F-78-R-4
Region 3

FISHERIES INVESTIGATIONS IN THE YELLOWSTONE AND SHIELDS RIVER BASINS, PARK COUNTY, MONTANA: FY 1998

Progress Report for Federal Aid
Project F-78-R-4

by

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ABSTRACT

Estimates of rainbow, brown, and cutthroat trout abundance in the Corwin Springs, Mill Creek Bridge, and Springdale sections of the Yellowstone river were similar in 1998 to estimates from previous years. Fish numbers near Livingston declined. In the Ninth Street section, rainbow trout larger than seven inches were 20 to 50 percent less abundant this year than in 1996; brown trout and cutthroat trout were too scarce to reliably estimate their abundance using mark recapture techniques.

Brown trout abundance in the Shields river was similar this year to estimates from previous surveys in the Todd and Convict Grade sections. About 140 fish larger than seven inches were estimated each river mile near Clyde Park; 210 fish were estimated each river mile near the Shields river mouth.

The average size of rainbow trout increased slightly this year in spring gillnet catches at Dailey lake to 18.9 inches, but fish less than 13 inches were missing from the sample. Rainbow abundance may have declined. The average size of walleye caught at Dailey lake was 10.4 inches, four inches less than their average size last year. Walleye abundance continues to increase. Yellow perch numbers remain abundant and stable: fish averaged 8.9 inches in gillnet samples.

Creel surveys in 1998 show strong seasonal variations of angling pressure, catch rate, and harvest of sport fish at Dailey lake. More than 45,000 yellow perch, 1,000 rainbow trout, and 1,800 walleye were estimated to have been caught at Dailey lake between January and September. During this period, overall catch rates for yellow perch, walleye, and rainbow trout were 2.08, 0.05, and 0.11 fish/hour, respectively. Fishing pressure averaged 8.6 angler hours/acre each month.

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 habitat and recreational fisheries in the upper Yellowstone and Shields river basins.

Local Project Objectives

In fiscal year 1998 (July 1, 1997 to June 30, 1998), 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 rainbow, brown, and cutthroat trout abundance in four sections of the Yellowstone river based on spring sampling in 1998.

B. Estimates of brown trout abundance in two sections of the Shields river based on spring sampling in 1998.

C. Summary of 1998 spring gillnet catches at Dailey lake.

D. Summary of creel surveys from Dailey lake, January through September, 1998.

State survey, inventory, and fish population management objectives are addressed under headings A through D. 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 1998 these meetings included participation in a Governor's task force investigating management issues affecting the upper Yellowstone river, other committee and public sessions concerning flood damage and related river concerns, educational seminars for local elementary school children, and meetings with local Trout Unlimited and Walleye Unlimited 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 rainbow, brown, and cutthroat trout abundance in four sections of the Yellowstone river based on spring sampling in 1998.

This spring we sampled trout abundance in four sections of the Yellowstone river that are normally examined as part of routine fisheries surveys (Table 1; Figure 1). Section lengths varied slightly this year compared to recent surveys (e.g. Tohtz 1996a; Tohtz 1997) primarily to accommodate channel changes in some areas caused by record spring discharges in 1996 and 1997.

Table 1. Survey section locations on the Yellowstone river, 1998.

Section name	Length (feet)	Approximate location\1	
Corwin Springs	20,590	upper boundary	N 45 06' 500" W 110 47' 371"
		lower boundary	N 45 09' 779" W 110 50' 230"
Mill Creek Bridge	26,620	upper boundary	N 45 25' 167" W 110 38' 523"
		lower boundary	N 45 27' 415" W 110 37' 505"
Ninth Street	11,850	upper boundary	N 45 39' 290" W 110 33' 009"
		lower boundary	N 45 40' 738" W 110 32' 092"
Springdale	19,000	upper boundary	N 45 41' 697" W 110 16' 815"
		lower boundary	N 45 43' 730" W 110 14' 336"

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

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.

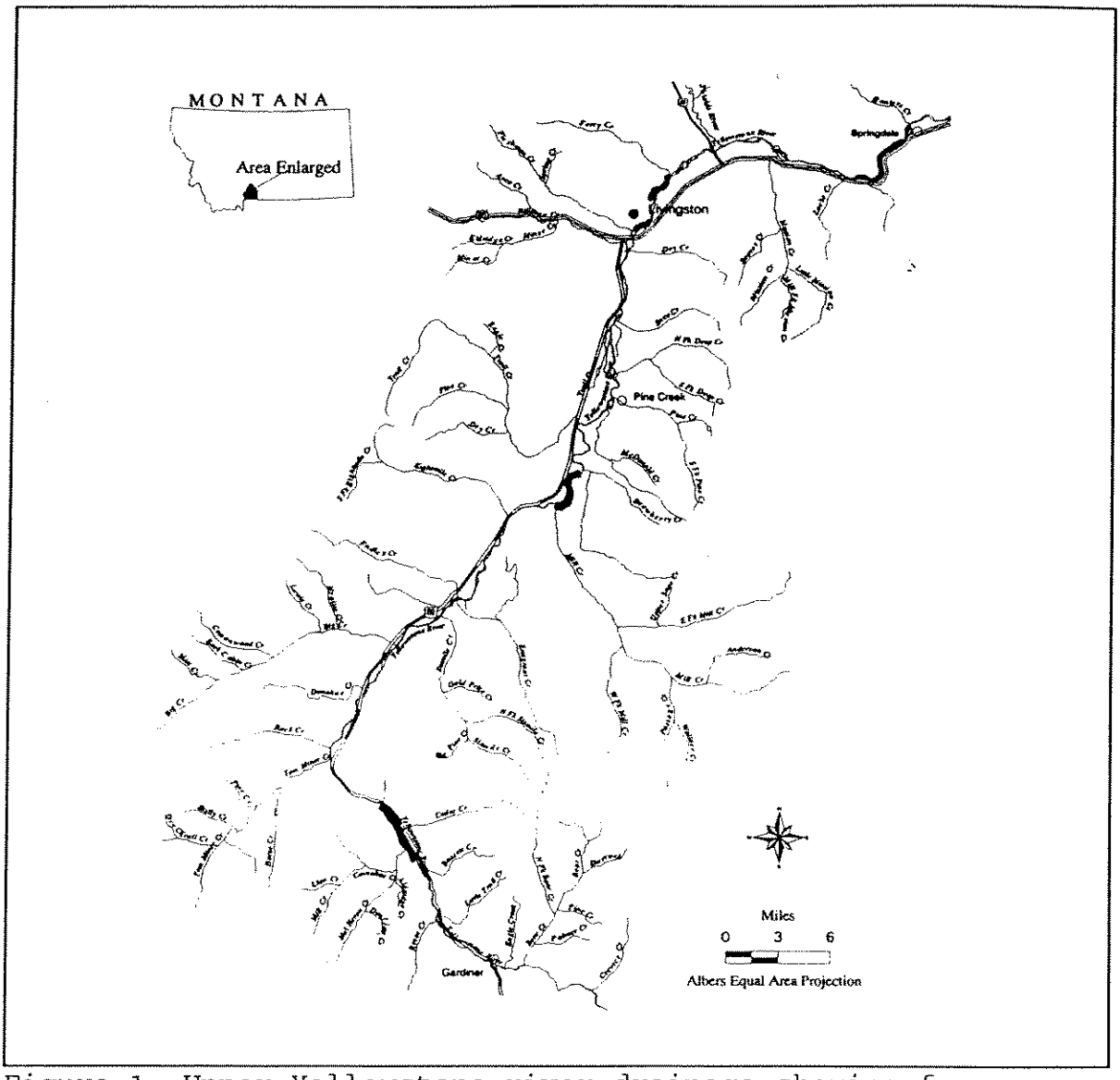

Figure 1. Upper Yellowstone river drainage showing four sections (heavy lines) sampled in spring 1998.

