

FISHERY RESEARCH



IDAHO SUPPLEMENTATION STUDIES

Brood Year 2011 Synthesis Report



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IDAHO SUPPLEMENTATION STUDIES

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ABBREVIATIONS AND ACRONYMS

| Acronym | Definition | Acronym | Definition |
|---------|--|---------|---|
| BPA | Bonneville Power Administration | M | Male |
| BY | Brood year | mm | Millimeter |
| C | Control | n | Number |
| cm | Centimeter | ND | No Data |
| cfs | Cubic feet per second | NOAAF | National Oceanic and Atmospheric Administration Fisheries |
| CRITFC | Columbia River Intertribal Fisheries Commission | NPTM | Nez Perce Tribe, McCall Office |
| CWT | Coded Wire Tag | NR | Nampa Research |
| d | Days | PIT | Passive Integrated Transponder |
| DIDSON | Dual Frequency Identification Sonar | PTAGIS | PIT Tag Information System |
| DNA | Deoxyribonucleic acid | SE | Standard Error |
| EFGL | Eagle Fish Genetics Laboratory | SURPH | Survival Under Proportional Hazards model |
| F | Female | T | Treatment |
| FL | Fork Length | U | Undetermined |
| GP | General Production (hatchery) | UCI | Upper Confidence Interval |
| IFRO | Idaho Fisheries Resource Office | VSP | Viable Salmonid Population |
| ISRP | Independent Scientific Review Panel | WFYF | West Fork Yankee Fork Salmon River |
| km | Kilometer | | |
| LCI | Lower Confidence Interval | | |
| m | Meter | | |

ABSTRACT

The Idaho Supplementation Studies (ISS) project was implemented in 1992 to evaluate the benefits and risks of using hatchery supplementation to increase natural production of spring/summer Chinook Salmon *Oncorhynchus tshawytscha*. This report documents ISS research tasks completed by the four cooperating agencies (Idaho Department of Fish and Game, Nez Perce Tribe, Shoshone-Bannock Tribes, and U.S. Fish and Wildlife Service). We present a summary of all activities associated with brood year 2011 Chinook Salmon in ISS study streams including data on the number of adults that returned to collection facilities (escapement), adults passed onto spawning grounds (adult treatments), juvenile releases in three streams, redd counts, and carcass information. The report then follows the resulting juveniles through migration, including natural production estimates and survival to Lower Granite Dam. Beginning with brood year 2008 the ISS project entered its final phase of evaluating post supplementation population responses. The last supplementation adults returned in 2007, therefore no further data are available for this group. The number of natural origin adults passed over weirs in 2011 ranged from 11 to 30 fish in the Clearwater River subbasin and from 211 to 693 fish in the Salmon River subbasin. Redd density in survey transects in the Clearwater River subbasin streams averaged 2.43 redds/km. Salmon River subbasin streams averaged 3.53 redds/km. Carcass data were collected concurrently with redd counts. We collected 1,869 carcasses in 2011. We estimated 954,912 brood year 2011 natural origin juvenile Chinook Salmon emigrated from 15 ISS streams with screw traps. Presmolt and smolt survival to Lower Granite Dam in the Clearwater subbasin averaged 21.0% and 25.3%, respectively, while parr, presmolt, and smolt survival in the Salmon subbasin averaged 14.0%, 25.3%, and 37.3%, respectively. Survival of age-0 smolts from the Pahsimeroi River was 37.2% to the dam.

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INTRODUCTION

Background

The Idaho Supplementation Studies (ISS) is a cooperative research project involving the Idaho Department of Fish and Game (IDFG), the Nez Perce Tribe (NPT), the Shoshone-Bannock Tribes (SBT), and the United States Fish and Wildlife Service (USFWS), and is funded by the Bonneville Power Administration (BPA). Each agency is responsible for data collection on a subset of study streams across the Clearwater and Salmon river subbasins as developed in the original study design (Bowles and Leitzinger 1991). Beginning with brood year 2008 the ISS project entered its final phase of evaluating post supplementation population responses. The last supplementation adults returned in 2007, therefore no further data are available for them. Data collected include estimates of escapement for natural origin adult Chinook Salmon *Oncorhynchus tshawytscha*, biological data from salmon carcasses, juvenile production in treatment and control streams, juvenile passive integrated transponder (PIT) tag interrogations at detection facilities throughout the Columbia River basin, and stray rates of general production hatchery adults into study streams.

The ISS study addresses critical uncertainties associated with hatchery supplementation of Chinook Salmon populations (i.e., effects on productivity, persistence, establishment, and advantages of localized broodstocks) in Idaho (Bowles and Leitzinger 1991). The ISS program also addresses questions identified in the Supplementation Technical Work Group Five Year Work Plan (STWG 1988), defines the potential role of supplementation in managing Snake River basin anadromous fisheries, and evaluates its usefulness as a recovery tool for salmon populations in the Snake River basin (Bowles and Leitzinger 1991).

The ISS program initially identified two goals in the Salmon and Clearwater subbasins: 1) assess the use of hatchery Chinook Salmon to increase natural populations, and 2) evaluate the genetic and ecological impacts of hatchery Chinook Salmon on naturally reproducing Chinook Salmon populations. In response to these goals, ISS addresses four objectives: 1) monitor and evaluate the effects of supplementation on presmolt and smolt numbers and spawning escapement of naturally produced Chinook Salmon; 2) monitor and evaluate changes in the productivity and genetic composition of naturally spawning target and adjacent populations following supplementation activities; 3) determine which supplementation strategies (broodstock and release stage) provide the most rapid and successful response in natural production without adverse effects on productivity; and 4) develop supplementation recommendations (Bowles and Leitzinger 1991).

This document summarizes activities conducted by ISS cooperators and data collected between 2011 and 2013 on Chinook Salmon that spawned in 2011 (brood year 2011) and their resulting progeny. Our summary includes data on the number of adults that returned to collection facilities, redd counts, and carcass information. The report then provides information on the resulting juveniles through migration, including natural production estimates and survival to Lower Granite Dam. Summaries and estimates contained herein are preliminary. Adult data are from natural origin and general production strays. Beginning with the report covering brood year 2002 activities (Venditti et al. 2005), the ISS now produces a single, synthesis report each year based on the brood year activities instead of individual agency reports covering either brood or calendar years. Additionally, we provide preliminary data on adult returns for 2012 (Appendix A) and 2013 (Appendix E).

Study Area

The ISS program incorporates treatment and control streams in the Clearwater River and Salmon River subbasins. Currently, 14 treatment and 13 control streams are included in ISS. The Clearwater River subbasin contains eight treatment and four control streams. The Salmon River subbasin includes six treatment and eight control streams (Figure 1).

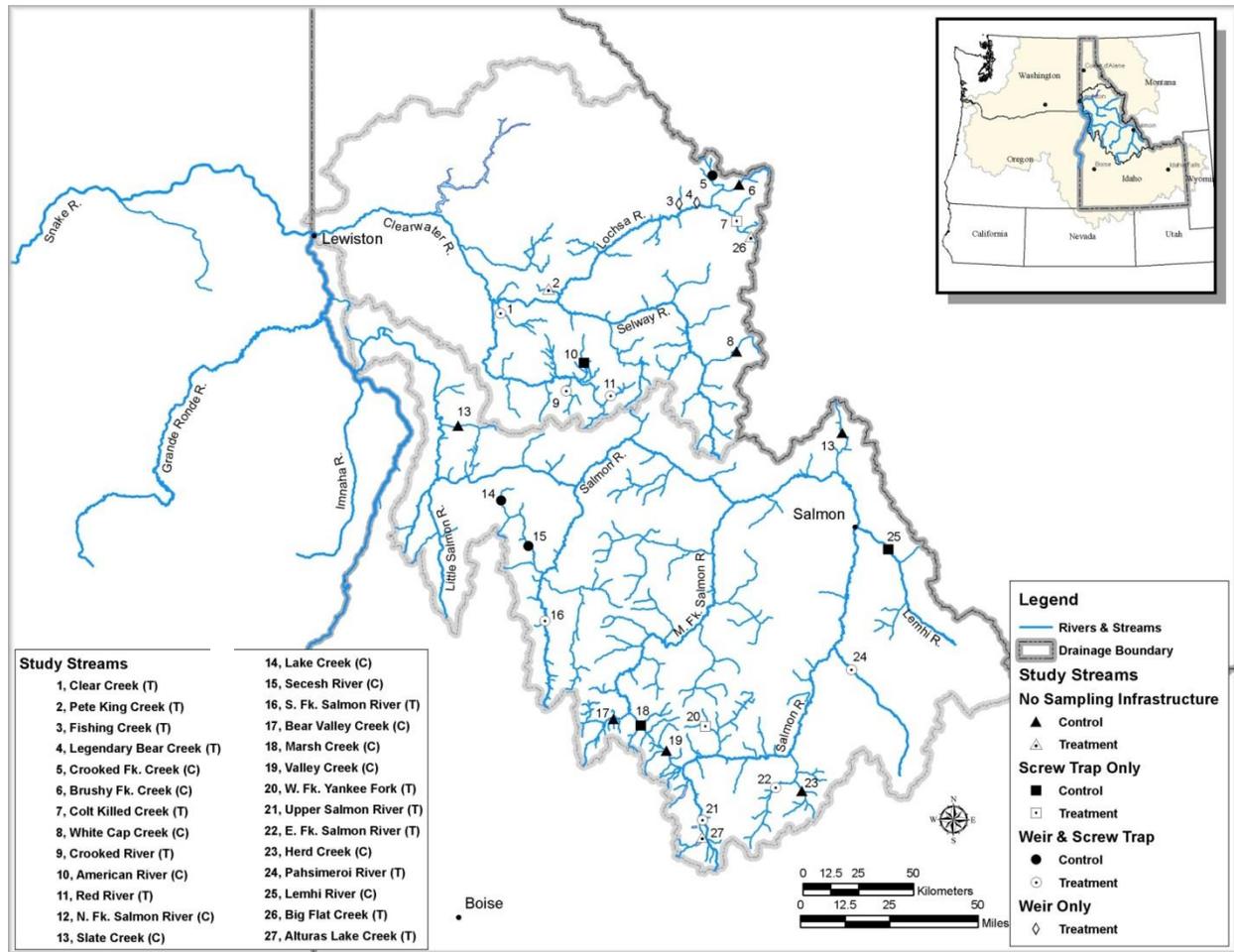


Figure 1. Current treatment and control streams in the Salmon River and Clearwater River subbasins monitored by the four agencies participating in the Idaho Supplementation Studies. Cooperators include the Idaho Department of Fish and Game, Nez Perce Tribe, Shoshone-Bannock Tribes, and the U.S. Fish and Wildlife Service. Legendary Bear and Fishing creeks are revised names for Papoose Creek and Squaw Creek, respectively.

Supplementation activities will continue in Johnson, Newsome, and Lolo/Eldorado creeks through other programs. Because the protocols used there do not contribute to ISS in phase three, the last year we reported data from these streams was in the brood year 2008 report (Venditti et al. 2012). Data from the Johnson Creek Artificial Propagation and Evaluation

Program (Project Number 1996-043-00) and Nez Perce Tribal Hatchery Monitoring and Evaluation Program (Project Number 1983-350-003) for Lolo and Newsome creeks will be available for analyses as recommended by the Independent Scientific Review Panel (ISRP) (ISRP 2003-8).

Fish communities are similar across all ISS study streams. Anadromous species in all streams include wild/natural (hereafter natural) and hatchery Chinook Salmon, summer-run Steelhead trout *O. mykiss*, and Pacific Lamprey *Entosphenus tridentatus*. Sockeye Salmon *O. nerka* are present in the upper Salmon River. Resident fish communities for the Clearwater and Salmon river subbasins include Bull Trout *Salvelinus confluentus*, Westslope Cutthroat Trout *O. clarkii lewisi*, Mountain Whitefish *Prosopium williamsoni*, Redside Shiner *Richardsonius balteatus*, Northern Pikeminnow *Ptychocheilus oregonensis*, Sculpin *Cottus* spp., Dace *Rhinichthys* spp., Suckers *Catostomus* spp., resident Redband Rainbow Trout *O. mykiss*, and Eastern Brook Trout *S. fontinalis* (Bowles and Leitzinger 1991). However, not all species inhabit all streams.

METHODS

Adult Escapement

Weirs

Where possible, we used adult weirs to capture, enumerate, and manage adult Chinook Salmon entering ISS study streams. Evaluation of escapement into streams without weirs was limited to spawning ground surveys and carcass recoveries. In the Clearwater subbasin, we operated adult weirs on Crooked River, Red River, Crooked Fork Creek, and Clear Creek (Figure 1; sites 9, 11, 5, 1). In the Salmon subbasin, weirs were located on the South Fork Salmon River, Pahsimeroi River, upper Salmon River, and East Fork Salmon River (Figure 1; sites 16, 24, 21, 22). All natural origin adults were passed above weirs to spawn. At most locations, adults passed above weirs were marked with an operculum punch to allow mark/recapture escapement estimates from carcass recovery data. We transported general production hatchery Chinook Salmon intercepted at weirs to the hatchery or recycled them into an ongoing fishery downstream of ISS evaluation reaches. In addition to enumeration, we recorded fork length (FL), sex, external tags, marks, and fin clips. We collected DNA samples from the fins of all adults passed above weirs. We used the ratio of marked (operculum punch) to unmarked carcasses in surveys to estimate total spawning escapement with a simple Peterson mark–recapture estimator (Everhart and Youngs 1981).

We operated two passive weirs in the Secesh River drainage during 2011. The ISS project took over the operation of a video weir on Lake Creek in 2007 and continued to operate it through this reporting period. The video weir was located at the mouth of Lake Creek (Figure 1; site 14). The design of the weir allowed fish to pass freely through the weir and in front of a video camera, which recorded fish passages in both directions on videotape. From these tapes, program personnel enumerated fish passages, identified fish to species, and examined fish images for fin clips or other marks. The 24-hour video footage throughout the season provided an estimate of fish that moved into Lake Creek. The Chinook Salmon Adult Abundance Monitoring Project (BPA Project No. 199703000) continued the operation of an acoustic imaging (dual frequency identification sonar or DIDSON) and video recorder in the Secesh River (Kucera 2012) at river kilometer 30.0 (Figure 1; site 15). The design of the structure allowed fish to pass freely past the sonar array. Program personnel enumerated fish passages and measured fish

lengths from the DIDSON files. The files recorded all fish passages in both directions, providing an estimate of fish that moved into the Secesh River, and the video camera provided validation for the DIDSON data (Kucera 2012).

