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 AND WARMWATER ECOSYSTEMS

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

PROJECT PERIOD: JULY 1, 1992 THROUGH JUNE 30, 1993

ABSTRACT

An electrofishing survey on the lowermost reach of Beaver Creek was conducted to document survival of smallmouth bass plants made the previous year. No bass were located. Trout population estimates were made on Sections 02 and 03 of Beaver Creek. The average size and condition of trout in Beaver Creek Reservoir improved and is believed to be directly related to low sucker numbers and the recent addition of Arlee strain rainbow. Despite the removal of 12.4 tons of suckers over the last four years at Bear Paw Lake, sucker numbers appear to be similar to that found in the year preceding removal efforts. Arlee rainbow in Bear Paw Lake showed fair growth and excellent condition, while McBride strain cutthroat exhibited poor condition despite an increase in length over previous years. Estimates were made for suckers and crayfish in Bear Paw Lake. Smallmouth bass were introduced into Bear Paw Lake following an environmental assessment and public review. Trout survival and growth was good at Grasshopper Reservoir following a successful chemical rehabilitation. 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 data 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. 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. All fish were measured for total length (TL) and weighed to the nearest 0.01 pound. Crayfish were captured in 1/4-inch hardware cloth traps of varying size, with throat entrance holes measuring 1.5-2.0 inches in diameter. The traps were set around the entire

reservoir in water less than 10 feet deep. Traps were baited with meat scraps, dead suckers, and canned cat food. Traps were set and emptied two consecutive days. Crayfish were marked with a partial clip of the extreme edge of their right uropod and scattered within several hundred yards of the trapping location.

A recapture sample was secured eight days later using the same technique. Length measurements for crayfish were determined by the distance between the tip of the rostrum and the posterior margin of the telson. Suckers were trapped in 1/4-inch mesh frame traps, weighed, measured and marked with a paper punch hole in their tail.

RESULTS AND DISCUSSION

Streams in the Bear Paw Mountains

Beaver Creek

An electrofishing survey was conducted below Beaver Creek Reservoir to document survival of smallmouth bass introduced in 1989 and 1991. The survey was conducted in late May and covered four sections of stream averaging 400 feet in length. Sampling near the mouth captured numerous minnow species, white suckers, a black bullhead and a small northern pike. A section near the U.S. Highway 2 crossing contained only minnows and suckers. A section immediately above Fort Assiniboine yielded 20 adult rainbow trout, several mottled sculpins and an assortment of minnows and suckers. The section below the dam, known historically as Section 01, yielded six large rainbow trout, a single large brown trout and numerous sculpins, suckers, and minnows. No smallmouth bass from either introduction were observed and few, if any, smaller trout were seen. It appears that trout reproduction in this reach is very marginal and habitat may not be suitable at all time periods for smallmouth bass survival. Bass may be inhabiting the deeper water behind the abundant beaver dams in this section. However, we were unable, with our backpack electrofishing gear, to adequately sample this deep water.

A 2-pass estimate of trout numbers was made for Sections 02 and 03 of Beaver Creek (Table 1). Rainbow trout numbers in Section 02 declined in 1992 to record low numbers. Low flows experienced throughout the winter, spring, and summer of 1992 are thought responsible. However, several young-of-the-year (YOY) rainbow trout were found in Section 02, indicating limited reproduction had occurred. Section 03 showed marked increases in brook trout numbers while rainbow trout remained at low levels. A few YOY brook trout were observed, but successful rainbow trout reproduction was not evident. The incidence of black spot disease infection is still very high, particularly in brook trout.

Table 1. 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	1991	1992
Section 02									
rainbow trout	51	68	36	11	90	36	28	33	8
Section 03									
rainbow trout	47	40	12	58	80	10	10	14	14
brook trout	172	186	149	188	169	40	36	62	114

Clear Creek

A 250-foot section below the mouth of Windy Creek was electrofished in the fall to document trout reproduction and survival of brown trout stocked in 1991. Five adult rainbow were observed and two adult brook trout. No YOY trout of any specie nor any brown trout were observed. Other fish species observed in order of abundance were: white sucker, fathead minnow, longnose dace, lake chub, and mottled sculpin.

