Ref # 51498
Rep #

MONTANA DEPARTMENT OF FISH, WILDLIFE AND PARKS

FISHERIES DIVISION
JOB PROGRESS REPORT

STATE: MONTANA PROJECT TITLE: STATEWIDE FISHERIES INVESTIGATIONS

PROJECT NO.: F-78-R-5 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, 1998 THROUGH JUNE 30, 1999

ABSTRACT

Trout gill net catch-per-unit-effort (CPUE) was similar to that observed in 1997 in Beaver Creek Reservoir. Trout gill net CPUE declined in Bear Paw Lake though condition remained stable. Average size and condition of trout has not improved despite the removal of 112,803 suckers (18.7 tons) since 1989. White sucker numbers decreased. The sucker population consists predominately of older fish. Crayfish numbers continue to decline due to bass predation. Smallmouth bass predation severely reduced the 1993-1996 sucker year-classes. Growth, survival and condition of rainbow trout at Grasshopper Reservoir remains good following a winterkill in the winter of 1995-96. Sucker numbers in Faber Reservoir are increasing. Trout survival, following stocking, has increased, however it is still below expected levels. Condition of trout is declining. Management recommendations for all waters are presented.

OBJECTIVES AND DEGREE OF ATTAINMENT

Survey and Inventory

To survey and monitor the characteristics and trends of fish populations, angler harvest and preferences, and to assess habitat conditions in selected waters. Objective accomplished, data presented.

Fish Population Management

To implement fish stocking programs and/or fish eradication actions to maintain fish populations at levels consistent with habitat conditions and other limiting factors. Objective accomplished, data presented.

Technical Guidance

To review projects by government agencies and private parties which have the potential to affect fisheries resources, provide technical advice or decisions to mitigate effects on these resources, and provide landowners and other private parties with technical advice and information to sustain and enhance fisheries resources. Objective accomplished, fifteen 310 permit applications were processed; water level recommendations were made to Department of Natural Resources for rehabilitating the dam and spillway at Bear Paw Reservoir; other related activities are presented. Assisted with negotiations with the Rocky Boy Indian Reservation regarding water rights.

Aquatic Education

To enhance the public's understanding, awareness and support of the state's fishery and aquatic resources and to assist young people to develop angling skills and to appreciate the aquatic environment. Objective accomplished; 21 public meetings associated with aquatic education were held.

MONTANA DEPARTMENT OF FISH, WILDLIFE & PARKS

FISHERIES DIVISION
JOB PROGRESS REPORT

STATE: MONTANA PROJECT TITLE: STATEWIDE FISHERIES INVESTIGATIONS

PROJECT NO.: F-78-R-6 STUDY TITLE: SURVEY AND INVENTORY OF COLDWATER AND WARMWATER ECOSYSTEMS

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

PROJECT PERIOD: JULY 1, 1999 THROUGH JUNE 30, 2000

ABSTRACT

Trout gill net catch-per-unit effort (CPUE) declined for the fourth consecutive year in Beaver Creek Reservoir. Trout gill net CPUE increased in Bear Paw Lake and condition is improving. Trapping has removed 121,042 suckers (22.5 tons) since 1989. The sucker population consists predominately of older fish. Crayfish numbers continue to decline due to bass predation. Smallmouth bass predation severely reduced or eliminated the 1993-97 sucker year-classes. Growth, survival and condition of rainbow trout at Grasshopper Reservoir remains good following a winterkill in the winter of 1995-96. Sucker and trout numbers in Faber Reservoir are decreasing. Condition of trout is declining. Management recommendations for all waters are presented.

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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 .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 dead fish and canned cat food. Traps were fished for 48-72 hours. Crayfish were marked with a partial clip of the extreme edge of the right uropod and scattered within several hundred yards of the trapping location. A recapture sample was secured eight to twelve days later using the same technique. Body length measurements for crayfish were taken from the tip of the rostrum to the posterior margin of the telson. Suckers were trapped, for population estimation, in 1/4-inch mesh frame traps. They were weighed, measured and marked with a paper punch hole in their tail or finclipped.

RESULTS AND DISCUSSION

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. The reservoir has been managed primarily as a trout fishery since its filling in 1974.

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 conducted over several years at Beaver Creek Reservoir indicated the Eagle Lake and DeSmet rainbow had increased longevity over Arlee rainbow. Studies also indicated Eagle Lake rainbow were easier to catch than the DeSmet rainbow (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 young-of-the-year (YOY) rainbow is suspected; however, recruitment and/or predation of naturally produced YOY rainbow is as yet undocumented. 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 restocked, along with Eagle Lake rainbow, at varying rates and at different times since 1990. Erwin strain rainbow were marked and planted in 1994 as catchable size trout. Though only 7% of the fall trout gill net catch was comprised of Erwin fish, a cursory creel check during the summer indicated Erwin trout made up 40% of the catch. It appears that growth, survival and catchability of the Erwin strain is similar to that of Arlee rainbow.

McBride strain Yellowstone cutthroat trout were introduced in 1997 due to surpluses available from the hatchery system. In May of 1997, 15,000 5-inch cutthroat were planted. Gill-netting in September of 1997 captured only 2 of these fish averaging 10.4 inches. No cutthroat trout were netted in 1998. Growth appears to be fair but survival poor.

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 1. The gill net CPUE of trout declined in 1998 for the third consecutive year. Condition also is declining.

