Summary of Shields River Yellowstone Cutthroat Trout Conservation Efforts 2014-2019

Scott Opitz and Matt McCormack
Montana Fish, Wildlife & Parks
June 23, 2020

Table of Contents

List of Figures

List of Tables

List of Appendices

Introduction and Background

Yellowstone Cutthroat Trout (YCT) were first described by Lewis and Clark in 1805 and their historical range included portions of Montana, Wyoming, Idaho, Utah and Nevada. In Montana they are native to the Yellowstone River drainage, including the Shields River Basin. YCT are a Species of Special Concern for the State of Montana.

YCT currently occupy 44% of their native range. In Montana, 32% of their historic range is occupied and 62% of the historic range in the Shields River Basin is occupied (YCT Range-wide Database 2016). The Shields River Basin above Chadbourne Diversion has been designated as a Core Conservation Area for YCT and is a stronghold for the species in Montana. The Shields Basin represents the current northern most distribution of YCT in Montana and across the five-state historic range (Figure 1).

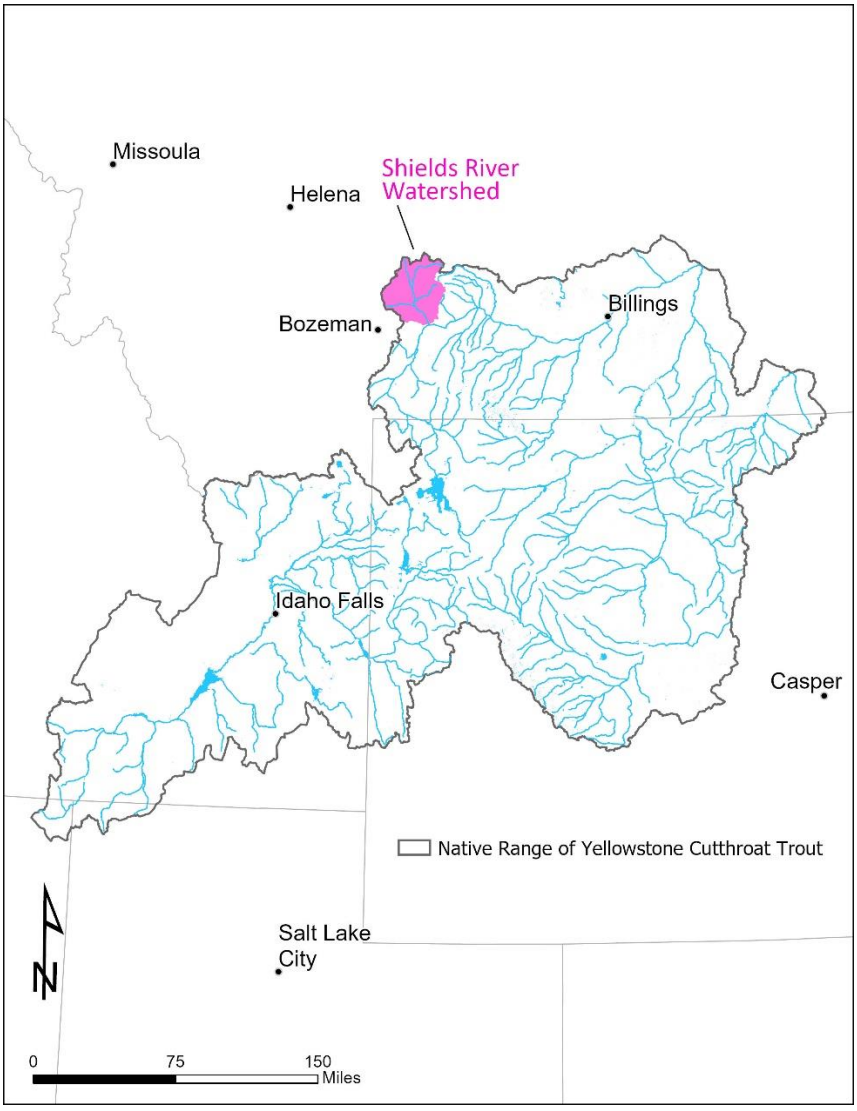


Figure 1: Upper Shields River Watershed in relation to the historic native range of Yellowstone Cutthroat Trout.

Historical declines of YCT were caused by interactions with nonnative trout, degradation of suitable habitats, and overharvest.

YCT were petitioned in 1998 for listing as “threatened” under the U.S. Endangered Species Act but were deemed “not warranted” for listing in 2006. Part of the reasoning for a “not warranted” decision was conservation actions being implemented by the states.

Current threats to conservation of YCT in the Shields River basin include hybridization with nonnative Rainbow Trout, competition with nonnative Brook and Brown Trout, and the continued loss of suitable habitat.

The Shields River Basin is unique in that the threat from hybridization by nonnative Rainbow Trout is low due to the past exclusion of Rainbow Trout from most of the basin by the Chadbourne Irrigation Diversion, located about 7 miles above the confluence with the Yellowstone River (Figure 2). The structure had begun to physically fail and posed a clear threat to opening the basin above this point to increased expansion of Rainbow Trout along with increased risk of hybridization. The Chadbourne Diversion was repaired and retrofitted in 2013 to prevent further movement of Rainbow Trout from the lower Shields and Yellowstone Rivers (Figure 3 and Figure 4).

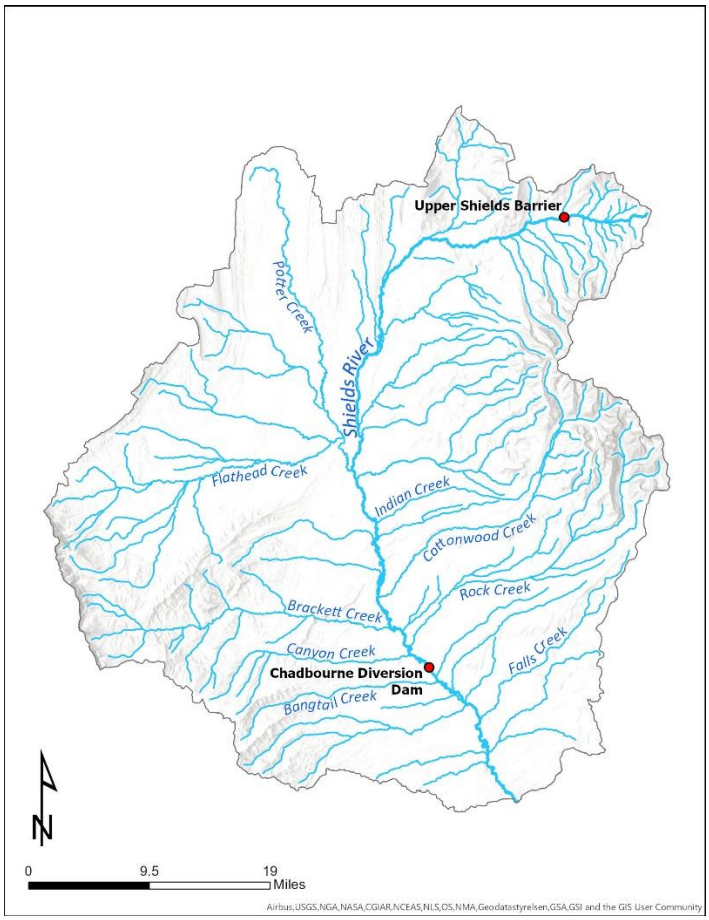


Figure 2: Shields River watershed with the locations of the Chadbourne Diversion Dam and the Upper Shields Barrier that act as fish passage barriers.

Figure 3: Chadbourne Diversion prior to repair and retrofit to act as a fish barrier.

Figure 4: Chadbourne Diversion in 2013 after repair and retrofit to act as a fish barrier.

Competition with Brook Trout remains a threat to YCT in the Shields River watershed. Brook Trout have been increasing in both numbers and distribution in the basin since the 1970s with significant increases occurring more recently. Surveys completed in the headwaters of the basin in 2009 clearly showed a change in distribution of Brook Trout as well as the complete loss of YCT in some areas. With continuing reductions and changes in timing of flows and increases in temperatures, along with the increasing number and distribution of Brook Trout it was clear that action needed to be taken to protect and conserve this valuable resource.

In 2014, a proposal to remove Brook and Brown Trout from the Shields River above a proposed barrier site, located at the Forest Service Road near the Crandall Creek Campground, was presented to the public and approved through the MEPA process to take place for a 10-year period from 2014 through 2024. The proposal was for the mechanical removal, electrofishing and netting, of Brook Trout above the proposed barrier site at the Crandall Creek Campground. Evaluation of success in removing Brook Trout with mechanical means and the potential need for a chemical treatment were part of the proposal. Removal of Rainbow Trout and hybrid trout (Yellowstone Cutthroat X Rainbow) in the mainstem Shields River and tributaries upstream of Chadbourne Diversion was another component of the proposal.

The fish passage barrier was completed at the Crandall Creek Campground on October 15, 2016 (Figure 2 and Figure 5). This barrier protects 27 miles of connected streams from further invasion by Brook Trout and potential invasion by Rainbow Trout and Brown Trout. Completion of the barrier involved removal of the existing bridge and replacement with a concrete structure that provides vertical drops to prevent passage of fish (Figure 6). The barrier was complete by the Custer Gallatin National Forest in partnership with FWP.

Since 2014, removal efforts have taken place through the cooperative effort of FWP, Custer Gallatin National Forest, United States Geological Service, and the Wildlife Conservation Society and the results of those efforts are presented here.

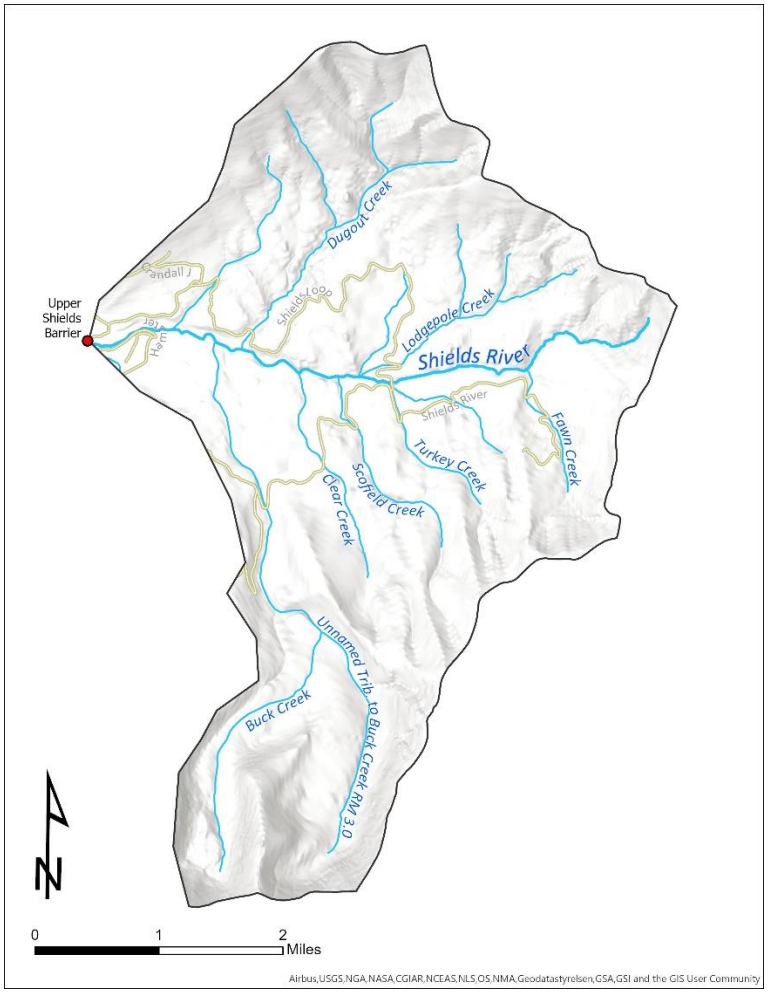


Figure 5: Upper Shields Barrier and the portion of the Shields River watershed that it protects from Brook Trout invasion.

Figure 6: Before (left) and after (right) photos of the fish passage barrier at Crandall Creek Campground. Photos courtesy of the Custer Gallatin National Forest.

Brook Trout Removal and Yellowstone Cutthroat Trout Monitoring

Mechanical removal of Brook Trout began on a limited scale in fall 2014 and has continued annually through 2019. The primary method of removal has been electrofishing. In 2015, Hoop nets were used in addition to electrofishing to remove Brook Trout.

Brook Trout removal has occurred in varying lengths of stream at varying times of the year in each of the last six years. Removal efforts have varied based on crew availability, stream conditions, and the number of YCT and Brook Trout present in a given water or reach of a water. This variability allows for limited direct comparison of efforts between reaches and streams. Long-term sampling reaches have been established in these streams to track populations changes and trends over time.

During Brook Trout removal efforts counts of YCT captured were completed. This was done to monitor YCT populations and their response to Brook Trout removal. The YCT were not held after capture but were immediately released downstream to avoid any additional stress. The exception to immediate release were YCT the had an adipose fin clip. These fish were part of a movement study being completed by the USGS (Shepard 2015). YCT with adipose fin clips were held, anesthetized, and scanned with a pit tag reader. The individual identification number from the PIT tag was recorded and the fish released.

Shields River

Brook Trout Removal

Brook Trout electrofishing removal efforts took place in eight sections of the Shields River in 2015-2019 (Figure 7 and Figure 8). During 2015, a hoop trap was used to capture Brook Trout in the Shields River near the mouth of Dugout Creek in addition to electrofishing efforts. During the five-year effort a total of 1,749 Brook Trout have been removed. The most Brook Trout removed during any year was 789 fish in 2015 and the least was 9 in 2018 (Figure 9 and Appendix 1) The most Brook Trout, 963, removed in any section during this five-year period occurred in Section 1, closest to the barrier site. The least amount of Brook Trout removed from a section was nine in Section 5, which has had the least amount of sampling.

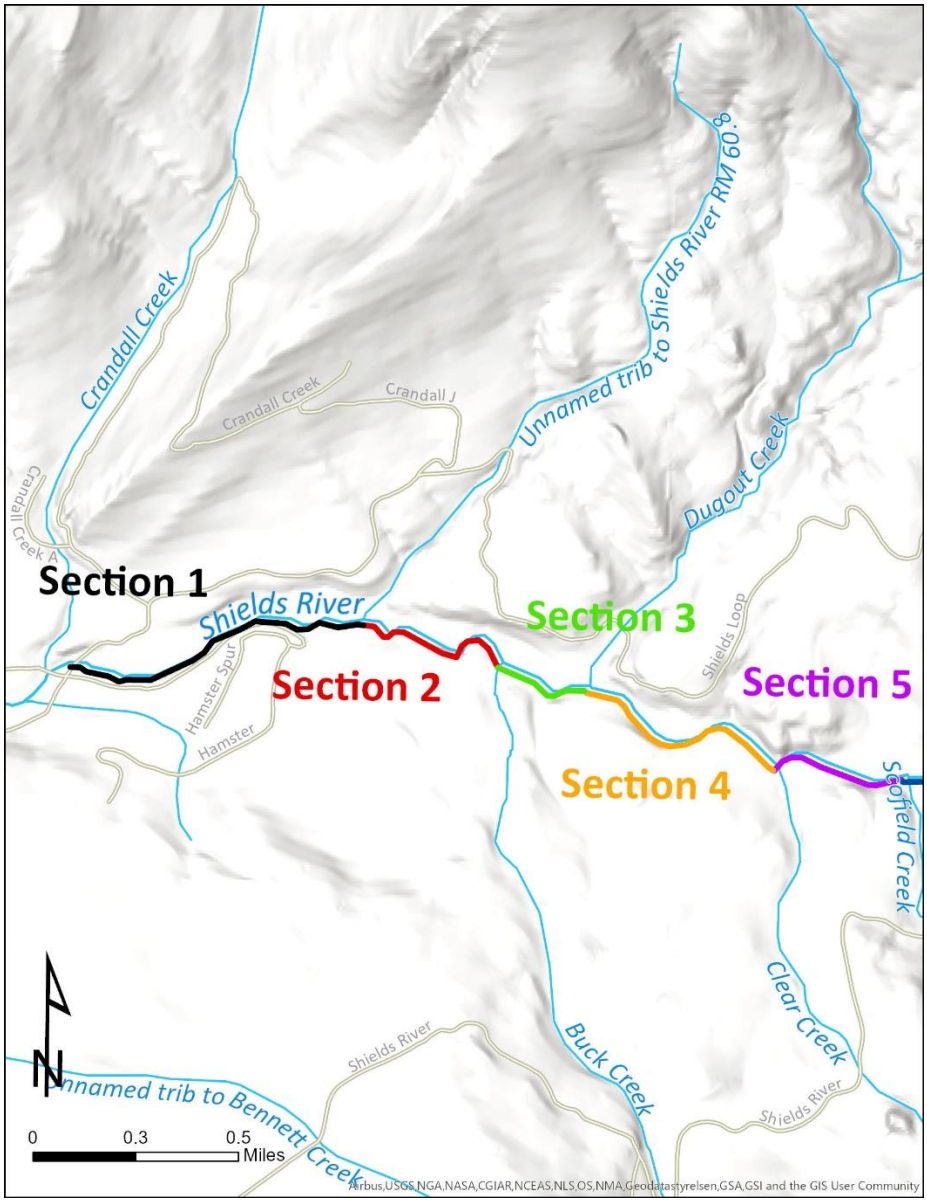


Figure 7: Sections 1 - 5 located on the Shields River where Brook Trout removals and Yellowstone Cutthroat Trout counts occurred.

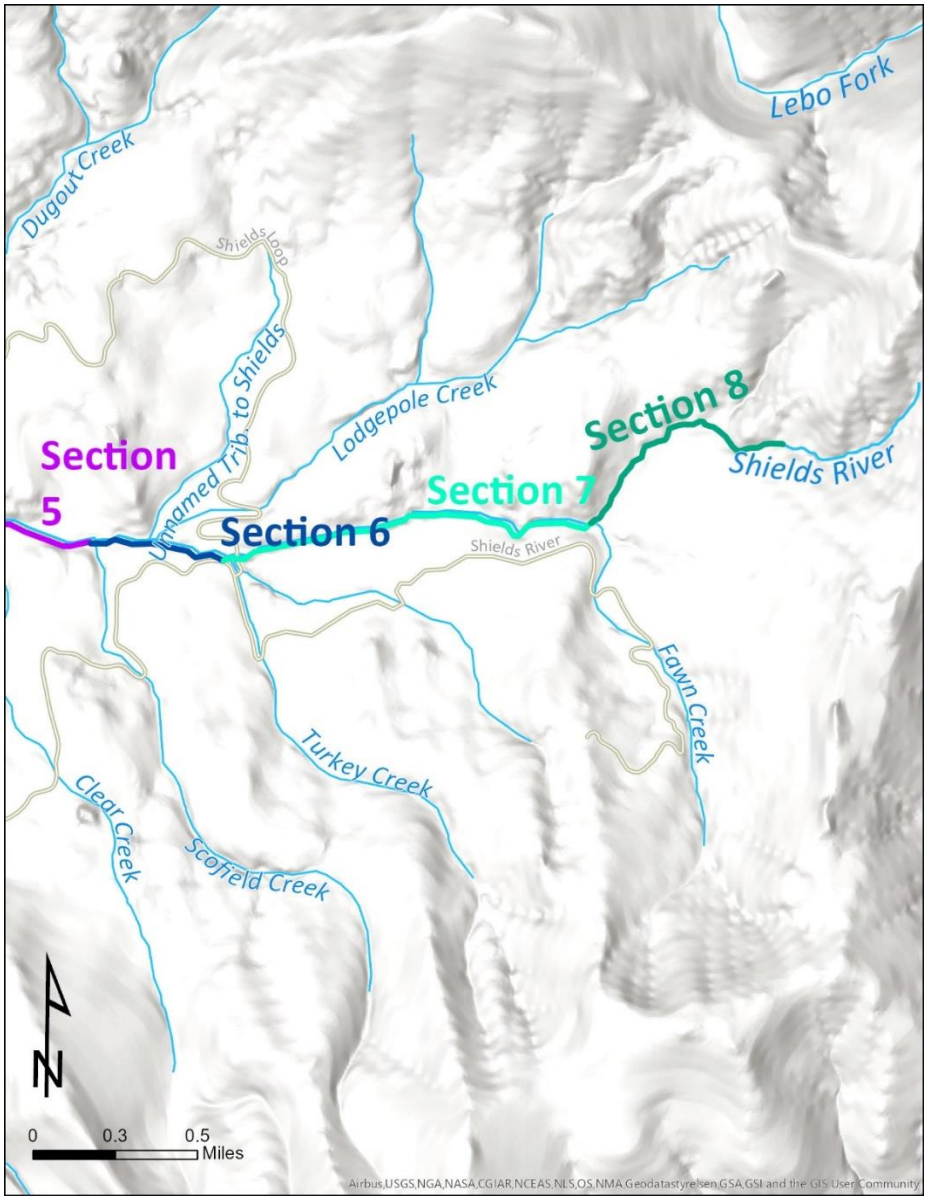


Figure 8: Sections 5 - 7 located on the Shields River where Brook Trout removals and Yellowstone Cutthroat Trout counts occurred.

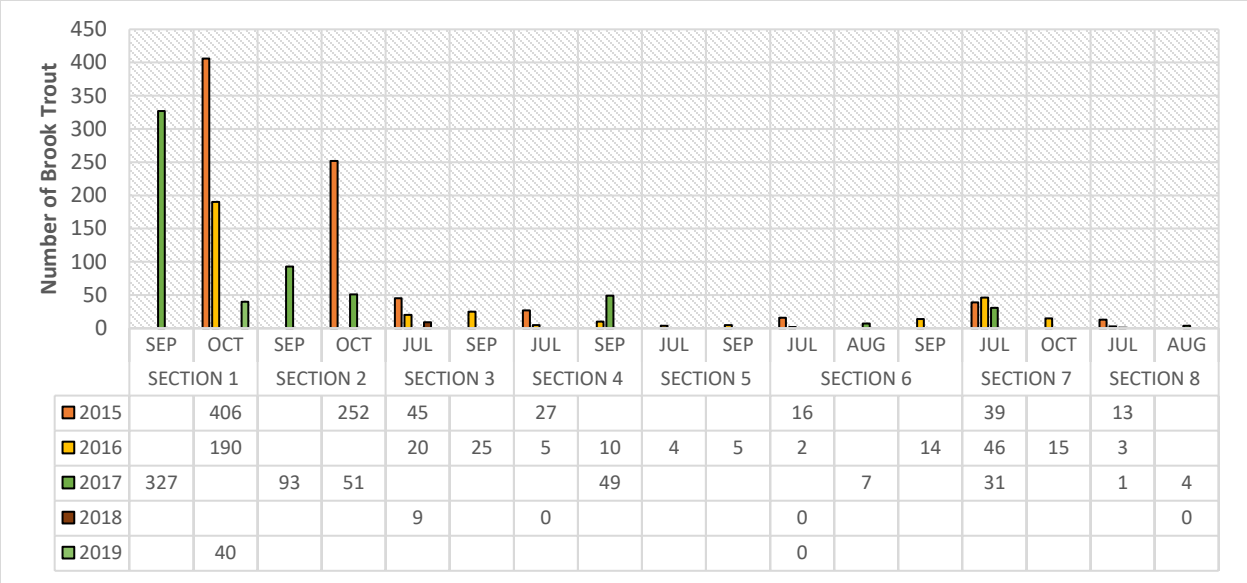


Figure 9: Brook Trout electrofishing removal results in the Shields River from 2015-2019.

Hoop Trap Captures

In 2015, a hoop trap was run in the Shields River near the mouth of Dugout Creek to capture Brook Trout that may have been moving to spawn. The hoop trap was first placed on September 23 and was removed on September 24, 2015. The trap was placed again on September 27 and run through October 2, 2015. The last set of the hoop trap was October 6 through October 8, 2105. A total of 13 Brook Trout and 3 YCT were captured in the trap during the times that it was run (Table 1). The captured Brook Trout ranged from 164-233 mm in total length and all but one were ripe males in spawning condition. This appears to be an effective way to passively capture Brook Trout, especially males, during spawning movements.

Table 1: Shields River hoop trap results for 2015.

Date	# of Brook Trout Captured	Brook Trout Length and Sex	# of Yellowstone Cutthroat Trout Captured	Yellowstone Cutthroat Trout Length
9/24/15	8	199 mm/Ripe Male	0	
		203 mm/Ripe Male		
		197 mm/Ripe Male		
		165 mm/Ripe Male		
		164 mm/Ripe Male		
		233 mm/Gravid Female		
		170 mm/Ripe Male		
		225 mm/Ripe Male		
9/30/15	0		0	
10/1/15	2	199 mm/Ripe Male	1	
		204 mm/Ripe Male		
10/2/15	1	70 mm		
10/8/15	2	213 mm/Ripe Male	2	123 mm
		184 mm/Ripe Male		196 mm
Total	**13**		**3**	

Capture rates for Brook Trout have been on an overall downward trend with variability from year to year in the Shields River (Figure 10 and Table 2). Brook Trout per 100 m sampled in the Shields River reached a high of 10.1 in 2015 and low of 0.7 in 2018.

