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

STATE: Montana PROJECT NO. F-78-R-1
PROJECT TITLE: Statewide Fisheries Investigations
JOB TITLE: Northcentral Montana Warm and Coolwater Ecosystems

PERIOD COVERED: July 1, 1994, through June 30, 1995

ABSTRACT

Fisheries investigations were carried out on 13 warm/coolwater ecosystems during the report period. Natural reproduction of walleye was documented for the second consecutive year in Bynum Reservoir. Exploitation of walleye for the first year following tagging is comparable at Bynum Reservoir and Lake Frances, but is only one half the rate found at Tiber Reservoir. Walleye tagged in the Willow Creek Arm of Tiber are exploited at a higher rate that those tagged in the Devon area. Forage fish populations increased slightly at Bynum, Pishkun and Tiber Reservoirs. Over 2700 spines and fin rays from walleye and northern pike were analyzed and ages determined. Yellow perch spawning structures were installed in Tiber Reservoir. Water levels of Lewistown ponds and reservoirs were generally high in the spring but were low by the fall of 1994. Yellow perch and possibly walleye reproduction were documented in Petrolia Reservoir. East Fork Reservoir is now considered a warmwater fishery, since the major game fish are northern pike and yellow perch. Reproduction of both of these species was documented. White suckers have increased dramatically in size in East Fork after northern pike were illegally introduced. Jakes Reservoir contains many stunted yellow perch, Payola Reservoir exhibits a diversified warmwater fishery and evidence of overwintering of largemouth bass was found in Catfish Reservoir.

OBJECTIVES

1. To identify and monitor the characteristics and trends of fish populations, angler harvest and preferences, 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.

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 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. Northern pike pelvic fin rays and walleye dorsal spines were mounted and sectioned according to methods described by Mackay et al (1990). Floy T-tags were used on northern pike, while Floy Cinch-up tags were used on walleye along with some T-tags. Pelvic fins were clipped on some walleye to help determine tag loss in future surveys. 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; SB=brook stickleback; MSc=mottled sculpin; WSu=white sucker; LnSu=longnose sucker.

FINDINGS

CHOTEAU AREA WATERS

Bynum Reservoir

Four to nine trap nets were fished nightly from April 5-11, 1994, for a total of 50 trap net nights. Water temperatures ranged from 40-48°F. during the surveys. Traps caught a total of 617 walleye, 45 yellow perch, 6,160 white sucker and 3 brook trout. A total of 483 walleye, ranging in length from 13.2 to 22.9 inches, were

tagged to assist in harvest determinations. Lengths and weights of the miscellaneous species taken are on file in the Choteau field office.

Anglers returned tags from 47 walleye caught in Bynum during 1994, representing fish tagged from 1990 to 1994 (Table 1). The harvest for 1994 tagged fish was 4.8 percent. Cumulative harvest ranges from 7.5 - 24.3 percent for earlier years.

Bynum water levels remained fairly stable throughout the summer with a slight decrease noted by the end of the irrigation season. Because spottail shiner numbers decreased to low levels in 1993, approximately 5500 yearling and adult fish were transferred from Tiber Reservoir on June 9, 1994. Surveys conducted on August 17, 1994, captured four forage species (Figure 1, Appendix I). Forage for walleye appears adequate as slight increases in yellow perch and spottail shiner were noted when compared with 1993 results. Natural reproduction of walleye was documented for the second consecutive year in lieu of stocking from the hatchery.

Table 1. Angler exploitation of walleye and northern pike in area reservoirs. (Based on voluntary tag returns, 1990-1994).

Lake	Species	Year tagged	Number tagged	Number of returns (%) 1990	1991	1992	1993	1994	Cumulative
Bynum Res.	WE	1990	219	14(6.4)	4(1.8)	8(3.7)	3(1.4)	1(0.5)	30(13.7)
		1991	226		12(5.3)	23(10.2)	4(1.8)	8(3.5)	47(20.8)
		1992	256			47(18.4)	9(3.5)	6(2.4)	62(24.3)
		1993	225				8(3.6)	9(4.0)	17(7.5)
		1994	483					23(4.8)	23(4.8)
Lake Frances	WE	1992	242			21(8.7)	12(4.9)	10(4.1)	43(17.8)
		1993	250				19(7.6)	7(2.8)	26(10.4)
		1994	242					12(4.9)	12(4.9)
	NP	1992	66			7(10.6)	1(1.5)	0(0.0)	8(12.1)
		1993	76				3(3.9)	4(5.3)	7(9.2)
		1994	310					17(5.4)	17(5.4)
Pishkun Res.	NP	1992	80			13(16.2)	3(3.8)	4(5.0)	20(25.0)
		1993	157				27(17.2)	12(7.6)	39(24.8)
Tiber Res.	WE	1990	271	19(7.0)	18(6.6)	3(1.1)	4(1.5)	3(1.1)	47(20.4)
		1991	692		70(10.1)	21(3.0)	15(2.2)	8(1.2)	114(16.5)
		1992	266			15(5.6)	20(7.6)	11(4.1)	46(17.3)
		1993	398				35(8.8)	26(6.5)	61(15.3)
		1994	461					49(10.6)	49(10.6)
	NP	1990	346	33(9.5)	7(2.0)	0(0.0)	1(0.3)	0(0.0)	41(11.8)
		1991	314		32(10.2)	5(1.6)	2(0.6)	2(0.6)	41(13.0)
		1992	99			6(6.1)	5(5.0)	3(3.0)	14(14.1)
		1993	225				21(9.3)	11(4.8)	32(14.2)
		1994	153					25(17.6)	25(17.6)