Redd Counts

Chinook Salmon redds were counted in all study streams from July through September to estimate spawning escapement. Since precise measures of production are critical to ISS evaluation, we maintained index reaches as reported in Walters et al. (1999) as well as expanding survey reaches to include all probable spawning habitat. Most reaches were surveyed three or more times with ground counts following standard procedures outlined in IDFG's Redd Count Manual (Hassemer 1993). Multiple ground counts allow observation either during redd construction or shortly thereafter and aid in redd identification. Multiple counts also increase the number of adult Chinook Salmon carcasses recovered over what would have been collected in a single count design. Exceptions included Big Flat and Colt Killed creeks (Figure 1; sites 26 and 7), which are remote streams where access is difficult. We surveyed these streams once with a single pass ground count that, based on historic spawn timing, we believe coincided with peak spawning activity. In 2011, we surveyed Alturas Lake Creek and the upper Salmon and Lemhi rivers with a combination of aerial and ground counts. White Cap Creek was surveyed once by ground count.

Redds observed during ground counts were flagged, assigned a unique number, and recorded using a global positioning system. Surveyors recorded the presence of any adult Chinook Salmon observed. For streams that received multiple ground counts, the final redd count was the sum of all new redds observed in each pass. We removed our flags during the last count.

Carcass Recoveries

We collected data from Chinook Salmon carcasses to determine their origin (general production hatchery or natural), ocean age, spawning status, and sex. Measurements collected included FL and mid-eye-to-hypural-plate length (nearest cm). We checked carcasses for fin clips, marks, tags, radio transmitters, and/or coded-wire tags (CWT). We collected dorsal fin rays (Kiefer et al. 2002) and scales for age determination and fin tissue for DNA analysis. Otoliths were collected in Middle Fork Salmon River tributaries. Structures collected varied by stream, and we did not collect all structures from all carcasses. We inspected visceral cavities to estimate egg retention, to look for PIT tags (most observers also used PIT tag detectors), and to determine the prevalence of prespawn mortality. During examination, female carcasses were given a percent spawned measure that ranged from zero (skeins fully intact) to 100% (no or few eggs remaining in body) in 25% increments. We considered female carcasses with a percent spawn value $\leq 25\%$ a prespawn mortality. All male carcasses recovered prior to observance of any spawning activity were designated prespawn mortalities. After spawning commenced, we did not evaluate male carcasses for spawning contribution.

Prespawn mortality occurs in all spawning streams and is influenced by such factors as stream flow, water temperature, natural predators, fish density, and crowding and handling at adult traps. During recent years, sport and tribal fisheries likely added an additional stressor. Beginning the first week of July, prior to the commencement of spawning activities, we surveyed all probable spawning areas in Lake Creek twice a week to locate prespawn carcasses, and we surveyed known staging areas in the South Fork Salmon River beginning in mid-July.

Juvenile Production

We based life stages used in production estimates on age, biological development, and arbitrary seasonal trapping dates. Newly emerged, young-of-the-year juveniles captured prior to July 1 (spring trapping season) were considered fry. Fry became “parr” as they entered their first summer and included age-0 fish collected between July 1 and August 31 (summer trapping season) as they migrated from natal streams. Presmolts were juvenile fish that were collected moving downstream between September 1 and trap removal at ice-up (fall trapping season). Although we defined juveniles in the act of migration before September 1 as parr in this report, they could also be considered presmolts. Migrating presmolts did not show typical smolt characteristics (e.g., silvery color and the tendency to lose their scales easily). Smolts were generally age-1 migrants captured between the start of spring trapping and June 30. However, a portion of the age-0 juveniles PIT tagged in the Lemhi and Pahsimeroi rivers (Figure 1; sites 25, and 24) during the spring trapping period were interrogated at detection facilities on the Lower Snake and Columbia rivers in that same year and were actually age-0 smolts (Copeland and Venditti 2009).

Rotary Screw Trap Estimates

We operated rotary screw traps on 15 streams to collect juvenile Chinook Salmon migrating downstream to estimate cohort abundance and survival to Lower Granite Dam as well as important life history information, such as size at migration and the timing of peak movements. We deployed traps as early in the spring as possible and fished them continuously until ice-up in the fall. We positioned the screw traps in the thalweg to maximize capture efficiency. Program personnel checked traps and processed fish at least once daily between 0700 hours and 1830 hours. However, high flows, debris, and ice prevented trap operation on some days. When we anticipated problems (e.g., high flows, ice, or debris) or when unusually high numbers of juveniles were passing (generally immediately following hatchery releases) we checked the traps several times throughout the day and night as necessary. We may have also moved traps out of the thalweg and/or stopped fishing them (i.e., raised the cone) during those times until it was prudent to resume fishing.

We processed juvenile Chinook Salmon collected in screw traps using standard protocols. Captured fish were anesthetized in buffered Tricaine Methanesulfonate (MS-222), scanned for PIT tags, weighed (to nearest 0.1 g), and measured to the nearest 1 mm FL. We anesthetized no more than 30 juvenile fish at one time to reduce exposure time to the anesthetic. A subsample of fish was marked with PIT tags (see below) to estimate trap efficiency and survival to Lower Granite Dam. In some streams, a large percentage of juveniles were too small to be PIT tagged. In these streams, juveniles were marked with Bismarck Brown Y dye (described below) to estimate trap efficiency. Fish needed to be ≥ 60 mm FL to be PIT tagged with a 12 mm tag or ≥ 35 mm FL to be dyed. A number of Chinook Salmon ≥ 50 mm FL were tagged with 9 mm PIT tags, and these data will be reported separately to maintain consistency with past ISS protocols. PIT tagging protocols followed established protocols (Kiefer and Forster 1991; PIT-Tag Steering Committee 1992; CBFWA 1999). Cooperators used single use injectors to PIT tag BY 2011 juveniles. We switched from multiple use injectors after we saw no survival differences in a side-by-side comparison of single and multiple use injectors (Venditti et al. 2013). After tagging and prior to release, we allowed fish to recover in large, lidded plastic boxes with sufficient free flow of water or in buckets of water with aeration and temperature control.

To estimate the efficiency of our traps, we released a subsample of marked fish approximately 0.4 km or at least two riffles and a pool upstream of the trap. We selected release sites to maximize the probability that marked fish would mix randomly with the general population prior to their recapture. We made trap efficiency releases daily using PIT-tagged fish and every 3-4 d when staining fry. The number of fish used in these releases was based on a predetermined percentage of the daily catch designed to distribute PIT tags proportionally over the entire trapping season and the maximum number of fry that could be effectively stained. We held all other fish in separate live boxes and released them downstream of the trap. In streams with a high abundance of predators, we released fish after dusk. We held fish no longer than necessary to reduce negative effects on their migration.

We calculated life stage (i.e., parr, presmolt, and smolt) specific migration (or population) estimates within the brood year from rotary screw trap operations with a computer program developed for use with screw trap data (Steinhorst et al. 2004). The program needs three inputs: the number of unmarked fish trapped (Capture); the number of captured fish marked and released upstream of the trap (Mark); and the number of marked fish recaptured (Recapture). The program uses the Lincoln-Petersen estimator and modifications (e.g., Bailey's estimator) for calculating abundance and bootstrap methods for calculating confidence intervals (Steinhorst et al. 2004; Hong 2002). We divided each trap season into periods of varying length corresponding to our life stage definitions above (i.e., fry, parr, presmolt, and smolt). Trap efficiency was monitored to detect changes relative to environmental conditions (e.g., flow and temperature), and efficiency strata were established within the periods based on these conditions. This resulted in an improvement in overall efficiency estimation and, therefore, tighter bounds on migration estimates. To maintain robustness for analysis, we targeted a lower limit of seven mark recaptures for any strata (Steinhorst et al. 2004). If a stratum did not contain a sufficient number of recaptures, it was included with the previous or subsequent strata depending on stream and trap conditions. Young-of-the-year Chinook Salmon fry were not included in smolt estimates for the spring season. Likewise, we did not include precocial Chinook Salmon in brood year estimates for parr, presmolt, or smolt emigrants. We did not estimate precocial Chinook Salmon emigrants because we could not estimate trapping efficiency for this group, which likely differed from other PIT-tagged migrants.

Bismarck Brown Y Stain Marking—Fry <60 mm FL represent a large fraction of the total juvenile migration from some study streams, and we used Bismarck Brown Y stain to conduct a complementary mark-recapture migration estimate that included fish too small to PIT tag with standard 12 mm tags. Once or twice a week, we selected a subsample of 10% of the total trap catch (up to a maximum of 300 individuals) for staining. We applied the mark by holding fish in the dye (0.4g/16 L solution) for 1 h. We used four battery-powered aerators to maintain oxygen saturation and ice packs to maintain an appropriate temperature (within 1-2°C of the river) in the baths. When properly stained, the mark lasted 3-4 d, but changing the dye concentration and/or exposure time provided some ability to adjust the mark's effective lifespan.

We derived abundance or migration estimates from Bismarck Brown Y stained fish using the same techniques as described for PIT-tagged fish, with the exception that marked fish were identified visually instead of via a scanner. To better detect stained fish, personnel removed no more than 10 fish in any one net load from the trap box and placed them in a shallow, white tub of water where stained fish were readily identifiable.

Snorkel Estimates

We used underwater observations by snorkelers in a number of ISS study streams to estimate the density of juvenile Chinook Salmon because of a lack of available screw traps, access issues, and limited potential trap locations. Techniques and rationale used during underwater observations to determine Chinook Salmon parr abundance and density follow Thurow (1994), Petrosky and Holubetz (1985), Hankin (1986), and Hankin and Reeves (1988).

Streams were divided into sampling strata based on channel and habitat types and areas that Chinook Salmon historically used for rearing. Channel types included confined, steep gradient reaches (Type B) and lower gradient, meandering reaches (Type C) (Rosgen 1985, 1994). We also identified four habitat types: pool, riffle, run, and pocket water. Pool, riffle, and run (glide) correspond to the definitions of Bisson et al. (1982). Pocket water was predominantly swift with numerous protruding boulders or other large obstructions, which create scour holes (pockets) or eddies (McCain et al. 1990). We established multiple sample sites in each stratum. Each sample site included one or more habitat types confined at both the upper and lower borders by a hydraulic control (Platts et al. 1983; McCain et al. 1990).

We performed snorkel surveys during July and August. To ensure adequate light, we made observations between 1000 and 1800 hours on non-overcast days. We measured underwater visibility prior to snorkeling, and then used enough snorkelers to observe the entire stream width in one pass. We identified and counted all salmonids and estimated their total length. We also recorded the presence of non-salmonids. We measured the thalweg length of each snorkel site along with three wetted stream widths (top, near midpoint, and bottom of transect). We then estimated Chinook Salmon parr density (number per 100 m²) for each snorkel site by dividing the total number of parr observed by the total area snorkeled and then multiplying the result by 100.

Juvenile Migration and Survival

Screw Trap Estimates

We estimated the survival of PIT-tagged juveniles to LGR using PIT tag interrogations at dams on the Snake and Columbia rivers and the Survival Under Proportional Hazards (SURPH) model (Lady et al. 2001). Juveniles from the Lemhi and Pahsimeroi rivers display both stream- and ocean-type life histories (Healey 1991), but the number of age-0 smolts from the Lemhi are typically too few to estimate survival and are included with parr. We report survival estimates separately for both groups from the Pahsimeroi River (age-0 and age-1 smolts) within a brood year.

Summer Parr Remote PIT Tagging

We collected natural origin parr and PIT tagged them in some ISS streams. Fisheries personnel from IDFG and NPT snorkeled to determine where juveniles were concentrated, and then collected them via beach seine. Bowles and Leitzinger (1991) recommended a target goal of 300-500 parr for PIT tagging. We used 9 mm PIT tags (instead of standard 12 mm tags) in fish from Legendary Bear and Fishing creeks in 2012. We used the smaller tags because fish in these streams are typically so small it required an inordinate amount of time to collect sufficient numbers of fish ≥ 60 mm FL, and greatly reduced the number of fish we needed to handle.

Genetic Sample Inventory

As part of the ISS program, we collected both adult and juvenile DNA samples from various traps and weirs for multiple purposes. Individual samples include tissue removed from fins stored in 100% non-denatured ethyl alcohol or on blotter paper. We sampled every adult passed over weirs, adults from carcass surveys not sampled at weirs, and approximately 100 juveniles from each brood year. Samples have been used to compare the reproductive contribution of natural and supplementation-hatchery origin adults (Leth 2005) and to contribute to the genetic baseline for genetic stock identification of Chinook Salmon adults passing Lower Granite Dam (Narum et al. 2007). The importance of collecting and archiving DNA from a variety of ISS study streams for current and future analyses have been acknowledged by the ISRP, which recommended we continue to collect and archive tissue samples (ISRP 2005-18, ISRP 2006-4B). In order to better manage the growing archive of DNA, we have compiled an inventory of the DNA samples the program currently maintains (Appendix D). We will update this inventory annually.

Data Storage

Data from the ISS program is available through several sources. Redd count and carcass data are available through StreamNet (<http://www.streamnet.org>) and Idaho Fish and Wildlife Information System (IFWIS; <https://fishandgame.idaho.gov/ifwis/portal>). Adult and juvenile PIT tag data are available through the PTAGIS database (<http://www.ptagis.org>). Coded wire tag data are available through the Regional Mark Processing Center (<http://www.rmpc.org>). Other data types are maintained in project and agency specific databases and spreadsheets. These data are available from the authors.

Beginning in 2010, the ISS program began operating a second screw trap on Marsh Creek and conducting additional redd counts in streams above this trap. Data from these efforts are not part of the ISS study but are used for regional viable salmonid population (VSP) monitoring efforts (Crawford and Rumsey 2011). The trap is located approximately 1 km downstream from the confluence of Marsh and Beaver creeks. Additional multiple pass redd counts have been initiated in Cape Horn, Beaver, Banner, and Marsh creeks that along with traditional ISS counts in Marsh and Knapp creeks will provide high intensity (fish-in fish-out) monitoring data for this population. Until data storage and reporting procedures are established for the VSP efforts, we will provide trap and redd count results in ISS annual reports (Venditti et al. 2012; Venditti et al. 2013; Appendix E). We will also provide these data to electronic repositories as described above.

RESULTS

Adult Escapement

Weirs

The number of adult Chinook Salmon that escaped to weirs varied among study streams and basins in 2011. Returns of general production and natural origin fish were generally lower in the Clearwater River subbasin and ranged from 109 fish in Crooked Fork Creek to 1,255 fish in Clear Creek. Returns to weirs in the Salmon River subbasin ranged from 216 fish in the East Fork Salmon River to 4,654 fish at the South Fork Salmon River weir (Table 1). Except for Lake Creek, these numbers are only the counts of fish handled and do not represent total

escapement above the weirs. The video weir on Lake Creek experienced no down time in 2011, so these counts represent an accurate estimate of the number of adults that escaped to this stream.