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, white and longnose suckers. Since the reservoir's initial filling in 1974, it has been managed primarily 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, exhibited poor growth and was short-lived. Studies at Beaver Creek Reservoir indicated the Eagle Lake and Desmet rainbow had increased longevity over Arlee rainbow and 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. Predation on YOY rainbow is suspected. The stocking of DeSmet rainbow

ceased in 1988 and the reservoir was planted exclusively with Eagle Lake rainbow until 1990 when Arlee rainbow were again introduced. Arlee rainbow have been stocked, along with Eagle Lake rainbow, at varying rates and at different times of the year since 1990.

Gill-net surveys were conducted in 1974, 1977, and annually since 1980. These surveys were conducted 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 2. The gill-net catch-per-unit-effort (CPUE) of trout declined slightly, but average size and condition improved considerably. Trout condition is believed to be associated with white sucker numbers which have declined to all time lows, and should remain low due to northern pike predation. Arlee rainbow have exhibited consistently higher condition factors than Eagle Lake in this reservoir and the addition of the Arlee strain is suspected as the largest contributing factor to the increase in average trout condition. The last time Arlee rainbow were present in the reservoir, the large sucker population presented significant competition. Sucker numbers have since declined to the lowest levels since the reservoir was first filled. Arlee rainbow were reintroduced to determine if they could achieve better growth than Eagle Lake rainbow under less competitive circumstances. It appears that growth performance is much better now than under the competitive circumstances of the past.

Northern pike numbers peaked in 1987, but are low at present due to several years of poor reproduction and heavy fishing pressure. The large year-classes produced in 1990 and 1991 did not show up in the gill-net catch as expected. The depressed adult pike population is at least partially responsible for the recent increase in trout numbers. Northern pike, at present, are large and not particularly numerous, but are still capable of causing significant predation on catchable trout and suckers.

Pike predation is expected to increase in the next few years if the recently produced year-classes are as strong as earlier sampling indicated.

Walleye were introduced in 1987 due to local demand and are not considered at this time to be major predators on hatchery trout though the population is increasing in size. Gill-net catch rates declined, but average size increased significantly.

Catch rates for yellow perch declined, as did average size.

Table 2. Summary of gill net catches and relative abundance of fishes in Beaver Creek Reservoir, 1974-92.

	Rainbow Trout				Northern Pike			Walleye			Yellow Perch			Sucker Sp.
Year	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
1991	15.5	12.8	0.77	36.72	2.3	16.6	1.20	5.7	14.0	0.97	12.0	7.4	0.26	11.0
1992	13.7	13.7	0.98	38.11	3.3	25.6	5.32	2.3	17.8	2.15	6.0	6.4	0.13	7.7

[1]Number of fish caught per gill net.
[2]Condition factor = $\frac{W \times 10^5}{L^3}$

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 Arlee 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. Suckers overpopulate periodically and the reservoir was chemically rehabilitated in 1983. Post-rehabilitation trout growth in 1984 and 1985 was excellent. However, sucker gill-net catches increased from a catch per net of 9 in 1985 to 278 per net in 1990 (Figure 1). Competition with large numbers of suckers has reduced growth rates of trout significantly. Fishing pressure has declined dramatically since 1988 due to the small size and poor condition of trout. Respondents to an angler survey indicated a desire to catch larger fish even at the expense of catching fewer fish. The survey results also indicated a preference for cutthroat trout over rainbow trout.

