State of Utah
Department of Natural Resources
Division of Wildlife Resources

Native Cutthroat Trout (*Oncorhynchus clarkii* ssp.) Conservation Activities in the Northern Region, 2023

Publication Number 24-12

Utah Division of Wildlife Resources
1594 West North Temple
Salt Lake City, Utah 84414

J. Shirley, Director

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by

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April 2024

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ACKNOWLEDGMENTS

Native cutthroat trout conservation work in the Northern Region in 2023 was completed with help from numerous individuals. I would like to acknowledge Chris Penne, Clint Brunson, Chante' Lundskog, Taylor Stewart, Emily Wright, Skyler Smith, Mackenzie Bingham, Sage Wayment, Garrett Green, Brock Thornley, Mike Loveland, Skylar Wolf, Hailey Barrett, UDWR personnel from other regions, and many volunteers for their help with these activities. Others who assisted with surveys, provided past survey data, or were otherwise involved in these activities included Cassie Mellon (BLM), Paul Chase and Cody Edwards (USFS), and Jim DeRito (Trout Unlimited). I acknowledge numerous private landowners who permitted access to their property.

INTRODUCTION

BONNEVILLE CUTTHROAT TROUT (*Oncorhynchus clarkii utah*)

The Bonneville Cutthroat Trout (BCT) conservation activities by the UDWR Ogden Office in 2023 included population monitoring in the Weber River drainage in the Northern Bonneville GMU, population monitoring in the Upper Bear River drainage in the Bear River GMU, and stocking of BCT into Deadman Creek in Summit County. In addition, a radio telemetry study was implemented in the Chalk Creek drainage to evaluate BCT movement related to spawning, diversions, and stream temperatures. Activities conducted during 2023 will help accomplish the objectives for long-term conservation of BCT in Utah (BCT State of Utah Conservation Team 2008) and range-wide (Oplinger and Birdsey 2019).

COLORADO RIVER CUTTHROAT TROUT (*Oncorhynchus clarkii pleuriticus*)

The Colorado River Cutthroat Trout (CRCT) conservation activities conducted in 2023 included stocking CRCT in the West Fork Smiths Fork drainage. The work completed in the Upper Green GMU North Slope subunit will help accomplish the objectives for long-term conservation of CRCT in Utah (Lentsch and Converse 1997).

YELLOWSTONE CUTTHROAT TROUT (*Oncorhynchus clarkii bouvieri*)

Yellowstone Cutthroat Trout (YCT) conservation work in 2023 included pre-planning for the proposed chemical treatment of portions of Raft River and South Junction Creek. As with the other cutthroat trout subspecies, conservation activities involving YCT help accomplish the objectives for long-term conservation of YCT (Range-wide YCT Conservation Team 2009).

METHODS

All stream surveys and monitoring stations were completed at or near base flow conditions. Surveys were completed to determine the extent of the resident cutthroat trout populations in each stream/stream section. When possible, stream survey locations were chosen as closely as possible to previous UDWR or USFS survey locations. Approximately 126 people days were required to complete the native cutthroat trout fieldwork in the Northern Region during 2023.

For surveys on small streams, a 100 m reach, representing habitat conditions throughout the entire stream/section, was identified. For monitoring efforts, the attempt was made to revisit select stations surveyed previously. Stations were measured using a 100 m tape. A natural habitat break (e.g., small waterfall/cascade) was chosen for the upper end of each reach and whenever possible, the lower end. Two to four battery-powered backpack electrofishing units, manufactured by Smith-Root or Halltech, were utilized side-by-side for surveys on larger streams (e.g., streams >2.5-7 m in width). On the remaining surveys, a single battery-powered backpack electrofishing unit was used. Between two and eight personnel were utilized on electrofishing surveys. Electrofishing settings varied depending on stream conductivity. In general, the frequency was set at 60 Hz and the voltage at 250-350V when using a Halltech HT-2000, and 50 Hz, 25% duty cycle, and 250V when using a Smith-Root LR-20B.

All captured fish were transferred to live cages placed in the stream. Fish collected from the first electrofishing pass were kept separate from fish collected on the second electrofishing pass, and so forth. Fish processing and data collection commenced immediately following electrofishing and fish not collected for genetic analyses or health inspections were returned to the stream. All fish captured were measured to the nearest millimeter (mm) total length (TL) and weighed to the nearest gram (g). Identification of cutthroat trout x rainbow trout hybrids is

generally based on examination of phenotypic traits, primarily spotting patterns, fin tips and body coloration.

Population estimates were calculated separately for ≥age-1 salmonids and age-0 salmonids because smaller fish are not immobilized as effectively as larger fish while electrofishing (Reynolds 1989) and consequently, population estimates for age-0 fish are usually not as meaningful. In general, cutthroat trout <50-60 mm TL were considered to be age-0.

Population estimates were based on two-pass electrofishing, unless otherwise noted. A modified Zippin multiple pass depletion electrofishing formula was used to calculate the population estimates and ninety-five percent confidence limits for each site surveyed (Zippin 1958). The formulas used to calculate the estimates were:

$$N = C_1^2 / C_1 - C_2$$

$$SE = [C_1 * C_2 / (C_1 - C_2)^2] * (C_1 + C_2)^{½}$$

$$95\%\ C.I. = 2 * SE$$

where,
N = estimated fish population,
C_1 = the number of fish captured from the first pass, and
C_2 = the number of fish captured on the second pass.

Condition factor (K) was calculated using the formula:

$$K = W * 100{,}000/L^3$$

where,
W = weight in g, and
L = TL in mm.

All cutthroat trout tissue samples retained for genetic analyses were collected according to protocol established by Brigham Young University (BYU). These samples were submitted to the Salt Lake Office during the fall of 2023 and will be analyzed with nuclear DNA and mitochondrial DNA techniques.

Population estimates were not attempted for many of the non-game species because these species are difficult to capture. An estimate of abundance was made for these species as follows: >50 individuals per 100 m - abundant, 10-50 individuals per 100 m station - common, and <10 individuals per 100 m station - sparse. Due to the difficulty of differentiating sculpin species (*Cottus* spp.) in the field, no distinction was attempted for this report and these species are simply referred to as sculpin.

Chalk Creek Telemetry Project
Adult BCT were collected from two reaches of Chalk Creek via backpack electrofishing and surgically implanted with radio transmitters in September 2022. During 2023, re-location of tagged BCT was attempted on 30 occasions. Transmitters were re-located using an ATS Receiver (Model No. R410) and five-element Yagi antenna (Model No. 13864) or magnetic roof-mounted dipole antenna (Model No. 13861). Transmitter frequency (unique to each fish), date, geographic coordinates, and habitat type were recorded on each re-location occasion. Late in the season attempts were made to capture tagged BCT via electrofishing; when tagged fish were captured, location, length, weight, and habitat were recorded; when no tagged fish were captured from a transmitting location, efforts were made to locate and recover the transmitter.

RESULTS AND DISCUSSION

BONNEVILLE CUTTHROAT TROUT

Surveys

Efforts to increase knowledge of the distribution of BCT through inventory of previously un-surveyed streams in the Bonneville Basin are essentially complete. However, a section of Silver Creek was surveyed for the first time in 2023 (Table 1).

Table 1. Bonneville Cutthroat Trout surveyed in 2023.

Stream/section	Approximate # of stream km occupied (# stream miles)	# of ≥age-1 BCT/km (#/mile)
Silver Creek, downstream of Promontory Ranch Road	1.7 (1.0)	10 (16)

Monitoring

Multiple-pass electrofishing was completed at 25 sites during 2023 BCT monitoring efforts (Table 2). Nine of the monitored populations appeared to have increased since the previous survey, eight showed a decline, and eight remained essentially flat. It should be noted that the absence of BCT at the Deadman Creek site is attributable to the 2020 rotenone treatment and delayed population recovery in that portion of the stream.

Fish species encountered during stream sampling in 2023 included Bonneville Cutthroat Trout, Brook Trout (BKT; *Salvelinus fontinalis*), Brown Trout (BNT; *Salmo trutta*), Fathead Minnow (FHM; *Pimephales promelas*), Longnose Dace (LND; *Rhinichthys cataractae*), Mountain Sucker (MTS; *Catostomus platyrhynchus*), Mountain Whitefish (MWF; *Prosopium williamsoni*), Northern Leatherside Chub (NLS; *Lepidomeda copei*), Redside Shiner (RSS; *Richardsonius balteatus*), sculpin (SC; *Cottus* spp.), Speckled Dace (SPD; *Rhinichthys osculus*), Utah Chub (UTC; *Gila atraria*), Utah Sucker (UTS; *Catostomus ardens*).

Table 2. Results of BCT population monitoring in 2023.

Stream/section	Year	# of ≥age-1 BCT/km	# of ≥age-1 BCT/mile
Bear River GMU, Uinta Mountains/Upper Bear River Subunit			
Mill Creek, border	2023	180 ± 975	290 ± 1569
	2021	58 ± 12	93 ± 19
	2017	196 ± 33	315 ± 53
	2014	72 ± 9	116 ± 14
	2011	45 ± 131	72 ± 212
	2008	120 ± 8	193 ± 13
	2006	140 ± 7	225 ± 11
	2003	80 ± 37	129 ± 60

Table 2.—cont.

Stream/section	Year	# of ≥age-1 BCT/km	# of ≥age-1 BCT/mile
Mill Creek, middle	2023	288 ± 56	464 ± 90
	2017	209 ± 308	337 ± 496
	2011	427 ± 120	687 ± 193
	2008	510 ± 8	821 ± 12
	2005	376 ± 0	606 ± 0
Mill Creek, upper (USFS)	2023	20 ± 0	32 ± 0
	2020	131 ± 7	211 ± 11
	2017	173 ± 14	279 ± 23
	2011	10 ± 0	16 ± 0
	2008	300 ± 17	483 ± 28
	2005	157 ± 7	253 ± 11
Deadman Creek	2023	none captured	
	2020	31 ± 0	50 ± 0
	2017	56 ± 20	89 ± 33
	2008	30 ± 31	48 ± 49
	2005	57 ± 0	91 ± 0
Carter Creek	2023	193 ± 13	310 ± 21
	2017	43 ± 0	69 ± 0
	2011	none captured	
	2008	119 ± 25	192 ± 40
	2005	129 ± 22	207 ± 35
	2004	240 ± 5	387 ± 7
McKenzie Creek	2023	30 ± 0	48 ± 0
	2017	53 ± 19	86 ± 31
	2008	121 ± 7	195 ± 12
North Fork Mill Creek	2023	144 ± 18	232 ± 28
	2017	160 ± 34	257 ± 54
	2011	149 ± 16	240 ± 25
	2008	210 ± 38	338 ± 61
West Fork Bear River (USFS)	2023	10 ± 0	16 ± 0
	2019	20 ± 0	32 ± 0
	2013	476 ± 61	766 ± 98

Table 2.—cont.

Stream/section	Year	# of ≥age-1 BCT/km	# of ≥age-1 BCT/mile
Deer Creek	2023	272 ± 25	438 ± 41
	2017	132 ± 50	213 ± 80
	2011	264 ± 27	424 ± 43
	2006	476 ± 51	766 ± 82
	1998	512 ± 125	824 ± 201
Thompson Creek	2023	40 ± 68	64 ± 109
	2017	50 ± 0	80 ± 0
	2011	222 ± 6	358 ± 9
	2006	132 ± 5	212 ± 8
East Fork Bear River	2023	one captured, no depletion	
	2018	13 ± 0	21 ± 0
	2008	21 ± 0	34 ± 0
	2003	169 ± 19	272 ± 30
Hayden Fork (USFS)	2023	63 ± 20	101 ± 32
	2018	21 ± 0	34 ± 0
	2013	80 ± 96	129 ± 155
Gold Hill Creek	2023	187 ± 26	300 ± 41
	2022	151 ± 38	243 ± 61
	2020	376 ± 19	606 ± 30
	2019	449 ± 41	722 ± 66
	2018	1025 ± 65	1650 ± 105
	2017	318 ± 37	511 ± 60
	2016	595 ± 106	958 ± 170
	2015	392 ± 66	631 ± 106
	2014	421 ± 19	677 ± 30
	2013	781 ± 23	1256 ± 38
	2012	564 ± 68	908 ± 109
	2011	342 ± 71	551 ± 114
	2010	210 ± 39	338 ± 63
Bear River GMU, Rich County Subunit			
South Branch Otter Creek	2023	100 ± 0	161 ± 0
	2021	63 ± 15	101 ± 24
	2019	none captured	

Table 2.—cont.

Stream/section	Year	# of ≥age-1 BCT/km	# of ≥age-1 BCT/mile
Middle Branch Otter Creek, lower	2023	231 ± 34	372 ± 54
	2021	303 ± 53	487 ± 86
	2019	110 ± 8	177 ± 13
Middle Branch Otter Creek, upper	2023	10 ± 0	16 ± 0
	2021	none captured	
	2019	20 ± 0	32 ± 0
Northern Bonneville GMU, Weber River Subunit			
Strawberry Creek	2023	188 ± 52	302 ± 83
	2018	154 ± 16	247 ± 26
	2013	557 ± 37	896 ± 59
	2007	492 ± 109	791 ± 176
	1996	50 ± 0	80 ± 0
Jacobs Creek	2023	242 ± 11	389 ± 17
	2018	471 ± 61	758 ± 97
	2014	159 ± 6	256 ± 10
Peterson Creek	2023	178 ± 28	287 ± 45
	2018	304 ± 9	489 ± 15
	2014	137 ± 17	221 ± 27
Deep Creek	2023	30 ± 0	48 ± 0
	2014	112 ± 16	180 ± 26
Hardscrabble Creek	2023	144 ± 18	232 ± 28
	2018	252 ± 16	405 ± 26
	2013	342 ± 19	551 ± 31
	2007	327 ± 898	526 ± 1445
	2000	598 ± 31	962 ± 50
Arthurs Fork	2023	510 ± 89	821 ± 143
	2018	428 ± 23	688 ± 37
	2013	422 ± 31	680 ± 50
	2007	1099 ± 373	1769 ± 600
	1997	566 ± 36	912 ± 58
Lost Creek, Section 01	2023	none captured	
	2018	7 ± 0	11 ± 0
	2013	7 ± 0	11 ± 0
	2007	13 ± 0	21 ± 0
	1999	110 ± 0	177 ± 0

Table 2.—cont.

Stream/section	Year	# of ≥age-1 BCT/km	# of ≥age-1 BCT/mile
Echo Creek	2023	82 ± 11	131 ± 17
	2022	45 ± 29	72 ± 47
	2021	141 ± 7	227 ± 11
	2018	229 ± 33	369 ± 54
	2014	58 ± 38	93 ± 61
	2007	85 ± 11	137 ± 18
Silver Creek	2023	40 ± 0	64 ± 0
	2017	121 ± 37	195 ± 59
	2003	none captured	
	1998	45 ± 29	72 ± 47

BEAR LAKE GMU

Bonneville Cutthroat Trout activities in the Bear Lake GMU, which consist of a wild egg take from adfluvial Bear Lake Cutthroat Trout and annual netting surveys, are conducted by Bear Lake Special Project Biologist. A summary of activities and results can be found in the annual Bear Lake Fishery Assessment report for 2023.

BEAR RIVER GMU
Uinta Mountains/Upper Bear River Subunit

Mill Creek **IVAQ230**

Monitoring

Three sites in Mill Creek were monitored in 2023; the lowermost station was just above the Wyoming border, the middle near the North Slope Road, and the upper station located in the headwaters.

Border Station

The Mill Creek “border” station, 200 m in length, was electrofished on July 20, 2023. This is a Northern Leatherside Chub monitoring station currently scheduled for sampling on a 3-year cycle. Results of the current and previous surveys are shown in Table 3 and Figure 1. Based on eight data points for this monitoring station, the BCT population demonstrated an increase of roughly triple the estimate for 2021, and estimated BCT biomass was higher in 2023 than any previous estimate (Table 3). The length-frequency histograms show a similar distribution of size-classes within BCT, indicating consistent, though limited, recruitment, in this reach (Figure 1). Brook Trout continued to exhibit lower numbers than several of the previous monitoring events (Table 3), as well as a far-reduced number of age-0 BKT in 2023 (Figure 1).

Middle Station

The middle monitoring station, 102 m in length, was sampled on July 19, 2023. Results of the current and previous surveys are shown in Table 4 and Figure 2. Based on five data points for this monitoring station, the BCT population increased slightly in number from 2017 and remained at a moderate level; the estimated biomass was similar to the 2017 estimate (Table 4). The 2023 length-frequency distribution shows a narrower range of lengths compared with the previous sampling events, namely the loss of larger adults in 2023; the age-1 and -2 cohorts were well-represented in the 2023 sample (Figure 2). The number of BKT in this portion of Mill Creek does not appear to be increasing, instead exhibiting a decrease to less than half of the 2017 abundance estimate (Table 4).

Upper Station

The upper monitoring station, 100 m in length, was electrofished by a USFS crew on August 10, 2023. Results of the current and previous surveys are shown in Table 5 and Figure 3. Based on four data points for this monitoring station, the BCT population increased from very low densities in 2011 to moderate abundance in 2017 and 2020, then showed a return to reduced abundance in 2023; the estimated biomass was lower than all previous estimates, except 2011 (Table 5). The length-frequency distribution shows that for 2023 the population was comprised of two adults and a single age-1 individual, with a number of missing size-classes in between (Figure 3). It is important to note that numerous beaver dams were observed upstream of the station, as well as several BCT in the ponds, thus the present decrease in abundance appears to be less of a reach-wide decline and likely more of a local reduction. Ideally, this portion of Mill Creek will continue to be dominated by BCT into the future and serve as a source of BCT for the broader drainage, especially with the presence of BKT in the lower reaches.

Table 3. Population statistics for species sampled in the Mill Creek border station, 2003, 2006, 2008, 2011, 2014, 2017, 2021, and 2023.

Year	Species	Total Catch	#/km ± 95% C.I. (#/mi ± 95% C.I.)	kg/ha (lb/ac)	TL (mm)		WT (g)		Mean K
					Mean	Range	Mean	Range	
2023	≥age-1 BCT	11	180±975 (290±1569)	57 (51)	229	54-332	226	57-386	1.04
	≥age-1 BKT	3	15±0 (24±0)	5 (4)	58	150-314	228	35-326	1.06
	age-0 BKT	1	no depletion		51				
	LND		abundant						
	MTS		common						
	RSS		common						
	SC		abundant						
	SPD		common						
	UTS		sparse						
2021	≥age-1 BCT	11	58±12 (93±19)	8 (7)	192	138-290	80	28-223	1.15
	≥age-1 BKT	4	23±15 (36±24)	4 (3)	181	127-240	79	22-160	1.10
	age-0 BKT	14	83±41 (134±66)		65	51-79	3	1-5	
	MWF	3	15±0 (24±0)	<1 (<1)	109	105-116	11	10-12	0.86
	LND		abundant						
	MTS		common						
	NLSC		sparse						
	RSS		sparse						
	SC		abundant						
	SPD		abundant						
	UTC		sparse						
	UTS		sparse						
2017	≥age-1 BCT	36	196±33 (315±53)	55 (49)	254	162-447	189	36-779	0.92
	≥age-1 BKT	34	206±70 (331±113)	28 (25)	199	134-261	93	22-190	1.07
	age-0 BKT	17	405±3K (652±5K)	3 (3)	78	60-101	5	1-10	
	MWF	3	20±34 (32±55)		121	98-165			
	FHM		sparse						
	LND		abundant						
	MTS		common						
	NLSC		common						
	RSS		sparse						
	SC		abundant						
	SPD		abundant						
	UTS		sparse						
2014	≥age-1 BCT	14	72±9 (116±14)	18 (16)	260	165-372	176	36-446	0.84
	≥age-1 BKT	29	152±18 (244±28)	22 (19)	195	122-345	100	15-391	0.95
	age-0 BKT	18	106±42 (170±68)	1 (1)	79	63-98	4	2-7	
	MWF	9	46±5 (74±8)	1 (1)	115	73-148	19	2-30	0.81
	FHM		sparse						
	LND		abundant						
	MTS		abundant						
	NLSC		sparse						
	RSS		sparse						
	SC		abundant						
	SPD		abundant						
	UTS		sparse						

Table 3.—cont.