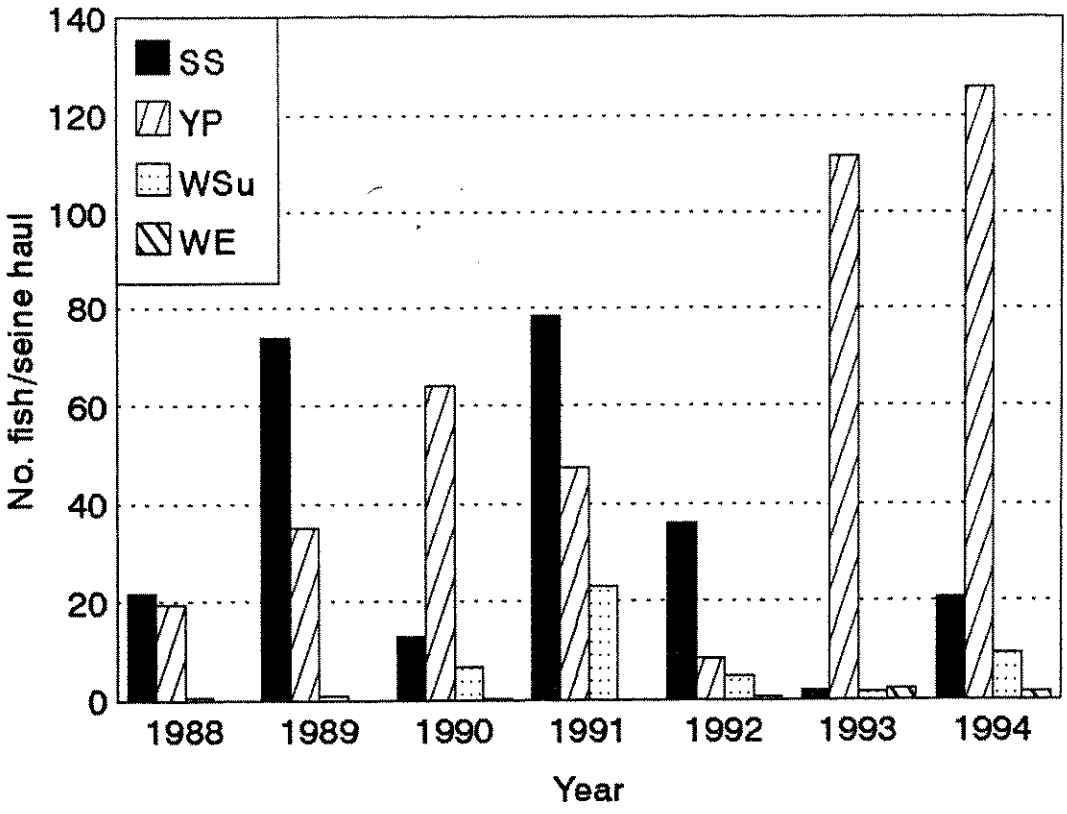

Figure 1. Forage fish trends in Bynum Reservoir, 1988-1994.

The gill net survey of September 13, 1994, shows that white sucker were most abundant followed by yellow perch (Table 2). Trend information depicted in Figure 2 shows that walleye numbers have decreased slightly while perch and sucker numbers have increased. Of 20 walleye stomachs analyzed, half had unidentified fish remains (either perch or spottail shiner), six had crayfish, three had perch and six were empty. A total of 366 crayfish were also taken in the gill nets.

Lake Frances

Trap nets (overnight sets) and gill nets (one-hour daytime sets) were fished from April 11-20, 1994, to monitor trends in the walleye and northern pike populations and to obtain fish for tagging purposes. A total of 310 northern pike and 242 walleye were tagged, while an additional 28 yellow perch, 8 burbot and 35 white sucker were taken in the two types of sampling gear. Walleye averaged 17.3 inches and 1.71 pounds while northern pike averaged 18.8 inches and 1.64 pounds. Lengths and weights of the other species taken are on file in the Choteau office. Water temperatures ranged from 42-48°F. during the surveys.

Anglers voluntarily returned tags from 29 walleye and 21 northern pike (Table 1) during the report period. Walleye from the 1994 tagging year were harvested at a rate of 4.9 percent while the rate for northern pike was 5.4 percent. Cumulative harvest is

Table 2. Overnight gill netting results in warm water reservoirs in the western portion of Region Four, 1994.

Water (date sampled)	Surface acres 1/	No. of nets 2/	Mean hrs/net	Species	No. of fish	Length range (avg.)	Weight range (avg.)
Bynum Res. (9/13/94)	2,000	4 S	20.3	WE	2	8.6- 9.9 (9.3)	0.19- 0.31 (0.25)
					15	13.5-15.9 (14.8)	0.90- 1.41 (1.13)
					9	16.2-17.1 (16.7)	1.45- 2.07 (1.65)
					1	(23.6)	(4.13)
				YP	12	5.8- 8.8 (7.0)	0.10- 0.40 (0.20)
					56	9.0-10.9 (10.1)	0.30- 0.82 (0.58)
					5	11.0-11.5 (11.1)	0.75- 0.94 (0.82)
				WSu	52	6.4-12.3 (9.3)	0.12- 0.99 (0.46)
					125	13.1-18.6 (15.7)	1.06- 3.04 (1.95)
Lake Frances (9/14/94)	3,000	10 S	15.3	WE	9	7.3-12.9 (11.0)	0.08- 0.71 (0.45)
					14	13.0-15.5 (14.4)	0.78- 1.30 (1.00)
					30	16.0-19.9 (17.9)	1.41- 2.76 (2.01)
					6	20.0-25.7 (22.1)	2.75- 6.50 (4.13)
				NP	12	9.1-15.7 (13.5)	0.20- 0.73 (0.51)
					22	16.0-19.8 (18.2)	0.78- 1.96 (1.39)
					13	20.0-26.2 (21.6)	1.72- 3.90 (2.26)
				Rb	1	(18.5)	(2.95)
				YP	40	4.9- 8.9 (6.9)	0.05- 0.31 (0.16)
					18	9.5-10.9 (10.2)	0.42- 0.78 (0.56)
					5	11.0-12.2 (11.4)	0.66- 1.13 (0.85)
				WSu	4	16.2-18.7 (17.6)	2.29- 3.38 (2.94)
Tiber Res. (9/19-22/94)	15,900	25 S	18.3	WE	37	7.0-12.7 (10.8)	0.10- 0.64 (0.39)
					26	13.0-15.5 (13.7)	0.55- 1.23 (0.80)
					8	17.1-19.7 (18.7)	1.44- 2.95 (2.25)
					2	20.2-21.9 (21.1)	3.12- 3.75 (3.42)
				NP	9	10.1-15.9 (12.3)	0.20- 0.84 (0.44)
					16	16.3-19.7 (17.9)	0.79- 1.54 (1.18)
					13	20.2-30.6 (26.5)	2.06- 9.00 (4.89)
				YP	141	5.1- 8.9 (7.0)	0.05- 0.35 (0.16)
					10	9.0-10.9 (9.8)	0.38- 0.67 (0.47)
					3	11.0-11.3 (11.2)	0.67- 0.73 (0.70)
				Rb	10	13.7-21.6 (16.7)	1.01- 3.24 (1.78)
				SNS	1	(41.0)	(13.70)
				Ling	1	(21.0)	(1.42)
				Carp	2	5.0-23.3 (-)	0.08- 7.50 (-)
				WSu	24	7.0-14.7 (12.2)	0.12- 1.56 (0.79)
					19	15.1-19.2 (16.7)	1.49- 3.08 (2.07)
				LnSu	10	6.9-20.4 (15.1)	0.12- 3.44 (1.72)

