MONTANA DEPARTMENT OF FISH, WILDLIFE AND PARKS

FISHERIES DIVISION
JOB PROGRESS REPORT

STATE: MONTANA PROJECT TITLE: STATEWIDE FISHERIES INVESTIGATIONS

PROJECT NO: F-46-R-1 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, 1987 THROUGH JUNE 30, 1988

ABSTRACT

A summer creel census was conducted at Beaver Creek Reservoir during 1987. Overall catch rates for rainbow trout and northern pike were 0.04 and 0.20 fish per hour (f/h), respectively. Approximately one-third of the anglers sought rainbow trout, another third northern pike, while the remaining third had no preference. Stocking recommendations are presented. Creel census data was collected at Bear Paw Lake to determine need for special regulations. Pressure decreased 21% from 1986, but is still considered to be excessive at 147 angler-days per surface acre. Reduction in creel limits and means of taking are proposed. A creel census at Faber Reservoir revealed an increase in fishing pressure of 45% over 1986. The trout harvest more than doubled that of 1986 and catch rates improved. Increased stocking rates have not decreased fish quality to date. Evaluation of Eagle Lake and DeSmet rainbow in several reservoirs concluded that Eagle Lake were more catchable. Eagle Lake rainbow exhibited better survival than DeSmet or Arlee rainbow. Growth rates were similar for Eagle Lake and DeSmet rainbow in Beaver Creek Reservoir. Predation of rainbow trout and species combinations were studied in four reservoirs and management efforts are discussed.

OBJECTIVES AND DEGREE OF ATTAINMENT

Streams

1. To ensure within hydrologic constraints that streamflows supporting trout fisheries do not fall below 1975-85 averages. Objective accomplished; data was collected for upper Cow Creek instream flow reservation.

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 investigated a fish kill on Clear Creek.

4. To maintain fish populations and habitat in streams at present levels. Objective accomplished; reviewed the Bureau of Land Management West Hi-line EIS and assisted in developing stream crossings on Beaver Creek.

5. To maintain at least 6,000 angler days per year and a trout catch of 0.5 fish per hour. Objective partially accomplished; brown trout were introduced into Beaver Creek and survival monitored. Angler pressure will be determined by a statewide angler use survey in 1989-90.

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

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

8. To obtain greater public involvement by attending approximately 20 public/sportsmen's club meetings and initiating two 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 partially accomplished and data presented. Angler pressure will be determined by a statewide angler use survey in 1989-90.

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; six existing BLM reservoirs were investigated for fisheries potential in the Turner area and a new reservoir construction project near Glasgow was investigated.

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

A partial creel survey of the "roving clerk" type was used to estimate fishing effort, harvest rate, catch rate, and total harvest at Beaver Creek Reservoir. Weekends and weekdays were treated as separate strata because they received markedly different fishing pressures. Sampling effort assigned to these strata were proportional to the anticipated amount of fishing pressure. Census days were chosen randomly and at least one weekend day and one weekday were surveyed each week throughout the study period. Fishing pressure was estimated from instantaneous fishermen counts made hourly throughout each creel day. Catch rates, expressed as fish per hour (f/h) were derived by dividing total catch by total hours expended.

A creel census was conducted on two popular trout reservoirs, Faber Reservoir and Bear Paw Lake, to evaluate the need for special regulations. Data was collected using car counters and direct interviews. Counts of fishermen per vehicle were made on creel days and used with the car-counter readings to estimate total pressure. All fish observed were measured for total length (TL) and weighed to the nearest 0.01 pound. Data was compiled and analyzed monthly.

Streams were sampled with a direct current (DC) bank electrofishing unit. Lakes were sampled with floating and/or sinking experimental gill nets. The gill nets measured 6 feet deep and 125 feet in length and consisted of 25-foot panels of 3/4-, 1-, 1 1/4-, 1 1/2-, and 2-inch square mesh. Beach seining to determine abundance of sport and forage fishes were conducted in late summer utilizing a 100- x 9-foot seine of 1/4-inch square mesh.

RESULTS AND DISCUSSION

Creel Census

Beaver Creek Reservoir

The creel census commenced April 10 and continued through September. Forty-seven days of the 173-day study period were sampled. A total of 1,390 fishermen were interviewed during the study period. Total pressure during that time period was estimated to be 6,210 angler days. Rainbow trout and northern pike were the primary sport fish sought by fishermen. Overall summer catch rates for trout and northern pike were 0.09 f/h and 0.20 f/h, respectively. A monthly breakdown of catch rates and harvest are presented in Table 1. Since the total hours fished each month were used to determine catch rates, it is very likely that catch rates were underestimated for both species by as much as 33%.

