FEDERAL AID IN FISH RESTORATIONS
2006 JOB PERFORMANCE REPORT
PROGRAM F-71-R-31

REGIONAL FISHERIES MANAGEMENT INVESTIGATIONS
SOUTHWEST REGION

PROJECT I. SURVEYS AND INVENTORIES
Job a. Southwest Region Mountain Lakes Investigations
Job b. Southwest Region Lowland Lakes Investigations
Job c. Southwest Region Rivers and Streams Investigations

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2006 SOUTHWEST REGION (NAMPA) ANNUAL PERFORMANCE REPORT

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2006 SOUTHWEST (NAMPA) ANNUAL PERFORMANCE REPORT

Mountain Lakes Investigations

State of: Idaho | Program: Fisheries Management F-71-R-31

Project I: Surveys and Inventories | Subproject I-D: Southwest Region

Job No.: a | Title: Mountain Lakes Investigations

Contract Period: July 1, 2006 to June 20, 2007

ABSTRACT

We surveyed lentic aquatic habitats in the Fly Trip Creek lakes basin located in the headwaters of the Middle Fork Boise River from July 24 to July 27, 2006. This basin is located within the Sawtooth National Recreational Area (SNRA). Surveys were designed to assess fish and amphibian presence or absence and population characteristics, lake and tributary habitat conditions, and human use. Surveys were conducted on a total of 17 lakes and two sets of small lake clusters. Six of these lakes, including Camp, Fly Trip #1, Heart, Herman, Island, and PS #1 are currently stocked by Idaho Department of Fish and Game (IDFG). Fish presence was documented in five of the surveyed lakes, which included Camp, Fly Trip #1, Heart, PS #1, and PS #2. Fish were not present in Herman or Island Lake, despite being on the current IDFG stocking schedule. Fish presence was documented in PS Lake #2, which has not been stocked recently. Natural reproduction was evident in two lakes (PS Lake #1 & #2). Gill net catch-per-unit-effort (CPUE) ranged from 11.5 to 16.7 in lakes that contained fish. Amphibians were present in nine lakes.

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OBJECTIVES

1. To describe the distribution, relative abundance, and species composition of fish and amphibian populations in high mountain lakes of the Southwest Region (Nampa).

2. Assess factors affecting the distribution, relative abundance, and species composition of fish and amphibian populations in high mountain lakes including stocking strategies, habitat characteristics, and human use.

3. Alter stocking strategies to reduce risk to native fish and amphibian populations, while maintaining quality fishing opportunities.

METHODS

We conducted mountain lake surveys on a majority of the lentic aquatic habitats in the Flytrip Creek basin in the headwaters of the Middle Fork Boise River between July 24 and 27, 2006. We attempted to sample all lentic habitats that appeared on 1:24,000 topographical maps (Figure 1). In stocked lakes and lakes presumably capable of supporting fish, we used overnight gillnet sets, using standard experimental gill nets. Nets measured 46 m long by 1.5 m depth, with 19, 25, 30, 33, 38, and 48 mm bar mesh panels. One unit of gill net sampling effort was defined as one standard experimental gill net fished overnight. Hook and line angling effort was expended when possible. One unit of angling effort was defined as one hour of active fishing. All fish captured were identified to species, measured for total length (mm), and weighed (g).

Basic limnological and morphological measurements were collected at lakes where fish surveys were conducted. To determine average depth, lake width measurements were taken at ¼, ½, and ¾ distances along the long axis of each lake using a laser rangefinder (Bushnell Yardage-Pro). Cross-sectional depth measurements were taken at 3 points along each of the width measurement transects using a hand held sonar (Strikemaster Polar Vision), resulting in nine total depth measurements for each lake surveyed. Maximum depth was recorded as the greatest depth observed at the nine points of measurement. Mean depth was calculated as the average of the nine depth measurements. Surface water temperatures were recorded along the lake shoreline at one point. Spawning potential was determined visually by assessing the presence and quality of substrate, flow, and gradient, in associated inlets and outlets to each lake. For lakes presumably incapable of supporting fish populations, partial surveys were conducted to assess amphibian populations and human use. We assigned numbers to unnamed lakes and unnamed lake clusters in an effort to improve report readability.

Amphibian surveys were conducted by walking the perimeter of each lake. Species, abundance, and life stages of all observed amphibians were recorded. Logs and other structure in or adjacent to the lake were moved in efforts to detect hidden amphibians. Amphibian life stages were recorded as either adult or larval.

Human use of mountain lakes was evaluated based on general appearance of use, number and condition of campsites, number of fire rings, access trail condition and difficulty, and presence of litter. General levels of human use were categorized as rare, low, moderate, and high based on based on overall visual assessment by IDFG personnel.

RESULTS

Survey results are summarized in Tables 1-3. Six of the lakes sampled have been stocked in the past 10 years and are currently remain on the stocking schedule. We encountered westslope cutthroat trout (WCT) *Oncorhynchus clarkii lewisi,* rainbow trout *O. mykiss*, and golden trout *O. aguabonita*, in our sampling efforts. Survey results confirmed fish presence in five of the lakes sampled; four that have been stocked recently; and one that was not. Fish were present in Camp, Fly Trip #1, Heart, PS #1, and PS #2 (not stocked) lakes.

Amphibian surveys confirmed amphibian presence in three lakes that are populated by fish, namely, Camp, Heart, and PS #1 lakes. While amphibian presence was documented, the numbers observed suggest that these populations are at low densities. In addition, amphibians were observed in varying densities at six lakes that do not support fish, namely, Fly Trip #4 & #5, Herman, PS #3 & #4, and unnamed lake #1.

Human use of the surveyed lakes ranked from rare to moderate. Moderate use lakes were generally those adjacent to, or near, the primary trail system. No lakes were documented as having high human use; likely due to the approximately 20.1 km required to reach these lakes by trail.

DISCUSSION

Survey results indicate that fish presence is primarily restricted to lakes that are currently being stocked. The exceptions to this were Herman and Island Lake, which are stocked but fishless, and PS Lake #2 lake which is not stocked but has a population of westslope cutthroat trout, likely migrants from PS Lake #1, which is currently stocked. Nearly all fish sampled in these lakes were WCT. This contradicts IDFG stocking records, which indicate only golden trout have been stocked in PS Lake #1. This may be an artifact of stocking that occurred prior to stocking record documentation (1967), but a more likely explanation is that these fish have migrated down from Island Lake which has been stocked with WCT in years past, and that natural reproduction is occurring in PS Lakes #1 and #2. Amphibian populations were well distributed thru the basin and human use of these lakes appeared to be low.

<u>Camp Lake</u>

UTM 0660277E 4866772N Z11

Camp Lake is located 20.1 km from the trailhead and is the first lake encountered as you approach the lake basin that was surveyed, making it the most accessible of the lakes we sampled. Camp Lake sits at 2,594 m in elevation and is surrounded on all aspects by coniferous trees. We surveyed Camp Lake on July 26 - 27th, 2006. The area of Camp Lake is 1.67 ha, with a maximum depth of 5 m and an average depth of 3.2 meters. Shoreline water temperature at the time of sampling was 12°C. Approximately 70 percent of the lake was directly accessible by the main trail. There were two established campsites, each with a fire ring, and human use was ranked as moderate. Over the last ten years, Camp Lake has received 500 WCT fry during odd years.

Fish surveys consisted of a single, overnight gill net set. We caught 15 WCT ranging from 165 - 325 mm in total length (Figure 2), resulting in a gill net CPUE = 15 (Figure 3). We suspect all of these fish are the result of stocking efforts as there was a lack of suitable spawning habitat associated with the lake. Observers documented six adult and 43 larval-stage Columbia spotted frogs *Rana luteiventris* and one adult Western toad *Bufo boreas*. The presence of habitat that is inaccessible to fish should allow amphibians to persist at the current water level of the lake. We recommend that the current stocking rate of Camp Lake be maintained.

Fly Trip Lake #1

UTM 0660869E 4865588N Z11

Fly Trip Lake #1, with an elevation of 2,645 m, is the largest and lowermost of the lakes in the Fly Trip chain. The entire south side of the lake is bordered by a steep, rocky, mountain slope and the north side of the lake is dominated by mixed high alpine conifers. We conducted a complete survey of Fly Trip Lake #1 on July 25 - 26th, 2006. The lake area is 2.55 ha, with a maximum depth of 9 m and an average depth of 4.9 m. Shoreline water temperature was 19°C and the lake had no suitable spawning habitat. Approximately 20 percent of the lake perimeter had an established trail. No campsites or fire rings were observed and human use was estimated as low. Over the last ten years, Fly Trip Lake # 1 has received 500, 462, and 200 golden trout during 1996, 2000, and 2004, respectively

Effort consisted of two gillnets fished overnight. A total of 25 golden trout, ranging from 55 to 375 mm in total length (Figure 4) were caught, resulting in a gillnet CPUE = 12.5 fish. Additionally, IDFG personnel handled a few fish as the result of angling efforts. Although data for angled fish was not recorded, one large fish (~400 mm total length) was caught, and angling CPUE < 1. No amphibians were documented in Fly Trip Lake #1. We recommend that the current stocking rate of Fly Trip Lake #1 be maintained.

Fly Trip Lake #2

UTM 0661228E 4865521N Z11

Fly Trip Lake #2 is the second lowermost lake in the Fly Trip Lake chain at an elevation of 2,670 m. We surveyed this lake on July 25 - 26th, 2006. The south aspect of the lake borders a steep, rocky mountain and the lake perimeter is primarily rocky shoreline with little vegetation. The lake measures 0.84 hectares in area, with maximum and average depths of 4.4 and 2.3 m, respectively. Shoreline water temperature was 14°C and there was no available spawning habitat. There was no established trail, camp sites or fire rings, and we described general human use as low.

Fish surveys consisted of one gill net fished overnight, resulting in no catch. Results indicate that this is a fishless lake. These findings are consistent with IDFG stocking records, which indicate this lake is not stocked. It appears that there is no fish migration into, or natural reproduction occurring in this lake. No amphibians were documented in this lake. We recommend not stocking fish in this lake.

Fly Trip Lake #3

UTM 0661516 4865360 Z11

Fly Trip Lake #3, at an elevation of 2,693 m, is the second uppermost lake in the Fly Trip Lake chain. The lake was surveyed on July 25 - 26th, 2006. The entire lake shoreline is rocky with little vegetation. It appears that this lake could connect with Fly Trip Lake #4 following multiple years of higher than average snow pack in the area. However, at the time of the survey the two lakes were distinctly disconnected. The lake area is 0.88 ha, with maximum and average water depths of 3.2 and 1.6 m, respectively. Shoreline water temperature was 10°C and there was no spawning habitat. No camp sites or fire rings were documented and human use is described as low.

The fish survey consisted of one gill net fished overnight, resulting in no catch. Results indicate that this lake is fishless. These findings are consistent with IDFG stocking records, which indicate this lake is not stocked. Results suggest that there is no fish migration into, or natural reproduction occurring in this lake. No amphibians were documented in this lake, presumably due to the lack of suitable habitat. We recommend this lake remain unstocked.

Fly Trip Lake #4

UTM 0661639 4865480 Z11

At an elevation of 2,694 m, Fly Trip Lake #4 is the uppermost lake in the Fly Trip Lakes chain. The lake was surveyed on July 25 - 26th, 2006. The southeast aspect of the lake is bordered by a rocky mountain slope. Mixed conifers surround all other lake aspects. As mentioned above, this lake could potentially connect with Fly Trip Lake #3 as a result of higher than average snow pack in the area. The lake area is 1.28 ha, with maximum and average water depths of 7.1 and 4.9 m, respectively. Shoreline water temperature was 17°C. There were no defined trails, fire rings, or camp sites observed and human use was described as low.

Fish surveys consisted of two gillnets fished overnight, resulting in no catch. Results suggest this lake is fishless. These findings are consistent with IDFG stocking records, which indicate this lake is not stocked. The overall size and depth of this lake may support fish; however, demand appears low based on human use descriptions. Observers identified 13 adult long-toed salamanders in amphibian survey efforts. It is unlikely that Columbia spotted frogs would persist in this habitat type. We recommend that this lake remain unstocked to preserve the amphibian community.

Fly Trip Lake #5

UTM 0660817E 4865838N Z11

Fly Trip Lake #5 is located approximately 0.4 km to the north of Fly Trip Lake #1, at an elevation of 2,620 m. We surveyed this lake on July 25 - 26th, 2006. The lake is surrounded on all aspects by mixed conifers. The lake area is 1.41 ha, with maximum and average water depths of 8.2 and 4.9 m, respectively. Shoreline water temperature was 18°C and there was no spawning habitat. There were no defined trails or fire rings, however, one campsite was observed and we described human use as low.

Fish surveys consisted of one gill net, fished overnight, resulting in no catch. Results suggest this lake is fishless. These findings are consistent with IDFG stocking records, which indicate this lake is not stocked. We documented the presence of three larval-stage Columbia spotted frogs in amphibian survey efforts. No adult amphibians were observed. For unknown reasons, it appears that this lake provides little in the way of a preferred amphibian habitat; however, it is clear that fish presence is not the factor limiting amphibian density or composition. We recommend that this lake remain unstocked, as nearby Fly Trip Lake #1 and Herman Lake should provide adequate angling opportunity.

Heart Lake
UTM 0660677E 4866782N Z11

Located in close proximity to the main pack trail, Heart Lake has an elevation of 2,618 m and is the second most accessible of the lakes in this basin. We surveyed Heart Lake on July 24 - 25th, 2006. The north aspect of the lake is bordered by a steep, rocky face; all other aspects are bordered by mixed conifers. The largest of the lakes we sampled, Heart Lake has an area of 5.26 ha and is surprisingly deep, with maximum and average water depths of 26.2 and 15.4 m, respectively. Shoreline water temperature was 17°C and there was no spawning potential. We documented a defined trail around 100 percent of the lake perimeter, two camp sites, and three fire rings. Overall human use was described as moderate. We encountered two groups of recreationists while conducting surveys on this lake. Based on the size of the lake, accessibility from the main trail, and relatively higher human use, Heart Lake appears to be the primary destination for anglers and campers visiting this basin.

Fish surveys consisted of three gill nets fished overnight, resulting in a combined catch of 50 fish and a gill net CPUE of 16.7. Species composition was 29 WCT, 18 rainbow, and 3 rainbow/cutthroat hybrids. Fish size ranged from 157 – 345 mm in total length (Figure 5). Fish species composition is consistent with IDFG stocking records (Table 4), as WCT and rainbow trout have both been stocked in the last 10 years. The fish documented as hybrids possessed characteristics of both cutthroat and rainbow trout and are likely hatchery-specific strains. In addition, this lake is one of many in part of a hatchery diploid/triploid rainbow trout performance evaluation. As a result of this study, several different strains of rainbow trout have been stocked in this lake (Figure 5). The amphibian survey resulted in the observation of two adult Western toads. With relatively high fish density and limited shoreline habitat that is inaccessible to fish, amphibians will likely not exceed low densities in Heart Lake with current stocking. We recommend that the current stocking schedule be maintained in Heart Lake.

Herman Lake
UTM 0660799E 4866271N Z11

Herman Lake is located between Fly Trip Lake #5 and PS Lake #4, at an elevation of 2,608 m. We surveyed Herman Lake on July 24 - 25th, 2006. The lake is surrounded on all aspects by mixed conifers. The lake area is 3.38 hectares with maximum and average water depths of 7 and 4.9 m, respectively. Shoreline water temperature was 20°C and there was no fish spawning potential. Approximately 25 percent of the lake perimeter had a defined trail, three campsites and no fire rings were observed. General human use is described as moderate.

Fish surveys consisted of two gill nets, fished overnight, resulting in no catch. Ten year stocking history indicates that Herman Lake was stocked with 500 Arctic grayling *Thymallus arcticus* in 1996 and 1000 Arctic grayling in 2001, but survey results suggest these fish are not establishing themselves in the lake. This lake was stocked with Arctic grayling in 2006, following our survey efforts. The time gap between this stocking and the stocking in 2001 was likely due to a limited supply of grayling. In contrast to our findings, the IDFG survey of this lake in 1997 resulted in the catch of 64 Arctic grayling in the 150 - 200 mm total length range. Amphibian surveyors documented 18 adult and 38 larval Columbia spotted frogs in the main lake. In addition, observers documented three adult and 437 larval Columbia spotted frogs in the outlet pond to Herman Lake. The amphibians in this lake do not provide a preferred food type for grayling, thus, continued stocking of grayling should not negatively impact the amphibian community directly. We recommend that the current stocking schedule be maintained in Herman Lake.

Island Lake

UTM 0660799E 4866271N Z11

At an elevation of 2,681 m, Island Lake sits between PS Lake #2 and #3. We surveyed Island Lake on July 26 - 27th, 2006. Conifers dominate the lake perimeter. This shallow lake is relatively small, measuring 1.6 ha, with maximum and average water depths of 2.4 and 1.8 m, respectively. Shoreline water temperature was 17°C. We estimated that 25 percent of the lake perimeter had an established trail, three old rudimentary camp sites were documented and there were no fire rings. General human use is described as low.

Fish surveys consisted of one gillnet, fished overnight, resulting in no catch. There is a decided lack of suitable fish habitat, and lake depth will not allow over-winter fish survival. There is no available spawning habitat in this lake. Much of the lake bottom was of a fine substrate type, primarily mud. Island Lake, stocked regularly throughout documented stocking history, shows no indication that it can support fish. Historical stocking records indicate that westslope cutthroat were stocked up until 1984, since that time only grayling have been stocked. Over the last ten years, 1,000 Arctic grayling have been stocked during 1997 and 2003. In addition, stocking rates in Island Lake far exceed that of any other lake in this basin.

No amphibians were observed at Island Lake. It is uncertain as to why amphibians were not observed in this fishless lake. We recommend stocking Island Lake be discontinued.

PS Lake #1

UTM 0661725E 4867045N Z11

PS Lake #1 is the largest lake in the PS Lake chain. At an elevation of 2,636 m, the lake is surrounded on all aspects by coniferous trees. We surveyed PS Lake #1 on July 26 - 27th, 2006. The lake measures 4.42 ha, with maximum and average water depths of 12.3 and 8.1 m, respectively, making it the second deepest lake in the basin. Shoreline water temperature was 19°C and spawning potential was excellent. We estimated that 70 percent of the lake was directly accessible by an established trail, and one camp site and one fire ring were observed. Some evidence of angling was observed and we ranked general human use as moderate. Golden trout have been stocked at four year intervals since 1996 at 250 - 500 fish per year.

Fish surveys consisted of two gill nets, fished overnight, resulting in a total catch of 23 fish and a gillnet CPUE = 11.5. Catch composition was 22 WCT and one golden trout. Fish size ranged from 150 to 395 mm (Figure 6). The gill net CPUE was likely reduced as a result of one of the nets drifting ashore during the night. The observed species composition is not consistent with IDFG stocking records; rather, only golden trout have been historically stocked in PS Lake #1. We believe that the presence of WCT is the result of historic cutthroat trout stocking that took place in Island Lake, which is located above PS Lakes #1 and #2 and has tributary connection to PS Lake #1, via PS Lake #2. With exceptional spawning potential in the inlet to PS Lake #1, from PS Lake #2, it appears that there is a well established, naturally recruiting population of WCT in PS Lake #1. Due to the range in fish sizes, it is unlikely that these findings are the result of stocking error. Amphibian surveys resulted in the detection of two adult and one larval Columbia spotted frog. With an established population of naturally reproducing WCT, we recommend that stocking of PS Lake #1 be discontinued.

PS Lake #2
UTM 0661389E 4866951N Z11

PS Lake #2 has an elevation of 2,658 m and is located just upstream and to the north of PS Lake #1. We surveyed PS Lake #2 on July 26 - 27th, 2006. This relatively small lake is surrounded on all aspects by conifers, with an open meadow area around the lake inlet. The lake area is 1.4 ha, with maximum and average water depths of 5.5 and 3.8 m, respectively. Shoreline water temperature was 17°C. Approximately 80 percent of the lake perimeter had an established trail, no camp sites or fire rings were observed, and general human use was described as moderate.

Fish surveys consisted of one gill net, fished overnight, and angling effort. Gill net efforts resulted in the catch of 12 westslope cutthroat trout ranging from 163 – 370 mm in total length (Figure 7), and a gill net CPUE = 12. Angling was conducted by three anglers for 1.5 hours each, for a total of 4.5 units of angling effort. Combined catch for all angling was 12 cutthroat trout, resulting in an Angling Catch Per Unit Effort (ACPUE) = 2.7. Eleven fish were estimated to be between 356 – 407 mm and one fish was near 300 mm in total length (Figure 7). The mean length for angled fish was much greater than that of gill netted fish, suggesting that either larger fish have increased net avoidance, or that our angling methods were more conducive to targeting the larger fish.

The combined catch for fish survey efforts was encouraging, given that this lake is not, and never has been stocked. The likely explanation for this is the same as for PS Lake #1. We believe that the presence of WCT is the result of historic cutthroat stocking that took place in Island Lake, which is located above PS Lake #2, with tributary connection between the two. With exceptional spawning potential in the outlet of PS Lake #2, it appears that there is a well established naturally recruiting population of WCT in the lake. Due to the range in fish sizes, it is unlikely that these findings are the result of stocking error. No amphibians were observed in PS Lake #2. The absence of amphibians may be an effect of fish population and lack of refugia habitat that is generally needed in the presence of fish, for amphibian persistence. With an established population of naturally reproducing westslope cutthroat trout, we recommend that this lake remain unstocked.

PS Lake #3
UTM 0662015E 4867014N Z11

The uppermost lake in the PS Lake chain, PS Lake #3 has an elevation of 2,730 m. We surveyed this lake on July 26 - 27th, 2006. The south and east aspects of the lake are bordered by rocky slopes with the remainder of the lake bordered by meadow and conifers. The lake area is 1.08 ha, with maximum and average water depths of 5.6 and 3.7 m, respectively. Shoreline water temperature was 19°C and there was no spawning potential. There was no evidence of a trail around the lake and no camp sites or fire pits were observed. We described general human use as rare.

Fish surveys consisted of one gill net, fished overnight, resulting in no catch. Results indicate that this lake is fishless. This is consistent with IDFG stocking records, as this lake is not stocked. Given the high elevation and small size of this lake, it is unlikely that it would support fish between years. Amphibian surveyors identified 17 adult and six larval Columbia spotted frogs in addition to six adult and 22 larval long-toed salamanders. Survey results indicate that multiple amphibian species exist at relatively high densities in this lake. We recommend that this lake remain unstocked, primarily to preserve the local amphibian community.

PS Lake #4

UTM 0660709E 4866537N Z11

At an elevation of 2,621 m, PS Lake #4 is located midway between Heart and Herman Lakes. We surveyed PS Lake #4 on July 24 - 25th, 2006. All aspects of the lake were bordered by meadow or coniferous trees. The lake area is 0.93 ha, with maximum and average water depths of 4.6 and 3.0 meters, respectively. We estimated that 20 percent of the lake perimeter was bordered by a trail, and there were no camp sites or fire rings observed. We described general human use as low.

Fish surveys consisted of two gill nets, fished overnight, resulting in no catch. Results indicate that this lake is fishless. This is consistent with IDFG stocking records, as this lake is not stocked. Given the small size and shallow depth of this lake, we recommend that it remain unstocked. Amphibian surveyors observed one adult western toad in addition to two adult and 11 larval Columbia spotted frogs. The presence of amphibians provides further reason to maintain the fishless status of this lake. We recommend that this lake remain unstocked, primarily to preserve the local amphibian community.

Unnamed Lake #1

UTM 0661184E 4867146N Z11

Located approximately 0.8 km to the northeast of Heart Lake, Unnamed Lake #1 sits at an elevation of 2,676 m. We surveyed this lake on July 26th, 2006. The lake was surveyed for water status and the presence of amphibians. The lake had a maximum depth of approximately 1.5 m, with an approximate length of 100 m, as assessed by visual observation. Visual observation confirmed the lake as being fishless. No signs of human use were evident. Observers documented 27 adult and ~750 larval Columbia spotted frogs in addition to one larval long-toed salamander *Ambystoma macrodactylum*. This lake is isolated and will not be affected by any fish stocking in the area.

Unnamed Lake #2

UTM 0661651E 4865655N Z11

Located approximately 0.4 km to the north of Fly Trip Lake #4, Unnamed Lake #2 sits at an elevation of 2,716 m. We surveyed this lake on July 26th, 2006, for amphibians and human use. Surveyors described this lake as having good depth. No amphibians were observed in this lake and visual observations suggest this lake is fishless. Human use was categorized as rare.

Unnamed Lake #3

UTM 0660353E 4867531N Z11

Located at an elevation of 2,706 m, this lake sits on the Northwest edge of the basin that was sampled. Currently, this lake is not recognized by the IDFG GIS lakes layer. The primary purpose of visiting this lake was to assess water status of this lake and three others located adjacent to it. Surveyors documented this lake as the only one that held water. Unnamed Lake #3 was large enough in size as to warrant a complete survey.

Unnamed Lake #3 is bordered on all aspects by steep, rocky slopes. The lake area is approximated at 1.0 ha, with depth measurements showing maximum and average depths of 4.3 and 4.2 m, respectively. Shoreline water temperature was 18°C. There were no trails, camp sites, or fire rings observed. Human use was documented as rare.

Fish surveys consisted of one gillnet, fished overnight, resulting in no catch. Results indicate that this lake is fishless. This is consistent with IDFG stocking records, as this lake is not stocked. Given the location and relative inaccessibility of this lake, we recommend that it remain off of the stocking schedule. No amphibians were observed in or near this lake. Amphibian absence can likely be attributed to lack of suitable habitat.

Unnamed Lake #4

UTM 0660353E 4867531N Z11

At an elevation of 2,660 m, Unnamed Lake #4 is located approximately 0.4 km to the east of Herman Lake. We surveyed this lake on July 25th, 2006, for water status, amphibians, and human use. The lake held water, no amphibians were observed, and no signs of human use were evident.

Unnamed lake cluster #1

UTM 0660135E 4867042N Z11

This cluster of four lakes is located at 2,691 m, approximately 0.8 km to the northwest of Camp Lake. We surveyed this group of lakes on July 25th, 2006, primarily for water status assessment. Surveyors documented each of the lakes as completely dry. There was no amphibian habit available, thus no amphibians were observed. No signs of human use were evident.

Unnamed lake cluster #2

UTM 0659905E 4867396N Z11

This cluster of six lakes is located at an elevation of 2,755 m. The lakes lie between the basin we sampled and the next basin the west, which contains Spangle Lake. We surveyed these lakes on July 25th, 2006, primarily to assess water status. Surveyors did not reach this lake, but made visual observations from a ridge above the location of the lake cluster. Surveyors documented the lakes as dry.

MANAGEMENT RECOMMENDATIONS

1. Maintain current stocking rates in Camp Lake and Heart Lake.

2. Discontinue stocking of Island Lake and PS Lake #1.

3. Stock surplus grayling from Island Lake in Herman Lake.

4. Maintain fishless status of Fly Trip Lakes #2, #3, #4, and PS Lakes #3, #4, to preserve amphibian communities.

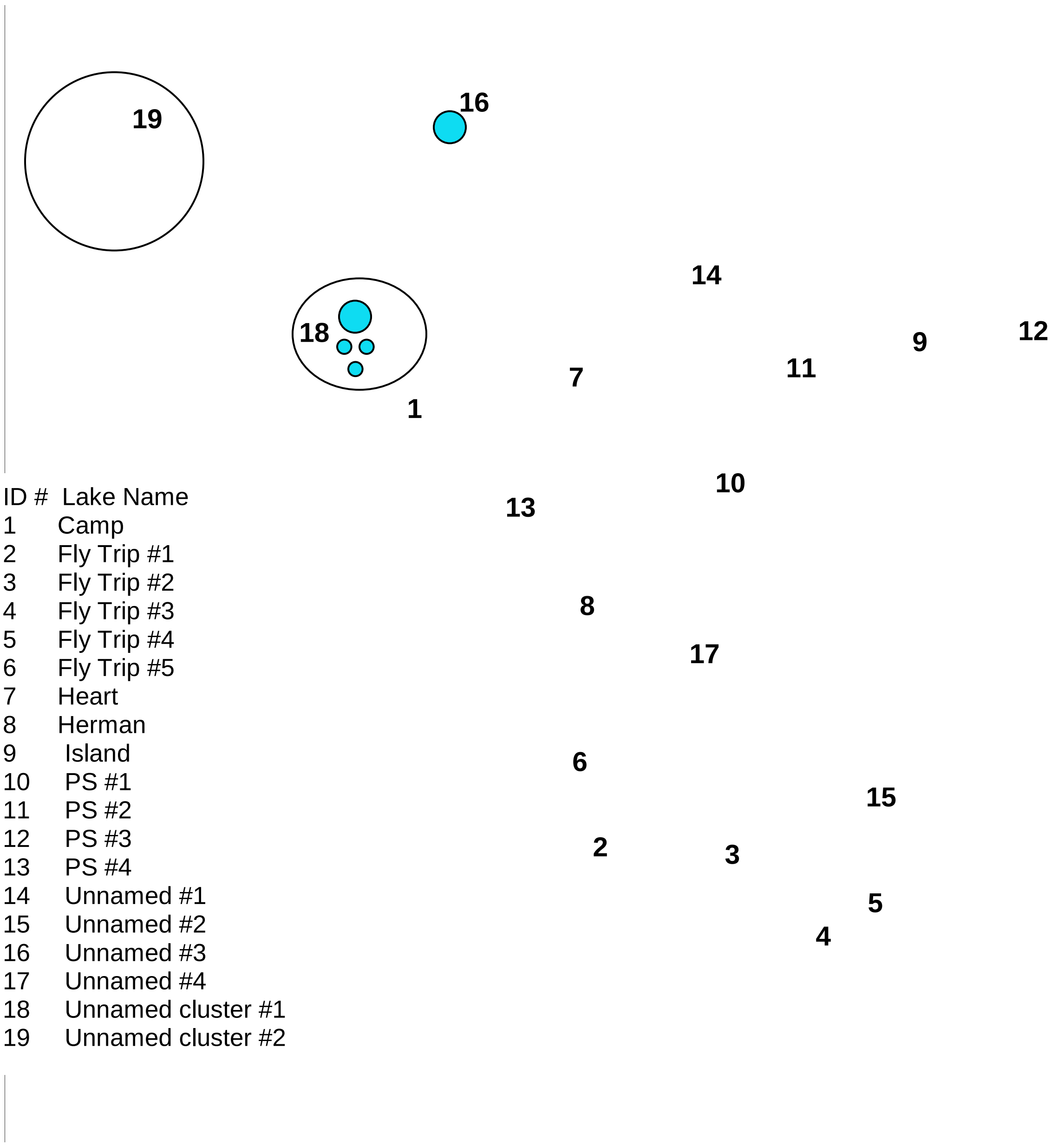


Figure 1. Location of aquatic habitats within the Flytrip Creek basin of the upper Middle Fork Boise River sampled during 2006 to document fish and amphibian populations, habitat characteristics, and use. Sites were determined from 1:24,000 topographical maps.

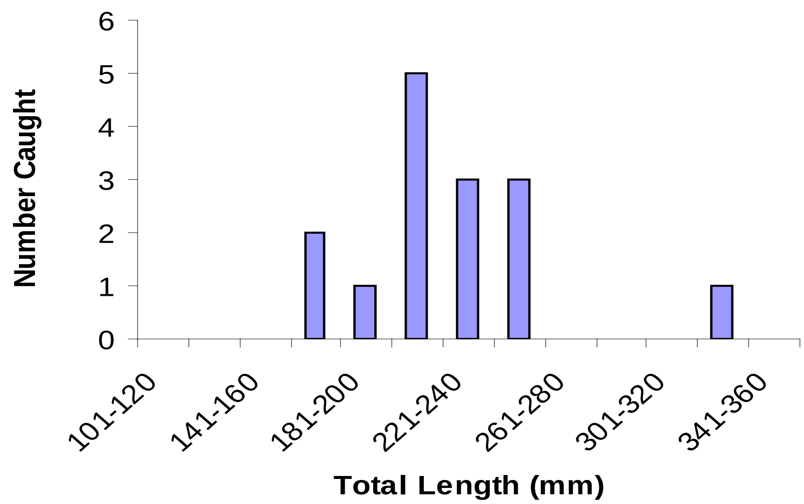


Figure 2. Length frequency of westslope cutthroat trout sampled from Camp Lake during 2006.

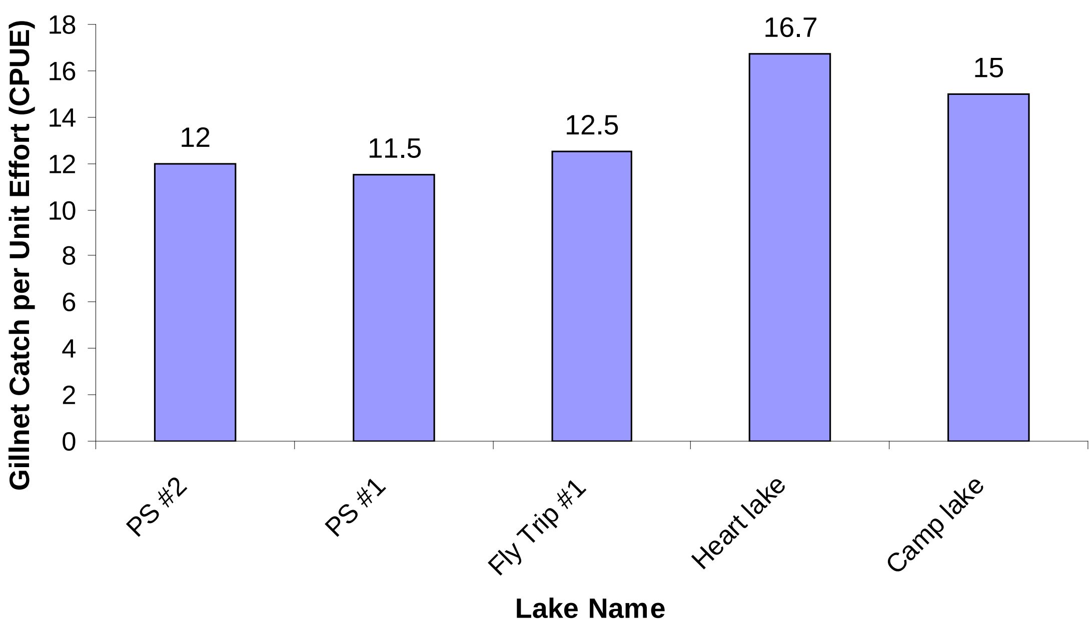
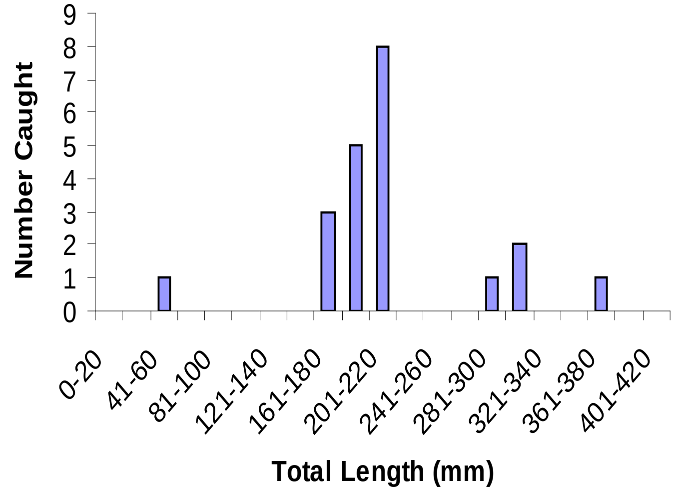


Figure 3. Catch per unit effort for salmonid species sampled from five high mountain lakes sampled in the Fly Trip Creek basin during 2006.

Figure 4. Length frequency of golden trout sampled from Fly Trip Lake #1 during 2006.



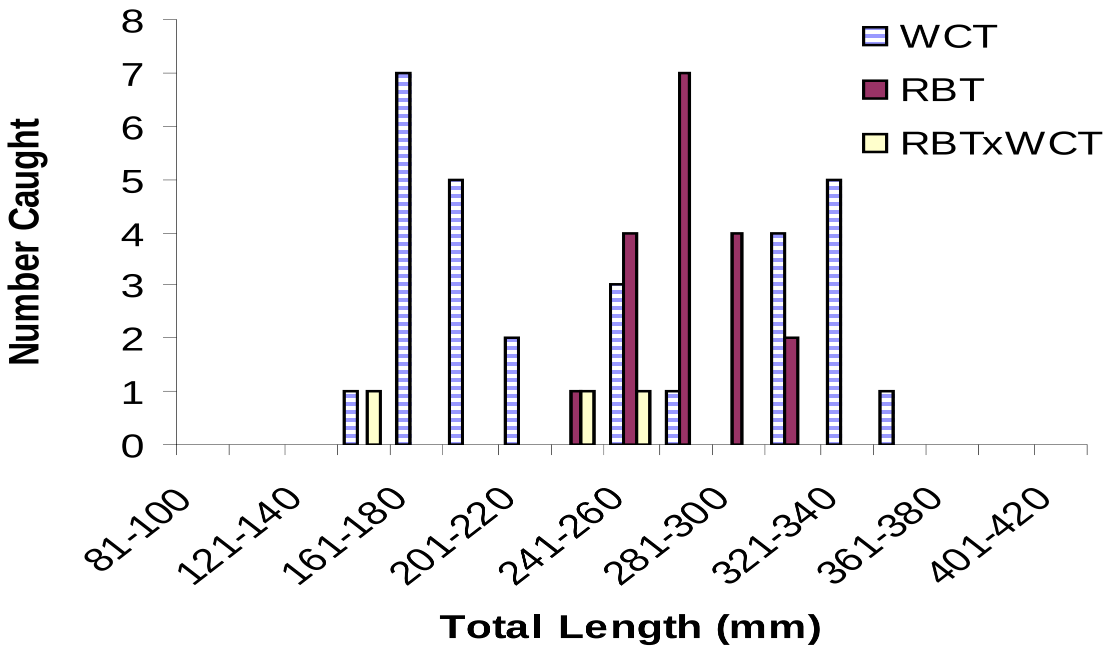


Figure 5. Length frequency of westslope cutthroat trout, rainbow trout, and their hybrids sampled from Heart Lake during 2006.

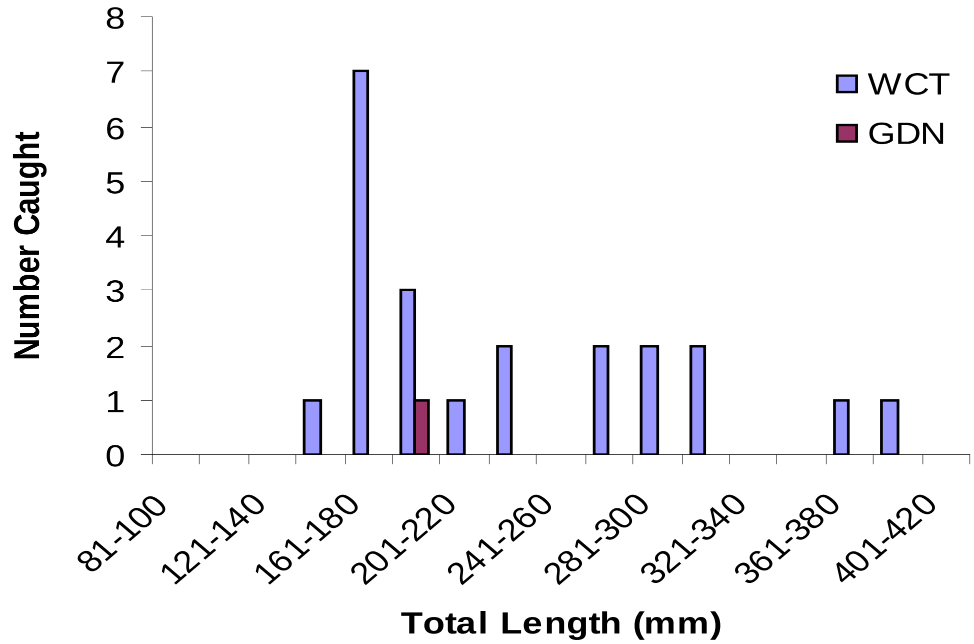


Figure 6. Length frequency of westslope cutthroat trout and golden trout sampled from PS Lake #1 during 2006.

