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

STATE: Montana PROJECT NO. F-46-R-3
PROJECT TITLE: Statewide Fisheries Investigations JOB NO: IV-b
STUDY TITLE: Survey and Inventory of Warmwater Lakes
JOB TITLE: Northcentral Montana Warmwater Lakes Investigations

PERIOD COVERED: July 1, 1989 through June 30, 1990

ABSTRACT

Six major warm water lakes and reservoirs were investigated during the report period. Work was also performed on 14 smaller ponds/reservoirs throughout the region. The walleye fishery in Bynum Reservoir continues to develop with anglers harvesting 12 percent of those tagged. Tagging studies in Lake Frances reveal accumulative returns as high as 28 percent for walleye and northern pike while in Lake Elwell approximately 20 percent of the walleye and 15 percent of the northern pike have been harvested over a several year period. Forage surveys indicate that yellow perch are increasing in Bynum Reservoir, stable in Pishkun Reservoir, and decreasing in Lake Frances and Elwell. Stomach analysis shows that walleye and northern pike primarily utilized yellow perch in most waters with the exception of Lake Frances where walleye fed more heavily on amphipods. Documentation was made of yellow perch using artificial spawning structures in Lake Elwell. A creel census at Lake Frances from April through September estimated a harvest of 11,411 walleye, 4,391 northern pike and 8,298 yellow perch. Catch rates for walleye averaged 0.36 fish/hour. Walleye numbers appear low in Petrolia and Morony Reservoirs. Habitat structures were placed in Petrolia Reservoir. Good survival of rainbow trout was observed in Drag Creek Reservoir. Largemouth bass populations were found in Drag Creek, Dry Blood, Hollands, Hopalong, and S. Fork Dry Blood Reservoirs. Yellow perch were present in Jakes and Payola Reservoirs. Warden creel surveys of waters in the Lewistown area from 1987-89 found the highest use at Petrolia Reservoir.

OBJECTIVES AND DEGREE OF ATTAINMENT

1. To find a source of walleye eggs that can be used to satisfy management demand.

2. To improve spawning habitat to maintain natural sport fish and forage fish populations. **(State funded).**

3. To enhance over-winter survival in Split Rock Lake for yellow perch and northern pike. **(State funded).**

4. To provide 2,000 angler days use for yellow perch and 3 to 6 pound northern pike in Pishkun Reservoir.

5. To provide a walleye fishery in Bynum and Morony Reservoirs to provide 6,000 angler days for two pound fish.

6. To provide 25,000 angler days for 2-4 pound walleye and 4-8 pound northern pike in Tiber Reservoir and Lake Frances.

7. To maintain current population level of walleye in Holter and Hauser Reservoirs. **(State funded).**

8. To develop a largemouth or smallmouth bass fishery in Lake Helena to provide 1,000 angler days of use. **(State funded).**

9. To develop fishable populations of largemouth bass, crappie and yellow perch in 20 farm ponds to provide 5,000 angler days use.

10. To maintain forage fish species to sustain game fish populations.

11. To evaluate need for new introductions of forage fish. **(State funded).**

12. To involve sportsman groups and general fishing public in management and planning process. **(State funded).**

Progress was made on most federally funded objectives and data are included in this report. Data for some state funded objectives were included for Regional purposes.

PROCEDURES

Fish populations were sampled with 125 x 6 foot experimental gill nets with 25 foot sections of 0.75, 1.0, 1.25, 1.5, and 2.0 inch square mesh; 300 x 8 foot gill nets with 100 foot sections of 2.5, 3.0, and 3.5 inch square mesh; 3x4 foot frame trap nets (0.25 inch mesh) and 4 x 6 foot frame trap nets (1 inch mesh) and a 100 x 10 foot seine (1/4 inch mesh) and by electrofishing at night using an 18-foot aluminum jet-boat. Standard seine hauls in small ponds and reservoirs were made with a 25 x 5 foot seine. The boat was equipped with a portable generator, headlights and fixed booms with stainless steel droppers suspended in front of the bow. Captured fish were measured to the nearest tenth of an inch and weighed to the nearest hundredth of a pound. Stomach

and scale samples were collected from some fish for food habit and age and growth studies. Northern Pike were tagged with Floy T-Tags while walleye were tagged with Floy Cinch-Up Tags or marked with fin clips.

Fishing pressure estimates for Lake Frances were obtained by total angler counts made four times each census day from selected shoreline vantage points. During each count, all shore anglers and fishing boats observed were tallied. Only anglers who were actually fishing or preparing to fish were counted. Counts were made on half the weekdays and half the weekend days and holidays in each month from April 23 through September 1989. The time of the first count on each day was randomly selected hourly between sunrise and sunset using a random numbers table. Subsequent counts on each sample day were made at two hour intervals. Starting times were selected without replacement for two week periods. Counts were considered instantaneous since a count on each section typically required less than 45 minutes to complete (Neuhold and Lu 1957). Catch rates, catch composition, fishing techniques, and angler and trip characteristics were determined by direct angler interviews. Pressure and harvest estimates were derived using the MDFWP creel census program run on IBM compatible micro-computers. This program uses procedures and formulae from Neuhold and Lu (1957).

FINDINGS

WALLEYE EGG SOURCE

Lake Frances was sampled intensively with trap nets, gill nets and electrofishing gear to collect spawning walleye. Adequate numbers of mature males were captured but few ripe females were taken. Consequently, no eggs were taken.

BYNUM RESERVOIR

Trap nets were fished in Bynum Reservoir on April 18 and 19 and from April 20-23, 1989, to assess species composition and relative abundance. Over 5,400 white sucker were captured in 16 trap days along with 148 yellow perch, 2 mountain whitefish, 1 brook trout and 1 rainbow trout. In addition, 294 walleye averaging 15.7 inches long were taken. Of these, 126 were tagged and 129 were fin clipped. The remaining 39 fish were less than 14 inches. Water temperatures ranged from 43-50 F.

Bynum Reservoir had been closed to fishing since 1987 to allow the walleye population to mature. The reservoir opened with the general fishing season on May 20, 1989, but received little fishing pressure until August. Excessively high winds and low lake levels kept most fishermen away. Water levels improved throughout the summer and into the winter with maximum capacity

reached in March 1990. Approximately 12 percent of the tagged walleye were harvested (Table 1) with most of these caught during August and September. Increased numbers of fisherman were observed throughout the winter with fair success reported on yellow perch but few walleye were taken.

Forage fish surveys taken on August 16 indicate that yellow perch and spottail shiner continue to increase (Appendix 1). Forage fish populations should continue to increase in 1990 as rising water levels inundate additional spawning habitat.

The walleye fishery continues to develop and expand in Bynum Reservoir. Fry plants have been made annually since 1985 and in addition, fingerlings were stocked in 1989. Gill nets fished during September produced 11.8 walleye and 7.3 yellow perch per net set (Table 2). Analysis of walleye stomachs indicate yellow perch and unidentified fish were the predominant food items (Appendix II). A temperature profile taken on September 13 showed a range of 56 F at the surface to 54 F on the bottom (20 feet).

LAKE ELWELL (Tiber Reservoir)

Due to the amount of time spent trapping Lake Frances, no

Table 1. Angler harvest of walleye and northern pike, 1985-89.