Year	Species	Total Catch	#/km ± 95% C.I. (#/mi ± 95% C.I.)	kg/ha (lb/ac)	TL (mm)		WT (g)		Mean K
					Mean	Range	Mean	Range	
2011	≥age-1 BCT	5	45±131 (72±212)	14 (12)	264	173-323	218	62-353	1.06
	≥age-1 BKT	33	184±39 (296±63)	39 (35)	185	56-393	154	3-656	1.04
	MWF	27	256±358 (412±577)	21 (19)	168	71-300	61	4-271	0.93
	LND		abundant						
	MTS		common						
	RSS		sparse						
	SC		abundant						
	SPD		common						
	UTS		sparse						
2008	≥age-1 BCT	12	120±8 (193±13)	40 (35)	261	163-360	181	17-486	0.92
	≥age-1 BKT	6	60±4 (97±6)	10 (9)	185	100-240	88	11-171	1.14
	age-0 BKT	1	10±0 (16±0)		66		1		
	MWF	14	160±76 (257±122)	5 (4)	112	60-187	16	1-52	0.71
	LND		abundant						
	MTS		common						
	NLSC		sparse						
	RSS		sparse						
	SC		abundant						
	SPD		common						
	UTS		sparse						
2006	≥age-1 BCT	14	140±7 (225±11)	33 (30)	211	76-371	131	5-438	1.04
	MWF	5	50±7 (80±11)		79	57-135	6	1-22	0.89
	LND		abundant						
	MTS		common						
	NLSC		common						
	RSS		sparse						
	SC		abundant						
	SPD		common						
	UTS		sparse						
2003	≥age-1 BCT	8	80±37 (129±60)	20 (18)	241	189-328	143	55-338	0.94
	≥age-1 BKT	4	40±26 (65±42)	4 (4)	184	177-190	65	55-81	1.03
	age-0 BKT	3	36±61 (57±98)		82	80-84	8	4-10	
	MWF	5	80±235 (129±378)		77	71-82	4	2-6	0.83
	LND		abundant						
	MTS		common						
	NLSC		sparse						
	RSS		common						
	SC		abundant						
	SPD		abundant						
	UTS		common						

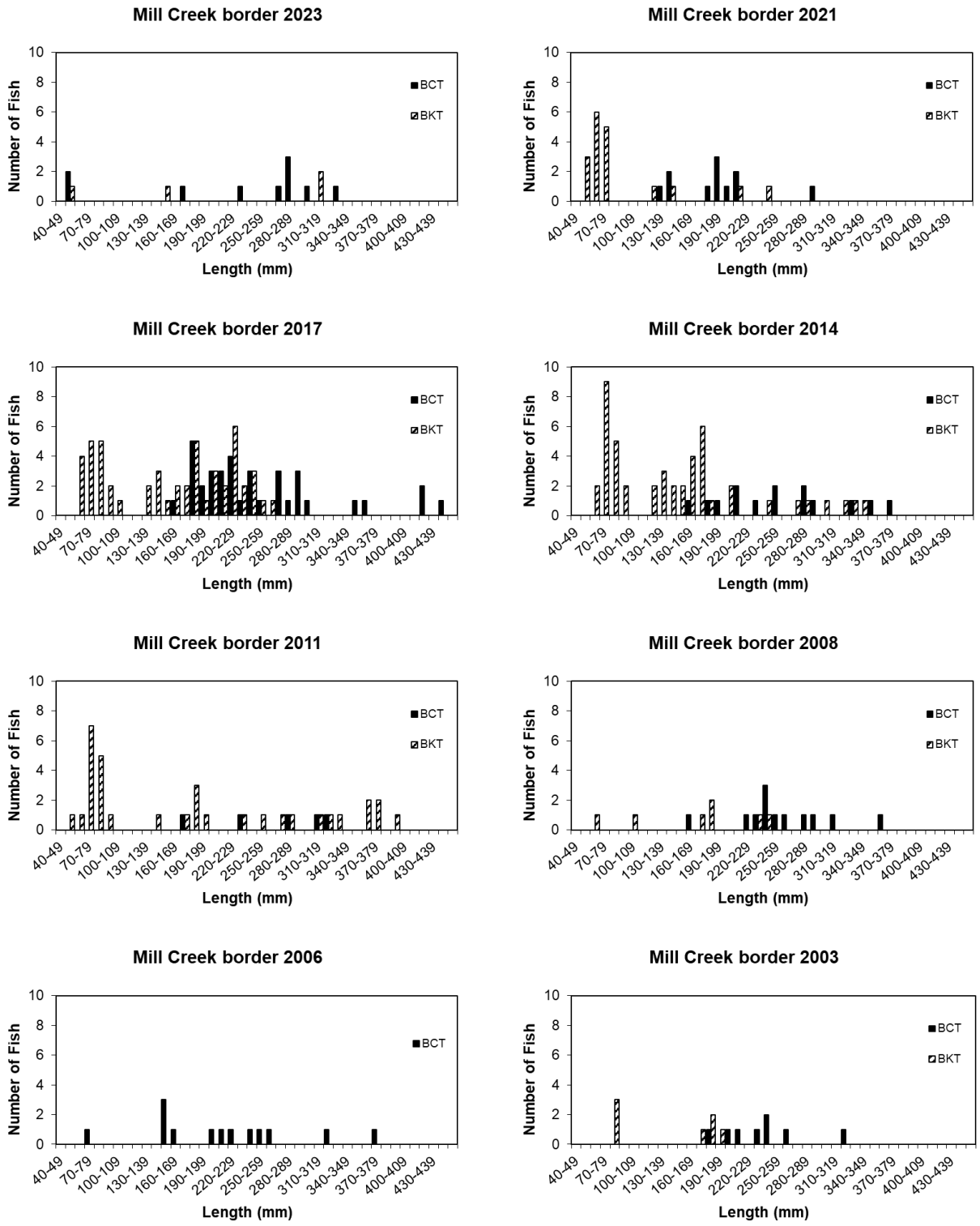

Figure 1. Size distribution of salmonid species sampled in the Mill Creek border monitoring station, 2003, 2006, 2008, 2011, 2014, 2017, 2021, and 2023.

Table 4. Population statistics for species sampled in the Mill Creek middle station, 2005, 2008, 2011, 2017, and 2023.

Year	Species	Total Catch	#/km ± 95% C.I. (#/mi ± 95% C.I.)	kg/ha (lb/ac)	TL (mm)		WT (g)		Mean K
					Mean	Range	Mean	Range	
2023	≥age-1 BCT	27	288±56 (464±90)	20 (18)	129	72-216	27	3-97	1.05
	≥age-1 BKT	5	52±19 (84±31)	8 (7)	168	115-218	59	14-123	1.04
	SC		abundant						
2017	≥age-1 BCT	13	209±308 (337±496)	20 (18)	161	74-300	45	3-166	0.92
	≥age-1 BKT	12	123±21 (197±33)	16 (14)	174	115-221	61	18-106	1.06
	SC		abundant						
	SPD		sparse						
2011	≥age-1 BCT	33	427±120 (687±193)	27 (24)	119	64-325	36	2-255	1.09
	≥age-1 BKT	3	33±0 (54±0)	4 (3)	173	135-206	66	28-104	1.15
	SC		abundant						
2008	≥age-1 BCT	51	510±8 (821±12)	62 (55)	161	77-270	52	3-199	0.99
	≥age-1 BKT	6	60±10 (97±16)	4 (3)	132	110-172	26	15-48	1.09
	SC		abundant						
	SPD		sparse						
2005	≥age-1 BCT	35	376±0 (606±0)	52 (47)	160	95-305	52	8-270	1.07
	≥age-1 BKT	9	98±10 (158±17)	10 (9)	150	90-187	39	10-64	1.04
	age-0 BKT	1	11±0 (17±0)		46				
	SC		abundant						

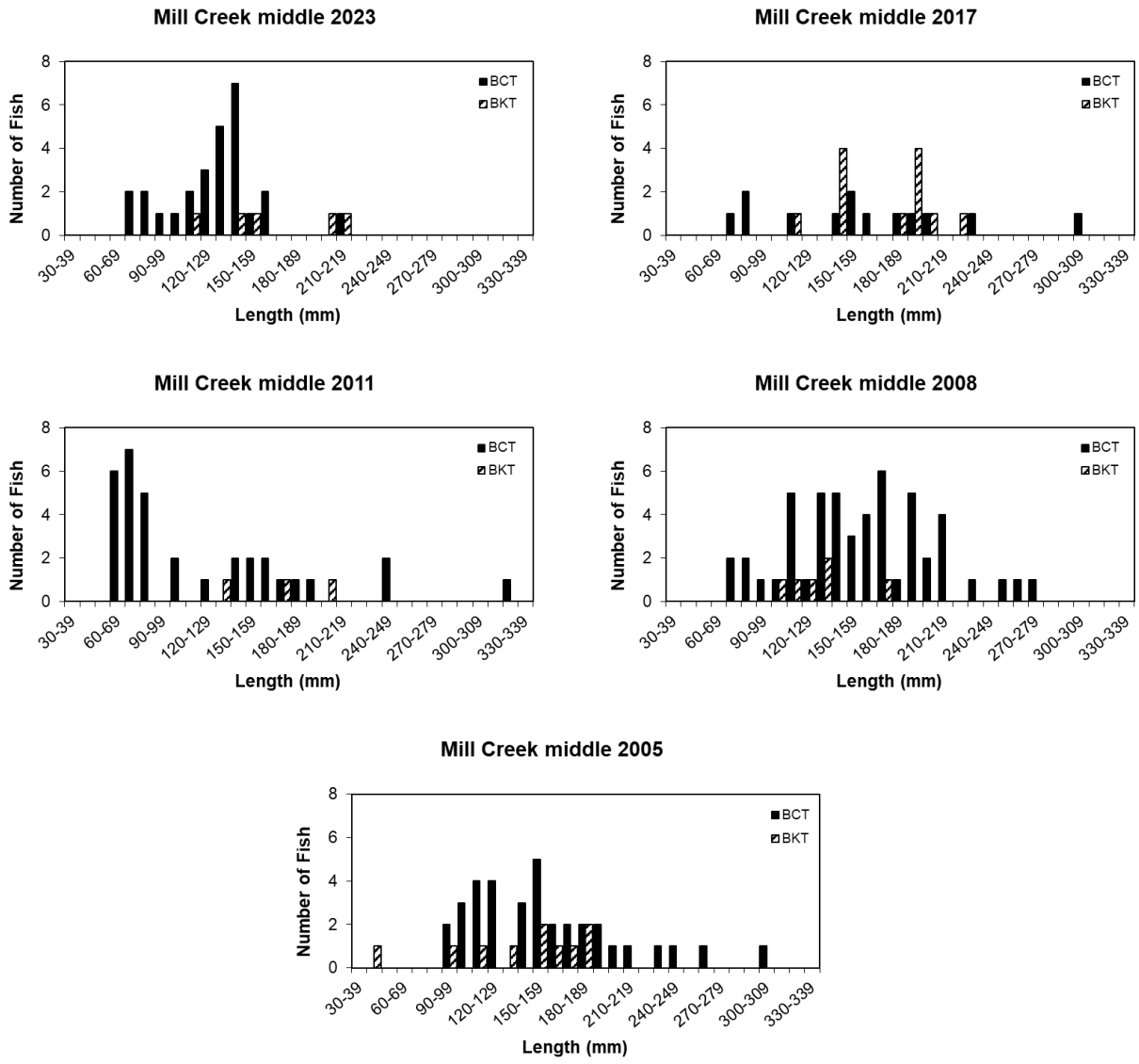

Figure 2. Size distribution of salmonid species sampled in the Mill Creek middle monitoring station, 2005, 2008, 2011, 2017, and 2023.

Table 5. Population statistics for species sampled in the Mill Creek upper station, 2011, 2017, 2020, and 2023.

Year	Species	Total Catch	#/km ± 95% C.I. (#/mi ± 95% C.I.)	kg/ha (lb/ac)	TL (mm)		WT (g)		Mean K
					Mean	Range	Mean	Range	
2023	≥age-1 BCT	3	32±0 (48±0)	17 (15)	193	77-253	125	5-195	1.12
2020	≥age-1 BCT	13	131±7 (211±11)	49 (44)	192	130-356	101	20-397	1.09
2017	≥age-1 BCT	17	173±14 (279±23)	89 (80)	280	167-371	252	45-525	1.04
2011	≥age-1 BCT	1	10±0 (16±0)	<1 (<1)	97		10		1.05

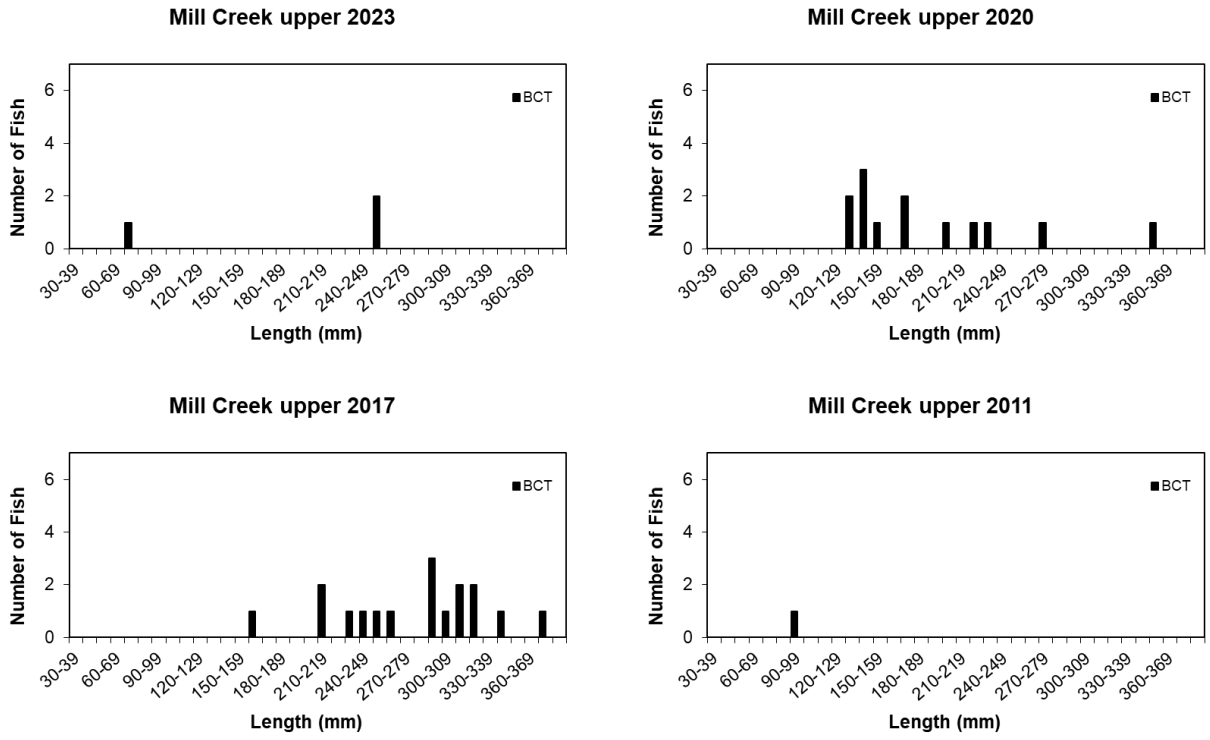

Figure 3. Size distribution of salmonid species sampled in the Mill Creek upper monitoring station, 2011, 2017, 2020, and 2023.

Deadman Creek **IVAQ230B**

Survey

A portion of the reach of Deadman Creek from which four BKT were removed in 2022 (see McKell 2023) was electrofished on July 28, 2023. Because much of the sample reach was covered heavily by riparian vegetation, the station was limited to 52 m of relatively accessible habitat. There were no BCT found in the station; a single adipose-clipped BKT (159 mm TL, stocked in September 2022 as part of BKT triploid swamping) and six Speckled Dace were captured and released. Spot electrofishing of several accessible pools upstream of the survey station produced five additional BKT, all adipose-clipped.

Monitoring

The established monitoring station in the meadow upstream of the North Slope Road was electrofished on July 18, 2023. No fish were sampled in the 100 m station. Even though BCT were restocked upstream of the station following the rotenone treatment in 2020 and marked BKT were downstream in 2022, they have evidently not yet found this reach.

Population Restoration

Two groups of BCT—155 catchable size (mean TL 221 mm) on May 31, and 200 fingerlings (mean TL 82 mm) on November 16—were stocked into the lower portions of the treatment reach to add to the BCT stocked in 2021 and 2022 to boost the BCT population in the drainage.

Carter Creek **IVAQ230C**

Monitoring

The Carter Creek monitoring station, 100 m in length, was electrofished on July 18, 2023. Results of the current and previous surveys are shown in Table 6 and Figure 4. Abundance of BCT was greater in 2023 than any sampling since 2004 (Table 6), but sampling in 2023 was unlike any previous sampling in that no adult BCT were found in the station; instead, the sample was comprised entirely of individuals from the age-1 cohort (Figure 4). This is in contrast to the 2017 sample, which contained only older age-classes (Figure 4). Sculpin unexpectedly appeared in the sample in 2017, and while they were sampled again in 2023, sculpin had experienced a decrease in abundance to sparse (Table 6).

Table 6. Population statistics for species sampled in the Carter Creek monitoring station, 2004, 2005, 2008, 2011, 2017, and 2023.

Year	Species	Total Catch	**#/km** ± 95% C.I. **(#/mi** ± 95% C.I.**)**	kg/ha (lb/ac)	TL (mm)		WT (g)		Mean K
					Mean	Range	Mean	Range	
2023	≥age-1 BCT SC	19	193±13 (310±21) sparse	8 (8)	85	65-102	6	3-10	0.95
2017	≥age-1 BCT SC	5	43±0 (69±0) abundant	17 (15)	187	157-232	72	48-124	1.06
2011	none captured								
2008	≥age-1 BCT	11	119±25 (192±40)	17 (15)	143	62-245	35	1-116	0.82
2005	≥age-1 BCT age-0 BCT	12 66	192±22 (207±35) 758±114 (1220±183)	14 (12)	125 50	83-194 34-60	22	4-47	0.99
2004	≥age-1 BCT age-0 BCT	24 2	240±5 (387±7)	11 (9)	104 35	73-197 33-36	13	3-65	0.89

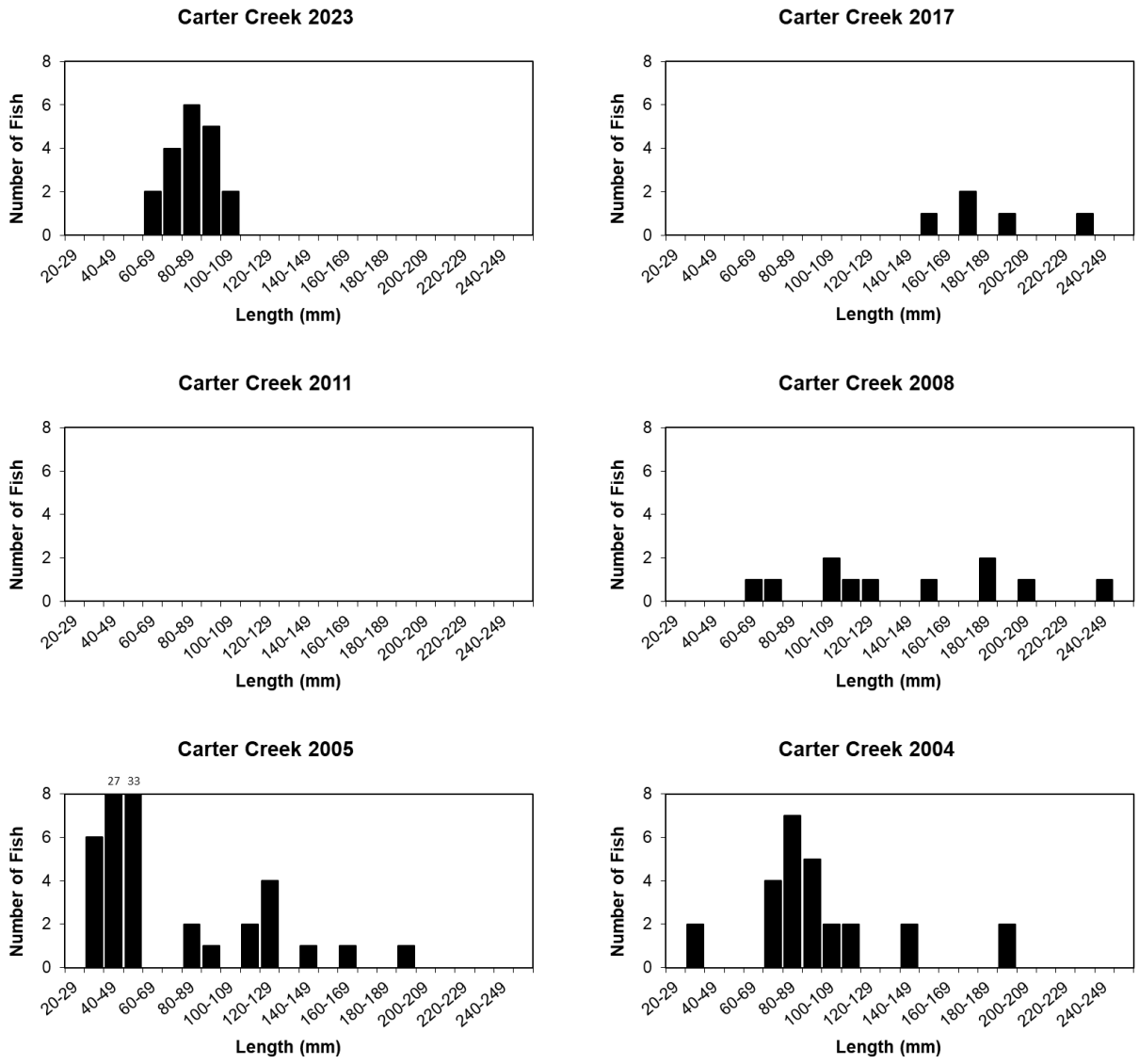

Figure 4. Size distribution of BCT sampled in the Carter Creek monitoring station, 2004, 2005, 2008, 2011, 2017, and 2023.

