FISHERY MANAGEMENT INVESTIGATIONS

IDAHO DEPARTMENT OF FISH AND GAME

FISHERIES MANAGEMENT ANNUAL REPORT

Virgil Moore, Director

SOUTHWEST REGION

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2011 Southwest Region (Nampa) Annual Fishery Management Report

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2010 Southwest Region (Nampa) Fisheries Management Report

Lowland Lake Surveys

Rough fish reduction in Arrowrock Reservoir

ABSTRACT

Arrowrock Reservoir is a 3,150 ha, dendritic impoundment located approximately 32 km northeast of Boise, Idaho in the upper Boise River drainage. Results of a recent lowland lake survey suggested that 88% of the total fish biomass was estimated to be comprised of northern pikeminnow *Ptychocheilus oregonensis*, largescale sucker *Catostomus macrocheilius*, and bridgelip suckers *Catostomus columbianus*. Intensive netting operations in Arrowrock Reservoir were conducted with three types of sampling gear during October 24 – November 11, 2011 throughout the reservoir in an effort to depress these populations. In total, 24 trap net sets, 57 gill net sets, and 13 beach seine hauls were conducted in 2011. A total of 12,001 fish were captured during fall netting efforts. Catch was predominantly largescale and bridgelip sucker *sp.* (*n* = 6,297) and northern pikeminnow (*n* = 4,079). A total of 971 yellow perch *Perca flavescens*, 234 mountain whitefish *Prosopium williamsoni*, 133 smallmouth bass *Micropterus dolomieu*, 114 rainbow trout *Oncorhynchus mykiss*, and 96 bull trout *Salvelinus confluentus* were also captured. A total of 5,077 kg of sucker *sp.* and 1,510 kg of northern pikeminnow were removed from their respective populations. An additional three weeks of intensive netting will begin in March 2012 and IDFG hopes to remove another 6,000 to 8,000 kg of rough fish during these efforts. The success of these efforts will then be evaluated by comparing lowland lake CPUE and WPUE estimates from a forthcoming June 2012 survey to that of the June 2009 survey. We are hopeful that these efforts will have resulted in a measurable reduction in abundance and biomass of northern pikeminnow and sucker *sp.* in Arrowrock Reservoir.

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INTRODUCTION

Arrockrock Reservoir is a 3,150 ha, dendritic impoundment located approximately 32 km northeast of Boise, Idaho in the upper Boise River drainage (Figure 1). It is a 29 km-long, narrow canyon reservoir that impounds two major tributaries; the Middle Fork Boise River (MFBR) and South Fork Boise River (SFBR). Arrowrock Dam, operated by the U.S. Bureau of Reclamation (BOR), sits directly upstream of Lucky Peak Reservoir. Due to its close proximity to Boise, the reservoir is a popular recreational area for boaters and anglers. The reservoir provides sport fisheries for rainbow trout *Oncorhynchus mykiss*, kokanee *Oncorhynchus nerka*, and smallmouth bass *Micropterus dolomieu*. An adfluvial population of bull trout *Salvelinus confluentus* also resides in Arrowrock Reservoir. According to historic Idaho Department of Fish and Game (IDFG) gill netting surveys, the fish community is dominated by two nongame species; northern pikeminnow *Ptychocheilus oregonensis* and largescale sucker *Catostomus macrocheilius*. In addition, yellow perch *Perca flavescens*, bridgelip sucker *Catostomus columbianus*, chiselmouth *Acrocheilus alutaceus*, and redside shiner *Richardsonius balteatus* have also been observed frequently in the reservoir.

Arrowrock Reservoir is managed by BOR for irrigation storage and flood control. Typically the reservoir experiences drawdowns of 60-70% of capacity during the irrigation season while Lucky Peak is managed at full capacity through the first week of September for recreation. After Labor Day, Arrowrock Reservoir begins refilling while Lucky Peak Reservoir is dropped for storage space for the following spring runoff. During fall 2003, Arrowrock Reservoir was drafted to approximately 1% of capacity for dam repairs. During this period, much of the reservoir was reduced to a river channel which likely caused high levels of mortality to many species.

Despite stocking over 1.3 million rainbow trout since the 2003 drawdown, IDFG regional fishery personnel field complaints every summer regarding poor catch rates. Many anglers also reported catching only northern pikeminnow during fishing trips. Results of a lowland lake survey further corroborated angler reports. During June 2009, 88% of the total biomass was estimated to be largescale suckers (48%) and northern pikeminnow (39%; Butts et al 2010). Rainbow trout comprised <1% of the total biomass during the survey.

During the fall of 2011, U.S. Bureau of Reclamation (BOR) contracted with a commercial fishing operation, Hickey Brothers Inc., to conduct intense gillnetting and trap netting in the reservoir to obtain a mark-recapture population estimate for bull trout. The marking efforts were conducted during November 2011 and the recapture efforts are scheduled for March 2012. IDFG is cooperating with these efforts – which include enumeration and euthanizing all northern pikeminnow and sucker sp. encountered during the netting activities. Effectiveness of removal efforts will be assessed during a lowland lake survey that will be conducted in June 2012.

METHODS

Netting operations in Arrowrock Reservoir were conducted with three types of sampling gear during October 24 – November 11, 2011 throughout the reservoir (Figure 1). Sampling gear included: (1) gill nets, (2) stationary trap nets, and (3) beach seine. Gill nets were sinking monofilament nets, 91- m x 2-m, with mesh sizes of 38, 59, 64, 76, and 89 mm. Gill nets were tied together lengthwise so that total net length was 364 m. Gill nets were retrieved shortly after deployment to minimize bull trout mortality. Trap nets possessed a 122-m leads, 23-m hearts, to a 5-m x 3.7-m x 3.7-m pot with 19-mm bar mesh, and had been treated with black tar. The beach seine was 91-m x 6-m deep and 6-mm bar mesh, with a 6-m bag. Trap nets were checked and processed every two days. In total, 24 trap net sets, 57 gill net sets, and 13 beach seine hauls were conducted during fall 2011. Duration and mesh composition of gill net sets were varied during the netting operation making catch-per-unit-effort (CPUE) and weight-per-unit-effort (WPUE) estimates not meaningful.

Captured fish were identified to species, and up to 300 individuals of each species were measured for total length (± 1 mm), and weighed (±1 g for fish under 5,000 g 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 established from fish weighed and measured which allowed us to estimate weights of un-weighed fish.

RESULTS

A total of 12,001 fish were captured during fall netting efforts (Table 1). Catch was predominantly largescale and bridgelip suckers (*n* = 6,297) and northern pikeminnow (*n* = 4,079). A total of 971 yellow perch, 234 mountain whitefish, 133 smallmouth bass, 114 rainbow trout, and 96 bull trout were also captured. Remaining fish species sampled included chiselmouth, kokanee, and cutthroat trout (*O. clarkii lewisi*). A total of 5,077 kg of sucker *sp.* and 1,510 kg of northern pikeminnow were removed from their respective populations.

Northern pikeminnow ranged between 47 and 530 mm; however, 85% were between 300 and 400 mm and likely belong to a single year class (Figure 2). Fish that measured <100 mm were collected by beach seining only, due to both mesh size and habitat use.

Largescale and bridgelip suckers were not consistently identified correctly by non-IDFG staff involved in netting efforts so these species were combined for analysis purposes. Sucker *sp.* ranged from 196 to 553 mm with over 91% of fish between 380 and 530 mm (Figure 2).

A total of 18 wild and 96 hatchery rainbow trout were captured during the survey. Wild rainbow trout ranged between 340 and 410 mm, while hatchery trout ranged between 190 and 500 mm (Figure 3).

Yellow perch were the third most abundant fish captured, primarily in trap nets (n = 971). Yellow perch ranged from 60 to 350 mm, with 77% over 200 mm (Figure 4). Mountain whitefish were captured frequently in gill nets (n = 234) and ranged from 170 to 510 mm. Smallmouth bass were primarily captured in gill nets and ranged from 140 to 540 mm.

DISCUSSION

Although over one million fingerling rainbow trout have been stocked since 2004, they contributed <1% of the total biomass collected at Arrowrock Reservoir in a June 2009 lowland lake survey (Butts et al. 2011). Conversely, 88% of the total biomass was comprised of largescale suckers (48%) and northern pikeminnow (39%) during the same survey. This survey also suggested that the historic rainbow trout stocking program has not been successful, particularly in terms of fingerling fish.

Predation by northern pikeminnow is thought to negatively affected survival of stocked fingerling trout. Furthermore, a majority of the reservoir's fish biomass is contained within rough fish species, primarily northern pikeminnow and suckers. By participating in USBR funded netting efforts, IDFG hopes to depress the populations of these rough fish species to a point where survival, growth, and overall species composition of the reservoir is shifted towards sportfish. During the fall efforts, IDFG expenses to remove 6,600 kg of rough fish were limited to personnel costs of approximately $2,500. An additional three weeks of intensive netting will begin in March 2012 and IDFG hopes to remove another 6,000 to 8,000 kg of rough fish during these efforts. The success of these efforts will then be evaluated by comparing lowland lake CPUE and WPUE estimates from a forthcoming June 2012 survey to that of the June 2009 survey. We are hopeful that these efforts will have resulted in a measurable reduction in abundance and biomass of northern pikeminnow and sucker *sp.* in Arrowrock Reservoir.

MANAGEMENT RECOMMENDATIONS

1. Cooperate with USBR during March/April 2012 netting efforts to remove additional northern pikeminnow and sucker *sp.*

2. Conduct a lowland lake survey on Arrowrock Reservoir in June 2012 and compare CPUE and WPUE of rough fish populations with previous surveys to assess success of rough fish reduction efforts.

Table 1. Numbers of all fish captured and weight of rough fish removed from Arrowrock Reservoir during rough fish removal efforts in fall 2011.

Species	Number captured	Weight removed (kg)
Bull trout	96	-
Chiselmouth	70	-
Cutthroat *sp.*	2	-
Kokanee	5	-
Mountain whitefish	234	-
Northern pikeminnow	4,079	1,510
Hatchery rainbow trout	96	-
Rainbow trout	18	-
Smallmouth bass	133	-
Sucker *sp.* (largescale and	6,297	5,077
bridgelip combined)		-
Yellow perch	971	-
Totals	**12,001**	**6,587**

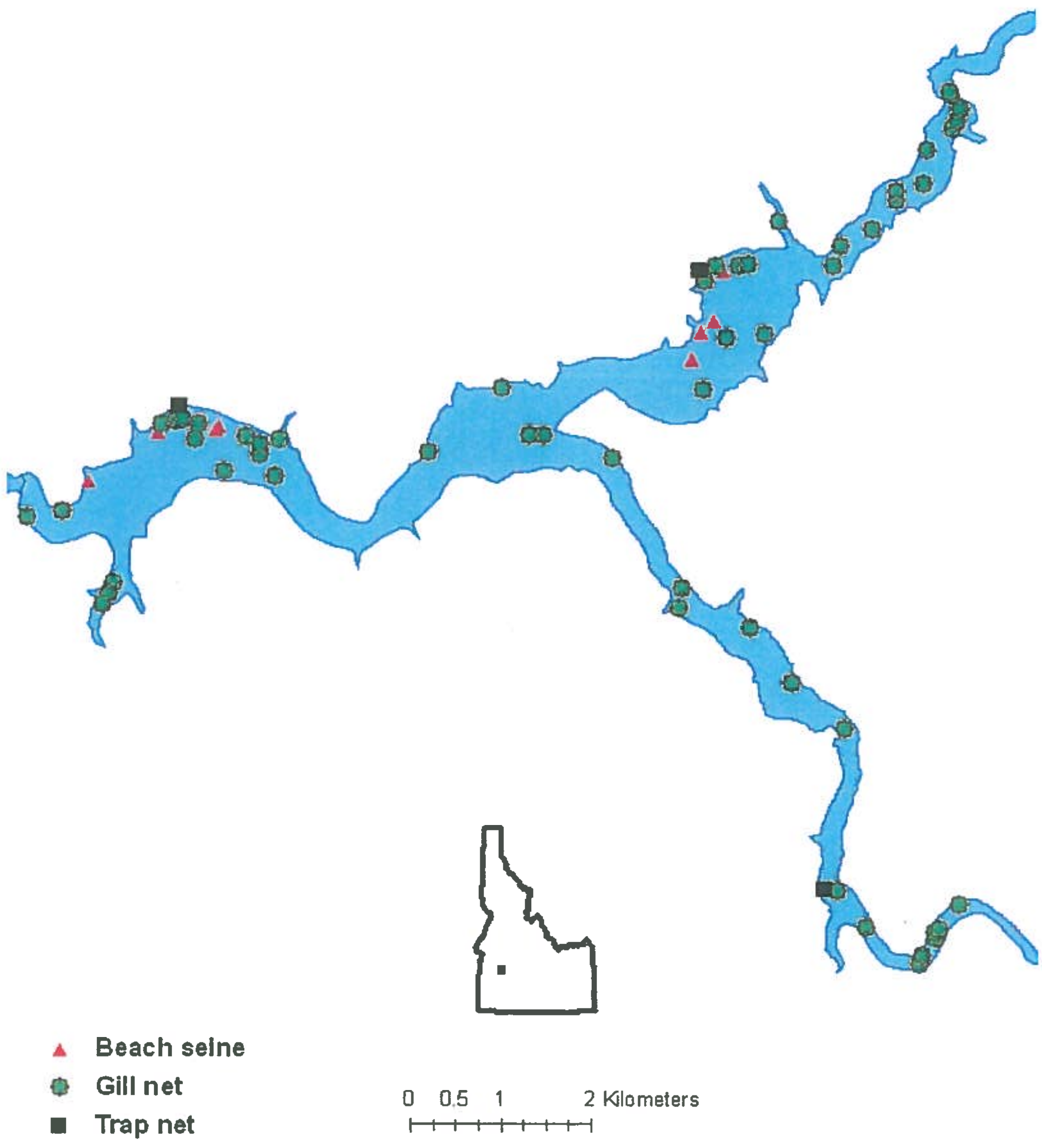

Figure 1. Map of Arrowrock Reservoir, Idaho showing gill-netting, trap-netting, and beach seining locations during the 2011 rough fish removal efforts.

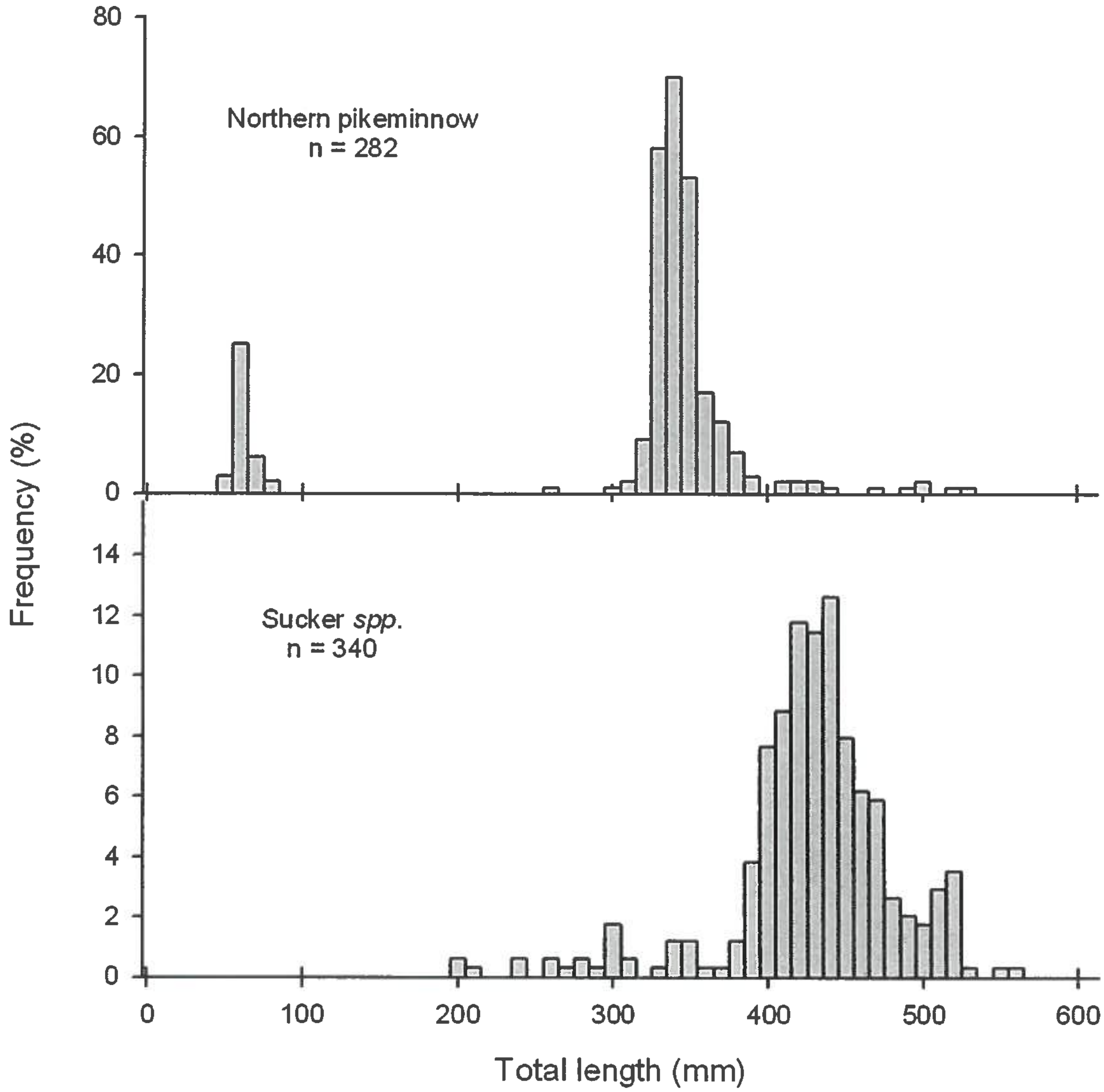

Figure 2. Length frequency and sample size of northern pikeminnow, and bridgelip and largescale sucker collected during removal efforts at Arrowrock Reservoir during fall 2011.

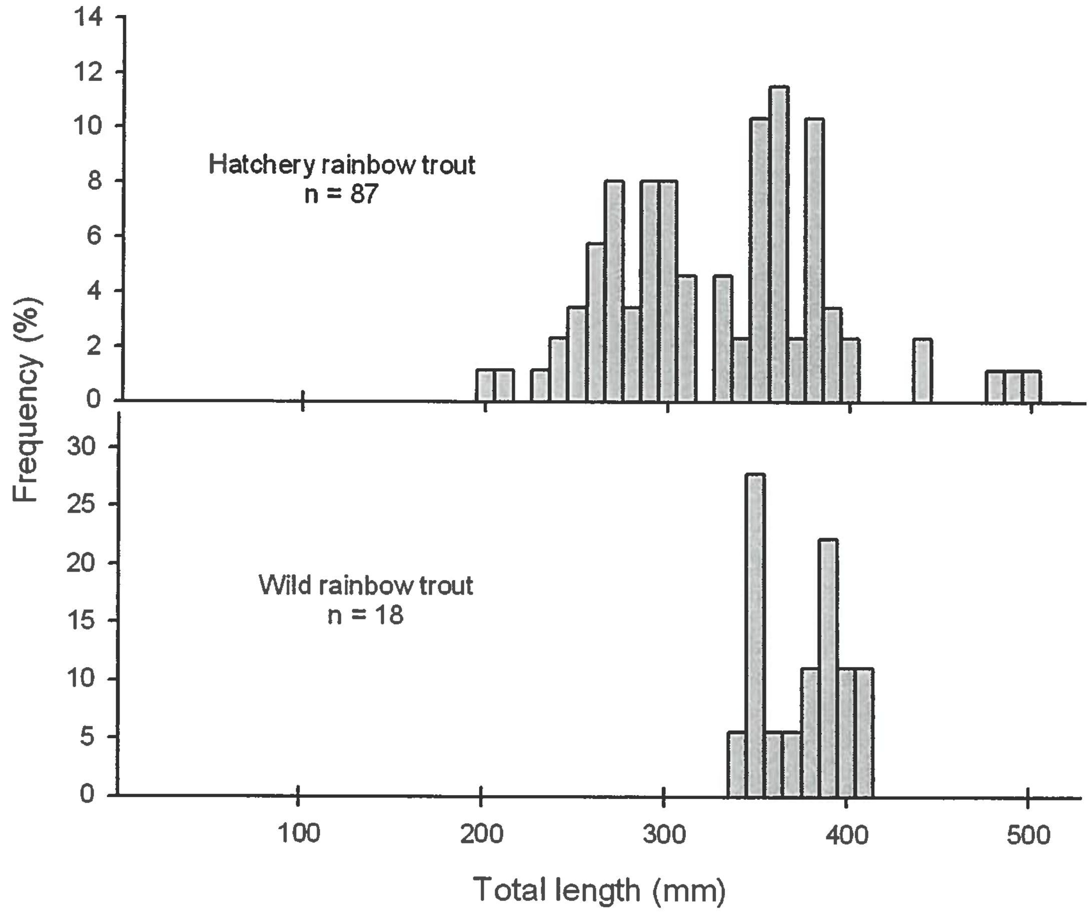

Figure 3. Length frequency and sample size of hatchery and wild rainbow trout during rough fish removal efforts at Arrowrock Reservoir during fall 2011.

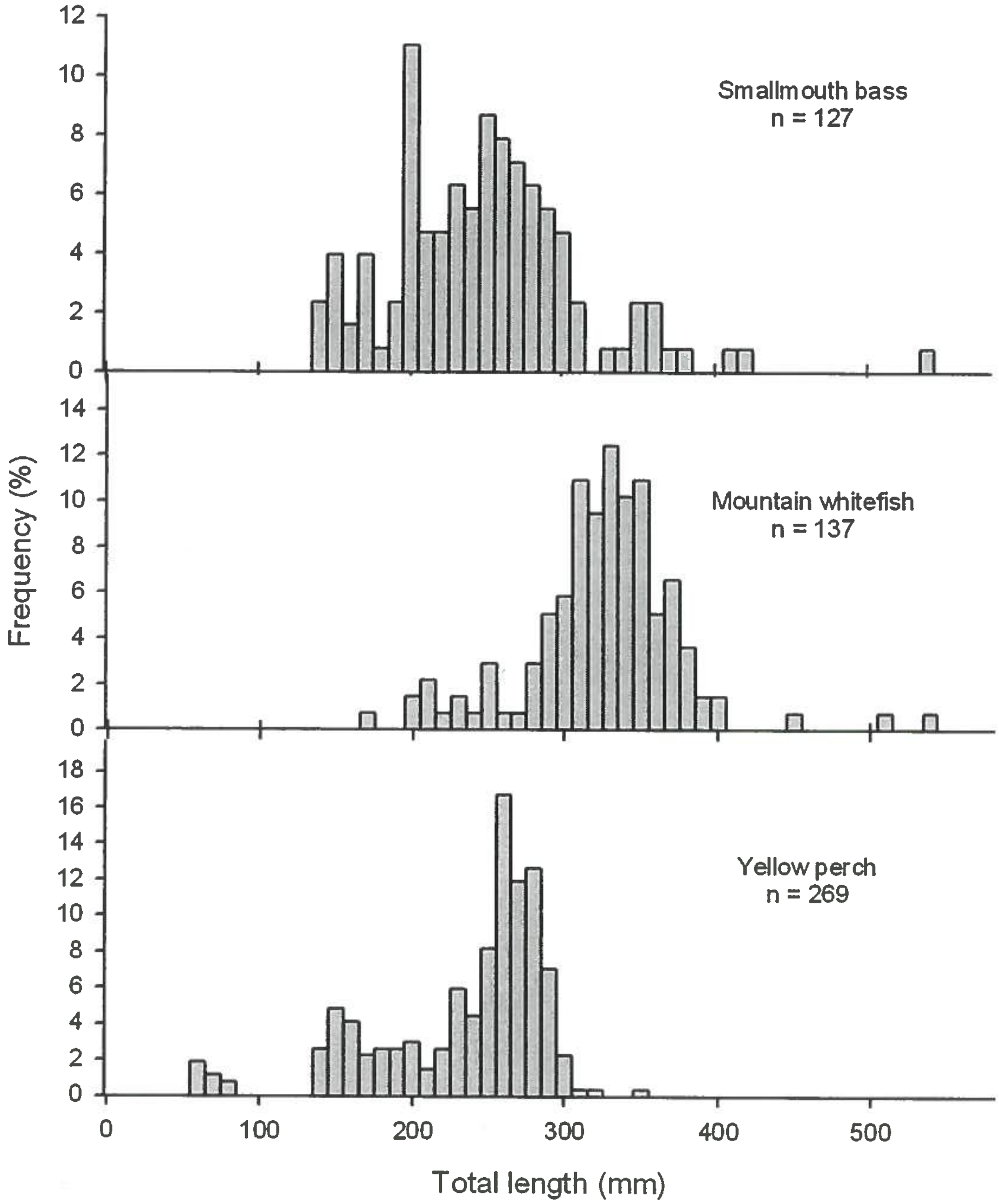

Figure 4. Length frequency and sample size of smallmouth bass, mountain whitefish, and yellow perch collected during rough fish removal efforts at Arrowrock Reservoir during fall 2011.

Angler Demographics and Use of Community Fishing Ponds in the Southwest Region, Idaho

ABSTRACT

A major component of providing angling opportunities in urban communities in southwestern Idaho has been the use of small ponds, often located within municipal parks. In 2010, IDFG stocked approximately 114,000 catchable rainbow trout into community ponds, which equates to 41% of the region's annual allotment of catchable-sized trout. Given the substantial resources that are currently directed towards providing and managing fisheries in southwestern Idaho community ponds, there is a need to evaluate this program. A roving creel survey was conducted at Settlers Pond in Meridian, McDevitt and Riverside ponds in Boise, and Merrill Pond in Eagle beginning in May 2011 and scheduled through April 2012. Demographic and other information that may affect future management of community ponds were also collected. A total of 184 angler counts were conducted on 46 different dates to estimate angler effort during May-December 2011. In addition, a total of 601 angler interviews were conducted at the ponds to estimate catch and harvest rates. Total angler effort expended from May-November 2011 varied greatly among ponds, ranging from an estimated 16,351 h expended at McDevitt Pond to 2,729 h at Merrill Pond. Total angler effort expended at all four ponds was 28,590 h. A total of 2,319 ± 2,354 rainbow trout were caught at the four ponds. The mean age of anglers and their dependents taking the survey was 30.5 years and 85% of those surveyed were male. Approximately 87% of anglers were Caucasian and the mean travel distance for anglers surveyed was 5.8 mi. Most anglers supported reducing the bag limit to two fish, and overall angler satisfaction with the ponds appears to be good.

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INTRODUCTION

As the United States becomes increasingly urbanized, hunting and angling participation has substantially declined. According to a 2006 national survey on wildlife-associated recreation, 13% of the U.S. population (16 and older) classified themselves as anglers (U.S. Department of the Interior 2006). This is a marked decline from 19% in 1991 and the peak of 31% that was reported in 1970. Reasons for the decline have been attributed to lack of opportunities, time constraints, and an overall change in lifestyle, where nature-based outdoor activities have been devalued.

Potential threats to natural resources from declines in hunting and fishing participation have been well described (Balsman and Shoup 2008; Schramm and Edwards 1994). Most states depend on revenue from hunting and fishing license sales and federal excise taxes on associated hunting and fishing equipment to fund wildlife management agencies and natural resource conservation programs. Also, decreased citizen involvement in natural resource-related activities may reduce support, involvement, and awareness regarding natural resources.

According to the U.S. Census Bureau (2012), 79% of the U.S. population lives in urban areas. Furthermore, 73% of people that classify themselves as anglers live in these urban areas, where the population has been shown to participate in fishing and hunting opportunities at a lower rate than rural-area residents (U.S. Department of the Interior 2006). People in urban areas typically have more recreational opportunities to choose from; and therefore, location, convenience, and cost often influence participation. Consequently, many state agencies have increased efforts to provide opportunities that are nearby and convenient for urban residents.

Boise and the surrounding metropolitan area, known as the Treasure Valley, contained approximately 43% of Idaho's population in 2010 (U.S. Census Bureau 2012). Ada and Canyon counties alone, contain over 580,000 people, or 37% of the state's population. Although Idaho Department of Fish and Game (IDFG) lacks a formal community fishery management program, managers have been responsive to the needs for nearby, easily accessible fishing opportunities. However, as Pape and Eades (2008) state, a better term for such a program, particularly within southwestern Idaho, is community fisheries. This term describes the location of many of the ponds more accurately and also encompasses smaller communities that still benefit from having a nearby opportunity.

Small ponds are a major component of community fisheries in southwestern Idaho and are often located within municipal parks. These ponds are either specifically built for fishing, or are flooded former gravel pits, or irrigation ponds where fishing is a secondary use. In most cases, IDFG is solely responsible for fishery management in the ponds, while city parks departments are responsible for land and facility management. Many of the parks that are associated with the ponds have a wide variety of amenities, including restrooms, playgrounds, walking paths, and picnic areas. Most ponds contain naturally reproducing bluegill *Lepomis macrochirus* and largemouth bass *Micropterus salmoides*. Hatchery rainbow trout *Oncorhynchus mykiss* are typically stocked on a monthly basis from October through June, when water temperatures are suitable for trout. Adult channel catfish *Ictalurus punctatus* are captured and moved from the Snake River during June-August to provide additional summer fisheries in selected ponds.

The community fishing ponds have been popular with city leaders, park departments, and local anglers. This is reflected in the increase in number of community ponds in southwestern Idaho over the past decade. From 2007 to 2010, the number of community ponds that IDFG stocks with hatchery catchable rainbow trout has increased from 11 to 20. The total number of ponds now approaches 35, although only 20 are stocked. In 2011, three new ponds could be added to the stocking rotation by year's end. The growth of this fishery program has placed considerable demand upon IDFG hatchery and management budgets as well as personnel. In 2010, IDFG stocked approximately 114,000 catchable rainbow trout into community ponds, which equates to 41% of the region's allotment of catchable-sized trout. Based on an estimated production cost of $0.84/fish to raise catchable-sized trout, IDFG spends approximately $96,000/year to stock community ponds in the Southwest Region.

Given the substantial resources that are currently directed towards providing and managing fisheries in southwestern Idaho community ponds, there is also a need to evaluate this program. Specifically, managers would like to have more information on anglers that use the community ponds and whether the ponds play a role in angler recruitment. Catch rates, effort, and harvest information will assist future management decisions such as stocking density and frequency, or whether harvest limits need to be changed to ensure more equitable distribution among anglers.

MANAGEMENT GOAL

1. Provide and manage convenient and cost-effective angling opportunities in southwestern Idaho communities. Promote these easily accessible angling opportunities to enhance the recruitment and retention of new and lapsed anglers.

OBJECTIVES

1. Describe basic demographics of anglers (age, gender, race), as well as monthly and seasonal trends in angler use of community fishing ponds stocked with hatchery rainbow trout.

2. Summarize angler interviews to describe the geographic area each pond serves, the importance of stocking trout, species of interest, experience of anglers, and dependence on community pond.

3. Compare angler use and demographics with hatchery rainbow trout tag return information collected by IDFG hatchery trout research project.

4. Develop guidelines for allocating hatchery rainbow trout in Southwest Idaho community ponds to benefit a geographically wide range of southwestern Idaho communities while also ensuring high utilization of hatchery trout.

METHODS

A roving creel survey that included on-site interviews was conducted at Settlers Pond in Meridian, McDevitt, and Riverside ponds in Boise, and Merrill Pond in Eagle beginning in May 2011 and scheduled through April 2012. The ponds were selected due to popularity with anglers and proximity to each other. They also provided a range of pond sizes, stocking densities, and amenities (Table 2). Estimates of effort and catch rate were summarized by month from May through December 2011. Sampling periods were determined using a stratified random sampling methodology. Survey periods were determined using a stratified random sampling methodology, where primary sampling units were days, and were stratified into two categories: 1) weekdays, and 2) weekends and holidays. Categorization of day type was designed to replicate periods of high- and moderate use by anglers. Therefore weekdays were defined as Sunday night to Friday afternoon while weekends were defined as Friday night to Sunday afternoon, including holidays. Four primary sampling units were selected from each of these two categories for a total of eight sampled days per month. Days were sub-divided into three 5-h periods (secondary sampling units), and one time period was sampled per day. These periods included morning (7 am to 12 pm), afternoon (12 pm – 5 pm), and night (5 pm to 10 pm). Time periods were selected with non-uniform probabilities based on expert opinion (Stanovick and Nielsen 1991). During suspected high use periods (April through October), time periods were selected at probabilities of 0.25 for morning, 0.25 for afternoon, and 0.50 for evenings. During the suspected low use periods (November-February), time periods were selected at probabilities of 0.5 for morning and 0.5 for afternoon. Local municipal ordinances close these parks ½ hr after sunset.

