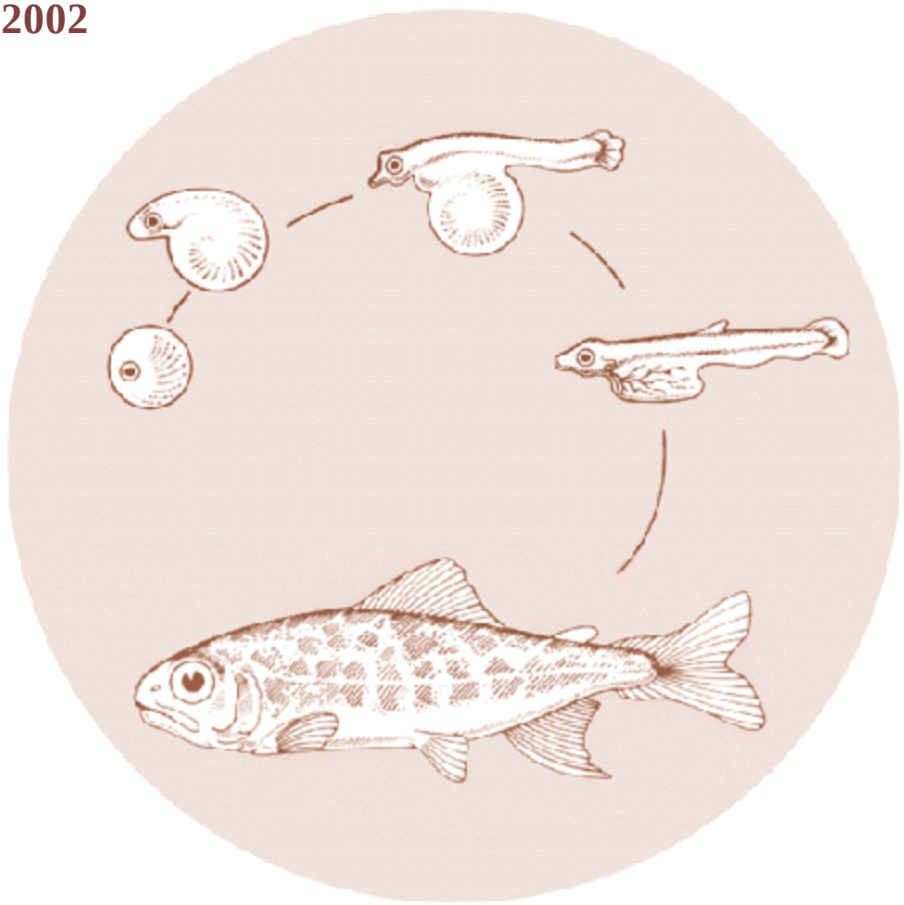
Salmon Supplementation Studies in Idaho Rivers

Field Activities Conducted on Clear and Pete King Creeks

Annual Report
2002



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Salmon Supplementation Studies in Idaho Rivers

Annual progress report for field activities conducted
on Clear and Pete King creeks in 2002

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Abstract

In 2002 the Idaho Fisheries Resource Office continued working as a cooperator on the Salmon Supplementation Studies in Idaho Rivers (ISS) project on Pete King and Clear creeks. Data relating to supplementation treatment releases, juvenile sampling, juvenile PIT tagging, broodstock spawning and rearing, spawning ground surveys, and snorkel surveys were used to evaluate the project data points and augment past data. Supplementation treatments included the release of 51,329 left ventral-clipped smolts into Clear Creek (750 were PIT tagged), and 12,000 unmarked coded-wire tagged parr into Pete King Creek (998 were PIT tagged). Using juvenile collection methods, Idaho Fisheries Resource Office staff PIT tagged and released 579 naturally produced spring chinook juveniles in Clear Creek, and 54 on Pete King Creek, for minimum survival estimates to Lower Granite Dam. For Clear Creek, minimum survival estimates to Lower Granite Dam of hatchery produced supplementation and naturally produced PIT tagged smolts, were 36.0%, and 53.1%, respectively. For Pete King Creek, minimum survival estimates to Lower Granite Dam, of hatchery produced supplementation smolts and naturally produced smolts PIT tagged as parr and presmolts, were 18.8%, and 8.3%, respectively. Adults collected for broodstock in 2002 represented the final adult broodstock group collected for the ISS project. Twenty-six ventral clipped, and 28 natural adult spring chinook were transported above the weir. Monitoring and evaluation of spawning success was continued on Clear and Pete King creeks. A total of 69 redds were counted and 79 carcasses were recovered on Clear Creek. Two redds were observed and no carcasses were collected on Pete King Creek.

Introduction

In 1991, the Idaho Supplementation Studies (ISS) project was implemented to address critical uncertainties associated with hatchery supplementation of chinook salmon *Oncorhynchus tshawytscha* populations in Idaho (Bowles and Leitzinger 1991). The project was designed to address questions identified in the Supplementation Technical Work Group (STWG) Five-Year Work Plan (STWG 1988). Two goals of the project were identified: 1) assess the use of hatchery chinook salmon to increase natural populations in the Salmon and Clearwater river drainages, and 2) evaluate the genetic and ecological impacts of hatchery chinook salmon on naturally reproducing chinook salmon populations. In response to these goals, four objectives were developed: 1) monitor and evaluate the effects of supplementation on presmolt and smolt numbers and spawning escapements of naturally produced fish; 2) monitor and evaluate changes in natural productivity and genetic composition of target and adjacent populations following supplementation; 3) determine which supplementation strategies (broodstock and release stage) provide the quickest and highest response in natural production without adverse effects on productivity; and 4) develop supplementation recommendations (Bowles and Leitzinger 1991).

ISS is a statewide cooperative effort involving the Idaho Department of Fish and Game (IDFG), the Shoshone-Bannock Tribes, and the U.S. Fish and Wildlife Service (USFWS). Thirty-one streams were identified for the ISS project in the Salmon and Clearwater river basins. The study identified 12 treatment and three control streams in the Clearwater River basin. Seven treatment and eight control streams were identified in the Salmon River basin. The USFWS Idaho Fisheries Resource Office (IFRO) focuses on data collection on Clear Creek and Pete King Creek (Figure 1). Both are identified as treatment streams within the Clearwater River Basin (Walters et al. 2001).

ISS experimental design divided the project into three phases. Phase one began in 1991 with the development of an extensive experimental design and the collection of baseline data. In 1992, ISS began phase two, the project implementation phase. In phase two, a known broodstock was established by collecting adults from streams with weirs and raising progeny in hatcheries. Prior to release, offspring were given external marks for differentiation from general production and naturally produced spring chinook once they returned as adults. Returning ISS marked adults were used as a known, second generation, broodstock whose progeny was used to supplement treatment streams. Phase two continued through 2002. It was decided by cooperators that 2002 would be the final year of broodstock collections, thereby setting up the transition to phase three. Phase three begins with cessation of supplementation treatments, and continued monitoring and evaluation of results of those treatments. Evaluation of phase three will be monitoring adult escapement to study streams. Phase three will continue until adults from the final juvenile treatment release group return (2007), giving a minimum of three returning generations.

The USFWS IFRO began as an ISS cooperator in 1992. In addition to meeting the objectives of the ISS program, IFRO established specific objectives for Clear Creek and Pete King Creek. The objectives and the tasks associated with them were developed to help specifically define the contribution to the overall ISS program. IFRO objectives for the Clear Creek and Pete King Creek components of the ISS program are to: (1) monitor and evaluate changes in natural smolt and parr chinook salmon numbers in Clear Creek following supplementation with ventral fin clipped hatchery smolts; (2) monitor and evaluate success of natural spawning adults in Clear Creek; (3) monitor and evaluate changes in natural chinook production in Pete King Creek following supplementation with marked (coded-wire tagged) hatchery parr from the IDFG Powell satellite facility of the CAFH. Upon completing the treatments and monitoring the response of each stream we will complete the last objective: (4) develop supplementation recommendations.

IFRO is responsible for conducting snorkel surveys for parr population estimates and maintaining General Parr Monitoring (GPM) sites, collecting and PIT tagging naturally produced juveniles, and conducting redd surveys and carcass recoveries for Pete King and Clear creeks. IFRO is also responsible for operation of a five-foot diameter rotary screw trap on Clear Creek for juvenile emigrant trapping.

This document reports on field activities conducted by the USFWS-IFRO during the 2002 contract period. Included are data collected that pertain to the interim evaluation points including juvenile trapping and PIT tagging, emigration estimates and run-timing, juvenile survival estimates to Lower Granite Dam juvenile collection facility, adult escapement, information relating to broodstock collection and spawning, and rearing, marking, and release of juvenile treatments. This document is not intended to provide analysis of the data. Appendices include summaries of data collected during 1991 to 2002 field seasons.