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

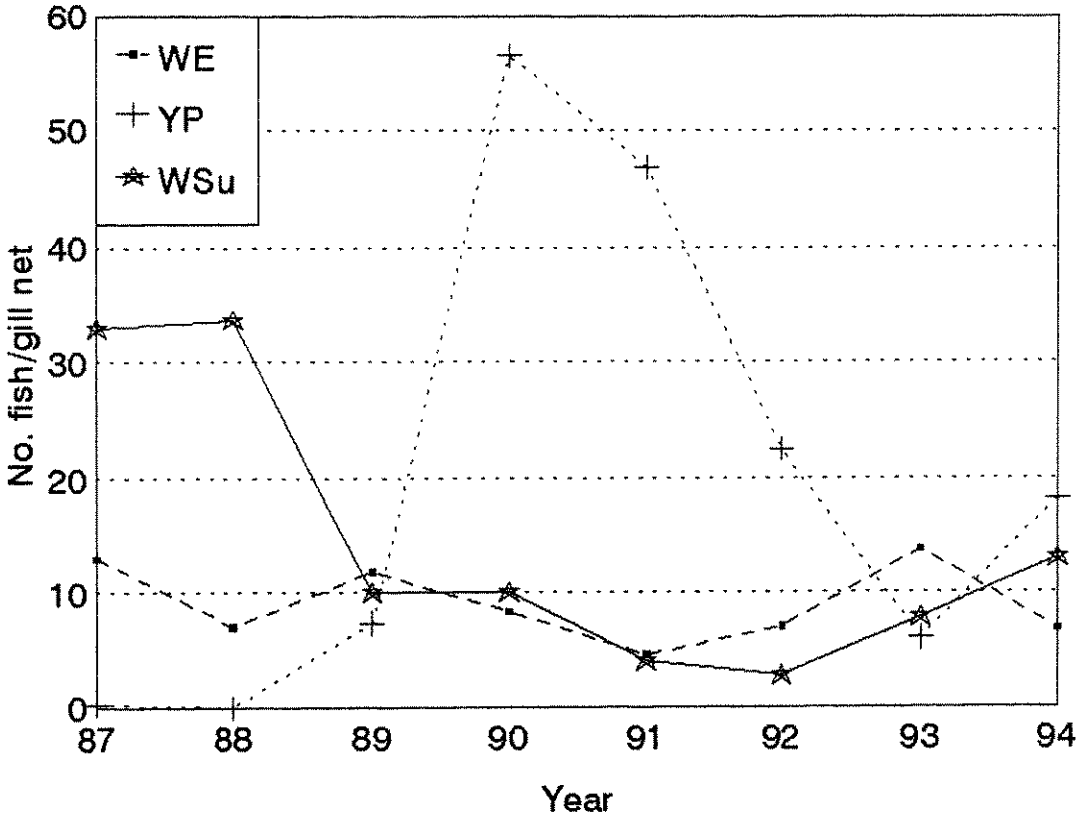

Figure 2. Trends of Bynum Reservoir fish populations (fall gill nets, 1987-1994).

approximately 18 and 12 percent, respectively, for walleye and northern pike tagged in 1992.

A total of 16 seine hauls were made on August 16, 1994, to monitor trends in forage fish numbers. Five species of forage fishes along with young-of-the-year walleye and northern pike were taken (Appendix I). Examination of Figure 3 indicates that spottail shiner have predominated since 1989. The 1992 survey produced over 700 spottail shiner per seine haul. (This information is not graphed to simplify the scale used). Information for 1993 has not been plotted because of vegetation problems encountered (Hill & Liknes, 1994). Yellow perch numbers continue to decrease, a trend beginning in 1991.

Ten overnight gill nets were fished in Lake Frances September 14, 1994. Yellow perch were most abundant, followed closely by walleye and northern pike (Table 2). Trend information since 1972 is shown in Figures 4 and 5 and walleye and yellow perch populations appear to be increasing gradually. A total of 215 crayfish were also taken in the gill nets.

A total of 22 walleye and 23 northern pike stomachs were analyzed for food content. Approximately 32 percent of walleye and 13 percent of northern pike stomachs were empty. Unidentified fish remains (presumably yellow perch and spottail shiner) were most common in walleye stomachs while crayfish were most readily taken

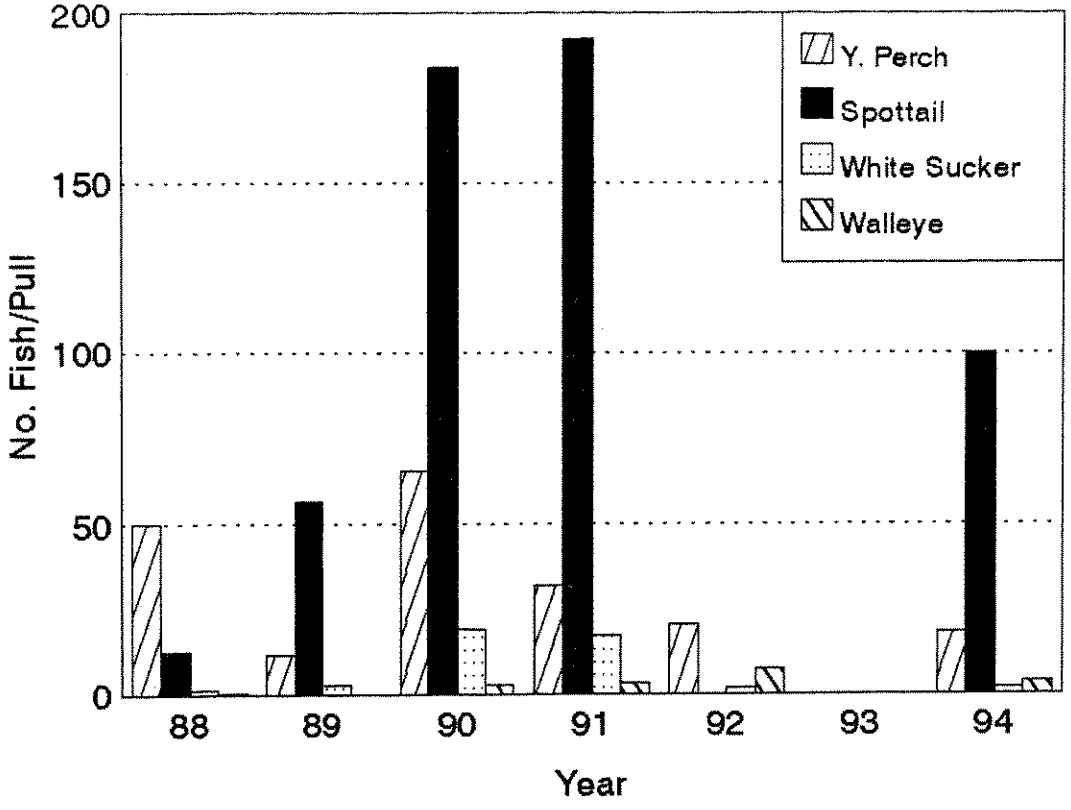

Figure 3. Forage fish trends in Lake Frances, 1988-1994.

