MONTANA DEPARTMENT OF FISH, WILDLIFE AND PARKS

FISHERIES DIVISION
JOB PROGRESS REPORT

STATE: MONTANA PROJECT TITLE: STATEWIDE FISHERIES INVESTIGATIONS

PROJECT NO: F-46-R-4 STUDY TITLE: SURVEY AND INVENTORY OF COLDWATER AND WARMWATER ECOSYSTEMS

JOB NO: V-d JOB TITLE: NORTHEAST MONTANA COLDWATER ECOSYSTEM INVESTIGATIONS

PROJECT PERIOD: JULY 1, 1990 THROUGH JUNE 30, 1991

ABSTRACT

An "opening day" creel census was conducted for the third consecutive year at Beaver Creek. Few fishermen turned out partly due to reduced fish stocks stemming from severe drought in 1988. Population estimates in two sections of Beaver Creek confirmed that trout populations are still at low levels. Trout continue to be heavily infested with "black-spot" disease." Beaver Creek Reservoir was gill-netted and showed a significant increase in catch-per-unit effort for trout. Average size of trout decreased for the second consecutive year but condition (c) remained stable. Sucker numbers have declined to all time lows. Arlee rainbow were reintroduced to determine if they could achieve better growth under less competitive circumstances than when they were previously utilized in this reservoir. Condition of Arlee rainbow trout was significantly higher than the Eagle Lake rainbow sampled. Since rehabilitation of Bear Paw Lake in 1983, sucker gill net catches have increased from 9 per gill net in 1985 to 278 per net in 1990. The sucker removal effort initiated in 1989 was continued. Trapping in 1990 removed 44,622 suckers with a total biomass of 10,206 pounds. Fall gillnetting in 1990 indicated good numbers of cutthroat and rainbow trout were present and their average size had increased to at least 1988 levels. However, condition of trout was still below 1988. Juvenile sucker numbers continue to increase dramatically and may be less susceptible to current control efforts. Faber Reservoir fishing pressure declined in 1990 from the last estimate made in 1987, but is consistent with angler pressure in 1986. Largemouth bass catches were reported by fishermen. Beach seining indicated largemouth bass spawning was unsuccessful in 1990. Implications of this illegal introduction are unknown at this time. A sucker removal project at Grasshopper Reservoir reduced the pounds of suckers taken per trap day from 128 in 1988 to 11 in 1990. Juvenile suckers are increasing, however. Average size and condition of trout decreased from 1989 despite the sucker reductions. Management recommendations are presented for all waters.

OBJECTIVES AND DEGREE OF ATTAINMENT

Streams

1. To ensure within hydrologic constraints that stream flows supporting trout fisheries do not fall below 1975-85 averages. Objective accomplished utilizing state funding.

2. To maintain all of the region's streambanks and channels in their present or improved condition. Objective accomplished utilizing state funding.

3. To maintain water quality at or above 1975-85 average levels. Objective accomplished; monitored compliance with water quality standards and adjusted streamflows in Beaver Creek for temperature moderation.

4. To maintain fish populations and habitat in streams at present levels. Objective accomplished and data presented.

5. To maintain at least 6,000 angler days per year and a trout catch of 0.5 fish per hour. Objective accomplished and data presented.

6. To develop fishing access site acquisition and development for the region. Objective accomplished utilizing state funds.

7. To establish cooperative watershed management plans with federal agencies. Objective accomplished utilizing state funds.

8. To obtain greater public involvement by attending approximately 20 public/ sportsmen's club meetings and initiating 2 news releases per year. Objective accomplished utilizing state funding.

Lakes

1. To maintain 70,000 angler days per year and provide catch rates of 0.5 fish per hour or greater. Objective accomplished and date presented.

2. To maintain acceptable trout fishing in waters with nongame and/or predator species. Objective accomplished and data presented.

3. To increase the number and distribution of public fishing waters by acquiring 2 reservoirs every 5 years. Objective accomplished.

4. To obtain public input for management decisions by attending 20 sportsmen's club meetings and providing 3 news releases per year. Objective accomplished utilizing state funding.

5. To develop fishing access site acquisition and development plan for the region. Objective accomplished utilizing state funding.

