FISHERY RESEARCH

LOWER SNAKE RIVER COMPENSATION PLAN CHINOOK SALMON FISH HATCHERY EVALUATIONS—IDAHO

Project Progress Report

Report Period October 1, 2005 to September 30, 2006

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Lower Snake River Compensation Plan
Chinook Salmon Fish Hatchery Evaluations—Idaho
Part 1: Chinook Salmon

2006 Annual Report
October 1, 2005 to September 30, 2006

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ABSTRACT

This annual report provides a finalized summary of the brood year 2001 Chinook salmon *Oncorhynchus tshawytscha* run and summarizes brood year 2004 juvenile survival and 2006 adult return data for Chinook salmon at Lower Snake River Compensation Plan (LSRCP) hatcheries operated by the Idaho Department of Fish and Game (IDFG).

Idaho-LSRCP hatcheries (McCall, Clearwater, and Sawtooth) released a combined total of 5,299,651 brood year 2004 Chinook salmon, including 650,462 subyearling parr and presmolts in 2005 and 4,649,189 yearling smolts in 2006.

Representative groups of brood year 2004 hatchery-origin Chinook salmon juveniles were tagged with passive integrated transponder (PIT) tags to estimate survival to Lower Granite Dam (LGD). Estimated survival rates ranged from 4.6% for presmolts released from Powell Pond to 79.0% for smolts released from Powell Pond.

In 2006, 31,223 adult and jack spring and summer Chinook salmon were counted at LGD, which was slightly lower than the 2005 return of 35,100, and 2.1 times lower than the previous 10-year average (1996-2005) of 64,622. Of the total 2006 return, 21,360 were estimated to be hatchery-origin (68.4%).

Contribution to the total hatchery return of adult Chinook salmon from individual LSRCP fish hatcheries operated by IDFG include 3,729 for McCall stock released at Knox Bridge, 490 for Sawtooth stock released at Sawtooth Fish Hatchery, and 2,050 for the Clearwater Fish Hatchery satellite facilities (822 at Powell, 1,228 at Red and Crooked rivers). These numbers include the estimated number of fish harvested in the Pacific Ocean, the Columbia and Snake river basins, and those trapped at the hatchery weirs.

Smolt-to-adult return (SAR) rates for brood year 2001 LSRCP spring and summer Chinook salmon released as yearling smolts (including the estimated harvest) ranged from 0.05% for the South Fork Clearwater to 0.56% for fish released from McCall Fish Hatchery.

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INTRODUCTION

The U.S. Army Corps of Engineers (USACE) constructed four hydroelectric dams (Ice Harbor, Lower Monumental, Little Goose, and Lower Granite) on the lower Snake River between 1961 and 1975. Fishery managers and biologists expected the survival of downstream migrating smolts and upstream migrating adults to be reduced by dam construction and operation as well as by the alteration of the river ecosystem. A joint Coordination Act Report (CAR) written by the U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS) in 1972 was submitted to the USACE describing the impacts of the four lower Snake River dams on both fish and wildlife. Based on that report, the USACE submitted a Special Report to Congress which was used to authorize the Lower Snake River Compensation Plan (LSRCP) through the Water Resources Development Act of 1976 (90 Stat. 2917). Intent of the LSRCP is to mitigate for the reduced survival of anadromous fish resulting from the construction and operation of the four lower Snake River dams. The primary compensation tool specified in the LSRCP is a hatchery mitigation program. In 1977, the USFWS was given budgeting and administrative responsibility for operation and maintenance funding of LSRCP fish hatchery programs through an interagency agreement among the USACE, NMFS, and the USFWS.

The LSRCP hatchery program specified the use of fish hatcheries to produce and release enough juvenile anadromous salmonids to meet adult return goals established to offset the estimated mortality caused by the four lower Snake River dams. Original mortality estimates for spring and summer run Chinook salmon *Oncorhynchus tshawytscha* attributable to the four lower Snake River dams were derived by applying a 15% smolt mortality rate at each of the four projects (a total estimated loss of 48%) (U.S. Army Engineer District, 1975). That expected loss was multiplied by the estimated return of spring/summer Chinook salmon adults (122,200) to the Snake River in 1957 (pre-dam construction). This resulted in an annual mitigation goal of 58,677 spring and summer run (50,677 spring run and 8,000 summer run) Chinook salmon above Lower Granite Dam (LGD) (LSRCP 1991, Table 1). Additionally, a return goal of 18,300 adult fall run Chinook salmon above LGD was also established using similar criteria, but those fish are not included in this report.

To achieve the established mitigation goals, LSRCP-funded hatcheries were constructed in Idaho, Oregon, and Washington. Hatcheries located in Idaho include three operated by Idaho Department of Fish and Game (IDFG) and one operated by the USFWS. Facilities operated by IDFG include Clearwater, McCall, and Sawtooth fish hatcheries (with four associated satellite facilities) (Figure 1; Table 2). Facilities operated by USFWS include Dworshak National Fish Hatchery (DNFH) and the associated Kooskia satellite facility (Figure 1). Adult return goals for LSRCP hatcheries operated by IDFG account for 39,360 of the 58,677 return goal above LGD (Table 2). Hatchery capacity specifications for LSRCP facilities operated by IDFG were based on adult escapement goals (Table 2) (U.S. Army Engineer District 1975) and an average smolt-to-adult return (SAR) rate of 0.87%.

In addition to the LSRCP funded hatcheries located in Idaho, Idaho Power Company (IPC) owns and maintains three additional Chinook salmon hatcheries that are operated by IDFG. Idaho Power Company's Rapid River Hatchery rears spring Chinook salmon, Pahsimeroi Hatchery rears summer Chinook salmon, and Oxbow Hatchery rears fall Chinook salmon (Figure 1). Specific information pertaining to the DNFH and IPC hatcheries are summarized in separate reports.

Table 1. Adult spring and summer run Chinook salmon return goals for the LSRCP program.

Agency / River System	Run Type	Adult Return Goal
IDFG		
S.F. Salmon River	Summer	8,000
Upper Salmon River	Spring	19,445
Clearwater River	Spring	11,915
		39,360
USWFS		
Clearwater River	Spring	9,135
		9,135
ODFW		
Grande Ronde River	Spring	5,820
Imnaha River	Spring	3,210
		9,030
WDFW		
Tucannon River	Spring	1,152
		1,152
	TOTAL	**58,677**

Table 2. Adult spring and summer run Chinook salmon return goals for LSRCP funded hatcheries located in Idaho and operated by IDFG. Return goals listed for satellite facilities are a subset of the overall hatchery return goal (in bold font).

Hatchery and Satellite	First Year of Operation	Run Type	Adult Return Goal
McCall	1979	Summer	**8,000**
Sawtooth	1985	Spring	**19,445**
E.F. Salmon	1984	Spring	6,090
Clearwater	1990	Spring	**11,915**
Powell	1989	Spring	2,553
Red River	1986	Spring	2,553
Crooked River	1990	Spring	6,809
		TOTAL	**39,360**

LSRCP Hatcheries Operated by IDFG

McCall Fish Hatchery

McCall Fish Hatchery was built in 1979 and is located in the city of McCall, Idaho on the North Fork of the Payette River approximately 0.16 km below the outlet of Payette Lake (Figure 1). The hatchery is the incubation and rearing facility for the South Fork Salmon River (SFSR) summer Chinook salmon program and has a rearing capacity for 1,100,000 smolts at 17 fish per pound. An adult trapping and spawning satellite facility is located on the upper SFSR near Warm Lake (Figure 1). The adult escapement goal for the SFSR is 8,000 adults above LGD.

The original broodstock for the SFSR program was composed of summer run adults collected at Little Goose Dam from 1974 to 1978, from Lower Granite Dam in 1979, and from LGD and the SFSR trap in 1980 (Kiefer et al. 1992). Adults collected between 1974 and 1980 were spawned at Rapid River or Dworshak National fish hatcheries. Resulting juveniles were released into the upper SFSR near the current location of the adult trap. Beginning in 1981, broodstock collection has come exclusively from adults captured at the adult trap site on the SFSR. From the inception of the SFSR program through brood year 1990, not all of the juvenile Chinook salmon released were marked with a fin clip. Therefore, an unknown proportion of the unmarked retuning adults through 1995 were hatchery-origin. Beginning with brood year 1991, all juvenile Chinook salmon released into the upper SFSR were marked with a fin clip, a visual implant tag, or a coded wire tag (CWT), allowing the differentiation of hatchery and naturally produced adults.

Sawtooth Fish Hatchery

Sawtooth Fish Hatchery (SFH) was completed in 1985. The hatchery is located on the mainstem Salmon River approximately 10 km upstream from the town of Stanley, Idaho (Figure 1). The hatchery consists of an adult weir, adult trap, spawning and incubation facilities, and rearing capacity of 1.7 million Chinook salmon smolts at 15 fish per pound. The original escapement goal for Sawtooth Fish Hatchery was 19,445 adult spring Chinook salmon above LGD from juvenile releases at SFH, the East Fork Salmon River, and Valley Creek.

The history of the Chinook broodstock at Sawtooth is complex. In 1966, a rearing pond was constructed at the current SFH site and received hatchery fry releases from Hayden Creek and Rapid River (Idaho), and Marion Forks fish hatchery (Oregon) (Bowles and Leitzinger 1991). During the 1970s, several releases from the Rapid River stock were made into the rearing pond. However, Bowles and Leitzinger (1991) note that adult returns from these releases were negligible. The original brood source for the SFH program came from adults captured at a temporary weir operated from 1981-1984 at the site of the current hatchery location. It was estimated that at least 50% of the adults trapped in 1981 resulted from a hatchery smolt release (914,000) in 1979 from Rapid River stock raised at the Mullen Fish Hatchery (Moore 1981). Also, an unknown proportion of adults trapped in 1982 consisted of age-5 adults from the same Rapid River smolt release. Beginning in 1983, all returning hatchery adults were SFH stock. Eggs collected from adults trapped at the temporary weir were incubated and reared at the McCall Fish Hatchery from 1981-1983 and at Pahsimeroi Fish Hatchery in 1984 and released in the upper Salmon River at the current hatchery location. Brood year 1985 was the first year that all adult trapping, incubation, and rearing occurred at the SFH. Through brood year 1990, not all of the juvenile Chinook salmon released were marked with a fin clip. Because of this, an unknown proportion of the unmarked retuning adults through

1995 were hatchery-origin. Beginning with brood year 1991, all juvenile Chinook salmon released at or above the Sawtooth Fish Hatchery weir were fin clipped or CWT and the origin of the retuning adults could be distinguished from naturally produced adults.

The East Fork Salmon River adult trap is a satellite facility of SFH that began operation in 1984. The trap is located approximately 29 km upstream of the mouth of the East Fork Salmon River (Figure 1). The escapement goal for the East Fork weir is 6,090 above LGD (Table 2). Eggs from adults that are trapped and spawned at the East Fork satellite are transferred to the SFH for incubation and rearing. Adult collection and spawning occurred at the East Fork satellite from 1985-1993. However, due to low numbers of returning adults, all adults captured were released above the weir to spawn naturally from 1994-1997. Trapping operations for Chinook salmon were discontinued from 1998-2003 due to low numbers of returning adults. Trapping resumed in 2004 but all Chinook salmon trapped since then have been released above the trap to spawn naturally.

Valley Creek, a tributary to the Salmon River just below the town of Stanley, was initially slated to receive off-site releases of up to 300,000 smolts annually. However, due to lack of adult returns to Sawtooth Fish Hatchery, no juvenile releases have occurred in Valley Creek.

Clearwater Fish Hatchery

Clearwater Fish Hatchery (CFH) was constructed in 1992 and is located on the North Fork Clearwater River approximately 1 km above the mouth near the town of Orofino, Idaho. The original adult escapement goal for CFH was set at 11,915 adult spring Chinook salmon above LGD. CFH contains adult holding, spawning, incubating facilities, and rearing space for 1,500,000 Chinook smolts and 1,700,000 steelhead smolts. Three satellite facilities (Red River, Crooked River, and Powell) associated with CFH were constructed prior to CFH (Table 2; Figure 1). Incubation and initial rearing of all Chinook salmon juveniles released at the three satellite facilities occurs at CFH.

Red River Satellite—The facility is located 24 km east of Elk City, Idaho on the Red River, a tributary to the South Fork Clearwater River. The Red River satellite facility is located approximately 21 km upstream from the mouth of Red River and approximately 183 km upstream from Clearwater Fish Hatchery. The mitigation goal for the Red River facility is 2,553 adult spring Chinook salmon above LGD. In 1976, a rearing pond and temporary weir were constructed at the site of the current satellite facility as part of the Columbia River Fisheries Development Program (Kiefer et al. 1992). In 1986, the satellite facility was updated and a permanent weir was installed near the rearing pond as part of the LSRCP program. Both fall presmolt and spring smolt releases have occurred at Red River. All adult fish trapped at Red River are temporarily held and then spawned at the Red River facility or transported to CFH for final holding and spawning.