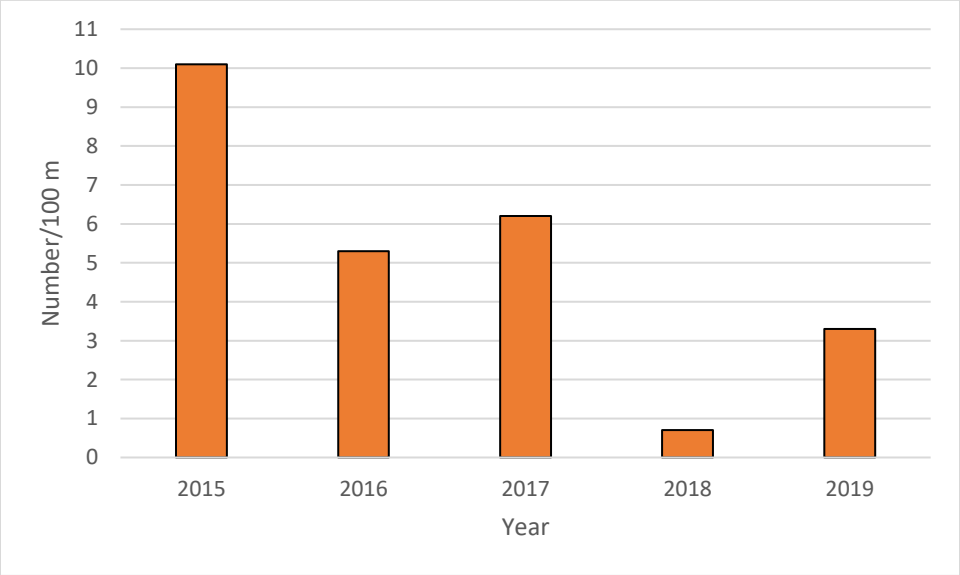


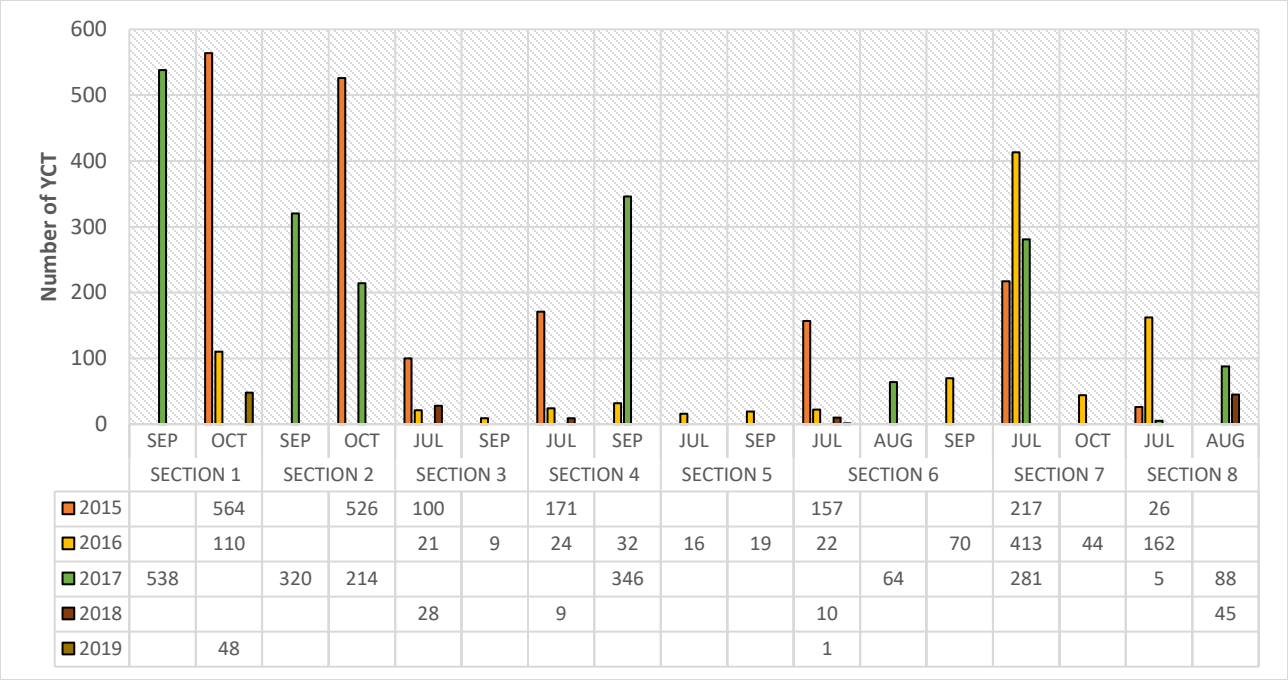
Figure 10: Brook Trout removed per 100 m sampled in the Shields River from 2015-2019.

Table 2: Brook Trout removed, meters sampled, and Brook Trout per 100 m in the Shields River by year from 2015-2019.

Year	2015	2016	2017	2018	2019
Brook Trout Removed	798	339	563	9	40
Meters Sampled	7,891	6,455	9,059	1,270	1,210
Brook Trout per 100 m	10.1	5.3	6.2	0.7	3.3

Yellowstone Cutthroat Trout Counts

During Brook Trout removal efforts in the Shields River counts of YCT were completed from 2015-2019. The highest count of YCT, 1,856, occurred in 2017 and the lowest count, 49, was in 2019, (Figure 11 and Appendix 2). Like Brook Trout, the highest number of YCT were captured in Section 1, 1,260, and the lowest number of YCT, 35, were captured in Section 5.



	SEP	OCT	SEP	OCT	JUL	SEP	JUL	SEP	JUL	SEP	JUL	AUG	SEP	JUL	OCT	JUL	AUG
	SECTION 1		SECTION 2		SECTION 3		SECTION 4		SECTION 5		SECTION 6			SECTION 7		SECTION 8	
2015		564		526	100		171				157			217		26	
2016		110			21	9	24	32	16	19	22		70	413	44	162	
2017	538		320	214				346				64		281		5	88
2018					28		9				10						45
2019		48									1						

Figure 11: Yellowstone Cutthroat Trout electrofishing capture results in the Shields River from 2015-2019.

The number of YCT captured per meter of stream sampled each year in the Shields River was variable. The highest catch per meter occurred in 2015 at 22.3 YCT per 100 m (Figure 12 and Table 3). The lowest was in 2019 at 4.0 YCT per 100 m. The much shorter distance sampled in 2018 and 2019 may have contributed to the decline in YCT per meter during both years depending on YCT distribution throughout the Shields River during the time of sampling.

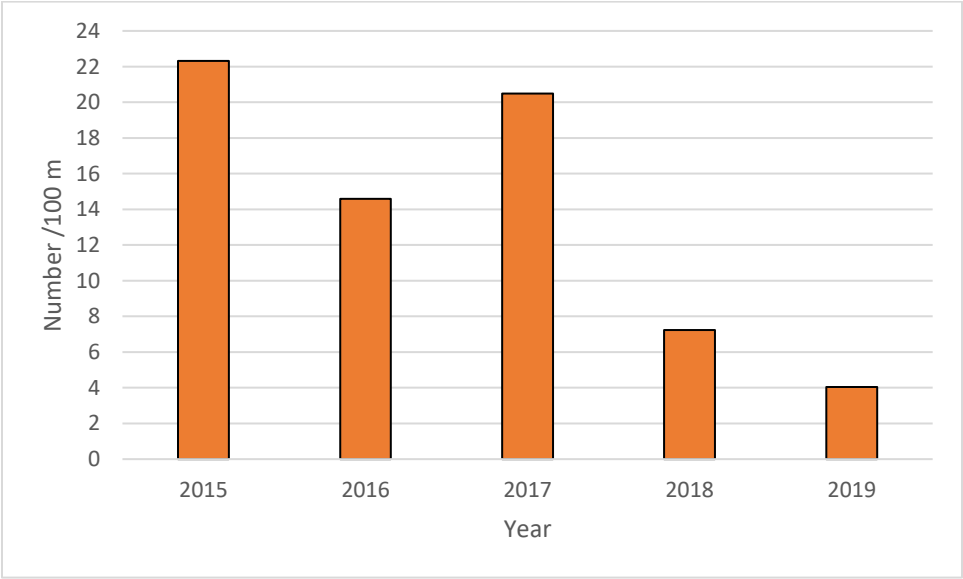


Figure 12: Yellowstone Cutthroat Trout captured per 100 m sampled in the Shields River from 2015-2019.

Table 3: Yellowstone Cutthroat Trout captured, meters sampled, and YCT per 100 m sampled in Shields River by year from 2015-2019.

Year	2015	2016	2017	2018	2019
YCT captured	1,761	942	1,856	92	49
Meters Sampled	7,891	6,455	9,059	1,270	1,210
YCT Trout per 100 m	22.3	14.6	20.5	7.2	4.0

Brown Trout

During all the Brook Trout removal efforts that have taken place from 2015-2019, in the Shields River and its tributaries, only one Brown Trout has been captured above the barrier site at the Crandall Creek Campground. The Brown Trout was captured in Section 1 of the Shields River on October 20, 2015 between the barrier site and the upstream end of the campground (Figure 7). This was just after the barrier was completed on October 15, 2015.

Unnamed Tributary to Shields River at RM 60.8

Brook Trout Removal

Brook Trout removal has occurred for six years, 2014-2019, in the Unnamed Tributary of the Shields River at RM 60.8 and 175 Brook Trout have been removed from two sections (Figure 13). The most Brook Trout removed in any year occurred in 2016 with 59 being removed (Figure 14 and Appendix 3). The least amount removed in a year was three Brook Trout in 2014. Over the six-year period, most Brook Trout were removed from the lower section, Section 1. A total of three Brook Trout were removed from Section 2 in 2014 and have not been found since. In 2014, the culvert between Section 1 and Section 2 was reset as a perched culvert to prevent upstream movement of Brook Trout and appears to be functioning well. Section 2 has not been sampled since 2017 and sampling is planned for 2020.

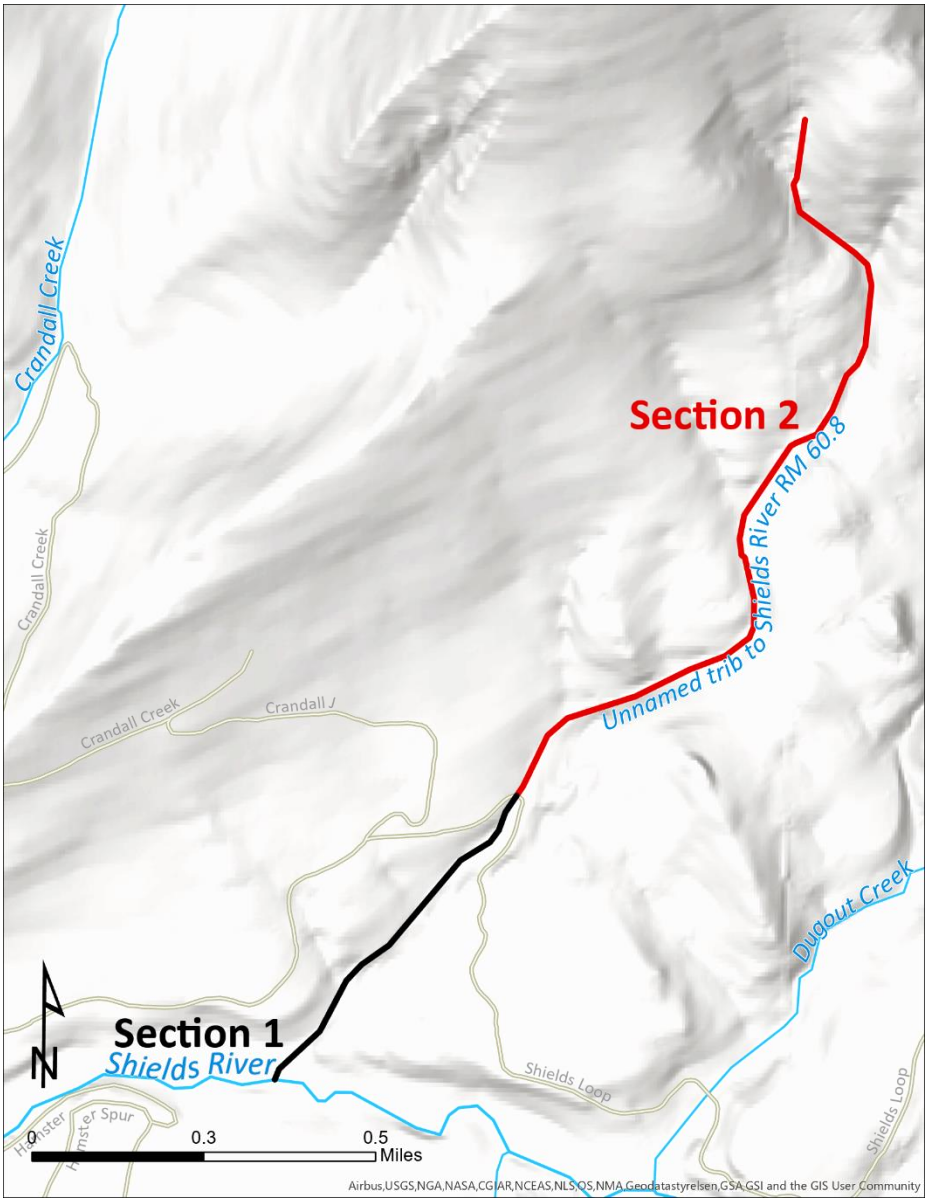
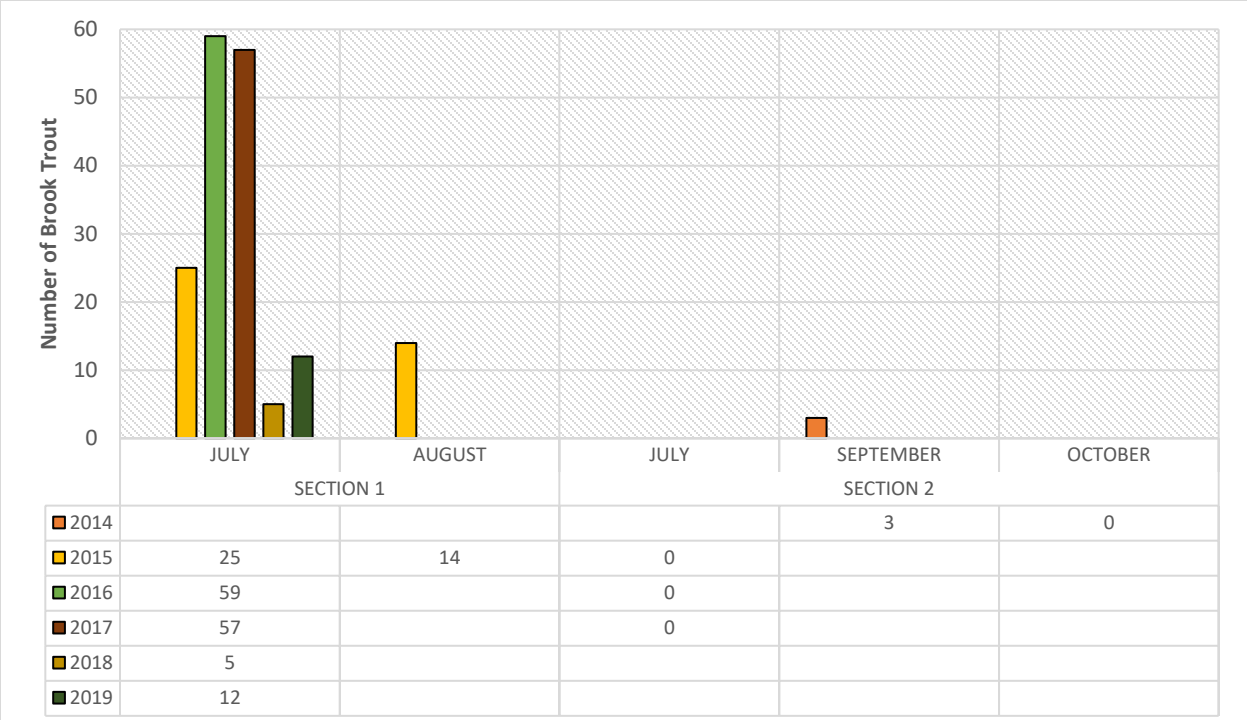


Figure 13: The two sampling sections located on the Unnamed Tributary to Shields River at RM 60.8 where Brook Trout removals and Yellowstone Cutthroat Trout counts occurred.



	SECTION 1		SECTION 2		
	JULY	AUGUST	JULY	SEPTEMBER	OCTOBER
2014				3	0
2015	25	14	0		
2016	59		0		
2017	57		0		
2018	5				
2019	12				

Figure 14: Brook Trout electrofishing removal results in Unnamed Tributary to Shields River at RM 60.8 from 2014-2019.

When the number of Brook Trout removed per 100 m of stream sampled each year is compared, Brook Trout increased from a low of 0.2 per 100m in 2014 to a high of 5.4 per 100 m in 2017. That trend ended in 2018 and captures began to increase again in 2019 (Figure 15 and Table 4).

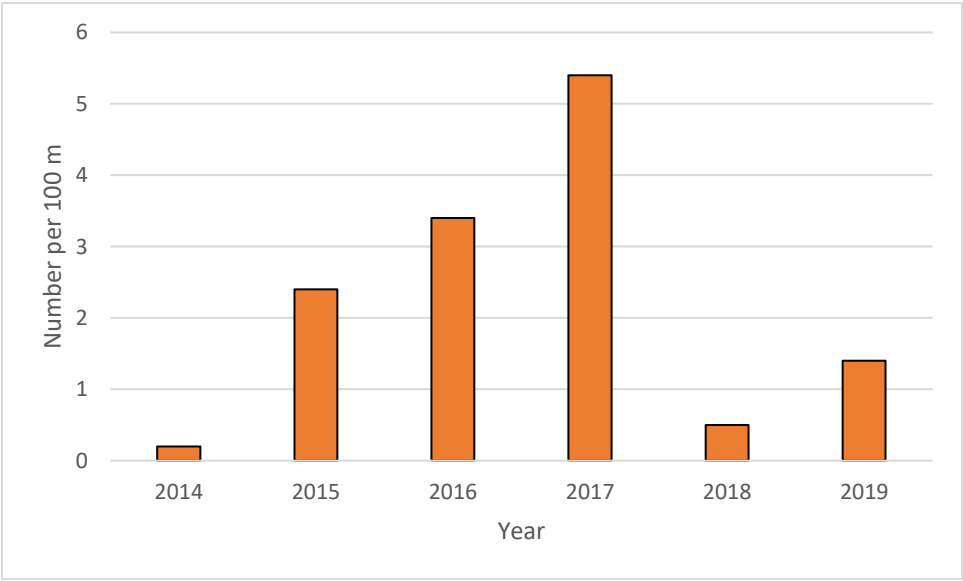


Figure 15: Brook Trout removed per 100 m sampled in the Unnamed Tributary to Shields River at RM 60.8 from 2014-2019.

Table 4: Brook Trout removed, meters sampled, and Brook Trout per 100 m in the Unnamed Tributary to Shields River at RM 60.8 by year from 2014-2019.

Year	2014	2015	2016	2017	2018	2019
Brook Trout Removed	3	39	59	57	5	12
Meters Sampled	1,531	1,615	1,754	1,052	850	850
Brook Trout per 100 m	0.2	2.4	3.4	5.4	0.5	1.4

Yellowstone Cutthroat Trout Counts

During Brook Trout removal efforts in the Unnamed Tributary to Shields River at RM 60.8 counts of YCT were completed. The highest count of YCT, 452, occurred in 2016 and the lowest count was in 2018, 26 (Figure 16 and Appendix 4). Like Brook Trout, the highest number of YCT have been captured in Section 1. Sampling for YCT in Section 2 above the Forest Service road was completed from 2014-2017 and is planned for 2020.

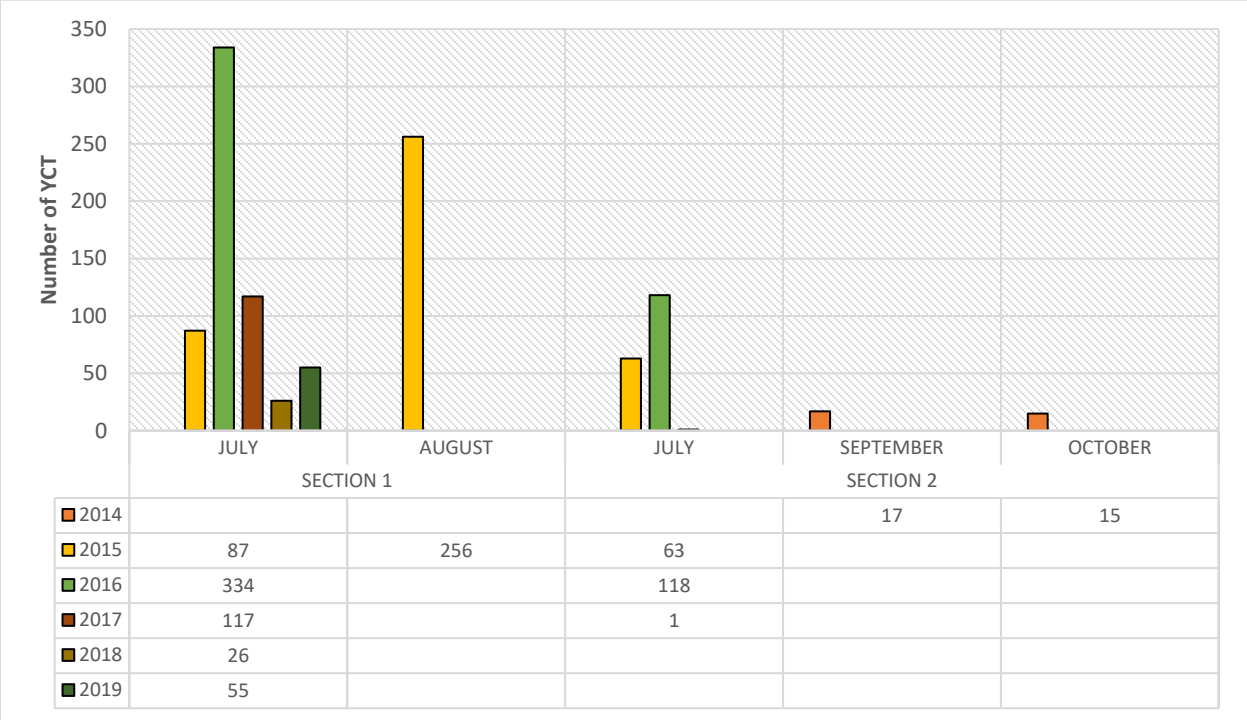


Figure 16: Yellowstone Cutthroat Trout electrofishing capture results in Unnamed Tributary to Shields River at RM 60.8 from 2014-2019.

Similar to Brook Trout, the number of YCT captured per 100 m of stream sampled each year increased from 2014 through 2016 (Figure 17 and Table 5Table 4). In 2017 and 2018, YCT per 100 m decreased with the 2018 value slightly higher than 2014. In 2019, YCT per 100m increased compared to 2018, but remained lower than all other years except 2014.

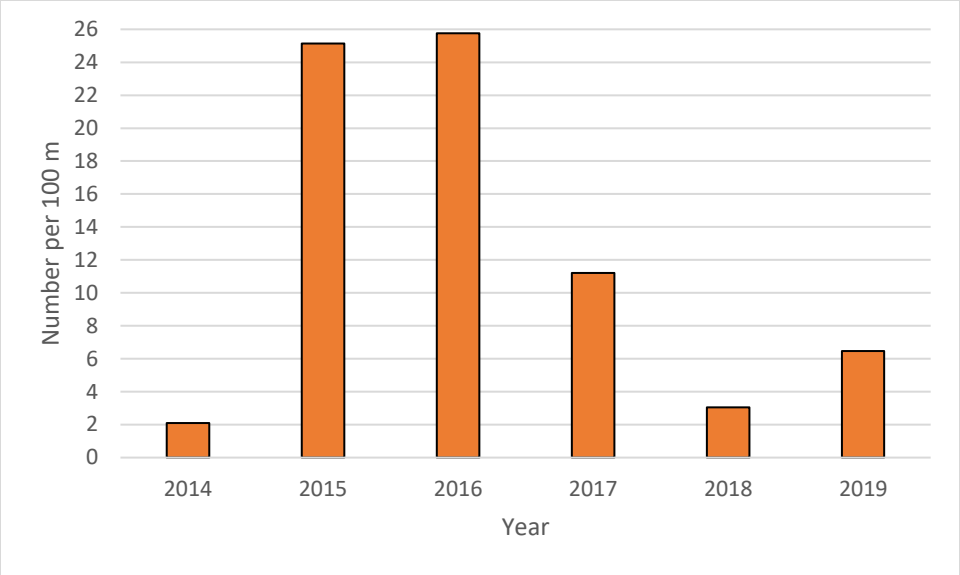


Figure 17: Yellowstone Cutthroat Trout captured per 100 m sampled in the Unnamed Tributary to Shields River at RM 60.8 from 2014-2019.

Table 5: Yellowstone Cutthroat Trout captured, meters sampled, and YCT per 100 m sampled in the Unnamed Tributary to Shields River at RM 60.8 by year from 2014-2019.

Year	2014	2015	2016	2017	2018	2019
YCT Captured	32	406	452	118	26	55
Meters Sampled	1,531	1,615	1,754	1,052	850	850
YCT per 100 m	2.1	25.1	25.8	11.2	3.1	6.5

Dugout Creek

Brook Trout Removal

In Dugout Creek, Brook Trout removal efforts were completed in four sections in 2014 -2019 (Figure 18). In addition to electrofishing, a hoop trap was placed at the mouth of Dugout in 2015 to capture Brook Trout migrating into the creek to spawn.

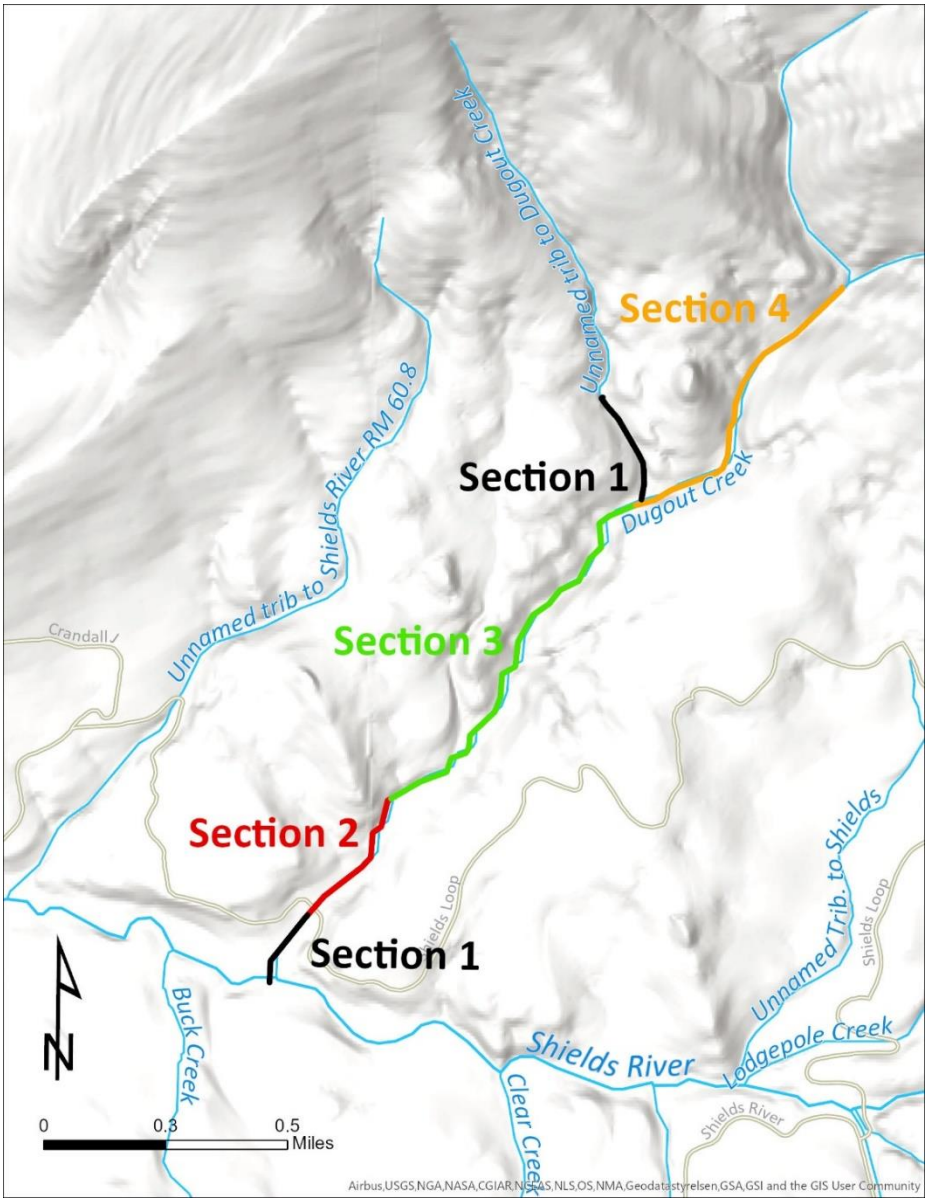


Figure 18: The four sampling sections located on Dugout Creek and the one sampling section located on the unnamed tributary to Dugout Creek were Brook Trout removals and Yellowstone Cutthroat Trout counts occurred.