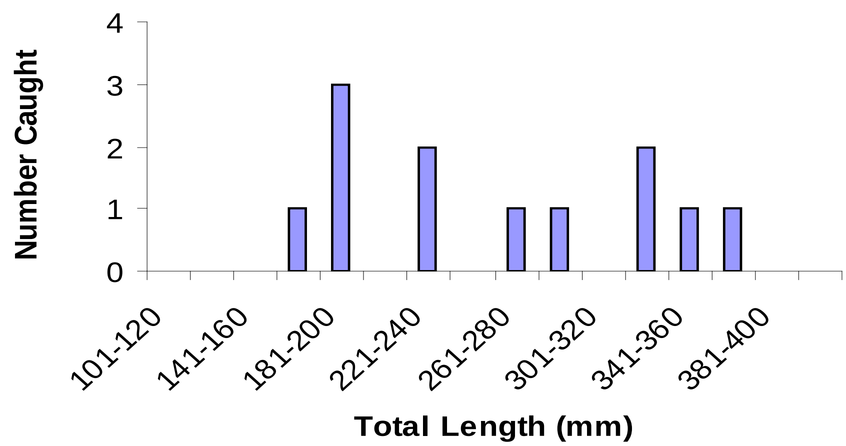


Figure 7. Length frequency of westslope cutthroat trout sampled from PS Lake #2 during 2006.

Table 1. Summary of 2006 amphibian surveys conducted in the Fly Trip Creek basin.

Lake name	CATNOGIS	Columbia spotted frog		Long-toed salamander		Western toad		Fishless
		adult	larval	adult	larval	adult	larval	
PS LAKE #1	1000000294	2	1	0	0	0	0	NO
PS LAKE #2	1000000295	0	0	0	0	0	0	NO
PS LAKE #3	1000000296	17	6	6	22	0	0	YES
PS LAKE #4	100000U070	2	11	0	0	1	0	YES
FLY TRIP #1	1000000287	0	0	0	0	0	0	NO
FLY TRIP #2	1000000288	0	0	0	0	0	0	YES
FLY TRIP #3	1000000290	0	0	0	0	0	0	YES
FLY TRIP #4	100000U127	0	0	13	0	0	0	YES
FLY TRIP #5	100000U128	0	3	0	0	0	0	YES
HEART LAKE	1000000292	0	0	0	0	2	2	NO
CAMP LAKE	1000000291	6	43	0	0	1	0	NO
ISLAND LAKE	NA	0	0	0	0	0	0	YES
HERMAN LAKE	1000000285	21	475	0	0	0	0	YES
UNNAMED #1	100000U130	27	750	0	1	0	0	YES
UNNAMED #2	100000U136	0	0	0	0	0	0	YES
UNNAMED #3	NA	0	0	0	0	0	0	YES
UNNAMED #4	100000U137	0	0	0	0	0	0	YES

Table 2. Summary of meristics used to index the amount of human use in the Fly Trip Creek basin during 2006.

Lake name	CATNOGIS	[1]Human use	# camp sites	# fire rings	% trail access
PS #1	1000000294	Moderate	1	1	70
PS #2	1000000295	Moderate	0	0	80
PS #3	1000000296	Rare	0	0	0
PS #4	100000U070	Low			20
FLY TRIP #1	1000000287	Low	0	0	20
FLY TRIP #2	1000000288	Low	0	0	0
FLY TRIP #3	1000000290	Low	0	0	0
FLY TRIP #4	100000U127	Low	0	0	0
FLY TRIP #5	100000U128	Rare	1	0	0
HEART	1000000292	Moderate	2	3	80
CAMP	1000000291	Moderate	2	2	70
ISLAND	UNK.	Low	1	0	30
HERMAN	1000000285	Low	3	0	25
UNNAMED #1	100000U130	Rare	0	0	0
UNNAMED #2	100000U136	Rare	0	0	0
UNNAMED #3	UNK.	Rare	0	0	0
UNNAMED #4	100000U137	Rare	0	0	0

Table 3. Summary of morphological and limnological characteristics of high mountain lakes sampled in the Fly Trip Creek basin during 2006.

Lake Name	Max. Depth (meters)	Av. Depth (meters)	Water Temp. (°C)	Spawn Opp.
PS #1	12.3	8.1	19	Yes
PS #2	5.5	3.8	17	Yes
PS #3	5.6	3.7	19	No
PS #4	4.6	3.0	23	No
FLY TRIP #1	9.0	4.9	14	No
FLY TRIP #2	4.4	2.3	14	No
FLY TRIP #3	3.2	1.6	10	No
FLY TRIP #4	7.1	4.9	17	No
FLY TRIP #5	8.2	4.9	18	No
HEART LAKE	26.2	15.4	17	No
CAMP LAKE	5.0	3.2	12	No
ISLAND LAKE	2.4	1.8	17	No
HERMAN LAKE	7.0	4.9	20	No
***UNNAMED #3**	4.3	4.2	18	No

Table 4. Ten year stocking history for Heart Lake.

Year	Species	No. of fish
8/27/2005	Westslope cutthroat trout	800
8/19/2003	Hayspur triploid rainbow trout	500
8/19/2003	Hayspur triploid rainbow trout	500
8/19/2003	Troutlodge triploid rainbow trout	500
8/27/2001	Westslope cutthroat trout	1000
9/8/1999	Westslope cutthroat trout	1000
8/11/1997	Westslope cutthroat trout	1000

2006 SOUTHWEST REGION (NAMPA) ANNUAL PERFORMANCE REPORT

Lowland Lakes Investigations

State of: Idaho Program: Fisheries Management F-71-R-31

Project I: Surveys and Inventories Subproject I-D: Southwest Region

Job No.: b Title: Lowland Lakes Investigations

Contract Period: July 1, 2006 to June 20, 2007

ABSTRACT

A number of reservoirs in the Southwest (Nampa) Region have been dewatered due to drought. This has required staff to transplant warmwater fishes to these waterbodies to rebuild economically important fisheries. Waters receiving transfers included Paddock, Indian Creek, Mountain Home, and Blacks Creek reservoirs. The sources of fish for transfer included private ponds, C. J. Strike Reservoir in southern Idaho and Owyhee Reservoir in Oregon.

Bybee, Grasmere, Little Blue Creek, and Shoofly reservoirs in the Riddle area of Owyhee County, were sampled to investigate Lahontan cutthroat trout survival. Stocking of cutthroat in these lakes began in the late 1980's with fry and fingerling plants have continued to the present time. Sampling results, when compared to previous surveys, indicate that fingerling stocking of Lahontan cutthroat produce higher fish densities.

Lake Lowell water quality and fish community surveys indicated high productivity and a diverse fish assemblage. Largemouth bass and channel catfish showed good body condition and several age classes. Other panfish showed depressed adult populations; bur bluegill recruitment appeared good in 2008.

Mann Creek Reservoir fish community studies showed gamefish make-up the majority of the population, however, wild redband trout has declined compared to previous year's surveys.

Claytonia Pond sampling was follow-up to a rotenone renovation project performed in 1999. Nongame fish have re-established in the pond and their biomass dominated the sampling effort.

Annual Deadwood Reservoir kokanee sampling showed strong age-0 and age-1 kokanee populations. Actions will need to be taken to reduce kokanee recruitment in future years to prevent further average length declines in mature fish.

WARMWATER FISH TRANSFERS

Introduction

Due to a series of years from 2001 to 2005 with low snowpack and limited spring rainfalls, several lowland lakes in the Southwest region, including Paddock, Indian Creek, Mountain Home, and Blacks Creek reservoirs, had become nearly or totally dewatered by late summer 2005. Prior to these low waters years, popular recreational fisheries for black crappie *Pomoxis nigromaculatus*, bluegill *Lepomis macrochirus*, and largemouth bass *Micropterus salmoides* had existed. During winter 2005-06, snowpack throughout much of southwest Idaho exceeded 120% of normal and combined with a wetter than normal spring acted to fill these reservoirs to full or near full capacity by spring 2006. We sought to restock these waters with warmwater fish to rebuild fishable populations, as warm water fish populations in these reservoirs had suffered substantial declines or elimination due to the persistent drought conditions.

Objective

1. To rebuild warmwater fisheries in four reservoirs in the Southwest Region (Nampa) through the trapping and transplanting of pre-spawn adults. These waters included Paddock, Indian Creek, Mountain Home, and Blacks Creek reservoirs.

Methods

Capture techniques for trap and transplant efforts included boat electrofishing as well as hook and line. Source ponds included private ponds, commercial gravel ponds, as well as public waters in Idaho (C.J. Strike Reservoir) and Oregon (Owyhee Reservoir). At these locations, we collected fish with day and night electrofishing efforts from April 11 to June 21, 2006 in the littoral zone using a Smith Root electrofishing boat. Pulsed direct current was produced by a 5,000 watt generator. Frequency was set at 120 pulses per second and a pulse width of 40, which yielded an output of 4-5 amps. After capture, fish were transferred to live cars and held until sufficient numbers were captured to fill a transport truck or trailer. Once loaded, fish were supplied with supplemental oxygen at the rate of 2 liters-per-minute. All transplanting occurred on the same day as fish were trapped. In addition to electrofishing, on May 13, 2006 volunteer fishermen from local fishing clubs volunteered to catch and donate black crappie at Owyhee Reservoir, Oregon; and, these fish were transferred to Paddock Reservoir, the only reservoir where we transplanted crappie.

Results and Discussion

In total, we moved 7,446 fish, including 3,522 black crappie, 2,599 bluegill, and 1,325 largemouth bass. Stocking density varied by species and water body (Table 5). We prioritized stocking in Indian Creek and Blacks Creek reservoirs and these water were stocked at densities that were likely high enough to establish self-sustaining populations. Additional stocking effort is likely needed for Paddock and Mountain Home reservoirs.

Overall, short term trap and transplant mortality was low. Examination of some of the few mortalities indicated that the majority of fish transferred prior to May 17th were in the pre-spawn stage. We moved few fish after this date. We did not attempt to document long-term mortality or if stress from capture and transport led to recruitment failure. Surveys of these reservoirs during 2007 are needed to determine if additional transfers are required.

Management Recommendations

1. Determine during early spring 2007 whether the transfer of pre-spawn adults during 2006 resulted in the production of juvenile bluegill, largemouth bass, and black crappie in these four reservoirs.

2. Initiate additional trap and transplant efforts if when needed to quickly re-establish game fish populations.

Table 5. Summary of fish trap and transplant efforts completed during 2006 by Southwest Region Fisheries Management staff.

Species stocked	Water body	Total # of fish transplanted	Stocking Density (#/acre)
Largemouth bass	Indian Creek Reservoir	487	3.9
	Paddock Reservoir	444	0.4
	Blacks Creek Reservoir	173	2.1
	Mt. Home Reservoir	221	0.5
Bluegill	Indian Creek Reservoir	960	7.6
	Paddock Reservoir	693	0.6
	Blacks Creek Reservoir	425	5.1
	Mt. Home Reservoir	521	1.3
Black crappie	Paddock Reservoir	3522	3.0

RIDDLE AREA RESERVOIRS

Introduction

The Riddle area reservoirs include six irrigation reservoirs located on tributaries of the Owhyee River in southwest Idaho approximately 20 to 40 km north of the Nevada border. IDFG maintains Lahontan cutthroat trout *Oncorhynchus clarkii henshawi* populations in four of the reservoirs, Bybee (28 ha), Grasmere (86 ha), Little Blue Creek (76 ha), and Shoofly (34 ha), through stocking. No trout are stocked in Blue Creek and Payne Creek reservoirs due to frequent dewatering and very difficult access, respectively. Stocking of Lahontan cutthroat trout fingerlings during the fall began in 1989 and continued through 1992. Since then, fry have been stocked in June (Allen et al. 1998).

The Riddle area reservoirs possess simple fish communities. Lahontan cutthroat trout, redside shiner *Richardsonius balteatus*, and bridgelip sucker *Catostomus columbianus* have been present in most of the reservoirs, whereas bluegill are present only in Shoofly Reservoir. The four stocked reservoirs are capable of producing trophy sized cutthroat trout that may exceed 600 mm if adequate water levels are maintained over several years. Despite the trophy potential, fishing effort is low due to the difficult access. Fish populations have been managed under general fishing regulations since 1994.

Objectives

1. Describe the relative abundance, and composition of the fish community in the four Riddle area reservoirs, including Bybee, Grasmere, Little Blue Creek, and Shoofly.

2. Compare the current fish relative abundance, size structure, and species composition to historical sampling information collected since the mid-1990s.

Methods

Fish populations in the Riddle lakes were sampled with standard IDFG lowland lake sampling gears, except no electrofishing effort was expended due to remoteness, rough roads, and the lack of boat ramps. Sampling gear included: (1) Gill nets – floating and sinking monofilament nets, 46 m x 2 m, with six panels composed of 19, 25, 32, 38, 51, and 64 mm bar mesh. One floating and one sinking net, fished for one night, equaled one unit of gill net effort; (2) Trap nets – 15 m lead, 1 m x 2 m frame, crowfoot throats on the first and third of five loops, 19 mm bar mesh, treated black. One trap net fished for one night equaled one unit of trap net effort. Catch data were summarized as catch per unit effort by number (CPUE) and by weight (WPUE).

Captured fish were identified to species, measured (± 1 mm), and weighed (± 1 g) with a digital scale. If weight was not determined, length-weight relationships were built from fish weighed and measured in 2006 which allowed us to estimate weights. Proportional stock densities (PSD) were calculated for gamefish populations as outlined by Anderson and Neuman (1996) to describe length-frequency data. Also, Fulton condition factors (K) were calculated for each fish as an index of general body condition where a value of 1.0 is considered average. Values greater than 1.0 describe robust body condition, whereas values less than 1.0 indicate less than ideal foraging conditions.

Results

Bybee Reservoir

During 2006, a total of 21 fish were sampled. Gill nets were more effective than trap nets. Seventeen cutthroat trout and two bridgelip sucker were sampled with gill nets, whereas two bridgelip sucker were sampled with trap nets. Six total units (four trap net and two gill net) of effort were expended sampling Bybee Reservoir (Table 6). Gill net CPUE was 4.25 fish for cutthroat trout and one fish for bridgelip sucker. Trap net CPUE was 0.5 fish for bridgelip sucker.

For both gears combined, mean length and weight for Lahontan cutthroat trout was 321 mm (± 37) and 376 g (± 109). Proportional stock density was 43, calculated from 14 stock length fish (≥200 mm) and 6 quality length fish (≥350 mm). Average condition, K, was 0.94, but was not consistent across lengths. Fish less than 250 mm and greater than 450 mm tended to have low K values (< 0.85).

Cutthroat trout populations have declined substantially since the mid 1990s. Gill net CPUE has declined from a high of 43 fish during 1995 to a low of 8.5 fish in 2006 (Figure 8). Trap net CPUE has remained low, less than 5 fish, in all years, but the maximum trap net CPUE coincided with the maximum gill net CPUE. Bridgelip sucker peaked in 1999 four years after the peak in cutthroat trout CPUE. Since then, bridgelip sucker CPUE has declined in each of the last three surveys (Figure 9).

Length frequency histograms from each of the four survey years also indicated a general decline in the cutthroat trout population. During the initial survey, 1995, a wide range of lengths were sampled (Figure 10). The length frequency plot was dome shaped with a peak near 340 mm and declining right limb with a maximum of 600 mm. Subsequently, the length frequency histograms for the 1999, 2002, and 2006 surveys have been relatively flat indicating poor survival of stocked fish.

Grasmere Reservoir

During 2006, a total of 47 fish were sampled from Grasmere Reservoir from a total effort of 4.5 units (Table 6). Gill nets were more effective than trap nets. Thirty-five cutthroat trout, one bridgelip sucker, and one redside shiner were sampled with gill nets, whereas nine cutthroat trout and one redside shiner were captured with trap nets. Gill net CPUE was 23.3 fish for cutthroat trout and 0.6 fish for both bridgelip sucker and redside shiner. Trap net CPUE for cutthroat trout was three fish and 0.3 fish for redside shiner.

For both gears combined, mean length and weight for cutthroat trout in Grasmere Reservoir was 297 mm (±23) and 290 g (±57). Proportional stock density was 49, calculated from 35 stock length fish (≥200 mm) and 17 quality length fish (≥350 mm). Average condition, K, was 0.87 and showed no trend across lengths.

Cutthroat trout populations in Grasmere Reservoir have declined substantially since the mid 1990s. Comparing our last four surveys, gill net and trap net CPUE were highest during 1995 at 112 and 23.5 fish, respectively (Figure 11). CPUE for gill nets declined to a low of 13 in and then increased to 23.3 fish for 2006. After 1995, trap net CPUE decreased and fluctuated between three and nine fish. CPUE of bridgelip sucker was initially low during the 1995 survey, peaked in 1999 at 254 fish, and declined substantially thereafter (Figure 12).

Length frequency histograms from each of the four survey years also indicated a general decline in the cutthroat trout population. During the initial survey, 1995, a wide range of length were sampled (Figure 13). The length frequency plot was dome shaped with a peak near 300 mm and declining right limb with a maximum of 500 mm. Subsequently, the length frequency histograms for the 1999, 2002, and 2006 surveys have been relatively flat indicating poor survival of young fish, yet adequate survival of old age classes.

Little Blue Creek Reservoir

During 2006, a total of 37 fish were sampled with six units of effort (Table 6). Gill nets were more effective than trap nets. Twenty-two cutthroat trout, two bridgelip sucker, and one redside shiner were sampled with gill nets, whereas only two cutthroat trout and two bridgelip sucker were sampled with trap nets. Gill net CPUE was 11 fish for cutthroat trout, 2.5 fish for bridgelip sucker, and 0.5 fish for redside shiner. Trap net CPUE was 0.5 fish for cutthroat trout and 1.8 fish for bridgelip sucker.

For both gears combined, mean length and weight for cutthroat trout was 304 mm (± 30) and 310 g (± 84). Proportional stock density was 39, calculated from 18 stock length fish (≥ 200 mm) and 7 quality length fish (≥ 350 mm). Average condition, K, was 0.89, and showed no trend across lengths.

Cutthroat trout populations have declined substantially since the mid 1990s. Gill net CPUE effort has declined from a high of 137 fish during 1994 to a low of 2.5 fish in 2005 (Figure 14) and then rebounded slightly to 11 fish during 2006. Trap net CPUE peaked at 15.5 fish during 1995 then decreased to 2 fish by the following year. No trap netting effort was expended during 2004 or 2005. Trap net CPUE in all other sampling years has been less than or equal to 3 fish. Gill net CPUE for bridgelip sucker was low (< 20 fish) during the 1993, 1994, and 1995 surveys, peaked during 1999 at 90 fish, declined to 15 fish by 2002, and has remained at low to moderate levels since (Figure 15).

Length frequency histograms from each of the eight survey years also indicated a general decline in the cutthroat trout population since 1994 and 1995. During the initial survey, 1993, few fish were sampled (Figure 16). However, by the following year (1994) a wide range of lengths were sampled. Also, the length frequency plot was bimodal with peaks at 245 mm and a lower peak at 370 mm. During 1995, the length frequency plot was dome shaped with a peak near 310 mm and sharply declining right limb. Subsequently, the length frequency histograms for the 1999, 2002, 2004, 2005, and 2006 surveys have been relatively low indicating low abundance and flat indicating poor survival of stocked fish, yet adequate survival of old age classes.

Shoofly Reservoir

During 2006, a total of 81 fish were sampled with five units of effort (Table 6). Gill nets were much more effective than trap nets. Seventy-seven cutthroat trout and two bluegill were sampled with gill nets, whereas one cutthroat trout and eight bluegill were sampled with trap nets. Gill net CPUE was 38.5 fish for cutthroat trout and one fish for bluegill. Trap net CPUE was 2.7 fish for bluegill and 0.3 fish for cutthroat trout. No bridgelip sucker have been sampled from Shoofly Reservoir during the last surveys

For both gears combined, mean length and weight for cutthroat trout was 303 mm (± 16) and 358 g (± 53). Proportional stock density was 43, calculated from 74 stock length fish (200 mm) and 32 quality length fish (350 mm). Average condition, K, was 1.04, and showed no trend across lengths.

Cutthroat trout populations have declined substantially since the mid 1990s. Gill net CPUE has declined from a high of 89 fish during 1994 to a low of 12 fish in 1999 (Figure 17). However, since 1999, gill net CPUE for Shoofly Reservoir has trended upwards. Trap net CPUE reached a high of 35 during 1995, coinciding with peak gill net CPUE. Trap net CPUE remained low in all other years, never exceeding four fish.

Cutthroat length frequency histograms for the last six survey efforts have been highly variable. Histograms for 1993, 1994, 1995, and 2006 were indicative of fairly healthy populations with relatively high numbers of juvenile trout and a wide range of lengths, especially for the 1995 survey (Figure 18). The 1999 and 2002 histograms indicated that populations were struggling with few juvenile trout present, missing year classes, and no peaks.

Discussion

Cutthroat trout abundance indices and size structure have declined from peaks observed during the 1994 and 1995 surveys to lows observed during 2002 or 2006. This trend was very consistent across. For Shoofly Reservoir, a similar peak in abundance during 1995 followed by a rapid decline from 1995 to 1999. However, unlike the other reservoirs, population abundance in Shoofly Reservoir has increased in each of the last two surveys, 2002 and 2006. The amount of sampling effort used to calculate abundance indices has varied across sampling efforts and was low during some years. Low amounts of sampling effort could have biased CPUE indices especially from low effort years. However, it is important to note that even with low effort a large areal portion of these lakes is covered. Even if some sampling error was present, it is doubtful that it substantially changed these trends, which has been a large decrease in cutthroat trout abundance since the mid 1990s.

Abundance of bridgelip sucker trends across Bybee, Grasmere, and Little Blue Creek reservoirs were remarkably similar. Bridgelip sucker abundance was low prior to 1999, peaked in 1999, and generally decreased thereafter. It appears that during peak cutthroat trout abundances bridgelip sucker abundance was suppressed. During 1999, cutthroat trout populations declined and it appear bridgelip sucker abundance increased. In the latter surveys both populations remained at low levels possibly due to low water levels and poor water quality caused by persistent drought conditions.

The most obvious change in these fisheries has been the switch from fall fingerling to spring fry plants. For most of the reservoirs, the last fingerling plants occurred during October 1992. It is likely that the peaks in abundance noted in 1994 and 1995 were remnants of these fall fingerling plants. In survey years after 1995, abundance and size structure of cutthroat trout indicated that survival of stocked fish has declined dramatically especially for small fish. The timing of fry plants in June coincides with increased metabolism in adult fish associated with recovering from spawning and increased water temperatures. Also, June fry plants also submit recently stocked fish to poor water quality over the late summer months. The use of fall fingerling plants prior to 1993 likely reduced these potential mortality factors. Water temperature and quality would likely be more optimal for fall stocked fingerlings. Also, their ability to avoid predators would be enhanced by their size and the presence of other similar sized prey items such as age-0 bridgelip suckers.

Management Recommendations

1. Adjust stocking strategies in the Riddle area reservoirs. Stock fingerling Lahontan cutthroat trout have proven to survive and recruit to the fishery more effectively than recent fry plants.

2. Assess the risk of stocking fertile Lahontan cutthroat trout in these reservoirs. Riddle area reservoirs are located on tributaries to the Owyhee River, where redband trout are native. Lahontan cutthroat trout have been observed in outlet streams below Little Blue Creek and Bybee reservoirs. Whether fish in these tributaries can seasonally access the Owyhee River drainage is unknown.

3. Resample these four Riddle area reservoirs during late May 2009 using adequate sampling efforts, including at least two gill nets pairs and three or more trap nets per lake.

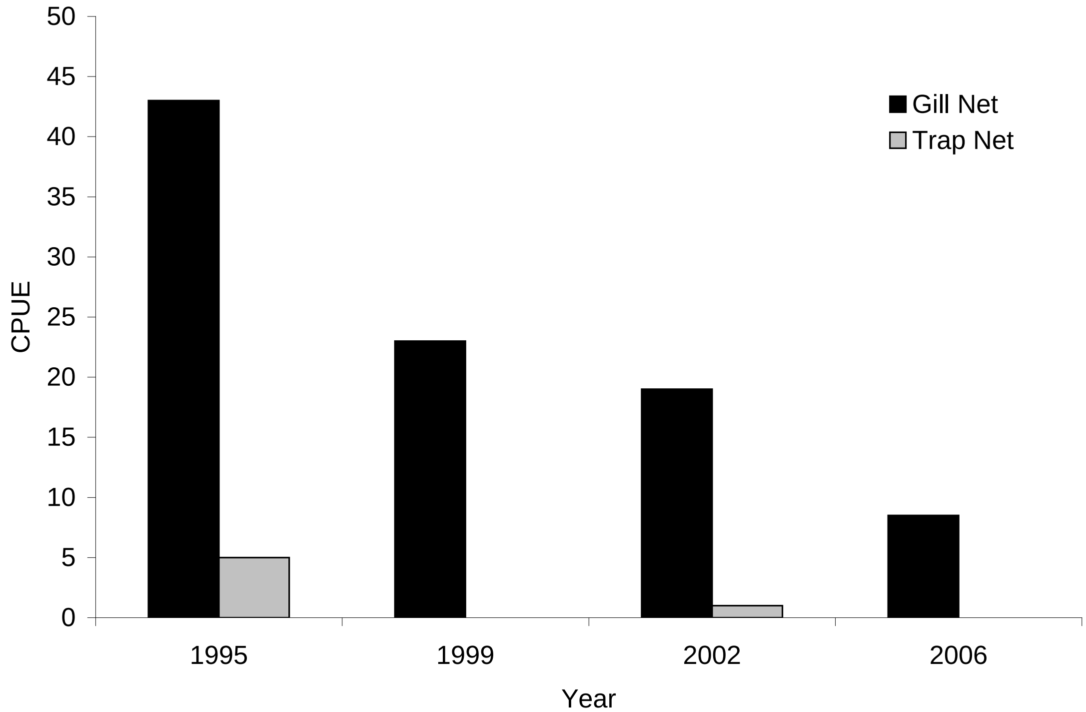


Figure 8. Catch per unit effort (CPUE) of Lahontan cutthroat trout for gill net and trap net sampling efforts expended on Bybee Reservoir from 1995 to 2006.

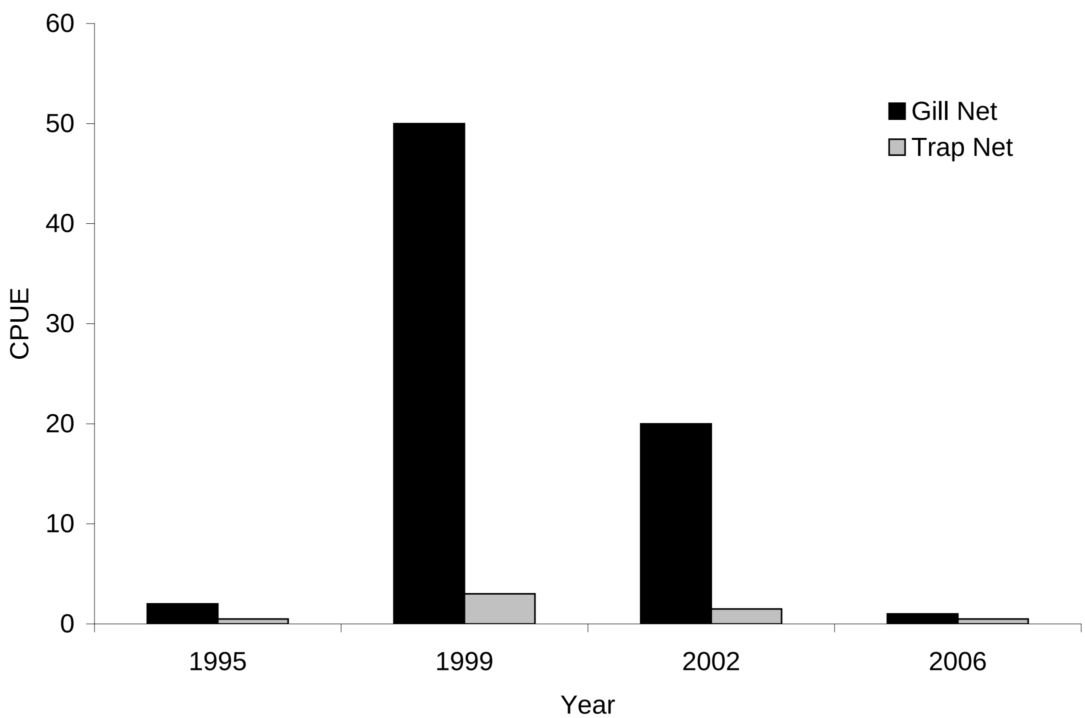


Figure 9. Catch per unit effort (CPUE) of bridgelip sucker for gill net and trap net sampling efforts expended on Bybee Reservoir from 1995 to 2006.

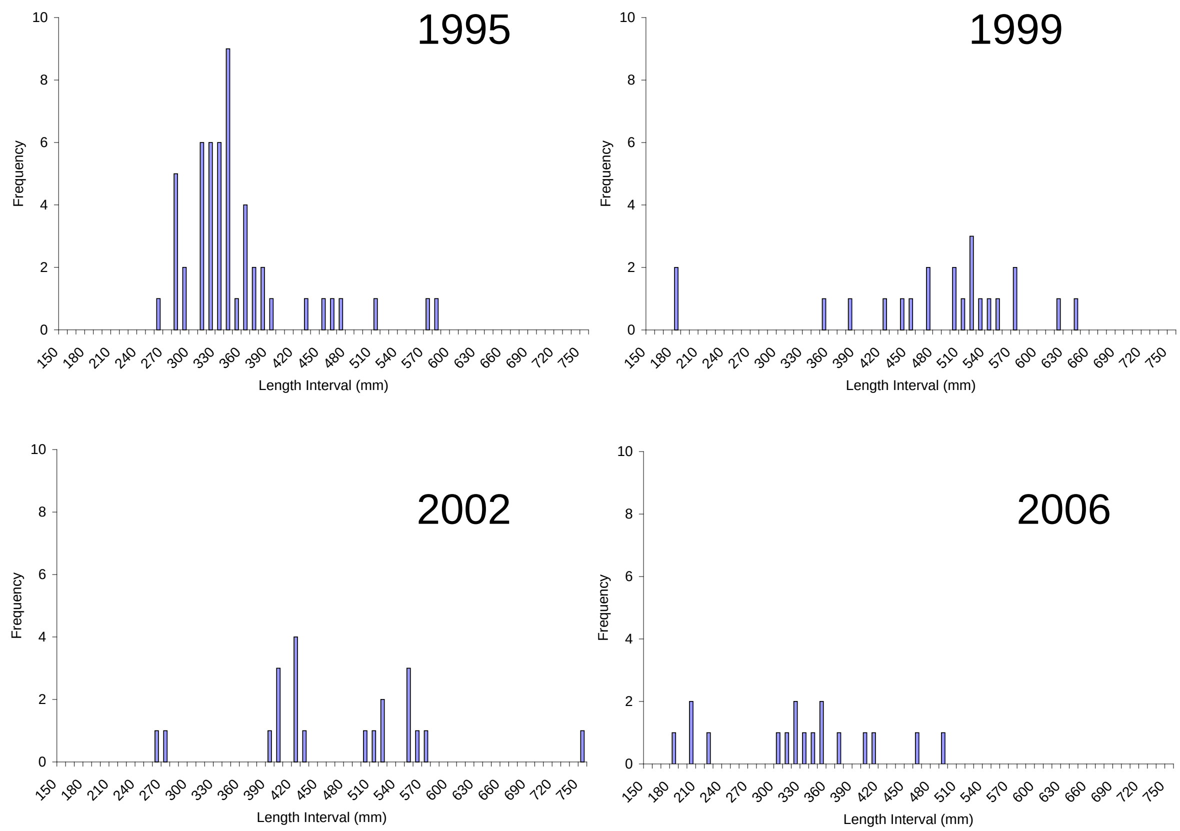


Figure 10. Length frequency histograms for cutthroat trout captured in gill nets and trap nets in Bybee Reservoir during 1995, 1999, 2002, and 2006 surveys.

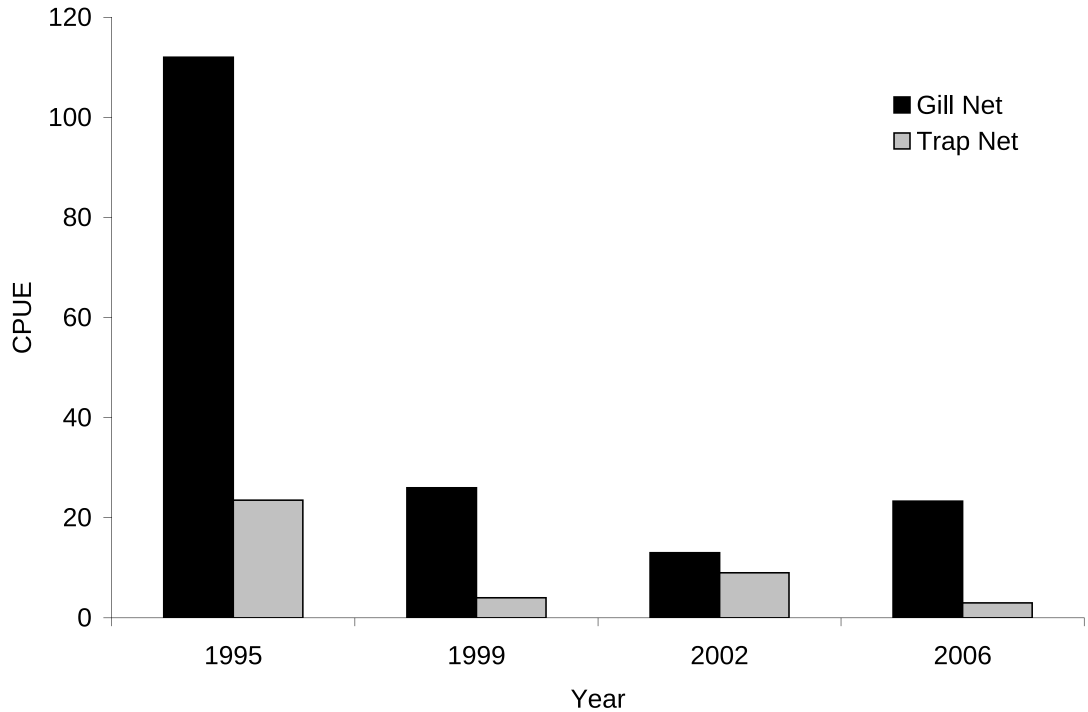


Figure 11. Catch per unit effort of Lahontan cutthroat trout for gill net and trap net sampling efforts expended on Grasmere Reservoir from 1995 to 2006.

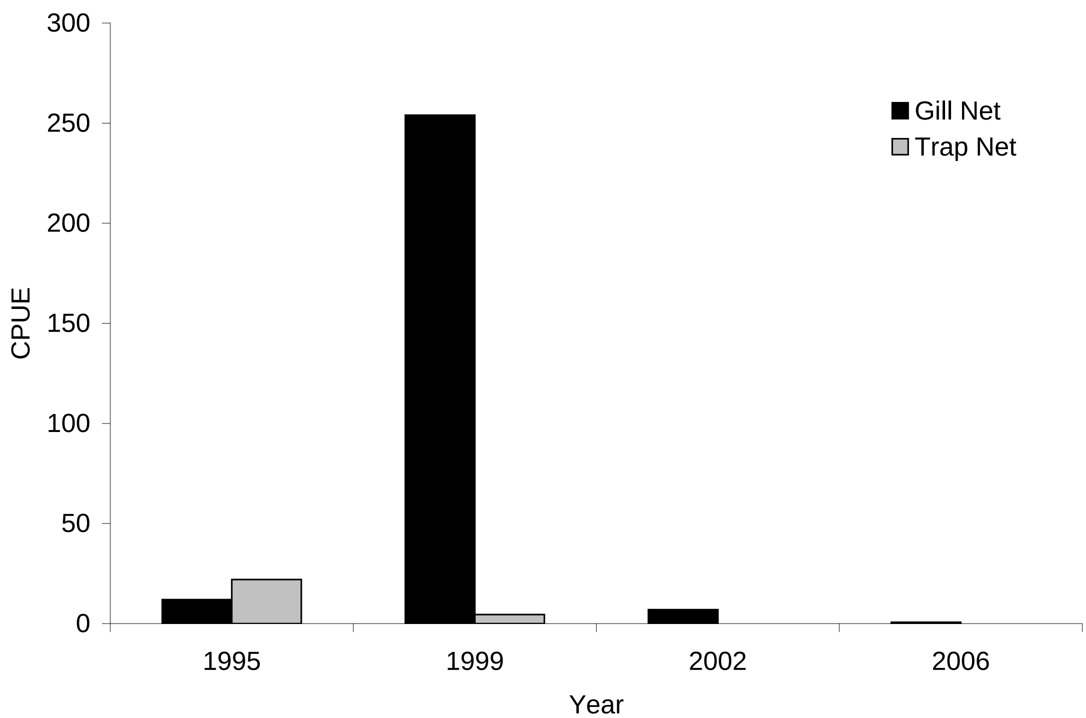


Figure 12. Catch per unit effort of bridgelip sucker for gill net and trap net sampling efforts expended on Grasmere Reservoir from 1995 to 2006.

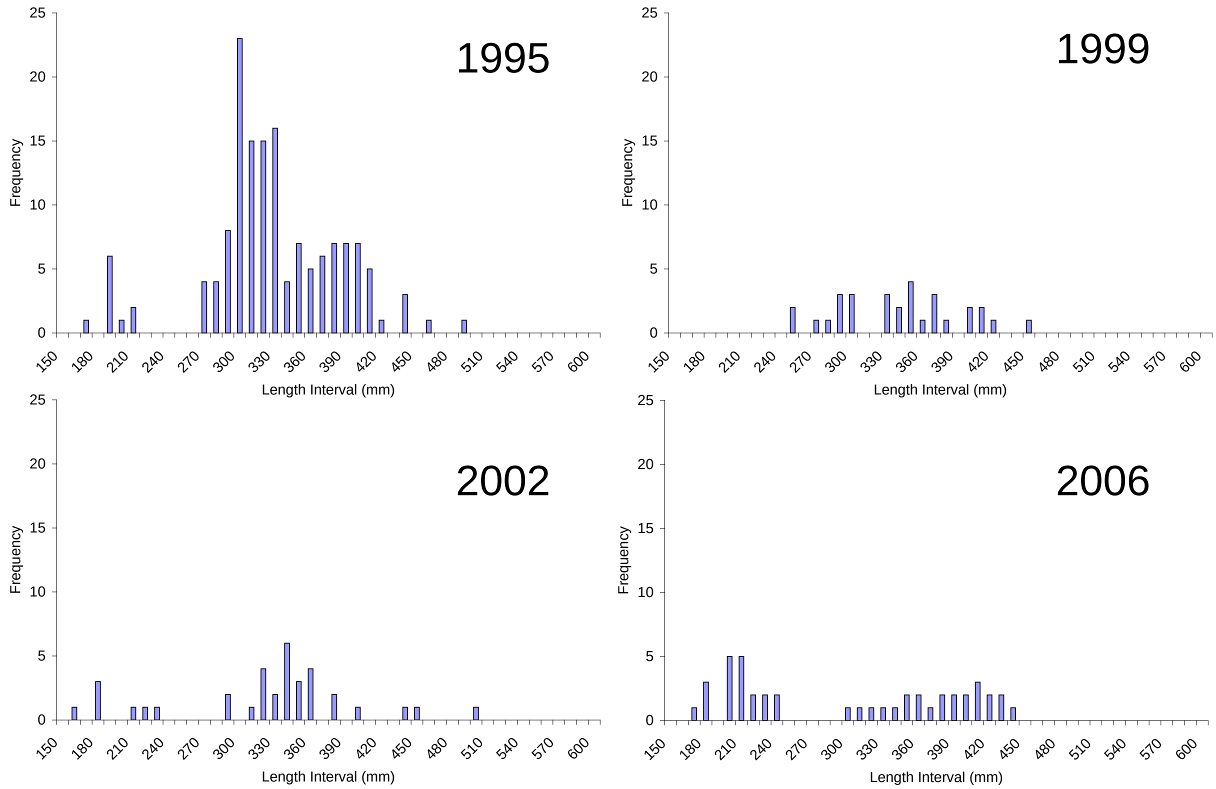


Figure 13. Length frequency histograms for cutthroat trout captured in gill nets and trap nets in Grasmere Reservoir during 1995, 1999, 2002, and 2006 surveys.