Table 1. The number, origin, and sex (male = M, female = F, and undetermined = U) of adult Chinook Salmon captured or counted at weirs on Idaho Supplementation Study (ISS) streams in 2011. Catch numbers are not expanded and do not represent total escapement, but see Appendix B. General production adults were generally not passed over the weirs.

| Stream Name | General production | | | Natural | | | Undetermined | | | Total |
|----------------------------------|--------------------|-------|-----|---------|-----|---|--------------|---|---|-------|
| | M | F | U | M | F | U | M | F | U | |
| Clearwater River Subbasin | | | | | | | | | | |
| Clear Creek | 756 | 488 | 0 | 9 | 2 | 0 | 0 | 0 | 0 | 1,255 |
| Crooked Fork Creek | 40 | 40 | 2 | 15 | 12 | 0 | 0 | 0 | 0 | 109 |
| Crooked River | 0 | 0 | 329 | 17 | 7 | 3 | 0 | 0 | 0 | 356 |
| Red River | 0 | 0 | 500 | 17 | 10 | 3 | 0 | 0 | 0 | 530 |
| Salmon River Subbasin | | | | | | | | | | |
| Lake Creek | | | | | | | | | | 255 |
| Pahsimeroi River | 1,401 | 2,024 | 0 | 216 | 160 | 0 | 0 | 0 | 0 | 3,801 |
| South Fork Salmon River | 2,422 | 1,518 | 0 | 395 | 309 | 0 | 6 | 4 | 0 | 4,654 |
| East Fork Salmon River | 3 | 1 | 0 | 146 | 62 | 4 | 0 | 0 | 0 | 216 |
| Upper Salmon River | 3,560 | 232 | 0 | 408 | 191 | 0 | 0 | 0 | 0 | 4,391 |

Of the fish captured at ISS weirs, we passed 1,968 natural-origin adult Chinook Salmon (99.1% of capture) onto the spawning grounds in 2011. These ranged from 11 (Clear Creek) to 30 (Red River) fish in the Clearwater subbasin and from 211 (East Fork Salmon River) to 693 (South Fork Salmon River) fish in the Salmon subbasin (Table 2). Lake Creek is not included in these results, since origin breakdown was not available from the video record.

The expanded estimates of total spawning escapement above weirs where mark recapture data were collected (Appendix B) indicated that ISS weirs had a wide range of efficiency in 2011. The South Fork Salmon River, Pahsimeroi, and upper Salmon River weirs were >90% efficient (>90% of recovered carcasses were marked). Conversely, the number of unmarked carcasses outnumbered marked carcasses recovered above weirs on Clear and Crooked Fork creeks and Red and Crooked rivers.

Redd Counts and Carcass Recoveries

The number of redds varied between streams in 2011, but redd densities (redds/km) were typically higher in the Salmon subbasin than the Clearwater subbasin. Redd density in the Clearwater River basin averaged 2.43 redds/km, while those in the Salmon River basin averaged 3.93 redds/km. In the Clearwater basin, Crooked Fork Creek had the highest redd density (6.31 redds/km), and Big Flat Creek (zero redds/km) had the lowest (Table 3). Salmon River basin redd densities were highest in the South Fork Salmon River (10.83 redds/km), and lowest in the West Fork Yankee Fork Salmon River (0.26 redds/km; Table 3).

Table 2. Summary of adult Chinook Salmon passed above weirs in Idaho Supplementation Study (ISS) streams in 2011. Fish are broken down by sex (male = M, female = F, and undetermined = U) and origin. Release numbers are not expanded and do not represent total escapement.

| | Natural | | | General production | | | Total |
|----------------------------|---------|-----|---|--------------------|---|---|-------|
| | M | F | U | M | F | U | |
| Clearwater Subbasin | | | | | | | |
| Clear Creek | 9 | 2 | 0 | 0 | 0 | 0 | 11 |
| Crooked Fork Creek | 15 | 12 | 0 | 0 | 0 | 0 | 27 |
| Crooked River | 17 | 7 | 3 | 0 | 0 | 0 | 27 |
| Red River | 17 | 10 | 3 | 0 | 0 | 0 | 30 |
| Salmon Subbasin | | | | | | | |
| Lake Creek | | | | | | | 255 |
| Pahsimeroi River | 214 | 158 | 0 | 0 | 0 | 0 | 372 |
| S. Fork Salmon River | 385 | 308 | 0 | 0 | 0 | 0 | 693 |
| E. Fork Salmon River | 145 | 62 | 4 | 0 | 0 | 0 | 211 |
| Upper Salmon River | 406 | 191 | 0 | 0 | 0 | 0 | 597 |

The ISS cooperators maintained the increased carcass sampling effort described in Lutch et al. (2003). We sampled 572 carcasses from the Clearwater basin and 1,297 from the Salmon basin totaling 1,869 carcasses in 2011. The total included 1,352, 473, and 44 carcasses of natural, general production, and unknown origin, respectively. In the Clearwater basin general production carcasses (N = 449) outnumbered natural origin carcasses (N = 92), but in Salmon basin streams natural origin carcasses (N = 1,260) far outnumbered general production strays (N = 24), even in streams without weirs (Table 4).

Juvenile Production Estimates

Rotary Screw Trap Estimates

We operated screw traps to collect brood year 2011 juvenile Chinook Salmon on 15 ISS study streams in 2012 and 2013 for 4,095.0 trap days. Brood year 2011 juvenile collection exceeded 300 days (mean = 345.0 d) at four traps; 10 traps operated from 200-299 days (mean = 263.0 d); and one trap operated less than 100 days (85.0 d; Appendix C). High spring runoff, torrential precipitation, and hatchery releases were responsible for most lost trap days, although low summer flows also made some traps inoperable.

Cooperators used data from PIT-tagged and stained fish recaptured at screw traps to estimate the number of brood year 2011 juveniles that migrated from ISS study streams in 2012 and 2013. We collected 147,923 brood year 2011 juvenile Chinook Salmon. Summing the point estimates for all the traps yielded a total brood year 2011 migration estimate of 954,912 juvenile Chinook Salmon from ISS study streams with screw traps. The Salmon River subbasin accounted for the majority of the juvenile production with 134,569 (90.9%) juveniles collected and an estimated 886,663 (92.9%) migrants. Migration estimates ranged from 1,196 fish from Colt Killed Creek to 275,634 fish from the Marsh Creek (Table 5).

Table 3. Number of Chinook Salmon redds counted in survey transects within Idaho Supplementation Study (ISS) streams in 2011 and summary information on transect length, number of passes, method of data collection, and when redd counting effort was stopped. Cases for which no data were available are designated ND.

| Stream | Survey length (km) | Redds | Redds per km | Passes | Last pass | Survey method |
|----------------------------|--------------------|-------|--------------|--------|-----------|---------------|
| Clearwater Subbasin | | | | | | |
| American R. | 34.6 | 160 | 4.62 | 3 | 09/20/11 | Ground |
| Big Flat Cr. | 5.2 | 0 | 0 | 1 | 09/04/11 | Ground |
| Brushy Fk. Cr. | 16.1 | 38 | 2.36 | 3 | 09/14/11 | Ground |
| Clear Cr. | 20.2 | 55 | 2.72 | 4 | 09/20/11 | Ground |
| Colt Killed Cr. | 50.9 | 25 | 0.41 | 1 | 09/08/11 | Ground |
| Crooked Fk. Cr. | 21.7 | 137 | 6.31 | 3 | 09/15/11 | Ground |
| Crooked R. | 18.8 | 15 | 0.80 | 3 | 09/19/11 | Ground |
| Fishing Cr. | 6.0 | 5 | 0.83 | 3 | 09/07/11 | Ground |
| Legendary Bear Cr. | 6.8 | 36 | 5.29 | 3 | 09/08/11 | Ground |
| Pete King Cr. | 5.8 | 1 | 0.17 | 3 | 09/22/11 | Ground |
| Red R. | 38.5 | 204 | 5.30 | 3 | 09/21/11 | Ground |
| White Cap Cr. | 14.0 | 4 | 0.29 | 1 | 09/13/11 | Ground |
| Salmon Subbasin | | | | | | |
| Alturas Lake Cr. | 16.6 | 7 | 0.42 | 1 | 09/07/11 | Ground |
| Bear Valley Cr. | 35.7 | 252 | 7.06 | 5 | 09/13 | Ground |
| EF Salmon R. | 27.0 | 21 | 0.78 | 3 | 09/07 | Ground |
| Herd Cr. | 16.4 | 60 | 3.66 | 3 | 09/07 | Ground |
| Lake Cr. | 16.8 | 134 | 7.98 | 3 | 09/01/11 | Ground |
| Lemhi R. | 51.7 | 123 | 2.38 | 4/1 | 09/21/11 | Ground/Aerial |
| Marsh Cr. | 20.2 | 160 | 7.92 | 6 | 09/05/11 | Ground |
| NF Salmon R. | 36.8 | 58 | 1.58 | 4 | 09/08/11 | Ground |
| Pahsimeroi R. | 31.5 | 115 | 3.65 | 3 | 09/30/11 | Ground/Aerial |
| Secesh R. | 40.1 | 257 | 6.41 | 3 | 09/16/11 | Ground |
| SF Salmon R. | 25.3 | 274 | 10.83 | 4 | 09/07/11 | Ground |
| W.F. Yankee Fork S.R. | 11.6 | 3 | 0.26 | 3 | 09/15 | Ground |
| Upper Salmon R. | 42.5 | 111 | 2.60 | 1 | 09/07/11 | Ground/Aerial |
| Valley Cr. | 33.2 | 86 | 2.59 | 3 | 09/14 | Ground |
| Slate Cr. | 15.4 | 14 | 0.90 | 3 | 09/14/11 | Ground |

Table 4. Number, origin (GP = general production hatchery), and sex of adult Chinook Salmon carcasses collected during 2011 spawning ground surveys on Idaho supplementation study (ISS) streams.

| Stream | Sex | Unknown | Natural | GP | Total |
|----------------------|--------------|----------|-----------|-----------|------------|
| Clearwater R. | | | | | |
| American R. | Males | 1 | 10 | 40 | 51 |
| | Females | 0 | 12 | 45 | 57 |
| | Unknown | 8 | 0 | 3 | 11 |
| | Total | 9 | 22 | 88 | 119 |
| Big Flat Cr. | Males | 0 | 0 | 0 | 0 |
| | Females | 0 | 0 | 0 | 0 |
| | Unknown | 0 | 0 | 0 | 0 |
| | Total | 0 | 0 | 0 | 0 |

Table 4. Continued.

| Stream | Sex | Unknown | Natural | GP | Total |
|--------------------|--------------|-----------|------------|------------|------------|
| Brushy Fk. Cr. | Males | 0 | 0 | 0 | 0 |
| | Females | 0 | 2 | 3 | 5 |
| | Unknown | 0 | 0 | 0 | 0 |
| | Total | 0 | 2 | 3 | 5 |
| Clear Cr. | Males | 0 | 2 | 41 | 43 |
| | Females | 0 | 1 | 11 | 12 |
| | Unknown | 0 | 0 | 0 | 0 |
| | Total | 0 | 3 | 52 | 55 |
| Colt Killed Cr. | Males | 0 | 2 | 1 | 3 |
| | Females | 0 | 2 | 1 | 3 |
| | Unknown | 0 | 1 | 0 | 1 |
| | Total | 0 | 5 | 2 | 7 |
| Crooked Fk. Cr. | Males | 0 | 11 | 23 | 34 |
| | Females | 0 | 10 | 30 | 40 |
| | Unknown | 0 | 0 | 1 | 1 |
| | Total | 0 | 21 | 54 | 75 |
| Crooked R. | Males | 0 | 4 | 1 | 5 |
| | Females | 0 | 4 | 1 | 5 |
| | Unknown | 2 | 0 | 1 | 3 |
| | Total | 2 | 8 | 3 | 13 |
| Fishing Cr. | Males | 0 | 0 | 0 | 0 |
| | Females | 0 | 1 | 2 | 3 |
| | Unknown | 0 | 0 | 0 | 0 |
| | Total | 0 | 1 | 2 | 3 |
| Legendary Bear Cr. | Males | 0 | 0 | 3 | 3 |
| | Females | 0 | 1 | 2 | 3 |
| | Unknown | 4 | 0 | 0 | 4 |
| | Total | 0 | 1 | 5 | 10 |
| Pete King Cr. | Males | 0 | 0 | 0 | 0 |
| | Females | 0 | 1 | 0 | 1 |
| | Unknown | 0 | 0 | 0 | 0 |
| | Total | 0 | 1 | 0 | 1 |
| Red R. | Males | 2 | 12 | 104 | 118 |
| | Females | 1 | 15 | 108 | 125 |
| | Unknown | 17 | 2 | 31 | 50 |
| | Total | 20 | 29 | 243 | 293 |
| Salmon R. | | | | | |
| Bear Valley Cr. | Males | 0 | 92 | 0 | 92 |
| | Females | 0 | 90 | 0 | 90 |
| | Unknown | 0 | 33 | 0 | 33 |
| | Total | 0 | 215 | 0 | 215 |
| E. Fork Salmon R. | Males | 0 | 10 | 0 | 10 |
| | Females | 0 | 6 | 0 | 6 |
| | Unknown | 0 | 0 | 0 | 0 |
| | Total | 0 | 16 | 0 | 16 |
| Herd Cr. | Males | 0 | 4 | 0 | 4 |
| | Females | 0 | 24 | 0 | 24 |
| | Unknown | 0 | 6 | 0 | 6 |
| | Total | 0 | 34 | 0 | 34 |
| Lake Cr. | Males | 1 | 33 | 0 | 34 |
| | Females | 0 | 44 | 0 | 44 |
| | Unknown | 0 | 0 | 0 | 0 |
| | Total | 1 | 77 | 0 | 78 |
| Lemhi R. | Males | 0 | 2 | 0 | 2 |
| | Females | 0 | 19 | 0 | 19 |
| | Unknown | 0 | 0 | 0 | 0 |
| | Total | 0 | 21 | 0 | 21 |

Table 4. Continued.

| Stream | Sex | Unknown | Natural | GP | Total |
|----------------------------------|--------------|----------|------------|----------------|------------|
| Marsh Cr. | Males | 0 | 74 | 0 | 74 |
| | Females | 0 | 74 | 1 | 75 |
| | Unknown | 0 | 0 | 0 | 0 |
| | Total | 0 | 148 | 1 | 149 |
| N. Fork Salmon R. | Males | 0 | 5 | 0 | 5 |
| | Females | 0 | 19 | 0 | 19 |
| | Unknown | 0 | 0 | 0 | 0 |
| | Total | 0 | 24 | 0 | 24 |
| Pahsimeroi R. | Males | 0 | 22 | 0 | 22 |
| | Females | 0 | 10 | 0 | 10 |
| | Unknown | 0 | 0 | 1 | 1 |
| | Total | 0 | 32 | 1 | 33 |
| Secesh R. | Males | 0 | 128 | 10 | 138 |
| | Females | 4 | 110 | 6 | 120 |
| | Unknown | 5 | 0 | 0 | 5 |
| | Total | 9 | 238 | 16 | 263 |
| S. Fork Salmon R. | Males | 0 | 177 | 0 ^a | 177 |
| | Females | 0 | 100 | 0 | 100 |
| | Unknown | 3 | 0 | 0 | 3 |
| | Total | 3 | 277 | 0 | 280 |
| Slate Cr. | Males | 0 | 0 | 1 | 1 |
| | Females | 0 | 0 | 0 | 0 |
| | Unknown | 0 | 0 | 0 | 0 |
| | Total | 0 | 0 | 1 | 1 |
| Upper Salmon R. | Males | 0 | 122 | 2 | 124 |
| | Females | 0 | 36 | 1 | 37 |
| | Unknown | 0 | 0 | 0 | 0 |
| | Total | 0 | 158 | 3 | 161 |
| Valley Cr. | Males | 0 | 3 | 0 | 3 |
| | Females | 0 | 14 | 0 | 14 |
| | Unknown | 0 | 2 | 0 | 2 |
| | Total | 0 | 19 | 0 | 19 |
| W. Fork Yankee Fork Salmon R. | Males | 0 | 0 | 0 | 0 |
| | Females | 0 | 1 | 0 | 1 |
| | Unknown | 0 | 0 | 0 | 0 |
| | Total | 0 | 1 | 0 | 1 |

^a Three GP jacks were found in Cabin Creek adjacent to the South Fork Salmon River Road. All had a left operculum punch, consistent with fish recycled through the fishery downstream from weir; thus, we suspect they arrived anthropogenically, and did not escape through the weir.

