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

STATE: Montana PROJECT NO. F-46-R-7
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, 1993 through June 30, 1994

ABSTRACT

Several lakes in Region Four continued to be evaluated in 1993 with various strains of rainbow trout. The Arlee strain provided a good fishery in Bean Lake and Nilan Reservoir. Little or no survival of the Eagle Lake strain is evident in Pishkun and Nilan Reservoirs. Few Arlee also was found in Pishkun Reservoir but those that survive exhibit excellent growth. Fair to good survival of AXE and DeSmet rainbow was found in Eureka Reservoir. Lake trout were tagged in Tiber Reservoir. Arctic grayling were introduced into Lake Levale. As in the three previous years, Eagle Lake rainbow trout plants in Ackley Lake displayed higher survival than Arlee rainbow trout. Good survival was found among Eagle Lake planted in 1992 and fair survival from the 1993 plant in Bair Reservoir. Big Casino Creek Reservoir had poor survival of Arlee rainbow trout; white sucker numbers also decreased from previous levels. Brown trout in East Fork Spring Creek Reservoir showed low survival; the northern pike catch was the highest to date. Poor survival of both the Arlee and the DeSmet strains of rainbow trout were observed in gill net catches in Smith River Reservoir. However, good survival of what may be wild fish was observed in gill net catches. Survival among the 1993 plants of Arlee rainbow trout in Martinsdale Reservoir was good. As in the past, survival of Yellowstone cutthroat trout was poor in Newlan Creek Reservoir. Good survival of Arlee rainbow trout was observed in Yellow Water Reservoir.

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 a 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 1-3 pound rainbow trout.

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

6. To reduce rough fish populations for maintenance of 11-20 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 to provide current information for regional waters.

PROCEDURES

Fish populations were sampled using standard 125 x 6 foot monofilament experimental gill nets with 25 foot sections of 0.75, 1.0, 1.25, 1.5 and 2.0 inch square mesh. Nets were either fished sinking or floating. Limited data was also collected through periodic creel census. Fish were measured to the nearest tenth of an inch and weighed to the nearest hundredth of a pound. Various rainbow trout strains were marked with tetracycline, fin clips, or fluorescent pigment. Gill net survival ratings were grouped under the following categories: good = ≥8.0 fish per net, fair = 4.0-7.9 fish per net, poor = 0.0-3.9 fish per net.

FINDINGS

Rainbow Trout Strain Evaluation

The following strains of rainbow trout are being evaluated in waters in the eastern portion of Region Four: Arlee in Ackley Lake

and Smith River Reservoir, DeSmet in Smith River Reservoir, and the Eagle Lake strain is being planted in Ackley Lake. Other strain evaluations were also performed in waters in the western portion of Region 4: Bean Lake, Eureka Reservoir, Nilan Reservoir, Pishkun Reservoir, and Willow Creek Reservoir. A previous report (Hill and Liknes 1992) presented the history of these strains in each respective water. Hill and Liknes (1993) recommended that certain strains be either continued or eliminated from the stocking program for these waters. Each water will be discussed separately.

Bean Lake- The 1993 report mentioned above, recommended that Arlee and AXE rainbow continue to be stocked in equal numbers in this lake. This document also reported that water levels have receded drastically throughout recent drought years. Although the summer of 1993 was very wet, water levels remained stable or increased only slightly. The gill net survey of late September produced 15 rainbow trout (Table 1) and represent only the Arlee strain from plants made in 1992 and 1993. Periodic checks of ice fishermen reveal both Arlee and AXE in the creel.

Eureka Reservoir- Eleven DeSmet rainbow and 5 AXE rainbow were collected in the fall gill net survey (Table 1). Although Arlee were also stocked in 1993, none were taken during sampling efforts. As recommended in the 1993 report, Arlee are to be discontinued in 1994 in this water. The winter fishery produced DeSmet from the 1992 plant, AXE from 1991 and 1992, and Arlee from 1991 only.

Nilan Reservoir- Arlee rainbow have historically been stocked in this water and have provided an excellent fishery most of the time, with the exception of two recent failures, in 1990 and 1991. Eagle Lake were added to the program in 1993 to hopefully eliminate a complete year class failure. The September netting suggests that Eagle Lake rainbow had poor survival as none were taken (Table 1). Creel checks of ice fishermen also revealed only Arlee being taken.

