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

STATE: Montana PROJECT NO. F-78-R-2
PROJECT TITLE: Statewide Fisheries Investigations
JOB TITLE: Northcentral Montana Warm and Coolwater Ecosystems

PERIOD COVERED: July 1, 1995, through June 30, 1996

ABSTRACT

Fisheries investigations were carried out on 12 warm/coolwater ecosystems during the report period. A total of 249 tags were returned by anglers catching tagged fish in area waters. Loss of T-tags and Cinch-up tags appears to be quite high on walleye. Exploitation of walleye is highest at Tiber Reservoir, while northern pike are equally exploited at Tiber and Lake Frances. Overall forage increased at Tiber and Lake Frances but decreased at Bynum Reservoir. Strong year-classes of walleye in Tiber Reservoir occurred in three years during the 1980's. Yellow perch successfully spawned over artificial brush structures. In Petrolia Reservoir, spring trap netting captured 85 walleye. Fall gill netting found the highest number of yellow perch in several years with average size increasing nearly three inches since 1990. Yellow perch up to 1.49 pounds were captured. Spottail shiners were introduced to Petrolia Reservoir. In East Fork Reservoir, gill net catch of northern pike increased from 1994 but average size decreased by seven inches. Yellow perch numbers declined but size increased. Five small reservoirs were gill netted in the Lewistown area.

OBJECTIVES

1. To identify and monitor the characteristics and trends of fish populations, angler harvest and preferences, and habitat conditions in northcentral Montana warm and coolwater ecosystems.

2. Use survey and inventory information to identify management problems and opportunities, then develop and implement management actions to maintain fish populations at levels consistent with habitat conditions or other limiting factors.

3. Review projects proposed by state, federal, and local agencies and private parties which have the potential to affect fisheries resources and aquatic habitats. Provide technical advice or decisions to reduce or mitigate resource damage.

4. Provide landowners and other private parties with technical advice and information to sustain and enhance fisheries resources and aquatic habitat.

5. Enhance public understanding and awareness of fishery and aquatic habitat resources and issues in northcentral Montana through oral and written communication.

6. Maintain and enhance public access to fishery resources in northcentral Montana.

PROCEDURES

Fish populations were sampled with standard 125 x 6 foot multifilament experimental gill nets (fished sinking or floating) with 25 foot sections of 0.75, 1.00, 1.25, 1.50, and 2.00 inch square mesh; 3 x 4 foot frame trap nets (0.25 inch square mesh); 4 x 6 foot frame trap nets (1.00 inch square mesh): and a 100 x 10 foot seine (0.25 inch square mesh). Small reservoirs were beach-seined with a 50 foot x 4 foot deep seine with 1/8 inch square mesh. Captured fish were measured to the nearest tenth of an inch and weighed to the nearest hundredth of a pound. Stomach samples, and scale and fin ray/spine samples, were collected from some fish for food habits, and age and growth studies, respectively. Walleye dorsal spines were mounted and sectioned according to methods described by Mackay et. al. (1990). A computer program designed by Liknes (1993) was used to generate age composition and estimate the number of walleye caught by age. An index of year-class strength of walleye was calculated using parameters developed by Goeman (1993). Age composition of a gill net catch was re-constructed according to Ketchen's stratified subsampling method described in Ricker (1975). Floy T-tags were used on northern pike, while Floy T-tags and Cinch-up tags were used on walleye. Throughout the report, abbreviations for fish species appear in tables and figures and are explained here rather than in each instance where they appear: WE=walleye; NP=northern pike; LMB=largemouth bass; Ling=burbot; SNS=shovelnose sturgeon; Rb=rainbow trout; LL=brown trout; BBh=black bullhead; YP=yellow perch; SS=spottail shiner; ES=emerald shiner; LND=longnose dace; LC=lake chub; FHC=flathead chub; FHM= fathead minnow; SB=brook stickleback; MSc=mottled sculpin; WSu=white sucker; LnSu=longnose sucker.

FINDINGS

CHOTEAU AREA WATERS

Bynum Reservoir

A total of 13 trap net nights on April 17 and 18, 1995, caught 458 walleye, 22 yellow perch, 835 white sucker, 1 rainbow trout and 1 cutthroat trout. Water temperatures ranged from 44-46°F. Walleye greater than 14 inches ranged in length from 14.0-23.5 inches and averaged 16.2 inches. Average weight was 1.42 pounds (range 0.81-4.48). Measurements of miscellaneous species are on file in the Choteau field office.

A total of 342 walleye were tagged to help monitor exploitation. During 1995, anglers voluntarily returned 48 tags, representing fish tagged from 1990 to 1995 (Table 1). First-year returns vary from 3.6 to 18.4 percent while cumulative exploitation ranged from 7.5 to 24.3 percent.

August seining surveys demonstrated that forage fish numbers, especially yellow perch, decreased in 1995 when compared to 1994 (Figure 1 and Appendix I). Observations through the ice in mid-February of 1996, however, indicate good numbers of small perch in some areas. Natural reproduction of walleye documented in 1993 and 1994 was absent in 1995 seine hauls (Figure 2). Above normal rainfall in late spring and fall produced good water levels throughout the summer, increasing the reservoir to near full pool during late fall. These conditions should provide excellent perch spawning habitat in the spring of 1996.

Ten sinking gill nets in mid-September captured 99 walleye, 15 yellow perch and 384 white sucker (Table 2). A total of 826 crayfish were also taken. Examination of Figure 3 shows that numbers of adult yellow perch are at their lowest level since being originally established. The perch population is expected to rebound with improved water levels. Also depicted in Figure 3 is the decrease in white suckers less than thirteen inches in length. Walleye are expected to maintain this species at low numbers in years to come.

A total of 25 walleye stomachs were examined in the field and only four percent were empty (Table 3). Fish remains, presumed to be yellow perch and spottail shiner, were most common, occurring in 56 percent of the stomachs, followed by crayfish (28 percent) and identifiable yellow perch (24 percent). Since 1992, crayfish have occurred in 17 to 30 percent of walleye stomachs examined.

Table 1. Angler exploitation of walleye and northern pike in Region Four reservoirs as indicated by voluntary tag returns, 1991-1995.

Lake	Species	Year tagged	Number tagged	Number of Returns (%)					
				1991	1992	1993	1994	1995	Cumulative
Bynum Res.	WE	1991	226	12(5.3)	23(10.2)	4(1.8)	8(3.5)	3(1.3)	50(22.1)
		1992	255		47(18.4)	9(3.5)	6(2.4)	0(0.0)	62(24.3)
		1993	225			8(3.6)	9(4.0)	6(2.7)	23(10.2)
		1994	483				23(4.8)	13(2.7)	36(7.5)
		1995	347					26(7.5)	26(7.5)
Lk. Frances	WE	1992	242		21(8.7)	12(4.9)	10(4.1)	5(2.1)	48(19.8)
		1993	250			19(7.6)	7(2.8)	9(3.6)	35(14.0)
		1994	242				12(4.9)	10(4.1)	22(9.1)
		1995	289					17(5.9)	17(5.9)
	NP	1992	66		7(10.6)	1(1.5)	0(0.0)	0(0.0)	8(12.1)
		1993	76			3(3.9)	4(5.3)	0(0.0)	7(9.2)
		1994	310				17(5.4)	9(2.9)	26(8.4)
		1995	325					26(8.0)	26(8.0)
Pishkun Res.	NP	1992	80		13(16.2)	3(3.8)	4(5.0)	1(1.3)	21(26.3)
		1993	157			27(17.2)	12(7.6)	1(0.6)	40(25.5)
Tiber Res.	WE	1991	692	70(10.1)	21(3.0)	15(2.2)	8(1.2)	4(0.6)	118(17.1)
		1992	266		15(5.6)	20(7.6)	11(4.1)	1(0.4)	47(17.7)
		1993	398			35(8.8)	26(6.5)	16(4.0)	77(19.3)
		1994	461				48(10.2)	14(3.0)	62(13.4)
		1995	500					63(12.6)	63(12.6)
	NP	1991	314	32(10.2)	5(1.6)	2(0.6)	2(0.6)	0(0.0)	41(13.1)
		1992	99		6(6.1)	5(5.0)	3(3.0)	2(2.0)	16(16.2)
		1993	225			21(9.3)	11(4.8)	5(2.2)	37(16.4)
		1994	153				25(17.6)	0(0.0)	25(17.6)
		1995	182					14(7.7)	14(7.7)

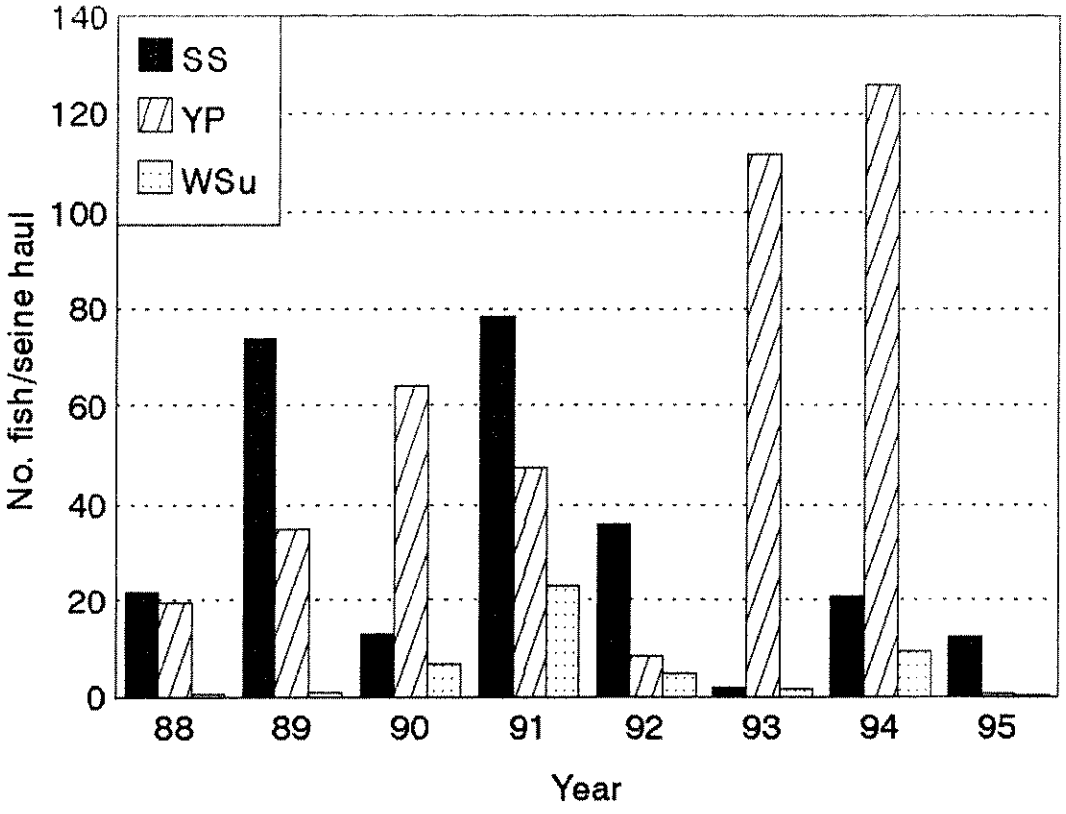


Figure 1. Forage fish trends in Bynum Reservoir, 1988-1995.

