Emigration of Natural and Hatchery Chinook Salmon and Steelhead Smolts from the Imnaha River, Oregon

Annual Report
2002 - 2003

DOE/BP-00004004-3

August 2004

This Document should be cited as follows:

Cleary, Peter, Michael Blenden, Paul Kucera, "Emigration of Natural and Hatchery Chinook Salmon and Steelhead Smolts from the Imnaha River, Oregon", 2002-2003 Annual Report, Project No. 199701501, 110 electronic pages, (BPA Report DOE/BP-00004004-3)

Bonneville Power Administration
P.O. Box 3621
Portland, OR 97208

This report was funded by the Bonneville Power Administration (BPA), U.S. Department of Energy, as part of BPA's program to protect, mitigate, and enhance fish and wildlife affected by the development and operation of hydroelectric facilities on the Columbia River and its tributaries. The views in this report are the author's and do not necessarily represent the views of BPA.

Emigration of Natural and Hatchery Chinook Salmon and Steelhead Smolts from the Imnaha River, Oregon from October 1, 2002 to June 25, 2003

2003 Annual Report

Prepared by:
Peter J. Cleary
Michael L. Blenden
Paul A. Kucera

Nez Perce Tribe
Department of Fisheries Resources Management
Lapwai, Idaho 83540

Prepared for:
U.S. Department of Energy
Bonneville Power Administration
P.O. Box 3621
Portland, Oregon 97208

and

U.S. Fish and Wildlife Service
Lower Snake River Compensation Plan
1387 Vinnell Way
Boise, Idaho 83709
Cooperative Agreement for FY 2003: 14110-3-J010

BPA Project Number: 1997-015-01
BPA 2003 Contract Number: 00004004

August 2004

EXECUTIVE SUMMARY

This report summarizes the Nez Perce Tribe's Imnaha River juvenile chinook salmon and steelhead emigration studies conducted from October 1, 2002 to June 25, 2003 (migration year 2003). The studies have been ongoing for the past 12 years and have contributed information to the Fish Passage Center's Smolt Monitoring Program for the past 10 years. The study collected and tagged fish at rkm 7 during the fall and spring. Tagged fish were tracked downstream as they passed through Snake and Columbia river dams. The project evaluated the biological characteristics and migration performance of natural and hatchery chinook salmon and steelhead at Lower Granite Dam (LGR), Little Goose Dam (LGO), Lower Monumental Dam (LMO), and McNary Dam (MCN).

Imnaha River chinook salmon and steelhead smolts migrating in the spring had normal hydrologic conditions in the Imnaha River. Average monthly discharge from March to June ranged from 604 cfs (March) to 1,467 cfs (June). Snake River run-off was low. Average monthly discharge in the Snake River ranged from 27,886 cfs in March to 62,248 cfs in June. Spill at LGR, LGO, LMO, and MCN began from April 3 to April 14 and lasted until June 20. Maximum water temperatures in the tailraces of LGR, LGO, LMO, and MCN exceeded 18 °C after June 30.

A total of 13,462 natural chinook salmon, 29,095 hatchery chinook salmon, 8,777 natural steelhead, and 39,582 hatchery steelhead were captured in 2003. The studies PIT tagged a total of 12,494 natural chinook salmon, 47 hatchery chinook salmon, 6,303 natural steelhead, and 5,227 hatchery steelhead. The catch of hatchery chinook salmon included 1,787 previously PIT tagged hatchery chinook salmon. The previously PIT tagged hatchery chinook salmon were first captured April 6, and 50% and 90% were recaptured 18 and 30 days, respectively, after the release on April 15. The hatchery chinook salmon had a mean fork length (139 mm) that was significantly different ($p < 0.05$) than the mean fork length of natural chinook salmon (104 mm). Hatchery steelhead also had a mean fork length (222 mm) that was significantly larger ($p < 0.05$) than the mean fork length of natural produced steelhead (174 mm).

The estimated post release survival of PIT tagged hatchery chinook salmon from release at the acclimation site to the lower Imnaha River Trap was 91.0% in 2003. The post-release survival estimate was within the range of previous estimates from 1994 to 2003, of 88.4% to 100.9%. The survival estimate of natural chinook salmon tagged in the fall was 29.8% to LGR. Past survival estimates from the trap to LGR for fall tagged Imnaha River natural chinook salmon have ranged from 25.6% to 60.4% from 1994 to 2003.

Imnaha River smolts were estimated to have the following survivals from release to LGR in 2003: 75.9% for natural chinook salmon, 73.6% for hatchery chinook salmon, 82.0% for natural steelhead, and 89.4% for hatchery steelhead. The survival estimate for natural chinook salmon was the lowest since 1993. The estimated survival for natural steelhead from release to

LGR was the lowest observed since 1995 for natural steelhead. Hatchery steelhead's estimated survival from release to LGR was the highest estimate since 1995 for hatchery steelhead. The estimated survival from release to LMO were 60.0% for natural chinook salmon, 61.5% for hatchery chinook salmon, 68.1% for natural steelhead, and 82.1% for hatchery steelhead.

A smolt-to-adult return rate (SAR) index from LGR to LGR was calculated for migrating fall and spring tagged natural chinook salmon for brood years 1996 to 1998 (migration years 1998 to 2000). The SARs are representative of Imnaha natural chinook that were mostly bypassed when detected at the dams and traveled in-river (i.e. not barged). The LGR to LGR SAR index for fall tagged natural chinook salmon is as follows: 3.08% (BY 1996), 2.41% (BY 1997), and 2.98% (BY 1998). Smolt-to-adult return rate index for spring tagged natural chinook salmon was lower: 1.75% (BY 1996), 2.24% (BY 1997) and 2.94% (BY 1998).

Significant difference ($p < 0.05$) in the median arrival timing of fall and spring PIT tagged natural chinook salmon was observed at LGR. Median arrival timing of fall tagged natural chinook salmon at LGR occurred on April 16; 13 days earlier than the median arrival timing for spring tagged natural chinook salmon smolts. A total of six years of arrival data for fall tagged natural chinook salmon, 11 and 12 and years of arrival data for spring tagged natural and hatchery chinook salmon, and 11 years of arrival data for natural and hatchery steelhead at LGR, LGO, LMO, and MCN was summarized for this report. The estimated median arrival time at LGR is as follows: April 17 (± 9 days) for fall tagged natural chinook salmon (1998 to 2003), April 28 (± 9 days) for spring tagged natural chinook salmon smolts (1993 to 2003), May 3 (± 10 days) for hatchery chinook salmon, May 11 (± 14 days) for natural steelhead (1993 to 2003) and May 21 (±12 days) for hatchery steelhead (1993 to 2003).

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDIX TABLES

INTRODUCTION

This report summarizes the results of the Lower Snake River Compensation Plan (LSRCP) hatchery evaluation studies and the Imnaha River Smolt Monitoring Program (SMP) for the 2003 smolt migration from the Imnaha River, Oregon. These studies are closely coordinated and provide information about juvenile natural and hatchery chinook salmon (*Oncorhynchus tshawytscha*) and steelhead (*O. mykiss*) biological characteristics, emigrant timing, survival, arrival timing and travel time to the Snake River dams and McNary Dam (MCN) on the Columbia River. These studies were designed to provide information on listed chinook salmon and steelhead for the Federal Columbia River Power System Biological Opinion (NMFS 2000).

The Lower Snake River Compensation Plan program's goal is to maintain a hatchery production program of 490,000 chinook salmon and 330,000 steelhead for annual release in the Imnaha River (Carmichael et al. 1998, Whitesel et al. 1998). These hatchery releases occur to compensate for fish losses due to the construction and operation of the four lower Snake River hydroelectric facilities. One of the aspects of the LSRCP hatchery evaluation studies in the Imnaha River was to determine natural and hatchery chinook salmon and steelhead smolt performance, emigration characteristics and survival (Kucera and Blenden 1998). A long term monitoring effort was established to document smolt emigrant timing and post release survival within the Imnaha River, estimate smolt survival downstream to McNary Dam, compare natural and hatchery smolt performance, and collect smolt-to-adult return information.

SMP shares information with, and is part of, a larger effort entitled Smolt Monitoring by Federal and Non-Federal Agencies (BPA Project No. 198712700). This larger project provides data on movement of smolts out of major drainages and past dams on the Snake River and Columbia River. Indices of migration strength and migration timing are provided for the run-at-large at key monitoring sites. Marked smolts are utilized to measure travel time and estimate survival through key index reaches. Fish quality and descaling measures are taken at each monitoring site and provide indicators of the health of the run.

Co-managers in the Imnaha River subbasin (Bryson et al. 2001) have identified the need to collect information on life history and movement patterns of juvenile steelhead migration patterns for both steelhead and chinook salmon, juvenile emigrant abundance, reach specific smolt survivals, and Smolt-to-Adult Return rates (SAR's). The current study provides information related to the majority of the high priority data needs. Current funding does not allow for determination of juvenile emigrant abundance and installation of adult PIT tag detectors at the mouth of the Imnaha River to calculate tributary specific SAR's.

Information is shared with the Fish Passage Center (FPC) on a real time basis during the spring emigration period. The Bonneville Power Administration (BPA) and the U.S. Fish and Wildlife Service contracted the Nez Perce Tribe (NPT) to monitor emigration timing and tag up to 21,200 emigrating natural and hatchery chinook salmon and steelhead smolts from the Imnaha River during the spring emigration period with passive integrated transponder (PIT) tags.

The completion of trapping in the spring of 2003 marked the twelfth year of emigration studies on the Imnaha River, and the tenth year of participating in the FPC smolt monitoring program. Monitoring and evaluation objectives were to:

1. Determine spring emigration timing of chinook salmon and steelhead smolts collected at the Imnaha River trap.

2. Evaluate effects of flow, temperature and other environmental factors on emigration timing.

3. Monitor the daily catch and biological characteristics of juvenile chinook salmon and steelhead smolts collected at the Imnaha River screw trap.

4. Determine emigration timing, travel time, and in-river survival of PIT tagged hatchery chinook salmon smolts released at the Imnaha River acclimation facility to the Imnaha River Trap.

5. Determine arrival timing, travel time and estimated survival of PIT tagged natural and hatchery chinook salmon and natural and hatchery steelhead smolts from the Imnaha River to Snake and Columbia River dams.

6. Compare emigration characteristics and survival rates of fall and spring tagged juvenile chinook salmon.

METHODS

Study Area Description

The Imnaha River subbasin is located in northeastern Oregon (Figure 1) and encompasses an area of approximately 2,538 square kilometers. The mainstem Imnaha River flows in a northerly direction for 129 km from its headwaters in the Eagle Cap Wilderness Area to its confluence with the Snake River (James 1984; Kucera 1989). The Snake River is 1,607 km long and is the longest tributary to the Columbia River. The Columbia River is the largest river in the Pacific Northwest, 1,953 km in length, and drains an area of 667,931 square kilometers from the Cascade Mountains to the west, Rocky Mountains to the east, and the Great Basin to the south (Anonymous 2003a). The source of the Columbia River is north of Oregon in Canada and is at an elevation of 809 m. The Columbia River runs south of the Canadian border and turns west at the confluence of the Snake River (Figure 2). Annual average discharge at the mouth is approximately 275,000 cfs (7,787 cms; 1 cfs = 0.283168 cms).

Reservoirs encountered by migrating Imnaha River chinook salmon and steelhead smolts are formed by Lower Granite Dam (LGR), Little Goose Dam (LGO), Lower Monumental Dam (LMO), Ice Harbor Dam, MCN, John Day Dam, The Dalles Dam, and Bonneville Dam. Juvenile emigration in this report is monitored at LGR, LGO, LMO, and MCN. Juvenile emigration at Ice Harbor Dam is not monitored because it lacks the necessary facilities. The four lower Snake River dams became operational between 1961 and 1975. MCN became operational in 1953 (Anonymous 2003b).

The Imnaha River drains the eastern escarpment of the Wallowa mountains and part of an adjacent plateau located between the Wallowa River drainage to the west and Hells Canyon of the Snake River to the east (Kucera 1989). Elevations in the watershed vary from 3,048 m at the headwaters to about 260 m in lower elevations (Kucera 1989). The trap is located at rkm 7.

The 72 year (1929 - 2001) mean annual discharge of the Imnaha River is 517 cfs at Imnaha, Oregon, USGS gauge 13292000. The minimum discharge, 16 cfs was observed November 22, 1931. The maximum river discharge, 20,200 cfs was observed January 1, 1997 (Anonymous 2000c). Maximum river discharge generally occurs from April to June with minimum flows from August to February (Kucera 1989).

Equipment Description

Floating rotary screw traps manufactured by E.G. Solutions Inc., Corvallis, Oregon, were used to capture emigrating salmonids (Figure 3). Similar traps have been used to capture migrating salmonid species in New York and Alaska (Kennen et al. 1994; Thedinga et al. 1994). When conditions permitted, two of these traps were fished in tandem. During hatchery releases, trap efficiency trials, high flows or periods of damage to one trap, a single trap was fished. The screw traps used in the spring and fall at the lower site consisted of a 2.1 m diameter trapping cone supported by a metal A-frame and two six meter pontoons that provided flotation. Fish

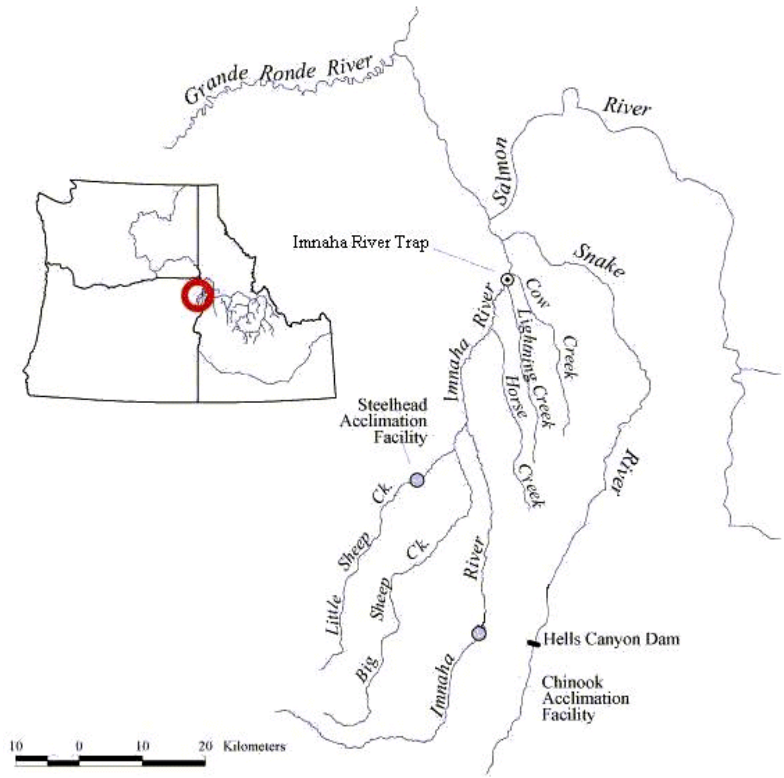

Figure 1. Map of the Imnaha River study area.

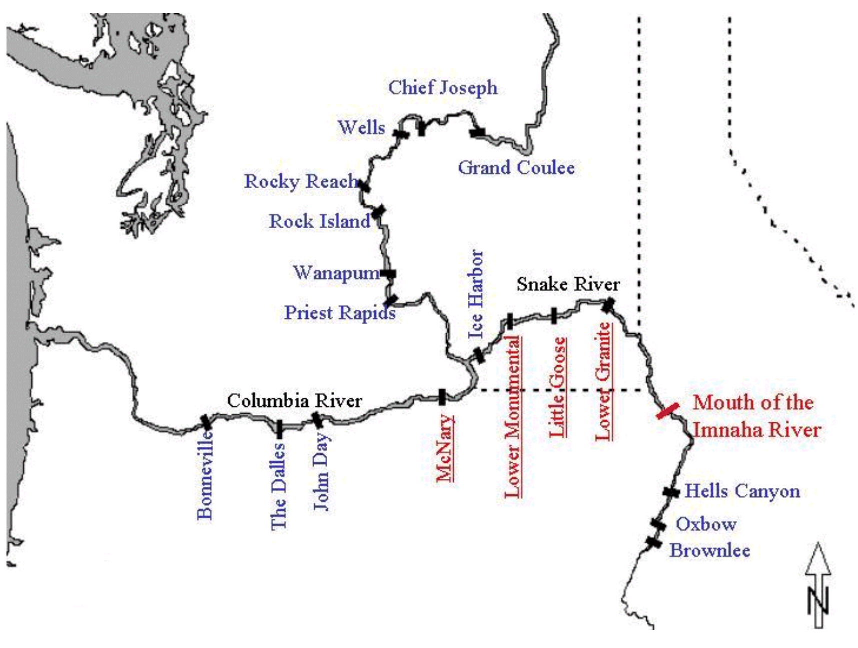

Figure 2. Map of the Columbia River Basin. Dams underlined indicate monitoring points for the Imnaha Smolt Monitoring Program.

Figure 3. The lower Imnaha River trap site with two rotary screw traps operating. Trap A is on the left and trap B is on the right.

entering the trapping cones move through to a livebox (1.68 m wide x 1.25 m long x 0.55 m deep). The live box was fitted with a removable baffle to dissipate water velocity during high flows.

Water temperature information for this study was collected using a thermograph placed 150 m upstream from the screw trap. Imnaha River discharge information was provided by the U.S. Geological Survey, USGS gauge 13292000 at Imnaha, Oregon. Snake River water discharge and temperature information were provided by the USGS for the Anatone stream gauge, 13334300. Measurements of outflow, spill, and temperature at LGR, LGO, LMO and MCN, were obtained online from DART at http://www.cqs.washington.edu/dart.

Trap Operations

The trap was operated from October 1 to November 21, 2002 and from March 7 to June 25, 2003. The trap was located 7 kilometers from the confluence of the Snake River. A second trap was operated in tandem with the first trap from April 2 to April 6, April 21, and May 4 to increase the catch of natural chinook salmon for PIT tagging. Trap position varied from1 to 4 m, upstream or downstream with the use of a cable and pulley system. The position was recorded daily. The live box of the screw trap was checked at 0800 every morning and several times throughout each night and day. Non-target piscivorus fish and large numbers of other non-target fish were removed from the live box first. Non-target piscivorus fish were scanned for PIT tags and then released 30-50 meters downstream. Fish were processed as they were removed from the trap.

Daily processing procedures were similar to those used by Ashe et al. (1995) and were as follows: 1) Fish were anaesthetized in a MS-222 bath (3 mL MS-222 stock solution (100 g/L) per 19 L of water) buffered with Propolyaqua (PRO-NOVAQUA), 2) Each fish was examined for existing marks (e.g. fin clips), and PIT tag insertion scars, 3) Chinook salmon, steelhead and large piscivorus fish were scanned with a PIT tag scanner, 4) 100 to 300 natural and hatchery chinook salmon smolts were targeted for use in daily trap efficiency trials, 5) A specified number of each species was selected for PIT tag insertion, 6) All other fish were enumerated and released 30-50 m downstream from the trap after recovering from the anaesthetic, and 7) All fish mortality was recorded.

PIT Tagging

Fish selected for passive integrated transponder (PIT) tagging were examined for previous PIT tags, descaling and general health. They were measured (FL-mm) and weighed (0.1 g). All chinook salmon selected for tagging were greater than 65 mm. Fish were PIT tagged using hand injector units following the methods described by Prentice et al. (1986, 1990) and Matthews et al. (1990, 1992). Hypodermic injector units and PIT tags were sterilized after each use in ethanol for at least 10 minutes prior to tagging and allowed to dry. Tagging was discontinued when water temperatures exceeded 15° C. Steelhead smolts were held until fully recovered and then released as a group. Chinook salmon smolts were held in perforated aquatic containers for a minimum of 12 hours and released after dark. Mortality due to tagging was recorded.

Trap Efficiencies

Efficiency trials using natural chinook salmon were conducted during the spring. Marked fish were measured (fork length) to the nearest mm and weighed to the nearest 0.1 g. Fish selected for trap efficiency trials in 2003 were marked with PIT tags. Fish marked for trap efficiency trials were held in perforated containers in the river during daytime hours (approximately 12 h) and then transported upstream, approximately one km, during evening hours and released after dark. Trap efficiency was determined by $E = R/M$; where E is estimated trap efficiency, R is number of marked fish recaptured, and M is number of fish marked and released.

Biological Characteristics

Length frequency distributions and condition factors were calculated for each fish species and origin. Length frequencies were based on 5 mm classes. Condition factors were calculated using Fulton's condition factor: $(W/L^3) \times 10^5$ (Bagenal and Tesch 1978). Natural steelhead less than 120 mm were assumed not to be actively migrating and therefore were not used in length, weight and condition factor calculations and were reported to the FPC as rainbow trout. Adult steelhead and large steelhead that had the characteristics of resident rainbow trout were not reported as juvenile steelhead or used in length, weight and condition factor calculations.

All statistics that compared fish captured and tagged during the spring were performed with STATGRAPHICS PLUS version 2 software (1995). A student t-test was used to test for significant differences in mean fork length between various groups of fish. Differences were considered significant at $p < 0.05$. Median fork lengths were compared when standard skewness values were outside the range of ±2 with the Wilcoxon rank sum test statistic (Ott 1984). Differences were considered significant at $p < 0.05$.

Survival Estimation

Survival probabilities were estimated by the Cormack, Jolly and Seber methodology (1964, and 1965, respectively, as cited in Smith et al. 1994) with the Survival Using Proportional Hazards (SURPH) model (Smith et. al. 1994). The data files for season wide and weekly release groups were created using the program CAPTHIST (Westhagen 1997). Data for input into CAPTHIST was obtained directly from PTAGIS. The lower and upper limits of the 95% confidence intervals (C.I.) were approximated from the standard error (SE) calculated by SURPH as follows: 95% C.I. = $S \pm (1.96(SE))$, where S is a survival estimate of a reach.

Recaptured hatchery chinook were used for survival estimates from the trap to downstream dams. Season-wide and weekly release groups of natural and hatchery chinook salmon and steelhead were treated as single release groups. Only weekly release groups of 200 or more fish were analyzed for survival on a weekly basis. The assumptions for the methodology can be found in Smith et al. 1994 and Burnham et al. 1987. When tagging chinook salmon in the fall, we assumed that fish did not migrate past LGR before PIT tag interrogation facilities became operational. A total of 2,052 of the 7,183 natural chinook salmon tagged in the fall were chosen at random to represent survival from the trap to LGR. The other 5,131 tagged fish were not used in the survival estimate because their tag codes were programed for monitor mode upon detection. Monitor mode would most likely divert these tagged fish into the juvenile transportation system and this would violate a key assumption that “captured fish that are rereleased have the same subsequent survival and capture rates as fish alive at that site which were not caught” (Burnham et al. 1987).

Population point estimates for natural chinook salmon smolts migrating past the trap were estimated using the Bootstrap method (Efron and Tibshirani 1986). The initial population estimate was calculated as N = U/E, where N is the total number of smolts, U is the number of unmarked natural chinook salmon smolts captured, and E is the trap efficiency estimate. Bootstrap iterations numbered 1,000.

Smolt to Adult Return Rates

An effort began in 1998 to obtain SARs to LGR for natural chinook salmon using passive integrated transponder (PIT) tags. SARs were calculated for fall and spring tagged natural chinook salmon from the lower Imnaha River trap back to LGR using the ratio of number of fish release to the number of PIT tag adults detected at LGR. A LGR to LGR SAR was estimated using Imnaha River smolt equivalents at LGR. Smolt equivalents to LGR were determined by multiplying the number of fish tagged at the trap by the estimated survival to LGR. SARs are representative of bypassed fish and not the population as a whole.

Arrival and Travel Timing to Trap Site and Lower Snake River Dams

Arrival timing to LGR, LGO, LMO, and MCN were determined for natural and hatchery chinook salmon and steelhead smolts. Detections and arrival timing at each dam for this report period are based on first-time observations of individual tag codes at each dam. Arrival timing estimates do not include subsequent detections of fish that were captured in the Snake River trap, held in sample rooms or raceways, had negative travel times or single coil detections. Release groups with 30 interrogations at LGR were pooled weekly to determine travel time to LGR. Travel time estimates to LGR do not include fish captured in the Snake River trap.

Arrival timing was compared by converting the date of individual detections into a value from 1 to 365 that corresponded to the day of the year. A Wilcoxon rank sum test statistic (Ott 1984) was then used to compare medians of each group. The cumulative distributions of arrival times between fall and spring tagged juvenile natural chinook salmon was also compared using a Kolmogrovov-Smirnov test (Steel et al. 1997 and STATAGRAPHICS 1995).

RESULTS AND DISCUSSION

River Discharge and Water Temperature

Imnaha River

The mean daily discharge during the study period ranged from 77 cfs on November 1, 2002 to 2,770 cfs (1 cfs = 0.283168 cms) on May 30, 2003 (Figure 4 and Appendix A). Daily mean water temperatures ranged from 0.07 °C (November 1 and 2) to 15.3 °C on June 18, 2003.

Monthly average discharge for the Imnaha River for the months of March, April, May, and June were, respectively, as follows: 604, 1,050, 1,510, and 1,467 cfs (Figure 5). The spring run off for the Imnaha River was normal and within the range of monthly average discharge values obtained from 1929 to 2003. Minimum monthly discharge for the Imnaha River were as follows: 114 cfs - March 1977, 345 cfs - April 1977, 445 cfs - May 1977, and 361 cfs - June 1992. Maximum monthly discharge for the Imnaha River were as follows: 1,026 cfs - March 1995, 1,760 cfs - April 1956, 2,804 cfs - May 1948, and 2,612 cfs - June 1974.

Snake River

Snake River mean daily discharge during the study period ranged from 13,000 cfs on January 13, 2003 to 147,000 cfs on May 31, 2003 (Figure 6, and Appendix A). Daily mean water temperatures ranged from 3.5 °C on February 12, 13, and 25 to 17.5° C on June 19, 2003.

Monthly average discharge for March, April, May, and June were as follows: 27,886 cfs, 37,139 cfs, 56,000 cfs, and 62,248 cfs, respectively (Figure 7). The months of March and April were characterized as below normal discharge for the Snake River by this study. May and June should be characterized as low to normal discharge for the Snake River.

Spill during the spring was provided in the Snake River. Spill began on April 3, 5, 7, and 14 at LGR, LGO, LMO, and MCN, respectively (Figures 8 to 11). Continuous spill occurred until June 20 at LGR, LGO, LMO, and MCN. Spill at MCN occurred again from June 24 to June 29 and on July 1. Water temperatures measured in the tailraces of LGR, LGO, LMO, and MCN were lowest in March and highest in July. Minimum water temperatures in the tailraces were as follows: 3.8 °C at LGR on March 5, 7.4 °C at LGO on March 26, 7.4 °C at LMO on March 24, and 4.8 °C at MCN on March 1. Maximum water temperatures in the tailraces were as follows: 19.9 °C at LGR on July 11, 20.7 °C at LGO on July 15, 21.1 °C at LMO on July 22, and 22.0 °C at MCN on July 31.

Assuming that spill is beneficial to the survival of emigrating smolts (Berggren and Filardo 1993) and that water temperatures in excess of 18 °C may increase mortality due to increased activity by Northern Pikeminnows (Mesa and Olson 1993), the best environmental conditions for smolt emigration through LGR, LGO, LMO, and MCN occurred from early April

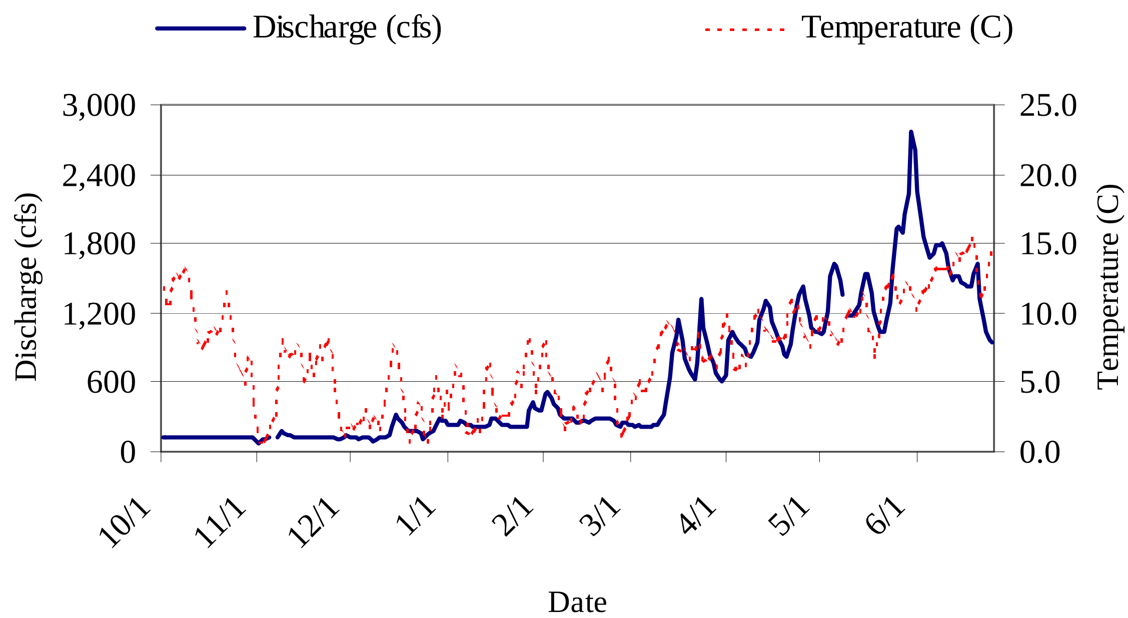

Figure 4. The average daily discharge at Imnaha River USGS gauge 13292000 from October 1, 2002 to June 25, 2003 and the average daily temperature from October 1, 2002 to June 25, 2003 at the Imnaha River trap.

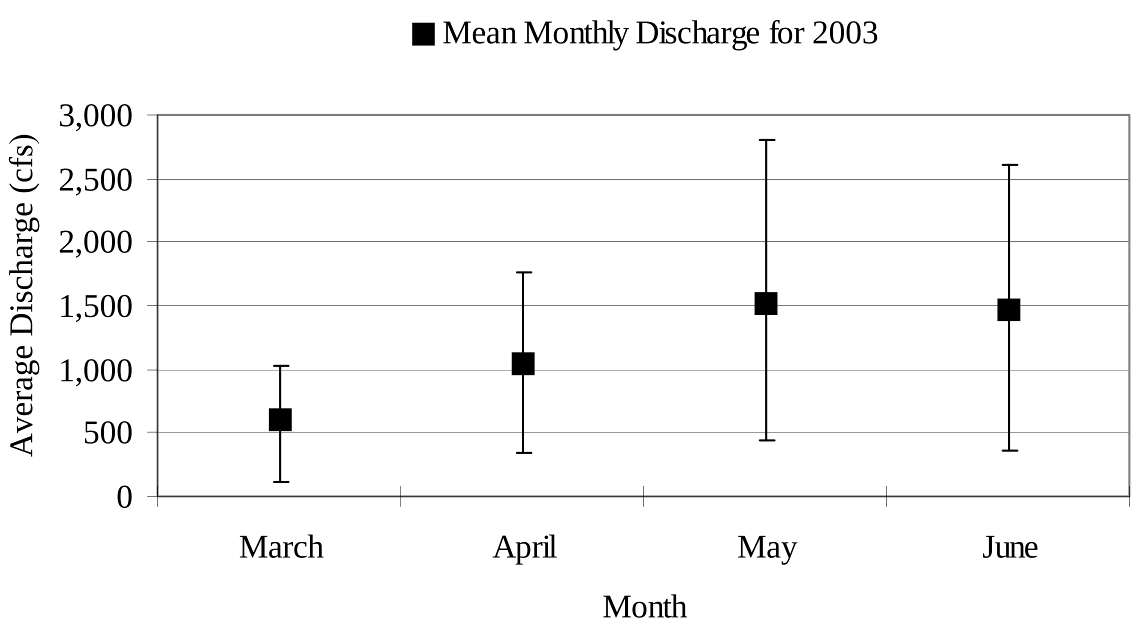

Figure 5. The average monthly discharge for the months of March, April, May, and June for 2003, at the Imnaha River USGS gauge 13292000. Bars indicate the minimum and maximum average monthly discharge values observed from 1929 to 2003.

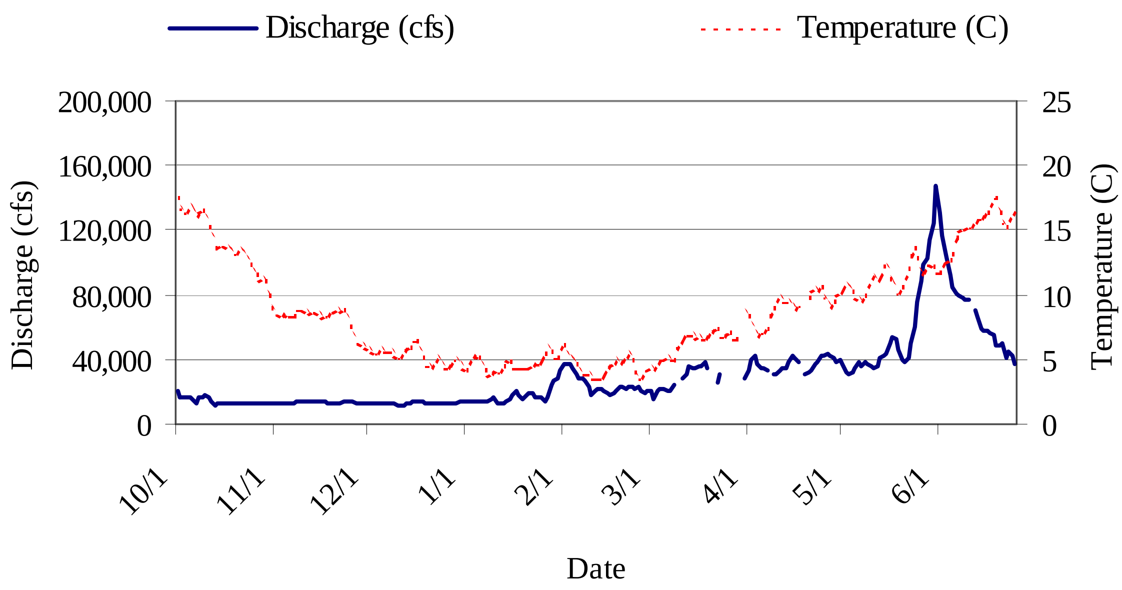

Figure 6. The average daily discharge and temperature at the Snake River gauge 13334300 from October 1, 2002 to June 25, 2003.

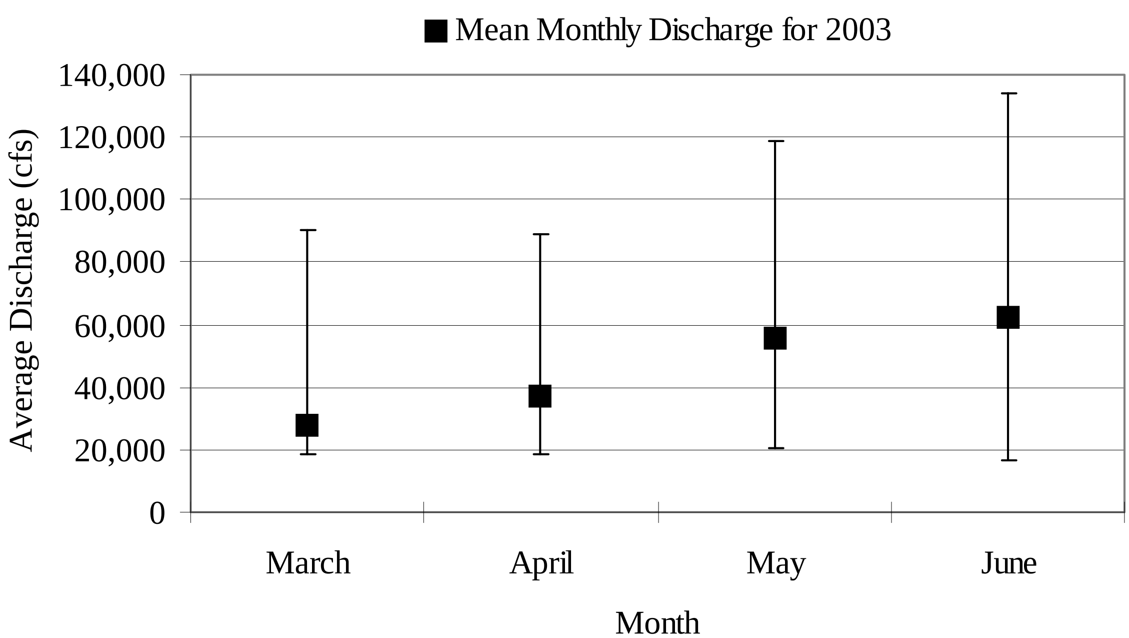

Figure 7. The average monthly discharge for the months of March, April, May, and June for 2003 at the Snake River USGS gauge 13334300. Bars indicate the minimum and maximum average monthly discharge values observed from 1959 to 2003.