Study Area

Clear Creek (Figure 2) is approximately 70.4 km in length, and its confluence with the Middle Fork Clearwater River is approximately 878-river km from the Pacific Ocean at an elevation of 387 meters. The geology of Clear Creek is basalt, gneiss, and schist. It is classified as a B/C channel type following the Rosgen (1985) stream classification system (Bowles and

Leitzinger 1991). The upper reaches of Clear Creek are in the Nez Perce National Forest and the lower reaches are in privately owned land and property owned by the USFWS at KNFH. The riparian habitat is primarily coniferous forest in the headwater areas, mixed coniferous and deciduous forest in the middle reaches, and deciduous and grassland areas in the lowest reaches. Riparian vegetation is sparse to nonexistent in the lower reaches. Bowles and Leitzinger (1991) classified the habitat quality of Clear Creek as 86% fair and 14% poor. The fish community consists of spring chinook salmon (*Oncorhynchus tshawytscha*), summer steelhead (*O. mykiss*), mountain whitefish (*Prosopium williamsoni*), longnose dace (*Rhinichthys cataractae*), speckled dace (*Rhinichthys osculus*), bridgelip sucker (*Catostomus columbianus*), Paiute sculpin (*Cottus beldingi*), northern pikeminnow (*Ptychocheilus oregonensis*), redside shiner (*Richardsonius balteatus*), rainbow trout (*O. mykiss*), and cutthroat trout (*O. clarki*). ISS related activities on Clear Creek are done in conjunction the USFWS Kooskia National Fish Hatchery (KNFH). Beginning in 1992 and continuing through 1996, a known ISS broodstock was developed for Clear Creek. A known origin broodstock was successfully established in 1997 from the 1994 – marked supplementation release. Supplementation releases from known origin broodstock have occurred in 1999, 2000, 2002, and additional releases are planned for 2003 and 2004. Releases were scheduled to include 2001, but low adult returns in broodyear 1999 prevented collection of the broodstock for that release.

Pete King Creek (Figure 3) is 21.8km in length and the confluence with the Lochsa River is approximately 919-river km from the Pacific Ocean at an elevation of 451 meters. The geology of the stream is batholithic (Bowles and Leitzinger, 1991). It is classified as a B/C channel type following Rosgen's (1985) stream classification system (Bowles and Leitzinger, 1991). The majority of Pete King Creek is in the Clearwater National Forest with one private residence located near the mouth. The riparian areas are densely covered with coniferous and deciduous forest. Bowles and Leitzinger (1991) classified the habitat quality of Pete King Creek as 100% fair. An unimproved road (Forest Service road no. 453) runs adjacent to the lower 8 km of stream. This road is prone to landslides in years of heavy rain or snow. The fish community consists primarily of summer steelhead (*O. mykiss*), spring chinook salmon (*O. tshawytscha*), cutthroat trout (*O. clarki*), rainbow trout (*O. mykiss*), and sculpin (Cottus spp.). Idaho Department of Fish and Game is responsible for collection of broodstock, rearing and releasing of parr treatments into Pete King Creek. No weirs or adult trapping facilities are installed on Pete King Creek, so broodstock is collected at the IDFG Powell satellite facility. Juveniles are reared at Clearwater Anadromous Fish Hatchery (CAFH) at Ahsahka, Idaho.

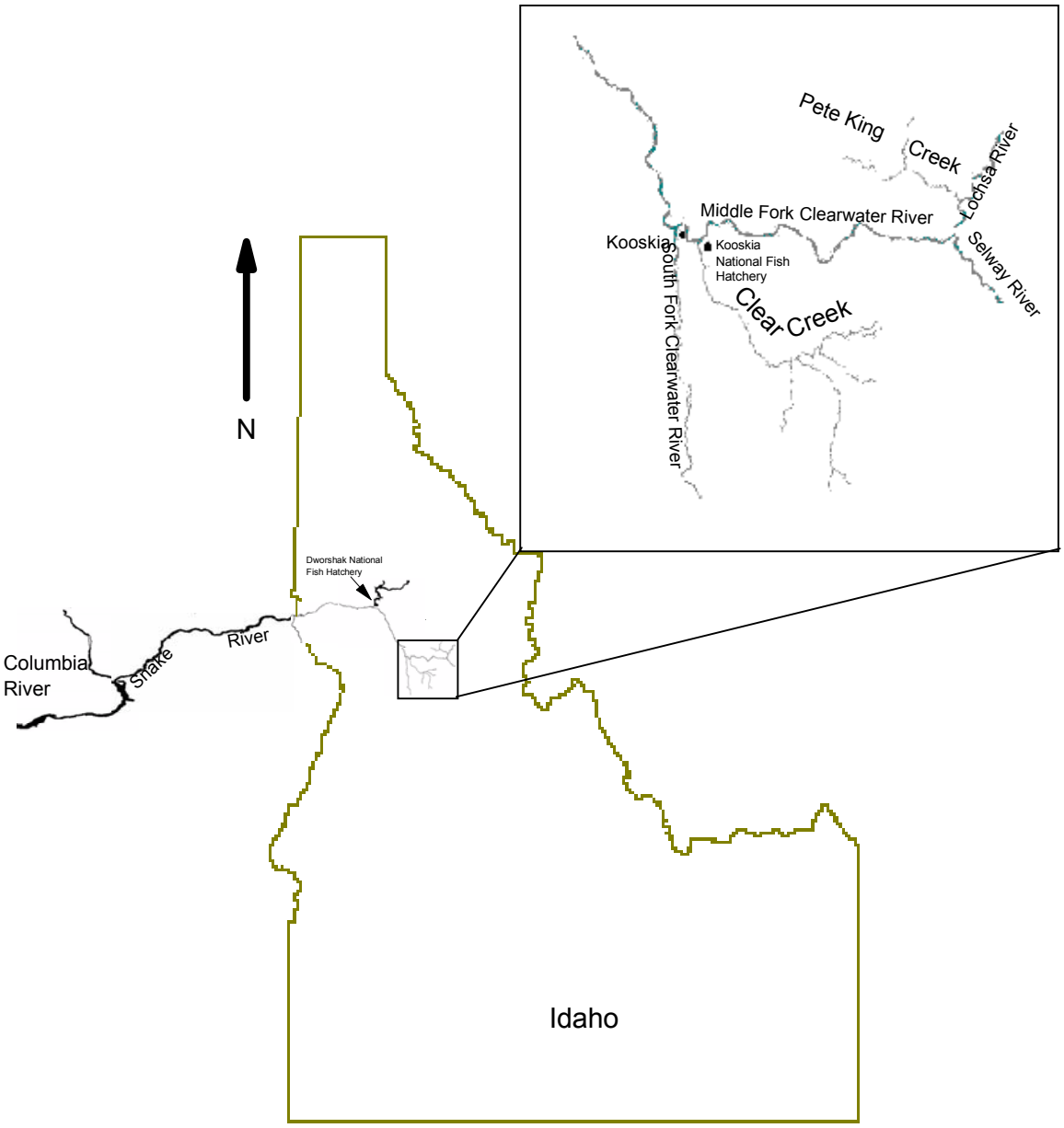

Figure 1. Location of Clear Creek and Pete King Creek in the Clearwater River drainage, Idaho

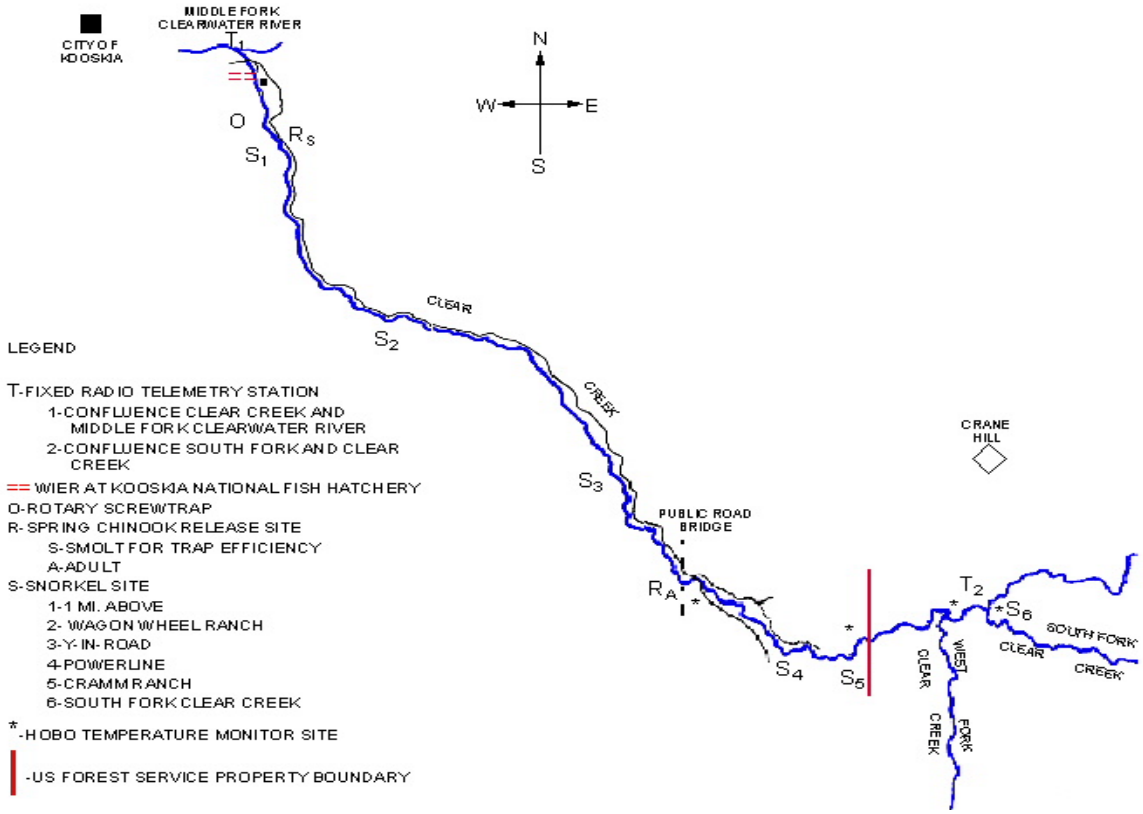

Figure 2. Location of Sites on Clear Creek in the Clearwater River drainage, Idaho.