Table 1. Summary of gill net catches and relative abundance of fishes in Beaver Creek Reservoir, 1974-98.

	Rainbow Trout				Northern Pike			Walleye			Yellow Perch			
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.)	Sucker Sp. 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
1993	3.2	16.4	1.67	37.86	2.0	27.5	6.37	3.3	16.8	1.73	12.3	7.2	0.21	8.5
1994	27.7	11.7	0.66	39.20	2.8	25.5	6.77	1.7	17.4	2.68	23.8	7.7	0.25	7.0
1995	20.2	13.5	0.94	38.59	3.5	21.7	2.89	2.5	18.0	2.62	20.0	7.7	0.28	12.8
1996	7.8	12.6	0.84	41.99	2.8	24.9	4.28	3.3	16.7	2.16	38.0	7.6	0.25	12.5
1997	6.8	13.0	0.84	38.23	4.2	21.7	2.72	2.2	17.7	2.42	60.7	7.6	0.24	6.2
1998	4.5	15.5	1.35	36.25	4.8	23.6	3.61	4.3	18.0	2.66	47.3	7.6	0.21	10.0

[1]Number of fish caught per gill net.

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

Poor trout condition was associated with high sucker numbers in the past. Though the white sucker population remains low, due primarily to northern pike predation, a huge perch population has developed and is most likely the factor responsible for reduced condition of trout. The stomachs of seven rainbow trout, ranging from 15.0 - 16.0 inches in length, were examined in late summer. All had consumed numerous spottail shiners.

Northern pike numbers have increased to the highest level in 10 years. Pike are capable of causing significant predation on catchable trout and suckers. Stomach contents of 63 pike were examined in late summer . Six of ten pike ranging in size from 7.0 - 13.9 inches were empty. Two had consumed spottail shiners and two had ingested yellow perch. Eleven of fourteen pike ranging in size from 14.0 - 20.9 inches were empty. The remaining three pike had all ingested spottail shiners. Twenty-four of 39 pike ranging in size from 21.0 - 28.0 inches were empty. Eight (53%) had trout in their guts. The trout ranged from 8.0 - 11.5 inches. Five (33%) had consumed perch and 2 (14%) ingested 4-inch long smallmouth bass.

Walleye gill net CPUE increased in 1998, and average size increased from 1997. Walleye were introduced in 1987 due to local demand and are not considered at this time to be major predators on hatchery trout, despite the fact that average walleye size is increasing. Sixteen of 18 walleye stomachs examined contained food items. Fish examined ranged in size from 12.0 - 26.0 inches. Average size of the sample was 15.9 inches. No trout were found in any stomachs. Ten walleye (63%) contained spottail shiners, five (31%) contained perch and one had what appeared to be a sucker.

Gill net catch-rates for yellow perch decreased, but average size remained stable. Perch are becoming a much sought-after fish and good catches are made at all times of the year.

Smallmouth bass, which flushed downstream from Bear Paw Lake, have grown well in the reservoir due to the abundance of crayfish and are being caught on a regular basis. A plant of 5,000 2-inch smallmouth bass was made for the first time in 1997. An additional 10,000 2-inch bass were planted in 1998. Stomach content analysis of 8 YOY bass indicated a preference for crayfish followed by spottail shiners and yellow perch.

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. 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 have historically overpopulated this reservoir. The reservoir was chemically rehabilitated in 1983 to reduce sucker numbers. 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 by 1990 (Figure A). Despite sucker removal efforts, the population remains high. 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.

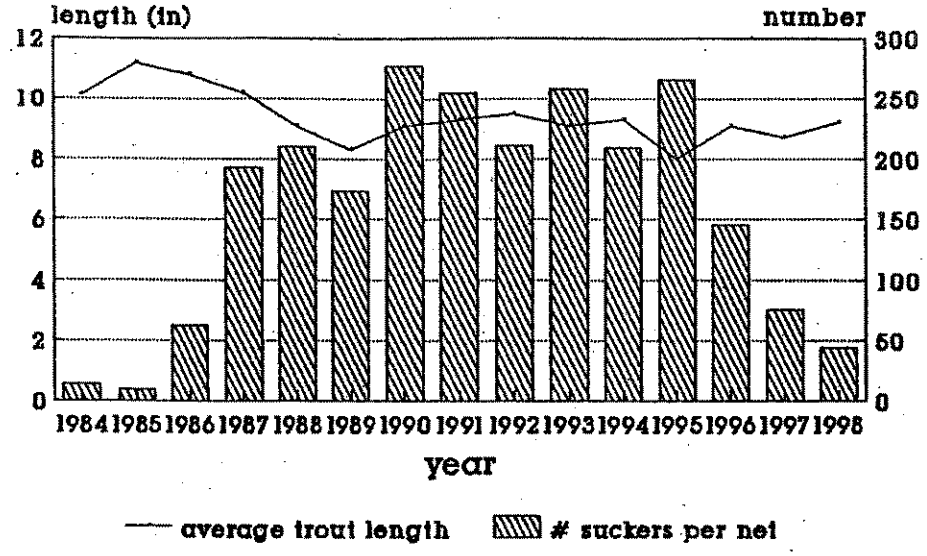

Figure A. Comparison of white sucker increases, after chemical rehabilitation in 1983, with trout growth in Bear Paw Lake.

