FISHERY MANAGEMENT INVESTIGATIONS

**IDAHO DEPARTMENT OF FISH AND GAME**

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**VIRGIL MOORE, DIRECTOR**

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# SOUTH FORK BOISE RIVER PRODUCTION AND TRIBUTARY MONITORING

## ABSTRACT

The South Fork Boise River (SFBR) below Anderson Ranch Dam is a nationally renowned tailwater fishery for Rainbow Trout (*Oncorhynchus mykiss*). Idaho Department of Fish and Game monitors the mainstem population every three years and the age-0 year class (production) on an annual basis in the fall. Additionally, efforts have been underway to sample and identify tributaries that serve as spawning and rearing habitat for the population. In August 2013, the Elk-Pony complex wildfire burned approximately 284,671 acres including along the SFBR below Anderson Ranch Dam and many of its tributaries. On September 12, 2013, following a rainstorm, large debris slides occurred in a number of the burned tributaries. These events covered the road and temporarily dammed the SFBR in a number of sections. The impacts from the slides were extensive in areas, and a large amount of sediment entered the mainstem SFBR. Efforts are underway to describe the impact to the fish populations and habitat. Furthermore, rehabilitation efforts are currently being planned and will take place over the next several years.

Rainbow Trout production at the SFBR is monitored through annual near shore electrofishing survey in October. Beginning in March 2013, spring sampling was added as a means of assessing overwinter survival of age-0 fish. On March 21, 2013 we collected 50 age-1 Rainbow Trout among the six sites ranging between 48-88 mm. These fish were age-0 fish during fall sampling. IDFG estimated overall mean age-1 density to be 0.3 $\pm$ 0.2 fish/m in March 2013. This is a marked decrease in density from the previous fall when 340 fish were captured and estimated density was 1.7 $\pm$ 1.9 fish/m. From these numbers, we estimate winter survival of age-0 fish to be approximately 15%. The 2013 age-0 year class density was assessed on October 16-17, 2013. The six original trend sites were sampled in addition to 33 additional sites that were added to better estimate over-winter survival. In the six trend sites, 104 Rainbow Trout were captured ranging and fry was measured at 0.6 $\pm$ 0.8 fish/m. In all 39 sites, age-0 was 0.4 $\pm$ 0.2 fish/m.

Two monitoring sites on Pierce Creek were sampled on July 23-24 2013. We collected 63 age-0 and two age-1 Rainbow Trout in the two Pierce Creek sites. In 2010, 23 age-0 and six age-1 fish were collected at the same sites. The upper site (2) in particular showed a nearly eight-fold increase in age-0 trout collected.

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## INTRODUCTION

The South Fork Boise River below Anderson Ranch Dam (SFBR) is a nationally renowned tailwater trout fishery and was the first river section in Southwest Idaho to be managed under "Trophy Trout" regulations. This fishery is supported by a population of wild Rainbow Trout and Mountain Whitefish *Prosopium williamsoni*. Migratory Bull Trout *Salvelinus confluentus* are present at very low densities, and native nongame fish including Largescale Sucker *Catostomus macrocheilus*, Northern Pikeminnow *Ptychocheilus oregonensis* and sculpin *Cottus sp*. Redband Trout populations in the SFBR have been monitored above Danskin Bridge every three years since 1994 (Butts et al. 2011). Results suggest that Rainbow Trout populations in the SFBR have been relatively stable, but the relative paucity of trout in the 200 to 400 mm length range upstream of Danskin Bridge has puzzled biologists. A population survey in the canyon section downstream of Danskin Bridge in 2008 showed that Rainbow Trout between 250-400 mm were present in higher proportions than what was observed in the monitored section above (Kozfkay et al. 2010). The SFBR wild trout population is thought to be mainly supported through main-stem spawning of fish with little recruitment from tributaries, as migration barriers are known to be present on most tributaries with spawning habitat (Moore et al. 1979).

An irregular size structure along with a belief by some anglers that the SFBR lacked spawning habitat led many to express concerns that the river was recruitment limited. To address these concerns IDFG revisited fry sampling transects that were established in 1994 during a whirling disease research study. Biologists observed high densities of age-0 trout within the transects and visual observations of near-shore habitat throughout the tailwater reach suggest reproduction is not a limiting factor in the population. These studies have continued annually since 2009 and have been relatively stable between 2009-2012 with a mean fry index of 2.3 fish/m.

