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FISHERIES INVESTIGATIONS IN THE YELLOWSTONE AND SHIELDS RIVER BASINS, PARK COUNTY, MONTANA

ANNUAL REPORT FOR 2004

Federal Aid Project F-113-R- 4

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ABSTRACT

Trout abundance for fish seven inches and longer at different locations throughout the upper Yellowstone River spring 2004 was lower than most estimates compiled in recent years. Trout populations may be responding to extended low flow conditions as a result of ongoing drought. In the Corwin Springs, 9th Street, and Springdale sections rainbow trout abundances were 365 fish/mile, 1146 fish/mile, and 192 fish/mile, respectively. Brown trout abundance for these same sections in the same order were 245 fish/mile, 216 fish/mile, and 105 fish/mile. Yellowstone Cutthroat trout abundances were 246 fish/mile in the Corwin Springs section, 40 fish/mile in the 9th Street Section, and 46 fish/mile in the Springdale Section.

Brown trout abundance was similar in the Convict Grade section of the Shields River sampled this spring compared to other recent estimates. Abundance of brown trout seven inches and longer in this section was 189 fish/mile.

The average size of rainbow trout in spring gillnet catches at Dailey Lake was 13.3 inches this year. Walleye averaged 13.5 inches, and yellow perch 8.4 inches. Walleye average lengths are similar to samples collected since 1999. Yellow perch average lengths are similar to samples collected since 2000. The rainbow trout average lengths increased slightly compared to last year but are still below long-term averages.

OBJECTIVES

Funds for this project are provided by grants from the Federal Aid in Sport Fish Restoration Act (16 U.S.C. 777-777k) supporting the Montana Statewide Fisheries Management Program. This program consists of two elements: Fisheries Management in Montana, and Statewide Program Coordination. The Fisheries Management element includes four activities, each with associated objectives:

State Program Activities and Objectives

1. Survey and Inventory
To survey and monitor the characteristics and trends of fish populations, angler harvest and preferences, and to assess habitat conditions in selected waters.

2. Fish Population Management
To implement fish stocking programs and/or fish eradication actions to maintain fish populations at levels consistent with habitat conditions and other limiting factors.

3. Technical Guidance
To review projects by government agencies and private parties which have the potential to affect fisheries resources, provide technical advice or decisions to mitigate effects on these resources, and provide landowners and other private parties with technical advice and information to sustain and enhance fisheries resources.

4. Aquatic Education
To enhance the public's understanding, awareness and support of the state's fishery and aquatic resources and to assist young people to develop angling skills and to appreciate the aquatic environment.

Statewide activities and objectives are addressed locally by ongoing fisheries investigations and management activities intended to enhance aquatic habitats and recreational fisheries in the upper Yellowstone and Shields River basins.

Local Project Objectives

In fiscal year 2004 (July 1, 2003 to June 30, 2004), project objectives for state project number 3350 (the Yellowstone and Shields drainage areas) were identical to the statewide objectives listed above. Project objectives are intended to guide continuing efforts to maintain and enhance local fisheries. In support of these efforts, the following data collections, compilations, and analyses are reported here under separate headings:

A. Estimates of trout abundance in three sections of the Yellowstone River based on spring sampling in 2004.

B. Estimates of brown and rainbow trout abundance in one section of the Shields River based on spring sampling in 2004.

C. Summary of gillnet catches at Dailey Lake: spring 2004.

State survey, inventory, and fish population management objectives are addressed under headings A through C. Technical guidance and aquatic education objectives are addressed on an ongoing basis by meetings with various angler groups, school groups, journalists, and the public. In fiscal year 2004 these meetings included work supporting the Upper Shields Watershed, Southern Crazy Mountain Watershed Associations, Upper Yellowstone Watershed Basin, educational seminars for local school children, and meetings with local angling groups to discuss a variety of fisheries topics. Landowner contacts and consultations occurred routinely each month in conjunction with administration of the Montana Natural Streambed and Land Preservation Act and the Montana Stream Protection Act.

PROCEDURES

Estimates of trout abundance in three sections of the Yellowstone River based on spring sampling in 2004.

This spring trout were sampled in three sections of the Yellowstone River (Table 1; Figure 1) normally examined as part of routine fisheries surveys (e.g., Tohtz 1996; Tohtz 1999; Tohtz 2001a; Tohtz 2003).

Table 1. Survey sections where trout abundance was sampled from the Yellowstone River in 2004.

Section name	Survey date	Length (ft)	Approximate location \[1]		
Corwin Springs	04/12/04	27,800	Upper Boundary	North	45.10897
				West	110.79036
			Lower Boundary	North	45.1583
				West	110.82926
Ninth Street	04/08/04	10,700	Upper Boundary	North	45.65436
				West	110.54992
			Lower Boundary	North	45.67879
				West	110.53682
Springdale	04/05/04	28700	Upper Boundary	North	45.69482
				West	110.27976
			Lower Boundary	North	45.72894
				West	110.23812

1. Latitude and longitude (decimal degrees, WGS84 datum).

Fish were sampled with electrofishing gear mounted on an aluminum-hulled jet boat. This gear included a 5,000-watt generator and a Coffelt Model VVP-15 rectifying unit. Anodes were metal hoops with stainless steel droppers suspended from twin booms at the bow of the boat. The boat hull served as the cathode.

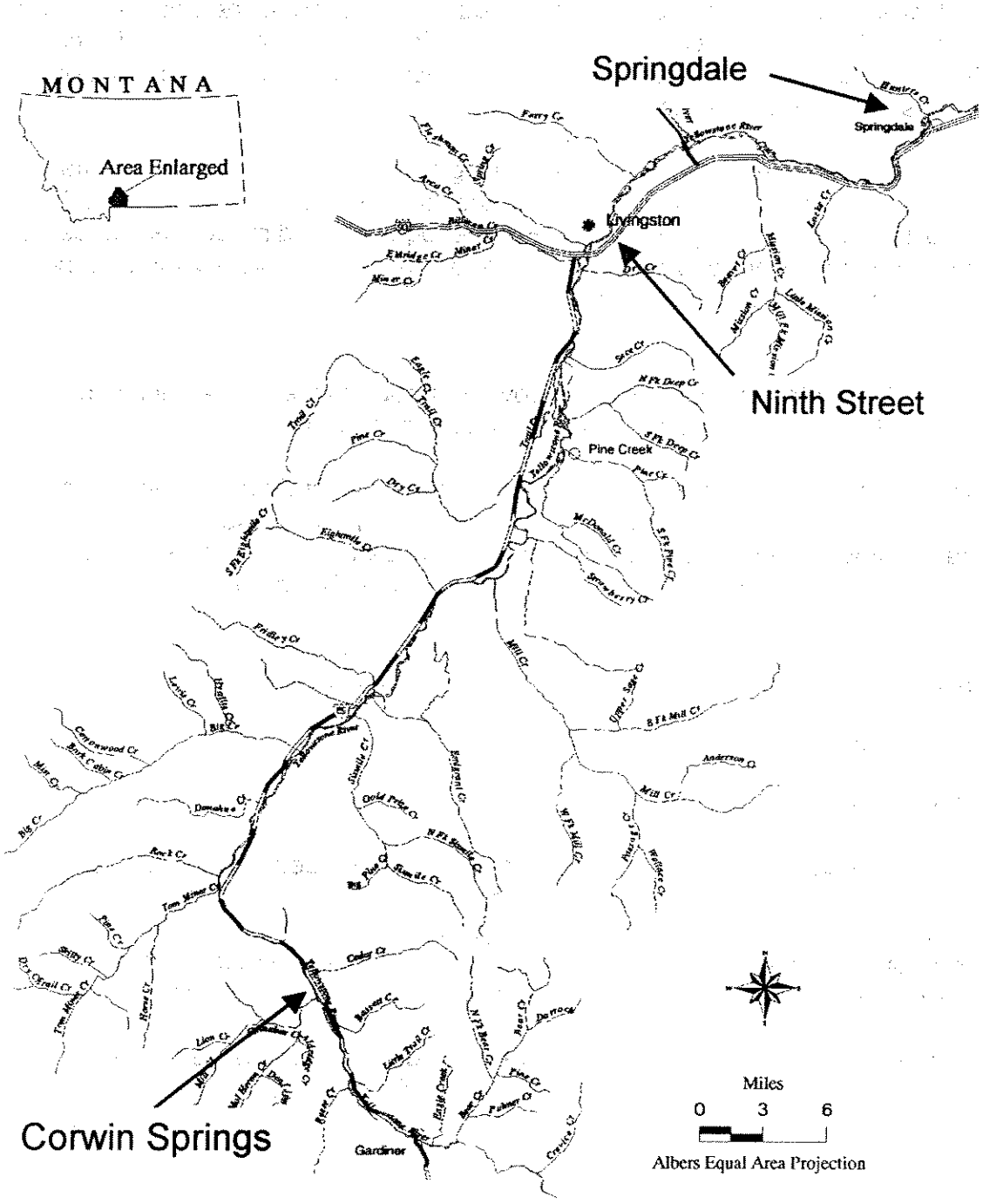

Figure 1. Upper Yellowstone drainage showing three areas where fish abundance was sampled from the Yellowstone River in spring 2004.

Fish were collected in live cars, identified [1], measured to the nearest 0.1 inch [2], and weighed to the nearest 0.01 pound. Trout were marked with fin clips and returned to the river after marking. Recapture sampling occurred about two weeks later in each section.

Fish abundance was estimated using a log-likelihood model and a modified Peterson model available in Fisheries Analysis + software from Montana Fish, Wildlife and Parks (MFWP, 2004). For the log-likelihood model, estimates were evaluated for reliability at alpha = 0.05 and fish were separated into one-inch length groups for abundance analysis.

Estimates of brown and rainbow trout abundance in one section of the Shields River based on spring sampling in 2004.

This spring we sampled fish abundance in the Convict Grade section of the Shields River (Table 2; Figure 2). This section is part of a series of locations we have sampled periodically to monitor fish abundance in the mainstem Shields River (e.g., Tohtz 1996; Tohtz 1999; Tohtz 2001a; Tohtz 2003).

Table 2. Shields River sections where fish were sampled in spring 2004.

Section name	Survey date	Section length (ft)	Location\[1]
Convict Grade	3/19/04	6,864	T1S, R10E, S22-23

1. Township, Range, Section

Fish were sampled in this section with electrofishing gear mounted on a small drift boat. This gear included a 4,500-watt generator and a Leach direct current rectifying unit. The cathode was a steel plate attached to the bottom of the drift boat; the anode was a single hand held (mobile) electrode connected to the power source by about 30 feet of cable.

In all cases, fish were collected in live cars, identified, measured to the nearest 0.1 inch, and weighed to the nearest 0.01 pound. Trout and mountain whitefish were marked with fin clips and returned to the stream. Recapture sampling was conducted about two weeks later in each section.

Data were processed using FA+, a computer program developed by FWP for processing electrofishing records (MFWP, 2004). Brown trout numbers were estimated using the log-likelihood model and rainbow trout number were estimated using the modified Peterson model.

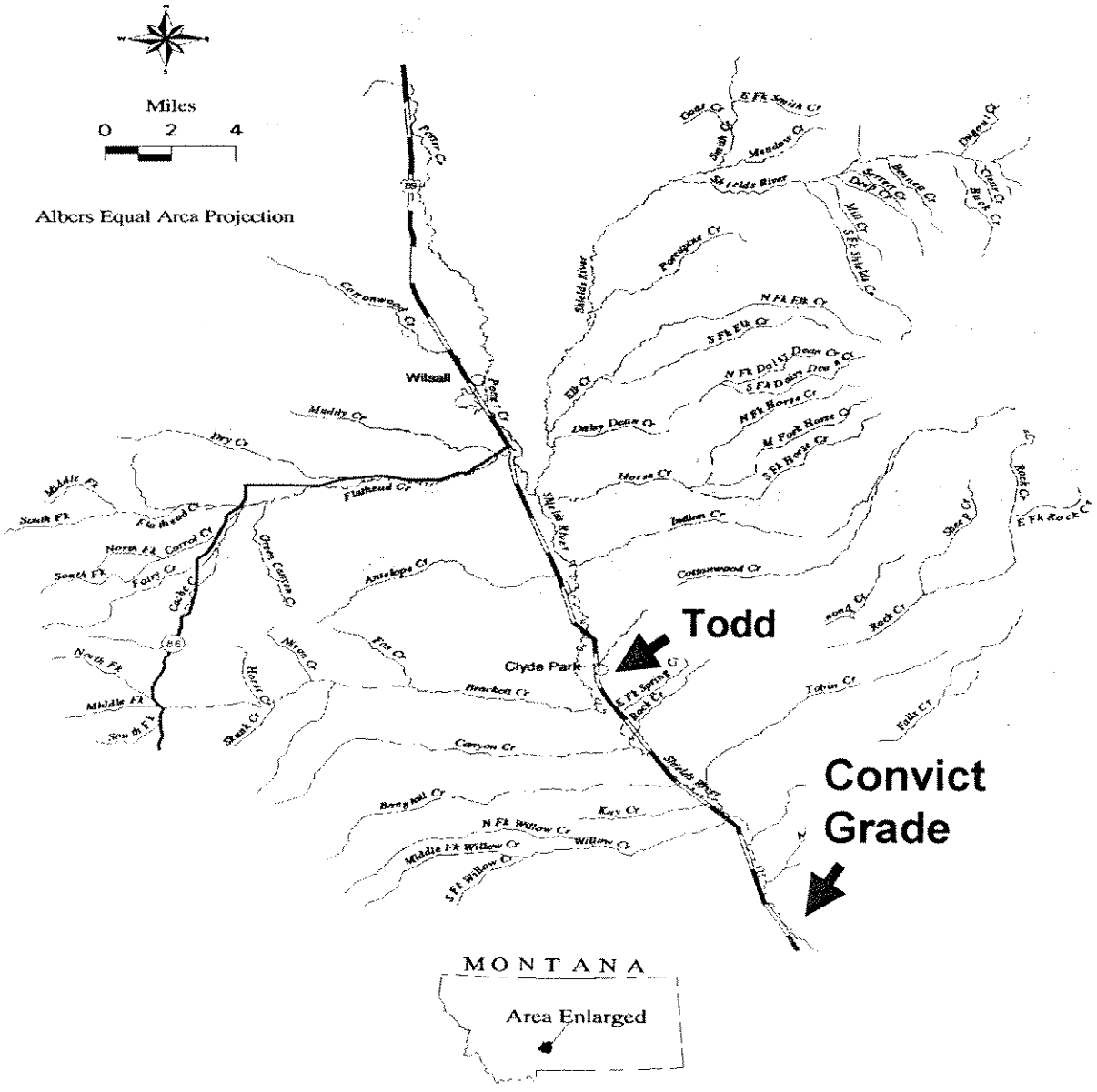

Figure 2. Shields River drainage showing the location of the Convict Grade section sampled in spring 2004.

