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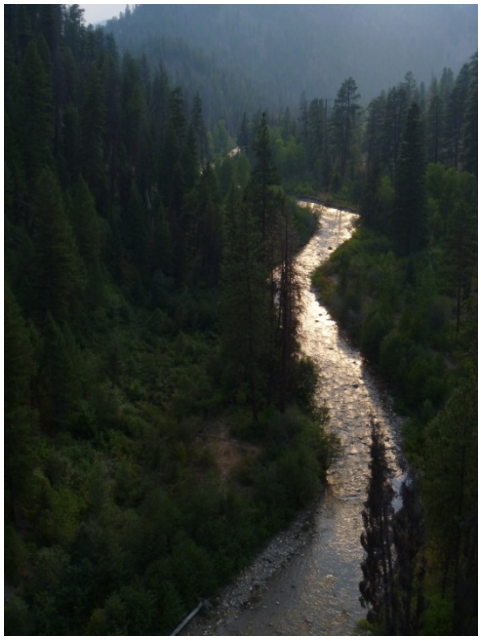

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Idaho Natural Production Monitoring and Evaluation

Project Progress Report

2011 Annual Report

By

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ABBREVIATIONS AND ACRONYMS

BPA	Bonneville Power Administration
BY	Brood Year
CI	Confidence Interval
COE	U.S. Army Corps of Engineers
CWT	Coded Wire Tag
DPS	Distinct Population Segment
EFSF	East Fork South Fork Salmon River
ESA	Endangered Species Act
ESU	Evolutionarily Significant Unit
FANR	Females Available for Natural Reproduction
FL	Fork Length
GPM	General Parr Monitoring
GSI	Genetic Stock Identification
ICBTRT	Interior Columbia Basin Technical Recovery Team
IDFG	Idaho Department of Fish and Game
INPMEP	Idaho Natural Production Monitoring and Evaluation Project
ISMES	Idaho Steelhead Monitoring and Evaluation Studies
LGR	Lower Granite Dam
MPG	Major Population Group
NOAA	National Oceanic and Atmospheric Administration
NWFSC	Northwest Fisheries Science Center
ODFW	Oregon Department of Fish and Wildlife
PIT	Passive Integrated Transponder
RPA	Reasonable and Prudent Alternatives
SAR	Smolt to Adult Return Rate
VSP	Viable Salmonid Population

TABLE OF CONTENTS

Page

ABBREVIATIONS AND ACRONYMS i
ABSTRACT 1
INTRODUCTION 2
OBJECTIVES 3
METHODS 4
- Wild Chinook Salmon Adult Abundance 4
  - Redd Surveys 4
- Wild Chinook Salmon Carcass Surveys and Age Composition 4
  - Carcass Surveys 4
  - Carcass Age Composition 5
- Wild Chinook Salmon Smolt-To-Adult Survival Rate 5
- Wild Chinook Salmon Intrinsic Population Productivity 6
  - Females Available for Natural Reproduction 6
  - Stock-Recruit Model 6
- Wild Chinook Salmon and Steelhead Juvenile Density and Spatial Structure 7
  - Core and Non-core Trend Surveys 8
  - Extensive Panel Surveys 8
  - Intensive Panel Surveys 9
  - Detection Probability 9
- Data Management 9

RESULTS 9
- Wild Chinook Salmon Abundance 9
  - Redd Surveys 9
- Wild Chinook Salmon Carcass Surveys and Age Composition 10
  - Carcass Surveys 10
  - Carcass Age Composition 10
- Wild Chinook Salmon Smolt-To-Adult Survival Rate 10
- Wild Chinook Salmon Intrinsic Population Productivity 11
  - Females Available for Natural Reproduction 11
  - Stock-Recruit Model 11
- Wild Chinook Salmon and Steelhead Juvenile Density Spatial Structure 11
  - Core and Non-core Trend Surveys 11
  - Extensive Panel Surveys 12
  - Intensive Panel Surveys 13
  - Detection Probability 14

DISCUSSION 14
ACKNOWLEDGEMENTS 17
LITERATURE CITED 18
TABLES 22
FIGURES 30
APPENDICES 33

ABSTRACT

The Idaho Natural Production Monitoring and Evaluation Project monitors the status of wild Snake River spring-summer Chinook salmon and summer steelhead populations in the Salmon and Clearwater river subbasins. In this report we summarize project activities for contract year 2011. We summarize redd surveys for Idaho trend transects and carcass surveys. We aged 1,238 Chinook salmon carcasses using dorsal fin rays in 2011; 337 salmon carcasses were from from the South Fork Salmon river MPG, 329 were from the Middle Fork Salmon river MPG, 494 were from the Upper Salmon river MPG, 55 were from the Dry Clearwater MPG, and 23 were from the Wet Clearwater MPG. We observed an increase in the Chinook salmon smolt-to-adult return rate to 4.20% for smolt year 2008 although cohort returns are incomplete. We updated our Chinook salmon stock-recruit curve ($r^2 = 0.939$, $n = 20$) for the Snake River at LGR, which predicts that natural production will exceed 1.4 million smolts during 2012 and 1.3 million smolts during 2013. Also during 2011, INPMEP snorkel crews surveyed 442 transects to help describe Chinook salmon and steelhead juvenile density, productivity, and spatial structure.

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INTRODUCTION

Populations of Chinook salmon *Oncorhynchus tshawytscha* and steelhead trout *O. mykiss* in the Snake River basin declined substantially following the construction of hydroelectric dams in the Snake and Columbia rivers. Raymond (1988) documented a decrease in survival of emigrating steelhead trout and Chinook salmon from the Snake River following the construction of dams on the lower Snake River during the late 1960s and early 1970s. Abundance rebounded slightly in the early 1980s, but then escapements over Lower Granite Dam (LGR) into the Snake River basin declined again (Busby et al. 1996). In recent years, abundances in the Snake River basin have slightly increased. The increase has been dominated by hatchery fish, while the returns of naturally produced Chinook salmon and steelhead remain critically low. As a result, Snake River spring-summer Chinook salmon (hereafter Chinook salmon) were classified as threatened in 1992 under the Endangered Species Act (ESA). Within the Snake River spring-summer Chinook salmon evolutionarily significant unit (ESU), there are seven major population groups (MPGs): Lower Snake River, Grande Ronde/Imnaha rivers, South Fork Salmon River, Middle Fork Salmon River, Upper Salmon River, Dry Clearwater, and the Wet Clearwater. However, the Dry Clearwater and the Wet Clearwater MPGs are considered to be extirpated. A total of 29 extant demographically independent populations have been identified. Snake River steelhead trout (hereafter steelhead) were classified as threatened under the ESA in 1997. Within the Snake River steelhead distinct population segment (DPS), there are six MPGs: Lower Snake River, Grande Ronde River, Imnaha River, Clearwater River, Salmon River, and Hells Canyon Tributaries (ICBTRT 2003, 2005; NMFS 2011). However, the Hells Canyon MPG is considered to be extirpated. A total of 24 extant demographically independent populations have been identified.

Anadromous fish management programs in the Snake River basin include large-scale hatchery programs intended to mitigate for the impacts of hydroelectric dam construction and operation in the basin and recovery planning and implementation efforts aimed at recovering ESA-listed wild salmon and steelhead stocks. The Idaho Department of Fish and Game (IDFG) anadromous fish program's long-range goal, consistent with basinwide mitigation and recovery programs, is to preserve Idaho's salmon and steelhead runs and recover them to provide benefit to all users (IDFG 2012). Management to achieve these goals requires an understanding of how salmonid populations function as well as regular status assessments (McElhany et al. 2000). However, specific data on some Snake River steelhead and Chinook salmon populations are lacking, particularly key parameters such as abundance, age composition, genetic diversity, recruits per spawner, and survival rates (ICBTRT 2003). The key metrics to assessing viability of salmonid populations are abundance, productivity, spatial structure, and diversity (McElhany et al. 2000).

The purpose of the Idaho Natural Production Research Monitoring and Evaluation Project (INPMEP) is to provide information for monitoring the status of Idaho's wild Chinook salmon and steelhead populations with respect to the VSP criteria and how status is trending over time. In the 1950s, IDFG developed a program to index annual spawning escapement by enumerating Chinook salmon redds in selected areas. Currently, the total area and number of streams surveyed represents a large portion of wild Chinook salmon spawning habitat (Hassemer 1993a). The number of redds counted in these areas provide an index of the annual wild adult Chinook salmon spawner abundance at the independent population scale (see ICBTRT 2003 for population delineations). For Chinook salmon, 2011 data were collected in selected spawning tributaries in the Clearwater and Salmon river subbasins to describe population-specific abundance, productivity, spatial structure, and diversity. For Chinook salmon and steelhead, we assess spatial structure and productivity of juveniles during 2011.

The INPMEP monitors the Idaho portion of the Snake River spring-summer Chinook salmon ESU (hereafter the aggregate) above LGR. The aggregate escapement of Snake River Chinook salmon and steelhead is measured at LGR, with the exception of the Tucannon River, Washington, population. Some of the wild fish are headed to Washington or Oregon tributaries to spawn, but the majority is destined for Idaho. Age, sex, and stock composition data are important for monitoring recovery of wild fish for both species. Age data collected at LGR are used to assign returning adults to specific brood years (BYs), for cohort analysis, and to estimate productivity and survival rates (Copeland et al. 2007; Copeland and Putnam 2009; Copeland et al. 2009; Copeland and Roberts 2010; Copeland et al. 2011; Kennedy et al. 2012; Schrader et al. 2011; Schrader et al. 2012). In addition, escapement estimates by cohort are used to forecast run sizes in subsequent years. Preseason forecasts are the basis for preliminary fisheries planning in the mainstem Columbia and Snake rivers. We sampled wild (unmarked) adult Chinook salmon at LGR in 2011, which are detailed in separate reports (Bill Schrader, IDFG, personal communication). In this report some large-scale analyses remain informative (e.g., stock-recruit model) and we will continue with these methods unchanged from past reports. Also, we provide a preliminary version of aggregate Chinook salmon age composition for estimating smolt-to-adult survival return rates.

Information presented in this report is summarized according to the viable salmonid population (VSP) criteria mentioned above. The data reported will be population-specific where possible. Population-specific redd survey data were added in the 2010 proposal to address the Reasonable and Prudent Alternatives (RPAs) 50 and 63, defined in the 2008 Federal Columbia River Power System Biological Opinion (http://www.nwr.noaa.gov/Salmon-Hydropower/Columbia-Snake-Basin/upload/Final-ExSum.pdf.) We address RPA 50 to produce data relevant to Chinook salmon and steelhead population status assessments and will also provide data on hatchery fraction for Chinook salmon carcasses recovered on the spawning grounds. The fraction of hatchery Chinook salmon contributing to natural spawning is relevant to RPA 63.

OBJECTIVES

Project tasks are grouped into four objectives. The purpose of each objective involves enumerating or describing individuals within the various life stages of wild Chinook salmon and steelhead. By understanding the transitions between life stages and associated controlling factors, we hope to achieve a mechanistic understanding of stock-specific population dynamics that will aide mitigation and population recovery efforts.

Objective 1. Estimate 2011 adult abundance and composition of returning wild adult Chinook salmon passing LGR. In collaboration with the Chinook and Steelhead Genotyping for Genetic Stock Identification (GSI) at Lower Granite Dam (Bonneville Power Administration [BPA] project #2010-026-00), we will decompose the aggregate estimates into major population groups and, in some cases, populations. Over time, productivity will be assessed. These results are reported in a separate document.

Objective 2. Estimate population-specific abundance, hatchery fraction, and composition of wild Chinook salmon from information obtained on the spawning grounds in the Salmon River and Clearwater River subbasins.

Objective 3. Estimate the distribution and abundance of wild Chinook salmon and steelhead parr in tributaries of the Salmon River and Clearwater River subbasins in coordination with the Idaho Steelhead Monitoring and Evaluation Studies (ISMES; BPA project #1990-055-00). Estimate spatial structure and productivity.

Objective 4. Estimate lifecycle survival and the freshwater productivity of the Snake River Chinook salmon ESU. There are two components: update and refine a stock-recruit model and estimate aggregate smolt-to-adult survival rates.

METHODS

Wild Chinook Salmon Adult Abundance

Redd Surveys

During 2011, redd survey methods were the same as past years using standardized procedures described in Hassemer (1993b). Trend transect boundaries have generally remained constant and were described in Hassemer (1993a). Redd survey trend transect names and target dates are listed by population in Table 1. Single-pass, peak-count surveys were made over each trend transect each year. Each survey was originally timed to coincide with the period of maximum spawning activity on a particular stream, based on historic observations, and assigned a target count-time window (Table 1). The method chosen for each redd survey was dependent on the best visual technique for each trend area and ability to maximize the number of river miles surveyed. Methods included low-flying helicopter or single-pass ground surveys conducted on foot. Currently no redd survey trend transects are identified for the following populations: Little Salmon River, Upper Middle Fork Salmon River, Lapwai/Big Canyon Creeks, Potlatch River, Lawyer Creek, and Meadow Creek. Partial or no surveys were conducted in Lolo Creek, Moose Creek, and the Upper Selway River populations.

These data were used by the Interior Columbia Basin Technical Recovery Team (ICBTRT) to estimate adult spawner abundance by expanding the number of redds counted in the trend transects to the extent of the available spawning habitat, the estimated number of fish/redd, and by multiplying by the sex ratios to determine the number of males (ICBTRT 2007). For this report, the peak trend survey count data were reported for 2011. These data will be used in subsequent reports to build trends of adult spawner abundance by population.

Wild Chinook Salmon Carcass Surveys and Age Composition

Carcass Surveys

Field personnel sampled carcasses from spawning areas throughout the Idaho portion of the study area (Figure 1) consistent with methods in Copeland et al. 2004. Reaches were a subset of the redd survey transects described in Hassemer (1993a). Not all redd survey reaches are surveyed from the ground; therefore, carcasses are not available for all populations. Because age composition, sex ratios, and hatchery/wild fraction can vary widely among populations, we have a minimum goal of 100 carcass samples from each population. We consider 100 to be conservatively high to adequately describe demographic parameters for an unknown population size.

Hatchery personnel also collected dorsal fins from known-age (Passive Integrated Transponder [PIT] or coded-wire-tagged [CWT]) hatchery adults at Rapid River, Sawtooth, Clearwater, Pahsimeroi, and McCall hatcheries. The known-age samples were collected from Chinook salmon tagged as juveniles with PIT tags or CWTs and recovered as returning adults. The known-age samples were used to estimate aging accuracy and train new personnel in growth patterns specific to the years being analyzed.

Carcass Age Composition

Fin ray analysis techniques were consistent with Copeland et al. 2007. Fin rays were dried, set in epoxy resin, cut into cross-sections with a bone saw, and mounted on microscope slides. All samples were aged independently by two technicians. Personnel were trained with reference fin rays and were required to demonstrate 90% accuracy in an aging test before they were allowed to begin aging new samples. If there was disagreement in age determination or the age did not match what was expected for fish length, then fins were aged again in a referee session. In a referee session, three personnel viewed the fin together and arrived at a consensus age. In some cases, a consensus could not be achieved and the fin ray was removed from the sample. Known-age samples were randomly included with the wild samples to assess accuracy. Chinook salmon with a fork length (FL) less than 45 cm were removed from the sample due to the possibility that they were mini-jacks.

We summarized carcass survey data in three ways: 1) the length-frequency distribution determined by fin ray analysis was plotted separately for 2011 to describe the aggregate population above LGR; 2) the number of carcasses collected was summarized by age for each population for each year; and 3) the frequencies of hatchery production and natural production carcasses were summed between the BioSamples and the Spawning Ground Survey databases for each independent population and MPG.

Wild Chinook Salmon Smolt-To-Adult Survival Rate

To estimate the aggregate smolt-to-adult survival rate for wild Chinook salmon, we combined the age assignments of adults, obtained from scale analysis at LGR, with estimates of emigrating wild Chinook salmon smolts at LGR from the Fish Passage Center (www.fpc.org). Abundance by cohort for the 2010 and 2011 returns were obtained from the LGR reports (Schrader et al. 2012, Bill Schrader, IDFG, personal communication). To calculate a smolt-to-adult return rate (SAR) for a particular smolt year, we used the sum of ocean returns from that cohort as the numerator and the estimate of wild smolts arriving at LGR as the denominator:

$$SAR_k = \frac{\sum_{l-1}^{4} r_{k+l}}{S_k},$$

where SAR_k is the smolt-to-adult return rate of smolt year k; r_{k+l} is the return from that cohort in year $k+l$; l is ocean age; and S_k is the estimate of smolts migrating in year k. The maximum value of l is four because that is the maximum ocean age observed for Chinook salmon at LGR (Copeland et al. 2004). We used formulas from Fleiss (1981) to estimate the 95% confidence limits on SAR values. The lower limit is given by

$$\frac{\left(2np + t_{\propto/2}^2 - 1\right) - t_{\propto/2}\sqrt{t_{\propto/2}^2 - (2 + 1/n) + 4p(nq + 1)}}{2\left(n + t_{\propto/2}^2\right)},$$

and the upper limit by

$$\frac{\left(2np + t_{\propto/2}^2 + 1\right) + t_{\propto/2}\sqrt{t_{\propto/2}^2 + (2 + 1/n) + 4p(nq + 1)}}{2\left(n + t_{\propto/2}^2\right)},$$

where n is the number of smolts, p is the SAR value as a proportion, q is 1-SAR, and $t_{\propto/2}$ is 1.96.

