MONTANA DEPARTMENT OF FISH, WILDLIFE AND PARKS

FISHERIES DIVISION

JOB PROGRESS REPORT

STATE: Montana	PROJECT TITLE: Statewide Fisheries Investigations
PROJECT NO: F-46-R- 6	STUDY TITLE: Survey and Inventory of Coldwater Streams
JOB NUMBER: I-O	JOB TITLE: Upper Clark Fork EPP

PROJECT PERIOD: July 1, 1992 through June 30, 1993.

ABSTRACT

A small sample of mountain whitefish from the Clark Fork River showed growth rates similar to brown trout, and similarly high rates of scale regeneration.

Brown trout redd counts in the fall of 1992 were higher in Warm Springs Creek and the Mill-Willow Bypass than mainstem locations, but fry traps placed this spring caught no age 0 brown trout in either creek. Low survivorship is possible, perhaps a result of low summer flows in 1992 and associated environmental stress. Estimates of fish abundance in tributaries of the Clark Fork sampled between 1989 and 1991 suggest that fish abundance varies much more in the tributaries than the mainstem river. The absence of young fish in traps this spring may be an artifact of trap location. However, age 0 fish were captured routinely in the same section of Warm Springs Creek in 1989, 1990, and 1991.

Rainbow trout released near Bearmouth in the Clark Fork River in 1987 have not been recaptured often despite regular sampling in this area and many other areas of the Clark Fork River and its tributaries. The last marked rainbow recaptured from this plant was caught in spring, 1990.

OBJECTIVES AND DEGREE OF ATTAINMENT

1. Collect, compile, and analyze fish population and habitat data on the Clark Fork and its tributaries.

A number of new assessments and syntheses of fisheries information have been completed for the upper Clark Fork River. Data collections, compilations, and analyses reported here include:

A. Age and growth of mountain whitefish[1] in the Clark Fork River.

B. Redd surveys in the Clark Fork River, Warm Springs Creek, and Racetrack Creek, fall, 1992

C. Spring trapping of Warm Springs Creek and the Mill-Willow Bypass to assess downstream movements of small fish.

D. Estimates of fish abundance in tributaries of the Clark Fork River, 1989 to 1991.

E. Stocked rainbow recaptures after their release near Bearmouth in 1987.

2. Assist in bringing the Natural Resource Damage Claim (NRDC) against Atlantic Richfield Company (ARCO) to a conclusion in favor of an improved trout fishery in the Clark Fork River.

Items listed under objective 1 pertain to objective 2. In addition, I assisted consultants working on the NRDC with live fish collections, tissue sampling, fish population surveys, and an angler creel survey during the project period.

The Aquatic Resources Injury Assessment Report for the upper Clark Fork River was completed on time and released July, 1993. A memorandum of understanding to enter into negotiated settlement of claims was signed by both ARCO and the State of Montana on March 9, 1993.

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1. Common names are used in this report. Binomial designations are listed in Appendix A.

PROCEDURES

A. Age and growth of mountain whitefish in the Clark Fork River.

Scales were collected from mountain whitefish during mark recapture population surveys in April, 1992. Fish were sampled from a river section beginning just north of the Deer Lodge sewage treatment plant and ending downstream at Mullan Gulch (EA Reach 4, Spoon 1990).

Age was determined from the number of annuli on scales. Annuli were recognized by overcutting, changes in angle of formation, and circuli continuous between anterior and posterior scale fields. The distance from scale focus to each annulus and scale edge was measured from acetate impressions projected on a microfiche reader. Annuli were considered fully formed only if circuli beyond the annulus suggested renewed growth.

A linear model approach (Weisberg 1986; Weisberg and Frie 1987) was used to backcalculate fish lengths at each annulus. Scale data were processed using software for this purpose produced by Minnesota Sea Grant, University of Minnesota (Weisberg 1989). The adequacy of data fit to these models was evaluated at alpha = 0.05.

The presence of regenerated scales was recorded for each fish. Scales that were unreadable for reasons other than regeneration (poor mounts, scales absent, etc) were not included in this summary.