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.

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[1] Common names for fish are used throughout this report. Scientific names are listed in Appendix A.

[2] Unless otherwise stated, all fish lengths in this report are total lengths (TL).

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.

B. Estimates of brown trout abundance in two sections of the Shields river based on spring sampling in 1998.

This spring we sampled brown trout abundance in the Convict Grade section of the Shields river, located near its mouth, and in the Todd section, located near Clyde Park (Figure 2; Table 2).

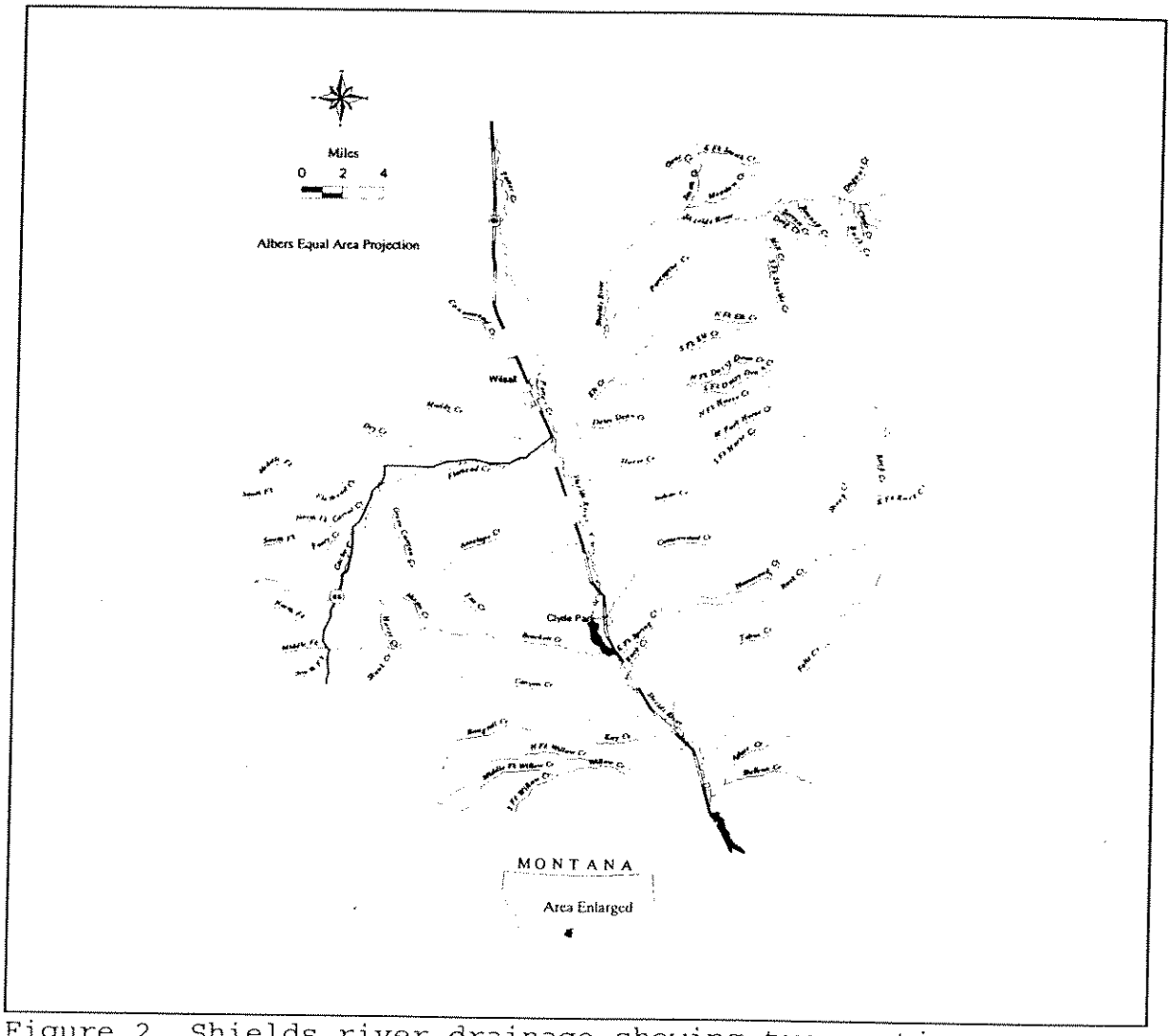

Figure 2. Shields river drainage showing two sections (heavy lines) sampled in spring 1998.

Table 2. Survey section locations on the Shields river, 1998.

Section name	Length (feet)	Approximate location\1	
Convict Grade	7,725	upper boundary	N 45 44′ 402" W 110 28′ 980"
		lower boundary	N 45 43′ 572" W 110 27′ 783"
Todd	7,500	upper boundary	N 45 53′ 136" W 110 37′ 077"
		lower boundary	N 45 52′ 270" W 110 36′ 485"

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

Fish were sampled 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 were marked with fin clips and returned to the stream. Recapture sampling occurred conducted about two weeks later in each section.

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

C. Spring gillnet catches at Dailey lake in 1998.

Gillnet sampling in 1998 mimicked previous spring sampling: a single overnight set using two floating and two sinking experimental gillnets (Shepard 1993a) determined the entire sample. Results from the 1998 sample are compared to earlier gillnet catches.

D. Creel surveys at Dailey lake, January through September, 1998.

A creel survey of anglers fishing at Dailey lake was begun in January 1998 to determine catch rates for sport fish, estimates of harvest, and estimates of angling pressure. The survey will be continued through the entire calendar year. Because of local interest, results to date are reported here.

The creel survey is stratified by day type: weekends and holidays are combined; regular weekdays are treated separately. Survey effort is ten days each month (Table 3), each day selected at random in approximate proportion to the monthly occurrence of different day types (weekdays, or weekends and holidays; Table 4). Surveys are conducted only during daylight hours. To avoid

Table 3. Days on which creel observations and angler interviews were conducted at Dailey lake, January through September, 1998. All dates were randomly selected.

Month:	Calendar date
January	3, 6, 7, 15, 18, 19, 22, 29, 30, 31
February	2, 4, 7, 8, 11, 12, 13, 15, 17, 22
March	2, 6, 7, 8, 11, 12, 13, 14, 16, 22
April	1, 2, 11, 14, 15, 18, 20, 24, 25, 26
May	1, 2, 6, 8, 9, 15, 18, 24, 27, 31
June	1, 3, 4, 7, 14, 15, 17, 20, 21, 22
July	8, 11, 12, 15, 17, 19, 22, 26, 27, 31
August	1, 2, 6, 11, 16, 18, 22, 26, 28, 31
September	2, 9, 10, 12, 20, 23, 25, 26, 27, 29

bias in angler counts and catch rates that could occur because lake use and fish feeding behavior is different at different times of the day, each day is divided into three equal-length observation periods (morning, mid-day, and evening). One of these periods is chosen at random for angler interviews and counts each survey day. The length of each observation period is adjusted for changes in available light that occur throughout the year (Figure 3).

Table 4. Number of weekdays, weekends and holidays, and periods of day when creel observations and angler interviews were conducted at Dailey lake, January through September, 1998.

