F-113-R-1

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

ANNUAL REPORT FOR 2000

Federal Aid Project F-113-R-1

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ABSTRACT

Estimates of rainbow, brown, and cutthroat trout abundance in the Corwin Springs and Springdale sections of the Yellowstone river were similar in 2000 to estimates from previous years. Fish numbers near Livingston increased dramatically. In the Ninth Street section, rainbow trout larger than seven inches were 2,250 fish/mile this year compared to 974 fish/mile in 1999.

The abundance of mountain whitefish larger than six inches in the Shields river was estimated to be about 1,200 fish/mile near Clyde Park, and about 1,500 fish/mile near the Shields river mouth. Brown trout abundance of fish larger than six inches was estimated to be 157 and 195 fish/mile respectively at these same locations.

The average size of rainbow trout in spring gillnet catches at Dailey lake was 16.2 inches this year. Walleye averaged 11.8 inches. Average length of yellow perch increased from 6.3 inches in 1999 to 8.9 inches in 2000.

The number of yellow perch caught in spring gillnets at Dailey lake decreased substantially in 2000 compared to the number of fish caught in 1999. Increased size, and lower abundance of yellow perch are desirable trends at this time.

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 2000 (July 1, 1999 to June 30, 2000), project objectives for state project number 3301 (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 2000.

B. Estimates of fish abundance in two sections of the Shields river based on spring sampling in 2000.

C. Summary of year 2000 spring gillnet catches at Dailey lake.

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 2000 these meetings included participation in a Governor's task force investigating management issues affecting the upper Yellowstone river, work supporting the Upper Shields Watershed Association, educational seminars for local elementary 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

A. Estimates of trout abundance in three sections of the Yellowstone river based on spring sampling in 2000.

This spring we sampled trout abundance in three sections of the Yellowstone river (Table1; Figure1) that are normally examined as part of routine fisheries surveys (e.g., Tohtz 1996a; Tohtz 1998).

Table 1. Survey sections where trout abundance was sampled from the Yellowstone river in 2000.

Section name	Survey date	Length (ft)	Approximate location /1		
Corwin Springs	04/17/00	24,552	upper boundary	North	45 06' 50"
				West	110 47' 37"
			lower boundary	North	45 09' 78"
				West	110 50' 23"
Ninth Street	04/10/00	11,814	upper boundary	North	45 39' 29"
				West	110 33' 01"
			lower boundary	North	45 40' 74"
				West	110 32' 10"
Springdale	04/07/00	20,064	upper boundary	North	45 41' 70"
				West	110 16' 82"
			lower boundary	North	45 43' 73"
				West	110 14' 34"

