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2000 LOWER GRANITE DAM SMOLT MONITORING PROGRAM

Annual Report



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2000 LOWER GRANITE DAM SMOLT MONITORING PROGRAM ANNUAL REPORT

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Summary

The 2000 fish collection season at Lower Granite was characterized by lower than average spring flows and spill, low levels of debris, cool water temperatures, increased unclipped yearling and subyearling chinook smolts, and 8,300,546 smolts collected and transported compared to 5,882,872 in 1999. With the continued release of unclipped supplementation chinook and steelhead above Lower Granite Dam, we can no longer accurately distinguish wild chinook, steelhead, and sockeye/kokanee in the sample. Although some table titles in this report still show "wild" column headings, the numbers in these columns for 1999 and 2000 include wild and unclipped hatchery origin smolts. The increases over previous years reflect the increased supplementation. A total of 8,300,546 juvenile salmonids were collected at Lower Granite Dam. Of these, 187,862 fish were bypassed back to the river and 7,950,648 were transported to release sites below Bonneville Dam, 7,778,853 by barge and 171,795 by truck. A total of 151,344 salmonids were examined in daily samples. Nine research projects conducted by four agencies impacted a total of 1,361,006 smolts (16.4% of the total collection).

Introduction

The Smolt Monitoring Program (SMP) is designed to provide a consistent, real-time database on fish passage and document the migration characteristics of the many stocks of salmon and steelhead in the Columbia Basin. Each SMP site collects daily data on fish passage, river flow (total river flow, total spill and flow through the powerhouse) and other site-specific data required by Fish Passage Center (FPC) during the migration season. FPC staff oversees and guides the SMP sampling program for each site. Fish Passage Center uses this data to work with fishery managers to seek appropriate flow and spill measures to enhance smolt passage and survival as identified in the hydrosystem's operations requirements set forth in NMFS Biological Opinion and in the Northwest Power Planning Council's Fish and Wildlife Program.

Lower Granite Dam is located on the Snake River, approximately 107.5 miles upstream from the confluence with the Columbia River. Lower Granite is the first of eight dams that migratory juvenile salmonids in the Snake River and its tributaries encounter on their way to the ocean. It is also the first of four juvenile fish collection and transportation facilities operated by the Corps of Engineers on the Snake and Columbia Rivers. Most of the collected fish are transported in barges and trucks to the release locations below Bonneville Dam on the Columbia River. From there, they complete the remaining 140-mile journey to the ocean on their own.

At Lower Granite Dam, SMP staff, collect and record data by inspecting a sample of each day's total smolt collection. Staff technicians and biologists identify and record the following information for each fish sampled; species, hatchery marks (freeze brands, fin clips, coded-wire tags and elastomer tags), injuries, and external signs of disease and/or stress. Lengths and weights are taken on a sub-sample of up to one hundred fish of each species, every other day. The staff also collects daily river flow and river temperature data, monitors and assists on-site research activities, maintains accurate records of sample and collection data, transmits daily reports to the FPC and prepares annual reports. The SMP has been active at Lower Granite since 1984 and has been operated by the Washington State Department of Fish and Wildlife (WDFW) since 1988.

River Conditions

Flow

Flows in the Snake River during the 2000 season were lower than in the previous four years (Table 1). With the exception of April and October, average flows for each month were the lowest of the last four years. Flows exceeded the Biological Opinion target of 100 thousand cubic feet per second (kcfs) (NMFS, 1995) during the spring migration for only ten days this season compared with 56 days in 1999.

River flows for the last few days of March were between 48 and 59 kcfs. Flows in April averaged 89 kcfs, the second lowest of the last five years, and ranged between 54 and 115 kcfs. River flows first exceeded 100 kcfs on April 15 (108.6), peaked on April 24 (115.0) and did not fall below 100 kcfs until April 26 (99.9). In May, river flows averaged 84.1 kcfs and peaked at 100.8 on May 5. River flows averaged 64.4 in June, less than half the average for the last four years and declined to less than 50 kcfs on June 24. Flows declined steadily from then on and dropped as low as 14.5 kcfs on September 4 before rebounding to the mid-to-lower 20 kcfs range during the remainder of the month, averaging 22.0 kcfs. River flows averaged 22.6 kcfs in October with a low of 12.6 kcfs on October 1 and peaked at 35.1 kcfs on October 5. The river flow on October 31, the last day of the collection season, was 20.7 kcfs.

The Snake River projects were drafted to minimum operation pool (MOP) or MOP plus one foot on April 8. Lower Granite pool was drafted to 733-734 feet elevation (ft. elev.) and Little Goose pool to 633-634 (ft. elev.). Little Goose pool was refilled between September 13 and 15 in order to improve adult fish passage conditions at Lower Granite Dam. Lower Granite reservoir was refilled in November.

Spill

Spill took place daily from April 8 through June 20. During the period of April 5 through April 9, spillbays one and two were operated at near 4,000 cfs for balloon tag testing of the surface bypass collector (SBC). Actual spill for SBC research occurred between April 10 and May 28. Surface collector discharge through spillbay one, along with accompanying discharges from spillbay two, occurred nearly continuously during the spring test. Discharge through the collector averaged 3.5 kcfs and was shut off only for maintenance activities. Discharge through spillbay two averaged two kcfs. In all, continuous spill occurred a total of 73 days, ranged between 17 and 46 kcfs and averaged 25.7 kcfs. Peak spill occurred on the peak flow date of April 24 (Figure 1 and Appendix 1, Table 1).

Table 1. Comparison of average monthly river flow and spill at Lower Granite Dam, 1996-2000.

Month	1996	1997	1998	1999	2000	1996-1999 Average
			Flow (kcfs)			
Apr	113.9	120.9	64.8	93.8	89.4	98.3
May	126.2	167.1	139.3	110.8	84.1	135.9
Jun	146.4	162.8	115.4	135.8	64.4	140.1
Jul	55.4	69.8	62.4	55.5	38.6	60.8
Aug	37.5	46.9	33.7	38.2	26.3	39.1
Sep	25.0	35.2	26.4	23.0	21.6	27.4
Oct	22.2	35.5	24.3	23.4	22.6	26.4
			Spill (kcfs)			
Apr	54.5	27.1	12.7	32.6	20.2	31.7
May	28.7	58.7	45.1	41.9	21.6	43.6
Jun	60.9	62.1	29.0	46.4	20.7	49.6
Jul	61.7	3.3	3.3	0.5	0.0	17.2
Aug	8.8	0.6	0.0	0.3	0.0	2.4
Sep	0.0	1.0	0.0	0.0	0.0	0.3
Oct	0.0	0.0	0.0	0.0	0.6	0.0

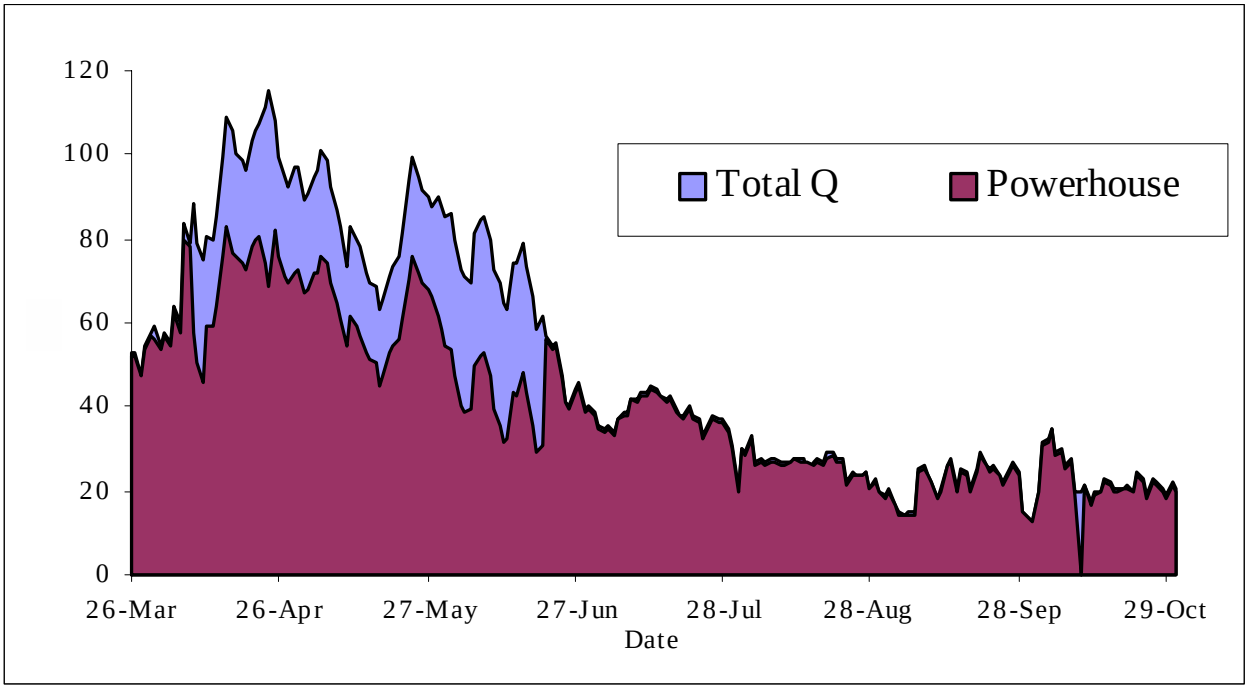


Figure 1. Daily average powerhouse discharge and spill at Lower Granite Dam, 2000.

Temperature

Facility water temperatures were in the mid-forty degree range at the beginning of the season in late March and did not exceed 60º F until June 8 (Appendix 1, Table 1). Water temperatures increased to 65º F on June 28 and did not reach 70º F this season. The peak temperature of 69.1ºF occurred August 10. Water temperatures declined slowly for the remainder of August and early September, with daily water temperatures at or near 65º F. Temperatures increased to 68ºF on September 21 and then decreased to 65º F September 28 and dropped below 60º F on October 8. The water temperature on October 31, the last day of the season, was 53.8º F.

From April 1 through October 31, 2000, temperature units (TU's), the number of Fahrenheit degrees above 32º F, totaled 6,033, the second highest in the last five years, but just 1.2% below the 1995 through 1999 average of 6,106. The number of temperature units for the same period in 1999 and 1998 were 5,853 and 6,414, respectively. Water temperatures during the spring migration period, April 1 to June 20, were the second highest since 1996 and represented an increase of 4.2% over the last five-year average. TU totals for this period in 2000, 1999 and 1998 were 1731, 1,601 and 1,776, respectively. Temperature unit totals during the summer migration period, June 21 through October 31, in 2000 were 4302, 1.2% warmer than in 1999 (4,252 in 1999) and 7.2% cooler than in 1998 (4,638 in 1998).

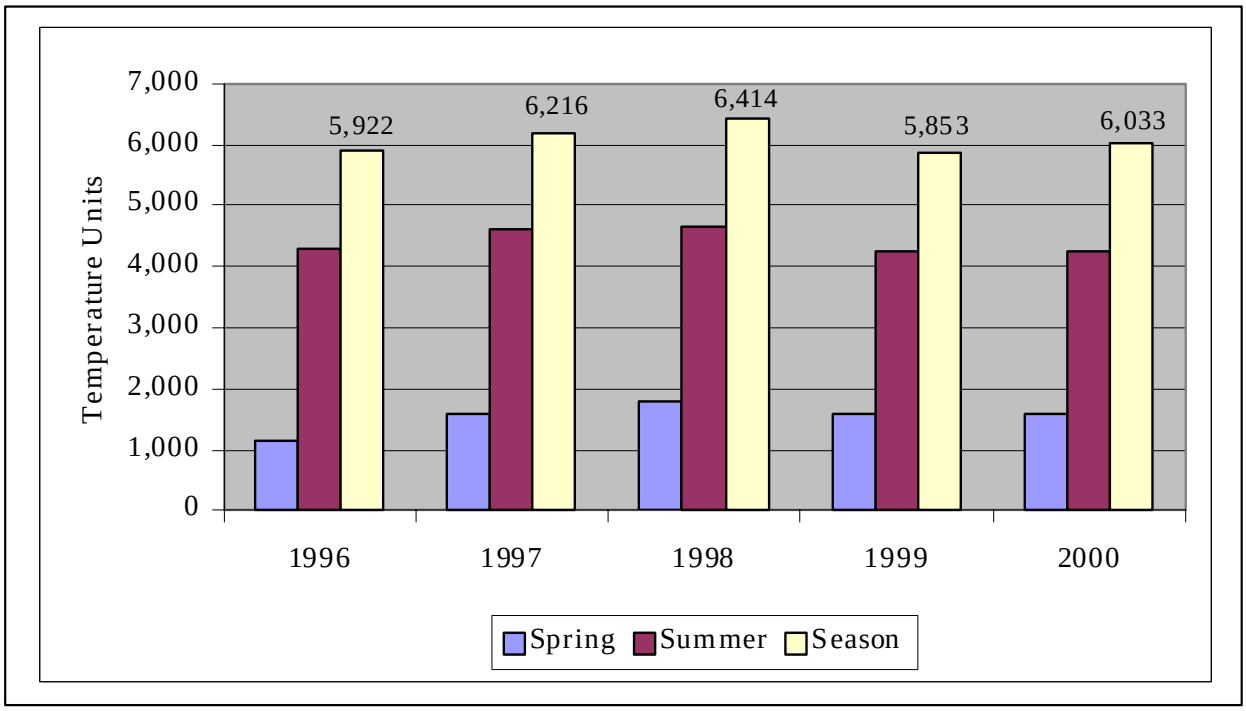


Figure 2. Number of temperature units for Spring (April 1-June 20), Summer (June 21-Oct. 31) and fish collection season (April 1-Oct. 31) at Lower Granite, 1996 through 2000.

Debris

We have measured the volume of small woody debris collected in the sample tank daily since 1998. Additionally, we made weekly estimates of floating debris in the forebay and recorded forebay debris removal events, trash rack raking events and de-watering screen-cleaning events. Daily facility debris loads were estimated based on daily sample tank accumulations and sample rates. The volume of woody debris too large to pass through the separator bars was not estimated.

An estimated total of nearly 212 cubic feet of small woody debris passed through the fish facility in 2000. Daily debris accumulation averaged approximately 0.16 cubic feet per day. This is a 71% decrease from debris volumes measured in 1999 when an estimated 730 cubic feet of material or 3.2 cubic feet per day passed through the collection facility. Peak facility debris periods in 2000 occurred at startup of fish collection, March 26 and on April 30, six days after the seasons' peak flow. Daily facility debris estimates during this periods ranged between zero and 20 cubic feet of material.

Throughout the 2000 fish collection season floating debris was minimal due to flows that were below the previous four years' average (Table 1). As a result,woody debris did not accumulate. Use of the log booms to tow away debris from the powerhouse was not needed as had occurred in the previous four years. In 1999 the floating woody debris in the forebay reached a maximum estimated area of four acres between June 17 and early July.

Trashracks on turbine units one and two were cleaned of debris in February. Due to extensive outages, it was not necessary to clean trashracks on these units again during the fish season. Additional trash rack cleaning did not take place on any unit until June. Trashracks on units five and six were cleaned of debris in late June and early July. Additional trashrack cleaning was not necessary during the remainder of the season.

Lower Granite's primary dewatering structure consists of an inclined screen of stainless steel mesh, supported by heavy bar screen, just upstream from the porosity control perforated plate for the separator. There is no mechanical cleaning device on this screen. It is cleaned with a long handled brush or scraper at periods ranging from every hour to once or twice per day. When the incline screen on the separator system becomes severely clogged with debris, it is necessary to go into temporary bypass mode by closing the dewatering valve below the screen and opening the 72 inch bypass valve. This takes pressure off of the incline screen and allows debris to either float off or be easily brushed off. Typically it takes 20 minutes to complete the procedure during which time fish are bypassed back to the river. Due to comparatively low amounts of debris moving down river, it was not necessary to clean the incline screen during the 2000 fish collection season. This was a considerable decrease in cleaning events from 1998 and 1999 when there were 14 and 36 separate cleanings, respectively.

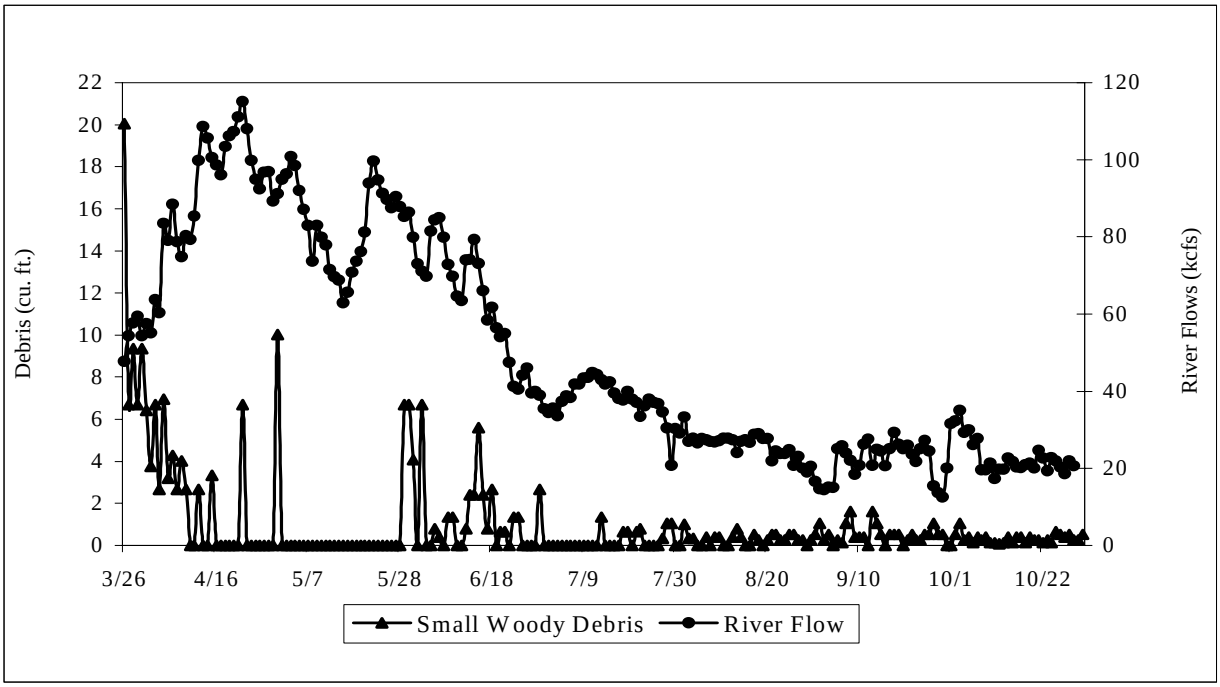


Figure 3. Estimated total daily small woody debris accumulation in the juvenile fish bypass system and flows at Lower Granite Dam, 2000.

Turbidity

We used a secchi disc to measure turbidity during the season in the adult fish ladder at Lower Granite. Visibility readings gave us a relative measure of turbidity. When loads of suspended solid particle materials in the river increased, visibility through the water decreased. Measurements were taken from the surface of the fish ladder adjacent to the adult fish viewing windows. We used a six-inch black and white disk attached to the end of a two-meter rod with graduations in tenths of feet. Daily measurements were taken between 10 A.M. and noon. Surface water conditions coupled with varying light conditions made measurements on some days more difficult than others. Shallower readings were easier to take accurately than deep ones.

We observed two relatively sharp decreases in visibility in the river this season. The first occurred on April 16, one day after flows first exceeded 100 kcfs on April 15. After the peak flow day on April 24, visibility remained below 3.8 feet for 17 days (Figure 4). River flows decreased to 62.9 kcfs on May 17 and increased to 99.7 kcfs on May 24. This increase in flows corresponded to a second decrease in visibility recorded May 27. Visibility reached five feet on June 18 and averaged 5.2 feet for the remainder of the year. In 1998 and 1999 visibility and collection numbers corresponded with storm events. During the 2000 fish collection season, there were no major storm events to affect visibility and collection numbers.

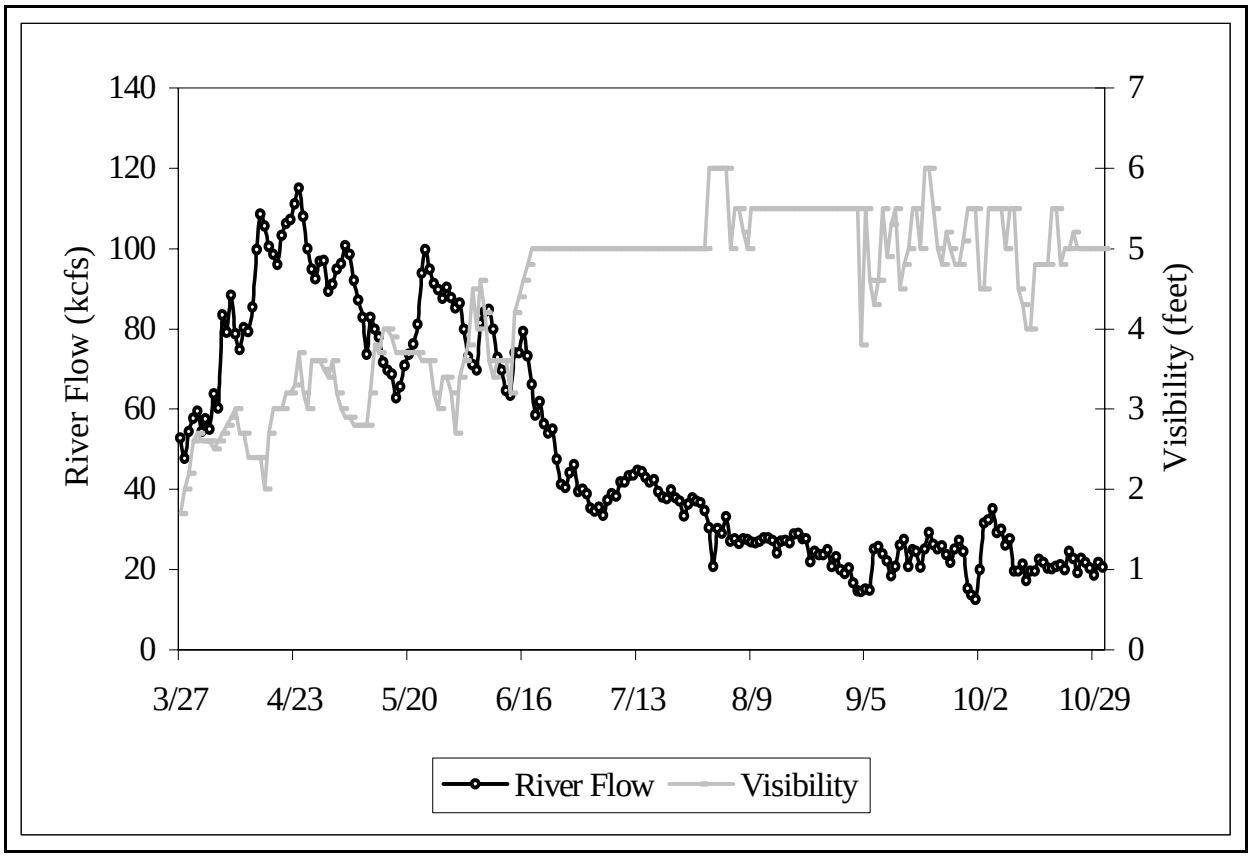


Figure 4. Fish ladder visibility and river flows at LGR, 2000.

Sample Program and Summary

Overview

Daily samples of fish from the general collection were counted by hand and examined throughout the season. Sample data including counts by species, weight and descaling data were recorded and summarized daily to provide real time information for the Smolt Monitoring Program and for the Corps of Engineers transportation program. Daily samples were collected over a 24-hour period between 0700 and 0700 and processed between 0730 and 1000 each day. In the latter part of the season when the mini-tanker was used to transport fish, daily samples were processed every-other-day on transport days. Throughout most of the season, researchers utilized anesthetized fish from the sample for marking and study purposes. We sampled a total of 151,344 smolts, 1.8% of the total collection this season. Daily sample sizes averaged 688 smolts for the season and ranged between seven and 3,275 smolts.

Daily sample procedure

Fish diverted to the sample tank were held for up to 24 hours prior to examination. The 24-hour sample period started at 0700. At the end of each 24-hour sampling period, the entire sample was processed. Small groups of fish were separated into batches as follows: screens in the sample holding tank were moved forward to crowd fish to the front of the tank. Once there, small groups of fish were drawn/guided into the pre-anesthetic chambers by opening and closing the knife gates. Batch sizes typically ranged between 30 and 60 fish per chamber and the number of fish was adjusted based on the amount of time the gate was opened and the position of the crowder screen. The fish anesthetic, ethyl m-aminobenzoate methansulfonate (MS-222®), was added to the chamber to obtain a concentration of about 62 mg/l. At this concentration, about 95 percent of the fish were adequately sedated within three minutes. Once anesthetized, these fish were flushed through the exit valve to the sorting trough.

The sorting trough is part of a re-circulating anesthetic system with water temperature control and aeration. The anesthetic levels in the system are set to keep fish sedated and easy to handle during the sample. Typically the MS-222 levels averaged between 55-60 mg/L. Sample fish remained in the sorting tank for as little as five seconds and up to five minutes. We strive to process fish within three minutes of entering the tank to minimize the effects of sedation and handling. Between the pre-anesthetic chambers and the sorting tank, sample fish were sedated an average of five minutes.

All fish handled in the sorting trough were enumerated by species and examined for unique marks and descaling. Additionally, a detailed sub-sample of up to 100 fish of each species was conducted during each daily sample. The detailed sub-sample recorded species, length, weight, unique marks, descaling, injuries and external symptoms of disease. In this process, fish were individually weighed and measured in a water-filled tray on an electronic balance. This detailed sub-sample provides the Corps with fish per pound and species composition data essential for calculations of raceway, barge and truck loading densities needed to stay within the maximum loading densities (0.5 pounds of fish per gallon of water).

Immediately after handling, fish were routed in fresh water to the recovery tank on non-transport days or routed directly onto a waiting truck or barge on transport days. The maximum time that any fish was held at the fish facility was 48 hours.

Sample rates

The sample system at Lower Granite consists of the following parts: two slide gates located in the bottom of the flumes a few feet downstream of the separator; a large slide gate which redirects PIT-tagged fish away from the sample fish; a sample tank with four 4-inch counter tunnel exits; an enclosed pipe that carries fish from the sample tank to the holding tank and a holding tank divided into two equal halves, each with two pre-anesthetizing chambers. The two primary slide gates, which are controlled by a timer calibrated in tenths of a minute, also act as PIT-tag diversion gates. The system has the capability to send PIT-tagged fish that exit the separator during a sample either to the sample or to the river. From March 25 through July 28 the system was set so the sample overrides the PIT-tag diversion system, sending PIT-tagged fish to the sample instead of diverting them to the river. From July 28 until October 31, the system was set to divert PIT-tagged fish back to the river during the sample.

Samples were taken six times per hour during the course of the season, through October 1. From October 2 at 0700 hours through the end of the season, 100% of the collection was sampled. Daily sampling began at Lower Granite at 0700 March 26 and continued daily through October 6 at which time every other day sampling started. However, due to the increased collection numbers on October 7 and 8, every day sampling resumed and continued until the end of the sampling season. Sample rates were adjusted throughout the season to achieve daily sample sizes of between 500 and 1,000 smolts whenever practical. Sample rate adjustments were based on guidelines provided by FPC (Table 2) and daily trends in total collection estimates. The sample rate was also adjusted when the National Marine Fisheries Service needed additional fish from the sample for PIT-tagging in the sample lab.

The sample rate was set at 10% for the first five days of the season between March 26 and 30, and fluctuated between 10% and 25% until April 11. The sample rate was set at 5% on April 12 and progressively lowered to the minimum setting of 0.67% on April 18 and varied between 1% and 0.67% for 43 days between April 18 and May 30, when collection counts were highest. Rates were then gradually increased to 16.7% on June 12, to 25% on August 16 and fluctuated between 25% and 16.7% for 48 days until October 2, when it was increased to 100%. The sample rate remained at 100% through the end of the collection season on October 31, a period of 29 days. A total of 220 daily samples were processed during the sampling season.

Sample and collection counts were biased May 31 and June 1 when one of the two sample slide gates in the flumes that carry fish away from the separator was stuck shut for 20 hours, between 1700 hours on May 30 and 1400 hours May 31. NMFS research shows the flume with the stuck gate typically passes one-third of the fish exiting the separator (Achord et al. 1982). Based on this, sample rates were adjusted to estimate collection totals for this time period. With the exception of this malfunction, the sample system worked properly, needing only minor adjustments in air pressure and gate timing by PSMFC personnel from time to time. Sample counts are expanded to reflect an estimated collection total.

Table 2. Lower Granite Dam Juvenile Fish Facility sample rate guidelines.

Daily Collection	Sample rate	Gate activations and Durations per hour**	Number of fish In sample
>80,000	0.67%	4 @ 6 seconds	533 plus
60,000 - 80,000	1.00%	6 @ 6 seconds	600 - 800
40,000 - 59,999	1.33%	4 @ 12 seconds	533 – 800
25,000 - 39,999	2.00%	6 @ 12 seconds	500 – 800
15,000 - 24,999	3.00%	6 @ 18 seconds	450 – 750
10,000 - 14,999	5.00%	6 @ 30 seconds	500 – 750
7,500 - 9,999	7.00%	6 @ 42 seconds	525 – 700
5,000 - 7,499	10.00%	6 @ 60 seconds	500 – 750
2,500 - 4,999	16.67%	10 @ 1 minute	417 – 833
500 – 2,499	25.00%	10 @ 1.5 minutes	125 – 625
<500	100.00%	Gate open	ALL

**This column refers to the number of times the sample slidegate opens in an hour. For instance the first set of numbers means the slidegate will open 3 times for 8 seconds each time during each hour of a 24-hour sampling period.

Season sample summary

A total of 151,344 fish, 1.8% of the total collection, were sampled in 2000 (Table 3 and 4). The total number of fish sampled by species included: 16,753 hatchery yearling chinook, 9,538 unclipped yearling chinook, 69,919 unclipped subyearling chinook, 41,624 clipped steelhead, 10,645 unclipped steelhead, 68 clipped sockeye/kokanee, 480 unclipped sockeye/kokanee and 2,317 hatchery coho (Table 4). Due to higher collection numbers, approximately 33,735 more smolts were sampled in 2000 than in 1999 when 117,609 fish, 2.0% of the collection, were sampled.

Subyearling fall chinook were sampled at a higher rate than other species because their summer migration timing exposes them to higher sample rates, due to guidelines established by the FPC. In 2000, we sampled 10.3% of the subyearling fall chinook compared to 19.8% in 1999 (Table 3). Higher daily collection counts of subyearling fall chinook in 2000 resulted in sample rates approximately 67.5% less than the previous four-year average (31.7%). In 1998, nearly 30% of the subyearling fall chinook smolts collected at the facility were sampled. Weekly sample totals and sample rates are provided in Table 4.

Sample sizes exceeded 1,000 fish on 28 days between March 25 and April 24 as daily collection counts increased and the sample rate was gradually reduced to the minimum rate of 0.67%. While the sample rate was set on the minimum, samples sizes exceeded 1,000 smolts for eighteen days. Sample sizes exceeded 1,000 smolts on eleven days when the NMFS was marking fish from the sample lab between June 5 and 19. After June 24, samples exceeded 1,000 smolts six times, three times in late-July, once on September 8 and twice in late-October.

Table 3. Weekly sample rates in percent and sample totals at Lower Granite Dam, 2000.

Week Ending	Weekly Rate (%)[1]	Yearling Chinook		Subyearling Chinook		Steelhead		Sockeye/Kokanee		Coho	Totals
		Clipped	Unclipped	Clipped	Unclipped	Clipped	Unclippe	Clipped	Unclipped	All	
3/30	10.00	63	39	0	4	12	65	0	5	0	188
4/6	24.06	781	449	0	20	1,396	1,473	1	33	4	4,157
4/13	9.82	964	1,150	0	29	3,385	2,274	0	31	11	7,844
4/20	1.22	1,505	987	0	9	1,766	824	0	4	1	5,096
4/27	0.73	2,468	644	0	8	5,094	673	0	0	8	8,895
5/4	0.67	4,074	495	0	5	4,873	476	0	1	22	9,946
5/11	0.67	4,502	498	0	2	10,208	1,395	3	2	47	16,657
5/18	0.75	1,176	192	0	1	2,652	767	1	3	30	4,822
5/25	0.86	635	215	0	0	4,210	1,207	13	4	469	6,753
6/1	0.85	121	264	0	14	1,579	320	3	6	323	2,630
6/8	10.75	185	2,085	0	1,386	2,169	515	15	24	853	7,232
6/15	10.96	36	1,174	0	3,618	998	153	2	15	85	6,081
6/22	10.88	63	635	0	5,942	701	132	6	12	108	7,599
6/29	4.82	9	300	0	4,895	641	82	3	1	91	6,022
7/6	1.57	2	76	0	3,224	185	27	0	0	16	3,530
7/13	9.23	3	29	0	3,594	166	16	0	1	25	3,834
7/20	9.36	2	99	0	3,906	277	24	0	1	52	4,361
7/27	16.20	5	55	0	2,890	313	25	0	0	25	3,313
8/3	21.50	1	50	0	3,996	226	24	1	6	26	4,330
8/10	16.67	0	41	0	3,638	249	24	0	2	11	3,965
8/17	18.26	0	12	0	2,552	101	16	0	9	20	2,710
8/24	25.00	1	11	0	1,936	37	11	0	6	5	2,007
8/31	25.00	0	0	0	3,459	23	8	0	17	4	3,511
9/7	25.00	1	4	0	4,005	24	9	0	20	9	4,072
9/14	22.30	0	8	0	2,680	46	12	0	40	5	2,791
9/21	25.00	0	5	0	1,426	22	3	0	24	6	1,486
9/28	25.00	0	6	0	1,139	17	8	0	19	1	1,190
10/5	59.22	0	3	0	1,722	21	6	0	51	5	1,808
10/12	100.00	0	3	0	3,792	48	14	0	44	8	3,909
10/19	100.00	5	1	0	1,889	60	22	1	41	12	2,031
10/26	100.00	73	0	0	4,184	53	15	0	37	13	4,375
10/31	100.00	78	8	0	3,954	72	25	19	21	22	4,199
Sampled		16,753	9,538	---	69,919	41,624	10,645	68	480	2,317	151,344
Morts		191	80	---	877	55	24	0	48	8	1,283
Mort %		1.1%	0.8%	---	1.3%	0.1%	0.2%	0.0%	10.0%	0.3%	0.8%

[1] Fish sampled/fish collected X 100%.

Table 4. Annual percentage of total juvenile salmonids collected that were sampled at Lower Granite Dam, 1996-2000.

	Yearling Chinook		Subyearling[1] Chinook		Steelhead		Sockeye/Kokanee[2]		Coho[3]	
Year	Clipped	Unclipped	Clipped	Unclipped[4]	Clipped	Unclipped	Clipped	Unclipped	All	Total
1996	1.5	2.5	---	38.5	1.7	2.6	7.4	9.7	8.4	1.9
1997	1.3	1.7	26.9	38.3	1.5	1.6	7.1	36.3	6.9	2.0
1998	1.4	2.5	14.0	30.0	1.3	1.6	2.0	2.5	2.7	1.8
1999	0.9	2.0	54.2	19.8	1.2	1.4	4.2	6.1	2.1	2.0
2000	0.8	2.2	---	10.3	1.0	1.4	2.5	11.6	1.9	1.8

[1]Hatchery subyearling chinook were not present until 1997.
[2]Hatchery sockeye/kokanee were not present until 1995.
[3]Hatchery coho were not present until 1996.
[4]Includes unclipped hatchery subyearling chinook with coded wire tags in 2000.

Three agencies conducted five studies using fish from daily samples in 2000. During the sample season, researchers utilized 8,452 smolts, 55.2% less than the 18,582 smolts utilized in 1999 from the daily samples (Table 5). Of the 8,452 sample fish taken by researchers, 7,547 fish (89.3%) were subsequently tagged and bypassed, including: 917 clipped yearling chinook, 2,723 unclipped yearling chinook, 1,175 clipped steelhead and 2,732 unclipped steelhead.

Table 5. Total number of fish taken from daily samples for research needs at LGR, 2000.

	Yearling Chinook		Subyearling Chinook		Steelhead		Sockeye/Kokanee		Coho	
	Clipped	Unclipped	Clipped	Unclipped	Clipped	Unclipped	Clipped	Unclipped	All	Total
Tag, byp.	917	2,723	0	0	1,175	2,732	0	0	0	7,547
Sacrificed	90	0	0	0	0	0	0	0	0	90
Handled	408	0	0	0	273	172	0	0	0	853
Mortality	51	0	0	0	1	0	0	0	0	52
Total	1,466	2,723	0	0	1,449	2,904	0	0	0	8,452

A complete description of research conducted at Lower Granite Dam is in the Research section of this report starting on page 58.

Mark Recapture

We recorded hatchery marks and tags from smolts sampled in the Smolt Monitoring Program (SMP) and Gas Bubble Trauma sampling program (GBT). These marks included freeze brands, fin clips, elastomer tags (VIE) and coded-wire tags (CWT). Information recorded for each mark type included: type of mark, location, orientation, colors, clip codes, lengths on branded fish and tally totals. This information was reported daily to the Fish Passage Center throughout the season. We also recorded passive integrated transponder (PIT) tag codes from tagged fish collected in GBT samples and PIT-tagged fish mortalities from the raceways and the sample. PIT-tag records were flagged with conditional codes "RE" for recaptured fish and "M" for mortalities where appropriate and were submitted to the Columbia River Basin PIT-Tag Information System (PTAGIS).

Because many groups of hatchery chinook were not fin clipped, we were unable to distinguish untagged hatchery fish from wild migrants. Therefore we did not record chinook as hatchery or wild, but as clipped or unclipped. All unclipped yearling and subyearling chinook were scanned for coded-wire tags (CWT). Steelhead were recorded with fin erosion/deformities, typical of hatchery rearing. Daily sampled fish and their respective hatchery marks are expanded by the sample rate to estimate daily total collection.

An estimated 27,530 coded-wire tagged yearling chinook were collected at Lower Granite between March 27 and September 10 (Table 6). Most of these fish were part of a supplementation release of 123,425 hatchery yearling spring chinook into the Salmon River at the Sawtooth hatchery marked only with coded-wire tags, no fin clip (Milks, 2001). The collection of 27,530 of these supplementation fish represents 22.3% of the total release. The Sawtooth hatchery is on the Salmon River 747 river kilometers above Lower Granite. The release was made between April 4 and April 21. The peak daily collection of 1,950 occurred on May 5 (Figure 5).

A total of 87,450 coded-wire tagged subyearling fall chinook were collected at Lower Granite between June 4 and October 31 (Table 6). A total of 2,174,125 Lyons Ferry hatchery subyearling fall chinook were released by the Nez Perce Tribe above Lower Granite of which 883,537 were released from Captain John Rapids Acclimation Facility between May 24 and June 26 (Milks, 2001). Of the 883,537 released, an estimated 397,503 (45%) were coded-wire tagged, but not fin clipped. Adjusting for reported tag loss of 2.3% reduces the number of CWT tagged fish to 388,193. The 87,450 collected CWT tagged fish represent 22.5% of the 388,193 fish that retained their tags and 9.9% of the total Captain John Rapids Acclimation Facility release of 883,537. The peak collection of CWT tagged subyearling fall chinook was 10,700 on July 3 (Figure 6).

An estimated 14,280 (11.9%) coded-wire tagged coho were collected at Lower Granite between April 7 and August 11 (Table 6). The Nez Pierce Tribe released 265,000 Kooskia Hatchery coho into Lapwai Creek, 265,000 Willard Hatchery coho into Potlatch River and 280,000 Kooskia Hatchery coho at the Kooskia Hatchery. Of the 810,000 total coho released, 120,000 were coded-wire tagged only (no fin clips). The 14,280 collected tagged coho represent

11.9% of the 120,000 released. Lapwai Creek, Potlatch River and Kooskia Hatchery are 63, 75 and 176 river kilometers above Lower Granite respectively. These release, made between March 13 and May 17, had a peak collection at Lower Granite of 2,100 on May 26 (Figure 7).

We recorded 307,284 unclipped steelhead of hatchery origin (based on fin erosion) at Lower Granite this season (Table 6). The Nez Pierce Tribe released 260,000 unmarked steelhead from the Magic Valley Hatchery and 140,000 unmarked steelhead from the Clearwater Hatchery at five different locations on the Clearwater River. These releases were made between April 8 and May 8 and are roughly 220 river kilometers above Lower Granite. The United States Fish and Wildlife Service (USFW) released 149,700 unmarked steelhead into the Little Salmon River and an additional 47,000 unmarked steelhead into Hazard Creek. Hazard Creek is a tributary of the Salmon River and is 301 river kilometers above Lower Granite. The USFW releases were made between April 3 and April 8. The collection of 307,284 of these unclipped hatchery steelhead represents 51.5% of the estimated 596,700 released. Of the estimated 757,523 total unclipped steelhead collected at Lower Granite, 40% showed fin erosion typical of hatchery origin smolts (Figure 8).