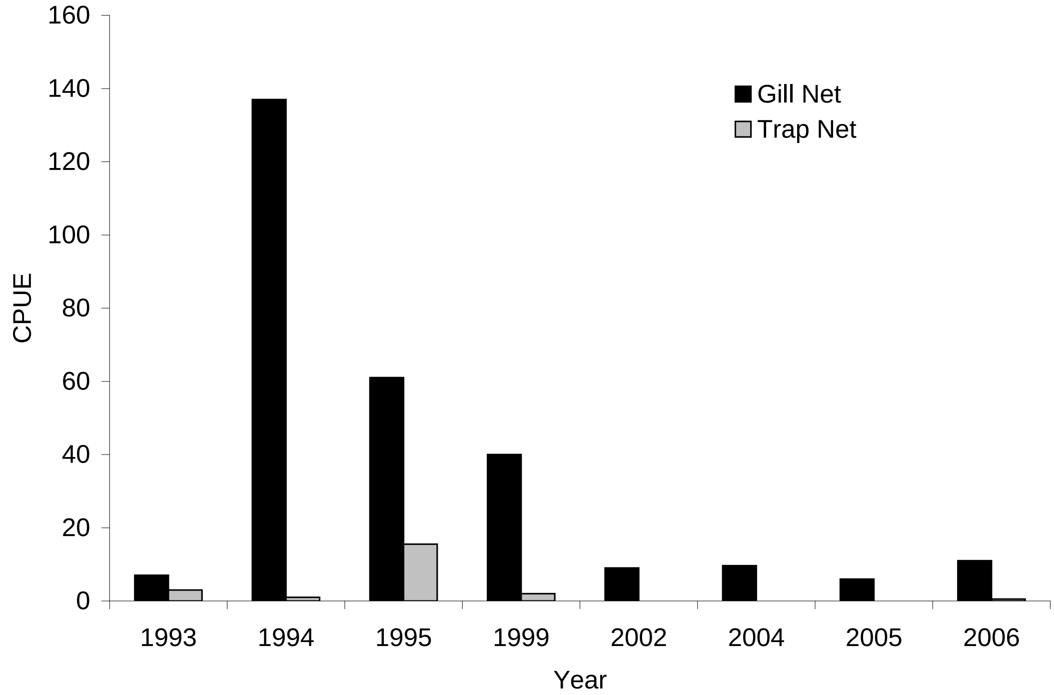


Figure 14. Catch per unit effort (CPUE) of Lahontan cutthroat trout for gill net and trap net sampling efforts expended on Little Blue Creek Reservoir during 1993-95, 1999, 2002, and 2004-06 surveys. No trap netting effort was expended during 2004 or 2005.

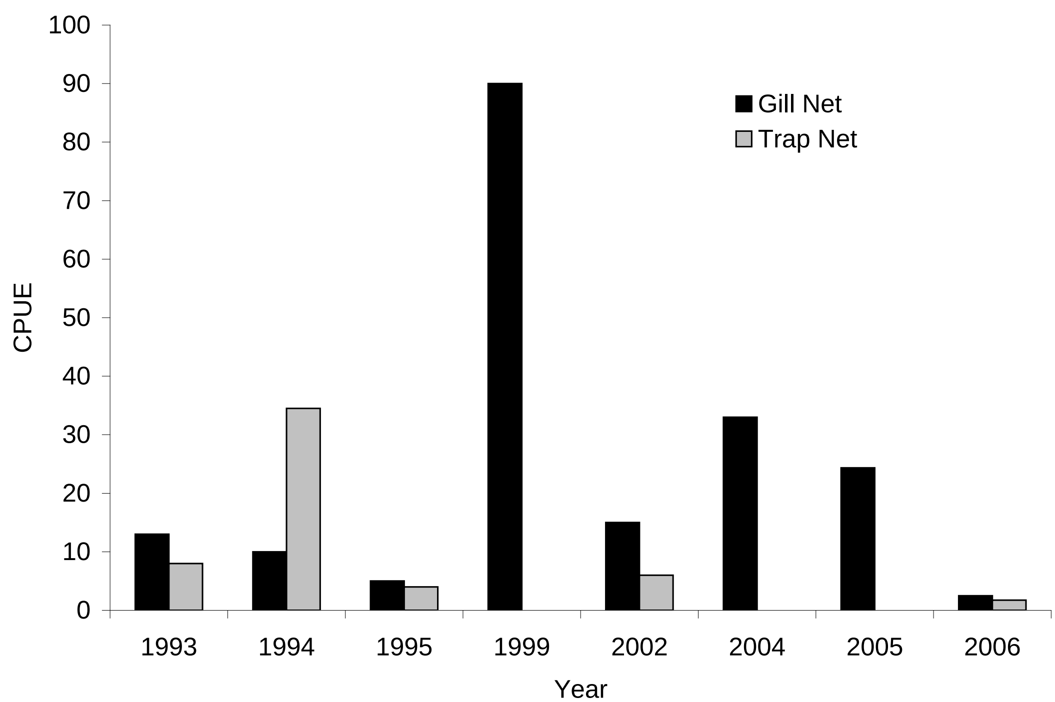


Figure 15. Catch per unit effort (CPUE) of bridgelip sucker for gill net and trap net sampling efforts expended on Little Blue Creek Reservoir during 1993-95, 1999, 2002, and 2004-06 surveys. No trap netting effort was expended during 2004 or 2005.

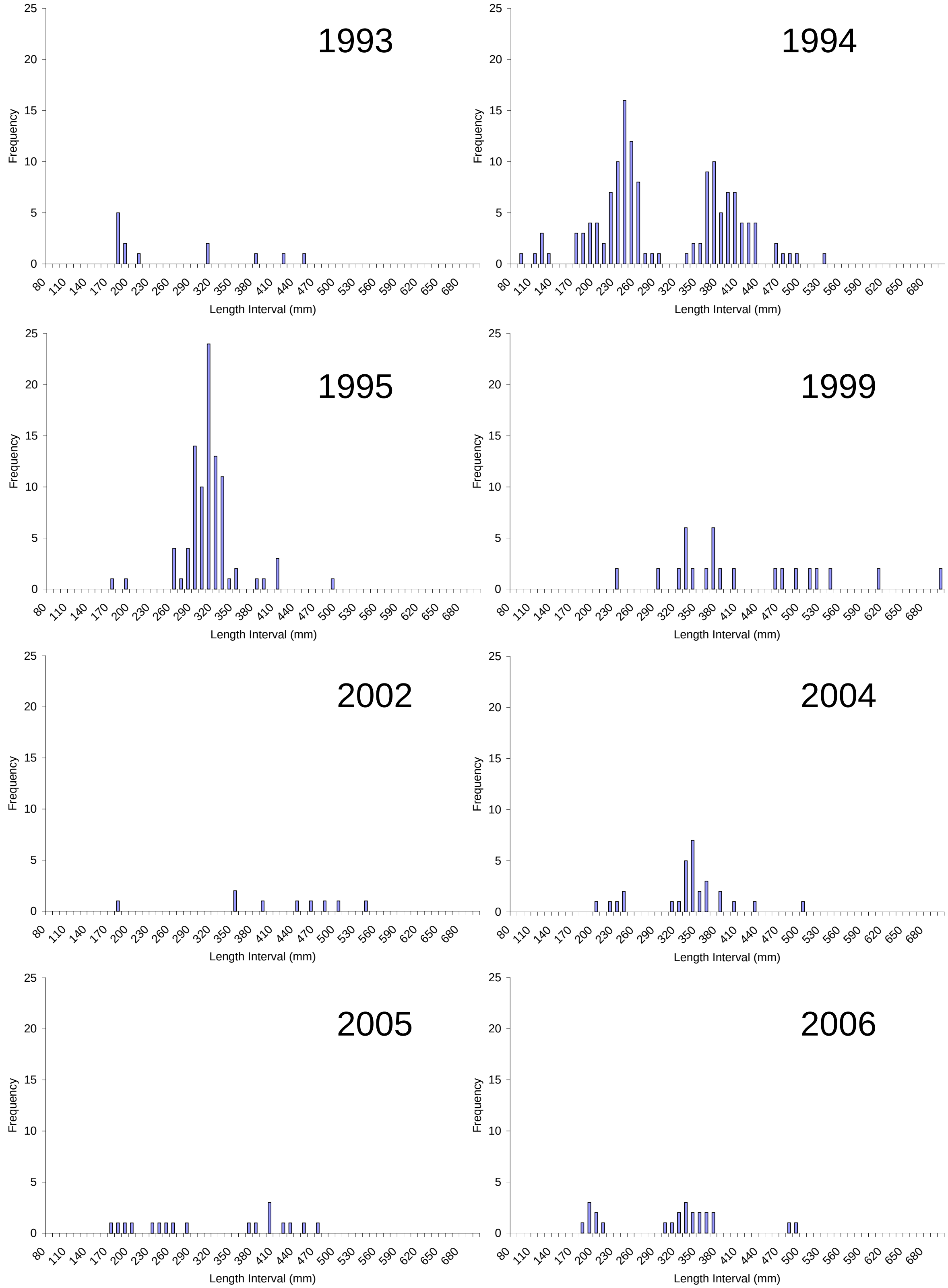


Figure 16. Length frequency histograms for Lahontan cutthroat trout captured in gill nets and trap nets in Little Blue Creek Reservoir during 1993-95, 1999, 2002, and 2004-06.

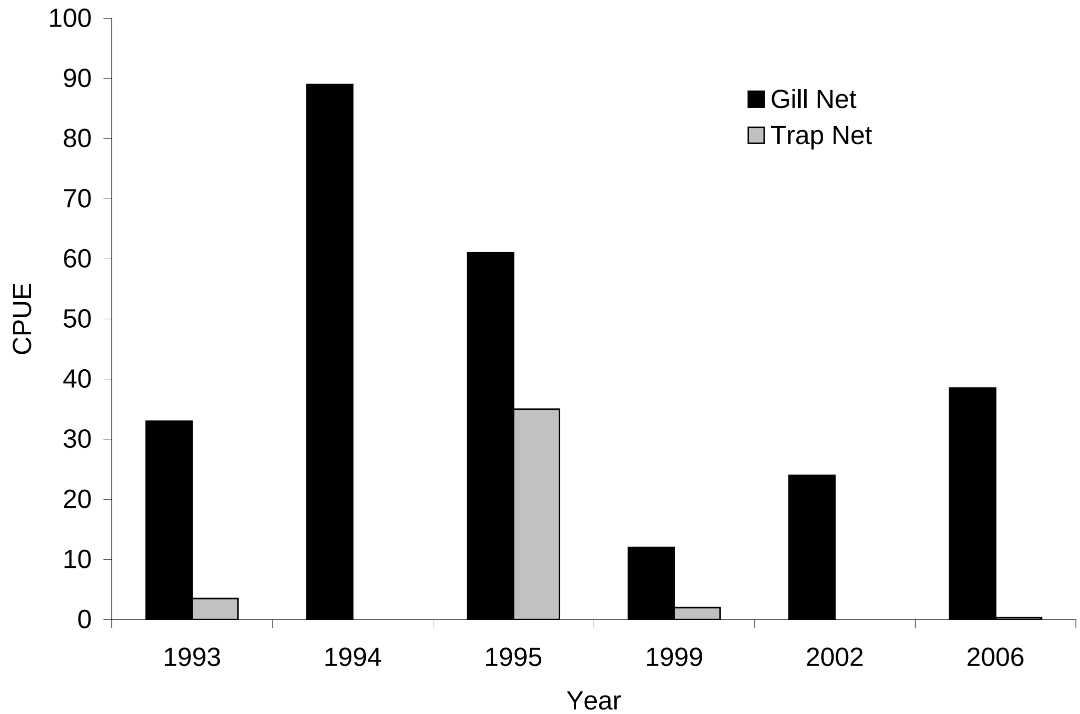


Figure 17. Catch per unit effort (CPUE) of cutthroat trout for gill net and trap net sampling efforts expended on Shoofly Reservoir from 1993 to 2006.

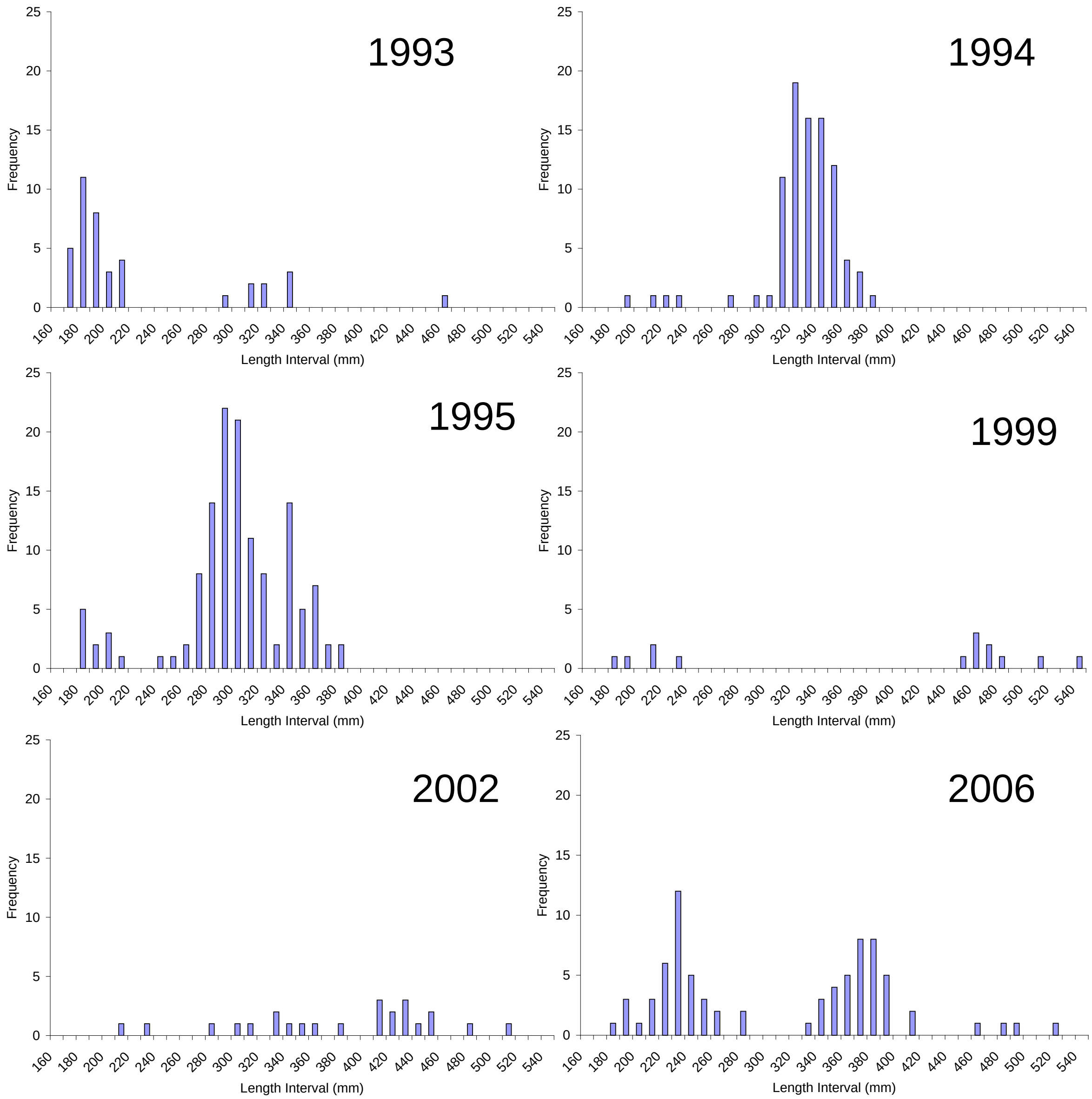


Figure 18. Length frequency histograms for Lahontan cutthroat trout captured in gill nets and trap nets in Shoofly Reservoir during 1993-95, 1999, 2002, and 2006 surveys.

Table 6. Gill net and trap net nights of effort expended during lowland lake surveys on four Riddle area reservoirs during 2006.

	Effort by Survey Year							
Gill Net	1993	1994	1995	1999	2002	2004	2005	2006
Bybee		1	1	1	1			2
Grasmere			1	1	2			1.5
Little Blue Creek	1	1	1	1	1	3	3	2
Shoofly	1	1	1	1	1			2
Trap Net								
Bybee			2	1	2			4
Grasmere			2	1	1			3
Little Blue Creek	2	2	2	1	1			4
Shoofly	2		2	1	1			3

LAKE LOWELL

Introduction

Lake Lowell is a 4,000 ha Bureau of Reclamation irrigation reservoir located 10 km southwest of Nampa, Idaho. The reservoir was built from 1906 to 1909 by forming four embankments around a naturally-occurring depression. Shortly thereafter, the land surrounding the reservoir was incorporated into the National Wildlife Refuge system and continues to be managed by the U. S. Fish and Wildlife Service. Uniquely, no streams or rivers flow into the reservoir; instead, water is supplied by the New York Canal which diverts water from the Boise River. Due to recent leakage at the upper embankment, maximum full pool was lowered from 771.5 m (2,531.2 ft) to 770 m (2,526.0 ft) during June 2005. Additionally, the lake will be lowered to 766 m (2,514 ft) during fall 2007 to allow repair work. The reservoir is fairly shallow with a maximum depth of 11 m. Much of the littoral zone is occupied by extensive beds of smartweed (*Polygonum* spp.).

Due to its' proximity to Idaho's population center, Lake Lowell receives substantial fishing pressure. Largemouth bass seem to receive the majority of the attention and several tournaments are held annually. Panfish fisheries (crappies, bluegill, and yellow perch *Perca flavescens*) are also popular; however, these populations have fluctuated widely leading to inconsistent use (Pollard 1974; Grunder et al. 1993). IDFG stocks both channel catfish *Ictalurus punctatus* and Lahontan cutthroat trout in the reservoir. Since 2003, approximately 6,000 to 9,000 fingerling channel catfish have been planted annually. Additionally, recent plants of Lahontan cutthroat trout have ranged from 40,000 to 103,000 fry annually. Lake Lowell is managed under general regulations, except for largemouth bass which are managed as a quality fishery: no harvest from January 1 thru June 30 and a 2 fish, 305-406 mm protected slot limit thereafter.

Objectives

1. Characterize game and non-game fish communities using standard IDFG lowland lake sampling techniques.

2. Characterize the size structure and relative abundance of prey-sized fish to assess potential for future predator fish introductions.

3. Assess reproductive success of recreationally-important, warm water fishes.

4. Describe seasonal trends in temperature and dissolved oxygen.

5. Characterize zooplankton size structure and abundance.

6. Monitor size structure and catch rates of largemouth and smallmouth bass caught during tournaments held on Lake Lowell and collect additional biological information.

Methods

Due to the relatively large size of Lake Lowell, the reservoir was divided into three sections as has been used in past IDFG sampling efforts (Figure 19). Based on our standard lowland lake sampling protocol, we expended at least three units of sampling effort in each of the three sections. Sampling gear included: (1) Gill nets – floating and sinking monofilament nets, 46 m x 2 m, with six panels composed of 19, 25, 32, 38, 51, and 64 mm bar mesh. One floating and one sinking net, fished for one night, equaled one unit of gill net effort; (2) Trap nets – 15 m lead, 1 m x 2 m frame, crowfoot throats on the first and third of five loops, 19 mm bar mesh, treated black. One trap net fished for one night equaled one unit of trap net effort; (3) Boat electrofishing – pulsed direct current was used to stun fish for sampling efforts. One hour of active on-time electrofishing equaled one unit of effort. One unit of effort for each of the three gear types combined equals one unit of standard unit sampling effort. Historical electrofishing sampling locations were used to compare fish population trends. Historical sites included Lower Embankment, Murphy's Neck (near the Lower Dam recreation site), Boat Launch Cove (Southwest side of the reservoir), Upper embankment, and Gott's Point east to "Bass Cove". A summary of sampling efforts is listed in Table 7. Reservoir level was 769.5 m (2524.6 ft) during lowland lake sampling efforts

Standard lowland lake sampling protocols are not specifically designed to capture prey-sized fish species (typically < 152 mm). Therefore, we used small-mesh, experimental gill nets at about monthly intervals to index and describe the seasonal abundance and composition of potential prey fish species. Floating and sinking monofilament nets were 46 m x 2 m, with six panels composed of 8, 11, 14, 16, 19, and 25 mm bar mesh. One floating and one sinking net, fished for one night, equaled one unit of small mesh gill net effort. Catch data were summarized as CPUE by number and WPUE by weight.

Captured fish were identified to species, measured (± 1 mm), and weighed (±1g for fish under 5,000g or ±10 g for fish greater than 5,000 g) with a digital scale. In the event that weight was not collected, length-weight relationships were built from fish weighed and measured in 2006 which allowed us to estimate weights of un-weighed fish. PSD were calculated for gamefish populations as outlined by Anderson and Neuman (1996) to describe length-frequency data. Also, relative weight, Wr, was calculated as an index of general fish body condition where a value of 100 is considered average. Values greater than 100 describe robust body condition, whereas values less than 100 indicate less than ideal foraging conditions.

Horizontal surface tows were used to index the abundance of larval fish in the reservoir (Sammons and Bettoli 1998). Tows were made with a 1 m x 2 m x 4 m long neuston net. Mesh size was 1.3 mm. The net was fitted with a flow meter (General Oceanics, Inc., Model 2030) to estimate the volume of water sampled. Tow duration was 5 minutes and an average of 612 m^3 was sampled per tow. Two tows were made in each of the three sections of the reservoir. Tows were made on a bi-weekly basis beginning in June until few larval fish were sampled in early September. Specimens were stored in 10% formalin and viewed under a dissecting microscope. Sampled fish from each tow were identified to species and measured for length. For large samples, we randomly selected 50 individuals, identified and measured those, and counted the remainder. Furthermore, we scanned the entire sample for larval channel catfish.

The Idaho Department of Environmental Quality recently completed a three year study of water quality at Lake Lowell. Due to the intensive nature of this monitoring program, it was not necessary for us to initiate a similar monitoring effort. However, we monitored some water quality parameters that may affect the quality of the fisheries in Lake Lowell. These measurements included water temperature profiles, dissolved oxygen profiles, and Secchi depth. Data were collected at two sampling points that were used during the IDEQ study and an additional site located in the upper end of the reservoir. The first site near the upper embankment, known as BOI-181 is located at 43 33 20 N and 116 39 14 W (NAD 27). The other site was located near the lower embankment, known as BOI-185 is located at 43 34 52 N and 166 43 24 W. The third site was located in the middle of the reservoir near the no wake buoy line. Water quality measurements were collected on a bi-weekly basis beginning in early May 2006. Additionally, we installed thermographs at three points located throughout the reservoir.

The zooplankton community was monitored at the same three sampling locations and times used for water quality monitoring. At each point, three vertical zooplankton tows were made using plankton nets fitted with 153, 500, and 750 micron mesh netting. Samples were stored in 95% ethanol and processed within 2 weeks of sampling. Zooplankton samples were analyzed using ZQI and ZPR indices (Teuscher 1999). These indices describe the overall abundance and abundance of large individuals within zooplankton communities.

We collected length and weight information for largemouth bass at a fishing tournament on May 18, 2006. Lengths and weights were collected from released fish. Also, tournament mortalities were collected and frozen. In the laboratory, we determined sex, maturity, and removed otoliths. Otoliths were embedded in resin and cross-sectioned using an Isomet low speed saw. Cross sections were viewed under a 10x microscope and aged independently by two readers. If agreement was not reached, the otolith was re-read and the age was determined collectively.

Results

From May 30 to June 2, 2006 during the standard lowland lake sampling effort, 1,303 fish were sampled from Lake Lowell. The 12 species sampled included brown bullhead *Ameirus nebulosus*, black crappie *Pomoxis nigromaculatus*, bluegill, channel catfish, common carp *Cyprinus carpio*, largemouth bass, largescale sucker *C. macrocheilus*, pumpkinseed *Lepomis gibbosus*, redside shiner, smallmouth bass, white crappie *P. annularis*, and yellow perch.

The fish community in Lake Lowell during 2006 was dominated both numerically (Table 8) and in terms of biomass (Table 9) by non-game fish. CPUE equaled 197 fish. The most abundant fish was common carp (22%) and largescale sucker (16%). Recreationally important gamefish such as channel catfish, largemouth bass, and smallmouth bass represented 6, 13, and 10% of total CPUE, respectively. For panfish, bluegill were the most numerous (18%) followed by yellow perch (10%), whereas the remainder of panfish species combined only equaled 1.5% of the total CPUE.

In terms of biomass, WPUE equaled 134 kg. The highest biomass estimate was for common carp (66 kg or 49 % of the weight sampled). Largescale sucker represented the second highest biomass estimate (36 kg or 27% of the weight sampled). Together, these two species represented over three-quarters (76%) of the biomass sampled. Recreationally important gamefish such as channel catfish, largemouth bass, and smallmouth bass represented 11, 7, and 1% of the biomass, respectively. For panfish populations, bluegill represented the highest biomass (2%), where as the remaining panfish species combined only represented 0.8% of the total biomass.

PSD estimates were mixed for panfish populations in Lake Lowell during 2006. PSD estimates for white crappie (100) and black crappie (75) were high, though these estimates were based on very small sample sizes. Nonetheless, this indicated that crappie recruitment has been poor in recent years as few stock length or shorter fish were sampled. The PSD estimate for yellow perch (27) was near, but below, the lower end of the range of what is considered a healthy perch population. Few quality size (≥ 200 mm) yellow perch were caught.

PSD for bluegill was 50, indicating a balanced size structure. Combined with the CPUE estimates, the bluegill population seems to be fairing well in Lake Lowell.

Proportion stock density estimates for gamefish populations were balanced except for smallmouth bass. PSD for largemouth bass was 45, within the 40-70 range of a balanced population (Table 10). The estimate for channel catfish was 55. Recruitment of channel catfish (mostly stocking) is fairly constant, so this balanced value indicates that little stunting or cropping has occurred. PSD estimates for smallmouth bass were nine with only three fish greater than 280 mm being sampled.

Relative weight estimates, Wr, were near or above average for all species except yellow perch and smallmouth bass (Table 10). For black crappie, bluegill, and white crappie; mean relative weight estimates were 111, 123, and 129, respectively. Even though estimates for the crappies were based on small sample sizes, these estimates indicate that these species were in very good condition. Similarly, channel catfish were in above average condition (114). Largemouth bass were slightly below average condition with a relative weight of 96. Both smallmouth bass (90) and yellow perch (88) were in poor condition. There was no relationship between length and relative weight for largemouth bass, smallmouth bass, bluegill, and channel catfish, indicating that body condition was consistent across all age and length groups sampled. The relationship between Wr and length for individual fish can be seen in Appendices A and B.

During small-mesh experimental gill netting efforts designed to capture forage sized fish, we captured 89 fish comprised of eight species for an overall numerical CPUE of 9.9 fish/net pair/night. Species sampled included brown bullhead, black crappie, channel catfish, kokanee salmon, largemouth bass, largescale sucker, and yellow perch. Kokanee salmon are not stocked in Lake Lowell and were likely entrained from Lucky Peak Reservoir. Numerically, common carp were the most abundant species captured (n=49), though they were not forage size fish.Yellow perch were the most abundant forage size fish sampled (n=20). Catch per unit effort for yellow perch was 2.2 fish/net pair/night. The majority (70%) of perch caught in small mesh gill nets were relatively small (<140 mm). Mean length of small yellow perch presumably age-1 fish on June 1, was 101 mm. By June 20, mean length of small yellow perch increased to 121 mm. On July 25, mean length decreased to 84 mm probably due to increased vulnerability of age-0 yellow perch to the sampling gear for the first time.

Species composition and abundance of larval fish varied seasonally and spatially. During 2006, we caught a total of 2,251 fish with the larval net during 30 separate tows (six fixed sites by five sampling dates). Fish species sampled included bluegill, yellow perch, channel catfish, largemouth and smallmouth bass as well as white and black crappie. Bluegill was by far the most numerous species (83%) captured, followed by unknown (12%) and black crappie (3.2%; Appendix C). In retrospect, most of the unknown category was likely bluegills that were too small to identify at that time. All other species represented less than 1% of the total abundance. Black crappie were the most numerous species caught during the first sampling date on June 29, 2006; however, their highest density (0.03 black crappie/m^3) occurred at site 5 on July 24, 2006 (Appendix D) and their density was low compared to bluegill. Thereafter, with few exceptions, bluegill represented the majority of the catch on all other sampling dates and sites; and their highest density (0.97 fish/m^3) occurred at site 6 on July 24, 2006.

Spatially, catch of larval fish was more uniform distributed during early summer then progressively became more skewed towards the upper reservoir by early fall. Catch of all species was low in sites 1, 2, and 3 through all sampling periods (Figure 20). On the first two sampling dates, June 29th and July 10th, catch in sites 4 and 5 collectively represented 37% and

24% percent of the total catch. Thereafter, the vast majority of the catch (61-86%) occurred at site 6. This pattern may have been influenced by the change in species composition to almost all bluegill, directed movement towards the upper reservoir, continued spawning in the upper reservoir, or higher vulnerability in the upper reservoir due to lower water clarity.

Adequate sample sizes for length comparison were only available for larval crappies and bluegill (Table 11). For bluegill, length increased steadily through the last four sampling periods; however, recently hatched fish were likely still entering the vulnerable portion of the population through the July 24 sample. Afterwards, it was unlikely that new fish became vulnerable to the net evidenced by few fish identified as unknown and the lack of bluegill less than 20 mm. Due to these factors, we could only estimate growth for the 16 day period from August 21 thru September 6. During this time period, bluegill increased in mean length from 28.3 mm to 33.0 mm a growth increment of 4.7 mm or 0.3 mm per day. We saw a similar pattern in crappie, when recently hatched fish recruited to our gear thru the July 24 sample. Similarly, growth may only be estimated from the 16 days from August 21 thru September 6. During this time period, crappies increased in mean length from 67.8 mm to 87.0 mm, a growth increment of 19.2 mm or 1.2 mm per day.

Measurement on waters quality parameters were compromised by equipment malfunction. Thermographs will be retrieved during spring 2007 and analysis will be presented in future reports.

Overall zooplankton abundance and the proportion of preferred to usable size zooplankton (ZPR) were moderate to high in Lake Lowell; however, the abundance of larger zooplankton (ZQI) was lower than many Idaho waters. Average weight for the 153 micron net was 1.68 g/m over the 3 sampling sites and 5 sampling dates. The overall ZPR was on the higher end of the spectrum with an average of 0.48. ZPR tended to be higher at the lower and upper embankment sites with the highest ratios for both sites being recorded for July 10^{th} (Figure 21). It appeared that ZPR was lower in the upper reservoir, where ZPR never exceeded 0.41 and averaged 0.34. ZQI indices were on the lower end of the spectrum for Idaho waters, with an overall mean of 0.50 and showed a strong seasonal trend (Figure 22). For instance, mean ZQI on June 14^{th} averaged 1.1 and decreased consistently over the next four sampling periods to 0.22 on August 21^{st}.

Largemouth bass (n=100) were sampled from a tournament on May 18, 2006. Mean length and weight of these fish were 404 mm (±6) and 1051 mm (±41), respectively. Since anglers were sorting for larger bass, no PSD estimates were calculated. However, relative weight estimates were still applicable and averaged 104. In addition 47 tournament mortalities were examined, including 45 largemouth bass and two smallmouth bass. These largemouth bass were slightly smaller than the 100 fish sample and averaged 383 mm and 863 g. All fish examined were in a pre-spawn condition. Of the 45 largemouth bass, 22 male bass and 22 twenty-two female bass were identified (one largemouth bass could not be sexed). Both the smallmouth bass were male.

Largemouth bass in Lake Lowell grow at slow rates, though it is important to note that the fish we estimated age for were not randomly selected from the population. Age estimates for largemouth bass from Lake Lowell ranged from 3 to 11 years old with a mean of 7.1 years. For example, we examined 12 bass within the 381 - 406 mm length group (15-16”). Their age estimates ranged from 8-11 years with a mean of 9.6 years. At a given age, female bass appeared to be longer than males, though samples sizes were too small to test this notion statistically (Figure 23).

Length frequency information for both large and smallmouth bass sampled indicate contrasting levels of recruitment into the age-1 classification. Smallmouth bass recruitment appears to be a significant component of the overall age class structure where age-largemouth bass make-up a smaller portion of the overall population structure (Figure 24). Habitat sampling bias (e.g. time and effort spent sampling rocky shoreline versus vegetated areas) may have influenced distribution in the histogram.

Bluegill length frequency information indicates at least three distinct year classes can be seen from 2006 sampling activities while channel catfish showed several year classes in excess of 200 mm (Figure 25).

Discussion

CPUE indices indicated that Lake Lowell is highly productive. However, the majority of the fish community both numerically and in biomass was composed of two non-game species, common carp and largescale sucker. These results correspond with past studies. For a survey conducted during 1995, non-game species represented at least 95% of the biomass sampled (Flatter et al. 1998). For an April 1998 sample, non-game fish represented 67% of the total catch by number (Allen et al. 2001).

Evaluating the status and tracking trends of some game fish populations in Lake Lowell is difficult due to inconsistent timing of past sampling efforts, highly complex near-shore cover, and fluctuating reservoir levels, which likely influence vulnerability to standard gears. Since 1994, eight electrofishing efforts have been documented for Lake Lowell. Sampling dates have ranged from April 9th to November 1st, while reservoir levels have ranged from 764.4 m (2508 ft) to 771 m (2529.3 ft) on these sampling dates. For example, CPUE for largemouth bass has ranged from 76.3 (1995) to a low of 5.3 (2000) (Table 12). However, it would be incorrect to assume that these estimates were good indicators of largemouth bass population abundance as the 1994 sample was composed nearly entirely of age-0 fish, while the 2000 sample was probably an underestimate due to poor vulnerability because of the reservoir being near full pool. The present sample, 2006, represented the highest weight per unit effort sampled and the third highest CPUE since 1994, these sampling dates and reservoir levels should be targets for future sampling efforts.

Because of the high WPUE and moderate CPUE, largemouth bass populations in Lake Lowell seem to be doing moderately well (Table 12). PSD estimates indicated that the number of stock size and quality size fish were in balance. Relative weight indices indicated that largemouth bass were below average condition, but only slightly so. Age and growth calculations indicated that growth was slow. For instance, we estimated that it takes an average of nearly 10 years for a largemouth bass to reach 406 mm (16”). This is a much slower growth rated than previously reported by Reid and Mabbott (1987). They estimated from scales that largemouth bass reached 424 mm by age six.

The channel catfish population in Lake Lowell appeared to be robust. CPUE, WPUE, and PSD estimates indicated high abundances, a wide range of lengths, good condition, and the presence of large individuals (>700 mm). We assume that the majority of these fish came from recent plants; however, we did document limited natural reproduction by capturing larval channel catfish during Neuston net tows. The release of clipped hatchery fish during 2006 and additional larval towing efforts will allow us to better assess the extent of natural reproduction and its contribution to adult recruitment. During 2006, channel catfish were rarely pursued by recreational anglers and seem underutilized.

Panfish populations in Lake Lowell currently exist at depressed levels, except for bluegill. The most recent creel survey indicated that 3,529 black crappie, 1,198 bluegill, and 174 yellow perch were harvested during 1990 (Grunder et al. 1993). Panfish populations were thought to decline significantly “sometime after 1989”(Allen et al. 1998). Yellow perch and crappies remain at low levels with few adult fish sampled during 2006, despite fish transfers. Contrastingly, bluegill populations have rebounded, as increases in CPUE and a balanced PSD estimate were noted. Also, bluegill were the most abundant fish captured in larval tows and appeared to create a strong year class during 2006, though we have no reference for comparison in Lake Lowell.

Stocked Lahontan cutthroat trout populations have declined precipitously from previous monitoring efforts. During the most recent creel survey (1990), 699 trout were harvested (Grunder et al. 1993). Plus, during the April 9, 1998 survey, Lahontan cutthroat trout were the most abundant gamefish sampled with a CPUE of 17 fish and a WPUE of 8.5 kg (Allen et al. 2001). During 2006, zero Lahontan cutthroat trout were captured. Even though our sampling dates don’t correspond to the 1998 efforts, it is doubtful that with the extensive amount of sampling efforts used during 2006 that Lahontan cutthroat trout escaped capture. Lahontan cutthroat trout have changed over the last 15 years. Fingerlings were stocked exclusively prior to 1992, whereas a mix of fry and fingerlings were stocked between 1995 and 2000. Since 2000, only fry have been stocked. The decline cutthroat trout abundance seems to correspond well with the shift in stocking strategies from fall fingerlings to spring fry plants. Stocking strategies for Lahontan cutthroat trout in Lake Lowell need to be adjusted or discontinued.

Small-mesh experimental gill netting efforts indicated that Lake Lowell supports few forage size fish in pelagic areas. The majority of small fish caught with these nets were age-0 and age-1 yellow perch. Repeat netting in future years may allow estimation of relative year-class strength and survival for these year classes of yellow perch. Surprisingly, no small catostomids or native cyprinids (chiselmouth *Acrocheilus alutaceus*, peamouth *Mylocheilus caurinus*, or northern pikeminnow *Ptychocheilus oregonensis*) were captured, except for one redside shiner. These species are common in other nearby reservoirs and may achieve high densities. Althought we plan continued assessments, the lack of forage does not support purposed introductions of new predator species at this time.

Catch of larval fish with Neuston net tows allowed us to monitor production of warm water species. Due to late acquisition of the net, tows were not begun until late June; therefore, we most likely missed peak densities of larval yellow perch and crappies. Tows will be conducted earlier in the season during future years to allow more accurate determination of reproductive timing and success for these species. Bluegill densities increased substantially by mid July and peaked by the end of the month. Spatially, bluegill larvae were concentrated in the upper reservoir.

The mean abundance of all sizes of zooplankton in Lake Lowell (1.68 g/m) was relatively high compared to other waters in Idaho (range 0.02 - 2.68 g/m; Teuscher 1999). Additionally, the ratio of preferred to usable size zooplankton (ZQI) was also adequate. However, the abundance of preferred and usable size zooplankton compared to total abundance decreased thru the season and reached low levels, especially in the upper reservoir. This seems to indicate that both useable and preferred zooplankton sizes were being cropped. If the abundance of useable and preferred size zooplankton continued to decline thru the fall, age-0 fish may suffer food shortages.

Management Recommendations

1. Continue channel catfish stocking program as it has produced a strong population. Channel catfish in Lake Lowell appear to be under-utilized. Use media outlets to increase local awareness of this population and fishery.

2. Re-evaluate current stocking program for Lahontan cutthroat trout. Absence of this species among sampled fish and negative angler contacts indicated that this population has decreased significantly from previous years. Determine if alternate release sizes or sites would improve return to creel.