Lake	Species	Year tagged	Number tagged	Number of returns (%) 1985	1986	1987	1988	1989	Cumulative
Bynum Res.	WE	1989	126	-	-	-	-	15(11.9)	15(11.9)
Lake Elwell	WE	1985	294	33(11.2)	14(4.8)	3(1.0)	9(3.1)	1(0.3)	60(20.4)
		1986	416	-	38(9.1)	19(4.6)	9(2.2)	1(0.2)	67(16.1)
		1987	444	-	-	50(11.3)	28(6.3)	4(0.9)	82(18.5)
		1988	299	-	-	-	45(15.1)	7(2.3)	52(17.4)
	NP	1985	194	17(18.8)	6(3.1)	2(1.0)	0(0.0)	0(0.0)	25(12.9)
		1986	279	-	34(12.2)	8(2.9)	0(0.0)	1(0.4)	43(15.4)
		1987	495	-	-	55(11.1)	7(1.4)	1(0.2)	63(12.7)
		1988	249	-	-	-	25(10.0)	1(0.4)	26(10.4)
Lake Frances	WE	1985	125	18(4.4)	6(4.8)	9(7.2)	1(0.8)	1(0.8)	35(28.0)
		1986	114	-	10(8.8)	8(7.0)	2(1.8)	5(4.4)	25(21.9)
		1988	21	-	-	-	4(19.0)	0(0.0)	4(19.0)
		1989	202	-	-	-	-	28(13.9)	28(13.9)
	NP	1985	137	29(21.1)	6(4.4)	2(1.4)	0(0.0)	1(0.7)	38(27.7)
		1986	212	-	36(17.0)	19(8.9)	3(1.4)	1(0.5)	59(27.8)
		1988	13	-	-	-	2(15.4)	1(7.7)	3(23.1)
		1989	430	-	-	-	-	87(20.3)	87(20.3)

Table 2. Overnight gill netting results in warmwater reservoirs in Region Four during 1989.

Water	Date	Surface acres	No. of[1] nets	Mean hrs fished/net	Species[2]	No. of fish	Length (in) Avg.(Range)	Weight (pounds) Avg. (Range)
Bynum Reservoir	9/13	1500	4S	20	WE	33	10.9(7.2-12.5)	0.40(0.12-0.59)
						2	15.6(15.4-15.7)	1.25(1.19-1.30)
						12	17.3(16.3-18.8)	1.84(1.42-2.50)
					YP	26	6.6(5.8-8.8)	0.13(0.08-0.30)
						3	9.3(9.0-9.6)	0.39(0.34-0.45)
					LL	1	25.5 -	6.00 -
					WSu	40	10.8(8.0-11.1)	0.50(0.20-0.58)
						93	12.7(12.2-13.1)	0.82(0.70-1.04)
						86	15.5(14.8-16.1)	1.77(1.64-1.92)
Lake Elwell	9/21-23	16,000	30S	19	WE	84	11.2(6.6-12.9)	0.50(0.10-0.97)
						93	14.3(13.0-15.8)	1.01(0.65-1.49)
						31	18.0(16.0-19.8)	2.05(1.47-2.76)
						2	20.4(20.1-20.7)	2.96(2.90-3.02)
					NP	23	11.3(9.3-15.9)	0.36(0.18-1.00)
						53	18.3(16.4-19.9)	1.47(0.96-2.96)
						16	21.8(20.3-24.0)	2.41(1.85-3.26)
						1	32.0 -	11.0 -
					YP	46	6.0(5.8-6.6)	0.10(0.06-0.12)
						5	10.5(9.6-10.8)	0.53(0.22-0.64)
						12	11.5(11.1-12.0)	0.78(0.69-0.90)
					Rb	8	14.0(13.4-15.0)	1.21(1.04-1.58)
						12	20.0(19.0-22.0)	2.77(1.95-3.32)
					LT	1	19.3 -	2.20 -
					MW	1	9.9 -	0.30 -
					FHC	1	7.1 -	0.13 -
					WSu	8	11.4(7.6-13.3)	0.90(0.18-1.40)
						36	16.9(15.0-19.5)	2.29(1.60-3.48)
					LnSu	7	17.6(13.3-20.2)	2.36(0.89-3.35)
					Carp	3	4.4(4.3-4.5)	0.06 -
						10	26.2(23.8-30.0)	9.73(6.75-14.00)
Lake Frances	9/12	5,000	4S	23	WE	20	11.1(7.3-12.7)	0.48(0.10-0.71)
						17	14.1(13.0-15.6)	0.94(0.60-1.20)
						6	18.3(16.1-19.6)	2.00(1.32-2.54)
					NP	4	18.9(18.6-19.3)	1.67(1.47-1.90)
						15	23.9(20.1-29.5)	3.52(2.09-6.85)
					YP	31	8.0(5.3-8.9)	0.31(0.08-0.37)
						10	9.8(9.3-10.0)	0.62(0.35-0.68)
						9	11.8(11.2-12.6)	0.89(0.81-1.02)
					WSu	3	16.4(15.8-16.8)	2.26(2.10-2.54)
Pishkun Reservoir	6/29	1,400	4S	23	KOK	1	10.8 -	0.50 -
					Rb	1	12.8 -	0.72 -
					NP	10	- (13.9-29.0)	- (0.84-7.00)
					YP	12	6.9(5.7-7.8)	0.15(0.08-0.20)
					WSu	11	15.0(9.6-18.9)	1.99(0.38-3.00)

1-Standard experimental gill nets (nylon and monofilament); F=Floating; S=Sinking
2-Species abbreviations: WE=Walleye; Rb=Rainbow trout; LL=Brown trout; LT=Lake trout; MW=Mountain whitefish; KOK=kokanee salmon; NP=Northern pike; YP=Yellow perch; WSu=White sucker; Lnu=Longnose sucker; FHC=Flathead chub

Table 2. (continued).

Water	Date	Surface acres	No. of[1] nets	Mean hrs fished/net	Species[2]	No. of fish	Length (in) Avg.(Range)	Weight (pounds) Avg. (Range)
Petrolia Reservoir	10/89	514	1S,1F	18.3	NP	4	14.7(11.2-16.3)	0.79(0.32-0.98)
					Carp	7	7.9(5.6-19.9)	0.67(0.11-3.87)
					WSu	1	13.4 -	1.14 -
			9 Seine		YP	43	3.5(2.6-4.4)	
					WE	3	5.0(4.8-5.2)	
					NP	2	11.2(9.8-12.6)	
					Carp	1	17.7 -	
Morony Reservoir	6/88	300	3S	18.0	WE	2	13.9(13.6-14.1)	0.96(0.91-1.00)
					WSu	329	-	
					LnSu	4	-	
					Carp	7	23.2(21.0-25.0)	
					YP	2	8.3(7.6-9.0)	0.31(0.20-0.41)
					LL	2	20.2(19.0-21.4)	
	11/89		2S	19.0	WE	7	14.0(12.2-15.8)	1.03(0.71-1.70)
					WSu	54	12.1(6.3-18.3)	0.84(0.09-2.25)
					LnSu	5	14.0(11.2-17.3)	1.00(0.51-1.51)
					LL	3	18.2(13.4-22.3)	2.35(0.82-3.96)
					Rb	2	15.8(15.5-16.2)	1.50(1.46-1.54)

1-Standard experimental gill nets (nylon and monofilament); F=Floating; S=Sinking
2-Species abbreviations: WE=Walleye; Rb=Rainbow trout; LL=Brown trout; LT=Lake trout; MW=Mountain whitefish; KOK=kokanee salmon; NP=Northern pike; YP=Yellow perch; WSu=White sucker; Lnu=Longnose sucker

sampling was conducted at Lake Elwell in the spring of 1989. Although fish were not tagged in 1989, fishermen returned 13 tags from walleye and 3 tags from northern pike marked in previous years. Based on voluntary angler tag returns, cumulative exploitation of walleye ranged from 16.1 to 20.4 percent for the years 1985-1989 while cumulative northern pike harvest ranged from 10.4 to 15.4 percent (Table 1).

Trapping and seining of spottail shiner was conducted in early June for transfer purposes. A total of 2,000 adult spottails were transferred to Pishkun Reservoir on June 8 and 1,200 sub-adults were transplanted on June 15.