1. Latitude and longitude (degrees, minutes, seconds).

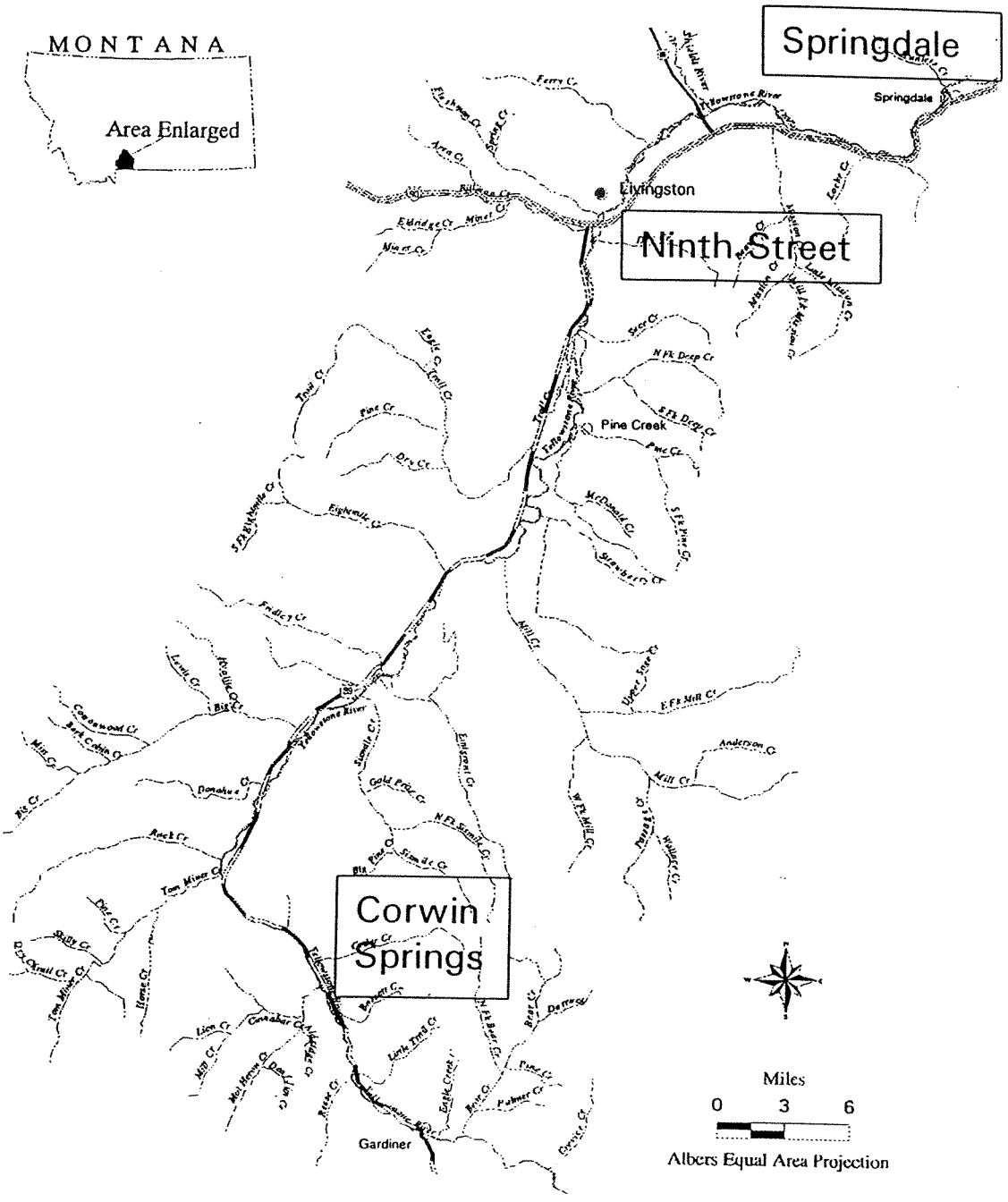

Figure 1. Upper Yellowstone drainage showing three areas where trout abundance was sampled from the Yellowstone river in spring, 2000.

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.

Fish were collected in live cars, identified[A], measured to the nearest 0.1 inch[B], 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 available in software from Montana Fish, Wildlife and Parks (FWP; Anon. 1994). Estimates were evaluated for reliability at alpha = 0.05. Fish were separated into one-inch length groups for all abundance analyses.

A. Common names for fish are used in this report. Scientific names are listed in Appendix A.

B. All fish lengths are total lengths (TL).

B. Estimates of fish abundance in two sections of the Shields river based on spring sampling in 2000.

This spring we sampled fish abundance in the Convict Grade and Todd sections of the Shields river (Figure 2; Table 2). These sections