In the six years that Brook Trout removal has occurred in Dugout Creek, a total of 1,019 Brook Trout have been removed from four sections (Figure 19 and Appendix 5). The highest number of Brook Trout removed in any year, 278, occurred in 2015 with 273 being removed through electrofishing and 5 through hoop trapping (Figure 19 and Table 6). The lowest number of removed Brook Trout occurred in 2018 with only 42 fish. It should be noted that removal efforts were not equal among years and did not always occur at the same time in each year. Over the six-year period, most of the removed Brook Trout came from Section 3, 591 fish, and the least, 102 fish, came from the upper most section, Section 4.

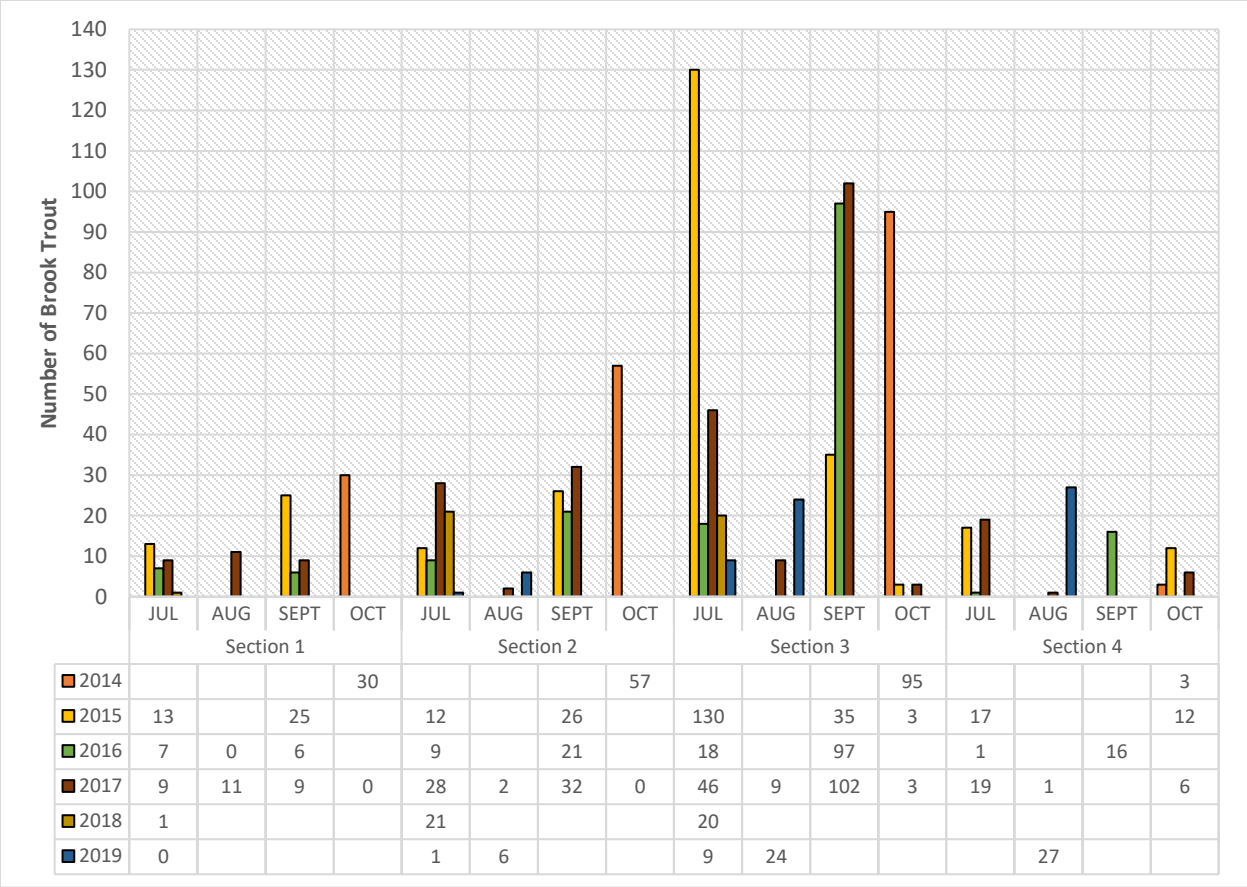


Figure 19: Brook Trout electrofishing removal results in Dugout Creek from 2014-2019.

Hoop Trap Captures

A hoop trap was placed in Dugout Creek, in the thalweg, just upstream of the mouth in order to capture Brook Trout migrating from the Shields River to spawn. The trap was initially placed on September 23, 2015 and run until September 25, 2015. The trap was run again from September 27, 2015 through October 2, 2015. The last set of the trap was from October 6, 2015 through October 8, 2015. During the duration of the trapping effort five Brook Trout ranging in total length from 68 to 80 mm were captured (Table 6). One YCT was captured in October as well.

Table 6: Dugout Creek hoop trap capture results for 2015.

Date	Number of Brook Trout Captured	Brook Trout Length	Number of Yellowstone Cutthroat Captured
9/24/15	1	68 mm	0
9/25/15	0	-	0
9/30/15	0	-	0
10/1/15	3	78 mm	1
		79 mm	
		80 mm	
10/2/15	0	-	0
10/8/15	1	69 mm	0
Total	**5**		**1**

When the number of Brook Trout captured per 100 m each year is compared, it does appear that removal efforts in Dugout have been successful in reducing the number Brook Trout. Brook Trout per meter has decreased from 11 per 100 m in 2014 to a low of 1 per 100 m in 2018 and then increased slightly to 2 per 100 m in 2019 (Figure 20 and Table 7).

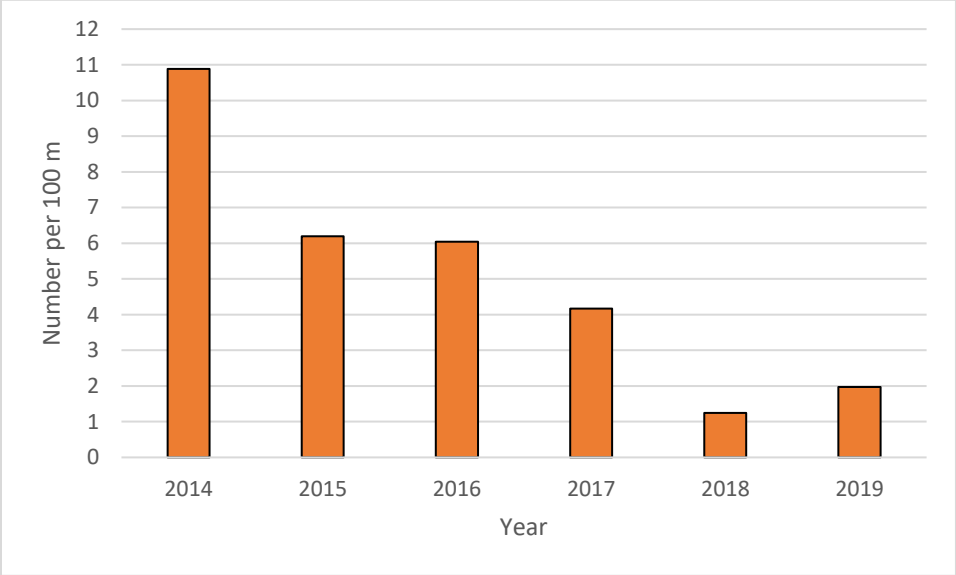


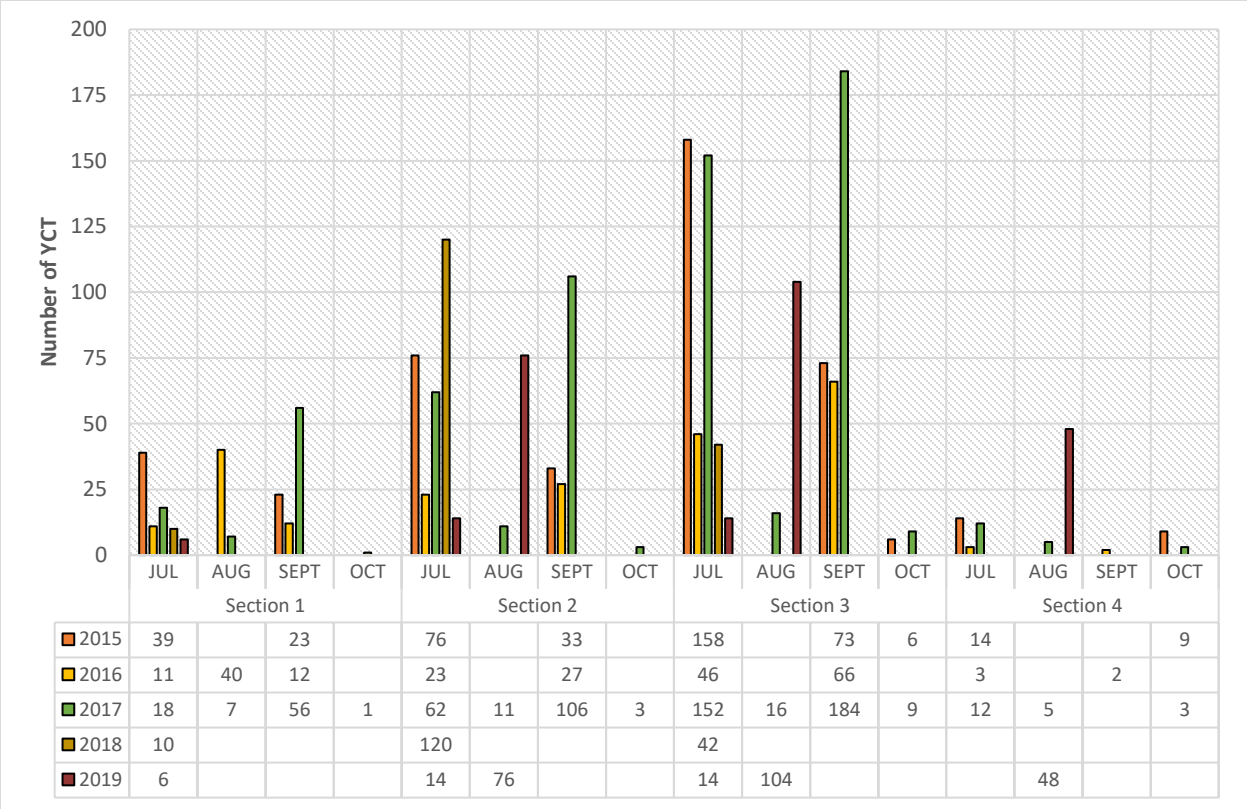
Figure 20: Brook Trout removed per 100 m sampled in Dugout Creek from 2014-2019.

Table 7: Brook Trout removed, meters sampled, and Brook Trout per 100 m in Dugout Creek by year from 2014-2019.

Year	2014	2015	2016	2017	2018	2019
Brook Trout Removed	185	273	175	277	42	67
Meters Sampled	1,700	4,405	2,896	6,646	3,368	3,399
Brook Trout per 100 m	10.9	6.2	6.0	4.2	1.2	2.0

Yellowstone Cutthroat Trout Counts

During Brook Trout removal efforts in Dugout Creek counts of YCT were completed. The highest number of YCT captured, 635, was in 2017 and the lowest number, 172, was in 2018 (Figure 21 and Appendix 6). Like Brook Trout, the section with the highest number of YCT captured over the six years, 980, was Section 3. The Section with the lowest number of captured YCT, 66, was Section 4.



	Section 1				Section 2				Section 3				Section 4			
	JUL	AUG	SEPT	OCT	JUL	AUG	SEPT	OCT	JUL	AUG	SEPT	OCT	JUL	AUG	SEPT	OCT
2015	39		23		76		33		158		73	6	14			9
2016	11	40	12		23		27		46		66		3		2	
2017	18	7	56	1	62	11	106	3	152	16	184	9	12	5		3
2018	10				120				42							
2019	6				14	76			14	104				48		

Figure 21: Yellowstone Cutthroat Trout electrofishing capture results in Dugout Creek from 2014-2019.

Similar to Brook Trout in Dugout Creek, the number of YCT captured per 100 m decreased from 2014 to 2018 (Figure 22 and Table 8). YCT per 100 m went from 16 in 2014 to a low of 5 in 2018. In 2019, the YCT per meter increased to 7.

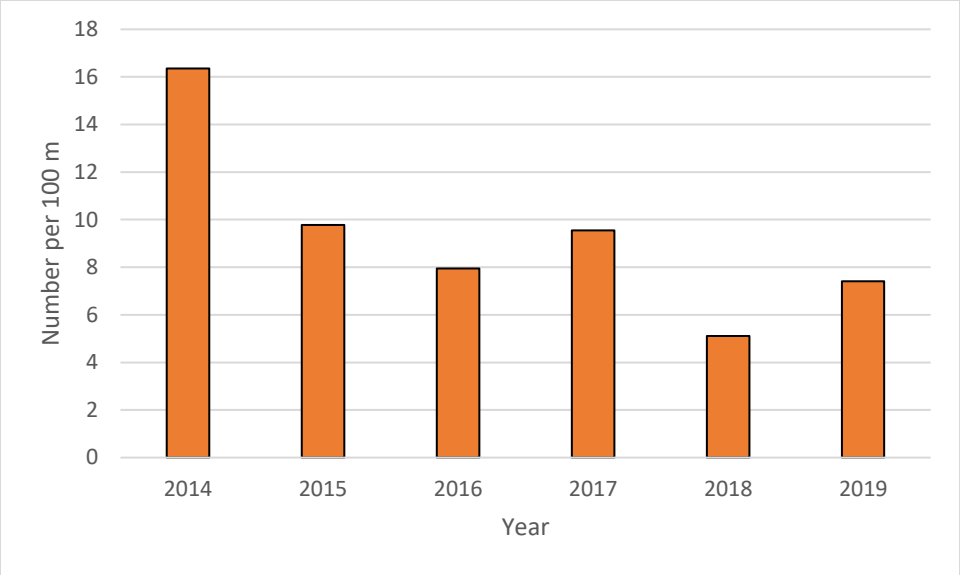


Figure 22: Yellowstone Cutthroat Trout captured per 100 m sampled in Dugout Creek from 2014-2019.

Table 8: Yellowstone Cutthroat Trout captured, meters sampled, and YCT per 100 m sampled in Dugout Creek by year from 2014-2019.

Year	2014	2015	2016	2017	2018	2019
YCT Captured	278	431	230	635	172	252
Meters Sampled	1,700	4,405	2,896	6,646	3,368	3,399
YCT per 100 m	16.4	9.8	7.9	9.6	5.1	7.4

Unnamed Tributary to Dugout Creek at RM 1.3

A 200-meter removal effort was done in Section 1 in 2015 (Figure 18). The presence of many young-of-the-year YCT was noted and three Brook Trout were removed. A 115-meter removal effort was completed in Section1 in 2019. During that effort one Brook Trout and three YCT were captured. Due to the presence of Brook Trout in both 2015 and 2019 sampling of this tributary will be included in future efforts.

Unnamed Tributary to Dugout Creek at RM 2.0

In 2015, a 161-meter section of the upper most unnamed tributary to Dugout Creek was sampled. The section was located just upstream of Section 4 (Figure 18). No fish were captured during the sampling effort suggesting that fish distribution in this basin does not extend this far upstream.

Unnamed Tributary to Shields River at RM 62.6

Brook Trout Removal

Brook Trout removal efforts were completed in 2016 and 2017 in the Unnamed Tributary to the Shields River RM 62.6 (Figure 23).

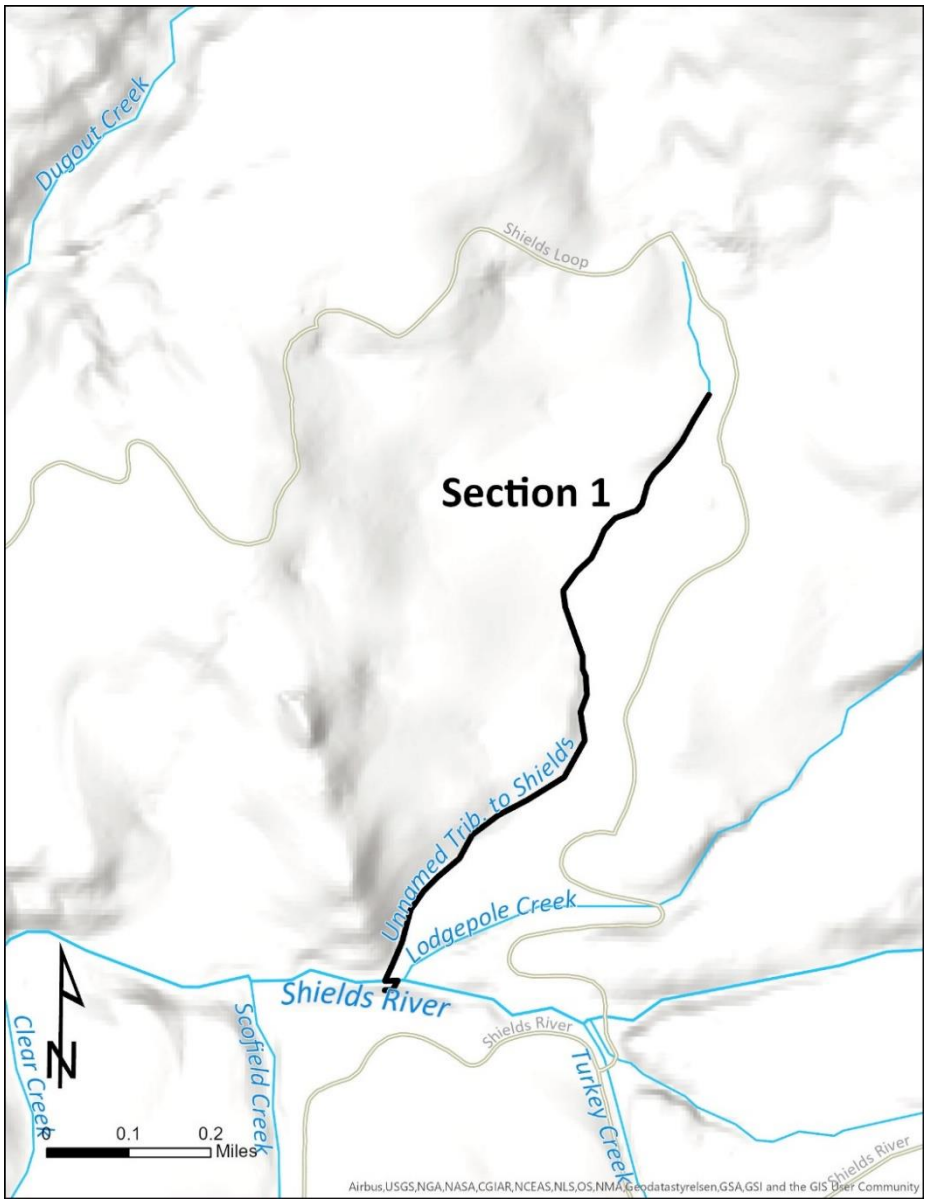


Figure 23: The sampling section located on the Unnamed Tributary of the Shields River at RM 62.6 where Brook Trout removals and Yellowstone Cutthroat Trout counts occurred.

A total of three Brook Trout were removed in 2017 (Figure 24 and Appendix 7). Due to the presence of Brook Trout in 2017 and their absence in 2016, sampling of this tributary is planned for 2020.

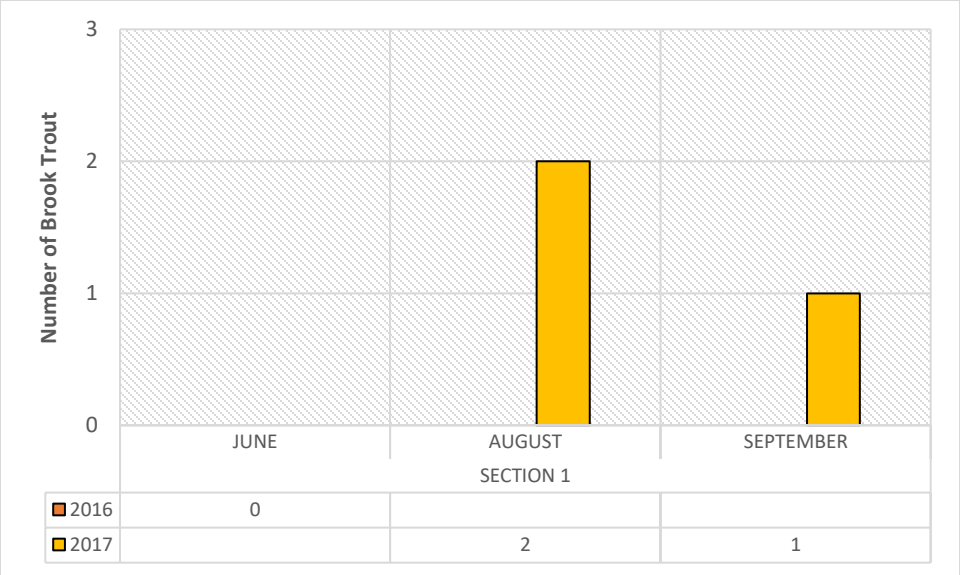


Figure 24: Brook Trout electrofishing removal results in the Unnamed Tributary to the Shields River at RM 62.6 in 2016 and 2017.

Yellowstone Cutthroat Trout Counts

Counts of YCT were completed during Brook Trout removal efforts in the Unnamed Tributary to the Shields River at RM 62.6. The highest count of YCT occurred in 2016 and was 202 fish (Figure 25 and Appendix 8). In 2017, 178 YCT were captured. As mentioned above this stream is scheduled for sampling in 2020.

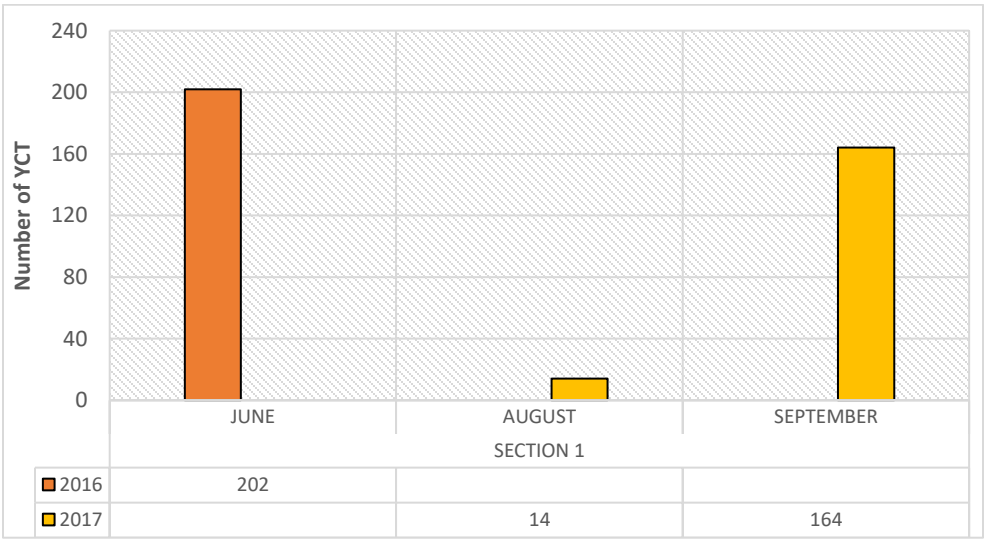


Figure 25: Yellowstone Cutthroat Trout electrofishing capture results in the Unnamed Tributary of the Shields River near Lodgepole Creek in 2016 and 2017.

Lodgepole Creek

Brook Trout Removal

In Lodgepole Creek, Brook Trout removal efforts were completed from 2014 -2019. During the six years that Brook Trout removal have occurred, 34 Brook Trout have been removed from four sections (Figure 26). The

highest number of Brook Trout removed in any year occurred in 2014 with 16 being removed (Figure 27 and Appendix 9). The lowest number of Brook Trout removed occurred in 2019 with only one fish. Over the six-year period, most Brook Trout were removed from the lower section, Section 1, and no Brook Trout were removed from the upper most section, Section 4. This suggests that Brook Trout have not expanded their distribution this far upstream or that habitat may be a limiting factor. Section 4 was not sampled 2017-2019.

In 2018, the culvert between Section 1 and Section 2 was replaced by the Forest Service with an Aquatic Organism Passage (AOP) structure. This replacement took place to take advantage of limited funding and because the existing culvert didn't appear to be acting as a complete barrier.