3. Continue larval sampling and small-mesh prey net assessments to allow characterization of larval panfish densities and recruitment to older age classes.

4. Determine alternative ways to characterize largemouth bass populations, especially abundance. CPUE and WPUE indices for Lake Lowell are highly dependent on sampling date and reservoir levels and have not allowed tracking of population trends despite many attempts. Other alternatives include populations estimation using tournaments to mark fish or monitoring of catch rate statistics to index population abundance.

5. Monitor zooplankton abundance over a longer time period, especially through the fall, to determine if the abundance of useable and preferred size zooplankton become relatively more scarce and possibly limit growth rates and eventual survival of 0-age fish.

Figure 19. Lake Lowell sampling sections (Bolded #1-3), larval fish towing sites (Asterisks #1-6), and zooplankton sampling sites (Asterisks #1, #3, & #5) used during 2006 for fish and invertebrate surveys.

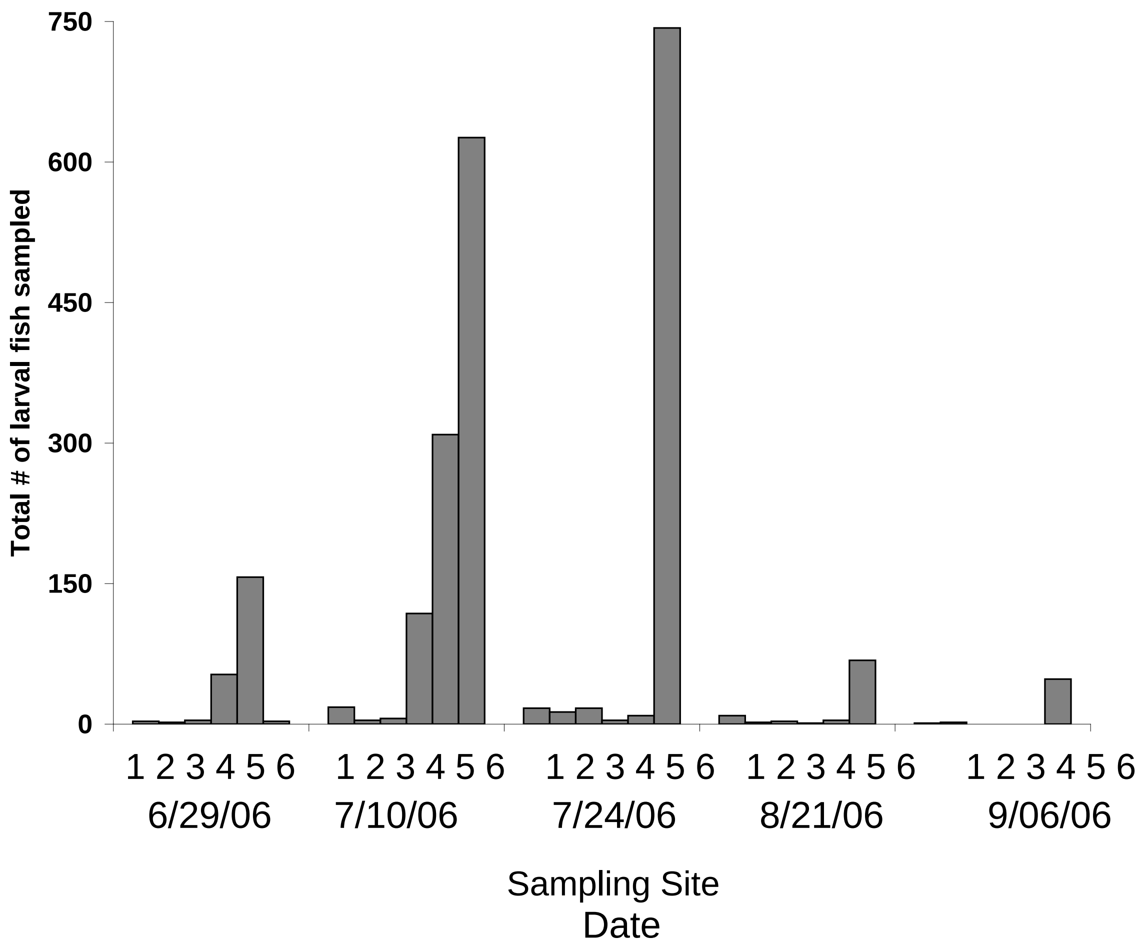


Figure 20. Spatial and temporal distribution of larval fish sampled from Lake Lowell during 2006 with a Neuston net. The labels immediately below the x-axis represent sampling sites 1-6 (Figure 19), whereas the labels below the sites represent sampling dates.

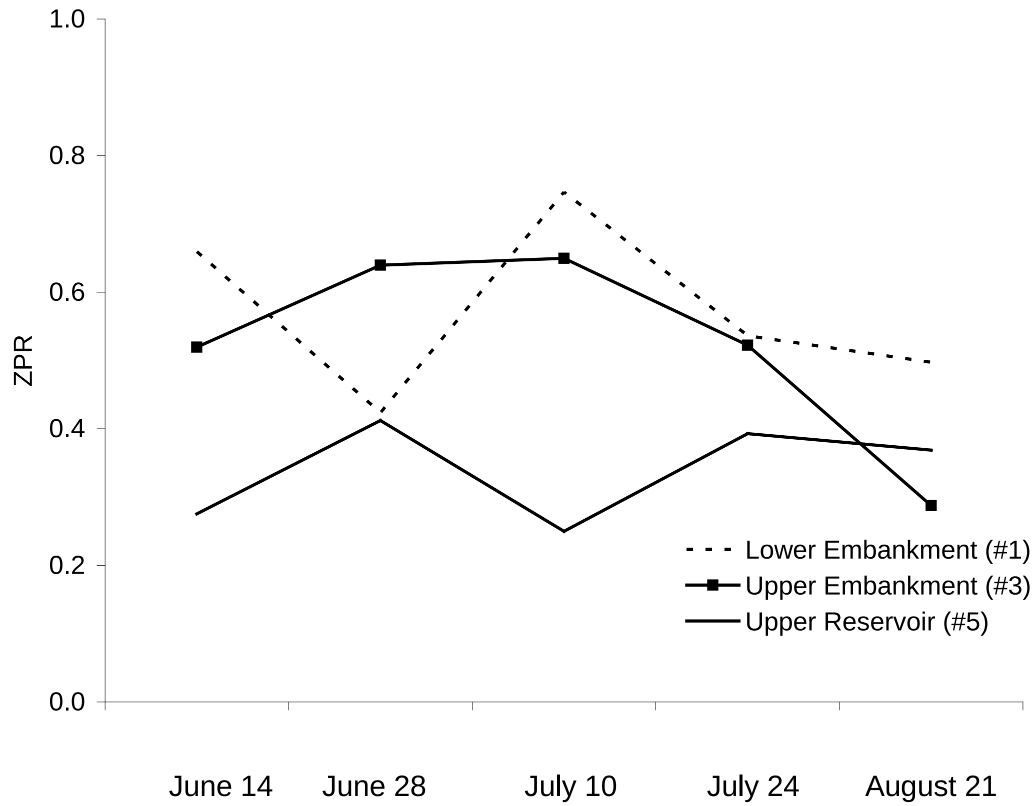


Figure 21. Temporal and spatial patterns in size structure of zooplankton in Lake Lowell measured by the zooplankton ratio method (ZPR).

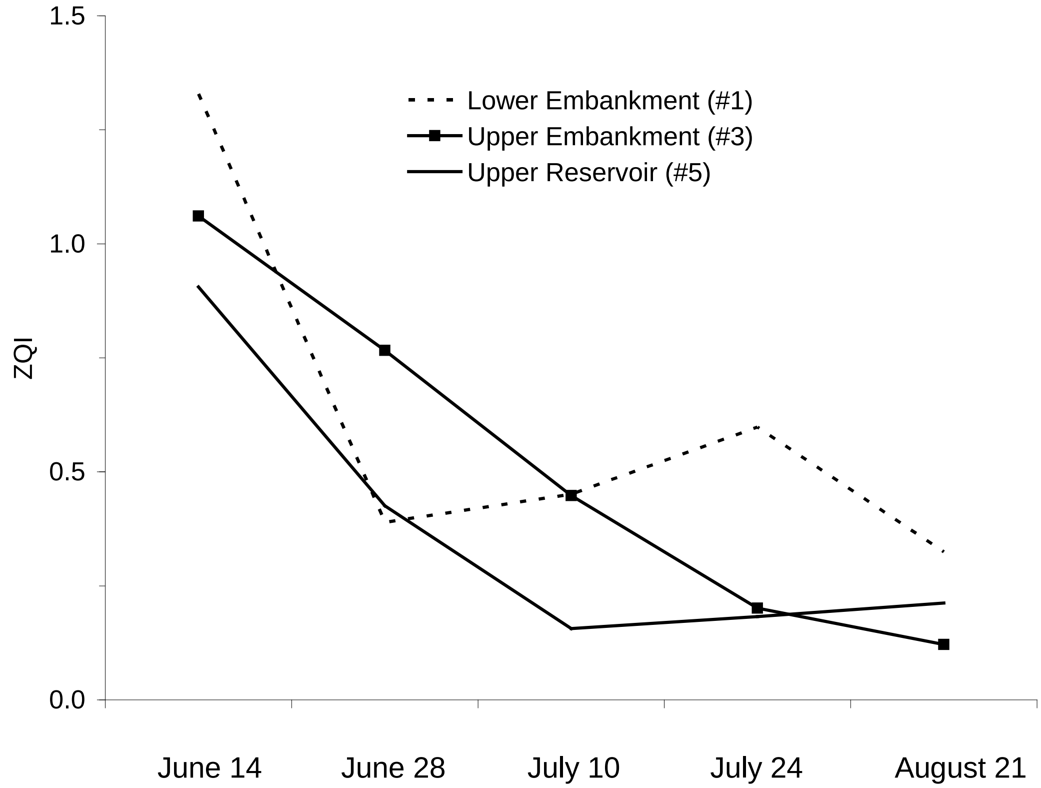


Figure 22. Temporal and spatial patterns in size structure and abundance of zooplankton in Lake Lowell measured by the zooplankton quality index (ZQI).

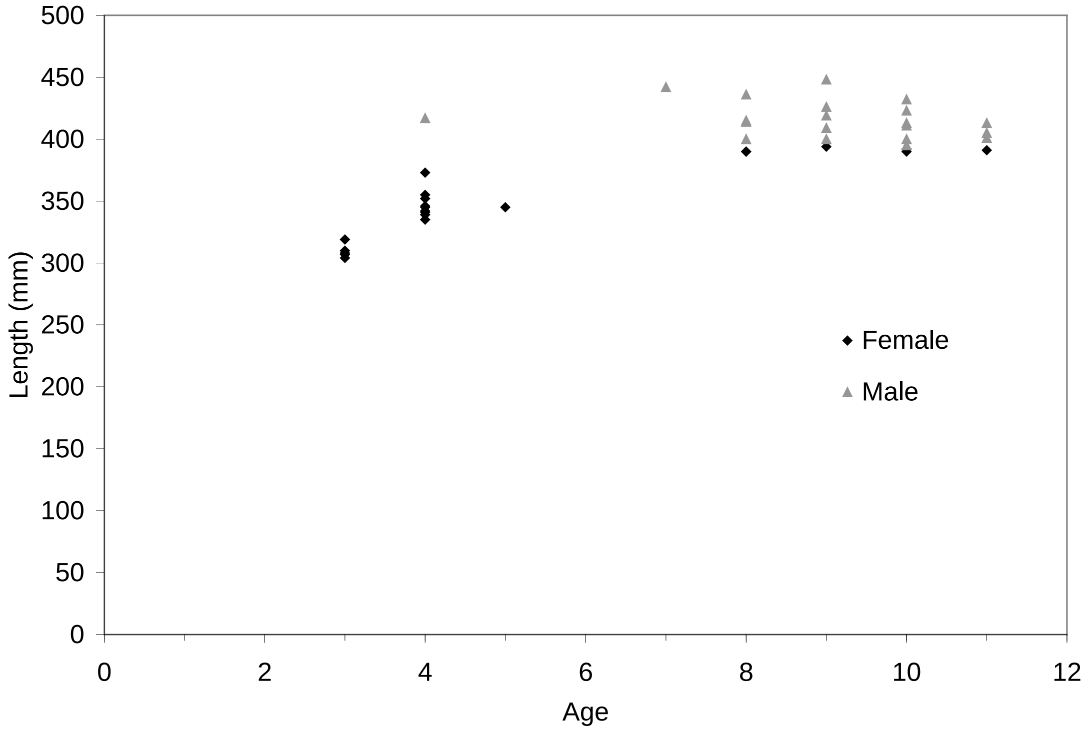
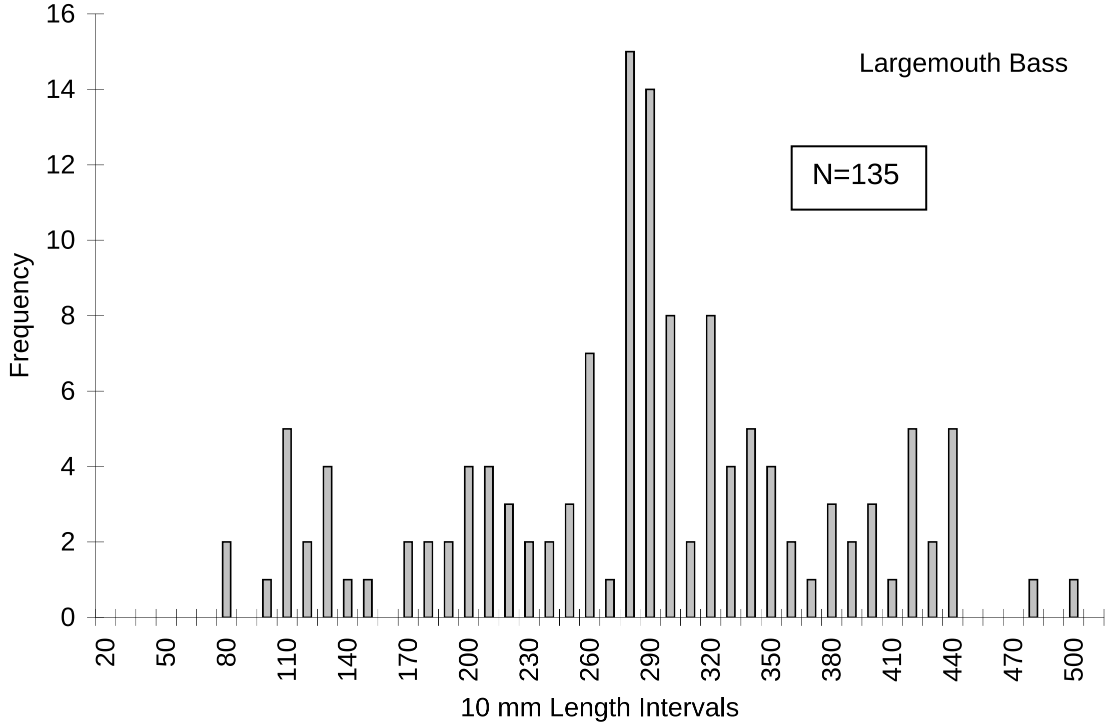


Figure 23. Length at age for 41 largemouth bass (20 male and 21 female) collected from Lake Lowell on May 17, 2006. Ages were determined from sectioned otoliths.



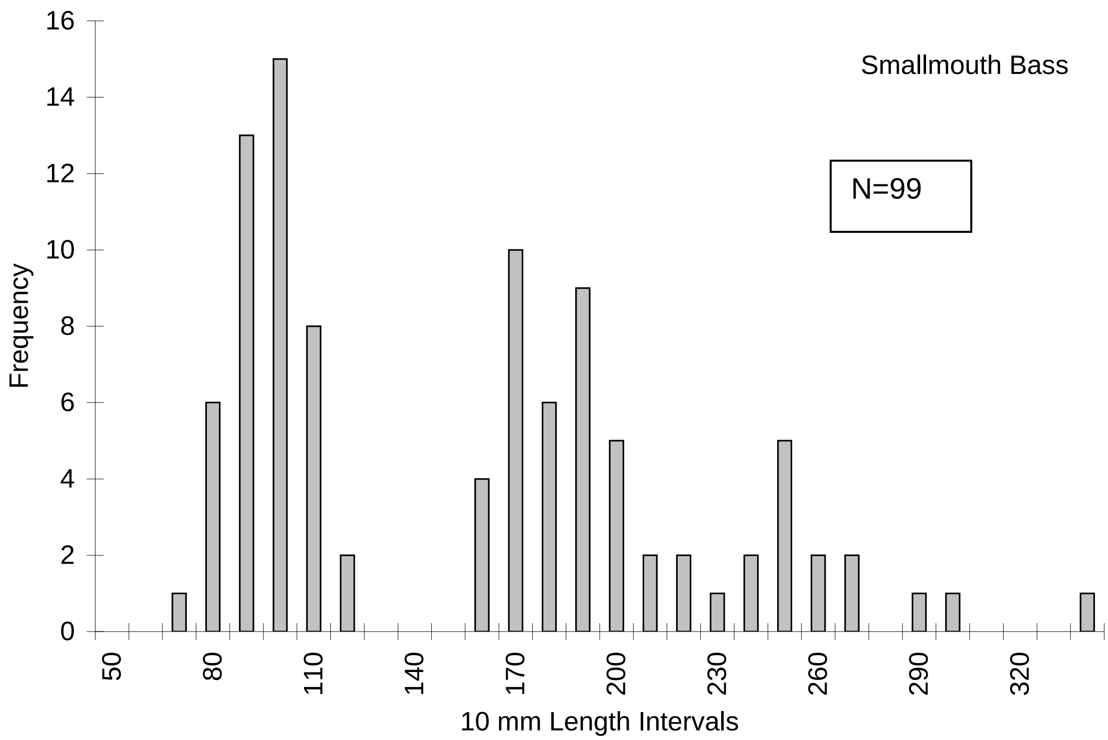
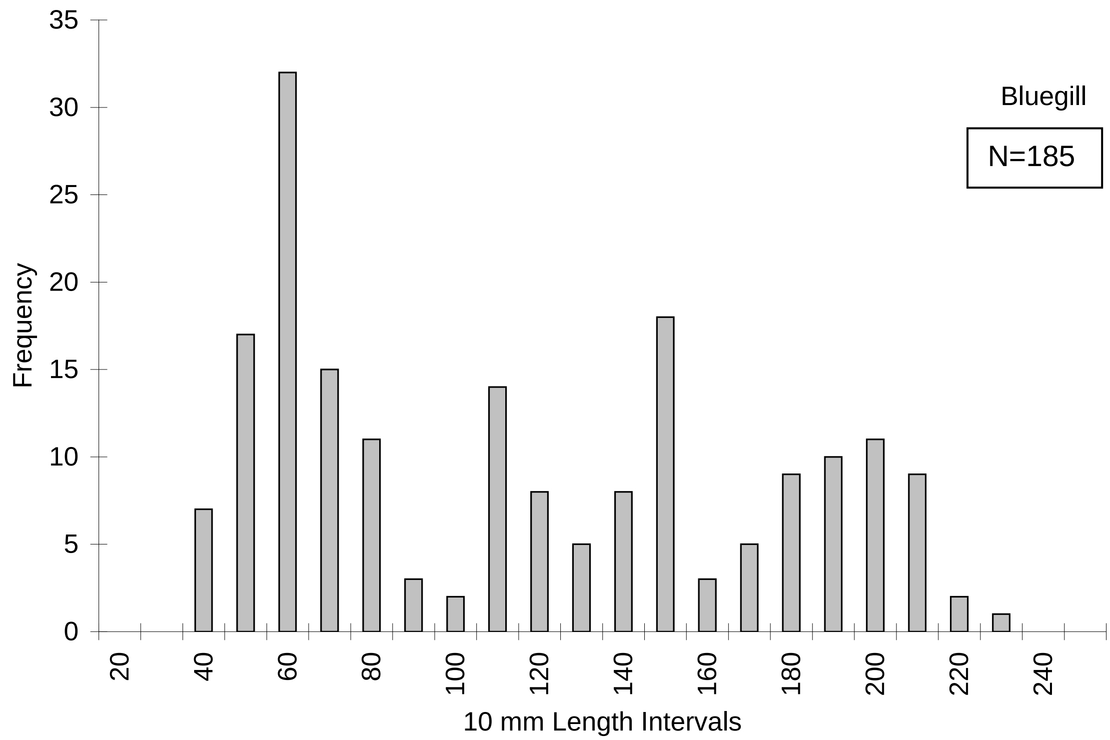


Figure 24. Length frequency for largemouth and smallmouth basses sampled from Lake Lowell during 2006. Length Intervals are labeled with the upper boundary of the intervals for instance, two largemouth bass were caught between and including 71 and 80 mm.



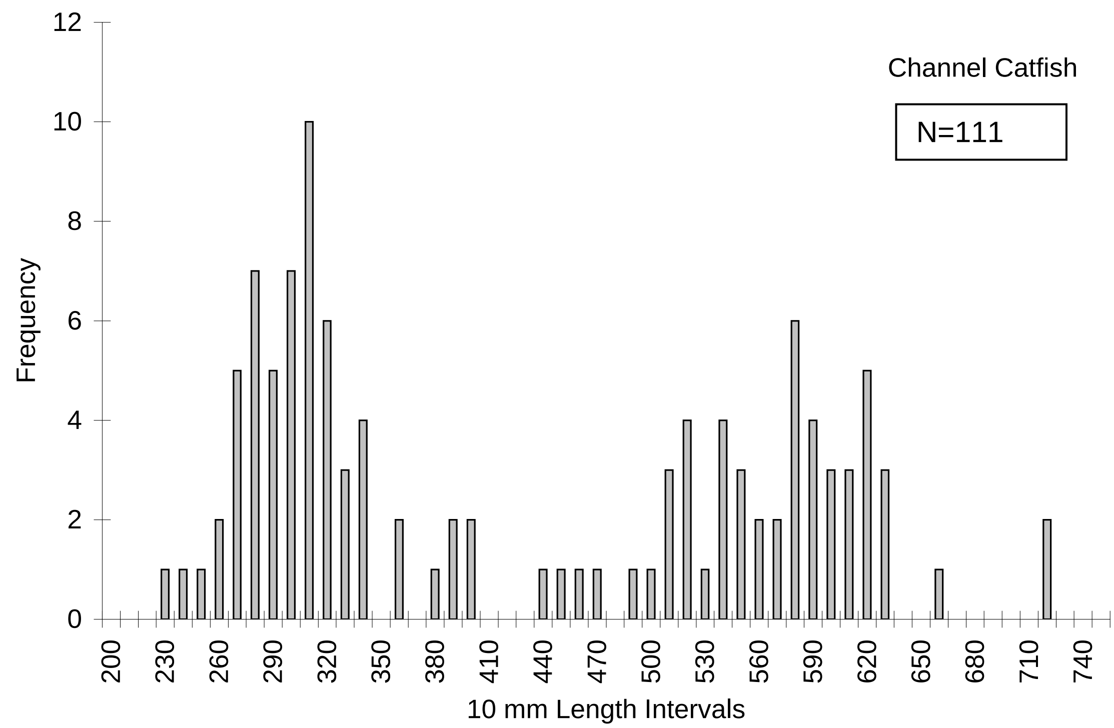


Figure 25. Length-Frequency for bluegill and channel catfish sampled from Lake Lowell during 2006. Length Intervals are labeled with the upper boundary of the intervals for instance, seven bluegill were caught between and including 31 and 40 mm.

Table 7. Summary of sampling efforts used to characterize fish populations in Lake Lowell during 2006.

Survey Date	Sampling Method	Effort
5/30/2006	Night Electrofishing	0.87
5/30/2006	Night Electrofishing	0.59
5/31/2006	Night Electrofishing	0.46
5/31/2006	Night Electrofishing	0.32
5/31/2006	Night Electrofishing	0.97
6/1/2006	Night Electrofishing	1.37
6/1/2006	Night Electrofishing	0.62
5/31/2006	Small Mesh Experimental Gill Net Pair	1
6/1/2006	Small Mesh Experimental Gill Net Pair	1
6/2/2006	Small Mesh Experimental Gill Net Pair	1
6/20/2006	Small Mesh Experimental Gill Net Pair	3
7/25/2006	Small Mesh Experimental Gill Net Pair	3
5/31/2006	Standard Gill Net Pair	3
6/1/2006	Standard Gill Net Pair	3
6/2/2006	Standard Gill Net Pair	3
5/18/2006	Tournament Monitoring	--
5/31/2006	Trap Nets	4
6/1/2006	Trap Nets	4
6/2/2006	Trap Nets	4

Table 8. Catch per unit effort (CPUE) for fish species collected during the lowland lake survey from May 30 to June 2, 2006.

Species	# of Fish Sampled by Species			Total # by Species	% of Total
	Standard Trap Net	Standard Gill Net	Night Electrofishing		
Brown bullhead	0.7	0.3	6.0	7.0	4
Black crappie	0.4	0.0	0.4	0.8	0.4
Bluegill	1.0	0.0	34.2	35.2	18
Channel catfish	0.0	10.2	1.7	12.0	6
Carp	17.2	14.1	13.1	44.4	22
Largemouth bass	0.0	0.0	25.8	25.8	13
Largescale sucker	0.9	10.3	19.4	30.7	16
Pumpkinseed	0.0	0.0	1.2	1.2	1
Redside shiner	0.0	0.0	0.2	0.2	0.1
Smallmouth bass	0.0	0.0	18.8	18.8	10
White crappie	1.1	0.0	0.0	1.1	1
Yellow perch	0.0	0.0	20.2	20.2	10
Total # by Gear	21.3	35.0	141.0	197.2	
% of Total by Gear	10.8	17.7	71.5		100

Table 9. Weight per unit effort (WPUE) for fish species collected during the lowland lake survey from May 30 to June 2, 2006.

	Biomass (kg) of Fish Sampled by Species				
Species	Standard Trap Net	Standard Gill Net	Night Electrofishing	Total # by Species	% of Total
Brown bullhead	0.4	0.1	3.0	3.5	2.6
Black crappie	0.2	0.0	0.0	0.2	0.1
Bluegill	0.2	0.0	2.0	2.2	1.7
Channel catfish	0.0	10.2	4.4	14.6	10.9
Carp	26.0	20.3	19.6	65.9	49.2
Largemouth bass	0.0	0.0	9.8	9.8	7.3
Largescale sucker	1.0	11.9	22.7	35.7	26.6
Pumpkinseed	0.0	0.0	0.0	0.0	0.0
Redside shiner	0.0	0.0	0.0	0.0	0.0
Smallmouth bass	0.0	0.0	1.3	1.3	0.9
White crappie	0.4	0.0	0.0	0.4	0.3
Yellow perch	0.0	0.0	0.5	0.5	0.3
Total # by Gear	28.1	42.5	63.3	133.9	
% of Total by Gear	21.0	31.8	47.3		100.0

Table 10. Proportional stock density (PSD) and relative weight (Wr) for gamefish species captured in Lake Lowell during 2006 lowland lake sampling efforts.

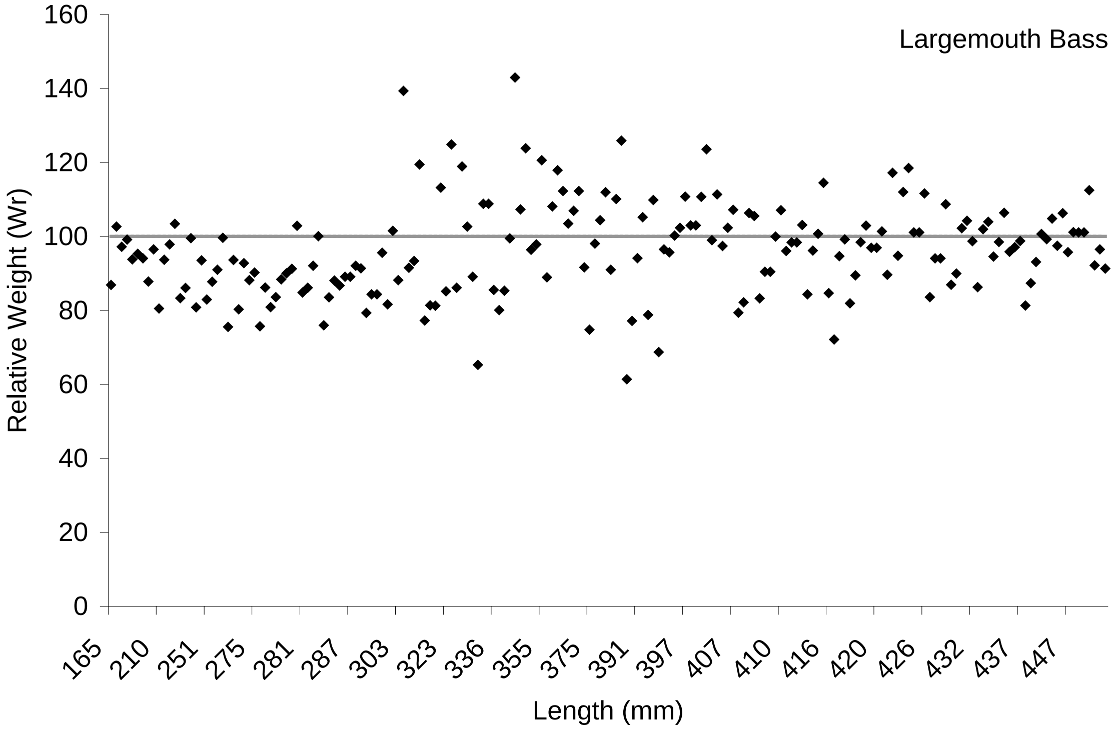
	Proportional Stock Density						Relative Weight		
Species	Sample Size	Stock Size (mm)	# of Stock Size	Quality Size (mm)	# of Quality Size	**PSD**	Min. Size (mm)	Sample Size	**Mean Wr**
Black Crappie	10	130	8	200	6	**75**	100	8	**111**
Bluegill	190	80	109	150	54	**50**	80	79	**123**
Channel Catfish	111	280	95	410	52	**55**	70	106	**114**
Largemouth bass	134	200	109	300	49	**45**	150	188	**96**
Smallmouth bass	98	180	34	280	3	**9**	150	32	**90**
White Crappie	13	130	13	200	13	**100**	100	13	**129**
Yellow Perch	125	130	33	200	9	**27**	100	67	**88**

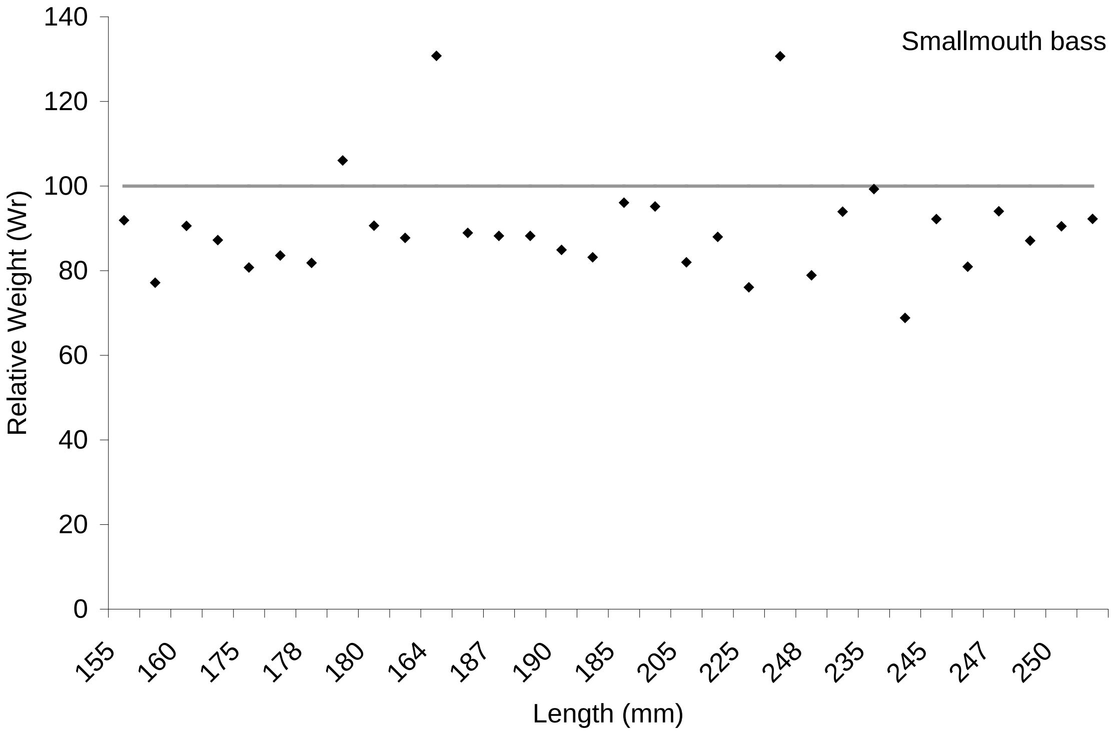
Table 11. Mean length of larval/age-0 fish sampled in neuston tows conducted in Lake Lowell during 2006.

Date	Bluegill	Crappie	Smallmouth Bass	Largemouth Bass	Unknown	Yellow Perch	Channel Catfish
29-Jun	--	19.7	--	--	10.0	--	--
10-Jul	13.8	26.8	11.0	--	10.4	--	16.7
24-Jul	20.1	23.7	--	15.0	9.9	--	17.0
21-Aug	28.3	67.8	--	--	--	--	--
6-Sep	33.0	87.0	--	--	--	76.0	--

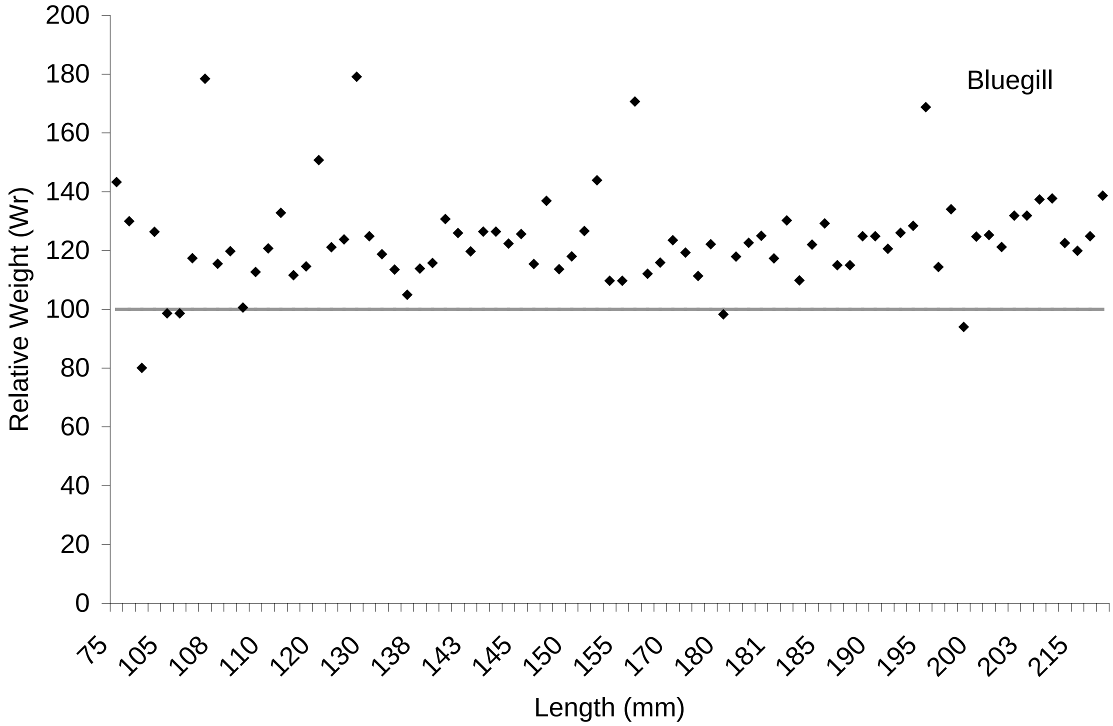
Table 12. Summary of electrofishing efforts and largemouth bass catch in Lake Lowell from 1994-2006.

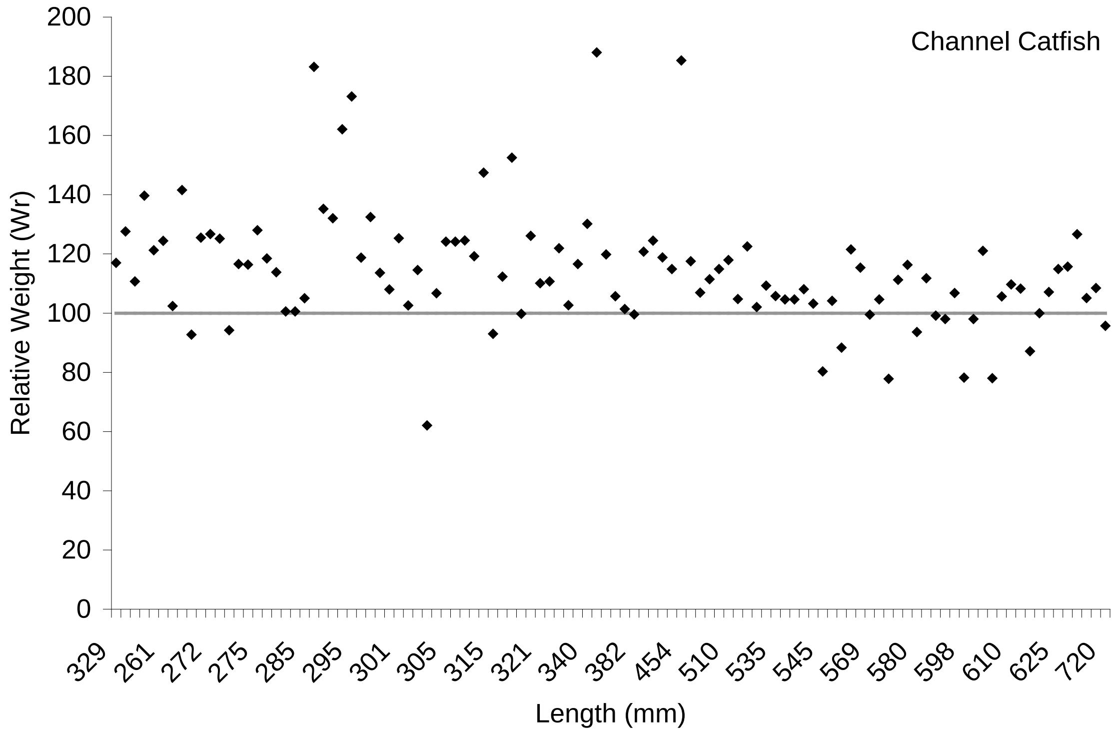
Sampling Date	Year	CPUE	WPUE	Mean Length	Mean Weight	Sample Size	Reservoir Level
6/1	1994	8.7	1.5	133	173	10	2522.7
11/1	1994	35.1				33	2508.0
4/10	1995	76.3	0.63	103	192	125	2524.3
8/22	1995	21.9	0.02	86		19	2519.2
10/24	1995	71.3	0.6	101	192	124	2522.0
4/9	1998	6	1.79	258	280	8	2528.5
5/31	2000	5.3	2.63	318	500	3	2529.3
5/31	2006	25.8	9.8	280	378	134	2524.6





Appendix A. Relationship of length and relative weight, Wr, for largemouth bass and smallmouth bass captured in Lake Lowell during 2006.





Appendix B. Relationship of length and relative weight, Wr, for bluegill and channel catfish captured in Lake Lowell during 2006.

Appendix C. Species composition of larval fish captured in Lake Lowell during 2006.