Pishkun Reservoir- Rainbow trout (Arlee and Eagle Lake strains) are being stocked in this water in attempts at producing a salmonid fishery in the face of a predator population of northern pike. Stocking is composed of 4-5 inch fish and 8-9 inch fish of each strain. In May of 1983, several Arlee were caught during a fish derby and they ranged in length from 16.5 - 17.1 inches and weighed from 1.83 - 2.53 pounds. They were stocked as 8-inch fish in 1992. Netting surveys in September (Table 1) captured only one rainbow of the Eagle Lake strain. Stomach contents of northern pike taken during netting surveys revealed fish remains, but positive identification was not possible.

Willow Creek Reservoir- The fall netting survey (Table 1) sampled Arlee and AXE rainbow trout strains from 1992 and 1993 along with 1991 AXE. Survival of both strains stocked in 1993 appears equal and the 1991 year class of AXE is still contributing to the fishery.

Table 1. Overnight gill netting results in coldwater lakes and reservoirs in the western portion of Region Four, 1993.

Water (Date surv)	Surface acres	No. of nets[1]	Mean hours fished/net	Species/strain year planted[2]	No.of fish	Length (in) range(mean)	Weight (lbs) range(mean)
Bean Lake (9-29-93)	180	2 S	19.7	Rb-A-1993	9	10.8-12.7(11.7)	0.54- 0.88(0.71)
				Rb-A-1992	6	12.4-13.6(13.2)	1.02- 1.20(1.11)
Eureka Res. (9-30-93)	350	3 F	20.2	Rb-D-1993	6	11.3-13.3(12.5)	0.55- 0.82(0.69)
				Rb-D-1992	5	14.7-15.9(15.3)	1.03- 1.29(1.14)
				Rb-AXE-1993	3	7.6-10.3(9.3)	0.17- 0.38(0.29)
				Rb-AXE-1992	2	14.3-15.4(14.9)	1.01- 1.29(1.15)
				LL	1	(23.0)	-
Nilan Res. (9-28-93)	450	2 F	20.5	Rb-A-1993	10	11.1-12.6(12.0)	0.62- 0.91(0.77)
Pishkun Res. (9-27-93)	1100	4F,4S	18.5	Rb-I-1993	1	(9.6)	(0.30)
				Kok	13	9.9-10.6(10.1)	0.26- 0.38(0.32)
					15	11.6-14.0(12.9)	0.54- 0.81(0.69)
					27	13.4-16.3(14.6)	0.84- 1.22(0.99)
				NP	1	(12.2)	(0.34)
					5	17.0-23.0(20.1)	1.22- 3.46(2.30)
					2	28.1-32.6(30.4)	7.52-10.80(9.16)
				WSu	14	10.2-14.4(13.2)	0.47- 1.41(1.06)
					13	15.5-19.4(18.2)	1.73- 3.18(2.74)
Tiber Res. (11-8,9-93)	15,600	12 S	1.0	Lt	18	20.9-28.1(25.7)	-
Willow Cr.Res. (9-28-93)	1500	2 F	19.2	Rb-A-1993	6	10.2-11.2(10.6)	0.47- 0.54(0.50)
				Rb-A-1992	1	(14.4)	(1.16)
				Rb-AXE-1993	7	8.3- 9.9(9.1)	0.20- 0.40(0.28)
				Rb-AXE-1992	1	(12.8)	(0.58)
				Rb-AXE-1991	7	14.4-15.0(14.9)	1.04- 1.20(1.18)

1/ Standard 125 foot experimental nylon gill nets: F = floating; S = sinking.
2/ Species abbreviations: Rb = rainbow trout; KOK - kokanee salmon; NP = northern pike; WSu = white sucker; Lt = lake trout.
Strain abbreviations: A = Arlee; D = DeSmet; AXE = Arlee-Eagle Lake cross; I = Eagle Lake.

Ackley Lake - As described in last years report, equal numbers (approximately 20,000 of each strain) of Arlee and Eagle Lake strain rainbow trout fingerlings have been planted in Ackley Lake since 1986. We continued this planting density in 1993 (Table 2). One way that the 1993 plants differed from previous years was the splitting of the Arlee plant between Giant and Big Springs Hatcheries. Planting dates were in late May for the Arlee; the mean length of the Giant Springs plant was 4.1 in while fish from the Big Springs plant averaged 5.4 in. This was designed to investigate the possibility of differential survival of the same strain from different hatcheries. The Eagle Lake plant was made on 10 June with fish averaging 3.2 in. Water temperatures averaged 59 F (58 & 60 F) for the two Arlee plants in 1993; it was 65 F when the Eagle Lake plant was made.

