FISHERY RESEARCH

KOOTENAI RIVER FISHERIES INVESTIGATIONS: SALMONID STUDIES

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Kootenai River Fisheries Investigations: Salmonid Studies

Project Progress Report

2005 Annual Report

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TABLE OF CONTENTS

Page

LIST OF TABLES

LIST OF FIGURES

Page

LIST OF APPENDICES

ABSTRACT

This research report addresses bull trout redd surveys, rainbow trout population monitoring, and westslope cutthroat trout distribution and genetic surveys in the Kootenai River drainage of Idaho. The bull trout *Salvelinus confluentus* is one of several sport fish native to the Kootenai River, Idaho that no longer supports a fishery. Because bull trout are listed under the Endangered Species Act, population data will be vital to monitoring status relative to recovery goals. Sixteen bull trout redds were found in North and South Callahan creeks and Boulder Creek in 2005. This was the second year in a row that bull trout redd counts have decreased following the high count in 2003. However, because redd numbers have only been monitored since 2002, the data series is too short to determine bull trout population trends based on redd counts. Rainbow trout *Oncorhynchus mykiss* still provide an important Kootenai River sport fishery, but densities are low, at least partly due to limited recruitment. A creel survey indicated that the rainbow trout catch rate has increased to 0.37 fish/h, the highest recorded for the Kootenai River in Idaho. This increased catch rate may be related to a 406 mm (16”) minimum length limit initiated in 2002. Rainbow trout made up 46% of the catch, followed by northern pikeminnow (15%), sucker (*Catostomus* spp.; 15%), and mountain whitefish (Prosopium williamsoni; 14%). The rainbow trout proportional stock density (PSD) decreased for the second year in a row. This may indicate increased recruitment to or survival in the 201-305 mm length group due to the length limit. Because of recent proposals for listing westslope cutthroat *O. clarkii lewisi* under the Endangered Species Act, it is important to document where populations exist throughout their range, including in the Kootenai River drainage where little data exists. Genetic studies indicated that five of 17 streams surveyed contained pure populations of westslope cutthroat trout, while nine streams contained cutbow trout (westslope cutthroat trout x rainbow trout hybrids). However, none of the streams had rainbow trout introgression levels >2.34%.

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INTRODUCTION

The Kootenai River in Idaho no longer has fisheries for several species, including white sturgeon *Acipenser transmontanus*, burbot *Lota lota*, and kokanee *Oncorhynchus nerka* (Richards 1997). The bull trout *Salvelinus confluentus*, another sportfish native to the Kootenai River, was listed as threatened under the Endangered Species Act in 1998. Bull trout are distributed throughout the Kootenai River mainstem and some tributaries downstream of migration barriers in Idaho (Partridge 1983; Paragamian 1994, 1995a; Downs 1999, 2000; Walters and Downs 2001; Walters 2002). Little is known about population numbers, but juvenile bull trout densities ranged from 1.64/100 m^2 to 7.65/100 m^2 across four sample reaches in the Callahan Creek drainage in 2003 (Walters 2004b). Bull trout redds were first documented in Boulder Creek in 2001 and in North and South Callahan creeks in 2002 (Walters 2003, 2004a). Annual bull trout redd counts have continued on Boulder Creek since 2000 and in the Callahan Creek drainage since 2003 (Walters 2004b, 2005). The bull trout draft recovery plan states that the trend criteria for recovery will be met when the bull trout population is accepted as stable or increasing based on at least 10 years of monitoring data (U.S. Fish and Wildlife Service 2002). The recovery plan calls for redd surveys to continue as a metric to document bull trout population trends (U.S. Fish and Wildlife Service 2002). The continuation of bull trout redd counts in Boulder Creek and North and South Callahan creeks will provide data to help document population trends.

Rainbow trout *O. mykiss* are native to the Idaho reach of the Kootenai River, but densities are low, ranging from 3 fish/ha in 1993 to 11 fish/ha in 2004 (Paragamian 1995a, 1995b; Downs 2000; Walters 2005). These low densities are at least partly due to limited juvenile recruitment (Walters et al. 2005). Decreased productivity in the Kootenai River downstream of Libby Dam may be another factor limiting fish populations (Woods 1982; Paragamian 1995a; Snyder and Minshall 1996). Woods (1982) reported that 63% of total phosphorus and 25% of total nitrogen in the Kootenai River system never pass through Libby Dam. A nutrient restoration experiment is currently underway to test the nutrient limitation hypothesis (IDFG and Kootenai Tribe of Idaho, unpublished data). Another possible factor limiting the Kootenai River rainbow trout population is angling exploitation (Walters and Downs 2001; Walters 2002). A 406 mm (16”) minimum length limit and 2-fish bag limit were initiated on January 1, 2002. An annual monitoring program is necessary to determine if nutrient restoration and the more restrictive fishing regulations are benefiting the rainbow trout population.

