FISHERY RESEARCH

IDAHO STEELHEAD MONITORING AND EVALUATION STUDIES

ANNUAL PROGRESS REPORT
January 1, 2009—December 31, 2009

Photo: Ron Roberts

Prepared by:

Timothy Copeland, Senior Fishery Research Biologist
Ronald V. Roberts, Senior Fishery Technician

IDFG Report Number 10-08
May 2010

IDAHO STEELHEAD MONITORING AND EVALUATION STUDIES

Project Progress Report

2009 Annual Report

By

Timothy Copeland
Ronald V. Roberts

Idaho Department of Fish and Game
600 South Walnut Street
P.O. Box 25
Boise, ID 83707

To

U.S. Department of Energy
Bonneville Power Administration
Division of Fish and Wildlife
P.O. Box 3621
Portland, OR 97283-3621

Project Number 1990-055-00
Contract Number 40650

IDFG Report Number 10-08
May 2010

TABLE OF CONTENTS

Page

ABSTRACT....1
INTRODUCTION....2
OBJECTIVES....2
  Report Topics....3
METHODS....3
  Adult Abundance and Productivity....3
    Adult Abundance and Sex Ratio....3
    Adult Age Composition....4
  Juvenile Abundance and Productivity....4
    Juvenile Abundance....4
    Juvenile Age Composition....5
  Spatial Structure....5
  Diversity....6
    Adult Migration Timing....6
    Smolt Migration Timing....6
    Genetic Diversity....6
  Water Temperature Monitoring....7
RESULTS....7
  Adult Abundance and Productivity....7
    Adult Abundance and Sex Ratio....7
      Fish Creek....7
      Rapid River....7
    Adult Age Composition....8
      Fish Creek....8
      Rapid River....8
      Other Locations....8
  Juvenile Abundance and Productivity....8
    Juvenile Abundance....8
      Fish Creek....8
      Rapid River....9
      Big Creek....9
    Juvenile Age Composition....10
  Spatial Structure....11
    Fish Creek Drainage....11
    Marsh Creek Drainage....11
    Rapid River Drainage....11
    Other Drainages....11
  Diversity....12
    Adult Migration Timing....12
      Fish Creek....12
      Rapid River....12
    Smolt Migration Timing....12
    Genetic Diversity....13
  Water Temperature Monitoring....13
DISCUSSION....13

Table of Contents, continued.

Page

Adult Abundance and Productivity....13
Juvenile Abundance and Productivity....14
Spatial Structure....15
Diversity....15
Water Temperature Monitoring....16
SUMMARY....16
ACKNOWLEDGEMENTS....17
LITERATURE CITED....18

LIST OF TABLES

Page

Table 1. Capture date percentiles of adult steelhead at the Fish Creek (Lochsa population) and Rapid River (Little Salmon population) weirs in 2009. N = number of fish. 20

Table 2. The number and mean length, by sex, of wild adult steelhead captured at Fish Creek (Lochsa population) and Rapid River (Little Salmon population) weirs during 2009. 20

Table 3. Number of fish by age of adult steelhead sampled at weirs during spring 2009. Age values before the period denote freshwater ages and values after denote saltwater ages. X means a freshwater age was not assigned....21

Table 4. Mean fork length (mm) at age of juvenile steelhead captured at screw traps in locations within the Clearwater and Salmon drainages during spring 2009 (March 1–May 31). Number of fish aged is in parentheses. 22

Table 5. Mean fork length (mm) at age of juvenile steelhead captured at screw traps in locations within the Clearwater and Salmon drainages during summer 2009 (June 1–August 14). Number of fish aged is in parentheses. 23

Table 6. Mean fork length (mm) at age of juvenile steelhead captured at screw traps in locations within the Clearwater and Salmon drainages during fall 2009 (August 15 – November 31). Number of fish aged is in parentheses. 24

Table 7. Densities (fish/100 m^2) of salmonids observed at basinwide sites snorkeled in the Fish Creek drainage (Lochsa steelhead population) during 2009. Trout fry includes all trout <50 mm. Sites are arranged by elevation (high to low). 25

Table 8. Densities (fish/100 m^2) of salmonids observed at basinwide sites snorkeled in the Marsh Creek drainage (Upper Middle Fork Salmon steelhead population) during 2009. Trout fry includes all trout <50 mm. Sites are arranged by elevation (high to low). 26

Table 9. Densities (fish/100 m^2) of salmonids observed at basinwide sites snorkeled in the Rapid River drainage (Little Salmon steelhead population) during 2009. Trout fry includes all trout <50 mm. Sites are arranged by elevation (high to low). 27

Table 10. Number of PIT-tagged steelhead smolts that were detected in the hydrosystem during 2009 by population and year tagged. See Methods for a list of interrogation sites. 28

Table 11. Percentile dates of arrival at Lower Granite Dam for PIT-tagged steelhead smolts detected in spring 2009....28

Table 12. Streams sampled for water temperatures in 2009. Measurements were taken within 1 km of the mouth of each stream unless otherwise noted. 29

Table 13. Adult abundance of wild adult steelhead in Fish Creek (Lochsa population) and Rapid River (Little Salmon population), 2007-2009. Confidence intervals are given in parentheses for Fish Creek only; Rapid River abundance is a census. 30

Table 14. Number of scale samples received from wild adult steelhead during 2007-2009 by population and location....30

List of Tables, continued.

Page

Table 15. Juvenile steelhead abundance at traps operated by ISMES, 2007-2009. Confidence intervals (95%) are in parentheses. 30

Table 16. Number of scale samples received from screw traps sampling wild juvenile steelhead during 2007-2009, by population and location. 31

Table 17. Data collected by ISMES during 2007-2009 as applicable to viable salmonid population criteria for steelhead populations. 32

LIST OF FIGURES

Figure 1. Locations of weirs and screw traps collecting steelhead in Idaho. The Clearwater Major Population Group is in pink, the Salmon in purple. Population boundaries are shown as light gray lines. 33

Figure 2. Daily number of steelhead juveniles (bars) captured in the Fish Creek screw trap and river level (line; ft) during 2009. Spring (n = 12) is top panel; summer (n = 837) is middle panel; and fall (n = 4,929) is bottom panel. Note difference in the left-axis scale in each panel. 34

Figure 3. Relative length frequency of steelhead juveniles captured in the Fish Creek screw trap during 2009. Spring (n = 12) is top panel; summer (n = 837) is middle panel; and fall (n = 4,929) is bottom panel. 35

Figure 4. Daily number of steelhead juveniles (bars) captured in the Rapid River screw trap and river level (line; ft) during 2009. Spring (n = 219) is top panel; summer (n = 131) is middle panel; and fall (n = 288) is bottom panel. 36

Figure 5. Relative length frequency of steelhead juveniles captured in the Rapid River screw trap during 2009. Spring (n = 219) is top panel; summer (n = 131) is middle panel; and fall (n = 288) is bottom panel. 37

Figure 6. Daily number of steelhead juveniles (bars) captured in the Big Creek screw trap and distance from pack bridge to water surface (line; cm) during 2009. Spring (n = 302) is top panel; summer (n = 464) is middle panel; and fall (n = 1,515) is bottom panel. 38

Figure 7. Relative length frequency of steelhead juveniles captured in the Big Creek screw trap during 2009. Spring (n = 302) is top panel; summer (n = 464) is middle panel; and fall (n = 1,515) is bottom panel. 39

ABSTRACT

The goal of Idaho Steelhead Monitoring and Evaluation Studies (ISMES) is to evaluate the status of wild steelhead populations in the Clearwater and Salmon river drainages. Abundance and life history data were collected in Fish Creek (Lochsa River tributary), Rapid River (Little Salmon River tributary), and Big Creek during 2009. In general, weirs were operated to estimate adult escapement; snorkel surveys were conducted to estimate parr density; screw traps were operated to estimate juvenile emigrant abundance and to tag fish for survival estimation. We also collected samples for age determination and genetic analysis. The estimated escapement into Fish Creek was 218 fish. Escapement into Rapid River was 108. Snorkel surveys of the Fish Creek, Marsh Creek, and Rapid River drainages were completed. We estimated juvenile emigration in 2009 was 15,278 steelhead from Fish Creek, 3,877 steelhead from Rapid River, and 21,918 steelhead from Big Creek. To estimate age composition, scale samples from 344 adult and 4,576 juvenile samples had been aged. The Eagle Fish Genetics Laboratory completed analyzed a group of samples from the upper Salmon River for addition to the genetic baseline for steelhead and to resolve questions regarding genetic population structure in the upper Salmon watershed. Water temperature was recorded at 23 locations in the Clearwater and Salmon river drainages.

The ISMES project is in the midst of expanding and adapting. The amount of coordination, work, and data produced has increased and will continue to do so. Several events have occurred or will occur in the near future that are driving these changes: completion of the 2007-2009 funding cycle and the proposal process for continued funding; development of a regional research, monitoring, and evaluation (RM&E) strategy; the upcoming status review for anadromous salmonids on the West Coast. We summarized ISMES activities for 2007-2009 and previewed items developed in the regional RM&E strategy that were included in the project proposal for future work (approved May 2010).

Authors:

Timothy Copeland
Senior Fishery Research Biologist

Ronald V. Roberts
Senior Fishery Technician

INTRODUCTION

Populations of steelhead trout *Oncorhynchus mykiss* in the Snake River basin declined precipitously 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 *O. tshawytscha* 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 into the Snake River basin declined again (Busby et al. 1996). While hatchery returns increased, the returns of naturally produced steelhead trout remained critically low, especially for stocks with later run timing (B-run populations; Busby et al. 1996). As a result, Snake River steelhead trout (hereafter steelhead) were classified as threatened under the Endangered Species Act (ESA) in 1997. Within the Snake River steelhead evolutionarily significant unit, there are six major population groups, of which three are located in Idaho (Clearwater River, Salmon River, and Hells Canyon; ICBTRT 2003). A total of 17 demographically independent populations have been identified within Idaho (ICBTRT 2003).

Federal management agencies in the Columbia basin are required to mitigate for hydroelectric impacts and recover all ESA-listed salmonid populations, including steelhead. In addition, the Idaho Department of Fish and Game (IDFG) has the long-term goal of preserving naturally-reproducing steelhead populations and recovering them to levels that will provide a sustainable harvest (IDFG 2007). Management to achieve these goals requires an understanding of how salmonid populations function (McElhany et al. 2000) as well as regular monitoring for status assessments. However, specific data on Idaho steelhead populations are lacking. Estimates of key parameters such as population abundance, age composition, genetic diversity, recruits per spawner, and survival rates (ICBTRT 2003) are needed to assess the population viability of salmonid populations using criteria of abundance, productivity, spatial structure and diversity (McElhany et al. 2000).

The goal of Idaho Steelhead Monitoring and Evaluation Studies (ISMES) is to provide information to guide restoration of wild steelhead populations in Idaho until they can sustain fisheries. Data are collected in selected spawning tributaries in the Clearwater and Salmon river basins. We also sample wild adult steelhead during the spring and fall at Lower Granite Dam. Because of the collaborative nature of that work and the need for more timely reporting than the calendar-year cycle of this project, the full description of work at Lower Granite Dam will be contained in a separate report issued by all IDFG projects conducting operations at Lower Granite Dam.

OBJECTIVES

1. Estimate wild adult steelhead escapement, sex ratio, age composition, and run timing at Fish Creek and Rapid River.

2. Estimate wild steelhead parr density in selected tributaries of the Clearwater and Salmon drainages.

3. Estimate abundance, timing, and age composition of wild juvenile steelhead emigrants from selected tributaries of the Clearwater and Salmon drainages.

4. Estimate wild steelhead smolt survival and migration timing from selected tributaries to Lower Granite Dam, through the hydrosystem, and to adult return.

5. Develop productivity metrics for wild steelhead populations in Idaho.

6. Describe the temporal and spatial patterns in genetic diversity of wild steelhead populations in Idaho.

7. Monitor water temperatures in selected tributaries of the Clearwater and Salmon drainages.

Report Topics

Past reports have been organized by objectives given in the most current proposal (submitted 2006), which is how they are listed above. However, now more emphasis is being given to assessment using the viable salmonid population (VSP) criteria. To facilitate such assessments, we are changing the format of this report. The VSP criteria are the new subsections: adult abundance and productivity, juvenile abundance and productivity, spatial structure, and diversity. The abundance and productivity subsections include age composition, sex ratio, hatchery fraction, as well as abundance estimates. Ideally, spatial structure would be assessed by redd locations, but steelhead redd counts in Idaho are not reliable because of snowmelt-related turbidity and changing flow conditions during the spring spawning period (Thurow 1985); therefore, we use parr distribution as a surrogate. The diversity subsection will include migration timing and genetic data. The final subsection will be water temperature monitoring, which is directed towards habitat rather than fish. Population designations are also important. Most fieldwork took place in Fish Creek, which is part of the Lochsa population; in Rapid River, which is part of the Little Salmon population; and in Big Creek, which is part of the Lower Middle Fork Salmon population (Figure 1).

METHODS

Adult Abundance and Productivity

Adult Abundance and Sex Ratio

The aggregate escapement of Snake River steelhead is measured at Lower Granite Dam in Washington State (excluding the Lower Snake population, which spawns primarily in the Tucannon River). Some of these fish are headed to Washington or Oregon, but the vast majority is destined for Idaho. In Idaho, a portion of the escapement for some populations is measured at weirs, such as in Rapid River (Little Salmon River population) and in Fish Creek (Lochsa River population; Figure 1). The Fish Creek weir is the only weir in Idaho operated solely for wild B-run steelhead.

