FISHERY MANAGEMENT INVESTIGATIONS

# IDAHO DEPARTMENT OF FISH AND GAME

# FISHERY MANAGEMENT ANNUAL REPORT

**Virgil Moore, Director**

## SOUTHEAST REGION
## 2011


Arnie Brimmer, Regional Fishery Biologist
Ryan Hillyard, Regional Fishery Biologist
David Teuscher, Regional Fishery Manager



December 2012
IDFG # 12-106

## 2011 Southeast Region Annual Fishery Management Report

## TABLE OF CONTENTS

## TABLE OF CONTENTS (CONT.)

**Page**

**2011 Southeast Region Annual Fishery Management Report**

**LOWLAND LAKE AND RESERVOIR INVENTORIES AND SURVEYS**

## ABSTRACT

We evaluated seven southeast Idaho reservoirs during the summer of 2011via gill netting, electrofishing and Passive Integrated Transponder (PIT) tag recoveries. Largemouth bass *Micropterus salmoides* (LMB) Proportional Stock Densities (PSD) were evaluated in four Franklin County reservoirs. Condie Reservoir had the highest largemouth bass PSD estimate of 57 followed by Winder (33), Johnson (26) and Twin Lakes (17). In 2010 we identified Johnson Reservoir as an underperforming fishery due its high catch rates of undesirable-sized bluegill. In an attempt to improve the size structure of the bluegill fishery we stocked 114 LMB into the reservoir during June 2011and will return in 2012 to evaluate the project. Blackfoot Reservoir had the highest relative abundance of rainbow trout *Oncorhynchus mykiss* (RBT; 15%) seen in the last three decades. However, Yellowstone cutthroat trout *O. clarkii bouvieri* (YCT) abundance remains low due to predation by American white pelicans *Pelecanus erythrorhynchos* (AWPE). We continued to monitor the population of illegally introduced LMB in Treasureton Reservoir. Our results suggest that at least four age classes of LMB were present at the time of the survey. Age-0 fish were the most abundant and comprised 59% of the total catch followed by age-1 (18%), age-2 (16%) and age-3 (7%), respectively. The presence of LMB in the reservoir will over time reduce the productivity of the RBT fishery. Over the past decade, AWPE use of Chesterfield Reservoir has increased along with expansion of the AWPE population using Blackfoot Reservoir. In 2011 we PIT tagged 300 RBT out of 32,000 destined for Chesterfield Reservoir. Over the course of the summer we recovered 97 tags from Chesterfield and Blackfoot Reservoirs that had been consumed by AWPE. These tag recoveries provided a minimum predation estimate of 32% which suggests about 10,347 RBT were lost to AWPE predation.

## **Largemouth Bass Surveys**

### Introduction and Methods

In the early 1990's a comprehensive research study was initiated to better understand the biology of largemouth bass *Micropterus salmoides* (LMB) in Idaho (Dillon 1991). A conclusion of that work indicated that water temperature was a key factor controlling LMB productivity. Several other studies described growth potential of LMB across their natural range (McCauley and Kilgour 1990; Beamesderfer and North 1995). Those studies coupled with Dillon (1991) identify the maximum growth potential for LMB in the predominately coldwater lakes and reservoirs in Idaho. However, many other factors can contribute to the population structure and success of a LMB fishery. Most importantly are harvest, lake productivity, and interaction among fish species (i.e., competition and predation). Monitoring of those variables is necessary to maintain or improve LMB fisheries in southeast Idaho.

Electrofishing surveys were completed on six southeast Idaho reservoirs in 2011. All of the reservoirs are small (< 200 ha), shallow, and productive. Table 1 shows reservoir name, elevation, surface area, species composition, and current LMB harvest regulations.

Largemouth bass and potential prey species abundance were evaluated using shoreline electrofishing. Target species for electrofishing included LMB and bluegill *Lepomis macrochirus* (BG). Catch-per-unit-effort (CPUE) was used to compare the relative abundance of LMB among the different reservoirs. The CPUE data were collected using night-time shoreline electrofishing with boat-mounted equipment. All electrofishing was completed in June between 2100 and 0400 hours. Netting effort varied depending on catch rates. The first priority was to obtain a random sample of all species. In some waters, BG densities were too high to continually net that species and achieve the sample goal for LMB. In such cases, selective netting for LMB was implemented. Size selective netting periods for LMB were not included in CPUE or Proportional Stock Density (PSD) analysis. Fish were weighed to the nearest 10 g and measured for total length (mm).

During 2010, we identified Johnson Reservoir as an underperforming fishery due its high catch rates of undesirable sized BG. In an attempt to improve the size structure of the BG fishery we collected LMB from two Franklin County reservoirs and introduced them into Johnson Reservoir. All LMB relocated to Johnson Reservoir were of adequate size to immediately start impacting the abundant BG population. These fish were collected and transferred while performing the surveys mentioned above. The Johnson Reservoir survey was completed prior to the transfer of the additional LMB.

### Results and Discussion

Catch rates of warmwater species varied markedly among reservoirs. Bluegills were most abundant in Johnson Reservoir followed by Winder, Crowthers and Twin Lakes Reservoirs, respectively. No bluegill were observed in Condie or Foster reservoirs. Largemouth bass were most abundant in Johnson Reservoir followed by Winder, Crowthers and Twin Lakes reservoirs, respectively (Table 2).

Proportional Stock Density trends for most of the Southeast Region reservoir fisheries are highly variable (Table 3). Protective harvest regulations may moderate the fluctuations in PSDs, but do not appear to guarantee quality fishing. For example, Condie Reservoir is managed using the trophy bass rule of no harvest of LMB under 508 mm. Despite the conservative harvest rule, the PSD in this reservoir fluctuates widely. In 2008, PSD was 90 but in just two years the PSD dropped to 36. Currently, the PSD seems to be climbing again in spite of the presence of several strong cohorts of young bass (Figure 1). It appears Condie Reservoir is poised to produce excellent bass angling opportunities for the next several years.

Similar to LMB, BG PSDs were also variable in the reservoirs surveyed. Twin Lakes and Crowthers reservoirs had the highest PSD at 41 while Winder had the lowest at 3 (Table 2). Bluegill are present in Condie Reservoir, however, we were unable to sample any during the survey. We suspect that during the survey, BG were occupying deeper portions of the reservoir and were therefore not susceptible to shoreline electrofishing methodology.

The BG fishery in Johnson Reservoir has changed little over the last two years. The population is dominated by small BG with the majority being less than the quality length of 150 mm (Figure 2). Johnson Reservoir had a PSD of 6 which is well below what other researchers have recommended (40-60; Guy 1990; Novinger 1978). Furthermore, Gabelhouse (1984) suggested that a BG PSD of 50-80 is needed to promote a high level of angler participation in the fishery. In the interest of creating a desirable BG fishery in Johnson Reservoir, we stocked 114 LMB into the reservoir during June. These LMB had a mean length and weight of 380 mm and 726 g, respectively and ranged in size from 338 to 435 mm. The transfers occurred on the nights of June $15^{th}$ and $16^{th}$. We anticipated these fish would have an immediate impact on emerging young-of-year as well as age-1 BG. We will return to Johnson Reservoir in 2012 to evaluate this project.

No BG or LMB were found in Foster Reservoir in 2011. In 2009, Foster Reservoir was nearly drained to provide needed water to irrigators. We believe the warmwater fishery was lost at that time. Foster has been drained in the past but has been restocked naturally by outflow from Glendale Reservoir. However, a new water delivery system was installed in 2009 that connects Glendale Reservoir to Foster Reservoir. The lack of LMB or BG in the catch from Foster Reservoir suggests that entrainment of fish from Glendale Reservoir to Foster Reservoir has been significantly reduced. It should be noted that rainbow trout *Oncorhynchus mykiss* (RBT) were collected during the survey of Foster Reservoir suggesting that our equipment was functioning properly and had LMB or BG been present, they should have been captured. Anglers have been reporting excellent catch rates for RBT but have not reported catches of any warmwater fish.

## Blackfoot Reservoir

### Introduction and Methods

Blackfoot Reservoir is located on the Blackfoot River in Caribou County north of Soda Springs, Idaho. Its primary uses are irrigation storage and flood control. The U.S. Bureau of Indian Affairs regulates the dam and reservoir. At full capacity, the reservoir is at 1,865 m elevation, covers 7,285 ha and contains 432,000,000 $m^3$ of water. Refilling begins in October and continues through spring. Irrigation use begins in June with drawdown beginning as irrigation demand exceeds inflow.

Historically, Blackfoot Reservoir was a premier fishery for large size (>500 mm) Yellowstone cutthroat trout *Oncorhynchus clarkii bouvieri* (YCT). The fishery slowly deteriorated and eventually crashed in the early 1980s. In 1989, a comprehensive plan to reestablish a fishery for wild YCT was formulated after several years of study (LaBolle and Schill 1990). It called for elimination of wild cutthroat trout harvest from Blackfoot Reservoir. In order to provide a harvest fishery, large numbers of both hatchery RBT and hatchery Bonneville cutthroat trout *O. clarkii. utah* (BCT) originating from Bear Lake were stocked. Attempts were made for BCT to establish their own natural spawning run into the Little Blackfoot River. Bonneville cutthroat trout stocking was discontinued in 1994. Rainbow trout stocking was increased as a replacement. We started by stocking catchables and fingerlings in the spring. However, after a few years of evaluation it was clear these fish were not recruiting to the fishery. In response to our findings, we switched to a fall release of triploid RBT catchable-sized fish.

Currently, predation by the American white pelican *Pelecanus erythrorhynchos* (AWPE) is threatening a genetically unique population of YCT in the Blackfoot River system. The adult AWPE population at Blackfoot Reservoir increased from a few hundred in 1993 to a peak of 3,416 in 2007. However, over the last two years the population has decreased from 1,734 in 2010 to 724 in 2011, the lowest recorded in past ten years. This AWPE population represents one of only two breeding colonies in Idaho. Conversely, the adult population of YCT declined from 4,747 in 2001 to about 938 in 2010. No YCT escapement estimates are available for 2011 due to the record run-off experienced during the 2011 migration season. Both AWPE and YCT are classified by Idaho Dept. of Fish and Game (IDFG) as "species of special concern." In addition to "special concern" status, recent genetic work showed that Blackfoot River YCT trout carry unique genetic markers not found in any other YCT population.

During the summer of 2011 we sampled Blackfoot Reservoir with gill nets (floating and sinking). Gill nets measured 42 m x 2 m with six panels composed of 19, 25, 32, 38, 51, and 64 mm bar mesh. The combination of one floating and one sinking net, fished overnight equaled one unit of gill net effort. Overall, we applied 4 units of gill net effort (Figure 3). All fish captured were identified, enumerated, measured to the nearest mm (Total Length; TL) and weighed to the nearest g. Occasionally, catches were too large to measure and weigh every fish. In these cases, we sub-sampled a portion of the total catch.

We had four objectives associated with this project. First, we wanted to determine if smallmouth bass *Micropterus dolomieu* (SMB) were present in the reservoir. Second, we wanted to assess the status of the yellow perch *Perca flavescens* population. Third, we wanted to assess the effects of predation by AWPE on the reservoir fishery relative to species composition and relative abundance. Lastly, we wanted to determine if our hatchery RBT program was continuing to recruit to the fishery as was observed in 2009.

## Results and Discussion

Over the past three to four years subtle changes have occurred in the Blackfoot Reservoir fishery. Non-trout species continue to dominate the fishery but for the first time since 1967 their relative abundance has been less than 90% (Table 4). This downward trend began in 2009 when the relative abundance of non-trout species went from 97% in 2005 to 91%. Non-trout species relative abundance declined again in 2011 to 85% (Table 4). We do not known what caused the slight decline in non-trout species relative abundance but it may be linked to AWPE predation.

As hoped, RBT continue to recruit to the fishery. We switched to fall stocking (after AWPE have migrated) of RBT in 2004. This stocking effort did not show up in the 2005 sample however these fall plants are now recruiting to the fishery with regularity (Table 4). Of the RBT captured in 2011 (60) were of quality size. These fish had a mean length and weight of 454 mm and 1,013 g, respectively. Analysis of the length frequency histogram suggests that several cohorts were present at the time we sampled but there was substantial overlap between the groups (Figure 4). Currently, the trout fishery appears to be driven largely by the Department's stocking program. Yellowstone cutthroat trout catch continues to be low and has not exceeded four individuals in any of the past five sampling events (Table 4). We believe AWPE predation on YCT adults and juveniles particularly when they are in the Blackfoot River system is preventing this population from reaching its full potential.

## Treasureton Reservoir

### Introduction and Methods

Treasureton Reservoir is located on Battle Creek in Franklin County. Its primary function is irrigation storage and flood control. Secondarily, the reservoir provides excellent sportfishing opportunities. The dam and reservoir are owned and operated by the Strongarm Reservoir Company. At full capacity, the reservoir is at 1,645 m elevation, covers 58 ha and contains 2,280,000 $m^3$ of water. The reservoir had been managed as a year-round fishery based on plants of catchable and fingerling RBT. In 1994, reservoir management changed to quality management with a two trout (none between 12 and 16 inches) limit. In 2008, management again changed to a two trout (none < 20") harvest limit. Recently, we have documented the presence of LMB, the product of an illegal fish introduction.