Westslope cutthroat trout *O. clarkii lewisi* distribution throughout the Idaho portion of the Kootenai River drainage is poorly documented. Because of recent proposals for listing the subspecies under the Endangered Species Act, it is important to document distribution and relative abundance in the Kootenai River drainage. Genetics surveys have been completed for some streams, but genetic purity is mostly unknown for the Kootenai River drainage in Idaho. Recent research in the upper Kootenay River basin in Canada suggests that hybridization is increasing and that hybrid swarms are likely to develop (Rubidge and Taylor 2005). In Idaho, westslope cutthroat trout were likely native to many Kootenai River tributaries that were inaccessible to rainbow trout due to upstream migration barriers. However, non-native rainbow trout strains were stocked into some of those tributaries and in headwater lakes (http://fishandgame.idaho.gov/apps/stocking/year.cfm?region=1). Identifying where westslope cutthroat trout populations exist in the Kootenai River drainage and their genetic purity will aid in identifying future threats to these populations and in providing management direction.

OBJECTIVES

1. Monitor bull trout redd numbers in index streams in the Kootenai River drainage, Idaho.

2. Conduct a creel survey on the Kootenai River to measure angling pressure, catch and harvest rates, total harvest, and the rainbow trout exploitation rate.

3. Determine if the rainbow trout population size structure is improving (e.g., a positive trend in quality stock density) in response to changes in trout regulations initiated in 2002.

4. Determine if any streams in the Kootenai River drainage, Idaho contain pure westslope cutthroat trout and determine the degree of hybridization between westslope cutthroat and rainbow trout when hybrids are present.

STUDY AREA

The Kootenai River (spelled Kootenay in Canada) flows south out of British Columbia into Montana, northwest into Idaho, then north back into British Columbia and Kootenay Lake (Figure 1). It flows out of the west arm of Kootenay Lake and enters the Columbia River at Castlegar, British Columbia. In the U.S., the Kootenai River is regulated by Libby Dam in Montana (Figure 1). In Idaho, the Kootenai River has the following three reaches: 1) the Canyon Reach (22 km) from the Montana border to the Moyie River, 2) the Braided Reach (10 km) from the Moyie River to Bonners Ferry, and 3) the Meandering Reach (73 km) from Bonners Ferry to the Canadian border (Fredericks and Hendricks 1997). The Meandering Reach has a relatively slow velocity and substrates consisting mainly of sand, silt, and clays (Partridge 1983). Dikes on either side of the river in this reach reduce flooding of the adjacent agricultural lands. The Braided and Canyon reaches upstream of Bonners Ferry appear more suitable for fluvial rainbow trout with riffles, runs and pools, and gravel and cobble substrates. Sampling in 2005 was conducted in the Kootenai River and in four tributary drainages including Boulder, Callahan, and Mission creeks and the Moyie River drainage (Figure 1). Waterfalls preventing the upstream migration of fish occur 1.9 km upstream from the mouth of Boulder Creek, 4.2 km upstream from the mouth of Mission Creek, and 2.4 km upstream from the mouth of the Moyie River (Partridge 1983).