Summary of gillnet catches at Dailey Lake: spring 2004

Gillnet sampling in year 2004 mimicked previous spring sampling (e.g., Tohtz 2003). A single overnight set using two sinking and two floating experimental gillnets (Shepard 1993) determined the entire sample. Results in 2004 are compared to samples from several previous years.

RESULTS AND DISCUSSION

Estimates of rainbow, brown, and cutthroat trout abundance in three sections of the Yellowstone River based on spring sampling in 2004.

Less than half of the data for rainbow, brown, and cutthroat trout from each of the sections sampled in 2004 fit the log-likelihood model well (Table 3). A Modified Peterson (MFWP, 2004) was used to produce population estimates for those that did not fit the log-likelihood model. Most of the data did not fit the log-likelihood model as a result of small numbers of marked fish, high numbers of captured fish, and low number of recaptured fish. Rainbow trout estimates do not include fish that appeared to be hybrid crosses between rainbow and Yellowstone cutthroat trout.

Table 3. Trout/mile in three sections of the Yellowstone River based on spring sampling in 2004. Estimates are for fish seven inches (TL) or longer.

Section (mark date):			Overall model			Pooled model		
Fish species	N	SD	DF	Chi-square	P	DF	Chi-square	P /1
Corwin Springs (April 12):								
Rainbow trout	365	56.9	6	5.9	0.42	3	2.99	0.39
Brown trout	245	83.8	*			*		
Cutthroat trout	248	43.9	*			*		
Ninth Street (April 17):								
Rainbow trout	1146	282.2	*			*		
Brown trout	216	44.2	*			*		
Cutthroat trout	40	14	*			*		
Springdale (April 9):								
Rainbow trout	192	22.2	7	13.48	0.06	6	12.49	0.05
Brown trout	105	11.4	7	4.95	0.66	3	1.54	0.67
Cutthroat trout	46	15.3	*			*		

1. N=estimated number; SD=standard deviation; DF=degrees of freedom; P=probability value. * = Modified Peterson was used to generate estimate because data did not fit Partial Log-likelihood model.

Corwin Springs Section

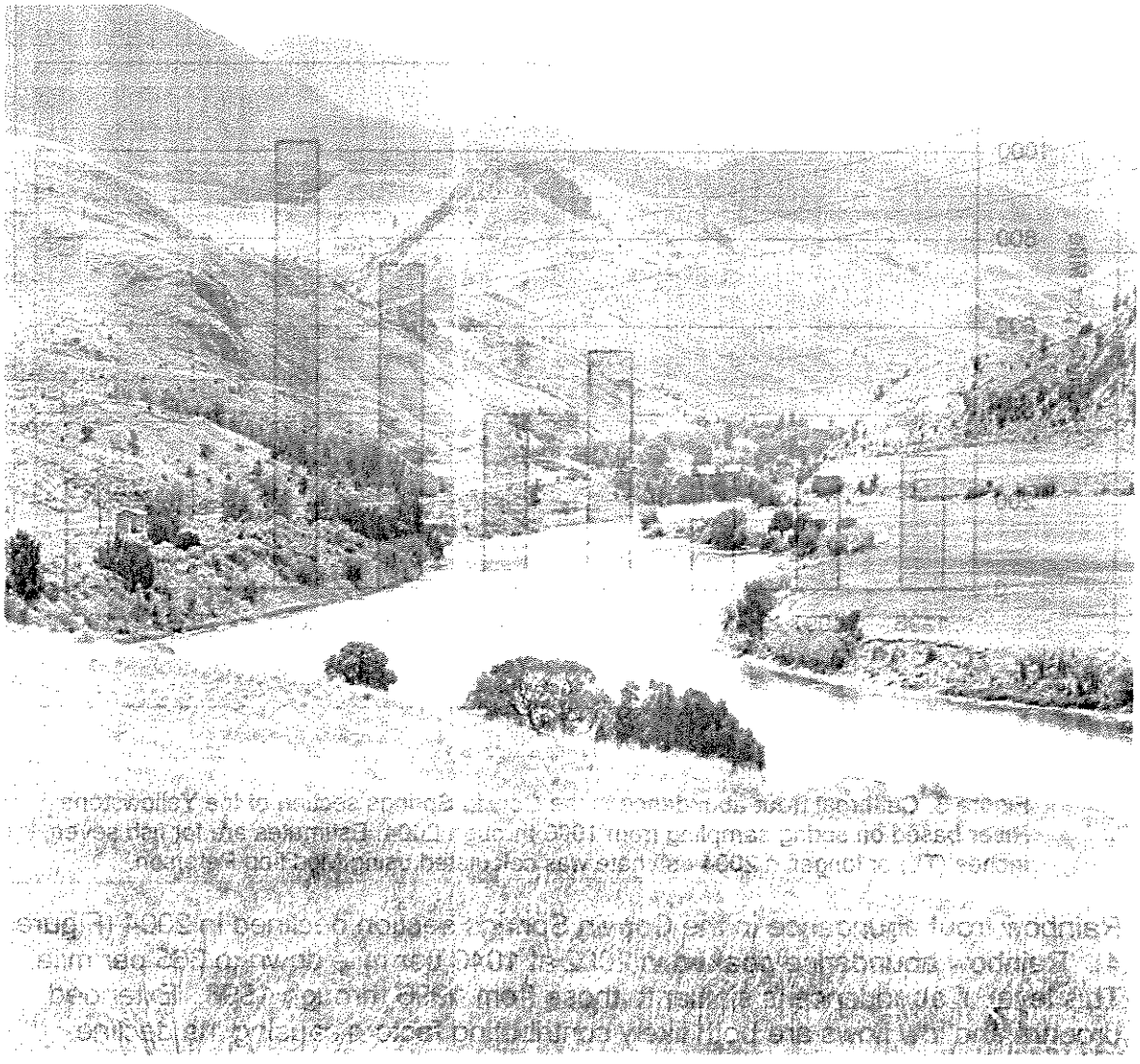

Photo 1. Portion of the Corwin Springs section, looking south (upstream).

Cutthroat trout abundances have dropped from a high of 1,020 per mile in 2002 down to 246 per mile in the Corwin Springs section (Tohtz 2003; Figure 3). This level is equivalent to the levels after record high runoff events in 1996 and 1997. Continued drought and record low flows since those events are more than likely a significant contributor to the reduction in abundance. The Corwin Springs section was not sampled in 2003. As a result, it is impossible to determine how rapid the decline in abundance was.

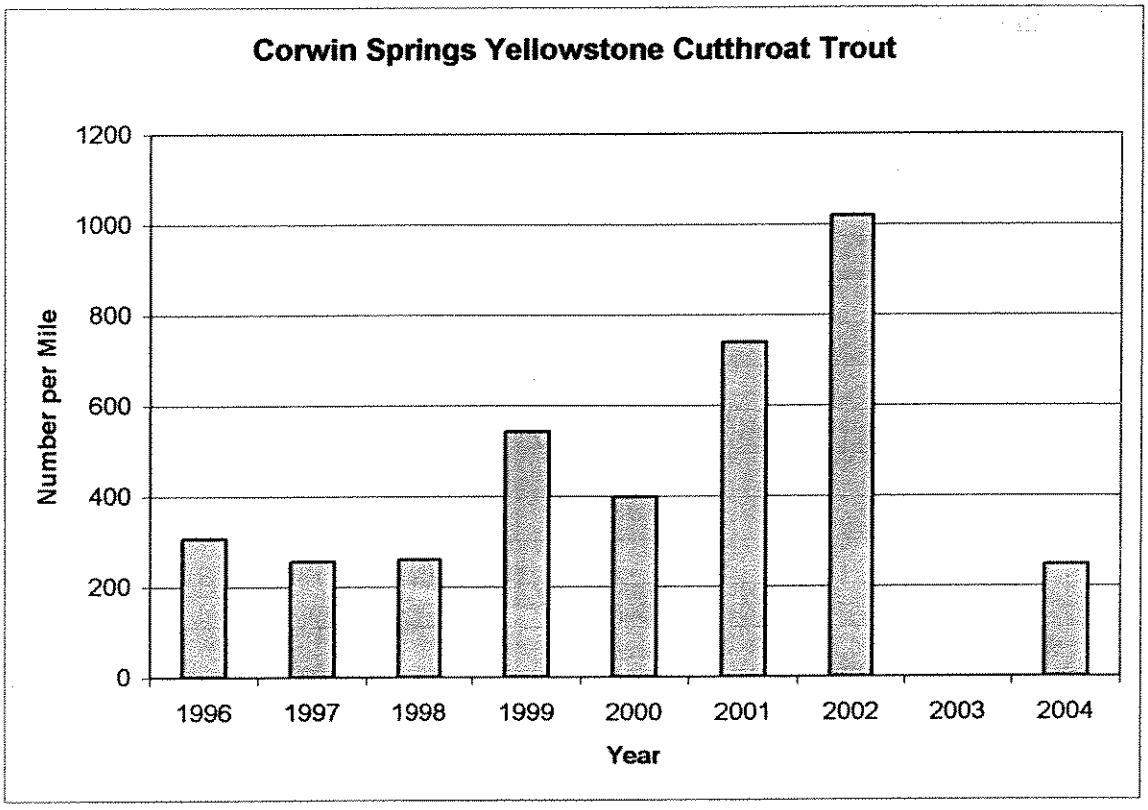

Figure 3. Cutthroat trout abundance in the Corwin Springs section of the Yellowstone River based on spring sampling from 1996 through 2004. Estimates are for fish seven inches (TL) or longer. * 2004 estimate was calculated using Modified Peterson.

Rainbow trout abundance in the Corwin Springs section declined in 2004 (Figure 4). Rainbow abundance peaked in 2002 at 1040 per mile down to 365 per mile. This level of abundance is similar to those from 1996 through 1998. Extended drought and low flows are both likely contributing factors causing the decline.

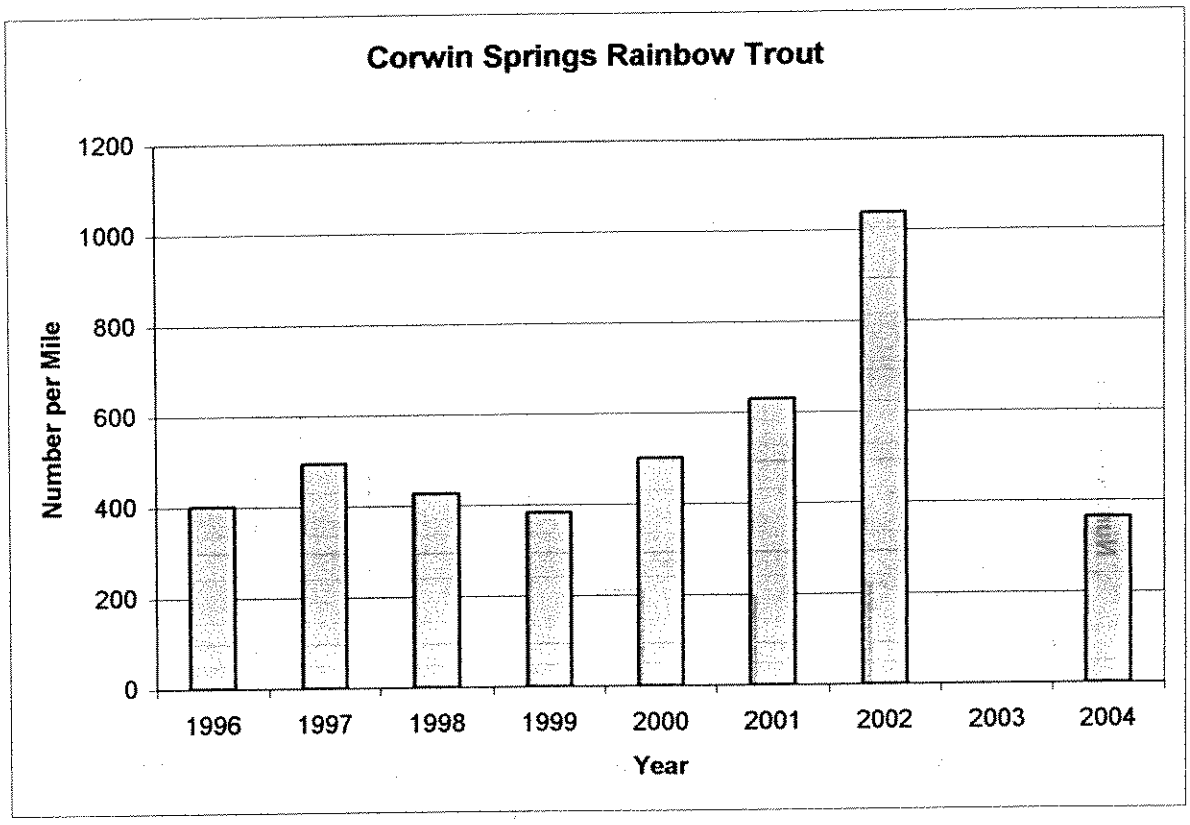

Figure 4. Rainbow trout abundance in the Corwin Springs section of the Yellowstone River based on spring sampling from 1996 through 2004. Estimates are for fish seven inches (TL) or longer.

The estimate of brown trout abundance in the Corwin Springs section was lower this year compared to estimates from 2000 through 2002 (Figure 5). Estimates in 2002 were at a high of 509 per mile and are currently at 245 per mile. Again this is likely related to the extended drought and lower flows.