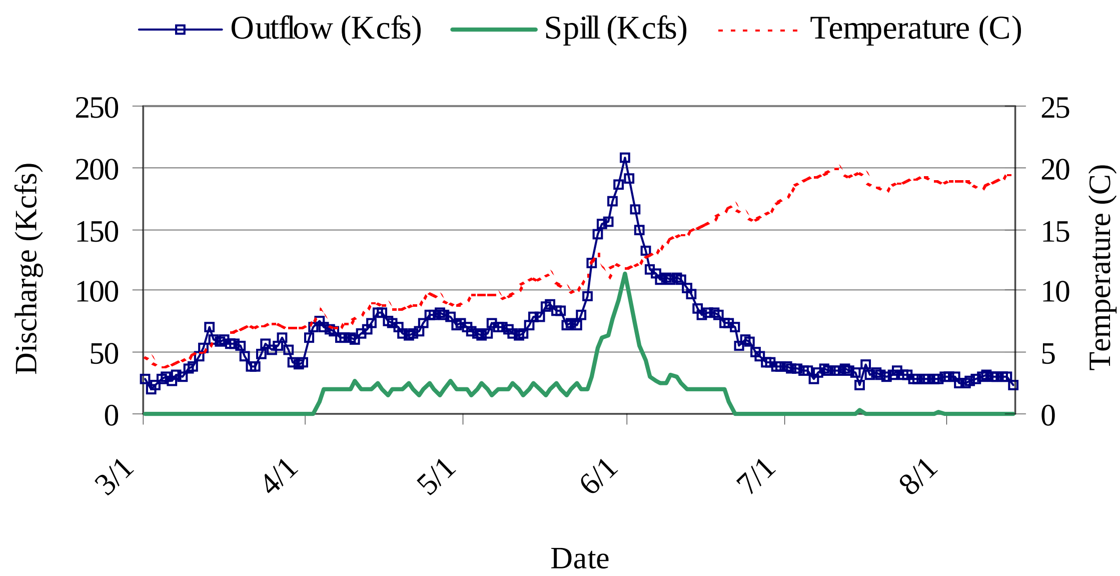

Figure 8. Measurements of outflow, spill, and mean temperature at Lower Granite Dam from March 1 to August 13, 2003. Data was obtained online at http://www.cqs.washington.edu/dart .

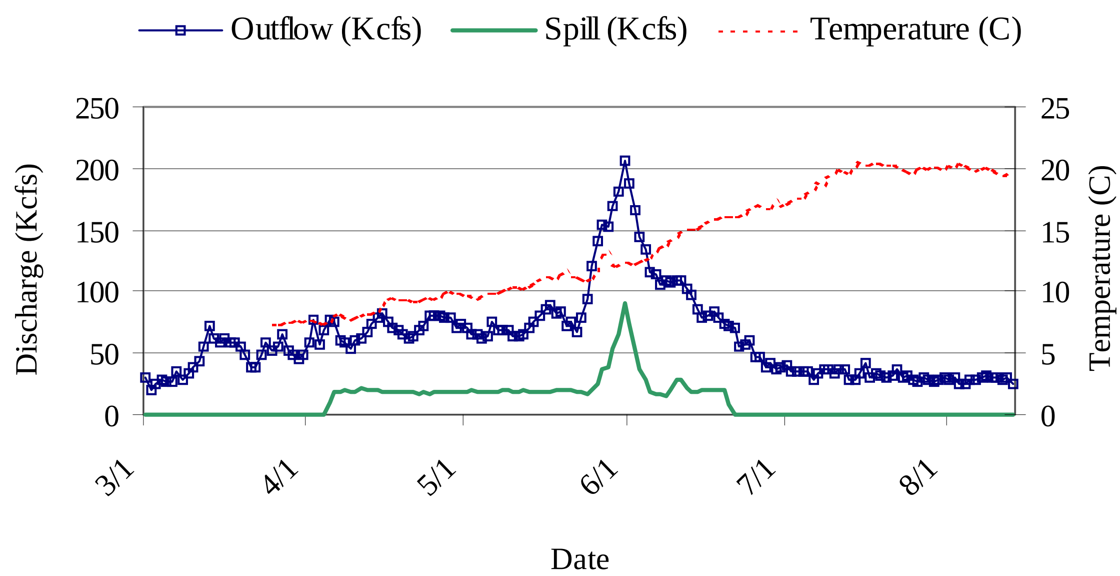

Figure 9. Measurements of outflow, spill, and mean temperature at Little Goose Dam from March 1 to August 13, 2003. Data was obtained online at http://www.cqs.washington.edu/dart .

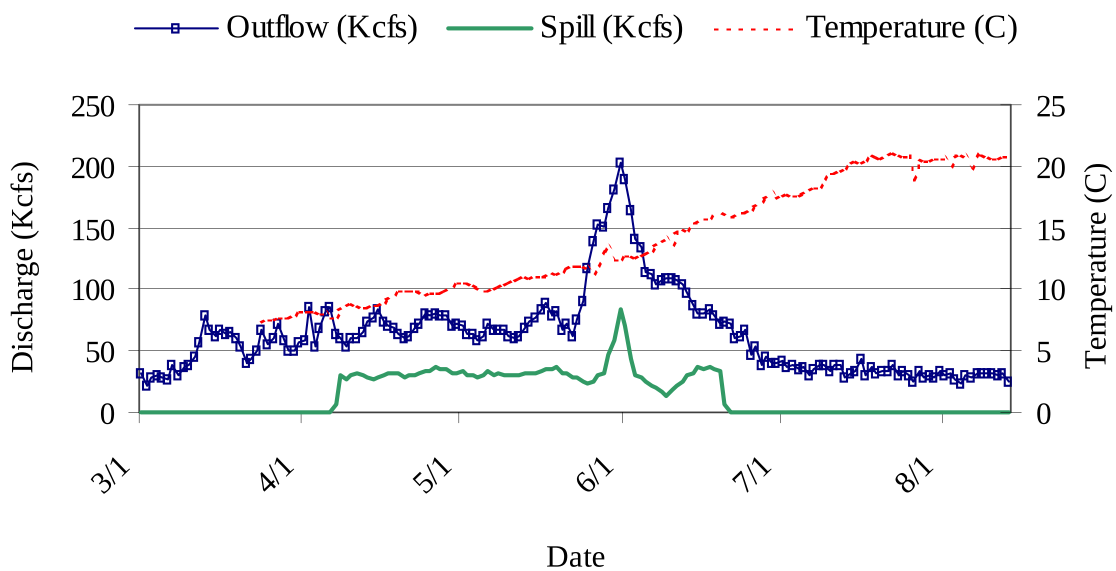

Figure 10. Measurements of outflow, spill, and mean temperature at Lower Monumental Dam from March 1 to August 13, 2003. Data was obtained online at http://www.cqs.washington.edu/dart .

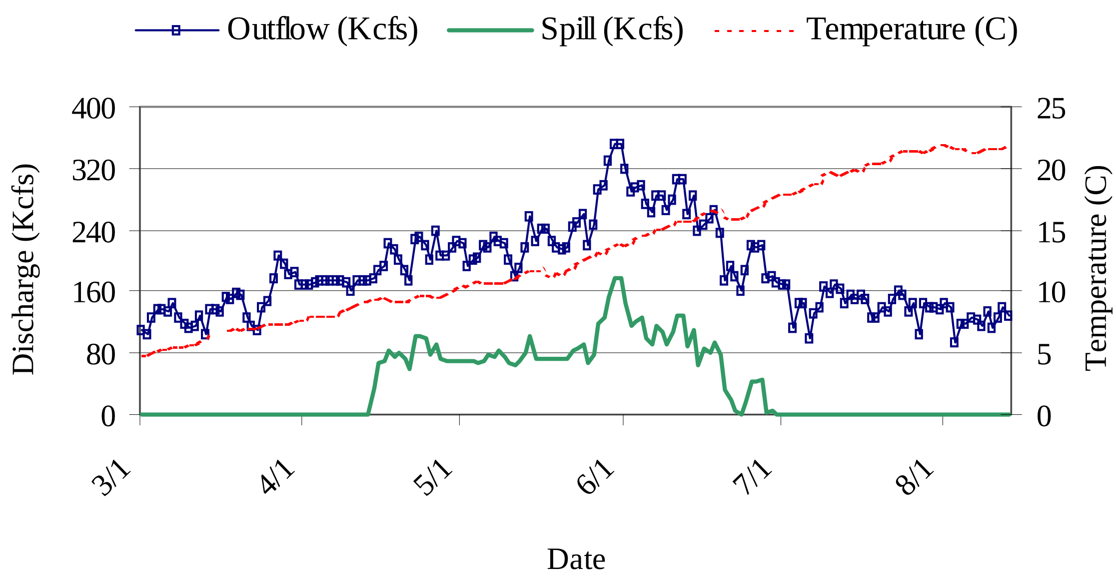

Figure 11. Measurements of outflow, spill, and mean temperature at McNary Dam from March 1 to August 13, 2003. Data was obtained online at http://www.cqs.washington.edu/dart .

(when spill began) to June 30 (before water temperatures reached 18 °C).

Hatchery Releases

Chinook Salmon

A total of 268,426 chinook salmon were released from the Imnaha River acclimation facility at rkm 74 (Table 1). Chinook salmon were ponded March 1 to March 5. Hatchery personnel began pulling dam boards on March 21 and fish were allowed to leave volitionally until April 15 when the remaining fish were forced into the river. All chinook salmon were marked with an adipose fin clip and coded wire tag, and 20,904 were marked with a PIT tag in addition to the adipose fin clip/coded wire tag mark (Eddy 2003 personal comm.).

Steelhead

Steelhead were released at two locations in the Imnaha River Subbasin in 2003 and releases totaled 373,452 fish (Table 1). A total of 123,266 steelhead were ponded March 4 at the Little Sheep Creek acclimation facility and released on April 9 and 10. Twenty-six thousand six hundred sixteen were marked with adipose-left ventral fin clips, and 43,377 were marked only with adipose fin clips. An additional 53,273 were marked with blank coded wire tags. Five hundred twenty were marked with PIT tags. A second release of 114,110 steelhead occurred from April 14 to April 18. The fish were released directly into Big Sheep Creek and 49,912 were marked with adipose and left ventral fin clips. No steelhead released into Big Sheep Creek were marked with PIT tags. The final release of 136,076 steelhead occurred from May 7 to May 8 into Little Sheep Creek. They were ponded at the acclimation facility on April 21 and 22. The fish were marked with adipose fin clips. An additional 27,777 were marked with adipose left ventral clips and 108,299 adipose fin clips in addition to 250 PIT tags (Eddy 2003 personal comm.).

Juvenile Chinook Salmon and Steelhead Catch

Catch for Migration Year 2003

The catch of natural chinook salmon for 2003 totaled 13,462 fish. The largest weekly catch occurred during the week of November 3, 2003 (n = 2,862). The weekly mean discharge and water temperature during the week of November 3 was 144 cfs and 4.1 °C, respectively (Table 2). After the week of November 3, the weekly catch of natural chinook salmon would exceed 1,000 fish only during the week of March 30 (n = 1,499) during a weekly mean discharge and water temperature of 877 cfs and 7.5 °C, respectively. A total of 29,095 hatchery chinook salmon were captured, with the first captures occurring on March 26 (Appendix B). More than half (n = 16,147) were captured during the week of April 6 when the weekly mean discharge was 959 cfs and the weekly mean temperature was 8.6 °C.

The catch of natural steelhead totaled 8,777 fish (Table 2, Appendix B). The largest

Table 1. Releases of hatchery reared chinook salmon and steelhead smolts in the Imnaha River Subbasin during migration year 2003 (Eddy 2003).

Year	Species	Dates Ponded	Number Released	Release Dates	Tags/Marks	Release Site
2003	Chinook Salmon	Mar. 1, and Mar. 4-5	268,426	Mar. 21 to Apr.15	100% adipose fin clipped with 20,904 PIT tags	Imnaha River
2003	Steelhead	Mar. 4	123,266	Apr. 9 to Apr. 10	26,616 with adipose left ventral clips, 53,273 with blank CWT, 43,377 with adipose fin clips, and 520 PIT tags	Little Sheep Creek
2003	Steelhead	NA[1]	114,110	Apr. 14 to Apr. 18	64,198 without marks, 49,912 with adipose left ventral clips	Big Sheep Creek
2003	Steelhead	Apr. 21, and Apr. 22	136,076	May 7 to May 8	100% adipose fin clipped with 27,777 adipose left ventral fin clips with CWT, and 250 PIT tags	Little Sheep Creek

[1] Steelhead were directly released into Big Sheep Creek.

weekly catch occurred during the week of May 11 and totaled 2,519 fish. The mean weekly discharge and water temperature during the week of May 11 was 1,354 cfs and 9.8 °C, respectively. The catch of hatchery steelhead was 39,582 fish with the largest weekly catch of hatchery steelhead (n = 13,260) occurring during the week of May 4. The mean weekly discharge and water temperature was 1,460 cfs and 8.7 °C.

PIT Tagging

A total of 12,494 natural chinook salmon were PIT tagged for the 2003 migration year. More than half (n = 7,183) were tagging in the fall of 2002 (Table 3, Appendix Table B3). Major tagging efforts resulting in weekly release groups of more than 1,000 fish occurred during the week of October 27, 2002 (n = 2,669), November 3, 2002 (n = 2,729), and March 30, 2003 (n = 1,460). Forty seven hatchery chinook salmon were PIT tagged during the spring.

PIT tagged natural steelhead totaled 6,303 fish (Table 3). Major tagging efforts resulting in weekly release groups of more than 1,000 fish occurred during the week of May 4 (n = 1,280) and May 11 (n = 2,017). An effort was made to produce weekly release groups of hatchery steelhead of 1,000 fish. Weekly release groups of hatchery steelhead from the week of April 13 to the week of May 11 ranged from 957 (week of April 27) to 1,023 (week of April 20).

Table 2. The weekly mean discharge (cfs), temperature (C), and catch of natural and hatchery chinook salmon and steelhead at the Imnaha River trap from October 1, 2002 to June 25, 2003.

Week	Average Discharge (cfs)	Average Temperature (C)	Natural Chinook Salmon	Hatchery Chinook Salmon	Natural Steelhead	Hatchery Steelhead
29-Sep	130	11.6	209			
6-Oct	124	11.3	97			1
13-Oct	124	8.3	533			
20-Oct	120	8.4	383		5	
27-Oct	110	3.5	2,781		1	
3-Nov	144	4.1	2,862			
10-Nov	130	6.7	685			
17-Nov	124	7.1	66			
2-Mar	219	8.0	14		1	
9-Mar	532	9.0	141		197	
16-Mar	815	6.8	570		106	1
23-Mar	892	6.7	502	792	186	14
30-Mar	877	7.5	1,499	2,536	292	40
6-Apr	959	8.6	412	16,147	132	603
13-Apr	1,064	8.3	417	5,955	241	7,897
20-Apr	1,168	9.5	733	2,617	1,117	4,824
27-Apr	1,081	9.0	440	584	745	1,934
4-May	1,460	8.7	334	248	1,782	13,260
11-May	1,354	9.8	271	153	2,519	6,780
18-May	1,196	10.6	209	60	1,299	3,853
25-May	2,203	11.3	6		8	25
1-Jun	1,859	12.1	33	1	90	104
8-Jun	1,631	13.4	66	1	34	155
15-Jun	1,461	13.9	109	1	21	83
22-Jun	990	14.7	90		1	8
			13,462	29,095	8,777	39,582

Table 3. The number of natural chinook salmon and steelhead PIT tagged weekly at the Imnaha River trap from October 1, 2002 to June 25, 2003.

Week	Natural Chinook Salmon	Hatchery Chinook Salmon	Natural Steelhead	Hatchery Steelhead
29-Sep	160			
6-Oct	59			
13-Oct	482			
20-Oct	365			
27-Oct	2,669		1	
3-Nov	2,729			
10-Nov	659			
17-Nov	60			
2-Mar	13		1	
9-Mar	140		195	
16-Mar	568		101	
23-Mar	512		212	2
30-Mar	1,460	7	289	1
6-Apr	330	10	116	243
13-Apr	366	20	211	995
20-Apr	670	4	969	1,023
27-Apr	354	4	518	957
4-May	231	1	1,280	1,003
11-May	254		2,017	1,000
18-May	194	1	259	1
25-May	5			
1-Jun	30		81	1
8-Jun	41		32	1
15-Jun	71		21	
22-Jun	72			
	12,494	47	6,303	5,227

Recaptures of Previously PIT Tagged Fish

NPT recaptured eight of the 1,008 natural chinook salmon that were previously PIT tagged by ODFW from August 26 to August 28 (Appendix Table B3). Recaptured fish averaged 104 mm in fork length, 11.0 g in weight, and 1.08 for a condition factor (Table 4). Fork length, weight, and condition factor sample sizes in Table 4 represent the number of times each attribute was recorded and summarized for this report.

A total of 1,787 PIT tagged hatchery chinook salmon released from the Imnaha River acclimation facility were recaptured. They averaged 139 mm in fork length, 28.8 g in weight, and a 1.06 condition factor. The first occurrence of a previously PIT tagged hatchery chinook salmon occurred on April 6, 12 days after the volitional release began. Fifty and 90% of the fish arrived 18 and 30 days, respectively, after the volitional release began (Figure 12).

The earliest 90% arrival time occurred in 1998. The release strategy in 1998 was an acclimated forced release. Ninety percent of all previously PIT tagged hatchery chinook salmon

Table 4. Averages, ranges, and standard deviations of fork lengths (mm), weights (g), and condition factors (K) for PIT tag recaptures of hatchery chinook salmon, natural chinook salmon, and hatchery steelhead observed at the Imnaha River trap from March 7 to June 25, 2003.

Attribute	Statistic	Natural Chinook Salmon	Hatchery Chinook Salmon	Hatchery Steelhead
Fork Length	Average	104	139	217
	Standard Deviation	9.6	13.9	23.1
	Minimum	93	99	102
	Maximum	125	199	260
	Sample Size (n)	8	1,319	75
Weight (g)	Average	11.0	28.8	100.3
	Standard Deviation	1.6	8.3	27.3
	Minimum	8.2	11.2	44.7
	Maximum	13.8	60.5	179.0
	Sample Size (n)	7	977	64
Condition Factor	Average	1.08	1.06	0.94
	Standard Deviation	0.08	0.12	0.07
	Minimum	1.01	0.66	0.79
	Maximum	1.25	1.49	1.16
	Sample Size (n)	7	977	64

arrived 8 days after the release in 1998 (Figure 12). The earliest 90% arrival time for an acclimated volitional release occurred in 2000 which occurred 22 days after the volitional release began. The latest 90% arrival time (34 days) occurred in 1999. The majority of the hatchery chinook salmon in 1999 (n = 184,567) were acclimated and released volitionally. A small number of hatchery chinook salmon in 1999 (n = 10,242) were directly released into the Imnaha River (Cleary et al. 2003a).

Ninety-four previously PIT tagged hatchery steelhead were recaptured during the spring of 2003. They averaged 217 mm in fork length, 100.3 g in weight, and a condition factor of 0.94 (Table 4). Sixty-six of the fish were recaptured from the acclimation facility on Little Sheep Creek and 28 were recaptured from direct releases into Big Sheep Creek.

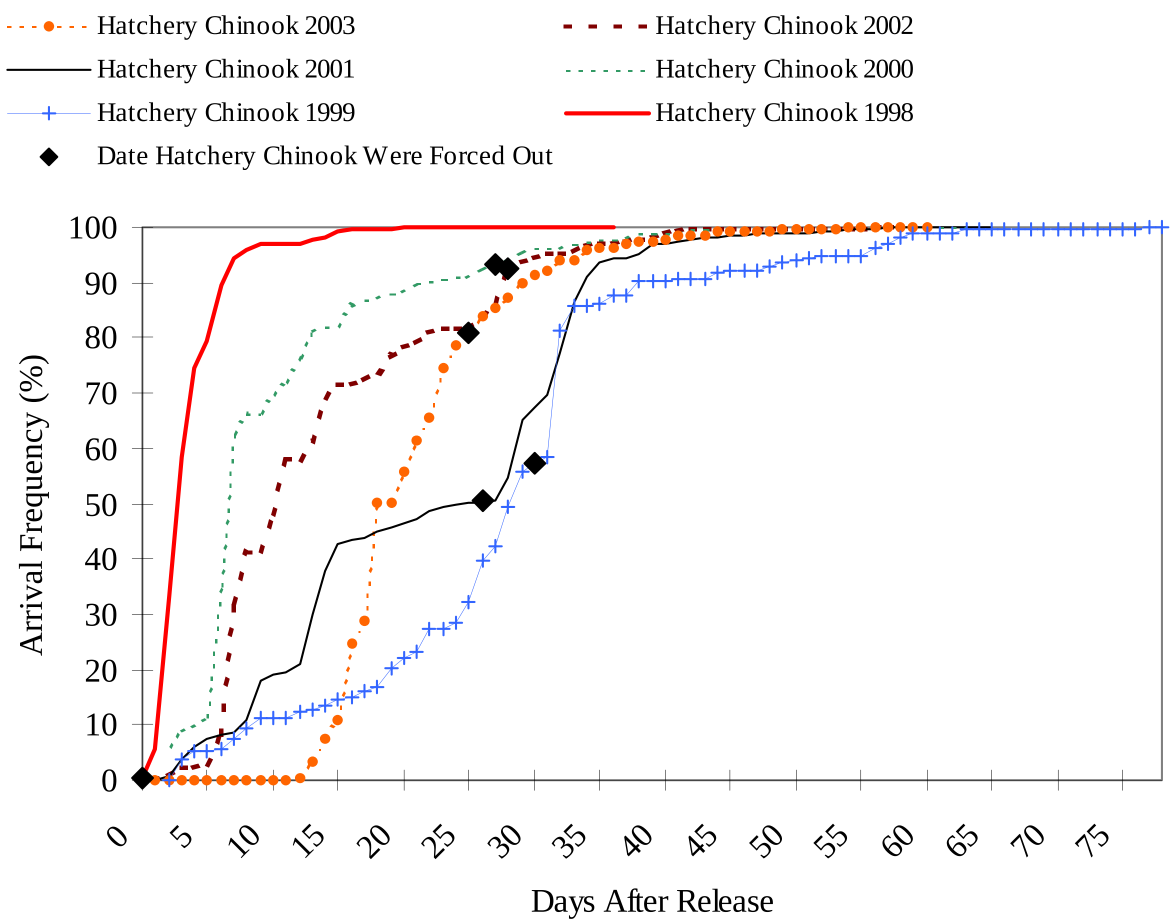

Figure 12. The arrival frequency of previously PIT tagged hatchery chinook salmon captured in the Imnaha River trap during the spring of 1998 to the spring of 2003. The release stratagy in 1998 was an acclimated forced release and the remainder of the releases were acclimated volitional releases.

Biological Characteristics

Annual Biological Characteristics

The length frequency distribution of fall tagged natural chinook salmon is shown in Figure 13. These fish averaged 82 mm in fork length, 7.1 g in weight, and had an average condition factor of 1.02 (Table 5). Natural chinook salmon captured in the spring averaged 104 mm, 11.8 g, and had an average condition factor of 1.02 (Figure 14, Table 5). Hatchery chinook salmon had a larger fork length of 139 mm (Figure 14, Table 5). Hatchery chinook salmon had an average weight of 29.7 g and an average condition factor of 1.06. The 137 mm median fork length of hatchery chinook salmon was significantly different from the 104 mm median form length of natural chinook salmon ($p < 0.05$). Statistical test results are presented in Appendix C.

Natural steelhead had an average fork length and weight of 174 mm and 53.9 g (Figure 15, Table 5). Hatchery steelhead were larger with an average fork length of 222 mm and weight of 110.6 g (Figure 15, Table 5). Condition factors for natural and hatchery steelhead were identical (0.98). The median fork length of natural steelhead (174 mm) was significantly different ($p <0.05$) than hatchery steelhead (222 mm).

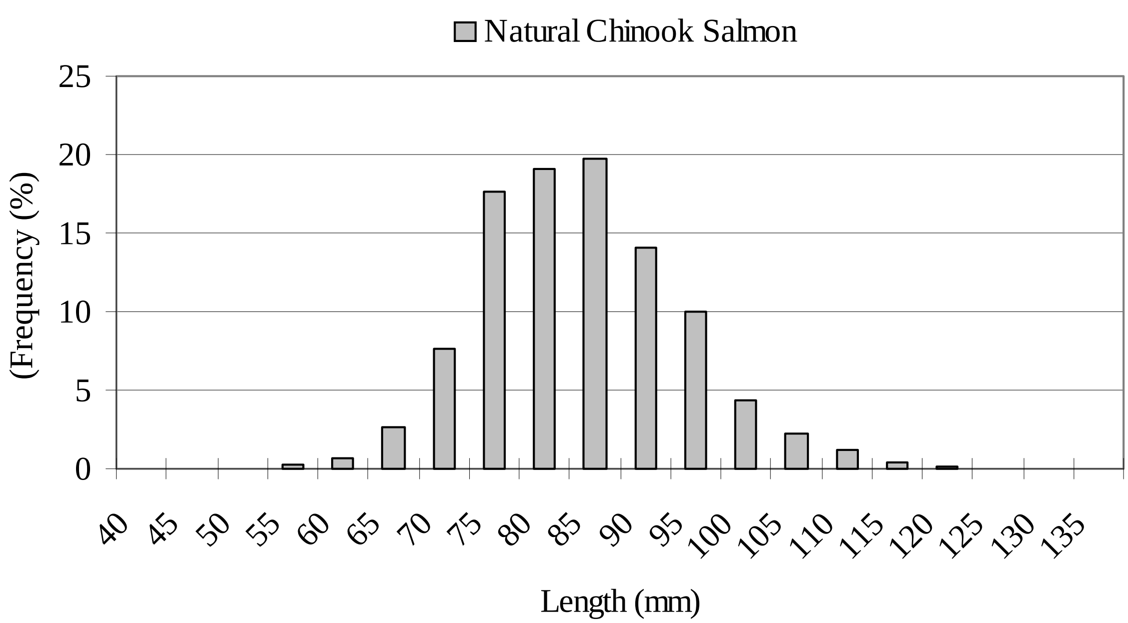

Figure 13. Length frequency distribution of natural chinook salmon trapped in the Imnaha River trap during the fall of 2002.

Table 5. Average fork length, weight, and condition factors with standard deviations, minimum, maximum, and sample size values for natural and hatchery chinook salmon and steelhead captured during the 2003 migration year October 1 to June 25, 2003 at the Imnaha River trap.

Attribute	Statistic	Natural Chinook Salmon (Pre-Smolts)	Natural Chinook Salmon (Smolts)	Hatchery Chinook Salmon	Natural Steelhead	Hatchery Steelhead
Fork Length (mm)	Average	82	104	139	174	222
	Standard Deviation	9.9	9.7	15.6	23.2	22.9
	Minimum	44	58	96	78	87
	Maximum	131	163	218	249	295
	Sample Size (n)	7,353	4,841	1,743	5,961	5,397
Weight (g)	Average	7.1	11.8	29.7	53.9	110.6
	Standard Deviation	1.9	3.6	11.4	20.7	34.0
	Minimum	4.0	2.3	9.1	4.5	7.3
	Maximum	20.1	42.7	115.8	161.7	265.9
	Sample Size (n)	3,352	4,828	1,732	5,944	5,385
Condition Factor	Average	1.02	1.02	1.06	0.98	0.98
	Standard Deviation	0.09	0.12	0.11	0.08	0.08
	Minimum	0.62	0.60	0.66	0.62	0.70
	Maximum	1.61	1.38	1.49	1.27	1.38
	Sample Size (n)	3,346	4,828	1,732	5,944	5,385

Hatchery programs from 1994 to 2000 for the Imnaha River tended to produce larger smolts than in nature (Cleary et al. 2002, Cleary et al. 2000, Blenden et al. 1998). The differences in size should be a concern if differences in downstream survival due to size and adult age structure become apparent.

There were no distinct weekly trends in the size or condition factors of captured natural and hatchery chinook salmon and steelhead. The largest weekly mean fork lengths of natural chinook salmon (> 108 mm) occurred during the weeks of April 20 to May 18 (Table 6). The largest weekly mean fork lengths for hatchery chinook salmon (> 140) were measured during the week of March 23 and the week of March 30. Natural steeelhead had weekly mean fork lengths greater than 170 mm from the week of April 13 to the week of May 25. The largest weekly mean fork lengths for hatchery steelhead were 226 mm and 225 mm and were measured during the weeks of April 27 and May 4, respectively (Table 6).

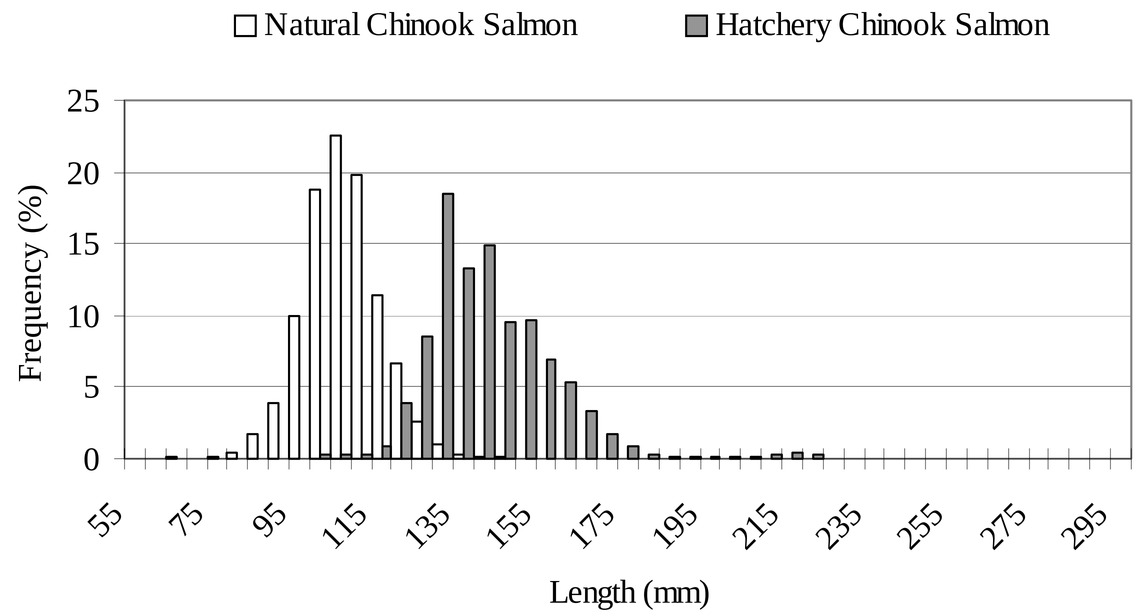

Figure 14. Length frequency distribution of natural and hatchery chinook salmon trapped in the Imnaha River trap, March 7 to June 25, 2003.

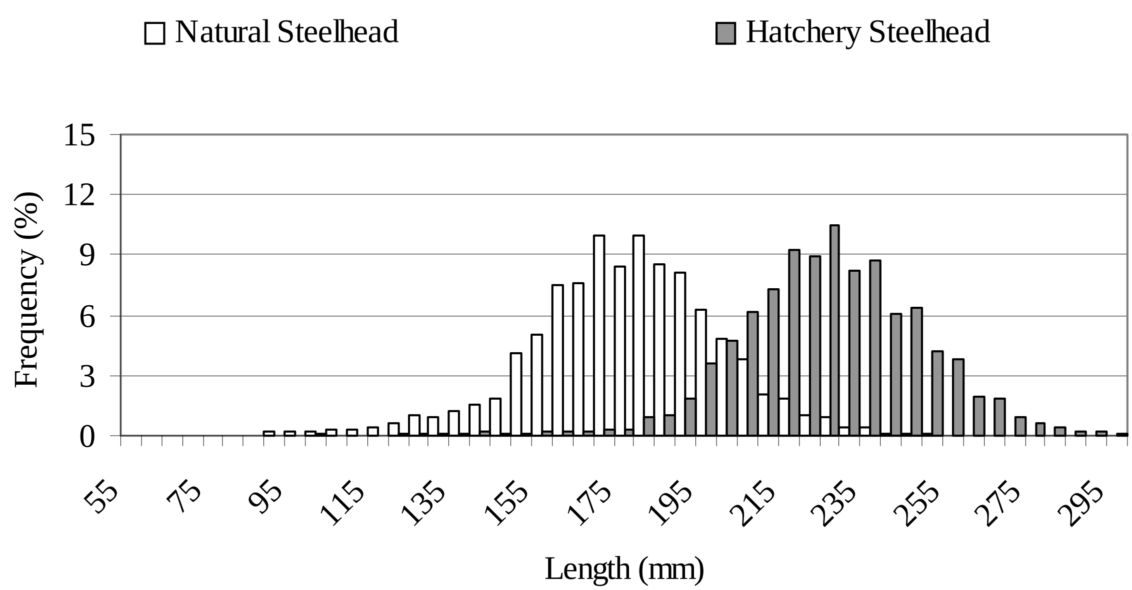

Figure 15. Length frequency distribution of natural and hatchery steelhead trapped in the Imnaha River trap, March 7 to June 25, 2003.

Table 6. Weekly mean fork lengths (FL) and condition factors (K) for natural and hatchery chinook salmon and steelhead captured at the Imnaha River trap during the spring of 2003.

	Natural Chinook Salmon		Hatchery Chinook Salmon		Natural Steelhead		Hatchery Steelhead	
Week	FL(mm)	K	FL(mm)	K	FL(mm)	K	FL(mm)	K
3/2	104	0.95			149	0.84		
3/9	105	0.96			146	0.96		
3/16	102	0.98			148	0.98	224	0.94
3/23	101	1.02	142	1.09	156	0.97	224	1.02
3/30	102	0.97	147	1.02	150	0.97	156	1.13
4/6	103	0.99	140	1.06	166	0.98	224	1.03
4/13	105	1.05	139	1.08	177	0.99	221	1.01
4/20	108	1.05	138	1.06	177	0.98	224	0.96
4/27	108	1.04	133	1.07	175	0.99	226	0.99
5/4	109	1.09	136	1.12	180	0.99	225	0.97
5/11	108	1.07	129	1.08	177	0.98	221	0.95
5/18	108	1.04	124	1.03	176	0.87	219	0.91
5/25	102	1.11			192	0.96	205	0.92
6/1	102	1.09			150	1.01	206	0.93
6/8	95	1.12	131	0.98	162	0.97	205	0.94
6/15	95	1.10			142	1.02	216	0.93
6/22	88	1.08					203	0.92

Survival of PIT Tagged Smolts

Chinook Salmon Abundance and Post Release Survival

Trap efficiency tests for natural chinook salmon were grouped into eight periods consisting of one or more daily trap efficiency trials from March 12 to May 19 (Appendix Table D1). Trap efficiencies ranged from 0.033 on April 12 to 0.226 on April 2, and averaged 11.6% ±10.1% (95% C.I.). An overall spring emigration abundance estimate was not attempted because of the variability of individual trial estimates. The variability creates unreliable abundances estimates for periods when the trap did not operate. Bootstrap mean population and variance estimates were calculated for periods with successful trap efficiencies and are presented in Appendix Table D1.

An estimated 244,426 ±9,938 (95% C.I.) hatchery chinook salmon emigrated past the Imnaha River trap during the spring of 2003. The population estimate is based on a post release survival estimate of 91.0% ±3.7% (95% C.I.) from the acclimation facility to the trap. This survival estimate is within the range of past post release survival estimates from the acclimation facility to the Imnaha River trap of 88.4% ± 2.0% (95% C.I.) in 1998 to 100.9% ± 14.3% (95% C.I.) in 1994 (Figure 16, and Appendix Table D2). The post release survival estimates is useful for evaluating the mortality that occurred within the Imnaha River and comparing that reach specific mortality to other reaches within the Snake River and Columbia River.

Estimated Season Wide Smolt Survival

The survival of fall PIT tagged natural chinook salmon from the Lower Imnaha River trap to LGR has been measured from migration years 1994 to 2003. All season wide and weekly survival estimates presented in this and the next section of the report are with 95% confidence intervals in parenthesis. Fall PIT tagged natural chinook salmon sample sizes have ranged from 442 (1997) to 2,052 (2003). The survival estimates range from 25.6% (± 4.3%) for migration year 1995 to 60.4% (± 4.1%) for migration year 1998. The migration year 2003 survival estimate for fall tagged natural chinook salmon from the trap to LGR was 29.8% (± 3.2%) (Figure 17). Fall PIT tagged natural chinook survival from the trap to LMO was 25.0% (± 6.5%).