Over the last few years Treasureton Reservoir has experienced avian predation problems. Double-crested Cormorants *Phalakros auritus sp.* (DC), on their annual migration to northern breeding colonies, consistently stopover to rest and feed in many of Franklin County's irrigation reservoirs including Treasureton Reservoir. In 2009, most of the 19,500 RBT fingerlings that were stocked into Treasureton in the spring were lost to DC predation (Figure 5). We responded in two ways to mitigate for this loss. First, we back filled the loss by stocking surplus catchable trout in May (1,955) and October (1,650) of 2010. Second, we adjusted the stocking schedules for most of the reservoirs in the county so that RBT were planted after DC had left the area (mid-June). We had two objectives associated with this project. The first was to evaluate the RBT stocking program changes implemented in 2010 and the second was to monitor the population of illegally introduced LMB.

An electrofishing survey was completed on Treasureton Reservoir in the fall of 2011. We used a boat mounted electrofishing unit to complete the survey. The survey was conducted from 2000 to 0000 hours on October 12th. All fish captured were measured and weighed to the nearest mm and g, respectively and released. Over the past decade we conducted these surveys during the spring but high water conductivity coupled with extensive macrophyte growth made fish collection difficult. Therefore we decided to switch to fall sampling since it would likely provide more consistent sampling conditions.

## Results and Discussion

The results from the 2011 survey suggest that our stocking change implemented in 2009 has been successful. Figure 5 shows that in 2011, three strong year classes were present. The RBT stocked in late June of 2011 comprised the majority of the catch followed by fish stocked the previous spring.

Largemouth bass have been sampled from Treasureton Reservoir over the past several years albeit at low numbers. It was not until 2011 that high numbers of LMB were captured from the reservoir. Our results suggest that at least four age classes of LMB were present at the time of the survey (Figure 6). Age-0 fish were the most abundant and comprised 59% of the total catch followed by age-1 (18%), age-2 (16%) and age-3 (7%), respectively. As mentioned above, Treasureton Reservoir is currently managed as a monoculture RBT trophy water. The presence of LMB in the reservoir will, over time, reduce the productivity of the RBT fishery and will likely make it difficult to maintain the trophy component of the fishery. Therefore, in the near future, we plan to renovate the reservoir with rotenone to remove all fish from the system and to reestablish a monoculture RBT fishery.

# Chesterfield Reservoir

## Introduction and Methods

Chesterfield Reservoir is the most popular trout fisheries in southeast Idaho. During the 1990s, the fishery was managed under general harvest rules that included a six-trout limit with no size or bait restrictions. Those regulations maximized yield from the reservoir. In 1994, anglers fished an estimated 158,000 hours and harvested over 70,000 RBT. Despite the popularity of the fishery, anglers began requesting more restrictive harvest regulations to allow more fish to grow to quality size. In response to angler requests and creel analysis that showed harvest would be significantly reduced under more conservative bag limits, the trout limit was reduced from 6 to 3 fish per day in 1998. The bag limit was reduced a second time to 2 trout in 2002.

Over the past decade, AWPE use of Chesterfield Reservoir has increased along with expansion of the AWPE population using Blackfoot Reservoir (Brimmer et al. 2011). Concerns have arisen regarding the predation impacts these birds may be having on the RBT fishery in Chesterfield Reservoir. The purpose then, of this work was to arrive at a minimum estimate of AWPE predation on RBT in Chesterfield Reservoir.

During 2011, we PIT (Passive Integrated Transponder) tagged RBT destined for Chesterfield Reservoir. We used half duplex 23 mm tags purchased from ORFID (www.oregonrfid.com) in this study. On May 15$^{th}$ and 16$^{th}$ we randomly selected 300 RBT from a larger group of 32,000 fish from Hagerman State Fish Hatchery that were to be stocked into the reservoir; PIT tagged them and released them back into the raceway they came from. These fish were stocked in Chesterfield Reservoir on May 18$^{th}$.

We attempted to recover PIT tags at two locations during the summer and fall of 2011. The first area we recovered PIT tags was a small island located at the north end of Chesterfield Reservoir. American white pelicans loafed on this island while at the reservoir. The second location was from Gull Island located on Blackfoot Reservoir. See Brimmer et al. 2011 for procedural details.

## Results and Discussion

Overall, we recovered 97 PIT tags from Chesterfield and Blackfoot Reservoirs in 2011. Thirty seven of these tags were collected from Chesterfield Reservoir and 60 from Blackfoot Reservoir. The minimum predation estimate generated from these recoveries was 32%. So, of the approximately 32,000 RBT stocked into Chesterfield Reservoir in May, we lost a minimum of 10,347 to AWPE predation which equates to a significant loss of angling and harvest opportunity. Results from a previous PIT tag AWPE predation study on Blackfoot Reservoir show that PIT tag recovery rates are low (21%). Therefore, the estimated predation rate of 32% is likely much lower than what actually occurred (Brimmer et al. 2011). It appears that AWPE predation on RBT may be greatest during the first few weeks post stocking as shown in a RBT study from Blackfoot Reservoir (Teuscher et al. 2004).

In the coming year, we plan to expand our study at Chesterfield to include estimating a predation rate similar to what has occurred on the Blackfoot River system over the past two years (Brimmer et al. 2011).

## MANAGEMENT ROCOMMENDATIONS

1. Continue tracking RBT and LMB in Treasureton Reservoir and renovate the reservoir when RBT growth or condition declines.
2. Repeat the gill net survey of Blackfoot Reservoir.
3. Evaluate the fishery improvement efforts completed at Johnson Reservoir.
4. Expand the AWPE predation work started at Blackfoot River to include surrounding sport fisheries.

Table 1. Species composition and bass harvest regulations for reservoirs included in the 2011 warmwater fishery evaluations.

| Water | Elevation (m) | Surface Area (ha) | Species Composition | Bass Harvest Regulations |
|---|---|---|---|---|
| Twin Lakes | 1,452 | 180 | LMB[a], BG[b], CR[c], RBT[d] | 6 none under 12” |
| Condie | 1,500 | 47 | LMB, BG, YP[e], TM[f] | 2 none under 20” |
| Winder | 1,492 | 38 | LMB, BG, RBT, YP, CR, TM | 6 none under 12” |
| Johnson | 1,485 | 20 | LMB, BG, YP, TM, RBT | 6 none under 12” |
| Crowthers | 1,428 | 13 | LMB, BG, RBT | 6 none under 12” |
| Foster | 1,480 | 145 | RBT | 6 none under 12” |

[a] Largemouth bass.
[b] Bluegill.
[c] Crappie.
[d] Rainbow trout.
[e] Yellow perch.
[f] Tiger musky.

Table 2. Catch-per-hour of electrofishing effort in six southeast Idaho reservoirs in 2011. Proportional Stock Density values for largemouth bass (LMB) and bluegill (BG) are shown in parenthesis.

| Species | Twin Lakes | Condie | Winder | Johnson | Crowthers | Foster |
|---|---|---|---|---|---|---|
| LMB | 148 (17) | 152 (57) | 204 (33) | 217 (26) | 127 (0) | None |
| BG | 113 (41) | None | 429 (3) | 471 (6) | 121 (41) | None |

Table 3. Trends in Proportional Stock Density (PSD) for select largemouth bass populations in reservoirs of southeast Idaho. Glendale and Lamont were not sampled in 2011.

| Year | Condie | Johnson | Glendale | Lamont | Twin Lakes | Winder |
|---|---|---|---|---|---|---|
| 1986 | | | | 13 | | |
| 1987 | | | | | | |
| 1988 | 30 | | 9 | | 25 | 10 |
| 1989 | | | | | | |
| 1990 | | | | | | |
| 1991 | | | | | | |
| 1992 | | | | 3 | | |
| 1993 | 21 | | 6 | 1 | | 25 |
| 1994 | 58 | | | | | |
| 1995 | | | | 1 | | |
| 1996 | | | | | | |
| 1997 | | | | | | |
| 1998 | | | 83 | | | |
| 1999 | 43 | | | | 0 | |
| 2000 | | | | | | |
| 2001 | | | | | | |
| 2002 | 97 | | 56 | 8 | 0 | 0 |
| 2003 | 14 | | | | | |
| 2004 | | | | | | |
| 2005 | | | | | | |
| 2006 | 20 | | 56 | 13 | 48 | 78 |
| 2008 | 90 | | 23 | | | |
| 2010 | 36 | 12 | 84 | 8 | | |
| 2011 | 57 | 26 | | | 17 | 33 |

Table 4. Summary of gill net data from Blackfoot Reservoir from 1963 to 2011.

| Year | Nets | Total catch | RBT | YCT | Total trout | % Trout | UC | US | CP | YP | Total non-trout | % Non-Trout |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1963 | 2 | | | | | 31 | | | | | | 69 |
| 1964 | | | | | | 25 | | | | | | 75 |
| 1967 | 4 | 348 | | | 13 | 4 | | | | | 335 | 96 |
| 1968 | | 270 | 15 | 4 | 19 | 8 | 122 | 129 | | | 251 | 92 |
| 1971 | 20 | 782 | 9 | 16 | 25 | 3 | 456 | 283 | 18 | | 757 | 97 |
| 1980 | 12 | 865 | 16 | 19 | 35 | 4 | 556 | 272 | 2 | | 830 | 96 |
| 1991 | | 273 | 1 | 7 | 8 | 3 | 216 | 49 | | | 265 | 97 |
| 1997 | | 389 | 6 | 6 | 12 | 3 | 351 | 22 | 4 | | 377 | 97 |
| 1999 | 6 | 1,528 | 22 | 1 | 23 | 2 | 1,291 | 200 | 7 | 7 | 1,505 | 98 |
| 2001 | 12 | 954 | 17 | 5 | 22 | 2 | 748 | 101 | 15 | 51 | 932 | 98 |
| 2003 | 6 | 454 | 26 | 1 | 27 | 6 | 304 | 123 | | | 454 | 94 |
| 2004 | 8 | 648 | 3 | 3 | 6 | 1 | 528 | 113 | 1 | | 648 | 99 |
| 2005 | 8 | 476 | 10 | 2 | 12 | 3 | 311 | 148 | 2 | 3 | 476 | 97 |
| 2009 | 8 | 973 | 82 | 3 | 85 | 9 | 590 | 235 | 47 | 16 | 973 | 91 |
| 2011 | 8 | 424 | 60 | 4 | 64 | 15 | 179 | 165 | 6 | 10 | 360 | 85 |

YCT = Yellowstone cutthroat trout, RBT = rainbow trout, UC = Utah chub, US = Utah sucker, YP = yellow perch, CP = common carp

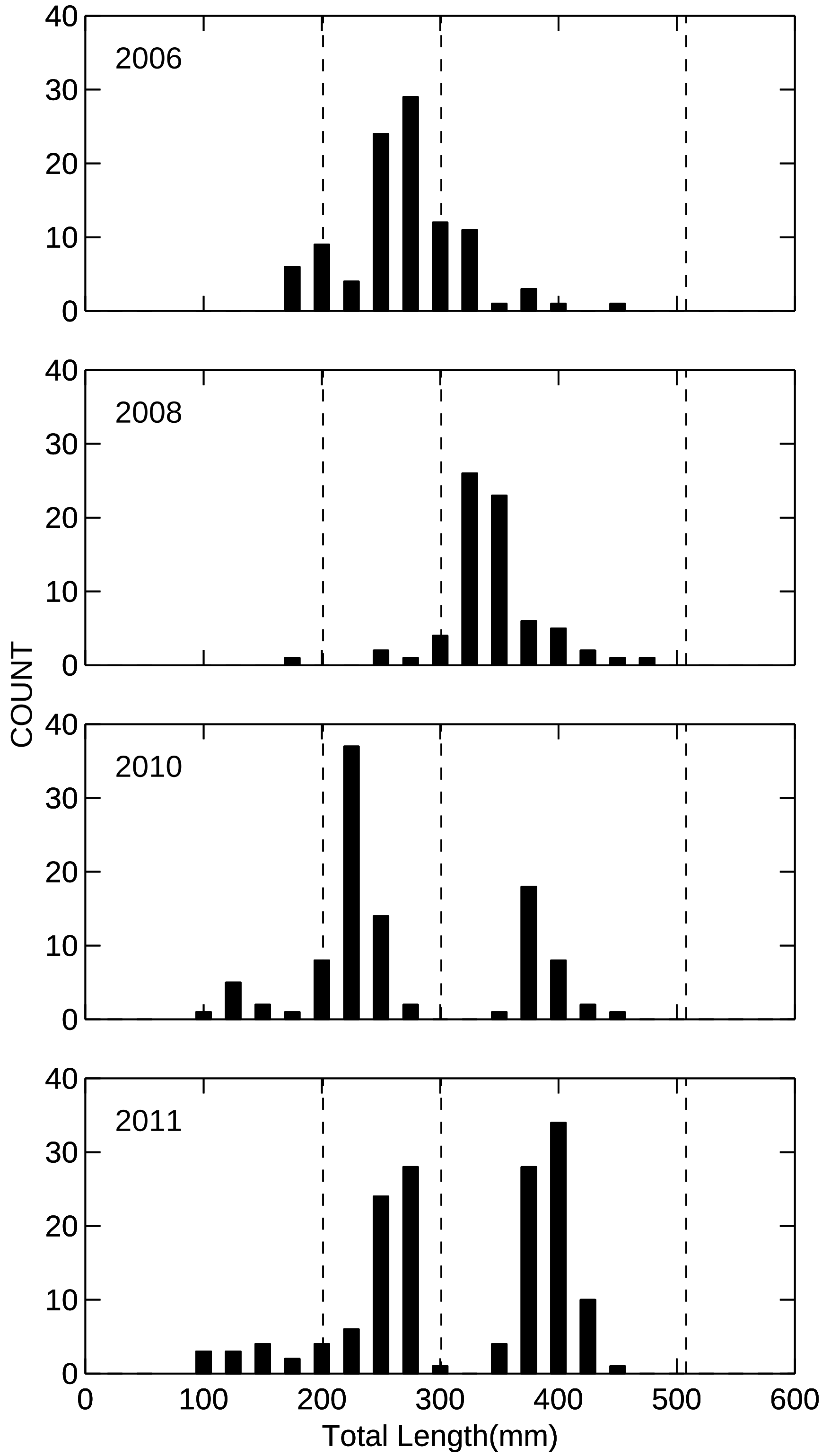


Figure 1. Largemouth bass length frequency distributions from Condie Reservoir. The vertical dashed lines represent largemouth bass stock length (200 mm), quality length (300 mm) and minimum harvest length (508 mm).