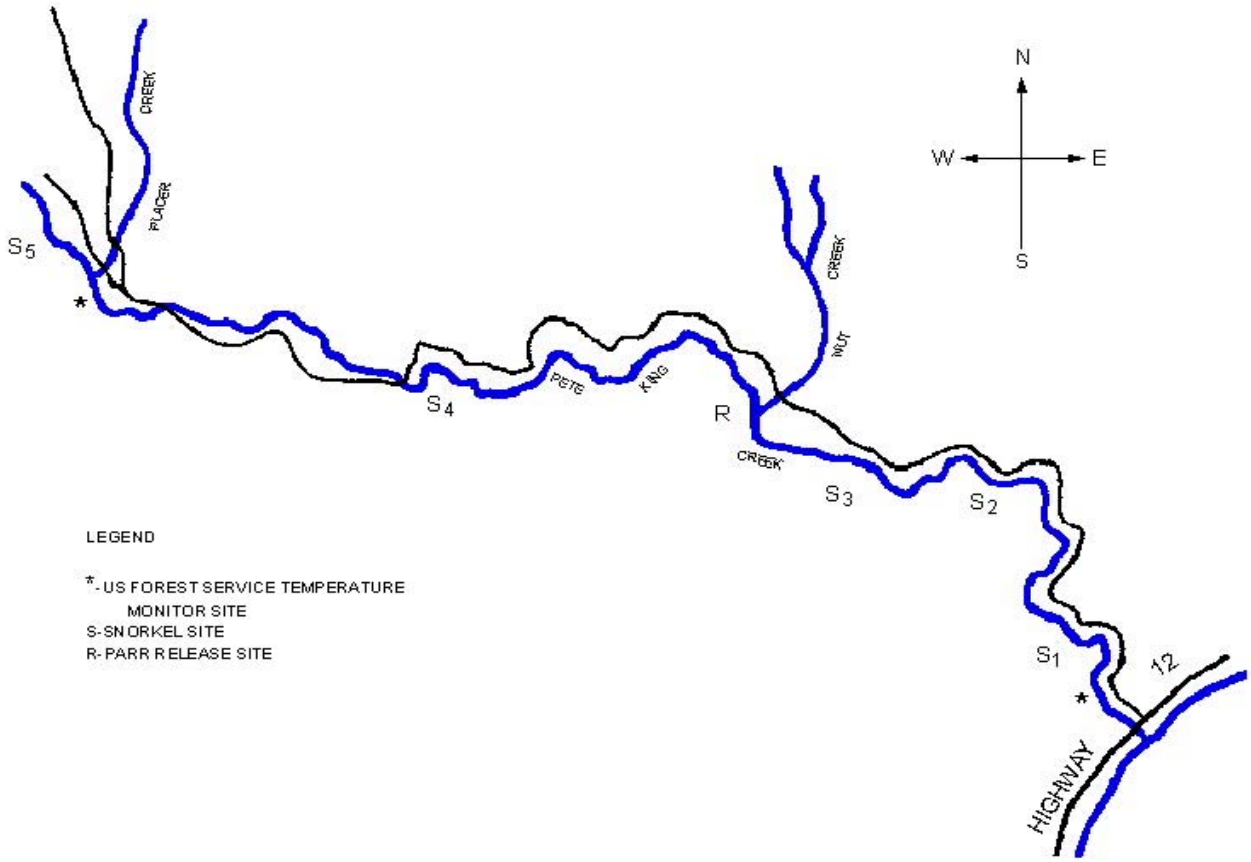

Figure 3. Location of Sites on Pete King Creek in the Clearwater River drainage, Idaho.

Methods

Treatments

The ISS experimental design tests the response of populations to treatments over time as compared to controls and baseline data. Supplementation treatments for each stream are detailed in Bowles and Leitzinger (1991).

The prescribed treatment for Clear Creek was a minimum release of 49,000 ventral fin clip-only smolts from KNFH (Bowles and Leitzinger 1991). General hatchery production smolts (100% marked with adipose fin clips), approximately 17% marked with coded-wire tags (CWT), were also released directly from KNFH into Clear Creek. These marks allowed differentiation of hatchery produced and naturally produced smolts and returning adults. Minimums of 500 smolts from the general hatchery release group, and 500 smolts from the supplementation treatment, were PIT tagged prior to release into Clear Creek. This 1000 minimum PIT tag group was used to monitor detection rates and run timing of each group to the Lower Granite Dam juvenile collection facility.

The prescribed treatment for Pete King Creek was a minimum release of 13,000 parr

(Bowles and Leitzinger 1991) containing no external marks and 100% coded wire tags. Broodstock for Pete King Creek parr were collected at the IDFG CAFH satellite facility at Powell, Idaho. Parr were reared and coded-wire tagged at CAFH in Ahsahka, Idaho. IFRO annually PIT tagged a minimum of 1000 of the coded-wire tagged parr prior to release into Pete King Creek for monitoring detection rates and run timing of each group to the Lower Granite Dam juvenile collection facility.

Summer Parr Density Estimates

Snorkel surveys were conducted to determine parr density estimates. Spring Chinook parr population was estimated using standardized snorkel methods described in Bowles and Leitzinger (1991), and Thurow (1994). In 1998, ISS cooperators decided to decrease snorkel activities until such time as an alternative means of estimating parr abundance could be established. This decision was based upon wide confidence intervals associated with parr population estimates obtained for the five-year ISS progress report (Walters, et al., 2001). ISS cooperators also agreed to continue snorkeling a minimum number of transects, giving priority to those sites previously established by IDFG for the General Parr Monitoring (GPM) project (BPA project number 91-73) (Walters, 1998). Crews from IFRO surveyed six of the original snorkel transects on Clear Creek, and five of the original ten snorkel transects on Pete King Creek to monitor observed parr densities. All sites have been monitored since 1991 (Rockhold, 1997).

Clear and Pete King creeks were snorkeled in July, between the hours of 0900 and 1630 to ensure adequate visibility. Water temperatures were recorded at each site prior to snorkeling using handheld mercurial thermometers ($\pm$ 0.1^{o}C). All salmonids were identified, counted, their lengths estimated to the nearest inch, and fin clips noted when discernible. The presence or absence of all non-salmonids was recorded. Upon completion of snorkeling of each transect, in-stream visibility was measured using a submerged orange and white nylon measuring tape and measuring the distance at which the observer can clearly identify the two reference points. Transect survey area (Area Sampled (m^2)) was calculated using the mean transect width multiplied by the total transect length. Total spring chinook density (fish/100m^2) was calculated for each stream using the total number of parr counted (Total Observed Number SCS) divided by the total area snorkeled (Total Area Sampled (m^2)), and multiplied by 100 m^2.

Figures 2 and 3 show the general locations of the snorkel sites on Clear Creek and Pete King Creek.

Juvenile Collection

Naturally produced juvenile spring chinook were collected and PIT-tagged on Clear and Pete King creeks to estimate emigration numbers and run timing. Minimum PIT tagging goals of 500 parr, 300 fall migrants (pre-smolts), and 100 spring migrants (smolts) were established to ensure detections necessary for statistical analysis (Bowles and Leitzinger, 1991). In order to differentiate between smolts, parr, and pre-smolts, ISS cooperators adopted specific dates of collection. Smolts were captured from January 1 to June 30, parr from July 1 to August 31, and pre-smolts from September 1 to December 31.

Juvenile spring chinook were collected on Clear Creek and Pete King Creek using two methods. On Clear Creek, a five-foot rotary screw trap was utilized until flow reduced to a point where the trap was not operational or until stream temperature at the screw trap reached 20^{o}C**.**

Hook-and-line was used at various locations on both Clear and Pete King creeks. All captured fish were sorted according to species. Non-salmonid species were identified, enumerated, and released back to the stream. Salmonid species were identified and fork lengths measured to the nearest millimeter. Spring chinook measuring 60mm and greater were transferred to a live well, PIT tagged, recovered and released. Spring chinook not meeting minimum PIT tagging fork length criteria and all other salmonid species, were released immediately after fork length measurements are recorded. All juvenile collection ceased once maximum daily stream temperature reached or exceeded 20^{o}C to reduce temperature related stress on captured fish.