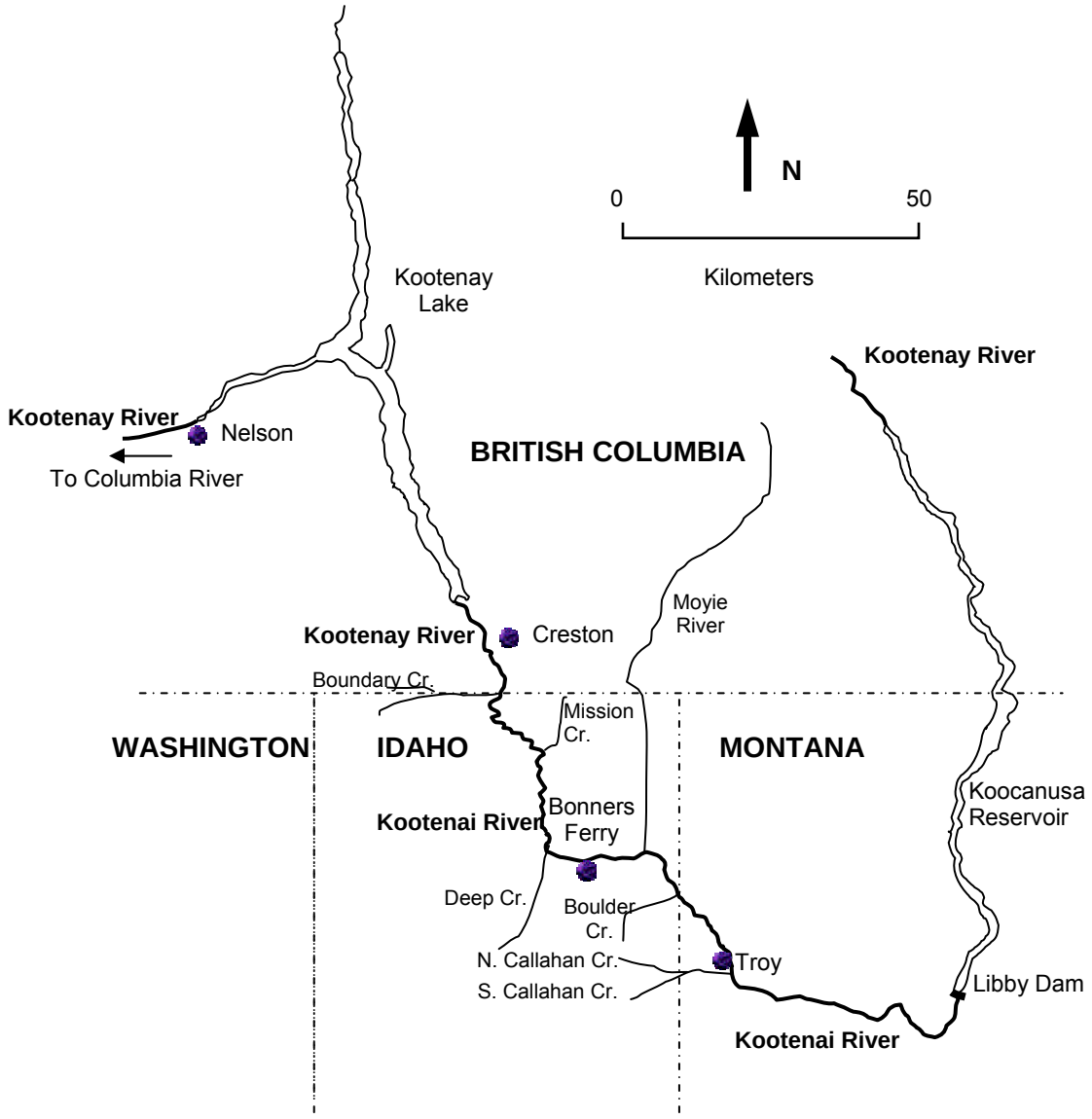

Figure 1. The Kootenai River drainage and major tributaries in Idaho.

METHODS

Bull Trout Redd Surveys

Bull trout redd surveys were conducted along index transects on October 11, 12, and 13 on North Callahan, South Callahan, and Boulder creeks, respectively (Walters 2004b). Each index transect was hiked once during midday. Disturbed and cleaned gravel or cobble areas showing a pit and tailspill were identified as bull trout redds (Shepard and Graham 1983; Dunham et al. 2001). Lengths of observed bull trout were also estimated to the nearest cm total length (TL).

Creel Survey

A stratified random creel survey was conducted from April 1 through October 31, 2005 and March 1 through March 31, 2006 to provide estimates of angling effort, total harvest, species composition of the catch, and catch and harvest rates. Estimates were made using the Idaho Department of Fish and Game Creel Census System (CCS) software (McArthur 2006). The survey was stratified into 30-day intervals with 12 sample days randomly selected for each interval, including four weekend days and eight weekdays. The Kootenai River was stratified into two sections with both sections sampled each creel day. Section 1 extended from the Idaho-Montana border downstream to the Highway 95 bridge at Bonners Ferry, and section 2 extended from the Highway 95 bridge downstream to Deep Creek. A previous creel survey showed that the majority of fishing pressure occurs within these two sections of the Kootenai River, Idaho (Paragamian 1995a). Two instantaneous angler counts per section were made each creel day between sunrise and sunset, including one count prior to 1330 h and the second count at 1330 h or later. Instantaneous counts were conducted from shore or by boat. Counts included the number of bank anglers and the number of boats per section of river. The CCS software randomly selected instantaneous count times.

Anglers were interviewed by boat and at access points. Angler interviews included completed and uncompleted trips. To increase interview sample size, angler interviews were conducted on non-creel as well as creel days. Anglers were queried for their residency, amount of time spent fishing, species targeted, and the number of fish (by species) harvested and released. Harvested fish were measured (mm, TL), weighed (g), and trout were checked for tags including radio and T-bar anchor tags. Interview questions are detailed in McArthur (1992).

Rainbow Trout Population Monitoring

In fall 2005, rainbow trout were sampled while electrofishing several sections of the Kootenai River from rkm 250 (Cow Creek) to rkm 275 (Boulder Creek). Rainbow trout were measured (mm, TL) and weighed (g), and those ≥390 mm were marked with a T-bar anchor tag before release. The tags were marked with "$10 reward" and the Idaho Department of Fish and Game phone number for the regional office in Coeur d'Alene. Rainbow trout catch-per-unit-effort, relative weights (W_r), proportional stock density (PSD), and quality stock density (QSD) were then calculated (Anderson 1976; Wege and Anderson 1978; Anderson and Neumann 1996). These variables are measured annually to monitor the rainbow trout population size structure. Relative weights were calculated for rainbow trout length groups of 201-305 mm TL, 306-406 mm TL, and >406 mm TL using the standard weight (W_s) equation for lotic rainbow trout populations proposed by Simpkins and Hubert (1996). Proportional and quality stock densities were calculated for rainbow trout >305 mm TL and >406 mm TL, respectively, using 200 mm TL as stock length (Schill 1991). Confidence intervals (95%) were estimated for the PSD and QSD using the table provided by Gustafson (1988). The 2005 rainbow trout population statistics were compared to those from previous years to help evaluate the 2002 regulations change.