B. Redd surveys in the Clark Fork River, Warm Springs Creek, and Racetrack Creek, fall, 1992

Fish redds were counted at 13 locations in the Clark Fork River, and in Warm Springs Creek and Racetrack Creek, between October 7 and November 20, 1992 (Table 1). Counts were made by a single observer wading through each section. Surveys were arbitrary, occurring once or twice each week throughout the sampling period. Redds were not measured or marked; counts in consecutive surveys may include the same redd more than once. All surveys were completed between 1000 and 1600 hours each day.

Table 1. Redd survey locations in the Clark Fork River, Warm Springs Creek, and Racetrack Creek, fall, 1992.

Site: description (township, range, section)
1. Mill Willow Bypass: outfall of pond 2 to Bypass mouth (5N,9W,19B-18D)
2. Warm Springs Creek: 300 m above USGS gauging station to creek mouth (5N,10W,24A-18D)
3. Warm Springs Bridge: from bridge downstream 500 m (5N,9W,17C)
4. Perkins Lane Bridge: from bridge downstream 500 m (5N,9W,6D)
5. Galen Bridge: from bridge downstream 500 m (6N,9W,29D)
6. Racetrack Bridge: from bridge downstream 500 m (6N,9W,20A)
7. Racetrack Creek: 100 m above to 200 m below east frontage road (6N,9W,16C-16D)
8. Sager Lane Bridge: from bridge downstream 500 m (7N,9W,33)
9. Deer Lodge Bridge: 200 m above to 200 m below Milwaukee Avenue bridge (8N,9W,33C)
10. Cottonwood Creek: 200 m above to 200 m below creek mouth (8N,9W,33C)
11. Vet Clinic: start 4 km north of Deer Lodge at clinic, downstream 500 m including side channel (8N,9W,16D)
12. Kohr's Bend FAS: from fishing access site downstream 500 (9N,9W,33D)
13. Pat's Bar: start 100 m below Rough Country Bar, downstream 500 m (9N,10W,14C)
14. Phosphate Bridge: from bridge downstream 500 m (9N,10W,14B)
15. Mouth of Gold Creek: 200 m above to 200 m below creek mouth (10N,11W,25)

C. Spring trapping of Warm Springs Creek and the Mill-Willow Bypass to assess downstream movements of small fish.

Fry traps were placed in Warm Springs Creek and the Mill-Willow Bypass to monitor fish movements during spring runoff. By convention, the confluence of these streams near Warm Springs Bridge marks the beginning of the Clark Fork River. Traps were located about 640 m upstream from the mouth of Warm Springs Creek and about 400 m upstream from the mouth of the Mill-Willow Bypass (Figure 1).