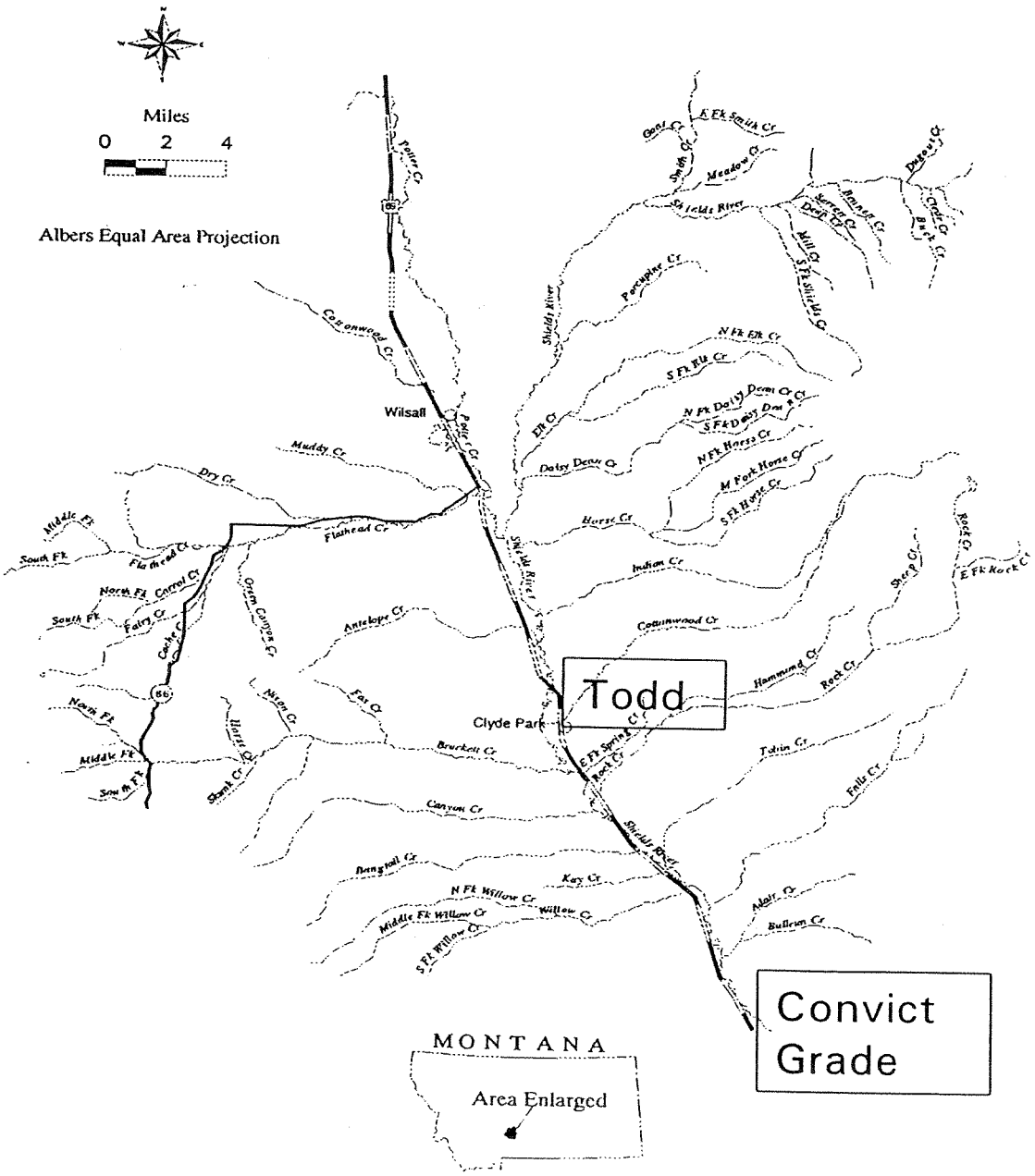

Figure 2. Shields river drainage showing locations of the Convict Grade and the Todd sample sections.

are sampled frequently, usually every year, to help monitor trout abundance in the mainstem Shields river.

Table 2. Shields river sections surveyed in spring, 2000.

Section name	Section length (ft)	Location\1
Todd	7,500	T2N, R9E, S33
Convict Grade	7,725	T1S, R10E, S22, 23

1. Township, Range, Section

Fish were sampled in both sections 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.

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 MR4, a computer program developed by FWP for processing electrofishing records (Anon. 1994). Fish numbers were estimated using the log-likelihood model.

C. Summary of year 2000 spring gillnet catches at Dailey lake.

Gillnet sampling in year 2000 mimicked previous spring sampling (e.g., Tohtz 1999). A single overnight set using two floating and two sinking experimental gillnets (Shepard 1993) determined the entire sample. Results in year 2000 are compared to several previous years.

RESULTS AND DISCUSSION

A. Estimates of trout abundance in three sections of the Yellowstone river based on spring sampling in 2000.

Data for rainbow trout, brown trout, and cutthroat trout from each of the sections sampled in 2000 fit the log-likelihood model well (Table 3).

Table 3. Trout/mile in three sections of the Yellowstone river based on spring sampling in 2000. 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 17):								
Rainbow trout	501	154	7	3.19	0.87	5	1.98	0.85
Brown trout	291	58	10	13.80	0.18	6	12.45	0.05
Cutthroat trout	399	46	7	5.98	0.54	5	4.95	0.42
Ninth Street (April 10):								
Rainbow trout	2282	301	8	7.94	0.44	4	4.34	0.36
Brown trout	254	89	6	2.23	0.90	2	1.87	0.39
Cutthroat trout	110	49	2	2.72	0.26	1	1.09	0.30
Springdale (April 7):								
Rainbow trout	518	54	11	9.53	0.57	10	9.53	0.48
Brown trout	263	93	8	10.45	0.23	7	9.44	0.22
Cutthroat trout	143	36	3	4.02	0.26	2	3.61	0.16

1. N = estimated number; SD = standard deviation; DF = degrees of freedom; P = probability value.

Corwin Springs Section

Cutthroat trout and rainbow trout abundance in the Corwin Springs section this year was similar to estimates from previous years. Both species continue to do well in the aftermath of large floods in 1996 and 1997 (Tohtz 1996b; Tohtz 1997; Figure 3).