Angler preference and bait type were not quantified from interviews. However, it was ascertained from conversations with many fishermen that approximately one-third fished exclusively for trout, one-third for northern pike, and the remainder had no preference. Pike fishermen

Table 1. Monthly pressure and harvest statistics from creel census conducted at Beaver Creek Reservoir, 1987.

Time Period	Pressure (Angler-Days)	Rainbow Trout				Northern Pike			
		Catch Rate (f/h)	Harvest Rate (f/h)	Total Harvest	Mean Length (in.)	Catch Rate (f/h)	Harvest Rate (f/h)	Total Harvest	Mean Length (in.)
4/10-4/30	689	0.22	0.18	372	13.2	0.14	0.05	103	14.8
5/1-5/31	1,869	0.14	0.11	610	12.6	0.35	0.20	1,108	15.7
6/1-6/30	1,255	0.10	0.10	377	12.8	0.15	0.11	415	18.4
7/1-7/31	1,188	0.05	0.05	141	13.0	0.20	0.12	339	18.3
8/1-8/31	715	0.03	0.03	62	13.9	0.17	0.11	227	19.8
9/1-9/30	494	0.05	0.05	61	14.5	0.13	0.10	122	21.5
TOTALS	6,210	0.09[1]	0.08[1]	1,623	13.0[1]	0.20[1]	0.13[1]	2,314	18.5[1]

[1]Weighted means.

primarily used large lures or frozen smelt while trout anglers fished with worms, corn, or files. Few pike were taken on trout tackle and vice versa.

Total summer harvest of trout was 1,623 fish averaging 13.0 inches TL. Trout catch rates ranged from 0.22 f/h in April to 0.03 f/h in August. Thirty-eight percent of the trout harvest occurred in May. Total harvest of northern pike was estimated at 2,314 fish averaging 18.5 inches TL. Forty-eight percent of the pike catch occurred in May. Pike catch rates varied from 0.35 f/h in May to 0.13 f/h in September. A comparison of catch and harvest rates indicates few trout were returned to the water while 39% of northern pike caught were released. Since most fishermen that caught pike were pursuing them, it is believed that the high release rate was due to unacceptable size rather than a disdain for the species.

Despite low catch rates, a large portion of local anglers prefer trout in this reservoir. The average size of trout has improved significantly in recent years which may explain angler interest. The dramatic increase in the northern pike population experienced recently necessitates the stocking of "catchable-size" trout. Northern pike appear highly susceptible to anglers and if natural reproduction should falter, the pike fishery may fluctuate excessively. Suckers and yellow perch are present in sufficient numbers to buffer trout predation at this time.

Bear Paw Lake

Bear Paw Lake is a 45 surface-acre reservoir maintained with annual plants of cutthroat trout since 1984. The first year following cutthroat introductions, 1985, proved to be very successful for anglers, but fish stocks were rapidly depleted. Although fishing pressure was heavy in 1986, catch rates were poor. Cutthroat stocking rates were increased and catchable-size rainbow trout were planted in 1987.

A total of 425 fishermen were interviewed during the April-September creel period. It was estimated that 6,599 fishermen expended 22,597 hours on the reservoir during the creel period. Pressure peaked in May and tapered off throughout the summer. Catch rates fluctuated widely but were much improved over 1986 (Figure A). Rainbow trout stocked in 1987 accounted for 34% of the catch. Approximately 3,666 trout were harvested at an overall catch rate of 0.24 f/h. These trout averaged 10.3 inches TL and provided a yield of 28.5 pounds/acre which was twice the yield of 1986 (Needham and Gilge, 1987).