We operated a temporary picket weir to estimate escapement in Fish Creek. Adult steelhead moving upstream entered a holding box that was checked several times daily. The trap tender removed the trapped fish with a net and placed them in a plastic livestock trough for processing. Gender was determined based on external sex characteristics, e.g., a developed kype for males. Fork length (FL) was measured to the nearest centimeter. Each fish was examined for marks or tags and scanned for the presence of a passive integrated transponder (PIT) tag or coded wire tag. Scales were collected and a small portion of the anal fin was removed for a genetics tissue sample. All fish were marked with a right opercular punch and released upstream of the weir, except hatchery fish were transported to the Lochsa River and released without processing. Using software developed by Steinhorst et al. (2004), we estimated escapement above the weir with Bailey's modification of the Lincoln-Peterson estimator. The 95% confidence intervals were computed with the bootstrap option (2,000 iterations). Program inputs were number of adults passed above the weir and the number of marked and unmarked kelts recovered.

We assisted hatchery staff at the Rapid River Hatchery to operate a permanent weir to enumerate steelhead escapement in Rapid River. This weir is a velocity barrier with the trap located in the fish ladder. Steelhead were processed as in Fish Creek. Hatchery fish are not released above the trap. Because fish cannot pass the trap without passing through the ladder, adult steelhead escapement was the total number of adults trapped. This number is considered a complete census and has no variance.

Adult Age Composition

Technicians processed scale samples in the IDFG Nampa Fisheries Research aging laboratory. Scales were examined for regeneration and 6-10 non-regenerated scales were cleaned and mounted between two glass microscope slides. Scales were examined on a computer video monitor using a Leica DM4000B microscope and a Leica DC500 digital camera. A technician chose the best scales for aging the fish and saved them as digitized images. The entire scale was imaged using the 12.5x magnification. In addition, the freshwater portion was imaged using the 40x magnification. Two technicians independently viewed each image to assign ages without reference to fish length. If there was no age consensus among the readers, a third reader viewed the image and all readers collectively examined the image to resolve their differences before a final age was assigned. If a consensus was not attained, the sample was excluded from further analysis.

Freshwater annuli were defined by pinching or cutting-over of circuli within the freshwater zone in the center of the scale. The criterion for a saltwater annulus was the crowding of circuli after the rapid saltwater growth had begun. We used only visible annuli formed on the scales, excluding time spent overwintering in fresh water prior to spawning. A spawn check was identified as a ragged scar-like mark within the saltwater zone. We use the European system to designate ages: freshwater age is separated from saltwater age by a decimal. Total age at spawning is the sum of freshwater and saltwater ages, plus 1.

Juvenile Abundance and Productivity

Juvenile Abundance

Abundance of emigrating juvenile steelhead was estimated from data collected at rotary screw traps located near the mouths of Fish Creek, Rapid River, and Big Creek (Figure 1). The traps were checked daily, and the number of steelhead captured and tagged was recorded. Each fish was scanned before tagging to verify that it had not been previously tagged. All steelhead ≥80 mm were PIT tagged, measured (FL, nearest mm) and weighed (nearest 0.1 g). The tag files were uploaded to the PTAGIS database (www.ptagis.org). After PIT-tagging, juvenile steelhead were released at least 300 m upstream of the screw traps. Recaptured fish were released downstream of the traps. When >50 steelhead were tagged in a day, only 50 fish were released upstream of the trap and the remainder were released downstream of the trap. When ≤50 steelhead were trapped in a day, all of the newly tagged fish were released upstream of the trap for estimation of trap efficiency. Flow conditions were recorded, either as flow at nearby stream gauges or as depth below the sill of the trap. In Big Creek, flow is indexed by the distance from a nearby bridge to water surface.

Data from each trap are summarized by season in this report. The seasonal designations we used are arbitrary but are consistent with past ISMES reports. Spring was from trap installation until May 31. Summer was from June 1 to August 14. Fall was from August 15 until trap removal. Using software developed by Steinhorst et al. (2004), we estimated emigrant abundance by season with Bailey's modification of the Lincoln-Peterson estimator. The 95% confidence intervals were computed with the bootstrap option (2,000 iterations).

Juvenile Age Composition

We estimated emigrant age composition using scale samples collected at most of the screw traps operated in Idaho (Figure 1). Screw trap tenders from ISMES collected scale samples from juvenile steelhead caught in Fish Creek, Rapid River, and Big Creek. Scale samples were also collected at screw traps operated by the Idaho Supplementation Studies (ISS, project 1989-098-00), the Johnson Creek Artificial Propagation Enhancement Project (JCAPE, project 1996-043-00), the Integrated Status and Effectiveness Monitoring Program (ISEMP, 2003-017-00) for a total of 22 locations (see Figure 1). We processed scale samples from the Potlatch River Steelhead Monitoring and Evaluation project but those results are reported by that project. We did not receive samples from four traps shown in Figure 1 (Lolo Creek, Newsome Creek, Meadow Creek, Yankee Fork). Scales were collected and processed as described above for adults, except that laboratory technicians examined scales using 100x magnification.

Spatial Structure

Snorkel surveys were used to estimate distribution and density of steelhead parr. Methods were identical to those used by the Idaho Natural Production Monitoring and Evaluation Project (INPMEP, project 1991-073-00) and fieldwork was planned in coordination with crews from that project. Site selection was based on a generalized random-tessellation stratification design, i.e. a spatially-balanced probabilistic selection from all potential sites (Stevens and Olsen 2004, Stevens et al. 2007). A list of all potential sites in the Clearwater and Salmon basins was obtained from the Columbia River basin master sample (Stevens et al. 2007) constructed by personnel in the Environmental Protection Agency office in Corvallis, Oregon. These sites were plotted on a 1:100,000 stream layer and their order randomized by EPA. The basins of interest in 2009 were Fish Creek, Rapid River, and Marsh Creek. We used the anadromous stream data layer from StreamNet (www.streamnet.org) to determine which sites in each watershed were within the anadromous production zone. The potential sites that fell within a 100 m buffer of an anadromous stream were retained. The minimum number of sites was 20 for Fish Creek, 20 for Rapid River, and 25 for Marsh Creek. A list of approximately twice the desired number of sites was drawn for both watersheds. The snorkel crew also surveyed 20 historic trend sites.

The site list was narrowed down to a logistically feasible plan before snorkel crews began field operations. Some new sites were inspected, documented, and photographed before the field crew arrived. Each potential site had a design number that was used as the unique site identifier for data entry forms and the IDFG Standard Stream Survey database. Site priority started with the lowest design number (high priority) and proceeded to the highest number (low priority). High priority sites were included or rejected before lower-priority sites could be considered in survey plans. Criteria for rejection were: 1) the site could not be safely surveyed or site boundaries adjusted to make it safe (see next paragraph); 2) the location was above barriers to spring movement of adult steelhead; 3) the site was dry at the time of survey (record as 0 abundance); 4) a private landowner denied access to the site; or 5) the site was too wide or complex to be surveyed efficiently by the full crew. Survey dates were arranged as logistics dictated and did not always follow the priority order. Sites that have been historically sampled in the past for General Parr Monitoring (GPM) were repeated as time and logistics allowed. The purpose of surveying the GPM sites was to provide a link between the new site selection protocol and previous statewide monitoring. All data from GPM sites will be reported by INPMEP.

Field surveys were done after preliminary site evaluations. Site locations and lengths were adjusted by the crew leader based on actual stream conditions. The desired average site length was 100 m. Actual site bounds were adjusted to fit within hydraulic controls. If necessary, a site was moved up to 500 m from the designated point, but no further than necessary. The percentage of each habitat type (pool, pocket water, riffle, or run) within the site was visually estimated and recorded. One to five snorkelers counted fish in each site, depending on the stream size and visibility. All salmonids observed were counted and individual size was estimated to the nearest inch while moving slowly upstream. Chinook salmon parr were assigned an age based on length. Non-salmonid species observed were noted as present. After the crew snorkeled each site, they measured site length and up to ten widths to calculate surface area. Gross habitat characteristics were also evaluated. Data were entered into the IDFG Standard Stream Survey database.

Diversity

Adult Migration Timing

We estimated the timing of adult steelhead returning to Fish Creek and Rapid River through the hydrosystem. The PTAGIS database (www.ptagis.org) was queried to obtain detection dates of fish PIT tagged as juveniles in Fish Creek or Rapid River and returning to spawn as adults between July 1, 2008 and June 30, 2009 at Bonneville, McNary, Ice Harbor, and Lower Granite dams. We calculated the proportion detected at Bonneville Dam that was also detected at upstream dams and at the Fish Creek/Rapid River traps, i.e. the conversion rate.

Smolt Migration Timing

We ascertained smolt detection rates and emigration timing during the 2009 emigration using PIT-tagged fish detections downstream of the three ISMES traps. The PTAGIS database (www.ptagis.org) was queried to obtain detection date and location, tagging date and location, and the length and weight at tagging of all wild steelhead smolts tagged by ISMES. Potential interrogation sites were Lower Granite, Little Goose, Lower Monumental, McNary, John Day, and Bonneville dams; the Clearwater, Salmon, and Snake River smolt traps; and the upper estuary towed array. Passage date at LGD was calculated for three percentiles (10%, 50%, and 90%) for each trap location.

Genetic Diversity

Since 2000, ISMES has collected tissue samples for genetic analysis from populations that span the range of geographic, temporal, and phenotypic variability observed in the Salmon and Clearwater basins (Nielsen et al. 2009). We also analyzed a group of samples (n = 85) from three locations in the upper Salmon River basin to expand coverage of the genetic baseline in that area. Genetic analyses were conducted by the IDFG Eagle Fish Genetics Laboratory.

Water Temperature Monitoring

Water temperatures were monitored in tributaries throughout the Clearwater and Salmon river drainages with temperature recorders to obtain yearly temperature profiles from streams with wild steelhead populations. The streams span a range of elevation, geomorphic, and vegetative cover found in Idaho's steelhead streams. Water temperature was recorded every 0.25 h for the entire year. The daily mean, maximum, and minimum water temperatures were calculated for each stream. These data are stored in a database located at the IDFG Nampa Fisheries Research office.

RESULTS

Adult Abundance and Productivity

Adult Abundance and Sex Ratio

Fish Creek—Operation of the Fish Creek weir began March 14 and the first adult fish was captured on March 22, 2009 (Table 1). High flows began in late April and peaked in mid-May. Large amounts of debris were associated with the high flows and the weir was breached on May 18. The weir was inoperable for 26 days but was re-erected and repaired on June 13. The last spawner moving upstream was captured on June 20.

Trap tenders passed 94 spawners upstream and 30 unmarked kelts downstream, for a total of 124 individuals handled (Table 2). Three hatchery fish were also collected at the weir but were not passed; the hatchery ratio was 3%. The escapement estimate is based on 20 marked and 30 unmarked kelts returning back to the weir. In addition, there was one marked kelt that escaped before it could be collected and there were two marked fish mistakenly released below the weir. Based on this information, we estimate that the 2009 escapement above the weir was 218 fish (95% CI 152—312).

The sex ratio was 66% female for spawners and 84% for kelts (Table 2). The mean FL of all females including kelts was 81 cm and ranged from 64 cm to 89 cm. The mean FL of all males including kelts was 77 cm and ranged from 60 cm to 95 cm.

The first female spawner was trapped on March 22 and the first male on April 4 (Table 2). The midpoint of the female spawner run was May 8 and the midpoint of the male spawners run was April 29. The midpoint for both sexes combined was May 3. Assessing the true timing of the run is impossible because of the extended period that the weir was inoperable. However, the first kelts were collected before the weir was breached and four fish were passed upstream after the weir was repaired.

Rapid River—Operation of the Rapid River weir began March 16 and the first adult fish was captured March 24, 2009 (Table 1). The last spawner moving upstream was captured on June 30. It is not possible to capture kelts at the Rapid River weir.

Trap tenders passed 108 spawners upstream (Table 2). An additional 18 adipose-clipped hatchery fish and 9 unclipped hatchery fish were also collected at the weir but were not passed. The hatchery ratio was 20%, of which 33% were not clipped. The number of trapped fish is considered a population census without error.

The sex ratio of the wild fish was 58% female (Table 2). The mean FL of females was 70 cm and ranged from 55 cm to 83 cm. The mean FL of males was 68 cm and ranged from 53 cm to 90 cm.

The first female spawner was trapped on April 17 and the first male spawner arrived on March 24 (Table 2). The midpoint of the female spawner run was May 21 and the midpoint of the male spawner run was May 12. The midpoint for both sexes combined was May 12.

Adult Age Composition

Fish Creek—All 124 unique steelhead adults collected at the weir were aged (Table 3). The majority (85%) had spent two years in the ocean, although 12% had spent one year and 3% had spent three years. There were 107 fish that had both freshwater and ocean ages assigned; the majority (87%) smolted after three years in freshwater, although some smolted after two or four years. Total ages ranged from four to seven years at spawning. There were seven different age classes identified.

Rapid River—All 108 adult steelhead collected at the Rapid River weir were aged (Table 3). About half (52%) had spent one year in the ocean and the other half (48%) had spent two years in the ocean. There were 97 fish that had both freshwater and ocean ages assigned. Most fish smolted after two years (49%) or three years (47%) in freshwater, although some smolted after four years. Total ages ranged from four to seven years at spawning. There were six different age classes identified.

Other Locations—We received scale samples from adults collected at the Sawtooth Hatchery weir, Big Creek, and the Pahsimeroi Hatchery weir. Only one sample was collected in Big Creek. No samples were collected at Crooked River because the weir was pulled during high water. Most (68%) of the fish at Sawtooth had spent one year in the ocean (Table 3), although there were some that spent two years (29%) or three years (3%). Total ages ranged from four to eight years. There were six different age classes identified. From the Pahsimeroi sample, three repeat spawners were identified; these fish were excluded from Table 3. Of the remaining Pahsimeroi fish, 19 were assigned total ages, ranging from three to five years in five age classes. Most (65%) had spent one year in the ocean, the rest spent two years.

Juvenile Abundance and Productivity

Juvenile Abundance

Fish Creek—The Fish Creek screw trap operated from March 12 to November 6, 2009. There were problems with ice for the first three days and then again for two days in October. Because of high water, the trap did not operate for a full day on eight days and was pulled completely for nine days from mid-April though late May. During high flows, a rock shifted into the thalweg and prevented the trap being put into the best positions for high-flow trapping. Consequently, trap efficiency was poor through most of the spring and early summer.