The estimated survival of natural chinook salmon smolts from the trap to LGR in 2003 was 75.9% (± 2.3%) (Table 7). The recaptured hatchery chinook salmon released at the Imnaha River trap had an estimated survival of 73.6% (± 8.1%) to LGR. The estimated survival of natural and hatchery steelhead from the trap to LGR was 82.0% (± 2.5%), and 89.4% (± 3.3%), respectively. The estimate of survival from release to LGR for natural chinook salmon smolts was the lowest observed since 1993 (Table 8). Natural chinook survival from the trap to LGR (1993 to 2002) had ranged from 76.2% in 1994 to 90.9% in 1995. Hatchery chinook salmon

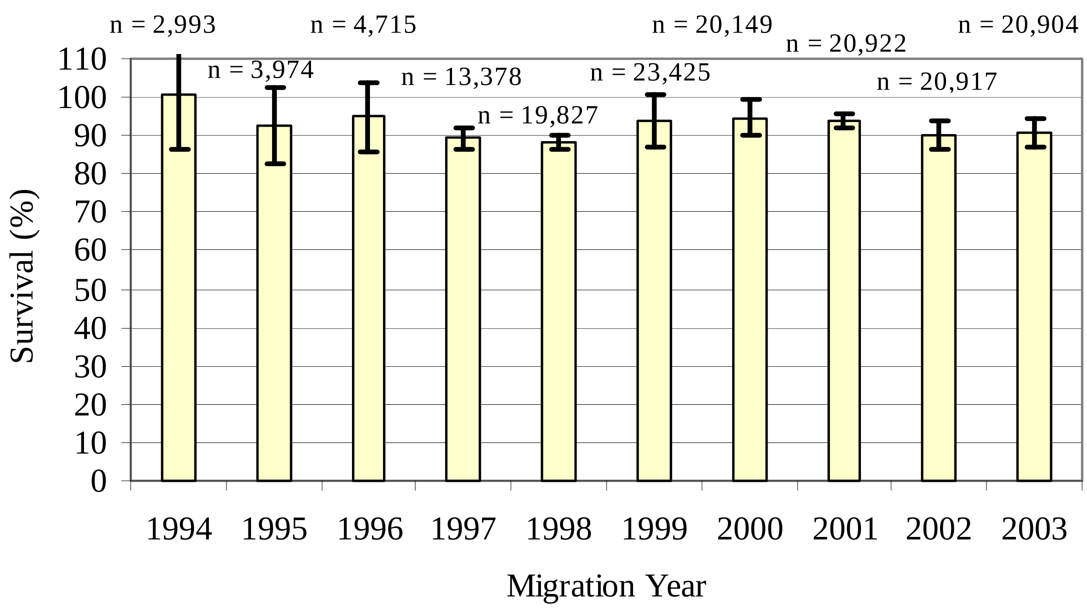

Figure 16. Estimated post release survival of hatchery chinook salmon from the Imnaha River acclimation facility to the Imnaha River trap from 1994 to 2003. The size of annual PIT tag release groups are shown above for each year and error bars indicate the 95% C.I..

estimated survival from release to LGR was within the past range of estimates of 67.1% in 1994 to 80.4% in 1997. Natural steelhead estimated survival was lower than previous estimates from 1995 to 2002. Natural steelhead survival estimates had ranged from 82.7% in 2001 to 90.1% in 1997. The estimated survival from release to LGR for hatchery steelhead was higher than previous estimates of 64.6% in 1996 to 85.8% in 2000 from 1995 to 2002.

Estimated survival from the Imnaha River trap to LMO in 2003 was as follows: natural chinook salmon - 60.0% (± 4.3%), hatchery chinook salmon - 61.5% (± 20.4%), natural steelhead - 68.1% (± 4.8%), and hatchery steelhead - 82.1% (± 5.5%). The estimated survival for natural chinook salmon was the lowest to LMO since 1998 and reflects the poor survival to LGR (Table 9). Previous survival estimates for natural chinook salmon from release to LMO ranged from 65.6% in 2001 to 78.3% in 1999.

A possible explanation for the poor survival of natural chinook salmon to LGR and LMO could be that survival was affected by the below average discharge during March and April in the Snake River. Past monitoring of chinook salmon and steelhead estimated survival from LGO and LGR to the Dalles Dam as ranging from “5% during the low-flow year of 1973 to as high as 42% during more favorable passage conditions of 1975" (Raymond 1979). However, this implies a relationship between flow and survival which may not have a strong correlation (Smith et al. 2002). The 2003 survival estimates for hatchery chinook salmon, natural steelhead, and hatchery steelhead from release to LMO did not appear to be affected by the below average discharge in the Snake River in 2003. Estimated survival for hatchery chinook salmon from

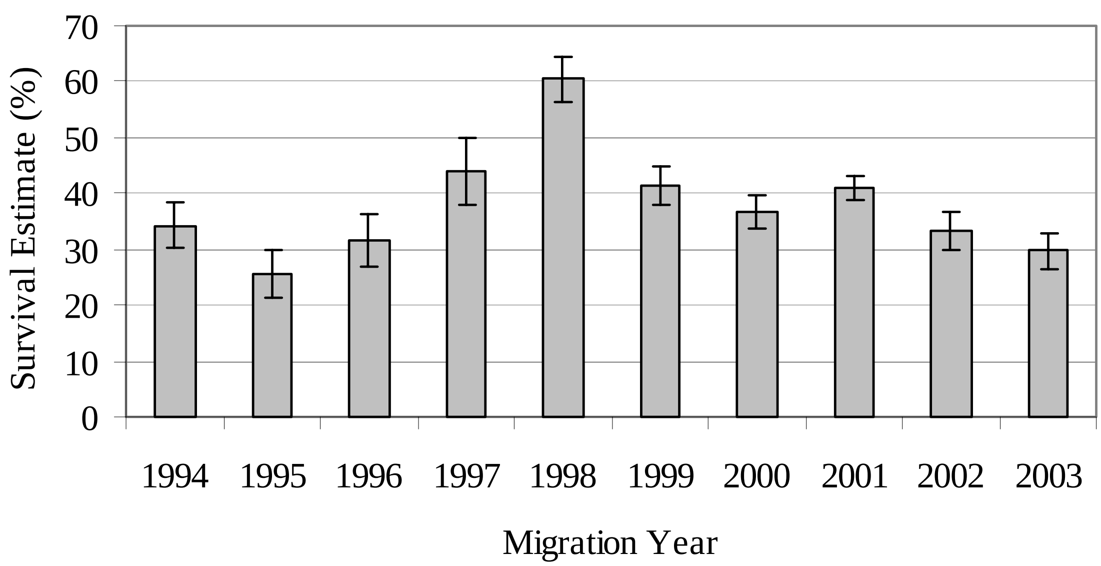

Figure 17. Estimated survival from the Imnaha River trap to Lower Granite Dam of natural chinook salmon tagged in the fall, for migration years 1994 to 2003. Error bars indicate the 95% C.I..

release to LMO was within the range of past estimates from 1998 to 2002 of 61.1% in 1999 to 68.1% in 2002. Both estimates of survival from release to LMO for natural and hatchery steelhead were within the range of estimates obtained from 1997 to 2002. Natural steelhead survival from release to LMO has ranged from 50.9% in 2000 to 75.1% in 1999 and hatchery steelhead survival from release to LMO has ranged from 57.8% in 2000 to 78.0% in 2002.

Past survival estimates for natural chinook salmon and steelhead, and hatchery steelhead from release to MCN were within the range of estimates from 1998 to 2003 (Table 10). Natural chinook salmon survival from release to MCN have ranged from 47.4% during the drought year of 2001 to 78.7% in 1998. The maximum average daily discharge from the Imnaha River in 2001 occurred on May 15 and was 1,150 cfs (32.6 cms) (Cleary et al. 2003b). The maximum average daily discharge from the Imnaha River in 1998 occurred on May 26 and was a magnitude of more than 5 times greater than in 2001 at 5,964 cfs (168.9 cms) (Cleary et al. 2000). Hatchery chinook salmon survival from release to MCN has ranged from 49.0% in 2003 to 56.0% in 2002. Natural steelhead survival from release to MCN has ranged from 18.4% in 2001 to 71.6%% in 1999. Hatchery steelhead survival from release to MCN has ranged from 13.9% in 2001 to 63.8%% in 1998. The lowest estimates of survival for steelhead from release to MCN, like natural chinook salmon, occurred during the drought year of 2001.

Table 7. Estimated survival probabilities for season-wide PIT tag release groups of natural and hatchery chinook salmon and steelhead smolts released from the Imnaha River trap from March 7 to June 25, 2003. Estimates are from release at the trap to Lower Granite Dam and tail race to tail race for all other sites. Abbreviations: LGR -Lower Granite Dam, LGO - Little Goose Dam, LMO - Lower Monumental Dam, MCN -McNary Dam.

Release Group	Number Released	Trap to LGR (%) (95%) C.I.	LGR to LGO (%) (95%) C.I.	LGO to LMO (%) (95%) C.I.	LMO to MCN (%) (95%) C.I.	Trap to LMO (%) (95%) C.I.	Trap to MCN (%) (95%) C.I.
Natural Chinook Salmon							
	5,311	75.9 (2.3)	92.5 (4.3)	85.4 (6.8)	101.6 (13.1)	60.0 (4.3)	57.1 (5.6)
Hatchery Chinook Salmon							
	1,787	73.6 (8.1)	96.3 (22.1)	77.3 (32.8)	89.5 (39.9)	61.5 (20.4)	49.0 (11.8)
Natural Steelhead							
	6,302	82.0 (2.5)	90.5 (4.5)	91.9 (7.2)	62.8 (9.6)	68.1 (4.8)	42.0 (5.6)
Hatchery Steelhead							
	5,227	89.4 (3.3)	98.3 (5.7)	93.4 (7.6)	76.0 (18.3)	82.1 (5.5)	63.0 (14.5)

Table 8. Season-wide estimates of survival from the lower Imnaha River trap to Lower Granite Dam from 1993 to 2003. Ninety-five percent confidence intervals are shown in parentheses.

Migration Year	Natural Chinook Salmon (%)	Hatchery Chinook Salmon (%)	Natural Steelhead (%)	Hatchery Steelhead (%)
1993	80.9 (11.8)			
1994	76.2 (5.3)	67.1 (10.2)		
1995	90.9 (6.7)	72.1 (6.3)	83.7 (7.1)	77.5 (3.1)
1996	81.2 (5.3)	71.4 (9.4)	86.5 (3.9)	64.6 (4.7)
1997	89.5 (12.9)	80.4 (8.0)	90.1 (3.9)	81.4 (2.0)
1998	85.2 (2.0)	75.7 (3.1)	86.0 (2.2)	82.9 (2.3)
1999	88.5 (2.0)	71.6 (4.7)	87.7 (3.1)	85.4 (2.0)
2000	84.8 (2.3)	74.4 (4.3)	84.4 (2.7)	85.8 (2.4)
2001	83.7 (0.8)	80.3 (1.6)	82.7 (1.4)	82.0 (1.6)
2002	86.9 (4.4)	77.3 (4.4)	83.0 (5.4)	81.8 (3.5)
2003	75.9 (2.3)	73.6[1] (8.1)	82.0 (2.5)	89.4 (3.3)

[1] Hatchery chinook salmon estimates based on the release of captured PIT tagged fish released from the chinook salmon acclimation facility.

Table 9. Season-wide estimates of survival from the lower Imnaha River trap to Lower Monumental Dam from 1997 to 2003. Ninety-five percent confidence intervals are shown in parentheses.

Migration Year	Natural Chinook Salmon (%)	Hatchery Chinook Salmon (%)	Natural Steelhead (%)	Hatchery Steelhead (%)
1997			73.0 (12.0)	64.0 (6.5)
1998	75.3 (4.7)	64.5 (6.7)	67.0 (5.7)	63.2 (4.9)
1999	78.3 (2.4)	61.1 (5.9)	75.1 (4.6)	73.9 (3.3)
2000	73.2 (4.3)	54.9 (7.5)	50.9 (4.7)	57.8 (7.8)
2001	65.6 (1.3)	69.0 (2.5)	49.2 (3.5)	42.8 (6.0)
2002	76.8 (4.5)	68.1 (4.2)	69.9 (4.5)	78.0 (8.4)
2003	60.0 (4.3)	61.5[1] (20.4)	68.1 (4.8)	82.1 (5.5)

[1] Hatchery chinook salmon estimates based on the release of captured PIT tagged fish released from the chinook salmon acclimation facility.

Table 10. Season-wide estimates of survival from the lower Imnaha River trap to McNary Dam from 1998 to 2003. Ninety-five percent confidence intervals are shown in parentheses.

Migration Year	Natural Chinook Salmon Survival (%)	Hatchery Chinook Salmon Survival (%)	Natural Steelhead Survival (%)	Hatchery Steelhead Survival (%)
1998	78.7 (6.8)	54.3 (8.0)	64.0 (10.1)	63.8 (10.5)
1999	68.5 (4.3)	53.8 (9.8)	71.6 (12.0)	58.8 (7.6)
2000	67.9 (6.3)	54.1 (9.7)	49.9 (12.2)	40.2 (12.5)
2001	47.4 (1.5)	52.1 (5.3)	18.4 (3.1)	13.9 (3.9)
2002	61.9 (5.3)	56.0 (5.6)	37.0 (4.8)	48.7 (13.2)
2003	57.1 (5.6)	49.0[1] (11.8)	42.0 (5.6)	63.0 (14.5)

[1] Hatchery chinook salmon estimates based on the release of captured PIT tagged fish released from the chinook salmon acclimation facility.

Estimated Weekly Smolt Survival

Weekly release groups of more than 300 fish resulted in estimates from release to LGR for natural chinook salmon that ranged from 72.2% (± 7.2%) released during the week of April 20 to 83.5% (± 4.2%) released during the week of March 30 (Table 11). Recaptured hatchery chinook salmon provided two weekly release groups for the weeks of April 6 and April 13. Estimated survival of these groups from release at the trap to LGR was 78.2% (± 10.5%) and 65.0% (± 10.3%), respectively. Weekly estimates of survival from release to LGR for natural steelhead ranged from 84.7% (±3.7) during the week of May 11 to 89.8% (±7.4%) during the week of May 4. Hatchery steelhead survival estimates ranged from 86.6% (±10.3%) during the week of April 27 to 95.2% (±9.3%) during the week of April 13.

The range of weekly estimates from release to LMO were as follows: 54.4% to 85.9% for natural chinook salmon, 57.7% to 95.1% for hatchery chinook salmon, 65.7% to 80.9% for natural steelhead, and 80.9% to 88.2% for hatchery steelhead.

Smolt to Adult Return Rates

Smolt-to-adult return rate (SAR) were calculated for two groups of PIT tagged juvenile natural chinook salmon emigrants from the Imnaha River, for brood years 1996 to 1998. The two groups were represented by: 1) juvenile chinook salmon tagged during the fall of the migration year which emigrated past the lower Imnaha River trap, and 2) chinook salmon smolts which emigrated past the lower Imnaha River trap during the spring. Estimated SAR's for these two groups represent in-river migrating fish (although a few smolts were inadvertently diverted

Table 11. Estimated survival probabilities for weekly PIT tag release groups of 300 or more natural and hatchery chinook salmon and steelhead smolts released from the lower Imnaha River trap from March 7 to June 25, 2003, with 95% confidence intervals in parentheses. Estimates are from release at the trap to Lower Granite Dam and tail race to tail race for all other sites. Abbrev.: LGR - Lower Granite Dam, LGO - Little Goose Dam, LMO - Lower Monumental Dam.

Week of Release	Number Released	Estimated Survival			
		Trap to LGR % (95% C.I.)	LGR to LGO % (95% C.I.)	LGO to LMO % (95% C.I.)	Trap to LMO % (95% C.I.)
Natural Chinook Salmon					
3/16	568	75.3 (7.6)	92.3 (14.7)	98.2 (36.4)	68.2 (24.0)
3/23	512	76.9 (7.9)	89.1 (13.7)	92.3 (29.1)	63.2 (18.8)
3/30	1,460	83.5 (4.2)	94.0 (7.8)	90.1 (15.4)	70.7 (11.2)
4/6	330	80.9 (8.6)	98.1 (18.8)	68.6 (21.4)	54.5 (14.7)
4/13	366	77.6 (9.7)	91.1 (18.6)	121.6 (70.3)	85.9 (47.9)
4/20	670	72.2 (7.2)	97.8 (15.5)	93.8 (25.6)	66.2 (16.2)
4/27	354	76.0 (11.5)	73.1 (15.0)	99.5 (33.4)	55.2 (17.6)
Hatchery Chinook Salmon					
4/6	977	78.2 (10.5)	102.7 (29.2)	73.2 (44.3)	58.7 (32.3)
4/13	435	65.0 (10.3)	107.3 (36.7)	136.3 (109.6)	95.1 (70.6)
Natural Steelhead					
4/20	969	85.2 (8.1)	93.8 (16.4)	82.2 (24.5)	65.7 (17.1)
4/27	957	86.6 (10.3)	103.3 (19.1)	90.5 (21.3)	80.9 (15.1)
5/4	1,280	89.8 (7.4)	89.7 (11.7)	92.0 (18.1)	74.1 (12.6)
5/11	2,017	84.7 (3.7)	90.5 (5.9)	100.9 (10.0)	77.4 (6.9)
Hatchery Steelhead					
4/13	995	95.2 (9.3)	95.7 (15.0)	95.7 (21.1)	87.2 (16.0)
4/20	1,023	89.2 (8.3)	102.4 (17.5)	96.5 (23.1)	88.2 (16.9)
4/27	957	86.6 (10.3)	103.3 (19.1)	90.5 (21.3)	80.9 (15.1)
5/4	1,003	87.7 (5.6)	102.4 (9.3)	90.7 (12.9)	81.5 (10.2)
5/11	1,000	91.7 (6.4)	95.3 (10.0)	94.5 (13.9)	82.6 (10.4)

to the transportation system) defined as those fish that migrated by either spill or turbine routes. The estimated SAR provides a SAR index of inriver migrating Imnaha River chinook salmon. A season wide juvenile survival rate from the lower trap to LGR was used to generate comparable estimated smolt equivalents at LGR, which was then used to estimate SAR's from LGR to LGR. The LGR to LGR SAR was calculated as it provides a SAR comparable to other tributaries.

The total number of chinook salmon adults detected at LGR for spring PIT tagged chinook salmon from brood years 1996, 1997, and 1998 were 59, 105, and 109 fish, respectively (Table 12). Adult detections from fall PIT tagged chinook salmon from brood years 1996, 1997, and 1998 were 27, 20, and 22 fish, respectively. Adult detections from the fall tagged chinook salmon was below the desired sample size of 30 adults per brood year.

Fall tagged natural chinook salmon evidenced a higher LGR to LGR SAR index for all brood years examined when compared to spring tagged chinook salmon (Table 12). The LGR to LGR SAR index for fall tagged chinook salmon ranged from 2.41% to 3.08%. The LGR to LGR SAR index for spring tagged chinook salmon ranged from 1.75% to 2.94% for the same brood years. The 1996 brood year fall tagged chinook salmon SAR of 3.08% appeared substantially different from the spring tagged chinook salmon SAR of 1.75%. Observed differences between fall and spring tag group SAR indexes for brood years 1997 and 1998 were relatively small (0.17% - brood year 1997, and 0.04% - brood year 1998).

The observed SAR index for fall tagged chinook salmon from the lower Imnaha River trap to LGR ranged from 1.00% to 1.86% for the three brood years examined (Table 12). The SAR index for spring tagged chinook salmon from the lower Imnaha River to LGR varied from 1.49% to 2.49%.

Arrival Timing at Dams

Natural and Hatchery Chinook Salmon Arrival Timing

Fall tagged natural chinook salmon had a statistically significant earlier median and cumulative arrival timing at LGR than spring tagged natural chinook salmon ($p < 0.05$). Statistical test results are presented in Appendix Table C2. The April 16 median arrival date for fall tagged chinook salmon was earlier than the April 29 arrival date for spring tagged chinook salmon ($p < 0.05$). A Kolmogorov-Smirnov test indicated there was a significant difference between the cumulative arrival distributions at LGR at a 95% confidence interval (Figure 18).

Fall tagged natural chinook salmon arrived at LGR in 2003 from March 26 to May 28 and had a 90% arrival timing of April 30. Arrival at the remaining dams occurred during the following times: April 2 to May 16 at LGO, April 14 to May 18 at LMO, and April 17 to May 21 at MCN. Median arrivals occurred April 21, April 22, and April 28 at LGO, LMO, and MCN, respectively. Ninety percent arrival occurred on the following dates: May 1 at LGO, May 6 at LMO, and May 9 at MCN (Appendix E1).

Spring tagged natural chinook salmon arrived at LGR from March 28 to July 25 and had a 90% arrival time of May 24 (Appendix Table E2). Arrival at LGO, LMO, and MCN occurred from April 13 to August 4, April 13 to July 12, and April 18 to June 28, respectively. Median arrival timing at these three dams was as follows: May 4 at LGO, May 14 at LMO, and May 8 at

Table 12. Detections of PIT tagged Imnaha River adult chinook salmon and estimated smolt to adult return rate indices (SAR) of in-river migrating fish from the lower Imnaha River trap to Lower Granite Dam (LGR) and from LGR to LGR for brood years 1996 to 1998.

Brood Year	Season Tagged	Number PIT Tagged	Estimated Smolt Equivalents at LGR	Number of Adult Detections at LGR	Age at Return III	Age at Return IV	Age at Return V	SAR Trap to LGR (%)	SAR LGR to LGR (%)
1996	Fall	1,453	878	27	5	15	7	1.86	3.08
1997		2,000	830	20	3	16	1	1.00	2.41
1998		2,009	739	22	2	12	8	1.10	2.98
1996	Spring	3,956	3,370	59	3	41	15	1.49	1.75
1997		5,306	4,696	105	8	69	28	1.98	2.24
1998		4,369	3,705	109	3	62	44	2.49	2.94

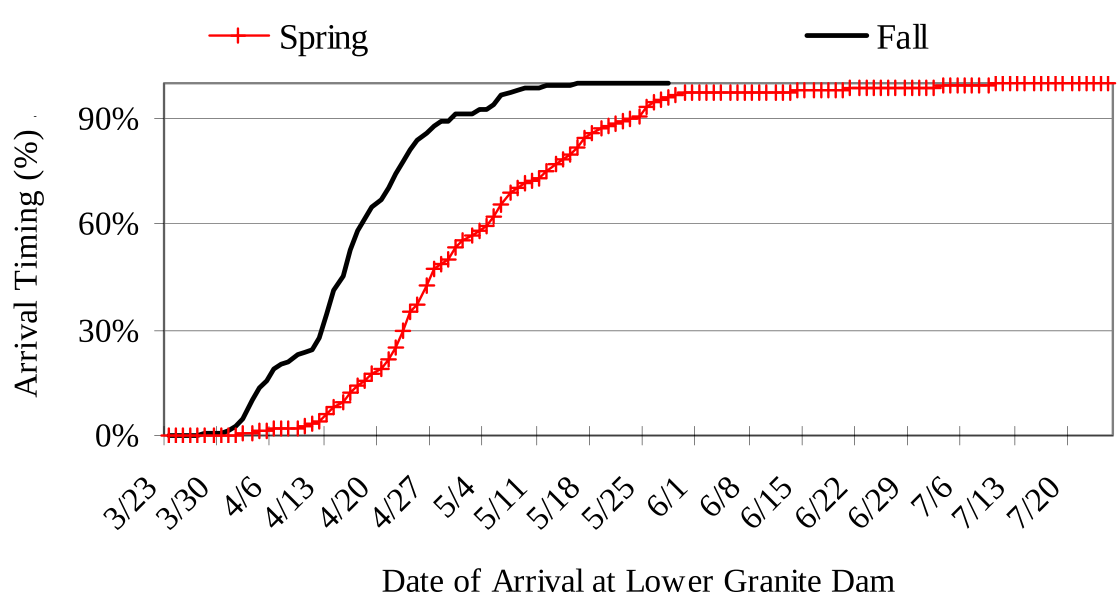

Figure 18. The cumulative arrival timing of fall and spring tagged natural chinook salmon at Lower Granite Dam during the 2003 migration year. Fall and spring tagged natural chinook salmon were released in the fall of 2002 and the spring of 2003, respectively.

MCN. The 90% arrival time at LGO was May 27, May 31 at LMO, and May 20 at MCN.

PIT tagged hatchery chinook salmon smolts recaptured at the Imnaha River trap had the following arrival times at the four dams in 2003: April 14 to May 25 at LGR, April 19 to May 27 at LGO, April 27 to May 27 at LMO, and April 26 to May 27 at MCN (Appendix Table E3). Median arrival timing occurred May 2 at LGR, May 6 at LGO, and May 15 at LMO and MCN. Ninety percent arrival timing occurred May 15 at LGR, May 18 at LGO, and May 22 at LMO and MCN.

This project has collected five to ten years of arrival timing data for natural and hatchery chinook salmon and steelhead from the Imnaha River (Table 13). The annual first, median, 90%, and last arrival times from previous years were averaged. Ninety five percent confidence intervals for arrival times are presented in parenthesis in the remainder of this section. The mean arrival timing range for fall tagged natural chinook salmon from 1998 to 2003 at LGR is from March 31 (± 8 days) to May 16 (± 19 days), with mean median and 90% arrival timing of April 17 (± 9 days) and May 2 (± 27 days), respectively. Mean median arrival times at LGO, LMO, and MCN for fall tagged natural chinook salmon are April 24 (± 11 days), April 27 (± 17 days), and May 1 (± 17 days), respectively. Mean 90% arrival timing for natural chinook salmon was May 1 (± 12 days) at LGO, May 5 (± 17 days) at LMO, and May 8 (± 15 days) at MCN.

Spring tagged natural chinook salmon mean arrival times at LGR from 1993 to 2003 are as follows: mean arrival time range of April 5 (± 15 days) to July 1 (± 56 days), mean median arrival time of April 28 (± 9 days), and mean 90% arrival of May 14 (± 11 days). Mean median arrival times at LGO, LMO, and MCN for natural chinook salmon smolts are May 1 (± 8 days), May 5 (± 13 days), and May 9 (± 11 days). Mean 90% arrival timing is May 14 (± 18 days) at LGO, May 22 (± 15 days) at LMO, and May 22 (± 12 days) at MCN.

Mean arrival timing of hatchery chinook salmon from 1992 to 2003 represents the PIT tagged hatchery chinook salmon used to estimate the survival from the trap to LGR, LMO, and MCN. Mean arrival ranges are April 12 (± 13 days) to May 26 (± 12 days) at LGR, April 20 (± 10 days) to May 31 (± 12 days) at LGO, April 25 (± 6 days) to June 2 (± 13 days) at LMO, and April 29 (± 11 days) to June 1 (± 13 days) at MCN. Mean median arrival timing is as follows: May 3 (± 10 days) at LGR, May 8 (± 9 days) at LGO, May 12 (± 7 days) at LMO, and May 14 (± 8 days) at MCN. Mean 90% arrival timing from 1992 to 2003 is as follows: May 13 (± 7 days), May 17 (± 10 days), May 21 (± 6 days), and May 22 (± 6 days), at LGR, LGO, LMO, and MCN, respectively.

Natural and Hatchery Steelhead Arrival Timing

Natural steelhead arrived at LGR, LGO, LMO, and MCN from March 26 to July 3, April 4 to June 29, April 2 to June 21, and April 1 to June 14, respectively (Appendix Table E4). Median arrival timing occurred May 14 at LGR, May 18 at LGO, May 25 at LMO, and May 24 at MCN. The 90% arriving timing occurred on May 25 at LGR, May 26 at LGO, May 28 at LMO,

Table 13. Mean first, median, 90%, and last arrival timing for fall and spring tagged natural chinook salmon juveniles, hatchery chinook salmon smolts, and natural and hatchery steelhead smolts, at Lower Granite Dam (LGR), Little Goose Dam (LGO), Lower Monumental Dam (LMO), and McNary Dam (MCN). All fish were captured in the Imnaha River trap. Mean arrival timing is presented with the 95% C.I. (± days).

Rearing, Species, Life Stage, Dam	First Arrival		Median Arrival		90% Arrival		Last Arrival	
	Mean	(± days)	Mean	(± days)	Mean	(± days)	Mean	(± days)
Fall Tagged Natural Chinook Salmon (1998 to 2003)[1]								
LGR	31-Mar	(8)	17-Apr	(9)	2-May	(27)	16-May	(19)
LGO	11-Apr	(14)	24-Apr	(11)	1-May	(12)	18-May	(28)
LMO	19-Apr	(16)	27-Apr	(17)	5-May	(17)	19-May	(18)
MCN	20-Apr	(16)	1-May	(17)	8-May	(15)	17-May	(15)
Spring Tagged Natural Chinook Salmon (1993 to 2003)								
LGR	5-Apr	(15)	28-Apr	(9)	14-May	(11)	1-Jul	(56)
LGO	15-Apr	(10)	1-May	(8)	14-May	(18)	1-Jul	(48)
LMO	21-Apr	(13)	5-May	(13)	22-May	(15)	2-Jul	(49)
MCN	20-Apr	(14)	9-May	(11)	22-May	(12)	18-Jun	(35)
Hatchery Chinook Salmon Smolts (1992 to 2003)								
LGR	12-Apr	(13)	3-May	(10)	13-May	(7)	26-May	(12)
LGO	20-Apr	(10)	8-May	(9)	17-May	(10)	31-May	(12)
LMO	25-Apr	(6)	12-May	(7)	21-May	(6)	2-Jun	(13)
MCN	29-Apr	(11)	14-May	(8)	22-May	(6)	1-Jun	(13)
Natural Steelhead Smolts (1993 to 2003)[2]								
LGR	15-Apr	(26)	11-May	(14)	27-May	(17)	9-Jul	(63)
LGO	19-Apr	(22)	14-May	(11)	27-May	(12)	7-Jul	(52)
LMO	24-Apr	(22)	16-May	(14)	7-Jun	(41)	9-Jul	(78)
MCN	27-Apr	(26)	18-May	(13)	28-May	(15)	15-Jun	(36)
Hatchery Steelhead Smolts (1993 to 2003)[2]								
LGR	23-Apr	(18)	21-May	(12)	6-Jun	(21)	26-Jul	(53)
LGO	26-Apr	(17)	25-May	(8)	14-Jun	(26)	28-Jul	(73)
LMO	30-Apr	(16)	30-May	(14)	19-Jun	(34)	4-Aug	(85)
MCN	7-May	(19)	2-Jun	(25)	18-Jun	(35)	5-Jul	(41)

[1] Median and 90% arrival timing does not include data from migration year 2001 due to the sample size.

[2] Median and 90% arrival timing does not include data from migration year 2002 due to the sample size.

and May 27 at MCN.

Hatchery steelhead had the following range of arrival times: April 14 to June 23 at LGR, April 16 to June 4 at LGO, April 21 to June 9 at LMO, and April 30 to June 1 at MCN (Appendix Table E5). Median arrival times for hatchery steelhead migrating in 2003 were May 13 at LGR, May 21 at LGO, May 26 at LMO, and May 25 at MCN. Ninety percent arrival times are as follows: May 26 at LGR, May 27 at LGO, and May 29 at LMO and MCN.

Historically, natural steelhead have a ten year mean arrival date range of April 15 (± 26 days) to July 9 (± 63 days) at LGR (Table 13). The mean arrival date range for LGO, LMO, and MCN is as follows: April 19 (± 22 days) to July 7 (± 52 days) at LGO, April 24 (± 22 days) to July 9 (± 78 days) at LMO, and April 27 (± 26 days) to June 15 (± 36 days) at MCN. The ten year median arrival time at LGR, LGO, LMO, and MCN is as follows: May 11 (± 14 days) at LGR, May 14 (± 11 days) at LGO, May 16 (± 14 days) at LMO, and May 18 (± 13 days) at MCN. The mean 90% arrival timing for natural steelhead is as follows: May 27 (± 17 days) at LGR, May 27 (± 12 days) at LGO, June 7 (± 41 days) at LMO, and May 28 (± 15 days) at MCN.

The ten year mean range of arrival for hatchery steelhead at LGR is April 23 (± 18 days) to July 26 (± 53 days). Downstream mean arrival ranges for hatchery steelhead are as follows: April 26 (± 17 days) to July 28 (± 73 days) at LGO, April 30 (± 16 days) to August 4 (± 85 days) at LMO, and May 7 (± 19 days) to July 5 (± 41 days) at MCN. The ten year median arrival time at LGR, LGO, LMO, and MCN is as follows: May 21 (± 12 days), May 25 (± 8 days), May 30 (± 14 days), and June 2 (± 25 days), respectively. Mean 90% arrival occurred on June 6 (± 21 days) at LGR, June 14 (± 26 days) at LGO, June 19 (± 34 days) at LMO, and June 18 (± 35 days) at MCN.

The data in Table 13 is the cumulation of 10 years of emigration studies in the Imnaha River. It provides a baseline for evaluating the performance of hatchery produced fish. Substantial variation exists in the data but it shows that the hatchery produced fish from the Imnaha River generally arrive later than naturally produced fish at LGR, LGO, LMO, and MCN.

Travel Time to Lower Granite Dam

Natural chinook salmon weekly median travel times to LGR ranged from 37 days (March 9) to six days (May 18). Median travel times to LGR decreased with an increase in the calender date (Table 14). The only weekly comparison of median travel times between natural and hatchery chinook salmon that was possible was March 30. Natural and hatchery chinook salmon median travel times for the week of March 30 were both 21 days (not significantly different).

Natural steelhead weekly median travel times to LGR ranged from 52 days (March 9) to four days (March 11 and March 18). Median travel times to LGR decreased with an increase in

Table 14. A summary of median travel times of natural and hatchery chinook salmon released from the Imnaha River screw trap, March 7 to June 25, 2003, at Lower Granite Dam. Weeks with less than 30 interrogations at Lower Granite Dam were not presented. Statistical test values represent a comparison of natural and hatchery chinook salmon median travel times using the Wilcoxon Rank Sum Test.

Species	Week Released	Number Interrogated: Natural	Number Interrogated: Hatchery	Median Travel Time (days): Natural	Median Travel Time (days): Hatchery	Wilcoxon Value	p Value
Chinook Salmon	9-Mar	35		37			
	16-Mar	165		29			
	23-Mar	151		27			
	30-Mar	524	44	21	21	11,172	0.73
	6-Apr	124		18			
	13-Apr	114		13			
	20-Apr	167		12			
	27-Apr	100		11			
	4-May	82		8			
	11-May	116		8			
	18-May	53		6			
Steehead	9-Mar	47		52			
	23-Mar	59		27			
	30-Mar	69		18			
	6-Apr	40	58	18	20	1,044	0.41
	13-Apr	83	243	8	12	8,264	0.01
	20-Apr	291	261	5	5	36,180	0.34
	27-Apr	134	168	6	9	6,957	0.00
	4-May	338	253	6	10	21,318	0.00
	11-May	647	275	4	4	81,689	0.05
	18-May	116		4			

the calendar date, with the exception of the week of April 20. Hatchery steelhead travel times ranged from 20 days (April 6) to four days (May 11). Significant differences in median travel times ($p < 0.05$) between natural and hatchery steelhead occurred during the weeks of April 13, April 27, and May 4. The differences in median travel time ranged from three days (April 27) to four days (April 13, and May 4). However, the median travel times for hatchery steelhead generally decrease with an increase in the calender date and no significant differences were observed for the weeks of April 6, April 20, and May 11. The relationship between the decrease in travel times and increase in calendar date has been previously described (Berggren and Filardo

1993) and is probably due to increased river discharge and smoltification (Groot et al. 1995).

Mortality

Chinook Salmon and Steelhead Mortality

A total of 61 natural chinook salmon, 12 hatchery chinook salmon, four natural steelhead, and 18 hatchery steelhead mortalities occurred during the study. Thirty five of the natural chinook salmon mortalities occurred during the fall; 0.46% of all natural chinook salmon captured in the fall of 2002 (Appendix Table F1). Trapping and handling each caused 5 mortalities and PIT tagging caused 25 mortalities (Appendix Table F2). No other mortalities occurred during the fall.

Twenty six natural chinook salmon mortalities occurred during the spring: 13 due to trapping, 7 due to handling, and 6 due to PIT tagging. The total number of mortalities accounted for 0.444% of the natural chinook salmon captured in the spring of 2003. Four trapping and eight handling mortalities occurred to hatchery chinook salmon with the total mortality accounting for 0.04% of the catch of hatchery chinook salmon in the spring of 2003.

Natural and hatchery steelhead had 4 and 18 mortalities, respectively, due to trapping. There were no handling or PIT tagging mortalities that occurred for steelhead. Trapping accounted for 0.046% and 0.003% of all natural and hatchery steelhead mortality, respectively.

Incidental Catch

Incidental Catch for Migration Year 2003

The incidental catch during the fall and spring of migration year 2003 total 3,107 fish. It was comprised of five families of fishes: Salmonidae, Centrarchidae, Catostomidae, Cyprinidae, and Cottidae (Appendix Table G1). The catch of Salmonidae consisted of 128 adult and 1,481 rainbow/juvenile steelhead, 375 mountain whitefish (*Prosopium williamsoni*), and 47 bull trout (*Salvelinus confluentus*). The juvenile rainbow/steelhead were resident fish based on morphological characteristics and are not a subset of the catch of natural steelhead reported in an earlier section of this report. The 19 Centrarchidae captured were smallmouth bass (*Micropterus dolomieui*). A total of 96 bridgelip suckers (*Catostomus columbianus*), 14 largescale suckers (*Catostomus macrocheilus*), and 431 unidentified sucker species represented the family Catostomidae. The catch of Cyprinidae was as follows: 30 chislemouth (*Acrocheilus alutaceus*), 356 longnose dace (*Rhinichthys cataractae*), 4 speckled dace (*Rhinichthys osculus*), 70 northern pikeminnow (*Ptychocheilus oregonensis*), and 31 redside shiner (*Richardsonius balteatus*). A total of 25 *Cottus* species (sculpins) of the family Cottidae were captured during the spring of 2003.

ACKNOWLEDGMENTS

The Nez Perce Tribe extends the administrative support necessary to complete these projects and this report. Project funding from the U.S. Fish and Wildlife Service's Lower Snake River Compensation Plan program initiated the Imnaha River emigration project investigations in 1992 and the project continues today. Project cost share funding is also provided by the Bonneville Power Administration with the Imnaha Smolt Monitoring Program. We wish to thank the following NPT employees for their hard work and dedication gathering the necessary data for this report: Cameron Albee, Clinton Barnhouse, David Bright, Michael Busby, Neal Espinosa, David Kane, Joe McCormack, Neal Meshell, Steve Senter, and Olicutt Watters. Jay Hesse, NPT Research Coordinator provided technical support and advice for these studies. We also acknowledge the Oregon Department of Fish and Wildlife for PIT tagging under BPA program number 199602000 and releasing the hatchery chinook salmon from the acclimation facility. We extend our gratitude to the United States Forest Service for allowing us the use of the Thorn Creek guard station facilities, and Jack and Scott McClaren for allowing us access to their land for trapping purposes. The Fish Passage Center's Data System Administrative Manager, Henry Franzoni, and Senior Data Analyst, Sergie Rasskazov provided software that assisted with daily tasks.