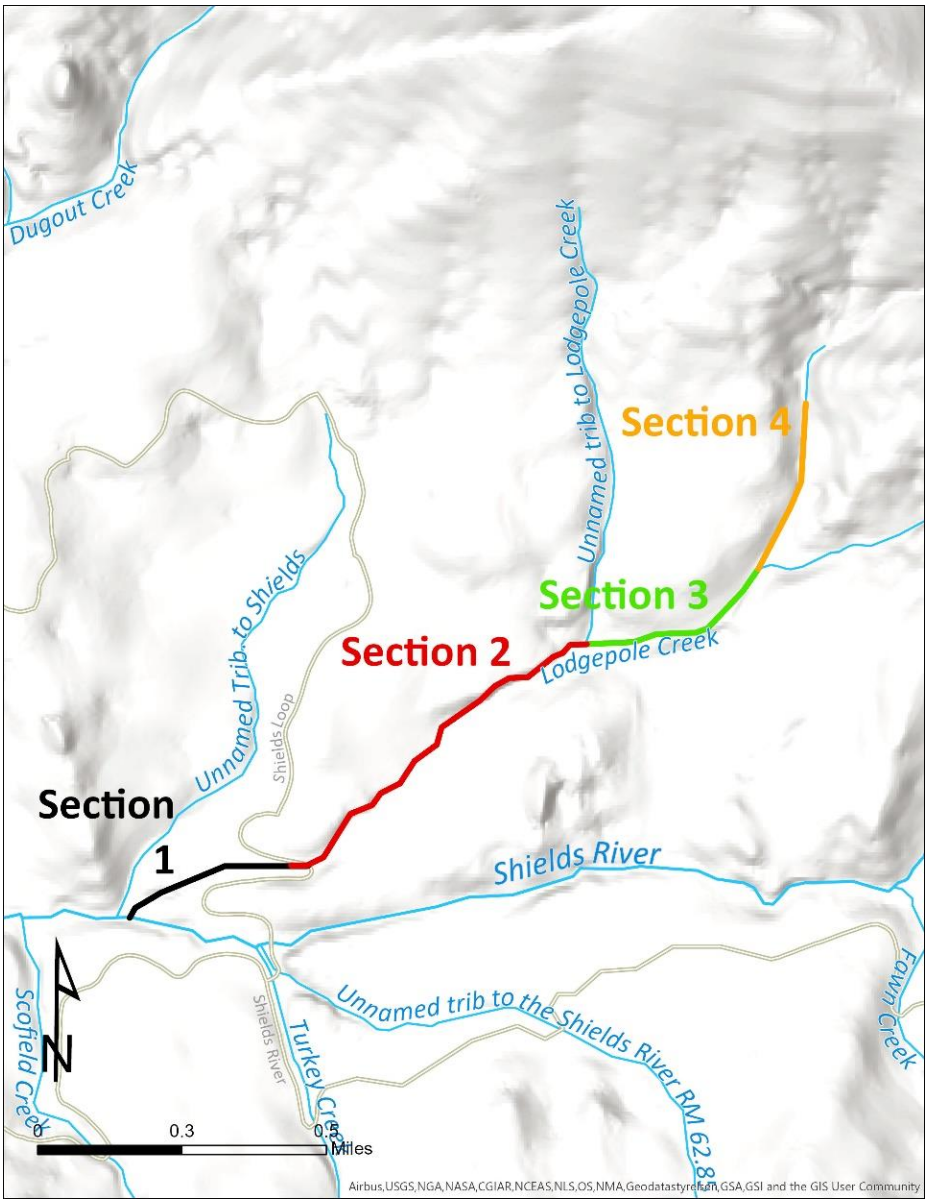
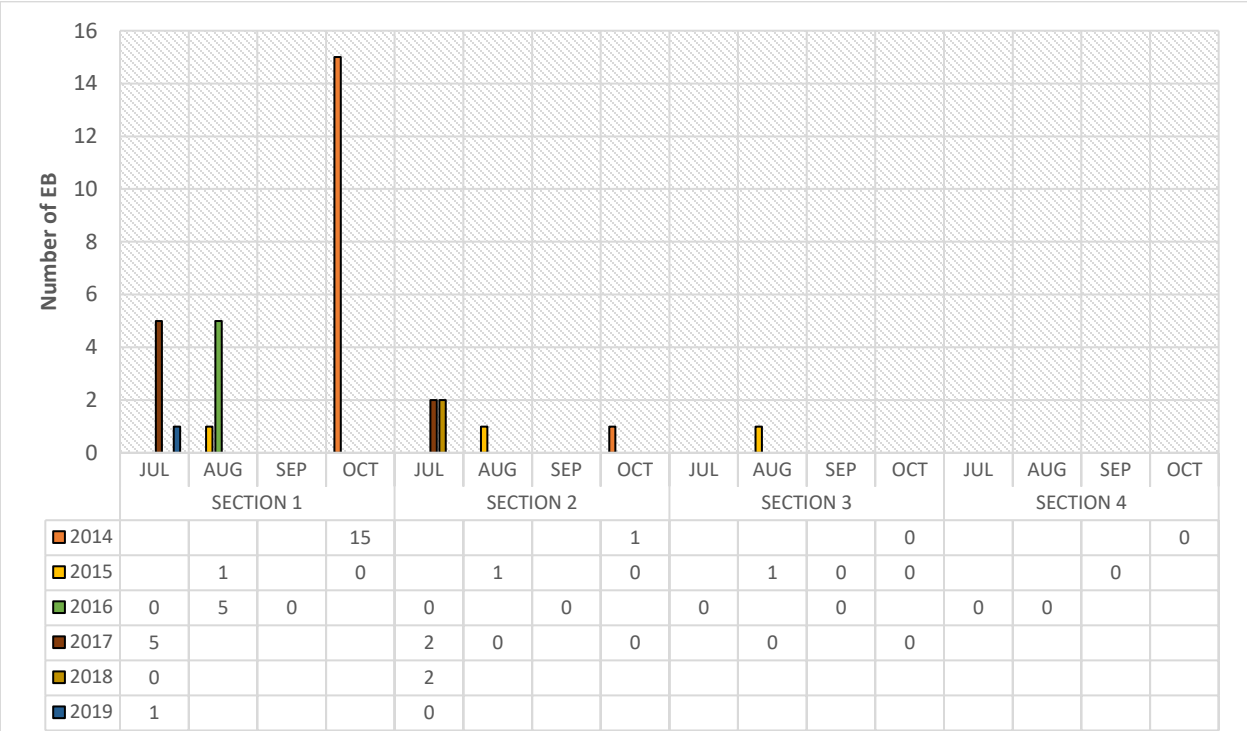


Figure 26: The four sampling reaches located on Lodgepole Creek where Brook Trout removals and Yellowstone Cutthroat Trout surveys occurred.



	SECTION 1				SECTION 2				SECTION 3				SECTION 4			
	JUL	AUG	SEP	OCT	JUL	AUG	SEP	OCT	JUL	AUG	SEP	OCT	JUL	AUG	SEP	OCT
2014				15				1				0				0
2015		1		0		1		0		1	0	0			0	
2016	0	5	0		0		0		0		0		0	0		
2017	5				2	0		0		0		0				
2018	0				2											
2019	1				0											

Figure 27: Brook Trout electrofishing removal results in Lodgepole Creek from 2014-2019.

When the number of Brook Trout captured per 100 m each year is compared, it does appear that removal efforts in Lodgepole Creek have been successful in reducing the number Brook Trout. Brook Trout per 100 m sampled has decreased from 1.3 Brook Trout per meter in 2014 to 0.1 Brook Trout per 100 m in 2019 with the low of 0.1 Brook Trout per 100 m occurring in 2015 as well (Figure 28 and Table 9).

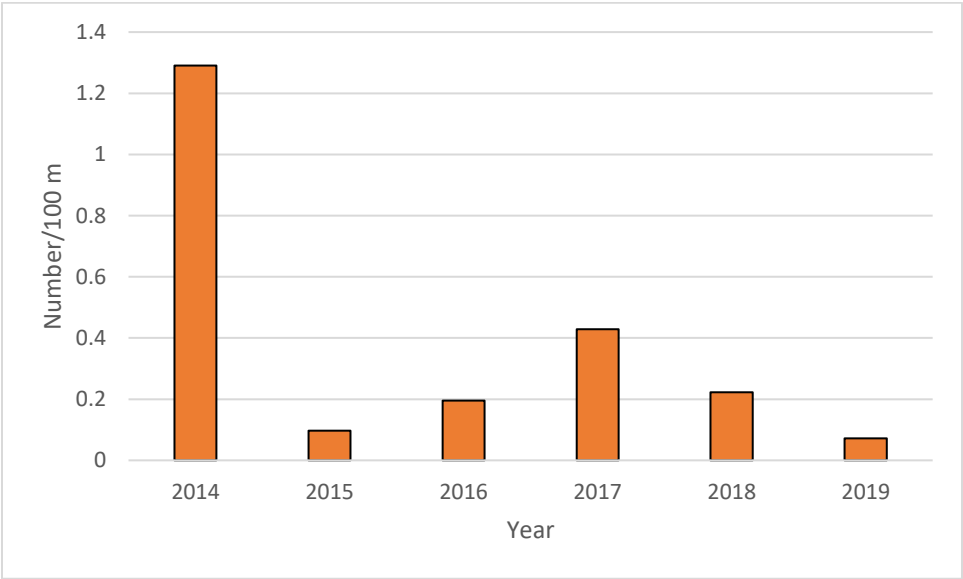


Figure 28: Brook Trout removed per 100 m sampled in Lodgepole Creek from 2014-2019.

Table 9: Brook Trout removed per meter sampled in Lodgepole Creek from 2014-2019.

Year	2014	2015	2016	2017	2018	2019
Brook Trout Removed	16	3	5	7	2	1
Meters Sampled	1,240	3,097	2,557	1,632	900	1,395
Brook Trout per 100 m	1.3	0.1	0.2	0.4	.02	0.1

Yellowstone Cutthroat Trout Counts

Counts of YCT were completed during Brook Trout removal efforts in Lodgepole Creek. The highest number of YCT captured, 532, was in 2015 and the lowest number was 28 captured in 2019 (Figure 29 and Appendix 10). Like Brook Trout, the section with the highest number of YCT captured from 2014-2019 was Section 1 with 369 fish. The Section with the lowest number of captured YCT, 23 was the uppermost section, Section 4, suggesting that habitat suitability may be limiting in the headwaters of this system. It should be noted that Section 4 was not sampled in 2017-2019.

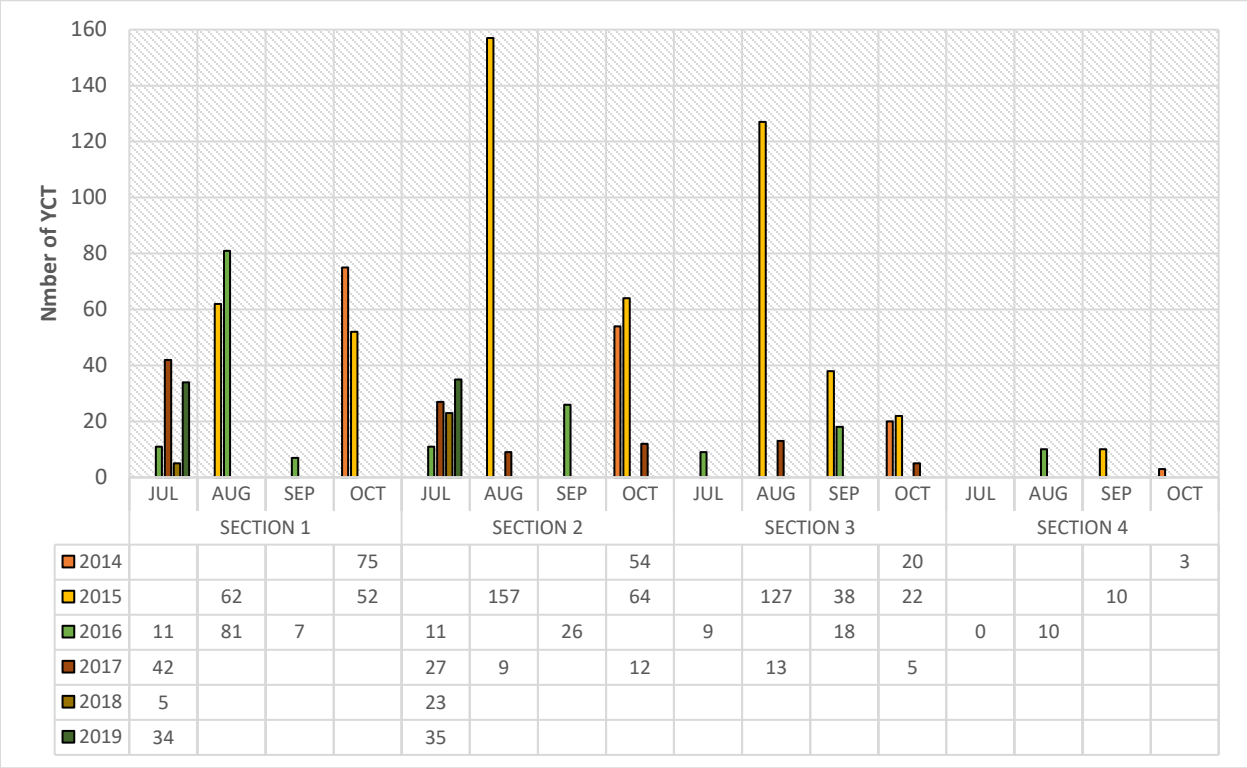


Figure 29: Yellowstone Cutthroat Trout electrofishing capture results in Lodgepole Creek from 2014-2019.

Like Brook Trout, the number of YCT captured per meter in Lodgepole Creek decreased from 2014 to 2019, with a small increase in 2015 (Figure 30 and Table 10). This result is concerning and suggests that factors in addition to Brook Trout presence appear to be limiting and reducing the numbers of YCT in this creek. Reduction of Brook Trout numbers were expected to increase the presence of YCT by reducing competition.

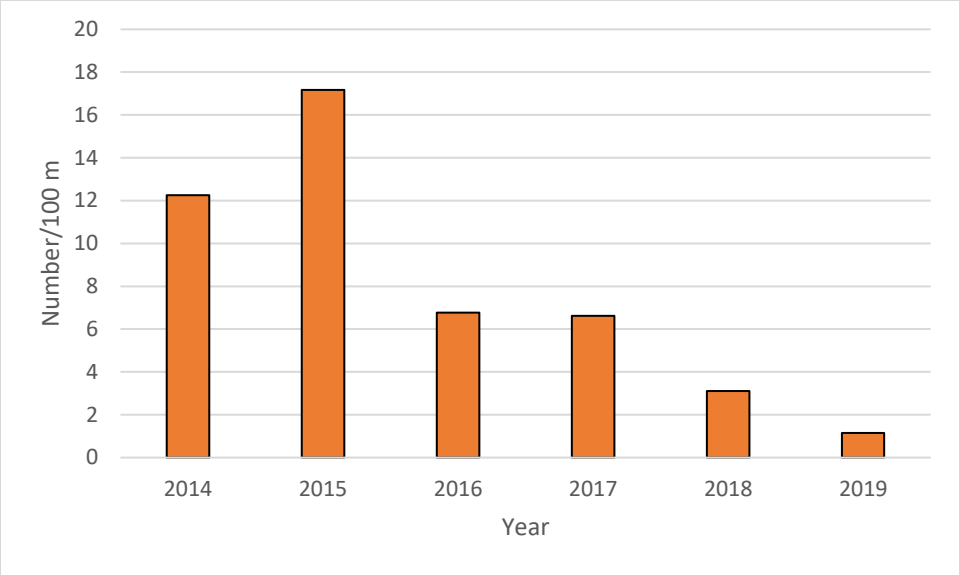


Figure 30: Yellowstone Cutthroat Trout captured per 100 m sampled in Lodgepole Creek from 2014-2019.

Table 10: Yellowstone Cutthroat Trout captured per meter sampled in Lodgepole Creek from 2014-2019.

Year	2014	2015	2016	2017	2018	2019
YCT Captured	152	532	173	108	28	16
Meters Sampled	1,240	3,097	2,557	1,632	900	1,395
YCT per 100 m	12.3	17.2	6.8	6.6	3.1	1.1

Fawn Creek

Brook Trout Removal

From 2015-2018, Brook Trout removal efforts took place in one reach of Fawn Creek (Figure 31). During the four years of removal efforts a total of 21 Brook Trout were removed (Figure 32 and Appendix 11). In 2015, the most Brook Trout were removed with a total of 15 fish while 2016 and 2018 were the lowest with just one fish removed each year. Removal efforts have not been conducted in Section 2 and are scheduled for 2020.

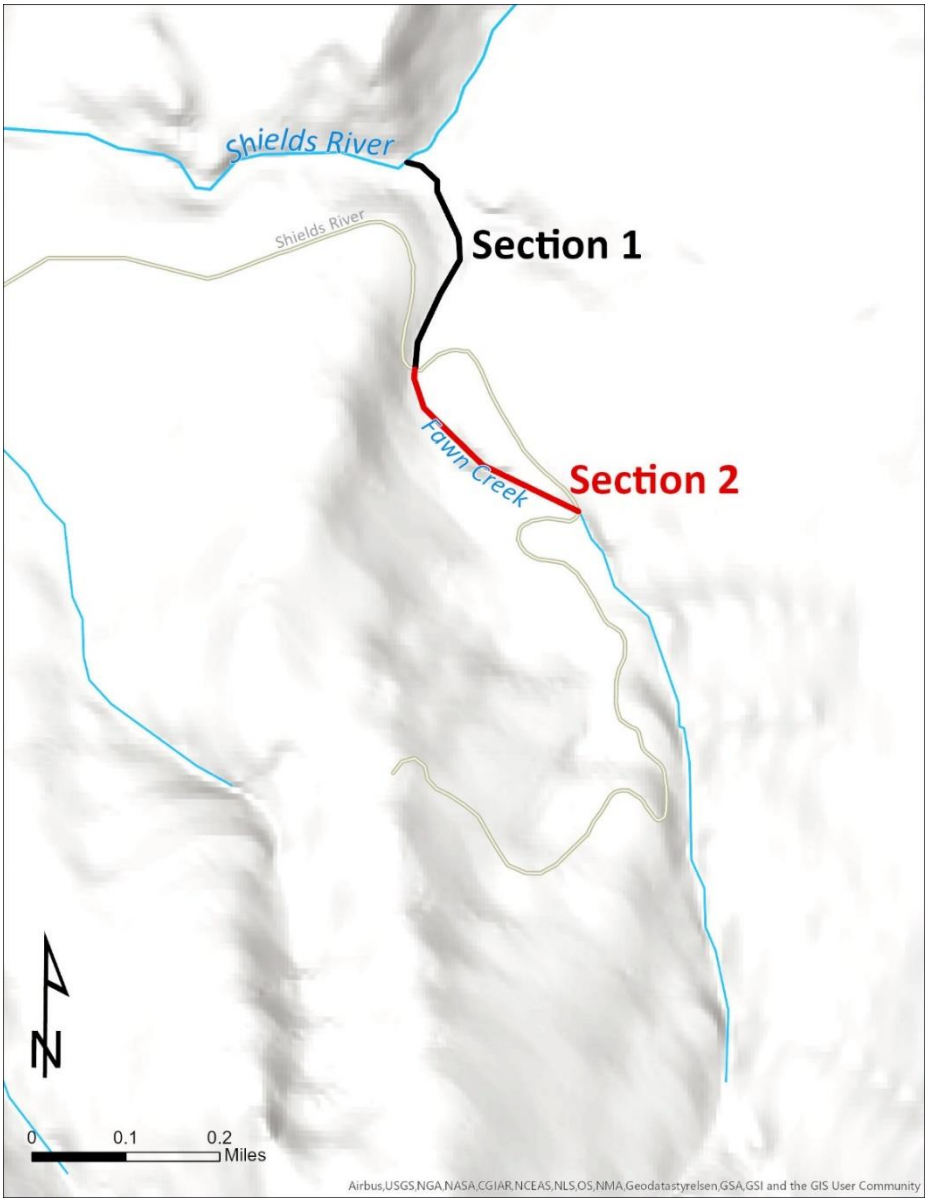


Figure 31: The sampling reach located on Fawn Creek where Brook Trout removals and Yellowstone Cutthroat Trout surveys occurred.

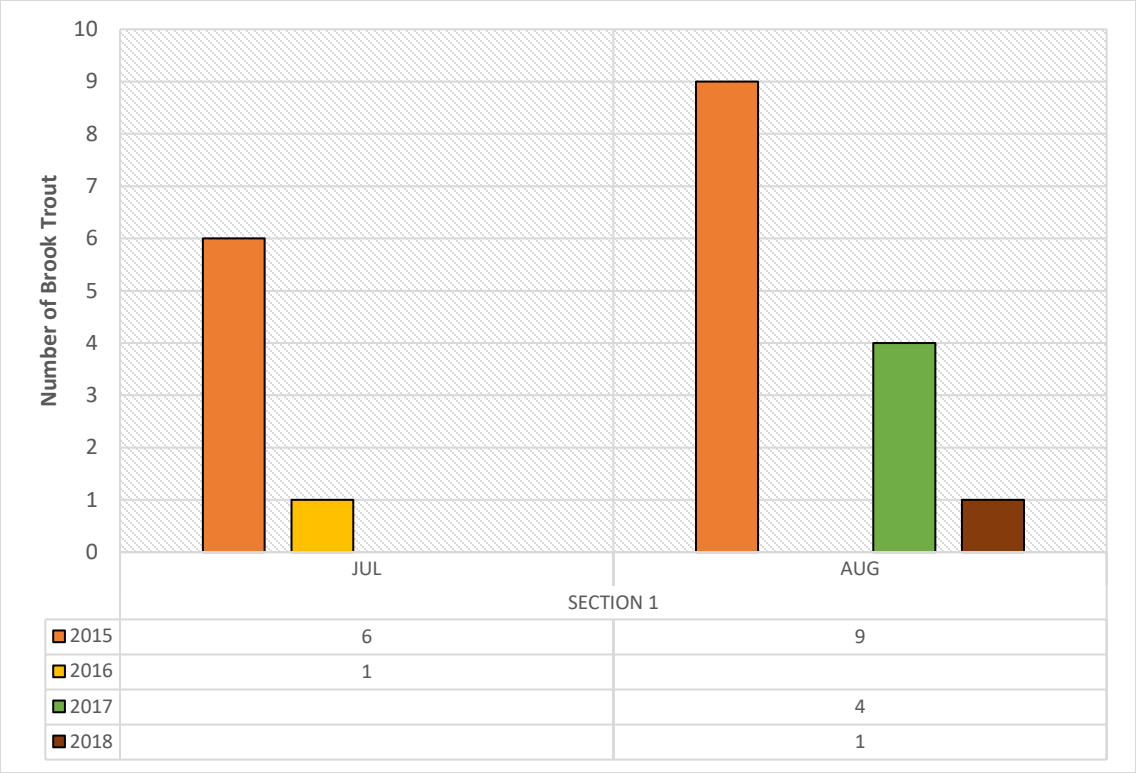


Figure 32: Brook Trout electrofishing removal results in Fawn Creek from 2015-2018.

Over time the removal efforts in Fawn Creek appear to have reduced the number Brook Trout present. Brook Trout sampled decreased from 1.7 per 100 m in 2015 to 0.1 per 100 m in 2018 with a slight increase to 0.6 per 100 m in 2017 (Figure 33 and Table 11).

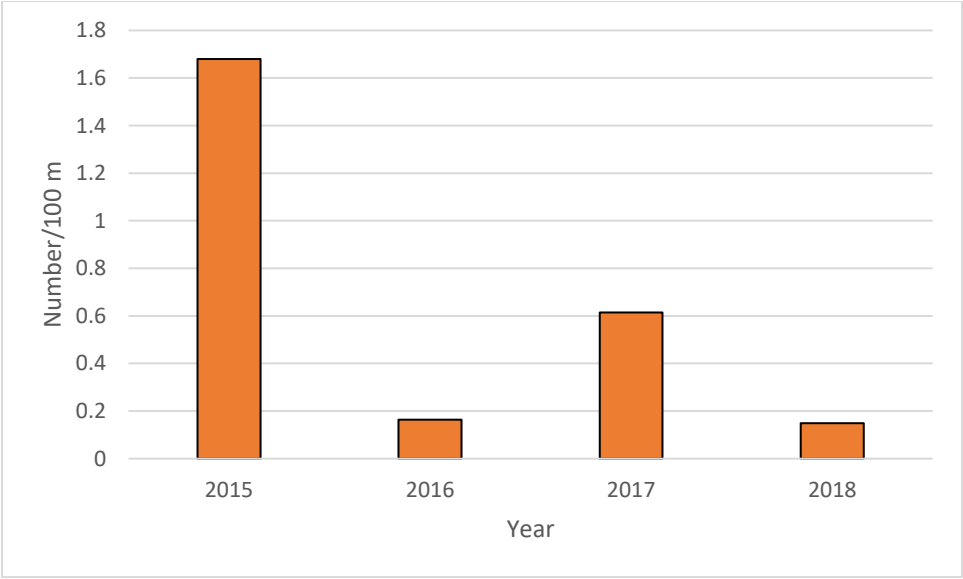


Figure 33: Brook Trout removed per 100 m sampled in Fawn Creek from 2015-2018.

Table 11: Brook Trout removed per meter sampled in Fawn Creek from 2015-2018.

Year	2015	2016	2017	2018
Brook Trout Removed	15	1	4	1
Meters Sampled	893	612	651	670
Brook Trout per 100 m	1.7	0.2	0.6	0.1

Yellowstone Cutthroat Trout Counts

Counts of YCT were completed during Brook Trout removal efforts in Fawn Creek and a total of 217 fish were captured. The highest number of YCT captured was in 2017 with a total of 83 fish and the lowest number was 23 fish in 2015 (Figure 34 and Appendix 12).

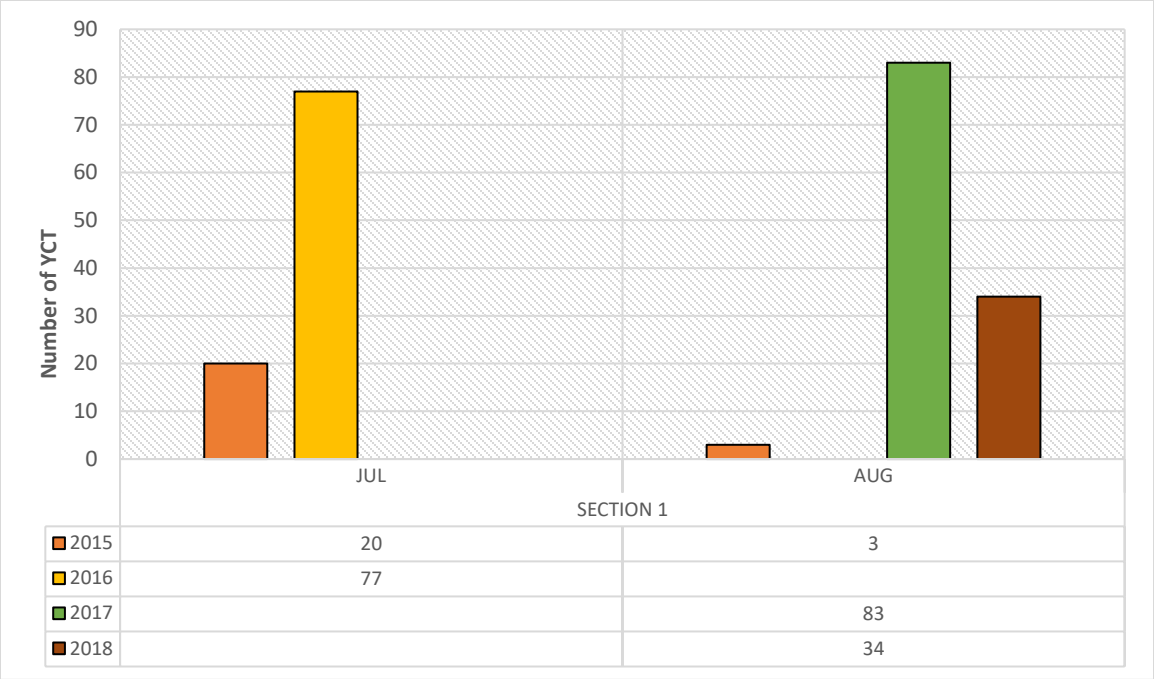


Figure 34: Yellowstone Cutthroat Trout electrofishing capture results in Fawn Creek from 2015-2018.

The number of YCT captured per 100 m increased from 2015 to 2017 and 2017 then declined from 2017 to 2018 (Figure 35 and Table 12). There was no obvious cause for this increase and then decrease in numbers. Sampling is planned for 2020 to determine if the decline has continued.

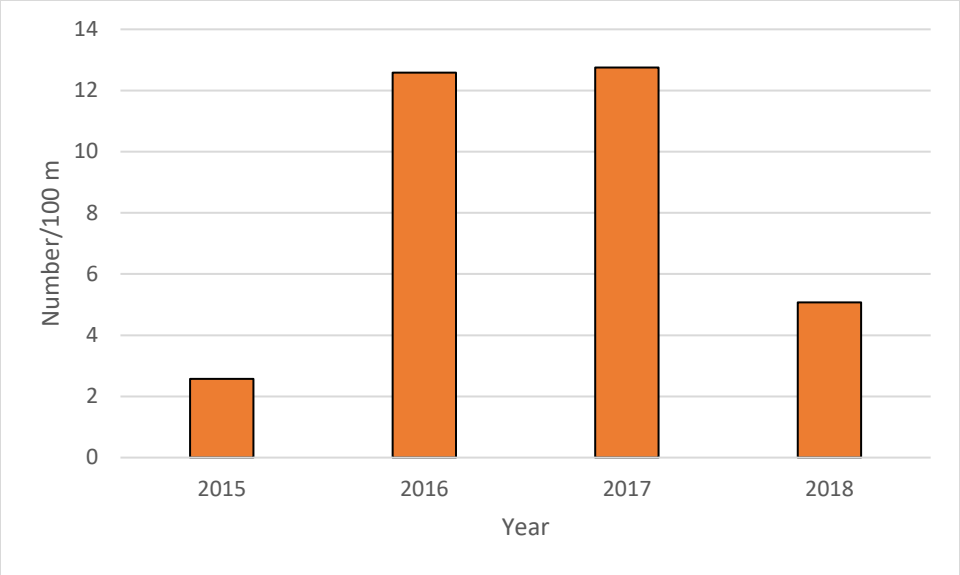


Figure 35: Yellowstone Cutthroat Trout captured per 100 m sampled in Fawn Creek from 2015-2018.

