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Salmon Supplementation Studies in Idaho Rivers

Field Activities Conducted on Clear and Pete King Creeks in 2001

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

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IDAHO SUPPLEMENTATION STUDIES:

Clear Creek and Pete King Creek Progress Report
For Field Activities conducted in 2001

Prepared by:

Carrie B. Gass, Fisheries Biologist
Jill M. Olson, Fisheries Biologist

U.S. Fish and Wildlife Service
4147 Ahsahka Road
P.O. Box 18
Ahsahka, Idaho 83520
Phone: 208-476-7647

Prepared for

Peter T. Lofy
U.S. Department of Energy
Bonneville Power Administration
Division of Fish and Wildlife
P.O. Box 3621
Portland, Oregon 97208-3621

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Abstract

In 2001 the Idaho Fisheries Resource Office continued 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, brood stock spawning and rearing, spawning ground surveys, and snorkel surveys were used to evaluate project data points and augment past data. Due to low adult spring Chinook returns to Kooskia National Fish Hatchery (KNFH) in brood year 1999 there was no smolt supplementation treatment release into Clear Creek in 2001. A 17,014 spring Chinook parr supplementation treatment (containing 1000 PIT tags) was released into Pete King Creek on July 24, 2001. On Clear Creek, there were 412 naturally produced spring Chinook parr PIT tagged and released. Using juvenile collection methods, Idaho Fisheries Resource Office staff PIT tagged and released 320 naturally produced spring Chinook pre-smolts on Clear Creek, and 16 natural pre-smolts on Pete King Creek, for minimum survival estimates to Lower Granite Dam. There were no PIT tag detections of brood year 1999 smolts from Clear or Pete King creeks. A total of 2261 adult spring Chinook were collected at KNFH. Forty-three females were used for supplementation brood stock, and 45 supplementation (ventral fin-clip), and 45 natural (unmarked) adults were released upstream of KNFH to spawn naturally. Spatial and temporal distribution of 37 adults released above the KNFH weir was determined through the use of radio telemetry. On Clear Creek, a total of 166 redds (8.2 redds/km) were observed and data was collected from 195 carcasses. Seventeen completed redds (2.1 redds/km) were found, and data was collected data from six carcasses 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 populations and spawning escapements of naturally produced adult spring Chinook; 2) monitor and evaluate changes in natural productivity and genetic composition of target and adjacent populations following supplementation; 3) determine which supplementation strategies (brood stock 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 research effort involving the Idaho Department of Fish and Game (IDFG), Nez Perce Tribe, 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 subbasins. The study identified 12 treatment and three control streams in the Clearwater River subbasin. Seven treatment and eight control streams were identified in the Salmon River subbasin. 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 subbasin (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 which ISS brood stock was established through the collection of adults from streams with weirs and raising of progeny in hatcheries. Prior to release, offspring were given external marks for differentiation from hatchery and naturally produced spring Chinook returning as adults. Returning ISS marked adults were used as a known, second generation brood stock whose progeny was used to supplement treatment streams. Phase 3 involves the cessation of treatments and monitoring of treatment effects until adults from the final juvenile treatment release group have returned. Effects are primarily measured through adult returns, however monitoring of the juvenile evaluation points will continue. The majority of ISS streams are planned to complete phase two in 2002 and enter phase three in 2003. Initially, ISS was designed to continue monitoring the response of the treatments until a minimum of three generations had returned (2012). The decision to stop treatments will be made based on statistical consultation planned for 2002. Pending consultation, we plan to complete the final smolt supplementation treatment releases on Clear Creek in spring of 2004.

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 and Pete King creeks. 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 and Pete King creeks 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 externally marked 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 Clearwater Anadromous Fish Hatchery (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 for General Parr Monitoring (GPM) sites, collecting and PIT tagging naturally produced juveniles, and conducting redd surveys and carcass recoveries for Clear and Pete King 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 2001 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 brood stock collection and spawning, and rearing, marking, and release of juvenile treatments. This document is not intended to provide data analysis. Appendices include summaries of data collected during 1991 to 2001 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 grasslands 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*).

Pete King Creek (Figure 3) is 21.8 km 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.).

