Fisheries Division
Federal Aid Job Progress Report

Montana Statewide Fisheries Management

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Project Title: Montana Statewide Fisheries Management

Job Title: Yellowstone and Shields River Drainages Fisheries Management

Abstract: Sampling results for the Yellowstone River, Shields River, and Dailey Lake for 2015 and 2016.

Fisheries Investigations in the Yellowstone and Shields River Basins, Park County, Montana

Annual Report for 2015 and 2016

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Abstract

The Mill Creek and Corwin Springs Sections on the Yellowstone River were sampled in 2015 and 2016, and trout abundance estimates were calculated for both sections. Rainbow Trout *Oncorhynchus mykiss*, Brown Trout *Salmo trutta*, and Yellowstone Cutthroat Trout *Oncorhynchus clarki bouvieri* estimates in both sections were all lower than the 2014 estimates. Brown Trout in the Corwin Springs section did increase in 2015, but decreased in 2016. The Zimmerman and Convict Grade sections in the Shields River were sampled in 2015 and 2016. In the Zimmerman Section, the Brown Trout abundance estimate was up slightly in 2015 and then increased in 2016. The abundance estimate for Mountain Whitefish *Prosopium williamsoni* increased in both 2015 and 2016. Low numbers of Yellowstone Cutthroat and Brook Trout in the Zimmerman Section prohibited the calculation of abundance estimates for both 2015 and 2016. In the Convict Grade Section, Brown Trout abundance was down in 2015 and 2016, while Rainbow Trout abundance remained steady in 2015 and increased in 2016. Low numbers of Yellowstone Cutthroat Trout in the Convict Grade Section prevented the calculation of population estimates. Results from the long-term gill netting series in Dailey Lake show that catch-per-unit-effort (CPUE) for Walleye *Stizostedion vitreum* increased both years while Yellow Perch *Perca flavescens* increased in 2015 and decreased in 2016. Rainbow and Yellowstone Cutthroat Trout both decreased and neither species was present in the catch in 2016. Average lengths of Rainbow Trout, Yellowstone Cutthroat Trout, Walleye, and Yellow Perch decreased both years.

Introduction

Electrofishing Procedures

Mark-recapture methodology was used to estimate trout populations in the Yellowstone River and trout and Mountain Whitefish in the Shields River. Marking and recapture runs consisted of electrofishing the entire section or reach of river, with multiple fish-working stops to minimize stress of sampled fish. During the marking run all fish were marked with a fin clip, which can be detected during subsequent sampling events. The fish were then released back into the section and allowed to redistribute for seven days prior to recapture runs. During recapture runs, fish were examined for fin clips and those that had the fin clip were noted as recaptured.

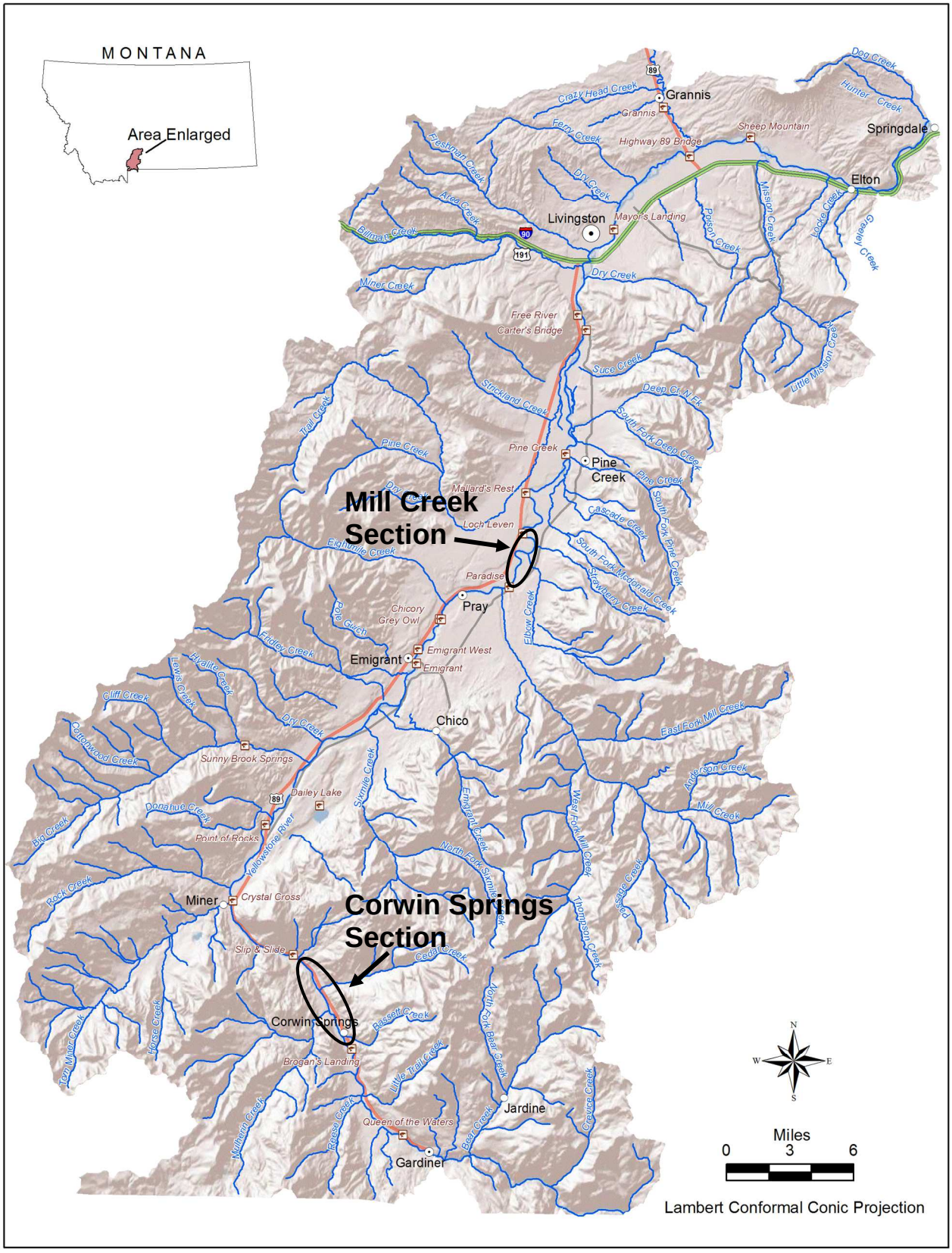
Yellowstone River Procedures

In spring 2015 and 2016, trout were sampled in the Mill Creek and Corwin Springs Sections of the Yellowstone River (Table 1 and Figure 1), both of which are long-term monitoring sections.

- Table 1: Survey sections where trout sampling occurred in the Yellowstone River in 2015 and 2016.

Section Name	Survey Date	Length (ft)	Approximate Location		
Mill Creek	04/20/15	24,816	Upper	North	45.41981
	04/18/16		Boundary	West	110.64209
			Lower	North	45.46176
			Boundary	West	110.62133
Corwin	04/22/15	28,402	Upper	North	45.10993
Springs	04/26/16		Boundary	West	110.79077
			Lower	North	45.16214
			Boundary	West	110.8350

- Coordinates in decimal degrees are NAD83 datum.



• Figure 1: Map of the upper Yellowstone River displaying 2015 and 2016 sampling locations.

Electrofishing of the Yellowstone River was completed through the use of one or two jet boats mounted with boom electrofishing equipment. One boat was an 18-foot aluminum Alumacraft™ outboard jet boat with a Mercury™ 90 jet, equipped with a Coffelt™ VVP-15 and a 5,000-watt Honda™ EG5000CL generator. The second boat was a 20-foot Wooldridge™ outboard jet boat with an Evenrude™ 225 jet, equipped with a Coffelt™ VVP-15 and a Honda™ EM7500 generator. The anodes on both boats were stainless steel cable droppers suspended from twin booms at the bow, and the hull served as the cathode.

A mark-recapture effort was made on the Mill Creek and Corwin Springs sections. Fish were netted and held in live cars. After anesthetizing, the fish were identified to species, measured to the nearest 0.1 inch, and weighed to the nearest 0.01 pound. Trout were marked with a fin clip and returned to the river. Seven days after the last marking run, the recapture effort was made.

Population abundance was estimated using the Chapman Modified Peterson method (Chapman 1951). Population estimates for Brown, Rainbow, and Yellowstone Cutthroat Trout (YCT) ≥ 7 inches were calculated in both sections.

Mill Creek Section

On the Mill Creek Section, marking runs were made on April 20 and 21, 2015. The section was split into five subsections. On April 20, the right and left bank of the first two subsections were sampled with the use of one boat. Both banks of the three remaining subsections were sampled on April 21 with the use of two boats, one on each bank. All trout were marked with an anal fin clip.

The recapture effort for the section was completed on April 27 and 28, 2015 with the use of two boats, one on each bank. The first two subsections were sampled on April 27 and the last three were sampled on April 28.

In 2016, marking runs were completed on April 18, 21, and 25. The section was not sampled on consecutive days due to mechanical issues with the boat. Similar to 2015, the section was split into five subsections and all were completed with the use of one boat.

The recapture effort was completed on May 2 and 3, 2016. The upper two sections were completed on May 2 with one boat and the remaining three were completed with the use of two boats.

Corwin Springs Section

The Corwin Springs Section was marked on April 22 and 23, 2015. The section was split into five subsections and on April 22, the right and left bank of the first two subsections were sampled with one boat on each bank. Both banks of the last three subsections were sampled on April 23 with one boat on each bank. All trout were marked with a left pelvic fin clip.

The recapture effort for the section was completed on April 29, 2015. All five subsections were completed with two boats, one on each bank.

In 2016, the marking runs were completed on April 26 and 27. The section was split into five subsections and two boats were used to complete the upper three subsections on the 26th and the last two on the 27th.

The recapture runs were completed on May 4, 2016 and all 5 subsections were completed with the use of two boats.

Yellowstone River Results

Yellowstone River Trout Abundances

Electrofishing data were used to calculate trout abundance estimates and monitor population trends. Results, by species, are presented below (Table 2).

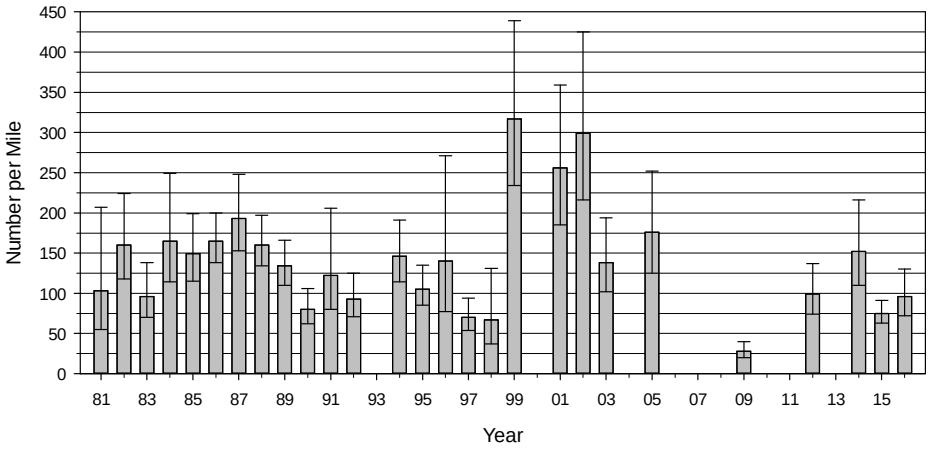
- Table 2: Population abundance results for the Mill Creek and Corwin Springs Sections of the Yellowstone River by species in 2015 and 2016. N/mile represents the estimated number of Brown, Rainbow, or Yellowstone Cutthroat Trout (≥7 inches) per mile. Lower and upper 95% confidence intervals are indicated as well.

Section	Fish Species	N/mile	Lower 95%	Upper 95%
Mill Creek 2015	Yellowstone Cutthroat Trout	75	63	91
	Rainbow Trout	394	355	440
	Brown Trout	412	341	502
Mill Creek 2016	Yellowstone Cutthroat Trout	96	72	130
	Rainbow Trout	430	380	490
	Brown Trout	230	177	308
Corwin Springs 2015	Yellowstone Cutthroat Trout	287	251	330
	Rainbow Trout	296	255	348
	Brown Trout	323	271	390
Corwin Springs 2016	Yellowstone Cutthroat Trout	289	235	359
	Rainbow Trout	275	227	337
	Brown Trout	206	168	257

Yellowstone Cutthroat Trout

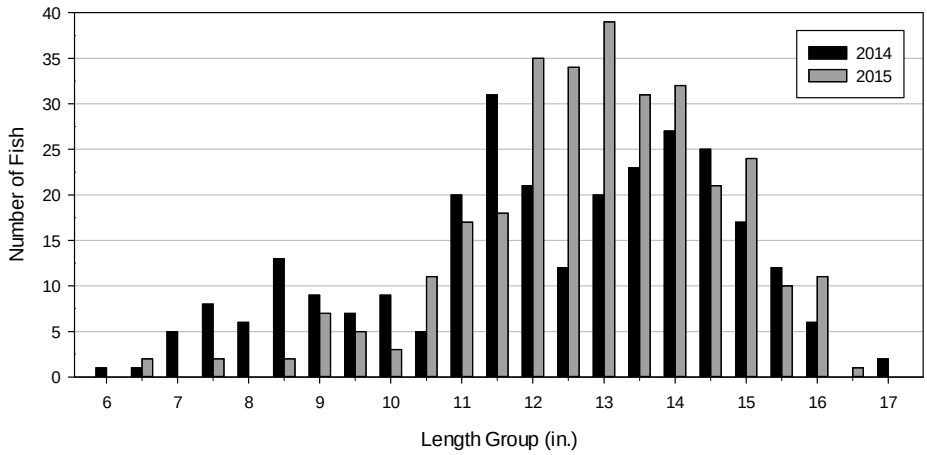
Mill Creek Section

The population estimate for YCT in the Mill Creek Section decreased to 75 fish/mile (≥ 7in) in 2015 from 152 fish/mile (≥ 7in) in 2014 and increased to 96 fish/mile (≥ 7in) in 2016. Both the 2015 and 2016 estimates remained lower than the 2012 and 2014 estimates (Figure 2). The estimates indicate that recruitment and survival have decreased since 2014 but the estimates remain higher than the low in 2009. Both estimates were below the long-term average of 145 fish/mile (≥ 7in) for estimates completed between 1981 and 2014. YCT that showed morphological signs of hybridization were categorized as hybrid fish and were not included in the YCT abundance estimates.



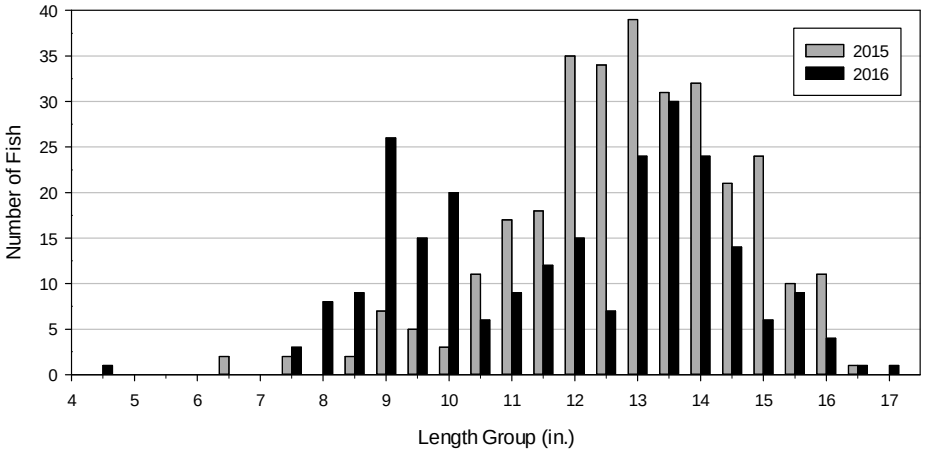
- Figure 2: Abundance estimates for Yellowstone Cutthroat Trout (≥ 7in) in the Mill Creek Section of the Yellowstone River from 1981-2016. Error bars represent the upper and lower 95% confidence intervals. The section was not sampled in 2004, 2006, 2008, 2010, and 2013. No abundance estimates were made in 2007 and 2011.

Comparison of length-frequency distributions of YCT from 2015 and 2014 indicates limited change in the range of length groups of captured fish (Figure 3). In 2015, there was a decrease in the number of fish captured in the 6.5 to 10-inch length groups indicating a decrease in recruitment of young fish. Increases in numbers from 2014 to 2015 were seen in the 12.0 to 16.0-inch length groups as the result of improved recruitment or sampling efficiency.



- Figure 3: Length-frequency distributions for Yellowstone Cutthroat Trout sampled in the Mill Creek Section of the Yellowstone River during 2014 and 2015.

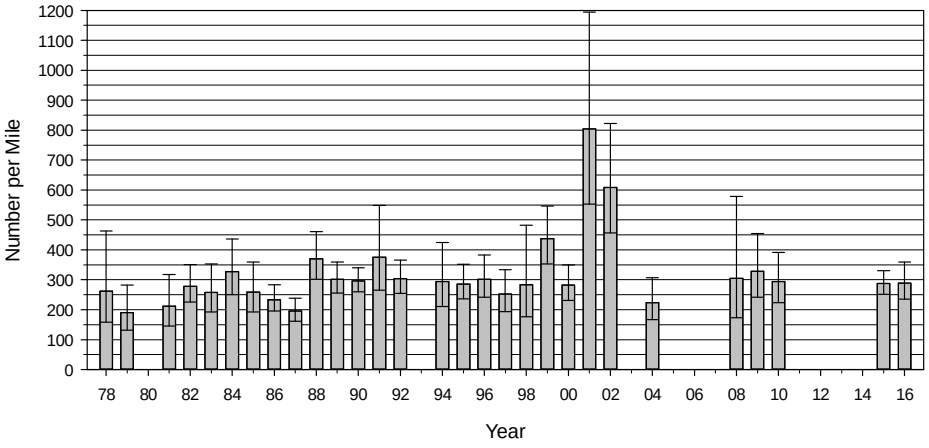
Length-frequency distributions of YCT in 2016 decreased in most length groups compared to 2015 (Figure 4). Increases in frequency were noted in the 7.5- to 10.0-inch classes indicating good recruitment of young fish. It appears there may have been limited spawning success, a recruitment issue, or combination of both that has limited the number of fish in the 5.0 to 7.0-inch classes. Limited recruitment may be the result of low later flows in late summer, particularly in important spawning tributaries such as Mill Creek. Monitoring in 2017 will help determine if the absence of YCT in those length groups was the result of poor recruitment or a result of poor sampling efficiency.



