FISHERY MANAGEMENT INVESTIGATIONS

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LOWLAND LAKE AND RESERVOIR INVESTIGATIONS

BLACKFOOT RESERVOIR

ABSTRACT

We sampled Blackfoot Reservoir using gillnets and boat electrofishing in order to assess salmonid and Smallmouth Bass *Micropterus dolomieu* populations in 2018. Results indicated that the size structure of Rainbow Trout *Oncorhynchus mykiss* has remained consistent over time, but catch rates have declined. Gillnet catch-per-unit-effort (CPUE) for Rainbow Trout was 15.8 fish/effort in 2015 compared to 2.8 fish/effort in 2018. We attributed this reduction in relative abundance directly to a reduction in the number of catchable sized fish stocked annually. From 2007 to 2011, on average, 125,359 catchable Rainbow Trout were stocked annually into Blackfoot Reservoir. The number then decreased to about 40,000 due to statewide changes in fish production funding. We anticipate an improvement of Rainbow Trout catch rates once hatchery stocking increases to previous levels typical of 2007 to 2011. The Smallmouth Bass population in Blackfoot Reservoir continues to increase in abundance. The CPUE of Smallmouth Bass in 2015 was 2.6 fish/effort, this increased to 26.3 fish/effort in 2018. Mean length and weight of Smallmouth Bass sampled in 2018 was 187 mm and 128 g, respectively.

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INTRODUCTION

Blackfoot Reservoir is located on the Blackfoot River in Bingham and Caribou counties north of Soda Springs, Idaho. The dam was constructed in 1909 and the primary uses of the reservoir include irrigation storage and flood control. The U.S. Bureau of Indian Affairs regulates the dam and reservoir level. At full capacity, the reservoir is at 1,865 m elevation, covers 7,285 ha. Refilling begins in October and continues through spring runoff. Irrigation use begins in June, with drawdown occurring as irrigation demand exceeds inflow.

Historically, Blackfoot Reservoir was a premier fishery for large (> 500 mm) Yellowstone Cutthroat Trout *Oncorhynchus clarkii bouvieri*. The quality of this species' fishery slowly deteriorated and eventually crashed in the early 1980s due to overharvest. In 1989, after several years of study, a comprehensive plan to rebuild the fishery for wild Yellowstone Cutthroat Trout was formulated as the Upper Blackfoot System Fishery Management Plan (LaBolle and Schill 1988). The plan called for the cessation of angler harvest of Yellowstone Cutthroat Trout from Blackfoot Reservoir. In order to continue to provide a harvestable fishery on this waterbody, large numbers of both hatchery Rainbow Trout *Oncorhynchus mykiss* and hatchery Bonneville Cutthroat Trout *Onchorhynchus clarkii utah* (originating from Bear Lake) were stocked. Attempts were made to establish naturalized Bonneville Cutthroat Trout in the Little Blackfoot River; however, those attempts failed and stocking of this species was discontinued in 1994. Rainbow Trout stocking was subsequently increased as a replacement. Originally catchable and fingerling size class Rainbow Trout were stocked in the spring; however, after a few years of evaluation, it was clear these fish were not recruiting to the fishery. In response to these findings, stocking was altered to a fall release of triploid Rainbow Trout of catchable size in 2004. This change was also partially to avoid predation of stocked fish by American White Pelicans *Pelecanus erythrorhynchos* by stocking the reservoir after the birds have migrated south. From 2007 to 2011, on average, 125,359 catchable Rainbow Trout were stocked annually into Blackfoot Reservoir. The number then decreased to about 40,000 due to statewide changes in fish production funding (Table 1, Figure 2).

The two objectives associated with sampling Blackfoot Reservoir in 2019 included an assessment of the relative performance of hatchery Rainbow Trout stocked in the reservoir and to establish baseline information on the Smallmouth Bass *Micropterus dolomieu* population which was first documented in the reservoir in 2015 (Brimmer et.al 2015).

METHODS

During the summer of 2018, we sampled Blackfoot Reservoir using gillnets (floating and sinking) and boat electrofishing (Figure 1). Gill netting was completed from August 8 to August 14. Gillnets measured 42 m × 2 m with six panels composed of 19-, 25-, 32-, 38-, 51-, and 64-mm bar mesh. The combination of one floating and one sinking net fished in tandem for one night equaled one unit of gill net effort. The four established trend sites were sampled in 2018, along with four additional new gillnet sites. All sites were non-randomly selected. Two trend sites were sampled twice, the second set at these locations was removed from analysis. Overall, we applied eight units of gillnet effort to Blackfoot Reservoir in 2018.

For electrofishing surveys on Blackfoot Reservoir, a boat-mounted pulsed-DC Infinity electrofishing unit (Midwest Lake Electrofishing Systems, Inc., Polo, Missouri) powered by a 7,500-W generator (American Honda Motor Co., Torrance, California) was used on the nights of

August 14 and 15. One hour of electrofishing equaled one unit of effort. Overall, we applied 1.75 units of electrofishing effort at index sites established in the early 2000s. These sites were non-randomly selected and targeted suitable habitat for Smallmouth Bass. All game species individuals were identified, enumerated, measured for total length to the nearest millimeter and weighed to the nearest gram. A count was recorded for non-game species captured.

RESULTS

Hatchery Rainbow Trout continue to recruit to the fishery but at a lower abundance than experienced over the past decade. In 2018, Rainbow Trout catch was the lowest observed since 2005 (Table 2). In 2018, mean length of Rainbow Trout captured in gillnets was 460 mm, and mean weight was 1,031 g. These values are similar to fish sampled in 2015 where Rainbow Trout had a mean length of 454 mm and a mean weight of 1,061 g. Catch per unit effort (CPUE) for Rainbow Trout in gillnets declined from 15.8 fish/effort in 2015 to 2.8 fish/effort in 2018, the lowest seen since 2005 (Table 3). Twelve Rainbow Trout were captured in electrofishing sampling in 2015 for a CPUE value of 3.9 fish/effort, no Rainbow Trout were captured electrofishing in 2018 (Table 4). Non-salmonids have consistently dominated the gillnet catch since sampling began on Blackfoot Reservoir in 1963 (Table 2). The size structure of Rainbow Trout in the population has remained relatively stable over time (Figure 3).

Smallmouth Bass were encountered and documented at Blackfoot Reservoir for the first time in 2015. The department has received anecdotal accounts of their presence in the reservoir since 2007, but had never sampled any until 2015. During the 2015 survey, we sampled five Smallmouth Bass using electrofishing (Table 4), and estimated CPUE was 2.6 fish/effort (SE = 0.7). One Smallmouth Bass was also captured in the gillnet survey. These results indicated that in 2015, Smallmouth Bass relative abundance was low. However, in 2018 we sampled 50 Smallmouth Bass in the electrofishing surveys (Table 4) for a CPUE of 26.3 fish/effort (SE = 12.6). Thirty-one Smallmouth Bass were also captured in the 2018 gillnets. This substantial increase in CPUE suggests the Smallmouth Bass population is growing rapidly. Smallmouth Bass sampled in 2015 had a mean length and weight of 169 mm and 83 g, respectively, and ranged in length from 135 to 226 mm. Smallmouth Bass sampled in 2018 were slightly larger than those from the 2015 sample with a mean length of 187 mm and a mean weight of 128 g. The range in length of these fish was also broader (131–266 mm) than in 2015, indicating successful recruitment of this species.

Gillnet catch in Blackfoot Reservoir has routinely been dominated by non-game species. However, the number of Utah Chub *Gila atraria* captured in 2018 was the highest observed since 1999 at 843 individuals. Both Utah Sucker *Catostomus ardens* and Common Carp *Cyprinus carpio* catch was the highest ever recorded in Blackfoot Reservoir with catches of 403 and 70 individuals, respectively.

DISCUSSION

Sterile hatchery Rainbow Trout catchables and fingerlings provide the bulk of the sport angling opportunity found at Blackfoot Reservoir. The high Rainbow Trout catch rates recorded from 2009 to 2011 could have partially been bolstered by the large numbers of fry and fingerlings stocked into the reservoir from 2003 to 2006 that would have been recruited to the fishery by the time of these surveys. The recent stocking history of this reservoir likely explains some aspects of the decreased gill net catch rate observed in the 2018 survey. When hatchery production was reduced in 2012, the Southeast Region assumed the loss of catchable Rainbow Trout in Blackfoot Reservoir stocking alone. Since 2012, catchable stocking rates have been consistently over 40,000 with additional Rainbow Trout fry stocked in 2017 and 2018. Over 53,000 catchable Rainbow Trout stocked in Blackfoot Reservoir in 2018 (Table 1). Additional years of stocking at this level will hopefully result in improved Rainbow Trout catch rates in future surveys of Blackfoot Reservoir.

The decreased Rainbow Trout gill net catch rates observed in 2018 could also be explained by the late season timing of this survey, when summer harvest and mortality had already had some influence on the population. In the future, angler creel data should be added to this assessment to provide a more accurate and complete picture of this hatchery-supported fishery. In addition, to a creel survey, an evaluation of catchable and fry hatchery products should be included in the next Blackfoot Reservoir survey to determine how well these different size classes are contributing to the fishery.

While non-game species have historically dominated the gillnet catch on Blackfoot Reservoir, the 2018 sample contained the most Utah Chub recorded since 1999 and both Utah Sucker and Common Carp were the highest catches ever recorded for those species. This abundance of non-game species may be a contributing factor limiting Rainbow Trout recruitment by creating competition for resources. In addition, the abundance and foraging behavior of Common Carp may be causing more turbid water conditions that may impact the feeding efficiency of trout species which are opportunistic sight predators.

The suspected illegal introduction of Smallmouth Bass into Blackfoot Reservoir could have serious fisheries management implications. Numerous studies have shown that Smallmouth Bass are effective predators on juvenile salmonids (Erhard 2017; Fritts 2011; and Tabor 1993). Since Yellowstone Cutthroat Trout emigrate to the reservoir as juveniles, it is possible Smallmouth Bass predation may reduce the survival of Yellowstone Cutthroat Trout and, in turn, make it difficult to reach objectives (i.e., escapement goal of 10,000 spawners annually) described by the Yellowstone Cutthroat Trout Management Plan (IDFG 2007). In regard to Rainbow Trout stocking, future stocking efforts may need to be comprised entirely of catchables to minimize predation impacts by Smallmouth Bass. This change could have implications to the cost of the program since hatchery catchables cost more to produce than fingerlings and fry. The prudent course of action at this time would be to implement liberal harvest regulations for Smallmouth Bass in an attempt to control the expansion of the population in addition to further aligning the management of Blackfoot Reservoir with the state fisheries management plan objectives. Setting public expectations will be important since the Smallmouth Bass population currently does not support a quality opportunity and an angling clientele has not developed around it.

MANAGEMENT RECOMMENDATIONS

1. Consider liberalization of Smallmouth Bass angling regulations in Blackfoot Reservoir to align management with Fisheries Management Plan direction. Scope regulation change with angling public and recommend liberalized harvest management framework to Fish and Game Commission.

2. Evaluate relative contribution and performance of fingerling and catchable hatchery Rainbow Trout to the Blackfoot Reservoir fishery.

3. Continue periodic (i.e., triennial) Smallmouth Bass population monitoring. Include assessment of diet, and population dynamics and demographics to facilitate future modelling efforts.