We trapped 12 juvenile steelhead during the spring, 837 during the summer, and 4,929 during the fall (Figure 2). These numbers include 237 fish <80 mm FL, which are not included in the population estimate below. Daily catches were <10 through the spring and most of the summer. Summer catch peaked at 108 on August 8, one day after the first peak in flow after spring runoff. There were several peaks in the fall catch, generally after rain events that caused flow to increase. Average daily catch was >50 steelhead during the fall. Seasonal trap efficiencies were 6%, 20%, and 42% for the spring, summer, and fall, respectively. There were no recaptures at the trap during the spring, so we combined the spring period with early summer (recapture period through June 21). This procedure would overestimate efficiency but give a conservative population estimate. We estimated 15,278 juvenile steelhead ≥80 mm FL (95% CI 14,352–16,048) emigrated from Fish Creek during the trapping period.

There were too few fish trapped to describe the length frequency of spring emigrants effectively (Figure 3). The summer and fall length distributions were broadly unimodal and skewed left. The summer mode was 150 mm FL and the fall mode was 160 mm FL.

Rapid River—The Rapid River trap operated from March 9 to November 3, 2009. The release of hatchery Chinook salmon from the Rapid River Hatchery began on March 16. We ran the trap for about 8 hours a day with continuous monitoring by the trap tenders until April 24. The trap ran either in the morning or evening, alternating daily. By April 24, enough of the Chinook smolts had emigrated such that we were able to run the trap round the clock. The trap was pulled for high water from May 18 to June 17. One of the anchor posts began to give way and had to be repaired. There were six days in late October when accumulated leaves interfered with trap operations.

We trapped 219 juvenile steelhead during the spring, 131 during the summer, and 288 during the fall (Figure 4). These numbers include 159 fish <80 mm FL, which are not included in the population estimate below. We collected five fish during the hatchery Chinook release period. After April 24, daily average catch was nine fish until high water began. Daily catches were low during the summer, peaking at 10 on July 19 and July 24. There were two peaks in the fall catch after rain events. Average daily catch was <5 steelhead during the fall, with several peaks. The largest peak was 38 fish on October 15. Seasonal trap efficiencies were 19%, 12%, and 9% for the spring, summer, and fall respectively. We estimated 3,877 juvenile steelhead ≥80 mm FL (95% CI 2,844–5,316) emigrated from Rapid River during the trapping period.

In general, the length frequency distribution of the steelhead catch in Rapid River had two peaks (Figure 5). There was a peak less than 100 mm FL throughout the year. In the spring, the mode for fish >100 mm FL was 177 mm. Few fish >100 mm FL were collected during the summer. The mode for fall fish >100 mm FL was very broad and peaked at 182 mm.

Big Creek—The Big Creek trap operated from March 10 to November 11, 2009. Due to spring ice, snowmelt, and summer rain events with tributary blowouts, the trap was pulled for a total of 45 days throughout the season. In all, the trap was run for 197.5 days during 2009. There were some problems with predators frequenting the trap. We recovered 42 dead fish found on or in the trap that were not killed by other fish. The most likely predators were mink. Four mink were seen together near the Rush Creek confluence in July; one was live trapped and relocated to Horsethief Reservoir near Cascade. A total of 12 PIT tagged Chinook were detected inside bull trout. All large bull trout captured were transported several hundred meters downstream from the trap for release to minimize the likelihood of recapture. We applied a small caudal clip to a subsample of bull trout to monitor incidents of recapture. Of 52 fish marked, we documented three recaptures. We have tried many types and amounts of cover/refuge for small fish within the trap box. A combination of shrubbery and an overturned laundry basket is the most recent strategy used.

We trapped 302 juvenile steelhead during the spring, 464 during the summer, and 1,515 during the fall (Figure 6). The maximum daily catch in the spring was 32. The trap was inefficient due to high flows and was not operated during peak flows (May 18–June 9). Once the trap was operational again (June 10), catch fluctuated at low levels for most of the summer (median daily catch = 4.5 steelhead). Summer catch peaked at 43 on August 9. There were several peaks in the fall steelhead catch but it declined to low levels after mid-October. Seasonal trap efficiencies were 7%, 6%, and 9% for the spring, summer, and fall respectively. We estimated 21,918 juvenile steelhead ≥80 mm FL (95% CI 18,424–26,334) emigrated from Big Creek during the trapping period.

The largest mode in the length frequency of the steelhead catch in each season was in lengths <90 mm FL (Figure 7). The mode of larger steelhead (>100 mm FL) was stable during the year and ranged from 168 mm in the spring to 175 mm in the fall.

Juvenile Age Composition

A total of 4,782 scale samples were taken from juvenile steelhead at 22 screw trap locations in 2009. A total of 4,576 samples have had an age assigned. We present number of fish aged and length at age by season.

There were 1,116 fish aged from samples during the spring period (Table 4). Ages ranged from one to six years. The largest fish at age 2 were from the Upper Lemhi, Lower Lemhi, and Pahsimeroi traps, respectively. This result also holds at age 1, if the single fish from Colt Killed Creek is disregarded. The locations with the smallest fish at age 2 were Lower Secesh and Johnson Creek. The locations with the oldest average ages were Colt Killed Creek, Crooked Fork, and Rapid River (3.45, 3.13, and 2.92 years, respectively). The locations with the youngest average ages were Pahsimeroi River, Upper Lemhi, and Sawtooth (1.14, 1.22, and 1.48 years, respectively). In general, locations with younger average ages had a less diverse age structure than locations with an older average age.

There were 1,012 fish aged from samples during the summer period (Table 5). Fish movement is reduced during the summer and ceases in some locations. Ages ranged from young of year to five years. Average lengths at age are similar but slightly larger than they were during the spring. The largest lengths at age for ages 1 and 2 were from the Upper Lemhi (excluding the single age-2 fish from East Fork Salmon River). The smallest lengths at age for age 1 were from Colt Killed Creek. Several locations had average length at age 2 <130 mm FL: Colt Killed Creek, American River, Lake Creek and the Lower Secesh River. In general, age compositions were younger and simpler than those in the spring.

There were 2,448 fish aged from samples during the fall period (Table 6). Ages ranged from young of year to four years. Young of year fish were collected in many locations and were abundant in four locations (Pahsimeroi, Sawtooth, Hayden Creek, and Lower Lemhi). At age 1, average length was greatest at Upper Lemhi, Lower Lemhi, and Pahsimeroi traps, respectively. The smallest average lengths at age 1 were at the Lower South Fork Salmon, South Fork at Knox Bridge, and Fish Creek traps. The oldest average age was at Lake Creek but there were only four fish collected. The locations with the oldest average ages were Colt Killed Creek, Lower Secesh, and Crooked Fork (2.62, 2.39, and 2.21 years, respectively). The locations with the youngest average ages were Pahsimeroi River and Sawtooth, with Hayden Creek and Upper Lemhi close together (0.58, 0.82, 0.96, and 0.99 years, respectively).

Spatial Structure

Fish Creek Drainage

The Fish Creek drainage was surveyed July 8 to July 15, 2009. A total of 17 sites were surveyed (Table 7). Four sites on the survey list were not snorkeled due to high water and time constraints. One site on Hungery Creek is four miles upstream with no trail access. High water made stream walking difficult and dangerous. An attempt was made to reach the site overland but two crew members were stung multiple times by yellowjackets and had to return to camp for medical aid. The other three sites were not surveyed due to time constraints and difficult access. These sites were of lowest priority and were dropped from the list.

Five salmonid taxa were observed within the Fish Creek drainage (Table 7): steelhead parr, trout fry, Chinook salmon parr, westslope cutthroat trout *Oncorhynchus clarkii lewisi* and mountain whitefish *Prosopium williamsoni*. Cutthroat trout were observed in all sites surveyed and their densities were greatest in the upper portion of the drainage. Steelhead parr were observed in all but two sites in the headwaters of Fish Creek. Steelhead parr were the most abundant taxa and densities ranged from 0.43/100 m^2 (upper Fish Creek) to 10.23/100 m^2 (Willow Creek). Mountain whitefish were the least abundant and only observed in the lowest two sites.

Marsh Creek Drainage

The Marsh Creek drainage was surveyed during July 22 to July 29, 2009. A total of 25 sites were surveyed (Table 8). Six salmonid taxa were observed within the drainage: steelhead parr, trout fry, Chinook salmon, bull trout *Salvelinus confluentus*, brook trout *S. fontinalis*, and mountain whitefish. Brook trout and steelhead parr were present in 72% and 64% of the sites, respectively. Steelhead parr densities ranged from 0.16/100 m^2 to 4.22/100 m^2 (average = 0.63/100 m^2). The most abundant species were Chinook par with a mean density of 5.16/100 m^2. The highest densities of Chinook parr were found in Cape Horn Creek where one site had a density of 55.97/100 m^2.

Rapid River Drainage

The Rapid River drainage was surveyed during August 5–12, 2009. A total of 20 sites were surveyed (Table 9). Six salmonid taxa were observed: steelhead parr, trout fry, Chinook parr (both hatchery and natural), bull trout, westslope cutthroat trout, and mountain whitefish. Steelhead parr were most abundant with a mean density of 3.03/100 m^2. They were observed in all but the upper six sites in the headwaters of Rapid River. Bull trout were observed in every site surveyed with a mean density of 1.18/100 m^2. They were the only species present in the upper six sites. Mountain whitefish were the least abundant and only observed in one site.

Other Drainages

Project personnel participated in surveys in two other drainages. The ISMES crew participated with the INPMEP snorkel crews in the training session and sampling trip in the Potlatch River drainage (June 10-15, 2009). The ISMES crew surveyed 17 sites in two days before heavy rain and turbid water cut the trip short by two days. The ISMES crew joined the Lewiston snorkel crew June 23-30, 2009 to finish the Potlatch survey and complete surveys in the South Fork Clearwater drainage. The results of the Potlatch and South Fork Clearwater surveys will be reported in the INPMEP 2009 annual report.

Diversity

Adult Migration Timing

Fish Creek—There were 50 individual adult steelhead detected in the hydrosystem during the 2008-2009 spawning run that were PIT-tagged in Fish Creek as juveniles. Median date of passage over Bonneville Dam was September 6, but fish passed from August 4 through September 26. All fish subsequently detected in the hydrosystem were first detected at Bonneville Dam. The conversion rate from Bonneville to McNary (n = 39) was 78%; from Bonneville to Ice Harbor (n = 36) was 72%; and from Bonneville to Lower Granite (n = 34) was 68%. There were 26 fish that passed Lower Granite during the fall and 8 during the spring. Median dates of passage for fall and spring migrants were October 1 and April 14, respectively.

The first PIT-tagged adult arrived at the Fish Creek weir on April 18 and 12 PIT-tagged fish were passed upstream before the weir failed on May 18. An additional PIT-tagged fish was collected that had been tagged as a smolt at Lower Granite Dam by NOAA Fisheries. Conversion rate from Lower Granite was 53%. There were nine PIT-tagged kelts that were recovered, of which four had been passed before the weir failed. Based on the latter four fish, median time above the weir was 41 days. This figure is likely biased high because fish with less time may have escaped while the weir was breeched.

Rapid River—There was only one adult steelhead detected in the hydrosystem during the 2008-2009 spawning run that was PIT-tagged in Rapid River as a juvenile. Additionally, there was a fish passed at the weir that had been tagged as a smolt at Lower Granite Dam by NOAA Fisheries. These fish passed Bonneville Dam as adults on August 19 and August 18 and Lower Granite on September 16 and September 20, respectively. They arrived at the Rapid River weir on April 17 and May 19.

Smolt Migration Timing

During spring 2009, there were 2,668 unique detections in the hydrosystem of steelhead smolts tagged in ISMES study streams from 2005 to 2009 (Table 10). Most of the detections (71%) were from fish tagged in Fish Creek; most were tagged 2007-2008 and had reared for a substantial period downstream of the trap. Only three Fish Creek smolts were detected from the 2009 tagging because of inefficient trap operations related to high flows. In contrast, detections of smolts from Rapid River were dominated by fish tagged in 2009 and there were no detections of fish tagged prior to 2008. There were detections of smolts tagged during the first year of operation of the Big Creek screw trap, 2007, but most detections were from fish tagged during 2008.

The period of smolt emigration was similar among all three populations, although the median passage date was not (Table 11). The 10th percentile arrival dates at Lower Granite Dam were within a week of each other (April 22-28). Similarly, the 90th percentile arrival dates were within a day (May 19-20). Median arrival dates were similar between Fish Creek and Big Creek, April 26 and April 25, respectively. Median arrival date of smolts from Rapid River was over two weeks later on May 12. Most smolts from Rapid River had started the spring emigration upstream of the Rapid River trap because they were tagged during spring 2009, whereas most smolts from Fish Creek and Big Creek were tagged in fall 2008 and had spent the winter downstream of those traps.

Genetic Diversity

The Eagle Fish Genetics Laboratory completed analyses to add to the genetic baseline for steelhead and to resolve questions regarding genetic population structure in the upper Salmon watershed. The samples analyzed were from Carmen Creek (near Salmon; n = 41), Morgan Creek (near Challis; n = 15), and Herd Lake (East Fork Salmon drainage; n = 29). Carmen Creek is a minor tributary to the Salmon River within the Lemhi steelhead population and is listed as occupied by wild fish in the current versions of the ESA population viability assessments (NOAA Fisheries, undated). Morgan Creek is also a minor tributary to the Salmon River but is considered to be within the East Fork Salmon population, as is Herd Lake. These areas are thought to be occupied by wild steelhead (NOAA Fisheries, undated). Results for Carmen and Morgan creeks suggest hatchery influence (Matt Campbell, personal communication). Samples from Herd Lake, which is above a natural barrier, exhibited significant genetic differentiation from all other steelhead populations in the upper Salmon River. This large differentiation does not appear to be the result of nonnative hatchery rainbow trout introgression. Rather, it is likely this is a group of native upper Salmon River *O. mykiss* whose diversity and differentiation is the result of a combination of founder effects and genetic drift acting on a small population that has been isolated for a long time (Matt Campbell, personal communication).