The catch rate improved significantly in 1987 but is still well below the target level of 0.5 f/h. Although fishing pressure decreased 21% from the same period in 1986, it is still excessive at 147 angler days per surface acre. A rapidly expanding sucker population is expected to inhibit trout growth. This factor, coupled with increased stocking rates, may produce fish of unacceptable size to the fishing public. Recommendations include reducing the trout limit from 10 to 5 fish

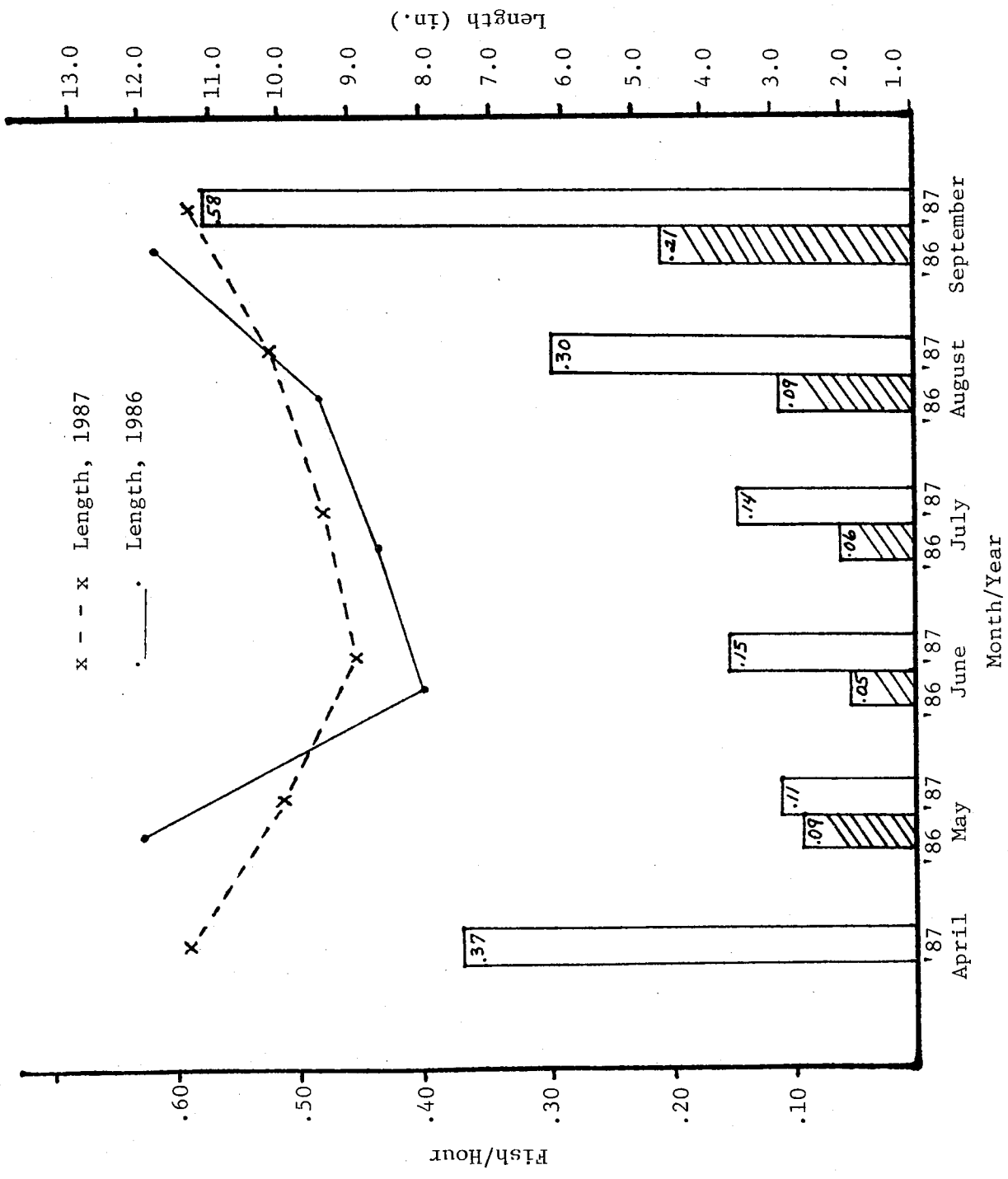


Figure A. Angler catch rates (histogram) and mean length of trout taken from Bear Paw Lake, 1986-87.

daily and limiting means of taking to a single line the entire year, which eliminates the six setline winter regulation. The improvement or development of other fisheries in the area may help alleviate some of the pressure from this water.

Faber Reservoir

Fishermen interviews totalled 413 during the April through September creel period. An estimated 3,028 fishermen used the reservoir during the study period resulting in 87 angler-days fishing pressure per acre. This was a 45% increase in pressure over 1986. Total pressure in August was estimated due to car-counter interference during road construction. Fishing pressure steadily increased from April through July, then tapered off in August and September.