					Species Composition (%)							
Date	Tow Site #	#of Fish Sampled	# of Fish IDed	# of Fish/ meter^3	Black Crappie	Bluegill	Channel Catfish	Largemouth Bass	Smallmouth Bass	Un-known	White Crappie	Yellow Perch
29-Jun	1	3	3	0.007	67	--	--	--	--	33	--	--
	2	2	2	0.004	100	--	--	--	--	0	--	--
	3	4	4	0.008	100	--	--	--	--	0	--	--
	4	0	0	0.000	--	--	--	--	--	0	--	--
	5	7	7	0.012	71	--	--	--	--	29	--	--
	6	3	3	0.006	33	--	--	--	--	67	--	--
10-Jul	1	18	18	0.027	22	--	--	--	--	78	--	--
	2	4	4	0.007	75	--	--	--	--	25	--	--
	3	6	6	0.010	17	83	--	--	--	0	--	--
	4	53	53	0.082	11	21	2	--	2	64	--	--
	5	157	50	0.225	6	92	2	--	--	0	--	--
	6	626	50	0.975	--	98	2	--	--	0	--	--
24-Jul	1	17	17	0.027	--	53	--	--	--	47	--	--
	2	13	13	0.025	69	--	--	--	--	31	--	--
	3	17	17	0.027	--	59	6	--	--	35	--	--
	4	118	50	0.173	--	84	--	2	--	14	--	--
	5	309	50	0.457	6	94	--	--	--	0	--	--
	6	743	50	1.269	--	76	--	--	2	22	--	--
21-Aug	1	9	9	0.014	--	100	--	--	--	--	--	--
	2	2	2	0.003	50	50	--	--	--	--	--	--
	3	3	3	0.004	--	100	--	--	--	--	--	--
	4	4	4	0.007	--	100	--	--	--	--	--	--
	5	9	9	0.015	--	100	--	--	--	--	--	--
	6	68	68	0.104	1	94	--	--	--	--	4	--
06-Sep	1	1	1	0.001	--	100	--	--	--	--	--	--
	2	2	2	0.003	100	--	--	--	--	--	--	--
	3	0	0	0.000	--	--	--	--	--	--	--	--
	4	1	1	0.002	--	100	--	--	--	--	--	--
	5	4	4	0.007	--	75	--	--	--	--	25	--
	6	48	48	0.091	2	79	--	--	--	--	--	19

Appendix D. Density estimates for larval fish captured in Lake Lowell during 2006.

Date	Tow Site #	Volume Sampled (meters^3)	# of Fish/ meter^3	Black Crappie	Bluegill	Channel Catfish	Largemouth Bass	Smallmouth Bass	Unknown	White Crappie	Yellow Perch
29-Jun	1	451	0.007	0.004	--	--	--	--	0.002	--	--
	2	509	0.004	0.004	--	--	--	--	--	--	--
	3	516	0.008	0.008	--	--	--	--	--	--	--
	4	589	0.000	--	--	--	--	--	--	--	--
	5	599	0.012	0.008	--	--	--	--	0.003	--	--
	6	542	0.006	0.002	--	--	--	--	0.004	--	--
10-Jul	1	655	0.027	0.006	--	--	--	--	0.021	--	--
	2	604	0.007	0.005	--	--	--	--	0.002	--	--
	3	625	0.010	0.002	0.008	--	--	--	--	--	--
	4	648	0.082	0.009	0.017	0.002	--	0.002	0.052	--	--
	5	699	0.225	0.013	0.207	0.004	--	--	--	--	--
	6	642	0.975	--	0.956	0.019	--	--	--	--	--
24-Jul	1	620	0.027	--	0.015	--	--	--	0.013	--	--
	2	528	0.025	0.017	--	--	--	--	0.008	--	--
	3	621	0.027	--	0.016	0.002	--	--	0.010	--	--
	4	682	0.173	--	0.145	--	0.003	--	0.024	--	--
	5	676	0.457	0.028	0.429	--	--	--	--	--	--
	6	585	1.269	--	0.965	--	--	0.025	0.279	--	--
21-Aug	1	643	0.014	--	0.014	--	--	--	--	--	--
	2	637	0.003	0.002	0.002	--	--	--	--	--	--
	3	679	0.004	--	0.004	--	--	--	--	--	--
	4	615	0.007	--	0.007	--	--	--	--	--	--
	5	598	0.015	--	0.015	--	--	--	--	--	--
	6	654	0.104	0.002	0.098	--	--	--	--	0.005	--
6-Sep	1	678	0.001	--	0.001	--	--	--	--	--	--
	2	646	0.003	0.003	--	--	--	--	--	--	--
	3	659	0.000	--	--	--	--	--	--	--	--
	4	607	0.002	--	0.002	--	--	--	--	--	--
	5	614	0.007	--	0.005	--	--	--	--	0.002	--
	6	526	0.091	0.002	0.072	--	--	--	--	--	0.017

MANN CREEK RESERVOIR

Introduction

Mann Creek is a third-order tributary stream of the Weiser River that drains the south-east side of the Hitt Mountains of Southwest Idaho. Mann Creek Dam was completed in 1967 and formed Mann Creek Reservoir, located approximately 21 km north of Weiser, ID. Black crappie, largemouth bass, and rainbow trout are the most commonly sought sport fishes within the reservoir. The rainbow trout in Mann Creek Reservoir are a mixture of hatchery rainbow and wild redband trout produced in the tributaries above the reservoir.

At normal pool (880.1 m), Mann Creek Reservoir has a surface area of 115 ha. Water levels in Mann Creek Reservoir are managed by the Mann Creek Irrigation District and are subjected to annual and substantial drawdowns (42 – 64 vertical feet (12.8 – 19.5 vertical meters); Figure 26). Over the last 16 years, reservoir levels have not dropped below the conservation pool of 2825 feet (861 m).

Despite these drawdowns, warm water fish populations are maintained through natural reproduction, though year class strength seems to be highly variable. Sterile rainbow trout are stocked to augment the fishery for native redband trout. Currently, the stocking request for Mann Creek Reservoir is for a total of 8,000 catchables: including, 3,000 stocked in April, 2,000 stocked in May, and 3,000 stocked in September. Usually, all catchables are reared and stocked by Nampa Fish Hatchery. Although Mann Creek Reservoir has been stocked primarily with catchable rainbow trout, fingerling rainbow trout have been stocked on three occasions during the last 16 years. Also, 5,400 catchable rainbow trout x cutthroat trout hybrids were stocked during 1990 (Figure 27). Mann Creek Reservoir is managed under general fishing regulations.

Objectives

1. To describe the relative abundance, composition, and size structure of the fish community within Mann Creek Reservoir.

2. To determine the relative abundance of hatchery and wild rainbow trout within the reservoir, and thus their relative importance to the fishery.

Methods

On June 7-8, 2006, we assessed the fish community in Mann Creek Reservoir using the IDFG standard lowland lakes protocol (Van Vooren 1992). Floating and sinking gill nets measured 46 m long by 2 m deep and were comprised of six panels of 1.9, 2.5, 3.2, 3.8, 5.2, and 6.4 cm bar mesh monofilament. Four units of gill netting effort (one floating and sinking net for each) were used. Trap nets had a 15.2 m lead that was 0.9 m deep with two, 0.9 x 1.8 m frames and four, 0.9 m hoops with a 10 cm diameter throat; all mesh was 25 mm bar knotless nylon. Four units of trap netting effort were used. I collected fish by electrofishing at night in the littoral zone using a Smith Root electrofishing boat. Pulsed direct current was produced by a 5,000 watt generator. Frequency was set at 120 pulses per second and a pulse width of 40, which yielded an output of 4-5 amps. Only four-tenths of a unit (1,415 sec) of night electrofishing effort was used due to lightning storms. Captured fish were identified to species, measured to the nearest millimeter, and weighed to the nearest gram. All rainbow trout were examined for an adipose clip that indicated hatchery origin. Unclipped rainbow trout were assumed to be wild origin. Catch data were summarized as CPUE and weight WPUE. PSD were calculated for black crappie and largemouth bass as outlined by Anderson and Neuman (1996).

Results and Discussion

During 2006 sampling efforts on Mann Creek Reservoir, we caught a total of 107 fish. The fish community was dominated numerically by game fish (98%), whereas the non-game fish community consisted of only bridgelip sucker (2%). CPUE and WPUE were 91 fish and 22 kg, respectively. Compared to the two previous standard surveys conducted on June 12, 1995 (Allen et al. 1998) and April 17, 1998 (Allen et al. 2001), CPUE declined by 66 and 64%, respectively. WPUE declined by 39% as compared to the 1995 surveys.

Black crappie represented 46% of the catch by number and 12% by weight. CPUE and WPUE for black crappie were 42 and 2.6 kg, respectively. This estimate represents a 68 and 14% decline in CPUE from the 1995 and 1998 surveys, respectively (Figure 29). The PSD for black crappie in 2006 was 89, indicating a population that was highly skewed towards large fish with few smaller recruits, though this index is based on a small sample (n = 9). For reference, the PSD for black crappie for 1995 and 1998 were 27 and 52. Despite the lack of stock size fish (≥130 mm), the catch of suspected age-1 fish (< 75 mm) from the 2005 year class was higher than documented in previous surveys. Examination of lengths and historical age and growth information indicated that the 2002, 2003, & 2004 year classes were relatively weak. However, the catch of large crappie (≥300 mm) was higher than previously documented. In fact, no black crappie longer than 260 mm had been caught in the previous surveys. These fish likely represented the last of a strong year class produced in 2001.

Largemouth bass represented 34% of the catch by number and 58% by weight. CPUE and WPUE were 31 fish and 12.8 kg. The 2006 CPUE estimate was intermediate to the 1995 (55 fish) and 1998 (28 fish) surveys, though the 1998 estimate was likely low due to the sample effort occurring in April when water temperatures were low. PSD was 69; however, this index was based on a small sample size (n = 13). Though this falls within the bounds (40-70) of a balanced bass population, it is near the upper limit; and, very few small bass were sampled. No largemouth bass less than 210 mm were sampled, whereas in 1995 and 1998, 39% & 30% of largemouth bass sampled were less than 210 mm. It appears largemouth bass reproductive success was poor in 2003, 2004, and 2005. Additionally, one 267 mm smallmouth bass was sampled during 2006 which is, to our knowledge, the first reported catch of this species in Mann Creek Reservoir.

Trout (hatchery rainbow and redband trout combined) represented 18% of the catch by number and 25% by weight. Of the 63 trout caught, 71% were determined to be wild redband trout, whereas the remaining 29% were hatchery rainbow trout, evidenced by an adipose clip. CPUE and WPUE for trout combined were 16 fish and 5.5 kg, respectively. These abundance and biomass indices are substantially lower than estimates generated for 1995 and 1998. CPUE for redband trout alone for 2006 (10 fish) was only 7% of that of the 1998 estimate (143 fish). However, during 1998 electrofishing was very efficient for redband trout; whereas, little electrofishing effort was expended in 2006 and few redband trout were caught. When only gill netting cpue is compared between these surveys, CPUE for the 1998 was twice as high as the 2006 survey. Despite these substantial reductions in densities, the length frequency for redband trout indicated that several year classes were present in the reservoir, including some fairly large wild trout (> 400 mm) (Figure 30). Additionally, the presence of larger hatchery rainbow trout indicated that some stocked fish were over-wintered as reported previously.

The wild redband trout in Mann Creek Reservoir are unique in several aspects that may warrant additional study or alternative management strategies. For one, adfluvial populations of redband trout are rare. To my knowledge, these fish represent the most robust population of adfluvial redband trout in Idaho. By migrating to the reservoir, this population of redband trout is able to access more forage and are able to reach fairly large sizes (>400 mm) for this species. Secondly, flat waters that produce wild, quality size trout are rare in Region 3, but are highly desired by a large segment of the angling public. Due to these factors, it is important that we manage this population effectively. Effective management requires a more thorough understanding of their life history characteristics such as adult spawning migration timing, juvenile out-migration timing, juvenile survival, and critical spawning areas. Additionally, we currently have little knowledge of exploitation rates of adult fish in the reservoir. If current exploitation rates are high, we may be reducing the quality or trophy component of this fishery.

In summary, catches from the 2006 survey indicated that the fish community in Mann Creek Reservoir was nearly entirely game fish. CPUE, WPUE, and proportional stock indices indicated that the warm water sport fish community (black crappie and largemouth bass) was reduced compared to previous surveys. Additionally, there was little evidence of reproductive success over the last three years, except for black crappie during 2005. From the 1995 survey, it appears that reservoir conditions were more conducive to warm water fish production during a series of low water years from 1990 to 1994, especially for black crappie. Lower reservoir levels during this time period prevented or reduced spill during summer when age-0 crappie are typically pelagic (Carlander 1977), which may have reduced entrainment (Beam 1983). Alternatively, lower creek inflows may have led to warmer water temperatures which have been known to improve hatching success. Similar mechanisms likely influenced largemouth bass reproductive success though the trends were not as pronounced. CPUE of wild redband trout has declined precipitously from the high reported during 1998 after a series of good water years. Despite this decline in abundance, multiple year classes were present in the reservoir along with some large redband trout.

<u>Management Recommendations</u>

1. Work cooperatively with the Bureau of Reclamation and Mann Creek Irrigation District to determine whether alternative water release strategies could be used to improve fish populations. It may be possible to improve black crappie and largemouth bass recruitment by reducing spill and therefore entrainment.

2. Determine the life history and exploitation rate of wild redband trout in Mann Creek proper and in the reservoir. According to the 2006 survey, wild redband trout populations are well below historical densities. Though this decline has been influenced by a series of poor water years, IDFG has no current information on exploitation rates for this population.

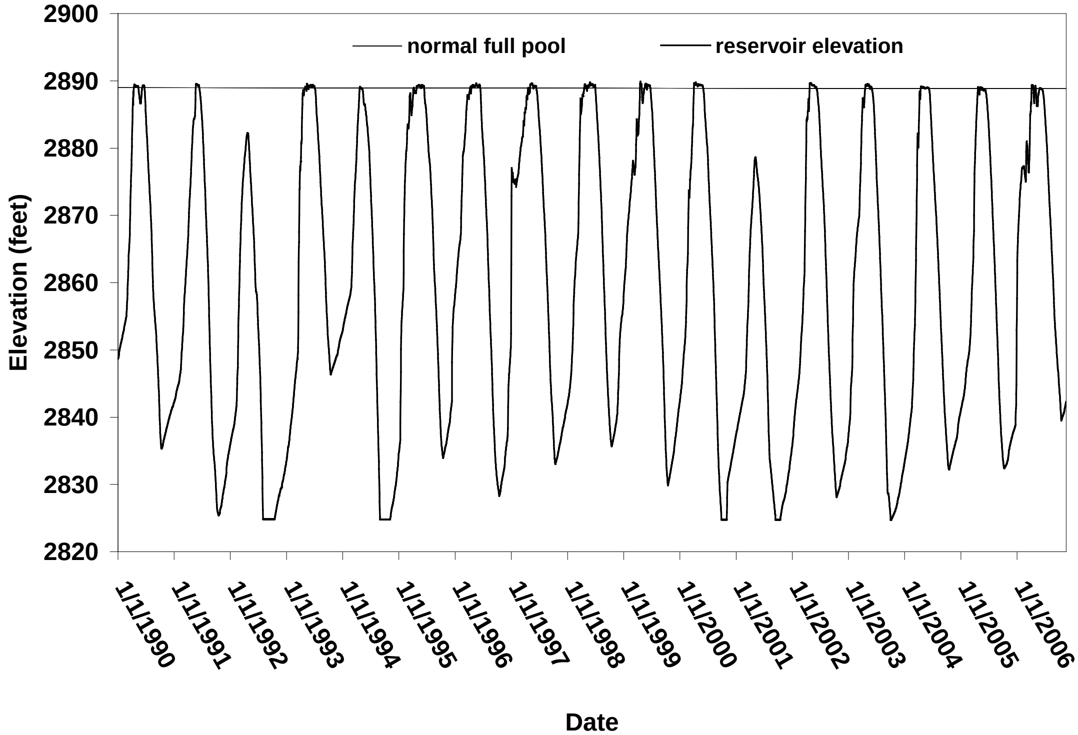


Figure 26. Surface elevation of Mann Creek Reservoir from 1990-2006.

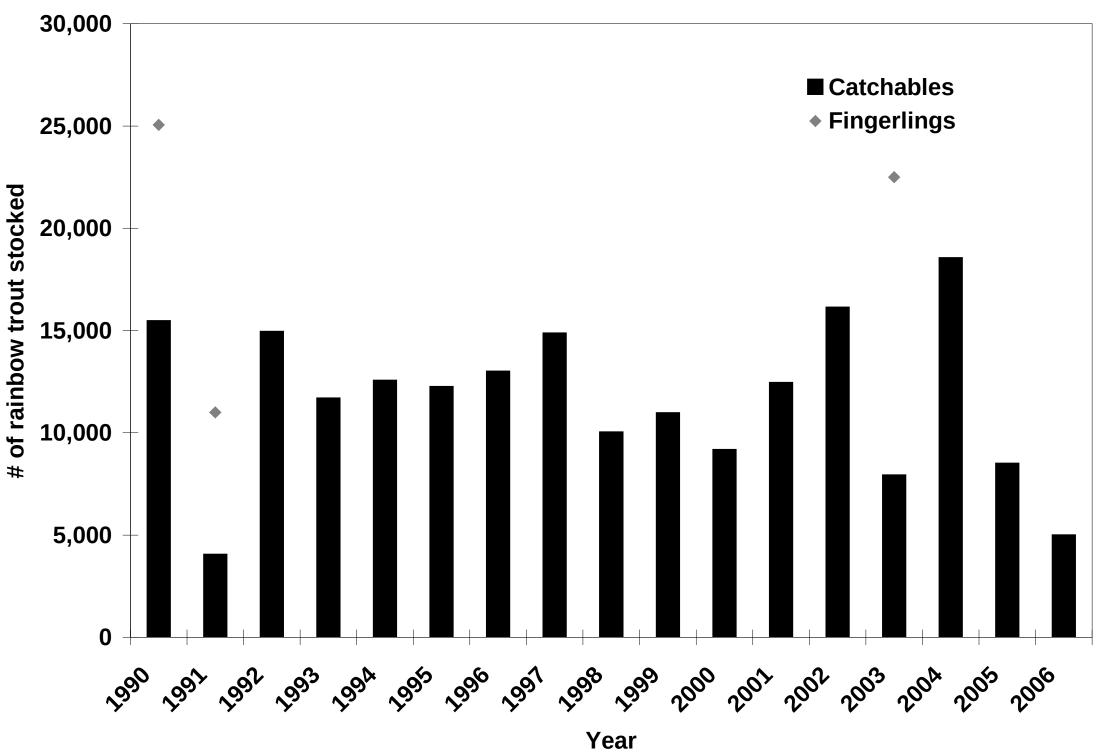


Figure 27. Stocking history of Mann Creek Reservoir from 1990-2006.

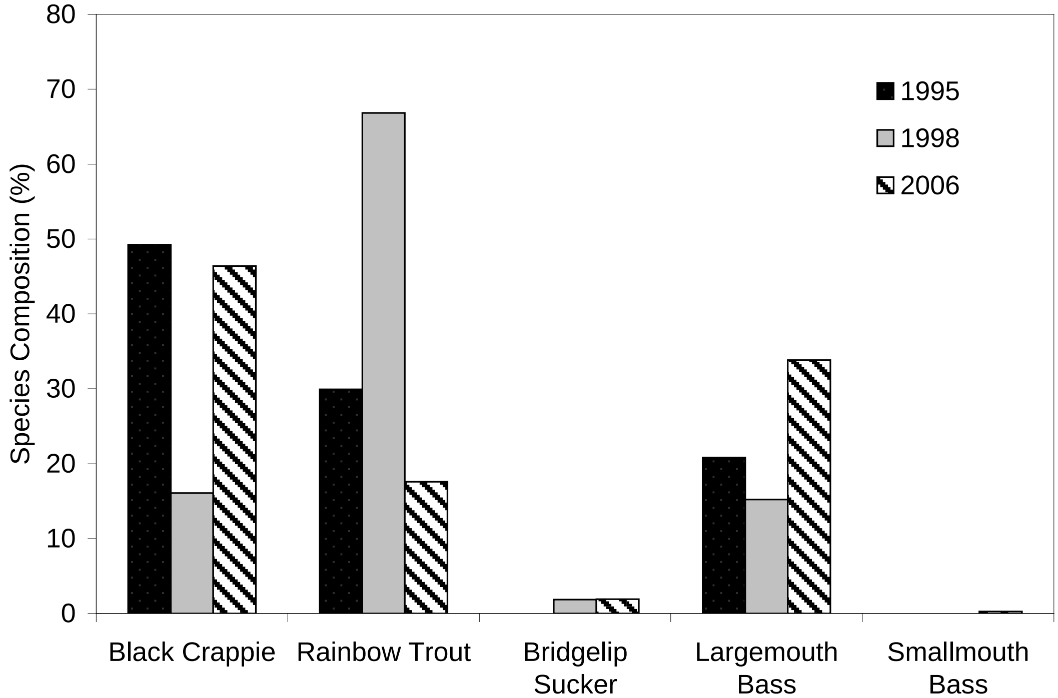


Figure 28. Species composition determined from CPUE in Mann Creek Reservoir for standard lowland lake surveys conducted during 1995, 1998, and 2006.

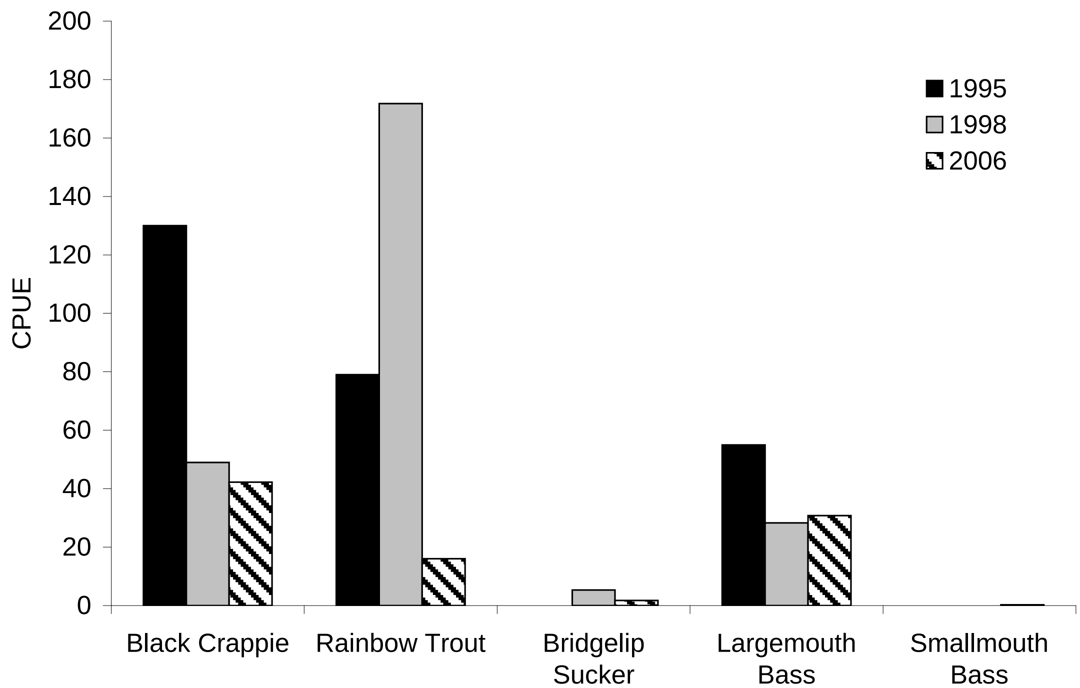


Figure 29. Catch per unit effort (CPUE) by species for lowland lake surveys conducted for Mann Creek Reservoir during 1995, 1998, and 2006 survey. The rainbow trout category represents both hatchery and wild fish, combined.

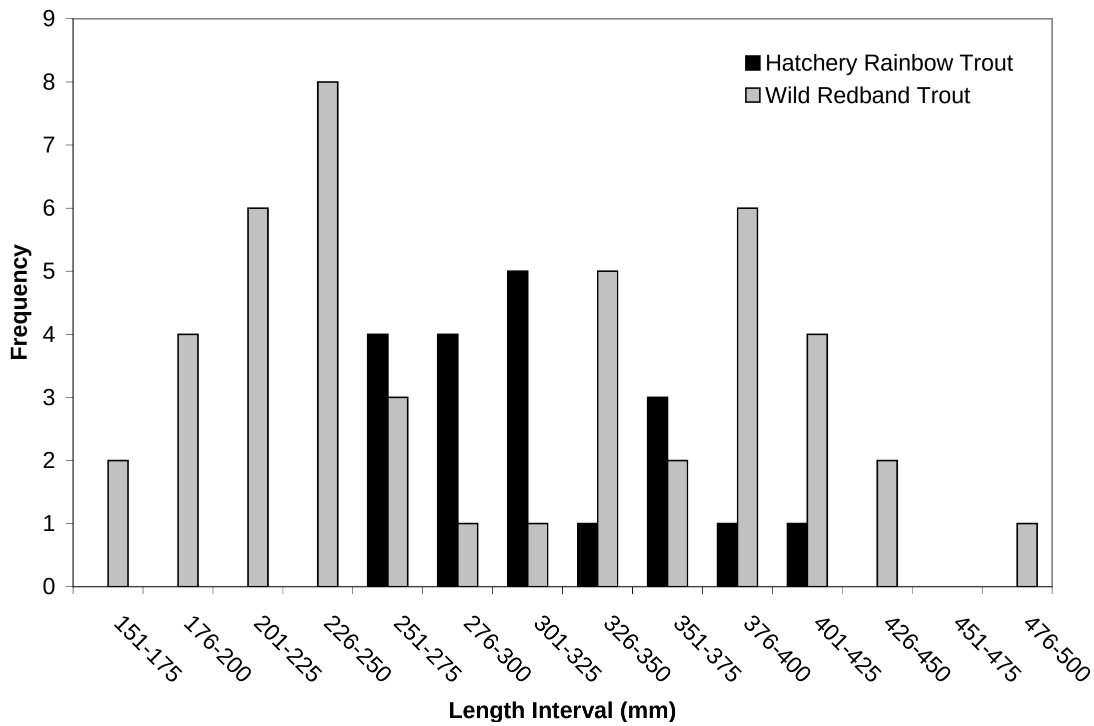


Figure 30. Length frequency of hatchery rainbow trout and wild redband trout sampled from Mann Creek during 2006 surveys.

CLAYTONIA POND SAMPLING

Introduction

In 1999 Claytonia Pond was renovated with rotenone to eliminate common carp The pond is fed by an open canal system making an increase in common carp populations likely following renovation. The pond supports fisheries for bluegill and largemouth bass that were transferred from local ponds in 2001 and channel catfish are stocked yearly. Claytonia Pond was sampled using standard lowland lake sampling methods to evaluate species composition and common carp abundance.

Methods

Claytonia pond was sampled on June 8, 2006 using IDFG standard gill nets, one sinking and one floating, fished overnight, and two IDFG standard trap nets fished overnight. We electrofished the entire shoreline of the pond accessible by boat at night for 0.82 units of night electrofishing effort (boat mounted, pulsed direct current, two netters). Gill nets were offset, approximately 100 meters apart near the center of the pond in north-south orientation. Trap nets were set off the mid section of the east shore of the pond and off the north shore near the middle of the pond. Fish species, total length (mm), and weights (g) were recorded. Catch data were standardized to CPUE by number and compared to previous sampling data taken from the Southwest Region (Nampa) lakes database.

Results and Discussion

The fish catch for all gear types at Claytonia Pond was 44 common carp, nine largemouth bass, four channel catfish, two bluegill, and one pumpkinseed. Electrofishing accounted for 75% of the fish captured despite extremely turbid water that reduced efficiency of netting stunned fish. Common carp accounted for 73 percent of all fish caught by number dominating the species composition (Figure 31). Gillnet CPUE increased for channel catfish and common carp, and decreased for largemouth bass and bluegill (Figure 32). Electrofishing CPUE had similar increases for common carp and decreases for largemouth bass, while channel catfish and bluegill were stable (Figure 33).

Month of sampling may confound between year comparisons of CPUE as the 2000 sampling was conducted in May, the 2003 in April and the 2006 in June. The likely impacts of June sampling was a reduced efficiency of electrofishing due to turbidity and possibly reduced gill net efficiency due to water levels. The CPUE for largemouth bass observed in sampling during 2001 is likely a result of 129 largemouth bass that were transferred to the pond in 2001.

The fishery in Claytonia Pond is focused on largemouth bass, bluegill and channel catfish. Claytonia Pond appears to have the ability to support warm water fish reproduction at least on a limited basis. The presence of several largemouth bass <150mm and bluegill/pumpkinseed <100mm indicate that natural recruitment is occurring. Channel catfish sampled were consistent with catchable size stocked channel catfish with total lengths between 200 and 320 mm.

Management Recommendations

1. Use standardized lowland lake sampling to describe fish populations and trends.

2. Evaluate alternatives to control common carp abundance, including the feasibility of another rotenone treatment.

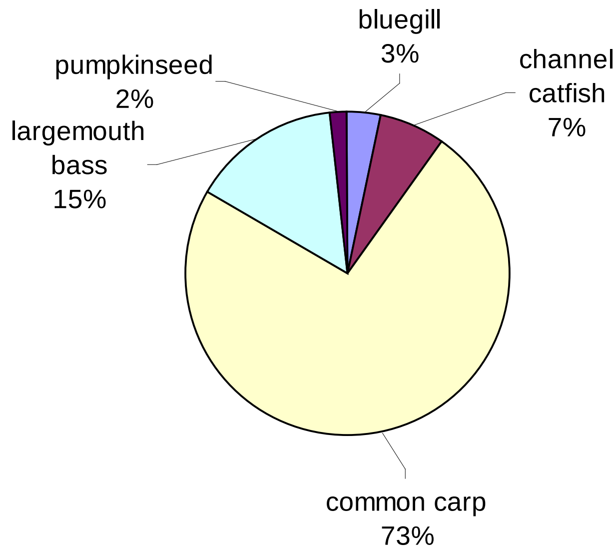


Figure 31. Species composition (n=60) for fish in Claytonia Pond from 2006 gillnet, trapnet and electrofishi ng sampling.

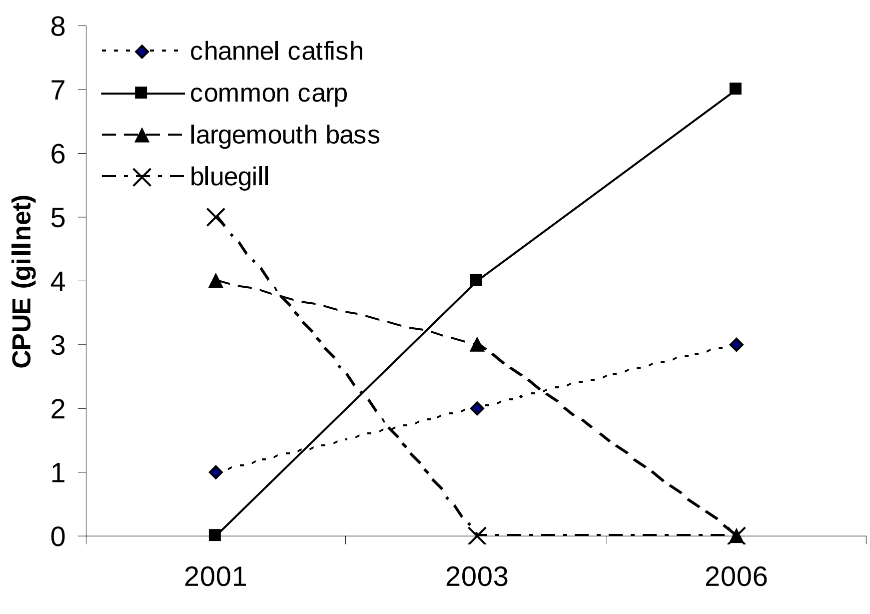


Figure 32. Claytonia Pond catch per unit effort (CPUE) for gillnet sampling for 2001, 2003, 2006.

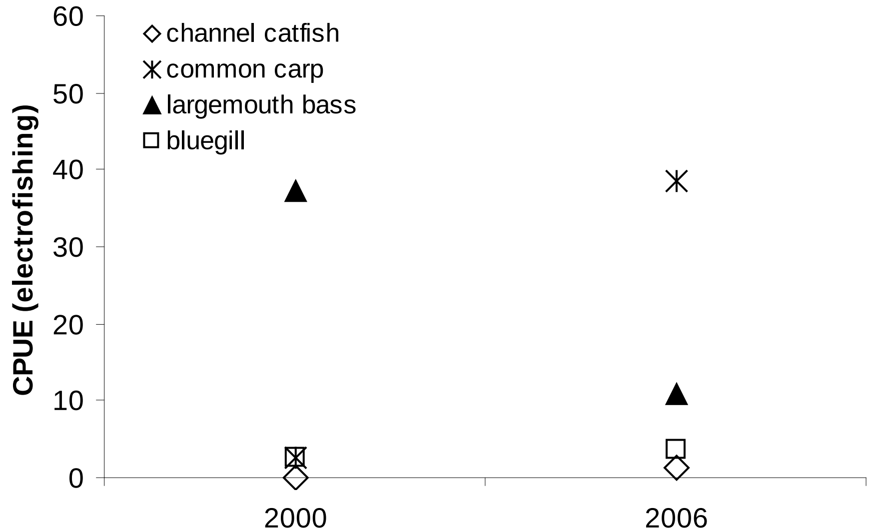


Figure 33. Claytonia Pond catch per unit effort (CPUE) for electrofishing for 2000, 2006.

DEADWOOD RESERVOIR KOKANEE MONITORING

Introduction

Over the last 10 years the kokanee *Oncorhynchus nerka* population in Deadwood Reservoir has cycled drastically. Because kokanee exhibit density dependent growth, increases in population result in decreases in adult fish length. Mean female kokanee length observed at the kokanee spawning trap on the Deadwood River has varied from a low of 208 mm in 1992 to a high of 421 mm in 2003 with mean size decreasing since 2003. Deadwood Reservoir provides sport fishing for kokanee, rainbow trout and cutthroat trout. Bull trout are present in Deadwood Reservoir at very low numbers. Deadwood Reservoir also functions as one of the IDFG's primary egg sources providing early spawn kokanee for stocking throughout the state.

Objectives

Determine kokanee population size and year class strength. Monitor adult kokanee and bull trout spawning escapement to tributaries.

Methods

Midwater Trawling

To estimate kokanee abundance, density, and biomass, in Deadwood Reservoir midwater trawling was conducted at night during the dark (new) moon on June 26 and again on August 22. Trawling was performed in a stepped-oblique fashion as described by Rieman (1992) and Kline (1994) with the exception that the otter-boards were replaced by a fixed frame at the net mouth with a 4.5 m^2 opening. Six transects were sampled in June (Figure 34). Reservoir elevations in August allowed sampling five transects on the east side and one transect from the dam toward the west shore. Density and biomass were estimated using the single section MS Excel Spreadsheet developed by the IDFG's Lake Pend O'reille Fish Recovery Project (Maiolie 2004). The net was towed at 1.5 m/s with a boat 7.3 m in length. Abundance estimates generated by the program were based on lake surface area on day of sampling. Kokanee captured were measured for total length, weighed and a subset had otoliths removed for age verification. Ages were determined using length frequency graphs. Hatchery origin was determined by presence of adipose fin clip for age-0 kokanee and presence of calcein marks on the otolith for age-1 kokanee. Because only 50% of the age-1 kokanee population was calcein marked at release we assumed that all kokanee from the August survey between 180 and 220 mm were hatchery origin.

Spawner Escapement

Weirs capable of blocking fish passage and trapping upstream migrating fish were installed on Basin Creek, Beaver Creek, Deadwood River, Trail Creek, and South Fork Beaver Creek on August 8-13 (Table 13). Basin Creek did not have an upstream trap installed due to high number of upstream migrating kokanee. Downstream trap boxes were installed between August 14 and September 28 (Table 13). Weirs were removed on October 16. Weirs were checked one to two times daily as required for maintenance and fish handling. Kokanee lengths and approximate numbers were collected at the weir on the Deadwood River associated with kokanee egg take activities. We recorded total length (mm), weight (g), sex, and direction of movement for captured bull trout. Bull trout were sampled for scales, genetics, and were tagged with Passive Integrated Transponder (PIT) tags and radio tagged.

Results and Discussion

Midwater Trawling

Two hundred five kokanee were captured during the June survey and 170 kokanee were captured in the August survey (Figure 35). Kokanee population was estimated at 712,967 (± 150,576) for the June survey and 491,681 (± 114,601) in August. Biomass was estimated at 16,177 kg in June and 24,253 kg in August. Age-1 kokanee were most abundant by number in both the June and August surveys (Figure 36). One hatchery kokanee from the 2005 release was captured during the June survey (identified by calcein marked otolith, 190 mm TL) and one hatchery kokanee age-0 was captured in the August survey (adipose fin clipped, 115 mm TL). Survival of hatchery kokanee from the 2005 plant to age-1 was estimated at 8% (90% CI ± 1% to 16%). Survival of hatchery kokanee from the 2006 plant from July to August was estimated at 5% (90% CI ± -12% to 34%).

The abundance of age-0 kokanee in 2006 is less than expected based on natural egg deposition in 2005 of over 8 million eggs. Survival from 2005 egg to 2006 fall fry was estimated at 1.1% for Deadwood Reservoir kokanee based on midwater trawl abundance, which is in the low range of observed survival from Lake Pend Oreille Kokanee which is typically around 6-8% with a range of 2-12% based on hydro-acoustic abundance estimates. Midwater trawl estimates typically are lower than estimates of generated with hydroacoustic gear which will make the estimate slightly lower.

Spawner Escapement

The fish weirs and traps on the Deadwood Reservoir tributaries were operated from August 13, 2006 to October 16, 2006. The Rattlesnake Complex Forest Fire started on August 21 and resulted in access restrictions and compromised weir maintenance activities on the Deadwood River from August 21 through August 31 and throughout the period of burning for Trail Creek, South Fork Beaver Creek and Beaver Creek. The restrictions resulted in inability to estimate kokanee escapement due to large numbers of kokanee escaping during periods when maintenance was not possible. On the main Deadwood River over 40,000 adult kokanee were handled at the Deadwood Trap and over 5 million kokanee eggs were collected. Average kokanee lengths were 268 mm for males (n=58) and 266 mm for females (n=42). Small kokanee lengths and large egg numbers indicate substantial numbers of adult kokanee present in the 2006 spawning run, most likely the largest adult escapement in the last decade.

Tributary weirs captured 12 bull trout (Table 14). The Trail Creek weir was successful at capturing pre-spawn fish. However, weir breaches allowed some adults to migrate upstream without being captured as evidenced by previously radio tagged adults located upstream of the weir without being handled at the weir. One adult female was found dead in the downstream trap on Beaver Creek. All other weirs captured only sub-adult downstream migrants.

Management Recommendations

1) Continue midwater trawling and spawner escapement counts to develop a stock recruitment curve to develop escapement goals for naturally spawning kokanee.

2) Develop a strategy to reduce kokanee densities to increase mean adult size.

3) Repeat midwater trawling and hydroacoustic kokanee population estimation for another year to refine estimates between methods.

4) Move bull trout weirs on tributary streams (except Deadwood River) above the reservoir full pool level to improve efficiency and decrease maintenance.