Recently, interest has increased in tributaries to the SFBR below Anderson Ranch Dam. Specifically, biologists wish to determine whether the tributaries currently have fish populations, contain spawning habitat, and whether tributary spawning and recruitment could be enhanced by removing migration barriers. Recent information on fish populations within these tributaries has not been collected. Moore et al. (1979) characterized the majority of the SFBR tributaries below Anderson Ranch and evaluated the presence of spawning trout and spawning habitat. However, changes in land use practices, roads, and climate over the past 30 years have likely altered conditions in these streams. In 2008, a number of SFBR tributaries were sampled by the United States Forest Service (USFS) for a genetic study on Rainbow and Redband Trout, but little or no population information was collected. More recently, IDFG personnel sampled several sites in Dixie, Granite, Pierce, Rock, and Rough creeks in 2010 (Kozfkay et al. 2010), with additional surveys in Bock, Cayuse, Cow, and Mennecke creeks in 2011 (Butts et al. 2013). In 2012 surveys were conducted on Trail, Rattlesnake, Little Rattlesnake and Cottonwood. Data describing the trout communities in tributaries to the SFBR will help guide conservation and restoration efforts in the future.

One such restoration effort was the Pierce Creek reconnection project completed in 2011. A culvert functioning as a barrier was removed, and replaced by a steel bridge, thereby opening up approximately 8 km of potential spawning and rearing habitat. Stream surveys were conducted in 2010, prior to the reconnection project, and those same sites will be monitored periodically to assess the resulting changes in the salmonid population in Pierce Creek.

During early August 2013, two lightning-caused wildfires merged forming what was called the Elk-Pony complex wildfires. Approximately 284,671 acres were burned including along the SFBR below Anderson Ranch Dam and many of its tributaries. Extensive loss of vegetation occurred in many of the tributary drainages but the damage in the riparian areas along the mainstem was less severe. Following a rainstorm event on September 12, 2013, a number of large debris slides occurred on at least six sites or tributaries. The main road (Forest Road 189) road was blown out or buried with mud and debris at a number of sites. Because of safety concerns, the USFS restricted public access to the area through the end of November. Debris slides or "blowouts" were documented, but not limited to, an unnamed drainage north of Reclamation Village, and also in the Dixie, Rough, Granite, and Pierce creek drainages (Figure 52). Some direct fish mortality was observed with these events. At the confluence of SFBR and Arrowrock Reservoir, approximately 400-600 fish, including Largescale Sucker, Mountain Whitefish, and Rainbow Trout, were observed floating in a mire of organic material and ash from the debris slides. Efforts are underway to describe the extent of the damage on fish populations and habitat. Furthermore, rehabilitation efforts are currently being planned and will take place over the next several years.

## METHODS

### Fry Monitoring

Rainbow Trout fry were sampled using a Smith Root Type VII backpack shocker in six long-term trend sites of the SFBR on March 21, 2013 (Figure 52). Four of the 33-m sites were monitored in 1996 by Elle (1997) to assess relative abundance of Rainbow Trout fry in relation to whirling disease and were resampled in 2009. Two additional sites were added in 2010 to correspond with redd sites that were being monitored by BOR.

During sampling, the area from the north shoreline out to approximately 4 m was sampled. A single, upstream electrofishing pass was completed at each site. All fish were identified, counted and measured for total length. Fry estimates and lengths were compared to those collected in previous years.

The sites have been generally used to assess fall abundance as an overall measure of production. However, additional sampling in the spring was conducted beginning in 2013 to address overwinter survival. Overwinter survival $S_t$ was estimated as

$$S_t = \frac{N_t}{N_o}$$

where, $N_o$ is the initial abundance in the fall and $N_t$ is the abundance in the spring (Ricker 1975).

During fall 2013, 33 additional sites were randomly selected and added to the survey to better capture the variability of age-0 relative abundance and survival of age-0 trout in the roaded section of the mainstem. For trend purposes, only the six original sites were used for calculation of a mean fry index. However, all 39 sites will be used for future estimates of overwinter survival.

## Tributary Surveys

Two sites on Pierce Creek were sampled in 2013 to evaluate presence, distribution and abundance of Rainbow Trout in comparison to 2010 (Figure 53). Sampling was conducted on July 23-24 2013.