Water Temperature Monitoring

Water temperatures were recorded at 23 locations in the Clearwater River and Salmon River drainages (Table 12). The Rapid River and Big Creek temperature monitors were lost in high flows. In addition to water temperature, we recorded air temperature at Fish Creek. Data were downloaded and stored at the Nampa Fisheries Research office.

DISCUSSION

The ISMES project is in the midst of expanding and adapting to meet information needs concerning the status and trend of wild steelhead populations in Idaho. The amount of coordination, work, and data produced has increased and may continue to do so. Several events are occurring or will occur in the near future that are driving these changes: completion of the 2007-2009 funding cycle and the proposal process for continued funding; development of a regional research, monitoring, and evaluation (RM&E) strategy to support the 2008 Federal Columbia River Power System Biological Opinion (NPCC 2010a, 2010b); and the upcoming ESA status review for anadromous salmonids on the West Coast. The chief purpose of this report is to document the work done during 2009. However, we also briefly summarize activities for the period 2007-2009 and preview items developed in the regional RM&E strategy that are included in the project proposal for future work (approved May 2010). The discussion will proceed by objective.

Adult Abundance and Productivity

Adult sampling was conducted annually 2007-2009 in Fish Creek and Rapid River. Adult abundance has increased through this period at both locations but remains below recovery goals (Table 13). The Lower Granite sampling program was added in fall 2008 (Copeland and Putnam 2009) and has a single complete data point (spawn year 2009); results will be reported in a separate document.

Three initiatives need to be developed with reference to this objective in the future. First, the products of the Lower Granite Dam adult sampling need to be expanded to develop a final escapement estimate because adult steelhead migrate during times when the trap is closed (late summer and winter). This final estimate will use a combination of trap data and window counts. Further, the Lower Granite data must be reported on a spawn year basis to meet management information needs and therefore will be reported on a different schedule than this annual report. Second, by combining adult abundances with age composition, adult-to-adult productivity can be calculated over time. With this in mind, we have described age composition at several locations (Table 14, Figure 1). We coordinated with hatchery personnel and the Potlatch River project to collect scale samples, which are sent to ISMES personnel for age assignment. Cooperation with hatchery personnel for adult sampling should be strengthened and collection of kelts above the weir should be initiated to assess weir efficiency. This may require additional personnel to conduct such collections because the hatcheries are typically busy with Chinook broodstock collection during the kelt emigration period. Third, we will attempt to develop adult steelhead abundance for Big Creek using PIT-tag detections at the PIT antenna array at Taylor Ranch. This effort will entail cooperation with ISMEP (2003-017-00) and NOAA Fisheries (1991-028-00).

One of our objectives was to develop productivity metrics for wild steelhead populations in Idaho. Expansion of the scope of ISMES has come at the cost of an analytical backlog, but development of productivity estimates is underway. A paper was presented at the Pacific Coast Steelhead Management meeting in March 2010 in collaboration with the Potlatch River Steelhead Monitoring and Evaluation project. In summary, we examined migration timing, age composition, and length at age of young steelhead leaving their natal streams in 2008 (Big Bear Creek, East Fork Potlatch River, Fish Creek, Crooked Fork, and Rapid River). Age structure has implications for population productivity, which we are exploring. The intention is to develop a model incorporating age structure, water temperature, and other variables that influence growth and survival that can be used to predict the intrinsic productivity of steelhead populations in Idaho. The other initiative we will pursue with respect to productivity is to complete a cohort analysis on Fish Creek data to develop spawner:spawner productivity estimates by brood year. Unfortunately, total ages were not estimated for adult steelhead prior to 2007, so assumptions regarding freshwater age structure must be made.

Juvenile Abundance and Productivity

Juvenile abundances fluctuated widely at the three ISMES screw traps during 2007-2009 (Table 15). ISMES operates three screw traps at Fish Creek, Big Creek, and Rapid River (Figure 1). Further, various amounts of age data have been collected at 22 locations where screw traps were operated during 2007-2009 (Table 16). Beginning in 2009, the lower Secesh trap, formerly operated by ISMES, was operated by the Nez Perce Tribe as a cost-saving measure. We received scale samples from many screw traps operated by cooperating projects (Clear Creek, Crooked Fork, Colt Killed Creek, Crooked River, Red River, American River, Lake Creek, upper Secesh, upper and lower South Fork Salmon, Johnson Creek, Marsh Creek, upper and lower Lemhi River, Hayden Creek, Pahsimeroi River, and Salmon River at Sawtooth Hatchery; Figure 1). Beginning in 2008, we have provided aging expertise to the Potlatch River Steelhead Monitoring and Evaluation Project, which has five sample locations (Figure 1). In 2009, we began a similar arrangement with ISEMP for dispersed collections in the South Fork Salmon, Secesh, and Lemhi populations (these data will be reported by ISEMP). The only screw traps from which we have not received samples are Lolo Creek, Newsome Creek, Meadow Creek, and Yankee Fork. As should be apparent, the aging laboratory has grown considerably and may continue to grow. For example, sampling of steelhead smolts at Lower Granite Dam has been proposed and these samples will require age assignments.

Another objective was to estimate smolt survival from selected tributaries to Lower Granite Dam, through the hydrosystem, and to adult return. ISMES coordinates the PIT tagging of most wild juvenile steelhead in the Snake River basin. For the 2009 migratory year, ISMES and its cooperators tagged 75% of the steelhead tagged in the Salmon River and 48% in the Clearwater River. We have made good progress towards cooperative sampling and PIT-tagging of juvenile steelhead by other projects in Idaho but not all potential cooperators are working with us. We will continue to pursue such coordination. However, there is a backlog of unanalyzed data. Preliminary data summaries have been presented in each annual report, but full survival estimation from trap to Lower Granite Dam has not been completed. The major issue is that many steelhead do not migrate during the anticipated year but frequently delay one or more years. The commonly used model for estimating survival in the Columbia River hydrosystem (SURPH, Lady et al. 2001) assumes that lack of movement equals mortality and that detection probability is equal among individuals. This model may yield biased estimates when used on groups with a flexible life history with respect to migration timing. An alternative has been suggested by Lowther and Skalski (1998) for fall Chinook salmon in the Snake River but it has not been adapted for use by non-statisticians.

Spatial Structure

During 2007-2009, a spatially-balanced set of sites was surveyed annually in Fish Creek and Rapid River by ISMES snorkel crews. Boulder Creek (adjacent to Rapid River) and Marsh Creek were surveyed once. The ISMES snorkel survey effort was fully integrated and coordinated with the INPMEP program. As part of the overall snorkel survey program, ISMES personnel conducted 312 snorkel surveys in the Clearwater and Salmon major population groups. This workload included spatially-balanced sites and a set of historic trend sites. The ISMES snorkel crew surveyed sites that are reported in the INPMEP reports (e.g., Potlatch River, Marsh Creek, Lochsa trend sites, South Fork Clearwater trend sites). Snorkel surveys have been and will continue to be the primary method for doing extensive evaluations of steelhead population status in Idaho, at least until other means have been proven satisfactory. Plans are being made to shift all snorkel surveys from INPMEP to ISMES in the future.

Diversity

ISMES has contributed a major portion of the current genetic baseline for Snake River steelhead and has added another 20 collections during 2007-2009, mostly in the upper Salmon River drainage. Previous work led to a publication that advances our understanding of genetic structure of steelhead in Idaho at multiple spatial scales (Nielsen et al. 2009). We continue to add to that knowledge but emphasis is shifting towards application of these data as a baseline to inform genetic stock identification (GSI) analyses. In collaboration with IDFG's Eagle Fish Genetics Laboratory, GSI technology was used to identify the stock composition of adult wild steelhead passing Lower Granite Dam by sex, length, age, and run-timing beginning in fall 2008. A paper is in preparation describing the initial results of the GSI work. The GSI work will become a separate project in the future (2010-026-00), but ISMES will continue to collect samples to support genetic baseline maintenance and GSI.

Water Temperature Monitoring

The last 2007-2009 objective was to monitor water temperatures in selected tributaries of the Clearwater and Salmon drainages. During 2007-2009, we have streamlined this work and upgraded the equipment (Copeland and Putnam 2008). Several new sites have been added and redundant sites eliminated. The intention is to use these data to predict steelhead growth and juvenile age structure, as mentioned above. ISMES temperature monitoring takes place year-round, whereas many other projects only monitor during the growing season. This feature should make ISMES data valuable for studies on potential effects of climate change.

SUMMARY

In conclusion, ISMES has been the primary monitoring and evaluation project collecting data on wild steelhead in Idaho. Further, it has become the central repository for wild steelhead data collected by other projects. Status assessments are conducted on a population-level basis and with reference to the four viable salmonid population criteria: abundance, productivity, spatial structure, and diversity. During 2007-2009, ISMES has generated data relevant to these criteria in 11 of Idaho's 17 steelhead populations, as well as on the Snake basin level (Table 17). The project has grown enormously in the last three years in response to regional demands.

We have already submitted a proposal for activities in 2010-2014. ISMES has expanded to incorporate the mandate from the Idaho Fish Accord to assess the status of wild steelhead in Idaho. Project objectives are reframed to be consistent with the Snake River monitoring and evaluation goals developed by the RPA Workgroup, with the strategies put forth by the Snake River basin fish managers, and with the guidance from NOAA Fisheries (Crawford and Rumsey 2009). There are five annual objectives in the proposal: 1) Monitor status and trends of wild Snake River steelhead at Lower Granite Dam at the ESU scale by estimating abundance and age/sex composition. In cooperation with the new Genetic Stock Identification project (2010-026-00), we will break the aggregate estimates into major population groups and, in some cases, populations. Over time, productivity will be assessed at ESU- and finer-level spatial scales. 2) Conduct intensive, high-precision (fish in, fish out) monitoring of steelhead in Fish Creek, Rapid River, and Big Creek. We will estimate adult abundance, length distribution, sex ratio, and age composition; smolt abundance, length structure, and age composition; survival of juveniles from spawning stream to Lower Granite and smolt-to-adult return rate. 3) Support and coordinate intensive, high-precision (fish in, fish out) monitoring of wild steelhead at other locations in Idaho where appropriate infrastructure already exists. 4) Conduct extensive monitoring in selected streams to assess spatial structure and parr density and to collect water temperature data. 5) Monitor temporal and spatial genetic patterns of steelhead populations in Idaho, which will also support maintenance of the genetic baseline used by project 2010-026-00.

ACKNOWLEDGEMENTS

Kim Apperson supervised operation of the Big Creek trap. Nick Agins, David Bechtold, Larry Fisher, Jeff Grote, Sam Hagen, Brook Hudson, Bryce Oldemeyer, Caleb Price, Jerek Richardson, Will Schrader, Kiira Sitari, and Kevin Young conducted the fieldwork. Scales were aged by Stacey Dauwalter, Kristin Ellsworth, Pete Gardner, Lisa Kautzi, and Rachel Neuenhoff. Genetic analyses were provided by Matt Campbell and Christine Kozfkay. Cheryl Zink helped format and edit the document. This report benefitted from reviews by Cathy Gidley and Bill Schrader.

LITERATURE CITED

Busby, P. J., T. C. Wainwright, G. J. Bryant, L. J. Lierheimer, R. S. Waples, F. W. Wauneta, and I. V. Lagomarsino. 1996. Status review of West Coast steelhead from Washington, Idaho, Oregon, and California. NOAA Technical Memorandum NMFS-NWFSC-27.

Copeland, T., and S. Putnam. 2008. Idaho steelhead monitoring and evaluation studies. 2007 annual report to the US Department of Energy, Bonneville Power Administration. Contract 31601, Project 199005500. Idaho Department of Fish and Game Report 08-05, Boise, Idaho.

Copeland, T., and S. Putnam. 2009. Idaho steelhead monitoring and evaluation studies. 2008 annual report to the US Department of Energy, Bonneville Power Administration. Contract 36150, Project 199005500. Idaho Department of Fish and Game Report 09-05, Boise, Idaho.

Crawford, B. A., and S. Rumsey. 2009. Guidance for monitoring recovery of salmon and steelhead listed under the Federal Endangered Species Act (Idaho, Oregon and Washington). NOAA Fisheries Service, Northwest Region draft document. Seattle, Washington.

ICBTRT (Interior Columbia Basin Technical Recovery Team). 2003. Independent populations of Chinook, steelhead, and sockeye for listed evolutionarily significant units within the interior Columbia River domain, July 2003 working draft. Available at http://www.nwfsc.noaa.gov/trt. (May 2004).

IDFG (Idaho Department of Fish and Game). 2007. Fisheries management plan 2007-2012. Boise, Idaho.

Lady, J., P. Westhagen, and J. R. Skalski. 2001. SURPH (Survival under Proportional Hazards). Version 2.2b [online]. Available at http://www.cbr.washington.edu/paramest/surph/.

Lowther, A. B., and J. R. Skalski. 1998. A multinomial likelihood model for estimating survival probabilities and overwintering for fall Chinook salmon using release-recapture methods. Journal of Agricultural, Biological, and Environmental Statistics 3:223-236.

McElhany, P., M. H. Ruckelshaus, M. J. Ford, T. C. Wainwright, and E. P. Bjorkstedt. 2000. Viable salmonids populations and the recovery of evolutionarily significant units. National Oceanic and Atmospheric Administration Technical Memorandum NMFS-NWFSC-42.

Nielsen, J. L., A. Byrne, S. L. Graziano, and C.C. Kozfkay. 2009. Steelhead genetic diversity at multiple spatial scales in a managed basin: Snake River, Idaho. North American Journal of Fisheries Management 29:680-701.

NOAA Fisheries. Undated. Salmon and steelhead recovery plans for Idaho. www.idahosalmonrecovery.net. [Accessed April 2010].