A total of 377,339 Lyons Ferry Hatchery fall yearling chinook marked with colored elastomer (VIE) tags were released above Lower Granite (Milks, 2001). Approximately 131,306 of these fish were left eye tagged with green elastomer tags (EL-LGR) and released at Big Canyon Acclimation Facility (Milks, 2001). The Big Canyon Acclimation Facility is on the Clearwater River approximately 108 river kilometers above Lower Granite. This release occurred between April 11 and 13. A total of 30,644 (23.3%) EL-LGR marked fish were collected at Lower Granite between April 15 and May 15 with a peak collection of 3,100 on April 16 (Figure 9). Another 114,709 smolts were right eye tagged with green elastomer tags (EL-RGR) and released at Pittsburg Landing Acclimation Facility between April 11 and 13 (Milks, 2001). The Pittsburgh Landing Acclimation Facility is approximately 173 river kilometers above Lower Granite. A total of 28,723 (25%) EL-RGR marked fish were collected at Lower Granite between April 15 and May 10 with a peak collection of 4,400 on April 17 (Figure 10). The remaining 131,324 smolts were right eye tagged with blue elastomer tags (EL-RBL) and released from Captain John Rapids Acclimation Pond between April 1 and April 12 (Milks, 2001). Captain John Rapids Acclimation Pond is 90 river kilometers above Lower Granite. A total of 36,283 (27.6%) EL-RBL marked fish were collected Lower Granite between April 12 and May 19 with a peak collection of 4,900 on April 17 (Figure 11).

A total of 1,703 yearling summer chinook with right eye, red elastomer tags (EL-RRD) were collected at Lower Granite between April 22 and July 17 (Table 6). A total of 78,950 McCall Hatchery yearling summer chinook, all marked with right eye, red elastomer tags (no fin clip) were released into Johnson Creek. The 1,703 collected represent 2.2% of the total released. The peak collection of these fish was 200 on April 22. Johnson Creek, a tributary of the East fork of the South Fork Salmon River and is approximately 429 river kilometers above Lower Granite. This release occurred between March 27 and March 29 (Figure 12).

Dworshak Hatchery released 2,100,000 steelhead of which 40,000 were freeze-branded. The 40,000 freeze-branded fish were divided into four groups of 10,000 smolts, each with a unique brand; RAT1, RAT2, LAT3 and LAT4. Each treatment group received an identifying freeze brand (Table 6). Releases were made from Dworshak Hatchery between April 17 and May 1 (Table 7). Only three hatchery steelhead with the RAT1 were found in daily samples. This represents a collection of 450 branded fish (4.5% of the total released) with a peak collection of 300 branded fish on May 8. We recorded fourteen hatchery steelhead with the RAIT3 freeze brand in daily samples. These fish were holdovers from a 1999 Dworshak Hatchery treatment group of 90,333 hatchery steelhead marked with the RAIT3 brand and released from Cottonwood Acclimation Pond between March 25, and April 30, 1999 (Milks, 2001).

A total of 17,376 steelhead with the freeze brand RA22 were collected between April 3 and June 21 (Table 6). Washington Dept of Fish and Wildlife released 274,146 hatchery steelhead from Lyons Ferry at the Cottonwood Acclimation Pond on the Grand Rhonde River between March 25 and April 30, of which 80,201 were marked with a RA22 freeze brand (Milks, 2001). The collection of 17,376 of these branded fish represents 21.6% of those released. The release site is 144 river kilometers above LGR. The peak collection of 3000 occurred on May 1.

Table 6. Number of hatchery steelhead, chinook and coho marked and released above LGR and the estimated total numbers and percent of each marked group collected at LGR fish facility, 2000.

Mark Code	Rearing Type & Species	Race	Hatchery	Release Site	RKm To LGR	Total Released	Total Recapture	Percent Recovered
CWT, nc	H. Chinook	SP, SU	Multiple Sites	Sawtooth Hatchery	747	123,425	27,530	22.3%
CWT, nc	H. Chinook	FA	Lyons Ferry	Cpt. John Accl. Pd.	90	338,193	87,450	25.9%
CWT, nc	H. Coho		Kooskia	Willard Hatchery	176	120,000	14,280	23.8%
Fin Erosion	H. Steelhead	SU	Multiple Sites	Multiple Sites		596,700	307,284	51.5%
EL-LE-GR	H. Chinook	FA	Lyons Ferry	Big Canyon Accl. Pd.	108	131,306	30,644	23.3%
EL-RE-GR	H. Chinook	FA	Lyons Ferry	Pittsburg Landing	173	114,709	28,723	25.0%
EL-LE-BL	H. Chinook	FA	Lyons Ferry	Cpt. John Accl. Pd.	90	131,324	36,283	27.6%
EL-RE-RD	H. Chinook	SU	McCall	South Fork	429	78,950	1,703	2.2%
FB-RA-T1	H. Steelhead	SU	Dworshak	Dworshak Hatchery	116	10,000	450	4.5%
FB-RD-T2	H. Steelhead	SU	Dworshak	Dworshak Hatchery	116	10,000	0	0.0%
FB-LD-T3	H. Steelhead	SU	Dworshak	Dworshak Hatchery	116	10,000	0	0.0%
FB-LA-T4	H. Steelhead	SU	Dworshak	Dworshak Hatchery	116	10,000	0	0.0%
FB-RA-22	H. Steelhead	SU	Lyons Ferry	Cottonwood	144	80,201	17,376	21.7%
Totals						1,754,808	551,723	31.4%

[1]Mark Codes: FB = freeze brands (location, brand, orientation); EL = elastomer tags (side, color); FE = fin erosion.
Table does not include marked fish collected during GBT examiniations.

Table 7. Passage dates of marked hatchery steelhead and chinook collected at Lower Granite Dam in 2000.

Mark Code	Species, run & rear type	Total Obs.	Release Date	First Observed	25%	50%	75%	Last Observed
CWT, nc	H.CH1	507	April 4-April 21	March 27	May 6	June 16	June 8	Sept. 10
CWT, nc	H.CH0, FA	6,850	May 30 and June 26	June 4	June 24	July 17	August 17	Oct. 31
CWT, nc	H.Coho	113	March 13-March 17	April 7	May 23	May 30	June 6	August 11
Fin Erosion	H.ST, SU	2,903	April 8- May 8	April 5	May 7	May 13	May 20	Oct. 30
EL-LE-GR	H.CH1, FA	255	April 11-13,	April 15	April 17	April 21	April 25	June 7
EL-RE-GR	H.CH1, FA	250	April 11-13,	April 15	April 17	April 20	April 23	June 17
EL-LE-BL	H.CH1, FA	300	April 1-12,	April 12	April 18	April 21	April 24	May 19
EL-RE-RD	H.CH1, FA	38	March 27-March 29	April 22	May 28	June 15	June 21	July 31
FB-RA-T1	H.ST, SU	3	April 17- May 1,	May 8	May 8	May 8	May 8	May 8
FB-RD-T2	H.ST, SU		April 17- May 1	----	----	----	----	----
FB-LD-T3	H.ST, SU		April 17- May 1	----	----	----	----	----
FB-LA-T4	H.ST, SU		April 17- May 1	----	----	----	----	----
FB-RA-22	H.ST, SU	171	March 25, April 30	April 3	April 13	April 28	May 1	June 21

[1]Mark Codes: FB = freeze brands (location, brand, orientation); EL = elastomer tags (side, color). No fin clip, nc.
Table does not include marked fish collected during GBT examinations.

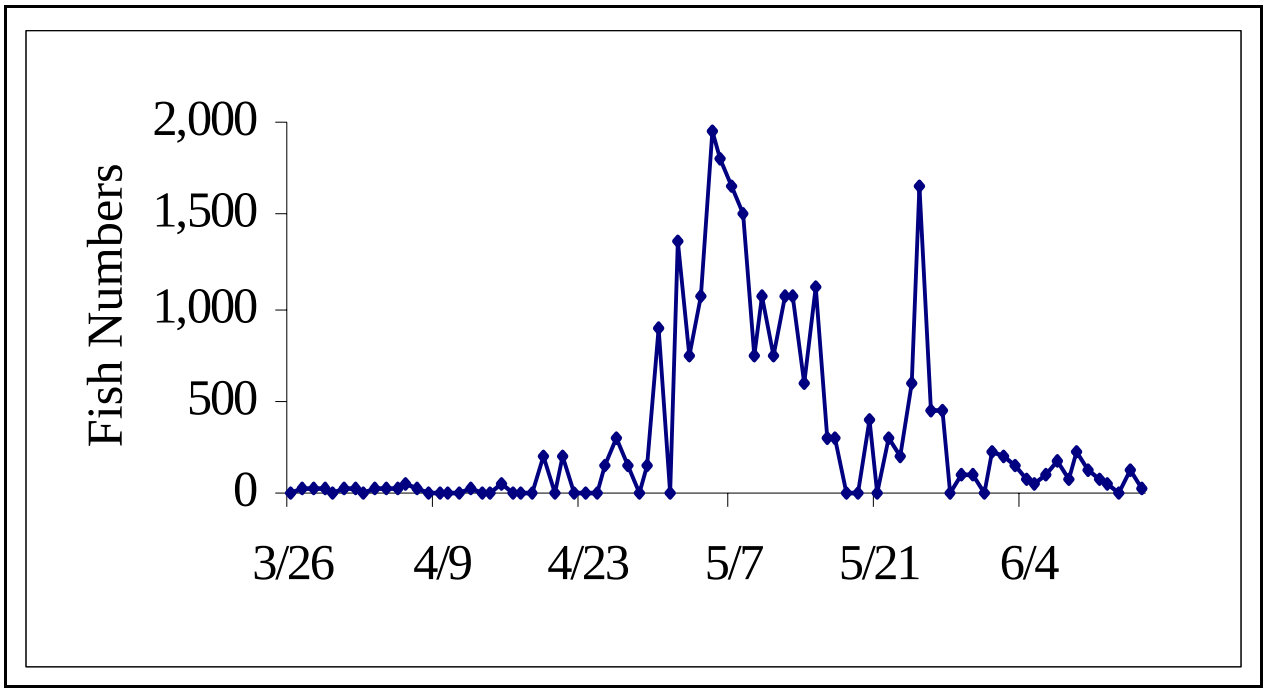


Figure 5. Daily collection of supplementation SP/SU hatchery yearling chinook (CWT only, no clip) at Lower Granite Dam, 2000.

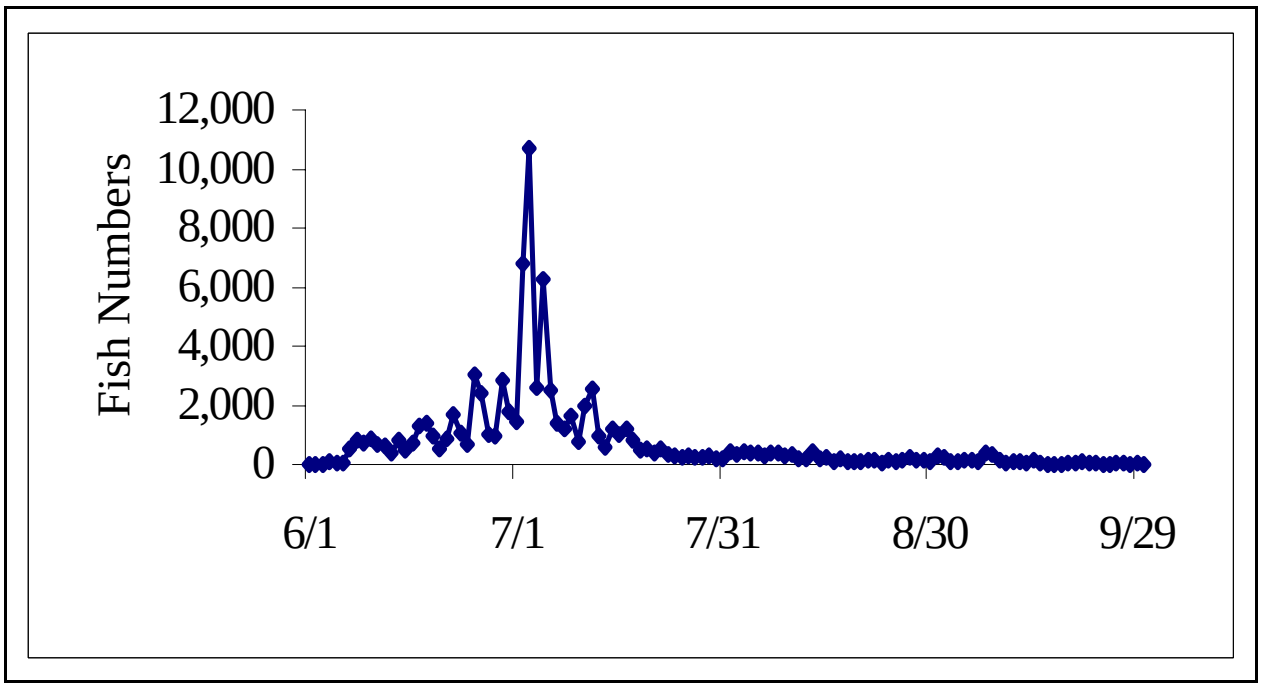


Figure 6. Daily collection of supplementation hatchery subyearling fall chinook (CWT only, no clip) at Lower Granite Dam, 2000.

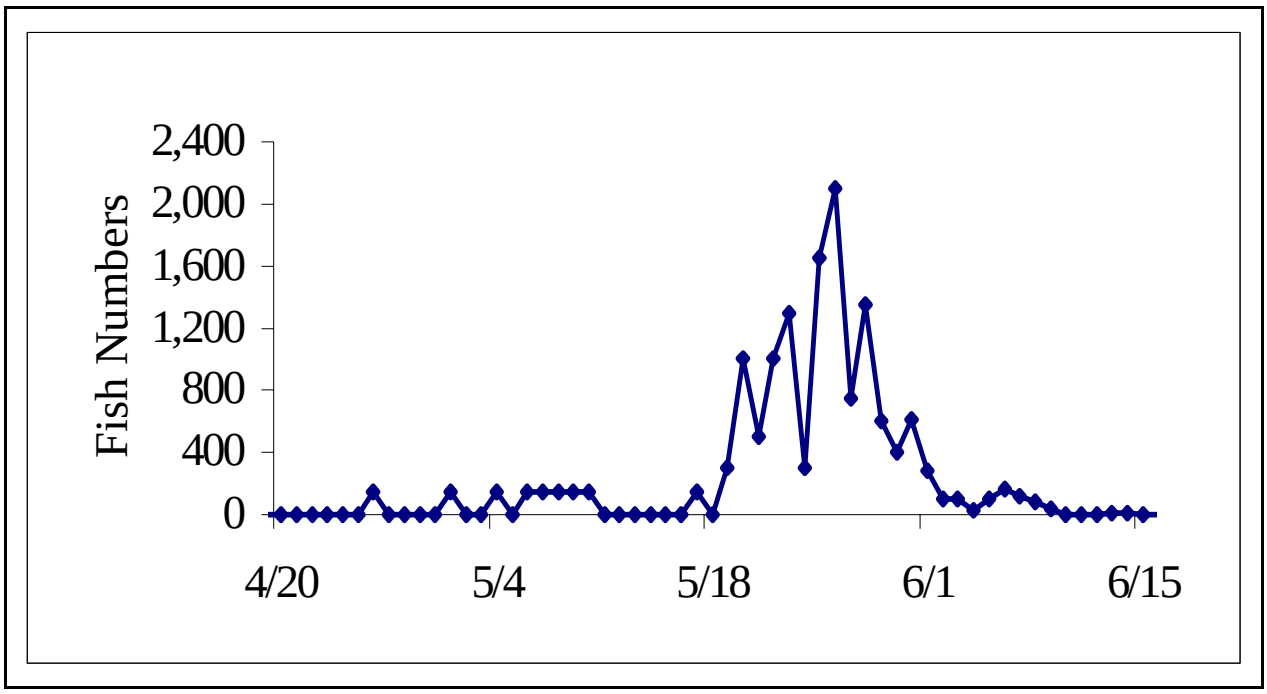


Figure 7. Daily collection of hatchery coho (CWT, no clip) at Lower Granite Dam, 2000.

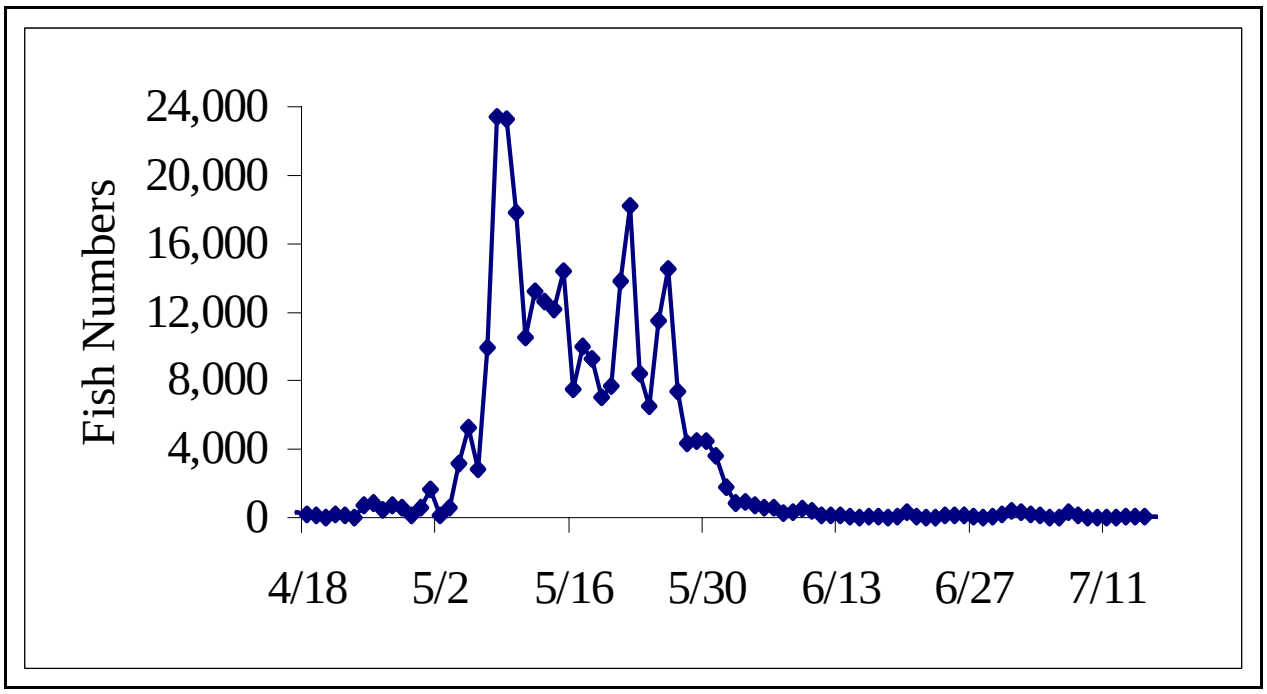


Figure 8. Daily collection of hatchery steelhead with fin erosion at Lower Granite Dam, 2000.

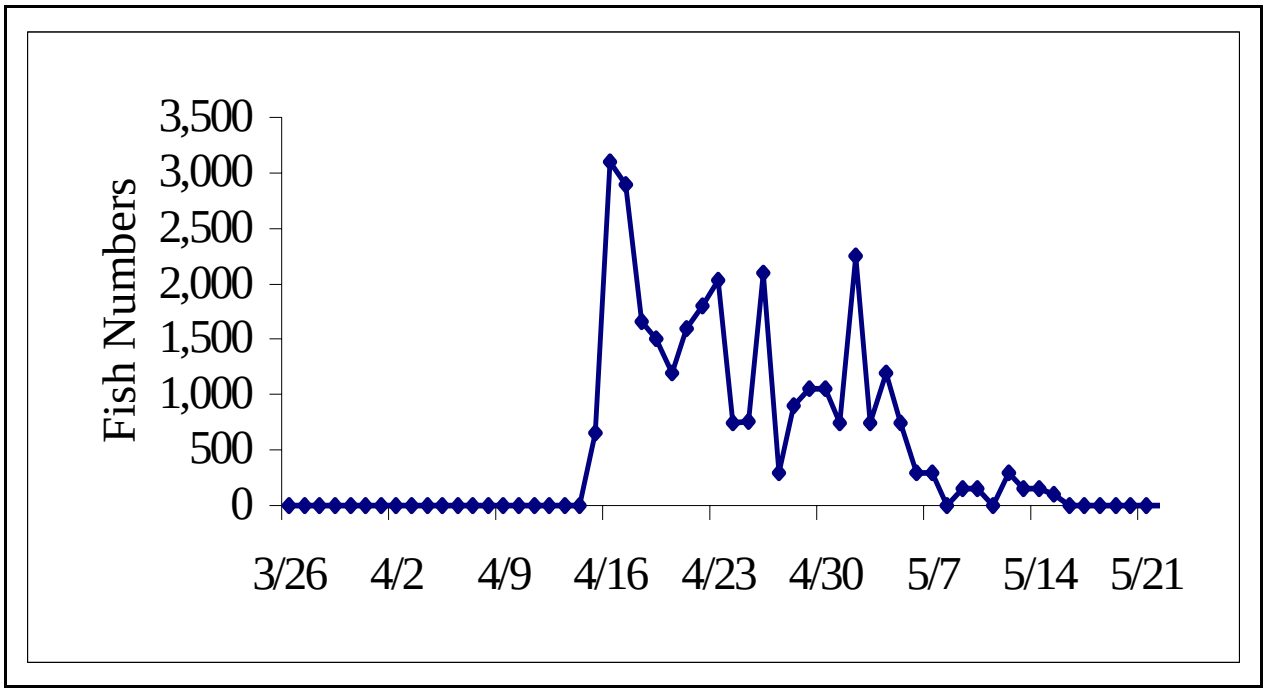


Figure 9. Daily collection of Lyons Ferry Hatchery yearling fall chinook (EL-LGR, Big Canyon) at Lower Granite Dam, 2000.

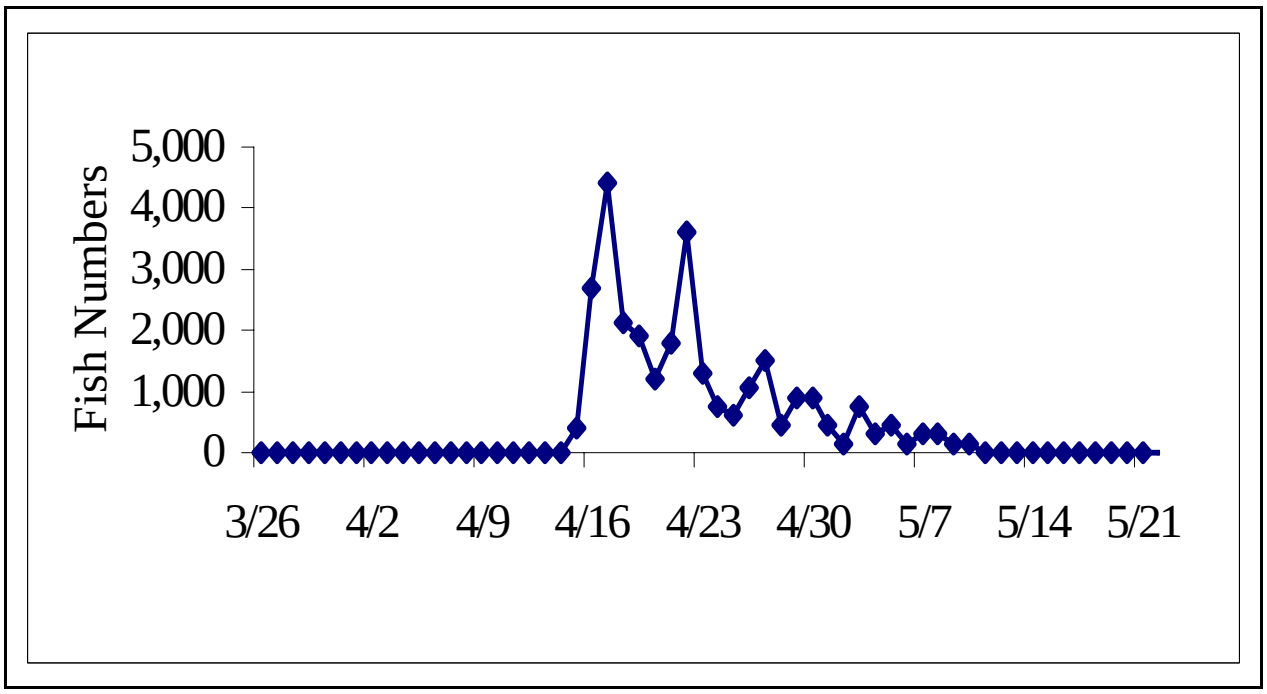


Figure 10. Daily collection of Lyons Ferry Hatchery yearling fall chinook (EL-RGR, Pittsburg Landing Acclimation Facility) at Lower Granite Dam, 2000.

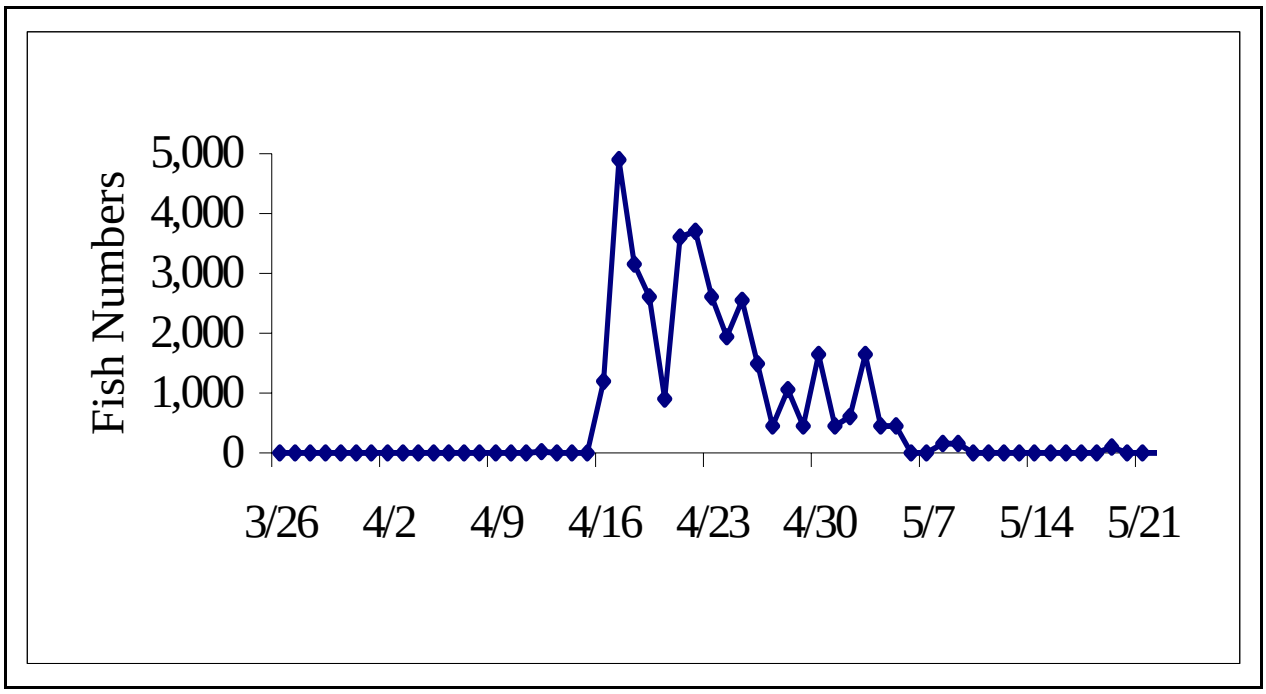


Figure 11. Daily collection of hatchery yearling fall chinook (EL-LBL, Captain John Rapids Acclimation Pond) at Lower Granite Dam, 2000.

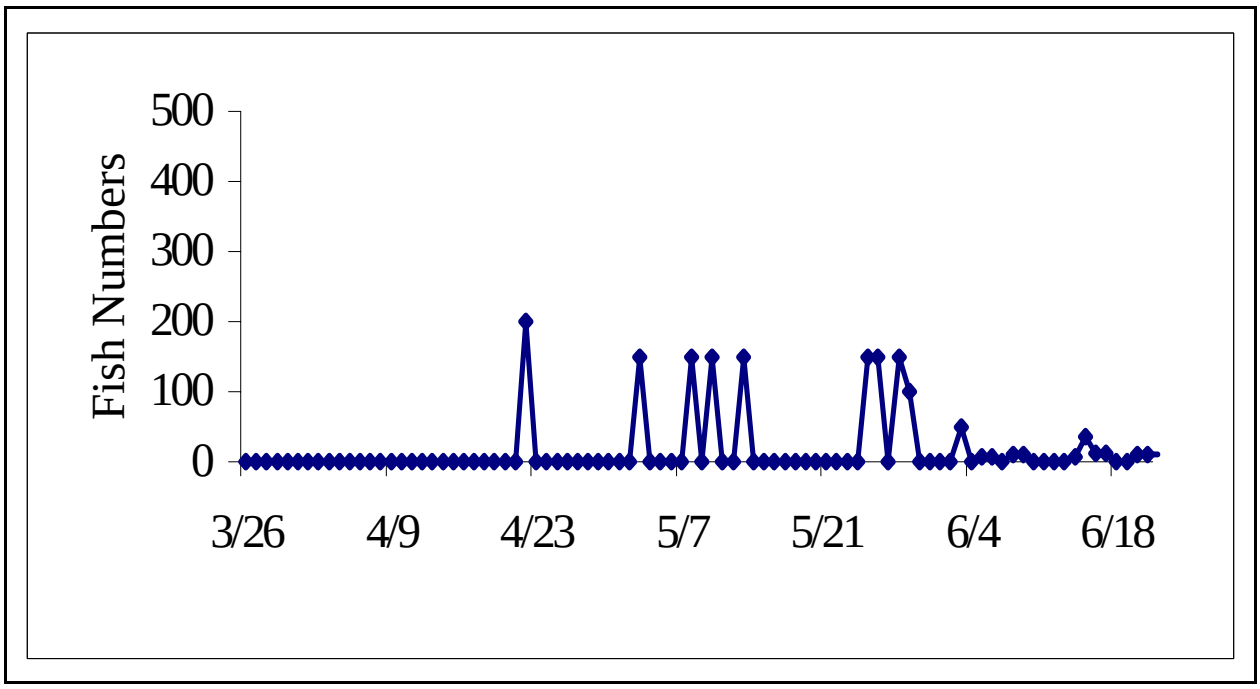


Figure 12. Daily collection of hatchery yearling fall chinook (EL-RRD, McCall Hatchery) at Lower Granite Dam, 2000.

Mark records for fish captured off the separator for Gas Bubble Trauma (GBT) examinations were reported to FPC. GBT sample fish removed from the separator between April 5 and June 19 and after examination were put into a raceway and added to the total daily collection. A total of 36 colored elastomer (VIE) tagged hatchery yearling chinook were examined for symptom of GBT, including: 13 left green, 15 right green and eight left-blue. Additionally, six freeze-branded steelhead (RA22) three unclipped yearling chinook with coded-wire tags and two unclipped steelhead with coded-wire tags were recorded in GBT samples.

All fish removed from the separator during the GBT monitoring program were scanned for PIT-tags. PIT-tagged fish were not examined but placed in fresh water and allowed to recover from the anesthesia before being returned to the separator. All PIT-tag codes were stored in a scanner and recorded on a form with species, rearing type and hatchery mark information. Daily PIT-tag records were combined into one tagging file and sent to PTAGIS database (GBT Sample Summary). A total of 18 PIT-tagged fish, three wild steelhead, two hatchery steelhead and 13 hatchery yearling chinook were netted from the separator incidental to GBT sampling.

We scanned all smolts collected between October 2 and 31 for PIT tags. A total of 199 PIT-tagged fish were detected by the PIT-tag detection system during this period (Table 8).

During the collection season, we scanned all smolt mortalities removed from daily samples and from raceways for PIT-tags. A total of seven tagged mortalities were recovered and recorded in files submitted to PTAGIS in 2000 compared to 173 in 1999. Tagged mortalities included six hatchery spring chinook and one hatchery unknown run chinook.

A total of 269 fallbacks were examined in daily samples between October 2 and October 31, when the sample rate was 100%. The 269 fallbacks represented 88% of the 304 total fallbacks recorded during the season. Of the 269, 242 (90%) were hatchery jack chinook, one was a wild adult chinook, three were wild jack chinook, 20 were hatchery steelhead and three were wild steelhead. Adult fallbacks that entered the sample were returned to the river throughout the season. Marked fallback sample data including sample date, fish length, eye tag, fin clip, opercula punch marks and CWT tag were reported to the NMFS Adult Monitoring Project staff at Lower Granite.

Table 8. Records of PIT-tagged fish detected in daily samples at Lower Granite Dam between October 2 and October 31, 2000 with 100% sample rates.

Organization	Tag Site	Release Site	Species and Race	Rearing Type	Release Date	Average Travel time	Number of fish
PTAGIS	ORPHAN	ORPHAN	UNK	U	N/A	N/A	8
NPT	LOLOC	LOLOC	CH, SP	W	11/06/99	348	1
NPT	MCCA	JOHNSC	CH, SU	H	3/27-3/29/00	212	1
NPT	CJRAP	CJRAP	CH, FA	H	4/8-4/12/2000	183	1
IDFG	REDTRP	REDTRP	CH, SP	W	05/22/00	159	1
NMFS	JDA	TDASPT	CH, SP	U	05/04/00	155	1
NPT	PLAP	PLAP	CH, FA	H	05/26/00	133	1
USFWS	SNAKER	SNAKER	CH, UNK	W	5/23-6/20/00	130	6
NPT	CLWR	CLWR	CH, UNK	U	06/20/00	128	1
NMFS	LYFE	SNAKER	CH, FA	H	6/8-7/6/00	117	26
NPT	BCCAP	BCCAP	CH, FA	H	6/1-7/13/00	106	149
CTUIR	LOOKGC	LOOKGC	CH, SP	H	07/21/00	89	1
NMFS	SECESR	SECESR	CH, SU	W	08/25/00	61	1
IDFG	CROOKP	CROOKP	CH, SP	H	09/28/00	24	1
Total							199

Abbreviations: NPT = Nez Perce Tribe, IDFG = Idaho Dept. of Fish and Game, NMFS = National Marine Fisheries Service, USFWS = United State Fish and Wildlife Service, CLWH = Clearwater Hatchery, LOLOC = Lolo Creek, JOHNSC = Johnson Creek, MCCA = McCall Hatchery, REDTRP = Red River trap, JDA = John Day Dam, TDASPT = The Dalles Dam, SECESR = Secesh River, CROOKP = Crooked River Pond, LYFE = Lyons Ferry, BCCAP = Big Canyon Creek Acclimation Facility, CJRAP = Captain John Rapids Acclimation Pond, SNAKER = Snake River, .

GBT Sample Program and Summary

GBT Sampling Procedures

Sampling methods to identify levels of dissolved gas in juvenile salmonids have undergone continuous review since the program began in 1994. Current sampling methods and protocol are based on research conducted by fish physiologists and health specialists/pathologists with the United States Geological Survey, Biological Research Division (USGS-BRD) at the Columbia River Lab at Cook, WA. Fish Passage Center staff have actively guided and participated in this process. USGS-BRD staff have conducted training sessions at the beginning of each season for the past four years. Staff from Lower Granite Dam attended this season's GBT training seminar at the Cook lab on March 29 and 30 where fish handling methods, examination techniques, and data handling protocols were reviewed and demonstrated. Site specific sample protocols at Lower Granite called for us to examine 100 yearling chinook and 100 steelhead, clipped or unclipped, on Mondays, between April 5 and June 19.

Smolts collected for GBT samples were netted from the open flume in front of the separator bars. We netted fish individually and placed them in a dark five-gallon bucket with 10 liters of water. When we had collected seven fish, we took the fish to the GBT lab located next to the separator and added three cc of MS-222® for a concentration of 30 mg/l. The time required to net seven fish varied with fish availability but generally took about five minutes. In the GBT lab,as the fish responded to the MS-222®, one fish at a time would be removed from the capture bucket and scanned for the presence of a PIT-tag. If a PIT-tag was detected, the code was recorded and the fish was allowed to recover and released back into the separator. Later, all PIT-tag codes were entered into a PTAGIS tagging file. If no PIT-tag was detected the fish was placed in a bucket with water and MS-222® at 80mg/l to fully sedate the fish for the detailed examination. Once fully sedated this fish was placed in an examination tray equipped with hoses that provide flowing water with 30mg/l of MS-222® directly to the mouth and over the gills throughout the examination. Another fish was then scanned for a PIT-tag and if not tagged, placed in the bucket of water with 80mg/l MS-222®. Staff then carefully examined the left lateral line, unpaired fins and both sides of the head on the fish in the examination tray for bubbles associated with GBT using a stereo microscope. The examiner recorded species, origin, fork length, presence or absence of bubbles, and the time at the start of the exam. The sample fish was then placed in a bucket of freshwater with aeration and allowed to recover before it was released into a raceway. This prevented them from being diverted to the sample tank and being sampled again. It took about two minutes to complete each examination. At the end of the day, sample data were transcribed to a database on a spreadsheet and transmitted to FPC. GBT fish were treated and recorded as a separate sample with a sample rate of 100% and their numbers added to the following day's collection totals.

GBT Sample Summary

Smolts were netted from the separator every Monday between April 5 and June 19 this season. We examined a total of 1,895 smolts for symptoms of GBT: 508 clipped yearling chinook, 256 unclipped yearling chinook, 869 clipped steelhead and 262 unclipped steelhead. These fish were anesthetized, examined, allowed to recover from anesthesia and then placed in raceways for transportation. The tallies for examined fish were added to daily collection totals on the day after they were examined. Symptoms of GBT were observed on 25 fish including 24 with bubbles in the lateral line, one with bubbles in the eye tissues. We were able to net 100 fish per day of both chinook and steelhead from April 24 through May 29 after which time chinook collection was too low to provide an adequate sample.

Incidental to fish netted from the separator and examined for GBT, we netted and released 56 fish back into the separator because they were not the target species, or were PIT-tagged. A total of 18 PIT-tagged fish were netted from the separator: three unclipped steelhead, two clipped steelhead, and 13 hatchery yearling chinook. After each GBT day, the codes stored in the scanner were downloaded to a temporary computer file, and later assembled in a PTAGIS tagging file. The remaining 38 fish not examined included, which were twelve unclipped subyearling chinook, 14 clipped steelhead, eleven unclipped steelhead and one clipped sockeye.

Sample Anesthesia

The use of MS-222® to safely sedate juvenile salmonids is an important component of the smolt monitoring programs. Reviews of methods employed at different sites by FPC, USGS-BRD and SMP program staff in 1992 provided specific guidelines for standard stock solutions, minimal induction times and total exposure times for SMP sampling programs. At Lower Granite Dam Juvenile Fish Facility concentrations of approximately 60 mg/L of MS-222® from stock solutions of 100 g/L enable us to follow the general guidelines and handle the juvenile salmonids safely and efficiently. Over the course of each season, adjustments are made to account for changes in water temperature and the number of fish in the sample. Induction and recovery times for a given concentration tend to decrease as water temperatures increase.

Anesthesia Procedures

Anesthetic solutions are used in the pre-anesthetic chambers and the re-circulating sample system. The pre-anesthetic chambers are drained to about 95 liters before we add between 70 and 90 ml of MS-222® to achieve an initial concentration of about 63 mg/L. This typically sedates nearly all the fish within three minutes. However the pre-anesthetic chambers are not watertight. Fresh water seepage reduces the effective concentration. Depending upon the amount of fresh water seepage, fish response, water temperature, the size and number of smolts in the chamber, we may add more MS-222®. Once sedated, these fish are flushed down to the sorting trough.

The re-circulation system holds 670 liters of water and includes the sorting trough, sump, chilling reservoir, a rotary chiller, a filter and two pumps. We add anesthetic to the sump and chilling reservoir to achieve an initial concentration of about 50 mg/L. This level maintains sedation in most fish and allows some fish to gradually recover. The effective concentration of anesthetic in this system diminishes over time as more fish are sampled and absorb the anesthetic. Some leakage and infusion of fresh water also occurs throughout the sample. The longer we use the re-circulation system the more likely we are to add additional MS-222® in 50 to 100 ml increments to maintain effective concentrations. As a result, careful monitoring of fish response is a constant component of our sample procedures. To monitor anesthetic effectiveness and ensure the safety of the fish in the sample, we continuously watch and observe fish behavior and gilling rates.

Anesthetic induction

Safe and effective induction times should be greater than one minute but not longer than three minutes. For each batch of fish sedated in the pre-anesthetic chambers, we recorded induction times as well as the estimated number and relative size of smolts, water temperature and concentration of MS-222® (Table 9). The induction time was that point when approximately 95% of the fish were belly-up or on their side and gilling evenly.