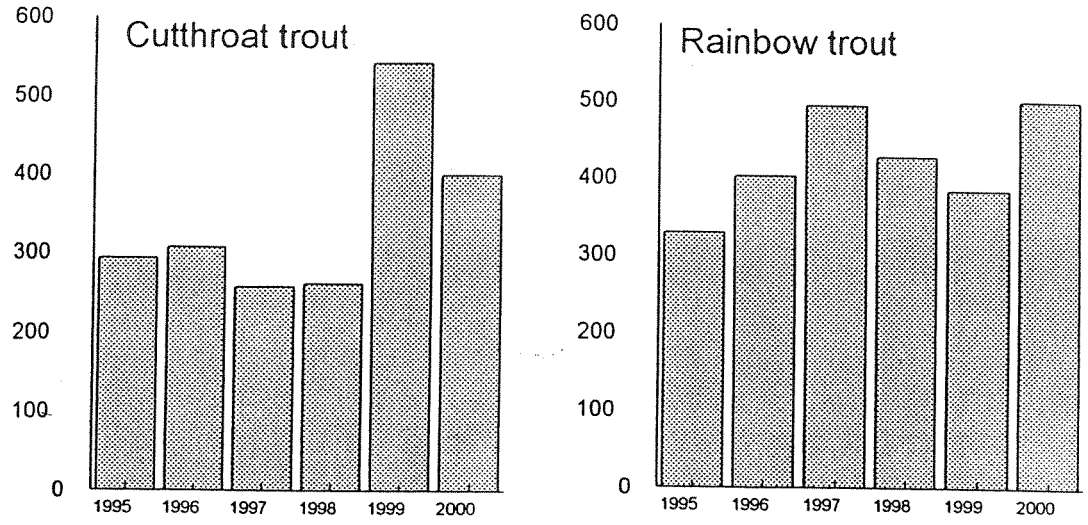

Figure 3. Cutthroat tout and rainbow trout abundance in the Corwin Springs section of the Yellowstone river based on spring sampling from 1995 through 2000. Estimates are for fish seven inches (TL) or longer. Vertical scales are fish/mile.

Brown trout abundance in the Corwin Springs section this year was also similar to previous years (Figure 4), again suggesting stable trout recruitment in this area of the river.

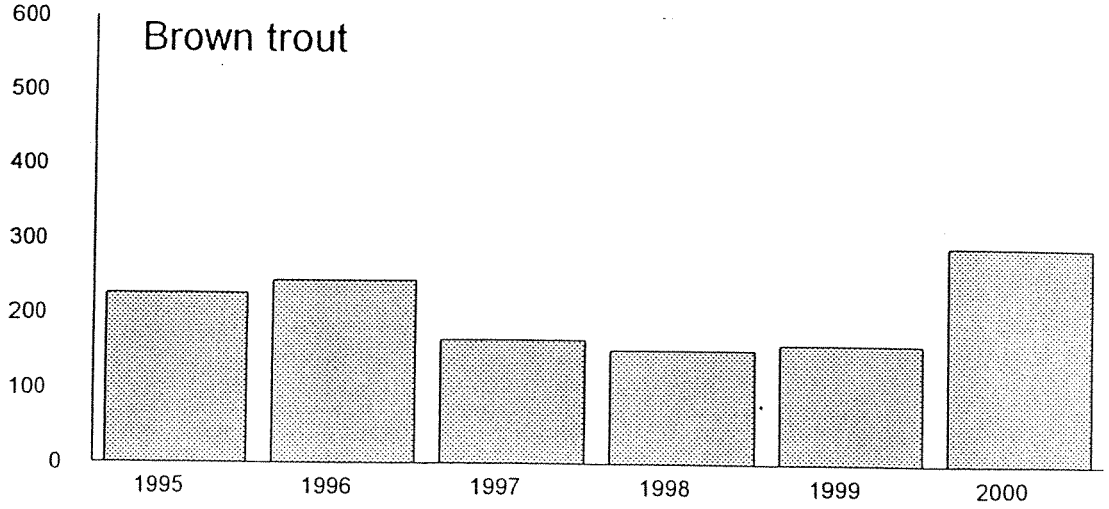

Figure 4. Brown trout abundance in the Corwin Springs section of the Yellowstone river based on spring sampling from 1995 through 2000. Estimates are for fish seven inches (TL) or longer. Vertical scale is fish/mile.

Springdale Section

Cutthroat, rainbow, and brown trout abundance in the Springdale section was similar in 2000 to estimates from previous years (Figure 5; Figure 6). Fish numbers remain remarkably stable at this location. Rainbow trout abundance may actually be increasing, although the trend is not statistically meaningful at this time.