Drawdown and chemical rehabilitation has been attempted twice. This, however, is not a preferred option for sucker control in this reservoir, primarily due to the loss of recreation, detoxification time, invertebrate loss, bank sloughing, and subsequent trout mortality.

Gill-netting trend data has been collected 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 withtrout CPUE and condition (Table 2). The trout gill-net catch has remained good, but average size and condition has not improved as yet. Eagle Lake strain rainbow trout had been utilized experimentally since 1986, but were replaced in 1991 with spring planted Arlee rainbow. The Arlee rainbow were responsible for the large increase in condition exhibited in 1992. Fall stocking of Arlee rainbow began in 1992 to facilitate hatchery demands.

Table 2. Relative abundance of suckers and trout as indicated by fall gill netting following sucker removal efforts (1988-98) in Bear Paw Lake.

	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
Fall 1993	200	+64	58	-35	6.0	9.1	33.18	0	---	-----
Fall 1994	157	+33	52	-42	13.7	9.1	31.85	5.7	9.7	38.34
Fall 1995	125	+1	141	+63	60.0	7.8	33.72	14.7	9.1	35.83
Fall 1996	5	-96	141	+63	59.7	9.1	33.18	1.7	10.4	40.89
Fall 1997	1	-99	75	-16	26.0	8.5	32.57	24.7	9.3	34.81
Fall 1998	0	-100	44	-51	3.7	8.8	29.35	10.0	10.0	34.81

[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 reduced from 1992 through 1996. With increased effort in 1997 and 1998, 112,803 suckers with a total biomass of 18.7 tons have been removed from the reservoir since 1989 (Table 3). Fall gill netting in 1989 indicated the effort had reduced the number of mature suckers significantly. However, by the fall of 1990, juvenile sucker numbers had increased 107% from 1988 levels. Figure B illustrates how juvenile suckers 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 vast numbers of smaller suckers replaced the larger suckers that were removed. Based on gill net CPUE, the current sucker population is similar to or higher than the preremoval level present in 1988. In 1995, however, the catch of adult suckers exceeded the catch of juveniles in the gill-net survey for the first time. A dramatic decrease in juvenile sucker numbers has occurred since the introduction of smallmouth bass in 1992 (Figures B and C). No suckers less than 10 inches in length were captured in gill nets in 1998. The catch of adult suckers remained constant through 1995 and 1996. However, after removal of four tons of suckers in the spring of 1997 the catch of adult suckers in the fall showed a marked decline. Following removal of 2.8 tons of suckers in 1998, fall gill netting indicated another decline in adult sucker numbers.

Mechanical/physical removal of juvenile suckers is very labor intensive. Juvenile suckers are not as susceptible to capture as they do not congregate in or near the creek to spawn. The topography of the reservoir with its steep sides and submerged woody vegetation does not readily facilitate frame trapping or seining.

Table 3. Number and poundage of white suckers removed from Bear Paw Lake from 1989 to 1998.

Year	Number	Pounds
1989	12,545	8,986
1990	44,622	10,206
1991	18,140	4,733
1992	4,133	828
1993	5,239	1,050
1994	6,995	810
1995	5,653	2,100
1996	1,991	670
1997	13,485	8,091
1998	6,708	5,206
TOTALS	112,803	37,474

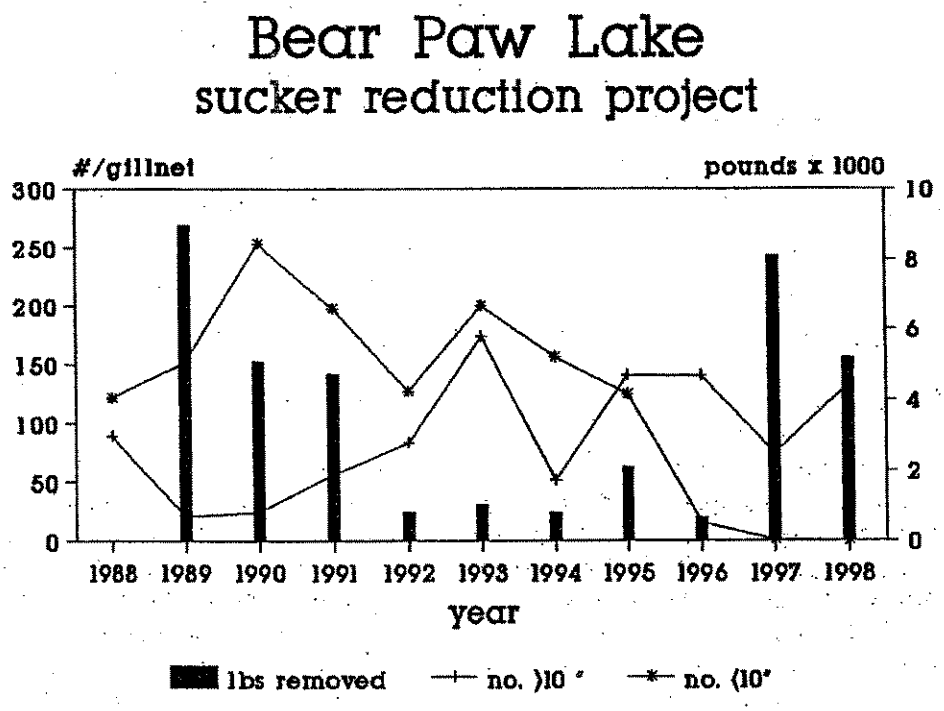

Figure B. Number of juvenile and adult suckers captured per gill net in each year of the study compared with the pounds of suckers removed each year.