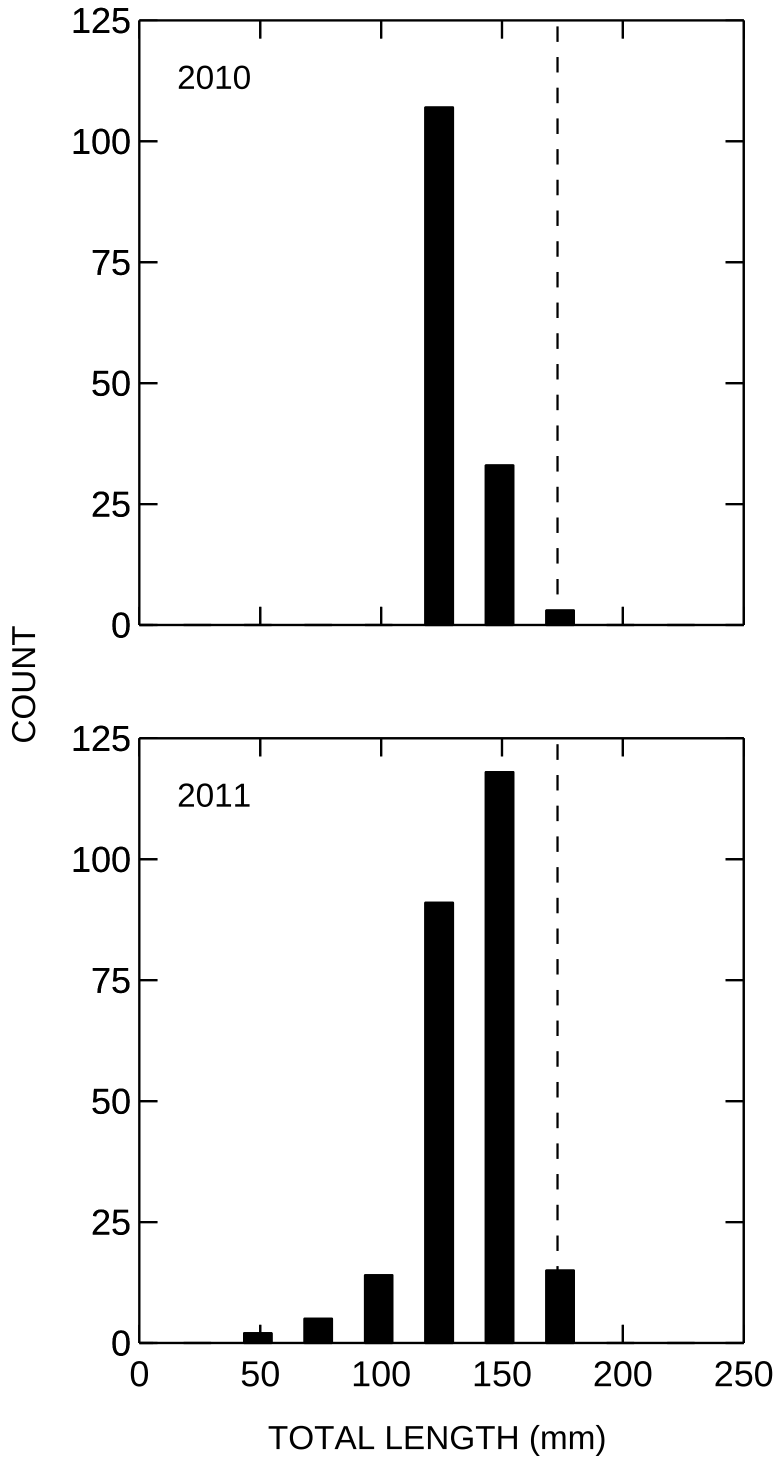


Figure 2. Length frequency distribution of bluegill collected from Johnson Reservoir, Idaho, in 2010 and 2011.

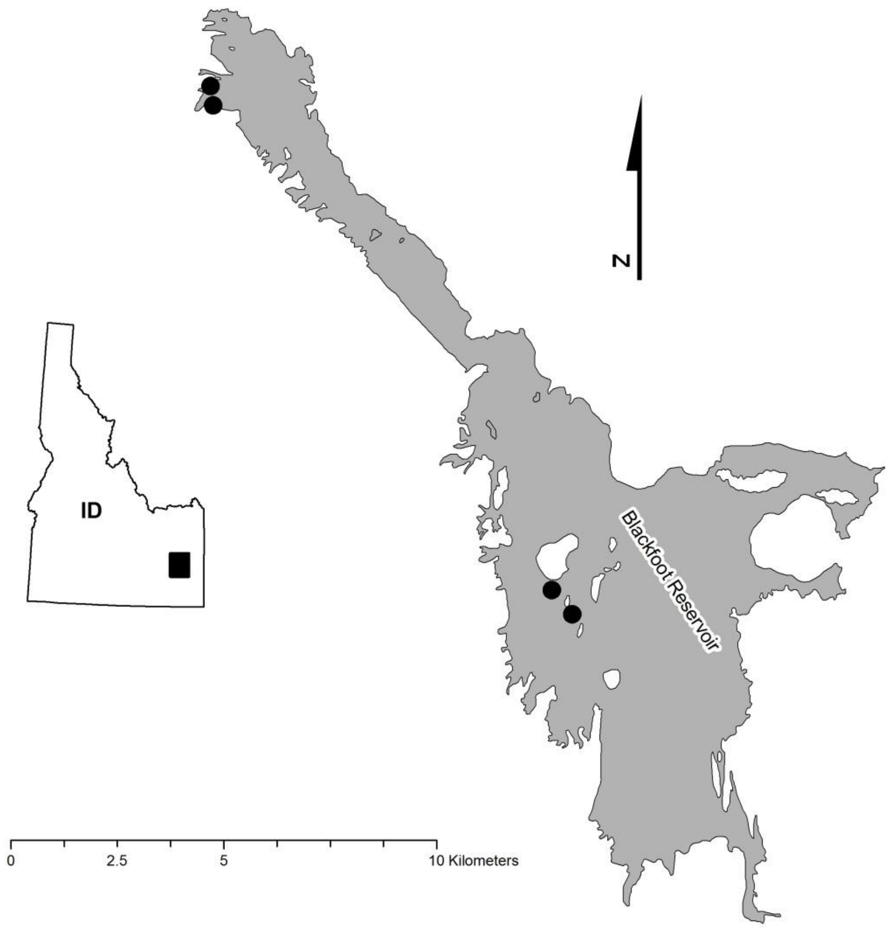


Figure 3. Locations where gill nets (●) were set at Blackfoot Reservoir during the summer of 2011.

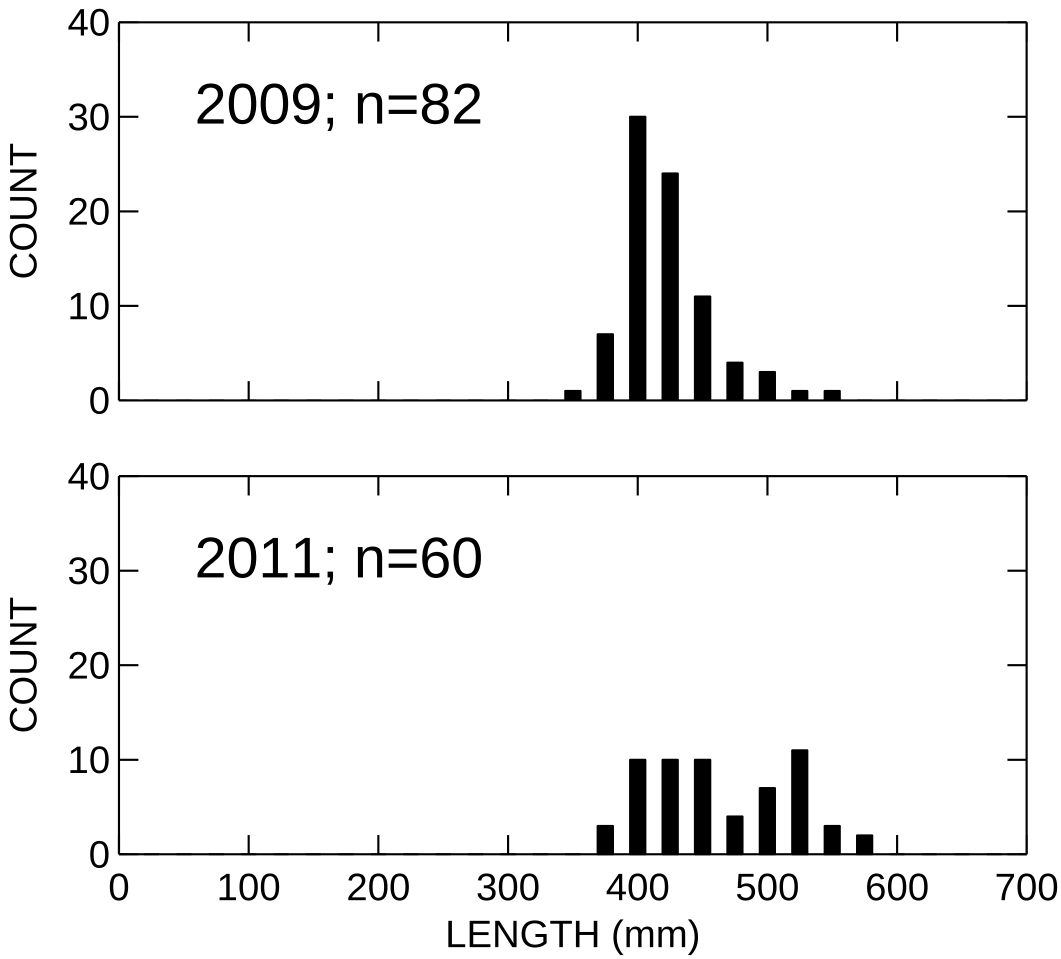


Figure 4. Length frequency of rainbow trout collected from Blackfoot Reservoir during the summers of 2009 and 2011.