A five-foot diameter rotary screw trap located 1.5 km above the KNFH weir, was operated in Clear Creek to capture migrating juvenile spring chinook salmon. The trap was pulled from operation for repair, or during periods of high debris attributed to high stream flows. The trap was cleaned and the captured fish removed a minimum of one time per 24 hour period depending upon weather and flow conditions. PIT tagged spring chinook were released 0.61km above the rotary screw trap for trap efficiency estimates. Trap efficiency was calculated by dividing the number of recaptured spring chinook by the number of PIT tagged spring chinook released above the trap. All estimates were conducted after daylight releases. At each event of checking the rotary screw trap, stream flow/height and temperature was recorded.

Hook and line sampling was used on Clear and Pete King creeks to capture parr and pre-smolts. Sampling involved using size 10-20 artificial dry and wet barbless flies.

PIT Tag Interrogation

Juvenile spring chinook salmon were PIT-tagged for estimates of smolt survival and run timing to Lower Granite Dam. PIT-tag operations were conducted following procedures described by the PIT Tag Steering Committee (1992) using the Columbia River Basin PIT-Tag Information System (PTAGIS) software. Hatchery-reared spring chinook salmon smolts for Clear Creek and parr for Pete King Creek were PIT-tagged at the respective rearing facilities. Naturally produced juvenile spring chinook salmon were collected using methods previously described and PIT-tagged at streamside. Captured spring chinook were anesthetized using buffered tricaine methanesulfonate (MS-222). Prior to tagging, all spring chinook were scanned for PIT-tags and checked for external marks to distinguish general hatchery production spring chinook from naturally produced spring chinook. The fork lengths of spring chinook and summer steelhead were measured to the nearest millimeter. Spring chinook measuring less than 60mm were allowed to recover and released downstream of the trap untagged. Chinook measuring 60mm or greater were PIT-tagged for ISS. Tagged spring chinook were transferred to a live well and allowed to recover for a minimum of 15 minutes before being released into the stream.

PIT-tag detection facilities located at Lower Granite Dam (GRJ), Little Goose Dam (GOJ), Lower Monumental Dam (LMJ), and McNary Dam (MCJ) were queried for detections of juvenile spring chinook PIT-tagged in Clear and Pete King Creeks. From the queries, unique detections were sorted from each facility. A sum of unique detections from each dam was totaled to obtain the total number of spring chinook that reached GRJ. Minimum estimates of survival to Lower Granite were based on these cumulative detections. Travel time to GRJ was determined by subtracting the release date from the detection date. Passage timing of 10%, 50%, and 90% of each release group was calculated from the interrogation dates at GRJ.

Adult Escapement

Adult escapement to Clear Creek was estimated by enumerating adult returns to the adult trap at KNFH. Additional escapement information was collected during redd counts and carcass surveys conducted on both streams. Broodstock for the supplementation program was collected using adult weirs located at KNFH (USFWS) and at the IDFG Powell satellite facility.

Adult Returns to the Weir

Adults were collected from a trap associated with a permanent picket weir located on Clear Creek at KNFH approximately 0.6km upstream of its confluence with the Middle Fork Clearwater River. The KNFH adult trap was operated from May through September to collect broodstock for the KNFH production program and the ISS project. Once broodstock goals were met, additional adult spring chinook collected at the KNFH adult trap were recycled into the Clearwater River spring chinook sport fishery. Spring chinook adults were sorted based upon ventral fin clips, the presence or absence of the adipose fin, and the presence of coded-wire or PIT tags. Fork length, external marks, and gender (when discernible) were recorded for each spring chinook. Sexually dimorphic characteristics weren't developed on adult spring chinook returning to KNFH in May and early June so gender differentiation was difficult. Fork length measurements were used to determine age breakdowns based on the following lengths: I Ocean: <=56 cm, II Ocean: 57cm to 81cm, III Ocean: >=82cm (R. Roseberg, IFRO, personal communication). Age is expressed as a Roman numeral representing the number of years spent in the ocean. Each spring chinook was checked for the presence of a coded-wire tag using a Northwest Marine Technology, Inc. R 8000 coded wire tag detector. Each spring chinook with a positive signal from the coded wire tag detector was checked for PIT-tags using 400mhz and 134mhz detectors. Adults with a positive signal from either detector were transported to Dworshak National Fish Hatchery (DNFH) for use as general production broodstock. No hatchery origin spring chinook adults were intentionally passed above the weir.

Both supplementation and natural origin adult spring chinook were collected at KNFH. Adults having an adipose fin but no external marks or coded-wire tags were considered natural origin, while adults having an adipose fin and right ventral, or left ventral clip (depending on brood year) were considered supplementation origin. Two out of every three adults fitting natural- or supplementation-origin criteria were given a right opercle plate notch and released above the KNFH weir. Adult spring chinook were released at a rate of one supplementation spring chinook for every natural spring chinook. Releases above the weir were based on protocol described in Bowles and Leitzinger (1991). Tissue samples were taken from the upper caudal fin of all natural and supplementation spring chinook passed above the weir for DNA analysis. Tissue samples were preserved in individually labeled scintillation vials containing 90% ethyl alcohol.

Broodstock Selection

Approximately one out of three captured natural, and one out of three captured supplementation adults was used for ISS broodstock. Adult spring chinook collected for broodstock were transported to Dworshak National Fish Hatchery (DNFH) and isolated in a holding pond containing Kooskia stock only. ISS broodstock was sorted from the KNFH

production broodstock based on fin clips and presence or absence of coded-wire tag. ISS broodstock had only left or right ventral fin clips (i.e. supplementation origin), depending on migratory year, or no marks (i.e. natural origin). KNFH production broodstock had only adipose clips. Spawning of ISS broodstock was conducted at DNFH. There was no selection for size, age, or origin (natural vs. supplementation). A 1:1 sex ratio with factorial crosses was attempted for enhancement of the effective population size (Bowles and Leitzinger, 1991) although some males were spawned multiple times due to shortage of milt. Ovarian fluid from each spawned female was tested for the causative agent of bacterial kidney disease, *Renibacterium salmoninarum*. Ovarian fluid was tested using an enzyme linked immunosorbent assay (ELISA). Individual crosses based on the origin of the spring chinook were recorded. Surplus supplementation adults were used for KNFH general hatchery production. Eggs from each individual cross were kept in separate individual heath trays and reared separately from general hatchery production eggs during incubation at both DNFH and KNFH. Upon eye-up, eggs from each ISS female were enumerated and transported to KNFH for incubation and final rearing. Once hatched, ISS juveniles were reared separately from hatchery production spring chinook juveniles and were marked with ventral fin clips. Ventral clipping allowed distinction from general hatchery production spring chinook, which were marked with adipose fin clips. Adults collected in 2002 were the final broodstock collected for supplementation treatments of hatchery origin ventrally marked juveniles.

Redd Counts and Carcass Recoveries

Redd counts and carcass recoveries were used to determine adult escapement and spawning distribution on Clear and Pete King creeks. Redd counts were conducted according to IDFG redd-walk protocols described in Hassemer (1993). Five consecutive weekly surveys were conducted on Clear Creek beginning on August 20 and ending on September 20. Surveys extended from the mouth of the South Fork of Clear Creek downstream to the confluence of Clear Creek and the Middle Fork of the Clearwater River (approximately 20.2-rk). Five weekly surveys were conducted on Pete King Creek beginning on August 19 and ending on September 9. Surveys on Pete King Creek were conducted from 8.0 km above the confluence of Pete King Creek and the Lochsa River, downstream to the confluence with the Lochsa River. Completed redds and test redds were marked for monitoring and avoidance of duplicate counts. For each carcass recovered, fork length and mid-eye to hyperal plate measurements, gender, external marks, and percent spawned were recorded. Scale samples, dorsal fin ray, and DNA samples were collected on all natural adult spring chinook for age analysis being conducted by IDFG (BPA project number 1991-73-00, IDFG). Snouts were collected from all fish without a right opercle plate notch and checked for coded-wire tags using an R8000 coded wire tag detector. In 2002 it was evident that additional adipose clipped hatchery origin adult spring chinook escaped above the weir. An estimate of hatchery adult escapement was made using a Lincoln-Peterson mark recapture estimate with a normal distribution and a 95% confidence interval.

Water Temperature

Water temperatures were monitored at five locations (Figure 2) in Clear Creek. These locations were the public road bridge on Clear Creek Road (rk-14), the main stem Clear Creek (rk-18.5), the West Fork Clear Creek (rk-19.6), and the South Fork Clear Creek (rk-20.2), and

KNFH. Temperatures were recorded throughout the field season using Onset, StowAway XTI temperature recorders. Temperature was recorded at KNFH using a Weksler Instruments thermograph. At the time of deployment and retrieval of each temperature recorder, mercurial temperature was recorded using a handheld thermometer for comparison and determination of a correction factor for each site. Water temperature for Pete King Creek was obtained from the United States Forest Service (USFS)-Clearwater National Forest. Stations in Pete King Creek (Figure 3) are located above the confluence of Pete King Creek and Placer Creek (rk-5.63), and approximately 0.37 km above the confluence of Pete King Creek and the Lochsa River.