Fishermen harvested 5,626 rainbow trout weighing 4,857 pounds. The 1987 catch more than doubled the 1986 harvest during the same period. The average size of trout creeled in 1987 increased to 13.2 inches TL compared to 12.2 inches TL in 1986. The overall summer catch rate was 0.48 f/h. The catch rate was highest in August when fingerling rainbow stocked in May achieved catchable size. However, one of every four fish was voluntarily returned to the water. The overall summer catch rate in 1987 approached the target level of 0.5 f/h and showed significant improvement over 1986 (Figure B).

Increased stocking rates apparently contributed to angler success without sacrificing fish quality. Daily creel limits are liberal at present but pressure is increasing at an alarming rate. A reduction in the daily limit from 10 to 5 fish is recommended to protect the fishery should pressure continue to increase. Using 1987 creel data, a 50% reduction in the daily limit from 10 to 5 fish would have reduced the take-home catch by 10.8% and returned approximately 500 fish to the water. This small infusion of returned fish may provide the impetus to achieve the target catch rate of 0.5 f/h.

Trout Strain Evaluations

Beaver Creek Reservoir

This 200-surface acre reservoir has been managed for rainbow trout since its filling in 1974. As is common with most new reservoirs, initial growth of Arlee strain rainbow trout was exceptional. However, trout condition rapidly degraded as the sucker population expanded and strong competition for available food developed.

Rehabilitation with fish toxicants was considered economically unfeasible due to the 90-foot depth of the reservoir and the short-term effects. Initial attempts to improve the condition of trout were aimed at reducing intraspecific competition by reducing the annual trout plant by approximately 50%. The condition of trout improved significantly over a period of five years. However, these lower stocking rates provided unacceptable catch rates for local fishermen.