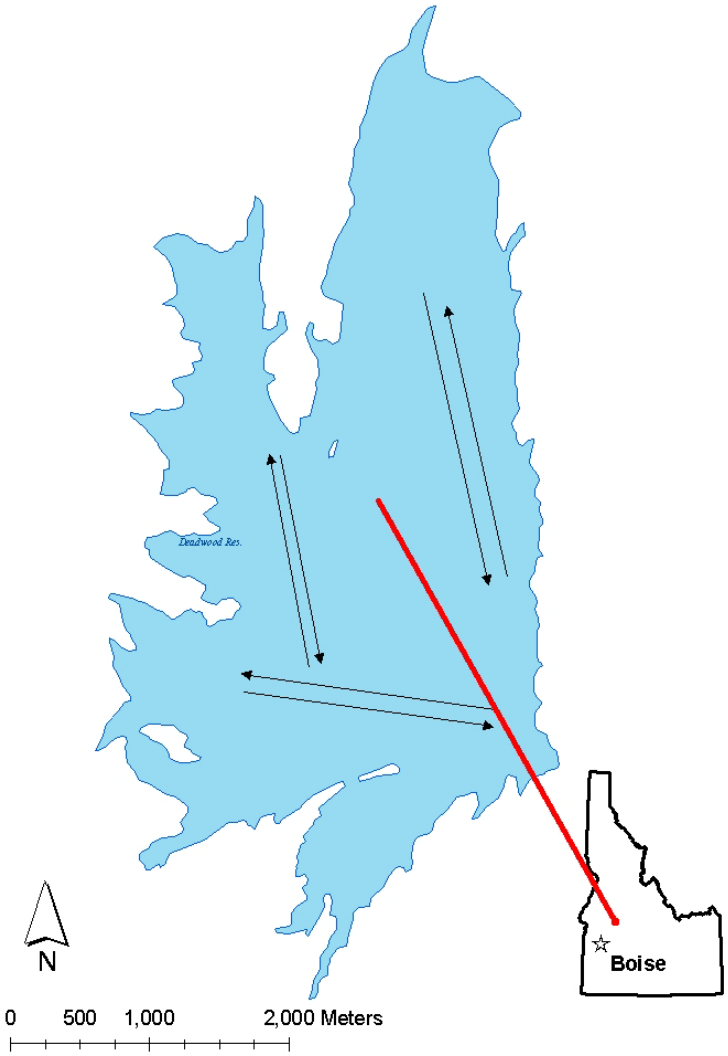


Figure 34. Transects sampled by midwater trawl in 2006 on Deadwood Reservoir. Transects arrows are not drawn to scale.

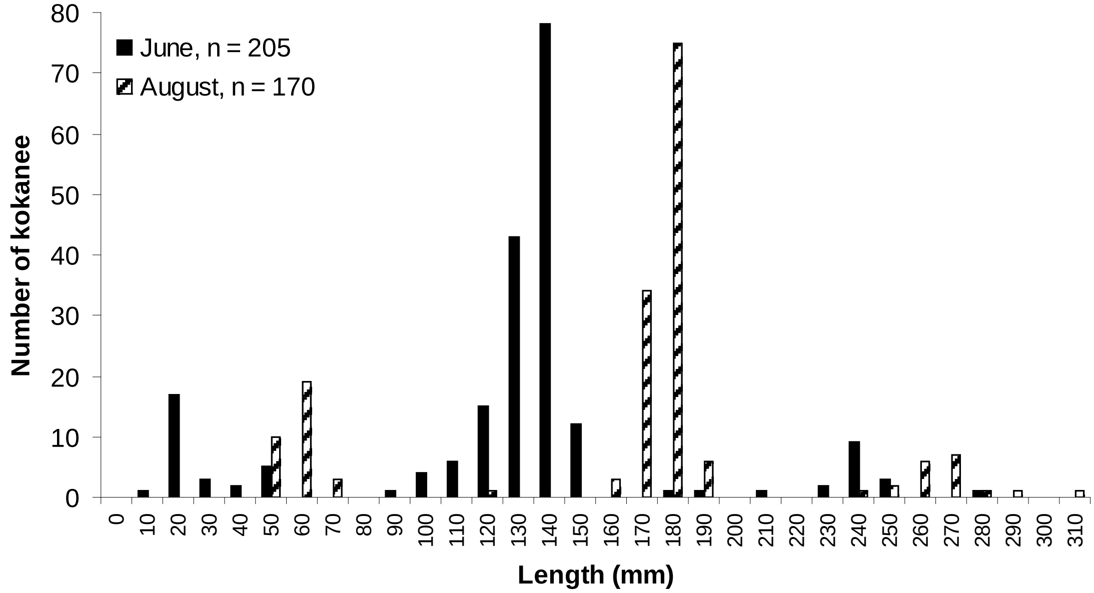


Figure 35. Length frequency of kokanee captured during June and August 2006 midwater trawl sampling.

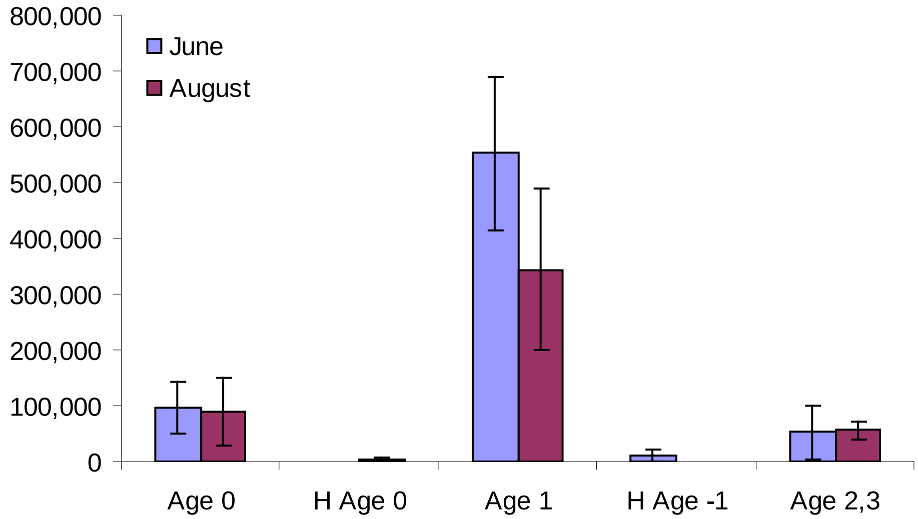


Figure 36. Numbers of kokanee by age class estimated from midwater trawling in 2006 on Deadwood Reservoir for June and August surveys. Age classes preceeded by H indicate hatchery origin. Bars represent 90% confidence intervals.

Table 13. Dates of weir and downstream trap box installation on Deadwood Reservoir tributaries.

Stream	Weir install	Downstream trap install
Basin Creek	8/8/2006	9/27/2006
Beaver Creek	8/8/2006	8/14/2006
Deadwood River	8/13/2006	9/28/2006
South Fork Beaver Creek	8/8/2006	8/14/2006
Trail Creek	8/8/2006	8/15/2006

Table 14. Bull trout trapped on tributaries to Deadwood Reservoir by date, Tributary, direction of travel (up= upstream, down = downstream) in 2006.

Date	Length (mm)	Weight (g)	Sex	Direction	PIT Tag #	Comments
			Trail Creek			
9/4	553	1430	male	Up	4578206263	Previously radio tagged
9/4	454	813	unk	Up	457828050C	
9/14	439	877	female	Up	45781C620C	
9/15	475	975	Unk	Up	457AOC505E	previously radio tagged
9/20	483	924	female	Down	45797B3C0E	spawned out
9/20	444	694	female	Down	4579681743	radio tag # 11
			Beaver Creek			
8/12	UNK	UNK	Unk	No	UNK	observed above weir
9/17	UNK	UNK	Unk	down	UNK	escaped from DS trap
9/20	424	794	female	NA	NONE	mort in downstream trap
			South Fork Beaver Creek			
10/10	133	21	Unk	Down	None	not tagged
			Basin Creek			
10/9	205	70	Unk	down	down	Escaped prior to PIT tag
10/12	168	38	unk	Down	4579612153	

2006 SOUTHWEST REGION (NAMPA) ANNUAL PERFORMANCE REPORT

River and Streams Investigation

State of: Idaho	Program: Fisheries Management F-71-R-31

Project I: Surveys and Inventories	Subproject I-D: Southwest Region

Job No.: c	Title: Rivers and Streams Investigations

Contract Period: July 1, 2006 to June 20, 2007

ABSTRACT

The Snake River from Swan Falls Dam to Brownlee Reservoir was surveyed to compare previous data on fish community composition and to establish permanent trend sites for future comparison. Results showed a diverse fish community dominated by nongame/non-native fish species. Native species have declined markedly since the 1970's and now represent about 14% of the fish community.

Annual Chinook salmon spawning ground surveys in the upper Middle Fork Salmon River showed a significant decline in observed redds compared to 2005. Overall redd counts showed a 35% decline compared to the previous year and a 91% decline when compared to 2003.

Bruneau River sampling was conducted to better understand the distribution of native and non-native fish within the river system. The fish community in the upper river system is still dominated by both native game and nongame fish while the lower river is predominately nongame fish mixed with exotic fish species.

In the roaded section of the South Fork Boise River below Anderson Ranch Dam, the wild rainbow trout population has changed over time. Abundance of fish gas declined and size structure has shifted to larger fish since 1994, and relatively few fish in the 200-400mm size range were observed.

SNAKE RIVER

Introduction

The segment of Snake River from Swan Falls Dam to the headwater of Brownlee Reservoir has been influenced by dam construction, altered flow and temperature regimes, reduced water quality, and other factors. The river reach upstream of Marsing, Idaho once supported spawning runs of fall Chinook salmon *Oncorhynchus tshawytscha* (Pirtle 1956), but this population was extirpated by construction of the Hells Canyon Complex from 1958 to 1967 (Dauble et al. 2003). Also, this reach of the Snake River was known to support more abundant and occasionally large white sturgeon *Acipenser transmontanas*. Currently, the white sturgeon population in this reach has declined in abundance and large sturgeon no longer exist (Idaho Power Company 2003). Fish kills have occurred on a semi-annual basis usually in late summer due to high water temperatures and poor water quality. Due to these and other factors, the fish community in this reach consists primarily of tolerant nonnative warmwater fish. Channel catfish and smallmouth bass receive the majority of the recreational fishing attention, though a limited fishery for white sturgeon exists in the upper reaches.

Very limited fisheries or fish population data has been collected within this segment of the Snake River by IDFG or other agencies. Fish populations surveys were completed by IDFG during the 1970s (Reid et al. 1973; Gibson 1974), due a proposed water project, Guffey Dam, downstream of Swan Falls Dam. Since then, Idaho Power estimated that the white sturgeon population from Swan Falls to Walter's Ferry contained 155 individuals > 70 cm total length during 1996-1997 (Idaho Power Company 2003) Also, a channel catfish exploitation study was completed and indicated that catfish exploitation rate in the river was 32% (Shrader et al. 2003). Recently, concern has arisen that fishing pressure has increased on this segment of the Snake River due to the rapidly increasing human population in southwest Idaho. We initiated this monitoring effort to compare current fish populations to limited historical data and to establish trend monitoring sites so that fish population trends may be tracked in the future.

Objectives

1. Establish monitoring sites in the Snake River from Swan Falls Dam to the headwaters of Brownlee Reservoir so that fish population trend data may be compared in future years.

2. Describe the distribution, relative abundance, and composition of the fish community, excluding white sturgeon, of the Snake River from Swan Falls Dam to the headwaters of Brownlee Reservoir.

3. Compare the current fish relative abundance, size structure, and species composition to historical sampling information collected during 1972 and 1973.

Methods

Swan Falls Dam, located at river kilometer (rkm) 737 was the upstream boundary of the study area for 2006 sampling efforts, whereas Farewell Bend (rkm 537) delineated the downstream boundary (Figure 37). To ensure adequate sampling throughout the study area, we divided this approximately 211 rkm segment into nine reaches. Boundaries were located at obvious break points such as highway bridges or the Idaho-Oregon state line (Table 15). River reaches ranged in length from 12.6 to 34.4 rkm. One of the nine reaches was located entirely in

Oregon and therefore was not sampled. we non-randomly selected two sampling sites in each of the sampled reaches. I preferentially selected sites with a diversity of habitat types, such as islands and backwaters, and visually noticeable flow. These sites allowed relatively high catch rates for several species compared to simpler habitats in low gradients areas where electrofishing attempts were ineffective.

To capture fish, we used electrofishing gear mounted to an aluminum jet boat. Pulsed direct current was produced by a 5,000 watt generator. Frequency was set at 120 pulses per second and a pulse width of 40, which yielded an output of 4-5 amps. Electrofishing effort ranged from 2,477 to 7,079 sec per sampling site with a mean effort of 4,232 seconds. Site length measured along the thalweg ranged from 610 to 1,410 m, with a mean of 975 m (Table 16). One netter positioned on the bow of the boat captured as many fish as possible, except common carp. For this species, we attempted to collect ten individuals at each site and then counted the remainder without bringing them into the boat. At each site, one electrofishing pass was expended along or as near as possible to all river banks, including the banks of islands. Surveys were conducted from June 28 to July 17, 2006 during daylight hours. During this period, mean daily river flow measured at the Nyssa gauging station ranged from 5,670 to 9,180 cubic feet per second.

Captured fish were identified to species, measured (± 1 mm), and weighed (±1g for fish < 5,000g or ±10 g for fish > 5,000 g) with a digital scale. In the event that fish weight was not collected, length-weight relationships were built from lengths and weights of fish sampled from the Snake River during 2006. Data were log transformed and linear regression was used to allow estimation of weight. PSD were calculated to describe length-frequency data for gamefish populations as outlined by Anderson and Neuman (1996). Also, relative weight (Wr) was calculated as an index of general fish body condition, for which a value of 100 is considered average. Values greater than 100 describe robust body condition, whereas values less than 100 indicate less than ideal foraging conditions. Electrofishing effort was converted to hours to standardize CPUE and weight WPUE indices.

Results

During 2006 Snake River sampling efforts, a total of 2,063 fish were sampled from 20 different species (Appendix E). Six species of game fish were sampled including channel catfish, hatchery rainbow trout, flathead catfish *Pylodictus olivaris*, largemouth bass, mountain whitefish *Prosopium williamsoni*, and smallmouth bass. Five species of panfish were sampled including, bluegill, black crappie, pumpkinseed, white crappie, and yellow perch. Relative abundance of panfish was generally low in all reaches. Also, six native, nongame species were sampled including bridgelip sucker, chiselmouth, largescale sucker, mottled sculpin *Cottus bairdi*, peamouth, and redside shiner. Finally, three nonnative, nongame species were sampled including common carp, Oriental weatherfish *Misgurnus anguillicaudatus*, and Western mosquitofish *Gambusia affinis*.

Electrofishing total CPUE averaged 112 fish/h (±20) for the 16 sites sampled during 2006 (Figure 38) (Appendix F). The highest total CPUE was 185 fish for the North Bank Springs site. The majority of catch at this site was composed of smallmouth bass (CPUE = 96 fish/h); in fact, the CPUE of smallmouth bass at this site was over 2-fold higher than any other site (Table 17). The Owyhee Canal site had the lowest total CPUE of 32. Poor catch at this site was likely influenced by low current velocity, low species diversity (6), and steep banks. For all sites combined, common carp were the most numerous species and represented 31% of the catch, followed by channel catfish (22%), smallmouth bass (19%), and largescale sucker (11%).

Over the 16 sites, total WPUE averaged 181 kg/h (± 46) (Appendix G). The highest total WPUE (429 kg/h) occurred at the Jensen Island site, 70% of which was composed of common carp. The lowest total WPUE (34 kg/h) was documented at the Guffey Island site. Though total CPUE at Guffey Island was near average (102 fish/h), the catch contained an abundance of small panfish and smallmouth bass, leading to its low total WPUE. For all of the sites combined, common carp represented the majority of the fish biomass (60%), followed by channel catfish (22%), largescale sucker (10%), flathead catfish (5%), and smallmouth bass (2%) (Figure 38).

Overall, channel catfish was the most abundant game fish sampled, with an average CPUE of 25.0 fish/h. Three sites had CPUE estimates exceeding 40 fish/h including Center, Prati, and Morton island sites. In total, 477 channel catfish were sampled, with a mean length of 544 mm and 1599 g. No catfish smaller than 332 mm were sampled (Figure 39). All other catfish exceeded quality length (≥ 410 mm), which a yielded a highly skewed PSD estimate of 99.9. Relative weight averaged 95 (± 0.7). Relative weight declined as length increased (slope = -0.017; P = 0.038). A small, unmeasured portion of channel catfish had external red lesions, *Aeromonas hydrophila*. Also, damaged or blinded eyes were fairly common.

Smallmouth bass was the second most numerous game fish sampled. Mean CPUE for smallmouth bass was 21.7 fish/h. Smallmouth bass CPUE was highest in the two most upstream sites: North Banks Springs (95.9 fish/h) and Guffey Island (42.4 fish/h). For the remainder of the sites CPUE ranged from 1.2 fish/h at the Owyhee Canal Site to 37.5 fish/h at the Goat Island site. In total, 409 smallmouth bass were sampled (Figure 40). Mean length and weight was 194 ± 8 mm and 170 ± 18g. Proportional stock density was 39, calculated from 206 stock length fish (≥180 mm) and 80 quality length fish (≥ 280 mm). Relative weight declined with length. Mean relative weights for fish measuring 150-249 mm, 250-349 mm, and 350-458 mm was 103, 92, and 87, respectively.

Flathead catfish was the next most abundant game fish sampled and showed the strongest trend in distribution of any game fish. Flathead catfish were rare in the upper half of the study area. Only one flathead catfish was caught upstream of the mouth of the Owyhee River (rkm 637). Whereas, below the mouth of the Owyhee River, flathead catfish were sampled at every site. In total, we sampled 53 flathead catfish ranging from 210 to 970 mm (Figure 41). Mean length and weight were 600 ± 49 mm 3,707 ± 732 g. The largest individual sampled was 970 mm (~38") and 12,330 g (~27 lbs). Proportional stock density was 78, calculated from 45 stock length fish (≥ 350 mm) and 35 quality length fish (≥ 510 mm). Relative weight averaged 96 and showed no trend by length (slope = 0.004; P = 0.45).

Other warmwater, game fish species existed at low densities. Largemouth bass were captured at eight sites. Largemouth bass were rarely caught in the upper river, and, within the upper river, were only sampled at the Guffey Island site. Below and including the Goat Island site, largemouth bass were sampled at all sites except for the Owyhee Canal site. The highest catch (7.7 fish/h) occurred at the Old Crow site. During 2006, mountain whitefish were practically non-existent. Only one small mountain whitefish was sampled. This fish was captured at the Annear Island site, presumably an emigrant from the Payette or Weiser River. Hatchery rainbow trout were sampled at one location near spring inflows at the North Bank Springs site.

Pan fish species also existed at low densities, with only a few exceptions. Lepomids (bluegill and pumpkinseed) showed similar patterns in abundance and distribution. Lepomids densities were highest at the Guffey Island site, then declined in a downstream direction though the Succor Creek site. At and downstream of the Succor Creek site, Lepomids were sampled at most sites but never exceeded a CPUE of 4.1 fish. Pomoxids (black and white crappies) were sampled at eight of the 16 sites, with no strong longitudinal pattern. The highest densities of Pomoxids were noted for the Succor Creek site, where CPUE for white and black crappie was 5.9 and 3.9 fish/h, respectively. Yellow perch were only captured at the two most upstream sites at low densities (CPUE < 3 fish) (Figure 42).

The catch of native, nongame fish was dominated by largescale sucker, whereas the abundance of all other native, nongame fish was low. Largescale sucker were captured at all 16 sampling locations. Higher catches of largescale sucker occurred at and upstream of the Clarks Island site. Downstream of Clarks Island CPUE for largescale sucker never exceed 14 fish, whereas above Clarks Island CPUE exceeded 20 fish/h for four of the six sites with a maximum CPUE of 53 fish/h at the Jensen Island site. Bridgelip sucker showed a strong pattern in distribution. Bridgelip sucker were only sampled from 5 sites. Four of the five sites were the four most upstream sites. Bridgelip sucker CPUE increased as rkm increased, with the highest catch of 32 fish occurring at the most upstream site, North Bank Springs. Peamouth were captured at 7 of the 16 sites with no distributional pattern. Chiselmouth were sampled at four sites, three of which were upstream of Marsing, ID. Redside shiner were captured at 2 sites and mottled sculpin were caught at one site. The CPUE by species of peamouth, chiselmouth, redside shiner, or mottled sculpin only exceeded a CPUE of 3 fish/h per site on one occasion (CPUE of peamouth equaled 5.3 fish/h at the Guffey Island site) (Figure 42).

The catch of nonnative, nongame fish was dominated by common carp. Common carp were caught at all sites. The lowest densities occurred at the most upstream and downstream sites. Densities tended to be higher in the middle reaches with the maximum CPUE of 94.4 fish/h at the Jensen Island site. Western mosquitofish showed a similar pattern. Western mosquitofish were captured at nine sites. No Western mosquitofish were caught in the four most upstream sites, nor the two most downstream sites. The highest density of mosquitofish was captured at the Goat Island site. Only one other non native, non-gamefish was caught, an oriental weatherfish. It was captured at the Boise Island site.

Historical survey information was collected from a slightly shorter river segment during 1973 from the proposed Guffey Dam site (6 km upstream of Walter's Ferry) to the upper end of Brownlee Reservoir (Gibson 1974). Therefore, to assess changes in the fish community, I compared only the catch from 14 of the 16 sites sampled during 2006 (2 sites were upstream of the 1973 study area). The species diversity during 2006 in this section was 17 species. During 1973, 16 species were sampled. Fourteen species were common to both studies. Warmouth and northern pikeminnow were caught during 1973, but not during the 2006. White crappie, mottled sculpin, Oriental weatherfish, and hatchery rainbow trout were caught during 2006, but not during 1973 (Table 18).

During 1973 and 2006, CPUE indices indicated that the majority of the fish community was composed of common carp, smallmouth bass, and sucker species. Overall CPUE was similar, but declined slightly from 1973 (CPUE = 133.5 fish/h) to 2006 (CPUE =107.3/h; Table 18 and Figure 42). For the most numerous taxa, common carp and sucker species combined, CPUE declined from a total of 84.8 fish/h during 1973 to 52 fish/h during 2006. Smallmouth bass CPUE was similar for 1973 and 2006 at 18.5 and 14.9 fish/h, respectively. Most notably, the CPUE for channel catfish increased over four fold from 6.0 fish/h during 1973 to 26.6 fish/h during 2006. Flathead catfish populations also seemed to increase from 0.1 fish/h during 1973 to 3.1 fish/h during 2006. For black crappie, bluegill, chiselmouth, redside shiner, and mountain whitefish, CPUE declined substantially from 1973 to 2006. Mountain whitefish were nearly absent from the reach (n=1) during 2006, whereas during 1973 they represented 6.2% of the gamefish population (Table 18).

Length frequencies for smallmouth bass and channel catfish have changed over the last 30+ years. The length frequency plot for smallmouth bass collected from June 22-July 25, 1973 was highly skewed towards age 0 fish (<80 mm). The frequency of fish declined rapidly over 80 mm and the frequency of fish between 100 and 400 mm was low and very flat. Maximum length was 430 mm. During 2006, the length frequency plot for smallmouth bass was more robust. Multiple age class peaks were evident. Frequency declined by length but did so gradually. Maximum length was 460 mm. Length frequency for channel catfish in 1973 was mound shaped, peaked at 300 mm and declined gradually to a maximum of 500 mm. Few fish were captured less than 270 mm. The shape of the length frequency plot for 2006 was similar; however, fish were much longer. The peak of the length frequency plot was at 510 mm and declined gradually to a maximum of 740 mm. Only one channel catfish less than 400 mm was caught during 2006 .

Additional survey information for the Snake River was collected during 1972 from 6 km upstream of Walters Ferry to Swan Falls Dam (Reid et al. 1973). This survey would correspond to the 2 most upriver sites sampled during 2006. Species diversity during 2006 in this section was 16 species, and was similar to 1972, when 15 species were sampled. Eleven species were common to both studies. Mountain whitefish and northern pikeminnow were caught in the 1972 surveys, but not during the 2006 survey. Pumpkinseed, white crappie, peamouth, yellow perch, and hatchery rainbow trout were caught during the 2006 survey, but not during the 1972 survey.

Fish density indices upstream of Walters Ferry seemed to have changed more drastically than downstream of Walters Ferry from 1972 to 2006. Total CPUE from 6 km upstream of Walters Ferry to Swan Falls Dam was higher during 2006 (143.8 fish/h) than 1972 (93.8 fish/h; Table 18). Smallmouth bass made up 48% of the total CPUE during 2006, compared to 3% during 1972. Channel catfish and the other game fish category were the only other species or group that increased over this time period. Common carp decreased substantially from 22.1 fish/h in 1972 to 3.9 fish/h by 2006. Mountain whitefish and northern pikeminnow were not sampled during 2006, whereas the CPUE in 1972 was 3.2 and 12.8 fish/h, respectively.

Discussion

Fish population surveys in the Snake River from Swan Falls Dam downstream to the headwaters of Brownlee Reservoir indicated that a diverse fish community was present. However, much of the community was composed of nonnative species. Common carp and largescale sucker were the most common species, followed by channel catfish and smallmouth bass.

The channel catfish population in the Snake River appeared to be healthy. Channel catfish were captured throughout the study area, often at high catch rates. A wide range of lengths were sampled including some fish exceeding 711 mm (28”) indicating that multiple year classes and large individuals were present. CPUE of channel catfish, an index of abundance, increased from 2- to 4- fold since past sampling efforts in the 1970s. Small channel catfish were entirely absent from the catch. Small channel catfish were either not vulnerable to our sampling gears or are produced in other areas of the system such as tributaries or in Brownlee Reservoir.

The smallmouth bass numbers in the lower proportion of the study area appeared to be stable, while numbers in upper portion of the study area appeared to have increased greatly since the early 1970s. Length frequency plots indicated that the size structure of the population has improved dramatically since the 1970s. Declining relative weight as length increased seemed to indicate that larger fish were still recovering from the rigors of spawning or struggling to find adequate food resources.

Flathead catfish were concentrated in the lower half of the study area, especially below the mouth of the Owyhee River. Habitat for this species was more optimal in the lower river due to an increase in river enormity from tributary inflow, increased amounts of large woody debris, and increased amounts of manmade crevices such as rip rap as well as automobile tires and bodies.

Flathead catfish populations and studies of them in northern latitudes are rare. I could find only one study that examined flathead catfish ecology at a similar latitude, the lower St. Joe River in southern Michigan (Daugherty and Sutton 2005). Comparison of length frequency plots indicated that they caught a much larger number of juvenile flathead catfish, possibly due to the use of a different electrofishing method. The shape of the plots from 300 to 1,000 mm was similar, relatively flat. Also, maximum lengths were similar. Flathead catfish in the St. Joe River exceeding 800 mm were on average 12 to 17 years old. Daugherty and Sutton concluded that flathead catfish in the St. Joe River were nearly unexploited. Since these populations exist at similar latitudes and therefore probably experience similar thermal regimes, it is probable that age structure in the Snake River is similar. Also, based on the relatively high abundance of large, presumably old flathead catfish in the Snake River, exploitation appears to be low.

The species composition in the Snake River has changed from the 1970s to the present. The change has been most noticeable in the decline of native species especially mountain whitefish, northern pikeminnow, and chiselmouth. Mountain whitefish declined sharply, or may have been functionally extirpated from the reach after a large fish kill in 2004 when literally thousands of whitefish could be seen floating on the surface near Walters Ferry (Jeff Dillon, IDFG, pers. comm.). Only one whitefish was sampled in the lower river during 2006 and was likely a fished produced in one of the tributaries. This reach of the Snake River has become inhospitable to whitefish or whitefish have yet to re-colonize suitable habitats after the fish kill. Northern pikeminnow may also have been extirpated from the reach, whereas they were common 30 years ago. Northern pikeminnow may have been replaced by smallmouth bass as happened in other southwestern Idaho waters (Herb Pollard, retired IDFG, pers. comm.). The mechanism for the decrease of chiselmouth is unknown, but the increased densities of smallmouth bass in upper portion of the study area and increased densities of channel catfish throughout the study area as well as reduced water quality are likely causes.

Changes in the fish communities across the two time periods are only valid if sampling strategies were comparable. During the 1973 survey when the lower section of the study areas was sampled, 82 sites within 13 areas were surveyed in a systematic fashion (at 1.6 km intervals). Site lengths were from 90 to 460 m. During 2006, we used eight reaches and non-randomly selected two sites within each reach. Site length was 610 to 1,410 m. We believe potential bias was probably minimal because of our different site selection strategies, at least for the comparison of the lower segment of this reach as sites were well dispersed, a similar length of habitat was sampled, sample sizes were large, and total CPUEs were similar. No explanation of site selection techniques was made for the upper segment of this reach sampled during 1972. Therefore, we could not assess if bias based on sampling location was present.

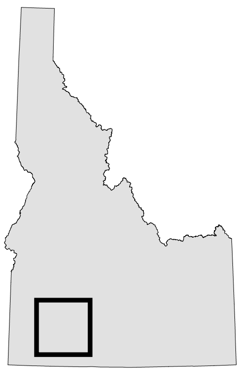
Although we did not specifically compare species abundance across habitat types, it appeared that gamefish abundance was higher in more complex habitats near the many islands in the Snake River. The restriction of flow into side channel created a wide range of habitat characteristics such as flow, substrate, depth, and cover. Species diversity, overall gamefish abundance, and the number of age classes present seemed to increase correspondingly. Additionally, islands acted as a source for large woody debris recruitment, which is important as cover and spawning sites for some gamefish species such as channel and flathead catfish. The amount of habitat complexity in most large rivers across the United States has tended to decline due to flow regulation, channelization, and loss of riparian vegetation (Junk et al. 1989). Conservation of fish populations in this section of Snake River requires protection of the mechanisms that create habitat diversity, improvements in water quality, and allowing occasional flood pulses.

Management Recommendations

1. Identify ways to improve water quality.

2. Develop a strategy to encourage harvest of channel catfish in this section of the river. Density indices, length frequency data, and other studies indicate this population could sustain additional harvest opportunity.

3. Identify methods to monitor and maintain habitat diversity.



Site #	Site Name
1	North Bank Springs
2	Guffey Island
3	Dredge Island
4	Center Island
5	Jensen Island
6	Clarks Island
7	Succor Creek
8	Goat Island
9	Boise Island
10	Prati Island
11	Old Crow Island
12	Morton Island
13	Annear Island
14	Smith-Long Island
15	McRea Island
16	Owyhee Canal

Figure 37. Location of 16 electrofishing sites used to index the distribution, abundance, and composition of the fish community in the middle Snake River from Swan Falls Dam to the upper end of Brownlee Reservoir, Idaho during 2006. Black dots represent locations of nearby cities, whereas red dots indicate sampling sites.

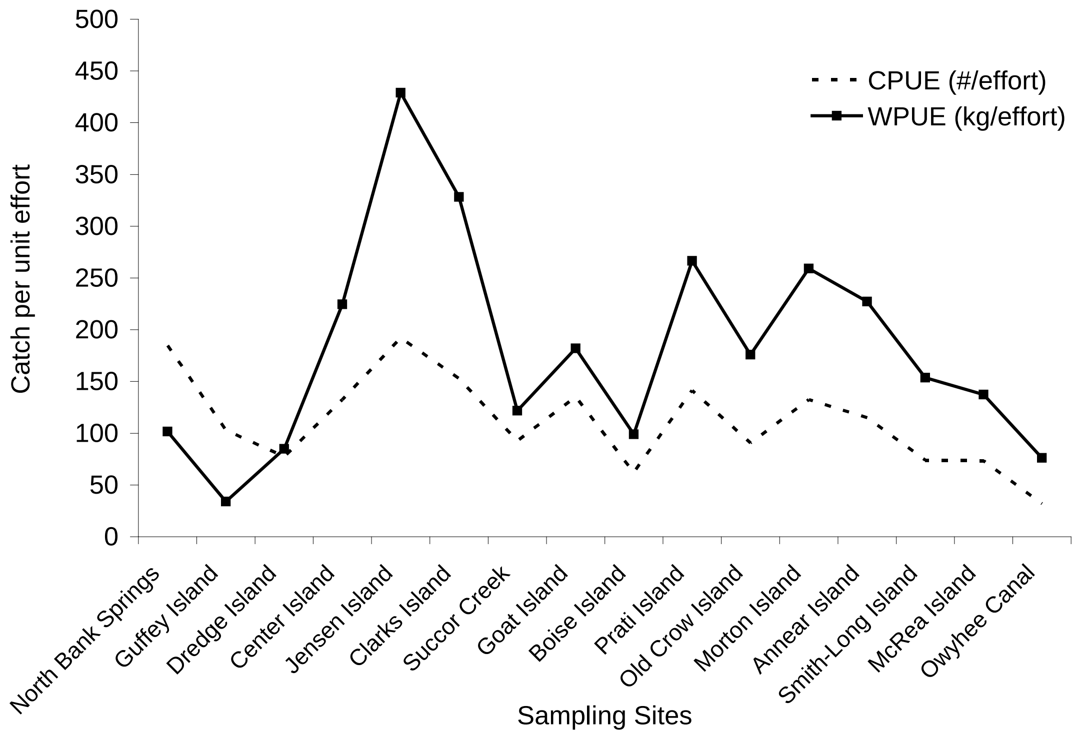


Figure 38. Total CPUE and WPUE indices used to describe the fish community in the Snake River at 16 sites during 2006.

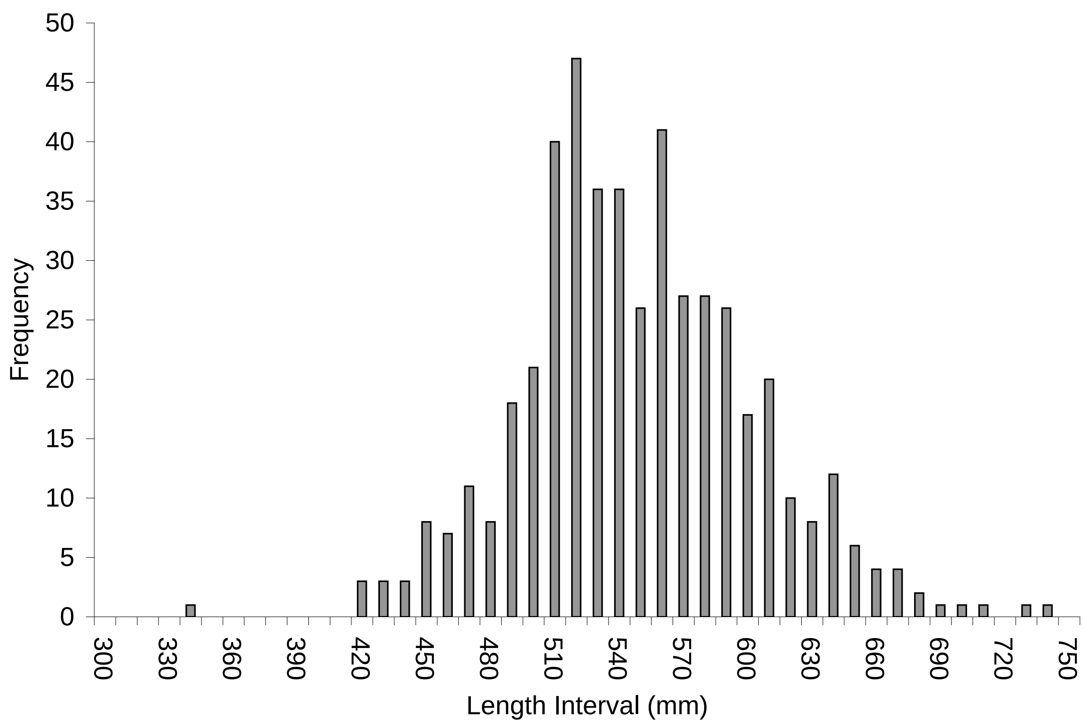


Figure 39. Length frequency of channel catfish captured by electrofishing in the Snake River during 2006. X-axis labels represent the upper end of the 10 mm length interval.

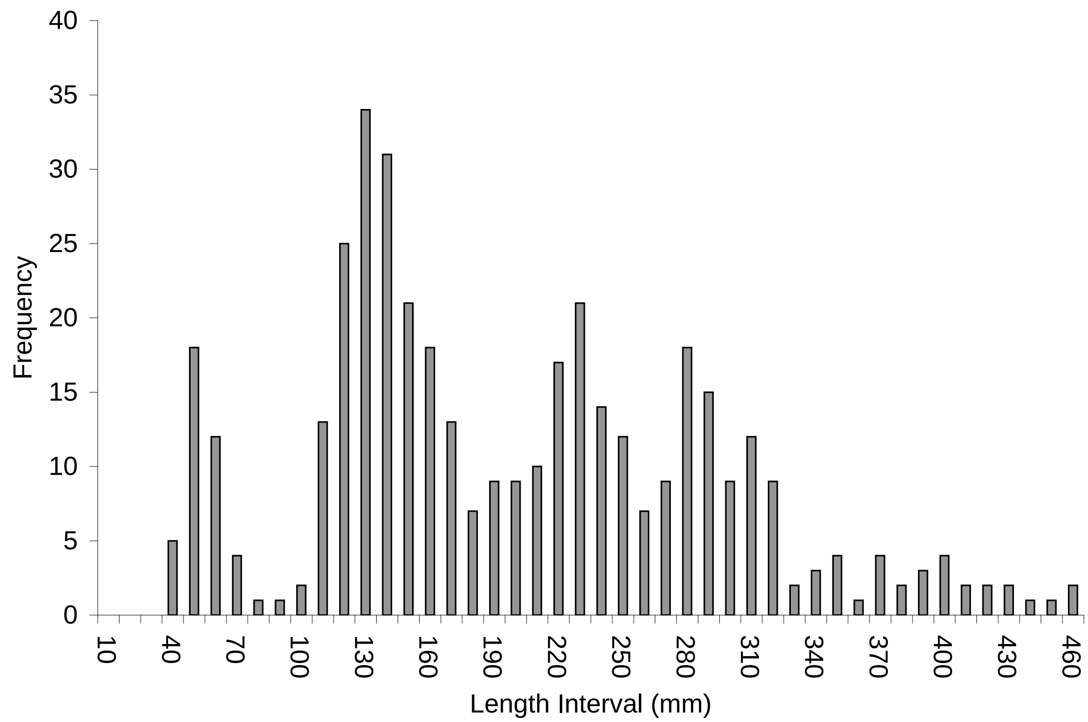


Figure 40. Length frequency of smallmouth bass captured by electrofishing in the Snake River during 2006. X-axis labels represent the upper end of the 10 mm length.

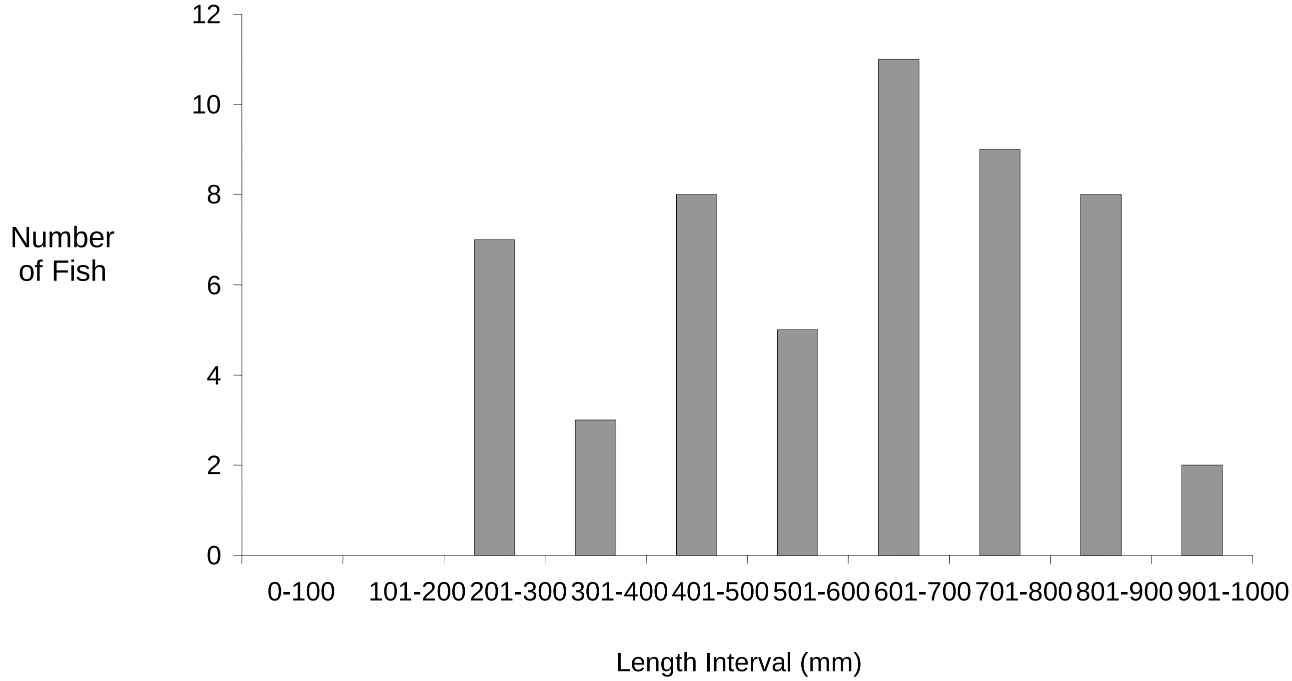


Figure 41. Length frequency of flathead catfish captured by electrofishing in the Snake River during 2006.