PROCEDURES

Streams were sampled with a direct current (DC) backpack electrofishing unit. Population estimates were made using the "two-pass" method. Beaver Creek creel census data was collected by interviewing all fishermen leaving the study area on the opening day of fishing season. Anglers were questioned as to hours, stream/ sections fished and gear type. All fish were measured for total length (TL) in inches.

Lakes were sampled with floating and/or sinking experimental gill nets. The gill nets measured 6 feet in depth and 125 feet in length and consisted of 25-foot panels of 3/4-, 1-, 1/4-, 1/2-, and 2-inch square mesh. Beach seining to determine abundance of sport and forage fishes was conducted in late summer utilizing a 100- x 9-foot seine of 1/4-inch square mesh. Frame traps of 1/4-, 1/2-, and 1-inch square mesh were utilized for sucker removal in Bear Paw Lake and Grasshopper Reservoir.

RESULTS AND DISCUSSION

Streams in the Bear Paw Mountains

An "opening day" creel census was initiated in 1988 to gather trend information on trout harvest from Beaver Creek. Because the third Saturday in May is the general trout season opening day, with a large number of anglers usually present, this day was chosen as a yearly indicator of use and harvest. The study area is described in detail in a previous report (Gilge, 1988). The creel census was conducted again in 1990 with poor results. Only 9 fishermen were interviewed; 4 fished Section 03, 2 fished Section 02, and 3 fished Section 01. The overall catch rate was 3.4 fish-per-hour (f/H) for Section 03, 3.1 f/h for Section 02, and 0.1 f/h for Section 01. Fishermen expended a total of 27.5 hours and caught 63 trout. The breakdown by stream section and average size of trout is presented in Tabled 1. The data is of limited use in determining long-term harvest trends. The poor showing of fishermen is believed to be a direct result of reduced fish stocks. Table 2 illustrates the affect recent droughts have had on fish populations. Most fish continue to show heavy infestation of "black-spot" disease. Its' affect on the fishery as a whole is unknown at this time.

Table 1. Numbers and mean lengths of trout creeled from three sections of Beaver Creek on "opening day," 1990.

	Rainbow		Brown		Brook		Cutthroat		Total Trout Harvest
	No.	Mean Lgth.	No.	Mean Lgth.	No.	Mean Lgth.	No.	Mean Lgth.	
Section 01	1	12.3	-	----	-	---	-	----	1
Section 02	3	11.2	1	15.8	-	---	-	----	4
Section 03	18	10.3	-	----	9	8.7	1	10.3	28

Table 2. Fall estimates of Age I and older trout from two sections of Beaver Creek. Estimates are presented as number of trout per 1,000 feet of stream.

	1980	1981	1982	1983	1988	1989	1990
Section 02							
rainbow trout	51	68	36	11	90	36	28
Section 03							
rainbow trout	47	40	12	58	80	10	10
brook trout	172	186	149	188	169	40	36

Beaver Creek Reservoir

This 200 surface-acre reservoir contains a variety of cold, cool, and warmwater species including rainbow trout, northern pike, walleye, yellow perch, and largemouth bass. Since its initial filling in 1974, it has been managed as a trout fishery. Stocking of Eagle Lake and DeSmet rainbow trout commenced in 1985 to provide a longer-lived trout capable of utilizing Beaver Creek for natural reproduction. The domestic Arlee rainbow stocked previously had failed to provide significant natural reproduction and was short-lived. Previous studies at Beaver Creek Reservoir indicated both the Eagle Lake and DeSmet rainbow had increased longevity over Arlee rainbow and that the Eagle Lake was easier to catch than the DeSmet (Needham and Gilge, 1987). Though Eagle Lake rainbow continue to utilize portions of Beaver Creek for spawning, recruitment to the lake fishery is minimal due to predation. The stocking of DeSmet ceased in 1988, and the reservoir was planted exclusively with Eagle Lake rainbow until 1990 when 4,885 marked Arlee rainbows were again added to the reservoir.