LITERATURE CITED

Anonymous 2003a. USGS/Cascade Volcano Observatory. [online] Available at http://vulcan.wr.usgs.gov/volcanoes/washington/columbia_river/discription_columbia_river.html.

Anonymous 2003b. Walla Walla District Hydropower Dams [online] Available at http://www.usace.army.mil/

Anonymous 2000c. 13292000-IMNAHA RIVER AT IMNAHA, OR. [online] Available at http://oregon.usgs.gov/rt-cgi/gen_stn_pg?station=13292000. February 24.

Ashe, B. L., A. C. Miller, P. A. Kucera, and M. L. Blenden. 1995. Spring Outmigration Of Wild And hatchery Chinook Salmon and Steelhead Smolts From The Imnaha River, March 1 - June15, 1994. FPC Technical Report. NPT DFRM Lapwai, Idaho

Bagenal, T. B., and F. W. Tesch. 1978. Age and growth. Pages 101-136 in T.B.Bagenal, editor. Methods for assessment of fish production in fresh waters, 3rd edition. Blackwell Scientific Publications, Oxford, England.

Berggren, T.J., and M.J. Filardo. 1993. An Analysis of Variables in Influencing the Migration of Juvenile Salmonids in the Columbia River Basin. North American Journal of Fisheries Management 13:48-63.

Blenden, M.L., P.A. Kucera, and E.R. Veach. 1998. Spring Emigration of Natural and Hatchery Chinook Salmon and Steelhead Smolts from the Imnaha River, Oregon, February 25 - June 27, 1997. Bonneville Power Administration Technical Report. Contract DE-FC79-88FC38906. Project 87-127. NPT DFRM, Lapwai, ID.

Bryson, D., C. Rabe, A. Davidson, and D. Saul. 2001. Draft Imnaha Subbasin Summary. Northwest Power Planning Council.

Burnham, K.P., D.R. Anderson, G.C. White, C. Brownie, and K.H. Pollock. 1987. Design and Analysis Methods for Fish Survival Experiments Based on Release-Recapture. American Fisheries Society, Bethesda, Maryland.

Carmichal, R.W., S.J. Parker, and T. A. Whitesel. 1998. Status Review of the Chinook Salmon Hatchery Program in the Imnaha Basin, Oregon. Lower Snake River Compensation Plan Status Review Symposium. USFWS Lower Snake River Compensation Plan Office. Boise, Idaho. pp. 119-140.

Cleary, P.J., M.L. Blenden, and P.A. Kucera. 2000. Emigration of Natural and Hatchery Chinook Salmon and Steelhead Smolts from the Imnaha River, Oregon October 14, 1997 to June16, 1998. Bonneville Power Administration Technical Report. Contract #97AM30423.

Cleary, P.J., M.L. Blenden, and P.A. Kucera. 2002. Emigration of Natural and Hatchery Chinook Salmon and Steelhead Smolts from the Imnaha River, Oregon October 19, 1998 to June 24, 1999. Bonneville Power Administration Technical Report. Contract # 97AM30423.

Cleary, P.J., P.A. Kucera, M.L. Blenden, and K. Gillogly. 2003a. Emigration of Natural and Hatchery Chinook Salmon and Steelhead Smolts from the Imnaha River, Oregon October 20, 1999 to June 15, 2000.Bonneville Power Administration Techincal Report. Contract # 97AM30423.

Cleary, P.J., P.A. Kucera, M.L. Blenden, N. Espinosa, and C.M. Albee. 2003b. Emigration of Natural and Hatchery Chinook Salmon and Steelhead Smolts from the Imnaha River, Oregon October 17, 2000 to June 12, 2002. Bonneville Power Administration Techincal Report. Contract # 97AM30423.

Eddy, D. 2003. [personal communication].

Efron, B. and R. Tibshirani. 1986. Bootstrap methods for standard errors, confidence intervals, and other measures of statistical accuracy. Statistical Science 1:54 -77.

Groot, C., L. Margolis, and W.C. Clarke (editors). 1995. Physiology of Ecology of Pacific Salmon. UBC Press. Vancouver, B.C.

James, G. 1984. Imnaha River basin recommended salmon and steelhead habitat improvement measures. Working paper. Confederated Tribes of the Umatilla Indian Reservation.

Kennen, J. G., S. J. Wisniewski, N. H. Ringler, and H. M. Hawkins. 1994. Application and modification of an auger trap to quantify emigrating fishes in Lake Ontario tributaries. North American Journal of Fisheries Management 14:828-836.

Kucera, P. A. 1989. Nez Perce Tribal review of the Imnaha River Lower Snake River Compensation Plan. Working paper. LSRCP Technical Report AFF1/LSR-89-08. Nez Perce tribe Fisheries Management, Lapwai, Idaho.

Kucera, P.A., and M.L. Blenden. 1998. Emigration of hatchery and natural chinook salmon from the Imnaha River. Lower Snake River Compensation Plan Status Review Symposium. USFWS Lower Snake River Compensation Plan Office. Boise, Idaho. pp.141-153.

Matthews, G. M., J. R. Harmon, S. Achord, O. W. Johnson, and L. A. Kubin. 1990. Evaluation of transportation…on the Columbia and Snake Rivers, 1989. Report to the U.S. Army Corps of Engineers, Contract DACW68-84-H0034. NMFS. Seattle, Washington.

Matthews, G. M., S. Accord, J. R. Harmon, O. W. Johnson, D. M. Marsh, B. P. Sandford, N. N. Paasch, K. W. McIntyre, and K. L. Thomas. 1992. Evaluation of transportation of juvenile salmonids…Columbia and Snake Rivers, 1990.Report to USACE, Seattle, Washington.

Mesa, M.G. and T.M. Olson. 1993. Prolonged Swimming Performance of Northern Squawfish. Transactions of the American Fisheries Society. 122:1104-1110.

National Marine Fisheries Service (NMFS). 2000. Endangered Species Act - Section 7 Consultation - Biological Opinion: Reiteration of consultation on operation of the Federal Columbia River Power System, including the Juvenile Fish Transportation Program, and 19 Bureau of Reclamation projects in the Columbia Basin. National Marine Fisheries Service, Northwest Region. December 2000.

Ott, L. 1984. An introduction to statistical methods and data analysis. PWS Publishers. Boston, Massachusetts.

Prentice, E. F., D. L. Park, T. A. Flagg, and S. McCutcheon. 1986. A study to determine the biological feasibility of a new fish tagging system, 1985-1986. Report to the Bonneville Power Administration. Contract DE-A179-83BP11982, Project 83-119. NMFS

Prentice, E. F., T. A. Flagg, C. S. McCutcheon, D. F. Brastow, and D. C. Cross. 1990. Equipment, methods, and an automated data-entry station for PIT tagging. American Fisheries Society Symposium 7:335-340.

Raymond, H.L. 1979. Effects of Dams and Impoundments on Migrations of Juvenile Chinook Salmon and Steelhead from the Snake River, 1966 to 1975. Transactions of the American Fisheries Society. 6:505-528.

Smith, S.G., J.R. Skalski, J.W. Schlechte, A. Hoffmann, and V. Cassen, J.R..1994. Statistical Survival Analysis of Fish and Wildlife Tagging Studies. Contract DE-BI79-90BP02341. Project 89-107. Bonneville Power Administration. Portland, Oregon.

Smith, S.G., W.D. Muir, J.G. Williams, and J.R. Skalski. 2002. Factors Associated with Travel Time and Survival of Migrant Yearling Chinook Salmon and Steelhead in the Lower Snake River. North American Journal of Fisheries Management. 22:385 - 405.

Steel, R.G.D., J.H. Torrie, D.A. Dicky. 1997. Principles and Procedures of Statistics: A Biometrical Aproach. Third Edition. McGraw-Hill, Inc. New York, New York.

Statgraphics Plus. 1995. Statgraphics Plus Version 2. Manugistics, Inc. Rockville, Maryland.

Thedinga, J. F., M. L. Murphy, S. W. Johnson, J. M. Lorenz, and K. V. Koski. 1994. Determination of salmonid smolt yield with rotary screw traps in the Situk River, Alaska, to predict effects of glacial flooding. North American J.F.M. 14:837-851.

Westhagen, P. and J. Skalski, 1997. The Design and Analysis of Salmonid Tagging Studies in the Columbia Basin. Bonneville Power Administration. Contract DE-BI79-90BP02341. Project 89-107-00. Portland, Oregon.

Whitesel, T.A., R.W. Carmichael, M.W. Flesher, D.L. Eddy. 1998. Summer Steelhead in the Imnaha River Basin, Oregon. Lower Snake River Compensation Plan Status Review Symposium. USFWS Lower Snake River Compensation Plan Office. Boise, Idaho. pp. 32-42.

APPENDIX A

IMNAHA AND SNAKE RIVER DISCHARGE AND TEMPERATURE FOR MIGRATION YEAR 2003

Appendix A. Table A1. The mean daily discharge and temperature for the Imnaha and Snake rivers from October 1, 2002 to October 31, 2002. Discharge data for USGS gauges 132292000 and 13334300 were obtained online from USGS web sites.

Date	Imnaha River		Snake River	
	Discharge (cfs)	Temperature (C)	Discharge (cfs)	Temperature (C)
10/1/2002	132	11.7	20,400	17.5
10/2/2002	129	10.7	17,000	16.6
10/3/2002	126	10.7	16,500	16.3
10/4/2002	131	12.4	16,100	16.4
10/5/2002	133	12.7	17,100	16.8
10/6/2002	129	12.4	15,400	16.5
10/7/2002	126	13.0	12,800	16.1
10/8/2002	124	13.0	17,300	16.4
10/9/2002	124	12.4	16,500	16.5
10/10/2002	123	11.1	18,000	16.0
10/11/2002	121	9.6	17,200	15.3
10/12/2002	121	7.9	13,800	14.6
10/13/2002	125	7.4	11,500	13.7
10/14/2002	124	7.7	12,600	13.6
10/15/2002	124	8.1	12,900	13.8
10/16/2002	125	8.6	13,000	13.8
10/17/2002	124	8.8	13,000	13.6
10/18/2002	123	8.5	13,000	13.4
10/19/2002	121	8.7	13,000	13.2
10/20/2002	120	9.7	13,000	13.2
10/21/2002	120	11.4	13,000	13.4
10/22/2002	120	10.5	13,000	13.3
10/23/2002	120	8.7	13,000	12.8
10/24/2002	120	6.9	13,000	12.3
10/25/2002	118	5.8	13,000	11.8
10/26/2002	119	5.5	13,000	11.5
10/27/2002	118	4.9	13,000	11.1
10/28/2002	121	6.7	13,000	11.2
10/29/2002	127	6.5	13,100	11.0
10/30/2002	122	3.5	13,200	9.9
10/31/2002	98	1.4	13,200	8.9

Appendix A. Table A2. The mean daily discharge and temperature for the Imnaha and Snake rivers from November 1, 2002 to November 30, 2002. Discharge data for USGS gauges 132292000 and 13334300 were obtained online from USGS web sites.

	Imnaha River		Snake River	
Date	Discharge (cfs)	Temperature (C)	Discharge (cfs)	Temperature (C)
11/1/2002	77	0.7	12,900	8.5
11/2/2002	104	0.7	12,600	8.5
11/3/2002	114	1.0	12,500	8.4
11/4/2002	120	1.8	12,400	8.5
11/5/2002		2.3	12,600	8.3
11/6/2002		2.7	13,000	8.3
11/7/2002	133	6.1	13,200	8.4
11/8/2002	186	8.0	13,500	8.8
11/9/2002	168	7.2	13,900	8.8
11/10/2002	145	6.9	14,100	8.8
11/11/2002	134	6.9	14,000	8.7
11/12/2002	129	7.2	13,800	8.5
11/13/2002	129	7.6	13,700	8.7
11/14/2002	127	7.0	13,600	8.7
11/15/2002	124	5.1	13,600	8.5
11/16/2002	122	5.9	13,500	8.2
11/17/2002	125	7.0	13,500	8.4
11/18/2002	123	5.6	13,400	8.4
11/19/2002	122	6.8	13,300	8.6
11/20/2002	122	7.5	13,400	8.7
11/21/2002	123	6.8	13,300	8.8
11/22/2002	127	7.7	13,400	8.7
11/23/2002	129	8.1	13,600	8.8
11/24/2002	128	6.9	13,700	8.4
11/25/2002	121	4.5	13,900	7.6
11/26/2002	103	2.5	13,700	6.9
11/27/2002	115	1.5	13,300	6.3
11/28/2002	132	1.2	13,100	6.2
11/29/2002	134	1.7	13,000	6.1
11/30/2002	127	1.7	13,000	6.0

Appendix A. Table A3. The mean daily discharge and temperature for the Imnaha and Snake rivers from December 1, 2002 to December 31, 2002. Discharge data for USGS gauges 132292000 and 13334300 were obtained online from USGS web sites.

	Imnaha River		Snake River	
Date	Discharge (cfs)	Temperature (C)	Discharge (cfs)	Temperature (C)
12/1/2002	125	1.7	13,100	5.8
12/2/2002	120	2.0	13,200	5.6
12/3/2002	115	2.1	13,200	5.5
12/4/2002	128	2.4	13,000	5.5
12/5/2002	131	3.0	12,600	5.7
12/6/2002	117	1.8	12,600	5.6
12/7/2002	102	2.3	12,700	5.6
12/8/2002	93	2.3	12,500	5.6
12/9/2002	115	2.1	12,200	5.3
12/10/2002	133	1.7	12,000	5.2
12/11/2002	133	3.6	11,900	5.2
12/12/2002	133	4.5	12,000	5.6
12/13/2002	146	6.4	12,600	5.7
12/14/2002	215	7.6	13,100	6.0
12/15/2002	317	7.2	13,500	6.4
12/16/2002	281	6.2	13,800	6.4
12/17/2002	251	3.9	14,000	5.8
12/18/2002	208	2.4	13,800	5.2
12/19/2002	184	0.7	13,300	4.5
12/20/2002	187	1.4	13,300	4.5
12/21/2002	184	1.8	12,700	4.4
12/22/2002	178	3.4	12,700	4.8
12/23/2002	155	3.1	12,700	5.1
12/24/2002	109	1.0	12,700	4.6
12/25/2002	151	0.8	12,600	4.3
12/26/2002	157	2.1	12,500	4.3
12/27/2002	174	4.4	12,400	4.5
12/28/2002	221	5.3	12,400	4.9
12/29/2002	289	3.9	13,400	5.0
12/30/2002	262	2.6	14,300	4.6
12/31/2002	262	4.4	14,100	4.4

Appendix A. Table A4. The mean daily discharge and temperature for the Imnaha and Snake rivers from January 1, 2003 to January 31, 2003. Discharge data for USGS gauges 132292000 and 13334300 were obtained online from USGS web sites.

	Imnaha River		Snake River	
Date	Discharge (cfs)	Temperature (C)	Discharge (cfs)	Temperature (C)
1/1/2003	240	3.2	13,800	4.2
1/2/2003	230	4.7	13,600	4.7
1/3/2003	238	6.0	13,600	5.1
1/4/2003	238	5.6	13,800	5.3
1/5/2003	263	5.5	14,100	5.2
1/6/2003	252	2.8	14,400	4.6
1/7/2003	240	1.4	14,700	4.2
1/8/2003	227	1.3	14,700	3.7
1/9/2003	211	1.5	15,300	3.8
1/10/2003	222	2.2	17,300	4.1
1/11/2003	222	1.5	13,000	4.0
1/12/2003	215	3.4	12,700	4.0
1/13/2003	213	5.9	13,000	4.5
1/14/2003	235	6.2	14,000	4.9
1/15/2003	278	4.1	15,500	4.8
1/16/2003	281	3.0	18,500	4.3
1/17/2003	263	2.4	20,900	4.3
1/18/2003	241	2.7	17,700	4.3
1/19/2003	233	2.6	15,400	4.3
1/20/2003	225	2.7	16,900	4.3
1/21/2003	219	3.5	18,900	4.4
1/22/2003	210	4.0	18,800	4.5
1/23/2003	216	5.6	17,100	4.7
1/24/2003	208	4.8	16,100	4.6
1/25/2003	207	6.1	16,700	5.0
1/26/2003	220	8.0	14,300	5.4
1/27/2003	359	8.0	16,900	5.9
1/28/2003	433	5.7	24,300	5.6
1/29/2003	383	4.3	27,400	5.1
1/30/2003	364	6.1	28,300	5.2
1/31/2003	364	7.5	33,900	5.8

Appendix A. Table A5. The mean daily discharge and temperature for the Imnaha and Snake rivers from February 1, 2003 to February 28, 2003. Discharge data for USGS gauges 132292000 and 13334300 were obtained online from USGS web sites.

	Imnaha River		Snake River	
Date	Discharge (cfs)	Temperature (C)	Discharge (cfs)	Temperature (C)
2/1/2003	508	7.8	37,600	6.1
2/2/2003	515	5.5	37,400	5.4
2/3/2003	464	5.2	36,600	5.2
2/4/2003	418	4.1	34,000	5.0
2/5/2003	367	3.8	30,900	4.7
2/6/2003	321	2.7	28,800	4.2
2/7/2003	284	1.7	27,600	3.8
2/8/2003	285	2.1	27,200	3.8
2/9/2003	288	2.2	22,800	3.9
2/10/2003	277	3.1	18,100	3.6
2/11/2003	250	2.5	21,000	3.6
2/12/2003	245	2.1	22,000	3.5
2/13/2003	262	2.5	21,400	3.5
2/14/2003	264	4.1	19,900	3.9
2/15/2003	246	4.4	19,000	4.4
2/16/2003	275	5.0	18,100	4.5
2/17/2003	291	5.4	18,800	4.6
2/18/2003	294	5.2	21,100	5.0
2/19/2003	292	4.4	23,300	4.7
2/20/2003	288	5.5	22,800	4.8
2/21/2003	283	6.6	21,400	5.1
2/22/2003	286	6.0	23,200	5.4
2/23/2003	274	4.8	23,100	5.0
2/24/2003	232	2.1	22,400	3.9
2/25/2003	221	1.2	23,300	3.5
2/26/2003	251	1.5	20,300	3.6
2/27/2003	255	2.4	19,800	4.1
2/28/2003	240	2.7	20,100	4.1

Appendix A. Table A6. The mean daily discharge and temperature for the Imnaha and Snake rivers from March 1, 2003 to March 31, 2003. Discharge data for USGS gauges 132292000 and 13334300 were obtained online from USGS web sites.

	Imnaha River		Snake River	
Date	Discharge (cfs)	Temperature (C)	Discharge (cfs)	Temperature (C)
3/1/2003	238	4.0	20,500	4.4
3/2/2003	213	3.9	15,400	4.2
3/3/2003	226	5.1	20,500	4.6
3/4/2003	215	4.5	21,500	4.9
3/5/2003	210	4.4	21,500	4.9
3/6/2003	219	5.0	20,500	5.1
3/7/2003	219	5.7	20,000	5.0
3/8/2003	234	6.6	24,300	5.0
3/9/2003	239	7.5		5.7
3/10/2003	265	8.5		6.3
3/11/2003	315	8.9	27,800	6.6
3/12/2003	420	9.2	31,000	6.9
3/13/2003	634	8.9	35,900	6.9
3/14/2003	862	8.6	35,200	6.9
3/15/2003	992	7.8	34,900	6.6
3/16/2003	1,150	7.4	36,100	6.7
3/17/2003	966	7.3	35,400	6.6
3/18/2003	807	6.9	37,900	6.5
3/19/2003	709	6.8	34,600	6.7
3/20/2003	674	7.4		7.1
3/21/2003	624	7.5		7.2
3/22/2003	775	8.5	25,400	7.4
3/23/2003	1,320	6.6	30,800	6.8
3/24/2003	1,070	6.6		6.7
3/25/2003	931	6.7	29,700	6.9
3/26/2003	843	6.8		7.0
3/27/2003	760	6.3		6.5
3/28/2003	685	6.1		6.5
3/29/2003	633	7.2	26,500	7.0
3/30/2003	607	9.0		
3/31/2003	664	9.8	28,100	8.6

Appendix A. Table A7. The mean daily discharge and temperature for the Imnaha and Snake rivers from April 1, 2003 to April 30, 2003. Discharge data for USGS gauges 132292000 and 13334300 were obtained online from USGS web sites.

	Imnaha River		Snake River	
Date	Discharge (cfs)	Temperature (C)	Discharge (cfs)	Temperature (C)
4/1/2003	969	8.8	33,900	8.3
4/2/2003	1,030	6.9	39,200	7.7
4/3/2003	994	6.0	41,800	7.1
4/4/2003	950	6.1	37,100	6.8
4/5/2003	922	6.9	35,200	7.1
4/6/2003	888	6.2	34,000	7.0
4/7/2003	841	7.0	32,900	7.3
4/8/2003	819	8.9		8.3
4/9/2003	854	9.6	31,000	9.0
4/10/2003	940	10.1	31,300	9.5
4/11/2003	1,140	9.5	32,900	9.7
4/12/2003	1,230	8.7	34,700	9.5
4/13/2003	1,310	8.7	34,600	9.5
4/14/2003	1,250	8.2	38,700	9.5
4/15/2003	1,130	8.0	42,400	9.1
4/16/2003	1,030	8.0	40,400	8.8
4/17/2003	978	8.3	38,500	9.2
4/18/2003	918	8.2		9.1
4/19/2003	835	8.3	30,700	
4/20/2003	824	9.8	31,800	9.7
4/21/2003	920	10.8	32,900	10.3
4/22/2003	1,060	10.1	37,400	10.4
4/23/2003	1,260	10.5	38,800	10.3
4/24/2003	1,360	9.1	41,900	10.5
4/25/2003	1,430	8.3	41,900	9.8
4/26/2003	1,320	8.1	43,400	9.3
4/27/2003	1,170	7.6	42,700	9.0
4/28/2003	1,070	8.6	41,400	9.4
4/29/2003	1,030	9.7	38,400	9.9
4/30/2003	1,040	8.8	40,000	10.1

Appendix A. Table A8. The mean daily discharge and temperature for the Imnaha and Snake rivers from May 1, 2003 to May 31, 2003. Discharge data for USGS gauges 132292000 and 13334300 were obtained online from USGS web sites.

	Imnaha River		Snake River	
Date	Discharge (cfs)	Temperature (C)	Discharge (cfs)	Temperature (C)
5/1/2003	1,020	9.5	37,700	10.4
5/2/2003	1,030	9.5	32,100	10.7
5/3/2003	1,210	9.3	31,300	10.6
5/4/2003	1,510	8.5	31,700	10.2
5/5/2003	1,620	8.0	34,600	9.8
5/6/2003	1,600	7.7	38,500	9.6
5/7/2003	1,490	8.0	36,500	9.5
5/8/2003	1,360	8.8	38,300	10.0
5/9/2003		9.9	36,600	10.6
5/10/2003	1,180	10.1	35,500	11.2
5/11/2003	1,170	9.9	34,300	11.3
5/12/2003	1,210	9.8	36,400	11.1
5/13/2003	1,270	10.2	40,800	11.3
5/14/2003	1,370	11.3	42,200	12.1
5/15/2003	1,540	10.5	44,000	12.2
5/16/2003	1,540	8.7	49,900	11.2
5/17/2003	1,380	8.1	53,700	10.9
5/18/2003	1,220	6.8	53,200	10.1
5/19/2003	1,090	8.3	46,700	10.1
5/20/2003	1,030	10.1	40,000	10.6
5/21/2003	1,030	11.8	38,800	11.2
5/22/2003	1,130	11.9	40,800	12.0
5/23/2003	1,290	12.5	50,300	13.0
5/24/2003	1,580	12.7	60,000	13.7
5/25/2003	1,930	11.1	76,200	12.9
5/26/2003	1,950	10.8	88,200	11.5
5/27/2003	1,890	11.6	98,700	11.7
5/28/2003	2,050	12.1	103,000	12.3
5/29/2003	2,230	11.8	114,000	12.4
5/30/2003	2,770	11.2	125,000	12.1
5/31/2003	2,600	10.3	147,000	11.7

Appendix A. Table A9. The mean daily discharge and temperature for the Imnaha and Snake rivers from June 1, 2003 to June 25, 2003. Discharge data for USGS gauges 132292000 and 13334300 were obtained online from USGS web sites.

	Imnaha River		Snake River	
Date	Discharge (cfs)	Temperature (C)	Discharge (cfs)	Temperature (C)
6/1/2003	2,250	10.7	131,000	11.7
6/2/2003	2,000	11.5	117,000	12.2
6/3/2003	1,850	11.6	104,000	12.5
6/4/2003	1,740	11.9	92,500	12.7
6/5/2003	1,680	12.4	84,100	13.2
6/6/2003	1,710	13.0	80,400	14.4
6/7/2003	1,780	13.3	79,000	14.9
6/8/2003	1,790	13.2	77,800	15.0
6/9/2003	1,800	13.2	77,200	15.1
6/10/2003	1,710	13.2	76,400	15.2
6/11/2003	1,590	12.8		15.3
6/12/2003	1,490	13.5	70,400	15.5
6/13/2003	1,520	14.1	66,300	15.9
6/14/2003	1,520	13.9	59,200	15.9
6/15/2003	1,470	14.3	57,700	16.0
6/16/2003	1,440	14.5	57,700	16.4
6/17/2003	1,420	14.8	56,600	16.9
6/18/2003	1,420	15.3	54,900	17.4
6/19/2003	1,530	14.9	49,100	17.5
6/20/2003	1,630	12.3	49,300	16.4
6/21/2003	1,320	11.2	49,500	15.5
6/22/2003	1,150	11.8	41,600	15.2
6/23/2003	1,030	12.6	45,200	15.7
6/24/2003	968	14.3	42,200	16.2
6/25/2003	955	14.8	37,400	16.5

Appendix A. Table A10. The mean monthly discharge for the Imnaha River from 1929 to 2003, and for the Snake River from1959 to 2003. Discharge data for USGS gauges 132292000 and 13334300 were obtained online from USGS web sites.

	Imnaha River				Snake River			
Year	March	April	May	June	March	April	May	June
1929	340	656	1,245	1,207				
1930	294	753	724	705				
1931	218	582	881	433				
1932	306	1,052	2,169	1,349				
1933	191	754	1,383	2,187				
1934	478	813	699	439				
1935	177	758	1,243	1,034				
1936	204	973	1,151	597				
1937	194	476	1,200	838				
1938	574	1,578	2,602	2,123				
1939	506	795	967	510				
1940	579	1,146	1,133	823				
1941	546	921	1,363	1,532				
1942	337	1,608	1,748	1,408				
1943	415	1,567	1,323	1,451				
1944	162	671	867	968				
1945	276	727	1,661	1,579				
1946	390	1,273	1,807	1,229				
1947	475	824	1,398	933				
1948	254	1,241	2,804	2,339				
1949	416	1,049	1,666	930				
1950	326	725	1,307	1,542				
1951	303	1,147	1,515	972				
1952	244	1,532	2,421	1,753				
1953	330	943	1,544	1,881				
1954	363	884	1,349	1,026				
1955	141	512	1,505	1,386				
1956	642	1,760	2,381	1,796				
1957	475	815	2,661	1,394				
1958	372	928	2,552	2,004				
1959	307	989	1,482	1,550	26,150	38,080	45,170	68,620
1960	500	923	1,316	1,094	31,990	41,700	53,050	61,850
1961	395	635	1,355	1,329	28,030	26,850	42,510	54,250
1962	287	1,192	1,336	1,371	26,390	49,480	55,730	60,800

Appendix A. Table A10. Continued.

	Imnaha River				Snake River			
Year	March	April	May	June	March	April	May	June
1963	408	891	1,561	1,291	23,800	28,640	64,420	83,850
1964	165	719	1,525	1,752	23,250	38,190	65,369	98,320
1965	419	1,426	1,845	1,791	54,870	71,080	93,730	102,400
1966	414	952	1,210	786	25,870	29,770	37,050	34,060
1967	377	533	1,990	2,132	23,600	23,760	56,789	87,320
1968	464	570	1,283	1,258	25,840	27,050	38,440	56,620
1969	351	1,492	2,083	1,491	48,410	74,380	86,150	59,460
1970	309	384	1,820	1,715	28,740	31,090	70,330	96,840
1971	378	1,068	2,777	1,965	52,430	82,970	117,200	116,900
1972	869	758	1,708	1,673	90,400	67,300	81,060	98,400
1973	255	517	1,148	767	28,310	26,179	42,060	38,530
1974	761	1,264	1,876	2,612	59,350	88,700	90,500	132,700
1975	272	557	2,249	2,284	43,870	60,929	85,360	100,800
1976	242	839	1,734	921	43,200	78,290	102,200	77,860
1977	114	345	445	423	18,680	18,880	20,610	24,380
1978	729	1,611	1,528	1,306	39,330	55,379	67,670	70,000
1979	437	681	1,802	912	38,290	40,140	56,899	44,080
1980	307	1,049	1,602	1,496	25,820	40,100	75,480	75,730
1981	393	888	1,501	1,397	26,500	32,880	58,660	75,340
1982	699	1,117	2,116	2,044	65,740	73,680	97,820	110,700
1983	970	1,007	1,933	1,710	77,140	64,080	97,250	106,600
1984	504	1,046	1,839	1,949	60,270	86,710	118,700	134,200
1985	282	1,078	1,285	1,157	36,080	63,280	57,550	48,920
1986	993	981	1,361	1,329	90,330	77,470	80,640	93,230
1987	518	704	764	417	24,820	27,430	38,620	21,210
1988	246	646	707	713	19,810	25,890	40,320	32,500
1989	510	961	1,099	1,014	40,740	58,460	51,800	44,630
1990	401	1,084	965	1,159	23,230	30,400	38,270	45,260
1991	228	531	1,177	914	18,910	19,840	45,160	48,240
1992	371	451	571	361	21,950	24,460	32,570	16,850
1993	432	871	2,172	1,510	37,920	49,890	86,760	77,750
1994	320	771	1,003	613	22,880	31,310	44,270	24,850
1995	1,026	1,149	2,197	1,759	36,540	41,510	78,030	92,740
1996	618	1,345	1,648	1,396	71,970	84,250	82,110	105,800
1997	657	1,398	2,038	1,681	77,640	85,020	109,600	117,800

Appendix A. Table A10. Continued.

	Imnaha River				Snake River			
Year	March	April	May	June	March	April	May	June
1998	582	940	2,500	1,661	40,040	49,040	105,900	90,590
1999	606	1,066	1,997	1,801	68,600	67,530	76,880	99,650
2000	358	1,247	1,245	989	38,290	56,210	53,600	42,620
2001	240	438	757	383	20,365	23,727	39,368	22,413
2002	245	1,005	1,260	1,188	24,019	39,466	44,881	53,183
2003	604	1,050	1,510	1,467	27,886	37,139	56,000	62,248

APPENDIX B

THE NUMBER OF CHINOOK SALMON AND STEELHEAD CAPTURED AND PIT TAGGED FOR MIGRATION YEAR 2003 AT THE IMNAHA RIVER TRAP

Appendix B. Table B1. The number of hours sampled and the catch of natural chinook salmon and steelhead at the Imnaha River trap from October 1, 2002 to June 25, 2003. Sampling periods exceeded 24 hours when trapping continued past the hour the trap was started from the previous day (eg. 8 am on March 25 to 9 am on March 26).

		Trap A				Trap B			
Sample End Date	Hours Fished	Natural Chinook Salmon	Hatchery Chinook Salmon	Natural Steelhead	Hatchery Steelhead	Natural Chinook Salmon	Hatchery Chinook Salmon	Natural Steelhead	Hatchery Steelhead
Oct 1	16.5	17							
Oct 2	25.0	51							
Oct 3	23.0	141							
Oct 8	16.5	25			1				
Oct 9	23.0	25							
Oct 10	23.5	14							
Oct 11	24.0	33							
Oct 15	18.5	192							
Oct 16	23.5	138							
Oct 17	24.0	136							
Oct 18	23.0	67							
Oct 22	16.0	6		5					
Oct 23	24.5	42							
Oct 24	24.3	65							
Oct 25	26.5	270							
Oct 29	18.0	171							
Oct 30	33.0	1,351		1					
Oct 31	21.0	1,024							
Nov 1	13.5	235							
Nov 5	18.0	300							
Nov 6	25.0	599							
Nov 7	27.5	1,232							
Nov 8	19.0	731							
Nov 13	16.0	182							
Nov 14	23.5	158							
Nov 15	25.0	345							
Nov 19	16.0	5							
Nov 20	23.5	12							
Nov 21	23.0	49							

Appendix B. Table B1. Continued.

Sample End Date	Hours Fished	Trap A Natural Chinook Salmon	Trap A Hatchery Chinook Salmon	Trap A Natural Steelhead	Trap A Hatchery Steelhead	Trap B Natural Chinook Salmon	Trap B Hatchery Chinook Salmon	Trap B Natural Steelhead	Trap B Hatchery Steelhead
Mar 7	15.5	6							
Mar 8	15.0	8		1					
Mar 9	24.5	6		6					
Mar 10	22.5	6		3					
Mar 11	24.5	30		18					
Mar 12	21.5	27		23					
Mar 13	16.0	33		41					
Mar 14	15.0	10		30					
Mar 15	24.0	29		76					
Mar 17	14.5	18		5					
Mar 18	15.5	90		15					
Mar 19	25.5	179		27					
Mar 20	23.5	107		18					
Mar 21	24.0	94		18	1				
Mar 22	22.0	82		23					
Mar 23	22.5	13		18	1				
Mar 24	14.0	49		42					
Mar 25	26.0	103		39					
Mar 26	23.0	83	792	34	12				
Mar 27	24.0	67		36	1				
Mar 28	24.0	126		17					
Mar 29	24.5	61							
Mar 30	15.5	186		30					
Mar 31	23.0	126		26					
Apr 1	26.0	147		63					
Apr 2	25.0	92	79	41	37	193	7	27	
Apr 3	16.5	114	576	26		119	39	14	
Apr 4	25.0	159	683	17	1	183	44	24	
Apr 5	23.0	84	1,070	14	1	96	38	10	1
Apr 6	24.0	100	2,083	11	3	68	126	1	
Apr 7	11.5	62	947	14					
Apr 8	23.0	52	5,115	4					
Apr 9	24.0	26	1,801	13					

Appendix B. Table B1. Continued.

Sample End Date	Hours Fished	Trap A				Trap B			
		Natural Chinook Salmon	Hatchery Chinook Salmon	Natural Steelhead	Hatchery Steelhead	Natural Chinook Salmon	Hatchery Chinook Salmon	Natural Steelhead	Hatchery Steelhead
Apr 10	14.5	13	3,138	19	31				
Apr 11	27.0	42	1,032	46	93				
Apr 12	23.5	49	1,905	24	476				
Apr 13	18.5	54	1,135	44	220				
Apr 14	24.0	53	1,170	34	207				
Apr 15	23.5	56	1,016	34	275				
Apr 16	26.0	60	709	37	682				
Apr 17	17.5	41	703	29	1,519				
Apr 18	20.0	65	367	27	3,392				
Apr 19	24.0	88	855	36	1,602				
Apr 20	24.5	144	707	41	777				
Apr 21	22.5	114	500	70	416				1
Apr 22	22.5	125	285	87	251				
Apr 23	25.0	133	477	166	286				
Apr 24	17.5	86	321	252	985				
Apr 25	21.5	97	239	296	1,174				
Apr 26	20.0	34	88	205	934				
Apr 27	26.5	90	145	106	528				
Apr 28	17.0	61	157	221	229				
Apr 29	23.0	56	40	47	167				
Apr 30	24.5	56	56	111	228				
May 1	17.0	70	97	86	240				
May 2	24.0	66	60	76	255				
May 3	23.0	41	29	98	287				
May 4	21.5	60	96	605	2,142	45	8	122	2
May 5	21.0	63	55	379	1,100				
May 6	18.5	37	16	169	436				
May 7	23.5	10	14	94	435				
May 8	12.0	10	10	75	3,192				
May 9	25.0	63	33	122	3,158				
May 10	23.5	46	16	216	2,795				
May 11	23.0	37	20	205	1,241				
May 12	23.5	33	23	193	796				

Appendix B. Table B1. Continued.

Sample End Date	Hours Fished	Trap A Natural Chinook Salmon	Trap A Hatchery Chinook Salmon	Trap A Natural Steelhead	Trap A Hatchery Steelhead	Trap B Natural Chinook Salmon	Trap B Hatchery Chinook Salmon	Trap B Natural Steelhead	Trap B Hatchery Steelhead
May 13	26.0	40	30	358	984				
May 14	24.0	54	30	525	1,240				
May 15	29.0	25	12	421	947				
May 16	22.5	50	22	503	1,000				
May 17	18.5	32	16	314	572				
May 18	24.0	40	16	210	502				
May 19	23.5	40	22	166	542				
May 20	24.0	17	5	122	360				
May 21	24.5	29	4	127	276				
May 22	25.5	26	6	227	620				
May 23	24.5	40	7	263	671				
May 24	23.0	17		184	882				
May 27	24.0	1		5	8				
May 28	9.5	4		2	17				
May 29	1.0	1		1					
Jun 3	13.0			11	4				
Jun 4	25.0	5	1	23	17				
Jun 5	10.5	10		26	28				
Jun 6	24.8	14		19	38				
Jun 7	22.0	4		11	17				
Jun 8	25.0	3		9	43				
Jun 9	24.0	3		2	9				
Jun 10	24.0	12	1	8	30				
Jun 11	23.5	9		3	18				
Jun 12	12.5	6		5	23				
Jun 13	24.0	24		4	16				
Jun 14	24.0	9		3	16				
Jun 15	24.0	15		5	17				
Jun 16	24.0	5		7	10				
Jun 17	24.0	18		6	7				
Jun 18	24.0	17			8				
Jun 19	11.0	19			14				
Jun 20	23.5	21		3	14				

Appendix B. Table B1. Continued.