Results from fall 1993 gill netting showed fair survival for the Eagle Lake strain from plants made in 1993 and 1992 but poor survival from the 1991 plant (Table 3). As in three previous years (Hill and Liknes 1993), the Eagle Lake strain planted in 1993 displayed greater survival than the Arlee strain through the first growing season. Gill net catches included Arlee rainbow trout from both the 1992 and 1993 plants. Survival was considered poor (Table 3). The 10 Eagle Lake rainbow trout from the 1993 plant averaged 2.1 in and 0.26 lbs less than the single 1993 Arlee gill netted. The Arlee captured from the 1992 plant was similar in length to the Eagle Lake strain. We have not observed any clear, consistent relationship between water temperature at the time of stocking and survival through the first season for either strain of rainbow trout in Ackley Lake for the years 1991-1993 (Figure 1).

Hatchery personnel from Big Springs Trout Hatchery collected some growth data from three anglers on 1 June 1994 while planting fish. Twenty-one fish were handled and measured; in contrast to the gill netting catch, more Arlee rainbow trout were caught by these anglers. Twelve or 57% of the creeled fish were Arlee while the remaining 9 were Eagle Lake rainbow trout. All the Arlee examined were from the 1993 plant; equal numbers of Arlee from the two hatcheries were creeled. The Arlee from the Big Springs hatchery averaged 15.1 in in length while Arlee from Giant Springs averaged 14.8 in. However, the largest Arlee was a 16.0 in fish from Giant Springs. The Eagle Lake strain was represented in the catch by two age classes. Five were from the 1993 plant (mean length = 13.7 in) and four were from the 1992 plant and averaged 17.75 in. This information shows that like previous creel data (Hill et al. 1990; Liknes et al. 1991) Eagle Lake rainbow tend to be available to anglers at older ages than Arlee.

Table 2. Planting details for reservoirs in the eastern portion of Region 4, 1991-1993.

Water	Date Planted	Strain	Hatchery*	Water temperature (F)	Mean length (in)	Number planted
Ackley Lake	05/24/93	Arlee	GS	60	4.1	10,000
	05/21/93	Arlee	BS	58	5.4	10,000
	06/10/93	Eagle L.	BS	65	3.2	20,008
	05/18/92	Arlee	GS	57	4.0	21,000
	05/28/92	Eagle L.	BS	59	3.7	22,515
	05/28/91	Arlee	GS	55	4.0	22,181
	06/10/91	Eagle L.	BS	62	3.5	21,488
Bair Res.	06/18/93	Eagle L.	BS	62	3.3	20,000
	05/14/92	Eagle L.	BS	55	3.4	20,010
	06/28/91	Eagle L.	BS	64	3.9	19,994
Big Casino Creek Res.	06/10/93	Arlee	BS	65	4.4	4,998
	05/15/92	Arlee	BS	58	4.6	4,998
	06/10/91	Arlee	BS	65	8.6	3,006
E. Fk Spring Creek Res.	06/16/93	Brown T.	BS	57	4.1	5,000
	06/23/92	Brown T.	BS	73	4.3	4,956
	06/21/91	Brown T.	BS	60	4.5	5,117
Smith River Res.	06/11/93	DeSmet	BS	56	2.7	12,000
	06/14/93	Arlee	BS	56	3.9	12,000
	08/28/92	DeSmet	BS	56	2.9	12,850
	05/26/92	Arlee	BS	56	3.9	12,104
	08/27/91	DeSmet	BS	68	2.3	11,974
	06/11/91	Arlee	BS	60	4.5	12,019
Martinsdale Res.	05/20/93	Arlee	GS	62	4.2	10,000
	05/24/93	Arlee	BL	64	5.1	31,825
	05/25/93	Arlee	BL	59	5.1	30,825
	05/26/93	Arlee	BL	58	5.1	17,945
	07/09/93	Arlee	FTC	-	2.7	3,820
	05/11/93	Yct	BS	58	7.0	15,174
	05/13/93	Yct	BS	54	7.0	11,928
	04/29/92	Arlee	JR	-	11.8	200
	06/12/92	Arlee	BL	67	5.1	34,810
	06/13/92	Arlee	BL	65	5.0	36,107
	06/23/92	Arlee	BL	72	5.6	4,687
	06/13/91	Arlee	BL	64	5.4	29,963
	06/17/91	Arlee	BL	56	5.5	27,944
	06/20/91	Arlee	BL	58	5.5	24,003
	06/21/91	Arlee	BL	61	5.5	20,486
	08/27/91	Arlee	GS	72	6.0	9,120
Yellow Water Res.	04/22/93	Arlee	BS	55	7.3	1,020
	06/10/93	Arlee	BS	74	4.4	13,083
	04/28/92	Arlee	BS	59	7.5	1,018
	04/23/91	Arlee	BS	60	7.0	10,035

