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MONTANA DEPARTMENT OF FISH, WILDLIFE AND PARKS
FISHERIES DIVISION
JOB PROGRESS REPORT

STATE: Montana PROJECT NO. F-46-R-1
PROJECT TITLE: Statewide Fisheries Investigations JOB NO. II-e
STUDY TITLE: Survey and Inventory of Coldwater Lakes
JOB TITLE: Northcentral Montana Coldwater Lakes Investigations

PERIOD COVERED: July 1, 1987 through June 30, 1988

ABSTRACT

Eighteen waters were investigated during the report period. Rainbow trout strains were evaluated in several waters. The Eagle Lake strain of rainbow trout displayed better survival than Arlee rainbow in Ackley Lake and in Bair Reservoir but Eagle Lake fish grew more slowly and were slightly less catchable than Arlee fish. Eagle Lake rainbow performed no better than Arlee fish in East Fork Spring Creek Reservoir. Severe drought hampered long-term strain evaluation efforts in Bair and Smith River Reservoirs. Preliminary results indicated survival and growth of DeSmet rainbow was similar to Arlees in Smith River Reservoir but catchability of DeSmet was relatively low. Performance of AXE hybrid rainbow was similar to the Arlee strain in Willow Creek Reservoir. Survival, growth and catchability of Arlee rainbow was good in most waters but longevity is still a problem with few trout available in the third summer following stocking, perhaps as a result of heavy harvest. The current poor quality rainbow trout fishery in Eureka Reservoir was attributed to low stocking density and an increase in number of fish planted was recommended. Numbers of the current years' plant of Arlee rainbow were surprisingly low in the fall 1987 gill net sample from Holter Reservoir but numbers of "holdover" fish were extremely high, presumably as a result of exceptionally low flows in the Missouri River. Kokanee salmon continue to exist in depressed numbers in Pishkun Reservoir but this condition may be improved by reverting to fry plants. Apparent naturally reproducing rainbow trout are currently making an unexpected contribution to the trout population in Newlan Creek Reservoir. Good rainbow trout populations were found in three of five small ponds surveyed in the Lewistown area.

OBJECTIVES AND DEGREE OF ATTAINMENT

1. To recommend acceptable water levels in irrigation reservoirs, within hydrologic constraints, for maintaining fishery values of last 10 years. **(State funded).**

2. To establish self-sustaining trout fishery in Smith River Reservoir that will support 5,000 angler days annually with a catch rate of 0.4 fish per hour.

3. To provide longer-lived, larger trout with adequate growth rates in Willow Creek, Bair, Ackley, East Fork Dam and Newlan Creek Reservoirs for 50,000 angler days annually.

4. To provide 10,000 angler days fishing in Bean Lake for 1 to 3 pound rainbow trout.

5. To provide 28,000 angler days per year for 11 to 20 inch trout in Fitzpatrick Lake and Martinsdale, Eureka, and Nilan Reservoirs.

6. To reduce rough fish populations for maintenance of 11 to 20 inch trout in 5 lakes and ponds. **(State funded).**

7. To maintain (within hydrologic constraints) viable trout fisheries in 60 ponds and small reservoirs. **(Partly State funded).**

8. To improve the kokanee fishery in Pishkun Reservoir to satisfy 5,000 angler days annually.

9. To provide 1,000 angler days of fishing for mature salmon in the Helena Valley Regulating Reservoir.

10. To maintain current level of fishing opportunity on Bean, Ackley and Fitzpatrick Lakes and Newlan Creek Reservoir. **(State funded).**

Progress was made on all federally funded objectives and data are included in this report. Data for some State objectives are included in this report to provide current information for Regional lakes.

PROCEDURES

Netting surveys were conducted using experimental gill nets or a 1/4 inch mesh seine. Unscheduled creel census was conducted on many waters. Fin clips (adipose or pelvic), tetracycline, and fluorescent pigment marks were used to identify various strains of rainbow trout where more than one strain was stocked in a water. Fishing pressure estimates were obtained from a periodic statewide mail survey of a random sample of licensed anglers.