Instantaneous counts were used to estimate angler effort. Angler counts began at randomly selected times within the sampling period and followed a consistent route. Counts began at Settlers Pond, and then continued to McDevitt, Merrill, and Riverside ponds (Figure 5). The entire route generally took between 40-60 minutes to complete. Anglers were interviewed for catch and harvest rate information during the period between angler counts. Fish license numbers were collected from most individual anglers $\geq$ 14 years of age. License data will be used to increase sample size of angler age and also allow us to mine other license buying characteristics from anglers utilizing the community ponds.

Demographic and other information that may affect future management of community ponds were also collected. Interview questions were designed to define the role that the ponds play in angler recruitment, the experience or avidity of anglers using the ponds, and the importance of stocked trout. When staffing allowed, additional secondary sampling units were surveyed to determine whether angler metrics were affected by recent plants. This information, along with exploitation estimates from a separate tagging study will help determine if a "boom-bust" fishery exists, defined as when catch rates peak immediately after stocking events and decline sharply afterwards as fish are depleted.

Mean catch rate $\hat{R}$ was estimated using the mean of ratios:

$$\hat{R} = \frac{\sum_{i=1}^{n} \frac{c_i}{e_i}}{n}$$

where $\hat{R}$ is the mean catch rate in fish/angler hour, c_i is the number of fish caught during the trip and e_i is the length of the trip in hours (equation R1 from Pollock et al 1994). Harvest rate was calculated using the equation above and replacing fish caught with fish harvested. All trips less than 0.5 h was excluded from the catch rate calculations. Daily, monthly, and annual catch rates and effort, and numbers of fish caught and harvested by species was calculated using spreadsheets. Confidence intervals (90%) were calculated for effort and catch using methods described by Zar et al. (1999).

RESULTS AND DISCUSSION

A total of 184 angler counts were conducted on 46 different dates to estimate angler effort during May-December 2011. However, due to the lack of anglers and the fact that the ponds had frozen over, the survey was discontinued in December. The survey will resume in March when angler use begins to increase again. Total angler effort expended from May-November 2011 varied greatly among ponds, ranging from an estimated 16,351 h expended at

McDevitt Pond to 2,729 h at Merrill Pond (Table 3). Riverside and Settlers ponds were quite similar in total effort with 4,637 h and 4,873 h, respectively.

Monthly effort expended was similar between ponds with May-June experiencing the highest effort among the months measured (Table 3). However, Settlers Pond was an exception to this as high effort was also expended in August. Estimated monthly effort was as high as 7,520 h in June at McDevitt Pond and as low as 40 h in November at Merrill Pond. Monthly effort decreased during the warm summer months (July-September) when rainbow trout were not stocked and increased again in October after plantings resumed. Total angler effort expended at all four ponds was 28,590 h.

A total of 601 angler interviews were conducted at the ponds to estimate catch and harvest rates. Of these, 147 (24%) interviews were from angler that had fished <30 min, and were not included. Angler catch rates are only reported for catchable rainbow trout in this report. Catch and harvest rates of catfish and bluegill, will be reported in a future report when the survey is completed at the end of April 2012. Nearly all interviews were considered as incomplete trips as creel clerks rarely encountered anglers as they were leaving

Mean monthly catch rates for rainbow trout varied by month and ponds, ranging from 0 fish/h during periods of minimal effort or months when fish were not stocked to a high of 0.53 $\pm$ 0.88 fish/h (Table 3). Total catch was highest at McDevitt Pond with 1,593 $\pm$ 1,394 fish and lowest at Settlers Pond where 73 $\pm$ 105 were estimated to be caught between May and November. A total of 2,319 $\pm$ 2,354 rainbow trout were caught at the four ponds during the survey period.

A total of 296 anglers were interviewed to obtain information on angler demography and opinion. Anglers were only interviewed once for the demography and opinion portion of the survey to avoid multiple questionnaires from the same angler.

The mean age of anglers and their dependents taking the survey was 30.5 and 85% of those surveyed were male (Table 4). Creel clerks determined ethnicity from visual observation and discussion with the angler, and approximately 87% were Caucasian, followed by 5% Hispanic. The mean travel distance for anglers surveyed was 5.8 mi, after removing two non-residents that were interviewed. Anglers were generally fishing either alone (36%), with one other person (33%), or in a group of three (17%). Approximately 32% of the anglers surveyed were fishing with a child or grandchild $\leq$ 14 years of age.

Anglers were asked as to whether they would support reducing the daily bag limit of rainbow trout in the ponds from six to two fish (Table 4). Most anglers supported the reduced bag limit, with 63% in favor, 36% opposing, and 2% with no opinion. Anglers were also asked to rank the importance of fish stocking and satisfaction of the community pond they were fishing. The rankings received were spread somewhat evenly across the spectrum of possible responses, but overall hatchery trout stocking is very important to an angler's decision to fish at a pond (Table 5). Respondents were mostly positive regarding satisfaction with the pond they were fishing, with 38% indicating they were very satisfied.

A great deal more information will be learned from the community pond creel and demographics study as it nears completion at the end of April 2012. Along with additional demographic information, license buying history, and opinions, angler effort in relation to stocking dates will be evaluated. Angler return information from tagged hatchery fish and the creel survey will be utilized to determine return to creel estimates of hatchery rainbow trout.

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Table 2. Surface area (ac), stocking numbers, and stocking density for creel and demography survey waters in 2011-12.

Water	Surface area (ac)	Stocking # (Monthly)	Stocking Density	Restroom	Playground	Parking	Docks
McDevitt (Norms) Pond	1.19	1000	840			•	
Merril Park Pond	1.76	500	284	•	•	•	
Riverside Pond #1	2.44	800	328	•			
Settlers Park Pond	0.63	300	476	•	•	•	

Table 3. Angler effort, rainbow trout CPUE, and monthly and total catch for McDevitt, Merrill, Riverside, and Settlers ponds during May-November 2011.

Water	Month	Daily Effort (h) ± 90% CI	Monthly Effort (h)	RBT CPUE ± 90% CI	Catch (fish/month)
McDevitt Pond	May	71 ± 66	2,302	0.16 ± 0..12	230 ± 293
	June	396 ± 333	7,520	0.26 ± 0.33	973 ± 913
	July	111 ± 36	3,618	0.01 ± 0.01	42 ± 39
	August	18 ± 14	376	0.00 ± 0.00	0 ± 0
	September	18 ± 15	477	0.00 ± 0.00	0 ± 0
	October	47 ± 23	1,118	0.19 ± 0.20	120 ± 80
	November	35 ± 15	940	0.41 ± 0.19	264 ± 69
	Partial year total		**16,351**		**1,593 ± 1,394**
Merrill Pond	May	4 ± 4	110	0.00 ± 0.00	0.0 ± 0.0
	June	111 ± 150	1,593	0.02 ± 0.03	16 ± 27
	July	23 ± 7	625	0.01 ± 0.02	7 ± 11
	August	3.4 ± 2.4	94	0.00 ± 0.00	0 ± 0
	September	5 ± 5	147	0.53± 0.88	100 ± 164
	October	25 ± 3	120	0.00 ± 0.00	0 ± 0
	November	2 ± 2	40	0.00 ± 0.00	0.0 ± 0.0
	Partial year total		**2,729**		**123 ± 202**
Riveside Pond	May	21 ± 15	672	0.02 ± 0.02	34 ± 34
	June	94 ± 45	1,888	0.11± 0.12	165 ± 167
	July	39 ± 20	1,300	0.05 ± 0.06	92 ± 124
	August	3 ± 4	81	0.00 ± 0.00	0 ± 0
	September	6 ± 7	140	0.0± 0.00	0 ± 0
	October	16 ± 15	369	0.00 ± 0.00	0 ± 0
	November	7 ± 5	187	0.80 ± 0.90	239 ± 328
	Partial year total		**4,637**		**530 ± 653**
Settlers Pond	May	8 ± 7	269	0.00 ± 0.00	0 ± 0
	June	88 ± 48	1,806	0.01 ± 0.01	14 ± 19
	July	38 ± 15	1,288	0.00 ± 0.00	0 ± 0
	August	22 ± 13	1,005	0.00 ± 0.00	0 ± 0
	September	7 ± 5	214	0.07 ± 0.11	37 ± 61
	October	5 ± 6	104	0.00 ± 0.00	0 ± 0
	November	7 ± 5	187	0.14 ± 0.16	22 ± 25
	Partial year total		**4873**		**73 ± 105**
	All ponds combined		**28,590**		**2,319 ± 2,354**

Table 4. Results of questions posed to 296 anglers during the creel survey for McDevitt, Merrill, Riverside, and Settlers ponds during May-November 2011.

Question	Results and response summaries
Mean angler age	30.5 (Range: 1 - 84)
Gender	85% Male, 15% Female
Ethnicity	87% Caucasian, 5% Hispanic, 3% Undetermined, 2% Asian, 1% African American
Mean travel distance	5.8 mi (Range <1 - 36 mi)
Mean Party Size	36% Single, 33% two, 17% three, 13% four or more
No people surveyed w/children fishing	32%
Employment	61% employed, 39% unemployed, 120 people not surveyed or did not answer
Support two-fish daily limit	63% Support, 36% do not support, 2% no opinion

Table 5. Results of questions posed to 296 anglers during the creel survey for McDevitt, Merrill, Riverside, and Settlers ponds during May-November 2011.

	Ranking				
	Not Important				Very Important
	1	2	3	4	5
Importance of catching fish	10%	9%	23%	22%	37%
Importance of harvesting fish	33%	19%	16%	7%	24%
Importance of stocked trout	7%	5%	11%	18%	59%
	Very Low				Very High
Current angling satisfaction	1	2	3	4	5
with pond	6%	13%	19%	23%	38%

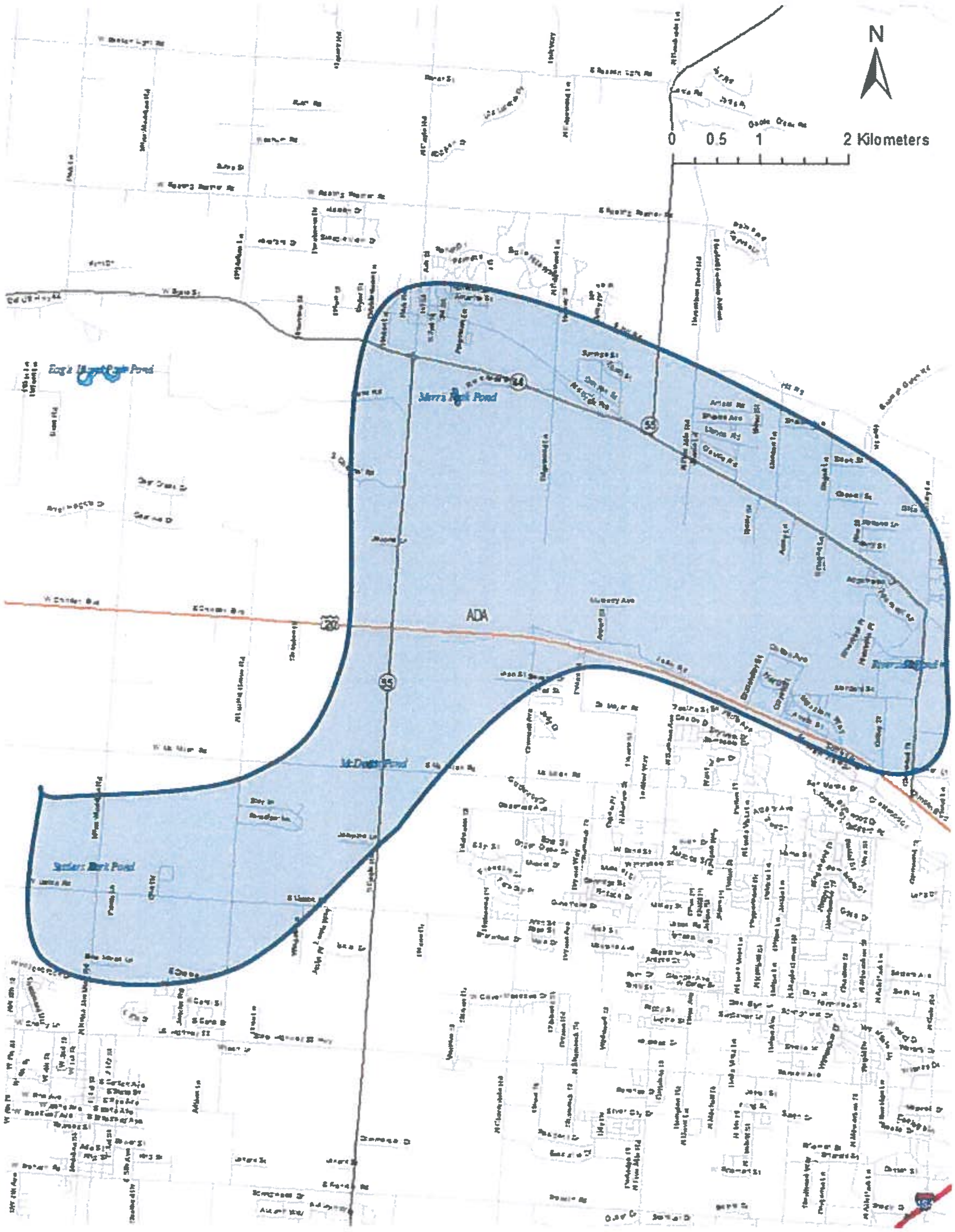

Figure 5. Map of various community ponds in the Boise metropolitan area, Idaho, including Settlers, McDevitts, Merrills, and Riverside ponds, where creel surveys were conducted in 2011.

Chemical treatment of nuisance aquatic plants in Payette Greenbelt and Sawyers ponds

ABSTRACT

Excessive aquatic plant growth in Payette Greenbelt and Sawyers ponds was hampering fishing opportunities, especially for shore-bound anglers. In order to maintain fisheries quality, we chemically treated these waters with Navigate®, a granular 2, 4 D, at 100-150 lbs./acre. Submerged aquatic plant abundance was reduced by greater than 90% in these ponds (in treated areas). Effective weed management in the coming years will require vigilance to find a balance between eradicating and maintaining aquatic plants for invertebrates and as juvenile fish habitat.

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INTRODUCTION

Idaho Department of Fish and Game's (IDFG) Southwest Region manages about 25 publicly-accessible small ponds and reservoirs. These community ponds receive significant fishing pressure and are an important resource for providing family-friendly fishing opportunities; and therefore, are thought to be important for angler recruitment and retention efforts. Excessive aquatic plant growth, especially during the summer months, in some ponds may limit access or in extreme cases may totally preclude fishing. Furthermore, excessive aquatic plant growth may create biological problems such as oxygen depletion during decomposition or may provide too much cover for juvenile fish leading to high abundances and small average sizes. By early spring 2011, excessive aquatic plant growth had covered much of the surface area of Payette Greenbelt Pond. Similarly, aquatic plant growth at Sawyers Pond near fishing docks, fishing areas, and a gravel boat ramp became excessive. Eurasian watermilfoil *Myriophyllum spicatum* was the predominant species present in both cases. Regional IDFG personnel, with partial financial assistance from the Idaho Department of Agriculture, treated these waters with granular herbicides to reduce plant abundance.

METHODS

We selected Navigate®, a granular 2, 4-D herbicide, to treat these waters, based on past efficacy in nearby waters. Recommended treatment levels were 100-150 lbs./surface acre for identified plant species. We used Idaho Fish and Game's Geographic Information Systems (GIS) information to estimate surface acreage for Payette Greenbelt Pond (5.5 acres). We applied 600 lbs. of Navigate to the entire surface areas of Payette Greenbelt Pond on May 31, 2011 using two hand-held fertilizer spreaders mounted to the gunwale of a small boat. At Sawyers Pond (35 acres), we only spot-treated (150 lbs..) in areas with excessive plant growth (approximately 1.0 acres) near the primary boat ramp and near several fishing docks and popular shore fishing areas. Treatment at Sawyers Pond was completed on May 18, 2011.

RESULTS AND DISCUSSION

Herbicide treatments were effective in Payette Greenbelt and Sawyers ponds. Over 90% of rooted submerged vegetation was killed. No significant plant re-growth occurred in treated areas prior to fall. Effective weed management in the coming years will require vigilance and finding a balance between weed eradication and maintaining aquatic plants communities for invertebrates and as juvenile fish cover.

MANAGEMENT RECOMMENDATIONS

1. Monitor plant re-growth in Payette Greenbelt and Sawyers ponds. Re-apply herbicide on a semi-annual basis as needed.

2. Utilize grass carp in Payette Greenbelt Pond as an experimental and proactive measure to keep aquatic plant abundance at relatively low levels.

Assessment of Fish Populations in Crane Falls Reservoir

ABSTRACT

A mark-recapture study was conducted at Crane Falls Reservoir during late May and early June 2011 to estimate population size and demographics of largemouth bass *Micropterus salmoides* and bluegill *Lepomis macrochirus*. We collected fish using night-time boat electrofishing. The marking run was completed on May 31, 2011, whereas the recapture run was completed on June 7, 2011. During marking efforts, we captured 923 fish, with 2.14 h of effort. Bluegill was the most numerous species sampled followed by largemouth bass. Recapture efforts were initiated approximately one week later. During recapture efforts we captured 2,934 fish or over a 3-fold increase compared to the marking run, with only a 40% increase in effort. A total of 325 bluegill (≥ 100 mm) were marked and released. During the recapture run, 1,010 bluegill were examined for marks, and 35 possessed marks. The pooled population estimate equaled 9,156 fish (± 2,293 or 25% of the estimate). Using the pooled estimate, population density equaled 294 bluegill/ha (≥ 100 mm). A total of 259 largemouth bass (≥ 150 mm) were marked and released. During the recapture run, 487 largemouth bass were examined for marks, and 78 were determined to be marked. The total largemouth bass population estimate equaled 1,607 fish (± 226 or 14%). Capture efficiency was 16%. Using the pooled estimate, population density equaled 37 largemouth bass/ha (≥ 150 mm). Largemouth population abundance has been relatively stable since 1977. The two lowest PSD estimates for largemouth bass are the most recent, 2002 and 2011. Earlier research indicated that this largemouth bass population was composed of individuals from only a few strong year classes which grew adequately to reach large sizes. From 2011 samples, age-length data suggest that recruitment events are more frequent and many year classes are well represented. Older age bass were common during the 2011 survey; however, growth rates were insufficient to allow these fish to reach quality or trophy sizes, similar to previous investigations. Reasons for slow growth of these bass are speculative, but poor water quality caused by a lack of recent water exchange or excessive filamentous algal growth leading to poor foraging efficiency are possibilities.

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INTRODUCTION

Crane Falls Reservoir is a 31-ha reservoir located 10 km north of Bruneau, Idaho on the south edge of the (inundated) Snake River. Crane Falls Reservoir was created shortly after CJ Strike Dam was completed in 1952. As CJ Strike Reservoir filled, sub-surface water levels rose in this vicinity, and water percolated into this low-lying area that is bounded by a naturally-occurring berm. Due to little fluctuation in the surface elevation of CJ Strike Reservoir, water surface elevations in Crane Falls Reservoir have remained constant (750 msl). Depth averages 3 m, but approaches 8 m at its deepest point.

Fisheries management direction in Crane Fall Reservoir has changed several times since formation to adapt to changing circumstances. Rainbow trout *Oncorhynchus mykiss* were stocked initially in 1955. Early plants of rainbow trout produced quality, even trophy, trout fishing opportunities, but began to decline by the mid-1960s (Mallet and Reid 1978). Poor water quality, high harvest rates, and establishment of additional fish species including black crappie *Pomoxis nigromaculatus*, bluegill *Lepomis macrochirus*, brown bullhead *Ameiurus nebulosis*, largemouth bass *Micropterus salmoides*, and pumpkinseed *Lepomis gibbosus* were implicated as likely causes. Due to the unique morphology and hydrology of Crane Fall Reservoir, water quality becomes compromised due to evaporation and leaching leading to an associated accumulation of salts. Trout growth and survival rates are thought to decrease as alkalinities and pH levels exceed 400 mg $CaCO_3$/L and 9.0, respectively (Piper et al. 1982). During 1968, total kills of recently planted trout were linked to alkalinity levels of 784 mg $CaCO_3$/L and a pH of 9.8. To mitigate this decline in water quality, a water pump was installed during 1971 that allowed withdrawal of hyper-alkaline, basic water allowing percolation of ground water. After substantial pumping during 1972, trout held in live cages survived exposure and stocking was resumed during 1973. During 1976, the IDFG Commission directed more intense study of Crane Falls Reservoir specifically to assess the possibility of managing with a quality or trophy trout regulation. Investigations revealed high use (18,000 h), high harvest of catchable rainbow trout, and poor survival of fingerlings (Mallet and Reid 1978). Because predatory and competitive fish species had become well established, IDFG fisheries personnel applied rotenone during 1978 and reported an effective treatment (Reid 1979; Reid and Anderson 1980). A quality or trophy trout fishery never developed and this management direction was discontinued. Approximately 3,000 to 8,000 catchable rainbow trout have been stocked on an annual basis since 1990, and the current stocking request is 4,000 catchable rainbow trout stocked during the spring. A 12-inch minimum length limit for largemouth bass was instituted during 1985, and raised to an 18-inch minimum length limit during 1989. Subsequently, a trophy bass regulation (20" minimum length; 2 bass bag limit) was adopted during 1992 to provide a diversity of bass angling opportunity in the region and is still in place. All other fish species are managed with general regulations. Additionally, gasoline-powered motors are not allowed on the reservoir. A partial-year creel survey during 1995 indicated that 13,601 h of fishing effort were expended from March through December (Allen et al. 1998). During this survey, anglers showed a strong preference for rainbow trout. Harvest and release rates for rainbow trout were high 44% and 43.6%, respectively. Subsequent investigations have focused on gaining understanding of bluegill and largemouth bass population dynamics and general fisheries monitoring (Allen et al. 1995; Allen et al. 1998; Dillon 1991; Dillon 1992; Grunder et al. 1993).

MANAGEMENT GOALS

1. To provide a trophy bass fishing opportunity.
2. To provide a high yield bluegill fishery.

3. To provide a hatchery supported-rainbow trout fishery with adequate catch rates (i.e. exceeding 0.5 fish/hr).

OBJECTIVES

1. To characterize the primary warm water fish populations in the reservoir namely bluegill and largemouth bass.

METHODS

To estimate warm water fish population sizes, we initiated a mark-recapture study during late May and early June 2011 similar to the time period of previous studies. We collected fish using night-time boat electrofishing. Pulsed direct current was produced by a 5,000 watt generator. Frequency was set at 120 pulses per second and a pulse width of 25, which yielded an output of 5-6 amps. The marking run was completed on May 31, 2011, whereas the recapture run was completed on June 7, 2011. Attempts were made to net all stunned fish $\geq$ 100 mm. The entire perimeter of the lake was sampled on both instances. Approximately 2,800 m of shoreline was broken up into five approximately equidistant transects (Figure 6).

Captured fish were identified to species and total length was measured (± 1 mm). During the initial marking run, all largemouth bass longer than 150 mm and bluegill longer than 100 mm were marked with a caudal punch. Marked fish were held in cloth, floating live cages until all marking runs were completed, then released on the same night (noting mortalities). Weights for largemouth bass and bluegill were measured (±1 g for fish under 1,000 g) with a digital scale, but only for the sub-sample of fish sacrificed for collection of otoliths. Length-weight relationships were built from fish weighed and measured during 2011 which allowed us to estimate weights of un-weighed fish and total biomass. Proportional stock densities (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. Catch data were summarized as the number of fish caught per unit of effort (CPUE) and the weight in kg caught per unit effort (WPUE). For standardization, one hour of active on-time electrofishing equaled one unit of effort.

We used the Chapman's modification of the Peterson model for two-event mark-recapture experiments to estimate bluegill and largemouth bass population sizes. Population size ($\widehat{N}$) was estimated as:

$$\widehat{N} = \frac{(M+1)(C+1)}{(R+1)} - 1$$

where M = number of fish caught, marked, and released in first event, C = number of fish captured during second event, and R = number of marked fish captured during the second event. Estimates were calculated using all fish combined, and by partitioning the catch into fish in length groups to allow comparisons of catchability.

During the recapture run, we collected bluegill (n = 159) and largemouth bass (n = 196) for determining the age structure of the population. We attempted to collect up to 10 individuals of each species per 10-mm length interval. In the laboratory, we measured and weighed each specimen as well as 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 independently, the otolith was re-aged jointly to resolve disagreements. Age-length keys were constructed to develop an age frequency from which we estimated mortality rates.

RESULTS AND DISCUSSION

During marking efforts, we captured 923 fish, with 2.14 h of effort. Bluegill was the most numerous species sampled followed by largemouth bass. Brown bullhead, pumpkinseed, hatchery rainbow trout, and yellow perch were also sampled (Table 6), but at low numbers (< 50 individuals each). Average shocking time for the five transects was 1,542 sec.

Recapture efforts were initiated approximately one week later. During recapture efforts we captured 2,934 fish or over a 3-fold increase compared to the marking run, with only a 40% increase in effort (Table 6). Total effort was 3.02 h or 2,177 sec/transect. The same species were sampled with the addition of three black crappie. The large increase in sample size can be attributed primarily to an increase in effort, water temperature, and in catchability of bluegill, especially small, presumably age-1 bluegill and adult males guarding nests.

Bluegill was the most common species sampled in both the mark and recapture runs. CPUE for bluegill was 291 fish/hr (± 163) and 773 fish/hr (± 424) in the marking and recapture runs, respectively. The length frequency indicated that there was a bi-modal length distribution with peaks in the 40-69 mm and 170-189 mm range (Figure 7). Mean relative weight for bluegill over 65 mm was 98 (n = 123). Proportional stock density for bluegill was 62, calculated from 1,413 stock length fish (≥ 80 mm) of which 871 were quality length fish (≥ 150 mm). This is a relatively high PSD and indicates that the sample was composed of many quality size fish. Wr tended to decrease as length increased (slope = -0.06 ; $P < 0.04$; $n = 123$); however, this sample was collected during the spawning period which may have negatively affected body condition of larger individuals.

A total of 325 bluegill (≥ 100 mm) were marked and released. During the recapture run, 1,010 bluegill were examined for marks, and 35 possessed marks. The pooled population estimate equaled 9,156 fish (± 2,293 or 25% of the estimate). Using the pooled estimate, population density equaled 294 bluegill/ha (≥ 100 mm). To examine whether size related catchability differences existed, we blocked bluegill by length into two groups and estimated group or partial population size. For bluegill between 100 and 149 mm, 138 fish were marked. During the recapture run, 326 bluegill between 100 and 149 mm were examined and 13 marks were noted. Capture efficiency equaled 4%. The partial population estimate was 3,248 bluegill (± 1,279 or 39%). For bluegill 150 mm and greater, 187 fish were marked. During the recapture run, 684 bluegill 150 mm and greater were examined and 22 marks were noted. Capture efficiency equaled 3.2%. The second, partial population yielded an estimate of 5,600 bluegill 150 mm or greater (± 1,732 or 31%). Summing these partial estimates yielded a slightly smaller (-3.4%) estimate of 8,848 bluegill (≥ 100 mm).

Bluegill ranged in age from 1 to 8 years (Table 7). Bluegill grew relatively quickly through age 5, but then mean length at age increased only slightly afterwards. Analysis of age-frequency plots indicated bluegills were fully recruited to electrofishing as age-2 (Figure 8). Regression analysis of frequency (natural log) versus age produced a line with the slope of -0.36 (i.e. Z, the instantaneous annual mortality rate; Figure 9) Mortality rate (A) equaled 0.36, when age 3 fish were excluded from the analysis and the line was fit with the remaining data.

Largemouth bass was the second most common fish species sampled. CPUE for largemouth bass was 132 (± 37) and 165 (± 37) in the marking and recapture runs, respectively. The length frequency for largemouth bass was skewed to the right, with a single peak in the distribution from 280 to 299 mm (Figure 10). There was a paucity of fish outside of this length range. Proportional stock density for largemouth bass was 25, calculated from 703 stock length fish (≥ 200 mm) of which 176 were quality length fish (≥ 300 mm). This was the second lowest PSD out of the last seven sampling efforts (Table 8). Mean relative weight was 97 for largemouth bass over 100 mm. Wr tended to decrease as length increased (slope = -0.05; $P < 0.01$; $n = 123$).

A total of 259 largemouth bass (≥ 150 mm) were marked and released. During the recapture run, 487 largemouth bass were examined for marks, and 78 were determined to be marked. The total largemouth bass population estimate equaled 1,607 fish (± 226 or 14%). Capture efficiency was 16%. Using the pooled estimate, population density equaled 37 largemouth bass/ha (≥ 150 mm). To examine whether size related catchability differences existed, we blocked largemouth bass by length into two groups and estimated group population sizes separately. For largemouth bass between 150 and 249 mm, 68 fish were marked. During the recapture run, 98 largemouth bass between 150 and 249 mm were examined, and 13 marks were noted, which yielded an estimate of 489 largemouth bass (± 171 or 35%). Capture efficiency was 13.3%. For largemouth bass 250 mm and greater, 191 fish were marked. During the recapture run, 389 largemouth bass 250 mm and greater were examined and 65 marks were noted, which yielded an estimate of 1,136 largemouth bass 250 mm or greater (± 168 or 15%). Capture efficiency was 16.7%. Estimating population size using two length intervals yielded a slightly larger estimate of 1,624.

Largemouth bass ranged in age from 1 to 14 years. Largemouth bass grew steadily through age 6 ($\bar{x}$ = 271 mm), afterwards growth slowed (Table 10). Analysis of age-frequency plots indicated that largemouth bass were not fully recruited to our gears until age 6 (Figure 11). Regression analysis of frequency (natural log) versus age produced a line with the slope of -0.12 (i.e. Z, the instantaneous annual mortality rate; Figure 12). Mortality rate (A) equaled 0.11.

Largemouth population abundance has been relatively stable since 1977. During three of the four previous sampling efforts, abundance has ranged between 1,579 and 2,167 largemouth bass (Table 9). During 2002, population abundance was substantially higher at 5,284 individuals. PSD estimates have ranged from one to 92 during the same time period, but with more sampling events (10). Outside of the 1990 event, the two lowest PSD estimates are the most recent, 2002 and 2011. Earlier research indicated that this largemouth bass population was composed of individuals from only a few strong year classes which grew adequately to reach large sizes. From 2011 samples, age-length data suggest that recruitment events are more frequent and many year classes are well represented. Older age bass were common during the 2011 survey; however, growth rates were insufficient to allow these fish to reach quality or trophy sizes, similar to previous investigations (Dillon 1991). This observation is surprising as bluegill, including small bluegill, were highly abundant compared to ranges of densities documented for other populations (Schneider 1999). Reasons for slow growth of these bass are speculative, but poor water quality caused by a lack of recent water exchange or excessive filamentous algal growth leading to poor foraging efficiency are possibilities. For bluegill, few bluegill over 200 mm were sampled. These larger fish were commonly age 7 and 8, near the maximum age for bluegill at these latitudes. Additionally, mortality rate (~35%) was very similar to what has been reported in the literature under light fishing pressure scenarios (Spotte 2007).

MANAGEMENT RECOMMENDATIONS

1. Periodically monitor water quality and initiate pumping as needed to maintain adequate water quality.

2. Determine whether trophy regulations are warranted by periodically monitoring this fishery. 2011 monitoring results indicate that growth rates of largemouth bass are insufficient to provide a trophy fishery; however, previous sampling indicated that trophy or quality fisheries have existed under this regulation scheme.

Table 6. Catch-per-unit-effort for electrofishing surveys conducted in Crane Falls Reservoir, Idaho during May and June 2011.

Species	Run 1	Run 2	Run 3	Run 4	Run 5	Mean
Marking Runs						
Bluegill	434	481	292	166	81	291
Brown Bullhead	0	0	3	6	2	2
Largemouth Bass	83	136	191	129	117	131
Pumpkinseed	30	11	13	0	8	12
Rainbow Trout (Hatchery)	12	24	20	31	8	19
Yellow Perch	6	3	0	2	2	3
Total	565	654	518	333	217	458
Recapture Runs						
Black Crappie	0	2	2	0	0	1
Bluegill	838	1508	647	482	389	773
Brown Bullhead	2	4	4	2	2	3
Largemouth Bass	114	177	175	242	119	165
Pumpkinseed	52	59	36	26	35	41
Rainbow Trout (Hatchery)	4	10	5	26	2	9
Yellow Perch	8	4	4	5	2	4
Total	1017	1764	873	780	548	996

Table 7. Length at age for bluegill (n = 154) sampled from Crane Falls Reservoir during spring 2011.

Age	1	2	3	4	5	6	7	8
Mean length	40	61	89	118	161	173	184	177
Sample size	11	38	14	42	26	14	3	6

Table 8. Sampling effort metrics used to calculate proportional stock density for largemouth bass in Crane Falls Reservoir, Idaho.