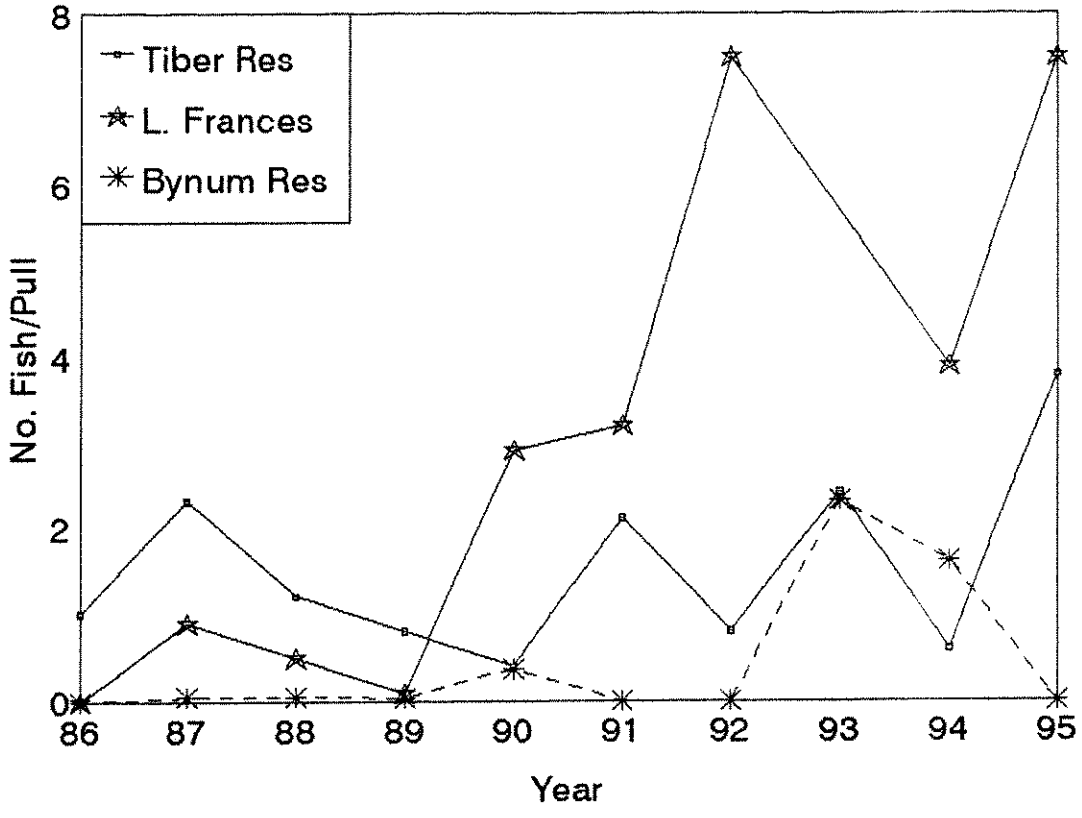


Figure 2. Reproduction of walleye in three reservoirs (1986-95).

Table 2. Overnight gill netting results in warm and coolwater reservoirs in the western portion of Region Four, 1995.

Water (date sampled)	Surface acres[1/]	No. of nets[2/]	Mean Hrs. per net	Species	No. of fish	Length range(avg)	Weight range(avg)
Bynum Res. (9/14-15/95)	3,000	10S	16.9	WE	32	7.7-12.1(9.3)	0.14- 0.53(0.27)
					28	14.3-15.9(15.2)	0.94- 1.64(1.27)
					38	16.0-19.0(17.0)	1.37- 2.62(1.76)
					1	(20.9)	(3.65)
				YP	5	10.0-10.9(10.5)	0.51- 0.82(0.69)
					10	11.1-11.8(11.3)	0.80- 1.00(0.89)
				WSu	57	6.5-12.6(9.2)	0.11- 1.06(0.44)
					327	13.0-19.7(16.1)	1.15- 3.12(1.98)
Lake Frances (9/12-13/95)	5,000	20S	18.4	WE	17	7.5-12.9(8.7)	0.10- 0.71(0.21)
					13	13.2-15.2(14.4)	0.78- 1.17(0.96)
					26	16.0-19.7(17.9)	1.36- 2.67(2.03)
					3	20.3-21.9(20.9)	2.80- 3.45(3.19)
				NP	23	8.7-15.5(12.8)	0.14- 0.84(0.48)
					27	16.0-19.8(18.2)	0.80- 1.84(1.35)
					21	20.0-34.7(23.1)	1.72- 9.10(2.86)
				YP	89	5.0- 8.9(7.5)	0.06- 0.49(0.21)
					39	9.0-10.7(9.8)	0.35- 0.72(0.53)
					7	11.2-12.2(11.6)	0.72- 1.11(0.93)
				WSu	13	15.3-19.3(18.0)	1.54- 3.55(2.82)
Tiber Res. (9/19-21/95)	16,000	28S	18.5	WE	59	7.2-12.9(11.1)	0.10- 0.74(0.44)
					82	13.0-15.7(14.2)	0.60- 1.36(0.93)
					23	16.2-19.2(17.7)	1.29- 2.42(1.88)
					2	20.0-28.0(24.0)	2.35- 9.60(5.98)
				NP	5	14.6-15.7(15.2)	0.70- 0.97(0.78)
					18	16.9-19.9(18.4)	0.90- 1.92(1.41)
					33	20.0-34.4(22.8)	1.48-10.60(2.87)
				YP	121	5.0- 8.9(5.9)	0.05- 0.32(0.08)
					17	9.1-10.5(9.7)	0.34- 0.58(0.44)
					2	11.2-11.5(11.4)	0.53- 0.79(0.66)
				Rb	2	(13.4)	0.92- 1.02(0.97)
					5	18.5-20.6(19.7)	2.30- 2.65(2.48)
				WSu	4	6.3-12.2(10.4)	0.09- 0.79(0.55)
					51	13.2-19.7(16.1)	0.93- 3.45(1.94)
				LnSu	2	13.0-19.6(16.3)	0.79- 2.95(1.87)
				Carp	4	25.1-30.6(27.6)	8.40-18.30(12.50)

1/ Approximate surface acres at time of survey.
2/ S = sinking experimental gill nets.

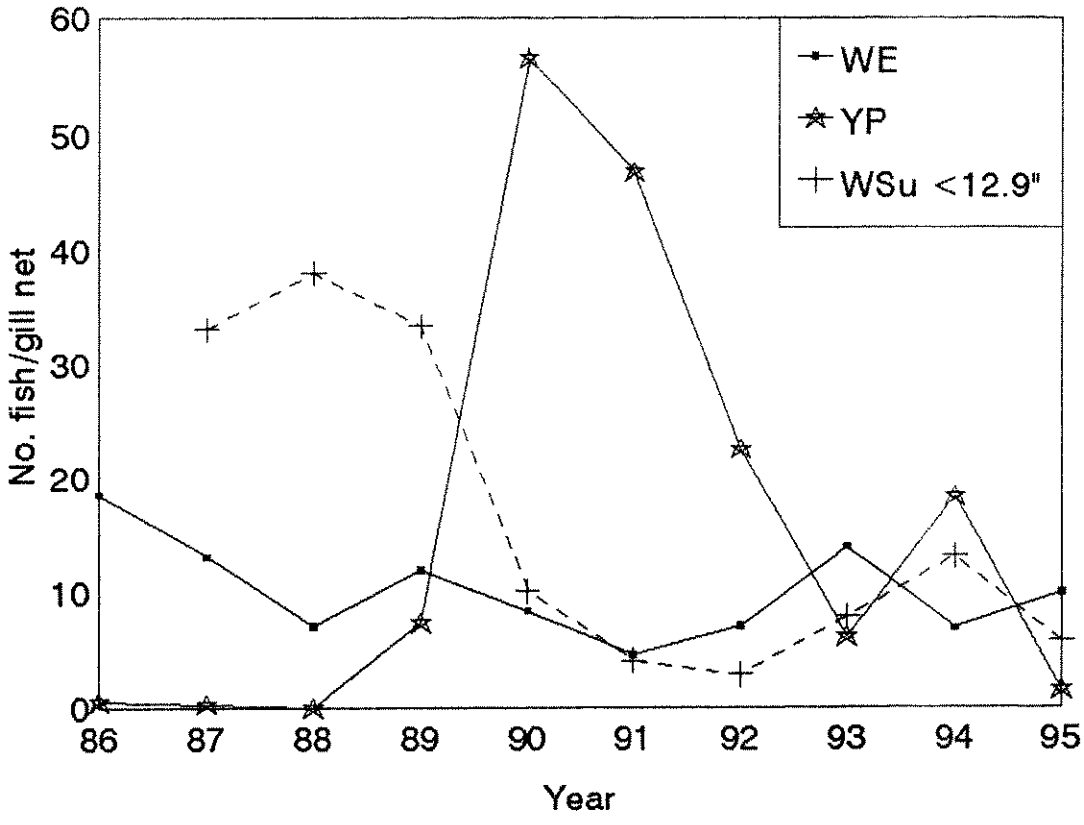


Figure 3. Trends of the fish populations in Bynum Res. (fall gill nets 1986-95).

Table 3. Items observed in stomachs of walleye and northern pike caught in gill nets in Bynum, Frances & Tiber reservoirs during fall, 1995.

	Walleye			Northern Pike	
	Bynum	Frances	Tiber	Frances	Tiber
No. of stomachs	25	31	80	31	52
% occurence by item:					
Empty	4	13	30	16	48
Fish remains	56	55	48	23	31
Y. perch	24	13	41	0	8
S. shiner	8	7	1	0	2
Crayfish	28	19	0	45	10
N. pike	0	3	0	0	2
Walleye	0	0	0	0	4
Vegetation	8	10	6	3	2
Tapeworms	20	10	6	0	2
Insects	0	0	5	0	0
Carp	0	0	1	0	4
Leeches	12	0	0	0	0

Lake Frances

Trap nets (30 trap nights) and gill nets (44 one-hour daylight sets) were employed from April 13-20, 1995, to monitor trends of the fish population in Lake Frances. Species taken and number of each were as follows: walleye-314; northern pike-377; yellow perch-6; burbot-4; and white sucker-132. Walleye greater than 14 inches averaged 17.6 inches (range 14.0-26.8) and 1.84 pounds (range 0.82-7.75). Northern pike greater than 16 inches averaged 20.0 inches (16.0-31.5) and 2.00 pounds (0.81-9.30). Lengths and weights of miscellaneous species taken are on file in the Choteau field office. Water temperatures varied from 42°F on April 13 to 45°F on April 20.

A total of 289 walleye and 325 northern pike were tagged and released in 1995 to determine exploitation. A total of 41 walleye and 34 northern pike tagged in 1995 or earlier years were caught and reported by anglers (Table 1). First-year returns for walleye ranged from 4.9 percent to 8.7 percent. The cumulative return for walleye tagged in 1992 was nearly 20 percent. For northern pike, returns by anglers during the first year following tagging ranged from 3.9 to 10.6 percent, with a cumulative return totaling 12.1 percent for 1992.

Seventeen shoreline seine hauls in mid-August captured three forage fish species, along with crayfish and young-of-the-year walleye and northern pike (Appendix I). Spottail shiner numbers have decreased dramatically since 1992, while yellow perch show an increase (Figure 4). Information for 1993 is not plotted due to vegetation problems (Hill & Liknes, 1994). Walleye reproduction is considered excellent, with good numbers of young-of-the-year taken in seine hauls in five of the past six years (Figure 2).

Twenty sinking gill nets were fished overnight on September 12-13, 1995. A total of 135 yellow perch, 71 northern pike, 59 walleye and 13 white sucker were taken (Figure 5). In addition, 391 crayfish were also taken in the gill nets. The 1995 catch of walleye and yellow perch is much reduced when compared to earlier years. Northern pike continue to fluctuate at less than five fish per net.

Walleye and northern pike stomachs were examined in the field during the gill net survey. Of 31 walleye stomachs examined (Table 3), unidentifiable fish remains occurred in 55 percent of them. Following in order of abundance were crayfish and yellow perch. Crayfish and fish remains were the most common items in 31 northern pike stomachs. Thirteen percent of walleye and 16 percent of northern pike stomachs were empty.