- Figure 4: Length-frequency distributions for Yellowstone Cutthroat Trout sampled in the Mill Creek Section of the Yellowstone River during 2015 and 2016.

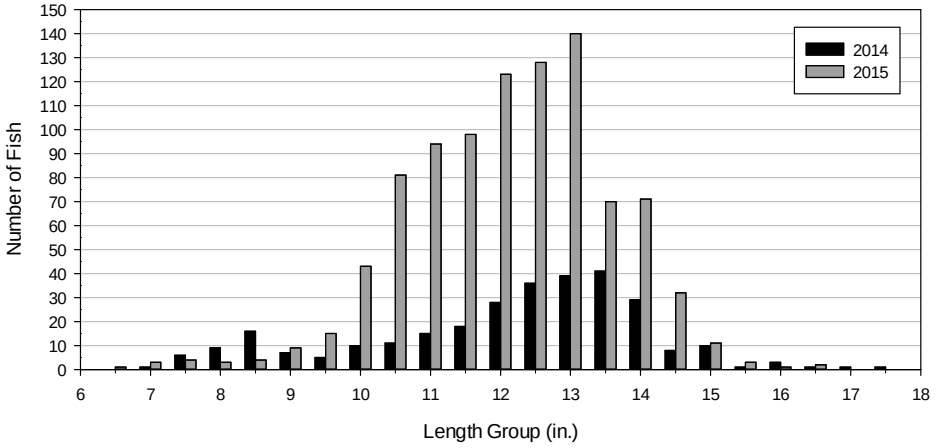
Corwin Springs Section

In 2015, the YCT population estimate in the Corwin Springs Section was 278 fish/mile (≥ 7in), down slightly from the last estimate of 294 fish/mile (≥ 7in) in 2010 (Figure 5). In 2016, the estimate increased to 289 fish/mile (≥ 7in), yet remained lower than the 2010 estimate. YCT population estimates in this section have remained stable over time with the exception of the estimates in 2001 and 2002. YCT that showed morphological signs of hybridization were categorized as hybrid fish and were not included in the YCT abundance estimates.



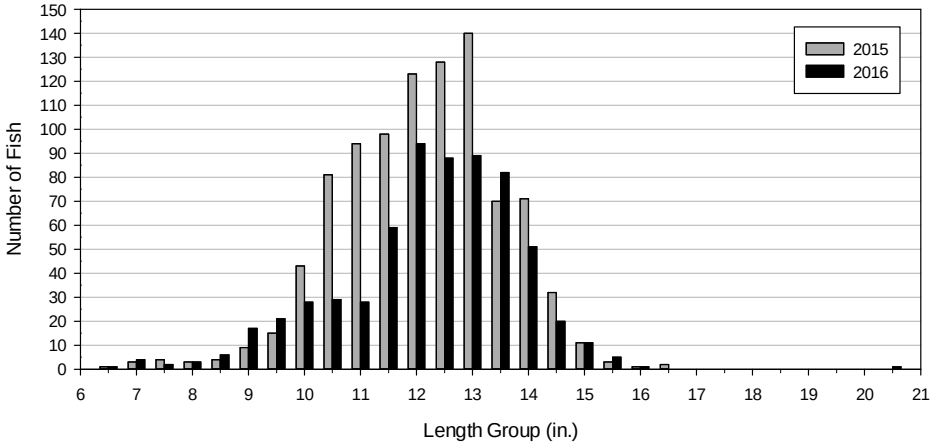
- Figure 5: Abundance estimates for Yellowstone Cutthroat Trout (≥ 7in) in the Corwin Springs Section of the Yellowstone River from 1978-2016. Error bars represent the upper and lower 95% confidence intervals. The section was not sampled in 1980, 2005, 2007, 2011, 2012, and 2013. No abundance estimates were made in 2006 and 2014.

For 2015 and 2014, length-frequency data indicates a range of captured YCT in length groups from 6.5 to 17.5 (Figure 6). Frequencies of fish in almost all length groups were much higher in 2015. This is the result of the limited sampling completed in 2014 as a result of river conditions; the recapture effort was unable to be completed therefore fewer fish were sampled in 2014.



- Figure 6: Length-frequency distributions for Yellowstone Cutthroat Trout sampled in the Corwin Springs Section of the Yellowstone River during 2014 and 2015.

Length-frequency data in 2016 show lower frequencies of YCT in almost every length group when compared to 2015 results (Figure 7). The range of length groups that fish were collected in varied from 6.5 to 20.5 inches. The high numbers of fish present in the 10.0 to 13.0-inch length groups in 2015 did not result in high numbers of larger length groups in 2016. This could be the result of limited recruitment or poor sampling efficiency between years.

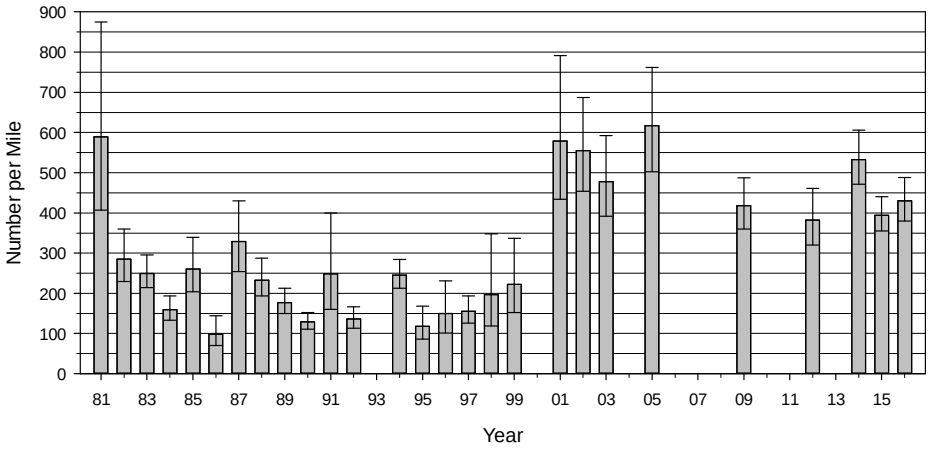


- Figure 7: Length-frequency distributions for Yellowstone Cutthroat Trout sampled in the Corwin Springs Section of the Yellowstone River during 2015 and 2016.

Rainbow Trout

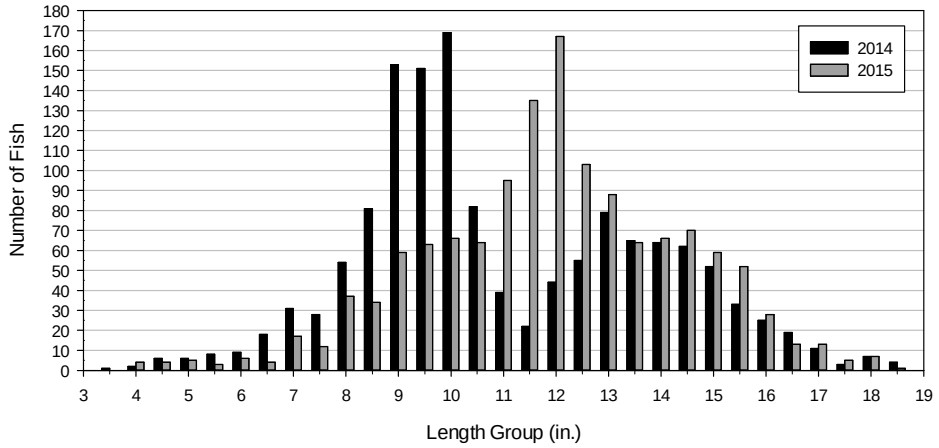
Mill Creek Section

In the Mill Creek Section, the 2015 abundance estimate for Rainbow Trout was 394 fish/mile (≥ 7in) (Figure 8). This was a decrease from 522 fish/mile (≥ 7in) in 2015. The 2016 estimate increased to 430 fish/mile (≥ 7in), yet remained lower than the 2014 estimate of 522 fish/mile (≥ 7in). Current estimates of Rainbow Trout abundance continue to be higher than those seen from 1982 - 1999.



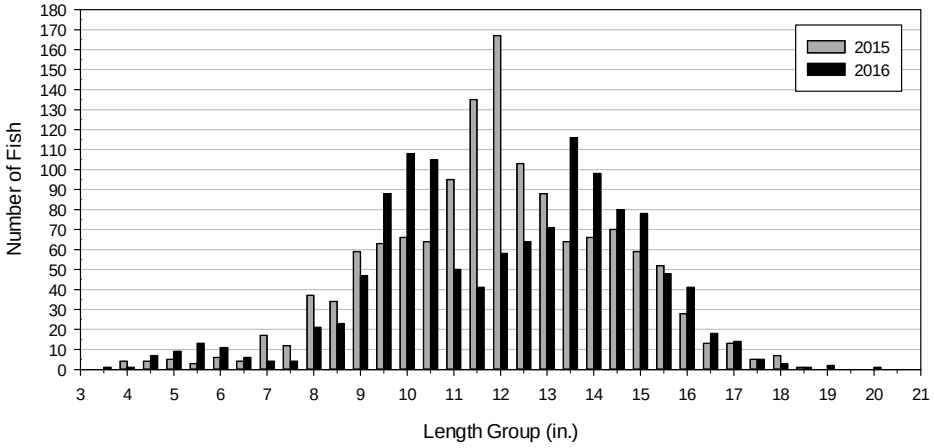
- Figure 8: Abundance estimates for Rainbow Trout (≥ 7in) in the Mill Creek Section of the Yellowstone River from 1981-2016. Error bars represent the upper and lower 95% confidence intervals. The section was not sampled in 2004, 2006, 2008, 2010, and 2013. No abundance estimates were made in 2007 and 2011.

The length-frequency distributions for Rainbow Trout in the Mill Creek Section in 2014 and 2015 are presented below (Figure 9). Fish were captured in the 3.5 to 18.5-inch length groups. There were high numbers of fish in the 8.0 to 11.0-inch length groups in 2014 that carried through to the 11.0 to 13.0-inch length groups in 2015 indicating continued strong recruitment and survival of these fish (likely the 2013 cohort). In 2015, the frequency of fish in the 10.5 inch and lower length groups was lower than those seen in 2014.



- Figure 9: Length-frequency distributions for Rainbow Trout sampled in the Mill Creek Section of the Yellowstone River during 2014 and 2015.

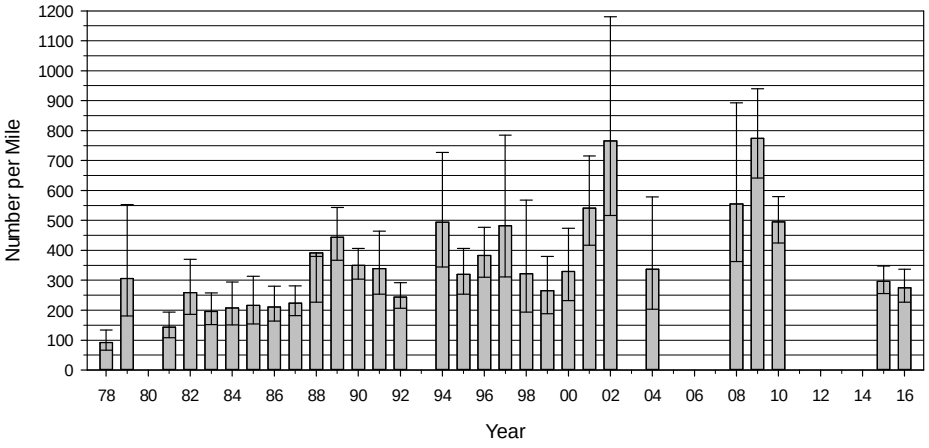
The strong 2013 cohort continued to move into larger length groups in 2016 as indicated by the increased frequencies of fish in the 13.5 to 16.5-inch length groups (Figure 10). Numbers of fish in the 9.5 to 10.5-inch length groups were higher than 2015 indicating good recruitment of the 2014 Rainbow cohort.



- Figure 10: Length-frequency distributions for Rainbow Trout sampled in the Mill Creek Section of the Yellowstone River during 2015 and 2016.

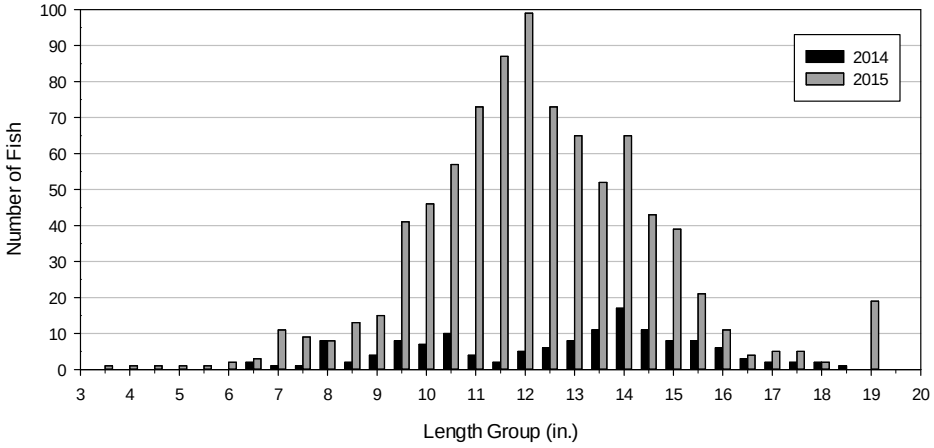
Corwin Springs Section

The Rainbow population estimate in 2015 for the Corwin Springs Section was 296 fish/mile (≥ 7in), down considerably from the last estimate of 495 fish/mile (≥ 7in) in 2010 (Figure 11Figure 5). In 2016, the estimate decreased again to 275 fish/mile (≥ 7in). Current Rainbow population estimates in this section are comparable to those seen in the 1980s and late 1990s.



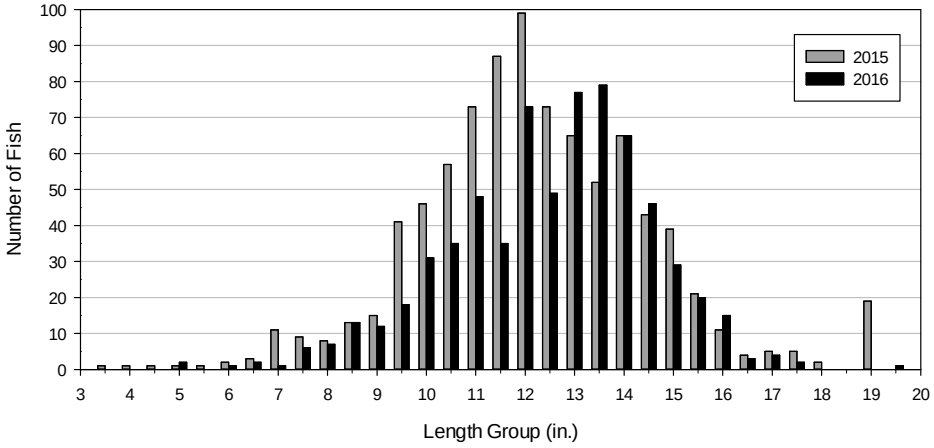
- Figure 11: Abundance estimates for Rainbow Trout (≥ 7in) in the Corwin Springs Section of the Yellowstone River from 1978-2016. Error bars represent the upper and lower 95% confidence intervals. The section was not sampled in 1980, 2005, 2007, 2011, 2012, and 2013. No abundance estimates were made in 2006 and 2014.

Length-frequency data indicates Rainbow Trout were captured in the 3.5 to 19.0-inch length groups in 2014 and 2015 (Figure 12). Frequencies are notably higher in most length groups in 2015. This is likely the result of limited sampling in 2014 as the result of river conditions at that time. In 2015, there were many Rainbow Trout in the 10.0 to 14.0 and 19.0-inch size classes.



- Figure 12: Length-frequency distributions for Rainbow Trout sampled in the Corwin Springs Section of the Yellowstone River during 2014 and 2015.

In 2016, the length-frequency distribution showed lower numbers of fish in most size groups with the exception of fish in the 13.0-, 13.5- and 16.0-inch groups when compared to 2015 (Figure 13). The increase in 13.0- and 13.5-inch fish indicates that there was good recruitment of fish from the 9.0- to 12.0-inch groups between 2015 and 2016.

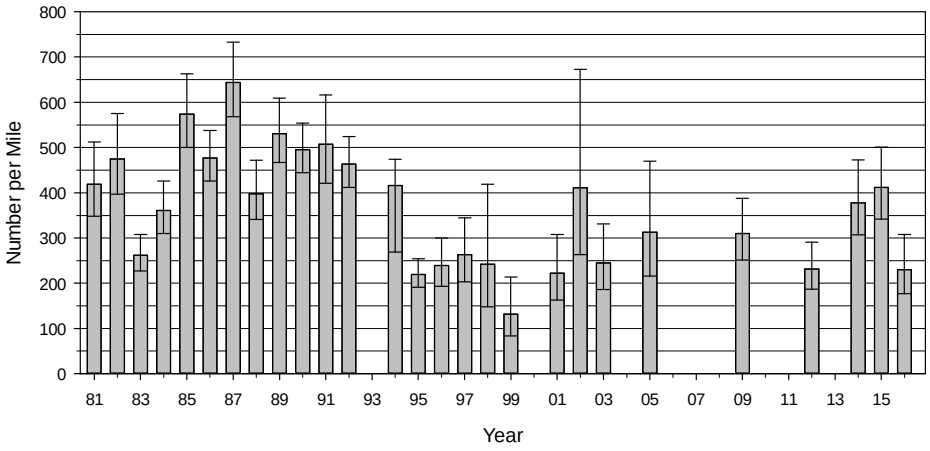


- Figure 13: Length-frequency distributions for Rainbow Trout sampled in the Corwin Springs Section of the Yellowstone River during 2015 and 2016.