Year	Sample Date	Electrofishing Effort (h)	largemouth bass > 200 mm (#)	largemouth bass > 300 mm (#)	PSD
1992	9/14	0.33	35	21	60
1994	5/11	0.66	53	36	68
1997	5/27	1	68	63	92
1998	6/10	0.59	54	38	70
2001	5/14	0.75	36	16	44
2002	6/20	6.5	950	192	20
2011	5/31	5.2	703	176	25

Table 9. Length at age for largemouth bass (n =192) sampled from Crane Falls Reservoir during spring 2011.

Age	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Mean length	70	141	202	227	255	271	275	295	307	299	284	293	315	287
Sample size	8	32	22	24	23	20	2	18	18	7	7	4	3	4

Table 10. Comparison of population parameters of largemouth bass in Crane Falls Reservoir over the last 25 years.

Year	Population Estimate	95% Confidence Interval	#/ha (reported)	#/ha (assume 31.1 ha)	kg/ha	#/km
1977	2,167		57	70	17.7	657
1991	1,579	162	42	51	14.9	478
2002	5,284	14.5	148	170	47	1822
2011	1,607	226	52	52	14	548

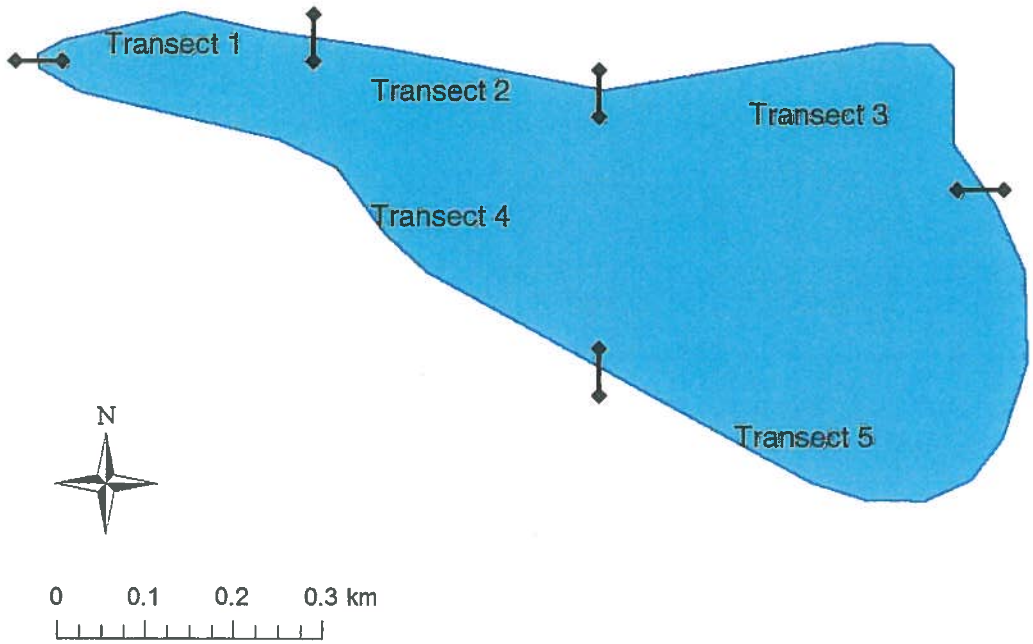

Figure 6. Location of five transects used to mark and recapture bluegill and largemouth bass in Crane Falls Reservoir during 2011.

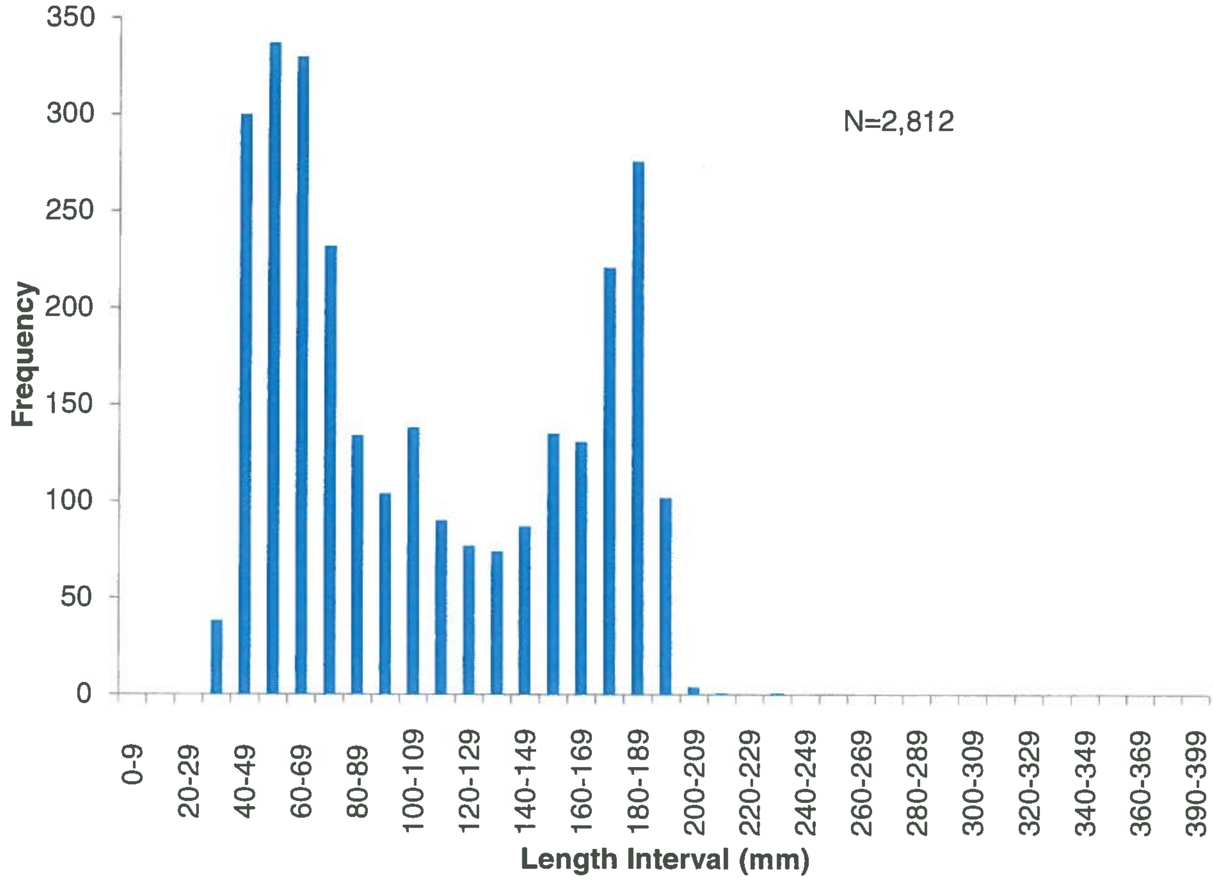

Figure 7. Length frequency of all bluegill sampled during the mark and recapture runs (n = 2,812) used to estimate population size in Crane Falls Reservoir, Idaho. Only fish ≥ 100 mm were used for the population abundance estimate.

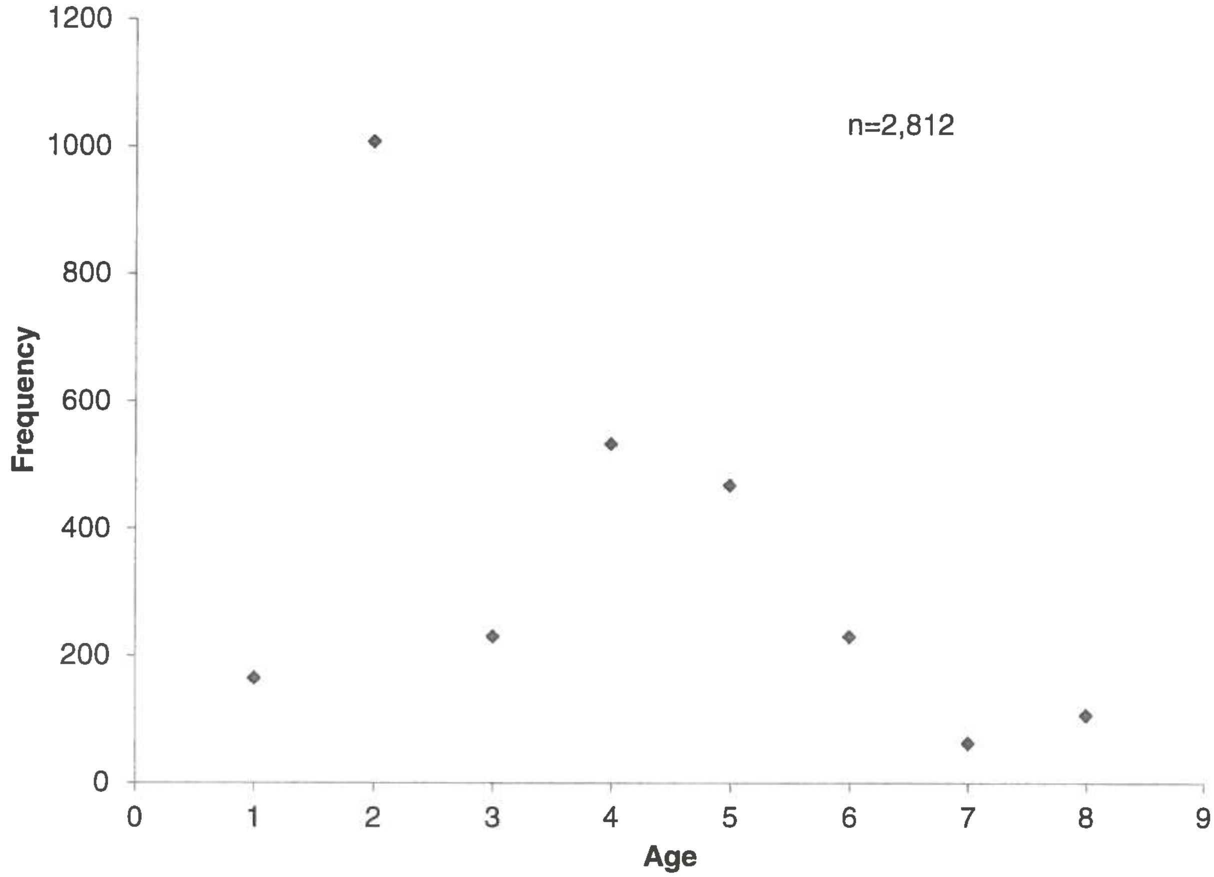

Figure 8. Age frequency of all bluegill sampled during the mark and recapture runs (n = 2,812) used to estimate population size in Crane Falls Reservoir, Idaho.

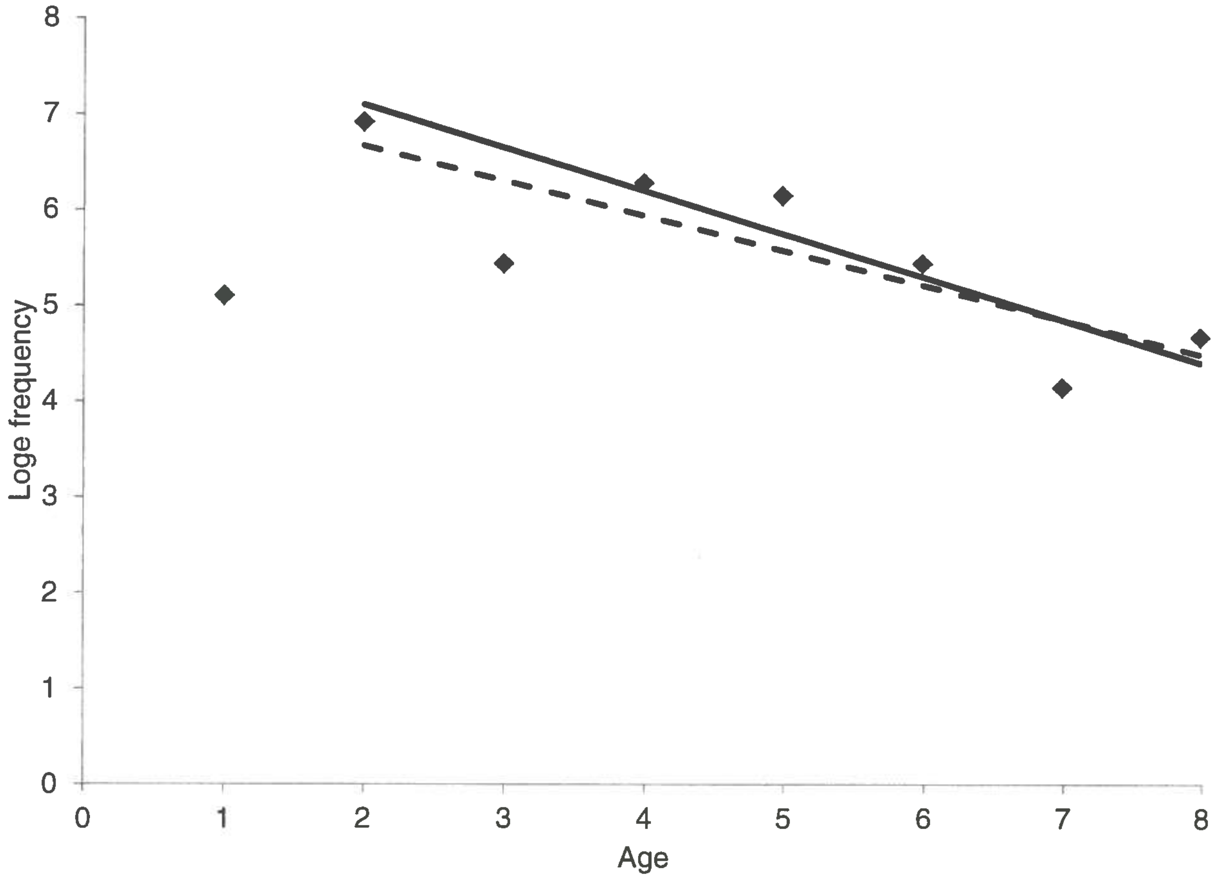

Figure 9. Catch curve for bluegill sampled from Crane Falls Reservoir during 2012. The points represent data. The hashed line represents the catch curve for ages 2-8. The unbroken line represents a catch curve for ages 2-8, excluding the outlier age 3.

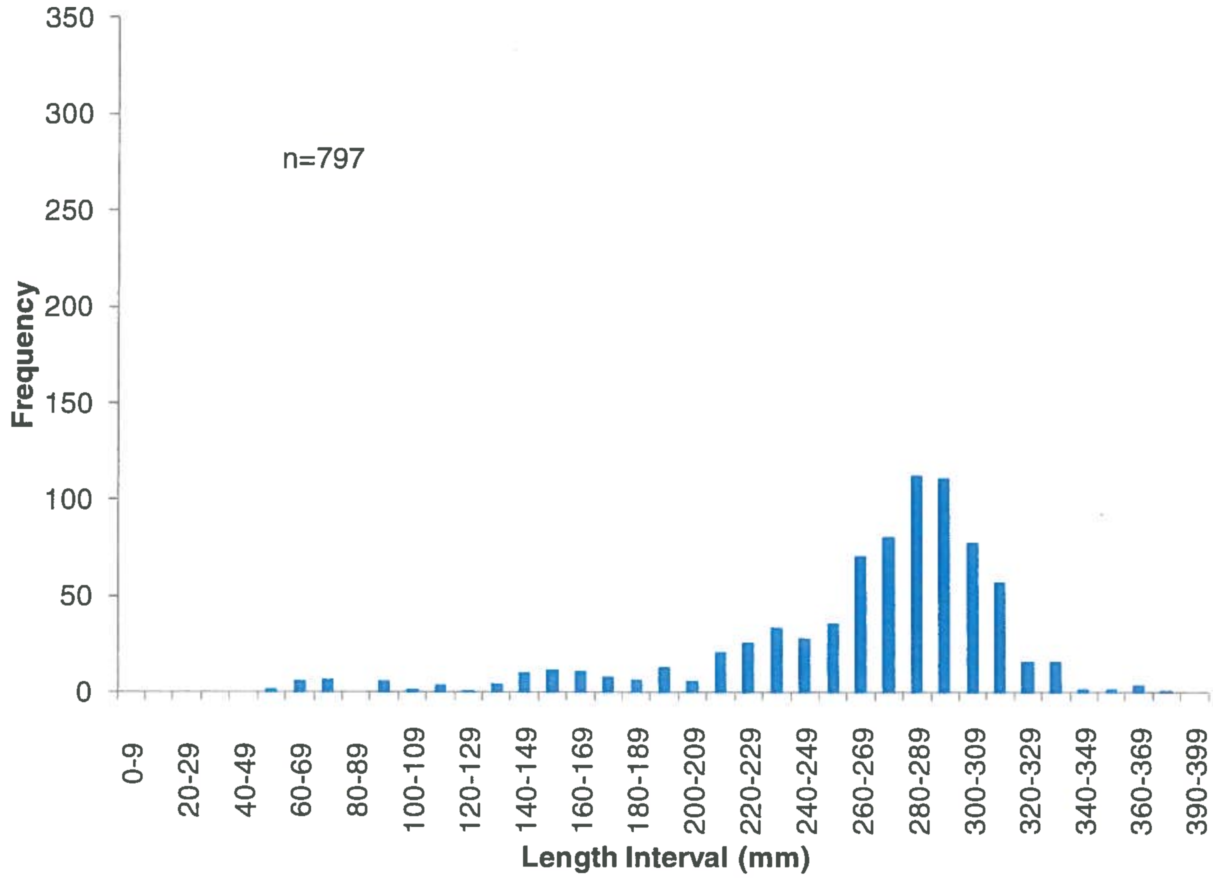

Figure 10. Length frequency of largemouth bass (n = 797) sampled from Crane Falls Reservoir during the 2011 mark-recapture survey. Only fish ≥ 100 mm were used for the population abundance estimate.

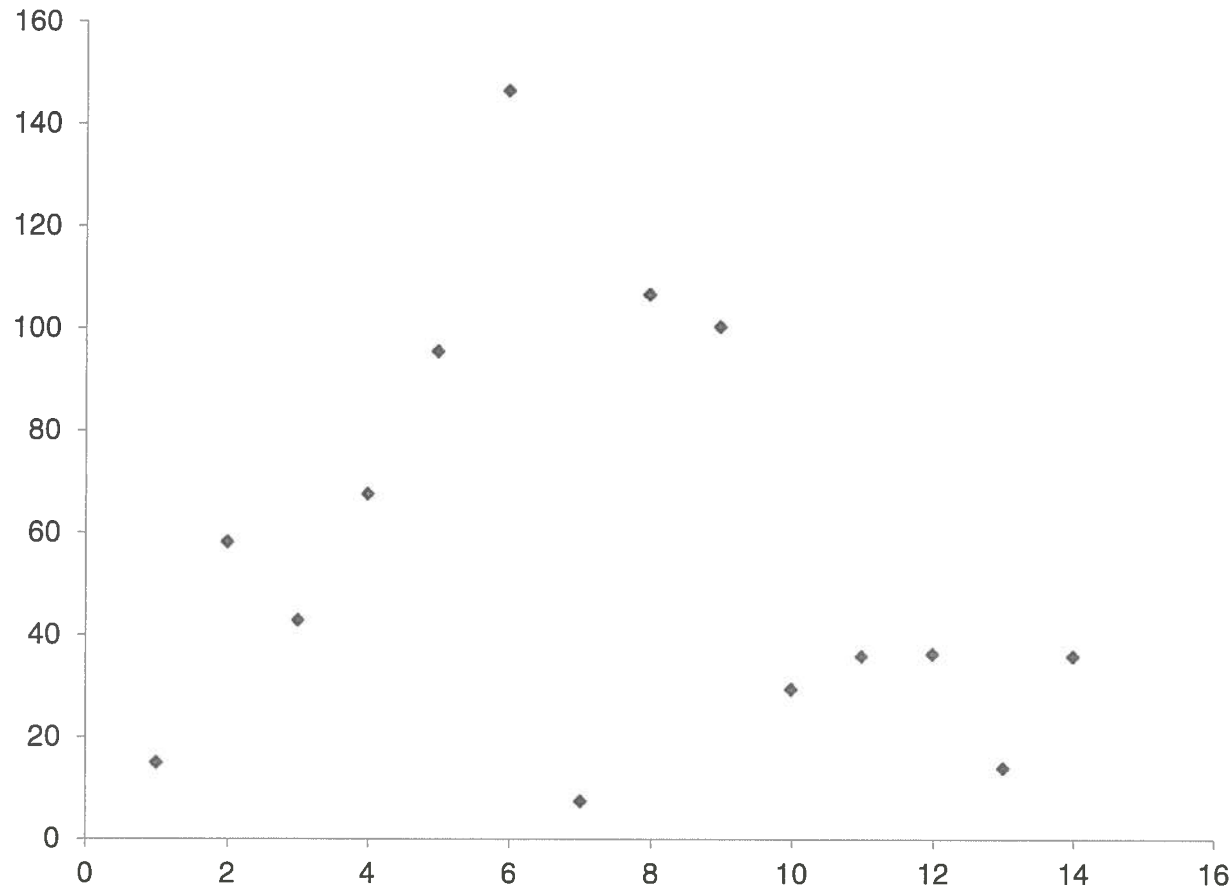

Figure 11. Age frequency of all largemouth bass sampled during the mark and recapture runs used to estimate population size in Crane Falls Reservoir, Idaho.

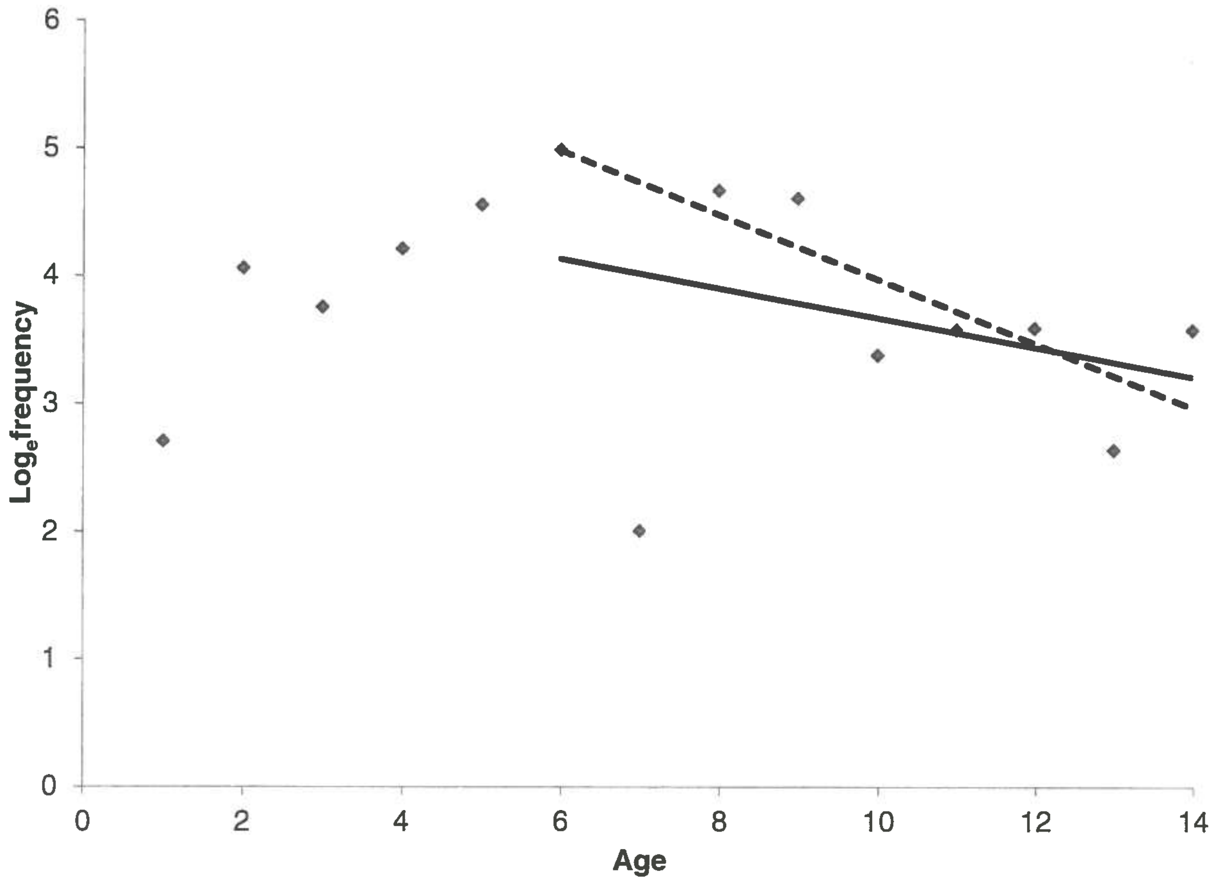

Figure 12. Catch curve for largemouth bass sampled from Crane Falls Reservoir during 2012. The points represent data. The unbroken line represents the catch curve for ages 6-14. The hashed line represents a catch curve for ages 6-14, excluding the outliner age 7.

Transplanting Catfish To Enhance Summer Fishing Opportunities In Community Ponds And Reservoirs

ABSTRACT

Capturing wild adult channel catfish *Ictalurus punctatus* and transferring them to high-use, community ponds may be a cost effective alternative to stocking commercially produced fingerlings for creating fisheries during summer months, if transferred fish are caught readily by anglers. During summer 2009 and 2010, we captured and transferred 2,533 catfish to eight ponds in southwest Idaho. Carlin-Dangler tags were affixed to 884 of these fish prior to release. Mean length and weight was 556 mm (±4) and 1,885 g (±37). Voluntary tag returns were monitored through the Idaho Department of Fish and Game's tag reporting hotline and entered into a database. We queried the database on 1/1/2012, and thus estimates for fish transferred during 2009 are for two full years, plus a third partial year, whereas estimates for fish transferred during 2010 are for one full year and a second partial year. Return rates were corrected to account for non-reporting for use as an index of exploitation. For all 2009 transfers, mean corrected harvest rate equaled 31%, whereas mean corrected release rate equaled 11%. There was little difference in encounter rate (combined harvest and release) among the three transfer periods for 2009 transfers. Encounter rates for the early, middle, and late transfer periods were 39%, 46%, and 40%, respectively. Mean time to encounter per ponds for 2009 transfers was 318 d with a maximum of 834 d. Times to encounter were directly related to transfer period, with the early transfer returning at shorter durations. For 2009 transfers, all catfish were harvested or released from March through October. For all 2010 transfers, mean corrected harvest rate equaled 27%, whereas mean corrected release rate equaled 7%. Unlike 2009 transfers, there was a substantial difference in encounter rate (combined harvest and release) among the three 2010 transfer periods with the early transfers outperforming the later efforts, though it's likely this disparity will moderate as additional tags are returned during 2012. Mean time to encounter for 2010 transfers was 144 d with a maximum of 485 d. There was little difference in mean time to encounter among the time periods. Capture and transferring channel catfish has shown to be a useful tool for increasing summer fishing opportunities in some urban ponds. Continued monitoring of tag returns will allow us to fine tune stocking locations, determine persistence of transferred fish, as well as to assess inter-annual variation in performance.

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INTRODUCTION

Idaho Department of Fish and Game's (IDFG) Southwest Region manages about 35 small ponds and reservoirs, hereafter referred to as ponds. The majority are located within urban or semi-urban settings. Ponds receive significant fishing pressure and are an important resource for providing easily-accessible, family-friendly fishing opportunities; and therefore, are thought to be vital in angler recruitment and retention efforts. Most ponds have self-sustaining largemouth bass *Micropterus salmoides* and bluegill *Lepomis macrochirus* populations. Natural production in these ponds is unable to meet angling demands; and therefore most ponds are stocked seasonally with catchable-sized rainbow trout *Oncorhynchus mykiss*. Catchable-sized rainbow trout are usually stocked on a bi-weekly basis from September through June. Summer water temperatures in southwestern Idaho ponds usually exceed thermal limits for rainbow trout, requiring a stocking cessation during July and August, occasionally stretching into June and September during warm years (Hebdon et al. 2008). Unfortunately, stocking cessations coincide with peak fishing effort periods.

Regional staff is interested in improving fisheries quality in the Southwest Region's urban ponds during summer peak effort periods using a channel catfish *Ictalurus punctatus* stocking program. Cost-based assessments of our management options led us to switch to an adult channel catfish capture and transfer program instead of our former program which included purchase and stocking of commercially produced channel catfish fingerlings (Kozfkay et al. 2010). To further gauge the cost effectiveness of this new program, we needed to gain a better understanding of how anglers were utilizing transferred channel catfish. Specifically, we sought to estimate relative harvest and release rates, estimate total harvest and the number of fish released, times to encounters (harvest and release), as well as persistence.

METHODS

Catfish were collected from the Snake River from Walters Ferry to Nyssa, OR. Fish were collected using boat-mounted electrofishing gear and two boom-mounted anodes and a 5,000 watt generator was used. Output was controlled by a Smith Root VVP-15. Frequency was set at 80-120 pulses per second and a pulse width of 15, which yielded an output of 5-6 amps.

Captured catfish were held in a 280-L livewell equipped with a re-circulating pump and supplemental oxygen. After approximately 75-100 catfish had been captured, they were transferred to an 1,100-L fish transport trailer at a boat ramp and transferred to local ponds. Our transfer targets were approximately 25-75 catfish once per month in June (Early), July (Middle), and August or September (Late), though not all ponds were stocked at this level in all months. Channel catfish were the primary target species; however, we did capture and transfer, flathead catfish *Pylodictis olivaris* occasionally, but only in small numbers (approximately 2% of the total) and none were tagged. Capture and transport efforts required 2- ½ ton trucks, 1 jet boat electrofishing unit, 1 fish transport trailer, and 4 IDFG employees. Usually, it required about 3 d of effort to complete the capture and transport efforts for eight ponds. During 2009, eight ponds were used including Beachs, Caldwell #2, Eds, Horseshoe Bend Mill, McDevitt (aka Norms), Park Center, Quinns, and Sawyers ponds (Figure 13). During 2010, Caldwell #2 and Quinns ponds were replaced by Caldwell Rotary and Riverside ponds.

Tagged channel catfish were released during all stocking events to estimate angler utilization. Prior to release, we affixed Carlin dangler tags (Wydoski and Emery 1983) to approximately one-third of transferred fish. Each tag was threaded to the mid-point of a 200-mm piece of stainless steel wire. After the tag was positioned at the mid-point of the wire, we twisted the wire five times to lock it in place. Then, the tagging apparatus, a pair of hypodermic needles affixed to a wooden dowel, was inserted into each tagged fish's body below the dorsal spine. The wire's tag ends were slid through the hypodermic needles, the needles were then removed, and the tag ends were twisted about five times on the opposite side of the fish and trimmed. Each tags possessed a unique identification number, the abbreviation IDFG, and a tag reporting hotline phone number (1-866-258-0338) to facilitate the reporting of caught fish. Furthermore, a tag reporting portal was available on IDFG's website (http://fishandgame.idaho.gov/apps/fishtag/). Length and weight of each tagged fish was recorded prior to release. It is important to note that a tag hotline data entry error was found and corrected during this analysis. This error caused calculations based on transfer period reported in the preceding annual report to be incorrect (for 2009 transferred fish only). Specifically, many middle transfers were entered as early transfers leading to over-estimated returns for the earlier period and under-estimated returns for the middle transfer period. This error did not affect total rates in the preceding report.

Catch, harvest, release, and angler information were recorded in IDFG's fish tagging database and queried on 1/1/2012. Thus, estimates reported in this document for fish stocked during 2009 are for two full years, plus a third, partial year (113 to 207 additional days at large), whereas estimates for fish stocked during 2010 are one full year, plus an additional partial year (135 to 194 days at large). Voluntary tag returns by anglers were adjusted for non-reporting error by dividing tag returns by the mean tag reporting rate (53%) estimated for other Idaho fisheries (Meyer et al. 2009). No further corrections were made as tagging mortality and tag loss for channel catfish with this tagging method equaled zero in Missouri impoundments (Michaletz et al. 2008).

RESULTS

2009 Capture and Transfer Efforts

During June, July, and September 2009, we captured 1,296 channel catfish and transferred them to eight ponds (Table 12). Mean length and weight was 562 mm (±4) and 1,879 g (±45). We affixed tags to 438 of these fish (33%). Tags were voluntarily reported by anglers from 97 catfish. Anglers reported harvesting 72 (74%) and releasing 25 (26%) catfish during the 843 to 940 d these fish were available to pond anglers. Some fish were encountered more than once. One tagged catfish in McDevitt Pond was reported to have been released twice. Similarly, in Caldwell Pond #2, a tagged catfish was caught and released 624 d after transfer, and caught a second time 44 d later and harvested.

For channel catfish captured and transferred during 2009, corrected tag return rates indicating harvest, release, and encounter showed high variation across ponds (Table 13). For all of the 2009 stocking periods and ponds combined, corrected tag return rates indicating harvest, release, and encounter (i.e. harvest and release combined) were 32 ± 9%, 10 ± 5%, and 42 ± 14%, respectively. McDevitt (85%) and Caldwell Ponds #2 (65%) ponds possessed the highest encounter rates, whereas Beachs (12%) and Horseshoe Bend (20%) ponds were the lowest (Table 13). Overall, encounter rates were very similar for the early (39%), middle (46%), and late (40%) transfer periods.