FINDINGS

Rainbow Trout Strain Evaluations

Rainbow trout strain evaluation continued in the six lakes and reservoirs presented in Table 1. Eagle Lake rainbows are currently being evaluated in Ackley, Bair and East Fork Spring Creek reservoirs. This strain is apparently well suited to productive waters where it typically grows to large size, displays good catchability, and will feed on chubs. All three Region 4 reservoirs have dense sucker populations and it was hoped that Eagle Lake rainbows would utilize this potential food source.
DeSmet rainbow were planted in Bean Lake in 1984 and in Smith River

Table 1. Gill net survey results for cold water lakes and reservoirs in central Montana where rainbow trout strain evaluations were being conducted in 1987.

Water name (& dated surveyed)	Surface acres	No. & type of nets 1/	Hours fished	Species, strain & year planted 2/	No. fish caught	Length range (inches)	Average length	Weight range (pounds)	Average weight
Ackley Reservoir (10/15/87)	240	1F, 1S	20	Rb-A-1987	1		(12.0)		(0.80)
				Rb-I-1987	31	7.0- 9.9	(9.1)	0.12-0.45	(0.32)
				Rb-A-1986	6	14.9-17.9	(16.2)	1.25-2.03	(1.69)
				Rb-I-1986	31	14.4-16.8	(15.4)	1.25-1.96	(1.49)
				LL	1		(18.0)		(2.40)
				LnSu	15	7.5-16.2	(11.6)		
				WSu	75	6.7-14.0	(10.1)		
Bair Reservoir (10/14/87)	272	1F, 1S	15	Rb-A-1987	10	9.0-10.5	(9.9)	0.32-0.52	(0.41)
				Rb-I-1987	37	7.7- 9.1	(8.6)	0.16-0.33	(0.23)
				Rb-A-1986	3	14.0-14.6	(14.3)	0.94-1.20	(1.10)
				Rb-I-1986	9	11.3-14.4	(13.3)	0.64-1.22	(0.90)
				EB	1		(11.1)		(0.48)
				WSu	86	7.0-13.3	(9.7)		
Bean Lake (5/1/87)	200	2S	18	Rb-A	77	8.2-12.8	(11.2)	0.26-0.80	(0.53)
				Rb-A	14	13.4-15.5	(14.3)	0.77-1.22	(1.07)
				Rb-D	1		(15.8)		(1.60)
Bean Lake (10/14/87)	200	2S	24	Rb-A	58	10.5-12.9	(11.3)	0.45-0.75	(0.57)
				Rb-A	2	13.3-14.5	(13.9)	0.90-1.02	(0.96)
				Rb-D	1		(16.3)		(1.40)
				LnSu	1		(19.1)		(3.04)
East Fork Spring Creek Reservoir (10/15/87)	100	1F, 1S	14	Rb-I-1987	37	6.6- 8.1	(7.4)	0.11-0.25	(0.18)
				Rb-I-1986	14	9.8-11.0	(10.4)	0.31-0.50	(0.44)
				Rb-I-1985+	2	14.9-17.2	(16.1)	1.40-2.17	(1.78)
				LL	1		(21.1)		(3.90)
				LnSu	34	7.4-12.8	(10.1)		
				WSu	89	6.6-13.6	(8.5)		
Smith River Reservoir (10/13/87)	327	1F, 1S	16	Rb-A	108	7.9-14.2	(11.4)	0.22-1.00	(0.59)
				Rb-D	125	9.8-14.5	(12.1)	0.37-1.00	(0.64)
				MWF	1		(13.2)		(0.73)
				Ling	2	10.1-22.5			
				LnSu	95	7.3-16.9	(11.9)		
				WSu	36	6.8-16.6	(12.1)		
Willow Creek Reservoir (10/14/87)	1250	2F	20	Rb-AXE-1987	35	8.3- 9.8	(9.0)	0.22-0.30	(0.27)
				Rb-AXE-1986	16	11.2-14.2	(12.4)	0.48-0.90	(0.62)

1/ Standard 6' X 125' experimental mesh gill nets; F=floating; S=sinking.

