AGE AND LENGTH COMPOSITION OF COLUMBIA BASIN CHINOOK AND SOCKEYE SALMON AND STEELHEAD AT BONNEVILLE DAM IN 2004

Technical Report

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ABSTRACT

In continuation of the Stock Assessment Project, the Columbia River Inter-Tribal Fish Commission (CRITFC) conducted a field study at Bonneville Dam in 2004 to assess the age, length-at-age and stock composition of adult Pacific salmon migrating up the Columbia River, and to predict the 2005 Chinook salmon run. Adult spring, summer and fall Chinook salmon (*Oncorhynchus tshawytscha*), sockeye salmon (*O. nerka*) and summer-run steelhead (*O. mykiss*) were randomly collected, sampled for scales and additional biological data, revived and released. Caudal fin clips were also taken from Chinook salmon and steelhead for later genetic analysis. Scales were examined to estimate age composition; the results contributed to an ongoing database for age class structure of Columbia Basin salmon populations. Based on scale pattern analysis of Chinook salmon, five-year-old fish (from brood year [BY] 1999) comprised 6.0% of the spring Chinook, 46.4% of the summer Chinook, and 39.2% of the bright fall Chinook salmon migration. Four-year-old fish (BY 2000) comprised 88.7% of the spring Chinook, 31.0% of the summer Chinook, and 24.7% of the bright fall Chinook salmon migration. Three-year-old fish (BY 2001) comprised 5.1% of the spring Chinook, 17.0% of the summer Chinook and 32.6% of the bright fall Chinook. The largest proportion of the sockeye salmon migration through Bonneville Dam was four-year-old fish (97.7%). The steelhead migration consisted of 40.7% four-year-old fish and 39.7% three-year-old fish. Based on the combination of scale pattern analysis and fin marks for classification, the steelhead migration consisted of 74.1% hatchery and 25.9% wild steelhead. A-run steelhead, less than 78cm in length, comprised 87.3% of the steelhead run. B-run fish, equal to or greater than 78cm, comprised 12.7% of the run. The steelhead run consisted of 59.7% females and 40.3% males. A year-class regression over the past 16 years of data was used to predict spring, summer, and bright fall Chinook salmon population sizes for 2005. Based on three-year-old returns, the relationship predicts four-year-old returns 118,000 (± 63,700, 90% predictive interval [PI]) spring Chinook, 58,200 (± 26,200, 90% PI) summer, and 256,500 (± 147,600, 90% PI) bright fall Chinook salmon for the 2005 runs. Based on four-year-old returns, the relationship predicts five-year-old returns of 39,000 (± 43,700, 90% PI) spring, 31,400 (± 8,200, 90% PI) summer, and 57,400 (± 45,400, 90% PI) bright fall Chinook salmon for the 2005 runs. The 2005 run size predictions should be used with caution; some of these predictions are beyond the range of previously observed data.

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INTRODUCTION

In 1985, the US-Canada Pacific Salmon Treaty was formed between the governments of the United States and Canada in an effort to manage research and enhance Pacific salmon (PSC 2000). The treaty established the Spawning Escapement-Monitoring program to assess indicator stocks within the Columbia River Basin and improve methods for providing population estimates, escapement monitoring, establishing spawner-recruit relationships and developing harvest management approaches (PST 1985). As part of this program, the Columbia River Inter-Tribal Fish Commission (CRITFC) has developed a comprehensive research strategy to monitor the age and stock composition of adult Pacific salmon returning to the Columbia River. This project has monitored the above Bonneville Dam adult migration of sockeye salmon since 1985, spring Chinook salmon since 1987, summer Chinook salmon since 1990, and up-river bright fall Chinook salmon and coho salmon since 1998. Coho salmon were not sampled this year.

At the request of the Northwest Fisheries Science Center, summer steelhead were added to our sampling regime in 2004. The Conservation Biology Division (NOAA Fisheries) formed the Mathematical Biology and Systems Monitoring Program to develop, in collaboration with the existing Salmon Science Programs and Salmon Recovery Planning Teams, quantitative tools for assessing population and habitat status and recovery potential and progress. Monitoring the age structure, hatchery fraction and stock composition of the adult Columbia River summer steelhead provides valuable information for this program.

Scale pattern analysis, the analysis of concentric rings or circuli to provide records of previous life history, is a common method for age determination in Pacific salmon. Fast summer growth widens the distances between circuli on the scale and slow winter growth shortens the distance between circuli. Typically, age can be determined by counting the number of winters observed on the scale (Gilbert 1913, Rich and Holmes 1929). This method is valuable in Pacific salmon management because scales can be collected without sacrificing the fish and scale samples can be collected, processed and aged promptly. Problems with this method may include variability in scale growth, scale reabsorption and difficulties in age validation (Knudsen 1990, Beamish and McFarlane 1983).

Scale pattern analysis can also be used to determine stock composition if specific scale pattern can be linked to specific stocks. This method has been successful in discriminating Columbia River sockeye partly because there are only two major runs of sockeye in the system, which experience drastically different early rearing environments (Fryer 2004). However, this method was found to be less successful with Chinook salmon where numerous populations can exhibit similar early life histories. Currently a coast wide genetic database is being developed to create baseline genetic data for individual Chinook populations throughout the region. This baseline genetic stock information can be utilized in mixed stock sampling to distinguish individual stocks and will be useful for the Chinook sampling program at Bonneville Dam.

The primary objectives of the 2004 sampling year were to estimate the age composition and length-at-age composition of Chinook, sockeye and steelhead using scale pattern analysis, to forecast the 2005 run size for Chinook salmon using the age composition data, and to collect tissue samples that will be used in the development of a genetic stock monitoring and identification program for Chinook salmon and steelhead.

METHODS

Study Area

Research was conducted at the Adult Fish Facility (AFF) located adjacent to the Second Powerhouse at Bonneville Dam (river km 235) on the north side of the Columbia River (Figure 1). This facility uses a picket weir to divert migrating fish, ascending the Washington shore fish ladder, into the adult sampling facility collection pool. An attraction flow is used to draw fish through a false weir where they can be selected for sampling. Fish not selected and fish that have recovered from sampling then migrate back to the Washington Shore Fish ladder above the picket weir.

Chinook salmon generally migrate between March and November and are typically categorized into three races based on migration timing past Bonneville Dam. Chinook salmon passing Bonneville from March 15 through May 31 are classified as spring Chinook, from June 1 through July 31 are classified as summer Chinook and August 1 through November 15 are classified as fall Chinook. The fall Chinook run consists of both the lower river Tules and the Upriver Bright fall Chinook. Based on the needs of the Pacific Salmon Commission, this study only collects information on Upriver Bright fall Chinook. Sockeye salmon migrate between May 15 and August 1 and summer-run steelhead between April 1 and October 31.

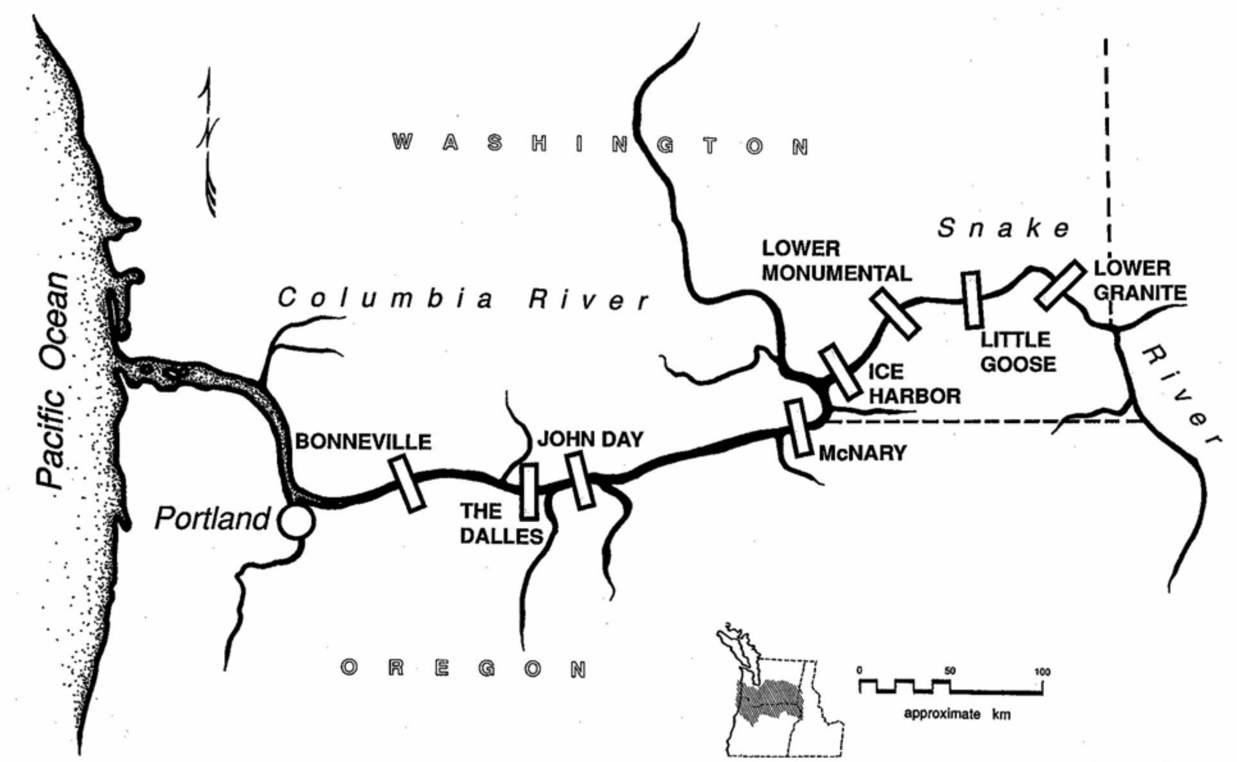

Figure 1: Map of the Columbia River displaying federal dams. Bonneville Dam (rkm 235) is the first dam upstream from the mouth.

Sample Design

Adult fish were sampled one or two days per statistical week[1] from March through October. A desired minimum sample size of 610 fish each was set for spring, summer, and fall Chinook and sockeye salmon. This sample size was derived from simulations we conducted based on the work of Thompson (1987) and assumes that the sample is distributed approximately proportional to the weekly run size. Also assumed is that our weekly sample represents a random sample of the run passing over Bonneville Dam that week. Given these assumptions, desired levels of precision and accuracy (d=0.05, a=0.10) for age composition estimates are achieved. Additional samples are collected to improve the precision of weekly age composition estimates. A sample size of 1% of the total summer steelhead run was established as a sampling goal for TAC. The composite age and length-at-age estimates are calculated from weekly estimates weighted by the number of each species migrating past Bonneville Dam during the sample week (Fryer 1995). Weekly and annual dam counts of fish passage[2] were obtained from DART (2005) and the Fish Passage Center (2005).

Fish Collection

Fish of each species were randomly trapped at the AFF and anesthetized. Chinook salmon under 35 cm were not sampled to exclude precocious juveniles. All sockeye and steelhead were sampled. Each fish was measured for fork length to the nearest 0.5 cm, checked for identifying fin marks, tags, coloration and condition. Scale samples were collected from all fish for aging and caudal fin tissue was collected from all Chinook salmon for genetic stock composition analysis. These genetic samples will be used in the development of a genetic stock identification program for Columbia River Chinook salmon. All fish were revived in a freshwater tank or pool and returned to a fishway leading to the Washington shore fish ladder.

Fish Coloration and Condition

Fish coloration and condition were recorded for all species at the time of sampling. Coloration was based on qualitative observations with the categories of Bright, Intermediate and Dark. Overall fish condition was also qualitative and was classified on a scale of 1 to 5 (Table 1). Fish classified as a 5 had no major injuries that break the skin, 4 had injuries that broke the skin, 3 had injuries that penetrate the muscle tissue, 2 had injuries that penetrate a body cavity and 1 are fish missing large sections of the body. In addition to the fish condition classification, specific recognizable injuries or afflictions were recorded. These included percentage of descaling, marine mammal injuries, net damage, parasites, fungus, headburn[3], gas bubble trauma, deformities and various other injuries.

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1. Statistical weeks are sequentially numbered calendar-year weeks starting with the week that includes January 1 (Week 1). Excepting the first and last weeks of most years, weeks are seven days long, beginning on Sunday and ending on Saturday. In 2004, for example, Statistical Week 15 began on April 4 and ended on April 10.
2. Tule fall Chinook counts are subtracted from the total fall Chinook counts to estimate the upriver bright fall Chinook.
3. Headburn, the exfoliation of skin and tissues of the jaw and cranial region, has been identified as a possible stress indicator of high river flow conditions or spillway discharge from dams (Elston 1996, Groberg 1996).

Age Determination

To minimize the scale sample rejection rate, six scales (three per side) were collected for each Chinook and steelhead sampled (Knudsen 1990) and four scales (two per side) were collected from each sockeye salmon sampled. Scales were mounted and pressed according to methods described by Clutter and Whitesel (1956) and the International North Pacific Fisheries Commission (1963). Individual samples were visually examined and categorized using well-established scale age-estimation methods (Gilbert 1913, Rich and Holmes 1929). A sub-sample of scales was sent to John Sneva of the Washington Department of Fish and Wildlife for corroboration of age estimates. Direct age validation (Beamish and McFarlane 1983) was not performed, as ages estimated from scale patterns could not be compared to known ages during this sampling season.

The European method for fish age description (Koo 1962) is used in this report. The number of winters a fish spent in freshwater (not including the winter of egg incubation) is described by an Arabic numeral followed by a period. The number following the period indicates the number of winters a fish spent in saltwater. Total age, therefore, is equal to one plus the sum of both numerals.

Age and Length-at-Age Composition

Age composition was determined by weighing the proportion of each age class sampled by the total counts of each species passing Bonneville dam during each statistical week. The length-at-age composition for each species sampled is determined by calculating the mean length for each age class present during each statistical week.

Steelhead Hatchery/Wild Determination

Methods developed by Oregon Department of Fish and Wildlife (ODFW) were used to determine hatchery versus wild origin using scale pattern analysis. Hatchery steelhead typically experience faster freshwater growth which results in relatively wide spaces between circuli, whereas natural origin fish typically show much slower fresh water growth narrowing the distance between circuli. In addition hatchery origin fish are reared to smolt in a single year whereas the natural origin fish tend to remain in fresh water for two to three years.

In addition to scale pattern analysis, hatchery/wild determination were also aided by fin clips and worn fins (typically the dorsal). Steelhead with a fin clip and/or a stubby dorsal fin are typically considered hatchery, although some wild fish may have a worn fins and some hatchery fish may have neither fin clips nor worn fins. The combination of scale analysis and fin mark assessment leads to a more accurate determination of hatchery/wild.