Gill-net surveys were conducted in 1974, 1977, and annually since 1980 to monitor growth and survival of hatchery trout and to determine relative abundance of other fishes. Results of these netting efforts are summarized in Table 3. Catch-per-unit effort (CPUE) of trout increased significantly in 1990 to the highest level in 10 years. The average size of trout decreased but overall condition of trout remained stable. Trout condition is believed to be associated with white sucker numbers which have declined considerably due to northern pike predation. Arlee rainbow exhibited a much higher condition factor (41.00) than Eagle Lake rainbow (34.39). The last time Arlee rainbow were present in the reservoir the sucker population presented significant competition. Sucker numbers have since declined to all-time lows. Arlee rainbow were reintroduced to determine if they could achieve better growth than Eagle Lake rainbow under less competitive circumstances.

Table 3. Summary of gill net catches and relative abundance of fishes in Beaver Creek Reservoir, 1974-90.

Year	Rainbow Trout				Northern Pike			Walleye			Yellow Perch			Sucker Sp.
	CPUE[1]	Ave. Lgth. (in.)	Ave. Wt. (lbs.)	C[2]	CPUE	Ave. Lgth. (in.)	Ave. Wt. (lbs.)	CPUE	Ave. Lgth. (in.)	Ave. Wt. (lbs.)	CPUE	Ave. Lgth. (in.)	Ave. Wt. (lbs.)	CPUE
1974	24.0	10.7	0.60	48.98	---	----	----	---	----	----	----	---	----	89.7
1977	35.0	10.1	0.39	37.85	---	----	----	---	----	----	----	---	----	115.7
1980	23.3	10.1	0.35	33.97	---	----	----	---	----	----	----	---	----	83.3
1981	7.0	10.4	0.35	31.11	---	----	----	---	----	----	----	---	----	171.7
1982	8.3	11.2	0.55	37.15	2.3	15.8	0.99	---	----	----	----	---	----	112.3
1983	3.3	11.8	0.62	37.74	3.7	25.1	4.78	---	----	----	----	---	----	99.7
1984	3.0	11.3	0.59	40.89	3.7	26.6	5.49	---	----	----	----	---	----	58.7
1985	3.0	11.9	0.77	45.82	4.3	26.0	5.72	---	----	----	----	---	----	68.3
1986	13.0	11.9	0.66	39.16	4.2	16.7	2.13	---	----	----	----	---	----	42.0
1987	11.3	13.6	0.92	36.57	5.2	22.0	2.81	---	----	----	0.3	6.3	0.12	18.0
1988	9.7	14.7	1.17	36.83	3.0	27.6	7.30	0.7	10.6	0.36	8.2	5.9	0.10	18.0
1989	10.7	13.1	0.80	35.59	1.2	30.3	8.31	0.0	----	----	9.2	7.6	0.21	16.8
1990	18.5	12.0	0.61	35.30	0.7	21.0	2.90	1.8	13.2	0.86	13.0	8.5	0.32	9.8

[1]Number of fish caught per gill net.

[2]Condition factor = $\frac{W \times 10^5}{L3}$

Northern pike numbers peaked in 1987 but are low at present due to several years of poor reproduction and heavy fishing pressure. A large year-class was produced in 1990, however. The depressed adult pike population may be partially responsible for the recent increase in trout numbers.

Walleye were introduced in 1987 due to local demand and are not considered at this time to be major predators on hatchery trout of catchable size.

Qualitative stomach content analysis of fall gill-netted fish indicated northern pike had consumed only young-of-the-year (YOY) yellow perch, while walleyes had eaten a number of YOY northern pike, crayfish, and YOY yellow perch. Yearling and younger yellow perch consumed exclusively plankton, while perch over 10 inches had eaten crayfish. The yellow perch population has been steadily increasing since their illegal introduction in 1987. Yellow perch may be effectively competing with trout.

A creel census was initiated in April, 1991. Data will be presented in an annual report to be completed June 30, 1992. The contribution of the various sport fishes to the creel will be determined as well as pressure and harvest. A preference survey is also being undertaken to assist in determining management strategies.