Wild Chinook Salmon Intrinsic Population Productivity

Females Available for Natural Reproduction

Intrinsic population productivity is estimated using a stock-recruit model. We did this for the aggregate population by relating the abundance of emigrating smolts at LGR to the number of female parents on the spawning grounds. The number of Chinook salmon females available for natural reproduction (FANR) upstream of LGR was estimated using methods consistent with Kennedy et al. (2012). The estimated number of adults per run type (excluding jacks) passing LGR during 2011 was obtained directly from the Fish Passage Center website (www.fpc.org, obtained December 2011). At Columbia River dams, U.S. Army Corps of Engineers (COE) designates jack Chinook salmon as fish between 30 and 56 cm in length at the counting window. Adult Chinook salmon that pass LGR between March 3 and June 17 are defined as "spring run," and those passing LGR between June 18 and August 17 are defined as "summer run." The total number of adult Chinook salmon (excluding jacks) captured at hatchery traps and the number of females taken into hatcheries was obtained from unpublished IDFG hatchery reports, IDFG hatchery database, Oregon Department of Fish & Wildlife (ODFW; Joseph Feldhaus, personal communication), and U.S. Fish & Wildlife Service (Howard Burge, personal communication). McCall and Pahsimeroi hatchery fish were considered summer run and all other hatchery stocks were considered spring run. The percentage of females, by run type, was estimated for all adult Chinook salmon identified to sex at hatchery weirs. The estimated percentage of females was applied to the aggregate LGR counts for each run type to estimate the total number of female Chinook salmon passing LGR. The total harvest estimates upstream of LGR were obtained from IDFG (Alan Byrne, personal communication), Nez Perce Tribe (Joe Oatman, personal communication), Shoshone-Bannock Tribes (Paul Kusnierz, personal communication), and ODFW (Joseph Feldhaus, personal communication). Female harvest was estimated by multiplying run-specific total harvest by the respective sex ratio. To estimate the FANR, the adjusted hatchery female number and the adjusted number of females harvested upstream of LGR were subtracted from the estimated number of females passing LGR. Spring and summer FANR estimates were combined to estimate total FANR.

Stock-Recruit Model

Smolt production in 2011 was estimated using daily counts of wild smolts at LGR and estimated daily collection efficiencies (probability of detection at the dam). The total daily wild Chinook salmon smolt migration number was estimated by dividing the daily count of wild smolts by the estimated collection efficiency for that day. The daily counts of wild Chinook salmon smolts at LGR were obtained from the Fish Passage Center website (www.fpc.org, accessed March 2011) and estimated daily smolt collection efficiencies were obtained from the Northwest Fisheries Science Center (NWFSC; Steve Smith, personal communication).

Efficiencies were estimated by NWFSC personnel using procedures detailed in Sandford and Smith (2002). Daily abundance estimates were summed for the year.

A Beverton-Holt function was used for this analysis. Previous work showed the Beverton-Holt function yielded a better model fit than the Ricker function (Copeland et al. 2004). Kennedy et al. (2012) estimated the FANR for BY1990-2010 and the number of smolts produced by BY1990-2010. The smolt estimate from the 2011 migration (BY2009) was added to these data. The stock-recruit model was refit using the Beverton-Holt formula (Ricker 1975).

$$R = \frac{1}{\alpha + \beta/P},$$

where P = parent year spawning escapement (i.e. FANR), R = recruits (smolts) produced by parent year spawning escapement (P), and α and β are fitted parameters representing the slope at the origin and the asymptote. In this formulation, α is the inverse of asymptotic production and β is the inverse of slope at the origin (Quinn and Deriso 1999). Model parameters were estimated using iterative nonlinear regression (Gauss-Newton algorithm; SYSTAT® 13).

Wild Chinook Salmon and Steelhead Juvenile Density and Spatial Structure

Field surveys were performed during summer base-flow conditions. The percentage of each habitat type (pool, pocket water, riffle, or run) within each transect was recorded. One to five snorkelers counted fish in each transect while moving upstream. The number of snorkelers depended on the stream width and visibility. All salmonids were identified to species, counted, and their size estimated to the nearest 25 mm length group. Chinook salmon parr were assigned an age based on length. Trout less than 80 mm cannot be distinguished between steelhead and cutthroat trout with underwater observation and were designated as “trout fry.” Non-salmonids and amphibians were noted if present. After the crew snorkeled each transect, they measured its final length and one to ten widths to calculate the surface area. We used a rotating panel design (Larsen et al. 2001) to select from previously established snorkeling transects focusing on three objectives: 1) to conduct surveys at core and non-core trend transects to maintain the long-term juvenile-to-juvenile productivity data series for steelhead; 2) to conduct extensive surveys to assess parr distribution and abundance at the population scale; and 3) to conduct intensive surveys to calibrate parr densities with production of juvenile emigrants estimated from screw traps in target drainages.

For the first objective, transects were selected from previously established trend transects on a two-year rotating panel (Appendix Table A-1). For the intensive and extensive panels, transect selection was based on a generalized random-tessellation stratification design (Stevens and Olsen 2004) to be a spatially-balanced probabilistic selection from all potential transects. A list of all potential transects in the Clearwater and Salmon river subbasins was obtained from the US-EPA office in Corvallis, Oregon. These transects were plotted on a 1:100,000 stream layer and their order randomized by EPA. We used the anadromous stream data layer from StreamNet (www.streamnet.org) to determine which transects in each drainage were within the anadromous production zone. Transects that fell within a 100 m buffer of an anadromous stream were retained. An ordered list of approximately twice the desired number of transects was drawn for the study drainages. Each potential transect was assigned a unique code for data entry forms and the IDFG Standard Stream Survey database. Transect priority started with the lowest number (high priority) and proceeded to the highest number (low priority). High priority transects were included or rejected before lower priority transects could be considered in survey plans. Criteria for rejection were: 1) the transect could not be safely

surveyed or transect boundaries adjusted to make it safe; 2) the location was above a barrier that would block spring movement of adult steelhead; 3) there was no water in the transect at the time of survey; 4) the private property owner denied access to the transect; or 5) the transect was too wide or complex to be surveyed efficiently by the full crew (six surveyors).

Forty transects were assigned to each large extensive drainage (Potlatch River, Panther Creek). Sample sizes were based upon previous power analysis (Copeland et al. 2008) and logistics. The intensive drainages and smaller extensive drainages were assigned desired sample sizes of 25 (140 total). Some additional transects were selected for three streams adjacent to the Potlatch River drainage. The desired transect length was 100 m, but transect length and location was adjusted by the crew leader based on stream conditions with transect bounds adjusted to fit within hydraulic controls. A transect was relocated up to 500 m from the designated point if necessary.

We estimate summaries of salmonid densities (standardized to number per 100 m^2) and occupancy rates observed by drainage. Occupancy rates, described as a percentage, are calculated by dividing the number of sites where the species are present by the total number of sites surveyed in the drainage. The total number of fish per species within each transect divided by the transect area equals the density. Density is estimated by species for all transects surveyed annually. The occupancy rates are only estimated for extensive panels by drainage. The probabilistic selection of transects is considered a representative sample for the drainage, so the proportion of transects where a species is present within a drainage equals the occupancy rate.

Core and Non-core Trend Surveys

Core trend transects were defined as locations where at least one survey had been conducted within each 5-year period during 1984-2011, including other transects deemed important (e.g., main stem Middle Fork Salmon River and Selway River transects). There are 218 core trend transects, and survey plans were made to do as many of these transects as logistically feasible on a 2-year rotating panel (Appendix Table A-1) during the months of July and August.

Extensive Panel Surveys

Extensive panel surveys are conducted to assess salmonid distribution at the landscape scale. Extensive panel drainages were chosen based the data needs for steelhead spawning aggregates as defined by the ICBTRT. For the extensive panel, we chose the Selway River population, Panther Creek population, Chamberlain Creek and Bargamin Creek in the Chamberlain Creek steelhead population, and the Potlatch River in the Clearwater River lower mainstem steelhead population. The Potlatch River was surveyed in June and all other areas were surveyed in July and August. Portions of the Selway River have been surveyed for the last three years; however, the 2010 surveys were interrupted and not completed. We completed the surveys started in 2010 and added transects that may have been missed during the surveys that occurred from 2008-2010. For the Panther Creek survey, we included the tributaries to the Salmon River between Panther Creek and Chamberlain Creek, excluding Chamberlain Creek and the Middle Fork Salmon River drainage, in order to cover the Panther Creek steelhead population as delineated by the ICBTRT (2003). The southern half of the Panther Creek drainage was surveyed in 2010, so the 2011 survey was conducted in the northern half of the drainage.

Intensive Panel Surveys

Intensive surveys are used to calibrate the densities observed during snorkel surveys. Snorkel survey data will be calibrated against screw trap estimated juvenile abundance in selected drainages. Therefore, intensive panel drainages were chosen based upon the location of associated screw traps. This knowledge can be applied to the extensive surveys to better understand the production of smolts out of those drainages. For the intensive panel in 2011, we chose Crooked Fork Creek (Lochsa River steelhead population), Fish Creek and the Crooked River (South Fork Clearwater River steelhead population), and Marsh Creek (Middle Fork Salmon River upper mainstem steelhead population).

Detection Probability

We evaluated the efficiency of snorkeling for juvenile steelhead at a subset of transects. A protocol modified from Thurow et al. (2006) was designed to allow us to estimate detection probability through observation of marked individuals. Juvenile steelhead were caught in the transect by angling, measured, marked (upper caudal notch), and released as close to the location of capture as possible. The next day, snorkeling began approximately 50 m downstream of the transect (lower half of oversample transect) and the number of marked fish was recorded. Then, the main 100 m transect (target transect) was snorkeled and all salmonids were counted and recorded by length group. Finally, a section approximately 50 m in length upstream of the main transect (upper half of oversample transect) was snorkeled and the number of marked fish was recorded. Boundaries of target and oversample transects were adjusted to begin and end at hydraulic controls. Habitat variables described by Thurow et al. (2006) were measured in the target transect. A target for the number of resight surveys conducted each year was for at least 10% of the total transects surveyed. We present a summary of data collected at each transect. The probability of detection was computed as the number of marked fish seen in the target and oversample reaches divided by number marked. We assumed fish would not move farther than 50 m between marking and the subsequent snorkel survey.

Data Management

The data resulting from the methods above are assessed for quality control, entered, and stored in two databases. The Spawning Ground Survey database stores all of the redd survey and carcass recovery data. The Biological Samples database stores the derived ages from the fin ray samples. The Standard Stream Survey database stores all of the snorkel survey data. All of the observed data are publicly available via the Idaho Fish and Wildlife Information System website (https://fishandgame.idaho.gov/ifwis/portal/).

RESULTS

Wild Chinook Salmon Abundance

Redd Surveys

Only trend monitoring surveys are presented in this report. We surveyed 3,123 Chinook salmon redds in trend transects in 2011 (Table 2). A total of 2,775 redds were identified in the Salmon River subbasin (Table 2). There were 992 redds observed in the South Fork Salmon MPG, of which most or 750 were observed in the South Fork Salmon River mainstem

population. The Middle Fork Salmon River MPG had 966 redds observed of which most or 400 were in the Bear Valley Creek population. There were 817 redds in the Upper Salmon River MPG of which most or 222 redds were in the Upper Salmon River mainstem population (above Redfish Lake Creek). There were no surveys conducted in the East Fork South Fork Salmon River population.

A total of 348 redds were observed in the Clearwater River subbasin (Table 2). There were 264 redds in the Dry Clearwater MPG and 84 redds in the Wet Clearwater MPG. Most Clearwater River redds were in the South Fork Clearwater River population. Partial or no surveys were conducted in Lolo Creek, Moose Creek, and the Upper Selway River populations.

Wild Chinook Salmon Carcass Surveys and Age Composition

Carcass Surveys

During 2011, we sampled a total of 3,787 wild Chinook salmon carcasses on Idaho spawning grounds (Table 3, Figure 1). A total of 697 hatchery origin and 3,090 natural origin carcasses were recorded in the databases.

Carcass Age Composition

During 2011, we assigned ages to 1,238 fin rays (Table 3). Of the assigned ages, 10.0% were BY2008, 46.9% were BY2007, 41.8% were BY2006, and 1.3% were BY2005. Freshwater age was assumed to be one year for all fin rays.

For the South Fork Salmon River MPG, 11.9% of carcasses were BY2008, 35.9% were BY2007, 51.0% were BY2006, and 1.2% were BY2005 (n = 337; Table 3). For the Middle Fork Salmon River MPG, 7.6% were BY2008, 48.1% were BY2007, 42.2% were BY2006, and 2.1% were BY2005 (n = 329). For the Upper Salmon River MPG, 11.1% were BY2008, 50.2% were BY2007, 37.9% were BY2006, and 0.8% were BY2005 (n = 494). For the Dry Clearwater MPG, 5.5% were BY2008, 69.1% were BY2007, 23.6% were BY2006, and 1.8% were BY2005 (n = 55). For the Wet Clearwater MPG 69.6% were BY2007, and 30.4% were BY2006 (n = 23).

Of the 152 known ocean-age fin rays that were assigned ages, 99.3% were aged correctly. Overall, there were 40 known-age samples from BY2008, 79 from BY2007, and 33 from BY2006.

The length distributions of one-ocean and two-ocean groups overlapped by 16 cm (Figure 2). The overlap between two- and three-ocean length distributions was greater than 20 cm. The length distribution for four-ocean fish was within the three-ocean length distribution.

Wild Chinook Salmon Smolt-To-Adult Survival Rate

Final smolt-to-adult survival rates were calculated for smolt cohorts through smolt year 2007 (Table 4). Returns for smolt years 2008-2011 are still incomplete. The SAR rate for the 2007 cohort, the last year for which all adults had returned in 2011, was 1.77% (95% CI 1.74%-1.80%).

Wild Chinook Salmon Intrinsic Population Productivity

Females Available for Natural Reproduction

We estimated 29,024 female Chinook salmon were available for natural spawning in 2011. From the estimated number of hatchery and wild adult Chinook salmon crossing LGR during 2011, excluding jacks by length (96,106; Table 5), there were 52,737 females comprising 54.9% of the adult run. Estimated removals above LGR totaled 23,713 females. Hatchery take accounted for 9,753 and angler harvest accounted for 13,960 females.

Stock-Recruit Model

The Beverton-Holt stock-recruit model fit the data very well ($r^2 = 0.939$, $n = 20$; Figure 3). For the 1990-2009 BYs, maximum intrinsic productivity was 426 smolts per female and asymptotic production was 1.56 million natural smolts from the Snake River ESU. The estimated number of smolts emigrating from the Snake River ESU past LGR during smolt year 2011 was 1,169,418 fish (Table 6). This estimate covers the period from March 26 to July 15, 2011. This completes the data set for BYs 1990-2009.

There was no obvious pattern in the model residuals when compared to predicted values (data not shown). The variance may be constrained at low abundances, but there was no indication of accelerating variances with increasing abundance. We predict that smolt production for BY2010 should exceed 1.4 million smolts and BY2011 should exceed 1.3 million smolts based on the Beverton-Holt model (Table 6).

Wild Chinook Salmon and Steelhead Juvenile Density Spatial Structure

Over 99 percent of planned surveys were completed in 2011 despite high and sustained snowmelt. In 2011, 442 transects were surveyed compared to the 445 transects planned.

Core and Non-core Trend Surveys

During 2011, a total of 52 core and 24 non-core trend transects were surveyed in the Salmon River subbasin (Appendix Tables A-2 & A-3). Six salmonid species were identified. Steelhead were observed at 62 transects; Chinook salmon were observed at 51 transects; westslope cutthroat trout *Oncorhynchus clarkii lewisi* were observed at 27 transects; and bull trout *Salvelinus confluentus* were detected at 24 transects. Chinook salmon were highly abundant in some transects and exceeded 40 fish/100 m^2 in Cape Horn Creek, Hannah Slough, and Middle Fork Salmon River at the Boundary Creek transect, and exceeded 60 fish/100 m^2 in the west forks of Chamberlain and Monumental creeks.

In the main stem of the Middle Fork Salmon River, 17 core transects and five core tributary transects were surveyed. We were unsuccessful in snorkeling Loon and Camas creeks due to extremely poor water visibility (<0.1 m) resulting from silt input from a rain event. Poor visibility from the rain event precluded any main-stem snorkeling downriver of Camas Creek. In the main-stem transects, five salmonid taxa were identified: juvenile steelhead, Chinook salmon parr, cutthroat trout, bull trout, and mountain whitefish *Prosopium williamsoni*. Mean density was highest for Chinook salmon at 6.30 fish/100 m^2, with the highest observed for this species at the Velvet transect at 30.62 fish/100 m^2. No brook trout *Salvelinus fontinalis* were observed in the main stem of the Middle Fork Salmon River.

Four transects were surveyed in the Upper Salmon River in 2011. Five salmonid taxa were identified: juvenile steelhead, Chinook salmon, bull trout, brook trout, and mountain whitefish. Unidentified trout fry were also observed. In the Upper Salmon, mean density was highest for Chinook salmon at 3.00 fish/100 m^2.