4. Conduct desktop analysis of historical hatchery Rainbow Trout stocking in Blackfoot Reservoir and pair with population and creel survey data. Use analysis to develop an economic, outcome-based stocking strategy.

5. Conduct full census creel survey on Blackfoot Reservoir.

Table 1. Stocking history of Rainbow Trout in Blackfoot Reservoir, Idaho from 2000-2018.

Year	Rainbow Trout strain	Life stage	Number stocked	Pounds stocked	Fish per pound
2000	Domestic Kamloops	Fingerling (3-6 inches)	92,380	4,000	23.10
	Hayspur Diploid	Fingerling (3-6 inches)	564,830	13,655	41.40
	Hayspur Triploid	Catchable (6+ inches)	35,100	15,000	2.45
	Hayspur Triploid	Fry (0-3 inches)	500,740	5,272	98.83
	Hayspur Kamloops Triploid	Fingerling (3-6 inches)	361,550	4,750	82.70
2001	Hayspur Triploid	Fingerling (3-6 inches)	146,640	2,600	56.40
	Troutlodge Triploid	Catchable (6+ inches)	36,654	15,050	2.37
2002	Hayspur Triploid	Catchable (6+ inches)	11,040	4,800	2.30
	Troutlodge Triploid	Catchable (6+ inches)	18,000	7,655	2.60
2003	Hayspur Kamloops Triploid	Fingerling (3-6 inches)	231,510	4,800	48.85
	Hayspur Triploid	Fingerling (3-6 inches)	256,271	3,920	61.07
	Troutlodge Triploid	Catchable (6+ inches)	18,000	6,300	2.85
	Troutlodge Triploid	Fry (0-3 inches)	477,189	996	494.92
2004	Troutlodge Triploid	Fingerling (3-6 inches)	200,709	4,350	46.14
	Troutlodge Triploid	Catchable (6+ inches)	17,440	16,000	1.09
2005	Hayspur Triploid	Catchable (6+ inches)	13,426	4,900	2.74
	Troutlodge Triploid	Catchable (6+ inches)	25,649	13,255	1.71
2006	Hayspur Triploid	Fingerling (3-6 inches)	495,860	22,500	29.33
	Hayspur Triploid	Catchable (6+ inches)	29,878	9,250	3.23
	Troutlodge Triploid	Catchable (6+ inches)	22,500	11,600	2.00
2007	Troutlodge Triploid	Catchable (6+ inches)	111,615	45,850	2.29
2008	Troutlodge Triploid	Catchable (6+ inches)	144,310	54,600	2.61
2009	Troutlodge Triploid	Catchable (6+ inches)	134,265	54,950	2.43
2010	Troutlodge Triploid	Catchable (6+ inches)	128,676	58,485	2.22
2011	Troutlodge Triploid	Catchable (6+ inches)	107,928	47,800	2.32
2012	Troutlodge Triploid	Catchable (6+ inches)	35,871	20,012	1.79
2013	Troutlodge Triploid	Catchable (6+ inches)	44,379	27,780	1.83
2014	Troutlodge Triploid	Catchable (6+ inches)	40,200	24,929	2.02
2015	Troutlodge Triploid	Catchable (6+ inches)	40,423	23,510	1.70
2016	Hayspur Triploid	Catchable (6+ inches)	48,041	21,000	2.19
	Troutlodge Triploid	Catchable (6+ inches)	42,250	26,242	1.61
2017	Hayspur Triploid	Fry (0-3 inches)	18,371	197	93.47
	Troutlodge Triploid	Catchable (6+ inches)	40,046	24,250	1.65
2018	Hayspur Triploid	Fry (0-3 inches)	150,150	1,050	143.00
	Hayspur Triploid	Catchable (6+ inches)	33,161	15,785	2.20
	Troutlodge Triploid	Catchable (6+ inches)	5,187	2,470	2.10
	Hayspur Triploid	Catchable (12-14 inches)	5,698	3,700	1.54
	Troutlodge Triploid	Catchable (12-14 inches)	42,365	29,251	1.53

Table 2. Summary of gillnet catch data from Blackfoot Reservoir, Idaho from 1963 to 2018.

Year	Gillnet effort	RBT	YCT	RXC	UTC	UTS	CRP	YEP	SMB	Total catch	% Trout	% Non-trout
1963	1	-	-	-	-	-	-	-	-	-	31	69
1964	-	-	-	-	-	-	-	-	-	-	25	75
1967	2	-	-	-	-	-	-	-	-	348	4	96
1968	-	15	4	-	122	129	-	-	-	270	7	93
1971	10	9	16	-	456	283	18	-	-	782	3	97
1980	6	16	19	-	556	272	2	-	-	865	4	96
1991	-	1	7	-	216	49	-	-	-	273	3	97
1997	-	6	6	-	351	22	4	-	-	389	3	97
1999	3	22	1	-	1,291	200	7	7	-	1,528	2	98
2001	6	17	5	-	748	101	15	51	-	937	2	98
2003	3	26	1	-	304	123	-	-	-	454	6	94
2004	4	3	3	-	528	113	1	2	-	650	1	99
2005	4	10	2	-	311	148	2	3	-	476	3	97
2009	4	82	3	-	590	235	47	16	-	973	9	91
2011	4	60	4	-	179	165	6	10	-	424	15	85
2012	4	33	0	-	80	97	15	0	-	225	15	85
2015	4	63	0	-	121	56	3	0	1	244	26	74
2018	8	22	13	1	843	403	70	1	25	1,378	3	97

YCT = Yellowstone Cutthroat Trout, RBT = Rainbow Trout, RXC = Rainbow Trout and Yellowstone Cutthroat Trout hybrid, UTC = Utah Chub *Gila atraria*, UTS = Utah Sucker *Catostomus ardens*, YEP = Yellow Perch *Perca flavescens*, CRP = Common Carp *Cyprinus carpio*

Table 3. Catch per unit effort (CPUE) for gillnet surveys in Blackfoot Reservoir, Idaho by species. One unit of gillnet effort is equal to one sinking and one floating gillnet set for one night. Several survey years have been omitted where gillnet effort or species specific catch was not recorded.

Year	Gillnet effort	RBT	YCT	RXC	UTC	UTS	CRP	YEP	SMB
1971	10	0.9	1.6	-	45.6	28.3	1.8	-	-
1980	6	2.7	3.2	-	92.7	45.3	0.3	-	-
1999	3	7.3	0.3	-	430.3	66.6	2.3	2.3	-
2001	6	2.8	0.8	-	124.7	16.8	2.5	8.5	-
2003	3	8.7	0.3	-	101.3	41.0	-	-	-
2004	4	0.8	0.8	-	132.0	28.3	0.3	0.5	-
2005	4	2.5	0.5	-	77.8	37.0	0.5	0.3	-
2009	4	20.5	0.8	-	147.5	58.8	11.8	4.0	-
2011	4	15.0	1.0	-	44.8	41.3	1.5	2.5	-
2012	4	8.3	0	-	20.0	24.3	3.8	0	-
2015	4	15.8	0	-	30.3	14.0	0.8	0	0.3
2018	8	2.8	1.6	0.1	105.4	50.4	8.8	0.1	3.1

YCT = Yellowstone Cutthroat Trout, RBT = Rainbow Trout, RXC = Rainbow Trout and Yellowstone Cutthroat Trout hybrid, UTC = Utah Chub *Gila atraria*, UTS = Utah Sucker *Catostomus ardens*, YEP = Yellow Perch *Perca flavescens*, CRP = Common Carp *Cyprinus carpio,* SMB= Smallmouth Bass *Micropterus dolomieu*

Table 4. Effort and catch by species for electrofishing surveys on Blackfoot Reservoir, Idaho in 2018. One hour of on-time shocking equals one unit of effort.

Year	Shocking Effort	RBT	YCT	UTC	UTS	CRP	SMB
2015	3	12	1	40	38	18	5
2018	1.75	0	1	2	20	28	50

YCT = Yellowstone Cutthroat Trout, RBT = Rainbow Trout, UTC = Utah Chub *Gila atraria*, UTS = Utah Sucker *Catostomus ardens*, YEP = Yellow Perch *Perca flavescens*, CRP = Common Carp *Cyprinus carpio,* SMB= Smallmouth Bass *Micropterus dolomieu*

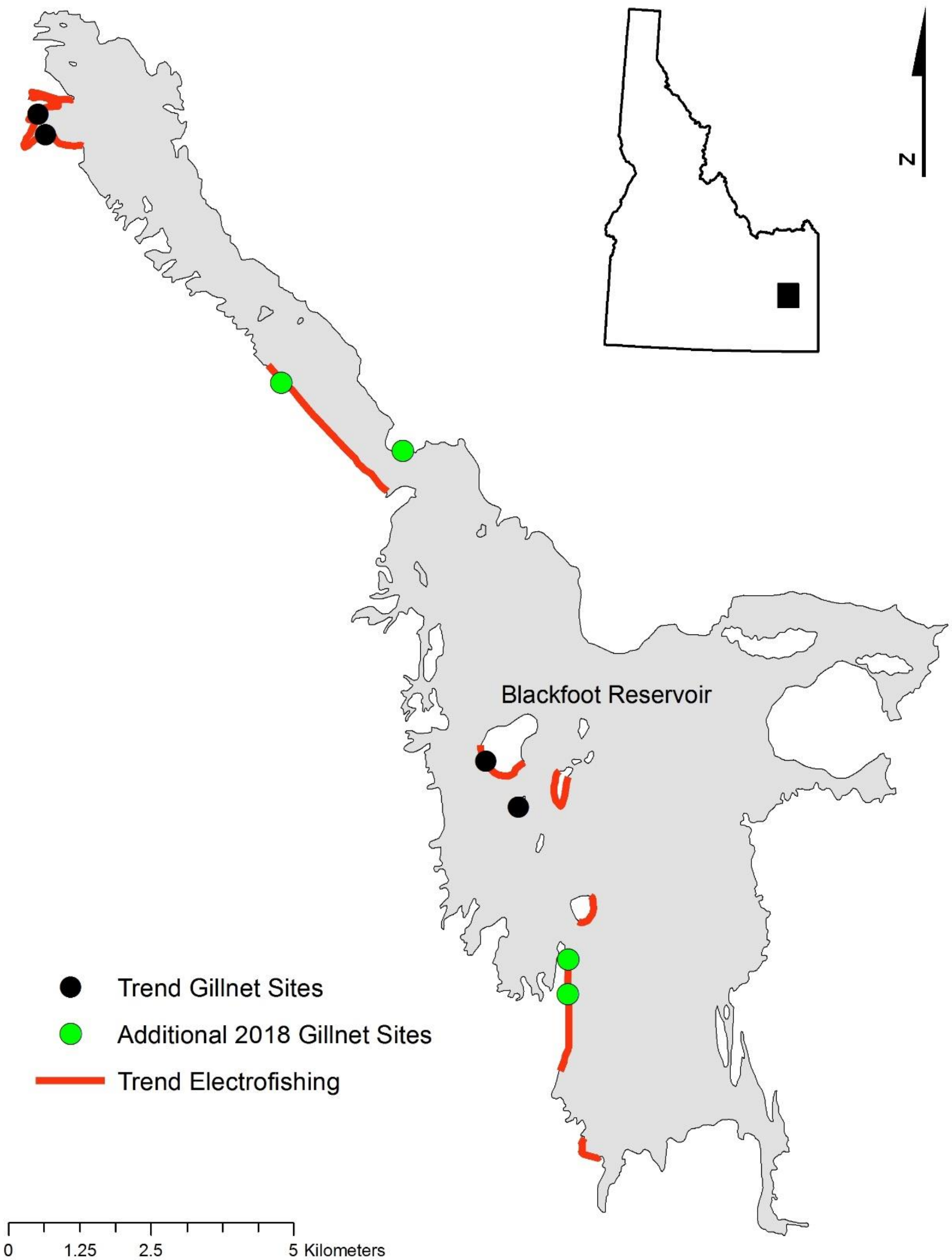

Figure 1. Locations of gillnet sets (●) and electrofishing transects (▬) at Blackfoot Reservoir, Idaho during the summer of 2018.