Snorkel Estimates

We used snorkel observations to estimate juvenile Chinook Salmon densities in two study streams in the Clearwater subbasin. The observed densities were highly variable and ranged from 1.93 to 21.31 fish/100 m² (Table 6).

Table 5. Seasonal and overall migration estimates of brood year 2011 juvenile Chinook Salmon and corresponding lower (LCI) and upper (UCI) 95% confidence intervals from 11 treatment (T) and seven control (C) study streams with rotary screw traps. Estimates are based on the total catch, recapture rate of tagged fish, and the estimated trap efficiency. Instances where no estimate was made are noted NE.

| Stream | T/C | Life Stage | Catch | Estimate | LCI | UCI |
|-------------------------|-----|-------------------------|---------------|----------------|----------------|----------------|
| Clearwater River | | | | | | |
| American River | C | Fry | 325 | NE | NE | NE |
| | | Parr | 1,470 | 7,223 | 5,877 | 9,068 |
| | | Presmolt | 1,039 | 6,209 | 5,300 | 7,370 |
| | | Smolt | 964 | 6,353 | 5,177 | 7,863 |
| | | Brood Year Total | 3,473 | 19,785 | 17,749 | 22,281 |
| Clear Creek | T | Fry | 54 | NE | | |
| | | Smolt | 358 | 3438 | 2321 | 5624 |
| | | Brood Year Total | 358 | 3438 | 2321 | 5624 |
| Colt Killed Creek | T | Fry | 80 | NE | | |
| | | Parr | 25 | NE | | |
| | | Presmolt | 126 | 984 | 630 | 1,563 |
| | | Smolt | 38 | 212 | 98 | 416 |
| | | Brood Year Total | 164 | 1,196 | 771 | 1,856 |
| Crooked Fork Creek | C | Fry | 245 | NE | | |
| | | Parr | 327 | 1,332 | 961 | 1,870 |
| | | Presmolt | 4,616 | 17,391 | 16,030 | 18,808 |
| | | Smolt | 142 | 1,540 | 910 | 2,661 |
| | | Brood Year Total | 5,085 | 20,263 | 18,607 | 21,937 |
| Crooked River | T | Fry | 0 | NE | NE | NE |
| | | Parr | 32 | 240 | 45 | 180 |
| | | Presmolt | 394 | 1,228 | 1,033 | 1,460 |
| | | Smolt | 304 | 792 | 670 | 938 |
| | | Brood Year Total | 730 | 2,260 | 1,865 | 2,423 |
| Red River | T | Fry | 623 | 2,523 | 1,752 | 3,807 |
| | | Parr | 1,398 | 6,790 | 5,629 | 8,250 |
| | | Presmolt | 559 | 6,346 | 4,599 | 8,785 |
| | | Smolt | 946 | 5,543 | 4,779 | 6,496 |
| | | Brood Year Total | 3,544 | 21,307 | 18,889 | 24,556 |
| Salmon River | | | | | | |
| Marsh Creek | C | Fry | 11,355 | 104,283 | 82,840 | 134,627 |
| | | Parr | 33,887 | 135,626 | 127,267 | 144,024 |
| | | Presmolt | 8,286 | 32,901 | 30,739 | 35,408 |
| | | Smolt | 630 | 2,824 | 2,288 | 3,595 |
| | | Brood Year Total | 54,158 | 275,634 | 251,332 | 305,772 |
| Pahsimeroi River | T | Fry | 1,139 | 15,946 | 12,566 | 19,876 |
| | | Parr | 210 | 5,513 | 2,665 | 11,480 |
| | | Presmolt | 1,383 | 22,001 | 17,612 | 27,403 |
| | | Smolt | 792 | 8,253 | 6,334 | 11,197 |
| | | Brood Year Total | 3,524 | 51,713 | 44,469 | 60,600 |
| Upper Salmon River | T | Fry | 111 | NE | | |
| | | Parr | 3,939 | 76,712 | 59,816 | 109,115 |
| | | Presmolt | 5,307 | 62,954 | 56,663 | 71,029 |
| | | Smolt | 1,516 | 13,481 | 11,347 | 16,610 |
| | | Brood Year Total | 10,762 | 153,147 | 134,573 | 184,453 |

Table 5. Continued.

| Stream | T/C | Life Stage | Catch | Estimate | LCI | UCI |
|--------------------------------|-----|-------------------------|---------------|----------------|----------------|----------------|
| South Fork Salmon | T | Fry | 1,110 | NE | NE | NE |
| | | Parr | 20,584 | 67,118 | 63,144 | 71,396 |
| | | Presmolt | 6,429 | 13,530 | 12,905 | 14,268 |
| | | Smolt | 440 | 1,615 | 1,294 | 2,002 |
| | | Brood Year Total | 27,453 | 82,264 | 78,365 | 86,215 |
| Lake Creek | C | Fry | 1,963 | 33,906 | 19,570 | 66,120 |
| | | Parr | 12,764 | 86,916 | 72,633 | 107,105 |
| | | Presmolt | 3,631 | 7,978 | 7,310 | 8,742 |
| | | Smolt | 521 | 2,076 | 1,689 | 2,547 |
| | | Brood Year Total | 18,879 | 130,876 | 108,918 | 163,589 |
| Secesh River | C | Fry | 352 | 10,384 | 5,664 | 18,526 |
| | | Parr | 6,182 | 101,251 | 69,704 | 163,960 |
| | | Presmolt | 6,209 | 27,739 | 23,341 | 34,156 |
| | | Smolt | 726 | 6,250 | 4,934 | 8,230 |
| | | Brood Year Total | 13,469 | 145,624 | 111,933 | 211,890 |
| EF Salmon River | T | Fry | 136 | NE | NE | NE |
| | | Parr | 364 | 2619 | 2351 | 3626 |
| | | Presmolt | 400 | 6240 | 5426 | 15483 |
| | | Smolt | 130 | 670 | 558 | 959 |
| | | Brood Year Total | 1030 | 9655 | 7503 | 12955 |
| Lemhi River | C | Fry | 252 | 1,368 | 1,019 | 1,866 |
| | | Parr | 62 | 350 | 191 | 630 |
| | | Presmolt | 3,678 | 26,852 | 24,196 | 29,892 |
| | | Smolt | 920 | 5,382 | 4,580 | 6,265 |
| | | Brood Year Total | 4,912 | 33,951 | 31,229 | 37,066 |
| WF Yankee Fork Salmon River | T | Fry | 28 | NE | NE | NE |
| | | Parr | 141 | 533 | 336 | 728 |
| | | Presmolt | 110 | 2027 | 943 | 4232 |
| | | Smolt | 63 | 1463 | 373 | 1321 |
| | | Brood Year Total | 342 | 3812 | 2400 | 5930 |

Table 6. Densities of brood year 2011 juvenile Chinook Salmon calculated from direct underwater observations in Idaho Supplementation Study (ISS) streams without screw traps in 2012.

| Stream | Density (Number/100 m ²) |
|----------------------------------|--------------------------------------|
| Clearwater River Subbasin | |
| Fishing Creek | 1.93 |
| Legendary Bear Creek | 21.31 |

Juvenile Migration and Survival

Screw Trap Estimates

We estimated survival to Lower Granite Dam from PIT tag detections of the various life stage groups of naturally produced juvenile Chinook Salmon tagged and released in ISS study streams. We PIT tagged 40,972 brood year 2011 juvenile Chinook Salmon at ISS screw traps for survival estimates in 2012 and 2013. This brood year produced few parr in Clearwater subbasin streams, so survival estimates for this life stage are typically not available. Sufficient

numbers of parr were typically produced and collected in Salmon subbasin streams for survival estimates to be calculated for this life stage. Survival was generally higher in the Salmon subbasin than in the Clearwater subbasin (Table 9). Parr, presmolt, and smolt survival averaged 14.0%, 25.3%, and 37.3%, respectively, in the Salmon River tributaries. Presmolt and smolt survival in the Clearwater tributaries averaged 21.0%, and 25.3%, respectively. When a single parr-presmolt survival estimate was calculated in either subbasin this estimate was included with the overall presmolt estimate, since in these instances very few parr were collected. Survival of brood year 2011 age-0 smolts from the Pahsimeroi River to Lower Granite Dam was 37.2% (Table 7).

Table 7. Estimated survival (proportion) and standard error (SE) to Lower Granite Dam for different life stages of naturally produced brood year 2011 juvenile Chinook Salmon PIT tagged in Idaho Supplementation Studies (ISS) streams. Survival estimates were computed using the SURPH2 or SURPH3 Model (Lady et al. 2001, Lady et al. 2010). Groups having no detections or insufficient detections for estimation are designated ND.

| Stream | Life stage | Number tagged | Survival (SE) |
|-------------------------|-------------|---------------|----------------|
| Salmon Subbasin | | | |
| Lemhi River | Fry | 228 | 0.37 (0.24) |
| Lemhi River | Parr | 57 | 0.11 (0.04) |
| Lemhi River | Presmolt | 2,524 | 0.33 (0.03) |
| Lemhi River | Age-1 smolt | 896 | 0.50 (0.03) |
| South Fork Salmon River | Parr | 2,998 | 0.08 (0.01) |
| South Fork Salmon River | Presmolt | 1,996 | 0.24 (0.03) |
| South Fork Salmon River | Smolt | 302 | 0.41 (0.06) |
| Marsh Creek | Parr | 4,533 | 0.10 (0.01) |
| Marsh Creek | Presmolt | 2,826 | 0.17 (0.01) |
| Marsh Creek | Smolt | 662 | 0.30 (0.04) |
| Pahsimeroi River | Age-0 smolt | 932 | 0.37 (0.13) |
| Pahsimeroi River | Parr | 199 | 0.12 (0.05) |
| Pahsimeroi River | Presmolt | 1,382 | 0.26 (0.03) |
| Pahsimeroi River | Age-1 smolt | 796 | 0.46 (0.04) |
| Upper Salmon River | Parr | 2,734 | 0.12 (0.01) |
| Upper Salmon River | Presmolt | 3,892 | 0.18 (0.01) |
| Upper Salmon River | Smolt | 1,517 | 0.44 (0.02) |
| East Fork Salmon River | Parr | 213 | 0.12 (0.07) |
| East Fork Salmon River | Presmolt | 233 | 0.20 (0.08) |
| East Fork Salmon River | Smolt | 128 | 0.38 (0.12) |
| West Fork Yankee Fork | Parr | 78 | 0.13 (0.05) |
| West Fork Yankee Fork | Presmolt | 91 | 0.16 (0.04) |
| West Fork Yankee Fork | Smolt | 62 | 0.26 (0.07) |
| Lake Creek | Parr | 67 | 0.060 (0.0416) |
| Lake Creek | Parr 9mm | 729 | 0.045 (0.0141) |
| Lake Creek | Presmolt | 1,116 | 0.098 (0.0133) |
| Lake Creek | Smolt | 489 | 0.266 (0.0615) |
| Lake Creek | Yearlings | 81 | 0.457 (0.2407) |
| Secesh River | Parr | 319 | 0.288 (0.1657) |
| Secesh River | Parr 9mm | 805 | 0.104 (0.0221) |
| Secesh River | Presmolt | 938 | 0.179 (0.0267) |
| Secesh River | Smolt | 634 | 0.213 (0.0505) |
| Secesh River | Yearlings | 91 | 0.246 (0.0665) |

Table 7. Continued.

| Stream | Life stage | Number tagged | Survival (SE) |
|----------------------------|-------------------|----------------------|----------------------|
| Clearwater Subbasin | | | |
| American River | Parr- Presmolt | 292 | 0.031 (0.024) |
| American River | Smolt | 923 | 0.17 (.0319) |
| Clear Creek | Presmolt | 0 | NE |
| Clear Creek | Smolt | 231 | 0.12 (0.03) |
| Colt Killed Creek | Parr-Presmolt | 126 | 0.26 (0.05) |
| Colt Killed Creek | Smolt | 43 | 0.40 (0.23) |
| Crooked Fork Creek | Parr-Presmolt | 1,864 | 0.26 (0.02) |
| Crooked Fork Creek | Smolt | 133 | 0.28 (0.04) |
| Crooked River | Parr- Presmolt | 331 | 0.29 (0.073) |
| Crooked River | Smolt | 283 | 0.43 (.0712) |
| Fishing Creek | Parr | 0 | NE |
| Legendary Bear | Parr | 746 | 0.132 (0.0207) |
| Red River | Parr | 158 | NE |
| Red River | Presmolt | 383 | NE |
| Red River | Smolt | 911 | 0.12 (.0490) |

Summer Parr Remote PIT Tagging

Efforts to tag summer parr in ISS streams were variable in 2012. We tagged 1,274 summer parr in two streams in 2012 (Table 8). The number of parr tagged ranged from 528 in the Lemhi River to 746 in Legendary Bear Creek (Table 8).

Table 8. Number of brood year 2011 Chinook Salmon summer parr PIT tagged in Idaho Supplementation Study (ISS) streams during 2012. Legendary Bear and Fishing creeks are proposed name changes for Papoose and Squaw creeks, respectively.

| Stream | Number PIT tagged |
|----------------------------------|--------------------------|
| Clearwater River Subbasin | |
| Legendary Bear Creek | 746 |
| Salmon River Subbasin | |
| Lemhi River | 528 |

DISCUSSION

Clear Creek Trap Relocation

The Clear Creek screw trap had been located immediately below the Kooskia Hatchery intake. Renovations to the intake rendered the site unusable. In response, the trap was relocated approximately 1 km downstream in 2011. The new site was marginal due to lack of a pool deep enough to float the screw trap and allow for the rotation of the cone, even at high flows. This site was abandoned in 2012 and a new trapping technique (fyke net) was employed. The use of a fyke net has been complicated by several factors, primarily the inability to maintain the net during periods of high flow when large amounts of debris are flushing out of the system

and the lack of stream coverage provided by the net. Because of these factors, the fyke net was also abandoned and the screw trap was re-installed approximately 0.5 km above the hatchery intake. The trap was operational during the brood year 2011 smolt emigration in 2013.