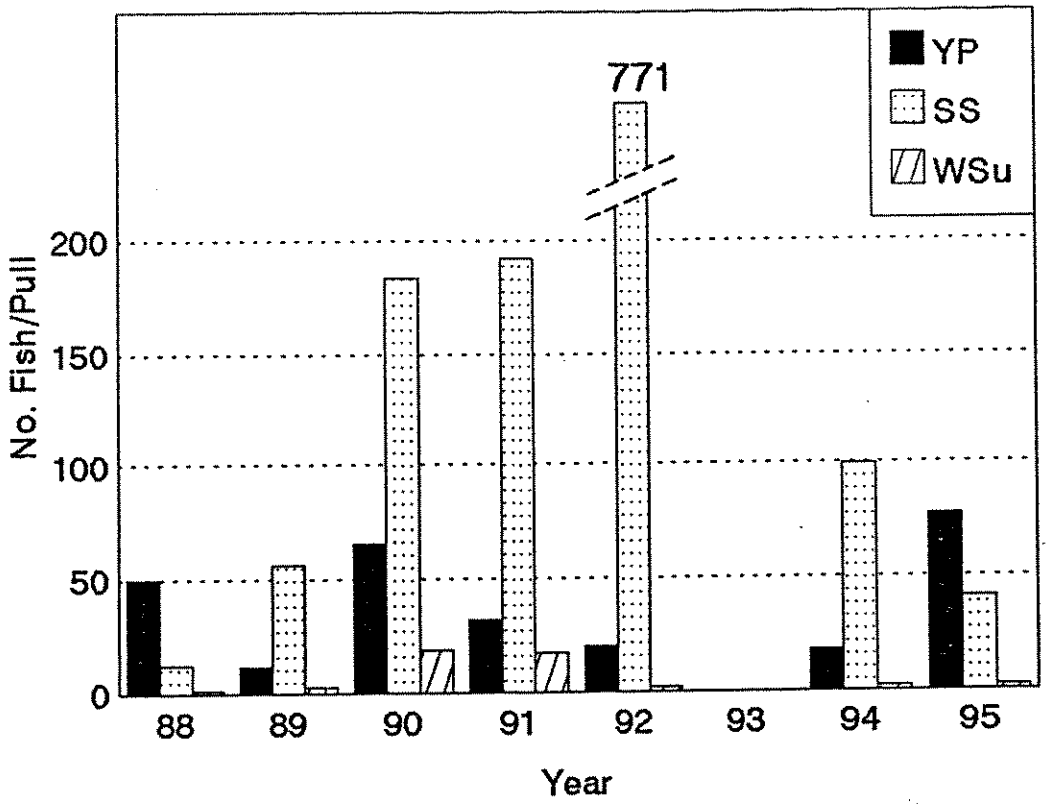


Figure 4. Forage fish trends in Lake Frances, 1988-1995.

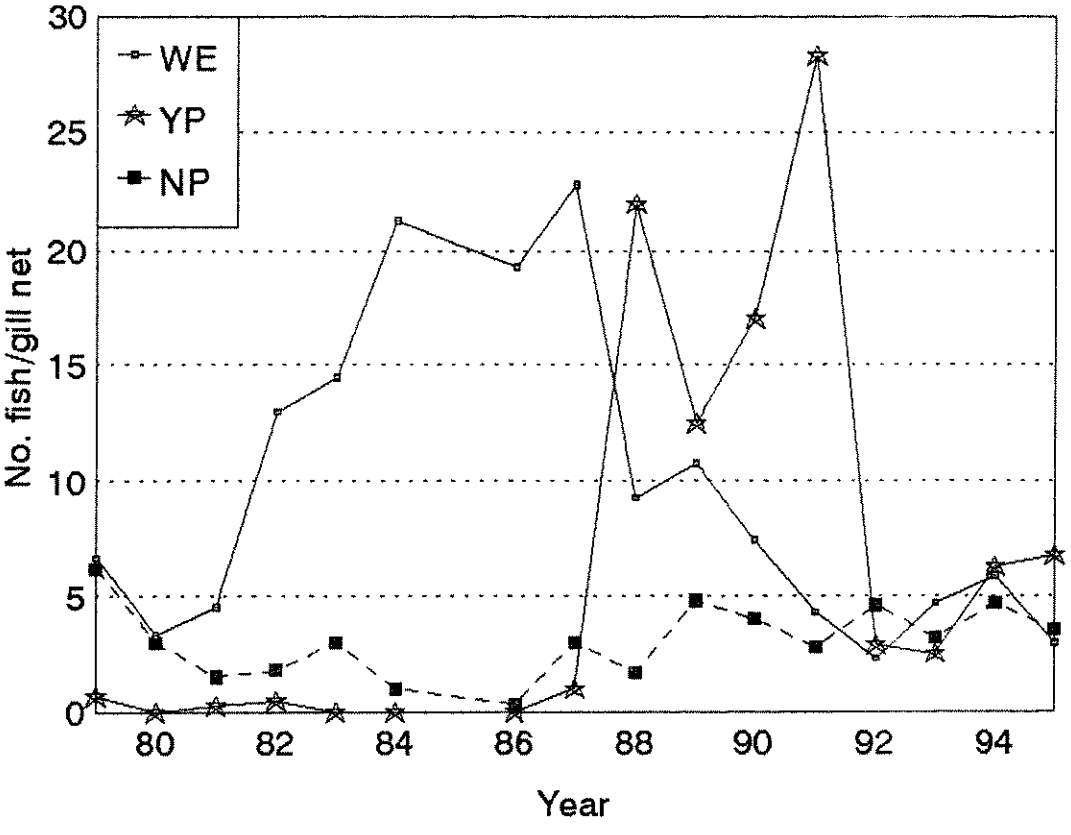


Figure 5. Trends of the fish populations in Lake Frances (fall gill nets, 1979-1995)

Pishkun Reservoir

Anglers returned two tags from northern pike tagged in 1992 and 1993 (Table 1). The cumulative return for 1992 is now 26.3 percent and for 1993 is 25.5 percent.

Fifteen seine hauls were made along the shoreline in mid-August to assess forage fish numbers. Yellow perch were most abundant followed by white sucker (Appendix I). Examination of Figure 6 shows an increase in yellow perch and spottail shiner. This may be an indication that spottail shiner have finally established a population.

Gill netting results for Pishkun Reservoir appear in the annual coldwater lakes report (Liknes, et al, 1996).

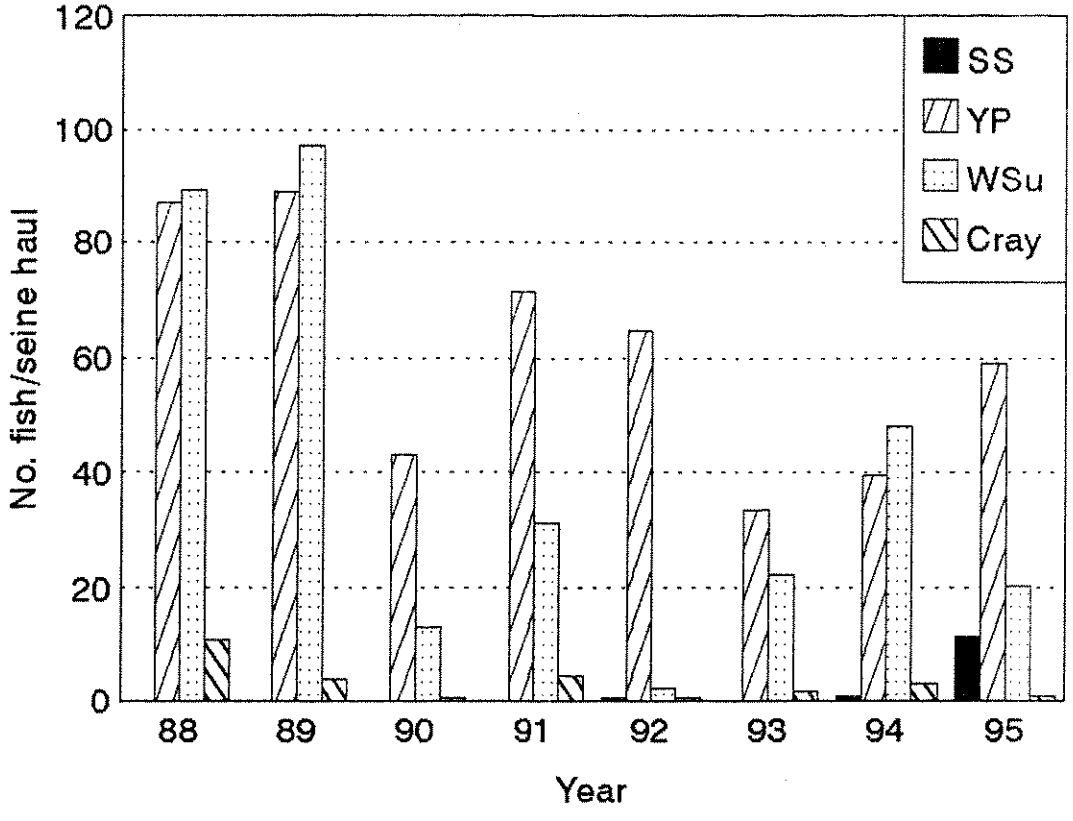


Figure 6. Forage fish trends in Pishkun Reservoir, 1988-1995.

Tiber Reservoir

Trap netting and electrofishing surveys were conducted in Tiber Reservoir to monitor spawning runs and obtain fish for tagging purposes. These investigations were carried out in the Marias River upstream from the reservoir and in the Devon area at the upper end of the reservoir from March 31 to April 8, 1995. Similar surveys were conducted in the Willow Creek Arm (WCA) from April 9-13 and April 19-21, 1995. Reservoir levels decreased slightly from elevation 2979.9 feet m.s.l. (mean sea level) at the beginning, to 2979.7 feet m.s.l. at the end of the surveys. Inflows averaged approximately 425 cfs. Water temperatures ranged from 40-49°F in the Devon/Marias area and 40-50°F in the WCA.

A total of 71 trap net nights in the Devon area captured 79 northern pike, 87 walleye, 125 rainbow trout, 75 burbot, 3 mountain whitefish, 9 yellow perch, 30 white sucker, 134 longnose sucker, 51 carp and 13 flathead chub. Five days of electrofishing in the Marias River produced 358 walleye along with several other species. These include shovelnose sturgeon, burbot, mountain whitefish, white sucker, longnose sucker and flathead chub.

In the WCA, 69 trap net nights collected 166 northern pike, 123 walleye, 4 rainbow trout, 18 burbot. 319 yellow perch, 2 black crappie, 100 white sucker, 10 longnose sucker and 17 carp. An additional 215 walleye were taken by electrofishing the upper portion of the WCA, along with northern pike, yellow perch, white sucker, longnose sucker and carp.

A total of 500 walleye (over 14 inches) and 182 northern pike (over 16 inches) were tagged in the reservoir and/or river. In the Devon/Marias area, walleye averaged 16.7 inches (range 14.0-30.1) and 1.60 pounds (range 0.76-13.30). Northern pike averaged 21.6 inches (range 16.0-42.0) and 3.52 pounds (range 0.81-21.30). For the WCA, walleye were larger than those in the Devon/Marias area, averaging 18.0 inches (range 14.1-24.3) and 1.98 pounds (range 0.82-4.86). Northern pike in the WCA were smaller than those found in the upper reservoir/river, averaging 20.8 inches (range 16.1-36.5) and 2.43 pounds (range 1.10-14.80). Lengths and weights of the miscellaneous species taken in both areas are on file in the Choteau field office.