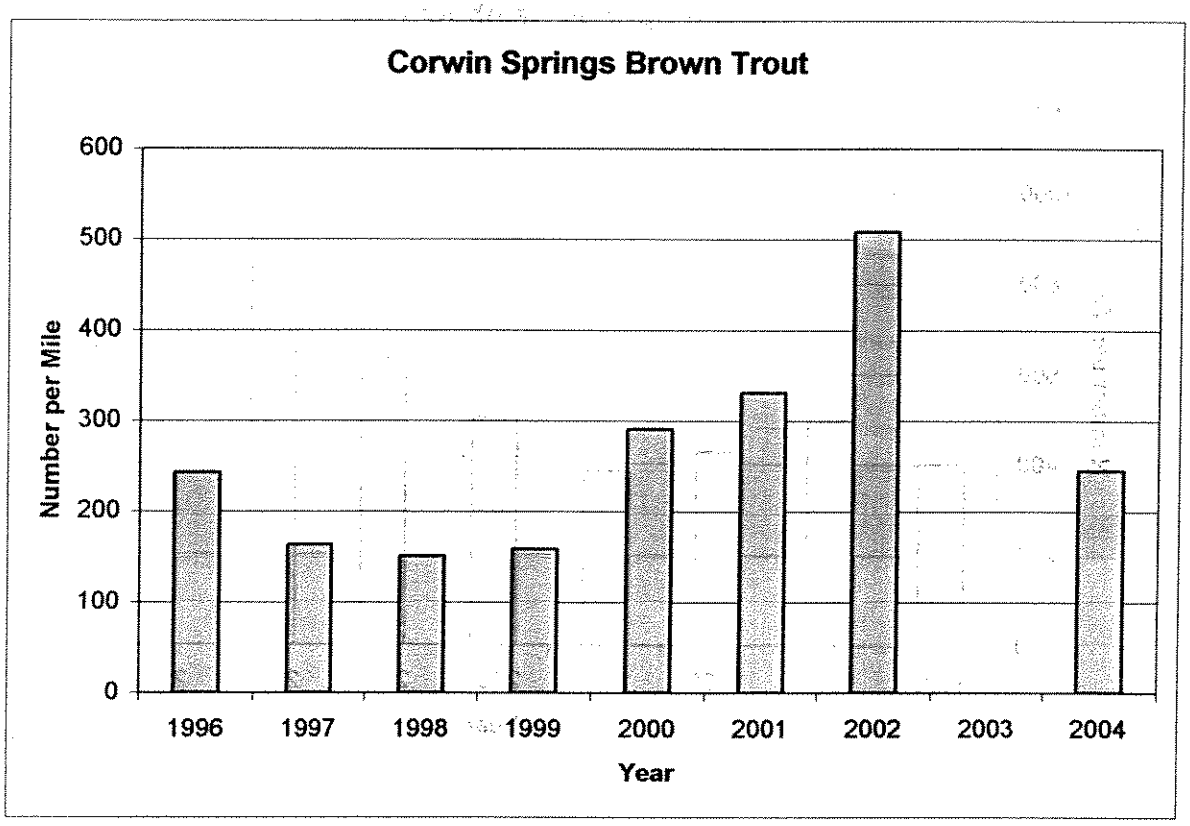

Figure 5. Brown trout abundance in the Corwin Springs section of the Yellowstone River based on spring sampling from 1996 through 2004. Estimates are for fish seven inches (TL) or longer. * 2004 estimate was calculated using Modified Peterson.

When length frequency graphs for cutthroat, rainbow, and brown trout in the Corwin Springs section are examined it is apparent that populations are weighted towards larger, older fish (Figures 6, 7, and 8). This suggests that recruitment of young fish may be limited in this section. This is especially true for brown trout in the Corwin Springs section. Extended drought and low flows may have reached the point were they are having and negative impact on spawning and recruitment of young fish.

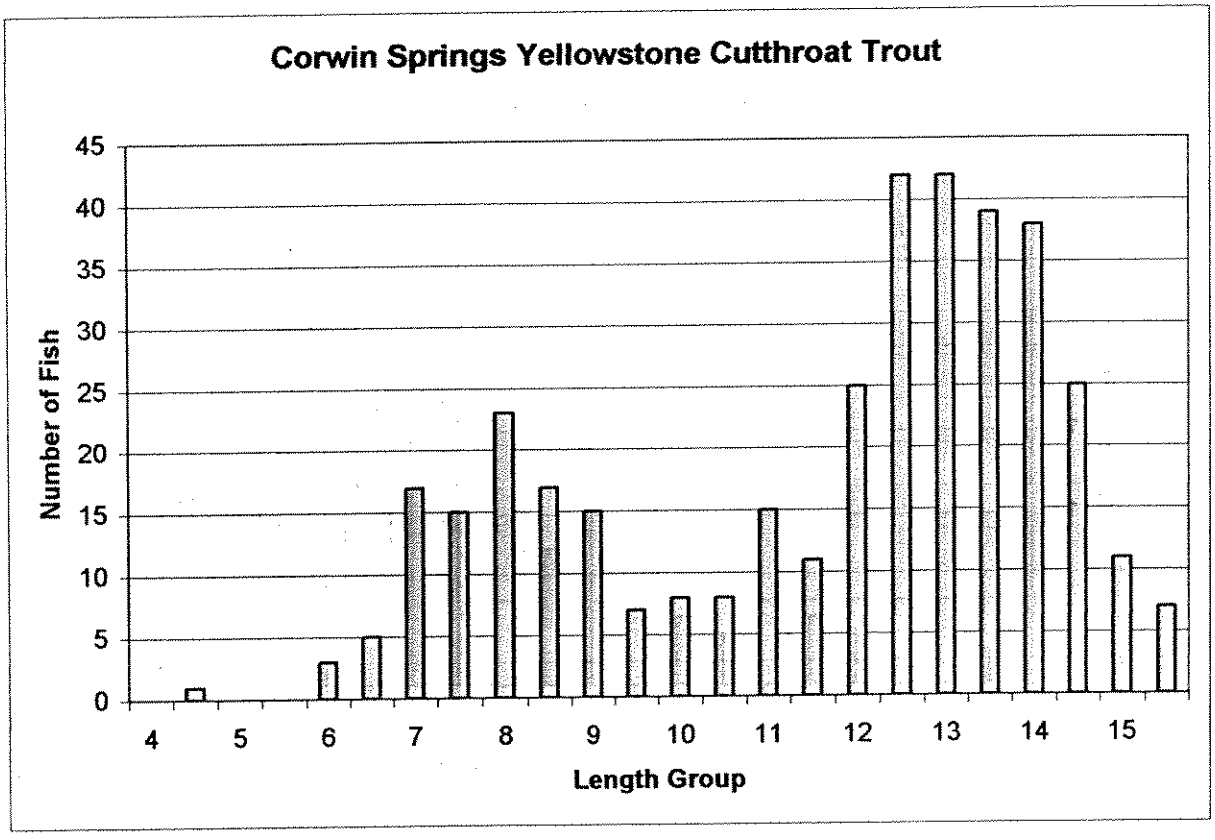

Figure 6. Yellowstone cutthroat length frequency distribution in the Corwin Springs section of the Yellowstone River based on spring sampling 2004.

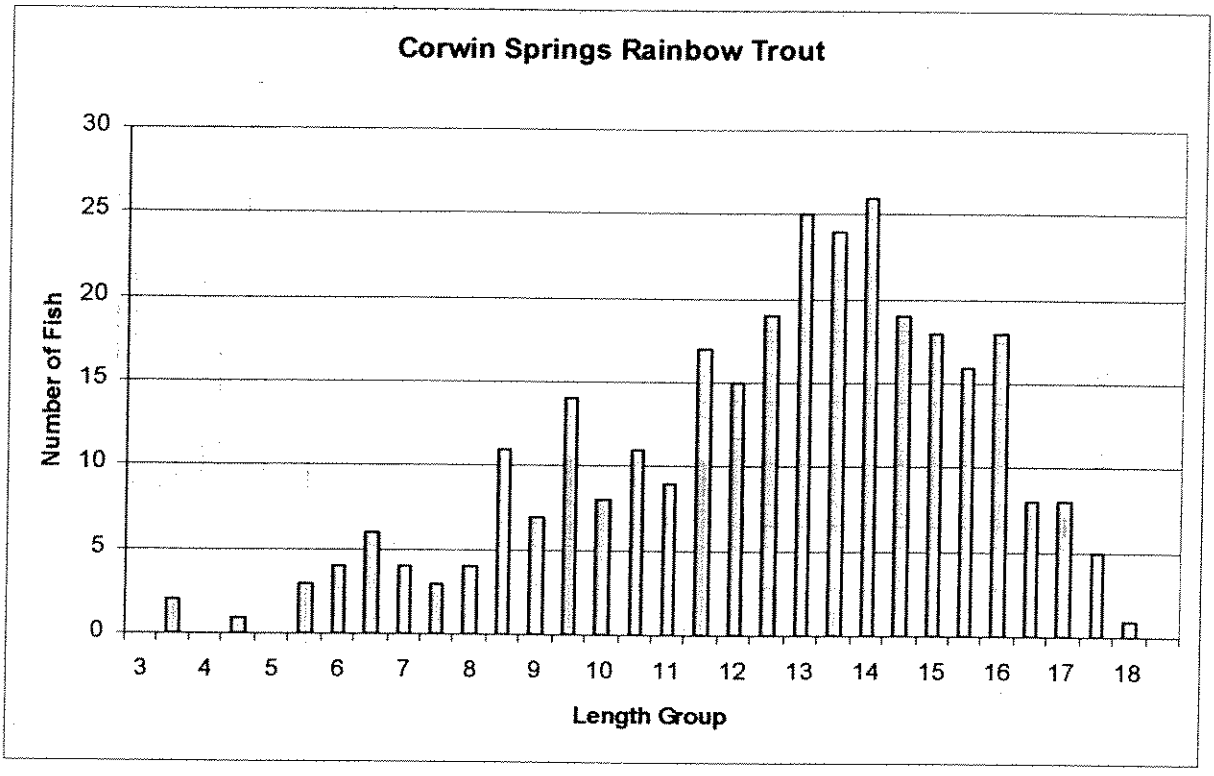

Figure 7. Rainbow trout length frequency distribution in the Corwin Springs section of the Yellowstone River based on spring sampling 2004.

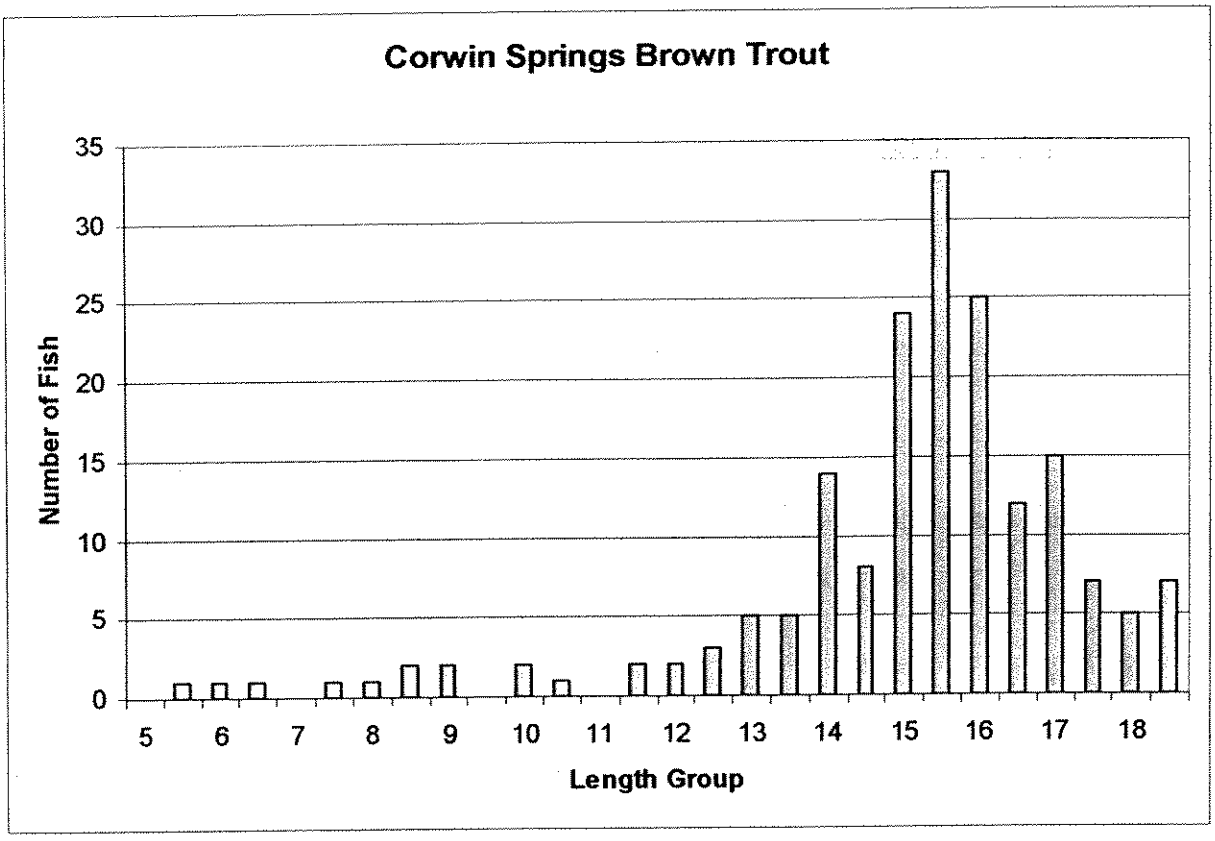

Figure 8. Brown trout length frequency distribution in the Corwin Springs section of the Yellowstone River based on spring sampling 2004.