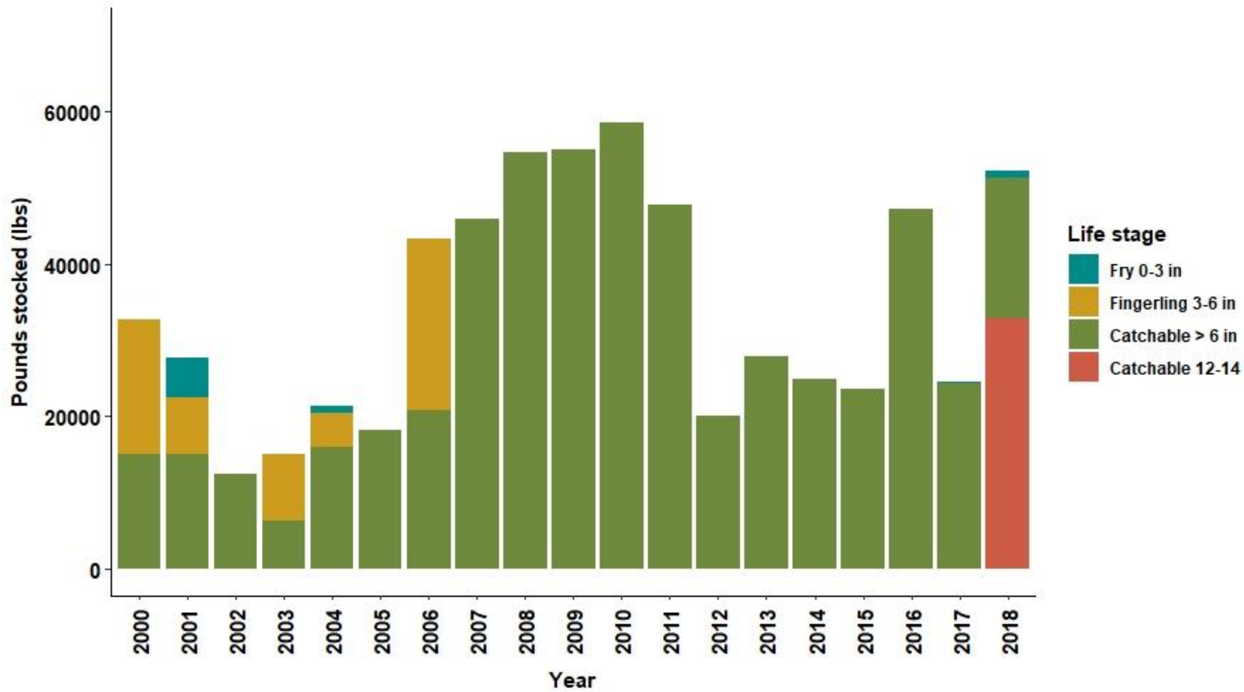

Figure 2. Pounds of Rainbow Trout stocked at various life stages in Blackfoot Reservoir, Idaho from 2000 to 2018.

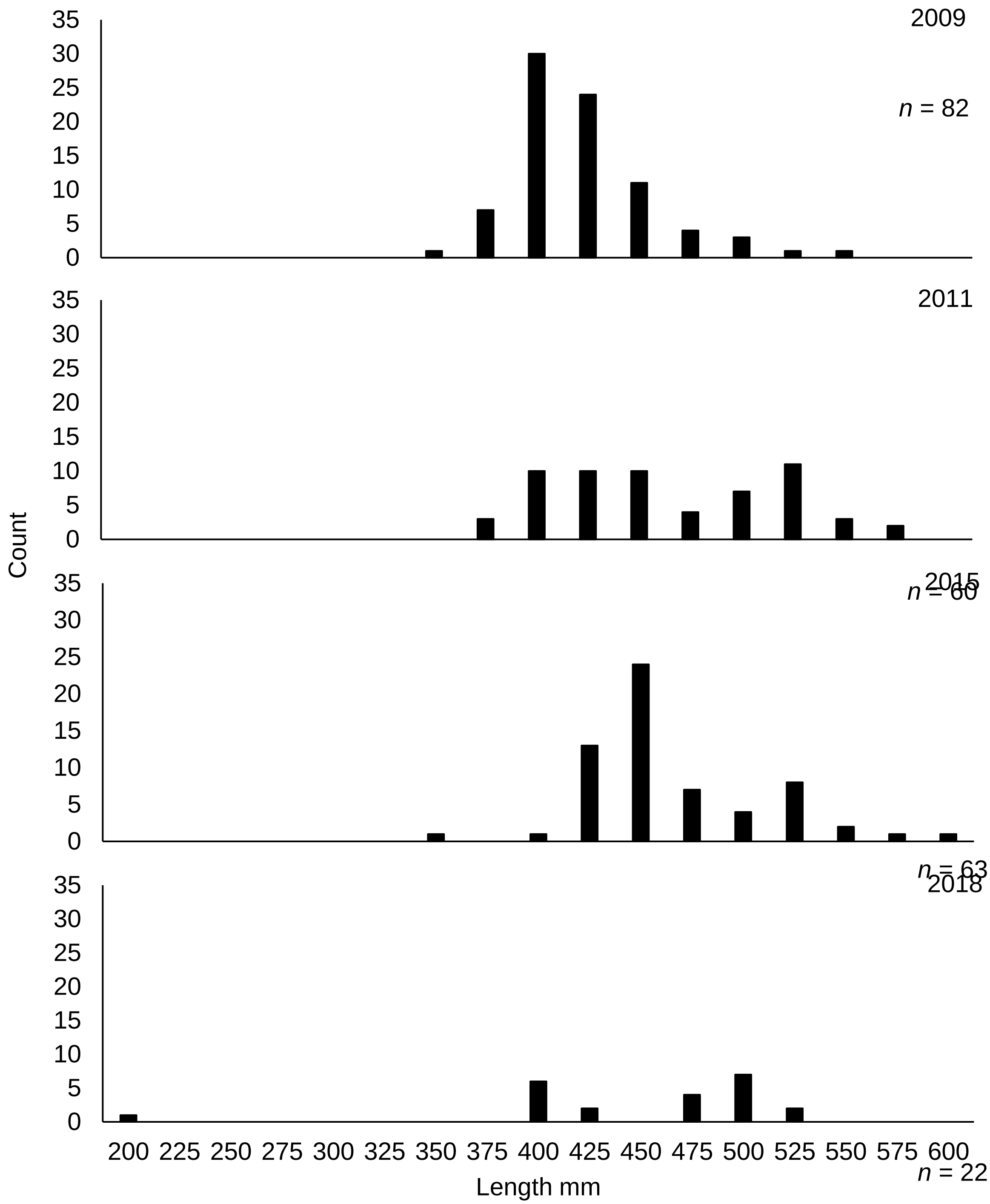

Figure 3. Length frequency distributions of Rainbow Trout collected using gillnets from Blackfoot Reservoir, Idaho during the summers of 2009, 2011, 2015, and 2018.

ANGLER OPINION SURVEYS ON BLACKFOOT RESERVOIR AND THE BLACKFOOT REACH OF THE SNAKE RIVER

ABSTRACT

In 2018, we conducted an angler opinion survey at major access areas on Blackfoot Reservoir and Snake River. In recent years, anglers expressed concern that the general six trout bag limit may be contributing to overexploitation or reduced angler satisfaction at both fisheries. Therefore, surveys were completed at each site on a bi-weekly interval to understand angler preference toward the existing general bag limit and a potential reduction in the bag limit to two trout per day. The questions that were asked were: 1) “Do you support or oppose a fishing regulation change that would reduce the current daily bag limit of six trout to two?” and 2) “Are you a resident of Idaho?”. Results of this study indicate the anglers preferred the general six fish daily bag limit at both fisheries. Both survey sites had higher satisfaction rates with the current regulations. On Blackfoot Reservoir, 87% of anglers surveyed preferred to keep the regulations the same and on the Snake River, 73% were satisfied.

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INTRODUCTION

Prior to 2018, anglers had expressed concern that the daily trout bag limits on Blackfoot Reservoir and the Snake River (Blackfoot reach; between American Falls Reservoir and Gem State Dam) were too high and that the current regulations contributed to overexploitation or reduced angler satisfaction. During this period, these fisheries were managed under general angling regulations using a six trout daily bag limit. Some anglers expressed interest in managing those fisheries using a two trout daily bag limit. At Blackfoot Reservoir, stocking rates had been decreased in 2012 due to statewide production changes and, as a result, angler catch rates decreased. Anglers expressed concern that a six fish limit could result in overexploitation which would decrease harvest and catch rates. Although in a system such as Blackfoot Reservoir stocking rates can be increased to limit the potential for overexploitation. In response to these concerns, we conducted an angler opinion survey at both locations during the spring and summer of 2018. The objective of these surveys was to evaluate angler opinions relative to existing management and potential regulation changes.

METHODS

Interview locations focused on popular fishing access sites known to receive high use. Surveys dates were opportunistic and sampling effort was allocated across the spring and summer fishing season. Surveys were completed on weekdays, weekends and holidays to reduce bias and capture angler perspectives across the various demographics and angler types representing each fishery. Surveys were conducted during daytime hours for approximately 2 hours at each site per survey day. Surveys were completed between April and August.

Survey locations on Blackfoot Reservoir were Dike Road (BLM), Hopkins Landing, and Pebble Beach boat ramps. Surveys at Blackfoot Reservoir were completed from April 27 to August 21, 2018. The survey locations on the Blackfoot Reach of the Snake River were conducted at Tilden Bridge. Surveys on the Snake River occurred from April 28 to August 28, 2018.

The angler satisfaction survey consisted of two questions that were intended to capture angler preference toward the existing angling regulations and the publicly proposed bag limit alternative, as well as the anglers' state of residency. The survey questions were as follows: 1) "Do you support or oppose a fishing regulation change that would reduce the current daily bag limit of six trout to two?" and 2) "Are you a resident of Idaho?" Anglers were also asked to report catch and effort data to describe catch and harvest rates in the fishery. Those data were used to better understand how an angler's harvest rate related to their response to the daily bag limit question as we were interested in evaluating associations between angler propensity toward harvest and opinions with existing regulations. Only completed trip surveys were retained for the analysis of the relationship between opinion and disposition of catch.