In addition to walleye and northern pike, 139 rainbow trout were also tagged in the Devon area of the reservoir. They averaged 19.2 inches and 2.42 pounds (range: 13.4-22.6 inches; and 0.85-3.68 pounds). Based on scale analysis, these fish ranged in age from three to seven years.

Anglers returned tags from 98 walleye and 21 northern pike during the report period (Table 1). First-year returns for walleye ranged from 5.6 percent in 1992 to 12.6 percent in 1995, with cumulative returns exceeding 19 percent for 1993. Northern pike first-year

returns ranged from 6.1 percent (1992) to 17.6 percent (1994). The highest cumulative total was 17.6 percent observed in 1994.

Movement of tagged fish during the first year is shown in Table 4. Walleye tagged in the WCA and northern pike tagged in the Devon and WCA areas were mainly caught near the tagging areas. The exception to this pattern is that of walleye tagged in the Marias and Devon areas. Tag returns show these fish were caught in the river and throughout the reservoir, with highest percentages taken in the Bootlegger area, WCA and Marias River.

Anglers also reported catching five tagged rainbow trout during the report period. All of these had moved upstream out of the reservoir with three being taken in Cut Bank Creek at the City water intake dam, approximately 60 river miles upstream. The other two tags were reported caught in the Marias River.

In late April and early May, local sportsmen's organizations used scuba gear to inspect brush structures placed for spawning substrate for yellow perch. Ribbons of yellow perch eggs were observed draped over structures in the WCA and Devon areas. In September, an additional 25 brush structures were installed in the WCA.

Sixty-seven seine hauls along the Tiber shoreline captured 14 species (Appendix I). The surveys were conducted throughout the reservoir from August 21-24, 1996. Water temperatures ranged from 65-70°F. and the reservoir elevation was approximately 2988 feet m.s.l. Spottail shiner were most abundant followed by yellow perch. Trends in forage fish numbers are shown in Figure 7. Yellow perch are increasing, spottail shiner are stable when compared to 1994, and emerald shiner continue at very low numbers. Carp generally occur in low numbers but were fairly abundant in 1991 and 1995. Reproduction of walleye in 1995 was considered good, averaging 3.8 fish per seine haul (Figure 2). The greatest numbers of young walleye were taken near the upper end of the reservoir and fewest numbers at the Dam area.

Twenty-eight sinking gill nets were fished overnight throughout the reservoir from September 19-21, 1995. Walleye and yellow perch were most common in the catch (Table 2), with northern pike and white sucker following in abundance. Crayfish continue to exist in low numbers, with only six taken in nets. Examination of Figure 8 shows that walleye numbers increased from 1994. The low numbers observed in 1994 suggests a declining walleye population, yet the 1994 summer catch rates of 0.72 fish per hour by anglers is the highest recorded since 1991 (Hill, 1995). Yellow perch decreased slightly from 1994 but still occur in good numbers.

Stomachs of 80 walleye and 52 northern pike were examined in the field for food content (Table 3). Forty-one percent of walleye stomachs and 8 percent of northern pike stomachs contained yellow

Table 4. Movement of walleye and northern pike in Tiber Reservoir, 1995 (tagged in spring).

Species	Area tagged	No. tagged fish caught	Number caught by area				
			Marias	Devon	Bootlegger	Dam	WCA
Walleye	Marias	24	4	2	10	1	7
	Devon	9	3	1	1	3	1
	WCA	27	1	1	0	3	21
N.Pike	Devon	1	0	1	0	0	0
	WCA	11	0	0	0	1	10

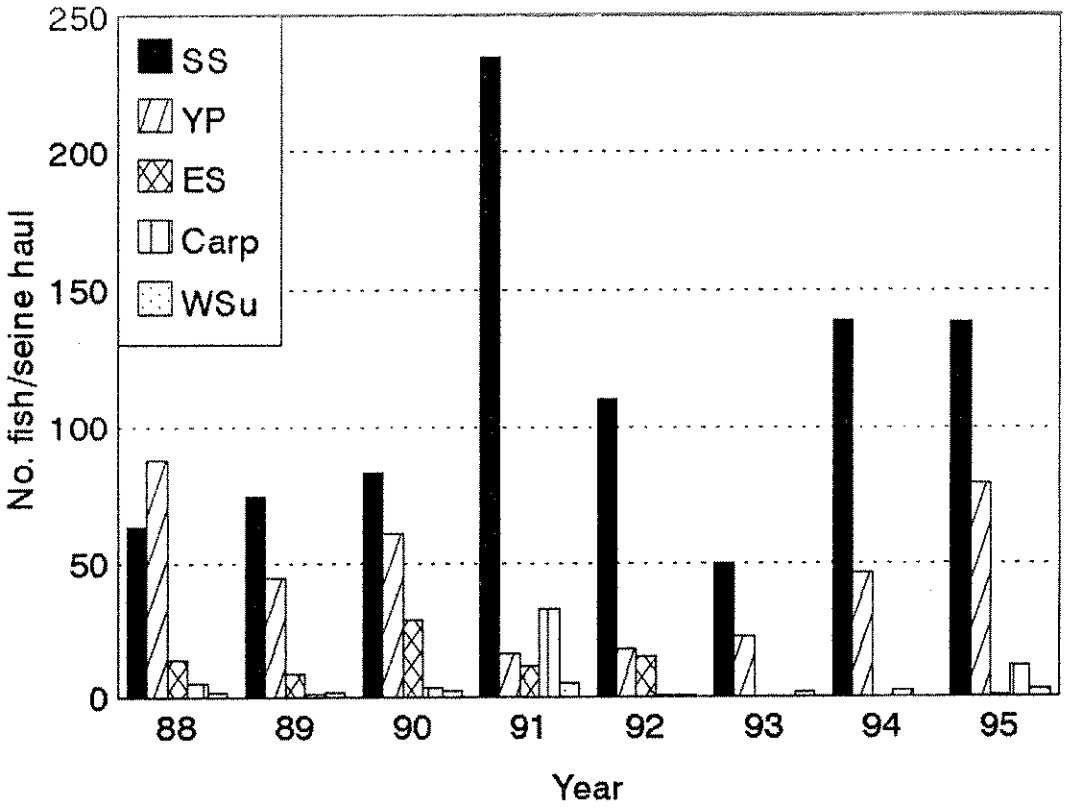


Figure 7. Forage fish trends in Tiber Reservoir, 1988-1995.

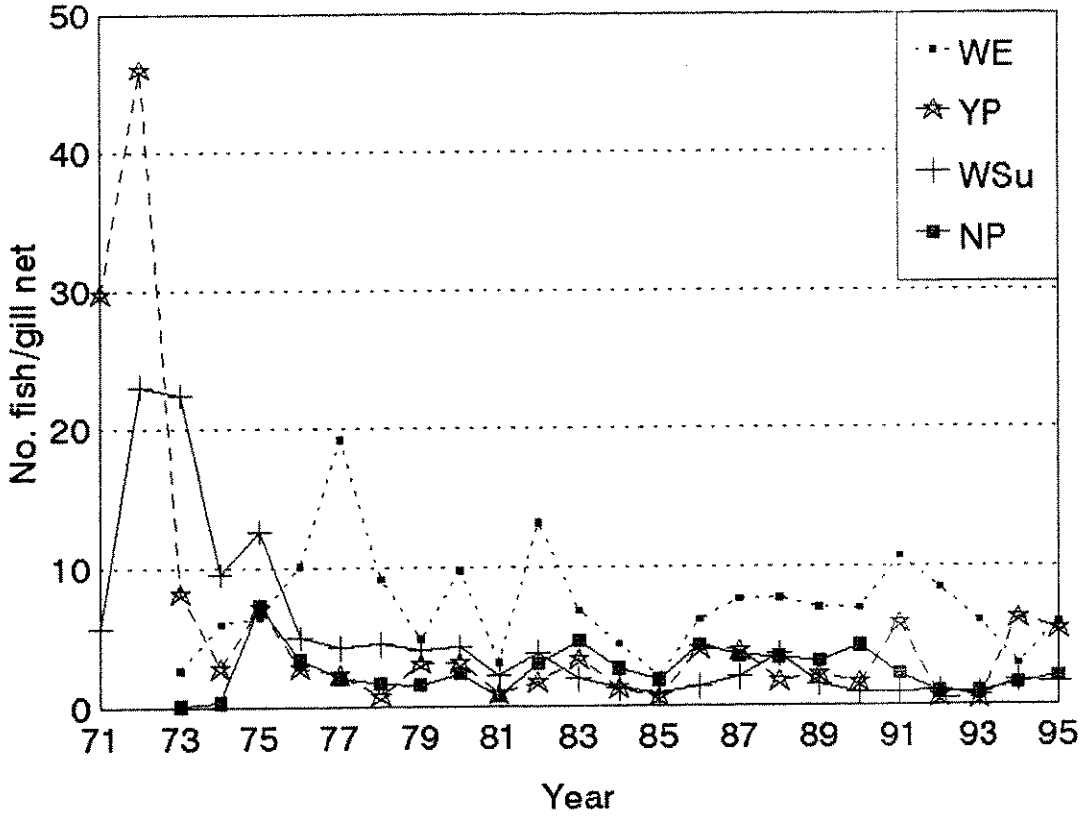


Figure 8. Trends of the fish populations in Tiber Res. (fall gill nets, 1971-95).

perch. Unidentifiable fish remains also occurred in 48 percent of walleye and 31 percent of northern pike stomachs. Thirty and 48 percent, of walleye and northern pike stomachs, respectively, were empty.

Participation in the Marias Management Committee continued as discussions were held with the Bureau of Reclamation to manage water elevations for the benefit of the fishery.

Creel Census

For the fourth consecutive year, weekend creel censuses were conducted at Tiber Reservoir and Lake Frances from Memorial Day through Labor Day. The data are presented in a separate document (Hill, 1996).

Tag Loss

In recent years, walleye were tagged with Floy T-tags and Cinch-up tags to determine tag retention capabilities. In 1993 at Bynum Reservoir, 100 walleye were tagged with T-tags and a right pelvic fin clip while another 125 walleye were tagged with Cinch-up tags and a left pelvic fin clip. Based on limited recaptures of marked fish taken in 1994 spring trap nets, first-year loss of 1993 T-tags was 50 percent (2 of 4 fish losing tags). First-year loss of Cinch-up tags was also 50 percent (3 of 6 fish losing tags). In 1994, 316 walleye were tagged with T-tags and 167 walleye were tagged with Cinch-up tags. As before, they were additionally marked with right, and left pelvic fin clips, respectively. During 1995 spring trap netting operations, recaptures were grouped together because the marking scheme was the same used in both 1993 and 1994. A loss of 90 percent was determined for T-tags (26 of 29 fish losing tags). Loss for Cinch-up tags was 53 percent (8 of 15 fish losing tags).

In 1995, at Tiber Reservoir, 500 walleye were double-tagged with T-tags and Cinch-up tags. During this report period, anglers have returned one or both tags from 72 of these fish. Loss of Cinch-up tags was slightly over 18 percent (13 fish losing tags). T-tag loss was only 4 percent (3 fish losing tags). Additional information on tag loss was obtained during spring trapping in April of 1996. A total of 21 double-tagged fish were recaptured. Loss of T-tags was 14 percent while 38 percent lost a Cinch-up tag.

Age and Growth

A total of 885 walleye spines were analyzed from Lake Frances, Bynum and Tiber Reservoirs, collected in fall gill net samples from 1991 through 1995. The analysis was done to facilitate calculation of year class strength. Due to small sample size obtained at Lake Frances and Bynum Reservoir, year class strength could not be determined for these waters. Appendixes III-V,

however, presents age composition for walleye from Frances and Bynum as well as Tiber.