	Number of different Day types each month		Number of days surveyed by day type and observation period (randomly selected)	
Month:	weekdays	weekend/ holidays	weekdays (am) [md] {pm}	weekend/holidays (am) [md] {pm}
January:	20	11	(3) [2] {1}	(0) [3] {1}
February:	18	10	(3) [1] {2}	(1) [0] {3}
March:	21	10	(2) [3] {1}	(1) [1] {2}
April:	21	9	(3) [1] {2}	(1) [2] {1}
May:	20	11	(2) [2] {2}	(0) [2] {2}
June:	22	8	(3) [2] {1}	(3) [0] {1}
July:	23	8	(3) [2] {1}	(1) [2] {1}
August:	21	10	(3) [2] {1}	(0) [2] {2}
September:	21	9	(3) [1] {2}	(1) [2] {1}

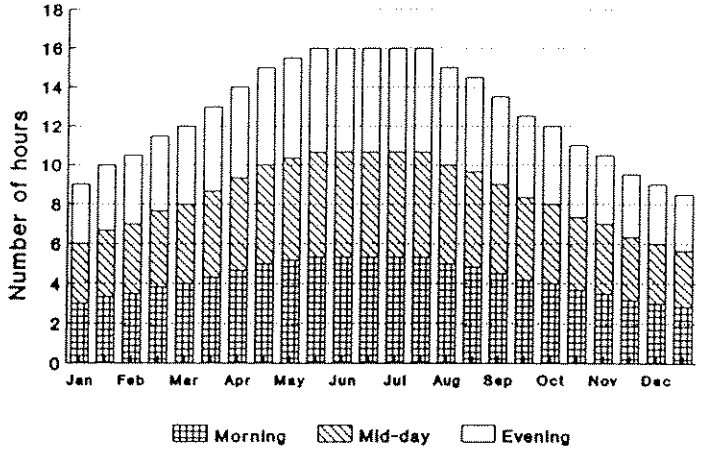

Figure 3. Observation periods for the 1998 Dailey lake creel survey, as adjusted for changing day length throughout the year.

Four angler counts are made during each observation period: the first at the start of the period; the remaining three at randomly selected times within the period. The largest number of anglers observed is presumed to represent typical angler use that day.

Estimates of angling pressure, fish catch, and fish harvest were developed using database and spreadsheet software programs on personal computers. Examples of the creel survey forms used in 1998 are provided in Appendix B.

RESULTS AND DISCUSSION

A. Estimates of rainbow, brown, and cutthroat trout abundance in four sections of the Yellowstone river based on spring sampling in 1998.

Most data for rainbow, brown, and cutthroat trout from each of the four sections sampled in 1998 fit the log-likelihood model well (Table 5). Very low numbers of brown trout and cutthroat trout were caught in the Ninth Street section: a reliable estimate of their abundance was not possible at this location.

Table 5. Trout/mile in four sections of the Yellowstone river based on spring sampling in 1998. Estimates are for fish seven inches or longer.

Section (mark date):			Overall model			Pooled model		
Species	N	SD	DF	Chi-square	P	DF	Chi-square	P \1
Corwin Springs (April 20):								
RB	427	206.1	6	5.62	0.47	3	1.37	0.71
LL	151	42.7	6	8.33	0.21	4	8.25	0.08
YCT	261	80.2	5	10.28	0.07	3	7.43	0.06
Mill Creek Bridge (April 15):								
RB	237	124.0	6	4.10	0.66	3	2.89	0.41
LL	711	525.8	9	10.74	0.29	1	0.61	0.44
YCT	103	114.8	3	3.38	0.34	----------		
Ninth St (April 13):								
RB	594	157.7	6	9.58	0.14	6	9.58	0.14
LL	----------		no estimate			----------		
YCT	----------		no estimate			----------		
Springdale (April 23):								
RB	291	74.5	6	12.57	0.05	6	12.57	0.05
LL	206	28.2	11	20.95	0.03	8	14.96	0.06
YCT	204	89.9	4	5.11	0.27	2	2.47	0.29

1. Species: RB=rainbow, LL=brown, YCT= cutthroat trout; N=estimated number; SD=standard deviation; DF=degrees of freedom; P=probability value.

Rainbow and cutthroat trout abundance in the Corwin Springs and Mill Creek Bridge sections this year was similar to estimates from previous years (Figure 4; Figure 5). Both species continue to show remarkable stability of numbers in these areas, despite record spring floods in 1996 and 1997.

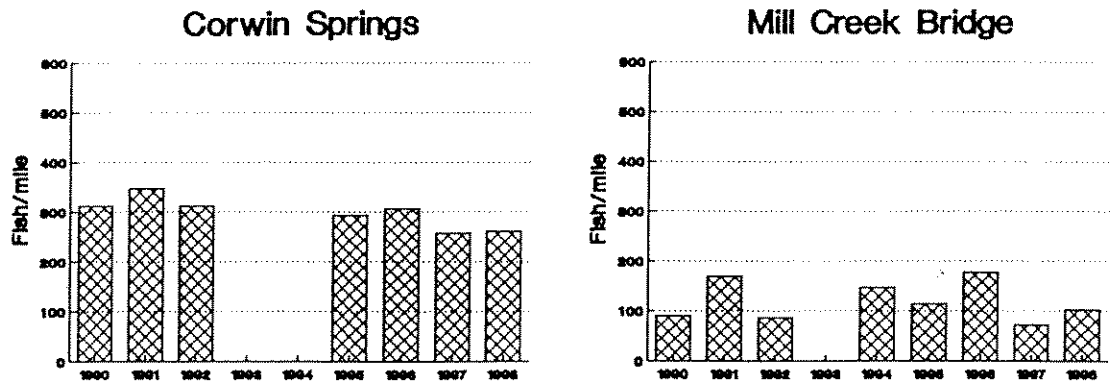

Figure 4. Cutthroat trout abundance in the Corwin Springs and Mill Creek Bridge sections of the Yellowstone river based on spring sampling from 1990 to 1998. Estimates are for fish seven inches or longer.

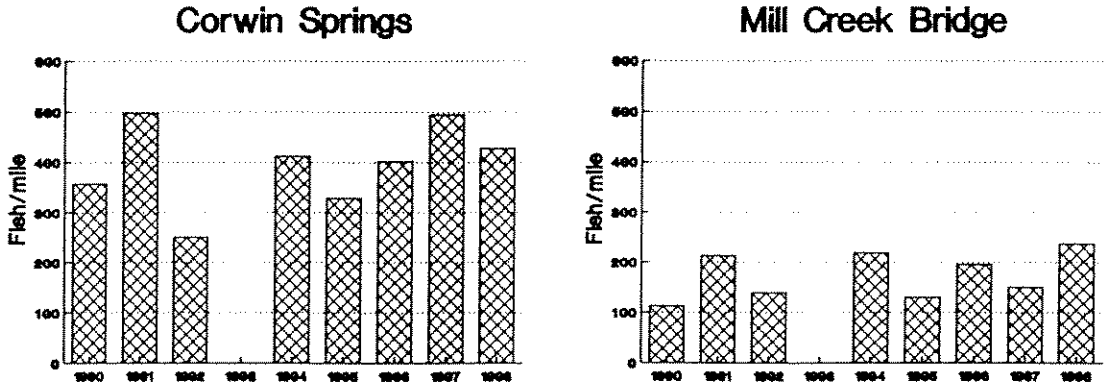

Figure 5. Rainbow trout abundance in the Corwin Springs and Mill Creek Bridge sections of the Yellowstone river based on spring sampling from 1990 to 1998. Estimates are for fish seven inches or longer.

Brown trout abundance in the Corwin Springs section this year was similar to last year's estimate suggesting again (e.g., Tohtz 1997) that brown trout abundance has declined in this area of the river compared to their abundance four or five years ago (Figure 6). However, a significant reduction can not be demonstrated statistically from these data: further work with larger sample sizes will be necessary to determine whether or not a meaningful decline in brown trout abundance has occurred in this area of the river.