2/ Species abbreviations: Rb=rainbow trout; LL=brown trout; EB=brook trout; MWF=mountain whitefish; LnSu=longnose sucker; WSu=white sucker.
Strain abbreviations: A=Arlee; AXE=Arlee x Eagle Lake hybrid; D=DeSmet; I=Eagle Lake.

Reservoir (=Lake Sutherlin) in 1986 and 1987. The purpose of the latter plant was to attempt to establish a naturally reproducing population that would use two available spawning streams. The DeSmet is a wild strain that reproduces well in some areas, has relatively slow growth and good longevity, fair catchability, and feeds on zooplankton and macroinvertebrates.

A hybrid cross between Arlee and Eagle Lake rainbow strains (termed AXE) has been planted in Willow Creek reservoir since 1984. This hybrid reportedly displays similar or better growth and catchablility than the Arlee fish and better ability to overwinter successfully.

Ackley Lake

Arlee and Eagle Lake rainbow were planted in equal numbers (about 20,000 each) in Ackley Lake in 1986 and 1987 for evaluation purposes. Eagle Lake fish were marked with tetracycline and planted as 3" fingerlings in mid-July 1986. In 1987 they were fin clipped (adipose) and planted at 3.5" on 1 July. Arlee rainbows were planted at 4" in mid-April each year. Since there are no known potential spawning areas it was assumed that virtually all rainbows netted were of hatchery origin.

Gill net survey results of fall 1987 indicated that Eagle Lake rainbow survival was much higher than Arlee survival in both 1986 and 1987 (Table 1). This was unexpected because Eagle Lake fish were planted at a smaller size later in the year when surface water temperatures can be unfavorable. Growth of Eagle Lakes was adequate but slower than Arlees in Ackley. At the end of their second growing season, Eagle Lakes averaged 15.4 inches compared to 16.2 inches for Arlees (Table 1). No trace of fish was found in the stomachs of the 37 rainbow trout captured that were longer than 14 inches. Primary food items of both rainbow strains were zooplankton (mostly Daphnia), aquatic insects, and algae.

Lewistown hatchery personnel interviewed 35 anglers fishing Ackley Lake between January and May 1988. Average catch rates for rainbow were good, 0.65 per hour for ice fishermen and 0.52 per hour during April after iceout. Eight rainbows from the 1987 plant were harvested by the 35 anglers interviewed and all were Eagle Lake strain ranging between 9.2 and 12.6 inches long. This confirmed the gill net results that indicated very poor survival of the 1987 Arlee plant (Table 1). Vertebral bone samples were taken from 26 creeled fish from the 1986 (and older) plant. Of these, seven were Arlee strain (27% of sample) and 19 were Eagle Lake (73%). Hence for the 1986 year class, Arlees made up 16% of the population (from gill net survey, Table 1) and 27% of the harvest while Eagle Lake comprised 84% of the population and 73% of the harvest. The net result is that although Arlee fish appeared to be more catchable, they provided a smaller return to the creel because of poor survival. Creeled 1986 Eagle Lakes averaged 16.0" (range 13.5 - 18.3") compared to 16.7" for Arlees (15.5 - 18.2").

Arlee rainbow were planted later in 1988 (mid-May rather than mid-April) to determine if planting date influences their survival. Water level in Ackley was far superior to most other reservoirs during summer and fall 1987, apparently because of good localized rainfall.