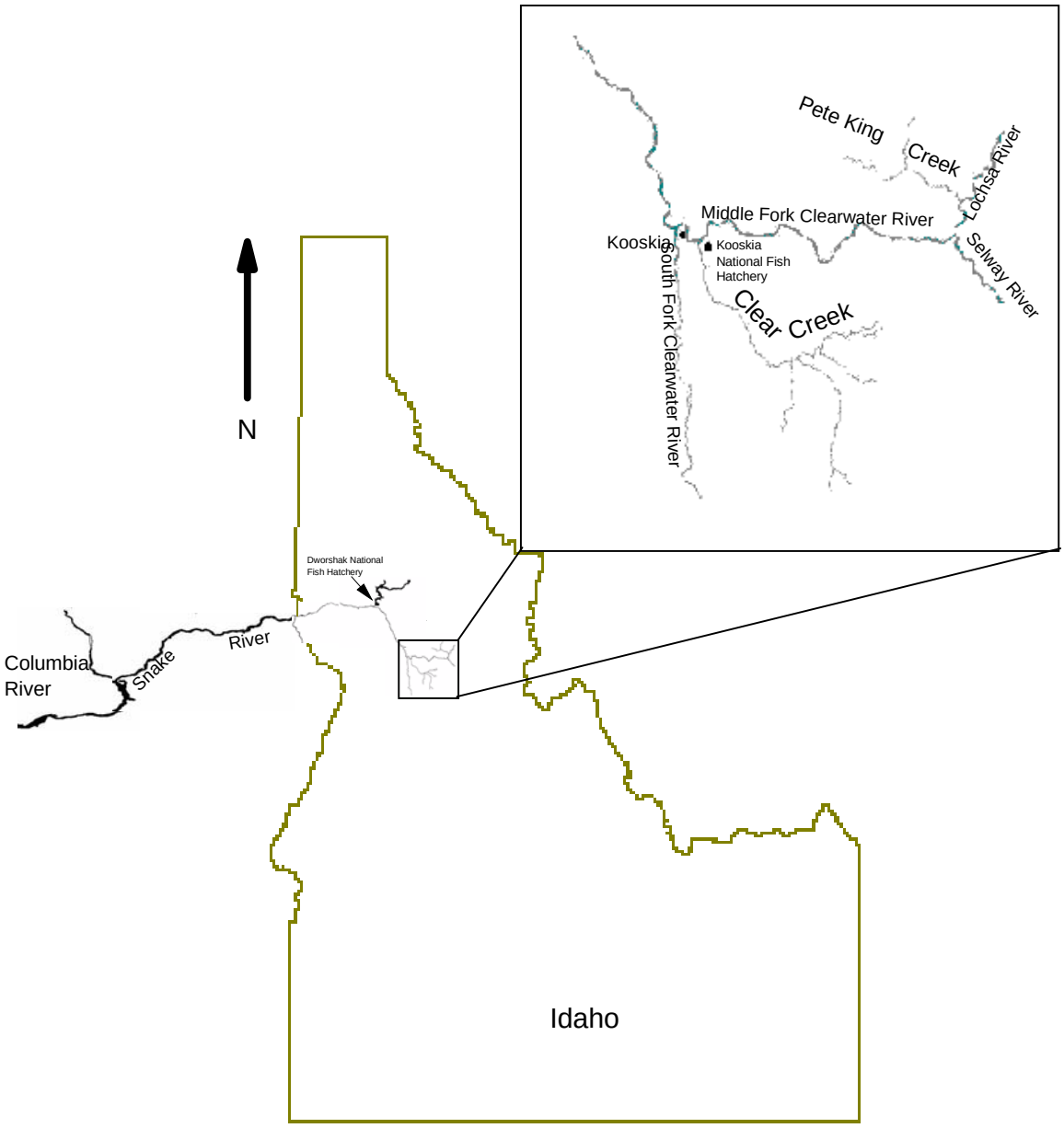

Figure 1. Location of Clear Creek and Pete King Creek in the Clearwater River drainage, Idaho

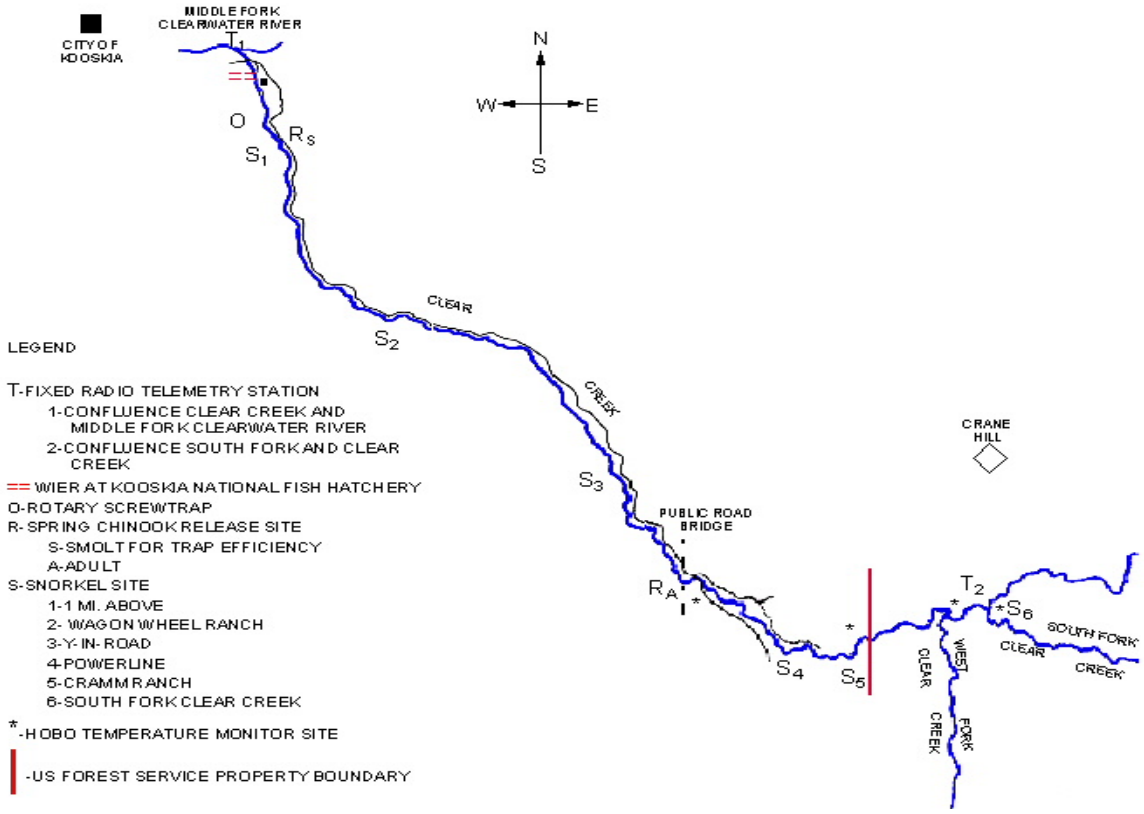

Figure 2. Location of Sites on Clear Creek in the Clearwater River drainage, Idaho.