Analysis of time to harvest and time to release indicated that channel catfish captured and transferred during 2009 returned to anglers over a long time period. Angler reported encountering channel catfish on the day of transfer and for up to 834 d afterwards with distinct peaks associated with summer months (Figure 14), and with the troughs occurring during late fall through early spring. Mean time to harvest was 318 d (±) for all 2009 transfer periods combined. There was a tendency for transferred fish from the early period to be encountered at shorter durations ($\bar{x}$ = 243 d ±, n = 32) compared to the middle ($\bar{x}$ = 316 d ±, n =33) and late transfer periods ($\bar{x}$ = 394 d ±, n = 32). All fish reported harvested or released were caught during the months of March through October (Figure 14). For fish transferred during 2009, 27 reported encounters (28%) occurred during 2009, 49 encounters (51%) occurred during 2010, and 21 encounters (22%) occurred during 2011.

2010 Capture and Transfer Efforts

During 2010, we captured 1,239 channel catfish and transferred them to eight ponds (Table 12). Two of the poorer performing ponds based on initial returns (Caldwell #2 & Quinns ponds) utilized during 2009 were replaced with alternatives (Caldwell Rotary and Riverside ponds) with the intention of increasing overall utilization of these fish. Mean length and weight was 551 mm (±5; n = 448) and 1,890 g (± 60) and was not statistically different from 2009, nor was any size at the time of transfer difference detected among periods in either year. We affixed tags to 448 channel catfish (36%). Tags were voluntarily reported by anglers from 81 channel catfish. Anglers reported harvesting 64 (79%) and releasing 17 catfish (21%).

For all of the 2010 stocking periods and ponds combined, corrected tag return rate indicating harvest, release, and encounter was 26 ± 11%, 6 ± 4%, and 32 ± 13%, respectively (Table 13). McDevitt (72%) and Caldwell Rotary Pond (48%) ponds possessed the highest encounter rates, whereas Eds (8%) and Horseshoe Bend (7%) ponds were the lowest (Table 13). Fish transferred during the early time period were encountered at a much higher rate (53%) than the middle (29%) or late periods (19%).

Analysis of time to harvest and time to release indicated that channel catfish captured and transferred during 2010 returned to anglers over a long time period. Angler reported encountering channel catfish on the day after transfer and for up to 485 d afterwards with distinct peaks associated with summer months (Figure 15), and with the troughs occurring during late fall through early spring. This tendency was nearly identical to 2009 transfers. Mean time to harvest was 144 d for all 2010 transfer periods combined. There was a tendency for the early period ($\bar{x}$ = 136 d, n = 43), to be encountered at shorter durations compared to the middle ($\bar{x}$ = 151 d, n =24) and late transfer periods ($\bar{x}$ = 157 d, n = 14). Most fish (95%) reported harvested or released were caught during the months of March through October (Figure X). For fish transferred during 2010, 49 encounters (60%) occurred during 2010 and 32 encounters (40%) occurred during 2011.

DISCUSSION

Wide variation in encounters (harvest or release) of transferred channel catfish among ponds was evident. For instance, approximately 85% of channel catfish transferred to McDevitt Pond during 2009 have been encountered within approximately 2.5 years, when harvest and release are corrected and combined. Similarly, encounter of tagged fish in Caldwell Pond #2 was also high (65%). Dissimilarly, Beaches (12%) and Horseshoe Bend (20%) ponds performed poorly. All other ponds were intermediate to these values and had sufficient utilization to justify continued capture and transfer efforts. The addition of substantial, even increasing returns, from Quinns, Sawyers, and Caldwell #2 ponds in the second and third year after transfer caused us to reverse our earlier decision to remove these water from the rotation. No such increase was documented for Beachs and Horseshoe Bend ponds; and therefore, we recommend discontinuing transfer of channel catfish into these waters as it is unlikely that substantial numbers of additional tags will be reported. Similar to 2009, 2010 waters showed a range of encounter rates. McDevitt and Parkcenter ponds ranked near the top of the spectrum in both years. Additionally, both newly selected waters (Caldwell Rotary and Riverside) performed well.

Tag returns indicated that anglers tended to favor harvesting captured fish (Table 13). For the 2009 and 2010 efforts, returns indicated that 75-80% of captured fish were harvested, with the remaining 20-25% being released. We also saw no evidence of size selection by anglers. Fish were harvested and released throughout the range of available sizes. Transferred catfish showed strong seasonal performance differences with very few tagged fish being caught during late Fall, Winter, and early Spring. Transferred catfish seemed to be remarkably persistent with little evidence of mortality or tag loss. Return of tags after fish had spent one or two winters at large was high, even increased as time progressed in some waters indicating high survival, good tag retention, and possibly increasing awareness of this program. Quite remarkably, McDevitt Pond was drawn down to very low levels to control milfoil levels during winter 2009-2010 and many transferred channel catfish survived this effort and were caught after the pond refilled. Based on the frequency of second and third year returns, we fully expect to receive additional returns, especially from the 2010 transfers, as tag return monitoring continues. Angler harvest rates suggest captured and transferred channel catfish to be an effective, low-cost method for creating fisheries in some urban ponds. This seems to be especially true during the summer months when the typical stocking of catchable-sized rainbow trout is precluded due to warm water temperatures.

MANAGEMENT RECOMMENDATIONS

1. Continue to monitor the return of tagged catfish until fish from the 2010 capture and transfer efforts have been at large for at least a full two years (September 2012). Additional tag return information should allow further evaluation of pond and seasonal differences in performance as well as whether publicity efforts have increased utilization.

2. Continue to publicize this program through media outlets to gain attention, especially of poorer performing waters.

3. Add Caldwell #2, Quinns, and Sawyers ponds back to the list of ponds for this program. Inclusion of additional data revealed that captured and transferred catfish were utilized at sufficient rates to justify project costs.

4. Remove Beaches and Horseshoe Bend ponds from the list of waters that receive transferred channel catfish. Tag return rates have been low for both transfer years and are unlikely to increase.

Table 12. Number of channel catfish captured and transferred by period to eight Southwestern Idaho Urban ponds during 2009 and 2010.

Pond Name	2009				2010				
	Early	Middle	Late	Sub-total	Early	Middle	Late	Sub-total	Total
Beaches	25		6	31	15	11	8	34	65
Caldwell #2	25	25	25	75					75
Caldwell Rotary					15	20	16	51	51
Eds	7	6	10	23	9	7	8	24	47
Horseshoe Bend	29	33	24	86	19	23	12	54	140
McDevitt	17	11	12	40	21	22	17	60	100
Park Center	25	19	25	69	30	43	29	102	171
Quinns		20	22	42					42
Riverside					23	15	14	52	52
Sawyers	25	20	26	71	21	16	33	70	141
Total	153	134	150	437	153	157	137	447	884

Table 13. Corrected harvest, release, and encounter rates (% of fish stocked) for tagged channel catfish captured and transferred during 2009 and 2010.

Corrected Harvest Rates (%)

	2009				2010				
	Early	Middle	Late	Sub-total	Early	Middle	Late	Sub-total	Total
Beaches	15		0	12	38	0	0	17	15
Caldwell #2	45	38	45	43					43
Caldwell Rotary					63	38	47	48	48
Eds	54	0	38	33	21	0	0	8	20
Horseshoe Bend	13	0	39	15	0	16	0	7	12
McDevitt	67	86	31	61	99	43	22	57	58
Park Center	30	70	23	38	31	26	7	22	29
Quinns		38	17	27					27
Riverside					66	13	13	36	36
Sawyers	23	28	22	24	18	35	0	13	19
Total	31	34	29	31	43	25	11	27	29

Corrected Release Rates (%)

	Early	Middle	Late	Sub-total	Early	Middle	Late	Sub-total	Total
Beaches	0		0	0	0	0	0	0	0
Caldwell #2	15	23	30	23					23
Caldwell Rotary					0	0	0	0	0
Eds	0	0	19	8	0	0	0	0	4
Horseshoe Bend	0	0	16	4	0	0	0	0	3
McDevitt	44	17	0	24	18	17	11	16	19
Park Center	8	40	0	14	31	4	13	15	14
Quinns		0	9	4					4
Riverside					8	0	0	4	4
Sawyers	0	9	7	5	0	0	17	8	7
Total	9	13	11	11	10	4	8	7	9

Corrected Encounter Rates (%)

	Early	Middle	Late	Sub-total	Early	Middle	Late	Sub-total	Total
Beaches	15		0	12	38	0	0	17	15
Caldwell #2	60	60	75	65					65
Caldwell Rotary					63	38	47	48	48
Eds	54	0	57	41	21	0	0	8	24
Horseshoe Bend	13	0	55	20	0	16	0	7	15
McDevitt	111	103	31	85	117	60	33	72	77
Park Center	38	109	23	52	63	31	20	37	43
Quinns		38	26	31					31
Riverside					74	13	13	40	40
Sawyers	23	38	29	29	18	35	17	22	25
Total	39	46	40	42	53	29	19	34	38

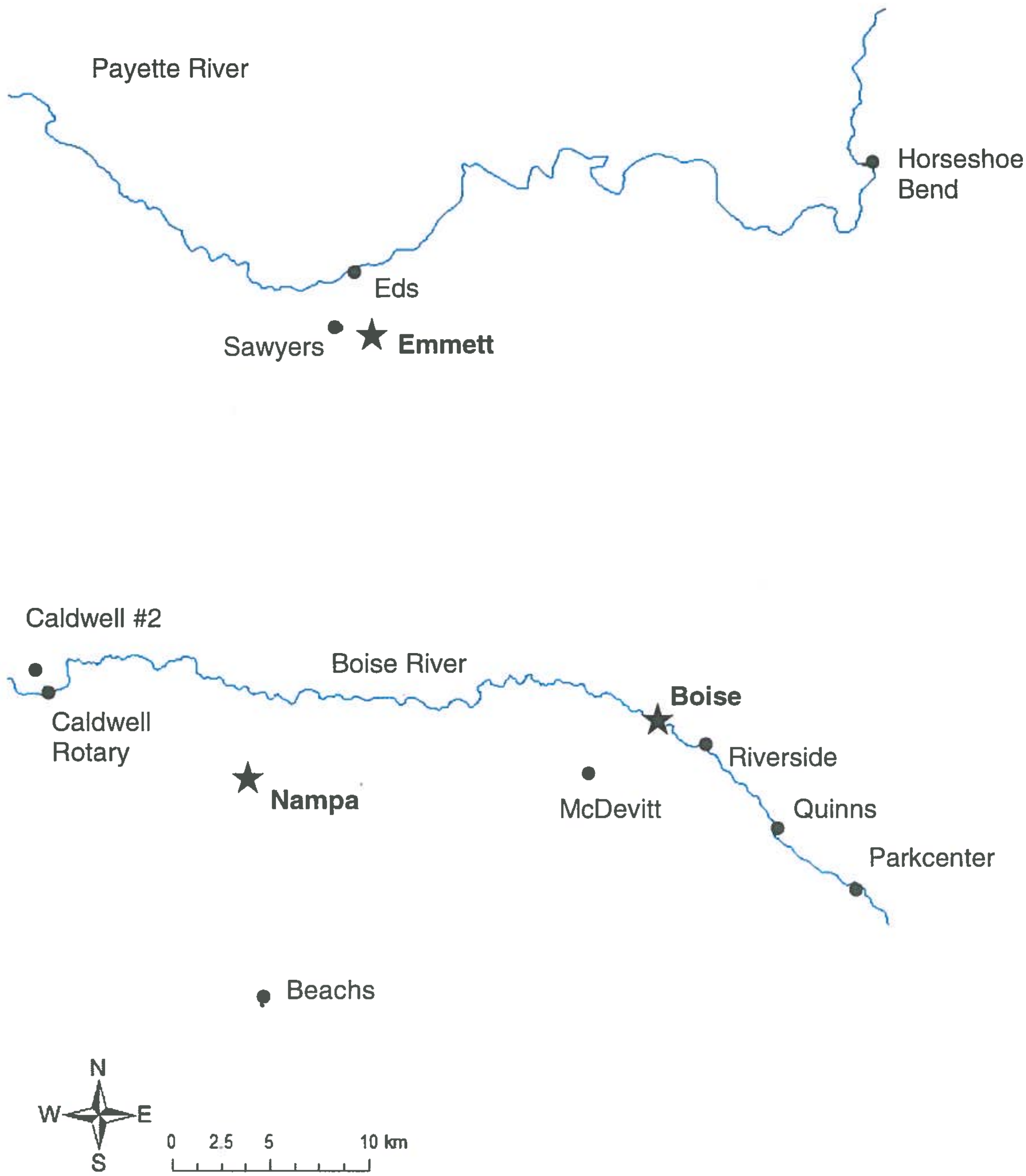

Figure 13. Location of ponds (circles) that received captured and transplanted catfish during 2009 or 2010.

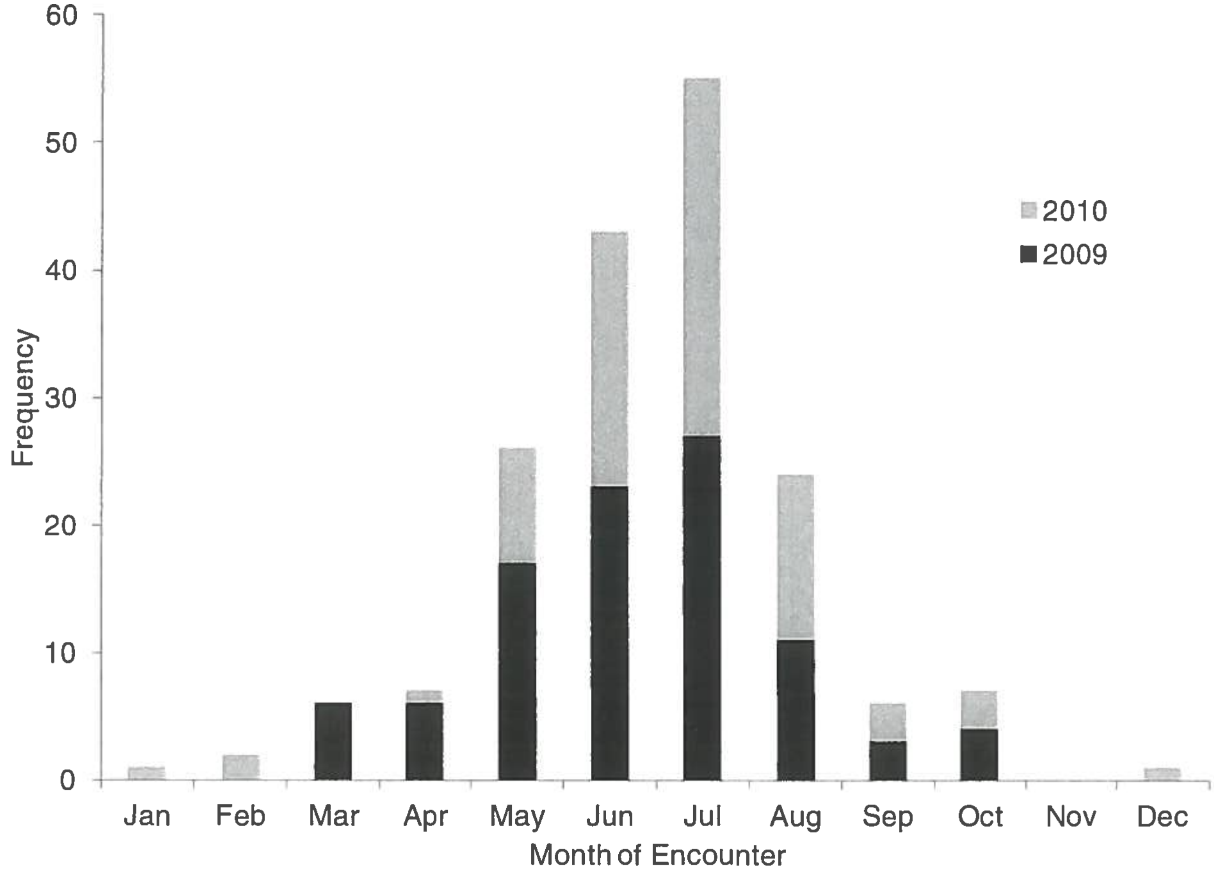

Figure 14. Month of encounter (harvest or release combined) for channel catfish captured and transferred during 2009 and 2010 transfer years.

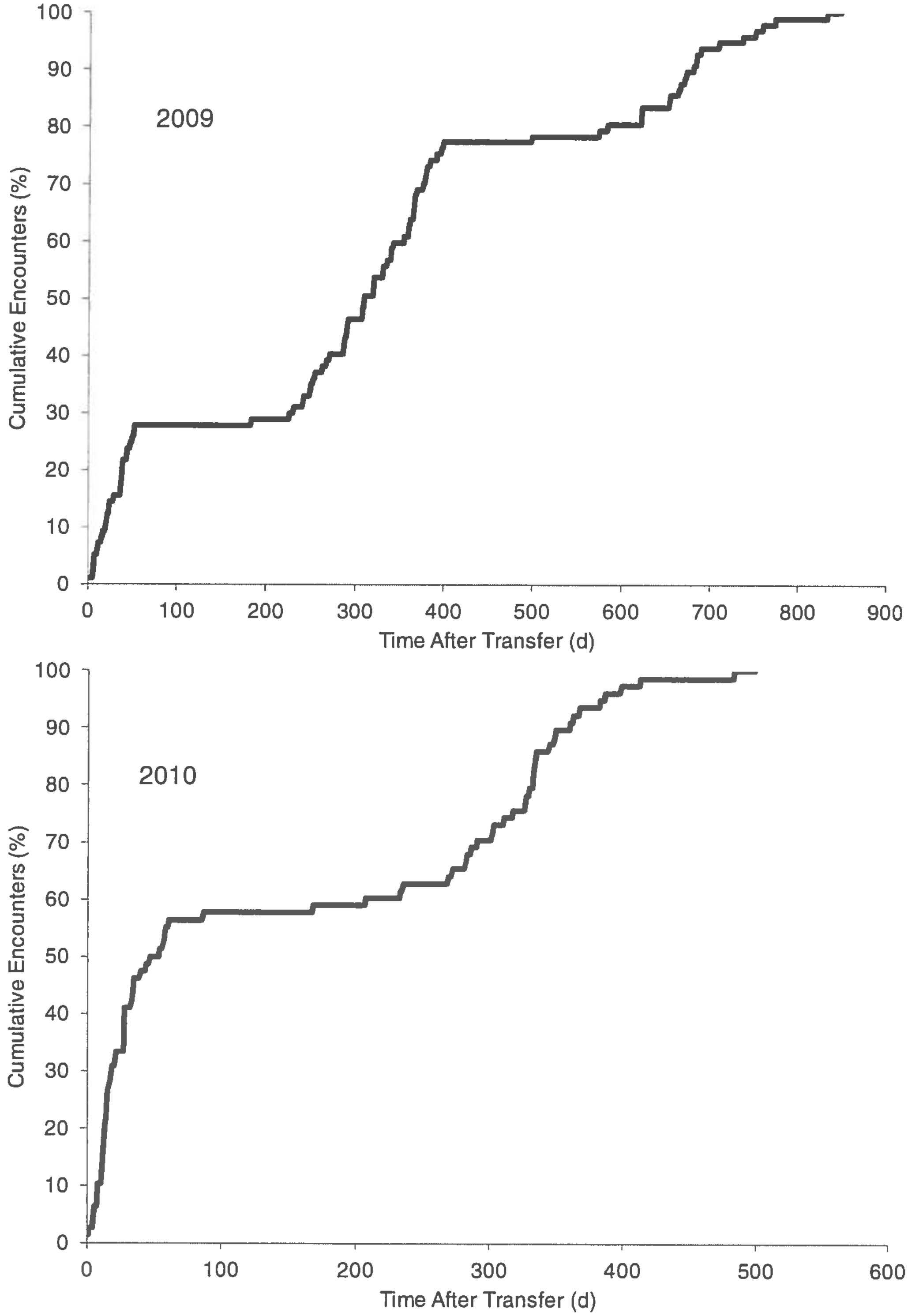

Figure 15. Cumulative encounters (harvest or release combined) for channel catfish captured and transferred during 2009 (top) and 2010 (bottom). Note differing x-axis scales.

Deadwood Reservoir - 2011 Kokanee Monitoring

ABSTRACT

Deadwood Reservoir provides both an important kokanee fishery and is the primary source for early-spawn kokanee *Oncorhynchus nerka* eggs for the Idaho Department of Fish & Game (IDFG) hatchery system. Because the kokanee population has a tendency to stunt, monitoring and control efforts are conducted on an annual basis during egg-take operations. Fourteen hydroacoustic transects were conducted at Deadwood Reservoir on August 1, 2011. Converted target strengths suggested that kokanee ranged between 30 and 380 mm and the length frequency from converted target strength corresponded well with fish collected during mid-water trawling. Fish densities among transects ranged from 1,365 fish/ha to 6,432 fish/ha with the highest densities (1,894 fish/ha) of fish corresponding to age-0 fish. Age-3 kokanee displayed the lowest densities (159 fish/ha) among age classes. Overall, total mean kokanee density was 3,261 (2,808 to 3,787) fish/ha. When expanded using the reservoir surface area (1,212 ha) on the survey date, kokanee total population abundance was estimated as 3,952,318 (3,403,750 to 4,589,264). Age-0 kokanee made up 58% of this total or 2,295,164 (1,921,177 to 2,741,906). Total kokanee abundance in 2011 has increased seven-fold since 2009, mostly due to the abundant age-0 year classes in 2010 and 2011. Hydroacoustic abundance trend information from 2000-2010 shows that age-0 kokanee numbers are at their highest numbers since hydroacoustic surveys began. In response, IDFG personnel operated aggressive control measures at the Deadwood River and Trail Creek weirs in 2011. Fish were not allowed past the Trail Creek weir in 2011 and only fish at the very end of the spawning escapement were allowed past the Deadwood River weir after it was removed.

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INTRODUCTION

Deadwood Reservoir is a 1,260-ha impoundment located on the Deadwood River in Valley County, approximately 40 km southeast of Cascade and 85 km northeast of Boise, Idaho (Figure 16). Deadwood Reservoir provides sport fishing opportunity for kokanee *Oncorhynchus nerka,* rainbow trout *O. mykiss,* and westslope cutthroat trout *O. clarki lewisi.* Bull trout *Salvelinus confluentus* are present in Deadwood Reservoir at very low numbers. In addition, resident fall Chinook *O. tshawytscha*, have been stocked at low densities (4 fish/ha) beginning in 2009.

Over the last 10 years, the kokanee population in Deadwood Reservoir has cycled drastically. Because kokanee exhibit density-dependent growth, increases in population result in decreases in adult fish length. Historically, this relationship has been especially evident at Deadwood Reservoir as the kokanee population experiences relatively low angler pressure and has access to five tributaries with excellent spawning habitat. In addition, Deadwood Reservoir contains very small populations of piscivorous predators that are not capable of exerting an impact upon the kokanee population

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. The management goal for adult kokanee at Deadwood Reservoir is an average size of 325 mm. Deadwood Reservoir also functions as one of the state's primary egg sources in Idaho, providing early spawning kokanee for stocking throughout the state. However, the egg take operation at Deadwood Reservoir was discontinued for one year in 2009 because a permanent weir was constructed on the South Fork Boise River (SFBR). Egg take operations at Deadwood Reservoir resumed in 2010 and are expected to remain there for the foreseeable future.

METHODS

Mid-Water Trawling

Mid-water trawling was conducted at night during the dark (new) moon on August 2, 2011 for hydroacoustic target and age verification. Trawling methodology and analysis is described in detail in Butts et al. (2011).

Hydroacoustics

Hydroacoustic estimates of fish densities, lengths, and vertical depth distributions were obtained with a Hydroacoustic Technology, Inc. (HTI) Model 241-2 split-beam digital echosounder on August 1, 2011. Hydroacoustic methodology and analysis is described in detail in Butts et al. (2011).

RESULTS

Mid-Water Trawling

Mid-water trawling captured 116 kokanee, ranging in size from 30-320 mm, on August 2, 2011 (Figure 17). Length frequency was used along with counting annuli on whole otoliths to construct size ranges of three age classes. These analyses suggested that age-0 fish were fish <100mm, age-1 fish were between 100-200 mm, age-2 fish between 200-300 mm, and age-3 fish were >300 mm.

Hydroacoustics

Fourteen hydroacoustic transects were conducted at Deadwood Reservoir on August 1, 2011. Converted target strengths suggested that kokanee ranged between 30 and 380 mm, and the length frequency from converted target strength corresponded well with fish collected during mid-water trawling (Figure 17). Therefore, length-age relationships estimated from mid-water trawling were used to partition hydroacoustic estimates into estimates for individual age classes.

Fish densities among transects ranged from 1,365 fish/ha to 6,432 fish/ha with the highest densities (1,894 fish/ha) of fish corresponding to age-0 fish (Table 14). Age-3 kokanee displayed the lowest densities (159 fish/ha) among age classes. Overall, total mean kokanee density was 3,261 (2,808 to 3,787) fish/ha. When expanded to a population estimate using the reservoir surface area (1,212 ha) on the survey date, a total of 3,952,318 (3,403,750 to 4,589,264) kokanee were estimated. Age-0 kokanee made up 58% of this total or 2,295,164 (1,921,177 to 2,741,906) fish. Population estimates for remaining age classes are reported in Table 14.

Total kokanee abundance in 2011 has increased seven-fold since 2009, mostly due to the abundant age-0 year classes in 2010 and 2011 (Figure 18). Hydroacoustic abundance trend information from 2000-2010 shows that age-0 kokanee numbers are at their highest numbers since hydroacoustic surveys began. Abundance of age-1 and older fish have increased to their highest numbers since 2005. Benefits from extensive escapement control efforts conducted by IDFG during 2006-2008 have disappeared as 2009 and later year classes have gone either unchecked or insufficiently suppressed.

DISCUSSION

Hydroacoustic evaluations of the Deadwood Reservoir kokanee population suggest that that the population is responding to the lack of spawning escapement control since 2009. In 2009, egg take weir operations were suspended at Deadwood Reservoir, which generally also operates to control the number of spawners in the mainstem Deadwood River. In addition, control efforts to remove spawning fish from the Deadwood River and other tributaries were in operation from 2006-2008. Thus, 2010 age-0 kokanee are the first year class in some time to be produced from a totally unregulated spawning run. Older age classes displayed densities that were likely influenced by previous control measurements which resulted in an overall mean female length of 308 mm, slightly under the management objective minimum length of 325 mm (Figure 19). Based on the observed increase in kokanee abundance the last two years, mean spawning female length is likely to fall under the management objective for the next couple of years. In response, IDFG personnel operated aggressive control measures at the Deadwood River and Trail Creek weirs in 2011. Fish were not allowed past the Trail Creek weir in 2011 and only fish at the very end of the spawning escapement were allowed past the Deadwood River weir after it was removed.

In 2009, IDFG began stocking approximately 5,000-7,000 Chinook salmon fingerlings, annually, in hopes that the fish would feed on kokanee and provide a trophy component to the Deadwood fishery. IDFG biologists plan to continue the program as a management tool for kokanee in addition to providing a sport fishery. A lowland lake survey is planned for Deadwood Reservoir in 2012 to assess the survival and growth of the Chinook salmon program. Assuming the 2010 and 2011 year classes results in a large spawning escapement in 2013 and 2014, IDFG should operate the Deadwood River weir for the entire duration of the spawning run to limit numbers. In addition, it may be necessary to limit or block spawning fish from Trail Creek.

MANAGEMENT RECOMMENDATIONS

1. Continue monitoring the kokanee population in Deadwood Reservoir with hydroacoustics and sample spawning fish to estimate mean length in 2012.

2. Operate spawning weirs on the Deadwood River and Trail Creek to limit the kokanee escapement in both tributaries on an annual basis. Develop protocol for periodically allowing kokanee past the Deadwood River weir so that the run timing does not shift from control and spawning efforts.

3. Stock additional 5,000 fall Chinook fingerling in spring or early summer 2012. Evaluate survival and growth of stocked Chinook salmon in August 2012, after three full years of stocking.

Table 14. Kokanee fish densities (number/ha) per transect and total abundance estimates calculated by arithmetic and geometric mean densities at Deadwood Reservoir, Idaho on July 14, 2010.

		Fish densities (number / ha)				
Transect	Transect length (m)	Age-0	Age-1	Age-2	Age-3	Total
1	536	2,911	1,030	199	111	4,252
2	451	1,911	672	258	129	2,970
3	461	1,878	684	372	178	3,112
4	453	1,901	567	246	164	2,878
5	299	2,063	882	510	155	3,611
6	532	1,607	1,222	742	303	3,874
7	402	2,667	985	506	253	4,412
8	442	1,565	481	243	148	2,437
9	1443	1,753	1,001	594	257	3,605
10	133	5,115	662	343	313	6,432
11	578	667	346	306	44	1,364
12	791	3,380	1,697	690	329	6,095
13	510	1,180	602	114	48	1,944
14	837	1,162	789	306	154	2,411
	Arithmetic Mean (AM)	**2,126**	**830**	**388**	**185**	**3,528**
	90% CI (AM)	**361**	**112**	**62**	**30**	**465**
	Abundance (AM)	**2,576,336 + 437,392**	**1,006,113 + 135,291**	**469,967 ± 74,547**	**224,008 ± 36,252**	**4,276,425 ± 563,767**
	Geometric Mean (GM)	**1,894**	**769**	**344**	**159**	**3,261**
	90% CI (GM)	**1,585 to 2,262**	**666 to 889**	**286 to 415**	**127 to 199**	**2,808 to 3,787**
	Abundance (GM)	**2,295,164 1,921,177 to 2,741,906**	**932,388 807,060 to 1,077,150**	**417,330 346,554 to 502,510**	**192,626 154,215 to 240,529**	**3,952,318 3,403,750 to 4,589,264**

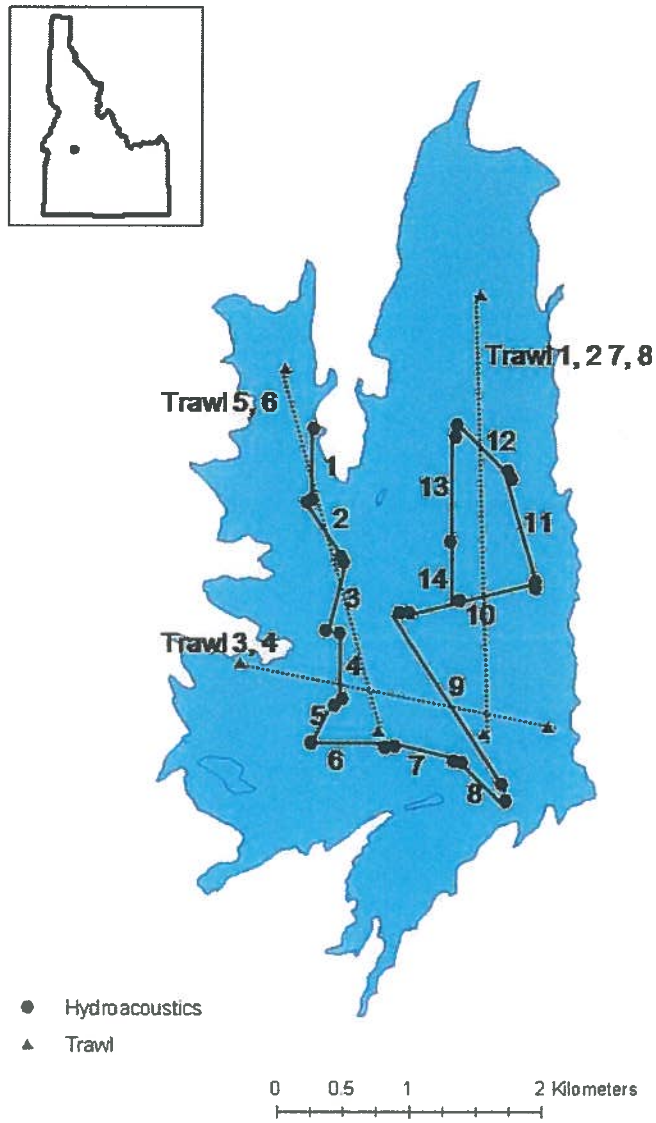

Figure 16. Map of Deadwood Reservoir, Idaho showing mid-water trawling and hydroacoustic transect locations during the 2011 survey.