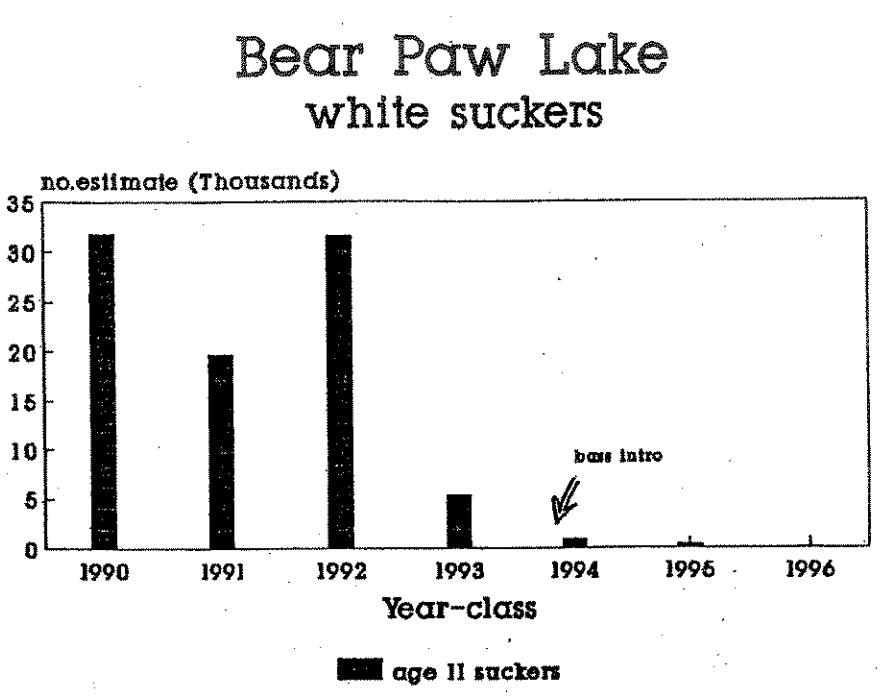

Figure C. Estimates of Age II suckers before and after smallmouth bass introductions in Bear Paw Lake.

Adult crayfish, ranging in size from 2.6 - 3.8 inches were estimated at 21,577 with a total biomass of 1,292 pounds, or 29 lbs./acre in 1992. Numbers of crayfish increased in 1993 to 25,906, but average size decreased (range 2.5 - 3.6 in.). A decrease in average size was reflected in a biomass reduction to 21 pounds per acre. Numbers of crayfish declined to less than 10 lbs./acre in both 1994 and 1995. In 1996, the crayfish population was reduced to 2.5 lbs./acre, and in 1997 to 1.6 lbs./acre. No crayfish estimate was attempted in 1998. Numbers remain low, evidenced by the fact that not a single crayfish was found in any gill net in 1998.

Crayfish, when in large numbers, 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 able to consume them on a regular basis. A 12-inch trout in Bear Paw Lake is a rarity, so utilization of crayfish by trout is negligible.

A proposal to introduce smallmouth bass for the purpose of inflicting significant predation on juvenile suckers was submitted in 1991. Juvenile bass were expected to feed primarily on YOY suckers, while adult bass were expected to prey heavily on crayfish. Adult smallmouth bass were 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.

A 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 (sucker over-population) occurred downstream in Beaver Creek Reservoir in 1982. Unknown

individual(s) introduced northern pike into this existing trout fishery apparently to control sucker numbers. Gill netting in Bear Paw Lake in 1992 proved that this was indeed the case, as a single adult walleye 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. A fisherman reported catching a northern pike from Bear Paw Lake in 1994, but the report could not be confirmed.

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 depredation losses; however, the bass were too small to effectively feed on YOY suckers. A cool August and September undoubtedly reduced growth rates of bass and over-winter survival of this introductory plant was questionable. No bass were captured in 56 trap-days of effort in the spring of 1993. However, electrofishing the shoreline in mid-July captured 23 age I smallmouth bass, ranging in length from 2.2 - 5.1 inches. All but two of the bass were taken from the dam face riprap. Bass preferred rocky substrate over emergent/submerged vegetation, which was plentiful. A total plant of 40,000 1.7-inch bass was made in July and August of 1993. Another plant of 24,000 fingerlings was made in 1994. No bass were stocked in 1995 due to unavailability. A plant of 20,000 bass was made in 1996 and 5,000 were planted in 1998.

In order to evaluate changes in the forage base due to bass predation, baseline data on sucker and crayfish populations was gathered prior to the smallmouth bass introduction (Figure D). Population data will be gathered annually. A mark-recapture estimate has been made of both sucker and crayfish populations since 1992.