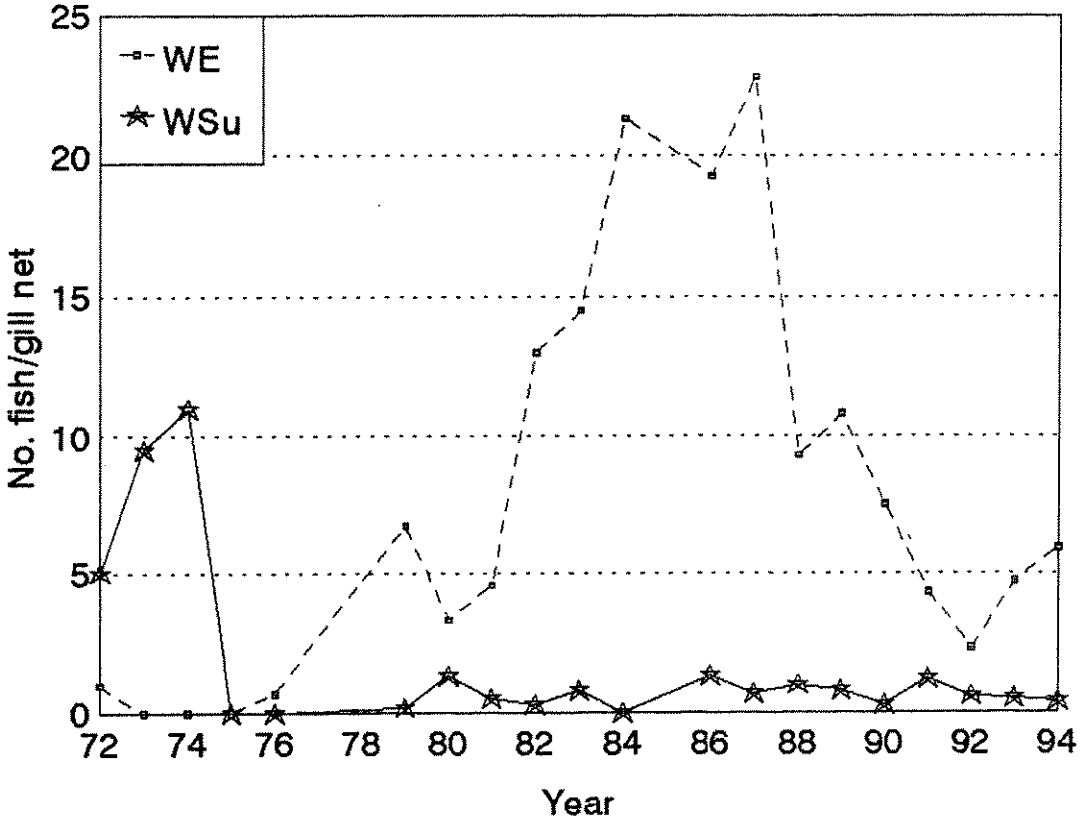

Figure 4. Trends of walleye and white sucker, Lake Frances (fall gill nets, 1972-1994).

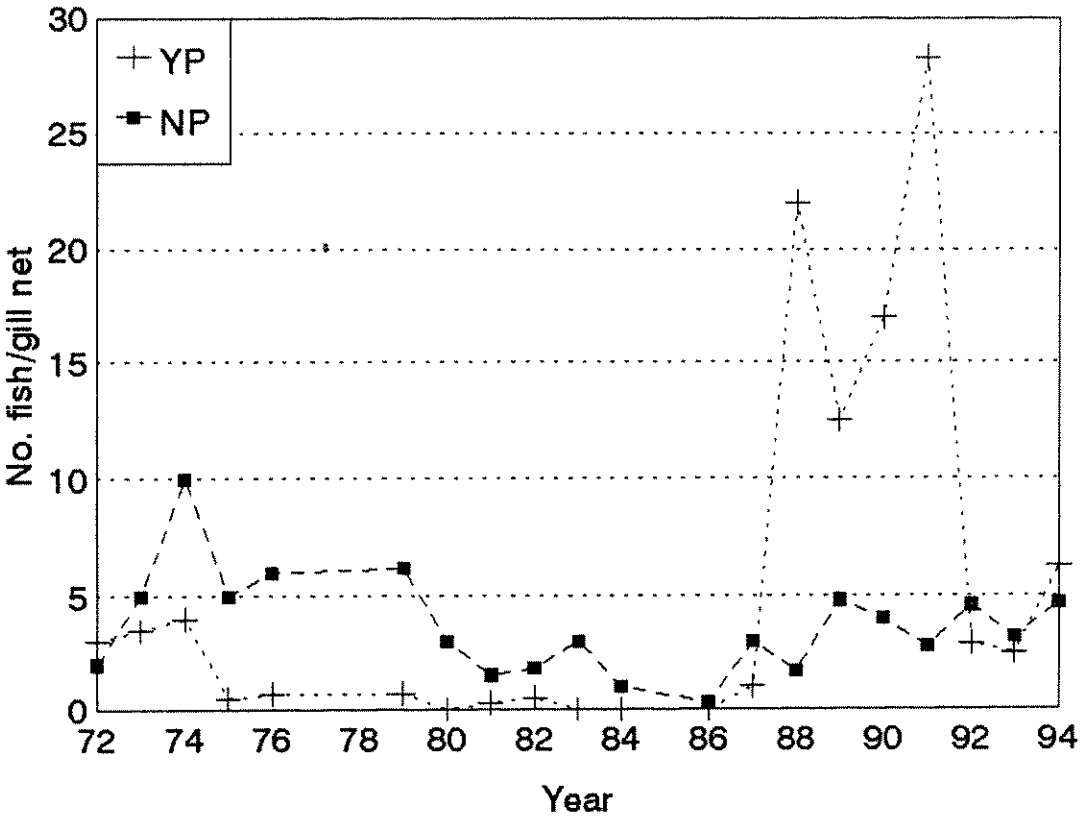

Figure 5. Trends of northern pike and yellow perch, Lake Frances (fall gill nets, 1972-1994).

by northern pike. Other items include spottail shiner, walleye, northern pike and vegetation. A tapeworm was also observed in a walleye stomach.

Pishkun Reservoir

During the report period, anglers returned 16 tags from northern pike tagged in 1992 and 1993. The cumulative return for these years is now approximately 25 percent (Table 1).

Forage fish numbers were sampled on August 15, 1994, with yellow perch and white sucker taken in comparable numbers (Appendix I). Examination of Figure 6 shows an increase in yellow perch and white sucker in 1994 following a decline since 1989.

Gill netting results for this water are presented in another document (Liknes et al, 1995).

Tiber Reservoir

Annual trap netting investigations to monitor trends in game fish populations were conducted from March 23 to April 2, 1994, in the Devon area and from April 14-16, 1994, in the Willow Creek Arm. A total of 125 trap net nights were fished between the two areas. Besides trapping in the lake, several miles of the Marias River above Tiber Reservoir was electrofished on five days to obtain

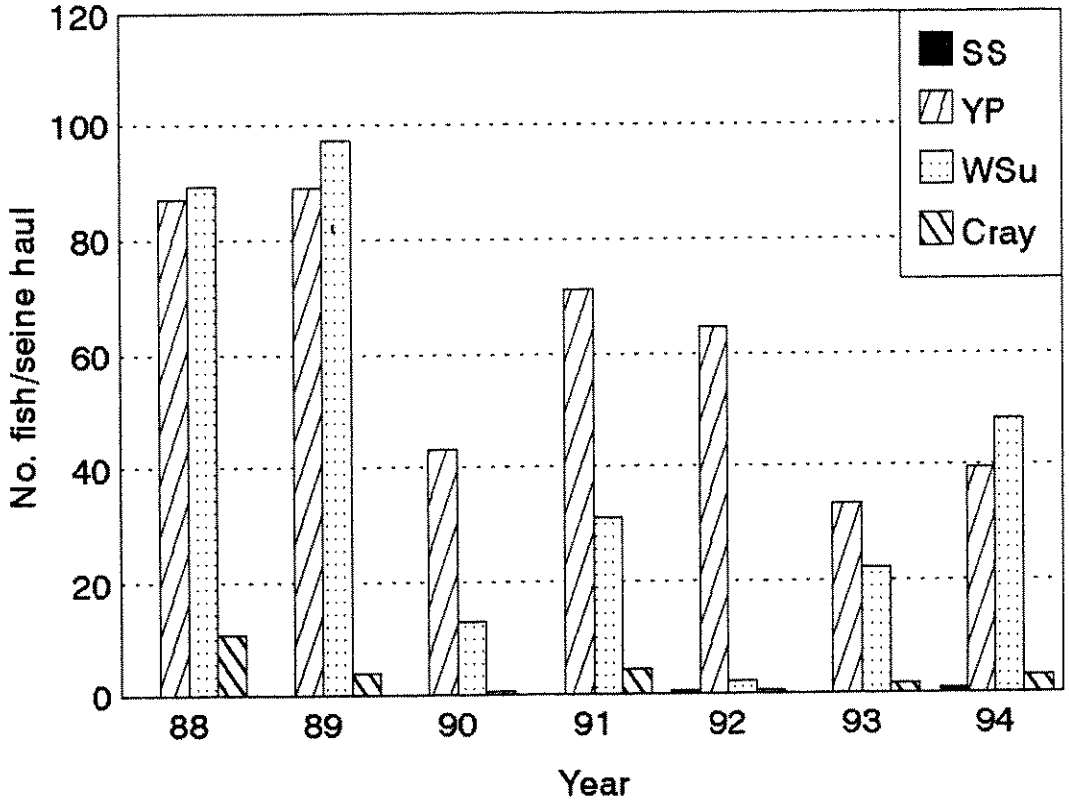

Figure 6. Forage fish trends in Pishkun Reservoir, 1988-1994.

additional walleye for tagging purposes.