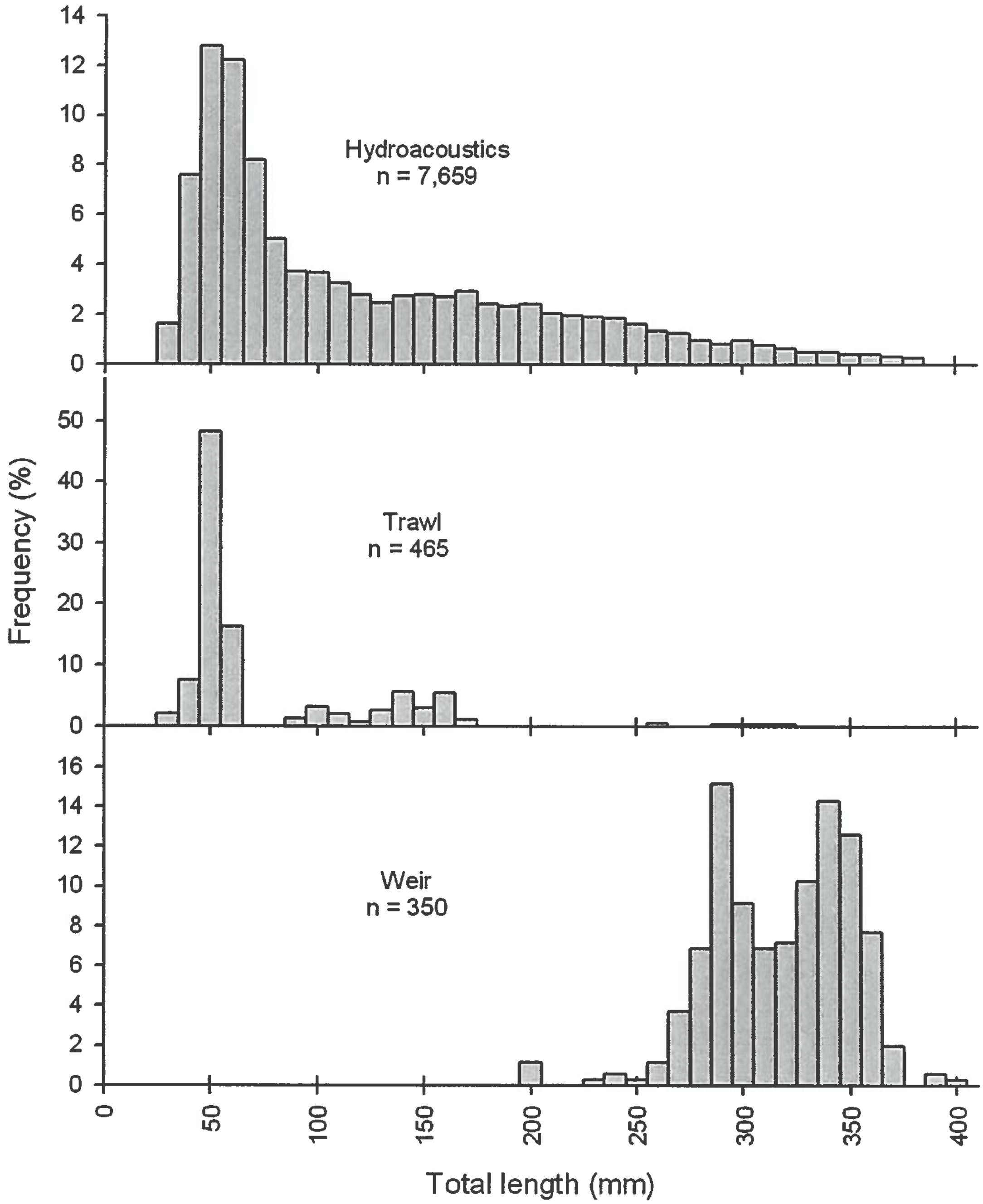

Figure 17. Length frequency of Deadwood Reservoir kokanee as estimated by converted hydroacoustic target strengths and length frequency of kokanee captured during mid-water trawling and if adult kokanee sampled during the spawning operation, 2011.

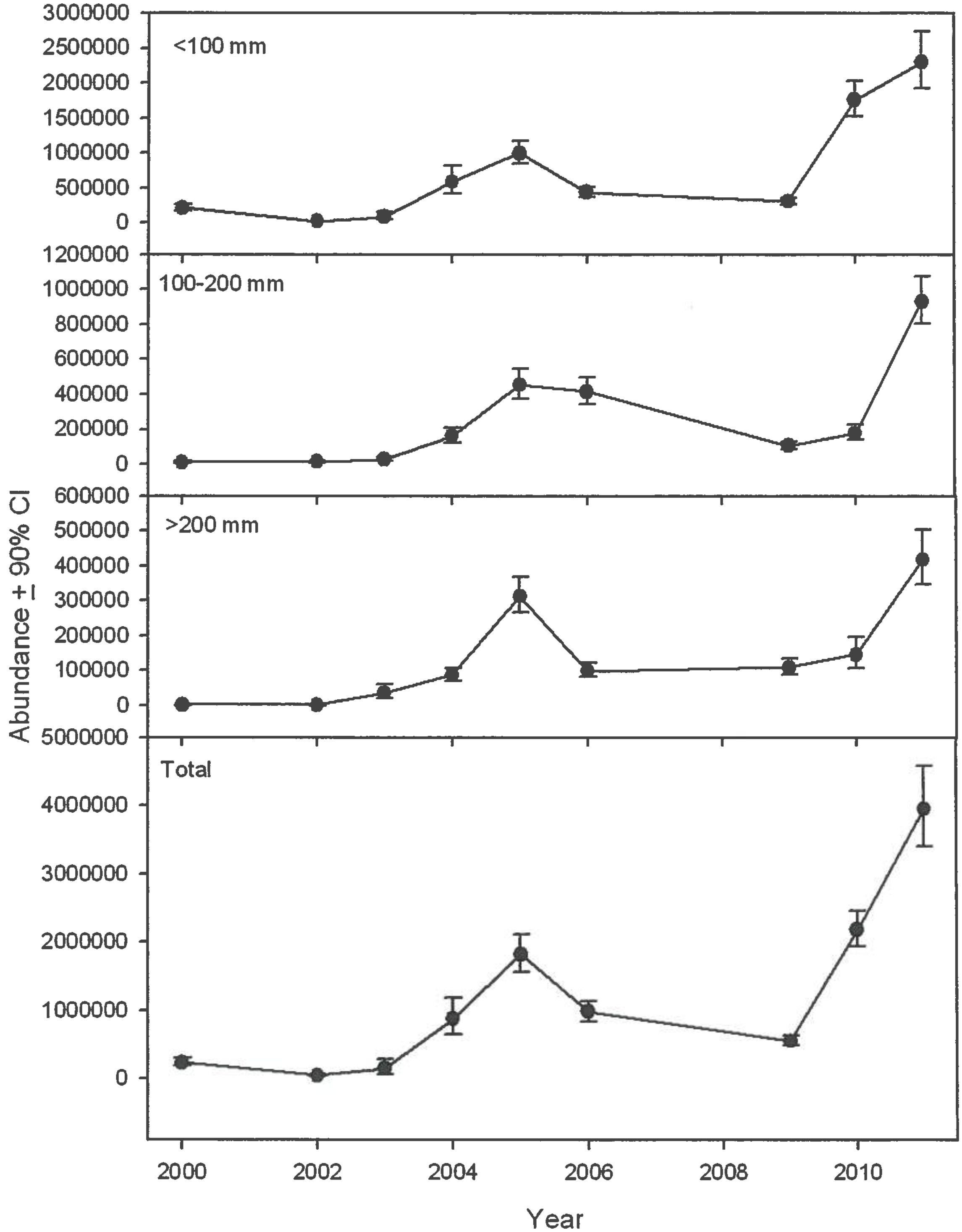

Figure 18. Comparison of kokanee abundance estimates ± 90% CI for fish <100 mm (age-0), 100-200 mm (age-1), >200 mm (age 2+), and total fish as estimated from annual hydroacoustic surveys in 2000-2011 at Deadwood Reservoir, Idaho.

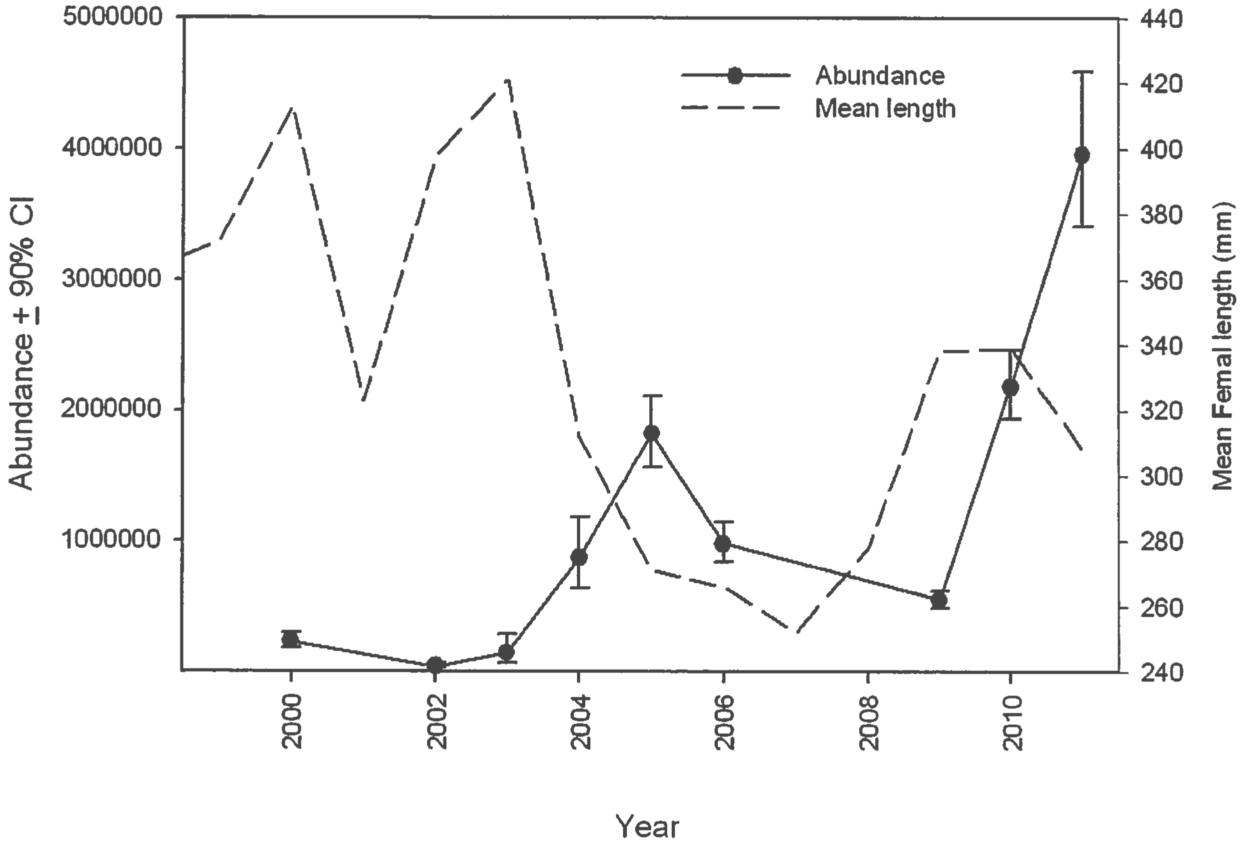

Figure 19. Trend data for 2000-2011 hydroacoustic total abundance estimates and mean female total length (mm) collected at the Deadwood River trap from 1998-2011. The management objective for mean adult length is also shown.

Assessment Of Larval Fish Production In Brownlee And C.J. Strike Reservoirs

ABSTRACT

Regional staff conducted larval trawl surveys in Brownlee and CJ Strike reservoirs during 2011 to gain a better understanding of recreationally-important warm water fish recruitment patterns, factors that may affect reproductive success, and to monitor trends in recruitment. Larval fish density was monitored by horizontally trawling a Neuston net near the waters' surface at nine to 11 sites within each reservoir. Average larval densities in Brownlee Reservoir (2005-2011) during the week of maximum abundance have ranged from 5 to 264 crappie/100 m^3 with an average of 81 crappie/100 m^3 ($n = 7$). Densities during 2011 were near the average, but slightly less (49 crappie/100 m^3). For CJ Strike Reservoir (2005-2011), average larval densities during the week of maximum mean abundance have ranged from 1.0 to 58 crappie/100 m^3 with an average of 18.2 crappie/100 m^3 ($n = 7$). During 2011 larval crappie production was very poor. Densities (1 crappie/100 m^3) were the lowest recorded since 2007 (4.0 crappie/100 m^3).

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INTRODUCTION

Fisheries for black and white crappie *Pomoxis nigromaculatus* and *P. annularis*, bluegill *Lepomis macrochirus*, and yellow perch *Perca flavescens* are popular among anglers in southwest Idaho when abundant. However, these species have been characterized by widely variable year-class strengths, which often lead to inconsistent fisheries. Year-class strength seems to be determined early in life, whether this occurs before or after the first winter is unknown. Fisheries personnel are interested in quantifying year-class strength before fish become vulnerable to anglers, so that anglers may be informed of potential fisheries quality. Monitoring larval fish densities with Neuston nets is one way to provide information on reproductive success and eventual year-class strength as long as strength isn't affected substantially by population bottlenecks later in life (e.g. survival during winter). Regardless, documentation of years with low larval production will identify potentially poor fishing years two to three years later. Monitoring of year-class strength in Brownlee and CJ Strike reservoirs has been conducted by IDFG's fisheries research personnel since 2005 as part of a statewide project. That project was discontinued, though regional staff plan to continue this work.

OBJECTIVES

1. Assess reproductive success of recreationally important warm-water fishes.

METHODS

Horizontal surface trawls were used to index the density of larval fish Brownlee and CJ Strike reservoirs. Trawls were made with a 1 m x 2 m x 4 m long Neuston net at nine to 11 sites spread throughout each of the reservoirs (Figures 20 and 21). Trawls were begun at dusk and all sites were completed within three or four hours. Mesh size was 1.3 mm. The net was fit with a flow meter to estimate the volume of water sampled. Trawl duration was 5 minutes and an average volume sampled was 559 m^3/tow. Trawls were made on an approximately bi-weekly basis beginning June 22 and ending July 19, 2011, which overlapped peaks of crappie production in previous years. Specimens were stored in 10% formalin and viewed under a dissecting microscope. Sampled fish tow were identified to species and measured for length, unless the total number of larval fish exceeded 50 individuals. For large samples, we randomly selected 50 individuals, identified and measured those, and counted the remainder.

RESULTS

Brownlee Reservoir

A total of 29 trawls were conducted on three sampling dates. Four trawls were not completed due to an abundance of floating debris. Crappie and bluegill were the only species sampled. Crappie were by far the most abundant group sampled composing 100% of the identified fish on June 22th, 97% on July 6th, and 99% on July 19th (Figure 22). Density of crappie were highest for our July sampling dates with average density equaling 1.5 crappie/100 m^3 on June 22-27th, 49 crappie/100 m^3 on July 6th, and 42 crappie/100 m^3 on July 19th. The highest density 304 crappie/100 m^3 occurred at site 2 (near the mouth of Hibbard Creek) on July 19th. During 2011, moderate to high larval abundances occurred in the upper reservoir (sites 2 & 3) as well as in the lower reservoir (sites 9-11) on July 6th. However by the next sampling period, moderate to high densities were only found in the upper reservoir. Average larval densities in Brownlee Reservoir during the week of maximum abundance have ranged from 5 to 264 crappie/100 m^3 with an average of 81 crappie/100 m^3 (n = 7). Densities during 2011 (49 crappie/100 m^3) were near the average (2005-2011)

CJ Strike Reservoir

A total of 27 trawls were conducted on 3 sampling dates. No samples were collected from trend monitoring site 4. Three species or groups of species were sampled including crappie *Pomoxis* spp., largemouth bass, smallmouth bass *Micropterus salmoides*, and channel catfish. No larval fish were sampled on the first sampling date June 23, 2011. In the two subsequent dates, bluegills were most abundant group sampled composing 51% of the identified fish on July 7^{th} & July 18^{th}, followed by crappie at 38%. For 2011, mean density of crappie was was highest during our middle sampling date (1.0 crappie/100 m^3 on July 7^{th}) and decreased to 0.4 crappie/100 m^3 on July 18th. The highest density 5.3 crappie/100 m^3 occurred at site 3 (west side of Bruneau Pool) on July 7^{th} (Figure 23). From 2005 to 2011, average larval densities in CJ Strike Reservoir during the week of maximum mean abundance have ranged from 1.0 to 58 crappie/100 m^3 with an average of 18.2 crappie/100 m^3 (n = 7). Densities during 2011 (1 crappie/100 m^3) were the lowest recorded since 2007 (4.0 crappie/100 m^3).

DISCUSSION

Production of larval crappie in large reservoirs in the Southwest Region shows high spatial and temporal variation and was asynchronous among reservoirs during 2011. For instance larval production in Brownlee Reservoir was near the average calculated from the last seven years of monitoring. During 2011, spawning events in the upper reservoir produced nearly all larvae similar to 2006 spatially. However, 2011 densities were about 40% of those documented during 2006. In contrast, larval production in CJ Strike Reservoir was the lowest recorded to date. Better understanding of crappie population dynamics is still needed. Larval production may or may not predict eventual fisheries quality. Determining habitat use and sampling techniques for post larval crappie will be needed to draw this link.

MANAGEMENT RECOMMENDATIONS

1. Monitor age structure in the harvest for fisheries on Brownlee and CJ Strike reservoirs.

2. Attempt to capture younger age classes with otter trawls to document relative abundance of advanced age-0 and age-1 crappie to determine whether larval production is predictive or future year class strength.

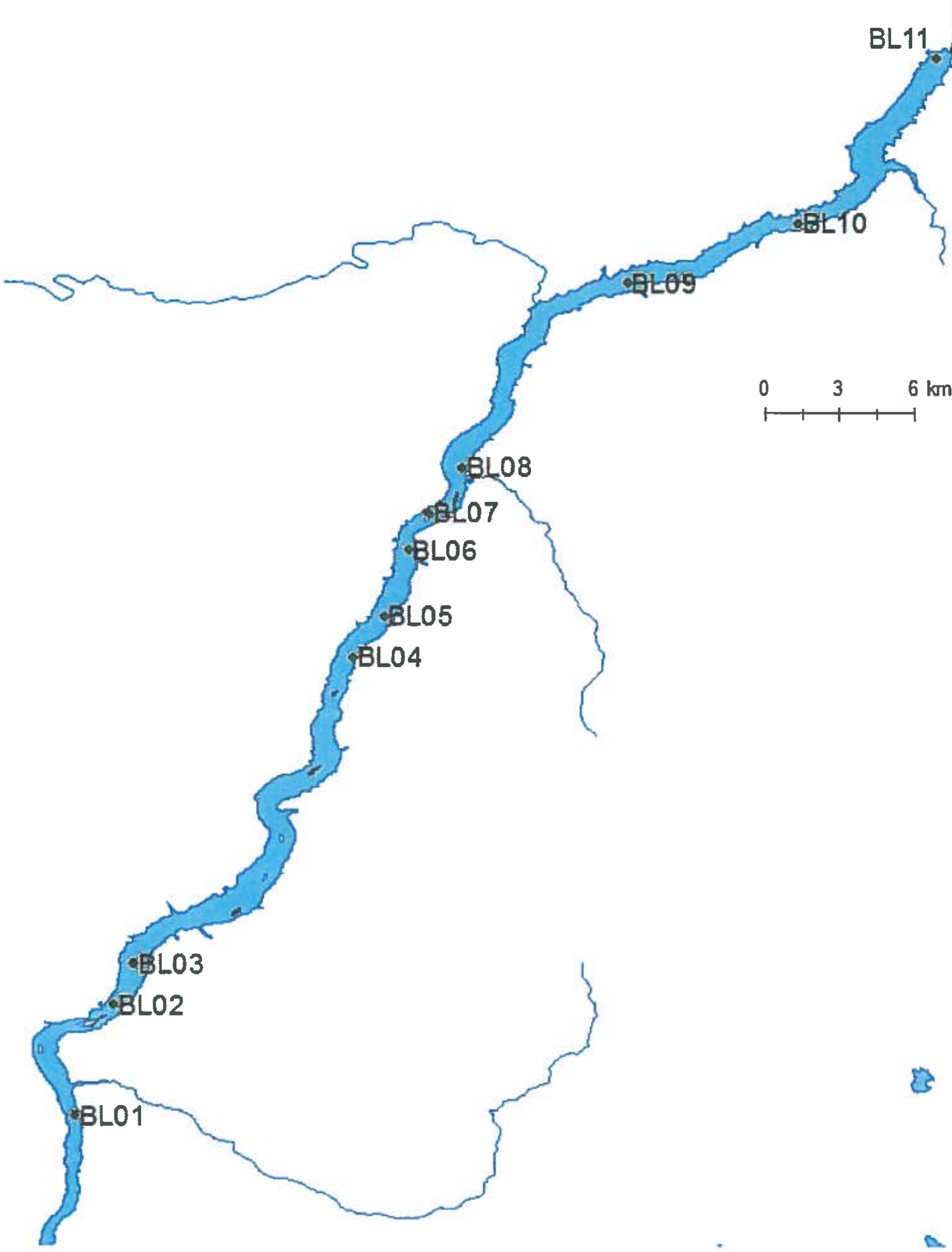

Figure 20. Location of eleven trawl sites used to index the abundance of larval fish in Brownlee Reservoir from 2005-2011.

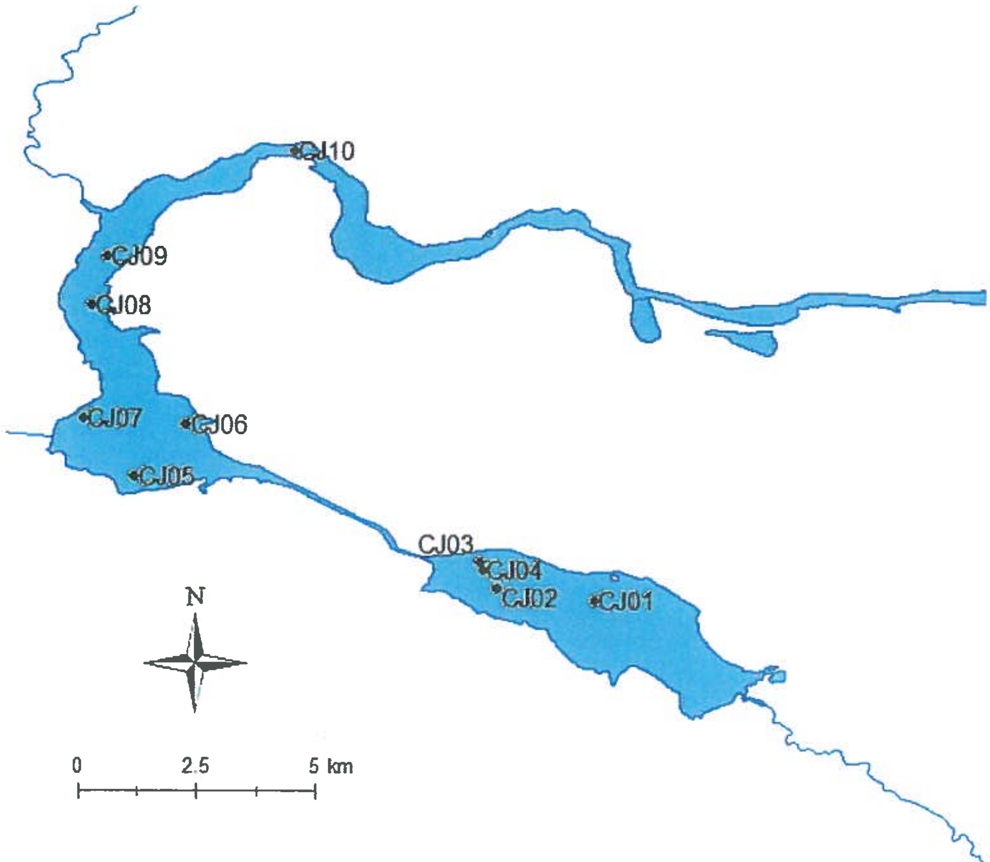

Figure 21. Location of ten trawl sites used to index the abundance of larval fish in CJ Strike Reservoir from 2005-2011.

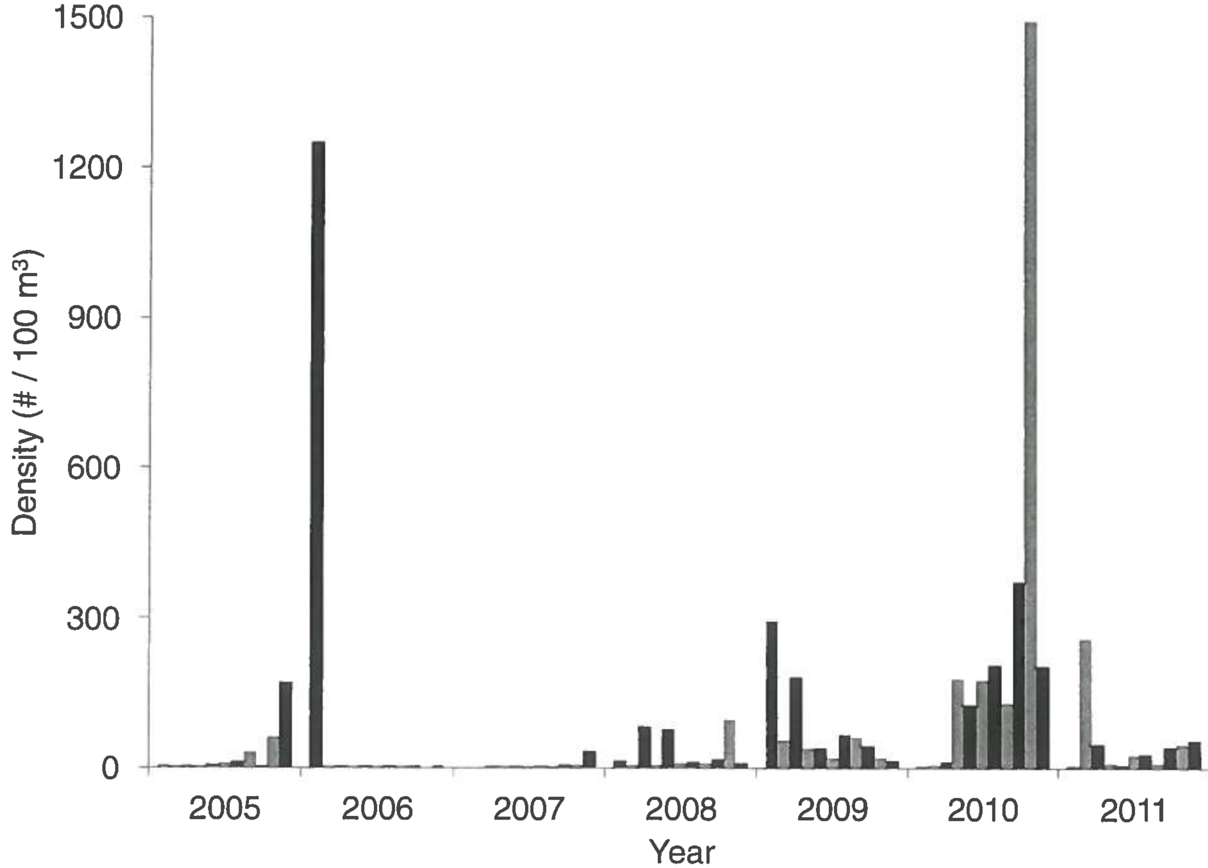

Figure 22. Densities of larval crappie (#/100 m3) in Brownlee Reservoir during 2005 through 2011. Bars within each year represent eleven individual sites. Site 1 (upstream) through site 11 (near Brownlee Dam) are displayed from left to right within X-axis categories (years).

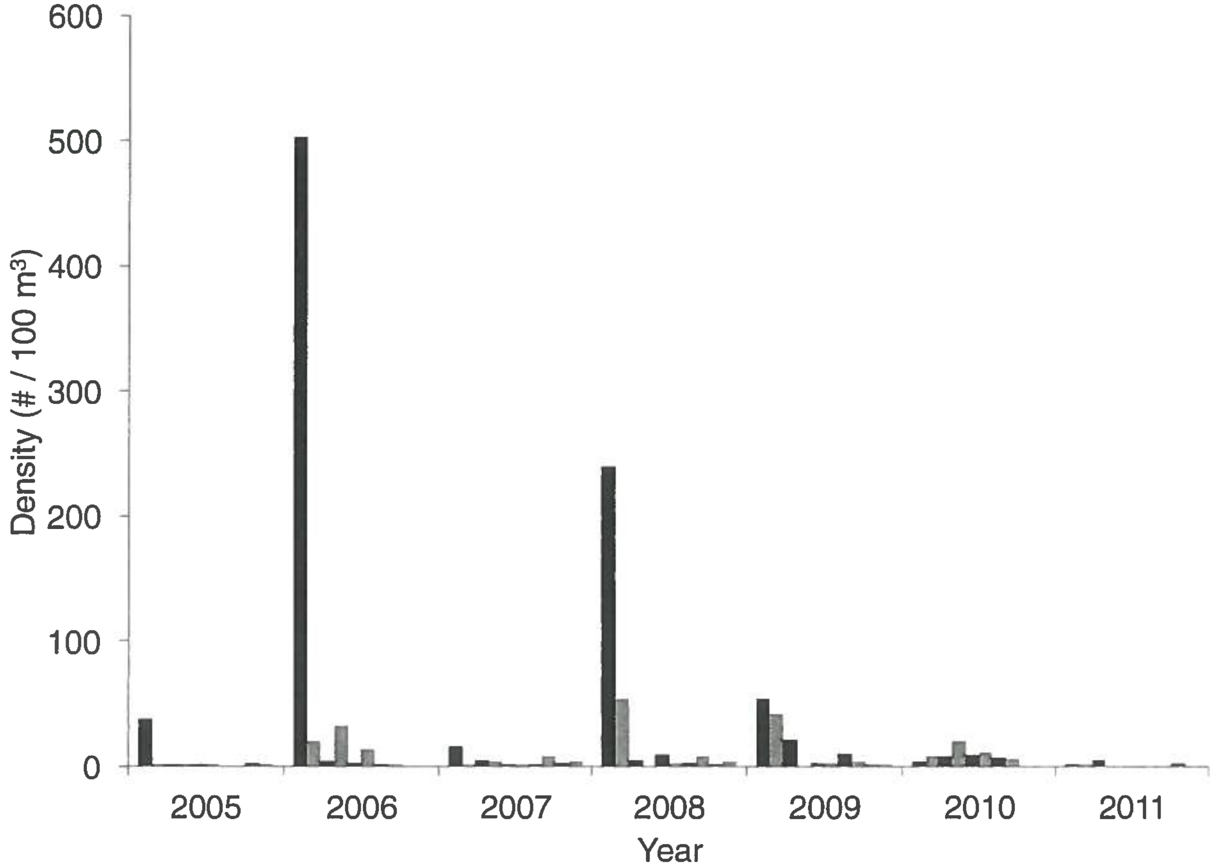

Figure 23. Densities of larval crappie (#/100 m^3) measured in CJ Strike Reservoir during 2005 through 2011. Bars within each year represent ten individual sites. Sites 1 through 10 are displayed from left to right within X-axis categories (years).

Warmwater Fish Transfers

ABSTRACT

During 2011, we captured and transferred a total of 5,875 fish including: 2,900 bluegill *Lepomis macrochirus*, 2,410 channel catfish *Ictalurus punctatus*, and 565 largemouth bass *Micropterus salmoides*. Fish were transferred to local community ponds to provide warmwater sportfishing opportunities. Channel catfish were also transferred to Black Canyon Reservoir in hopes of establishing a naturally reproducing population.

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INTRODUCTION

Regional fisheries personnel transferred bluegill *Lepomis macrochirus*, channel catfish *Ictalurus punctatus*, and largemouth bass *Micropterus salmoides* to ponds and reservoirs in southwest Idaho to establish self-sustaining populations or provide fishing opportunity. Due to a series of low water years, Indian Creek Reservoir had become nearly dewatered by late summer 2010. Previously, a popular recreational fisheries for bluegill and largemouth bass existed. During winter 2010-11, higher snowpack and a wetter than normal spring filled this reservoir to the highest level since Spring 2006. We sought to restock this water with bluegill and largemouth bass to rebuild fishable populations, as these populations had declined. Similarly, centrarchid populations had declined in Beachs Pond due to predation or overharvest. Also, three new community park ponds were created in Boise and Meridian, ID during 2011. The new ponds in Boise are located immediately east of the new Parkcenter Bridge (within Marianne Williams Park). Loggers Pond (2.5 surface acres) is located on the west side of the park, whereas Williams Pond (1.8 surface acres) is located on the east side. The new pond in Meridian, Heros Park Pond (0.5 surface acres) is located 0.3 miles south of 10 mile and Chinden roads. All three ponds were stocked with bluegill and largemouth bass to establish self-sustaining populations. Additionally, we sought to establish a self-sustaining population of channel catfish in Black Canyon Reservoir by transferring pre-spawn adults from the Snake River. Currently, Black Canyon Reservoir provides only marginal fisheries due to relatively poor water quality, siltation, and an abundance of small panfish and non-game fish. We hope that transferred pre-spawn adults will recruit successfully, create a self-sustaining population, and provide additional fishing opportunity. Lastly, we continued transferring adult-sized channel catfish to community fishing ponds to provide put and take fishing opportunities.