Historically we have observed a decrease in anesthetic induction time for all species as water temperature increased. When water temperatures were below 12 C (53.6 F) average induction times ranged between 2.3 minutes and 2.6 minutes. This year our staff noticed that stock solution concentrations of MS-222® appeared to vary from one batch to another. This made comparative analysis extremely difficult. Unlike previous years, the comparison between induction time and temperature (Figure 8) and the comparison of small fish (chinook) and induction time (Figure 9) showed little or no correlation this season.

Table 9. Average induction times of sample fish exposed to MS-222®, by week at LGR, 2000.

Week Ending Date	Average Temp. (C.)	Number of Batches	Average No. Fish per Batch	Average Proportion Small Fish/Batch	Average Concentration (mg/L) MS-222®	Average Induction Time (seconds)
4/1	8.6	14	24	0.53	84	166
4/8	8.9	159	36	0.25	79	152
4/15	9.8	127	48	0.39	73	149
4/22	9.9	104	50	0.47	77	149
4/29	10.3	130	59	0.33	73	152
5/6	11.3	170	74	0.42	69	150
5/13	11.0	163	67	0.28	74	136
5/20	12.5	99	44	0.22	71	143
5/27	13.5	107	43	0.12	65	152
6/3	10.8	48	39	0.19	76	152
6/10	14.8	134	48	0.55	71	156
6/17	14.8	93	56	0.86	74	164
6/24	16.5	76	51	0.85	79	157
7/1	18.6	78	47	0.87	81	148
7/8	19.3	47	52	0.95	81	147
7/15	18.6	56	44	0.94	82	145
7/22	19.6	68	51	0.91	79	142
7/29	20.0	60	51	0.91	76	144
8/5	19.9	77	47	0.94	76	143
8/12	20.0	78	46	0.93	76	138
8/19	19.2	55	43	0.95	76	144
8/26	18.3	57	41	0.97	76	147
9/2	18.0	83	52	0.99	76	159
9/9	18.7	81	53	0.98	79	149
9/16	18.5	36	44	0.95	79	148
9/23	19.4	5	43	0.97	79	148
9/30	18.8	23	37	0.96	79	151
10/7	16.8	64	45	0.96	81	160
10/14	15.1	53	51	0.96	87	155
10/21	14.7	59	47	0.95	88	150
10/28	13.0	87	56	0.97	89	151
11/4	12.4	44	56	0.95	93	152

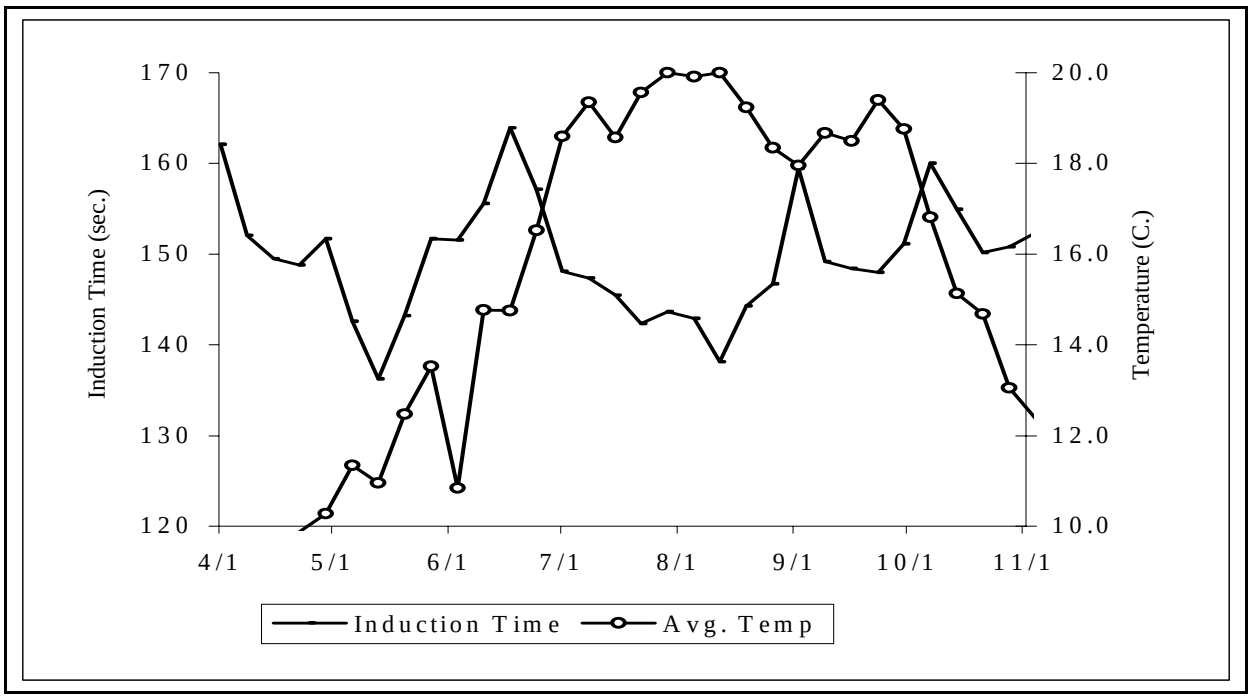


Figure 13. Average weekly induction times for fish exposed to MS-222® (~60 mg/L) compared to average weekly temperature at LGR in 2000.

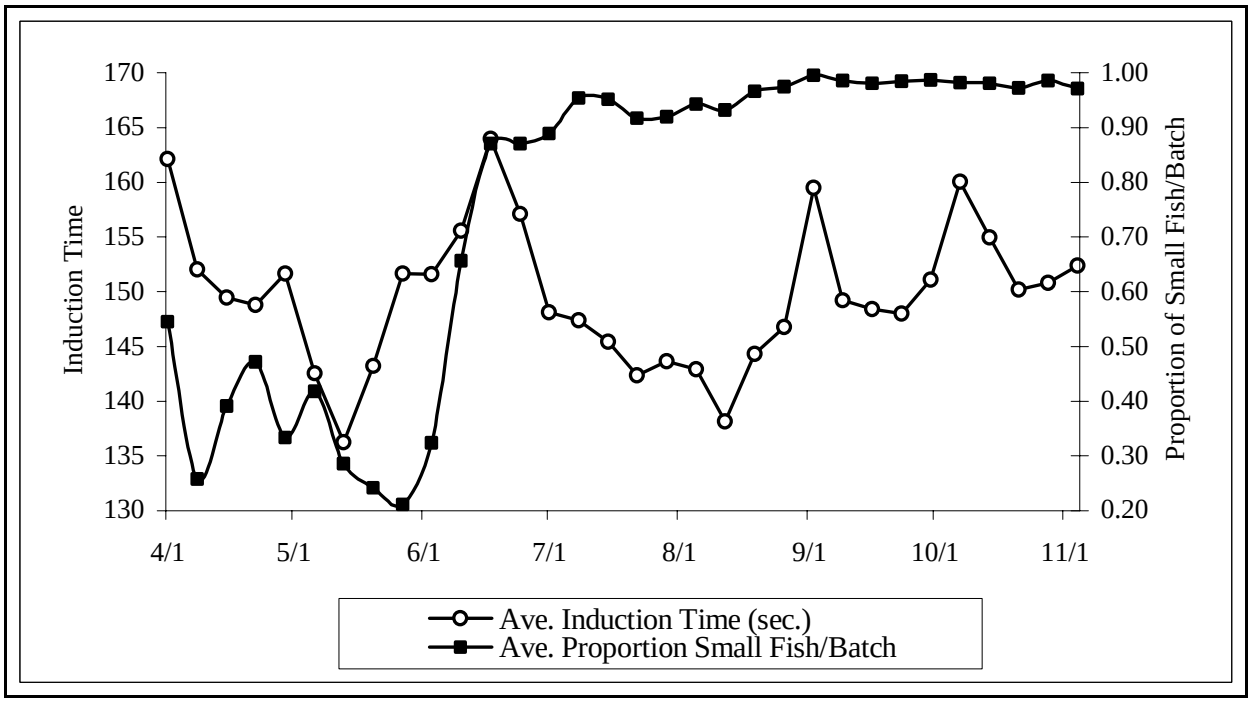


Figure 14. Weekly average induction time and proportion of small fish (chinook) per sample batch at LGR, 2000.

Anesthetic recovery

In past years, the time required for fish to recover equilibrium following exposure to MS-222® during sampling was monitored. In 1997, 1998 and 1999 the average recovery time was 133, 127 and 111 seconds respectively. The induction time is dependent upon dose per batch, which is influenced by water temperature, size and number of fish in each batch. Because the recovery times have been relatively consistent we did not conduct recovery tests this season.

Audit of data entry

During the course of the season, a total of 220 daily sample batches were generated and sent to FPC. A total of 21 batches, 10%, were sent again because they were revised after the original posting. In 1999, 32 of the 230 total batches (15%) of the daily samples were revised and resubmitted. We categorized the errors that led to the revisions into six categories; setup errors, recording errors, omitted data, fish identification errors, facility errors and miscellaneous changes (Table 11).

Table 10. Number and percentages of sample batches revised and resent to FPC, 2000.

Error Type	Number of re-posted batches	Percent of total re-posted batches	Percent of total number of batches
Setup	1	5%	<1%
Recording	11	52%	5%
Omitted data	6	29%	3%
Fish I.D.	0	0%	0%
Facility	3	14%	1%
Miscellaneous	0	0%	0%
Total	21		9.5%

Setup errors resulted from problems with templates, formulas within spreadsheets used to summarize daily data or software. One batch revision was attributed to this type of error because computer software problems resulted in the improper year being used.

Recording errors resulted from "typos" and inaccurate transcription of handlog data into the FPC32 data entry program. Eleven batches were revised and re-posted because of recording errors. These errors include: incorrect entries of powerhouse flows (one batch), incorrect recording of species run type (one batch), incorrect entry of steelhead numbers (two batches), incorrect recording of the natural supplementation identifier on a coho (one record), incorrect recording of research mortalities (one batch) and incorrect recording of incidentals (five batches). Most of the recording errors should have been detected prior to file transmission by comparing handlogs to FPC32 printouts.

Missing or omitted data resulted in revisions of eight batches this season. In these revised batches, data was originally left out, including: a facility or research mortality number (two batches), a natural supplementation code (one batch), a freeze brand (one batch), incidental fish (one batch), elastomer tagged fish (two batches) and an elastomer tag location (one batch).

Facility errors resulted from events or changes in the data because of unusual operations, mistakes in fish facility data reporting or technical problems related to the fish facility. This season, three batches were revised to correct a facility related error. A flume gate malfunction was not reported until after the following day's sample was processed and submitted. When the error came to our attention, we revised two sample quality codes to reflect an incomplete and biased sample. One batch was revised because Corps of Engineers personnel mistakenly identified the wrong sample rate being used. This resulted in one sample being revised to correct for the wrong sample rate.

Fish Collection

Migration and Collection

The juvenile fish bypass gallery was watered up at 0700 on March 13. Fish were bypassed through the 42-inch pipe (primary bypass) until 0700 on March 25, when the separator was watered up and collection of fish for transportation began. Collection ended at 0700 hours October 31. Total collection estimates were derived from expanded hand counts of smolts in the daily sample and includes smolts removed from the separator for research (Table 12). An estimated 8,300,546 juvenile salmonids were collected at Lower Granite Dam during the 2000 operating season. The species composition included: 2,007,545 clipped yearling chinook, 442,635 unclipped yearling chinook, 681,803 unclipped subyearling chinook, 4,281,834 clipped steelhead, 757,786 unclipped steelhead, 2,688 clipped sockeye/kokanee, 4,152 unclipped sockeye/kokanee and 122,103 (unclipped and clipped combined) coho (Table 11).

An estimated 19,621,000 hatchery fish (6,796,000 yearling spring/summer chinook, 377,339 yearling fall chinook, 2,174,125 subyearling chinook, 9,265,000 steelhead and 810,000 coho) were released above Lower Granite Dam between October 1999 and July 2000 for the 2000 outmigration. These fish were raised at nineteen hatcheries, operated by the following agencies; Idaho Department of Fish and Game, The Nez Perce Tribe, the United States Fish and Wild Service, the Oregon Department of Fish and Wildlife and the Washington Department of Fish and Wildlife.

Subyearling chinook smolts collected this season included both hatchery origin and natural production (wild) fish. In late May and June, five releases totaling approximately 2,174,125 externally unmarked subyearling chinook from Lyons Ferry Hatchery stock were released at sites above Lower Granite Dam by the Nez Perce Tribe. The Nez Perce Tribe release sites were at Captain John's Acclimation Facility (883,537 fish) on the Snake River, Pittsburg Landing Acclimation Facility (400,150 fish) on the Snake River and Big Canyon Acclimation Facility (890,438 fish) on the Clearwater River. Of the 883,537 released at Captain John's Acclimation Facility, 388,193 were marked with coded wire tags. To identify these CWT fish we scanned all unmarked subyearling fall chinook in our daily samples. We detected 6,703 unclipped subyearling fall chinook (9.7%) with coded-wire tags in the sample. This represents 87,450 unclipped subyearling fall chinook collected and 22.5% of the total coded-wire tagged subyearling chinook released. These unclipped, CWT subyearlings were included in the unclipped totals.

In addition, a total of 377,339 unclipped yearling fall chinook from Lyons Ferry Hatchery, marked with colored-eye tags (left-blue, left-green and right-green elastomer tags) and coded-wire tags were released above LGR in 2000. Of these, approximately 25% (95,650) were collected and transported. These unclipped fall chinook were included in the clipped yearling data. The estimated 95,650 elastomer tagged smolts represent 4.8% of the total hatchery yearling chinook collection at Lower Granite Dam this season and 24% of the Lyons Ferry Hatchery elastomer marked fish released above lower Granite Dam.

More fish were collected and transported this season than in any of the previous four years (Table 11). Clipped and unclipped yearling chinook, unclipped subyearling chinook, unclipped steelhead and coho collection totals in 2000 were all greater than yearly totals collected during the previous four years while unclipped and clipped sockeye numbers declined noticeably from the 1999 totals. Clipped steelhead total collection increased by more than one million over 1999, yet the 2000 collection is only 8 % more than the average for the previous four years. Total collection numbers for yearling chinook and steelhead might have been higher if not for spill and the operation of the experimental surface bypass collector in conjunction with the behavioral guidance screen. The large number of unclipped subyearling chinook smolts collected reflects the release of approximately 2,174,125 Lyons Ferry Hatchery smolts.

Table 11. Annual collection, bypass, and transport at Lower Granite Dam, 1996-2000.

	Yearling Chinook		Subyearling[1] Chinook		Steelhead		Sockeye/Kokanee		Coho	
Year	Clipped	No clip	Clipped	No clip[2]	Clipped	No clip	Clipped	No clip	All	Total
Collection										
1996	462,995	126,895	---	17,346	4,264,688	321,821	5,137	9,762	19,029	5,227,672
1997	224,847	56,978	73,437	17,473	4,022,510	300,215	411	2,937	1,517	4,700,325
1998	1,317,503	287,186	520	81,286	4,527,534	557,991	48,623	1,025	155,546	6,977,214
1999	1,762,655	410,842	107	257,507	3,032,104	323,083	10,085	7,975	78,621	5,882,872
2000	2,007,545	442,635	---	681,803	4,281,834	757,786	2,688	4,152	122,103	8,300,546
Bypass										
1996	49,978	19,332	---	358	30,883	977	107	30	765	102,430
1997	407	787	1,031	617	110,753	2,941	---	---	29	116,565
1998	88,312	20,074	---	1,033	107,561	17,990	---	---	1,474	236,414
1999	88,628	27,289	---	861	235,513	30,851	1,338	309	14,609	399,398
2000	53,561	61,883	---	46	143,732	82,869	0	16	400	342,507
Truck										
1996	2,207	4,004	---	15,857	82,108	12,802	889	6,054	2,260	126,887
1997	2,659	3,100	70,793	15,221	134,154	20,533	399	799	420	248,078
1998	21,764	20,344	18	70,260	49,629	18,215	613	32	6,430	187,305
1999	9,235	23,261	----	162,646	26,133	9,158	315	1,640	1,564	233,952
2000	4,072	3,151	----	145,460	10,875	6,596	28	1,002	611	171,795
Barge										
1996	407,960	102,368	---	885	4,149,222	307,805	4,120	3,184	16,004	4,990,798
1997	219,740	52,680	---	998	3,774,372	276,520	---	2,022	1,066	4,327,398
1998	1,203,805	245,809	489	8,043	4,366,903	521,297	47,921	990	147,145	6,542,402
1999	1,653,625	357,962	----	91,851	2,769,501	282,912	8,348	5,652	62,254	5,232,105
2000	1,947,270	376,939	----	533,095	4,126,649	668,158	2,658	3,039	121,045	7,778,853
Total Transported										
1996	410,167	106,372	---	16,742	4,231,330	320,607	5,009	9,238	18,221	5,117,685
1997	222,342	55,779	70,793	16,219	3,908,523	297,053	399	2,821	1,486	4,575,415
1998	1,225,569	226,153	507	78,303	4,416,532	539,512	48,534	1,022	153,575	6,729,707
1999	1,662,860	381,223	----	254,497	2,795,634	292,070	8,663	7,292	63,818	5,466,057
2000	1,951,342	380,090	----	678,555	4,137,524	674,754	2,686	4,041	121,656	7,950,648

[1]Hatchery subyearling chinook were not present until 1997.
[2]Includes unclipped hatchery subyearling chinook with CWT in 1999 and 2000.

Migration timing

In general, peak collection days this season followed a different pattern than the previous four years (Table 12). The peak daily collection total (491,250) on May 6 was not the peak collection day for any one species. In the past, the peak collection day has also been the peak collection day for clipped (hatchery) steelhead. This year, the collection of clipped steelhead (343,350) peaked on May 7, the latest peak in six years. Unclipped steelhead (49,350) also peaked on May 7. Unclipped subyearling chinook peaked at 71,900 smolts on July 3, the highest peak in six years. The total collection exceeded 100,000 fish for 27 days, 200,000 fish for 13 days, 300,000 fish for five days, and 400,000 for three days.

Table 12. Annual peak collection days at Lower Granite Dam, 1996-2000.

	Chinook									
	Yearling		Subyearling[1, 2]		Steelhead		Sockeye/Kokanee		Coho	
Year	Clipped	No Clip	Clipped	No Clip[3]	Clipped	No Clip	Clipped	No Clip	Hatchery	Total
1996	May 14 (31,350)	April 21 (9,000)	--- ---	July 13 (1,004)	April 27 (366,900)	April 27 (22,350)	May 17 (750)	April 2 (910)	May 19 (1,650)	April 27 (407,550)
1997	April 22 (13,070)	April 22 (5,730)	July 18 (2,876)	July 2 (480)	May 2 (250,146)	April 22 (27,821)	July 25 (28)	April 22 (400)	May 27 (150)	May 2 (261,350)
1998	May 4 (70,950)	May 3 (19,050)	June 1-2 (60)	July 9 (6,210)	May 4 (375,900)	April 28 (40,220)	May 15 (5,550)	May 15 (450)	May 15 (15,000)	May 4 (489,450)
1999	May 10 (82,650)	April 27 (20,877)	--- ---	June 9 (12,700)	May 5 (291,750)	May 26 (19,050)	May 29 (1,800)	May 2 (300)	May 26 (8,400)	May 5 (353,250)
2000	May 5 (171,300)	April 15 (18,100)	--- ---	July 3 (71,900)	May 7 (343,350)	May 7 (49,350)	May 23 (600)	May 28 (300)	May 25 (15,600)	May 7 (491,250)

[1]Hatchery subyearling chinook were not present until 1996.
[2]Hatchery and wild subyearling chinook were indistinguishable in 1999 and 2000.
[3]Includes unclipped hatchery subyearling chinook with CWT in 1999 and 2000.

The distribution of daily collection counts for a particular species provides a measure of migration timing for smolts passing Lower Granite Dam (Table 13). Collection efficiency, spill and spill volume influence daily and seasonal collection at the facility. Thus the 10 and 90% dates are approximations of the middle 80% passage timing for smolts passing LGR. These dates of 10% and 90% passage are based on the cumulative daily collection.

Clipped yearling chinook, clipped and unclipped steelhead, and coho passage followed the general trend of the previous four years for their respective 10% and 90% passage dates. Subyearling chinook in 2000, a mix of unmarked hatchery origin and naturally produced fish, also followed the general trend of the previous four years, with the exception of 1997. Subyearling chinook passage dates were influenced by the early June release of approximately 2.2 million unclipped subyearling fall chinook above Lower Granite Dam in the Clearwater and Snake Rivers. Clipped and unclipped sockeye/kokanee migration timing dates over the last five years show a wide variation for their respective 10% and 90% passage dates. Also, unclipped yearling chinook (13 days) and unclipped sockeye/kokanee (156 days) had noticeably longer passage times than their respective previous four-year average (Table 14). The length of time for the middle 80% passage for all species combined in 2000 was nine days longer than the previous four-year average (Table 14).

Table 13. Estimated middle 80% passage dates based on 10% and 90% cumulative numbers of fish at LGR, 1996 through 2000.

	Yearling Chinook		Subyearling[1, 2] Chinook		Steelhead		Sockeye/Kokanee		Coho	
	Clipped	No Clip	Clipped	No Clip	Clipped	No Clip	Clipped	No Clip	All	Total
10%										
1996	4/24	4/17	---	6/27	4/24	4/17	5/17	3/30	5/18	4/23
1997	4/22	4/13	6/30	6/22	4/23	4/17	7/18	4/23	5/22	4/22
1998	4/20	4/12	6/1	6/24	4/27	4/25	5/8	5/11	5/6	4/24
1999	4/23	4/17	6/10		4/22	5/24	4/1	5/20	4/23	4/23
2000	4/22	4/15	6/18		4/22	4/18	5/11	4/12	5/12	4/23
90%										
1996	5/19	5/19	---	8/29	5/18	5/20	6/15	5/16	6/17	5/19
1997	5/20	5/16	8/19	9/20	5/23	5/19	9/25	7/5	6/27	5/25
1998	5/10	5/17	6/17	8/30	5/20	5/23	5/26	5/26	5/29	5/20
1999	5/22	6/2	8/22		5/30	6/7	6/7	6/9	5/30	5/30
2000	5/13	6/3	8/26		5/23	5/24	5/28	9/15	6/3	6/2

[1]Hatchery subyearling chinook were not present until 1997.
[2]Hatchery and wild subyearling chinook were indistinguishable in 1999 and 2000.
[3]Includes unclipped hatchery subyearling chinook with CWT in 1999 and 2000.

Table 14. Estimated number of days for the middle 80% passage run-timing at Lower Granite Dam, 1995-2000.

	Yearling Chinook		Subyearling[1, 2] Chinook		Steelhead		Sockeye/Kokanee		Coho	
	Clipped	No Clip	Clipped	No Clip	Clipped	No Clip	Clipped	No Clip	All	Total
1995	24	50	62	77	24	30	27	82	---	27
1996	25	32	---	63	24	33	28	47	30	26
1997	28	33	50	69	30	32	38	73	36	33
1998	20	35	16	67	23	28	18	15	23	26
1999	29	46	---	73	33	38	14	67	20	37
95-99 ave.	25	39	43	70	27	32	25	57	27	30
2000	21	49	---	69	31	36	17	156	22	40

[1]Hatchery subyearling chinook were not present until 1996.
[2]Hatchery and wild subyearling chinook were indistinguishable in 1999.
[3]Includes unclipped hatchery subyearling chinook with CWT in 1999 and 2000.

Transportation

An estimated 7,950,648 juvenile salmonids (95.8% of all fish collected) were transported from Lower Granite Dam in 2000 (Table 11). The numbers of fish and the percentages transported of each species group were: 1,951,342 clipped yearling chinook (97.2%), 380,090 unclipped yearling chinook (85.9%), 678,555 unclipped subyearling chinook (99.5%), 4,137,524 clipped steelhead (96.6%), 674,754 unclipped steelhead (89.0%), 2,686 clipped sockeye/kokanee (99.9%), 4,041 unclipped sockeye/kokanee (97.3%) and 121,656 coho (95.8%).

The COE transport season began with trucks, switched to barges as fish numbers increased and then back to trucks when fish numbers declined. The first truck left Lower Granite on March 27, starting every-other-day trucking through April 6. The first barge departed Lower Granite on April 8 and barging continued every-other-day through April 18. COE barges left Lower Granite every day from April 20 through May 26 and every-other-day from May 28 through July 21. Every-other-day trucking resumed July 23 and continued until October 31. Last season (1999) trucking operations were extended through November 10. The 3,500-gallon trailers were used during the early and late season trucking phase up through October 13 due to the fish collection numbers. The 300-gallon pickup-mounted midi-tanker was used only on October 15, 17, 19 and 21. The 3,500 gallon tanker was used for the remainder of the season. The majority of the fish transported in 2000 were transported in barges.

Approximately 171,795 juvenile salmonids, 2.2% of the fish transported in 2000, were transported by truck (Table 2). The numbers of fish trucked and the percentages of the total transported for each species group were: 4,072 clipped yearling chinook (0.2%), 3,151 unclipped yearling chinook (0.8%), 145,460 unclipped subyearling chinook (21.4%), 10,875 clipped steelhead (0.3%), 6,596 unclipped steelhead (1.0%), 28 clipped sockeye/kokanee (1.0%), 1,002 unclipped sockeye/kokanee (24.8%) and 611 coho (0.5%).

An estimated 7,778,853 juvenile salmonids, 97.8% of transported fish, were barged from Lower Granite Dam in 2000 (Table 8). The number of fish barged and the percentages of the total transported by species group were: 1,947,270 clipped yearling chinook (99.8%), 376,939 unclipped yearling chinook (99.2%), 533,095 unclipped subyearling chinook (78.6%), 4,126,649 clipped steelhead (99.7%), 668,158 unclipped steelhead (99.0%), 2,658 clipped sockeye/kokanee (99.0%), 3,039 unclipped sockeye/kokanee (75.2%) and 121,045 coho (99.5%).

Fish collected at Little Goose Dam, Lower Monumental Dam and McNary Dam were also loaded onto barges that originated from Lower Granite Dam during the season. The total number of fish barged from these other sites included: Little Goose Dam (2,804,942), Lower Monumental Dam (1,486,190) and McNary Dam (7,070,344).

Bypass

Primary bypass at Lower Granite (fish diverted directly back to the river) was initiated on March 13 and continued until 0700 hours on March 25 when collection began. At 0700 hours on October 31, the system returned to primary bypass when collection for the transportation program ended. The facilities remained in primary bypass until December 9 when the entire bypass system was de-watered for the season. When the facility was in primary bypass mode, no estimates of the number of fish bypassed are made because fish do not pass through a counting system.

An estimated 342,507 juvenile salmonids, 4.1% of the collection, were bypassed from Lower Granite Dam in 2000 (Table 2). This is a decrease of 14.2% from the number bypassed in 1999 when 399,398 (6.8%) of the juveniles were bypassed. The numbers and percentages of fish bypassed during 2000 by species group were: 53,561 clipped yearling chinook (2.7%), 61,883 unclipped yearling chinook (14.0%), 46 unclipped subyearling chinook (<0.1%), 143,732 clipped steelhead (3.4%), 82,869 unclipped steelhead (10.9%), 16 unclipped sockeye/kokanee (0.4%) and 400 coho (0.3%).

Three times during the 2000 season, fish were released back to the river when collection numbers exceeding the capacity of the raceways and barge holds. These events occurred on May 6, 7 and 8 and resulted in the bypass of a total of 187,746 fish (2.3% of collection) comprised of 52,315 hatchery yearling chinook, 2,229 unclipped yearling chinook, 46 wild subyearling chinook, 121,829 clipped steelhead, 10,917 unclipped steelhead, 14 unclipped sockeye and 396 unclipped coho. This is a decrease of 25% compared to 1999 when 250,687 fish were bypassed due to collection numbers exceeding the fish facility holding capacity.

Steelhead were bypassed after the sample rate was set at 100%. A total of 250 clipped and 81 unclipped steelhead were returned to the river from October 2 to October 31 to reduce loading densities and interaction between the larger steelhead and smaller subyearling Chinook in the transport tanks.

Some fish were also bypassed as a part of on-going research projects at Lower Granite Dam. National Marine Fisheries Service staff PIT-tagged and bypassed 64 clipped chinook, 59,341 unclipped yearling chinook, 20,330 clipped steelhead, 71,170 unclipped steelhead and four coho as part of their In-River migration study. The United States Geological Survey Biological Research Division (USGS BRD) radio-tagged 232 clipped steelhead and handled but did not tag 125 clipped steelhead, for their summer 3D Sonic Surface Bypass Collector study. The USGS BRD also bypassed 1,322 clipped yearling chinook, 623 clipped steelhead and 611 unclipped steelhead and released them into the prototype Surface and Bypass Collector and were bypassed.

An estimated 116 fish, about 25% yearling chinook, 73% steelhead and 2% sockeye/kokanee were bypassed on April 4 between 1200 and 1600 hours while technicians from the Pacific States Marine Fisheries Service tested the new 134.2-kHz PIT-tag interrogation and diversion system. During testing, the sample gate was turned off and for four hours no fish were diverted to the sample holding tank. Visual counts of fish passing into the separator were made to estimate the number of fish that would have been sampled at a rate of 10%. These counts were later used, along with the sample hand count, to calculate the estimated total fish collection for April 5.

PIT-tag Diversion

This season marked the first year of operation for the new International Standards Organization (ISO) based 134.2kHz PIT-tag detection system at Lower Granite. The PIT-tag diversion system was operated in the standard diversion mode (with the exception of April 4) between March 26 and July 28. During this time, the sample diversion gate overrode the PIT-tag diversion gate and any fish present during a sample diversion gate operation went to the sample holding tank. After July 28 at 0700 hours the PIT-tag diversion system was set to override the sample diversion gate and divert all PIT-tagged fish to the river. Most of the PIT-tagged fish detected exiting the separator were bypassed. Some PIT-tagged fish were sent to the raceways and transported or to the separation-by-code holding tanks for research purposes. Others missed by the diversion system were sent to either the raceways or the sample tank and then transported.

According to the PTAGIS database, 99,931 PIT-tagged fish were detected at Lower Granite Dam this season. Of these, 61,598 (62.0%) were bypassed through the PIT-tag diversion system, 34,399 (34.0%) were diverted to the raceways and transported, 1,252 (1.0%) were diverted to the sample tank, sampled and then transported, 2,682 (3.0%) were not detected at any of the exits, bypass, raceway or sample monitors (fish disposition unknown). The PIT-tagged fish bypassed included: 28,476 hatchery yearling chinook, 8,658 wild yearling chinook, 74 unknown rearing type chinook, 15,926 hatchery steelhead, 7,604 wild steelhead, 451 hatchery sockeye/kokanee, 40 wild sockeye/kokanee and 369 coho. PIT-tagged fish that were diverted to raceways included: 33,508 hatchery yearling chinook, 205 wild yearling chinook, one yearling chinook of unknown rearing type, 511 hatchery steelhead, 149 wild steelhead, 15 hatchery sockeye/kokanee, five wild sockeye/kokanee and five coho. An unknown number of non-tagged fish were also bypassed by the PIT-tag diversion system along with the tagged fish. Fish bypassed through the PIT-tag diversion system are not included in the facility bypass numbers.

Table 15. Final disposition of PIT-tagged juvenile salmonids detected at LGR, 2000.

	Chinook			Steelhead			Sockeye/Kokanee		Coho	
Disposition	h.ch1	w.ch1	u.ch	h.st	w.st	u.st	h.so	w.so	All	Total
Raceway, T	33,508	205	1	511	149	0	15	5	5	34,399
Bypass, D	28,476	8,658	74	15,926	7,604	0	451	40	369	61,598
Sample, T	769	198	5	162	107	0	7	1	3	1,252
Unk. Exit	1,943	420	1	172	126	0	8	0	12	2,682
Total	64,696	9,481	81	16,771	7,986	0	481	46	389	99,931

Key: T=transported, D=diversion (to river), UNK=not detected at a final exit monitor.
Note: PIT-tagged fish were denoted as hatchery or wild rather than clipped and unclipped.

During the migration season, we scanned all smolt mortalities removed from daily samples and from raceways for PIT-tags. Only seven PIT-tagged sample and raceway mortalities were recorded this season. In 1999, 172 tagged mortalities were recovered and recorded in files submitted to PTAGIS. We suspect that the reduction in PIT-tag mortalities reflects a combination of improved efficiencies of the new PIT-tag detection system (resulting in fewer PIT-tagged fish being diverted to the raceway) and the lower levels of debris in the river system, resulting in lower level of descaling and subsequent mortality.

Fish Condition

Descaling

The combined descaling rate of 1.3% for all species was the lowest in the last five years (Table 16). Annual descaling rates for unclipped yearling chinook, unclipped subyearling chinook, unclipped steelhead, unclipped sockeye/kokanee and coho all decreased in 2000 compared to 1999. Annual descaling rates by species group were: clipped yearling chinook (3.1%), unclipped yearling chinook (1.0%), unclipped subyearling chinook (0.6%), clipped steelhead (1.8%), unclipped steelhead (0.9%), clipped sockeye/kokanee (0.0%), unclipped sockeye/kokanee (12.0%), and coho (1.3%).

Weekly average descaling rates were highest during the spring migration in May (Table 17). Weekly average descaling rates for clipped yearling chinook, when sample numbers exceeded 100 fish per week, never exceeded 7.0%. Unclipped subyearling chinook descaling rates peaked at 2.2% for the week ending October 19. Descaling rates for clipped steelhead for the spring migration ending June 20 peaked at 3.8% for the week ending May 25. The descaling rates for clipped and unclipped sockeye/kokanee reflect the small sample sizes, which never exceeded 100 fish for any week of the season.

Table 16. Annual percent descaling rate for fish sampled at Lower Granite Dam, 1996-2000.

Year	Yearling Chinook		Subyearling[1] Chinook		Steelhead		Sockeye/Kokanee[2]		Coho All	Total
	Clipped	No Clip	Clipped	No Clip[2,3]	Clipped	No Clip	Clipped	No clip		
1996	3.0	1.5		9.3	6.3	1.1	3.8	18.4	2.4	5.8
1997	5.6	2.8	6.5	7.4	6.2	2.7	9.9	24.5	0.9	6.2
1998	3.1	2.3	9.9	4.7	5.3	2.2	4.7	3.0	4.3	4.4
1999	3.1	1.1	3.4	1.7	7.2	1.7	3.4	10.0	4.2	3.6
2000	3.1	1.0		0.6	1.8	0.9	0.0	12.0	1.3	1.3

[1]Hatchery subyearling chinook were not present until 1996.
[2]Includes unmarked hatchery subyearling chinook in 1999.
[3]Includes unclipped hatchery subyearling chinook with CWT in 1999 and 2000.

Table 17. Weekly descaling rates in percent for fish sampled at Lower Granite Dam, 2000.

Week Ending	Yearling Chinook		Subyearling Chinook		Steelhead		Sockeye/Kokanee		Coho	
	Clipped	No Clip	Clipped	No Clip	Clipped	No Clip	Clipped	No Clip	All	Total
3/30	*10.0	*5.6	---	*0.0	*0.0	*1.6	---	*0.0	---	5.2
4/6	6.4	3.4	---	*0.0	0.4	0.8	*0.0	*10.3	*0.0	2.0
4/13	2.9	0.7	---	*0.0	0.4	0.5	---	*10.0	*9.1	0.8
4/20	1.6	0.8	---	*0.0	1.1	0.4	---	*0.0	*0.0	1.1
4/27	1.0	0.6	---	*0.0	0.8	0.9	---	---	*0.0	0.8
5/4	2.9	2.2	---	*0.0	1.3	1.9	---	*100	*0.0	2.1
5/11	4.9	3.1	---	*0.0	1.1	1.0	*0.0	*0.0	*0.0	2.1
5/18	2.7	1.0	---	*0.0	1.7	0.7	*0.0	*0.0	*0.0	1.7
5/25	1.9	1.4	---	*0.0	3.8	0.3	*0.0	*0.0	0.6	2.7
6/1	2.5	1.5	---	*0.0	3.6	0.6	*0.0	*0.0	0.9	2.6
6/8	1.1	0.2	---	0.4	2.8	1.8	*0.0	*0.0	1.2	1.3
6/15	*0.0	0.1	---	0.2	2.2	1.3	*0.0	*13.3	*1.2	0.6
6/22	*3.2	0.9	---	0.2	5.0	1.6	---	*41.7	1.9	0.9
6/29	*11.1	1.0	---	0.2	2.3	*3.7	*0.0	*100	*0.0	0.6
7/6	*0.0	*1.3	---	0.4	3.3	*0.0	---	---	*0.0	0.6
7/13	*0.0	*0.0	---	0.3	3.6	*6.3	---	*0.0	*0.0	0.5
7/20	*0.0	*0.0	---	0.3	7.6	*0.0	---	*0.1	*2.0	0.8
7/27	*0.0	*0.0	---	0.2	4.2	*0.1	---	---	*0.0	0.6
8/3	*0.0	*0.0	---	0.2	4.0	*8.3	*0.0	*0.0	*0.0	0.5
8/10	*0.0	*2.4	---	0.3	9.3	*8.3	---	*50.0	*9.1	1.0
8/17	---	*0.0	---	0.3	5.9	*0.0	---	*0.0	*0.0	0.5
8/24	*0.0	*9.1	---	0.6	*2.7	*0.0	---	*20.0	*0.0	0.7
8/31	---	---	---	0.2	*4.3	*0.0	---	*16.7	*0.0	0.3
9/7	*100	*25.0	---	0.4	*4.3	*0.0	---	*21.1	*0.0	0.5
9/14	---	*0.0	---	0.5	*0.0	*0.0	---	*9.1	*20.0	0.7
9/21	---	*25.0	---	1.4	*0.0	*0.0	---	*4.8	*16.7	1.5
9/28	---	*0.0	---	1.2	*0.0	*0.0	---	*0.0	*0.0	1.2
10/5	---	*0.0	---	1.1	*0.0	*0.0	---	*15.6	*0.0	1.4
10/12	---	*0.0	---	2.1	*4.2	*14.3	---	*14.3	*12.5	2.3
10/19	*0.0	*0.0	---	2.2	*5.0	*0.0	*0.0	*17.6	*16.7	2.6
10/26	*1.4	---	---	1.3	*1.8	*0.0	*0.0	*14.3	*7.7	1.5
10/31	*2.6	*12.5	---	1.5	*1.4	*4.0	*0.0	*4.8	*0.0	1.6
Total Descaled	518	93	---	434	739	91	0	52	29	1,956
Examined	16,562	9,458	---	69,042	41,569	10,621	68	432	2,309	150,061
%Desc'd	3.1%	1.0%	---	0.6%	1.8%	0.9%	0.0%	12.0%	1.3%	1.3%

*Less than 100 fish sampled during the week.
---No fish sampled during the week.
[1]Includes unmarked subyearling chinook with coded-wire tags.

Injury and disease

In addition to fork length, weight and descaling data recorded for individual smolts in the daily sub-sample, smolts were also examined for visible injuries and symptoms of disease. A total of 29,316 smolts were examined in the detailed sub-sample during the 2000 season, compared to 29,254 in 1999 and 40,371 in 1998. Of the fish examined in 2000, a total of 8,233 (28.1%) smolts were recorded as having some level of descaling, head, body, disease or predator-caused injury compared to 7,779 (26.6%) in 1999. Rates of visible injury and disease in 1996, 1997 and 1998 were 20.2%, 16.8%, and 22.2%, respectively.

This season, descaling typical of patchy low level scale loss (scale loss greater than 5% but less than 20%) was observed on 1.8% of all fish examined. Unclipped subyearling chinook suffered most of this type of low level scale loss (2.4%), when sample counts exceeded 500 smolts. The next highest was clipped steelhead with 1.9%. Similarly, descaling typical of less than 20% scattered descaling for all species combined was 1.3%. Clipped steelhead (2.7%) and clipped yearling chinook (1.5%) had the highest rates. The greater than 50% descaling rate for all species combined was 0.5% with the highest percentage in clipped yearling chinook (0.7%).

Head injuries that were noted this season included abrasions and injury to the eye, "pop" eye, opercula, mandible, maxillary and head deformity. Head injuries were recorded on 3.9% of the smolts examined in 2000, up from 2.9% of smolts examined in 1999, 2.1% in 1998, and 0.9 % observed in 1997. Head injuries were recorded in 2.1% of clipped yearling chinook examined and were primarily of the eye and opercula. Unclipped subyearling chinook had the highest rate of head injuries (6.7%) of any species, primarily to the opercle (5.3% of all subyearling chinook examined). Clipped steelhead had the next highest head injury rate (3.5%), again primarily to the opercle.

Body injuries recorded this season included bloat, scale regeneration, emaciation, fin damage, lacerations, lesion and deformity. Approximately 5.9% of all smolts examined this year exhibited some visible body injury compared to 7.0% recorded in 1999 and 2.4% in 1998. Fin injuries, split rays and fraying, were common in all species and represented 88% of all body injuries. Lacerations and emaciated bodies were the next highest categories (0.2% each) and they were most evident in clipped steelhead and in unclipped subyearling chinook.