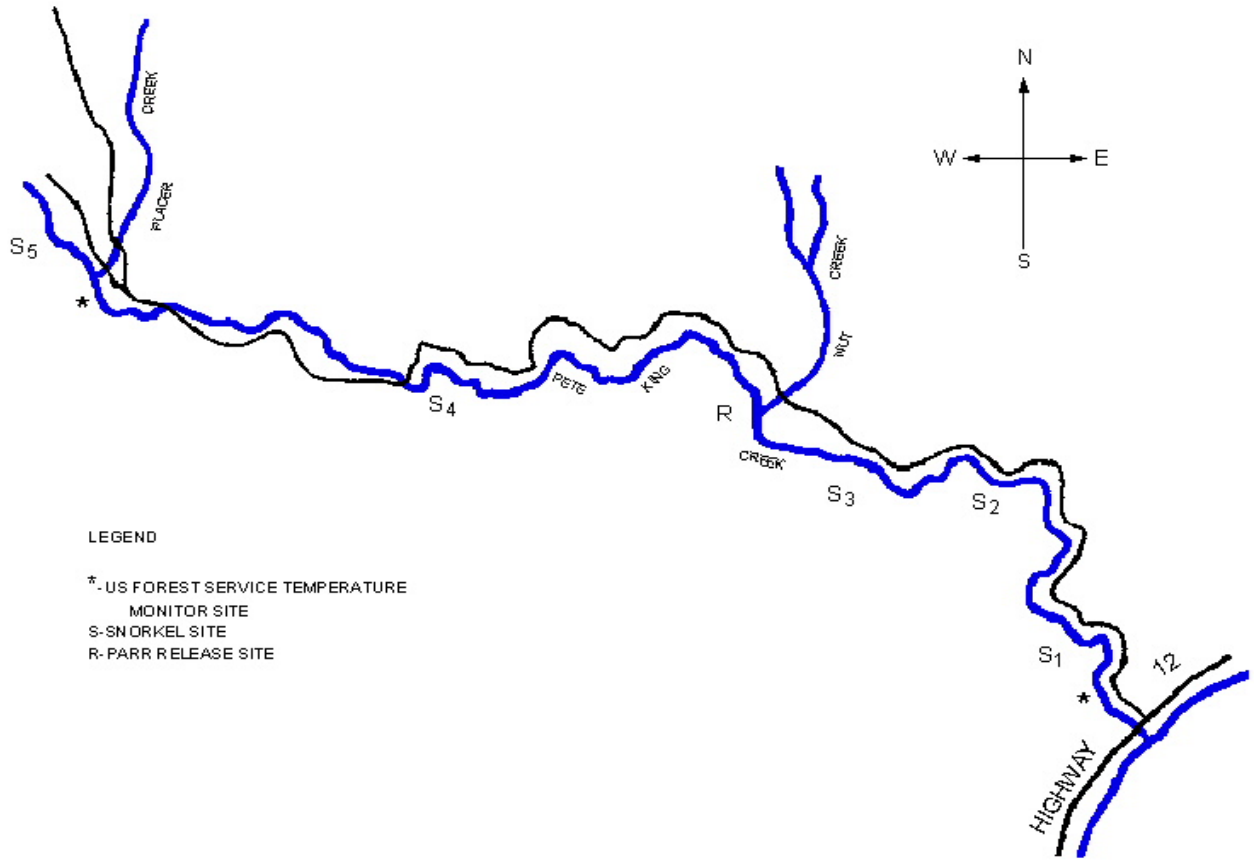

Figure 3. Location of Sites on Pete King Creek in the Clearwater River drainage, Idaho.

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 is 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), are also released directly from KNFH into Clear Creek. These marks allow differentiation of hatchery and naturally produced smolts, and returning adults. A minimum of 500 smolts are PIT tagged prior to release into Clear Creek from the general hatchery release and supplementation treatments, respectively. This 1000 minimum PIT tag group is used to monitor detection rates, minimum survival, and run timing of each group to the Lower Granite Dam juvenile collection facility.

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

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

Parr Density Estimates

Snorkel surveys are conducted to determine parr density estimates. Spring Chinook parr population is estimated using standardized snorkel methods described in Bowles and Leitzinger (1991), and Thurow (1994). In 1998, it was decided by ISS cooperators that a decrease snorkel activities was warranted 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 did agree 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 survey six of the original snorkel transects on Clear Creek, and five of the original transects on Pete King Creek. All sites have been monitored since 1991 (Rockhold, 1997).

Total spring Chinook parr density (fish/100m^2) is calculated for each stream using the total number of observed parr (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 and Marking

Naturally produced juvenile spring Chinook are collected and PIT tagged on Clear and Pete King creeks for emigrating population and run timing estimations. Minimum PIT tagging goals of 500 parr, 300 fall migrants (pre-smolts), and 100 spring migrants (smolts) are established to ensure detections necessary for statistical analysis (Bowles and Leitzinger, 1991). PIT tag operations are conducted following procedures described by the PIT Tag Steering Committee (1992) using the Columbia River Basin PIT Tag Information System (PTAGIS) software. Prior to tagging, all spring Chinook are scanned for PIT tags and checked for external marks to distinguish general hatchery production spring Chinook from naturally produced spring Chinook. Tagged spring Chinook are allowed to recover for a minimum of 15 minutes before being released. In order to differentiate between smolts, parr, and pre-smolts, ISS cooperators adopted specific dates of collection. Smolts are 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 are collected on Clear Creek and Pete King Creek using a five-foot diameter rotary screwtrap (Clear Creek only) and hook-and-line sampling. All captured fish are sorted according to species. Non-salmonid species are identified,

enumerated, and released back to the stream. Salmonid species are identified and fork lengths measured to the nearest millimeter. Spring Chinook measuring 60mm and greater are retained for PIT tagging. Chinook not meeting minimum PIT tagging fork length criteria and all other salmonid species are released immediately after fork length measurements are recorded. All juvenile collection ceases once maximum daily stream temperature reaches or exceeds 20^{o}C to reduce temperature related stress on captured fish.

A rotary screw trap located 1.5 km above the KNFH weir, is operated in Clear Creek to capture migrating juvenile spring Chinook salmon. The trap is pulled from operation only for repair, or during periods of high debris attributed to high stream flows. The trap is 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 are released 0.61km above the rotary screw trap for trap efficiency estimates. All estimates are conducted after daylight releases. At each event of checking the rotary screw trap, stream flow/height and temperature is recorded.

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

PIT Tag Interrogation

Juvenile spring Chinook salmon are PIT tagged for estimates of smolt detection rates, minimum survival, and run timing to Lower Granite Dam.

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

Adult Escapement

Adult spring Chinook escapement to Clear Creek is estimated by enumerating adult returns to the adult trap at KNFH. No escapement estimation is done for Pete King Creek due to no weir being located at that site. Additional escapement information is collected during redd counts and carcass surveys conducted on both Clear and Pete King creeks.

Adult Returns to the Weir

Adults are 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 is operated from May through September for the collection of brood stock for the KNFH production program and the

ISS project. Once ISS and hatchery brood stock goals are met, additional adult spring Chinook collected at the KNFH adult trap may be recycled into the Clearwater River spring Chinook sport fishery. Spring Chinook adults are sorted based upon ventral and adipose fin clips, and the presence of coded-wire or PIT tags. Fork length, external marks, and gender (when discernible) are recorded for each adult. Sexually dimorphic characteristics may not be fully developed on adult spring Chinook returning to KNFH in May and early June so gender differentiation is difficult. Fork length measurements are 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 is checked for the presence of a coded-wire tag using a Northwest Marine Technology, Inc. R8000 coded wire tag detector. Each spring Chinook with a positive signal from the coded wire tag detector is checked for a PIT-tag using 400mhz and 134mhz detectors. Adults with a positive signal from either detector are transported to Dworshak National Fish Hatchery (DNFH) for use as general production brood stock. No adipose-clipped or coded-wire tagged spring Chinook adults are intentionally passed above the weir.

Both supplementation and natural origin adult spring Chinook are collected at KNFH. Adults having an adipose fin but no external marks or coded-wire tags are considered natural origin, while adults having an adipose fin and right ventral, or left ventral clip (depending on brood year) are considered supplementation origin. Releases above the weir are based on protocol described in Bowles and Leitzinger (1991). Tissue samples are taken from the upper caudal fin of all natural and supplementation spring Chinook passed above the weir for genetic analysis. Tissue samples are preserved in individually labeled scintillation vials containing 90% ethyl alcohol.