Bair Reservoir

Coincidental plants of Arlee and Eagle Lake rainbow were made in Bair Reservoir in 1986 and 1987. About 14,000 5" Arlees were stocked on 4 June and 4,000 3" tetracycline marked Eagle Lakes were planted on 25 July, 1986. The 1987 plant consisted of 13,000 5" Arlees on 6 May and 9,600 4" Eagle Lakes with adipose fin clips on 30 June.

As was seen in Ackley Lake, survival of Eagle Lakes far exceeded that of Arlee fish in Bair Reservoir. Eagle Lake rainbow outnumbered Arlee 3:1 in the fall 1987 gill net sample of the 1986 and 1987 year classes (Table 1). Based on stocking densities, one would have expected a 3:1 ratio in favor of **Arlees** for the 1986 plant and better than 1:1 in favor of Arlees in the 1987 plant if survival of the two strains was equal. This was obviously not the case. Planting dates appeared to be especially favorable (in terms of water temperature and probable plankton densities) for Arlees relative to Eagle Lakes in 1986 yet this apparently did not confer a survival advantage to the Arlee fish.

Although both strains grew more slowly than in Ackley, Arlees again displayed a faster growth rate. Arlee fish were an average of 1.3 and 1.0 inches longer than Eagle Lake at the end of the first and second growing seasons respectively in Bair (Table 1). Fish remains were found in only one of twelve stomachs examined from rainbows longer than 13 inches and it was from an Arlee rainbow. Water levels in Bair were extremely low in fall 1987 and due to a severe drought the reservoir was totally drained by early July 1988. No creel survey data were collected to evaluate relative catchability.

East Fork Spring Creek Reservoir

Eagle Lake rainbow were stocked in East Fork Reservoir beginning in 1984 in hopes that they would feed on the abundant sucker population and provide a good fishery for large trout. Previous plants of Arlee rainbow had resulted in a marginal fishery for small trout. Netting results for fall 1987 showed little improvement, few rainbows larger than 11 inches were captured (Table 1). It appears as though the Eagle Lake fish did not utilize available forage to any significant degree as evidenced by poor growth rates. After two full growing seasons, East Fork fish were about three inches smaller than Bair Reservoir fish and five inches smaller than the same strain in Ackley Lake (Table 1). A dense population of stunted suckers continues to exist in this reservoir.

Bean Lake

Bean Lake was sampled twice with gill nets in 1987 (Table 1). The Arlee strain of rainbow trout displayed good survival and growth, averaging 11.3 inches near the end of their first growing season (Table 1). First year growth was similar to Holter Reservoir, and better than in Bair, Martinsdale and Nilan reservoirs (Tables 1 and 2). however, survival through the second growing season appeared to be low. DeSmet rainbow

Table 2. Gill net survey results for large cold water reservoirs in central Montana, 1987.