Diseases with common external symptoms noted during the season include fungus, cysts, columnaris, digenia, gill hyperplasia, hemorrhaged fin, bacterial kidney disease, parasites and scoliosis. Fin hemorrhaging, characterized by redness in the fin tissues, was observed in 3.5% of fish examined and was most prevalent in subyearling chinook (7.0%) and clipped steelhead (3.1%). In 1999, fin hemorrhaging was recorded in 1.6% of the total fish examined and in 4.5% of the unclipped subyearling chinook. In 1998, fin hemorrhaging was recorded in 9.2% of all fish examined and in 28.6% of the wild subyearling chinook.

The percentage of smolts observed with symptoms consistent with columnaris, yellowish blemishes, lesions, and loss of skin from the snout increased this year. This disease, caused by the bacterium *Flavobacterium columnare*, infects mainly summer and early fall migrants because it becomes more virulent when water temperatures exceed 60 F. Columnaris rates in subyearling chinook increased to 14.6% in 2000, up from 0.34% in 1996, 0.75% in 1997, 7.8% in 1998 and 11.1% in 1999 partially because diagnosis was better defined beginning in 1999. Warren Groberg, Fish Pathologist for Oregon Department of Fish and Wildlife visited the fish facility on September 30, 1998 and provided additional information on external symptoms characteristic of columnaris. Groberg explained that the snout injuries (loss of protective skin tissue) and yellowish blemishes without broken skin were also symptoms of *F. columnare* infection. Based on this information, subyearling chinook with this symptom were identified as being infected with columnaris.

Subyearling chinook with snout injuries characteristic of columnaris were observed in significant numbers beginning in July after water temperatures surpassed 19 C (65 F). Between August 1 and October 31, 16.5% of the subyearling chinook exhibited this symptom. We sampled 37,825 unclipped subyearling chinook, an increase of 42% over a similar period in 1999. This season, weekly columnaris symptoms peaked at 33.3% for the week ending August 24 and gradually decreased to 21% on September 28 and 2.5% on October 31. Though the seasonal recorded incidence of columnaris symptoms was 14.6%, mortality rates in subyearling chinook during the peak times for this disease were low (near 1%). This is the first year we have calculated columnaris rates based on the entire sample (detailed subsample columnaris tallies plus the general sample tallies). In previous years, we used only the detailed subsample data. Using the total sample provides a more accurate estimate and may be one of the reasons for the higher observed rates of columnaris this year versus 1999 and 1998.

Gill hyperplasia, characterized by swollen or "club-shaped" gill filaments, decreased in clipped steelhead from 2.0% in 1999 to 1.5% in 2000. In 1996, 13.5% of hatchery steelhead examined were infected and in 1997, 5.9% of hatchery steelhead were infected. This condition is primarily associated with hatchery steelhead and occurs throughout the main portion of the migration in April and May.

Injuries associated with predator marks included wounds inflicted by anglers, birds, and lampreys. This year, as in the previous four years, birds were the primary predator causing most of the injuries. Bird predation marks, characterized by V-shaped scratches on both sides of a fish, were most prevalent on clipped steelhead (2.3%) and unclipped steelhead (1.7%). In 1996, 2.5% of hatchery steelhead and 0.8% of wild steelhead had bird predator marks. In 1997, 2.0% of hatchery and 1.4% of wild steelhead had bird predator marks. In 1998, 1.8% of hatchery steelhead and 1.7% of the wild steelhead had bird predator marks. The 1999 bird mark rates for hatchery and wild steelhead were 1.8% and 1.5%, respectively. Wounds inflicted by anglers, characterized by torn or punctured tissues in the jaw area, although very low, were less than 0.1% for all species. Few lamprey marks, characterized by the presence of small disc-shaped patches of scale loss sometimes with central petechial hemorrhaging, were noted this season.

Table 18. Annual Injury Rates in Percent from Lower Granite Dam Subsample, 2000.

	Yearling Chinook		Subyearling Chinook		Steelhead		Sockeye/Kokanee		Coho	
	Clipped	No Clip	Clipped	No Clip[1]	Clipped	No Clip	Clipped	No Clip	All	Total
Tot injr'd	590	340	---	4,520	1,829	622	1	106	225	8,233
Tot smp'd	3,691	2,986	---	10,411	6,257	4,177	68	413	1,313	29,316
% injr'd	16.0%	11.4%	---	43.4%	29.2%	14.9%	1.5%	25.7%	17.1%	28.1%
Descale										
>P	3.71%	1.64%	---	1.61%	2.53%	1.44%	0.00%	7.51%	0.99%	2.10%
>S	0.89%	0.17%	---	0.39%	1.57%	0.29%	0.00%	1.45%	0.38%	0.68%
<P	1.54%	1.21%	---	2.37%	1.85%	0.77%	0.00%	2.18%	1.45%	1.76%
<S	1.49%	0.74%	---	0.82%	2.70%	0.77%	0.00%	3.63%	1.14%	1.34%
5P	0.68%	0.44%	---	0.41%	0.38%	0.12%	0.00%	3.63%	0.61%	0.45%
Total	**307**	**125**	**---**	**584**	**565**	**141**	**0**	**76**	**60**	**1,858**
%	8.32%	4.19%	---	5.61%	9.03%	3.38%	0.00%	18.40%	4.57%	6.34%
Head										
AB	0.03%	0.03%	---	0.76%	0.13%	0.02%	0.00%	0.24%	0.15%	0.32%
EL	0.49%	0.17%	---	0.26%	0.64%	0.26%	0.00%	0.00%	0.30%	0.36%
EP	0.27%	0.03%	---	0.13%	0.03%	0.05%	0.00%	0.00%	0.15%	0.11%
OP	0.68%	0.64%	---	5.29%	1.69%	0.79%	0.00%	1.21%	0.84%	2.56%
JW	0.22%	0.07%	---	0.13%	0.14%	0.10%	1.47%	0.00%	0.08%	0.13%
MX	0.05%	0.07%	---	0.06%	0.05%	0.02%	0.00%	0.00%	0.08%	0.05%
HD	0.33%	0.03%	---	0.06%	0.80%	0.69%	0.00%	0.00%	0.08%	0.34%
Total	**76**	**31**	**---**	**697**	**218**	**81**	**1**	**6**	**22**	**1,132**
%	2.06%	1.04%	---	6.69%	3.48%	1.94%	1.47%	1.45%	1.68%	3.86%
Body										
BL	0.27%	0.07%		0.09%	0.00%	0.02%	0.00%	0.00%	0.00%	0.08%
SR	0.03%	0.03%		0.13%	0.18%	0.00%	0.00%	0.00%	0.08%	0.10%
EM	0.03%	0.10%		0.05%	0.46%	0.19%	0.00%	0.00%	0.30%	0.17%
FI	3.33%	3.11%	---	6.76%	5.48%	4.21%	0.00%	2.66%	5.86%	5.21%
LA	0.24%	0.23%	---	0.11%	0.22%	0.24%	0.00%	0.00%	0.00%	0.17%
LE	0.08%	0.03%	---	0.12%	0.18%	0.05%	0.00%	0.24%	0.00%	0.10%
BD	0.08%	0.03%	---	0.06%	0.24%	0.05%	0.00%	0.00%	0.00%	0.09%
Total	**150**	**108**	**---**	**761**	**423**	**199**	**0**	**12**	**82**	**1,735**
%	4.06%	3.62%	---	7.31%	6.76%	4.76%	0.00%	2.91%	6.25%	5.92%

--- No fish sampled

[1]Includes unmarked subyearling chinook with coded-wire tags.

Table continued on next page.

Table 18 continued.

	Yearling Chinook		Subyearling[1] Chinook		Steelhead		Sockeye/Kokanee[2]		Coho[3]	
	Clipped	No Clip	Clipped	No Clip	Clipped	No Clip	Clipped	No Clip	All	Total
Disease										
FU	0.03%	0.13%	---	0.06%	0.38%	0.29%	0.00%	0.24%	0.00%	0.16%
CY	0.00%	0.03%	---	0.12%	0.10%	0.02%	0.00%	0.00%	0.00%	0.07%
CO	0.08%	0.44%	---	14.54%	0.40%	0.19%	0.00%	0.24%	1.22%	5.39%
DI	0.03%	0.07%	---	0.02%	0.00%	0.67%	0.00%	0.00%	0.99%	0.16%
GH	0.11%	0.10%	---	1.08%	1.50%	0.34%	0.00%	0.00%	0.23%	0.78%
HE	0.33%	1.57%	---	6.97%	3.07%	0.72%	0.00%	0.48%	1.14%	3.49%
KD	0.11%	0.07%	---	0.23%	0.06%	0.07%	0.00%	0.00%	0.08%	0.13%
PA	0.11%	0.13%	---	0.32%	2.08%	0.74%	0.00%	0.24%	0.46%	0.71%
SC	0.05%	0.00%	---	0.07%	0.03%	0.02%	0.00%	0.00%	0.00%	0.04%
Total	**31**	**76**	**---**	**2436**	**477**	**128**	**0**	**5**	**54**	**3,207**
%	0.84%	2.55%	---	23.40%	7.62%	3.06%	0.00%	1.21%	4.11%	10.94%
Predator										
PH	0.00%	0.00%	---	0.00%	0.03%	0.02%	0.00%	0.00%	0.00%	0.01%
PB	0.57%	0.00%	---	0.15%	2.25%	1.68%	0.00%	0.73%	0.46%	0.88%
PL	0.00%	0.00%	---	0.03%	0.00%	0.00%	0.00%	0.00%	0.00%	0.01%
MD	0.03%	0.00%	---	0.06%	0.02%	0.00%	0.00%	0.48%	0.00%	0.03%
PP	0.11%	0.00%	---	0.16%	0.03%	0.05%	0.00%	0.48%	0.08%	0.10%
Total	**26**	**0**	**---**	**42**	**146**	**73**	**0**	**7**	**7**	**301**
%	0.70%	0.00%	---	0.40%	2.33%	1.75%	0.00%	1.69%	0.53%	1.03%

--- No fish sampled

Table 19. Key to injury abbreviations.

Head		**Body**		**Descaling**	
AB	Abrasion	BL	Bloated	>P	>20% patchy on 1 side
EI	Eye Injury	SR	Scale Regeneration	<P	5-20%patchy on 1 side
EP	"Pop" Eye	EM	Emaciated	>S	>20% scattered on 1 side
OP	Opercula	FI	Fin Injury	<S	5-20% scattered on 1 side
JW	Mandible (Jaw)	LA	Laceration	5P	>50% patchy on 1 side
MX	Maxillary	LE	Lesion		
HD	Head Deformity	BD	Deformity		

Disease		**Disease**		Predator	
FU	Fungus	HE	Hemorrhage	PH	Angler
CY	Cyst	KD	BKD	PB	Bird
CO	Columnaris	PA	Parasite	PL	Lamprey
DI	Digenia	SC	Scoliosis	MD	Moribund
GH	Gill Hyperplasia	WH	Whirling Disease	PP	Fish Bite

Fish Mortality

Mortality

The overall facility mortality rate for juvenile salmonids collected at Lower Granite Dam in 2000 was an estimated 0.09% (Table 20). In all, 7,304 facility mortalities were recorded out of a total collection of 8,300,546. The numbers of facility mortalities and the mortality percentages of the total collected by species group were: 2,571 clipped yearling chinook (0.13%), 662 unclipped yearling chinook (0.15%), 3,187 unclipped subyearling chinook (0.47%), 577 clipped steelhead (0.01%), 163 unclipped steelhead (0.02%), two clipped sockeye/kokanee (0.07%), 95 unclipped sockeye/kokanee (2.29%) and 47 coho (0.04%).

Facility mortality included fish removed from the raceways, barges or trucks before departure, sample mortalities, recovery tank mortalities and NMFS marking mortalities. The combined facility mortality rate was heavily influenced by clipped steelhead as they made up the bulk of fish in the total collection. Clipped steelhead mortality rates for the last five years have been less than 0.1% (Table 20). Clipped and unclipped yearling chinook mortality rates were .13% and .15% respectively in 2000 and were well below the 1996-1999 averages. Unclipped subyearling chinook mortality decreased from 2.4% in 1998 to 0.8% in 1999 and to 0.5% in 2000 and the 2000 rate was the lowest in the last four years. Weekly subyearling chinook mortality rates were generally highest during late September through October and exceeded 1% twice during this time (Table 24). Clipped sockeye/kokanee mortality rates decreased from 1999 and were the lowest in the last five years. Unclipped sockeye/kokanee annual mortality rate of 2.3% is lower than the previous four average of 2.9%. Daily mortality by species is provided in Appendix 1, Table 3 and weekly mortality rates are listed in Table 24.

NMFS recorded a total of 561 mortalities while tagging 150,909 fish for the Survival Study. This total included: 340 clipped yearling chinook, 27 unclipped yearling spring chinook, 42 unclipped yearling fall chinook, two unclipped subyearling fall chinook, 136 clipped steelhead, 12 unclipped steelhead, one unclipped sockeye/kokanee and one coho. These fish represent approximately 7.7% of the total facility mortality observed in 2000.

Sample mortalities include dead fish removed from the sample tank prior to sampling and those from the sorting trough in the sample lab. This season a total 1,283 sample mortalities were recorded and the mortality rate of 0.85% (1,283 out of 151,344 fish sampled) was the lowest in the last five years (Table 21). Sample mortality rates were lower than in 1999 for every species group except unclipped sockeye/kokanee. Unclipped subyearling chinook sample mortality rates were the same as in 1999 (1.3%), which is the lowest of the last five years. The total mortalities by species group included: 191 clipped yearling chinook, 80 unclipped yearling chinook, 877 unclipped subyearling chinook, 55 clipped steelhead, 24 unclipped yearling chinook, 48 unclipped sockeye/kokanee and eight coho.

The overall mortality rate for fish trucked from Lower Granite Dam in 2000 (Table 22) was 0.23% (390 mortalities out of 171,795 trucked fish) compared to 0.24% (a total of 572 mortalities out of 239,557 trucked fish) in 1999. This includes fish trucked prior to barging and fish trucked during the late season ending on October 31. Total 2000 trucking mortality numbers

by species were as follows: 22 clipped yearling chinook, 28 unclipped yearling chinook, 247 unclipped subyearling chinook, 54 clipped steelhead, 35 unclipped steelhead and four unclipped sockeye/kokanee.

Barge mortalities (Table 23) included fish removed from barge holds after the barges departed Lower Granite Dam. Mortalities include fish loaded at Lower Granite, Little Goose, Lower Monumental and McNary Dams. The total barge mortality rate in 2000 for all facilities was 0.02%, a total of 4,729 mortalities out of 19,140,329 barged fish. The total number barged included 7,778,853 fish from Lower Granite, 2,804,942 from Little Goose Dam, 1,486,190 fish from Lower Monumental Dam and 7,070,344 from McNary Dam. Barge mortalities by species include 2,651 clipped yearling chinook, 464 unclipped yearling chinook, 895 unclipped subyearling chinook, 567 clipped steelhead, 138 unclipped steelhead, four clipped sockeye/kokanee, five unclipped sockeye/kokanee and five coho.

Table 20. Annual facility mortality rate (%) at Lower Granite Dam, 1996-2000.

	Yearling Chinook		Subyearling[1] Chinook		Steelhead		Sockeye/Kokanee		Coho	
Year	Clipped	No Clip	Clipped	No Clip	Clipped	No Clip	Clipped	No Clip	All	Total
1996	0.58	0.88	---	0.37	0.04	0.05	0.35	3.78	0.06	0.12
1997	0.86	0.67	1.15	1.38	0.07	0.04	0.49	2.50	0.00	0.14
1998	0.25	0.32	2.50	2.42	0.07	0.08	0.18	0.29	0.32	0.15
1999	0.60	0.55		0.83	0.03	0.04	0.83	4.69	0.25	0.28
2000	0.13	0.15		0.47	0.01	0.02	0.07	2.29	0.04	0.09
96-99	0.50	0.54	2.20	1.33	0.06	0.06	0.31	4.55	0.55	0.18

[1]Hatchery subyearling chinook were not present until 1996.
[2]Includes unclipped hatchery subyearling chinook with CWT in 1999 and 2000.

Table 21. Annual sample mortality rate (%) at Lower Granite Dam, 1996-2000.

	Yearling Chinook		Subyearling[1] Chinook		Steelhead		Sockeye/Kokanee		Coho	
Year	Clipped	No Clip	Clipped	No Clip[2]	Clipped	No Clip	Clipped	No Clip	All	Total
1996	1.86	2.36	---	2.71	0.35	0.19	0.79	13.24	0.75	0.78
1997	2.48	3.15	3.89	5.66	0.41	0.45	6.71	20.59	1.87	1.65
1998	1.80	2.23	2.74	4.67	0.82	0.67	2.65	11.54	2.37	1.85
1999	1.62	1.48		1.31	0.32	0.51	1.67	9.61	0.56	1.06
2000	1.14	0.84		1.25	0.13	0.23	0.00	10.00	0.35	0.85
96-99	1.79	1.97	3.87	2.66	0.49	0.46	2.39	13.05	1.63	1.35

[1]Hatchery subyearling chinook were not present until 1996.
[2]Includes unclipped hatchery subyearling chinook with CWT in 1999 and 2000.

Table 22. Annual truck mortality rate (%) at Lower Granite Dam, 1996-2000.

	Yearling Chinook		Subyearling[1] Chinook		Steelhead		Sockeye/Kokanee		Coho	
Year	Clipped	No Clip	Clipped	No Clip[2]	Clipped	No Clip	Clipped	No Clip	All	Total
1996	1.22	0.97	---	0.43	0.31	0.37	0.03	9.67	0.00	0.41
1997	0.79	0.26	0.26	0.45	0.13	0.04	0.00	1.25	0.00	0.19
1998	0.43	0.52	0.00	0.62	0.47	0.27	0.02	0.00	68.75	0.50
1999	0.39	0.18	0.00	0.22	0.45	0.09	0.00	0.30	0.22	0.24
2000	0.54	0.89	---	0.17	0.50	0.53	0.00	0.40	0.00	0.23
96-99	0.71	0.48	0.09	0.43	0.34	0.19	0.01	2.81	17.24	0.34

[1]Hatchery subyearling chinook were not present until 1996.
[2]Includes unclipped hatchery subyearling chinook with CWT in 1999 and 2000.

Table 23. Annual barge mortality rate (%) from Lower Granite Dam, 1996-2000.

	Yearling Chinook		Subyearling[1] Chinook		Steelhead		Sockeye/Kokanee		Coho	
Year	Clipped	No Clip	Clipped	No Clip[2]	Clipped	No Clip	Clipped	No Clip	All	Total
1996	0.27	0.36	---	0.33	0.04	0.02	5.21	0.00	0.01	0.08
1997	0.29	0.45	0.00	0.30	0.03	0.01	0.00	1.22	0.00	0.05
1998	0.19	0.18	0.00	4.03	0.02	0.03	0.01	0.03	0.08	0.06
1999	0.07	0.07	0.00	0.07	0.01	0.02	0.53	0.27	0.11	0.04
2000	0.08	0.05	---	0.01	0.01	0.01	0.06	0.02	0.00	0.02
96-99	0.13	0.14	0.00	0.29	0.02	0.02	0.42	0.22	0.09	0.06

[1]Hatchery subyearling chinook were not present until 1996.
[2]Includes unclipped hatchery subyearling chinook with CWT in 1999 and 2000.

Table 24. Weekly facility mortality rate (%) at Lower Granite Dam, 2000.

Week Ending	Yearling Chinook		Subyearling Chinook		Steelhead		Sockeye/Kokanee		Coho	Total
	Clipped	No Clip	Clipped	No Clip	Clipped	No Clip	Clipped	No Clip	All	
3/30	2.22	5.38	----	5.00	16.67	1.69	----	6.00	----	3.78
4/6	0.96	1.22	----	1.25	0.04	0.26	0.00	4.17	0.00	0.46
4/13	0.47	0.43	----	2.41	0.02	0.05	----	1.28	0.00	0.18
4/20	0.12	0.19	----	0.12	0.00	0.01	----	0.00	0.00	0.07
4/27	0.14	0.11	----	0.24	0.01	0.00	----	----	0.00	0.05
5/4	0.09	0.06	----	0.80	0.00	0.00	----	1.33	0.00	0.04
5/11	0.09	0.08	----	0.67	0.00	0.00	0.00	0.00	0.00	0.03
5/18	0.16	0.11	----	0.00	0.01	0.04	0.00	0.89	0.00	0.05
5/25	0.11	0.12	----	----	0.01	0.01	0.07	0.60	0.01	0.03
6/1	0.22	0.19	----	0.89	0.02	0.02	0.22	0.30	0.07	0.06
6/8	0.23	0.16	----	0.34	0.04	0.03	0.00	0.47	0.08	0.14
6/15	0.41	0.08	----	0.73	0.08	0.19	0.00	0.00	0.00	0.46
6/22	0.31	0.14	----	0.46	0.12	0.31	0.00	0.00	0.18	0.39
6/29	0.00	0.05	----	0.27	0.07	0.28	0.00	0.00	0.11	0.23
7/6	0.00	0.21	----	0.33	0.49	1.11	----	----	0.00	0.34
7/13	1.67	0.26	----	0.45	1.25	3.13	----	0.00	0.36	0.50
7/20	10.00	0.77	----	0.60	0.60	0.36	----	0.00	0.36	0.60
7/27	3.33	2.94	----	1.08	0.78	0.68	----	----	0.00	1.07
8/3	25.00	1.75	----	0.62	0.77	0.91	0.00	0.00	0.00	0.65
8/10	----	0.81	----	0.59	0.07	0.00	----	8.33	0.00	0.55
8/17	----	1.56	----	0.51	0.00	0.00	----	3.70	0.00	0.50
8/24	0.00	0.00	----	0.81	2.03	0.00	----	4.17	0.00	0.83
8/31	----	----	----	0.40	0.00	3.13	----	11.76	0.00	0.46
9/7	0.00	0.00	----	0.51	2.08	0.00	----	8.75	0.00	0.55
9/14	----	0.00	----	0.62	1.39	1.61	----	6.86	0.00	0.73
9/21	----	5.00	----	1.09	2.27	0.00	----	7.29	0.00	1.21
9/28	----	0.00	----	0.64	0.00	0.00	----	3.95	0.00	0.67
10/5	----	0.00	----	0.62	3.70	0.00	----	6.86	0.00	0.85
10/12	----	0.00	----	0.90	0.00	0.00	----	4.55	0.00	0.92
10/19	0.00	0.00	----	0.79	0.00	0.00	0.00	17.07	0.00	1.08
10/26	1.37	----	----	0.53	1.89	6.67	----	24.32	0.00	0.78
10/31	0.00	0.00	----	2.78	1.39	0.00	0.00	4.76	0.00	2.67
Total Morts	2,571	662	----	3,187	577	163	2	95	47	7,304
Total Collected	2,007,545	442,635	----	681,803	4,281,834	757,786	2,688	4,152	122,103	8,300,546
% Mort	0.13	0.15	----	0.47	0.01	0.02	0.07	2.29	0.04	0.09

---No fish collected during the week.

Incidental Fishes

Incidental species

A total of 31,617 incidental fish entered the fish facility at Lower Granite Dam in 2000 (Table 25). This represents a decrease of 42.9% compared to last season's total of 55,333. Approximately 92% of this season's incidental fish were sampled prior to October 2 when the facility went to a 100% sample rate. Similarly, 92% of last year's incidentals were counted prior to September 2 when the facility went to a 100% sample rate.

A total of 6,316 lamprey, (predominately juveniles) represented the majority of incidentals collected and made up 22% of the total this year. In 2000, 6,316 lamprey were transported, a decrease of 52.9% from 1999. The majority of the lamprey this season were collected by May 26. The second most abundant incidental species in 2000 were peamouth, with 4,551 collected, almost three times less than the 11,283 collected in 1999. Other incidentals collected in significant numbers were ammocete lamprey, juvenile american shad, crappie (sp), suckers (sp), mountain whitefish and rainbow trout . All sampled incidental fish counts were expanded based on daily sample rates to estimate the total collection.

Table 25. Estimated collection of incidental fish species at Lower Granite Dam, 2000.

Common Name	Scientific Name	Expanded Sample	Separator	Collection[1]
Pacific lamprey (Adult)	Entosphenus tridentatus	12	0	12
Pacific lamprey (Juvenile)	E. tridentatus	5,051	0	5,051
Pacific lamprey (Ammocete)	E. tridentatus	1,253	0	1,253
American shad (Adult)	Alosa sapidissima	271	112	383
American shad (Juvenile)	A. sapidissima	1,067	0	1,067
Smallmouth bass	Micropterus dolomieui	200	0	200
Bluegill	Lepomis machrochirus	231	0	231
Bullhead (misc.)	Ictalurus sp.	126	0	126
Common carp	Cyprinus carpio	72	300	372
Channel catfish	Ictalurus punctatus	479	59	538
Chiselmouth	Acrocheilus alutaceus	703	0	703
Crappie	Pomoxis sp.	2,660	44	2,704
Crayfish	Cambarus sp	12	0	12
Kokanee2	Oncorhynchus nerka	129	0	129
Longnose dace	Rhinichthys cataractae	3	0	3
Peamouth	Mylocheilus caurinus	4,551	2	4,553
Rainbow Trout3	Oncorhynchus mykiss	3,901	0	3,901
Redside shiner	Richardsonius balteatus	54	0	54
Sculpin	Cottus sp.	94	0	94
Northern pikeminnow	Ptychocheilus oregonensis	90	12	102
Sucker (misc.)	Catostomus sp.	3,177	2,373	5,550
Sunfish (misc.)	Lepomis sp.	0	0	0
Whitefish	Prosopium sp.	4,330	5	4,335
White Sturgeon	Acipenser transmontanus	0	94	94
Yellow perch	Perca flavescens	150	0	150
Total		28,616	3,001	31,617

[1]Incidental species collection estimated based on numbers sampled, sample rates, and separator counts.
[2]Kokanee in the sample are classified as any sockeye over 200 mm in length.
[3]Rainbow trout are classified by morphological characteristics.

Adult Fallbacks

A total of 6,512 adult salmonids were removed from the Lower Granite separator in 2000 (Table 26). This included: 268 adult chinook, 202 jack chinook, 3,349 hatchery steelhead, and 2,693 wild steelhead. Hatchery steelhead were the most abundant adult salmonid removed from the separator and made up nearly 51% of the total salmonid fallbacks during 2000. Wild steelhead were second in abundance and made up about 41% of the fallbacks. As is typical at Lower Granite Dam, April and May were the months of highest fallback for hatchery and wild steelhead, while adult and jack chinook fallback counts were highest in October (Table 27).

Table 26. Annual total of adult salmonids released from the juvenile fish separator at Lower Granite Dam, 1996-2000.

Year	Adult Chinook	Jack Chinook	Hatchery Steelhead	Wild Steelhead	Total
1996	150	70	5,385	1,167	6,772
1997	470	19	6,609	1,944	9,042
1998	226	163	4,340	2,043	6,772
1999	187	95	4,091	1,951	6,324
96-99 ave.	258	87	5,106	1,776	7,228
2000	268	202	3,349	2,693	6,512

The number of adult chinook removed from the separator in 2000 was 43% higher than in 1999 and 3.8% higher than the previous four-year average (Table 26). Jack chinook fallback numbers were 213% above 1999 totals and 233% higher than the previous four-year average. Numbers of adult hatchery steelhead were about 18% below 1999 and 66% below the previous four-year average. Wild steelhead were 138% above 1999 and 152% above the previous four-year average. Fallback salmonids were superficially examined for condition while being released off the separator. Over 96% of all adult salmonids were reported in good or fair condition (Table 28).

Table 27. Monthly totals of adult salmonids released from the juvenile fish separator at Lower Granite Dam, 2000.

Month	Adult Chinook	Jack Chinook	Hatchery Steelhead	Wild Steelhead	Total
April[1]	12	3	1,047	1,003	2,065
May	49	9	843	1,191	2,072
June	34	9	28	116	766
July	18	10	104	53	186
August	7	6	173	92	278
September	41	37	367	87	532
October	107	128	787	151	1,173
Total	268	202	3,349	2,693	6,512

[1] Includes March 26-31.

Table 28. Condition of adult salmonids released from the juvenile fish separator at Lower Granite Dam, 2000.

Condition	Adult Chinook	Jack Chinook	Hatchery Steelhead	Wild Steelhead	Total
Good	228	197	2,548	2,161	5,134
Fair	35	3	610	449	1,097
Poor	4	2	171	78	255
Dead	1	0	20	5	26
Total	268	202	3,349	2,693	6,512

Adult fallbacks that passed through the separator bars were not counted on daily separator fallback forms. Some of these passed into raceways and were transported but not counted while others entered the sample tank and were counted as incidental fish. A total of 119 adult salmonids were recorded in the daily samples this season, including: 59 hatchery jack chinook, 14 hatchery mini-jack chinook, 11 wild jack chinook, 22 hatchery steelhead, 5 wild steelhead and 8 wild sockeye/kokanee. Adult chinook between 12 to 22 inches in fork length were recorded as jacks. Mini-jacks were between 6 to 12 inches in fork length. Nearly 67% of the hatchery jack chinook were marked with color-coded elastomer tags. These 49 elastomer marked jacks included 22 left-orange, ten left-blue, six right-green, six left-green, and five left-red. We also handled two hatchery chinook jacks that NMFS staff had marked at the LGR adult ladder trap with a double opercula punch. There were six adult fish in the sample recorded as mortalities during the season, four hatchery chinook, one wild chinook and one hatchery steelhead.

Surface Bypass/Collector

Background

The National Marine Fisheries Service (NMFS) issued their Biological Opinion (BiOp) on operation of the federal Columbia River Power System for the years 1994-1998 in March 1995. Measure 11 of the BiOp required the Corps of Engineers to "investigate the application of surface collection technology at lower Snake River projects, prototype surface collectors should be designed and tested at Lower Granite Dam by June 1996". A prototype surface bypass /collector (SBC) was installed at Lower Granite in April 1996. Testing of the SBC began in 1996 and concluded in 2000. The SBC was installed in front of turbine units 4,5 and 6 and required passing 4,000 cfs through spillbay 1 to operate. During 1996 and 1997, a range of flows through the collector and different entrance configurations were tested. In 1998, three modifications were made to the SBC. The Lower Granite intakes were modified with the addition of a Simulated Wells Intake (SWI), which was thought to reduce entrainment of migrating smolts into turbine intakes and make more fish available to the SBC. Second, a behavioral guidance structure (BGS) was added. The BGS is a floating steel curtain 1,100 feet long that is attached to the south end of the SBC and extends upstream towards the south shore. It was designed to guide fish away from turbine units 1-3 and toward the SBC. The BGS is moveable, so at times it was moved upstream for different tests. The third addition was a new overflow entrance near the confluence of the SBC and BGS. Full-scale tests of the SBC and BGS were not conducted in 1999, but the SBC was operated for fish passage benefits during the spring out-migration. During the 2000 season, the SBC was operated 24 hours per day from April 10 to May 27 with the BGS fully deployed.

Evaluations

Testing of the SWI structure in 1998 was successful in making larger numbers of fish available to the SBC. Despite the improved performance of the SBC in 1998, the percentage of fish that actually entered the SBC that were in the proximity of the entrances was lower. The BGS was successful in guiding more fish away from turbine units 1-3. Testing in 1999 involved radically changing the entrance conditions. Two shallow entrances, the middle entrance and BGS were operated which resulted in increased velocities at the entrances. Hydroacoustic monitoring indicated that overall performance improved during the 1999 testing. The BGS entrance greatly increased fish passage in 1999 compared to 1998, when low velocity entrances were used. Further modifications were made for the 2000 evaluation. Single-beam hyroacoustic units were used to monitor fish passage at the SBC, powerhouse and spillway. A single dual head multi-beam sonar was deployed to monitor fish movement in the vicinity of the BGS entrance. The BGS entrance to the SBC was retrofitted and shaped within the SBC to allow for more gradual acceleration at the entrance, emulating a smooth-crested weir. For comparisons, the middle entrance was unchanged from a sharp-crested weir tested in 1999. The testing of the SBC during the 2000 season revealed that the proportions of fish within six meters of the SBC generally increased compared to 1999 and 1998. Entrance efficiency (the number of fish to enter the SBC divided by the number of fish detected within six meters of the SBC) generally increased, with the exception of clipped steelhead. Again, the BGS appeared effective at diverting fish away from the south half of the powerhouse (turbine units 1-3).

Research

Nine research projects conducted by four agencies impacted a total of 1,360,992 smolts, 16.4 % of the total number of smolts collected at Lower Granite Dam during the 2000 season. Of these, 1,204,829 smolts, or 88.5%, were anesthetized and handled but not tagged, examined or sacrificed for research. In 1999, research activities impacted 7.5% (440,810) of the total number of smolts collected that year and handled but did not use 65% (357,001) of them. In 2000, researchers PIT-tagged 152,969 smolts, radio-tagged 1,828, examined 1,895, sacrificed 607 and reported 692 incidental smolt mortalities.

USGS-BRD Summer SBC Radio Telemetry

The United States Geological Survey Biological Research Division (USGS-BRD) researchers surgically implanted radio tags in 1,828 fish between April 9 and May 22. A total of 914 clipped yearling chinook, 475 clipped steelhead and 439 unclipped steelhead were collected for this study. The fish were taken from the SMP sample and held for 24 hours prior to tagging, were subsequently tagged and held for another 24 hours to allow them to recover and then released upstream of the SBC. Tagged fish migration patterns and dam passage routes at the tailrace were tracked using radio telemetry. A total of 408 clipped yearling chinook, 148 clipped steelhead and 172 unclipped steelhead were handled and bypassed without being tagged. A total of 16 mortalities were reported during this study, including 15 clipped yearling chinook and one clipped steelhead.

USGS-BRD 3-D Sonic Evaluation

Research staff from the USGS-BRD tagged 232 clipped steelhead from the daily sample with sonic tags between April 11 and May 20. These steelhead were released above the dam and tracked with 3-D tracking equipment to monitor movement and passage through the Surface Bypass Collector (SBC). An additional 125 clipped steelhead were handled for this study, but not tagged. No mortalities were recorded during this study.

USGS-BRD Tissue Fat Content

Research staff from the USGS-BRD collected 26 unclipped subyearling fall chinook from the Lower Granite sample July 31. The purpose of this study was to collect tissue fat content data from 15 smolts (all sacrificed) and also take snout swabs from 11 randomly selected smolts for the presence of columnaris.

WDFW Gas Bubble Trauma Monitoring

The Washington Department of Fish and Wildlife (WDFW) conducted Gas Bubble Trauma (GBT) examinations on fish collected from the wet separator on Mondays from April 3 through June 19. The examinations required stereo microscopic inspections of the unpaired fins, the left lateral line and both eyes of sample fish for the presence of gas bubbles. Up to 100 chinook (clipped and unclipped) and up to 100 steelhead (clipped and unclipped), depending upon the numbers of fish available, were examined each day for GBT symptoms. A total of 1,895 salmonids were examined, including: 508 clipped yearling chinook, 256 unclipped yearling chinook, 869 clipped steelhead and 262 unclipped steelhead. Fish handled during sampling for GBT but not examined include 38 fish that were netted and immediately released and 18 PIT-tagged smolts that were anesthetized. The PIT-tagged smolts were allowed to recover and released back into the separator. Smolts examined for symptoms of GBT were released into a raceway to prevent them from getting diverted to the sample tank and anesthetized again. These fish were added to daily collection counts. There were four yearling chinook and 18 steelhead observed with symptoms of GBT.

NMFS: A Study to Compare the Adult Returns of In-river Migrating versus Barged Juvenile Anadromous Salmonids

The National Marine Fisheries Service (NMFS) tagged a total of 150,909 smolts with PIT-tags for the transportation evaluation study from March 30 to June 19. All tagged fish were bypassed to the river via the PIT-tag bypass outfall pipe after a 24-hour recovery period. Bypassed fish included: 64 clipped yearling chinook, 59,341 unclipped yearling chinook, 20,330 clipped steelhead, 71,170 unclipped steelhead and four coho. A total of 1,200,328 smolts were handled but not tagged, including: 458,707 clipped yearling chinook, 3,232 unclipped yearling chinook, 29,384 clipped fall yearling chinook, 299 unclipped subyearling fall chinook, 673,415 clipped steelhead, 21,777 unclipped steelhead, 1,161 unclipped sockeye/kokanee and 12,353 unclipped coho. Mortalities removed from raceways in which smolts were collected and held for tagging and those removed from raceways holding tagged fish for transportation were included with facility raceway mortalities and not research. Mortalities recorded from the holding tank for the bypass treatment group totaled 561 smolts: 340 clipped yearling chinook, 27 unclipped yearling chinook, 42 unclipped fall yearling chinook, two unclipped subyearling chinook, 136 clipped steelhead, 12 unclipped steelhead, one unclipped sockeye/kokanee and one unclipped coho. These were identified as research mortalities. Most of the smolts handled and tagged for this study were collected in the raceways and tagged in the NMFS marking trailer. Marking for this study was conducted in the sample lab between March 30 and April 7 and June 5 and 19. During this time 5,719 smolts were tagged including: three clipped yearling chinook, 2,723 unclipped yearling chinook, 700 clipped steelhead and 2,293 unclipped steelhead.

U of I: Evaluation of the Effects of Multiple Dam Passage on the Physiological Condition of Migrating Juvenile Salmon. Objective 1B: Determine cumulative physiological response to passage through multiple dams: verify results with Snake River spring chinook salmon stocks.

In-river migrants

University of Idaho Fishery co-op researchers used the PIT-tag diversion-by-code system (GRX) to collect and sample migrating clipped yearling chinook and unclipped subyearling chinook (provided by the ongoing Hatchery Relative Survival Study) to evaluate the physiological response of these fish to cumulative dam passage. Between April 26 and May 27, research staff sacrificed 245 clipped yearling chinook smolts collected at the GRX holding tanks to measure physiological indices. A relatively large number (3,608) of other fish, both untagged and PIT-tagged, were also diverted to the GRX tanks. This total included: 2,239 clipped yearling chinook, 403 unclipped yearling chinook, 811 clipped steelhead, 128 unclipped steelhead and 27 unclipped coho. These fish were handled and released through the PIT-tag outfall bypass pipe after they were scanned for PIT-tags. Tagged fish recapture events were reported to PTAGIS. A total of 11 clipped yearling chinook and one clipped steelhead were recorded as mortalities.

Run-at-large migrants

For comparison with the in-river migrating fish, a total of 127 clipped yearling chinook were obtained from daily samples at Lower Granite Dam between May 2 and June 2 and held in tanks supplied with filtered river water. These fish were not fed and were sacrificed at 0, 6, 12 and 18 days. These samples will provide baseline data to compare changes in energy stores, condition factor, gall bladder fullness, and plasma alkaline phosphatase concentrations (all indicators of nutritional status) observed with in-river migrating fish. Research staff sacrificed 90 clipped yearling chinook and reported 37 clipped yearling chinook mortalities.

In-river migrants, salt water challenge

To assess the readiness of fish from three selected hatcheries for seawater entry, fish from each hatchery were collected at the GRX holding tanks and exposed to temperature controlled artificial seawater. Blood samples were taken for measurement of plasma Na^+ and CL^- concentrations and other physiological indices after 24 hours. Between May 3 and May 23 a total of 210 clipped yearling chinook smolts were sacrificed. Research staff reported four clipped yearling chinook mortalities.

U of I: Evaluation of the Effects of Multiple Dam Passage on the Physiological Condition of Migrating Juvenile Salmon. Objective: Determine cumulative physiological response to passage through multiple dams and verify results with Snake River subyearling fall chinook salmon stocks (run-at-large migrants).

For comparison with the in-river migrating fish, a total of 65 unclipped subyearling fall chinook of Lyons Ferry Hatchery origin were obtained from daily samples at Lower Granite Dam between July 7 and August 27 and held in tanks supplied with filtered river water. These fish were not fed and were sacrificed at 0, 6, 12 and 18 days. These samples will provide baseline data to compare changes in energy stores, condition factor, gall bladder fullness, and plasma alkaline phosphatase concentrations (all indicators of nutritional status) observed in in-river migrating fish. Research staff sacrificed 62 unclipped subyearling fall chinook and reported two unclipped subyearling fall chinook mortalities.

USGS-BRD: Preliminary test of the efficacy of the UV system installed in the juvenile fish facility at Lower Granite Dam for reduction of bacterial loads in the sorting troughs.

Early this season we installed an ultraviolet (UV) light system in the re-circulating water supply system for the sample tank in the fish facility. Because UV light is lethal to many forms of bacterium, we hoped to reduce the bacteria levels identified in the system in 1999 (Diane Elliott, USGS-BRD, per.comm.). The Walla Walla district contracted with the Biological Resources Division, U.S. Geological Survey (USGS-BRD) to evaluate the effectiveness of the UV filters. USGS-BRD staff sampled the re-circulation water supply system June 6 to 8, 2000.