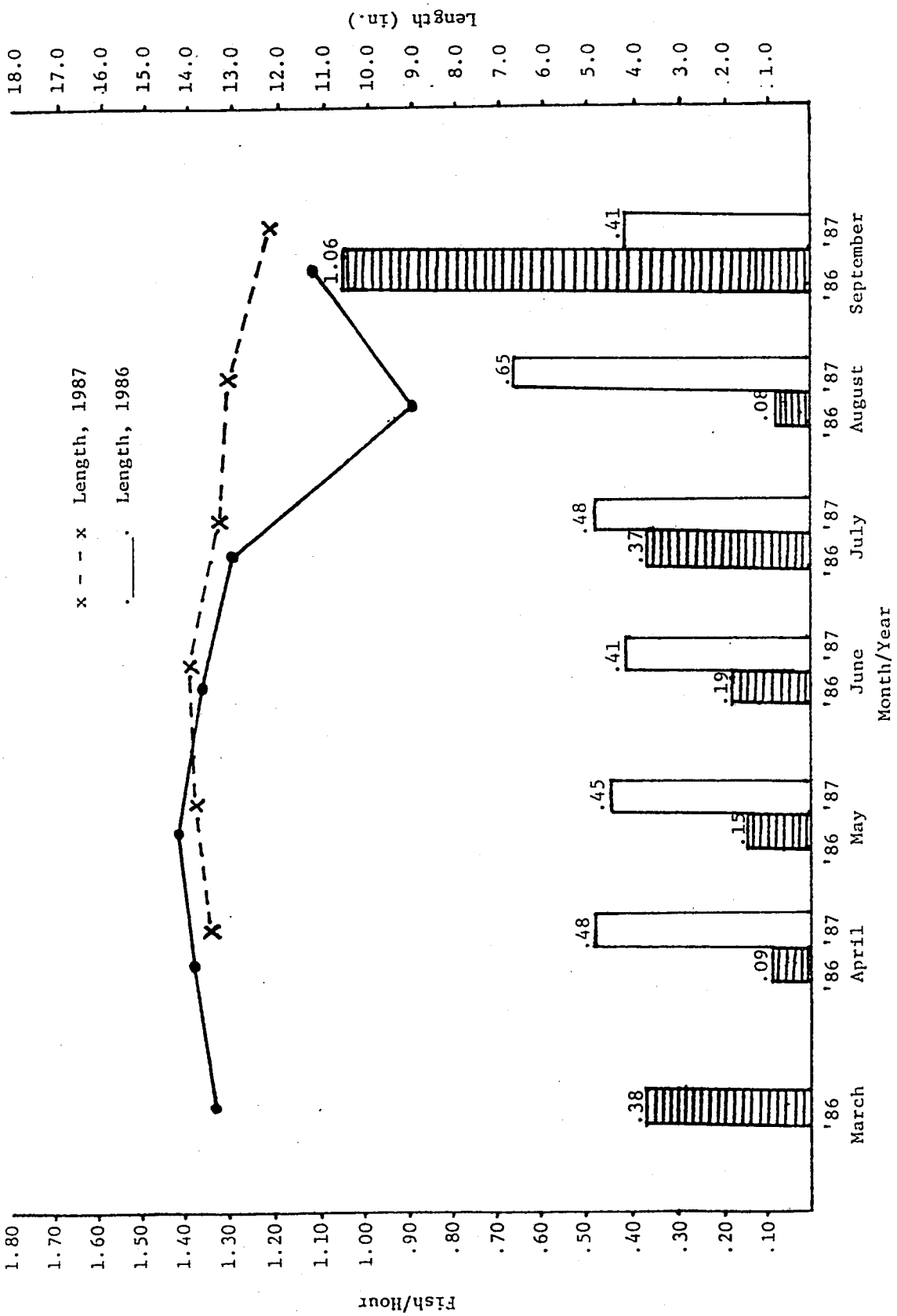


Figure B. Angler catch rates and mean length of rainbow trout taken from Faber Reservoir, 1986-87.

Arlee rainbow exhibit good growth rates under a variety of conditions and are highly catchable, but this domestic rainbow strain appears to be short-lived in many waters and is not consistently successful in utilizing available spawning habitat. A decision was made in 1985 to replace the domestic Arlee rainbow with one or several wild rainbow strains. Two wild rainbow strains, the DeSmet and Eagle Lake were chosen to be evaluated concurrently in this reservoir on the basis of their history, characteristics, and availability. Both strains are spring spawners and should utilize available spawning habitat in Beaver Creek. The DeSmet has exhibited good longevity (7-8 years), the Eagle Lake slightly less. The principal characteristic difference inherent in these strains is their food preference. Adult DeSmet are considered strict plankton/invertebrate feeders while adult Eagle Lake are assumed to be primarily piscivorous.

Initial introductions occurred in the fall of 1985 with fingerling plants of DeSmet and Eagle Lake rainbow. These plants were followed in 1986 and 1987 with spring plants of catchable fish and fall plants of fingerlings of both strains. All fish were fin-clipped or dye-marked for future identification.

Three sinking and three floating experimental gill nets were set overnight in mid-June and mid-September to sample fish from the various plants and determine growth and survivability. Survivability and subsequent carry-over was higher for Eagle Lake rainbow in all four comparison stockings (Table 2). Arlee rainbow were not found in the reservoir two years after cessation of stocking.

Table 2. Survivability of three strains of rainbow trout as determined by gill netting Beaver Creek Reservoir, 1986-87.

Strain	Stocking Size (inches)	Date	Return Rate[1] 6/17/86	9/15/86	6/15/87	9/15/87
Arlee	4.0	4/85	0.3	0.2	0.0	0.0
Eagle Lake	5.0	8/85	0.3	0.2	0.2	0.4
DeSmet	2.6	8/85	0.3	0.3	0.2	0.2
Eagle Lake	8.5	5/86	4.6	5.6	1.5	1.5
DeSmet	6.5	5/86	1.7	1.2	1.5	0.5
Eagle Lake	5.1	9/86	---	---	0.3	0.4
DeSmet	3.1	9/86	---	---	0.0	0.0
Eagle Lake	8.9	5/87	---	---	1.7	3.8
DeSmet	6.8	5/87	---	---	0.8	0.7

[1]Number of fish captured per 1,000 fish planted.

Growth rates were similar for Eagle Lake and DeSmet rainbow as shown in Figure C. Although DeSmet rainbow were much smaller at stocking than Eagle Lake, they were able to achieve similar length two years after introduction. DeSmet rainbow exhibited better condition than Eagle Lake rainbow throughout the year.

A creel census was conducted from April through September at Beaver Creek Reservoir. Eagle Lake rainbow comprised 70-83% of the catch in all months surveyed. Using summer and fall gill netting as indicators of relative abundance, Eagle Lake rainbow were determined to be 1.5 times more catchable than DeSmet.