McKenzie Creek **IVAQ230E**

Monitoring

The McKenzie Creek monitoring station, 100 m in length, was electrofished on July 18, 2023. Results of the current and the previous survey are shown in Table 7 and Figure 5. Based on three data points, the BCT population in this stream is maintained at fairly low densities (Table 7). Although the population is small, there has been a variety of size-classes present during each sampling event, until 2023 when only a single age-class was represented (Figure 5). Once again, BKT were found in the station in 2023. Hopefully, the BCT will maintain a population in McKenzie Creek and resist what is likely to be replacement by BKT.

Table 7. Population statistics for species sampled in the McKenzie Creek monitoring station, 2008, 2017, and 2023.

Year	Species	Total Catch	#/km ± 95% C.I. (#/mi ± 95% C.I.)	kg/ha (lb/ac)	TL (mm)		WT (g)		Mean K
					Mean	Range	Mean	Range	
2023	≥age-1 BCT	3	30±0 (48±0)	6 (5)	171	163-178	51	43-58	1.02
	≥age-1 BKT	2	present		207	199-214	112	94-129	1.25
	SC		abundant						
2017	≥age-1 BCT	5	53±19 (86±31)	8 (7)	151	60-223	46	2-109	0.98
	≥age-1 BKT	1	present		157		41		1.06
	SC		abundant						
2008	≥age-1 BCT	12	121±7 (195±12)	19 (17)	165	82-260	50	5-133	0.89
	SC		abundant						

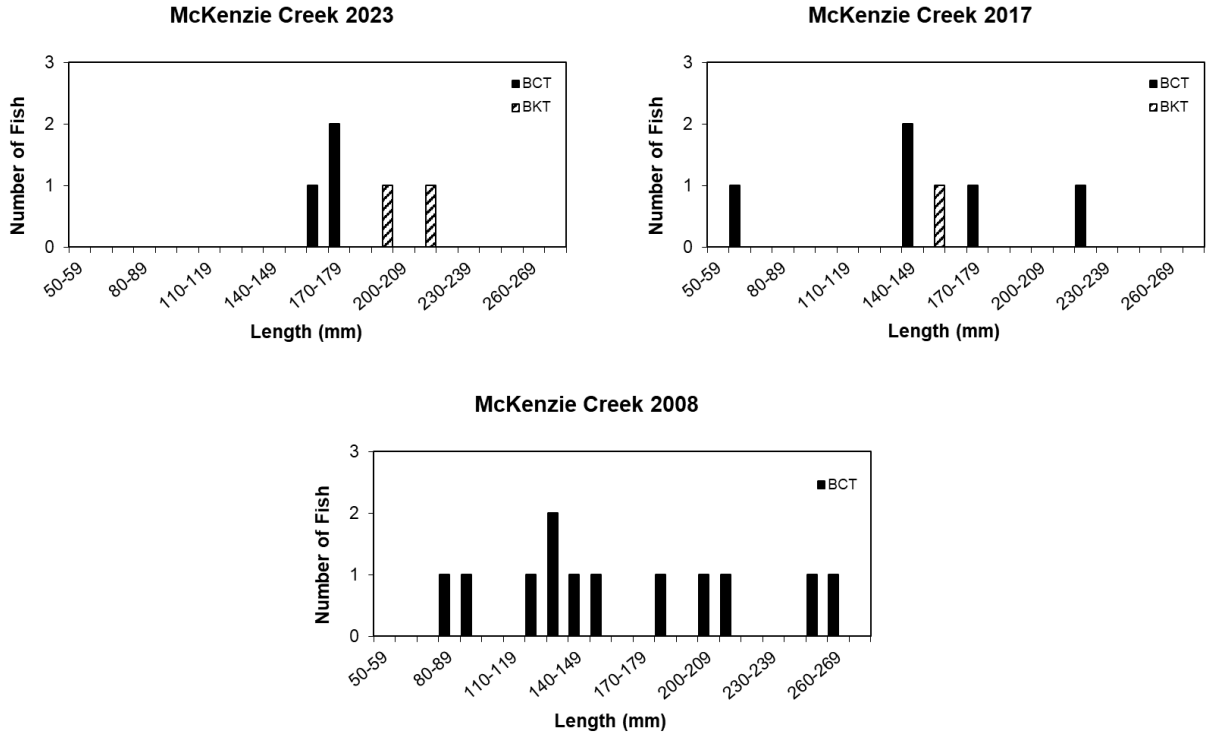

Figure 5. Size distribution of salmonid species sampled in the McKenzie Creek monitoring station, 2008, 2017, and 2023.

North Fork Mill Creek **IVAQ230F**

Monitoring

The upper North Fork Mill Creek monitoring station, 100 m in length, was electrofished on July 18, 2023. Results of the current and the previous surveys are shown in Table 8 and Figure 6. The BCT population in this portion of the North Fork is being maintained at moderate densities (Table 8). Although the population is small, there has been a variety of size-classes present during each sampling event and recruitment appears consistent (Figure 6). To date, no BKT have been sampled in this station.

Table 8. Population statistics for species sampled in the North Fork Mill Creek upper monitoring station, 2008, 2011, 2017, and 2023.

Year	Species	Total Catch	#/km ± 95% C.I. (#/mi ± 95% C.I.)	kg/ha (lb/ac)	TL (mm)		WT (g)		Mean K
					Mean	Range	Mean	Range	
2023	≥age-1 BCT	30	346±96 (556±155)	10 (9)	90	44-186	12	1-74	0.92
2017	≥age-1 BCT	15	160±34 (257±54)	15 (14)	126	42-194	28	1-69	0.95
2011	≥age-1 BCT	15	149±16 (240±25)	19 (17)	144	84-206	41	8-99	1.15
2008	≥age-1 BCT	36	360±7 (579±11)	22 (19)	116	61-194	19	2-60	1.04

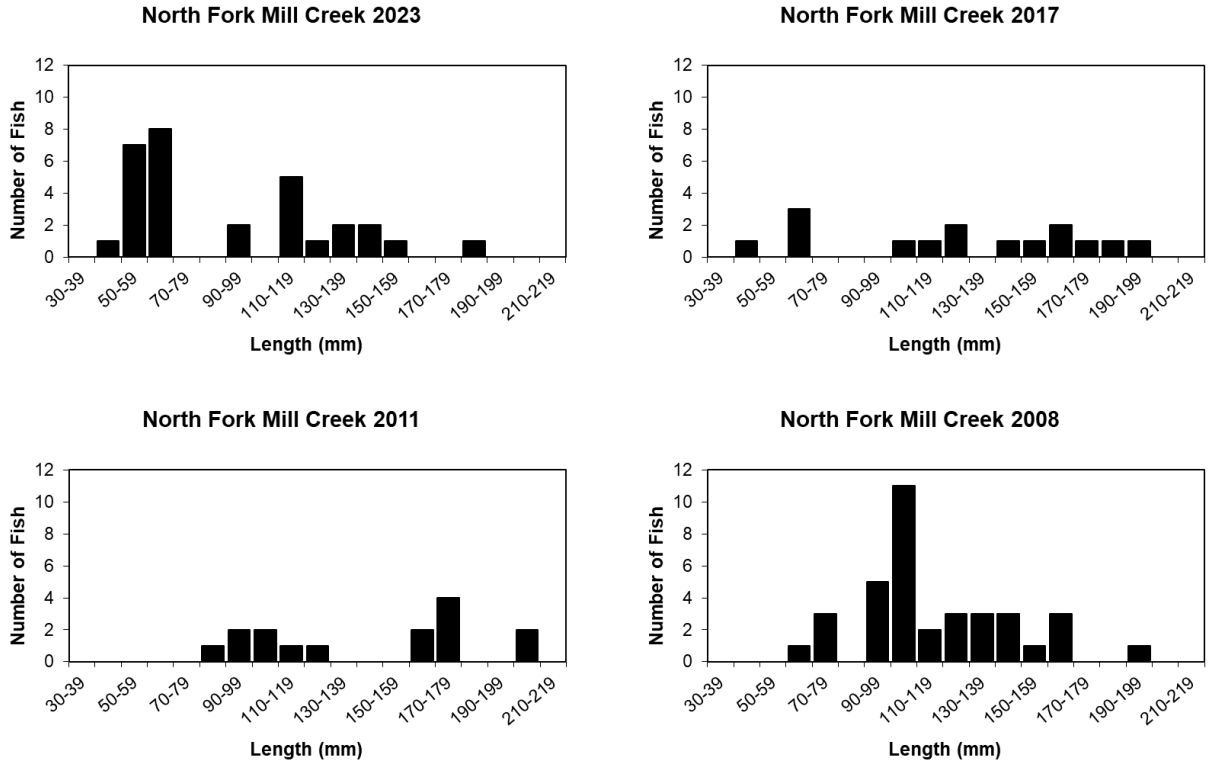

Figure 6. Size distribution of BCT sampled in the North Fork Mill Creek upper monitoring station, 2008, 2011, 2017, and 2023.

West Fork Bear River **IVAQ240**

Monitoring

The West Fork Bear River monitoring station, 100 m in length, was electrofished by a USFS crew on August 16, 2023. Results of the current and the previous surveys are shown in Table 9 and Figure 7. The BCT population in this station showed a decline between 2013 and 2019 but exhibited an increase in 2023 (Table 9). This reach appears to be primarily spawning/rearing habitat for BCT, as all sampled individuals have represented age-1 or age-2 cohorts, except one small adult (TL 163 mm) sampled in 2013 (Figure 7). Sculpin continue to be abundant in the station.

Table 9. Population statistics for species sampled in the West Fork Bear River monitoring station, 2013, 2019, and 2023.

Year	Species	Total Catch	#/km ± 95% C.I. (#/mi ± 95% C.I.)	kg/ha (lb/ac)	TL (mm)		WT (g)		Mean K
					Mean	Range	Mean	Range	
2023	≥age-1 BCT SC	9	98±33 (158±53) abundant	3 (3)	80	62-129	11	5-23	1.12
2019	≥age-1 BCT SC	2	20 ± 0 (32 ± 0) abundant	2 (2)	120	119-120	16		0.94
2013	≥age-1 BCT SC	44	476 ± 61 (766 ± 98) abundant	17 (15)	92	69-163	8	3-42	0.93

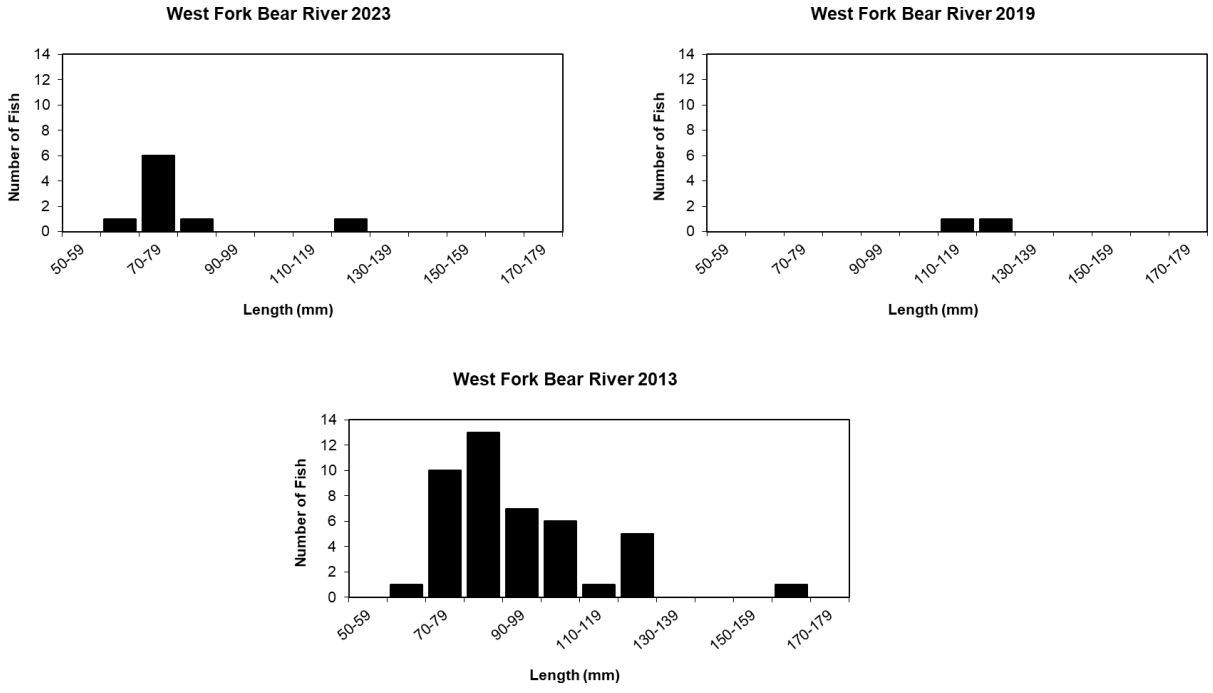

Figure 7. Size distribution of BCT sampled in the West Fork Bear River monitoring station, 2013, 2019, and 2023.

Deer Creek **IVAQ240A**

Monitoring

The Deer Creek monitoring station, 100 m in length, was electrofished on July 18, 2023. Results of the current and the previous surveys are shown in Table 10 and Figure 8. The BCT population in the Deer Creek monitoring station exhibited a decline in number during each sampling since the initial survey in 1998 but showed an increase in 2023 (Table 10). During each sampling there has been a variety of size-classes represented, indicating recruitment is occurring consistently (Figure 8). Sculpin returned to the sample in 2023 after an absence in 2017.

Table 10. Population statistics for species sampled in the Deer Creek monitoring station, 1998, 2006, 2011, 2017, and 2023.

Year	Species	Total Catch	#/km ± 95% C.I. (#/mi ± 95% C.I.)	kg/ha (lb/ac)	TL (mm)		WT (g)		Mean K
					Mean	Range	Mean	Range	
2023	≥age-1 BCT SC	16	272±25 (438±41) sparse	28 (25)	122	76-231	33	4-140	1.09
2017	≥age-1 BCT	12	132±50 (213±80)	29 (26)	136	75-261	45	2-178	0.87
2011	≥age-1 BCT SC	33	264±27 (424±43) abundant	60 (54)	136	57-253	43	2-183	1.14
2006	≥age-1 BCT SC	39	476±51 (766±82) abundant	27 (24)	91	55-197	14	1-84	0.99
1998	≥age-1 BCT SC	44	512±125 (824±201) common	75 (67)	157	70-280	49	2-200	0.86

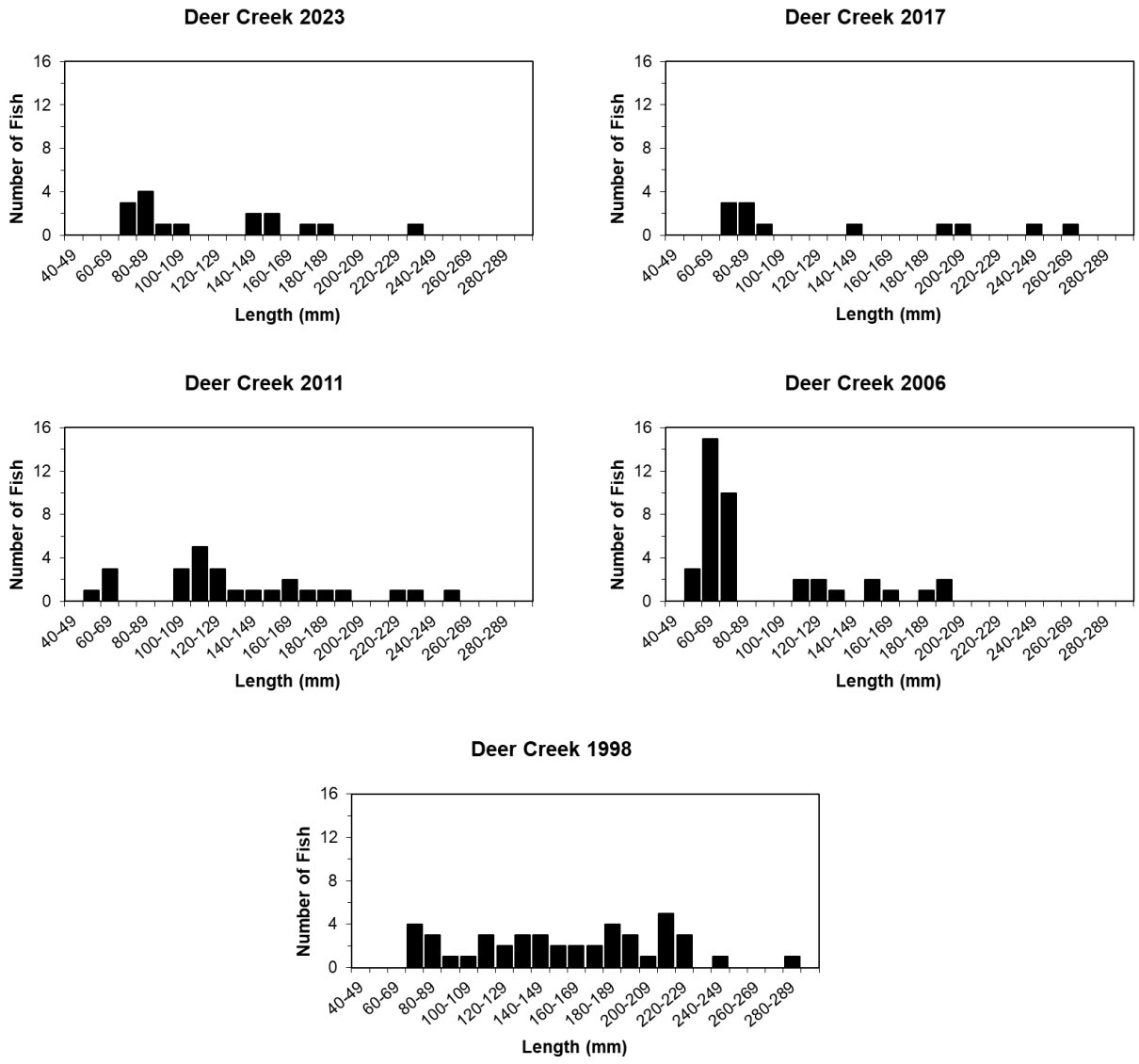

Figure 8. Size distribution of BCT sampled in the Deer Creek monitoring station, 1998, 2006, 2011, 2017, and 2023.