NPCC (Northwest Power and Conservation Council). 2010a. Draft Columbia River basin monitoring, evaluation, research, and reporting plan. Council Document 2010-17. Portland, Oregon. www.nwcouncil.org/fw/merr. [Accessed December 2010].

NPCC (Northwest Power and Conservation Council). 2010b. Anadromous salmonid monitoring strategy, viable salmonid population parameters, and subset of tributary habitat and hatchery effectiveness. www.nwcouncil.org/fw/merr. [Accessed December 2010].

Raymond, H. L. 1988. Effects of hydroelectric development and fisheries enhancement on spring and summer Chinook salmon and steelhead in the Columba River basin. North American Journal of Fisheries Management 8:1-24.

Steinhorst, K, Y. Wu, B. Dennis, and P. Kline. 2004. Confidence intervals for fish out-migration estimates using stratified trap efficiency methods. Journal of Agricultural, Biological, and Environmental Statistics 9:284-299.

Stevens, D. L., and A. R. Olsen. 2004. Spatially balanced sampling of natural resources. Journal of the American Statistical Association 99:262-278.

Stevens, D. L., D. P. Larsen, and A. R. Olsen. 2007. The role of sample surveys: why should practitioners consider using a statistical sampling design? Pages 11-23 in D. H. Johnson, B. M. Shrier, J. S. O'Neal, J. A. Knutzen, X. Augerot, T. A. O'Neil, and T. N. Pearsons, editors. Salmonid field protocols handbook: techniques for assessing status and trends in salmon and trout populations. American Fisheries Society, Bethesda, Maryland.

Thurow, R. 1985. Middle Fork Salmon River fisheries investigations. Job Completion report, Federal Aid in Sport Fish Restoration project F-73-R-6. Idaho Department of Fish and Game, Boise, Idaho.

Table 1. Capture date percentiles of adult steelhead at the Fish Creek (Lochsa population) and Rapid River (Little Salmon population) weirs in 2009. N = number of fish.

Life stage	Sex	N	Date percentile attained						
			First	10%	25%	50%	75%	90%	Last
Fish Creek									
Spawner	Female	62	3/22	4/8	4/25	5/8	5/11	5/16	6/16
Spawner	Male	32	4/4	4/11	4/16	4/29	5/3	5/15	6/20
Spawner	All	94	3/22	4/9	4/21	5/3	5/11	5/15	6/20
Kelt	Female	42	5/1	6/14	6/16	6/21	6/24	6/26	7/10
Kelt	Male	8	5/8	6/5	6/18	6/18	6/23	6/26	6/27
Kelt	All	50	5/1	6/11	6/17	6/21	6/24	6/27	7/10
Rapid River									
Spawner	Female	63	4/17	4/23	5/4	5/21	6/7	6/18	6/25
Spawner	Male	45	3/24	4/2	4/17	5/12	6/5	6/20	6/30
Spawner	All	108	3/24	4/2	4/17	5/12	6/5	6/20	6/30

Table 2. The number and mean length, by sex, of wild adult steelhead captured at Fish Creek (Lochsa population) and Rapid River (Little Salmon population) weirs during 2009.

Sex	Adult spawners trapped	Unmarked kelts recovered	Marked kelts recovered	Fork length (cm)		
				Mean	Minimum	Maximum
Fish Creek						
Female	62	28	14	81	64	89
Male	32	2	6	77	60	95
All	94	30	20	79	60	95
Rapid River						
Female	63	0	0	70	55	83
Male	45	0	0	68	53	90
All	108	0	0	69	53	90

Table 3. Number of fish by age of adult steelhead sampled at weirs during spring 2009. Age values before the period denote freshwater ages and values after denote saltwater ages. X means a freshwater age was not assigned.

Location	Population	1.1	1.2	2.1	2.2	2.3	3.1	3.2	3.3	4.1	4.2	4.3	x.1	x.2	x.3
Fish Creek	Lochsa	--	--	--	8	1	11	81	1	2	2	--	2	15	1
Rapid River	Little Salmon	--	--	19	29	--	31	15	--	1	2	--	5	6	--
Big Creek	Lower MF Salmon	--	--	--	--	--	--	--	--	1	--	--	--	--	--
Pahsimeroi	Pahsimeroi	1	1	7	7	--	--	--	--	--	--	--	6	1	--
Sawtooth	Upper Salmon	--	--	22	14	--	10	3	--	14	--	3	14	8	--

Table 4. Mean fork length (mm) at age of juvenile steelhead captured at screw traps in locations within the Clearwater and Salmon drainages during spring 2009 (March 1–May 31). Number of fish aged is in parentheses.

		Fork length					
Location	**Population**	**Age 1**	**Age 2**	**Age 3**	**Age 4**	**Age 5**	**Age 6**
Clearwater MPG							
Clear Creek	Lower Clearwater	--	164 (16)	167 (3)	--	--	--
Fish Creek	Lochsa	--	117 (4)	167 (4)	182 (1)	--	--
Colt Killed Creek	Lochsa	125 (1)	136 (4)	182 (20)	188 (29)	197 (1)	--
Crooked Fork	Lochsa	--	155 (1)	174 (18)	191 (4)	--	--
American River	SF Clearwater	--	135 (12)	151 (2)	--	--	--
Crooked River	SF Clearwater	--	125 (8)	--	176 (1)	--	--
Red River	SF Clearwater	--	--	--	--	--	--
Salmon MPG							
Rapid River	Little Salmon	94 (12)	151 (30)	181 (125)	194 (33)	198 (2)	--
SF Salmon at Knox	SF Salmon	92 (3)	122 (18)	166 (3)	218 (1)	--	--
Lower SF Salmon	SF Salmon	--	--	--	--	--	--
Johnson Creek	SF Salmon	71 (5)	109 (12)	154 (2)	--	185 (1)	--
Lake Creek	Secesh	--	--	--	--	--	--
Secesh (Lower)	Secesh	69 (2)	104 (6)	163 (7)	177 (5)	--	212 (1)
Big Creek	Lower MF Salmon	90 (12)	136 (31)	174 (57)	196 (7)	--	--
Marsh Creek	Upper MF Salmon	83 (3)	132 (20)	166 (6)	--	--	--
Upper Lemhi	Lemhi	119 (123)	186 (26)	200 (2)	223 (1)	--	--
Lower Lemhi	Lemhi	151 (25)	187 (73)	190 (18)	--	--	--
Hayden Creek	Lemhi	93 (8)	160 (41)	185 (12)	232 (1)	--	--
Pahsimeroi River	Pahsimeroi	134 (70)	168 (9)	181 (1)	--	--	--
EF Salmon River	EF Salmon	78 (1)	148 (5)	--	--	--	--
WF Yankee Fork	Upper Salmon	--	149 (6)	180 (2)	--	--	--
Salmon at Sawtooth	Upper Salmon	90 (84)	162 (73)	158 (2)	--	--	--

Table 5. Mean fork length (mm) at age of juvenile steelhead captured at screw traps in locations within the Clearwater and Salmon drainages during summer 2009 (June 1–August 14). Number of fish aged is in parentheses.

		Fork length					
Location	**Population**	**Age 0**	**Age 1**	**Age 2**	**Age 3**	**Age 4**	**Age 5**
Clearwater MPG							
Clear Creek	Lower Clearwater	--	--	--	--	--	--
Fish Creek	Lochsa	--	--	155 (4)	140 (1)	--	--
Colt Killed Creek	Lochsa	--	83 (2)	128 (17)	210 (2)	--	--
Crooked Fork	Lochsa	--	105 (27)	149 (90)	182 (5)	193 (1)	--
American River	SF Clearwater	--	113 (9)	129 (24)	160 (2)	230 (1)	--
Crooked River	SF Clearwater	--	93 (5)	134 (33)	144 (2)	--	--
Red River	SF Clearwater	--	96 (14)	150 (15)	--	--	--
Salmon MPG							
Rapid River	Little Salmon	--	--	--	--	--	--
SF Salmon at Knox	SF Salmon	--	98 (32)	144 (83)	200 (2)	--	--
Lower SF Salmon	SF Salmon	--	--	--	--	--	--
Johnson Creek	SF Salmon	53 (1)	86 (101)	142 (48)	--	--	--
Lake Creek	Secesh	--	117 (1)	125 (13)	172 (20)	205 (1)	208 (1)
Secesh (Lower)	Secesh	--	87 (29)	128 (85)	169 (31)	226 (3)	--
Big Creek	Lower MF Salmon	--	93 (45)	149 (38)	192 (2)	--	--
Marsh Creek	Upper MF Salmon	--	97 (51)	143 (56)	169 (2)	--	--
Upper Lemhi	Lemhi	--	132 (66)	186 (3)	--	--	--
Lower Lemhi	Lemhi	--	118 (4)	161 (10)	--	205 (1)	--
Hayden Creek	Lemhi	--	126 (8)	152 (5)	--	--	--
Pahsimeroi River	Pahsimeroi	--	125 (10)	--	--	--	--
EF Salmon River	EF Salmon	--	117 (5)	203 (1)	--	--	--
WF Yankee Fork	Upper Salmon	--	--	--	--	--	--
Salmon at Sawtooth	Upper Salmon	--	--	--	--	--	--

Table 6. Mean fork length (mm) at age of juvenile steelhead captured at screw traps in locations within the Clearwater and Salmon drainages during fall 2009 (August 15 – November 31). Number of fish aged is in parentheses.

		Fork length					
Location	**Population**	**Age 0**	**Age 1**	**Age 2**	**Age 3**	**Age 4**	**Age 5**
Clearwater MPG							
Clear Creek	Lower Clearwater	--	--	--	--	--	--
Fish Creek	Lochsa	83 (1)	122 (103)	160 (167)	184 (17)	--	--
Colt Killed Creek	Lochsa	--	128 (1)	170 (26)	189 (32)	195 (4)	--
Crooked Fork	Lochsa	--	148 (1)	163 (114)	180 (31)	--	--
American River	SF Clearwater	--	156 (6)	141 (24)	--	--	--
Crooked River	SF Clearwater	--	127 (1)	145 (21)	163 (1)	--	--
Red River	SF Clearwater	--	110 (2)	135 (19)	134 (1)	--	--
Salmon MPG							
Rapid River	Little Salmon	87 (1)	137 (24)	179 (99)	190 (34)	--	--
SF Salmon at Knox	SF Salmon	82 (1)	120 (44)	162 (58)	--	--	--
Lower SF Salmon	SF Salmon	63 (4)	115 (17)	162 (45)	205 (5)	--	--
Johnson Creek	SF Salmon	78 (5)	123 (40)	164 (69)	192 (3)	--	--
Lake Creek	Secesh	--	--	--	182 (2)	--	262 (2)
Secesh (Lower)	Secesh	--	102 (10)	163 (33)	183 (38)	219 (2)	--
Big Creek	Lower MF Salmon	89 (1)	115 (40)	170 (136)	191 (35)	205 (2)	--
Marsh Creek	Upper MF Salmon	127 (1)	128 (50)	162 (36)	178 (1)	--	--
Upper Lemhi	Lemhi	120 (3)	185 (196)	186 (1)	--	--	--
Lower Lemhi	Lemhi	107 (27)	189 (193)	212 (34)	243 (3)	--	--
Hayden Creek	Lemhi	68 (99)	152 (161)	183 (78)	225 (3)	--	--
Pahsimeroi River	Pahsimeroi	113 (52)	158 (55)	177 (5)	--	--	--
EF Salmon River	EF Salmon	--	98 (1)	179 (5)	--	--	--
WF Yankee Fork	Upper Salmon	--	117 (1)	173 (2)	--	--	--
Salmon at Sawtooth	Upper Salmon	84 (35)	149 (70)	159 (14)	--	--	--

Table 7. Densities (fish/100 m^2) of salmonids observed at basinwide sites snorkeled in the Fish Creek drainage (Lochsa steelhead population) during 2009. Trout fry includes all trout <50 mm. Sites are arranged by elevation (high to low).

		Density						
Stream	**Site**	**Trout Fry**	**Steelhead**	**Chinook Salmon**	**Cutthroat Trout**	**Whitefish**	**Visibility (m)**	**Temp (C)**
Basinwide sites								
Hungery Creek	24610	0.00	2.66	0.00	0.48	0.00	2.6	10
Hungery Creek	33698	0.00	3.92	0.00	2.85	0.00	3	9.5
Hungery Creek	164770	0.00	0.43	0.00	1.52	0.00	2.2	10
Fish Creek	57378	0.73	0.00	0.00	6.95	0.00	2.2	10
Hungery Creek	17314	0.00	1.08	0.00	0.36	0.00	2.2	9.5
Fish Creek	69666	0.00	0.00	0.00	1.09	0.00	4.2	9.5
Fish Creek	96194	0.00	3.95	0.00	0.88	0.00	3.2	12
Fish Creek	167874	0.00	2.21	0.00	0.11	0.00	3.8	13.5
Fish Creek	20418	0.00	3.77	0.00	6.15	0.00	2.7	15
Fish Creek	151490	0.00	1.79	0.00	6.89	0.00	2.7	13
Fish Creek	102338	0.00	1.58	0.32	2.42	0.00	2.7	15.5
Hungery Creek	58050	0.11	3.17	0.00	0.77	0.00	3.1	13
Fish Creek	172738	0.00	3.66	0.43	0.81	0.00	2.1	16
Willow Creek	156354	0.00	10.23	0.00	0.91	0.00	3.3	10.5
Fish Creek	74434	0.00	6.25	0.00	0.57	0.00	3.1	13
Fish Creek	41666	1.26	6.98	1.40	2.39	0.07	4	14.5
Fish Creek	12994	0.51	8.33	1.45	0.43	0.34	3.1	16.5
Mean		**0.15**	**3.53**	**0.21**	**2.09**	**0.02**		
SD		**0.35**	**2.93**	**0.47**	**2.32**	**0.08**		

Table 8. Densities (fish/100 m^2) of salmonids observed at basinwide sites snorkeled in the Marsh Creek drainage (Upper Middle Fork Salmon steelhead population) during 2009. Trout fry includes all trout <50 mm. Sites are arranged by elevation (high to low).