Westslope Cutthroat Trout Genetics Surveys

Streams with the highest probability of having pure westslope cutthroat trout were given highest priority for sampling in 2005. In summary, I developed a list of Kootenai River drainage streams in Idaho that had no rainbow trout stocking history, including stocking in headwater lakes (http://fishandgame.idaho.gov/apps/stocking/year.cfm?region=1). From this list, I selected

the streams that were reported to have westslope cutthroat trout phenotypes or genotypes present based on past surveys (Sage 1993, 1995; Leary 1997; IDFG unpublished data). From this second list, I excluded the streams that were likely accessible to rainbow trout from the Kootenai River. The final list included mainly Moyie River drainage streams, along with streams from the Mission and Boulder Creek drainages.

Streams were sampled using a backpack electrofisher and by hook and line. Typically, two or three sites, separated by at least 1 km, were sampled on each stream. Each site was at least 50 m long, but longer reaches were typically surveyed in an attempt to collect genetic samples from 20 to 30 fish per site. Electrofishing of all habitat types was conducted while working upstream. All trout collected were measured in total length (TL) to the nearest mm and weighed (g) except for young of the year, which were enumerated. Approximately 40 to 60 *Oncorhynchus spp*. genetic samples were targeted from each stream. Genetic samples were collected from all *Oncorhynchus spp*., i.e. no attempt was made to discriminate westslope cutthroat trout from rainbow trout or cutbow (*O. clarkii* x *O. mykiss*) phenotypes for collection of genetic samples. Genetic samples were taken from all size classes collected. Brook trout were also weighed and measured. At the request of the U.S. Fish and Wildlife Service (USFWS), brook trout samples from some drainages were sacrificed and shipped to the USFWS Lab at Ahsahka, Idaho for pathology testing. Other nontarget species were identified and enumerated.

The UTM coordinates (Zone 11, WGS 84) were determined for each site using a GPS unit or later estimated from electronic versions of topographical maps when satellite contact could not be made in the field. The length and five width measurements (nearest 0.1 m) were taken at each site. A random start point within the first 1/5 of the site length was chosen for the first width measurement, with the next four measurements spaced equidistance apart. Total electrofisher effort(s) was also recorded.

Genetics samples were analyzed at the Idaho Department of Fish and Game's Eagle Fish Genetics Lab in Eagle, Idaho. All samples were screened with eight codominant nuclear DNA (nDNA) markers (Occ16, Occ34, Occ35, Occ36, Occ37, Occ38, Occ42, and OM55) diagnostic between rainbow trout and cutthroat trout (Ostberg and Rodriguez 2002, 2004). In addition to being diagnostic between rainbow trout and cutthroat trout, the OM55 nDNA marker is also diagnostic between westslope cutthroat trout and Yellowstone cutthroat trout *O. clarkii bouvieri* allowing assessment of intraspecific hybridization between these two subspecies. All samples were also screened with a mitochondrial DNA (mtDNA) marker diagnostic between all three taxa (D-loop digested with the restriction enzyme *Rsa-I*). Rainbow trout Introgression (percent of rainbow trout alleles detected out of total) was also quantified.

RESULTS

Bull Trout Redd Surveys

Ten bull trout redds were observed in North Callahan Creek, five in South Callahan Creek, and one in Boulder Creek. A summary of bull trout redd counts for the Kootenai River drainage in Idaho since 2000 is given in Table 1. Lengths of bull trout observed during 2005 redd surveys are given in Table 2.

Table 1. Numbers of bull trout redds in the Kootenai River drainage of Idaho, 2000 through 2005.