An index of year class strength for Tiber Reservoir walleye is shown in Figure 9. Based on index values averaging near 100, strong year classes were evident in 1985, 1986 and 1989. Year class strength for 1992 and later will be presented as additional fish are aged. As data becomes available, year class strength will also be presented for Lake Frances and Bynum Reservoir.

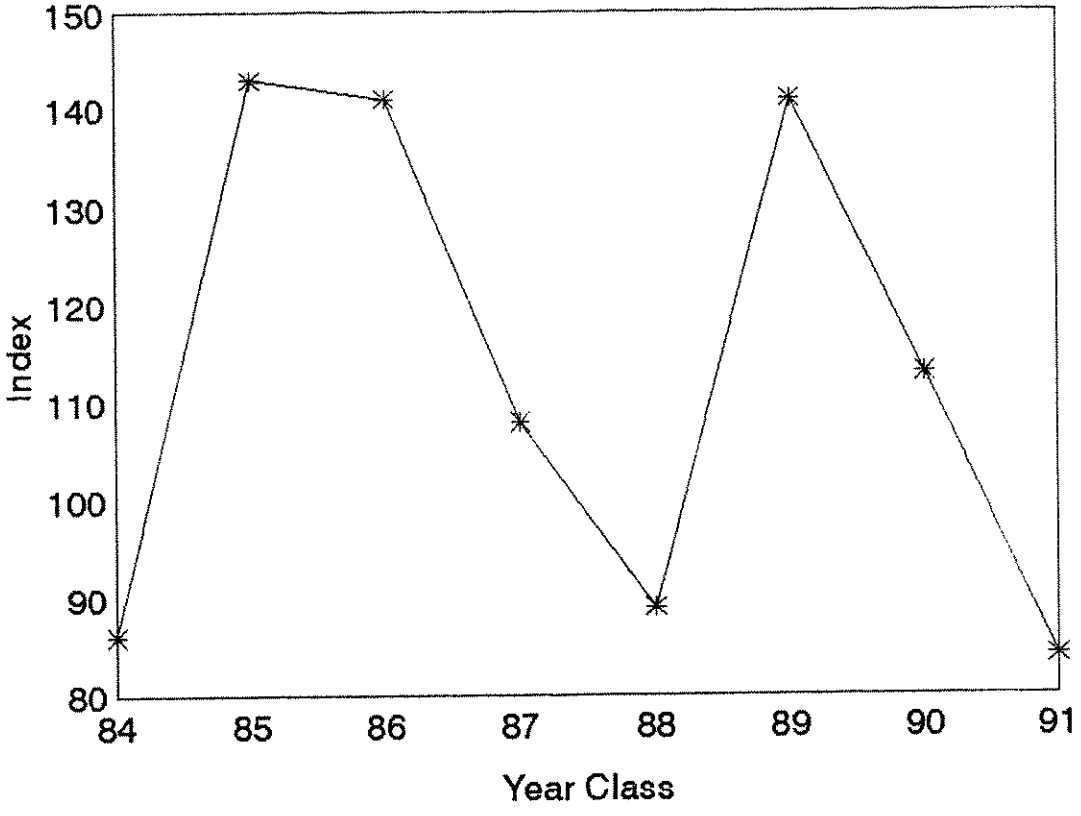


Figure 9. Year class strength of Tiber Reservoir walleye, 1984-91.

Petrolia Reservoir

Trap nets were set in Petrolia Reservoir in April 1995, for the first time in several years. A total of 85 walleye, 10 northern pike and 66 yellow perch were captured (Table 5). Water temperature was 44-45°F during trapping. Trapped walleye and northern pike were tagged and six percent of walleye tags and ten percent of northern pike tags were voluntarily returned by March 1996. These return rates are similar to other Region 4 waters (Hill et al, 1995).

Shoreline seining surveys on Petrolia were completed about three weeks later in 1995 than in 1994. Yellow perch were the most common forage species captured in 1995, but only 2.1 were captured per haul which is a dramatic decline from 23.5 per haul captured in 1994 (Table 6, Hill et al, 1995). Mean length of yellow perch was 3.1 inches. Walleye were the second most common species caught during forage fish surveys and had similar catch rates to 1994. Other species captured included lake chub, longnose dace, fathead minnows and adult carp. About 220 juvenile and 30 adult spottail shiners from Tiber Rreservoir were introduced into Petrolia on August 29, 1995. Three of these fish were captured during seining immediately after release. An additional 2000 spottail shiners in spawning condition were transferred from Tiber Reservoir to Petrolia on June 16, 1996.

Table 5. Trap net catches on Lewistown area reservoirs during 1995.

Water name (Date surveyed)	# of trap nights	Species & Strain	Total # of fish	Length (in) Range	Length (in) (Mean)	Weight (lbs) Range	Weight (lbs) (Mean)	Condition Factor Range	Condition Factor (Mean)
East Fork (4/26-4/28/95)	4	NP	17	18.6-30.0	(23.4)	1.55-6.40	(3.49)	20.4-25.4	(23.1)
		YP	7	7.7- 9.7	(8.2)	0.17-0.34	(0.24)	37.2-48.5	(42.7)
		WSu	140	9.7-16.1	(11.8)	0.30-2.04	(0.65)	28.5-48.9	(38.3)
Petrolia (4/11-4/13/95)	15	We	85	11.1-27.0	(14.8)	0.38-7.20	(1.16)	23.7-42.0	(29.8)
		NP	10	19.6-32.1	(21.2)	1.48-8.00	(2.67)	16.1-24.2	(21.2)
		YP	66	5.8-12.6	(9.4)	0.08-1.49	(0.58)	32.0-81.1	(52.0)

Table 6. Number of forage fish captured per seine haul during 1995 beach seining of Lewistown area reservoirs.

Water	Date	Water temp(°F)	# of pulls	Species YP	WE	NP	LC	LND	WSU
Petrolia	8/29/95	72	10	2.1	1.5	-	0.1	0.1	-
East Fork	8/30/95	64	7	8.2	-	-	-	-	3.4

Four gill nets set on September 26 captured 11 walleye from 7.5-25.2 inches when water levels were low (Table 7, Table 8). Walleye gill net catch declined from 1994, but was higher than in 1992 and 1993 (Figure 10). Two northern pike and 16 yellow perch were also captured. White suckers were captured for the first time since 1991 (Figure 10).

Walleye were sporadically stocked in Petrolia Reservoir until 1993, when annual stocking began (Table 9). Age data obtained from dorsal spine cross sections is presented in Table 10. Walleye less than five years old in Petrolia Reservoir were slightly larger than those found in Lake Frances and Tiber Reservoir. For example, four year old spring walleye averaged 12.8-13.2 inches in Lake Frances, 12.5-13.8 inches in Tiber Reservoir (Hill et al, 1995) and 14.0 inches long in Petrolia. No trends are obvious for older fish. Tiber and Frances rely on natural reproduction, so growth rates are difficult to compare with walleye that are stocked in Petrolia Reservoir. Walleye from three to eight years old were captured in spring trap nets and indicated an excellent 1991 year class (Table 10). Walleye ages from Petrolia Reservoir indicates natural reproduction has occurred in several different years. Walleye from the 1987, 1989, 1990 and 1992 year classes were captured i nets even though none were stocked during those years. Based on data obtained this year, ages in Table 7 of Hill et al, 1995 are incorrect and should be one year less than shown.

Christmas tree structures placed in Petrolia Reservoir in 1990 and 1993 may have benefitted yellow perch. Average size of yellow perch captured in gill nets has increased dramatically from 7.0 inches in 1990 to 9.8 inches in 1993 and perch up to 1.49 pounds were caught in 1995 (Figure 11). Gill net catch of yellow perch was higher in 1995 than it had been since 1987 (Figures 10, 11). High numbers of yellow perch captured during trap netting (Table 5) also indicate a good perch fishery is developing in Petrolia Reservoir. However, the decline in YOY yellow perch during seine hauls indicates that benefits from the tree structures may be short-lived, that more structures are needed, or that predator densities are too high. The yellow perch numbers of 44.5 per net in 1987 (shown in Table 1 in Hill et al, 1988 and in Figure 11 in Hill et al, 1995) are in error. These numbers should be 4 yellow perch captured per net.

East Fork Spring Creek Reservoir

East Fork Reservoir was trap netted in the spring for the first time in 1995. Seventeen northern pike, 7 yellow perch and 140 white suckers were captured during four trap nights (Table 5).

Shoreline seining found only 8.2 yellow perch per haul during 1995 compared with 154 per haul in 1994 (Table 6). Mean yellow perch length was 2.7 inches, but included several 3 to 5 inch fish that may have been two years old. White suckers were captured during

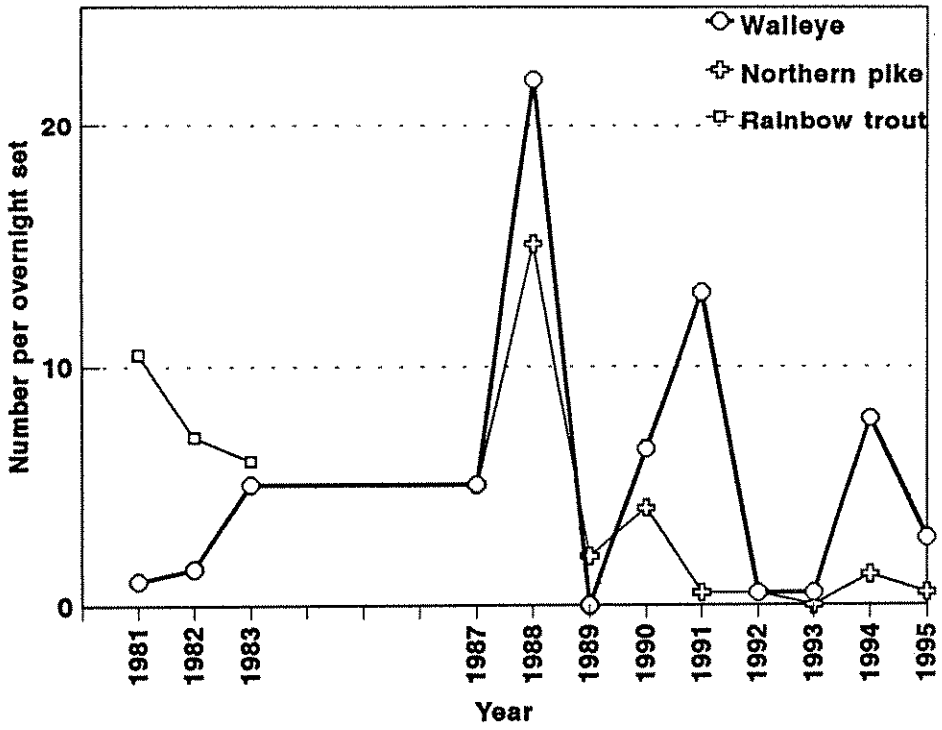
Table 7. Overnight gill netting results on large lakes and reservoirs in the Lewistown area during 1995.