In the Devon/Marias River area, a total of 419 walleye and 107 northern pike were tagged to assist in harvest and movement determinations. Walleye averaged 16.5 inches (range 14.0-26.0) and 1.49 pounds (range 0.70-6.75). Northern pike averaged 24.2 inches (range 17.2-32.7) and 3.68 pounds (range 1.25-12.75). Trap nets also captured 82 longnose sucker, 33 rainbow trout, 32 burbot, 27 white sucker, 25 carp, 6 yellow perch, 2 cutthroat trout and 1 channel catfish.

A total of 42 walleye and 46 northern pike were tagged in the Willow Creek Arm. Walleye in this area averaged larger than those in the Devon/Marias area, at 17.4 inches (range 14.1-21.0) and 1.75 pounds (range 0.83-3.09). Northern pike averaged 23.4 inches (range 19.6-27.6) and 3.24 pounds (range 1.87-5.05). Other species taken include 68 white sucker, 17 burbot, 2 carp and 1 rainbow trout.

Water levels remained fairly stable throughout the netting surveys with a slight increase occurring at the end of the period to elevation 2980.5 feet m.s.l. Water temperatures were quite cold (39-41°F.) until the end of March and then warmed to 46-48°F. for the remainder of the survey. Lengths and weights of miscellaneous species taken in both areas are on file in the Choteau field office.

During the report period, anglers returned tags representing several tagging years from 97 walleye and 41 northern pike (Table 1). Walleye tagged in 1994 were harvested at a rate of 10.6 percent and northern pike at 17.6 percent. Walleye tagged in the Devon/Marias areas were caught throughout the reservoir but a higher percentage occurred in the Willow Creek Arm (Table 3). Walleye tagged in the Willow Creek Arm were caught at nearly equal proportions in Willow Creek and Dam areas. Northern pike tagged at Devon were harvested mainly at the Bootlegger and Devon areas while the majority of those tagged in Willow Creek were taken in Willow Creek.

Table 3. Movement of 1994 tagged fish in Tiber Reservoir.

Species	Area tagged	No. tagged fish caught	Number caught by area				
			Marias	Devon	Bootlegger	Dam	WCA
Walleye	Devon	15		2	7	1	5
	Marias	18	4	4	1	2	7
	WCA	9				5	4
N. Pike	Devon	13	1	4	6	1	1
	WCA	10			1		9

Walleye and northern pike have been tagged in Tiber Reservoir for nearly twenty years. In some years, fish were tagged only in the Willow Creek Arm or only at Devon, while in other years fish were tagged in both areas. Table 4 compares first-year harvest for walleye by area tagged dating back to 1984. Fish tagged in the Willow Creek Arm generally have a greater harvest rate.

Forage fish surveys were conducted from August 22-25, 1994. A total of 66 seine hauls captured 12 species along with reproduction of walleye and northern pike (Appendix 1). Trends in yellow perch, spottail shiner and emerald shiner numbers are shown in Figure 7, covering a several year period. Yellow perch and spottail shiner are the main forage in Tiber with emerald shiner occurring in sufficient numbers on occasion. Examination of Figure 7 shows that spottail have rebounded since declines that occurred in 1992 and 1993. Yellow perch have gradually increased since 1991. Approximately 5500 spottail shiner were transferred to Bynum Reservoir on June 9, 1994.

A total of 25 overnight gill net sets were made throughout the reservoir from September 20-24, 1994 (Table 2). Yellow perch were

ble 4. Rate of exploitation (first-year) for walleye tagged at Devon and Willo
Creek Arm, 1984-94.

Year	Devon		Willow Creek Arm	
	No. tagged	% return	No. tagged	% return
1984	57	14.0	129	19.4
1985	41	12.1	252	9.5
1986	127	6.3	289	8.3
1987	259	7.7	250	12.0
1988	0	-	299	17.0
1990	141	5.7	130	7.7
1991	488	8.2	204	14.8
1992	267	5.6	0	-
1993	298	10.4	100	5.0
1994	419	9.3	42	23.8
Totals	2097	8.3	1695	12.3

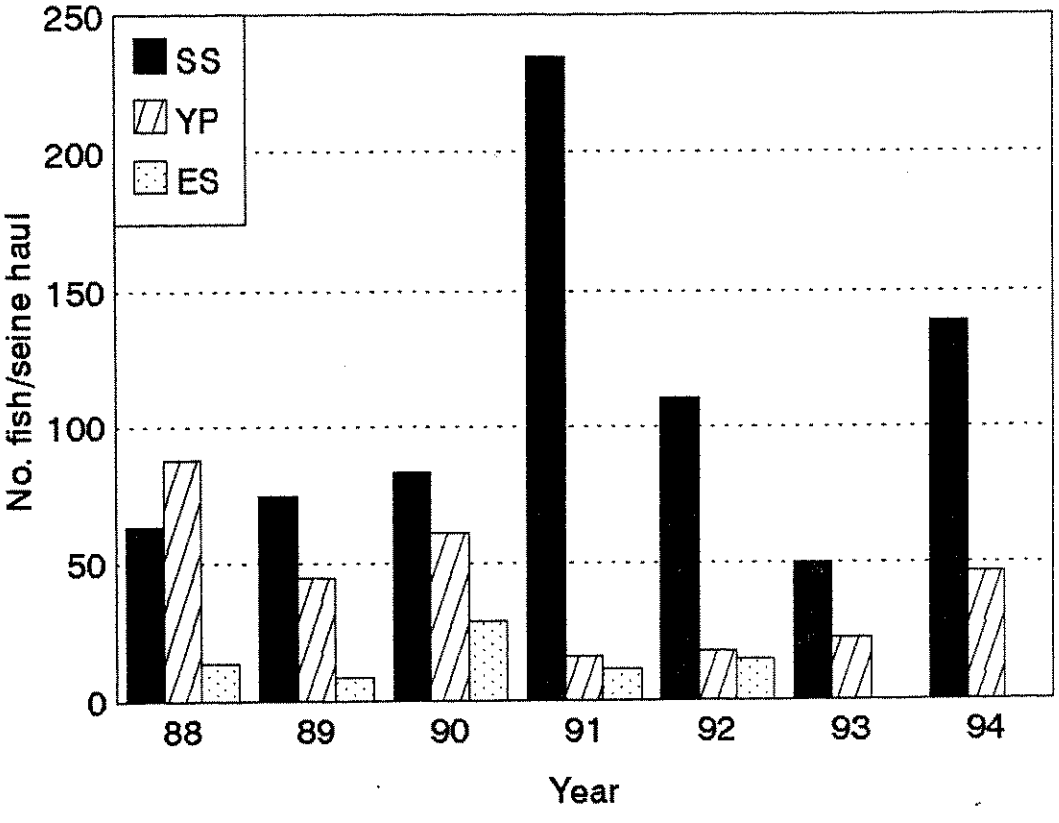

Figure 7. Forage fish trends in Tiber Reservoir, 1988-1994.

most abundant followed by walleye. The major predators, walleye and northern pike, were graphed with yellow perch and white sucker (Figures 8 and 9). Catch per net shows slight increases for all species except walleye. The walleye population is thought to be much higher than depicted in Figure 8 when based on catch rates of 0.72 fish/hour as reported in the 1994 creel report (Hill, 1995). Appendix II provides netting summaries for each of four areas of the reservoir. Only 2 crayfish were taken in the gill nets.