Ninth Street Section

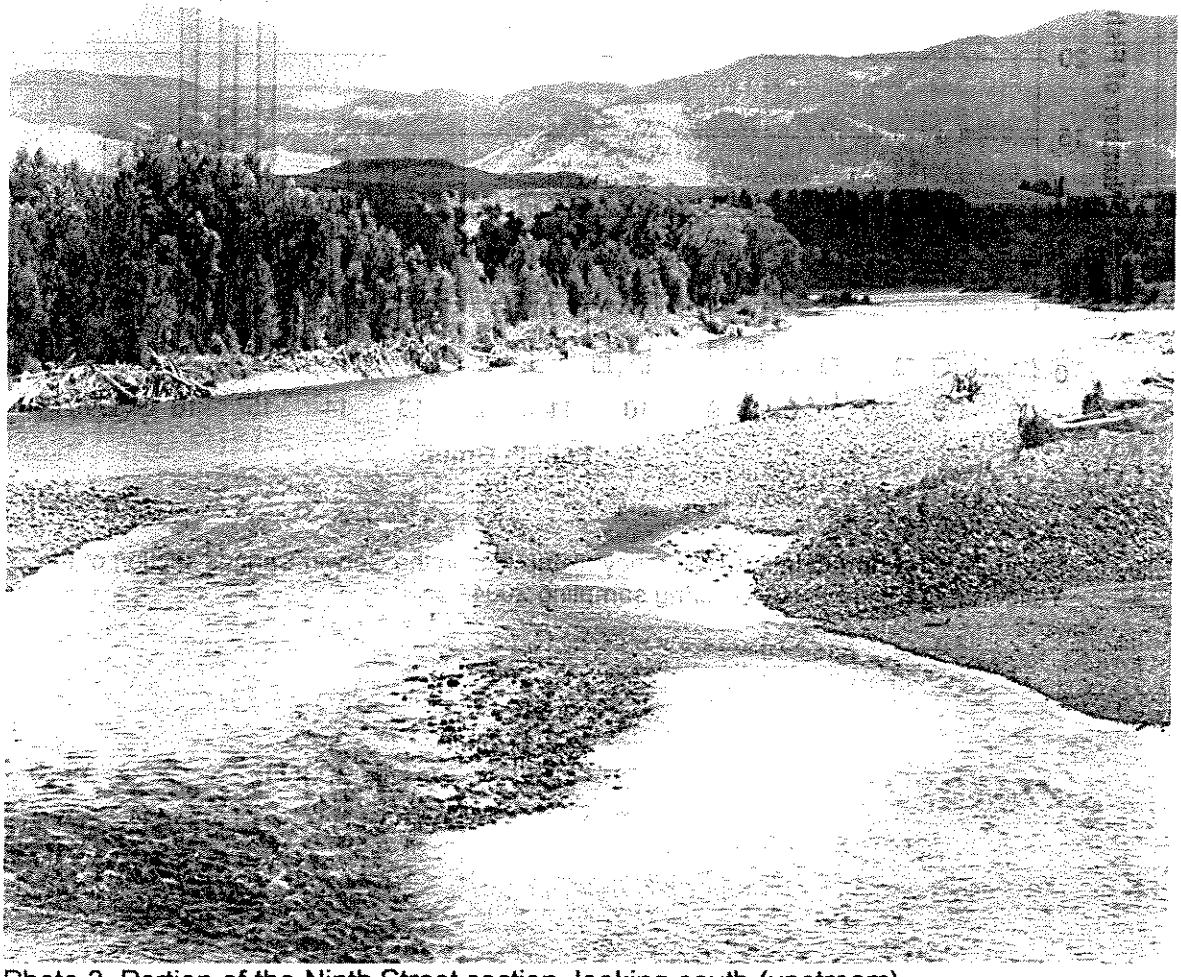

Photo 3. Portion of the Ninth Street section, looking south (upstream).

Estimates of cutthroat trout and brown trout abundance in the Ninth Street section have continued to decline since 2000 (Figures 9 and 10). Yellowstone cutthroat declined to 40 per mile and brown trout have declined to 216 per mile. Continued drought may be a contributing factor in these declines.

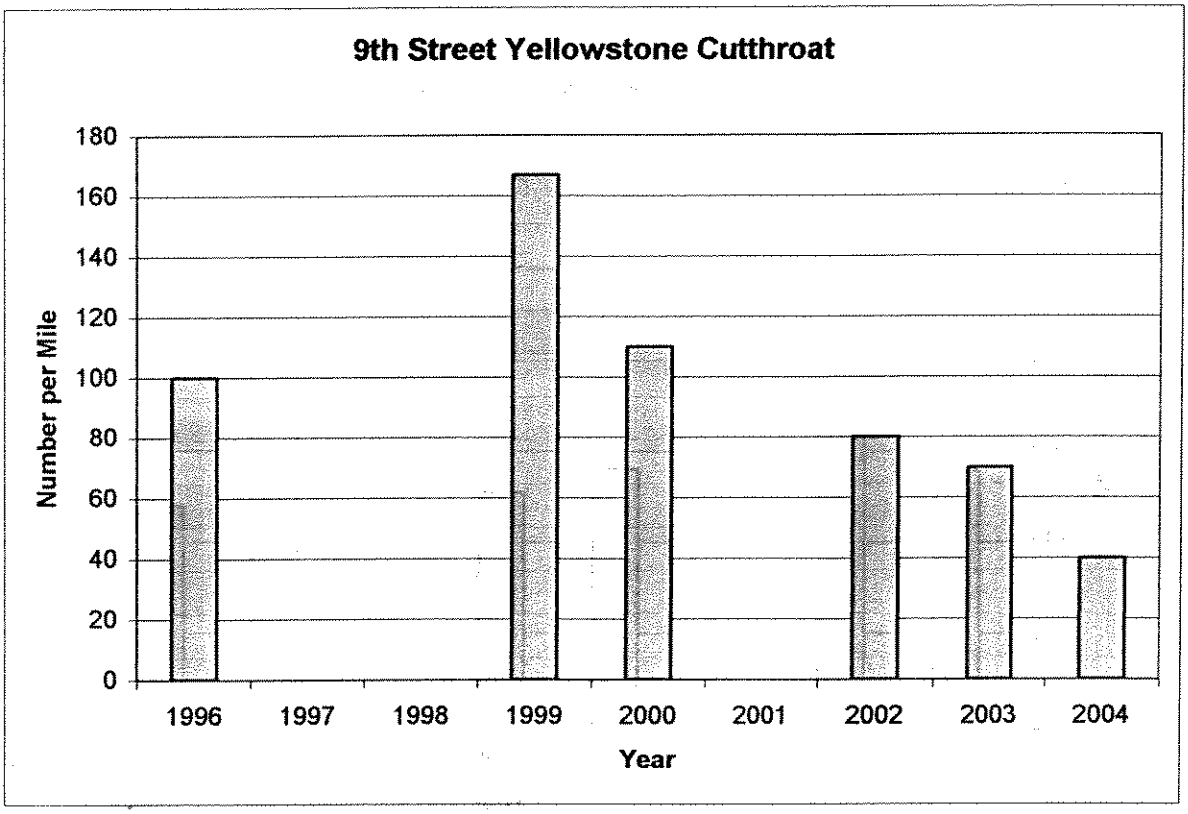

Figure 9. Cutthroat trout abundance in the Ninth Street section of the Yellowstone River based on spring sampling from 1999 through 2004. Estimates are for fish seven inches (TL) or longer. Fish were not sampled at this location in 2001. * 2004 estimate was calculated using Modified Peterson.

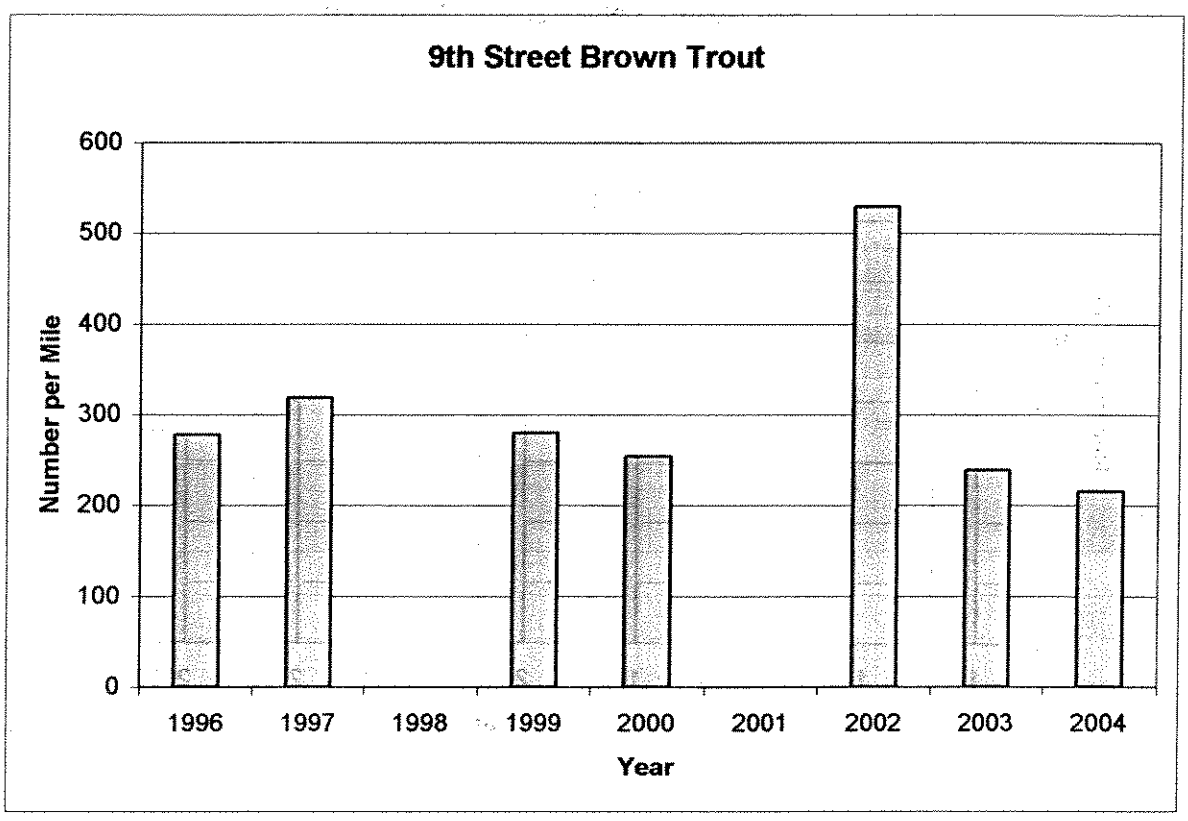

Figure 10. Brown trout abundance in the Ninth Street section of the Yellowstone River based on spring sampling from 1999 through 2004. Estimates are for fish seven inches (TL) or longer. Fish were not sampled at this location in 2001. * 2004 estimate was calculated using Modified Peterson.

Rainbow trout abundance is slightly higher than last year's estimate at 1146 per mile, and continues to resemble estimates from samples collected before the high runoff events of 1996 and 1997 (Figure 11).

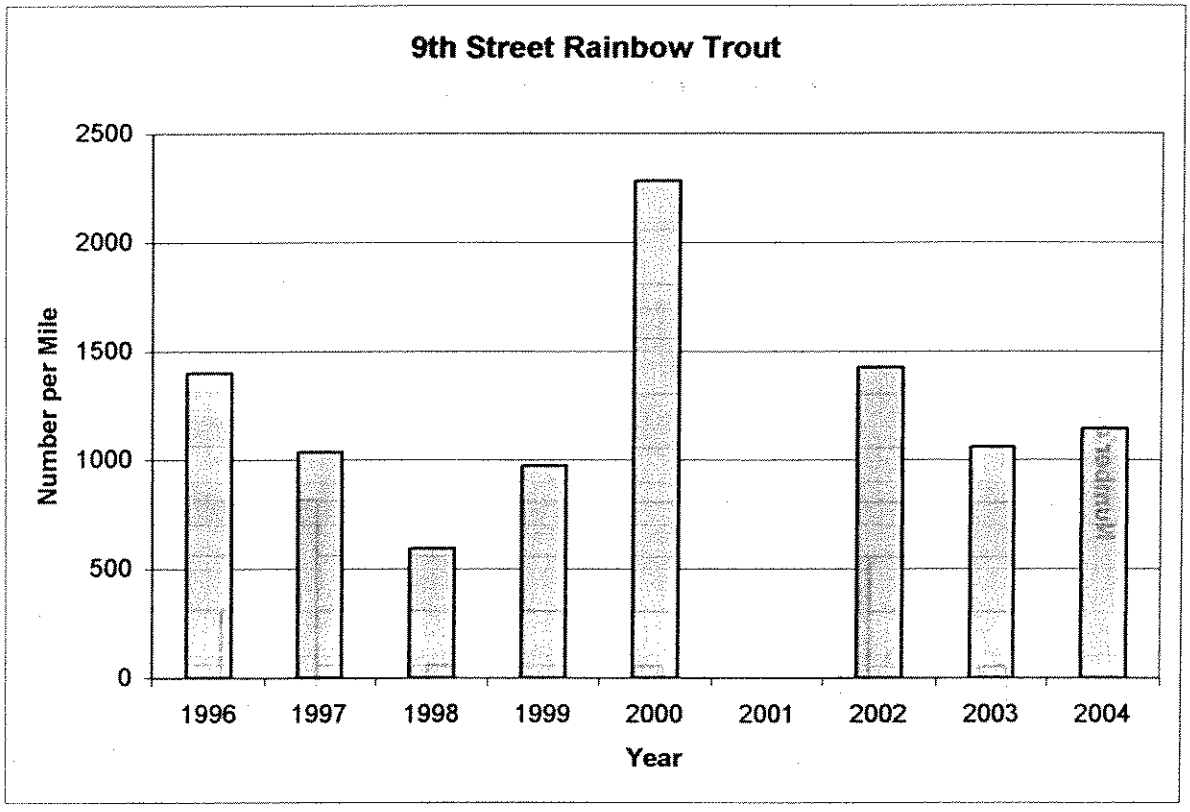

Figure 11. Rainbow trout abundance in the Ninth Street section of the Yellowstone River based on spring sampling from 1995 through 2004. Estimates are for fish seven inches (TL) or longer. Fish were not sampled at this location in 2001. * 2004 estimate was calculated using Modified Peterson.

Length frequency graphs show that the Yellowstone cutthroat trout population in this section is composed of two distinct age groups (Figure 12). It also appears that there is a missing age group in the 11.0 to 12.5 inch size. The rainbow trout population shows three distinct age groups and is weighted heavily toward larger, older fish (Figure 13). This may indicate limited spawning and recruitment in this section. The brown trout have a fairly sporadic length frequency distribution with the bulk of the fish in middle of the distribution (Figure 14).