Water name (& date surveyed)	Surface acres	No. & type of nets 1/	Hours fished	Species, strain & year planted 2/	No. fish caught	Length range (inches)	Average length	Weight range (pounds)	Average weight
Eureka Reservoir (9/10/87)	300	2F, 1S	24	Rb-A	1		(11.0)		(0.62)
				LL	6	11.1-21.0	(17.0)	0.55-3.50	(2.14)
				WSu	37				
Holter Reservoir (10/19/87)	4800	2F 1-300'F	17	Rb-A-1987	69	10.2-12.4	(11.4)	0.59-1.02	(0.76)
				Rb- -1986+	80	12.6-18.6	(15.7)	0.82-2.38	(1.61)
				Rb-M-1986	3	15.0-16.7	(15.9)	1.32-1.90	(1.70)
				KOK	7	14.7-21.5	(18.1)	1.58-3.60	(2.46)
				LL	1		(20.8)		(3.58)
				WE	1		(20.2)		(2.73)
				LnSu	10				
				WSu	12				
Martinsdale Reservoir (10/14/87)	1000	1F, 1S	19	Rb-A-1987	50	9.0-11.3	(10.3)	0.24-0.51	(0.41)
				Rb-A-1986+	3	16.3-19.9	(18.2)	1.66-3.22	(2.35)
				LL	11	9.0-24.5	(16.4)	0.29-5.60	(1.92)
				LnSu	20	8.2-16.1	(10.8)		
				WSu	36	6.2-16.7	(10.3)		
Nilan Reservoir (10/13/87)	500	2F	18	Rb-A	15	9.3-11.0	(10.3)	0.28-0.50	(0.42)
				Rb-A	4	13.1-13.9	(13.6)	0.70-0.92	(0.83)
Newlan Creek Reservoir (10/13/87)	280	1F, 1S	15	YCT	26	9.6-17.6	(12.7)	0.26-1.89	(0.74)
				Rb	11	8.6-15.2	(12.9)	0.28-1.16	(0.82)
				LnSu	33	6.3-17.8	(9.1)		
Pishkun Reservoir (7/16/87)	1400	4S	18	KOK	5	7.0- 8.3	(7.5)	0.12-0.20	(0.15)
				KOK	2	10.0-11.0	(10.5)	0.38-0.44	(0.41)
				Rb	1		(17.3)		(2.38)
				NP	10	10.8-21.2	(15.6)	0.28-2.40	(1.06)
				YP	52	6.3- 8.7	(7.2)	0.10-0.38	(0.20)
				WSu	28		(17.6)		(2.50)

1/ Standard 6 x 125' experimental mesh gill nets (unless otherwise noted). F=floating; S=sinking.
2/ Species abbreviations: Rb=rainbow trout; LL=brown trout; KOK=kokanee salmon; YCT=Yellowstone cutthroat trout; WE=walleye; NP=northern pike; YP=yellow perch; WSu=white sucker; LnSu=longnose sucker.
Strain abbreviations: A=Arlee; M=McConaughy.

Table 3. Netting survey results for small cold water lakes and reservoirs in central Montana, 1987 & 1988.

Water name (& date surveyed)	Surface acres	No. & type of nets 1/	Hours fished	Species, strain & year planted 2/	No. fish caught	Length range (inches)	Average length	Weight range (pounds)	Average weight
Barta Reservoir (4/14/88)	7.5	2S	2	Rb	4	13.0-14.3	(13.9)	1.00-1.55	(1.34)
				EB	1		(12.8)		(0.95)
Buffalo Willow Reservoir (5/26/88)	2.5	1S	16	Rb-A-1988	2	6.3- 6.3	(6.3)	0.13-0.14	(0.13)
				Rb-A-1987	9	9.2-10.2	(9.7)	0.27-0.40	(0.32)
				Rb-A-1986+	8	11.1-19.0	(13.9)	0.55-1.90	(0.97)
				YP	3	10.7-11.7	(11.3)	0.59-0.72	(0.68)
				LCh	2	5.8- 6.5	(6.2)		
C-1 Reservoir (4/13/88)	4	1S 1SE	6	No fish caught No fish caught					
Fitzpatrick Lake (10/27/87)	25	1S	5	Rb-A	2	11.0-12.1	(11.6)	0.67-0.75	(0.71)
				Rb-A	1		(16.4)		(2.03)
Kovacich Pond (4/14/88)	1	2S	2	No fish caught					
Urs Pond (4/13/88)	4	1S	3	Rb	11	12.0-14.2	(12.9)	0.55-1.40	(1.09)

1/ Standard experimental mesh 6 x 125' gill nets (F=floating; S=sinking) or 1/4" mesh seine.
2/ Species abbreviations: RB=rainbow trout; EB=brook trout; YP=yellow perch; LCh=lake chub.
Strain abbreviations: A=Arlee.

planted in 1984 also showed poor long -term survival as by only one fish taken on each sampling date. Angler success remains good and pressure has varied from 4,845 angler days (1985-86 survey) to 10,400 angler days (1983-84 survey).