In 2013, single-pass electrofishing was used to survey salmonids using a backpack electrofishing unit (Smith-Root Model 15-D) with pulsed DC. Depletion estimates were not conducted because miss-communication with crews regarding techniques with age-0 fish. Nongame fish and amphibian species were also recorded if observed. Fish were identified, enumerated, measured to the nearest millimeter (total length, TL) and weighed to the nearest gram, and released downstream of the study sites. Study sites were about 100 m in length. Sections of stream where vegetation was too thick to sample effectively were not included in the sample site. Because electrofishing is characteristically size selective (Sullivan 1956; Reynolds 1996), trout were separated into two length groups (<100 mm TL and $\geq$100 mm TL) and abundance estimates were calculated individually for each size group.

# RESULTS AND DISCUSSION

## Fry Monitoring

On March 21, 2013 we collected 50 age-1 Rainbow Trout among the six sites ranged between 48-88 mm (Figure 54). These fish were considered to be age-0 fish during fall sampling. IDFG estimated overall mean age-1 index to be 0.3 $\pm$ 0.2 fish / m in March 2013 (Figure 55). This is a marked decrease in density from the previous fall when 340 fish were captured and estimated density was 1.7 $\pm$ 1.9 fish/m (Butts et al. 2013). From these numbers, we estimate winter survival of age-0 fish to be approximately 15%.

The 2013 age-0 year class density and abundance was assessed on October 16-17, 2013. The six original trend sites were sampled in addition to 33 additional sites that were added to better estimate over-winter survival. In the six trend sites, 104 Rainbow Trout were captured and fry density was measured at 0.6 $\pm$ 0.8 fish/m. In all 39 sites, age-0 index was 0.4 $\pm$ 0.2 fish/m.

Annual fall age-0 Rainbow Trout density had appeared to be stable, averaging 2.3 $\pm$ 1.8 fish during 1996-2012 (Figure 56). However, the 2013 fall survey showed an approximate 75% decrease in density estimates. This decline can easily be attributed to debris and sediment flows that occurred beginning on September 12, 2013. The presence of age-0 trout and high numbers of sculpin that were observed during sampling was encouraging. However, approximately 1-3 cm of fine sediment covered and embedded the substrate in the near-shore areas that were sampled for age-0 abundance. This level of fine sediment had not been observed in these sections in any of the previous sampling efforts. Considering that age-0 trout utilize the interstitial spaces in gravel during cold winter temperatures, over-winter survival of age-0 fish between 2013-2014 is expected to be low.

## Tributary Surveys

We collected 63 age-0 and two age-1 Rainbow Trout in the two Pierce Creek sites (Table 19). In 2010, 23 age-0 and six age-1 fish were collected at the same sites (Kozfkay et al. 2011). The upper site (2) in particular showed a nearly eight-fold increase in age-0 trout

collected. This vast increase is likely due to cooperative fish passage improvements that were completed in 2012 where a culvert was replaced with a bridge. Unfortunately, Pierce Creek was one of the tributaries that incurred direct damage from the wildfire and a debris slide in fall 2013. Pierce Creek should be sampled again in the next 1-2 years to assess status and if spawning fish are utilizing the tributary.

## MANAGEMENT RECOMMENDATIONS

1. Conduct mark-recapture estimates in the three trend sites during fall 2014 to assess effects of debris flows and fires on trout and whitefish populations. The monitoring, which occurs every three years, had previously been scheduled for 2015, but efforts should be moved up to address concerns.

2. Continue to use annual shoreline electrofishing to monitor spawning success, fry production, and overwinter survival; relate fry densities to adult abundance, flows, or other environmental variables as data becomes available.

3. Conduct tributary surveys to assess post-fire status and 2014 year class in Cayuse, Bock, Meinecke, Trail, and Pierce creeks.

Table 19. Dates and results from backpack electrofishing assessments that occurred on Pierce Creek, a tributary to the South Fork Boise River in 2010 and 2013. Depletion estimates were not conducted in 2013.

| | | | | < 100 mm | | | ≥ 100 mm | | | Total | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | Site | Temp (°C) | Passes | n | Estimate | 95% CI | n | Estimate | 95% CI | n | Estimate | fish/100m$^2$ |
| 7/24/2013 | 1 | - | 1 | 10 | - | - | 1 | - | - | 11 | - | - |
| 7/23/2013 | 2 | 14.6 | 1 | 53 | - | - | 1 | - | - | 54 | - | - |
| 6/8/2010 | 1 | 15.2 | 3 | 17 | 19 | 12-26 | 3 | 3 | 2-4 | 20 | 22 | 12.1 |
| 6/23/2010 | 2 | 13.1 | 3 | 6 | 6 | 2-10 | 3 | 3 | 3-3 | 9 | 9 | 6 |