In the South Fork Salmon River drainage, Chinook salmon parr were observed at a mean density of 2.55 fish/100 m^2 and juvenile steelhead were observed at a mean density of 4.39 fish/100 m^2. In the Little Salmon River drainage, Chinook salmon parr were present at 31% of all transects and at a mean density of 0.50 fish/100 m^2. Juvenile steelhead were present at all transects with mean a density of 10.47 fish/100 m^2.

Bargamin Creek had Chinook salmon parr present at one transect nearest to the mouth with a mean density of 0.28 fish/100 m^2. Juvenile steelhead were present at both transects with a mean density of 5.12 fish/100 m^2.

A total of 35 core and 52 non-core trend transects were surveyed in the Clearwater River subbasin in 2011 (Appendix Tables A-4 and A-5). Steelhead were observed at 71 transects and cutthroat trout were observed in 68 transects. Chinook were observed in 43 transects, excluding the Potlatch River drainage. Brook trout were observed in the Potlatch and South Fork Clearwater drainages at 15 transects, but not in the Lochsa or Selway drainages. Bull trout were observed in the Lochsa, Selway, and South Fork Clearwater river drainages at 58 transects. A brook/bull trout hybrid was observed in the East Fork Moose Creek in the Selway drainage.

Extensive Panel Surveys

A total of 41 transects were surveyed in the Potlatch River drainage (Appendix Table A-6). Four salmonid taxa were identified: juvenile steelhead, Chinook salmon parr, brook trout, and Coho salmon *Oncorhynchus* kisutch. Unidentified trout fry were also observed. Juvenile steelhead were observed at a mean density of 1.00 fish/100 m^2. Brook trout were observed at 41.5% of transects (n = 17) with a mean density of 0.77 fish/100 m^2. Trout fry were observed at eight transects, but at highest mean density of 1.02 fish/100 m^2. The occupancy rate for steelhead within the drainage was 71%.

Three streams (Bedrock Creek, Louse Creek, and Pine Creek) were surveyed in the lower Clearwater drainage immediately adjacent to the Potlatch drainage on June 12-14 and June 28. Fifteen transects were surveyed (Appendix Table A-7). Juvenile steelhead and trout fry were observed in those drainages. Juvenile steelhead had a mean density of 1.72 fish/100 m^2 and an occupancy rate of 47%. Steelhead were most abundant in Bedrock Creek.

In the Panther Creek drainage, the target was 21 transects and 19 transects were sampled (Appendix Table A-8). Two transects were rejected on main-stem Panther Creek due to the proximity downstream from the confluence of Blackbird Creek, a known highly toxic stream, and a construction crew removing soil along the stream bank, causing low visibility. Five salmonid taxa were identified: juvenile steelhead, Chinook salmon parr, west slope cutthroat trout, bull trout, and mountain whitefish. Unidentified trout fry were also observed. Juvenile steelhead had the highest mean density at 4.24 fish/100 m^2. The highest observed mean density of juvenile steelhead, at 8.93 fish/100 m^2, was in the main stem of Panther Creek at a transect located approximately 12 km upstream from the mouth. Chinook salmon were observed in all transects surveyed in the main stem of Panther Creek. The highest observed mean density of Chinook salmon, at 11.73 fish/100 m^2, was found in Horse Creek approximately 100 m upstream of the confluence of the Salmon River. Chinook salmon were not detected in

any of the other transects in the Horse Creek drainage. When these data were combined with the 2010 surveys (Kennedy et al. 2012), the occupancy of the Panther Creek steelhead population was 83% for steelhead and 28% for Chinook salmon.

In the Selway River drainage, 25 transects were surveyed (Appendix Table A-9). Two transects were visited but were dry at the time of the survey (Vance and Canyon creeks). A transect on Three Lakes Creek was visited but was high gradient and judged unsafe to survey. Five taxa were observed: bull trout, Chinook salmon (fry, parr, smolts, and adults), mountain whitefish, juvenile steelhead, and westslope cutthroat trout. Unidentified trout fry were also observed. Westslope cutthroat trout were observed at most transects (96%) and had the highest mean density at 2.44 fish/100 m^2. Chinook salmon were observed at the highest mean density of any transect at 13.52 fish/100 m^2 in O'Hara Creek, while mountain whitefish and bull trout were observed at the lowest mean densities at 0.06 fish/100 m^2 and 0.08 fish/100 m^2, respectively. When these data were combined with the 2008-2010 surveys (Kennedy et al. 2012), the occupancy of the Selway drainage is 75% for steelhead and 45% for Chinook salmon.

In the Chamberlain Creek drainage, 34 transects were visited, 32 of which were surveyed (Appendix Table A-10). Seven transects could not be surveyed due to difficult access and time constraints. One transect was dry at the time of the survey and no fish were observed at seven other transects. Five salmonid taxa were identified: steelhead trout, Chinook salmon parr, cutthroat trout, bull trout, and mountain whitefish. Unidentified trout fry were also observed. Chinook salmon parr were observed only in Chamberlain Creek and the lower reaches of McCalla and Lodgepole creeks, but comprised the highest mean density across all transects at 4.69 fish/100 m^2. Steelhead were observed at the second highest mean density and were detected in all but 11 transects, with a mean density of 4.14 fish/100 m^2. The occupancy of the Chamberlain Creek drainage was 62% for steelhead and 38% for Chinook salmon.

In the Bargamin Creek drainage, 22 transects were surveyed (Appendix Table A-11). Four transects could not be surveyed due to difficult access (downed timber on the trails) and a fire in the area. Another transect was visited but a barrier was found in the transect; no fish were observed but those data are excluded from Appendix Table A-11. No fish were observed at five transects. Five salmonid taxa were identified: steelhead, Chinook salmon parr, cutthroat trout, bull trout, and mountain whitefish. Unidentified trout fry were also observed. Chinook salmon parr were observed in only one transect near the mouth of Bargamin Creek and had a mean density of <0.01 fish/100 m^2 across all transects. Steelhead were the most abundant species with a mean density of 4.40 fish/100 m^2. Porcupine Creek was the only tributary surveyed where steelhead were not detected. The occupancy of the Bargamin Creek drainage was 70% for steelhead and 4% for Chinook salmon.

Intensive Panel Surveys

In the Crooked River drainage, 25 transects were surveyed (Appendix Table A-12). All transects that were visited were surveyed. Six salmonid taxa were identified: Chinook salmon juveniles and adults, steelhead juveniles, brook trout, bull trout, westslope cutthroat trout, and mountain whitefish. Unidentified trout fry were also observed. Steelhead were the most abundant in the drainage with a mean density of 0.92 fish/100 m^2. Westslope cutthroat trout were the next most abundant at 0.60/100 m^2. Occupancy rates of the drainage by steelhead were 80% and 12% for Chinook salmon.

In the Crooked Fork drainage, 20 transects were surveyed (Appendix Table A-13). Five taxa were identified: bull trout, Chinook salmon (fry and parr), mountain whitefish, juvenile steelhead, and westslope cutthroat trout. Westslope cutthroat trout were observed at 75% of all transects (n = 15) and at the highest mean density at 0.56 fish/100 m^2. Steelhead were observed at a mean density of 0.47 fish/100 m^2. Bull trout were only observed at one transect. Chinook salmon were observed at a mean density of 0.19 fish/100 m^2. Occupancy rates of the drainage by steelhead were 70% and 35% for Chinook salmon.

In the Marsh Creek drainage, the goal was to survey at least 25 transects and a total of 26 transects were sampled (Appendix Table A-14). Six salmonid taxa were identified: juvenile steelhead, Chinook parr, cutthroat trout, bull trout, brook trout, and mountain whitefish. Unidentified trout fry were also observed. Mean density was highest for Chinook salmon at 3.55 fish/100 m^2 with the highest observed abundance in Cape Horn Creek at 37.46 fish/100 m^2. Westslope cutthroat trout were observed in low abundances within the drainage and were only present at two transects. The most common species in the Marsh Creek drainage was brook trout, which were observed at 14 of the 26 transects. Despite the higher encounter rate of brook trout at 0.36 fish/100 m^2, their mean density was lower than juvenile steelhead and Chinook salmon. Occupancy rates were 46% for steelhead and 38% for Chinook salmon in the drainage.

Detection Probability

We conducted mark-resight studies at 14 locations to assess detection probability for steelhead parr in 2011 (Appendix Table A-15). Selected habitat variables were measured at these locations (data not shown). Crews marked 264 fish (including 1 cutthroat trout) and detected 138 of them. Thirteen were observed outside of the main survey unit, eight of which were downstream. One transect had only three fish marked, and the water became turbid before the resight survey, resulting in no marked fish observed. Transect detection probabilities ranged from 0% to 100% with a mean of 52.6%.

DISCUSSION

The majority of the Chinook salmon information presented in this report was acquired during spawning ground surveys, which typically includes both redd and carcass surveys. For monitoring wild Chinook salmon abundance, redd surveys account for a large proportion of the available spawning habitat in Idaho. In contrast to the redd surveys, the spatial and temporal distribution of carcass surveys could be improved (Figure 1). Increased effort or spatially balanced sampling would benefit the analysis and interpretation of the data used to monitor these wild populations. In 2011, we conducted many surveys over a wide geographic area to obtain some carcass data from as many populations as possible. Future efforts should attempt to get better coverage in fewer populations to increase the sample size and the power of inferences from the data. Focused efforts could rotate among populations over the years.

Currently, population-specific adult Chinook salmon abundances are indexed using redd surveys in most populations. The IDFG redd survey dataset is extensive, has recently been improved to accommodate survey data from a variety of projects, and can be easily accessed. Therefore, it should be noted that not all redd surveys conducted in Idaho were presented here.

Biological data from carcass surveys provide estimates of length-at-age, age composition, sex composition, and hatchery fraction at the independent population scale with a resolution not currently available using data collected at LGR. Hatchery fraction of the

population can only be measured on the spawning grounds. Most of these metrics will be used in the future to estimate the productivity of each population. Tissue samples obtained from carcasses also contribute to the GSI baseline used to estimate the proportions of returning adults by population for harvest management and abundance monitoring (Ackerman and Campbell 2011). Because these metrics can vary widely among populations, we have a minimum goal of 100 carcass samples from each population. We consider 100 to be conservatively high to adequately describe demographic parameters for an unknown population size. In Idaho, wild Chinook population-specific escapements are difficult to estimate before fish reach the spawning grounds.

Population-specific age composition was reported as frequencies or percentages of fish sampled from the spawning grounds (Table 3). Where sample sizes are approximately equal to 100, we considered the frequencies to be representative of the population's age composition (Gerritsen and McGrath 2007).

The frequencies of hatchery and natural origin carcasses were reported as they were encountered and we think the reported ratio is indicative of the hatchery/wild spawning fraction for Idaho populations. Most carcass surveys conducted by IDFG were within areas of controlled escapement such as natural production areas above hatchery weirs, or areas that have been designed to monitor supplementation. For some supplemented populations like the South Fork Salmon River, this results in estimates of hatchery fraction that can be biased high or low depending on the transect. For other populations with no history of hatchery supplementation, such as those in the Middle Fork Salmon River MPG, we assume this bias does not exist. Thus, the frequencies of fish encountered by production type provide an accurate estimate of hatchery fraction on the spawning grounds. In general, the frequency of hatchery carcasses encountered on the spawning grounds varied among MPGs, populations, and years.

The Chinook salmon 4.20% SAR for smolt year 2008 was the highest in the 16-year time series and the cohort returns were incomplete (Table 4). The increasing survival trend from smolt years 2006-2008 appeared to have peaked. For smolt year 2009, preliminary results suggest adults were returning with slightly diminished success although cohort returns were incomplete. A number of factors influence cohort returns, including ocean productivity, weather patterns, high water years, and improved hydrosystem management.

The stock-recruit curve describes productivity for a substantial time series (Figure 3; $r^2 = 0.939, n = 20$). Kennedy et al. (2012) predicted wild Chinook salmon smolt production for BY2009 (smolt year 2011) and BY2010 (smolt year 2012) using the stock-recruit curve and the observed number of smolts in 2011 was within 10% of the prediction. Given the escapements observed, we predict approximately 1.4 million smolts in 2012 and 2013. Asymptotic production appears to be slightly over 1.5 million wild Chinook salmon smolts under current conditions. There are various candidate hypotheses for this observed asymptote in Snake River wild Chinook salmon productivity (Table 7).

We investigated correcting the FANR estimate for bias in the adult Chinook salmon window count at LGR using PIT tags from hatchery fish (John Cassinelli, IDFG personal communication). We evaluated removing known-age jacks over 56 cm that were counted as adults. We also investigated the effect that fallback and ascension and after-hours passage might have on the window counts. However, these corrections were not applied due to the uncertainty with fallback and reascension estimates, and that PIT-tagged hatchery fish may not be representative of wild fish potentially biasing the model. Correcting for jacks and fallback/reascension would decrease FANR estimates, and correcting for after-hours passage

would increase FANR estimates. We assumed the balance of the two corrections were approximately equivalent and did not reduce the accuracy of model predictions. We re-evaluated assumptions and constants applied to past estimates based on updated or completed datasets. One correction was made for the FANR estimate in 2008. In the past, the escapement estimate was reduced by 20% to account for prespawn mortality and tribal harvest for years when tribal harvest was not available. The 20% was applied in 2008, and then tribal harvest became available and was also applied to the escapement estimate. The FANR estimate was changed from 19,823 to 22,942. Historical data used to estimate hatchery take may be a substantial source of uncertainty in the FANR estimates. A hatchery database for all hatcheries in Idaho is approaching maturity which will result in improved hatchery return estimates. When the database is complete, we will use it to check past estimates of hatchery take and sex ratios for an additional quality control measure.

In 2011, both steelhead and Chinook densities increased in comparison to the 2010 GPM trend transect surveys in the Salmon River drainage (Kennedy et al. 2012; 4.67 fish/100 m^2 vs. 2.69 fish/100 m^2 and 7.53 fish/100 m^2 vs. 4.44 fish/100 m^2, respectively). Densities of steelhead and Chinook parr in the Clearwater subbasin were slightly lower than those observed in 2010 (Kennedy et al. 2012; 1.16 fish/100 m^2 vs. 1.97 fish/100 m^2 and 5.35 fish/100 m^2 vs. 7.98 fish/100 m^2, respectively).

Detection probability was computed as the number of marked fish seen in the target and oversample reaches divided by number marked. We included all marked fish observed in the oversample reaches because movement of marked fish from the target reach biased the estimate downwards. Keeping them in the calculation increases precision because each marked fish is treated as an independent trial: seen or not seen. Habitat variables are not measured outside of the target transect in the oversample reaches so there has been some disagreement among the co-authors about this estimate. We will evaluate the difference to determine the best approach for subsequent reports.

The general parr monitoring (GPM) program has monitored the abundance and distribution of anadromous salmonids since 1985. A large proportion of Idaho's Chinook salmon and steelhead habitat is located within congressionally-designated wilderness areas and the GPM dataset, which includes the core trend transects, is the best description of juvenile salmonid abundance and occurrence (Copeland and Meyer 2011). Spring snowmelt runoff in Idaho precludes the use of redd surveys for steelhead in Idaho. As a result, GPM data are particularly important for monitoring the spatial structure and estimating the juvenile-to-juvenile productivity of these populations.

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TABLES

Table 1. Transect name and target dates for redd surveys used to index wild Chinook salmon abundance by major population group and independent population.

Major Population Group and Population	**Transect Name**	**Target Survey Date**
South Fork Salmon River		
Little Salmon River	n/t[a]	n/t
South Fork Salmon River	NS-26	9/5
	NS-27	9/5
	NS-28	9/5
	NS-29	9/5
Secesh River	WS-16	8/25-9/1
	WS-17	8/25-9/1
	WS-18	8/25
	WS-19	8/25
East Fork South Fork Salmon River	NS-30	9/1-9/5
	NS-31	9/1-9/5
	NS-32	9/1-9/5
Middle Fork Salmon River		
Chamberlain Creek	WS-1	8/25
	WS-1a	8/25
Big Creek	WS-13	9/5
	WS-14a	9/5
	WS-14b	9/5
	WS-14c	9/5
	WS-14d	9/5
Lower Middle Fork Salmon	WS-15	9/8
Camas Creek	WS-8	8/25-9/5
Loon Creek	WS-6	8/25-9/5
	WS-7	8/25-9/5
Sulphur Creek	OS-4	8/21
	WS-12	8/21
Bear Valley Creek	WS-9a	8/27
	WS-9b	8/27
	WS-9c	8/27
	WS-9d	8/27
	WS-10a	8/27
	WS-10b	8/27
	WS-11a	8/27
	WS-11b	8/27
	WS-11c	8/27
Marsh Creek	WS-2a	8/15-8/20
	WS-2b	8/15-8/20
	WS-3	8/15-8/20
	WS-4	8/15-8/20
	WS-5	8/15-8/20
Upper Middle Fork Salmon	n/t	n/t
Upper Salmon River		
North Fork Salmon River	NS-25a	9/8
	NS-25b	9/8
	NS-25c	9/8
Lemhi River	NS-9	9/8
	NS-10	9/8
Pahsimeroi River	NS-33a	9/8
Lower Salmon River	NS-17	9/8
	NS-18	9/8
	NS-19	9/8
	NS-20	9/8
	NS-21	9/8
	NS-22	9/8
	NS-23	9/8

Table 1. Continued.