Bear Paw Lake

This reservoir receives heavy fishing pressure due to its proximity to the city of Havre. The fishery has been maintained with spring and fall plants of McBride strain cutthroat trout. Supplemental plants of catchable Eagle Lake and DeSmet rainbow trout were made in the spring of 1987. These fish were fin-clipped for identification. Creel inspections of 425 fishermen provided harvest data. Gill netting was conducted in September to determine relative numbers of trout in the reservoir.

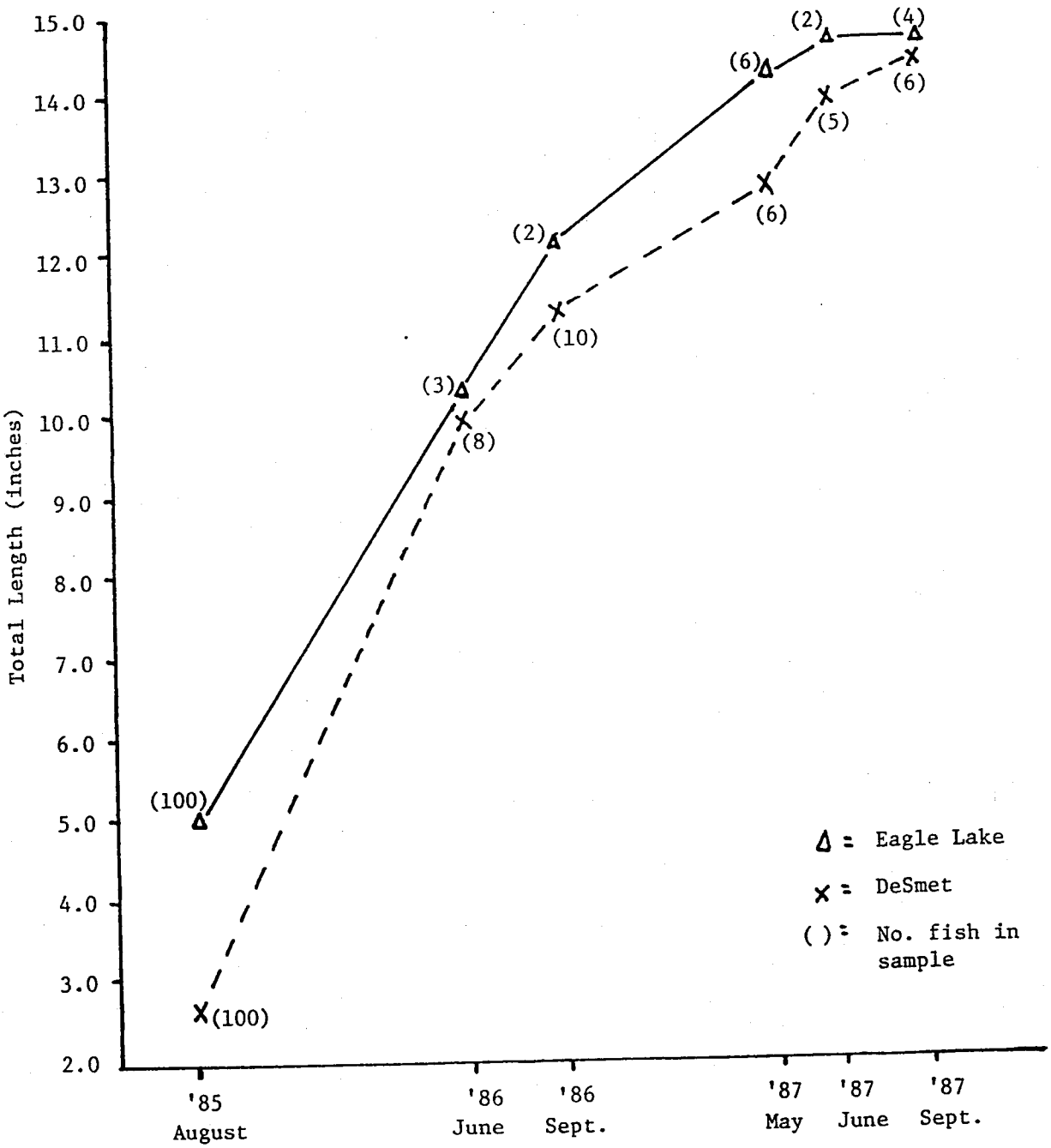
DeSmet rainbow were planted at twice the rate of Eagle Lake rainbow and comprised 77% of the gill-net catch in September. However, DeSmet rainbow accounted for only 40% of the rainbow trout observed in fishermen creels. Eagle Lake were observed in the creel at a rate of 1.4:1 over DeSmet. If net catches accurately reflect relative populations of the two strains, creel census results indicate Eagle Lake rainbow were 4.5 times more catchable than DeSmet rainbow. McBride cutthroat were represented in the creel proportionally to their relative abundance in the reservoir. They exhibited a catch rate similar to the two rainbow strains combined.