RESULTS

Blackfoot Reservoir

Blackfoot Reservoir angler opinion surveys were completed on 27 days (19 weekdays and 8 weekend days). A total of 208 anglers was contacted, and 174 of those responded to the survey. Of the respondents, 87% were satisfied with the current daily bag limit, while 13% were unsatisfied (Figure 4). Respondents harvested and released trout at equal rates 0.4 trout/angler (± 0.1 SE;

Figure 5). Anglers that expressed satisfaction with the existing daily bag limit released trout at a slightly higher rate (0.5 ± 0.1 SE trout/angler) than anglers responding unfavorably toward existing rules (0.3 ± 0.1 SE trout/angler; Figure 6). Residents comprised 84% of the respondents and 16% were non-residents. The satisfaction rate of residents and non-residents was 90% and 85%, respectively.

Blackfoot Reach of the Snake River

Snake River angler opinion surveys were completed on 14 days (3 weekdays, 10 weekend days, and 1 holiday). A total of 226 anglers were contacted, and 214 of those responded to the survey. Of respondents, 73% expressed satisfaction and 27% expressed dissatisfaction with the existing daily bag limit on the Snake River (Figure 7). Respondents released 2.6 trout/angler (± 0.4 SE) at a rate almost four times higher than the estimated rate of harvest (0.7 trout/angler [± 0.1 SE]; Figure 8). Anglers that expressed dissatisfaction with the existing regulations released trout at a higher rate (4.0 trout/angler [± 0.5 SE]) than those that were satisfied (1.9 trout/angler [± 0.3 SE]; Figure 9). Residents comprised 95% of the respondents and 5% were non-residents. The satisfaction rate for residents and non-residents was 73% and 55%¸ respectively.

DISCUSSION

The difference in opinions based upon release rates between these two waterbodies could be due to angler demographics. For instance, Blackfoot Reservoir anglers are more harvest oriented compared to Snake River anglers. Therefore, it is reasonable to believe that Snake River anglers, who release trout at a higher rate, would be dissatisfied with current regulations. From a social perspective, anglers that have a higher propensity to release fish often do not favor harvest whatsoever.

Fisheries management agencies typically strive for simple regulations that meet management intent or direction (Anderson and Nehring 1984). Fishery management strategies implemented by IDFG fall in line with this philosophy. The 2019–2024 Idaho Fisheries Management Plan (IDFG 2019) indicates that both Blackfoot Reservoir and the Blackfoot Reach of the Snake River are managed as “General” fishery types for all coldwater species except for Cutthroat Trout *Oncorhynchus spp*. The “General” fishery type is defined as a fishery that is harvest oriented and where coldwater fishing is primarily managed through stocking. In the Blackfoot Reach of the Snake River, Cutthroat Trout are managed as a “Quality” fishery type, meaning that there are regulations that limit the size or number of fish that may be harvested to increase the catch rates of larger fish. In contrast, Cutthroat Trout regulations in the Blackfoot Reservoir center on a “Conservation” fishery type. This fishery type allows for angling opportunity but limits any harvest. Based upon the results of the angler opinion survey and current regulations, both these waterbodies are currently managed in accordance with the IDFG’s overarching plan and these directions are currently providing adequate public satisfaction.

MANAGEMENT RECOMMENDATIONS

1. Maintain existing daily trout bag limit on Blackfoot Reservoir and the Blackfoot Reach of the Snake River.

2. Evaluate population dynamics and angler exploitation of trout populations in the Snake River between American Falls Reservoir and Gem State Dam.

3. Conduct full census creel survey on Snake River to evaluate angler effort and species-specific catch rates.

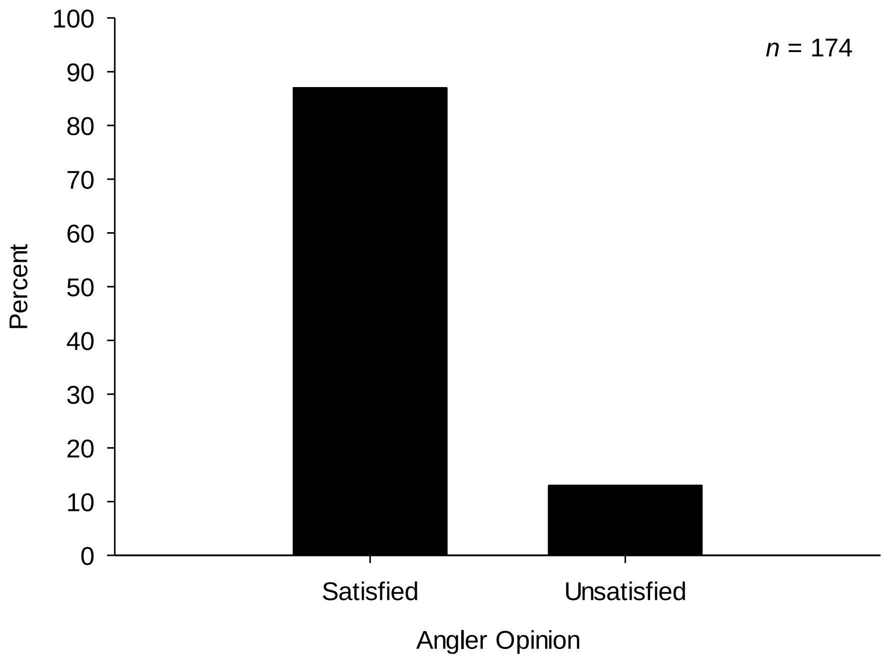

Figure 4. Proportion of anglers that were satisfied and unsatisfied with the daily trout bag limit on Blackfoot Reservoir, Idaho based on 2018 survey results.

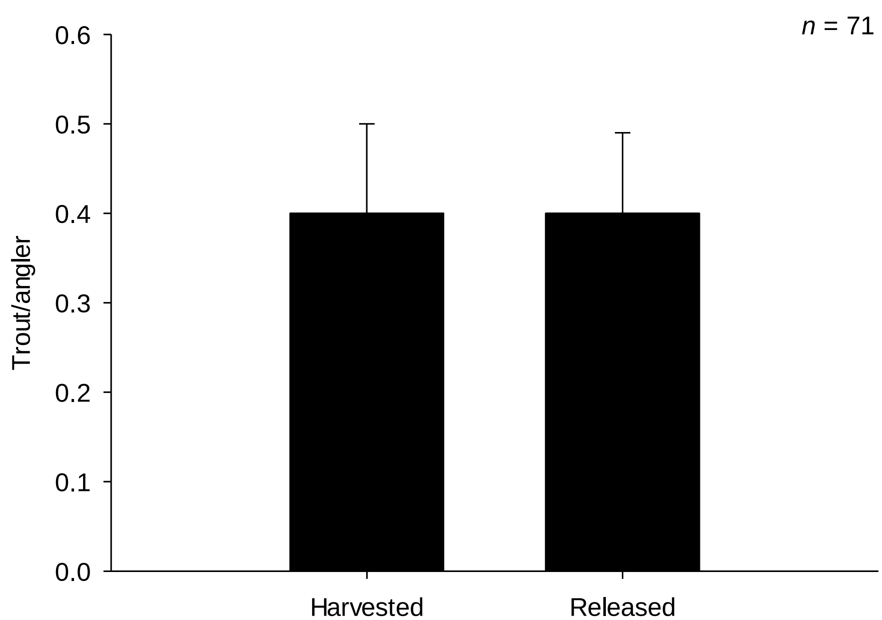

Figure 5. Comparison between trout harvest and release rates *n* = 71 ers surveyed at Blackfoot Reservoir, Idaho in 2018. Error bars represent one standard error around the mean.

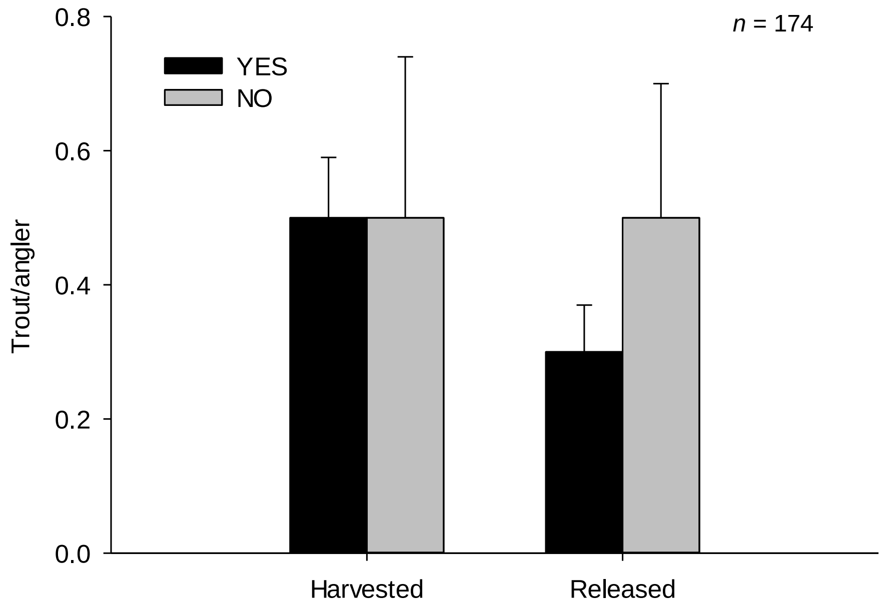

Figure 6. Comparison of trout harvest and release rates between respondents satisfied (YES) and unsatisfied (NO) with the existing daily bag limit on Blackfoot Reservoir, Idaho in 2018. Error bars represent one standard error around the mean.

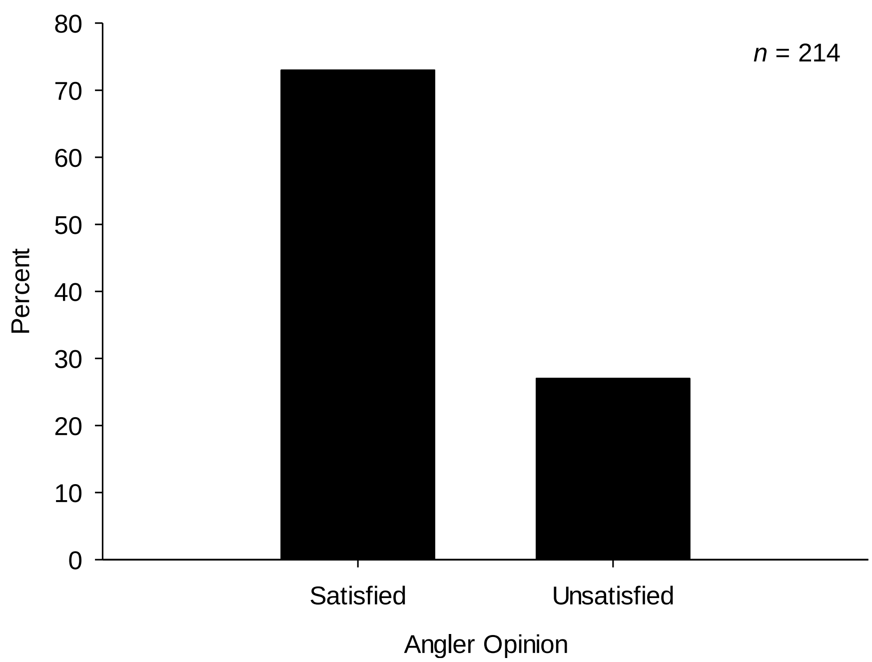

Figure 7. Percent of anglers that were satisfied and unsatisfied with the daily bag limit on the Blackfoot Reach of the Snake River, Idaho in 2018.