Brown Trout

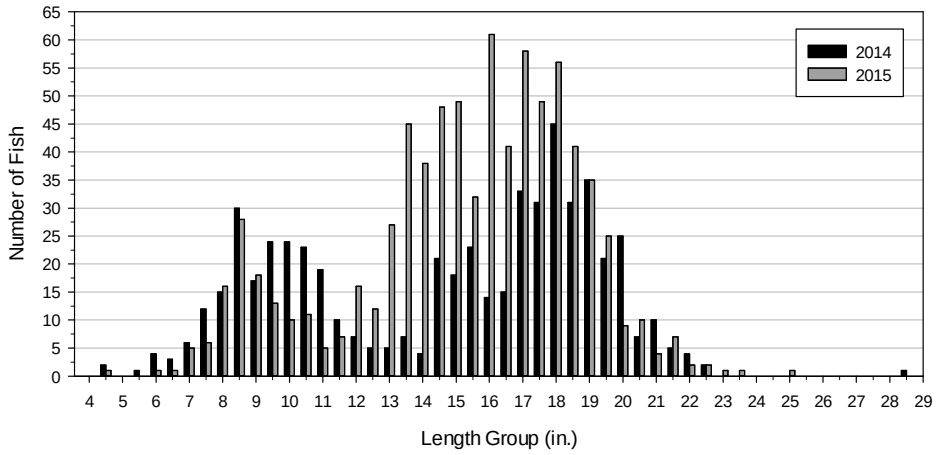
Mill Creek Section

In 2015, the abundance estimate for Brown Trout in the Mill Creek Section was 412 fish/mile (≥ 7in), an increase from 378 fish/mile (≥ 7in) in 2014 (Figure 14). The 2016 abundance estimate decreased to 230 fish/mile (≥ 7in), which is lower than both of the previous estimates. The lower abundance of Brown Trout in 2016 is similar to the 2012 and the mid-1990s to early 2000s estimates. Future surveys will determine whether the population decrease is a long-term trend or the result of sampling error.



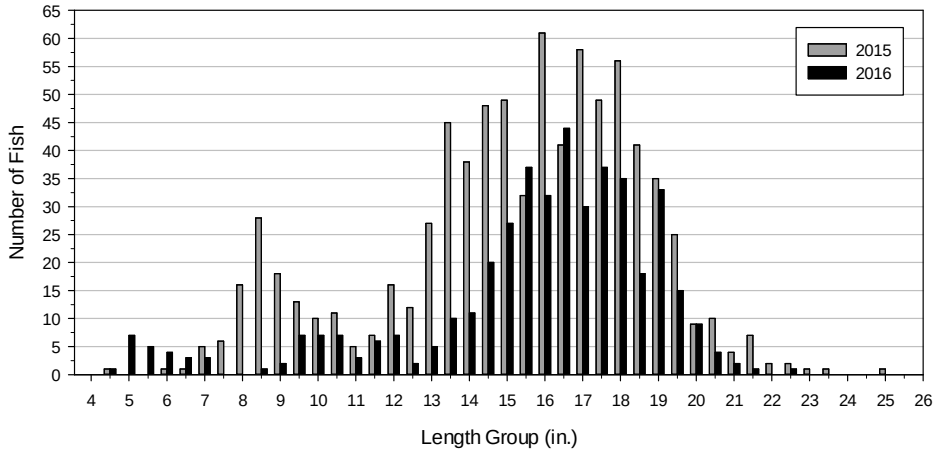
- Figure 14: Abundance estimates for Brown Trout (≥ 7in) in the Mill Creek Section of the Yellowstone River from 1981-2016. Error bars represent the upper and lower 95% confidence intervals. The section was not sampled in 2004, 2006, 2008, 2010, and 2013. No abundance estimates were made in 2007, 2009, and 2011.

The 2015 length-frequency distribution for Brown Trout in the Mill Creek Section showed an increase in the frequency of fish in the 12.0- to 18.5-inch length groups indicating good recruitment of 7.0- to 11.5-inch fish from 2014; this appears to be the 2013 cohort (Figure 15). Three fish were greater than 22.5 inches in 2015 compared to only one in 2014.



- Figure 15: Length-frequency distributions for Brown Trout sampled in the Mill Creek Section of the Yellowstone River in 2014 and 2015.

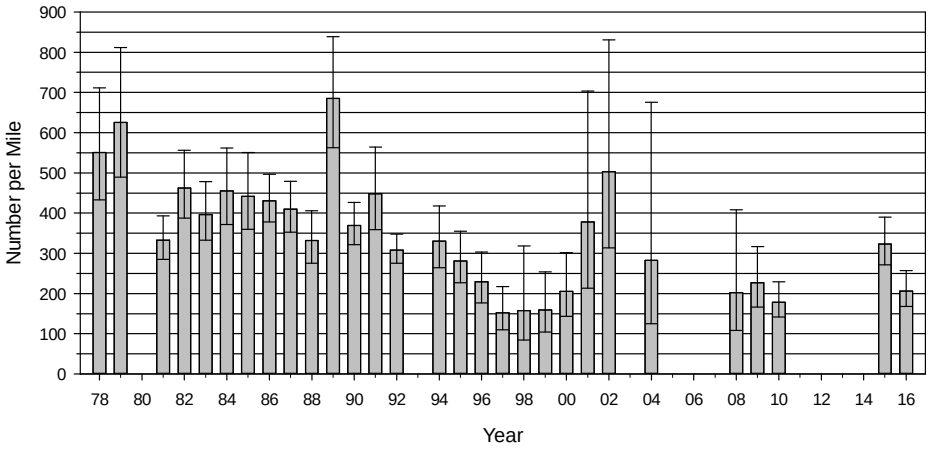
The length-frequency distribution for Brown Trout in 2016 indicates a reduction in frequency in almost all length groups when compared to 2015 with the exception of 5.0- to 6.5-inch groups (Figure 16). This could be the result of poor sampling efficiency or poor recruitment of Brown Trout in this reach. At this time, there are no obvious causes for this decline and future sampling will help identify the cause of the low estimates.



- Figure 16: Length-frequency distributions of Brown Trout sampled in the Mill Creek Section of the Yellowstone River in 2015 and 2016.

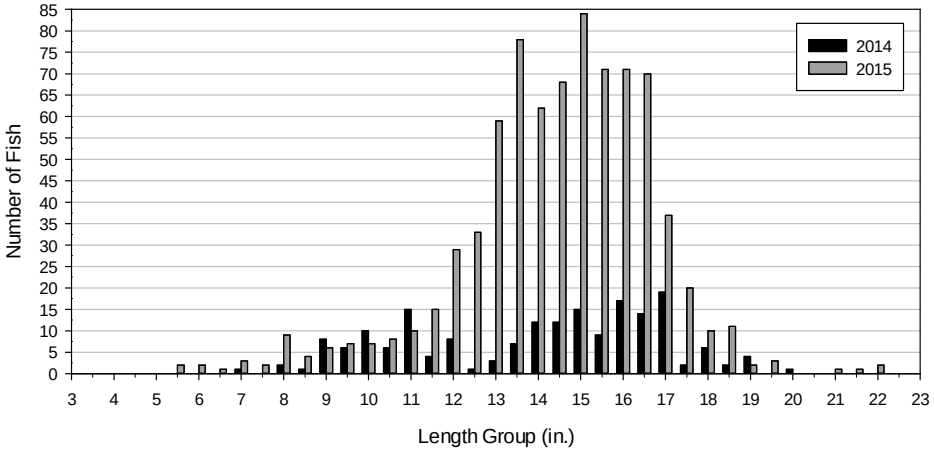
Corwin Springs Section

The 2015 Brown Trout population estimate in for the Corwin Springs Section was 323 fish/mile (≥ 7in), markedly up from the last estimate of 178 fish/mile (≥ 7in) in 2010 (Figure 17Figure 11Figure 5). In 2016, the estimate decreased to 206 fish/mile (≥ 7in). Even with the large increase in 2015, current Brown Trout population estimates continue to be lower than those seen in the 1980s and early 1990s.



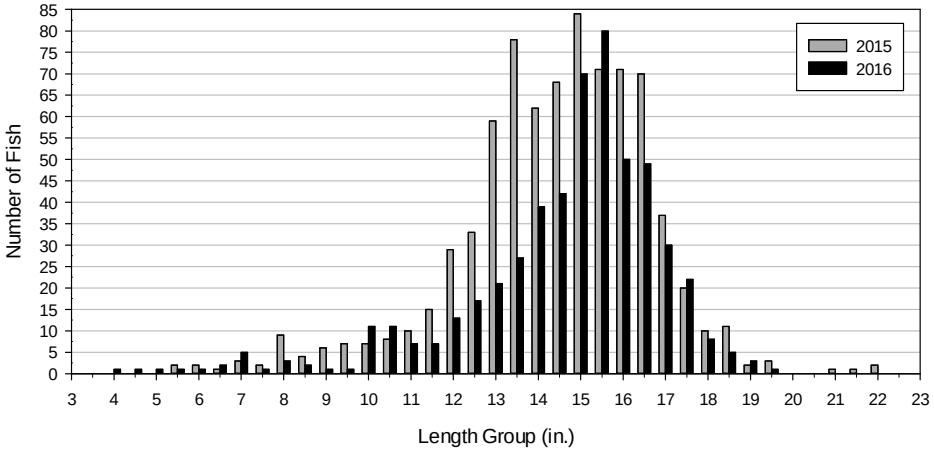
- Figure 17: Abundance estimates for Brown Trout (≥ 7in) in the Corwin Springs Section of the Yellowstone River from 1978-2016. Error bars represent the upper and lower 95% confidence intervals. The section was not sampled in 1980, 2005, 2007, 2011, 2012, and 2013. No abundance estimates were made in 2006 and 2014.

Brown Trout length-frequency data indicates an increase in frequency in most length groups from 2014 to 2015 (Figure 18). These large changes, as seen with YCT and rainbow in this section, are the result of the limited sampling effort in 2014 due to river conditions.



- Figure 18: Length-frequency distributions for Brown Trout sampled in the Corwin Springs Section of the Yellowstone River during 2014 and 2015.

Length-frequency distributions of Brown Trout in 2016 showed a reduction in frequency in the majority of length groups (Figure 19). Frequency in the 7.0-, 10.0-, 10.5-, 15.5-, 17.5-, and 19.5-inch groups did show slight increases in 2016 compared to 2015. The overall decrease in frequencies in 2016 corroborates the decrease noted in the population estimate.



- Figure 19: Length-frequency distributions for Brown Trout sampled in the Corwin Springs Section of the Yellowstone River during 2015 and 2016.

Mill Creek Brook Trout

In 2015, one Brook Trout was captured in the Mill Creek Section. It was 12.4 inches in length and weighed 0.61 lbs. The last time Brook Trout were captured in this section was in 2009. There were two trout that were 11.9-inches long and 0.71 lbs and 14.1-inches long and 1.02 lbs. These Brook Trout are likely migrating in from a tributary and do not appear to be establishing a population in the Yellowstone River.

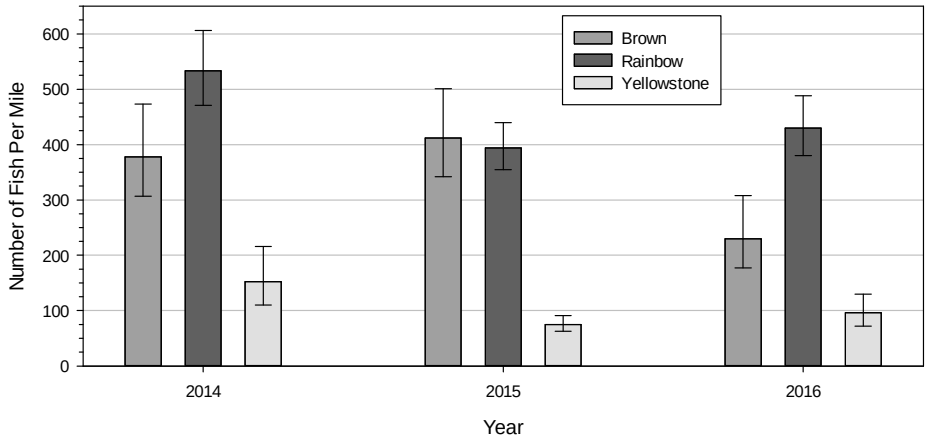
Corwin Springs Brook Trout

One Brook Trout was captured in 2016. It was 9.9-inches long and 0.26 lbs. The last time a Brook Trout was captured in this section was 2010 and it was 10.1-inches long and 0.42 lbs. Brook Trout remain extremely rare in this section and are likely migrating in from a tributary.

Summary

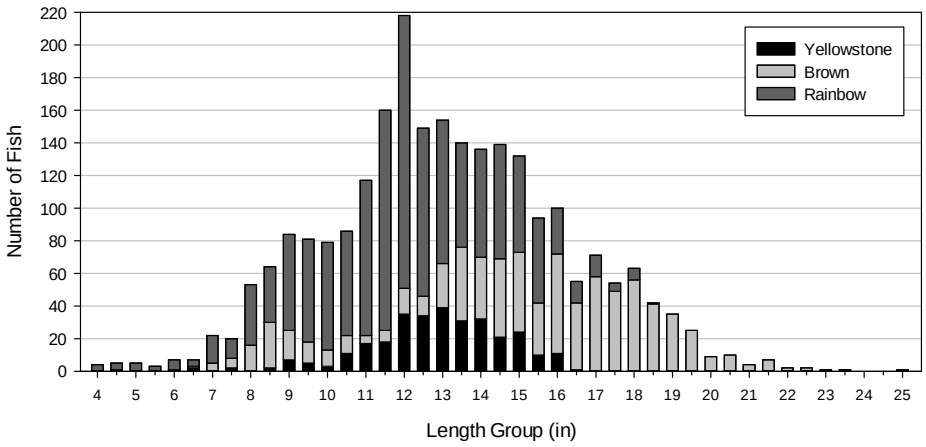
Mill Creek Section

There are obvious differences among the abundance estimates for Brown, Rainbow, and YCT in the Mill Creek Section for 2014-2016. The Rainbow and Brown Trout estimates are significantly higher than the YCT (Figure 20). Rainbow Trout had the highest abundance of the three species in 2014 and 2016. Brown Trout had the highest abundance in 2015 and YCT had the lowest abundance of the three species for all three years. Brown Trout were highest in abundance in the 1980s and 1990s. In 2000, Rainbow Trout began to have the highest abundance in the section, with the exception of 2015. The trend of YCT having the lowest abundance has been ongoing since the early 1980s and is likely the result of habit change, dewatering of spawning tributaries, and limited fry production and recruitment.



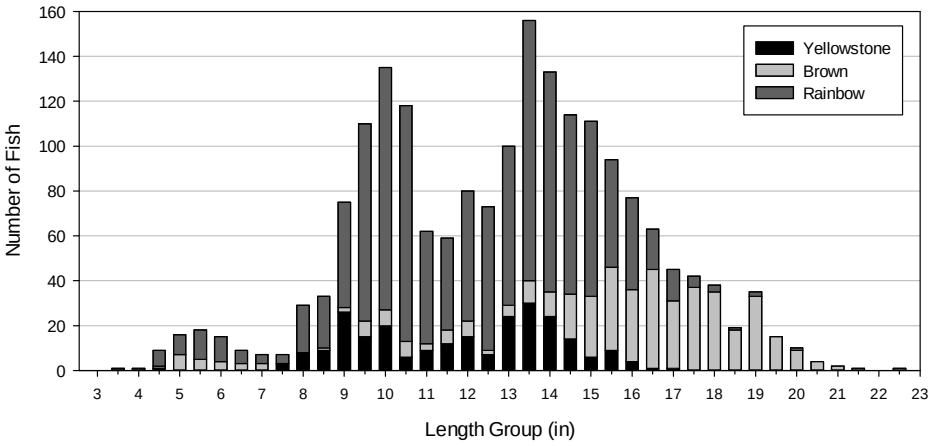
- Figure 20: Abundance estimates for Brown, Rainbow, and Yellowstone Cutthroat Trout (≥ 7in) in the Mill Creek Section of the Yellowstone River for 2014 - 2016. Error bars represent the upper and lower 95% confidence intervals.

The 2015 length-frequencies for all trout species in the Mill Creek Section are combined below (Figure 21). Rainbow Trout made up the majority of the fish in the 3.5- to 15.5-inch length groups. Both Rainbow Trout and YCT made up almost all of the fish in the 11.0- to 13.0-inch length groups with few Brown Trout in the sample. YCT had the smallest range of distribution among length groups. Brown Trout made up the majority of the fish in the 16.0- to 25.0-inch length groups and were the only species in the 19.0- to 25.0-inch length groups for the Mill Creek Section. The majority of the combined trout species in this section were in the 8.0- to 19.0-inch length groups with the 12.0-inch length group being the highest at 218 fish.



- Figure 21: Length-frequency distribution for Rainbow, Brown, and Yellowstone Cutthroat Trout sampled in the Mill Creek Section of the Yellowstone River in 2015.

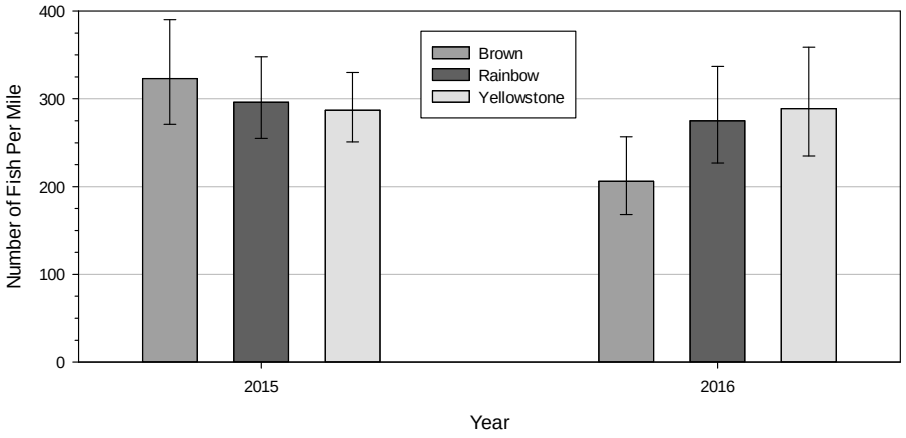
The 2016 length-frequency distributions for the combined trout species in the Mill Creek section had two distinct peaks compared to the those for 2015 (Figure 22). The peaks are the result of increases in Rainbow Trout in those length groups. Rainbow Trout continued to make up the majority of the fish in the 3.5- to 15.5-inch length groups and Brown Trout remained a small portion of the fish in the 3.5- to 14.0-inch length groups. YCT occupied a similar range of length groups as in 2015.



