
		09-Jul-99	507F7D2B2B	126	570		NR
15-Apr-98		15-May-99	511B545426	128	460		NR
		15-May-99	511B322C79	130	490		NR
		16-May-99	511B52602A	141	510	01-Jul-99	DWOR
		19-May-99	511C60424E	136	480	03-Jul-99	RAPH
		26-Jul-99	511C354F24	130			NR
17-Apr-98		12-Jun-99	511A6A701C	124		22-Jul-99	DWOR
		27-Jun-99	507F6F6705	144	610		NR
19-Apr-98		14-Jun-99	511A717177	147	450		NR
		17-Jun-99	510C77250C	120	480		NR
21-Apr-98		15-Jul-99	5107587F5F	118	510		NR
23-Apr-98		18-May-99	511021317E	142	480	01-Jul-99	DWOR
		22-May-99	510E281139	117	470		NR
		26-May-99	510E307756	138	500	26-Jul-99	RAPH
		30-Jun-99	5105652050	110			NR
		30-Jun-99	5113487002	143	540	27-Jul-99	PAHSIW
27-Apr-98		14-Jun-99	510D475600	139			NR
28-Apr-98		18-May-99	511773436B	139	510		NR
		17-Jun-99	5113514E38	143	480		NR
		06-Jul-99	5113397A7E	146		25-Jul-99	SALSFW
29-Apr-98		26-May-99	510F777C7D	137	520		NR
		03-Jul-99	5118220754	136	510		NR
30-Apr-98		31-May-99	504C4B1817	139	490		NR
		27-Jun-99	511773053C	151	530		NR
		01-Jul-99	510B267B35	134	570		NR
06-May-98		26-Jun-99	5104245803	159	590		NR
07-May-98		04-Jun-99	511744762B	142	500	01-Jul-99	DWOR
09-May-98	12-May-99	06-Jun-99	511D0B7031	150	490	09-Jul-99	CROTRP
22-May-98		29-May-99	51195B4524	151		21-Jul-99	SALSFW

Total adult returns:

Jacks	34
2-ocean	NA
3-ocean	NA

[a] Upstream recoveries of jacks returning in 1999 were incomplete at the time this document was published.

[b] Recovery location abbreviatons: NR = Not recovered; CROTRP = Crooked River Trap; DWOR = Dworshak Hatchery; PAHSIW = Pahsimeroi Weir; RAPH = Rapid River Hatchery; SALSFW = South Fork Salmon River Weir.

Appendix Table 16.1 Total jack returns to Lower Granite Dam from hatchery spring/summer chinook salmon smolts tagged as transport fish at Lower Granite Dam in spring 1998. Also shown in the table are adults detected at Bonneville Dam.

Smolt release date	Adult return date		Pit-tag code	Length		Upstream adult recovery[a]	
	Bonn	LGR		At smolt tagging (mm)	At adult return (mm)	Date	Location[b]
11-Apr-98		18-May-99	507F70304B	131	520		NR
13-Apr-98		29-May-99	511202627D	132			NR
		02-Jun-99	510C05504C	142		22-Jul-99	DWOR
		09-Jul-99	507F7D2B2B	126	570		NR
15-Apr-98		15-May-99	511B322C79	130	490		NR
		15-May-99	511B545426	128	460		NR
		16-May-99	511B52602A	141	510	01-Jul-99	DWOR
		19-May-99	511C60424E	136	480	03-Jul-99	RAPH
		26-Jul-99	511C354F24	130			NR
17-Apr-98		12-Jun-99	511A6A701C	124		22-Jul-99	DWOR
		27-Jun-99	507F6F6705	144	610		NR
19-Apr-98		14-Jun-99	511A717177	147	450		NR
23-Apr-98		18-May-99	511021317E	142	480	01-Jul-99	DWOR
		26-May-99	510E307756	138	500	26-Jul-99	RAPH
		30-Jun-99	5113487002	143	540	27-Jul-99	PAHSIW
		30-Jun-99	5105652050	110			NR
27-Apr-98		14-Jun-99	510D475600	139			NR
28-Apr-98		18-May-99	511773436B	139	510		NR
		17-Jun-99	5113514E38	143	480		NR
		06-Jul-99	5113397A7E	146		25-Jul-99	SALSFW
29-Apr-98		26-May-99	510F777C7D	137	520		NR
		03-Jul-99	5118220754	136	510		NR
30-Apr-98		31-May-99	504C4B1817	139	490		NR
		27-Jun-99	511773053C	151	530		NR
		01-Jul-99	510B267B35	134	570		NR
06-May-98		26-Jun-99	5104245803	159	590		NR
07-May-98		04-Jun-99	511744762B	142	500	01-Jul-99	DWOR
09-May-98	12-May-99	06-Jun-99	511D0B7031	150	490	09-Jul-99	CROTRP
22-May-98		29-May-99	51195B4524	151		21-Jul-99	SALSFW

Total adult returns:

Jacks	29
2-ocean	NA
3-ocean	NA

[a] Upstream recoveries of jacks returning in 1999 were incomplete at the time this document was published.

[b] Recovery location abbreviatons: NR = Not recovered; CROTRP = Crooked River Trap; DWOR = Dworshak Hatchery; PAHSIW = Pahsimeroi Weir; RAPH = Rapid River Hatchery; SALSFW = South Fork Salmon River Weir.

Appendix Table 16.2 Total jack returns to Lower Granite Dam from wild spring/summer chinook salmon smolts tagged as transport fish at Lower Granite Dam in spring 1998. Also shown in the table are adults detected at Bonneville Dam.

Smolt release date	Adult return date		Pit-tag code	Length		Upstream adult recovery[a]	
	Bonn	LGR		At smolt tagging (mm)	At adult return (mm)	Date	Location[b]
11-Apr-98		25-May-99	510612626B	116	500		NR
13-Apr-98		07-Jul-99	5106765B09	121			NR
19-Apr-98		17-Jun-99	510C77250C	120	480		NR
21-Apr-98		15-Jul-99	5107587F5F	118	510		NR
23-Apr-98		22-May-99	510E281139	117	470		NR

Total adult returns:

Jacks	5
2-ocean	NA
3-ocean	NA

[a] Upstream recoveries of jacks returning in 1999 were incomplete at the time this document was published.

[b] Recovery location abbreviatons: NR = Not recovered.