Crooked River Satellite—An adult trap and juvenile rearing ponds were constructed on Crooked River, a tributary to the South Fork Clearwater River, in 1989. The adult trap is located on Crooked River approximately 1 km upstream from the mouth. The juvenile rearing ponds are located approximately 16 km upstream of the adult trap. The Crooked River satellite facility is located approximately 150 km upstream from the Clearwater Fish Hatchery. The mitigation goal for the Crooked River facility is 6,809 adult spring Chinook salmon above LGD. Both fall presmolt and spring smolt releases have occurred at Crooked River. There are no adult holding facilities at Crooked River so all adults retained for broodstock are transported to the Red River satellite facility. Initially, Red River and Crooked River adults were kept separate and treated as

two different stocks. However, in 1997, it was decided to treat the Red River and Crooked River adults as a single stock and adults trapped from each of the facilities are combined into the same holding ponds and are referred to as the "South Fork" stock (McGhee and Patterson 1999). For this report, harvest and escapement estimates for the South Fork stock will represent the combined juvenile release and adult recovery data from Red River and Crooked River satellite facilities.

Powell Satellite—The Powell facility is located on the upper Lochsa River approximately 200 km upstream from the Clearwater Fish Hatchery at the confluence of Crooked Fork and Colt Killed creeks (Figure 1). Both fall presmolt and spring smolt releases occur at the Powell facility, and the mitigation goal is to return 2,553 adults above LGD. Construction of an adult trap, weir, holding ponds, and a juvenile rearing pond was completed in 1989 but adult trapping began in 1988. Originally, a floating weir that spanned the Lochsa River was used to guide fish into Walton Creek where another weir guided them into the trap box. The floating weir was operated from 1988 to 1992. High water events in 1992 caused extensive damage to weir panels and the floating weir has not been operated since. Since 1992, fish have no longer been guided to Walton Creek by a mechanical structure, but rather by attraction flow from the creek, which is a small tributary with no natural run of Chinook salmon and the water source for the Powell satellite facility. Adults retained for broodstock are spawned at the Powell facility and eggs are transferred to Clearwater Fish Hatchery for incubation and rearing.

Hatchery Evaluation Component of LSRCP

The LSRCP includes a Hatchery Evaluation Study (HES) component to monitor and evaluate the hatchery mitigation program. The primary goal of the HES is to work with individual hatcheries to help determine the best hatchery management practices that allow the hatcheries to meet LSRCP and IDFG anadromous fisheries goals. The objectives of the HES are: 1) to monitor and document the extent to which hatcheries meet their mitigation goals, and 2) to conduct small-scale manipulative studies involving modified or alternative hatchery practices that show potential for increasing adult returns and achieving LSRCP and IDFG goals. These small-scale studies may be printed and bound as independent reports.

In addition to monitoring production and productivity of the LSRCP hatcheries, some production and productivity data collected from natural populations that are adjacent to the LSRCP hatchery programs are also reported. These data are typically collected by ongoing IDFG research programs (e.g., Idaho Supplementation Studies and Idaho Natural Production Monitoring programs).

The primary purpose of this report is to summarize activities at each of the LSRCP funded hatcheries operated by IDFG and to estimate at what level each facility contributed to fisheries in the Pacific Ocean and Columbia River as well as to the adult return above LGD and back to the respective hatchery trapping facilities. This includes reporting adult returns to hatchery facilities and juvenile rearing and release information on a yearly basis. Additionally, life stage specific survival post-release is reported to address overall survival from release to return. In each annual report, a given brood year is summarized or "closed out" by consolidating the juvenile rearing and release information and the adult returns from that particular brood year. Because of the five-year generation length of Chinook salmon, there is a five-year lag associated with summarizing the productivity of a brood year. Hence, brood year 2001 is finalized in the current 2006 report while some preliminary data is reported for brood years 2002, 2003, and 2004. To avoid unnecessary duplication of data reporting, only the major components of data collected by hatchery staff are reported. Specific hatchery broodstock

collection, spawning, incubation, and rearing summaries can be found in hatchery specific brood year reports available from IDFG.

This report is organized into three major sections: 1) juvenile release and survival information for brood year 2004 juveniles including parr or presmolts released in 2005 and yearling smolts released in 2006; 2) adult return information, by age class (BY2001-2003), collected in 2006 including the estimated number of spring and summer Chinook salmon harvested in the Pacific Ocean, Columbia and Snake river fisheries, the number that passed over LGD, and the number of adults that returned to each hatchery; and 3) productivity estimates of the adults that returned to each hatchery facility from brood year 2001 (e.g., brood year reconstruction and parent:progeny relationships).

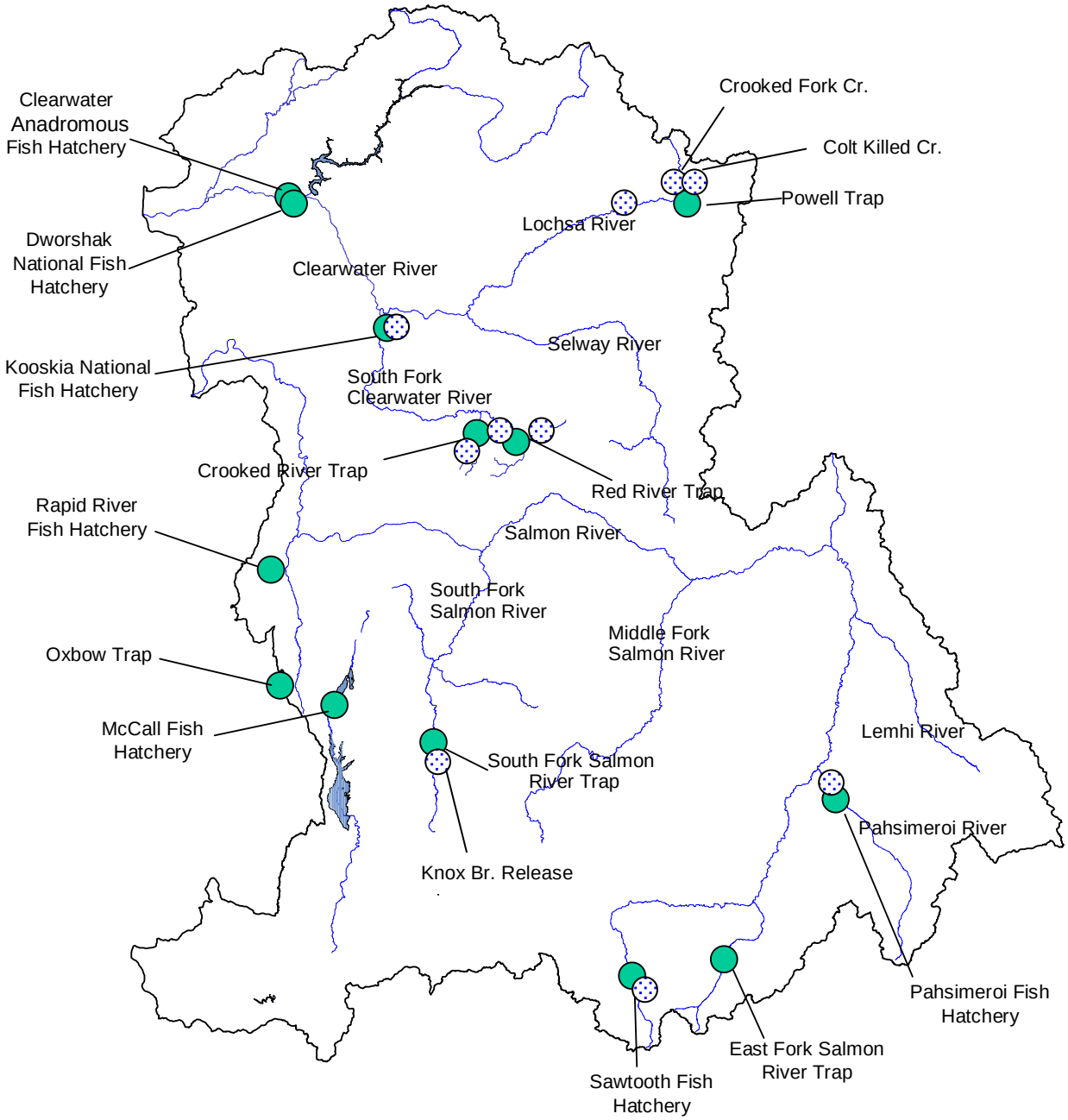

Figure 1. Locations of Chinook salmon hatcheries and trapping facilities in Idaho. Solid circles represent adult trapping or hatchery locations. Circles with dot matrix represent locations where natural-origin Chinook salmon are PIT tagged in order to estimate survival to Lower Granite Dam.

METHODS

Smolt Survival From Release To LGD

PIT-tagged Chinook salmon groups are released every year from LSRCP facilities, and one of the roles of the PIT tags is to help evaluate migration timing and survival of hatchery-reared juveniles to LGD. We calculated survival estimates of hatchery-origin juvenile Chinook salmon from release to arrival at LGD using PIT tag release groups from the various hatchery facilities. We used the Survival Under Proportional Hazards (SURPH) computer program (Lady et al. 2002) to generate point estimates of survival and 95% confidence intervals. The program uses the Cormack-Jolly-Seber model (Cormack 1964, Jolly 1965, Seber 1965) for single release and multiple recapture events, which accounts for differences in collection efficiency at the dams. For BY2004, PIT tag groups of Chinook salmon ranged in size from 300 fish at Powell and Red River to 52,000 fish at McCall. In addition to reporting survival rates of hatchery-origin fish, survival rates for several groups of natural-origin Chinook salmon that are tagged from other ongoing research projects in Idaho are also reported for comparison. All PIT-tagged natural-origin fish were captured using rotary screw traps as they volitionally emigrated from the rearing areas. In order to make comparisons with the hatchery-origin parr, presmolt and smolt releases, natural-origin fish were also classified as parr, presmolts, or smolts based on the date they were captured and tagged. Subyearlings trapped prior to September 1 are considered parr, and those captured on or after September 1 are considered presmolts. Yearling smolts are captured between February and June of the following year.

To compare arrival timing at LGD among different release groups, we also report the "arrival window" in which the middle 80% of PIT tag detections occurred. This interval provides a measure of when fish arrive at LGD and how "spread out" the major component of each release group of juveniles were as they passed LGD.

Estimating Downstream Harvest (Ocean and Columbia River)

In order to estimate the total adult production of the LSRCP hatchery facilities in Idaho, estimates of harvest from fisheries in the Pacific Ocean and Columbia River must also be evaluated. We generated harvest estimates by utilizing CWT harvest data retrieved from the Regional Mark Information System (RMIS) database, maintained by the Pacific States Marine Fisheries Commission (PSMFC). Coded-wire tags recovered from harvested fish were expanded based on two criteria: 1) the estimated sample rate of the fishery, and 2) the proportion of the release group that was tagged with CWTs. These expanded values represent the total estimated harvest of each release group within each fishery.

Adult Returns to LGD

Adult Chinook salmon returns to LGD associated with this report are comprised of both spring and summer run components. Adult counting facilities operated by the Fish Passage Center (FPC) at Lower Snake and Columbia river hydroelectric projects categorize spring and summer runs of Chinook based on their arrival timing at individual projects. At LGD, Chinook salmon arriving between March 1 and June 17 are classified as spring run while Chinook salmon arriving between June 18 and August 17 are classified as summer run. The FPC does not differentiate returning Chinook salmon by their respective origins (natural or hatchery) because some hatchery-origin Chinook salmon have no external mark, and a visual determination of origin is not possible. However, the U.S. v. Oregon Technical Advisory Committee (TAC) further breaks down the adult escapement crossing LGD into hatchery or wild origin by using data collected at

hatcheries and from fisheries. It should be noted that the TAC estimate does do not include jacks. Adult Chinook salmon return data presented in this report is from both sources (FPC and TAC).

In addition to the TAC estimates, adults Chinook salmon returning from McCall Fish Hatchery were well represented with a group of roughly 52,000 PIT tags. These PIT tags are part of the Comparative Survival Study (CSS) and undergo separation by code, meaning 70% of the tags are treated as the run-at-large and represent the untagged population while 30% of the tags are default returned to the river when detected and do not represent untagged fish. PIT tag detection antennas are present in the adult ladder at LGD and detect tags in returning adults at a high percentage. Using the juvenile tagging rate and adult detections of the run-at-large group, the returning McCall Hatchery PIT tags were expanded to estimate the number of adult returns to LGD from this facility.

Estimating Harvest from Fisheries in Idaho

Chinook salmon sport fisheries in Idaho have been variable and between 1979 and 1996 only occurred on the Little Salmon River, a terminal fishery for the Rapid River Fish Hatchery. From 1996 to 2006, more widespread sport fisheries occurred in the Salmon and Clearwater rivers. Estimates of harvest from these fisheries were calculated by IDFG regional staff and by IDFG staff funded through the LSRCP Harvest Monitoring Program (HMP) from data collected through a combination of angler check stations, roving creel, and voluntary drop-off check station boxes. CWTs are used in the mixed-stock fisheries to help determine the proportion of the harvest that each stock represents and are also used to aid in estimating the age composition of harvested fish. An example of a mixed-stock fishery is the lower Salmon River, where anglers may encounter fish destined for the South Fork Salmon River, Rapid River, Pahsimeroi, or Sawtooth hatcheries.