- Figure 22: Length-frequency distribution for Rainbow, Brown, and Yellowstone Cutthroat Trout sampled in the Mill Creek Section of the Yellowstone River in 2016.

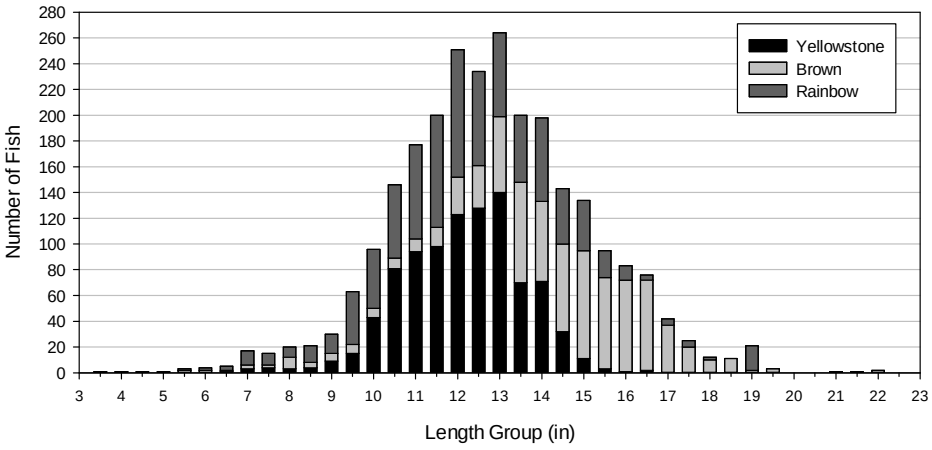
Corwin Springs Section

Proportions of Brown Trout, Rainbow Trout, and YCT in the Corwin Springs Section varied in 2015 and 2016 (Figure 23). Brown Trout had the highest abundance of the three species in 2015 and YCT had the highest in 2016. Historically, Brown Trout were highest in abundance in the 1980s and early1990s. In 1993, Rainbow Trout began to have the highest abundance in the section, with the exception of 1998, 2001, and 2016. The trend of YCT having abundance between Brown and Rainbow Trout has been ongoing since the early 1980s.



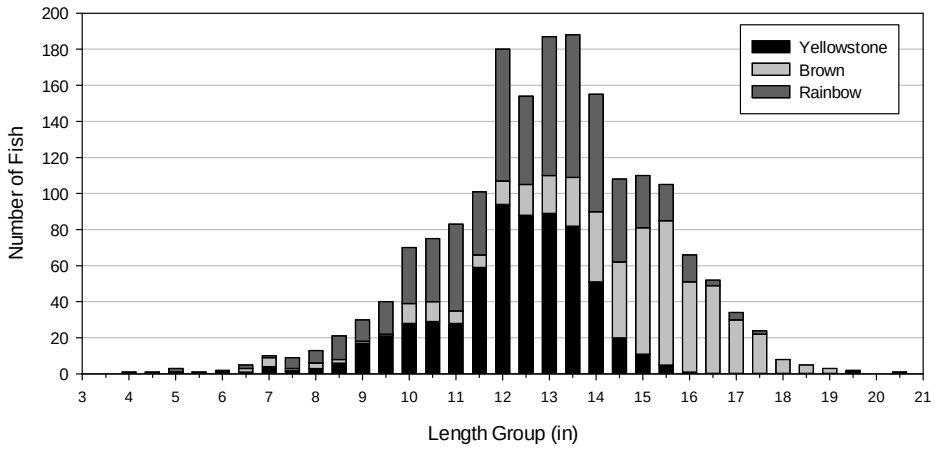
- Figure 23: Abundance estimates for Brown, Rainbow, and Yellowstone Cutthroat Trout (≥ 7in) in the Corwin Springs Section of the Yellowstone River for 2015 and 2016. Error bars represent the upper and lower 95% confidence intervals.

When length-frequencies for all trout species in the Corwin Springs Section were compared for 2015, YCT made up the majority of the fish in the 10.5- to 13.0-inch groups and the 14.0-inch length groups (Figure 24). Brown Trout made up the majority of the fish in the 13.5- and 14.5- to 18.5-inch length groups. Rainbow Trout made up the majority of the fish in the 3.5-, 6.0- to 7.5-, 8.5- to 10.0-, and 19.0-inch length groups.



- Figure 24: Length-frequency distribution for Rainbow, Brown, and Yellowstone Cutthroat Trout sampled in the Corwin Springs Section of the Yellowstone River in 2015.

Similar trends in length-frequency distributions were observed when all species of trout were combined in 2016 (Figure 25). YCT made up the majority of the fish in the middle of the histogram while Brown Trout made up the majority of the larger length groups. Rainbow Trout made up most of the smaller length groups and a few of the larger ones.



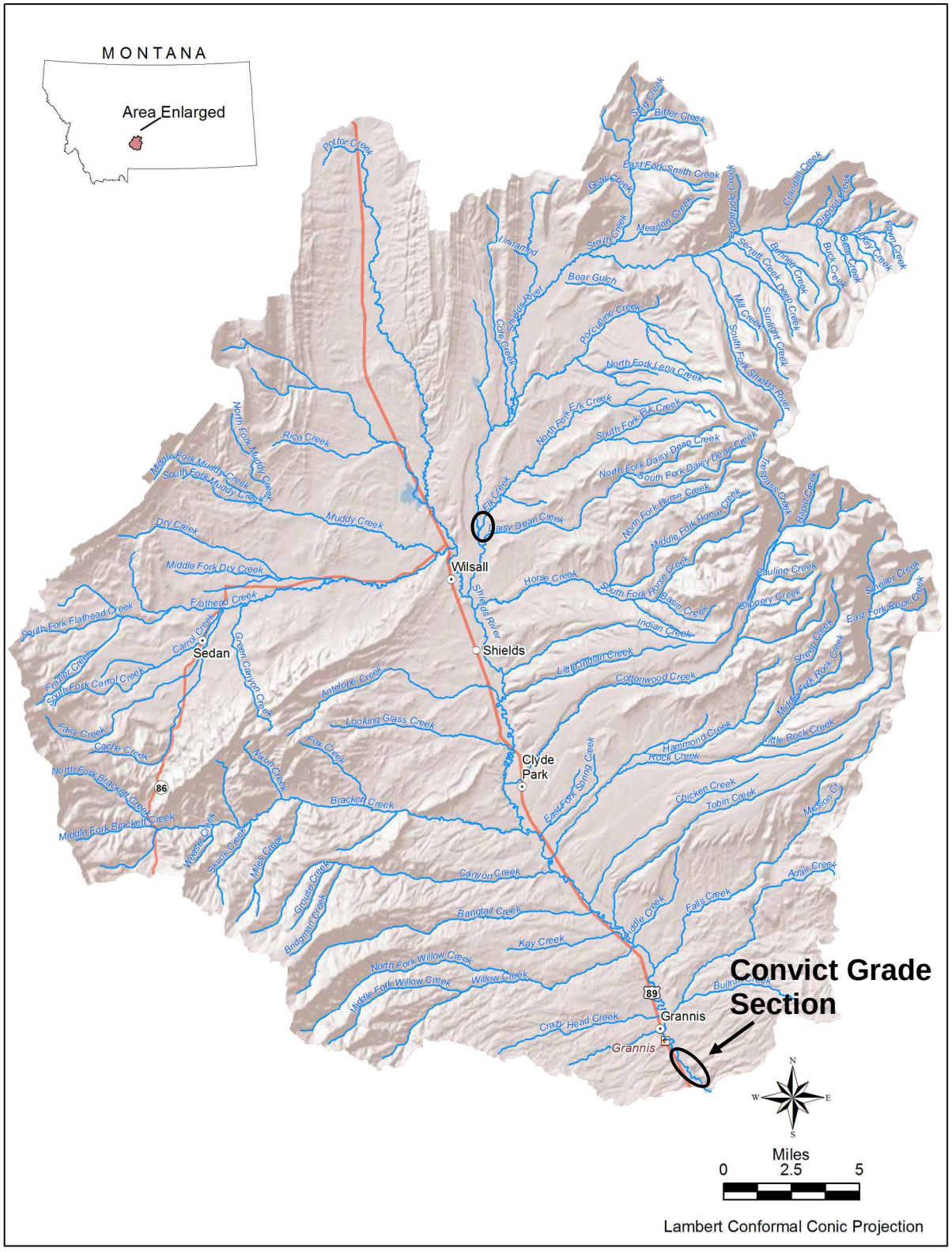
- Figure 25: Length-frequency distribution for Rainbow, Brown, and Yellowstone Cutthroat Trout sampled in the Corwin Springs Section of the Yellowstone River in 2016.

Shields River Procedures

In spring 2015 and 2016, the Convict Grade and Zimmerman Sections of the Shields River were sampled (Table 3 and Figure 26).

- Table 3: Survey sections where trout and mountain whitefish sampling occurred in the Shields River in 2014.

Section Name	Survey Date	Length (ft)	Approximate Location		
Convict Grade	03/26/15 04/13/16	6,758	Upper	North	45.74036
			Boundary	West	110.48224
			Lower	North	45.72618
			Boundary	West	110.46231
Zimmerman	04/07/15 04/12/16	4,224	Upper	North	46.02599
			Boundary	West	110.64086
			Lower	North	46.01728
			Boundary	West	110.64012



• Figure 26: Map of the Shields River drainage displaying the 2015 sampling locations.

A plastic drift boat mounted with mobile electrofishing gear was used to sample the Convict Grade Section of the Shields River. The drift boat had a Coffelt™ VVP-15 and a 5,000-watt Honda™ EG5000CL generator. The anode was a single hand-held (mobile) electrode connected to the power source by 30 feet of cable, and an aluminum band around the bottom of the drift boat served as the cathode.

A Coleman Crawdad™ boat mounted with mobile electrofishing gear was used to sample the Zimmerman Section. The gear included a 3,500-watt Honda™ EG3500X generator and a Coffelt™ VVP-15. The cathode consisted of two braided steel cables that were hung over each side of the boat and the anode was a single hand-held (mobile) electrode connected to the power source by 30 feet of cable.

In both sections, sampled fish were held in live cars, identified to species, measured to the nearest 0.1 inch, and weighed to the nearest 0.01 pound. Trout were marked with a fin clip and returned to the stream.

Population abundance was estimated using the Chapman Modified Peterson method (Chapman 1951). Population estimates for Brown and Rainbow Trout ≥ 7 inches were calculated in the Convict Grade Section. For the Zimmerman Section population estimates for Brown Trout and Mountain Whitefish ≥ 7 inches were calculated.

Convict Grade Section

On April 17 and 18, 2015 marking runs were completed on the Convict Grade Section. Captured trout were marked with a left pelvic fin clip. The recapture run was completed eight days later on April 26, 2015.

In 2016, marking runs were completed on April 6 and 7 and captured trout were marked with a left pelvic clip. On April 13, 2016, the recapture run was completed.

Zimmerman Section

The marking run for this section was completed on March 31, 2015. Captured trout and mountain whitefish were marked with a left pelvic fin clip. The recapture run was completed on April 7, 2015.

In 2016, the marking run for the Zimmerman Section was completed on April 5 and trout and mountain whitefish were marked with a left pelvic fin clip. On April12, 2016 the recapture run was completed.

Shields River Results

Shields River Abundances

Electrofishing data were used to calculate trout and Whitefish abundance estimates and monitor population trends. Results, by section and species, are presented below (Table 4).

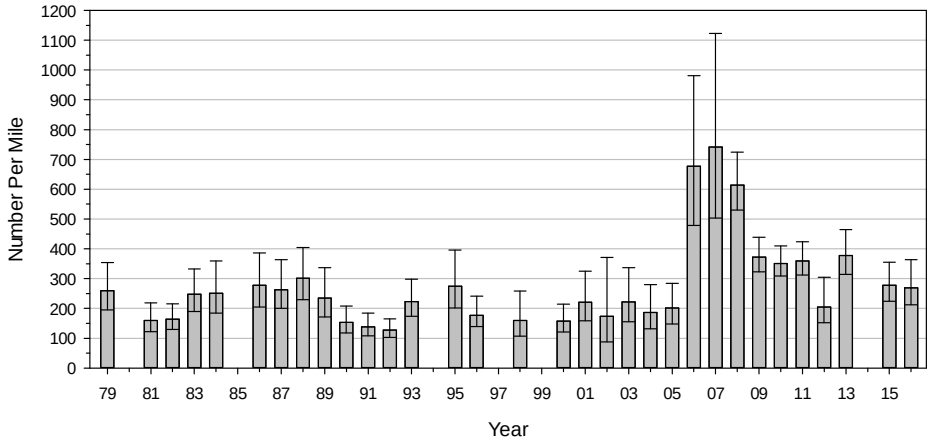
- Table 4: Population abundance estimate results for the Zimmerman Section of the Shields River by section and species in 2015 and 2016. N/mile represents the number of trout and Mountain Whitefish (≥7 inches) per 1,000 ft.

Section	Fish Species	N/mile	Lower 95%	Upper 95%
Convict Grade 2015	Rainbow Trout	175	127	257
	Brown Trout	277	224	355
Convict Grade 2016	Rainbow Trout	422	267	712
	Brown Trout	269	212	363
Zimmerman 2015	Mountain Whitefish	91	112	76
	Brown Trout	55	73	43
Zimmerman 2016	Mountain Whitefish	116	141	98
	Brown Trout	71	92	57

Brown Trout

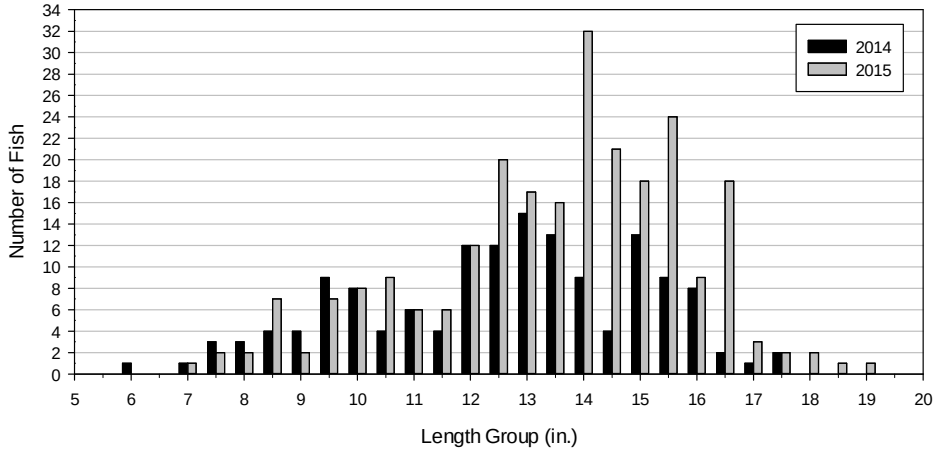
Convict Grade Section

The Brown Trout population estimate for the Convict Grade Section was 277 fish/mile (≥ 7in) in 2015 (Figure 27). In 2016, the population estimate decrease to 269 fish/mile (≥ 7in). Both of these estimates were lower than the 2013 estimate of 377 fish/mile (≥ 7in). The 2015 and 2016 estimates are similar to those from 1979 – 2005 and the peak in abundance from 2006-2008 appears to be leveling off.



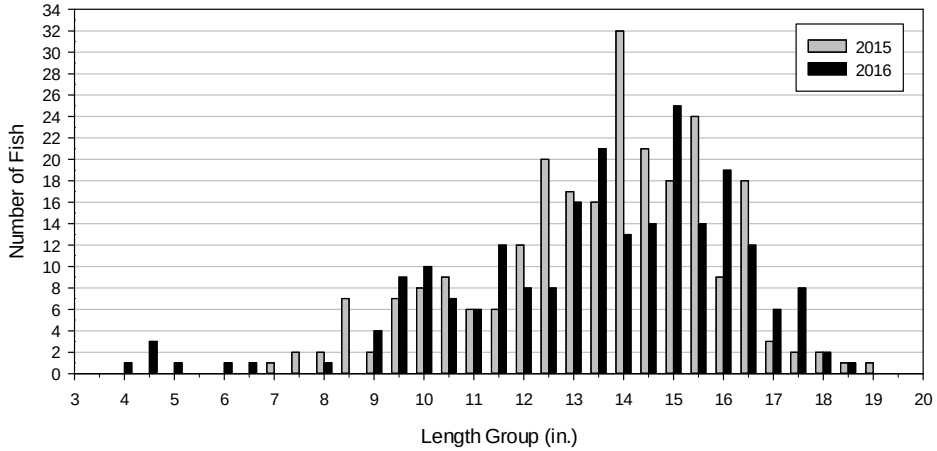
- Figure 27: Abundance estimates for Brown Trout (≥ 7in) in the Convict Grade Section of the Shields River from 1979-2016. Error bars represent the upper and lower 95% confidence intervals. The section was not sampled in 1980, 1985, 1994, 1997, and 1999. No abundance estimate was made in 2014 as the result of not being able to complete the recapture run.

The length-frequency distribution for Brown Trout in the Convict Grade Section shows an increase in frequencies in the 12.5- to 17.5-inch length groups from 2014 to 2015 (Figure 28). These increases are likely the result of limited sampling effort in 2014 rather than actual changes in the Brown Trout population. However, the increase in fish 18.0 inches and larger does suggest that there was some increase in recruitment of these larger fish from 2014 to 2015.



- Figure 28: Length-frequency distributions for Brown Trout sampled in the Convict Grade Section of the Shields River in 2014 and 2015.