Steelhead A/B Run Determination

A-run steelhead occur throughout the Columbia and Snake river basins and rarely exceed the length of 78 cm, whereas B-run steelhead are thought to be produced only in the Clearwater, Middle Fork Salmon, and South Fork Salmon Rivers and typically exceed 78cm (Busby et al. 1996). Determination of A-run or B-run was based on length measurement.

Steelhead Gender Determination

Methods developed by ODFW were used in gender determination. Gender was be determined by snout shape and/or body shape. Male steelhead tend to have a more protruding snout and may have beak development. Female steelhead tend to have a more rounded, short snout and a wider body near the anus indicating they contain roe.

Steelhead Kelts

Unlike other species of Pacific salmon *(Oncorhynchus spp.),* anadromous steelhead naturally exhibit varying degrees of iteroparity (repeat spawning). Successful steelhead iteroparity involves downstream migration of kelts (post-spawned steelhead) to the estuary or ocean environments (Hatch et al. 2003). During scale pattern analysis we found a few steelhead scales to have a kelt pattern. A kelt scale age is indicated by the standard age followed by an S.

Chinook salmon Run-Size Prediction

Salmon mature and return to spawn between two and seven years of age. Age composition, life history and total age vary among species. For this analysis a brood year (BY) is defined as the year in which the eggs are fertilized and a brood is defined as all the returning progeny of a given BY. This run-size prediction model is based on the relationship between the survivors within a single brood returning at different ages in successive years.

Fryer and Schwartzberg (1994) determined that the number of three-year-old fish for a given BY was a relatively good predictor of the number of subsequent returning four-year-old fish of the same BY. This relationship and a regression analysis (Neter et al. 1985, Weisberg 1985) are used herein to predict the abundance (four-year-old fish in 2005) and the predictive interval ([PI] range), from a known value (the three-year-old fish that returned in 2004). A similar relationship is used to predict returning five-year-old fish in 2005 from four-year-old fish that returned in 2004.

RESULTS

Sampling

Chinook salmon (spring, summer and fall) were sampled for 25 weeks (March through October) during their migration representing 93.6% of the entire Chinook salmon run. A total of 731 spring Chinook were sampled, 705 summer Chinook and 961 fall Chinook (Table 2, 3 and 4 respectively). A total of 650 sockeye salmon were sampled (Table 5) over 6 weeks (June through July) representing 97.7% of their run, and 1146 steelhead were sampled (Table 6 and 7) over 14 weeks (July through October) representing 65.4% of the steelhead run. Summer Chinook were not sampled during week 31 and fall Chinook were not sampled during statistical weeks 32 through 35 due to river water temperatures exceeding 20°C, which is approaching the lethal temperature for migrating adult Chinook salmon (McCullough 1999). Due to high river water temperatures, we were also unable to sample during statistical weeks 32 and 33 of the summer steelhead run.

Fish Coloration and Condition

Bright coloration was observed in the majority of each species, 99.2% of spring Chinook, 97.0% of summer Chinook, 76.6% of fall Chinook, 100.0% of sockeye and 89.7% of steelhead. The highest condition rating of 5 was given to 92.3% of spring Chinook, 94.0% of summer Chinook, 86.5% of fall Chinook, 96.3% of sockeye and 86.9% of steelhead (Table 1). Additional fish condition data can be found in Appendix A.

Table 1: Composition (%) of observed coloration and condition of Columbia Basin salmonids sampled at Bonneville Dam in 2004.

Species	Spring	Summer	Fall	Sockeye	Steelhead
Coloration					
Bright	99.2	97.0	76.6	100.0	89.7
Intermediate	0.5	2.3	15.1	0.0	8.7
Dark	0.1	0.7	8.3	0.0	1.6
Condition					
5	92.3	94.0	86.5	96.3	86.9
4	4.1	3.8	9.4	1.8	8.3
3	3.3	2.0	4.0	1.8	4.7
2	0.1	0.1	0.2	0.0	0.1
1	0.0	0.0	0.0	0.0	0.0

Age Composition

Based on scale pattern analysis spring Chinook salmon returns consisted of 88.7% four-year-olds (Table 2, Figure 2), with a small proportion of five-, three- and six-year-old fish at 6.0%, 5.1% and 0.2% respectively. An estimated 0.4% of the run had scale patterns indicating an ocean-type life history and 99.6% of the run had a stream-type life history (Table 2, Figure 3).

The summer Chinook salmon run consisted of 46.4% five-year-old fish (Table 3, Figure 2), 31.0% four-year-old fish and smaller proportions of three-, six- and two-year-old fish at 17.4%, 4.5% and 0.7% respectively. Scale patterns indicated that 24.5% of the summer run had an ocean-type life history and 75.5% of the run had a stream-type life history (Table 3, Figure 3).

Upriver Bright fall Chinook salmon were mostly five- (39.2%), three (32.6%) and four-year-olds (24.7%), with smaller proportions of two- (2.2%) and six-year-old (1.3%) age classes (Table 4, Figure 2). Scale patterns indicated that 82.9% of the fall run had scale patterns indicating an ocean-type life history and 17.1% had a stream-type life history (Table 4, Figure 3).

Table 2: Weekly and cumulative age composition of Columbia Basin spring Chinook salmon sampled at Bonneville Dam in 2004.

Age Composition by Brood Year and Age Class

Statistical Week	Sampling Date	Number Sampled	Number Ageable	Weekly Run Size	2001	2000	1999		1998
					1.1	1.2	0.4	1.3	1.4
15[a]	4/8	18	15	4294		0.933		0.067	
16	4/13,4/15	130	112	21792	0.009	0.911		0.080	
17	4/19,4/23	240	203	62241		0.966		0.034	
18	4/27,4/29	100	83	20415	0.060	0.916		0.024	
19	5/2,5/5	93	79	29253	0.063	0.873		0.063	
20	5/11	50	38	13583	0.184	0.789		0.026	
21	5/18	50	47	13629	0.149	0.766		0.064	0.021
22[b]	5/25	50	41	13830	0.098	0.683	0.049	0.171	
Cumulative		**731**	**618**	**179037**	**0.051**	**0.887**	**0.004**	**0.057**	**0.002**
Ten Year Average		**776**	**716**	**135233**	**0.070**	**0.746**	**0.001**	**0.179**	**0.001**

Comments: Official spring Chinook run starts on March 15 and ends on May 31 at Bonneville Dam.

a Weekly run size includes fish numbers from Weeks 12-14. Sampling began in Week 15.

b Weekly run size includes fish numbers through May 31 of Week 23. Sampling ended in Week 22.

Age composition of ten year average does not add to 100% as not all age classes of previous years are displayed.

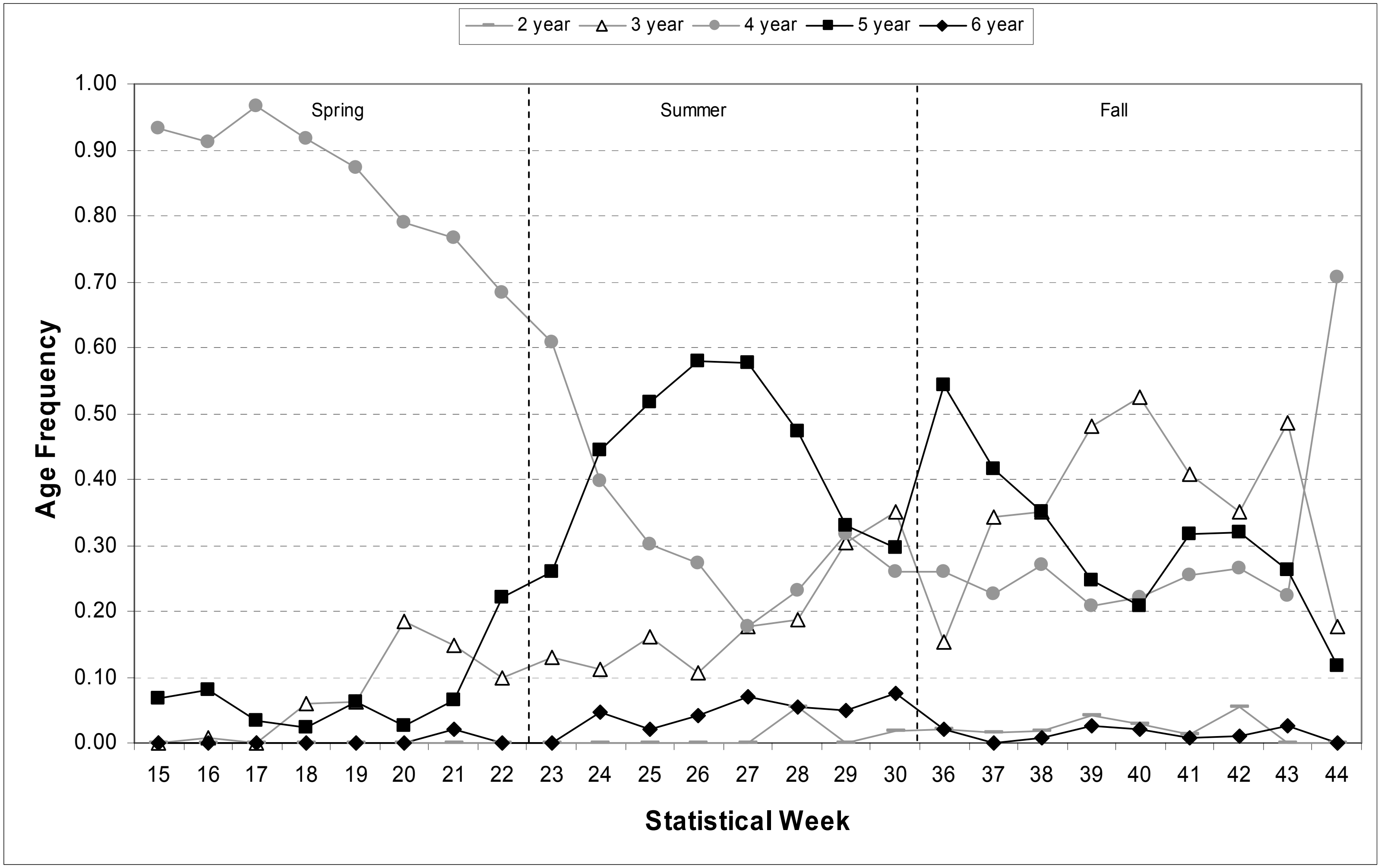

Figure 2: Weekly age composition estimates for age groups of Columbia Basin Chinook salmon sampled at Bonneville Dam in 2004. Sampling did not occur during Weeks 31-35.

Table 3: Weekly and cumulative age composition of Columbia Basin summer Chinook salmon sampled at Bonneville Dam in 2004.

Age Composition by Brood Year and Age Class

Statistical	Sampling	Number	Number	Weekly	2002		2001		2000		1999		1998
Week	**Date**	**Sampled**	**Ageable**	**Run Size**	**0.1**	**1.0**	**0.2**	**1.1**	**0.3**	**1.2**	**0.4**	**1.3**	**1.4**
23	6/1	50	46	9603				0.130		0.609		0.261	
24	6/9	70	63	15015				0.111	0.016	0.381	0.048	0.397	0.048
25	6/15,6/17	100	93	15875			0.022	0.140	0.011	0.290	0.226	0.290	0.022
26	6/22,6/24	100	95	19653			0.032	0.074	0.053	0.221	0.221	0.358	0.042
27	6/29,6/30	140	130	15545			0.085	0.092	0.023	0.154	0.223	0.354	0.069
28	7/6,7/8	100	91	11312	0.033	0.022	0.088	0.099	0.022	0.209	0.198	0.275	0.055
29	7/13,7/15	90	82	9508			0.134	0.171	0.024	0.293	0.146	0.183	0.049
30[a]	7/20,7/22	55	54	8521	0.019		0.167	0.185	0.037	0.222	0.111	0.185	0.074
Cumulative		**705**	**654**	**105032**	**0.005**	**0.002**	**0.057**	**0.118**	**0.025**	**0.285**	**0.159**	**0.305**	**0.045**
Ten Year Average		**521**	**480**	**59158**	**0.005**	**0.000**	**0.026**	**0.119**	**0.081**	**0.355**	**0.067**	**0.318**	**0.026**

Comments: Official summer Chinook run starts on June 1 and ends on July 31 at Bonneville Dam.
a Weekly run size includes fish numbers from Week 31. Sampling ended in Week 30.
Age composition of ten year average does not add to 100% as not all age classes of previous years are displayed.

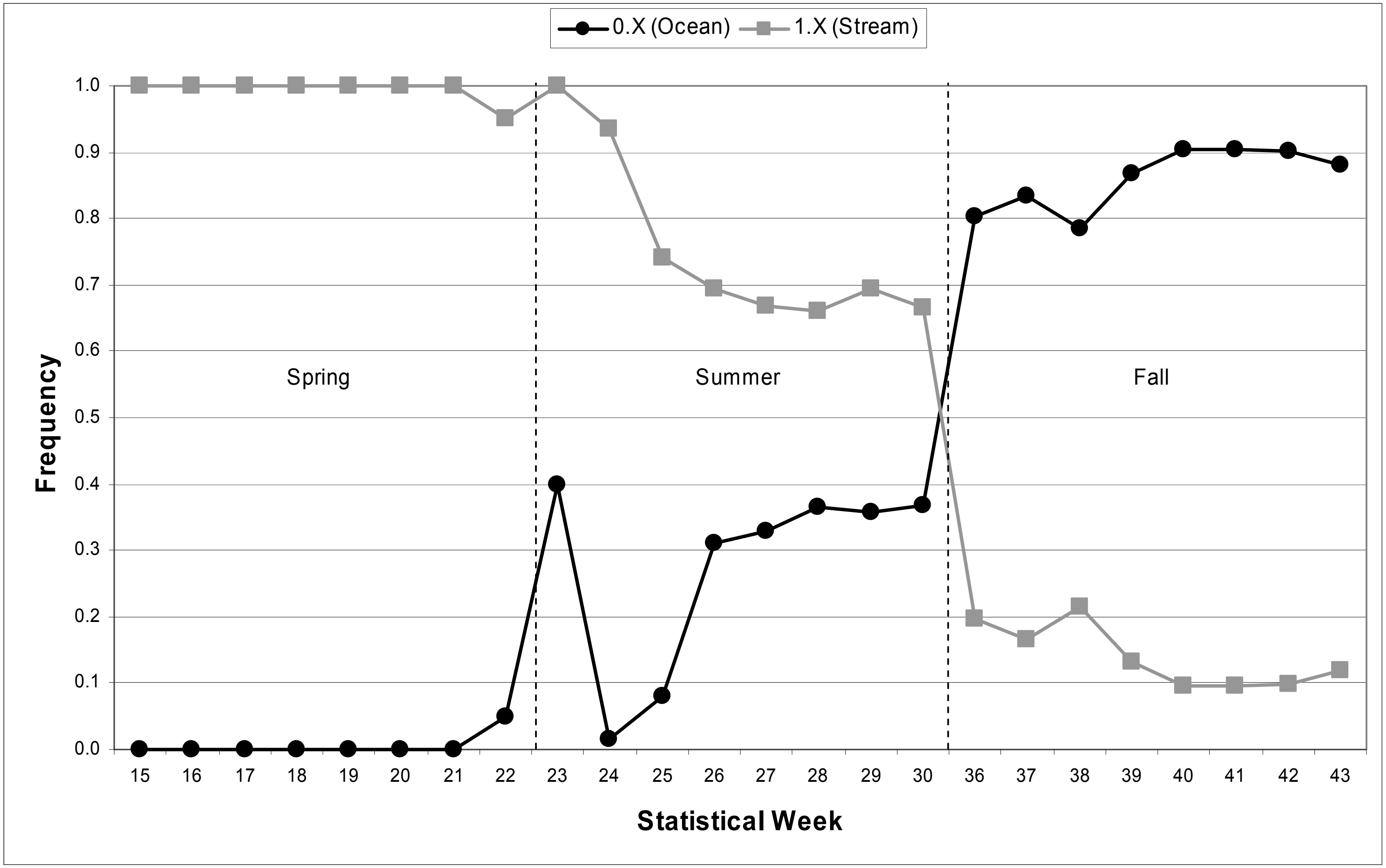

Figure 3: Weekly freshwater age composition estimates of Columbia Basin Chinook salmon sampled at Bonneville Dam in 2004. Sampling did not occur during Weeks 31 through 35.