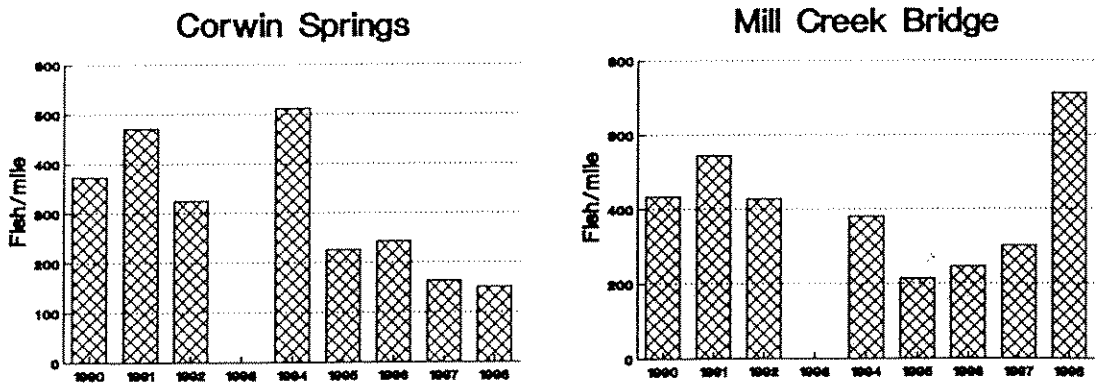

Figure 6. Brown trout abundance in the Corwin Springs and Mill Creek Bridge sections of the Yellowstone river based on spring sampling from 1990 to 1998. Estimates are for fish seven inches or longer.

Brown trout abundance in the Mill Creek Bridge section may have increased this year compared to previous surveys (Figure 6), but sampling errors are large (Table 3). River conditions changed dramatically between mark and recapture sampling trips: more fish were caught during recapture surveys because their vulnerability to capture increased with increasing river turbidity.

Cutthroat, rainbow, and brown trout abundance in the Springdale section was similar in 1998 to estimates from previous years (Figure 7; Figure 8). Fish numbers remain stable despite the effects of exceptionally large spring floods in recent years.

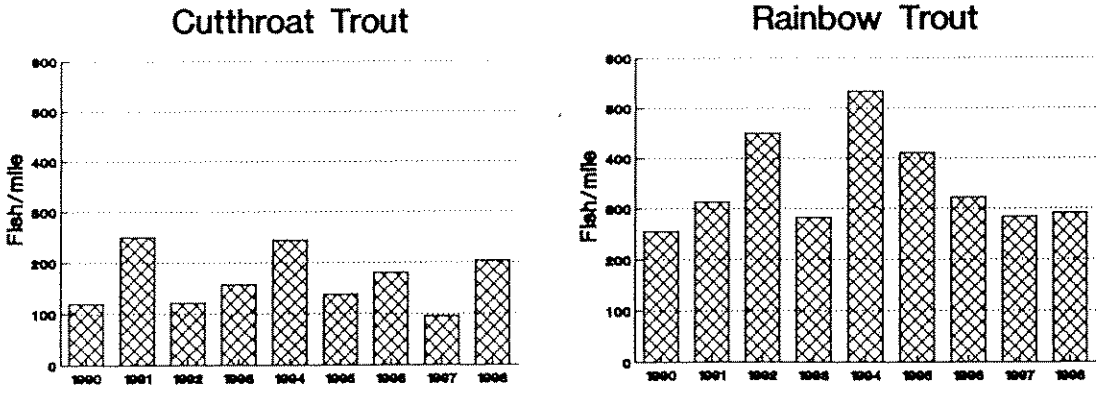

Figure 7. Cutthroat trout and rainbow trout abundance in the Springdale section of the Yellowstone river based on spring sampling from 1990 to 1998. Estimates are for fish seven inches or longer.

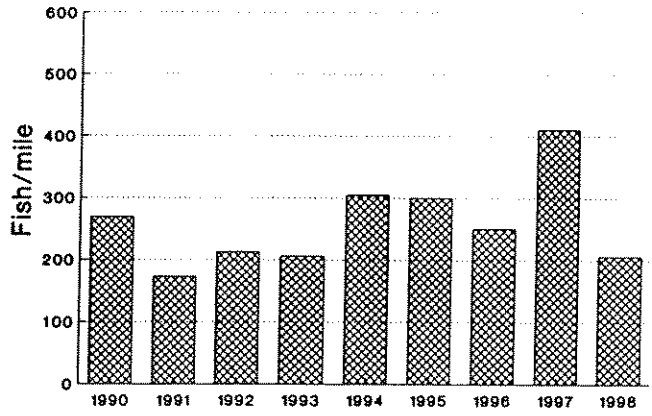

Figure 8. Brown trout abundance in the Springdale section of the Yellowstone river based on spring sampling from 1990 to 1998. Estimates are for fish seven inches or longer.

In contrast to other sections sampled this year, fish abundance in the Ninth Street section of the Yellowstone river has changed. Rainbow trout numbers were significantly less compared to previous years (Figure 9). Brown trout and cutthroat trout numbers were so low that we could not meaningfully estimate their

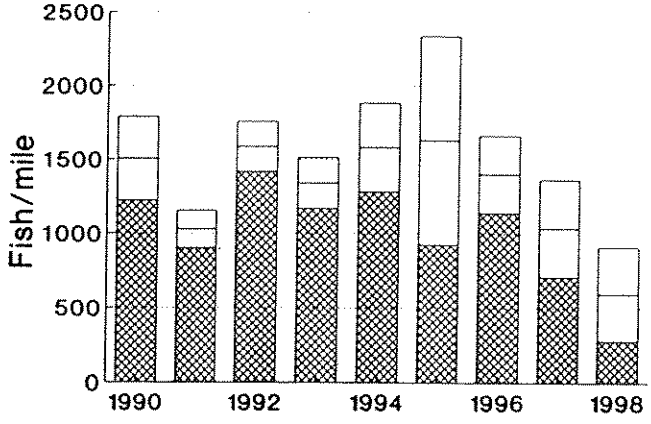

Figure 9. Rainbow trout abundance in the Ninth Street section of the Yellowstone river based on spring sampling from 1990 to 1998. Open intervals are plus or minus 2 SD of each point estimate. Estimates are for fish seven inches or longer.

abundance using mark recapture techniques. Compared to previous records, the current low numbers of rainbow trout in the Ninth Street section are unusual, not part of the normal population variation observed in this section of the river (Figure 10).

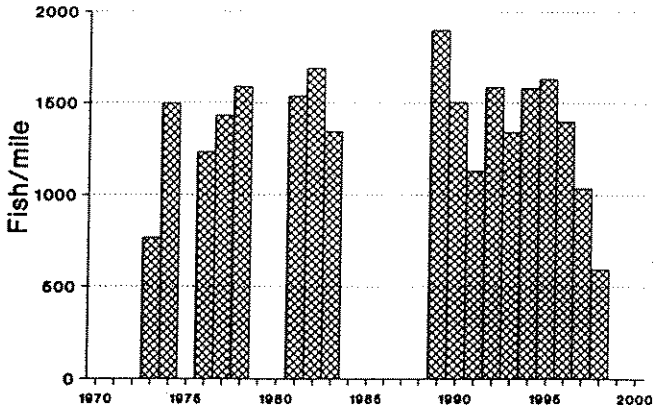

Figure 10. Rainbow trout abundance in the Ninth Street section of the Yellowstone river based on spring sampling from 1973 to 1998. Estimates are for fish seven inches or longer. Missing bars occur where no sampling was conducted.