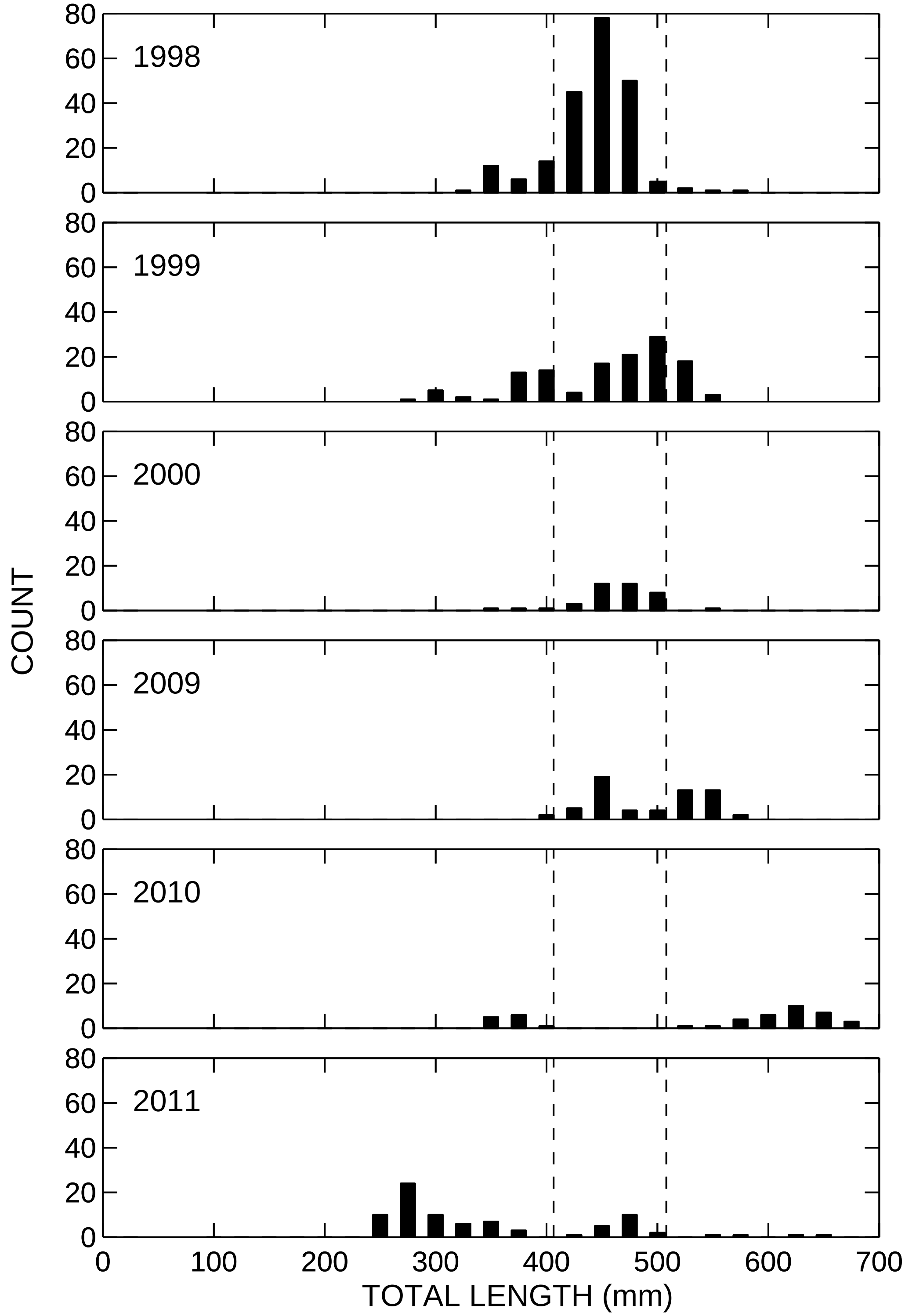


Figure 5. Length frequency distribution of rainbow trout collected from Treasureton Reservoir, Idaho, from 1998-2011. The left vertical dashed line represents the 16" minimum length regulation that the reservoir was previously managed under and the right, the current minimum size limit of 20".

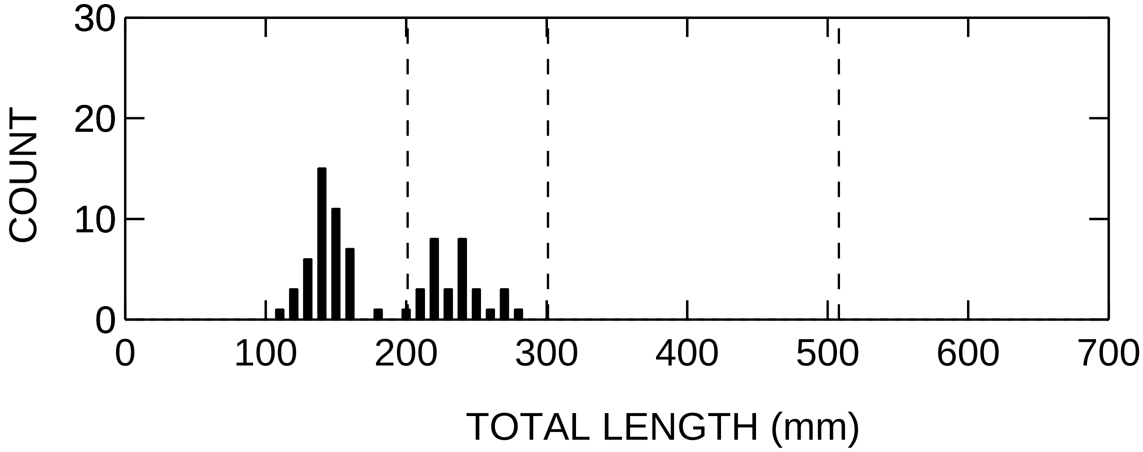


Figure 6. Length frequency distribution of largemouth bass collected from Treasureton Reservoir, Idaho, in the fall 2011. The vertical dashed lines represent stock length (200 mm), quality length (300 mm) and memorable length (510 mm).

## RIVERS AND STREAMS INVESTIGATIONS AND SURVEYS

## ABSTRACT

We surveyed the Blackfoot, Bear, and Snake River systems via electrofishing in 2011. Using a Maximum Likelihood model, we estimated 3,222 Yellowstone cutthroat trout *Oncorhynchus clarkii bouvieri* (YCT) using the Blackfoot River Wildlife Management Area in August which was slightly higher than average (3,098). The density estimate of 370 YCT/km was similar to what was observed in previous years. We also estimated predation rates of American white pelicans *Pelecanus erythrorhynchos* (AWPE) on YCT in the Blackfoot River system. Juvenile YCT (≤ 224 mm) had a predation rate of 36% in 2011 which was substantially lower than observed in 2010 (71%). Conversely, resident YCT (≥ 225 mm) had a predation rate of 32% which was higher than what was observed in 2010 (6%). Adfluvial YCT tagged at-large in Blackfoot Reservoir had a predation rate of 27% which was similar to the 34% observed in 2010. Similar to our results, a concurrent radio telemetry study on adult adfluvial YCT yielded predation rates of 38% (2010) and 31% (2011). Bonneville cutthroat trout *Oncorhynchus clarkii utah* (BCT) were sampled from 17 sites within the Bear River drainage. The highest mean BCT densities were observed in Third Creek (23.0 BCT/100 $m^2$) and the lowest in Whiskey Creek (0.1 BCT/100 $m^2$). Bonneville cutthroat trout densities appear to be trending upward in Third and Maple creeks but downward in Beaver Creek. In 2008, the smallmouth bass *Micropterus dolomieu* angling regulation changed from 6 bass none under 12” to 2 bass any size on the Snake River between American Fall Dam and Gifford Springs. We attempted to evaluate the regulation change in 2011 but were unable to do so due to high Snake River discharge in June. We will attempt to evaluate the regulation change again in 2012.

## Yellowstone Cutthroat Trout Monitoring in the Blackfoot River System

### Introduction and Methods

There are two long-term monitoring programs in place for Yellowstone cutthroat trout *Oncorhynchus clarkii bouvieri* (YCT) in the upper Blackfoot River. They are adult spawning counts and population estimates within the Blackfoot Wildlife Management Area (BWMA) located about 51 km above the reservoir. The spawning counts have been completed every year since 2001. The population surveys are completed less frequently.

An electric fish migration barrier was installed in the Blackfoot River in 2003. The barrier includes a trap box designed using Smith Root Inc. specifications. The barrier components include four flush mounted electrodes embedded in Insulcrete, four BP-X.X.-POW pulsators, and a computer control and monitoring system. The computer system can be operated remotely, records electrode outputs, and has an alarm system that triggers during power outages. Detailed descriptions of these components and their function can be obtained at www.smith-root.com.

The electric barrier was operated from May 2$^{nd}$ to June 23$^{rd}$. Prior to observing fish at the trap, field crews checked the live box several times a week. On numerous occasions YCT were angled below the trap, processed and released above the trap. Once fish began entering the trap, it was checked at least once a day. Fish species and total lengths (mm) and weights (g) were recorded. Yellowstone cutthroat trout were visually checked for bird scars. Bird scar monitoring began in 2004. Scar rates were associated with increases in pelicans feeding in the Blackfoot River downriver of the trap. All salmonids handled at the trap were injected with a 32 mm half duplex Passive Integrated Transponder (PIT) tag purchased from Oregon RFID (oregonrfid.com). These fish were tagged so they could be included in a pelican predation study currently underway.

In 1994, the Idaho Department of Fish and Game (IDFG), with assistance from the Conservation Fund, purchased the 700-ha ranch and began managing the property as the BWMA. The BWMA straddles the Blackfoot River, with an upper boundary at the confluence of Lanes, Diamond, and Spring creeks and a lower boundary at the head of a canyon commonly known as the upper narrows. Approximately 9 km of river meander through the property along with 1.6 km of Angus Creek, which is a historical YCT spawning and rearing stream. Since purchasing the BWMA, IDFG has completed periodic population estimates to monitor native YCT abundance.

We estimated YCT abundance within 5.2 km of the BWMA reach of the Blackfoot River in 2011. The estimate was completed using mark-recapture methods. Fish were sampled with drift boat-mounted electrofishing gear. All YCT captured were injected (marked) with a 23 mm PIT tag (oregonrfid.com). Fish were marked on Aug 22$^{nd}$ and recaptured Aug 31$^{st}$. Data were analyzed using Fish Analysis + software package (Montana Fish Wildlife and Parks 2004). All YCT caught were measured for total length (mm) and weighed to the nearest g.

## Results and Discussion

In 2011, a total of 11 adult YCT were collected at the migration trap. The small number of adult fish encountered at the trap was not due to a weak run but rather to record high May and June river discharge. Mean May discharge was 936 cfs, nearly twice what we have ever experienced while operating the trap in previous years. The average discharge for May is 522 cfs. Similarly, the mean June discharge of 667 cfs was also nearly twice as high as ever encountered. The average discharge for June is 289 cfs. When river discharge reaches about 750 cfs two issues arise. First, the water level in the trap box becomes too high to effectively crowd and extract fish and second, the river begins to enter the floodplain which provides numerous avenues for fish to circumvent our trapping facilities. None of the YCT observed in the trap in 2011 had fresh bird scars or healed bird scars. Scarring rates have varied from no visible scars on fish collected in 2002 to a high of 70% scarred in 2004. Scarring rates may be related to the predation rate by pelicans, but no information is available to determine the relationship. Variation in scarring rates is likely impacted by the overall number of pelicans feeding on the river below the migration trap, water levels and clarity, and hazing efforts exerted on the birds to reduce predation impacts. The hazing efforts were described by Teuscher and Scully (2008). Escapement and bird scar trends are shown in Table 5.

A total of 449 YCT were sampled on the BWMA during the mark and recapture electrofishing surveys which was similar to numbers sampled in recent history (Table 6). Normally the survey is conducted during the first two weeks of July. However, during this time frame in 2011 the river was too high to effectively electrofish so we postponed the effort until August.

In past surveys of the BWMA reach, juveniles (< 300 mm) dominated the catch. Thurow (1981) reported that about 80% of the fish caught during population surveys were less than 300 mm TL. Results from 1995, 2005, 2006, 2009, 2010 and 2011 surveys show similar ratios of juvenile cohorts (Figure 7).

## <u>Predation Rates of Yellowstone Cutthroat Trout by American White Pelicans on the Upper Blackfoot River and Blackfoot Reservoir</u>

### Introduction and Methods

During the past nine years, fisheries and wildlife crews have been investigating interactions between AWPE and YCT in the Blackfoot Reservoir/River system in Southeast Idaho. Early work focused on estimating consumption and bird scarring rates of YCT by AWPE. Later research focused on estimating predation rates of YCT by AWPE using radio telemetry. All of this early research focused on the impacts of adult AWPE on adult YCT. Over the past two years we have expanded the research to include juvenile YCT.

Blackfoot Reservoir is located in the southeast corner of Idaho at an elevation of 1,685 m. The reservoir covers 7,284 ha (Figure 8). The fish community is dominated by Utah chub *Gila atraria*, Utah sucker *Catastomus ardens*, yellow perch *Perca flavescens*, and common carp *Cyprinus carpio*. Yellowstone cutthroat trout and hatchery-stocked RBT make up about 15% of the species composition in the reservoir. Rainbow trout and various species of cutthroat trout have been stocked in the reservoir since its impoundment in 1912. Recently, cutthroat trout stocking was terminated to reduce the potential interaction with native YCT and triploid RBT are now stocked in the fall after piscivorous birds have left the area for the winter.

The Blackfoot River flows into the southeast corner of the reservoir and is approximately 39 km in length from its origin to its confluence with the reservoir (Figure 8). The adult spawning populations of YCT in the upper Blackfoot River has varied markedly over the past 15 years. Predation loss by AWPE is contributing to the low YCT population. The fish community in the river is largely comprised of YCT, redside shiner (*Richardsonius balteatus*), Utah sucker and speckled dace (*Rhinichthys osculus*).