Major Population Group and Population	**Transect Name**	**Target Survey Date**
	NS-24	9/8
East Fork Salmon River	NS-1a	9/8
	NS-1b	9/8
	NS-2a	9/8
	NS-2b	9/8
Yankee Fork River	NS-5	9/8
	NS-6	9/8
	NS-7	9/8
	NS-8	9/8
Valley Creek	NS-3a	9/8
	NS-3b	9/8
	NS-4	9/8
Upper Salmon River	NS-15a	9/8
	NS-15b	9/8
	NS-15c	9/8
	NS-16	9/8
	NS-12	8/31-9/5
	NS-13a	9/8
	NS-13b	9/8
	OS-1	8/31-9/5
	OS-2	8/31-9/5
	OS-3	8/31-9/5
	OS-5	9/8
	OS-6	9/8
Panther Creek	NS-11	9/8
Dry Clearwater		
Lapwai/Big Canyon Creeks	n/t	n/t
Potlatch River	n/t	n/t
Lawyer Creek	n/t	n/t
South Fork Clearwater	NC-1	9/3
	NC-2a	9/3
	NC-2b	9/3
	NC-3	9/3
	NC-4	9/1-9/5
	NC-6	9/3
	NC-8	9/3
Wet Clearwater		
Lolo Creek	NC-14	9/3
Lochsa River	NC-10	9/3
	NC-11	9/3
	NC-13	9/8
Meadow Creek	n/t	n/t
Moose Creek	WC-3a	9/8
	WC-3b	9/8
Upper Selway River	WC-1	9/8
	WC-2	9/8
	WC-4a	9/8
	WC-4b	9/8
	WC-5	9/8
	WC-6	9/8
	WC-7	9/8
	WC-8	9/8
	WC-9	9/8

[a] n/t = No trend monitoring transects have been identified within these populations.

Table 2. Wild Chinook salmon redds surveyed in Idaho trend transects in the Salmon River and Clearwater River subbasins during the years 2009-2011 by major population group and independent population.

Major Population Group and Population		**2009**	**2010**	**2011**
South Fork Salmon River				
Little Salmon River		n/t[a]	n/t	n/t
South Fork Salmon River		459	244[b]	750
Secesh River		380	299[b]	242
East Fork South Fork Salmon River		160[b]	n/c[c]	n/c
	MPG total	999	543	992
Middle Fork Salmon River				
Chamberlain Creek		63	78[b]	114[b]
Big Creek		124	92	96
Lower Middle Fork Salmon		1	1	0
Camas Creek		12	17	3
Loon Creek		28	20	15
Sulphur Creek		23	52	79
Bear Valley Creek		265	418	400
Marsh Creek		64	243	204
Upper Middle Fork Salmon		n/t	n/t	n/t
	MPG total	580	921	966
Upper Salmon River				
North Fork Salmon River		28	39	46
Lemhi River		61	79	99
Pahsimeroi River		42	47	56
Lower Salmon River		48[b]	63[b]	119
East Fork Salmon River		59	289	224
Yankee Fork River		363	4[b]	9
Valley Creek		43	68	42
Upper Salmon River		240	279	222[b]
Panther Creek		11	1	0
	MPG total	895	869	817
Dry Clearwater				
Lapwai/Big Canyon Creeks		n/t	n/t	n/t
Potlatch River		n/t	n/t	n/t
Lawyer Creek		n/t	n/t	n/t
South Fork Clearwater		193	144	264
	MPG total	193	144	264
Wet Clearwater				
Lolo Creek		n/c	n/c	n/c
Lochsa River		51	50	69
Meadow Creek		n/t	n/t	n/t
Moose Creek		n/c	n/c	n/c
Upper Selway River		8[b]	23[b]	15[b]
	MPG total	59	73	84
	Idaho total	2,726	2,550	3,123

[a] n/t = No trend monitoring transects have been identified.
[b] Indicates partial survey. Some areas were not surveyed during 2010 due to a helicopter accident.
[c] n/c = No survey conducted.

Table 3. Brood year and age class frequencies of natural Chinook salmon carcasses sampled from Idaho spawning grounds during 2011. Freshwater age was assumed to be one year. Frequencies of all carcasses, hatchery production and natural production, recovered during surveys, from the BioSamples database and the Spawning Ground Survey database are summed.

	Brood year and age class of natural carcasses					All Carcasses	
	2008	2007	2006	2005			
Major Population Group and Population	**1.1**	**1.2**	**1.3**	**1.4**	**Total Aged**	**Hatchery**	**Natural**
South Fork Salmon River							
Little Salmon River	-	-	-	-	0	-	-
South Fork Salmon River	10	15	69	2	96	113	687
Secesh River	13	68	35	-	116	0	118
East Fork South Fork Salmon River	17	38	68	2	125	61	127
MPG total	40	121	172	4	337	174	932
Middle Fork Salmon River							
Chamberlain Creek	5	16	7	1	29	0	63
Big Creek	9	30	28	2	69	1	105
Lower Middle Fork Salmon	-	1	-	-	1	-	-
Camas Creek	-	-	-	-	0	-	-
Loon Creek	4	7	2	-	13	0	13
Sulphur Creek	-	6	4	-	10	0	19
Bear Valley Creek	4	63	43	2	112	7	675
Marsh Creek	3	35	55	2	95	1	318
Upper Middle Fork Salmon	-	-	-	-	0	0	2
MPG total	25	158	139	7	329	9	1,195
Upper Salmon River							
North Fork Salmon River	-	13	10	-	23	0	50
Lemhi River	-	37	11	1	49	2	122
Pahsimeroi River	2	17	12	-	31	1	64
Lower Salmon River	7	27	18	1	53	55	119
East Fork Salmon River	-	11	33	-	44	0	80
Yankee Fork	3	6	2	-	11	0	26
Valley Creek	9	65	14	1	89	16	101
Upper Salmon River	34	72	87	1	194	4	207
Panther Creek	-	-	-	-	0	0	23
MPG total	55	248	187	4	494	78	792
Dry Clearwater							
Lapwai/Big Canyon Creeks	-	-	-	-	0	-	-
Potlatch River	-	-	-	-	0	-	-
Lawyer Creek	-	-	-	-	0	-	-
South Fork Clearwater	3	38	13	1	55	380	120
MPG total	3	38	13	1	55	380	120
Wet Clearwater							
Lolo Creek	-	-	-	-	0	-	-
Lochsa River	-	16	5	-	21	51	42
Meadow Creek	-	-	-	-	0	-	-
Moose Creek	-	-	-	-	0	-	-
Upper Selway River	-	-	2	-	2	5	9
MPG total	0	16	7	0	23	56	51
Snake River ESU total	123	581	518	16	1,238	697	3,090

Table 4. Estimated number of wild Chinook salmon smolts at Lower Granite Dam, number of adults at Lower Granite Dam by ocean-age, and percent smolt-to-adult survival rate (SAR). Fin ray samples were used to estimate age composition above the dashed line and scale samples were used below. Confidence intervals are at 95% and are given in parentheses.

Smolt Year	Smolts	Ocean-Age 1	2	3	4	%SAR (95% CI)
1996	419,826	[a]	845	467	0	0.31 (0.30-0.33)
1997	161,157	161	2,206	423	33	1.75 (1.69-1.82)
1998	599,159	241	7,177	1,242	306	1.50 (1.47-1.53)
1999	1,560,298	1,550	41,999	13,532	639	3.70 (3.67-3.73)
2000	1,344,382	1,829	15,882	23,234	50	3.05 (3.02-3.08)
2001	490,534	364	6,518	2,115	94	1.85 (1.82-1.89)
2002	1,128,582	2,309	18,364	2,350	14	2.04 (2.02-2.07)
2003	1,455,786	1,276	6,056	1,519	154	0.62 (0.61-0.63)
2004	1,517,951	635	7,173	3,415	74	0.74 (0.73-0.76)
2005	1,734,464	312	4,007	2,188	20[b]	0.38 (0.37-0.39)
2006	1,227,474	1,246	11,483	2,957[b]	0[c]	1.28 (1.26-1.30)
2007	787,150	2,551	10,014[b]	1,370[c]	0[d]	1.77 (1.74-1.80)
2008	856,556	3,488[b]	24,900[c]	7,613[d]	[e]	4.20 (4.16-4.25)
2009	929,749	1,370[c]	14,814[d]	[e]		1.74 (1.71-1.77)
2010	1,219,742	4,059[d]	[e]			0.33 (0.32-0.34)
2011	1,162,084	[e]				

[a] One-ocean samples were not collected.
[b] From spawn year 2009 Lower Granite Dam report (Schrader et al. 2011).
[c] From spawn year 2010 Lower Granite Dam report (Schrader et al. 2012).
[d] Preliminary until the spawn year 2011 Lower Granite Dam report is complete (Schrader et al., in prep.).
[e] Adult return of cohort is incomplete.

Table 5. Estimated adult Chinook salmon returns to Lower Granite Dam, percentage of females based on hatchery sex ratios, loss accounting for harvest and hatcheries, and females available for natural reproduction (FANR) for 2011. Harvest was adjusted to include 10% of fish caught and released to account for hooking mortality.

	Run Type		
Estimate	**Spring**	**Summer**	**Total**
Dam count	59,342	36,764	96,106
Percent females	60	46.6	54.9
Total females	35,605	17,132	52,737
Hatchery	6,416	3,337	9,753
Harvest	12,296	1,664	13,960
FANR	16,893	12,131	29,024

Table 6. Abundance of females available for natural reproduction (FANR) and the number of wild smolts by brood year.

Brood Year	Smolt Year	FANR	Smolts
1990	1992	4,976	527,000
1991	1993	2,916	627,037
1992	1994	6,826	627,942
1993	1995	8,514	1,558,786
1994	1996	1,043	419,826
1995	1997	497	161,157
1996	1998	1,556	599,159
1997	1999	11,885	1,560,298
1998	2000	3,726	1,344,382
1999	2001	1,630	490,534
2000	2002	8,733	1,128,582
2001	2003	51,902	1,455,786
2002	2004	31,415	1,517,951
2003	2005	26,126	1,734,464
2004	2006	28,374	1,227,474
2005	2007	10,899	787,150
2006	2008	9,253	856,556
2007	2009	8,562	894,629
2008	2010	22,942	1,219,742
2009	2011	17,314	1,169,418
2010	2012	36,348	*1,413,606*[a]
2011	2013	29,024	*1,390,495*[a]

[a] Predicted values based on the Beverton-Holt model.

Table 7. Candidate hypotheses explaining density dependence observed in smolt production of Snake River spring/summer Chinook salmon populations during 1990-2010.

Hypothesis	Explanation
Marine-derived nutrients	Lack of adult carcasses reduces carrying capacity of infertile spawning streams (Naiman et al. 2002).
Retreat to core areas	Current spawners home to relatively small patches of habitat (Thurow 2000; Isaak and Thurow 2006).
Invasion of predators and competitors	Introduced species and hatchery-produced fish compete with and prey on young salmon (Levin et al. 2002; Weber and Fausch 2003).
Hatchery strays and supplementation fish	Hatchery fish do not spawn as effectively as natural fish and strays or supplementation fish may increase localized density dependence. (Fleming and Gross 1993).
Habitat loss	Reduction of off-channel habitat in spawning and rearing areas (Pollock et al. 2004).
Temperature stress	Global warming and loss of tree cover via forest fires and grazing raise water temperatures at critical times (Flebbe 1997; Schoennagel et al. 2005).
Drought/low flows	High escapements are coincident with drought. Stream flow is critical to juvenile survival in the interior Columbia basin (Arthaud et al. 2004).
Life history diversity	Loss of local adaptations and temporal variations in movement lead to a reduction in occupied habitat and regional productivity (Adkison 1995; Lichatowich and Mobrand 1995).

FIGURES

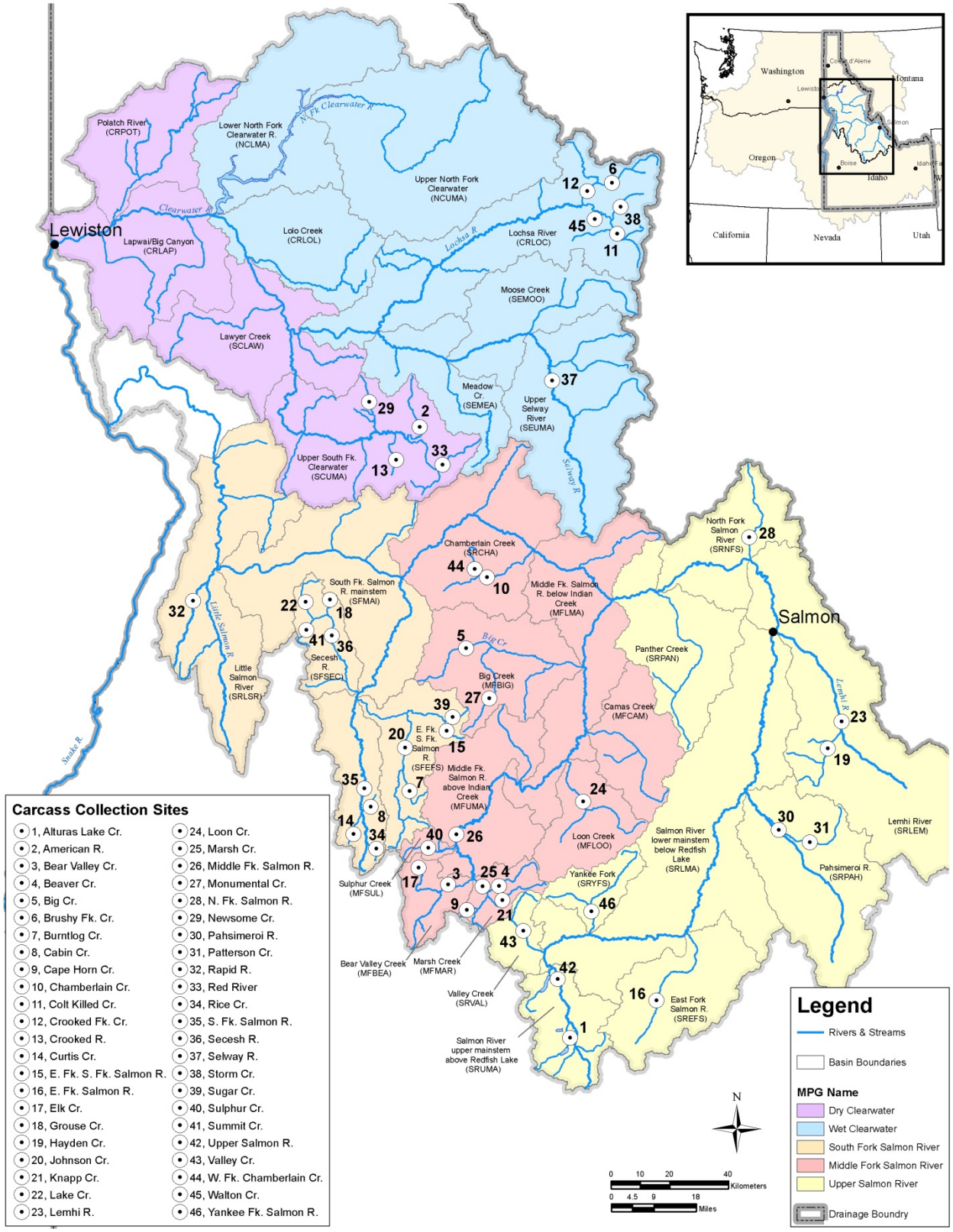

Figure 1. Spawning ground survey locations where wild spring-summer Chinook salmon carcasses were collected in 2011.