Brood Stock Selection

Approximately one out of three captured natural, and one out of three captured supplementation adults is used for ISS brood stock. Adult spring Chinook collected for brood stock are transported to Dworshak National Fish Hatchery (DNFH) and isolated in a holding pond containing Kooskia stock only. ISS brood stock is sorted from the KNFH production brood stock based on fin clips and presence of coded-wire tags. Spawning of ISS brood stock is conducted at DNFH. There is no selection for size, age, or origin (natural vs. supplementation). A 1:1 sex ratio with factorial crosses is attempted for enhancement of the effective population size (Bowles and Leitzinger, 1991) although some males are spawned multiple times due to shortage of milt. Ovarian fluid from each spawned female is tested for the causative agent of bacterial kidney disease, *Renibacterium salmoninarum*. Ovarian fluid is tested using an enzyme linked immunosorbent assay (ELISA). Individual crosses based on the origin of the spring Chinook are recorded. Surplus supplementation adults are used for KNFH general hatchery production. Eggs from each individual cross are kept in individual heath trays and reared separately from general hatchery production eggs during incubation at both DNFH and KNFH. Upon eye-up, eggs from each heath tray are enumerated and transported to KNFH for further incubation and final rearing. Once hatched, ISS juveniles are reared separately from hatchery production spring Chinook juveniles and

marked with ventral fin clips.

Redd Counts and Carcass Recoveries

Redd counts and carcass recoveries are used to determine adult spring Chinook escapement and spawning distribution on Clear and Pete King creeks. Redd counts are conducted according to those protocols described in Hassemer (1993). Weekly surveys are conducted on Clear and Pete King creeks beginning in mid-August and ending in September (three-pass minimum). For Clear Creek, surveys extend 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), and for Pete King Creek, surveys are conducted from 8.0 km above the mouth downstream to its confluence with the Lochsa River.

For each stream, completed redds and test redds are 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 are recorded. Scale samples, dorsal fin ray, and genetic samples are collected on all natural adult spring Chinook for age analysis being conducted by IDFG (BPA project number 1991-73-00, IDFG). Snouts are collected from all fish without a right opercle plate notch and checked for coded-wire tags using an R8000 coded wire tag detector.

Radio Telemetry

Radio telemetry is used to monitor adult spring Chinook salmon passed above the KNFH weir. Using telemetry equipment, spawning success, redd distribution, and determination of whether or not natural adults were spawning with hatchery-reared, or supplementation adults, is determined. Adults are captured at KNFH and anesthetized using MS-222, carbon dioxide, or Aqui-S™ (a clove oil derivative). Three-volt coded aquatic transmitters (MCFT-3B) are inserted into the stomachs. An SRX-400 manual tracking receiver, SRX-400 data-logging receiver, and a 3-element Yagi antenna (LOTEK Engineering, Inc.) are used in tracking of radio tagged adults. Tracking is conducted a minimum of once a week. Date, time, channel, code, location and signal strength of each transmitter is recorded. Radio transmitters that remain in one location longer than three consecutive tracking sessions are “ground-truthed” to determine their viability. Fixed telemetry stations are set up at the mouth of Clear Creek and at the confluence of Clear Creek and the South Fork Clear Creek to determine fish passage to or past these locations

Water Temperature

Water temperatures are monitored at four locations (Figure 2) in Clear Creek using Onset, StowAway XTI temperature recorders.. These locations are 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). At the time of deployment and retrieval of each temperature recorder, temperature is recorded using a handheld mercurial thermometer for determination of a correction factor for each site. Water temperature data for Pete King Creek is 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 is 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 and the Middle Fork Clearwater River. Stream staff gauge height is recorded at each event of checking the rotary screw trap.

Results

Treatments

No ISS smolt treatment was released into Clear Creek in 2001 due to a low adult spring Chinook return to KNFH in 1999 which didn't allow broodstock collection for a smolt treatment.

KNFH released 80,430 adipose fin-clipped general production smolts (brood year (BY) '99) on March 28, 2001 directly from KNFH into Clear Creek. Approximately 17% of the total release was marked with coded-wire tags, and 749 were PIT tagged.

PIT tagging of parr for supplementation treatment releases into Pete King Creek was coordinated with IDFG. A total of 17,014 parr were released into Pete King Creek on July 24, 2001. These were 100% coded wire tagged, and 1000 of the 17,014 were PIT tagged. None received external marks. Dates and size at release are shown in Appendix A.

Parr Density Estimates

Snorkel sites on Clear Creek were surveyed on July 23 -25, 2001. Water temperatures recorded during surveys ranged from 15 ^{0}C to 20.5 ^{0}C. The total observed spring Chinook parr density for Clear Creek was 5.2 fish/100m^2 (Table 1). Sites on Pete King Creek were surveyed on July 19, 2001. Recorded water temperatures ranged from 14 ^{0}C to 17 ^{0}C. The total observed spring Chinook parr density for Pete King Creek was 4.16 fish/100m^2 (Table 2). The observed parr densities for surveys conducted in 1991 to 2001 are shown in Appendix B.

Table 1. Spring Chinook parr density estimates for Clear Creek, 2001.

	GPM Site Number	Area Sampled (m^2)	Observed Number spring Chinook	Density (fish/100m^2)
1 Mile Above Weir	3	316.2	5	1.58
Wagon Wheel	7	297.2	16	5.38
Y-In Road	12	250.6	17	6.78
Power line	16	343.6	27	7.86
Ring (Cram) Ranch	18	647.4	39	6.02
Above Mouth	20	147.7	0	0
	Total	**2002.7**	**104**	**5.19**

Table 2. Spring Chinook parr density estimates for Pete King Creek, 2001.

	GPM Site Number	Area Sampled (m^2)	Observed Number spring Chinook	Density (fish/100m^2)
0.5 Mile Above Mouth	2	393.7	7	1.78
Last Slide	3	138.6	14	10.1
Above Z-Hole	5	238.2	18	7.56
Big Boulder	8	168.8	6	3.55
Road End	10	141.7	0	0
	Total	**1081**	**45**	**4.16**

Juvenile Collection and Marking

A total of 749 hatchery produced (adipose fin clipped) smolts were PIT tagged at KNFH Prior to release into Clear Creek. Due to the low adult return in 1999, there were no smolts for the 2001 ISS supplementation treatment release. No naturally produced (unmarked) smolts were captured and PIT tagged from BY'99.