This section describes our effort to quantify the impacts of AWPE on adult and juvenile YCT populations in Blackfoot Reservoir and the upper Blackfoot River. The specific questions addressed in this study include: 1) What is the predation rate of adult YCT by AWPE, and 2) what is the predation rate of juvenile YCT by AWPE?

Half duplex PIT tags were used to tag YCT in this study. The tags measured 23 or 32 mm in length and 3.85 mm in diameter and were purchased from Oregon RFID (www.oregonrfid.com). The 23 mm tags were injected in to YCT measuring 120-350 mm TL while the 32 mm tags were injected into YCT greater than 350 mm. We tagged YCT at three locations during the 2011 field season: Blackfoot Reservoir, upper Blackfoot River, and at our adult trap situated on the lower Blackfoot River (Figure 8). Adult YCT tagged in the reservoir were captured by electrofishing, adult YCT tagged in the lower river were captured at the adult trap and adult and juvenile YCT tagged in the upper river were captured via boat electrofishing. All fish tagged were released in the general vicinity of where they were captured.

We also deployed PIT tag detection antennas at two locations on the Blackfoot River (Figure 8). These antennas were constructed on site using 8 gauge plastic coated braided wire, and PVC pipe and fittings. Each antenna was custom fabricated to cover the bottom of the stream. The antenna deployed on the upper Blackfoot River measured 27 m long X 0.5 m wide while the antenna installed on the lower Blackfoot River, below our adult trap, measured 15 m long X 1 m wide. Both antennas were rectangular in shape and were placed entirely under water with their horizontal plane parallel to the bottom (Figure 9). The arrays were maintained at least once a week which consisted of battery changes and data downloads.

We corrected PIT tag estimates of predation by feeding adult AWPE PIT tagged fish. The correction accounts for PIT tag deposition away from the nesting islands and our efficiency of detecting PIT tags on the islands. Chubs and suckers were collected from the reservoir via trap net, PIT tagged, injected with air via hypodermic syringe and then fed to AWPE. If a tagged fish was not observed being consumed, it was excluded from the analysis. After AWPE left their nesting sites on Blackfoot Reservoir (Willow and Gull Islands) we went there to recover the PIT tags known to be consumed by AWPE and any other PIT tags (from YCT) that were deposited there (Figure 8). A grid was laid out on the islands and we covered each grid with a backpack PIT tag detector purchased from Oregon RFID (www.oregonrfid.com; Figure 10). The purpose of this exercise was to determine a depositional rate of PIT tags on the islands so this rate could be applied to the YCT tags we also recovered. We tagged a total of 233 chubs and suckers that were consumed by AWPE. Of these 233 tags, we recovered 28 from the islands which provided us with a deposition and recovery rate of 12%. We then applied this rate to YCT tags we recovered from the islands to arrive at a corrected predation rate. For example, if we recovered 10 YCT tags from the islands and applied the correction factor to this number we would obtain an estimate of predation ($10 \div 0.12 = 83$). So in this example, the minimum number of YCT actually consumed by AWPE was 83.

We estimated AWPE predation rates for three groups of YCT. The first group was comprised of adfluvial sized fish (> 400 mm) captured from the reservoir or at the adult trap. The second and third groups were comprised of YCT collected from the Blackfoot River Wildlife Management Area (BWMA) located in the upper Blackfoot River drainage. The second group included fish ≤ 224 mm which contained mostly age-1 and age-2 YCT. Some of the fish in this group were likely to migrate out of the BWMA and end up in the reservoir. The third group included YCT ≥ 225 mm. We think this group mainly consisted of resident fish.

## Results and Discussion

Overall, 593 YCT were PIT tagged during 2011. A total of 248 YCT ≥ 225 mm were tagged with 11 being tagged at the adult trap, 30 at Blackfoot Reservoir and 166 on the upper Blackfoot River. We also tagged 386 juvenile (≤ 224 mm) YCT collected from the upper Blackfoot River (Table 7).

The number of YCT lost to AWPE predation varied by size classes. We currently have a graduate student conducting a telemetry study on adfluvial YCT. His preliminary results indicate AWPE predation rates of about 38% (2010) and 31% (2011), respectively which is similar to the results we obtained via PIT tags in 2010 (34%) and 2011 (27%; Green, Master's Thesis, In Progress). We think the predation rate dropped in 2011 due to the exceptional run-off experienced that year. The AWPE population was estimated to be 1,734 in 2010, nearly identical to the estimate of 1,748 in 2004. Given that AWPE numbers were similar between the two years, one would expect the predation rate to be similar as well but that was not the case. We think the difference in predation rates between 2004 (21%) and 2010 (38%) can be attributed to tagging location and our inability to account for telemetry tag deposition away from the nesting islands in 2004. In 2004, YCT were telemetry tagged at the trap which is located above the reach of river where AWPE predation is significant. So, YCT captured at the trap had a higher probability of surviving the remainder of their spawning migration than fish that had yet to navigate the lower river. In 2010 and 2011, all YCT were telemetry tagged at-large in the reservoir. Therefore, these groups were better suited to capture the extent of AWPE predation than the group of fish tagged in 2004. Furthermore, in 2004 we did not have a telemetry receiver stationed on the nesting islands. So if an AWPE containing a telemetry tag flew to an island and then left before depositing its tag, we were unable to assign the cause of mortality. In 2010 and 2011, telemetry stations were in place on the nesting islands so the correct type of mortality could be assigned regardless if the tag was deposited on the island or elsewhere. Results from 2010 and 2011 showed that on average only 50% of the telemetry tags consumed were deposited on the nesting islands and the remaining half of the tags consumed were deposited elsewhere. If this information is applied to the 2004 data then the actual predation rate in 2004 was about 42%. The estimated predation rate of 42% is plausible since we experienced a poor water year in 2004 which made migrating YCT extremely vulnerable to predation. We also conducted a radio telemetry study on adult YCT in 2007. But again we were only able to estimate predation based on the number of tags recovered from the nesting islands (33%; Teuscher et al. 2009). If we "correct" for deposition away from the islands as mentioned above, we obtain a more accurate estimate of predation (67%). We experienced another poor water year in 2007 and the AWPE population peaked at 3,416. These factors combined suggest a predation rate of 67% is reasonable.

As mentioned before, all of the research prior to 2010 has focused on adult YCT and AWPE interactions, mainly because it was thought AWPE predation was only significantly affecting this size class of YCT. However, we now know this is not the case. In 2010, of the 165 (≤ 224 mm)

YCT tagged in the upper Blackfoot River, 24 of them were consumed by AWPE. When corrected, this represents 117 juvenile YCT consumed by AWPE which translates to a staggering predation rate of 71% (Table 7; Brimmer et al. 2011). Juvenile YCT fared better in 2011 when only 36% were lost to AWPE predation (Table 7). Previously we hypothesized that juvenile YCT are more susceptible to avian predation than adult YCT because the young fish are migrating to the reservoir in May, June, and early July and then again in the fall (Brimmer et al. 2011). We think this life history behavior puts them at higher risk to AWPE predation than older age classes. Results obtained in 2011 once again support this hypothesis. In 2011, juvenile YCT again had a higher predation rate than fish ≥ 225 mm tagged during the same time frame and in the same location. None of the PIT tags from the August group were recovered from Gull Island. We think this is because AWPE have ceased using the island in August. So, tags consumed during this time would have been deposited elsewhere.

In 2009 we jaw tagged all adult YCT collected at the trap to estimate AWPE predation. However, jaw tags proved difficult to recover from the nesting islands so we were unable to estimate predation in 2009. But the jaw tag returns from live fish (coupled with PIT tag returns) have yielded interesting life history characteristics. We jaw tagged a total of 811 YCT (575 females and 236 males) collected at the trap in 2009. The following year, we PIT tagged a total of 891 YCT. Of these, 662 were female and 229 were male (Table 8). In both years, the composition of the spawning run was dominated by females at about 73%. Of the jaw tagged YCT that attempted a spawning run the following year (2010), 13% were female and 5% were male. Only 4% of the original group tagged in 2009 attempted a third run spawning run in 2011 and the sex ratio was evenly split at 2% (Table 8). Initially it appeared that female YCT PIT tagged in 2010 and returning in 2011 did not exhibit similar second year returns as the jaw tagged group of fish. However, we think the lower return rate of female PIT tagged YCT might have been due to a shed tag issue rather than a lower than expected number of females making a second spawning run. Meyer et al. (2011) found that sexually mature RBT (> 15 cm) had tag loss rates of up to 33% while tag loss rates in mature males was only 10%. They concluded that tag loss in female trout was associated with egg expulsion during spawning activities. If the tag loss rate mentioned above is applied to our data, then the true number of PIT tagged females returning for their second spawning run should have been about 46 or 7% of the original marked group. These “corrected” figures appear to be more in line with what we observed in the jaw tagged group. Thurow (1980) also jaw tagged YCT in the upper Blackfoot River during the early 1980s to determine spawning frequency. Our results were similar to Thurow’s regarding second time spawning attempts; however he did not document any third time spawning events.

We plan to continue our PIT tagging efforts in the upper Blackfoot River in 2012. We will attempt to PIT tag groups of YCT during May, June, July, and August. It is hoped that by expanding the samples temporally, we will be able to more accurately identify when AWPE predation is occurring on up-river YCT.

## Bonneville Cutthroat Trout Monitoring Program

### Introduction and Methods

Bonneville cutthroat trout *Oncorhynchus clarkii utah* (BCT) are one of three native cutthroat trout sub-species in Idaho. The distribution of BCT, in Idaho, is limited to the Bear River Drainage. In the early 1980s, distribution and abundance data for this native trout were deficient. Initially, to better understand BCT population trends and the potential influence of natural and anthropogenic processes, a long-term monitoring program was initiated for three tributary streams of the Thomas Fork Bear River (Preuss, Giraffe, and Dry Creeks). These streams were to be sampled every other year. Although, in 2006, as part of the BCT management plan (Teuscher and Capurso 2007), additional streams were added to the BCT monitoring program to implement a broader representation of BCT population trends from across their historical range in Idaho. These additional monitoring streams included Eightmile, Bailey, Georgetown, Beaver, Whiskey, Montpelier, Maple, Cottonwood, Snow slide, First, Second, and Third creeks, and the Cub River. Finally, in 2010, IDFG personnel determined that the monitoring program would be better represented by dropping some sites and streams initiated in 2006, while adding other streams throughout the four BCT management units in the Bear River drainage (Figure 11). Currently, the monitoring program consists of three streams and eight sites in the Pegram Management Unit, six streams and 14 sites in the Nounan Management Unit, four streams and nine sites in the Thatcher Management Unit, four streams and eight sites in the Riverdale Management Unit, and three streams and six sites in the Malad Management Unit (Table 5). Every year, IDFG personnel will sample half of these streams. In addition, the monitoring program will include two segments of the mainstem Bear River in each of the management units. Mainstem Bear River segments in each management unit will be sampled every four years.

There are a number of variables that may be influencing BCT population trends in monitoring streams; which may include annual precipitation, water temperature, irrigation, grazing, etc. Given the sensitive status of BCT and recent petitions to list the species under the Endangered Species Act, it is important to identify and correlate variation in BCT densities that appear to be associated with these and other variables. Therefore in 2011, we collected a suite of habitat variables to begin monitoring potential changes in habitats and stream channel condition. Description of habitat variables and collection methods are listed in Table 10 In the future, habitat data will be correlated to variation in BCT abundance. Analysis of habitat variables require many years of data collection. Therefore, no statistical analysis is reported here.

To calculate mean BCT densities, we sampled at least two sites on each stream using multiple pass removal techniques with backpack electrofishing equipment. At each site, a segment of stream (approximately 100 m) was sampled, which included block nets at the downstream and upstream boundaries. The area ($m^2$) sampled was calculated using length (m) and average width (m). We calculated a population estimate using Microfish 3.0 software (Microfish Software, Durham, NC, USA). BCT percent composition was calculated by dividing the number of BCT by the total number of all salmonids sampled. Mean densities and percent composition for an entire stream was calculated by averaging the mean values from each site within a stream. Relative weights ($W_r$) were calculated for individual fish using the equation $Log_{10}W_s = -5.189 + 3.099\ log_{10}TL$, which was developed from Kruse and Hubert (1997). Mean relative weight for each stream was calculated by averaging individual relative weights.

## Results and Discussion

In 2011, nine streams were sampled which included 17 total sites within the Riverdale, Thatcher and Malad Management Units (Figure 11). Overall, mean BCT densities were 7.6 BCT/100 $m^2$ (±1.9; range 0.1 – 23.0). The highest BCT densities was observed in Third Creek (23.0 BCT/100 $m^2$) and the lowest in Whiskey Creek (0.1 BCT/100$m^2$) (Table 11). The percent composition of BCT in relationship to other salmonids sampled was variable between streams. Whiskey Creek had the lowest composition of BCT with only 3% and several streams had 100% BCT composition (Table 11).