A total of 66 seine hauls made during August collected 8 different forage fishes along with crayfish and young-of-the-year walleye, northern pike and burbot (Appendix I). Five regions in the reservoir were sampled, with eight to eighteen seine hauls made per region. Trends in forage fish numbers show decreases in yellow perch and emerald shiner but spottail shiner continue to increase (Figure 1). Other species are somewhat

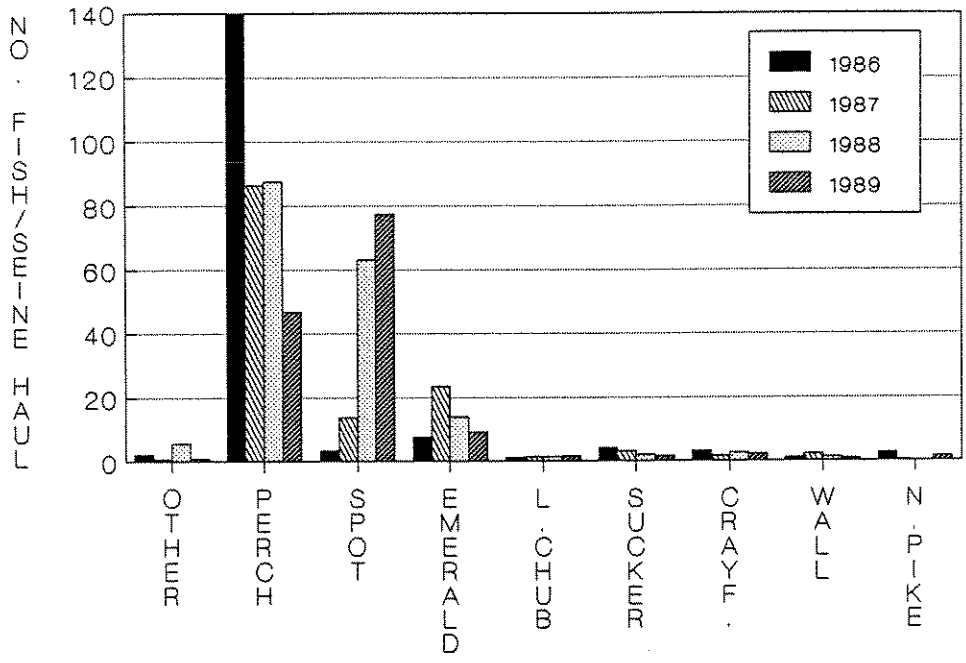

Figure 1. Forage fish trends in Lake Elwell from 1986-89 (Other = crappies, burbot, carp, sculpin, flathead chub, longnose dace).

stable. Seining was difficult due to the abundance of tumbleweeds that had blown in the water from adjacent fields.

Two experimental yellow perch spawning structures were placed in the Willow Creek Arm on April 22, 1989. Both had a 4x4x6 feet frame of 1.5 inch PVC pipe. One was covered with nylon netting and the other was filled with brush. Structures were checked on April 30 and May 3. Perch eggs were observed on both structures on the latter date with the most eggs on the brush structure.

A total of 30 experimental sinking gill nets were fished in Lake Elwell from September 21-23. Ten species were taken with walleye most abundant followed by northern pike and yellow perch (Table 2). Four areas were sampled and individual netting summaries are presented in Appendix III. Walleye and northern pike numbers are fairly stable when compared to the last four years (Figure 2). Yellow perch show a slight increase and sucker numbers remain very low. Both of these species are important forage for walleye and pike but because of their relatively low numbers they are providing a suboptimal food base.

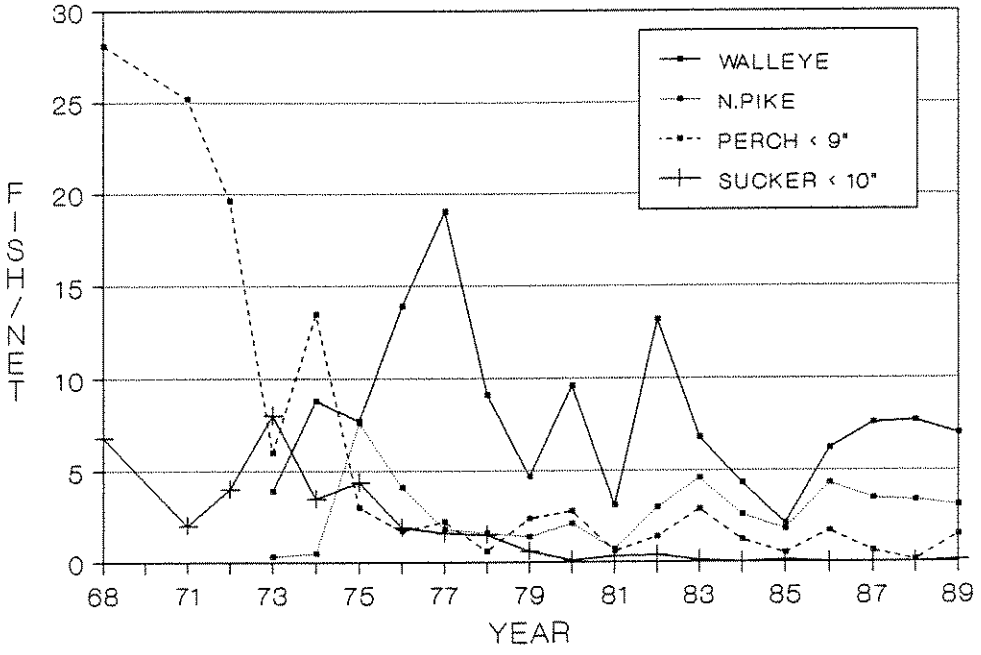

Figure 2. Number of fish per gill net, Lake Elwell, 1968-89.

Average length of walleye taken in gill nets was compared from 1973-1989. Average walleye length has fluctuated around 14 inches and has been very stable since 1979 (Figure 3). Steadily increasing average length of walleye through 1977 represents fish maturing from initial introductions. Growth of the initial plant was exceptional, which is typical of a new species introduction. After 1977 natural reproduction increased the walleye population but growth rates declined as a probable result of competition for a diminished food supply.

The majority of the walleye in Tiber Reservoir at present are less than 16 inches in total length. There has been a steady decline of fish larger than 16 inches from nearly 39 percent in 1986 to approximately 16 percent in 1989 (Table 3). Inadequate numbers of forage fish, mainly yellow perch, are thought to be the major cause of this decline. The potential influence of angler harvest will be evaluated by a special creel census scheduled to begin in spring 1991.

Stomachs from northern pike and walleye taken in gill nets were analyzed for food content. Both species preferred yellow perch and also had a high percentage of unidentifiable fish remains

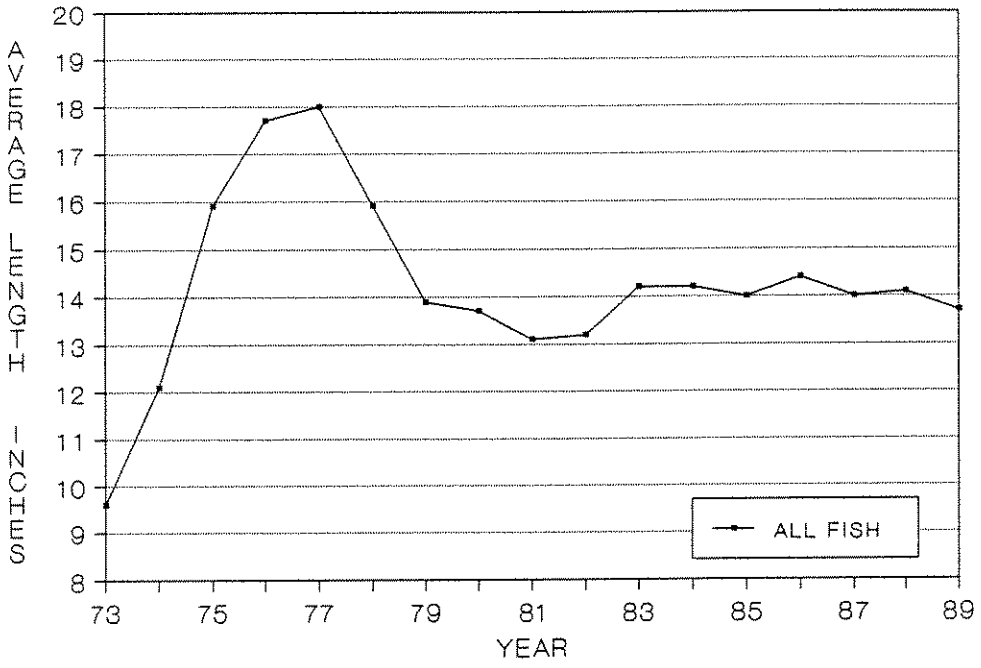

Figure 3. Average length of walleye taken in gill nets, 1973-89, Lake Elwell.