Seventy-seven sub-taggable (<60mm.) juvenile spring Chinook salmon were captured in the rotary screw trap and released untagged. The rotary screw trap was operated for 105 total days on Clear Creek from February 26 to July 9, 2001. The trap was not operational after July 9, 2001 due to low flows, which prevented operation. 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 2001 is shown in Appendix C.

Using hook-and-line techniques 412 parr and 320 pre-smolts were captured, tagged and released on Clear Creek from July 7 to October 25**.** On Pete King Creek, 240 hatchery reared, coded-wire tagged, and 16 unmarked naturally produced pre-smolts were captured. Only the 16 unmarked naturally produced pre-smolts were PIT tagged and released.

PIT Tag Detections

There were no detections of PIT-tagged naturally produced spring Chinook salmon juveniles from Clear Creek. The percent of first detections was 55.8% for the hatchery-produced smolts. No naturally produced Clear Creek origin pre-smolts (BY'00) were interrogated at any of the 4 detection facilities. The travel time and dates for 10%, 50%, and 90% detection rates for the hatchery-produced smolts at GRJ are shown in Appendices D1 and D2.

There were no detections of pit-tagged spring Chinook juveniles from Pete King Creek at any detection facility.

Adult Returns to Weir

A total of 2,261 adult spring Chinook salmon were collected at KNFH in 2001. The KNFH adult trap was operated intermittently from May 17 through August 27, 2001, for the collection of adults necessary for both hatchery production and ISS needs. The ocean age, fin clips, and gender, when discernible, are shown in Table 3. Adult returns for 1991-2001 are shown in Appendix E. A total of 194 supplementation adults and 60 unmarked (natural) adults were collected at KNFH. Caudal fin samples were collected from 146 supplementation adults and 60 natural (unmarked) adults for future genetic analysis. A total of 90 adults (45 supplementation and 45 natural) were released into Clear Creek to spawn naturally. Genetic samples were collected from each of the 90 adults released in Clear Creek. In addition to the 90 adults released above the weir, an unknown number escaped upstream of the weir during a storm event on May 1 in which debris forced panels of the weir open for approximately 24 hours. Using a 3 fish per redd estimate from 2000 data, when we presumed the weir was 100% efficient, it was estimated that 408 adults escaped above the weir

Table 3. Brood year 2001 adult trapping data for KNFH adult trap.

Trapping Year	Date of Trap Operation Open-Close	Total Adults Trapped	I-Ocean	II-Ocean	III-Ocean	AD	RV	LV	Unmarked
2001	5/17-8/27	2261	29	2163	96	2007	5	189	60

Adult escapement

A storm event on May 1, 2001 resulted in high debris load that subsequently forced the weir panels open for approximately 24 hours. Using a three fish per redd estimate from 2000 data, when we presumed the weir was 100% efficient, it was estimated that 408 adults escaped above the weir in 2001.

Brood stock selection

Fifty-two females were spawned for the ISS program. Ovarian fluid samples were taken from each female to test for bacterial kidney disease. Eggs from eight

females were culled due to ELISA values that rated high (1.523 average OD) to very high (3.936 average OD). An additional cross between a general hatchery production male and a supplementation female was culled. After culling, progeny from 43 pairs remained for a total of 154,209 eyed-eggs. The total mating composition for ISS brood stock is shown in Table 4a. All eggs were transferred to KNFH by November 5, 2001 for final incubation and rearing. The smolt treatment release for migratory year (MY) 2003 contained progeny from nine supplementation by supplementation (SxS) crosses, one natural by natural (NxN) cross, and eleven natural by supplementation (NxS) crosses for a total of 75,977 eyed eggs at 91.7% eye up (Table 4b). Excess progeny will be adipose fin clipped and released as general hatchery production smolts.

Table 4a. Total ISS Brood stock mating composition for BY 2001, Clear Creek.

Brood Year	Number of Takes	Dates of First and Last Takes	MATING COMPOSITION (N-natural, S-supplementation)			# EYED EGGS	# GREEN EGGS	% EYE UP
			NxN	NxS	SxS			
2001	4	8/21-9/11	1	11	31	154,209	167,060	92.3

Table 4b. ISS Brood stock mating composition for smolt supplementation treatment MY 2003, Clear Creek.

Brood Year	Number of Takes	Dates of First and Last Takes	MATING COMPOSITION (N-natural, S-supplementation)			# EYED EGGS	# GREEN EGGS	% EYE UP
			NxN	NxS	SxS			
2001	4	8/21-9/11	1	11	9	75,977	82,869	91.7

Redd Counts and Carcass Recoveries

Five redd surveys were conducted on Clear Creek. These surveys were conducted from August 15 to September 24. A total of 166 redds, and 195 carcasses were counted (Table 5), and 157 snouts were collected for coded-wire tag analysis (Table 5). All recovered snouts were taken to KNFH and checked for presence of coded-wire tags. Twenty-nine coded-wire tags were recovered; 27 were KNFH stock, released into Clear Creek, one was DNFH stock, and one was Powell stock released into Boulder Creek on the Lochsa River. Carcass recoveries on Clear Creek were conducted during redd surveys. Data taken on carcasses included fork lengths, origin of the carcasses, based on fin clips, percent spawned and sex (Table 6a).

Three redd surveys were conducted and 17 redds were recorded on Pete King Creek from August 14 to September 10, 2001. Six carcasses were collected, which are the first carcasses ever observed or collected on Pete King Creek (no carcasses were observed in past surveys). There were no external marks, coded-wire tags, or PIT tags detected in any of the carcasses recovered on Pete King Creek. Carcass collection data is summarized and shown in Table 5. The specific fork lengths and sex of the carcasses recovered on Pete King Creek is shown in Table 6b.

Redd survey summaries for Clear Creek and Pete King Creek from 1991-2001 are shown in Appendix F.

Table 5. Redd surveys and carcass summary for Clear Creek and Pete King Creek, ID. 2001.

Stream	Distance Surveyed	# Released Above Weir	# Redds	Carcasses	Redds per km
Clear Cr.	20.2 km	90[a]	166	195	8.2
Pete King Cr.	8.0 km	-	17	6	2.1

[a] Known releases only, in addition an estimated 408 adults escaped above the weir.

Table 6a. Length frequency distribution of spring Chinook carcass recoveries collected on Clear Creek, 2001. (Unmarked-no fin-clip, Supplementation-ventral fin-clip only, Hatchery-adipose fin-clip only, Origin Undeterminable-no determinable origin due to decomposition of carcass). (I-, II-, and III-ocean age class assumed by length.)