Table 4: Weekly and cumulative age composition of Columbia Basin bright fall Chinook salmon sampled at Bonneville Dam in 2004.

Age Composition by Brood Year and Age Class

Statistical Week	Sampling Date	Number Sampled	Number Ageable	Weekly run size	2002	2001		2000		1999		1998	
					0.1	0.2	1.1	0.3	1.2	0.4	1.3	0.5	1.4
36[a]	8/31,9/2	99	92	120203	0.022	0.109	0.043	0.196	0.065	0.467	0.076	0.011	0.011
37	9/7,9/9	127	120	117463	0.017	0.283	0.058	0.167	0.058	0.367	0.050		
38	9/14,9/16	115	111	90524	0.018	0.315	0.036	0.162	0.108	0.279	0.072	0.009	
39	9/21,9/24	126	121	56139	0.041	0.446	0.033	0.140	0.066	0.215	0.033	0.025	
40	9/28,10/1	149	145	32340	0.028	0.517	0.007	0.186	0.034	0.166	0.041	0.007	0.014
41	10/5,10/7	149	145	15097	0.014	0.400	0.007	0.214	0.041	0.269	0.048	0.007	
42	10/12,10/14	99	91	8542	0.055	0.319	0.033	0.220	0.044	0.297	0.022	0.011	
43	10/19,10/20	80	76	4606		0.487		0.184	0.039	0.197	0.066	0.013	0.013
44[b]	10/26	17	17	3637		0.176		0.529	0.176	0.118			
Cumulative		**961**	**918**	**448551**	**0.022**	**0.286**	**0.040**	**0.177**	**0.069**	**0.334**	**0.058**	**0.009**	**0.004**
Eight Year Average		**642**	**603**	**310427**	**0.038**	**0.220**	**0.039**	**0.371**	**0.085**	**0.196**	**0.042**	**0.005**	**0.005**

Comments: Official fall run starts on August 1 and ends on November 15 at Bonneville Dam.

a Weekly run size includes fish numbers from Weeks 32-35. Sampling began in Week 36.

b Weekly run size includes fish numbers from Weeks 45-47. Sampling ended in Week 44.

The run size includes upriver brights only.

Age composition of six year average does not add to 100% as not all age classes of previous years are displayed.

The Sockeye salmon run was composed mainly of 97.7% four-year-olds, with smaller proportions of five-year-old (1.1%), three-year-old (1.0%) and six-year-old fish (0.2%) (Table 5).

The 2004 summer steelhead run passing Bonneville Dam consisted of mainly 40.7% four-year-old fish and 39.7% three-year-old fish. There were smaller proportions of five- (12.5%), six- (5.3%), seven- (1.0%) and eight-year-old fish (0.8%) (Table 6). Age compositions for hatchery and wild steelhead based only on scale pattern analysis and only on fin marks are presented in Appendix A.

Length-at-Age Composition

Length-at-age composition estimates are presented in Figure 4 and Appendix A.

Steelhead Hatchery/Wild Determination

When classifying hatchery and wild steelhead based on both scale pattern analysis and fin marks, the run was consisted of 74.1% hatchery and 25.9% wild steelhead (Table 7). Steelhead hatchery/wild compositions based only on scale pattern analysis and only on fin marks are presented in Appendix A.

Steelhead A/B Determination

Assuming that A-run (less than 78 cm) and B-run (greater than 78 cm) steelhead can be differentiated by length alone, the majority of the steelhead run passing Bonneville Dam (87.3%) are A-run, and the remaining (12.7%) are B-run. Though A-run steelhead dominate the run, the percentage of B-run fish does generally increase as the run progresses (Table 7). Hatchery and wild A/B compositions are presented in Appendix A.

Steelhead Gender Determination

The 2004 steelhead run consisted of 59.7% females and 40.3% males (Table 7). Gender compositions for hatchery and wild steelhead are presented in Appendix A.

Table 5: Weekly and cumulative age composition of Columbia Basin sockeye salmon sampled at Bonneville Dam in 2004.

Age Composition by Brood Year and Age Class

Statistical Week	Sampling Date	Number Sampled	Number Ageable	Weekly Run Size	2001	2000	1999			1998
					1.1	1.2	1.3	2.2	3.1	2.3
24[a]	6/9	70	68	9997		0.971		0.029		
25	6/15,6/17	140	138	31706		0.978		0.007	0.007	0.007
26	6/22,6/24	160	153	44331	0.013	0.980		0.007		
27	6/29,6/30	140	134	22241		0.985	0.015			
28	7/6,7/8	100	97	10175	0.052	0.948				
29[b]	7/13,7/15	40	36	4841	0.028	0.972				
Cumulative		**650**	**626**	**123291**	**0.010**	**0.977**	**0.003**	**0.007**	**0.002**	**0.002**
Six Year Average		**502**	**485**	**64499**	**0.045**	**0.764**	**0.075**	**0.072**	**0.016**	**0.003**

Comments: a Weekly run size includes fish numbers from Weeks 21-23. Sampling began in Week 24.
b Weekly run size includes fish numbers from Weeks 30-45. Sampling ended in Week 29.
Age composition of seven year average does not add to 100% as not all age classes of previous years are displayed.

Table 6: Weekly and cumulative age composition of Columbia Basin steelhead sampled at Bonneville Dam in 2004.

Age Composition by Brood Year and Age Class

Statistical	Sampling	Number	Number	Weekly	2001	2000		1999			1998			1997	1-Fresh Wild		Kelt		Unageable			
Week	Date	Sampled	Ageable	Run Size	1.1	1.2	2.1	1.3	2.2	3.1	2.3	3.2	4.1	4.2	W1.1	W1.3	2.1S	3.1S	R	R.1	R.2	R.3
29[a]	7/13,7/15	140	114	54613	0.360	0.281	0.175	0.009	0.053	0.061		0.044	0.009		0.009				0.007	0.057	0.121	
30	7/20,7/22	130	101	19480	0.248	0.386	0.089	0.010	0.149	0.050		0.059				0.010			0.008	0.131	0.085	
31	7/27	100	77	13473	0.390	0.364	0.078		0.091		0.013	0.039			0.013	0.013				0.080	0.150	
34[b]	8/17	84	61	83070	0.443	0.262	0.082		0.115	0.033		0.016			0.016	0.016	0.016		0.119	0.083	0.071	
35	8/24	50	35	8942	0.686	0.114	0.086	0.029				0.029					0.029	0.029		0.180	0.100	0.020
36	8/31,9/2	122	89	39713	0.517	0.281	0.045		0.079	0.011		0.056				0.011			0.008	0.131	0.131	
37	9/7,9/9	78	59	22788	0.373	0.373	0.017	0.017	0.085			0.085		0.017	0.017	0.017				0.128	0.115	
38	9/14,9/16	104	84	26249	0.286	0.452	0.012	0.048	0.060	0.012	0.012	0.107		0.012					0.029	0.058	0.087	0.019
39	9/21,9/24	104	90	18108	0.200	0.511	0.022	0.044	0.067	0.011	0.022	0.111						0.011	0.029	0.038	0.058	0.010
40	9/28,10/1	60	49	9348	0.306	0.592		0.041	0.041			0.020							0.017	0.050	0.067	0.050
41	10/5,10/7	60	53	6763	0.396	0.472		0.057	0.057	0.019										0.067	0.033	0.017
42	10/12,10/14	60	43	3841	0.372	0.442	0.047	0.047		0.047	0.023	0.023								0.183	0.100	
43	10/19,10/20	40	34	1572	0.235	0.382	0.088	0.059	0.147	0.029		0.059								0.025	0.125	
44[c]	10/26	14	12	998	0.833	0.083			0.083										0.071			0.071
Cumulative		**1146**	**901**	**308958**	**0.391**	**0.332**	**0.075**	**0.014**	**0.082**	**0.027**	**0.003**	**0.049**	**0.002**	**0.002**	**0.008**	**0.008**	**0.005**	**0.001**	**0.040**	**0.088**	**0.096**	**0.005**

Comments: Official summer run starts on April 1 and ends on October 31 at Bonneville Dam.

a Weekly run size includes fish numbers from Weeks 14-28. Sampling began in Week 29.

b Weekly run size includes fish numbers from Weeks 32 and 33.

c Weekly run size includes fish numbers from Week 45. Sampling ended in Week 44.

Steelhead are classified based on both scale pattern analysis and fin marks.

Table 7: Weekly and cumulative fin mark, gender, length and hatchery/wild composition of Columbia Basin steelhead sampled at Bonneville Dam in 2004.

Hatchery/Wild

Statistical	Sampling	Number	Number	Weekly	Fin Clips		Stubby	Sex		Length		Hatchery/Wild	
Week	Date	Sampled	Ageable	Run Size	Adipose	Other	Dorsal	Female	Male	< 78cm	≥ 78cm	H	W
29[a]	7/13,7/15	140	114	54613	0.400	0.050	0.429	0.693	0.307	0.993	0.007	0.667	0.333
30	7/20,7/22	130	101	19480	0.423	0.100	0.408	0.730	0.270	0.985	0.015	0.653	0.347
31	7/27	100	77	13473	0.500	0.090	0.480	0.465	0.535	1.000		0.753	0.247
34[b]	8/17	84	61	83070	0.476	0.095	0.357	0.690	0.310	0.988	0.013	0.705	0.295
35	8/24	50	35	8942	0.540	0.140	0.520	0.600	0.400	0.980	0.020	0.829	0.171
36	8/31,9/2	122	89	39713	0.574	0.131	0.508	0.512	0.488	0.918	0.082	0.798	0.202
37	9/7,9/9	78	59	22788	0.590	0.141	0.538	0.494	0.506	0.744	0.256	0.763	0.237
38	9/14,9/16	104	84	26249	0.702	0.067	0.413	0.529	0.471	0.606	0.394	0.786	0.214
39	9/21,9/24	104	90	18108	0.654	0.038	0.288	0.462	0.538	0.510	0.490	0.756	0.244
40	9/28,10/1	60	49	9348	0.783	0.033	0.333	0.441	0.559	0.483	0.517	0.939	0.061
41	10/5,10/7	60	53	6763	0.767	0.100	0.433	0.433	0.567	0.650	0.350	0.925	0.075
42	10/12,10/14	60	43	3841	0.667	0.067	0.500	0.400	0.600	0.717	0.283	0.860	0.140
43	10/19,10/20	40	34	1572	0.450	0.025	0.250	0.225	0.775	0.725	0.275	0.676	0.324
44[c]	10/26	14	12	998	0.786	0.071	0.429	0.571	0.429	0.857	0.143	0.917	0.083
Cumulative		**1146**	**901**	**308958**	**0.532**	**0.088**	**0.419**	**0.597**	**0.403**	**0.873**	**0.127**	**0.741**	**0.259**

Comments: Official summer run starts on April 1 and ends on October 31 at Bonneville Dam.

a Weekly run size includes fish numbers from Weeks 14-28. Sampling began in Week 29.

b Weekly run size includes fish numbers from Weeks 32 and 33.

c Weekly run size includes fish numbers from Week 45. Sampling ended in Week 44.

Hatchery steelhead are determined by scale pattern analysis, and the presence of fin clips and/or a stubby dorsal fin.

Wild steelhead are determined by scale pattern analysis and the absence of fin clips.