OBJECTIVES

1. To re-establish or bolster warmwater fisheries in Beach's Pond and Indian Creek Reservoir by capturing and transferring centrarchids.
2. Create self-sustaining fish populations and new fisheries in newly created community ponds (Heros, Loggers, and Williams) and in Black Canyon Reservoir.
3. To continue to provide channel catfish fishing opportunities in community fishing ponds.

METHODS

We utilized boat electrofishing to capture warm water fish for transfer to local waters. Source waters included private ponds, commercial gravel ponds, as well as public waters (Crane Falls Reservoir, Duff Lake Pond, and the Snake River). At these locations, we collected fish with day and night electrofishing efforts from May 10 to August 19, 2011 using a Smith Root electrofishing boat or a jet-powered electrofishing boat equipped with a Coffelt VVP-15B. 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/minute. Most transfers occurred on the same day as capture; however, some occurred the following morning.

RESULTS AND DISCUSSION

During 2011, we captured and transferred a total of 5,875 fish including: 2,900 bluegill, 2,410 channel catfish, and 565 largemouth bass (Table 15). We did not collect length and weight data during these efforts. However, a majority of the bluegill and largemouth bass were captured from Crane Falls Reservoir and average size is summarized in Chapter 4 of this report. Also, average size of channel catfish captured from the Snake River has been determined in previous years (Kozfkay et al. 2011) and we do not suspect it has changed substantially. We will continue to transfer adult channel catfish to Black Canyon Reservoir for an additional two years to bolster the spawning potential within this reservoir. Afterwards, we will sample to determine whether recruitment is occurring. Also, we will continue transferring channel catfish to community fishing waters as these fisheries have become popular and are cost effective. Distribution and allocation of fish will be modified based on tag returns, pond size, and fishing pressure. Due to construction delays, Loggers and Williams ponds were still closed to the public as of January 2012. This may have allowed greater survival and better reproduction. Cursory monitoring of these newly created waters will determine whether additional transfer efforts are needed.

MANAGEMENT RECOMMENDATIONS

1. Continue transfers of channel catfish to Black Canyon Reservoir for an additional two year, then monitor to determine whether natural reproduction is occurring.

2. Continue transfers of channel catfish to community fishing waters. Assess and modify stocking levels based on pond size and fishing pressure.

3. Determine whether bluegill and largemouth bass transfers were successful. If not, transfer additional fish.

Table 15. Number of bluegill, channel catfish, and largemouth bass captured and transferred to local waters to create self-sustaining populations or provide fishing opportunity.

Water	# of bluegill	# of channel catfish	# of largemouth bass	Total
Black Canyon Reservoir		990		990
Horseshoe Bend Pond		195		195
Indian Creek Reservoir	800		350	1,150
Beachs Pond	200		75	275
Heros Park Pond	400	50	40	490
Williams Pond	750		50	800
Loggers Pond	750		50	800
Caldwell Pond #2		150		150
Caldwell Rotary Pond		150		150
Eds Pond		100		100
McDevitt Pond		175		175
Parkcenter Pond		205		205
Riverside Pond		140		140
Sawyers Pond		195		195
Settlers Pond		60		60
Total	2,900	2,410	565	5,875

2011 Southwest Region (Nampa) Fisheries Management Report

High Mountain Lakes Surveys

ABSTRACT

IDFG personnel conducted surveys at 17 mountain lakes in the Southwest Region in 2011. The lakes were located across five headwaters (HUC 5) including, Black Warrior Creek, Roaring River, Taylor Creek, upper Smith Creek, and the Yuba River drainages. The lakes either had not been surveyed in recent years or had never been surveyed according to IDFG records. Fish, amphibian, and habitat surveys were conducted at each lake. IDFG stocking records show 6 of the 17 lakes sampled had been stocked in the past 20 years and surveys confirmed fish presence in 4 of these lakes. Overall, 13 lakes (76%) lakes were determined to be fishless. We encountered westslope cutthroat trout *Oncorhynchus clarkii lewisi* and rainbow trout *O. mykiss* in our surveys. Amphibians were observed in 14 (82%) of the surveyed lakes. Of the 14 lakes with amphibians, 11 (79%) were fishless and 3 (21%) contained fish.

Amphibian species observed included Columbia spotted frog *Rana pretiosa*, long-toed salamander *Ambystoma macrodactylum*, and Western toad *Bufo boreas.* We observed neither fish nor amphibians in 2 lakes (12%), Warrior Lakes #4 and #5.

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OBJECTIVES

1. Describe the distribution, relative abundance, and species composition of fish and amphibian populations in high mountain lakes of the Southwest Region.

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. Adjust stocking where appropriate to more efficiently use hatchery resources and to conserve native fauna.

METHODS

We conducted surveys on 17 mountain lakes in the Southwest Region between July 27 and August 24, 2011. The lakes were located across five headwaters (HUC 5) including, Black Warrior Creek, Roaring River, Taylor Creek, upper Smith Creek, and the Yuba River drainages (Figure 23). The lakes either had not been surveyed in recent years or had never been surveyed according to IDFG records. At each lake, we assessed fish and amphibian presence/absence, human use, and habitat characteristics. In some lakes that were capable of supporting fish or had previous stocking history, we set Swedish type gill nets that measured 46 m long by 1.5 m deep, with 19, 25, 30, 33, 38, and 48 mm bar mesh panels. One unit of sampling effort was defined as one gill net fished overnight. In other lakes containing fish, hook and line sampling was used to obtain species, length, and weight information. All fish captured were identified to species, measured for total length (mm), and weighed (g). Fulton's condition factor was calculated for each captured fish according to the formula (Anderson and Neumann 1996):

$$K = (100{,}000 \times W)/L^3$$

where W is weight (g) and L is length (mm). For instances when time constraints prevented fish sampling, lakes were visually surveyed during amphibian surveys for the presence of fish.

Habitat surveys consisted of collecting limnological and morphological data in individual lake basins. Lake length was measured across the long axis of each lake using a laser rangefinder (Bushnell Yardage-Pro), and width measurements were recorded at ¼, ½, and ¾ distances along the length axis. Average depth was determined by taking cross-sectional measurements at three points along each width measurement transect using a hand-held sonar device (Strikemaster Polar Vision). Maximum depth was estimated as the greatest depth observed during the cross-sectional measurements. Surface water temperatures were recorded along the lake shore at one point. A visual assessment of spawning habitat availability in each lake and the inlets and outlets was determined based on substrate quality, flow, and gradient.

Amphibian surveys were conducted by walking the perimeter of each lake and noting the abundance and life stages of individual species. Life stages were classified as adult, sub-adult, or larvae. Shoreline habitat adjacent to lakes including areas under logs and rocks were also inspected to detect hidden amphibians.

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 by IDFG personnel as rare, low, moderate, and high based on an overall visual assessment of the factors described above.

RESULTS AND DISCUSSION

IDFG stocking records show 6 of the 17 lakes sampled had been stocked in the past 20 years and surveys confirmed fish presence in four of these lakes (Table 16). Overall, 13 lakes (76%) lakes were determined to be fishless. We encountered westslope cutthroat trout *Oncorhynchus clarkii lewisi* and rainbow trout *O. mykiss* in our surveys (Table 17).

Amphibians were observed in 14 (82%) of the surveyed lakes. Of the 14 lakes with amphibians, 11 (79%) were fishless and three (21%) contained fish (Table 17). Amphibian species observed included Columbia spotted frog *Rana pretiosa*, long-toed salamander *Ambystoma* macrodactylum, and Western toad *Bufo boreas* (Table 18). We observed neither fish nor amphibians in two lakes (12%), Warrior Lakes #4 and #5.

Human use in the areas was generally low, but North Star Lake appeared to be frequented often by anglers and campers. The long hiking distance required to reach the lakes coupled with steep, rugged terrain likely contributes to the lakes' infrequent use. Results of human use and most habitat characteristics are not reported here, but have been recorded in the statewide IDFG lake survey database.

Survey results from individual and groups of lakes, organized by drainage (HUC 5), are summarized below.

Black Warrior Creek Drainage

We surveyed five lakes in the Black Warrior Creek drainage on August 2, 2011 (Table 17). Fish were not observed, but amphibians were observed in three lakes. Warrior Lake #2 was the only lake in this cluster that is on the current stocking rotation and it was last stocked with Westslope cutthroat trout in 2009 and is generally stocked every three years. There are no records of a previous survey for this lake and therefore no indications on previous fish presence and survival. The maximum depth in Warrior Lake #2 was approximately 2 m, making a winter kill event highly probable. The lake was classified as having moderate human use.

Roaring River Drainage

We surveyed three lakes located in the Roaring River drainage in 2011 on July 28, 2011 (Table 17). Fish were not observed in any of the lakes, but Columbia spotted frogs and long-toed salamanders were present. None of the lakes surveyed have been stocked since 1967 and only Roaring River Lake #2 has adequate depth to overwinter fish (15.3 m) although it is relatively small (0.9 ha; Table 17). It is recommended that these lakes remain fishless due to amphibian presence and availability of nearby Trinity lakes for angling opportunity.

Taylor Creek-North Fork Boise River

Two lakes in the Taylor Creek drainage were surveyed on August 2, 2011 (Table 17). Lodgepole Lake contained both triploid rainbow trout and westslope cutthroat but amphibians were not observed during the survey. Blue Jay Lake did not contain fish but was home to

>100,000's of larval western toads and Columbia spotted frogs (Table 18). Human use at both lakes appears to be rare.

Eleven westslope cutthroat trout were sampled with hook and line during the survey. These fish ranged between 185-293 mm (TL) with a mean total length of 289 ± 26 mm and a mean K of 1.2 ± 0.3 (Figure 24). Stocking of westslope cutthroat trout in Lodgepole Lake was discontinued after 2008 and was switched to triploid rainbow trout in 2011 (Table 16).

Upper Smith Creek

We surveyed three lakes in the Upper Smith Creek drainage during July 27-28, 2011 (Table 17). Fish were observed in two lakes, and amphibians were observed in all three lakes. All of the lakes were stocked historically, with two currently on the stocking rotation. Triploid rainbow trout were stocked in North Star and Smith Creek lakes in 2009 and Potter Lake was last stocked with various strains of rainbow trout in 2006. Potter Lake is only 3.5 m deep and may have experienced previous winter kills as no fish were observed in 2011. Western toad were observed in all three lakes surveyed in 2011 and adult Columbia spotted frogs were observed in Smith Creek Lake (Table 18).

Of the lakes surveyed in 2011, North Star and Smith Creek lakes appeared most frequented by anglers. A single gillnet was set overnight at Smith Creek Lake on July 28, 2011 which captured 19 rainbow trout ranging between 245-420 mm total length. Mean length ± 90% CI was 303 ± 22 mm and mean condition factor (K) was 0.96 ± 0.05 (Figure 24). Hook and line sampling captured 10 rainbow trout in North Star Lake, ranging between 140-320 mm. Mean length ± 90% CI was 210 ± 36 mm, and mean K was 1.7 ± 0.5 (Figure 24).

Yuba River

We surveyed four lakes in the Yuba River drainage on August 23-24, 2011 (Table 17). Only Corbus Lake contained fish and is the only lake that has been historically stocked with westslope cutthroat trout (Table 16). Western toads were observed in all four lakes and long-toed salamanders were observed in Corbus South Fork lakes #1 and #3 (Table 18).

Hook and line sampling captured eight westslope cutthroat between 265-455 mm (TL) in Corbus Lake. Mean length was 294 ± 46 mm and a mean condition factor (K) of 1.1 ± 0.1 (Figure 24) for Corbus Lake fish. Human use appeared to be low to moderate at this lake. We recommend shifting stocking of westslope cutthroat to triploid rainbow in this lake to reduce risk of hybridization with native redband trout lower in the drainage.

MANAGEMENT RECOMMENDATIONS

1. Shift from stocking westslope cutthroat trout to triploid rainbow trout in Corbus Lake.

2. Discontinue stocking trout in Warrior Lake #2 because of lack of depth.

3. Maintain all lakes surveyed in 2011 where fish were not present as fishless amphibian habitat.

Table 16. Fish stocking data from lakes where fish were observed during 2011 surveys. The last year each species was stocked in a given lake is listed, and superscript letters denote previous ten-year stocking history. Fish observed refers to species which were encountered by IDFG during surveys conducted from July 28 through August 24, 2011.

		Trout species					
Lake	Map #	Westslope cutthroat	Cuthroat (unspecified)	Rainbow (triploid)	Rainbow/Cutthroat hybrid	Rainbow (various)	Fish observed
Taylor Creek - North Fork Boise River							
Lodgepole Lake	4	2008^2		2011*			WCT, RBT
Black Warroir Creek							
Warrior Lake #2	7	2009^2					None
Upper Smith Creek							
North Star Lake	11			2009*		2006^2	RBT
Potter Lake	12					2006^2	None
Smith Creek Lake	13			2009*		2006^2	RBT
Yuba River							
Corbus Lake	14	2009^2	1978		1981		WCT

^{2}Fry stocked every 3 years since 1999

*Programatic change to triploid rainbow trout

Table 17. Map number, elevation, area, maximum depth, and fish and amphibian presence/absence results for lakes surveyed in the Roaring River, Taylor Creek, Black Warrior Creek, Upper Smith Creek, and Yuba River drainages during July 28 through August 24, 2011.

Lake name / LLID#	Map #	Elevation (m)	Area (ha)	Maximum depth (m)	Fish observed	Amphibians observed
Roaring River						
Roaring River Lake #1	1	2,593	2.26	2	No	Yes
Roaring River Lake #2	2	2,494	0.85	15.3	No	Yes
Roaring River Lake #3	3	2,506	2.55	3	No	Yes
Taylor Creek - North Fork Boise River						
Lodgepole Lake	4	2,496	1.98	2	Yes	No
Blue Jay Lake	5	2,469	0.29	1	No	Yes
Black Warroir Creek						
Warrior Lake #1	6	2,402	1.37	5.9	No	Yes
Warrior Lake #2	7	2,497	0.04	2	No	Yes
Warrior Lake #3	8	2,412	0.09	1	No	Yes
Warrior Lake #4	9	2,423	0.22	2.5	No	No
Warrior Lake #5	10	2,471	0.46	2	No	No
Upper Smith Creek						
North Star Lake	11	2,520	1.14	13.5	Yes	Yes
Potter Lake	12	2,356	0.62	3.5	No	Yes
Smith Creek Lake	13	2,461	0.25	2.5	Yes	Yes
Yuba River						
Corbus Lake	14	2,379	0.07	4.5	Yes	Yes
Corbus South Fork Lake #1	15	2,446	2.17	32	No	Yes
Corbus South Fork Lake #2	16	2,506	0.63	15	No	Yes
Corbus South Fork Lake #3	17	2,396	2.72	24	No	Yes

Table 18. Results from amphibian surveys conducted by IDFG personnel from July 28 through August 24, 2011. Juveniles include all sub-adult and larval stages. Fish status for the lakes has been included.

	Columbia spotted frog		Long-toed salamander		Western toad			Fish
Lake name / LLID#	Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Egg Mass	present
Roaring River								
Roaring River Lake #1	29	-	-	3	-	-	-	No
Roaring River Lake #2	20	-	-	7	-	-	-	No
Roaring River Lake #3	54	20	-	8	-	-	-	No
Taylor Creek - North Fork Boise River								
Blue Jay Lake	-	>100,000	-	-	-	>100,000	1	No
Black Warroir Creek								
Warrior Lake #1	3	350	-	-	1	-	2	No
Warrior Lake #2		-	-	26	-	-	-	No
Warrior Lake #3	3	1	-	31	1	-	-	No
Upper Smith Creek								
North Star Lake	-	-	-	-	5	-	-	Yes
Potter Lake	-	-	-	-	2	4	-	No
Smith Creek Lake	4	-	-	-	4	-	-	Yes
Yuba River								
Corbus Lake	-	-	-	-	2	-	-	Yes
Corbus South Fork Lake #1	-	-	-	15	1	-	-	No
Corbus South Fork Lake #2	-	-	-	-	2	-	-	No
Corbus South Fork Lake #3	-	-	-	9	1	-	-	No

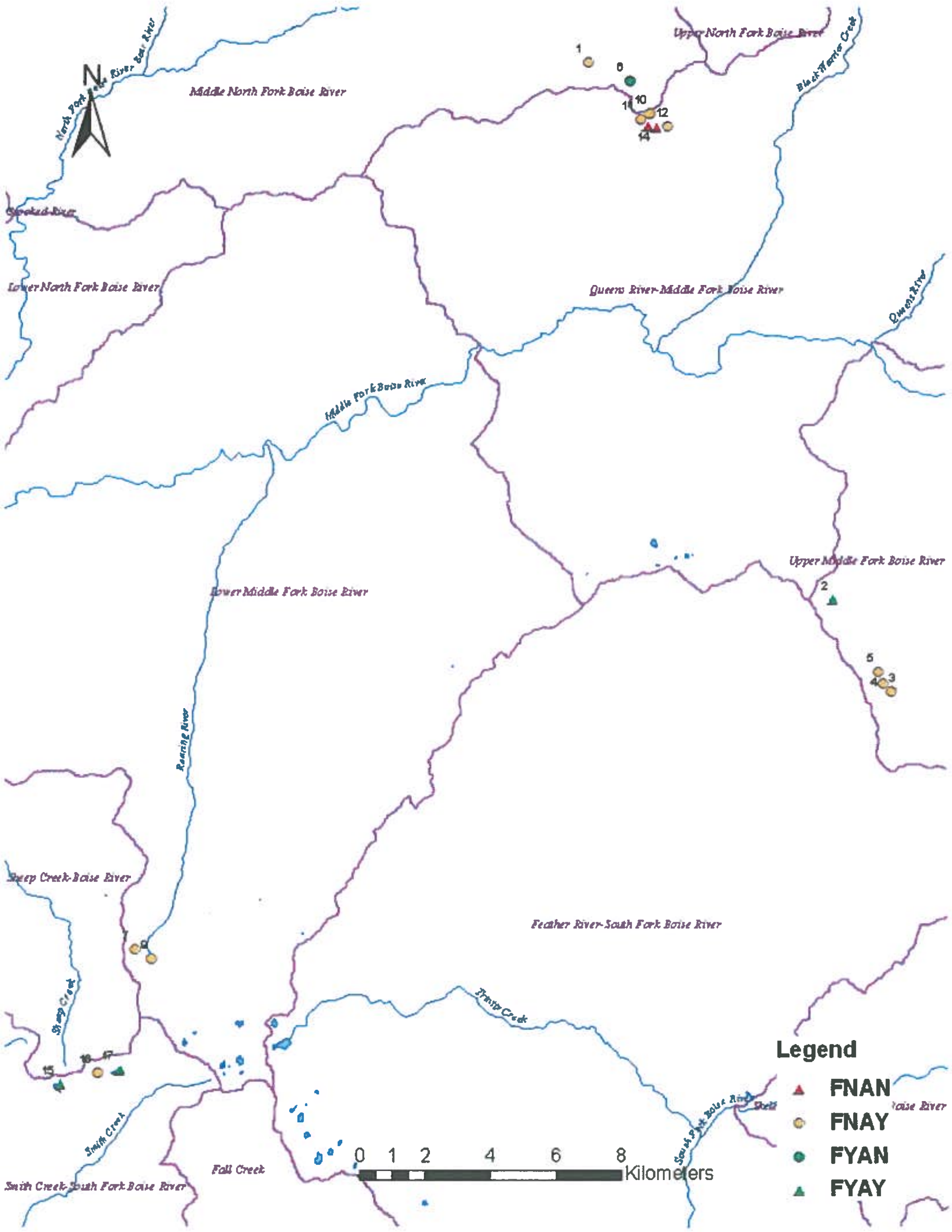

Figure 23. Lakes surveyed by IDFG personnel during July 28 through August 28, 2011 in Roaring River, Taylor Creek, Black Warrior Creek, Upper Smith Creek, and Yuba River drainages (HUC 5). Lake names can be found in table 17 and are referenced by the numbers displayed above. Legend denotes survey results for presence/absence of fish and amphibians: FNAN is no fish, no amphibians, FNAY is no fish, yes amphibians, FYAN is fish yes, amphibians no, and FYAY is fish yes, amphibians yes.

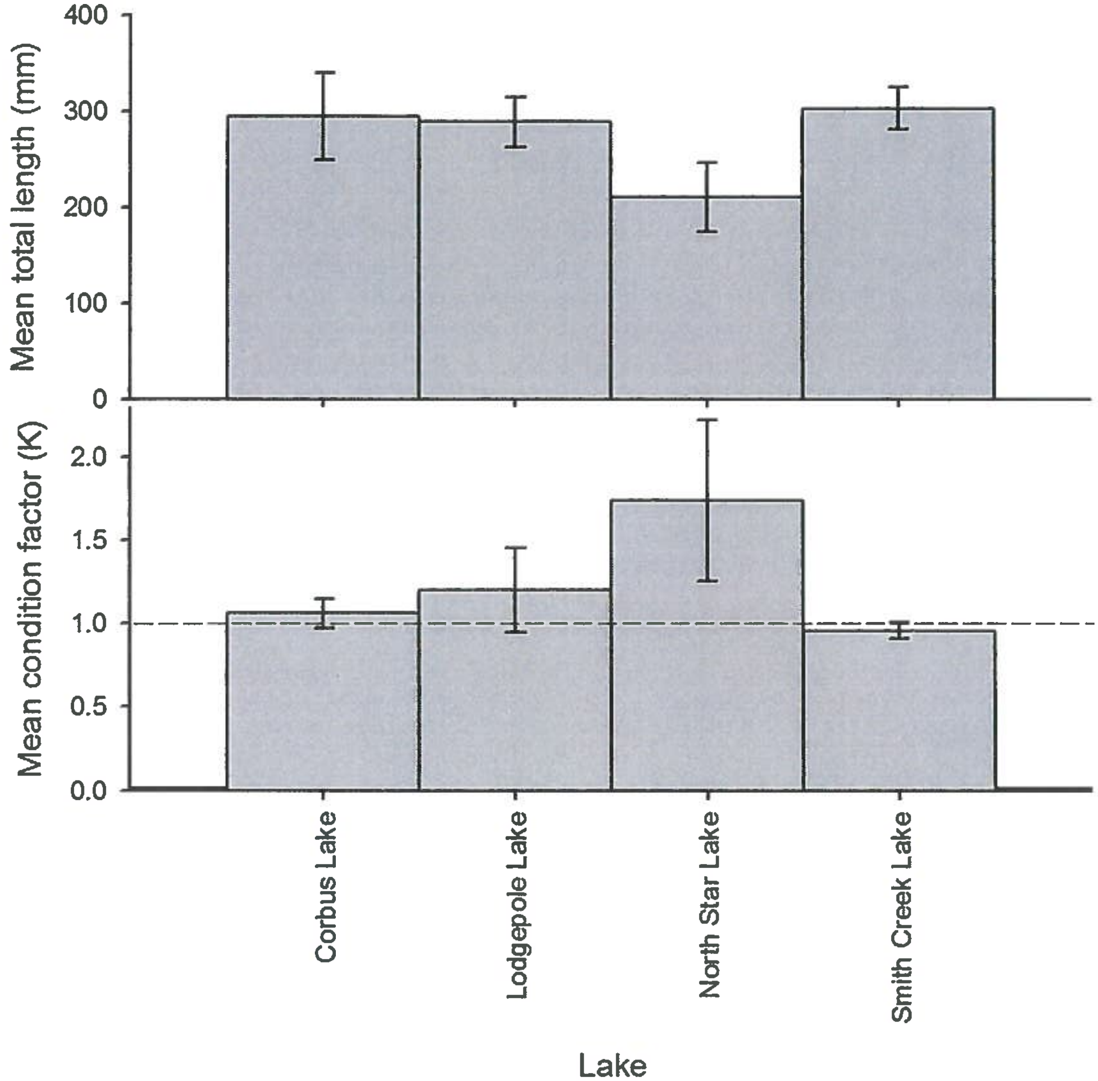

Figure 24. Mean values for fish length and Fulton's condition factor (K) calculated for lakes where fish were sampled during 2011 surveys. Error bars represent the 90% CI. A condition factor value of 1.0 represents the standard value for healthy fish.

2011 Southwest Region (Nampa) Fisheries Management Report

Rivers and Streams Investigations

Long-term monitoring of redband trout populations in desert basins of the Bruneau, Owyhee, and Snake River drainages in Southwestern Idaho

ABSTRACT

As part of a long-term redband trout *Oncorhynchus mykiss gairdneri* monitoring effort, Idaho Department and Fish and Game and Bureau of Land Management personnel agreed to sample 63 stream sites within the Bruneau, Owyhee, and Snake river drainages. During 2011, the fourth year of sampling for this effort, we completed seven standard stream surveys on the east side of the Owyhee Mountains, south side of Bennett Mountain, and along the Boise Front. Redband trout were captured at all seven sites. Redband trout density ranged from 1.2 trout/100 m^2 to 30.6 trout/100 m^2, with a mean of 13.5 ± 9 trout/100 m^2 of stream (mean ± 90% CI). Capture probability for larger and smaller redband trout were not calculable since few sites contained adequate sample sizes from both length groups. For all the 2011 sites combined, a total of 156 redband trout were sampled, and overall, 28 or 18 % of the fish sampled were less than 100 mm, whereas 128 or 82 % were greater or equal to 100 mm.

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INTRODUCTION

Redband trout *Oncorhynchus mykiss gairdneri* are native to all major river drainages in Southwestern Idaho. Within this large and diverse geographical area, redband trout have adapted to a variety of stream habitats including those of montane and desert areas. Some controversy has existed regarding whether adaptation to these disparate habitats has led to speciation at some level. Recently, redband trout that reside in desert locales were petitioned for listing under the Endangered Species Act (ESA), under the assumption that they could be considered a separate sub species. The petition was denied. Since that time, additional research has indicated that only one species of resident stream dwelling redband trout may exist in Southwest Idaho (Cassinelli 2008). Regardless of species designations, it is important to monitor redband trout population status across their full distribution. Population status of the redband trout from montane habitats has been extensively studied in Southwestern Idaho. However, due to remoteness and little angling interest (Schill et al. 2007), redband trout from desert habitats have received less attention. These habitats include tributaries of the Bruneau, Owyhee, and Snake River drainages most often in headwater areas. As these populations are near the southern extent of their range and water temperatures are projected to increase, it has become more important to monitor these populations closely (Narum et al. 2010).

A long-term assessment of redband trout distribution, density, and size structure was completed by Zoellick et al. (2005). This assessment compared redband population characteristics at 43 sites within the Bruneau, Owyhee, and Snake river drainages from 1993-2003 to data collected at the same sites during 1977-1982. Site numbers referred to in this report correspond to the site numbers in Zoellick et al. (2005). As a continuation of this effort, Idaho Department of Fish and Game (IDFG) and Bureau of Land Management (BLM) personnel agreed to resample these 43 sites over a three- to five-year period beginning in 2008. Also, an additional 20 sites were added to more fully encompass the redband trout's distribution in the high desert environs of Southwest Idaho.

METHODS

Fish population characteristics were estimated at all sites were collected using multiple-pass depletion methods. Previously-sampled sites were located using descriptions, photographs, or coordinates. Block nets were installed at the upstream and downstream end of each transect. Fish were collected with a Smith Root backpack electrofisher (Model 15-B) and a two- or three-person crew. Captured fish were held in small buckets and transferred to a livewell placed downstream of the site. Non-game species were also captured, identified to species, and visually categorized as sparse (1-10), many (10-50), or abundant (>50). The number of passes completed depended on catch during the first pass. If redband trout catch in the first pass was less than five, sampling was terminated. If more than five redband trout were sampled, a second pass was completed. If catch remained relatively high in subsequent passes (> 25% of the previous pass) additional passes were completed. Also, herpetofauna were identified visually to species and recorded as eggs, larval form, juvenile, or adult. We sampled 7 sites during 2011 primarily in Owyhee River (Figure 26). Six of the seven sites had been sampled previously (Zoellick et al. 2005). Population estimates were calculated using MicroFish 3.0 (Van Deventer 2006). Due to the potential for size-related catchability differences, population estimates were calculated for two strata: (1) trout less than 100 mm, and (2) trout greater than or equal to 100 mm, then summed. Confidence interval for mean density and the difference between density for a particular site across time (d) were calculated using an $\propto = 0.1$.

RESULTS

Redband trout were captured at all seven stream sites sampled during 2011. Total catch ranged from four to 56 redband trout. No non-native trout or smallmouth bass were sampled in this subset of sites. In addition, three native species were sampled during these stream surveys including longnose dace *Rhinichthys cataractae*, speckled dace *Rhinichthys osculus*, and sculpin *Cottus spp.*.

Redband trout density for the seven sites averaged 13.5 ± 9 trout/100 m^2 of stream (mean ± 90% CI) and was highly variable among sites (Table 19). The lowest density of 1.2 trout/100 m^2 occurred at the lower Castle Creek site (#32), whereas the highest density of 30.6 trout/100 m^2 occurred at the North Fork Castle Creek site (#51). We could not compare capture probability among the two size classes used for this analysis due to inadequate sample sizes for most sites. For all the 2011 sites combined, a total of 156 redband trout were sampled, and overall, 28 (18%) of the fish sampled were less than 100 mm, whereas 128 (82%) were greater than or equal to 100 mm. This is the most skewed ratio (i.e fewest young fish) for a set of sites since sampling began during 2008.

Many of the sites sampled during 2011 had been sampled previously during 1977-1981 or during 1995-2003, which allowed us to compare population trends through time (Table 20). Six of the sites sampled during 2011 were sampled during both the 1977-1983 and 1995-2003 survey efforts. For this set of sites, densities have seemed to decline consistently through time. Mean density declined from 80 redband trout/100 mm^2 ± 53 during 1977-1981 to 41 redband trout/100 mm^2 ± 46 during 1995-2003. The difference in mean density ($\bar{d}$) was -39 ± 30. Mean density declined to 11 redband trout/100 mm^2 ± 9 during 2011. The difference in mean density ($\bar{d}$) was -30 ± 42.

DISCUSSION

For the relatively small number of sites sampled during 2011, presence of redband trout was similar to past surveys, in fact, redband trout were seen at all sites including increases in density at two sites where no and few trout were seen only eight years ago. However, combining all sites, there was a marked decline in mean redband trout density compared to historical surveys. It is important to note that this is just a small sub-set of the sites that will be sampled for this effort. After completion of the remaining trend monitoring sites during 2012, a more thorough analysis of redband trout distribution and abundance will be completed as well as assessment of correlated factors.

Table 19. Population estimates (N) by length group and total sampled for redband trout sampled at seven monitoring sites sampled during 2011.

Site #	Stream Name	Run 1	Run 2	Run 3	Total	*N*	LCL	UCL	Confidence Range (%)
					ALL				
3	Little Jacks	12	2		14	14	13	15	7.1
4	Little Jacks	32	16	8	56	62	52	72	16.1
32	Castle	4			4	4			
37	Syrup	22	2		24	24	23	25	4.2
38	Dive	11	2		13	13	12	14	7.7
39	Bennett	5			5	5			
51	NF Castle	29	11		40	44	35	53	20.5
					< 100 mm				
3	Little Jacks								
4	Little Jacks								
32	Castle								
37	Syrup	11	1		12	12	11	13	8.3
38	Dive	2	2		4	4	-1	9	125
39	Bennett								
51	NF Castle	7	5		12	15	2	28	86.7
					≥ 100 mm				
3	Little Jacks	12	2		14	14	13	15	7.1
4	Little Jacks	32	16	8	56	62	52	72	16.1
32	Castle	4			4	4			
37	Syrup	12	1		13	13	12	14	7.7
38	Dive	9			9	9			
39	Bennett	5			5	5			
51	NF Castle	22	6		28	29	25	33	13.8

Table 20. Comparison of redband trout density estimates (#/100 m2) and 95% confidence intervals over the last thirty-plus years for 2011 trend monitoring sites in the Owyhee River Drainage.