Adult Age Classification

We determined the age composition of adults returning to individual LSRCP hatchery facilities by one of two methods, depending on the availability of known age information (e.g., CWTs, PIT tags, or other age-specific marks) recovered from returning adults. In cases where enough known age information is available, the computer program *Rmix* was used. *Rmix* was developed by Du (2002) as an add-on program to the R (R-Development Core Team 2004) computing environment that utilized the original MIX program developed by Macdonald and Pitcher (1979). *Rmix* was designed to estimate the parameters of a mixture distribution with overlapping components, such as the overlapping length distributions associated with adult salmon returns composed of multiple age classes. *Rmix* utilizes the maximum likelihood estimation method. If known age information was lacking, then age composition was determined using length frequency histograms and the estimated mean length at age imputed into the NORMSEP feature in the FAO-ICLARM Stock Assessment Tools (FiSat) II software (FAO Computerized Information Series 2005). This method applies the maximum likelihood concept to the separation of the normally distributed components of a length frequency sample and provides an estimated number of fish for each age class.

The age notations used throughout this report for returning adults refer to the total age of the fish (fresh- plus saltwater) and assume all juveniles migrate to the ocean as age-1+ smolts. Therefore, fish that spend one, two, or three years in the ocean are classified as three-, four-, and five-year-olds, respectively.

Determination of Origin

Chinook salmon that originate in a hatchery can carry one or more marks, depending on the program the fish is from. Chinook salmon bearing an external mark, typically an adipose or ventral fin clip, are classified as hatchery-origin. However, some hatchery-origin fish have no external mark but do have a CWT and are also classified as hatchery-origin. Hatchery-origin fish are referred to as either reserve/production fish or supplementation fish. The terms reserve and production are used in reference to a hatchery-origin Chinook salmon with an adipose fin clip (AD) that can be legally harvested in a mark selective fishery while supplementation fish refers to Chinook salmon that are part of the Idaho Supplementation Study (ISS) or the Nez Perce Tribal (NPT) hatchery program and are not intended to contribute to selective sport fisheries. Supplementation fish are typically marked with a right ventral (RV) or left ventral (LV) fin clip or with a CWT and no external mark. For a more detailed explanation of the ISS program, refer to Bowles and Leitzinger (1991).

Brood Year Reconstruction, SARs, and Progeny-to-Parent Ratios

In order to reconstruct a brood year of hatchery-origin Chinook salmon, adults that return from a given brood year over three return years are summarized. For example, the 2001 brood year includes age-3 fish that returned in 2004, age-4 fish that returned in 2005, and age-5 fish that returned in 2006. These returns include fish recovered at hatchery weirs, in fisheries, and those recovered as strays, at trap sites, or during spawning ground surveys. For adult fish recovered in mixed-stock fisheries (Pacific Ocean, Columbia and Snake rivers), the total number of fish harvested from each age class is estimated based on the number of CWTs recovered from each age class expanded by both the sample rate of the fishery and the tagging rate. For fish recovered in terminal fisheries, the number of fish harvested in each age class is estimated based on the number of CWTs recovered from each age class expanded by the tagging rate. Then, the proportion of each age class (as determined from known-age CWTs) is applied to the total estimated harvest in that terminal fishery. If insufficient numbers of CWTs are recovered in the terminal fishery, length frequency data from fish sampled during the fishery will be used to estimate age-composition of the harvest.

Smolt-to-adult survival rates (SARs) were estimated by summing the total returns from a given brood year (brood year reconstruction as described above) divided by the number of smolts released from the brood in question.

Female progeny-to-parent ratios were estimated by dividing the total number of female returns from a brood year by the number of females that were spawned to create the brood in question. For example, brood year 2001 female progeny-to-parent ratio was calculated by dividing the number of age-4 and age-5 females that returned in 2005 and 2006, respectively, by the number of females that were spawned in 2001. A one-to-one ratio signifies the brood was at replacement or, simply stated, that each female spawned in 2001 produced one returning female adult. Two different female progeny-to-parent ratios are provided in this report. The first includes only the number of female-progeny that returned to the hatchery weir, and the second includes the estimated number of females harvested in addition to those returning to the weir. Harvest information includes Pacific Ocean, Columbia and Snake rivers, and terminal fisheries. The number of females harvested is estimated by applying the sex ratio of adults recovered at the hatchery weir to the estimated number of fish harvested in each fishery with the assumption that there is no gender bias either at the trap or in the fisheries. It is assumed that all three-year-old fish are males.

RESULTS AND DISCUSSION

Brood Year 2004 Juvenile Releases

From September 16, 2004 through April 21, 2006, a total of 5,299,651 brood year 2004 juvenile spring and summer Chinook salmon were released from three LSRCP hatcheries (Table 3). An additional 5,849,551 brood year 2004 juvenile spring and summer Chinook salmon were released in Idaho from IPC's Rapid River and Pahsimeroi facilities and the USFWS's Dworshak facilities (Table 3). Subyearling presmolt were released from September 16 through September 18, 2005 and smolt releases occurred from March 22 through April 21, 2006 (Table 3).

Table 3. Brood year 2004 juvenile Chinook salmon released in 2005 (subyearling fry, parr, or presmolts) and 2006 (yearling smolts) from hatcheries located in Idaho.

Rearing Hatchery	Life Stage	Release Date	Release Location	Marks	Purpose	Number Released
Clearwater	Parr	6/21	Selway R.[b]	OTC	NPT	301,528
	Presmolt	9/16	Walton Cr.	AD	LSRCP	348,934
	Smolt	4/3	Crooked R. Pond	AD	LSRCP	140,989
	Smolt	3/27	Crooked R. Trap	AD/CWT	LSRCP	42,670
	Smolt	3/27	Crooked R. Trap	AD	LSRCP	565,802
	Smolt	3/30	Red R.	AD	LSRCP	380,672
	Smolt	3/30	Red R.	AD/CWT	LSRCP	42,931
	Smolt	3/22	Walton Cr.	AD	LSRCP	339,556
	Smolt	3/22	Walton Cr.	AD/CWT	LSRCP	84,077
	Smolt	4/3	Selway R.[b]	CWT	NPT	107,540
	Smolt	4/3	Selway R.[b]	AD/CWT	NPT	209,842
			Total			**2,564,541**
McCall	Smolt	3/13	Johnson Cr.	CWT/VIE	NPT	90,450
	Smolt	3/20	Knox Bridge	AD	LSRCP	828,975
	Smolt	3/20	Knox Bridge	AD/CWT	LSRCP	263,241
			Total			**1,182,666**
Sawtooth	Smolt	3/30	Sawtooth Weir	AD	LSRCP	1,421,932
	Smolt	3/30	Sawtooth Weir	AD/CWT	LSRCP	130,512
			Total			**1,552,444**
Pahsimeroi	Smolt	3/13	Pahsimeroi Ponds	AD/CWT	IPC	54,006
	Smolt	3/13	Pahsimeroi Ponds	AD	IPC	966,596
	Smolt	3/13	Pahsimeroi Ponds	AD/CWT	IPC	53,349
			Total			**1,073,951**
Rapid River	Smolt	3/15	Rapid R.	AD	IPC	2,419,662
	Smolt	3/15	Rapid R.	AD/CWT	IPC	110,866
	Smolt	3/16	Pollock Bridge (LSR)[b]	AD	IPC	200,000
	Smolt	3/14	Hells Canyon Dam	AD	IPC	400,000
			Total			**3,130,528**
Dworshak[a]	Smolt	3/31-4/1	N.F. Clearwater R.	AD	LSRCP	1,007,738
			Total			**1,007,738**
Kooskia[a]	Smolt	3/30	Clear Creek	AD	USFWS	**637,334**
			Grand Total			**11,149,202**

[a] Data is from Burge et al. 2008.
[b] This is an offsite release, and no adult trapping facilities exists to evaluate adult returns.

Migration Timing and Survival of Brood Year 2004 Juvenile Chinook Salmon

Representative groups from all hatchery facilities were PIT tagged to evaluate migration timing and survival to LGD. These evaluation groups include fish released as subyearling parr and presmolts as well as yearling smolts.

Hatchery-Origin Yearling Smolts

The majority of PIT tagged juvenile Chinook salmon released as yearling smolts from Idaho fish hatcheries arrived at LGD from late April to mid-May (Table 4). The “80% arrival window” for yearling smolt releases averaged 17.4 days and ranged from 14 to 21 days (Table 4).

Survival estimates for yearling smolts from release to LGD averaged 59.4% and ranged from 36.9% for the Crooked River Pond release to 79.0% for the Powell Pond release group (Table 4, Figure 2). Survival of hatchery-origin yearling smolts released in 2005 is inversely related (r^2 = 0.14) with distance from the release sites to Lower Granite Dam (Figure 3). This relationship is typical of previous years (Leth et. al. 2004, Leth 2007, Cassinelli and Lindley 2008).

Hatchery-Origin Subyearling Parr and Presmolts

Only one presmolt release of hatchery origin Chinook salmon from brood year 2004 contained PIT tags. The majority of individuals from this release arrived at LGD throughout the month of April. The “80% arrival window” for the presmolt release was 25 days compared to an average of 17.4 days for the yearling smolt releases (Table 4).

The estimated survival to LGD of hatchery-origin juveniles released as presmolts was 4.6%. This is a substantial decrease from the hatchery-origin smolt survival and is likely due to the overwinter mortality associated with fish released as subyearlings. Differential survival of subyearling and yearling hatchery-origin juveniles observed in 2006 was consistent with previous years (Leth et al. 2004, Leth 2007, Leth and Lindley 2008, Cassinelli and Lindley 2008).

Table 4. Estimated survival, migration and arrival timing of brood year 2004 juvenile Chinook salmon released from fish hatcheries located in Idaho and from natural-origin juveniles PIT tagged in populations adjacent to the hatchery release sites. Probability of detection is based on output from the SURPH computer program and represents collection efficiency of the juvenile detection system at Lower Granite Dam. Survival data for natural-origin fish is from David Venditti (IDFG, personal communication). Interrogation data is from the PTAGIS database (http://www.ptagis.org).

Rearing Hatchery	Life Stage	Release Site	Program[a]	Distance to LGD (Km)	Number PIT Tagged	Number of Unique Detections at LGD	Estimated Survival (%) to LGD (95% CI)	Probability of Detection	Median Arrival Date	80% Arrival Window (# of Days)
Clearwater	Presmolt	Powell Pond	LSRCP	321	694	12	**4.6** (2.1-7.2)	0.3731	4/22	4/5 - 4/29 (25)
	Smolt	Crooked R. (low)	LSRCP	266	15,274	2,401	**62.8** (58.8-66.7)	0.2505	5/8	4/25 - 5/8 (14)
	Smolt	Crooked R. Pond	LSRCP	280	299	32	**36.9** (28.3-45.5)	0.2904	5/9	5/1 - 5/20 (20)
	Smolt	Powell Pond	LSRCP	321	15,266	3,164	**79.0** (74.6-83.3)	0.2625	5/4	4/25 - 5/11 (17)
	Smolt	Red R. Pond	LSRCP	299	15,270	2,217	**52.4** (49.3-59.6)	0.2769	5/7	4/27 - 5/14 (20)
	Smolt	Colt Killed Ck.	ISS/Nat.	341	139	21	**60.0** (40.0-80.0)	0.2500	5/15	4/14 - 6/18 (66)
	Smolt	Crooked Fork Cr.	ISS/Nat.	323	278	31	**48.0** (28.0-68.0)	0.2300	5/20	4/21 - 6/18 (54)
	Smolt	Red R.	ISS/Nat.	299	106	7	**23.0** (15.0-31.0)	0.2900	6/3	5/19 - 6/9 (22)
	Smolt	American R.	ISS/Nat.	272	384	49	**37.0** (27.0-47.0)	0.3500	5/31	5/12 - 6/17 (37)
McCall	Smolt	S. Fork Salmon R.	CSS	457	51,895	9,725	**63.8** (62.5-65.1)	0.2937	5/6	4/26 - 5/15 (21)
Sawtooth	Smolt	Sawtooth Weir	LSRCP	747	500	100	**65.3** (56.2-74.4)	0.3064	5/8	5/3 - 5/16 (14)
	Smolt	Sawtooth Weir	ISS/Nat.	747	1,634	318	**57.0** (51.0-63.0)	0.3400	5/13	4/29 - 6/4 (37)
	Smolt	Yankee Fork	LSRCP	721	695	136	**64.8** (57.5-72.1)	0.3021	5/11	5/4 - 5/18 (15)
Pahsimeroi	Smolt	Pahsimeroi R.	IPC	630	497	43	**26.7** (21.7-31.6)	0.3243	5/2	4/26 - 5/11 (16)
Rapid River	Smolt	Rapid River Hatchery	IPC	283	51,874	13,161	**75.9** (74.7-77.1)	0.3339	5/5	4/26 - 5/13 (18)
Dworshak	Smolt	N.F. Clearwater R.	LSRCP	116	52,985	8,567	**85.5** (84.3-86.7)	0.1866	4/30	4/8 - 5/12 (34)
Kooskia	Smolt	Clear Cr.	LSRCP	176	1,196	201	**69.3** (62.9-75.7)	0.2427	5/8	4/30 - 5/15 (17)

[a] ISS/Nat = Natural fish tagged as part of the Idaho Supplementation Study; LSRCP = hatchery-origin fish released as part of the LSRCP mitigation program; IPC = hatchery-origin fish released as part of the Idaho Power Company mitigation program.