(Appendix II). Spottail shiner were positively identified in several northern pike stomachs.

Fluctuations in walleye condition factors are evident for the period of record from 1973-89 (Figure 4) and appear to be directly related to the availability of yellow perch as forage (Hill et al. 1989). A slight increase in condition factor was noted in 1989.

Table 3. Abundance of walleye in Tiber Reservoir, 1986-1989. (percent by size group)

Size group (inches)	Year			
	1986	1987	1988	1989
<12.9	34.7	43.8	34.9	40.0
13.0-15.9	26.3	24.8	46.7	44.3
16.0-19.9	35.9	28.8	14.8	14.8
>20.0	3.0	2.6	3.6	0.9

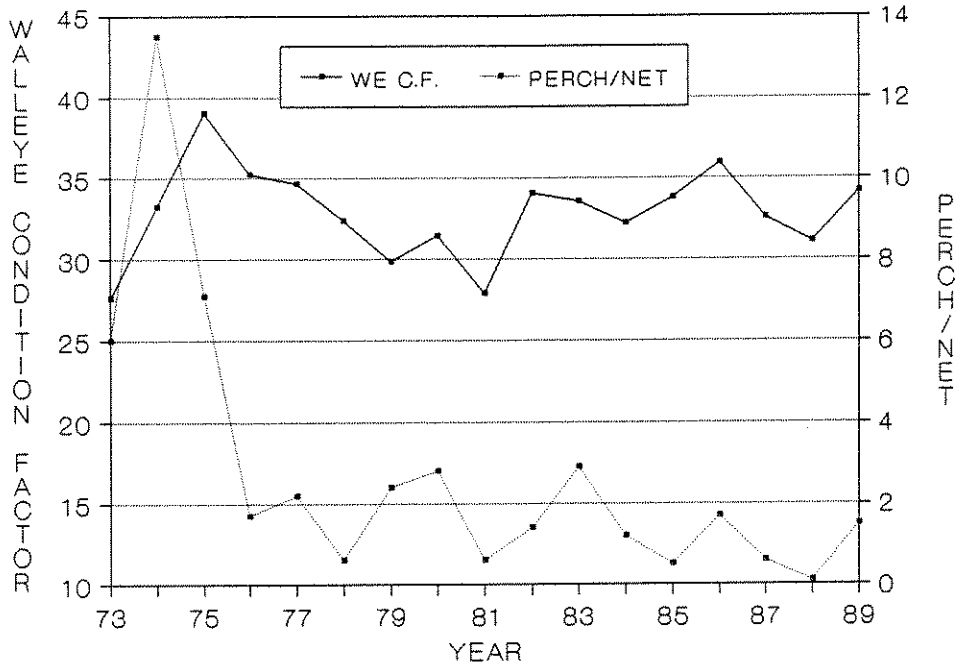

Figure 4. Condition factor of walleye, Lake Elwell, 1973-89.

Maximum water levels reached elevation 2989.4 feet M.S.L. on June 18, 1990. Negotiations are continuing through the Marias Management Committee to provide suitable reservoir levels for yellow perch spawning. Low water levels in early spring continue to be a problem that hinders perch reproduction. Reservoir levels are kept low for flood control purposes and refill (with subsequent flooding of shoreline debris and vegetation) occurs too late in the spring to provide additional perch spawning habitat. Temperature profiles taken during fall 1989 gill net surveys in the Willow Creek Arm and Dam areas ranged from 61 F on the surface to 59 F at 80 feet.

LAKE FRANCES

Intensive netting surveys were conducted at Lake Frances from April 20 to May 9, 1989 in an attempt to collect walleye eggs for the hatchery system and to tag walleye and northern pike for determining exploitation rates. Species composition and relative abundance was measured by trap nets, gill nets and electrofishing. Trap nets were most effective in catching northern pike while day-time gill net sets produced the most walleye. Night shocking and traps caught nearly equal numbers of walleye. Gill nets were fished approximately three hours and fish were cut free with scissors to reduce mortality. A total of 202 walleye and 432 northern pike were tagged and released using

the three types of gear.

Trap nets were fished a total of 60 trap days with water temperatures ranging from 44-52 F during this period. Traps caught a total of 44 walleye, 394 northern pike, 257 white sucker, 121 burbot and 30 yellow perch.

Harvest of walleye and northern pike through voluntary angler tag returns is presented in Table 1. Approximately 14 percent of the walleye and 20 percent of the northern pike tagged in 1989 were harvested. Accumulative returns for individual tagging years ranged between 14 and 28 percent for both species.

Forage fish were sampled in August 1989 with 24 seine hauls (Appendix I). Young-of-the-year yellow perch were considerably less abundant than in 1988 while spottail shiner numbers continue to increase.

Four gill nets fished in September 1989 caught four fish species (Table 2) with yellow perch most abundant followed by walleye and northern pike. The walleye population in Lake Frances has an abundance of fish under 16 inches, similar to Lake Elwell. Stomach analysis indicates that walleye prefer shrimp while northern pike consumed a variety of fish and invertebrate species (Appendix II).

CREEL CENSUS

Lake Frances is an off-stream irrigation storage reservoir that covers approximately 5,000 surface acres at full pool. Maximum lake levels were reached in 1989 and 1990 but low water was a problem in several previous years. Walleye fishing has become very popular throughout Central and Eastern Montana and Lake Frances is one of the most popular waters to fish. A creel census was initiated to determine angler characteristics and harvest of walleye, northern pike, and yellow perch. This report presents preliminary results for the period from late April through September, 1989. A full-year analysis will be published in 1991.

From April 23 through September 30, 1989 creel clerks made 319 counts of boat and shore anglers. They interviewed 934 parties of anglers, 45 percent of whom had completed their fishing trip. The average party size was 2.29 for boat anglers and 2.08 for shore anglers. Boat fisherman spent 5.2 hours fishing per completed trip each while shore anglers fished 3.5 hours. Seventy percent of the anglers were from the local area (within a 75 mile radius), 17.4 percent were from western Montana and 2.9 percent were non-resident.

A total of 11,688 angler days were expended with boat fisherman

accounting for slightly over 82 percent of the total. Anglers fished a total of 57,359 hours and harvested 11,411 walleye, 4,391 northern pike, and 8,298 yellow perch.

Fishermen caught an average of 0.36 walleye/hour (Table 4) followed by perch at 0.30 and pike at 0.11. Anglers kept 50 percent of all walleye, and 64 and 46 percent of all northerns and perch, respectively. Fisherman had a tendency to harvest a higher percentage of fish when fishing was slow. Walleye and perch were most readily caught during August and the first half of September while northerns were most vulnerable during September. The majority of the fish were caught from boats (walleye-88%; northerns-86%; perch-97%).