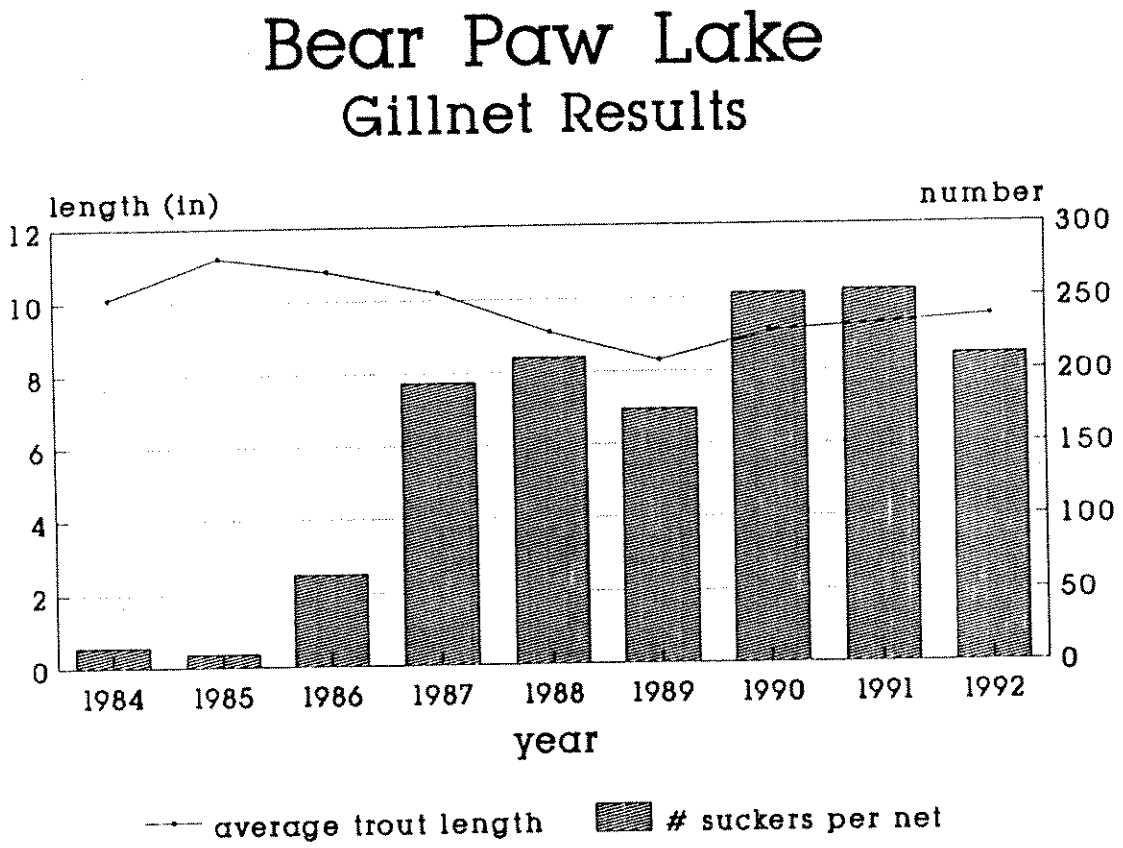

Figure 1. Comparison of white sucker increases, after chemical rehabilitation in 1983, with trout growth in Bear Paw Lake.

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.

Gill netting has been conducted for a number of years in early September. Utilizing 1988 as a base year, numbers of mature (>10 inches) and juvenile suckers (<10 inches), as they appeared in the catch, were compared with trout CPUE and condition (Table 3). The trout gill-net catch increased fourfold from 1991. This could be partially due to reduced fishing pressure. Eagle Lake strain rainbow trout had been utilized experimentally since 1986, but were replaced in 1991 with Arlee rainbow. The Arlee rainbow are no doubt responsible for the large increase in relative plumpness exhibited in 1992. On the other hand, McBride strain Yellowstone cutthroat condition declined dramatically, perhaps as a function of intraspecific competition, as well as competition with suckers for food.

Table 3. Relative abundance of suckers and trout as indicated by fall gill netting following sucker removal efforts in Bear Paw Lake 1988-91.

	Suckers				Cutthroat Trout			Rainbow Trout		
Date	No. <10" Per Net	% Chg[1]	No. >10" Per Net	% Chg	No. Per Net	Avg. Lgth.	C[2]	No. Per Net	Avg. Lgth.	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
Fall 1991	198	+62	57	-36	15.0	9.1	34.50	4.0	10.2	34.87
Fall 1992	127	+4	84	-6	58.6	9.6	24.87	17.0	9.1	45.12

[1]1988 used as base year determining percent change in relative abundance.
[2]Condition factor - $\frac{W \times 10^5}{L^3}$

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. Trapping effort was increased in 1990, but was reduced in 1991 and 1992. To date, a total of 79,440 suckers with a total biomass of 12.4 tons have been removed from the reservoir (Table 4).

increased after removal of adult suckers and how quickly the sucker population returned to pre-removal levels even while some control pressure remained. It appears that the biomass of suckers remained relatively stable as large numbers of smaller suckers replaced the larger suckers that were removed.