Smith River Reservoir

Arlee and DeSmet rainbow were planted in nearly equal numbers (about 12,000 each) in Smith River Reservoir during 1986 and 1987. The gill net catch was extremely high in fall 1987 (218 rainbows in a single floating net) because the reservoir was drawn down to a critically low level as a result of drought conditions. Netting results indicated nearly equal survival and growth of both strains (Table 1). The local game warden interviewed 20 anglers who fished a total of 77 hours in April, May and June of 1987. These anglers harvested 47 Arlee (0.61/hr) and only six DeSmet (0.08/hr).

Continued drought conditions and irrigation use caused water level to drop below minimum survival pool in spring 1988. Numerous dead burbot but few dead trout were reported in summer 1988. All fishing limits were removed in June 1988 to allow maximum utilization of trout that would likely not survive overwinter. Rainbow trout plants scheduled for 1988 were canceled.

Willow Creek Reservoir

The Arlee-Eagle Lake hybrid rainbow (AXE) has been stocked in Willow Creek Reservoir since 1984. Survival and catchability of the AXE are good but longevity is short and growth is slower than for Arlee fish in surrounding waters (Tables 1 and 2). Recent estimates of fishing pressure range from a low of 2,318 angler days in 1983-84 to high of 19,172 angler days in 1985-86.

Other Large Reservoirs

Eureka Reservoir

Gill netting conducted in September 1987 indicated extremely poor survival of Arlee rainbow trout (Table 2). Periodic creel checks during the year revealed that fishermen were catching some rainbow trout of the 1987 plant plus occasional fish from earlier plants. All of these fish exhibited good growth. Examination of stomach contents indicated that trout were feeding on small suckers. Fishing pressure has been much lower than the lake can support, and is a direct result of few trout available. Fishing pressure estimates range from 1,166 angler days in 1985-86 to 2,910 in 1982-83. As will be discussed later, review of past stocking and netting data indicates best results when greater numbers of trout were stocked.

Holter Reservoir

The annual netting survey on Holter Reservoir initiated in 1979 was continued in fall 1987 to facilitate analysis of long-term population trends in relation to reservoir operation and angler use. Total catch of

hatchery Arlee rainbow in their first growing season was very low (69 fish) in comparison to other years (Table 2, also Wipperman et al. 1987). Higher catches of first-year rainbow were expected because spring runoff was minimal, hence fewer fish would have been flushed over or through the dam. Catches of second year (and older) fish were nearly double the maximum previously recorded, probably a result of very low flushing losses in spring 1987 when outflows never exceeded 4500 cfs. Spilling over Holter dam (and associated higher losses of "holdover" rainbow) does not occur until outflow reaches about 7000 cfs. Detailed summaries of the fish populations and angler use of Holter Reservoir may be found in Lere (1986, 1988).

Martinsdale and Newlan Creek Reservoirs

Water level was very low in Martinsdale Reservoir in fall 1987. A good sample of rainbow trout planted in 1987 was obtained in gill nets but few fish from previous year classes were found (Table 2). For unknown reasons, brown trout catches in gill nets set in Martinsdale were high in 1987 and 1985. Plants of Arlee rainbow trout into Newlan Creek Reservoir ceased after 1983 but a significant rainbow population continues to exist despite subsequent annual stocking of about 30,000 one to three inch McBride strain Yellowstone cutthroat (Table 2). Rainbow trout were observed spawning in Newlan Creek about 1/2 mile upstream from the reservoir in spring 1987. Although the creek is very small and substrate is very silty, there is apparently a significant amount of successful natural reproduction by rainbow trout. Migration barriers created by beaver dams are numerous in this stream and may limit the extent of natural reproduction.