In the BRD Executive Summary, Elliott (2001) states, "Ultraviolet (UV) water treatment systems were installed at Lower Granite Dam in 2000 to reduce the numbers of bacteria in the sorting and marking troughs of the juvenile fish facility. Multiple water samples were taken from various locations in the laboratory facility on June 6, 7, and 8, 2000 for bacteriological analysis. During the three sample days, fish were sorted and marked for one 1.5 to 3 hours, between 1,258 and 2,887 fish were handled and 37 to 960 chinook salmon or steelhead were marked in the system. Despite the use of a transport medium and a selective growth medium intended to reduce the numbers of contaminating organisms while preserving the viability of the kidney disease bacterium *Recnibacterium salmoninarum*, no *R. salmoninarum* was cultured from the water samples. However, other unidentified bacteria were cultured from the water samples, and may have overgrown any fastidious, slow-growing *R. salmonimarum* present in the samples."

"Mean concentrations of culturable bacteria for a given sample time ranged from 127 to 237 bacteria/mL in the collection pool, from 27 to 753 bacteria/mL in the sorting trough, and from 187 to 1616 bacteria/mL in a marking trough. The concentrations of total viable bacteria in the single-pass waster of the collection pool, which was not exposed to the UV system, usually showed no significant changes ($p>0.05$) during a sample day. In contrast, samples from the recirculating water of the sorting and marking troughs, which passed through the UV system, usually showed significant increases ($p<0.05$) in concentrations of viable bacteria between the first and last samples. Bacterial concentrations in the final samples from the marking trough

were usually significantly higher than concentrations in equivalent samples from the sorting trough, which in turn were usually significantly higher than equivalent samples from the collection pool. Comparison of bacterial numbers in equivalent samples taken on different days suggested, for the most part, a direct relation between the number of fish sorted or marked in the recirculating water system and the total counts of viable bacteria. In comparison, total bacterial counts in equivalent collection spool samples did not differ significantly among sample days."

"The increases in total bacteria in the sorting and marking troughs during a sample day indicated that the UV system was not effectively destroying bacteria shed by fish into the recirculating water. Although it was not determined whether any of the isolated bacteria were fish pathogens, the study results suggested that ample opportunity existed for exposure of fish to bacteria in the sorting and marking troughs before the water passed through the UV system. Factors such as the presence of particulate material in the water, or water flow pattern that allow the buildup of bacteria in parts of the system might decrease the effectiveness of UV sterilization. Further research should be done to examine the efficacy of UV systems installed in juvenile fish facilities for reducing or eliminating specific fish pathogens from the water, and to determine if modifications are needed to improve the effectiveness of the systems."

A full copy of the BRD research analysis can be found in the Army Corp of Engineer's 2000 annual report.

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Milks D., L. Wargo, and M. Varney. 2001. Draft. Lower Snake River Compensation Plan, Lyons Ferry Hatchery Evaluation Program, Fall chinook salmon 1998 and 1999 annual report. Washington Department of Fish and Wildlife Hatcheries Report # FPA 00-21 to U.S. Fish and Wildlife Service, Boise, ID.

Elliott D., R. J. Pascho, C. L. McKibben. 2001. Evaluation of Procedures for Collection, Transportation, Downstream Passage, and Post-release Survival of Outmigrating Salmonids. Executive Summary. Preliminary test of the efficacy of the UV system installed in the juvenile fish facility at Lower Granite Dam for reduction of bacterial loads in the sorting troughs. Western Fisheries Research Center. U.S. Geological Survey, Biological Resources Division, Seattle, WA. Appendices.

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Appendix 1. Passage Plots

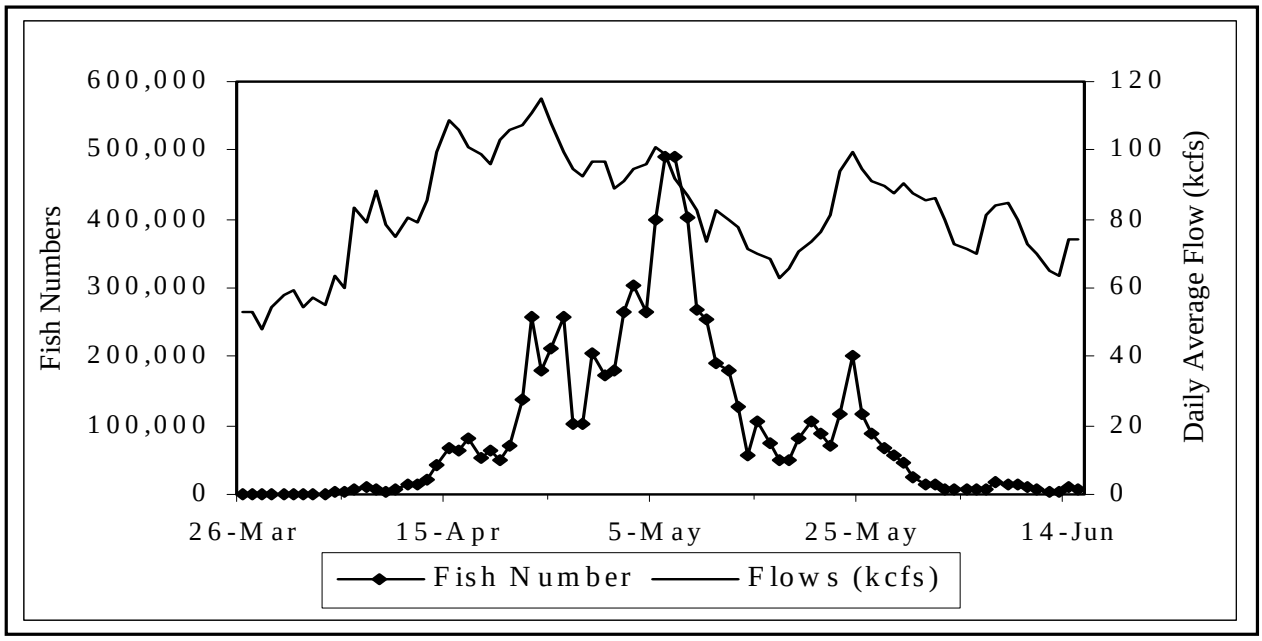


Figure 1. Daily juvenile salmonid collection and river flow at Lower Granite Dam from March 26 through June 15,2000.

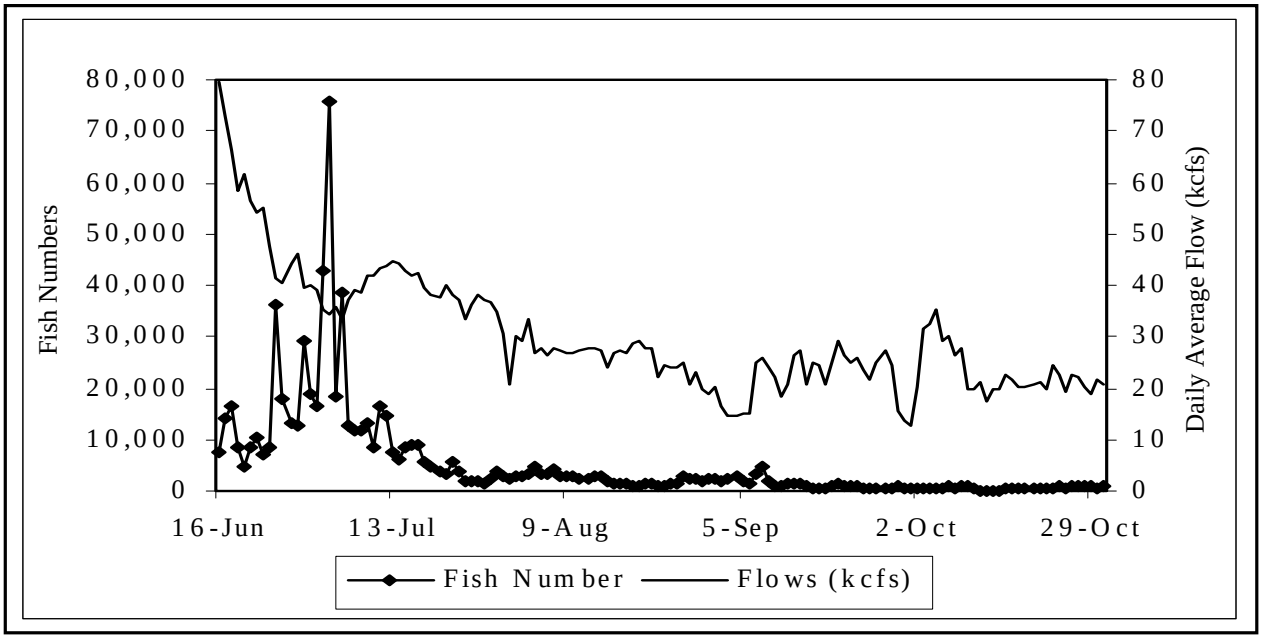


Figure 2. Daily juvenile salmonid collection and river flow at Lower Granite Dam from July 16 through Oct. 31, 2000.

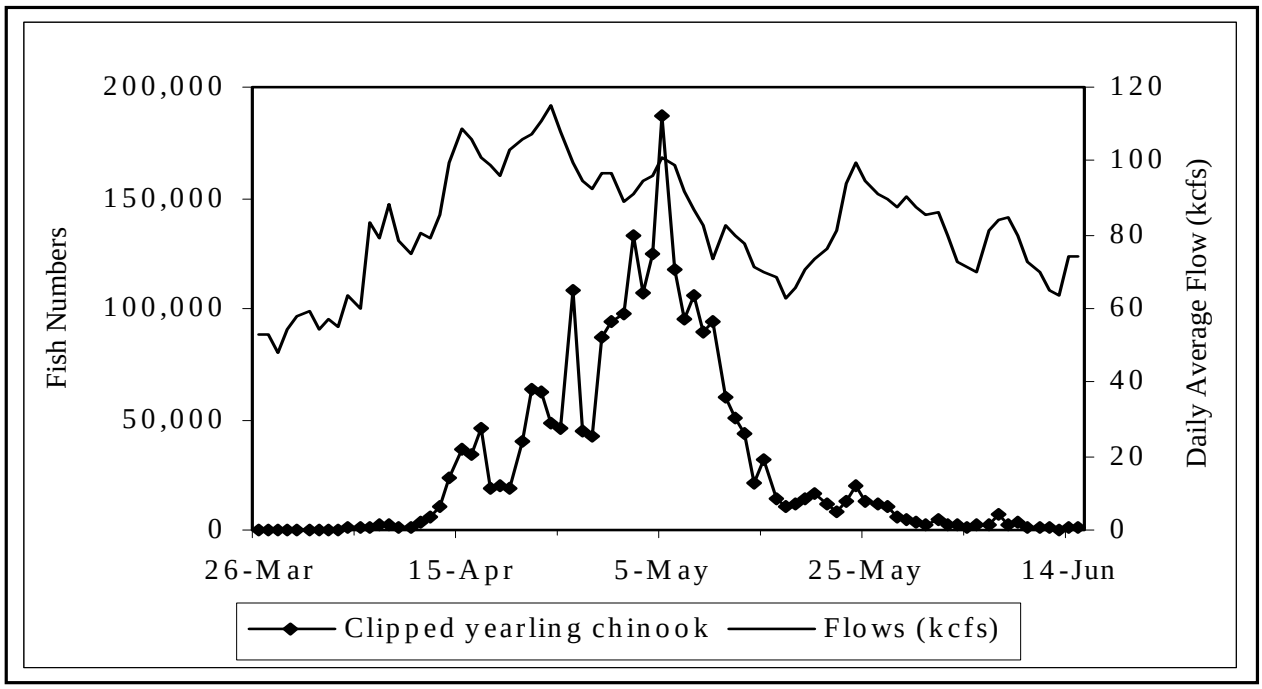


Figure 3. Daily clipped yearling chinook collection and river flow at Lower Granite Dam from March 26 through June 15, 2000.

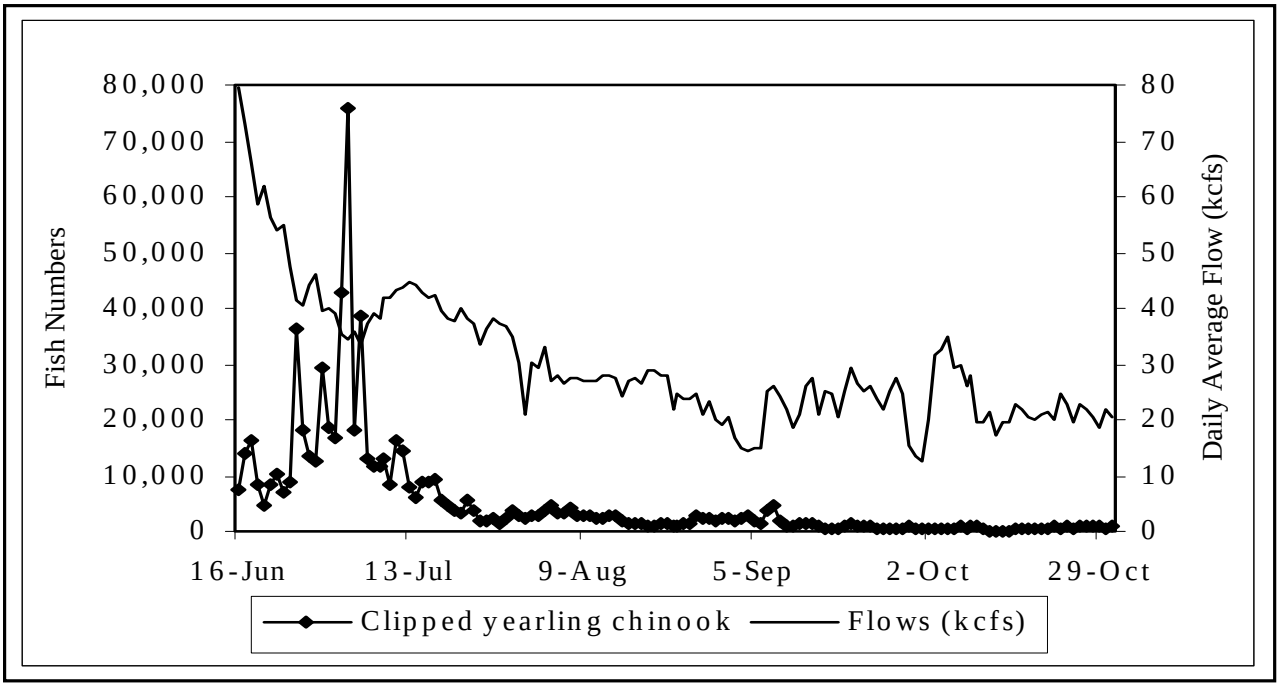


Figure 4. Daily clipped yearling chinook collection and river flow at Lower Granite Dam from June 16 through Oct. 31, 2000.

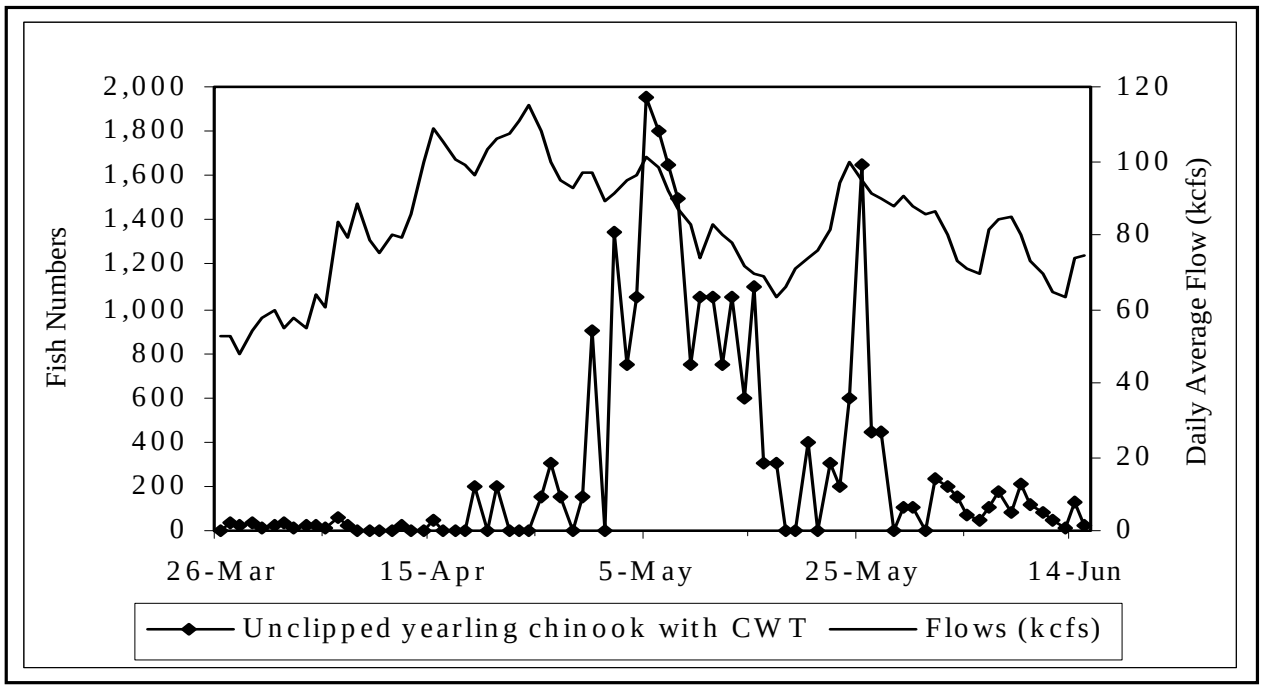


Figure 5. Daily unclipped yearling chinook collection and river flow at Lower Granite Dam from March 26 through June 15, 2000.

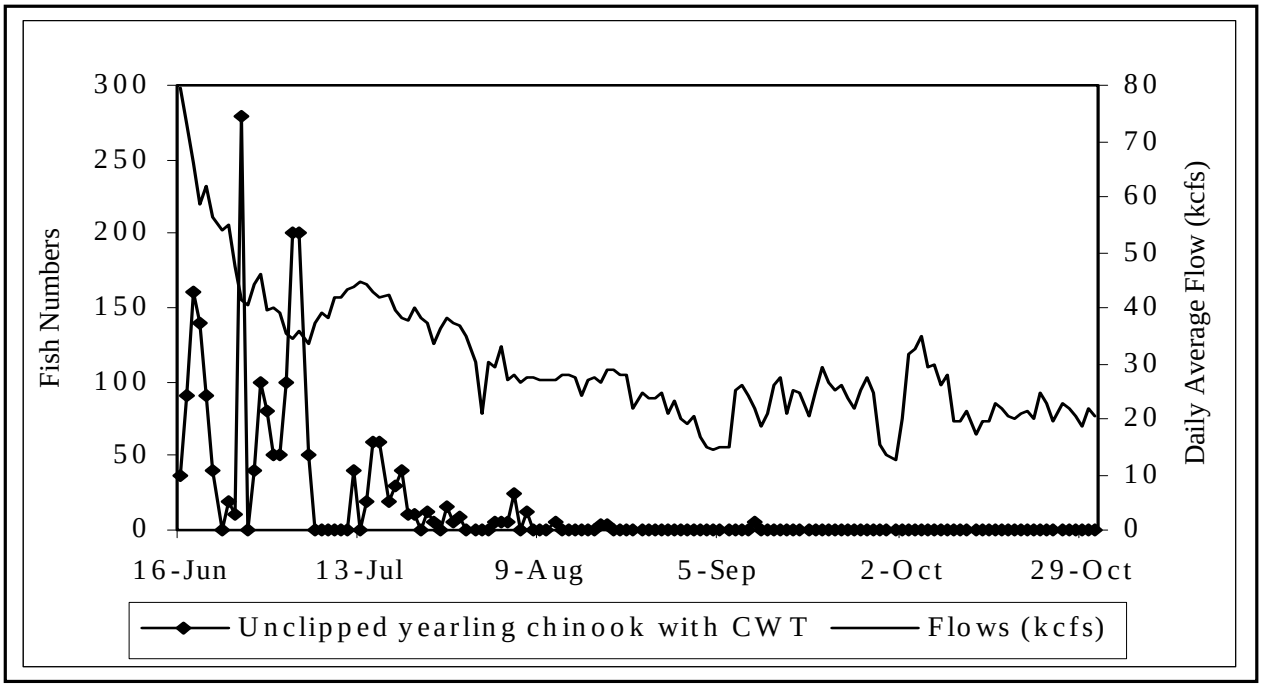


Figure 6. Daily unclipped yearling chinook collection and river flow at Lower Granite Dam from June 16 through Oct. 31, 2000.

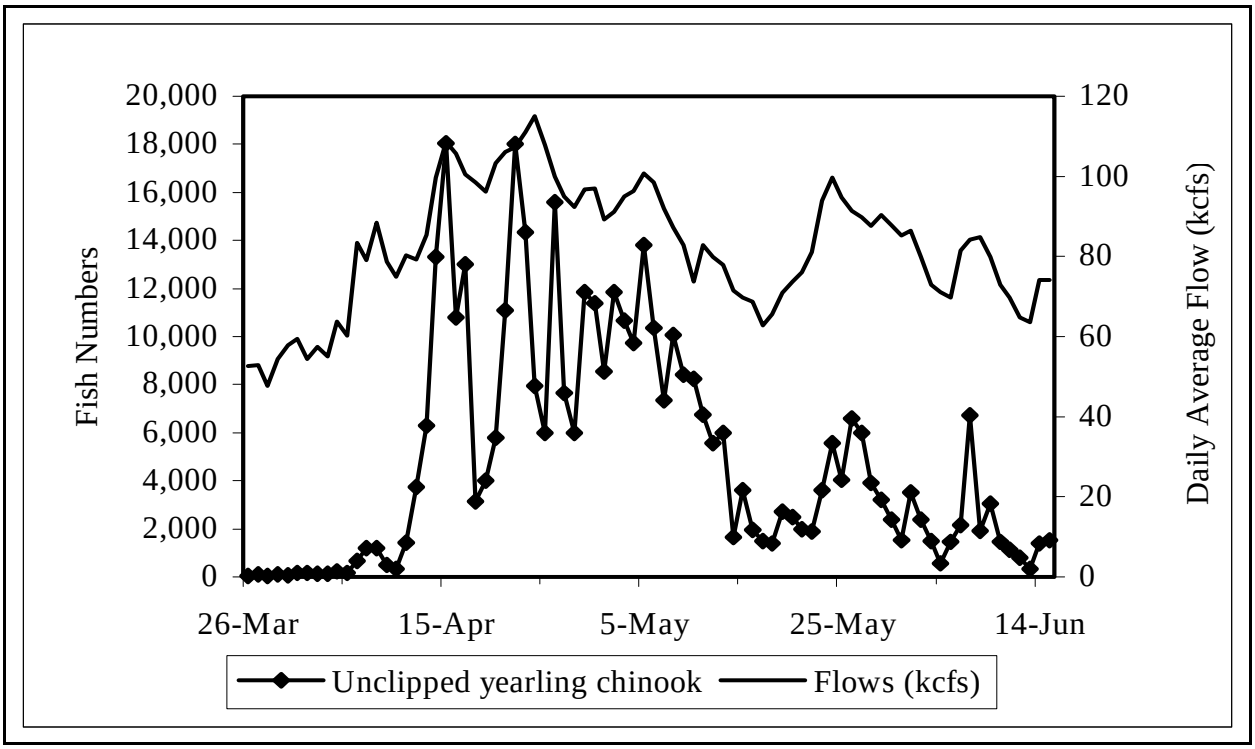


Figure 7. Daily unclipped yearling chinook collection and river flow at Lower Granite Dam from March 26 through June 15, 2000.

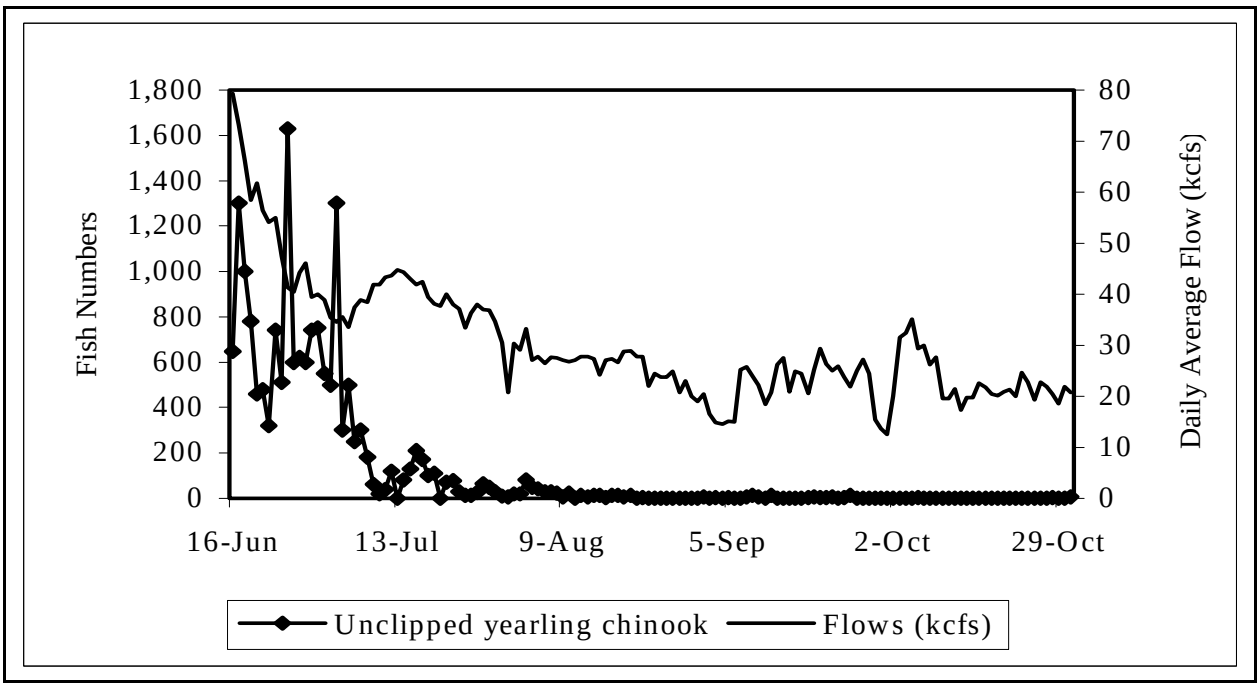


Figure 8. Daily unclipped yearling chinook collection and river flow at Lower Granite Dam from June 16 through Oct. 31, 2000.

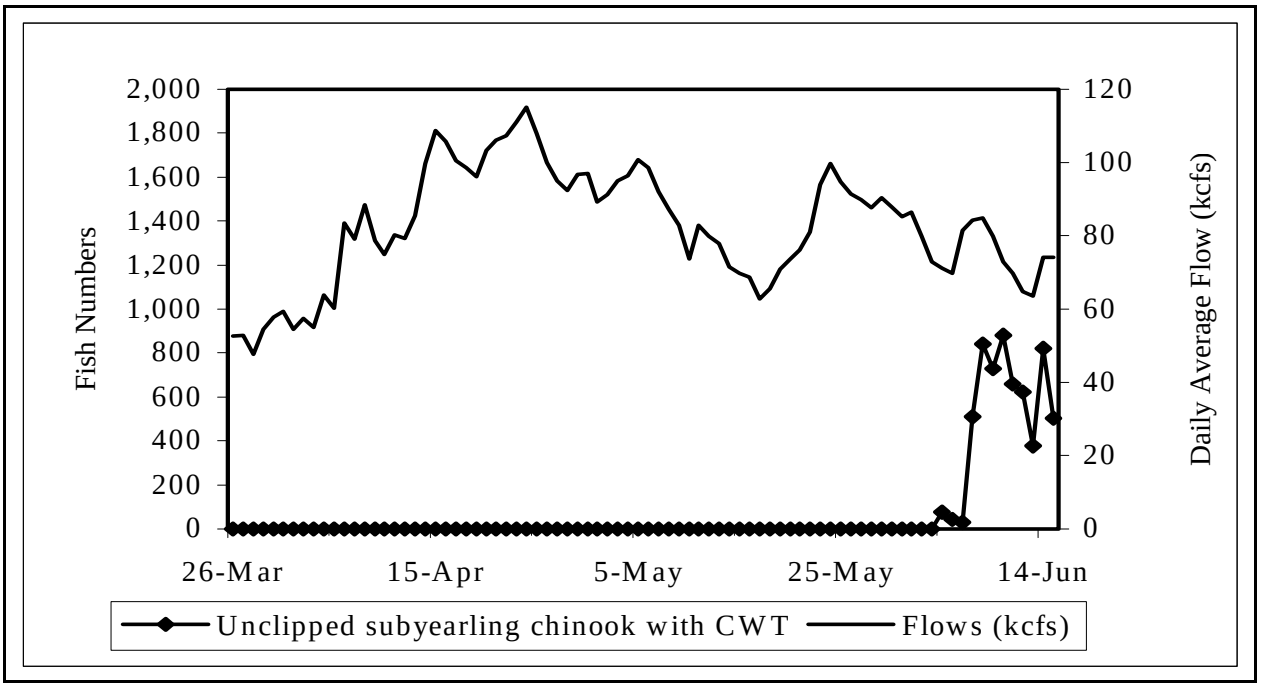


Figure 9. Daily unclipped subyearling chinook with CWT collection and river flow at Lower Granite Dam from March 26 through June 15, 2000.

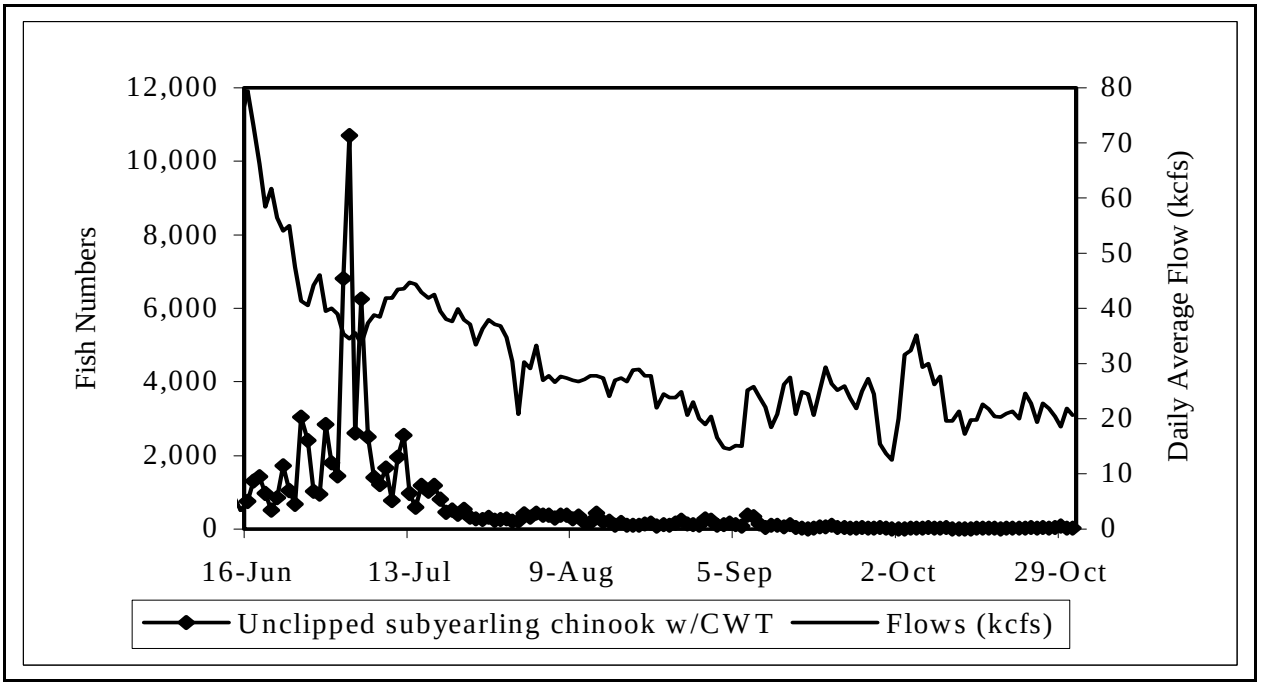


Figure 10. Daily unclipped subyearling chinook with CWT collection and river flow at Lower Granite Dam from June 16 through Oct. 31,2000.

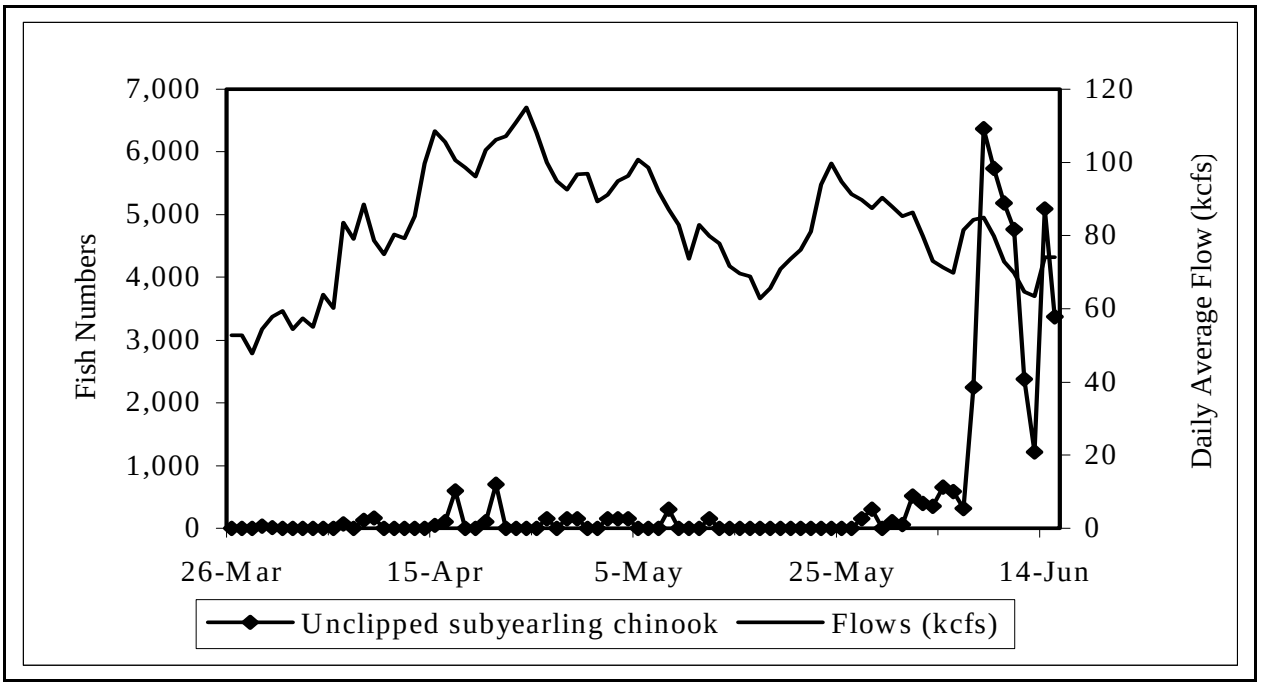


Figure 11. Daily unclipped subyearling collection and river flow at Lower Granite Dam from March 26 through June 15, 2000.

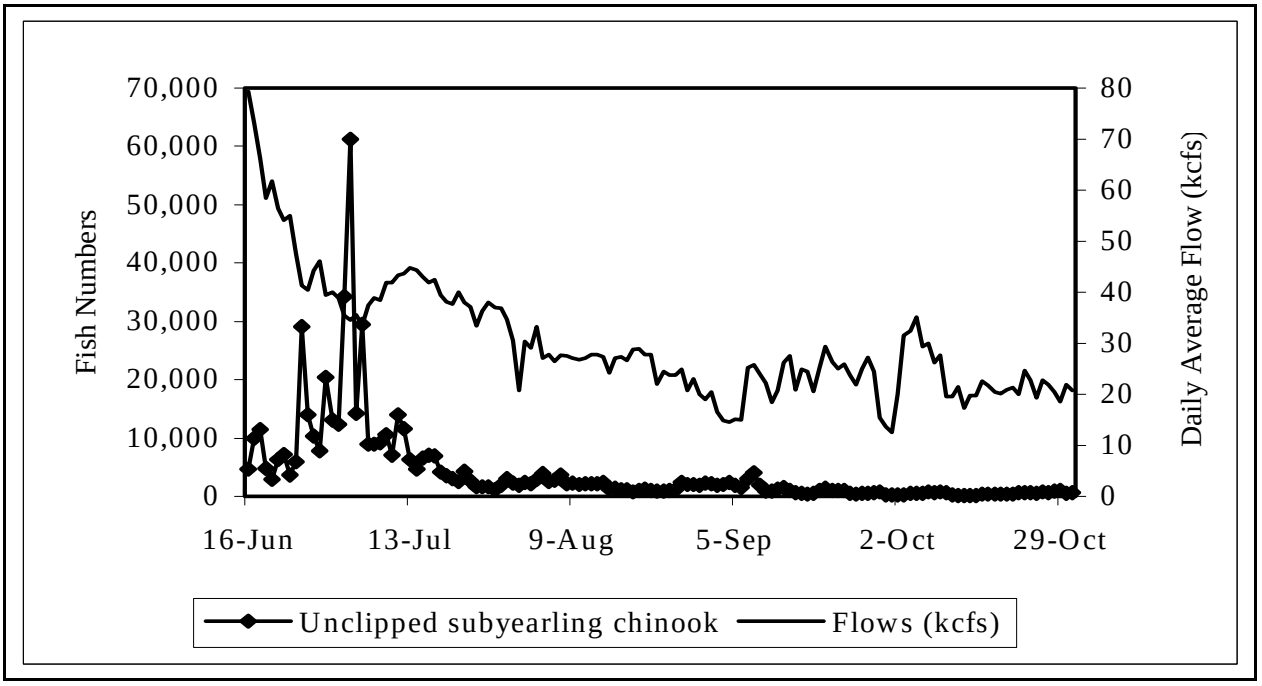


Figure 12. Daily unclipped subyearling collection and river flow at Lower Granite Dam from June 16 through Oct. 31, 2000.

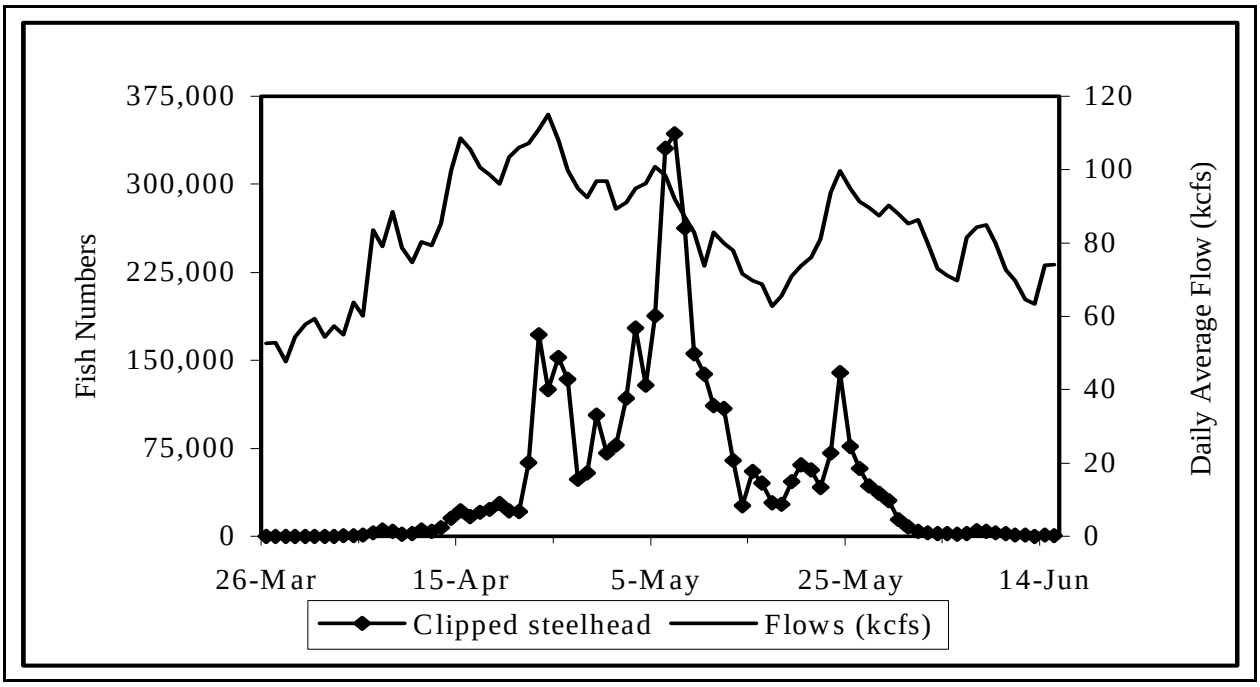


Figure 13. Daily clipped steelhead collection and river flow at Lower Granite Dam from March 26 through June 15, 2000.