Bear Paw Lake

Bear Paw Lake is a 45 surface-acre reservoir on Beaver Creek in the Bear Paw Mountains. It is maintained with annual plants of McBride strain cutthroat and Eagle Lake rainbow trout. In recent years, summer fishing pressure has exceeded 140 angler days per surface acre. Fishing pressure becomes excessive when acceptable-size fish are readily available. A creel reduction from 10 to 5 fish was imposed in 1987 to distribute the catch under such conditions. White suckers over-populate periodically and the reservoir was chemically rehabilitated in 1983. Post-rehabilitation trout growth in 1984 and 1985 was excellent. However, sucker gill net catches have increased from a catch per net of 9 in 1985 to 278 per net in 1990. Competition from large numbers of suckers has reduced trout growth rates significantly. Fishing pressure has declined dramatically since 1988 due to the small size and poor condition of trout. Respondents to a angler survey indicated a desire to catch larger fish even at the expense of catching fewer fish.

Drawdown and chemical rehabilitation is not a preferred option for sucker control in this reservoir. This is primarily due to the heavy recreational use it receives, detoxification time, invertebrate loss, bank sloughing, and subsequent trout mortality.

A sucker control program was initiated in May of 1989. Frame traps were utilized to capture suckers in the spring as they frequented shorelines and the mouth of Beaver Creek prior to spawning. A total of 12,545 suckers weighing 8,986 pounds were removed in 1989. Trapping and removal was conducted again in May of 1990. In this effort 27,224 suckers weighing 5,089 pounds were removed. An additional 17, 398 fish (5,117 pounds) were removed in October of 1990.

Gillnetting has been conducted for a number of years in September. Utilizing 1988 as a base year, ratios of mature (>10 inches) and juvenile suckers (<10 inches) as they appeared in the catch were compared with trout CPUE and condition (Table 4). Fall gill netting indicated that the effort has reduced the number of mature suckers greater than 10 inches significantly. However, the catch of juvenile suckers less than 10 inches increased 25% in 1989 and 107% in 1990. Trout numbers were higher in both 1989 and 1990, despite reduced stocking rates; however, current condition of trout is still below pre-sucker removal levels. Increased numbers of small resident trout has increased intraspecific competition for food, exacerbating the problem. As seen in previous years, fishing pressure has decreased as the average size of fish declined. Juvenile suckers are not as susceptible to capture, as they do not congregate in the creek to spawn.

The topography of the reservoir with its steep sides and submerged woody vegetation limits frame trapping. Though trapping is very labor intensive, it is still a preferred option over draining and rehabilitation with fish toxicant. Several years of trapping may be required before significant growth of trout is achieved.

Crayfish have become extremely abundant in recent years and may have an effect on food availability for trout. A study from Newcastle Reservoir in Utah by Hepworth and Duffield concluded that crayfish changed the reservoir ecosystem by altering the food web, thereby reducing energy transfer to rainbow trout.

If trapping efforts are unsuccessful in reducing competition with trout, an alternative sport fish capable of utilizing juvenile suckers for food should be introduced. Smallmouth bass may utilize both juvenile suckers and crayfish without significant losses to catchable-size trout which are stocked annually.

Table 4. Relative abundance of suckers and trout as indicated by fall gill-netting following sucker removal efforts in Bear Paw Lake 1988-1990.

	Suckers				Cutthroat Trout			Rainbow Trout		
	No. <10" Per Net	% Chg[1]	No. >10" Per Net	% Chg	No. Per Net	$\bar{X}$L	C[2]	No. Per Net	$\bar{X}$L	C[2]
Fall 1988	122	----	89	---	8.7	7.9	36.50	9.0	10.3	41.18
Fall 1989	152	+ 25	21	-76	19.0	8.1	30.11	15.3	8.4	33.74
Fall 1990	253	+107	25	-72	22.3	8.7	34.68	9.0	10.0	32.00

[1] 1988 used as base year determining percent change in relative abundance.

[2] Condition factor $\frac{W \times 10^5}{L^3}$

A creel census was initiated in April of 1991 which will provide harvest and pressure data to be used in future management strategies.

Faber Reservoir

This popular reservoir has provided quality rainbow trout fishing for over 25 years. The department acquired a 20-year lease in 1986 and has developed it as a fishing access site. Fishing pressure, expressed in angler-days, has been determined periodically at this site using car counters and personal interviews with fishermen. Angler-day use was estimated from May through September. In 1986, it was estimated that 1,860 anglers used the reservoir. In 1987, use had increased to 5,319 angler-days. A severe drought in 1988 was followed by an outbreak of "black-spot" disease. Fishermen use decreased noticeably. An estimate conducted in 1990 indicated fishing pressure was similar to that experienced in 1986, approximately 1,986 angler-days. The acceptance of infected fish is slowly increasing.