Stream Flow (Staff Gauge) Measurement

Stream staff gauge height of Clear Creek was monitored at a staff gauge located at the base of the Clear Creek road bridge located approximately 0.31rk above the confluence of Clear Creek with the Middle Fork Clearwater River. Stream staff gauge height was recorded at each event of checking the rotary screw trap.

Results

Treatments

KNFH released 51,329 left ventral-clipped supplementation treatment smolts (brood year (BY) '00) containing 750 PIT tags, on April 4, 2002 into Clear Creek at the public road bridge crossing (rk-14). Hatchery smolts externally marked with adipose fin clips and internally marked with coded-wire tags were released from KNFH directly into Clear Creek. Approximately 17% of the total hatchery production release was marked with coded-wire tags, and 750 were PIT tagged. Dates and size at release of Clear Creek smolts is shown in Appendix A1.

PIT tagging of parr for supplementation releases into Pete King Creek was coordinated with IDFG. A total of 12,000 parr (BY'01) were released into Pete King Creek on August 1. Spring chinook parr released into Pete King Creek are 100% coded wire tagged, and 998 of the 12,000 were PIT tagged. No external marks were given to the treatment group. Dates and size at release for the Pete King Creek parr are shown in Appendix A2.

Summer Parr Density Estimates

Snorkel sites on Clear Creek were surveyed on July 29 and 31, 2002. Water temperatures recorded during surveys ranged from 12 °C to 21 °C. The total observed spring chinook parr density for Clear Creek (Table 1a.) is 14.03 fish/100m^2. Sites on Pete King Creek were surveyed on July 18, 2002. Recorded water temperatures ranged from 16 °C to 21 °C. The total observed spring chinook parr density for Pete King Creek (Table 1b.) is 12.65 fish/100m^2. The observed parr densities for surveys conducted in 1991 to 2002 or Clear and Pete King creeks, are shown in Appendix B1 and B2.

Table 1a. Spring chinook parr counts and abundance estimates for Clear Creek, 2001.

Site	GPM Site #	Area Sampled (m^2)	Observed # Spring Chinook	Density (Fish/100m^2)
1 Mile Above Weir	3	229.96	28	12.18
Wagon Wheel	7	386.88	34	8.79
Y-In Road	12	306.47	85	27.74
Power Line	16	268.28	40	14.91
Ring (Cram) Ranch	18	433.45	41	9.46
Above Mouth	20	116.98	7	5.98
Total		1625.04	228	14.03

Table 1b. Spring chinook parr counts and abundance estimates for Pete King Creek, 2001.

Site	GPM Site #	Area Sampled (m^2)	Observed # Spring Chinook	Density (Fish/100m^2)
0.5 miles above mouth	2	376.88	51	13.53
Last Slide	3	171.28	15	8.76
Above Z-Hole	5	258.08	72	27.90
Big Boulder	8	169.50	17	10.03
Road End	10	249.85	0	0.00
Total		1225.59	155	12.65

Juvenile Collection

The rotary screw trap was operational for a total of 99 days on Clear Creek from March 14 to June 26, 2002. The screw trap was not operational for a total of 8 days due to mechanical problems or flow and debris problems. The trap was not operational after June 26, 2002 due to low flows and high water temperatures. Two hundred eighty-three juvenile spring chinook salmon were captured and PIT tagged; Six-hundred forty-six spring chinook were captured that were less than the minimum 60mm fork length required for PIT tagging. The rotary screw trap was not operated in the fall due to low flows. The number of juveniles captured in the screw trap from 1993 through 2002 is shown in Appendix C.

Using hook-and-line techniques 277 parr and 191 pre-smolts were collected and PIT tagged on Clear Creek from August 1 to October 18**.** A total of 54 unmarked naturally produced pre-smolts were captured and PIT tagged on Pete King Creek, from July 16 to July 24.

PIT Tag Detections

A total of 750 hatchery-produced, adipose fin-clipped smolts, and left-ventral clipped supplementation treatment smolts were PIT tagged at KNFH for release into Clear Creek. Using a rotary screw trap, 283 naturally produced, unmarked smolts (BY'00) were PIT tagged. BY'00 naturally produced, unmarked chinook PIT tagged as smolts had a detection rate of 13.1% at GRJ. BY'00 naturally produced, unmarked chinook smolts PIT tagged as presmolts had a detection rate of 6.6% at GRJ. BY'00 naturally produced, unmarked chinook smolts PIT tagged as parr had a detection rate of 3.6% at GRJ. Hatchery produced left ventral-clipped supplementation treatment smolts had a detection rate of 11.3% at GRJ. BY'00 hatchery produced adipose clipped chinook PIT tagged as smolts had a detection rate of 13.6% at GRJ. Percent of first detections at GRJ, GOJ, LMJ, and MCJ was 56.1% for hatchery-produced smolts, 53.1% for left-ventral clipped ISS supplementation treatment smolts, 36.0% for naturally produced, unmarked smolts, 15.6% for naturally produced, unmarked chinook smolts tagged as presmolts, and 19.4% for naturally produced, unmarked, chinook smolts tagged as parr. Travel time and dates for 10%, 50%, and 90% detection rates for the BY'00 Clear Creek origin smolts at Lower Granite Dam (GRJ) are shown in Appendix D1.

A total of 998 spring chinook parr (BY'01) were PIT tagged and released into Pete King Creek as part of a 12,000 parr supplementation treatment. Using hook and line sampling, 54 BY'01 naturally produced presmolts were PIT tagged in Pete King Creek. BY'00 hatchery produced, adipose clipped spring chinook tagged as parr had a detection rate of 2.8% at GRJ. There were no detections of naturally produced, unmarked spring chinook tagged as presmolts (n=16) at GRJ. Percent first detections at GRJ, GOJ, LMJ, and MCJ was 8.3% for hatchery produced, adipose clipped supplementation treatment chinook smolts (BY'00) tagged as parr, and 18.8% for naturally produced, unmarked spring chinook smolts (BY'00) tagged as presmolts. Travel time and dates for 10%, 50%, and 90% detection rates for BY'00 Pete King Creek origin smolts at Lower Granite Dam (GRJ) are shown in Appendix D2.

Adult Escapement

Adult Returns to Weir

A total of 1,037 adult spring chinook salmon were collected from the KNFH adult trap in 2002. Adult spring chinook were collected from May 8 through September 12 for brood stock needs of KNFH and ISS. Surplus adults were either released back into the Clearwater River for a sport fishery recycle, or transferred to the Nez Perce Tribe for supplementation of natural production in Lolo Creek, Newsome Creek, Meadow Creek on the Selway River, and the Selway River. Data for adults trapped at the KNFH trap is shown in Table 2. Adult returns for 1991-2002 are shown in Appendix E. A total of 142 supplementation (ventral fin clipped) adults and 43 natural (unmarked) adults returned to KNFH in 2002. A total of 54 adults (26 supplementation and 28 natural) were transported up Clear Creek and released to spawn naturally. It was estimated that in addition to the 54 adults intentionally passed above the weir,

148 (CI=± 65) escaped undetected. Tissue samples from the adults released over the weir were taken for DNA analysis.

Table 2. Broodyear 2002 adult trapping data for KNFH adult trap.

Trapping Year	Date of Trap Operation Open-Close	Peak Trapping Day	Total Adults Trapped	I-Ocean	II – III Ocean	AD	RV	LV	Unmarked
2002	5/8-9/12	10-Jul	1037	14	1023	852	135	7	43

Broodstock Selection

A total of 46 female spring chinook were spawned for the ISS program. Samples of ovarian fluid were taken from each female to test for bacterial kidney disease (BKD). The eggs taken from females whose ELISA value (BKD level) rated greater than 0.100 were culled. A total of 29 females remained after culling. Progeny from these females totaled 105,367 eyed-eggs at 93.4% eye-up. The mating composition for the ISS brood stock is shown in Table 3. ISS eggs were transferred to KNFH for final incubation and rearing. Progeny used for the ISS supplementation treatment will be kept isolated from general production fish. All excess progeny will be adipose clipped and released as general hatchery production.

Table 3. Total ISS broodstock mating composition for BY 2002, Clear Creek.

Brood Year	Number of Takes	Dates of first and last takes	MATING COMPOSITION (N-natural, H-hatchery origin)			#Eyed Eggs	#Green Eggs	% Eye Up
			NxN	NxH	HxH			
2002	5	8/20-9/17	3	7	36	105367	112864	93.4

Redd Surveys and Carcass Recoveries

Five redd surveys were conducted on Clear Creek in 2002. Redd surveys were conducted from the South Fork Clear Creek to the confluence of Clear Creek and the Middle Fork Clearwater River, a survey distance of approximately 20.2 km. These surveys were conducted weekly from August 19 to September 20. Redd surveys continued until no new redds and no live adult spring chinook were observed. A total of 69 redds were counted, and 79 carcasses were recovered (Table 4). Snouts were collected on all adults without the right opercle notch given to those adults intentionally passed above the weir. All recovered snouts were checked for presence of coded-wire tags. At the time of this report, no coded-wire tags have been analyzed.