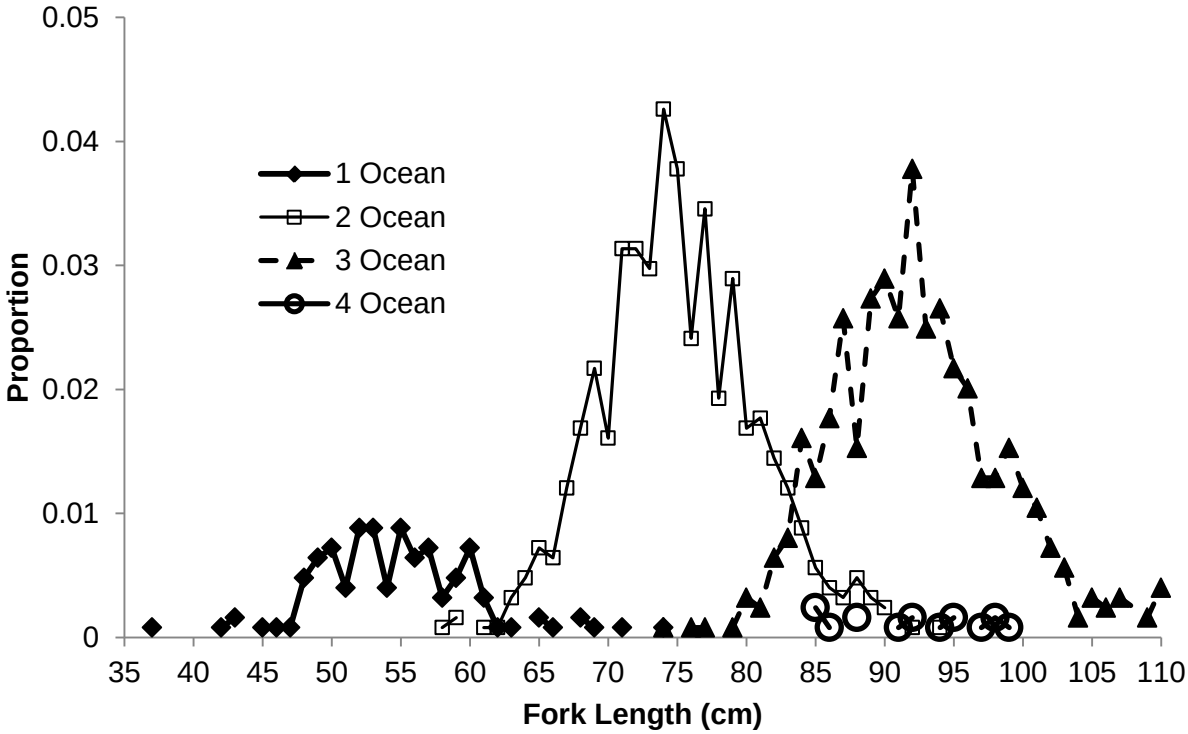

Figure 2. Length distribution by ocean age of wild Snake River spring-summer Chinook salmon carcasses collected on the spawning grounds in 2011. Ages were determined from fin ray analysis (*n* = 1,244).

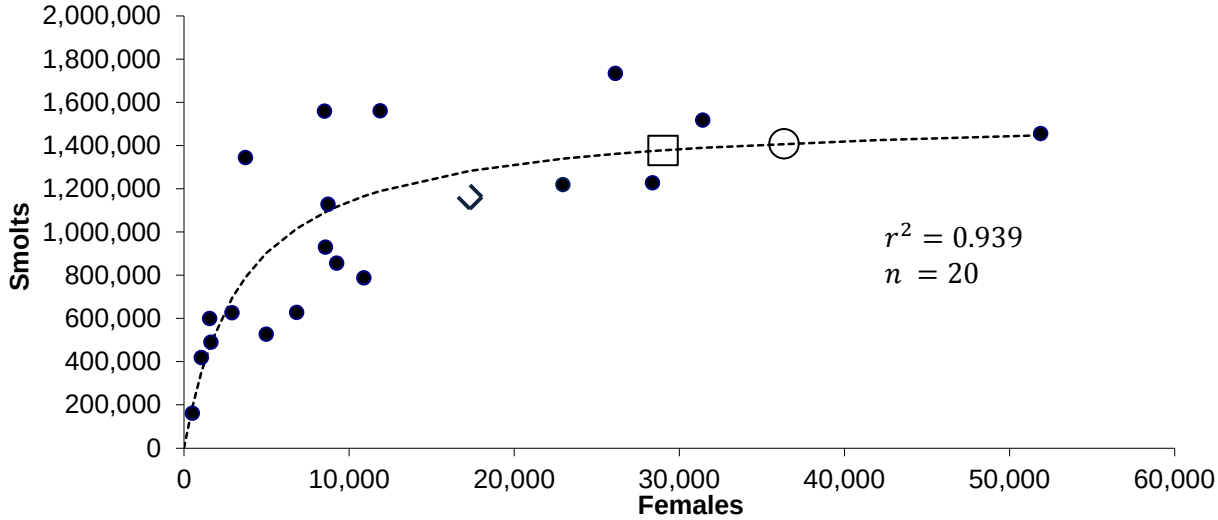

Figure 3. Comparison of observed data (BY1990 to BY2009) to model predictions for the Beverton-Holt model. Observed data are filled circles. The observed BY2009 point is a hollow diamond. The predictions for BY2010 and BY2011 are the hollow square and hollow circle, respectively.

APPENDICES

Appendix A. Wild Chinook Salmon and Steelhead Spatial Structure Tables

Table A-1. IDFG core trend snorkel survey transects ($n = 218$) by Snake River steelhead major and independent population.

Steelhead Major Population Group and Population	**Stream Name**	**Strata**	**Transect Name**
Hells Canyon Tributaries			
Hells Canyon (SNHCT-s)	Granite Creek	---	1
	Granite Creek	---	3
	Sheep Creek	---	1
	Sheep Creek	---	2
Independent Population Total:			4
MPG Total:			4
Clearwater River			
Lower Mainstem (CRLMA-s)	Big Canyon Creek	---	1
Independent Population Total:			1
Lolo Creek (CRLOL-s)	---	N/A	N/A
Independent Population Total:			0
South Fork Clearwater (CRSFC-s)	American River	2	1
	American River	3	2
	Crooked River	1	BOULDER-A
	Crooked River	1	BOULDER-B
	Crooked River	1	SILL-LOG-B
	Crooked River	2	CONTROL1
	Crooked River	2	CONTROL2
	Crooked River	2	TREAT2
	Crooked River	3	NATURAL1
	Crooked River	4	MEANDER1
	Crooked River	C	CAN2
	Crooked River	C	CAN3
	East Fork Crooked River	H	EF1
	East Fork Crooked River	H	EF2
	Johns Creek	1	1
	Johns Creek	1	2
	Johns Creek	2	3
	Red River	1	CNTL 1
	Red River	1	CNTL 2
	Red River	2	CNTL 2
	Red River	2	TREAT 2
	Red River	4	CNTL 2
	Red River	4	TREAT 2
	Red River	5	CNTL 2
	Red River	5	TREAT 2
	Relief Creek	1	1A
	Relief Creek	1	1B
	Tenmile Creek	---	1
	West Fork Crooked River	H	WF1
	West Fork Crooked River	H	WF2
Independent Population Total:			30
Lochsa River (CRLOC-s)	Brushy Fork	3	1
	Brushy Fork	3	2
	Colt Creek		BRIDGE
	Crooked Fork Creek	1	2A
	Crooked Fork Creek	2	3A
	Crooked Fork Creek	2	4A
	Crooked Fork Creek	3	1
	Crooked Fork Creek	3	2
	Crooked Fork Creek	3	2B
	Crooked Fork Creek	4	1B
	Fish Creek	---	1
	Fish Creek	---	2
	Lochsa River	---	L1

Table A-1. Continued.

Steelhead Major Population Group and Population	**Stream Name**	**Strata**	**Transect Name**
	Lochsa River	---	L2
	Lochsa River	---	L3
	Lochsa River	---	L4
	Old Man Creek	---	1
	Postoffice Creek	---	1
	Postoffice Creek	---	2
	Warm Springs Creek	---	1
	White Sands Creek	---	LWRMONITOR
Independent Population Total:			21
Selway River (CRSEL-s)	Bear Creek	---	1
	Bear Creek	---	2
	Deep Creek	---	CACTUS
	Deep Creek	---	SCIMITAR
	East Fork Moose Creek	---	3
	Meadow Creek	---	1
	Moose Creek	---	1
	Moose Creek	---	2
	Running Creek	---	1
	Running Creek	---	2
	Selway River	---	HELLSHALF
	Selway River	---	LITTLE-CW
	Selway River	---	MAG-XING
	Selway River	---	RUNNING CR
	Three Links Creek	---	1
	White Cap Creek	3	1
	White Cap Creek	4	2
	White Cap Creek	5	3
Independent Population Total:			18
MPG Total:			70
Salmon River			
Little Salmon River (SRLSR-s)	Boulder Creek	ABOVE	1
	Boulder Creek	ABOVE	2
	Boulder Creek	BELOW	3
	Boulder Creek	BELOW	5
	Hazard Creek	---	HAZ1
	Little Salmon River	---	1
	Little Salmon River	---	2
	Rapid River	BLW W FK	RAP2
	Slate Creek	---	1
	Slate Creek	---	2
	Slate Creek	---	3
	Slate Creek	---	4
	Slate Creek	---	6
	South Fork White Bird Creek	---	SF-#2
	South Fork White Bird Creek	---	SF-#3
	West Fork Rapid River	BLW FALLS	RAP1
	White Bird Creek	---	1
Independent Population Total:			17
South Fork Salmon (SFMAI-s)	East Fork South Fork Salmon	ABV JHNSN	3
	East Fork South Fork Salmon	BLW JHNSN	6
	East Fork South Fork Salmon	BLW JHNSN	7
	Johnson Creek	LOWER IV	L2
	Johnson Creek	LOWER IV	L3
	Johnson Creek	MID LOWIII	PW3B
	Johnson Creek	MID UPR II	PW3A
	Johnson Creek	UPPER I	M1
	Johnson Creek	UPPER I	M2
	Johnson Creek	UPPER I	M3
	Johnson Creek	UPPER I	PW1A
	Rock Creek	UPPER I	M1
	Sand Creek	UPPER I	M2
	South Fork Salmon River	---	11
	South Fork Salmon River	---	14
	South Fork Salmon River	---	16
	South Fork Salmon River	---	5

Table A-1. Continued.

Steelhead Major Population Group and Population	**Stream Name**	**Strata**	**Transect Name**
	South Fork Salmon River	---	7
	South Fork Salmon River	---	POVERTY
	South Fork Salmon River	---	STOLLE1
	South Fork Salmon River	---	STOLLE2
Independent Population Total:			21
Secesh River (SFSEC-s)	Lake Creek	---	BURGDORF
	Lake Creek	---	WILLOW CR
	Lick Creek	---	L3
	Secesh River	---	GROUSE
	Secesh River	---	LONG-GULCH
Independent Population Total:			5
Chamberlain Creek (SRCHA-s)	Bargamin Creek	---	1
	Bargamin Creek	---	2
	Chamberlain Creek	---	CHA1
	Chamberlain Creek	---	CHA4
	Sheep Creek	---	L1
	Sheep Creek	---	L2
	West Fork Chamberlain Cr.	---	CHA2
	West Fork Chamberlain Cr.	---	CHA3
Independent Population Total:			8
Lower Middle Fork (Loon Creek and below; MFBIG-s)	Big Creek	LOWER	L1
	Big Creek	MIDDLE	Cabin Cr
	Big Creek	MIDDLE	TAYLOR 1
	Big Creek	UPPER	LOGAN CR
	Camas Creek	---	2
	Camas Creek	---	CAM1
	Loon Creek	C CHANNEL	2
	Loon Creek	LNM1	3
	Loon Creek	PACK BR	1
	Middle Fork Salmon River	2	HOSPPL
	Middle Fork Salmon River	2	HOSPRUN
	Middle Fork Salmon River	2	TAPPANPOOL
	Middle Fork Salmon River	2	TAPPANRUN
	Middle Fork Salmon River	3	AIRSTRIP
	Middle Fork Salmon River	3	FLYING-B
	Middle Fork Salmon River	3	SURVEY
	Middle Fork Salmon River	4	BIG-CR-BR
	Middle Fork Salmon River	4	GOATPOOL
	Middle Fork Salmon River	4	GOATRUN
	Middle Fork Salmon River	4	LITOUZEL
	Middle Fork Salmon River	4	LOVEBAR
	Middle Fork Salmon River	4	OTTERBAR
	Middle Fork Salmon River	4	SHIPISLAND
	Monumental Creek	---	MON1
	Monumental Creek	---	MON2
	Monumental Creek	---	MON3
	Monumental Creek	---	MON5
	West Fork Monumental Creek	---	MON4
Independent Population Total:			28
Upper Middle Fork (above Loon Creek; MFUMA-s)	Beaver Creek	---	A
	Beaver Creek	---	B
	Cape Horn Creek	1	A
	Cape Horn Creek	2	B
	Elk Creek	---	1A
	Elk Creek	---	1B
	Elk Creek	---	2A
	Elk Creek	---	2B
	Knapp Creek	1	A
	Knapp Creek	1	B
	Knapp Creek	1	LCKD FENCE
	Marble Creek	UPPER	MAR1
	Marble Creek	UPPER	MAR1B
	Marble Creek	UPPER	MAR2

Table A-1. Continued.

Steelhead Major Population Group and Population	**Stream Name**	**Strata**	**Transect Name**
	Marsh Creek	1	A
	Marsh Creek	1	B
	Marsh Creek	3	A
	Marsh Creek	4	B
	Marsh Creek	5	A
	Middle Fork Salmon River	1	BOUNDARY
	Middle Fork Salmon River	1	ELKHORN
	Middle Fork Salmon River	1	GRDLHOLE
	Middle Fork Salmon River	1	GREYHOUND
	Middle Fork Salmon River	1	INDIAN
	Middle Fork Salmon River	1	RAPID-R
	Middle Fork Salmon River	1	SHEEPEATER
	Middle Fork Salmon River	1	VELVET
	Middle Fork Salmon River	2	COUGAR
	Middle Fork Salmon River	2	LJACKASS
	Middle Fork Salmon River	2	MARBLPL
	Middle Fork Salmon River	2	PUNGO
	Middle Fork Salmon River	2	ROCK IS
	Middle Fork Salmon River	2	SKIJUMP
	Middle Fork Salmon River	2	WHITEYCX
Independent Population Total:			34
Panther Creek (SRPAN-s)	Horse Creek	---	L1
	Horse Creek	---	L2
	Panther Creek	ABOVE	PC9
	Panther Creek	DS-BIGD	PC4
	Panther Creek	DS-BLACKB	PC6
	Panther Creek	DS-CLEAR	PC1
Independent Population Total:			6
North Fork Salmon (SRNFS-s)	North Fork Salmon River	2	DAHLONEGA
	Pine Creek	---	BRIDGE
	Pine Creek	---	SAWMILL CR
	North Fork Salmon River	2	HUGHES
Independent Population Total:			4
Lemhi River (SRLEM-s)	Big Springs Creek	LEM1	A
	Hayden Creek	HC2	B
	Hayden Creek	HC3	B
	Lemhi	1	LEM3A
Independent Population Total:			4
Pahsimeroi River (SRPAH-s)	Pahsimeroi River	LOWER	DWTNLANE
Independent Population Total:			1
East Fork Salmon River (SREFS-s)	East Fork Salmon River	ABOVE-WEIR	2
	East Fork Salmon River	ABOVE-WEIR	3
	Morgan Creek	UPPER	BLM CAMP
Independent Population Total:			3
Upper Salmon River Mainstem (SRUMA-s)	Alturas Lake Creek	2	2B
	Redfish Lake Creek	---	LOWER
	Redfish Lake Creek	---	WEIR DS
	Salmon River	1	RBNSN-BAR
	Salmon River	2	2B
	Salmon River	3	3B
	Salmon River	3	3BRA
	Salmon River	4	4B
	Salmon River	7	7A
	Valley Creek	1	B
	Valley Creek	3	A
	Valley Creek	3	B
	Valley Creek	6	B
Independent Population Total:			13
MPG Total:			144
Snake River DPS Total:			218

Table A-2. Densities (fish/100 m^2) of salmonids observed at core trend transects snorkeled in the Salmon River subbasin during 2011. Trout fry = all trout <80 mm that could not be distinguished between steelhead and cutthroat trout.