Water name (Date surveyed)	Surface acres	# of[1] nets	Mean hours fished/net	Species	Total # of fish	Length (in) Range	Length (in) (Mean)	Weight (lbs) Range	Weight (lbs) (Mean)	Condition Factor Range	Condition Factor (Mean)
East FK Spring (9/18/95)	100	1F,1S	28.0	NP	10	13.2-40.1	(23.4)	-		-	
				YP	11	7.0- 8.4	(7.4)	0.14-0.26	(0.18)	37.5-46.9	(42.3)
				WSu	52	9.7-16.2	(12.4)	0.36-1.15	(0.65)	20.9-40.5	(34.0)
				LnSu	8	12.4-15.2	(13.6)	0.57-0.70	(0.64)	19.9-30.2	(25.6)
Petrolia 9/26/95	500	2F,2S	23.9	WE	3	7.5- 8.0	(7.8)	0.15-0.20	(0.17)	29.3-39.1	(34.6)
				WE	7	11.3-15.0	(12.8)	0.40-1.10	(0.68)	26.3-34.7	(30.8)
				WE	1	-	(25.2)	-	(5.40)	-	(33.7)
				NP	2	15.0-33.5	(24.2)	0.70-10.7	(5.70)	20.7-28.5	(24.6)
				YP	16	5.7-12.8	(9.8)	0.10-1.20	(0.59)	36.4-60.9	(52.6)
				WSu	8	9.3-17.3	(14.5)	0.3 -2.1	(1.39)	37.3-45.5	(41.2)
				Carp	12	17.0-25.2	(21.0)	2.50-7.50	(4.65)	41.2-54.4	(48.6)

[1] F= Floater and S= Sinker

Table 8. Water quality parameters from waters in Central Montana during 1995.

Water	Date	Temp (°F)	Secchi (ft)	Maximum depth(ft)	Conductivity (μohms/cm)*	Comment
Benes #2	6/13/95	71.9	10.5	13.5	10600	Close to full
Dry Blood	5/11/95	13.8	-	-	405	Close to full
	5/31/95	66.0	9.5	16.0	416	
East Fork	4/27/95	45.0				
	9/18/95	59.6	5.0	20.0	1750	full
Hopalong	5/24/95	59.4	6.5	9.0	2950	1.5 ft below full
Petrolia	9/25/95	56.4	3.5	17+	1820	very low
South Fork Blood	5/11/95	15.1	-	-	650	
	5/24/95	59.0	10	10+	740	2 ft below full
Upper Wolf Coulee (Dry Wolf)	5/23/95	57.3	6.8	9	10000	full



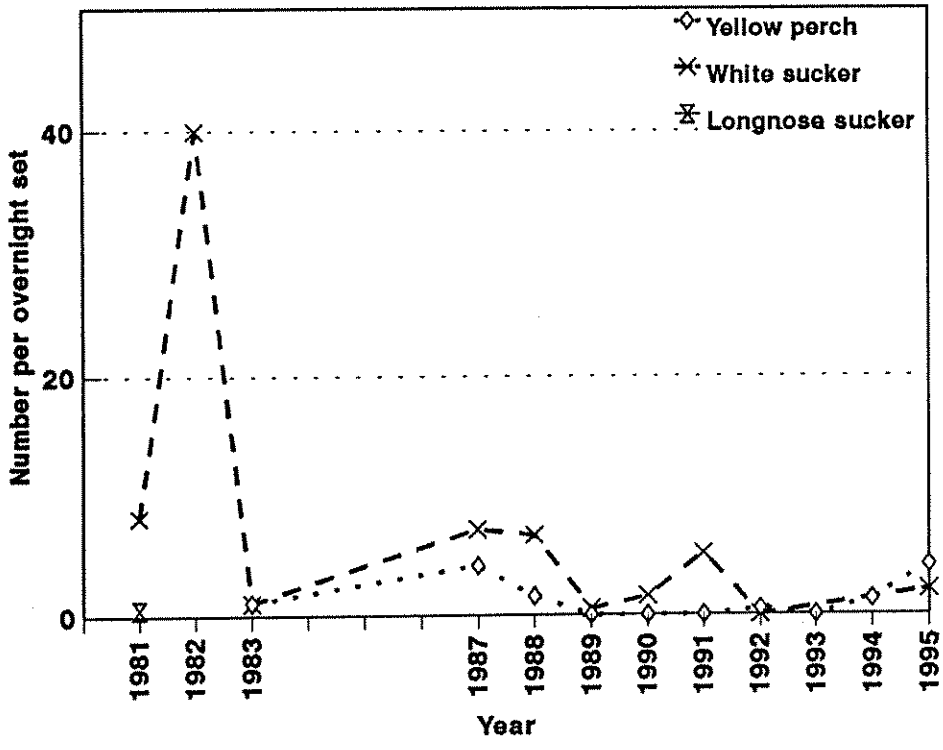


Figure 10. Gill netting trends from Petrolia Reservoir.

Table 9. Number and size of walleye stocked in Petrolia Reservoir[1] during 1985 - 1995.

Date	Number	Length (inches)	Total Weight (pounds)
4/03/85	100000	0.0	1.00
5/14/86	100000	0.0	0.45
4/07/88	150000	0.5	4.00
6/19/91	10000	1.8	16.80
6/14/93	20000	1.2	14.30
6/07/94	20000	1.5	21.80
6/08/95	20000	1.1	7.70

[1] From FWP stocking records

Table 10. Total length of walleye at age in Petrolia Reservoir caught in trap nets during spring and in gill nets during late summer/fall 1995 on Petrolia Reservoir.

April

Age	Length (inches) Range	Length (inches) Average	Number	Year class
3	11.1-14.6	12.5	16	1992
4	11.7-15.6	14.0	44	1991
5	12.6-15.7	14.8	4	1990
6	14.9-22.7	17.6	3	1989
7	23.4-24.7	24.1	2	1988
8	21.8-27.0	24.4	2	1987

August/September

Age	Length (inches) Range	Length (inches) Average	Number	Year class
0	3.6- 5.1	4.5	15	1995
1	7.5- 8.1	7.8	6	1994
2	11.3-12.5	12.0	3	1993
3	11.5-12.8	12.3	3	1992
4	15.0	15.0	2	1991
7	25.2	25.2	1	1988

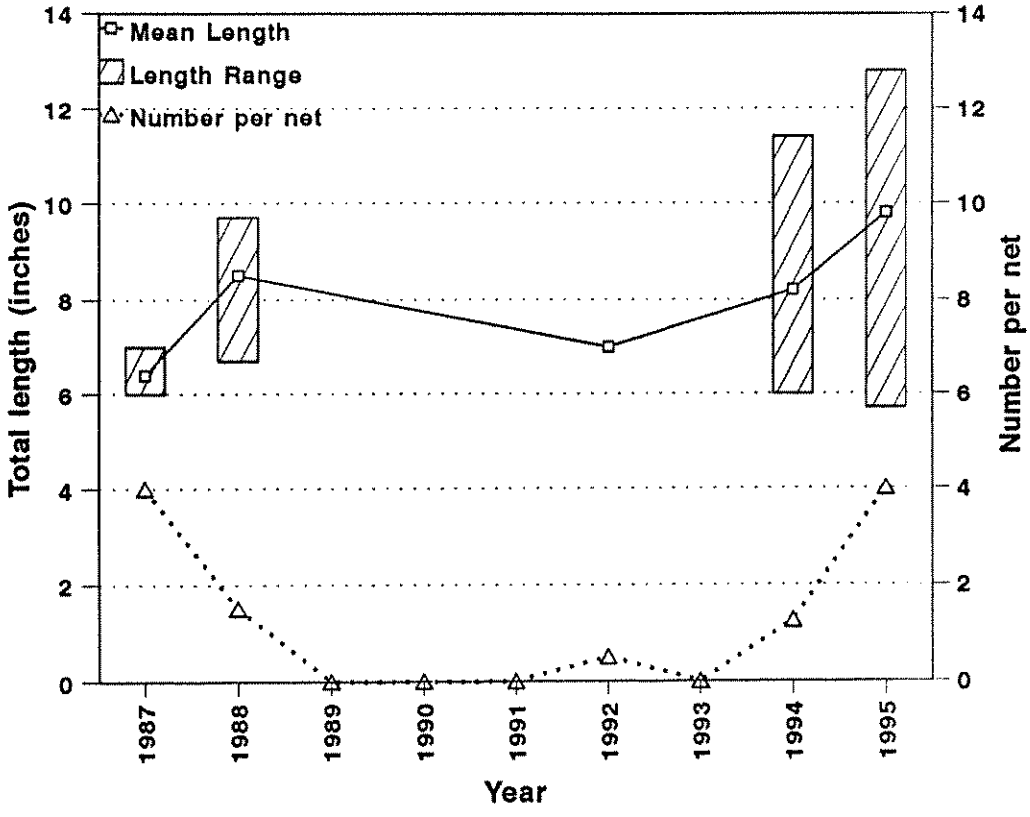


Figure 11. Yellow perch size and catch from fall gill net sets in Petrolia Reservoir 1987 - 1995.

the 1995 surveys but were absent during 1994, possibly because they were too small to be captured in 1994. Seining was done three weeks later in 1995 and most white suckers were less than 2 inches total length. Northern pike reproduction was not documented in 1995.

Gill netting captured 5 northern pike per net, an increase from 1.5 per net captured in 1994 (Table 7, figure 12). Average size of northern pike decreased from 29.4 to 23.4 inches (Hill et al, 1995). The oldest northern pike captured during trapping was four years old and most were three years old (Table 11). White sucker numbers were similar to 1994 but average size of white suckers continues to increase. White suckers average 12.4 inches in 1995 compared to 11.3 inches in 1994 and 8.1 inches in 1990 (Hill et al, 1995). Yellow perch increased in size from 6.8 to 7.4 inches average total length from 1994 to 1995, but catch declined from 15 to 6.5 per overnight set (Table 7, Figure 12, Hill et al, 1995). No trout were captured.

Small Lewistown Area Reservoirs

Five small warmwater reservoirs in the Lewistown area were gill netted in 1995 (Table 12). Water quality parameters for these reservoirs are summarized in Table 8. With the exception of those found in northern Petroleum County, most area reservoirs filled during spring run-off in 1995 (Table 8). The winter of 1994-1995 was mild which allowed several ponds to overwinter fish despite low water levels. One year old largemouth bass were captured in Hopalong Reservoir. Largemouth bass stocked in both 1993 and 1994 were netted in South Fork Blood Reservoir (Table 12).

No fish were captured in three of the gill netted ponds (Table 12). Benes #3 was stocked with 5,000 1.7 inch northern pike fingerlings in 1991. No fish were captured in 2 sinking gill nets set in 1995. The landowner reported angler caught northern pike up to five pounds in 1994 and a few caught in 1995. Based on water level reports and the presence of small numbers of pike, Benes' pond almost surely overwinters. Upper Wolf Coulee Reservoir (Dry Wolf) does not appear to overwinter fish even during mild winters. No fish were netted in Dry Blood Reservoir despite a depth of about 16 feet. It is likely this pond filled during the early spring after winter kill occurred. The type of soils in the area of Dry Blood Reservoir apparently create some seepage through the dam.