Five redd surveys were conducted on Pete King Creek from August 14 to September 10, 2001. Surveys were conducted until no new redds and no live adult spring chinook were observed. Two competed redds and 1 test redd was observed. There were no carcasses collected, and no live adult spring chinook observed in Pete King Creek. Carcass collection length frequency distribution data for Pete King Creek is summarized and shown in Table 5. Redd walk summaries for Clear and Pete King creeks from the 1991-2002 field seasons are shown in Appendix F1 and F2.

Table 4. Redd Survey summary for Clear and Pete King creeks, 2002.

Stream	Year	Distance Surveyed	Released Above Weir	Redds	Carcasses	Redds per km
Clear Cr.	2002	20.2 km	54[a]	69	79	3.41
Pete King Cr.	2002	8.0 km	-	2	0	0.25

[a] Known releases only, in addition an estimated 148 (CI=± 65) adults escaped above the weir.

Table 5. Length frequency distribution and age class breakdown of carcasses collected during Redd Surveys on Clear Creek, 2002.

		Unmarked		Supplementation		Hatchery		Origin Undeterminable	
	Fork Length Frequency	Male	Female	Male	Female	Male	Female	Male	Female
I-Ocean	<=56	0	0	0	0	1	0	0	0
	57 to 60	0	0	0	0	0	0	0	0
	61 to 65	0	0	0	0	0	0	0	0
II-Ocean	66 to 70	0	2	0	1	2	3	0	0
	71 to 75	0	3	0	1	2	16	0	0
	76 to 81	1	2	2	2	6	10	0	0
III-Ocean	82 to 90	1	2	3	0	8	3	0	0
	>90	2	0	0	0	4	2	0	0
Unknown Fork Length[a]		1		1		3		9	
	Subtotal	4	9	5	4	23	34	0	0
	Total	14		9		57		9	

[a] Fork length unknown due to decomposition of the carcass.

Water Temperature

Water temperature monitors have not been collected and downloaded at the time of this report. Data recovered from these monitors will be presented in the 2003 annual report.

Stream Flow

Staff gauge height was measured a minimum of once daily while the screw trap was operational. Average gauge height for 2002 was 0.83 feet. Peak gauge height was recorded on March 22, 2002 at 3.25 ft. Figure 6. shows the daily staff gauge measurement on Clear Creek for March 14 to June 26, 2002.

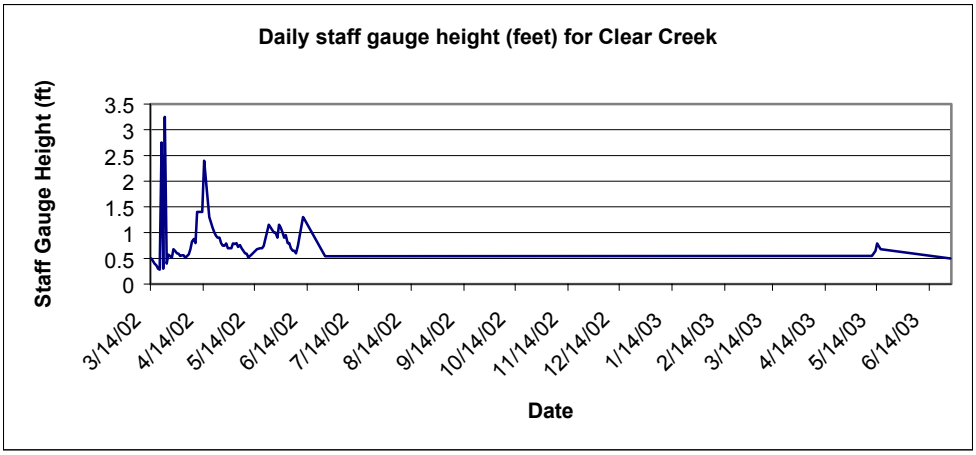

Figure 6. Daily staff gauge height for Clear Creek, 2002.

Summary and Conclusions

Treatments

The minimum prescribed smolt treatment for Clear Creek, of 50,000 was surpassed in 2002 with a total smolt release of 51,329 smolts. This was due to the successful broodstock collection in 2000. Due to the low return of adult spring chinook in 1999, no broodstock was collected so there was no smolt treatment in 2001. Because of this problem, it was decided by ISS cooperators to extend the second-generation broodstock collection through 2002. Final determination of cessation of treatment was decided by ISS cooperators to end with 2002 brood stock. The supplementation treatment resulting from the 2002 broodstock (migratory year 2004) will complete the minimum five supplementation releases, or one generation, as prescribed in the experimental design (Bowles and Leitzinger, 1991).

The minimum prescribed parr treatment of 12,000 was applied to Pete King Creek on August 1. This is the fifth treatment release to be completed on Pete King Creek since the implementation phase began in 1992.

Summer Parr Density Estimates

Observed parr densities for both Pete King Creek and Clear Creek were up from 2001. This was anticipated based upon the high number of redds observed during the 2001 field season. Low water flows prevented operation of the rotary screw trap during the summer and fall trapping periods of 2002. As a result, no juvenile emigration estimates were conducted for brood year 2001 parr and pre-smolts.

Juvenile Collection

Juvenile collection in Clear Creek using the rotary screwtrap was successful in 2002. In 2001, no BY' 99 smolts were captured due to the low adult escapement up Clear Creek (n=20). It was evident in 2001 that, based on the high number of parr and presmolt captured and tagged

during the summer and fall using hook and line, 2002 would have a relatively large BY'00 smolt migration.

Using hook and line in Pete King Creek, numbers of juvenile spring chinook PIT tagged was up from 2001. A total of 54 naturally produced parr were PIT tagged as opposed to 16 in 2001. This was anticipated because of the relatively high number of redds (n=17) observed in Pete King Creek in 2001. Because there is no rotary screw trap installed on Pete King Creek, this is our only means of capturing juvenile spring chinook for PIT tagging to conduct survival and travel time estimates to Lower Granite Dam.

The number of parr and presmolt captured and PIT tagged in Clear Creek was comparable to 2001. A total of 277 naturally produced parr and 191 presmolts were captured and injected with PIT tags for survival and travel time estimates to Lower Granite Dam.

In 2003, the number of smolts, parr, presmolts in Clear Creek should be up from previous years due to the high number of redds observed in 2001, and 2002. These numbers will give a better opportunity for capturing and PIT tagging greater numbers of juvenile spring chinook for survival and travel time estimates to Lower Granite Dam.

Because there were only two redds observed in Pete King Creek in 2002, numbers of parr and presmolts captured and PIT tagged should be lower in 2003 than in 2002.

PIT Tag Detections

Because of the relatively high number of BY'00 juveniles captured and PIT tagged as parr, presmolts, and smolts, 2002 interrogation percentages at the juvenile detection facilities were up from 2001 levels. This was to be expected as that there were no smolts (BY' 99) captured and PIT tagged for detections in 2001. The number of BY' 01 juveniles captured and PIT tagged as smolt in 2003 should be up from 2001 numbers but may fall below 2002 levels.

Adult Escapement

The 2002 adult returns to KNFH were up from pre-2001 levels, but fell below the numbers returning in 2001. This allowed for passage of the naturally spawning component of the adults above the weir, and for collection of broodstock for hatchery reared supplementation treatment release smolts. In 2002, as in 2001, there were a large number of hatchery origin adults that escaped above the KNFH weir. This was apparent during redd and carcass surveys. Power was lost to the electric hoists used to raise and lower each panel of the weir. Manually raising and lowering of the panels for cleaning was a slow enough process that fish were allowed to escape beneath the raised panels before they could be lowered. In the future, high numbers of hatchery adults escaping above the weir undetected will only be a problem if high debris flows in Clear Creek force the panels open, as in 2001, or electricity is lost once again to the panel hoists, as in 2002.

The 20.8 km stretch of Clear Creek was surveyed for the duration of the spawning season as previously conducted in 2000, and 2001. In the past three years, the intensity of redd walks was increased on Clear Creek in response to the concern by ISS cooperator's of the need to intensify redd counts, and carcass recoveries on all study streams. Difficulties caused by increasing effort and survey areas are raised during the 2000 cooperator's meeting, and are addressed in the Five-Year Report (Walters et al, 1999).

Literature Cited

Bowles, E.C. and E. Leitzinger, 1991. Salmon Supplementation studies in Idaho Rivers: Experimental Design. Idaho Department of Spring chinook and Game, prepared for U.S. Department of Energy, Bonneville Power Administration, Contract DE-B179-89BP01466, Project 89-098.

George, B. 2001. Personal communication. Idaho Department of Fish and Game. Clearwater Anadromous Fish Hatchery. Ahsahka, Idaho.

Hassemer, P.F.1993. Manual of standardized procedures for counting Chinook salmon redds (draft). Idaho Department of Fish and Game, Boise, Idaho.

National Marine Fisheries Service. December 1998. Memorandum to Investigators: Backpack Electrofishing Guidelines. Portland, Oregon.