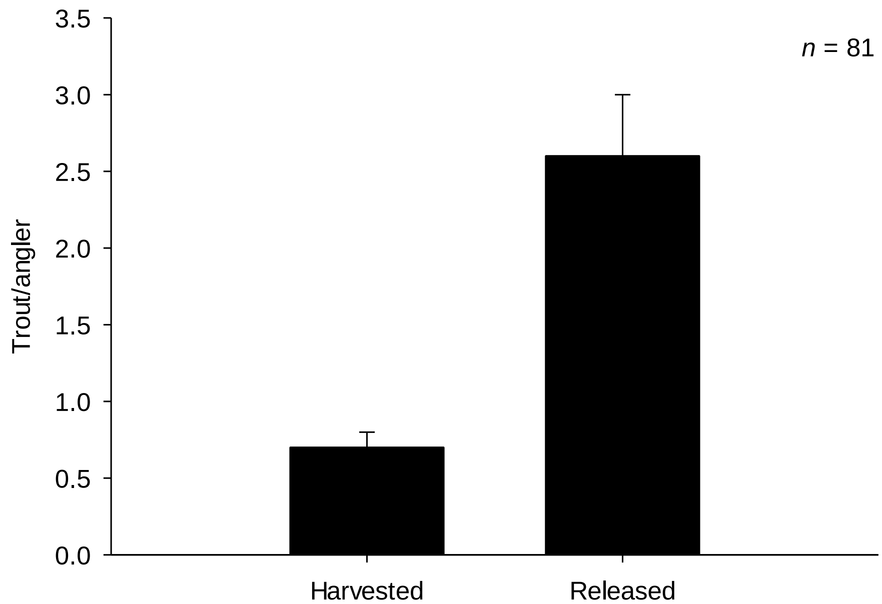

Figure 8. Comparison between rates of trout harvested and released by anglers surveyed from the Blackfoot Reach of the Snake River, Idaho in 2018. Error bars represent one standard error about the mean.

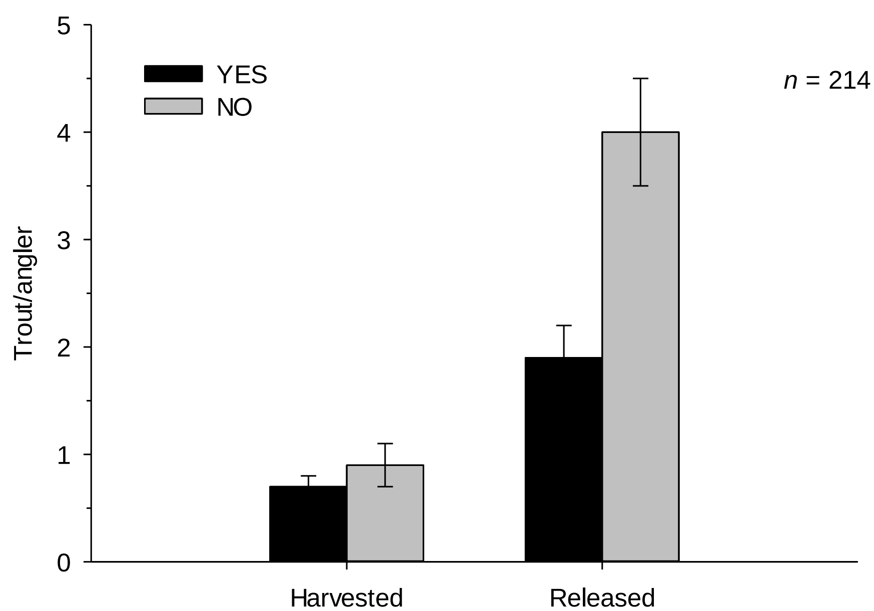

Figure 9. Comparison of trout harvest and release rates between respondents satisfied (Yes) and unsatisfied (No) with the existing daily bag limit on the Blackfoot Reach of the Snake River, Idaho in 2018. Error bars represent one standard error about the mean.

RIVER AND STREAM INVESTIGATIONS

YELLOWSTONE CUTTHROAT TROUT MONITORING IN THE BLACKFOOT RIVER SYSTEM

ABSTRACT

We surveyed the Blackfoot River via an electric weir and drift boat electrofishing in 2018. Escapement of Yellowstone Cutthroat Trout *Oncorhynchus clarkii bouvieri* at the electric weir was 527 adults in 2018, well below the highest observed on the Blackfoot River (N = 4,747) and the Yellowstone Cutthroat Trout Management Plan objective of 10,000 adults. Furthermore, the population of Yellowstone Cutthroat Trout on the Blackfoot River Wildlife Management Area continues to be below historical levels due to two primary factors: habitat degradation from land use practices and continued predation by American White Pelicans *Pelecanus erythrorhynchos*.

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INTRODUCTION

There are two long-term monitoring programs in place for Yellowstone Cutthroat Trout *Oncorhynchus clarkii bouvieri* in the upper Blackfoot River: adfluvial escapement estimates and river density estimates. Both of these programs provide valuable information that are used to monitor fishery recovery and to inform effectiveness of ongoing management actions including pelican predation management and river habitat enhancement in the system.

Adfluvial escapement estimates are derived from fish captured at an electric weir and trap located in the lower river near its confluence with Blackfoot Reservoir. Adfluvial escapement estimates have been completed since 2001 when a floating electric weir was installed. In 2003, a permanent electric weir and trap were installed, and this method is still in use.

In addition, staff estimate the density of YCT from fish captured within approximately 10 km of the Blackfoot River on the Blackfoot River Wildlife Management Area (BRWMA) located about 51 river km above the reservoir. This 700-ha property was acquired by the Idaho Department of Fish and Game (IDFG), with assistance from the Water and Land Conservation Fund, in 1994. The BRWMA has an upper boundary at the confluence of Lanes, Diamond, and Spring creeks which form the Blackfoot River and a lower boundary at the head of the canyon commonly known as the Upper Narrows. The river density surveys are completed annually to document population trends in response to instream habitat enhancements and American White Pelicans *Pelecanus erythrorhynchos* predation control measures.

METHODS

Adfluvial Escapement Estimate

An electric weir and trap were operated in the Blackfoot River from 2 May to 7 June, 2018 to collect adult Yellowstone Cutthroat Trout migrating from Blackfoot Reservoir to spawning areas in the upper basin. The barrier includes a trap box designed using Smith Root Inc. specifications. The barrier components include four electrodes mounted flush to the stream bed that are embedded in Insulcrete, four BP-POW pulsators, and a computer control and monitoring system. The computer system can be operated remotely, records electrode outputs, and has an alarm system that triggers during power outages. Detailed descriptions of these components and their function can be obtained at www.smith-root.com. Electric weir and trap efficiency is assumed to be 100% when mean May discharge of the Blackfoot River does not exceed 800 cfs. No escapement estimates are available for 2011 or 2017 due to high water and poor trap efficiencies.

Prior to observing fish at the trap, field crews checked the live box several times a week. Once fish began entering the trap, it was checked at least once a day. Fish species, total length (mm), and weight (g) were recorded. All Yellowstone Cutthroat Trout handled at the trap greater than 120 mm were injected with a 23 mm half duplex Passive Integrated Transponder (PIT) tag purchased from Oregon RFID (oregonrfid.com) and allowed to pass upstream of the weir and continue their spawning migration. These fish were also visually checked for bird scars. Non-target species were counted and allowed to pass upstream of the weir.

River Abundance Estimates

We estimated Yellowstone Cutthroat Trout abundance within 10.2 river km of the BRWMA reach of the Blackfoot River using mark-recapture methods. The first pass was completed on June 21 and 22, 2018 and the second pass on June 25 and 26, 2018. The total distance sampled was divided into three sections, the Diamond Creek Road Bridge to the Angus Creek confluence, Angus Creek confluence to the BRWMA cabin and the BRWMA cabin to the USFS boundary at the Upper Narrows. Fish were sampled with drift boat-mounted electrofishing gear employing standard pulsed-DC waveforms generated with a Honda 5,000-watt generator and a Midwest Lake Electrofishing Systems (MLES) Infinity Box. All Yellowstone Cutthroat Trout captured were scanned for a PIT tag. If a PIT tag was found, the identification number was recorded. Those Yellowstone Cutthroat Trout without a PIT tag were injected (marked) with a 23 mm half duplex Passive Integrated Transponder (PIT) tag purchased from Oregon RFID (oregonrfid.com. All Yellowstone Cutthroat Trout were given a caudal fin mark unique to the river section they were captured in. Captured fish were also measured for total length (mm), weighed to the nearest gram (g) before being released. Population estimates were previously generated using FA+ software but beginning in 2018, estimates were calculated in the program R using the FSA package. A Peterson estimate with the Chapman modification was used. Density estimates were derived by dividing the section abundance estimate by the section length. Abundance and density estimates were also calculated for the total river distance sampled.

RESULTS

Adfluvial Escapement Estimate

In 2018, 529 unique adult Yellowstone Cutthroat Trout were collected at the trap (Table 5). Of the fish that could be sexed, 431 were females and 84 were males. Captured females and males had a mean length of 483 and 496 mm, respectively. The bird scarring rate observed was one percent.

River Abundance Estimates

A total of 513 Yellowstone Cutthroat Trout were sampled on the BRWMA during the mark-recapture electrofishing survey (Table 6). The mean length of Yellowstone Cutthroat Trout was 311 mm, and lengths ranged from 162 to 558 mm. Numerous age classes of Yellowstone Cutthroat Trout were encountered during the survey with juvenile young of the year fish being the most frequently encountered age class followed by successive age classes (Figure 10). The total population estimate for the three BRWMA sections combined was 2,910 (SE = 553.3) individuals across the 10.2 km sampled. Based on this estimate, there were about 285 YCT/km occupying the BFRWMA during time the survey was completed. Individual section estimates ranged from 846 in the Angus Creek to BRWMA cabin section to a high of 1,709 in the BRWMA cabin to USFS line section (Table 7).

DISCUSSION

The Blackfoot River watershed has historically supported high angling effort as a popular fishery for large Yellowstone Cutthroat Trout. As a result, rigorous investigations within the Blackfoot River watershed have been completed periodically since the 1960s (Thurow 1981). Ongoing monitoring of pelican predation, spawner abundance, and juvenile population estimates have been integral to understanding the long-term trends of this watershed's fisheries as well as the effects of pelican hazing and habitat restoration efforts.

The adult Yellowstone Cutthroat Trout escapement at the Blackfoot River electric weir was higher in 2018 than both the 2016 and 2015 values observed, but still far below the management goal of 10,000 spawners. We continue to observe a high proportion of females to males which is common for such a depressed population (Bowen et al. 1991). Mean total length of females and males was slightly less in 2018 than values observed in 2016 and 2017 when mean total length was over 500 mm for each sex (Brimmer et al. 2018; Brimmer et al. 2017). Monitoring spawner escapement continues to be a useful means of documenting population trends and the effects of pelican hazing efforts.

Juvenile abundance in the Blackfoot River within the BRWMA also continues to be below historical abundance but similar to values observed in recent years. The 2018 total population estimates of Yellowstone Cutthroat Trout on the BRWMA was less than the estimate in 2017 but more similar to the estimate from 2016. The Yellowstone Cutthroat Trout per kilometer calculation for 2018 was the lowest observed since 2015. The majority of fish encountered on the BRWMA continue to be 1 to 2 years old, less than 300 mm and at a similar distribution to electrofishing samples collected during the late 1970s and early 1980s (Thurow 1981). Juvenile abundance monitoring via mark-recapture surveys continues to be a valuable tool in assessing the effects of pelican predation management and instream habitat restoration efforts.