Stream	Year	Transect start point description	Start point UTM coordinates[a] Eastings	Start point UTM coordinates[a] Northings	Transect end point description	End point UTM coordinates[a] Eastings	End point UTM coordinates[a] Northings	Number of bull trout redds
Boulder Cr.	2000	mouth	569849	5386164	Waterfalls 1.9 km upstream	568641	5385028	0
Boulder Cr.	2001	mouth	569849	5386164	Waterfalls 1.9 km upstream	568641	5385028	2
Boulder Cr.	2002	mouth	569849	5386164	Waterfalls 1.9 km upstream	568641	5385028	2
Boulder Cr.	2003	mouth	569849	5386164	Waterfalls 1.9 km upstream	568641	5385028	0
Boulder Cr.	2004	mouth	569849	5386164	Waterfalls 1.9 km upstream	568641	5385028	0
Boulder Cr.	2005	mouth	569849	5386164	Waterfalls 1.9 km upstream	568641	5385028	1
N. Callahan Cr.	2002	100 m downstream of Smith Cr.	569501	5365990	Waterfalls barrier	568218	5366538	13
N. Callahan Cr.	2003	Jill Cr., Montana[b]	570786[c]	5365340[c]	Waterfalls barrier	568218	5366538	32
N. Callahan Cr.	2004	Jill Cr., Montana	570786[c]	5365340[c]	Waterfalls barrier	568218	5366538	17
N. Callahan Cr.	2005	Jill Cr., Montana	570786[c]	5365340[c]	Waterfalls barrier	568218	5366538	10
S. Callahan Cr.	2002	bridge on forest rd. 4554	570596	5362719	Forest Rd. 414 bridge (trailhead #154)	566519	5361191	3[e]
S. Callahan Cr.	2003	bridge on forest rd. 4554	570596	5362719	Forest Rd. 414 bridge (trailhead #154)	567347	5360822	10
S. Callahan Cr.	2004	bridge on forest rd. 4554	570596	5362719	Forest Rd. 414 bridge (trailhead #154)[d]	567347	5360822	8
S. Callahan Cr.	2005	bridge on forest rd. 4554	570596	5362719	Forest Rd. 414 bridge (trailhead #154)	567347	5360822	5

[a] UTM Zone 11; WGS84 datum.

[b] On 9/24/2003 the section from approximately 500 m downstream of Jill Creek upstream to Jill Creek was also surveyed, but no redds were seen.

[c] Estimated from electronic version of topographic map.

[d] S. Callahan was also surveyed from the Forest Road 414 bridge upstream approximately 500 m, but no redds were seen.

[e] One additional redd was found within 0.9 km upstream of Forest Road 414 bridge.

Table 2. Estimated lengths of bull trout observed during redd surveys, Kootenai River drainage Idaho, October 2005.

Date	Stream	Estimated Total Length (cm)
10/11/2005	N. Callahan Cr.	56
10/12/2005	S. Callahan Cr.	36
10/12/2005	S. Callahan Cr.	61
10/12/2005	S. Callahan Cr.	41
10/12/2005	S. Callahan Cr.	33
10/13/2005	Boulder Cr.	33

Creel Survey

A total of 172 angler interviews were conducted. Estimated fishing pressure for the creel year was 4,374 h (95% CI = ± 473 h) for section 1 and 4,147 h (95% CI = ± 355 h) for section 2, for a total of 8,521 h (95% CI = ± 413 h). The proportion of anglers fishing from boat and shore were 65% and 35%, respectively. Overall, 79% of anglers fished with bait, 11% with lures, and 6% with fly-fishing gear, while 4% used a combination of gear types.

Peamouth *Mylocheilus caurinus* was the most common species in the creel with a harvest of 158 fish (95% CI = ± 85) for both river sections combined, followed by northern pikeminnow *Ptychocheilus oregonensis* with a harvest of 154 fish (95% CI = ± 2) and mountain whitefish *Prosopium williamsoni* with a harvest of 142 (95% CI = ± 24). An estimated 70 (95% CI = ± 8) rainbow trout were harvested, while 3,249 (95% CI = ± 257) were released. The catch composition by species as a percentage of total catch was as follows: rainbow trout 46%, northern pikeminnow 15%, sucker *Catostomus* spp. 15%, mountain whitefish 14%, peamouth 7%, westslope cutthroat trout 2%, bull trout 1%, largemouth bass *Micropterus salmoides* 1%, cutbow trout 0.4%, and Kootenai River white sturgeon 0.2%. Catch rates included 0.37 rainbow trout/h, 0.12 northern pikeminnow/h, 0.11 sucker spp./h, 0.11 mountain whitefish/h, 0.05 peamouth/h, and 0.01 westslope cutthroat/h for both river sections combined. Mean lengths and weights of fish measured in the creel are given in Table 3. An undersized (356 mm) westslope cutthroat trout was also harvested.

Table 3. Mean total lengths and weights of harvested fish, Kootenai River creel survey, April 2005-March 2006.

	Cutbow trout	Largemouth bass	Mountain whitefish	Northern pikeminnow	Peamouth	Rainbow trout
Total length (mm)						
n	1	1	3	3	10	2
Mean	457	235	327	435	246	452
Standard error			31	130	6	17
Minimum			280	210	201	435
Maximum			385	660	265	469
Weight (g)						
n	1	1	3	3	10	2
Mean	762	187	254	1232	115	748
Standard error			65	811	10	183
Minimum			180	65	55	565
Maximum			383	2790	146	930

Rainbow Trout Population Monitoring

In fall 2005, 124 rainbow trout were collected during 13,983 s (3.9 h) of electrofishing effort on the Kootenai River, for a catch per unit effort of 31.9 fish/h. A summary of electrofishing catch per unit effort data collected for rainbow trout since 2000 is given in Appendix A. The rainbow trout proportional stock density (PSD) was 29, while the quality stock density (QSD) was 4. Relative weight values were 89 for the 201-305 mm length group, 83 for the 306-406 mm length group, and 84 for fish >406 mm. A summary of rainbow trout population metrics data collected since 1993 is given in Appendix B. A total of 25 rainbow trout and one cutbow trout were marked with T-bar anchor tags in spring 2005, but no tagged trout were observed in the creel or reported harvested by anglers.