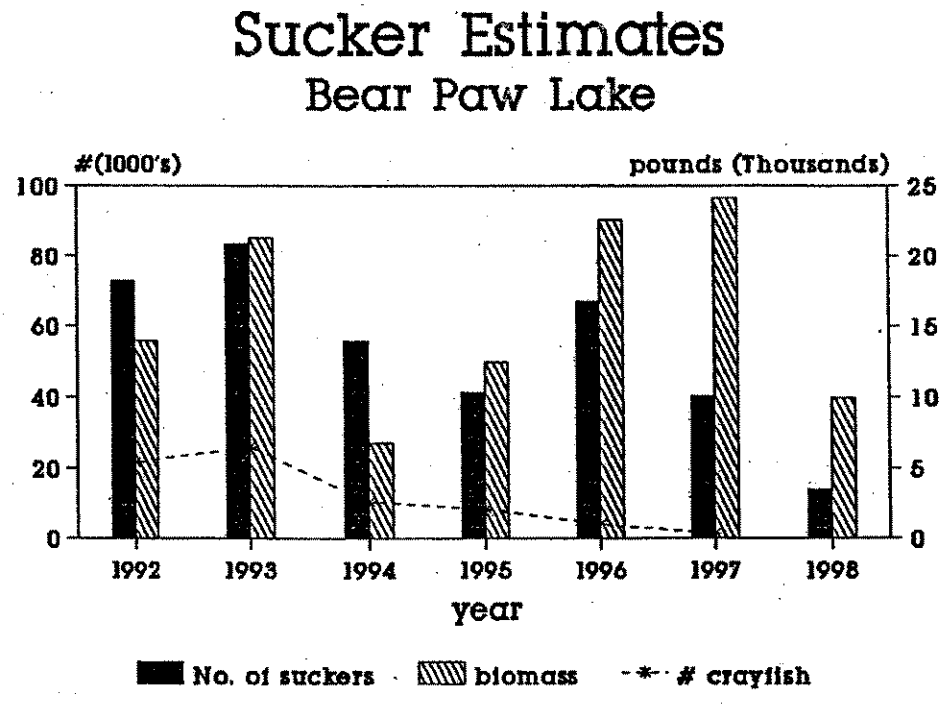

Figure D. White sucker and crayfish estimates for Bear Paw Lake, 1992-98.

The estimate of age II and older suckers was 72,737 in 1992. Total biomass was 13,992 pounds or 311 pounds per surface acre. The estimate of age II and older suckers in 1993 was 83,328 with a biomass of 21,324 pounds. Sucker biomass increased 163 pounds per acre from 1992 to 1993. However, in 1994, the population decreased to 56,012 fish with a total biomass of only 6,745 pounds. The decrease was primarily due to the loss of adult suckers. This is unexplained at this time as predation by bass could not have been a factor in reducing numbers of older suckers. Sucker estimates made in 1995 indicated the population is at the lowest level since 1992. The sucker estimate for 1996 was 67,100 fish with a total biomass almost double that of the 1995 population. Biomass estimates of suckers in 1997 was similar to that observed in 1996 but total numbers had decreased by 40,000 fish. The 1993 year-class of suckers was the first to be impacted by bass predation. Estimates made since 1992 indicate significant reductions in the 1993-96 sucker year-classes. These reductions are most likely the result of smallmouth bass predation.

Smallmouth bass were the first predator fish utilized in this lake in an attempt to reduce sucker numbers. The results to date are summarized here: White sucker YOY congregate in dense schools in the upper, warmer, weedier portion of the reservoir in July. At this time suckers are very susceptible to predation. It was determined (Gilge 1994) that smallmouth bass must be 1.5 inches total length (TL) by mid-July to take full advantage of prey size. The 1.3 inch bass introduced in August of 1992 were too small and planted too late to affect any predation on the 1992 sucker year class. Their small size also inhibited over-winter survival, as few bass recruited in 1993. Bass stocked in 1994 and 1995 were of sufficient size by mid-July to effectively feed on YOY suckers. Bass utilized suckers heavily for two weeks in July of 1994. However, while YOY suckers apparently moved to deeper water in early August, bass stayed in the shallows and switched to a diet of crayfish and insects (Gilge 1994). Yearling and two-year-old bass appeared to feed primarily on crayfish and YOY bass. As the summer progressed, newly planted bass migrated from the weedy, upper reservoir where they were planted, to the rip-rap on the face of the dam. All bass older than Age 0 were found in the rocks of the dam face. As YOY bass infiltrated the rocky habitat, they were often cannibalized by older bass. Suckers did not frequent the dam face but utilized the warmer, weedier upper reservoir causing predator and prey to be spatially separated by late summer. This behavior was observed in each of the three years since introduction. More detailed food habit analysis is presented in a previous report by Gilge (1994).

Due to the apparent spatial separation of bass and suckers and the short period of active feeding by bass, it was felt that a suitable level of predation may not be exerted upon the sucker population. The use of walleye was investigated and an Environmental Assessment prepared in 1995 (Gilge, 1995). Walleye fingerlings (5,000-1.5 -inch) were introduced in May of 1995 and an additional 500 4-inch fish were planted in early fall. An additional plant of 4,000 walleye fingerlings was made in 1996. Three walleye from the 1996 plant were netted in 1997 and ranged in length from 7.6 - 7.9 inches. Walleye were again planted in 1997. Walleye netted in 1998 ranged from 7.2 - 10.5 inches.

In light of the reduced juvenile sucker population it may be feasible at his time to remove large numbers of adult suckers and rely on the existing predators to keep juvenile recruitment to a minimum.