Population changes in the Ninth Street section may simply reflect local adjustments to habitat changes associated with exceptional runoff events: the river channel at this location has been considerably straightened and filled by large quantities of bedload gravel during floods in 1996 and 1997. Disease effects have been a concern, particularly after the detection of Myxobolus cerebralis near this section of the river last year (Tohtz 1997). The decline in fish numbers we observe, however, is attributable to fewer numbers in most size classes of larger fish (Figure 11), indicating displacement of the population,

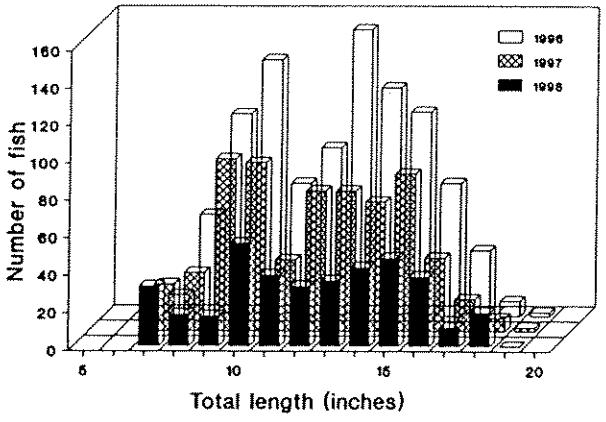

Figure 11. Number of rainbow trout captured in the Ninth Street section of the Yellowstone river on the first day of sampling in 1996, 1997, and 1998.

rather than a whirling disease effect: whirling disease would more likely result in the loss of young individuals. For this same reason, recruitment losses that might be expected to result from loss of spawning and rearing habitat, or potential losses from flood damage to the larger spring creeks near this area, do not seem to explain the declining abundance of fish we have observed. The number of rainbow trout between six and twelve inches in the Ninth Street section is similar this year to numbers estimated each year since 1990 (Figure 12). Healthy recruitment and survivorship of young fish apparently continues in this area of the river.

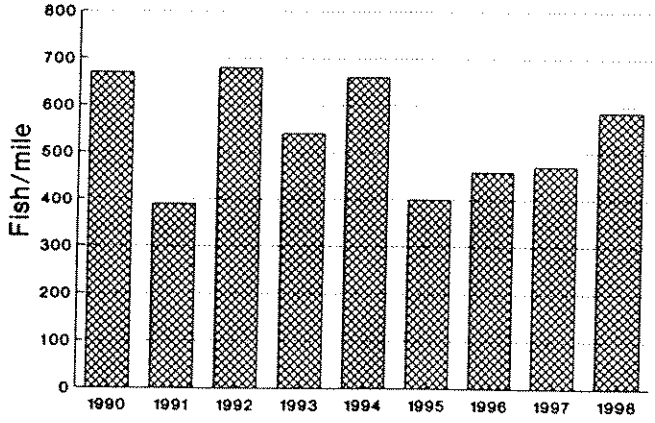

Figure 12. Abundance of rainbow trout between six and twelve inches in the Ninth Street section of the Yellowstone river based on spring sampling from 1990 to 1998.

B. Estimates of brown trout abundance in two sections of the Shields river based on spring sampling in 1998.

Numbers of brown trout greater than seven inches in the Todd and Convict Grade sections of the Shields river were similar in each section, and unchanged compared to recent surveys (Table 6). Low numbers of fish persist in these sections despite chronic low water conditions and large amounts of fine sediment deposited each year. Most fish collected in these sections exceed 12 inches (Figure 13). Fish length suggests that spawning and rearing limitations occur in both of these areas of the river.

Table 6. Brown trout number/1,000 feet in the Todd and Convict Grade sections of the Shields river based on spring sampling from 1995 to 1998. Estimates are for fish seven inches or longer.

Section:			Overall model			Pooled model		
Year	N	SD	DF	Chi-square	P	DF	Chi-square	P \1
Todd section:								
1995	.....		Not sampled			.....		
1996	37	17.2	4	7.14	0.13	1	0.44	0.51
1997	47	29.4	5	5.11	0.40	3	2.42	0.49
1998	26	18.6	4	3.15	0.53	3	3.15	0.37
Convict Grade section:								
1995	52	15.2	7	10.22	0.18	5	7.89	0.16
1996	31	8.3	4	5.20	0.27	3	5.20	0.27
1997	.....		Not sampled			.....		
1998	40	16.7	6	6.69	0.35	2	1.78	0.41

1. Species: LL=brown trout, N=estimated number; SD=standard deviation; DF=degrees of freedom; P=probability value.

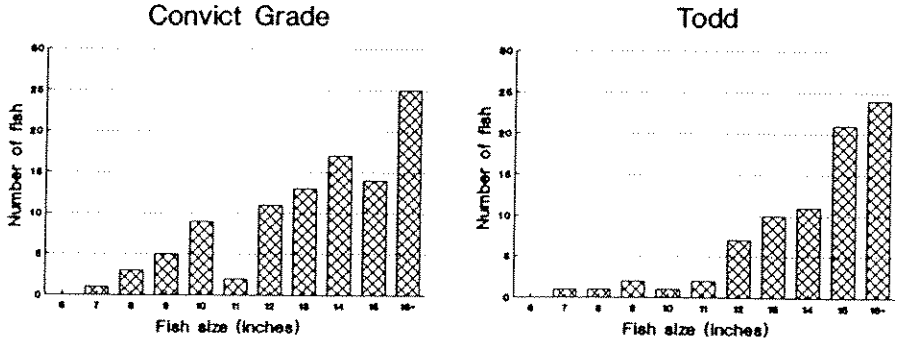

Figure 13. Length frequency distributions of brown trout caught in the Todd and Convict Grade sections of the Shields river, spring 1998.

C. Summary of 1998 spring gillnet catches at Dailey lake.

The average length of rainbow trout caught in gillnets at Dailey lake increased slightly again this year (Table 7) but this increase appears to be an artifact of sampling and the absence of smaller fish (Figure 14). Nothing suggests actual growth gains of the population. The number of fish stocked in 1997 was less

Table 7. Summary of gillnet catches at Dailey lake based on spring sampling from 1990 to 1998.

		Rainbow trout		Yellow Perch		Walleye	
Year\1	Set date	Fish/ net	Mean TL (in)	Fish/ net	Mean TL (in)	Fish/ net	Mean TL (in)
1990	4/30	8.2	12.8	48.7	7.4	4.7	11.4
1991	5/14	5.3	14.8	21.8	7.5	3.0	12.0
1992	5/04	7.3	15.1	58.3	7.7	4.5	12.7
1993	----------	no information	----------				
1994	5/12	9.3	15.2	32.3	8.7	11.5	11.3
1995	5/18	13.5	14.6	71.5	8.0	2.5	13.7
1996	----------	no information	----------				
1997	4/23	9.8	17.4	35.8	8.8	15.3	14.6
1998	5/23	5.8	18.9	59.0	8.9	15.8	10.6

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

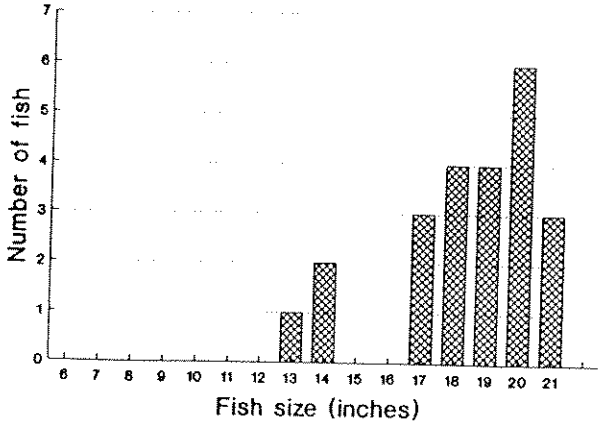

Figure 14. Length frequency distribution of rainbow trout caught in gillnets at Dailey lake, spring 1998.

than normal (Table 8): many fish (perhaps twelve percent of the Desmet total) died on the hatchery truck during transport from

the hatchery to Dailey lake when an aerator failed to function properly. Low numbers, and perhaps low survivorship, of this one year class could explain why the total number of rainbow trout caught in gillnets this year was less compared to recent samples (Table 7).

Table 8. Numbers of walleye and rainbow trout stocked in Dailey lake in 1997 and 1998.

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

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

Yellow perch numbers and size in our samples (Table 7) suggest that we are maintaining a stable and desirable perch fishery at Dailey lake. Angling mortality and predation by other fish apparently continue to be an adequate means by which to avoid problems associated with the overpopulation of this species.