		Density							
Stream	**Site**	**Trout Fry**	**Steelhead**	**Chinook Salmon**	**Bull Trout**	**Brook Trout**	**Whitefish**	**Visibility (m)**	**Temp (C)**
Beaver Creek	32111	0.00	0.00	0.00	0.58	0.00	0.00	3.3	9
Winnemucca Creek	141143	0.00	0.00	0.00	0.68	0.00	0.00	1.1	9.5
Beaver Creek	97111	0.00	0.00	0.00	1.49	0.00	0.00	3	11
Bench Creek	101719	0.00	0.00	0.00	0.00	0.41	0.00	2	9
Winnemucca Creek	123735	0.00	0.00	0.00	0.34	0.69	0.00	3.2	13
Knapp Creek	130391	0.00	0.21	0.21	0.00	2.50	0.00	4.5	12.5
Beaver Creek	83799	0.00	0.65	0.00	0.00	0.00	0.00	2.2	8.5
Winnemucca Creek	18263	0.00	0.20	0.60	0.40	1.60	0.00	6.9	12
Beaver Creek	51031	0.00	0.49	0.00	0.16	0.00	0.82	3	11
Knapp Creek	73047	0.00	0.77	0.00	0.00	0.64	0.00	3	12
Bear Creek	109911	0.00	0.00	0.00	0.23	0.23	0.00	4.3	7.5
Beaver Creek	15703	0.00	0.94	0.00	0.38	0.38	0.00	2.4	13
Swamp Creek	120151	0.00	0.25	0.00	0.00	0.74	0.00	3.3	8
Knapp Creek	40279	0.43	0.43	0.00	0.00	0.65	0.00	3	14
Knapp Creek	126295	0.47	3.12	0.31	0.00	1.25	0.00	3.2	17.5
Beaver Creek	27991	0.00	0.85	6.24	0.09	0.09	0.09	3.4	14
Swamp Creek	21847	0.00	0.00	0.84	0.28	0.84	0.00	3.8	10
Knapp Creek	60759	2.51	0.72	1.91	0.00	3.58	1.07	3.5	18.5
Cape Horn Creek	150871	0.00	0.00	55.97	0.00	0.10	0.00	2.3	13
Marsh Creek	56663	2.29	1.47	14.95	0.09	0.73	0.46	3.6	17
Beaver Creek	11607	2.34	0.22	8.78	0.00	0.00	0.00	4.3	12
Marsh Creek	105815	1.79	0.16	20.61	0.00	3.89	0.32	2.6	16
Marsh Creek	89431	4.32	0.63	16.02	0.09	0.18	0.18	2.8	18.5
Lola Creek	60247	0.64	0.32	0.32	3.81	0.32	0.00	2.7	11
Marsh Creek	125783	0.00	4.22	2.16	0.05	0.00	0.42	3.2	16
Marsh Creek	Resight 1	4.05	1.89	0.48	0.00	0.00	0.92	3.3	10.5
Marsh Creek	Resight 2	0.00	0.38	0.05	0.00	0.00	0.66	3.6	14.0
	Mean	**0.59**	**0.63**	**5.16**	**0.35**	**0.75**	**0.13**		
	SD	**1.14**	**1.00**	**12.07**	**0.79**	**1.08**	**0.28**		

Table 9. Densities (fish/100 m^2) of salmonids observed at basinwide sites snorkeled in the Rapid River drainage (Little Salmon steelhead population) during 2009. Trout fry includes all trout <50 mm. Sites are arranged by elevation (high to low).

		Density								
Stream	**Site**	**Trout Fry**	**Steelhead**	**Wild Chinook**	**Hatchery Chinook**	**Cutthroat Trout**	**Bull Trout**	**Whitefish**	**Visibility (m)**	**Temp (C)**
Basinwide sites										
Rapid River	200786	0.00	0.00	0.00	0.00	0.00	3.36	0.00	4.5	12
Rapid River	24658	0.00	0.00	0.00	0.00	0.00	1.30	0.00	2.4	11
Rapid River	237650	0.00	0.00	0.00	0.00	0.00	3.07	0.00	3.2	9
Rapid River	90194	0.00	0.00	0.00	0.00	0.00	3.64	0.00	3.2	9
Rapid River	155730	0.00	0.00	0.00	0.00	0.00	3.45	0.00	4.5	9
Rapid River	196690	0.00	0.00	0.00	0.00	0.00	1.85	0.00	3.6	9
Rapid River	192402	0.00	1.63	0.00	0.00	0.00	1.63	0.00	2.7	10.5
Rapid River	257938	0.00	1.79	0.00	0.00	0.00	0.36	0.00	3.4	9
Rapid River	126866	0.00	4.06	0.00	0.00	0.00	1.54	0.00	2.8	10.5
Rapid River	17298	0.00	4.33	0.00	0.00	0.00	0.10	0.00	3	12
Rapid River	122258	0.00	3.65	0.00	0.00	0.00	0.33	0.00	3	12
Rapid River	15762	0.00	5.93	0.00	0.00	0.08	0.16	0.00	2.3	12
Rapid River	228754	0.29	5.85	0.10	0.00	0.19	0.19	0.00	2.8	13.5
WF Rapid River	163218	0.00	3.45	0.00	0.00	0.38	0.13	0.00	2.1	13
Rapid River	193426	2.79	4.57	1.24	0.00	0.54	0.16	0.00	3.1	10
Rapid River	127890	0.77	4.34	0.14	0.00	0.28	0.28	0.00	2.6	12
Rapid River	62354	0.42	3.14	0.08	0.00	0.08	0.25	0.00	3.6	11
Rapid River	19346	3.14	7.25	4.80	0.00	0.10	0.20	0.00	2.9	11.5
Rapid River	215954	12.53	6.44	9.44	1.32	0.71	0.44	0.00	3.2	14.5
Rapid River	232338	0.26	4.20	0.26	1.22	0.52	1.22	0.09	3	15.5
	Mean	**1.01**	**3.03**	**0.80**	**0.13**	**0.14**	**1.18**	**0.00**		
	SD	**2.86**	**2.44**	**2.30**	**0.39**	**0.22**	**1.26**	**0.02**		

Table 10. Number of PIT-tagged steelhead smolts that were detected in the hydrosystem during 2009 by population and year tagged. See Methods for a list of interrogation sites.

		Number detected					
Stream	**Population**	**2005**	**2006**	**2007**	**2008**	**2009**	**Total**
Fish Creek	Lochsa	2	3	402	1,496	3	1,906
Rapid River	Little Salmon	0	0	0	66	138	204
Big Creek	Lower MF Salmon	0	0	74	425	59	558

Table 11. Percentile dates of arrival at Lower Granite Dam for PIT-tagged steelhead smolts detected in spring 2009.

		Percentile		
Stream	**Population**	**10%**	**50%**	**90%**
Fish Creek	Lochsa	April 23	April 26	May 19
Rapid River	Little Salmon	April 28	May 12	May 20
Big Creek	Lower MF Salmon	April 22	April 25	May 19

Table 12. Streams sampled for water temperatures in 2009. Measurements were taken within 1 km of the mouth of each stream unless otherwise noted.

<u>Salmon River drainage</u>
Big Creek (tributary of Middle Fork Salmon River) at Taylor Ranch
Marsh Creek, 100 m downstream of screw trap site
Pahsimeroi River at weir
Rapid River (tributary of Middle Fork Salmon River), upstream of bridge
Rapid River at Rapid River Fish Hatchery
Redfish Lake Creek at weir
Salmon River at Sawtooth Fish Hatchery
Valley Creek, 200 m upstream of Meadow Creek
<u>Clearwater River drainage</u>
Boulder Creek
Brushy Fork Creek
Crooked Fork Creek, 50 m upstream of Brushy Fork Creek
Fish Creek #1 at screw trap site
Fish Creek #2, 100 m upstream of screw trap site (backup)
Fish Creek #3, 2 km upstream of Hungery Creek
Gedney Creek, 2 km upstream of mouth
Hungery Creek
Indian Creek (tributary of Selway River)
Little Clearwater River (tributary of Selway River)
Red River, 500 m upstream of SF Red River
Selway River, at Magruder Cabin
Selway River, near Cache Creek (7.6 km downstream of Selway Falls)
White Cap Creek (tributary of Selway River), downstream of Paradise Cabin
Willow Creek (tributary of Fish Creek)

Table 13. Adult abundance of wild adult steelhead in Fish Creek (Lochsa population) and Rapid River (Little Salmon population), 2007-2009. Confidence intervals are given in parentheses for Fish Creek only; Rapid River abundance is a census.

	Spawn year		
Location	**2007**	**2008**	**2009**
Fish Creek	81 (79-96)	134 (84-184)	218 (152-312)
Rapid River	32	88	108

Table 14. Number of scale samples received from wild adult steelhead during 2007-2009 by population and location.

Population	**Location**	**2007**	**2008**	**2009**
Lower Clearwater	Big Bear Creek	--	20	24
	Little Bear Creek	--	40	53
	East Fork Potlatch River	--	64	70
	Upper Potlatch River	--	10	19
Lochsa	Fish Creek	84	17	127
South Fork Clearwater	Crooked River	--	41	--
Little Salmon	Rapid River	34	88	110
Lower Middle Fork Salmon	Big Creek	--	12	1
Pahsimeroi	Pahsimeroi River	20	44	30
Upper Salmon	Sawtooth	--	23	34
DPS-wide	Lower Granite	398	1532	3856

Table 15. Juvenile steelhead abundance at traps operated by ISMES, 2007-2009. Confidence intervals (95%) are in parentheses.

Location	**Population**	**2007**	**2008**	**2009**
Big Creek	Lower MF Salmon	21,346 (18,253-25,630)	47,767 (37,244-62,717)	21,918 (18,424-26,334)
Fish Creek	Lochsa	24,127 (22,008-24,492)	15,946 (14,697-17,313)	15,278 (14,352-16,048)
Rapid River	Little Salmon	5,632 (4,108-7,091)	5,165 (3,912-6,082)	3,877 (2,844-5,316)

Table 16. Number of scale samples received from screw traps sampling wild juvenile steelhead during 2007-2009, by population and location.

Population	Location	2007	2008	2009
Lower Clearwater	Big Bear Creek	--	302	210
	Clear Creek	84	25	20
	East Fork Potlatch River	--	103	277
Lochsa	Colt Killed Creek	28	198	140
	Crooked Fork	608	507	297
	Fish Creek	457	425	310
South Fork Clearwater	American River	30	96	--
	Crooked River	149	97	--
	Red River	15	50	--
Little Salmon	Rapid River	524	495	369
Secesh	Secesh River (upper & lower)	304	205	289
	Lake Creek	--	--	41
South Fork Salmon	Johnson Creek	--	254	303
	South Fork Salmon River	431	303	343
Lower Middle Fork Salmon	Big Creek	754	403	422
Upper Middle Fork Salmon	Marsh Creek	219	249	227
Lemhi	Hayden Creek	--	--	436
	Lemhi River	410	143	822
Pahsimeroi	Pahsimeroi River	976	110	204
East Fork Salmon	East Fork Salmon River	--	--	18
Upper Salmon	Sawtooth	127	38	285
	West Fork Yankee Fork	--	--	12

Table 17. Data collected by ISMES during 2007-2009 as applicable to viable salmonid population criteria for steelhead populations.

Major population group	Population	Viable Salmonid Population Criterion: Abundance	Productivity	Spatial structure	Diversity
DPS (all)	Lower Granite	Adult abundance	Adult ages	--	Adult ages
Clearwater River	Lower Clearwater	--	Juvenile ages (Clear Cr, Potlatch River)	--	Juvenile ages (Clear Cr, Potlatch River)
	Lolo Creek	--	--	--	--
	Lochsa River	Adult, parr[a] & smolt abundance (Fish Cr)	Life cycle survival (Fish Cr), juvenile ages (Crooked Fk, Colt Killed Cr), hatchery fraction (Fish Cr)	Juvenile occurrence[gt]	Adult & juvenile genetic samples, migration timing, ages (Fish Cr); juvenile ages (Crooked Fk, Colt Killed Cr)
	Selway River	--	--	--	Juvenile genetic samples
	South Fork Clearwater	--	Adult ages (Crooked R), juvenile ages (Crooked, Red, American rivers)	--	--
Salmon River	Little Salmon	Adult, parr[a] & smolt abundance (Rapid)	Life cycle survival, hatchery fraction (Rapid River)	Juvenile occurrence[ab]	Adult & juvenile genetic samples, migration timing, ages (Rapid River)
	Secesh River	--	Juvenile ages	--	--
	South Fork Salmon	--	Juvenile ages	--	--
	Chamberlain Creek	--	--	--	--
	Lower Middle Fork Salmon	Smolt abundance (Big Cr)	Life cycle survival (Big Cr)	--	Adult & juvenile ages, genetic samples (Big Cr)
	Upper Middle Fork Salmon	--	Juvenile ages (Marsh Cr)	--	Juvenile ages (Marsh Cr)
	Panther Creek	--	--	--	--
	North Fork Salmon	--	--	--	--
	Lemhi River	--	Juvenile ages	--	Juvenile ages
	Pahsimeroi River	Adult abundance	Adult & juvenile ages	--	Adult & juvenile ages
	East Fork Salmon	--	--	--	--
	Upper Main Salmon	Adult abundance	Adult & juvenile ages	--	Adult & juvenile ages

[a] Based on a generalized random tessellation design.
[b] Based on non-random trend sites.