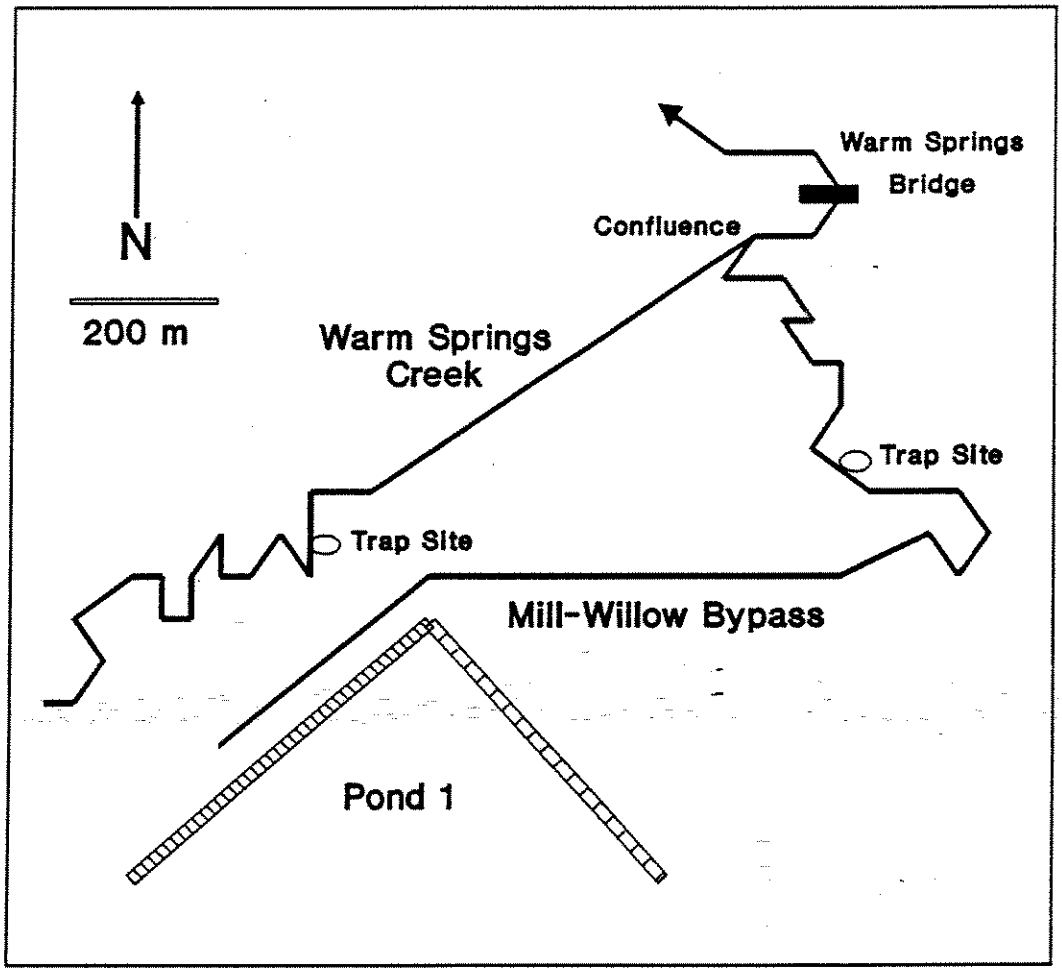

Figure 1. Trap locations in Warm Springs Creek and the Mill-Willow Bypass, Spring, 1993.

Each trap was a square steel frame 76.0 x 76.0 cm supporting a wire mesh cone that tapered to a 10.2 cm opening downstream. Wire screens were 0.6 and 0.3 cm mesh. Fish were guided into a 0.2 cm mesh nylon catch bag attached by plastic couplings at the smaller opening of the trap (Figure 2).

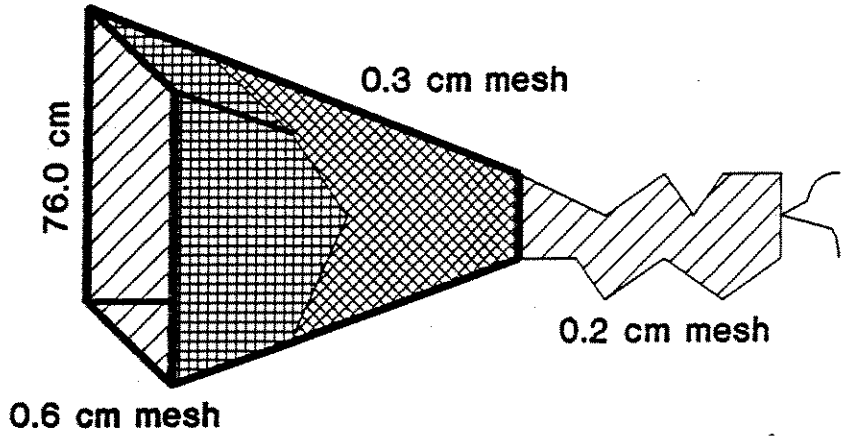

Figure 2. Fry trap configuration and approximate dimensions.

One trap was placed at each site April 15. Traps were removed from both creeks because of high flows on May 29. Traps were operated continuously, checked once each day throughout the sampling period. On May 21 the Mill-Willow Bypass trap was destroyed by high water and debris and no catch was recorded.

All fish were identified, measured to the nearest 1.0 mm (total length), and weighed to the nearest 5.0 g. Trout in Warm Springs Creek were marked before release to monitor recapture rates. All fish were released downstream. Age estimates of brown trout were based on length at age relationships established last year (Tohtz 1992).

Relative water surface elevations were monitored once each day with staff gauges in both creeks. Water temperature was measured once each day when traps were checked for fish.

D. Estimates of fish abundance in tributaries of the Clark Fork River, 1989 to 1991.

Fish surveys were conducted in many tributaries of the upper Clark Fork River between 1989 and 1991 (Table 2). Most of these surveys were done cooperatively with consultants hired by ARCO.