Walleye numbers caught in each net continue to increase slightly each year in our samples at Dailey lake, but this year their average size was much smaller than in previous samples (Table 5). Walleye abundance continues to increase (Figure 15), perhaps now

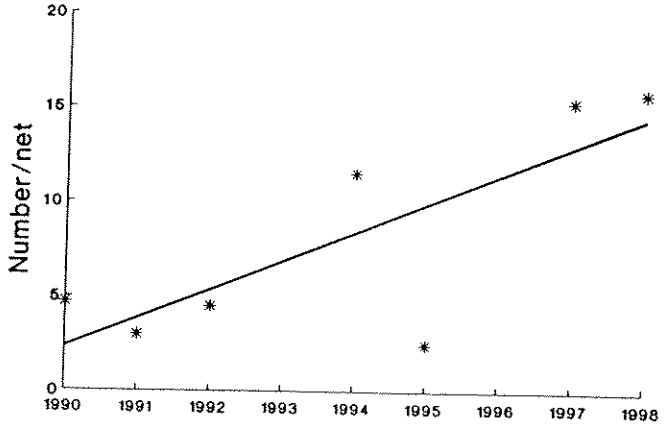

Figure 15. Trend in average number of walleye caught in gillnets at Dailey lake from 1990 to 1998. Trend line is a least squares linear regression.

reaching the point where walleye numbers in this small lake are reducing their own growth performance. Steadily increasing numbers of walleye pose a threat to the stability of the rainbow fishery by threatening rainbow survivorship: walleye, of course, are extremely piscivorous. This threat is exacerbated whenever the number of rainbow to be planted is reduced by losses incurred in transportation from the hatchery, as happened for rainbow trout in 1997. Natural reproduction of rainbow trout documented last year (Tohtz 1997) is now known to be a sporadic event that depends on exceptionally good water availability. Since this availability is unusual at Dailey lake, hatchery stocking will continue to be the primary means by which both the walleye and rainbow fisheries will be maintained.

A recent weak year class of rainbow trout, combined with an increasing number of small walleye, suggest that reducing the number of walleye stocked, and increasing the number of rainbow stocked, is warranted and appropriate at this time to meet current management objectives (Tohtz 1997; Anon. 1997). However, dramatic changes to the stocking program are not necessary. The following adjustments are recommended for calendar year 1999:

1) Walleye plants should be reduced by 30 percent, but should retain all 5,000 fish of the over-summered walleye that are currently used in the Dailey lake stocking program.

2) An additional 5,000 to 10,000 rainbow trout fry or fingerlings should be planted to increase the standing crop. Using the Arlee strain may help to diversify fishing opportunities and to increase rainbow catch rates for anglers, a desirable management objective at this time (see 1998 creel summary below).

D. Summary of creel surveys at Dailey lake, January through September, 1998.

Seventy-five percent of our creel schedule at Dailey lake was completed by the end of September. From January through September we had interviewed 635 anglers (Table 9), and had measured 1,504 fish (Table 11).

Table 9. Creel survey counts and observations at Dailey lake, January through September, 1998.

Month daytype	Angler interviews	Hours fished	Mean angler count	Mean trip length	Fish kept/caught YP	RB	WE/1
January							
weekday	33	109.50	6.00	3.98	209/273	2/2	0/2
weekend	70	172.62	17.00	4.32	384/567	3/3	2/4
February							
weekday	42	107.33	8.17	4.96	336/410	1/1	1/1
weekend	17	71.70	6.00	5.00	145/175	3/3	1/1
March							
weekday	26	101.33	5.20	4.43	181/322	3/3	0/1
weekend	13	63.76	6.50	6.09	69/128	2/2	0/0
April							
weekday	12	25.82	3.00	2.54	1/1	0/9	0/0
weekend	39	80.32	10.00	2.32	10/10	1/2	0/0
May							
weekday	24	63.26	4.00	2.89	29/56	4/12	0/0
weekend	40	124.93	18.75	3.44	42/54	7/15	3/3
June							
weekday	39	136.66	6.00	3.73	69/94	2/3	4/4
weekend	39	117.51	14.25	3.95	60/107	4/4	3/3
July							
weekday	23	49.08	2.50	2.04	30/152	4/6	4/4
weekend	82	242.66	19.50	3.43	128/538	3/5	22/61
August							
weekday	35	84.16	5.00	2.68	161/279	2/2	6/30
weekend	70	220.57	12.00	3.72	290/626	3/5	27/67
September							
weekday	12	37.73	4.50	3.34	2/4	2/3	1/5
weekend	19	52.75	8.00	3.37	13/70	3/4	0/21

1. YP = yellow perch; RB = rainbow trout; WE = walleye

As expected, creel results show strong seasonal variations of angling pressure, catch rate, and harvest (Table 10). Seasonal summaries are provided below:

Table 10. Angling pressure, fish catch, and fish harvest estimates based on creel survey information collected at Dailey lake, January through September, 1998.

Month daytype	Angler hours	Angler days	Estimated catch			Estimated harvest		
			YP	RB	WE	YP	RB	WE\1
January								
weekday	1,095	275	3,572	26	26	2,734	26	0
weekend	1,424	330	7,960	42	56	5,391	42	28
February								
weekday	966	195	8,359	20	20	6,850	20	20
weekend	538	108	2,197	38	13	1,820	38	13
March								
weekday	1,064	240	4,612	43	14	2,592	43	0
weekend	478	79	2,384	37	0	1,285	37	0
April								
weekday	271	107	19	167	0	19	0	0
weekend	542	234	78	16	0	78	8	0
May								
weekday	633	219	614	132	0	318	44	0
weekend	1,031	300	920	256	51	716	119	51
June								
weekday	1,503	403	1,016	32	43	746	22	43
weekend	705	178	1,230	46	34	690	46	34
July								
weekday	564	277	1,090	43	29	215	29	29
weekend	1,456	424	3,559	33	404	847	20	146
August								
weekday	884	330	2,799	20	301	1,615	20	60
weekend	1,654	445	3,801	30	407	1,761	18	164
September								
weekday	396	119	100	75	125	50	50	25
weekend	356	106	966	55	290	179	41	0

1. YP = yellow perch; RB = rainbow trout; WE = walleye

Winter

A popular ice fishery develops in winter at Dailey lake. Ice formed on Dailey lake the third week of December, 1997; the lake remained frozen through the second week of March, 1998. During this period total fishing pressure exceeded 4,000 angler hours (Table 10). When the lake was ice-covered, anglers fished almost exclusively for yellow perch, using baited hooks and baited lures (Figure 16).

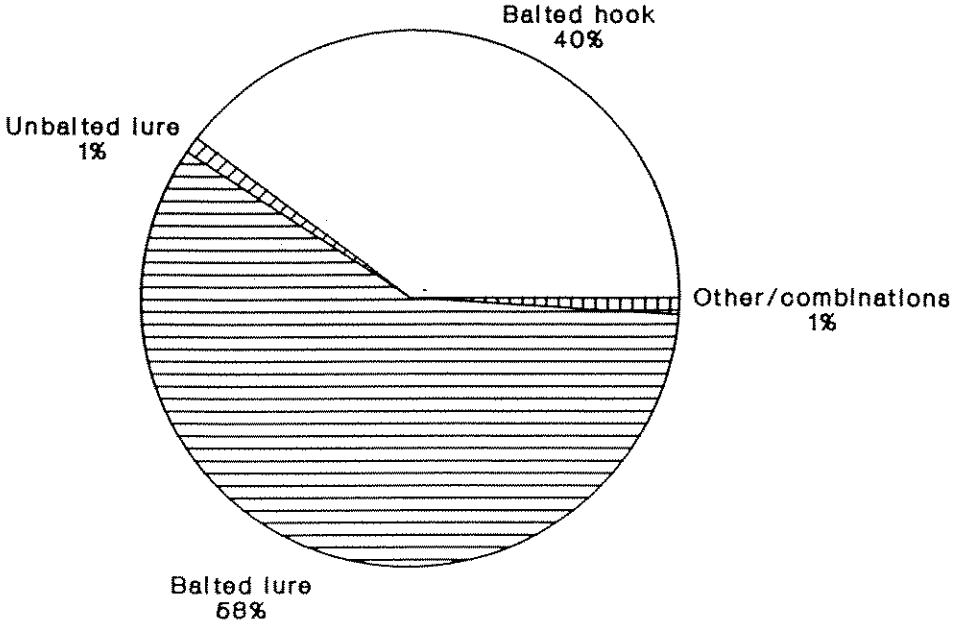

Figure 16. Fishing gear types observed at Dailey lake from January through March, 1998.