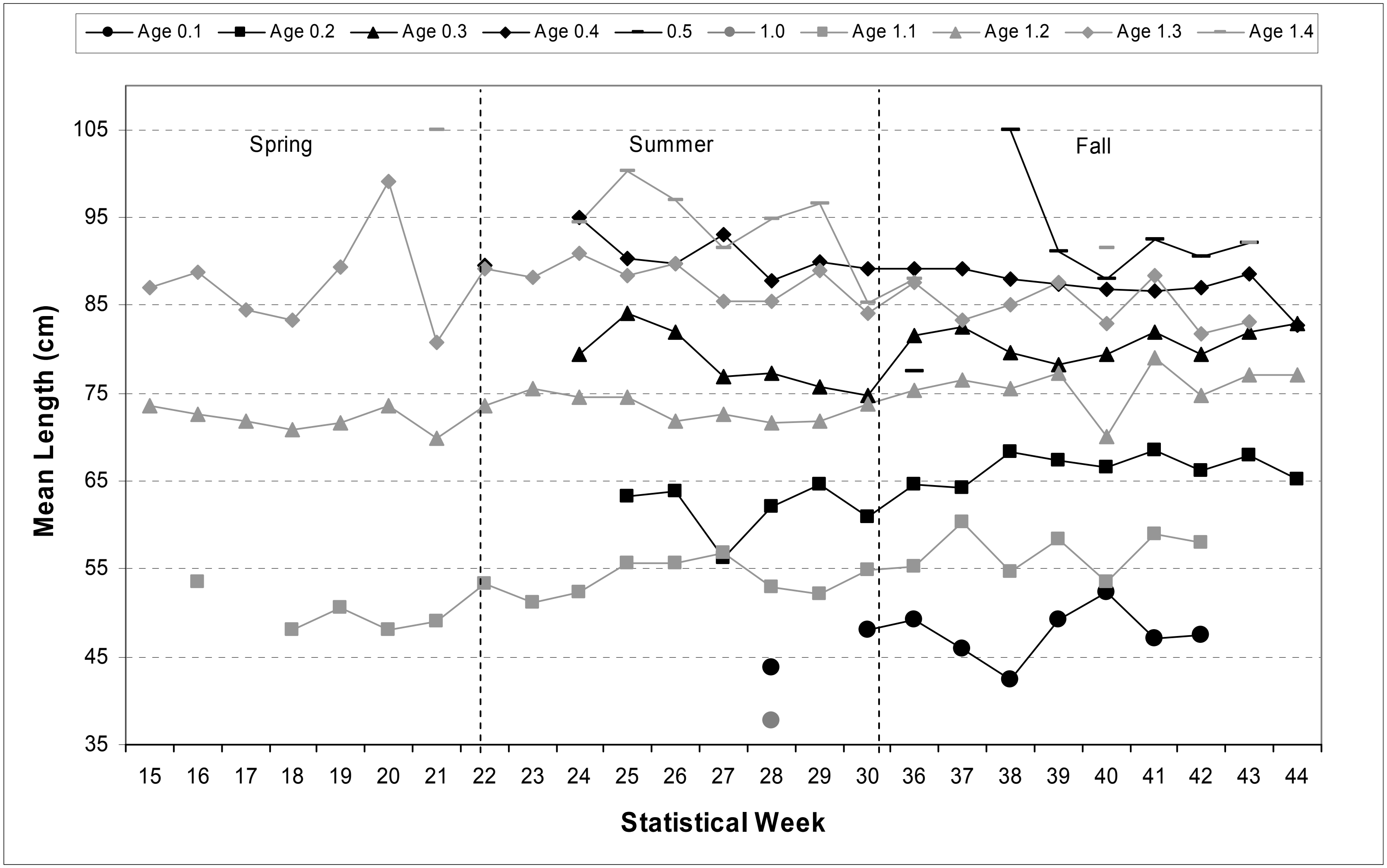

Figure 4: Weekly mean length estimates of Columbia Basin Chinook salmon by age class (showing ocean- and stream-type) sampled at Bonneville Dam in 2004. Not all life history types were present each week of sampling. Sampling did not occur during Weeks 31 through 35.

Chinook Salmon Run-Size Prediction for 2005

Using a linear relationship between the 2004 three- and four-year-old returns of spring Chinook (Figure 5) to predict the abundance of four-year-old adult spring Chinook salmon returning to Bonneville Dam in 2005, the estimated number of adult returns is 118,000 (± 63,700, 90% PI). Using the relationship between four- and five-year-olds to construct the model (Figure 6), albeit poorer than that existing between three-year-olds and four-year-olds, predicts that the 2005 five-year-old adult abundance at Bonneville Dam will be 39,000 (± 43,700, 90% PI).

For the 2005 summer Chinook salmon run at Bonneville Dam, the relationship between three- and four-year-olds (Figure 7) results in a prediction of 58,200 (± 26,200, 90% PI) four-year-olds. The relationship between four- and five-year-olds (Figure 8), the model predicts a return of 31,400 (± 8,200, 90% PI) five-year-olds.

Based on the relationship between three- and four-year-olds (Figure 9), the model results in a prediction of 256,500 (± 147,600, 90% PI) four-year-old Upriver Bright fall Chinook salmon returns for 2005. Using the relationship between four- and five-year-olds (Figure 10), the model results in a prediction of 57,400 (± 45,400, 90% PI) returning five-year-olds.

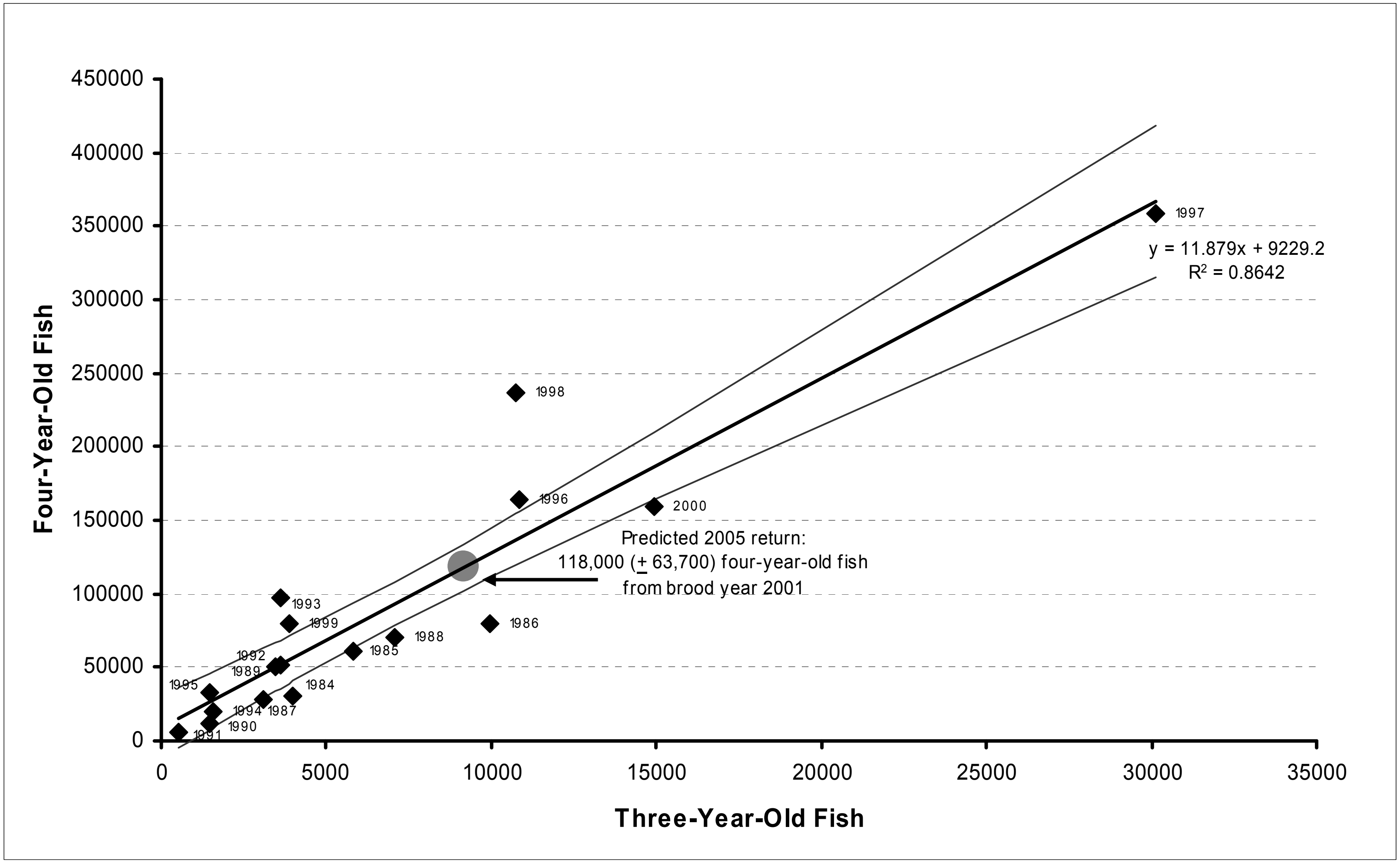

Figure 5: Predicted 2005 four-year-old Columbia Basin spring Chinook salmon abundance (at Bonneville Dam) based on a linear relationship between four-year-old and three-year-old fish abundance during brood years 1984 through 2000. Confidence intervals (90%) are also graphed.

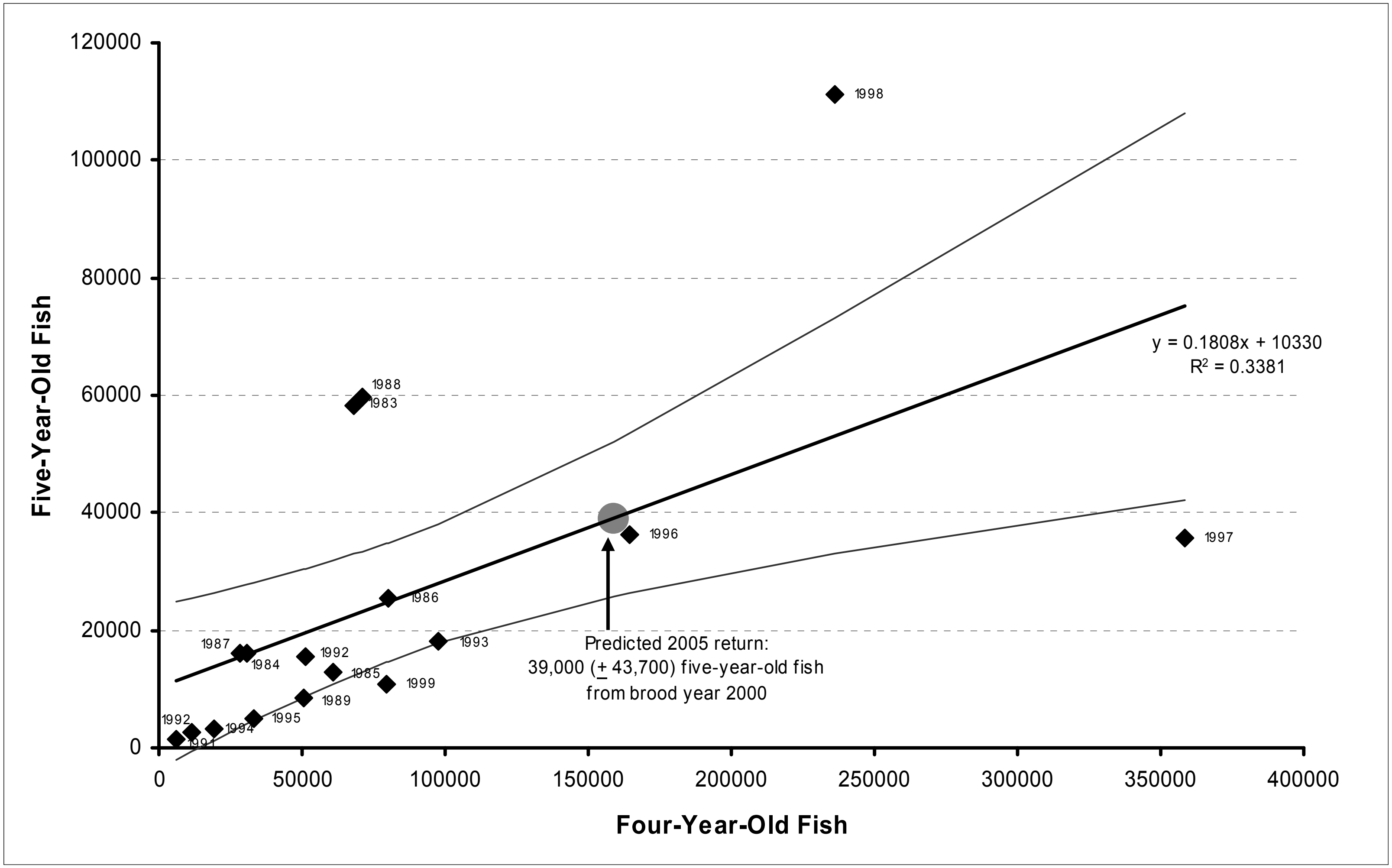

Figure 6: Predicted 2005 five-year-old Columbia Basin spring Chinook salmon abundance (at Bonneville Dam) based on a linear relationship between five-year-old and four-year-old fish abundance during brood years 1983 through 1999. Confidence intervals (90%) are also graphed.

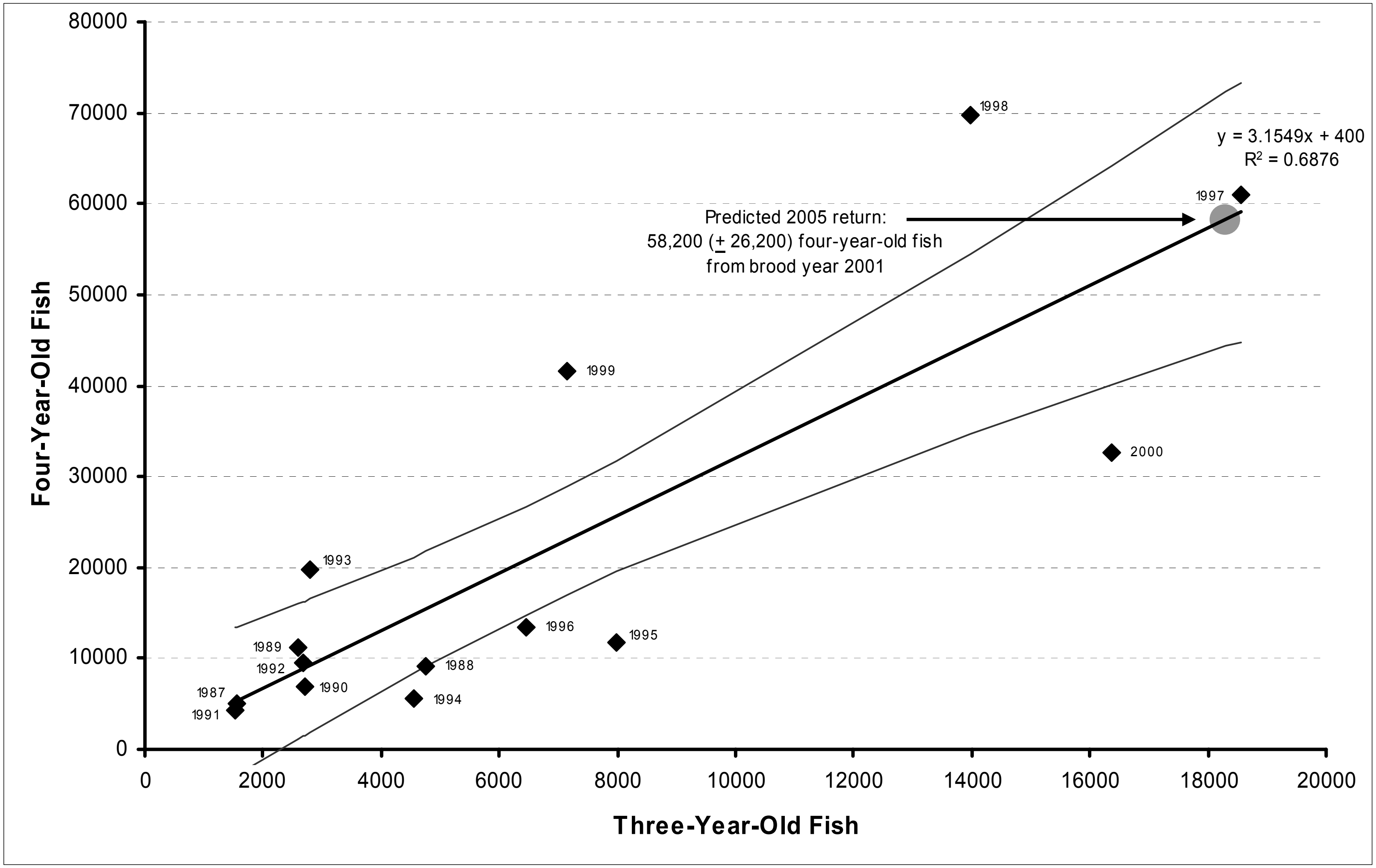

Figure 7: Predicted 2005 four-year-old Columbia Basin summer Chinook salmon abundance (at Bonneville Dam) based on a linear relationship between four-year-old and three-year-old fish abundance during brood years 1987 through 2000. Confidence intervals (90%) are also graphed.