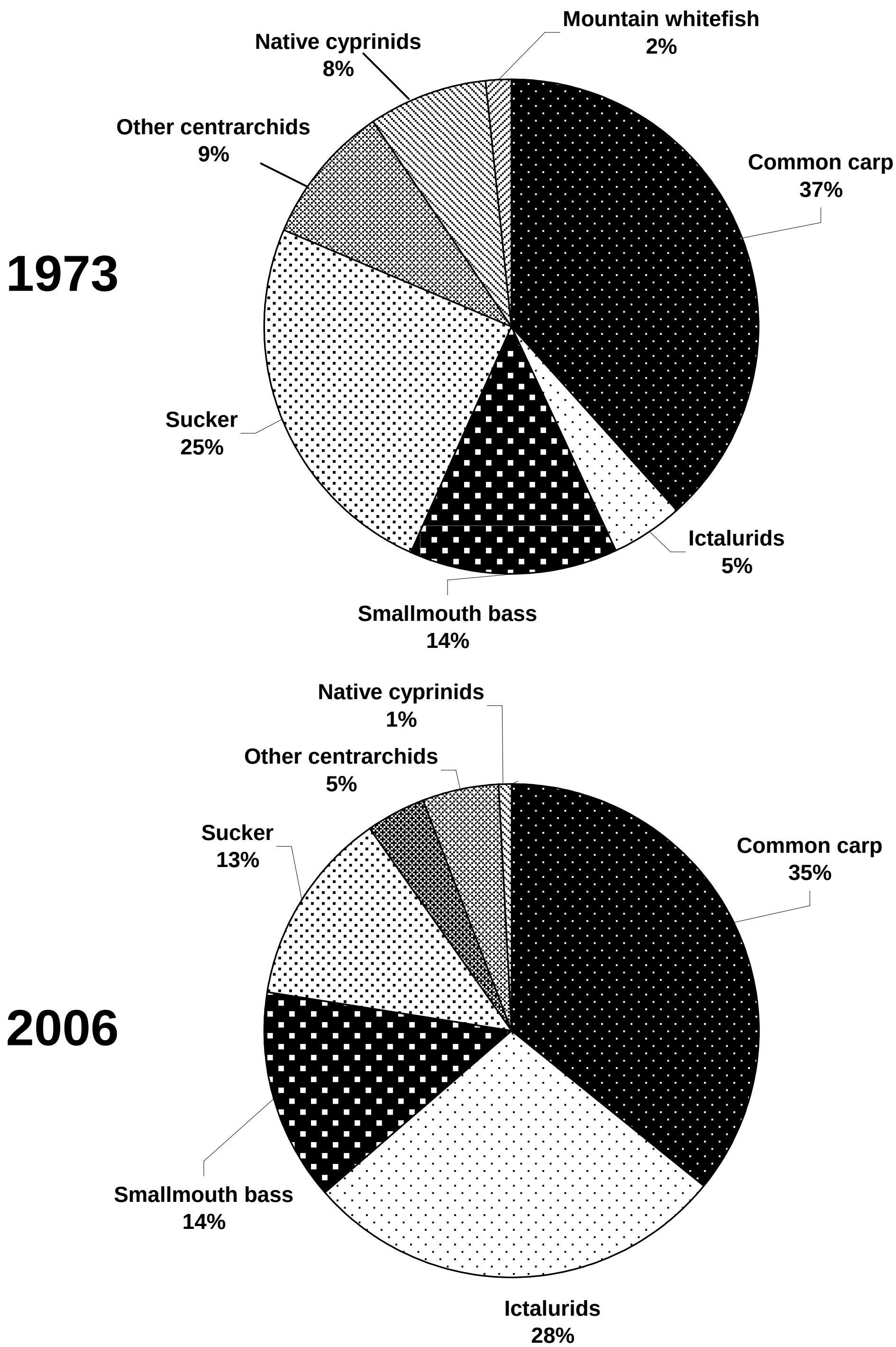


Figure 42. Species composition based on catch per unit effort (fish/h) for electrofishing surveys conducted during 1973 (top) and 2006 (bottom) on the Snake River. Only common survey areas were compared and included from 6 km upstream of Walters Ferry downstream to the headwaters of Brownlee Reservoir.

Table 15. Reaches used during 2006 sample fish populations in the Snake River from Swan Falls Dam to the. Reach boundaries were delineated and are described by highway bridges and their adjacent towns as well as the Idaho/Oregon state line.

Reach	Upstream Boundary	Rkm	Downstream Boundary	Rkm	Reach Length (Km) Subtraction	Reach Length (Km) from TOPO©	Gradient
1	Swan Falls Dam	737	Walters Ferry (Hwy 45)	711	25.4	26.9	0.057
2	Walters Ferry (Hwy 45)	711	Marsing (Hwy 55)	682	28.8	31.4	0.029
3	Marsing (Hwy 55)	682	Homedale (Hwy 95)	671	11.3	15.0	0.018
4	Homedale (Hwy 95)	671	South Stateline	654	16.7	12.6	0.041
5	South Stateline	654	North Stateline	637	17.1	21.6	0.023
6	North Stateline	637	Nyssa (Hwy 20)	620	17.7	15.1	0.036
7	Nyssa (Hwy 20)	620	Payette (Hwy 52)	587	32.2	34.4	0.036
8	Payette (Hwy 52)	587	Weiser (Hwy 95 Spur)	565	22.2	24.1	0.038
9	Weiser (Hwy 95 Spur)	565	Farewell Bend	537	28.5	29.9	0.016

Table 16. Sampling sites used during 2006 to describe the fish community in the Snake River from Swan Falls Dam to upper end of Brownlee Reservoir. Coordinates were collected in North American Datum 1983.

			Upstream boundary		Downstream boundary			
Reach	Site #	Site Name	UTM-E	UTM-N	UTM-E	UTM-N	Shock Time (sec)	Site Length (m)
1	1	N. Bank Springs	542261	4793140	541534	4793007	2477	760
	2	Guffey Is.	537894	4794062	537136	4794344	6115	860
2	3	Dredge Is.	522677	4808670	521834	4809687	5495	1410
	4	Center Is.	517483	4816364	517462	4817166	3452	810
3	5	Jensen Is.	514600	4824741	513934	4825550	3280	1150
	6	Clarks Is.	512741	4826752	512121	4826730	2805	610
4	7	Succor Cr.	504289	4831060	503400	4831692	3655	1200
	8	Goat Is.	503211	4832665	503010	4833321	4315	720
5		No sites---Snake River lies within the Oregon border						
6	9	Boise Is.	498047	4851034	498216	4852143	3488	1230
	10	Prati Is.	499344	4856772	500223	4856906	6187	880
7	11	Old Crow Is.	503108	4866477	502743	4867052	4653	950
	12	Morton Is.	504513	4871903	504663	4872632	3261	870
8	13	Annear Is.	507880	4888204	508383	4889001	7079	1030
	14	Smith-Long Is.	502207	4894023	502227	4894723	2678	710
9	15	McRea Is.	499095	4899163	498084	4899613	5835	1130
	16	Owyhee Canal	496317	4897377	495363	4897751	2941	1280

Table 17. Catch per unit effort (fish/h) for electrofishing surveys conducted during 1973 and 2006 on the Snake River. Only common survey areas were compared and included from 6 km upstream of Walters Ferry downstream to the headwaters of Brownlee Reservoir.

Species	1973	2006
Common carp	51.7	38.5
Channel catfish	6.0	26.6
Smallmouth bass	18.5	14.9
Sucker	33.1	13.5
Western mosquitofish	---	4.2
Flathead catfish	0.1	3.1
Largemouth bass	2.5	1.9
Pumpkinseed	0.2	1.4
White crappie	---	1.0
Black crappie	4.8	0.6
Bluegill	4.8	0.5
Peamouth	0.1	0.5
Chiselmouth	7.6	0.3
Mottled sculpin	---	0.1
Redside shiner	1.6	0.1
Oriental weatherfish	---	0.1
Warmouth	0.1	---
Mountain whitefish	2.4	0.04
Northern pikeminnow	1.1	---
Total	133.5	107.3

Table 18. Catch per unit effort (fish/h) for electrofishing surveys conducted during 1972 and 2006 on the Snake River. Only common survey areas were compared, which included from Swan Falls Dam downstream to near Walters Ferry (the proposed Guffey Dam site).

Species	1972	2006
Common carp	22.1	3.9
Channel catfish	5.6	13.5
Smallmouth bass	2.9	69.2
Sucker	35.9	32.8
Northern pikeminnow	12.8	---
Crappie	3.9	2.1
Chiselmouth	5.9	0.7
Mountain whitefish	3.2	---
Other game fish	1.2	18.6
Other nongame fish	0.5	2.9
Total	93.8	143.8

Appendix E. Electrofishing catch per unit effort (fish/h) for 16 Snake River trend monitoring sites sampled during 2006.

Site Name	CRP	CAT	SMB	LSS	WMF	BLS	FLT	PKS	PKS	LMB	BLG	WCR
N Bank Springs	4.4	21.8	95.9	21.8	0.0	32.0	0.0	1.5	1.5	0.0	0.0	0.0
Guffey Island	3.5	5.3	42.4	2.4	0.0	6.5	0.0	10.0	10.0	1.2	17.1	0.6
Dredge Island	7.2	22.9	28.8	11.8	0.0	2.6	0.7	1.3	1.3	0.0	0.7	0.0
Center Island	34.4	44.8	19.8	28.2	0.0	2.1	0.0	0.0	0.0	0.0	0.0	0.0
Jensen Island	94.4	30.7	8.8	52.7	5.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Clarks Island	75.7	27.0	14.1	28.2	5.1	0.0	0.0	0.0	0.0	0.0	0.0	1.3
Succor Creek	28.6	13.8	10.8	6.9	19.7	0.0	0.0	2.0	2.0	0.0	0.0	5.9
Goat Island	31.7	25.9	37.5	13.3	20.9	0.0	0.0	0.8	0.8	0.8	0.0	0.8
Boise Island	20.6	6.2	6.2	11.4	0.0	0.0	5.2	4.1	4.1	4.1	0.0	1.0
Prati Island	51.2	49.5	24.4	4.1	0.6	0.0	2.9	1.7	1.7	0.6	1.2	1.2
Old Crow Island	33.3	26.3	8.5	2.3	1.5	0.0	7.0	2.3	2.3	7.7	0.8	0.0
Morton Island	55.2	48.6	15.5	2.2	1.1	0.0	2.2	2.2	2.2	0.0	2.2	0.0
Annear Island	51.9	23.4	18.8	3.6	1.0	0.0	5.1	0.5	0.5	4.1	1.5	3.1
Smith-Long Island	26.9	18.8	1.3	1.3	4.0	0.0	9.4	4.0	4.0	5.4	1.3	0.0
McRea Island	11.7	29.0	13.0	6.2	0.0	1.2	6.8	0.0	0.0	3.7	0.0	0.6
Owyhee Canal	15.9	6.1	1.2	3.7	0.0	0.0	3.7	1.2	1.2	0.0	0.0	0.0
Total CPUE by Species	547	400	347	200	59	44	43	32	31.7	28	25	14
% of Total CPUE by Species	31	22	19	11	3	2	2	2	2	2	1	1

*CRP = common carp, CAT = channel catfish, SMB = smallmouth bass, LSS = largescale sucker, WMF = Western mosquitofish, BLS = bridgelip sucker, FLT = flathead catfish, PKS = pumpkinseed, LMB = largemouth bass, BLG = bluegill, WCR = white crappie.

Appendix E. continued. Catch per unit effort (fish/h) for 16 Snake River trend monitoring sites sampled during 2006.

Site Name	PEA	BCR	SUK	CSL	YLP	HRB	RSS	MSC	MWF	OWF	Total CPUE by Site	% of Total CPUE by
N Bank Springs	0.0	0.0	0.0	1.5	2.9	2.9	0.0	0.0	0.0	0.0	185	10
Guffey Island	5.3	3.5	2.9	0.0	1.8	0.0	0.6	0.0	0.0	0.0	103	6
Dredge Island	0.0	0.0	0.0	1.3	0.0	0.0	0.0	0.0	0.0	0.0	77	4
Center Island	0.0	0.0	0.0	2.1	0.0	0.0	0.0	1.0	0.0	0.0	132	7
Jensen Island	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	192	11
Clarks Island	1.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	153	9
Succor Creek	0.0	3.9	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	93	5
Goat Island	0.8	2.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	135	8
Boise Island	0.0	0.0	1.0	0.0	0.0	0.0	1.0	0.0	0.0	1.0	62	3
Prati Island	2.3	0.0	1.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	141	8
Old Crow Island	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	91	5
Morton Island	1.1	0.0	2.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	132	7
Annear Island	1.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.5	0.0	115	6
Smith-Long Island	0.0	1.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	74	4
McRea Island	0.0	0.0	0.6	0.6	0.0	0.0	0.0	0.0	0.0	0.0	73	4
Owyhee Canal	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	32	2
Total CPUE by Species	13	11	10	5	5	3	2	1	1	1	1790	
% of Total by Species	1	1	1	0	0	0	0	0	0	0		100

*PEA = peamouth, BCR = black crappie, SUK = unidentified sucker, CSL = chiselmouth, YLP = yellow perch, HRB = hatchery rainbow trout, RSS = redside shiner, MSC = mottled sculpin, MWF = mountain whitefish, and OWF = Oriental weatherfish.

Appendix F. Electrofishing weight per unit effort (kg/h) for 16 Snake River trend monitoring sites sampled during 2006.

Sampling Sites	CRP	CAT	LSS	FLC	SMB	BLS	LMB	HRB	BCR	PKS	WCR
N Bank Springs	15.1	29.4	30.7	0.0	12.5	12.1	0.0	1.5	0.0	0.1	0.0
Guffey Island	19.0	8.8	2.5	0.0	2.2	0.9	0.0	0.0	0.1	0.3	0.0
Dredge Island	21.3	39.5	14.2	4.1	4.2	1.5	0.0	0.0	0.0	0.0	0.0
Center Island	109.5	64.3	44.6	0.0	5.3	0.8	0.0	0.0	0.0	0.0	0.0
Jensen Island	300.5	48.7	77.5	0.0	2.3	0.0	0.0	0.0	0.0	0.0	0.0
Clarks Island	233.3	48.5	40.8	0.0	5.6	0.0	0.0	0.0	0.0	0.0	0.0
Succor Creek	81.2	24.5	12.0	0.0	2.8	0.0	0.0	0.0	0.8	0.0	0.2
Goat Island	100.9	47.3	20.5	0.0	12.9	0.0	0.1	0.0	0.2	0.0	0.0
Boise Island	65.7	9.6	8.0	11.1	1.8	0.0	2.7	0.0	0.0	0.0	0.0
Prati Island	164.6	77.8	3.3	17.1	3.7	0.0	0.0	0.0	0.0	0.0	0.1
Old Crow Island	102.3	40.1	4.4	23.1	2.1	0.0	3.8	0.0	0.0	0.0	0.0
Morton Island	175.7	70.8	3.2	6.2	3.1	0.0	0.0	0.0	0.0	0.0	0.0
Annear Island	166.2	36.9	6.0	14.8	2.6	0.0	0.6	0.0	0.0	0.0	0.2
Smith-Long Island	85.6	28.3	2.7	36.7	0.0	0.0	0.1	0.0	0.3	0.0	0.0
McRea Island	48.2	48.8	6.4	31.9	1.5	0.0	0.3	0.0	0.0	0.0	0.1
Owyhee Canal	50.7	11.1	6.2	7.8	0.4	0.0	0.0	0.0	0.0	0.0	0.0
Total WPUE by Species (Kg)	1,740	634	283	153	63	15	8	2	1	1	1
% of Total by Species	60	22	10	5	2	1	0	0	0	0	0

*CRP = common carp, CAT = channel catfish, LSS = largescale sucker, FLC = flathead catfish, and SMB = smallmouth bass, BLS = bridgelip sucker, LMB = largemouth bass, WCR = white crappie, PKS = pumpkinseed, BCR = black crappie.

Appendix G. Electrofishing catch per unit effort (fish/h) for 16 Snake River trend monitoring sites sampled during 2006.

Sampling Sites	CSL	WMF	PEA	BLG	YLP	OWF	SUK	MSC	RSS	MWF	Total by Site (Kg)	% of Total WPUE by Site
N Bank Springs	0.3	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	102	4
Guffey Island	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	34	1
Dredge Island	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	85	3
Center Island	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	225	8
Jensen Island	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	429	15
Clarks Island	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	328	11
Succor Creek	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	122	4
Goat Island	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	182	6
Boise Island	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	99	3
Prati Island	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	267	9
Old Crow Island	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	176	6
Morton Island	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	259	9
Annear Island	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	227	8
Smith-Long Island	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	154	5
McRea Island	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	137	5
Owyhee Canal	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	76	3
Total WPUE by Species (Kg)	0	0	0	0	0	0	0	0	0	0	2,901	
% of Total by Species	0	0	0	0	0	0	0	0	0	0		100

* CSL = chiselmouth, WMF = western mosquitofish, PEA = peamouth, BLG = bluegill, YLP = yellow perch, OWF = Oriental weatherfish, SUK = unidentified sucker, MSC = mottled sculpin, RSS = redside shiner, and MWF = mountain whitefish.

UPPER MIDDLE FORK SALMON RIVER CHINOOK SALMON REDD COUNTS

Introduction

Tributaries of the upper Middle Fork Salmon River, including Bear Valley, Elk, and Sulphur creeks possess some of the best remaining spring/summer Chinook salmon spawning habitat in the Snake River basin. Idaho Department of Fish and Game has conducted annual spawning ground surveys on these systems since 1957 to, primarily, enumerate the number of Chinook salmon redds as an index of adult population abundance. Initially, surveys were conducted along fairly long transects (6-8 km) using aerial counts or, less often, on foot; however, beginning in about 1989, transects were shortened (3-4 km) and have been surveyed on foot (Hassemer 1993).

Despite the abundance of high quality spawning and juvenile rearing habitat, overall numbers of wild Chinook salmon have declined precipitously from highs observed during the late 1950-60s. This led to federal listing of Snake River Chinook salmon as threatened under the Endangered Species Act during April 1992. Since then, returning adult abundances have remained critically low, except for a three year period from 2001-2003, when adult numbers rebounded temporarily. During 2004-05, this trend reversed, and adult abundances returned to near historical low levels of the late 1990s.

Objectives

1. To index the abundance of returning wild adult Chinook salmon by counting redds within historical trend monitoring transects in Bear Valley, Elk, and Sulphur creeks during 2006.

2. To compare current redd count information to historical data.

Methods

Spawning ground surveys were conducted along 11 historical trend monitoring transects in Bear Valley, Elk, and Sulphur creeks (Figure 43) from August 23 thru September 21, 2006. Plus, an additional site on Sulphur Creek was surveyed (upstream of OS-4 to the confluence of North Fork Sulphur Creek). The timing of surveys conducted along Bear Valley and Elk creeks occurred within the interval of past sampling dates, though were conducted 3-4 days earlier than normal. Surveys conducted along Sulphur Creek occurred about one month later than normal due to nearby large forest fires.

All surveying techniques followed the protocol outlined by Hassemer (1992). Prior to conducting surveys, surveyors were required to attend an IDFG sponsored training session taught by experienced biologists. Afterwards, pairs of surveyors walked upstream through each transect. After locating a prospective redd site, surveyors determined and recorded whether a redd, multiple redds, or a test dig had been excavated and documented its location with a global positioning system. For each site, surveyors also recorded the number of live and dead adult Chinook salmon observed, as well as their age and sex. Biological samples were collected from salmon carcasses and provided to the Idaho Natural Production Monitoring and Evaluation Project.

Results and Discussion

A total of 31 redds were counted along six transects in Bear Valley Creek during 2006 surveys. Overall, this represents a 65% decline from 2005 (88 redds), a 91% decline from the recent high of 2003 (364 redds), and a 95% decline from the historical high of 1961 (675 redds; Figure 44, 45, and 46). No fish were counted along three transects: WS-9a, WS-9b, and WS-10b. The highest count in Bear Valley Creek of 17 redds occurred at WS-9d. Only 9 and 5 redds were counted along WS-10a and WS-9c, respectively. Transects WS-9a and WS-9b seem to offer less than optimal spawning habitat and counts in these transects combined have often been very low and may only exceed 25-30 redds during peak escapement years.

A total of 53 redds were counted along three transects in Elk Creek during 2006 surveys. Similar to Bear Valley Creek, this represents a decline from last year, as well as a decline from recent and historical highs (Figure 47). Overall, the 2006 count represents a 28% decline from 2005 (74 redds), a 86% decline from the recent high of 2002 (377 redds), and a 92% decline from the historical high of 1961 (654 redds). The majority of the redds (n=36) were located in the most upstream transect, WS-11a. Whereas, 15 and 2 redds were counted in the middle (WS-11b) and lower (WS-11c) transects along Elk Creek.

A total of 26 redds were counted along three transects in Sulphur Creek during 2006 surveys. One of the redds counted was in a non-traditional site that was located just upstream of OS-4 and spanned to the mouth of North Fork Sulphur Creek. This site possessed poor Chinook salmon spawning habitat and should not be added as a trend monitoring site. In contrast to Bear Valley and Elk creeks, counts for Sulphur Creek were higher than 2005, possibly due to the later than normal sampling, but still depressed from recent and historical highs (Figure 48). Overall for Sulphur Creek traditional transects, the 2006 count (25 redds) represented a 92% increase from 2005 (13 redds), a 73% decline from the recent high of 2002 (93 redds), and a 93% decline (only comparing WS-12, 18 redds in 2006) from the historical high of 1957 (381 redds).

Over the three monitoring streams and 11 traditional transects combined, a total of 109 redds were counted in 2006. This is the eleventh lowest count over the 50 year record and represents a more than 92% decline in abundance from the high of 1440 redds counted across these streams in 1957. Though abundances were inarguably low for 2006, I believe that counts for Bear Valley and Elk creek may have been biased low slightly from traditional index counts due to timing of counts, the timing of the salmon run, and higher counts in Sulphur Creek. Due to large forest fires, I was forced to conduct counts on Bear Valley and Elk creeks about 3-4 days earlier than normal, which could have reduced the number of redds available for counting, though we saw few live fish so the magnitude of this bias was probably minimal. Additionally, during 2006, salmon runs across much of the Pacific Northwest were approximately 2 weeks later than normal. If late migration led to later than normal redd excavation in Bear Valley and Elk creeks, counts may have been biased low. The higher counts in Sulphur Creek were noted at a sample date that was one month later than normal seem to support these notions. It seems unlikely that counts have declined in Bear Valley and Elk creeks and increased in Sulphur creeks as adult abundances have become highly synchronous (Issak et al. 2003). Alternatively, by counting redds at such a late date when redds had aged, it is possible that we artificially inflated the Sulphur Creek count by counting 2005 redds in addition to 2006 redds. Though there were some potential biases due to the above mentioned factors, their magnitude was most likely minimal. From our surveys, it was apparent that adult densities have dropped back to near historic low levels after 30-35 year highs experienced only 3 or 4 years ago. These critically low adult abundances increase the likelihood that these populations could be extirpated by stochastic events.

Management Recommendations

1. Continue to index the abundance of wild adult Chinook salmon by counting redds in Bear Valley, Elk, and Sulphur creeks.

2. Continue to pursue strategies that improve down river and ocean survival of these stocks.

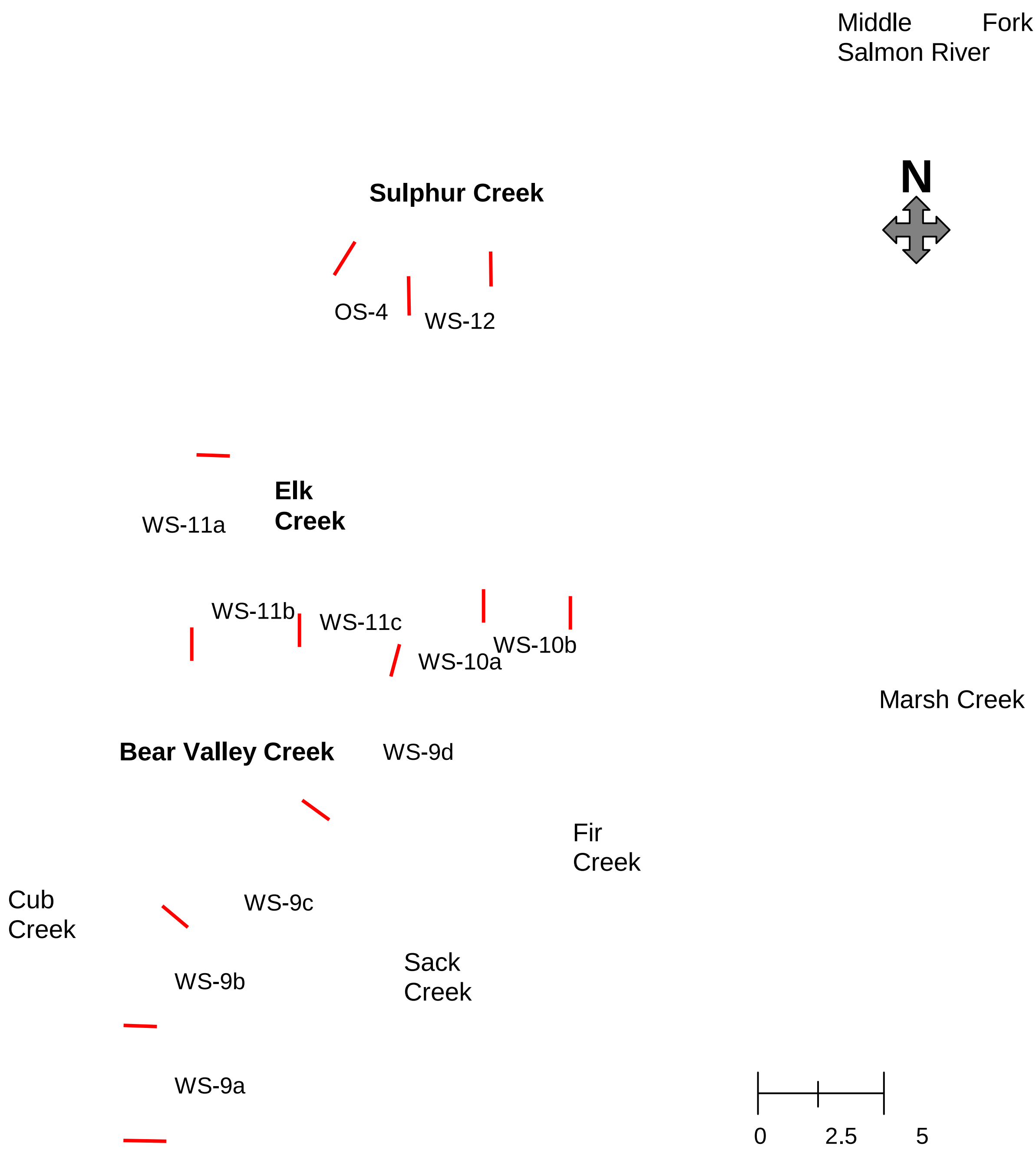


Figure 43 . Location of 11 redd count trend transects on Bear Valley, Elk, and, Sulphur creeks used to index the abundance of wild spring/summer-run Chinook Salmon in the upper Middle Fork Salmon River Drainage, ID. Red lines denote transect boundaries.

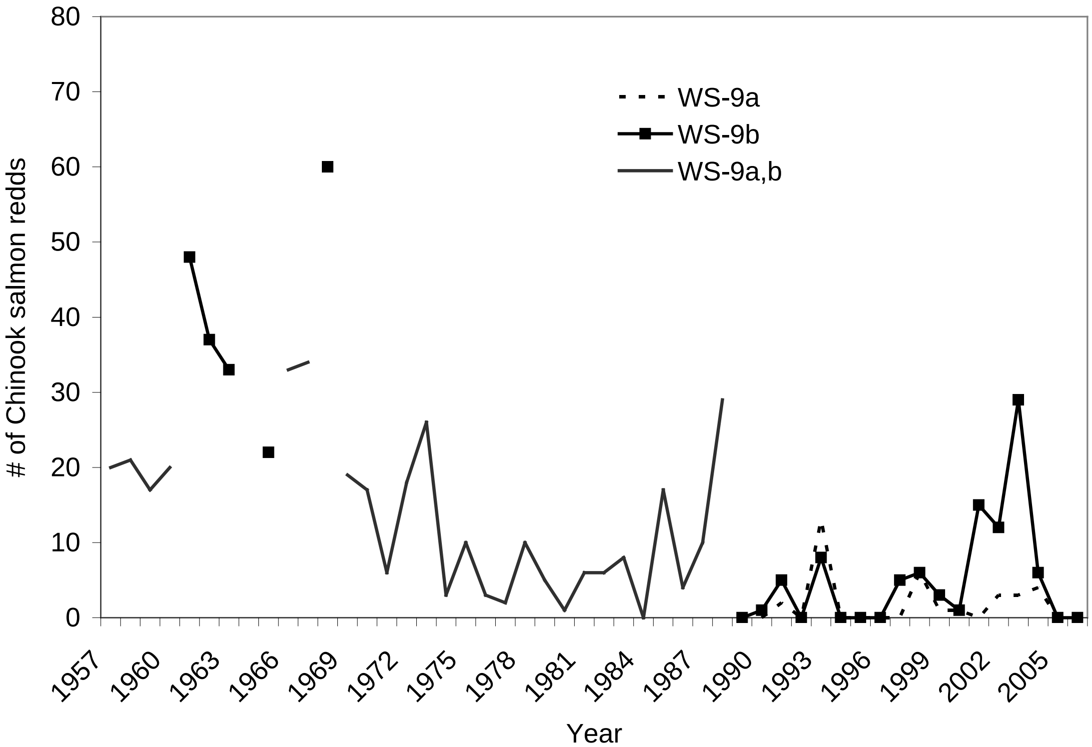


Figure 44. Number of Chinook salmon redds counted along upper Bear Valley Creek index transects from 1957-2006. The green line represents a cumulative count for WS-9a & b that was monitored in most years from 1957 to 1989.

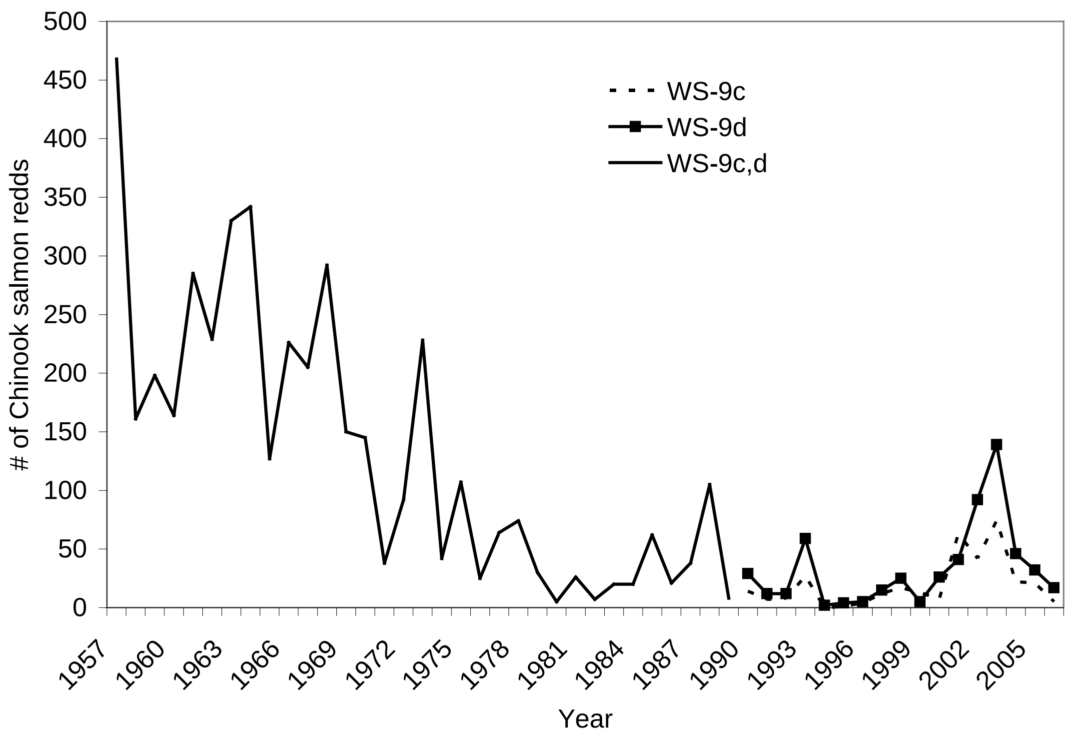


Figure 45. Number of Chinook salmon redds counted along middle Bear Valley Cr. index transects from 1957-2006. The green line represents cumulative counts for WS-9c & d.

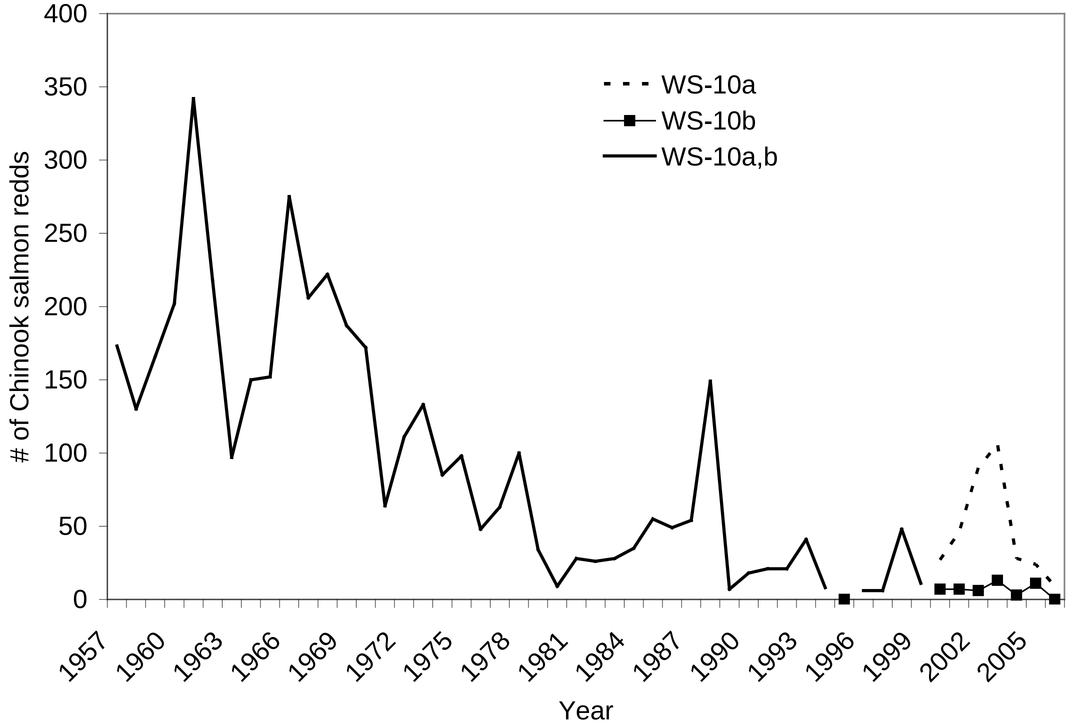


Figure 46. Number of Chinook salmon redds counted along lower Bear Valley Cr. index transects from 1957-2006. The green line represents cumulative counts for WS-10a & b.

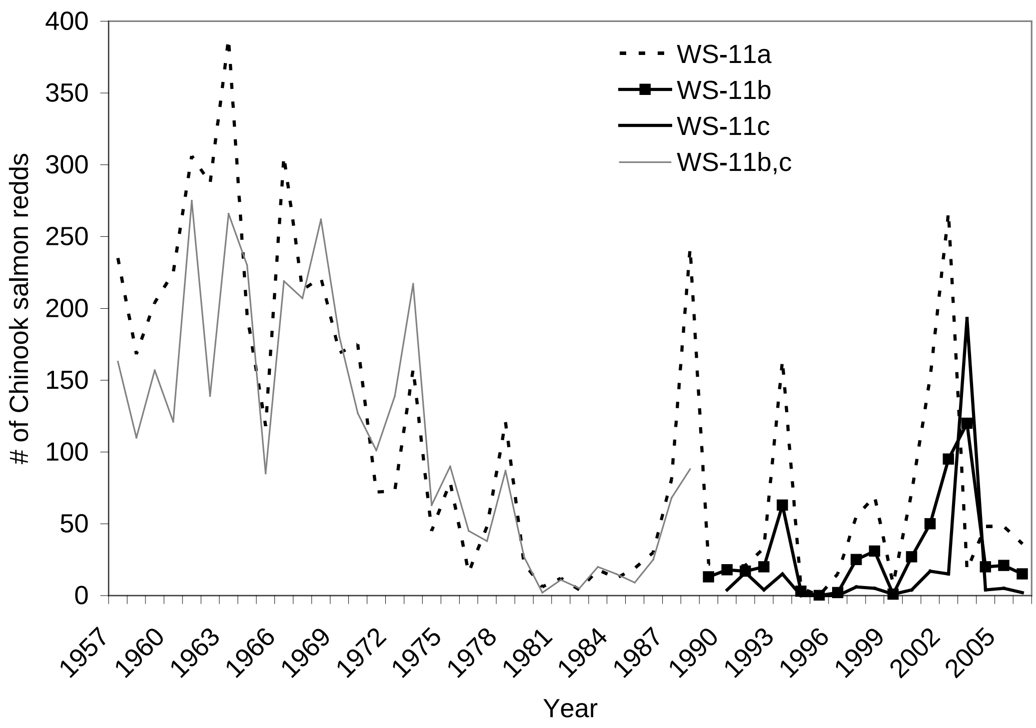


Figure 47. Number of Chinook salmon redds counted along Elk Creek index transects from 1957-2006. The light blue line represents a cumulative count for WS-11b and WS-11c, whereas all other lines represent individual transects.