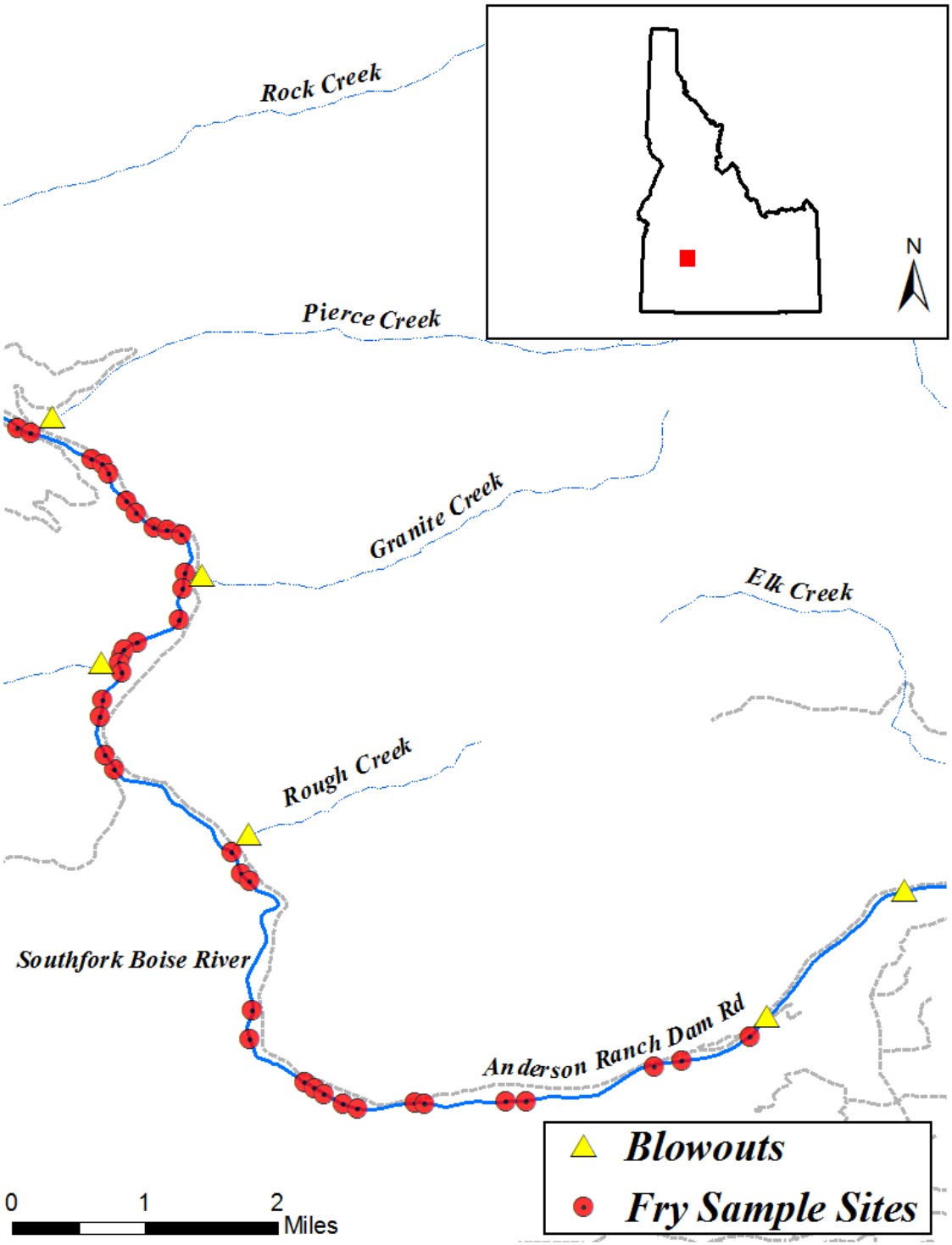


Figure 52. Map of South Fork Boise River, Idaho tailwater section showing location of major debris slides in September 2013, 2013 fry monitoring sites.