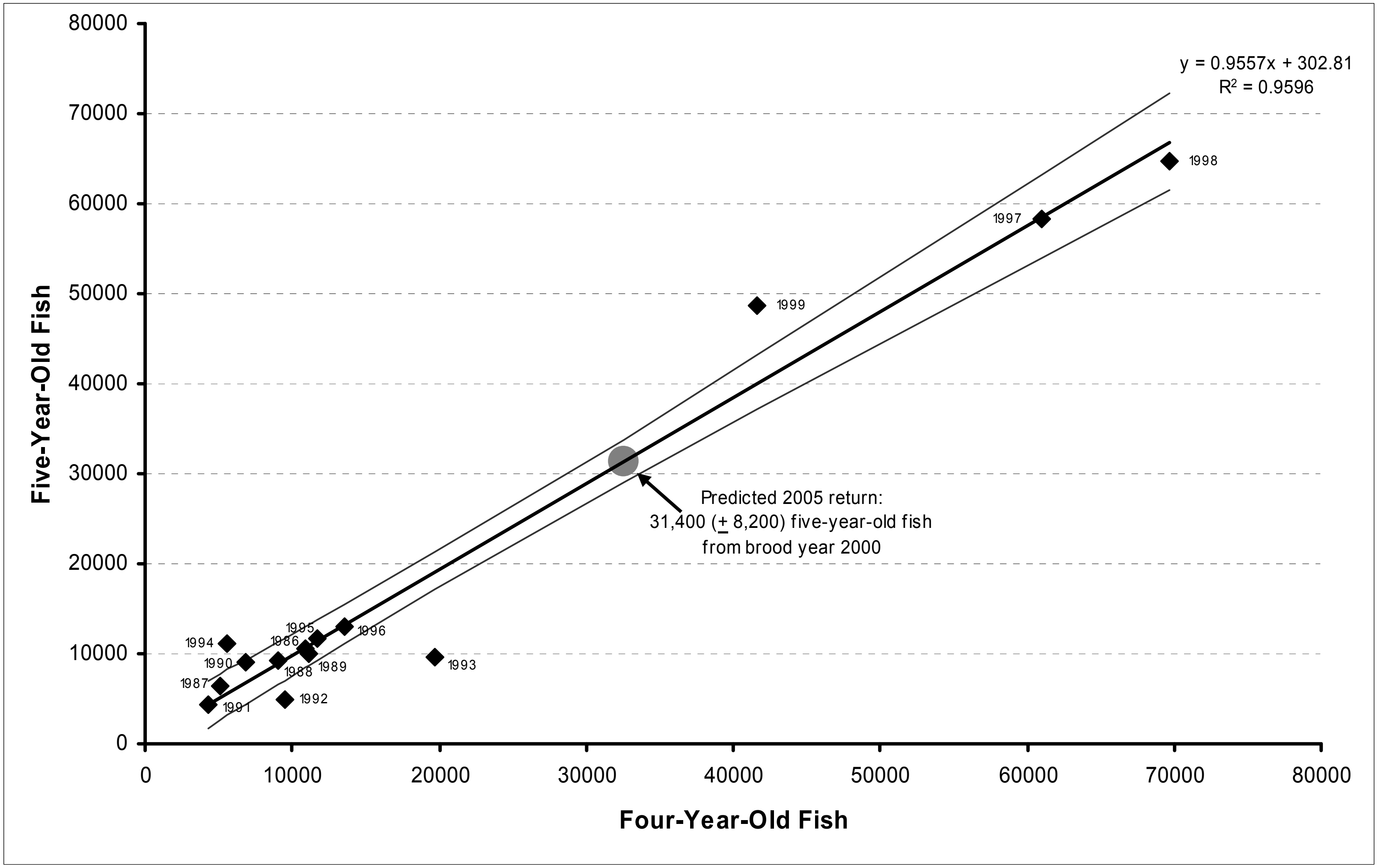

Figure 8: Predicted 2005 five-year-old Columbia Basin summer Chinook salmon abundance (at Bonneville Dam) based on a linear relationship between five-year-old and four-year-old fish abundance during brood years 1986 through 1999. Confidence intervals (90%) are also graphed.

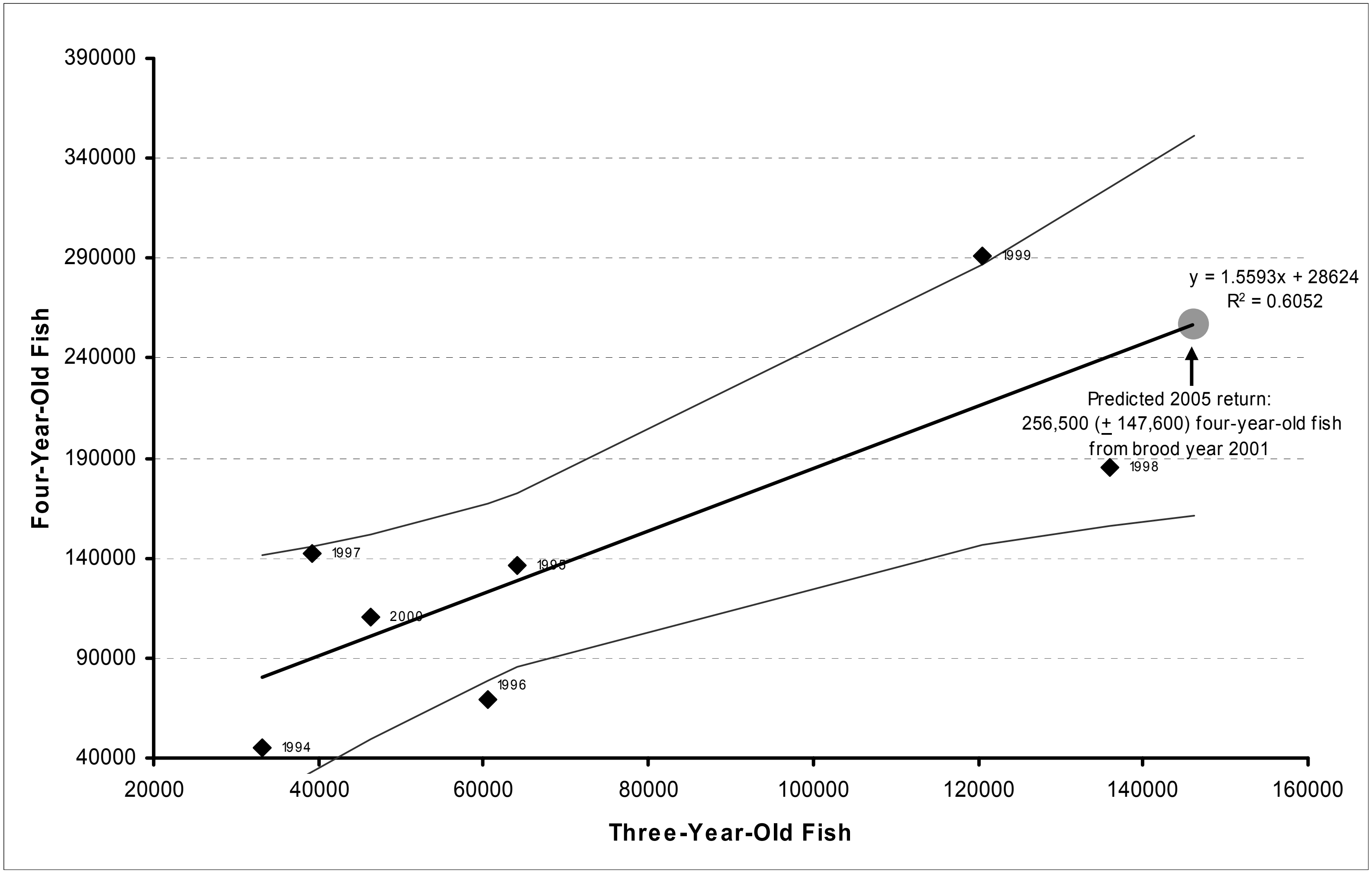

Figure 9: Predicted 2005 four-year-old Columbia Basin bright fall Chinook salmon abundance (at Bonneville Dam) based on a linear relationship between four-year-old and three-year-old fish abundance during brood years 1994 through 2000. Confidence intervals (90%) are also graphed.

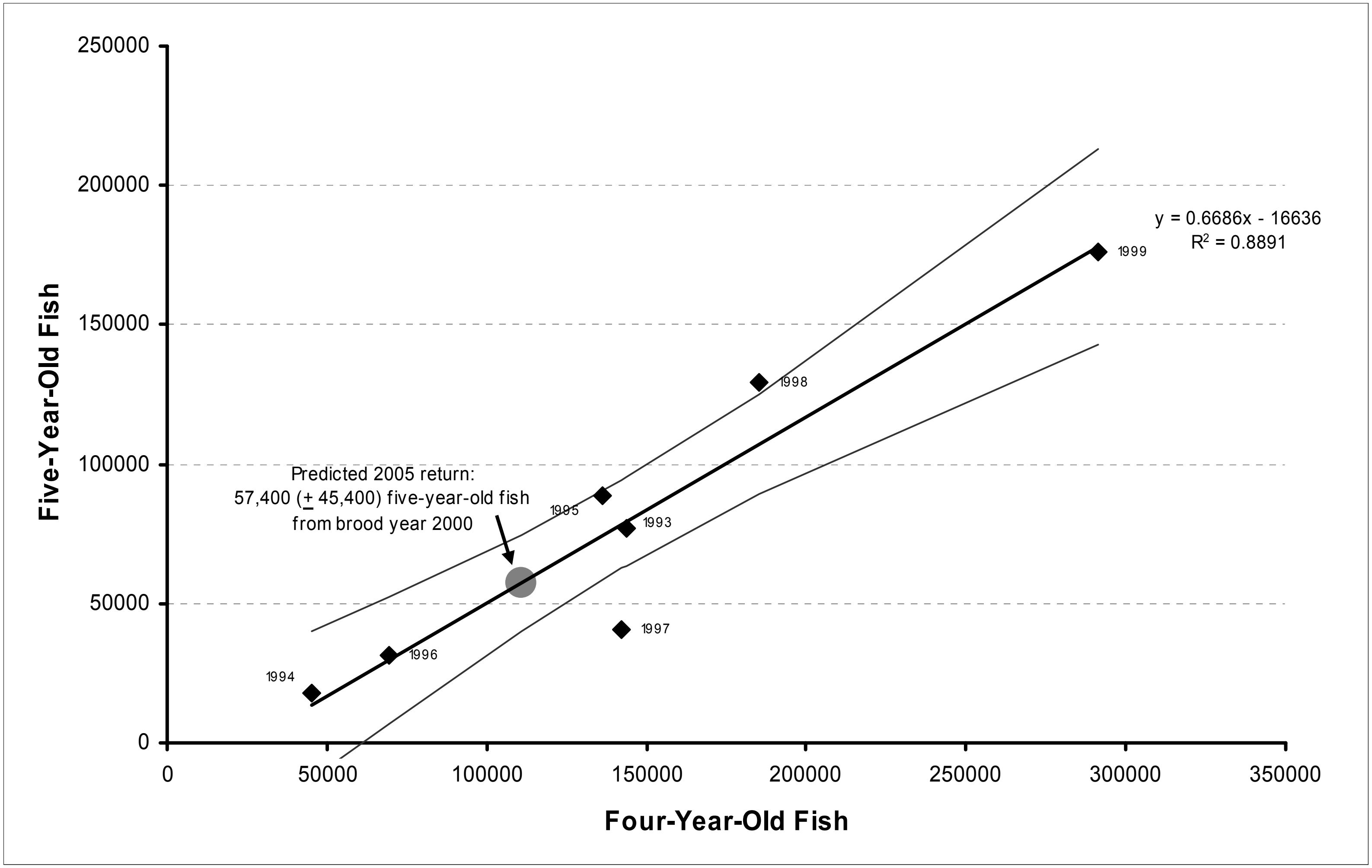

Figure 10: Predicted 2005 five-year-old Columbia Basin bright fall Chinook salmon abundance (at Bonneville Dam) based on a linear relationship between five-year-old and four-year-old fish abundance during brood years 1993 through 1999. Confidence intervals (90%) are also graphed.

Based on 2003 results, we made run size predictions for four- and five-year-old spring, summer, and bright fall Chinook salmon returning to Bonneville Dam in 2004 (Miranda et al. 2004) using the methods discussed in this report. For the two principle age groups (four-year-old and five-year-old), we predicted 216,900 spring, 98,800 summer and 281,100 bright fall Chinook versus DART (2005) and the Fish Passage Center (2005) estimated returns of 169,600 spring, 81,200 summer and 286,500 bright fall Chinook salmon. Four of the six age groups predicted for 2004 were within the 90% prediction interval (Table 8) and the two that were outside were those with by far the smallest prediction intervals. Overall, we predict that the 2005 spring, summer and Upriver Bright fall Chinook return of four-year-old and five-year-old fish will be similar to the 2004 return (Table 8).

All of our predictions for Chinook returning in 2005 are based on a relatively low number of data points and are beyond the majority of historical data points. In particular, our prediction for five-year-old Upriver Bright fall Chinook salmon returning in 2005 is based on a low number of data points. Our prediction for four-year-old summer and Upriver Bright fall Chinook is beyond the range of previous data. A regression to predict beyond the range of past data should be used with extreme caution, as it cannot be assumed that the regression function that fits the past data is appropriate over a wider range (Neter et al. 1985).

Table 8: Predicted and estimated abundance of Chinook salmon returning to Bonneville Dam.