		Trap A				Trap B			
Sample End Date	Hours Fished	Natural Chinook Salmon	Hatchery Chinook Salmon	Natural Steelhead	Hatchery Steelhead	Natural Chinook Salmon	Hatchery Chinook Salmon	Natural Steelhead	Hatchery Steelhead
Jun 21	24.0	14	1		13				
Jun 22	25.0	24			2				
Jun 23	23.0	29			4				
Jun 24	23.5	19		1					
Jun 25	24.5	18			2				
	Total	12,758	28,833	8,579	39,578	704	262	198	4

Appendix B. Table B2. The number of natural chinook salmon and steelhead PIT tagged at the Imnaha River trap from October 1, 2002 to June 25, 2003.

Week	Natural Chinook Salmon	Hatchery Chinook Salmon	Natural Steelhead	Hatchery Steelhead
1-Oct	15			
2-Oct	42			
3-Oct	103			
8-Oct	18			
9-Oct	12			
10-Oct	5			
11-Oct	24			
15-Oct	174			
16-Oct	128			
17-Oct	118			
18-Oct	62			
22-Oct	5			
23-Oct	42			
24-Oct	62			
25-Oct	256			
29-Oct	167			
30-Oct	1289		1	
31-Oct	989			
1-Nov	224			
5-Nov	294			
6-Nov	585			
7-Nov	1175			
8-Nov	675			
13-Nov	176			
14-Nov	154			
15-Nov	329			
19-Nov	5			
20-Nov	11			
21-Nov	44			
7-Mar	5			
8-Mar	8		1	
9-Mar	6		6	
10-Mar	6		3	

Appendix B. Table B2. Continued.

Week	Natural Chinook Salmon	Hatchery Chinook Salmon	Natural Steelhead	Hatchery Steelhead
11-Mar	30		17	
12-Mar	27		23	
13-Mar	32		40	
14-Mar	10		30	
15-Mar	29		76	
17-Mar	17		5	
18-Mar	90		15	
19-Mar	179		27	
20-Mar	107		14	
21-Mar	94		18	
22-Mar	81		22	
23-Mar	13		18	1
24-Mar	49		38	
25-Mar	102		39	
26-Mar	83		33	
27-Mar	66		35	1
28-Mar	126		18	
29-Mar	73		31	
30-Mar	186		30	
31-Mar	126		26	
1-Apr	146		63	
2-Apr	39		9	
2-Apr	244		59	
3-Apr	229	2	39	
4-Apr	315	4	39	
5-Apr	175	1	24	1
6-Apr	136	2	6	
7-Apr	61		13	
8-Apr	28		4	
9-Apr	24	1	12	
10-Apr	11		19	12
11-Apr	41		40	62
12-Apr	29	7	22	169
13-Apr	53		44	123

Appendix B. Table B2. Continued.

Week	Natural Chinook Salmon	Hatchery Chinook Salmon	Natural Steelhead	Hatchery Steelhead
14-Apr	52	1	34	115
15-Apr	54	2	34	159
16-Apr	58	17	36	320
17-Apr	41		28	227
18-Apr	38		9	51
19-Apr	70		26	
20-Apr	140		41	273
21-Apr	114		70	251
22-Apr	124	1	87	245
23-Apr	129	3	163	251
24-Apr	74		250	2
25-Apr	60		247	1
26-Apr	29		111	
27-Apr	85	4	106	432
28-Apr	58		73	225
29-Apr	47		46	131
30-Apr	56		110	169
1-May	69		86	
3-May	39		97	
4-May	62	1	256	
5-May	32		390	
6-May	20		167	1
7-May	14		152	1
8-May	7		26	397
9-May	58		99	417
10-May	38		190	187
11-May	35		205	1
12-May	70		550	506
14-May	54		338	262
15-May	25		421	231
16-May	45		503	
17-May	25			
18-May	36	1		
19-May	35			

Appendix B. Table B2. Continued.

Week	Natural Chinook Salmon	Hatchery Chinook Salmon	Natural Steelhead	Hatchery Steelhead
20-May	17			
21-May	28			
22-May	26		227	1
23-May	38		32	
24-May	14			
27-May	1			
28-May	4			
3-Jun			11	
4-Jun	5		23	
5-Jun	8		26	1
6-Jun	13		10	
7-Jun	4		11	
8-Jun	3		7	
9-Jun	3		2	
10-Jun	9		8	
11-Jun	8		3	
12-Jun	3		5	
13-Jun	9		4	
14-Jun	6		3	1
15-Jun	8		5	
16-Jun	3		7	
17-Jun	9		6	
19-Jun	18			
20-Jun	21		3	
21-Jun	12			
22-Jun	17			
23-Jun	24			
24-Jun	18			
25-Jun	13			
Total	12,494	47	6,303	5,227

Appendix B. Table B3. Chinook salmon captured and PIT tagged at the Imnaha River Trap from October 1 to November 21, 2002 and randomly chosen for bypass at Lower Granite Dam during the 2003 migration.

File ID	Tag ID	Length	File ID	Tag ID	Length	File ID	Tag ID	Length
JAH02274.NT1	3D9.1BF139878B	81	JAH02303.NT2	3D9.1BF13A2DBC	101	JAH02311.NT1	3D9.1BF167570D	83
JAH02274.NT1	3D9.1BF16A0548	98	JAH02303.NT2	3D9.1BF13A2F1F	87	JAH02311.NT1	3D9.1BF1687C62	92
JAH02274.NT1	3D9.1BF16A15C9	60	JAH02303.NT2	3D9.1BF13A4079	71	JAH02311.NT1	3D9.1BF1688BC5	76
JAH02274.NT1	3D9.1BF168D4B6	75	JAH02303.NT2	3D9.1BF13A40B1	70	JAH02311.NT1	3D9.1BF167021C	87
JAH02275.NT1	3D9.1BF139E62F	65	JAH02303.NT2	3D9.1BF13A4D4A	89	JAH02311.NT1	3D9.1BF167194C	85
JAH02275.NT1	3D9.1BF169FA00	73	JAH02303.NT2	3D9.1BF13A51A6	120	JAH02311.NT1	3D9.1BF168434B	73
JAH02275.NT1	3D9.1BF1681413	64	JAH02303.NT2	3D9.1BF13A5268	78	JAH02311.NT1	3D9.1BF1688128	83
JAH02275.NT1	3D9.1BF1699396	80	JAH02303.NT2	3D9.1BF168A842	92	JAH02311.NT1	3D9.1BF1693377	80
JAH02275.NT1	3D9.1BF1680E1F	68	JAH02303.NT2	3D9.1BF168D9EF	74	JAH02311.NT1	3D9.1BF1678CE7	74
JAH02275.NT1	3D9.1BF13A3347	75	JAH02303.NT2	3D9.1BF168E69E	76	JAH02311.NT1	3D9.1BF1697C3E	75
JAH02275.NT1	3D9.1BF13A169A	64	JAH02303.NT2	3D9.1BF168F1CE	67	JAH02311.NT1	3D9.1BF1676FC5	69
JAH02275.NT1	3D9.1BF16A0A94	71	JAH02303.NT2	3D9.1BF168F374	75	JAH02311.NT1	3D9.1BF1688AD2	86
JAH02275.NT1	3D9.1BF16A03F5	65	JAH02303.NT2	3D9.1BF168F63F	79	JAH02311.NT1	3D9.1BF1694453	86
JAH02275.NT1	3D9.1BF139A89F	64	JAH02303.NT2	3D9.1BF168FD28	95	JAH02311.NT1	3D9.1BF168AB39	70
JAH02275.NT1	3D9.1BF139A4F7	82	JAH02303.NT2	3D9.1BF1695952	71	JAH02311.NT1	3D9.1BF167303C	87
JAH02275.NT1	3D9.1BF1699AF7	79	JAH02303.NT2	3D9.1BF1696D43	92	JAH02311.NT1	3D9.1BF16779A0	93
JAH02276.NT1	3D9.1BF169D29D	72	JAH02303.NT2	3D9.1BF1697921	86	JAH02311.NT1	3D9.1BF16701C0	75
JAH02276.NT1	3D9.1BF169FA8C	81	JAH02303.NT2	3D9.1BF169997F	81	JAH02311.NT1	3D9.1BF16858B7	82
JAH02276.NT1	3D9.1BF169D8B3	77	JAH02303.NT2	3D9.1BF1699E14	72	JAH02311.NT1	3D9.1BF16931DE	92
JAH02276.NT1	3D9.1BF1694299	82	JAH02303.NT2	3D9.1BF1699ED4	87	JAH02311.NT1	3D9.1BF1687B6E	79
JAH02276.NT1	3D9.1BF169AC1F	71	JAH02303.NT2	3D9.1BF169A620	71	JAH02311.NT1	3D9.1BF168AE47	92
JAH02276.NT1	3D9.1BF169FC40	103	JAH02303.NT2	3D9.1BF169AAEB	72	JAH02311.NT1	3D9.1BF16715FB	80
JAH02276.NT1	3D9.1BF1694D73	90	JAH02303.NT2	3D9.1BF169ABA1	82	JAH02311.NT1	3D9.1BF167263A	84
JAH02276.NT1	3D9.1BF13A1BF7	68	JAH02303.NT2	3D9.1BF169C861	68	JAH02311.NT1	3D9.1BF1692127	85
JAH02276.NT1	3D9.1BF1699A06	78	JAH02303.NT2	3D9.1BF169DE6E	88	JAH02311.NT1	3D9.1BF169213A	67
JAH02276.NT1	3D9.1BF13940A9	93	JAH02303.NT2	3D9.1BF169ED84	79	JAH02311.NT1	3D9.1BF1670141	82
JAH02276.NT1	3D9.1BF169AF7C	79	JAH02303.NT2	3D9.1BF169F160	82	JAH02311.NT1	3D9.1BF16719BA	74
JAH02276.NT1	3D9.1BF16775B8	69	JAH02303.NT2	3D9.1BF16A02DB	90	JAH02311.NT1	3D9.1BF168FEB0	98
JAH02276.NT1	3D9.1BF16A12C4	77	JAH02303.NT2	3D9.1BF16A037C	82	JAH02311.NT1	3D9.1BF13949C0	71
JAH02276.NT1	3D9.1BF16A0A06	92	JAH02303.NT2	3D9.1BF16A06B5	80	JAH02311.NT1	3D9.1BF168D519	86
JAH02276.NT1	3D9.1BF16A0DEA	91	JAH02303.NT2	3D9.1BF16A088F	81	JAH02311.NT1	3D9.1BF1685983	82
JAH02276.NT1	3D9.1BF168EB2A	67	JAH02303.NT2	3D9.1BF16A0907	93	JAH02311.NT1	3D9.1BF1692730	91
JAH02276.NT1	3D9.1BF1691177	70	JAH02303.NT2	3D9.1BF16A0C0B	77	JAH02311.NT1	3D9.1BF1689193	95
JAH02276.NT1	3D9.1BF13A1602	72	JAH02303.NT2	3D9.1BF16A0F51	80	JAH02311.NT1	3D9.1BF1690ED4	74
JAH02276.NT1	3D9.1BF16A0BAB	64	JAH02303.NT2	3D9.1BF16A1144	84	JAH02311.NT1	3D9.1BF16844D0	74
JAH02276.NT1	3D9.1BF169FE5F	67	JAH02303.NT2	3D9.1BF16A1456	73	JAH02311.NT1	3D9.1BF16752BE	78
JAH02276.NT1	3D9.1BF16A19BC	63	JAH02304.NT1	3D9.1BF13A6F55	80	JAH02311.NT1	3D9.1BF15472D1	73
JAH02276.NT1	3D9.1BF1697B99	63	JAH02304.NT1	3D9.1BF13A5882	85	JAH02311.NT1	3D9.1BF166FF61	72
JAH02276.NT1	3D9.1BF16A092D	73	JAH02304.NT1	3D9.1BF1398908	81	JAH02311.NT1	3D9.1BF1670CD9	73
JAH02276.NT1	3D9.1BF169C43B	80	JAH02304.NT1	3D9.1BF1699DD6	80	JAH02311.NT1	3D9.1BF16717BC	81
JAH02276.NT1	3D9.1BF169AF0B	73	JAH02304.NT1	3D9.1BF16963A1	76	JAH02311.NT1	3D9.1BF1676427	74
JAH02276.NT1	3D9.1BF139A691	77	JAH02304.NT1	3D9.1BF1696C28	83	JAH02311.NT1	3D9.1BF16764C4	95
JAH02276.NT1	3D9.1BF139EEE5	73	JAH02304.NT1	3D9.1BF169A3DC	72	JAH02311.NT1	3D9.1BF16764D7	83
JAH02276.NT1	3D9.1BF168E6BE	92	JAH02304.NT1	3D9.1BF13A335A	68	JAH02311.NT1	3D9.1BF1685A03	77
JAH02276.NT1	3D9.1BF1695816	69	JAH02304.NT1	3D9.1BF168ACBE	84	JAH02311.NT1	3D9.1BF16872D8	94
JAH02281.NT1	3D9.1BF1399CE3	70	JAH02304.NT1	3D9.1BF13A3C2E	70	JAH02311.NT1	3D9.1BF16877B8	82
JAH02281.NT1	3D9.1BF1699BB3	86	JAH02304.NT1	3D9.1BF169555D	80	JAH02311.NT1	3D9.1BF168856E	90
JAH02281.NT1	3D9.1BF168EEBA	75	JAH02304.NT1	3D9.1BF13A1E2C	87	JAH02311.NT1	3D9.1BF168C099	83
JAH02281.NT1	3D9.1BF1679815	66	JAH02304.NT1	3D9.1BF1399FBF	85	JAH02311.NT1	3D9.1BF1694C17	75
JAH02281.NT1	3D9.1BF16A1923	67	JAH02304.NT1	3D9.1BF169A14A	66	JAH02311.NT1	3D9.1BF1676F33	76
JAH02281.NT1	3D9.1BF169ECD0	70	JAH02304.NT1	3D9.1BF13A631B	71	JAH02311.NT1	3D9.1BF16934C4	79
JAH02282.NT1	3D9.1BF1691152	75	JAH02304.NT1	3D9.1BF13A501B	81	JAH02311.NT1	3D9.1BF1670590	98
JAH02282.NT1	3D9.1BF1690F53	94	JAH02304.NT1	3D9.1BF16971F1	73	JAH02311.NT1	3D9.1BF16943C2	95
JAH02282.NT1	3D9.1BF1678661	66	JAH02304.NT1	3D9.1BF13A3547	84	JAH02311.NT1	3D9.1BF1676918	73
JAH02283.NT1	3D9.1BF16995C9	97	JAH02304.NT1	3D9.1BF1680A94	79	JAH02311.NT1	3D9.1BF168993E	73
JAH02284.NT1	3D9.1BF139E2FB	84	JAH02304.NT1	3D9.1BF1697559	83	JAH02311.NT1	3D9.1BF1675DF8	99
JAH02284.NT1	3D9.1BF16A16EB	87	JAH02304.NT1	3D9.1BF16953D8	83	JAH02311.NT1	3D9.1BF16880ED	85
JAH02284.NT1	3D9.1BF1680801	86	JAH02304.NT1	3D9.1BF13A1B68	73	JAH02311.NT1	3D9.1BF1678E59	66
JAH02284.NT1	3D9.1BF13A2FBE	73	JAH02304.NT1	3D9.1BF169F1C2	108	JAH02311.NT1	3D9.1BF16718F7	76

Appendix B. Table B3 Continued.

File ID	Tag ID	Length	File ID	Tag ID	Length	File ID	Tag ID	Length
JAH02284.NT1	3D9.1BF168BD93	66	JAH02304.NT1	3D9.1BF156AD5F	71	JAH02311.NT1	3D9.1BF16895D7	81
JAH02284.NT1	3D9.1BF16A108B	82	JAH02304.NT1	3D9.1BF13A43BF	83	JAH02311.NT1	3D9.1BF16893A5	94
JAH02284.NT1	3D9.1BF168F475	73	JAH02304.NT1	3D9.1BF168B65C	93	JAH02311.NT1	3D9.1BF1394094	69
JAH02288.NT1	3D9.1BF12F6FF6	83	JAH02304.NT1	3D9.1BF168DB60	72	JAH02311.NT1	3D9.1BF1681562	76
JAH02288.NT1	3D9.1BF16772C2	107	JAH02304.NT1	3D9.1BF139E8D3	94	JAH02311.NT1	3D9.1BF1394F86	68
JAH02288.NT1	3D9.1BF13A2498	69	JAH02304.NT1	3D9.1BF168BC7E	90	JAH02311.NT1	3D9.1BF168A384	72
JAH02288.NT1	3D9.1BF1677F02	75	JAH02304.NT1	3D9.1BF139EF62	66	JAH02311.NT1	3D9.1BF1692909	80
JAH02288.NT1	3D9.1BF1697747	84	JAH02304.NT1	3D9.1BF1681580	81	JAH02311.NT1	3D9.1BF1692991	73
JAH02288.NT1	3D9.1BF169692B	76	JAH02304.NT1	3D9.1BF1696441	92	JAH02311.NT1	3D9.1BF169D712	77
JAH02288.NT1	3D9.1BF1694DDD	81	JAH02304.NT1	3D9.1BF1699D1D	83	JAH02311.NT1	3D9.1BF168C825	80
JAH02288.NT1	3D9.1BF12F512A	92	JAH02304.NT1	3D9.1BF16A11EF	87	JAH02311.NT1	3D9.1BF1678614	91
JAH02288.NT1	3D9.1BF12F55BD	85	JAH02304.NT1	3D9.1BF13A54F5	87	JAH02311.NT1	3D9.1BF169101B	84
JAH02288.NT1	3D9.1BF167765F	72	JAH02304.NT1	3D9.1BF139E446	65	JAH02311.NT1	3D9.1BF169ADF5	92
JAH02288.NT1	3D9.1BF139A1EF	75	JAH02304.NT1	3D9.1BF13A2A06	76	JAH02311.NT1	3D9.1BF16794D6	81
JAH02288.NT1	3D9.1BF169AA33	86	JAH02304.NT1	3D9.1BF13A53FA	80	JAH02311.NT1	3D9.1BF1695644	83
JAH02288.NT1	3D9.1BF1394FD6	91	JAH02304.NT1	3D9.1BF169AD65	84	JAH02311.NT1	3D9.1BF139E55A	78
JAH02288.NT1	3D9.1BF168EA6A	73	JAH02304.NT1	3D9.1BF169F507	78	JAH02311.NT1	3D9.1BF16707B5	0
JAH02288.NT1	3D9.1BF16A1632	68	JAH02304.NT1	3D9.1BF169E1C1	77	JAH02311.NT1	3D9.1BF16878D4	85
JAH02288.NT1	3D9.1BF16A1544	71	JAH02304.NT1	3D9.1BF16A06FA	76	JAH02311.NT1	3D9.1BF166FE82	76
JAH02288.NT1	3D9.1BF1394BFA	68	JAH02304.NT1	3D9.1BF169F0B1	84	JAH02311.NT1	3D9.1BF1670FC0	85
JAH02288.NT1	3D9.1BF1690519	76	JAH02304.NT1	3D9.1BF139E18E	76	JAH02311.NT1	3D9.1BF1670FE8	82
JAH02288.NT1	3D9.1BF1676B13	90	JAH02304.NT1	3D9.1BF13A1C30	82	JAH02311.NT1	3D9.1BF1671AC5	89
JAH02288.NT1	3D9.1BF168F8AF	71	JAH02304.NT1	3D9.1BF169ADE8	74	JAH02311.NT1	3D9.1BF16761CB	84
JAH02288.NT1	3D9.1BF139A949	86	JAH02304.NT1	3D9.1BF16A07B3	79	JAH02311.NT1	3D9.1BF16768BA	93
JAH02288.NT1	3D9.1BF16A1A0E	69	JAH02304.NT1	3D9.1BF13A2600	82	JAH02311.NT1	3D9.1BF1677281	88
JAH02288.NT1	3D9.1BF16A0FA3	87	JAH02304.NT1	3D9.1BF16A0B46	78	JAH02311.NT1	3D9.1BF167839A	91
JAH02288.NT1	3D9.1BF168F152	74	JAH02304.NT1	3D9.1BF1694AEF	90	JAH02311.NT1	3D9.1BF1678404	80
JAH02288.NT1	3D9.1BF16999DC	65	JAH02304.NT1	3D9.1BF169E5C0	81	JAH02311.NT1	3D9.1BF167860B	74
JAH02288.NT1	3D9.1BF168E0D0	86	JAH02304.NT1	3D9.1BF139E57D	63	JAH02311.NT1	3D9.1BF16789A1	101
JAH02288.NT1	3D9.1BF169AE59	91	JAH02304.NT1	3D9.1BF1690901	114	JAH02311.NT1	3D9.1BF1678AD5	100
JAH02288.NT1	3D9.1BF16796C2	72	JAH02304.NT1	3D9.1BF1399998	67	JAH02311.NT1	3D9.1BF1684259	79
JAH02288.NT1	3D9.1BF168A993	91	JAH02304.NT1	3D9.1BF13A0F7B	83	JAH02311.NT1	3D9.1BF168462A	86
JAH02288.NT1	3D9.1BF16814DE	76	JAH02304.NT1	3D9.1BF13A6817	82	JAH02311.NT1	3D9.1BF1687938	76
JAH02288.NT1	3D9.1BF13A414A	78	JAH02304.NT1	3D9.1BF16811BB	69	JAH02311.NT1	3D9.1BF16879E5	89
JAH02288.NT1	3D9.1BF139A5DA	87	JAH02304.NT1	3D9.1BF16996B8	72	JAH02311.NT1	3D9.1BF1687A29	76
JAH02288.NT1	3D9.1BF168D5BA	69	JAH02304.NT1	3D9.1BF169AEF4	93	JAH02311.NT1	3D9.1BF16897DB	76
JAH02288.NT1	3D9.1BF1697024	94	JAH02304.NT1	3D9.1BF169DDAF	86	JAH02311.NT1	3D9.1BF168A30A	87
JAH02288.NT1	3D9.1BF16910DB	76	JAH02304.NT1	3D9.1BF16A1568	81	JAH02311.NT1	3D9.1BF168A465	94
JAH02288.NT1	3D9.1BF13A1BF3	94	JAH02304.NT1	3D9.1BF13A37B3	68	JAH02311.NT1	3D9.1BF169137B	79
JAH02288.NT1	3D9.1BF139F38A	72	JAH02304.NT1	3D9.1BF169E53B	73	JAH02311.NT1	3D9.1BF1691428	83
JAH02288.NT1	3D9.1BF168BD92	94	JAH02304.NT1	3D9.1BF169EB0F	96	JAH02311.NT1	3D9.1BF169182B	75
JAH02288.NT1	3D9.1BF16A1344	90	JAH02304.NT1	3D9.1BF13943C5	89	JAH02311.NT1	3D9.1BF1691CF6	84
JAH02288.NT1	3D9.1BF16A018D	65	JAH02304.NT1	3D9.1BF139A143	76	JAH02311.NT1	3D9.1BF1691D2C	73
JAH02288.NT1	3D9.1BF16A0E69	84	JAH02304.NT1	3D9.1BF139A746	90	JAH02311.NT1	3D9.1BF1691F73	82
JAH02288.NT1	3D9.1BF1399C7B	65	JAH02304.NT1	3D9.1BF13A2114	88	JAH02311.NT1	3D9.1BF1692066	87
JAH02288.NT1	3D9.1BF16A096A	73	JAH02304.NT1	3D9.1BF13A239B	92	JAH02311.NT1	3D9.1BF16920F4	92
JAH02288.NT1	3D9.1BF13A5496	65	JAH02304.NT1	3D9.1BF13A35CA	95	JAH02311.NT1	3D9.1BF16923AD	66
JAH02288.NT1	3D9.1BF169AD9C	81	JAH02304.NT1	3D9.1BF13A426E	77	JAH02311.NT1	3D9.1BF1692858	83
JAH02288.NT1	3D9.1BF169BEF1	92	JAH02304.NT1	3D9.1BF13A51C7	83	JAH02311.NT1	3D9.1BF1692CAB	85
JAH02288.NT1	3D9.1BF12F5AC2	85	JAH02304.NT1	3D9.1BF13A5269	68	JAH02311.NT1	3D9.1BF1692CE1	79
JAH02288.NT1	3D9.1BF168DF1A	94	JAH02304.NT1	3D9.1BF1699E54	63	JAH02311.NT1	3D9.1BF1692F55	69
JAH02288.NT1	3D9.1BF168EB87	74	JAH02304.NT1	3D9.1BF1699EDE	85	JAH02311.NT1	3D9.1BF16933A9	77
JAH02288.NT1	3D9.1BF16A0264	84	JAH02304.NT1	3D9.1BF169ABA2	81	JAH02311.NT1	3D9.1BF1693405	89
JAH02289.NT1	3D9.1BF12F02EC	90	JAH02304.NT1	3D9.1BF169DE55	73	JAH02311.NT1	3D9.1BF1693710	89
JAH02289.NT1	3D9.1BF12FE7E9	84	JAH02304.NT1	3D9.1BF169FA0A	90	JAH02311.NT1	3D9.1BF1693748	81
JAH02289.NT1	3D9.1BF12EFB7B	71	JAH02304.NT1	3D9.1BF16A0830	83	JAH02311.NT1	3D9.1BF1693789	89
JAH02289.NT1	3D9.1BF12F6FF0	71	JAH02304.NT1	3D9.1BF16A09E9	91	JAH02311.NT1	3D9.1BF169397B	82
JAH02289.NT1	3D9.1BF12EED7B	89	JAH02304.NT1	3D9.1BF16A0B93	86	JAH02311.NT1	3D9.1BF16939B9	90
JAH02289.NT1	3D9.1BF12F6A72	86	JAH02304.NT1	3D9.1BF16A117A	95	JAH02311.NT1	3D9.1BF1693AB2	94
JAH02289.NT1	3D9.1BF12F72A6	78	JAH02304.NT1	3D9.1BF13A2B47	79	JAH02311.NT1	3D9.1BF1693C4D	71
JAH02289.NT1	3D9.1BF12FE468	100	JAH02304.NT1	3D9.1BF169620E	89	JAH02311.NT1	3D9.1BF1693D0F	78

Appendix B. Table B3 Continued.

File ID	Tag ID	Length	File ID	Tag ID	Length	File ID	Tag ID	Length
JAH02289.NT1	3D9.1BF12FF599	109	JAH02304.NT1	3D9.1BF1699118	91	JAH02311.NT1	3D9.1BF1694344	83
JAH02289.NT1	3D9.1BF12F4E32	73	JAH02304.NT1	3D9.1BF16A065F	68	JAH02311.NT1	3D9.1BF166FE06	87
JAH02289.NT1	3D9.1BF12F70C5	70	JAH02304.NT1	3D9.1BF16A103B	73	JAH02311.NT1	3D9.1BF139479C	76
JAH02289.NT1	3D9.1BF12FE871	78	JAH02304.NT1	3D9.1BF16A16D9	63	JAH02311.NT1	3D9.1BF169D8A9	90
JAH02289.NT1	3D9.1BF12FECB5	76	JAH02304.NT1	3D9.1BF13A2A88	81	JAH02311.NT1	3D9.1BF168EE96	101
JAH02289.NT1	3D9.1BF12F56B7	85	JAH02304.NT1	3D9.1BF168D98F	72	JAH02311.NT1	3D9.1BF139E2F3	78
JAH02289.NT1	3D9.1BF12EE28B	72	JAH02304.NT1	3D9.1BF16998B2	92	JAH02311.NT1	3D9.1BF16771A8	93
JAH02289.NT1	3D9.1BF12EF8B1	62	JAH02304.NT1	3D9.1BF16A1A45	94	JAH02311.NT1	3D9.1BF168DAAA	73
JAH02289.NT1	3D9.1BF12F4EB0	104	JAH02304.NT1	3D9.1BF139A4FA	95	JAH02311.NT1	3D9.1BF168E6CB	89
JAH02289.NT1	3D9.1BF12F5170	75	JAH02304.NT1	3D9.1BF139E766	80	JAH02311.NT1	3D9.1BF168FC5F	74
JAH02289.NT1	3D9.1BF12F559C	70	JAH02304.NT1	3D9.1BF13A1951	78	JAH02311.NT1	3D9.1BF16900F7	89
JAH02289.NT1	3D9.1BF12FED9B	119	JAH02304.NT1	3D9.1BF13A247F	84	JAH02311.NT1	3D9.1BF16999EA	76
JAH02289.NT1	3D9.1BF12EE154	92	JAH02304.NT1	3D9.1BF13A2D93	84	JAH02311.NT1	3D9.1BF16A038B	75
JAH02289.NT1	3D9.1BF12EFAA4	77	JAH02304.NT1	3D9.1BF13A6289	84	JAH02311.NT1	3D9.1BF16A0FF2	82
JAH02289.NT1	3D9.1BF12F53A4	82	JAH02304.NT1	3D9.1BF168B157	71	JAH02311.NT1	3D9.1BF13A1ECE	78
JAH02289.NT1	3D9.1BF12EEF56	71	JAH02304.NT1	3D9.1BF1699F44	88	JAH02311.NT1	3D9.1BF1677F78	72
JAH02289.NT1	3D9.1BF12EE0F1	67	JAH02304.NT1	3D9.1BF169A54E	79	JAH02311.NT1	3D9.1BF16795B4	82
JAH02289.NT1	3D9.1BF12EEC74	70	JAH02304.NT1	3D9.1BF169CB2F	68	JAH02311.NT1	3D9.1BF167973D	80
JAH02289.NT1	3D9.1BF12FE148	87	JAH02304.NT1	3D9.1BF16A002B	75	JAH02311.NT1	3D9.1BF1689481	84
JAH02289.NT1	3D9.1BF12ED4BF	78	JAH02304.NT1	3D9.1BF16A03FF	94	JAH02311.NT1	3D9.1BF168AF1E	80
JAH02289.NT1	3D9.1BF12FE198	77	JAH02304.NT1	3D9.1BF16A126A	89	JAH02311.NT1	3D9.1BF168BCBF	85
JAH02289.NT1	3D9.1BF12F5AF2	103	JAH02304.NT1	3D9.1BF1394937	99	JAH02311.NT1	3D9.1BF168C1C4	95
JAH02289.NT1	3D9.1BF12EE52B	86	JAH02304.NT1	3D9.1BF1398776	77	JAH02311.NT1	3D9.1BF168C1F5	77
JAH02289.NT1	3D9.1BF12EF828	73	JAH02304.NT1	3D9.1BF139A854	86	JAH02311.NT1	3D9.1BF168D891	91
JAH02289.NT1	3D9.1BF12F0416	94	JAH02304.NT1	3D9.1BF13A115F	76	JAH02311.NT1	3D9.1BF168E4A3	75
JAH02289.NT1	3D9.1BF12F584D	77	JAH02304.NT1	3D9.1BF13A17F1	79	JAH02311.NT1	3D9.1BF168E7B0	85
JAH02289.NT1	3D9.1BF12F72A7	97	JAH02304.NT1	3D9.1BF13A3062	78	JAH02311.NT1	3D9.1BF168E8DE	99
JAH02289.NT1	3D9.1BF12F7301	88	JAH02304.NT1	3D9.1BF13A534E	70	JAH02311.NT1	3D9.1BF168ED55	86
JAH02289.NT1	3D9.1BF12FE4EC	77	JAH02304.NT1	3D9.1BF16811FC	78	JAH02311.NT1	3D9.1BF168EFB8	72
JAH02290.NT1	3D9.1BF16A1C1D	90	JAH02304.NT1	3D9.1BF1682DA3	78	JAH02311.NT1	3D9.1BF168F5FC	78
JAH02290.NT1	3D9.1BF16976CE	73	JAH02304.NT1	3D9.1BF169772F	75	JAH02311.NT1	3D9.1BF168FA5C	80
JAH02290.NT1	3D9.1BF139417F	72	JAH02304.NT1	3D9.1BF16987DE	94	JAH02311.NT1	3D9.1BF168FAF0	85
JAH02290.NT1	3D9.1BF12FED52	85	JAH02304.NT1	3D9.1BF169A18A	100	JAH02311.NT1	3D9.1BF1690506	87
JAH02290.NT1	3D9.1BF16A0D63	84	JAH02304.NT1	3D9.1BF169A84A	79	JAH02311.NT1	3D9.1BF16909DC	81
JAH02290.NT1	3D9.1BF168F561	75	JAH02304.NT1	3D9.1BF169AF75	86	JAH02311.NT1	3D9.1BF1690A93	83
JAH02290.NT1	3D9.1BF167205D	83	JAH02304.NT1	3D9.1BF169C877	77	JAH02311.NT1	3D9.1BF1691150	95
JAH02290.NT1	3D9.1BF168F6CD	71	JAH02304.NT1	3D9.1BF169D05D	96	JAH02311.NT1	3D9.1BF1694D1D	90
JAH02290.NT1	3D9.1BF169047D	80	JAH02304.NT1	3D9.1BF169EFB6	87	JAH02311.NT1	3D9.1BF1697850	75
JAH02290.NT1	3D9.1BF168FA3F	92	JAH02304.NT1	3D9.1BF169FFAE	93	JAH02311.NT1	3D9.1BF16A16F6	85
JAH02290.NT1	3D9.1BF139A97F	74	JAH02304.NT1	3D9.1BF16A01EE	72	JAH02311.NT1	3D9.1BF1399F37	72
JAH02290.NT1	3D9.1BF16A1016	69	JAH02304.NT1	3D9.1BF16A07DA	77	JAH02311.NT1	3D9.1BF13A1DB5	108
JAH02290.NT1	3D9.1BF168ED23	87	JAH02304.NT1	3D9.1BF16A0DE9	94	JAH02311.NT1	3D9.1BF1680541	93
JAH02290.NT1	3D9.1BF168F76E	103	JAH02304.NT2	3D9.1BF167A26A	79	JAH02311.NT1	3D9.1BF16995DD	80
JAH02290.NT1	3D9.1BF168AE6C	85	JAH02304.NT2	3D9.1BF169BC35	86	JAH02311.NT1	3D9.1BF1394DE2	85
JAH02290.NT1	3D9.1BF139A799	78	JAH02304.NT2	3D9.1BF156AA56	83	JAH02311.NT1	3D9.1BF139A404	70
JAH02290.NT1	3D9.1BF139A502	85	JAH02304.NT2	3D9.1BF13A7517	65	JAH02311.NT1	3D9.1BF13A16A6	79
JAH02290.NT1	3D9.1BF168E6D0	77	JAH02304.NT2	3D9.1BF13A735B	72	JAH02311.NT1	3D9.1BF16A0126	91
JAH02290.NT1	3D9.1BF1679855	71	JAH02304.NT2	3D9.1BF13A4B68	91	JAH02311.NT1	3D9.1BF16A0CDF	91
JAH02290.NT1	3D9.1BF13A1D18	94	JAH02304.NT2	3D9.1BF16A1C00	81	JAH02311.NT1	3D9.1BF1681267	74
JAH02290.NT1	3D9.1BF168E1AF	65	JAH02304.NT2	3D9.1BF169A0FC	90	JAH02311.NT1	3D9.1BF16A1074	88
JAH02290.NT1	3D9.1BF168D7B9	72	JAH02304.NT2	3D9.1BF13A2287	72	JAH02311.NT1	3D9.1BF1688795	71
JAH02290.NT1	3D9.1BF16A1925	84	JAH02304.NT2	3D9.1BF1699DBC	77	JAH02311.NT1	3D9.1BF1394656	96
JAH02290.NT1	3D9.1BF168AC7D	86	JAH02304.NT2	3D9.1BF1696EEE	85	JAH02311.NT1	3D9.1BF139A358	88
JAH02290.NT1	3D9.1BF169DFF9	78	JAH02304.NT2	3D9.1BF1695DB7	75	JAH02311.NT1	3D9.1BF13A19CA	80
JAH02290.NT1	3D9.1BF13A1695	69	JAH02304.NT2	3D9.1BF1697625	93	JAH02311.NT1	3D9.1BF1676A16	76
JAH02290.NT1	3D9.1BF1394B85	68	JAH02304.NT2	3D9.1BF1696A5D	80	JAH02311.NT1	3D9.1BF1679072	90
JAH02290.NT1	3D9.1BF168F462	70	JAH02304.NT2	3D9.1BF1695084	71	JAH02311.NT1	3D9.1BF1679213	70
JAH02290.NT1	3D9.1BF1691012	83	JAH02304.NT2	3D9.1BF13A1AF4	72	JAH02311.NT1	3D9.1BF1679997	86
JAH02290.NT1	3D9.1BF1394AB3	81	JAH02304.NT2	3D9.1BF139E782	86	JAH02311.NT1	3D9.1BF168B354	77
JAH02290.NT1	3D9.1BF13A1C03	81	JAH02304.NT2	3D9.1BF13A3BF7	71	JAH02311.NT1	3D9.1BF168BEF7	73
JAH02290.NT1	3D9.1BF168C986	97	JAH02304.NT2	3D9.1BF1696A00	73	JAH02311.NT1	3D9.1BF168CF4E	77

Appendix B. Table B3 Continued.