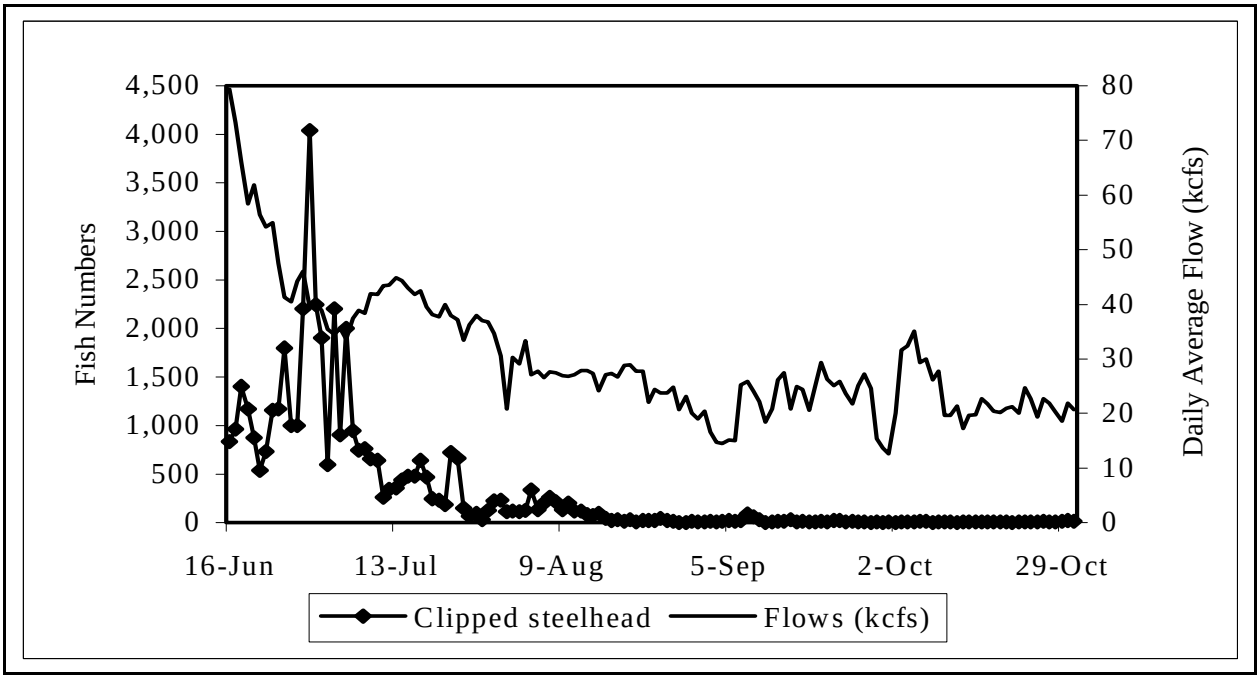


Figure 14. Daily clipped steelhead collection and river flow at Lower Granite Dam from June 16 through Oct. 31, 2000.

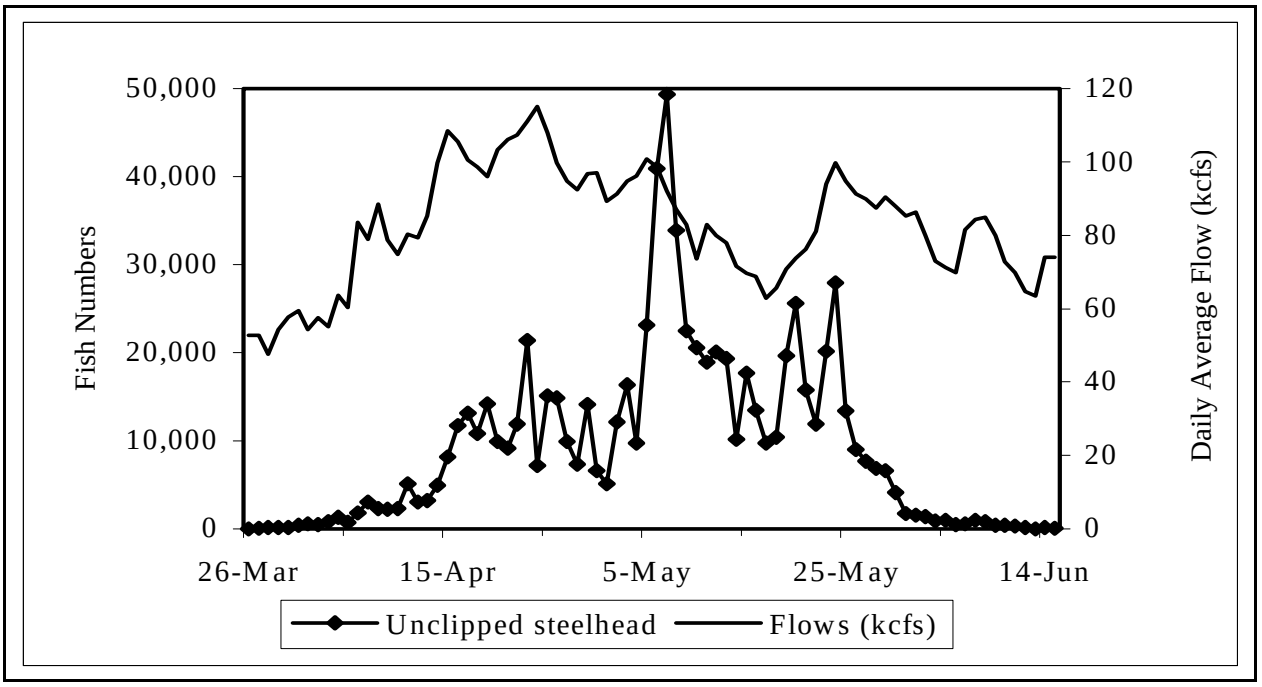


Figure 15. Daily unclipped steelhead collection and river flow at Lower Granite Dam from March 26 through June 15, 2000.

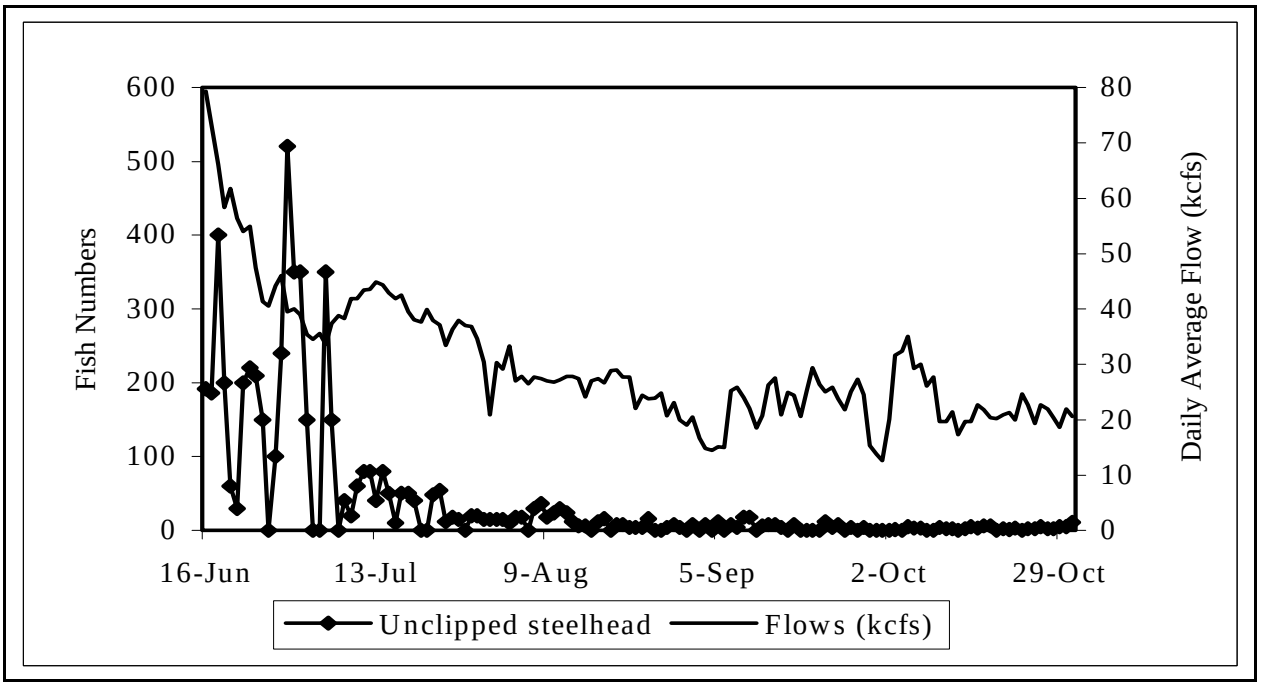


Figure 16. Daily unclipped steelhead collection and river flow at Lower Granite Dam from June 16 through Oct. 31, 2000.

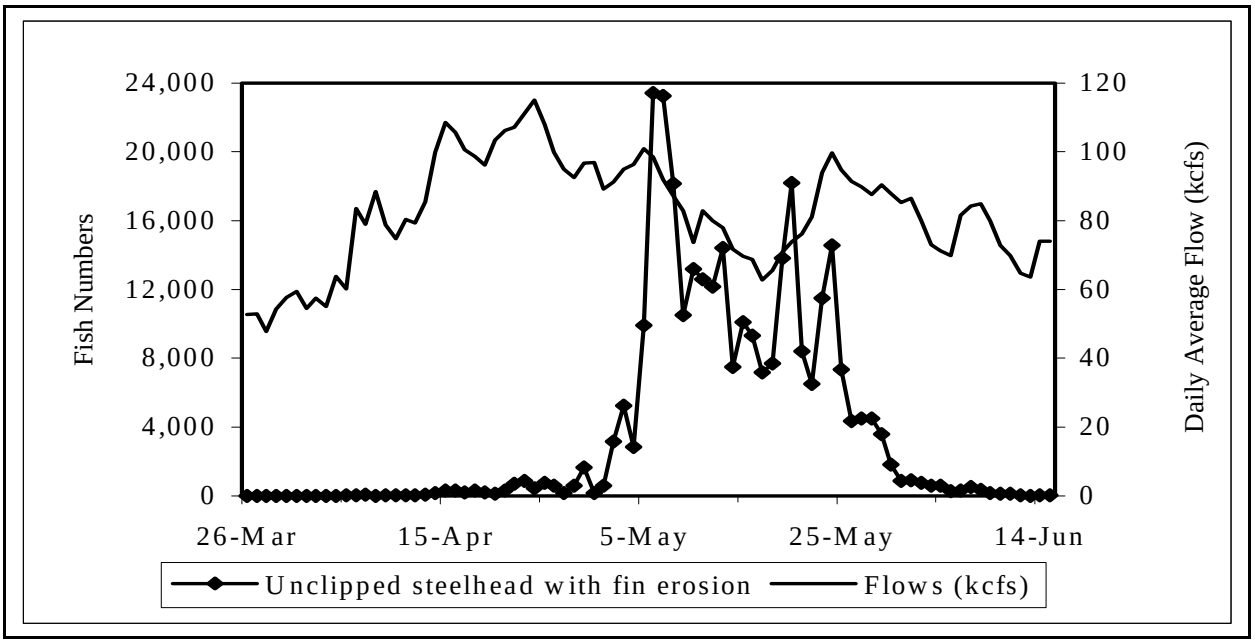


Figure 17. Daily collection of unclipped steelhead with fin erosion (typical of hatchery rearing) and river flow at Lower Granite Dam from March 26 through June 15, 2000.

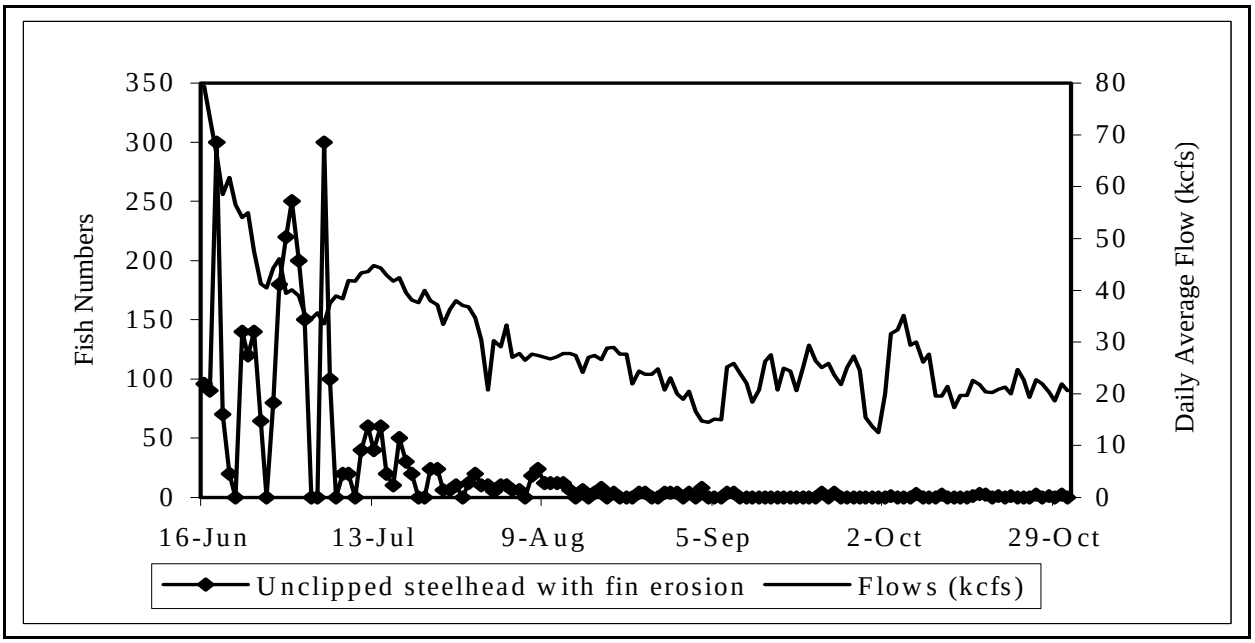


Figure 18. Daily collection of unclipped steelhead with fin erosion (typical of hatchery rearing) and river flow at Lower Granite from June 16 through Oct. 31, 2000.

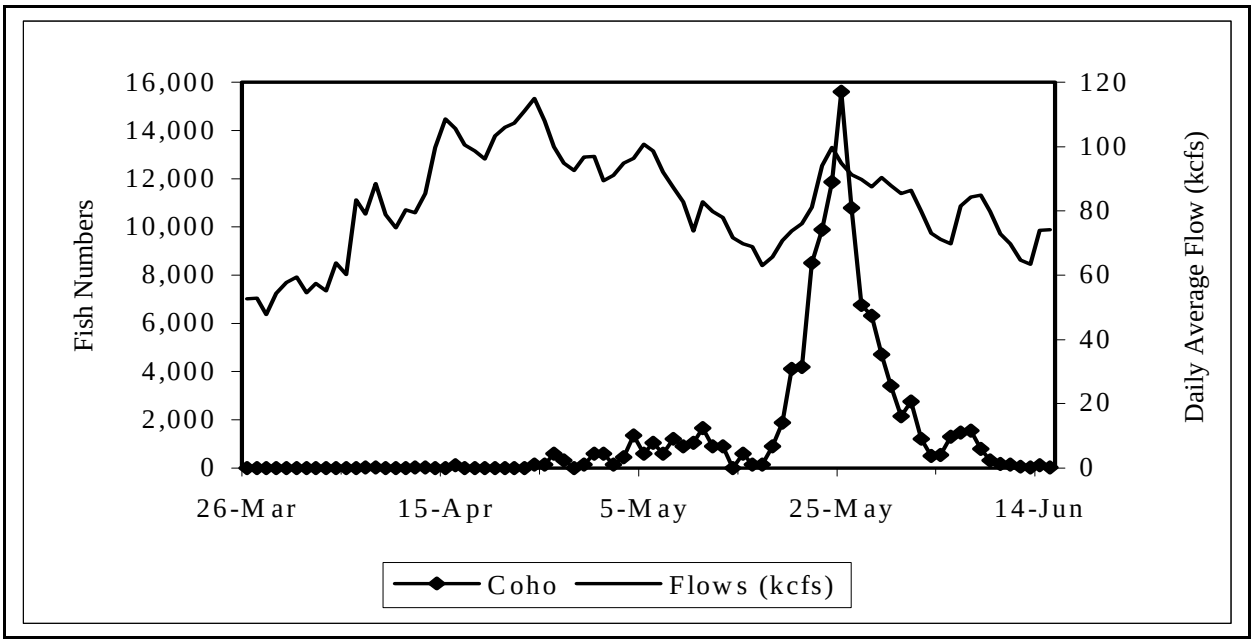


Figure 19. Daily coho collection and river flow at Lower Granite Dam from March 26 through June 15, 2000.

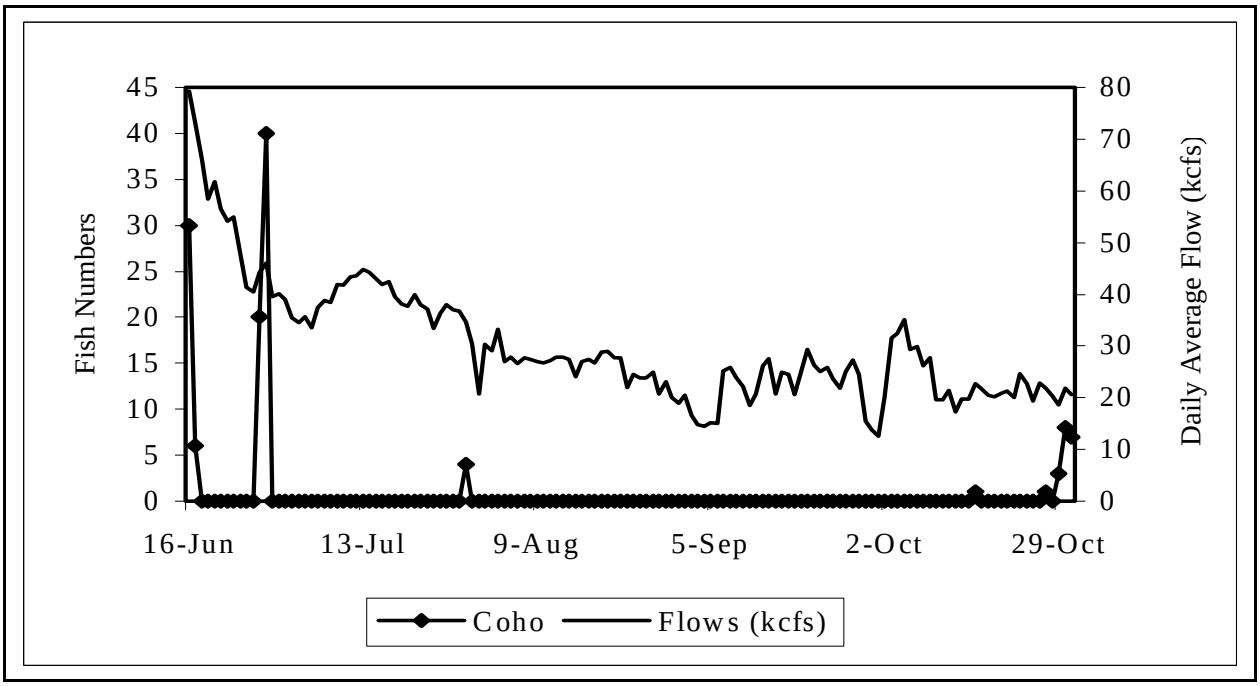


Figure 20. Daily coho collection and river flow at Lower Granite Dam from June 16 through Oct. 31, 2000.

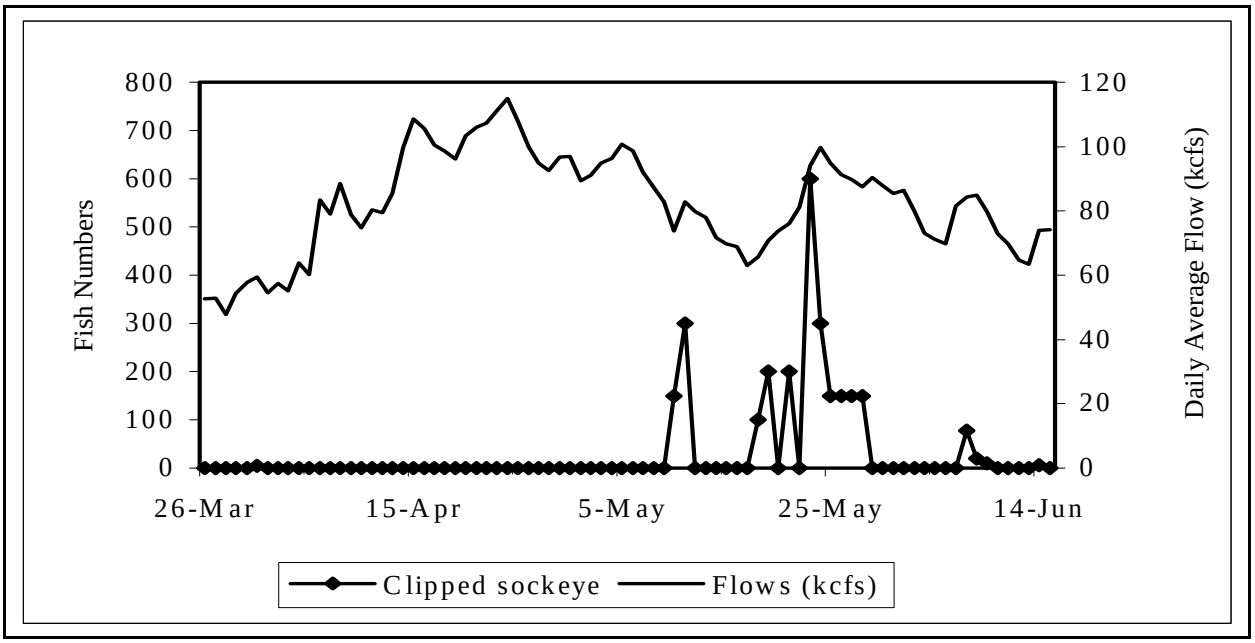


Figure 21. Daily clipped sockeye collection and river flow at Lower Granite Dam from March 26 through June 15, 2000.

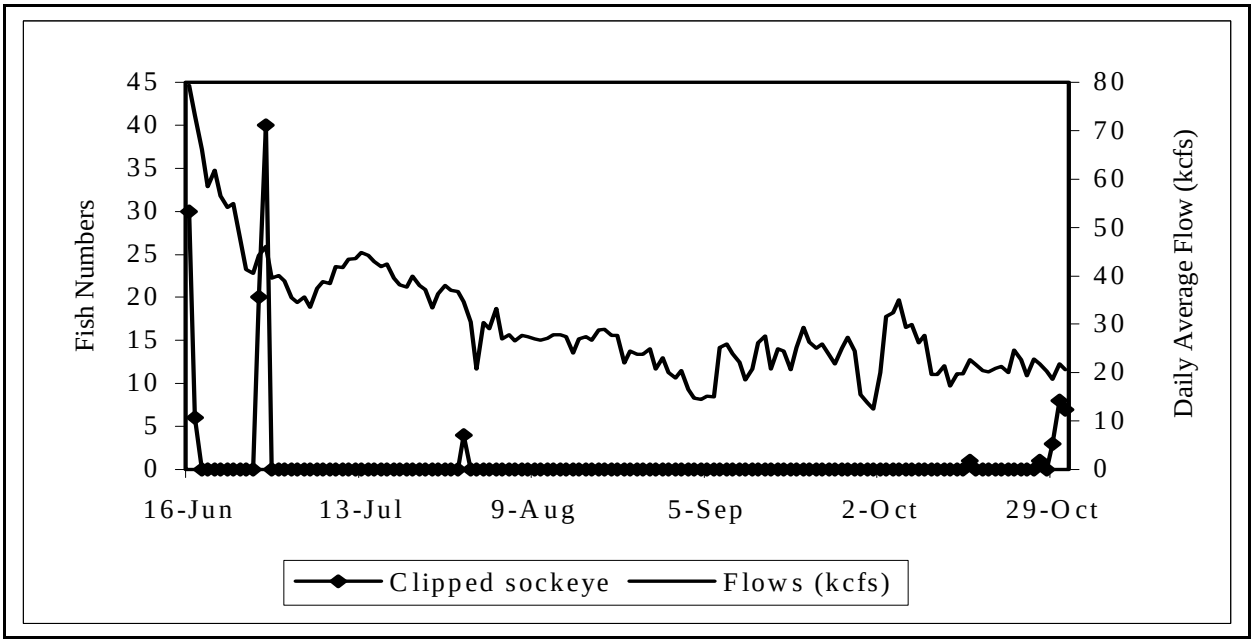


Figure 22. Daily clipped sockeye collection and river flow at Lower Granite Dam from June 16 through Oct. 31, 2000.

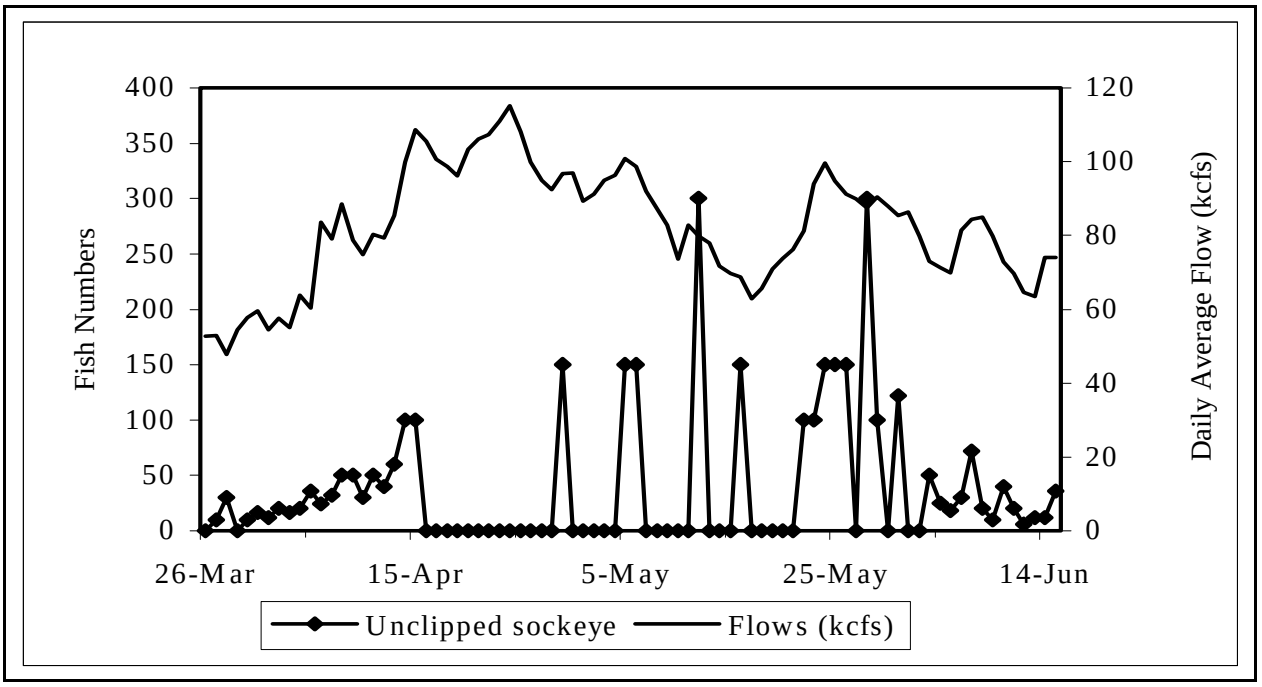


Figure 23. Daily clipped sockeye collection and river flow at Lower Granite Dam from March 26 through June 15, 2000.

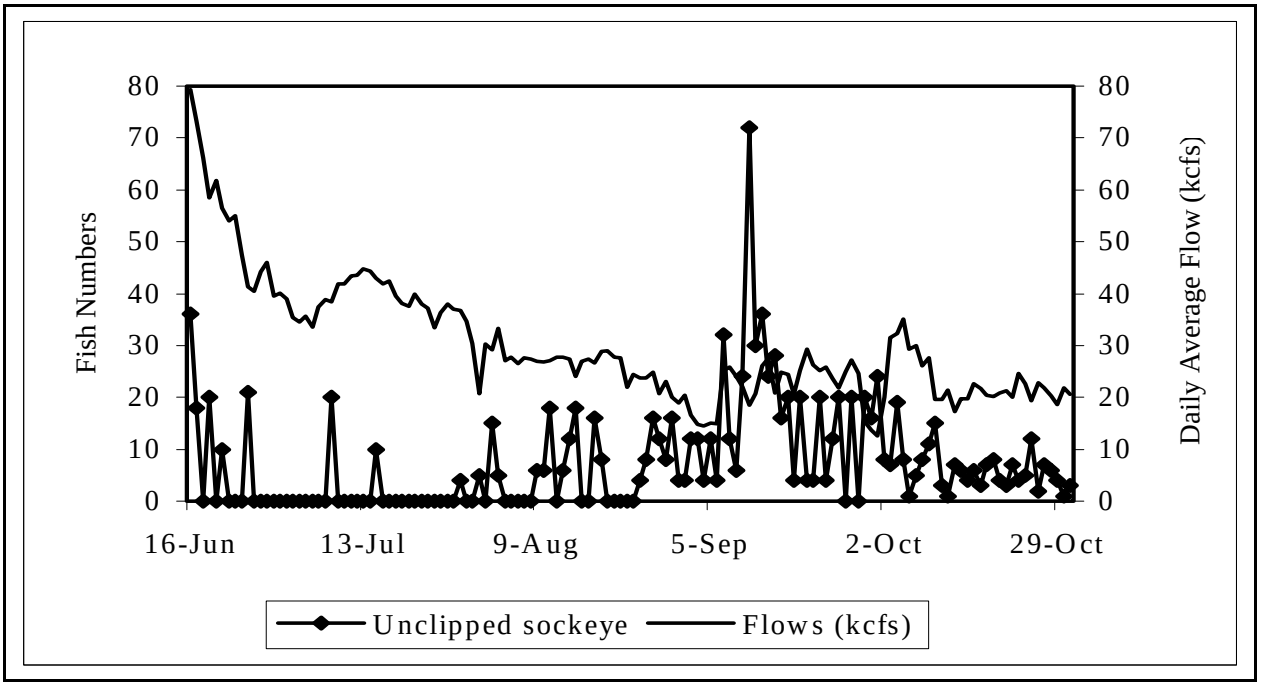


Figure 24. Daily unclipped sockeye collection and river flow at Lower Granite Dam from June 16 through Oct. 31, 2000.

Appendices

Appendix 2. Collection Tables

Note: appendices tables are best viewed in landscape mode

Table 1. Daily Smolt Collection Counts, River Flows and Temperature at Lower Granite Dam, 2000

	Daily Number of Fish Collected											River Conditions		
	Yearling Chinook		Subyr Chinook		Steelhead		Sockeye/Kokanee		Coho	Daily	Cumulative	River	Spill	Temp.
Date	Hatchery	Wild	Hatchery	Unk.	Hatchery	Wild	Hatch	Wild	Unk	Total	Total	(kcfs)	(kcfs)	(F)
26-Mar	0	20	0	0	40	10	0	0	0	70	70	52.70	0.00	45.1
27-Mar	120	130	0	0	0	100	0	10	0	360	430	52.80	0.00	45.9
28-Mar	190	60	0	0	30	200	0	30	0	510	940	47.70	0.00	45.5
29-Mar	180	120	0	30	30	160	0	0	0	520	1,460	54.35	0.00	45.5
30-Mar	140	60	0	10	20	180	0	10	0	420	1,880	57.73	0.00	47.3
31-Mar	368	204	0	0	20	424	4	16	0	1,036	2,916	59.45	2.68	47.3
1-Apr	388	200	0	0	48	564	0	12	0	1,212	4,128	54.42	0.00	47.5
2-Apr	310	130	0	0	60	470	0	20	0	990	5,118	57.49	0.00	47.3
3-Apr	384	148	0	0	348	800	0	16	0	1,696	6,814	55.07	0.00	46.9
4-Apr	503	277	0	0	884	1,369	0	20	0	3,053	9,867	63.75	0.76	47.8
5-Apr	428	188	0	4	1,056	708	0	36	12	2,432	12,299	60.28	1.64	48.9
6-Apr	936	732	0	76	3,236	1,852	0	24	4	6,860	19,159	83.53	3.33	48.9
7-Apr	1,280	1,204	0	0	5,352	3,064	0	32	20	10,952	30,111	79.04	0.28	48.7
8-Apr	860	1,200	0	130	4,100	2,280	0	50	20	8,640	38,751	88.42	30.17	47.8
9-Apr	340	490	0	160	1,850	2,210	0	50	0	5,100	43,851	78.70	27.73	47.1
10-Apr	300	340	0	0	2,790	2,350	0	30	10	5,820	49,671	74.83	28.60	48.2
11-Apr	1,619	1,458	0	0	5,676	5,136	0	50	0	13,939	63,610	80.35	20.18	48.9
12-Apr	2,480	3,760	0	0	4,480	3,080	0	40	40	13,880	77,490	79.36	19.73	49.8
13-Apr	4,200	6,280	0	0	7,760	3,200	0	60	20	21,520	99,010	85.37	20.95	50.4
14-Apr	9,900	13,300	0	0	15,400	4,950	0	100	0	43,650	142,660	99.81	23.88	50.2
15-Apr	17,800	18,100	0	50	21,750	8,200	0	100	0	66,000	208,660	108.58	25.46	50.2
16-Apr	23,200	10,800	0	100	16,800	11,700	0	0	100	62,700	271,360	105.60	28.94	49.8
17-Apr	32,900	13,000	0	600	20,300	13,100	0	0	0	79,900	351,260	100.60	24.38	49.1
18-Apr	15,808	3,175	0	0	23,005	10,829	0	0	0	52,817	404,077	98.62	24.09	48.4
19-Apr	15,600	4,200	0	0	28,300	14,200	0	0	0	62,300	466,377	96.09	23.18	48.9
20-Apr	12,900	5,800	0	100	21,600	9,900	0	0	0	50,300	516,677	103.38	24.34	50.0
21-Apr	28,800	11,300	0	700	21,100	9,200	0	0	0	71,100	587,777	106.14	26.07	51.1
22-Apr	45,200	18,000	0	0	63,200	11,900	0	0	0	138,300	726,077	107.24	26.13	51.1
23-Apr	48,364	14,336	0	0	171,882	21,431	0	0	0	256,013	982,090	111.05	36.45	50.9
24-Apr	40,800	7,950	0	0	124,950	7,200	0	0	150	181,050	1,163,140	115.03	45.58	50.9
25-Apr	39,378	6,172	0	0	152,482	15,168	0	0	150	213,350	1,376,490	107.97	25.39	49.8
26-Apr	92,400	15,900	0	150	133,800	14,850	0	0	600	257,700	1,634,190	99.85	23.51	49.5
27-Apr	36,600	7,800	0	0	48,450	9,900	0	0	300	103,050	1,737,240	94.87	23.64	50.4
28-Apr	36,450	6,000	0	150	54,000	7,350	0	0	0	103,950	1,841,190	92.48	22.40	50.4
29-Apr	75,600	12,000	0	150	103,200	14,100	0	150	150	205,350	2,046,540	96.78	24.28	51.6
30-Apr	81,600	12,300	0	0	71,250	6,600	0	0	600	172,350	2,218,890	96.95	23.68	52.5
1-May	88,650	8,550	0	0	78,000	5,100	0	0	600	180,900	2,399,790	89.28	21.72	52.2
2-May	119,624	13,226	0	150	117,832	12,168	0	0	150	263,150	2,662,940	91.16	22.76	52.2
3-May	95,850	11,400	0	150	177,600	16,350	0	0	450	301,800	2,964,740	94.90	22.57	52.7
4-May	113,400	10,800	0	150	129,150	9,750	0	0	1,350	264,600	3,229,340	96.28	23.56	53.2
5-May	171,300	15,750	0	0	188,400	23,100	0	150	600	399,300	3,628,640	100.80	24.32	52.5
6-May	106,050	12,150	0	0	330,900	40,950	0	150	1,050	491,250	4,119,890	98.57	23.69	51.6
7-May	86,850	9,000	0	0	343,350	49,350	0	0	600	489,150	4,609,040	92.03	22.20	50.9
8-May	94,050	11,550	0	300	263,100	33,900	0	0	1,200	404,100	5,013,140	87.16	21.89	51.4
9-May	80,029	9,171	0	0	155,624	22,526	0	0	900	268,250	5,281,390	82.90	21.10	51.1
10-May	85,350	9,300	0	0	138,300	20,550	150	0	1,050	254,700	5,536,090	73.66	18.61	52.2
11-May	51,750	7,800	0	0	111,600	18,900	300	0	1,650	192,000	5,728,090	82.88	20.62	52.2

12-May	43,800	6,300	0	150	108,750	20,100	0	300	900	180,300	5,908,390	79.96	19.89	52.2
13-May	36600	7050	0	0	64500	19350	0	0	900	128,400	6,036,790	77.92	20.30	52.2

Table 1. Daily Smolt Collection Counts, River Flows and Temperature at Lower Granite Dam, 2000

	Daily Number of Fish Collected											River Conditions		
	Yearling Chinook		Sub-yr Chinook		Steelhead		Sockeye/Kokanee		Coho	Daily	Cumulative	River	Spill	Temp.
Date	Hatchery	Wild	Hatchery	Unk.	Hatchery	Wild	Hatch	Wild	Unk	Total	Total	(kcfs)	(kcfs)	(F)
14-May	19,200	2,250	0	0	26,100	10,200	0	0	150	57,900	6,094,690	71.58	17.98	51.8
15-May	26,800	4,700	0	0	55,500	17,700	0	0	600	105,300	6,199,990	69.71	17.75	52.7
16-May	11,934	2,266	0	0	45,527	13,523	0	150	150	73,550	6,273,540	68.77	17.60	53.2
17-May	9,150	1,800	0	0	28,350	9,750	0	0	150	49,200	6,322,740	62.86	17.05	54.5
18-May	10,400	1,400	0	0	27,600	10,400	100	0	900	50,800	6,373,540	65.62	17.36	54.9
19-May	11,300	2,700	0	0	46,500	19,700	200	0	1,900	82,300	6,455,840	70.88	17.58	56.3
20-May	13,100	2,900	0	0	61,200	25,600	0	0	4,100	106,900	6,562,740	73.73	18.66	57.7
21-May	9,300	2,000	0	0	56,900	15,800	200	0	4,200	88,400	6,651,140	76.13	19.69	56.7
22-May	6,500	2,200	0	0	41,700	11,900	0	100	8,500	70,900	6,722,040	81.15	19.88	57.0
23-May	9,663	3,837	0	0	70,866	20,234	600	100	9,900	115,200	6,837,240	93.95	23.55	56.3
24-May	13,800	6,150	0	0	139,500	27,900	300	150	11,850	199,650	7,036,890	99.73	23.61	56.7
25-May	6,750	5,700	0	0	76,350	13,350	150	150	15,600	118,050	7,154,940	94.79	22.73	56.8
26-May	4,650	7,050	0	0	57,900	9,000	150	150	10,800	89,700	7,244,640	91.30	21.60	55.9
27-May	4,350	6,450	0	150	43,050	7,650	150	0	6,750	68,550	7,313,190	89.78	21.68	55.4
28-May	2,250	3,900	0	300	36,600	6,900	150	300	6,300	56,700	7,369,890	87.56	20.65	55.2
29-May	1,900	3,300	0	0	30,800	6,600	0	100	4,700	47,400	7,417,290	90.38	28.50	55.4
30-May	534	2,566	0	100	14,182	4,118	0	0	3,400	24,900	7,442,190	87.81	29.05	55.0
31-May	732	1,525	0	61	8,233	1,769	0	122	2,135	14,577	7,456,767	85.30	30.13	54.9
1-Jun	574	3,729	0	516	4,475	1,549	0	0	2,754	13,597	7,470,364	86.38	32.03	54.9
2-Jun	250	2,600	0	400	2,950	1,400	0	0	1,200	8,800	7,479,164	79.86	31.92	54.9
3-Jun	300	1,650	0	350	2,350	950	0	50	500	6,150	7,485,314	73.00	32.42	53.8
4-Jun	0	650	0	725	2,675	975	0	25	525	5,575	7,490,889	71.16	32.28	56.3
5-Jun	288	1,488	0	630	1,638	534	0	18	1,290	5,886	7,496,775	69.80	29.60	56.8
6-Jun	258	2,276	0	342	2,701	597	0	30	1,476	7,680	7,504,455	81.46	31.07	58.1
7-Jun	354	6,894	0	2,754	4,674	954	78	72	1,542	17,322	7,521,777	84.32	31.72	58.8
8-Jun	260	2,010	0	7,210	4,660	860	20	20	800	15,840	7,537,617	84.89	31.95	60.4
9-Jun	40	3,260	0	6,470	3,280	380	10	10	300	13,750	7,551,367	79.90	31.81	60.3
10-Jun	0	1,580	0	6,060	2,360	420	0	40	180	10,640	7,562,007	72.83	32.33	61.0
11-Jun	20	1,220	0	5,420	1,320	300	0	20	140	8,440	7,570,447	69.77	33.62	59.7
12-Jun	0	858	0	3,006	948	186	0	6	48	5,052	7,575,499	64.67	32.61	58.8
13-Jun	6	348	0	1,590	305	35	0	12	36	2,332	7,577,831	63.48	30.41	57.7
14-Jun	72	1,506	0	5,910	1,374	180	6	12	120	9,180	7,587,011	74.02	30.15	58.3
15-Jun	108	1,536	0	3,876	378	84	0	36	30	6,048	7,593,059	74.08	30.72	57.7
16-Jun	120	684	0	5,454	834	192	30	36	180	7,530	7,600,589	79.32	30.55	58.3
17-Jun	132	1,392	0	11,256	966	186	6	18	60	14,016	7,614,605	73.17	28.90	59.5
18-Jun	60	1,160	0	12,880	1,400	400	0	0	340	16,240	7,630,845	66.12	30.08	60.1
19-Jun	100	920	0	5,690	1,170	200	0	20	200	8,300	7,639,145	58.42	27.85	60.3
20-Jun	20	550	0	3,360	960	70	0	0	0	4,960	7,644,105	61.77	30.29	61.2
21-Jun	0	520	0	7,190	540	30	0	10	160	8,450	7,652,555	56.45	0.00	62.8
22-Jun	60	320	0	8,890	730	200	0	0	150	10,350	7,662,905	54.09	0.00	62.1
23-Jun	20	760	0	4,720	1,160	220	0	0	120	7,000	7,669,905	54.95	0.00	62.6
24-Jun	10	520	0	6,630	1,170	210	0	0	110	8,650	7,678,555	47.45	0.00	63.5
25-Jun	43	1,907	0	32,115	1,800	150	0	21	86	36,122	7,714,677	41.28	0.00	63.9
26-Jun	50	600	0	16,400	1,000	0	0	0	50	18,100	7,732,777	40.47	0.00	63.9
27-Jun	0	660	0	11,400	1,000	100	20	0	160	13,340	7,746,117	44.19	0.00	64.6
28-Jun	0	700	0	8,780	2,200	240	40	0	560	12,520	7,758,637	46.05	0.00	65.8
29-Jun	80	820	0	23,200	4,040	520	0	0	660	29,320	7,787,957	39.45	0.00	66.2
30-Jun	50	800	0	14,850	2,250	350	0	0	300	18,600	7,806,557	40.02	0.00	66.9
1-Jul	0	600	0	13,800	1,900	350	0	0	50	16,700	7,823,257	38.91	0.00	67.3