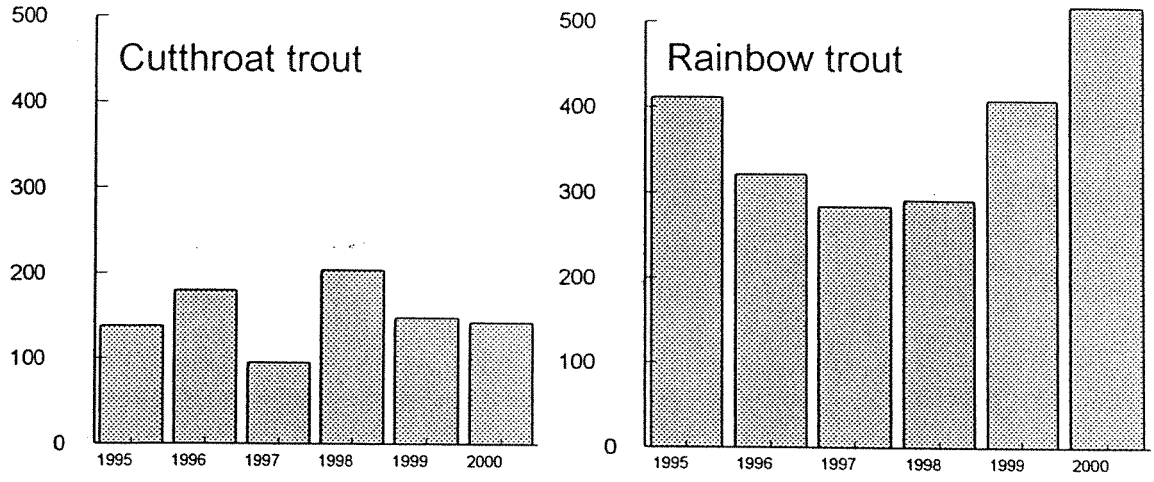

Figure 5. Cutthroat trout and rainbow trout abundance in the Springdale section of the Yellowstone river based on spring sampling from 1995 through 2000. Estimates are for fish seven inches (TL) or longer. Vertical scales are fish/mile.

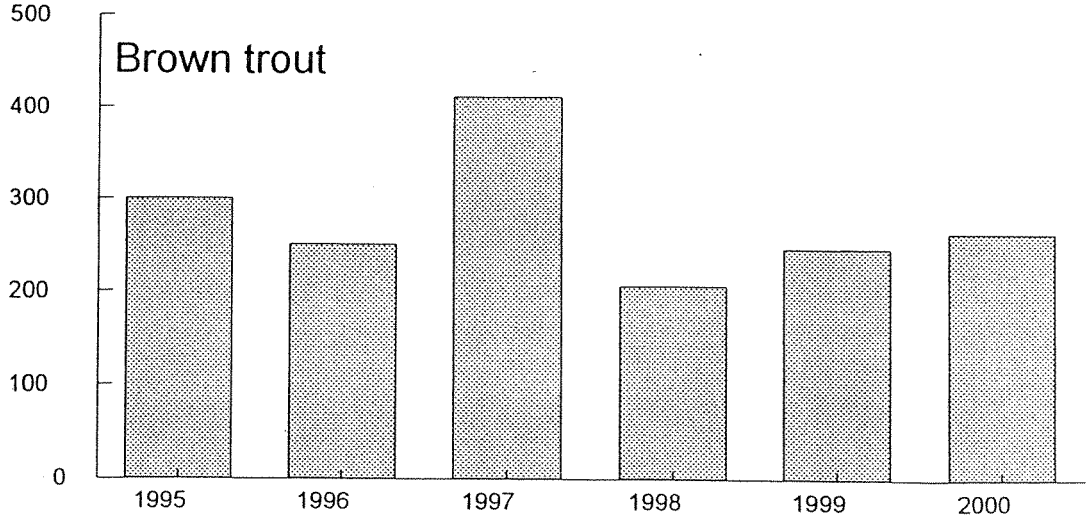

Figure 6. Brown trout abundance in the Springdale section of the Yellowstone river based on spring sampling from 1995 through 2000. Estimates are for fish seven inches (TL) or longer. Vertical scale is fish/mile.

Ninth Street section

Cutthroat and brown trout in the Ninth Street section were again captured in adequate numbers this year to produce reliable population estimates using mark-recapture techniques. Their abundance was similar to previous years for which these types of estimates are available (Figure 7).