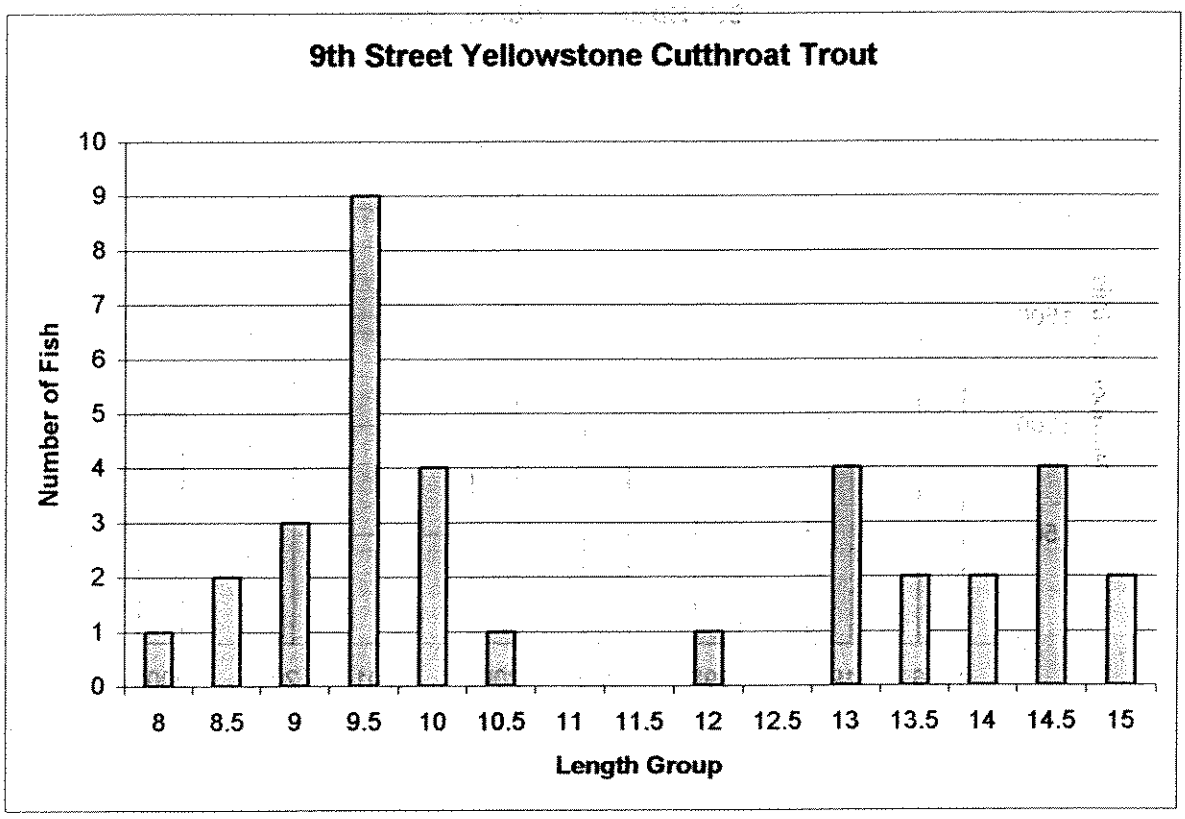

Figure 12. Yellowstone cutthroat length frequency distribution in the 9th Street section of the Yellowstone River based on spring sampling 2004.

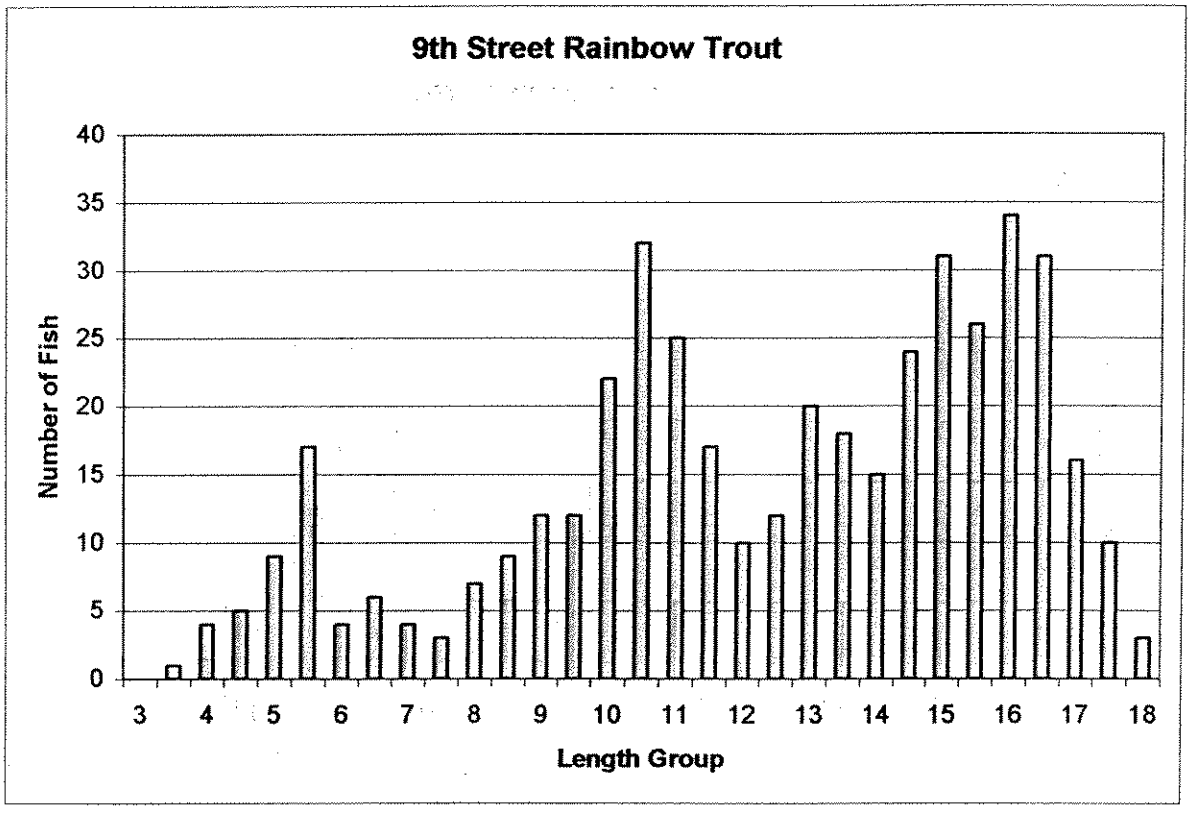

Figure 13. Rainbow trout length frequency distribution in the 9th Street section of the Yellowstone River based on spring sampling 2004.

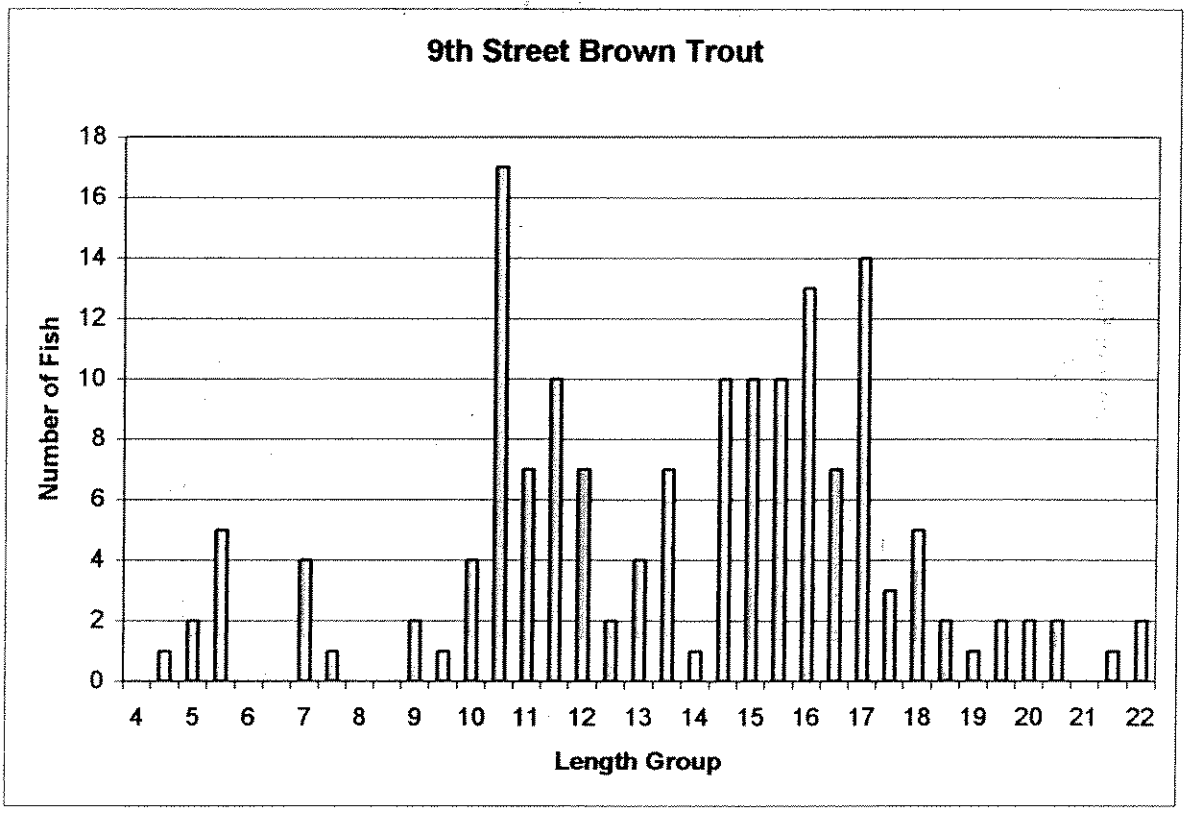

Figure 14. Brown trout length frequency distribution in the 9th Street section of the Yellowstone River based on spring sampling 2004.

Springdale Section

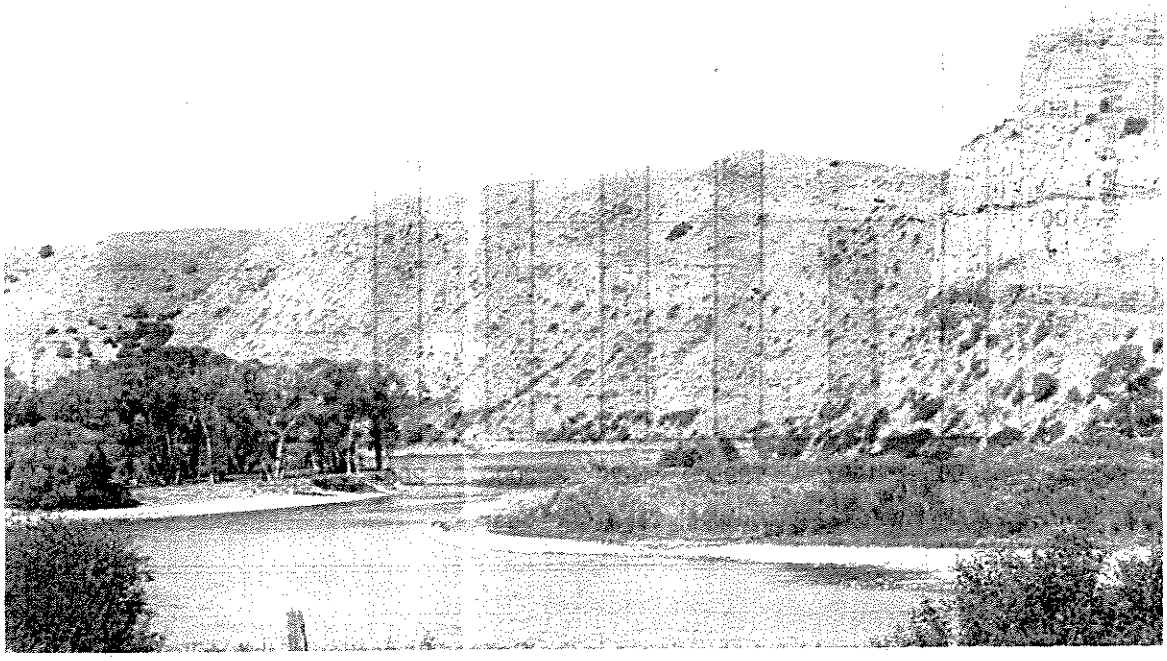

Photo 4. Portion of the Springdale section, looking west (upstream).

Our estimates of cutthroat trout abundance near Springdale in 2004 were slightly higher than 2003 at 46 per mile (Figure 15). Rainbow and brown trout abundance decreased from 2003 to 192 per mile and 105 per mile, respectively (Figures 16 and 17). As with the other sections of the Yellowstone River it appears that extended drought may be affecting fish populations in this section.

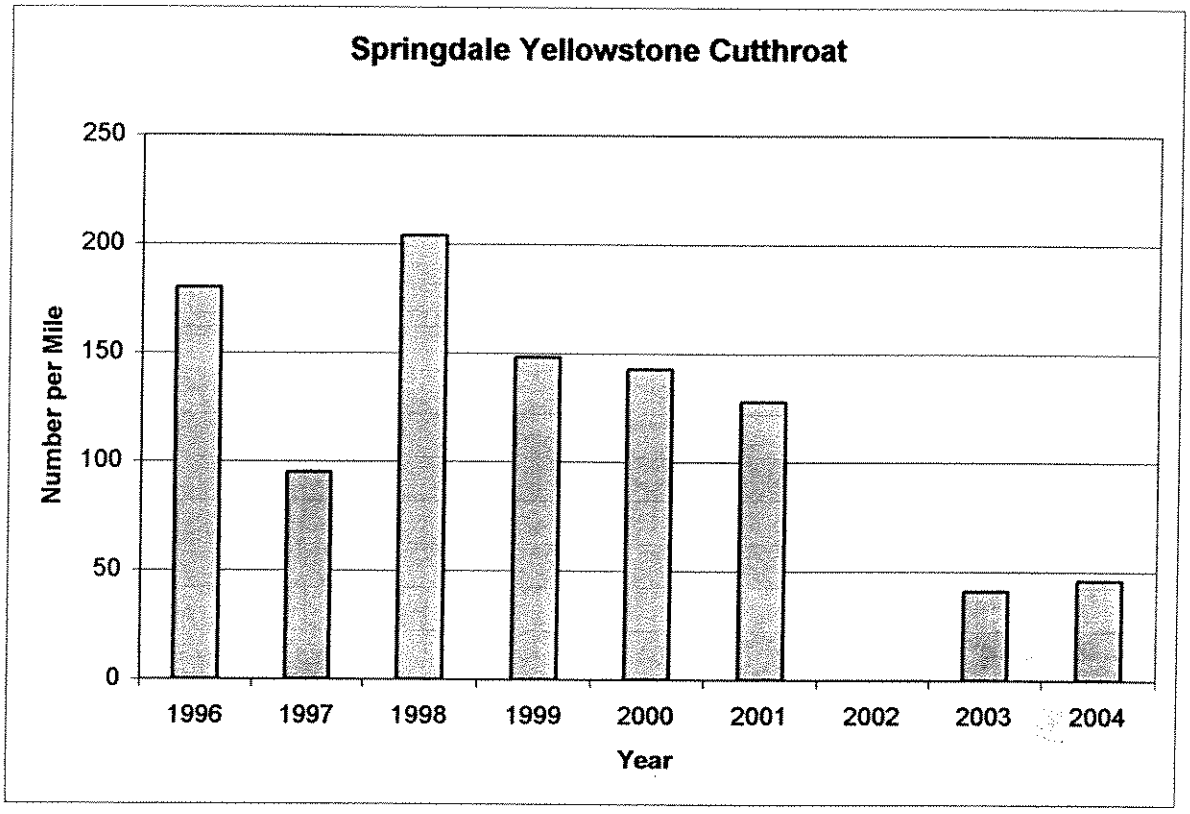

Figure 15. Cutthroat trout abundance in the Springdale section of the Yellowstone River based on spring sampling from 1999 through 2004. Estimates are for fish seven inches (TL) or longer. Fish were not sampled at this location in 2002. * 2004 estimate was calculated using Modified Peterson.