Thompson Creek **IVAQ240A01**

Monitoring

The Thompson Creek monitoring station, 100 m in length, was electrofished on July 18, 2023. Results of the current and the previous surveys are shown in Table 11 and Figure 9. The BCT population in the Thompson Creek monitoring station exhibited a 75% decline in both number and biomass between 2011 and 2017 and has apparently remained at low density since 2017 (Table 11). Recruitment has also been less consistent than it was previously, with the age-1 cohort missing from the sample in both 2017 and 2023 (Figure 9).

Table 11. Population statistics for species sampled in the Thompson Creek monitoring station, 2006, 2011, 2017, and 2023.

Year	Species	Total Catch	#/km ± 95% C.I. (#/mi ± 95% C.I.)	kg/ha (lb/ac)	TL (mm)		WT (g)		Mean K
					Mean	Range	Mean	Range	
2023	≥age-1 BCT	3	40±68 (64±109)	27 (24)	217	166-250	114	50-160	1.05
2017	≥age-1 BCT	5	50±0 (80±0)	25 (23)	177	155-224	49	28-96	0.80
2011	≥age-1 BCT	33	222±6 (358±9)	95 (84)	162	73-312	67	5-325	1.04
2006	≥age-1 BCT age-0 BCT	16 1	132±5 (212±8) 8±0 (13±0)	21 (18)	118 21	67-202	23	2-82	1.03

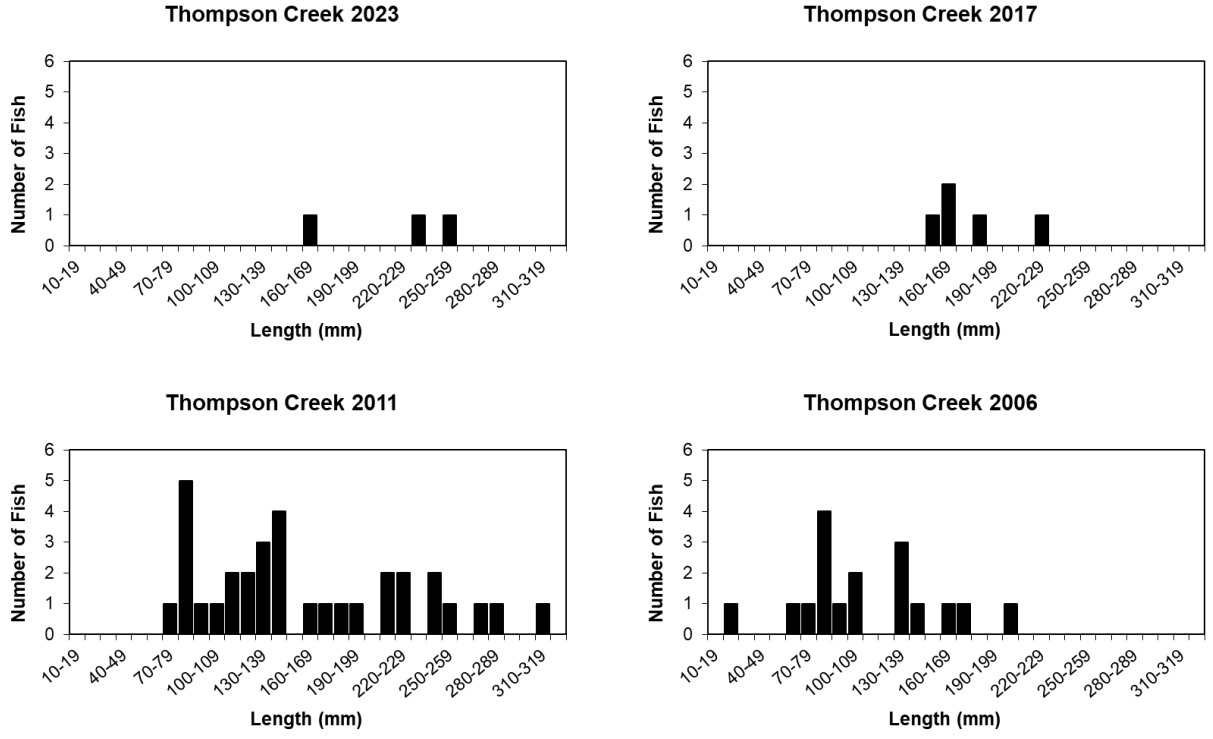

Figure 9. Size distribution of BCT sampled in the Thompson Creek monitoring station, 2006, 2011, 2017, and 2023.

East Fork Bear River **IVAQ250**

Monitoring

The East Fork monitoring station downstream of the scout camp, 150 m in length, was electrofished on July 20, 2023. Results of the current and previous surveys are shown in Table 12 and Figure 10. Flows at the time of monitoring were higher than normal, which resulted in less efficient electrofishing; discharge measured at the USGS gage on the Bear River downstream of the confluence of all forks was three times what it was on the date the East Fork was monitored in 2018. Due to poor capture efficiency (i.e. more fish captured on the second electrofishing pass than the first), population estimates are not available for BCT or MWF, and the estimate for BKT is questionable with the wide confidence interval. Regardless, the actual population size of each of the salmonid species appears to be small (Table 12 and Figure 10). Although the number of sculpin collected in 2023 fell within the "common" category, they likely remain abundant in the station and the high flows made capture difficult (Table 12). Speckled Dace were also among the sample.

Table 12. Population statistics for species sampled in the East Fork Bear River station, 2003, 2008, 2018, and 2023.

Year	Species	Total Catch	**#/km** ± 95% C.I. (**#/mi** ± 95% C.I.)	kg/ha (lb/ac)	TL (mm)		WT (g)		Mean K
					Mean	Range	Mean	Range	
2023	≥age-1 BCT	1	present		99		8		0.82
	≥age-1 BKT	3	27±45 (43±73)	3 (3)	193	114-320	137	14-368	1.00
	age-0 BKT	1	7±0 (11±0)		57		2		
	MWF	1	present		305		307		1.08
	SC		common						
	SPD		sparse						
2018	≥age-1 BCT	2	13±0 (21±0)	<1 (<1)	86	81-90	6	36-779	0.92
	≥age-1 BKT	38	280±53 (451±85)	16 (14)	162	102-275	53	22-190	1.07
	age-0 BKT	6	42±10 (67±16)		62	50-79	5	1-10	
	MWF	1	7±0 (11±0)	1 (1)	236				
	SC		abundant						
2008	≥age-1 BCT	3	21±0 (34±0)	2 (2)	216	152-262	106	35-165	0.95
	≥age-1 BKT	12	89±15 (143±24)	4 (4)	161	117-200	45	16-80	1.02
	age-0 BKT	6			59	41-72	2	1-4	
	MWF	1	7±0 (11±0)		52		1		
	SC		abundant						
	SPD		sparse						
2003	≥age-1 BCT	20	169±19 (272±30)	9 (8)	167	91-270	55	7-197	0.96
	age-0 BCT	1			34				
	≥age-1 BKT	15	126±13 (203±22)	8 (7)	170	120-250	68	19-204	1.07
	age-0 BKT	1	8±0 (13±0)		67		2		
	MWF	9	74±0 (119±0)	19 (17)	278	231-325	268	138-552	1.17
	SC		abundant						

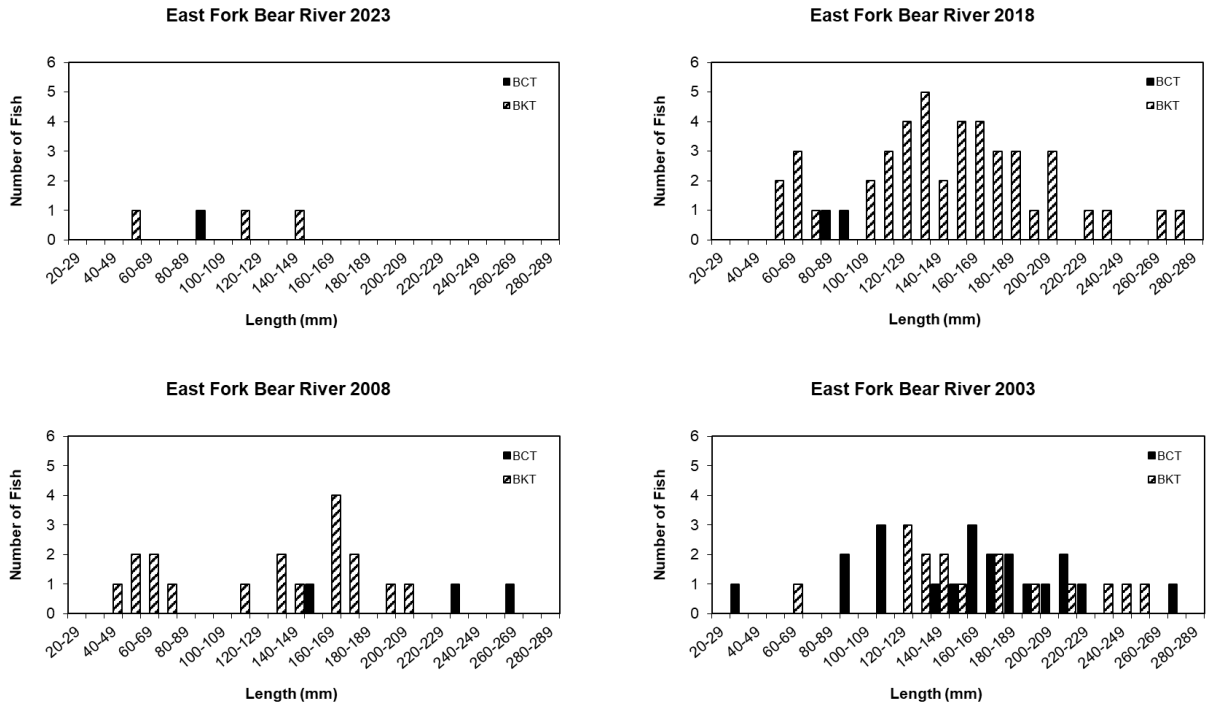

Figure 10. Size distribution of salmonid species sampled in the East Fork Bear River monitoring station, 2003, 2008, 2018, and 2023.

Stillwater Fork **IVAQ260**

Monitoring

Monitoring was planned for two stations on Stillwater Fork; however, high flows made sampling ineffective at the lower station and unsafe at the upper station.

Lower Station

This monitoring station, 118 m in length, was electrofished on July 17, 2023. As noted above, electrofishing was inefficient as a result of high stream flows. Data are included in Table 13 but are not particularly useful. Two MWF were captured on the second electrofishing pass, but none were captured on the first pass. No BKT were captured, but a few were observed evading capture.

Upper Station

This site, located mid-drainage at the confluence with Ostler Fork, was visited on July 19, 2023, but flows were determined to be too high for safe and efficient electrofishing.

Table 13. Population statistics for species sampled in the Stillwater Fork stations, 2003, 2008, 2018, and 2023.

Year	Species	Total Catch	#/km ± 95% C.I. (#/mi ± 95% C.I.)	kg/ha (lb/ac)	TL (mm)		WT (g)		Mean K
					Mean	Range	Mean	Range	
Lower station									
2023	MWF	2	present		370	344-395	572	413-730	1.10
	SC		common						
2008	≥age-1 BCT	3	25±0 (41±0)	5 (4)	239	204-288	133	78-207	0.92
	≥age-1 BKT	15	136±29 (218±46)	13 (12)	181	123-221	69	16-123	1.06
	age-0 BKT	1			48		1		
	MWF	14	119±0 (191±0)	22 (20)	246	204-296	136	76-220	0.89
	MTS		sparse						
	SC		abundant						
2003	≥age-1 BCT	6	55±0 (89±0)	3 (3)	175	155-193	58	32-73	1.09
	≥age-1 BKT	11	150±186 (241±299)	14 (13)	183	112-276	87	17-246	1.16
	age-0 BKT	2			74	73-74	5	4-5	
	MWF	6	57±14 (92±22)	6 (5)	185	54-285	91	2-219	1.00
	SC		abundant						
Upper station									
2023	Not sampled due to high flows								
2018	≥age-1 BCT	4	43±28 (69±45)	3 (2)	163	150-180	43	30-66	0.96
	≥age-1 BKT	19	188±23 (302±37)	20 (18)	184	107-264	73	11-212	1.03
	SC		common						

Hayden Fork **IVAQ270**

Monitoring

The monitoring station in Hayden Fork, 100 m in length, was electrofished by a USFS crew on August 15, 2023. Results of the current and previous surveys are shown in Table 14 and Figure 11. Based on three data points for this station, the BCT population has experienced some fluctuation but at present appears to be maintaining numbers in the midst of a growing population of BKT (Table 14 and Figure 11). The estimated number of BKT in the reach in 2023 is not available due to a lack of electrofishing depletion, but a very strong age-0 cohort was represented (Table 14 and Figure 11). Sculpin were unexpectedly sparse in the station, exhibiting a decrease from both previous sampling events (Table 14).

Table 14. Population statistics for species sampled in the Hayden Fork monitoring station, 2013, 2018, and 2023.

Year	Species	Total Catch	#/km ± 95% C.I. (#/mi ± 95% C.I.)	kg/ha (lb/ac)	TL (mm)		WT (g)		Mean K
					Mean	Range	Mean	Range	
2023	≥age-1 BCT	10	101±9 (163±14)	7 (6)	119	81-198	19	5-74	0.92
	≥age-1 BKT	17	present		107	90-145	12	7-26	0.95
	age-0 BKT	54	656±181 (1056±291)	5 (4)	56	45-62			
	SC		sparse						
2018	≥age-1 BCT	2	21±0 (34±0)	2 (2)	146	86-205	41	5-76	0.83
	≥age-1 BKT	26	278±18 (448±29)	19 (17)	129	87-260	29	6-159	0.98
	age-0 BKT	21	234±38 (377±61)		46	36-56			
	SC		abundant						
2013	≥age-1 BCT	6	80±96 (129±155)	4 (3)	123	76-192	20	2-63	0.75
	age-0 BCT	2			48	47-48			
	≥age-1 BKT	10	107±28 (172±44)	13 (11)	153	100-231	52	12-166	1.05
	age-0 BKT	2	20±0 (32±0)		53	50-55			
	SC		common						

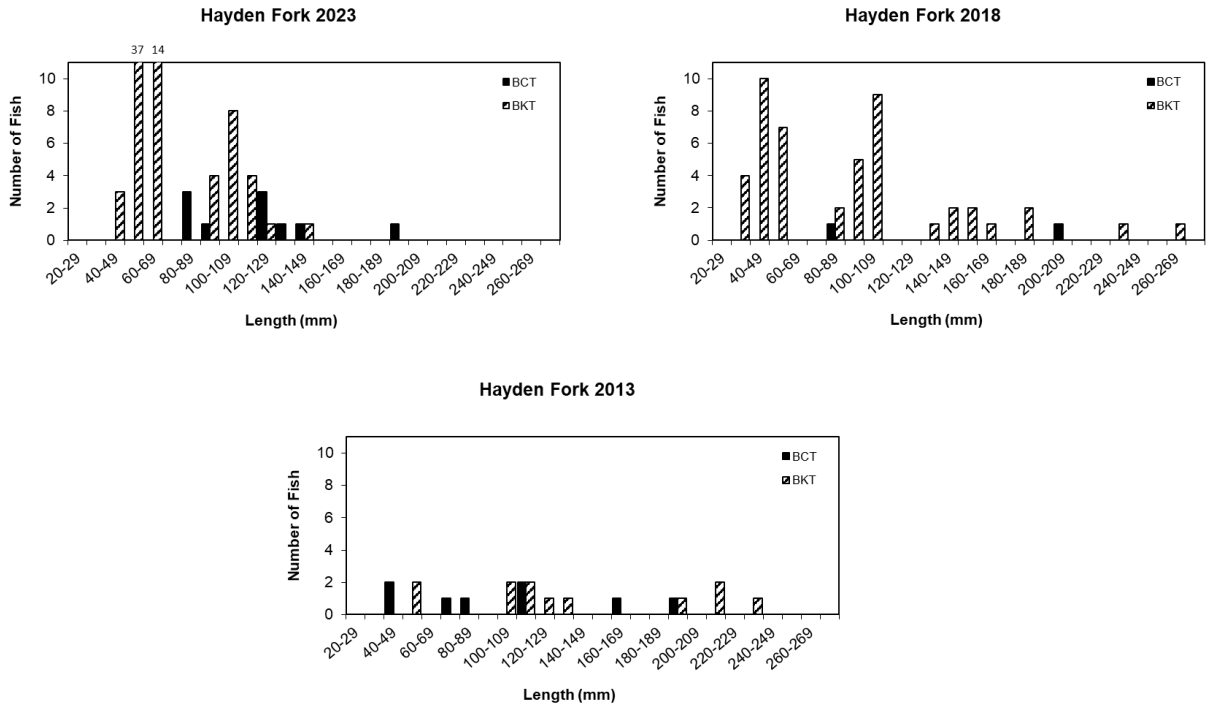

Figure 11. Size distribution of salmonid species sampled in the Hayden Fork monitoring station, 2013, 2018, and 2023.

Gold Hill Creek **IVAQ270A**

Monitoring

The 2023 monitoring station, 200 m in length, was electrofished on July 17, 2023. This was a NLSC reintroduction site in 2010 and has been sampled annually since then (Table 15 and Figure 12). Based on the data points for this station, the BCT population has experienced fluctuations but maintained moderate-high densities (Table 15 and Figure 12). Recruitment has been documented each year, with relatively strong age-1 cohorts present during most years (Figure 12). NLSC were abundant in the station during 2010, absent in 2011, sparse in 2012-2015, and absent again in 2016-2023 (Table 15).

Table 15. Population statistics for species sampled in Gold Hill Creek, 2010-2023.