Nilan Reservoir

Arlee rainbow continue to provide a good, heavily used fishery in Nilan Reservoir. Fishing pressure estimates for the 1984-85 survey indicates 15,553 angler days expended on this water. Periodic winter creel checks indicate many daily limits taken with catch rates approaching 3 fish/hour. Approximately 5 percent of fish caught through the ice were planted two years earlier. Although survival, growth and catchability of Arlee are good, longevity remains a problem. Results of fall gill netting are summarized in Table 2.

Pishkun Reservoir

Kokanee salmon have not been present in sufficient numbers in recent years to satisfy angler demand in Pishkun Reservoir. Gill net survey results indicate that population levels remained low in summer 1987 (Table 2). Predation by illegally introduced northern pike has been a factor but good kokanee populations were present in the past when pike populations were much higher. Of five pike stomachs analyzed in 1987, one contained young-of-year kokanee. As will be discussed later, the poor showing of kokanee may be related to a recent change in stocking policy. Fishing pressure in recent years has varied from 2,304 angler days in 1984-85 to 9,177 in 1982-83. Since few kokanee have been available for harvest it is likely the majority of angler use was directed at northern pike.

Small Ponds and Reservoirs

Fitzpatrick Lake

Arlee rainbow have shown good survival, growth and catchability in this lake. A fish kill reported in September was probably related to low water levels caused by drought and irrigation withdrawal. Fitzpatrick normally is a 75 acre lake with a maximum depth of 20 feet but by fall 1987 it was reduced to approximately 25 acres and nine feet maximum depth. A five-hour gill net survey in October revealed that rainbow trout were still present (Table 3). Dissolved oxygen readings taken on January 26, 1988 indicated low levels with winterkill possible. Fishing pressure on this lake has varied from 2,250 angler days in 1985-86 to 4,025 angler days in 1983-84.

Lewistown Area Ponds

Short duration daytime gill net sets indicated good numbers of hatchery rainbows with good average size in Barta Reservoir and Urs Pond (Table 3). No fish were taken in Kovacich Pond and C-1 Reservoir. Several dead trout were observed in C-1 indicating substantial (perhaps total) winterkill. The catch in Buffalo Wallow Reservoir was better than in past years, indicating a healthy population of fair sized Arlee rainbows (Table 3). The three relatively large yellow perch caught in Buffalo Wallow in 1988 are the first ever taken in netting surveys dating back to 1973. These fish were apparently illegally introduced sometime during the past three years.

DISCUSSION AND RECOMMENDATIONS

Preliminary results indicate that Eagle Lake rainbow have higher survival rates than Arlee rainbow in Ackley and Bair Reservoirs. Catchability of Arlee was higher than Eagle Lake fish in Ackley but this advantage was offset by poor survival of Arlee strain. Growth of Arlee was superior in both reservoirs, with Arlees averaging about one inch longer than Eagle Lake fish after the second growing season. Neither strain was found to utilize forage fish in their diet. Relative longevity of the two strains has not yet been determined but will be examined in subsequent years. It is recommended that the paired comparison of Arlee vs. Eagle Lake continue for two or three more years in Ackley to determine longevity differences, forage fish utilization, and confirm apparent survival and catchability differences.

Performance of Eagle Lake rainbow in East Fork Spring Creek Reservoir was no better than observed previously for Arlee rainbow. The Eagle Lake strain showed similar slow growth and failure to utilize suckers as forage fish. Rainbow plants were discontinued in favor of brown trout beginning in 1988 since this reservoir has shown some potential to produce large brown trout. Brown trout will be evaluated for growth, recreational fishery potential, and utilization of suckers over the next three to four years. If unsuccessful, other alternatives will be considered.

Severe drought conditions experienced in summer 1987 and especially summer 1988 interrupted long-term strain evaluations being conducted in Bair and Smith River reservoirs. Bair Reservoir was dry and Smith River Reservoir was nearly dry by the end of June 1988. Survival and growth of DeSmet rainbow in Smith River Reservoir was nearly identical to Arlee fish through fall 1987, after two years of coincidental planting. Limited creel survey data indicated that catchability of Arlee strain was about seven or eight times higher than DeSmet fish. It is recommended that paired comparison of Arlee and DeSmet continue in Smith River Reservoir for two or three more years if drought conditions allow. DeSmet fish should continue to be fin clipped for easy identification and Arlee fish should be tetracycline marked to facilitate quantification of natural reproduction. If water levels return to normal, Bair Reservoir will be managed strictly with Eagle Lake rainbow beginning in 1989.