Table 2. Fish survey locations in tributaries of the Clark Fork River, 1989 to 1991.

Stream (site)	Month/year sampled	Location (T,R,S)[a]	Section length (m)
Mill Creek			
(downstream)	11/1989 11/1990 7/1991	4N,10W,11	91
(upstream)	7/1991	4N,10W,11	84
Willow Creek			
(downstream)	7/1990 11/1990 8/1991 10/1991	4N,10W,2BD	91
(upstream)	7/1990 11/1990 7/1991 10/1991	4N,10W,11A	114
Lost Creek			
(downstream)	11/1989 7/1990 11/1990 7/1991	5N,9W,6B	91
(upstream)	7/1990 11/1990 7/1991 10/1991	5N,9W,5B-6A	91
Johnson Creek	8/1991	8N,9W,33B	91
Cottonwood Creek	9/1991	8N,9W,33C	91

Continued ...

a Township, Range, Section

Table 2. Fish survey locations in tributaries of the Clark Fork River, 1989 to 1991 (Continued from page 7).

Stream (site)	Month/year sampled	Location (T,R,S) [a]	Section length (m)
Dempsey Creek	8/1990 8/1991 10/1991	6N,9W,5BA	31
Gold Creek (downstream)	7/1990 11/1990 7/1991 10/1991	10N,10W,31B	152
(upstream)	7/1990 11/1990 7/1991 10/1991	10N,10W,31B	159
Harvey Creek (downstream)	9/1991	11N,14W,16D	91
(upstream)	8/1991	11N,14W,16D	91
Schwartz Creek (downstream)	8/1991	12N,17W,34D	91
(upstream)	8/1991	12N,17W,34D	72
Bateman Creek (downstream)	8/1991	11N,15W,21	91
(upstream)	8/1991	11N,15W,21	91

a Township, Range, Section

Fish were sampled either with backpack mounted electrofishing gear and a hand held electrode, or with gear mounted on a small boat. Boat mounted gear included a 5000 watt generator and a Coffelt Model VVP-15 rectifying unit. The cathode was cables suspended from the bow of the boat; the anode was a single hand held electrode connected to the power source by about 10 m of cable.

All fish in a section were removed and held in live cars during repeated passes with the electrofishing gear. Fish were identified, measured to the nearest 1.0 mm (total length), and weighed to the nearest 5.0 g. All fish were returned to the stream after sampling.

Fish abundance was estimated using MicroFish 3.0 (Van Deventer and Platts 1986), a software package developed especially to process electrofishing data obtained by removal methods.

E. Marked rainbow recaptures after rainbow stocking in 1987.

A total of 4733 marked rainbow trout were released in the Clark Fork River September 11, 1987 between Bear Creek and the Bearmouth Chalet (EA Reach 9, Spoon 1990). When released, fish averaged 162 mm total length (N = 96, SD = 13). Many electrofishing surveys have been conducted in the Clark Fork River and its tributaries since these rainbow trout were stocked. Records were reviewed to determine the number and location of marked rainbow captured in subsequent surveys.

RESULTS AND DISCUSSION

A. Age and growth of mountain whitefish in the Clark Fork River.

Scale data fit the linear model well. The F value testing equal slope in different age groups was small (0.6, 3, 56) indicating lengths were reliably estimated by the model. Sample size is small (Table 3).

Table 3. Mean length at annulus formation for 65 mountain whitefish caught in the Clark Fork River near Deer Lodge, Montana, spring, 1992.

Age	Sample size	Total length (mm)	Standard error (mm)
1	3	147.9	29.4
2	19	230.0	41.0
3	24	284.4	45.9
4	18	325.4	50.7
5	1	394.4	66.3

Among 65 fish examined, 56 had regenerated scales. This high incidence of scale regeneration has also been observed in brown trout samples from the Clark Fork River (Tohtz 1992).