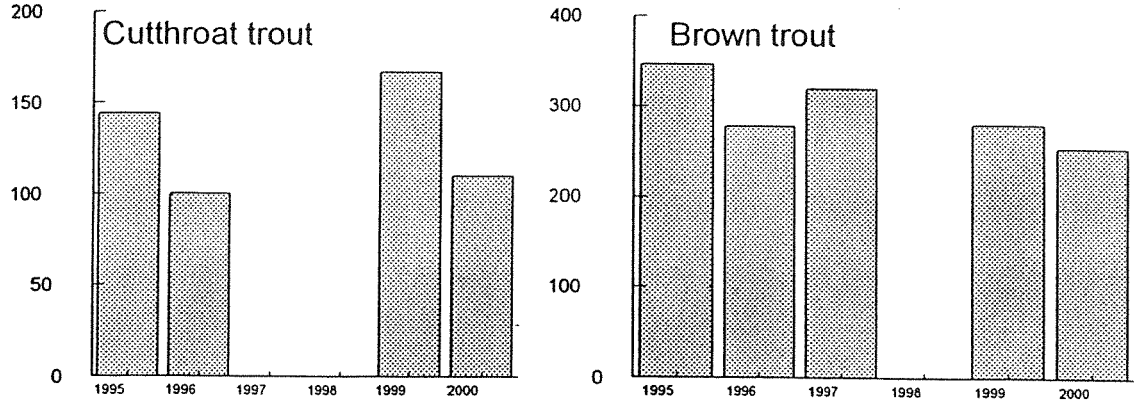

Figure 7. Cutthroat trout and brown trout abundance in the Ninth Street section of the Yellowstone river based on spring sampling from 1995 through 2000. Estimates are for fish seven inches (TL) or longer. Vertical scales are fish/mile. Vertical scales differ. Missing values are years for which no reliable estimate could be calculated from the available capture data.

Rainbow trout abundance in the Ninth Street section increased dramatically this year, continuing a trend of population increase begun last year (Figure 8). This increase is attributable to a greater abundance of both large and

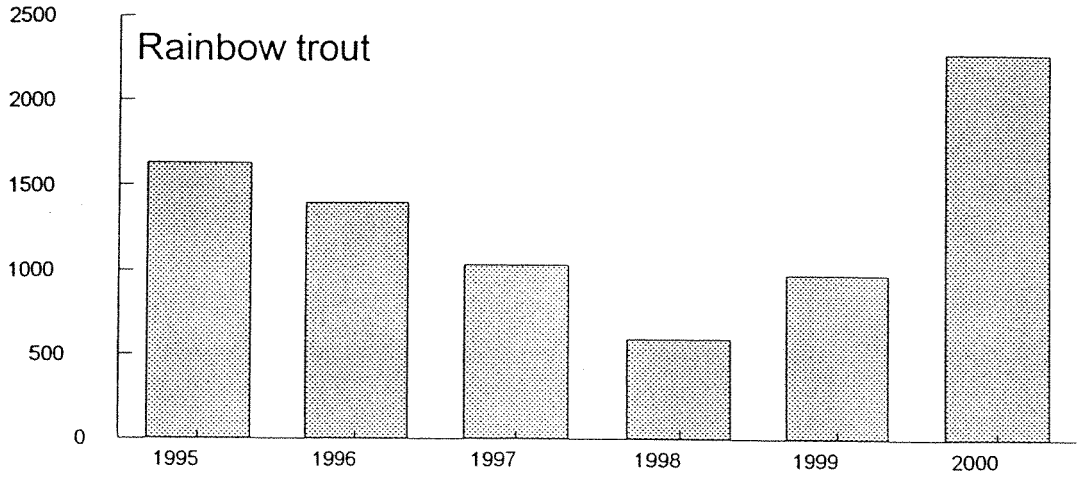

Figure 8. Rainbow trout abundance in the Ninth Street section of the Yellowstone river based on spring sampling from 1995 through 2000. Estimates are for fish seven inches (TL) or longer. Vertical scale is fish/mile.

small fish (Figure 9). More large fish have moved into this area as the channel recovers from damage it suffered in the 1996 and 1997 floods. Recruitment and survivorship of young fish has been especially good in recent years.