Year	Species	Total Catch	#/km ± 95% C.I. (#/mi ± 95% C.I.)	kg/ha (lb/ac)	TL (mm)		WT (g)		Mean K
					Mean	Range	Mean	Range	
2023	≥age-1 BCT	61	383±115 (617±186)	56 (50)	113	38-273	27	1-187	0.93
2022	≥age-1 BCT	14	151±38 (243±61)	25 (23)	138	44-255	52	7-171	1.15
2021	≥age-1 BCT	40	single pass		114	50-245	24	1-158	1.10
2020	≥age-1 BCT	73	376±19 (606±30)	34 (31)	118	54-237	24	1-126	0.85
2019	≥age-1 BCT	84	449±41 (722±66)	75 (67)	124	53-250	35	1-137	0.92
2018	≥age-1 BCT	98	1025±65 (1650±105)		90	45-219			
2017	≥age-1 BCT	76	318±37 (511±60)		129	47-236	30	4-124	0.96
2016	≥age-1 BCT	49	595±106 (958±170)	126 (113)	105	50-225	31	1-119	0.88
2015	≥age-1 BCT NLSC	36 1	392±66 (631±106) 10±0 (16±0)	65 (58)	122 95	46-219	36 8	1-125	1.04
2014	≥age-1 BCT NLSC	53 1	421±19 (677±30) 8±0 (13±0)	51 (46)	116 90	49-212	29 8	3-89	0.99
2013	≥age-1 BCT NLSC	153 1	781±23 (1256±38) 5±0 (8±0)	33 (29)	90 72	39-220	12 4	1-100	0.98
2012	≥age-1 BCT NLSC	123 3	564±68 (908±109) 12±0 (20±0)	27 (24)	93 61	46-223 55-66	12 2	1-90 2-3	0.91
2011	≥age-1 BCT	59	342±71 (551±114)	16 (14)	90	42-249	15	1-134	0.92
2010	≥age-1 BCT age-0 BCT NLSC	38 2	210±39 (338±63) 10±0 (16±0) abundant (stocked)	24 (21)	110 27	62-232 27-27	21	1-124	0.86

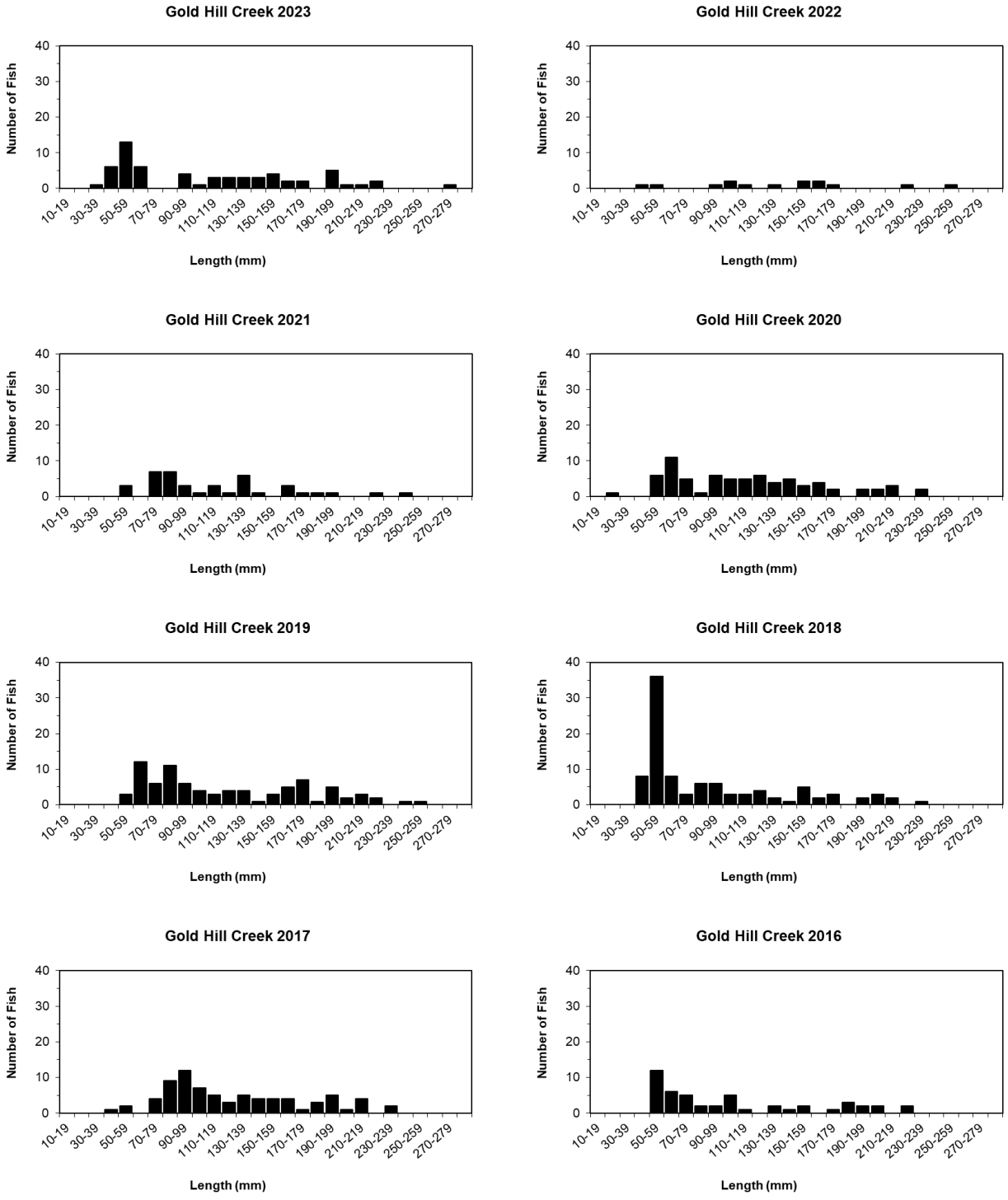

Figure 12. Size distribution of BCT sampled in Gold Hill Creek, 2016-2023.

Rich County Subunit

South Branch Otter Creek — IVAQ170A

Monitoring

This station, 100 m in length, was electrofished on August 11, 2023. Results of this and the previous sampling events are summarized in Table 16 and Figure 13. The BCT population demonstrated a slight increase in abundance between 2021 and 2023 but a large increase in biomass during the same period (Table 16). The BCT population appears to still be in the process of becoming established in this reach following rotenone treatments in 2015 and 2016, and reintroduction of BCT in 2016.

Table 16. Population statistics for species sampled in South Branch Otter Creek, 2015-2023.

Year	Species	Total Catch	#/km ± 95% C.I. (#/mi ± 95% C.I.)	kg/ha (lb/ac)	TL (mm)		WT (g)		Mean K
					Mean	Range	Mean	Range	
2023	≥age-1 BCT	10	100±0 (161±0)	44 (40)	181	128-286	69	19-206	0.91
2021	≥age-1 BCT	6	63±15 (101±24)	10 (9)	155	109-209	43	12-98	0.99
2019	No fish sampled								
2016	BCT stocked post-treatment								
2015	≥age-1 BKT	1	9±0 (14±0)	2 (2)	168	44-66	46	20-503	0.97
	age-0 BKT	11	present		51	126-361	114		0.99
	≥age-1 BNT	23	206±4 (331±7)	122 (109)	203	35-45			
	age-0 BNT	15	154±61 (248±98)		40	44-90			
	SC	554	abundant		60				

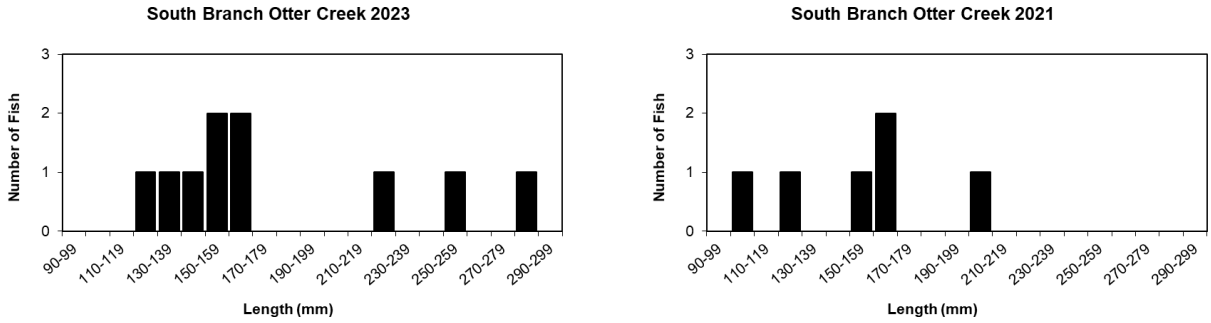

Figure 13. Size distribution of BCT sampled in South Branch Otter Creek monitoring station, 2021 and 2023.

Middle Branch Otter Creek — IVAQ170A01

Monitoring

In an effort to monitor the restoration of BCT in the Otter Creek drainage, two stations in the Middle Branch were sampled in 2023, replicating sites sampled in 2019 and 2021 to evaluate post-treatment fish densities. The two sites, both upstream of the Pole Line Road, were electrofished on August 11, 2023. The lower of the two stations was within a BLM riparian exclosure and the other directly upstream and outside of the exclosure. Both stations were 100 m in length.

Lower Station

The BCT population at this site exhibited a slight drop in abundance between 2021 and 2023 but remained at a moderate level (Table 17). Despite the decrease in population abundance, the BCT biomass estimate more than doubled since the previous sampling. Curiously, the younger age-classes were virtually absent from the sample, with only a single individual representing the age-1 cohort and just two from the age-2 cohort (Figure 14); this is in contrast to the 2021 sample in which the younger age-class(es) dominated the sample. Sculpin have increased in abundance since 2021.

Upper Station

Although a single age-1+ individual was captured in 2023, compared with 2021 when no BCT were captured in this station, the sampling of several age-0 individuals in 2023 (Table 17 and Figure 15) suggests this reach is being used for spawning. Sculpin remained common in this station.

Based on the data points for these stations, which were spatially contiguous and separated only by a barbed-wire fence, the habitat within the BLM riparian exclosure appears to be more preferable by BCT than the habitat immediately upstream. This was also apparent in the 2015 BNT population and biomass estimates, the lower station exhibiting double and quadruple, respectively, those of the upper station (Table 14).

Table 17. Population statistics for species sampled in Middle Branch Otter Creek, 2003, 2015, 2019, 2021, and 2023.

Year	Species	Total Catch	#/km ± 95% C.I. (#/mi ± 95% C.I.)	kg/ha (lb/ac)	TL (mm)		WT (g)		Mean K
					Mean	Range	Mean	Range	
Lower Station									
2023	≥age-1 BCT SC	22	231±34 (372±54) abundant	195 (174)	232	104-318	127	8-276	0.90
2021	≥age-1 BCT SC	28	303±53 (487±86) common	92 (82)	159	102-247	46	10-146	0.91
2019	≥age-1 BCT	11	110±8 (177±13)	72 (64)	213	126-297	107	17-245	0.90
2015	≥age-1 BNT age-0 BNT SC	38 4 118	359±3 (577±5) present abundant	283 (253)	215 48	118-332 43-51	126	18-358	1.04
2003	≥age-1 BKT age-0 BKT SC	19 21 226	193±13 (310±21) 216±22 (348±35) abundant	168 (150) 6 (5)	267 85	173-372 61-105	222 7	62-512 3-13	1.12
Upper Station									
2023	≥age-1 BCT age-0 BCT SC	1 15	10±0 (16±0) 154±16 (247±26) common	3 (3)	144 30	22-36	36		1.21
2021	SC		common						
2019	≥age-1 BCT	2	20±0 (32±0)	14 (12)	224	203-245	97	82-112	0.87
2015	≥age-1 BNT age-0 BNT SC	18 5 19	198±47 (319±76) present common	71 (64)	155 44	110-270 40-52	48	14-198	1.03

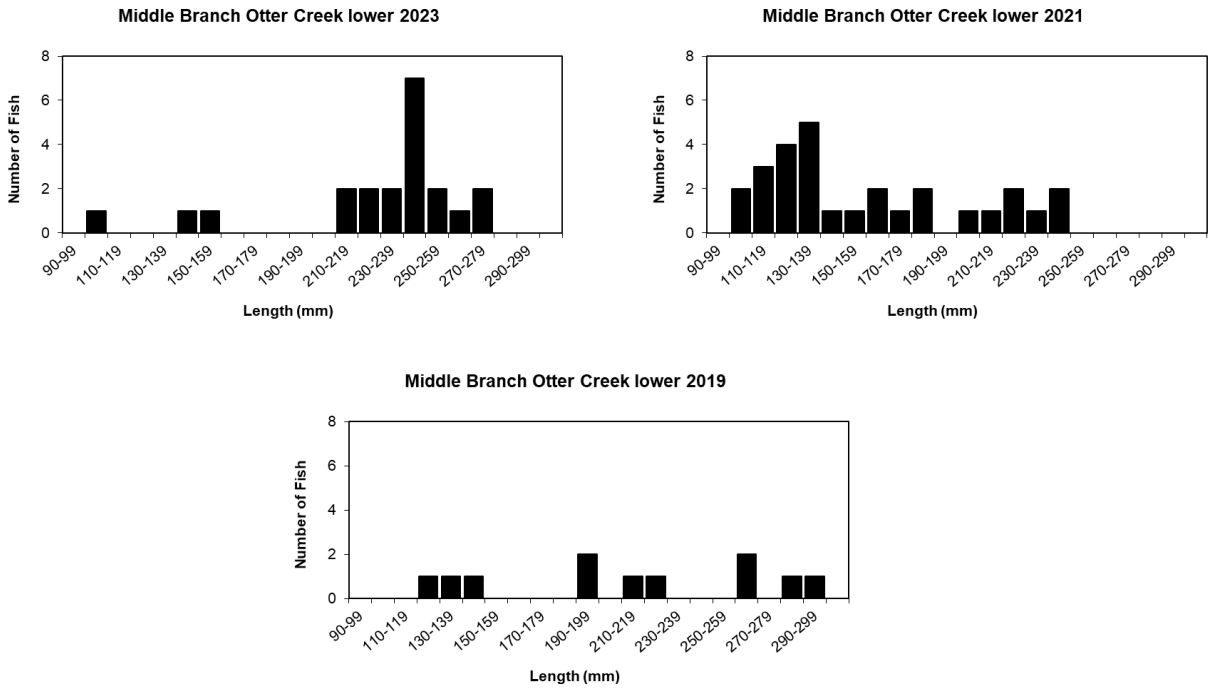

Figure 14. Size distribution of BCT sampled in the Middle Branch Otter Creek lower monitoring station, 2019, 2021, and 2023.

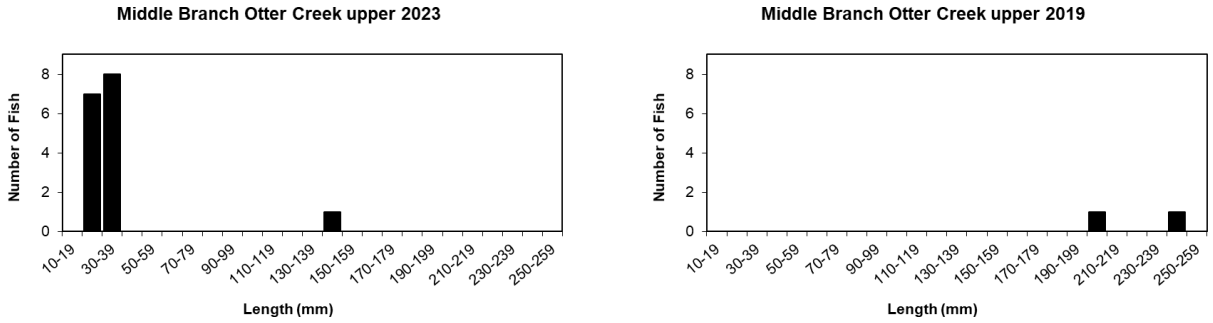

Figure 15. Size distribution of BCT sampled in the Middle Branch Otter Creek upper monitoring station, 2019 and 2023.

NORTHERN BONNEVILLE GMU
Weber River Subunit

Strawberry Creek **IVAP060**

Monitoring

The Strawberry Creek monitoring station, 100 m in length, was electrofished on July 11, 2023. Results of this and prior surveys are shown in Table 18 and Figure 16. The data collected in 2023 suggest the BCT population size has rebounded slightly since the decline observed during the 2018 sampling (Table 18), although the estimated biomass continued on a negative trend. The length-frequency distribution shows the same narrowness in the range of size-classes that was observed in 2018 (Figure 16). Even though the population demographic within the station appeared to be somewhat homogeneous, larger individuals remain in the stream near the station, as several BCT larger than those sampled in the station were visually observed in a deep pool a short distance downstream.

Table 18. Population statistics for species sampled in the Strawberry Creek monitoring station, 1996, 2007, 2013, 2018, and 2023.

Year	Species	Total Catch	**#/km** ± 95% C.I. **(#/mi** ± 95% C.I.**)**	kg/ha (lb/ac)	TL (mm)		WT (g)		Mean K
					Mean	Range	Mean	Range	
2023	≥age-1 BCT	17	188±52 (302±83)	5 (4)	101	80-142	11	5-28	0.98
2018	≥age-1 BCT	15	154±16 (247±26)	12 (11)	125	92-156	19	8-45	0.93
2013	≥age-1 BCT age-0 BCT	54 32	557±37 (896±59) 441±256 (710±412)	52 (46)	124 38	87-215 29-45	21	6-95	0.99
2007	≥age-1 BCT age-0 BCT	39 9	492±109 (791±176)	47 (42)	121 42	85-239 36-47	22	6-136	0.99
1996	≥age-1 BCT	5	50±0 (80±0)	19 (17)	196	131-244	102	20-171	1.07

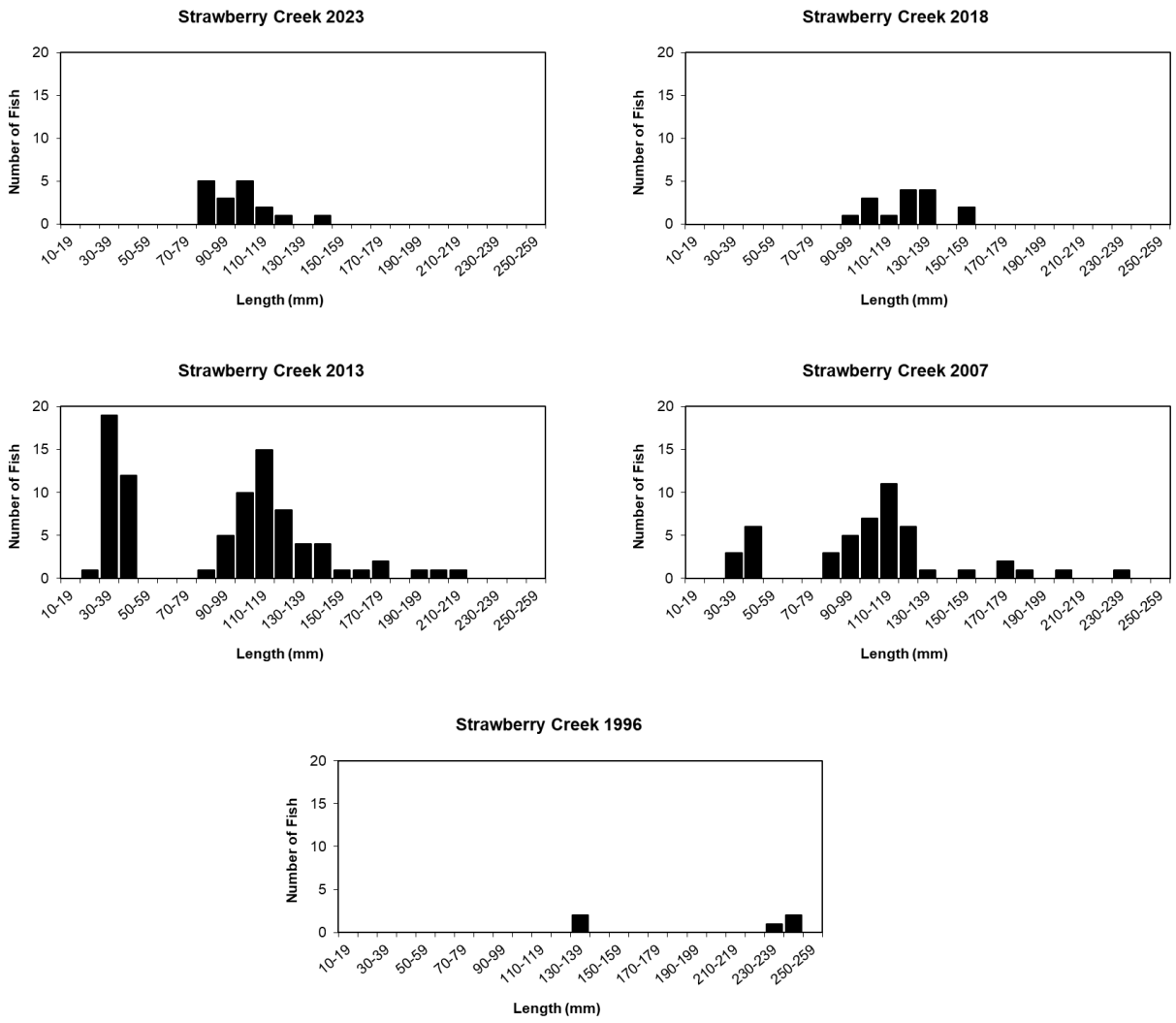

Figure 16. Size distribution of BCT sampled in the Strawberry Creek monitoring station, 1996, 2007, 2013, 2018, and 2023.

Jacobs Creek **IVAP065**

Monitoring

The Jacobs Creek monitoring station, 100 m in length, was electrofished on July 11, 2023. Results of this and the prior surveys are shown in Table 19 and Figure 17. Based on three data points for this station the BCT population has experienced a decrease in number by half since the 2018 sampling and also lost a large majority (>75%) of the previously estimated biomass (Table 19). The length-frequency distribution for 2023 is strikingly similar to 2014, comprised of only age-0 individuals (Figure 17). Despite the decrease in population size, the BCT population remained moderately abundant.

Table 19. Population statistics for BCT sampled in Jacobs Creek, 2014, 2018, and 2023.