Table 4. Number and poundage of white suckers removed from Bear Paw Lake from 1989 to 1992.

Year	Number	Pounds
1989	12,545	8,986
1990	44,622	10,206
1991	18,140	4,733
1992	4,133	828
TOTALS	79,440	24,753

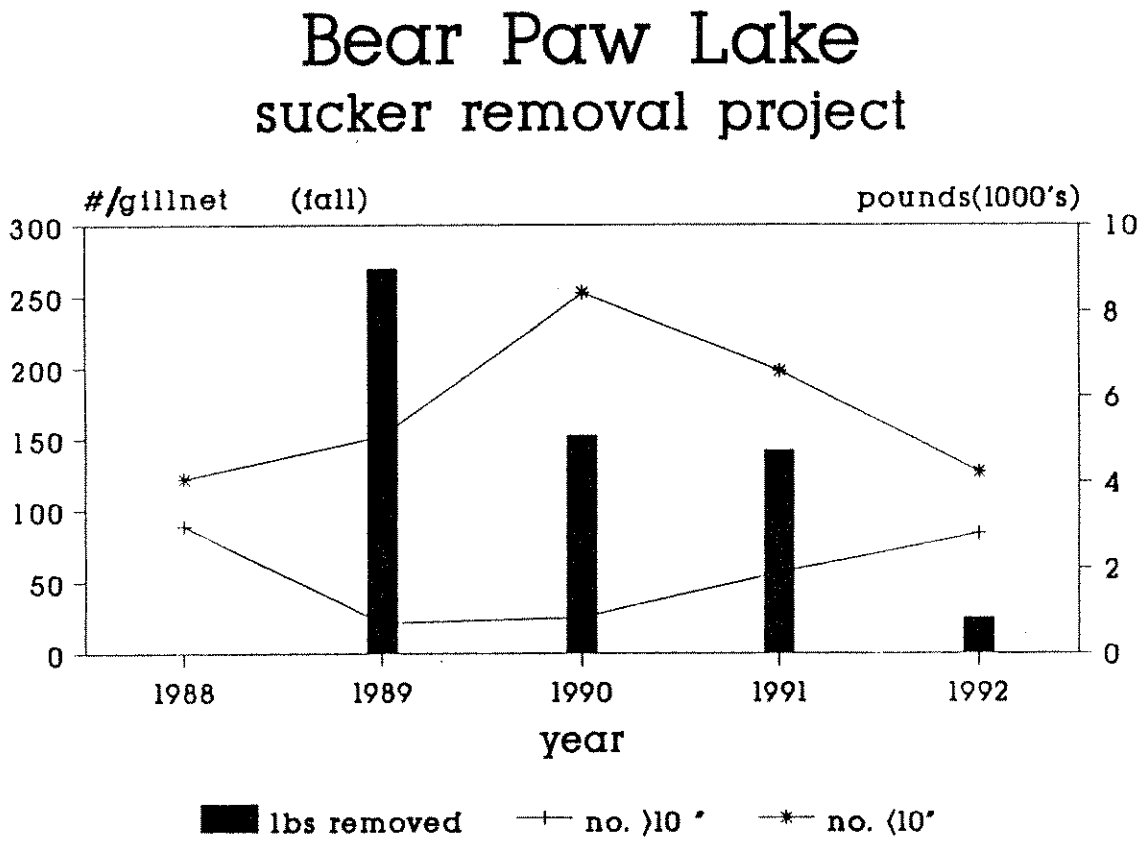

Figure 2. Number of juvenile and adult suckers captured per gill net in each year of the study compared with the pounds of suckers removed each year with decreasing effort.

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 does not facilitate frame trapping or seining.