Grasshopper Reservoir

This 12 surface-acre reservoir has been managed with Arlee rainbow trout for many years. Arlee exhibited fair growth but poor carry-over to Age II. The reservoir has abundant fish forage consisting of white suckers, Iowa darters, brook sticklebacks, fathead and silvery minnows. Eagle Lake rainbow were planted concurrently with Arlee in 1985 and exclusively in 1986. It was hoped that the Eagle Lake would exhibit better carry-over and utilize one or more of the forage fishes.

Gill netting with three experimental nets was conducted annually in September. The return rate, defined as the number of fish captured in the gill nets per 1,000 fish stocked, was used to determine relative survivability. Arlee rainbow return rates in 1985 and 1986 ranged between 0.83 and 2.4. In contrast, Eagle Lake return rates in 1986 and 1987 ranged between 10.0 and 22.5. By September of 1987, 28 months after the last Arlee stocking, Arlee rainbow had disappeared from the reservoir.

Figure C. Typical growth curves of Eagle Lake and DeSmet rainbow trout in Beaver Creek Reservoir, 1985-87.



The stomachs of 13 Eagle Lake rainbow and 6 Arlee were examined in 1986. One Eagle Lake contained a brook stickleback while all of the Arlee contained fish remains. No fish were found in any of the Eagle Lake sampled in 1987. The condition of Arlee fish was consistently higher than that of the Eagle Lake, but both strains exhibited good growth and condition.

Catchability information collected by creel census at Beaver Creek Reservoir and Bear Paw Lake indicates conclusively that Eagle Lake rainbow are considerably easier to catch than DeSmet rainbow. Although growth to Age II+ for Eagle Lake and DeSmet rainbows is similar, survivability to Age II+ also favors the Eagle Lake. Eagle Lake in Grasshopper Reservoir exhibited much greater carry-over than the domestic Arlee rainbow had previously shown. Based on these observations, it is recommended that DeSmet rainbow stocking be discontinued and Eagle Lake rainbow be utilized in reservoirs exhibiting poor survival of Arlee fish.

Predation Studies

Bailey Reservoir

Annual stocking of Arlee rainbow fingerlings has provided excellent trout fishing in this reservoir for many years. Unauthorized introductions of northern pike occurred around 1980 and natural reproduction soon contributed to an expanding population. Attempts to control the northern pike population by spring trap netting were marginally successful until 1986 when an extremely large year-class was produced.

Beach seining conducted in May of 1987 captured northern pike yearlings at a rate of 28 per 100 feet of shoreline. This sampling captured none of the 35,000 fingerling trout planted a month earlier. Fingerling trout were the only available forage fish in the reservoir. Since good survival of fingerling plants has been experienced in all previous years, the disappearance of the fingerling trout is believed to be due entirely to northern pike predation. The paucity of suitable forage has suppressed pike growth. To date, catchable-sized trout have been unaffected by predation.

Recommendations include establishing a forage base of minnows, yellow perch, and black crappie and discontinuing fingerling trout plants. A one-time plant of 7- to 9-inch rainbow trout is recommended for the spring of 1988 to provide some trout fishing until panfish and larger northern pike provide a suitable fishery.

Beaver Creek Reservoir

This 200 surface-acre reservoir has been managed for trout since its impoundment in 1973. Trout growth has been greatly suppressed by the presence of large numbers of suckers. Sucker catches in sinking experimental gill nets have ranged from 172/net in 1981 to 45/net in

1987. Largemouth bass were introduced in 1986 in an attempt to utilize suckers as forage and provide an additional sport fish. A naturally reproducing largemouth bass population was established, but contributes little to the sport fishery due to poor carry-over of young-of-year (YOY) fish. The stomach contents of 20 YOY and several adult bass were examined. All of the YOY bass contained YOY suckers, while 100% of the adult bass stomachs contained exclusively crayfish.