		1977-1982				1993-2003				2011			
Site #	Stream	EST	LCL	UCL	YEAR	EST	LCL	UCL	YEAR	EST	LCL	UCL	YEAR
3	Little Jacks	172.2	126.8	217.6	1980	94.7	46.2	146.9	1995	5.2	4.9	5.6	2011
4	Little Jacks	134.5	127.3	143.5	1980	129.9	126.9	132.9	1995	28.7	24.1	33.4	2011
32	Castle	16.9	16.4	19.1	1977	2.8	2.8	3.7	2002	1.2	0.0	0.0	2011
37	Syrup	48.4	45.3	53.8	1980	18.2	17.2	20.6	2003	16.8	16.1	17.5	2011
38	Dive	16.4	15.3	20.8	1981	0.8	0.8	3.2	2003	9.6	8.8	10.3	2011
39	Bennett	92.3	66.2	126.9	1980	0			2003	2.3	0.0	0.0	2011
51	NF Castle									30.6	24.4	36.9	2011

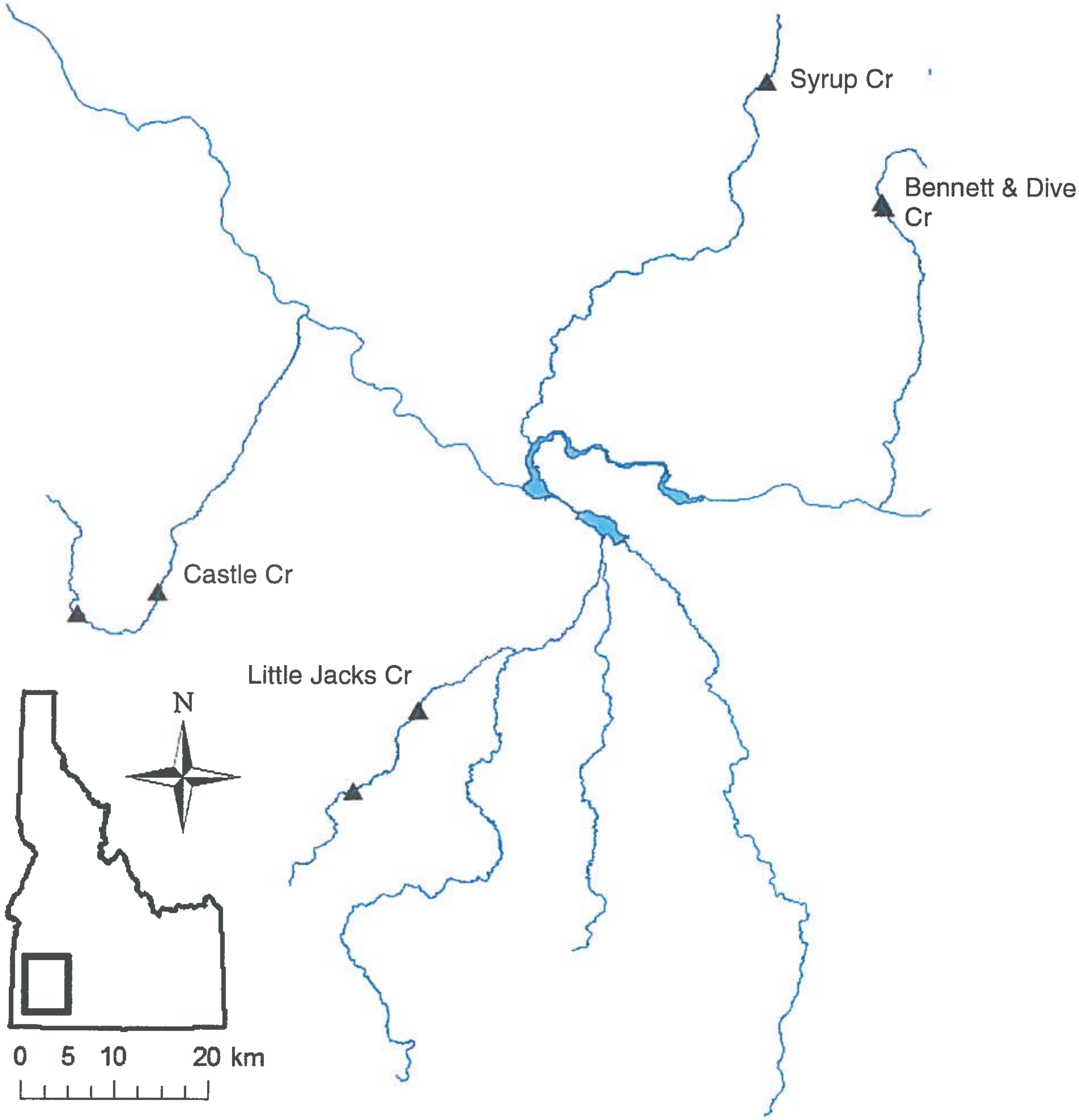

Figure 26. Map of monitoring sites sampled in the Owyhee drainage to assess redband trout populations in 2011.

Redband Trout Evaluations In Tributaries To The South Fork Boise River, Below Anderson Ranch Reservoir

ABSTRACT

Tributaries to the SFBR below Anderson Ranch Dam were surveyed to provide information for prioritizing habitat work such as barrier removal. A total of 337 fish were collected at seven of the nine sites in Bock, Cayuse, Cow, and Mennecke creeks in 2011. Redband trout *Oncorhynchus mykiss gairdneri* were collected in all four of the streams sampled. However, no redband trout were sampled in the two upper Cow Creek sites where flows were inadequate to support a fish population. Redband trout density for the three sites ranged from 43 fish/100 m^2 in Cayuse Creek, to 129 fish/100 m^2 in Mennecke Creek. Nearly all of the fish captured were less than 100 mm and capture probability for that size ranged from 49-90%. Length frequency distributions show that all fish captured were between 40-160 mm. None of the creeks appeared to contain adequate water to sustain fish populations during late-summer sampling and are likely acting as hatching/rearing habitats for age-0 fish. More tributary sampling will be conducted in 2012, continuing with streams in the roadless section downstream of Danskin Bridge.

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INTRODUCTION

The South Fork Boise River below Anderson Ranch Dam (SFBR) is a nationally renowned tailwater trout fishery and was the first river section in Southwest Idaho to be managed under "Quality Trout" regulations. Regulations restrict the use of bait and barbed hooks from Neal Bridge (Forest Road 189) upstream to Anderson Ranch Dam. Redband or rainbow trout *Oncorhynchus mykiss gairdneri* harvest is restricted to 2 fish, none under 20 inches. The fishery is supported by a population of wild rainbow trout and mountain whitefish *Prosopium williamsoni*. Migratory bull trout *Salvelinus confluentus* are present at very low densities, and native nongame fish include largescale suckers *Catostomus macrocheilius*, northern pikeminnow *Ptychocheilus oregonensis* and sculpin *Cottus sp.* Approximately 15,000 rainbow trout were stocked annually in SFBR between Anderson Ranch Dam and Cow Creek Bridge until 1976, when management emphasis shifted towards wild trout (Beach 1975; Moore et al. 1979).

Redband trout populations in the SFBR have been monitored in a 9.6 km reach above Danskin Bridge every three years since 1994 (Butts et al. 2011). Mark-recapture techniques are used to estimate abundance of trout and mountain whitefish in three sections within this reach. Results have suggested that rainbow trout populations in the SFBR have been relatively stable, but the relative paucity of trout in the 200 to 400 mm length range upstream of Danskin Bridge has puzzled biologists. The numbers of trout greater than 400 mm are currently providing an excellent fishery despite the relative lack of smaller trout in the survey section. A population survey in the canyon section downstream of Danskin Bridge in 2008 showed that rainbow trout between 250-400 mm were present in higher proportions than what was observed in the tailwater section (Kozfkay et al. 2010). The SFBR wild trout population is thought to mainly be supported through main-stem spawning of fish with little recruitment from tributaries, as migration barriers are known to be present on most tributaries with spawning habitat (Moore et al. 1979).

Recently, interest has increased in tributaries to the SFBR below Anderson Ranch Dam. Specifically, biologists wish to determine whether the tributaries currently have fish populations, contain spawning habitat, are blocked by fish migration barriers, and whether tributary spawning and recruitment could be enhanced with barrier removals. Surprisingly, there is little current information on fish populations within these tributaries. A number of tributaries were sampled in 2008 by United States Forest Service (USFS) biologists for a genetic study on rainbow and redband trout within the SFBR drainage. However, little or no population information was collected during these surveys. Prior to this, Moore et al. (1979) characterized the majority of the SFBR tributaries below Anderson Ranch and evaluated streams for the presence of both spawners and spawning habitat. However, changes in land use practices, roads, and climate over the past 30 years have likely altered conditions in these streams. Five tributaries to the SFBR were sampled in 2010 to evaluate presence, population density, and size distribution of fish populations within these tributaries. Seven sites in Dixie Creek, Granite Creek, Pierce Creek, Rock Creek, and Rough Creek were sampled between 8 June and 26 July 2010 (Kozfkay et al. 2010)

Methods

Four additional tributaries to the SFBR were sampled in 2011 to evaluate presence, population density, and size distribution of fish populations. Nine sites in Bock Creek, Cayuse Creek, Cow Creek, and Mennecke Creek were sampled between 26 July and 11 August 2011 (Figure 27). Sample sites were selected fom a 1:100,000 hydrography layer through the

Environmental Protection Agency's Environmental Monitoring and Assessment Program (see Stevens and Olsen 2004). Sampling occurred during base flow conditions so that streams could be evaluated as to whether they contain enough water to support fish and so that migrations barriers could be better assessed.

Fish sampling

At each site that contained enough water to support fish, we used depletion electrofishing to determine the abundance of salmonids, using a backpack electrofisher (Smith-Root Model 15-D) with pulsed DC. Nongame fish and amphibian species were also recorded if observed. Fish were identified, enumerated, measured to the nearest millimeter (total length, TL) and gram, and released downstream of the study sites. Block nets were installed at the upper and lower ends of the sites to prevent fish from leaving or entering a study site during the survey. Study sites were generally 100 m in length of shockable stream; sections of stream where vegetation was too thick to sample effectively, were not included in the sample site. Maximum-likelihood abundance and variance estimates were calculated with the MicroFish software package (Van Deventer 2006; Van Deventer and Platts 1989). When all trout were captured on the first pass, we estimated abundance to be the total catch. Because electrofishing is characteristically size selective (Sullivan 1956; Reynolds 1996), trout were separated into two length groups (<100 mm TL and $\geq$100 mm TL) and abundance estimates were calculated individually for each size group. Depletions were attempted only for salmonids, whereas relative abundance was recorded for all nongame fish and amphibian species.

Habitat Sampling

Various habitat measurements were recorded at ten equally spaced transects within the sample site. Stream width was measured at each transect and depth (m) was measured at ¼, ½, and ¾ distance across the channel. The sum of these depth measurements was divided by four to account for zero depths at the stream margins for trapezoidal channels (Platts et al. 1983; Arend 1999). Wetted stream width (m) was calculated from the average of all transect measurements. In most cases stream temperature (°C) and conductivity (µS/cm) were measured at the bottom of a site with a calibrated hand-held meter accurate to ± 2%. Various other habitat measurements such as percent substrate composition, percent shading, and bank stability were measured but the results are not reported here.

RESULTS

Redband trout were collected in all four of the streams sampled in 2011. A total of 337 fish were collected at seven of the nine sites in Bock, Cayuse, Cow, and Mennecke creeks. No redband trout were sampled in the two upper Cow Creek sites where flows were inadequate to support a fish population (Table 21). A population estimate was not estimated for the lowest Cow Creek site because a second electrofishing pass was not conducted. Sculpin and tailed frogs *Ascaphus truei* (adults and tadpoles) were also collected in Bock, Cayuse, and Mennecke creeks.

Redband trout density for the three sites ranged from 43 fish/100 m^2 in Cayuse Creek (Site 1), to 129 fish/100 m^2 in Mennecke Creek (Site 1; Table 21). Nearly all of the fish captured were less than 100 mm and capture probability for that size ranged from 49-90% (Table 27). Length frequency distributions show that all fish captured were between 40-160 mm (Figure 28).

DISCUSSION

The 2011 stream surveys provided additional information for prioritizing SFBR tributaries for habitat work such as barrier removal. None of the creeks appeared to contain adequate water to sustain fish populations during late summer and are likely acting as hatching/rearing habitats for age-0 fish as adults were not detected in the streams during sampling. In Cow Creek, habitat degradation from active grazing and water diversions appear to be limiting use of the stream to a small area near the confluence of the SFBR. Before any of the streams are further considered for habitat improvements, seasonal flow in these streams should be investigated to determine if these tributaries can provide annual spawning habitat. The flows in SFBR were higher for a longer period in 2011 because of a strong snow pack and therefore may have provided uncommon access to these streams by spawning rainbow trout. More tributary sampling will be conducted in 2012, continuing with streams in the roadless section downstream of Danskin Bridge.

Table 21. Rainbow trout population and density (fish/100 m^2) estimates by length group and stream temperatures (°C) at 9 monitoring sites during July-August 2011 in the Bock, Cayuse, Cow, and Mennecke Creek drainages.

				< 100 mm		≥ 100 mm		Total	
Stream	Site	Temp (°C)	Passes	Estimate	95% CI	Estimate	95% CI	Estimate	fish/100m^2
Bock Creek	1	13.3	2	71	58-84	-	-	71	54.4
Bock Creek	2	13.4	2	88	53-123	4	4-4	88	91.8
Cayuse Creek	1	15.6	2	19	18-20	-	-	19	43.3
Cayuse Creek	2	15.6	2	25	23-27	-	-	25	70.7
Cow Creek	1	15.7	1	-	-	-	-	-	
Cow Creek	2	-	1	-	-	-	-	-	
Cow Creek	3	-	1	-	-	-	-	-	
Mennecke Creek	1	16.2	2	80	74-86	1	1-1	81	128.6
Mennecke Creek	2	13.7	2	22	18-26	1	1-1	23	44.9

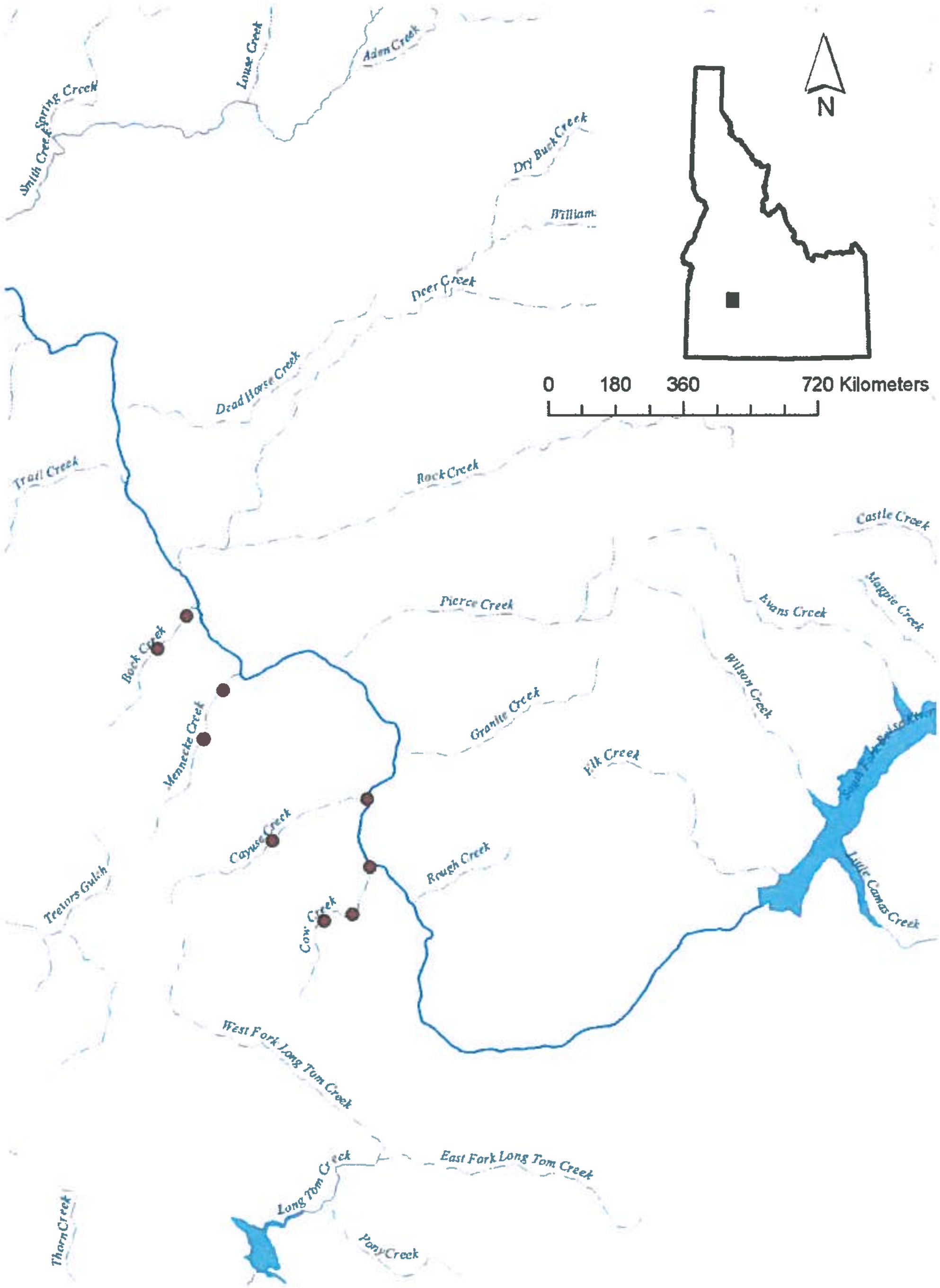

Figure 27. Map of the South Fork Boise River drainage, Idaho and the nine sites sampled to assess fish populations within the drainage during July-August 2011.

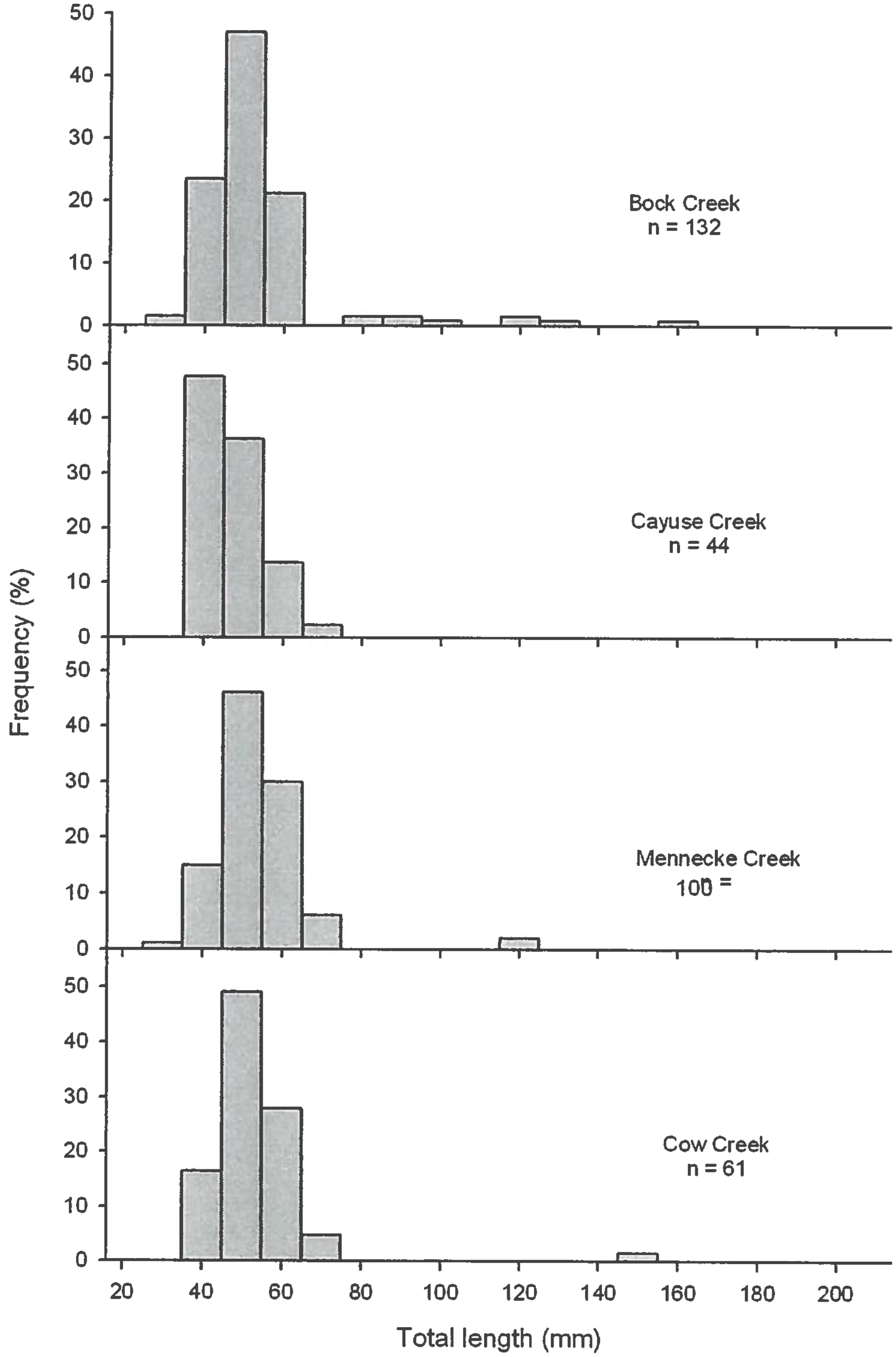

Figure 28. Rainbow trout length distribution (%) of fish captured in July-August 2011 at 6 sites in the Bock, Cayuse, and Mennecke Creek drainages.

Monitoring Of Bull Trout And Redband Trout Populations In The Yuba River Drainage, A Tributary To The Middle Fork Boise River

ABSTRACT

A total of 41 redband trout were captured in Trail Creek (T0.5) and Yuba River (YU4.7) in 2011 and both sites contained fish. Total catch of redband trout ranged from 19 at Trail Creek (T0.5) to 22 fish at Yuba River (YU4.7). A single juvenile bull trout was collected in the Yuba River, and sculpin *sp.* and tailed frogs were observed in all streams. No migratory bull trout were captured during the 2011 sampling. Redband trout density for the sites averaged 15.2 trout/100 m^2 and fish $\geq$ 100 mm comprised 88% of the fish captured. Redband trout in Trail Creek ranged from 58-274 mm while fish in the upper Yuba River ranged from 62-195 mm. Compared to surveys conducted in 2010, Trail Creek (T0.5), redband density increased from 4.1 fish/100m^2 in 2000 to 24 fish/100m^2, while in the upper Yuba River (YU4.7) densities increased slightly from 3.9 to 6.4 fish/100m^2. With the sites that were sampled in 2010 and 2011, redband density appears to have increased over 100% from estimates obtained in 2000. Resident bull trout density within these streams is low but appears to be stable.

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INTRODUCTION

The Yuba River is a 4th order tributary to the Middle Fork Boise River (MFBR) located near Atlanta, in Elmore County, Idaho. Yuba River enters the MFBR approximately 60 km upstream of Arrowrock Reservoir and 0.3 km above Kirby Dam, which prior to the construction of a fish ladder in July 1999, had blocked upstream fish passage for approximately 90 years. The drainage has recently been designated as critical habitat for bull trout *Salvelinus confluentus* recovery by the U.S. Fish and Wildlife Service in September 2010. In addition to bull trout, the drainage is also home to redband trout *Oncorhynchus mykiss gairdneri* and sculpin *Cottus sp.* Fish bearing tributaries to the Yuba River include Decker Creek, Grouse Creek, Trail Creek, and Sawmill Creek. James Creek is adjacent to the Yuba River, entering the MFBR just downstream of Kirby Dam, and is also known to contain redband and bull trout.

Both resident and migratory bull trout utilize the MFBR and its tributaries. Migratory fish (adfluvial and fluvial) winter in Arrowrock Reservoir or the South Fork Boise River (SFBR) and typically enter the lower MFBR in mid-May through early June and proceed to migrate upstream towards a number of higher elevation spawning tributaries in the North Fork Boise River (NFBR) and MFBR drainages (Flatter 2000). Spawning generally occurs in August and September, after which fish move back downstream to wintering areas.

Kirby Dam was built in the early 1900s to provide electricity and water for nearby mining activities. The structure had to be rebuilt in 1992 after the original earthen material failed. The dam is owned by the U.S. Forest Service (USFS) and operated by the Atlanta Hydropower Corporation to provide electricity to the town of Atlanta. After functioning as a barrier to upstream fish migration for approximately 90 years, a fish ladder was built by Idaho Department of Fish and Game (IDFG) and USFS in 1999. The fish ladder, when functioning, effectively reconnects the upper headwaters of the MFBR to the mainstem and opens access to potential spawning tributaries such as the Yuba River drainage to migratory bull trout.

Methods

The Yuba River and Trail Creek were sampled at 2 sites on 15-16 August 2011 to evaluate bull trout presence, trout population density, and size distribution of fish populations within these tributaries (Figure 29). These sites were previously sampled in 2000 and were a continuation of an attempt to revisit survey sites beginning in 2010. Sites were located using descriptions and coordinates listed in Flatter et al. 2003. Sampling occurred in August to maximize the chance of encountering migratory bull trout from Arrowrock Reservoir. However, it should be noted that the fish ladder at Kirby Dam did not contain adequate flows for most of the summer in 2011. All streams were sampled at base flow conditions to minimize changes in stream habitat and electrofishing efficiency.

Fish sampling

At each site, we used depletion electrofishing to determine the abundance of salmonids, using 1-2 backpack electrofishers (Smith-Root Model 15-D) with pulsed DC. Nongame fish and amphibian species were also recorded if observed. Fish were identified, enumerated, measured to the nearest millimeter (total length, TL) and gram, and released downstream of the study sites. Block nets were installed at the upper and lower ends of the sites to prevent fish from leaving or entering a study site during the survey. Study sites were variable in length and in most cases we used the section lengths that were sampled in Flatter et al. 2003. Maximum-likelihood abundance and variance estimates were calculated with the MicroFish software package (Van Deventer 2006; Van Deventer and Platts 1989). When all trout were captured on the first pass, we estimated abundance to be the total catch. Because electrofishing is characteristically size selective (Sullivan 1956; Reynolds 1996), trout were separated into two length groups (<100 mm TL and ≥100 mm TL) and abundance estimates were calculated individually for each size group. Depletions were attempted only for salmonids, whereas relative abundance was recorded for all nongame fish and amphibian species.

Habitat Sampling

Various habitat measurements were recorded at ten equally spaced transects within the sample site. Stream width was measured at each transect and depth (m) was measured at ¼, ½, and ¾ distance across the channel. The sum of these depth measurements was divided by four to account for zero depths at the stream margins for trapezoidal channels (Platts et al. 1983; Arend 1999). Wetted stream width (m) was calculated from the average of all transect measurements. In most cases stream temperature (°C) and conductivity (µS/cm) were measured at the bottom of a site with a calibrated hand-held meter accurate to ± 2%. Various other habitat measurements such as percent substrate composition, percent shading, and bank stability were measured but the results are not reported here.

RESULTS

A total of 41 redband trout were captured in Trail Creek (T0.5) and Yuba River (YU4.7) in 2011 and both sites contained fish. Total catch of redband trout ranged from 19 at Trail Creek (T0.5) to 22 fish at Yuba River (YU4.7; Figure 29). A single juvenile bull trout was collected in the Yuba River and sculpin *sp.,* and tailed frogs were observed in all streams. No adult migratory bull trout were captured during the 2011 sampling.

Redband trout density for the sites averaged 15.2 trout/100 m^2 and fish ≥ 100 mm comprised 88% of the fish captured (Table 22). Capture probabilities for the two size classes of trout were quite similar where capture probability for fish < 100 mm was 71% and 77% for fish ≥ 100 m. Length distributions for redband trout in each stream were quite similar (Figure 30). Redband trout in Trail Creek ranged from 58-274 mm while fish in the upper Yuba River ranged from 62-195 mm.

The sites at Yuba River and Trail Creek were previously sampled with backpack electrofishing in 2000 (Flatter et al. 2003). At Trail Creek (T0.5), redband density increased from 4.1 fish/100m^2 in 2000 to 24 fish/100m^2 fish in 2011, while the upper Yuba River (YU4.7) increased slightly from 3.9 to 6.4 fish/100m^2 (Table 23).

DISCUSSION

Redband trout abundance appears to have increased in the Yuba River drainage during the past 10 years. Including all sites sampled in 2010 and 2011, redband density appears to have increased over 100% from estimates obtained in 2000. Fishery regulations during this period have been constant but land use or forest management practices may have changed in the drainage during this period. Much of the lower drainage was affected by the Hot Creek Fire in 2003, and the Yuba River in particular has very little canopy cover and many sediment sources given the loose granitic nature of the surrounding soils.

Resident bull trout density within these streams is low but appears to be stable. In 2000, a single bull trout was collected in Decker Creek (D0.4) and Yuba River (Y0.2; Flatter et al. 2003). Two bull trout were also collected in Grouse Creek in 2000. Similar numbers have been collected during the 2010-11 surveys. Migratory bull trout were not observed in 2000 or 2010-11, therefore it is difficult to assess whether or not the Kirby fish ladder has allowed for migratory fish to access the drainage. However, sampling in 2000 occurred in July, which may not have allowed enough time for migratory fish to reach the drainage. Additionally, sampling a small number of stream sections does not provide a good indication as to whether or not migratory fish are using the Yuba drainage. A better approach may be to disregard obtaining population estimates and electroshock long stream sections or habitats capable of holding larger fish or trap fish at the Kirby Dam ladder.

Table 22. Redband trout population and density (fish/100 m^2) estimates by length group at 11 monitoring sites during August 2010 in the Decker, Grouse, and James creeks and Yuba River drainages.

Stream	Site (length-m)	Passes	< 100 mm Estimate	< 100 mm 95% CI	≥ 100 mm Estimate	≥ 100 mm 95% CI	Total Estimate	Total 95% CI
Trail Creek	T0.5 (40)	2	2	0-15	20	10-30	24	9-39
Yuba River	YU4.7 (66)	3	3	0-6	19	18-20	22	21-23

Table 23. Comparison of redband trout population and density estimates (fish/100 m^2) over the last ten years (2000-2011) at monitoring sites in Trail Creek and Yuba River.

Stream	Site	2000 Estimate	2000 95% CI	2000 fish/100m^2	2011 Estimate	2011 95% CI	2011 fish/100m^2
Trail Creek	T0.5	5	5-7	4.1	24	9-39	24
Yuba River	YU4.7	14	13-19	3.9	22	21-23	6.4

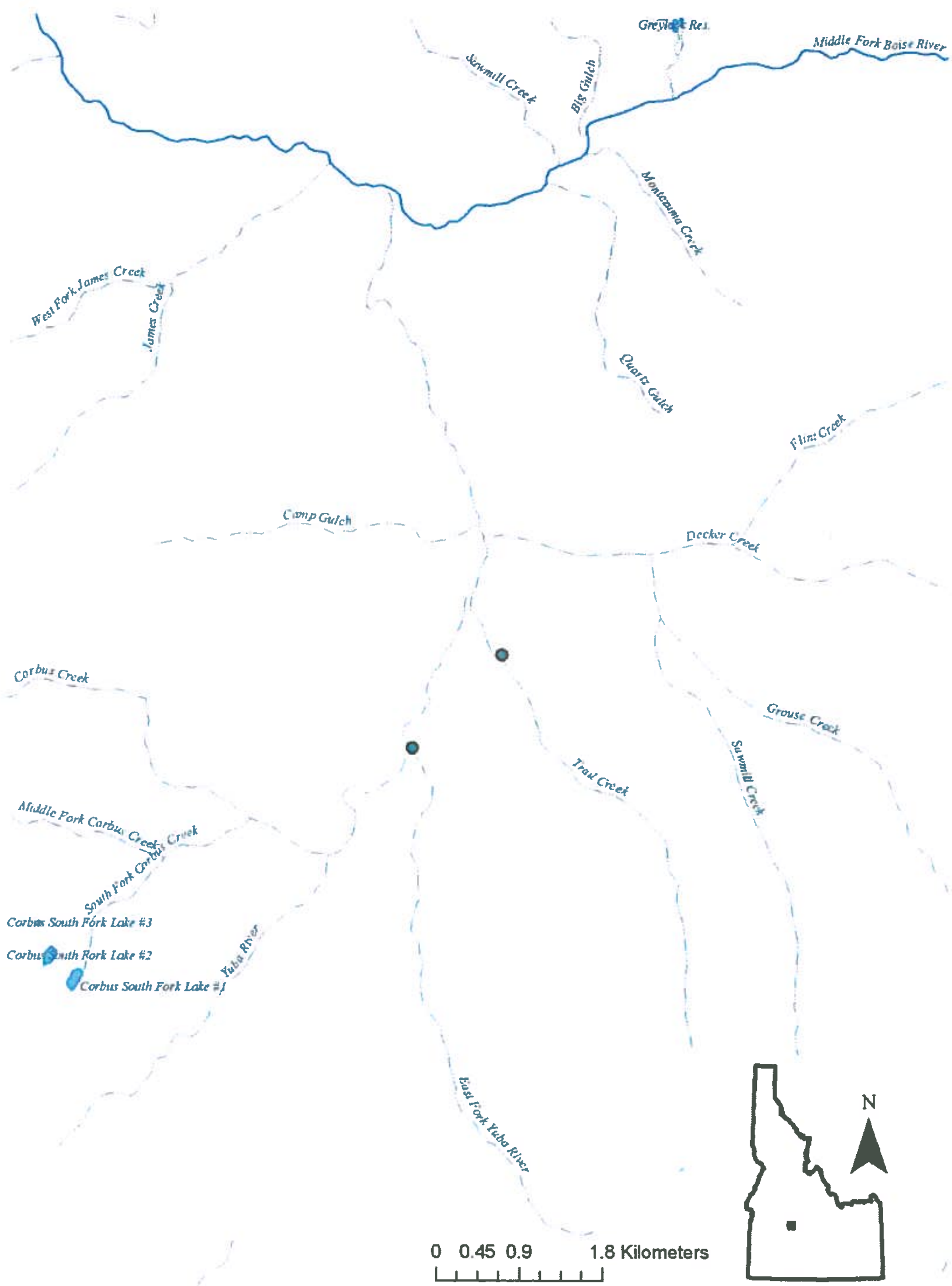

Figure 29. Map of the Yuba River drainage, Idaho and the 11 sites sampled to assess fish populations within the drainage during August 2010.