National Marine Fisheries Service. June 2000. Memorandum to Investigators: Backpack Electrofishing Guidelines. Portland, Oregon.

Northwest Power Planning Council. 1987. Columbia River Basin Fish and Wildlife Program. Portland, Oregon.

Olson, J.M. and J.K. Bretz. 2001. Idaho supplementation studies –Pete King Creek and Clear Creek Progress Report 1997. United States Fish and Wildlife Service report to U.S. Department of Energy, Bonneville Power Administration, Contract DE-A179-92BP49446, Project Number 89-098-1.

PIT Tagging Steering Committee. 1992. PIT tag specification document, Columbia River Basin PIT tag information system, data source input specifications.

Regional Assessment of Supplementation Project. 1991. Draft status report for review and comment. Prepared for Bonneville Power Administration, PJSP, Portland, Oregon.

Rockhold, E.A., R.B. Roseberg, and J.M. Olson. 1997. Idaho supplementation studies –Pete King Creek and Clear Creek Progress Report 1991-1993. United States Fish and Wildlife Service report to U.S. Department of Energy, Bonneville Power Administration, Contract DE-A179-92BP49446, Project Number 89-098-1.

Roseberg, R.B. 2000. Personal communication. U.S. Fish and Wildlife Service, Ahsahka, Idaho.

Rosgen, D.L. 1985. A stream classification system. North American Riparian Conference. Tucson, Arizona. April 16-18, 1985.

STWG (Supplementation Technical Work Group). 1988. Supplementation research-proposed five-year work plan. Northwest Power Planning Council, Portland, Oregon.

Thurow, R. F.1994. Underwater methods for study of salmonids in the Intermountain West. General Technical Report INT-GTR-307. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Research Station.

Walters, J., J. Hansen, J. Lockhart, C. Reighn, R. Keith, and J. Olson. 2001 Draft. Idaho supplementation studies five-year report 1992-1996. Idaho Department of Fish and Game report to U.S. Department of Energy, Bonneville Power Administration, Contract DE-B179-89BP01466, Project Numbers 89-098.

Appendix A1. Treatments for Clear Creek (brood year 1991-2000). Fin clips are left ventral (LV), right ventral (RV). Rearing facility is Kooskia National Fish Hatchery (KNFH). (N/A-data not available)

Brood Year	Proposed Treatment	Date Released	Life Stage	Number Released	Number PIT Tagged	Fin Clips	Mean Fork Length	Broodstock Source	Rearing Facility
2000	50,000	4/4/02	smolt	51,329	750	LV	131	Kooskia	KNFH
1999	50,000	N/A	N/A	0	N/A	N/A	N/A	N/A	N/A
1998	50,000	4/9/00	smolt	84,304	750	RV	131	Kooskia	KNFH
1997	50,000	4/9/99	smolt	50,030[a]	502	LV	145	Kooskia	KNFH
1996	50,000	4/14/98	smolt	33,681	500	RV	146	Kooskia	KNFH
1995	50,000	N/A	N/A	0	N/A	N/A	N/A	N/A	N/A
1994	50,000	4/12/96	smolt	49,674	503	LV	142	Kooskia	KNFH
1993	50,000	4/12/95	smolt	49,319	494	RV	105	Kooskia	KNFH
1992	50,000	N/A	N/A	0	N/A	N/A	N/A	N/A	N/A
1991	50,000	N/A	N/A	0	N/A	N/A	N/A	N/A	N/A

[a] First year of brood stock selection releases; an additional 63,845-hatchery smolt (499 PIT tagged) are released above KNFH weir.

Appendix A2. Treatment for Pete King Creek (brood years 1991-2001). Fin clips are left ventral (LV), right ventral (RV). Rearing facility is Clearwater Anadromous Fish Hatchery (CAFH).

Brood Year	Proposed Treatment	Date Released	Life Stage	Number Released	Number PIT Tagged	Fin Clips	Mean Fork Length	Broodstock Source	Rearing Facility
2001	15,000	8/1/02	parr	12,000	995	none	101.4	Powell	CAFH
2000	15,000	6/24/01	parr	17,014	1000[a]	none	76.6	Powell	CAFH
1999	15,000	N/A	N/A	0	N/A	N/A	N/A	N/A	N/A
1998	15,000	N/A	N/A	0	N/A	N/A	N/A	N/A	N/A
1997	15,000	7/20/98	parr	12,889	0b	none	114.3[c]	Powell	CAFH
1996	15,000	N/A	N/A	0	N/A	N/A	N/A	N/A	N/A
1995	15,000	N/A	N/A	0	N/A	N/A	N/A	N/A	N/A
1994	15,000	N/A	N/A	0	N/A	N/A	N/A	N/A	N/A
1993	15,000	7/5/94	parr	15,080	998	RV	77.6[c]	Powell	CAFH
1992	15,000	8/6/93	parr	12,000	1000	LV	104.0[c]	Powell	CAFH
1991	15,000	N/A	N/A	0	N/A	N/A	N/A	N/A	N/A

[a] PIT tagged and 100% CWT; no external mark (IDFG).
[b] 100% CWT no PIT tags; no external mark (IDFG).
[c] Total Length (IDFG).

APPENDIX B1. Observed parr density for spring chinook salmon in Clear Creek for survey years 1991-2002

Brood Year	Year Surveyed	Area Surveyed (m^2)	Observed Density (fish/100m^2)
2001	2002	1625.04[a]	14.03
2000	2001	2,002.7[a]	5.2
1999	2000	1,642.3[a]	0
1998	1999	1,267.0[a]	6.6
1997	1998	2,087.0[a]	6.42
1996	1997	6371.6	0.97
1995	1996	6033.8	0
1994	1995	6215.6	1.15
1993	1994	6794.2	6.3
1992	1993	6589.9	2.63
1991	1992	6110.5	2.86
1990	1991	4442.7	20.66

[a] ISS decreased snorkel effort in 1998.

APPENDIX B2. Observed parr density for spring chinook salmon in Pete King Creek for survey years 1991-2002

Brood Year	Year Surveyed	Area Surveyed (m^2)	Observed Density (fish/100m^2)
2001	2002	1225.59[a]	12.65
2000	2001	1,081.0[a]	4.2
1999	2000	1,038.1[a]	0.2
1998	1999	922.2[a]	1.7
1997	1998[b]	790.3[a]	15.7
1996	1997	1832.4	0
1995	1996	1750.5	0.17
1994	1995	2108.6	0.19
1993	1994[b]	1972.6	11.51
1992	1993	1917.7	0.52
1991	1992	1394.9	0.22
1990	1991[c]	1516.1	2.18

[a] ISS decreased snorkel effort in 1998.
[b] Survey is conducted after parr supplementation treatment release..
[c] Survey conducted by IDFG

APPENDIX C. Trapping of juvenile natural spring chinook salmon (SCS) in Clear Creek for Brood Year 1991-2001.

Brood Year	Life Stage	Trap Start Date	Trap End Date	Total Trapping Days	Number Unmarked SCS Trapped	Number SCS PIT Tagged and Released Above Trap	Recaptures
2001	parr*	-	-	-	-	-	-
2000	smolt	3/14/02	6/26/02	99	929	293	76
2000	parr	7/7/01	7/8/01	8	22	0[a]	0
1999	smolt	2/26/01	6/30/01	97	55	0[a]	0
1999	parr	7/2/00	7/24/00	22[b]	1	0	0
1998	smolt	3/17/00	6/30/00	90	61	13	2
1998	parr	7/1/99	7/9/99	9	0	0	0
1997	smolt	3/16/99	6/30/99	100	575	403	62
1997	parr	7/1/98	7/21/98	21	55	42	0
1996	smolt	3/21/98	3/21/98	101	227	83	3
1996	presmolt	10/2/97	12/17/97	69	4	3[c]	0
1996	parr	7/1/97	7/8/97	8	0	0	0
1995	smolt	3/19/97	6/30/97	71	0	0	0
1995	parr	7/1/96	7/12/96	5	0	0	0
1994	smolt	3/1/96	6/30/96	122	17	8	0
1994	parr	7/1/95	8/13/95	44	9	0	0
1993	smolt	3/14/95	6/29/95	60	64	54[e]	0
1993[d]	presmolt	9/14/94	11/11/94	59	160	63[e]	0
1993	parr	7/1/94	7/14/94	14	12	8[e]	0
1992	smolt	3/14/94	6/26/94	105	30	5[e]	0
1992	parr	7/1/93	8/9/93	40	63	0	0
1991	smolt	5/16/93	6/30/93	49	23	0	0

[*] Rotary screw trap was pulled on 6/26, prior to parr date

[a] Captured juvenile spring chinook below minimum PIT tagging fork length (<60mm).

[b] Rotary screw trap operated from 7/6/99 through 7/24/99 at night through morning due to temperature constraints (temp. $\geq 20^{o}$C).

[c] Began upstream releases for trapping efficiency.

[d] Single event of a juvenile weir being used, all other trapping done by rotary screw trap.

[e] Released below rotary screw trap-no trapping efficiency conducted.