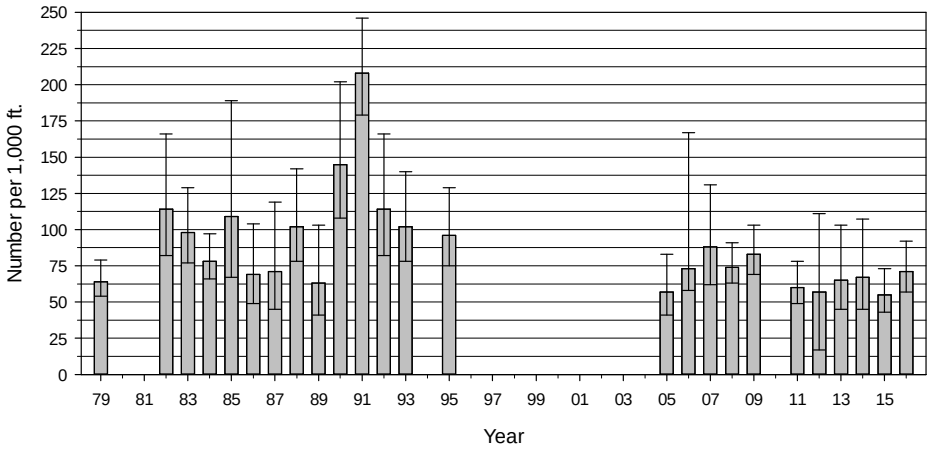
In 2016, the length-frequency distribution for Brown Trout in the Convict Grade Section had an increase in frequencies of fish less than 6.5 inches when compared to 2015 suggesting spawning success and good recruitment the previous year (Figure 29). There was some fluctuation in the 8.0- to 16.5-inch length groups and increases in the 17.0- and 17.5-inch length groups suggesting recruitment of the larger fish in this section.



- Figure 29: Length-frequency distributions for Brown Trout sampled in the Convict Grade Section of the Shields River in 2015 and 2016.

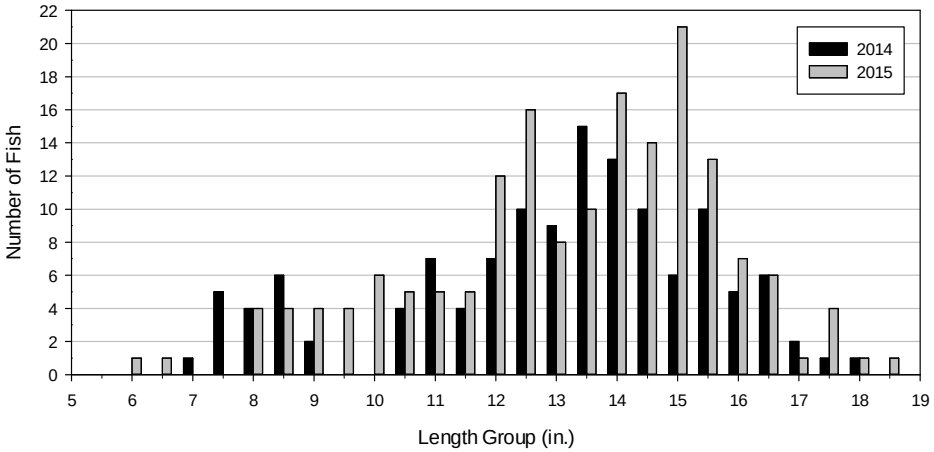
Zimmerman Section

In 2015, the population estimate for Brown Trout in the Zimmerman Section was 55 fish/mile (≥ 7 in), down slightly from 67 fish/mile (≥ 7 in) in 2014 (Figure 30). In 2016, the population estimate increased to 71 fish/mile (≥ 7 in). Population estimates for Brown Trout in 2015 and 2016 remain similar to those from 2005 to 2014 and are lower than most estimates from 1979 to 1995.



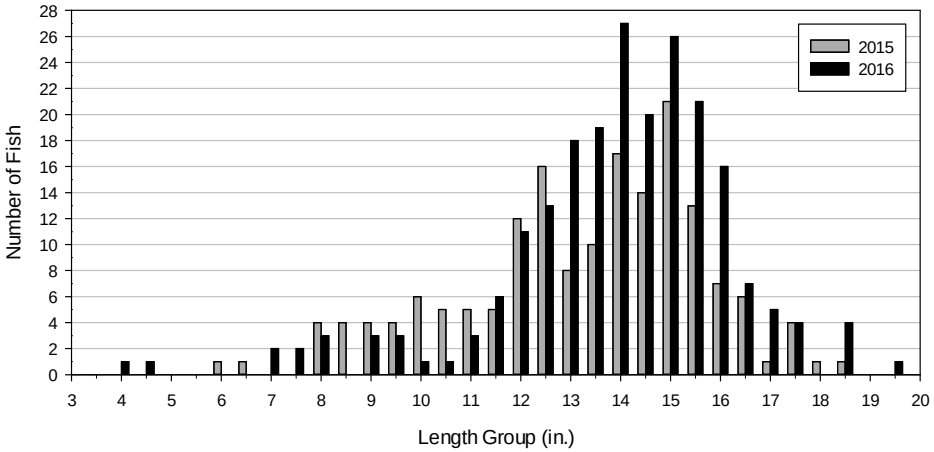
- Figure 30: Abundance estimates for Brown Trout (≥ 7 in) in the Zimmerman Section of the Shields River from 1979-2016. Error bars represent the upper and lower 95% confidence intervals. No sampling occurred in 1980-1982, 1994, 1996-2000, 2002-2004, and 2010. Sampling occurred in 2001, but there was not enough data to generate an estimate.

The length-frequency distributions for Brown Trout in the Zimmerman Section showed increases in frequencies in a number of length groups from 2014 to 2015. These included the 6.0 to 6.5-, 9.5 to10.0-,14.0 to16.0-, 17.5-, and 18.5-inch groups (Figure 31). These increases suggest improved spawning and recruitment for Brown Trout in this section between 2014 and 2015.



- Figure 31: Length-frequency distributions for Brown Trout sampled in the Zimmerman Section of the Shields River in 2014 and 2015.

Length-frequency distributions of Brown Trout in 2016 continued to show increases in a number of length groups suggesting continued strong recruitment that was first noted in 2015 (Figure 32). The 8.0- to 12.5-inch length groups did not have increases in frequencies and may be a result of sampling efficiency.

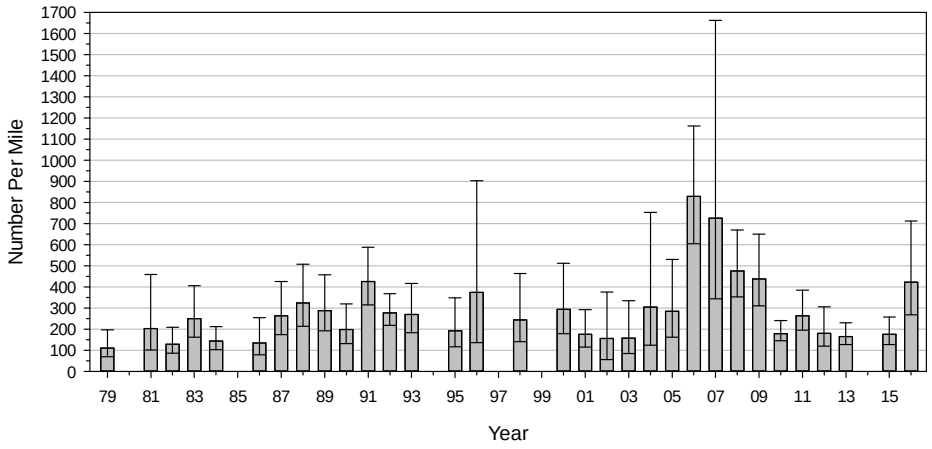


- Figure 32: Length-frequency distributions for Brown Trout sampled in the Zimmerman Section of the Shields River in 2015 and 2016.

Rainbow Trout

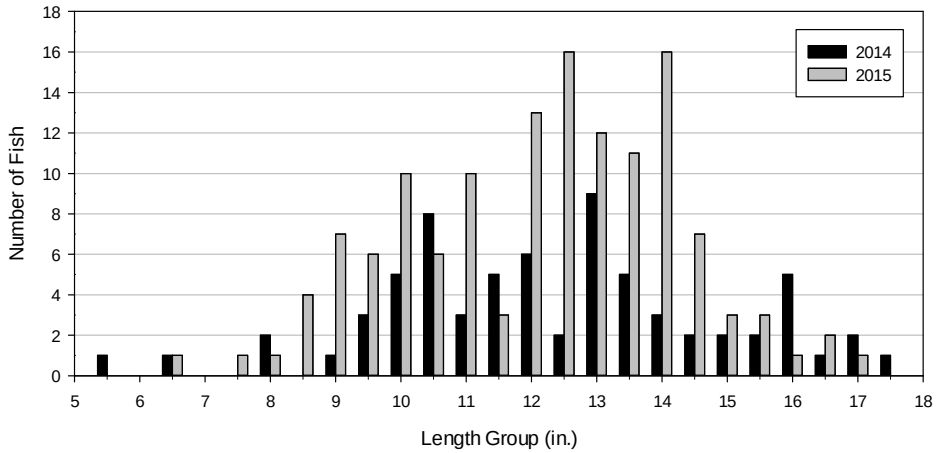
Convict Grade Section

In the Convict Grade Section, the population estimate for Rainbow Trout in 2015 was 175 fish/mile (≥ 7in) (Figure 33). This was up from the last estimate of 165 fish/mile (≥ 7in) in 2013. In 2016, the population estimate for Rainbow Trout increased to 422 fish/mile (≥ 7in). As seen in the graph abundance estimates fluctuate widely and are influenced year to year by Rainbow Trout spawning and associated movement of fish into and out of this section. The modification of Chadbourne Diversion as a fish barrier may also be contributing to this increase by restricting upstream migration.



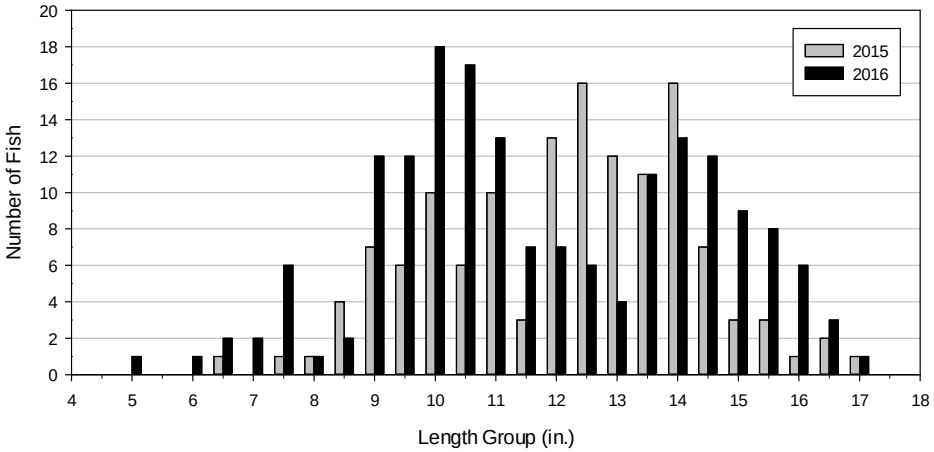
- Figure 33: Abundance estimates for Rainbow Trout (≥ 7in) in the Convict Grade Section of the Shields River from 1979-2016. Error bars represent the upper and lower 95% confidence intervals. The section was not sampled in 1980, 1985, 1994, 1997, and 1999. No abundance estimate was made in 2014 as the result of not being able to complete the recapture run.

The 2015 length-frequency distributions for Rainbow Trout in the Convict Grade Section indicate an increase in frequencies in most length groups when compared to 2014 (Figure 34). This is likely the result of limited sampling that occurred in 2014 or changes in the timing of Rainbow movement into or out of this section.



- Figure 34: Length-frequency distributions for Rainbow Trout sampled in Convict Grade Section of the Shields River in 2014 and 2015.

When the 2016 length-frequencies for Rainbow Trout in the Convict Grade Section are compared to 2015 some obvious shifts have occurred. There was an increase in the frequency of fish in the 5.0- to 11.0- and 14.5- to 16.5-inch groups (Figure 35). The increase in smaller fish indicates a strong year class of fish in the population. The increase in larger fish could be the result of large adults moving into and out of the section as part of their spawning migration which may have been influenced by the modification of Chadbourne Diversion that was designed to prevent Rainbow Trout and other species from ascending the Shields River.



- Figure 35: Length-frequency distributions for Rainbow Trout sampled in Convict Grade Section of the Shields River in 2015 and 2016.

Zimmerman Section

The first documentation of Rainbow Trout in the Zimmerman Section occurred in 2013. Two Rainbow Trout were captured in the section and were 7.3 and 8.1 inches in total length. No Rainbow Trout were captured in the section in 2014. One hybrid fish that was 7.5 inches in total length was captured in 2014. In 2015, 3 hybrid fish that were 14.4, 16.2, and 17.1 inches in total length were captured in the section. Three hybrid fish were captured in 2016 as well. They were 13.0, 13.2, and 16.9 inches in total length. Hybrid fish, the result of crosses between Rainbow Trout and YCT, have been captured in the section in the past.

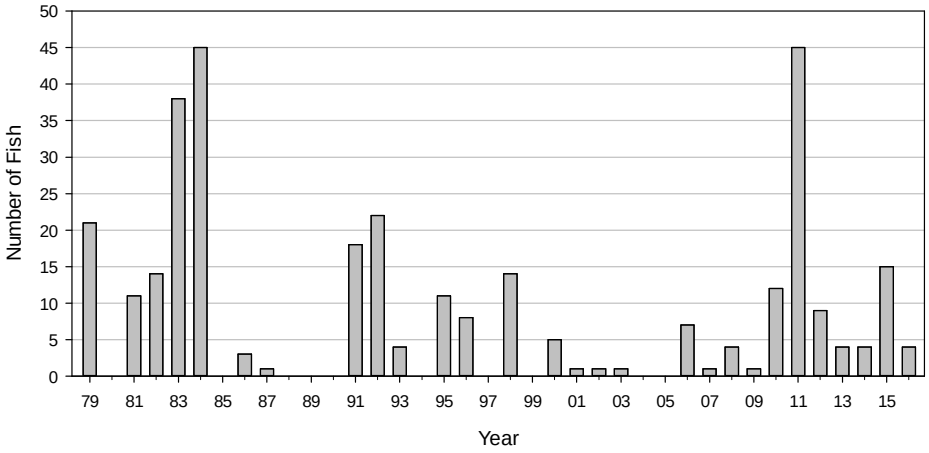
Yellowstone Cutthroat Trout

Convict Grade Section

As a result of consistent low numbers of YCT in the Convict Grade Section a population estimate is not generated, and total number of captured fish is compared annually.

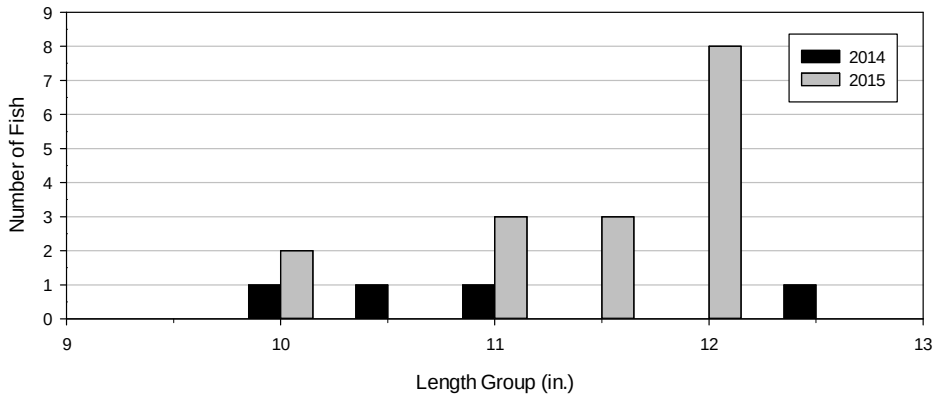
Captures of YCT in this section have ranged from 1 to 45 fish from 1979-2016 (Figure 36). In 2015, the total number of YCT that were captured increased to 15 from 4 in 2014. In 2016, the number of captured YCT dropped back to four. These both remain below the recent high of 45 in 2011.

YCT that showed morphological signs of hybridization were categorized as hybrid fish and were not included in the YCT abundance estimates.



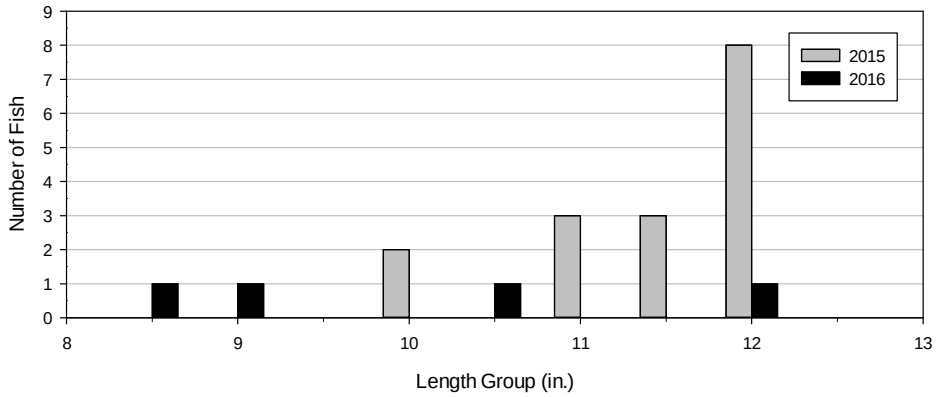
- Figure 36: Number of Yellowstone Cutthroat Trout captured in the Convict Grade Section of the Shields River for 1979-2016.

The 2014 and 2015 length-frequencies for YCT in the Zimmerman Section are presented below (Figure 37). In 2015, there was a large increase in fish 11.0- to 12.0-inch range.



- Figure 37: Length-frequency distributions for Yellowstone Cutthroat Trout sampled in the Convict Grade Section of the Shields River in 2014 and 2015.

In 2016, the length-frequency distribution for YCT had lower frequencies and a wider range of fish were sampled than in 2015 (Figure 38).