Catch rates were 3.0, 3.3, and 2.7 fish/hour for perch in January, February, and March, respectively (Figure 17). Perch averaged 8.5, 8.9, and 8.8 inches these same months (Table 11). Catch rates for rainbow trout and walleye were less than 0.03 fish/hour during the winter period. Most anglers used ice-fishing techniques strongly biased to catch yellow perch, explaining in part why catch rates for rainbow trout and walleye were particularly low this time of year. Rainbow trout averaged 13.6, 17.3, and 17.1 inches in January, February, and March, respectively. Walleye averaged 12.3, 10.2, and 11.5 inches.

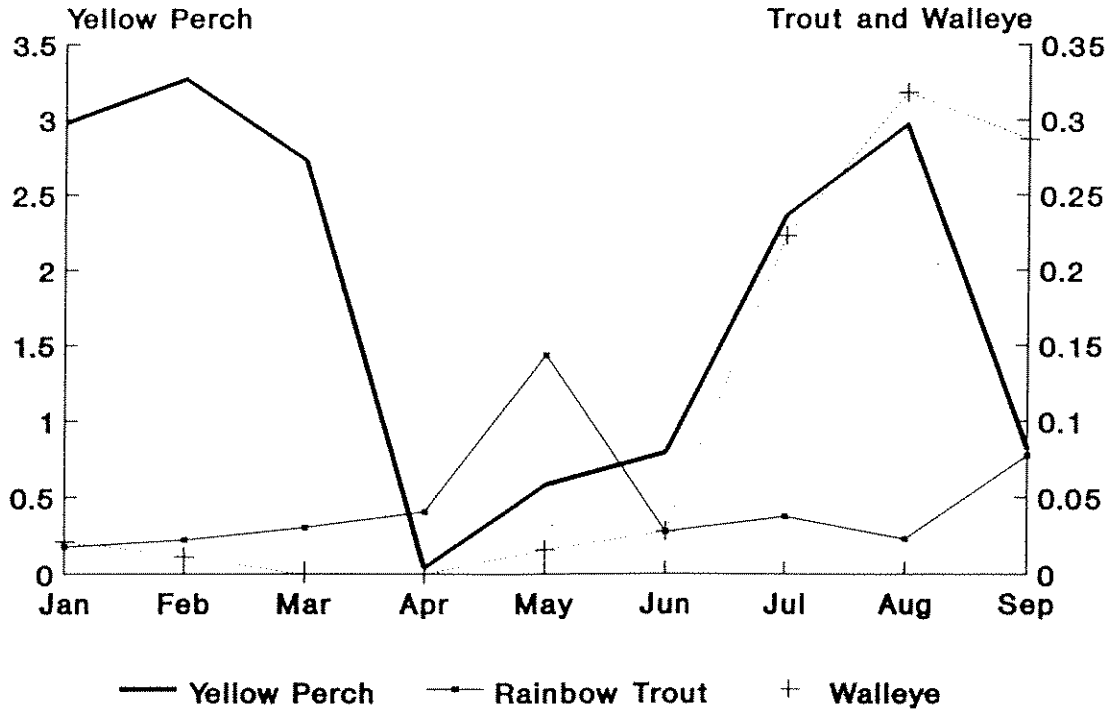

Figure 17. Monthly catch rates for yellow perch, rainbow trout, and walleye at Dailey lake based on creel surveys in 1998. Vertical scales are fish/hour.

Table 11. Mean length (inches) of yellow perch, rainbow trout, and walleye measured during creel surveys at Dailey lake, January through September, 1998.

	Yellow perch			Rainbow trout			Walleye		
Month	Length	SD	N	Length	SD	N	Length	SD	N\1
Jan	8.5	1.9	483	13.6	2.3	5	12.3	0.8	2
Feb	8.9	1.7	284	17.2	4.5	3	10.2	4.2	2
Mar	8.8	1.2	189	17.1	1.6	3	11.5	-0-	1
Apr	---	---	0	27.0	-0-	1	----	---	0
May	9.7	1.1	42	18.6	0.9	8	12.1	2.2	4
Jun	9.0	1.2	87	16.7	0.7	6	11.0	1.6	7
Jul	8.8	1.2	78	13.5	5.0	10	11.3	1.1	26
Aug	7.1	1.5	222	15.1	2.0	5	12.4	1.4	29
Sep	10.2	-0-	1	12.7	2.5	5	17.5	-0-	1

1. SD = standard deviation (inches); N = sample size

Spring

During spring break-up of ice and subsequent lake mixing, catch rates for rainbow trout steadily increased, reaching a high rate of 0.14 fish/hour in May (Figure 17). Rainbow trout caught by anglers averaged 18.6 inches at this time. Many anglers were fishing specifically for trout in the spring, often using artificial flies (Figure 18). As in winter, gear bias and angling techniques strongly influenced the catch rate patterns we observed for different species during creel surveys at this time. Catch rates for walleye and yellow perch were lower than for rainbow trout in April and May, but increased steadily through the spring season, exceeding trout catch rates by early summer (Figure 17).

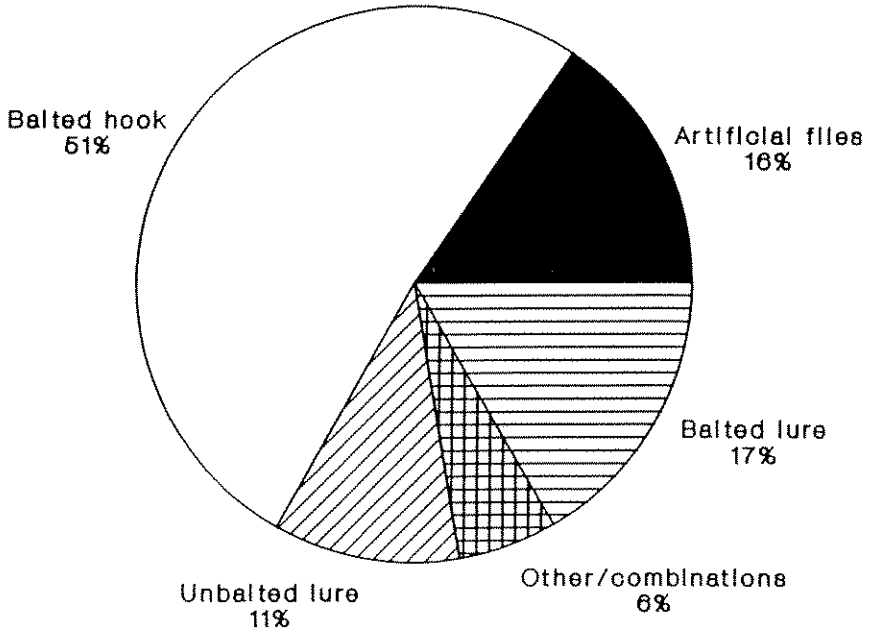

Figure 18. Fishing gear types observed at Dailey lake from April through June, 1998.