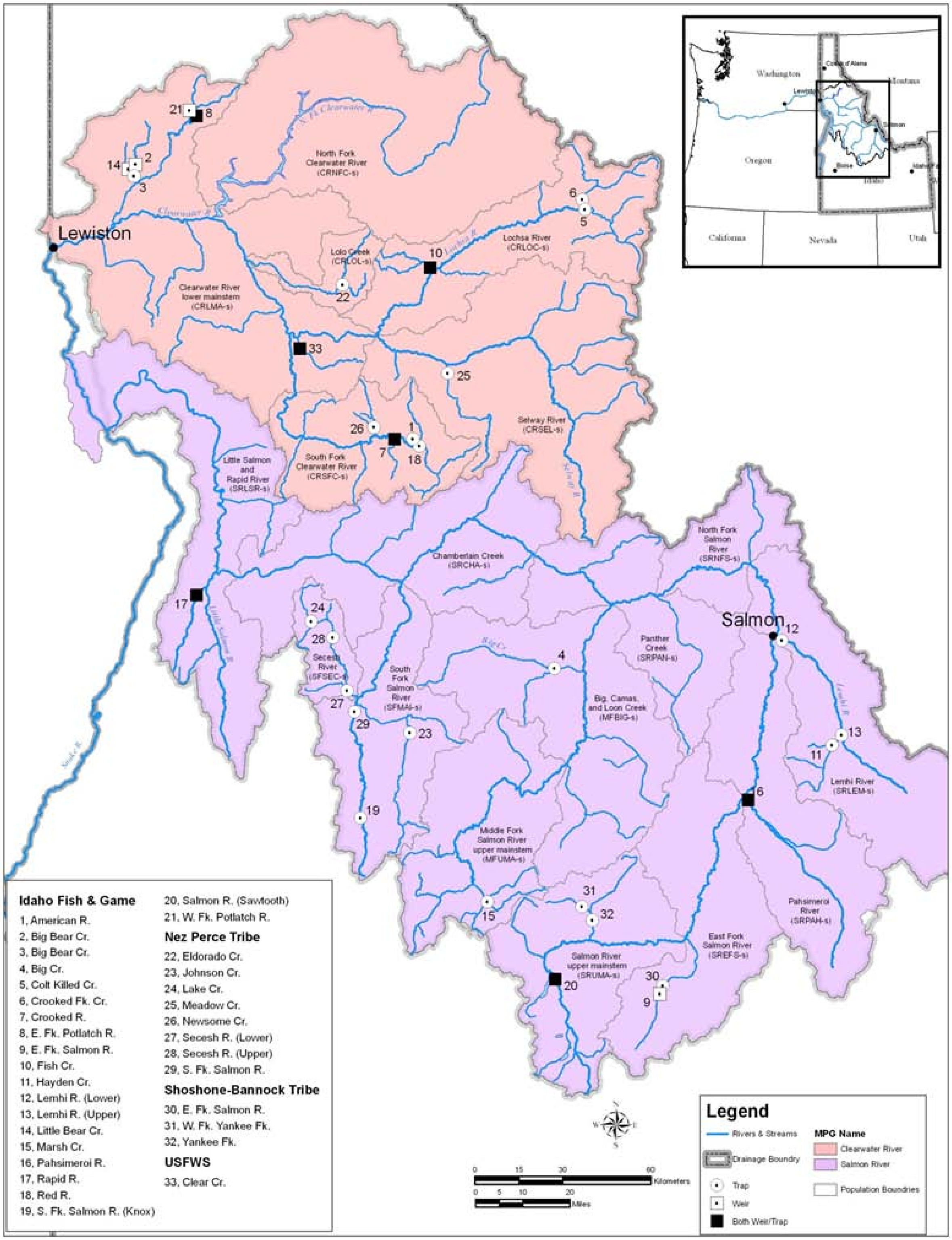

Figure 1. Locations of weirs and screw traps collecting steelhead in Idaho. The Clearwater Major Population Group is in pink, the Salmon in purple. Population boundaries are shown as light gray lines.

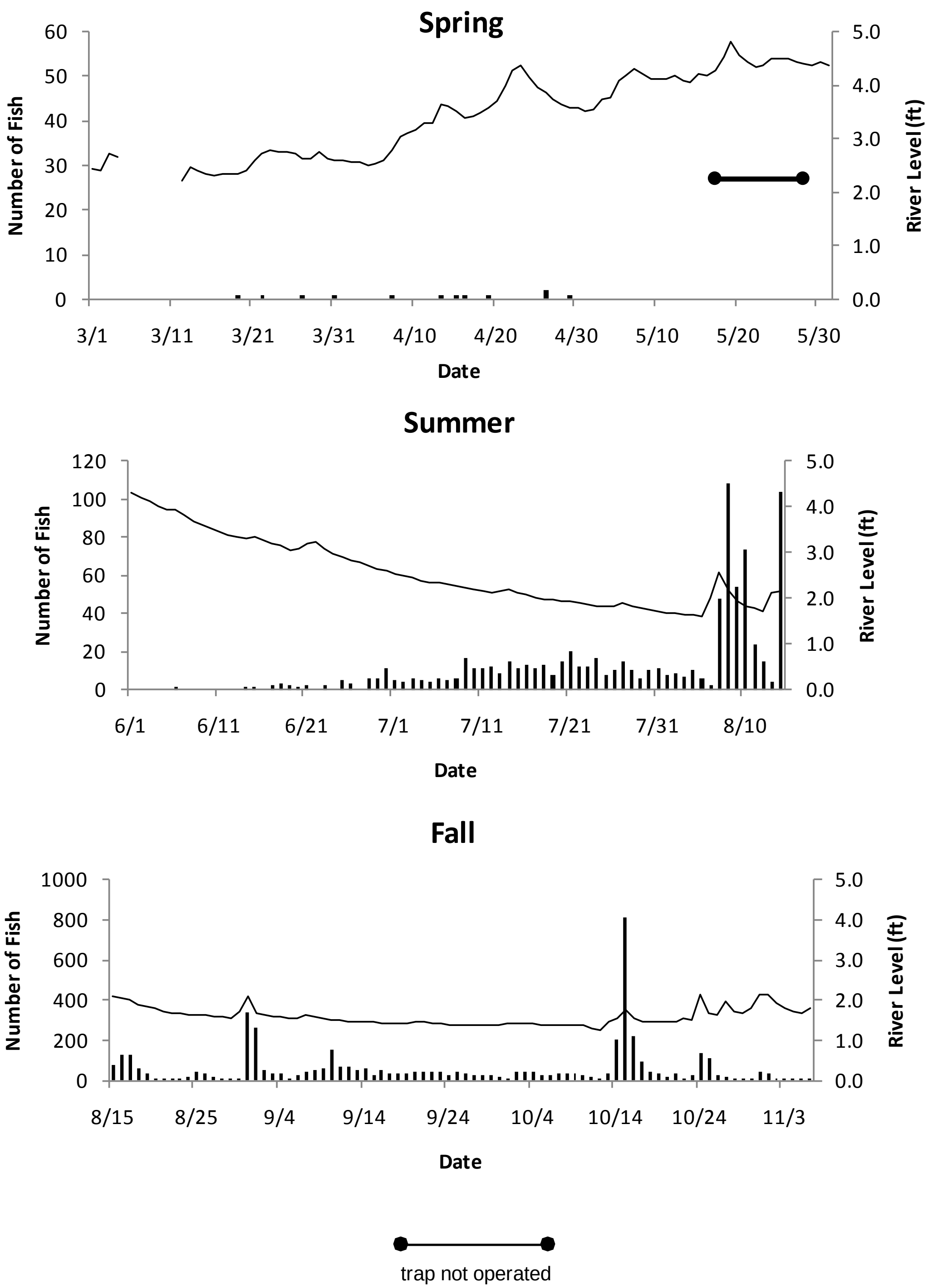

Figure 2. Daily number of steelhead juveniles (bars) captured in the Fish Creek screw trap and river level (line; ft) during 2009. Spring (n = 12) is top panel; summer (n = 837) is middle panel; and fall (n = 4,929) is bottom panel. Note difference in the left-axis scale in each panel.

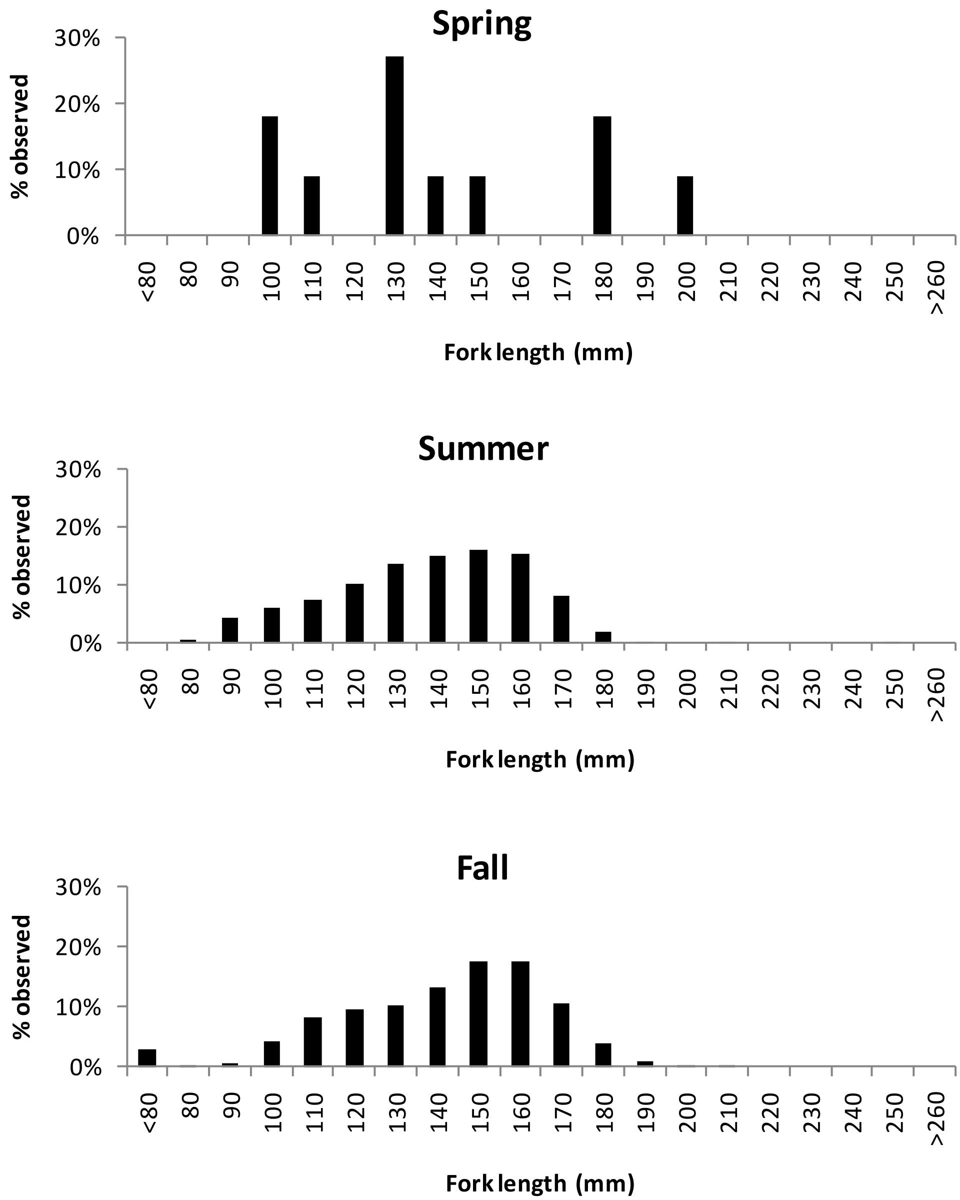

Figure 3. Relative length frequency of steelhead juveniles captured in the Fish Creek screw trap during 2009. Spring (n = 12) is top panel; summer (n = 837) is middle panel; and fall (n = 4,929) is bottom panel.

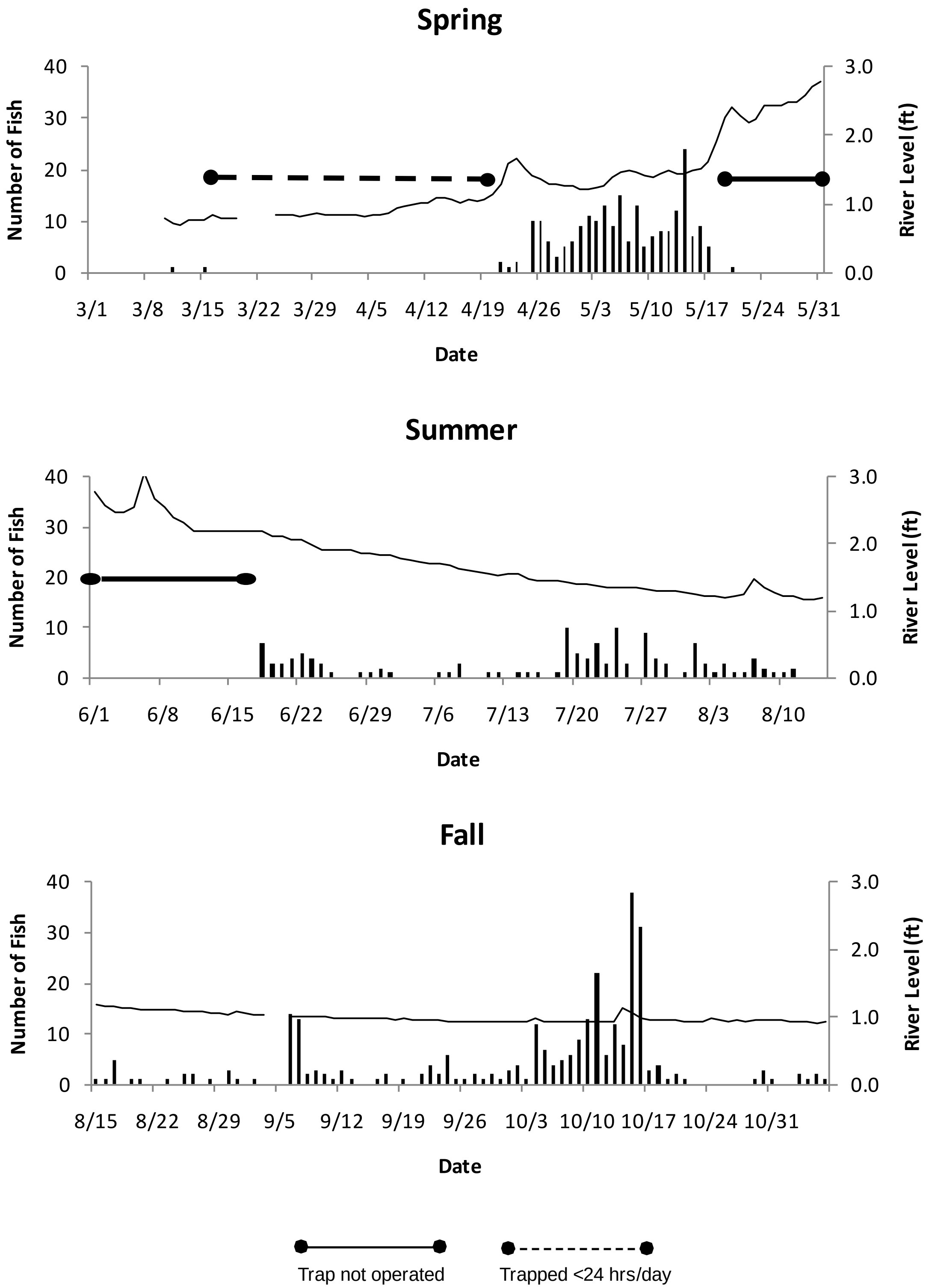

Figure 4. Daily number of steelhead juveniles (bars) captured in the Rapid River screw trap and river level (line; ft) during 2009. Spring (n = 219) is top panel; summer (n = 131) is middle panel; and fall (n = 288) is bottom panel.