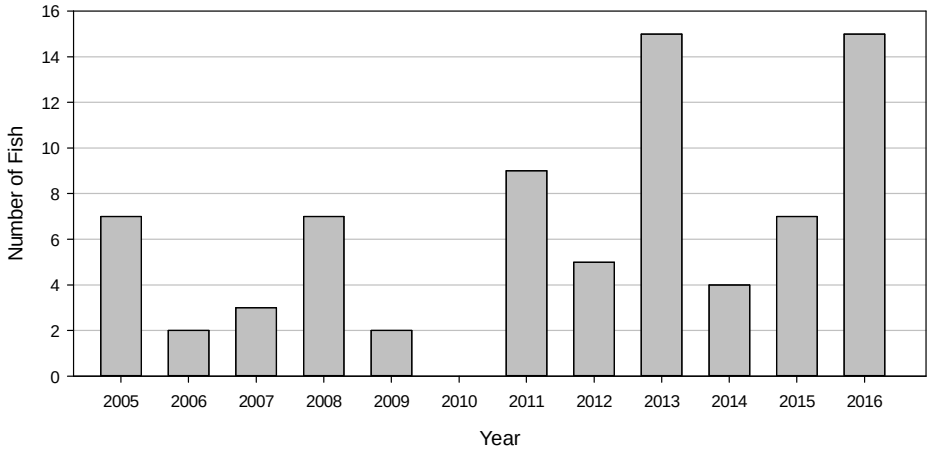


- Figure 38: Length-frequency distributions for Yellowstone Cutthroat Trout sampled in the Convict Grade Section of the Shields River in 2015 and 2016.

Zimmerman Section

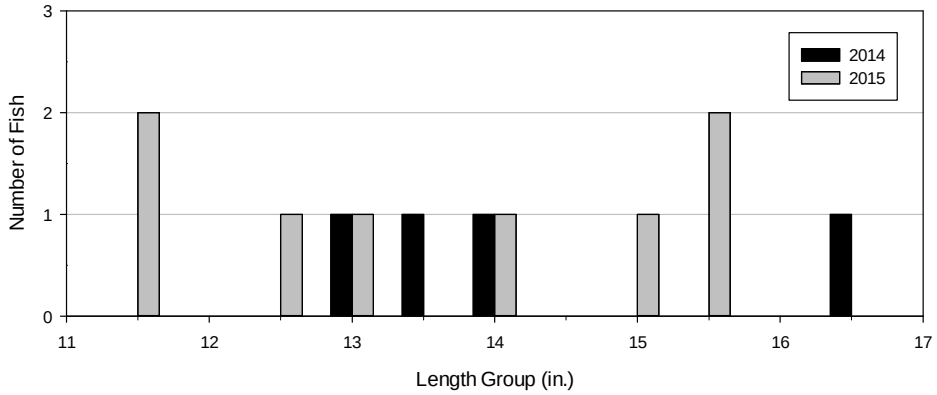
In the Zimmerman Section, the low number of YCT prevent the calculation of a population estimate. In 2015, a total of seven YCT were captured in this section. This is up from four in 2014 (Figure 39). The number of YCT captured in 2016 increased to the previous high of 15 fish. Numbers of YCT captured in the Zimmerman section remain variable from year to year.

YCT that showed morphological signs of hybridization were categorized as hybrid fish and were not included in the YCT abundance estimates.



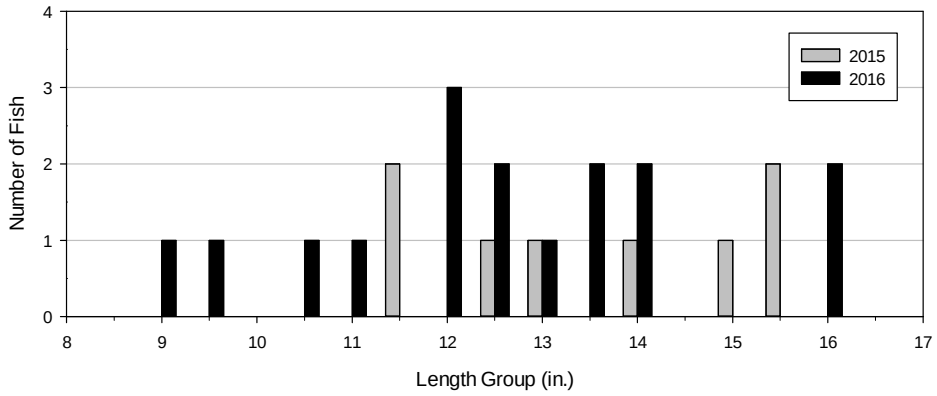
- Figure 39: Total numbers of Yellowstone Cutthroat Trout captured in the Zimmerman Section of the Shields River 2005-2016. No sampling occurred in 2010.

The length-frequency distributions for YCT in the Zimmerman Section indicate little change from 2014 to 2015 (Figure 40). There was only a slight change in the range of lengths of fish captured as well and the number of fish in each length group.



- Figure 40: Length-frequency distributions for Yellowstone Cutthroat Trout sampled in the Zimmerman Section of the Shields River in 2014 and 2015.

The length- frequency distribution for YCT in 2016 had a wider range of lengths of fish captured than 2015 with fish as small as 9.0-inches long (Figure 41). The majority of the fish captured in 2016 were in the 12.0- to 14.0-inch length groups.

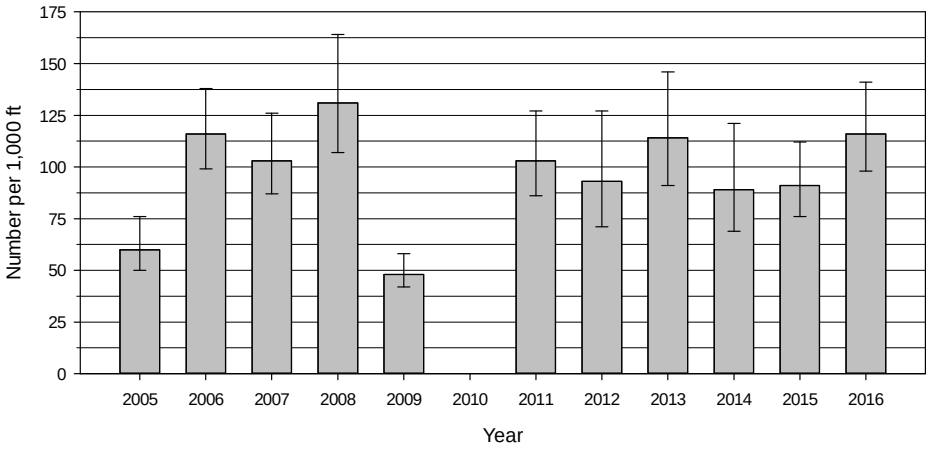


- Figure 41: Length-frequency distributions for Yellowstone Cutthroat Trout sampled in the Zimmerman Section of the Shields River in 2015 and 2016.

Mountain Whitefish

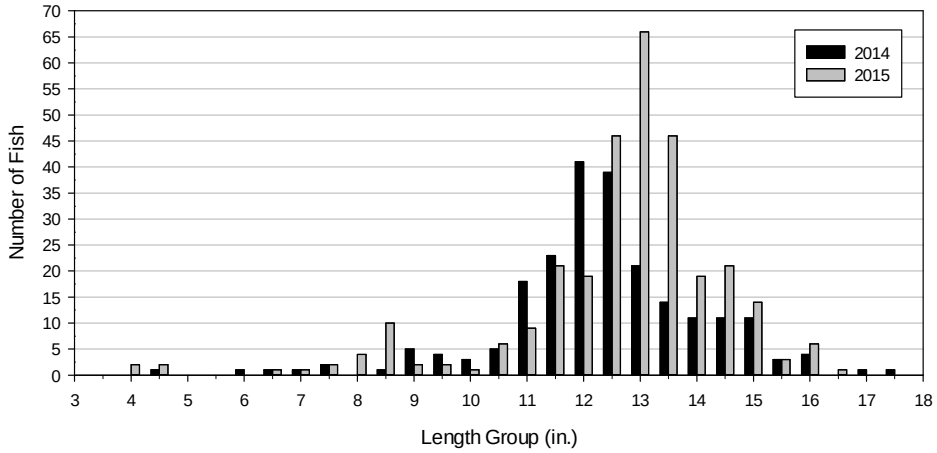
Zimmerman Section

Abundance estimates for Mountain Whitefish in the Zimmerman Section increased from 2014 through 2016 (Figure 42). The 2014 abundance estimate for Mountain Whitefish in the Zimmerman Section was 89 fish/1,000 feet (≥ 7in) and increased to 91 fish/1,000 feet (≥ 7in) in 2015. In 2016, the abundance estimate for Mountain Whitefish increased to 116 fish/1,000 feet (≥ 7in) and remains just below the high of 131 fish/1,000 feet (≥ 7in) in 2008.



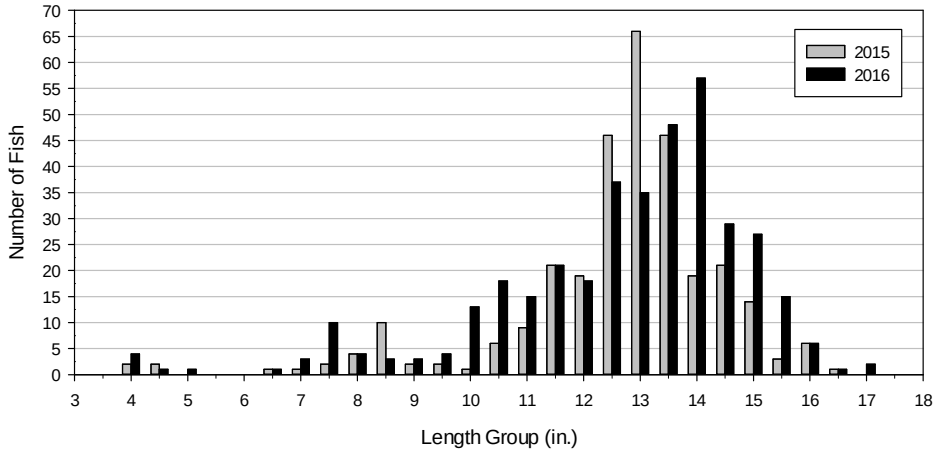
- Figure 42: Abundance estimates for Mountain Whitefish (≥ 10in) in the Zimmerman Section of the Shields River from 2005-2016. Error bars represent the upper and lower 95% confidence intervals. The section was not sampled in 2010.

The length-frequency distributions of Mountain Whitefish for 2014 and 2015, in the Zimmerman Section, were similar with the exception of fish larger than 12.0 inches (Figure 43). Increases in the frequencies of a few length groups, particularly fish in the 12.5- to 16.5-inch length groups, occurred in 2015 suggesting strong recruitment.



- Figure 43: Length-frequency distributions for Mountain Whitefish sampled in the Zimmerman Section of the Shields River in 2014 and 2015.

In 2016, the length-frequency distribution for Mountain Whitefish in the Zimmerman Section continued to indicate strong recruitment of larger fish with increases in the 13.5- to 17.0-inch groups (Figure 44).

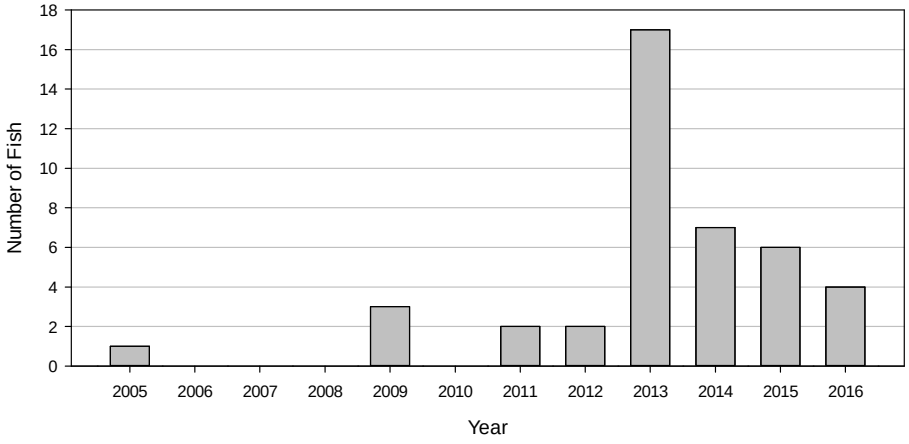


- Figure 44: Length-frequency distributions for Mountain Whitefish sampled in the Zimmerman Section of the Shields River in 2014 and 2015.

Brook Trout

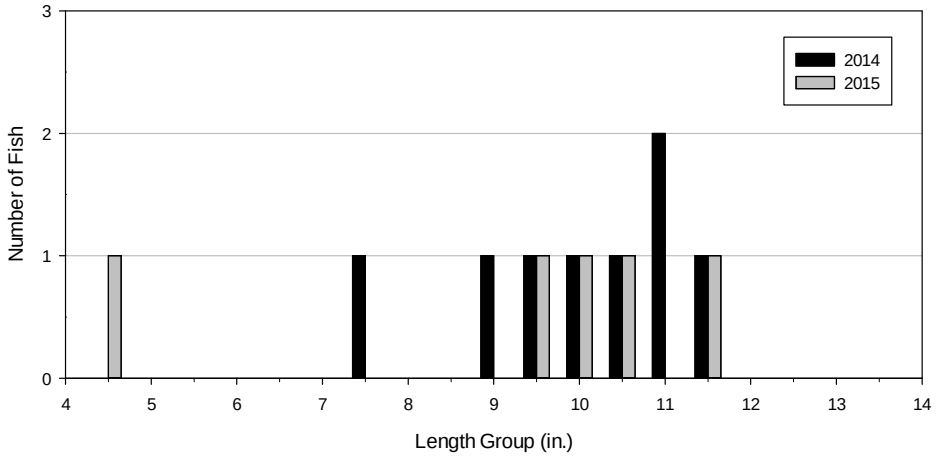
Zimmerman Section

Brook Trout have been present in low numbers in the Zimmerman Section since 1979 and currently their capture is on a downward trend (Figure 45). In 2015 and 2016, a total of six and four Brook Trout were captured, respectively. It is unknown if these are resident or migratory fish. Continued monitoring will determine the ability of Brook Trout to expand and establish a population in this section.



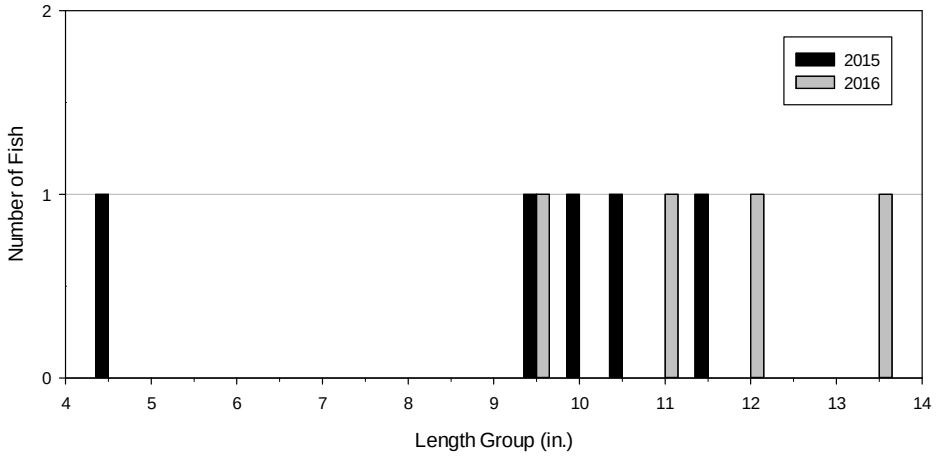
- Figure 45: Total numbers of Brook Trout captured in the Zimmerman Section of the Shields River 2005-2016. No sampling occurred in 2010.

In 2014, eight Brook Trout were captured in the Zimmerman Section and ranged from 7.8 to 13.3 inches in total length (Figure 46). In 2015, the six Brook Trout that were captured ranged in total length from 4.9- to 11.6-inches long.



- Figure 46: Length-frequency distributions for all Brook Trout sampled in the Zimmerman Section of the Shields River in 2014 and 2015.

In 2016, the Brook Trout that were captured in the Zimmerman Section were generally larger than those captured in 2015 and ranged from 9.5 to 13.5 inches in total length (Figure 47).

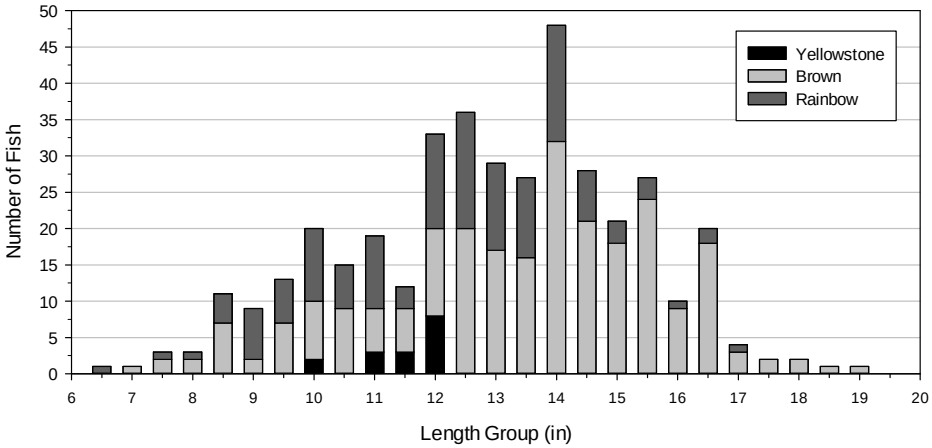


- Figure 47: Length-frequency distributions for all Brook Trout sampled in the Zimmerman Section of the Shields River in 2015 and 2016.

Summary

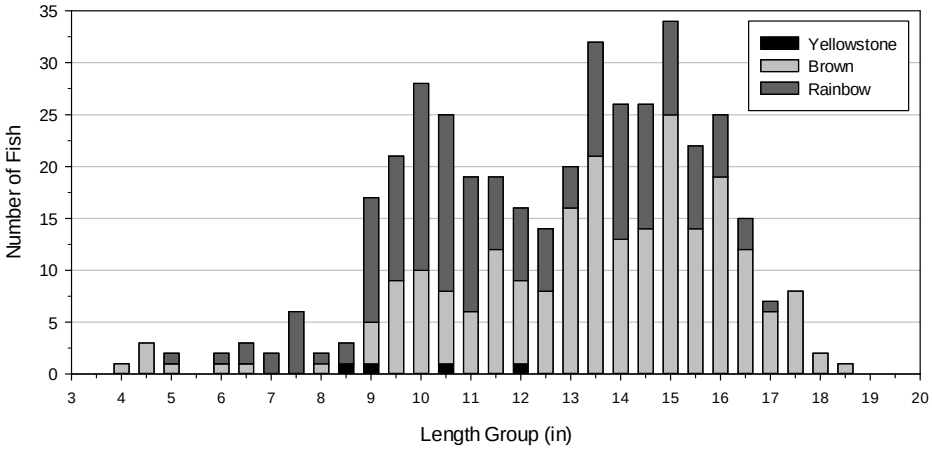
Convict Grade Section

When the length-frequencies for all trout in 2015, in the Convict Grade Section, are combined Brown Trout make up the majority of the fish in the 7.0- to 19.0-inch length groups (Figure 48). Rainbow Trout made up the second largest proportion of fish in the same range of length groups. YCT only made up a total of 15 fish in the 10.0 to- 12.0-inch length group range. The peak of trout frequency was in the 14.0-inch length group and contained no YCT.