Examination of stomachs of walleye and northern pike taken in fall gill nets show a high occurrence of unidentified fish remains, thought to be mainly spottail shiner and some yellow perch. Approximately 36 percent of all walleye stomachs and 35 percent of all northern pike stomachs were empty. Identifiable yellow perch commonly occurred in both species. Rainbow trout, northern pike, burbot and walleye were also taken by northern pike, while spottail shiner were observed in walleye stomachs. Tapeworms were present in five walleye stomachs.

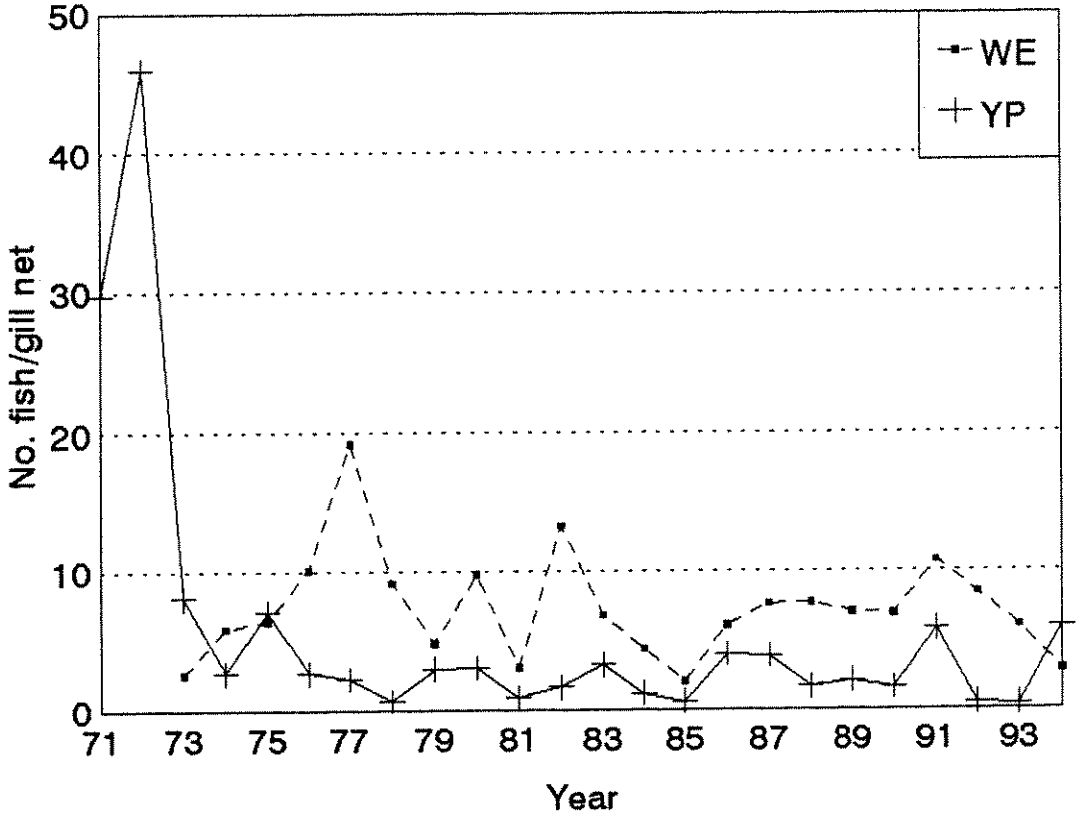

Figure 8. Trends of walleye and yellow perch, Tiber Reservoir (fall gill nets, 1971-1994).

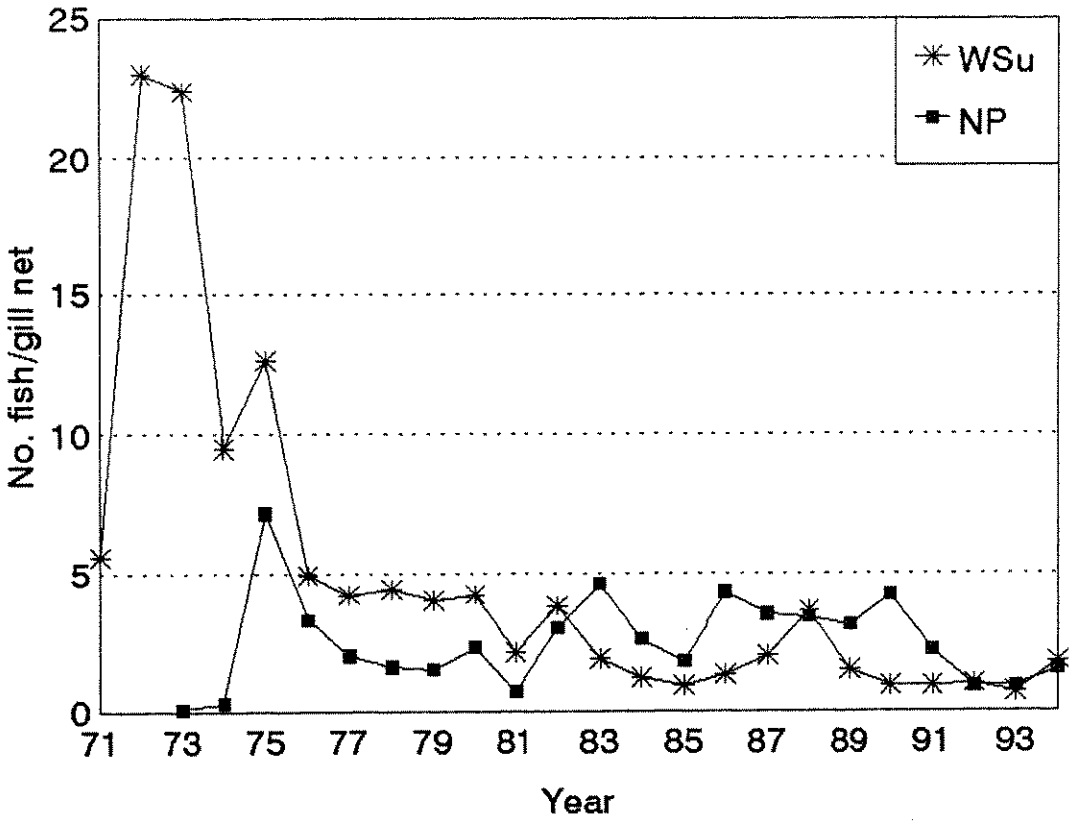

Figure 9. Trends of northern pike and white sucker, Tiber Reservoir (fall gill nets, 1971-1994).

During the summer of 1994, a number of anglers complained about the condition of walleye. Examination of Figure 10 shows average length has declined steadily since 1990 for all fish taken in fall gill nets. However, an increase in average length is noted if only fish over 14 inches are considered, suggesting strong year classes of younger aged fish.