GREAT FALLS AREA WATERS

Missouri River between Morony Dam and Marias River

The Portage Coulee section was electrofished on 7-8 September 1995 for a total of 5.4 hours. Water temperatures ranged from 62-67° F. Sixteen species were collected for length and weight measurements

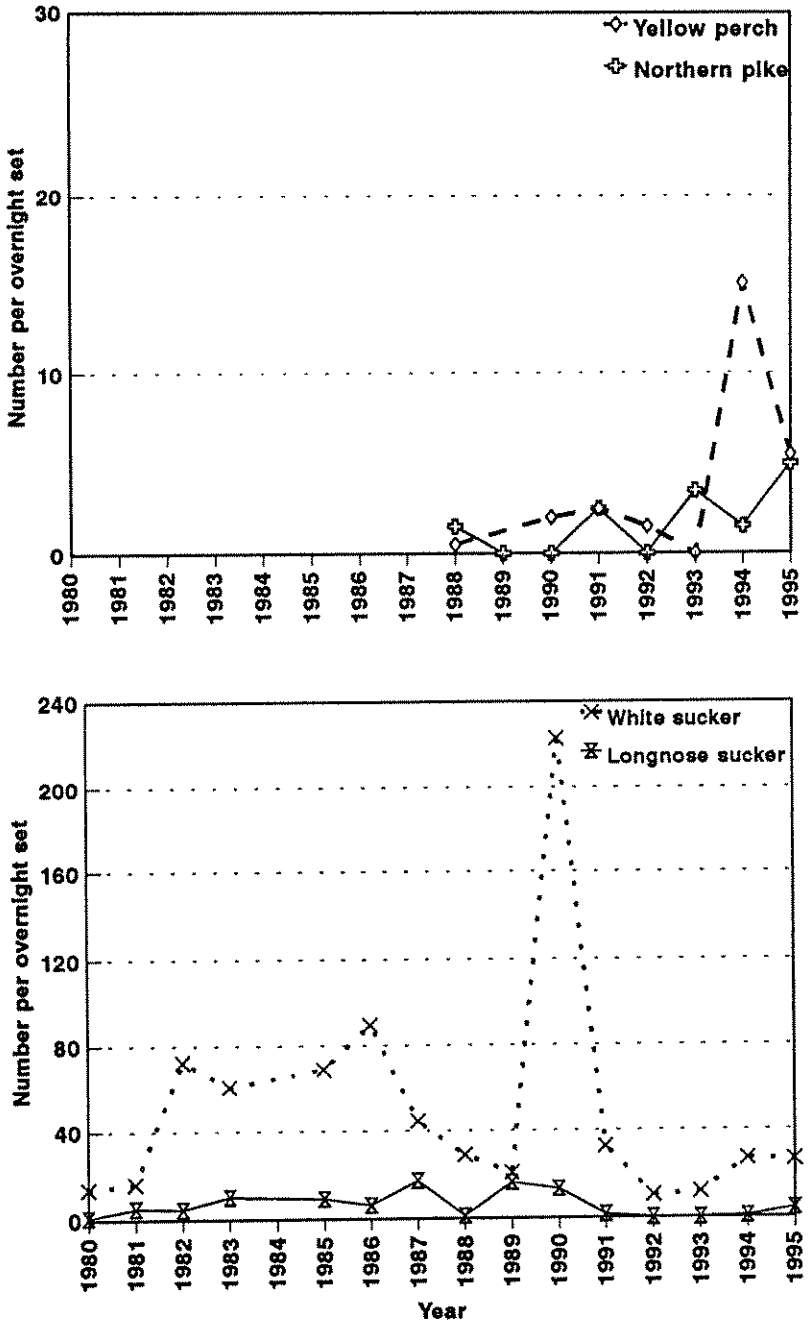


Figure 12. Gill netting trends from East Fork Reservoir, 1980-95.

Table 11. Total length of northern pike at age in East Fork Reservoir during spring trap netting.

Age	Length (inches) Range	Average	Number
2	20.1-20.3	20.2	2
3	23.5-30.0	26.4	9
4	28.1	28.1	1

Table 12. Overnight gill netting results for small reservoirs in the Lewistown area during 1995.

Water name (Date surveyed)	Surface acres	# of nets	Mean hours fished/net	Species strain & year planted	Total # of fish	Length (in) Range	(Mean)	Weight (lbs) Range	(Mean)	Condition Factor Range	(Mean)
Benes #3		2 S	22.5	No Fish							
Dry Blood (5/31/95)		1T, 1S	21.6	No Fish							
				Tiger Salamander	2						
(5/11/95)		1 Seine		No Fish							
Hopalong (5/24/95)		1 S	20.8	LmB-94	6	5.1- 5.5	(5.3)	0.06-0.07	(0.06)	40.3-52.8	(48.9)
				Tiger salamander	4						
		3 seine		Tiger salamander	1						
South Fork Blood (5/25/95)		1S, 1T	19.9	LmB-94	2	5.3- 5.7	(5.5)	0.04-0.08	(0.06)	26.9-43.2	(35.0)
				LmB-93	29	8.2-10.4	(9.6)	0.40-0.83	(0.60)	57.6-81.6	(68.3)
		1 Seine		LmB-94	9	4.2- 5.7	(5.0)	-	-	-	-
Upper Wolf Coulee (5/27/95)		1 S	16.6	No Fish							

(Table 13). Common carp, smallmouth buffalo, longnose dace and mottled sculpins were observed but not captured. Up to thirty specimens for each species of all other non-game species were collected. Relative abundance is shown for game species and those non-game species where less than 30 were captured (Table 13). Shorthead redhorse suckers and goldeye were the most common non-game species observed during the electrofishing operation.

Rainbow and brown trout catch per unit effort (CPUE) declined in 1995 to 3.3 and 1.9 fish per hour, respectively (Table 14). Thirty seven mountain whitefish were captured in 1995 for a CPUE of 6.9 per hour which doubled the previous high catch in 1994.

Equal numbers of walleye (19) and sauger (19) were sampled for a CPUE of 3.5 fish per hour (Table 14). Walleye catch rates were the highest since sampling began in 1988 while sauger numbers increased from an all-time low in 1994. One walleye captured came from fin clipped fingerlings stocked previously in Morony Reservoir. Eleven smallmouth bass were collected for a CPUE of 2.0 fish per hour, the highest catch since sampling started in 1988. Twenty thousand smallmouth bass have been stocked annually in this area of the Missouri River since 1994.

DISCUSSION AND RECOMMENDATIONS

Based on results of seining operations, forage fish numbers in Bynum Reservoir are low at the present time. Use of seines may not be a true indicator of forage fish abundance because analysis of walleye stomachs revealed they consumed perch, spottail shiners, and unidentified fish remains, along with crayfish. Although perch were not sampled in seining operations, good numbers of young-of-the-year were observed through the ice in February 1996. Seining also failed to sample any young-of-the-year walleye. It is recommended to not stock walleye in 1996 because population levels appear adequate and natural reproduction was documented in 1993 and 1994. Yellow perch numbers should improve in 1996 because lake levels are near maximum pool and good spawning habitat is inundated.

In Lake Frances, seining indicates that spottail shiner numbers continue to decrease, however, young-of-the-year yellow perch were found in good numbers as were adult perch taken in fall gill nets. Good numbers of young-of-the-year walleye continue to be found seining, but gill nets indicate that they do not appear to recruit into the fishery in as large a proportion as expected. Northern pike are abundant and presumably prey quite heavily on young walleye. Water levels in Lake Frances are also near full pool and should be conducive to yellow perch spawning in the spring of 1996.

Forage fish numbers in Tiber Reservoir continue to improve from lows experienced in past years, with spottail shiner comparable to 1994 levels and yellow perch increasing from lows observed in 1993.

Table 13. Catch statistics from electrofishing surveys of the Portage Coulee Section on the Missouri River, Montana, 7-8 September 1995.

Species	Number of fish	Length (inches) Mean	Length (inches) Range	Weight (pounds) Mean	Weight (pounds) Range	Mean Condition Factor
Freshwater drum	56	13.9	10.0-23.2	1.62	0.44-6.00	48.75
Goldeye	52	12.1	11.0-15.4	0.66	0.46-1.34	36.41
Rainbow trout	18	10.8	5.0-19.4	0.72	0.04-2.64	40.72
Brown trout	10	16.1	8.6-28.0	2.28	0.28-8.60	41.25
Mountain whitefish	37	10.4	5.0-17.5	0.67	0.02-2.46	42.90
Walleye	19	19.3	13.0-28.5	3.23	0.70-9.20	37.34
Sauger	19	15.5	10.5-18.2	1.33	0.30-2.30	32.84
Smallmouth bass	11	8.7	4.3-14.1	0.60	0.06-1.92	65.59
Silvery minnow	1	3.7	---	--	---	---
Shorthead redhorse	40	16.9	6.2-20.8	2.45	0.04-5.00	45.59
Longnose sucker	56	10.9	6.8-20.3	0.88	0.10-3.60	46.68
White sucker	22	13.7	6.6-18.0	1.38	0.08-2.84	44.69
Emerald shiner	8	2.8	2.6- 3.0	--	---	---
Northern pike	3	23.2	22.5-24.0	3.48	2.90-3.92	27.68
Channel catfish	2	24.6	23.5-25.6	5.88	4.76-7.00	39.20
River carpsucker	15	17.6	15.2-20.1	2.70	1.70-3.66	48.84

Table 14. Comparison of catch per unit effort (CPUE) of game species from electrofishing surveys of the Portage Coulee section on the Missouri River, Montana, 1988-1995.

	Date					
	9/8-9/88	8/23-24/89	8/23&28/91	9/14/93	9/1-2/94	9/7-8/95
Species	CPUE - number of fish/hour (total number captured)					
Sauger	13.8 (94)	2.3 (15)	0.4 (3)	4.2 (11)	0.1 (1)	3.5 (19)
Walleye	2.1 (14)	0.2 (1)	0.1 (1)	2.3 (6)	0.4 (3)	3.5 (19)
Rainbow trout	1.2 (8)	0.5 (3)	0.3 (2)	2.7 (7)	4.8 (34)	3.3 (18)
Brown trout	2.4 (16)	0.5 (3)	0.1 (1)	3.8 (10)	2.9 (20)	1.9 (10)
Mountain whitefish	0.3 (2)	0.2 (1)	- (0)	0.4 (1)	3.4 (24)	6.9 (37)
Smallmouth bass	- (0)	- (0)	- (0)	0.4 (1)	0.3 (2)	2.0 (11)
Total effort (hours)	6.8	6.5	7.2	2.6	7.0	5.4

Adult yellow perch were also taken in good numbers in fall gill nets for the second consecutive year. Past experience has shown that forage fish numbers fluctuate in Tiber Reservoir because of unsuitable water levels during the spawning season. Although conditions are favorable now, it is a matter of time until forage will be limited and condition of walleye will degrade. For this reason, an environmental analysis prepared by Leathe (1996) proposes to introduce cisco in Tiber as an additional forage fish. Participation in the Marias Management Committee should continue in which discussions held with the Bureau of Reclamation are directed towards improving water levels to benefit the fishery in the reservoir. Brush structures installed in Tiber through the years have shown they serve as spawning substrate for yellow perch. Additional structures should be placed with assistance from local sporting groups.

T-tags and Cinch-up tags placed on walleye have experienced fairly high losses. Future tagging will include metal jaw tags for walleye in Bynum, Lake Frances and Tiber. Tiber walleye will also be tagged with Cinch-up tags to help determine past tag loss as most walleye were tagged with this type of tag for a considerable length of time.

Ageing of walleye with spines collected in fall gill nets should continue in future years to aid in determining year-class strength. Compared to past years, additional gill nets were set in Bynum and Lake Frances in 1995 to obtain sufficient numbers of walleye for ageing purposes. Similar numbers of nets should be fished in future surveys.

Legislation enacted in 1995 may prevent future public access to Petrolia reservoir. This legislation stipulated dam repairs will be paid using state funds with the requirement that the dam and surrounding Department of Natural Resources and Conservation (DNRC) lands be transferred to a private water users group. Fish, Wildlife and Parks have worked with DNRC personnel to insure continued public access. It is important that public access to Petrolia Reservoir is maintained as it is the only walleye fishery in the area and is a popular recreation area. This issue is still unresolved. Shoreline seining surveys indicate forage fish numbers in Petrolia are extremely low, so further enhancement of the forage base is needed. Spottail shiners were stocked in June 1996, since the numbers of this species introduced in 1995 were insufficient to establish a population. Walleye should be stocked at similar rates to those of the past few years. Christmas tree structures for yellow perch need to be monitored to determine use, longevity and the need for additional structures.

East Fork Reservoir should continue to be monitored to determine if additional management is needed. Supplementation of forage, changes in harvest regulations and introduction of other game species may be needed.

Several ponds sampled this year are not conducive to electrofishing due to high conductivities. These include Benes, Dry Wolf and Hopalong. South Fork Blood and Dry Blood could be electrofished since conductivities are lower (Table 8). A trammel net set in South Fork Blood caught similar numbers of 9-10 inch bass as found in a standard experimental gill net but smaller bass were only caught in the gill net. It is possible trammel nets would be more effective than gill nets for larger bass which were probably not in the pond due to past winter kill.