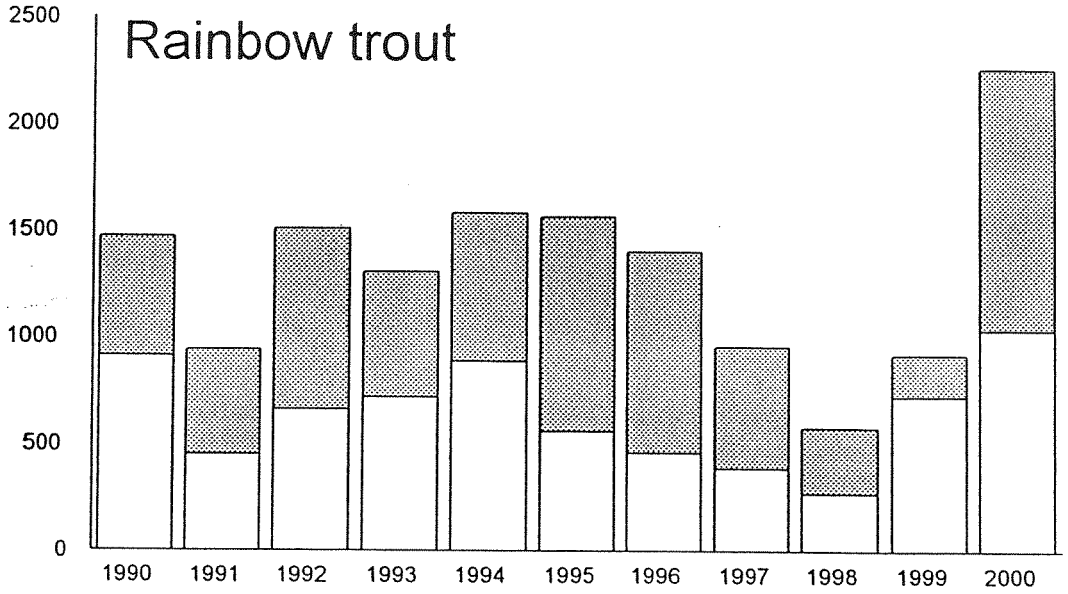

Figure 9. Rainbow trout abundance in the Ninth Street section of the Yellowstone river based on spring sampling from 1990 through 2000. The open (small fish) and shaded (large fish) intervals of each bar show the relative contribution of fish less than 12 inches TL, and fish 12 inches or larger, to the total estimate of fish abundance each year. Vertical scale is fish/mile.

B. Estimates of fish abundance in two sections of the Shields river based on spring sampling in 2000.

Data for several fish species collected in the Convict Grade and Todd sections of the Shields river this spring fit the log-likelihood model well (Table 4). We routinely find many mature rainbow trout in the lower

Table 4. Fish/mile in two sections of the Shields river based on spring sampling in 2000. Estimates are for fish six inches (TL) or longer.

Section (mark date):			Overall model			Pooled model		
Fish species	N	SD	DF	Chi-square	P	DF	Chi-square	P /1
Todd (March 23):								
Brown trout	157	18	8	6.43	0.60	6	6.29	0.39
Mountain whitefish	1205	92	6	4.10	0.66	5	4.07	0.54
Convict Grade (March 20):								
Rainbow trout	285	60	3	3.98	0.26	1	2.97	0.08
Brown trout	195	28	7	9.88	0.20	4	6.23	0.18
Mountain whitefish	1536	218	6	6.49	0.37	1	1.43	0.23

Shields river each spring. Presumably these fish have moved into the Shields river from the Yellowstone river to spawn. Rainbow trout abundance drops dramatically above a cross-channel diversion structure located about ten miles upstream from the Shields river confluence with the Yellowstone river. This diversion structure apparently limits fish passage upstream, but may not be a total fish passage barrier. Near Clyde Park (the Todd section), for example, we usually find a few rainbow trout. These trout contribute to our concerns about hybridization with native Yellowstone cutthroat trout.

Brown trout abundance of fish greater than six inches was similar in the Convict Grade and Todd sections this spring (Table 4). Curiously, brown trout abundance tends to be similar regardless of where fish are sampled in the Shields river, and it also tends to fluctuate synchronously at all locations

in any given year (Tohtz 1999; Figure 10). Similar fish abundance and similar annual fluctuations at widely disparate locations suggest population limitations. Chronic dewatering, and associated warm summer temperatures, are suspected to be significant factors affecting brown trout population dynamics at this time.