B. Redd counts in the Clark Fork River, Warm Springs Creek, and Racetrack Creek, Fall, 1992.

Highest daily redd counts occurred in late November in surveys of Warm Springs Creek and the Mill-Willow Bypass (Table 4). Few redds were observed in the mainstem Clark Fork River. Counts were highest in surveys near bridge crossings at Warm Springs and Perkins Lane. Low redd counts in mainstem sections are partly explained by low visibility in deeper portions of the river and by the short length of some of the survey sections. It is possible too that most spawning occurred in areas outside the survey sections.

Table 4. Redd counts in the Clark Fork River and tributaries, fall, 1992.

	Location [a]														
Date	1	2	3	4	5	6	7	8	9	10	11[b]	12	13	14	15
October															
7	0	0	0	0	0	0	0	0	0	0	-	0	0	0	0
9	0	0	0	0	0	0	0	0	—— Not surveyed ————						
15	0	0	0	0	0	0	0	0	0	0	-	0	0	0	0
20	0	0	0	0	0	0	0	0	—— Not surveyed ————						
23	——— Not surveyed ————								0	0	-	0	0	0	0
29	0	1?	0	0	0	0	0	0	0	0	-	0	0	0	0
November															
5	3	3	1	0	1?	0	0	0	—— Not surveyed ————						
13	7	9	6	1	0	2	0	0	0	0	2	0	2	0	3
18	10	13	8	6	0	0	4	0	0	0	1	0	4	1?	1
20	15	11	8	4	0	0	2	0	0	0	0	0	4	0	0
25	——— Ice formation, no counts, surveys ended ————														

a Described Table 1, page 4.

1. Mill-Willow Bypass
2. Warm Springs Creek
3. Warm Springs Bridge
4. Perkins Lane Bridge
5. Galen Bridge
6. Racetrack Bridge
7. Racetrack Creek
8. Sager Lane Bridge
9. Deer Lodge Bridge
10. Cottonwood Creek
11. Vet Clinic
12. Kohr's Bend FAS
13. Pat's Bar
14. Phosphate Bridge
15. Mouth of Gold Creek

b Site was added 11/13/92

C. Spring trapping of Warm Springs Creek and the Mill-Willow Bypass to assess downstream movements of small fish.

Warm Springs Creek:

Sixty-four fish were trapped moving downstream. Most fish were brown trout less than 150 mm total length (Table 5).

Table 5. Fish captures in Warm Springs Creek, spring, 1993.

Species	Number of fish	Trap Days
Brown Trout	57	43
Rainbow Trout	4	43
Largescale Sucker	1	43
Longnose Sucker	2	43

Downstream captures increased rapidly the first two weeks in May. Highest capture rates occurred a little earlier in 1993 than in 1989, 1990, or 1991 (Figure 3).

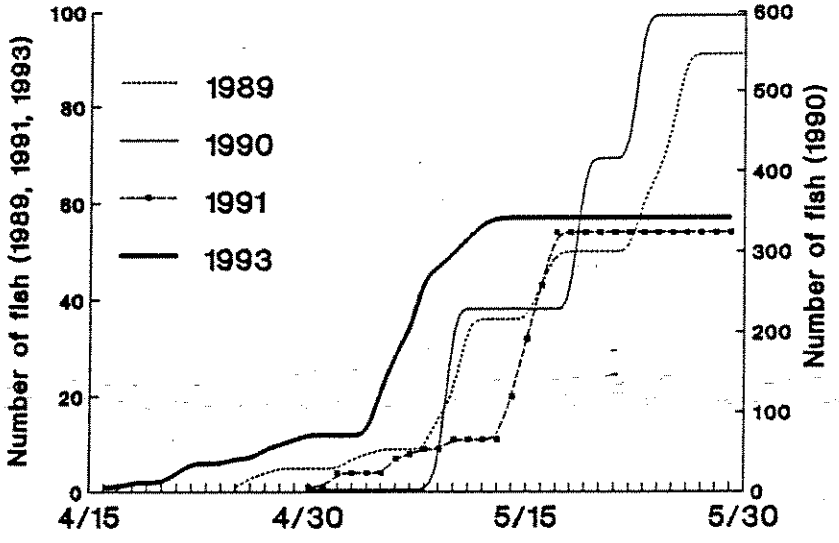

Figure 3. Cumulative number of brown trout caught each day in fry traps placed in Warm Springs Creek in 1989, 1990, 1991, and 1993.