Table 5. Yellowstone Cutthroat Trout (YCT) escapement estimates for the Blackfoot River, Idaho 2001-2018. Escapement estimates are not available for 2011 or 2017 due to extremely high river discharge during the spawning run which resulted in poor trapping efficiency.

Year	Weir type	YCT total count	Mean length (mm)	Mean May discharge (cfs)	Adult pelican count
2001	Floating	4,747	486	-	-
2002	Floating	902	494	132	1,352
2003	Electric	427*	495	1,674	-
2004	Electric	125	478	127	1,748
2005	Electric	16	-	388	2,800
2006	Electric	19	-	453	2,548
2007	Electric	98	445	115	3,416
2008	Electric	548	485	409	2,390
2009	Electric	865	484	568	3,174
2010	Electric	938	468	248	1,734
2011	Electric	-	-	936	724
2012	Electric	530	483	200	3,034
2013	Electric	1,843	486	176	1,996
2014	Electric	807	487	302	2,096
2015	Electric	190	496	278	1,466
2016	Electric	204	496	316	974
2017	Electric	-	-	870	1,232
2018	Electric	529	482	380	1,416

*The 2003 estimate is likely not reliable due to high river discharge.

Table 6. Yellowstone Cutthroat Trout catch rates, population and density estimates for the Blackfoot River Wildlife Management Area reach of the Blackfoot River, Idaho.

Year	Distance sampled	Marking run catch	Recapture run catch	Recaptured fish	Population estimate (N)	SE	Density (YCT/km)
2005	10.2	266	202	20	3,664	569.1	359
2006	10.2	339	450	57	3,534	352.3	346
2008	10.2	223	186	28	2,504	336.5	245
2009	10.2	279	319	44	2,567	286.5	252
2010	5.6	317	272	11	12,944	4,131.2	2,311
2011	5.6	318	147	16	3,222	411.3	575
2012	5.6	137	99	12	1,672	421.7	299
2013	5.6	65	--	--	--	--	--
2014[a]	5.6	137	130	12	2,147	417.9	383
2015	5.6	149	119	14	3,659	593.9	653
2016	5.6	210	309	23	2,717	386.3	485
2017	10.2	191	167	3	7,343	1,530.2	720
2018	10.2	209	304	21	2,910	553.3	285

[a] Excludes adfluvial fish > 400 mm

Table 7. Yellowstone Cutthroat Trout catch rates and population estimates for the three sections of the Blackfoot River, Idaho sampled on the Blackfoot River WMA in 2018.

Section description	Marking run	Recapture run	Recaptured fish	Population estimate (N)	SE
Bridge to Angus Creek	132	169	19	1,130	213.6
Angus Creek to WMA cabin	21	76	1	846	460.2
WMA cabin to USFS line	56	59	1	1,709	953.5

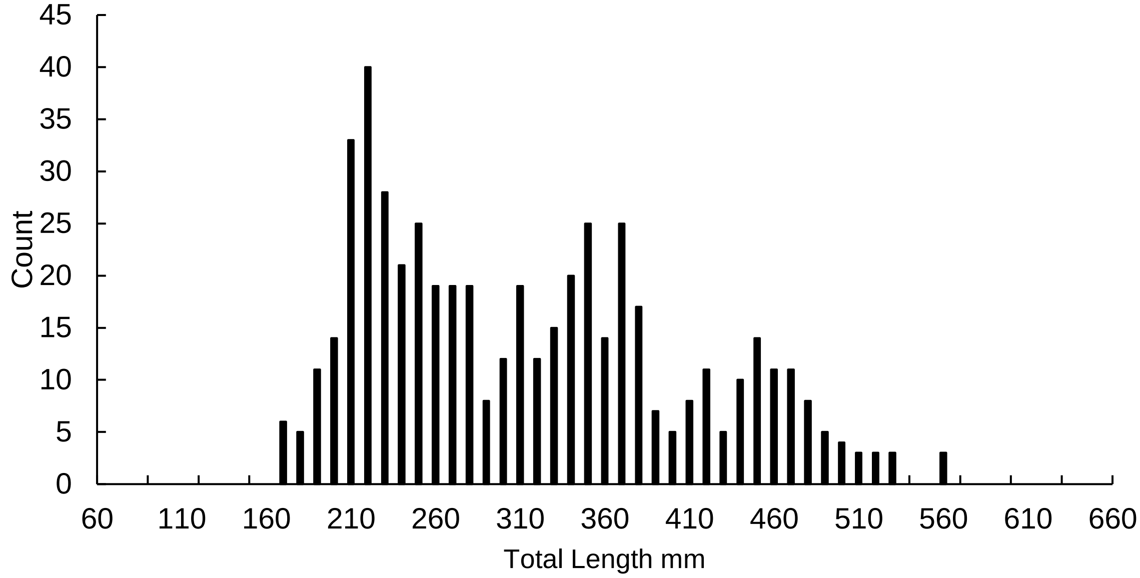

Figure 10. Length-frequency distribution of Yellowstone Cutthroat Trout sampled from the Blackfoot River Wildlife Management Area reach of the Blackfoot River, Idaho in 2018. The majority of fish greater than 400 mm TL are post-spawn adfluvial fish that will return to Blackfoot Reservoir.

BONNEVILLE CUTTHROAT TROUT MONITORING PROGRAM

ABSTRACT

One of the objectives of the 2007 BCT management plan was to maintain current distribution and restore distribution in previously occupied areas. In order to accomplish this, a subset of streams were chosen to complete population surveys for purposes of monitoring population status or to identify sections for reintroductions. Due to the number of streams that were selected, surveys are completed on each stream every other year. For example, on odd years streams that are in the Thatcher, Riverdale, and Malad Management units are sampled and on even years streams in the Pegram and Nounan Management units are sampled.

In 2018, we sampled Bonneville Cutthroat Trout *Oncorhynchus clarkii utah* (BCT) in nine index streams within the Nounan and Pegram management units. In the Pegram management unit, overall BCT densities increased and in the Nounan management unit densities were stable compared to the previous surveys in 2016.

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INTRODUCTION

Bonneville Cutthroat Trout *Oncorhynchus clarkii utah* (BCT) are one of three native Cutthroat Trout sub-species in Idaho. The distribution of BCT is limited to the Bear and Malad River Drainages in Southeastern Idaho. In the early 1980s, distribution and abundance data for the species were deficient. To better understand BCT population trends and the potential influence of natural and anthropogenic factors, a long-term monitoring program was initiated for three tributary streams of the Thomas Fork Bear River (Preuss, Giraffe, and Dry creeks). These streams were initially sampled every other year. In 2006, as part of the BCT management plan (Teuscher and Capurso 2007), additional streams were added to the BCT monitoring program to describe broader BCT population trends across the species' distribution in Idaho.

The Bear River drainage in Idaho, was separated into BCT management units (MU) based upon spatial separation and genetic results that suggested that these management units had some variation in genetic composition. Spatially these management units were separated by major dams on the Bear River. The Pegram MU starts at the Idaho/Wyoming border and continues downstream to Bear Lake. The Nounan MU begins at the Bear Lake outlet and continues downstream to Alexander Reservoir. From Alexander Reservoir downstream to Oneida Reservoir is the Thatcher MU. Between Oneida Reservoir and the Idaho/Utah border is the Riverdale MU. Finally, The Malad MU consists of all streams located in the Malad River drainage of the Bear River. Originally, index streams included Eightmile, Bailey, Georgetown, Beaver, Whiskey, Montpelier, Maple, Cottonwood, Snow slide, First, Second, and Third creeks, and the Cub River. In 2010, IDFG determined that the monitoring program would benefit from reducing some index sites and streams initiated in 2006, while adding other streams throughout the five BCT management units in the Bear River drainage (Figure 11). The intent of this change was to improve the spatial extent of the index monitoring while economizing effort. Currently, the monitoring program consists of three streams and eight sites in the Pegram Management Unit (PMU), six streams and 14 sites in the Nounan Management Unit (NMU), four streams and nine sites in the Thatcher Management Unit (TMU), four streams and eight sites in the Riverdale Management Unit (RMU), and three streams and six sites in the Malad Management Unit (MMU; Table 8). Each stream is sampled on a biannual basis. In addition, the monitoring program includes two segments of the mainstem Bear River in each of the management units except for the Malad MU. Main-stem Bear River segments in each management unit are sampled quadrennially.

There are a number of variables that may influence BCT population trends which include annual precipitation patterns, water temperature, nonnative species, water use, and land use. (Teuscher and Capurso 2007). Given the sensitive status of BCT and petitions to list the species under the Endangered Species Act, it is important to identify and correlate variation in BCT densities that appear to be associated with these and other variables. Therefore in 2011, we collected a suite of habitat variables to begin monitoring potential changes in habitat and stream channel condition. The descriptions of these habitat variables and collection methods are listed in Table 9. In the future, habitat data will be correlated to variation in BCT abundance. An evaluation of the influence of habitat on BCT distribution and abundance will require the collection of several years of data; therefore, no statistical analysis will be reported until sufficient data is collected.

METHODS

Starting on July 17th and continuing through August 2nd, 2018, we sampled index streams in the Pegram and Nounan Management Units. These fixed index sites within each stream were non-randomly selected based on access constraints. To estimate mean BCT densities, we sampled at least two sites on each stream using multiple pass backpack electrofishing. At each site, a segment of stream (approximately 100 m) was sampled, and block nets were placed at the downstream and upstream transect termini to meet the closed population assumption. The area sampled was calculated using transect length (m) and average width (m) based upon 10 transects. We calculated a population estimate using Microfish 3.0 software (Microfish Software, Durham, NC, USA). Bonneville Cutthroat Trout percent composition was calculated by dividing the number of BCT by the total number of all salmonids sampled. Mean densities and percent composition for an entire stream was calculated by averaging the mean values from each site within a stream. Relative weights (W_r) were calculated for individual fish using the standard weight equation developed for Cutthroat Trout (Kruse and Hubert 1997). Mean relative weight for each stream was calculated by averaging individual relative weights.

RESULTS

In 2018, nine streams were sampled which included 13 sites within the NMU and six sites in the PMU (Figure 11). Some sites were not sampled due to lack of landowner permission or water. Overall, mean BCT density was 6.6 fish/100 m^2 (SE = 2.5; range = 0 – 20.7). The highest BCT density was observed in Giraffe Creek (20.7 fish/100 m^2) and the lowest was in Bailey and Georgetown Creeks (0.0 fish/100 m^2). The percent composition of BCT was lowest in Bailey and Georgetown Creeks (0%) and the highest in Dry, Giraffe, Preuss and Stauffer creeks at 100% (Table 10, Table 11). Bonneville Cutthroat Trout densities in 2018 were higher in the Pegram Management Unit, except for Dry Creek, which population estimates were similar to 2016 estimates (Figure 12). In the Nounan Management Unit, BCT densities in 2018 were similar to the 2016 estimates (Figure 13).