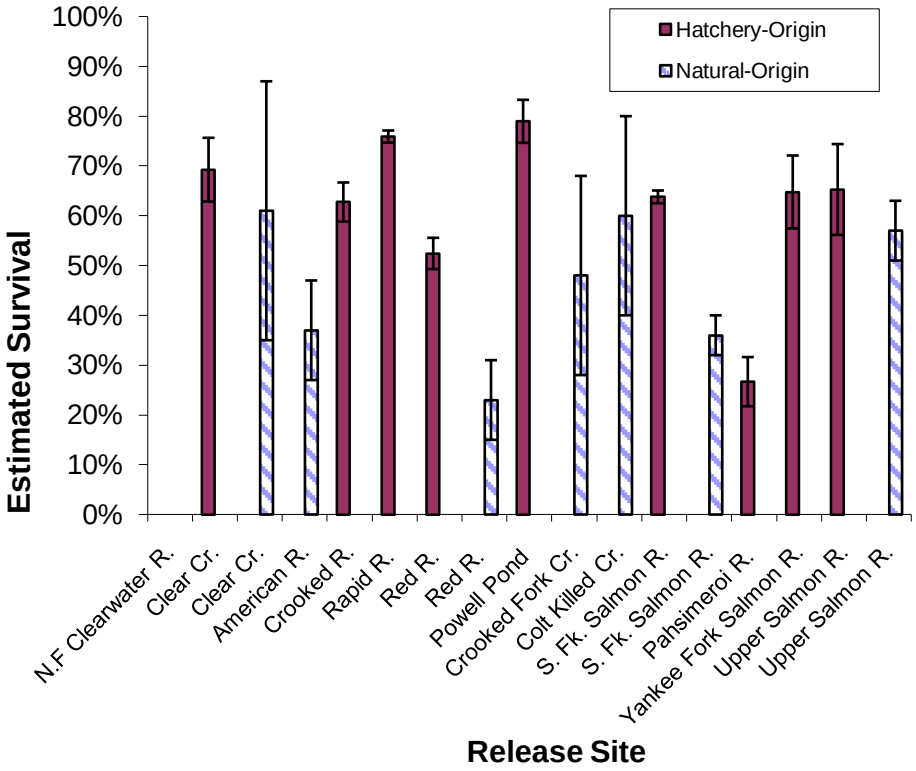

Figure 2. Estimated survival to Lower Granite Dam (LGD) of hatchery- and natural-origin Chinook salmon tagged and released as yearling smolts, spring 2006. Release sites are ordered in increasing distance from LGD (see Table 4). Error bars represent two standard errors.

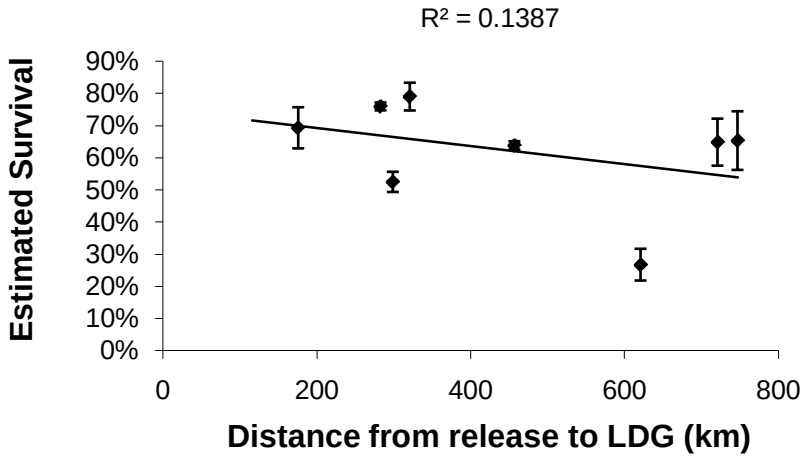

Figure 3. Relationship between estimated survival and distance from release site to Lower Granite Dam (LGD) for hatchery-origin Chinook salmon PIT tagged and released as yearling smolts, 2006. Error bars represent two standard errors.

Naturally Produced Chinook Salmon

Naturally produced Chinook salmon were PIT tagged throughout the Salmon and Clearwater river subbasins as yearling smolts (Table 4, Figure 2). Arrival timing to LGD of natural-origin juveniles that were tagged as yearling smolts was later and more protracted than the hatchery-origin smolts. The date at which 50% of the natural-origin juveniles arrived at LGD was 17 days later, on average, than the hatchery-origin smolts. The "80% arrival window" for natural-origin smolts ranged from 22 to 66 days and averaged 43.2 days compared to a range of 14 to 21 days and an average of 17.4 days for hatchery-origin smolts. Averaged over all release sites, the estimated survival rate for natural-origin yearling smolts was 45.0% (range: 23.0-60.0%) compared to 59.4% (range: 26.7-79.0%) for the hatchery-origin smolts.

2006 Adult Returns to LGD

During the 2006 adult migration, an estimated 30,561 combined hatchery- and natural-origin Chinook salmon crossed LGD between April 27 and August 17, of which 29,588 were adults and 1,635 were jacks. The 2006 return was 87% of the return in 2005 and 47% of the most recent 10-year average of 64,622 (Table 5).

Table 5. Hatchery- and natural-origin spring and summer Chinook salmon counted at Lower Granite Dam (LGD) 1979-2006. Spring Chinook salmon are defined as crossing LGD March 1 to June 17 and summer Chinook salmon as crossing June 18 to August 17. Data obtained from Fish Passage Center (http://www.fpc.org).

	LGD Count						
Return Year	Spring Adult	Spring Jack	Spring Total	Summer Adult	Summer Jack	Summer Total	Spring and Summer Combined
2006	22,530	973	**23,503**	7,058	662	**7,058**	**30,561**
2005	26,028	1,258	**27,286**	6,736	1,078	**7,814**	**35,100**
2004	70,742	4,482	**75,224**	8,767	2,510	**11,277**	**86,501**
2003	70,609	8,295	**78,904**	16,422	4,137	**20,559**	**99,463**
2002	75,025	2,089	**77,114**	22,159	1,953	**24,112**	**101,226**
2001	171,958	3,135	**175,093**	13,735	3,804	**17,539**	**192,632**
2000	33,822	10,318	**44,140**	3,939	3,756	**7,695**	**51,835**
1999	3,296	2,507	**5,803**	3,260	1,584	**4,844**	**10,647**
1998	9,854	109	**9,963**	4,355	328	**4,683**	**14,646**
1997	33,855	81	**33,936**	10,709	127	**10,836**	**44,772**
1996	4,207	1,639	**5,846**	2,607	944	**3,551**	**9,397**
1995	1,105	373	**1,478**	692	157	**849**	**2,327**
1994	3,120	43	**3,163**	795	73	**868**	**4,031**
1993	21,035	183	**21,218**	7,889	130	**8,019**	**29,237**
1992	21,391	533	**21,924**	3,014	298	**3,312**	**25,236**
1991	6,623	980	**7,603**	3,809	1,179	**4,988**	**12,591**
1990	17,315	244	**17,559**	5,093	128	**5,221**	**22,780**
1989	12,955	1,549	**14,504**	3,169	902	**4,071**	**18,575**
1988	29,495	924	**30,419**	6,145	362	**6,507**	**36,926**
1987	28,835	946	**29,781**	5,891	660	**6,551**	**36,332**
1986	31,576	1,307	**32,883**	6,154	1,255	**7,409**	**40,292**
1985	25,207	2,530	**27,737**	4,938	1,568	**6,506**	**34,243**
1984	6,511	1,410	**7,921**	5,429	1,815	**7,244**	**15,165**
1983	9,517	509	**10,026**	3,895	767	**4,662**	**14,688**
1982	12,367	379	**12,746**	4,210	318	**4,528**	**17,274**
1981	13,115	527	**13,642**	3,326	479	**3,805**	**17,447**
1980	5,461	1,298	**6,759**	2,688	759	**3,447**	**10,206**
1979	6,753	786	**7,539**	2,714	858	**3,572**	**11,111**
1996-2005 Ten-Year Average							**64,622**

The estimated number of natural-origin adult Chinook salmon crossing LGD in 2006 from the TAC estimates was 9,340 fish (US v Oregon Technical Advisory Committee, 2008). Therefore, the total adult hatchery escapement above LGD was estimated at 21,221, which is below the LSRCP escapement goal of 58,000 spring/summer Chinook salmon. It should also be noted that not all hatchery fish crossing LGD are from LSRCP funded hatcheries, but also include fish destined to return to IPC funded hatcheries.

2006 Adult Returns and Harvest Information by Hatchery Facility

McCall Fish Hatchery

Adult Returns—The weir was put in the South Fork Salmon River trap on June 30 and was removed on September 13. The first Chinook salmon was captured on July 1 and the last

was captured on September 13. During the 2006 trapping period, 2,151 Chinook salmon were captured including 1,563 (865 males, 698 females) hatchery production fish, 326 (158 males and 168 females) hatchery ISS fish, and 262 (170 males and 92 females) natural-origin fish (McPherson et al. 2008). The 2006 adult return was below the 2005 total return of 3,214 and 2.1 times lower than the previous ten-year average (IDFG unpublished data).

During the 2006 adult migration, 78 CWTs were recovered from McCall Hatchery Chinook salmon from fisheries in the ocean, Columbia River, Snake River below LGD, and from strays in Columbia and Snake River tributaries. Expansions for these tags resulted in a harvest estimate of 856 McCall Hatchery fish (Table 6). Estimated harvest from the terminal fishery that occurred on the South Fork Salmon River from June 29 to July 13 included 364 fish harvested from the sport fishery and 234 fish harvested from the tribal fisheries. During spawning ground surveys both above and below the SFSR weir, IDFG and NPT research staff collected carcass and redd data. From this data, an estimated 66 hatchery-origin Chinook salmon escaped above the weir and an estimated 305 dropped out below the weir. Thus, total estimated harvest and escapement of McCall hatchery-origin Chinook salmon for 2006 was 3,729 (Table 6).

Of the 1,889 hatchery origin fish that were trapped at the South Fork Trap in 2006, 1,563 were adipose clipped production fish. These fish, combined with the 984 production fish from fisheries and strays above Lower Granite Dam, create a total return of 2,547 production fish. This return was made up of fish from brood years 2001, 2002, and 2003, and the hatchery production release groups were PIT tagged at a rate of 4.9%. Based on Run-at-Large PIT tag detections of returning adults at LGD, expansions based on tagging rate indicate a return over the dam of 2,445 production fish. This expanded total is only 102 fish fewer than the return based on rack returns, harvest, dropouts, and strays, possibly indicating a slight error in harvest estimates. This error could have been caused by a difference in survival between PIT and non-PIT-tagged fish, some shed PIT tags, some PIT tag malfunction, PIT tag detection problems, or a combination of all of the above.

Table 6. Estimated harvest and escapement of hatchery-origin Chinook salmon in 2006. Recoveries are from fish released from McCall Fish Hatchery into the South Fork Salmon River (SFSR) above the adult weir and include fish from brood year 2001, 2002, and 2003.

Release Group/Site	Location and Recovery Type	Number CWTs Recovered	Estimated Number
	Ocean	7	32
	Columbia River		
	Non-Treaty Sport	11	232
	Non-Treaty Commercial	36	149
	Treaty Net	20	430
	Treaty C&S	0	0
SFSR-Knox	Strays	4	13
Bridge	Snake River		
	Non-Treaty Sport	0	0
	Strays	0	0
	Idaho		
	Sport Harvest		
	Main Salmon River	1	15
	SF Salmon River[a]	—	364
	Tribal Harvest	—	234
	Others[b]	—	371
	SFSR Weir (hatchery-origin)	—	1,889
Total		**79**	**3,729**

[a] South Fork Salmon River harvest is from Summer Chinook Salmon Sport Fishery on the South Fork Salmon River, Idaho authored by Apperson.

[b] Idaho "Others" include hatchery-origin fish that strayed in Idaho, were recovered above the SFSR weir, or dropped out below the weir. Data from Venditti et al. 2007 as well as Kim Apperson (IDFG) and Nez Perce Tribe personal communication.

Run Timing—Arrival timing of adults to the South Fork Salmon River Trap in 2006 occurred in a bimodal distribution. The majority of adults returned in the first mode from early July to early August (Figure 4). The second mode occurred from mid-August to early September. The median arrival date for males occurred on 7/19 and 7/11 for hatchery- and natural-origin fish, respectively. Median arrival date for females occurred on 7/12 and 7/11 for hatchery- and natural-origin fish, respectively.