		Density									
Stream	**Transect**	**Trout Fry**	**Steelhead**	**Chinook Salmon**	**Cutthroat Trout**	**Bull Trout**	**Brook Trout**	**Whitefish**	**Cutt/ Steel Hybrid**	**Visibility (m)**	**Temp (C)**
Alturas Lake Creek	2B	0	0.56	0.06	0	0	1	0.22	0	2	18
Bargamin Creek	1	0.38	5.13	0.57	0.66	0	0	0.28	0	4.5	15
Bargamin Creek	2	0.61	5.11	0	0.2	0	0	0.72	0	4.4	16
Beaver Creek	3/B	0	0	3.69	0	0	0	0	0	4.1	8.5
Boulder Creek	1	2.59	1.19	0	0	0	5.48	0	0	1.4	12
Boulder Creek	2	0	1.36	0	0	0	0	0	0	2.1	11.5
Boulder Creek	3	13.01	21.15	1.63	0	0	0	0	0	1.8	12
Boulder Creek	5	0.31	8.14	2.15	0	0.15	0.15	0	0	1.6	12
Cape Horn Creek	1/A (UPPER)	0	0	23.41	0	0	0	0	0	3.4	8
Cape Horn Creek	2/B (LOWER)	0	0	47.27	0	0	0	0	0	3.4	9
Chamberlain Creek	CHA1	1.81	2.48	25.96	0	0.15	0	0.45	0	2.9	16
EF SF Salmon River	3	0	3.88	0.1	0	0.31	0	0	0	2	13
Hazard Creek	HAZ1	0	4.58	0.11	0	0.05	0	0.16	0	1.5	13.5
Horse Creek	Talus Slope/L1	1.14	6.99	2.27	0.81	0	0	0.49	0	3.5	14
Horse Creek	Bridge/L2	1.69	14.48	26.06	0.72	0.24	0	2.41	0	3.6	14.5
Johnson Creek	M1	3.31	0	0	0	0	6.35	0	0	1.5	15
Johnson Creek	M2	4.21	0	0	0	0	7.51	0	0	1.9	17
Johnson Creek	M3	0.2	0.34	0.54	0	0	1.97	0.27	0	1.6	17
Johnson Creek	PW1A	0	0.51	0	0	0	0.17	0	0	1.6	17
Lake Creek	BURGDORF	0	0	8.61	0	0	0	0.18	0	--	13
Lemhi River	1/LEM3A	0	5.81	0.17	0	0	0	2.44	0	1.9	10.5
Little Salmon River	2	0.1	1.93	2.62	0	0.1	0.15	0.54	0	1	14
Marble Creek	1-Mar	0.21	1.27	0	0	0	0	0	0	3.2	13
Marble Creek	MAR1B	0	11.72	0	0	0	0	0	0.73	3	10
Marble Creek	2-Mar	0	1.55	0	0.69	0.52	0	0.17	0	2.5	12
MF Salmon River	BOUNDARY	0	2.5	45.54	0.92	0	0	3.07	0	3.6	14
MF Salmon River	GRDLHOLE	0	0	9.3	0.81	0	0	0	0	3.2	14
MF Salmon River	VELVET	0	11.4	30.62	12.25	0	0	0	0	3.2	14
MF Salmon River	ELKHORN	0	1.95	8.5	0.34	0	0	0.34	0	3.2	14
MF Salmon River	SHEEPEATER	0	0.69	5.28	0.23	0	0	0.46	0	3.2	16
MF Salmon River	GREYHOUND	0	0.16	30.3	0.9	0	0	0.41	0	3.1	17
MF Salmon River	RAPID-R	0	2.07	1.63	4.8	0.11	0	2.18	0	3.1	13
MF Salmon River	INDIAN	0	1.47	0	3.77	0.12	0	1.24	0	3.1	14
MF Salmon River	PUNGO	0	0	5.55	1.15	0.21	0	0	0	3.1	14
MF Salmon River	MARBLPL	0	0.23	0.28	4.43	0.06	0	3.18	0	3.1	12
MF Salmon River	LJACKASS	0	1.26	1.19	1.32	0	0	1.39	0	3.4	15
MF Salmon River	COUGAR	0	0.15	2.21	0.74	0.15	0	0.59	0	3.4	16
MF Salmon River	WHITEY COX	0	0.15	0	1.91	0	0	0.23	0	3.2	15
MF Salmon River	ROCK ISLAND	0	0	2.56	3.39	0	0	1.47	0	3.2	15
Monumental Creek	MON2	1.07	19.62	2.32	0	0	0	0	0	1.4	14.5
Monumental Creek	MON3	0.41	4.83	3.6	0	0	0	0	0	0.9	13
Monumental Creek	MON5	1.47	2.94	37.37	0.07	0.07	0	0.22	0	1.6	10

Table A-2. Continued.

		Density									
Stream	**Transect**	**Trout Fry**	**Steelhead**	**Chinook Salmon**	**Cutthroat Trout**	**Bull Trout**	**Brook Trout**	**Whitefish**	**Cutt/ Steel Hybrid**	**Visibility (m)**	**Temp (C)**
NF Salmon River	DAHLONEGA	0.4	10.76	5.9	0	0	0	0.56	0	2.8	12
Panther Creek	PC9	0	4.76	8.32	0	0	0.17	0.17	0	1.8	10
Redfish Lake Creek	WEIR DS	0	0.13	0.04	0	0.09	0	0.18	0	3.1	15
Salmon River	3BRA	0.16	0.65	5.13	0	0.07	0.03	0.26	0	1.7	16
Secesh River	GROUSE	0	0.53	0.63	0	0	0	0	0	2	10.5
Secesh River	LONG-GULCH	0.37	0.06	11.67	0	0.12	0	3.15	0	2.3	10
SF Salmon River	STOLLE1	0	0	7.92	0	0	0	2.5	0	1.7	13
SF Salmon River	STOLLE2	0	0	0.77	0	0	0	0.64	0	1.4	12
Valley Creek	3/A	0	0.83	6.77	0	0	0.06	0.19	0	2.7	12.5
WF Monumental Cr	MON4	0	2.16	60.57	0.11	0	0	0.11	0	5.2	11.5

Table A-3. Densities (fish/100 m^2) of salmonids observed at non-core trend transects snorkeled in the Salmon River subbasin during 2011. Trout fry = all trout <50 mm that could not be distinguished between steelhead and cutthroat trout.

		Density									
Stream	**Transect**	**Trout Fry**	**Steelhead**	**Chinook Salmon**	**Cutthroat Trout**	**Bull Trout**	**Brook Trout**	**Whitefish**	**Cutt/ Steel Hybrid**	**Visibility (m)**	**Temp (C)**
Big Springs Creek	1/BSC Bridge	0	2.27	0	0	0	0.3	0	0	1.1	12
EF SF Salmon River	SUGAR CR	0	1.99	2.92	0	1.06	0.13	0.27	0	3.2	11
Hannah Slough	UPS Garden Cr	0	0.1	42.01	0	0	0	2.56	0	1.8	16
Hazard Creek	HAZ2	8.66	75.32	0	0	0	0	0	0	1.5	13
Indian Creek	UPPER	0	0	0.77	0	0	0	0.19	0	2.9	13
Indian Creek	LOWER	0	0.14	0.41	0	0	0	0	0	2.9	13
Johnson Creek	PW3A	0.09	7.97	0	0	0	0.18	0	0	1.5	11
Johnson Creek	PW3B	0.49	41.79	0	0	0.99	0	0	0	3.4	13
Lemhi River	LEM2/B	0.12	7.82	6.21	0	0	0.5	2.61	0	1.8	9
Marble Creek	L1	0	0	0	0	0	0	0	0	2.3	12
MF Salmon River	LICRGS	0	0.43	0	2.77	0	0	2.6	0	3.4	15
MF Salmon River	MAHONEY CMP	0	0	0	2.97	0	0	0	0	3.2	16
MF Salmon River	WCPB	0	0.1	3.36	3.44	0	0	0.49	0	3.2	15
Panther Creek	PC10	0	5.72	0	0	0	4.13	0	0	1.2	13
Pistol Creek	L2/UPPER	0	1.21	1.85	1.81	0	0	0	0	3.1	12
Pistol Creek	L1/LOWER	0	1.65	7.94	6.28	0	0	1.98	0	3.2	12
WF Chamberlain Cr	CHA6	8.46	11.93	62.13	0	0	0	1.73	0	1.5	13.5
WF Chamberlain Cr	CHA7	0.22	6.54	5.66	0	0	0	0	0	--	11

Table A-4. Densities (fish/100 m^2) of salmonids observed at core trend transects snorkeled in the Clearwater River subbasin during 2011. Trout fry = all trout <50 mm that could not be distinguished between steelhead and cutthroat trout.

		Density									
Stream	**Transect**	**Trout Fry**	**Steelhead**	**Chinook Salmon**	**Cutthroat Trout**	**Bull Trout**	**Brook Trout**	**Whitefish**	**Brook/Bull Hybrid**	**Visibility (m)**	**Temp (C)**
American River	1	0	1.64	0	0	0	0	0	0	1.2	9
American River	2	0	1.76	11.19	0	0	0	0.56	0	2	12
Bear Creek	1	0	2.18	4.28	0.76	0	0	1.68	0	--	18
Bear Creek	2	0	0.07	1.1	0	0	0	0	0	--	19
Brushy Fork	1	0	0.56	0	0.28	0	0	1.68	0	4	12
Crooked Fork	2A	0	0	0	2.29	0	0	0	0	4	9
Crooked Fork	2B	0.73	0	0	0.21	0.05	0	0.68	0	6.5	12
Crooked Fork	4A	0	0	0	3.02	0.38	0	0	0	4	9
Crooked River	SILL-LOG-B	0	0	1.26	1.64	0.13	0.13	0.13	0	2	9.5
Crooked River	NATURAL1	0	0	0.06	0	0	0	0.13	0	1.7	10
Crooked River	MEANDER1	0	1.76	6.2	0	0	0	0	0	1.2	12
Crooked River	CONTROL2	0	0.06	0.06	0.78	0	0	0.06	0	2	12
Crooked River	CAN3	0	0.33	2.78	0.11	0	0	0	0	1.6	10.5
Crooked River	CAN2	0	0	0	0	0	0	0	0	1.4	9.5
Crooked River	TREAT2	0	0	0.63	0.63	0	0	0.27	0	2.1	12
Deep Creek	CACTUS	0	0	0.54	4.46	0	0	0.18	0	5	13
EF Crooked River	EF2	0	0.41	0	0	0	0	0	0	2	8
EF Crooked River	EF1	0	0	0	0.41	0	0	0	0	3.1	8
EF Moose Creek	3	0	4.41	2.41	1.17	0	0	0.17	0.08	--	18
Fish Creek	1	6.82	6.45	0.09	2.49	0	0	0	0	2.6	16
Fish Creek	2	6.12	10.33	0	0.79	0	0	0.07	0	1.9	13
Meadow Creek	1	0	1.33	17.06	0.93	0.13	0	0.93	0	4.5	17
Moose Creek	1	0	9.1	0	3.24	0	0	2.12	0	--	19
Red River	TREAT 2	0.55	0.55	0	0	0	0.11	0	0	2.3	10.5
Red River	TREAT 2	0	0.32	43.39	0	0	0.11	0.11	0	1.9	12
Red River	TREAT 2	0	0.09	2.72	0.88	0	0.31	0	0	12	12
Red River	CNTL 2	0	0.35	0.11	0	0	0.71	0	0	1.8	12
Red River	CNTL 2	0	0.22	0.11	0	0	0	0	0	2.6	9
Red River	CNTL 2	0	0.45	60.76	0	0	0.15	0.4	0	2.3	9
Red River	CNTL 1	0	0.2	0	0	0	0	0	0	2.4	9
Relief Creek	1B	0	0	0	0	0	0.18	0	0	1.3	8
Running Creek	1	0	0.24	0.24	0	0	0	0.24	0	--	--
Running Creek	2	0	0.74	0.62	0.62	0	0	0	0	3.5	10
Selway River	MAG-XING	0	0.37	17.85	0.61	0.14	0	0.23	0	6	13
Selway River	LITTLE-CW	0.12	0.32	6.49	0.32	0.04	0	0.32	0	6.1	12

Table A-5. Densities (fish/100 m^2) of salmonids observed at non-core trend transects snorkeled in the Clearwater River subbasin during 2011. Trout fry = all trout <50 mm that could not be distinguished between steelhead and cutthroat trout.

		Density									
Stream	Transect	Trout Fry	Steelhead	Chinook Salmon	Cutthroat Trout	Bull Trout	Brook Trout	Whitefish	Brook/Bull Hybrid	Visibility (m)	Temp (C)
American River	GUNTLEYS	19.47	0.32	0	0	0	0.65	1.3	0	1.8	11
American River	GRAVEL PIT	0	0	0	0	0	0	0	0	1.8	11
American River	FLAT IRON RIDGE	0.45	2.49	0	0	0	0	0	0	1.8	9
American River	BUFFALO PIT	0	0.91	6.72	1.82	0	0	0	0	1.6	11
American River	.5MI BLW BOXSING	8.23	0.61	0	0	0	0	0	0	1.9	8
American River	1/8MABVEFK	20.65	1.61	0	0	0	0.48	0	0	1.8	10
American River	2.25U	0	1.21	0	0	0	0	1.67	0	1.9	9
American River	2.65U	0	0.6	0	0	0	0	0.15	0	1.9	10
American River	TREATMENT2	0	0	0.63	0.63	0	0	0.27	0	2.1	12
Crooked River	NATURAL3	0	2.66	0	0	0	0	0	0	1.3	9.5
Crooked River	MEANDER2	0	1.89	2.97	0.07	0	0.2	1.01	0	1.9	11.5
Crooked River	EF1	0	0	0	0.41	0	0	0	0	3.1	8
EF Crooked River	UPPER SHISSLER	0	0	0	0	0	0	0	0	2	8
Fire Creek	GPM1	0	2.32	0	0.17	0	0	0	0	2.7	10
Fire Creek	GPM2	0	3.69	0	0.05	0	0	0.17	0	2.7	10.5
Gedney Creek	2	4.18	3.8	2.03	1.39	0.13	0	0.13	0	5	17
Hopeful Creek	1-BOOGIEDN	0	0	0	4.67	0	0	0	0	4.3	9
Little Clearwater	1	0	2.03	0	0.29	0	0	0.29	0	3	10.5
Little Clearwater	2	0	1.96	0	0.59	0	0	0	0	1.5	11
Marten Creek	1	0	9.78	0	6.52	0	0	0	0	--	14
Meadow Creek	2	0	0.68	7	0.28	0	0	0	0	3.9	18.5
NF Moose Creek	4	0	1.87	7.89	1.07	0	0	1.11	0	--	17
O'Hara Creek	1	0	2.56	99.25	0.2	0	0	0	0	2	14
O'Hara Creek	2	0.37	1.11	1.85	2.6	0	0	0.19	0	1.4	13.5
Postoffice Creek	1	0	0	0	6.1	0	0	0	0	4	9
Postoffice Creek	2	0	0	0	5.71	0	0	0	0	4	9
Red River	SHISSLER CR	0	0	0	0	0	0	0	0	1.9	8
Red River	OLD BRIDGE	0	0	27.49	0	0	0.24	0.24	0	1.2	11
Red River	CSUP 5	0	1.39	14.33	0.13	0.13	0	0.38	0	1.8	10
Red River	CSUP 3	0	0.19	25.43	0	0.19	0.19	0.94	0	1.9	11.5
Red River	BOULDER POOL	0	0	94.95	0	0	0	0.61	0	1.8	11.5
Red River	BELOW WEIR	0	0.92	10.12	0.15	0	0.15	0.77	0	1.6	10
Red River	1A	0	0.36	0	0.91	0	0	0	0	1.3	8
Relief Creek	2A	0	0	0	0	0	0	0	0	1.7	9
Relief Creek	2B	0	1.34	0	0	0	0.67	0	0	1.3	9.5
Selway River	BEAVERPT	0	0.26	45.19	0.74	0.05	0	0.37	0	6.5	13
Selway River	ABV GOAT CREEK	0	0.02	0.12	0.02	0	0	0.25	0	--	--
Selway River	SELWAY LODGE	0	0.04	0.15	0.04	0	0	0.19	0	--	--
Selway River	DIVIDE CREEK	0	1.5	0.62	0.37	0	0	0.57	0	--	--
Selway River	MOOSE CONFLNCE	0	1.96	1.31	1.45	0.03	0	0.71	0	--	--
Selway River	ABV LADLE CREEK	0	0	0	0.02	0	0	0.02	0	--	--
Selway River	BELOW TANGO	0	0.28	0.08	0.38	0	0	0.45	0	--	17

Table A-5. Continued.

Stream	Transect	Density								Visibility (m)	Temp (C)
		Trout Fry	Steelhead	Chinook Salmon	Cutthroat Trout	Bull Trout	Brook Trout	Whitefish	Brook/Bull Hybrid		
Selway River	BLW THREE LINKS	0	0.09	0	0.22	0.02	0	0.05	0	--	--
Selway River	ABV RODEO RAPID	0	0	0	0.1	0	0	0.08	0	--	--
Selway River	OSPREY ISLAND	0	0.17	0	0.79	0.02	0	0.5	0	--	16
Selway River	ABV WOLF CREEK	0	0.02	0	0.04	0	0	0.02	0	--	--
Selway River	DRY BAR	0	0.2	0	0.34	0	0	0.2	0	--	--
Selway River	1/2 mi blw white cap	0	0	0	0.07	0.02	0	0.14	0	--	--
Selway River	1 mi blw white cap	0	0.03	0	0.08	0	0	0.34	0	--	--
Selway River	BELOW HAM RAPID	0	0.3	0	0.63	0	0	0.07	0	--	--
Selway River	RATTLESNAKE	0	0	0	0.04	0	0	0.02	0	--	--
Selway River	BLW RODEO RAPID	0	0.14	0	0.01	0	0	0.01	0	--	--

Table A-6. Densities (fish/100 m^2) of salmonids observed at extensive panel transects snorkeled in the Potlatch River drainage in the Clearwater lower mainstem steelhead population, June 12-15 and June 21, 2011. Trout fry = all trout <50 mm that could not be distinguished between steelhead and cutthroat trout. Mean and standard deviation are given by species.