In the PMU, BCT densities declined slightly in Dry Creek, but increased in Preuss and Giraffe creeks (Figure 12). During the 2017 water year, these drainages received above average annual precipitation. Therefore, we expected that 2018 BCT densities should increase, which they did. The mean relative weight (W_r) for BCT in streams sampled in the Pegram management unit was 81 (±3 SE). This is a slight increase from the mean W_r in 2016, which was 79 (±2 SE) but is still in the range of variability.

In the NMU, BCT density trends varied among streams when compared to our sampling efforts in 2016 (Figure 13). In Bailey and Georgetown creeks, we did not sample any BCT. BCT have not been sampled in Georgetown creek since surveys began. In Bailey creek, BCT were sampled in 2008 and 2012, but abundance was low. Sampling different sites in Bailey creek could identify BCT presence in other reaches of the system. In contrast, BCT have never been sampled in Georgetown Creek since index surveys began; however, a telemetry tagged adfluvial BCT was interrogated in Georgetown Creek during the spawning period during 2005. Still, a diversion on the lower portion of Georgetown Creek limits upstream movement of fluvial BCT, and populations are thought to be extirpated from the portion upstream. In Eightmile and Stauffer Creeks, we observed a slight increase in BCT densities. In Montpelier and Pearl Creeks, we observed a slight decrease in mean BCT densities that fell within in the range of variability when compared to 2016.

The mean W_r for BCT in streams sampled in the Nounan management unit was 84 (±2 SE). This is similar to the W_r estimated in 2016 (85 ±1 SE).

DISCUSSION

Monitoring of BCT index streams throughout the Bear and Malad River drainages has been useful for assessing BCT population increases and decreases throughout time. Although, in all the streams sampled in 2018, previous sampling shows that trends are stable. In addition to BCT density estimates, habitat characteristics have also been measured annually since 2011 to help explain variation in BCT densities. We plan to assess how these habitat characteristics affect BCT densities starting in 2020, once we have enough data.

Continuing to sample these BCT index streams will help to determine regulations and management strategies in the future. These efforts will also provide important information for the update of the BCT management plan.

MANAGEMENT RECOMMENDATIONS

1. Continue to implement Bonneville Cutthroat Trout Management Plan through periodic monitoring in the Bear River Drainage. Monitor mainstem and tributary index sites in each GMU biennially.

2. Begin analyzing the habitat characteristics and their relationship to BCT densities in 2020.

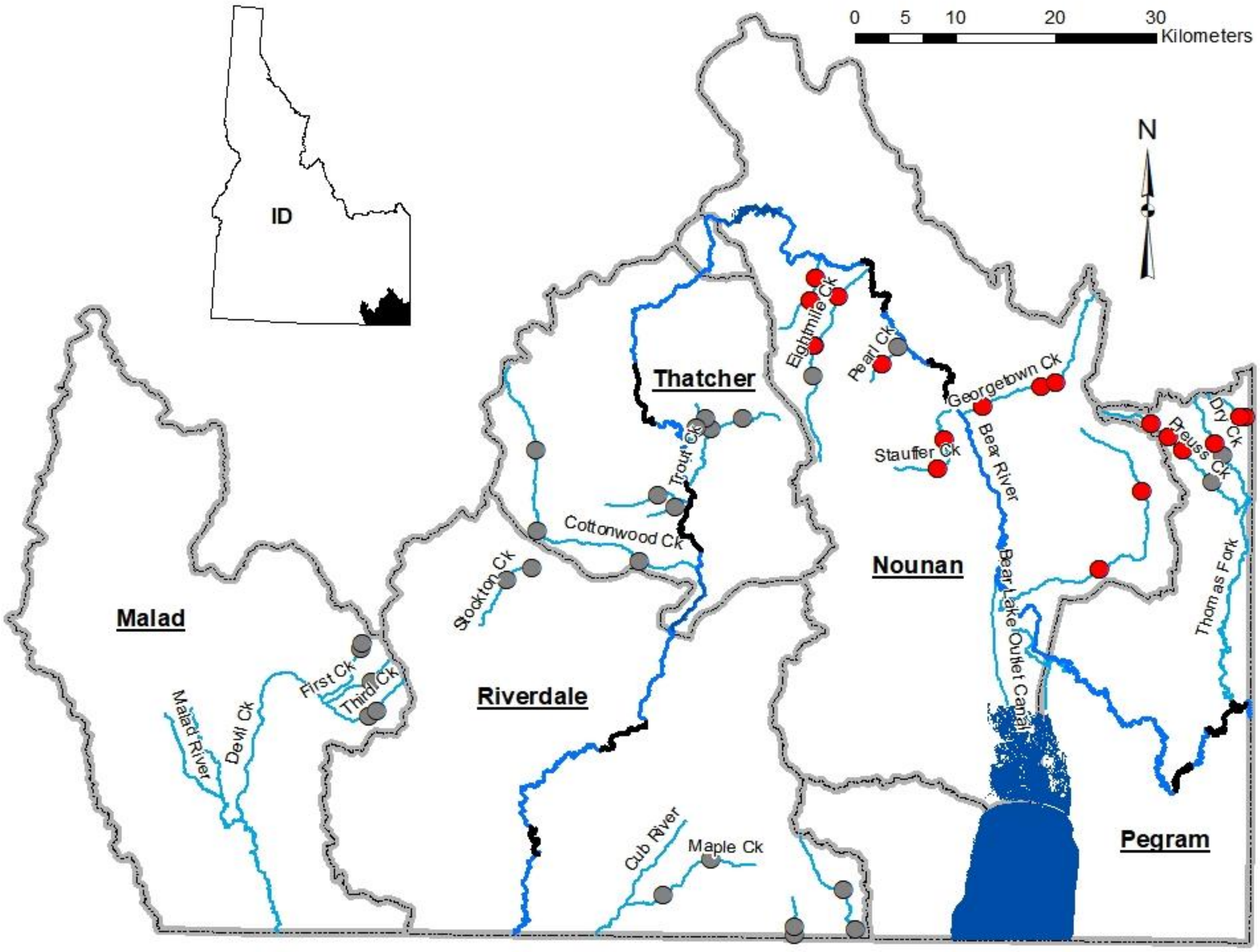

Figure 11. Map of the Bear River watershed, Idaho, including the five Bonneville Cutthroat Trout management units. The gray circles represent all monitoring sites and red circles represent sites that were sampled in 2018. The black line segments on the main-stem Bear River represent monitoring reaches.

Table 8. The 20 index monitoring streams and number of sites within the five BCT management units, including the sample distance (km), total stream length (km), and the percent of stream sampled.

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

Table 9. List of habitat variables, units of measurement and collection methods for habitat characteristics collected to examine variation in BCT abundance estimates.

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

Table 10. Descriptive values of Bonneville Cutthroat Trout population trends for the Pegram Management Unit.

Management Unit	Stream	Year	Sites	BCT / 100 m² Mean	BCT / 100 m² (+/-) 1 SE	% Comp	BCT Mean Rel. Wt. (W_r)
Pegram	Dry Ck.	1987	1	13.8	N/A	100	61
		1990		4.3		100	
		1993		0.0		100	
		1998	3	13.8	0.8	100	
		2000		24.9		100	
		2002		0.6		100	
		2004		0.0		100	
		2006	3	3.1		100	78
		2008	2	0.5	0.2	100	106
		2010	2	2.0	0.1	100	
		2012	2	14.9	0.1	100	82
		2014	1	3.6	N/A	100	91
		2016	2	2.4	1.2	100	83
		2018	1	2.1	N/A	100	79
	Giraffe Ck.	1981		2.2		100	
		1986	1	20.3	N/A	100	61
		1987	2	36.0	4.5	100	78
		1989	1	26.5	N/A	100	
		1990	1	9.8	N/A	100	
		1993	2	0.3	0.3	100	
		1995	3	3.9	0.7	100	
		1998	4	15.7	4.7	100	
		2000		16.9		100	
		2002	1	4.0	N/A	100	
		2004		4.0		100	
		2006	3	4.2		100	
		2008	4	5.0		100	92
		2012	2	25.1	2.9	100	90
		2014	2	15.8	6	100	84
		2016	2	13.0	2.4	100	76
		2018	2	20.7	4.2	100	76
	Preuss Ck.	1981	1	21.5	N/A	100	
		1985	2	24.1	9.7	100	78
		1986	2	15.7	1.1	100	58
		1987	3	10.7	2.8	100	71
		1988		22.0		100	
		1989	2	2.6	2.0	100	
		1990	3	2.8	0.1	100	
		1991	4	3.2	1.2	100	
		1993	5	5.1	2.6	100	90
		1995	6	3.1	0.7	100	
		1997		8.8		100	
		1998		3.2		100	
		2000		7.9		100	
		2002	2	5.0	1.7	100	
		2004	11	9.1		100	
		2006	7	6.0		100	77
		2008	7	4.0		100	87
		2010	2	2.7	0.3	100	87
		2012	2	28.2	15.6	100	82
		2014	3	4.6	2.5	100	88
		2016	2	2.8	0.8	100	78
		2018	3	15.9	7.5	100	85

Table 11. Descriptive values of Bonneville Cutthroat Trout population trends for the Nounan Management Unit.

Management Unit	Stream	Year	Sites	BCT / 100 m^2 Mean	BCT / 100 m^2 (+/-) 1 SE	% Comp	BCT Mean Rel. Wt. (W_r)
Nounan	Bailey Ck.	2001	1	0.0	N/A	0	
		2006	1	0.0	N/A	0	
		2008	1	2.9	2.9	12	110
		2010	1	0.0	N/A	0	
		2012	2	0.3	0.3	2	
		2014	2	0.0	N/A	0	
		2016	2	0.0	N/A	0	
		2018	2	0.0	N/A	0	
	Eightmile Ck.	1993	4	1.0	0.4	3	
		1994	4	0.7	0.3	6	
		2001	4	0.1	0.1	1	
		2006	1	0.3	N/A	4	
		2007	3	2.4	0.7	25	93
		2008	1	2.8	N/A	12	87
		2010	3	0.9	0.3	4	80
		2012	3	2.2	1.9	5	90
		2014	2	0.3	0.3	1.5	95
		2016	2	0.9	0.4	18	84
		2018	3	1.1	0.6	15	82
	Georgetown Ck.	1994	4	0.0	N/A	0	
		2000	3	0.0	N/A	0	
		2006	3	0.0	N/A	0	
		2007	4	0.0	N/A	0	
		2008	2	0.0	N/A	0	
		2012	3	0.0	N/A	0	
		2014	2	0.0	N/A	0	
		2016	2	0.0	N/A	0	
		2018	3	0.0	N/A	0	
	Montpelier Ck.	2000	3	1.1	0.3	32	
		2006	3	1.6	0.6	20	82
		2008	2	1.8	1.1	42	97
		2012	2	2.1	1.9	15	73
		2014	2	2.4	2.4	21	91
		2016	2	4.3	4.3	24	84
		2018	2	1.6	1.6	13	87
	Pearl Ck.	2007	1	35.0	N/A	72	76
		2012	2	11.8	8.8	76	106
		2018	1	8.7	N/A	73	86
	Stauffer Ck.	2007	5	7.7	4.7	100	81
		2012	2	22.9	20.0	100	78
		2014	1	5.8	N/A	100	91
		2016	2	3.8	0	100	86
		2018	2	9.4	6.5	100	83