Redd Count Methodology

The spawning distribution of Chinook Salmon in the Pahsimeroi River spread upstream after the Big Springs Creek reconnect. Areas that were previously unavailable for spawning are now being utilized, with a concurrent reduction in spawning in the traditional spawning areas. Much of the newly accessible spawning area is on private property, where access has not been granted. In response, we will need to use a combination of ground and aerial redd counts to complete our counts in this system. We will consider these changes in our final analyses; however, aerial redd counts in sections we are unable to access from the ground will be the only counts available.

Big Timber Creek was reconnected to the Lemhi River in 2009, which added an additional 15 km of potential spawning and rearing habitat. No spawning has been documented to date, but we will continue aerial redd counts.

After a helicopter accident in 2010, IDFG re-evaluated where aerial redd counts could be reduced. In response, several aerial counts were replaced with ground counts. In the Clearwater subbasin, a single pass ground count replaced the traditional single flight on White Cap Creek. In the Salmon subbasin one aerial transect on the upper Salmon River (OS-6) was replaced with a single ground count, and we conducted a single ground count on Alturas Lake Creek covering transects OS1-3 and NS-12. Ground counts in both subbasins were timed to correspond with peak spawning activity and aerial counts in adjacent stream reaches.

Effects of Other Programs

Beginning with brood year 2010 and continuing through the end of the ISS program, consistent with the HSRG guidance, a portion of the Chinook Salmon broodstocks at the Sawtooth, Pahsimeroi, and McCall hatcheries were used to create an integrated program. The purpose of this program was to incorporate a number of natural origin adults into the hatchery program. To avoid removing ISS treatment adults from natural spawning and evaluation areas, it was decided that for brood years 2010-2012 only sexually mature males collected at hatchery traps on spawning days would be used in the integrated program. An approximate 5 ml sample of milt was expressed from sexually mature males and used to fertilize eggs from hatchery origin females. The males were then passed immediately over the weir. It was our judgment that this action would not affect the spawning performance of these fish or the overall productivity of the population (Young 2009).

The Shoshone Bannock Tribes Supplementation Monitoring and Evaluation Program is continuing an ongoing Chinook Salmon reintroduction project in the Yankee Fork Salmon River initiated in 2008 to assist in returning 2,000 adults for Tribal conservation and harvest management objectives. Operations include managing two adult picket weirs for adult escapement and a screw trap on the mainstem Yankee Fork for juvenile emigration. All natural adults collected at the lower weir are released immediately above the weir for natural spawning. Any hatchery influence (i.e., returns or adult outplants) is transported above the upper weir for spawning to prevent migration into the West Fork Yankee Fork to minimize conflicts and preserve protocols with the ongoing Idaho Supplementation Studies.

Adult Escapement

Total spawning escapement provided by the Peterson mark-recapture estimates (Appendix B) is an important analysis variable for the ISS program and should be continued on all streams with weirs. The exception would be streams with video or acoustic weirs, where marking would not be possible. Based on this analysis, all fish released above study weirs should be operculum punched and the presence/absence of this mark should be recorded during all carcass collections.

Summer Parr Remote PIT Tagging

Since NOAAF collects and PIT tags summer parr in a number of ISS study streams (Lake Creek, Secesh River, Bear Valley Creek, Valley Creek, Marsh Creek, South Fork Salmon River, Herd Creek), we do not collect summer parr for our program in these streams. Data from NOAAF marked fish will be available for future analyses and can be found in reports from Project Number 1991-028-00.

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APPENDICES

Appendix A.

Four tables of preliminary BY2012 data collected from weirs on project streams and spawning ground surveys. Data reported include the number of adults collected at weirs, number of adults passed over the weirs, redd counts, and carcass information.

Appendix A. Table 1. The number, origin, and sex (male = M, female = F, and undetermined = U) of adult Chinook Salmon captured or counted at weirs on Idaho Supplementation Study (ISS) streams in 2012. Catch numbers are not expanded and do not represent total escapement. General production adults were generally not passed over the weirs, but see Appendix B.

| Stream Name | General production | | | Wild/Natural | | | Undetermined | | | Total |
|-------------------------------|--------------------|-------|-----|--------------|-----|---|--------------|---|---|-------|
| | M | F | U | M | F | U | M | F | U | |
| Clearwater R. Subbasin | | | | | | | | | | |
| Clear Creek | 397 | 488 | 125 | 8 | 1 | 1 | 0 | 0 | 0 | 1,020 |
| Crooked Fork Creek | 7 | 5 | 0 | 7 | 0 | 0 | 0 | 0 | 0 | 19 |
| Crooked River | 2 | 2 | 68 | 19 | 20 | 1 | 0 | 0 | 0 | 112 |
| Red River | 4 | 2 | 837 | 45 | 38 | 4 | 0 | 0 | 0 | 930 |
| Salmon R. Subbasin | | | | | | | | | | |
| Lake Creek | | | | | | | | | | 265 |
| Pahsimeroi River | 344 | 301 | 0 | 127 | 89 | 0 | 0 | 0 | 0 | 861 |
| South Fork Salmon River | 1,116 | 1,141 | 0 | 251 | 205 | 0 | 0 | 0 | 0 | 2,713 |
| East Fork Salmon River | 0 | 0 | 0 | 133 | 111 | 0 | 0 | 0 | 0 | 244 |
| Upper Salmon River | 3,359 | 2,886 | 0 | 308 | 196 | 0 | 0 | 0 | 0 | 6,749 |

Appendix A. Table 2. Summary of adult Chinook Salmon passed above weirs as adult treatments to Idaho Supplementation Study (ISS) streams in 2012. Treatments are broken down by sex (male = M, female = F, and undetermined = U) and origin. Release numbers are not expanded and do not represent total escapement.

| | Natural | | | General production | | | Total |
|----------------------------|------------------|-----|---|--------------------|---|---|-------|
| | M | F | U | M | F | U | |
| Clearwater Subbasin | | | | | | | |
| Clear Creek | 1 | 8 | 1 | 0 | 0 | 0 | 10 |
| Crooked Fork Creek | 7 | 0 | 0 | 0 | 0 | 0 | 7 |
| Crooked River | 19 | 20 | 1 | 2 | 2 | 0 | 44 |
| Red River | 45 | 38 | 4 | 4 | 2 | 1 | 94 |
| Salmon Subbasin | | | | | | | |
| Lake Creek | | | | | | | 265 |
| Pahsimeroi River | 127 ^a | 89 | 0 | 0 | 0 | 0 | 216 |
| South Fork Salmon River | 250 ^b | 204 | 0 | 0 | 0 | 0 | 454 |
| East Fork Salmon River | 133 | 111 | 0 | 0 | 0 | 0 | |
| Upper Salmon River | 308 ^c | 196 | 0 | 0 | 0 | 0 | 504 |

^a Includes 19 males spawned in the integrated broodstock program and released.

^b Includes 49 males spawned in the integrated broodstock program and released.

^c Includes 27 males spawned in the integrated broodstock program and released.

Appendix A. Table 3. Number of Chinook Salmon redds counted in survey transects within Idaho Supplementation Study (ISS) streams in 2012 and summary information on transect length, number of passes, method of data collection, and date of final redd count. Cases where no data are available are designated ND.

| Stream | Survey length (km) | Redds | Redds per km | Passes | Last pass | Survey method |
|----------------------------------|--------------------|-------|--------------|--------|-----------|---------------|
| Clearwater Subbasin | | | | | | |
| American R. | 34.6 | 102 | 2.95 | 3 | 9/19 | Ground |
| Big Flat Cr. ^d | 5.2 | ND | ND | ND | ND | ND |
| Brushy Fk. Cr. | 21.7 | 35 | 1.61 | 3 | 9/05 | Ground |
| Clear Cr. | 20.2 | 45 | 2.22 | 4 | 9/10 | Ground |
| Colt Killed Cr. ^d | 50.9 | ND | ND | ND | ND | ND |
| Crooked Fk. Cr. | 21.7 | 97 | 4.47 | 4 | 9/12 | Ground |
| Crooked R. | 18.8 | 2 | 0.11 | 1 | 8/23 | Ground |
| Fishing Cr. | 6.0 | 19 | 3.17 | 3 | 9/10 | Ground |
| Legendary Bear Cr. | 6.8 | 17 | 2.5 | 3 | 9/11 | Ground |
| Pete King Cr. | 5.8 | 1 | 0.17 | 3 | 9/11 | Ground |
| Red R. | 38.5 | 129 | 3.35 | 3 | 9/18 | Ground |
| White Cap Cr. | 12.9 | 2 | 0.16 | 1 | 9/11 | Ground |
| Salmon Subbasin | | | | | | |
| Alturas Lake Cr. | 16.6 | 11 | 0.66 | 1 | 9/07 | Ground |
| Bear Valley Cr. | 35.7 | 272 | 7.62 | 3 | 9/11 | Ground |
| EF Salmon R. | 27.0 | 95 | 3.52 | 3 | 9/10 | Ground |
| Herd Cr. | 17.1 | 63 | 3.68 | 3 | 9/11 | Ground |
| Lake Cr. | 16.8 | 136 | 8.10 | 3 | 9/05 | Ground |
| Lemhi R. | 51.7 | 82 | 1.59 | 4/1 | 9/17 | Ground/Aerial |
| Marsh Cr. | 14.7 | 118 | 8.02 | 4 | 9/04 | Ground |
| Knapp Cr. ^c | 5.5 | 13 | 2.36 | 1 | 9/5 | Aerial |
| NF Salmon R. ^a | 36.8 | 42 | 1.14 | 2 | 9/04 | Ground |
| Pahsimeroi R. | 26 | 134 | 3.32 | 3 | 10/02 | Ground |
| Secesh R. | 40.1 | 242 | 6.03 | 3 | 9/17 | Ground |
| SF Salmon R. | 25.3 | 196 | 7.74 | 4 | 9/11 | Ground |
| Slate Cr. | 7.5 | 12 | 1.6 | 2 | 8/31 | Ground |
| Upper Salmon R. | 51.7 | 181 | 3.50 | 1 | 9/05 | Aerial |
| Valley Cr. ^b | 33.2 | 129 | 3.89 | 3 | 9/19 | Ground |
| WF Yankee Fork S.R. ^e | 11.6 | 9 | 0.78 | 1 | 9/19 | Ground |

^a Partial third pass, but only in core areas due to the Mustang Complex Fire.

^b Only two passes (1st and last) completed in upper Valley Creek due to Halstead Complex Fire.

^c Only one pass due to Halstead Fire. Typically, Knapp Cr. count combined with Marsh Cr.

^d Could not access streams due to Powell Complex Fire.

^e Only one pass was possible due to Halstead Complex Fire.

Appendix A. Table 4. Number, origin, and sex of adult Chinook Salmon carcasses collected during 2012 spawning ground surveys on Idaho Supplementation Study (ISS) streams. Streams where no data were collected are designated ND.

| Stream | Sex | Unknown | Natural | General production |
|------------------------------|--------------|-----------|------------|--------------------|
| Clearwater Subbasin | | | | |
| American R. | Male | 2 | 42 | 7 |
| | Female | 3 | 39 | 14 |
| | Unknown | 6 | 5 | 4 |
| | Total | 11 | 86 | 25 |
| Big Flat Cr. ^a | Males | ND | ND | ND |
| | Females | ND | ND | ND |
| | Unknown | ND | ND | ND |
| | Total | ND | ND | ND |
| Brushy Fk. Cr. | Males | 0 | 3 | 3 |
| | Females | 1 | 7 | 2 |
| | Unknown | 0 | 0 | 0 |
| | Total | 1 | 10 | 5 |
| Clear Cr. | Males | 0 | 1 | 24 |
| | Females | 0 | 1 | 32 |
| | Unknown | 0 | 0 | 0 |
| | Total | 0 | 2 | 56 |
| Colt Killed Cr. ^a | Males | ND | ND | ND |
| | Females | ND | ND | ND |
| | Unknown | ND | ND | ND |
| | Total | ND | ND | ND |
| Crooked Fk. Cr. | Males | 0 | 17 | 7 |
| | Females | 2 | 12 | 16 |
| | Unknown | 0 | 0 | 0 |
| | Total | 2 | 29 | 23 |
| Crooked R. | Males | 0 | 0 | 0 |
| | Females | 0 | 1 | 0 |
| | Unknown | 1 | 2 | 0 |
| | Total | 1 | 2 | 0 |
| Fishing Cr. | Males | 0 | 2 | 1 |
| | Females | 2 | 10 | 0 |
| | Unknown | 0 | 0 | 0 |
| | Total | 2 | 12 | 1 |
| Legendary Bear Cr. | Males | 0 | 1 | 0 |
| | Females | 0 | 4 | 2 |
| | Unknown | 3 | 0 | 0 |
| | Total | 3 | 5 | 2 |
| Pete King Cr. | Males | 0 | 0 | 0 |
| | Females | 1 | 0 | 0 |
| | Unknown | 0 | 0 | 0 |
| | Total | 1 | 0 | 0 |
| Red R. | Males | 14 | 77 | 132 |
| | Females | 15 | 49 | 218 |
| | Unknown | 56 | 16 | 39 |
| | Total | 85 | 142 | 389 |

Appendix A. Table 4. (continued)

| Stream | Sex | Unknown | Natural | General production |
|------------------------|--------------|----------------|----------------|---------------------------|
| Salmon Subbasin | | | | |
| Bear Valley Cr. | Males | 0 | 27 | 0 |
| | Females | 0 | 29 | 0 |
| | Unknown | 0 | 0 | 0 |
| | Total | 0 | 56 | 0 |
| EF Salmon R. | Males | 0 | 64 | 0 |
| | Females | 0 | 36 | 0 |
| | Unknown | 0 | 0 | 0 |
| | Total | 0 | 100 | 0 |
| Herd Cr. | Males | 0 | 3 | 0 |
| | Females | 0 | 4 | 0 |
| | Unknown | 0 | 0 | 0 |
| | Total | 0 | 7 | 0 |
| Lake Cr. | Males | 0 | 36 | 1 |
| | Females | 1 | 76 | 1 |
| | Unknown | 1 | 2 | 0 |
| | Total | 2 | 114 | 2 |
| Lemhi R. | Males | 0 | 2 | 0 |
| | Females | 0 | 11 | 0 |
| | Unknown | 0 | 0 | 0 |
| | Total | 0 | 13 | 0 |
| Marsh Cr. | Males | 1 | 38 | 1 |
| | Females | 0 | 55 | 1 |
| | Unknown | 0 | 0 | 0 |
| | Total | 1 | 93 | 2 |
| NF Salmon R. | Males | 0 | 5 | 0 |
| | Females | 0 | 10 | 0 |
| | Unknown | 0 | 0 | 0 |
| | Total | 0 | 15 | 0 |
| Pahsimeroi R. | Males | 0 | 8 | 0 |
| | Females | 0 | 1 | 0 |
| | Unknown | 0 | 0 | 0 |
| | Total | 0 | 9 | 0 |
| Secesh R. | Males | 1 | 104 | 1 |
| | Females | 2 | 122 | 1 |
| | Unknown | 1 | 1 | 0 |
| | Total | 4 | 227 | 2 |
| S.F. Salmon R. | Males | 1 | 84 | 12 |
| | Females | 2 | 70 | 6 |
| | Unknown | 6 | 0 | 0 |
| | Total | 9 | 154 | 18 |
| Slate Cr. | Males | 0 | 0 | 0 |
| | Females | 0 | 1 | 0 |
| | Unknown | 0 | 0 | 0 |
| | Total | 0 | 1 | 0 |
| Upper Salmon R. | Males | 1 | 138 | 52 |
| | Females | 0 | 69 | 19 |
| | Unknown | 0 | 0 | 0 |
| | Total | 1 | 207 | 71 |
| Valley Cr. | Males | 0 | 7 | 0 |
| | Females | 0 | 7 | 0 |
| | Unknown | 0 | 0 | 0 |
| | Total | 0 | 14 | 0 |

Appendix A. Table 4. (continued)

| Stream | Sex | Unknown | Natural | General production |
|---------------|--------------|----------------|----------------|---------------------------|
| WFYF S.R. | Males | 0 | 0 | 0 |
| | Females | 0 | 0 | 0 |
| | Unknown | 0 | 0 | 0 |
| | Total | 0 | 0 | 0 |

^a Stream could not be accessed due to Powell Complex Fire.