File ID	Tag ID	Length	File ID	Tag ID	Length	File ID	Tag ID	Length
JAH02290.NT1	3D9.1BF169A4A2	68	JAH02304.NT2	3D9.1BF13A1E4E	74	JAH02311.NT1	3D9.1BF168E119	93
JAH02291.NT1	3D9.1BF13A6FCE	93	JAH02304.NT2	3D9.1BF1394938	72	JAH02311.NT1	3D9.1BF168E15C	73
JAH02291.NT1	3D9.1BF1681A8F	70	JAH02304.NT2	3D9.1BF13A72A4	84	JAH02311.NT1	3D9.1BF168E252	90
JAH02291.NT1	3D9.1BF169AC4D	73	JAH02304.NT2	3D9.1BF169A1C1	75	JAH02311.NT1	3D9.1BF168F290	81
JAH02291.NT1	3D9.1BF16964C1	93	JAH02304.NT2	3D9.1BF1394DBC	85	JAH02311.NT1	3D9.1BF168F6BB	79
JAH02291.NT1	3D9.1BF168BFA6	67	JAH02304.NT2	3D9.1BF13A3843	101	JAH02311.NT1	3D9.1BF168F806	90
JAH02291.NT1	3D9.1BF168EC80	87	JAH02304.NT2	3D9.1BF139A892	76	JAH02311.NT1	3D9.1BF168F828	76
JAH02291.NT1	3D9.1BF1680EEF	78	JAH02304.NT2	3D9.1BF13A4FCE	76	JAH02311.NT1	3D9.1BF168F8C3	90
JAH02291.NT1	3D9.1BF16902BD	70	JAH02304.NT2	3D9.1BF169A888	73	JAH02311.NT1	3D9.1BF1690332	102
JAH02291.NT1	3D9.1BF139A9A6	80	JAH02304.NT2	3D9.1BF1699B05	67	JAH02311.NT1	3D9.1BF16903A2	67
JAH02291.NT1	3D9.1BF13953A8	85	JAH02304.NT2	3D9.1BF1699C70	80	JAH02311.NT1	3D9.1BF1693667	67
JAH02291.NT1	3D9.1BF168150C	100	JAH02304.NT2	3D9.1BF169A2AE	93	JAH02311.NT1	3D9.1BF169385F	84
JAH02291.NT1	3D9.1BF13A0803	87	JAH02304.NT2	3D9.1BF1680CA5	68	JAH02311.NT1	3D9.1BF16938AD	79
JAH02291.NT1	3D9.1BF169C57E	72	JAH02304.NT2	3D9.1BF169B376	69	JAH02311.NT1	3D9.1BF1693FEF	90
JAH02291.NT1	3D9.1BF168BD7C	97	JAH02304.NT2	3D9.1BF16812BC	81	JAH02311.NT1	3D9.1BF16942AF	81
JAH02291.NT1	3D9.1BF16A0950	67	JAH02304.NT2	3D9.1BF13A07B9	79	JAH02311.NT1	3D9.1BF16992B6	84
JAH02291.NT1	3D9.1BF13A110F	78	JAH02304.NT2	3D9.1BF169D53B	79	JAH02311.NT1	3D9.1BF16A018E	69
JAH02291.NT1	3D9.1BF139A809	69	JAH02304.NT2	3D9.1BF13A2FF8	72	JAH02311.NT1	3D9.1BF16A0ADB	82
JAH02291.NT1	3D9.1BF169F62C	81	JAH02304.NT2	3D9.1BF1688DE1	76	JAH02311.NT1	3D9.1BF16A0EB3	105
JAH02295.NT1	3D9.1BF169A53C	82	JAH02304.NT2	3D9.1BF1695F7A	89	JAH02311.NT1	3D9.1BF139A55F	94
JAH02296.NT1	3D9.1BF13A6E06	96	JAH02304.NT2	3D9.1BF168B4A4	85	JAH02311.NT1	3D9.1BF13A17BB	80
JAH02296.NT1	3D9.1BF1681E16	113	JAH02304.NT2	3D9.1BF16959E0	84	JAH02311.NT1	3D9.1BF166FCAF	78
JAH02296.NT1	3D9.1BF13A51ED	97	JAH02304.NT2	3D9.1BF169E0DC	72	JAH02311.NT1	3D9.1BF167000B	95
JAH02296.NT1	3D9.1BF168C1FB	88	JAH02304.NT2	3D9.1BF16A0CA1	71	JAH02311.NT1	3D9.1BF1670425	87
JAH02296.NT1	3D9.1BF169EB8E	103	JAH02304.NT2	3D9.1BF139A368	74	JAH02311.NT1	3D9.1BF1677331	81
JAH02296.NT1	3D9.1BF168B9C7	106	JAH02304.NT2	3D9.1BF169EBC8	71	JAH02311.NT1	3D9.1BF1677C5C	79
JAH02296.NT1	3D9.1BF13A17F7	95	JAH02304.NT2	3D9.1BF13A17FC	106	JAH02311.NT1	3D9.1BF1677C81	74
JAH02296.NT1	3D9.1BF13A16A3	86	JAH02304.NT2	3D9.1BF16804D8	86	JAH02311.NT1	3D9.1BF16782E5	78
JAH02296.NT1	3D9.1BF169D6F3	85	JAH02304.NT2	3D9.1BF1681572	90	JAH02311.NT1	3D9.1BF1680EA8	70
JAH02296.NT1	3D9.1BF169F688	102	JAH02304.NT2	3D9.1BF1681B64	72	JAH02311.NT1	3D9.1BF1686FF7	90
JAH02296.NT1	3D9.1BF169E606	116	JAH02304.NT2	3D9.1BF16A11EB	68	JAH02311.NT1	3D9.1BF16884EE	83
JAH02296.NT1	3D9.1BF13A374B	92	JAH02304.NT2	3D9.1BF139EEA1	78	JAH02311.NT1	3D9.1BF16890D2	75
JAH02297.NT1	3D9.1BF13A2F86	59	JAH02304.NT2	3D9.1BF169EA8F	71	JAH02311.NT1	3D9.1BF168A4C9	73
JAH02297.NT1	3D9.1BF168DAD6	76	JAH02304.NT2	3D9.1BF13A1696	67	JAH02311.NT1	3D9.1BF168A501	70
JAH02297.NT1	3D9.1BF168F607	77	JAH02304.NT2	3D9.1BF13A540A	85	JAH02311.NT1	3D9.1BF16918E9	89
JAH02297.NT1	3D9.1BF167798D	97	JAH02304.NT2	3D9.1BF1699320	80	JAH02311.NT1	3D9.1BF1695F46	79
JAH02297.NT1	3D9.1BF169B137	72	JAH02304.NT2	3D9.1BF169FA82	85	JAH02311.NT1	3D9.1BF16A1C0F	85
JAH02297.NT1	3D9.1BF16A0096	77	JAH02304.NT2	3D9.1BF169FF66	68	JAH02311.NT1	3D9.1BF1394274	72
JAH02297.NT1	3D9.1BF139ECB4	80	JAH02304.NT2	3D9.1BF139A27C	79	JAH02311.NT1	3D9.1BF139432C	72
JAH02297.NT1	3D9.1BF1698505	74	JAH02304.NT2	3D9.1BF16A072E	82	JAH02311.NT1	3D9.1BF13A1702	78
JAH02297.NT1	3D9.1BF139A379	70	JAH02304.NT2	3D9.1BF16A0CD7	84	JAH02311.NT1	3D9.1BF1550F03	73
JAH02297.NT1	3D9.1BF16A09B9	86	JAH02304.NT2	3D9.1BF13A19D8	76	JAH02311.NT1	3D9.1BF166FEC5	84
JAH02297.NT1	3D9.1BF168A7C6	76	JAH02304.NT2	3D9.1BF13A25A4	79	JAH02311.NT1	3D9.1BF16702BF	85
JAH02297.NT1	3D9.1BF168C966	89	JAH02304.NT2	3D9.1BF169DB0C	72	JAH02311.NT1	3D9.1BF1670BAF	78
JAH02297.NT1	3D9.1BF13A1F69	79	JAH02304.NT2	3D9.1BF16A021D	91	JAH02311.NT1	3D9.1BF16710A3	86
JAH02297.NT1	3D9.1BF13A172F	94	JAH02304.NT2	3D9.1BF13A1BED	76	JAH02311.NT1	3D9.1BF1675C35	93
JAH02297.NT1	3D9.1BF13A18DA	89	JAH02304.NT2	3D9.1BF169E331	91	JAH02311.NT1	3D9.1BF1675EF3	72
JAH02297.NT1	3D9.1BF168BFAA	75	JAH02304.NT2	3D9.1BF169F694	96	JAH02311.NT1	3D9.1BF167626F	93
JAH02297.NT1	3D9.1BF1696D97	77	JAH02304.NT2	3D9.1BF169CB12	67	JAH02311.NT1	3D9.1BF16768BE	80
JAH02297.NT1	3D9.1BF169AAAF	84	JAH02304.NT2	3D9.1BF13A2616	87	JAH02311.NT1	3D9.1BF1676EC2	88
JAH02298.NT1	3D9.1BF13A6A6A	66	JAH02304.NT2	3D9.1BF16979C2	79	JAH02311.NT1	3D9.1BF1676F83	72
JAH02298.NT1	3D9.1BF13A509C	72	JAH02304.NT2	3D9.1BF16A15EB	88	JAH02311.NT1	3D9.1BF1676FA4	81
JAH02298.NT1	3D9.1BF168CB02	78	JAH02304.NT2	3D9.1BF139A45D	76	JAH02311.NT1	3D9.1BF16771F2	75
JAH02298.NT1	3D9.1BF13A6290	73	JAH02304.NT2	3D9.1BF169A83F	75	JAH02311.NT1	3D9.1BF16781B6	95
JAH02298.NT1	3D9.1BF1681AA5	74	JAH02304.NT2	3D9.1BF139E5DC	64	JAH02311.NT1	3D9.1BF1678405	76
JAH02298.NT1	3D9.1BF16A1BFC	75	JAH02304.NT2	3D9.1BF169D9E3	81	JAH02311.NT1	3D9.1BF167891E	85
JAH02298.NT1	3D9.1BF16988B3	93	JAH02304.NT2	3D9.1BF1689039	75	JAH02311.NT1	3D9.1BF1678CFA	94
JAH02298.NT1	3D9.1BF13A22B3	70	JAH02304.NT2	3D9.1BF169668B	78	JAH02311.NT1	3D9.1BF1678D5A	86
JAH02298.NT1	3D9.1BF1695E51	75	JAH02304.NT2	3D9.1BF139A939	81	JAH02311.NT1	3D9.1BF1678D7B	71
JAH02298.NT1	3D9.1BF1696F22	69	JAH02304.NT2	3D9.1BF13A52FA	80	JAH02311.NT1	3D9.1BF1678E63	83
JAH02298.NT1	3D9.1BF13A27F4	77	JAH02304.NT2	3D9.1BF1680ED0	96	JAH02311.NT1	3D9.1BF1678F37	72

Appendix B. Table B3 Continued.

File ID	Tag ID	Length	File ID	Tag ID	Length	File ID	Tag ID	Length
JAH02298.NT1	3D9.1BF16A1B89	81	JAH02304.NT2	3D9.1BF13948D6	80	JAH02311.NT1	3D9.1BF167912A	83
JAH02298.NT1	3D9.1BF16817B1	107	JAH02304.NT2	3D9.1BF139A575	90	JAH02311.NT1	3D9.1BF16843B8	79
JAH02298.NT1	3D9.1BF16A11E2	77	JAH02304.NT2	3D9.1BF139A5E5	84	JAH02311.NT1	3D9.1BF1686239	86
JAH02298.NT1	3D9.1BF16A154C	71	JAH02304.NT2	3D9.1BF13A0F6C	77	JAH02311.NT1	3D9.1BF1686E12	84
JAH02298.NT1	3D9.1BF1699955	94	JAH02304.NT2	3D9.1BF13A6895	96	JAH02311.NT1	3D9.1BF1686E30	93
JAH02298.NT1	3D9.1BF13A193F	90	JAH02304.NT2	3D9.1BF16811C8	80	JAH02311.NT1	3D9.1BF1688AED	78
JAH02298.NT1	3D9.1BF16900D9	73	JAH02304.NT2	3D9.1BF1681225	74	JAH02311.NT1	3D9.1BF1689265	83
JAH02298.NT1	3D9.1BF1394729	87	JAH02304.NT2	3D9.1BF1681330	74	JAH02311.NT1	3D9.1BF1689628	75
JAH02298.NT1	3D9.1BF16A0366	77	JAH02304.NT2	3D9.1BF1681B01	73	JAH02311.NT1	3D9.1BF16897F6	89
JAH02298.NT1	3D9.1BF16A0878	83	JAH02304.NT2	3D9.1BF16997CC	89	JAH02311.NT1	3D9.1BF168A258	94
JAH02298.NT1	3D9.1BF169EF94	71	JAH02304.NT2	3D9.1BF169C205	74	JAH02311.NT1	3D9.1BF168ACC9	78
JAH02298.NT1	3D9.1BF16A03C5	73	JAH02304.NT2	3D9.1BF169DDCB	82	JAH02311.NT1	3D9.1BF168AFC0	94
JAH02298.NT1	3D9.1BF1399F97	76	JAH02304.NT2	3D9.1BF169AD10	71	JAH02311.NT1	3D9.1BF168B293	76
JAH02298.NT1	3D9.1BF13A62C7	87	JAH02304.NT2	3D9.1BF1696D6E	86	JAH02311.NT1	3D9.1BF168DCE8	74
JAH02298.NT1	3D9.1BF169981A	85	JAH02304.NT2	3D9.1BF169EB8C	82	JAH02311.NT1	3D9.1BF168DDE7	79
JAH02298.NT1	3D9.1BF169A6A0	74	JAH02304.NT2	3D9.1BF1399EC0	79	JAH02311.NT1	3D9.1BF168E5D9	100
JAH02298.NT1	3D9.1BF139A509	94	JAH02304.NT2	3D9.1BF139A0B0	81	JAH02311.NT1	3D9.1BF168EEBD	83
JAH02298.NT1	3D9.1BF168E6BB	75	JAH02304.NT2	3D9.1BF139A1EA	69	JAH02311.NT1	3D9.1BF16903AB	87
JAH02298.NT1	3D9.1BF1699EA6	73	JAH02304.NT2	3D9.1BF139A6DF	83	JAH02311.NT1	3D9.1BF16905AF	88
JAH02298.NT1	3D9.1BF169D89C	86	JAH02304.NT2	3D9.1BF13A1C4D	87	JAH02311.NT1	3D9.1BF1690C1F	74
JAH02298.NT1	3D9.1BF1681274	81	JAH02304.NT2	3D9.1BF13A2375	80	JAH02311.NT1	3D9.1BF1690DE5	81
JAH02298.NT1	3D9.1BF16A1274	84	JAH02304.NT2	3D9.1BF13A273D	77	JAH02311.NT1	3D9.1BF169123A	83
JAH02298.NT1	3D9.1BF139A9F0	74	JAH02304.NT2	3D9.1BF13A2736	85	JAH02311.NT1	3D9.1BF169129E	73
JAH02298.NT1	3D9.1BF1699E0C	76	JAH02304.NT2	3D9.1BF13A2CF6	82	JAH02311.NT1	3D9.1BF1691500	71
JAH02298.NT1	3D9.1BF168B684	92	JAH02304.NT2	3D9.1BF13A2EDC	82	JAH02311.NT1	3D9.1BF1691628	73
JAH02298.NT1	3D9.1BF168B522	83	JAH02304.NT2	3D9.1BF13A4C7A	69	JAH02311.NT1	3D9.1BF1691716	87
JAH02298.NT1	3D9.1BF16A13CF	66	JAH02304.NT2	3D9.1BF13A51CD	71	JAH02311.NT1	3D9.1BF169183E	87
JAH02298.NT1	3D9.1BF16A0E35	83	JAH02304.NT2	3D9.1BF1697A22	82	JAH02311.NT1	3D9.1BF1691B2C	97
JAH02298.NT1	3D9.1BF16A1097	84	JAH02304.NT2	3D9.1BF1699E6F	73	JAH02311.NT1	3D9.1BF1691C79	77
JAH02298.NT1	3D9.1BF13A163D	90	JAH02304.NT2	3D9.1BF169A67E	86	JAH02311.NT1	3D9.1BF169254C	81
JAH02298.NT1	3D9.1BF13A6CC8	93	JAH02304.NT2	3D9.1BF169AB5A	81	JAH02311.NT1	3D9.1BF1692A19	109
JAH02298.NT1	3D9.1BF13A3B66	79	JAH02304.NT2	3D9.1BF169CD29	77	JAH02311.NT1	3D9.1BF16931F8	79
JAH02298.NT1	3D9.1BF16A078B	76	JAH02304.NT2	3D9.1BF169F169	76	JAH02311.NT1	3D9.1BF1693424	73
JAH02298.NT1	3D9.1BF139EE99	82	JAH02304.NT2	3D9.1BF16A03D7	80	JAH02311.NT1	3D9.1BF16939FB	89
JAH02298.NT1	3D9.1BF13A16AE	80	JAH02304.NT2	3D9.1BF16A09E3	80	JAH02311.NT1	3D9.1BF1693D20	87
JAH02298.NT1	3D9.1BF169FAAB	70	JAH02304.NT2	3D9.1BF16A0FA4	93	JAH02311.NT1	3D9.1BF16942DE	76
JAH02298.NT1	3D9.1BF16A0F55	79	JAH02304.NT2	3D9.1BF16A1178	79	JAH02311.NT1	3D9.1BF16943E0	73
JAH02298.NT1	3D9.1BF1681638	73	JAH02304.NT2	3D9.1BF16A1B79	84	JAH02311.NT1	3D9.1BF1694455	79
JAH02298.NT1	3D9.1BF139A7D9	77	JAH02304.NT2	3D9.1BF13A18A3	76	JAH02311.NT1	3D9.1BF169617F	73
JAH02298.NT1	3D9.1BF13A258B	86	JAH02304.NT2	3D9.1BF13A2B40	76	JAH02311.NT1	3D9.1BF1699317	70
JAH02298.NT1	3D9.1BF1394A4C	75	JAH02304.NT2	3D9.1BF169953B	91	JAH02311.NT1	3D9.1BF169DFF6	75
JAH02298.NT1	3D9.1BF169A485	0	JAH02304.NT2	3D9.1BF16A10A7	73	JAH02311.NT1	3D9.1BF169FF70	82
JAH02298.NT1	3D9.1BF169FE5D	94	JAH02304.NT2	3D9.1BF16A171E	85	JAH02311.NT1	3D9.1BF16A1174	92
JAH02298.NT1	3D9.1BF1681C4A	85	JAH02304.NT2	3D9.1BF13A1A53	68	JAH02311.NT1	3D9.1BF16A1860	94
JAH02298.NT1	3D9.1BF139A40E	73	JAH02304.NT2	3D9.1BF13A6E15	84	JAH02312.NT1	3D9.1BF13A6A5D	74
JAH02298.NT1	3D9.1BF13A1203	81	JAH02304.NT2	3D9.1BF1681509	86	JAH02312.NT1	3D9.1BF1698ECC	79
JAH02298.NT1	3D9.1BF1680C2D	82	JAH02304.NT2	3D9.1BF1681AB8	86	JAH02312.NT1	3D9.1BF168C2C2	74
JAH02298.NT1	3D9.1BF13A530C	74	JAH02304.NT2	3D9.1BF16A050D	78	JAH02312.NT1	3D9.1BF1694F02	78
JAH02298.NT1	3D9.1BF1680ECA	84	JAH02304.NT2	3D9.1BF16A058E	77	JAH02312.NT1	3D9.1BF16966F1	87
JAH02298.NT1	3D9.1BF13999C5	85	JAH02304.NT2	3D9.1BF1399FAA	78	JAH02312.NT1	3D9.1BF1690D50	73
JAH02298.NT1	3D9.1BF139A663	81	JAH02304.NT2	3D9.1BF139E799	73	JAH02312.NT1	3D9.1BF1695907	79
JAH02298.NT1	3D9.1BF13A1720	86	JAH02304.NT2	3D9.1BF13A1953	79	JAH02312.NT1	3D9.1BF169618E	90
JAH02298.NT1	3D9.1BF13A686D	96	JAH02304.NT2	3D9.1BF13A1DAB	71	JAH02312.NT1	3D9.1BF16775CB	77
JAH02298.NT1	3D9.1BF168113C	95	JAH02304.NT2	3D9.1BF13A2408	84	JAH02312.NT1	3D9.1BF168C649	75
JAH02298.NT1	3D9.1BF168139A	82	JAH02304.NT2	3D9.1BF13A25D2	65	JAH02312.NT1	3D9.1BF169678E	75
JAH02298.NT1	3D9.1BF16814CC	93	JAH02304.NT2	3D9.1BF13A4138	71	JAH02312.NT1	3D9.1BF13A26B7	90
JAH02298.NT1	3D9.1BF1681AF3	72	JAH02304.NT2	3D9.1BF13A690F	84	JAH02312.NT1	3D9.1BF168EDC8	87
JAH02298.NT1	3D9.1BF169717E	100	JAH02304.NT2	3D9.1BF13A743E	82	JAH02312.NT1	3D9.1BF169516F	98
JAH02298.NT1	3D9.1BF16997C2	78	JAH02304.NT2	3D9.1BF156AA92	89	JAH02312.NT1	3D9.1BF16954FA	80
JAH02298.NT1	3D9.1BF169C216	77	JAH02304.NT2	3D9.1BF156AC16	63	JAH02312.NT1	3D9.1BF168AED0	84
JAH02298.NT1	3D9.1BF169DDBB	73	JAH02304.NT2	3D9.1BF1681456	75	JAH02312.NT1	3D9.1BF168F7B0	91

Appendix B. Table B3 Continued.

File ID	Tag ID	Length	File ID	Tag ID	Length	File ID	Tag ID	Length
JAH02298.NT1	3D9.1BF16A1509	68	JAH02304.NT2	3D9.1BF16817B7	87	JAH02312.NT1	3D9.1BF1683D96	70
JAH02302.NT1	3D9.1BF13A308C	70	JAH02304.NT2	3D9.1BF16817C1	80	JAH02312.NT1	3D9.1BF168AE20	113
JAH02302.NT1	3D9.1BF1681D9A	86	JAH02304.NT2	3D9.1BF1695C32	70	JAH02312.NT1	3D9.1BF1399FB4	87
JAH02302.NT1	3D9.1BF13A4DBB	90	JAH02304.NT2	3D9.1BF1697371	93	JAH02312.NT1	3D9.1BF16973E4	71
JAH02302.NT1	3D9.1BF169A541	88	JAH02304.NT2	3D9.1BF169A4F2	86	JAH02312.NT1	3D9.1BF169E4D4	74
JAH02302.NT1	3D9.1BF13A3C1F	109	JAH02304.NT2	3D9.1BF169A531	79	JAH02312.NT1	3D9.1BF1679381	85
JAH02302.NT1	3D9.1BF13953B9	84	JAH02304.NT2	3D9.1BF169CB21	74	JAH02312.NT1	3D9.1BF1697039	74
JAH02302.NT1	3D9.1BF1680555	89	JAH02304.NT2	3D9.1BF169DCAD	73	JAH02312.NT1	3D9.1BF169FAC0	83
JAH02302.NT1	3D9.1BF16998A4	109	JAH02304.NT2	3D9.1BF169DD95	88	JAH02312.NT1	3D9.1BF16947A6	70
JAH02302.NT1	3D9.1BF139A4F1	71	JAH02304.NT2	3D9.1BF169EC50	76	JAH02312.NT1	3D9.1BF13A398F	76
JAH02302.NT1	3D9.1BF1699AF5	84	JAH02304.NT2	3D9.1BF169F830	80	JAH02312.NT1	3D9.1BF13A43A1	85
JAH02302.NT1	3D9.1BF13A561C	101	JAH02304.NT2	3D9.1BF16A0068	95	JAH02312.NT1	3D9.1BF13944C2	76
JAH02302.NT1	3D9.1BF168CD59	98	JAH02304.NT2	3D9.1BF16A0462	90	JAH02312.NT1	3D9.1BF1696DF6	94
JAH02302.NT1	3D9.1BF169C161	92	JAH02304.NT2	3D9.1BF16A0BEF	88	JAH02312.NT1	3D9.1BF168B9DD	82
JAH02302.NT1	3D9.1BF1397CE5	78	JAH02304.NT2	3D9.1BF16A14FA	76	JAH02312.NT1	3D9.1BF168B484	73
JAH02302.NT1	3D9.1BF139EE1B	88	JAH02304.NT2	3D9.1BF16A1980	77	JAH02312.NT1	3D9.1BF169A5B1	76
JAH02302.NT1	3D9.1BF16952D1	84	JAH02305.NT1	3D9.1BF139E635	80	JAH02312.NT1	3D9.1BF168E16D	74
JAH02302.NT1	3D9.1BF13A15A0	81	JAH02305.NT1	3D9.1BF1698EB7	74	JAH02312.NT1	3D9.1BF169442A	76
JAH02302.NT1	3D9.1BF169645F	89	JAH02305.NT1	3D9.1BF168C7AB	78	JAH02312.NT1	3D9.1BF1678F5C	83
JAH02302.NT1	3D9.1BF16A11EE	82	JAH02305.NT1	3D9.1BF168D467	74	JAH02312.NT1	3D9.1BF13A158D	83
JAH02302.NT1	3D9.1BF169A8EC	97	JAH02305.NT1	3D9.1BF13A26B1	105	JAH02312.NT1	3D9.1BF1399CD9	82
JAH02302.NT1	3D9.1BF169BF19	97	JAH02305.NT1	3D9.1BF139E2AF	82	JAH02312.NT1	3D9.1BF168C45D	84
JAH02302.NT1	3D9.1BF139A817	91	JAH02305.NT1	3D9.1BF139EF26	84	JAH02312.NT1	3D9.1BF16A165A	74
JAH02302.NT1	3D9.1BF168DFCC	88	JAH02305.NT1	3D9.1BF1699C67	69	JAH02312.NT1	3D9.1BF13A29CC	79
JAH02302.NT1	3D9.1BF169D297	88	JAH02305.NT1	3D9.1BF169D858	70	JAH02312.NT1	3D9.1BF169D709	72
JAH02302.NT1	3D9.1BF1394204	99	JAH02305.NT1	3D9.1BF1694BCF	74	JAH02312.NT1	3D9.1BF168C88A	65
JAH02302.NT1	3D9.1BF13A1200	99	JAH02305.NT1	3D9.1BF169A5C7	78	JAH02312.NT1	3D9.1BF139A25A	75
JAH02302.NT1	3D9.1BF1680C33	91	JAH02305.NT1	3D9.1BF13A38E4	91	JAH02312.NT1	3D9.1BF168F3DA	83
JAH02302.NT1	3D9.1BF1680ECE	85	JAH02305.NT1	3D9.1BF168AC44	82	JAH02312.NT1	3D9.1BF168EAA8	80
JAH02302.NT1	3D9.1BF13A6903	91	JAH02305.NT1	3D9.1BF16A04D5	71	JAH02312.NT1	3D9.1BF168EB5F	81
JAH02302.NT1	3D9.1BF168141D	88	JAH02305.NT1	3D9.1BF13A3F99	83	JAH02312.NT1	3D9.1BF1394A20	74
JAH02302.NT1	3D9.1BF16A1313	90	JAH02305.NT1	3D9.1BF169E1B4	98	JAH02312.NT1	3D9.1BF1679AE0	76
JAH02302.NT1	3D9.1BF169ACFC	74	JAH02305.NT1	3D9.1BF169DB4A	88	JAH02312.NT1	3D9.1BF168F273	84
JAH02302.NT1	3D9.1BF13A2871	85	JAH02305.NT1	3D9.1BF169E30D	78	JAH02312.NT1	3D9.1BF169ADD9	77
JAH02302.NT1	3D9.1BF139AA00	85	JAH02305.NT1	3D9.1BF1681C30	83	JAH02312.NT1	3D9.1BF139FAA8	82
JAH02302.NT1	3D9.1BF13A1C98	90	JAH02305.NT1	3D9.1BF169D947	84	JAH02312.NT1	3D9.1BF16A1637	81
JAH02302.NT1	3D9.1BF1697A18	77	JAH02305.NT1	3D9.1BF13A1F1A	93	JAH02312.NT1	3D9.1BF169E64C	95
JAH02302.NT1	3D9.1BF169C7DF	85	JAH02305.NT1	3D9.1BF169C41A	89	JAH02312.NT1	3D9.1BF1680BED	93
JAH02302.NT1	3D9.1BF16A06E3	91	JAH02305.NT1	3D9.1BF13A170A	69	JAH02312.NT1	3D9.1BF1684297	83
JAH02302.NT1	3D9.1BF16A0F44	94	JAH02305.NT1	3D9.1BF156A98A	80	JAH02312.NT1	3D9.1BF1691804	83
JAH02302.NT1	3D9.1BF13A1EC6	90	JAH02305.NT1	3D9.1BF13A368F	69	JAH02312.NT1	3D9.1BF13A3DCA	93
JAH02302.NT1	3D9.1BF168E0DE	110	JAH02305.NT1	3D9.1BF169EB6C	76	JAH02312.NT1	3D9.1BF1680EE5	85
JAH02302.NT1	3D9.1BF1690526	94	JAH02305.NT1	3D9.1BF139A973	78	JAH02312.NT1	3D9.1BF1399995	85
JAH02302.NT1	3D9.1BF16A107D	84	JAH02305.NT1	3D9.1BF13A23A8	71	JAH02312.NT1	3D9.1BF13A1728	71
JAH02302.NT1	3D9.1BF139A7B3	110	JAH02305.NT1	3D9.1BF13A4F44	71	JAH02312.NT1	3D9.1BF169AC4E	93
JAH02302.NT1	3D9.1BF13A2A68	87	JAH02305.NT1	3D9.1BF169998B	76	JAH02312.NT1	3D9.1BF169F7F0	81
JAH02302.NT1	3D9.1BF1681A7C	103	JAH02305.NT1	3D9.1BF169CD30	77	JAH02312.NT1	3D9.1BF168DCD5	72
JAH02302.NT1	3D9.1BF1699AC8	71	JAH02305.NT1	3D9.1BF169F159	92	JAH02312.NT1	3D9.1BF169ACAD	77
JAH02302.NT1	3D9.1BF16A147C	93	JAH02305.NT1	3D9.1BF16A10FA	68	JAH02312.NT1	3D9.1BF13994D9	74
JAH02303.NT1	3D9.1BF1398C25	98	JAH02305.NT1	3D9.1BF16A13D5	62	JAH02312.NT1	3D9.1BF168BAA8	83
JAH02303.NT1	3D9.1BF16949E4	81	JAH02305.NT1	3D9.1BF13A189A	81	JAH02312.NT1	3D9.1BF168DC0A	82
JAH02303.NT1	3D9.1BF1690CE4	78	JAH02305.NT1	3D9.1BF1699545	80	JAH02312.NT1	3D9.1BF168EECB	98
JAH02303.NT1	3D9.1BF169579F	79	JAH02305.NT1	3D9.1BF13A6E17	73	JAH02312.NT1	3D9.1BF1394423	82
JAH02303.NT1	3D9.1BF169A37A	73	JAH02305.NT1	3D9.1BF169982E	86	JAH02312.NT1	3D9.1BF1394B8D	75
JAH02303.NT1	3D9.1BF168D212	70	JAH02305.NT1	3D9.1BF139A529	85	JAH02312.NT1	3D9.1BF139A0B9	88
JAH02303.NT1	3D9.1BF168B317	74	JAH02305.NT1	3D9.1BF139E751	88	JAH02312.NT1	3D9.1BF139E40E	81
JAH02303.NT1	3D9.1BF139E79D	73	JAH02305.NT1	3D9.1BF13A20A4	77	JAH02312.NT1	3D9.1BF13A2113	81
JAH02303.NT1	3D9.1BF168E9FD	88	JAH02305.NT1	3D9.1BF13A24F6	76	JAH02312.NT1	3D9.1BF13A51A5	69
JAH02303.NT1	3D9.1BF168AA28	82	JAH02305.NT1	3D9.1BF13A743D	96	JAH02312.NT1	3D9.1BF167717C	93
JAH02303.NT1	3D9.1BF168AF3C	76	JAH02305.NT1	3D9.1BF16814A2	93	JAH02312.NT1	3D9.1BF168D3DB	93
JAH02303.NT1	3D9.1BF168944B	86	JAH02305.NT1	3D9.1BF168B10F	66	JAH02312.NT1	3D9.1BF168DDEF	88

Appendix B. Table B3 Continued.