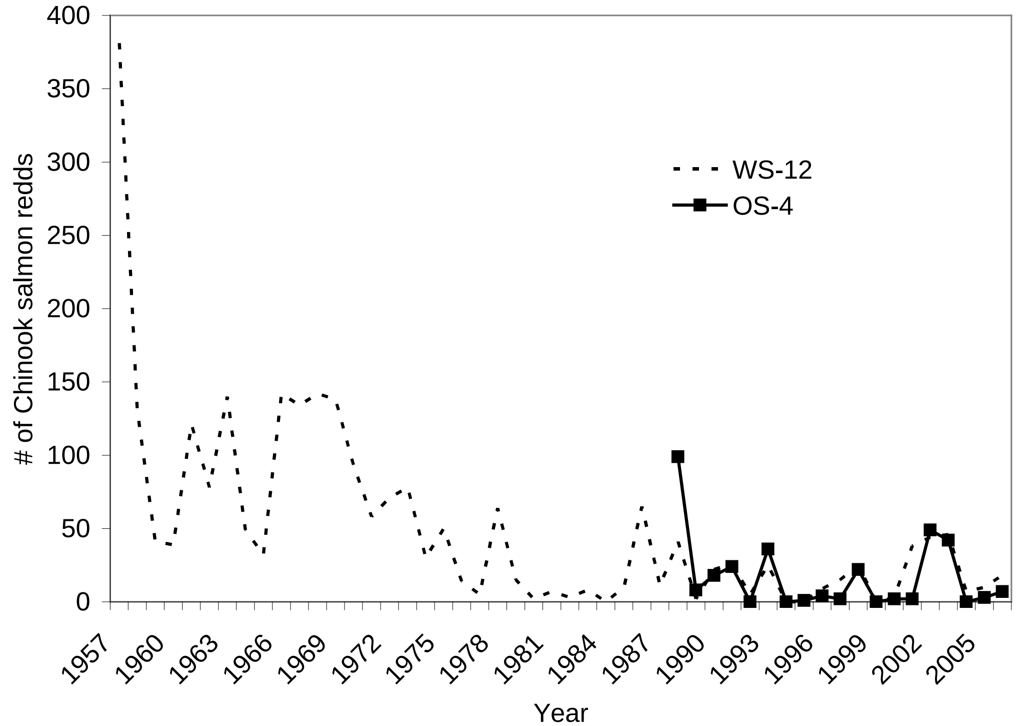


Figure 48. Number of Chinook salmon redds counted along Sulphur Creek index transects from 1957-2006.

BRUNEAU RIVER

Introduction

The Bruneau River originates in the Mahogany and Copper mountains of northern Nevada. After flowing north for about 35 km, the river enters Idaho. The Bruneau River continues on its northerly path and flows un-impounded for 105 km through a steep, narrow canyon that bisects the high desserts of southern Idaho. Shortly after leaving these dessert canyon lands, the river is interrupted by two irrigation diversion dams that divert water into the Hot Springs Canal and Buckaroo Ditch thus providing irrigation water for agricultural production in the Bruneau Valley. Below these diversions, for the next 20 km, flow is often intermittent; however, during good water years or spring runoff, surface water reaches the impounded waters of the Snake River in the Bruneau Arm of C. J. Strike Reservoir.

The fish community in the Bruneau River above the Hot Springs diversion dam, the uppermost diversion dam, is thought to include only native species. Redband trout, northern pikeminnow, chiselmouth, bridgelip sucker, largescale sucker, redside shiner, as well as longnose, leopard, and speckled daces *Rhinichthys cataractae, R. falcatus,* and *R. osculus* are known to reside in the Bruneau River drainage (Simpson and Wallace 1982). Native bull trout are present in the Jarbidge River, a tributary to the Bruneau River, but are restricted to headwater reaches. Immediately below the mouth of the Bruneau River in C. J. Strike Reservoir, non-native piscivorous species, especially channel catfish and smallmouth bass, are abundant (Flatter et al. 2003). The presence of channel catfish and smallmouth bass has been implicated in the decline of native species in other rivers (Marsh and Douglas 1997; Fritts and Pearsons 2004). Fortunately, the diversion dams in the lower Bruneau River are thought to act as migration barriers. Previous sampling efforts that occurred in the upper and middle reaches of the Bruneau River did not identify any non-native fish (K. Meyer and S. Elle, IDFG, unpublished data); however, no sampling was conducted in the lower Bruneau where non-native fish are more likely to occur. This sampling effort was initiated to fill this data gap.

Objectives

1. Determine whether non-native fish species are present in the lower Bruneau River immediately above the Hot Springs diversion dam

2. Describe the abundance and composition of native species in the lower Bruneau River immediately above the Hot Spring diversion dam.

Methods

We used canoe electrofishing gear to sample the fish population in the lower Bruneau River above Hot Springs Diversion dam on October 2, 2006. The sampling gear consisted of a Coffelt VVP15 powered by a 5,000 watt generator. The two positive electrodes were mobile and throw-able allowing coverage of the entire river channel. An aluminum canoe acted as the negative and held the VVP, generator, and livewell. Electrofishing was conducted in an upstream direction from approximately 200 m above the Hot Spring Diversion dam near the whitewater boat ramp (11T 604740, 4736574) upstream to near the mouth of Hot Creek (11T 604181, 4735751). A total of 1.9 units of standard electrofishing effort (6753 sec) were used over the approximately 2 km of stream sampled (Figure 49). The crew consisted of six people, three of which were netters. Stunned fish were netted and transferred to a livewell. Fish were identified to species, measured to the nearest mm weighed to the nearest gram, and released. Dace spp. were pooled and enumerated in the field with a sub-sample was for later identification. Afterwards, three dace species were identified, but relative abundance could not be determined.

Results and Discussion

A total of 1,047 fish were caught comprised of 10 different species. All fish sampled were native, non-game fish, except for one blue tilapia *Oreochromis aureus* that was caught near the Hot Creek springs. Additionally, a few juvenile tilapia were visually identified in the hot springs pool (aka Indian Bathtub) immediately upstream on the electrofishing site. Largescale sucker were the most numerous species sampled representing 35% of the catch, followed by chiselmouth (31%), northern pikeminnow (16%), and bridgelip sucker (12%). Length frequencies for these species indicated that multiple year classes were likely present. Four other species accounted for the remainder of the catch, including redside shiner and three species of dace.

The lower Bruneau River fish community is of little interest to anglers due to the lack of sport fish. The only game fish residing in the drainage, the redband trout, was not sampled in this section of the river. However, this section, is unique and valuable from a native fish conservation perspective in that non-native fish species were very rare and a relatively high number of native fish species were present. In fact, the Bruneau River likely represents one of only a few remaining fourth order or larger drainages in Idaho not significantly impacted by non-native fish species. Only one species of non-native fish, the blue tilapia, was present albeit at very low densities. It is unlikely that tilapia are a threat to native fish species as they are dependent entirely on warm water inflows from the several small hot springs. Therefore, their habitat is very limited, especially during winter when river temperatures drop. If desired, these non-natives could be removed by spot application of rotenone during the winter. The physical integrity of the diversion dams (i.e. migration barriers) is probably of greater concern due to their age and dilapidated state. If these structures failed, non-native species would almost certainly gain access to the drainage from the river below the diversions or from C. J. Strike Reservoir.

Management Recommendations

1. Manage the Bruneau River and its' tributaries above the Hot Springs diversion dam for native, non-game species and redband trout.

2. Find funding sources to improve or rebuild the current diversion structures to prevent failure and possible migration of non-native fish into the middle and upper Bruneau River.

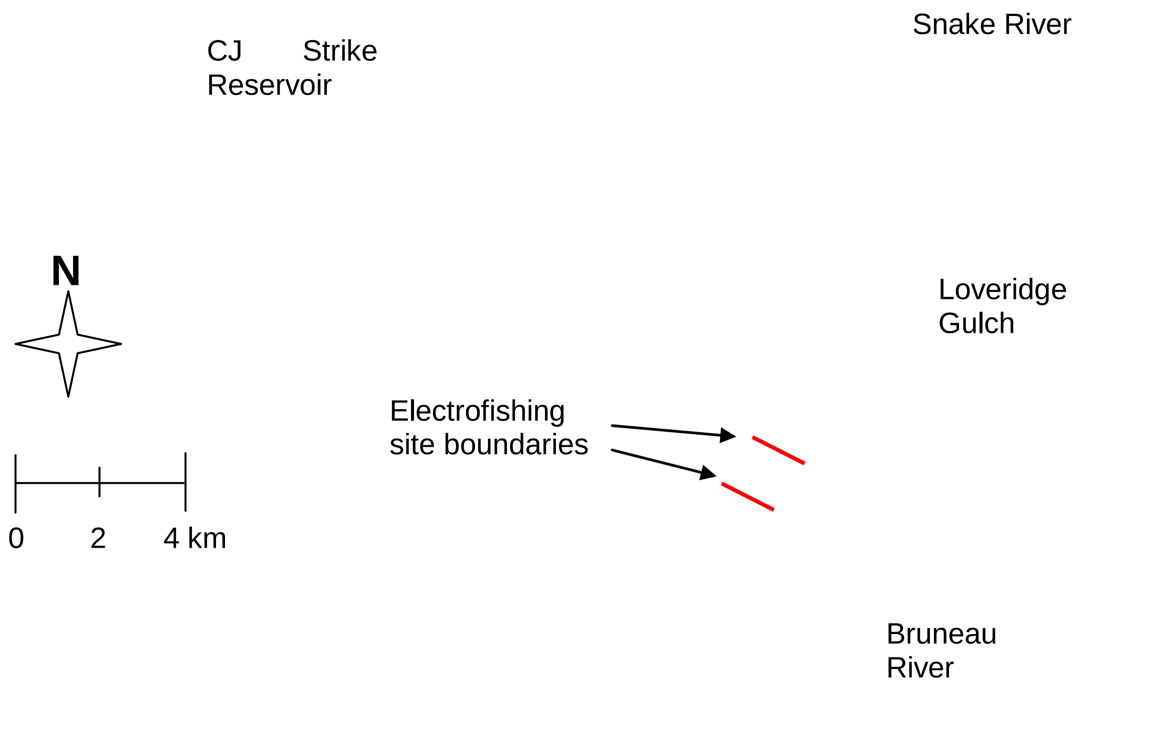


Figure 49. Location of an electrofishing section sampled in the Bruneau River during 2006 to determine whether nonnative fish species had migrated above barriers in the lower river.

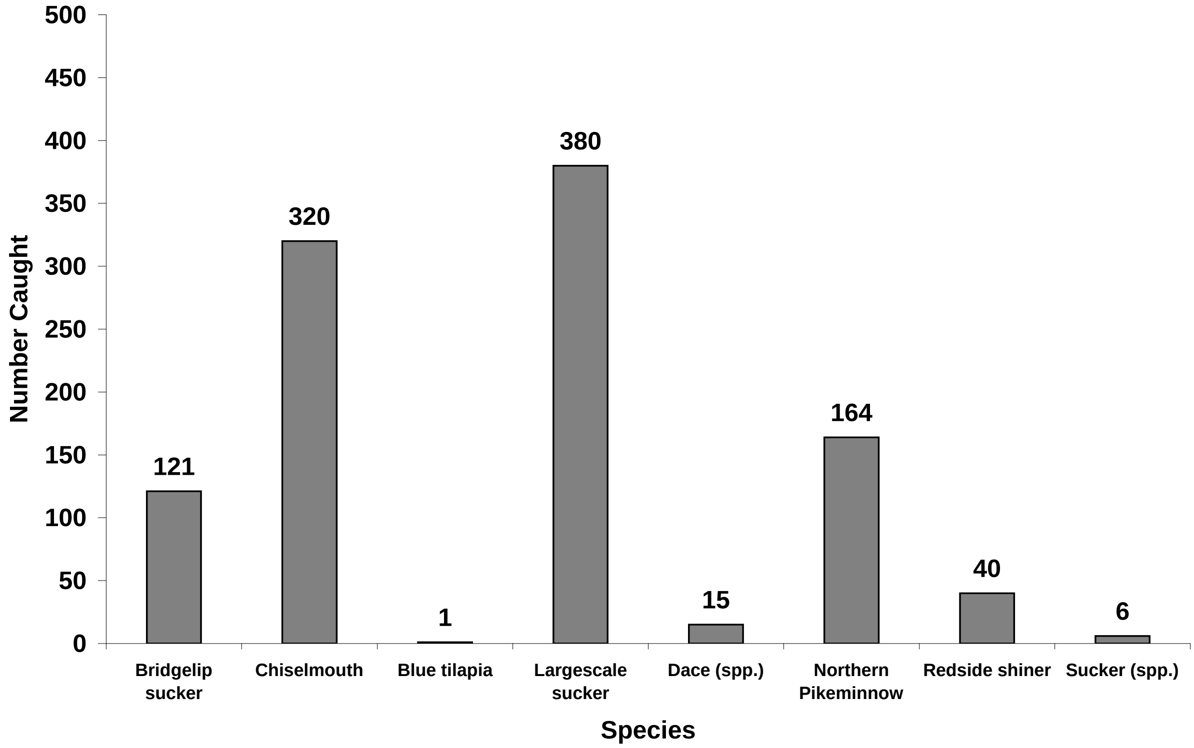


Figure 50. Total number of fish sampled by species in the lower Bruneau River. The site spanned from 200 m upstream of the Hot Springs Diversion upstream to the confluence of the Bruneau River and Hot Creek. Dace and very small sucker were

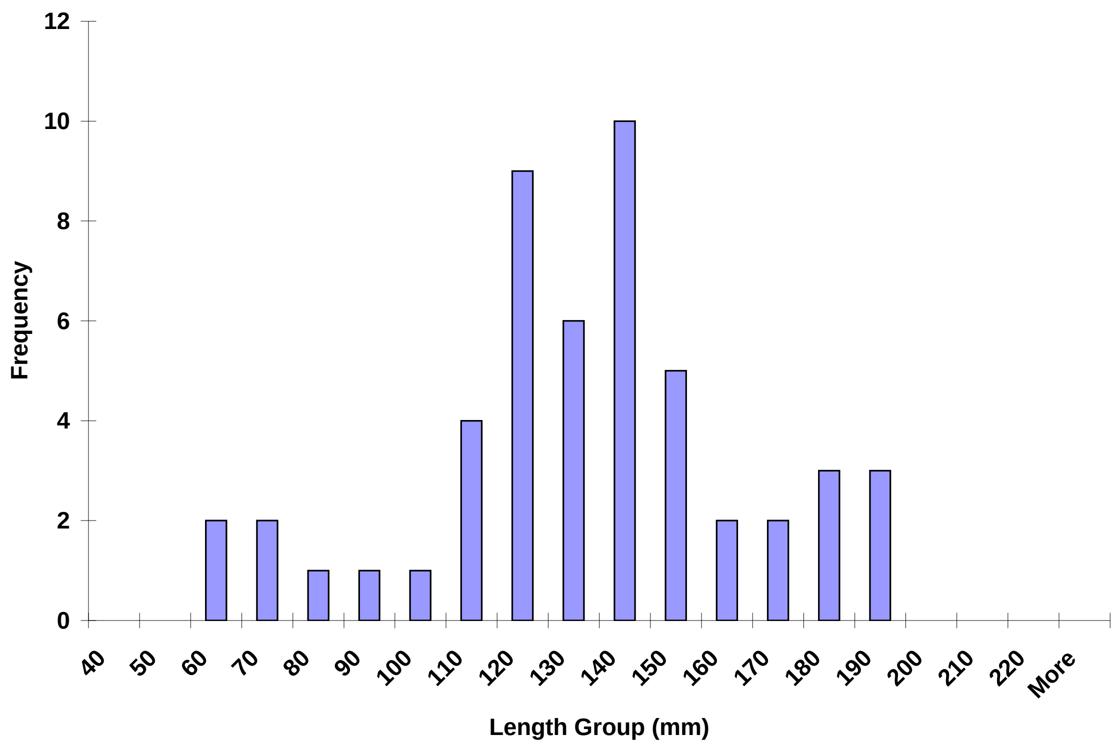


Figure 51. Length frequency for bridgelip sucker sampled in the lower Bruneau River during October 2006.

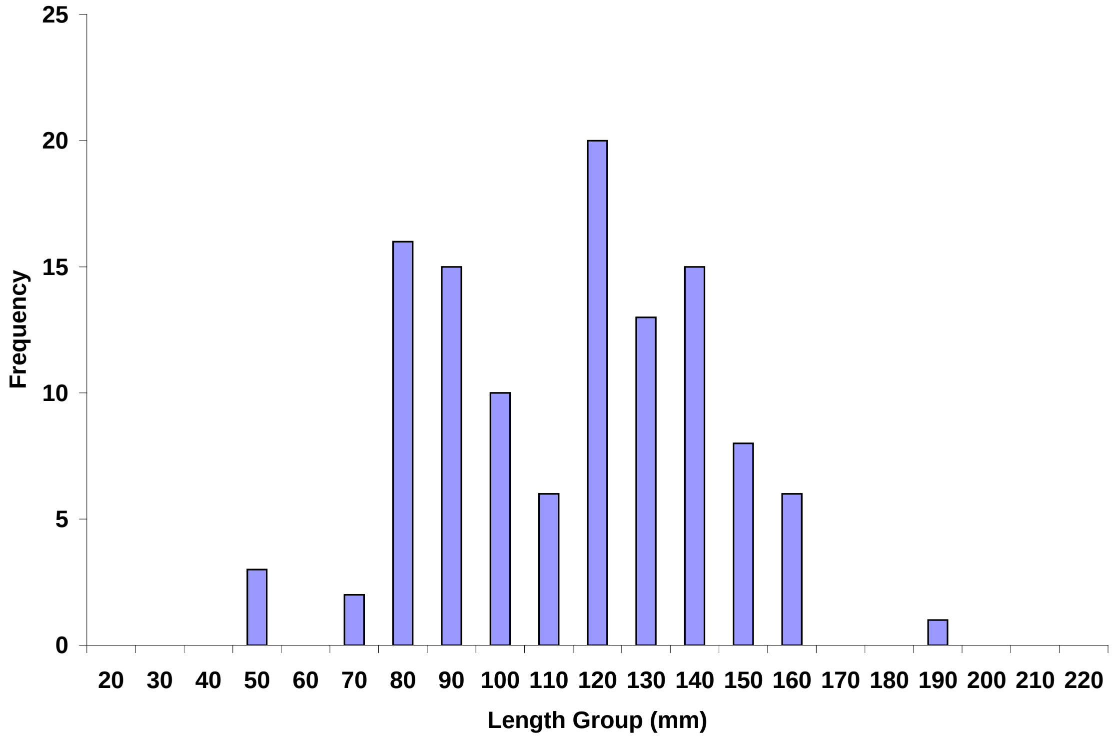


Figure 52. Length frequency for chiselmouth sampled in the lower Bruneau River during October 2006.

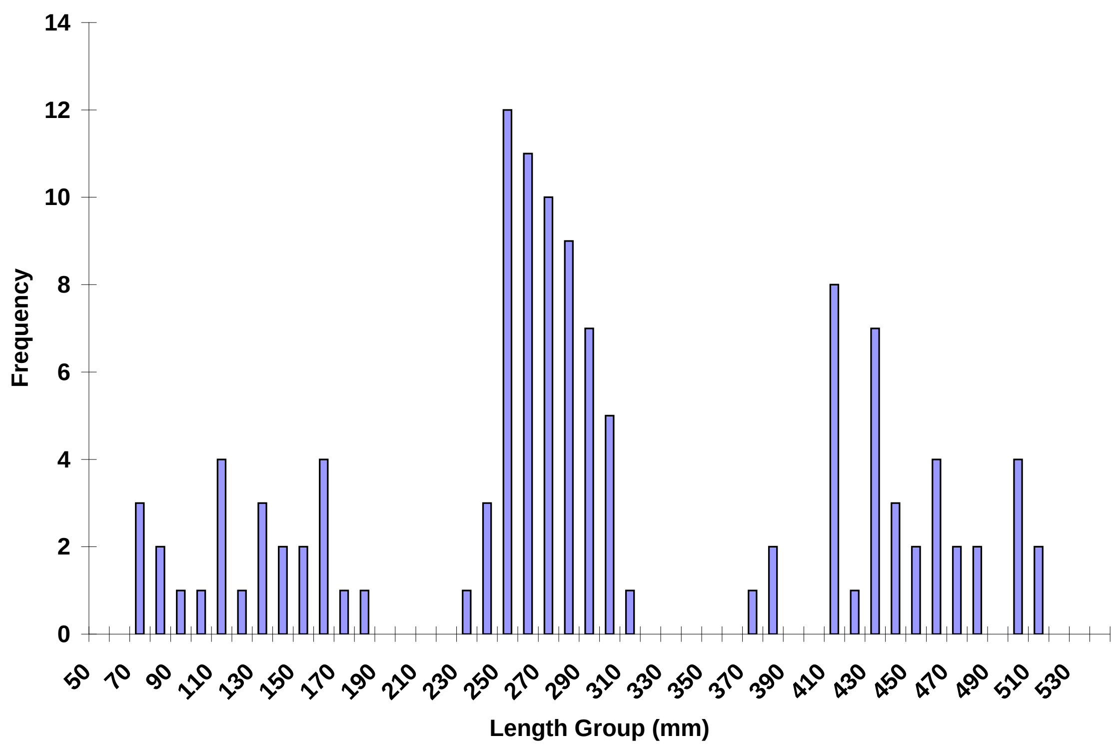


Figure 53. Length frequency for largescale sucker sampled in the lower Bruneau River during October 2006.

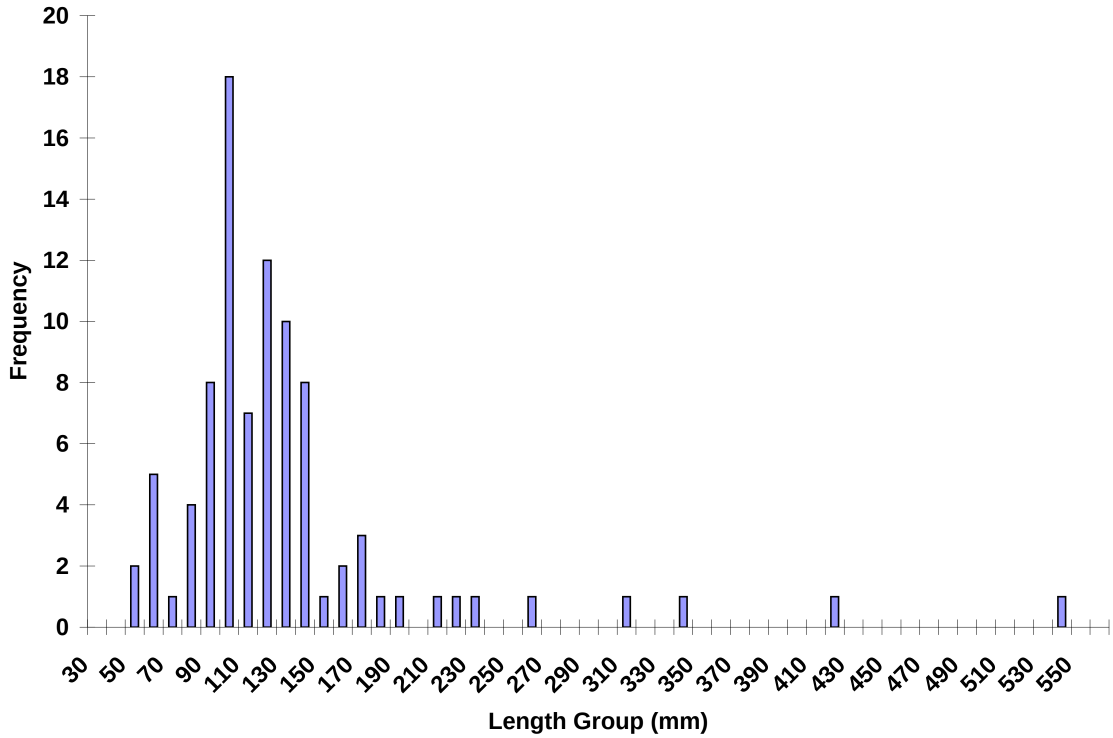


Figure 54. Length frequency for northern pikeminnow sampled in the lower Bruneau River during October 2006.

SOUTH FORK BOISE RIVER ELECTROFISHING SURVEY

Introduction

Rivers downstream from dams form some of the most valued trout fisheries in the western U.S. The South Fork Boise River below Anderson Ranch Dam is a highly valued trout fishery and was the first river section in Southwest Idaho to be managed under "Quality Trout" regulations. Regulations restrict terminal tackle to no bait and barbless hooks from Neal Bridge (Forest Road 189) upstream to Anderson Ranch Dam. Rainbow trout harvest is restricted to 2 fish, none under 20 inches (508 mm). The fishery is supported by a population of wild rainbow trout and mountain whitefish. Migratory bull trout are present at very low densities.

Methods

Rainbow trout populations in the South Fork Boise River have been monitored in a 9.6 km section every three years since 1994. The section starts at the boat ramp near Reclamation Village (4.2 km downstream from the dam) and ends at the take-out 1.1 km downstream from Cow Creek Bridge (Flatter et al. 2003). Previous surveys on this reach used raft mounted electrofishing gear to estimate abundance and size structure. In 2006 we made the decision to more intensively sample shorter reaches within the historic section. We identified three stream reaches approximately 1 km in length located within the boundaries of the original reach. The upper boundary corresponded to the starting point of the historic section and the end of the lower reach corresponded to the end of the historic section. The middle section corresponded to the section sampled for density in 2003. Riffles formed the upper and lower reach boundaries. Section length was determined from 1:24 k topographic maps. Wetted widths were measured with a hand-held laser range finder (Leupold RX series). Section area was estimated by multiplying mean widths and section length. For braided channels mean width was measured across the river excluding any distances across islands.

We used mark-recapture techniques to estimate abundance of trout and mountain whitefish in each section. Fish were collected with a canoe electrofishing unit consisting of a 5.2 m Grumman aluminum canoe fitted with two mobile anodes connected to 15.2 m cables. The canoe served as the cathode and carried the generator, Coffelt VVP-15, and a live well for holding fish. Oxygen was introduced to the live well (2 l/min) through an air-stone. Pulsed direct current was produced by a 5,000 watt generator (Honda EG500X). Frequency was set at 60 pulses per second and a pulse width of 60-80, with an output of 4-5 amperes. Crews consisted of six to seven people. Two operators managed the mobile anodes, one person guided the canoe and operated the safety switch controlling the output, the remaining crew of four or five people were equipped with dip nets to capture stunned fish. Only trout and whitefish were placed in the live well.

Marking and recapture runs were conducted with a single pass from upstream to downstream. The canoe was held upstream of the anode operators. Anodes were swept through the water or thrown across the stream and retrieved. Crews with dip nets walked backward facing upstream, while staying downstream of the anodes and capturing stunned fish. Fish were placed in the live well. When the live well was judged to be at capacity the crew stopped at the nearest riffle to process fish.

Rainbow trout, mountain whitefish and bull trout were marked on October 19, 20. Fish were marked with a 7 mm diameter hole from a standard paper punch on the upper, middle or lower section of the caudal fin corresponding to their capture reach. Only fish larger than 100 mm were marked. Fish were measured for total length (mm) and a subset were weighed (g). Fish were released 50 to 100 m upstream from the processing site to prevent them from drifting downstream into the next section of water to be sampled. Recapture sampling was completed on October 24 - 25. During the recapture effort all whitefish and trout greater than 100 mm were captured and placed in the live well. Fish were examined for marks on the caudal fin. All fish were measured for length (mm). All bull trout were scanned for presence of passive integrated transponder tags (PIT).

To account for selectivity of electrofishing gear population estimates (N) were calculated using a maximum likelihood estimation to fit the recapture data. A capture probability function of the form

$$Eff = (exp(-5+\beta_1 L+ \beta_2 L^2)) /(1+ exp(-5+\beta_1 L+ \beta_2 L^2))$$

where Eff is the probability of capturing a fish of length L, and β_1 and β_2 are estimated parameters (MFWP 2004). Then N is estimated by length group where M is the number of fish marked by length group.

$$N = M / Eff$$

Population estimates were calculated for each reach and pooled for a comprehensive estimate expressed as # fish/km for comparison to previous surveys. Three rainbow trout mortalities were excluded from the population estimates.

Rainbow trout population estimates (Ň) for surveys from 1994 – 2003 were calculated using the Modified Petersen equation for fish >129 mm and >239 mm. In order to make comparisons with the 2006 estimates I used the Modified Petersen equation to estimate the rainbow trout population for the 2006 survey.

$$\check{N} =[((M+1)*(C+1)) / (R+1)] - 1$$

Where M is the number of fish marked, C is the number of fish captured and R is the number of fish recaptured. Population estimates and proportional stock density (PSD) values for previous surveys were taken from Flatter et al. (2003). The PSD index was calculated using the equation from Anderson (1976) with rainbow trout values from Anderson and Neumann (1996).

$$PSD = [\text{Rainbow trout} \geq 400 \text{ mm} / \text{Rainbow trout} \geq 250 \text{ mm}] * 100$$

Results and Discussion

We captured 420 wild rainbow trout and 7 hatchery rainbow trout greater than 100 mm in the three sections combined (Figure 55). We marked 255 rainbow trout and recaptured 30 of the marked fish. We estimated 705 rainbow trout / km for the 9.6 km section (Figure 56). Hatchery rainbow trout were included in the population estimate. Rainbow trout population estimates were similar between reaches (Figure 56). Low numbers of recaptured rainbow trout (n=5) influenced the population estimate for the middle reach. The number of large rainbow trout in the South Fork Boise River has increased over the last 10 years but the numbers of fish between 129 and 239 mm has declined (Figure 55). We captured five bull trout in the two sections. Four bull trout were between 331 and 370 mm total length, with one 505 mm. One bull trout had been previously tagged with a PIT tag on September 27, 2005 at a weir operated by the Bureau of Reclamation on the North Fork Boise River. The bull trout was 217 mm and 86 g at tagging and 341 mm and 388 g when recaptured. Population estimates for mountain whitefish will be presented in a separate report as part of a statewide mountain whitefish status review.

Rainbow trout populations in the South Fork Boise River have been relatively stable, but the relative absence of trout in the 200 to 400 mm length range is puzzling. The numbers of trout greater than 400 mm are currently providing an excellent fishery despite the decline of smaller trout in the survey section. Using the canoe electrofishing gear increased sampling efficiency for smaller fish (Figure 58). The peculiar bi-modal length frequency plot is atypical of what would be considered a normal population. The explanations for the missing length groups could be attributed to fish of those sizes occurring outside our sampling area or the larger fish could be migrating to the system from Andersen Ranch Reservoir, Arrowrock Reservoir or unsampled reaches downstream.

Management Recommendations

1. Analyze flow data and fish abundance data from previous surveys to evaluate relationships.

2. Summarize fish stocking history for reservoirs above and below and compare to observed population trends.

3. Continue to monitor rainbow trout population trends on 3 year intervals or less.

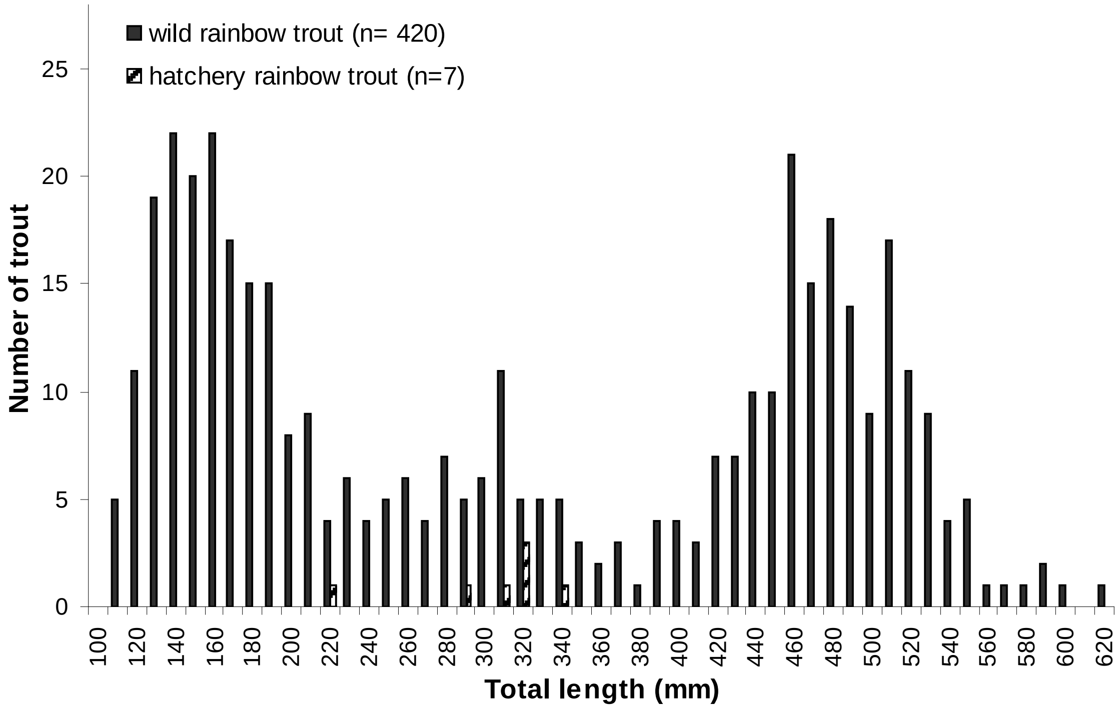


Figure 55. Length of rainbow trout captured by electrofishing on the South Fork Boise River downstream from Andersen Ranch Dam in 2006. Only trout greater than 100 mm total length are included.

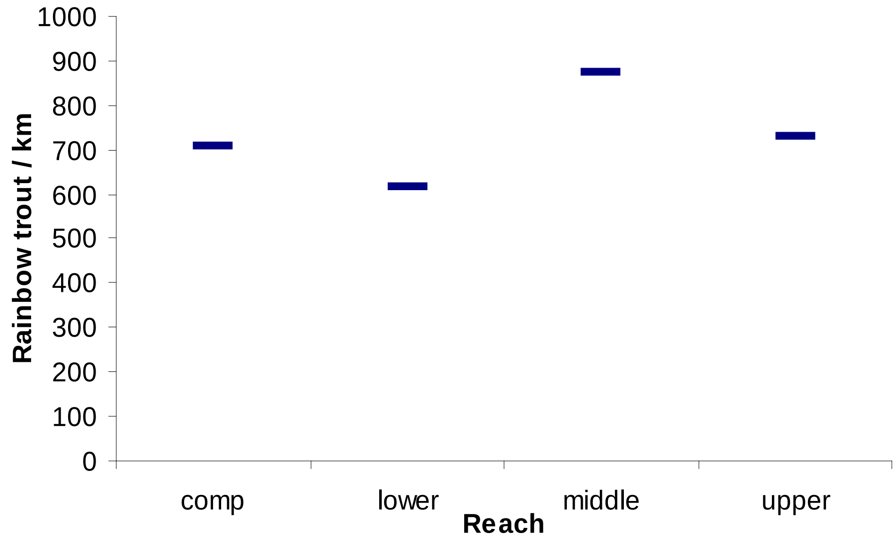


Figure 56. Linear density estimates for rainbow trout (>100mm) by reach for the South Fork Boise River in 2006 from maximum likelihood estimation. Comp is the estimate from pooling the data from all three reaches.

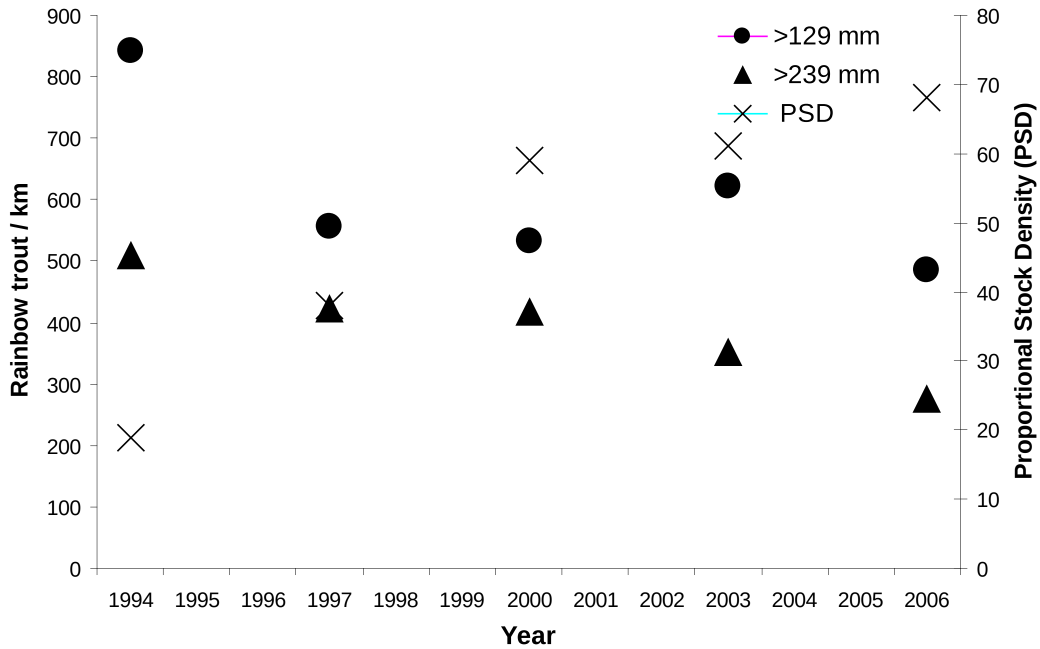


Figure 57. Linear density and Proportional Stock Density (PSD) for rainbow trout on the South Fork Boise River downstream from Andersen Ranch Dam between 1994 and 2006. Estimates for 2006 were for rainbow trout > 130 mm and > 240 mm.

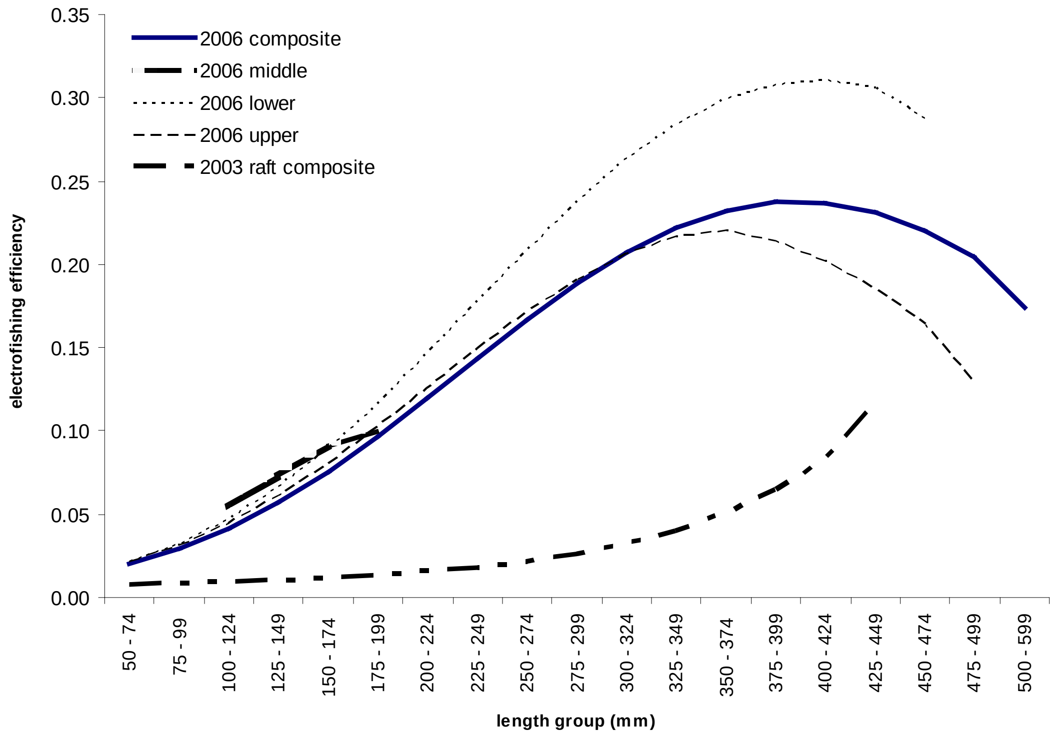


Figure 58. Sampling efficiency curves for 2006 canoe electrofishing sampling and for 2003 raft electrofishing sampling by section.

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