* - GS = Giant Springs Hatchery; BS = Big Springs Hatchery; BL = Bluewater Springs Hatchery; Y = Yellowstone Hatchery; JR = Jocko River Hatchery; FTC = Fish Technology Center.

Table 2. (continued).

Water	Date Planted	Strain	Hatchery*	Water temperature (F)	Mean length (in)	Number planted
Newlan Creek Res.	04/29/93	Yct	GS	40	19.9	437
	08/03/93	Yct	Y	65	19.5	95
	08/03/93	Yct	Y	65	17.5	50
	08/04/93	Yct	Y	64	17.5	150
	08/05/93	Yct	Y	65	17.5	147
	09/17/93	Yct	Y	56	2.9	28,548
	09/08/92	Yct	Y	59	2.5	23,988
	09/11/92	Yct	Y	56	2.6	17,512
	06/19/91	Yct	Y	59	20.1	66
	06/20/91	Yct	Y	62	20.1	51
	06/19/91	Yct	Y	59	17.1	100
	06/20/91	Yct	Y	62	17.1	123
	06/26/91	Yct	Y	65	17.1	140
	00/00/91	???				

* - GS = Giant Springs Hatchery; BS = Big Springs Hatchery; BL = Bluewater Springs Hatchery; Y = Yellowstone Hatchery; JR = Jocko River Hatchery; FTC = Fish Technology Center.

Smith River Reservoir - As last year, fall gill netting work in 1993 found poor survival among both the Arlee and the DeSmet Strain of rainbow trout (Table 3). Both strains were represented by the last two years of plants from 1992-1993. Arlee were larger than DeSmet when planted but even after that was taken into account, growth among the 1993 Arlee plant was much better. Water temperature and time of planting does not appear to be major factors in survival for either the 1993 or 1992 plants of either strain. Water temperature was 56 F for all plants during those 2 years (Table 2). However, DeSmet plants in late August may be late to provide the potential for good overwinter survival. The surprise catch during 1993 sampling was the high catch for what may be wild fish (Table 3). All wild fish, which did not have a tetracycline mark and were not fin clipped, were within a fairly small size range, varying from 13.0-15.5 in. Additional data collection is needed before we will be certain that these are wild fish since this represents the first time we sampled them and with such a small size range, they could be DeSmet from a single plant with a non-visible tetracycline mark. Hatchery records verify the fish planted in Smith River Reservoir were marked with tetracycline.

Table 3. Overnight gill netting results in coldwater lakes and reservoirs in the eastern portion of Region Four during 1993.