Grasshopper Reservoir

This reservoir winterkilled during the winter of 1995-96 and was restocked with Arlee rainbow trout. Survival and condition of trout is good. Over-winter water levels have been marginal in recent years due to increased irrigation demand. Winterkill is a distinct possibility.

Faber Reservoir

This reservoir is one of the most popular fishing access sites in north central Montana. It has been a consistent producer of quality rainbow trout for three decades.

Adult largemouth bass were found in the reservoir in 1990, the result of an illegal introduction. Shoreline seining and electrofishing were conducted in August of 1993 to determine if bass had successfully reproduced. No YOY bass were found; however, numerous YOY white suckers and several adult suckers were captured. This was the first observation of suckers in the reservoir. Two gill-nets set the following week captured 25 rainbow trout and 81 adult suckers. Similar gill-net sets in 1987 produced 51 trout and no suckers. The suckers ranged in length from 10.6 - 13.3 inches. In 1994, the same net sets produced only eight rainbow trout, but 128 suckers. No fish from the 1994 fingerling plant were captured, which indicates a probable loss of the entire year-class. In 1995, only four trout were netted along with 169 suckers. The trout catch increased in 1996 while the sucker catch declined sharply (Figure E). Both trout and sucker catches increased in 1997 and survival of fish plants improved. Trout and sucker numbers increased in 1998. Trout condition appears to be on the decline, as was expected. An Environmental Assessment was prepared for the introduction of smallmouth bass to the reservoir in an attempt to control recruitment of young suckers. Smallmouth bass were introduced in 1998.

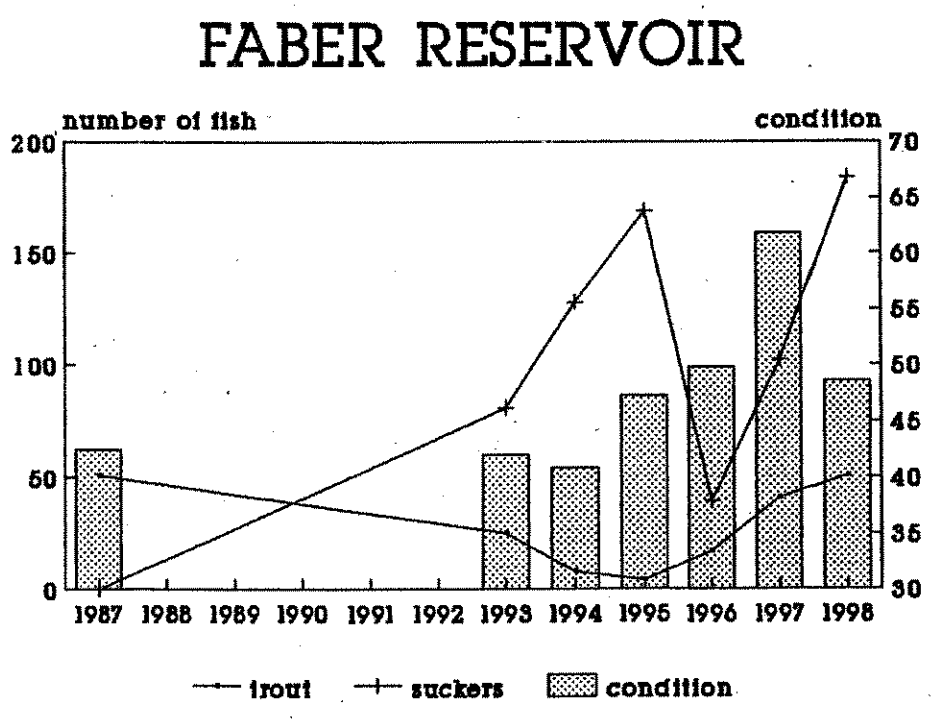

Figure E. Population trends for white suckers and rainbow trout on Faber Reservoir, 1987-98.

RECOMMENDATIONS

Beaver Creek Reservoir: Continue stocking of Eagle Lake and Arlee rainbow catchable-size trout. Evaluate the Erwin domestic strain as a possible replacement for Arlee due to projected future shortfalls of Arlee rainbow in the hatchery system. Survival and catchability of cutthroat trout should be evaluated. Increase stocking rate as northern pike population increases. Plant suitable numbers of smallmouth bass to utilize abundant crayfish population. Consider implementing northern pike suppression measures.

Bear Paw Lake: Continue McBride strain cutthroat stocking at reduced rates. Increase Arlee catchable stocking. Periodic population estimates of suckers and crayfish should be made to monitor effects of smallmouth bass and walleye introductions. Determine food competition overlap between species and evaluate extent of bass and walleye predation on suckers. Continue stocking of walleye and smallmouth bass until predation objectives are met. Investigate rock placement around reservoir to help redistribute bass. Remove large numbers of adult suckers by trapping and electrofishing.

Grasshopper Reservoir: Continue with annual plants of Arlee fingerlings and alternate year plants of Eagle Lake rainbow. Monitor with annual gill net survey. Consider aeration device to increase over-winter survival.

Faber Reservoir: Continue to monitor sucker population and growth and condition of trout. Continue plants of smallmouth bass to control sucker recruitment.

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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
15-5140-01	Faber Reservoir

Key Words or Fish Species:

Arlee, Eagle Lake rainbow trout, sucker removal, crayfish, population estimates, smallmouth bass, walleye, dietary studies.