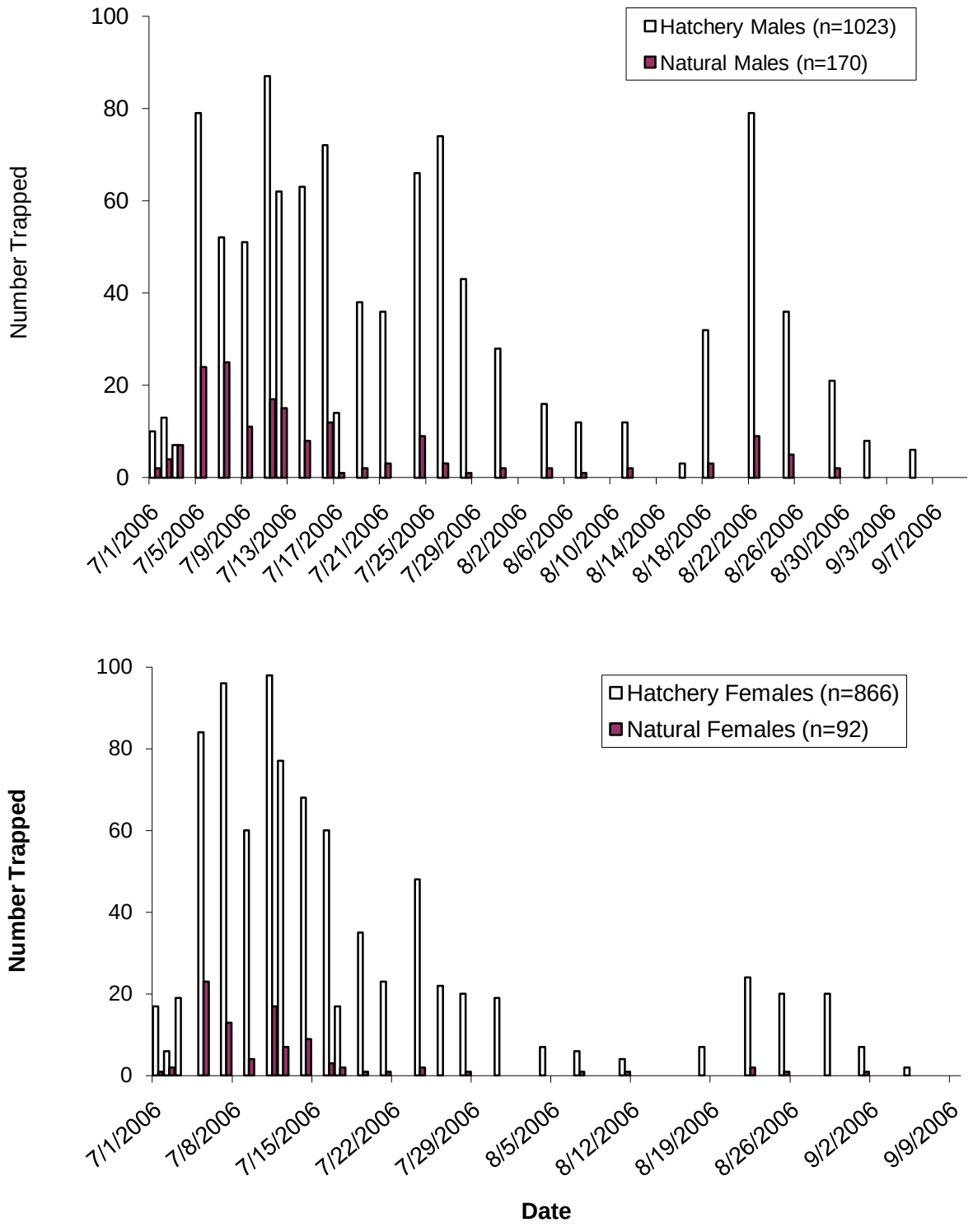

Figure 4. Run timing of hatchery- and natural-origin Chinook salmon at the South Fork Salmon River Trap in 2006.

Age Structure—Age classifications of returning hatchery-origin adults were estimated using the computer program *Rmix*. Coded-wire tags were recovered from 368 (10 age-3, 323 age-4, and 35 age-5) of the 1,889 hatchery-origin fish that returned to the South Fork Salmon River trap in 2006. Results from the *Rmix* analysis indicated that the male return was composed of 25.2% age-3, 72.8% age-4, and 2.0% age-5 returns. The female return was composed of 84.2% age-4 and 15.8% age-5 fish (Table 7). Average length-at-age for males and females is displayed in Table 7.

Table 7. Estimated age structure of hatchery-origin Chinook salmon that returned to South Fork Salmon River Trap in 2006. Average length-at-age is based on fish recovered with CWTs. Fish lengths are in centimeters. SD = standard deviation. The "Number Represented" and 95% confidence interval are based on the *Rmix* analysis.

Gender	Age	CWTs Recovered	Average Length (SD)	Number Represented (95%CI)	Percent of Return
Male	3	10	55.9 (6.9)	258 (+/-30)	25.2%
	4	154	76.0 (5.4)	744 (+/-34)	72.8%
	5	6	92.5 (6.9)	21(+/-17)	2.0%
Male Total		*170*		*1,023*	*100.0%*
Female	4	169	77.7 (3.9)	729(+/-31)	84.2%
	5	29	87.9 (3.9)	137 (+/-32)	15.8%
Female Total		*198*		*866*	*100.0%*
Total		**368**		**1,889**	

Age classifications of returning natural-origin adults were estimated using estimates of mean length of each age class applied to NORMSEP in the computer program FiSAT II. Resulting age compositions for males and females are shown in Figure 5 and Table 8 below. The male return was composed of 16.5% age-3, 65.9% age-4, and 17.6% age-5 fish. The female return was composed of 70.7% age-4 and 29.3% age-5.

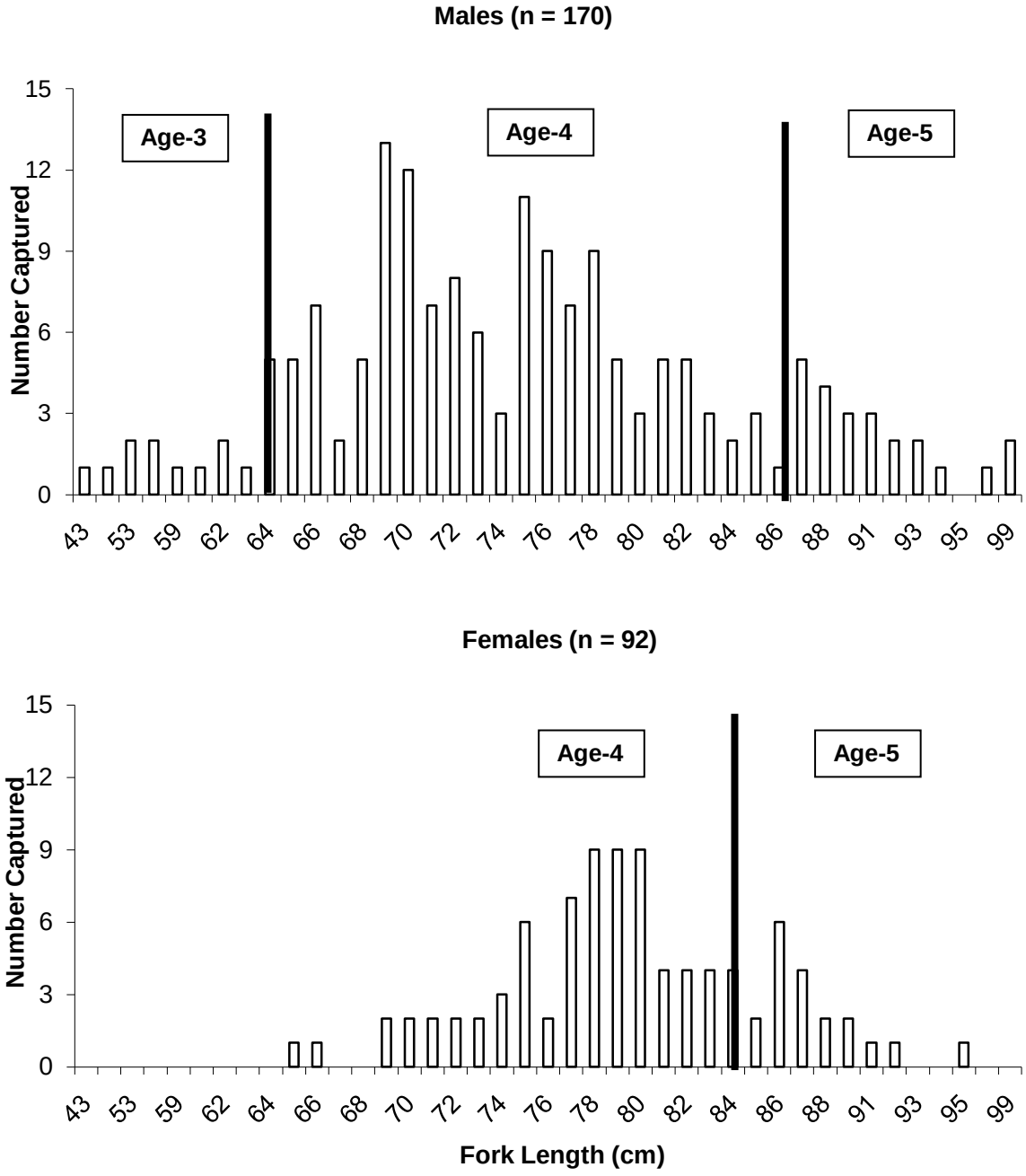

Figure 5. Length frequency and estimated age composition of natural-origin Chinook salmon trapped at the South Fork Salmon River Trap in 2006. Solid vertical bars represent length cutoffs between age classes. These cutoffs were determined after the number of fish in each age-class was determined in NORMSEP.

Table 8. Estimated age composition of natural-origin Chinook salmon that returned to the South Fork Salmon River Trap in 2006.

Gender	Age	Length Criteria	Number Trapped	Percent of Return
Male	3	<64	28	16.5%
	4	64-86	112	65.9%
	5	>86	30	17.6%
Male Total			*170*	
Female	4	<84	65	70.7%
	5	≥84	27	29.3%
Female Total			*92*	
Total			**262**	

2001 Brood Year Reconstruction and SAR—In 2006, the last of the progeny from the 2001 brood stock returned to the SFSR. In 2001, 417 females were spawned to create the release of 61,800 parr in July of 2002 and 1,054,242 smolts in March of 2003 above the SFSR Weir (Table 9). The parr were not ad-clipped but were marked with CWTs. Therefore, they were used in calculating the SAR.

From the 61,800 parr and 1,054,242 smolt released above the SFSR weir, a total of 3,213 adults returned back to the weir and an estimated 2,295 fish were harvested or recovered as strays above LGD in 2004, 2005, and 2006 (Table 10) resulting in an estimated 5,508 BY01 fish over LGD. Additionally, an estimated 417 fish were harvested or recovered as strays below LGD resulting in 5,925 fish and an overall SAR of 0.53% for brood year 2001. Excluding the parr from this analysis and only including the smolt release improves the SAR to 0.56%.

PIT tag expansions from unique detections at LGD for BY01 fish returning in 2004, 2005, and 2006 resulted in an estimate of 5,326 fish over the dam. This estimate is 182 fish fewer than the estimate obtained from rack returns combined with harvest and estimated strays (5,508 fish). Assuming PIT tag detection at LGD is close to 100%, this discrepancy would indicate that for BY01 South Fork Salmon River stock, fish with functioning PIT tags did not return to LGD at the same rate as non-PIT-tagged fish. This could be due to a higher rate of mortality in PIT-tagged fish, loss of PIT tags in a portion of tagged fish, tag malfunction resulting in non-detection, or simply missing some tags in returning fish. There is also a level of error in the harvest estimates that contributes to the variation in total estimates.

Female Progeny-to-Parent Ratio—From the 417 females that were spawned in 2001, a total of 1,223 females returned to the SFSR weir in 2005 and 2006 resulting in a female-progeny-to-parent ratio of 2.9 (Table 10). In addition to the 1,223 females recovered at the weir, an estimated 1,206 brood year 2001 females were harvested or recovered as strays in 2005 and 2006 resulting in 2,429 females and a female progeny-to-parent ratio of 5.8 indicating that for brood year 2001, the SFSR Hatchery program was above replacement.

Table 9. Number of females spawned and survival of resultant progeny from egg to release at the McCall Fish Hatchery for brood year 2001 fish released above the SFSR weir as yearling smolts. The "# of Females Spawned" does not include females whose eggs were culled and is an estimate based on average green egg to release survival.

# of Females Spawned	Average Fecundity	# of Green Eggs	# of Eyed Eggs	# of Juveniles Released[a]	Green Egg to Release Survival
417	4,354	1,793,667	1,139,385	1,116,042	62.2%

[a] Includes 61,800 parr released in the fall of 2002 and 1,054,242 smolt released in the spring of 2003.

Table 10. Estimated escapement and harvest of brood year 2001 hatchery-origin Chinook salmon adults from McCall Fish Hatchery in 2004, 2005, and 2006. Numbers in parentheses represent the percentage of the total for each recovery type. Estimated harvest and strays are reported for the area downstream of LGD (Blw. LGD) and upstream of LGD (Abv. LGD) separately.