Benes' pond needs a better forage base for northern pike. An EA was prepared for yellow perch introduction and a few yellow perch were introduced in June 1996. More yellow perch will need to be introduced in 1997. According to Bill Wiedenheft (personal communication) yellow perch and northern pike grow well and reproduce in high conductivity waters like Benes' and many waters in northeastern Montana have successful northern pike/yellow perch fisheries. Largemouth bass may grow well but would probably not reproduce due to high conductivity.

Fish, Wildlife and Parks met with the BLM in March 1996 to consider enhancement activities for fisheries in the Judith Resource Area. The BLM is investigating the possibility of increasing the depth of both Blood Reservoirs. Deepening Drag Reservoir will also be investigated, but is unlikely due to previous dam damage, drainage orientation and the age of the dam's outlet structure. BLM personnel thought there may be two other ponds with potential for fisheries. These will be investigated.

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LITERATURE CITED

Goeman, Tim. 1993. Parameters used to determine year-class strength. Minn. DNR. Pers. comm.

Hill, W. J. 1995. Creel Census - Lake Frances and Tiber Reservoir. Statewide Fisheries Investigations. Project 3491. Montana Department of Fish, Wildlife and Parks, Job Progress Report. 9 pp.

Hill, W. J., G. A. Liknes, A. Tews and P. D. Hamlin. 1995. Northcentral Montana warm and coolwater ecosystems. Montana Department of Fish, Wildlife and Parks. Job Progress Report F-78-R-1. 31 pp.

Hill, W. J., and G. A. Liknes. 1994. Northcentral Montana warmwater lakes investigations. Montana Department of Fish, Wildlife and Parks. Job Progress Report F-46-R-7, Job No. IV-b. 22 pp.

Hill, W. J., S. A. Leathe, and G. A. Liknes. 1988. Survey and Inventory of warm water lakes. Northcentral Montana Warmwater Lakes Investigations. Montana Department of Fish, Wildlife and Parks. Job Progress Report F-46-R-2, Job No. IV-b.

Leathe, S. A. 1996. An environmental analysis relating to the introduction of cisco into Tiber Reservoir. MDFWP.

Liknes, G. A. 1993. Computer program to determine age composition of fish. MDFWP. Pers. comm.

Liknes, G. A., A. Tews, and W. J. Hill. 1996. Northcentral Montana Coldwater Lake Ecosystems. Montana Department of Fish, Wildlife and Parks. Job Progress Report F-78-R-2.

Mackay, W. C., G. R. Ash, and H. J. Norris (eds.). 1990. Fish ageing methods for Alberta. RL&L Environmental Services Ltd. in association with Alberta Fish and Wildlife Division and University of Alberta, Edmonton. 113 pp.

Ricker, W. E. 1975. Computation and interpretation of biological statistics of fish populations. Bull. 191. Fish. Res. Bd. Canada. 382 pp.

Wiedenheft, William. Fisheries Manager, MDFWP, Glasgow, MT.

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DATE: October 1996

PRINCIPAL FISH SPECIES INVOLVED: Walleye, northern pike, yellow perch, spottail shiner, largemouth bass.

CODE NUMBERS OF WATERS REFERRED TO IN REPORT:

14-7080	Bynum Reservoir
14-7440	Lake Frances
14-9240	Tiber Reservoir
16-4461	Benes Pond #3
16-4950	East Fork Spring Creek Reservoir
16-8986	Wolf Coulee
17-4864	Missouri River Sec. 07
18-7560	Drag Reservoir
18-7565	Dry Blood Reservoir
18-7920	Hopalong Reservoir
18-8720	Petrolia Reservoir
18-9150	South Fork Blood Reservoir
20-7950	Pishkun Reservoir

Appendix I. Forage fish/reproduction beach seining survey results for several Region 4 reservoirs during August, 1995.

Water	Date	Water temp(°F)	No.of pulls	Number of fish/pull												
				YP	SS	WSu	Cray	WE	NP	Carp	MSc	Ling	FHM	LC	ES	SB	FHC
Bynum Res.	8/15	64°	16	0.8	12.5	0.4	Tr										
LakeFrances	8/14	61°	17	77.6	41.2	2.2	0.7	7.5	1.8								
PishkunRes.	8/16	61°	15	59.2	11.5	20.4	0.9										
Tiber Res																	
Dam	8/21	70°	16	21.8	69.8	2.0	0.8	0.3	0.1	4.4	0.3						
WCA	8/22	65°	17	148.5	226.2	2.3	0.9	2.1	0.1	26.5					0.2	5.2	
BT	8/23	67°	18	120.4	113.7	7.3	0.4	2.2	0.1	13.6	0.1	0.1	0.1		0.1		0.1
Devon	8/24	69°	16	16.8	139.9	0.1		10.9	0.1	0.1	0.5			4.4	0.8		0.1
Tiber combined			67	79.2	138.0	3.0	0.6	3.8	0.1	11.5	0.2	Tr.	Tr.	1.1	0.3	1.3	Tr.

Appendix II. Gill net summaries by area of Tiber Reservoir (1995).

Area (Date)	No. of nets	Hours fished	Species	No. of fish	Length range(avg)	Weight range(avg)
WCA Area (9/19/95)	11	17.96	WE	34	8.6-12.9(11.5)	0.21- 0.74(0.49)
				56	13.0-15.7(14.3)	0.66- 1.36(0.96)
				14	16.2-18.8(17.5)	1.29- 2.20(1.80)
				1	(28.0)	(9.60)
			NP	9	18.0-19.9(19.1)	1.28- 1.92(1.65)
				15	20.0-24.0(21.8)	2.07- 2.72(2.30)
			YP	90	5.0- 8.2(5.8)	0.05- 0.24(0.08)
				8	9.4-10.5(10.0)	0.36- 0.58(0.45)
			Carp	2	25.1-27.3(26.2)	8.40-11.70(10.05)
			Rb	3	18.8-19.9(19.4)	2.30- 2.65(2.48)
			WSu	3	11.0-12.2(11.7)	0.62- 0.79(0.70)
				27	13.2-19.7(16.1)	1.03- 3.45(1.93)
Dam area (9/20/95)	6	18.25	WE	6	9.5-12.3(11.4)	0.26- 0.60(0.48)
				14	13.4-15.1(14.2)	0.76- 1.20(0.94)
				5	17.4-19.1(18.1)	1.64- 2.42(2.01)
			NP	5	17.0-19.6(18.1)	0.90- 1.73(1.25)
				9	20.7-34.4(25.4)	1.84-10.60(4.24)
			YP	11	5.5- 6.2(5.9)	0.07- 0.09(0.08)
				1	(9.1)	(0.34)
			WSu	1	(6.3)	(0.09)
				16	13.2-18.5(16.2)	0.93- 2.90(1.95)
			LnSu	1	(19.6)	(2.95)
			Rb	2	20.2-20.6(20.4)	2.44- 2.50(2.47)
			Carp	1	(30.6)	(18.30)
[redacted] Area (9/20-21/95)	6	18.50	WE	12	8.2-12.6(11.0)	0.14- 0.64(0.42)
				7	13.2-14.4(13.8)	0.72- 0.92(0.79)
				4	17.5-19.2(18.2)	1.79- 2.29(2.01)
				1	(20.0)	(2.35)
			NP	5	14.6-15.7(15.2)	0.70- 0.97(0.78)
				3	16.9-17.6(17.3)	0.96- 1.14(1.06)
				7	20.2-27.6(22.7)	1.48- 5.70(2.68)
			YP	16	5.7- 8.9(6.0)	0.06- 0.32(0.09)
				5	9.1-10.2(9.6)	0.34- 0.57(0.42)
				1	(11.2)	(0.79)
			WSu	7	14.9-19.2(16.5)	1.48- 3.26(2.00)
			Rb	1	(13.4)	(1.02)
			Carp	1	(27.4)	(11.60)
Devon Area (9/21/95)	5	19.75	WE	7	7.2-11.9(9.5)	0.14- 0.64(0.42)
				5	13.1-14.4(13.8)	0.74- 0.87(0.76)
			NP	5	14.6-15.7(15.2)	0.70- 0.97(0.78)
				3	16.9-17.6(17.3)	0.96- 1.14(1.06)
				7	20.2-27.6(22.7)	1.48- 5.70(2.68)
			LnSu	1	(13.0)	(0.79)
			WSu	1	(15.1)	(1.46)
			Rb	1	(13.4)	(0.92)
			YP	4	6.0- 8.0(7.4)	0.08- 0.25(0.18)
				3	9.2-10.3(9.6)	0.34- 0.57(0.45)
				1	(11.5)	(0.53)

Appendix III. Age composition of walleye captured in fall gill nets on Bynum Reservoir, 1991-1995.

Year	No. of spines	No.of nets	Number of fish per age per gill net set									
			1	2	3	4	5	6	7	8	9	Totals
1991	14	4	1.00		0.50	1.75		1.25				4.50
1992	23	4		1.50	3.50	0.50	0.50	0.50				6.50
1993	45	4		4.00	7.50	0.50	1.18		0.33	0.25		13.76
1994	26	4		0.50	1.38	4.13	0.25	0.25			0.25	6.76
1995	94	10	3.10	0.10	0.31	3.69	1.97	0.53		0.10		9.80
Mean catch for each age class			0.82	1.22	2.64	2.11	0.78	0.51	0.07	0.07	0.05	8.27
Avg % contribution by each age class			.099	.148	.319	.255	.094	.062	.008	.008	.006	.999

Appendix IV. Age composition of walleye captured in fall gill nets in Lake Frances, 1991-1995.

Year	No. of spines	No.of nets	Number of fish per age per gill net set												Totals
			1	2	3	4	5	6	7	8	9	10	11	12	
1991	41	6	0.67	0.83	2.00	1.50	0.83	0.50		0.33	0.17				6.83
1992	24	12		0.33	0.94	0.39		0.42	0.08					2.16	
1993	45	10		0.70	1.30	0.70	0.80	0.10	0.30	0.30	0.20	0.30			5.40
1994	54	10		0.20	0.68	1.44	1.09	0.41	0.30	0.61	0.78		0.10	0.20	5.81
1995	57	20	0.65	0.05	0.40	0.40	0.25	0.45	0.20		0.25	0.10	0.05	0.05	2.85
Mean catch for each age class			0.26	0.42	1.06	0.89	0.59	0.38	0.18	0.25	0.28	0.08	0.03	0.05	4.47
Avg % contribution by each age class			.058	.094	.237	.199	.132	.085	.040	.056	.063	.018	.007	.011	1.000

Appendix V. Age composition of walleye captured in fall gill nets on Tiber Reservoir, 1991-1995.

Year	No.of spines	No.of nets	Number of fish per age per gill net set													
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	Total
1991	105	24	0.91	4.18	2.12	1.44	1.05	0.42	0.36	0.15	0.05	0.04				0.04	10.76
1992	102	25		1.70	3.22	1.14	0.93	0.69	0.60		0.04						8.32
1993	92	25	0.28	0.59	2.80	0.72	0.68	0.44	0.33	0.13							5.97
1994	66	25		0.38	1.65	0.37	0.12	0.13		0.09	0.05	0.04	0.04	0.04			2.91
1995	97	28	0.18	0.48	1.58	2.13	0.92	0.23	0.26	0.08	0.04						5.90
Mean catch for each age class			0.27	1.47	2.27	1.16	0.74	0.38	0.31	0.09	0.04	0.02	0.01	0.01		0.01	6.78
Avg % contribution by ea. age class			.040	.217	.335	.171	.109	.056	.046	.013	.006	.003	.001	.001		.001	.999