Species	2003 Report's Predicted (± 90%) for Year 2004	Year 2004 Estimate	Predicted (± 90%) for Year 2005
Spring Chinook 4-year-old	191,300 (± 67,400)	158,800	118,000 (± 63,700)
Spring Chinook 5-year-old	25,600 (± 44,100)	10,800	39,000 (± 43,700)
Summer Chinook 4-year-old	60,400 (± 23,400)	32,500	58,200 (± 26,200)
Summer Chinook 5-year-old	38,400 (± 7,000)	48,700	31,400 (± 8,200)
Bright Fall Chinook 4-year-old	98,200 (± 149,400)	110,700	256,500 (± 147,600)
Bright Fall Chinook 5-year-old	182,900 (± 89,600)	175,800	57,400 (± 45,400)

2004 estimate is calculated using the proportion of X-year-old returning in 2004 multiplied by the count of spring, summer and fall Chinook at Bonneville Dam.

DISCUSSION

River Water Temperature

High river water temperature is a factor affecting sampling procedures during most summer sampling seasons. Our section 10 permit only allows sampling of Chinook salmon at temperatures up to 20^{o}C. The ACOE also has modified sampling protocols for temperatures between 20 and 23.3^{o}C with no sampling allowed at temperatures above 23.3^{o}C. Therefore, during the 2004 sampling season, summer Chinook were not sampled during week 31 and fall Chinook were not sampled during statistical weeks 32 through 35. We were also unable to sample the summer steelhead run during statistical weeks 32 and 33 due to river temperatures exceeding 23.3^{o}C. McCullough (1999) asserts that temperatures exceeding 21^{o}C may establish a migratory barrier for Chinook salmon and Figure 11 appears to support that claim. Temperatures in this range don't appear to be as much of a factor in the steelhead migration.

Genetic Sampling

In 2004, genetic samples were collected from the majority of Chinook and steelhead that were sampled at the Adult Fish Facility at Bonneville Dam. This was the second full year for Chinook genetic collection and the first year that we collected samples from steelhead. In previous years steelhead genetic samples were collected by ODFW and WDFW. Currently significant progress has been made through the coast wide Chinook genetic database to assemble baseline genetic stock identification information for all Columbia River Chinook populations. The development of baseline genetic stock information for steelhead is still in its infancy. Once this baseline stock information is readily available, mixed stock sampling at Bonneville will be a valuable tool for fisheries and ESA management within the Columbia River Basin.

Project Continuation

It is expected that this stock assessment study will continue to develop an accurate age composition and length-at-age database for Columbia Basin upriver salmon populations, and work towards improving the forecasting of terminal runs, which is important for the calibration of the PSC Chinook Technical Committee's Chinook model. The data will also aid fisheries managers in formulating spawner-return relationships and analyzing productivity. Continued data collection on age composition and length-at-age will allow managers to more accurately monitor the effects of ocean harvest restrictions agreed upon by the Pacific Salmon Treaty. The addition of steelhead to our normal sampling regime provides valuable information for NOAA-Fisheries and TAC for use in steelhead assessments, fisheries forecasting and harvest management. This study will work to improve accurate age determination, hatchery fraction, and stock identification and assessment.

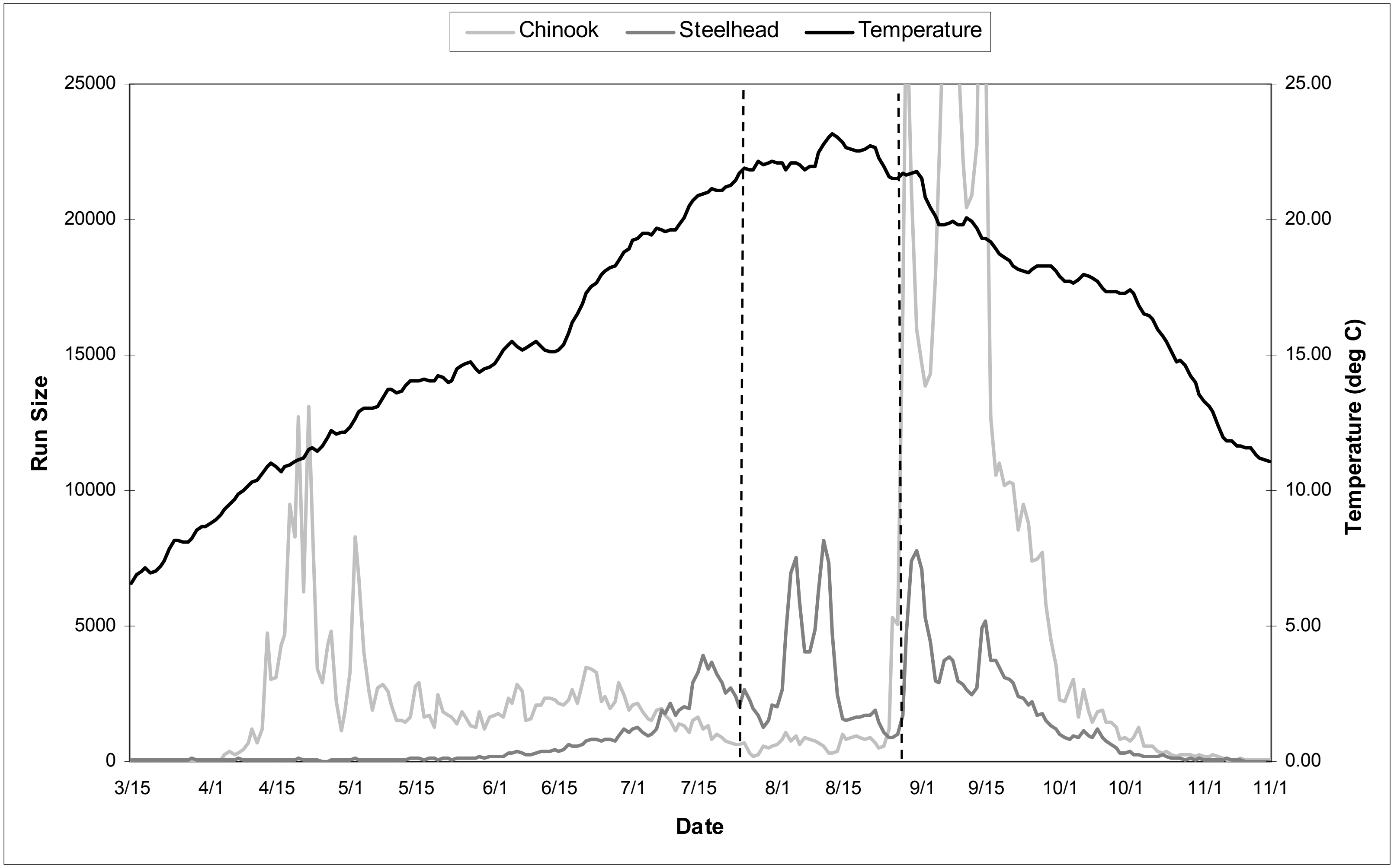

Figure 11: Chinook and steelhead daily run size and daily river temperature from March 15 through November 1, 2004. The dashed lines represent the date range that we did not sample due to high river water temperatures (weeks 32 through 35 for Chinook and weeks 32 and 33 for steelhead.

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APPENDIX A

LIST OF TABLES

Table A1: Percent of sampled Chinook, sockeye and steelhead at Bonneville Dam having identifying clips by statistical week and total sampled in 2004.

Statistical Week	Spring Chinook	Summer Chinook	Fall Chinook	Sockeye	Steelhead
12	X				
13	X				
14	X				X
15	83.3				X
16	62.3				X
17	74.6				X
18	78.0				X
19	71.0				X
20	70.0				X
21	42.0			X	X
22	50.0			X	X
23	X	44.0		X	X
24		47.1		8.6	X
25		43.0		2.1	X
26		32.0		3.8	X
27		34.3		1.4	X
28		40.0		2.0	X
29		37.8		0.0	45.0
30		41.8		X	52.3
31		X		X	59.0
32			X	X	X
33			X	X	X
34			X	X	57.1
35			X	X	68.0
36			6.1	X	70.5
37			15.7	X	73.1
38			5.2	X	76.9
39			4.8	X	69.2
40			6.7	X	81.7
41			3.4	X	86.7
42			6.1	X	73.3
43			1.3	X	47.5
44			0.0	X	85.7
45			X	X	X
46			X		
47			X		
% of Total Sampled	68.4	39.0	6.2	2.9	64.8

X Represents a week that a species was present, but sampling did not occur. Therefore, the percent in a statistical week before or after an X is assumed to represent the weeks during which sampling did not occur. For example, spring Chinook were first sampled in Week 15 and this week is assumed to represent Weeks 12 through 14 as well.

Table A2: Composition (%) of observed injuries of Columbia Basin Chinook salmon sampled at Bonneville Dam in 2004.

Injury Category	Spring	Summer	Fall
Marine Mammal			
Bite	0.7	0.1	0.0
Scrape	24.9	6.0	4.9
Total[a]	25.6	6.1	4.9
Descaling			
10-19%			
Left side	10.3	16.6	6.3
Right side	7.7	13.9	6.2
Total[b]	7.4	13.3	6.1
≥20%			
Left side	0.7	2.6	1.1
Right side	0.7	3.5	0.9
Total[c]	0.8	4.1	1.0
Other Injuries			
Bruise	0.5	0.0	0.0
Cut	0.0	0.3	0.1
Head Injury	12.6	14.5	17.1
Head Burn	0.1	0.3	0.0
Fin	22.0	17.3	27.9
Fungus	3.6	0.3	2.8
Gash	1.1	1.1	2.5
Gas Bubble Trauma	0.0	0.0	0.0
Gill Net	4.2	0.3	8.5
Fish Hook	2.1	1.0	1.4
Lamprey	1.1	0.4	0.0
Parasite	4.1	6.2	6.1
Total[a]	36.3	33.5	44.1

a Totals do not represent the sum of subcategories, they are the number of fish with at least one injury. Fish can display more than one type of marine mammal or general injury. Marine mammal injuries described as follows: Bite (ragged wounds, often in caudal area), and Scrape (parallel or curved scratches on flanks of fish).

b This total represents the number of fish with descaling on either side, which is 10% - 19% descaled. If either side is > 19%, the fish moves into another category.

c This total represents the number of fish with descaling on either side, which is ≥ 20% descaled.

Table A3: Composition (%) of observed injuries of Columbia Basin sockeye and steelhead sampled at Bonneville Dam in 2004.

Injury Category	Sockeye	Steelhead
Marine Mammal		
Bite	0.0	0.2
Scrape	2.8	14.9
Total[a]	2.8	15.0
Descaling		
10-19%		
Left side	25.4	12.8
Right side	22.0	10.4
Total[b]	20.2	9.5
≥20%		
Left side	5.8	3.1
Right side	6.8	3.1
Total[c]	8.5	4.0
Other Injuries		
Bruise	0.0	0.0
Cut	0.3	0.5
Head Injury	1.5	5.1
Head Burn	0.0	0.0
Fin	3.8	17.6
Fungus	0.0	1.0
Gash	1.4	5.5
Gas Bubble Trauma	0.0	0.0
Gill Net	0.3	4.6
Fish Hook	0.2	0.1
Lamprey	0.2	0.0
Parasite	4.5	1.2
Total[a]	11.1	28.8

a Totals do not represent the sum of subcategories, they are the number of fish with at least one injury. Fish can display more than one type of marine mammal or general injury. Marine mammal injuries described as follows: Bite (ragged wounds, often in caudal area), and Scrape (parallel or curved scratches on flanks of fish).

b This total represents the number of fish with descaling on either side, which is 10% - 19% descaled. If either side is > 19%, the fish moves into another category.

c This total represents the number of fish with descaling on either side, which is ≥ 20% descaled.

Table A4: Length-at-age estimates for Columbia Basin spring Chinook salmon sampled at Bonneville Dam in 2004. Composite estimates of age classes are weighted by weekly run size.

Brood Year and Age Class	2001 1.1	2000 1.2	1999 0.4	1999 1.3	1998 1.4
Statistical Week 15					
Mean Fork Length (cm)		73.57		87.00	
Maximum		78.0		87.0	
Minimum		65.0		87.0	
Standard Deviation		3.97		-	
Sample Size		14		1	
Statistical Week 16					
Mean Fork Length (cm)	53.50	72.64		88.72	
Maximum	53.5	84.0		102.5	
Minimum	53.5	60.5		80.0	
Standard Deviation	-	3.85		7.38	
Sample Size	1	101		9	
Statistical Week 17					
Mean Fork Length (cm)		71.81		84.57	
Maximum		83.5		94.0	
Minimum		55.5		72.5	
Standard Deviation		4.66		6.96	
Sample Size		195		7	
Statistical Week 18					
Mean Fork Length (cm)	48.10	70.77		83.25	
Maximum	50.0	88.5		83.5	
Minimum	45.0	49.0		83.0	
Standard Deviation	2.22	6.33		0.35	
Sample Size	5	73		2	
Statistical Week 19					
Mean Fork Length (cm)	50.50	71.62		89.40	
Maximum	59.0	81.0		96.0	
Minimum	44.0	53.5		81.0	
Standard Deviation	5.55	4.35		5.55	
Sample Size	5	69		5	
Statistical Week 20					
Mean Fork Length (cm)	48.00	73.57		99.00	
Maximum	56.5	83.0		99.0	
Minimum	42.0	61.5		99.0	
Standard Deviation	4.40	4.95		-	
Sample Size	7	30		1	
Statistical Week 21					
Mean Fork Length (cm)	48.93	69.90		80.83	105.00
Maximum	51.5	82.5		85.5	105.0
Minimum	44.0	52.5		78.0	105.0
Standard Deviation	2.44	5.95		4.07	-
Sample Size	7	36		3	1
Statistical Week 22					
Mean Fork Length (cm)	53.25	73.64	89.50	89.07	
Maximum	55.5	80.0	95.0	98.0	
Minimum	49.5	63.0	84.0	75.0	
Standard Deviation	2.60	3.77	7.78	9.29	
Sample Size	4	28	2	7	
2004 Composite					
Mean Fork Length (cm)	49.59	71.91	89.50	87.31	105.00
Maximum	59.0	88.5	95.0	102.5	105.0
Minimum	42.0	49.0	84.0	72.5	105.0
Standard Deviation	3.87	4.87	7.78	7.30	-
Sample Size	29	546	2	35	1

Table A5: Length-at-age estimates for Columbia Basin summer Chinook salmon sampled at Bonneville Dam in 2004. Composite estimates of age classes are weighted by weekly run size.