Appendix B. Expanded (Peterson estimator; Everhart and Youngs 1981) estimates of spawning escapement into project study streams with weirs for years in which mark-recapture data were collected. Streams for which no data are available are designated ND.

| Stream | Year | Marked fish | | Unmarked fish | | Escapement estimate upstream from weir | | |
|----------------------------|-------------------------|---------------|------------------|---------------|------------------|--|---------------------------|----|
| | | Number passed | Number recovered | Number passed | Number recovered | Estimate | ± 95% Confidence interval | |
| Clearwater Subbasin | | | | | | | | |
| Clear Creek | 2012 | 10 | 2 | 0 | 56 | 290 | 354 | |
| | 2011 | 11 | 3 | 0 | 52 | 202 | 190 | |
| | 2010 | 7 | 0 | 0 | 233 | ND | ND | |
| | 2009 | 10 | 1 | 0 | 13 | 150 | 270 | |
| | 2008 | 15 | 12 | 0 | 113 | 156 | 38 | |
| | 2007 | 19 | 3 | 0 | 7 | 63 | 55 | |
| | 2006 | 30 | 5 | 0 | 14 | 114 | 79 | |
| | 2005 | 17 | 3 | 0 | 10 | 74 | 67 | |
| | 2004 | 122 | 15 | 0 | 60 | 610 | 259 | |
| | 2003 | 65 | 1 | 0 | 13 | 910 | 1,706 | |
| Crooked Fork Creek | 2002 | 56 | 4 | 0 | 89 | 1,302 | 1,203 | |
| | 2012 | 7 | 1 | 1 | 64 | 455 | 820 | |
| | 2011 | 27 | 4 | 0 | 67 | 479 | 422 | |
| | 2010 | 24 | 0 | 0 | 33 | NE | NE | |
| | 2009 | 20 | 5 | 0 | 29 | 136 | 96 | |
| | 2008 | 43 | 16 | 0 | 90 | 285 | 102 | |
| | 2007 | 33 | 2 | 0 | 33 | 578 | 754 | |
| | 2006 | 23 | 3 | 0 | 16 | 146 | 142 | |
| | 2005 | 28 | 0 | 0 | 9 | | | |
| | 2004 | 81 | 15 | 0 | 36 | 275 | 106 | |
| | 2003 | 40 | 1 | 0 | 10 | 440 | 813 | |
| | 2002 | 35 | 4 | 0 | 86 | 788 | 710 | |
| | 2001 | 176 | 26 | 1 | 200 | 1,530 | 511 | |
| | 2000 | 17 | 2 | 2 | 95 | 825 | 1,063 | |
| | 1999 | 0 | 0 | 3 | 19 | | | |
| | Lolo Creek ^a | 2010 | 23 | 0 | 0 | 8 | 101 ^b | ND |
| | | 2009 | 33 | 7 | 0 | 0 | 141 | ND |
| 2008 | | 58 | 17 | 0 | 36 | 182 | 54 | |
| Total | | 0 | 0 | 0 | 16 | 29 ^b | ND | |
| Upper | 2007 | 0 | 0 | 0 | 0 | | | |
| Lower | | 0 | 0 | 0 | 16 | | | |
| Total | | 16 | 3 | 0 | 0 | 34 ^c | ND | |
| Upper | 2006 | 12 | 1 | 0 | 0 | | | |
| Lower | | 4 | 2 | 0 | 0 | | | |
| Total | | 27 | 4 | 0 | 22 | 176 | 146 | |
| Upper | 2005 | 13 | 1 | 0 | 9 | 130 | 233 | |
| Lower | | 14 | 3 | 0 | 13 | 75 | 68 | |
| Total | | 154 | 33 | 0 | 72 | 490 | 123 | |
| Upper | 2004 | 143 | 31 | 0 | 22 | 244 | 49 | |
| Lower | | 11 | 2 | 0 | 50 | 286 | 352 | |
| Total | | 23 | 2 | 0 | 69 | 817 | 1,067 | |
| Upper | 2003 | 10 | 1 | 0 | 16 | 170 | 702 | |
| Lower | | 13 | 1 | 0 | 53 | 308 | 1,311 | |
| Total | 2002 | 111 | 22 | 0 | 121 | 621 | 211 | |
| Total | 2001 | 1,081 | 363 | 0 | 523 | 2,638 | 170 | |
| Total | 2000 | 161 | 19 | 0 | 102 | 1,025 | 398 | |
| Total | 1999 | 65 | 4 | 0 | 3 | 114 | 71 | |
| Newsome Creek ^a | 2010 | 137 | 15 | 0 | 5 | 183 | 44 | |
| | 2009 | 26 | 1 | 0 | 4 | 150 | 37 | |
| | 2008 | 47 | 6 | 0 | 2 | 62 | 19 | |

Appendix B. Continued.

| Stream | Year | Marked fish | | Unmarked fish | | Escapement estimate upstream from weir | |
|-------------------------|------|---------------|------------------|---------------|------------------|--|---------------------------|
| | | Number passed | Number recovered | Number passed | Number recovered | Estimate | ± 95% Confidence interval |
| | 2007 | 3 | 0 | 8 | 2 | 11 | ND |
| | 2006 | 3 | 1 | 0 | 0 | 3 | 0 |
| | 2005 | 24 | 6 | 0 | 2 | 32 | 11 |
| | 2004 | 83 | 17 | 0 | 1 | 88 | 9 |
| | 2003 | 290 | 49 | 0 | 20 | 408 | 56 |
| | 2002 | 219 | 43 | 0 | 5 | 244 | 21 |
| | 2001 | 263 | 88 | 0 | 24 | 335 | 26 |
| | 2000 | 93 | 15 | 0 | 21 | 223 | 79 |
| Salmon Subbasin | | | | | | | |
| Johnson Creek | 2009 | 666 | 318 | 0 | 46 ^d | 786 | 33 |
| | 2008 | 550 | 328 | 0 | 4 | 557 | 4 |
| | 2007 | 315 | 103 | 0 | 7 | 336 | 14 |
| | 2006 | 113 | 57 | 0 | 0 | 113 | 0 |
| | 2005 | 119 | 65 | 0 | 0 | 119 | 0 |
| | 2004 | 246 | 68 | 0 | 6 | 267 | 16 |
| | 2003 | 691 | 478 | 0 | 16 | 714 | 6 |
| | 2002 | 1,085 | 606 | 0 | 11 | 1,105 | 8 |
| | 2001 | 1,335 | 837 | 0 | 4 | 1,341 | 4 |
| | 2000 | 78 | 19 | 0 | 8 | 110 | 22 |
| | 1998 | 60 | 38 | 0 | 30 | 107 | 14 |
| Pahsimeroi River | 2013 | NE | NE | NE | NE | NE | NE |
| | 2012 | 216 | 8 | 0 | 1 | 243 | 55 |
| | 2011 | 372 | 29 | 0 | 4 | 385 | 25 |
| | 2010 | 293 | 15 | 0 | 2 | 332 | 56 |
| | 2009 | 322 | 22 | 0 | 2 | 368 | 54 |
| | 2008 | 229 | 29 | 0 | 0 | 229 | 0 |
| South Fork Salmon River | 2013 | 328 | 68 | 0 | 0 | 328 | 0 |
| | 2012 | 454 | 151 | 0 | 20 | 514 | 23 |
| | 2011 | 693 | 269 | 0 | 7 | 711 | 11 |
| | 2010 | 1,339 | 651 | 2 | 9 | 1358 | 9 |
| | 2009 | 546 | 291 | 0 | 2 | 550 | 4 |
| | 2008 | 589 | 261 | 0 | 4 | 598 | 7 |
| | 2007 | 337 | 101 | 0 | 10 | 370 | 18 |
| | 2006 | 505 | 119 | 0 | 26 | 615 | 45 |
| | 2005 | 382 | 165 | 0 | 10 | 405 | 11 |
| | 2004 | 849 | 216 | 0 | 451 | 2,622 | 248 |
| | 2003 | 2,381 | 1,235 | 0 | 177 | 2,722 | 44 |
| | 1997 | 547 | 322 | 0 | 80 | 700 | 23 |
| Upper Salmon River | 2013 | 384 | 104 | 0 | 3 | 395 | 11 |
| | 2012 | 504 | 175 | 0 | 101 | 795 | 58 |
| | 2011 | 597 | 148 | 0 | 12 | 645 | 25 |
| | 2010 | 723 | 293 | 0 | 7 | 740 | 10 |
| | 2009 | 447 | 100 | 0 | 1 | 452 | 8 |
| | 2008 | 390 | 107 | 0 | 55 | 590 | 56 |
| | 2007 | 206 | 76 | 0 | 0 | 206 | 0 |
| | 2006 | 394 | 135 | 0 | 4 | 406 | 9 |
| | 2005 | 445 | 96 | 0 | 0 | 445 | 0 |
| | 2004 | 709 | 185 | 0 | 5 | 728 | 15 |
| | 1999 | 128 | 28 | 0 | 3 | 142 | 14 |

^a Adults removed for Nez Perce Tribal Hatchery broodstock not included in these estimates.

^b Based on an expansion of 2.1 fish per redd for redds located above the lower weir.

^c Based on an expansion of 2.3 fish per redd for redds located above the lower weir.

^d All unmarked fish recovered were age 3 males; likely a small hole in a picket weir. All adults (>age 3) recovered were marked (n = 209).

Appendix C. Juvenile trap operations to collect brood year 2011 spring/summer Chinook salmon in Idaho Supplementation Study (ISS) streams. The spring trapping season extends from trap deployment in the spring to June 30. The summer season extends from July 1 to August 31. The fall season runs from September 1 to trap removal.

| Stream | Season and Calendar Year | Start Date | End Date | Total Days Trapped |
|----------------------------------|--------------------------|-------------------|-------------------|--------------------|
| Clearwater River Subbasin | | | | |
| American River | Spring 2012 | 3/22/2012 | 6/30/2012 | 96 |
| | Summer 2012 | 7/1/2012 | 8/31/2012 | 57 |
| | Fall 2012 | 9/1/2012 | 11/7/2012 | 51 |
| | Spring 2013 | 3/21/2013 | 6/30/2013 | 96 |
| | Total | 3/22/2012 | 6/30/2013 | 300 |
| Clear Creek | Spring 2012 | 6/8/2012 | 6/29/2012 | 21 |
| | Fall 2012 | | | 0 |
| | Spring 2013 | 4/3/2013 | 6/28/2013 | 85 |
| | Total | | | |
| Crooked River | Spring 2012 | 3/29/2012 | 6/30/2012 | 94 |
| | Summer 2012 | 7/1/2012 | 8/31/2012 | 57 |
| | Fall 2012 | 9/1/2012 | 11/7/2012 | 48.5 |
| | Spring 2013 | 3/22/2013 | 6/30/2013 | 94.5 |
| | Total | 3/29/2012 | 6/30/2013 | 294 |
| Red River | Spring 2012 | 4/9/2012 | 6/30/2012 | 82 |
| | Summer 2012 | 7/1/2012 | 8/31/2012 | 54.5 |
| | Fall 2012 | 9/1/2012 | 11/7/2012 | 50 |
| | Spring 2013 | 4/11/2013 | 7/14/2013 | 79.5 |
| | Total | 4/9/2012 | 6/30/2013 | 266 |
| Crooked Fork Creek | Spring 2012 | 03/21/2012 | 06/30/2012 | 69 |
| | Summer 2012 | 07/01/2012 | 08/31/2012 | 57 |
| | Fall 2012 | 09/01/2012 | 11/07/2012 | 68 |
| | Spring 2013 | 03/21/2013 | 06/30/2013 | 78 |
| | Total | 03/21/2012 | 06/30/2013 | 272 |
| Colt Killed Creek | Spring 2012 | 03/21/2012 | 06/30/2012 | 68 |
| | Summer 2012 | 07/01/2012 | 08/31/2012 | 58 |
| | Fall 2012 | 09/01/2012 | 11/07/2012 | 68 |
| | Spring 2013 | 03/21/2013 | 06/30/2013 | 76 |
| | Total | 03/21/2012 | 06/30/2013 | 270 |
| Salmon River Subbasin | | | | |
| Lake Creek | Spring 2012 | 3/29/2012 | 6/30/2012 | 90.5 |
| | Summer 2012 | 7/1/2012 | 8/31/2012 | 60 |
| | Fall 2012 | 9/1/2012 | 10/22/2012 | 50 |
| | Spring 2013 | 3/21/2013 | 6/30/2013 | 87 |
| | Total | 3/29/2012 | 6/30/2013 | 287.5 |
| Secesh River | Spring 2012 | 4/16/2012 | 6/30/2012 | 71.5 |
| | Summer 2012 | 7/1/2012 | 8/31/2012 | 58.5 |
| | Fall 2012 | 9/1/2012 | 10/22/2012 | 50.5 |
| | Spring 2013 | 4/10/2013 | 6/30/2013 | 68.5 |
| | Total | 4/16/2012 | 6/30/2013 | 249 |
| South Fork Salmon River | Spring 2012 | 3/04/2012 | 6/30/2012 | 51.5 |
| | Summer 2012 | 7/01/2012 | 8/31/2012 | 61.0 |
| | Fall 2012 | 9/01/2012 | 10/19/2012 | 46.5 |
| | Spring 2013 | 3/05/2013 | 6/30/2013 | 61.5 |
| | Total | 3/04/2012 | 6/30/2013 | 220.5 |
| Marsh Creek | Spring 2012 | 03/20/2012 | 06/30/2012 | 98 |
| | Summer 2012 | 07/01/2012 | 08/31/2012 | 60 |
| | Fall 2012 | 09/01/2012 | 11/01/2012 | 61 |
| | Spring 2013 | 03/21/2013 | 06/30/2013 | 98 |
| | Total | 03/20/2012 | 06/30/2013 | 317 |