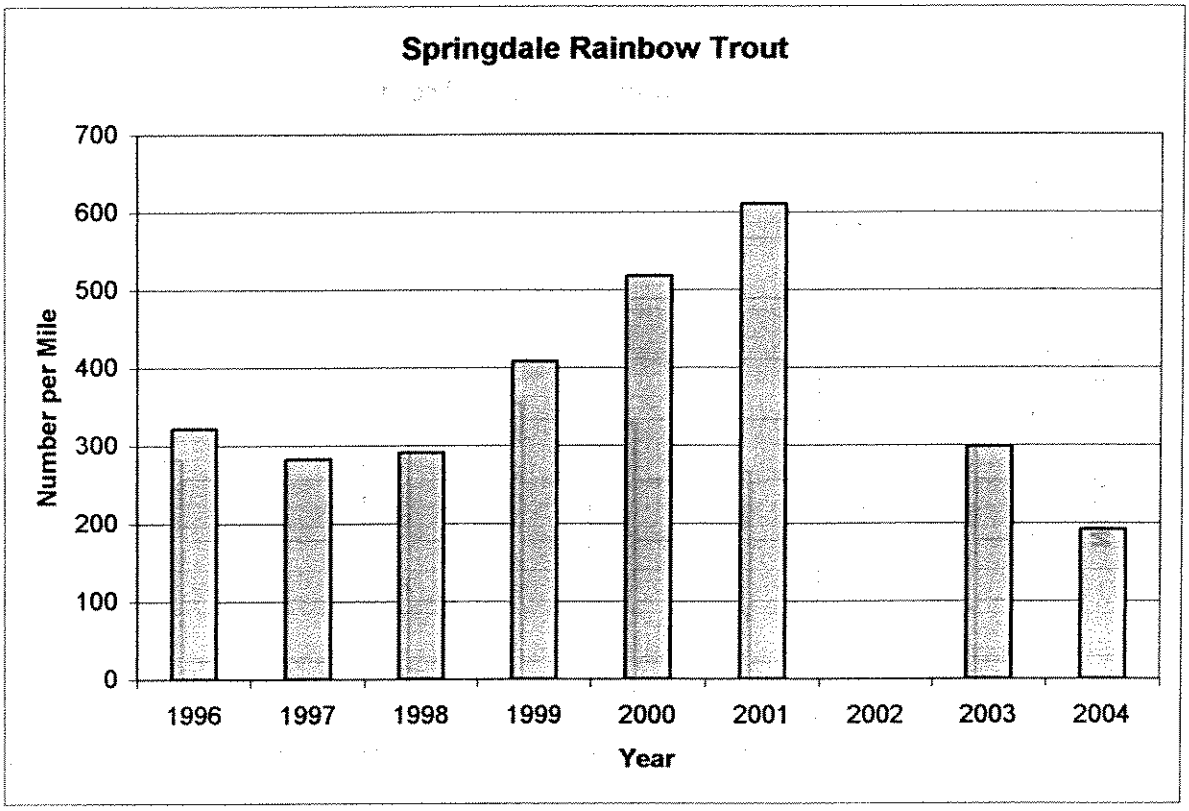

Figure 16. Rainbow trout abundance in the Springdale section of the Yellowstone River based on spring sampling from 1999 through 2004. Estimates are for fish seven inches (TL) or longer. Fish were not sampled at this location in 2002.

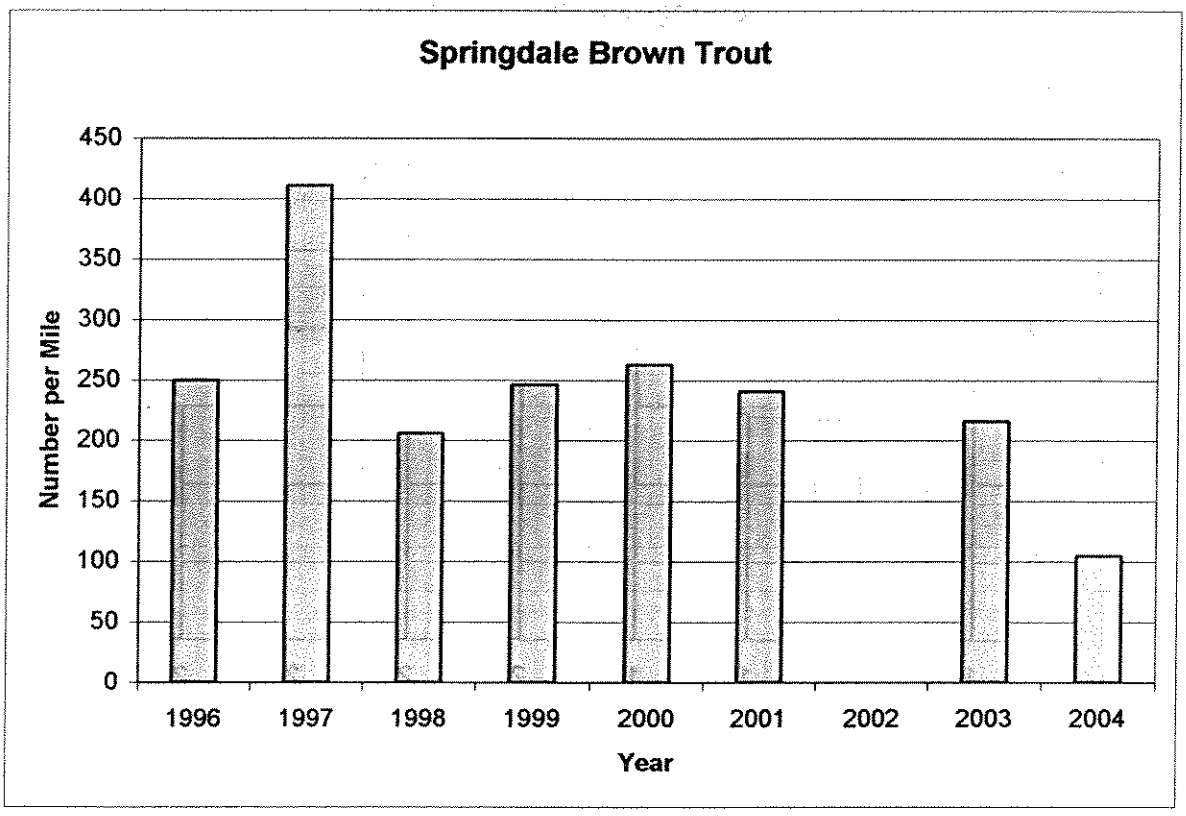

Figure 17. Brown trout abundance in the Springdale section of the Yellowstone River based on spring sampling from 1999 through 2003. Estimates are for fish seven inches (TL) or longer. Vertical scale is fish/mile. Fish were not sampled at this location in 2002.

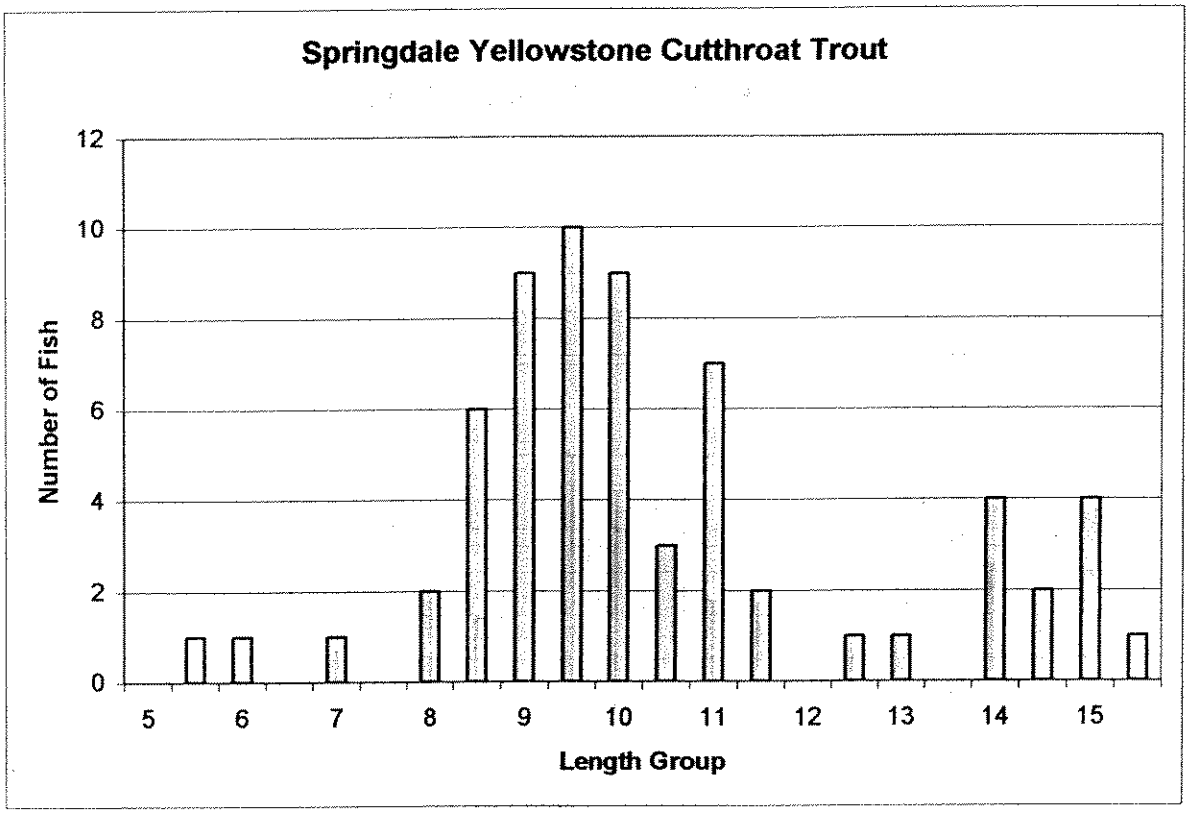

Figure 18. Yellowstone cutthroat length frequency distribution in the Springdale section of the Yellowstone River based on spring sampling 2004.

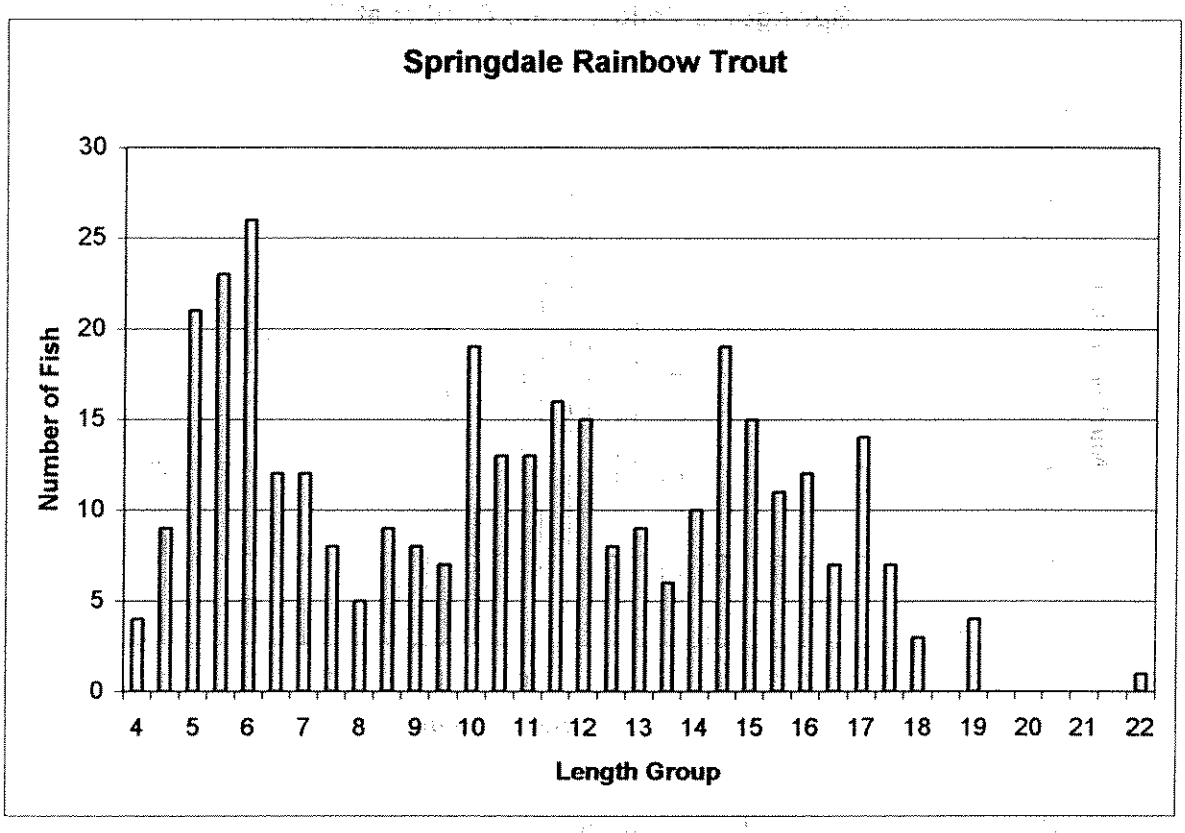

Figure 19. Rainbow trout length frequency distribution in the Springdale section of the Yellowstone River based on spring sampling 2004.