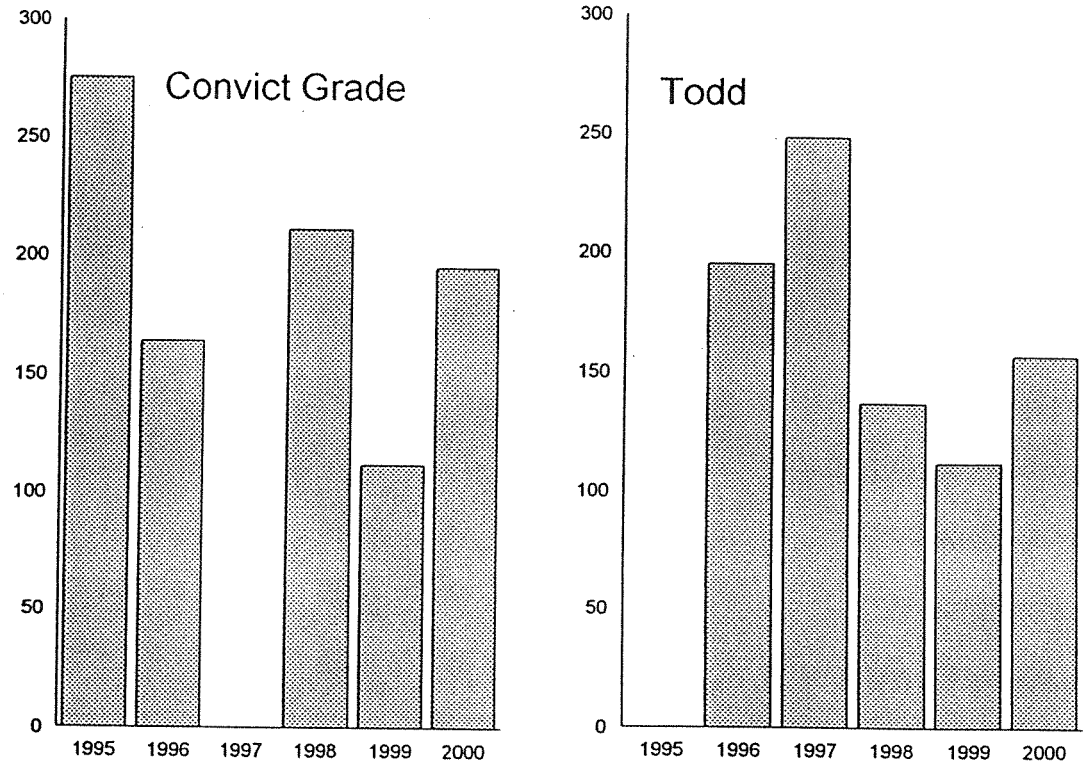

Figure 10. Brown trout abundance in the Convict Grade and Todd sections of the Shields river based on spring sampling from 1995 through 2000. Estimates are for fish six inches (TL) or longer. Missing bars are years for which no data are available. Vertical scales are fish/mile.

C. Summary of year 2000 spring gillnet catches at Dailey lake.

The average number of rainbow trout caught in each gillnet at Dailey lake was less in 2000 than in 1999. Average fish length increased (Table 5).

Table 5. Summaries of gillnet catches at Dailey lake based on spring sampling from 1990 through 2000.

		Rainbow trout		Yellow perch		Walleye	
Year /1	Set date	Fish/net	Mean TL (inches)	Fish/net	Mean TL (inches)	Fish/net	Mean TL (inches)
1990	04/30	8.2	12.8	48.7	7.4	4.7	11.4
1991	05/14	5.3	14.8	21.8	7.5	3.0	12.0
1992	05/04	7.3	15.1	58.3	7.7	4.5	12.7
1993	----------	----------	no	information	----------	----------	
1994	05/12	9.3	15.2	32.3	8.7	11.5	11.3
1995	05/18	13.5	14.6	71.5	8.0	2.5	13.7
1996	----------	----------	no	information	----------	----------	
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

1. Data summaries for years 1990 through 1992 are from Shepard 1993.

An additional 10,000 Arlee strain rainbow trout requested last year (Tohtz 1999) were available this year and stocked to augment the rainbow fishery (Table 6).

Table 6. Numbers of walleye and rainbow trout stocked in Dailey lake from 1997 through 2000.

Year	Species	Variety	Number	Mean length (in)
1997	Walleye	Fort Peck	10,000	1.2
	Walleye	Fort Peck	4,810	3.2
	Rainbow trout	Eagle Lake	10,050	3.3
	Rainbow trout	Desmet	2,960 /1	6.7
1998	Walleye	Fort Peck	10,000	1.4
	Walleye	Fort Peck	5,000	2.5
	Rainbow trout	Eagle Lake	10,192	3.9
	Rainbow trout	Desmet	5,440	5.3
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	10,000/2	3.5/2
	Rainbow trout	Desmet	4,769	4.6
	Rainbow trout	Arlee	10,140	2.5

1. Number adjusted for loss of approximately 400 fish during transport from the hatchery.
2. Approximate

Yellow perch numbers in our samples were less this spring compared to previous years (Table 5), and average length increased. This result suggests that slight modifications in the stocking program last year (Tohtz 1999) are having their desired effect.

The number of walleye caught in our nets was slightly less this year compared to recent years, but average size was similar (Table 5). Walleye growth rate is consistently slow at Dailey lake.

LITERATURE CITED

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

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. 1996a. 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. 1996b. Fisheries investigations in the Yellowstone and Shields river basins, second report, 1996. Progress report for federal aid project F-78-R-2. Montana Department of Fish, Wildlife and Parks, Bozeman.

Tohtz, J. 1997. Fisheries investigations in the Yellowstone and Shields river basins, Park County, Montana: FY 1997. Progress report for federal aid project F-78-R-3. 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.

APPENDIX A: Common and scientific names for fish referred to in this report.

Common name	Scientific name
Brown trout	*Salmo trutta*
Mountain whitefish	*Prosopium williamsoni*
Rainbow trout	*Oncorhynchus mykiss*
Walleye	*Stizostedion vitreum*
Yellow perch	*Perca flavescens*
Yellowstone cutthroat trout (cutthroat trout)	*Oncorhynchus clarki bouvieri*