Anglers using two lines caught more but kept fewer fish than those using only one line (Table 5). Most anglers (59%) fished specifically for walleye. Only eight percent of anglers fished specifically for northern pike, 15% fished for walleye and northerns, and less than one percent fished specifically for perch. Sixteen percent of anglers fished for "any fish" or a combination of walleye, northern, and perch. Anglers specifically seeking walleye had higher catch rates for walleye than northern pike, and conversely, pike anglers caught more northerns than walleye (Table 5). Anglers using a combination of lures and bait caught more walleye and yellow perch whereas more northerns were caught using lures only. Boat anglers were more successful than shore anglers for walleye and perch. Anglers who fished at night caught walleye at the rate of 0.70 fish/hour, which was nearly double the daytime catch rate. However, only 4.7 percent of all parties interviewed fished at night. Only five of 934 parties interviewed indicated that they used setlines during their trip.

Fishing pressure was highest in July and August (Table 6). Anglers fished a total of 18,687 hours in July. Approximately 48 percent of all walleye and 51 percent of all perch harvested were taken in August. The July and August catch accounted for 32 and 30 percent of all northern pike harvested. Average size of fish harvested was 14.4 inches for walleye, 21.2 inches for northern pike, and 9.4 inches for yellow perch.

AGE AND GROWTH

Scale samples from northern pike and walleye were collected from Bynum Reservoir, Lake Elwell and Lake Frances (Table 7). Northern pike growth per respective age class was good in Lake Frances and Lake Elwell. Walleye growth is best in Bynum Reservoir and poorest in Lake Frances. Considerable overlap occurs in length and ages for walleye from these waters. Due to difficulty in analyzing scales, walleye older than five and northern pike older than four years old were grouped together.

Table 4. Lake Frances catch rates (fish/hour) by two-week periods and percent of fish kept (% in parenthesis).

Period	Walleye	N. Pike	Y. Perch
4/23-5/15	0.13 (70)	0.05 (32)	0.01 (67)
5/16-5/31	0.03 (100)	0.05 (77)	-
6/1-6/15	0.20 (63)	0.10 (55)	0.04 (97)
6/16-6/30	0.47 (44)	0.11 (63)	0.08 (61)
7/1-7/15	0.17 (63)	0.11 (63)	0.16 (68)
7/16-7/31	0.15 (65)	0.12 (68)	0.36 (45)
8/1-8/15	0.78 (44)	0.12 (66)	0.59 (42)
8/16-8/31	0.85 (43)	0.12 (67)	0.83 (42)
9/1-9/15	0.51 (63)	0.18 (65)	0.52 (48)
9/16-9/30	0.28 (67)	0.21 (64)	0.08 (35)
Overall:	0.36 (50)	0.11 (64)	0.30 (46)

Table 5. Catch rates according to various parameters, Lake Frances, April-Sept, 1989.

	Walleye		N.pike		Y.Perch		Number of
Category	catch rate	% fish kept	catch rate	% fish kept	catch rate	% fish kept	interviews
One Line/Angler	0.34	51	0.10	68	0.28	47	718
Two Lines/Anglers	0.40	38	0.15	56	0.50	49	126
Walleye Target Anglers	0.46	48	0.11	57	0.36	44	534
N. Pike Target Anglers	0.08	48	0.18	78	0.23	21	85
Lure Anglers	0.21	63	0.18	72	0.05	26	139
Bait Anglers	0.36	51	0.07	63	0.27	46	312
Lure & Bait Anglers	0.39	48	0.12	62	0.38	46	467
Boat Anglers	0.39	49	0.11	63	0.33	47	731
Shore Anglers	0.15	68	0.11	73	0.17	27	203
Night Anglers	0.70	32	0.11	67	0.03	33	44
Categories Combined	0.36	50	0.11	64	0.30	46	934

Table 6. Fishing pressure and angler success, Lake Frances.

	Month					
	April	May	June	July	Aug	Sept
Number of angler days	161	816	2,840	3,296	3,541	2,179
Hours fished	283	4,092	12,046	18,687	15,707	6,544
Fish Harvested - WE	-	261	2,041	1,870	5,433	1,806
NP	7	118	752	1,416	1,318	780
YP	-	14	514	2,729	4,249	792

Scale samples collected during the Lake Frances creel census will be analyzed and incorporated into the final creel report.

PISHKUN RESERVOIR

Trap nets were set in Pishkun Reservoir from April 22 through April 26, 1990. A scheduled population estimate of northern pike was cancelled due to individuals tampering with the traps and stealing fish. While traps fished, a total of 384 northern pike were captured along with 32 yellow perch, 32 white sucker and 2 rainbow trout. Water temperatures varied from 46-52 F and reservoir levels remained stable.

Gill nets fished in late June caught few northern pike and yellow perch because nets were set deep for kokanee salmon (Table 2). Northern pike stomachs analyzed throughout the summer indicate a preference for yellow perch (Appendix II).

Approximately 3,200 adult and sub-adult spottail shiner were transferred from Lake Elwell to Pishkun Reservoir during June. Only one young-of-the-year spottail was 18 seine hauls during forage fish surveys in August, 1989 most abundant forage species was white sucker followed by yellow perch (Appendix I).

PETROLIA RESERVOIR

Water levels were substantially higher in 1989 than in 1988 during sampling but the catch from two gill net sets were lower than in 1988 (Table 2). Although a comparison of the 1988 and 1989 gill netting data suggests a decrease in fish populations, the concentrating of fish due to low water levels was partially responsible for the higher catch in 1988. No walleye or yellow

Table 7. Age determinations of northern pike and walleye from several waters, 1989.

Water	Species	Number of fish	Age class	Range in length(in)	Time of year
Bynum Res.	WE	3	I+	7.2-8.5	Sept.
		17	II+	10.0-12.1	
		7	III+	11.3-17.1	
		8	IV+	15.4-18.4	
Lake Elwell	WE	1	O+	6.6	Sept.
		18	I+	8.4-11.2	
		36	II+	9.7-14.2	
		15	III+	13.7-15.8	
		10	IV+	15.5-17.0	
		23	V & older	17.3-20.7	
Lake Frances	WE	1	II	7.7	April
		10	III	10.4-11.8	
		48	IV	11.9-14.6	
		121	V & older	14.5-24.6	
	WE	2	II	9.9-10.1	Sept.
		11	III	12.3-14.1	
		7	IV	13.9-16.1	
		3	V & older	18.0-19.7	
Lake Elwell	NP	5	O+	9.5-12.5	Sept.
		2	I+	18.1-19.3	
		3	II+	18.0-20.9	
		1	III+	20.7	
Lake Frances	NP	1	I	12.1	April
		74	II	14.0-20.8	
		50	III	18.4-26.8	
		35	IV & older	23.8-37.0	

perch were captured in the gill nets in 1989 and the four northern pike sampled averaged 14.7 inches in length, which was 6.3 inches less than in 1988. Carp and white sucker catches were also less than observed in 1988.

Nine hauls using a 6 ft x 75 ft seine with 0.25 inch mesh were made to assess forage fish abundance (Table 2). An average of 4.8 yellow perch were caught per seine haul. Also, three walleye and two northern pike were captured. The walleye, which ranged in length from 4.8-5.2 inches, were from the 1988 plant of 100,000 fry.

Since water levels in Petrolia Reservoir had reached such a low level in 1988, concern developed over the forage fish population. A transplant of 250 yellow perch was made from Jakes Reservoir to ensure that spawning occurred in spring 1990.

The Lewistown Rod and Gun Club, the Billings Bass Busters, and the MDFWP placed 44 structures made from 7-9 christmas trees each in three areas of Petrolia Reservoir in May 1990. We hope to continue this project on an annual basis to increase cover and improve perch spawning habitat.

MORONY RESERVOIR

Morony Reservoir was gill netted in June 1988 and October 1989. The walleye catch was poor during both surveys and the average length remained about 14.0 inches (Table 2). However, the walleye catch was better than expected considering the short retention time of the reservoir and the limited stocking density. The average size of brown trout sampled remained high in both years.