Westslope Cutthroat Trout Genetics Surveys

Seventeen streams were surveyed in 2005, with 14 streams containing westslope cutthroat trout phenotypes (Table 4). Three streams contained cutbow trout phenotypes, while only one stream contained rainbow trout phenotypes. Ten streams contained brook trout *Salvelinus fontinalis*. No fish were collected from McDougal and Rutledge creeks, while only brook trout and slimy sculpin *Cottus cognatus* were caught in Gillon Creek. Tailed frog *Ascaphus truei* tadpoles were caught in 13 streams (Table 4).

Five streams surveyed contained pure populations of westslope cutthroat trout, while nine streams contained cutbow trout. None of the streams had rainbow trout introgression levels >2.34% (Table 5). Samples from Spruce Creek included three fish with both WCT and Yellowstone cutthroat trout (YCT) alleles, one with WCT, YCT, and RBT alleles, and eight with WCT and RBT alleles. Three hybrids, two with RBT mtDNA and one with WCT mtDNA, were identified from the lowest elevation site of Keno Creek. Fish with genotypes indicative only of WCT were found at the two sites sampled at higher elevations in the drainage. In Skin Creek, the single hybrid identified was homozygous for WCT alleles at all loci, but contained RBT mtDNA, indicative of a multigenerational backcross hybrid.

No individual fish with genotypes indicative of rainbow trout or F_1 hybrids were detected from streams sampled in the Moyie River and Mission Creek drainages. In comparison, the majority of fish from the Middle Fork Boulder Creek were hybrids, while only two fish had genotypes indicative of westslope cutthroat trout (Table 5).

Table 4. Streams surveyed for westslope cutthroat trout and numbers of salmonids collected (based on phenotypes), Kootenai River drainage, Idaho, 2005.

Stream	Drainage	Date	Site number	Sampling method[a]	Site area (m^2)[b]	Number of salmonids collected[c]				Tailed frog Tadpole[d]
						WCT	RBT	Cutbow	BRKT	
Bussard Cr.	Moyie R.	7/20	1	E	NM	0	0	0	0	X
Bussard Cr.	Moyie R.	7/27	2	E	706.2	36	0	0	0	X
Canuck Cr.	Moyie R.	7/14	1	E	690	33	0	0	0	
Canuck Cr.	Moyie R.	7/14	2	E	1324.3	44	0	0	0	
Copper Cr.	Moyie R.	7/19	1	E	332.1	35	0	0	0	X
Copper Cr.	Moyie R.	7/19	2	E	NM	0	0	0	0	X
Copper Cr.	Moyie R.	7/19	3	E	423.2	30	0	0	0	
Davis Cr.	Deer Cr., Moyie R.	6/29	1	E	765.4	21	0	6	2	X
Davis Cr.	Deer Cr., Moyie R.	6/29	2	E	478.8	37	0	0	0	X
E. Fork Mission Cr.	Mission Cr., Kootenai R.	6/23	1	E	957.7	21	0	0	16	
E. Fork Mission Cr.	Mission Cr., Kootenai R.	7/5	2	E	720	40	0	0	25	
Faro Cr.	Deer Cr., Moyie R.	6/22	1	E	499.5	23	0	0	9	
Faro Cr.	Deer Cr., Moyie R.	6/27	2	E	363	18	0	0	21	X
Gillon Cr.	Round Prairie Cr., Moyie R.	6/15	1	E	616.5	0	0	0	32	
Gillon Cr.	Round Prairie Cr., Moyie R.	6/23	2	E	499.8	0	0	0	14	
Hellroaring Cr.	Round Prairie Cr., Moyie R.	6/16	1	E	531.1	35	0	0	1	
Hellroaring Cr.	Round Prairie Cr., Moyie R.	6/21	2	E	258.3	0	0	0	0	
Hellroaring Cr.	Round Prairie Cr., Moyie R.	6/21	3	E	649.8	22	0	0	0	X
Keno Cr.	Deer Cr., Moyie R.	7/11	1	E	390.6	21	0	0	15	
Keno Cr.	Deer Cr., Moyie R.	7/11	2	E	372	15	0	0	29	
Keno Cr.	Deer Cr., Moyie R.	7/11	3	E	194.4	21	0	0	0	
Kreist Cr.	Moyie R.	6/14	1	E	145	0	0	0	0	
Kreist Cr.	Moyie R.	6/14	2	E	625.6	11	0	0	0	X
Kreist Cr.	Moyie R.	6/15	3	E	342.9	20	0	4	7	
M. Fork Boulder Cr.	Boulder Cr., Kootenai R.	7/25	1	A	NM	3	7	2	2	
M. Fork Boulder Cr.	Boulder Cr., Kootenai R.	7/27	2	E	1570.8	9	35	1	10	
McDougal Cr.	Moyie R.	6/16	1	E	281.3	0	0	0	0	
Mill Cr.	Deer Cr., Moyie R.	7/6	1	E	NM	22	0	0	0	X
Mill Cr.	Deer Cr., Moyie R.	7/26	2	E	394.8	28	0	0	0	X
Mission Cr.	Kootenai R.	7/13	1	A	1664	26	0	0	3	
Mission Cr.	Kootenai R.	7/13	2	AE	NM	25	0	0	30	X
Rutledge Cr.	Moyie R.	6/22	1	E	153	0	0	0	0	
Skin Cr.	Moyie R.	7/18	1	E	432	33	0	0	15	
Skin Cr.	Moyie R.	7/18	2	E	558.8	52	0	0	0	X
Spruce Cr.	Moyie R.	7/12	1	E	347.8	9	0	0	0	
Spruce Cr.	Moyie R.	7/12	2	E	656.6	50	0	0	0	