Table 12: Yellowstone Cutthroat Trout captured per meter sampled in Lodgepole Creek from 2015-2018.

Year	2015	2016	2017	2018
YCT Captured	23	77	83	34
Meters Sampled	893	612	651	670
YCT per 100 m	2.6	12.6	12.7	5.1

Unnamed Tributary to Shields River at RM 62.8

Brook Trout Removal

Brook Trout removal efforts were done from 2015-2018 in the Unnamed Tributary to the Shields River at RM 62.8 (Figure 36). During the four years of removal efforts a total of 34 Brook Trout were removed (Figure 37 and Appendix 13). All the Brook Trout were removed below the barrier (Figure 38). The barrier is bed rock that is 6 feet tall. In 2015, the most Brook Trout were removed with a total of 18 fish and 2018 was the lowest with 3 fish removed. Sampling above the barrier in this tributary is planned for 2020 to determine if fish are still absent based on sampling that occurred in 2012.

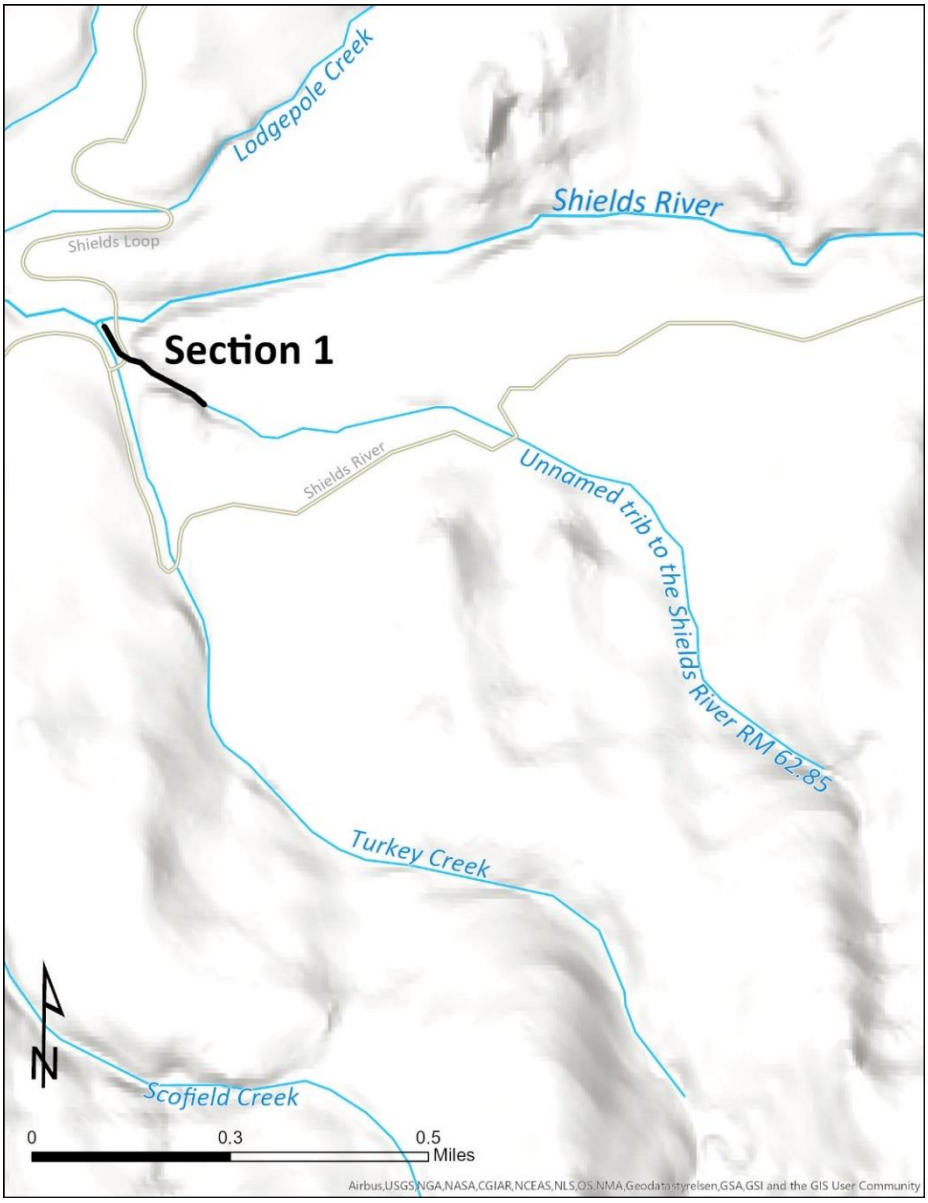


Figure 36: The sampling reach located on the Unnamed Tributary to the Shields River at RM 62.8 where Brook Trout removals and Yellowstone Cutthroat Trout surveys occurred.

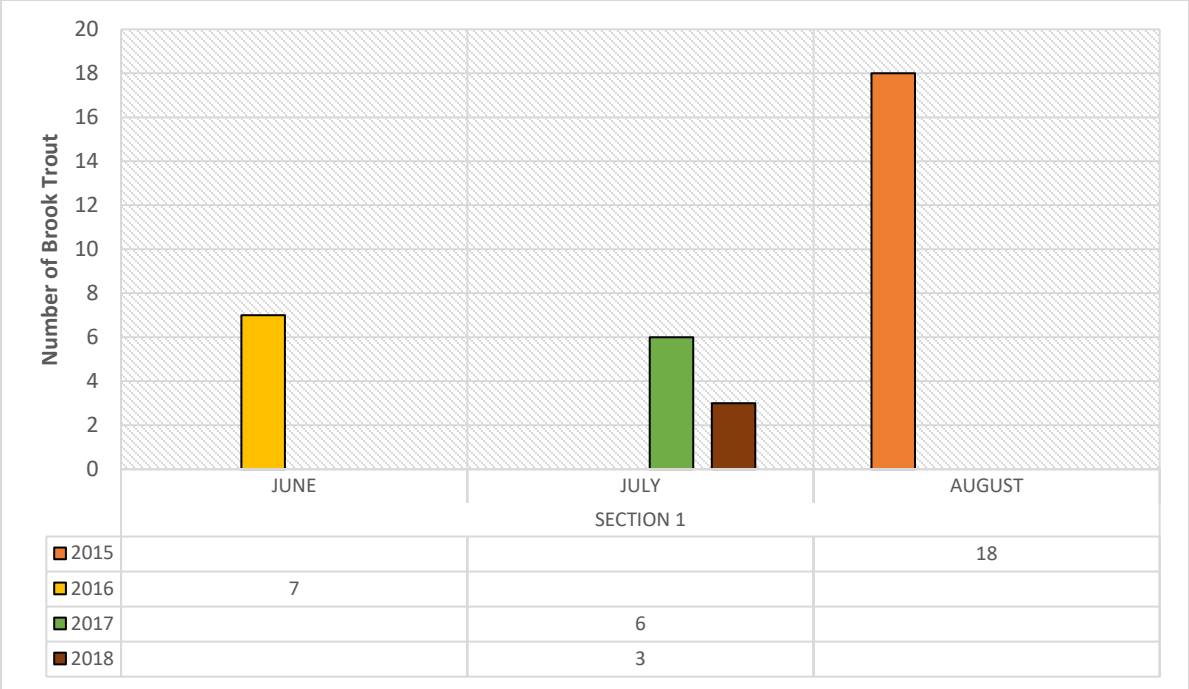


Figure 37: Brook Trout electrofishing removal results in Unnamed Tributary to the Shields River at RM 62.8 from 2015-2018.

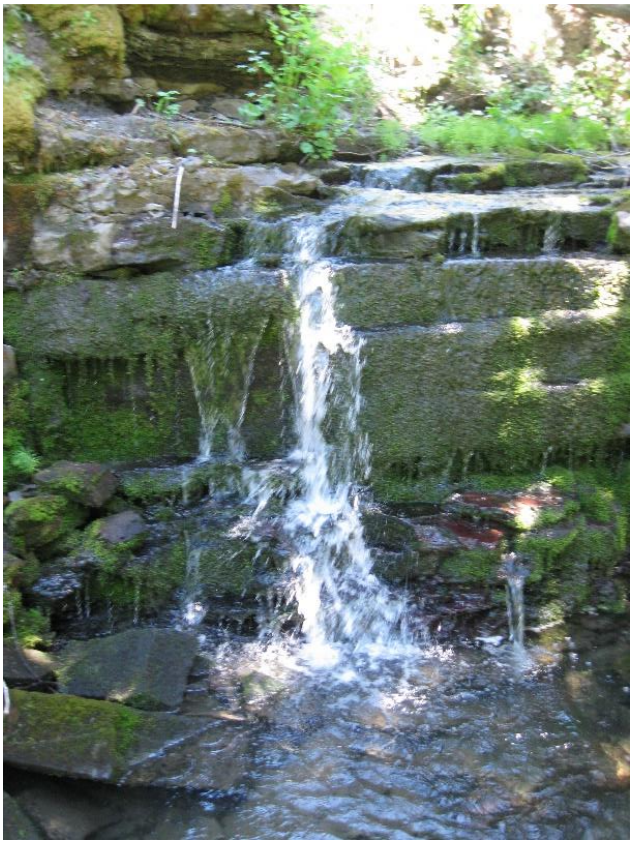


Figure 38: Natural rock barrier in the Unnamed Tributary to the Shields River at RM 62.8. The barrier is 6 feet in height.

From 2015-2018 the number Brook Trout per 100 m captured in the Unnamed Tributary to the Shields River at RM 62.8 decreased. Brook Trout per meter went from 7.5 per 100 m in 2015 to 1.3 per 100 m in 2018 (Figure 39 and Table 13). These results strongly suggest that removal efforts have been successful in reducing overall number of Brook Trout in the Unnamed Tributary to the Shields River at RM 62.8.

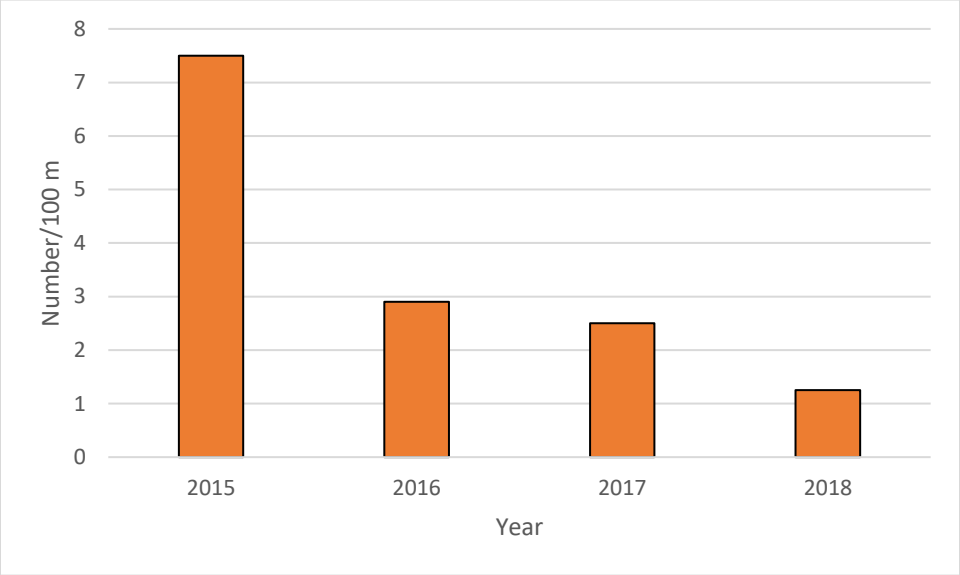


Figure 39: Brook Trout removed per 100 m sampled in Unnamed Tributary to the Shields River at RM 62.8 from 2015-2018.

Table 13: Brook Trout removed per 100 m sampled in the Unnamed Tributary to the Shields River at RM 62.8 from 2015-2018.

Year	2015	2016	2017	2018
Brook Trout Removed	18	7	6	3
Meters Sampled	240	241	240	240
Brook Trout per 100 m	7.5	2.9	2.5	1.3

Yellowstone Cutthroat Trout Counts

Seventy-four YCT were captured during Brook Trout removal efforts in the Unnamed Tributary of the Shields River at RM 62.8 (Figure 40 and

Appendix 14). The most YCT were captured in 2016 with a total of 24 fish. The lowest number captured was nine YCT in 2018. As mentioned above sampling above the barrier is planned for 2020 to determine if fish are still absent based on sampling in 2012. This reach of stream could be a possible location to introduce YCT in order to expand their distribution in the Upper Shields Basin.

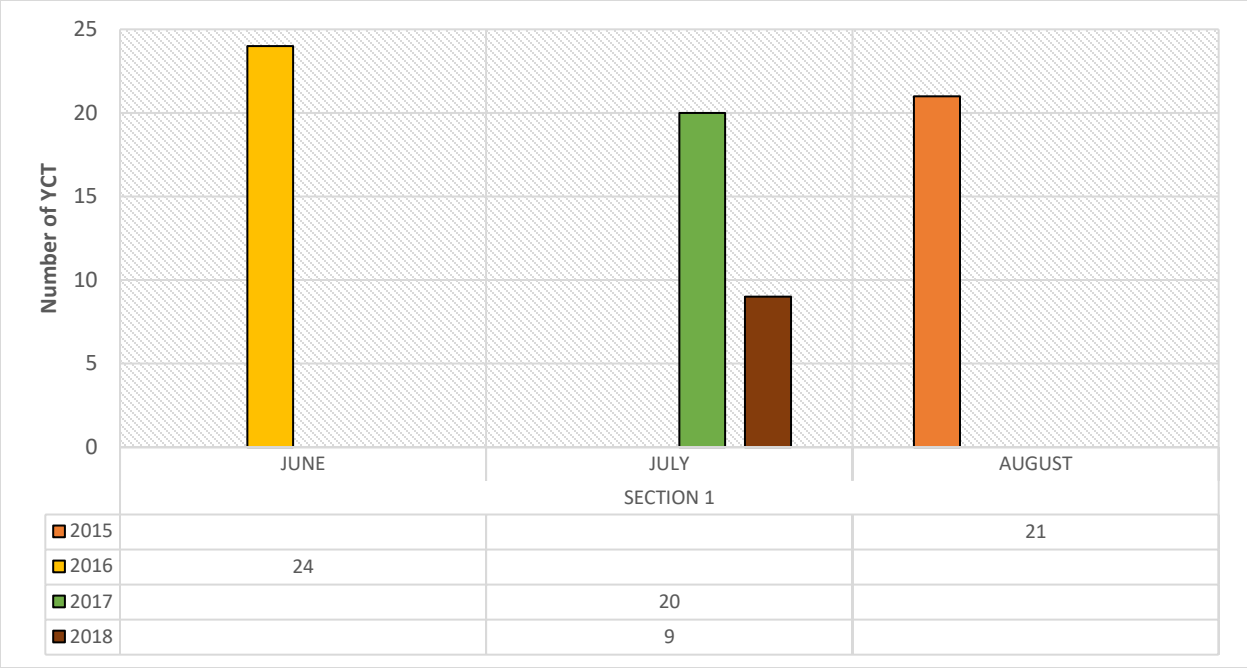


Figure 40: Yellowstone Cutthroat Trout electrofishing capture results in the Unnamed Tributary to the Shields River near Turkey Creek from 2015-2018.

The number of YCT captured per 100 m in the Unnamed Tributary to the Shields River at RM 62.8 increased from 2015 to 2016 (Table 14). The number of YCT per 100 m declined in 2017 and 2018 reaching a low of 3.8 per 100 m. It appears that habitat conditions or some other factor may have changed and reduced the abundance of YCT in the Unnamed Tributary. Future monitoring may provide better information about the cause of the decline.

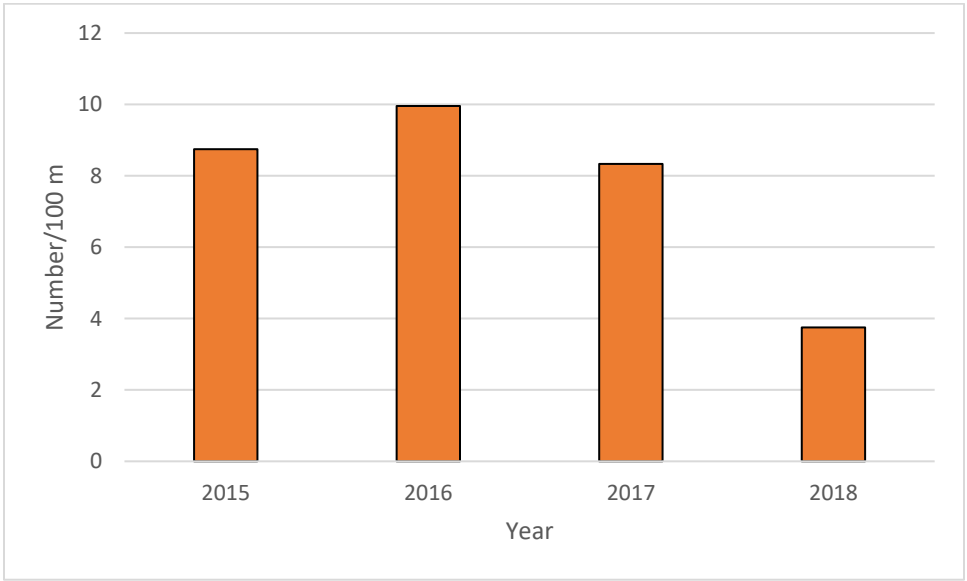


Figure 41: Yellowstone Cutthroat Trout captured per 100 m sampled in the Unnamed Tributary to the Shields River at RM 62.8 from 2015-2018.

Table 14: Yellowstone Cutthroat Trout captured per meter sampled in Lodgepole Creek from 2015-2018.

Year	2015	2016	2017	2018
YCT Captured	21	24	20	9
Meters Sampled	240	241	240	240
YCT per 100 m	8.8	10.0	8.3	3.8

Turkey Creek

Brook Trout Removal

In Turkey Creek, Brook Trout removal efforts have taken place in three reaches from 2014-2018 (Figure 42). A total of 20 Brook Trout were removed during the five years of removal efforts (Figure 43 and Appendix 15). The most Brook Trout removed in any year was 11 fish in 2014 and the least was 0 in both 2015 and 2018. Most of the Brook Trout that were removed came from Section 1. The culvert between Section 1 and Section 2 was intentionally perched to prevent fish passage in 2013. Only one 1 Brook Trout was removed in Section 2 and no Brook Trout were removed from Section 3. This suggests that the culvert between Section 1 and Section 2 that was modified in 2013 by the Forest Service to function as temporary barrier is working. Once Brook Trout removal is completed this barrier will be replaced with an AOP structure to provide more connected habitat for YCT. The culvert between Section 2 and Section 3 was replaced in 2019 by the Forest Service with AOP structure.

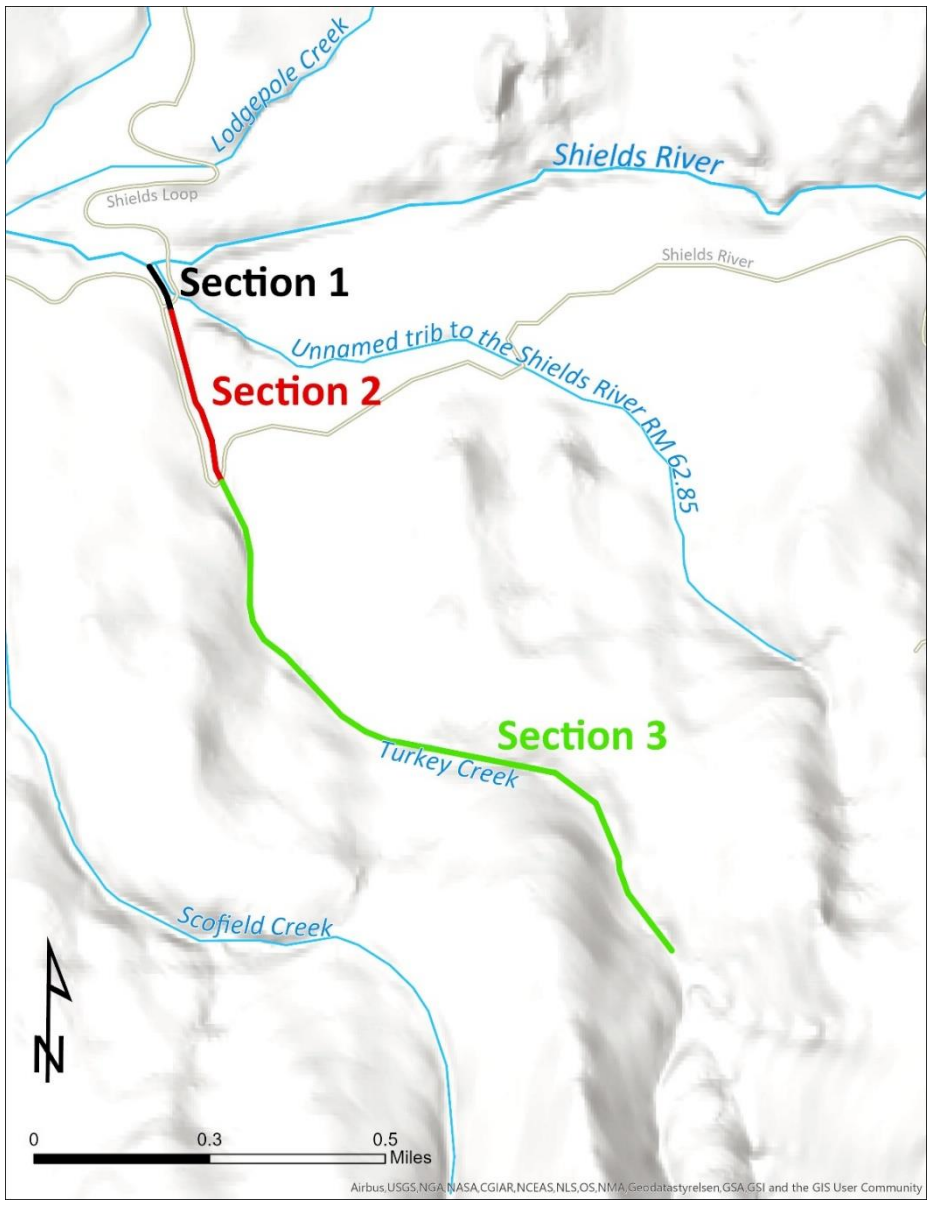


Figure 42: The three sampling reaches located on Turkey Creek where Brook Trout removals and Yellowstone Cutthroat Trout surveys occurred.

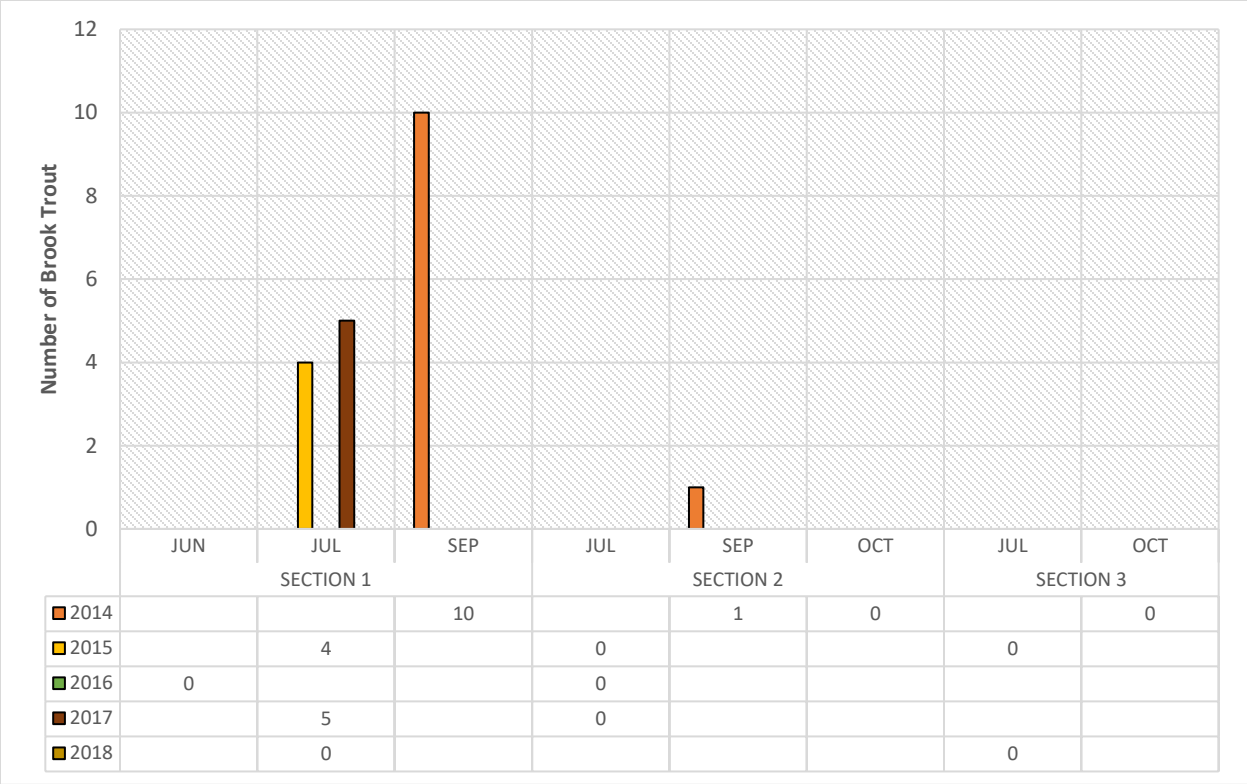


Figure 43: Brook Trout electrofishing removal results in Turkey Creek from 2014-2018.

The number of Brook Trout removed per meter in Turkey Creek fluctuated from 2014-2018. In 2017, there was a high of 2.5 Brook Trout per 100 m and in 2016 and 2018 no Brook Trout were captured (Figure 44 and Table 15). Some of the variability of capture between years may be the result of Brook Trout entering Turkey Creek from the Shields River.