		Unmarked		Supplementation		Hatchery		Origin Undeterminable	
	Fork Length Frequency	**Male**	**Female**	**Male**	**Female**	**Male**	**Female**	**Male**	**Female**
I-Ocean	<=56	0	0	0	0	2	0	1	0
	57 to 60	0	0	0	0	0	0	0	0
	61 to 65	0	0	1	1	0	0	0	0
II-Ocean	66 to 70	0	1	0	1	4	8	0	1
	71 to 75	1	4	2	7	9	32	1	3
	76 to 81	2	0	3	1	20	37	7	0
III-Ocean	82 to 90	4	1	2	0	29	6	0	0
	>90	1	0	0	0	1	0	0	0
	Unknown Fork Length[a]	0		0		1		1	
	Subtotal	8	6	8	10	65	83	9	4
	Total	18				149		14	

[a]-Carcass too decomposed for measurement of fork length and gender differentiation.

Table 6b. Length frequency distribution of spring Chinook carcass recoveries collected on Pete King Creek, 2001. (Unmarked-no fin-clip, Supplementation-ventral fin-clip only, Hatchery-adipose fin-clip only, Origin Undeterminable-no determinable origin due to decomposition of carcass). (I-, II-, and III-ocean age class assumed by length.)

		Unmarked		Supplementation		Hatchery		Origin Undeterminable	
	Fork Length Frequency	Male	Female	Male	Female	Male	Female	Male	Female
I-Ocean	<=56	0	0	0	0	0	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	1	1	0	0	0	0	0	0
	71 to 75	0	3	0	0	0	0	0	0
	76 to 81	0	1	0	0	0	0	0	0
III-Ocean	82 to 90	0	0	0	0	0	0	0	0
	>90	0	0	0	0	0	0	0	0
Unknown Fork Length[a]		0		0		0		0	
	Subtotal	1	5	5	0	0		0	0
	Total	6		0		0		0	

[a]-Carcass too decomposed for measurement of fork length and gender differentiation.

Radio Telemetry

The radio-tracking component of the study continued with transmitters being placed in 37 adults. Of those adults, 18 were natural (unmarked) origin, nine being female; 19 were supplementation (left ventral clip) origin, twelve being female. By the end of spawning season, twenty-three transmitters had been recovered.

Fifteen-spring Chinook were tracked through the end of spawning season, five were male and ten were female. Fourteen of the fifteen were tracked to locations with heavy spawning activity and it was assumed spawning by these radio tagged spring Chinook was successful. Due to the high number of stray adipose clipped spring Chinook in the stream, and the presence of multiple redds in the key spawning areas, it was not possible to determine if the radio-tagged Chinook spawned with other supplementation, hatchery, or natural fish.

Eighteen radio tags were recovered prior to the end of spawning season. Of these, three were tagging mortalities, six may have been regurgitated tags as there were no carcasses present at the time of radio tag recovery, three were tracked until the transmitters were recovered from the carcasses prior to spawning and two escaped below the KNFH weir into the Middle Fork Clearwater River and were detected by the fixed telemetry station located at the mouth of Clear Creek. Eight of the twenty-two radio-tagged spring Chinook moved out of the range of mobile tracking or the transmitters ceased to transmit after release. Four of these spring Chinook were last detected upstream

of a fixed radio telemetry station located at the confluence of the South Fork Clear Creek and Clear Creek

WaterTemperature

Temperatures ranged from 10.8 C at four monitoring sites in Clear Creak from June 30, to August 18, 2001 (Figure 4). The lowest temperatures were recorded at the West Fork Site, and the highest were recorded at the Public Road Bridge. The maximum daily water temperature on Pete King Creek was 22.1^{o}C, recorded on July 10 at the USFS gauge above the mouth. Mean daily water temperatures on Pete King Creek from June 6 to September 26, 2001 as recorded at the USFS monitoring station (USFS-gauge) and above Placer Creek (Placer) are illustrated in Figure 5.

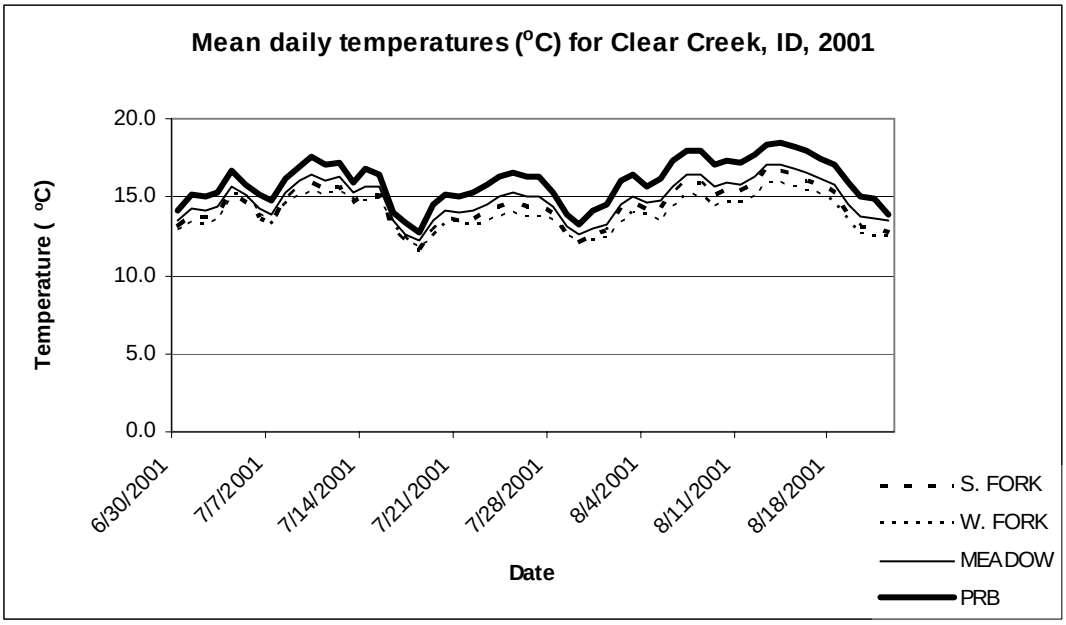

FIGURE 4. Mean daily water temperature for Clear Creek, Idaho. Temperature data recorded from June 6 through September 22, 2001 at the Public Road Bridge (PRB), Cram Ranch Meadow (Meadow), West Fork Clear Creek (W. Fork), and South Fork Clear Creek (S. Fork).