Plants of 10,000 smallmouth bass and walleye fingerlings are scheduled for Morony Reservoir in 1990. Hopefully the fingerling plants will minimize the flushing of walleye downstream. Since smallmouth bass may be better adapted to conditions in Morony Reservoir, we will closely monitor survival of this plant.

SMALL PONDS AND RESERVOIRS

CHOTEAU AREA

Forage surveys were conducted at Eyraud Lakes in August. Young-of-the-year and yearling yellow perch averaged 325 fish/seine haul in the middle lake and 153 fish/seine haul in the upper lake. Crayfish and young-of-the-year northern pike were most abundant in the upper lake with 33 and 6 individuals per seine haul, respectively. Crappie averaged one fish/seine haul in the main lake. No largemouth bass were taken in any of the lakes. One spottail shiner was collected in the middle lake, apparently a downstream migrant from Bynum Reservoir.

Seining was also conducted in Little Pishkun Pond to assess survival of largemouth bass stocked in 1988. None were taken in nine hauls.

Crappie, yellow perch and white sucker were collected from Priest Butte Lake to measure selenium levels. The crappie ranged in length from 8.6-9.4 inches and represent fish stocked in 1984. Results of the selenium tests were not available for this report.

GREAT FALLS AREA

Woodland Estates Pond, which was recently surveyed, had a maximum depth of 13.5 feet and is scheduled for rainbow trout plants. If the potential for overwinter survival is high, we will attempt to establish a fishery using yellow perch, bass, or bluegill. Bluegill were transplanted to Schoonover #1 and Silvan Reservoirs during April 1990.

LEWISTOWN AREA

Ten warmwater ponds east of Lewistown were surveyed in July 1989 to determine progress in the establishment or maintenance of largemouth bass and yellow perch fisheries (Table 8). No fish were captured in Catfish, Sage Brush Study, and Upper Wolf Coulee (Dry Wolf) Reservoirs. Both Sage Brush Study and Upper Wolf Coulee Reservoirs may be prone to winterkill since maximum depths were 8.5 feet.

Catfish Reservoir has been planted with largemouth bass six times from 1974-1989 but these plants have not succeeded in maintaining a bass population. The most recent bass plants were in 1982 (2,000 fingerlings) and 1989 (3,600 fingerlings 1.2 inches in length). Also, no sign of the 135 black crappie transplanted from Siroky's Pond in 1988 or the previously healthy yellow perch population was observed.

Good survival of rainbow trout was observed in Drag Creek Reservoir from the 1988 plants. The large variation in size was a result of two different plants made in July 1988; 500 catchable Eagle Lake (mean length at stocking = 10.1 inches) and 1,000 Arlee (mean length when planted = 4.7 inches) rainbow trout. The three largemouth bass captured in the gill net averaged 8.1 inches in length. Growth was exceptional if these fish were from the 1988 plant of 20,000 largemouth bass fry. These bass may also have been a result of natural reproduction since largemouth bass were stocked in 1978. In addition, fisheries personnel transplanted 10 largemouth from Siroky's Pond on 26 May 1988; however, all these fish were longer than those caught in the gill nets (mean length = 9.9 inches, range = 9.5-11.3 inches). Stocking of both Arlee rainbow trout and largemouth bass was continued in 1989.

The only fish captured in a gill net and two seine hauls in Hollands Reservoir was a brook stickleback. This was unexpected since excellent survival of largemouth bass was observed in 1988 (Hill et al. 1988), and the water level in both years appeared sufficient to allow fish to overwinter. Hollands Reservoir was stocked with largemouth bass in 1986 and 1989.

Table 8. Results from overnight gill netting and seine hauls in warm/cool water ponds and reservoirs in the Lewistown area during July 1989.

Water	Surface acres	Type of[1] nets	Mean hrs fished/net	Species[2]	No. of fish	Length (in) Avg.	Length (in) Range	Weight(pounds) Avg.	Weight(pounds) Range	Maximum Depth (ft)	Secchi disk (ft)
Catfish Reservoir	5.9	1S	17.5	-	0	-	-	-	-	17.0	13.1
		1TN	17.25	-	0	-	-	-	-		
		2 Seine	-	-	0	-	-	-	-		
Drag Crk Reservoir	12.8	1S	19.5	Rb	30	11.7	7.9-16.6	0.82	0.22-1.89	14.0	11.0
				LMB	3	8.1	7.7-8.4	0.34	0.30-0.37		
		2 Seine	-	LMB	9	-	1.8-2.5	-	-		
Dry Blood Reservoir	5.0	1S	18.5	LMB	6	10.2	8.6-11.1	0.63	0.37-0.82	15.5	2.5
		2 Seine	-	LMB	1	11.0	-	-	-		
Hollands Reservoir	5.0	1S	17.8	-	0	-	-	-	-	16.0	8.5
		2 Seine	-	BS	1	-	-	-	-		
Hopalong Reservoir	-	1S	14.75	LMB	6	11.4	10.1-12.3	0.94	0.62-1.20	12.0	7.5
				YP	1	13.4	-	1.36	-		
				LnSu	1	11.9	-	0.74	-		
		2 Seine	-	LMB	22	-	1.2-2.0	-	-		
Jakes Reservoir	-	1S	20.0	YP	44	6.4	5.1-13.4	0.11	0.03-1.15	17.0	0.4
		2 Seine	-	YP	11	5.0	4.3-6.9	-	-		
Payola Reservoir	5.9	1S	20.0	YP	15	7.8	5.9-11.3	0.26	0.10-0.65	14.0	1.2
		2 Seine	-	YP	7	2.7	1.1-4.6	-	-		
Sage Brush Study Res.	1.0	1S	20.0	-	0	-	-	-	-	8.5	0.8
S. Fork Dry Blood Reservoir	4.0	1S	19.0	LMB	1	6.5	-	-	-	13.0	7.0
		3 Seine	-	-	0	-	-	-	-		
Upper Wolf Coulee (Dry Wolf) Res.	2.5	1S	16.0	-	0	-	-	-	-	8.5	7.0

1-Standard experimental gill nets (nylon and monofilament); S=Sinking: TN=Trap net
2-Species abbreviations: Rb=Rainbow trout; LMB=Largemouth bass; YP=Yellow perch; LuSu=Longnose sucker; BS=brook stickleback

Hopalong Reservoir, which was planted in 1986 with 3,350 2.0 inch largemouth bass, appears to be developing a self-sustaining bass fishery. The largemouth bass captured in the gill net were the largest from any water in the Lewistown area. All the largemouth captured in the seine appear to be from natural reproduction. The single yellow perch was large with a length and weight of 13.4 inches and 1.36 pounds, respectively. The only sucker sampled in the Lewistown area warm water ponds was captured in Hopalong Reservoir.

Yellow perch was the only species sampled in both Jakes and Payola Reservoir. The numbers and size of yellow perch in both reservoirs should provide a fishable population. A northern pike had previously been netted in Jakes and both largemouth bass and black bullheads have been found in Payola Reservoir in the past. Water levels were favorable for fish survival in both reservoirs.

Jakes Reservoir contains turbid water that is apparently due to a colloidal suspension of clay particles.

Netting surveys yielded seven largemouth bass from Dry Blood and one largemouth bass from the South Fork Dry Blood Reservoir. The number of bass sampled in Dry Blood was substantially less than in 1988 but the average length was 2.1 inches larger (Hill et al. 1988). Planting records show only largemouth bass have been planted in these reservoirs.

Warden Creel Survey - Lewistown Area Waters

Eight cool/warm water ponds and reservoirs were checked by Lewistown area wardens from May - September from 1987-89 (Table 9). Anglers were present only at Drag and Petrolia Reservoirs, and Vanek Pond; fish had been caught only at Drag and Petrolia Reservoirs. The highest use in all years was found at Petrolia Reservoir.