Water name (Date surveyed)	Surface acres	No. of[1] nets	Mean hours fished/net	Species, strain[2] & year planted	Total no. of fish	Length(in) Range	Length(in) Mean	Weight(pounds) Range	Weight(pounds) Mean	Condition Factor Range	Condition Factor Mean
Ackley Res. (10/21/93)	240	1F,1S	16.4	Rb-I-1993	10	7.5-11.4	(10.0)	0.18-0.62	(0.43)	38.2-48.0	(41.5)
				Rb-I-1992	10	16.0-17.0	(16.5)	1.45-1.87	(1.66)	33.6-40.2	(37.1)
				Rb-I-1991	2	17.5-18.0	(17.8)	1.93-2.00	(1.97)	34.3-36.0	(35.2)
				Rb-A-1993	1	-	(12.1)	-	(0.69)	-	(38.9)
				Rb-A-1992	1	-	(16.5)	-	(1.56)	-	(34.7)
				MW	1	-	(15.6)	-	(2.00)	-	(52.7)
				LnSu	38	10.5-17.7	(15.6)	0.45-2.37	(1.60)	33.9-47.2	(41.3)
				LL	1	-	(15.6)	-	(1.42)	-	(37.4)
				WSu	33	13.7-17.6	(16.1)	1.04-2.47	(1.91)	36.6-51.8	(45.1)
Bair Reservoir (10/20/93)	272	1F,1S	15.5	Rb-I-1993	11	8.0- 9.5	(8.6)	0.22-0.37	(0.27)	37.7-47.2	(42.8)
				Rb-I-1992	23	10.9-12.3	(11.6)	0.42-0.59	(0.52)	28.2-38.1	(33.2)
				Eb	3	8.1-11.1	(9.8)	0.20-0.45	(0.34)	32.9-37.6	(35.2)
				WSu	88	6.6-13.5	(9.6)	0.11-1.04	(0.38)	33.4-50.3	(39.9)
Big Casino Creek Reservoir (11/03/93)	17.5	1F,1S	14.9	Rb-A-1993	3	9.2-10.3	(9.7)	0.20-0.38	(0.26)	24.5-34.8	(28.3)
				RB-A-1991	1	-	(18.5)	-	(3.10)	24.5-34.8	(28.3)
				WSu	36	7.9-13.5	(9.6)	0.16-0.73	(0.31)	28.3-40.2	(33.4)
East Fk Spring Creek Res. (10/21/93)	100	1F,1S	13.8	LL-1992	1	-	(11.3)	-	(0.58)	-	(40.2)
				NP	7	19.3-30.0	(24.7)	2.00-7.80	(4.38)	22.8-28.9	(26.4)
				WSu	23	8.6-11.8	(10.4)	0.22-0.67	(0.44)	34.6-42.0	(37.8)
Smith River Res. (10/19/93)	327	1F,1S	14.6	Rb-A-1993	3	9.9-11.2	(10.5)	0.46-0.60	(0.53)	42.7-49.4	(46.5)
				Rb-A-1992	3	13.5-14.7	(14.1)	0.97-1.26	(1.08)	36.4-39.7	([illegible])
				Rb-Wild	18	13.0-15.5	(14.4)	0.87-1.37	(1.09)	-	([illegible])
				Rb-D-1993	2	6.7- 7.6	(7.2)	0.13-0.20	(0.17)	43.2-45.6	(44.4)
				Rb-D-1992	1	-	(13.7)	-	(1.10)	-	(42.8)
				MW	2	11.4-16.1	(13.8)	0.58-1.52	(1.05)	36.4-39.1	(37.8)
				LnSu	41	7.4-17.9	(15.0)	0.19-2.20	(1.40)	34.6-46.9	(39.2)
				WSu	9	12.0-16.9	(14.9)	0.72-2.06	(1.50)	41.7-45.9	(43.7)
				Burbot	3	24.1-31.9	(27.5)	2.91-7.00	(4.53)	19.6-21.6	(20.6)
Holter Reservoir	Netted by R-8 fisheries staff										
Martinsdale Res. (10/20/93)	1000	1F,1S	17.8	Rb-A-1993	74	10.0-12.6	(11.4)	0.47-0.85	(0.68)	38.5-51.3	(45.2)
				Rb-A-1992	7	15.1-16.7	(16.0)	1.55-1.96	(1.68)	35.2-45.3	(41.2)
				Rb-A-1991	1	-	(19.2)	-	(2.54)	-	(35.9)
				YCt	10	12.1-14.5	(13.2)	0.60-0.99	(0.80)	32.5-36.4	(34.8)
				MW	1	-	(11.1)	-	(0.59)	-	(43.1)
				WSu	53	8.4-17.1	(14.2)	0.21-2.27	(1.42)	35.4-56.8	(45.6)
				LnSu	1	-	(13.6)	-	(0.97)	-	(38.6)
Newlan Creek Res. (10/19/93)	280	1F,1S	14.7	YCt	2	16.5-18.3	(17.4)	0.77-1.98	(1.38)	17.1-32.3	(24.7)
				Rb	8	8.9-13.3	(12.2)	0.32-0.88	(0.69)	34.8-45.4	(37.0)
				LnSu	79	7.2-16.4	(12.1)	0.13-1.23	(0.64)	27.7-45.6	(34.8)
				Ling	2	17.4-17.5	(17.4)	1.15-1.29	(1.22)	21.5-24.5	(23.0)
Yellow Water Reservoir (11/2/93)	193	1F,1S	14.5	Rb-A-1993	69	10.1-13.9	(12.2)	0.60-1.67	(1.05)	46.8-66.9	(57.3)
				Rb-A-1992	12	15.0-17.9	(16.3)	1.39-3.45	(2.36)	32.7-60.2	(53.6)
				Rb-A-1991?	1	-	(23.1)	-	(6.00)	-	(48.7)