File ID	Tag ID	Length	File ID	Tag ID	Length	File ID	Tag ID	Length
JAH02303.NT1	3D9.1BF1678D07	73	JAH02305.NT1	3D9.1BF1699F72	77	JAH02312.NT1	3D9.1BF168DE5C	84
JAH02303.NT1	3D9.1BF169047C	66	JAH02305.NT1	3D9.1BF169DD4D	73	JAH02312.NT1	3D9.1BF168F148	100
JAH02303.NT1	3D9.1BF168FD62	79	JAH02305.NT1	3D9.1BF16A041C	74	JAH02312.NT1	3D9.1BF168FC48	83
JAH02303.NT1	3D9.1BF16990D8	84	JAH02305.NT1	3D9.1BF1398797	94	JAH02312.NT1	3D9.1BF169009A	78
JAH02303.NT1	3D9.1BF1690B4B	78	JAH02305.NT1	3D9.1BF139A81C	69	JAH02312.NT1	3D9.1BF1697913	80
JAH02303.NT1	3D9.1BF13A178C	72	JAH02305.NT1	3D9.1BF13A1809	70	JAH02312.NT1	3D9.1BF1699E35	74
JAH02303.NT1	3D9.1BF1679624	101	JAH02305.NT1	3D9.1BF13A4121	77	JAH02312.NT1	3D9.1BF169F12D	79
JAH02303.NT1	3D9.1BF168D6F9	82	JAH02305.NT1	3D9.1BF168124D	73	JAH02312.NT1	3D9.1BF16A05EF	80
JAH02303.NT1	3D9.1BF168F838	73	JAH02305.NT1	3D9.1BF169A75E	85	JAH02312.NT1	3D9.1BF16A08B6	78
JAH02303.NT1	3D9.1BF168FAF6	77	JAH02305.NT1	3D9.1BF169DF52	85	JAH02312.NT1	3D9.1BF16A0A05	80
JAH02303.NT1	3D9.1BF1683D84	81	JAH02305.NT1	3D9.1BF139A1F6	63	JAH02312.NT1	3D9.1BF16A0F31	89
JAH02303.NT1	3D9.1BF16796AB	76	JAH02305.NT1	3D9.1BF13A1E2B	84	JAH02312.NT1	3D9.1BF16A1001	81
JAH02303.NT1	3D9.1BF168A93F	69	JAH02305.NT1	3D9.1BF13A2F24	83	JAH02312.NT1	3D9.1BF16A1361	74
JAH02303.NT1	3D9.1BF16995C4	92	JAH02305.NT1	3D9.1BF13A4007	72	JAH02312.NT1	3D9.1BF16A19A9	72
JAH02303.NT1	3D9.1BF168FE57	73	JAH02305.NT1	3D9.1BF16804E1	92	JAH02312.NT1	3D9.1BF16A1B94	73
JAH02303.NT1	3D9.1BF13949D6	80	JAH02305.NT1	3D9.1BF16976C3	79	JAH02312.NT1	3D9.1BF1679573	71
JAH02303.NT1	3D9.1BF16A045D	78	JAH02305.NT1	3D9.1BF169AA49	73	JAH02312.NT1	3D9.1BF1679694	93
JAH02303.NT1	3D9.1BF1394075	71	JAH02305.NT1	3D9.1BF169E773	75	JAH02312.NT1	3D9.1BF1679796	82
JAH02303.NT1	3D9.1BF139A8B7	81	JAH02305.NT1	3D9.1BF16A10AE	84	JAH02312.NT1	3D9.1BF1679844	79
JAH02303.NT1	3D9.1BF1699748	88	JAH02309.NT1	3D9.1BF169D312	100	JAH02312.NT1	3D9.1BF168A999	94
JAH02303.NT1	3D9.1BF168EF6A	83	JAH02309.NT1	3D9.1BF1681E0B	97	JAH02312.NT1	3D9.1BF168AD63	84
JAH02303.NT1	3D9.1BF1690EF2	79	JAH02309.NT1	3D9.1BF16951EC	99	JAH02312.NT1	3D9.1BF168AF20	83
JAH02303.NT1	3D9.1BF16974F7	91	JAH02309.NT1	3D9.1BF1695D6D	99	JAH02312.NT1	3D9.1BF168AFB5	83
JAH02303.NT1	3D9.1BF16953E2	102	JAH02309.NT1	3D9.1BF1694FA9	89	JAH02312.NT1	3D9.1BF168BD94	86
JAH02303.NT1	3D9.1BF16A12C2	83	JAH02309.NT1	3D9.1BF1685396	86	JAH02312.NT1	3D9.1BF168CFA8	73
JAH02303.NT1	3D9.1BF13944D9	91	JAH02309.NT1	3D9.1BF1680F09	81	JAH02312.NT1	3D9.1BF168D769	81
JAH02303.NT1	3D9.1BF1696CB9	84	JAH02309.NT1	3D9.1BF1699B82	79	JAH02312.NT1	3D9.1BF168E06E	84
JAH02303.NT1	3D9.1BF168B9F3	89	JAH02309.NT1	3D9.1BF169E2FB	105	JAH02312.NT1	3D9.1BF168E607	77
JAH02303.NT1	3D9.1BF1697436	84	JAH02309.NT1	3D9.1BF168C0C4	98	JAH02312.NT1	3D9.1BF168E7CC	73
JAH02303.NT1	3D9.1BF16942CB	73	JAH02309.NT1	3D9.1BF16955AA	89	JAH02312.NT1	3D9.1BF168E8F5	85
JAH02303.NT1	3D9.1BF168BCD2	90	JAH02309.NT1	3D9.1BF168B7E1	88	JAH02312.NT1	3D9.1BF168ED71	72
JAH02303.NT1	3D9.1BF168E50E	64	JAH02309.NT1	3D9.1BF13A3B7E	74	JAH02312.NT1	3D9.1BF168F0F2	78
JAH02303.NT1	3D9.1BF1679A26	69	JAH02309.NT1	3D9.1BF168C742	74	JAH02312.NT1	3D9.1BF168F5F8	94
JAH02303.NT1	3D9.1BF168E19D	76	JAH02309.NT1	3D9.1BF1681641	77	JAH02312.NT1	3D9.1BF168F613	99
JAH02303.NT1	3D9.1BF168E232	77	JAH02309.NT1	3D9.1BF139E1CD	112	JAH02312.NT1	3D9.1BF168FABE	73
JAH02303.NT1	3D9.1BF1690150	70	JAH02309.NT1	3D9.1BF13A3A7D	99	JAH02312.NT1	3D9.1BF1690363	74
JAH02303.NT1	3D9.1BF1676CA5	84	JAH02309.NT1	3D9.1BF139F38B	88	JAH02312.NT1	3D9.1BF16903A4	101
JAH02303.NT1	3D9.1BF16A01D6	87	JAH02309.NT1	3D9.1BF169091D	74	JAH02312.NT1	3D9.1BF169060E	88
JAH02303.NT1	3D9.1BF13A15AA	93	JAH02309.NT1	3D9.1BF13A0F4B	72	JAH02312.NT1	3D9.1BF1690635	91
JAH02303.NT1	3D9.1BF139A2F3	83	JAH02309.NT1	3D9.1BF13A6878	86	JAH02312.NT1	3D9.1BF16907AD	77
JAH02303.NT1	3D9.1BF16A18C0	70	JAH02309.NT1	3D9.1BF1681AD8	97	JAH02312.NT1	3D9.1BF16909C4	87
JAH02303.NT1	3D9.1BF1394643	94	JAH02309.NT1	3D9.1BF13A36A5	73	JAH02312.NT1	3D9.1BF1690A8F	77
JAH02303.NT1	3D9.1BF13A182B	70	JAH02309.NT1	3D9.1BF13A2884	74	JAH02312.NT1	3D9.1BF1690B00	75
JAH02303.NT1	3D9.1BF169FE16	83	JAH02309.NT1	3D9.1BF13A07D1	71	JAH02312.NT1	3D9.1BF169108C	87
JAH02303.NT1	3D9.1BF16A1660	82	JAH02309.NT1	3D9.1BF13A2ACA	94	JAH02312.NT1	3D9.1BF169115C	80
JAH02303.NT1	3D9.1BF16A0AB0	75	JAH02309.NT1	3D9.1BF13A403F	83	JAH02312.NT1	3D9.1BF16961F3	77
JAH02303.NT1	3D9.1BF168A7BE	70	JAH02309.NT1	3D9.1BF169A5FF	84	JAH02312.NT1	3D9.1BF1697875	84
JAH02303.NT1	3D9.1BF139A26C	87	JAH02309.NT1	3D9.1BF16A06F1	84	JAH02312.NT1	3D9.1BF16A0640	83
JAH02303.NT1	3D9.1BF16A072F	78	JAH02309.NT1	3D9.1BF16A10CC	104	JAH02312.NT1	3D9.1BF1394168	99
JAH02303.NT1	3D9.1BF168F472	97	JAH02309.NT1	3D9.1BF139A767	74	JAH02312.NT1	3D9.1BF168D97A	85
JAH02303.NT1	3D9.1BF13A198D	93	JAH02309.NT1	3D9.1BF1699814	70	JAH02312.NT1	3D9.1BF1699819	85
JAH02303.NT1	3D9.1BF168D826	94	JAH02309.NT1	3D9.1BF16A1A5C	72	JAH02312.NT1	3D9.1BF1399F13	78
JAH02303.NT1	3D9.1BF1690FEE	73	JAH02309.NT1	3D9.1BF13A1530	96	JAH02312.NT1	3D9.1BF16814A0	79
JAH02303.NT1	3D9.1BF16A0246	85	JAH02309.NT1	3D9.1BF13A208B	83	JAH02312.NT1	3D9.1BF16996E3	81
JAH02303.NT1	3D9.1BF16A182D	74	JAH02309.NT1	3D9.1BF13A40A6	69	JAH02312.NT1	3D9.1BF169F823	79
JAH02303.NT1	3D9.1BF1679332	94	JAH02309.NT1	3D9.1BF13A6943	112	JAH02312.NT1	3D9.1BF16A044C	76
JAH02303.NT1	3D9.1BF169AE39	103	JAH02309.NT1	3D9.1BF1680560	92	JAH02312.NT1	3D9.1BF16A0BCC	72
JAH02303.NT1	3D9.1BF169E7CC	72	JAH02309.NT1	3D9.1BF16817B8	84	JAH02312.NT1	3D9.1BF16A1486	86
JAH02303.NT1	3D9.1BF139A3F7	66	JAH02309.NT1	3D9.1BF169A4EC	75	JAH02312.NT1	3D9.1BF1394910	87
JAH02303.NT1	3D9.1BF1394216	95	JAH02309.NT1	3D9.1BF16A0083	86	JAH02312.NT1	3D9.1BF1399F75	85
JAH02303.NT1	3D9.1BF1672078	84	JAH02309.NT1	3D9.1BF16A14E9	107	JAH02312.NT1	3D9.1BF139A446	78

Appendix B. Table B3 Continued.

File ID	Tag ID	Length	File ID	Tag ID	Length	File ID	Tag ID	Length
JAH02303.NT1	3D9.1BF1694349	82	JAH02309.NT1	3D9.1BF139A430	78	JAH02312.NT1	3D9.1BF13A16EE	77
JAH02303.NT1	3D9.1BF1697B37	89	JAH02309.NT1	3D9.1BF139A862	95	JAH02312.NT1	3D9.1BF13A3069	89
JAH02303.NT1	3D9.1BF13A1722	96	JAH02309.NT1	3D9.1BF13A2FB7	97	JAH02312.NT1	3D9.1BF169774B	75
JAH02303.NT1	3D9.1BF1681211	80	JAH02309.NT1	3D9.1BF13A5386	96	JAH02312.NT1	3D9.1BF169A190	85
JAH02303.NT1	3D9.1BF16997CD	79	JAH02309.NT1	3D9.1BF1681B65	84	JAH02312.NT1	3D9.1BF169AF48	78
JAH02303.NT1	3D9.1BF16A132C	71	JAH02309.NT1	3D9.1BF169A1CA	92	JAH02312.NT1	3D9.1BF169FFB2	73
JAH02303.NT1	3D9.1BF168DDA3	79	JAH02309.NT1	3D9.1BF169A85F	78	JAH02312.NT1	3D9.1BF16A017C	78
JAH02303.NT1	3D9.1BF13A194D	72	JAH02309.NT1	3D9.1BF16A0D50	80	JAH02312.NT1	3D9.1BF16A02B4	73
JAH02303.NT1	3D9.1BF16977A9	96	JAH02309.NT1	3D9.1BF13A1F35	81	JAH02312.NT1	3D9.1BF16A07F7	93
JAH02303.NT1	3D9.1BF1399EDF	81	JAH02309.NT1	3D9.1BF13A3F6F	100	JAH02312.NT1	3D9.1BF16A0D25	75
JAH02303.NT1	3D9.1BF1399F56	74	JAH02309.NT1	3D9.1BF168127F	101	JAH02312.NT1	3D9.1BF139A1CC	81
JAH02303.NT1	3D9.1BF139A05A	77	JAH02309.NT1	3D9.1BF169AA27	87	JAH02312.NT1	3D9.1BF13A2F10	80
JAH02303.NT1	3D9.1BF139A970	75	JAH02309.NT1	3D9.1BF139A5D9	91	JAH02312.NT1	3D9.1BF13A3910	74
JAH02303.NT1	3D9.1BF139A9E4	94	JAH02309.NT1	3D9.1BF13A237A	99	JAH02312.NT1	3D9.1BF16804BB	78
JAH02303.NT1	3D9.1BF168A7EF	94	JAH02309.NT1	3D9.1BF16811B7	87	JAH02312.NT1	3D9.1BF1699650	94
JAH02303.NT1	3D9.1BF168A829	75	JAH02309.NT1	3D9.1BF1699C60	75	JAH02312.NT1	3D9.1BF169A9FB	79
JAH02303.NT1	3D9.1BF168D9F5	64	JAH02309.NT1	3D9.1BF169EB5B	81	JAH02312.NT1	3D9.1BF16A02F4	77
JAH02303.NT1	3D9.1BF168DE79	89	JAH02309.NT1	3D9.1BF16A0F4D	72	JAH02312.NT1	3D9.1BF16A18B8	88
JAH02303.NT1	3D9.1BF168F2C0	76	JAH02309.NT1	3D9.1BF139E7A3	84	JAH02312.NT1	3D9.1BF1394CC3	80
JAH02303.NT1	3D9.1BF168F35D	90	JAH02309.NT1	3D9.1BF13A1C60	74	JAH02312.NT1	3D9.1BF139A0DB	70
JAH02303.NT1	3D9.1BF168F686	79	JAH02309.NT1	3D9.1BF13A22BB	96	JAH02312.NT1	3D9.1BF139A630	76
JAH02303.NT1	3D9.1BF16900DF	81	JAH02309.NT1	3D9.1BF13A39AA	105	JAH02312.NT1	3D9.1BF13A195F	77
JAH02303.NT1	3D9.1BF1697962	67	JAH02309.NT1	3D9.1BF1699D39	76	JAH02312.NT1	3D9.1BF16769D5	89
JAH02303.NT1	3D9.1BF169A619	74	JAH02309.NT1	3D9.1BF16A162E	79	JAH02312.NT1	3D9.1BF1679291	84
JAH02303.NT1	3D9.1BF169E96C	86	JAH02309.NT1	3D9.1BF13A1759	71	JAH02312.NT1	3D9.1BF16799B9	91
JAH02303.NT1	3D9.1BF16A02D7	71	JAH02309.NT1	3D9.1BF16944A3	94	JAH02312.NT1	3D9.1BF16811CB	79
JAH02303.NT1	3D9.1BF16A03AA	90	JAH02309.NT1	3D9.1BF169E0BF	96	JAH02312.NT1	3D9.1BF168BF06	106
JAH02303.NT1	3D9.1BF16A0874	72	JAH02309.NT1	3D9.1BF169FF5B	89	JAH02312.NT1	3D9.1BF168BF22	81
JAH02303.NT1	3D9.1BF16A0F3D	104	JAH02309.NT1	3D9.1BF16A1272	87	JAH02312.NT1	3D9.1BF168CF6C	96
JAH02303.NT1	3D9.1BF16A10F3	80	JAH02309.NT1	3D9.1BF139999B	69	JAH02312.NT1	3D9.1BF168E0D5	72
JAH02303.NT1	3D9.1BF16A138D	76	JAH02309.NT1	3D9.1BF13A15DB	85	JAH02312.NT1	3D9.1BF168E1D3	85
JAH02303.NT1	3D9.1BF16A1A6D	87	JAH02309.NT1	3D9.1BF13A16D0	82	JAH02312.NT1	3D9.1BF168E233	85
JAH02303.NT1	3D9.1BF13A2B45	74	JAH02309.NT1	3D9.1BF13A1862	108	JAH02312.NT1	3D9.1BF168EB75	88
JAH02303.NT1	3D9.1BF1679648	87	JAH02309.NT1	3D9.1BF13A29E5	83	JAH02312.NT1	3D9.1BF168F37A	69
JAH02303.NT1	3D9.1BF1679847	81	JAH02309.NT1	3D9.1BF1679D07	80	JAH02312.NT1	3D9.1BF168F7B6	81
JAH02303.NT1	3D9.1BF167998F	80	JAH02309.NT1	3D9.1BF1680CAE	81	JAH02312.NT1	3D9.1BF168F836	96
JAH02303.NT1	3D9.1BF168AD24	73	JAH02309.NT1	3D9.1BF16955D1	76	JAH02312.NT1	3D9.1BF16901C6	82
JAH02303.NT1	3D9.1BF168B094	82	JAH02309.NT1	3D9.1BF1699835	104	JAH02312.NT1	3D9.1BF16901E4	74
JAH02303.NT1	3D9.1BF168D05B	78	JAH02309.NT1	3D9.1BF169A52B	84	JAH02312.NT1	3D9.1BF16902A6	81
JAH02303.NT1	3D9.1BF168D913	83	JAH02309.NT1	3D9.1BF169DD96	91	JAH02312.NT1	3D9.1BF169031A	85
JAH02303.NT1	3D9.1BF168E0E4	67	JAH02309.NT1	3D9.1BF16A0654	85	JAH02312.NT1	3D9.1BF1690B9E	89
JAH02303.NT1	3D9.1BF168E604	87	JAH02309.NT1	3D9.1BF16A0FE7	83	JAH02312.NT1	3D9.1BF1690BEB	83
JAH02303.NT1	3D9.1BF168E7B9	96	JAH02310.NT1	3D9.1BF169F8AE	84	JAH02312.NT1	3D9.1BF1693698	85
JAH02303.NT1	3D9.1BF168E8A9	76	JAH02310.NT1	3D9.1BF13A0137	76	JAH02312.NT1	3D9.1BF1693F15	79
JAH02303.NT1	3D9.1BF168F0E4	82	JAH02310.NT1	3D9.1BF168982B	92	JAH02312.NT1	3D9.1BF16942BF	73
JAH02303.NT1	3D9.1BF168FAFE	89	JAH02310.NT1	3D9.1BF168A672	104	JAH02312.NT1	3D9.1BF1696AAB	82
JAH02303.NT1	3D9.1BF1690000	75	JAH02310.NT1	3D9.1BF1691610	76	JAH02312.NT1	3D9.1BF1699C64	78
JAH02303.NT1	3D9.1BF1690553	80	JAH02310.NT1	3D9.1BF1691B2B	92	JAH02312.NT1	3D9.1BF169A49D	81
JAH02303.NT1	3D9.1BF16905CB	77	JAH02310.NT1	3D9.1BF168A6DD	84	JAH02312.NT1	3D9.1BF169DB65	81
JAH02303.NT1	3D9.1BF169078F	64	JAH02310.NT1	3D9.1BF167040C	99	JAH02312.NT1	3D9.1BF169E96D	76
JAH02303.NT1	3D9.1BF1690B7F	71	JAH02310.NT1	3D9.1BF16921E8	74	JAH02312.NT1	3D9.1BF16A0587	81
JAH02303.NT1	3D9.1BF1691131	87	JAH02310.NT1	3D9.1BF169D4B4	86	JAH02312.NT1	3D9.1BF16A0ADF	85
JAH02303.NT1	3D9.1BF16961FB	77	JAH02310.NT1	3D9.1BF1698EAE	97	JAH02312.NT1	3D9.1BF16A0F97	91
JAH02303.NT1	3D9.1BF16972F5	88	JAH02310.NT1	3D9.1BF1677E75	82	JAH02312.NT1	3D9.1BF16A1870	74
JAH02303.NT1	3D9.1BF16990F1	73	JAH02310.NT1	3D9.1BF1698769	72	JAH02317.NT1	3D9.1BF168B54F	85
JAH02303.NT1	3D9.1BF16A0613	77	JAH02310.NT1	3D9.1BF1677DBC	91	JAH02317.NT1	3D9.1BF168AA74	92
JAH02303.NT1	3D9.1BF16A0948	85	JAH02310.NT1	3D9.1BF1678204	94	JAH02317.NT1	3D9.1BF1688DCB	79
JAH02303.NT1	3D9.1BF16A099A	73	JAH02310.NT1	3D9.1BF169576A	84	JAH02317.NT1	3D9.1BF1694A25	65
JAH02303.NT2	3D9.1BF13A3F55	85	JAH02310.NT1	3D9.1BF16952E7	85	JAH02317.NT1	3D9.1BF139EF55	79
JAH02303.NT2	3D9.1BF1398C1D	81	JAH02310.NT1	3D9.1BF169A04B	69	JAH02317.NT1	3D9.1BF169FA9B	98
JAH02303.NT2	3D9.1BF13A73C5	81	JAH02310.NT1	3D9.1BF1695EC0	103	JAH02317.NT1	3D9.1BF169A1D9	77

Appendix B. Table B3 Continued.

File ID	Tag ID	Length	File ID	Tag ID	Length	File ID	Tag ID	Length
JAH02303.NT2	3D9.1BF13A6EB3	91	JAH02310.NT1	3D9.1BF16945CF	98	JAH02317.NT1	3D9.1BF13A2630	95
JAH02303.NT2	3D9.1BF13A24A2	84	JAH02310.NT1	3D9.1BF1677E58	83	JAH02317.NT1	3D9.1BF169E597	82
JAH02303.NT2	3D9.1BF13A2A2E	71	JAH02310.NT1	3D9.1BF16791A9	80	JAH02317.NT1	3D9.1BF1394B97	86
JAH02303.NT2	3D9.1BF1693FB8	69	JAH02310.NT1	3D9.1BF13A1A84	84	JAH02317.NT1	3D9.1BF13A2AFE	75
JAH02303.NT2	3D9.1BF1698EC3	68	JAH02310.NT1	3D9.1BF1670C70	74	JAH02317.NT1	3D9.1BF13A427D	75
JAH02303.NT2	3D9.1BF169889D	70	JAH02310.NT1	3D9.1BF16756B9	90	JAH02317.NT1	3D9.1BF16A1B71	70
JAH02303.NT2	3D9.1BF168B412	91	JAH02310.NT1	3D9.1BF16894B7	81	JAH02317.NT1	3D9.1BF16A0ED1	77
JAH02303.NT2	3D9.1BF168C2A9	85	JAH02310.NT1	3D9.1BF167021F	72	JAH02317.NT1	3D9.1BF13A2D98	81
JAH02303.NT2	3D9.1BF1697392	89	JAH02310.NT1	3D9.1BF1686E39	80	JAH02317.NT1	3D9.1BF13A40E2	69
JAH02303.NT2	3D9.1BF16965FE	81	JAH02310.NT1	3D9.1BF168935D	73	JAH02317.NT1	3D9.1BF1699FAF	82
JAH02303.NT2	3D9.1BF168C4E1	100	JAH02310.NT1	3D9.1BF169BFFF	74	JAH02317.NT1	3D9.1BF169E863	74
JAH02303.NT2	3D9.1BF168B89A	77	JAH02310.NT1	3D9.1BF1696A41	92	JAH02317.NT1	3D9.1BF16A001B	84
JAH02303.NT2	3D9.1BF1696C5A	77	JAH02310.NT1	3D9.1BF16868F5	93	JAH02317.NT1	3D9.1BF16987D9	71
JAH02303.NT2	3D9.1BF169B0F1	83	JAH02310.NT1	3D9.1BF16931E2	67	JAH02317.NT1	3D9.1BF169AF2D	86
JAH02303.NT2	3D9.1BF168DAC7	90	JAH02310.NT1	3D9.1BF16726C4	79	JAH02317.NT1	3D9.1BF169DEA8	92
JAH02303.NT2	3D9.1BF168D08A	71	JAH02310.NT1	3D9.1BF1685382	92	JAH02317.NT1	3D9.1BF13A38B0	75
JAH02303.NT2	3D9.1BF1699F40	71	JAH02310.NT1	3D9.1BF154CC17	83	JAH02317.NT1	3D9.1BF169DDB2	76
JAH02303.NT2	3D9.1BF13A4E90	88	JAH02310.NT1	3D9.1BF169F6A7	91	JAH02317.NT1	3D9.1BF1681145	77
JAH02303.NT2	3D9.1BF13A2CE9	91	JAH02310.NT1	3D9.1BF1699BB0	92	JAH02317.NT1	3D9.1BF16A0AD0	96
JAH02303.NT2	3D9.1BF168BF0D	109	JAH02310.NT1	3D9.1BF16844E2	96	JAH02317.NT1	3D9.1BF13A1C92	76
JAH02303.NT2	3D9.1BF139978F	86	JAH02310.NT1	3D9.1BF169755F	90	JAH02317.NT1	3D9.1BF13A4F92	88
JAH02303.NT2	3D9.1BF168E49B	80	JAH02310.NT1	3D9.1BF139EC8A	76	JAH02317.NT1	3D9.1BF1699E84	70
JAH02303.NT2	3D9.1BF139E734	80	JAH02310.NT1	3D9.1BF169C56F	84	JAH02317.NT1	3D9.1BF16A079F	80
JAH02303.NT2	3D9.1BF169BC39	71	JAH02310.NT1	3D9.1BF1670454	85	JAH02317.NT1	3D9.1BF1699385	94
JAH02303.NT2	3D9.1BF168C5B2	75	JAH02310.NT1	3D9.1BF1688564	72	JAH02317.NT1	3D9.1BF169FF27	75
JAH02303.NT2	3D9.1BF168F53D	87	JAH02310.NT1	3D9.1BF169A2C3	92	JAH02317.NT1	3D9.1BF139951D	81
JAH02303.NT2	3D9.1BF169075C	108	JAH02310.NT1	3D9.1BF1694AAA	69	JAH02317.NT1	3D9.1BF13A29BA	91
JAH02303.NT2	3D9.1BF168FF18	68	JAH02310.NT1	3D9.1BF167058E	75	JAH02317.NT1	3D9.1BF1699809	79
JAH02303.NT2	3D9.1BF13A534A	91	JAH02310.NT1	3D9.1BF16943D8	78	JAH02317.NT1	3D9.1BF16A061C	82
JAH02303.NT2	3D9.1BF168FCAF	73	JAH02310.NT1	3D9.1BF1678E43	76	JAH02317.NT1	3D9.1BF16A11E6	72
JAH02303.NT2	3D9.1BF13A26C4	86	JAH02310.NT1	3D9.1BF16718DD	75	JAH02317.NT1	3D9.1BF1681546	66
JAH02303.NT2	3D9.1BF1394C3E	88	JAH02310.NT1	3D9.1BF1693AF8	80	JAH02317.NT1	3D9.1BF1698508	94
JAH02303.NT2	3D9.1BF16905AD	84	JAH02310.NT1	3D9.1BF139EF5F	78	JAH02317.NT1	3D9.1BF169ECA6	90
JAH02303.NT2	3D9.1BF1676B02	95	JAH02310.NT1	3D9.1BF16A123A	77	JAH02317.NT1	3D9.1BF16A0988	83
JAH02303.NT2	3D9.1BF169513C	77	JAH02310.NT1	3D9.1BF13A552E	72	JAH02317.NT1	3D9.1BF16A09BF	77
JAH02303.NT2	3D9.1BF16978AB	82	JAH02310.NT1	3D9.1BF169291D	76	JAH02317.NT1	3D9.1BF16A0C5B	82
JAH02303.NT2	3D9.1BF16A08DC	84	JAH02310.NT1	3D9.1BF1681640	112	JAH02317.NT1	3D9.1BF139E1DE	83
JAH02303.NT2	3D9.1BF1678750	72	JAH02310.NT1	3D9.1BF1394A63	85	JAH02317.NT1	3D9.1BF13A5215	84
JAH02303.NT2	3D9.1BF1690AA2	91	JAH02310.NT1	3D9.1BF168C971	86	JAH02317.NT1	3D9.1BF168179D	86
JAH02303.NT2	3D9.1BF16A1A08	83	JAH02310.NT1	3D9.1BF16979C5	85	JAH02317.NT1	3D9.1BF1696AEE	72
JAH02303.NT2	3D9.1BF168AB7A	74	JAH02310.NT1	3D9.1BF13A120E	87	JAH02317.NT1	3D9.1BF169AD2E	83
JAH02303.NT2	3D9.1BF1697BBD	101	JAH02310.NT1	3D9.1BF1680C26	108	JAH02317.NT1	3D9.1BF16A0188	71
JAH02303.NT2	3D9.1BF1679652	66	JAH02310.NT1	3D9.1BF1680FBA	85	JAH02317.NT1	3D9.1BF16A1711	86
JAH02303.NT2	3D9.1BF168ED46	65	JAH02310.NT1	3D9.1BF1670B02	101	JAH02318.NT1	3D9.1BF139976E	87
JAH02303.NT2	3D9.1BF167790E	77	JAH02310.NT1	3D9.1BF16726F4	73	JAH02318.NT1	3D9.1BF1695617	70
JAH02303.NT2	3D9.1BF168FB06	87	JAH02310.NT1	3D9.1BF16768D7	101	JAH02318.NT1	3D9.1BF169AE57	95
JAH02303.NT2	3D9.1BF168E11D	88	JAH02310.NT1	3D9.1BF16771FF	92	JAH02318.NT1	3D9.1BF169F1DE	77
JAH02303.NT2	3D9.1BF13A4266	75	JAH02310.NT1	3D9.1BF1677B57	86	JAH02318.NT1	3D9.1BF1696C70	81
JAH02303.NT2	3D9.1BF139471A	91	JAH02310.NT1	3D9.1BF16783AC	83	JAH02318.NT1	3D9.1BF168D527	92
JAH02303.NT2	3D9.1BF16796D3	75	JAH02310.NT1	3D9.1BF1678968	106	JAH02318.NT1	3D9.1BF169EA8C	85
JAH02303.NT2	3D9.1BF16797B5	91	JAH02310.NT1	3D9.1BF1684243	83	JAH02318.NT1	3D9.1BF169BFE2	87
JAH02303.NT2	3D9.1BF168FE4F	78	JAH02310.NT1	3D9.1BF168793A	91	JAH02318.NT1	3D9.1BF1398B86	92
JAH02303.NT2	3D9.1BF168FEDC	69	JAH02310.NT1	3D9.1BF16897F1	80	JAH02318.NT1	3D9.1BF139E582	71
JAH02303.NT2	3D9.1BF1694C9A	90	JAH02310.NT1	3D9.1BF168A3D6	110	JAH02318.NT1	3D9.1BF16812F7	79
JAH02303.NT2	3D9.1BF1394935	80	JAH02310.NT1	3D9.1BF169090F	94	JAH02318.NT1	3D9.1BF139E2FE	77
JAH02303.NT2	3D9.1BF169B46C	92	JAH02310.NT1	3D9.1BF1691518	88	JAH02318.NT1	3D9.1BF13A277C	76
JAH02303.NT2	3D9.1BF13A2ADA	79	JAH02310.NT1	3D9.1BF1691A80	74	JAH02318.NT1	3D9.1BF169DE84	82
JAH02303.NT2	3D9.1BF13A4157	91	JAH02310.NT1	3D9.1BF16923B7	94	JAH02318.NT1	3D9.1BF1697830	90
JAH02303.NT2	3D9.1BF13A2362	77	JAH02310.NT1	3D9.1BF1692E4A	100	JAH02318.NT1	3D9.1BF13A2A77	83
JAH02303.NT2	3D9.1BF1690BD0	75	JAH02310.NT1	3D9.1BF1693428	74	JAH02318.NT1	3D9.1BF13A2479	79
JAH02303.NT2	3D9.1BF1394DFC	72	JAH02310.NT1	3D9.1BF1693980	90	JAH02318.NT1	3D9.1BF169736E	97

Appendix B. Table B3 Continued.

File ID	Tag ID	Length	File ID	Tag ID	Length	File ID	Tag ID	Length
JAH02303.NT2	3D9.1BF13A37C2	103	JAH02310.NT1	3D9.1BF1693CD3	75	JAH02318.NT1	3D9.1BF16A0BD1	74
JAH02303.NT2	3D9.1BF13A62C6	78	JAH02310.NT1	3D9.1BF1693D36	74	JAH02318.NT1	3D9.1BF16987A8	89
JAH02303.NT2	3D9.1BF16973BE	80	JAH02310.NT1	3D9.1BF13999B1	101	JAH02318.NT1	3D9.1BF169C879	77
JAH02303.NT2	3D9.1BF13A4EAD	73	JAH02310.NT1	3D9.1BF139A4DC	89	JAH02318.NT1	3D9.1BF16A1325	94
JAH02303.NT2	3D9.1BF16971C6	91	JAH02310.NT1	3D9.1BF13A1FF4	72	JAH02318.NT1	3D9.1BF13A5437	83
JAH02303.NT2	3D9.1BF13A670C	89	JAH02310.NT1	3D9.1BF1681394	88	JAH02318.NT1	3D9.1BF169B330	96
JAH02303.NT2	3D9.1BF16A0102	84	JAH02310.NT1	3D9.1BF169AC52	86	JAH02318.NT1	3D9.1BF16A1072	81
JAH02303.NT2	3D9.1BF139EF45	92	JAH02310.NT1	3D9.1BF169E527	77	JAH02318.NT1	3D9.1BF139A981	92
JAH02303.NT2	3D9.1BF1679435	72	JAH02310.NT1	3D9.1BF139E3FE	93	JAH02318.NT1	3D9.1BF1681134	83
JAH02303.NT2	3D9.1BF168EF77	92	JAH02310.NT1	3D9.1BF13A26DF	101	JAH02318.NT1	3D9.1BF16A08E4	88
JAH02303.NT2	3D9.1BF169A72F	98	JAH02310.NT1	3D9.1BF13A4EF7	78	JAH02318.NT1	3D9.1BF16A0E55	77
JAH02303.NT2	3D9.1BF13A2717	82	JAH02310.NT1	3D9.1BF13A5253	100	JAH02318.NT1	3D9.1BF16A1816	68
JAH02303.NT2	3D9.1BF1696307	109	JAH02310.NT1	3D9.1BF169F135	87	JAH02318.NT1	3D9.1BF168AEB6	77
JAH02303.NT2	3D9.1BF169E965	75	JAH02310.NT1	3D9.1BF16A059F	93	JAH02318.NT1	3D9.1BF169AB6F	77
JAH02303.NT2	3D9.1BF1394312	72	JAH02310.NT1	3D9.1BF16A0FDB	83	JAH02318.NT1	3D9.1BF13A2204	86
JAH02303.NT2	3D9.1BF169476D	86	JAH02310.NT1	3D9.1BF16A1B8C	93	JAH02318.NT1	3D9.1BF169F4FE	91
JAH02303.NT2	3D9.1BF169B33F	75	JAH02310.NT1	3D9.1BF13A1EC9	86	JAH02318.NT1	3D9.1BF13A369F	73
JAH02303.NT2	3D9.1BF13A218B	81	JAH02310.NT1	3D9.1BF168D05D	103	JAH02318.NT1	3D9.1BF1681C9C	76
JAH02303.NT2	3D9.1BF13A21FF	93	JAH02310.NT1	3D9.1BF16A1700	91	JAH02318.NT1	3D9.1BF16A027C	79
JAH02303.NT2	3D9.1BF16A05C2	81	JAH02310.NT1	3D9.1BF13A1A68	77	JAH02318.NT1	3D9.1BF139E402	85
JAH02303.NT2	3D9.1BF16A0A13	78	JAH02310.NT1	3D9.1BF16814F7	90	JAH02318.NT1	3D9.1BF13A2A80	103
JAH02303.NT2	3D9.1BF16A12A2	77	JAH02310.NT1	3D9.1BF16A146F	91	JAH02318.NT1	3D9.1BF13A5533	76
JAH02303.NT2	3D9.1BF167983A	94	JAH02310.NT1	3D9.1BF139A50D	77	JAH02318.NT1	3D9.1BF16979F9	81
JAH02303.NT2	3D9.1BF169D539	82	JAH02310.NT1	3D9.1BF139E75A	92	JAH02318.NT1	3D9.1BF1699BA9	83
JAH02303.NT2	3D9.1BF13A2FAC	73	JAH02310.NT1	3D9.1BF139E79F	0	JAH02318.NT1	3D9.1BF16A0C51	79
JAH02303.NT2	3D9.1BF13A43A4	74	JAH02310.NT1	3D9.1BF13A1945	100	JAH02318.NT1	3D9.1BF16A0D57	90
JAH02303.NT2	3D9.1BF16786EB	70	JAH02310.NT1	3D9.1BF13A406F	84	JAH02319.NT1	3D9.1BF13A3F5C	89
JAH02303.NT2	3D9.1BF16955B6	80	JAH02310.NT1	3D9.1BF168052D	88	JAH02319.NT1	3D9.1BF169D317	78
JAH02303.NT2	3D9.1BF16909B9	92	JAH02310.NT1	3D9.1BF1699609	75	JAH02319.NT1	3D9.1BF1695219	81
JAH02303.NT2	3D9.1BF168D529	91	JAH02310.NT1	3D9.1BF169A52A	78	JAH02319.NT1	3D9.1BF168C230	77
JAH02303.NT2	3D9.1BF139A050	79	JAH02310.NT1	3D9.1BF169CAF2	77	JAH02319.NT1	3D9.1BF168102D	88
JAH02303.NT2	3D9.1BF13A1CE8	89	JAH02310.NT1	3D9.1BF169DCAA	83	JAH02319.NT1	3D9.1BF16950D0	106
JAH02303.NT2	3D9.1BF168C39F	85	JAH02310.NT1	3D9.1BF16A0418	90	JAH02319.NT1	3D9.1BF13A3549	76
JAH02303.NT2	3D9.1BF168E4B7	79	JAH02310.NT1	3D9.1BF16A0BEB	76	JAH02319.NT1	3D9.1BF169D484	109
JAH02303.NT2	3D9.1BF168E609	73	JAH02310.NT1	3D9.1BF16A14DD	73	JAH02319.NT1	3D9.1BF1698509	80
JAH02303.NT2	3D9.1BF1690396	91	JAH02310.NT1	3D9.1BF13A10F1	78	JAH02319.NT1	3D9.1BF169483C	100
JAH02303.NT2	3D9.1BF16903E2	75	JAH02310.NT1	3D9.1BF13A16EA	90	JAH02319.NT1	3D9.1BF1696B2A	88
JAH02303.NT2	3D9.1BF1690E78	91	JAH02310.NT1	3D9.1BF13A2FB8	71	JAH02319.NT1	3D9.1BF1394FAA	112
JAH02303.NT2	3D9.1BF16901BF	76	JAH02310.NT1	3D9.1BF13A533A	89	JAH02319.NT1	3D9.1BF16991A5	86
JAH02303.NT2	3D9.1BF1678F1B	71	JAH02310.NT1	3D9.1BF16811DF	91	JAH02319.NT1	3D9.1BF169FECC	83
JAH02303.NT2	3D9.1BF16A13C8	74	JAH02310.NT1	3D9.1BF16987A4	72	JAH02319.NT1	3D9.1BF139E559	88
JAH02303.NT2	3D9.1BF169E0F4	90	JAH02310.NT1	3D9.1BF169A1CB	0	JAH02319.NT1	3D9.1BF1694DD5	73
JAH02303.NT2	3D9.1BF1699477	94	JAH02310.NT1	3D9.1BF169C7CD	92	JAH02319.NT1	3D9.1BF13A1FD2	71
JAH02303.NT2	3D9.1BF16A0E4F	81	JAH02310.NT1	3D9.1BF169FFC6	98	JAH02319.NT1	3D9.1BF169F801	84
JAH02303.NT2	3D9.1BF13A38B9	80	JAH02310.NT1	3D9.1BF16A0CCC	97	JAH02319.NT1	3D9.1BF16977BE	91
JAH02303.NT2	3D9.1BF169FFC4	82	JAH02310.NT1	3D9.1BF139A1C0	86	JAH02319.NT1	3D9.1BF139E2F9	79
JAH02303.NT2	3D9.1BF16A0B7C	81	JAH02310.NT1	3D9.1BF13A374D	96	JAH02319.NT1	3D9.1BF13A2723	74
JAH02303.NT2	3D9.1BF16A0BD5	65	JAH02310.NT1	3D9.1BF13A3C0A	98	JAH02319.NT1	3D9.1BF13A2EF3	90
JAH02303.NT2	3D9.1BF16A10DC	106	JAH02310.NT1	3D9.1BF1681282	90	JAH02319.NT1	3D9.1BF13A5225	95
JAH02303.NT2	3D9.1BF16A1114	72	JAH02310.NT1	3D9.1BF1699672	85	JAH02319.NT1	3D9.1BF168DA80	104
JAH02303.NT2	3D9.1BF1696ACE	72	JAH02310.NT1	3D9.1BF169D865	78	JAH02319.NT1	3D9.1BF16999C5	85
JAH02303.NT2	3D9.1BF16A0EC0	74	JAH02310.NT1	3D9.1BF16A1071	76	JAH02319.NT1	3D9.1BF169AABA	94
JAH02303.NT2	3D9.1BF16A0EE3	86	JAH02310.NT1	3D9.1BF16711E7	90	JAH02319.NT1	3D9.1BF16A059E	82
JAH02303.NT2	3D9.1BF13946D6	81	JAH02310.NT1	3D9.1BF1394D2D	85	JAH02319.NT1	3D9.1BF16A137C	78
JAH02303.NT2	3D9.1BF13A1830	80	JAH02310.NT1	3D9.1BF139A5F8	70	JAH02319.NT1	3D9.1BF16990EE	87
JAH02303.NT2	3D9.1BF1680448	90	JAH02310.NT1	3D9.1BF13A236B	85	JAH02319.NT1	3D9.1BF16A0994	111
JAH02303.NT2	3D9.1BF169DF1D	85	JAH02310.NT1	3D9.1BF1693697	89	JAH02319.NT1	3D9.1BF16A0F1A	90
JAH02303.NT2	3D9.1BF169FE08	73	JAH02310.NT1	3D9.1BF1693869	84	JAH02319.NT1	3D9.1BF1398814	80
JAH02303.NT2	3D9.1BF16A097F	80	JAH02310.NT1	3D9.1BF16969A5	99	JAH02319.NT1	3D9.1BF13A2D8B	78
JAH02303.NT2	3D9.1BF13A54C9	80	JAH02310.NT1	3D9.1BF169A486	85	JAH02319.NT1	3D9.1BF169E866	96
JAH02303.NT2	3D9.1BF16A0578	90	JAH02310.NT1	3D9.1BF16A0C31	76	JAH02319.NT1	3D9.1BF16A00B7	100

Appendix B. Table B3 Continued.