Year	Species	Total Catch	#/km ± 95% C.I. (#/mi ± 95% C.I.)	kg/ha (lb/ac)	TL (mm)		WT (g)		Mean K
					Mean	Range	Mean	Range	
2023	≥age-1 BCT	24	242±11 (389±17)	8 (7)	94	68-121	9	3-18	1.05
2018	≥age-1 BCT age-0 BCT	44 5	471±61 (758±97) 53±19 (86±31)	36 (32)	115	86-186 30-39	14	6-53	0.90
2014	≥age-1 BCT	16	159±6 (256±10)	9 (8)	101	82-127	12	6-25	1.09

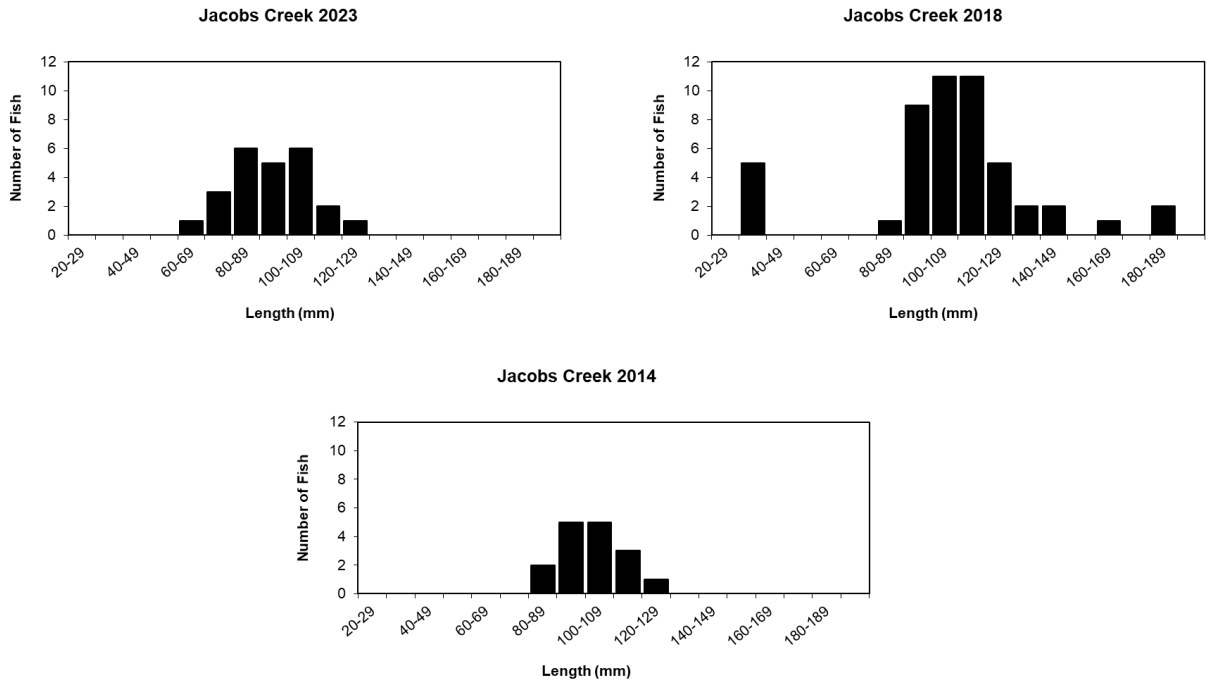

Figure 17. Size distribution of BCT sampled in the Jacobs Creek monitoring station, 2014, 2018, and 2023.

Peterson Creek **IVAP090**

Monitoring

The Peterson Creek monitoring station, 100 m in length, was electrofished on July 12, 2023. Results of this and the prior surveys are shown in Table 20 and Figure 18. Comparison of the three data points for this station indicates the size of the BCT population decrease by nearly half since 2018, after more than doubling between 2014 and 2018 (Table 20); estimated biomass also decreased by half since 2018. The length-frequency distribution shows the majority of the 2023 sample was comprised of age-1 individuals with a couple of small adults as well (Figure 18), similar to the collections in 2014 and 2018. These data suggest that the habitat in this reach functions as spawning/nursery habitat, possibly for fluvial BCT coming from the Weber River, and may not host a resident BCT population. Brown Trout, represented by a single age-0 individual in 2018, appear to utilize this reach for spawning, at least periodically. Sculpin continue to occupy the station.

Table 20. Population statistics for species sampled in the Peterson Creek monitoring station, 2014, 2018, and 2023.

Year	Species	Total Catch	**#/km** ± 95% C.I. **(#/mi** ± 95% C.I.**)**	kg/ha (lb/ac)	TL (mm)		WT (g)		Mean K
					Mean	Range	Mean	Range	
2023	≥age-1 BCT SC	17	178±28 (287±45) common	7 (7)	122	99-186	22	10-73	1.05
2018	≥age-1 BCT age-0 BCT age-0 BNT RSS SC	29 27 1	304±9 (489±15) 321±88 (516±141) no depletion sparse abundant	15 (13)	121 37 56	94-190 28-46	17	8-61	0.89
2014	≥age-1 BCT age-0 BCT SC	16 2	137±17 (221±27) 19±0 (31±0) abundant	12 (11)	134 68	99-157 67-69	24	10-34	0.96

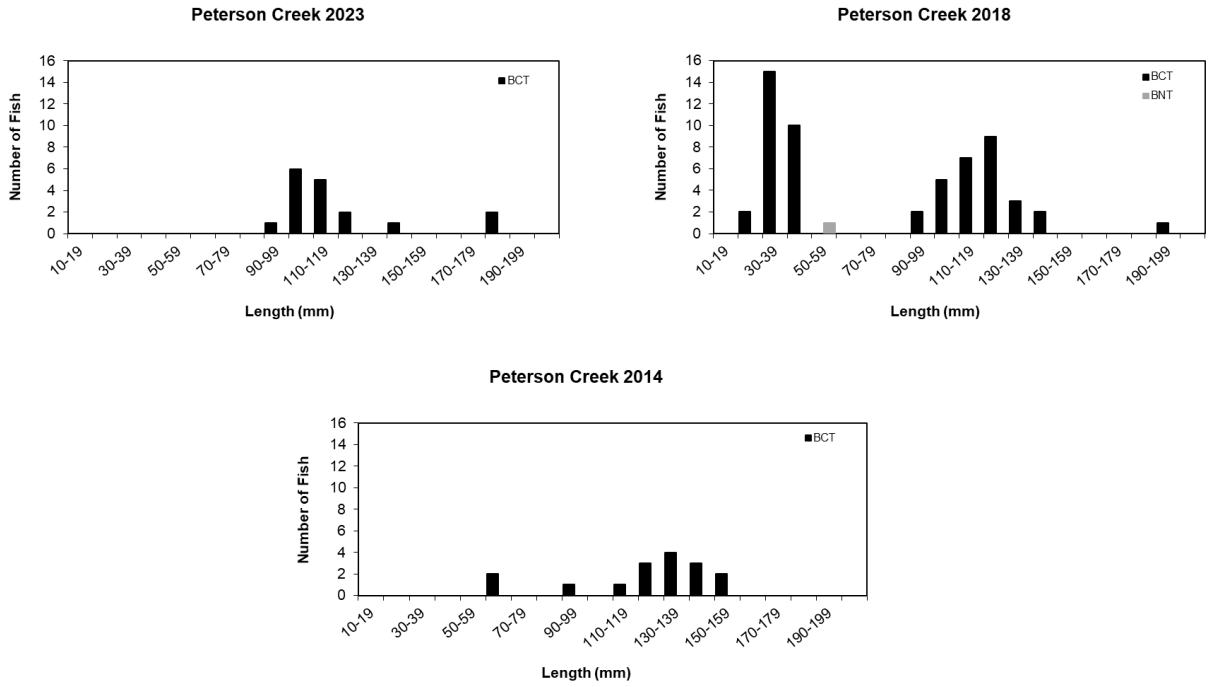

Figure 18. Size distribution of salmonids sampled in the Peterson Creek monitoring station, 2014, 2018, and 2023.

Deep Creek **IVAP140**

Monitoring

The reach surveyed in 2014 was electrofished on July 12, 2023, to monitor the BCT population. Comparing the two data points, the BCT population has experienced a decline of roughly 70% (Table 21) and the presence and number of BNT suggests the decline of BCT is likely to continue. The length-frequency distribution indicates that both trout species were represented by a variety of age-classes (Figure 19), and in the case of BNT that they have been in the section for several years. Sculpin and mountain sucker were also again sampled in the station.

Table 21. Population statistics for species sampled in the Deep Creek monitoring station, 2014 and 2023.

Year	Species	Total Catch	#/km ± 95% C.I. (#/mi ± 95% C.I.)	kg/ha (lb/ac)	TL (mm)		WT (g)		Mean K
					Mean	Range	Mean	Range	
2023	≥age-1 BCT	3	30±0 (48±0)	9 (8)	200	109-288	107	12-229	0.94
	≥age-1 BNT	11	116±24 (186±38)	40 (36)	208	137-339	119	26-362	1.01
	MTS		common						
	SC		abundant						
2014	≥age-1 BCT	13	112±16 (180±26)	22 (20)	117	130-263	55	15-166	0.91
	age-0 BCT	7	69±48 (112±77)		51	46-57			
	MTS		common		118	45-178			
	SC		abundant		68	25-101			

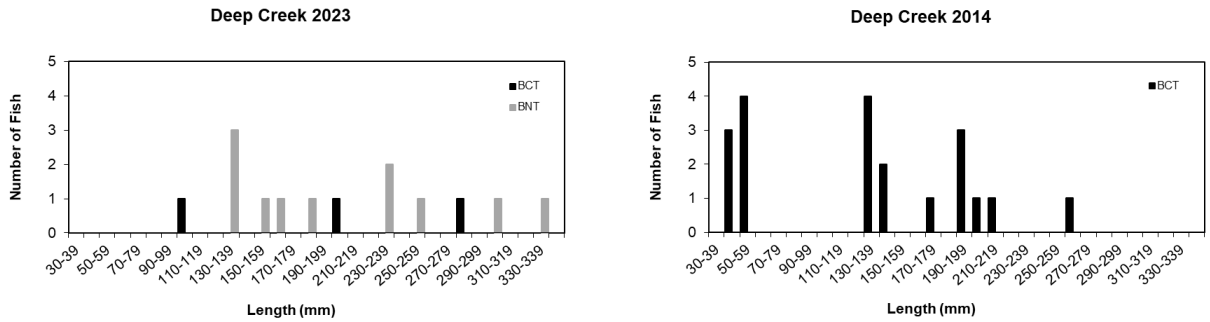

Figure 19. Size distribution of salmonids sampled in the Deep Creek monitoring station, 2014 and 2023.

Hardscrabble Creek **IVAP150A**

Monitoring

The monitoring station in Hardscrabble Creek, 100 m in length, was electrofished on August 17, 2023. Results of this and prior sampling events are shown in Table 22 and Figure 20. Based on five data points for this station the BCT population has experienced a steady decline since the initial survey in 2000, decreasing in abundance by three-quarters and biomass by more than half since 2000 (Table 22). The BCT length-frequency distribution for 2023 shows a relatively broad range of size-classes with similar numbers of individuals within each size-class (Figure 20). Of significant concern is the sharp increase apparent in the number and biomass of BNT in this section of Hardscrabble Creek (Table 22); absence in 2023 of the age-0 BNT cohort, which comprised a vast majority of the BNT sampled in 2018, may be related to high spring flows in 2023 and consequent flushing of small BNT downstream; alternatively, low fall flows may have had significant, negative impacts on spawning success in recent years. Sculpin continue to maintain high densities in the sampled reach.

Table 22. Population statistics for fish species sampled in Hardscrabble Creek, 2000, 2007, 2013, 2018, and 2023.

Year	Species	Total Catch	**#/km** ± 95% C.I. **(#/mi** ± 95% C.I.**)**	kg/ha (lb/ac)	TL (mm)		WT (g)		Mean K
					Mean	Range	Mean	Range	
2023	≥age-1 BCT	14	144±18 (232±28)	24 (21)	195	92-291	92	8-234	0.95
	≥age-1 BNT	21	338±374 (544±601)	53 (47)	186	135-351	88	24-474	1.02
	SC		abundant						
2018	≥age-1 BCT	26	252±16 (405±26)	31 (28)	181	112-278	73	13-189	0.97
	≥age-1 BNT	6	60±14 (96±23)	20 (18)	243	149-335	199	4-438	0.97
	age-0 BNT	100	925±190 (1533±306)	8 (7)	77	59-94	5	1-9	
	SC		abundant						
2013	≥age-1 BCT	35	342±19 (551±31)		204	105-305			
	age-0 BCT	6	58±0 (93±0)		65	53-75			
	≥age-1 BCTxRT	1	10±0 (15±0)		266		scale malfunction, weight data not collected		
	≥age-1 BNT	16	157±15 (253±24)		188	137-316			
	age-0 BNT	14	195±198 (313±319)		87	55-106			
	SC		abundant						
2007	≥age-1 BCT	14	327±898 (526±1445)	48 (43)	175	68-484	123	4-988	1.02
	≥age-1 BCTxRT	2	no depletion		243	210-275	148	102-194	1.02
	≥age-1 BNT	1	10±0 (16±0)	5 (4)	347		404		0.97
	SC		abundant						
2000	≥age-1 BCT	55	598±31 (962±50)	55 (49)	159	91-311	55	6-308	0.94
	age-0 BCT	36	563±374 (906±602)		62	45-77			
	SC		abundant						

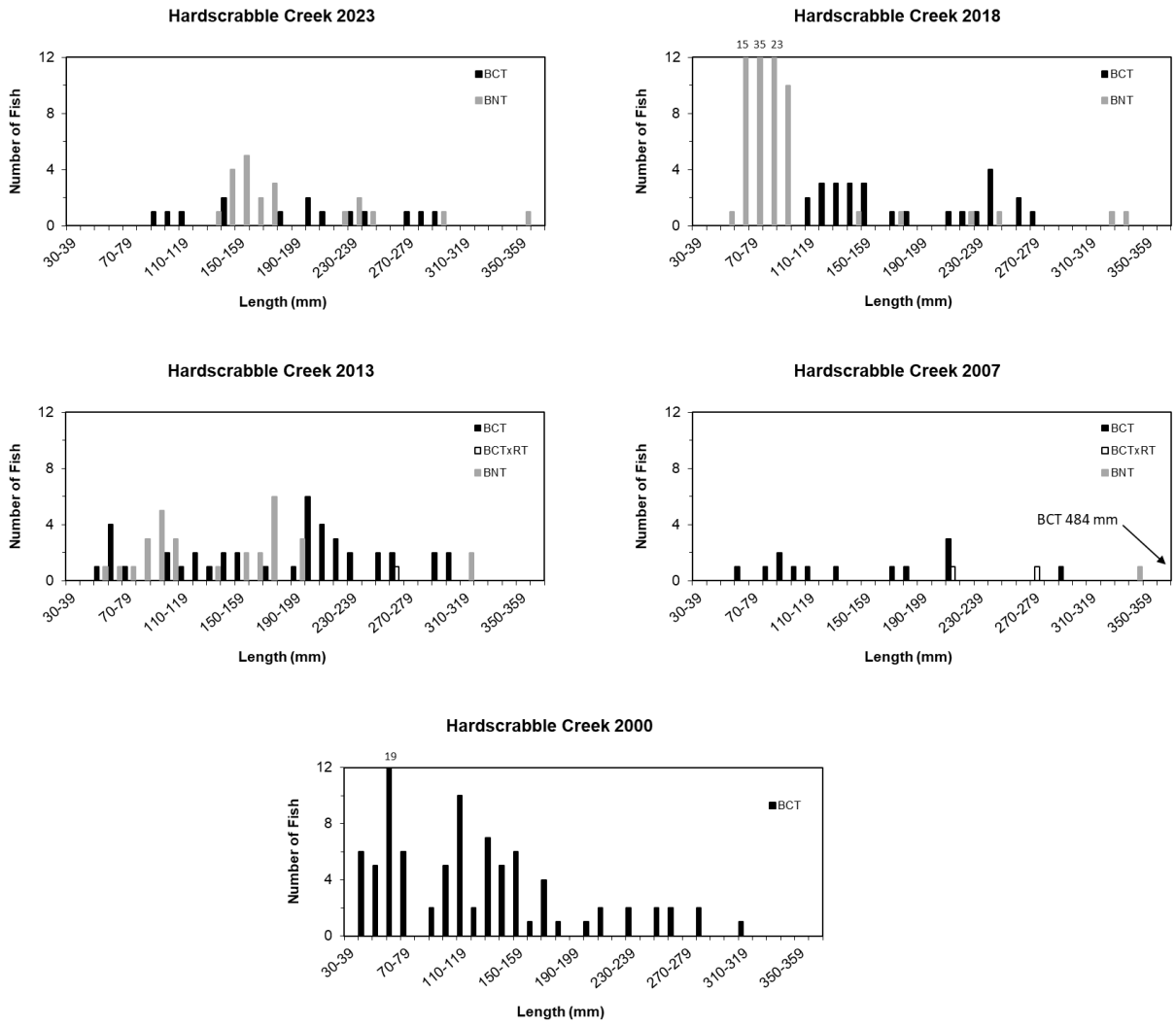

Figure 20. Size distribution of salmonids sampled in the Hardscrabble Creek monitoring station, 2000, 2007, 2013, 2018, and 2023.

Arthurs Fork **IVAP150A02**

Monitoring

The monitoring station in Arthurs Fork, 100 m in length, was electrofished on August 17, 2023. Results of this and prior sampling events are shown in Table 23 and Figure 21. Based on five data points for this station the BCT population has remained at moderate levels of abundance during all sampling events, increasing slightly since the last monitoring (Table 23). The BCT length-frequency distribution for 2023 appears similar to that of 2018, showing a relatively broad range of size-classes with good representation of the age-1 size-class (Figure 21). Of significant concern is the continued increase in the number and biomass of BNT at this site (Table 23); absence in 2023 of the age-0 BNT cohort, which comprised a vast majority of the BNT sampled in 2018, may be related to high spring flows in 2023 and consequent flushing of small BNT downstream; alternatively, low fall flows may have had significant, negative impacts

on spawning success in recent years. Sculpin appear to be less abundant in the sampled reach.

Table 23. Population statistics for species sampled in the Arthurs Fork monitoring station, 1997, 2007, 2013, 2018, and 2023.