- Figure 48: Length-frequency distribution for Yellowstone Cutthroat, Brown and Rainbow Trout sampled in the Convict Grade Section of the Shields River in 2015.

When the length-frequencies for all trout in the Convict Grade Section were combined, Brown Trout made up the majority of the fish in the 11.5- to 18.5-inch length groups (Figure 49). Rainbow Trout made up the second largest share of fish in the same range of length groups. In contrast to 2015, Rainbow Trout made up the majority of fish in the 6.5- to 11.0-inch range. YCT made up an even smaller number of the total fish with four fish in the 10.0- to 12.0-inch length group range. There were two peaks of trout frequency with the highest being in the 15.0-inch length group and contained no YCT. Overall frequencies of fish were lower in 2016 than 2015. As noted earlier in this report, Brown Trout populations remain stable while rainbow trout continue to vary from year to year mainly as a function of spawning movements. YCT counts continue to vary from year to year and may be influenced by spawning movements.

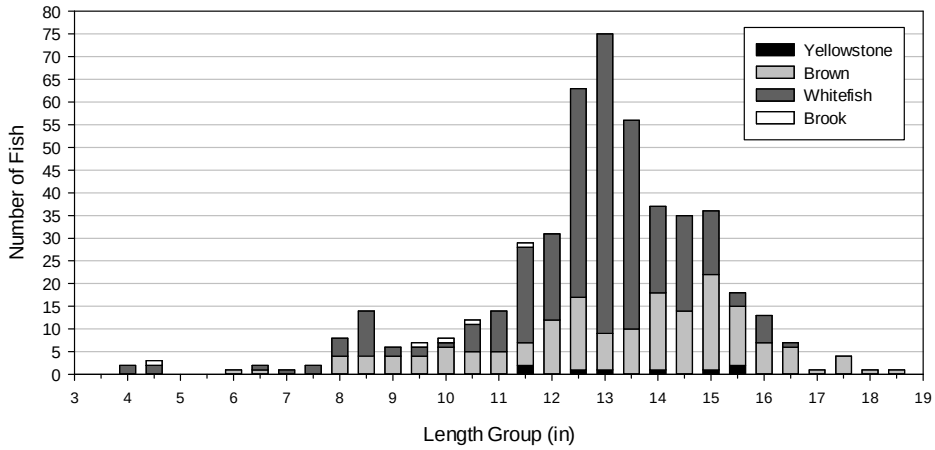


- Figure 49: Length-frequency distribution for Yellowstone Cutthroat, Brown and Rainbow Trout sampled in the Convict Grade Section of the Shields River in 2016.

Zimmerman Section

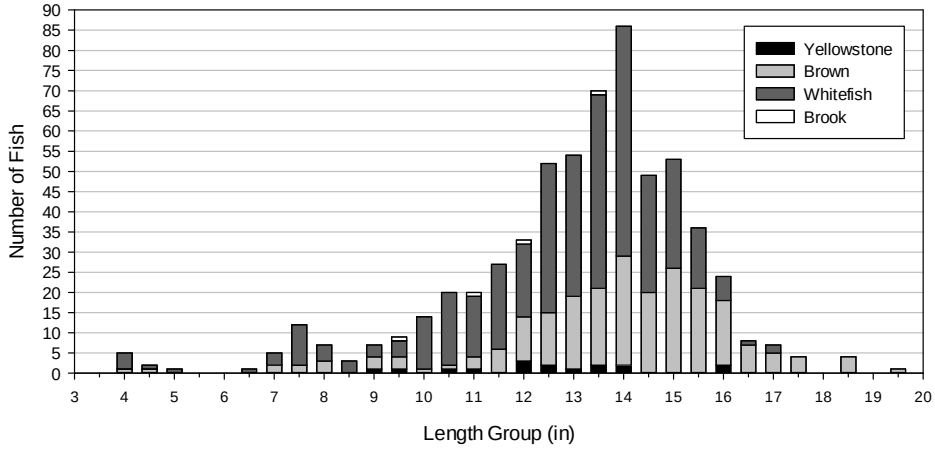
In the Zimmerman Section, Mountain Whitefish made up the majority of the fish in a number of length groups when all species length-frequencies were combined for 2015 (Figure 50). Mountain Whitefish made up most of the fish in the 4.0- to 8.5-inch range as well as the 11.0- to

14.5-inch range. Brown Trout made up the majority of the fish in the 9.0- to 10.5-inch length groups, 15.0- to 16.5-inch groups, and all of the fish in the 17.0- to 18.5-inch range. YCT only contributed to the 11.5- to 15.5-inch range. Brook Trout made up a small portion of the fish in the 9.5- to 11.5-inch length groups. The peak of fish frequency was in the 13.0-inch group.



- Figure 50: Length-frequency distribution for Yellowstone Cutthroat, Brown Trout, and Brook Trout and Mountain Whitefish sampled in the Zimmerman Section of the Shields River in 2015.

Length-frequency distribution of all species in the Zimmerman Section for 2016 was similar to the 2015 distribution. Mountain Whitefish made up the majority of the fish in the 4.0- to 15.0-inch range, which was a larger range than 2015 (Figure 51). Brown Trout made up most of the fish in the 15.5- to 17.0-inch length groups and all of the fish in the 17.5- to 19.5-inch range. YCT contributed to a slightly wider range of length groups than in 2015, 9.5- to 16.0-inch range. Brook Trout again made up a small portion of the fish in the 9.5- to 13.5-inch length groups. The peak of fish frequency increased slightly from the 13.0-inch group in 2015 to the 14-inch group in 2016.



- Figure 51: Length-frequency distribution for Yellowstone Cutthroat, Brown, and Brook Trout and Mountain Whitefish sampled in the Zimmerman Section of the Shields River in 2016.

Overall fish populations in the Zimmerman Section remain stable. The only change of note is the continued decline in the number of Brook Trout captured in this section. This could indicate a change in immigration or the inability of the species to maintain a mainstem population in this section.

Dailey Lake Fish Stocking

Dailey Lake has been stocked with Rainbow Trout, YCT, and Walleye in order to maintain a fishery for these species. In 2015 and 2016, Dailey Lake was stocked with Rainbow Trout and YCT. The lake was also stocked with Walleye in 2015 as part of the 2-year rotation for this species.

Walleye

In 2015, Dailey Lake was stocked with Walleye as part of a stocking plan change that was initiated in 2012. Walleye stocking was changed from annually to every other year in the lake and the number of Walleye stocked was reduced from 10,000 to 5,000. The intent of the change is to increase the survival of Walleye by reducing competition within and among the fish species in the lake. This change will be monitored to determine success and will be changed as necessary.

Stocking rates for Walleye from 2009 through 2015 are presented in the table below (Table 5). As indicated above, Walleye were not stocked in 2016 as part of the new stocking plan.

- Table 5: Walleye stocking information from 2009-2015.

Year	Date	Strain	Length (in)	Number
2009	July 01	Fort Peck	1.6	5,000
	Sept. 22	Fort Peck	2.9	5,500
			Total	10,500
2010	July 01	Fort Peck	1.4	5,000
	Sept. 14	Fort Peck	3.8	5,000
			Total	10,000
2011	June 29	Fort Peck	1.6	5,112
	Sept. 13	Fort Peck	5.0	5,000
			Total	10,112
2013	Sept. 03	Fort Peck	4.5	5,000
			Total	5,000
2015	Sept. 02	Fort Peck	5.0	5,000
			Total	5,000

Rainbow Trout and Yellowstone Cutthroat Trout

A total of 4,984 Arlee Rainbow Trout young-of-the-year (YOY) from Giant Springs Trout Hatchery were stocked on April 13, 2015 (Table 6). On June 09, 215, a total of 5,500 Eagle Lake strain YOY Rainbow Trout from Bluewater Springs Trout Hatchery were stocked. In 2016, a total of 5,500 Arlee Rainbow Trout from the Giant Springs Hatchery and 6,309 Eagle Lake Rainbow Trout were stocked in the lake on April 27 and June 08, respectively. The Eagle Lake Rainbow Trout were given an adipose clip prior to stocking both years to allow for future identification and determination of survival in the lake.

The number of Rainbow Trout that were stocked in the lake was reduced from 20,000 to 10,000 as part of an annual stocking plan change implemented in 2012. The intent is to increase the survival of

Rainbow Trout by reducing the competition within the species. This change will be monitored and modified if needed.

- Table 6: Trout stocking information from 2010-2016.

Year	Date	Strain	Length (in)	Number
2012	Apr. 25	Arlee	4.3	5,000
	Apr. 23	Yellowstone	6.7	4,900
	June 13	Eagle lake	3.21	5,500
			Total	15,400
2013	Apr. 29	Arlee	4.4	4,988
	Apr. 29	Yellowstone	7.0	5,000
	May 28	Eagle lake	3.15	5,500
			Total	14,988
2014	Apr. 21	Arlee	4.4	5,152
	Apr. 22	Yellowstone	7.3	5,000
	May 29	Eagle lake	3.38	5,500
			Total	15,652
2015	Apr. 13	Arlee	3.69	4,984
	Apr. 22	Yellowstone	6.45	5,000
	Jun. 09	Eagle lake	3.02	5,500
			Total	15,484
2016	Apr. 27	Arlee	3.5	5,500
	Apr. 20	Yellowstone	6.09	5,192
	Jun. 08	Eagle lake	3.08	6,309
			Total	17,001

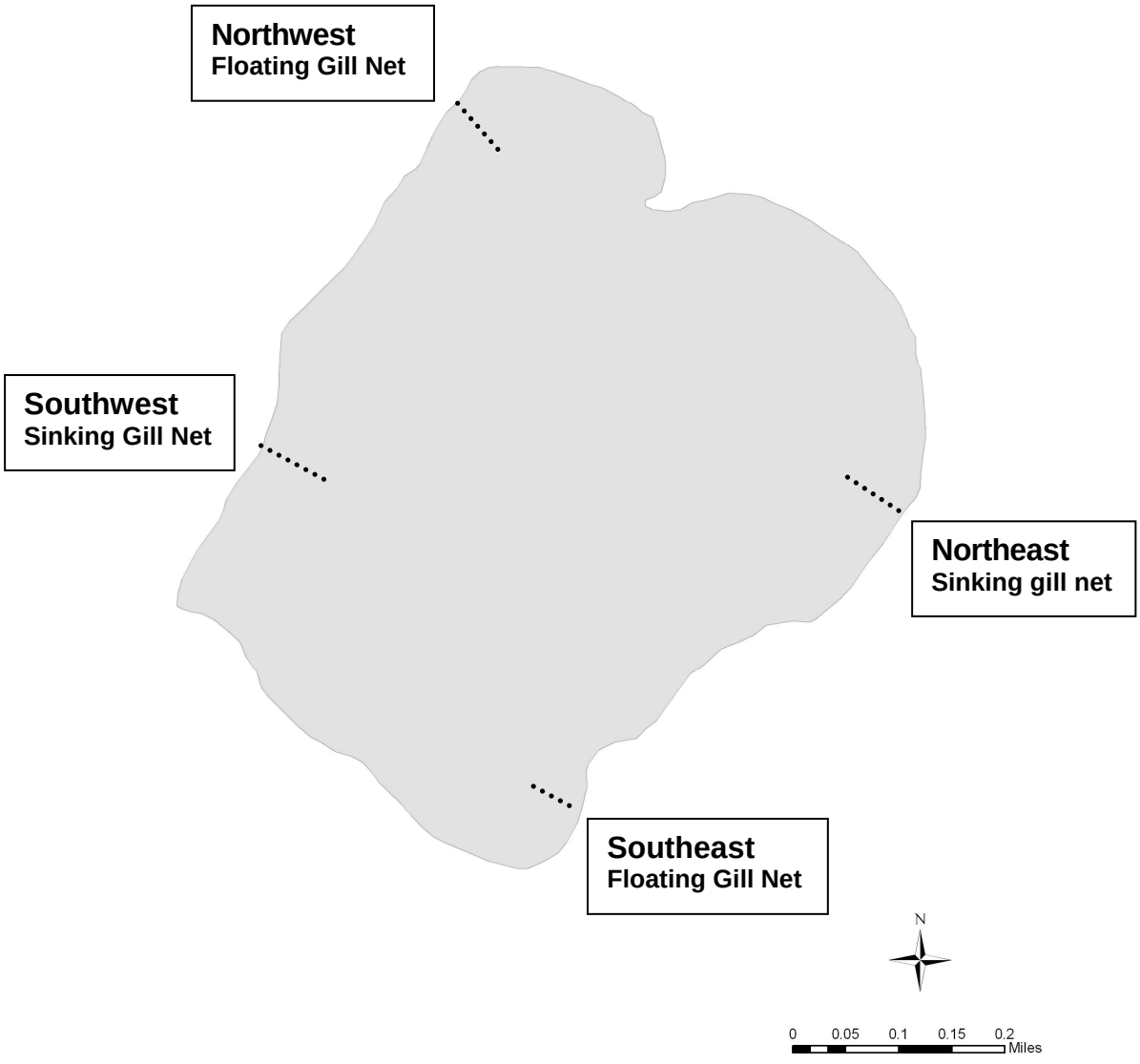
On April 22, 2015, Dailey Lake was stocked with 5,000 YCT YOY from the Yellowstone River Hatchery (Table 6). In April 20, 2016, a total of 5,192 YCT were stocked into the lake.

Dailey Lake Procedures

Gill Netting

Two floating and two sinking experimental (125-feet long and 6.0-feet deep with 1.0, 1.5, 2.0, 2.5 and 3.0 inch-bar-measure mesh) gill nets were used to sample Dailey Lake in 2015 and 2016. The long-term series of gill nets were set the evening of May 13, 2015 and May 10, 2016. This set consists of four gill nets located in the four corners of the lake (Figure 52).

The nets were pulled on the morning of May 14, 2015 and May 11, 2016. Lengths were recorded for all fish to the nearest 0.1 inch and weights to the nearest 0.01 pound. All live fish were released back into the lake.



- Figure 52: Map of Dailey Lake showing locations of gill nets in 2015 and 2016.

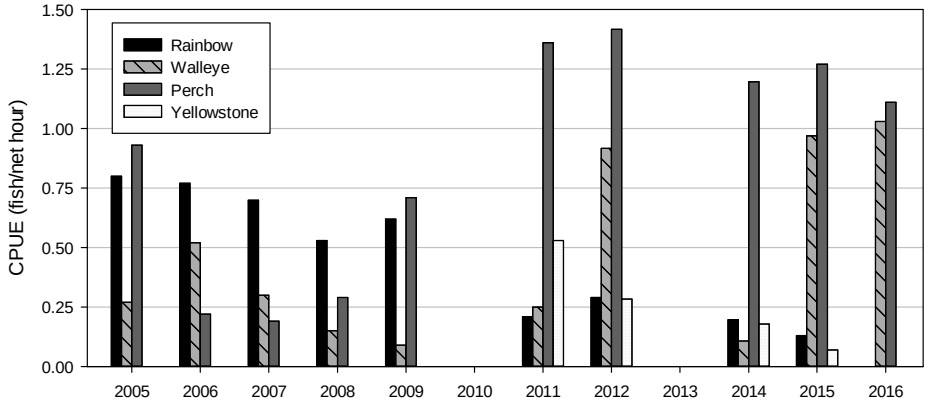
Dailey Lake Results

Gill Netting

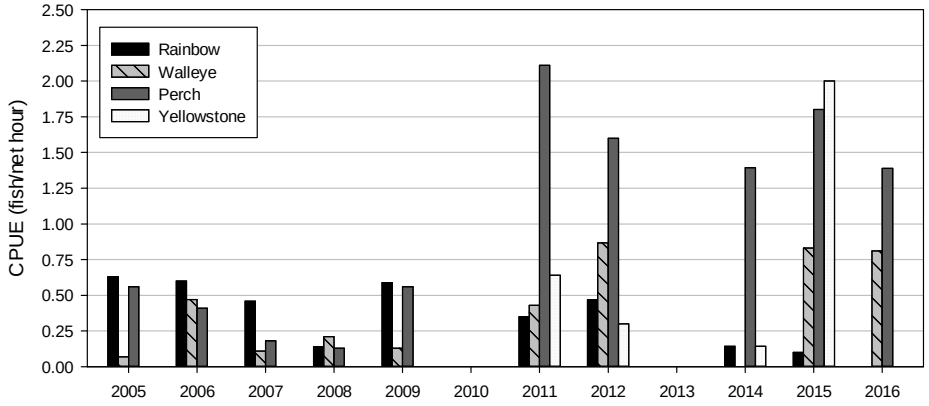
Catch-Per-Unit-Effort

Rainbow Trout

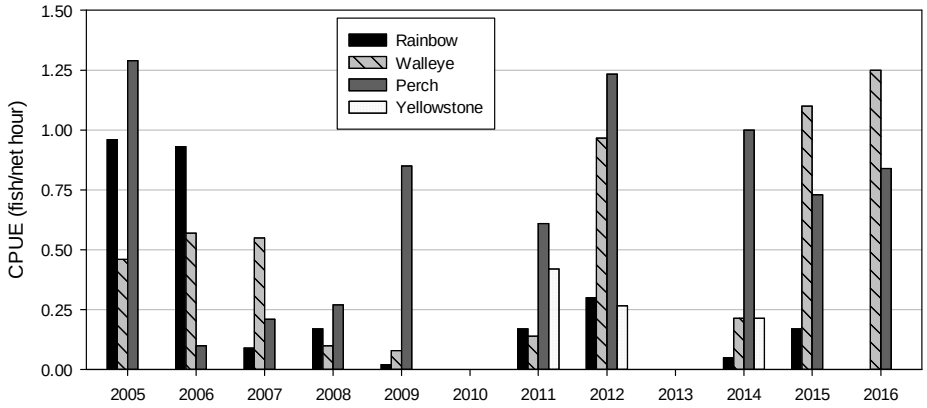
In 2015, catch-per-unit effort (CPUE) for rainbow trout in all nets decreased to 0.13 fish/net hour, from 0.20 fish/net hour in 2014 (Figure 53). In 2016, no Rainbow Trout were captured in any of the nets. One large Rainbow was observed near the northwest floating net when it was being pulled. The CPUE for Rainbow Trout in floating nets also decreased from 0.14 fish/net hour in 2014 to 0.10 fish/net hour in 2015 (Figure 54). CPUE in sinking nets increased from 0.05 fish/net hour in 2014 to 0.17 fish/net hour in 2015 (Figure 55). The CPUE in the sinking nets then went to 0.0 fish/net hour in 2016. There was no obvious explanation for the lack of Rainbow Trout in the 2016 nets. Further sampling will hopefully determine if there was a decline in the population or some other factor affected sampling.