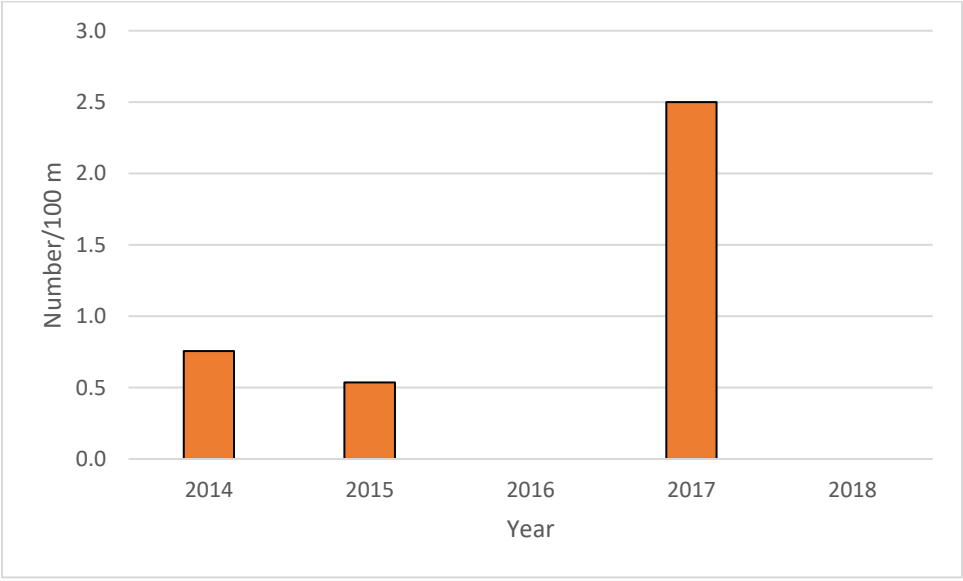


Figure 44: Brook Trout removed per 100 m sampled in Turkey Creek 2014-2018.

Table 15: Brook Trout removed per meter sampled in the Turkey Creek from 2014-2018.

Year	2014	2015	2016	2017	2018
Brook Trout Removed	11	4	0	5	0
Meters Sampled	1,455	746	494	200	200
Brook Trout per 100 m	0.8	0.5	0.0	2.5	0.0

Yellowstone Cutthroat Trout Counts

During Brook Trout removal efforts in Turkey Creek counts of YCT were completed and a total of 231 fish were captured (Figure 45 and Appendix 16). The highest number of YCT captured, 138 fish, was in 2014 and the lowest number was 12 fish in 2018. It should be noted that removal efforts were not equal and did not always occur at the same time in each year. The section with the highest number of YCT captured was Section 2 with 146 fish. The Section with the lowest number of captured YCT was Section 1 with 29 fish. In contrast, Section 1 had the highest number of Brook Trout and in Section 2 only 1 Brook Trout was captured in the five years of sampling.

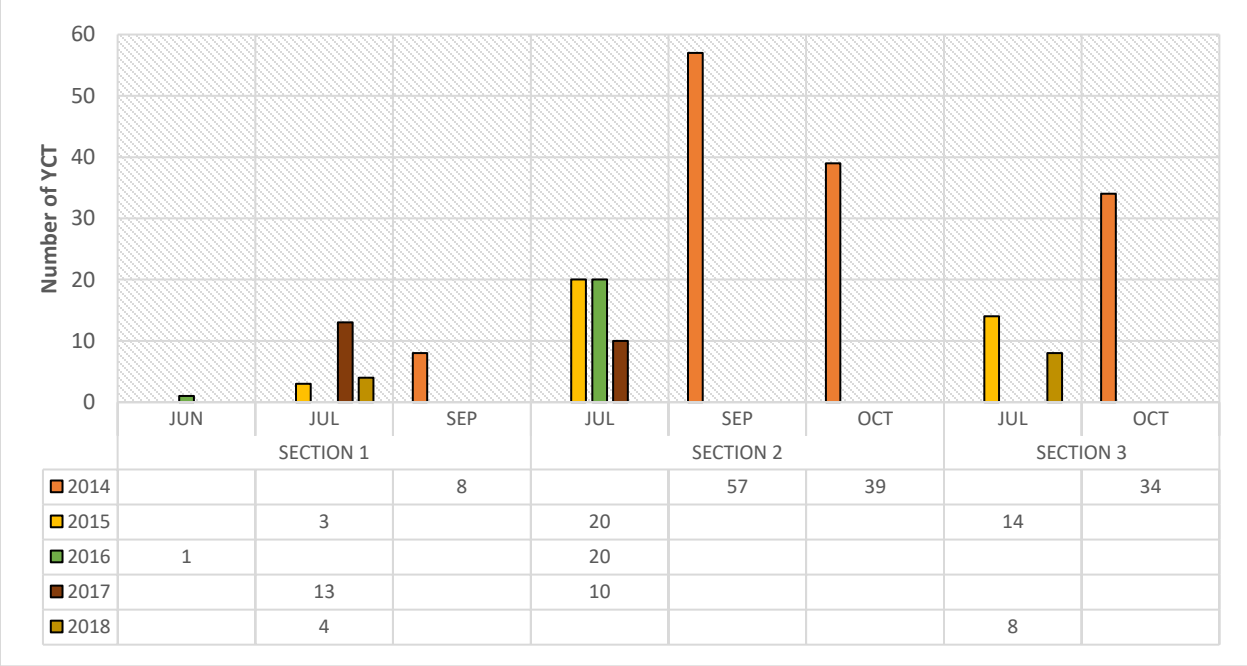


Figure 45: Yellowstone Cutthroat Trout electrofishing capture results in Turkey Creek from 2014-2018.

Like Brook Trout, the number of YCT captured per 100 m in Turkey Creek fluctuated from 2014-2018. The number of YCT per meter had a high of 11.5 per 100 m in 2017 and a low of 4.3 per 100 m in 2016 (Figure 46 and Table 16).

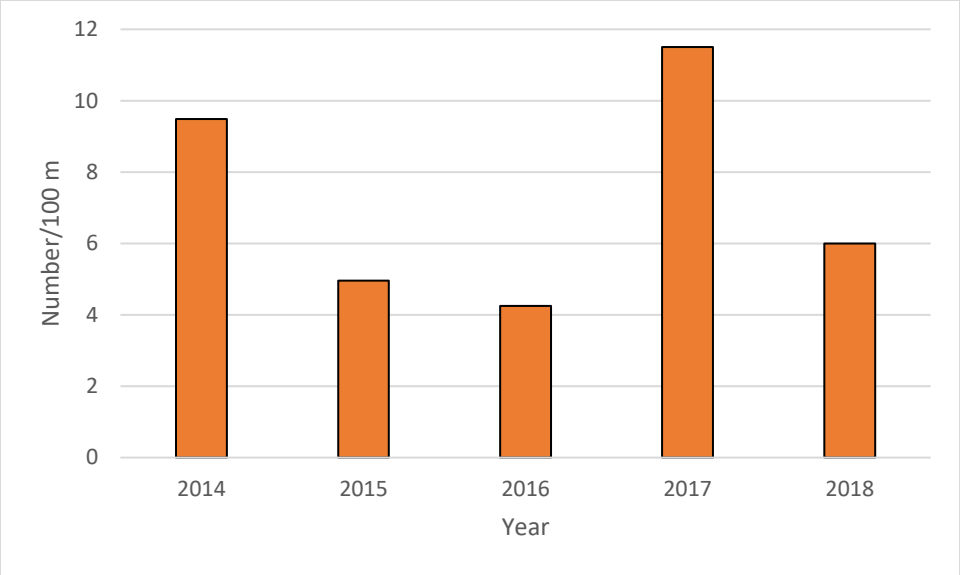


Figure 46: Yellowstone Cutthroat Trout captured per 100 m sampled in Tukey Creek 2014-2018.

Table 16: Yellowstone Cutthroat Trout captured per meter sampled in Turkey Creek from 2014-2018.

Year	2014	2015	2016	2017	2018
YCT Captured	138	37	21	23	12
Meters Sampled	1,455	746	494	200	200
YCT per 100 m	9.5	5.0	4.3	11.5	6.0

Scofield Creek

Brook Trout Removal

Brook Trout removal efforts took place in two reaches from 2014-2019 in Scofield Creek (Figure 47). A total of 19 Brook Trout were removed during the six years of removal efforts (Figure 48 and Appendix 17). The most Brook Trout removed in any year was 15 fish in 2015 and no Brook Trout were captured in 2014 and 2018. No removal efforts were completed in Scofield Creek in 2017. During all the removal efforts only one of the removed Brook Trout came from Section 2. The culvert between Section 1 and Section 2 was modified by the Forest Service in 2013 to act as a temporary fish passage barrier. The Brook Trout removal data suggests that the modification is working and limiting the expansion of Brook Trout in Scofield Creek. When Brook Trout removal is completed as part of this project the barrier will be replaced with an AOP structure to provide more connected habitat for YCT.

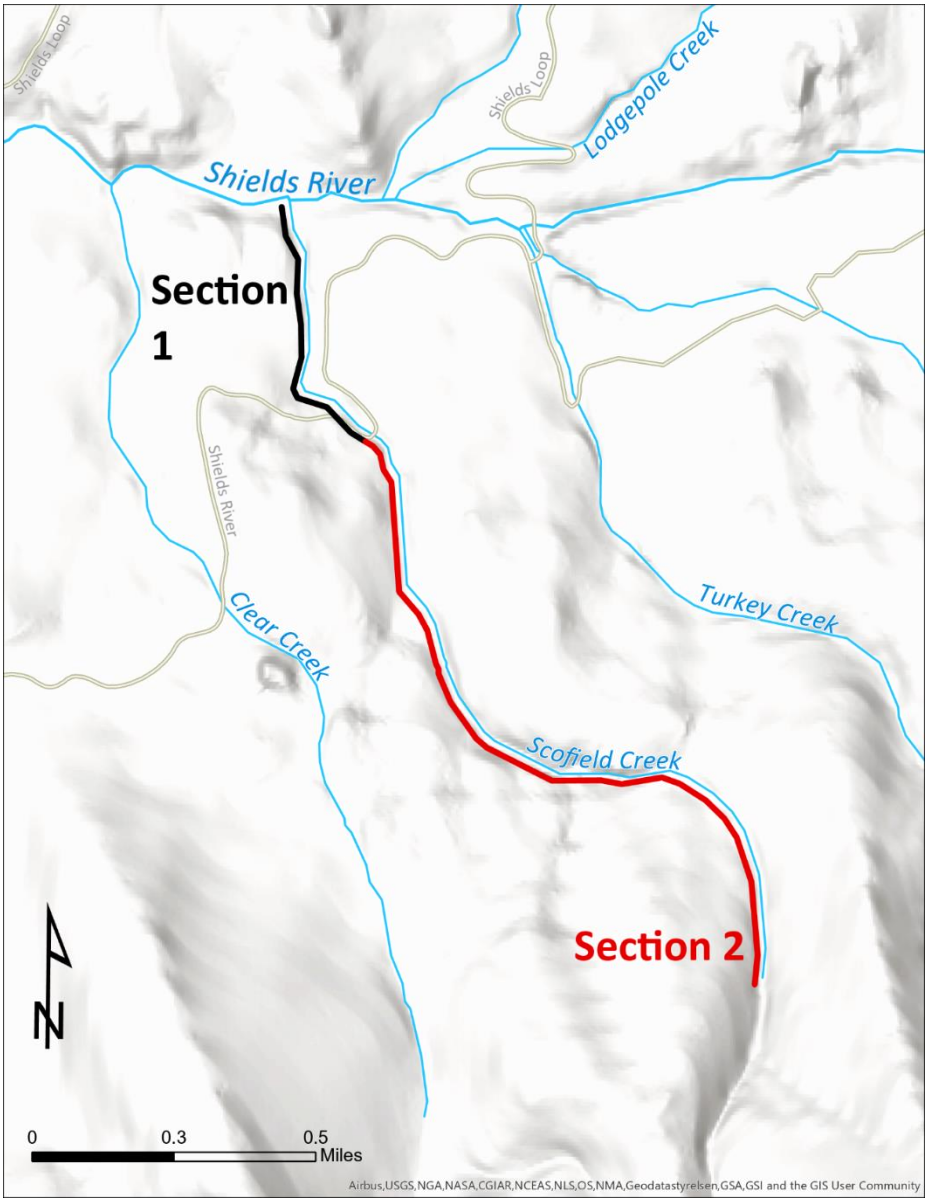


Figure 47: The two sampling reaches located on Scofield Creek where Brook Trout removals and Yellowstone Cutthroat Trout surveys occurred.

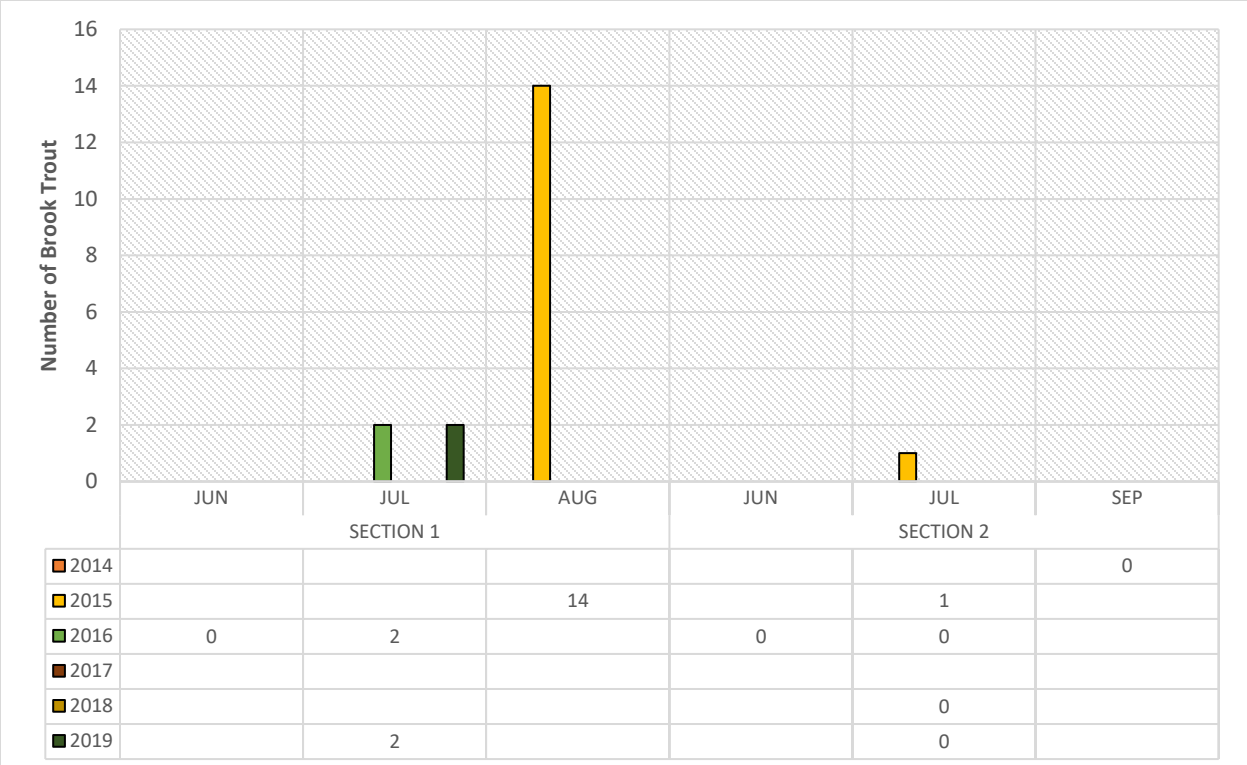


Figure 48: Brook Trout electrofishing removal results in Scofield Creek from 2014-2019.

The number of Brook Trout per 100 m in Scofield Creek fluctuated from 2014-2019. The high was 0.7 Brook Trout per 100 m. In 2014 and 2018, no Brook Trout were captured (Figure 49 and Table 17). No removals were completed in 2017 in Scofield Creek.

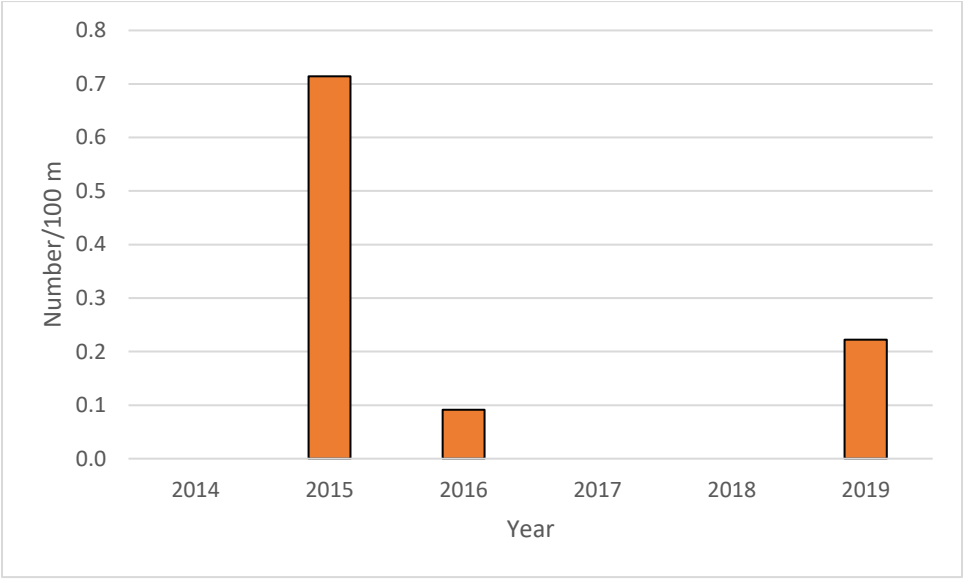


Figure 49: Brook Trout removed per 100 m sampled in Scofield Creek 2014-2019. No removal efforts were done in 2017.

Table 17: Brook Trout removed per meter sampled in the Scofield Creek from 2014-2019. No removals were done in 2017.

Year	2014	2015	2016	2017	2018	2019
Brook Trout Removed	0	15	2	-	0	2
Meters Sampled	282	2,100	2,192	-	1,000	900
Brook Trout per 100 m	0.0	0.7	0.1	-	0.0	0.2

Yellowstone Cutthroat Trout Counts

Counts of YCT were completed during Brook Trout removal efforts in Scofield Creek in 2014-2019 and a total of 433 fish were captured (Figure 50 and Appendix 18). The highest number of YCT captured in any year was 179 fish in 2015. The lowest number captured in a year was 31 fish in 2019. No removal efforts were completed in 2017. The section with the highest number of YCT captured was Section 1 with 238 fish.

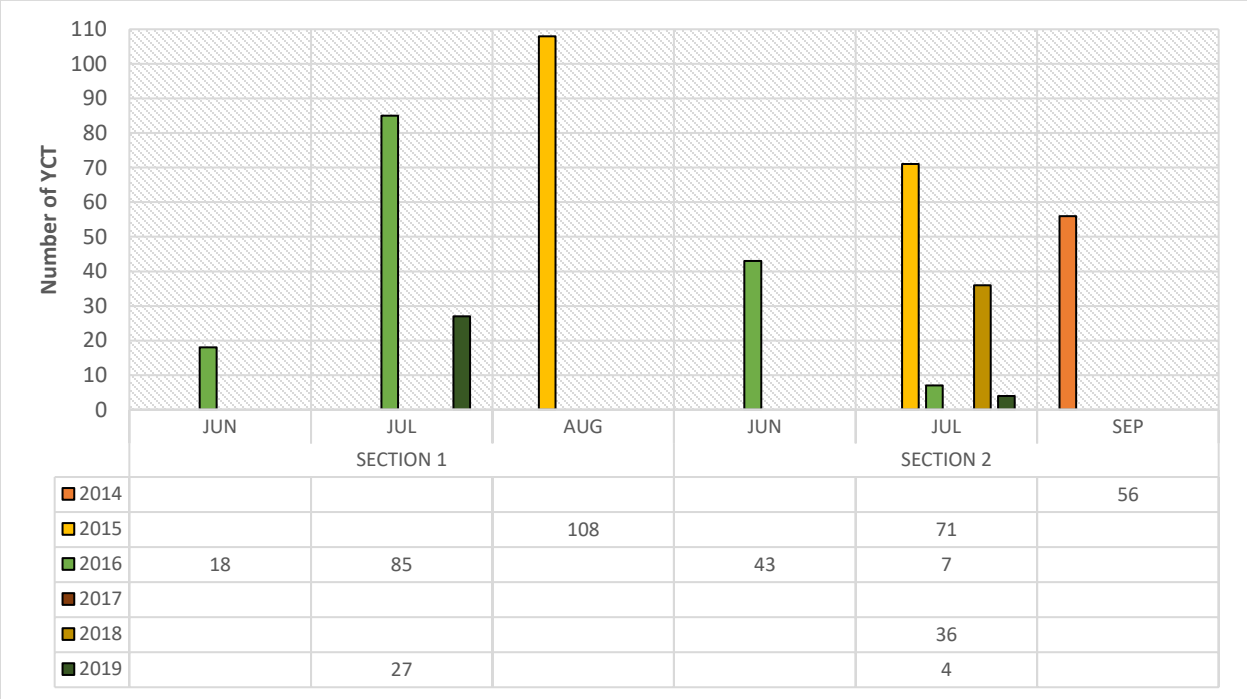


Figure 50: Yellowstone Cutthroat Trout electrofishing capture results in Scofield Creek from 2014-2019.

The number of YCT captured per 100 m in Scofield Creek decreased from 2014-2019. The number of YCT per 100 meter was at a high of 19.9 per 100 m in 2014 and declined to a low of 3.4 per 100 meter in 2019 (Figure 51 and Table 18Table 16). Some of this decline may be the result of the resetting the culvert between Section 1 and Section 2 to act as a passage barrier in 2013.

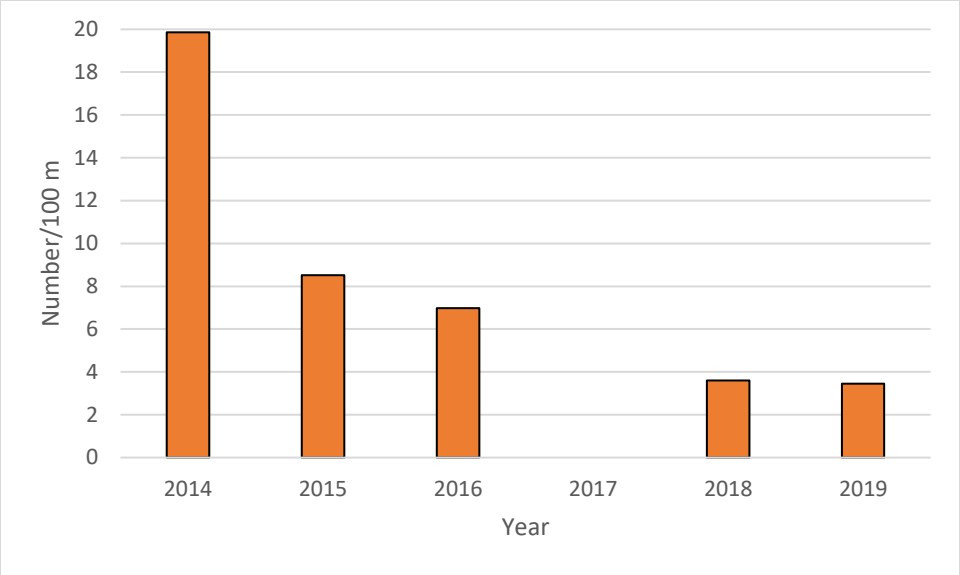


Figure 51: Yellowstone Cutthroat Trout captured per 100 m sampled in Scofield Creek 2014-2019. No capture efforts were done in 2017.

Table 18: Yellowstone Cutthroat Trout captured per meter sampled in Scofield Creek from 2014-2019.

Year	2014	2015	2016	2017	2018	2019
YCT Captured	56	179	153	-	36	31
Meters Sampled	282	2,100	2,192	-	1,000	900
YCT per 100 m	19.9	8.5	7	-	3.6	3.4

Clear Creek

Brook Trout Removal

Brook Trout removal efforts in Clear Creek were competed in 2015 and 2016 (Figure 52). No Brook Trout were captured or seen during either year (Table 19). During a sampling effort in 2009 no Brook Trout were captured.

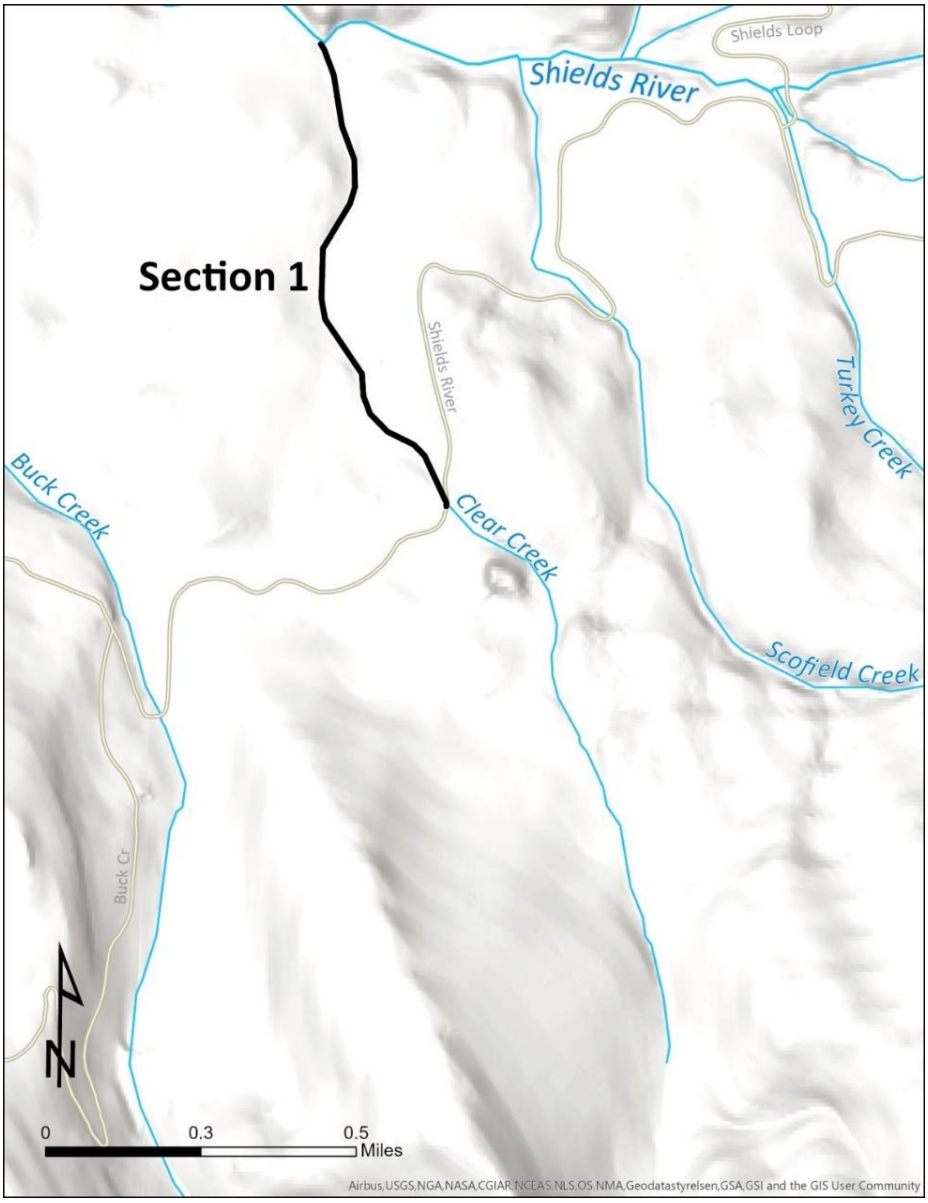


Figure 52: The sampling reach located on Clear Creek where Brook Trout removals and Yellowstone Cutthroat Trout surveys occurred.