Table 1. Daily Smolt Collection Counts, River Flows and Temperature at Lower Granite Dam, 2000

	Daily Number of Fish Collected											River Conditions		
	Yearling Chinook		Sub-yr Chinook		Steelhead		Sockeye/Kokanee		Coho	Daily	Cumulative	River	Spill	Temp.
Date	Hatchery	Wild	Hatchery	Unk.	Hatchery	Wild	Hatch	Wild	Unk	Total	Total	(kcfs)	(kcfs)	(F)
2-Jul	0	600	0	41,050	600	150	0	0	200	42,600	7,865,857	35.44	0.00	66.7
3-Jul	0	1,500	0	71,900	2,200	0	0	0	200	75,800	7,941,657	34.48	0.00	67.5
4-Jul	0	500	0	16,800	900	0	0	0	0	18,200	7,959,857	35.59	0.00	67.5
5-Jul	50	550	0	35,650	2,000	350	0	0	100	38,700	7,998,557	33.58	0.00	66.7
6-Jul	0	250	0	11,500	950	150	0	0	50	12,900	8,011,457	37.39	0.00	66.2
7-Jul	0	300	0	10,400	750	0	0	0	100	11,550	8,023,007	38.85	0.00	66.2
8-Jul	0	180	0	10,420	760	40	0	20	120	11,540	8,034,547	38.36	0.00	66.2
9-Jul	0	60	0	12,200	660	20	0	0	140	13,080	8,047,627	41.89	0.00	66.4
10-Jul	20	20	0	7,800	640	60	0	0	60	8,600	8,056,227	41.80	0.00	64.6
11-Jul	40	40	0	15,960	260	80	0	0	100	16,480	8,072,707	43.38	0.00	65.5
12-Jul	0	160	0	14,060	340	80	0	0	0	14,640	8,087,347	43.53	0.00	66.6
13-Jul	0	0	0	7,280	360	40	0	0	40	7,720	8,095,067	44.79	0.00	66.0
14-Jul	0	100	0	5,220	440	80	0	0	80	5,920	8,100,987	44.30	0.00	64.8
15-Jul	10	190	0	7,790	480	50	0	10	120	8,650	8,109,637	42.95	0.00	65.8
16-Jul	10	270	0	8,040	480	10	0	0	50	8,860	8,118,497	41.81	0.00	66.2
17-Jul	0	190	0	8,070	640	50	0	0	140	9,090	8,127,587	42.47	0.00	67.1
18-Jul	0	130	0	5,020	470	50	0	0	60	5,730	8,133,317	39.48	0.00	66.4
19-Jul	0	150	0	3,960	250	40	0	0	80	4,480	8,137,797	38.07	0.00	67.1
20-Jul	0	10	0	3,570	230	0	0	0	30	3,840	8,141,637	37.65	0.00	66.4
21-Jul	0	80	0	2,900	190	0	0	0	50	3,220	8,144,857	39.93	0.00	67.1
22-Jul	18	78	0	4,800	726	48	0	0	30	5,700	8,150,557	37.93	0.00	68.7
23-Jul	12	42	0	2,970	666	54	0	0	48	3,792	8,154,349	37.13	0.00	67.8
24-Jul	0	18	0	1,884	150	12	0	0	18	2,082	8,156,431	33.43	0.00	67.8
25-Jul	0	12	0	1,920	66	18	0	0	0	2,016	8,158,447	36.27	0.00	68.5
26-Jul	0	40	0	1,935	100	15	0	0	20	2,110	8,160,557	37.96	0.00	67.5
27-Jul	0	70	0	1,420	30	0	0	0	0	1,520	8,162,077	37.04	0.00	67.5
28-Jul	0	56	0	2,204	124	20	0	4	4	2,412	8,164,489	36.79	0.00	67.3
29-Jul	4	28	0	3,292	224	20	4	0	56	3,628	8,168,117	34.68	0.00	68.5
30-Jul	0	10	0	2,470	230	15	0	0	20	2,745	8,170,862	30.46	0.00	68.0
31-Jul	0	5	0	2,055	110	15	0	5	25	2,215	8,173,077	20.79	0.00	67.5
1-Aug	0	20	0	2,805	120	15	0	0	5	2,965	8,176,042	30.30	0.00	66.9
2-Aug	0	25	0	2,495	110	15	0	15	5	2,665	8,178,707	29.12	0.00	67.3
3-Aug	0	85	0	3,285	125	10	0	5	0	3,510	8,182,217	33.25	0.00	68.5
4-Aug	0	54	0	4,326	336	18	0	0	0	4,734	8,186,951	27.03	0.01	68.4
5-Aug	0	66	0	2,898	138	18	0	0	24	3,144	8,190,095	27.78	0.00	67.6
6-Aug	0	30	0	3,120	204	0	0	0	12	3,366	8,193,461	26.53	0.00	68.0
7-Aug	0	42	0	4,038	264	30	0	0	18	4,392	8,197,853	27.63	0.00	67.6
8-Aug	0	24	0	2,544	216	36	0	0	6	2,826	8,200,679	27.42	0.00	68.0
9-Aug	0	6	0	2,538	138	18	0	6	6	2,712	8,203,391	26.98	0.00	68.9
10-Aug	0	24	0	2,364	198	24	0	6	0	2,616	8,206,007	26.77	0.00	69.1
11-Aug	0	6	0	2,328	120	30	0	18	30	2,532	8,208,539	27.11	0.00	67.5
12-Aug	0	12	0	2,316	120	24	0	0	12	2,484	8,211,023	27.80	0.00	66.7
13-Aug	0	6	0	2,526	84	12	0	6	24	2,658	8,213,681	27.28	0.00	68.2
14-Aug	0	12	0	2,544	78	6	0	12	12	2,664	8,216,345	27.36	0.00	66.9
15-Aug	0	12	0	1,518	96	6	0	18	12	1,662	8,218,007	27.11	0.00	66.9
16-Aug	0	4	0	1,436	48	0	0	0	8	1,496	8,219,503	27.00	0.00	66.6
17-Aug	0	12	0	1,284	24	12	0	0	12	1,344	8,220,847	27.38	0.00	66.9
18-Aug	0	16	0	1,196	32	16	0	16	4	1,280	8,222,127	26.68	0.00	66.0
19-Aug	0	12	0	872	12	0	0	8	4	908	8,223,035	28.83	0.00	65.1

Table 1. Daily Smolt Collection Counts, River Flows and Temperature at Lower Granite Dam, 2000

	Daily Number of Fish Collected											River Conditions		
	Yearling Chinook		Subyr Chinook		Steelhead		Sockeye/Kokanee		Coho	Daily	Cumulative	River	Spill	Temp.
Date	Hatchery	Wild	Hatchery	Unk.	Hatchery	Wild	Hatch	Wild	Unk	Total	Total	(kcfs)	(kcfs)	(F)
20-Aug	0	12	0	1,052	28	8	0	0	0	1,100	8,224,135	28.98	0.00	65.1
21-Aug	0	0	0	1,452	8	8	0	0	0	1,468	8,225,603	27.72	0.00	64.9
22-Aug	4	4	0	1,172	20	4	0	0	12	1,216	8,226,819	27.70	0.00	65.3
23-Aug	0	0	0	960	24	4	0	0	0	988	8,227,807	21.98	0.00	64.9
24-Aug	0	0	0	1,040	24	4	0	0	0	1,068	8,228,875	24.45	0.00	65.3
25-Aug	0	0	0	1,116	44	16	0	4	0	1,180	8,230,055	23.80	0.00	65.1
26-Aug	0	0	0	1,312	20	0	0	8	4	1,344	8,231,399	23.81	0.00	64.4
27-Aug	0	0	0	2,608	12	0	0	16	0	2,636	8,234,035	24.85	0.00	63.5
28-Aug	0	0	0	2,200	0	4	0	12	0	2,216	8,236,251	20.72	0.00	63.5
29-Aug	0	0	0	2,108	0	8	0	8	4	2,128	8,238,379	23.08	0.00	64.4
30-Aug	0	0	0	2,008	12	4	0	16	0	2,040	8,240,419	20.00	0.00	64.8
31-Aug	0	0	0	2,484	4	0	0	4	8	2,500	8,242,919	18.98	0.00	64.8
1-Sep	0	8	0	2,356	4	8	0	4	0	2,380	8,245,299	20.45	0.00	64.4
2-Sep	0	0	0	1,940	12	0	0	12	4	1,968	8,247,267	16.61	0.00	64.9
3-Sep	4	4	0	2,164	4	8	0	12	4	2,200	8,249,467	14.77	0.00	65.3
4-Sep	0	0	0	2,580	16	0	0	4	8	2,608	8,252,075	14.49	0.00	65.5
5-Sep	0	4	0	1,956	24	12	0	12	12	2,020	8,254,095	15.10	0.00	65.3
6-Sep	0	0	0	1,584	12	0	0	4	0	1,600	8,255,695	14.99	0.00	65.7
7-Sep	0	0	0	3,440	24	8	0	32	8	3,512	8,259,207	25.15	0.00	66.0
8-Sep	0	8	0	4,372	92	4	0	12	16	4,504	8,263,711	25.82	0.00	66.2
9-Sep	0	12	0	1,974	60	18	0	6	0	2,070	8,265,781	23.98	0.00	65.7
10-Sep	0	12	0	978	30	18	0	24	6	1,068	8,266,849	22.09	0.00	64.8
11-Sep	0	0	0	1,032	0	0	0	72	0	1,104	8,267,953	18.45	0.00	64.8
12-Sep	0	12	0	1,416	6	6	0	30	0	1,470	8,269,423	20.78	0.00	64.9
13-Sep	0	0	0	1,560	16	8	0	36	0	1,620	8,271,043	26.18	0.00	65.3
14-Sep	0	0	0	1,188	12	8	0	24	0	1,232	8,272,275	27.52	0.00	66.2
15-Sep	0	0	0	684	32	4	0	28	8	756	8,273,031	20.80	0.00	65.5
16-Sep	0	0	0	504	8	0	0	16	4	532	8,273,563	24.89	0.00	65.7
17-Sep	0	0	0	396	16	8	0	20	4	444	8,274,007	24.89	0.00	65.8
18-Sep	0	4	0	500	4	0	0	4	0	512	8,274,519	20.60	0.00	66.2
19-Sep	0	8	0	1,124	8	0	0	20	0	1,160	8,275,679	25.14	0.00	66.7
20-Sep	0	4	0	1,412	12	0	0	4	8	1,440	8,277,119	29.32	0.00	67.6
21-Sep	0	4	0	1,084	8	0	0	4	0	1,100	8,278,219	26.30	0.00	68.0
22-Sep	0	8	0	1,048	20	12	0	20	0	1,108	8,279,327	25.08	0.00	67.1
23-Sep	0	0	0	1,028	20	4	0	4	0	1,056	8,280,383	25.90	0.00	66.9
24-Sep	0	4	0	488	4	8	0	12	0	516	8,280,899	23.68	0.00	67.3
25-Sep	0	12	0	340	12	0	0	20	0	384	8,281,283	21.80	0.00	67.1
26-Sep	0	0	0	488	4	4	0	0	0	496	8,281,779	25.05	0.00	67.5
27-Sep	0	0	0	488	8	0	0	20	0	516	8,282,295	27.22	0.00	66.2
28-Sep	0	0	0	676	0	4	0	0	4	684	8,282,979	24.53	0.00	65.5
29-Sep	0	0	0	752	4	0	0	20	0	776	8,283,755	15.38	0.00	63.5
30-Sep	0	0	0	276	0	0	0	16	4	296	8,284,051	13.71	0.00	63.3
1-Oct	0	0	0	260	4	0	0	24	0	288	8,284,339	12.56	0.00	63.0
2-Oct	0	0	0	288	0	0	0	8	4	300	8,284,639	20.02	0.00	62.8
3-Oct	0	1	0	305	5	1	0	7	1	320	8,284,959	31.55	0.00	63.9
4-Oct	0	1	0	489	6	0	0	19	1	516	8,285,475	32.35	0.00	62.8
5-Oct	0	1	0	534	8	5	0	8	1	557	8,286,032	35.07	0.00	61.9
6-Oct	0	2	0	555	12	3	0	1	1	574	8,286,606	29.30	0.00	60.8
7-Oct	0	0	0	824	12	3	0	5	0	844	8,287,450	29.98	0.00	60.8

Table 1. Daily Smolt Collection Counts, River Flows and Temperature at Lower Granite Dam, 2000

	Daily Number of Fish Collected											River Conditions		
	Yearling Chinook		Subyr Chinook		Steelhead		Sockeye/Kokanee		Coho	Daily	Cumulative	River	Spill	Temp.
Date	Hatchery	Wild	Hatchery	Unk.	Hatchery	Wild	Hatch	Wild	Unk	Total	Total	(kcfs)	(kcfs)	(F)
8-Oct	0	1	0	641	1	0	0	8	2	653	8,288,103	26.12	0.00	59.9
9-Oct	0	0	0	726	8	0	0	11	0	745	8,288,848	27.7	0.00	59.2
10-Oct	0	0	0	691	8	4	0	15	1	719	8,289,567	19.6	0.00	58.8
11-Oct	0	0	0	250	5	2	0	3	3	263	8,289,830	10.9	1.80	59.9
12-Oct	0	0	0	105	2	2	0	1	1	111	8,289,941	21.4	0.00	58.8
13-Oct	0	0	0	107	10	0	0	7	1	125	8,290,066	17.3	0.00	58.8
14-Oct	0	0	0	90	10	2	0	6	2	110	8,290,176	19.7	0.00	59.2
15-Oct	1	0	0	157	10	5	0	4	0	177	8,290,353	19.7	0.00	58.8
16-Oct	0	0	0	325	6	3	1	6	1	342	8,290,695	22.64	0.00	59.0
17-Oct	1	0	0	435	10	6	0	3	1	456	8,291,151	21.73	0.00	58.8
18-Oct	1	0	0	432	10	6	0	7	2	458	8,291,609	20.39	0.00	58.6
19-Oct	2	1	0	343	4	0	0	8	5	363	8,291,972	20.20	0.00	58.1
20-Oct	3	0	0	379	11	2	0	4	1	400	8,292,372	20.91	0.00	57.9
21-Oct	0	0	0	428	1	1	0	3	2	435	8,292,807	21.29	0.00	57.6
22-Oct	13	0	0	672	6	3	0	7	3	704	8,293,511	20.00	0.00	57.0
23-Oct	11	0	0	611	7	0	0	4	2	635	8,294,146	24.64	0.00	55.9
24-Oct	18	0	0	683	8	2	0	5	2	718	8,294,864	22.70	0.00	55.6
25-Oct	12	0	0	586	4	2	0	12	2	618	8,295,482	19.31	0.00	55.0
26-Oct	16	0	0	825	16	5	0	2	1	865	8,296,347	22.75	0.00	54.7
27-Oct	19	0	0	665	9	2	1	7	3	706	8,297,053	21.89	0.00	55.0
28-Oct	4	2	0	986	10	2	0	6	2	1,012	8,298,065	20.36	0.00	55.0
29-Oct	9	0	0	1,072	17	5	3	4	1	1,111	8,299,176	18.60	0.00	54.9
30-Oct	12	1	0	534	19	5	8	1	4	584	8,299,760	21.86	0.00	54.1
31-Oct	34	5	0	697	17	11	7	3	12	786	8,300,546	20.65	0.00	53.8
Total	2,007,545	442,635	0	681,803	4,281,834	757,786	2,688	4,152	122,103	8,300,546				

Table 2. Daily Bypass and Transportation at Lower Granite Dam, 2000

	Daily Number of Fish Bypassed										Daily Transportation Numbers									
	Yearling Chin.		Subyr Chin.		Steelhead		Sockeye/Kok		Coho	Daily	Yearling Chin.		Subyr Chin.		Steelhead		Sockeye/Kok		Coho	Daily
Date	Hatch	Wild	Hatch	Unk.	Hatch	Wild	Hatch	Wild	Unk	Total	Hatch	Wild	Hatch	Unk.	Hatch	Wild	Hatch	Wild	Unk	Total
26-Mar	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27-Mar	0	0	0	0	0	0	0	0	0	0	120	144	0	0	32	106	0	10	0	412
28-Mar	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29-Mar	0	0	0	0	0	0	0	0	0	0	357	165	0	28	48	353	0	27	0	978
30-Mar	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31-Mar	0	0	0	0	0	15	0	0	0	15	506	261	0	10	40	582	4	26	0	1,429
1-Apr	2	0	0	0	0	86	0	0	0	88	0	0	0	0	0	0	0	0	0	0
2-Apr	0	2	0	0	0	125	0	0	0	127	676	323	0	0	108	819	0	30	0	1,956
3-Apr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4-Apr	0	1	0	0	75	189	0	0	0	265	883	414	0	0	1,156	1,977	0	34	0	4,464
5-Apr	22	10	0	0	211	361	0	2	0	606	0	0	0	0	0	0	0	0	0	0
6-Apr	0	5	0	0	117	143	0	0	0	265	1,335	900	0	79	3,963	2,054	0	56	16	8,403
7-Apr	0	17	0	0	116	416	0	0	0	549	0	0	0	0	0	0	0	0	0	0
8-Apr	0	49	0	0	232	717	0	0	0	998	2,106	2,292	0	123	9,099	4,205	0	79	40	17,944
9-Apr	0	30	0	0	0	297	0	0	0	327	0	0	0	0	0	0	0	0	0	0
10-Apr	1	28	0	0	0	378	0	0	0	407	634	769	0	160	4,636	3,883	0	79	10	10,171
11-Apr	0	51	0	0	220	1,180	0	0	0	1,451	0	0	0	0	0	0	0	0	0	0
12-Apr	4	127	0	0	140	939	0	0	0	1,210	4,089	5,032	0	0	9,795	6,094	0	90	40	25,140
13-Apr	24	769	0	0	152	1,691	0	0	0	2,636	0	0	0	0	0	0	0	0	0	0
14-Apr	0	696	0	0	281	926	0	0	0	1,903	14,043	18,055	0	0	22,726	5,532	0	160	20	60,536
15-Apr	80	2,305	0	0	322	1,996	0	0	0	4,703	0	0	0	0	0	0	0	0	0	0
16-Apr	9	3,973	0	0	0	2,359	0	0	0	6,341	40,837	22,558	0	149	38,228	15,544	0	100	100	117,516
17-Apr	109	3,270	0	0	57	3,518	0	0	0	6,954	0	0	0	0	0	0	0	0	0	0
18-Apr	54	1,795	0	0	376	4,552	0	0	0	6,777	48,491	11,100	0	600	42,871	15,857	0	0	0	118,919
19-Apr	52	1,132	0	0	378	4,150	0	0	0	5,712	0	0	0	0	0	0	0	0	0	0
20-Apr	1	556	0	0	350	2,025	0	0	0	2,932	28,410	8,308	0	100	49,161	17,924	0	0	0	103,903
21-Apr	2	1,363	0	0	351	4,391	0	0	0	6,107	28,773	9,930	0	700	20,687	4,807	0	0	0	64,897
22-Apr	2	2,087	0	0	351	3,641	0	0	0	6,081	45,152	15,901	0	0	62,833	8,255	0	0	0	132,141
23-Apr	2	2,280	0	0	0	2,645	0	0	0	4,927	48,261	12,029	0	0	171,871	18,786	0	0	0	250,947
24-Apr	80	0	0	0	142	24	0	0	0	246	40,640	7,931	0	0	124,805	7,176	0	0	150	180,702
25-Apr	0	1,275	0	0	770	1,186	0	0	0	3,231	39,291	4,886	0	0	151,708	13,981	0	0	150	210,016
26-Apr	110	877	0	0	953	1,581	0	0	0	3,521	92,203	15,006	0	148	132,846	13,268	0	0	600	254,071
27-Apr	2	2,317	0	0	771	1,634	0	0	0	4,724	36,519	5,476	0	0	47,675	8,266	0	0	300	98,236
28-Apr	1	2,179	0	0	771	3,193	0	0	0	6,144	36,362	3,814	0	149	53,226	4,156	0	0	0	97,707
29-Apr	58	1,662	0	0	802	2,781	0	0	0	5,303	75,439	10,331	0	149	102,397	11,319	0	148	150	199,933
30-Apr	30	2,418	0	0	75	2,190	0	0	0	4,713	81,490	9,865	0	0	71,166	4,410	0	0	600	167,531
1-May	29	1,261	0	0	102	1,544	0	0	0	2,936	88,540	7,283	0	0	77,895	3,556	0	0	600	177,874
2-May	2	2,321	0	0	911	1,595	0	0	0	4,829	119,500	10,897	0	147	116,911	10,573	0	0	150	258,178
3-May	89	1,111	0	0	991	2,289	0	0	0	4,480	95,658	10,282	0	149	176,598	14,061	0	0	450	297,198
4-May	30	634	0	0	960	2,012	0	0	0	3,636	113,327	10,163	0	150	128,188	7,738	0	0	1,350	260,916
5-May	30	1,227	0	0	924	2,032	0	0	0	4,213	171,154	14,520	0	0	187,473	21,068	0	150	600	394,965
6-May	35,481	1,502	0	0	60,961	4,050	0	14	264	102,272	70,432	10,640	0	0	269,938	36,900	0	136	786	388,832
7-May	13,489	2,018	0	0	53,214	9,805	0	0	93	78,619	73,214	6,968	0	0	290,131	39,545	0	0	507	410,365
8-May	3,099	1,067	0	46	8,596	2,204	0	0	40	15,052	90,923	10,479	0	252	254,503	31,696	0	0	1,160	389,013
9-May	29	869	0	0	821	1,351	0	0	0	3,070	79,957	8,296	0	0	154,797	21,173	0	0	900	265,123
10-May	59	1,064	0	0	872	662	0	0	0	2,657	85,148	8,221	0	0	137,423	19,888	150	0	1,050	251,880
11-May	33	1,580	0	0	820	827	0	0	1	3,261	51,577	6,209	0	0	110,776	18,071	300	0	1,649	188,582
12-May	30	1,762	0	0	821	650	0	0	0	3,263	43,714	4,533	0	150	107,927	19,444	0	299	900	176,967

Table 2. Daily Bypass and Transportation at Lower Granite Dam, 2000

	Daily Number of Fish Bypassed										Daily Transportation Numbers									
	Yearling Chin.		Subyr Chin.		Steelhead		Sockeye/Kok		Coho	Daily	Yearling Chin.		Subyr Chin.		Steelhead		Sockeye/Kok		Coho	Daily
Date	Hatch	Wild	Hatch	Unk.	Hatch	Wild	Hatch	Wild	Unk	Total	Hatch	Wild	Hatch	Unk.	Hatch	Wild	Hatch	Wild	Unk	Total
13-May	0	0	0	0	0	0	0	0	0	0	36,492	5,745	0	0	63,684	18,797	0	0	900	125,618
14-May	61	1,410	0	0	30	521	0	0	0	2,022	19,109	835	0	0	26,058	9,679	0	0	150	55,831
15-May	35	0	0	0	20	17	0	0	0	72	26,748	4,698	0	0	55,476	17,682	0	0	600	105,204
16-May	0	895	0	0	455	409	0	0	2	1,761	11,881	1,366	0	0	45,066	13,110	0	146	148	71,717
17-May	105	273	0	0	516	394	0	0	0	1,288	9,012	1,523	0	0	27,832	9,348	0	0	150	47,865
18-May	1	289	0	0	490	231	0	0	0	1,011	10,383	1,111	0	0	27,105	10,152	100	0	900	49,751
19-May	70	307	0	0	495	254	0	0	0	1,126	11,226	2,393	0	0	45,999	19,446	200	0	1,900	81,164
20-May	3	321	0	0	490	290	0	0	0	1,104	13,081	2,571	0	0	60,705	25,309	0	0	4,100	105,766
21-May	70	0	0	0	40	20	0	0	0	130	9,215	1,992	0	0	56,850	15,778	199	0	4,200	88,234
22-May	34	0	0	0	20	20	0	0	0	74	6,446	2,197	0	0	41,664	11,877	0	99	8,499	70,782
23-May	1	401	0	0	280	235	0	0	0	917	9,632	3,435	0	0	70,570	19,994	600	100	9,897	114,228
24-May	1	313	0	0	280	347	0	0	0	941	13,785	5,828	0	0	139,198	27,550	300	148	11,850	198,659
25-May	1	257	0	0	280	193	0	0	0	731	6,736	5,441	0	0	76,056	13,157	150	150	15,598	117,288
26-May	0	405	0	0	280	211	0	0	0	896	4,642	6,643	0	0	57,611	8,786	149	150	10,787	88,768
27-May	131	753	0	0	295	214	0	0	0	1,393	0	0	0	0	0	0	0	0	0	0
28-May	0	0	0	0	0	0	0	0	0	0	6,453	9,575	0	443	79,343	14,334	300	300	13,040	123,788
29-May	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30-May	0	0	0	0	0	0	0	0	0	0	2,426	5,838	0	100	44,959	10,717	0	98	8,097	72,235
31-May	1	718	0	0	175	105	0	0	0	999	0	0	0	0	0	0	0	0	0	0
1-Jun	1	1,151	0	0	175	86	0	0	0	1,413	1,297	3,379	0	573	12,354	3,125	0	122	4,888	25,738
2-Jun	0	1,296	0	0	175	27	0	0	0	1,498	0	0	0	0	0	0	0	0	0	0
3-Jun	0	1,462	0	0	175	41	0	0	0	1,678	549	1,481	0	750	4,948	2,282	0	50	1,699	11,759
4-Jun	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5-Jun	0	0	0	0	0	0	0	0	0	0	287	2,134	0	1,343	4,311	1,508	0	43	1,814	11,440
6-Jun	0	185	0	0	0	30	0	0	0	215	0	0	0	0	0	0	0	0	0	0
7-Jun	0	328	0	0	0	37	0	0	0	365	611	8,644	0	3,078	7,372	1,484	78	101	3,014	24,382
8-Jun	0	1,014	0	0	0	60	0	0	0	1,074	0	0	0	0	0	0	0	0	0	0
9-Jun	0	148	0	0	0	44	0	0	0	192	298	4,104	0	13,653	7,938	1,134	30	30	1,100	28,287
10-Jun	0	261	0	0	0	19	0	0	0	280	0	0	0	0	0	0	0	0	0	0
11-Jun	0	0	0	0	0	0	0	0	0	0	20	2,539	0	11,445	3,676	700	0	60	320	18,760
12-Jun	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13-Jun	0	122	0	0	0	25	0	0	0	147	6	1,084	0	4,572	1,252	196	0	18	84	7,212
14-Jun	0	56	0	0	0	4	0	0	0	60	0	0	0	0	0	0	0	0	0	0
15-Jun	0	196	0	0	0	21	0	0	0	217	179	2,784	0	9,624	1,749	238	6	48	150	14,778
16-Jun	0	179	0	0	0	7	0	0	0	186	0	0	0	0	0	0	0	0	0	0
17-Jun	0	65	0	0	0	13	0	0	0	78	252	1,824	0	16,592	1,799	357	36	54	240	21,154
18-Jun	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19-Jun	0	0	0	0	0	0	0	0	0	0	160	2,080	0	18,516	2,566	598	0	20	539	24,479
20-Jun	0	93	0	0	0	15	0	0	0	108	0	0	0	0	0	0	0	0	0	0
21-Jun	0	0	0	0	0	0	0	0	0	0	20	977	0	10,489	1,499	85	0	10	159	13,239
22-Jun	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23-Jun	0	0	0	0	0	0	0	0	0	0	80	1,079	0	13,569	1,888	417	0	0	270	17,303
24-Jun	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25-Jun	0	0	0	0	0	0	0	0	0	0	53	2,425	0	38,698	2,967	360	0	21	196	44,720
26-Jun	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27-Jun	0	0	0	0	0	0	0	0	0	0	50	1,260	0	27,735	1,998	99	20	0	209	31,371
28-Jun	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29-Jun	0	0	0	0	0	0	0	0	0	0	80	1,520	0	31,838	6,236	759	40	0	1,219	41,692

Table 2. Daily Bypass and Transportation at Lower Granite Dam, 2000

	Daily Number of Fish Bypassed										Daily Transportation Numbers									
	Yearling Chin.		Subyr Chin.		Steelhead		Sockeye/Kok		Coho	Daily	Yearling Chin.		Subyr Chin.		Steelhead		Sockeye/Kok		Coho	Daily
Date	Hatch	Wild	Hatch	Unk.	Hatch	Wild	Hatch	Wild	Unk	Total	Hatch	Wild	Hatch	Unk.	Hatch	Wild	Hatch	Wild	Unk	Total
30-Jun	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-Jul	0	0	0	0	0	0	0	0	0	0	50	1,398	0	28,523	4,135	691	0	0	350	35,147
2-Jul	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Jul	0	0	0	0	0	0	0	0	0	0	0	2,097	0	112,718	2,785	146	0	0	400	118,146
4-Jul	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5-Jul	0	0	0	0	0	0	0	0	0	0	50	1,045	0	52,169	2,882	348	0	0	100	56,594
6-Jul	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7-Jul	0	0	0	0	0	0	0	0	0	0	0	550	0	21,820	1,670	150	0	0	150	24,340
8-Jul	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9-Jul	0	0	0	0	0	0	0	0	0	0	0	240	0	22,534	1,404	60	0	20	260	24,518
10-Jul	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11-Jul	0	0	0	0	0	0	0	0	0	0	59	59	0	23,643	897	140	0	0	158	24,956
12-Jul	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13-Jul	0	0	0	0	0	0	0	0	0	0	0	159	0	21,238	697	110	0	0	40	22,244
14-Jul	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15-Jul	0	0	0	0	0	0	0	0	0	0	8	288	0	12,917	916	129	0	10	199	14,467
16-Jul	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17-Jul	0	0	0	0	0	0	0	0	0	0	10	457	0	16,021	1,118	60	0	0	189	17,855
18-Jul	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19-Jul	0	0	0	0	0	0	0	0	0	0	0	277	0	8,927	709	90	0	0	140	10,143
20-Jul	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21-Jul	0	0	0	0	0	0	0	0	0	0	0	90	0	6,441	417	0	0	0	80	7,028
22-Jul	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23-Jul	0	0	0	0	0	0	0	0	0	0	29	120	0	7,683	1,384	101	0	0	78	9,395
24-Jul	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25-Jul	0	0	0	0	0	0	0	0	0	0	0	21	0	3,742	212	30	0	0	18	4,023
26-Jul	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27-Jul	0	0	0	0	0	0	0	0	0	0	0	109	0	3,326	129	15	0	0	20	3,599
28-Jul	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29-Jul	0	0	0	0	0	0	0	0	0	0	3	82	0	5,453	345	40	4	4	60	5,991
30-Jul	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31-Jul	0	0	0	0	0	0	0	0	0	0	0	14	0	4,486	339	29	0	5	45	4,918
1-Aug	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2-Aug	0	0	0	0	0	0	0	0	0	0	0	44	0	5,259	228	30	0	15	10	5,586
3-Aug	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4-Aug	0	0	0	0	0	0	0	0	0	0	0	138	0	7,581	459	28	0	5	0	8,211
5-Aug	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6-Aug	0	0	0	0	0	0	0	0	0	0	0	96	0	5,988	341	18	0	0	36	6,479
7-Aug	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8-Aug	0	0	0	0	0	0	0	0	0	0	0	66	0	6,552	480	66	0	0	24	7,188
9-Aug	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10-Aug	0	0	0	0	0	0	0	0	0	0	0	29	0	4,856	336	42	0	11	6	5,280
11-Aug	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12-Aug	0	0	0	0	0	0	0	0	0	0	0	17	0	4,621	240	54	0	18	42	4,992
13-Aug	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14-Aug	0	0	0	0	0	0	0	0	0	0	0	18	0	5,041	162	18	0	16	36	5,291
15-Aug	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16-Aug	0	0	0	0	0	0	0	0	0	0	0	16	0	2,941	144	6	0	18	20	3,145

Table 2. Daily Bypass and Transportation at Lower Granite Dam, 2000

	Daily Number of Fish Bypassed										Daily Transportation Numbers									
	Yearling Chin.		Subyr Chin.		Steelhead		Sockeye/Kok		Coho	Daily	Yearling Chin.		Subyr Chin.		Steelhead		Sockeye/Kok		Coho	Daily
Date	Hatch	Wild	Hatch	Unk.	Hatch	Wild	Hatch	Wild	Unk	Total	Hatch	Wild	Hatch	Unk.	Hatch	Wild	Hatch	Wild	Unk	Total
17-Aug	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18-Aug	0	0	0	0	0	0	0	0	0	0	0	28	0	2,459	55	28	0	15	16	2,601
19-Aug	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20-Aug	0	0	0	0	0	0	0	0	0	0	0	24	0	1,908	39	8	0	8	4	1,991
21-Aug	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22-Aug	0	0	0	0	0	0	0	0	0	0	4	4	0	2,606	27	12	0	0	12	2,665
23-Aug	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24-Aug	0	0	0	0	0	0	0	0	0	0	0	0	0	1,986	48	8	0	0	0	2,042
25-Aug	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26-Aug	0	0	0	0	0	0	0	0	0	0	0	0	0	2,418	64	16	0	9	4	2,511
27-Aug	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28-Aug	0	0	0	0	0	0	0	0	0	0	0	0	0	4,790	12	4	0	26	0	4,832
29-Aug	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30-Aug	0	0	0	0	0	0	0	0	0	0	0	0	0	4,099	12	11	0	21	4	4,147
31-Aug	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-Sep	0	0	0	0	0	0	0	0	0	0	0	8	0	4,821	8	8	0	8	8	4,861
2-Sep	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Sep	0	0	0	0	0	0	0	0	0	0	4	4	0	4,075	15	8	0	19	8	4,133
4-Sep	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5-Sep	0	0	0	0	0	0	0	0	0	0	0	4	0	4,516	39	12	0	14	20	4,605
6-Sep	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7-Sep	0	0	0	0	0	0	0	0	0	0	0	0	0	5,001	36	8	0	36	8	5,089
8-Sep	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9-Sep	0	0	0	0	0	0	0	0	0	0	0	20	0	6,315	152	22	0	17	16	6,542
10-Sep	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11-Sep	0	0	0	0	0	0	0	0	0	0	0	12	0	1,996	29	17	0	94	6	2,154
12-Sep	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13-Sep	0	0	0	0	0	0	0	0	0	0	0	12	0	2,952	20	14	0	58	0	3,056
14-Sep	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15-Sep	0	0	0	0	0	0	0	0	0	0	0	0	0	1,859	44	12	0	48	8	1,971
16-Sep	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17-Sep	0	0	0	0	0	0	0	0	0	0	0	0	0	887	23	8	0	35	8	961
18-Sep	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19-Sep	0	0	0	0	0	0	0	0	0	0	0	11	0	1,602	12	0	0	21	0	1,646
20-Sep	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21-Sep	0	0	0	0	0	0	0	0	0	0	0	8	0	2,473	19	0	0	6	8	2,514
22-Sep	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23-Sep	0	0	0	0	0	0	0	0	0	0	0	8	0	2,058	40	16	0	22	0	2,144
24-Sep	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25-Sep	0	0	0	0	0	0	0	0	0	0	0	16	0	824	16	8	0	32	0	896
26-Sep	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27-Sep	0	0	0	0	0	0	0	0	0	0	0	0	0	969	12	4	0	19	0	1,004
28-Sep	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29-Sep	0	0	0	0	0	0	0	0	0	0	0	0	0	1,428	4	4	0	20	4	1,460
30-Sep	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-Oct	0	0	0	0	0	0	0	0	0	0	0	0	0	535	3	0	0	39	4	581
2-Oct	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Oct	0	0	0	0	5	1	0	0	0	6	0	1	0	591	0	0	0	14	5	611

Table 2. Daily Bypass and Transportation at Lower Granite Dam, 2000

	Daily Number of Fish Bypassed										Daily Transportation Numbers									
	Yearling Chin.		Subyr Chin.		Steelhead		Sockeye/Kok		Coho	Daily	Yearling Chin.		Subyr Chin.		Steelhead		Sockeye/Kok		Coho	Daily
Date	Hatch	Wild	Hatch	Unk.	Hatch	Wild	Hatch	Wild	Unk	Total	Hatch	Wild	Hatch	Unk.	Hatch	Wild	Hatch	Wild	Unk	Total
4-Oct	0	0	0	0	6	0	0	0	0	6	0	0	0	0	0	0	0	0	0	0
5-Oct	0	0	0	0	8	5	0	0	0	13	0	2	0	1,008	0	0	0	22	2	1,034
6-Oct	0	0	0	0	12	3	0	0	0	15	0	0	0	0	0	0	0	0	0	0
7-Oct	0	0	0	0	12	3	0	0	0	15	0	2	0	1,367	0	0	0	6	1	1,376
8-Oct	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
9-Oct	0	0	0	0	8	0	0	0	0	8	0	1	0	1,348	0	0	0	18	2	1,369
10-Oct	0	0	0	0	8	4	0	0	0	12	0	0	0	0	0	0	0	0	0	0
11-Oct	0	0	0	0	5	2	0	0	0	7	0	0	0	938	0	0	0	17	4	959
12-Oct	0	0	0	0	2	2	0	0	0	4	0	0	0	0	0	0	0	0	0	0
13-Oct	0	0	0	0	10	0	0	0	0	10	0	0	0	212	0	0	0	8	2	222
14-Oct	0	0	0	0	10	2	0	0	0	12	0	0	0	0	0	0	0	0	0	0
15-Oct	0	0	0	0	10	5	0	0	0	15	1	0	0	245	0	0	0	8	2	256
16-Oct	0	0	0	0	6	3	0	0	0	9	0	0	0	0	0	0	0	0	0	0
17-Oct	0	0	0	0	10	6	0	0	0	16	1	0	0	751	0	0	1	9	2	764
18-Oct	0	0	0	0	10	6	0	0	0	16	0	0	0	0	0	0	0	0	0	0
19-Oct	0	0	0	0	4	0	0	0	0	4	3	1	0	771	0	0	0	10	7	792
20-Oct	0	0	0	0	10	2	0	0	0	12	0	0	0	0	0	0	0	0	0	0
21-Oct	0	0	0	0	1	1	0	0	0	2	3	0	0	802	0	0	0	3	3	811
22-Oct	0	0	0	0	6	3	0	0	0	9	0	0	0	0	0	0	0	0	0	0
23-Oct	0	0	0	0	7	0	0	0	0	7	23	0	0	1,276	0	0	0	10	5	1,314
24-Oct	0	0	0	0	8	1	0	0	0	9	0	0	0	0	0	0	0	0	0	0
25-Oct	0	0	0	0	4	2	0	0	0	6	30	0	0	1,263	0	0	0	13	4	1,310
26-Oct	0	0	0	0	16	5	0	0	0	21	0	0	0	0	0	0	0	0	0	0
27-Oct	0	0	0	0	9	2	0	0	0	11	35	0	0	1,479	0	0	1	9	4	1,528
28-Oct	0	0	0	0	10	2	0	0	0	12	0	0	0	0	0	0	0	0	0	0
29-Oct	0	0	0	0	17	5	0	0	0	22	13	2	0	1,961	0	0	3	9	3	1,991
30-Oct	0	0	0	0	18	5	0	0	0	23	0	0	0	0	0	0	0	0	0	0
31-Oct	0	0	0	0	17	11	0	0	0	28	46	6	0	1,225	0	0	15	4	16	1,312
Total	53,560	60,588	0	46	142,927	82,321	0	16	400	339,858	1,951,342	380,090	0	678,555	4,137,524	674,754	2,686	4,041	121,656	7,950,648

Daily bypassed totals include raceway, sample and research.