- Figure 53: Catch-per-unit-effort for Rainbow Trout, Walleye, Yellow Perch, and Yellowstone Cutthroat Trout in all gill nets for 2005-2016. No gill net sampling was completed in 2010 and 2013.



- Figure 54: Catch-per-unit-effort for Rainbow Trout, Walleye, Yellow Perch, and Yellowstone Cutthroat Trout in floating gill nets for 2005-2016. No gill net sampling was completed in 2010 and 2013.



- Figure 55: Catch-per-unit-effort for Rainbow Trout, Walleye, Yellow Perch, and Yellowstone Cutthroat Trout in sinking gill nets for 2005-2016. No gill net sampling was completed in 2010 and 2013.

Yellow Perch

In 2014, the CPUE for Yellow Perch in all nets was 1.20 fish/net hour and increased to 1.27 fish/net hour in 2015 (Figure 53). In 2016, the CPUE for all nets decreased to 1.11 fish/net hour. In 2014, CPUE for Yellow Perch in the floating nets was 1.39 fish/net hour, it increased to 1.80 fish/net hour in 2015, and returned to 1.39 fish/net hour (Figure 54). The CPUE for sinking gill nets was 1.00 fish/net hour in 2014, it decreased to 0.73 fish/net hour in 2015, and increased to 0.84 fish/net hour (Figure 55).

Walleye

CPUE for Walleye in all nets increased markedly from a low of 0.11 fish/net hour in 2014 to 0.97 fish/net hour in 2015 and then to the high of 1.03 fish/net hour in 2016 (Figure 53). In 2014, no Walleye were captured in floating nets (Figure 54). Then in 2015 and 2016, the CPUE in the floating nets was 0.83 and 0.81 fish/net hour, respectively. An increasing trend was noted in the CPUE of Walleye in sinking gill nets. The CPUE was 0.21 fish/net hour in 2014 and increased to 1.10 and 1.25 fish/net hour in 2015 and 2016, respectively (Figure 55).

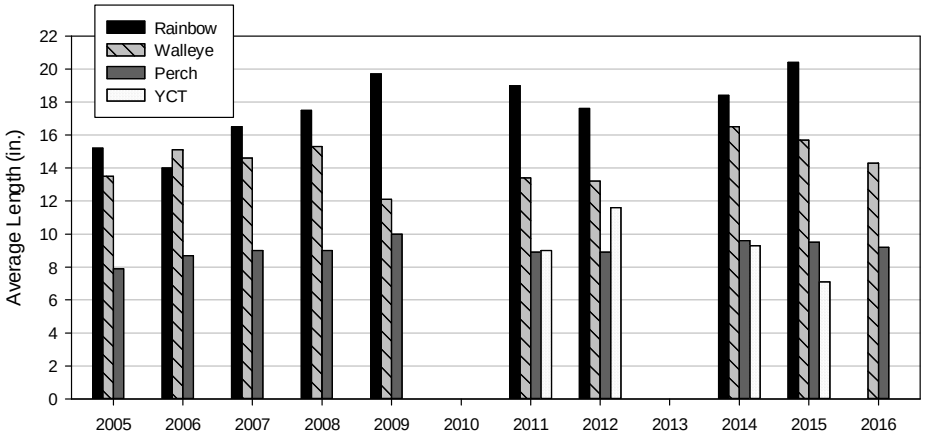
Yellowstone Cutthroat Trout

The CPUE for YCT in all nets has been on a declining trend since 2011 when they first recruited to the nets (Figure 53). The CPUE for all nets went from 0.18 to 0.07, and then to 0.0 from 2014 to 2016. In 2014, CPUE for floating nets was 0.14 fish/net hour and increased to 2.00 fish/net hour in 2015 (Figure 54). It then dropped to 0.00 in 2016. The CPUE for the sinking nets in 2014 was 0.21 fish/net hour and decreased to 0.00 fish/net hour in both 2015 and 2016 (Figure 55). Similar to Rainbow Trout, there was no apparent cause of the complete absence of YCT in the net samples in 2016. Further sampling is needed to determine if there was a decline in the population or if sampling conditions or effort was a factor in the lack of catch in 2015 and 2016.

Average Length

Rainbow trout

The average length of Rainbow Trout was 18.4 inches in 2014. It then increased to 20.4 inches in 2015 and exceeded the previous high of 19.7 inches in 2009 (Figure 56). As noted earlier there were no Rainbow Trout captured in the nets in 2016.



- Figure 56: Average lengths of Rainbow Trout, Walleye, Yellow Perch and Yellowstone Cutthroat Trout captured in gill nets in Dailey Lake for 2005-2016. Nets were not set in 2010 and 2013.

Yellow Perch

In 2014, the average length of Yellow Perch was 9.6 inches (Figure 56). In 2015 and 2016, the average length decreased slightly to 9.5 and 9.2 inches, respectively. The average length remains below the high of 10.0 inches in 2009.

Walleye

The average length of Walleye in 2014 was 16.5 inches (Figure 56). This is the highest average length for 2005 through 2016. In 2015, the average length was 15.7 inches and then decreased to 14.3 inches in 2016. The decline in average length could be the result of the increase in overall numbers of Walleye and limited carrying capacity for walleye biomass.

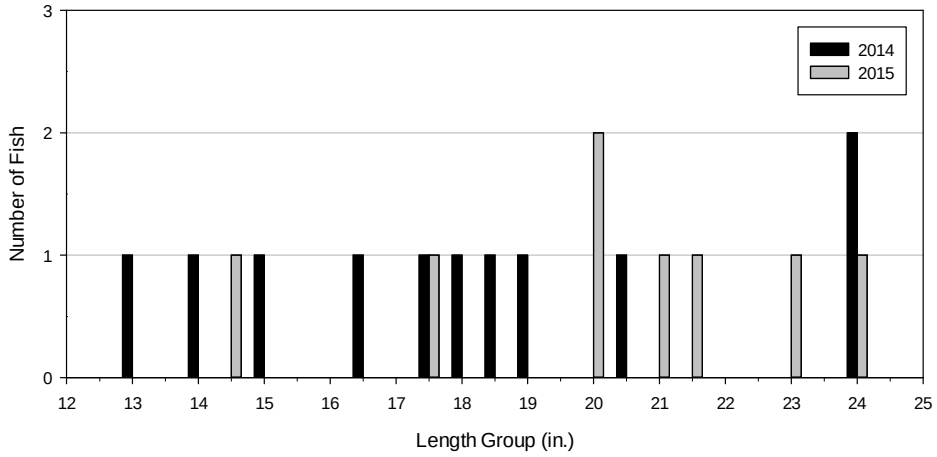
Yellowstone Cutthroat Trout

The average length of YCT in 2014 was 9.3 inches in total length (Figure 56). The average length dropped to 7.1 inches in 2015 and no YCT were captured in the nets in 2016. YCT have been stocked in Dailey Lake since 2008 and have only been sampled in gill nets in 2011, 2012, 2014, and 2015.

Length-Frequency

Rainbow Trout

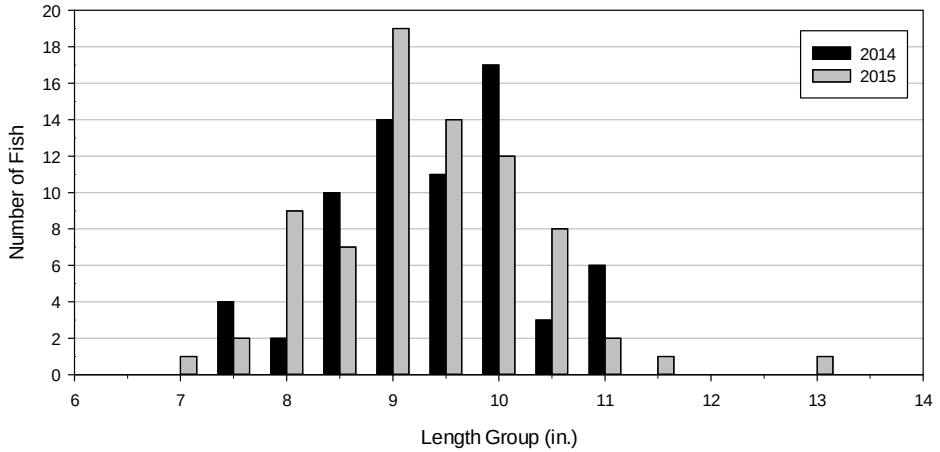
In 2014 and 2015, the length-frequency distribution of Rainbow Trout in Dailey Lake shifted from being primarily made up of fish less than 20.0 inch to fish 20.0 inches and larger (Figure 57). Rainbow Trout were not sampled in length groups less than 12.0 inches both years and the largest length group with fish remained the same at 24.0 inches. The continued lack of smaller fish and lower numbers of fish sampled appears to be a result of sampling efficiency and has been the case since 2008. The lack of many fish smaller than 20.0 inches in combination with no Rainbow Trout in the nets in 2016 provides some indication that there may be a survival after stocking issue.



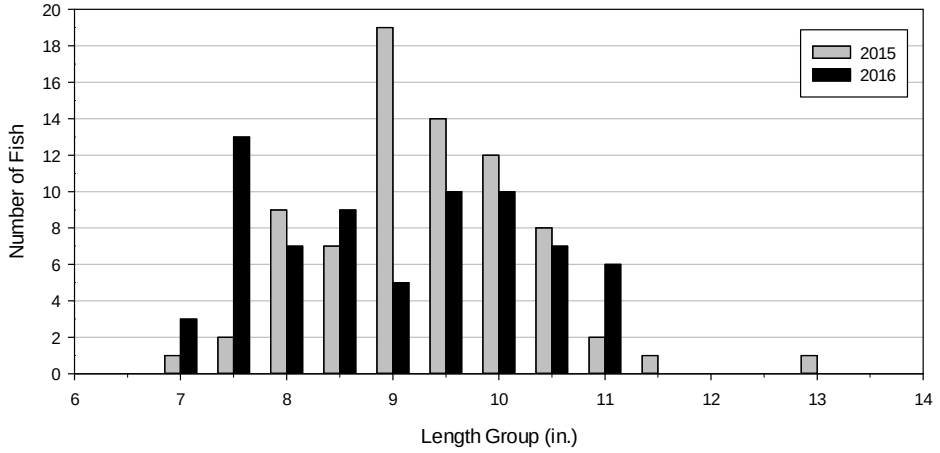
• Figure 57: Length-frequency distribution for Dailey Lake Rainbow Trout in 2014 and 2015.

Yellow Perch

The length-frequency distribution for Yellow Perch in 2014 and 2015 are similar with the exception of the two fish in the 11.5- and 13.0-inch length groups (Figure 58). The length-frequency distribution for 2016 did not have fish larger than 11.0 inches (Figure 59). There was a large increase in the frequency of fish in the 7.5-inch length group as well as a large drop in the frequency in the 9.0-inch length group between 2015 and 2016.



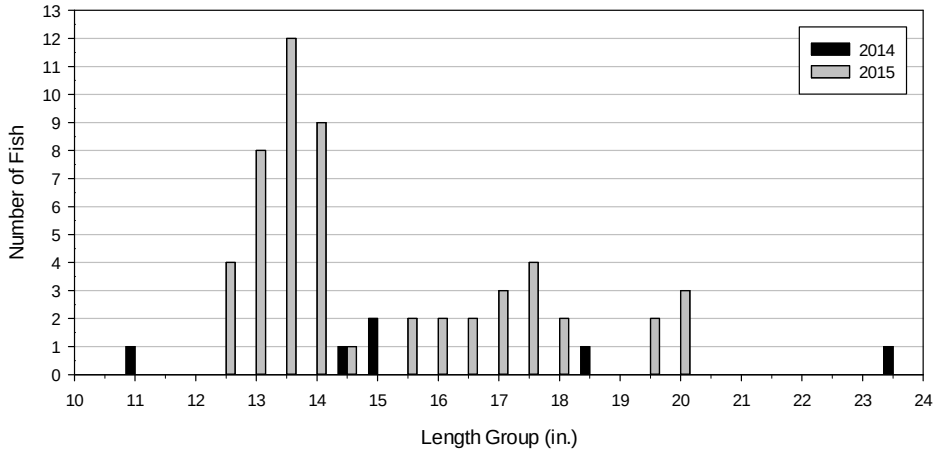
• Figure 58: Length-frequency distribution for Dailey Lake Yellow perch in 2014 and 2015.



• Figure 59: Length-frequency distribution for Dailey Lake Yellow Perch in 2015 and 2016.

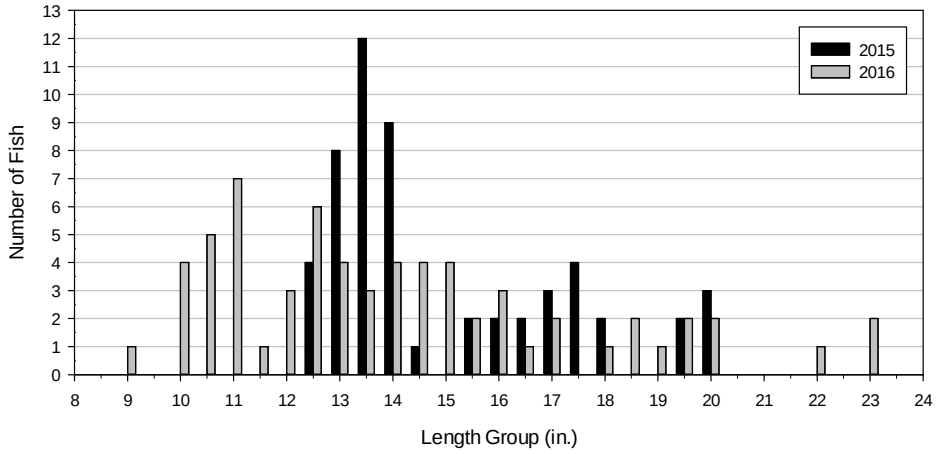
Walleye

The length-frequency distribution of Walleye in 2015 shows a much higher frequency of fish across a smaller range of length groups than in 2014 (Figure 60). These changes are likely due to the large increase in the number of fish caught in the nets in 2015 compared to 2014. The large number of fish in the 12.5- to 14.0-inch length groups indicate a strong year class in the Walleye population.



• Figure 60: Length-frequency distribution of Dailey Lake Walleye in 2014 and 2015.

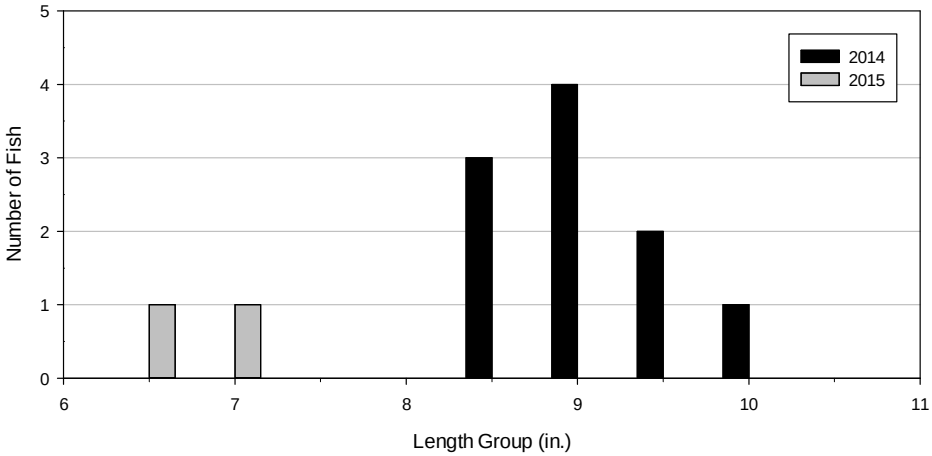
Length-frequency distribution for Walleye in 2016 covered a wider range of length groups than 2015 (Figure 61). There were many fish that were under 13.0 inches in length suggesting good survival of prior plants. Fish in the 13.0- to 14.0-inch length groups were much lower in 2016 than 2015. The strong group in this range in 2015 did not appear to carry forward in 2016 at such a high level. Fish larger than 20 inches returned to the sample in 2016 as well.



• Figure 61: Length-frequency distribution of Dailey Lake Walleye in 2015 and 2016.

Yellowstone Cutthroat Trout

In 2015, the length-frequency distribution of YCT shows a narrower range of lengths and lower frequency of fish captured than 2014 (Figure 62). This indicates a continued drop in survival of fish from prior stocking. The lack of YCT in the nets in 2016 is further indication that there may be a survival issue for these fish in the lake. Continued monitoring is needed to clearly understand stocking survival and capture efficiency.



• Figure 62: Length-frequency distribution of Dailey Lake Yellowstone Cutthroat Trout in 2014 and 2015.

Dailey Lake Summary

The biggest changes for species in Dailey Lake in 2015 and 2016 was the decline and absence of Rainbow Trout and YCT in the nets. It appears that there may be a survival issue with both species and it is unclear why the larger fish in both species disappeared so rapidly. Conversation with anglers has indicated little to no catch of either species in 2016. Stomach contents of Walleye were examined in 2016 and only a few trout were found. The Walleye were primarily feeding on Brook Stickle Back. Further monitoring will provide the information needed to determine what is causing the suppression of these two species.

Literature Cited

Chapman, D. G. 1951. Some properties of the hypergeometric distribution with applications to zoological censuses. University of California Publications in Statistics 1:131-160.