Third Creek exhibited a large increase in BCT densities between 2010 and 2011. Data suggests there was a large year class of young-of-year BCT in 2010 (Figure 12). When we sampled Third Creek in 2011, this year class was larger and more susceptible to electrofishing methods. This resulted in a large proportion of the fish sampled coming from this size range (Figure 12). BCT densities in Maple Creek and Third Creek demonstrated an upward trend over the last decade, whereas, Beaver Creek has shown a downward trend (Table 11). BCT densities in Cottonwood Creek and Logan River have been fluctuating over the past decade.

Whiskey Creek and Trout Creek were sampled in 2006 and 2007, respectively, no BCT were sampled. This year, both streams were stocked with juvenile BCT from the Thatcher conservation hatchery program. Even though sampling efforts were conducted in close proximity to stocking locations, few BCT were sampled.

## Smallmouth Bass Investigations

### Introduction and Methods

In the late 1980s, smallmouth bass *Micropterus dolomieu* (SMB) were introduced into the upper Snake River System. Stocking locations included Gem Lake, Lake Walcott, and American Falls Reservoir. The initial stocking events resulted in natural reproducing populations, which expanded rapidly during the 1990s. The success of the smallmouth bass population enhanced fishing opportunities in the Snake River system.

Anglers quickly responded to the new SMB fishery. In American Falls Reservoir, SMB increased from 0% of total catch in 1993 to 28% in 2000. The same trend was observed in the Snake River below American Falls Dam. Smallmouth bass started contributing to river creels in the late 1990s and currently make up a significant component of effort and total catch. Perhaps the best indicator of angler response is growth in tournament angling. The first tournament on the river was held at the Massacre Rocks State Park boat launch in 2001. The number of tournaments increased to four in 2004 and six in 2005.

The U.S. Fish and Wildlife Service manage a wildlife refuge that includes 40 km of the Snake River between American Falls and Minidoka dams. The primary function of the refuge is to preserve breeding grounds for migratory birds. To facilitate that goal, about 60% of the refuge is closed to boating. Since the primary method of fishing for smallmouth bass is by boat and shore access is extremely limited, the closed boating sections are largely unexploited by anglers.

Angler opinions regarding future management of the fishery vary. Local bass club members prefer restrictive harvest regulations. Other users support the general regulation which allows harvest of six smallmouth bass over 305 mm (12 inches). In 2003, results of a random survey of 1,000 anglers showed more support for general bass regulations (41%) compared to those that favored a change to more restrictive harvest (28%). In addition to interest in harvest regulations, anglers are requesting more fishing access for sections of the Snake River that are currently closed to boats.

In 2005, IDFG began investigating the SMB fishery in the Snake River from the tailrace of American Falls Dam downriver to Minidoka Dam. The primary goals of the work were to estimate angler exploitation and determine how the closed boating zones affect angling impacts on smallmouth bass populations. The boating closure provided a unique opportunity to compare

SMB populations from open (exploited) and closed (unexploited) areas. Specific questions included: 1) are SMB mortality rates different between open and closed boating zones, and 2) has the quality of smallmouth bass being caught in the open boating zones declined with increases in angling pressure? The results of this research indicated that the exploitation rate of SMB in areas accessible to anglers was nearly 50%. These results clearly showed that under the then current general bass regulations, the quality of this fishery could not be maintained. In response to these findings, IDFG implemented a 2 bass any size regulation on the reach of the Snake River that runs from American Falls Dam to the closed boating zone below Gifford Springs. This regulation change took effect in 2008. See Teuscher and Scully 2008 for details. The purpose of our current work was to evaluate the regulation change implemented three years ago.

Smallmouth bass were collected using night-time shoreline electrofishing. The area sampled was between Gifford Springs and the upper end of Massacre Rocks State Park (areas open to boating; Figure 13). Samples were collected with boat-mounted electrofishing equipment. All electrofishing effort was completed between 2100 and 0400 hours. Lengths (TL; mm) and weights (g) were recorded for each fish. We pooled the catch data (as was done in 2005) then used SMB length frequency and Proportional Stock Density (PSD) information to assess the efficacy of the angling regulation change mentioned above.

## Results and Discussion

We sampled SMB from the open boating zones of Massacre Rocks and Gifford Springs on September 13th and 14th. In all, we captured 161 SMB ranging in size from 52 mm to 492 mm. Mean length and weight of SMB collected were 253 mm and 476 g, respectively. The SMB collected in 2011 were significantly greater in length and heavier than fish collected in 2005 (Wilks' Lambda = 0.992; df = 2, 517; P = 0.000). The PSD of 61 and catch-per-unit-effort of 71 SMB / hour were also greater than what was observed in 2005 (Table 12).

Initially, the wholesale increases described above suggest that the regulation change implemented in 2008 has benefitted the Snake River SMB population; however, differences in sampling dates may confound comparisons. The work we completed in 2005 showed that SMB undergo seasonal migrations to and from spawning areas (Teuscher and Scully 2008). The fish collected in 2005 were captured during June when SMB of spawning age were concentrated near their respective spawning areas. The area we sampled in the fall of 2011 contains few spawning locations and is considered mostly wintering habitat (Teuscher and Scully 2008). Once SMB have spawned, the majority of these fish remain near their respective spawning areas for several days or months before they begin their migration back to wintering areas. These migrations can begin in July and may continue well into October. Therefore it is possible that we did not sample the same component of the population in 2011 that was sampled in 2005 i.e. we may have sampled more large fish than we would have had we sampled in June. We had planned on sampling the river in June of 2011 to replicate what was done in 2005, but high river discharge that occurred throughout May and June was prohibitive. We will attempt to replicate the 2005 sampling effort again in 2012.

## MANAGEMENT RECOMMENDATIONS

1. Continue pelican predation work on the Blackfoot River system.
2. Continue Bonneville cutthroat trout monitoring.
3. Evaluate the smallmouth bass regulation change in the Snake River.

Table 5. Yellowstone cutthroat trout escapement estimates for the Blackfoot River 2001-2011. No escapement estimates are available in 2011 due to extremely high river discharge during the migration season which resulted in poor tapping efficiency.

| Year | Weir Type | YCT Count | Mean Length(mm) | % Bird Scars | Mean May River Discharge (cfs) | Adult Pelican Count |
|---|---|---|---|---|---|---|
| 2001 | Floating | 4,747 | 486 | No data | 74 | No data |
| 2002 | Floating | 902 | 494 | 0 | 132 | 1,352 |
| 2003 | Electric | 427 | 495 | No data | 151 | 1,674 |
| 2004 | Electric | 125 | 478 | 70 | 127 | 1,748 |
| 2005 | Electric | 16 | Na | 6 | 388 | 2,800 |
| 2006 | Electric | 19 | Na | 38 | 453 | 2,548 |
| 2007 | Electric | 98 | 445 | 15 | 115 | 3,416 |
| 2008 | Electric | 548 | 485 | 10 | 409 | 2,390 |
| 2009 | Electric | 865 | 484 | 14 | 568 | 3,174 |
| 2010 | Electric | 938 | 468 | 12 | 248 | 1,734 |
| 2011 | Electric | Na | Na | Na | 936 | 724 |

Table 6. Yellowstone cutthroat trout abundance estimates collected from the Wildlife Management Area of the Blackfoot River, Idaho.

| Year | Fish Marked | Fish Captured | Fish Recaptured | % Recaptured | Pop. Estimate | Pop. Estimate SD |
|---|---|---|---|---|---|---|
| 2005 | 266 | 202 | 20 | 7.5 | 3,664 | 569.1 |
| 2006 | 339 | 450 | 57 | 16.8 | 3,534 | 352.3 |
| 2008 | 223 | 186 | 28 | 12.6 | 2,504 | 336.5 |
| 2009 | 279 | 319 | 44 | 15.8 | 2,567 | 286.5 |
| 2010 | 317 | 272 | 11 | 3.5 | 12,944 | 4,131.2 |
| 2011 | 318 | 147 | 16 | 5.0 | 3,222 | 411.3 |
| Mean[a] | 285 | 261 | 33 | 11.5 | 3,098 | 391.1 |

[a]Excludes 2010.

Table 7. Number tagged, size class, tagging and recovery locations of Yellowstone cutthroat trout Passive Integrated Transponder (PIT) tagged in the Blackfoot River drainage, Idaho, in 2010 and 2011. Results from 2011 are in parentheses. Blackfoot Reservoir = BFRES, Upper Blackfoot River = UBFR. The adult trap was not operated during most of the 2011 migration season due to high river discharge.

| | | | PIT Tag Recovery Locations | | | | | |
|---|---|---|---|---|---|---|---|---|
| Year Size | Tag Location | Number Tagged | Adult Trap | Upper Blackfoot R. | Lower Blackfoot R. | Nesting Islands | Pit Tagged YCT Consumed | Predation Rate % |
| **2010** | | | | | | | | |
| Adult | Trap | 901 | 28 | 739 | 66 | 14 | 68 | 8 |
| Adult | BFRES | 59 | 25 | 27 | 16 | 4 | 20 | 34 |
| ≥ 225 | UBFR | 78 | 0 | 19 | 4 | 1 | 5 | 6 |
| ≤ 224 | UBFR | 165 | 0 | 45 | 4 | 24 | 117 | 71 |
| Total | | 1,203 | 53 | 830 | 90 | 43 | -- | -- |
| **2011** | | | | | | | | |
| Adult | Trap | 11 | 0 | 4 | 2 | 0 | NA | NA |
| Adult | BFRES | 30 | 0 | 1 | 13 | 1 | 8 | 27 |
| ≥ 225 | UBFR | 77[a] | 0 | 5 | 15 | 3 | 25 | 32 |
| ≤ 224 | UBFR | 161[b] | 0 | 11 | 23 | 7 | 58 | 36 |
| Total | | 279 | 0 | 21 | 53 | 11 | -- | -- |

[a] Only includes Yellowstone cutthroat trout tagged in June and July.
[b] Only includes Yellowstone cutthroat trout tagged in June and July.

Table 8. Number of Yellowstone cutthroat trout jaw tagged and Passive Integrated Transponder (PIT) tagged and number of tags recovered from the Blackfoot River system, Idaho, in 2009, 2010 and 2011.

| | | Year Tagged | | Year Recovered | |
|---|---|---|---|---|---|
| Tag Type | Sex | 2009 | 2010 | 2010 | 2011 |
| Jaw | Female | 575 (71%) | None Tagged | 76 (13%) | 9 (2%) |
| | Male | 236 (29%) | None Tagged | 12 (5%) | 5 (2%) |
| Total | | 811 | | 88 | 14 |
| PIT | Female | None Tagged | 662 (74%) | N/A | 31 (5%) |
| | Male | None Tagged | 229 (26%) | N/A | 23 (10%) |
| Total | | | 891 | | 54 |

Table 9. The 20 monitoring streams and number of sites within the four BCT management units, including the length (km) of stream sampled, total stream length (km), and the percent of stream sampled.

| Management Unit | Stream | Sites | Stream Sampled (km) | Stream Length (km) | % Sampled |
|---|---|---|---|---|---|
| Pegram | Dry Ck. | 2 | 0.2 | 13.4 | 1.5 |
| | Giraffe Ck. | 2 | 0.2 | 5.7 | 3.5 |
| | Preuss Ck. | 4 | 0.4 | 22.0 | 1.8 |
| | Bear River | 2 | 17.2 | 61.2 | 28.1 |
| Nounan | Bailey Ck. | 2 | 0.2 | 9.9 | 2.0 |
| | Eightmile Ck. | 3 | 0.3 | 23.6 | 1.3 |
| | Georgetown Ck. | 3 | 0.3 | 21.8 | 1.4 |
| | Montpelier Ck. | 2 | 0.2 | 36.0 | 0.6 |
| | Pearl Ck. | 2 | 0.2 | 5.3 | 3.8 |
| | Stauffer Ck. | 2 | 0.2 | 14.5 | 1.4 |
| | Bear River | 2 | 18.8 | 94.5 | 19.9 |
| Thatcher | Cottonwood Ck. | 3 | 0.3 | 37.4 | 0.8 |
| | Hoopes Ck. | 2 | 0.2 | 13.5 | 1.5 |
| | Trout Ck. | 2 | 0.2 | 18.3 | 1.1 |
| | Whiskey Ck. | 2 | 0.2 | 5.1 | 3.9 |
| | Bear River | 2 | 18.0 | 37.8 | 47.6 |
| Riverdale | Beaver Ck. | 2 | 0.2 | 13.7 | 1.5 |
| | Logan R. | 2 | 0.2 | 4.7 | 4.3 |
| | Maple Ck. | 3 | 0.3 | 16.1 | 1.9 |
| | Stockton Ck. | 2 | 0.2 | 9.8 | 2.0 |
| | Bear River | 2 | 13.6 | 50.2 | 27.1 |
| Malad | First Ck. | 2 | 0.2 | 9.0 | 2.2 |
| | Second Ck. | 2 | 0.2 | 8.4 | 2.4 |
| | Third Ck. | 2 | 0.2 | 11.2 | 1.8 |

Table 10. List of habitat variables, units of measurement and collection methods for habitat characteristics used to explain variation in BCT abundance estimates.