Recovery Type	Age-3 Recoveries in 2004	Age-4 Recoveries in 2005	Age-5 Recoveries in 2006	Total Brood Year Recoveries
Hatchery Weir	895 (27.9%)	2,200 (68.5%)	118 (3.6%)	3,213
Harvest (Blw. LGD)	73 (17.9%)	268 (65.8%)	66 (16.3%)	407
Strays (Blw. LGD)	0	6 (60.0%)	4 (40.0%)	10
Harvest (Abv.LGD)[a]	181 (9.7%)	1,654 (89.0%)	23 (1.3%)	1,858
Stray/Other (Abv.LGD)[b]	174 (39.8%)	237 (54.2%)	26 (6.0%)	437
Total Recoveries	**1,323 (22.3%)**	**4,365 (73.7%)**	**237 (4.0%)**	**5,925**
Estimated # of Females[c]	0	2,234 (92.0%)	195 (8.0%)	2,429
# of Females at Weir	0	1,126 (92.1%)	97 (7.9%)	1,223

[a] Harvest above LGD includes estimates of both sport and tribal terminal harvest.
[b] Only includes fish recovered with CWTs; individual fish recovered are then expanded based on the tagging rate. Includes non-stray carcasses recovered above and below the SFSR weir.
[c] The fraction of total recoveries estimated to be female is based on the sex ratio of age-4 and age-5 fish observed at the hatchery weir in 2004 and 2005, respectively. In 2005, 51.2% of the age-4 hatchery-origin fish were female. In 2005, 82.2% of the age-5 hatchery-origin fish were female.

Sawtooth Fish Hatchery

Adult Returns—Trapping of adult Chinook salmon at the Sawtooth Fish Hatchery (SFH) began on June 19 and continued until September 15 when the weir panels were removed. The first Chinook salmon was captured on June 28 and the last was captured on September 13. During the 2006 trapping period, 761 Chinook salmon were captured including 465 (232 males, 233 females) hatchery- and 296 (208 males, 88 females) natural-origin fish (Snider et al. 2006). The 2006 adult return was less than the 2005 total return of 1,561 Chinook salmon and 2.38 times higher than the previous ten-year average (IDFG unpublished data).

For the adults returning in 2006, the only adipose clipped fish with CWT were from brood year 2002. There were three recoveries of SFH CWTs in 2006 from Columbia River fisheries and no recoveries from ocean fisheries or from stray fish (Table 11). No fisheries targeting SFH stock occurred in Idaho in 2006. In total, 465 hatchery-origin fish contributed to the return in 2006 (Table 11). Of these, 97 were unclipped supplementation fish (CWT-only) and the remainder (368) were adipose clipped production fish.

Table 11. Estimated harvest and escapement of hatchery-origin Chinook salmon in 2006. Recoveries are from fish released from Sawtooth Fish Hatchery.

Release Group/Site	Location and Recovery Type	Number CWTs Recovered	Estimated Number
	Ocean	0	0
Sawtooth Weir	Columbia River		
	Non-Treaty Sport	1	6
	Non-Treaty Commercial	2	19
	Treaty Net	0	0
	Treaty C&S	0	0
	Strays	0	0
	Idaho		
	Harvest	—	0
	Strays	—	0
	Sawtooth Hatchery Weir	—	465
Total		**3**	**490**

Run Timing—Arrival timing of hatchery adults to the SFH facility in 2006 was bimodal in distribution and showed a second spike in returns in late August and early September that is typical of previous years. The majority of adults returned from late June to late July (Figure 6). The median arrival date for hatchery males occurred on 7/8 and on 7/13 for natural-origin males. The median arrival date for hatchery females occurred on 7/8 and on 7/9 for natural-origin females.

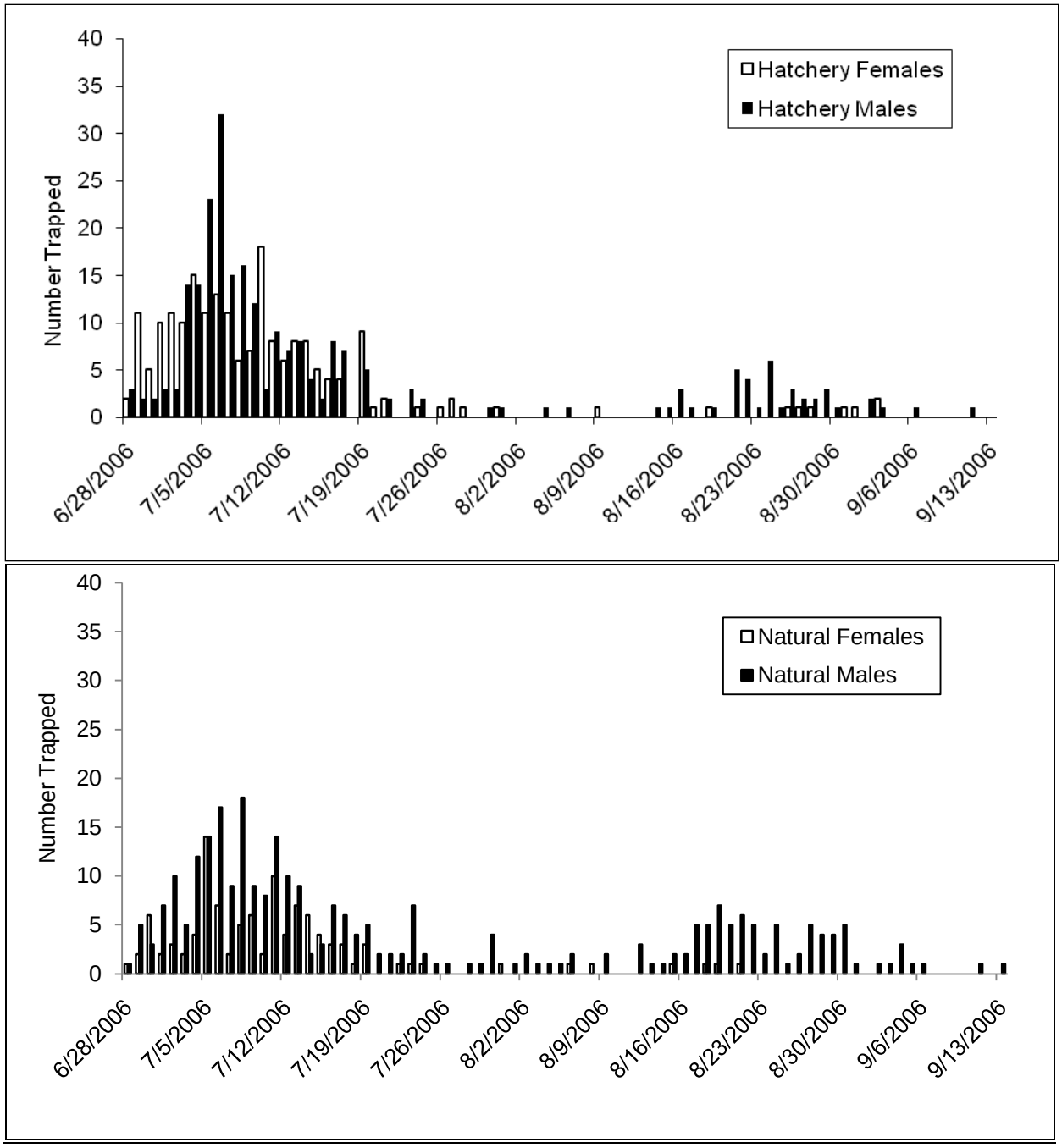

Figure 6. Run timing of hatchery- and natural-origin Chinook salmon at Sawtooth Fish Hatchery in 2006.

Age Structure—Age classification of returning hatchery-origin adult males and females was estimated using NORMSEP in the computer program FiSAT II rather than with *Rmix*, because of the lack of wire recoveries for all age classes in fish that returned to the SFH in 2006.

Results from the NORMSEP analysis indicate that the male return was composed of 15.3% age-3, 79.4% age-4, and 5.3% age-5 returns and the female return was composed of 92.2% age-4 and 7.8% age-5 fish (Table 12). Average length at age for males and females is displayed in Table 12.

Table 12. Estimated age structure of hatchery-origin Chinook salmon that returned to Sawtooth Fish Hatchery in 2006. The Number Trapped is based on the NORMSEP analysis.

Gender	Age	Average Length	Number Trapped	Percent of Return
Male	3	59.5	35	15.3
	4	71.0	183	79.4
	5	85.4	12	5.3
Male Total			*230*	*100*
Female	4	71.1	214	92.2
	5	86.3	18	7.8
Female Total			*232*	*100*
Total			**462**	

Age classification of returning natural-origin adults was estimated using estimates of mean length of each age class applied to NORMSEP. Resulting age compositions for males and females are shown in Table 13. Based on these length criteria, the male return was composed of 9.1% age-3, 83.2% age-4, and 7.7% age-5 fish. The female return was composed 90.4% age-4 and 9.6% age-5 adults.

Table 13. Estimated age composition of natural-origin Chinook salmon trapped at the Sawtooth Fish Hatchery weir in 2006. Lengths are in centimeters and measured as fork length.

Gender	Age	Average Length	Number Trapped	Percent of Return
Male	3	57.0	24	9.1
	4	72.8	225	83.2
	5	91.1	21	7.7
Male Total			*270*	*100*
Female	4	73.0	99	90.4
	5	85.6	11	9.6
Female Total			*110*	*100*
Total			**380**	

2001 Brood Year Reconstruction and SAR—In 2006, the last of the progeny from the 2001 brood stock returned to the Sawtooth Fish Hatchery. In 2001, 340 females were spawned for production resulting in the release of 960,193 smolts in April of 2003 (Table 14). From this smolt release, all 960,193 had only an adipose clip. From BY2001, 1,680 adults were produced that returned to the hatchery weir and an estimated one stray was recovered below Lower Granite (no harvest estimate was made for fisheries above LGD due to the lack of CWT) resulting in an overall return of 1,681 adults and an SAR of 0.18% (Table 14 and Table 15).

Female Progeny-to-Parent Ratio—From the 340 females that were spawned in 2001, a total of 578 females returned to the SFH weir in 2005 and 2006 resulting in a female progeny-to-parent ratio of 1.7 (Table 15) indicating that for brood year 2001, the SFH program was above replacement.

Table 14. Number of females spawned and survival of resultant progeny from egg to release at the Sawtooth Fish Hatchery for brood year 2001.

# of Females Spawned	Average Fecundity	# of Green Eggs	# of Eyed Eggs	# of Smolts Released	Green Egg to Release Survival
340	4,002	1,529,051	1,371,133	960,193	62.8%

Table 15. Estimated escapement and harvest of brood year 2001 hatchery-origin Chinook salmon adults from Sawtooth Fish Hatchery in 2004, 2005, and 2006. Numbers in parentheses represent the percentage of the total for the recovery type. Estimated harvest and strays are reported for the area downstream of LGD (Blw. LGD) and upstream of LGD (Abv. LGD) separately.

Recovery Type	Age-3 Recoveries in 2004	Age-4 Recoveries in 2005	Age-5 Recoveries in 2006	Total Brood Year Recoveries
Hatchery Weir	573 (34.1%)	1,077 (64.1%)	30 (1.8%)	1,680
Harvest (Blw. LGD)	0	0	0	0
Strays (Blw. LGD)	0	0	0	0
Harvest (Abv.LGD)	0	0	0	0
Strays (Abv.LGD)	0	0	0	0
Total Recoveries	**573 (34.1%)**	**1,077 (64.1%)**	**30 (1.8%)**	**1,680**
Estimated # of Females[a]	0 (0%)	560 (95.4%)	27 (4.6%)	587
# of Females at Weir	0 (0%)	560 (95.4%)	27 (4.6%)	587

[a] The fraction of total recoveries estimated to be female is based on the sex ratio of age-4 and age-5 fish observed at the hatchery weir in 2005 and 2006, respectively. In 2005, 52.0% of the age-4 hatchery-origin fish were female. In 2006, 90.0% of the age-5 hatchery-origin fish were female.

Clearwater Fish Hatchery

Adult Returns and Harvest—All three of the Clearwater Fish Hatchery (CFH) satellite trapping facilities were operated in 2006 and adult returns to each facility are described below. Beginning in 1997, broodstocks for Red River and Crooked River satellites have been combined and is referred to as the “South Fork” stock. For this report, brood year reconstruction for the South Fork stock includes the combined juvenile releases, adult returns, and harvest estimates from both Red River and Crooked River satellites.

Chinook salmon sport fisheries were held on sections of the mainstem Clearwater River and its tributaries in 2006. These fisheries were targeting fish destined for Dworshak Fish Hatchery, Kooskia Fish Hatchery, and the three satellite facilities of Clearwater Fish Hatchery.

Powell Satellite Facility

Adult Returns—Fish held and spawned at the Powell Facility are trapped both at the Powell Trap on Walton Creek and at a trap on Crooked Fork Creek. Trapping of adult Chinook salmon at the Powell Satellite facility began on June 6 and continued until September 11 when the trap was taken out of operation. The first Chinook salmon was captured on June 14 and the last was captured on September 7. During the 2006 trapping period, 436 (426 hatchery-origin and 10 natural-origin) Chinook salmon were captured at the Powell satellite facility. Additionally, 89 hatchery-origin and 28 natural-origin Chinook salmon were captured at a temporary weir on Crooked Fork Creek. This trap is operated by IDFG staff associated with the ISS study to monitor the escapement of natural-origin Chinook salmon in Crooked Fork Creek and to intercept hatchery-origin strays. Hatchery-origin fish captured at this trap are considered strays from the Powell release site and, in 2006, were transferred to the Powell holding ponds. The combined total of hatchery-origin fish captured at both traps was 515 fish.