File ID	Tag ID	Length	File ID	Tag ID	Length	File ID	Tag ID	Length
JAH02303.NT2	3D9.1BF1394F48	89	JAH02310.NT1	3D9.1BF16A188F	76	JAH02319.NT1	3D9.1BF16A14C1	107
JAH02303.NT2	3D9.1BF13A3F63	94	JAH02310.NT1	3D9.1BF139E7B1	67	JAH02319.NT1	3D9.1BF1399F9F	93
JAH02303.NT2	3D9.1BF168A734	90	JAH02310.NT1	3D9.1BF13A17DE	88	JAH02319.NT1	3D9.1BF13A533E	79
JAH02303.NT2	3D9.1BF169AD7C	66	JAH02310.NT1	3D9.1BF13A1C5B	84	JAH02319.NT1	3D9.1BF1697D2F	69
JAH02303.NT2	3D9.1BF169FF40	80	JAH02310.NT1	3D9.1BF13A37E5	93	JAH02319.NT1	3D9.1BF169AF11	85
JAH02303.NT2	3D9.1BF169F4C6	70	JAH02310.NT1	3D9.1BF13A3A09	83	JAH02319.NT1	3D9.1BF169C849	73
JAH02303.NT2	3D9.1BF169E1D1	94	JAH02310.NT1	3D9.1BF13A4005	74	JAH02319.NT1	3D9.1BF169C80B	75
JAH02303.NT2	3D9.1BF169BEF3	81	JAH02310.NT1	3D9.1BF13A4F71	83	JAH02319.NT1	3D9.1BF16A013B	81
JAH02303.NT2	3D9.1BF1394AF5	82	JAH02310.NT1	3D9.1BF13A560A	70	JAH02319.NT1	3D9.1BF16A0D02	96
JAH02303.NT2	3D9.1BF169918A	93	JAH02310.NT1	3D9.1BF1670014	92	JAH02319.NT1	3D9.1BF139A169	71
JAH02303.NT2	3D9.1BF1678666	77	JAH02310.NT1	3D9.1BF167732C	74	JAH02319.NT1	3D9.1BF13A36CA	77
JAH02303.NT2	3D9.1BF16A0CD4	101	JAH02310.NT1	3D9.1BF16788F6	73	JAH02319.NT1	3D9.1BF168049D	79
JAH02303.NT2	3D9.1BF16A0D49	89	JAH02310.NT1	3D9.1BF1680EC8	84	JAH02319.NT1	3D9.1BF1699904	72
JAH02303.NT2	3D9.1BF13A20B5	69	JAH02310.NT1	3D9.1BF1681BC5	79	JAH02319.NT1	3D9.1BF169FD83	84
JAH02303.NT2	3D9.1BF13A2598	80	JAH02310.NT1	3D9.1BF1686F98	101	JAH02319.NT1	3D9.1BF16A02F7	76
JAH02303.NT2	3D9.1BF168EB67	92	JAH02310.NT1	3D9.1BF1688539	91	JAH02319.NT1	3D9.1BF139A60E	86
JAH02303.NT2	3D9.1BF1691030	114	JAH02310.NT1	3D9.1BF168A4DE	94	JAH02319.NT1	3D9.1BF168113A	97
JAH02303.NT2	3D9.1BF16A0234	71	JAH02310.NT1	3D9.1BF16918FF	93	JAH02319.NT1	3D9.1BF168B4D9	91
JAH02303.NT2	3D9.1BF16A1866	80	JAH02310.NT1	3D9.1BF1691BE4	76	JAH02319.NT1	3D9.1BF169A462	76
JAH02303.NT2	3D9.1BF13A1C2B	71	JAH02310.NT1	3D9.1BF169546B	97	JAH02319.NT1	3D9.1BF169E918	90
JAH02303.NT2	3D9.1BF169A448	73	JAH02310.NT1	3D9.1BF1699764	88	JAH02319.NT1	3D9.1BF16A0524	75
JAH02303.NT2	3D9.1BF16A07F0	85	JAH02310.NT1	3D9.1BF1699ECB	78	JAH02319.NT1	3D9.1BF16A0B2D	74
JAH02303.NT2	3D9.1BF16A0815	102	JAH02310.NT1	3D9.1BF169D275	82	JAH02319.NT1	3D9.1BF16A0C3D	95
JAH02303.NT2	3D9.1BF169FECD	75	JAH02310.NT1	3D9.1BF169DF8D	87	JAH02319.NT1	3D9.1BF16A0F4A	88
JAH02303.NT2	3D9.1BF139FAD5	76	JAH02310.NT1	3D9.1BF16A0751	80	JAH02319.NT1	3D9.1BF16A1541	74
JAH02303.NT2	3D9.1BF169E750	77	JAH02310.NT1	3D9.1BF16A162C	83	JAH02319.NT1	3D9.1BF139E73E	85
JAH02303.NT2	3D9.1BF1695636	80	JAH02311.NT1	3D9.1BF1679FC3	68	JAH02319.NT1	3D9.1BF13A397E	83
JAH02303.NT2	3D9.1BF16A0AF7	83	JAH02311.NT1	3D9.1BF154B75D	87	JAH02319.NT1	3D9.1BF13A4F2E	97
JAH02303.NT2	3D9.1BF16A15AE	99	JAH02311.NT1	3D9.1BF16777A0	88	JAH02319.NT1	3D9.1BF16997A3	0
JAH02303.NT2	3D9.1BF1694B23	82	JAH02311.NT1	3D9.1BF1679153	78	JAH02319.NT1	3D9.1BF1699E98	75
JAH02303.NT2	3D9.1BF169DDA2	73	JAH02311.NT1	3D9.1BF16896B6	74	JAH02319.NT1	3D9.1BF169A740	93
JAH02303.NT2	3D9.1BF169A855	88	JAH02311.NT1	3D9.1BF16898EA	68	JAH02319.NT1	3D9.1BF169DAB9	74
JAH02303.NT2	3D9.1BF139F369	86	JAH02311.NT1	3D9.1BF169139C	82	JAH02319.NT1	3D9.1BF13942AC	97
JAH02303.NT2	3D9.1BF1677228	77	JAH02311.NT1	3D9.1BF1691579	97	JAH02319.NT1	3D9.1BF168BF8C	98
JAH02303.NT2	3D9.1BF169433B	74	JAH02311.NT1	3D9.1BF1691606	81	JAH02319.NT1	3D9.1BF16970C4	89
JAH02303.NT2	3D9.1BF13A3DB9	91	JAH02311.NT1	3D9.1BF1691DF2	79	JAH02319.NT1	3D9.1BF169DFE6	75
JAH02303.NT2	3D9.1BF13A3DD1	89	JAH02311.NT1	3D9.1BF169200B	84	JAH02319.NT1	3D9.1BF16A0390	82
JAH02303.NT2	3D9.1BF1680EDC	80	JAH02311.NT1	3D9.1BF16932C0	73	JAH02319.NT1	3D9.1BF16A11A4	79
JAH02303.NT2	3D9.1BF13947D4	75	JAH02311.NT1	3D9.1BF1693800	88	JAH02319.NT1	3D9.1BF13A2185	93
JAH02303.NT2	3D9.1BF139A5A4	70	JAH02311.NT1	3D9.1BF1693DDB	74	JAH02319.NT1	3D9.1BF13A2B3B	77
JAH02303.NT2	3D9.1BF139A62D	98	JAH02311.NT1	3D9.1BF168883B	88	JAH02319.NT1	3D9.1BF1699830	89
JAH02303.NT2	3D9.1BF13A1FC6	91	JAH02311.NT1	3D9.1BF16781A7	96	JAH02319.NT1	3D9.1BF16A0DF6	81
JAH02303.NT2	3D9.1BF13A689A	63	JAH02311.NT1	3D9.1BF167620B	87	JAH02319.NT1	3D9.1BF16A0FC4	85
JAH02303.NT2	3D9.1BF16811FE	74	JAH02311.NT1	3D9.1BF16784B2	83	JAH02319.NT1	3D9.1BF1399C7D	84
JAH02303.NT2	3D9.1BF1699642	94	JAH02311.NT1	3D9.1BF16784F1	98	JAH02319.NT1	3D9.1BF13A2FE1	77
JAH02303.NT2	3D9.1BF1699762	91	JAH02311.NT1	3D9.1BF168A6AE	82	JAH02319.NT1	3D9.1BF13A369A	78
JAH02303.NT2	3D9.1BF16997C8	85	JAH02311.NT1	3D9.1BF1692539	83	JAH02319.NT1	3D9.1BF13A3A60	85
JAH02303.NT2	3D9.1BF169AF6F	92	JAH02311.NT1	3D9.1BF1675B37	86	JAH02319.NT1	3D9.1BF13A4F25	85
JAH02303.NT2	3D9.1BF169DDBE	73	JAH02311.NT1	3D9.1BF1691E8F	71	JAH02319.NT1	3D9.1BF1681CB4	85
JAH02303.NT2	3D9.1BF169E847	93	JAH02311.NT1	3D9.1BF16921AE	76	JAH02319.NT1	3D9.1BF1694C41	86
JAH02303.NT2	3D9.1BF169F833	81	JAH02311.NT1	3D9.1BF16702A1	82	JAH02319.NT1	3D9.1BF1695AAD	76
JAH02303.NT2	3D9.1BF16A135E	91	JAH02311.NT1	3D9.1BF169425B	90	JAH02319.NT1	3D9.1BF169852A	94
JAH02303.NT2	3D9.1BF16A149B	67	JAH02311.NT1	3D9.1BF1675F64	85	JAH02319.NT1	3D9.1BF169947A	76
JAH02303.NT2	3D9.1BF16A1516	89	JAH02311.NT1	3D9.1BF1693E85	94	JAH02319.NT1	3D9.1BF169A65C	71
JAH02303.NT2	3D9.1BF16A1594	103	JAH02311.NT1	3D9.1BF1677DAA	67	JAH02319.NT1	3D9.1BF169CAF3	89
JAH02303.NT2	3D9.1BF168DD8F	87	JAH02311.NT1	3D9.1BF169124C	88	JAH02319.NT1	3D9.1BF169F132	81
JAH02303.NT2	3D9.1BF169E590	75	JAH02311.NT1	3D9.1BF167810D	84	JAH02319.NT1	3D9.1BF16A06A3	90
JAH02303.NT2	3D9.1BF13994F9	80	JAH02311.NT1	3D9.1BF1676B67	82	JAH02319.NT1	3D9.1BF16A0883	82
JAH02303.NT2	3D9.1BF13A18E7	101	JAH02311.NT1	3D9.1BF1678457	94	JAH02319.NT1	3D9.1BF16A0DDA	84
JAH02303.NT2	3D9.1BF168BF57	73	JAH02311.NT1	3D9.1BF1679055	79	JAH02323.NT1	3D9.1BF16A00A7	87
JAH02303.NT2	3D9.1BF168EF1F	78	JAH02311.NT1	3D9.1BF168CE78	75	JAH02324.NT1	3D9.1BF168B7C8	67

Appendix B. Table B3 Continued.

File ID	Tag ID	Length	File ID	Tag ID	Length	File ID	Tag ID	Length
JAH02303.NT2	3D9.1BF169AA28	83	JAH02311.NT1	3D9.1BF1678DF9	81	JAH02324.NT1	3D9.1BF139A58A	84
JAH02303.NT2	3D9.1BF169AA4D	71	JAH02311.NT1	3D9.1BF1695D31	84	JAH02324.NT1	3D9.1BF13A2693	81
JAH02303.NT2	3D9.1BF16A0D6E	73	JAH02311.NT1	3D9.1BF1694F5B	107	JAH02325.NT1	3D9.1BF16994C8	84
JAH02303.NT2	3D9.1BF13943D2	66	JAH02311.NT1	3D9.1BF1683E78	78	JAH02325.NT1	3D9.1BF1697062	83
JAH02303.NT2	3D9.1BF1394B7A	69	JAH02311.NT1	3D9.1BF167778C	66	JAH02325.NT1	3D9.1BF139FAD3	120
JAH02303.NT2	3D9.1BF1399F8D	86	JAH02311.NT1	3D9.1BF16790D6	83	JAH02325.NT1	3D9.1BF13A2EF9	100
JAH02303.NT2	3D9.1BF139A148	91	JAH02311.NT1	3D9.1BF16791BF	83	JAH02325.NT1	3D9.1BF13A40C9	97
JAH02303.NT2	3D9.1BF139A1E6	109	JAH02311.NT1	3D9.1BF1677F97	85	JAH02325.NT1	3D9.1BF139E475	76
JAH02303.NT2	3D9.1BF139A787	71	JAH02311.NT1	3D9.1BF16724CC	80	JAH02325.NT1	3D9.1BF169B457	76
JAH02303.NT2	3D9.1BF139A964	81	JAH02311.NT1	3D9.1BF1677594	90	JAH02325.NT1	3D9.1BF168B4D6	97
JAH02303.NT2	3D9.1BF13A0823	77	JAH02311.NT1	3D9.1BF168A87F	83	JAH02325.NT1	3D9.1BF13A1791	121
JAH02303.NT2	3D9.1BF13A2765	95	JAH02311.NT1	3D9.1BF1696784	71	JAH02325.NT1	3D9.1BF1394082	91
JAH02303.NT2	3D9.1BF13A2B4B	87	JAH02311.NT1	3D9.1BF1671C15	83	JAH02325.NT1	3D9.1BF16A115F	80
JAH02303.NT2	3D9.1BF13A2CFC	97	JAH02311.NT1	3D9.1BF1671CA5	73	JAH02325.NT1	3D9.1BF16A0D46	84
JAH02303.NT2	3D9.1BF13A2DA0	79	JAH02311.NT1	3D9.1BF1673095	78	JAH02325.NT1	3D9.1BF16A0175	75

Appendix B. Table B4. PIT tagged natural chinook salmon recaptured in the Imnaha River trap during the spring of 2003.

Migration Year	Agency	Recapture File	Tag ID	Date Tagged	Date Recaptured	Travel Time
2003	ODFW	PJC03092.NT2	3D9.1BF148F726	8/26/02	4/2/03	218 days 15 hrs 49 mins
2003	ODFW	PJC03125.NT1	3D9.1BF148F82B	8/26/02	5/5/03	252 days 7 hrs 6 mins
2003	ODFW	PJC03086.NT1	3D9.1BF1491BAF	8/26/02	3/27/03	212 days 16 hrs 15 mins
2003	ODFW	PJC03114.NT1	3D9.1BF1524B51	8/26/02	4/24/03	240 days 12 hrs 22 mins
2003	ODFW	PJC03093.NT1	3D9.1BF159E480	8/27/02	4/3/03	218 days 17 hrs 19 mins
2003	ODFW	PJC03132.NT1	3D9.1BF149758F	8/27/02	5/12/03	258 days 12 hrs 19 mins
2003	ODFW	PJC03104.NT1	3D9.1BF148EDC0	8/28/02	4/14/03	229 days 6 hrs 44 mins
2003	ODFW	PJC03132.NT1	3D9.1BF14A4E4D	8/28/02	5/12/03	257 days 9 hrs 19 mins

APPENDIX C

STATISTICAL COMPARISONS OF MEDIAN FORK LENGTHS OF NATURAL AND HATCHERY CHINOOK SALMON AND STEELHEAD SMOLTS CAPTURED IN THE IMNAHA RIVER SMOLT TRAP DURING MIGRATION YEAR 2003

Appendix C. Table C1. Statistical comparisons of median fork lengths between groups of smolts captured in the Imnaha River smolt trap during the spring of migration year 2003.

Group 1	Group 2	Sample Sizes		Median Fork Length (mm)		Wilcoxon Value (W)	Significance Level p = 0.05
		Group 1	Group 2	Group 1	Group 2		
Natural Chinook Salmon	Hatchery Chinook Salmon	4,841	1,743	104	137	8.32 (10^6)	0.00
Natural Steelhead	Hatchery Steelhead	5,961	5,397	174	222	3.02 (10^7)	0.00

Appendix C. Table C2. A statistical comparison of median arrival time between natural chinook salmon released in the fall of 2002 and smolts released in the spring of 2003 from the Imnaha River trap during migration year 2003[1].

Group 1	Group 2	Sample Sizes		Median Arrival Time (PTAGIS Julian Date)		Wilcoxon Value (W)	Significance Level p = 0.05
		Group 1	Group 2	Group 1	Group 2		
Pre-Smolts	Smolts	715	1,685	106	119	982,784	0.00

[1] The Kolmogorov-Smirnov Test indicated that the maximum distance between the cumulative distributions was 0.528 and p value = 0.00.

APPENDIX D

IMNAHA RIVER JUVENILE HATCHERY CHINOOK SALMON POST RELEASE SURVIVAL ESTIMATES FROM 1994 TO 2003

Appendix D. Table D1. Trap efficiency trial results and Bootstrap population and variance estimates for individual trials for natural chinook salmon marked and released during the 2003 migration year.

Trial Dates	Marked Number Released	Marked Number Recaptured	Trap Efficiency	Unmarked Captures	Bootstrap	
					Mean Population Estimate	Variance
12-Mar	30	3	0.100	27	338	54,673
15-Mar to 20-Mar	272	26	0.096	423	4,632	106,536
21-Mar to 22-Mar	59	8	0.136	176	1,493	443,070
25-Mar to 26-Mar	58	5	0.086	186	2,650	2,863,734
28-Mar to 31-Mar	61	7	0.115	499	5,156	8,221,291
2-Apr	31	7	0.226	92	478	62,680
12-Apr	30	1	0.033	49	729	435,946
19-May	29	4	0.138	40	371	63,425
				Total =	15,847	12,251,355

Appendix D. Table D2. The number of trap efficiency trials, mean trap efficiency, PIT tag interrogation percentage and estimated survival of hatchery chinook salmon from release at the Imnaha River Acclimation Facility (rkm 74) to the Imnaha River trap (rkm 7), and from release to Lower Granite Dam from 1994 to 2003.

Year	Number of Trials	Mean Trap Efficiency (%)	PIT Tag Interrogations at the Screw Trap (%)	Estimated Survival		
				Release to Trap		Release to Lower Granite Dam (%)[1]
				SURPH (%)	Bootstrap (%)	
2003	13	11.6	8.5	90.0	NA[2]	73.6
2002	39	9.1	7.3	90.2	95.5	67.1
2001	6	29.1	12.0	93.9	45.0	74.7
2000	11	18.1	9.8	94.7	66.9	68.7
1999	51	21.8	4.5	93.7	45.9	68.5
1998	9	29.4	17.0	88.4	66.9	68.3
1997	6	45.9	19.6	89.2	44	61.6
1996	9	11.6	10.6	95.0	101.7	56.8
1995	7	14.8	10.8	92.6	68	61.8
1994	1	13.8	6.2	100.9	88.1	68.5

[1] Estimated as the product of the SURPH Survival estimates from release to the Imnaha River trap, and from the trap to Lower Granite Dam.

[2] No trap efficiencies were conducted with hatchery chinook salmon for migration year 2003.

APPENDIX E

ARRIVAL TIMING AT SNAKE RIVER AND COLUMBIA RIVER DAMS

Appendix E. Table E1. Arrival timing of PIT tagged Imnaha River natural chinook salmon , tagged and released in the fall at the lower trap site at Lower Granite, Little Goose, Lower Monumental, and McNary dams from 1998 to 2003.

		Sample Size		Arrival Timing	
Trap Site and Dam	Year	(n)	Date Range	Median	90%
Lower Granite	2003	715	March 26 - May 28	April 16	April 30
	2002	162	April 1 - May 20	April 16	May 30
	2001	644	April 3 - May 26	April 26	April 30
	2000	262	April 4 - May 12	April 14	April 23
	1999	103	April 3 - May 2	April 19	April 25
	1998	428	March 27 - May 12	April 14	April 24
Little Goose	2003	406	April 2 - May 16	April 21	May 1
	2002	159	April 13 - May 16	May 1	May 5
	2001	135	April 23 - June 16	April 30	May 11
	2000	239	April 12 - May 12	April 17	April 24
	1999	364	April 8 - May 9	April 19	April 25
	1998	228	April 11 - May 12	April 25	May 2
Lower Monumental	2003	78	April 14 - May 18	April 22	May 6
	2002	100	April 30 - June 4	May 5	May 16
	2001	21	April 28 - May 17	NA	NA
	2000	62	April 13 - May 6	April 21	April 26
	1999	144	April 10 - May 21	April 19	April 25
	1998	202	April 19 - May 19	Apr 25	May 4
McNary	2003	314	April 17 - May 21	April 28	May 9
	2002	86	April 21 - May 26	May 5	May 15
	2001	5	May 5 - May 18	NA	NA
	2000	35	April 18 - May 6	April 27	May 4
	1999	64	April 10 - May 10	April 21	April 28
	1998	236	April 20 - May 23	April 30	May 4

Appendix E. Table E2. Arrival timing of spring PIT tagged Imnaha River natural chinook salmon smolts at Lower Granite, Little Goose, Lower Monumental, and McNary dams from 1993 to 2003.

Trap Site and Dam	Year	Sample Size (n)	Date Range	Arrival Timing Median	90%
Lower Granite	2003	1685	March 28 - July 25	April 29	May 24
	2002	489	April 2 - June 27	May 5	May 20
	2001	6857	March 30 - August	April 28	May 12
	2000	1291	April 2 - August 8	April 22	May 11
	1999	1218	March 28 - July 15	April 27	May 22
	1998	1,630	April 1 - June 27	April 25	May 6
	1997	74	April 6 - May 18	April 22	May 11
	1996	421	April 6 - June 12	April 30	May 18
	1995	184	April 11 - July 11	May 1	May 11
	1994	348	April 14 - June 23	April 24	May 11
	1993	109	April 21 - June 12	May 4	May 14
Little Goose	2003	782	April 13 - August 4	May 4	May 27
	2002	519	April 15 - June 20	May 7	May 23
	2001	1216	April 16 - July 23	May 2	May 17
	2000	1103	April 11 - July 14	April 23	May 11
	1999	2,099	April 9 - August 1	April 29	May 22
	1998	837	April 14 - June 25	May 3	May 12
	1997	70	April 15 - May 22	April 26	May 11
	1996	358	April 12 - June 16	April 27	May 20
	1995	144	April 15 - July 15	May 7	May 20
	1994	194	April 23 - June 17	April 28	May 7
	1993	46	April 27 - June 2	May 3	May 16
Lower Monumental	2003	163	April 13 - July 12	May 14	May 31
	2002	336	April 22 - June 14	May 13	May 22
	2001	131	April 28 - July 18	May 13	May 20
	2000	335	April 13 - July 12	April 25	May 29
	1999	688	April 9 - August 4	May 1	May 23
	1998	289	April 19 - June 8	April 30	May 11
	1997	74	April 20 - June 1	April 30	May 14
	1996	359	April 13 - June 15	May 10	May 22
	1995	142	April 19 - August 4	May 8	June 4
	1994	215	April 25 - July 26	May 1	May 24
	1993	37	May 3 - June 2	May 8	May 13

Appendix E. Table E2. Continued.

		Sample Size				Arrival Timing	
Trap Site and Dam	Year	(n)	Date Range			Median	90%
McNary	2003	439	April 18		June 28	May 8	May 20
	2002	189	April 23	-	June 10	May 14	May 23
	2001	45	April 29	-	June 5	May 18	May 31
	2000	192	April 18	-	July 4	May 7	May 29
	1999	152	April 18	-	June 27	May 6	May 21
	1998	187	April 19	-	June 2	May 1	May 15
	1997	24	April 22	-	May 19	May 1	May 12
	1996	148	April 19	-	June 8	May 14	May 24
	1995	89	April 28	-	July 9	May 12	May 21
	1994	229	April 29	-	July 16	May 12	May 28
	1993	20	May 3	-	June 15	May 9	May 21

Appendix E. Table E3. Arrival timing of PIT tagged Imnaha River hatchery chinook salmon smolts at Lower Granite, Little Goose, Lower Monumental, and McNary dams from 1992 to 2003.

Dam	Year	Sample Size (n)	Date Range	Arrival Timing Median	Arrival Timing 90%
Lower Granite	2003	475	April 14 - May 25	May 2	May 15
	2002	461	April 1 - May 23	May 7	May 19
	2001	1,725	March 31 - May 27	April 29	May 10
	2000	782	April 7 - May 24	May 3	May 13
	1999	267	April 18 - May 25	May 5	May 14
	1998	696	April 15 - May 22	May 2	May 9
	1997	227	April 16 - May 22	May 5	May 14
	1996	169	April 13 - May 26	May 7	May 16
	1995[1]	128	April 13 - June 7	May 2	May 13
	1995[2]	83	April 16 - May 22	May 8	May 15
	1994	129	April 24 - May 18	May 12	May 12
	1992[3]	273	April 12 - June 6	April 21	May 6
Little Goose	2003	227	April 19 - May 27	May 6	May 18
	2002	544	April 13 - June 1	May 12	May 22
	2001	509	April 15 - May 29	May 7	May 16
	2000	450	April 14 - May 24	May 3	May 13
	1999	387	April 16 - June 6	May 10	May 19
	1998	391	April 25 - May 26	May 7	May 14
	1997	267	April 20 - May 27	May 9	May 18
	1996	131	April 23 - June 6	May 13	May 20
	1995[1]	114	April 26 - June 11	May 10	May 20
	1995[2]	67	April 27 - June 7	May 12	May 23
	1994	65	April 28 - June 2	May 14	May 21
	1992[3]	116	April 17 - May 22	April 27	May 5
Lower Monumental	2003	34	April 27 - May 27	May 15	May 22
	2002	457	April 30 - June 11	May 14	May 23
	2001	79	April 27 - June 4	May 12	May 25
	2000	107	April 19 - May 26	May 5	May 22
	1999	124	April 23 - May 25	May 11	May 20
	1998	143	April 23 - May 26	May 8	May 15
	1997	199	April 25 - June 3	May 10	May 19
	1996	136	April 23 - May 29	May 15	May 23
	1995[1]	106	April 27 - June 10	May 12	May 21
	1995[2]	71	April 29 - June 9	May 17	May 26
	1994	73	April 30 - June 7	May 14	May 20
McNary	2003	156	April 26 - May 27	May 15	May 22
	2002	220	April 16 - June 10	May 15	May 25
	2001	25	May 5 - May 31	NA	NA
	2000	99	April 24 - May 30	May 13	May 27
	1999	56	May 2 - May 26	May 19	May 24

Appendix E. Table E3. Continued.

Dam	Year	Sample Size (n)	Date Range	Arrival Timing Median	Arrival Timing 90%
McNary	1997	61	May 1 - June 1	May 10	May 19
	1996	55	May 1 - May 27	May 16	May 23
	1995[1]	67	April 29 - June 9	May 16	May 23
	1995[2]	36	May 3 - May 30	May 16	May 22
	1994	119	May 6 - June 17	May 21	May 26
	1992[3]	61	April 27 - June 1	May 8	May 17

[1] HxW crossed chinook salmon smolts PIT tagged for NPT and released at dark.

[2] HxW crossed chinook salmon smolts PIT tagged for the FPC and released one hour after tagging and recovery.

[3] Hatchery chinook salmon smolts PIT tagged and released in 1992 were over a two day period only for survival estimation.

Appendix E. Table E4. Arrival timing of PIT tagged Imnaha River natural steelhead smolts at Lower Granite, Little Goose, Lower Monumental, and McNary dams from 1993 to 2003.

		Sample Size		Arrival Timing	
Dam	Year	(n)	Date Range	Median	90%
Lower Granite	2003	1887	March 26 - July 3	May 14	May 25
	2002	979	April 10 - June 26	May 18	May 31
	2001	2,736	March 29 - September 9	May 14	May 18
	2000	2,262	April 6 - August 3	May 8	May 25
	1999	649	April 19 - June 26	May 18	June 5
	1998	1,474	April 2 - June 12	May 3	May 22
	1997	368	April 20 - July 10	May 8	May 24
	1996	537	April 19 - June 10	May 6	June 4
	1995	128	April 28 - June 19	May 2	May 9
	1994[1]	332	April 25 - Aug 15	May 8	June 1
	1994[2]	207	May 3 - Aug 20	May 9	May 30
	1993	101	May 3 - June 13	May 26	June 8
Little Goose	2003	1085	April 4 - June 29	May 18	May 26
	2002	856	April 13 - August 28	May 21	June 2
	2001	219	April 7 - August 19	May 16	May 24
	2000	458	April 11 - June 26	May 8	May 29
	1999	717	April 8 - June 24	May 21	May 25
	1998	481	April 14 - June 19	May 8	May 26
	1997	319	April 20 - June 19	May 10	May 26
	1996	365	April 20 - June 14	May 9	May 28
	1995	70	May 1 - June 23	May 7	May 12
	1994[1]	159	April 29 - July 29	May 12	May 31
	1994[2]	121	May 6 - July 26	May 15	June 1
	1993	48	May 6 - June 11	May 24	June 7
Lower Monumental	2003	497	April 2 June 21	May 25	May 28
	2002	828	April 30 - August 8	May 22	June 3
	2001	23	May 6 - October 3	NA	NA
	2000	246	April 12 - August 12	May 14	May 30
	1999	342	April 19 - June 21	May 23	May 27
	1998	213	April 16 - June 11	May 10	May 27
	1997	264	April 21 - June 6	May 11	May 25
	1996	397	April 22 - June 15	May 14	May 29
	1995	81	May 3 - May 17	May 9	May 14
	1994[1]	148	May 1 - August 8	May 12	July 8
	1994[2]	91	May 9 - July 31	May 15	July 10
	1993	43	May 6 - June 15	May 30	June 11
McNary	2003	210	April 1 June 14	May 24	May 27
	2002	124	April 29 - June 7	May 22	May 27
	2001	4	May 16 - August 5	NA	NA
	2000	58	April 15 - June 16	May 24	June 7
	1999	55	April 17 - May 31	May 25	May 27
	1998	53	April 20 - June 4	May 7	May 28

Appendix E. Table E4. Continued.

Dam	Year	Sample Size (n)	Date Range	Arrival Timing Median	Arrival Timing 90%
McNary Dam	1997	62	April 24 - June 5	May 13	May 18
	1996	157	April 25 - June 11	May 11	May 21
	1995	35	May 5 - May 27	May 11	May 17
	1994[1]	66	May 5 - June 22	May 18	June 9
	1994[2]	42	May 13 - June 25	May 18	June 6
	1993	17	May 11 - June 13	May 25	May 31

[1] NPT PIT tagged fish

[2] FPC PIT tagged fish

Appendix E. Table E5. Arrival timing of PIT tagged Imnaha River hatchery steelhead smolts at Lower Granite, Little Goose, Lower Monumental, and McNary dams from 1993 to 2003.

		Sample Size		Arrival Timing	
Dam	Year	(n)	Date Range	Median	90%
Lower Granite	2003	1261	April 14 - June 23	May 13	May 26
	2002	442	April 15 - June 27	May 17	May 31
	2001	2,541	April 21 - September 23	May 16	May 26
	2000	3,249	April 8 - July 24	May 16	May 25
	1999	1,973	April 18 - August 5	May 24	June 18
	1998	1,683	April 25 - July 29	May 15	May 26
	1997	2,346	April 19 - July 24	May 23	June 13
	1996	440	April 23 - July 14	May 28	June 14
	1995	661	May 6 - July 12	May 31	June 16
	1994[1]	164	April 29 - August 20	May 29	July 15
	1994[2]	306	May 6 - August 21	May 25	June 23
	1993	224	May 3 - June 28	May 17	May 31
Little Goose	2003	1015	April 16 - June 4	May 21	May 27
	2002	326	April 19 - June 29	May 24	June 3
	2001	121	April 28 - October 30	May 20	June 21
	2000	309	April 13 - July 22	May 22	July 1
	1999	1,593	April 20 - August 22	May 25	June 18
	1998	555	May 3 - July 10	May 25	May 30
	1997	1,844	April 21 - August 23	May 26	June 13
	1996	261	April 24 - July 11	May 25	June 16
	1995	409	May 8 - Juyl 13	Jun 3	June 20
	1994[1]	86	May 2 - July 30	May 31	July 17
	1994[2]	165	May 10 - August 12	May 27	July 9
	1993	106	May 5 - July 8	May 25	June 2
Lower Monumental	2003	734	April 21 - June 9	May 26	May 29
	2002	406	April 30 - October 18	May 28	June 9
	2001	28	May 8 - October 25	NA	NA
	2000	243	April 16 - August 18	May 25	July 3
	1999	790	April 21 - July 20	May 26	June 19
	1998	253	May 5 - July 15	May 26	June 3
	1997	1,432	April 22 - August 6	May 27	June 15
	1996	232	May 6 - July 7	May 27	June 15
	1995	410	May 9 - July 13	Jun 6	June 16
	1994[1]	30	May 5 - August 5	Jun 3	July 17
	1994[2]	75	May 11 - August 24	Jun 18	July 21
	1993	92	May 7 - June 14	May 26	June 5
McNary	2003	110	April 30 - June 1	May 25	May 29
	2002	56	May 2 - June 16	May 25	June 6
	2001	8	May 21 - July 4	NA	NA
	2000	58	May 3 - July 30	July 2	July 17
	1999	79	April 27 - July 8	May 28	May 31
	1998	31	May 13 - July 2	Jun 1	June 19

Appendix E. Table E5. Continued.

Dam	Year	Sample Size (n)	Date Range	Arrival Timing Median	Arrival Timing 90%
McNary Dam	1997	245	April 23 - August 12	May 27	June 18
	1996	30	April 27 - July 3	May 23	June 7
	1995	69	May 15 - July 17	Jun 5	June 27
	1994[1]	22	May 17 - July 14	Jun 5	July 10
	1994[2]	56	May 20 - July 11	Jun 17	July 8
	1993	7	May 11 - June 5	May 19	May 30

[1] NPT PIT tagged fish released at dark

[1] FPC PIT tagged fish released after recovery

APPENDIX F

MORTALITY AT THE IMNAHA RIVER TRAP DURING MIGRATION YEAR 2003

Appendix F. Table F1. Mortality of chinook salmon and steelhead smolts due to trapping, handling, and PIT tagging at the upper Imnaha River trap from October 1 to November 21, 2002.

	Chinook Salmon				Steelhead			
	Natural		Hatchery		Natural		Hatchery	
Number Captured	7,616		0		6		1	
Mortality (n)	35		0		0		0	
Source	(n)	(%)	(n)	(%)	(n)	(%)	(n)	(%)
Trapping	5	(0.066)	0	(0.000)	0	(0.000)	0	(0.000)
Handling	5	(0.066)	0	(0.000)	0	(0.000)	0	(0.000)
PIT Tagging	25	(0.328)	0	(0.000)	0	(0.000)	0	(0.000)
Total	35	(0.460)	0	(0.000)	0	(0.000)	0	(0.000)

Appendix F. Table F2. Mortality of chinook salmon and steelhead smolts due to trapping, handling, and PIT tagging at the lower Imnaha River trap from March 7 to June 25, 2003.

	Chinook Salmon				Steelhead			
	Natural		Hatchery		Natural		Hatchery	
Number Captured	5,846		29,095		8,771		39,581	
Mortality (n)	26		12		4		18	
Source	(n)	(%)	(n)	(%)	(n)	(%)	(n)	(%)
Trapping	13	(0.222)	4	(0.014)	4	(0.046)	18	(0.003)
Handling	7	(0.120)	8	(0.027)	0	(0.000)	0	(0.000)
PIT Tagging	6	(0.103)	0	(0.000)	0	(0.000)	0	(0.000)
Total	26	(0.444)	12	(0.041)	4	(0.046)	18	(0.003)

APPENDIX G

INCIDENTAL CATCH FOR MIGRATION YEAR 2003

Appendix G. Table G1. The catch of incidental fish during the fall, October 1 to November 21, 2002, and the spring, March 7 to June 25, at the Imnaha River juvenile fish trap for the 2003 migration year.

Family	Common Name	Fall of 2002	Spring of 2003	Total Catch
Salmonidae	Adult Steelhead	0	128	128
	Rainbow Trout / Steelhead	968	513	1481
	Mountain Whitefish	367	8	375
	Bull Trout	44	3	47
				0
Centrarchidae	Smallmouth Bass	5	14	19
				0
Catostomidae	Bridgelip Sucker	14	82	96
	Largescale Sucker	4	10	14
	Sucker (unidentified species)	107	324	431
				0
Cyprinidae	Chislemouth	0	30	30
	Longnose Dace	12	344	356
	Speckled Dace	1	3	4
	Northern Pikeminnow	46	24	70
	Redside Shiner	21	10	31
				0
Cottidae	Sculpin (unidentified species)	0	25	25
				0
	Total Catch	1,589	1,518	3,107