Appendix C. Continued.

| Stream | Season and Calendar Year | | | |
|-----------------------------|-----------------------------|-------------------|-------------------|--------------|
| Upper Salmon River | Spring 2012 | 03/20/2012 | 06/30/2012 | 48 |
| | Summer 2012 | 07/01/2012 | 08/31/2012 | 62 |
| | Fall 2012 | 09/01/2012 | 11/01/2012 | 62 |
| | Spring 2013 | 03/21/2013 | 06/30/2013 | 94 |
| | Total | 03/20/2012 | 06/30/2013 | 266 |
| Pahsimeroi River | Spring 2012 | 02/28/2012 | 06/30/2012 | 102 |
| | Summer 2012 | 07/01/2012 | 08/31/2012 | 61 |
| | Fall 2012 | 09/01/2013 | 11/27/2012 | 87 |
| | Spring 2013 | 03/01/2013 | 06/30/2013 | 104 |
| | Total | 02/28/2012 | 06/30/2013 | 354 |
| Lemhi River | Spring 2012 | 03/06/2012 | 06/30/2012 | 115.0 |
| | Summer 2012 | 07/01/2012 | 08/31/2012 | 62.0 |
| | Fall 2012 | 09/01/2012 | 11/29/2012 | 119.5 |
| | Spring 2013 | 03/06/2013 | 06/30/2013 | 112.5 |
| | Total | 03/06/2012 | 06/30/2013 | 409.0 |
| East Fork Salmon River | Spring 2012 | 3/27/2012 | 6/30/2012 | 50 |
| | Summer 2012 | 7/01/2012 | 8/31/2012 | 59 |
| | Fall 2012 | 9/01/2012 | 11/15/2012 | 74 |
| | Spring 2013 | 3/26/2013 | 6/30/2013 | 69 |
| | Total | 03/27/2012 | 06/30/2013 | 252 |
| WF Yankee Fork Salmon River | Spring 2012 | 4/10/2012 | 6/30/2012 | 52 |
| | Summer 2012 | 7/01/2012 | 8/31/2012 | 50 |
| | Fall 2012 | 9/01/2012 | 11/15/2012 | 61 |
| | Spring 2013 | 3/26/2013 | 6/30/2013 | 90 |
| | Total | 03/27/2012 | 06/30/2013 | 253 |

Appendix D. Inventory of adult and juvenile (parr, presmolt, and smolt) DNA samples collected from ISS sampling sites including number collected and location of the samples. Adults are separated by origin (natural = Nat, general production hatchery = H, and supplementation = Sup). Locations include the Eagle Fish Genetics Laboratory (EFGL), IDFG Nampa Research (NR), Idaho Fishery Resource Office (IFRO), and NPT McCall (NPTM).

| Sample Site | Brood Year | Life Stage | Origin | Number Collected | Archive Location |
|--------------------|-------------------|-------------------|---------------|-------------------------|-------------------------|
| Pahsimeroi River | 2002 | adult | Sup | 142 | EFGL |
| | | adult | Nat | 264 | EFGL |
| | | parr/presmolt | Nat | 442 | EFGL |
| | | smolt | Nat | 692 | EFGL |
| | 2003 | adult | Sup | 435 | EFGL |
| | | adult | Nat | 325 | EFGL |
| | | parr/presmolt | Nat | 375 | EFGL |
| | | smolt | Nat | 511 | EFGL |
| | 2004 | adult | Sup | 281 | EFGL |
| | | adult | Nat | 200 | EFGL |
| | | parr/presmolt | Nat | 959 | EFGL |
| | | smolt | Nat | 476 | EFGL |
| | 2005 | age 1 precocial | Nat | 74 | EFGL |
| | | adult | Sup | 302 | EFGL |
| | | adult | Nat | 326 | EFGL |
| | | parr/presmolt | Nat | 349 | EFGL |
| | | age 0 precocial | Nat | 74 | EFGL |
| | | smolt | Nat | 305 | EFGL |
| | 2006 | age 1 precocial | Nat | 106 | EFGL |
| | | adult | Sup | 76 | EFGL |
| | | adult | Nat | 97 | EFGL |
| | | parr/presmolt | Nat | 561 | EFGL |
| | 2007 | Smolt | Nat | 231 | EFGL |
| | | adult | Sup | 17 | EFGL |
| | | adult | Nat | 138 | EFGL |
| | 2008 | parr/presmolt | Nat | 453 | NR |
| | | smolt | Nat | 84 | NR |
| | | adult | Nat | 224 | EFGL |
| parr/presmolt | | Nat | 111 | NR | |
| 2009 | smolt | Nat | 41 | NR | |
| | adult | Nat | 322 | EFGL | |
| | parr/presmolt | Nat | 59 | NR | |
| 2010 | smolt | Nat | 19 | NR | |
| | adult | Nat | 292 | NR | |
| | parr/presmolt | Nat | 48 | NR | |
| 2011 | adult | Nat | 372 | NR | |
| Upper Salmon River | 2002 | adult | Sup | 546 | NR |
| | | adult | Nat | 794 | NR |
| | | parr/presmolt | Nat | 765 | NR |
| | | smolt | Nat | 620 | NR |
| | 2003 | adult | Sup | 371 | NR |
| | | adult | Nat | 381 | NR |
| | | parr/presmolt | Nat | 437 | NR |
| | | smolt | Nat | 850 | NR |

Appendix D. Continued.

| Sample Site | Brood Year | Life Stage | Origin | Number Collected | Archive Location |
|-------------------------------|-------------------|-------------------|---------------|-------------------------|-------------------------|
| Upper Salmon River (Cont.) | 2004 | adult | Sup | 215 | NR |
| | | adult | Nat | 473 | NR |
| | | parr/presmolt | Nat | 597 | NR |
| | | smolt | Nat | 332 | NR |
| | 2005 | adult | Sup | 159 | NR |
| | | adult | Nat | 286 | NR |
| | | parr/presmolt | Nat | 238 | NR |
| | | smolt | Nat | 188 | NR |
| | 2006 | precocial | Nat | 15 | NR |
| | | adult | Sup | 99 | NR |
| | | adult | Nat | 294 | NR |
| | | parr/presmolt | Nat | 397 | NR |
| | 2007 | smolt | Nat | 123 | NR |
| | | adult | Sup | 23 | NR |
| | | adult | Nat | 183 | NR |
| | 2008 | parr/presmolt | Nat | 351 | NR |
| | | smolt | Nat | 571 | NR |
| | | adult | Nat | 390 | NR |
| | 2009 | parr/presmolt | Nat | 83 | NR |
| | | smolt | Nat | 61 | NR |
| adult | | Nat | 438 | NR | |
| 2010 | parr/presmolt | Nat | 68 | NR | |
| | smolt | Nat | 54 | NR | |
| | adult | Nat | 681 | NR | |
| 2011 | parr/presmolt | Nat | 69 | NR | |
| | smolt | Nat | | NR | |
| | adult | Nat | 582 | EFGL | |
| Crooked Fork Creek | 2004 | smolt | Nat | 52 | NR |
| | 2005 | adult | Nat | 27 | NR |
| | | parr/presmolt | Nat | 251 | NR |
| | 2006 | smolt | Nat | 41 | NR |
| | | adult | Nat | 26 | NR |
| | | parr/presmolt | Nat | 287 | NR |
| | 2007 | smolt | Nat | 84 | NR |
| | | adult | Nat | 36 | NR |
| | | parr/presmolt | Nat | 21 | NR |
| | 2008 | smolt | Nat | 25 | NR |
| | | adult | Nat | 41 | NR |
| | | parr/presmolt | Nat | 57 | NR |
| | 2009 | smolt | Nat | 85 | NR |
| | | adult | Nat | 20 | NR |
| | | parr/presmolt | Nat | 28 | NR |
| | 2010 | smolt | Nat | 20 | NR |
| | | adult | Nat | 23 | NR |
| parr/presmolt | | Nat | 22 | NR | |
| 2011 | smolt | Nat | | NR | |
| | adult | Nat | 27 | NR | |
| Colt Killed Creek | 2004 | smolt | Nat | 25 | NR |
| | 2005 | parr/presmolt | Nat | 37 | NR |
| | | smolt | Nat | 3 | NR |

Appendix D. Continued.

| Sample Site | Brood Year | Life Stage | Origin | Number Collected | Archive Location | |
|---------------------------|-------------------------|-----------------|-------------------|-------------------|------------------|----|
| Colt Killed Creek (Cont.) | 2006 | parr/presmolt | Nat | 36 | NR | |
| | | smolt | Nat | 42 | NR | |
| | 2007 | parr/presmolt | Nat | 73 | NR | |
| | | smolt | Nat | 27 | NR | |
| | 2008 | parr/presmolt | Nat | 55 | NR | |
| | | smolt | Nat | 40 | NR | |
| | 2009 | parr/presmolt | Nat | 42 | NR | |
| | | smolt | Nat | 49 | NR | |
| | 2010 | parr/presmolt | Nat | 43 | NR | |
| | | smolt | Nat | | NR | |
| | South Fork Salmon River | 2005 | adult | Sup | 132 | NR |
| | | | adult | Nat | 251 | NR |
| | | parr/presmolt | Nat | 1,885 | NR | |
| | | smolt | Nat | 444 | NR | |
| 2006 | | adult | Sup ⁱ | 75 | NR | |
| | | adult | Sup | 245 | NR | |
| | | adult | Nat | 259 | NR | |
| | | parr/presmolt | Nat | 576 | NR | |
| | | smolt | Nat | 117 | NR | |
| | | yearling | Nat | 71 | NR | |
| 2007 | | adult | Sup | 60 | NR | |
| | | adult | Nat | 276 | NR | |
| | | parr/presmolt | Nat | 340 | NR | |
| | | Smolt | Nat | 105 | NR | |
| | | Yearling | Nat | 9 | NR | |
| | | 2008 | Adult | Hat ⁱⁱ | 5 | NR |
| | | Adult | Nat | 580 | NR | |
| | | parr/presmolt | Nat | 102 | NR | |
| | | smolt | Nat | 42 | NR | |
| | | yearling | Nat | 13 | NR | |
| 2009 | | Adult | Hat ⁱⁱ | 10 | NR | |
| | | Adult | Nat | 539 | NR | |
| | | parr/presmolt | Nat | 111 | NR | |
| | | smolt | Nat | 43 | NR | |
| | | Yearling | Nat | 36 | NR | |
| | | 2010 | adult | Nat | 1338 | NR |
| | | parr/presmolt | Nat | 100 | NR | |
| 2011 | | adult | Nat | 690 | NR | |
| 2012 | | Adult | Nat | 451 | NR | |
| Marsh Creek | | 2004 | smolt | Nat | 61 | NR |
| | | 2005 | parr/presmolt | Nat | 496 | NR |
| | | | smolt | Nat | 77 | NR |
| | 2006 | parr/presmolt | Nat | 43 | NR | |
| | | smolt | Nat | 37 | NR | |
| | | age 1 precocial | Nat | 95 | NR | |
| | | 2007 | parr/presmolt | Nat | 34 | NR |
| | | smolt | Nat | 44 | NR | |
| | | age 1 precocial | Nat | 51 | NR | |
| | 2008 | parr/presmolt | Nat | 63 | NR | |
| | | smolt | Nat | 54 | NR | |

Appendix D. Continued.

| Sample Site | Brood Year | Life Stage | Origin | Number Collected | Archive Location |
|---------------------|-------------------|-------------------|---------------|-------------------------|-------------------------|
| Marsh Creek (Cont.) | 2009 | parr/presmolt | Nat | 53 | NR |
| | | smolt | Nat | 21 | NR |
| | 2010 | parr/presmolt | Nat | 135 | NR |
| | | Smolt | Nat | | NR |
| Lemhi River | 2004 | Smolt | Nat | 100 | NR |
| | 2005 | parr/presmolt | Nat | 100 | NR |
| | 2005 | Smolt | Nat | 81 | NR |
| | 2006 | parr/presmolt | Nat | 99 | NR |
| | 2007 | parr/presmolt | Nat | 98 | NR |
| | 2007 | Smolt | Nat | 16 | NR |
| | 2008 | parr/presmolt | Nat | 51 | NR |
| | | Smolt | Nat | 13 | NR |
| | 2009 | parr/presmolt | Nat | 67 | NR |
| | | Smolt | Nat | 98 | NR |
| | 2010 | parr/presmolt | Nat | 100 | NR |
| Smolt | | Nat | 50 | NR | |
| American River | Unk | Juvenile | Nat | 55 | NR |
| | Unk | Juvenile | Nat | 100 | NR |
| | 2005 | Juvenile | Nat | 100 | NR |
| | 2006 | Juvenile | Nat | 44 | NR |
| | 2007 | Juvenile | Nat | 150 | NR |
| | 2008 | Juvenile | Nat | 155 | NR |
| | 2009 | Juvenile | Nat | 94 | NR |
| | 2010 | Juvenile | Nat | 52 | NR |
| | 2011 | Juvenile | Nat | 102 | NR |
| | Crooked River | Unk | Juvenile | Nat | 105 |
| Unk | | Juvenile | Nat | 50 | NR |
| 2005 | | Juvenile | Nat | 100 | NR |
| 2006 | | Juvenile | Nat | 18 | NR |
| 2007 | | Juvenile | Nat | 4 | NR |
| 2008 | | Juvenile | Nat | 123 | NR |
| 2009 | | Juvenile | Nat | 148 | CRITFC |
| 2010 | | Juvenile | Nat | 65 | CRITFC |
| 2011 | | Juvenile | Nat | 106 | NR |
| Red River | | Unk | Juvenile | Nat | 102 |
| | Unk | Juvenile | Nat | 50 | NR |
| | 2005 | Juvenile | Nat | 100 | NR |
| | 2006 | Juvenile | Nat | 47 | NR |
| | 2007 | Juvenile | Nat | 173 | NR |
| | 2008 | Juvenile | Nat | 178 | NR |
| | 2009 | Juvenile | Nat | 103 | NR |
| | 2010 | Juvenile | Nat | 53 | NR |
| | 2011 | Juvenile | Nat | 96 | NR |
| | Clear Creek | 2004 | adult | Sup | 57 |
| Nat | | | | 61 | IFRO |
| 2005 | | adult | Sup | 8 | IFRO |
| | | | Nat | 8 | IFRO |