No age 0 brown trout were caught this year, which is surprising because age 0 fish were commonly collected in the same fry traps placed near this location in 1989. 1990, and 1991 (Figure 4).

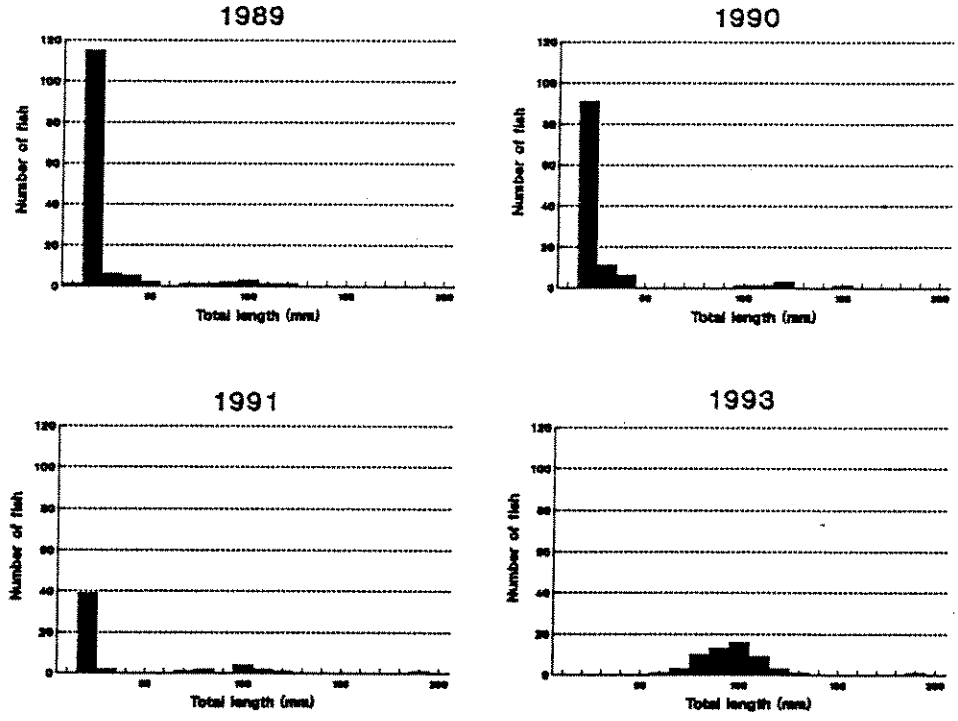

Figure 4. Length frequency of brown trout by 10 mm size classes for fish caught in fry traps placed in Warm Springs Creek in 1989, 1990, 1991, and 1993.

Mill-Willow Bypass:

Nine fish were trapped moving downstream. No trout were captured; most fish were suckers (Table 6).

Table 6. Fish captures in the Mill-Willow Bypass, spring, 1993.

Species	Number of fish	Trap Days
Redside shiner	1	43
Largescale sucker	6	43
Longnose sucker	2	43

It is possible that age 0 brown trout in Warm Springs Creek moved downstream with peak flows after traps had been removed. This would mean age 0 fish moved downstream many weeks later than was true in 1989, 1990, or 1991. Fifteen days of continuous trapping at high flows before the traps were removed this year produced no fish. However, debris clogging the traps at high flows greatly reduces trap efficiencies. Lack of age 0 fish might reflect poor recruitment this year, perhaps related to very low summer flows in 1992. Low survivorship may also explain why no trout fry were caught in the Mill-Willow Bypass, despite fall spawning activity above the trap location.

Flows were similar in both creeks throughout the sampling period. Water temperature was much warmer in the Mill-Willow Bypass than Warm Springs Creek after May 15 (Figure 5).