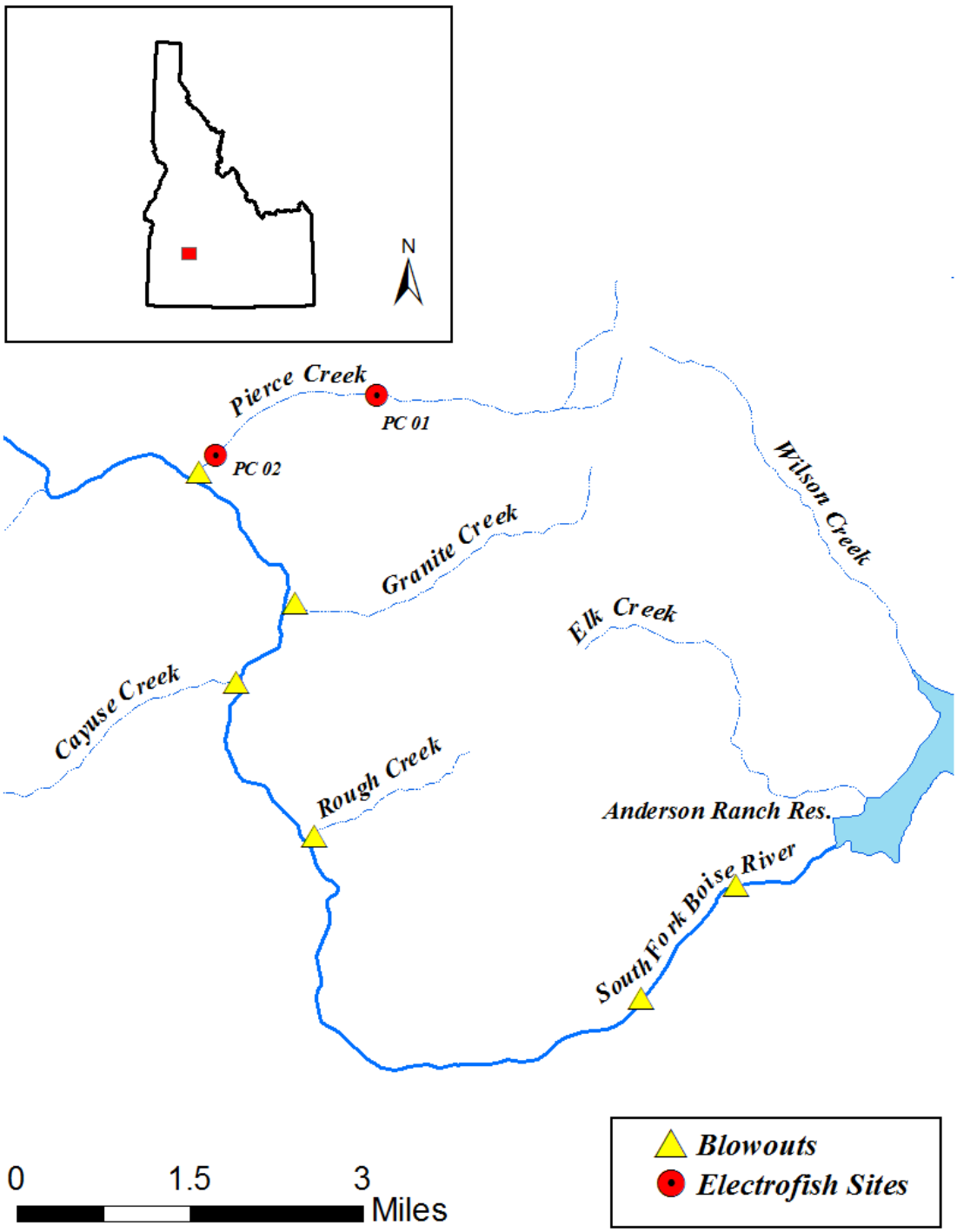


Figure 53. Map of South Fork Boise River, Idaho tailwater section showing sampling locations in Pierce Creek in July 2013 and major debris slides in September 2013.