Chinook salmon returning to the Powell facility in 2006 were from groups released from brood years 2001, 2002, and 2003. Only a portion of the adipose clipped fish released from brood year 2003 were tagged with coded wire, and therefore, estimates of harvest from the Pacific Ocean or Columbia River are made for only those fish. Hatchery evaluation staff estimated that 42 Chinook salmon destined for the Powell facility were harvested in the Clearwater River (IDFG unpublished data, Table 16). Including the harvest estimate, 569 Powell fish were accounted for in the 2006 return (Table 16).

Table 16. Estimated harvest and escapement of hatchery-origin Chinook salmon in 2006. Recoveries are from fish released from the Powell satellite facility.

Release Group/Site	**Location and Recovery Type**	**Estimated Number**
Powell Satellite	Columbia River	
	Strays	12
	Idaho	
	Harvest	42
	Strays	0
	Powell Satellite Trap*	515
Total		**569**

* Includes hatchery-origin fish captured at the Crooked Fork Creek weir.

Run Timing—Arrival timing of adults to the Powell trap in 2006 was unimodal in distribution. The majority of adults returned from mid-June to mid-July and lower numbers of adults continued to return through early September (Figure 13). The median arrival date for hatchery-origin and natural-origin adults occurred on 6/30 and 7/3, respectively.

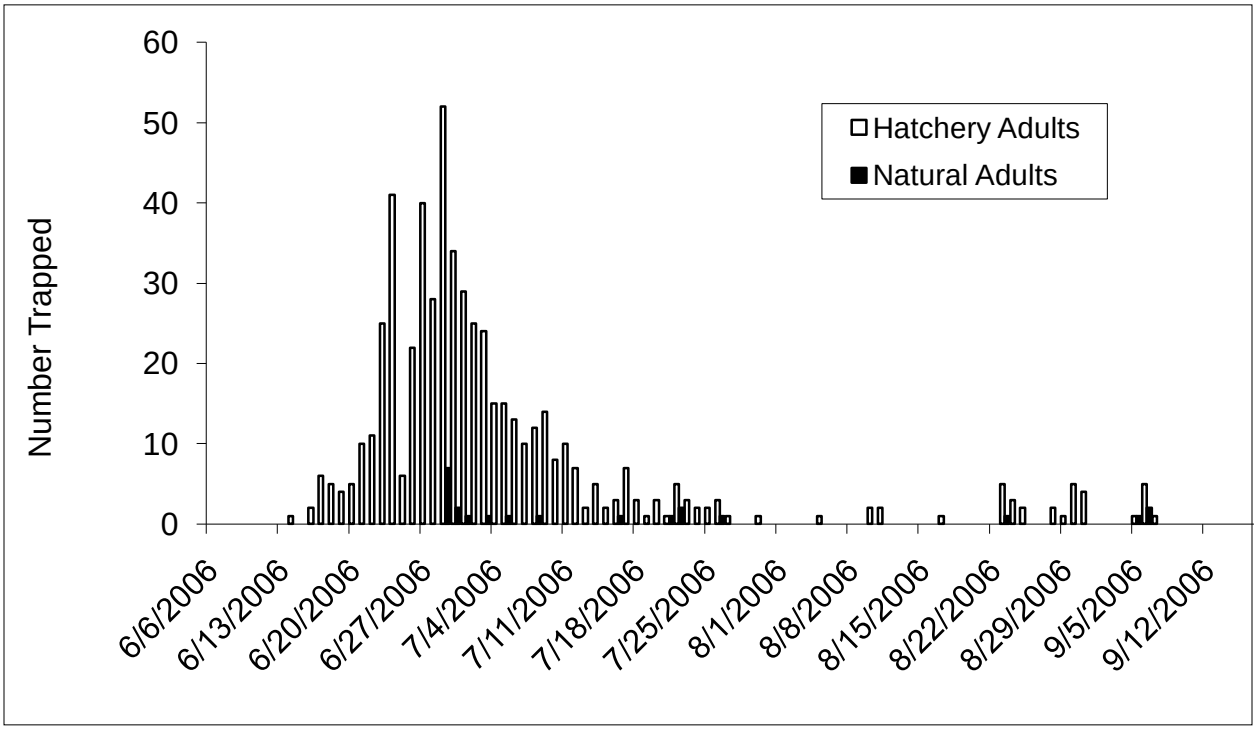

Figure 7. Run timing of hatchery- and natural-origin Chinook salmon at the Powell satellite facility in 2006.

Age Structure—Age classification of returning hatchery-origin adults was estimated from the length frequency data of fish recovered at the Powell trap using NORMSEP in the FiSAT II program. Based on length frequency data, the 2006 male return was composed of 32% age-3, 64% age-4, and 4% age-5 hatchery-origin fish and the female return was composed of 92% age-4 and 8% age-5 hatchery-origin fish (Table 17).

Table 17. Estimated age composition of hatchery-origin Chinook salmon that returned to the Powell and Crooked Fork traps in 2006.

Gender	Age	Number of Fish	Percent of Return
Male	3	85	32.5%
	4	167	63.6%
	5	10	3.9%
Male Total		*262*	*100.0%*
Female	4	233	92.0%
	5	20	8.0%
Female Total		*253*	*100.0%*
Total		**515**	

2001 Brood Year Reconstruction and SAR—For the brood year 2001 releases at Powell, no adipose-clipped fish were tagged with CWTs; therefore, no estimate of harvest was generated for the mixed stock fisheries that occurred in the ocean and Columbia and Snake rivers in 2004, 2005, and 2006. However, estimates of harvest are included for the terminal fisheries that occurred in the Clearwater and Lochsa Rivers. In 2006, the last of the progeny from the 2001 brood stock returned to the Powell satellite facility. In the fall of 2002 and the spring of 2003, a total of 526,762 parr and 350,665 smolts were released respectively from the Powell facility (Table 18). From the 877,427 fish released, 210 adults returned to the hatchery weir and 160 contributed to the harvest, resulting in an overall adult return of 370 and an SAR of 0.042%. However, it should be noted that 60% of the release was parr and their survival compared to yearling smolt releases is very low. The SAR, excluding the parr, is 0.11%.

Female Progeny-to-Parent Ratio—From the 605 females that were spawned in 2001 (Table 18), a total of 171 females returned to the Powell satellite facility or were harvested in 2005 and 2006 resulting in a female progeny-to-parent ratio of 0.28 indicating that for brood year 2001, the Powell stock was not above replacement (Table 19). However, due to the lack of CWT to estimate harvest as well as a portion of the juveniles being released off site for ISS, this estimate is biased low.

Table 18. Number of females spawned and survival of resultant progeny from egg to release at the Powell satellite facility for brood year 2001.

# of Females Spawned	Average Fecundity	# of Green Eggs	# of eyed Eggs	# of Juveniles Released[a]	Green Egg to Release Survival
605	3,829	2,067,596	1,895,201	1,256,757	66.3%

[a] Includes 526,762 parr released in August of 2002 and 350,665 smolt released in the spring of 2003 at the Powell Satellite Facility for production. Also includes 52,225 smolt (2003 release) and 327,105 parr (2002 release) released as part of the ISS study.

Table 19. Estimated escapement and harvest of brood year 2001 Chinook salmon from the Powell satellite facility in 2004, 2005, and 2006. Numbers in parentheses represent the percentage of the total for the recovery type. Estimated harvest and strays are reported for the area upstream of LGD (Abv. LGD).

Recovery Type	Age-3 Recoveries in 2004	Age-4 Recoveries in 2005	Age-5 Recoveries in 2006	Total Brood Year Recoveries
Hatchery Weir[a]	42 (20.0%)	138 (65.7%)	30 (14.3%)	210
Harvest (Abv.LGD)[b]	6 (3.8%)	151 (94.4%)	3 (1.8%)	160
Strays (Abv.LGD)	0	0	0	0
Total Recoveries	**48 (13.0%)**	**289 (78.1%)**	**33 (8.9%)**	**370**
Estimated # of Females[c]	0 (0%)	149 (87.1%)	22 (12.9%)	171
# of Females at Weir	0 (0%)	71 (78.0%)	20 (22.0%)	91

[a] Age composition at the hatchery weir in 2004 is from Leth and Lindley 2008, and 2005 data is from Cassinelli and Lindley 2008.
[b] Idaho harvest data is from Barrett 2004 and 2005 IDFG draft harvest reports.
[c] The fraction of total recoveries estimated to be female is based on the sex ratio of age-4 and age-5 fish observed at the hatchery weir in 2005 and 2006, respectively. In 2005, 51.5% of the age-4 hatchery-origin fish were female. In 2006, 66.6% of the age-5 hatchery-origin fish were female.

South Fork Clearwater River Satellites (Red River and Crooked River)

Adult Returns—Trapping of adult Chinook salmon at the Crooked River Satellite began on April 4 and continued until September 8. During the 2006 trapping period, 452 Chinook salmon were trapped at Crooked River including 444 hatchery-origin and eight (3 males, 3 females and 2 unknown sex) natural-origin fish. Trapping at Red River began on April 4 and continued until September 13. During the 2006 trapping period, 720 Chinook salmon were trapped including 684 hatchery-origin and 36 (15 males, 12 females, and 9 unknown sex) natural origin fish. All ponded fish from the Red and Crooked River traps were combined at the Red River adult holding facility.

Chinook salmon returning to the Red and Crooked River traps in 2006 were from groups released from brood years 2001, 2002, and 2003. Only fish from brood year 2003 were adipose clipped and tagged with CWTs; however, there was no harvest from the Pacific Ocean or Columbia River of these fish (this is not surprising considering they were jacks). Previous years' methods to estimate harvest of hatchery-origin Chinook salmon destined for the Red and Crooked river traps harvested in the Clearwater and South Fork Clearwater rivers were used to estimate a harvest of 89 fish for 2006 (Table 20). In all, 1,218 hatchery-origin Chinook salmon destined for the Red and Crooked river traps were accounted for in 2006 (Table 20).

Table 20. Estimated harvest and escapement of hatchery-origin Chinook salmon in 2006. Recoveries are from fish released from the Red and Crooked River satellite facilities.

Release Group/Site	Location and Recovery Type	Estimated Number
Red and Crooked River Satellites	Idaho	
	Harvest	89
	Strays	1
	Red and Crooked River Traps	1,128
Total		**1,218**

Run Timing—Adults returning to the Crooked River trap arrived primarily in a single mode from mid-June to mid-July and continued to trickle in through early September (Figure 9). The median arrival date for hatchery- and natural-origin adults occurred on 6/24.

Adults returning to the Red River trap arrived primarily in a single mode from mid-June to early July with a couple more fish arriving towards the end of August (Figure 10). The median arrival date for hatchery- and natural-origin adults occurred on 6/22 and 6/26, respectively.

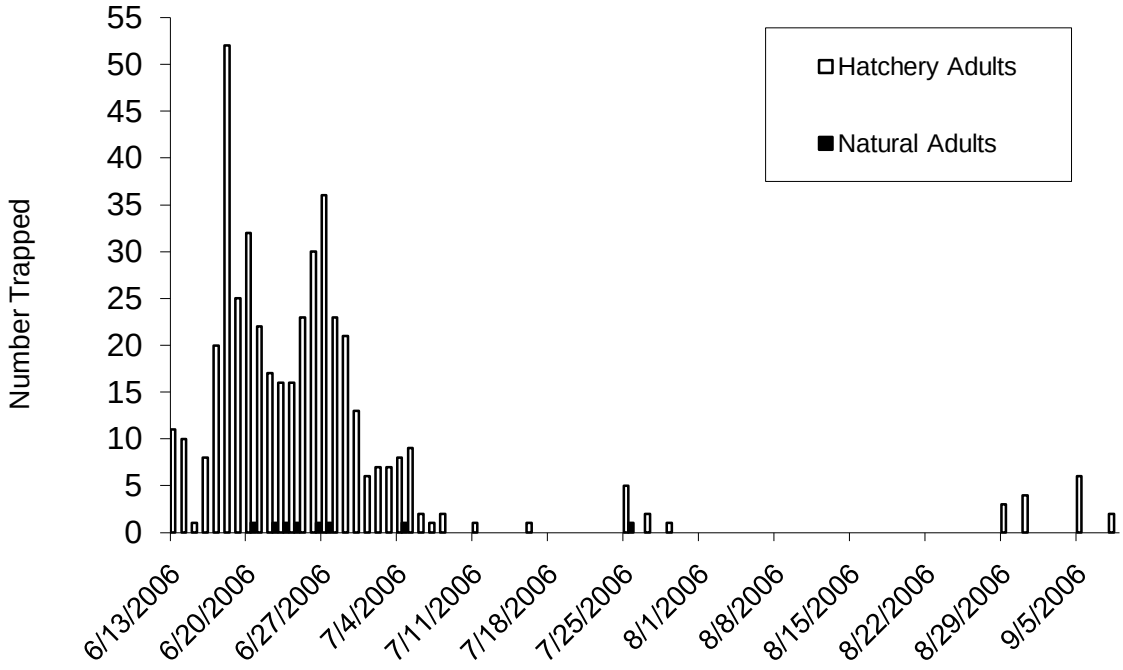

Figure 8. Run timing of hatchery- and natural-origin Chinook salmon at the Crooked River satellite facility in 2006.