		Density				
Stream	**Transect**	**Trout Fry**	**Steelhead**	**Brook Trout**	**Visibility (m)**	**Temp (C)**
Big Bear Creek	107538	0.00	0.11	0.00	1.2	14.5
Big Bear Creek	91154	7.89	0.00	0.00	1.0	14.0
Bloom Creek	78705	0.00	0.00	4.24	1.6	7.0
Bobs Creek	103281	0.00	0.51	0.25	1.3	10.0
Bobs Creek	35697	0.00	0.00	0.00	2.0	12.0
Bobs Creek	37745	0.00	2.84	0.47	1.2	11.0
Bobs Creek	54129	0.41	0.41	0.00	1.6	11.0
Bobs Creek	86897	0.00	0.00	2.07	1.2	11.0
EF Big Bear Creek	126946	0.00	0.48	0.48	0.9	8.0
EF Potlatch River	130018	0.00	1.50	0.27	1.2	13.0
EF Potlatch River	13169	0.00	0.00	0.00	1.4	9.0
EF Potlatch River	134001	0.00	0.26	0.79	0.9	9.0
EF Potlatch River	144241	0.00	0.26	1.11	1.3	11.5
EF Potlatch River	168817	0.00	0.87	0.44	0.9	12.0
EF Potlatch River	182242	0.00	0.21	0.00	1.1	10.0
EF Potlatch River	2929	0.00	0.80	1.87	1.0	8.5
EF Potlatch River	34786	0.00	0.10	0.00	1.2	10.0
EF Potlatch River	45937	0.00	0.43	0.60	0.9	9.0
EF Potlatch River	95089	0.00	0.58	2.89	1.6	7.0
Jackson Creek	174050	0.00	0.00	8.24	0.9	11.0
Jackson Creek	26954	0.00	0.00	1.39	0.8	9.0
Little Bear Creek	13330	6.45	3.29	0.00	1.1	17.5
Little Bear Creek	144402	8.63	2.54	0.10	1.1	18.0
Little Bear Creek	158226	6.09	0.72	0.00	1.2	15.0
Little Bear Creek	177170	0.00	0.68	0.00	1.3	14.0
Nora Creek	27154	0.00	0.00	0.00	0.9	17.0
Ruby Creek	113634	0.00	0.00	4.08	0.7	9.0
Ruby Creek	2018	0.00	0.60	0.00	0.9	12.0
Ruby Creek	31714	0.00	0.00	0.00	0.9	9.0
Ruby Creek	67554	0.00	0.87	0.00	1.1	12.0
Schwartz Creek	24594	0.00	2.95	0.00	0.8	11.0
Spring Valley Creek	111122	0.00	4.39	0.00	1.6	23.0
WF Little Bear Cr	100882	0.00	0.52	2.07	0.9	12.0
WF Little Bear Cr	136210	0.00	0.71	0.00	0.8	18.0
WF Little Bear Cr	150034	0.00	2.59	0.00	0.8	11.0
WF Little Bear Cr	191506	8.03	3.01	0.00	0.9	12.0
WF Little Bear Cr	193554	0.00	0.00	0.00	1.5	12.0
WF Little Bear Cr	224274	3.39	3.84	0.00	1.0	12.0
WF Little Bear Cr	267282	0.00	2.45	0.33	1.2	16.0
WF Little Bear Cr	60434	1.02	2.39	0.00	0.9	13.0
WF Little Bear Cr	78354	0.00	0.00	0.00	1.5	13.0
Mean		1.02	1.00	0.77		
SD		2.50	1.25	1.61		

Table A-7. Densities (fish/100 m^2) of salmonids observed at extensive panel transects snorkeled in drainages adjacent to the Potlatch River drainage in the Clearwater lower mainstem steelhead population, June 12-14 and June 28, 2011. Trout fry = all trout <50 mm that could not be distinguished between steelhead and cutthroat trout. Mean and standard deviation are given by species.

		Density			
Stream	**Transect**	**Trout Fry**	**Steelhead**	**Visibility (m)**	**Temp (C)**
Bedrock Creek	15074	0.00	3.78	1.2	14
Bedrock Creek	490210	0.00	2.72	1.3	14
Bedrock Creek	509666	0.00	0.00	1.3	8.5
Bedrock Creek	514786	0.00	7.54	0.8	14
Bedrock Creek	64226	14.95	3.83	1.2	12
Louse Creek	116450	0.00	0.00	1.3	9.3
Louse Creek	9954	0.00	5.54	1.5	9.3
Pine Creek	120338	0.00	0.00	0.4	17
Pine Creek	519906	0.00	0.00	0.4	17
Pine Creek	532194	0.00	0.00	--	--
Pine Creek	218642	1.17	0.58	0.6	20
Pine Creek	251410	0.00	0.00	0.6	--
Pine Creek	532194	0.00	0.00	0.6	--
Pine Creek	388834	0.00	0.00	0.7	14
Pine Creek	87570	5.13	1.87	0.7	17
Mean		0.40	3.69		
SD		0.81	2.32		

Table A-8. Densities (fish/100 m^2) of salmonids observed at extensive panel transects snorkeled in the Panther Creek steelhead population, July 11-August 12, 2011. Area includes tributaries to the Salmon River between the North Fork and Panther Creek. Trout fry = all trout <50 mm that could not be distinguished between steelhead and cutthroat trout. Mean and standard deviation are given by species.

		Density							
Stream	**Transect**	**Trout Fry**	**Steelhead**	**Chinook Salmon**	**Cutthroat Trout**	**Bull Trout**	**Whitefish**	**Visibility (m)**	**Temp (C)**
Panther Cr	133855	0.57	4.76	5.47	0.07	0.00	2.50	1.9	13.0
Panther Cr	68319	1.74	4.94	2.23	0.00	0.10	1.40	1.9	15.0
Panther Cr	101087	1.50	4.97	0.84	0.00	0.00	1.41	1.7	15.0
Panther Cr	29407	0.00	8.93	2.33	0.29	0.10	3.59	4.9	16.0
Panther Cr	60127	0.27	2.12	1.53	0.05	0.00	1.17	1.8	18.0
Horse Cr	146751	0.00	0.00	0.00	0.00	3.12	0.00	3.2	8.0
Horse Cr	15679	0.00	0.49	0.00	0.00	2.21	0.00	2.6	8.0
Horse Cr	105791	0.00	2.49	0.00	0.00	0.62	0.00	2.7	10.0
Horse Cr	113983	0.00	3.35	0.00	0.00	0.58	0.00	2.7	10.0
Horse Cr	75071	0.00	7.80	0.00	0.00	0.20	0.00	3.6	9.0
EF Reynolds	116031	0.00	3.15	0.00	0.00	0.73	0.00	3.5	8.0
Reynolds Cr	9535	0.00	5.45	0.00	0.00	0.51	0.00	5.0	12.0
Reynolds Cr	140607	0.00	3.09	0.00	0.00	0.00	0.00	4.6	7.0
Horse Cr	107839	0.00	4.42	0.00	0.11	0.00	0.00	3.3	14.0
Horse Cr	50495	0.00	5.28	0.00	0.00	0.11	0.00	3.3	13.0
Horse Cr	83759	0.00	6.72	0.00	0.00	0.39	0.00	3.3	13.0
WF Horse C	13119	0.00	0.00	0.00	0.38	0.00	0.00	5.0	8.0
WF Horse C	70463	0.00	5.48	0.00	0.30	0.00	0.00	3.0	9.0
Horse Cr	103231	0.00	7.16	11.73	0.27	0.27	1.57	3.6	14.0
Mean		0.21	4.24	1.27	0.08	0.47	0.61		
SD		0.52	2.53	2.89	0.13	0.82	1.05		

Table A-9. Densities (fish/100 m^2) of salmonids observed at extensive panel transects snorkeled in the Selway River steelhead population, July 31-August 10 and August 29-31, 2011. Trout fry = all trout <50 mm that could not be distinguished between steelhead and cutthroat trout. Mean and standard deviation are given by species.

		Density							
Stream	**Transect**	**Trout Fry**	**Steelhead**	**Chinook Salmon**	**Cutthroat Trout**	**Bull Trout**	**Whitefish**	**Visibility (m)**	**Temp (C)**
Canyon Cr	130946	0.00	0.89	0.00	1.61	0.48	0.00	8.0	13.0
Canyon Cr	131138	0.00	0.00	0.00	0.00	0.00	0.00	--	--
Canyon Cr	19330	0.00	2.22	0.00	0.13	0.00	0.00	6.0	14.0
Canyon Cr	196482	0.00	1.04	0.00	1.11	0.00	0.00	7.0	12.0
Canyon Cr	52098	0.00	1.48	0.00	0.46	0.29	0.00	7.0	11.0
Canyon Cr	66	0.00	1.22	0.00	0.61	0.00	0.00	8.0	10.5
Canyon Cr	84866	0.00	1.78	0.00	0.34	0.08	0.00	8.5	14.0
Cayuse Cr	152767	0.00	0.00	0.00	2.25	0.00	0.00	6.0	12.0
Deep Cr	126143	0.00	0.42	0.00	3.78	0.14	0.00	4.0	14.0
Deep Cr	158911	0.00	0.22	1.66	5.65	0.11	0.00	4.0	14.0
Deep Cr	160959	0.00	0.00	0.00	4.75	0.00	0.00	4.2	14.0
Deep Cr	163007	0.00	0.00	0.00	5.33	0.53	0.00	12.0	12.0
Deep Cr	195775	0.42	0.00	0.00	10.57	0.00	0.00	4.5	13.0
Deep Cr	60607	0.00	0.00	1.25	5.01	0.00	0.11	4.5	14.0
Deep Cr	62655	2.59	0.00	0.34	3.97	0.00	0.00	5.5	13.5
Gedney Cr	129474	6.00	9.93	2.59	1.34	0.00	0.00	6.5	14.0
Gedney Cr	14786	5.34	4.30	1.56	1.04	0.00	0.26	5.0	17.0
Gedney Cr	67010	2.36	6.03	1.54	0.83	0.00	0.12	6.5	15.0
Lookout Cr	53122	0.00	3.40	0.00	0.43	0.00	0.00	8.0	14.0
O'Hara Cr	104226	0.94	2.46	0.00	0.35	0.00	0.00	1.4	14.0
O'Hara Cr	87842	0.00	4.07	13.52	0.00	0.00	0.00	2.0	15.0
Selway R	109759	0.00	0.39	2.27	2.66	0.11	0.28	6.0	12.0
Selway R	12479	0.15	0.69	1.00	1.00	0.15	0.08	6.0	13.0
Selway R	134335	0.00	0.98	2.41	2.28	0.07	0.26	6.5	14.0
Sweet Cr	172351	0.86	0.00	0.00	5.16	0.00	0.00	4.0	10.0
Vance Cr	7359	0.00	0.00	0.00	0.00	0.00	0.00	--	--
White Cap	85890	0.44	0.79	0.04	0.31	0.00	0.31	6.5	16.0
Mean		0.71	1.57	1.04	2.26	0.07	0.05		
SD		1.58	2.30	2.64	2.52	0.14	0.10		

Table A-10. Densities (fish/100 m^2) of salmonids observed at intensive panel transects snorkeled in the Chamberlain Creek steelhead population, August 3-10, 2011. Trout fry = all trout <50 mm that could not be distinguished between steelhead and cutthroat trout. Mean and standard deviation are given by species.

		Density							
Stream	**Transect**	**Trout Fry**	**Steelhead**	**Chinook Salmon**	**Cutthroat Trout**	**Bull Trout**	**Whitefish**	**Visibility (m)**	**Temp (C)**
Chamberlain Cr	18527	3.10	10.65	29.67	0.00	0.27	0.00	2.0	13.0
Chamberlain Cr	24671	0.52	5.90	15.93	0.00	0.00	0.20	2.4	15.0
Chamberlain Cr	26527	0.00	6.62	5.83	0.00	0.30	0.49	3.4	15.0
Chamberlain Cr	38815	0.21	7.29	18.75	0.00	0.00	0.21	1.7	11.0
Chamberlain Cr	45375	0.11	7.74	16.91	0.00	0.05	0.27	2.5	15.0
Chamberlain Cr	49247	0.16	7.54	11.11	0.00	0.08	0.16	2.9	13.0
Chamberlain Cr	59295	1.53	3.86	15.25	0.00	1.19	0.85	3.4	11.5
Chamberlain Cr	84063	0.00	12.82	6.41	0.00	0.22	0.77	2.2	10.0
Chamberlain Cr	90207	1.67	4.75	10.00	0.00	0.00	0.00	1.6	17.0
Chamberlain Cr	127295	0.15	6.29	17.80	0.00	0.00	0.15	2.5	16.0
Chamberlain Cr	130975	0.29	6.02	9.31	0.00	0.00	0.10	2.1	17.0
Flossie Creek	6239	0.00	0.46	0.00	0.00	0.92	0.00	0.9	14.0
Game Creek	104351	0.00	7.13	0.00	0.00	0.00	0.00	3.0	10.0
Lodgepole Cr	2143	0.00	0.00	0.00	0.00	0.00	0.00	--	--
Lodgepole Cr	71582	2.47	4.12	0.00	0.00	0.00	0.00	1.2	13.0
Lodgepole Cr	96159	0.45	2.47	2.47	0.00	0.22	0.00	2.0	14.0
McCalla Cr	95	0.00	2.51	0.00	0.00	0.00	0.00	--	11.0
McCalla Cr	3999	0.65	2.91	0.00	0.00	0.00	0.00	1.4	12.0
McCalla Cr	8287	0.23	9.05	0.00	0.00	0.00	0.00	1.4	15.0
McCalla Cr	69535	0.00	0.00	0.00	0.00	0.88	0.00	1.1	8.0
McCalla Cr	122975	0.50	8.47	0.12	0.12	0.00	0.50	1.5	15.0
Rim Creek	54623	0.23	0.00	0.00	0.00	0.45	0.00	1.8	9.0
Unnamed stream	55391	0.76	0.00	0.00	0.00	0.00	0.00	1.8	17.0
Unnamed stream	87391	0.00	0.00	0.00	0.00	0.00	0.00	2.0	9.0
Unnamed stream	147551	0.00	0.00	0.00	0.00	0.00	0.00	--	--
Unnamed stream	186463	1.88	0.00	0.00	0.00	0.00	0.00	1.8	16.0
Whimstick Creek	53855	0.00	0.00	0.00	0.00	3.18	0.00	1.7	14.0
Whimstick Creek	65631	0.00	14.07	0.00	0.14	0.00	0.00	2.1	13.0
Whimstick Creek	135775	0.00	0.00	0.00	0.00	6.66	0.00	2.2	15.0
Whimstick Creek	163935	0.59	9.96	0.00	0.15	0.00	0.00	1.5	15.0
Whimstick Creek	172127	0.00	0.00	0.00	0.00	0.12	0.00	1.3	11.0
Mean		0.49	4.14	4.69	0.01	0.43	0.11		
SD		0.78	4.26	7.71	0.04	1.25	0.22		

Table A-11. Densities (fish/100 m^2) of salmonids observed at intensive panel transects snorkeled in the Bargamin Creek drainage, in the Chamberlain Creek steelhead population, August 17-23, 2011. Trout fry = all trout <50 mm that could not be distinguished between steelhead and cutthroat trout. Mean and standard deviation are given by species.

		Density							
Stream	**Transect**	**Trout Fry**	**Steelhead**	**Chinook Salmon**	**Cutthroat Trout**	**Bull Trout**	**Whitefish**	**Visibility (m)**	**Temp (C)**
Bargamin Cr	63810	0.76	4.39	0.00	0.13	0.06	0.64	3.0	12.0
Bargamin Cr	83266	0.47	7.39	0.00	0.05	0.21	0.05	4.7	14.0
Bargamin Cr	96578	0.62	4.59	0.06	0.06	0.17	0.45	4.1	13.0
Bargamin Cr	129346	0.23	6.66	0.00	0.00	0.15	0.15	12.4	15.0
Bargamin Cr	137538	1.44	7.59	0.00	0.00	0.00	0.14	3.5	12.0
Bargamin Cr	148802	0.10	10.38	0.00	0.00	0.00	0.00	3.5	14.0
Bargamin Cr	203074	1.07	7.04	0.00	0.00	0.10	0.05	>3.0	11.0
Bargamin Cr	163138	0.00	9.72	0.00	0.00	0.33	0.00	2.9	14.5
Bargamin Cr	48450	0.00	4.29	0.00	0.00	0.11	0.00	--	9.0
Bargamin Cr	122178	0.00	4.01	0.00	0.00	0.00	0.00	3.8	12.0
Bargamin Cr	220482	0.00	7.18	0.00	0.00	0.08	0.00	2.9	13.0
Bargamin Cr	165186	0.00	4.96	0.00	0.08	0.08	0.00	3.7	12.0
Cache Cr	50498	0.00	0.00	0.00	1.02	0.00	0.00	2.2	9.0
Cache Cr	25922	0.00	1.81	0.00	0.00	0.40	0.00	3.5	9.0
Porcupine Cr	66370	0.00	0.00	0.00	0.00	0.00	0.00	2.1	9.0
Porcupine Cr	130370	0.00	0.00	0.00	0.00	0.00	0.00	--	11.0
Porcupine Cr	164674	0.00	0.00	0.00	0.00	0.00	0.00	>2.0	9.0
Porcupine Cr	197442	0.00	0.00	0.00	0.00	0.00	0.00	3.5	8.0
Prospector Cr	834	0.00	0.00	0.00	0.00	0.00	0.00	3.0	6.5
Rainey Cr	271682	0.00	4.28	0.00	0.00	0.00	0.00	1.2	14.0
Salt Creek	460098	0.00	4.92	0.00	0.00	0.00	0.00	2.5	9.0
Unnamed stream	197954	0.00	0.41	0.00	0.00	0.00	0.00	3.0	10.5
Mean		0.21	4.59	0.05	0.06	0.08	0.07		
SD		0.41	3.38	0.01	0.22	0.11	0.16		

Table A-12. Densities (fish/100 m^2) of salmonids observed at intensive panel transects snorkeled in the Crooked River drainage in the South Fork Clearwater steelhead population, June 22-26 and July 6-13, 2011. Mean and standard deviation are given by species.