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. A total of 30 artificial spawning structures for yellow perch were placed in the Bootlegger Trail area with assistance of the Tri-anglers Walleye Unlimited Club.

Creel Census

For the second consecutive year, weekend creel censuses were conducted at Tiber Reservoir and Lake Frances from Memorial Day through Labor Day. The data will be presented in a separate document.

Age and Growth

A total of 1789 walleye spines and 927 northern pike pelvic fin rays have been analyzed from collections made in 1991 through 1994,

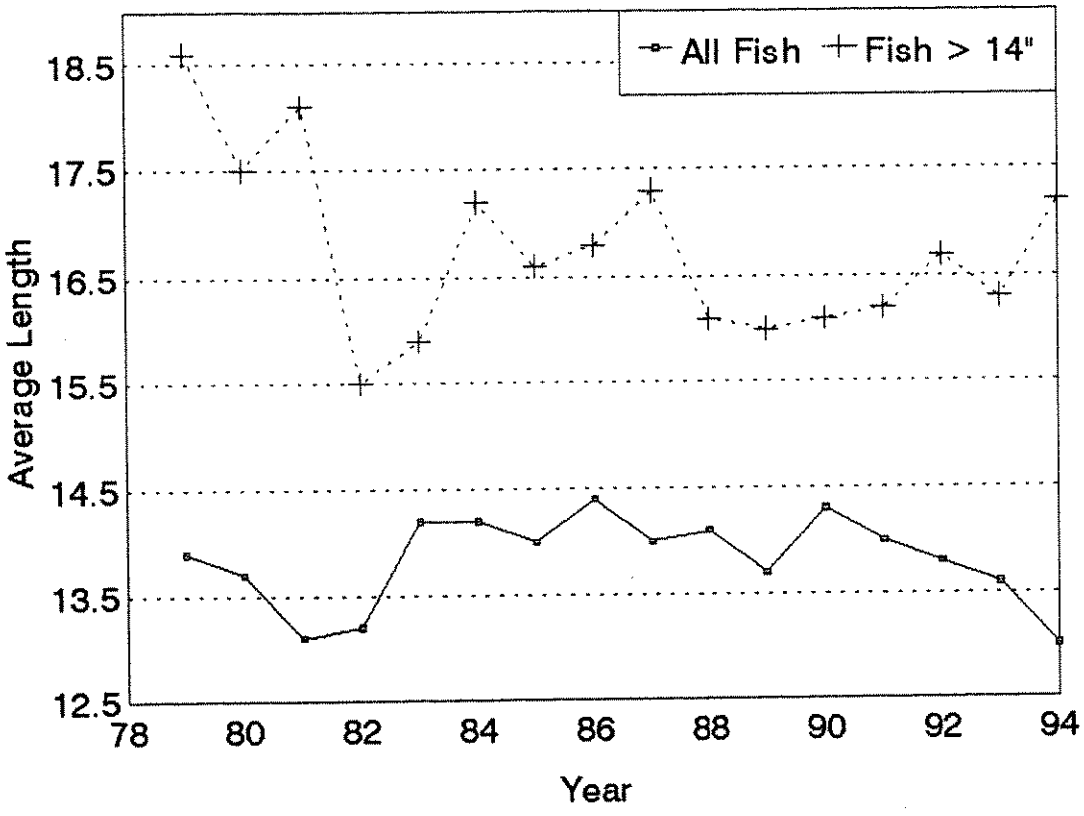

Figure 10. Average length of walleye from Tiber Reservoir (fall gill nets, 1978-1994).

from Lake Frances, Bynum, Pishkun and Tiber Reservoirs. Walleye collections include both spring and fall sampling while northern pike analysis is from spring surveys only. The analysis is presented in table form in Appendices 3 through 8 showing percent composition by age and average length by age.

Most of the fish sampled in the spring are mature fish and older than those taken in the fall. Walleye from Bynum Reservoir in the spring are predominantly ages 3 to 7 and in the fall are represented by ages 2 to 4. Lake Frances and Tiber Reservoir walleye are mainly ages 4 to 8 in the spring and ages 2 to 5 in the fall sampling. Northern pike from Lake Frances, Pishkun and Tiber Reservoirs are represented mostly by ages 2 to 5.

Walleye growth is best at Bynum Reservoir while Lake Frances and Tiber Reservoir are comparable. Pishkun and Tiber Reservoirs has better northern pike growth than does Lake Frances. The oldest walleye aged at Bynum Reservoir was nine years while a sixteen year old was taken at Lake Frances and a seventeen year old was aged in the Tiber Reservoir collection. Seven and eight year old northern pike, were aged from Lake Frances and Pishkun Reservoir, respectively, while a ten year old was taken at Tiber Reservoir.

A future report will present an index of year class strength for walleye taken in fall gill net samples.

Petrolia Reservoir

Yellow perch were the most common forage species caught during August seining and averaged 23.5 per haul. Small walleye and lake chub were also noted (Table 5). Large fish captured during seining included 7 carp, 2 walleye, 4 yellow perch and 1 white sucker. In 1995, MT FWP plans to introduce spottail shiners into Petrolia to diversify the forage fish population. An environmental assessment for this introduction was completed in 1994.

Table 5. Forage fish/reproductive surveys (number per pull) during 1994 beach seining of Lewistown area reservoirs.

Water	Date	Water temp(F°)	# of pulls	Species YP	WE	NP	LC	Carp	LND
Petrolia	8/1/94	76	12	23.5	1.4	-	1.5	0.2	0.1
East Fork	8/2/94	70	5	154.0	-	1.0	-	-	-

Four gill nets set on September 15 captured 31 walleye from 7.7 - 20.7 inches (Table 6). Five northern pike ranged from 12.8 - 18.5 inches. Numbers of game fish, while still low, were higher than in recent years (Figure 11). Longnose and white suckers remain at low levels.

Table 6. Overnight gill netting results in large lakes and reservoirs in north central Montana during 1994.

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 Fork Spring Creek Reservoir (8/20/94)	100	1F,1S	18.0	LL	1	-	(13.8)	-	(1.12)	-	(44.5)
				NP	3	26.2-34.8	(29.4)	4.38-11.0	(6.85)	21.3-28.8	(24.4)
				YP	30	5.5- 8.1	(6.8)	0.05-0.19	(0.11)	25.2-41.1	(33.3)
				WSu	53	9.3-12.8	(11.3)	0.26-0.75	(0.51)	28.4-42.8	(35.1)
				LnSu	1	-	(13.1)	-	(1.12)	-	(44.5)
Petrolia 9/15/94	500	1F,2S,1F/S	21.8	WE	5	7.7- 8.1	(7.8)	0.08-0.13	(0.10)	17.5-26.4	(20.4)
				WE	28	10.4-15.8	(13.2)	0.28-1.21	(0.70)	21.8-34.2	(29.3)
				WE	1	-	(20.7)	-	(2.95)	-	(
				NP	5	12.8-20.5	(23.0)	0.42-4.88	(3.20)	20.0-25.5	(21.7)
				YP	5	6.0-11.4	(8.2)	0.04-0.88	(0.30)	18.5-48.1	(34.0)
				Carp	3	4.9-23.5	(16.0)	-		-	

[1] F= Floater and S= Sinker;

Age structure of gill netted walleye was determined by cross-sectioned spines (Table 7). These walleye were slower growing than angler-caught walleye in Tiber and Francis Reservoirs (Hill 1994). For example Age 3 walleye averaged 12.7 inches in Tiber and 12.9 inches in Lake Frances, but were only 11.3 inches long in Petrolia.