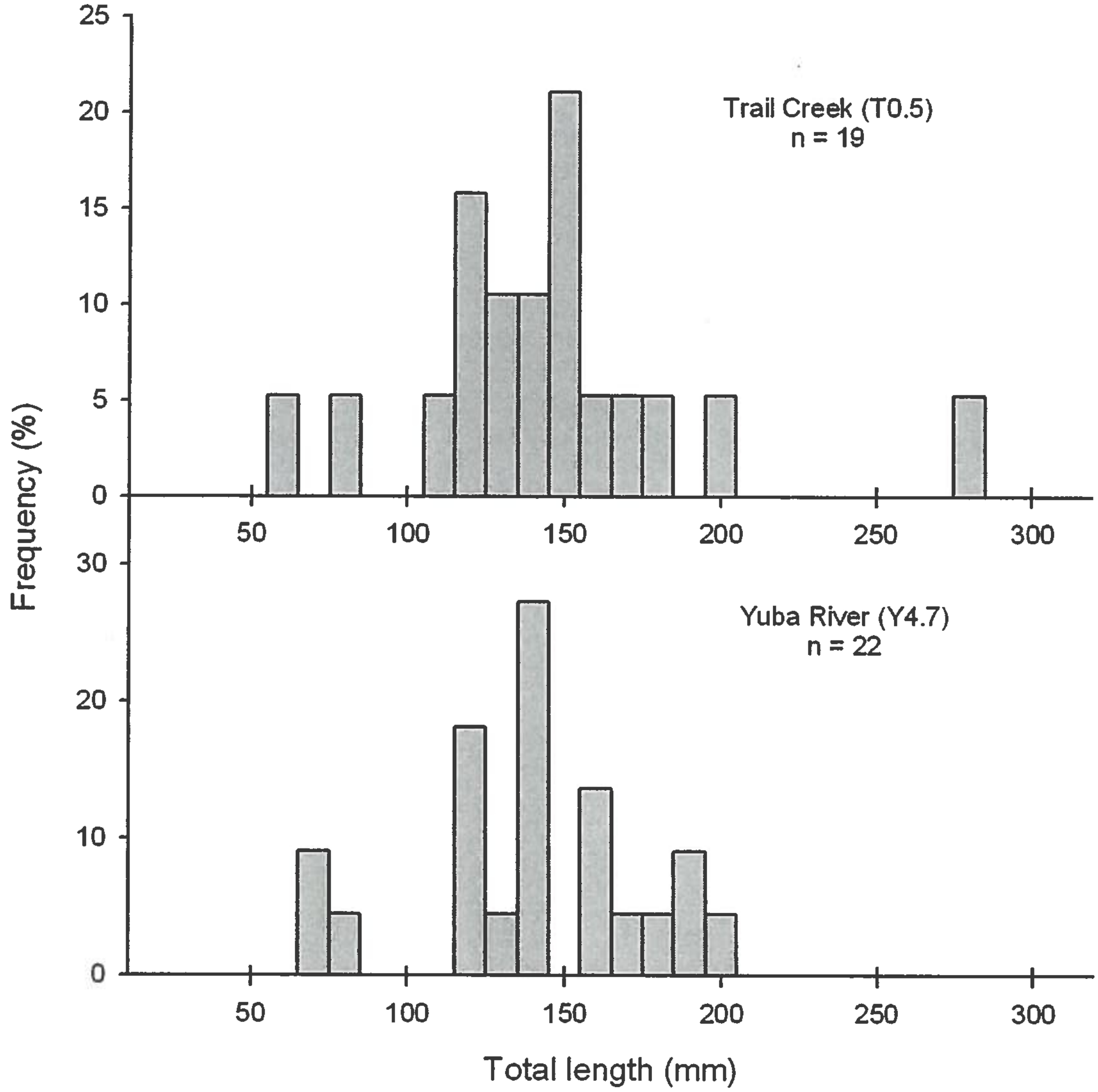

Figure 30. Redband trout length distribution (%) of fish captured in August 2011 at monitoring sites in Trail Creek and Yuba River.

Upper Middle Fork Salmon River Chinook Salmon Redd Counts

ABSTRACT

Spawning ground surveys were conducted along 11 historical trend monitoring transects in Bear Valley, Elk, and Sulphur creeks from August 29 through 31, 2011 to index the abundance of wild Chinook salmon *Oncorhynchus tshawytscha*. In Bear Valley Creek, a total of 211 redds were counted along six transects. These counts exceed the 10-year average (151 redds) by 36%, but represents a 42% decline when compared to the more recent high of 2003 (364 redds) and a 69% decline from the highest counts ever recorded during 1961 (675 redds). In Elk Creek, a total of 189 redds were counted along three transects. These counts exceed the 10-year average by 11%, but represent a 50% decline from the recent high of 2002 (377 redds), and an 71% decline from the historical high of 1961 (654 redds). In Sulphur Creek, a total of 79 redds were counted along two transects during 2011. For Sulphur Creek transects, these counts exceed the 10-year average by 98%, but represented a 15% decline from the recent high of 2002 (93 redds), and a 79% decline from the historical high of 1957 (381 redds).

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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 streams since 1957 to enumerate the number of Chinook salmon redds, primarily, 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 split into shorter segments (3-4 km) and have been surveyed on foot annually during the last week of August (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 and 1960s. 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. 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 2011.

2. 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 30) from August 29 through 31, 2011. The timing of initial surveys conducted along Bear Valley, Elk, and Sulphur creeks occurred within the interval of past sampling dates, at a time when nearly all adult Chinook salmon had recently spawned.

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. Redd locations were recorded with hand-held global positioning system units. For each site, surveyors also recorded the number of live and dead adult Chinook salmon observed, as well as their estimated age and sex. Biological samples were collected from salmon carcasses and provided to the Idaho Natural Production Monitoring and Evaluation Project. All survey data was entered and archived in the Spawning Ground Survey database.

RESULTS AND DISCUSSION

In Bear Valley Creek, a total of 211 redds were counted along six transects during 2011 surveys (Figure 31). These counts exceeded the 10-year average (151 redds) by 40%, but represents a 42% decline when compared to the recent high of 2003 (364 redds) and a 69% decline from the highest counts ever noted during 1961 (675 redds). Despite this marked difference between present and historical counts, trend counts along these six transects cumulatively have increased in each of the last five years (Figure 32-34). In Bear Valley Creek, redds were concentrated (156 of the 211 redds) in the two transects bracketing the mouth of Elk Creek (WS-10a and WS-9d). The number of redds counted in the four remaining Bear Valley Creek transects was less than 31 each. A total of 51 live adult Chinook salmon and 138 carcasses were observed.

In Elk Creek, a total of 189 redds were counted along three transects (Figure 31). These counts exceeded the 10-year average by 11%, but represented a 50% decline from the recent high of 2002 (377 redds), and an 71% decline from the historical high of 1961 (654 redds; Figure 35). The majority of redds in Elk Creek (n = 105) were concentrated in the most upstream monitoring sites, WS-11a. Whereas, 67 and 17 redds were counted in the middle (WS-11b) and lower (WS-11c) transects along Elk Creek, respectively. A total of 14 live adult Chinook salmon and 77 carcasses were observed.

In Sulphur Creek, a total of 79 redds were counted along two transects during 2011 (Figure 31). These counts exceeded the 10-year average by 98%, but represented a 15% decline from the recent high of 2002 (93 redds; Figure 35), and a 79% decline from the historical high of 1957 (381 redds). Only two live adult Chinook salmon and 7 carcasses were observed.

Over the three monitoring streams and 11 trend monitoring transects combined, a total of 479 redds were counted in 2011 (Figure 31). This total exceeded the 10-year average by 33% and is the highest total count since 2003 (n = 783; Figure 37). Despite a general increasing trend since 2004, total redd counts in this area are still much lower than the high of 1,440 redds counted within these streams during 1957 and the consistently high counts documented during the 1960s (only 10 transects were surveyed until 1988). During this decade, cumulative counts in this area exceeded 770 redds in all years except 1965 when 536 redds were counted. Furthermore, total redd counts during 2011 were still 26% less than recent highs documented during 2001-2003, when cumulative counts averaged 643 redds for this period.

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.

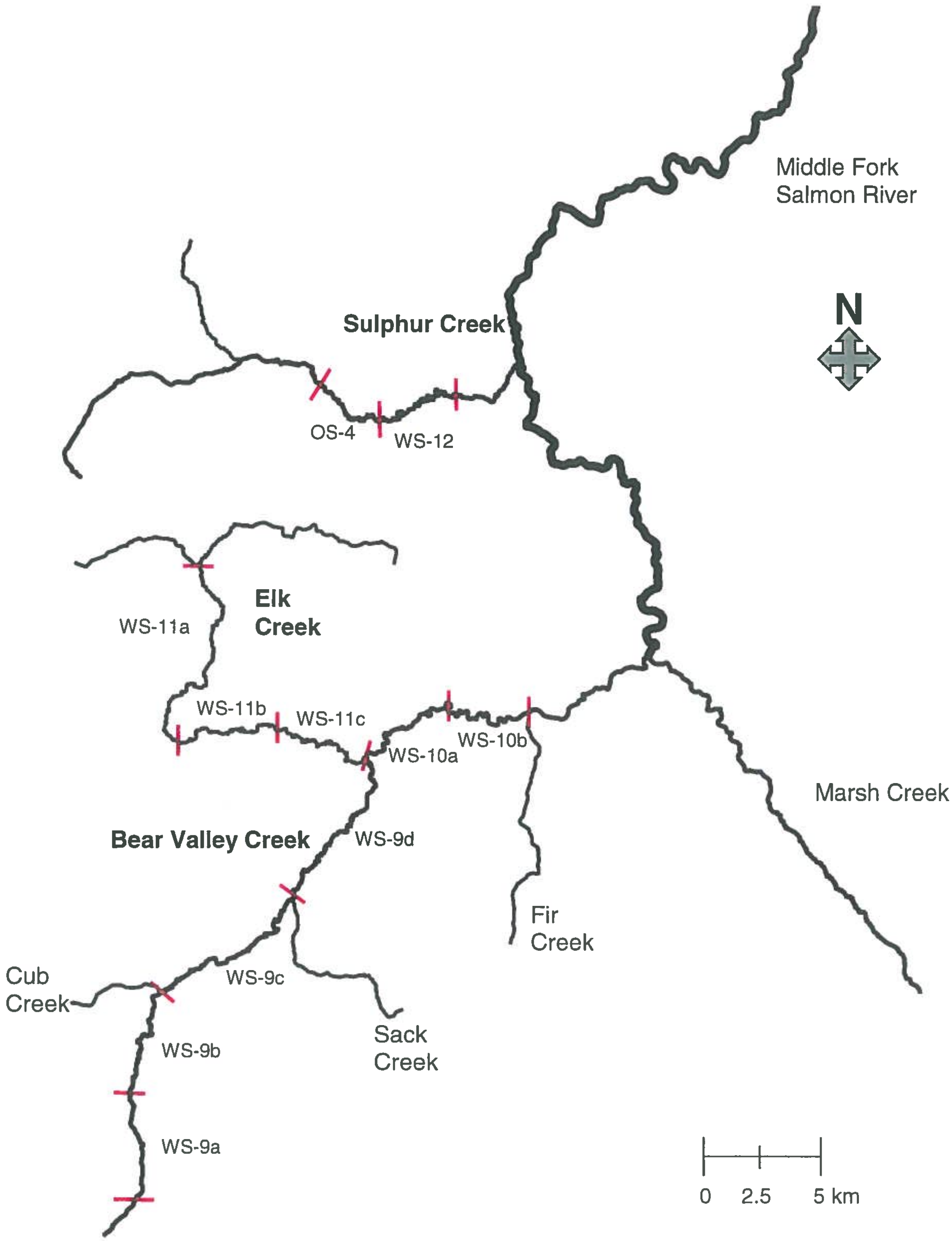

Figure 31. Location of 11 trend monitoring transects on Bear Valley, Elk, and, Sulphur creeks used to index the abundance of wild spring/summer-run Chinook Salmon in the upper Middle Fork Salmon River Drainage, ID. Red lines denote transect boundaries.

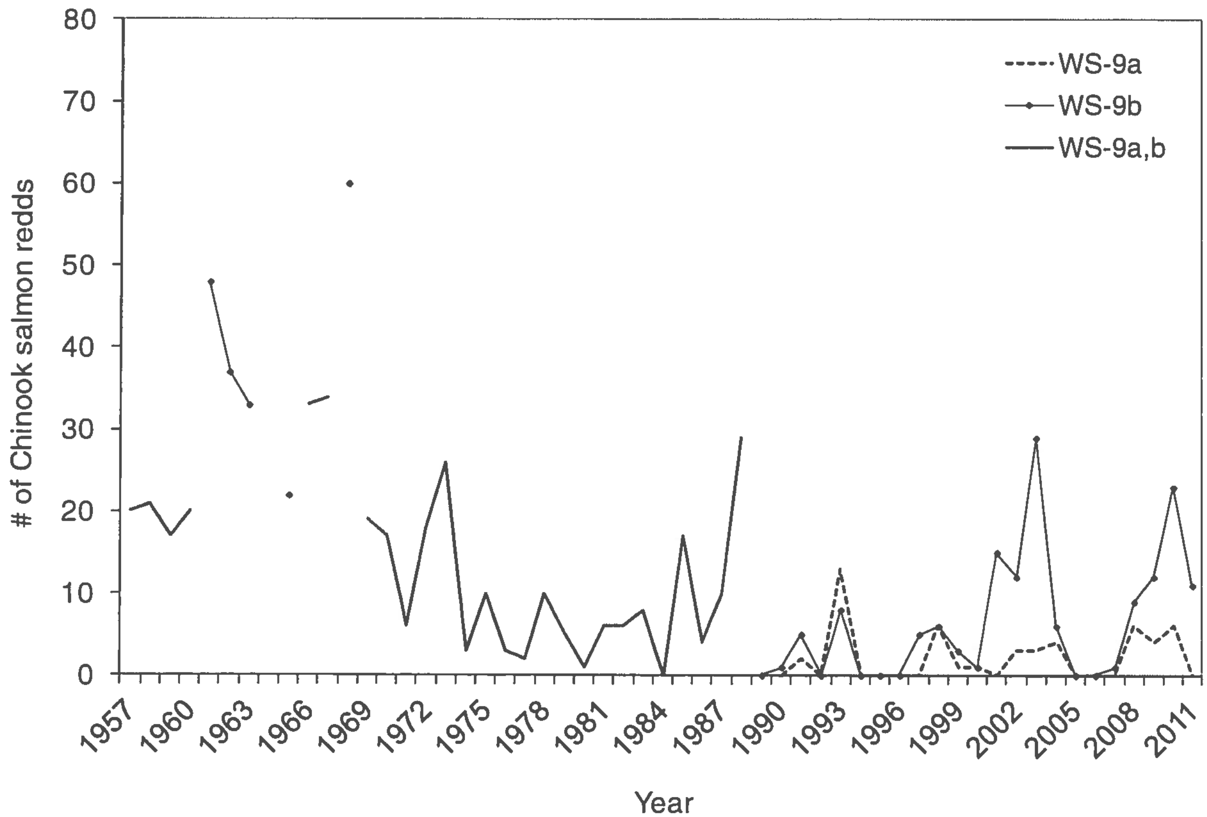

Figure 32. Number of Chinook salmon redds counted along upper Bear Valley Creek index transects from 1957-2011. The solid line represents a cumulative count for WS-9a & b that was monitored in most years from 1957 to 1989.

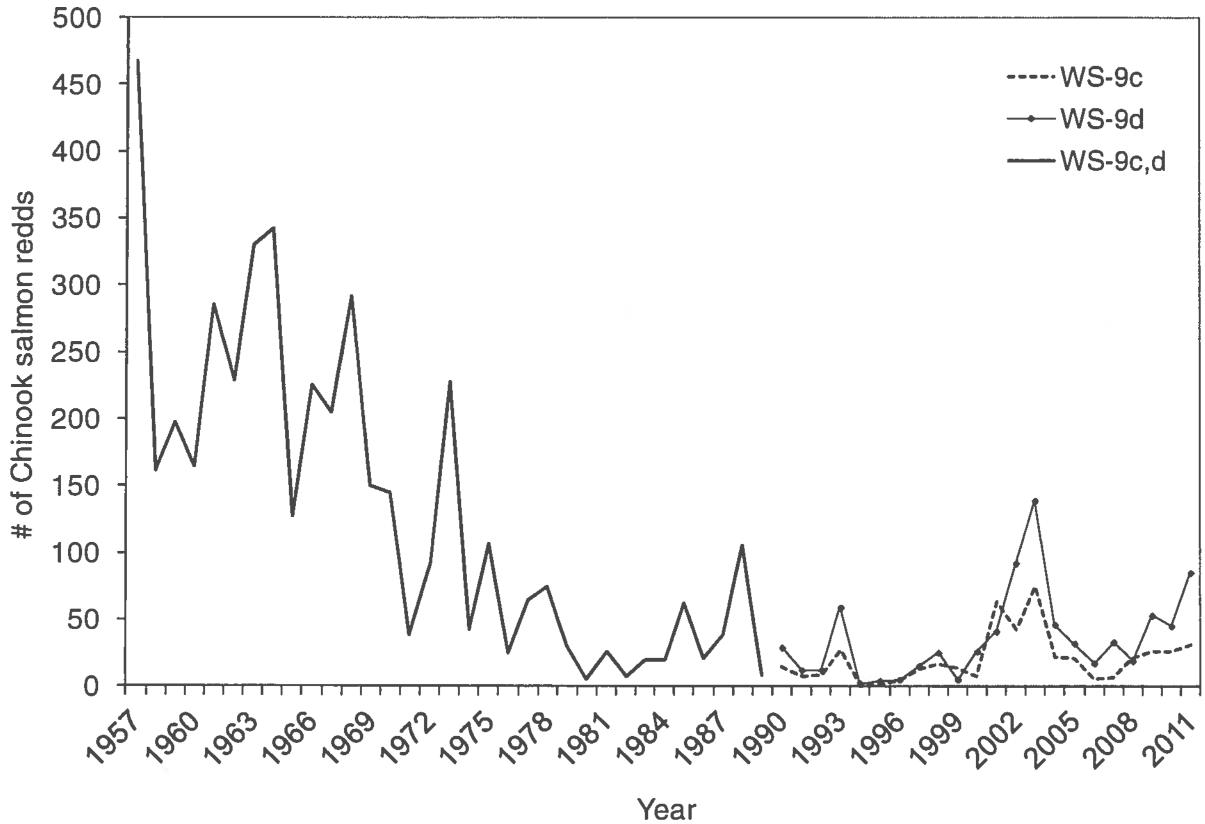

Figure 33. Number of Chinook salmon redds counted along middle Bear Valley Cr. index transects from 1957-2011. The solid line represents cumulative counts for WS-9c & d.

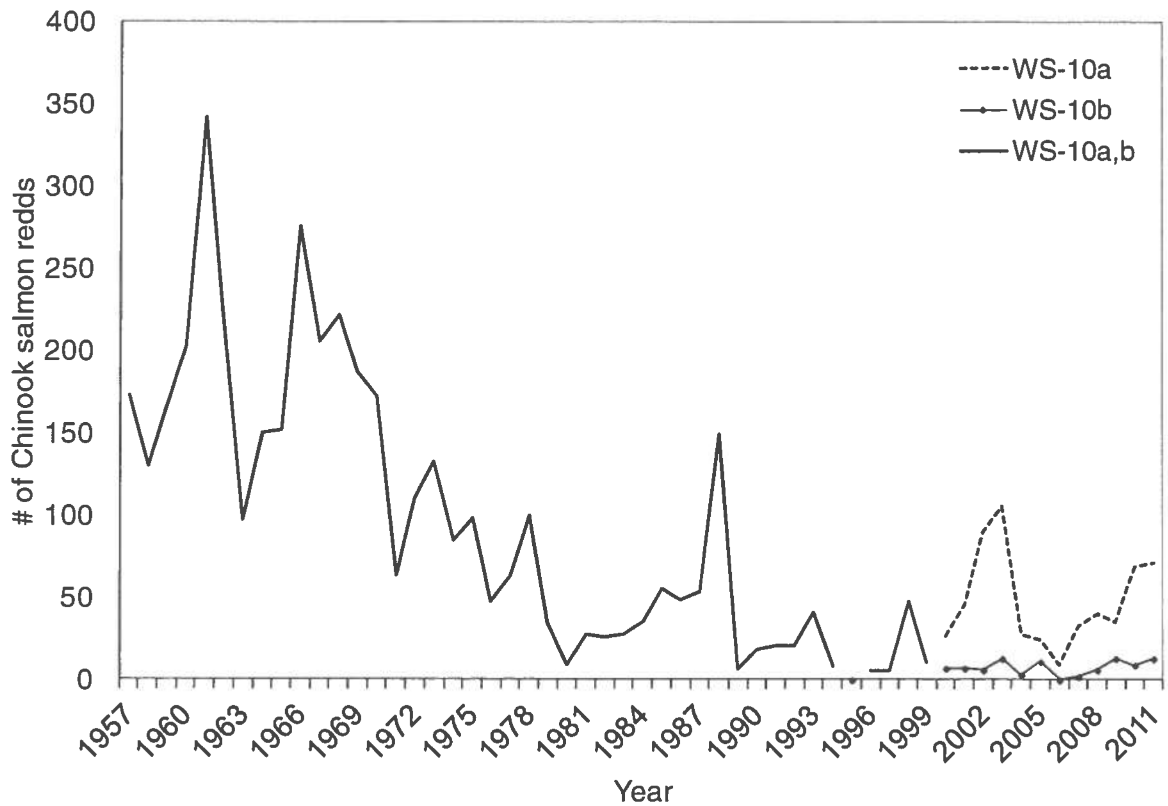

Figure 34. Number of Chinook salmon redds counted along lower Bear Valley Cr. index transects from 1957-2011. The solid line represents cumulative counts for WS-10a & b.

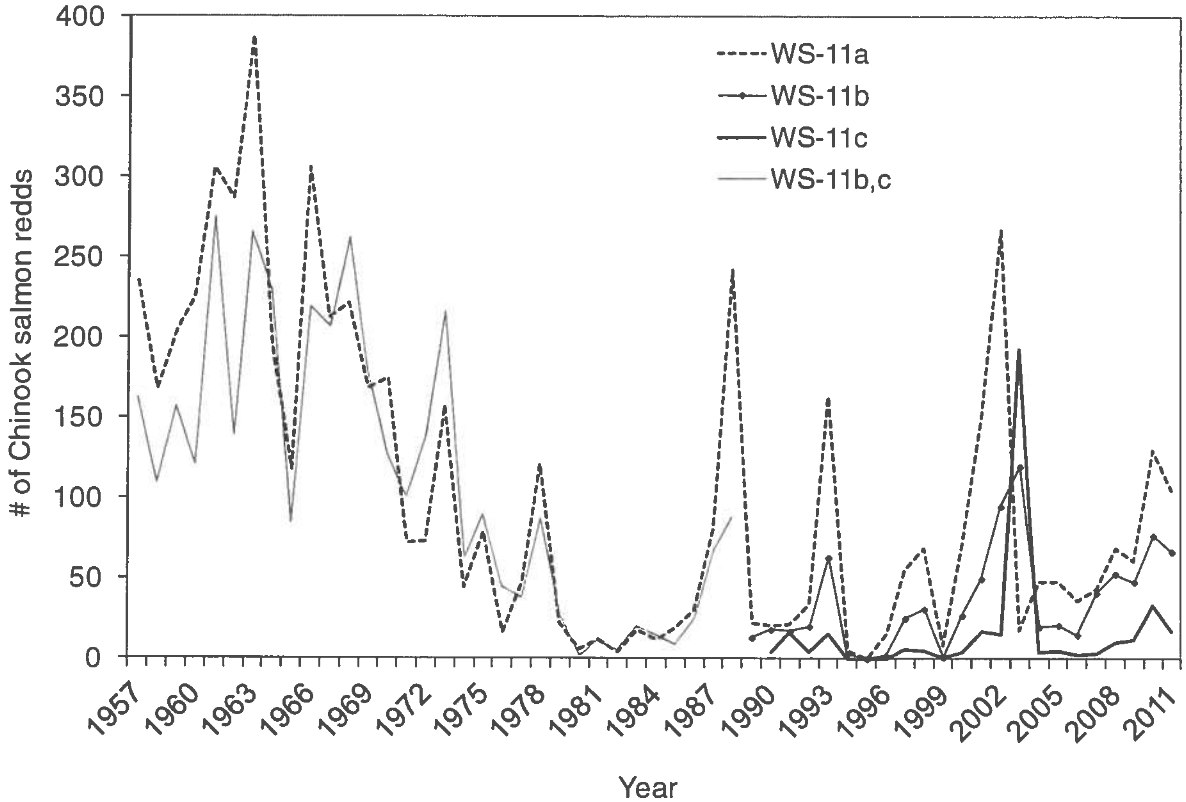

Figure 35. Number of Chinook salmon redds counted along Elk Creek index transects from 1957-2011. The solid line represents a cumulative count for WS-11b and WS-11c, whereas all other lines represent individual transects.

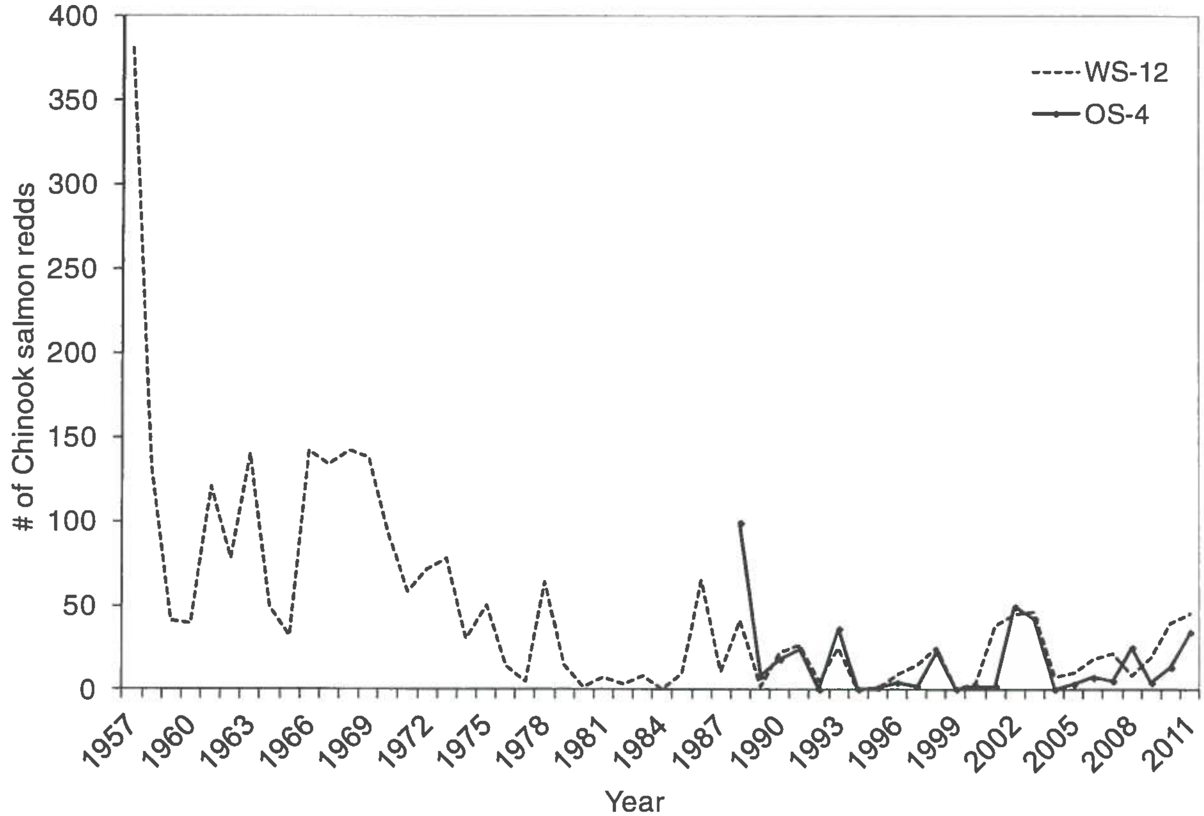

Figure 36. Number of Chinook salmon redds counted along Sulphur Creek index transects from 1957-2011.

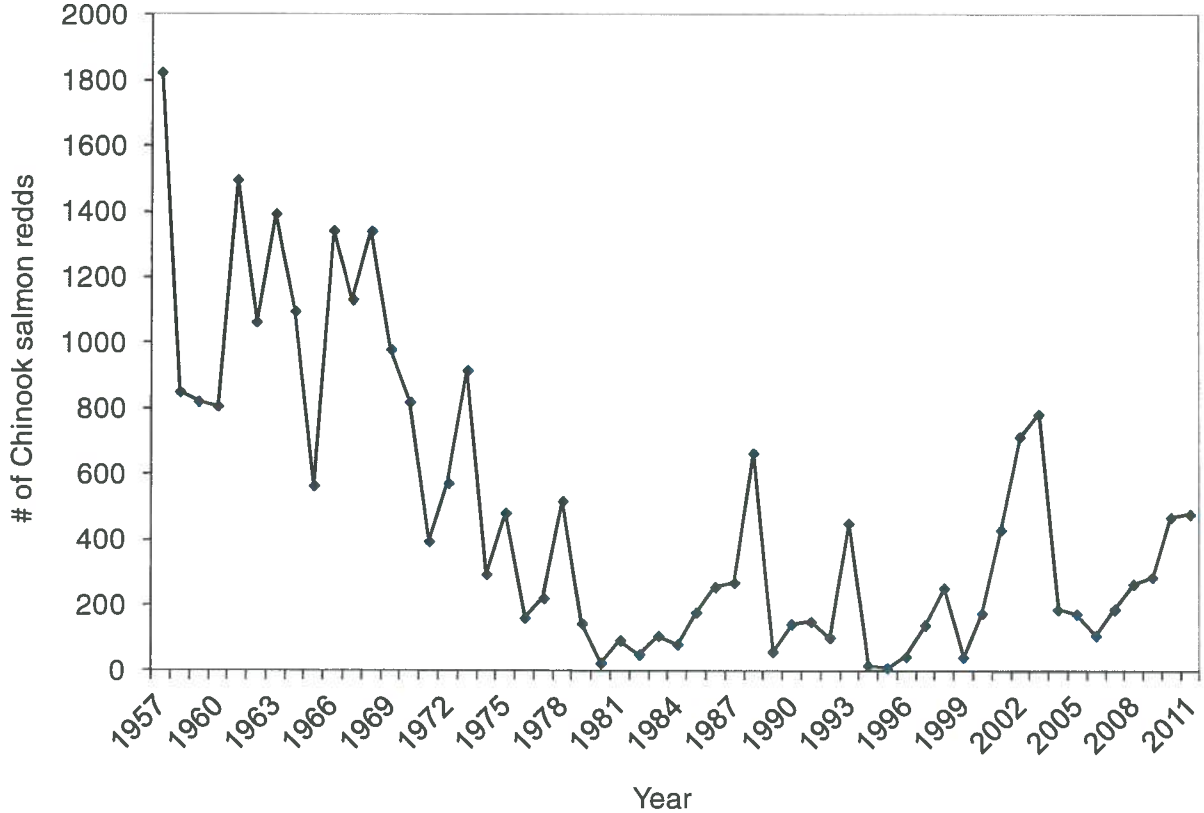

Figure 37. Cumulative number of Chinook Salmon redds counted along 11 trend monitoring sites in Bear Valley, Elk, and Sulphur creeks from 1957 through 2011. Counts for the upper Sulphur Creek transect (OS-4) from 1957-1987 were estimated with linear regression techniques and data collected from 1988-2011.

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