1-Standard experimental gill nets (nylon and monofilament); F=Floating; S=Sinking
2-Species abbreviations: Rb=Rainbow trout; LL=Brown trout; YCt=Yellowstone cutthroat trout; BT= Brook trout; KOK=Kokanee salmon; MW=Mountain Whitefish; NP=Northern pike; YP=Yellow perch; WSu=White sucker; LuSu=Longnose sucker
Strain abbreviations: A=Arlee; AXE=Arlee x Eagle Lake Hybrid; D=DeSmet; I=Eagle Lake

ACKLEY LAKE
PLANTING TEMP. VS 1ST YEAR SURVIVAL

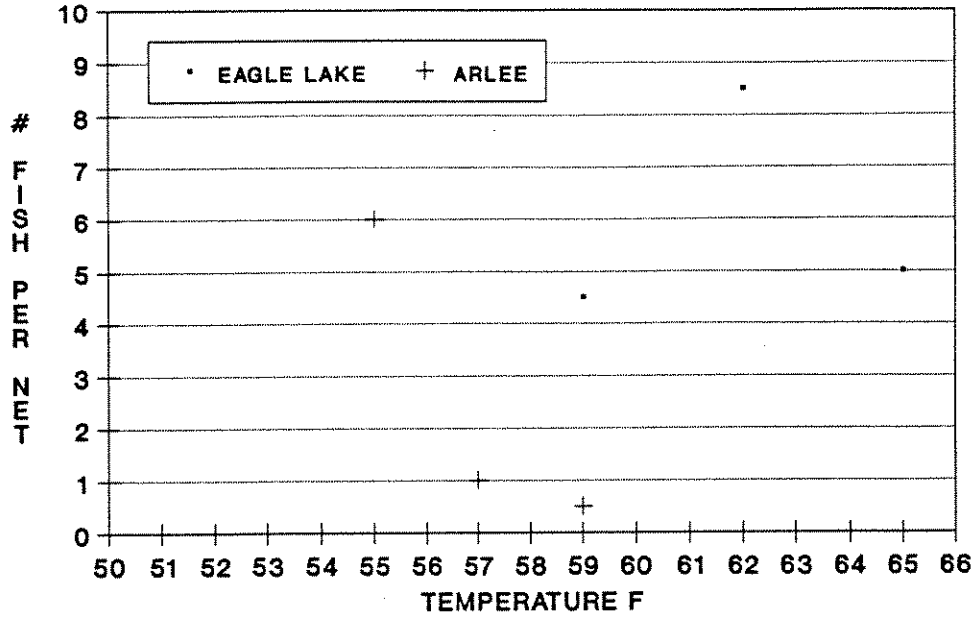

Figure 1. Fall gill netting catches of the current year's plant of Arlee and Eagle Lake rainbow trout versus water temperature at the time of stocking for the years 1991-1993 in Ackley Lake, Montana.

Other Waters-

Tiber Reservoir- Overnight sinking gill nets were fished in mid-July at depths ranging from 95 to 145 feet in attempts to sample lake trout. Net locations ranged from near the dam (145') to the Bootlegger Trail area (95'). Five lake trout were taken during the survey and all were captured at the dam location. These fish ranged from 22.3 - 28.8 inches and 3.94 - 9.20 pounds. Lake trout were also sampled in early November (Table 1) on suspected spawning areas in the Bootlegger Trail area. Thirteen lake trout were tagged and released. Four fish tagged previously, in 1991 and 1992, were also released. Harvest of lake trout by fishermen is unknown but is thought to be minimal.

Lake Levale- Lake Levale is a mountain lake in the Bob Marshall Wilderness. As reported by Hill and Liknes (1993), the cutthroat trout fishery gradually disappeared in recent years. An environmental assessment was prepared and approved to introduce arctic grayling into this lake. Approximately 1500 one-inch grayling were transported by pack animals and stocked into Lake Levale on July 27, 1993. Good numbers of small fish were observed in late August by forest service crews and outfitters.