[a] E = electrofishing, A = angling, EA = electrofishing and angling.

[b] NM = not measured.

[c] WCT = westslope cutthroat trout, RBT = rainbow trout, Cutbow = WCT x RBT hybrid, BRKT = brook trout.

[d] Tailed frog tadpoles were collected in the streams marked with "X," and an adult tailed frog was collected in Mill Creek.

Table 5. Number of genotypes by species and percent rainbow trout introgression in streams sampled for westslope cutthroat trout, summer 2005 (WCT = westslope cutthroat trout, RBT = rainbow trout).

Stream	Drainage	N	Number of genotypes indicative of:				Percent rainbow trout introgression
			WCT	RBT	>F_1 Hybrid	F_1 Hybrid	
Bussard Cr.	Moyie R.	36	31	0	5	0	0.77
Canuck Cr.	Moyie R.	50	50	0	0	0	0.00
Copper Cr.	Moyie R.	50	50	0	0	0	0.00
Davis Cr.	Moyie R.	50	50	0	0	0	0.00
East Fork Mission Cr.	Mission Cr.	50	49	0	1	0	0.14
Faro Cr.	Moyie R.	41	37	0	4	0	0.85
Hell Roaring Cr.	Moyie R.	50	46	0	4	0	0.79
Keno Cr.	Moyie R.	50	47	0	3	0	1.25
Kreist Cr.	Moyie R.	35	31	0	4	0	0.63
Middle Fork Boulder Cr.	Boulder Cr.	50	2	11	35	2	N/A
Mill Cr.	Moyie R.	50	50	0	0	0	0.00
Mission Cr.	Kootenai R.	50	50	0	0	0	0.00
Skin Cr.	Moyie R.	50	49	0	1	0	<0.01
Spruce Cr.	Moyie R.	50	38	0	12	0	2.34

DISCUSSION

Bull trout redd counts in North and South Callahan creeks decreased for the second year in a row following the high count in 2003 (Table 1). However, because redd numbers have only been monitored since 2002 in the Callahan Creek drainage, the data series is too short to determine bull trout population trends based on redd counts. Index redd counts should continue annually on North and South Callahan creeks and Boulder Creek.

The rainbow trout catch rate of 0.37 fish/h is the highest recorded for the Kootenai River in Idaho, with past catch rates ranging from 0.02 fish/h in 1993 to 0.20 fish/h in 2001 (Paragamian 1994; Walters 2003). This catch rate increase may be in response to an increased rainbow trout density following initiation of the 406 mm (16”) minimum length in 2002 (Walters 2005). Rainbow trout also made up the highest percentage of fish caught (46%), an increase compared to 2002 when rainbow trout made up 12% of the catch (Hardy 2003), but similar to 2001 when rainbow trout made up 49% of the catch (Walters 2003).

Rainbow trout PSD values decreased in 2004 and 2005 relative to the high value of 55 recorded in 2002 and 2003. This change appears due to an increase in numbers of rainbow trout in the 201-305 mm length group relative to the 306-406 mm group; for example, catch per unit effort (CPUE) increased in this size group in 2004 and 2005, while the CPUE for the 306-405 mm group remained about the same (Appendix A). This may indicate increased recruitment to or survival in the 201-305 mm length group in response to the 406 mm length limit initiated in 2002. Angler exploitation of rainbow trout could not be estimated as no tagged fish were reported harvested. My sample size of tagged fish was likely too small to provide an angler exploitation estimate, or anglers could have failed to report any tagged fish they harvested.