In 1982 northern pike first appeared in gill nets, the progeny of an unauthorized introduction several years previous. In 1986 an extremely large year-class of northern pike was produced. The stomachs of 210 adult northern pike were examined during the summer of 1987, and 141 were empty. The remaining 69 northern pike had all ingested fish; 47 of these pike contained exclusively suckers, 16 ingested trout and 6 contained either Iowa darters, yellow perch, or YOY northern pike.

Trout growth is expected to improve as the sucker population decreases. However, fingering trout stocking should be replaced by the stocking of catchable-size fish if some level of trout fishing is to be provided. The return of trout in the creel should be evaluated periodically to determine the feasibility of continued trout stocking.

Grasshopper Reservoir

This 12-acre reservoir contains large numbers of white suckers, and moderate numbers of fathead minnows, brook sticklebacks, silvery minnows, and Iowa darters. Annual plants of rainbow trout have provided a fishery but growth of trout is affected by the large sucker population. Sucker catches often exceed 100 fish per overnight gill net set. Largemouth bass were introduced in 1986 and 1987 to provide an additional sport fish capable of utilizing the abundant forage. Sampling in the fall of 1987 showed excellent growth of bass. Age I+ bass averaged 9.2 inches TL and YOY fish ranged from 3.4 to 5.2 inches TL. The stomach contents of the three largest YOY bass were examined and all contained unidentifiable fish remains.

It is hoped that predation from the expanding bass population will reduce sucker numbers and thereby improve trout growth. Food preference of adult bass should be evaluated to determine if suckers and minnows comprise a significant part of the diet and are preferred over fingerling trout. If trout are being preyed on extensively, optimum size for stocking should be determined.

Reser Reservoir

First year survival of stocked fingerling trout has been low, however, surviving fish exhibit exceptional growth rates. The adult bass population is severely depressed and is incapable of significant trout depredation at this time. Several minnow species, crappies, yellow perch, and crayfish provide alternate forage at present. Due to the depressed bass population, it will be several years before food preference investigations show the extent to which largemouth bass prey

on trout fingerlings in this reservoir. Current investigations should be directed at determining other factors affecting trout survival. The Eagle Lake rainbow strain will be concurrently evaluated for over-winter survival with the present Arlee rainbow plants in 1989.

RECOMMENDATIONS

1. Beaver Creek Reservoir: Discontinue stocking of fingerling trout due to poor survival, which may be partially due to northern pike predation.

   Maintain trout fishery with catchable-size Eagle Lake rainbow due to higher catchability and better survival than DeSmet rainbow in this study.

   Evaluate angler success periodically.

   Monitor spawning utilization of Beaver Creek by Eagle Lake and DeSmet trout in 1988.

2. Bear Paw Lake: Reduce daily trout limit to 5 and limit means of taking to a single line the entire year.

   Evaluate pressure and harvest in 1989.

   Continue Eagle Lake rainbow stocking.

3. Faber Reservoir: Reduce trout limit to 5 fish daily.

   Evaluate pressure and harvest in 1989.

4. Grasshopper Reservoir: Alternate Eagle Lake and Arlee rainbow stocking.

   Evaluate adult bass food preference and predation on fingerling trout.

   Catchability comparisons between Arlee and Eagle Lake rainbow should be investigated.

5. Bailey Reservoir: Discontinue fingerling trout stocking and manage for warm/cool water fisheries due to an increase in northern pike.

6. Reser Reservoir: Stock marked Eagle Lake rainbow to evaluate survival.

LITERATURE CITED

Needham, R. G. and K. W. Gilge. 1987. Inventory and Survey of Waters of the Project Area. Job Prog. Rept. for Dingell-Johnson Project F-11-R-34, Job I-a. P (mimeo).

Waters referred to:

15-4570-03	Beaver Creek Reservoir
15-4560-05	Bear Paw Lake
15-5140-07	Faber Reservoir
15-4535-07	Bailey Reservoir
15-5380-07	Grasshopper Reservoir
15-8860-06	Reser Reservoir
16-0940-01	Cow Creek
15-0960-01	Clear Creek
15-0320-01	Beaver Creek

Key Words or Fish Species:

creel census, Eagle Lake rainbow trout, DeSmet rainbow trout, catchability comparisons, trout predation

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