| Habitat Variable | Unit of Measurement | Collection Methods |
|---|---|---|
| Water Temperature | Celsius | Measured at beginning of survey with handheld thermometer to the nearest ± 0.5 (°C). |
| Conductivity | µs/cm | Measured at beginning of survey with conductivity meter to the nearest ± 0.1 (µs/cm). |
| Discharge | $ft^3$/sec | Measured stream discharge with Rickly discharge meter in a uniform stream segment, using methods proposed by Harrelson et al. (1994) |
| Gradient | Percent | Gradient was calculated using aerial imagery by calculating the difference in water elevation from an upstream location to a downstream location that was greater than 50 meters apart. |
| Stream Width | Meters | Measure the wetted width (± 0.1 m) of the stream at ten (10) equally spaced transects within the survey reach and then calculate the mean reach width. |
| Stream Depth | Centimeters | At ten (10) equally spaced transects, measure and sum the depth (± 1 cm) of the stream at ¼, ½, and ¾ distance across the channel and divide by four. Use these values to calculate the mean reach depth. |
| Width/Depth Ratio | Meters | Convert the mean reach depth into meters. Divide the mean reach width by the mean reach depth. |
| Percent Stable Banks | Percent | At the ten (10) equally spaced transects, determine and circle if the bank on the left and right are stable using the following definition. Streambank is stable if they DO NOT show indications of alteration such as breakdown, erosion, tension cracking, shearing, or slumping (Burton 1991). |
| Total Cover | Percent | Followed instructions from the streambank cover form in Bain and Stevenson (1999). |
| Canopy | Percent | Used a spherical densiometer and followed the methods of Platts (1987). |

Table 11. Descriptive values of Bonneville cutthroat trout population trends from monitoring streams sampled in 2011.

| | | | | Bonneville Cutthroat Trout / 100 m2 | | | | |
|---|---|---|---|---|---|---|---|---|
| **Management Unit** | **Stream** | **Year** | **Sites** | **Mean** | **Range** | **(+/-) 1 SE** | **% Comp** | **Relative Weight (Wr)** |
| Riverdale | Stockton Creek | 2010 | 2 | 8.0 | 3.0 - 12.9 | 5.0 | 97 | 90.1 |
| | | 2011 | 2 | 5.4 | 2.6 - 8.1 | 2.6 | 100 | 96.6 |
| | Maple Creek | 2001 | 2 | 3.3 | 2.1 - 4.4 | 1.2 | 100 | N/A |
| | | 2006 | 2 | 9.0 | 6.0 - 12.0 | 3.0 | 100 | 83.1 |
| | | 2009 | 3 | 10.9 | 7.2 - 16.3 | 2.8 | 98 | 88.1 |
| | | 2011 | 2 | 11.0 | 9.7 - 12.3 | 1.3 | 100 | 92.7 |
| | Beaver Ck | 2006 | 3 | 6.0 | 1.0 - 10.0 | 2.6 | 45 | 87.6 |
| | | 2009 | 3 | 1.3 | 0.8 - 2.3 | 0.5 | 26 | 89.4 |
| | | 2011 | 2 | 0.6 | 0.3 - 0.9 | 0.3 | 19 | 102.0 |
| | Logan River | 2001 | 1 | 16.4 | N/A | N/A | 100 | N/A |
| | | 2009 | 1 | 13.9 | N/A | N/A | 92 | 94.5 |
| | | 2011 | 2 | 14.2 | 11.5 - 17.0 | 2.8 | 99 | 103.1 |
| Thatcher | Hoopes Ck | 2011 | 2 | 0.9 | 0.7 - 1.1 | 0.2 | 100 | 93.3 |
| | Cottonwood | 2006 | 3 | 3.5 | 1.1 - 7.8 | 2.1 | 100 | 90.0 |
| | | 2007 | 2 | 19.0 | 10.0 - 28.0 | 9.0 | 100 | 97.0 |
| | | 2008 | 2 | 12.8 | 2.5 - 23.0 | 10.3 | 92 | 91.5 |
| | | 2011 | 3 | 11.4 | 2.4 - 17.8 | 4.6 | 97 | 85.8 |
| | Whiskey Ck | 2006 | 1 | 0.0 | N/A | N/A | 0 | N/A |
| | | 2011 | 2 | 0.1 | 0.0 - 0.2 | 0.1 | 4 | N/A |
| | Trout Ck | 2007 | 1 | 0.0 | N/A | N/A | 0 | N/A |
| | | 2011 | *2* | 2.0 | 0.0 - 3.9 | 2.0 | 42 | 91.0 |
| Malad | Third Creek | 2000 | *2* | 3.2 | 2.2 - 4.2 | 1.0 | 100 | N/A |
| | | 2006 | 2 | 1.0 | 0.0 - 2.0 | 1.0 | 100 | N/A |
| | | 2010 | 3 | 1.7 | 0.0 - 2.9 | 0.9 | 100 | 80.5 |
| | | 2011 | 2 | 23.0 | 21.7 - 24.2 | 1.3 | 97 | 87.8 |

Table 12. Catch-per-unit-effort (CPUE; Hour), Proportional Stock Density (PSD) and other parameters of interest generated from smallmouth bass captured from the open boating areas of the Snake River below American Falls, Idaho, in 2005 and 2011.

| Year | CPUE | PSD | Mean Length (mm) | Mean Weight (g) | Sample Size |
|---|---|---|---|---|---|
| 2005 | 52 | 21 | 197 | 202 | 358 |
| 2011 | 71 | 61 | 253 | 476 | 161 |

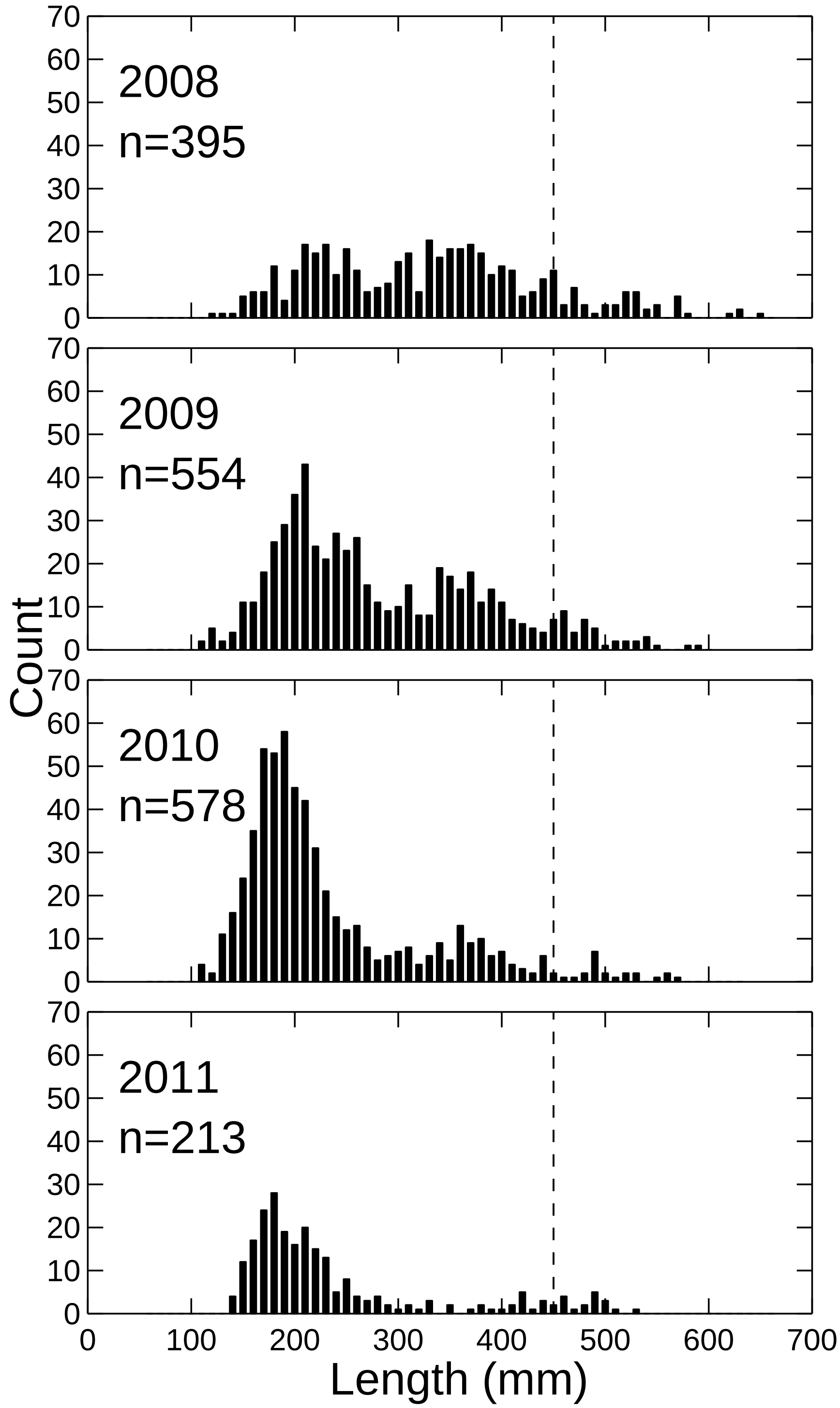


Figure 7. Length frequency distributions of Yellowstone cutthroat trout caught from the Blackfoot Wildlife Management Area of the Blackfoot River, Idaho. The majority of fish located to the right of the vertical dashed lines are likely post spawn adfluvial fish that may return to Blackfoot Reservoir.

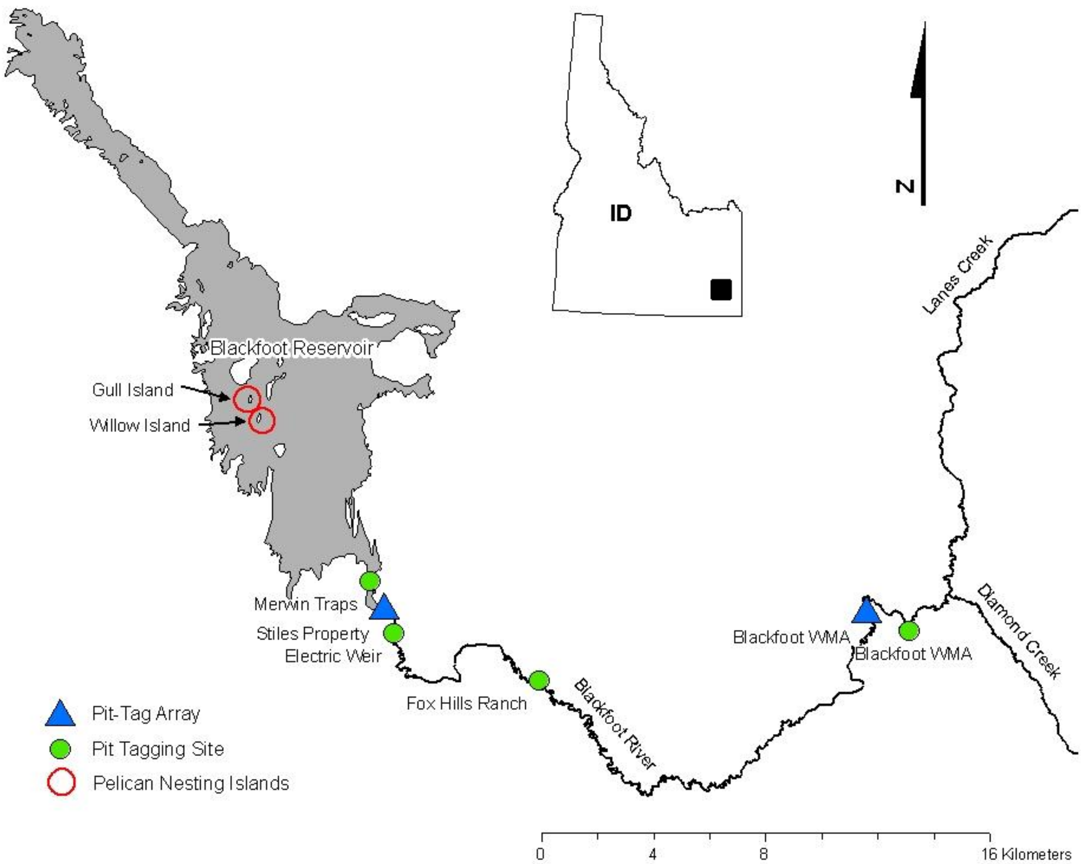


Figure 8. Locations in the Blackfoot River drainage where Yellowstone cutthroat trout were collected, Passive Integrated Transponder tagged, interrogated and released in 2011.

Figure 9. Typical Passive Integrated Transponder detection antenna, similar in design to those installed in the Blackfoot River, Idaho, in 2011. Photo provided by Oregon RFID (www.oregonrfid.com).

Figure 10. Backpack Passive Integrated Transponder (PIT) tag detector used to recover PIT tags from the American White Pelican nesting colony on Blackfoot Reservoir, Idaho, in 2011. Photo provided by Oregon RFID (www.oregonrfid.com).