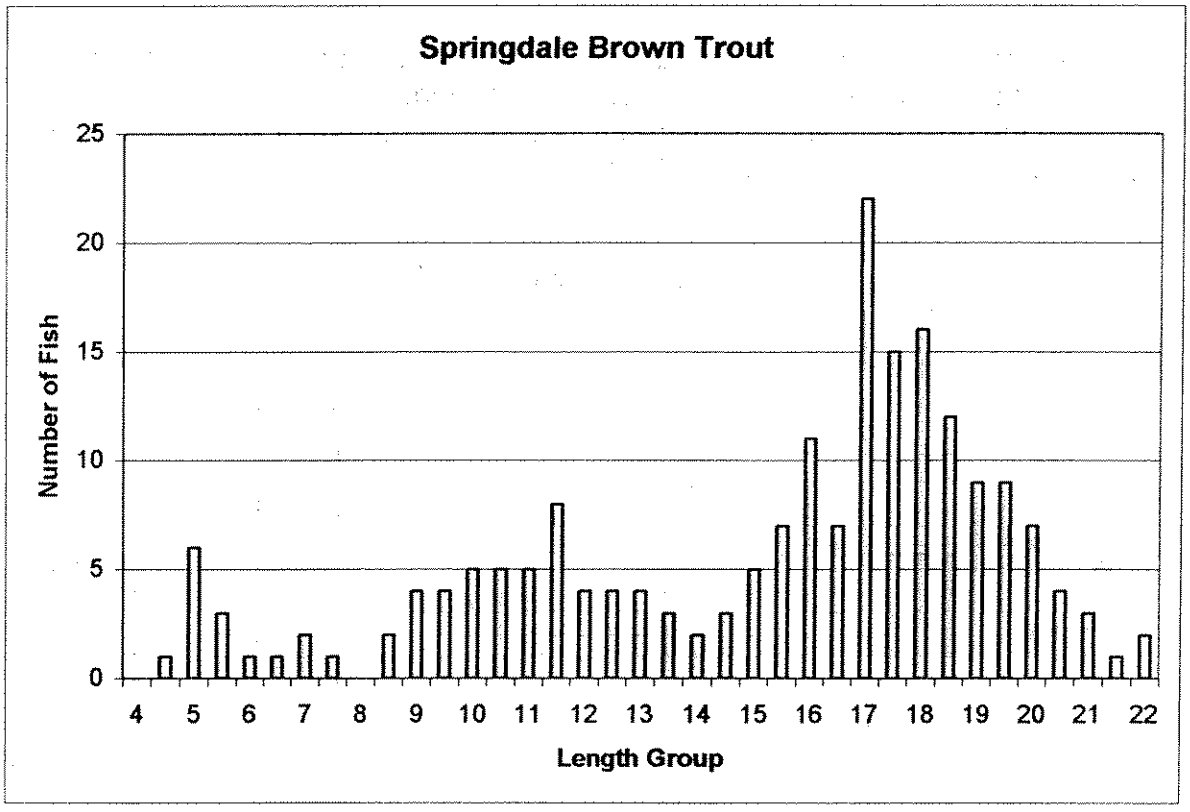

Figure 20. Brown trout length frequency distribution in the Springdale section of the Yellowstone River based on spring sampling 2004.

Estimates of brown and rainbow trout abundance in one section of the Shields River based on spring sampling in 2004.

Data for brown trout collected in the Shields River this spring fit the log-likelihood model well (Table 4). Modified Peterson was used to generate a population estimate for rainbow trout because the data did not fit the log-likelihood model.

Table 4. Brown and rainbow trout/mile in the Convict Grade section of the Shields River based on spring sampling in 2004. Estimates are for fish seven inches (TL) or longer.

Section (mark date):			Overall model			Pooled model		
	N	SD	DF	Chi-square	P	DF	Chi-square	P \[1]
Convict Grade (April 9):								
Rainbow	296	118.9		*			*	
Brown	189	33.4	7	11.44	0.12	6	10.75	0.09

1. N=estimated number; SD=standard deviation; DF=degrees of freedom; P=probability value.
2. * = Modified Peterson estimate

In both sections, brown trout abundance was similar compared to other recent surveys at these same locations (Figure 21). Abundance was also similar between the upstream and downstream locations, a pattern of similarity noted in earlier reports (e.g., Tohtz 2001a; Tohtz 2001b).

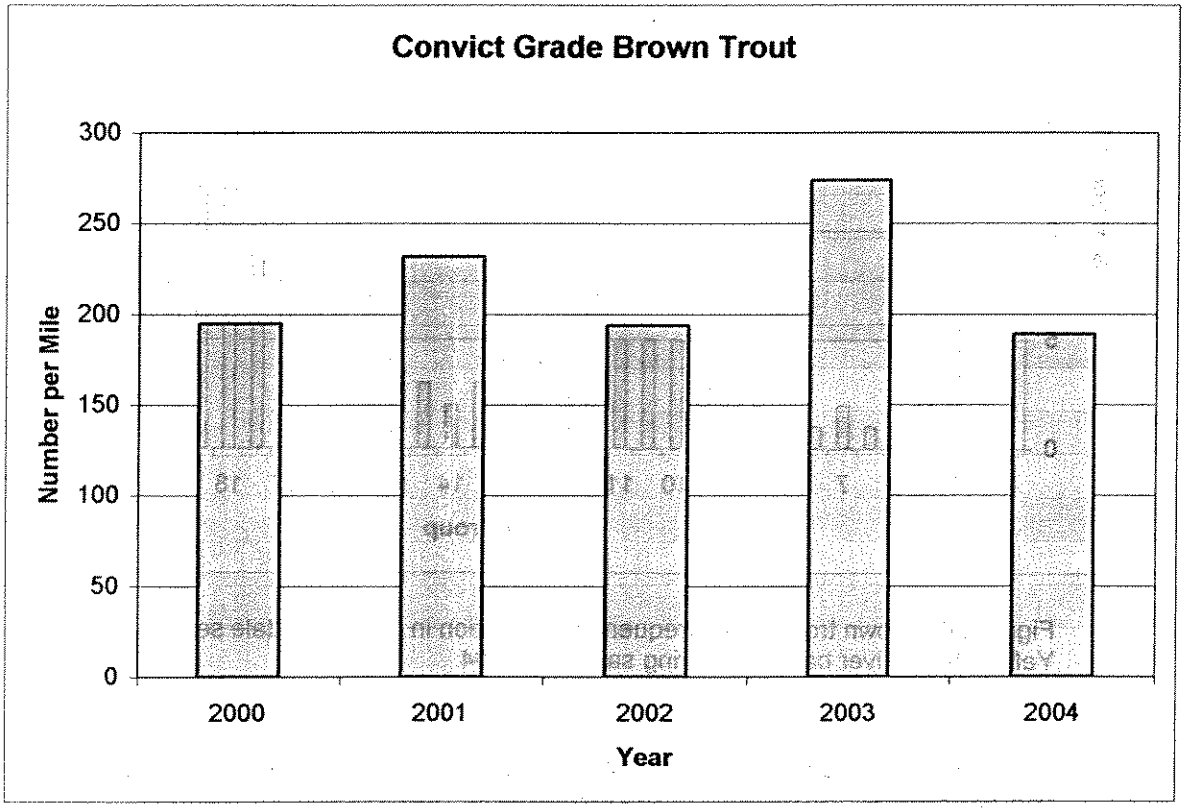

Figure 21. Brown trout abundance in the Convict Grade section of the Shields River based on spring sampling from 2000 through 2004. Estimates are for fish seven inches (TL) or longer.

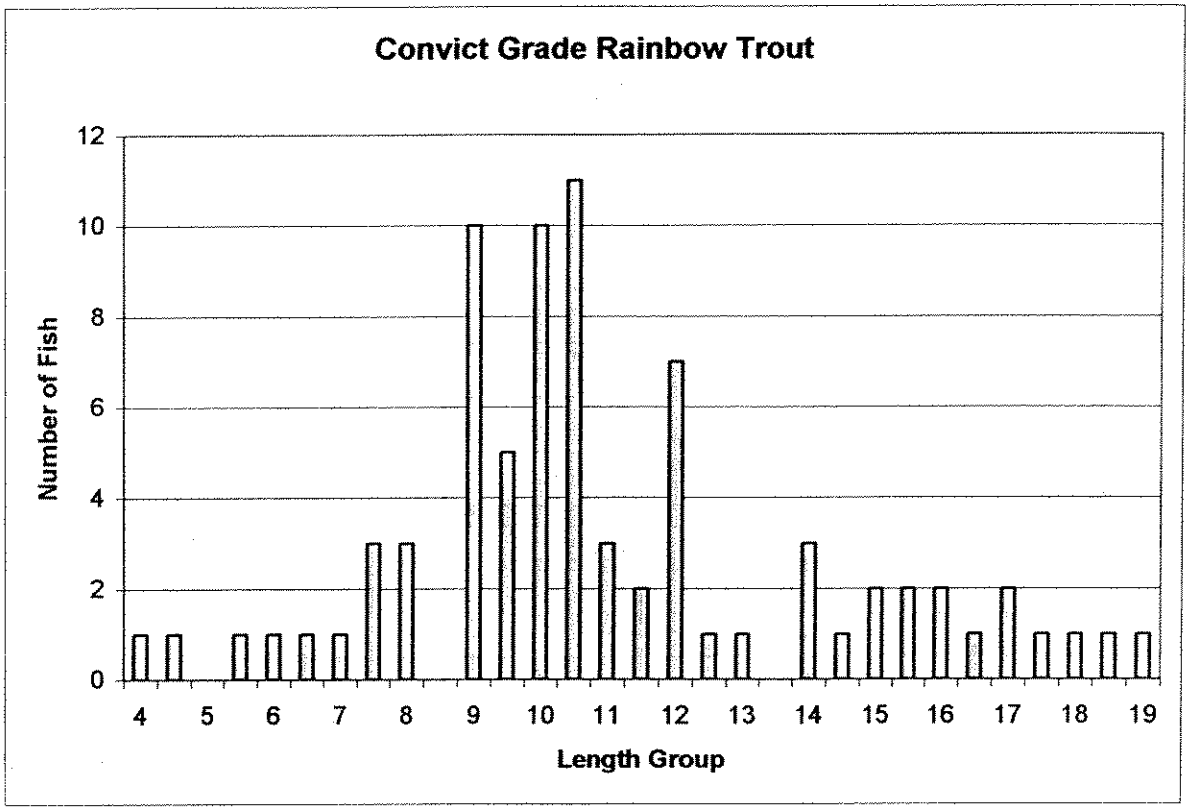

Figure 22. Rainbow trout length frequency distribution in the Convict Grade section of the Shields River based on spring sampling 2004.

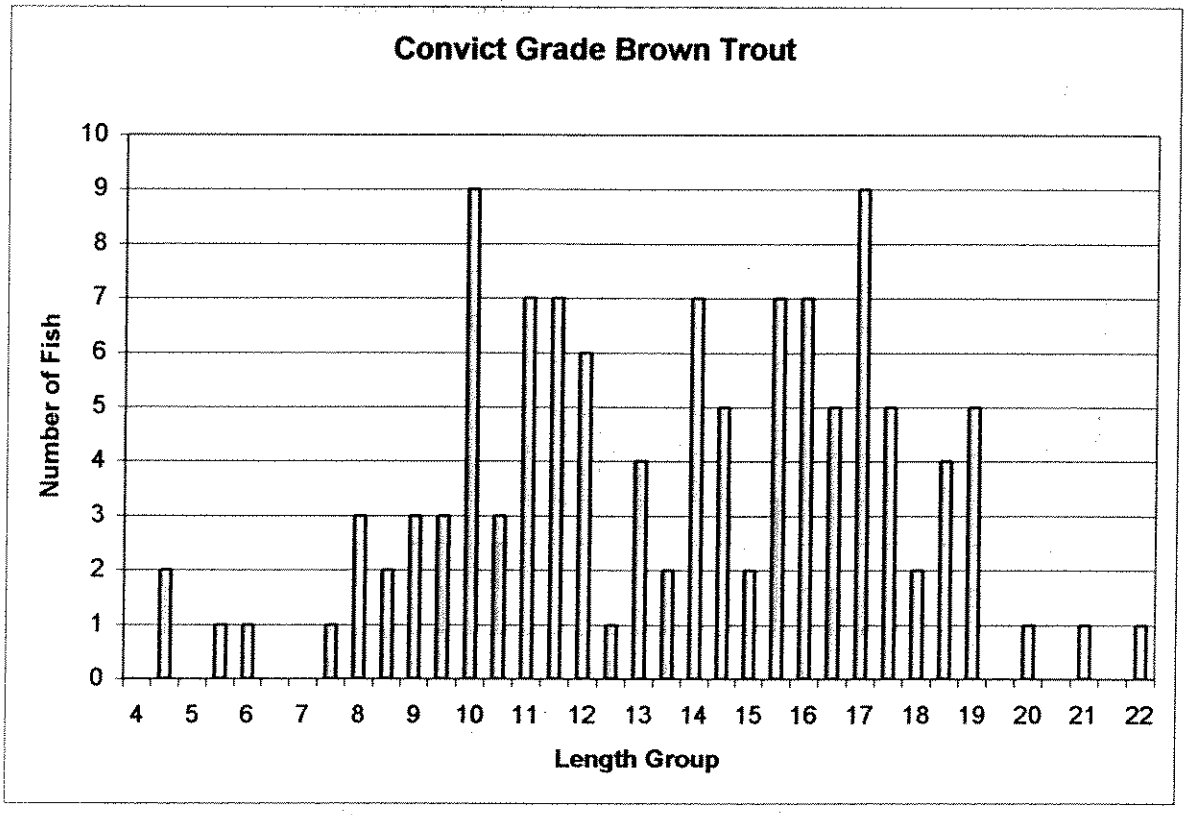

Figure 23. Brown trout length frequency distribution in the Convict Grade section of the Shields River based on spring sampling 2004.

Summary of gillnet catches at Dailey Lake: spring 2004.

The average number of rainbow trout caught in each gillnet at Dailey Lake was much larger in 2003 compared to similar sampling efforts in recent years (Table 9). Average fish length was smaller because all of the increased catch is explained by a larger number of smaller fish in the sample (Figure 19). A larger number of smaller fish indicates good survivorship of recently stocked rainbow trout.

Table 5. Summaries of gillnet catches at Dailey Lake based on spring sampling from 1997 through 2004.