Brood Year and	2002		2001		2000		1999		1998
Age Class	0.1	1.0	0.2	1.1	0.3	1.2	0.4	1.3	1.4
Statistical Week 23				51.17		75.52		88.25	
Mean Fork Length (cm)				59.5		83.0		102.0	
Maximum				46.0		64.0		75.5	
Minimum				4.77		4.31		8.18	
Standard Deviation				6		28		12	
Sample Size									
Statistical Week 24				52.43	79.50	74.48	95.00	90.98	94.33
Mean Fork Length (cm)				57.0	79.5	90.5	102.5	104.5	98.0
Maximum				51.0	79.5	61.0	90.5	82.0	92.5
Minimum				2.07	-	6.67	6.54	5.92	3.18
Standard Deviation				7	1	24	3	25	3
Sample Size									
Statistical Week 25			63.25	55.62	84.00	74.61	90.36	88.37	100.25
Mean Fork Length (cm)			68.0	62.0	84.0	89.5	101.0	102.5	104.0
Maximum			58.5	47.5	84.0	59.0	82.0	65.0	96.5
Minimum			6.72	3.95	-	7.29	5.04	8.24	5.30
Standard Deviation			2	13	1	27	21	27	2
Sample Size									
Statistical Week 26			63.83	55.64	82.00	71.76	89.73	89.66	96.88
Mean Fork Length (cm)			66.5	63.0	86.5	84.5	105.0	102.0	108.0
Maximum			59.0	44.0	73.0	54.0	78.5	71.5	89.0
Minimum			4.19	6.11	6.19	8.92	6.07	7.03	8.29
Standard Deviation			3	7	5	21	20	34	4
Sample Size									
Statistical Week 27			56.32	56.79	76.83	72.58	92.97	85.51	91.50
Mean Fork Length (cm)			65.5	64.0	92.0	83.0	105.0	105.0	108.5
Maximum			43.0	48.5	69.0	65.0	74.0	64.5	76.5
Minimum			6.81	4.17	13.14	5.13	6.84	9.02	10.85
Standard Deviation			11	12	3	20	29	46	9
Sample Size									
Statistical Week 28	43.83	37.75	62.06	53.00	77.25	71.66	87.72	85.50	94.80
Mean Fork Length (cm)	47.0	38.0	67.5	58.0	79.0	84.0	94.0	103.0	97.5
Maximum	39.0	37.5	54.0	48.0	75.5	61.0	80.0	70.5	93.0
Minimum	4.25	0.35	4.37	3.04	2.47	6.12	4.40	8.04	1.68
Standard Deviation	3	2	8	9	2	19	18	24	5
Sample Size									
Statistical Week 29			64.68	52.21	75.75	71.81	89.86	88.87	96.63
Mean Fork Length (cm)			70.0	65.0	82.5	86.0	105.0	98.5	102.5
Maximum			53.0	42.0	69.0	59.5	83.0	83.0	94.0
Minimum			4.50	5.70	9.55	6.85	6.04	4.31	4.03
Standard Deviation			11	14	2	24	11	15	4
Sample Size									
2004 Composite									
Mean Fork Length (cm)	44.88	37.75	61.22	54.17	78.72	73.40	90.52	87.71	93.68
Maximum	48.0	38.0	70.0	65.0	92.0	90.5	105.0	105.0	108.5
Minimum	39.0	37.5	43.0	42.0	69.0	54.0	74.0	64.5	76.5
Standard Deviation	4.05	0.35	6.10	4.68	7.17	6.66	5.94	7.77	7.66
Sample Size	4	2	44	78	16	175	108	193	30

Table A6: Length-at-age estimates for Columbia Basin bright fall Chinook salmon sampled at Bonneville Dam in 2004. Composite estimates of age classes are weighted by weekly run size.

Brood Year and	2002	2001		2000		1999		1998	
Age Class	0.1	0.2	1.1	0.3	1.2	0.4	1.3	0.5	1.4
Statistical Week 36									
Mean Fork Length (cm)	49.25	64.55	55.25	81.56	75.42	89.10	87.64	77.50	88.00
Maximum	54.0	73.0	58.0	91.0	83.0	109.5	101.0	77.5	88.0
Minimum	44.5	53.5	49.0	76.0	70.0	79.5	78.5	77.5	88.0
Standard Deviation	6.72	6.14	4.19	4.31	5.30	5.42	6.97	-	-
Sample Size	2	10	4	18	6	43	7	1	1
Statistical Week 37									
Mean Fork Length (cm)	46.00	64.20	60.29	82.63	76.43	89.22	83.33		
Maximum	47.0	78.5	64.0	96.0	86.0	103.0	90.5		
Minimum	45.0	57.0	55.0	71.0	65.0	77.0	73.0		
Standard Deviation	1.41	4.59	3.16	5.57	6.89	4.67	6.37		
Sample Size	2	32	7	20	7	44	6		
Statistical Week 38									
Mean Fork Length (cm)	42.50	68.31	54.63	79.59	75.46	88.06	85.06	105.00	
Maximum	43.0	82.0	55.5	91.0	88.0	105.0	90.5	105.0	
Minimum	42.0	49.5	54.0	72.0	66.5	75.0	77.5	105.0	
Standard Deviation	0.71	6.44	0.75	4.18	5.90	6.68	4.24	-	
Sample Size	2	35	4	17	12	31	8	1	
Statistical Week 39									
Mean Fork Length (cm)	49.20	67.26	58.38	78.26	77.31	87.48	87.63	91.17	
Maximum	55.0	77.0	62.0	88.0	83.0	100.0	94.0	96.0	
Minimum	45.0	59.0	51.5	67.0	68.0	77.0	77.5	83.0	
Standard Deviation	3.78	4.53	4.96	4.80	4.73	5.48	7.18	7.11	
Sample Size	5	54	4	17	8	26	4	3	
Statistical Week 40									
Mean Fork Length (cm)	52.25	66.56	53.50	79.41	70.10	86.75	82.83	88.00	91.50
Maximum	58.0	74.0	53.5	91.0	74.5	97.5	96.0	88.0	93.0
Minimum	44.0	52.0	53.5	72.5	67.0	78.5	73.5	88.0	90.0
Standard Deviation	6.24	4.26	-	4.56	2.99	4.35	9.09	-	2.12
Sample Size	4	75	1	27	5	24	6	1	2
Statistical Week 41									
Mean Fork Length (cm)	47.00	68.56	59.00	81.95	79.08	86.59	88.43	92.50	
Maximum	47.5	76.5	59.0	91.5	86.0	102.0	99.5	92.5	
Minimum	46.5	56.5	59.0	68.5	71.5	73.5	83.5	92.5	
Standard Deviation	0.71	4.18	-	5.13	5.58	5.89	5.40	-	
Sample Size	2	58	1	31	6	39	7	1	
Statistical Week 42									
Mean Fork Length (cm)	47.50	66.12	58.00	79.50	74.75	87.04	81.75	90.50	
Maximum	58.0	72.0	63.5	86.5	82.5	105.5	86.5	90.5	
Minimum	39.5	56.5	51.5	65.0	71.0	78.0	77.0	90.5	
Standard Deviation	6.79	3.91	6.06	5.57	5.24	5.25	6.72	-	
Sample Size	5	29	3	20	4	27	2	1	
Statistical Week 43									
Mean Fork Length (cm)		68.01		82.00	77.00	88.50	83.20	92.00	92.00
Maximum		75.0		88.5	82.0	102.0	89.0	92.0	92.0
Minimum		60.0		76.5	70.5	68.0	77.5	92.0	92.0
Standard Deviation		3.68		4.58	5.89	7.86	4.44	-	-
Sample Size		36		13	3	15	5	1	1
Statistical Week 44									
Mean Fork Length (cm)		65.17		82.89	77.00	82.75			
Maximum		71.0		88.0	79.0	88.0			
Minimum		54.5		76.0	75.0	77.5			
Standard Deviation		9.25		4.68	2.00	7.42			
Sample Size		3		9	3	2			
2004 Composite									
Mean Fork Length (cm)	48.27	67.03	57.56	80.76	75.88	87.90	85.33	91.00	90.75
Maximum	58.0	82.0	64.0	96.0	88.0	109.5	101.0	105.0	93.0
Minimum	39.5	49.5	49.0	65.0	65.0	68.0	73.0	77.5	88.0
Standard Deviation	5.16	4.76	4.12	5.01	5.46	5.65	6.26	7.84	2.22
Sample Size	22	332	24	172	54	251	45	9	4

Table A7: Length-at-age estimates for Columbia Basin sockeye salmon sampled at Bonneville Dam in 2004. Composite estimates of age classes are weighted by weekly run size.

Brood Year and Age Class	2001 1.1	2000 1.2	1.3	1999 2.2	3.1	1998 2.3
Statistical Week 24						
Mean Fork Length (cm)		49.54		50.75		
Maximum		54.5		51.5		
Minimum		45.0		50.0		
Standard Deviation		2.01		1.06		
Sample Size		66		2		
Statistical Week 25						
Mean Fork Length (cm)		49.90		54.50	52.50	50.00
Maximum		58.5		54.5	52.5	50.0
Minimum		44.0		54.5	52.5	50.0
Standard Deviation		2.18		-	-	-
Sample Size		135		1	1	1
Statistical Week 26						
Mean Fork Length (cm)	38.75	49.73		52.00		
Maximum	39.0	55.0		52.0		
Minimum	38.5	41.5		52.0		
Standard Deviation	0.35	2.33		-		
Sample Size	2	150		1		
Statistical Week 27						
Mean Fork Length (cm)		50.20	58.75			
Maximum		57.0	64.0			
Minimum		44.5	53.5			
Standard Deviation		2.36	7.42			
Sample Size		132	2			
Statistical Week 28						
Mean Fork Length (cm)	37.50	49.64				
Maximum	40.0	55.0				
Minimum	35.5	44.0				
Standard Deviation	1.77	2.24				
Sample Size	5	92				
Statistical Week 29						
Mean Fork Length (cm)	36.50	49.11				
Maximum	36.5	53.0				
Minimum	36.5	43.0				
Standard Deviation	-	2.23				
Sample Size	1	35				
2004 Composite						
Mean Fork Length (cm)	37.69	49.80	58.75	52.00	52.50	50.00
Maximum	40.0	58.5	64.0	54.5	52.5	50.0
Minimum	35.5	41.5	53.5	50.0	52.5	50.0
Standard Deviation	1.53	2.26	7.42	1.87	-	-
Sample Size	8	610	2	4	1	1

Table A8: Length-at-age estimates for Columbia Basin steelhead sampled at Bonneville Dam in 2004. Composite estimates of age classes are weighted by weekly run size.

Brood Year and	2001	2000		1999			1998			1997	1-Fresh Wild		Kelt	
Age Class	1.1	1.2	2.1	1.3	2.2	3.1	2.3	3.2	4.1	4.2	W1.1	W1.3	2.1S	3.1S
Statistical Week 29														
Mean Fork Length (cm)	56.20	68.70	57.48	71.00	65.50	56.14		69.40	57.00		61.00			
Maximum	69.5	75.5	71.0	71.0	68.0	61.5		71.0	57.0		61.0			
Minimum	51.0	56.5	48.5	71.0	62.0	52.0		63.0	57.0		61.0			
Standard Deviation	3.66	4.11	4.27	-	2.43	3.39		3.58	-		-			
Sample Size	41	32	20	1	6	7		5	1		1			
Statistical Week 30														
Mean Fork Length (cm)	56.10	68.67	56.06	80.00	68.90	56.40		72.08				68.50		
Maximum	62.5	81.0	61.5	80.0	76.5	59.0		77.0				68.5		
Minimum	51.5	58.0	52.0	80.0	52.0	54.5		70.0				68.5		
Standard Deviation	2.72	4.72	3.33	-	5.85	2.38		2.75				-		
Sample Size	25	39	9	1	15	5		6				1		
Statistical Week 31														
Mean Fork Length (cm)	56.77	68.00	56.92		68.00		73.50	70.50			57.50	76.50		
Maximum	76.0	74.0	61.5		75.0		73.5	73.5			57.5	76.5		
Minimum	52.5	63.0	53.5		61.5		73.5	69.0			57.5	76.5		
Standard Deviation	4.17	2.81	3.48		4.05		-	2.60			-	-		
Sample Size	30	28	6		7		1	3			1	1		
Statistical Week 34														
Mean Fork Length (cm)	58.36	68.13	61.50		70.25	58.25		70.50			56.00	63.50	68.50	
Maximum	67.5	80.5	63.5		77.5	59.5		70.5			56.0	63.5	68.5	
Minimum	53.5	58.5	59.0		61.0	57.0		70.5			56.0	63.5	68.5	
Standard Deviation	3.49	5.17	2.03		5.47	1.77		-			-	-	-	
Sample Size	25	15	5		6	2		1			1	1	1	
Statistical Week 35														
Mean Fork Length (cm)	56.42	67.75	59.00	72.00				67.50					65.00	64.50
Maximum	61.5	73.0	63.0	72.0				67.5					65.0	64.5
Minimum	53.0	62.0	56.5	72.0				67.5					65.0	64.5
Standard Deviation	2.42	4.79	3.50	-				-					-	-
Sample Size	24	4	3	1				1					1	1
Statistical Week 36														
Mean Fork Length (cm)	57.59	71.54	59.63		74.14	62.50		73.00				67.00		
Maximum	62.0	83.0	62.0		82.0	62.5		77.5				67.0		
Minimum	53.0	61.0	56.0		65.5	62.5		69.0				67.0		
Standard Deviation	2.49	6.04	2.75		6.25	-		3.34				-		
Sample Size	46	25	4		7	1		5				1		
Statistical Week 37														
Mean Fork Length (cm)	59.07	76.84	63.00	84.00	78.80			77.90		73.00	59.00	73.00		
Maximum	67.0	90.0	63.0	84.0	86.5			82.0		73.0	59.0	73.0		
Minimum	54.0	63.0	63.0	84.0	72.5			69.0		73.0	59.0	73.0		
Standard Deviation	3.47	8.33	-	-	6.76			5.46		-	-	-		
Sample Size	22	22	1	1	5			5		1	1	1		
Statistical Week 38														
Mean Fork Length (cm)	60.13	79.79	58.50	79.75	73.30	58.00	84.00	75.72		88.00				
Maximum	74.0	91.0	58.5	82.0	79.5	58.0	84.0	82.0		88.0				
Minimum	54.0	63.5	58.5	74.0	68.5	58.0	84.0	68.5		88.0				
Standard Deviation	4.81	6.41	-	3.86	4.16	-	-	5.10		-				
Sample Size	24	38	1	4	5	1	1	9		1				

Table A8: Continued. Length-at-age estimates for Columbia Basin steelhead sampled at Bonneville Dam in 2004. Composite estimates of age classes are weighted by weekly run size.