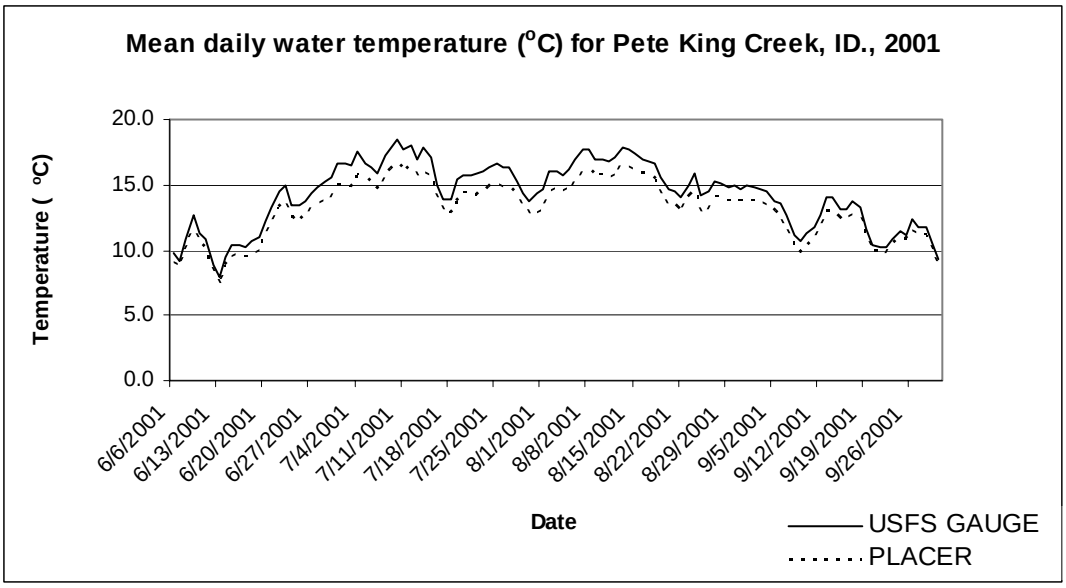

Figure 5. Mean daily water temperature for Pete King Creek, Idaho. Temperature data recorded from June 6 through September 26, 2001 at the USFS monitor station (USFS Gauge), and in Pete King Creek above the confluence with Placer Creek at rk-5.63 (Placer).

Stream Flow

Gauge height on Clear Creek ranged from under .50 to 2.6 feet, recorded on May 1, 2001. Gauge height reduced to a point the week of July 8, that the rotary screw trap would no longer function so gauge height recording ceased. Figure 6 shows the daily gauge height on Clear Creek for March 18 to July 8, 2001.

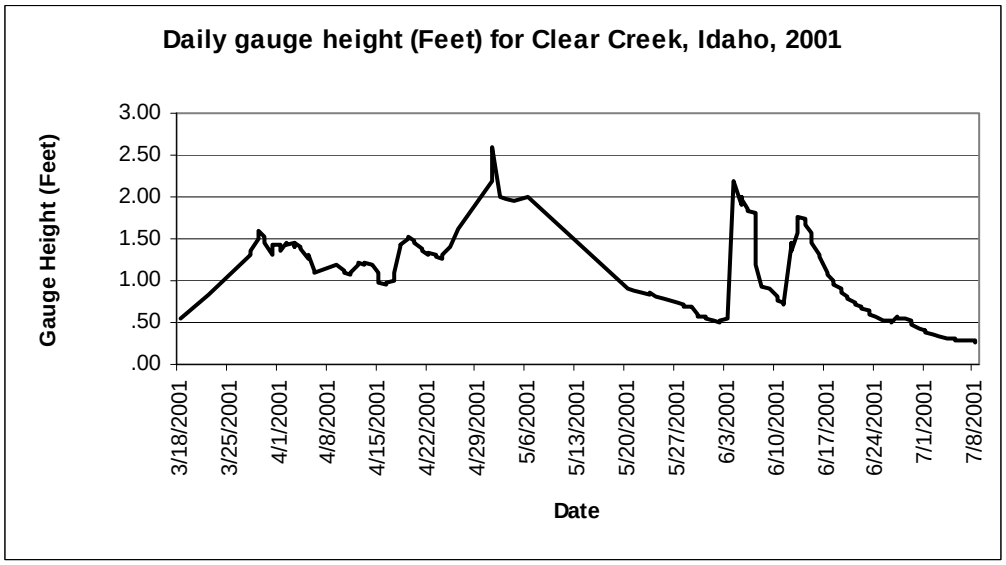

Figure 6. Daily gauge heights for Clear Creek, Idaho, 2001. Gauge height data recorded from March 28 through July 8, 2001.

Summary and Conclusions

Treatments

The prescribed smolt treatment on Clear Creek was not completed this year due to a low adult return to KNFH in 1999. The experimental design stated that brood stock should be collected to complete a minimum of five supplementation releases. To compensate for no treatment release in 2001, second-generation brood stock selection efforts will be extended through 2002. Progeny from 2002 brood stock will be released in 2004. This will allow for five treatments, or one generation, as prescribed in the experimental design (Bowles and Leitzinger, 1991). The number of treatments and final determination of cessation of treatments will ultimately depend upon the statistical consultations scheduled to begin in February 2002. The consultations will be done with Dr. Kirk Steinhorst from the University of Idaho, as well as cooperators from each of the agencies represented in this study.

The prescribed parr treatment was applied to Pete King Creek on June 24. This was the fourth 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 higher than last year. This was anticipated based upon the number of redds observed during the 2000 field season.

Juvenile Collection

The rotary screw trap was operated for 105 days in attempt to capture smolts on Clear Creek. On May 1, woody debris collected in the rotary screw trap, causing the trap to sink. High flows prevented the trap from being recovered from the bottom of Clear Creek for 3-5 days causing irreparable damage. No trapping was conducted for 27 days while a new trap was prepared and installed on May 23. No spring Chinook smolts were captured in the rotary screw trap this year. A very low number was expected due to the low number of adult spring Chinook (n=20) released above the weir in 1999. Because there were no juvenile spring Chinook PIT tagged, there could be no trapping efficiencies estimated. The rotary screw trap was not operational after July due to too low a stream flow not permitting the trap to function. As a result, there are no emigration estimates for project year 2001.

PIT Tag Detections

There were no PIT tag interrogations at detection facilities for fish tagged in Clear Creek and Pete King Creek from brood year 2000.