		Density								
Stream	**Transect**	**Trout Fry**	**Steelhead**	**Chinook Salmon**	**Cutthroat Trout**	**Bull Trout**	**Brook Trout**	**Whitefish**	**Visibility (m)**	**Temp (C)**
Crooked R	161346	1.93	2.41	0.00	0.00	0.00	0.00	0.07	1.6	10.0
Crooked R	202306	0.00	0.00	0.06	0.38	0.00	0.00	0.00	1.7	9.5
Crooked R	214594	0.00	0.61	0.00	0.41	0.00	0.00	0.10	1.9	12.0
Crooked R	243266	0.00	0.33	0.00	0.00	0.00	0.00	0.07	1.4	--
Crooked R	50754	0.00	0.33	0.00	0.08	0.00	0.08	0.08	2.2	12.0
Crooked R	5698	0.00	1.12	0.07	0.15	0.00	0.00	0.07	1.8	10.0
Crooked R	72258	0.09	0.19	0.00	0.66	0.00	0.09	0.00	2.0	9.0
Crooked R	73282	0.00	0.11	0.11	0.00	0.00	0.00	0.00	1.6	9.5
EF Crooked	55874	0.00	0.27	0.00	0.00	0.13	0.00	0.00	1.9	8.0
EF Crooked	219714	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.9	8.0
EF Relief Cr	157250	0.69	2.43	0.00	0.00	0.00	0.00	0.00	1.1	9.0
EF Relief Cr	247362	0.00	1.04	0.00	0.00	0.00	0.00	0.00	1.1	9.0
EF Relief Cr	58946	0.00	2.23	0.00	0.00	0.00	0.00	0.00	1.4	9.0
EF Relief Cr	132674	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.4	8.0
Fivemile Cr	14914	0.00	0.00	0.00	2.81	0.00	0.00	0.00	1.5	10.0
Fivemile Cr	186946	0.00	0.77	0.00	2.31	0.00	0.00	0.00	2.0	10.0
Relief Cr	124482	0.00	1.43	0.00	2.04	0.00	0.00	0.00	1.2	8.0
Relief Cr	181826	0.00	0.50	0.00	1.01	0.00	0.00	0.00	1.2	9.0
Relief Cr	235074	0.00	2.60	0.00	0.58	0.00	0.00	0.00	1.4	7.0
WF Crooked	170562	0.00	1.76	0.00	0.00	0.00	0.00	0.00	2.7	7.0
WF Crooked	178754	0.52	0.00	0.00	3.12	1.87	0.00	0.00	2.3	8.5
WF Crooked	211522	0.00	3.14	0.00	0.13	0.13	0.00	0.00	3.1	7.0
WF Crooked	236098	0.00	0.47	0.00	0.23	1.40	0.00	0.00	2.2	11.0
WF Crooked	244290	0.00	0.90	0.00	0.80	1.20	0.00	0.00	2.6	7.0
WF Crooked	256578	0.00	0.32	0.00	0.32	0.00	0.00	0.00	1.4	9.0
Mean		0.13	0.92	0.01	0.60	0.19	0.01	0.02		
SD		0.41	0.97	0.03	0.94	0.50	0.02	0.03		

Table A-13. Densities (fish/100 m^2) of salmonids observed at intensive panel transects snorkeled in the Crooked Fork Creek drainage in the Lochsa River steelhead population from July 20-27 and August 31-September 1, 2011. Trout fry = all trout <50 mm that could not be distinguished between steelhead and cutthroat trout. Mean and standard deviation are given by species.

		Density							
Stream	**Transect**	**Trout Fry**	**Steelhead**	**Chinook Salmon**	**Cutthroat Trout**	**Bull Trout**	**Whitefish**	**Visibility (m)**	**Temp (C)**
Boulder Cr	34625	0.00	0.83	0.00	0.91	0.00	0.00	4.0	9.0
Brushy Fork	103233	0.00	0.00	0.00	0.00	0.00	0.00	4.4	10.5
Brushy Fork	117569	0.68	0.68	0.15	0.00	0.00	0.00	4.0	13.0
Brushy Fork	136001	0.00	0.06	0.00	0.06	0.00	0.00	5.0	11.5
Brushy Fork	150337	0.13	0.32	0.38	0.06	0.00	0.00	3.7	12.5
Brushy Fork	21313	0.00	1.39	0.00	0.66	0.00	0.00	5.0	11.0
Crooked Fork	10049	0.09	0.09	0.00	2.28	0.00	0.00	4.5	9.0
Crooked Fork	12097	0.00	0.54	2.73	0.22	0.00	0.13	4.3	11.0
Crooked Fork	122689	0.00	0.00	0.00	1.12	0.00	0.00	4.0	9.0
Crooked Fork	132929	0.00	0.37	0.06	0.18	0.00	0.00	4.3	10.0
Crooked Fork	151361	0.00	0.00	0.00	0.00	0.00	0.00	3.6	12.5
Crooked Fork	159553	0.00	0.04	0.04	0.07	0.00	0.14	3.6	10.0
Crooked Fork	165697	0.00	1.62	0.00	0.54	0.00	0.00	6.5	11.5
Crooked Fork	48961	0.00	1.86	0.12	0.47	0.00	0.00	6.5	11.5
Crooked Fork	64321	0.00	1.03	0.36	0.48	0.00	0.36	4.0	12.0
Crooked Fork	67393	0.00	0.33	0.00	0.17	0.00	0.06	4.9	9.5
Crooked Fork	80705	1.22	0.00	0.00	2.97	0.00	0.00	4.3	9.0
Hopeful Cr	105281	0.00	0.00	0.00	0.99	0.74	0.00	4.0	5.5
Spruce Cr	111425	0.00	0.18	0.00	0.00	0.00	0.00	3.8	8.0
Spruce Cr	123969	0.00	0.00	0.00	0.00	0.00	0.00	3.7	7.0
Mean		0.11	0.47	0.19	0.56	0.04	0.03		
SD		0.30	0.59	0.61	0.80	0.17	0.09		

Table A-14. Densities (fish/100 m^2) of salmonids observed at intensive panel transects snorkeled in the Marsh Creek drainage in the Middle Fork Salmon upper mainstem steelhead population from July 21-25, 2011. Trout fry = all trout <50 mm that could not be distinguished between steelhead and cutthroat trout. Mean and standard deviation are given by species.

		Density								
Stream	**Transect**	**Trout Fry**	**Steelhead**	**Chinook Salmon**	**Cutthroat Trout**	**Bull Trout**	**Brook Trout**	**Whitefish**	**Visibility (m)**	**Temp (C)**
Swamp Creek	120151	0.00	0.00	0.00	0.00	0.00	0.72	0.00	3.7	6.0
Swamp Creek	21847	0.00	0.56	0.00	0.00	0.00	0.28	0.00	2.7	10.0
Knapp Creek	164695	0.00	0.00	0.00	0.00	0.00	0.60	0.00	5.8	8.0
Knapp Creek	130391	0.00	0.00	0.00	0.00	0.00	0.23	0.00	5.8	9.0
Knapp Creek	73047	0.00	0.45	0.00	0.00	0.00	0.57	0.00	3.9	14.0
Knapp Creek	40279	0.16	1.93	0.96	0.00	0.00	1.45	0.00	4.0	14.0
Knapp Creek	126295	0.00	2.90	3.63	0.00	0.00	2.18	0.15	3.7	16.0
Knapp Creek	60759	0.25	0.17	14.93	0.00	0.00	0.84	0.00	5.6	9.5
Marsh Creek	56663	0.00	0.00	9.01	0.00	0.00	0.00	0.00	4.1	8.0
Marsh Creek	89431	0.00	0.11	3.53	0.00	0.00	0.11	0.11	2.0	8.0
Bench Creek	101719	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.6	5.0
Cape Horn Cr	150871	0.00	0.32	37.46	0.00	0.00	0.21	0.11	2.6	13.0
Marsh Creek	105815	0.00	3.14	0.00	0.10	0.21	0.31	0.84	3.4	9.0
Beaver Creek	32111	0.00	0.00	0.00	0.00	0.72	0.00	0.00	3.4	8.5
Beaver Creek	97111	0.00	0.00	0.00	0.00	0.77	0.00	0.00	4.8	10.0
Beaver Creek	83799	0.00	0.65	0.00	0.00	0.22	0.86	0.00	4.1	9.0
Beaver Creek	51031	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.0	10.0
Beaver Creek	15703	0.00	0.00	0.22	0.00	0.00	0.00	0.00	3.4	11.0
Winnemucca Cr	141143	0.00	0.00	0.00	0.00	4.09	0.00	0.00	4.7	8.0
Winnemucca Cr	123735	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.3	11.0
Winnemucca Cr	18263	0.00	0.00	0.00	0.00	0.00	0.55	0.00	4.9	7.0
Beaver Creek	27991	0.00	0.24	3.51	0.00	0.00	0.00	0.32	2.4	6.5
Bear Creek	109911	0.00	0.00	0.00	0.00	0.49	0.00	0.00	2.1	6.0
Beaver Creek	11607	0.06	0.00	14.03	0.00	0.00	0.00	0.00	3.2	7.5
Lola Creek	60247	0.00	1.43	0.00	0.00	0.36	0.36	0.00	5.1	6.5
Marsh Creek	125783	0.00	3.68	4.90	0.09	0.70	0.00	0.53	2.4	9.0
Mean		0.02	0.60	3.55	0.01	0.29	0.36	0.08		
SD		0.06	1.08	8.10	0.03	0.81	0.52	0.20		

Appendix B. Data Collected By INPMEP During 2011 Relevant To VSP Criteria

Table B1. Data provided by INPMEP during 2011 as applicable to viable salmonid population criteria for wild Chinook salmon populations.

		Viable salmonid population criterion			
Major population group	**Population**	**Abundance**	**Productivity**	**Spatial Structure**	**Diversity**
South Fork Salmon River	South Fork Salmon	Redd abundance[t]	Adult ages	Redd distribution[t], Juvenile occurrence[t]	Adult ages
	Secesh River	Redd abundance[t], Parr densities[g]	Adult ages	Redd distribution[t], Juvenile occurrence[gt]	Adult ages
	East Fork South Fork	--	Adult ages	Juvenile occurrence[t]	Adult ages
	Little Salmon	--	--	Juvenile occurrence[t]	--
Middle Fork Salmon River	Chamberlain Creek	Redd abundance[t]	Adult ages	Redd distribution[t], Juvenile occurrence[t]	Adult ages
	Lower Main Middle Fork	Redd abundance[t]	--	Redd distribution[t], Juvenile occurrence[t]	--
	Big Creek	Redd abundance[t], Parr densities[g] (upper basin)	Adult ages	Redd distribution[t], Juvenile occurrence[gt]	Adult ages
	Camas Creek	Redd abundance[t]	Adult ages	Redd distribution[t]	Adult ages
	Loon Creek	Redd abundance[t]	Adult ages	Redd distribution[t]	Adult ages
	Upper Main Middle Fork	Redd abundance[t], Parr densities[g] (Rapid River)	--	Redd distribution[t], Juvenile occurrence[gt]	--
	Sulphur Creek	Redd abundance[t]	Adult ages	Redd distribution[t]	Adult ages
	Bear Valley/Elk Creek	Redd abundance[t]	Adult ages	Redd distribution[t], Juvenile occurrence[t]	Adult ages
	Marsh Creek	Redd abundance[t], Parr densities[g]	Adult ages	Redd distribution[t], Juvenile occurrence[gt]	Adult ages
Upper Salmon River	North Fork Salmon	Redd abundance[t], Parr densities[g]	Adult ages	Redd distribution[t], Juvenile occurrence[gt]	Adult ages
	Lemhi River	Redd abundance[t]	Adult ages	Redd distribution[t], Juvenile occurrence[t]	Adult ages
	Pahsimeroi River	Redd abundance[t], Parr densities[g]	Adult ages	Redd distribution[t], Juvenile occurrence[gt]	Adult ages
	Lower Main Salmon	Redd abundance[t], Parr densities[g] (above YF)	Adult ages	Redd distribution[t], Juvenile occurrence[gt]	Adult ages
	East Fork Salmon	Redd abundance[t]	Adult ages	Redd distribution[t]	Adult ages
	Panther Creek	--	Adult ages	Juvenile occurrence[t]	Adult ages
Upper Salmon River	Yankee Fork	Parr densities[g]	Adult ages	Juvenile occurrence[gt]	Adult ages
	Valley Creek	Redd abundance[t], Parr densities[g]	Adult ages	Redd distribution[t], Juvenile occurrence[gt]	Adult ages
	Upper Main Salmon	Redd abundance[t], Parr densities[g]	Adult ages	Redd distribution[t], Juvenile occurrence[gt]	Adult ages
Dry Clearwater	South Fork Clearwater	Redd abundance[t], Parr densities[g] (Crooked R)	Adult ages	Redd distribution[t], Juvenile occurrence[gt]	Adult ages
	Lawyer Creek	--	--	--	--
	Potlatch River	--	--	--	--
	Lapwai/Big Canyon	--	--	--	--
	Lolo Creek	--	--	--	--
	Lochsa River	Redd abundance[t], Parr densities[g] (Crooked Fk)	Adult ages	Redd distribution[t], Juvenile occurrence[gt]	Adult ages
	Meadow Creek	Parr densities[g]	--	Juvenile occurrence[g]	--
	Moose Creek	Parr densities[g] (below Moose)	--	Juvenile occurrence[gt]	--
Wet Clearwater	Upper Selway	Redd abundance[t], Parr densities[g]	Adult ages	Redd distribution[t], Juvenile occurrence[gt]	Adult ages

[g] based on a generalized random-tessellation stratification design
[t] based on non-random trend transects

Table B2. Data collected by INPMEP during 2011 as applicable to viable salmonid population criteria for steelhead populations.

Major population group	Population	Viable Salmonid Population Criterion			
		Abundance	Productivity	Spatial structure	Diversity
Clearwater River	Lower Clearwater	Parr density[g] (Potlatch)	Parr-parr productivity[t]	Juvenile occurrence[gt]	--
	Lolo Creek	--	--	--	--
	Lochsa River	Parr density[g] (Crooked Fk)	Parr-parr productivity[t]	Juvenile occurrence[gt]	--
	Selway River	Parr density[g] (upper basin)	Parr-parr productivity[t]	Juvenile occurrence[gt]	--
	South Fork Clearwater	Parr density[g] (Crooked R)	Parr-parr productivity[t]	Juvenile occurrence[gt]	--
Salmon River	Little Salmon	--	Parr-parr productivity[t]	Juvenile occurrence[t]	--
	Secesh River	Parr density[g]	Parr-parr productivity[t]	Juvenile occurrence[gt]	--
	South Fork Salmon	--	Parr-parr productivity[t]	Juvenile occurrence[t]	--
	Chamberlain Creek	--	Parr-parr productivity[t]	Juvenile occurrence[t]	--
	Lower Middle Fork Salmon	Parr density[g] (upper Big Cr)	Parr-parr productivity[t]	Juvenile occurrence[t]	--
	Upper Middle Fork Salmon	Parr density[g] (Marsh & Rapid)	Parr-parr productivity[t]	Juvenile occurrence[gt]	--
	Panther Creek	--	Parr-parr productivity[t]	Juvenile occurrence[t]	--
	North Fork Salmon	Parr density[g]	Parr-parr productivity[t]	Juvenile occurrence[gt]	--
	Lemhi River	--	Parr-parr productivity[t]	Juvenile occurrence[t]	--
	Pahsimeroi River	Parr density[g]	Parr-parr productivity[t]	Juvenile occurrence[gt]	--
	East Fork Salmon	--	--	--	--
	Upper Main Salmon	Parr density[g]	Parr-parr productivity[t]	Juvenile occurrence[gt]	--

[g] based on a generalized random-tessellation stratification design
[t] based on non-random trend transects

Appendix C. Other Project Accomplishments

Presentations by project personnel

Johnson, J., T. Johnson, and T. Copeland. 2011. Comparison of Life Histories in Precocial Parr, Minijack, and Jack Chinook Salmon as Inferred from Scale Patterns. Poster presented at the Idaho Chapter American Fisheries Society annual meeting. March 2011. Boise, Idaho.

Kennedy, P. 2011. Carcass Surveys: The importance and use of biological data. Oral presentation at the annual cooperative spawning ground survey training. August 9, 2011. Stanley, Idaho.

Johnson, J. 2011. An explanation and demonstration on how to conduct Chinook salmon carcass surveys. Presented at the annual cooperative spawning ground survey training. August 5, 2011, Stanley, Idaho.

Publications

Copeland T., and K. A. Meyer. 2011. Interspecies synchrony in salmonid densities associated with large-scale bioclimatic conditions in Central Idaho. Transactions of the American Fisheries Society 140:4. pp 928-942.

Data Management

Project efforts with data management begin with training personnel prior to data collection. When sampling in the field during data collection we foster a strict regard for quality assurance. All project data are then monitored for quality control before they are incorporated into databases for long-term storage and reliable dissemination. Database maintenance is directed toward the Standard Stream Survey database, the Biosamples database, the Lower Granite Dam database, and the Spawning Ground Survey database. We also updated the generalized fish distribution for Idaho in StreamNet (www.streamnet.org/). All project data are available via the Idaho Fish and Wildlife Information System (https://fishandgame.idaho.gov/ifwis/portal/).

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