		Rainbow trout		Yellow perch		Walleye	
Year	Set date	Fish/net	Mean TL (inches)	Fish/net	Mean TL (inches)	Fish/net	Mean TL (inches)
1997	04/23	9.8	17.4	35.8	8.8	15.3	14.6
1998	05/03	5.8	18.9	59.0	8.9	15.8	10.6
1999	04/27	10.3	15.0	210.3	6.3	15.0	13.4
2000	05/16	4.8	16.2	14.5	8.9	11.8	13.2
2001	05/17	4.5	17.4	8.5	8.5	11.8	13.5
2002	05/20	5.3	15.7	28.5	8.9	11.5	13.1
2003	05/14	22.8	9.1	58.0	8.2	8.8	12.4
2004	05/10	8.5	13.3	17.5	8.4	16.8	13.5

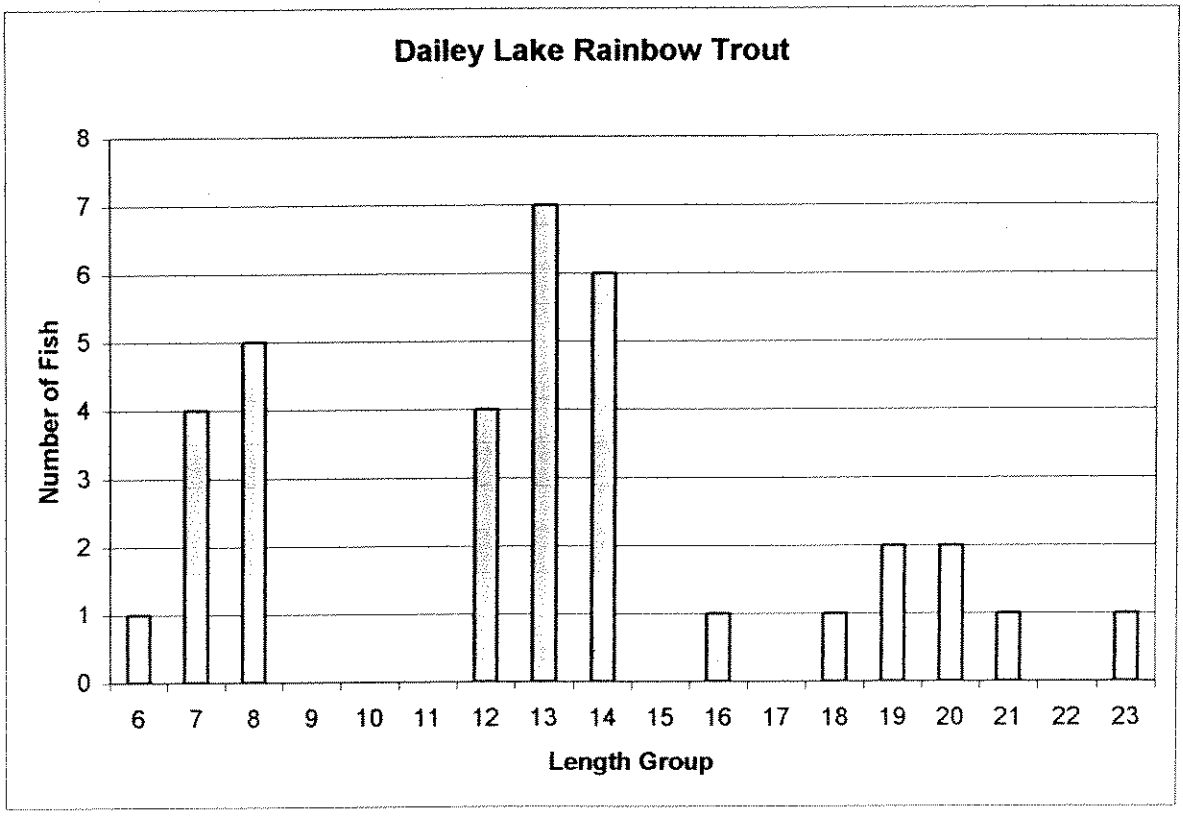

Figure 24. Length frequency distribution of rainbow trout caught in gillnets at Dailey Lake in spring 2004.

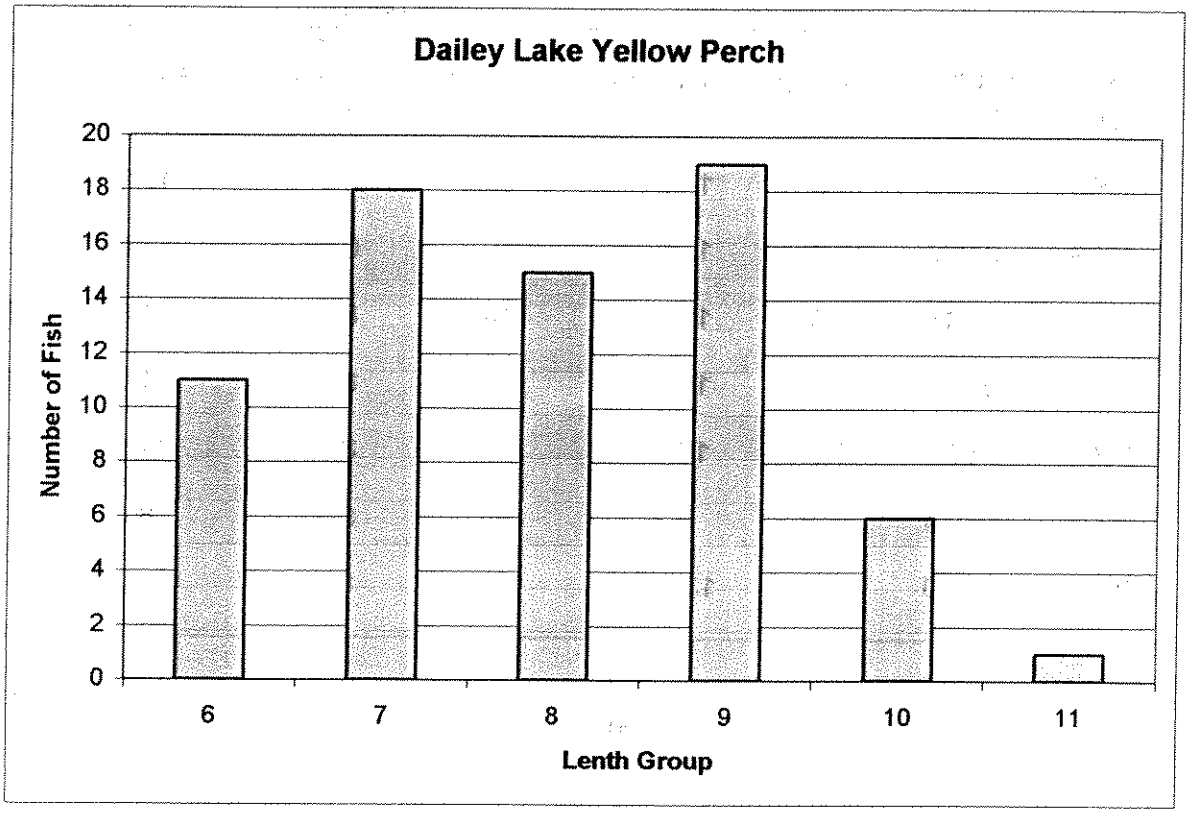

Figure 25. Length frequency distribution of yellow perch caught in gillnets at Dailey Lake in spring 2004.

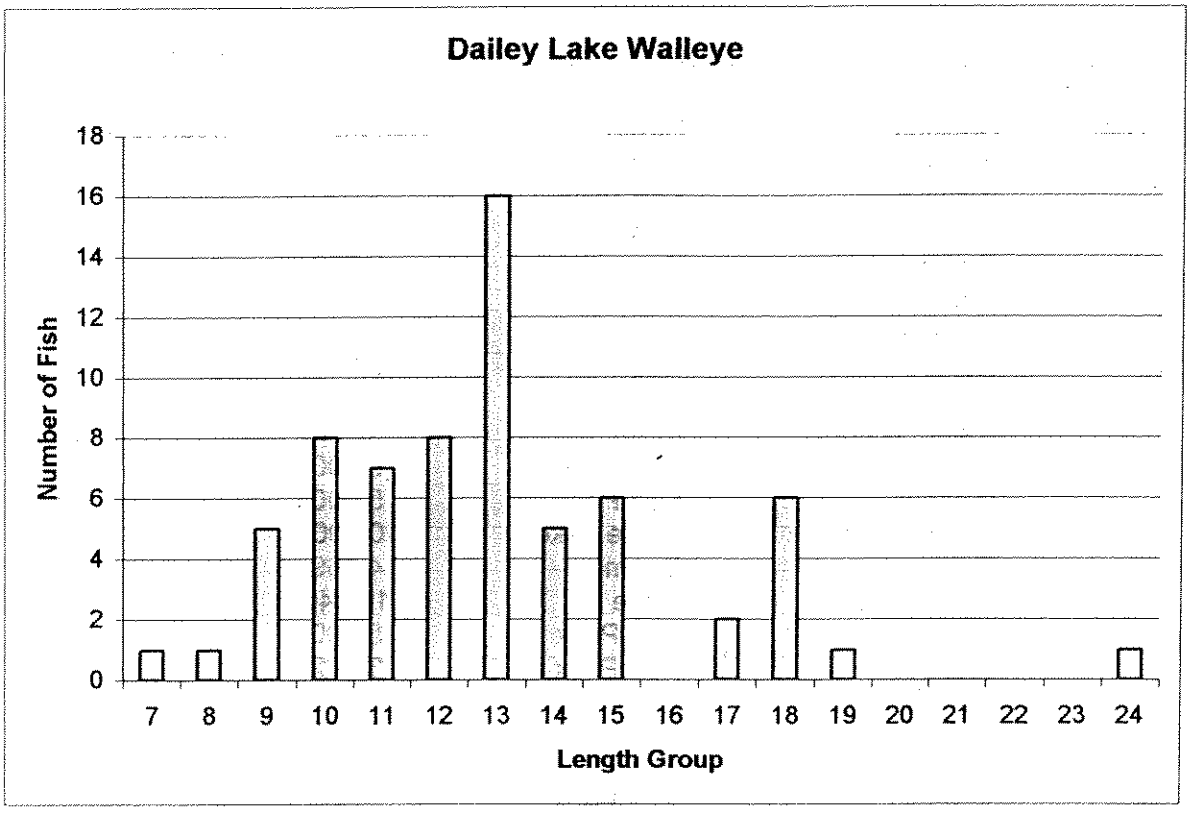

Figure 26. Length frequency distribution of walleye caught in gillnets at Dailey Lake in spring 2004.

The average length of yellow perch in our sample this year resembled last year's catch. Average length has been consistently similar now for several years (Table 5). The average number of yellow perch caught in our nets in recent years has increased (Table 5). Yellow perch continue to thrive in Dailey Lake.

The number of walleye caught in our nets this year was slightly less than our sample size in recent years (Table 5). Average length was also slightly less. Small differences like these could easily be explained by chance occurrences in sampling. Like rainbow trout and yellow perch, walleye seem to be maintaining steady growth and abundance over time. For these reasons, current stocking rates (Table 6) will be continued at this time.

Table 6. Numbers of walleye and rainbow trout stocked in Dailey Lake from 1999 through 2004.

Year	Species	Strain	Number	Mean length (in)
1999	Walleye	Fort Peck	5,000	1.6
	Walleye	Fort Peck	5,000	3.3
	Rainbow trout	Eagle Lake	10,098	4.8
	Rainbow trout	Desmet	5,000	5.3
2000	Walleye	Fort Peck	5,000	1.6
	Walleye	Fort Peck	5,000	3.3
	Rainbow trout	Eagle Lake	10,000\[1]	3.5\[1]
	Rainbow trout	Desmet	4,769	4.6
	Rainbow trout	Arlee	10,140	2.5
2001	Walleye	Fort Peck	5,000	1.6
	Walleye	Fort Peck	5,000	3.5
	Rainbow trout	Eagle Lake	10,000\[1]	3.5\[1]
	Rainbow trout	Desmet	4,769	4.6
	Rainbow trout	Arlee	10,140	2.5
2002	Walleye	Fort Peck	5,000	1.7
	Walleye	Fort Peck	3,542	2.6
	Rainbow trout	Eagle Lake	10,305	3.8
	Rainbow trout	Desmet\[2]	5,049	5.0
	Rainbow trout	Arlee	10,392	3.0
2003	Walleye	Fort Peck	5,000	1.1
	Walleye	Fort Peck	5,069	3.0
	Rainbow trout	Eagle Lake	10,179	3.5
	Rainbow trout	Desmet\[2]	5,227	6.3
	Rainbow trout	Arlee	10,000	3.8
2004	Walleye	Fort Peck	5,000	1.5
	Walleye	Fort Peck	5,000	2.4
	Rainbow Trout	Eagle Lake	*	*
	Rainbow Trout	Desmet\[2]	5,000	5.6
	Rainbow Trout	Arlee	10,000	3.5

1. Approximate
2. The "Desmet" strain rainbow stocked at Dailey Lake includes other wild rainbow strains.

* The Eagle Lake strain of rainbow trout were not stocked as a result of Big Springs Hatchery being shut down and reallocation of fish across the state.

LITERATURE CITED

Anonymous. 1994. MarkRecapture version 4.0: a software package for fishery population estimates. Montana Department of Fish, Wildlife and Parks, Bozeman.

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Shepard, B.B. 1993. Fisheries of Dailey lake: annual report for 1991 and 1992. Progress report for federal aid project F-46-R-2. Montana Department of Fish, Wildlife and Parks, Bozeman.

Tohtz, J. 1996. Fisheries investigations in the Yellowstone and Shields river basins, Park County, Montana. Progress report for federal aid project F-78-R-1 and F-78-R-2. Montana Department of Fish, Wildlife and Parks, Bozeman.

Tohtz, J. 1998. Fisheries investigations in the Yellowstone and Shields river basins, Park County, Montana: FY 1998. Progress report for federal aid project F-78-R-4. Montana Department of Fish, Wildlife and Parks, Bozeman.

Tohtz, J. 1999. Fisheries investigations in the Yellowstone and Shields river basins, Park County, Montana: Annual Report for 1999. Progress report for federal aid project F-78-R-4. Montana Department of Fish, Wildlife and Parks, Bozeman.

Tohtz, J. 2001a. Fisheries investigations in the Yellowstone and Shields river basins, Park County, Montana: Annual Report for 2000. Progress report for federal aid project F-113-R-1. Montana Department of Fish, Wildlife and Parks, Bozeman.

Tohtz, J. 2001b. Fisheries investigations in the Yellowstone and Shields river basins, Park County, Montana: Annual Report for 2001. Progress report for federal aid project F-113-R-1. Montana Department of Fish, Wildlife and Parks, Bozeman

Tohtz, J. 2003. Fisheries investigations in the Yellowstone and Shields river basins, Park County, Montana: Annual Report for 2002. Progress report for federal aid project F-113-R-2. Montana Department of Fish, Wildlife and Parks, Bozeman

Tohtz, J. 2003. Fisheries investigations in the Yellowstone and Shields river basins, Park County, Montana: Annual Report for 2003. Progress report for federal aid project F-113-R-3. Montana Department of Fish, Wildlife and Parks, Bozeman