Anglers checked by wardens had harvested no largemouth bass at Drag Creek Reservoir but the harvest rate for rainbow trout was 0.38 fish/hour. In Petrolia Reservoir, harvest rates decreased from 0.34 fish/hour in 1987 to 0.02 fish/hour in 1989 (Table 9). The highest catch rate for an individual species in Petrolia was observed in 1987 for northern pike.

During the winter months (October-April), warden creel surveys indicated the highest use at Petrolia Reservoir (Table 10). In contrast to the summer months, total harvest rates on Petrolia Reservoir increased from 1987-89. The highest harvest rate for any fish was found at Jakes Reservoir for yellow perch. As in the summer months, no largemouth bass and only rainbow trout were reported caught in Drag Creek Reservoir.

Table 9. Results of warden creel surveys on cool/warm water ponds and reservoirs in the Lewistown area from May-September in 1987, 1988, and 1989.

Water	Year	Number of visits	Number of anglers checked	Total hours fished	Number of fish caught	Harvest rate Species	Fish/hr
Drag Crk Reservoir	1987	1	0	-	0	-	-
	1988	3	0	-	0	-	-
	1989	2	3	24	9	Rb	0.38
Dry Blood Reservoir	1987	2	0	-	0	-	-
	1989	1	0	-	0	-	-
Hollands Reservoir	1987	1	0	-	0	-	-
	1988	1	0	-	0	-	-
Payola Reservoir	1987	2	0	-	0	-	-
Petrolia Reservoir	1987	12	49	145	43	NP	0.30
					1	WE	0.01
					5	YP	0.03
					49	TOTAL	0.34
	1988	11	33	257	24	WE	0.09
					10	NP	0.04
					34	TOTAL	0.13
	1989	2	22	66	4	WE	0.02
S. Fork Dry Blood Reservoir	1987	3	0	-	0	-	-
	1988	2	0	-	0	-	-
	1989	1	0	-	0	-	-
Vanek Pond	1987	2	6	4.5	0	-	-
Wolf Coulee (Dry Wolf) Reservoir	1988	3	0	-	0	-	-

DISCUSSIONS AND RECOMMENDATIONS

Insufficient numbers of gravid female walleye collected at Lake Frances precluded taking eggs. Walleye egg collection efforts were redirected to Lake Elwell in spring 1990.

Development of the walleye fishery in Bynum Reservoir continues to progress. The lake reopened to fishing in May 1989 after being closed for two years. Water levels improved throughout the summer and into the winter with maximum pool levels being

Table 10. Results of warden creel surveys on cool/ warmwater ponds and reservoirs in the Lewistown area from October-April in 1987, 1988, and 1989.

Water	Year	Number of visits	Number of anglers checked	Total hours fished	Number of fish caught	Harvest rate Species	Fish/hr
Catfish Reservoir	1987	1	0	-	0	-	-
Crooked Creek Res	1987	1	0	-	0	-	-
Drag Crk Reservoir	1987	2	0	-	0	-	-
	1988	5	2	4	1	Rb	0.25
Dry Blood Reservoir	1987	1	0	-	0	-	-
Hollands Reservoir	1987	1	0	-	0	-	-
Jakes Reservoir	1987	1	0	-	0	-	-
	1988	2	3	12	50	YP	4.17
Petrolia Reservoir	1987	5	8	21	1	WE	0.05
	1988	10	53	140	22	NP	0.16
	1989	10	46	161	22	WE	0.14
					13	NP	0.08
					35	TOTAL	0.22
Upper & Lower Wolf Coulee Reservoirs	1987	1	0	-	0	-	-

attained prior to ice-out. Fishing pressure was light but is expected to increase as walleye approach acceptable sizes of 1.5-2 pounds. Forage fish numbers should increase with the improved lake levels. We recommend continued stocking of walleye fingerlings until strong year classes develop and adequate natural reproduction occurs.

Adequate numbers of walleye and northern pike are present in Lake Elwell but average size is less than desired and is thought to be related to limited forage availability. Based on seining surveys, spottail shiner are the most abundant forage fish in Lake Elwell and their numbers continue to increase. However, yellow perch numbers continue to decrease and perch seem to be the preferred forage species for walleye. To improve perch spawning habitat, experimental structures were placed in the reservoir with the assistance of two area sportsmen's groups.

Utilization by perch suggests that more effort should be put into installation of artificial structures. Negotiations with the Bureau of Reclamation through the Marias Management Committee to manipulate water levels should continue. The introduction of an additional forage fish species should also be investigated.

A year-long creel census was initiated at Lake Frances with preliminary results appearing in this report. A complete summary will be published in a separate document. Available forage is similar to Lake Elwell, with perch numbers decreasing and spottail shiner increasing. The need for artificial spawning structures should be investigated.

A population estimate of northern pike in Pishkun Reservoir was attempted but cancelled due to unauthorized tampering with nets. An estimate will again be attempted in 1990. Introduction of spottail shiner in Pishkun Reservoir had limited success. Additional stockings of this species should be made to increase forage available for northern pike.

Efforts to develop fisheries for black crappie and largemouth bass should continue. Survival of earlier introductions into Eyraud Lakes and Little Pishkun Pond should be determined by electrofishing.

Wadsworth Pond, located on City of Great Falls property near the Sun River in Cascade County, was sampled in 1988 but is closed to fishing since trespass is prohibited. Local anglers and Cascade County officials have expressed interest in developing the site for recreational purposes. If the site is opened to the public, we will attempt to establish a warm water fishery.

We plan to add Shaw, Silvan, and Schoonover #1 Reservoirs to the planting program for largemouth bass until self-sustaining populations are developed. Englandt Reservoir, formerly managed as a coldwater trout fishery, will be planted with male northern pike in an attempt to control a black bullhead population. Other cool/warm water species may be considered for introductions in the future.

In the Lewistown area, we hope to continue largemouth bass plants in Dry Blood and South Fork Dry Blood Reservoirs and reinstate Payola Reservoir to the planting program. Hopalong Reservoir has received above average fishing pressure (Jack Boyce, personal communication) and apparently has had successful natural reproduction. Future plants of largemouth bass in Hopalong will be scheduled when and if needed to maintain the fishery.

Efforts to develop a fishery in Sage Brush Study Reservoir will not be made because of the shallow maximum water depth. Upper Wolf Coulee, also known as Dry Wolf Reservoir, should be planted with largemouth for one to two more years to determine if

overwintering will be possible. Catfish and Hollands Reservoirs should receive plants of yellow perch or largemouth bass and Missouri Breaks Pond (a.k.a. Crossing Dam or Crossover Reservoir) should receive transplanted yellow perch from Jakes Reservoir. If the plants are not successful, limited plants of rainbow trout early in the spring should be reinstated. We should continue to monitor the yellow perch population in Jakes Reservoir and introduce non-reproducing predators if stunting develops. Each largemouth bass pond should be planted on an alternate year basis providing water levels are sufficient while natural reproduction is evaluated in each of the ponds. Also, experimental escape structures for juvenile bass should be placed in reservoirs that may lack cover for vulnerable life stages at certain times of the year.

We will continue to monitor gamefish and forage fish abundance in Petrolia Reservoir each fall. Additional habitat structures to provide cover and spawning substrate will be placed in the reservoir if continued assistance from local anglers can be secured. Walleye plants have been scheduled on an alternate year basis but low water levels or a reduced forage base may force cancelation of the stocking in some years. No additional plants of northern pike are anticipated because of adverse effects on the walleye food supply and the high potential for natural reproduction.