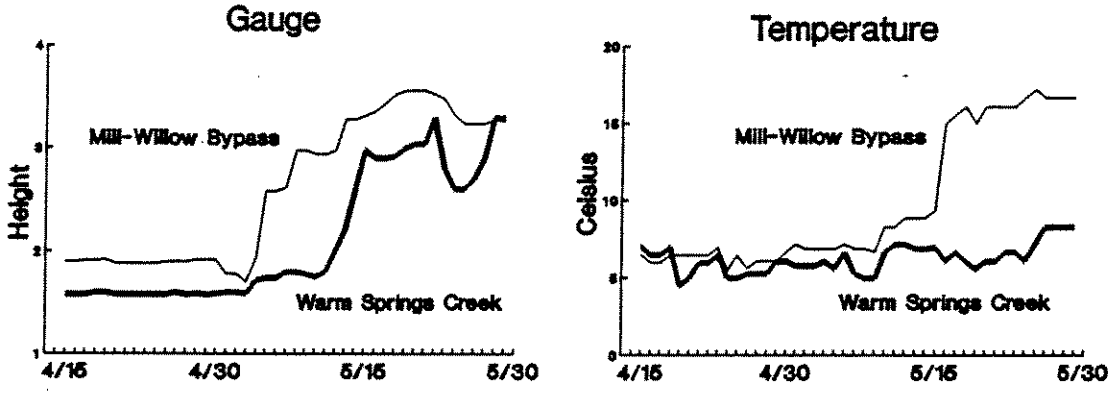

Figure 5. Relative gauge height and water temperature each day in the Mill-Willow Bypass and Warm Springs Creek, spring, 1993.

D. Estimates of fish abundance in tributaries of the Clark Fork River, 1989 to 1991.

Trout abundance changed with season, year, and location in most tributaries (Table 7). This variability contrasts with relatively more stable numbers of fish in sections of the mainstem river sampled during these same years (Tohtz 1992).

Table 7. Trout abundance in tributaries of the Clark Fork River, 1989 to 1991.

Stream (site) [a]	Spp [b]	Month /year	Removal pattern	N [c]	SE [d]	P [e]	Section length (m)	Fish / 304.8 m
Mill Creek								
(D)	LL	11/1989	19,5,0	24	0.39	0.83	91	80
(D)	LL	11/1990	30,21,14	91	18.68	0.34	91	303
(D)	LL	7/1991	4,1,1	6	0.67	0.67	91	20
(U)	LL	7/1991	12,10,4	31	5.78	0.44	84	113
Willow Creek								
(D)	LL	7/1990	28,6,8	45	3.18	0.58	91	150
(D)	LL	11/1990	31,20,7	65	5.48	0.51	91	217
(U)	LL	7/1990	23,9,0	32	0.68	0.78	114	85
(U)	LL	11/1990	29,11,11	60	7.20	0.46	114	160
(D)	LL	8/1991	22,9,3	35	1.74	0.65	91	117
(D)	LL	10/1991	29,10,2	41	1.02	0.75	91	137
(U)	LL	7/1991	32,6,5	44	1.51	0.69	114	117
(U)	LL	10/1991	42,19,4	67	2.27	0.66	114	179
Lost Creek								
(D)	LL	11/1989	51,24,0	76	1.49	0.74	91	253
(D)	LL	7/1990	91,25,17	140	4.18	0.62	91	467
(D)	LL	11/1990	67,23,15	113	4.99	0.58	91	377
(U)	LL	7/1990	10,3,4	19	3.20	0.50	91	63
(U)	LL	11/1990	15,13,7	48	12.87	0.35	91	160
(D)	LL	7/1991	89,20,7	117	1.56	0.76	91	390
(U)	LL	7/1991	109,32,11	156	2.78	0.70	91	520
(U)	LL	10/1991	29,20,12	80	13.72	0.38	91	267

Continued ...

a) D = downstream site, U = upstream site (locations see Table 2, pages 7-8); b) LL = brown trout, EB = brook trout, RB = rainbow trout, WC = westslope cutthroat trout; c) Estimated number in the sampled reach; d) Standard error of the estimate; e) Probability of capture

Table 7. Trout abundance in tributaries of the Clark Fork River, 1989 to 1991 (Continued from page 15).