Bair Reservoir - Gill netting results showed fair survival of the 1993 plant and good survival among the 1992 Eagle Lake rainbow trout plants (Table 3). As in 1992 fall netting, no rainbow trout were captured that represented third year survival. Water temperature at the time of planting in 1992 was 55° F (Table 2); this was considerably cooler than for other years' plants that showed lower survival. However, the 1991 plant showed even higher survival in last year's gill netting (Hill and Liknes 1993) than the 1992 plant did during this reporting period and water temperature was 64 F at planting. The numbers of white suckers captured has fluctuated between years but the average size has declined from a high of 10.6 in in 1991 (Hill and Liknes 1992) to 9.9 in in 1992 (Hill and Liknes 1993) to 9.6 in 1993. Low water levels in 1988 appear to have reduced sucker numbers dramatically; only 3 with a mean length 11.5 in were found in 1989 sampling (Hill et al. 1990). Sampling in 1990 showed increased sucker numbers and a decreased mean length (8.4 in) (Liknes et al. 1991). This suggested an increasing and young sucker population through 1990, a peaking of size in 1991 and possibly stunting in more recent years. Drawdowns that may occur in summer 1994 may affect both trout growth and survival as well as the sucker numbers. A total of 88 white suckers were captured. Most trout stomachs examined contained plankton; one contained a fish.

Big Casino Creek Reservoir - Up until 1993, survival of rainbow trout had been high in Big Casino Creek Reservoir. The catch of rainbow trout in 1993 was poor (Table 3); the number of white suckers sampled was also low when compared to previous years. No previous sampling had occurred as late as November; water temperature was 38° F. The low catch may be a result of conditions when the sampling occurred. We should resample Big Casino. If catches remain low, we should again take steps to reduce sucker numbers. Actions could include lowering the water level and applying a fish toxicant to the remaining pool. Trapping the inlet stream to control any sucker spawning run may be an action to consider even if future netting shows good or fair survival of trout. Two of the rainbow trout sampled had stomach contents that included sucker fry.

East Fork Spring Creek Reservoir - Sampling produced a poor catch of brown trout in East Fork Spring Creek Reservoir (Table 3). The catch also included the highest number (7) of northern pike sampled to date. The northern pike population is the result of an illegal introduction. White suckers were the only other fish sampled; the number of suckers captured in gill nets during 1992 and 1993 was lower than in previous years. This suggests predation by brown trout and northern pike may have a controlling influence on the sucker population. Two of the northern pike netted in 1993 had white suckers in their stomachs. Another contained fish remains while all others were empty.

Martinsdale Reservoir - The 1993 Arlee plant had a very high survival rate (Table 3). Yellowstone cutthroat had fair survival even though they were planted at a mean size of 7.0 in (Tables 2 and 3). Water temperatures would be considered favorable for the Yellowstone cutthroat plants since both were made into water between 50-60 F (Table 2). The mean size of the Yellowstone cutthroat trout was intermediate between the average lengths of the 1992 and 1993 Arlee plants. Substantial numbers of white suckers were also netted. Only one longnose sucker and one mountain whitefish were captured. Only one of the 10 Yellowstone cutthroat netted had fish remains in its stomach. However, none of the 50 rainbow trout stomachs examined contained fish. If Yellowstone cutthroat do not show a higher utilization of suckers or if they do not contribute adequately to the creel, we should consider halting the plant. Other rainbow strains could then be considered to replace the Yellowstone cutthroat.

Newlan Creek Reservoir - As in 1992, we averaged only one Yellowstone cutthroat trout in each net set (Table 3). The naturally reproducing rainbow trout catch was fair; this represents the third consecutive year that the wild rainbow made up a greater portion of the catch than Yellowstone cutthroat trout. The large plants of Yellowstone cutthroat have occurred in 1993 and 1992 in September when water temperatures were in the 50's F (Table 2). Modification of the planting size and/or time may increase survival. However, the low condition factors suggest additional mechanisms are operating that limit Yellowstone cutthroat growth and survival. In 1994, a plant of Eagle Lake rainbow trout was scheduled for Newlan Creek Reservoir. Comparing their growth and survival with the Yellowstone cutthroat will help us to determine what course management actions should take. Monitoring of rainbow reproduction, trap netting, and trapping Newlan Creek are also planned for future years.

Yellow Water Reservoir - Only rainbow trout were captured in nets set in Yellow Water Reservoir in November 1993. Extremely high survival was found for the 1993 plants (Table 3), which included both an early catchable plant and another 13,083 4 in fingerlings in June (Table 2). Survival from the 1992 plant was rated as fair. This suggests fairly good survival from the single plant of 1,018 catchables in 1992 (Table 2). Good water levels and continued low sucker numbers should allow Yellow Water Reservoir rainbow to have excellent growth rates. Other strains that may live longer could be experimentally substituted for a portion of the Arlee plant.