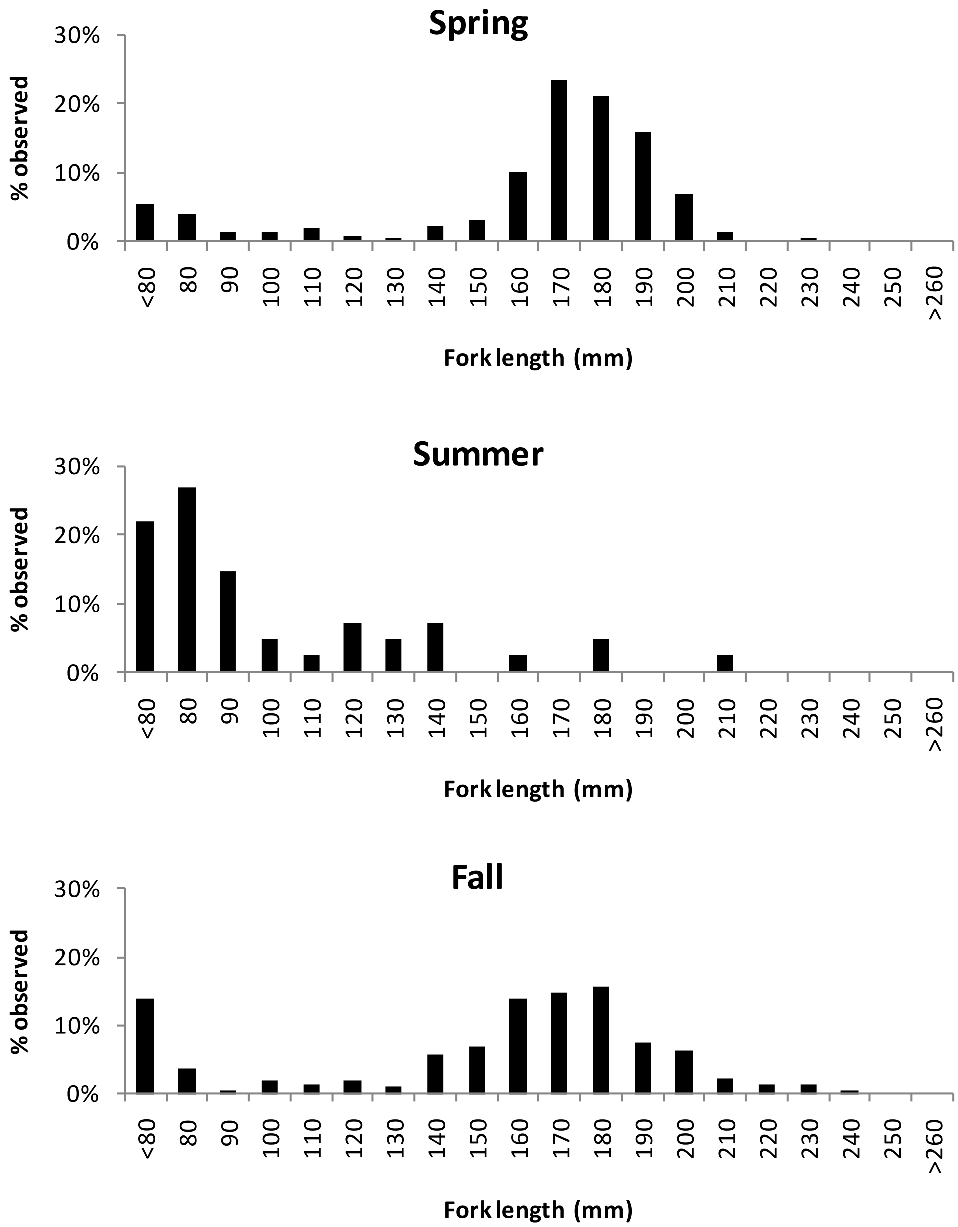

Figure 5. Relative length frequency of steelhead juveniles captured in the Rapid River screw trap during 2009. Spring (n = 219) is top panel; summer (n = 131) is middle panel; and fall (n = 288) is bottom panel.

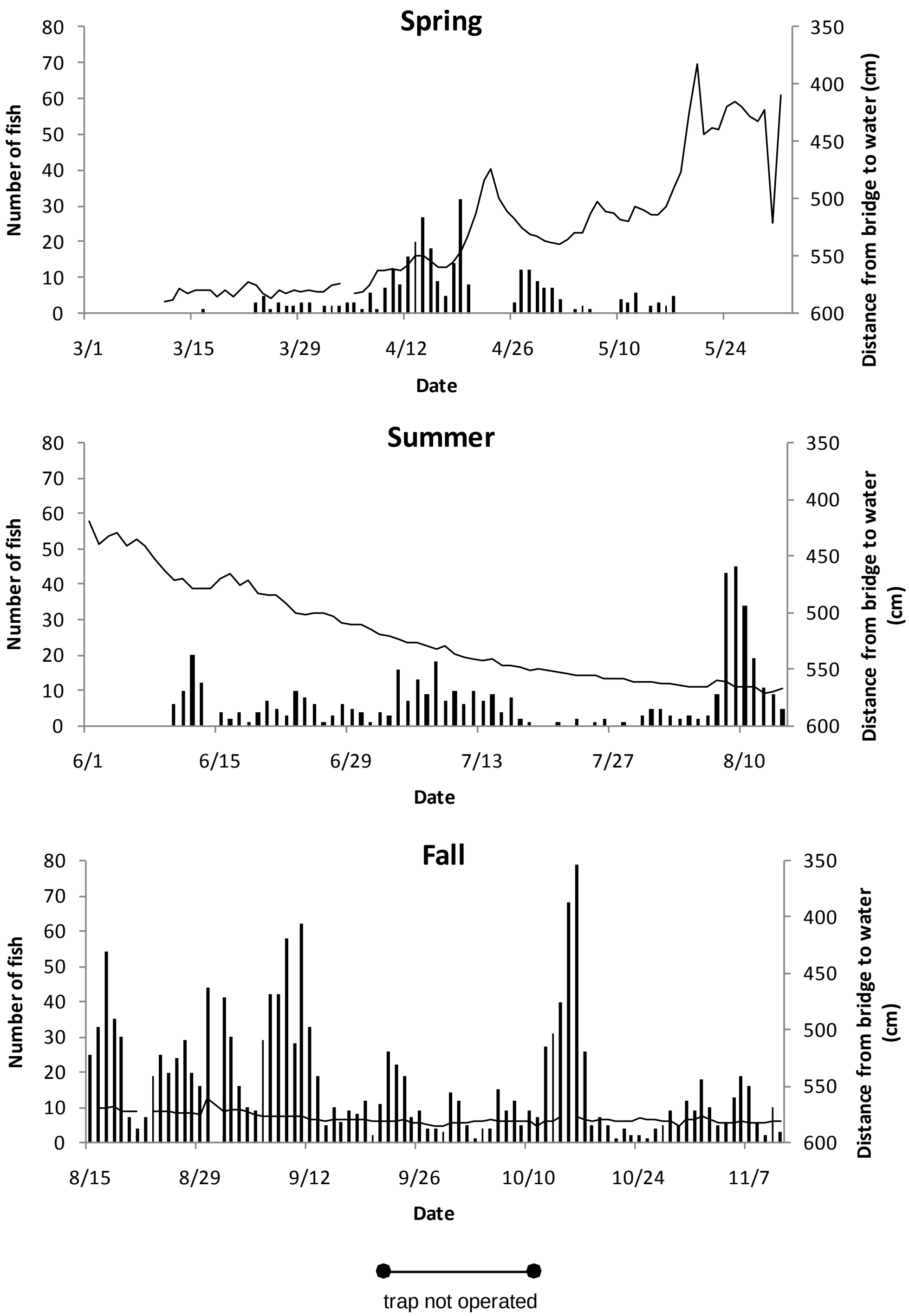

Figure 6. Daily number of steelhead juveniles (bars) captured in the Big Creek screw trap and distance from pack bridge to water surface (line; cm) during 2009. Spring (n = 302) is top panel; summer (n = 464) is middle panel; and fall (n = 1,515) is bottom panel.

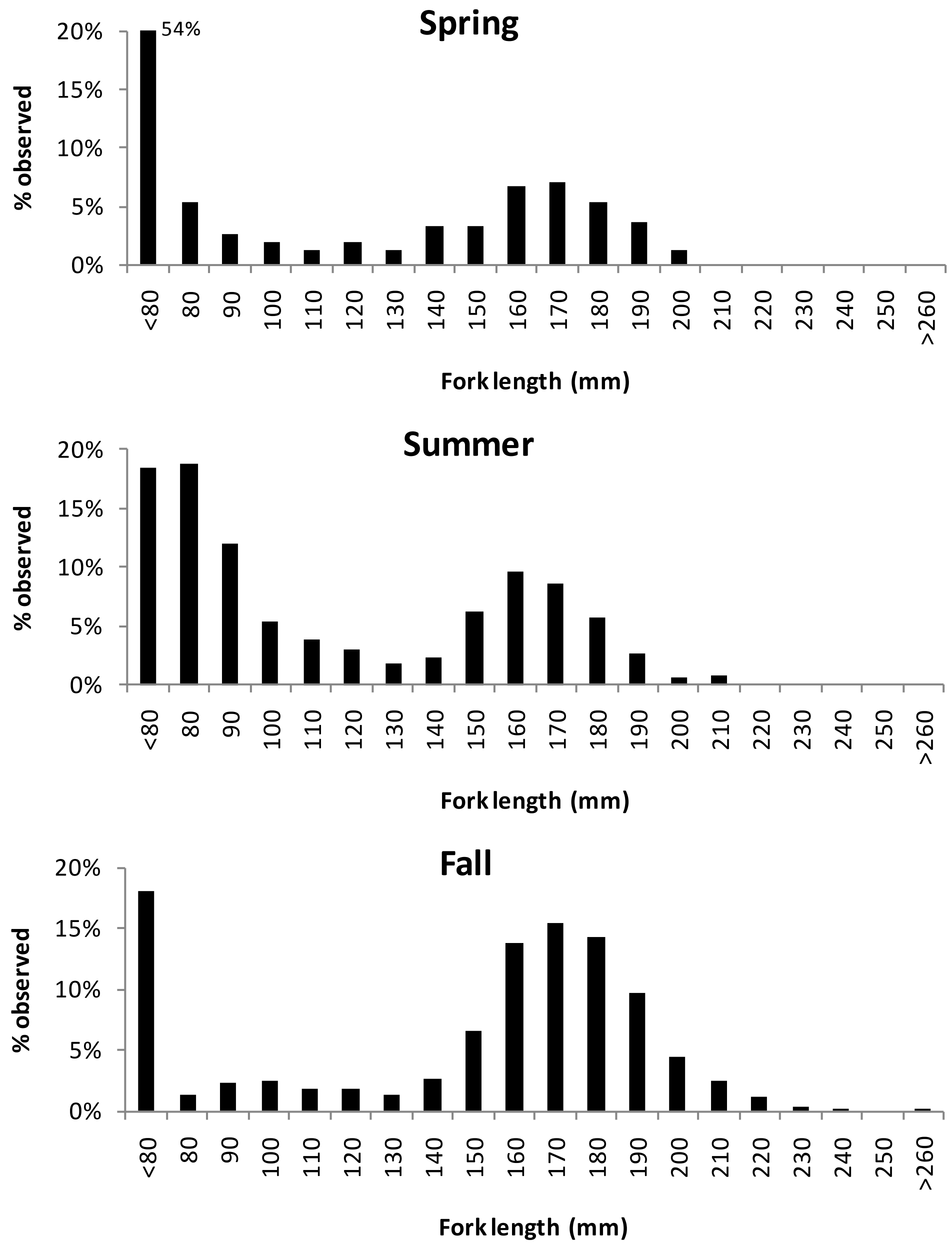

Figure 7. Relative length frequency of steelhead juveniles captured in the Big Creek screw trap during 2009. Spring (n = 302) is top panel; summer (n = 464) is middle panel; and fall (n = 1,515) is bottom panel.

Prepared by:	**Approved by:**
	IDAHO DEPARTMENT OF FISH AND GAME
Timothy Copeland Senior Fishery Research Biologist	Daniel J. Schill Fisheries Research Manager
Ronald V. Roberts Senior Fishery Technician	Edward B. Schriever, Chief Bureau of Fisheries