Appendix D. Continued.

| Sample Site | Brood Year | Life Stage | Origin | Number Collected | Archive Location | |
|---------------------|-------------------|-------------------|---------------|-------------------------|-------------------------|-----|
| Clear Creek (Cont.) | 2006 | adult | Sup | 13 | IFRO | |
| | | | Nat | 16 | IFRO | |
| | 2006 | smolt | Nat | 39 | IFRO | |
| | | | 2007 | adult | Sup | 1 |
| | Nat | 18 | | | IFRO | |
| | 2008 | adult | Nat | 7 | IFRO | |
| | | | 2009 | adult | Nat | |
| | 2010 | adult | | | Nat | 7 |
| | | | 2011 | adult | H | 50 |
| | 2011 | adult | | | Nat | 11 |
| | | | 2012 | adult | Nat | 10 |
| | Fishing Creek | 2002 | | | adult | H |
| Nat | | | 13 | NPTM | | |
| 2003 | | juvenile | Nat | 60 | CRITFC | |
| | | | Nat | 2 | NPTM | |
| 2004 | | juvenile | Nat | 80 | CRITFC | |
| | | | Nat | 3 | NPTM | |
| 2005 | | juvenile | Nat | 80 | CRITFC | |
| | | | 2006 | adult | Nat | 1 |
| 2007 | | adult | | | Nat | 1 |
| | | | 2008 | juvenile | Nat | 100 |
| 2008 | | adult | | | Nat | 11 |
| | | | 2008 | adult | H | 6 |
| 2009 | | adult | | | H | 1 |
| | | | 2009 | juvenile | Nat | 60 |
| 2010 | | juvenile | | | Nat | 60 |
| | | | 2011 | adult | Nat | 1 |
| 2011 | | adult | | | H | 2 |
| | | | 2012 | adult | H | 1 |
| Lake Creek | | 2002 | | | juvenile | Nat |
| | | | 2002 | adult | | H |
| | 2002 | adult | | | Nat | 141 |
| | | | 2003 | juvenile | Nat | 25 |
| | 2003 | adult | | | Nat | 229 |
| | | | 2004 | juvenile | Nat | 886 |
| | 2004 | adult | | | H | 4 |
| | | | 2004 | adult | Nat | 170 |
| | 2004 | adult | | | Unk | 3 |
| | | | 2005 | juvenile | Nat | 720 |
| | 2005 | adult | | | Nat | 74 |
| | | | 2006 | juvenile | Nat | 890 |
| | 2006 | adult | | | H | 2 |
| | | | 2006 | adult | Nat | 26 |
| | 2007 | juvenile | | | Nat | 890 |
| | | | 2007 | adult | Nat | 32 |
| | 2008 | juvenile | | | Nat | 878 |
| | | | 2008 | adult | Nat | 121 |
| | 2008 | adult | | | H | 5 |
| | | | 2009 | adult | H | 2 |
| | 2009 | adult | | | Nat | 109 |
| | | | 2009 | juvenile | Nat | 90 |

Appendix D. Continued.

| Sample Site | Brood Year | Life Stage | Origin | Number Collected | Archive Location |
|----------------------|-------------------|-------------------|---------------|-------------------------|-------------------------|
| Lake Creek (Cont.) | 2010 | juvenile | Nat | 100 | CRITFC |
| | 2011 | juvenile | Nat | 100 | CRITFC |
| | 2011 | adult | Nat | 67 | NPTM |
| | 2012 | adult | Nat | 101 | NPTH |
| | 2012 | adult | H | 2 | NPTH |
| Legendary Bear Creek | 2002 | juvenile | Nat | 60 | CRITFC |
| | 2002 | adult | H | 12 | NPTM |
| | 2002 | adult | Nat | 13 | NPTM |
| | 2002 | adult | Unk | 2 | NPTM |
| | 2003 | juvenile | Nat | 80 | CRITFC |
| | 2003 | adult | H | 2 | NPTM |
| | 2003 | adult | Nat | 3 | NPTM |
| | 2004 | juvenile | Nat | 80 | CRITFC |
| | 2004 | adult | H | 10 | NPTM |
| | 2004 | adult | Sup | 8 | NPTM |
| | 2004 | adult | Nat | 7 | NPTM |
| | 2004 | adult | Unk | 1 | NPTM |
| | 2005 | juvenile | Nat | 80 | CRITFC |
| | 2006 | adult | Sup | 1 | NPTM |
| | 2006 | adult | H | 6 | NPTM |
| | 2006 | adult | Nat | 4 | NPTM |
| | 2008 | juvenile | Nat | 100 | CRITFC |
| | 2008 | adult | Nat | 14 | NPTM |
| | 2008 | adult | H | 19 | NPTM |
| | 2009 | adult | Unk | 1 | NPTM |
| | 2009 | adult | N | 3 | NPTM |
| | 2009 | adult | H | 12 | NPTM |
| | 2009 | juvenile | Nat | 60 | CRITFC |
| | 2010 | juvenile | Nat | 60 | CRITFC |
| | 2010 | adult | Nat | 2 | NPTM |
| | 2010 | adult | H | 6 | NPTM |
| | 2011 | adult | Nat | 1 | NPTM |
| | 2011 | adult | H | 5 | NPTM |
| | 2011 | juvenile | Nat | 60 | CRITFC |
| | 2012 | adult | H | 2 | NPTM |
| Secesh River | 2009 | adult | Nat | 4 | NPTM |
| | 2002 | adult | H | 16 | NPTM |
| | 2002 | adult | Sup | 2 | NPTM |
| | 2002 | adult | Nat | 129 | NPTM |
| | 2002 | juvenile | Nat | 68 | CRITFC |
| | 2003 | adult | H | 3 | NPTM |
| | 2003 | adult | Nat | 241 | NPTM |
| | 2003 | juvenile | Nat | 27 | CRITFC |
| | 2004 | adult | H | 2 | NPTM |
| | 2004 | adult | Nat | 111 | NPTM |
| | 2004 | adult | Unk | 1 | NPTM |
| | 2004 | juvenile | Nat | 894 | CRITFC |
| | 2005 | juvenile | Nat | 731 | CRITFC |
| | 2005 | adult | H | 1 | NPTM |
| | 2005 | adult | Nat | 76 | NPTM |

Appendix D. Continued.

| Sample Site | Brood Year | Life Stage | Origin | Number Collected | Archive Location | |
|----------------------|-------------------|-------------------|---------------|-------------------------|-------------------------|------|
| Secesh River (Cont.) | 2006 | juvenile | Nat | 873 | CRITFC | |
| | 2006 | adult | H | 2 | NPTM | |
| | 2006 | adult | Nat | 34 | NPTM | |
| | 2006 | adult | Unk | 1 | NPTM | |
| | 2007 | juvenile | Nat | 893 | CRITFC | |
| | 2007 | adult | H | 7 | NPTM | |
| | 2007 | adult | Nat | 47 | NPTM | |
| | 2008 | juvenile | Nat | 891 | CRITFC | |
| | 2008 | adult | Nat | 181 | NPTM | |
| | 2008 | adult | H | 19 | NPTM | |
| | 2008 | adult | Unk | 1 | NPTM | |
| | 2009 | adult | H | 5 | NPTM | |
| | 2009 | adult | Nat | 153 | NPTM | |
| | 2009 | juvenile | Nat | 100 | CRITFC | |
| | 2010 | adult | Nat | 286 | NPTM | |
| | 2010 | adult | H | 1 | NPTM | |
| | 2010 | Juvenile | Nat | 98 | CRITFC | |
| | 2011 | adult | Nat | 207 | NPTM | |
| | 2011 | adult | H | 13 | NPTM | |
| | 2011 | adult | Unk | 1 | NPTM | |
| | 2011 | juvenile | Nat | 100 | CRITFC | |
| | 2012 | adult | Nat | 207 | NPTM | |
| | 2012 | adult | H | 2 | NPTM | |
| | Slate Creek | 2002 | adult | H | 2 | NPTM |
| | | 2002 | adult | Nat | 17 | NPTM |
| | | 2002 | adult | Unk | 1 | NPTM |
| 2003 | | adult | H | 1 | NPTM | |
| 2003 | | adult | Nat | 1 | NPTM | |
| 2008 | | adult | Nat | 4 | NPTM | |
| 2009 | | adult | H | 1 | NPTM | |
| 2010 | | adult | Nat | 10 | NPTM | |
| 2011 | | adult | H | 1 | NPTM | |
| 2012 | | adult | Nat | 1 | NPTM | |
| Pete King Creek | 2011 | Adult | Nat | 1 | IFRO | |

Appendix E.

Six tables of data collected for VSP monitoring in the upper Marsh Creek spawning population in 2012. Tables include information on redd count/carcass survey transect boundaries, redd counts, carcass collections, juvenile screw trap operations, juvenile migration estimates, and juvenile survival estimates to Lower Granite Dam. These data will not be used in the ISS analysis.

Appendix E. Table 1. Stream sections and lengths (km) surveyed for Chinook Salmon redds and carcasses for viable salmonid population (VSP) monitoring in the upper Marsh Creek spawning population. These reaches include all likely spawning habitats in these streams. Data from these reaches must be combined with Idaho Supplementation Studies surveys in Marsh and Knapp creeks to summarize the entire spawning population.

| Stream | Upper boundary | Lower boundary | km |
|------------------|---|-------------------------------------|-----------|
| Cape Horn Creek | Banner Creek | Mouth | 6.61 |
| Banner Creek | Highway 21 culvert at mile post 107 | Mouth | 4.40 |
| Marsh Creek | Cape Horn Creek mouth | Screw Trap at Lola Creek campground | 1.75 |
| Beaver Creek | Bridge 0.63 km downstream of Prospect Creek | Mouth | 15.12 |
| Winnemucca Creek | 500 meters upstream of mouth | Mouth | 0.50 |

Appendix E. Table 2. Summary of Chinook Salmon redd count data associated with viable salmonid population monitoring activities in the upper Marsh Creek spawning population in 2012. These data must be combined with Idaho Supplementation Studies redd counts for Marsh and Knapp creeks to summarize the entire spawning population.

| Stream | Survey length (km) | Redds | Redds per km | Passes | Last pass | Survey method |
|------------------|---------------------------|--------------|---------------------|---------------|------------------|----------------------|
| Marsh Creek | 1.75 | 4 | 2.28 | 2 | 09/04/2012 | Ground |
| Cape Horn Creek | 6.61 | 53 | 8.01 | 4 | 09/05/2012 | Ground |
| Banner Creek | 4.40 | 10 | 2.27 | 3 | 09/05/2012 | Ground |
| Beaver Creek | 15.12 | 21 | 1.39 | 1 | 09/05/2012 | Aerial ^a |
| Winnemucca Creek | 0.50 | 0 | 0 | 1 | 09/05/2012 | Aerial ^a |

^a The Halstead Complex fire prevented access by ground counters. Aerial counts provided by R. Thurow (USFS, Rocky Mountain Research Station) Project Number 1999-020-00.

Appendix E. Table 3. Number, origin (GP = general production hatchery), and sex of adult Chinook Salmon carcasses collected during 2012 spawning ground surveys associated with viable salmonid population monitoring activities in the upper Marsh Creek spawning population. These data must be combined with Idaho Supplementation Studies carcass collections for Marsh and Knapp creeks to summarize the entire spawning population. Streams not walked in 2012 are designated ND.

| Stream | Sex | Unknown | Natural | General production |
|---------------------------|--------------|----------------|----------------|---------------------------|
| Marsh Creek | Male | 0 | 4 | 0 |
| | Female | 0 | 1 | 0 |
| | Unknown | 0 | 0 | 0 |
| | Total | 0 | 5 | 0 |
| Cape Horn Creek | Male | 0 | 11 | 0 |
| | Female | 0 | 13 | 1 |
| | Unknown | 0 | 1 | 0 |
| | Total | 0 | 25 | 1 |
| Banner Creek | Male | 0 | 0 | 0 |
| | Female | 0 | 0 | 0 |
| | Unknown | 0 | 0 | 0 |
| | Total | 0 | 0 | 0 |
| Beaver Creek ^a | Male | ND | ND | ND |
| | Female | ND | ND | ND |
| | Unknown | ND | ND | ND |
| | Total | ND | ND | ND |

^a Beaver Creek was not walked in 2012 due to the Halstead Complex Fire.

Appendix E. Table 4. Juvenile trap operations to collect brood year 2010 spring/summer Chinook Salmon in the upper Marsh Creek spawning population for viable salmonid population (VSP) monitoring. The spring trapping season extends from trap deployment in the spring to June 30. The summer season extends from July 1 to August 31. The fall season runs from September 1 to trap removal.

| Stream | Season and Calendar Year | Start Date | End Date | Total Days Trapped |
|-----------------|---------------------------------|-------------------|-------------------|---------------------------|
| Marsh Creek VSP | Spring 2011 | 03/20/2011 | 06/30/2011 | 82.5 |
| | Summer 2011 | 07/01/2011 | 08/31/2011 | 62.0 |
| | Fall 2011 | 09/01/2011 | 11/02/2011 | 57.0 |
| | Spring 2012 | 03/20/2012 | 06/30/2012 | 99.0 |
| | Total | 03/20/2011 | 06/30/2012 | 300.5 |

Appendix E. Table 5. Seasonal and overall migration estimates of brood year 2010 juvenile Chinook Salmon and corresponding lower (LCI) and upper (UCI) 95% confidence intervals from the upper Marsh Creek spawning population. Estimates are based on the total catch, recapture rate of tagged fish, and the estimated trap efficiency.

| Stream | Life Stage | Catch | Estimate | LCI | UCI |
|-----------------|-------------------------|---------------|-----------------|----------------|----------------|
| Marsh Creek VSP | Fry | 885 | NE | NE | NE |
| | Parr | 10,785 | 262,536 | 199,831 | 350,506 |
| | Presmolt | 9,646 | 88,743 | 78,832 | 100,221 |
| | Smolt | 770 | 14,803 | 10,781 | 20,524 |
| | Brood Year Total | 32,871 | 366,082 | 303,708 | 465,501 |

Appendix E. Table 6. Estimated survival (proportion) and standard error (SE) to Lower Granite Dam for different life stages of naturally produced brood year 2010 juvenile Chinook Salmon PIT tagged from the upper Marsh Creek spawning population for viable salmonid population (VSP) monitoring. Data represent an aggregate survival for juveniles from Marsh, Knapp, Cape Horn, Banner and Beaver creeks. Survival estimates were computed using the SURPH2 Model (Lady et al. 2001).

| Stream | Life stage | Number tagged | Survival (SE) |
|-----------------|-------------------|----------------------|----------------------|
| Marsh Creek VSP | Parr | 2,658 | 0.1494 (0.01) |
| | Presmolt | 2,200 | 0.1849 (0.01) |
| | Smolt | 848 | 0.2803 (0.03) |

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