The performance of AXE strain rainbow in Willow Creek Reservoir has been similar to the Arlee strain. Stocking of AXE rainbow will continue for two more years with appropriate monitoring. If performance of AXE fish continues to be similar to the Arlee strain, future stockings will consist of whichever strain the hatchery system can produce most efficiently. In an attempt to improve the rainbow fishery, Bean Lake will be converted to AXE rainbow in 1988. This water has abundant invertebrates and growth of AXE should be much better than that displayed in Willow Creek Reservoir.

Arlee rainbow stocked in Bean, Fitzpatrick and Nilan in recent years have displayed good survival, average growth and good catchability. All of these waters experience longevity problems, with few if any Arlee rainbows fish surviving into the third summer following planting. It is possible that the apparent short lifespan of rainbow trout is a result of heavy fishing pressure and harvest. Fishing for Arlee rainbow in Eureka Reservoir has been extremely poor during the last seven years when only 25,000 to 50,000 fish have been planted annually. Historical data indicate a much better fishery existed when 100-150,000 fish were planted each year. Consequently, we recommend increasing the annual plant in Eureka Reservoir to 75-80,000 fish.

The kokanee salmon fishery in Pishkun Reservoir has been extremely poor or even non-existent for the past five years. In previous years a good kokanee fishery existed based on annual fry plants. Recent declines in the fishery are probably related to the establishment of predatory northern pike and a change in kokanee stocking practice. In an attempt to enhance kokanee survival, fry plants were superceded by stocking of two-inch fingerlings beginning in 1981. However, hatchery personnel have reported increased mortality during transport of fingerlings to the planting site. To evaluate this possibility we recommended that fry plants resume for a four year period beginning in 1988. Stocking of kokanee should be discontinued if no improvement of the fishery results and no new alternatives are identified.

Netting survey results indicated that a significant amount of natural reproduction by rainbow trout may be occurring in Newlan Creek upstream

from the reservoir. It is possible that Yellowstone cutthroat may be reproducing naturally as well. To evaluate this possibility we recommend that cutthroat trout stocked in the future be marked with tetracycline. Removal of migration barriers (beaver dams) in the spring might substantially increase the amount of accessible spawning habitat.

Suitable rainbow trout populations were found in most of the small ponds and reservoirs surveyed in the Lewistown area. The frequency and severity of winterkill in C-1 Reservoir have increased in recent years. This appears to be due to shallower water depths resulting from interception of runoff water by newly constructed upstream reservoir(s). As a result we recommend that stocking of C-1 be discontinued. Kovacich Pond should also be considered for termination because of shallow depth and reports of poor fishing.

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Principal Fish Species Involved:
Rainbow trout, brown trout, cutthroat trout, kokanee salmon

Code Numbers of Waters Referred To In Report:

14-7320	Eureka Reservoir
14-7370	Fitzpatrick Lake
16-4300	Ackley Lake
16-4400	Barta Pond
16-4590	C-1 Reservoir
16-4950	East Fork Spring Creek Reservoir
16-8110	Kovacich Pond
16-8660	Urs Pond
17-8720	Bean Lake
17-9136	Holter Reservoir
17-9330	Newlan Creek Reservoir
17-9616	Smith River Reservoir
18-7340	Buffalo Wallow Reservoir
18-7750	Bair Reservoir
18-8380	Martinsdale Reservoir
20-7900	Nilan Reservoir
20-7950	Pishkun Reservoir
20-8500	Willow Creek Reservoir