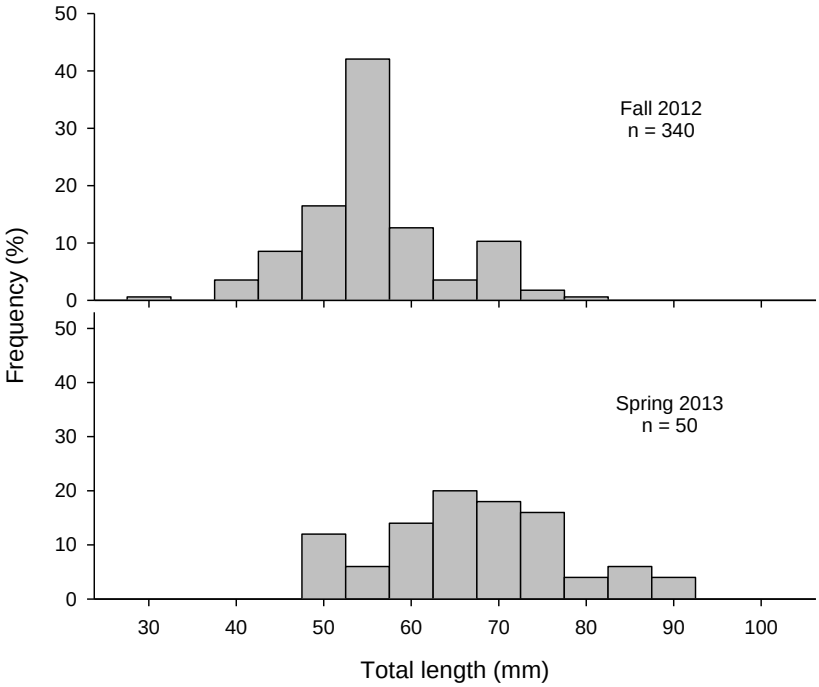


Figure 54. Length distributions of Rainbow Trout fry, calculated as proportion of total catch, during fry index surveys between October 2012 and March 2013 in the South Fork Boise River below Anderson Ranch Dam.

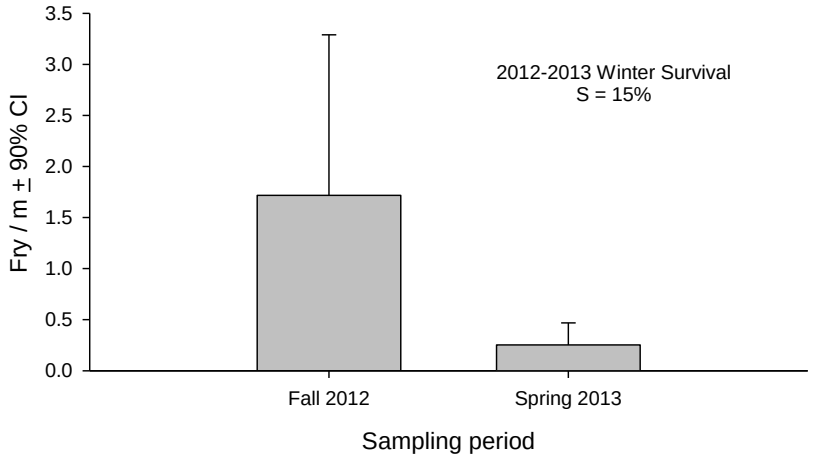


Figure 55. Comparison of mean Rainbow Trout fry collected at six 33-m long shoreline trend sections between fall 2012 and spring 2013 at the South Fork Boise River, Idaho. Overwinter survival was estimated at 15%.

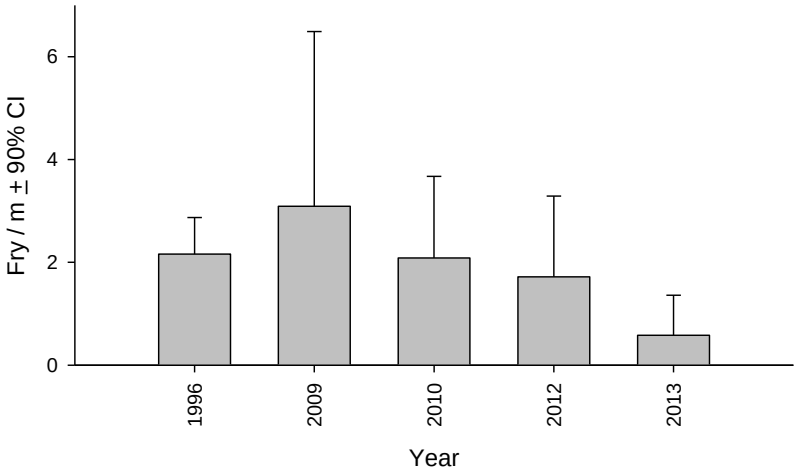


Figure 56. Comparison of mean Rainbow Trout collected at six 33-m long shoreline trend sections between 1996-2013 at the South Fork Boise River, Idaho.