Table 19: Brook Trout electrofishing removal results in Clear Creek in 2015 and 2016.

Section (Length in Meters)	Number of Brook Trout Removed (Number of Meters Removal Occurred In)			
	Month	2015	2016	Total
	August	**0** (1,356)	**0** (1,358)	
Total		**0** (1,356)	**0** (1,358)	**0** (2,758)

Yellowstone Cutthroat Trout Counts

YCT counts were completed in one section of Clear Creek in 2015 and 2016 (Figure 52). Only one YCT was captured in 2015 (Table 20). This is the only YCT that has been captured in Clear Creek as far back as 2009. There is no record of sampling prior to 2009.

Table 20: Yellowstone Cutthroat Trout electrofishing removal results in Clear Creek in 2015 and 2016.

Section (Length in Meters)	Month	Number YCT Captured (Meters of Stream Sampled) 2015	2016	Total
	August	**1** (1,356)	**0** (1,358)	
Total		**1** (1,356)	**0** (1,358)	**1** (2,758)

There have been no clear indications as to why this stream does not support fish populations. There is no barrier to prevent fish entering from the Shields River. However, in the Section 1 there is a reach of the creek that goes subsurface. It has not been determined if this is a seasonal barrier or if it occurs annually. No other obvious habitat or environmental limitations have been noted.

Buck Creek

Brook Trout Removal

From 2015-2017, Brook Trout removal efforts took place in two reaches of Buck Creek (Figure 53). During the three years of removal efforts a total of 42 Brook Trout were removed (Figure 54). Most of the Brook Trout that were removed came from Section 1 with only two being removed from Section 2. The most Brook Trout removed in any year was 15 fish in 2017 and in 2016 the lowest number, 13, fish removed. The limited number of Brook Trout removed from Section 2 suggests that the culvert between these sections may have been a partial barrier. In 2018, this culvert was replaced with an AOP by the Forest Service. This replacement took place to take advantage of limited funding and because the existing culvert didn't appear to be acting as a complete barrier. Sampling of this stream is scheduled for 2020.

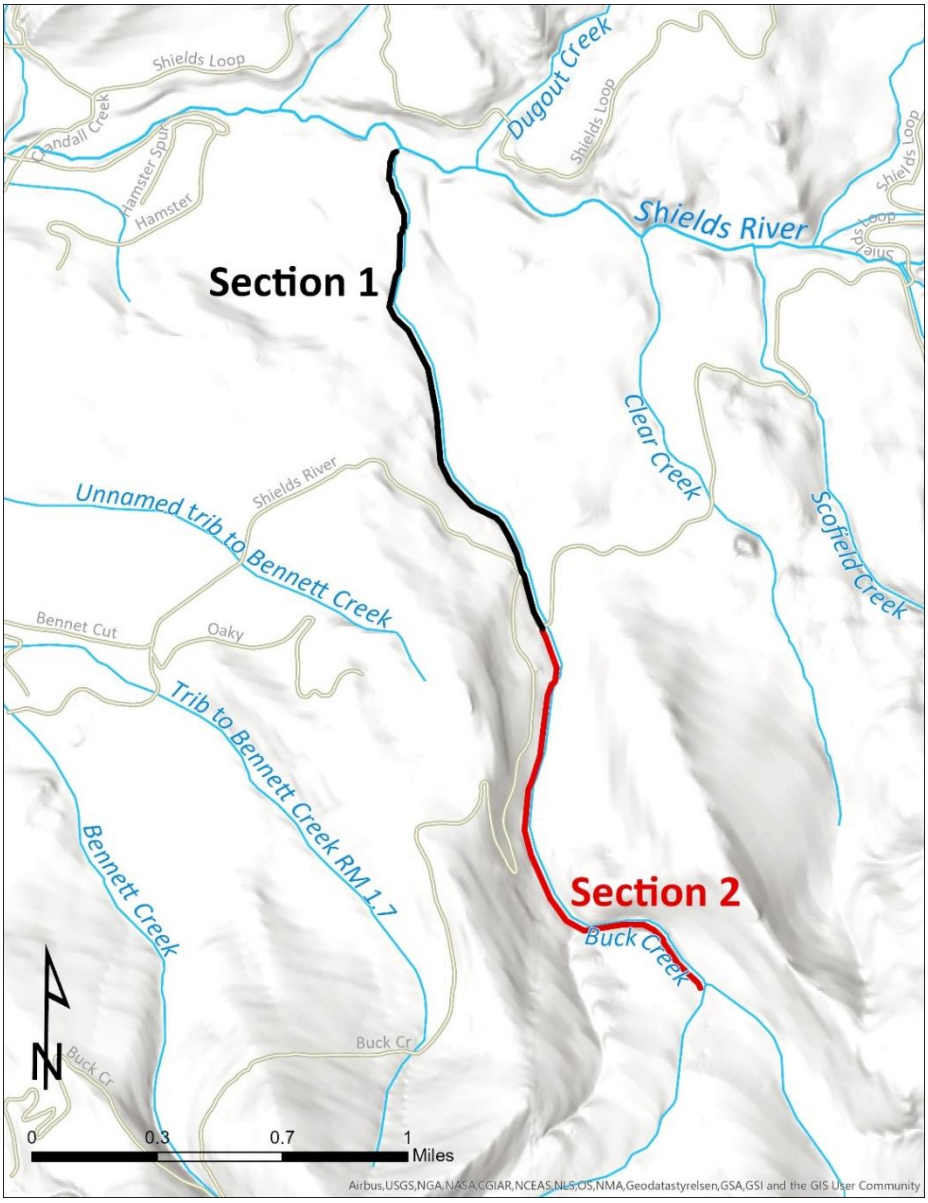


Figure 53: The two sampling reaches located on Buck Creek where Brook Trout removals and Yellowstone Cutthroat Trout surveys occurred.

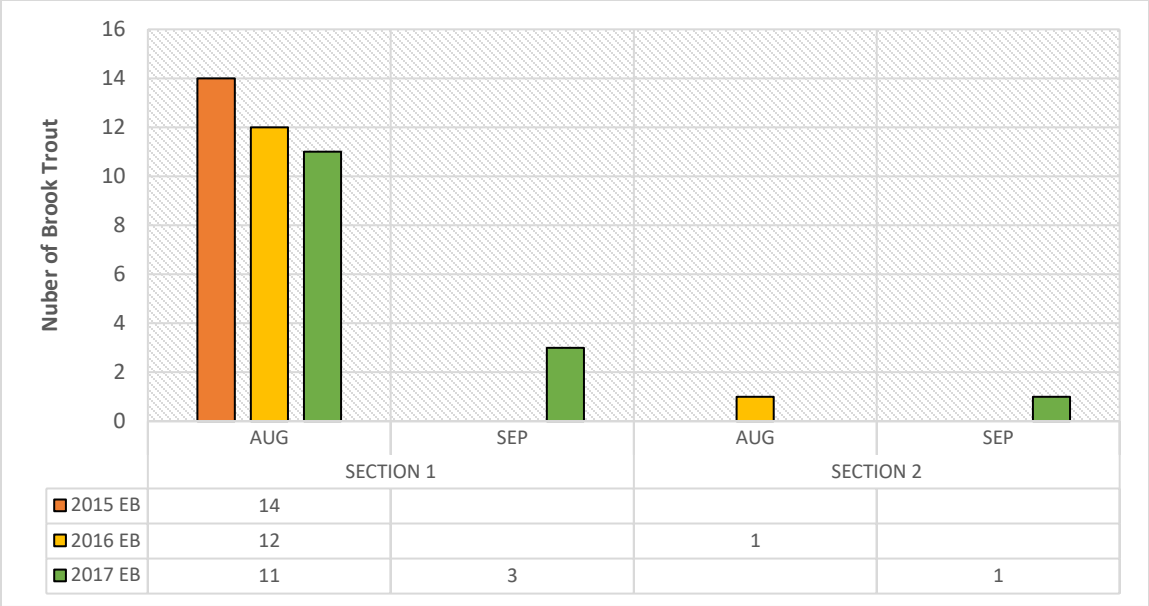


Figure 54: Brook Trout electrofishing removal results in Buck Creek from 2015-2017.

Over the three years that the removal efforts in Buck Creek have occurred the number Brook Trout per 100 m has been variable. Brook Trout per meter sampled was highest at 1.0 Brook Trout per 100 m in 2017 and lowest at 0.4 Brook Trout per 100 m in 2016 (Figure 55 and Table 21).

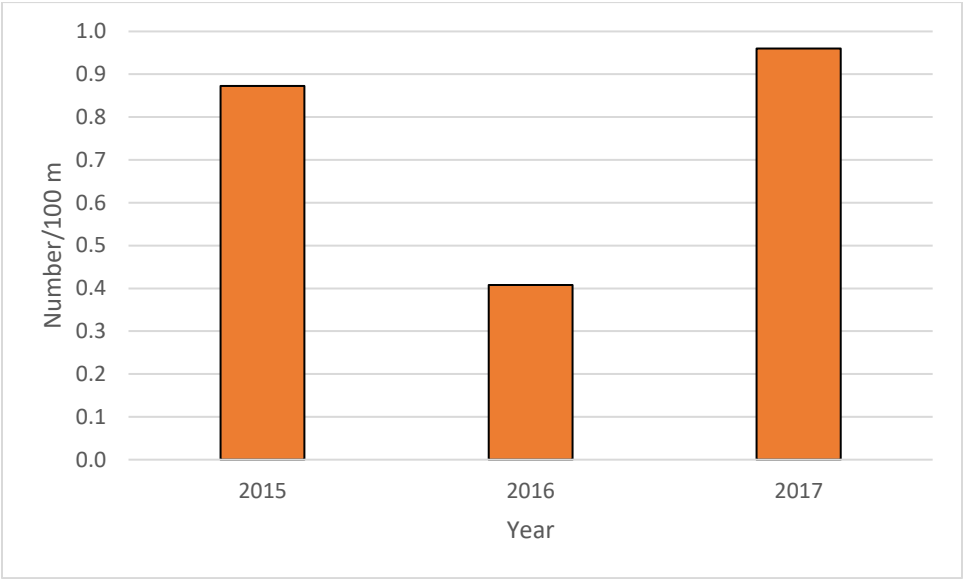


Figure 55: Brook Trout removed per 100 m sampled in Buck Creek 2015-2017.

Table 21: Brook Trout electrofishing removal results in Buck Creek from 2015-2017.

Year	2015	2016	2017
Brook Trout Removed	14	13	15
Meters Sampled	1,604	3,186	1,562
Brook Trout per 100 m	0.9	0.4	1.0

Yellowstone Cutthroat Trout Counts

Counts of YCT were completed during Brook Trout removal efforts in Buck Creek from 2015-2017 and a total of 85 fish were captured. The highest number of YCT captured was in 2016 with a total of 32 fish and the lowest was 24 fish in 2017 (Figure 56). Like Brook Trout, the section with the highest number of YCT captured was Section 1 with 77 fish. Only eight YCT were captured in Section 2 further suggesting that access or habitat above the road crossing may be limiting.

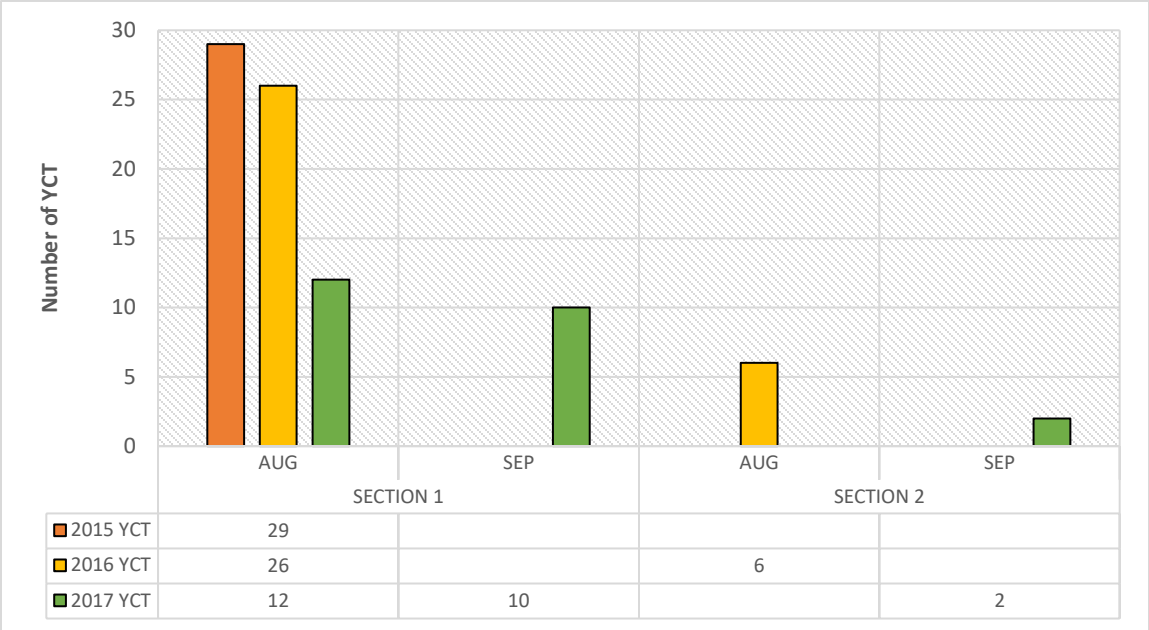


Figure 56: Yellowstone Cutthroat Trout electrofishing capture results in Buck Creek from 2015-2017.

The number of YCT captured per 100 m in Buck Creek varied little from 2015-2017. The number of YCT per 100 m then declined from 1.8 in 2015 to 1.0 in 2016 and increased to 1.5 in 2017 (Figure 57 and Table 22).

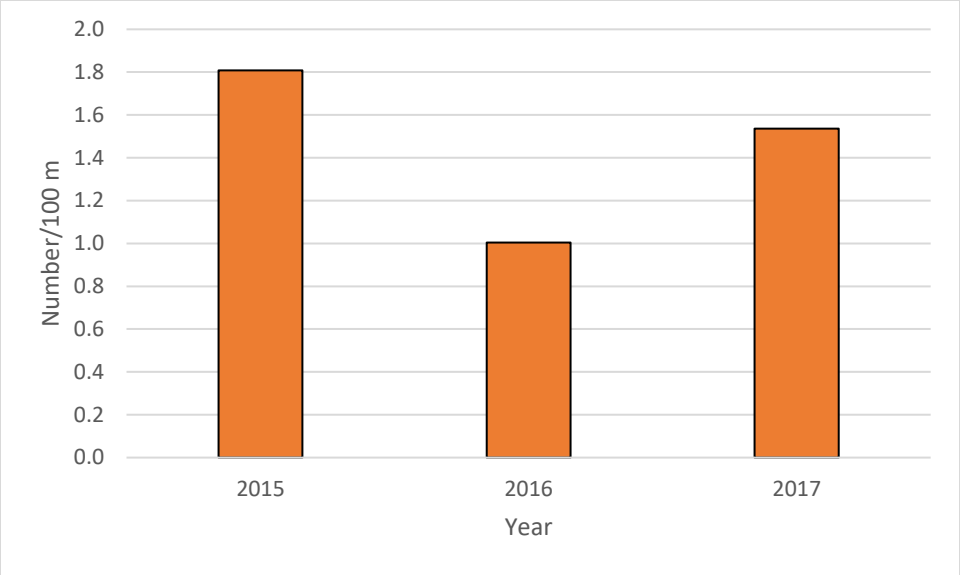


Figure 57: Yellowstone Cutthroat Trout captured per 100 m sampled in Buck Creek 2015-2017.

Table 22: Yellowstone Cutthroat Trout electrofishing removal results in Buck Creek in 2015-2017.

Year	2015	2016	2017
YCT Captured	29	32	24
Meters Sampled	1,604	3,186	1,562
YCT per Meter	1.8	1.0	1.5

Summary

From 2014-2019, 3,116 Brook Trout were removed from 89,177 m of the Shields River and tributaries upstream from the barrier at Crandall Creek Campground. In the same area more than 3 times as many (10,362) YCT were captured during Brook Trout removal efforts.

Removal data for Brook Trout indicates that the presence of Brook Trout in Dugout Creek, Lodgepole Creek, Turkey Creek, and Scofield Creek have been reduced since 2014. This includes what appears to be the complete removal of Brook Trout in Section 2 of the Unnamed Tributary of the Shields River at RM 60.8, Section 2 of Lodgepole Creek, Section 2 and 3 of Turkey Creek, and Section 2 of Scofield Creek.

Mechanical removal of Brook Trout has been successful in reducing and in some cases removing Brook Trout in reaches above the barrier in the Shields River; however, the efforts do not appear to be reaching the project goals. Chemical removal of Brook Trout should be considered and vetted in order to accomplish project goals in a timely and less expensive manner. Given the size of the Shields River above the barrier and the limited ability to complete significant mechanical removal efforts in some years, mechanical removal may not achieve the goal of complete removal of Brook Trout. Mechanical removal should be continued at as high of a level as possible while a chemical treatment is evaluated.

Once removal is completed by either method, efforts with the Forest Service to provide fish passage at the remaining road crossings that are currently acting as barriers should be pursued to allow for uninhibited movement of YCT in the basin above the barrier at Crandall Creek Campground.

Rainbow Trout Removal

Removal of Rainbow Trout to decrease hybridization risk with native Yellowstone cutthroat trout, in the Shields River upstream of the Chadbourne Diversion began in 2014 and continued through 2016 in the mainstem of the Shields River. No removals took place because of high water and sampling efforts focused on the Yellowstone River in 2017. Removal efforts took place in the Upper Chadbourne, Weeping Wall, and Todd Sections (Figure 58). A plastic drift boat equipped with mobile electrofishing gear that included a 500-watt Honda generator and a VVP-15B electrofishing unit was used to capture fish.

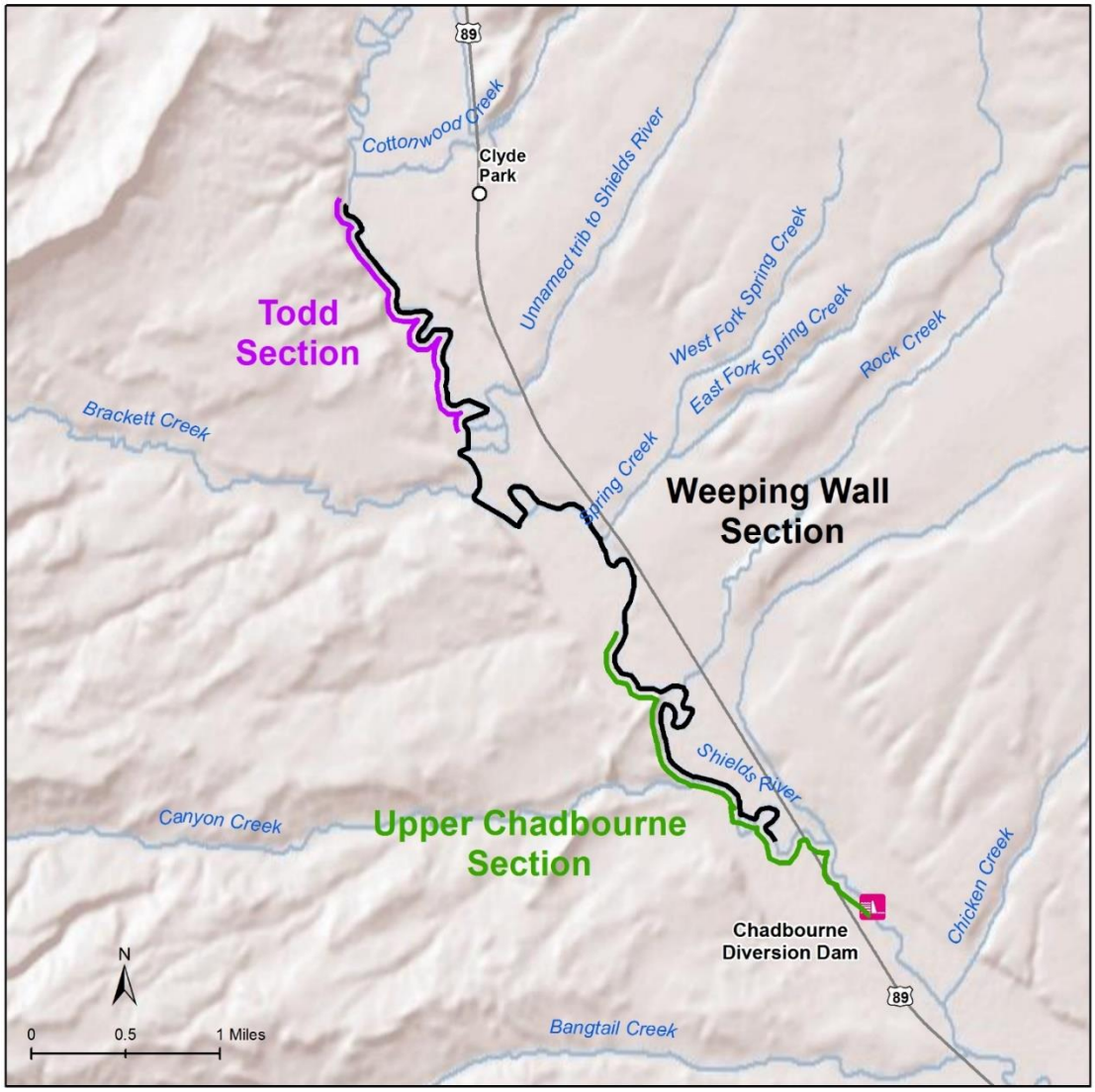


Figure 58: Map of Rainbow Trout removal sections in the Shields River for 2014 through 2016.

Upper Chadbourne Section

The Upper Chadbourne Section of the Shields began 0.61 miles upstream from the Chadbourne Diversion and ended at the diversion in 2014 (Figure 58). In 2015, as the result of new access, the section was increased to 2.96 miles in length above the diversion. A one pass removal effort was completed on April 2 and 3, 2014 and April 1, 2015. The entire width of the river was sampled during these efforts. In this section, captured Rainbow Trout and hybrid fish (YCT X Rainbow) were given a floy tag then transported and released below the diversion dam to assess the effectiveness of the diversion as a barrier to fish passage. The Upper Chadbourne Section was not sampled after 2015 as it became part of the Weeping Wall section in 2016.

A total of 14 Rainbow Trout were captured in the Upper Chadbourne Section in 2014 and 10 were captured in 2015 (Table 23). The number of hybrid fish and YCT increased from nine and four in 2014 to 14 and 10 in 2015, respectively. Brown Trout captured increased from 125 to 175 between 2014 and 2015.

Table 23: Numbers of trout captured in the Upper Chadbourne Section in 2014 and 2015.

Year	Rainbow	Hybrid	YCT	Brown
2014	14	9	4	125
2015	10	14	10	175

None of the Rainbow trout captured in 2015 had been captured, tagged and released below the barrier in 2014. One of the hybrid fish captured in 2015 had been tagged and released below the barrier in 2014. This individual fish increased 1.7 inches in length and 0.55 lbs in weight between captures in 2014 and 2015. It is unknown if the fish was able to move upstream of the Chadbourne Diversion on its own or if it was moved by an angler. A debris jam of large Cottonwood trees on the diversion in the spring of 2015 may have allowed for limited passage over the structure.

Minimum and maximum lengths for each species increased from 2014 to 2015 except for the maximum length of hybrid fish and brown trout, which both decreased (Table 24).

Table 24: Minimum and maximum lengths of trout captured in the Upper Chadbourne Section in 2014 and 2015.

	Rainbow		Hybrid		YCT		Brown	
Year	Min	Max	Min	Max	Min	Max	Min	Max
2014	10.2	16.0	13.5	17.2	9.3	11.5	4.0	19.4
2015	13.0	16.4	13.8	17.0	10.3	16.6	8.9	17.8

Catch-per-unit-effort (CPUE) was calculated for all species in 2014 and 2015. The CPUE for Rainbow Trout was lower in 2015, 4.4 fish/hour, than 5.6 fish/hour in 2014 indicating a potential reduction in abundance (Table 25). For both hybrid fish and YCT the CPUE was higher in 2015 than 2014. The CPUE for brown trout was similar in both years at 50.4 and 55.2 fish/hour.

Table 25: CPUE for all fish captured in the Upper Chadbourne Section in 2014 and 2015.

	CPUE (Fish/Hour)			
Year	Rainbow	Hybrid	YCT	Brown
2014	5.6	2.4	0.2	50.4
2015	4.4	6.2	4.4	55.2

Todd Section

The Todd Section began just below the Brackett Creek Road Bridge and continued 4,136 feet downstream (Figure 58). A one-pass effort was completed on April 8, 2015 and Rainbow Trout and hybrid fish (Rainbow X YCT) that were collected were removed from the population. This section became part of the Weeping Wall Section in June 2015.

Five Rainbow trout and two hybrid fish were removed from the Todd Section of the river (Table 26). Seven YCT and 99 Brown trout, the most abundant species, were collected in this section. The Rainbow trout ranged from 4.7 to 20.7 inches in total length while the hybrid fish were 14.0 and 14.3 inches in total length (Table 27). YCT ranged from 10.3 to 12.7 inches in total length and Brown Trout ranged from 4.7 to 20.7 inches in total length.

Table 26: Numbers of trout captured in the Todd Section in 2015.

Year	Rainbow	Hybrid	YCT	Brown
2015	5	2	7	99

Table 27: Minimum and maximum lengths of trout captured in the Todd Section in 2015.

	Rainbow		Hybrid		YCT		Brown	
Year	Min	Max	Min	Max	Min	Max	Min	Max
2015	4.7	20.7	14.0	14.3	10.3	12.7	4.7	20.7

CPUE for all species was calculated as part of the removal effort in the Todd Section. The CPUE for Rainbow Trout was 3.6 fish/hour and 1.5 fish/hour for hybrid fish (Table 28). YCT had a CPUE of 5.1 fish/hour and Brown Trout had the highest CPUE, 72.0 fish/hour.

Table 28: CPUE for all fish captured in the Todd Section in 2015.

	CPUE (Fish/Hour)			
Year	Rainbow	Hybrid	YCT	Brown
2015	3.6	1.5	5.1	72.0

Weeping Wall Section

The Weeping Wall Section was created to consolidate nonnative trout removals into one effort and includes the Todd and Upper Chadbourne Sections as well as the river between them. The Weeping Wall Section begins at the upstream end of the Todd Section and ends 6.5 miles downriver at the bottom of the Upper Chadbourne Section (Figure 58). A one-pass removal effort was completed on June 17, 2015 and April 20, 2016. Rainbow Trout and hybrid fish (Rainbow X YCT) were collected and removed from the population.

Rainbow trout and hybrid fish (Rainbow X YCT) that were captured in the lower end of the section during both years were tagged with a floy tag then transported and released below the diversion dam to assess the effectiveness of the diversion as a fish passage barrier.