Summer

More anglers using a variety of angling techniques (Figure 19) increasingly caught more of the spiny-rayed species during the summer months (Table 10). Warm-season catch rates for yellow perch and walleye increased rapidly throughout the summer, reaching their maximums (3.0 and 0.3 fish/hour, respectively) in August. By September catch rates for both species began to decline (Figure 17).

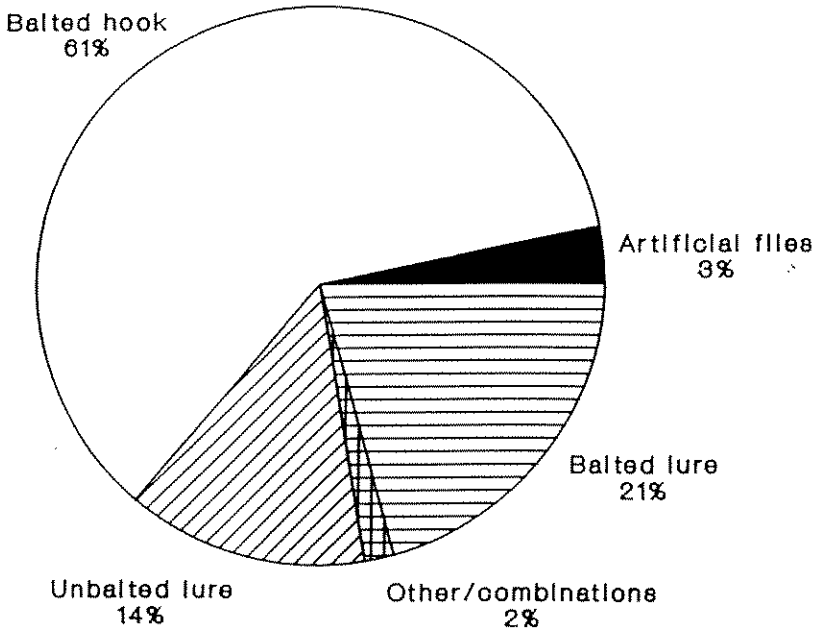

Figure 19. Fishing gear types observed at Dailey lake from July through September, 1998.

Comparing recent estimates of summer angling pressure at Dailey lake (Shepard 1991; Tohtz 1996b) with our survey in 1998 suggests that angling pressure has increased steadily in recent years, after a notable decline that occurred between 1990 and 1991 (Figure 20). Patterns of angling use at Dailey lake may also have

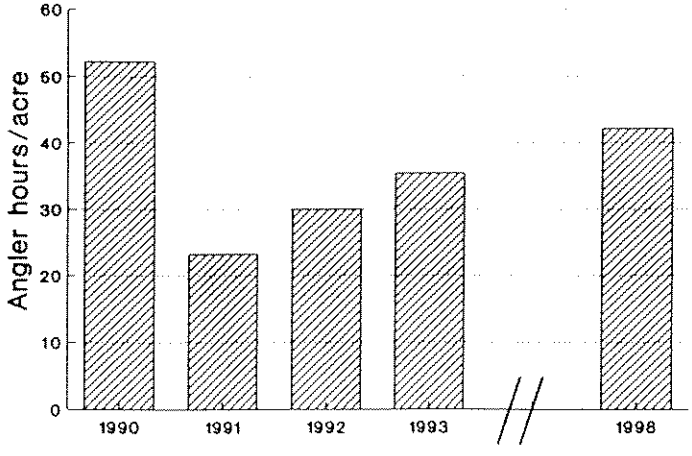

Figure 20. Angler hours/acre at Dailey lake in summer months (May through August) based on information collected between 1990 and 1998. The 1990 estimates are adapted from Shepard 1991; 1991 through 1993 estimates from Tohtz 1996b.

changed since the earlier surveys were conducted. In 1998, for example, it appears that angling pressure has increased in early spring, and has decreased in summer, compared to information collected in 1990 (Figure 21). This possibility is not certain, however: slightly different angler count methods have been used in the different surveys, and the apparent change might simply reflect differences in weather or other random factors influencing lake use differently in different years. Additional survey work would be required to confirm whether or not a significant long-term change in angler use has occurred at Dailey lake.

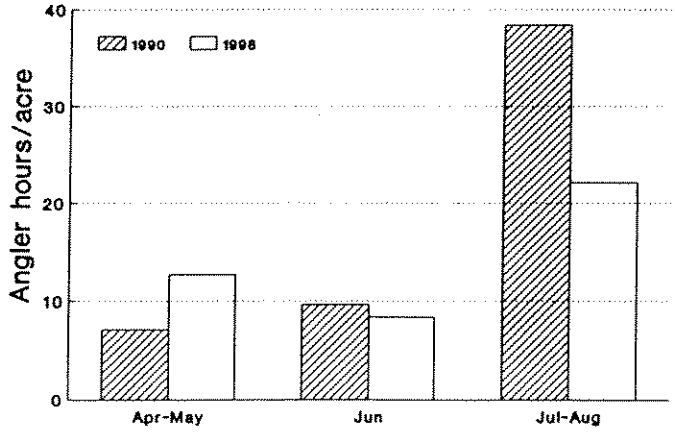

Figure 21 Fishing pressure at Dailey lake in 1990 compared to fishing pressure in 1998. The 1990 estimates were adapted from Shepard 1991; the 1998 estimates are based on creel surveys conducted in 1998.

Between January and September 1998, average catch rates for yellow perch, rainbow trout, and walleye were 2.08, 0.05, and 0.11 fish/hour, respectively. Catch rates for yellow perch and walleye to date exceed annual rates targeted to be achieved in the 1993 Dailey lake management plan (Shepard 1993b). These rates are consistent with the state's new warmwater fisheries management plan and its objective "to provide the best recreational fishery that Dailey lake can reasonably support using trout, walleye, and yellow perch" (Anon. 1997). The rainbow trout catch rate, however, was less than the rate targeted by the 1993 management plan, and represents less than an eight percent return to the creel based on the number of trout currently planted each year at Dailey lake. Increasing the catch rate of rainbow trout, if possible, is warranted considering the already considerable investment of hatchery fish, and the existing strong recreational interest in catching this particular species. Management recommendations to increase the rainbow trout catch rate are included in section C of this report.

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

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

APPENDIX B: Creel forms used during the 1998 angler survey at Dailey lake

1. Creel count summary form

DATE _____ Period: A M P

Weather/notes:

Number of angler interviews: _____

Number of fish length/weight data sheets attached to angler interviews: _____, for Int.No.(s):_____

Angler Counts:

Count 1: Shore _____ Boat/float _____ Ice _____ Time _____

Other lake users? (specify no., type, etc):

Count 2: Shore _____ Boat/float _____ Ice _____ Time _____

Other lake users? (specify no., type, etc):

Count 3: Shore _____ Boat/float _____ Ice _____ Time _____

Other lake users? (specify no., type, etc):

Count 3: Shore _____ Boat/float _____ Ice _____ Time _____

Other lake users? (specify no., type, etc):

Additional Comments/Notes:

2. Angler interview form

Date _____ Survey period: A M P Interview No. _____

A) Angler info: Int.Time _____

1. Location (circle): Shore Boat/float Ice Done? YES NO

2. Origin/miles _____ Start hr ____ End hr ____ Tot hr _____

3. Bait type (circle all that apply):

Organic Lures Flies Other (specify) _____

4. Were you fishing for a particular species ? NO YES

If YES, specify _____

B) Fish data:

Fish caught: WE _____ RB _____ YP _____ Other (spp)_____

Fish kept: WE _____ RB _____ YP _____ Other (spp)_____

Were any fish measured? NO YES (SEE NOTE AT PAGE BOTTOM)

NOTE: If any fish were measured, be sure to reference the correct INTERVIEW DATE and INTERVIEW NUMBER with that data,and attach.