Prepared by: Kent W. Gilge
Date: June 30, 1999

Walleye gill net CPUE has remained steady, but averaged size decreased from 1998. Walleye were introduced in 1987 due to local demand and to help control numbers of yellow perch illegally introduced. No trout were found in 18 walleye stomachs examined in 1998; however, 5 of 24 walleye examined in 1999 had eaten trout. Perch also appear to be a major food item for walleyes.

Gill net catch-rates for yellow perch remained stable, but average size increased. Perch are becoming a much sought-after fish by anglers and good catches are made at all times of the year.

Smallmouth bass, which flushed downstream from Bear Paw Lake, have grown well in the reservoir due to the abundance of crayfish and are being caught on a regular basis. A plant of 5,000 2-inch bass was made in 1998 and 1999. Stomach content analysis of smallmouth bass indicates a preference for crayfish, followed by spottail shiners and yellow perch.

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. Summer fishing pressure has exceeded 150 angler-days per surface acre in some years. 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 have historically overpopulated this reservoir. The reservoir was chemically rehabilitated in 1983 to reduce sucker numbers. Post-rehabilitation trout growth in 1984 and 1985 was excellent. However, sucker gill net catch increased from a catch per net of 9 in 1985, to 278 per net by 1990 (Figure A). Despite sucker removal efforts, the population remains high. Competition with large numbers of suckers has reduced growth rates of trout significantly. Fishing pressure has decline 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.

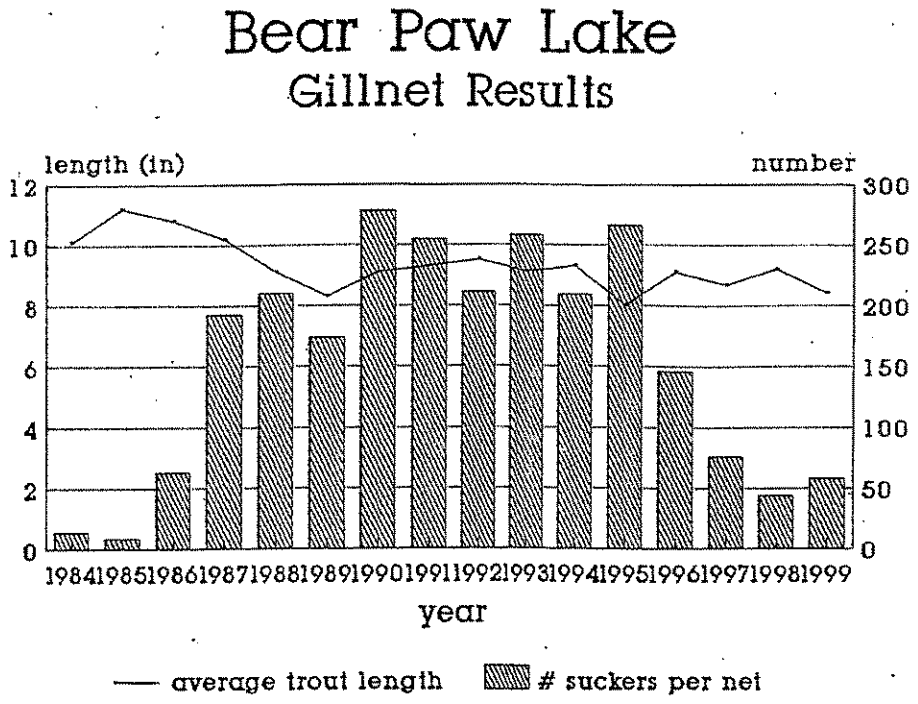

Figure A. Comparison of white sucker increases, after chemical rehabilitation in 1983, with trout growth in Bear Paw Lake.

Drawdown and chemical rehabilitation has been attempted twice. This, however, is not a preferred option for sucker control in this reservoir, primarily due to the loss of recreation, detoxification time, invertebrate loss, bank sloughing, and subsequent trout mortality.

Gill-netting trend data has been collected for a number of years in early September. Utilizing 1988 as a base year, numbers of mature (>10 inches) and juvenile sucker (<10 inches), as they appeared in the catch, were compared with trout CPUE and condition (Table 2). The trout gill-net catch has remained good, and average size and trout condition has improved. Eagle Lake strain rainbow trout had been utilized experimentally since 1986, but were replaced in 1991 with spring

Table 3. Number and poundage of white suckers removed from Bear Paw Lake from 1989 to 1999.

Year	Number	Pounds
1989	12,545	8,986
1990	44,622	10,206
1991	18,140	4,733
1992	4,133	828
1993	5,239	1,050
1994	6,995	810
1995	5,653	2,100
1996	1,991	670
1997	13,485	8,091
1998	6,708	5,206
1999	8,239	7,459
Totals	121,042	44,933