Monitoring of the rainbow trout population structure should continue, as the population appears to be responding positively to the regulations change. In addition, the Kootenai River

nutrient restoration project was initiated in 2005. Nutrient restoration of the Kootenai River Idaho may increase rainbow trout survival and densities. An average of 5,300 age-0 rainbow trout out-migrate to the canyon reach of the Kootenai River each year from tributary streams in Idaho (Walters et al. 2005). Little is known about the ecology of these juvenile fish, but if nutrient restoration increases available food, juvenile survival would likely increase with higher growth rates and body condition. Improved growth rates and condition of rainbow trout may also result in a younger age at maturity and higher fecundity rates. Monitoring of the rainbow population should continue in order to assess the success of the nutrient restoration program.

Populations of pure westslope cutthroat trout were found in the Moyie River and Mission Creek drainages. Streams sampled in these two drainages also contained cutbow trout with rainbow trout introgression levels of <2.4%. Keno and Spruce creeks, identified as pure westslope cutthroat trout in previous studies (Sage 1995; Leary 1997), now contain hybrids, while Copper Creek, reported to have westslope cutthroat trout x Yellowstone cutthroat trout hybrids in 1995 (Leary 1997), now has pure westslope cutthroat trout. Canuck Creek still has a pure population of westslope cutthroat trout as Sage (1995) found in samples from 1994. Because Canuck, Copper, Davis, Mill, and Mission creeks all contain pure populations of westslope cutthroat trout, these streams should receive high priority for genetic preservation.

It will be important for managers to identify all possible sources of westslope cutthroat x rainbow trout hybridization to determine the probability that hybridization and introgression will increase over time (Matt Campbell and Christine Cegelski, Eagle Fish Genetics Lab, personal communication). It will also be essential to identify other streams containing westslope cutthroat trout, as their distribution and genetic status remains unknown for most of the Kootenai River drainage in Idaho. A more extensive survey design, such as one based on the U.S. Environmental Protection Agency's Environmental Monitoring and Assessment Program (EMAP) protocols, would allow extrapolations to be made for the entire drainage by sampling at random but spatially distributed sites throughout the drainage (Stehman and Overton 1994).

RECOMMENDATIONS

1. Continue annual bull trout redd surveys on index reaches of North and South Callahan creeks and Boulder Creek. This will allow construction of a time series to determine the bull trout population trend.

2. Maintain the current harvest regulations for rainbow trout (406 mm [16"] minimum size and two fish creel limit) and continue monitoring rainbow trout population statistics. Continued monitoring of rainbow trout population statistics will provide information necessary to determine changes due to nutrient restoration or regulation changes.

3. Conduct an extensive westslope cutthroat trout survey throughout the Kootenai River drainage of Idaho. Identification of the genetic characteristics of westslope cutthroat trout populations will provide information necessary to better manage for pure stocks and reduce introgression.

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APPENDICES

Appendix A. Rainbow trout catch per unit effort (CPUE) by electrofishing in the fall, Kootenai River, Idaho.

Length group (mm)	2000 CPUE (n/h)	2001 CPUE (n/h)	2002 CPUE (n/h)	2003 CPUE (n/h)	2004 CPUE (n/h)	2005 CPUE (n/h)
<= 199	7.9	3.8	7.0	3.8	4.3	4.1
200-305	12.7	10.5	6.5	7.0	18.1	19.8
306-406	7.9	3.4	7.8	7.6	7.2	7.0
>406	0.4	0.0	0.3	1.0	0.0	1.0
all	28.8[a]	17.7	21.5[a]	19.3	29.6	31.9

[a] Differs from column total due to rounding error.

Appendix B. Summary of population statistics for rainbow trout sampled by electrofishing during fall in the Kootenai River (rkm 250 to rkm 275), including proportional (PSD) and quality (QSD) stock densities ("—" = no data).

Year	Population estimate	Lower 95% C. L.	Upper 95% C. L.	n/ha	n/km	PSD	PSD ± 95% CI	QSD	QSD ± 95% CI[a]	Relative weights 201-305 mm	Relative weights 306-406 mm	Relative weights >406 mm
1993	98	78	118	3.3	33	—	—	—	—	—	—	—
1994	135	114	160	4.6	45	—	—	—	—	—	—	—
1998	217	168	294	7.4	72	42	12	5	—	85	83	83
1999	217	160	332	7.4	72	47	13	3	—	95	86	81
2000	—	—	—	—	—	39	15	2	—	86	79	82
2001	—	—	—	—	—	24	22	0	—	83	80	—
2002	—	—	—	—	—	55	15	2	—	83	80	96
2003	—	—	—	—	—	55	16	6	—	84	85	83
2004	335	190	800	11.4	112	35	9	7	5	86	85	—
2005	—	—	—	—	—	29	10	4	5	89	83	84

[a] Sample sizes were too small prior to 2004 to calculate confidence intervals for QSD.

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