Stream (site) [a]	Spp [b]	Month /year	Removal pattern	N [c]	SE [d]	P [e]	Section length (m)	Fish / 304.8 m
Dempsey Creek								
	LL	8/1990	60,17,7	86	2.11	0.69	31	843
	EB	8/1990	31,9,1	41	0.73	0.79	31	402
	LL	8/1991	6,1,1	8	0.51	0.73	31	78
	LL	10/1991	9,3,2	14	1.02	0.67	31	137
Cottonwood Creek								
	LL	9/1991	43,14,7	67	2.73	0.63	91	223
Gold Creek								
(D)	LL	7/1990	46,14,4	65	1.55	0.72	152	130
(D)	LL	11/1990	91,67,28	230	17.63	0.42	152	460
(U)	LL	7/1990	27,9,6	44	2.58	0.61	159	85
(U)	LL	11/1990	41,31,27	194	71.49	0.21	159	373
(D)	LL	7/1991	89,33,18	151	5.71	0.58	152	302
(D)	LL	10/1991	105,27,22	163	4.89	0.61	152	326
(U)	LL	7/1991	63,26,17	119	7.25	0.52	159	229
(U)	LL	10/1991	59,34,17	129	10.04	0.47	159	248
Schwartz Creek								
(D)	LL	8/1991	14,3,4	22	1.92	0.60	91	73
(D)	EB	8/1991	11,5,6	29	8.79	0.37	91	97
(D)	RB	8/1991	6,6,2	10	1.11	0.63	91	33
(U)	LL	8/1991	15,2,2	19	2.29	0.76	72	81
(U)	EB	8/1991	57,21,12	97	4.62	0.58	72	413
(U)	RB	8/1991	9,3,0	12	0.36	0.80	72	51
(U)	WC	8/1991	10,5,2	17	0.82	0.65	72	72

Continued ...

a) D = downstream site, U = upstream site (locations see Table 2, pages 7-8); b) LL = brown trout, EB = brook trout, RB = rainbow trout, WC = westslope cutthroat trout; c) Estimated number in the sampled reach; d) Standard error of the estimate; e) Probability of capture

Table 7. Trout abundance in tributaries of the Clark Fork River, 1989 to 1991 (Continued from page 16).

Stream (site) [a]	Spp [b]	Month /year	Removal pattern	N [c]	SE [d]	P [e]	Section length (m)	Fish / 304.8 m
Bateman Creek								
(D)	WC	8/1991	37,9,6	53	1.77	0.68	91	177
(U)	WC	8/1991	35,14,0	49	0.87	0.78	91	163
Johnson Creek								
	LL	8/1991	7,3,3	14	2.45	0.52	91	47
Harvey Creek								
(D)	LL	9/1991	39,15,14	80	8.16	0.46	91	267
(D)	LL	9/1991	30,13,14	74	12.71	0.38	91	247
(D)	EB	9/1991	11,3,4	19	2.23	0.56	91	63
(D)	WC	9/1991	16,11,4	35	4.34	0.50	91	117
(U)	WC	8/1991	34,10,3	35	4.34	0.50	91	117

a) D = downstream site, U = upstream site (locations see Table 2, pages 7-8); b) LL = brown trout, EB = brook trout, RB = rainbow trout, WC = westslope cutthroat trout; c) Estimated number in the sampled reach; d) Standard error of the estimate; e) Probability of capture

E. Recapture summary of marked rainbow released near Bearmouth in 1987.

Marked rainbow stocked in 1987 have been recovered only in the mainstem Clark Fork River, and only in EA Reach 9 (Spoon 1990) between Bear Creek and the Bearmouth Chalet. Although sampling was continued in 1991 and 1992, no fish from the 1987 plant have been caught since spring surveys in 1990 (Table 8).

Table 8. Rainbow trout recaptured after stocking in 1987 near Bear Creek and Bearmouth.

Year	Season	Rainbow caught	Marked rainbow	Total length of fish (mm)
1987	Fall	33	9	all about 162
1988	No sampling			
1989	Spring	168	1	311
1989	Fall	85	3	360,369,369
1990	Spring	128	2	367,369

Prepared by: Joel Tohtz

Date: July, 1993

Waters Referred To:

Clark Fork River	Cottonwood Creek
Mill Creek	Johnson Creek
Willow Creek	Gold Creek
Warm Springs Creek	Harvey Creek
Lost Creek	Schwartz Creek
Racetrack Creek	Bateman Creek
Dempsey Creek	

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APPENDIX A

Table A1. Common names and binomial designations of fish referred to in this report.

Common name	Scientific name
Brown Trout	*Salmo trutta*
Mountain Whitefish	*Prosopium williamsoni*