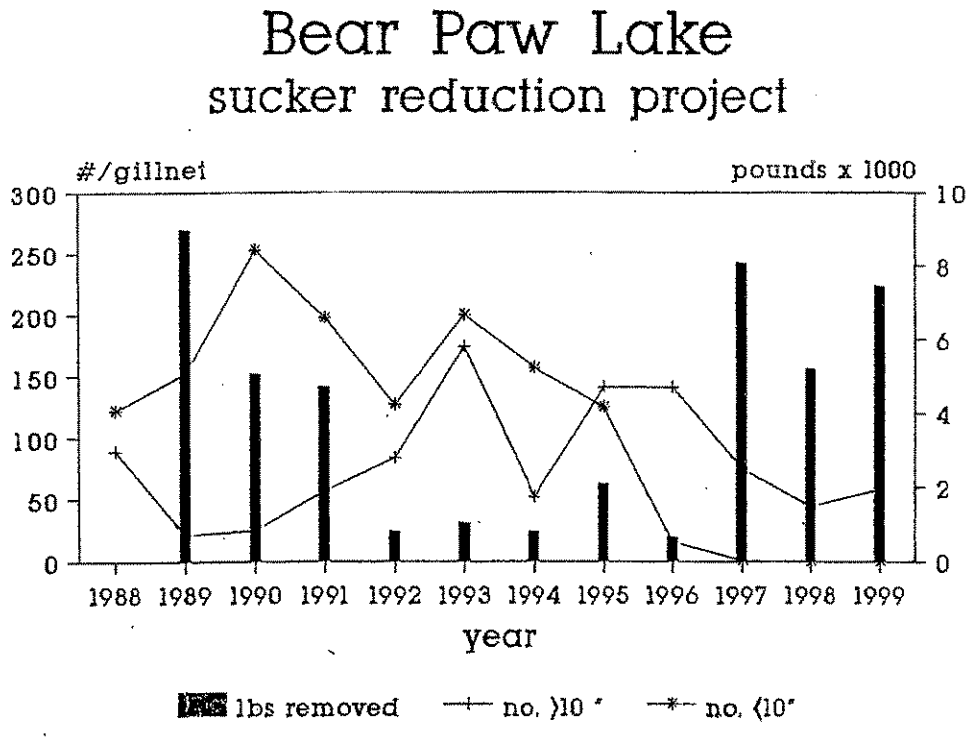

Figure B. Number of juvenile and adult suckers captured per gill net in each year of the study associated with the pounds of suckers removed each year, 1988-99.

suckers, while adult bass were expected to prey heavily on crayfish. Adult smallmouth bass were 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.

A concern that arose during the lengthy environmental review process was that a "no action" alternative, or delay in implementing an action, might cause frustrated fishermen to attempt their own predator introduction. A similar situation (sucker over-population) occurred downstream in Beaver Creek Reservoir in 1982. Unknown individual(s) introduced northern pike into this existing trout fishery apparently to control sucker numbers. Gill netting in Bear Paw Lake in 1992 proved that this was indeed the case, as a single adult walleye 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. A fisherman reported catching a northern pike from Bear Paw Lake in 1994, but the report could not be confirmed.

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 depredation losses; however, the bass were too small to effectively feed on YOY suckers. A cool August and September undoubtedly reduced growth rates of bass and over-winter survival of this introductory plant was questionable. No bass were captured in 56 trap-days of effort in the spring of 1993. However, electrofishing the shoreline in mid-July captured 23 age I smallmouth bass, ranging in length from 2.2-5.1 inches. All but two of the bass were taken from the dam face rip-rap. Bass preferred rocky substrate over emergent/submerged vegetation, which was plentiful. A total plant of 40,000 1.7-inch bass was made in July and August of 1993. Another plant of 24,000 fingerlings was made in 1994. No bass were stocked in1995 due to unavailability. A plant of 20,000 bass was made in 1996 and 5,000 were planted in 1998. Stocking of bass was discontinued in 1999, once natural reproduction was documented.

In order to evaluate changes in the forage base due to bass predation, baseline data on sucker and crayfish populations was gathered prior to the smallmouth bass introduction (Figure D). Population data has been gathered annually. A mark-recapture estimate has been made of the sucker population since 1992; however, no sucker estimate was attempted in 1999, due to time and manpower constraints.

the dam face. As YOY bass infiltrated the rocky habitat, they were often cannibalized by older bass. Suckers did not frequent the dam face, but utilized the warmer, weedier upper reservoir causing predator and prey to be spatially separated by late summer. This behavior was observed in each of the three years since introduction. Shoreline rock was placed at two mid-reservoir locations to protect shorelines from wind erosion and provide bass cover. Bass immediately colonized the structures. More detailed food habit analysis is presented in a previous report by Gilge (1994).

Due to the apparent spatial separation of bass and suckers and the short period of active feeding by bass, it was felt that a suitable level of predation may not be exerted upon the sucker population. The use of walleye was investigated and an Environmental Assessment prepared in 1995 (Gilge, 1995). Walleye fingerlings (5,000 1.5-inch) were introduced in May of 1995, and an additional 500 4-inch fish were planted in early fall. An additional plant of 4,000 walleye fingerlings was made in 1996. Three walleye from the 1996 plant were netted in 1997 and ranged in length from 7.6-7.9 inches. Walleye were again planted in 1997. Walleye netted in 1998 ranged from 7.2-10.5 inches. Walleye stocking was discontinued in 1998 as the desired level of predation was achieved.

In light of the reduced juvenile sucker population, it may be feasible at this time to remove large numbers of adult suckers and rely on the existing predator population to keep juvenile recruitment to a minimum.

Grasshopper Reservoir

This reservoir winterkilled during the winter of 1995-1996 and was restocked with Arlee rainbow trout. Survival and condition of trout is good. Over-winter water levels have been marginal in recent years due to increased irrigation demand downstream. Winterkill is likely in most years.

Faber Reservoir

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