Brown Trout were observed in this section but were not collected in order to reduce stress both on the Brown Trout and Rainbow Trout that were being collected and held in live cars.

The number of Rainbow Trout collected in the Weeping Wall Section decreased from 25 fish to 16 fish between 2015 and 2016 (Table 29). The number of hybrid fish collected during both years also decreased, 21 fish to 5 fish. In contrast, the number of YCT collect in this section more than doubled from 13 fish in 2015 to 28 fish in 2016. The changes in numbers of fish may be the result of a post runoff effort in 2015 and a pre-runoff effort in 2016.

Table 29: Numbers of trout captured in the Weeping Wall Section in 2015 and 2016.

Year	Rainbow	Hybrid	YCT
2015	25	21	13
2016	16	5	28

In 2015, one of the Rainbow Trout captured was a fish that was tagged and released below the barrier 77 days earlier, April 1, 2015, in the Upper Chadbourne Section (Figure 58). This Rainbow Trout was a mortality and was not transported back below the diversion. It is unknown how this fish was able to pass upstream of the diversion. On June 17, 2015, a total of one Rainbow and seven hybrid fish were tagged and transported downstream to the Chadbourne Diversion. One of the eight fish transported for release below the diversion escaped upstream of the barrier before it could be released below. It is unknown which fish escaped and in 2016 no tagged fish were captured above the barrier.

The minimum and maximum lengths of all three species of fish captured increased from 2015 to 2016 except for the maximum length of hybrid fish which decreased (Table 30). Rainbow Trout had the highest increase in both minimum and maximum lengths of the three species.

Table 30: Minimum and maximum lengths of trout captured in the Weeping Wall Section in 2015 and 2016.

	Rainbow		Hybrid		YCT	
Year	Min	Max	Min	Max	Min	Max
2015	6.2	16.5	10.2	17.1	6.1	14.8
2016	10.6	18.3	12.4	15.6	9.4	15.9

In the Weeping Wall Section CPUE for all species was calculated for captured fish. The CPUE for Rainbow Trout and hybrid fish decreased from 2015 to 2016, while the CPUE for YCT increased during the same time (Table 31). Rainbow Trout had the highest CPUE in 2015 and YCT had the highest in 2016.

Table 31: CPUE for all fish captured in the Weeping Wall Section in 2015 and 2016.

	CPUE (Fish/Hour)		
Year	Rainbow	Hybrid	YCT
2015	5.5	4.6	2.9
2016	3.6	1.1	6.3

Summary

Removal efforts of Rainbow Trout and hybrid fish have been limited in the Shields due to flow conditions and boat access. There was some reduction in numbers of both Rainbow Trout and hybrid fish captured during the years they were completed, but with limited data it is not clear if these reductions are the result of removal effort or natural fluctuation of the populations.

Acknowledgements

We would like to acknowledge the following people for their contributions and efforts in securing and conserving this vital YCT population.

FWP: Gary Senger, Jody Hupka, Ben Bailey, Dan Frazer, Christine Marozick, Kyrsten Wolterstorff, Tim Weiss, and Carol Endicott

USFS: Clint Sestrich, Bonnie Frazer, Andy Godtel, Kaitlin Gahl, and Jed Hinkle

USGS: Robert Al-Chokhachy and Brad Shepard

References

Shepard et all 2015. Distributions, survival, growth, and movements of nonnative Brook Trout and native Yellowstone Cutthroat Trout in the Upper Shields River Basin:2011 to 2013 North American Program of the Wildlife Conservation Society, Bozeman, Montana. National Fish and Wildlife Foundation – Jackson Hole One Fly Foundation Grant #0903.12.033943

Appendix

Appendix 1: Brook Trout electrofishing removal results in the Shields River from 2015-2019. * Part of the sampling effort extended upstream beyond the boundary for this section

Section	Month	Number of Brook Trout Removed (Number of Meters Removal Occurred In) 2015	2016	2017	2018	2019	Total
Section 1	September	_	_	**327 *** (2,744)	_	_	
	October	**406** (1,267)	**190 *** (1,587)	_	_	**40** (1,110)	
Section Total		**406** (1,267)	**190** (1,587)	**327** (2,744)	_	**40** (1,110)	**963** (6,708)
Section 2	September	_	_	**93 *** (1,200)	_	_	
	October	**252** (884)	_	**51 *** (1,000)	_	_	
Section Total		**252** (884)	_	**144** (2,200)	_	_	**396** (3,084)
Section 3	July	**45** (380)	**20** (180)	_	**9** (180)	_	
	September	_	**25** (180)	_	_	_	
Section Total		**45** (380)	**45** (360)	-	**9** (180)	_	**99** (920)
Section 4	July	**27 *** (1,600)	**5** (300)	_	**0** (150)	_	
	September	_	**10** (300)	**49 *** (1,125)	_	_	
Section Total		**27** (1,600)	**15** (600)	**49** (1,125)	**0** (150)	_	**91** (3,475)
Section 5	July	_	**4** (250)	_	_	_	
	September	_	**5** (250)	_	_	_	
Section Total		_	**9** (500)	_	_	_	**9** (500)
Section 6	July	**16** (690)	**2** (335)	_	**0** (220)	**0** (100)	
	August	_	_	**7** (386)	_	_	
	September	_	**14** (335)	_	_	_	
Section Total		**16** (690)	**16** (670)	**7** (386)	**0** (220)	**0** (100)	**39** (2,066)
Section 7	July	**39** (1,952)	**46** (1,497)	**31** (1,904)	_	_	
	October	_	**15** (565)	_	_	_	
Section Total		**39** (1,952)	**61** (2,062)	**31** (1,904)	_	_	**131** (5,918)
Section 8	July	**13** (1,118)	**3** (676)	**1** (100)	_	_	
	August	_	_	**4** (600)	**0** (720)	_	
Section Total		**13** (1,118)	**3** (676)	**5** (700)	**0** (720)	_	**21** (3,214)
Total		**798** (7,891)	**339** (6,455)	**563** (9,059)	**9** (1,270)	**40** (1,210)	**1,749** (25,885)

Appendix 2: Yellowstone Cutthroat Trout electrofishing capture results in the Shields River from 2015-2019. * Part of the sampling effort extended upstream beyond the boundary for this section.

Section	Month	Number of YCT Captured (Meters of Stream Sampled) 2015	2016	2017	2018	2019	Total
Section 1	September	_	_	**538 *** (2,744)	_	_	
	October	**564** (1,267)	**110 *** (1,587)	_	_	48 (1,110)	
Section Total		**564** (1,267)	**110** (1,587)	**538** (2,744)	_	**48** (1,110)	**1,260** (6,708)
Section 2	September	_	_	**320 *** (1,200)	_	_	
	October	**526** (884)	_	**214 *** (1,000)	_	_	
Section Total		**526** (884)	_	**534** (2,200)	_	_	**1,060** (3,084)
Section 3	July	**100** (380)	**21** (180)	_	**28** (180)	_	
	September	_	**9** (180)	_	_	_	
Section Total		**100** (380)	**30** (360)	_	**28** (180)	_	**158** (920)
Section 4	July	**171*** (1,600)	**24** (300)	_	**9** (150)	_	
	September	_	**32** (300)	**346 *** (1,125)	_	_	
Section Total		**171** (1,600)	**56** (600)	**346** (1,125)	**9** (150)	_	**582** (3,475)
Section 5	July	_	**16** (250)	_	_	_	
	September	_	**19** (250)	_	_	_	
Section Total		_	**35** (500)	_	_	_	**35** (500)
Section 6	July	**157** (690)	**22** (335)	_	**10** (220)	**1** (100)	
	August	_	_	**64** (386)	_	_	
	September	_	**70** (335)	_	_	_	
Section Total		**157** (690)	**92** (670)	**64** (386)	**10** (220)	**1** (100)	**324** (2,066)
Section 7	July	**217** (1,952)	**413** (1,497)	**281** (1,904)	_	_	
	October	_	**44** (565)	_	_	_	
Section Total		**217** (1,952)	**457** (2,062)	**281** (1,904)	_	_	**542** (5,918)
Section 8	July	**26** (1,118)	**162** (676)	**5** (100)	_	_	
	August	_	_	**88** (600)	**45** (720)	_	
Section Total		**26** (1,118)	**162** (676)	**93** (700)	**45** (720)	_	**326** (3,214)
Total		**1,761** (7,891)	**942** (6,455)	**1,856** (9,059)	**92** (1,270)	**49** (1,210)	**4,700** (25,885)

Appendix 3: Brook Trout electrofishing removal results in Unnamed Tributary to Shields River at RM 60.8 from 2014-2019.

Section	Month	Number of Brook Trout Removed (Number of Meters Removal Occurred In)						Total
		2014	2015	2016	2017	2018	2019	
Section 1	July	_	**25** (200)	**59** (853)	**57** (952)	**5** (850)	**12** (850)	
	August	_	**14** (460)	_	_	_	_	
Section Total			**39** (660)	**59** (853)	**57** (952)	**5** (850)	**12** (850)	**160** (3,315)
Section 2	July	_	**0** (955)	**0** (901)	**0** (100)	_	_	
	September	**3** (781)	_	_	_	_	_	
	October	**0** (750)	_	_	_	_	_	
Section Total		**3** (1,531)	**0** (955)	**0** (901)	**0** (100)	_	**_**	**3** (3,487)
Total		**3** (1,531)	**39** (1,615)	**59** (1,754)	**57** (1,052)	**5** (850)	**12** (850)	**175** (7,652)

Appendix 4: Yellowstone Cutthroat Trout electrofishing capture results in Unnamed Tributary to Shields River at RM 60.8 from 2014-2019.

Section	Month	Number of YCT Captured (Meters of Stream Sampled)						Total
		2014	2015	2016	2017	2018	2019	
Section 1	July	_	**87** (200)	**334** (853)	**117** (952)	**26** (850)	**55** (850)	
	August	_	**256** (460)	_	_	_	_	
Section Total			**343** (660)	**334** (853)	**117** (952)	**26** (850)	**55** (850)	**875** (4,165)
Section 2	July	_	**63** (955)	**118** (901)	**1** (100)	_	_	
	September	**17** (781)	_	_	_	_	_	
	October	**15** (750)	_	_	_	_	_	
Section Total		**32** (1,531)	**63** (955)	**118** (901)	**1** (100)	_	**_**	**214** (3,487)
Total		**32** (1,531)	**406** (1,615)	**452** (1,754)	**118** (1,052)	**26** (850)	**55** (850)	**1,089** (7,652)

Appendix 5: Brook Trout electrofishing removal results in Dugout Creek from 2014-2019.

Section	Month	Number of Brook Trout Removed (Number of meters Removal occurred in) 2014	2015	2016	2017	2018	2019	Total
Section 1	July	_	**13** (260)	**7** (110)	**9** (255)	**1** (268)	**0** (268)	
	August	_	_	**0** (1,136)	**11** (100)	_	_	
	September	_	**25** (110)	**6** (110)	**9** (268)	_	_	
	October	**30** (300)	_	_	**0** (100)	_	_	
Section Total		**30** (300)	**38** (370)	**13** (1,356)	**29** (723)	**1** (268)	**0** (268)	**111** (3,285)
Section 2	July	_	**12** (965)	**9** (200)	**28** (520)	**21** (1,500)	**1** (100)	
	August	_	_	_	**2** (100)	_	**6** (984)	
	September	_	**26** (320)	**21** (200)	**32** (683)	_	_	
	October	**57** (600)	_	_	**0** (100)	_	_	
Section Total		**57** **(**600**)**	**38** (1,285)	**30** (400)	**62** (1,403)	**21** (1,500)	**7** (1,084)	**215** (6,272)
Section 3	July	_	**130** (1,592)	**18** (420)	**46** (1,840)	**20** (1,600)	**9** (100)	
	August	_	_	_	**9** (200)	_	**24** (856)	
	September	_	**35** (388)	**97** (520)	**102** (1,000)	_	_	
	October	**95** (700)	**3** (90)	_	**3** (300)	_	_	
Section Total		**95** (700)	**168** (2,070)	**115** (940)	**160** (3,340)	**20** (1,600)	**33** (956)	**591** (9,606)
Section 4	July	_	**17** (580)	**1** (100)	**19** (780)	_	_	
	August	_	_	_	**1** (200)	_	**27** (1,091)	
	September	_	_	**16** (100)	_	_	_	
	October	**3** (100)	**12** (100)	_	**6** (200)	_	_	
Section Total		**3** (100)	**29** (680)	17 (200)	**26** (1,180)	_	**27** (1,091)	**102** (3,3251)
Total		**185** (1,700)	**273** (4,405)	**175** (2,896)	**277** (6,646)	**42** (3,368)	**67** (3,399)	**1,019** (22,414)

Appendix 6: Yellowstone Cutthroat Trout electrofishing capture results in Dugout Creek from 2014-2018.

Section	Month	Number of YCT Captured (Number of meters Removal occurred in)						Total
		2014	2015	2016	2017	2018	2019	
Section 1	July	_	**39** (260)	**11** (110)	**18** (255)	**10** (268)	**6** (268)	
	August	_	_	**40** (1,136)	**7** (100)	_	_	
	September	_	**23** (110)	**12** (110)	**56** (268)	_	_	
	October	**52** (300)	_	_	**1** (100)	_	_	
Section Total		**52** (300)	**62** (370)	**63** (1,356)	**81** (723)	**10** (268)	**6** (268)	**247** (3,285)
Section 2	July	_	**76** (965)	**23** (200)	**62** (520)	**120** (1,500)	**14** (100)	
	August	_	_	_	**11** (100)	_	**76** (984)	
	September	_	**33** (320)	**27** (200)	**106** (683)	_	_	
	October	**79** (600)	_	_	**3** (100)	_	_	
Section Total		**79** (600)	**109** (1,285)	**50** (400)	**182** (1,403)	**120** (1,500)	**90** (1,084)	**630** (6,272)
Section 3	July	_	**158** (1,592)	**46** (420)	**152** (1,840)	**42** (1,600)	**14** (100)	
	August	_	_	_	**16** (200)	_	**104** (856)	
	September	_	**73** (388)	**66** (520)	**184** (1,000)	_	_	
	October	**129** (700)	**6** (90)	_	**9** (300)	_	_	
Section Total		**129** (700)	**237** (2,070)	**112** (940)	**352** (3,340)	**42** (1,600)	**108** (956)	**980** (9,606)
Section 4	July	_	**14** (580)	**3** (100)	**12** (780)	_	_	
	August	_	_	_	**5** (200)	_	**48** (1,091)	
	September	_	_	**2** (100)	_	_	_	
	October	**18** (100)	**9** (100)	_	**3** (200)	_	_	
Section Total		**18** (100)	**23** (680)	**5** (200)	**20** (1,180)	_	**48** (1,091)	**66** (2,160)
Total		**278** (1,700)	**431** (4,405)	**230** (2,896)	**635** (6,646)	**172** (3,368)	**252** (3,399)	**2,001** (22,414)

Appendix 7: Brook Trout electrofishing removal results in Unnamed Tributary to the Shields River at RM 62.6 in 2016 and 2017.

Section	Number of Brook Trout Removed (Number of Meters Sampled)			
	Month	**2016**	**2017**	**Total**
Section 1	June	**0** (1,207)	_	
	August	_	**2** (100)	
	September	_	**1** (1,390)	
Total		**0** (1,207)	**3** (1,490)	**3** (2,697)

Appendix 8: Yellowstone Cutthroat Trout electrofishing capture results in Unnamed Tributary to the Shields River at RM 62.6 in 2016 and 2017.

Section	Number of YCT Captured (Number of Meters Sampled)			
	Month	**2016**	**2017**	**Total**
Section 1	June	**202** (1,207)	_	
	August	_	**14** (100)	
	September	_	**164** (1,390)	
Total		**202** (1,207)	**178** (1,490)	**380** (2,697)

Appendix 9: Brook Trout electrofishing removal results in Lodgepole Creek from 2014-2019.

Section	Month	Number of Brook Trout Removed (Number of Meters Removal Occurred In)						
		2014	2015	2016	2017	2018	2019	Total
Section 1	July	_	_	**0** (110)	**5** (495)	**0** (100)	**1** (595)	
	August	_	**1** (310)	**5** (1,337)	_	_	_	
	September	_	**–**	**0** (110)	_	_	_	
	October	**15** (510)	**0** (500)	_	_	_	_	
Section Total		**15** (510)	**1** (810)	**5** (1,557)	**5** (495)	**0** (100)	**1** (595)	**27** (4,067)
Section 2	July	_	_	**0** (200)	**2** (337)	**2** (800)	**0** (800)	
	August	_	**1** (820)	_	**0** (200)	**–**	**–**	
	September	_	**–**	**0** (200)	**–**	_	_	
	October	**1** (530)	**0** (300)	_	**0** (200)	_	_	
Section Total		**1** (530)	**1** (1,120)	**0** (400)	**2** (737)	**2** (800)	**0** (800)	**6** (4,387)
Section 3	July	**–**	**–**	**0** (200)	**–**	_	_	
	August	_	**1** (575)	_	**0** (200)	_	_	
	September	_	**0** (92)	**0** (200)	_	_	_	
	October	**0** (100)	**0** (100)	_	**0** (200)	_	_	
Section Total		**0** (100)	**1** (767)	**0** (400)	**0** (400)	_	**–**	**1** (1,667)
Section 4	July	**–**	**–**	**0** (100)	**–**	_	_	
	August	**–**	**–**	**0** (100)	**–**	_	_	
	September	**–**	**0** (400)	_	**–**	_	_	
	October	**0** (100)	**–**	_	**–**	_	_	
Section Total		**0** (100)	**0** (400)	**0** (200)	**–**	_	**–**	**0** (700)
Total		**16** (1,240)	**3** (3,097)	**5** (2,557)	**7** (1,632)	**2** (900)	**1** (1,395)	**34** (10,821)

Appendix 10: Yellowstone Cutthroat Trout electrofishing capture results in Lodgepole Creek from 2014-2019.

Section	Month	Number of YCT Captured (Meters of Stream Sampled)						
		2014	2015	2016	2017	2018	2019	Total
Section 1	July	_	_	**11** (110)	**42** (495)	**5** (100)	**34** (595)	
	August	_	**62** (310)	**81** (1,337)	_	_	_	
	September	_	**–**	**7** (110)	_	_	_	
	October	**75** (510)	**52** (500)	_	_	_	_	
Section Total		**75** (510)	**114** (810)	**99** (1,557)	**42** (495)	**5** (100)	**34** (595)	**369** (4,067)
Section 2	July	_	_	**11** (200)	**27** (337)	**23** (800)	**35** (800)	
	August	_	**157** (820)	_	**9** (200)	**–**	**–**	
	September	_	**–**	**26** (200)	**–**	**–**	**–**	
	October	**54** (530)	**64** (300)	_	**12** (200)	_	_	
Section Total		**54** (530)	**221** (1,120)	**37** (400)	**48** (737)	**23** (800)	**35** (800)	**418** (4,387)
Section 3	July	**–**	**–**	**9** (200)	**–**	_	_	
	August	_	**127** (575)	_	**13** (200)	_	_	
	September	_	**38** (92)	**18** (200)	_	_	_	
	October	**20** (100)	**22** (100)	_	**5** (200)	_	_	
Section Total		**20** (100)	**187** (767)	**27** (400)	**18** (400)	_	**–**	**252** (1,667)
Section 4	July	**–**	**–**	**0** (100)	**–**	_	_	
	August	**–**	**–**	**10** (100)	**–**	_	_	
	September	**–**	**10** (400)	_	**–**	_	_	
	October	**3** (100)	**–**	_	**–**	_	_	
Section Total		**3** (100)	**10** (400)	**10** (200)	**–**	_	**–**	**23** (700)
Total		**152** (1,240)	**532** (3,097)	**173** (2,557)	**108** (1,632)	**28** (900)	**69** (1,395)	**1,062** (10,821)

Appendix 11: Brook Trout electrofishing removal results in Fawn Creek from 2015-2018.

Section	Month	Number of Brook Trout Removed (Number of Meters Removal Occurred In)				
		2015	2016	2017	2018	Total
Section 1	July	**6** (373)	**1** (612)	_	_	
	August	**9** (520)	_	4 (651)	**1** (670)	
Total		**15** (893)	**1** (612)	**4** (651)	**1** (670)	**21** (2,826)

Appendix 12: Yellowstone Cutthroat Trout electrofishing capture results in Fawn Creek from 2015-2018.

Section	Month	Number of YCT Captured (Meters of Stream Sampled)				
		2015	2016	2017	2018	Total
Section 1	July	**20** (373)	**77** (612)	_	_	
	August	**3** (520)	_	**77** (651)	**34** (670)	
Total		**23** (893)	**77** (612)	**83** (651)	**34** (670)	**217** (2,826)

Appendix 13: Brook Trout electrofishing removal results in Unnamed Tributary to the Shields River at RM 62.8 from 2015-2018.

Section	Number of Brook Trout Removed (Meters of Stream Sampled)					
	Month	**2015**	**2016**	**2017**	**2018**	**Total**
Section 1	June	_	**7** (241)	_	_	
	July	_	_	**6** (240)	**3** (240)	
	August	**18** (240)	_	_	_	
Total		**18** (240)	**7** (241)	**6** (240)	**3** (240)	**34** (961)

Appendix 14: Yellowstone Cutthroat Trout electrofishing capture results in Unnamed Tributary to the Shields River at RM 62.8 from 2015-2018.

Section	Number of YCT Captured (Meters of Stream Sampled)					
	Month	**2015**	**2016**	**2017**	**2018**	**Total**
Section 1	June	_	**24** (241)	_	_	
	July	_	_	**20** (240)	**9** (240)	
	August	**21** (240)	_	_	_	
Total		**21** (240)	**24** (241)	**20** (240)	**9** (240)	**74** (961)

Appendix 15: Brook Trout electrofishing removal results in Turkey Creek from 2014-2018.

Section	Month	Number of Brook Trout Removed (Meters of Stream Sampled)					
		2014	2015	2016	2017	2018	Total
Section 1	June	–	–	**0** (100)	–	–	
	July	–	**4** (96)	–	**5** (100)	**0** (100)	
	September	**10** (96)	–	–	–	–	
Section Total		**10** (96)	**4** (96)	**0** (100)	**5** (100)	**0** (100)	**19** (492)
Section 2	July	–	**0** (350)	**0** (394)	**0** (100)	–	
	September	**1** (470)	–	–	–	–	
	October	**0** (471)	–	–	–	–	
Section Total		**1** (941)	**0** (350)	**0** (394)	**0** (100)	–	**1** (1,785)
Section 3	July	–	**0** (300)	–	–	**0** (100)	
	October	**0** (418)	–	–	–	–	
Section Total		**0** (418)	**0** (300)	–	–	**0** (100)	**0** (818)
Total		**11** (1,359)	**8** (842)	**0** (494)	**5** (200)	**0** (200)	**20** (3,095)

Appendix 16: Yellowstone Cutthroat Trout electrofishing capture results in Turkey Creek from 2014-2018.

Section	Month	Number of YCT Captured (Meters of Stream Sampled)					
		2014	2015	2016	2017	2018	Total
Section 1	June	–	–	**1** (100)	–	–	
	July	–	**3** (96)	–	**13** (100)	**4** (100)	
	September	**8** (96)	–	–	–	–	
Section Total		**8** (96)	**3** (96)	**1** (100)	**13** (100)	**4** (100)	**29** (492)
Section 2	July	–	**20** (350)	**20** (394)	**10** (100)	–	
	September	**57** (470)	–	–	–	–	
	October	**39** (471)	–	–	–	–	
Section Total		**96** (941)	**20** (350)	**20** (394)	**10** (100)	–	**146** (1,785)
Section 3	July	–	**14** (300)	–	–	**8** (100)	
	October	**34** (418)	–	–	–	–	
Section Total		**34** (418)	**14** (300)	–	–	**8** (100)	**56** (818)
Total		**138** (1,359)	**45** (842)	**21** (494)	**23** (200)	**12** (200)	**231** (3,095)

Appendix 17: Brook Trout electrofishing removal results in Scofield Creek from 2014-2019.

Section	Month	Number of Brook Trout Removed (Number of Meters Removal Occurred In)						
		2014	2015	2016	2017	2018	2019	Total
Section 1	June	_	_	**0** (152)	_	_	_	
	July	_	_	**2** (700)	_	_	**2** (800)	
	August	_	**14** (1,000)	_	_	_	_	
Section Total		_	**14** (1,000)	**2** (852)	_	_	**2** (800)	**18** (2,652)
Section 2	June	_	_	**0** (1,004)	_	_	_	
	July	_	**1** (1,100)	**0** (336)	_	**0** (1,000)	**0** (100)	
	September	**0** (282)	_	_	_	_	_	
Section Total		**0** (282)	**1** (1,100)	**0** (1,340)	_	**0** (1,000)	**0** (100)	**1** (3,822)
Total		**0** (282)	**15** (2,100)	**2** (2,192)	_	**0** (1,000)	**2** (900)	**19** (6,474)

Appendix 18: Yellowstone Cutthroat Trout electrofishing capture results in Scofield Creek from 2014-2019.

Section	Month	Number of YCT Captured (Meters of Stream Sampled)						
		2014	2015	2016	2017	2018	2019	Total
Section 1	June	_	_	**18** (152)	_	_	_	
	July	_	_	**85** (700)	_	_	**27** (800)	
	August	_	**108** (1,000)	_	_	_	_	
Section Total		_	**108** (1,000)	**103** (852)	_	_	**27** (800)	**238** (2,652)
Section 2	June	_	_	**43** (1,004)	_	_	_	
	July	_	**71** (1,100)	**7** (336)	_	**36** (1,000)	4 (100)	
	September	**56** (282)	_	_	_	_	_	
Section Total		**56** (282)	**71** (1,100)	**50** (1,340)	_	**36** (1,000)	**4** (100)	**217** (3,822)
Total		**56** (282)	**179** (2,100)	**153** (2,192)	_	**36** (1,000)	**31** (900)	**433** (6,474)

Appendix 19: Brook Trout electrofishing removal results in Buck Creek from 2015-2017.

Section	Month	Number of Brook Trout Removed (Number of Meters Removal Occurred In) 2015	2016	2017	Total
Section 1	August	**14** (1,604)	**12** (2,416)	**11** (880)	
	September	_	_	**3** (552)	
Section Total		**14** (1,604)	**12** (2,416)	**14** (1,432)	**40** (5,452)
Section 2	August	_	**1** (770)	_	
	September	_	_	**1** (130)	
Section Total		_	**1** (770)	**1** (130)	**2** (900)
Total		**14** (1,604)	**13** (3,186)	**15** (1,562)	**42** (6,352)

Appendix 20: Yellowstone Cutthroat Trout electrofishing capture results in Buck Creek from 2015-2017.

Section	Month	Number of YCT Captured (Meters of Stream Sampled) 2015	2016	2017	Total
Section 1	August	**29** (1,604)	**26** (2,416)	**12** (880)	
	September	_	_	**10** (552)	
Section Total		**29** (1,604)	**26** (2,416)	**22** (1,432)	**77** (5,452)
Section 2	August	_	**6** (770)	_	
	September	_	_	**2** (130)	
Section Total		_	**6** (770)	**2** (130)	**8** (900)
Total		**29** (1,604)	**32** (3,186)	**24** (1,562)	**85** (6,352)