Adult Escapement

Due to a storm event on May 1, high flows forced large woody debris into the

panels of the KNFH weir which was forced open for approximately 24 hours. During redd surveys, it was apparent that a large number of adult spring Chinook passed the adult weir during this event. An estimate was made of the number of unobserved adult spring Chinook that escaped above the KNFH weir based on our ability to locate redds, and percentage of coded wire tags in recovered carcasses. This incident will become a problem as progeny from this brood year return as adults in 2004 - 2006. The design of the weir at KNFH may make this problem continue in the future, in that any event causing high debris flow may cause panels to be lifted to a point where fish may escape beneath the pickets.

A 20.8 km stretch of Clear Creek was surveyed for the duration of the spawning season as previously conducted in 2000. In the past two years, the number of redd walks has been increased on Clear Creek in response to the ISS cooperator's decision that redd counts and carcass recoveries on all study streams need to be intensified. Difficulties caused by increasing effort and expanding survey areas were raised during the 2000 cooperator's meeting. These are addressed in the Five-Year Report (Walters et al, 1999).

Radio Telemetry

Due to the high number of hatchery origin adult spring Chinook in the stream, and the presence of multiple redds in the key spawning areas, it was not possible to determine whether or not radio-tagged adult Chinook spawned with supplementation, natural, or hatchery origin adults. As a result, radio telemetry was not as useful in observations of specific fish interactions as it had been in previous years.

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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	Brood Stock 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) were released above KNFH weir.

Appendix A2. Treatment for Pete King Creek (brood years 1991-2000). Fin clips are left ventral (LV), right ventral (RV). Rearing facility is Clearwater Anadromous Fish Hatchery (CAFH). (N/A-data not available)

Brood Year	Proposed Treatment	Date Released	Life Stage	Number Released	Number PIT Tagged	Fin Clips	Mean Fork Length	Brood Stock Source	Rearing Facility
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 1991-2001

Brood Year	Year Surveyed	Area Surveyed (m^2)	Observed Density (fish/100m^2)
2000	2001	2,002.7[a]	5.20
1999	2000	1,642.3[a]	0.00
1998	1999	1,267.0[a]	6.60
1997	1998	2,087.0[a]	6.42
1996	1997	6371.6	0.97
1995	1996	6033.8	0.00
1994	1995	6215.6	1.15
1993	1994	6794.2	6.30
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 1991-2001

Brood Year	Year Surveyed	Area Surveyed (m^2)	Observed Density (fish/100m^2)
2000	2001	1,081.0[a]	4.20
1999	2000	1,038.1[a]	0.20
1998	1999	922.2[a]	1.70
1997	1998[b]	790.3[a]	15.70
1996	1997	1832.4	0.00
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 was 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 1991-2000.

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
2000	parr	07/07/01	07/08/01	8	22	0[a]	0
1999	smolt	02/26/01	06/30/01	97	55	0[a]	0
1999	parr	07/02/00	07/24/00	22[b]	1	0	0
1998	smolt	03/17/00	06/30/00	90	61	13	2
1998	parr	07/01/99	07/09/99	9	0	0	0
1997	smolt	03/16/99	06/30/99	100	575	403	62
1997	parr	07/01/98	07/21/98	21	55	42	0
1996	smolt	03/21/98	03/21/98	101	227	83	3
1996	pre smolt	10/02/97	12/17/97	69	4	3[c]	0
1996	parr	07/01/97	07/08/97	8	0	0	0
1995	smolt	03/19/97	06/30/97	71	0	0	0
1995	parr	07/01/96	07/12/96	5	0	0	0
1994	smolt	03/01/96	06/30/96	122	17	8	0
1994	parr	07/01/95	08/13/95	44	9	0	0
1993	smolt	03/14/95	06/29/95	60	64	54[e]	0
1993[d]	pre smolt	09/14/94	11/11/94	59	160	63[e]	0
1993	parr	07/01/94	07/14/94	14	12	8[e]	0
1992	smolt	03/14/94	06/26/94	105	30	5[e]	0
1992	parr	07/01/93	08/09/93	40	63	0	0
1991	smolt	05/16/93	06/30/93	49	23	0	0

[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 1991-2001 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
2000	smolt	H_{lv}	750	N/A	N/A	N/A	N/A	N/A	N/A
2000	smolt	H	750	N/A	N/A	N/A	N/A	N/A	N/A
2000	pre smolt	N	320	N/A	N/A	N/A	N/A	N/A	N/A
2000	parr	N	412	N/A	N/A	N/A	N/A	N/A	N/A
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	pre smolt	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	pre smolt	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	pre smolt	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 1991-2001 from (Origin is H=hatchery reared, N=natural; Fin clips represented are lv=left ventral, rv=right ventral, ad=adipose). N/A= data not yet 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	pre smolt	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	pre smolt	N	6	0	-	0	-	-	-
1993	pre smolt	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	pre smolt	N	298	15.4	221	25.8	4/1/94	4/23/94	4/29/94
1991	pre smolt	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 1991-2000 (origin is H=hatchery reared, N=natural reared). No brood year 1994-1996 were 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
2000	pre smolt	N	16	N/A	N/A	N/A	N/A	N/A	N/A
2000	parr	H	1,000	N/A	N/A	N/A	N/A	N/A	N/A
1999	parr	N	0	0	-	-	-	-	-
1998	parr	N	2	0	-	-	-	-	-
1997	parr	N	300	2	201	8.3	03/30/99	04/06/99	05/10/99
1993	parr	H	998	4.1	310	7.5	04/20/95	05/10/95	06/05/95
1992	parr	H	1,000	6.1	275	10.0	04/25/94	05/04/94	05/16/94

APPENDIX E. Adult spring Chinook salmon returns to Kooskia National Fish Hatchery adult trap for 1991-2001. 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
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 were reported in DNFH fish disposition summary.

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

[f] Estimate based on 6-year average.

Appendix F1. Redd count summaries for Clear Creek, 1991-2001.

Year Surveyed	Distance Surveyed (km)	# Redds	Redds/km
2001	20.2	166[a]	8.2
2000	20.2	30	1.5
1999	16.1	0	0.0
1998	18.5	2	0.1
1997	18.5	17	0.9
1996	16.1	3	0.2
1995	16.1	0	0.0
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 408 adults escaped above weir in addition to the 90 known adults released.

Appendix F2. Redd count summaries for Pete King Creek, 1991-2001.

Year Surveyed	Distance Surveyed (km)	# Redds	Redds per km
2001	8.0	17	2.1
2000	8.0	2	0.3
1999	8.0	0	0.0
1998	8.0	0	0.0
1997[a]	8.0	1	0.1

[a] 1997 was the first year redds or carcasses were found on Pete King Creek However, Pete King Creek was surveyed each year from 1991-2001.