Year	Species	Total Catch	#/km ± 95% C.I. (#/mi ± 95% C.I.)	kg/ha (lb/ac)	TL (mm)		WT (g)		Mean K
					Mean	Range	Mean	Range	
2023	≥age-1 BCT	46	510±89 (821±143)	87 (78)	160	86-303	58	5-262	0.94
	≥age-1 BCTxRT	1	10±0 (16±0)	9 (8)	301		299		1.10
	≥age-1 BNT	15	150±0 (241±0)	60 (53)	215	136-332	134	25-426	1.06
	SC		common						
2018	≥age-1 BCT	42	428±23 (688±37)	48 (43)	137	88-251	35	7-162	0.97
	≥age-1 BCTxRT	13	134±19 (216±31)	17 (15)	146	109-244	40	12-159	0.99
	≥age-1 BNT	5	50±0 (80±0)	39 (35)	277	239-399	250	122-604	1.05
	age-0 BNT	16	405±1235 (652±1987)		46	35-52			
	SC		abundant						
2013	≥age-1 BCT	41	422±31 (680±50)	90 (80)	173	92-302	66	15-252	1.06
	age-0 BCT	75	906±206 (1458±331)		55	40-67			
	≥age-1 BCTxRT	1	no depletion		310				
	≥age-1 BNT	1	10±0 (16±0)		166				
	SC		abundant						
2007	≥age-1 BCT	75	1099±373 (1769±600)	85 (76)	121	70-357	31	3-483	1.17
	≥age-1 BCTxRT	8	99±46 (159±74)	31 (28)	210	121-331	128	22-380	1.16
	SC		common						
1997	≥age-1 BCT	55	566±36 (912±58)	124 (111)	171	94-357	72	6-300	1.12
	age-0 BCT	10	107±28 (172±44)		51	39-64			
	≥age-1 BCTxRT	14	320±880 (515±1416)	142 (127)	213	123-292	145	22-278	1.65
	SC		abundant						

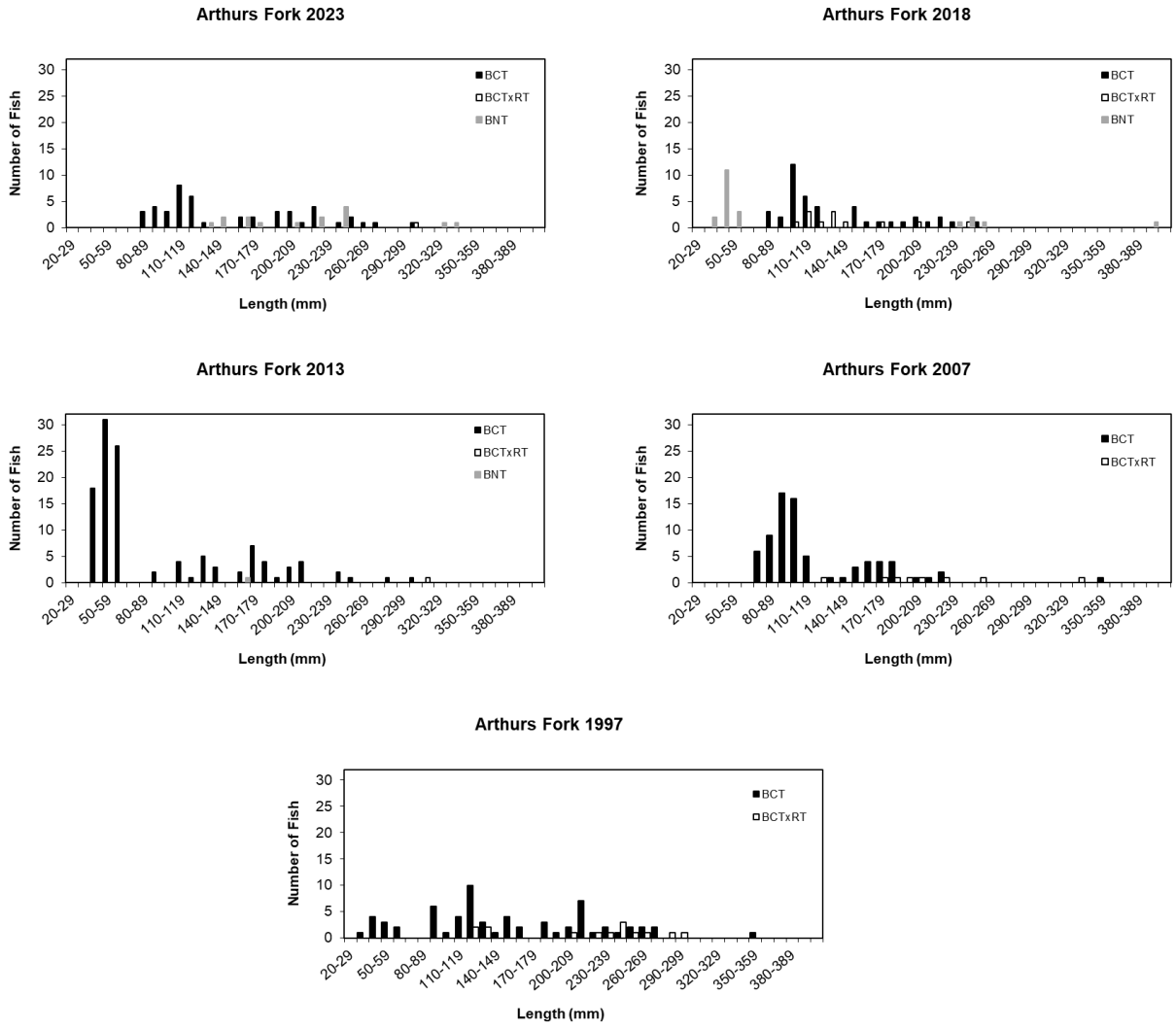

Figure 21. Size distribution of salmonids sampled in the Arthurs Fork monitoring station, 1997, 2007, 2013, 2018, and 2023.

Lost Creek IVAP180

Monitoring

The monitoring station in lower Lost Creek, 151 m in length, was electrofished on August 16, 2023. Results of this and previous samplings are shown in Table 24 and Figure 22. Based on the five data points for this station the BCT population appears to have disappeared from this site between 2018 and 2023, after maintaining low densities in the sample reach during the previous three sampling events (Table 24). Numbers of BNT were relatively stable during most previous monitoring events, until 2023 when both abundance and biomass exhibited substantial increases (Figure 22). Sculpin continue to maintain high densities in the station.

Table 24. Population statistics for species sampled in the Lost Creek monitoring station, 1999, 2007, 2013, 2018, and 2023.

Year	Species	Total Catch	#/km ± 95% C.I. (#/mi ± 95% C.I.)	kg/ha (lb/ac)	TL (mm)		WT (g)		Mean K
					Mean	Range	Mean	Range	
2023	≥age-1 BNT	67	450±16 (724±26)	152 (136)	266	168-407	228	53-697	1.02
	SC		abundant						
2018	≥age-1 BCT	1	7±0 (11±0)	12 (11)	503		1240		0.97
	≥age-1 BNT	34	236±26 (380±42)	123 (110)	320	260-410	356	178-704	1.04
	age-0 BNT	3	26±45 (43±72)		71	64-75	3	2-4	
	SC		abundant						
2013	≥age-1 BCT	1	7±0 (11±0)	2 (2)	315		275		0.88
	≥age-1 BNT	37	245±0 (394±0)	95 (85)	279	154-442	301	22-946	1.10
	age-0 BNT	10	119±246 (192±396)	1 (1)	69	60-77	4	1-10	
	SC		abundant						
2007	≥age-1 BCT	2	13±0 (21±0)	3 (2)	239	238-240	141	131-150	1.03
	age-0 BCT	2	13±0 (21±0)		52	44-59			
	≥age-1 BNT	7	56±38 (89±62)	15 (14)	223	154-414	196	43-822	1.20
	SC		abundant						
1999	≥age-1 BCT	11	110±0 (177±0)	25 (22)	230	163-293	151	38-278	1.11
	age-0 BCT	7	83±58 (134±93)		73	60-78	3		
	≥age-1 BNT	15	173±68 (278±110)	111 (99)	328	219-431	427	90-866	1.05
	age-0 BNT	17	173±14 (279±23)	4 (3)	110	80-134	14	6-22	1.01
	SC		abundant						

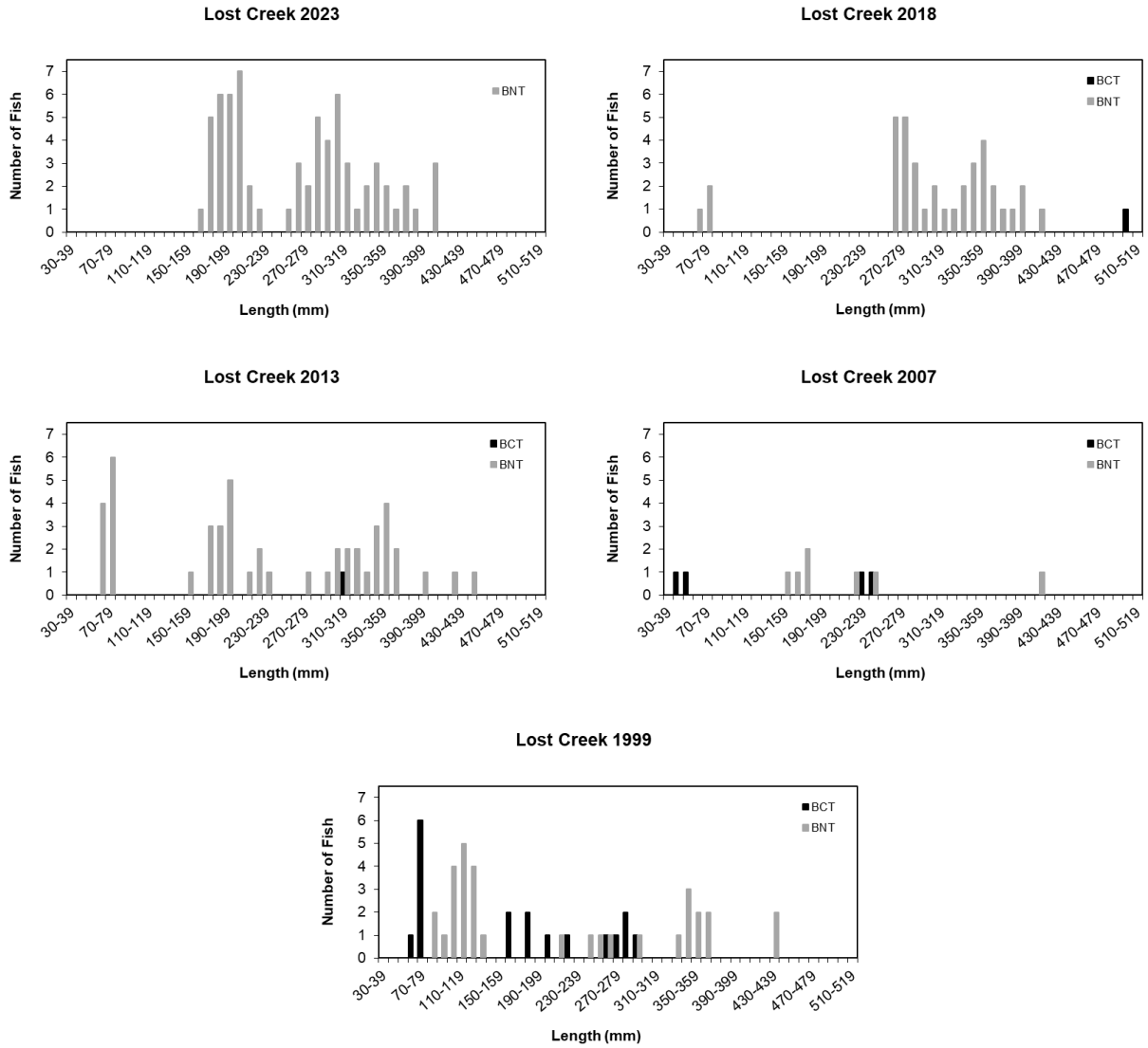

Figure 22. Size distribution of salmonids sampled in the Lost Creek monitoring station, 1999, 2007, 2013, 2018, and 2023.

Echo Creek **IVAP210**

Monitoring

This monitoring station, an “index site” for BCT in the Northern Bonneville GMU, was electrofished on August 16, 2023. Results of this and previous samplings are shown in Table 25 and Figure 23. Based on six data points for this station the BCT population is not static and experiences frequent fluctuation (Table 25); abundance was up in 2023 from the low observed in 2022. The length-frequency distribution for 2023 shows three distinct size-classes representing primarily adult BCT (Figure 23); the occasional presence of smaller, younger size-classes suggests this reach may not always provide suitable BCT spawning/rearing habitat. Multiple species of native nongame fish have been present at varying densities in this stream reach during the sampling events.

Table 25. Population statistics for species sampled in the Echo Creek monitoring station, 2007, 2014, 2018, 2021, 2022, and 2023.

Year	Species	Total Catch	**#/km** ± 95% C.I. **(#/mi** ± 95% C.I.**)**	kg/ha (lb/ac)	TL (mm)		WT (g)		Mean K
					Mean	Range	Mean	Range	
2023	≥age-1 BCT	8	82±11 (131±17)	60 (54)	218	147-359	129	26-474	0.87
	MTS		common						
	RSS		common						
	SC		common						
	SPD		common						
2022	≥age-1 BCT	4	45±29 (72±47)	41 (37)	263	231-287	155	110-192	0.84
	MTS		common						
	RSS		sparse						
	SC		common						
	SPD		common						
2021	≥age-1 BCT	14	141±7 (227±11)	60 (54)	204	115-332	89	14-281	0.86
	MTS		sparse						
	SC		abundant						
	SPD		abundant						
2018	≥age-1 BCT	22	229±33 (369±54)	77 (69)	182	109-285	73	13-210	1.08
	MTS		sparse						
	RSS		common						
	SC		abundant						
	SPD		abundant						
2014	≥age-1 BCT	4	58±38 (93±61)	13 (12)	239	222-255	119	98-139	0.87
	MTS		common						
	SC		abundant						
	SPD		common						
2007	≥age-1 BCT	8	85±11 (137±18)	36 (32)	178	85-284	84	6-242	0.99
	MTS		sparse						
	SC		abundant						
	SPD		common						

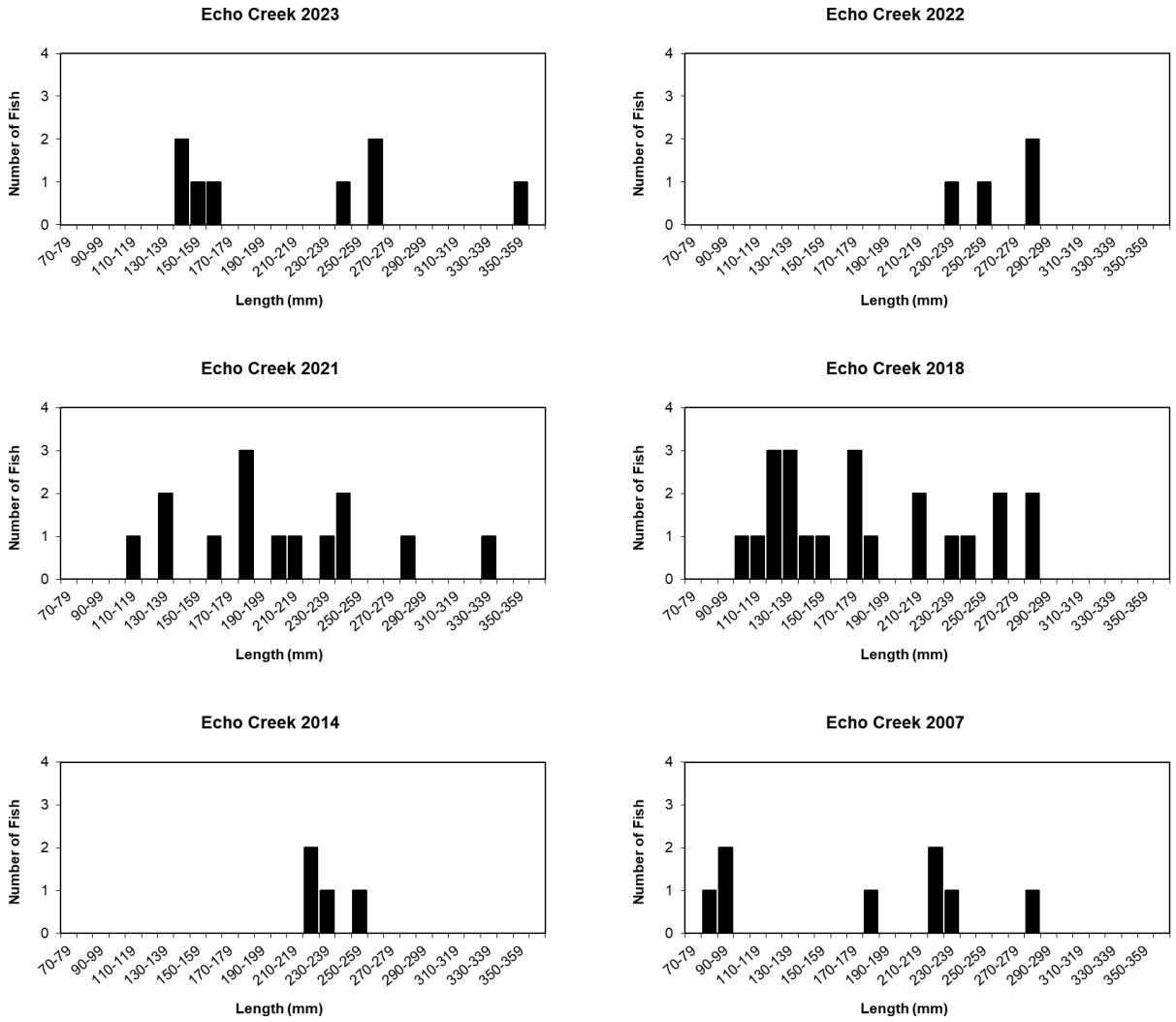

Figure 23. Size distribution of BCT sampled in the Echo Creek monitoring station, 2007, 2014, 2018, 2021, 2022, and 2023.

Chalk Creek **IVAP230**

Surveys

The BCT movement study utilizing radio telemetry implemented in Chalk Creek in 2022 (see McKell 2023) was continued in 2023. The study was undertaken to assess seasonal movements associated with spawning, evaluate behavior related to summertime water temperatures, and identify impediments to movement (e.g. irrigation diversions), as well as the degree to which the water withdrawal network is an entrainment issue for BCT movement. The 40 tagged BCT were tracked through the spring, summer, and fall on 30 occasions. Movements of individual fish were tracked from the point of first re-location a week after tagging to allow for the re-distribution of fish from the release sites. Every fish moved following initial re-location, except two, both of which were re-located on multiple occasions, but only at the same location. One was last re-located on January 13, and the signal was never detected after that date; the other tag was found on April 27, at the base of a cottonwood tree, tangled in the casting pellet of

a great blue heron (there were herons nesting overhead and occasionally observed standing in a nearby portion of the creek). The remainder of the tagged BCT traveled between 28 m and 35.4 km (mean 9.9 km, median 6.7 km). Figures 24, 25, and 26 show a map of tag location data, frequency distribution of distances traveled, and the distance traveled by total length of each individual BCT, respectively. Table 26 details tagging, movement, final tag disposition, and other data.

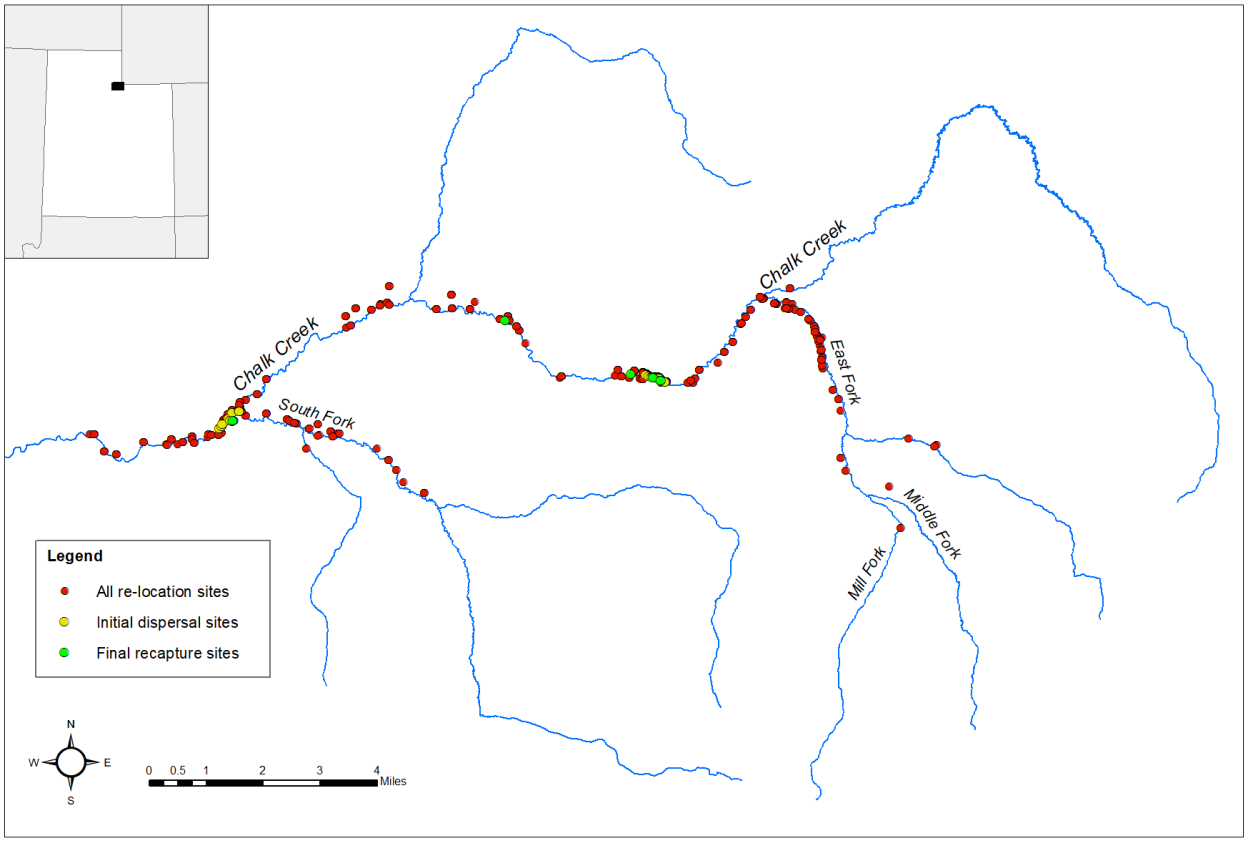

Figure 24. Map of Chalk Creek radio tag location data. Red points indicate all re-location sites, yellow are the sites of initial dispersal after tagging, and green are the sites of final recapture (i.e. verified survival of tagged BCT recaptured at the end of the study).