Crayfish have become 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. Momot (1978) described the ability of crayfish to dominate the benthic community and prey on amphipods, isopods, chironomids, cladocerans, ostracods, and odonate naiads. Crayfish have also been reported to eat gastropods (Dean, 1969). Crayfish are utilized, to some degree, as food by trout. However, only trout greater than 12 inches appear to be able to consume them on a regular basis. A 12-inch trout in Bear Paw Lake is a rarity, so predation on crayfish and subsequent utilization is negligible.

A proposal to introduce smallmouth bass for the purpose of affecting significant predation on juvenile suckers was submitted in 1991. Following an environmental review, 25,000 smallmouth bass fingerlings, averaging 1.3 inches, were introduced into Bear Paw Lake in August of 1992. It was hoped that YOY suckers would suffer immediate predation losses, but the bass were too small to effectively feed on small suckers. A cool August and September undoubtedly reduced growth rates of bass and overwinter survival of this introductory plant is questionable. Juvenile bass should feed primarily on YOY suckers while adult bass are expected to prey heavily on crayfish. Adult smallmouth bass are not expected to consume a significant number of the catchable-size trout stocked annually. Though the primary objective is to improve trout growth, smallmouth bass should make an outstanding addition to the fishery. One concern that arose during the lengthy environmental review process was that a no-action alternative or a delay in implementing an action might cause frustrated fishermen to attempt their own predator introduction. A similar situation occurred downstream in Beaver Creek Reservoir in 1982 when unknown individual(s) introduced northern pike into the existing trout fishery. Gill netting in the fall of 1992 proved that this was indeed the case as a single adult trout was captured. It is believed that only a few fish were illegally introduced and the probability of successful reproduction in this reservoir is extremely low.

Baseline data on sucker and crayfish populations was gathered prior to smallmouth bass predation. A Peterson mark-recapture estimate was made of both sucker and crayfish populations. The estimate of Age II and older suckers was 72,737 ± 10,768. Total biomass was 13,992 pounds or 311 pounds per surface acre. Crayfish ranging in size from 2.6-3.8 inches were estimated at 21,577 ± 7,421 with a total biomass of 1,292 pounds or 29 lbs./acre.

Continued monitoring of these populations and food habit analysis of all fish species should assist in evaluating the affect of this experimental introduction and better define dietary overlap. It is uncertain whether continued removal of adult suckers would be of value at this time.

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 was conducted from 1988 to 1991. Though the sucker catch rate decreased from 128 lbs./trap-day (TD) in 1988 to 11 lbs./TD in 1990, juvenile sucker numbers continued to increase. Gill netting in the fall of 1991 revealed a low trout population accompanied by very low water levels. A decision was made to chemically rehabilitate the reservoir with rotenone. The reservoir and the immediate upstream drainage was successfully treated and the reservoir was fallowed overwinter. Catchable-size (7 inch) and fingerling (3 inch) Arlee rainbow trout were planted in the spring of 1992.

A floating and a sinking experimental gill net were fished overnight in mid-September of 1992. A total of 122 trout were captured. The fingerling cohort had grown sufficiently to make distinction between the two plants difficult. The trout averaged 10.3 inches in length and 0.47 pounds. Condition factors were the best ever recorded in this reservoir. No suckers were netted indicating successful rehabilitation with no recent recontamination.

RECOMMENDATIONS

Beaver Creek: Continue to monitor trout populations in all sections. Stock brown trout periodically.

Beaver Creek Reservoir: Continue stocking of Eagle Lake and Arlee rainbow catchable-size trout. Increase stocking rate as northern pike population increases.

Bear Paw Lake: Continue McBride strain cutthroat stocking at reduced rates. Continue Arlee catchable stocking at current rates. Annual population estimates of suckers and crayfish should be made to monitor effects of smallmouth bass introduction. Determine food competition overlap between species and evaluate extent of bass predation on suckers.

Grasshopper Reservoir: Continue with alternate year plants of Arlee and Eagle Lake rainbow. Monitor with annual gill net survey.

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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
15-0960-01 Clear Creek

Key words or fish species:

Arlee, Eagle Lake rainbow trout, sucker removal, crayfish, population estimates, smallmouth bass

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