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DATE: August, 1990

PRINCIPAL FISH SPECIES INVOLVED:

Walleye, northern pike, largemouth bass, black crappie, yellow perch, spottail shiner

CODE NUMBERS OF WATERS REFERRED TO IN REPORT:

14-7080 Bynum Reservoir
14-6840 Eyraud Lake
14-7440 Lake Frances
14-8540 Priest Butte Lake
14-9240 Lake Elwell (Tiber Reservoir)
16-5070 Englandt Reservoir
16-7050 Missouri Breaks Pond
16-8275 Silvan Reservoir
16-868? Vanek Pond
17-8773 Shaw Reservoir
17-9056 Hauser Reservoir
17-9072 Lake Helena
17-9136 Holter Reservoir
17-9296 Morony Reservoir
17-9509 Schoonover Reservoir #1
17-9870 Woodland Estates Pond
18-7395 Catfish Reservoir
18-7560 Drag Creek Reservoir
18-7565 Dry Blood Reservoir
18-7840 Hollands Reservoir
18-7920 Hopalong Reservoir
18-8700 Payola Reservoir
18-8720 Petrolia Reservoir
18-8985 Upper Wolf Coulee (Dry Wolf) Reservoir
18-9150 South Fork Dry Blood Reservoir
18-? Crooked Creek Reservoir
18-? Jakes Reservoir
18-? Sagebrush Study Reservoir
18-? Siroky's Pond
20-7730 Little Pishkun Pond
20-7950 Pishkun Reservoir
20-8470 Wadsworth Pond

Appendix I. Forage fish / reproduction surveys, 1989 (100x10 feet x 0.25 inch seine).

Water	Date	Water temp(F)	No. of pulls	Number of fish / pull[1]												
				WE	NP	YP	Cr	SPS	EMS	WSu	Carp	Ling	Crayfish	LCH	Sculpin	FHC	LND
Bynum Reservoir	8/16/89	68	23	Tr.	N/A	35.0	N/A	73.8	N/A	1.0	N/A	N/A	Tr.	N/A	-	N/A	N/A
Lake Elwell																	
Devon	8/21/89	70	12	2.2	-	16.3	-	87.6	9.6	-	2.2	0.1	0.8	2.8	0.5	-	-
N. BT	8/21/89	70	8	0.5	3.4	32.3	-	162.5	8.4	3.5	1.4	-	4.0	0.4	0.1	-	-
S. BT	8/22/89	69	16	1.1	2.1	39.3	-	96.2	6.1	0.9	-	-	1.4	3.8	0.1	-	0.1
WCA	8/23/89	67	18	-	1.8	92.7	0.1	47.0	16.4	2.2	1.6	-	3.5	0.7	-	-	-
Dam	8/24/89	66	12	0.3	0.1	15.8	-	12.3	0.2	1.8	-	-	0.8	-	-	-	-
All areas combined		-	66	0.8	1.4	44.5	Tr.	74.0	8.8	1.5	1.0	Tr.	2.1	1.7	0.1	-	-
Lake Francis	8/17/89	68	24	0.1	0.2	11.5	N/A	56.6	N/A	2.7	N/A	0.1	Tr.	N/A	Tr.	N/A	N/A
Pishkun Reservoir	8/15/89	69	18	N/A	0.8	89.0	N/A	Tr.	N/A	97.2	N/A	N/A	3.9	N/A	-	N/A	N/A

1-Species abbreviations: WE=walleye; NP=northern pike; YP=yellow perch; Cr=crappie; SPS-spottail shiner; EMS=emerald shiner; WSu=white sucker; Ling=burbot; LCH=lake chub; FHC=flathead chub; LND=longnose dace.

Appendix II. Food preference of northern pike and walleye, 1989 (stomach analysis).

Water	Species[1]	Number of stomachs	Number empty	Number of stomachs with food item											
				YP	SS	Fish remains	Carp	Shrimp	Crayfish	Insects	Leeches	Vegetation	WE	NP	Ling
Lake Elwell	NP	45	15	9	3	16	1	-	5	-	-	1	2	-	-
Lake Francis	NP	13	7	2	-	1	N/A	-	2	-	1	-	-	1	1
Pishkun Reservoir	NP	22	7	9	-	7	N/A	-	-	-	2	-	N/A	-	N/A
Lake Elwell	WE	73	22	17	-	33	-	-	2	-	-	14	-	-	-
Lake Francis	WE	20	6	-	-	3	N/A	13	-	1	-	-	-	-	-
Bynum Reservoir	WE	19	7	4	-	8	N/A	-	-	-	-	4	-	N/A	N/A

1-Species abbreviations: NP=northern pike; WE=walleye.

Appendix III. Gill net summaries by area in Lake Elwell, Montana in 1989.

Area (date)	No. of nets	Species	No. of fish	Length range	Length mean	Weight range	Weight mean
Devon	5	WE	4	9.8-12.3	11.3	0.31-0.61	0.51
(9/21/89)			2	14.3-14.8	14.6	1.03-1.08	1.06
			2	17.0-18.3	17.7	1.64-2.13	1.89
		NP	6	18.3-23.4	22.1	1.20-3.20	2.58
		YP	3	-	6.2	-	0.11
			3	10.5-10.8	10.7	0.62-0.64	0.63
			7	11.1-12.0	11.6	0.70-0.90	0.79
		MW	1	-	9.9	-	0.30
		FHC	3	-	7.1	-	0.13
		LnSu	2	13.3-16.4	14.9	0.89-1.85	1.37
		WSu	7	13.3-17.4	16.4	1.10-2.34	2.15
		Carp	5	23.8-30.0	26.3	6.75-14.0	9.85
Bootlegger	9	WE	27	8.4-12.8	11.1	0.16-0.73	0.45
(9/20-21/89)			17	13.0-15.7	14.2	0.65-1.38	0.92
			6	17.0-19.3	17.8	1.49-2.49	2.00
			1	-	20.1	-	3.02
		NP	2	10.0-11.8	10.9	0.20-0.36	0.28
			3	18.4-19.1	18.7	1.40-1.57	1.47
			3	20.9-24.0	22.5	1.85-3.26	2.61
		YP	3	-	5.8	0.06-0.10	0.09
			2	10.7-11.7	11.2	0.54-0.86	0.70
		Rb	7	13.4-15.0	14.0	1.04-1.58	1.22
			5	19.0-20.5	19.7	1.95-3.08	2.60
		WSu	2	7.6-8.3	8.0	0.18-0.26	0.22
			7	12.2-16.7	13.8	1.04-2.13	1.55
Dam	6	WE	15	9.1-12.7	11.7	0.27-0.97	0.58
(9/20/89)			30	13.0-15.8	14.4	0.72-1.49	1.05
			2	16.2-18.8	17.5	1.62-2.33	1.98
			1	-	20.7	-	2.90
		NP	10	9.3-12.5	10.9	0.18-0.45	0.30
			13	18.0-20.9	19.6	1.30-2.96	1.86
			1	-	32.0	-	11.0
		YP	6	-	6.6	-	0.11
			1	-	11.3	-	0.84
		LT	2	19.3-31.0	25.2	2.20-6.00	4.10
		Rb	2	14.1-19.7	16.9	1.15-2.75	1.95
		LnSu	1	-	18.4	-	2.51
		WSu	7	16.5-17.8	16.7	1.96-3.15	2.13
		Carp	5	25.5-26.5	26.1	7.50-11.0	9.60

Appendix III. (continued).

Area (date)	No. of nets	Species	No. of fish	Length range	Length mean	Weight range	Weight mean
Willow Creek Arm (WCA) (9/19/89)	10	WE	38	6.6-12.9	11.2	0.10-0.82	0.44
			44	13.1-15.8	14.3	0.74-1.45	1.02
			21	16.0-19.8	18.1	1.47-2.76	2.09
		NP	11	9.8-15.9	11.8	0.21-1.00	0.42
			44	16.4-21.9	18.4	0.96-2.30	1.46
		YP	34	5.0-6.0	5.8	0.07-0.12	0.09
			4	9.6-11.5	10.8	0.22-0.77	0.59
		Rb	6	19.1-22.0	20.4	2.35-3.32	2.82
		LnSu	4	16.4-20.2	18.7	1.90-3.35	2.82
		WSu	21	12.8-19.5	17.0	1.08-3.48	2.30
		Carp	3	4.3-4.5	4.4	-	0.06