As expected, the South Fork and East Fork tributaries were used during the spawning period in the spring and movement was primarily in an upstream direction during that time; five tagged BCT entered the South Fork, while 10 migrated to the East Fork, including one from the lower release site. The remainder of the tagged fish stayed in the mainstem; several remained near the initial dispersal sites, while a few appeared to swim or drift downstream. Timing of spawning-related movements began in early-mid May and were completed by mid-late July. Generally, tagged BCT returned to the reach in which they were tagged and released once spawning-related migrations were complete.

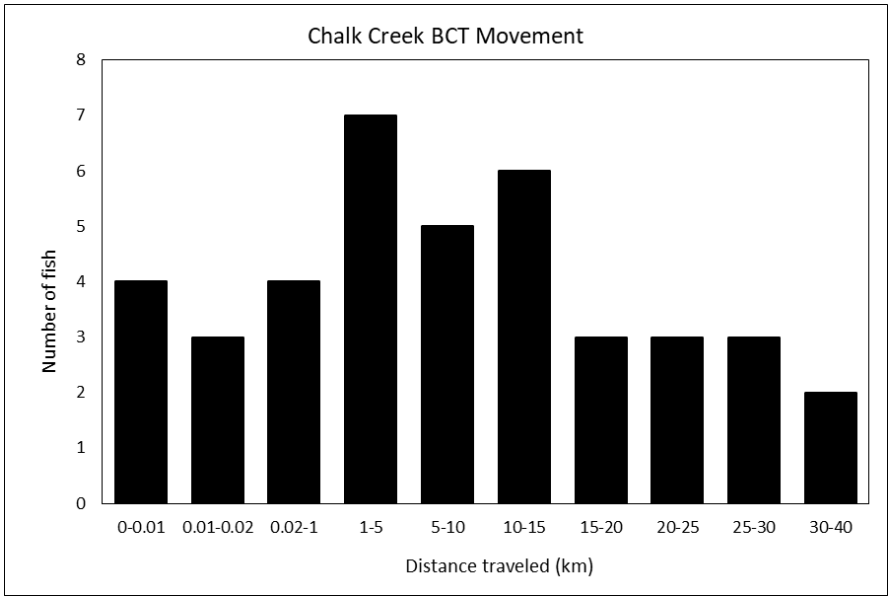

Figure 25. Distribution of distances traveled by radio tagged BCT in Chalk Creek, September 2022 to November 2023.

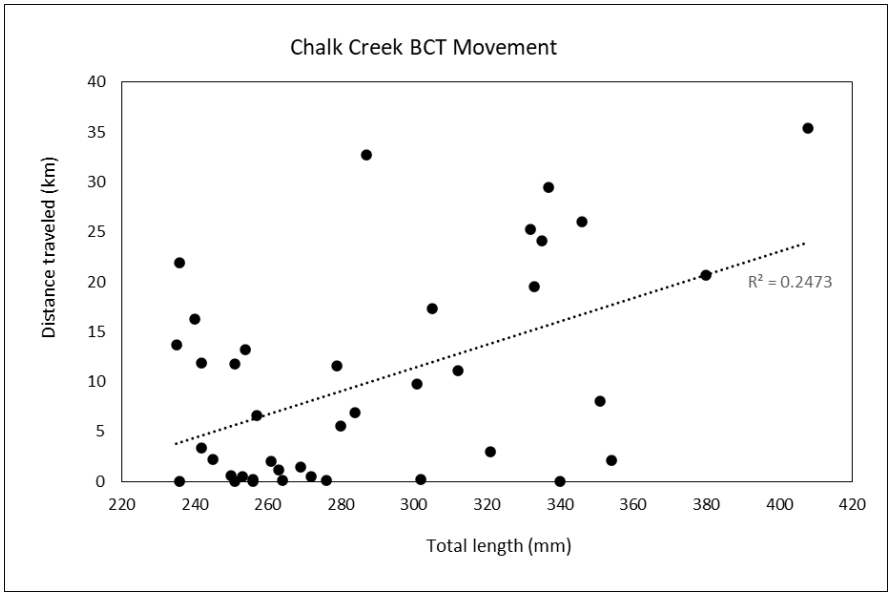

Figure 26. Total distance traveled by radio tagged BCT in Chalk Creek plotted against total length (mm) at tagging for each individual, September 2022 to November 2023.

Table 26. Tag data, including release site, general direction and total distance traveled, tributary entered, and other data collected during the Chalk Creek BCT radio telemetry study. Notes: all "last detection" dates occurred during 2023; final disposition: "recov" indicates the tag was recovered from the stream channel, from the bank, or from beneath a bird (great blue heron) nest; "streambed" indicates the transmitter signal was coming from the streambed (i.e. electrofishing yielded no tagged fish but the signal continued transmitting from targeted location).

Tag ID	Tagging TL (mm)	Release site	Direction traveled	Distance (km)	Tributary	Last detection	Final disposition	Recapture TL / growth
009	408	lower	up	35.4	East	11/22	streambed	
089	340	lower		0		1/13	lost signal	
132	253	lower		0.5		11/22	streambed	
152	380	lower	up	20.7	South	6/15	lost signal	
171	321	lower	down	3.0		10/25	recov (stream)	
191	305	lower	up	17.3	South	11/22	streambed	
210	245	lower	down	2.2		11/22	recov (stream)	
251	279	lower	up	11.6	South	11/22	recaptured	313 / 34
272	312	lower	up	11.1	South	11/22	streambed	
291	302	lower		0.2		3/29	lost signal	
313	301	lower	up	9.8	South	11/22	streambed	
333	335	lower	up	24.1		6/12	recov (bird)	
352	280	lower	down	5.5		10/25	recov (stream)	
372	256	lower		0.05		3/29	lost signal	
032	337	upper	up	29.4	East	11/22	recaptured	350 / 13
051	332	upper	up	25.3	East-Mill	8/18	recov (bird)	
072	351	upper	up	8.0	East	8/23	recov (bank)	
110	287	upper	up	32.7	East	11/22	recaptured	326 / 39
232	333	upper	up	19.5	East	11/22	recaptured	344 / 11
393	346	upper	up	26.0	East-Middle	11/22	streambed	
410	251	upper	down	11.8		9/11	recov (bank)	
432	250	upper		0.6		11/22	streambed	
450	261	upper	up	2.0		8/10	lost signal	
472	236	upper		0.03		4/20	lost signal	
491	269	upper		1.4		6/1	recov (bird)	
512	354	upper	up	2.1		11/22	streambed	
533	272	upper		0.5		11/22	recaptured	346 / 74
550	276	upper		0.1		10/25	recov (stream)	
571	257	upper	down	6.6		11/22	recaptured	314 / 57
592	256	upper		0.2		4/20	lost signal	
610	254	upper	down	13.2		8/10	recov (stream)	
631	263	upper		1.2		6/1	recov (bird)	
650	251	upper		0		3/29	recov (bird)	
671	264	upper		0.1		11/22	streambed	
691	240	upper	down	16.3		11/22	streambed	
713	242	upper	up	11.9	East	8/18	recov (bird)	
730	242	upper	down	3.4		8/18	recov (bank)	
752	235	upper	down	13.6		7/27	lost signal	
771	236	upper	up	21.9	East	11/22	recaptured	253 / 17
791	284	upper	up	6.9	East	6/22	lost signal	

On the last two days of tag re-location, tracking was coupled with electrofishing to verify survival and collect length measurements for each recaptured fish. Only seven tagged BCT were recaptured (Table 26); the recaptured fish exhibited an average increase in total length of 35 mm (range 11-74 mm increase) during the 14-month study period. Several tags were recovered throughout the study period; six were found beneath bird nests, three were found on the bank, and five were found in the stream sediments (Table 26). Ten tags were transmitting from the stream channel, but repeated electrofishing did not produce tagged BCT and in most cases habitats were too deep to effectively search for the tags; thus, it is presumed the tags were buried in the streambed sediments. The signals from the remaining nine tags were lost during the study; possible explanations include premature battery depletion, tagged fish were carried from the stream beyond the reach of the receiver, or tagged fish were taken underground by predators.

Incidentally, there was no evidence that entrainment in the Chalk Creek irrigation network was an issue (e.g. no tagged fish were found in canals, ditches, or irrigated fields). In addition, two tagged BCT migrated from the lower release site beyond the upper, and several from the upper site migrated into the East Fork, demonstrating that any presumed mainstem migration barriers within the study area were in fact not impassable to all fish.

Silver Creek **IVAP280**

Monitoring

One station ("middle") in Silver Creek was monitored in 2023, located just upstream of the I-80 overpass near Silver Creek Junction. The 100 m station was electrofished on September 27, 2023. Results of the current and previous samplings are shown in Table 27 and Figure 27. The BCT population has experienced a decrease in both abundance and biomass since 2017 but has shown variability in number during all sampling events (Table 27). Multiple size-classes were represented in 2023 but the numbers suggest that recruitment is sporadic and limited (Figure 27). Brown Trout were sampled at this site for the first time, although BNT were sampled at a site downstream in 2017 (McKell 2018); the presence of multiple age-classes suggests BNT are not new to the site, and while the population is still relatively limited, they are established in the reach. Nongame fishes were well-represented in the station (Table 27).

Survey

A site ("upper") just downstream of Promontory Road was surveyed for the first time in 2023. The station was 100 m in length and was electrofished on September 27, 2023. The BCT population was represented by a single age-1 individual (Table 27 and Figure 28). Similar to the monitoring station, BNT were also sampled, but all BNT in this station were adults (Figure 28). Nongame species were sampled but weren't as well represented as in the monitoring reach, likely attributed to the habitat differences between the sites, this station consisting of a deeper and much narrower channel than the monitoring station.

Table 27. Population statistics for species sampled in the Silver Creek monitoring station, 1998, 2003, 2017, and 2023, and in the survey station, 2023.

Year	Species	Total Catch	#/km ± 95% C.I. (#/mi ± 95% C.I.)	kg/ha (lb/ac)	TL (mm)		WT (g)		Mean K
					Mean	Range	Mean	Range	
Monitoring Station									
2023	≥age-1 BCT	4	40±0 (64±0)	14 (12)	190	99-282	90	9-202	0.90
	≥age-1 BNT	10	101±9 (163±14)	55 (49)	230	183-333	139	64-365	1.01
	FHM		common						
	MTS		abundant						
	RSS		abundant						
	SPD		abundant						
2017	≥age-1 BCT	13	121±37 (195±59)	52 (46)	199	83-346	136	5-482	1.00
	MTS		abundant						
	RSS		abundant						
	SPD		common						
2003	MTS		abundant						
	RSS		common						
	SPD		abundant						
1998	≥age-1 BCT	4	45±29 (72±47)		187	84-297	99	5-282	0.92
	MTS		abundant						
	RSS		abundant						
	SPD		abundant						
Survey Station									
2023	≥age-1 BCT	1	10±0 (16±0)	<1 (<1)	96		7		0.79
	≥age-1 BNT	4	30±0 (48±0)	45 (40)	274	241-294	224	150-264	1.06
	FHM		sparse						
	MTS		sparse						
	RSS		abundant						
	SPD		common						

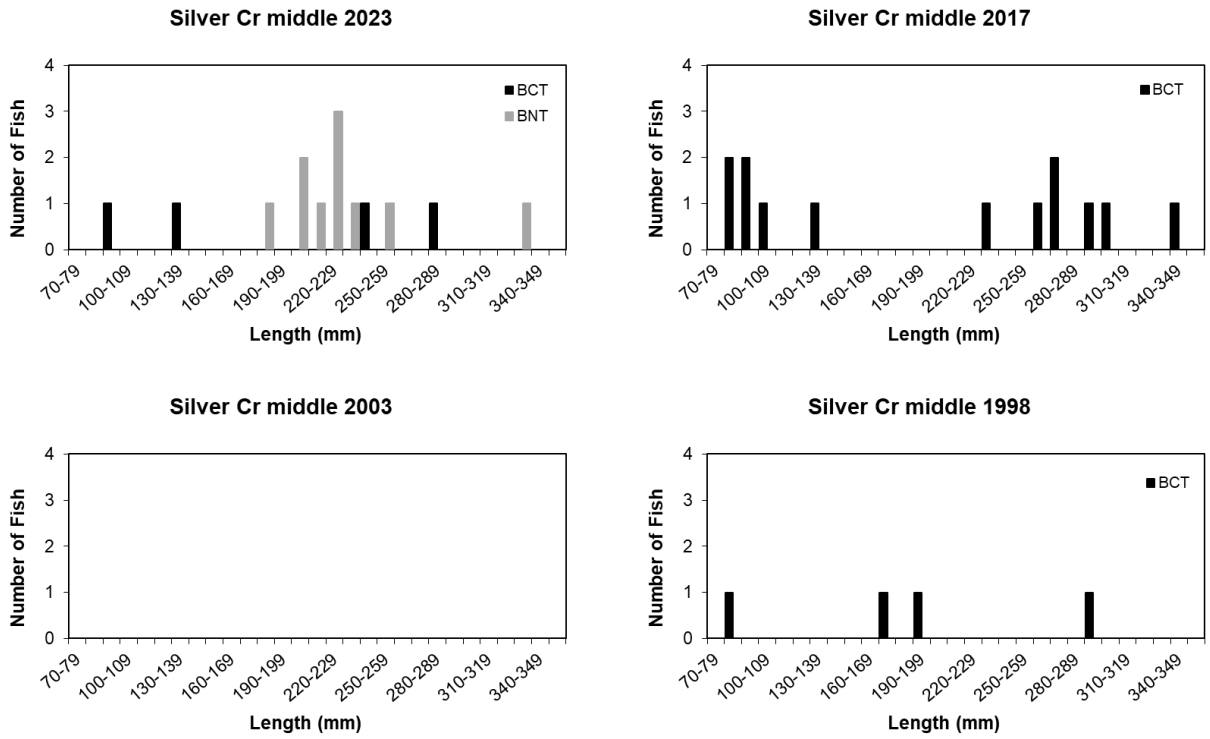

Figure 27. Size distribution of salmonid species sampled in the Silver Creek monitoring station, 1998, 2003, 2017, and 2023.

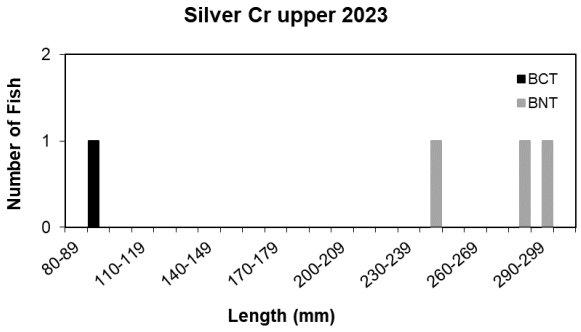

Figure 28. Size distribution of salmonid species sampled in the Silver Creek upper survey station, 2023.

COLORADO RIVER CUTTHROAT TROUT

UPPER GREEN GMU
North Slope of the Uinta Mountains Subunit

West Fork Smiths Fork **IICK020B**

Population Restoration

Cutthroat trout produced from the North Slope CRCT brood source at Mammoth Creek Hatchery were stocked into West Fork Smiths Fork to aid in the reestablishment of CRCT following the rotenone treatment in 2021 to remove nonnative trout from the drainage. Approximately 300 adult CRCT (mean TL 337 mm) were stocked on July 19, 2023, and 2,700 fingerling (mean TL 42 mm) were stocked on September 29, 2023.

In addition, a small headwater lake, G-113, which was also part of the rotenone treatment, was stocked with approximately 270 fingerling CRCT (mean TL 44 mm) on September 19, 2023.

RECOMMENDATIONS

BONNEVILLE CUTTHROAT TROUT

Monitoring

The 25 BCT populations monitored in 2023 appeared to be mostly stable in comparison with previous surveys. Ten populations showed an increase in abundance, eight appeared flat, and seven showed some degree of decline. Overall, populations appeared to be mostly stable, with consistent recruitment indicated by multiple age-classes in most of the samples.

As noted for some streams surveyed twice during 2008 (see McKell and Thompson 2009), timing of surveys or monitoring may produce varying results—results that may not accurately characterize the long-term status of a population. Unless monitoring is conducted during the same month in the field season as the previous survey, the results may reflect seasonal variation instead of actual trends. Tracking trends is ultimately the purpose of monitoring, which is an important part of efforts to conserve native trout. Monitoring should continue as populations of BCT representative of each GMU/subunit are revisited on an approximate five-year cycle. Specifically for 2024, monitoring is planned for streams in Rich County and Cache Valley, tributaries of the Ogden River, as well as the Northern Bonneville GMU index sites.

Restoration

Opportunities for BCT expansion and enhancement, including barrier construction and chemical treatments, will continue to be explored on an opportunistic basis. Finalization of the EA in August 2012 (USFWS 2012) signaled the commencement of treatment project implementation in 2012 in the Right Hand Fork of Logan River, continued with the second chemical treatment of the Right Hand Fork in September 2013 and stocking of BCT fingerling (produced from Temple Fork gametes) in October 2013 and September 2014, and the small-scale chemical treatment between the barriers in 2015. The chemical treatment of the Otter Creek drainage in Rich County was initiated with the first treatment in September 2015, continued with the second treatment in October 2016, and reintroduction of BCT in October 2016. The first treatment of Big Creek was conducted in September 2018 and the second in September 2019. The chemical treatment of Deadman Creek in the upper Bear River drainage was conducted in 2020. With the Deadman Creek treatment concluded, the Northern Region has decreased efforts to restore BCT and increased focus on population monitoring.

Identifying opportunities to repatriate fishless streams along the Wasatch Front should continue to be a priority. This will add to cutthroat trout reintroduction efforts for Holmes and Willard creeks in 2011 and 2012, Mill and Steed creeks in 2013 and 2014, upper Willard Creek and Stone Creek in 2015, upper Stone Creek in 2016, Ricks, Barnard, and Stone creeks in 2017, North Fork Kays Creek in 2018, and Mill, Stone, Barnard, Ricks, and Holmes creeks in 2019. Opportunities that should be explored further include the headwater portions of Barnard, Ricks, and Parrish creeks in Davis County, and Waterfall and Beus canyons in Weber County.

COLORADO RIVER CUTTHROAT TROUT

Monitoring
Monitoring of CRCT populations is scheduled for West Fork Smiths Fork and tributaries in 2024. Regular monitoring should follow the timeline established by the UDWR and USFS, and should remain a high priority.

Restoration
Opportunities for CRCT expansion and enhancement in North Slope drainages should continue to be explored. Following the chemical treatment of the West Fork Smiths Fork drainage in 2021, efforts have been made to re-establish CRCT in the drainage in 2022 and 2023. Opportunities to enhance CRCT habitat are also being pursued.

YELLOWSTONE CUTTHROAT TROUT

Restoration
Opportunities for YCT restoration and enhancement in Raft River tributaries should continue to be explored, particularly for the population in the headwaters of George Creek. The headwaters of the Raft River are likely to be treated in coming years, primarily South Fork Junction Creek below a fish passage improvement project downstream to and including the Raft River through the Narrows section to a diversion just upstream of the Utah-Idaho state line. Rotenone application would target nonnative Brown Trout, with the ultimate goal of restoring the stream entirely to native aquatic species, including YCT, Green (formerly Bluehead) Sucker, Redside Shiner, Speckled Dace, Winged Floater, and others.

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