Brood Year and	2001	2000		1999			1998			1997	1-Fresh Wild		Kelt	
Age Class	1.1	1.2	2.1	1.3	2.2	3.1	2.3	3.2	4.1	4.2	W1.1	W1.3	2.1S	3.1S
Statistical Week 39														
Mean Fork Length (cm)	58.28	78.33	57.75	86.13	78.00	55.00	84.25	80.50						66.00
Maximum	64.5	86.5	60.5	88.0	89.0	55.0	85.0	85.0						66.0
Minimum	53.0	60.0	55.0	84.5	66.0	55.0	83.5	75.0						66.0
Standard Deviation	3.80	5.68	3.89	1.65	10.43	-	1.06	2.92						-
Sample Size	18	46	2	4	6	1	2	10						1
Statistical Week 40														
Mean Fork Length (cm)	61.47	80.21		86.25	72.25			69.00						
Maximum	68.5	95.0		91.0	75.0			69.0						
Minimum	54.5	68.0		81.5	69.5			69.0						
Standard Deviation	4.00	6.36		6.72	3.89			-						
Sample Size	15	29		2	2			1						
Statistical Week 41														
Mean Fork Length (cm)	58.88	78.34		86.00	78.83	65.00								
Maximum	67.0	87.0		91.0	83.0	65.0								
Minimum	49.5	66.5		76.5	74.5	65.0								
Standard Deviation	5.21	6.09		8.23	4.25	-								
Sample Size	21	25		3	3	1								
Statistical Week 42														
Mean Fork Length (cm)	57.13	78.42	58.00	87.25		61.75	86.00	73.50						
Maximum	61.0	89.5	58.5	88.0		63.5	86.0	73.5						
Minimum	53.5	65.5	57.5	86.5		60.0	86.0	73.5						
Standard Deviation	2.28	6.38	0.71	1.06		2.47	-	-						
Sample Size	16	19	2	2		2	1	1						
Statistical Week 43														
Mean Fork Length (cm)	58.69	76.58	58.17	84.00	70.60	62.50		64.00						
Maximum	65.0	87.5	61.0	89.0	84.0	62.5		68.0						
Minimum	55.5	62.0	54.5	79.0	59.5	62.5		60.0						
Standard Deviation	2.98	9.83	3.33	7.07	9.19	-		5.66						
Sample Size	8	13	3	2	5	1		2						
Statistical Week 44														
Mean Fork Length (cm)	57.40	86.00			75.00									
Maximum	64.5	86.0			75.0									
Minimum	55.0	86.0			75.0									
Standard Deviation	2.73	-			-									
Sample Size	10	1			1									
2003 Composite														
Mean Fork Length (cm)	57.78	74.53	57.96	83.02	71.77	58.00	82.40	74.30	57.00	80.50	58.38	69.70	66.75	65.25
Maximum	76.0	95.0	71.0	91.0	89.0	65.0	86.0	85.0	57.0	88.0	61.0	76.5	68.5	66.0
Minimum	49.5	56.5	48.5	71.0	52.0	52.0	73.5	60.0	57.0	73.0	56.0	63.5	65.0	64.5
Standard Deviation	3.77	7.63	3.68	6.03	7.07	3.64	5.07	5.69	-	114.34	2.14	5.11	2.47	1.06
Sample Size	325	336	56	21	68	21	5	49	1	2	4	5	2	2

Table A9: Weekly and cumulative age, fin mark, gender and length composition of Columbia Basin hatchery and wild steelhead sampled at Bonneville Dam in 2004.

Hatchery

Statistical	Sampling	Number	Hatchery	Weekly	2001	2000		1999		Fin Clips		Stubby	Sex		Length	
Week	Date	Sampled	Ageable	Run Size	1.1	1.2	2.1	1.3	2.2	Adipose	Other	Dorsal	Female	Male	< 78cm	≥ 78cm
29[a]	7/13,7/15	140	76	54613	0.539	0.421	0.013	0.013	0.013	0.350	0.050	0.364	0.632	0.368	1.000	
30	7/20,7/22	130	66	19480	0.379	0.591		0.015	0.015	0.331	0.062	0.300	0.677	0.323	0.970	0.030
31	7/27	100	58	13473	0.517	0.483				0.410	0.070	0.400	0.456	0.544	1.000	
34[b]	8/17	84	43	83070	0.628	0.372				0.357	0.083	0.298	0.698	0.302	0.975	0.025
35	8/24	50	29	8942	0.828	0.138		0.034		0.380	0.100	0.380	0.586	0.414	1.000	
36	8/31,9/2	122	71	39713	0.648	0.352				0.410	0.090	0.361	0.521	0.479	0.930	0.070
37	9/7,9/9	78	45	22788	0.489	0.489		0.022		0.436	0.077	0.372	0.409	0.591	0.711	0.289
38	9/14,9/16	104	66	26249	0.364	0.576		0.061		0.577	0.029	0.288	0.485	0.515	0.545	0.455
39	9/21,9/24	104	68	18108	0.265	0.676		0.059		0.529	0.038	0.260	0.412	0.588	0.529	0.471
40	9/28,10/1	60	46	9348	0.326	0.630		0.043		0.683	0.033	0.300	0.457	0.543	0.500	0.500
41	10/5,10/7	60	49	6763	0.429	0.510		0.061		0.667	0.083	0.350	0.469	0.531	0.673	0.327
42	10/12,10/14	60	37	3841	0.432	0.514		0.054		0.483	0.067	0.367	0.405	0.595	0.622	0.378
43	10/19,10/20	40	23	1572	0.348	0.565		0.087		0.425	0.025	0.200	0.217	0.783	0.609	0.391
44[c]	10/26	14	11	998	0.909	0.091				0.714		0.429	0.636	0.364	0.909	0.091
Cumulative		**1146**	**688**	**308958**	**0.530**	**0.446**	**0.002**	**0.018**	**0.003**	**0.418**	**0.067**	**0.329**	**0.574**	**0.426**	**0.866**	**0.134**

Comments: Hatchery steelhead are determined by scale pattern analysis.

Wild

Statistical	Sampling	Number	Wild	Weekly	2000	1999		1998			1997	1-Fresh Wild		Kelts		Stubby	Sex		Length	
Week	Date	Sampled	Ageable	Run Size	2.1	2.2	3.1	2.3	3.2	4.1	4.2	W1.1	W1.3	2.1S	3.1S	Dorsal	Female	Male	< 78cm	≥ 78cm
29[a]	7/13,7/15	140	38	54613	0.500	0.132	0.184		0.132	0.026		0.026				0.007	0.816	0.184	1.000	
30	7/20,7/22	130	35	19480	0.257	0.400	0.143		0.171				0.029				0.794	0.206	1.000	
31	7/27	100	19	13473	0.316	0.368		0.053	0.158			0.053	0.053				0.368	0.632	1.000	
34[b]	8/17	84	18	83070	0.278	0.389	0.111		0.056			0.056	0.056	0.056			0.556	0.444	1.000	
35	8/24	50	6	8942	0.500		0.000		0.167					0.167	0.167		0.667	0.333	1.000	
36	8/31,9/2	122	18	39713	0.222	0.389	0.056		0.278				0.056				0.647	0.353	0.889	0.111
37	9/7,9/9	78	14	22788	0.071	0.357			0.357		0.071	0.071	0.071				0.643	0.357	0.643	0.357
38	9/14,9/16	104	18	26249	0.056	0.278	0.056	0.056	0.500		0.056						0.500	0.500	0.667	0.333
39	9/21,9/24	104	22	18108	0.091	0.273	0.045	0.091	0.455						0.045		0.545	0.455	0.364	0.636
40	9/28,10/1	60	3	9348		0.667			0.333								1.000		1.000	
41	10/5,10/7	60	4	6763		0.750	0.250										0.250	0.750	0.500	0.500
42	10/12,10/14	60	6	3841	0.333		0.333	0.167	0.167								0.500	0.500	0.833	0.167
43	10/19,10/20	40	11	1572	0.273	0.455	0.091		0.182								0.182	0.818	0.909	0.091
44[c]	10/26	14	1	998		1.000												1.000	1.000	
Cumulative		**1146**	**213**	**308958**	**0.257**	**0.327**	**0.096**	**0.014**	**0.205**	**0.005**	**0.010**	**0.027**	**0.031**	**0.020**	**0.007**	**0.001**	**0.627**	**0.373**	**0.880**	**0.120**

Comments: Wild steelhead are determined by scale pattern analysis.

Table A10: Weekly and cumulative age, fin mark, gender and length composition of Columbia Basin hatchery and wild steelhead sampled at Bonneville Dam in 2004.

Hatchery

Statistical	Sampling	Number	Hatchery	Weekly	2001	2000	1999		Unageable				Fin Clips		Stubby	Sex		Length	
Week	Date	Sampled	Ageable	Run Size	1.1	1.2	1.3	2.2	R	R.1	R.2	R.3	Adipose	Other	Dorsal	Female	Male	< 78cm	≥ 78cm
29[a]	7/13,7/15	140	64	54613	0.578	0.422			0.007	0.007	0.036		0.400	0.050	0.393	0.549	0.451	0.986	0.014
30	7/20,7/22	130	57	19480	0.439	0.526	0.018	0.018	0.008	0.062	0.062		0.423	0.100	0.392	0.718	0.282	0.973	0.027
31	7/27	100	53	13473	0.528	0.472				0.040	0.070		0.500	0.090	0.480	0.476	0.524	1.000	
34[b]	8/17	84	39	83070	0.641	0.359			0.071	0.036	0.024		0.476	0.095	0.333	0.700	0.300	0.979	0.021
35	8/24	50	27	8942	0.852	0.148				0.160	0.020	0.020	0.540	0.140	0.500	0.568	0.432	1.000	
36	8/31,9/2	122	68	39713	0.647	0.353			0.008	0.115	0.082		0.574	0.131	0.484	0.484	0.516	0.935	0.065
37	9/7,9/9	78	43	22788	0.512	0.465	0.023			0.128	0.090		0.590	0.141	0.538	0.424	0.576	0.783	0.217
38	9/14,9/16	104	65	26249	0.369	0.569	0.062		0.029	0.058	0.067	0.010	0.702	0.067	0.413	0.512	0.488	0.598	0.402
39	9/21,9/24	104	61	18108	0.262	0.672	0.066		0.029	0.038	0.048	0.010	0.654	0.038	0.288	0.446	0.554	0.527	0.473
40	9/28,10/1	60	46	9348	0.326	0.630	0.043			0.017	0.050	0.033	0.783	0.033	0.333	0.423	0.577	0.462	0.538
41	10/5,10/7	60	47	6763	0.447	0.489	0.064			0.067	0.033	0.017	0.767	0.100	0.433	0.444	0.556	0.648	0.352
42	10/12,10/14	60	37	3841	0.432	0.514	0.054			0.167	0.017		0.667	0.067	0.483	0.354	0.646	0.702	0.298
43	10/19,10/20	40	22	1572	0.364	0.545	0.091			0.025			0.450	0.025	0.225	0.261	0.739	0.652	0.348
44[c]	10/26	14	11	998	0.909	0.091			0.071			0.071	0.786	0.071	0.429	0.615	0.385	0.846	0.154
Cumulative		**1146**	**640**	**308958**	**0.547**	**0.436**	**0.016**	**0.001**	**0.026**	**0.057**	**0.048**	**0.004**	**0.532**	**0.088**	**0.401**	**0.561**	**0.439**	**0.874**	**0.126**

Comments: Hatchery steelhead are determined by the presence of fin clips and/or a stubby dorsal fin.

Age Composition by Brood Year and Age Class

Wild

Statistical	Sampling	Number	Wild	Weekly	2001	2000		1999			1998			1997	1-Fresh Wild		Kelts		Unageable				Stubby	Sex		Length	
Week	Date	Sampled	Ageable	Run Size	1.1	1.2	2.1	1.3	2.2	3.1	2.3	3.2	4.1	4.2	W1.1	W1.3	2.1S	3.1S	R	R.1	R.2	R.3	Dorsal	Female	Male	< 78cm	≥ 78cm
29[a]	7/13,7/15	140	50	54613	0.080	0.100	0.400	0.020	0.120	0.140		0.100	0.020		0.020					0.120	0.180		0.007	0.831	0.169	1.000	
30	7/20,7/22	130	44	19480		0.205	0.205		0.318	0.114		0.136				0.023				0.182	0.045			0.736	0.264	1.000	
31	7/27	100	24	13473	0.083	0.125	0.250		0.292		0.042	0.125			0.042	0.042				0.167	0.333			0.444	0.556	1.000	
34[b]	8/17	84	22	83070	0.091	0.091	0.227		0.318	0.091		0.045			0.045	0.045	0.045		0.182	0.136	0.136			0.656	0.344	1.000	
35	8/24	50	8	8942	0.125		0.375	0.125				0.125					0.125	0.125		0.125	0.375			0.667	0.333	0.917	0.083
36	8/31,9/2	122	21	39713	0.095	0.048	0.190		0.333	0.048		0.238				0.048					0.238			0.600	0.400	0.846	0.154
37	9/7,9/9	78	16	22788		0.125	0.063		0.313			0.313		0.063	0.063	0.063					0.125			0.722	0.278	0.611	0.389
38	9/14,9/16	104	19	26249		0.053	0.053		0.263	0.053	0.053	0.474		0.053							0.105	0.053		0.591	0.409	0.636	0.364
39	9/21,9/24	104	29	18108	0.069	0.172	0.069		0.207	0.034	0.069	0.345						0.034			0.034			0.500	0.500	0.467	0.533
40	9/28,10/1	60	3	9348					0.667			0.333							0.333	0.667	0.333	0.333		0.571	0.429	0.625	0.375
41	10/5,10/7	60	6	6763		0.333			0.500	0.167		0.000												0.333	0.667	0.667	0.333
42	10/12,10/14	60	6	3841			0.333			0.333	0.167	0.167								0.167	0.833			0.583	0.417	0.750	0.250
43	10/19,10/20	40	12	1572		0.083	0.250		0.417	0.083		0.167									0.333			0.188	0.813	0.813	0.188
44[c]	10/26	14	1	998					1.000																1.000	1.000	
Cumulative		**1146**	**261**	**308958**	**0.062**	**0.098**	**0.209**	**0.007**	**0.276**	**0.077**	**0.012**	**0.175**	**0.004**	**0.009**	**0.022**	**0.026**	**0.016**	**0.006**	**0.059**	**0.102**	**0.170**	**0.015**	**0.001**	**0.651**	**0.349**	**0.864**	**0.136**

Comments: Wild steelhead are determined by the absence of fin clips.