Miscellaneous Waters-
Water levels and access problems continue to prevent management of a fishery in Fitzpatrick Lake. Tomsheck Pond, in Toole County, was stocked with rainbow trout and added to the management program. Two private ponds, Minnehan Pond (Liberty County) and Lozing Pond (Glacier County), were surveyed and found to be too marginal for a fishery. Sock Lake in the Bob Marshall Wilderness was sampled in September and found to have good numbers and all sizes of Yellowstone cutthroat trout. Eight ponds in the eastern portion of the region were surveyed.

RECOMMENDATIONS

Where necessary, rainbow trout strain evaluations should continue. Both Arlee and AXE rainbow should continue to be stocked in Bean Lake. Efforts should be made to improving water levels in this important fishery. AXE and DeSmet rainbow stocking should continue in Eureka Reservoir. DeSmet spawning potential in the inlet to Eureka should be investigated. Eagle Lake rainbow should be planted again in Nilan Reservoir and evaluated. The five-year stocking of rainbow trout in Pishkun Reservoir should continue. Trout survival and growth will be evaluated along with predation by northern pike. Survivors exhibit excellent growth rates. AXE rainbow are the only strain planted in Willow Creek Reservoir and they provide better carry-over into the second and third years. Lake trout monitoring should continue in Tiber Reservoir and fishermen made aware of this underutilized fishery. Since the relationship between survival data and water temperatures at the time of planting in Ackley Reservoir were not consistent, no recommendations can be provided to increase survival. Ackley Reservoir should be maintained as a water where two strains of rainbow trout are planted. However, we could experiment with alternative strains. Survival of Eagle Lake rainbow trout in Bair Reservoir appears to be adequate to maintain a fishery. We recommend continuing with the Eagle Lake rainbow trout strain in Bair Reservoir. If overwinter survival is poor due to low water levels, the water should be replanted with catchables as soon as water storage increases sufficiently. Consideration should be given to any salmonid strain or species that will provide some sucker control. Big Casino Creek Reservoir should be resampled before any management changes are implemented. We should continue to monitor East Fork Spring Creek Reservoir to determine the degree of expansion of the northern pike population and the other illegally introduced species. Another year of DeSmet plants should be made in Smith River Reservoir. If after sampling in 1994, few wild trout are found and we continue to observe poor survival of stocked DeSmet rainbows, an alternative strain should be planted in Smith River Reservoir. We should continue to evaluate Yellowstone cutthroat for another year in Martinsdale Reservoir; Arlee rainbow plants should be continued. The Eagle

Lake rainbow plants in Newlan Creek Reservoir should be continued for another year. If survival of Yellowstone cutthroat trout does not increase in Newlan Creek Reservoir, adding or switching to a strain of rainbow trout should be considered. We recommend maintaining Arlee plants in Yellow Water Reservoir; however, other strains could be experimentally substituted for a portion of the plant.

ACKNOWLEDGEMENTS

The authors acknowledge the following individuals for assistance in this project. Kelly Smith, Troy Humphrey, and Paul Hamlin assisted in all aspects of data collection and analysis. Betty Hill, Jose Serrano-Piche and Jimmy Forrest assisted in gill netting surveys. Ray Mills of the U. S. Forest Service packed grayling to Lake Levale. Volunteers from the office at the Regional headquarters helped clip fins from various rainbow strains. Hatchery personnel are also acknowledged for having to coordinate various rainbow strains and the respective marking schemes.

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Date: September 1994

Principal Fish Species Involved: Rainbow trout, lake trout, brown trout, Yellowstone cutthroat trout, arctic grayling, kokanee salmon.

Code Numbers of Waters Referred to in Report:

14-7320	Eureka Reservoir
14-7370	Fitzpatrick Lake
14-9240	Tiber Reservoir
14-9282	Tomsheck Pond
16-4300	Ackley Lake
16-4628	Big Casino Creek Reservoir
16-4950	East Fork Spring Creek Reservoir
17-8720	Bean Lake
17-9136	Holter Reservoir
17-9330	Newlan Creek Reservoir
17-9616	Smith River Reservoir
18-7750	Bair Reservoir
18-8380	Martinsdale Reservoir
18-9500	Yellow Water Lake
20-7650	Lake Levale
20-7900	Nilan Reservoir
20-7950	Pishkun Reservoir
20-8150	Sock Lake
20-8500	Willow Creek Reservoir