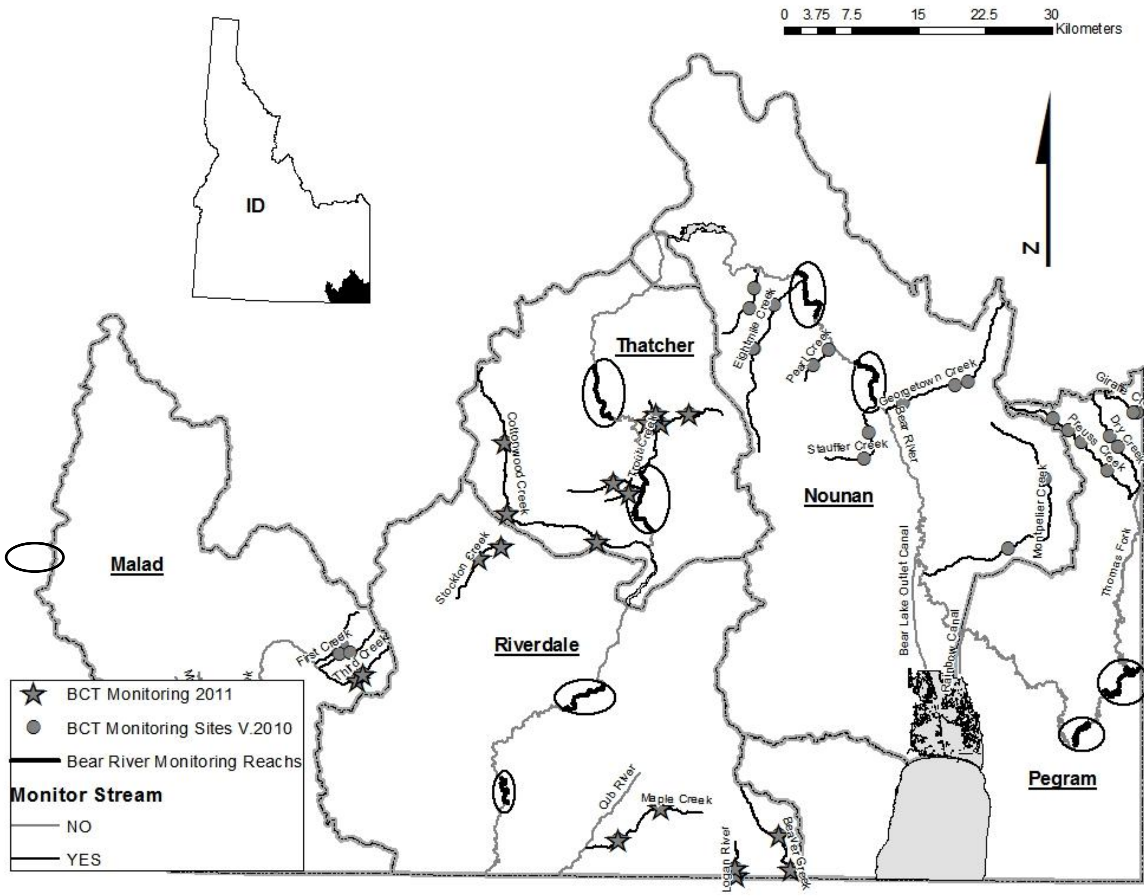


Figure 11. Map of the Bear River watershed in Idaho, including the five Bonneville cutthroat trout management units, 20 population monitoring streams, and eight main-stem Bear River monitoring reaches. Gray circles represent all monitoring sites and stars are monitoring sites sampled during the summer of 2011.

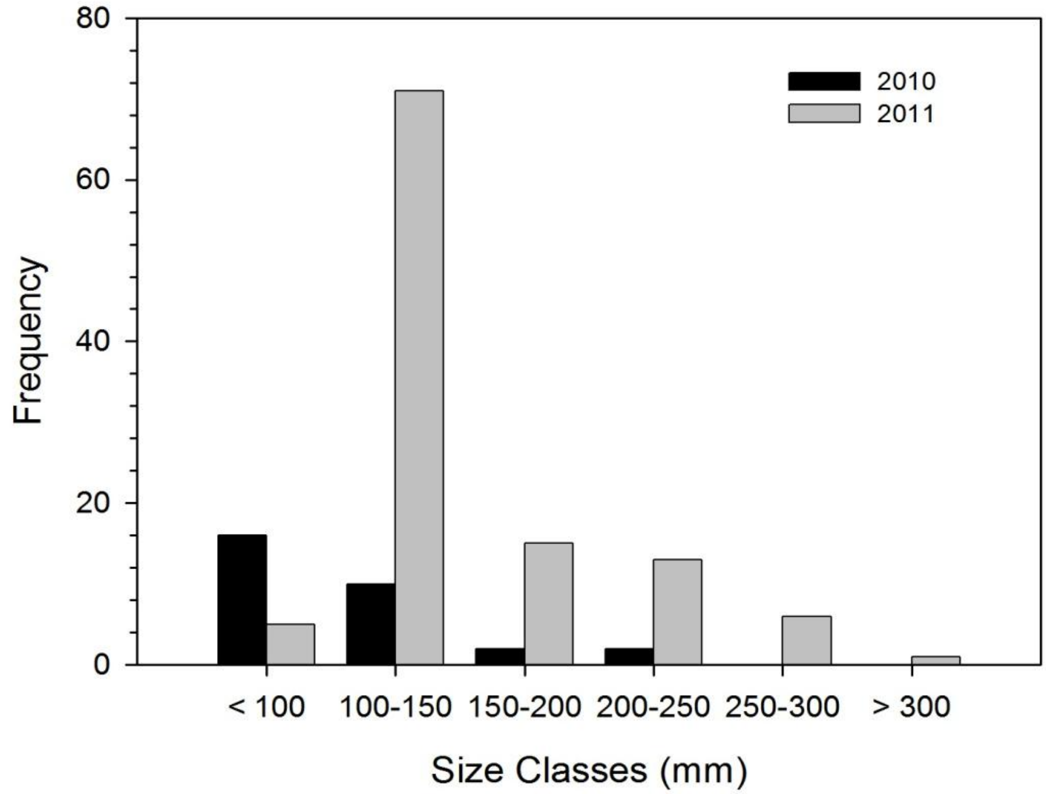


Figure 12. Frequency of the different size classes of BCT sampled in Third Creek during 2010 and 2011.

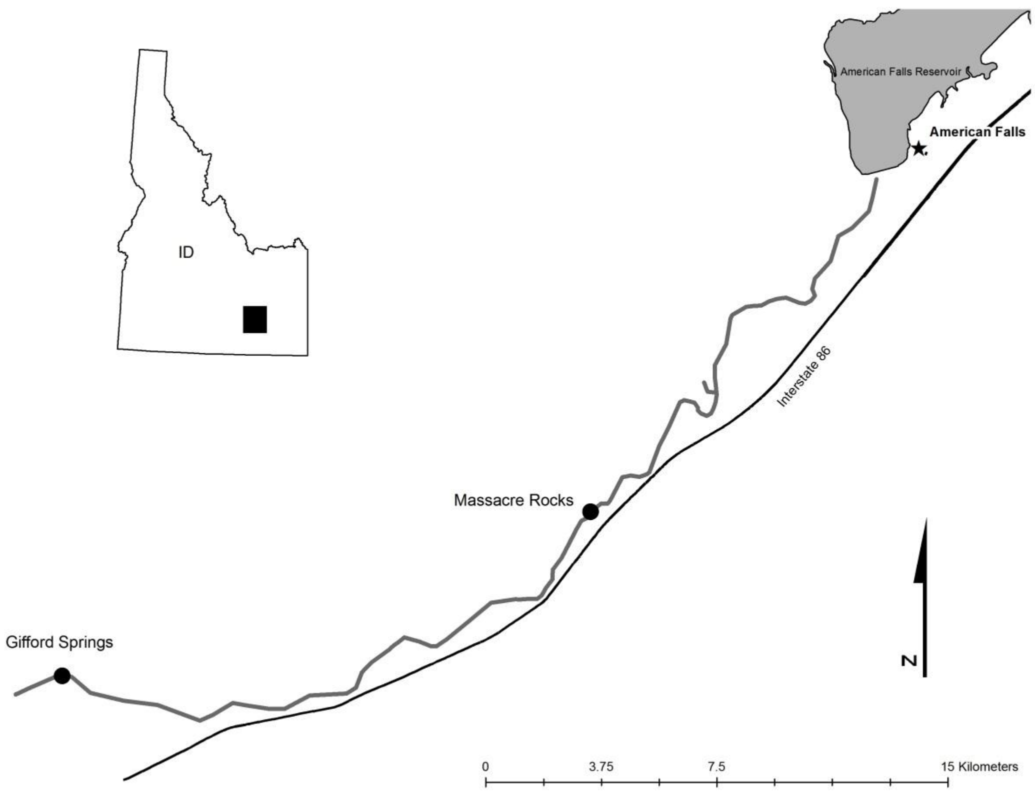


Figure 13. Locations (●) where smallmouth bass were sampled from the Snake River near American Falls, Idaho, in 2005 and 2011.

## LITERATURE CITED


Beamesderfer, R. C. P. and J. A. North. 1995. Growth, natural mortality, and predicted response to fishing for largemouth bass and smallmouth bass populations in North America. North American Journal of Fisheries Management 15:688-704.

Brimmer, A., R. Hillyard, and D. Teuscher. 2011. Regional Fishery Management Investigations. Idaho Department of Fish and Game, 2010 Job Performance Report, Project F-71-R-30, Boise.

Dillon, J. C. 1991. Lake and Reservoir Investigations. Largemouth Bass Forage Investigations. Job Performance Report. Project F-73-R-13.

Gablehouse, D. W., Jr. 1984. An Assessment of Largemouth Bass Slot Length Limits in Five Kansas Lakes. Kansas Fish and Game Commission, Comprehensive Planning Option, Federal Aid in Fish Restoration, Project FW-9-P-3, Pratt.

Guy, C.S., and D.W. Willis. 1990. Structural Relationships of Largemouth Bass and Bluegill Populations in South Dakota Ponds. North American Journal of Fisheries Management 10:338-343.

Kruse, C.G. and W.A. Hubert. 1997. Proposed Standard Weight ($W_s$) Equations for Interior Cutthroat Trout. North American Journal of Fisheries Management 17:784-790.

LaBolle, L and D. Schill. 1990. Regional Fishery Management Investigations. Idaho Department of Fish and Game, 1987 Job Performance Report, Project F-71-R-13, Boise.

McCauley, R. W. and D. M. Kilgour. 1990. Effect of air temperature on growth of largemouth bass in North America. Transactions of the American Fisheries Society 119:276-281.

Meyer, K. A., B. High, N. Gastelecutto, E.R.J. Mamer, and F.S. Elle. 2011. Retention of Passive Integrated Transponder Tags in Stream-Dwelling Rainbow Trout. North American Journal of Fisheries Management 31:236-239.

Montana Fish, Wildlife and Parks. 2004. Fisheries Analysis +, Version 1.0.8. Bozeman, Montana.

Novinger, G. D., and R. E. Legler. 1978. Bluegill population structure and dynamics. Pages 37-49 in G. D. Novinger and J.G. Dillard, editors. New approaches to the management of small impoundments. American Fisheries Society, North Central Division, Special Publication 5, Bethesda, Maryland.

Teuscher, D. and J. Capurso. 2007. Management plan for conservation of Bonneville cutthroat trout in Idaho. Idaho Department of Fish and Game, USDA Forest Service. IDFG 07-48.

Teuscher, D. and R. Scully. 2009. Regional Fishery Management Investigations. Idaho Department of Fish and Game, 2007 Job Performance Report, Project F-71-R-30, Boise.

Teuscher, D. and R. Scully. 2008. Regional Fishery Management Investigations. Idaho Department of Fish and Game, 2005 Job Performance Report, Project F-71-R-30, Boise.

## LITERATURE CITED (CONTINUED)


Teuscher, D. and R. Scully. 2008. Regional Fishery Management Investigations. Idaho Department of Fish and Game, 2004 Job Performance Report, Project F-71-R-30, Boise.

Teuscher, D., R. Scully and R. Hillyard. 2004. Regional Fishery Management Investigations. Idaho Department of Fish and Game, 2003 Job Performance Report, Project F-71-R-28, Boise.

Thurow, R. 1981. Blackfoot River and fisheries investigations. Idaho Department of Fish and Game, Job Completion Report, F-73-R-3, Boise.

Thurow, R. 1980. Blackfoot River and fisheries investigations. Idaho Department of Fish and Game, Job Completion Report, F-73-R-2, Boise.

Prepared by:

David Teuscher
Regional Fishery Manager

Arnie Brimmer
Regional Fishery Biologist

Ryan Hillyard
Regional Fishery Biologist

Approved by:

Edward B. Schriever, Chief
Fisheries Bureau

Jeff Dillon
State Fishery Manager