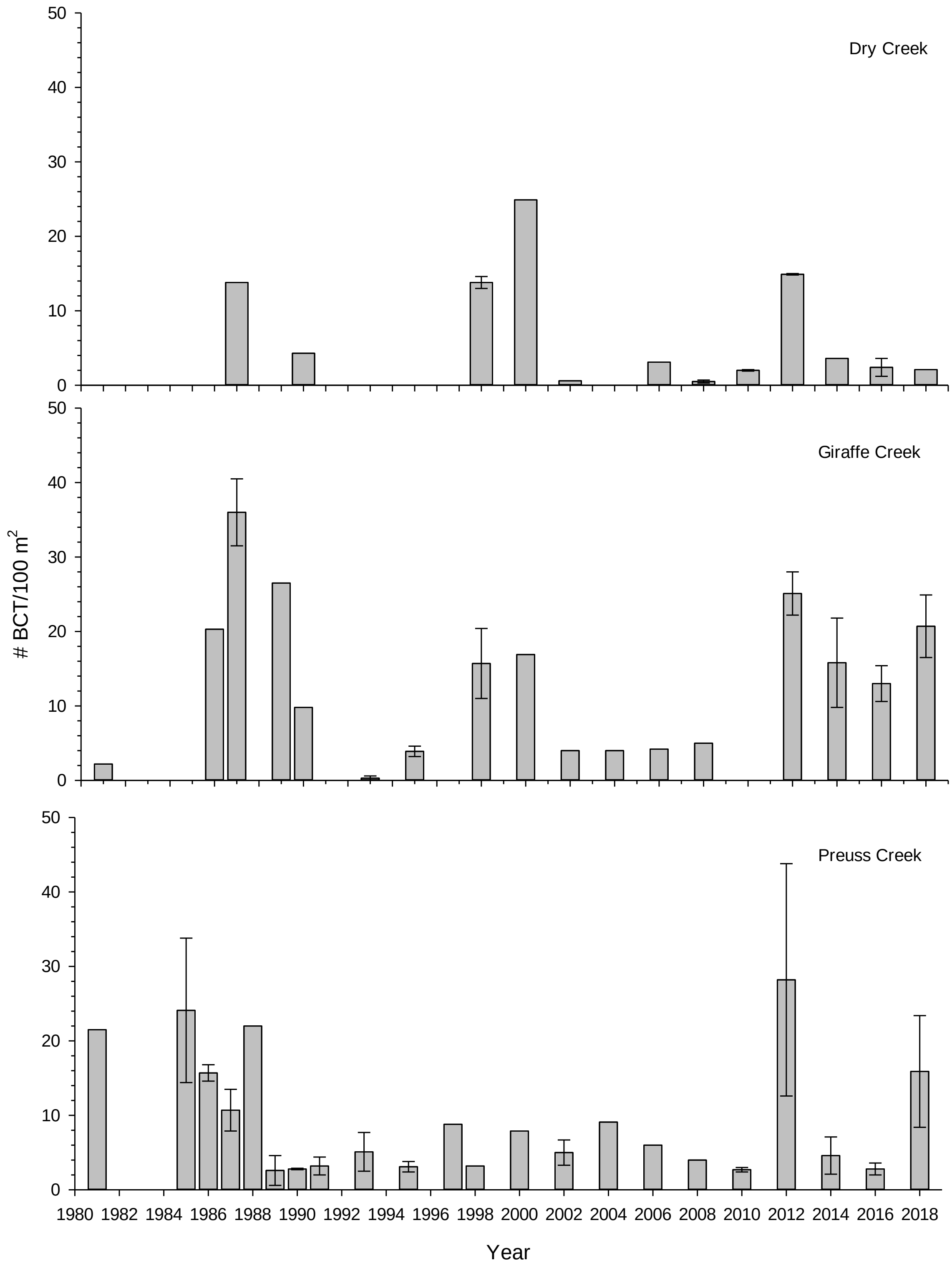

Figure 12. Mean BCT density (fish/100 m^2) trends in streams located in the Pegram Management Unit.

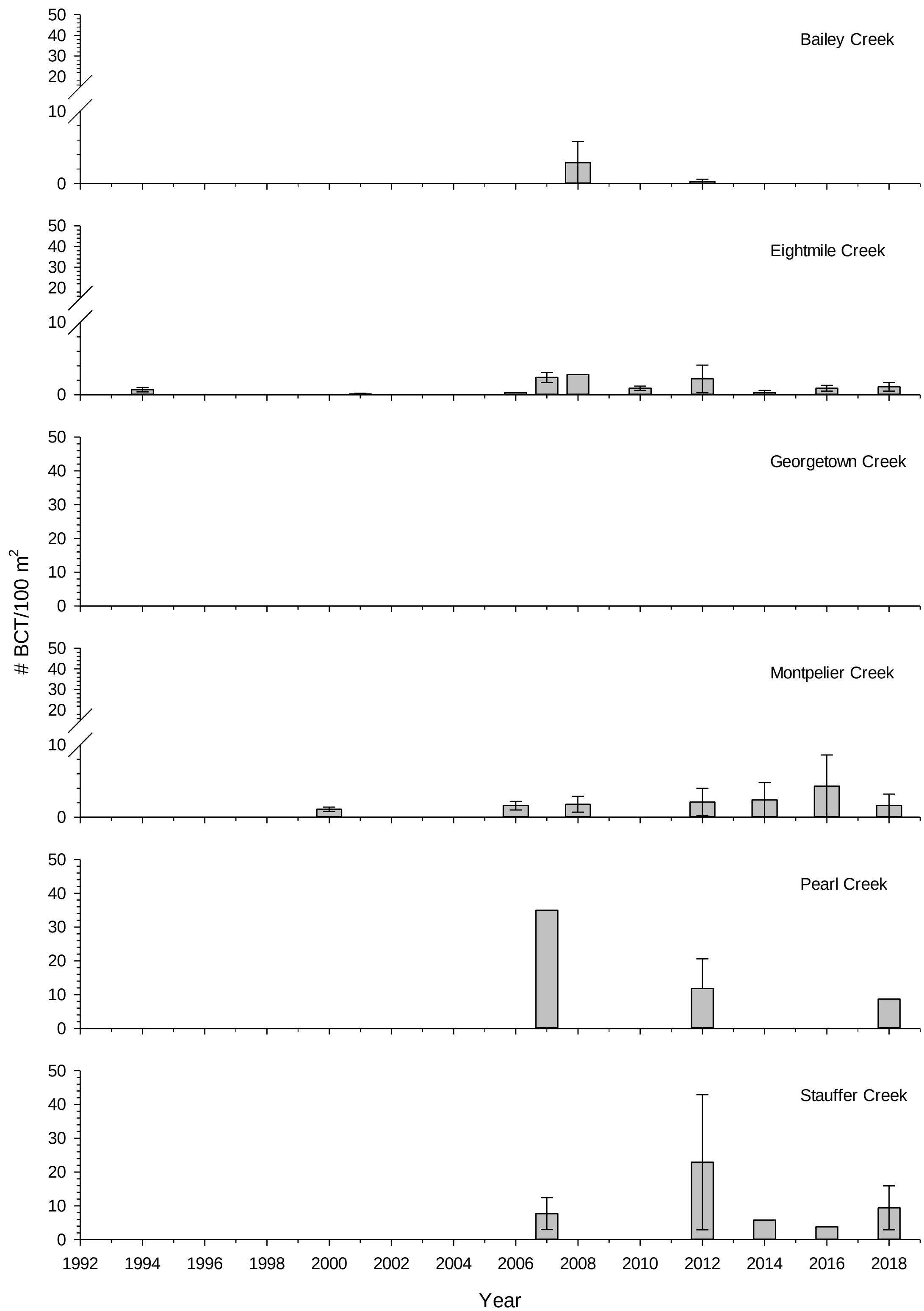

Figure 13. Mean BCT density (fish/100 m^2) trends in streams located in the Nounan Management Unit.

LITERATURE CITED

Anderson, R. M. and R. B. Nehring. 1984. Effects of Catch-and-Release Regulation on a Wild Trout Population in Colorado and Its Acceptance by Anglers. North American Journal of Fisheries Management 4:257-265.

Bain, M. B., and N. J. Stevenson, editors. 1999. Aquatic habitat assessment: common methods. American Fisheries Society, Bethesda, Maryland.

Bowen, Stephen H., D. J. D'angelo, S. H. Arnold, M. J. Keniry, and R. J. Albrecht. Density-Dependent Maturation, Growth, and Female Dominance in Lake Superior Lake Herring (*Coregonus artedii*). 1991. *Canadian Journal of Fisheries and Aquatic Sciences*. 48(4): 569-576.

Brimmer, A., R. Hillyard, and D. Teuscher. 2018. 2016 Southeast Regional Fishery Management Annual Report. Idaho Department of Fish and Game, Boise. IDFG 17-106.

Brimmer, A., R. Hillyard, and D. Teuscher. 2017. 2015 Southeast Regional Fishery Management Annual Report. Idaho Department of Fish and Game, Boise. IDFG 17-102.

Brimmer, A., R. Hillyard, and D. Teuscher. 2015. Regional Fishery Management Investigations. Idaho Department of Fish and Game, 2013 Job Performance Report, IDFG 15-101.

Burton, T.A., E. Cowley, G.W. Harvey, and B. Wicherski. 1991. Protocols for evaluation and monitoring of stream/riparian habitats associated with aquatic communities in rangeland streams. Idaho Department of Health and Welfare, Division of Environmental Quality.

Erhardt, J.M., K.F. Tiffan, and W.P. Connor. 2017. Juvenile Chinook Mortality in a Snake River Reservoir: Smallmouth Bass Revisited. Transactions of the American Fisheries Society 147:2.

Fritts, A.L., and T.N. Pearsons. 2011. Smallmouth Bass Predation on Hatchery and Wild Salmonids in the Yakima River, Washington. Transactions of the American Fisheries Society 133:4.

Harrelson, C. C., C. L. Rawlins, and J. P. Potyondy. 1994. Stream Channel reference sites: an illustrated guide to field techniques. U.S. Forest Service, Rocky Mountain Forest and Range Experiment Station, General Technical Report RM-245, Fort Collins, Colorado.

Idaho Department of Fish and Game (IDFG). 2019. Fisheries Management Plan 2019-2024. Idaho Department of Fish and Game, Boise, USA.

Idaho Department of Fish and Game (IDFG). 2007. Management Plan for Conservation of Yellowstone Cutthroat Trout in Idaho. Idaho Department of Fish and Game, Boise, USA.

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

LaBolle, L. and D. Schill. 1988. Upper Blackfoot River Fishery Management Plan 1988. Idaho Department of Fish and Game. Boise Idaho.

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

Platts, W. S., C. Armour, G. D. Booth, M. Bryant, J. L. Bufford, P. Cuplin, S. Jensen, G. W. Lienkameemper, G. W. Minshall, S. B. Monsen, R. L. Nelson, L. R. Sedell, and J. S. Tuhy. 1987. Methods for evaluating riparian habitats with applications to management. U.S. Forest Service, General Technical Report INT-221, Ogden, Utah.

Tabor, R.A., R.S. Shively, and T.P. Poe. 1993. Predation on Juvenile Salmonids by Smallmouth Bass and Northern Squawfish in the Columbia River near Richland, Washington. North American Journal of Fisheries Management 13:4.

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

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

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