APPENDIX D1. Detection rate and travel time of Clear Creek juvenile spring chinook salmon for brood years 1991-2002 from (Origin is H=hatchery reared, N=natural; Fin clips represented are lv=left ventral, rv=right ventral, ad=adipose). (N/A- data not available)

Brood Year	Life Stage	Origin	No. Released	% Detected @GRJ	Travel Time (Avg. Days)	First Detections at Main Observation Sites (%)	Date 10% detected @ GRJ	Date 50% detected @ GRJ	Date 90% detected @ GRJ
2001	presmolt	N	191	N/A	N/A	N/A	N/A	N/A	N/A
2001	parr	N	277	N/A	N/A	N/A	N/A	N/A	N/A
2000	smolt	N	283	13.1	36.4	36.0	4/15/02	5/9/02	5/30/02
2000	smolt	H_{lv}	750	11.3	37.3	53.1	4/18/02	5/7/02	5/20/02
2000	smolt	H	750	13.6	36.1	56.1	4/16/02	5/8/02	5/21/02
2000	presmolt	N	320	6.6	199.1	15.6	4/11/02	4/17/02	5/22/02
2000	parr	N	412	3.6	257.4	19.4	4/12/02	4/22/02	5/21/02
1999	smolt	H_{ad}	749	41.4	43	55.8	4/28/01	5/8/01	5/27/01
1998	smolt	N	56	14.3	25.4	53.6	4/13/00	4/15/00	5/3/00
1998	smolt	H_{rv}	750	25.9	22.5	48.1	4/21/00	4/28/00	5/9/00
1998	smolt	H_{ad}	746	26.4	24.5	56.3	4/22/00	5/1/00	5/8/00
1998	presmolt	N	230	6.1	188	20.9	4/12/00	4/15/00	4/24/00
1998	parr	N	63	6.3	254	12.6	4/12/00	4/12/00	5/8/00
1997	smolt	N	482	15.4	25.5	62.2	4/14/99	5/4/99	6/9/99
1997	smolt	H_{lv}	502	12.9	29	50	4/21/99	5/3/99	5/24/99
1997	smolt	H_{ad}	498	14.4	34	56.8	4/29/99	5/6/99	5/25/99
1997	presmolt	N	397	8.1	204	24.2	3/30/99	4/21/99	5/6/99
1997	parr	N	103	2.9	293	9.7	4/14/99	4/21/99	4/21/99
1996	smolt	N	49	36.7	33	61.2	4/22/98	5/1/98	5/15/98
1996	smolt	H_{rv}	500	26.2	32	49.6	4/22/98	5/3/98	5/13/98
1996	smolt	H_{ad}	501	30.7	31	57.9	4/21/98	5/3/98	5/14/98
1996	presmolt	N	302	18.9	177	34.4	4/5/98	4/21/98	5/3/98
1996	parr	N	0	-	-	-	-	-	-

APPENDIX D1 (cont.). Detection rate and travel time of Clear Creek juvenile spring chinook salmon for brood years 1991-2002 from (Origin is H=hatchery reared, N=natural; Fin clips represented are lv=left ventral, rv=right ventral, ad=adipose). (N/A- data not available)

Brood Year	Life Stage	Origin	No. Released	% Detected @GRJ	Travel Time (Avg. Days)	First Detections at Main Observation Sites (%)	Date 10% detected @ GRJ	Date 50% detected @ GRJ	Date 90% detected @ GRJ
1995	smolt	N	8	25	22	75	4/23/96	4/23/96	5/11/96
1995	smolt	H_{lv}	0	-	-	-	-	-	-
1995	smolt	H_{ad}	0	-	-	-	-	-	-
1995	presmolt	N	0	-	-	-	-	-	-
1995	parr	N	0	-	-	-	-	-	-
1994	smolt	$H_{ad/rv}$	503	14.9	23	35.4	4/28/96	5/8/96	5/15/96
1994	presmolt	N	6	0	-	0	-	-	-
1993	presmolt	N	432	10.2	205	20.9	4/13/95	4/24/95	5/4/95
1993	smolt	N	54	33.3	27	51.9	4/17/95	4/22/95	5/13/95
1993	smolt	$H_{ad/rv}$	494	20.1	30	42.5	4/30/95	5/11/95	5/29/95
1992	smolt	N	1	0	31	100	-	-	-
1992	presmolt	N	298	15.4	221	25.8	4/1/94	4/23/94	4/29/94
1991	presmolt	N	128	8.6	224	11.7	4/24/93	4/30/93	5/13/93
1991	parr	N	240	8.8	266	12.2	4/20/93	4/30/93	5/13/93

APPENDIX D2. Interrogations of spring chinook juveniles from Pete King Creek for brood years 1991-2001 (origin is H=hatchery reared, N=natural reared). No brood year 1994-1996 are produced

. Brood Year	Life Stage	Origin	No. Released	% Detected @ GRJ	Travel Time (Avg. Days)	First Detections at Main Observation Sites (%)	Date 10% detected @ GRJ	Date 50% detected @ GRJ	Date 90% detected @ GRJ
2001	parr	N	54	-	-	-	-	-	-
2001	parr	H	998	-	-	-	-	-	-
2000	presmolt	N	16	0	N/A	18.8	N/A	N/A	N/A
2000	parr	H	1,000	2.8	288.6	8.3	4/7/02	5/7/02	5/24/02
1999	parr	N	0	0	-	-	-	-	-
1998	parr	N	2	0	-	-	-	-	-
1997	parr	N	300	2	201	8.3	3/30/99	4/6/99	5/10/99
1993	parr	H	998	4.1	310	7.5	4/20/95	5/10/95	6/5/95
1992	parr	H	1,000	6.1	275	10	4/25/94	5/4/94	5/16/94

APPENDIX E. Adult spring chinook salmon returns to Kooskia National Fish Hatchery adult trap for 1991-2002. Ocean age class breakdown, and fin clip data are for male and female adult spring chinook salmon.

				Ocean Age Class [a]		Fin Clips					
Trapping Year	Date of Trap Operation Open-Close	Peak Trapping Day	Total Adults Trapped	I-Ocean	II – III Ocean	AD	RV	LV	No Fin Clip	No. SCS Released Above Weir	Mean no. Eggs/Female
2002	5/8-9/12	10-Jul	1037	14	1023	852	135	7	43	54	3928
2001	5/17-8/27[b]	16-Jul	2261	29	2232	2007	5	189	60	90[c]	4,128
2000	5/18-9/20	8-Jun	966	966	615[d]	1275	201	36	61[e]	92	3,555
1999	5/7-9/13	14-Jun	157	72	85	135	10	3	9[e]	20	4,378
1998	5/11-9/17	18-Jun	408	1	407	372	8	6	22	27	3,726
1997	5/16-9/24	13-Jun	1657	7	1650	1530	14	2	111	127	3,545
1996	6/6-9/24	28-Jun	202	88	114	189	1	0	12	32	3,565
1995	5/24-7/26	28-Jun	40	21	19	*	*	*	*	0	3,961
1994	5/15-7/8	26-May	232	1	231	*	*	*	*	25	4,106
1993	5/28-8/10	28-May	1180	11	1169	*	*	*	*	91	4,270
1992	5/29-8/28	29-May	312	14	298	*	*	*	*	20	3,963[f]
1991	6/15-9/11	15-Jun	467	10	457	*	*	*	*	11	4,117

* No marked adult spring chinook returned prior to 1996.

[a] Ocean age class based on coded-wire tag recovery data and corresponding fork length.

[b] Adult trap operated intermittently to allow adult spring chinook salmon to remain in fishery for a longer period of time

[c] An estimated 408 adult spring chinook salmon escaped above the weir in addition to 90 intentionally released.

[d] Includes 8 adult spring chinook salmon of unknown marks/unknown gender that are reported in DNFH fish disposition summary.

[e] Two adult spring chinook salmon in 1999 and 2000 had no fin clips but are coded-wire tagged.

[f] Estimate based on 6-year average.

Appendix F1. Redd count summaries for Clear Creek, 1991-2002.

Year Surveyed	Distance Surveyed (km)	# Redds	Redds/km
2002	20.2	69[a]	3.41
2001	20.2	166[b]	8.2
2000	20.2	30	1.5
1999	16.1	0	0
1998	18.5	2	0.1
1997	18.5	17	0.9
1996	16.1	3	0.2
1995	16.1	0	0
1994	16.1	1	0.1
1993	16.1	7	0.4
1992	16.1	1	0.1
1991	16.1	4	0.3

[a] An estimated 148 (CI=±65) adults escaped above the weir in addition to 54 intentionally released adults

[b] An estimated 408 adults escaped above weir in addition to the 90 known adults released.

Appendix F2. Redd count summaries for Pete King Creek, 1991-2002.

Year Surveyed	Distance Surveyed (km)	# Redds	Redds per km
2002	8	2	0.25
2001	8	17	2.1
2000	8	2	0.3
1999	8	0	0
1998	8	0	0
1997[a]	8	1	0.1

[a] 1997 is the first year redds or carcasses are found on Pete King Creek. However, Pete King Creek was surveyed each year from 1991-2002.