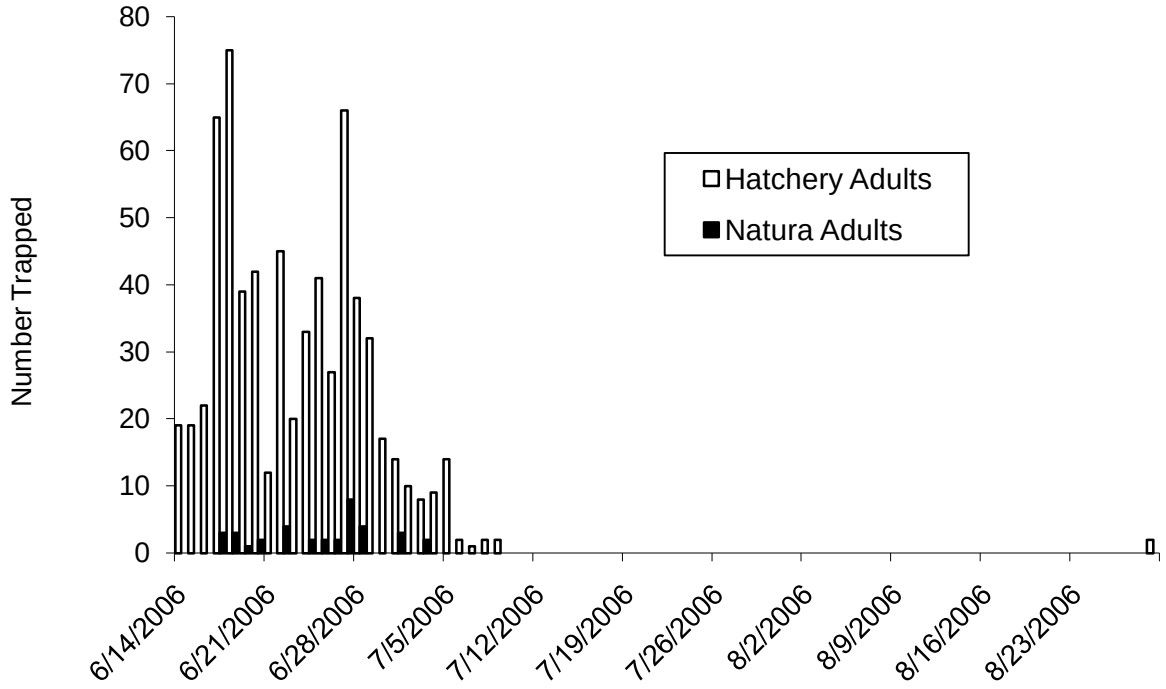

Figure 9. Run timing of hatchery- and natural-origin Chinook salmon at the Red River satellite facility in 2006.

Age Structure—We estimated age classification of returning hatchery-origin adults to the Red and Crooked river traps using estimates of mean length of each age class applied to NORMSEP in the computer program FiSAT II. Resulting age compositions show the 2006 male return was composed of 3.9% age-3, 94.1% age-4, and 2.0% age-5 hatchery-origin fish and the female return was composed of 99.1% age-4 and 0.9% age-5 hatchery-origin fish (Table 21).

Table 21. Estimated age composition of hatchery-origin Chinook salmon that returned to Red and Crooked River satellite facilities in 2006.

Gender	Age	Number of Fish	Percent of Return
Male	3	24	5.1%
	4	442	93.1%
	5	9	1.8%
Male Total		*475*	*100.0%*
Female	4	650	98.2%
	5	13	1.8%
Female Total		*663*	*100.0%*
Total		**1,138**	

We estimated the age classification of natural-origin adults from the length frequency data of fish recovered at the Red and Crooked River traps using NORMSEP in the FiSAT II program. Age composition for males is estimated at 22.2% age-3, 66.7% age-4, and 11.1% age-5. Female age composition is estimated to be 88.2% age-4 and 11.8% age-5 (Table 22).

Table 22. Estimated age composition of natural-origin Chinook salmon trapped at the Red River and Crooked river satellite facilities in 2006.

Gender	Age	Number Trapped	Percent of Return
Male	3	2	11.1%
	4	14	77.8%
	5	2	11.1%
Male Total		*18*	*100.0%*
Female	4	15	100.0%
	5	0	0.0%
Female Total		*15*	*100.0%*
Total		**33**	

2001 Brood Year Run Reconstruction and SAR—For the brood year 2001 releases in Red River and Crooked River, no adipose clipped fish were tagged with CWTs; therefore, no estimate of harvest was generated for the mixed stock fisheries that occurred in the ocean and Columbia and Snake rivers in 2004, 2005, and 2006. However, estimates of harvest are included for the terminal fisheries that occurred in the Clearwater and South Fork Clearwater rivers. Smolt-to-adult survival and female progeny-to-parent relationships only reflect the number of adults that returned to the weir and the estimated number harvested in the terminal fishery and therefore should be considered minimum estimates.

From the 255,352 presmolts released from the Red and Crooked river release sites in 2002, only eight adults were accounted for at the Red and Crooked river traps in 2004, 2005,

and 2006 resulting in an SAR of 0.003%. This SAR of presmolts for BY2001 is 70% lower than it was for BY 2000. These fish were all ventral clipped and not subject to harvest in the mark selective terminal fishery. From the 980,753 smolts released in 2003, 491 adults were accounted for in the terminal fishery and the Red and Crooked river traps in 2004, 2005, and 2006 (Table 24) resulting in an SAR of 0.05%. These fish were all adipose clipped and subject to harvest in mark-selective fisheries. Fish released as smolts had about a 16 times better smolt-to-adult return advantage over the fish released as presmolts.

Female Progeny-to-Parent Ratio—A total of 490 females were spawned in 2001 (Table 23) to create the presmolt and smolt releases in 2002 and 2003. A total of 222 adult females returned from the smolt release resulting in a female progeny-to-parent ratio of 0.45, which indicates that for BY2001, the South Fork Clearwater Stock was not above replacement.

Table 23. Number of females spawned and survival of resultant progeny from egg to release at the Red and Crooked River release sites for brood year 2001.

# of Females Spawned	Average Fecundity	# of Green Eggs	# of Eyed Eggs	# of Juveniles Released[a]	Green Egg to Release Survival
490	4,100	1,484,173	1,435,499	1,236,105	83.3%

[a] Includes 255,352 presmolts released in September of 2000 and 980,753 smolts released in March-April 2001.

Table 24. Estimated escapement and harvest of brood year 2001 Chinook salmon adults from the Red and Crooked river satellite facilities in 2004, 2005, and 2006. Numbers in parentheses represent the percentage of the total for that recovery type. Estimated harvest only includes the terminal fishery on the Clearwater and South Fork Clearwater River.

Recovery Type	Age-3 Recoveries in 2004	Age-4 Recoveries in 2005	Age-5 Recoveries in 2006	Total Brood Year Recoveries
Hatchery Weir	56 (19.4%)	210 (72.9%)	22 (7.7%)	288
Terminal Harvest	7 (3.4%)	194 (95.6%)	2 (1.0%)	203
Total Recoveries	**63 (12.8%)**	**404 (82.3%)**	**24 (4.9%)**	**491**
Estimated # of Females[a]	0	208 (93.7%)	14 (6.3%)	222
# of Females at Weir	0	108 (89.3%)	13 (10.7%)	121

[a] The fraction of total recoveries estimated to be female is based on the sex ratio of age-4 and age-5 fish observed at the hatchery weir in 2005 and 2006, respectively. In 2005, 51.4% of the age-4 hatchery fish were females. In 2006, 59.1% of the age-5 hatchery-origin fish were females.

SUMMARY

Table 25. Mitigation adult return goals for Idaho LSRCP Hatcheries and actual returns and SARs for brood year 2001 Chinook salmon.

Hatchery/Stock	Adult Return Goal	Actual 2006 Return
McCall/S.F. Salmon	8,000	5,508
Sawtooth/Upper Salmon R.	12,000	465
Clearwater/Powell	2,553	822
Clearwater/South Fork	9,362	1,228

The basis of this report is to provide a summary of Chinook salmon juvenile releases and adult returns for the three IDFG LSRCP hatcheries in 2006 as well as to “close out” brood year 2001 Chinook salmon. The LSRCP mitigation goal for the three IDFG facilities is 39,360 summer/spring Chinook salmon returning to Lower Granite Dam. Original adult return goals were calculated using a SAR rate of 0.87% (U.S. Army Engineer District 1975). To facilitate the return goal, the combined annual release goal of the three facilities is roughly 4.5 million juveniles.

McCall Hatchery has an annual release goal of 1,100,000 yearling smolts that was established to return approximately 8,000 adults to LGD. Since the inception of the facility in 1979, release numbers have ranged from a low of 122,247 smolts in 1982 to a high of 1,182,666 smolts in 2006. In March of 2003, 1,054,242 brood year 2001 smolts were released above the SFSR Weir at Knox Bridge. From this release, 3,213 adults returned to the SFSR weir in 2004, 2005, and 2006 and an additional 2,295 fish were harvested or recovered as strays above LGD resulting in a return of 5,508 adults. Therefore, for brood year 2001, adult returns did not surpass the mitigation goal of 8,000 fish. Also, for return year 2006, which included fish from brood year 2001, 2002, and 2003, only 2,873 adults were trapped, harvested, or accounted for as strays above LGD indicating that for this return year, McCall Hatchery did not meet its mitigation goal. By comparison, 4,815 SFSR adults returned over LGD in 2005, 9,523 returned in 2004, 13,527 returned in 2003, 14,685 returned in 2002, and 17,021 returned in 2001.

Sawtooth Hatchery has a production goal of 1,400,000 smolts. The original smolt production goal for Chinook salmon was 2,300,000, which included 600,000 released into the East Fork Salmon River and 300,000 into Valley Creek. Due to low adult returns, broodstock collection in the East Fork Salmon River was discontinued in 1993 and no releases have ever occurred in Valley Creek. Currently, all Chinook salmon releases are conducted on site at the hatchery. The original adult return goal for Sawtooth Hatchery was 19,445 adults and included returns from juveniles released at Valley Creek and the East Fork Salmon River. To date, hatchery-origin adult returns to the Sawtooth adult trap have ranged from 10-1,535 fish in a single return year. Based on the original modeled SAR of 0.87%, expectations of adult returns from the current juvenile release goal of 1.3 million smolts would result in approximately 12,000 adults over Lower Granite Dam. In March of 2003, 1,096,739 brood year 2001 smolts were released above the Sawtooth Hatchery weir. From this release, 1,680 adults returned to the weir in 2004, 2005, and 2006 with no additional fish being recovered as strays above Lower Granite Dam resulting in a return of 1,680 fish indicating that for brood year 2001, the Sawtooth Hatchery was well below its mitigation goal. Also, for return year 2006, which included fish from

brood year 2000, 2001, and 2002, only 465 adults were trapped above LGD. By comparison, in 2005, 1,280 adults returned above LGD, 1,540 adults returned in 2004, 698 returned in 2003, 923 returned in 2002, and 1,427 returned in 2001.

Clearwater Fish Hatchery has historically released Chinook salmon at various sites in the Clearwater basin and the release goals for those release sites have varied. Currently, Chinook salmon releases occur at the three Clearwater satellite facilities. Also, CFH releases about 300,000 Chinook salmon smolts and 300,000 parr into the Selway River on an annual basis. The smolt release goal for the Powell satellite is 334,000 juveniles to meet the return goal of 2,553 adults above LGD. In 2003, a total of 526,762 parr and 350,665 smolts were released from the Powell facility. From the 913,427 fish released, 210 adults returned to the hatchery weir and 160 contributed to harvest in 2004, 2005, and 2006 resulting in an overall adult return of 370 brood year 2001 adults, well below the mitigation goal for this facility. However, harvest estimates were not available for these fish because of a lack of CWT. For return year 2006, 822 Powell adults returned above LGD, well below the mitigation goal for this facility. By comparison, 400 Powell adults returned above LGD in 2005, 2,496 retuned in 2004, 1,678 returned in 2003, and 1,837 returned in 2002.

The smolt release goal of the South Fork Clearwater is 1,134,000 juveniles (800,000 fish from Crooked River and 334,000 from Red River) to meet a return goal of 9,362 adults (6,809 for Crooked River and 2,553 for Red River) above LGD. In the fall of 2002, 255,352 brood year 2001 presmolts were released from the Red and Crooked river release sites. From this release, eight adults were accounted for at the Red and Crooked river traps in 2004, 2005, and 2006. From the 980,753 brood year 2001 smolts released in 2003, 491 adults were accounted for in the terminal fishery and the Red and Crooked river traps in 2004, 2005, and 2006. Fish released as smolts showed a 16 times better smolt-to-adult return advantage over the fish released as presmolts. The total return for brood year 2001 adults for the South Fork Clearwater of 491 fish was well below the mitigation goal for this facility. For return year 2006, 1,228 South Fork adults returned above LGD. By comparison, 516 adults returned above LGD in 2005, 2,170 adults returned in 2004, 1,579 returned in 2003, and 925 returned in 2002.

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