Anglers also reported several catches of largemouth bass from the reservoir in 1990. These were introduced illegally by unknown individual(s). Approximately 450 feet of shoreline was seined to determine if any bass reproduction had occurred. No adult or YOY bass were captured. It is too early to tell what affect bass may have on the fishery. Monitoring will continue to confirm natural reproduction.

A creel census was initiated in April of 1991 to determine changes in harvest and fishing pressure. Data will be presented in future reports.

Grasshopper Reservoir

The most recent stocking strategy for this reservoir includes alternate year plants of Arlee and Eagle Lake rainbow trout. This is done to utilize the longevity of Eagle Lake rainbow, along with the growth and catchability characteristics of the Arlee.

Poor trout growth in the past has been associated with high numbers of white suckers in the reservoir. Spring trapping and removal of suckers has been conducted since 1988. The removal of 1,969 suckers weighing 1,531 pounds was accomplished in 1988 in 12 trap-days. A similar catch in 1989 of 1,785 fish totalling 1,530 pounds was made with twice the effort.

In the spring of 1990, 21 trap-days of effort produced only 256 suckers weighing 237 pounds. The sucker catch rate, expressed as pounds per trap-day (lbs/TD), has decreased from 128 lbs/TD in 1988 to 64 lbs/TD in 1989, and 11 lbs/TD in 1990.

Gillnetting in 1990 showed a further reduction in mature suckers (>10 in.) but an alarming increase in juvenile sucker numbers (Table 5). Gillnetting also showed a decrease in average size of trout as well as a significant drop in body condition.

Crayfish numbers appear to be increasing and are not utilized to any extent by trout.

Table 5. Results of gill net sampling in Grasshopper Reservoir, 1988-1990.

Year	Trout				Suckers		
					No./Net		Lbs./
	No./ Net	Mean Lgth. (in.)	Wt. (lbs.)	C Factor	<10 in.	>10 in.	Trap-Day
1988	75	9.4	0.29	34.92	0	42	.128
1989	27	11.9	0.60	35.60	0	7	64
1990	41	10.1	0.31	30.09	27	4	11

RECOMMENDATIONS

Beaver Creek: Discontinue opening day creel census. Monitor trout populations in all sections.

Beaver Creek Reservoir: Continue creel census to determine harvest rates of trout and contributions of other sport fish. Experiment with Arlee rainbow plants to determine if catch rates and growth rates can be improved.

Bear Creek Lake: Continue sucker removal. Reduce trout plants until significant growth is achieved. Consider Arlee rainbow trout and/or smallmouth bass in future stocking strategies. Conduct creel census to determine harvest data.

Faber Reservoir: Conduct creel census. Evaluate illegal largemouth bass introduction.

Grasshopper Reservoir: Continue annual sucker removal. Adjust stocking rates to maintain a trout gill-net catch between 25-35 fish per net.

LITERATURE CITED

Gilge, K. W. 1988. Northeast Montana Coldwater Ecosystem Investigations, Job Pro. Rept. for D-J Project F-46-R-2, Job No. V-d. 10 pp. (mimeo).

Hepworth, Dale K. and Daniel J. Duffield. 1987. Interactions Between an Exotic Crayfish and Stocked Rainbow Trout in Newcastle Reservoir, Utah. No. Amer. Jour. of Fisheries Mgt. 7:554-561.

Needham, Robert G. and Kent Gilge. 1987. Inventory and Survey of the Project Area, Job Prog. Rept. for D-J Project F-11-R-34, Job. No. I-a. 40 pp. (mimeo).

Waters referred to:

15-4570-03	Beaver Creek Reservoir
15-4560-05	Bear Paw Lake
15-5380-07	Grasshopper Reservoir
15-0320-01	Beaver Creek
15-5140-05	Faber Reservoir

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creel census, Eagle Lake rainbow trout, sucker removal.

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