Table 3. Daily Facility Mortality and Percent Descaling at Lower Granite Dam, 2000

Page 1. Raceway, NMFS, Recovery tank and Sample Brought over from task computer

	Daily Facility (raceway, sample and recovery tank) Mortality											Daily Percent Descaling									
	Yearling Chin.		Sub-yr Chin.		Steelhead		Sockeye/Kok		Coho	Daily	%	Yearling Chin.		Sub-yr Chin.		Steelhead		Sockeye/Kok		Coho	Daily
Date	Hatch	Wild	Hatch	Ukn.	Hatch	Wild	Hatch	Wild	Unk	Total	Mortality	Hatch	Wild	Hatch	Ukn.	Hatch	Wild	Hatch	Wild	Unk	Total
26-Mar	0	4	0	0	8	0	0	0	0	12	17.14	----	0.00	----	----	0.00	0.00	----	----	----	0.00
27-Mar	0	2	0	0	0	4	0	0	0	6	1.67	0.08	0.00	----	----	----	0.00	----	0.00	----	0.03
28-Mar	4	7	0	0	11	5	0	3	0	30	5.88	0.00	0.17	----	----	0.00	0.00	----	0.00	----	0.02
29-Mar	9	8	0	2	1	2	0	0	0	22	4.23	0.17	0.11	----	0.00	0.00	0.07	----	----	----	0.11
30-Mar	1	0	0	0	0	0	0	0	0	1	0.24	0.15	0.00	----	0.00	0.00	0.00	----	0.00	----	0.05
31-Mar	1	3	0	0	0	7	0	0	0	11	1.06	0.07	0.08	----	----	0.00	0.04	0.00	0.50	----	0.06
1-Apr	10	5	0	0	0	4	0	0	0	19	1.57	0.06	0.08	----	----	0.00	0.01	----	0.00	----	0.04
2-Apr	10	0	0	0	0	0	0	2	0	12	1.21	0.17	0.15	----	----	0.00	0.00	----	----	----	0.07
3-Apr	1	4	0	0	0	2	0	0	0	7	0.41	0.05	0.03	----	----	0.02	0.01	----	0.00	----	0.02
4-Apr	3	6	0	0	1	1	0	2	0	13	0.43	0.07	0.01	----	----	0.00	0.01	----	0.00	----	0.02
5-Apr	1	0	0	1	0	1	0	0	0	3	0.12	0.05	0.02	----	----	0.00	0.01	----	0.11	0.00	0.01
6-Apr	6	5	0	0	1	1	0	2	0	15	0.22	0.06	0.01	----	0.00	0.00	0.00	----	0.00	0.00	0.01
7-Apr	14	6	0	0	1	5	0	1	0	27	0.25	0.05	0.01	----	----	0.00	0.01	----	0.14	0.00	0.01
8-Apr	20	40	0	7	4	1	0	2	0	74	0.86	0.01	0.01	----	0.00	0.00	0.00	----	0.20	0.50	0.01
9-Apr	2	0	0	0	0	0	0	0	0	2	0.04	0.00	0.00	----	0.00	0.01	0.01	----	0.20	----	0.01
10-Apr	3	3	0	0	4	2	0	1	0	13	0.22	0.03	0.00	----	----	0.01	0.00	----	0.00	0.00	0.01
11-Apr	2	4	0	0	0	1	0	0	0	7	0.05	0.03	0.01	----	----	0.01	0.00	----	0.00	----	0.01
12-Apr	4	4	0	0	1	2	0	0	0	11	0.08	0.02	0.01	----	----	0.01	0.01	----	0.00	0.00	0.01
13-Apr	8	6	0	0	0	0	0	0	0	14	0.07	0.01	0.00	----	----	0.00	0.01	----	0.00	0.00	0.00
14-Apr	25	54	0	0	1	1	0	0	0	81	0.19	0.03	0.02	----	----	0.01	0.01	----	0.00	----	0.02
15-Apr	40	47	0	0	0	0	0	0	0	87	0.13	0.01	0.01	----	0.00	0.02	0.00	----	0.00	----	0.01
16-Apr	34	17	0	1	0	1	0	0	0	53	0.08	0.02	0.00	----	----	0.01	0.01	----	----	0.00	0.01
17-Apr	26	3	0	0	0	2	0	0	0	31	0.04	0.02	0.00	----	0.00	0.00	0.00	----	----	----	0.01
18-Apr	28	7	0	0	1	0	0	0	0	36	0.07	0.01	0.00	----	----	0.01	0.00	----	----	----	0.01
19-Apr	22	2	0	0	7	1	0	0	0	32	0.05	0.01	0.00	----	----	0.01	0.01	----	----	----	0.01
20-Apr	15	2	0	0	4	0	0	0	0	21	0.04	0.01	0.00	----	0.00	0.00	0.00	----	----	----	0.00
21-Apr	25	7	0	0	62	2	0	0	0	96	0.14	0.00	0.01	----	0.00	0.01	0.01	----	----	----	0.01
22-Apr	46	12	0	0	16	4	0	0	0	78	0.06	0.01	0.00	----	----	0.01	0.01	----	----	----	0.01
23-Apr	101	27	0	0	11	0	0	0	0	139	0.05	0.01	0.00	----	----	0.01	0.01	----	----	----	0.01
24-Apr	80	19	0	0	3	0	0	0	0	102	0.06	0.01	0.00	----	----	0.01	0.02	----	----	0.00	0.01
25-Apr	87	11	0	0	4	1	0	0	0	103	0.05	0.03	0.00	----	----	0.01	0.00	----	----	0.00	0.01
26-Apr	87	17	0	2	1	1	0	0	0	108	0.04	0.01	0.03	----	0.00	0.01	0.00	----	----	0.00	0.01
27-Apr	79	7	0	0	4	0	0	0	0	90	0.09	0.00	0.00	----	----	0.01	0.02	----	----	0.00	0.01
28-Apr	87	7	0	1	3	1	0	0	0	99	0.10	0.01	0.05	----	----	0.03	0.04	----	----	----	0.02
29-Apr	99	7	0	1	1	0	0	2	0	110	0.05	0.02	0.01	----	----	0.01	0.03	----	1.00	0.00	0.02
30-Apr	79	17	0	0	9	0	0	0	0	105	0.06	0.01	0.01	----	----	0.01	0.02	----	----	0.00	0.01
1-May	80	6	0	0	3	0	0	0	0	89	0.05	0.02	0.00	----	----	0.02	0.00	----	----	0.00	0.01
2-May	122	8	0	3	10	0	0	0	0	143	0.05	0.02	0.03	----	----	0.01	0.01	----	----	0.00	0.02
3-May	64	7	0	1	11	0	0	0	0	83	0.03	0.08	0.03	----	----	0.01	0.02	----	----	0.00	0.03
4-May	43	3	0	0	2	0	0	0	0	48	0.02	0.03	0.03	----	0.00	0.02	0.00	----	----	0.00	0.02
5-May	115	3	0	0	3	0	0	0	0	121	0.03	0.02	0.03	----	----	0.02	0.01	----	0.00	0.00	0.02
6-May	135	8	0	0	1	0	0	0	0	144	0.03	0.12	0.05	----	----	0.01	0.00	----	0.00	0.00	0.03
7-May	147	14	0	0	5	0	0	0	0	166	0.03	0.03	0.03	----	----	0.01	0.00	----	----	0.00	0.01

Table 3. Daily Facility Mortality and Percent Descaling at Lower Granite Dam, 2000
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Daily Facility (raceway, sample and recovery tank) Mortality

Date	Yearling Chin. Hatch	Yearling Chin. Wild	Sub-yr Chin. Hatch	Sub-yr Chin. Ukn.	Steelhead Hatch	Steelhead Wild	Sockeye/Kok Hatch	Sockeye/Kok Wild	Coho Unk	Daily Total	% Mortality
8-May	27	4	0	2	1	0	0	0	0	34	0.01
9-May	42	6	0	0	6	2	0	0	0	56	0.02
10-May	143	15	0	0	5	0	0	0	0	163	0.06
11-May	140	11	0	0	4	2	0	0	0	157	0.08
12-May	56	5	0	0	2	6	0	1	0	70	0.04
13-May	107	10	0	0	11	5	0	0	0	133	0.10
14-May	30	5	0	0	12	0	0	0	0	47	0.08
15-May	16	2	0	0	4	1	0	0	0	23	0.02
16-May	53	5	0	0	6	4	0	4	0	72	0.10
17-May	32	4	0	0	2	8	0	0	0	46	0.09
18-May	16	0	0	0	5	17	0	0	0	38	0.07
19-May	4	0	0	0	5	0	0	0	0	9	0.01
20-May	16	8	0	0	5	1	0	0	0	30	0.03
21-May	15	8	0	0	10	2	1	0	0	36	0.04
22-May	19	3	0	0	16	3	0	1	1	43	0.06
23-May	12	1	0	0	16	5	0	0	3	37	0.03
24-May	14	9	0	0	22	3	0	2	0	50	0.03
25-May	13	2	0	0	14	0	0	0	2	31	0.03
26-May	8	2	0	0	9	3	1	0	13	36	0.04
27-May	9	14	0	0	9	0	0	0	0	32	0.05
28-May	7	8	0	7	3	2	0	0	10	37	0.07
29-May	3	21	0	0	6	1	0	2	0	33	0.07
30-May	5	7	0	0	17	0	0	0	3	32	0.13
31-May	7	6	0	1	2	1	0	0	0	17	0.12
1-Jun	0	0	0	3	2	1	0	0	1	7	0.05
2-Jun	0	2	0	0	1	0	0	0	1	4	0.05
3-Jun	1	9	0	0	1	0	0	0	0	11	0.18
4-Jun	0	4	0	2	1	0	0	0	0	7	0.13
5-Jun	1	0	0	10	1	1	0	0	1	14	0.24
6-Jun	0	6	0	4	1	0	0	0	1	12	0.16
7-Jun	1	7	0	14	2	0	0	1	3	28	0.16
8-Jun	2	2	0	12	2	1	0	0	0	19	0.12
9-Jun	0	2	0	15	0	1	0	0	0	18	0.13
10-Jun	0	0	0	13	0	1	0	0	0	14	0.13
11-Jun	0	0	0	22	4	0	0	0	0	26	0.31
12-Jun	0	0	0	11	1	0	0	0	0	12	0.24
13-Jun	0	0	0	13	0	0	0	0	0	13	0.58
14-Jun	1	1	0	12	0	0	0	0	0	14	0.15
15-Jun	0	5	0	150	3	1	0	0	0	159	2.63
16-Jun	0	7	0	72	1	1	0	0	0	81	1.08
17-Jun	0	1	0	46	0	0	0	0	0	47	0.34
18-Jun	0	0	0	32	3	2	0	0	0	37	0.23
19-Jun	0	0	0	22	1	0	0	0	1	24	0.29

Daily Percent Descaling

Date	Yearling Chin. Hatch	Yearling Chin. Wild	Sub-yr Chin. Hatch	Sub-yr Chin. Ukn.	Steelhead Hatch	Steelhead Wild	Sockeye/Kok Hatch	Sockeye/Kok Wild	Coho Unk	Daily Total
8-May	0.07	0.04	----	0.00	0.01	0.01	----	----	0.00	0.02
9-May	0.02	0.00	----	----	0.01	0.00	----	----	0.00	0.01
10-May	0.04	0.02	----	----	0.01	0.04	0.00	----	0.00	0.02
11-May	0.04	0.04	----	----	0.01	0.03	0.00	----	0.00	0.02
12-May	0.02	0.00	----	0.00	0.02	0.00	----	0.00	0.00	0.02
13-May	0.03	0.00	----	----	0.02	0.01	----	----	0.00	0.02
14-May	0.04	0.00	----	----	0.03	0.00	----	----	0.00	0.03
15-May	0.01	0.00	----	----	0.02	0.01	----	----	0.00	0.02
16-May	0.08	0.13	----	----	0.00	0.00	----	0.00	0.00	0.02
17-May	0.07	0.00	----	----	0.00	0.03	----	----	0.00	0.02
18-May	0.01	0.00	----	----	0.01	0.00	0.00	----	0.00	0.01
19-May	0.01	0.00	----	----	0.01	0.01	0.00	----	0.05	0.01
20-May	0.05	0.00	----	----	0.04	0.00	----	----	0.00	0.03
21-May	0.03	0.05	----	----	0.04	0.01	0.00	----	0.00	0.03
22-May	0.03	0.05	----	----	0.06	0.01	----	0.00	0.00	0.04
23-May	0.00	0.00	----	----	0.04	0.00	0.00	0.00	0.01	0.03
24-May	0.00	0.02	----	----	0.04	0.00	0.00	0.00	0.00	0.03
25-May	0.00	0.00	----	----	0.03	0.00	0.00	0.00	0.01	0.02
26-May	0.06	0.00	----	----	0.04	0.02	0.00	0.00	0.00	0.03
27-May	0.00	0.00	----	0.00	0.05	0.02	0.00	----	0.00	0.03
28-May	0.07	0.04	----	0.00	0.03	0.00	0.00	0.00	0.00	0.02
29-May	0.00	0.06	----	----	0.02	0.00	----	0.00	0.04	0.02
30-May	0.00	0.00	----	0.00	0.04	0.00	----	----	0.03	0.02
31-May	0.00	0.00	----	0.00	0.02	0.00	----	0.00	0.00	0.01
1-Jun	0.00	0.02	----	0.00	0.08	0.00	----	----	0.00	0.03
2-Jun	0.00	0.00	----	0.00	0.09	0.04	----	----	0.00	0.03
3-Jun	0.00	0.00	----	0.00	0.09	0.00	----	0.00	0.00	0.03
4-Jun	----	0.00	----	0.00	0.02	0.00	----	0.00	0.00	0.01
5-Jun	0.02	0.01	----	0.01	0.02	0.01	----	0.00	0.00	0.01
6-Jun	0.02	0.00	----	0.00	0.04	0.01	----	0.00	0.01	0.02
7-Jun	0.00	0.00	----	0.01	0.03	0.02	0.00	0.08	0.02	0.01
8-Jun	0.00	0.00	----	0.00	0.01	0.03	0.00	0.00	0.04	0.01
9-Jun	0.00	0.00	----	0.00	0.02	0.00	0.00	1.00	0.00	0.01
10-Jun	----	0.00	----	0.00	0.03	0.00	----	0.00	0.00	0.01
11-Jun	0.00	0.00	----	0.00	0.05	0.00	----	0.00	0.00	0.01
12-Jun	----	0.00	----	0.00	0.02	0.06	----	0.00	0.13	0.01
13-Jun	0.00	0.00	----	0.01	0.03	0.00	----	0.00	0.00	0.01
14-Jun	0.00	0.00	----	0.00	0.01	0.00	0.00	0.00	0.00	0.00
15-Jun	0.00	0.00	----	0.00	0.05	0.00	----	0.17	0.00	0.01
16-Jun	0.05	0.01	----	0.00	0.07	0.00	0.00	0.50	0.07	0.01
17-Jun	0.00	0.01	----	0.00	0.06	0.03	0.00	0.33	0.00	0.01
18-Jun	0.00	0.00	----	0.00	0.04	0.00	----	----	0.00	0.00
19-Jun	0.00	0.00	----	0.00	0.04	0.00	----	0.50	0.00	0.01

Table 3. Daily Facility Mortality and Percent Descaling at Lower Granite Dam, 2000
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Daily Facility (raceway, sample and recovery tank) Mortality

	Yearling Chin.		Sub-yr Chin.		Steelhead		Sockeye/Kok		Coho	Daily	%
Date	Hatch	Wild	Hatch	Ukn.	Hatch	Wild	Hatch	Wild	Unk	Total	Mortality
20-Jun	0	0	0	21	0	0	0	0	0	21	0.43
21-Jun	0	0	0	40	1	0	0	0	1	42	0.50
22-Jun	0	0	0	20	2	1	0	0	0	23	0.22
23-Jun	0	1	0	21	0	2	0	0	0	24	0.34
24-Jun	0	2	0	18	1	0	0	0	0	21	0.24
25-Jun	0	0	0	29	2	0	0	0	0	31	0.09
26-Jun	0	0	0	24	1	0	0	0	0	25	0.14
27-Jun	0	0	0	41	1	1	0	0	1	44	0.33
28-Jun	0	0	0	49	4	1	0	0	0	54	0.43
29-Jun	0	0	0	93	0	0	0	0	1	94	0.32
30-Jun	0	1	0	65	3	1	0	0	0	70	0.38
1-Jul	0	1	0	62	12	8	0	0	0	83	0.50
2-Jul	0	0	0	79	4	4	0	0	0	87	0.20
3-Jul	0	3	0	153	11	0	0	0	0	167	0.22
4-Jul	0	0	0	123	3	0	0	0	0	126	0.69
5-Jul	0	5	0	158	15	2	0	0	0	180	0.47
6-Jul	0	0	0	32	5	0	0	0	0	37	0.29
7-Jul	0	0	0	48	25	0	0	0	0	73	0.63
8-Jul	0	0	0	26	11	0	0	0	0	37	0.32
9-Jul	0	0	0	60	5	0	0	0	0	65	0.50
10-Jul	0	0	0	30	1	0	0	0	0	31	0.36
11-Jul	1	1	0	87	2	0	0	0	2	93	0.56
12-Jul	0	1	0	49	1	10	0	0	0	61	0.42
13-Jul	0	0	0	53	2	0	0	0	0	55	0.71
14-Jul	0	2	0	30	2	0	0	0	1	35	0.59
15-Jul	2	0	0	63	2	1	0	0	0	68	0.79
16-Jul	0	1	0	34	0	0	0	0	0	35	0.40
17-Jul	0	2	0	55	2	0	0	0	1	60	0.66
18-Jul	0	0	0	18	2	0	0	0	0	20	0.35
19-Jul	0	3	0	35	9	0	0	0	0	47	1.05
20-Jul	0	0	0	15	1	0	0	0	0	16	0.42
21-Jul	0	0	0	14	2	0	0	0	0	16	0.50
22-Jul	1	0	0	42	3	0	0	0	0	46	0.81
23-Jul	0	0	0	45	5	1	0	0	0	51	1.34
24-Jul	0	1	0	14	1	0	0	0	0	16	0.77
25-Jul	0	8	0	48	3	0	0	0	0	59	2.93
26-Jul	0	0	0	15	0	0	0	0	0	15	0.71
27-Jul	0	1	0	14	1	0	0	0	0	16	1.05
28-Jul	0	1	0	20	2	0	0	0	0	23	0.95
29-Jul	1	1	0	23	1	0	0	0	0	26	0.72
30-Jul	0	1	0	11	1	1	0	0	0	14	0.51
31-Jul	0	0	0	13	0	0	0	0	0	13	0.59
1-Aug	0	1	0	14	2	0	0	0	0	17	0.57

Daily Percent Descaling

	Yearling Chin.		Sub-yr Chin.		Steelhead		Sockeye/Kok		Coho	Daily
Date	Hatch	Wild	Hatch	Ukn.	Hatch	Wild	Hatch	Wild	Unk	Total
20-Jun	0.50	0.04	----	0.01	0.01	0.00	----	----	----	0.01
21-Jun	----	0.00	----	0.00	0.06	0.00	----	0.00	0.00	0.01
22-Jun	0.00	0.03	----	0.00	0.07	0.05	----	----	0.00	0.01
23-Jun	0.00	0.00	----	0.00	0.00	0.00	----	----	0.00	0.00
24-Jun	0.00	0.02	----	0.00	0.05	0.05	----	----	0.00	0.01
25-Jun	0.00	0.00	----	0.00	0.05	0.14	----	1.00	0.00	0.00
26-Jun	0.00	0.00	----	0.01	0.00	----	----	----	0.00	0.01
27-Jun	----	0.00	----	0.00	0.04	0.00	0.00	----	0.00	0.00
28-Jun	----	0.00	----	0.00	0.00	0.00	0.00	----	0.00	0.00
29-Jun	0.25	0.05	----	0.00	0.01	0.04	----	----	0.00	0.01
30-Jun	0.00	0.06	----	0.01	0.02	0.00	----	----	0.00	0.01
1-Jul	----	0.00	----	0.03	0.03	0.00	----	----	0.00	0.03
2-Jul	----	0.00	----	0.00	0.08	0.00	----	----	0.00	0.00
3-Jul	----	0.00	----	0.00	0.05	----	----	----	0.00	0.00
4-Jul	----	0.00	----	0.01	0.00	----	----	----	----	0.01
5-Jul	0.00	0.00	----	0.00	0.03	0.00	----	----	0.00	0.00
6-Jul	----	0.00	----	0.00	0.06	0.00	----	----	0.00	0.00
7-Jul	----	0.00	----	0.02	0.00	----	----	----	0.00	0.02
8-Jul	----	0.00	----	0.00	0.03	0.00	----	0.00	0.00	0.00
9-Jul	----	0.00	----	0.00	0.03	0.00	----	----	0.00	0.00
10-Jul	0.00	0.00	----	0.00	0.00	0.00	----	----	0.00	0.00
11-Jul	0.00	0.00	----	0.00	0.15	0.25	----	----	0.00	0.01
12-Jul	----	0.00	----	0.00	0.12	0.00	----	----	----	0.01
13-Jul	----	----	----	0.00	0.00	0.00	----	----	0.00	0.00
14-Jul	----	0.00	----	0.00	0.00	0.00	----	----	0.00	0.00
15-Jul	0.00	0.00	----	0.00	0.06	0.00	----	0.00	0.00	0.00
16-Jul	0.00	0.00	----	0.00	0.06	0.00	----	----	0.00	0.00
17-Jul	----	0.00	----	0.01	0.09	0.00	----	----	0.07	0.01
18-Jul	----	0.00	----	0.00	0.13	0.00	----	----	0.00	0.01
19-Jul	----	0.00	----	0.00	0.04	0.00	----	----	0.00	0.00
20-Jul	----	0.00	----	0.00	0.09	----	----	----	0.00	0.01
21-Jul	----	0.00	----	0.00	0.05	----	----	----	0.00	0.01
22-Jul	0.00	0.00	----	0.00	0.04	0.00	----	----	0.00	0.01
23-Jul	0.00	0.00	----	0.00	0.06	0.00	----	----	0.00	0.01
24-Jul	----	0.00	----	0.01	0.00	0.00	----	----	0.00	0.01
25-Jul	----	0.00	----	0.00	0.00	0.00	----	----	----	0.00
26-Jul	----	0.00	----	0.00	0.00	0.00	----	----	0.00	0.00
27-Jul	----	0.07	----	0.00	0.00	----	----	----	----	0.01
28-Jul	----	0.00	----	0.00	0.03	0.20	----	0.00	0.00	0.01
29-Jul	----	0.00	----	0.00	0.05	0.20	0.00	----	0.00	0.01
30-Jul	----	0.00	----	0.00	0.09	0.00	----	----	0.25	0.01
31-Jul	----	0.00	----	0.00	0.00	0.00	----	0.00	0.00	0.00
1-Aug	----	0.00	----	0.00	0.00	0.00	----	----	0.00	0.00

Table 3. Daily Facility Mortality and Percent Descaling at Lower Granite Dam, 2000
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Daily Facility (raceway, sample and recovery tank) Mortality

	Yearling Chin.		Sub-yr Chin.		Steelhead		Sockeye/Kok		Coho	Daily	%
Date	Hatch	Wild	Hatch	Ukn.	Hatch	Wild	Hatch	Wild	Unk	Total	Mortality
2-Aug	0	0	0	27	0	0	0	0	0	27	1.01
3-Aug	0	0	0	8	2	0	0	0	0	10	0.28
4-Aug	0	1	0	22	0	0	0	0	0	23	0.49
5-Aug	0	0	0	14	0	0	0	0	0	14	0.45
6-Aug	0	0	0	16	1	0	0	0	0	17	0.51
7-Aug	0	0	0	13	0	0	0	0	0	13	0.30
8-Aug	0	0	0	17	0	0	0	0	0	17	0.60
9-Aug	0	0	0	13	0	0	0	0	0	13	0.48
10-Aug	0	1	0	33	0	0	0	1	0	35	1.34
11-Aug	0	0	0	9	0	0	0	0	0	9	0.36
12-Aug	0	1	0	14	0	0	0	0	0	15	0.60
13-Aug	0	0	0	13	0	0	0	0	0	13	0.49
14-Aug	0	0	0	16	0	0	0	2	0	18	0.68
15-Aug	0	0	0	3	0	0	0	0	0	3	0.18
16-Aug	0	0	0	10	0	0	0	0	0	10	0.67
17-Aug	0	0	0	6	0	0	0	0	0	6	0.45
18-Aug	0	0	0	15	1	0	0	1	0	17	1.33
19-Aug	0	0	0	8	1	0	0	0	0	9	0.99
20-Aug	0	0	0	8	0	0	0	0	0	8	0.73
21-Aug	0	0	0	10	0	0	0	0	0	10	0.68
22-Aug	0	0	0	8	1	0	0	0	0	9	0.74
23-Aug	0	0	0	4	0	0	0	0	0	4	0.40
24-Aug	0	0	0	10	0	0	0	0	0	10	0.94
25-Aug	0	0	0	4	0	0	0	0	0	4	0.34
26-Aug	0	0	0	6	0	0	0	3	0	9	0.67
27-Aug	0	0	0	8	0	0	0	0	0	8	0.30
28-Aug	0	0	0	10	0	0	0	2	0	12	0.54
29-Aug	0	0	0	5	0	0	0	1	0	6	0.28
30-Aug	0	0	0	12	0	1	0	2	0	15	0.74
31-Aug	0	0	0	10	0	0	0	0	0	10	0.40
1-Sep	0	0	0	9	0	0	0	0	0	9	0.38
2-Sep	0	0	0	13	0	0	0	4	0	17	0.86
3-Sep	0	0	0	16	1	0	0	1	0	18	0.82
4-Sep	0	0	0	10	0	0	0	0	0	10	0.38
5-Sep	0	0	0	10	1	0	0	2	0	13	0.64
6-Sep	0	0	0	8	0	0	0	0	0	8	0.50
7-Sep	0	0	0	15	0	0	0	0	0	15	0.43
8-Sep	0	0	0	22	0	0	0	1	0	23	0.51
9-Sep	0	0	0	9	0	0	0	0	0	9	0.43
10-Sep	0	0	0	3	1	1	0	0	0	5	0.47
11-Sep	0	0	0	11	0	0	0	2	0	13	1.18
12-Sep	0	0	0	2	0	0	0	0	0	2	0.14
13-Sep	0	0	0	22	2	0	0	8	0	32	1.98

Daily Percent Descaling

	Yearling Chin.		Sub-yr Chin.		Steelhead		Sockeye/Kok		Coho	Daily
Date	Hatch	Wild	Hatch	Ukn.	Hatch	Wild	Hatch	Wild	Unk	Total
2-Aug	----	0.00	----	0.00	0.00	0.00	----	0.00	0.00	0.00
3-Aug	----	0.00	----	0.00	0.04	0.00	----	0.00	----	0.00
4-Aug	----	0.00	----	0.00	0.13	0.00	----	----	----	0.01
5-Aug	----	0.09	----	0.00	0.00	0.00	----	----	0.25	0.00
6-Aug	----	0.00	----	0.00	0.06	----	----	----	0.00	0.01
7-Aug	----	0.00	----	0.00	0.11	0.20	----	----	0.00	0.01
8-Aug	----	0.00	----	0.00	0.08	0.00	----	----	0.00	0.01
9-Aug	----	0.00	----	0.00	0.13	0.33	----	1.00	0.00	0.01
10-Aug	----	0.00	----	0.01	0.09	0.00	----	0.00	----	0.01
11-Aug	----	0.00	----	0.00	0.05	0.00	----	0.00	0.00	0.00
12-Aug	----	0.00	----	0.00	0.00	0.00	----	----	0.00	0.00
13-Aug	----	0.00	----	0.00	0.14	0.00	----	0.00	0.00	0.01
14-Aug	----	0.00	----	0.00	0.08	0.00	----	0.00	0.00	0.01
15-Aug	----	0.00	----	0.00	0.00	0.00	----	0.00	0.00	0.00
16-Aug	----	0.00	----	0.00	0.08	----	----	----	0.00	0.00
17-Aug	----	0.00	----	0.01	0.17	0.00	----	----	0.00	0.01
18-Aug	----	0.25	----	0.01	0.00	0.00	----	0.33	0.00	0.01
19-Aug	----	0.00	----	0.02	0.00	----	----	0.00	0.00	0.02
20-Aug	----	0.00	----	0.00	0.00	0.00	----	----	----	0.00
21-Aug	----	----	----	0.00	0.50	0.00	----	----	----	0.00
22-Aug	0.00	0.00	----	0.00	0.00	0.00	----	----	0.00	0.00
23-Aug	----	----	----	0.01	0.00	0.00	----	----	----	0.01
24-Aug	----	----	----	0.00	0.00	0.00	----	----	----	0.00
25-Aug	----	----	----	0.00	0.09	0.00	----	0.00	----	0.00
26-Aug	----	----	----	0.00	0.00	----	----	----	0.00	0.00
27-Aug	----	----	----	0.00	0.00	----	----	0.00	----	0.00
28-Aug	----	----	----	0.00	----	0.00	----	0.00	----	0.00
29-Aug	----	----	----	0.00	----	0.00	----	1.00	0.00	0.00
30-Aug	----	----	----	0.00	0.00	0.00	----	0.33	----	0.00
31-Aug	----	----	----	0.00	0.00	----	----	0.00	0.00	0.00
1-Sep	----	0.00	----	0.00	0.00	0.00	----	0.00	----	0.00
2-Sep	----	----	----	0.00	0.33	----	----	0.33	0.00	0.01
3-Sep	1.00	0.00	----	0.00	0.00	0.00	----	0.50	0.00	0.01
4-Sep	----	----	----	0.01	0.00	----	----	0.00	0.00	0.01
5-Sep	----	1.00	----	0.00	0.00	0.00	----	0.33	0.00	0.01
6-Sep	----	----	----	0.00	0.00	----	----	0.00	----	0.00
7-Sep	----	----	----	0.00	0.00	0.00	----	0.13	0.00	0.00
8-Sep	----	0.00	----	0.00	0.00	0.00	----	0.00	0.25	0.00
9-Sep	----	0.00	----	0.00	0.00	0.00	----	0.00	----	0.00
10-Sep	----	0.00	----	0.00	0.00	0.00	----	0.00	0.00	0.00
11-Sep	----	----	----	0.02	----	----	----	0.00	----	0.02
12-Sep	----	0.00	----	0.00	0.00	0.00	----	0.00	----	0.00
13-Sep	----	----	----	0.00	0.00	0.00	----	0.33	----	0.01

Table 3. Daily Facility Mortality and Percent Descaling at Lower Granite Dam, 2000

Daily Facility (raceway, sample and recovery tank) Mortality

Date	Yearling Chin. Hatch	Yearling Chin. Wild	Sub-yr Chin. Hatch	Sub-yr Chin. Ukn.	Steelhead Hatch	Steelhead Wild	Sockeye/Kok Hatch	Sockeye/Kok Wild	Coho Unk	Daily Total	% Mortality
14-Sep	0	0	0	9	0	0	0	3	0	12	0.97
15-Sep	0	0	0	4	0	0	0	1	0	5	0.66
16-Sep	0	0	0	3	0	0	0	0	0	3	0.56
17-Sep	0	0	0	10	1	0	0	1	0	12	2.70
18-Sep	0	0	0	6	0	0	0	1	0	7	1.37
19-Sep	0	1	0	16	0	0	0	2	0	19	1.64
20-Sep	0	0	0	5	0	0	0	0	0	5	0.35
21-Sep	0	0	0	18	1	0	0	2	0	21	1.91
22-Sep	0	0	0	5	0	0	0	1	0	6	0.54
23-Sep	0	0	0	13	0	0	0	1	0	14	1.33
24-Sep	0	0	0	0	0	0	0	0	0	0	0.00
25-Sep	0	0	0	4	0	0	0	0	0	4	1.04
26-Sep	0	0	0	3	0	0	0	0	0	3	0.60
27-Sep	0	0	0	4	0	0	0	1	0	5	0.97
28-Sep	0	0	0	0	0	0	0	0	0	0	0.00
29-Sep	0	0	0	0	0	0	0	0	0	0	0.00
30-Sep	0	0	0	0	0	0	0	0	0	0	0.00
1-Oct	0	0	0	1	1	0	0	1	0	3	1.04
2-Oct	0	0	0	1	0	0	0	1	0	2	0.67
3-Oct	0	0	0	1	0	0	0	0	0	1	0.31
4-Oct	0	0	0	7	0	0	0	2	0	9	1.74
5-Oct	0	0	0	8	0	0	0	3	0	11	1.97
6-Oct	0	0	0	7	0	0	0	0	0	7	1.22
7-Oct	0	0	0	5	0	0	0	0	0	5	0.59
8-Oct	0	0	0	9	0	0	0	1	0	10	1.53
9-Oct	0	0	0	10	0	0	0	0	0	10	1.34
10-Oct	0	0	0	3	0	0	0	1	0	4	0.56
11-Oct	0	0	0	0	0	0	0	0	0	0	0.00
12-Oct	0	0	0	0	0	0	0	0	0	0	0.00
13-Oct	0	0	0	0	0	0	0	0	0	0	0.00
14-Oct	0	0	0	1	0	0	0	1	0	2	1.82
15-Oct	0	0	0	1	0	0	0	1	0	2	1.13
16-Oct	0	0	0	5	0	0	0	0	0	5	1.46
17-Oct	0	0	0	4	0	0	0	0	0	4	0.88
18-Oct	0	0	0	4	0	0	0	1	0	5	1.09
19-Oct	0	0	0	0	0	0	0	4	0	4	1.10
20-Oct	0	0	0	3	1	0	0	3	0	7	1.75
21-Oct	0	0	0	2	0	0	0	1	0	3	0.69
22-Oct	0	0	0	3	0	0	0	1	0	4	0.57
23-Oct	1	0	0	4	0	0	0	0	0	5	0.79
24-Oct	0	0	0	3	0	1	0	1	0	5	0.70
25-Oct	0	0	0	3	0	0	0	3	0	6	0.97
26-Oct	0	0	0	4	0	0	0	0	0	4	0.46

Daily Percent Descaling

Date	Yearling Chin. Hatch	Yearling Chin. Wild	Sub-yr Chin. Hatch	Sub-yr Chin. Ukn.	Steelhead Hatch	Steelhead Wild	Sockeye/Kok Hatch	Sockeye/Kok Wild	Coho Unk	Daily Total
14-Sep	----	----	----	0.02	0.00	0.00	----	0.25	----	0.02
15-Sep	----	----	----	0.00	0.00	0.00	----	0.00	0.00	0.00
16-Sep	----	----	----	0.02	0.00	----	----	0.00	0.00	0.02
17-Sep	----	----	----	0.03	0.00	0.00	----	0.25	0.00	0.04
18-Sep	----	1.00	----	0.02	0.00	----	----	0.00	----	0.03
19-Sep	----	0.00	----	0.02	0.00	----	----	0.00	----	0.02
20-Sep	----	0.00	----	0.01	0.00	----	----	0.00	0.50	0.01
21-Sep	----	0.00	----	0.01	0.00	----	----	----	----	0.01
22-Sep	----	0.00	----	0.01	0.00	0.00	----	0.00	----	0.01
23-Sep	----	----	----	0.01	0.00	0.00	----	0.00	----	0.01
24-Sep	----	0.00	----	0.01	0.00	0.00	----	0.00	----	0.01
25-Sep	----	0.00	----	0.02	0.00	----	----	0.00	----	0.02
26-Sep	----	----	----	0.02	0.00	0.00	----	----	----	0.02
27-Sep	----	----	----	0.02	0.00	----	----	0.00	----	0.02
28-Sep	----	----	----	0.01	----	0.00	----	----	0.00	0.01
29-Sep	----	----	----	0.01	0.00	----	----	0.00	----	0.01
30-Sep	----	----	----	0.01	----	----	----	0.00	0.00	0.01
1-Oct	----	----	----	0.00	0.00	----	----	0.00	----	0.00
2-Oct	----	----	----	0.00	----	----	----	0.00	0.00	0.00
3-Oct	----	0.00	----	0.01	0.00	0.00	----	0.14	0.00	0.01
4-Oct	----	0.00	----	0.01	0.00	----	----	0.24	0.00	0.02
5-Oct	----	0.00	----	0.01	0.00	0.00	----	0.40	0.00	0.01
6-Oct	----	0.00	----	0.02	0.17	0.00	----	0.00	0.00	0.02
7-Oct	----	----	----	0.02	0.00	0.33	----	0.40	----	0.03
8-Oct	----	0.00	----	0.02	0.00	----	----	0.00	0.00	0.02
9-Oct	----	----	----	0.01	0.00	----	----	0.36	----	0.02
10-Oct	----	----	----	0.04	0.00	0.00	----	0.00	1.00	0.04
11-Oct	----	----	----	0.00	0.00	0.50	----	0.00	0.00	0.00
12-Oct	----	----	----	0.02	0.00	0.00	----	0.00	0.00	0.02
13-Oct	----	----	----	0.03	0.00	----	----	0.14	0.00	0.03
14-Oct	----	----	----	0.04	0.00	0.00	----	0.20	0.00	0.05
15-Oct	0.00	----	----	0.03	0.10	0.00	----	0.67	----	0.05
16-Oct	----	----	----	0.02	0.17	0.00	0.00	0.00	1.00	0.02
17-Oct	0.00	----	----	0.02	0.00	0.00	----	0.33	0.00	0.02
18-Oct	0.00	----	----	0.02	0.10	0.00	----	0.17	0.00	0.03
19-Oct	0.00	0.00	----	0.02	0.00	----	----	0.00	0.20	0.02
20-Oct	0.00	----	----	0.01	0.00	0.00	----	0.00	0.00	0.01
21-Oct	----	----	----	0.01	0.00	0.00	----	0.00	0.00	0.01
22-Oct	0.08	----	----	0.01	0.17	0.00	----	0.00	0.33	0.02
23-Oct	0.00	----	----	0.00	0.00	----	----	0.00	0.00	0.00
24-Oct	0.00	----	----	0.01	0.00	0.00	----	0.50	0.00	0.01
25-Oct	0.00	----	----	0.03	0.00	0.00	----	0.11	0.00	0.03
26-Oct	0.00	----	----	0.02	0.00	0.00	----	0.50	0.00	0.02

Table 3. Daily Facility Mortality and Percent Descaling at Lower Granite Dam, 2000
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Daily Facility (raceway, sample and recovery tank) Mortality

Date	Yearling Chin. Hatch	Yearling Chin. Wild	Sub-yr Chin. Hatch	Sub-yr Chin. Ukn.	Steelhead Hatch	Steelhead Wild	Sockeye/Kok Hatch	Sockeye/Kok Wild	Coho Unk	Daily Total	% Mortality
27-Oct	0	0	0	7	0	0	0	0	0	7	0.99
28-Oct	0	0	0	75	0	0	0	0	0	75	7.41
29-Oct	0	0	0	22	0	0	0	1	0	23	2.07
30-Oct	0	0	0	5	1	0	0	0	0	6	1.03
31-Oct	0	0	0	1	0	0	0	0	0	1	0.13
Total	2571	662	0	3187	577	163	2	95	47	7304	
Percent of Collection	0.13%	0.15%	0.00%	0.47%	0.01%	0.02%	0.07%	2.29%	0.04%	0.09%	

Daily Percent Descaling

Date	Yearling Chin. Hatch	Yearling Chin. Wild	Sub-yr Chin. Hatch	Sub-yr Chin. Ukn.	Steelhead Hatch	Steelhead Wild	Sockeye/Kok Hatch	Sockeye/Kok Wild	Coho Unk	Daily Total
27-Oct	0.00	----	----	0.01	0.00	0.00	0.00	0.00	0.00	0.01
28-Oct	0.25	0.00	----	0.02	0.00	0.00	----	0.17	0.00	0.02
29-Oct	0.00	----	----	0.01	0.06	0.00	0.00	0.00	0.00	0.01
30-Oct	0.00	0.00	----	0.02	0.00	0.00	0.00	0.00	0.00	0.02
31-Oct	0.03	0.20	----	0.02	0.00	0.09	0.00	0.00	0.00	0.02