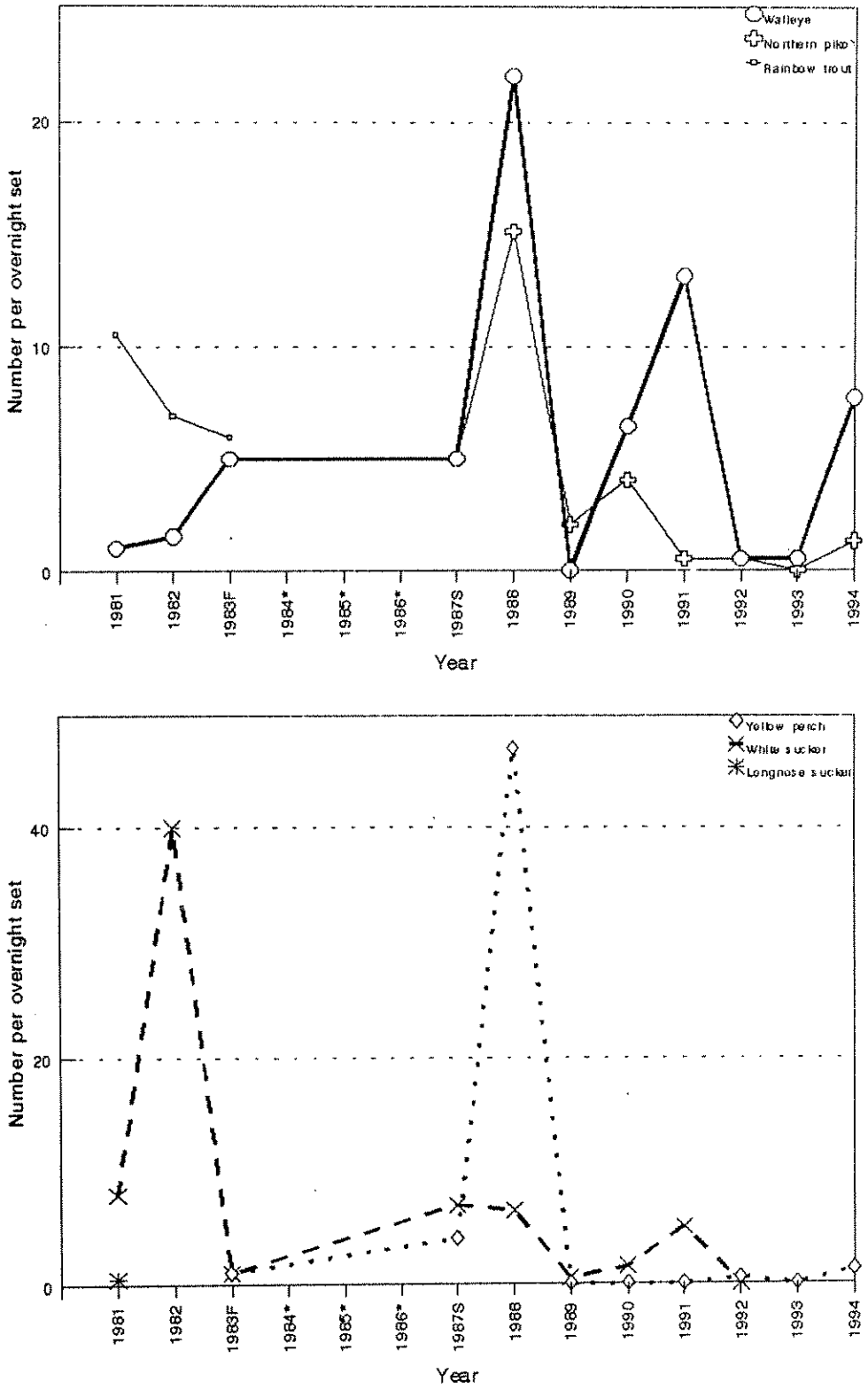

Figure 11. Fall gill netting trends from Petrolia Reservoir from 1981 - 1994. Sets include 1 floater and 1 sinker except marked as S = sinker only and F = floater only, * means not netted.

Table 7. Total length of walleye at age in Petrolia Reservoir.

Age	Length		Number
	Range	Average	
2	7.1- 8.1	7.9	4
3	10.4-12.3	11.3	6
4	12.4-15.4	13.7	11
5	12.3-15.6	13.8	7

These growth rates are difficult to compare since 10,000-20,000 one to two-inch walleye were stocked in Petrolia in 1991, 1993 and 1994, whereas Tiber and Lake Frances rely on natural reproduction. If spines were read correctly, there is evidence that walleye reproduce in Petrolia. Walleye were not stocked in 1989, 1990 or 1992 (Miles City Hatchery computer records). However, checks during stocking and poor spines may have resulted in incorrect aging.

Petrolia had good water levels throughout much of the summer, but was down several feet by September (Table 8). Water quality parameters are summarized in Table 8.

Table 8. Water quality parameters from warm water lakes and reservoirs in Central Montana in 1994.

Water	Date	Temp (°F)	Secchi (ft)	Maximum depth(ft)	Conductivity (uohms/cm)[1]	Comment
Catfish	6/20/94	72	5.0	20	4400	full
Drag	6/21/94	75	-	11-12	740	full
East Fork	8/2/94	70	-	-	1024	normal pool
Jakes	6/3/94	68	0.2	16	250	full
Holland	6/20/94	74	7.5	16	1778	fairly full
Payola	8/18/94	71	7.0	-	900	fairly low
Petrolia	8/1/94	76	-	-	1395	fairly full
	9/15/94	62	1.5	20+	1607	very low

[1] Conductivity corrected to 25 degrees C.

East Fork Reservoir

Reproductive surveys found high numbers of yellow perch and evidence of northern pike reproduction (Table 5). These were the only small fish captured. Yellow perch numbers would have been much higher, but their 1.5 - 2 inch length meant many escaped through the seine. In addition to small fish, 9 white suckers, 7 yellow perch and 1 northern pike were caught during seining.

Gill netting captured only one brown trout (Table 6) and catches have generally been low for brown trout since they were first stocked in 1981 (Figure 12). Northern pike gill net catch from 1994 was less than in 1993 (Figure 12) but they were a larger average total length than in previous years (Figure 13). Yellow perch catch skyrocketed in 1994 (Figure 12) and average size has decreased (Figure 13). White sucker gill net catch increased in 1994, but northern pike seem to be impacting the white suckers since they were illegally stocked in the late 1980's. White sucker average size has increased from just over 8 inches in 1990 to 11.3 inches in 1994 (Figure 14). White suckers have been the most frequently found food item in East Fork northern stomachs (Hill and Liknes, 1994) and were the only food found in pike stomachs in 1994. Longnose suckers continue to be extremely rare in the reservoir (Figure 12).

Small Lewistown Area Reservoirs

Four small warmwater reservoirs were gill netted in 1994 (Table 9). Water quality parameters for these reservoirs are summarized in Table 8. In general, reservoirs were full in the spring of 1994 due to extensive late summer and fall precipitation throughout central Montana in 1993. Lack of summer moisture resulted in low reservoir levels by fall 1994 (Table 8).

Table 9. Overnight gill netting and seining results in small warmwater reservoirs in north central Montana during 1994.

Water name (Date surveyed)	# of 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)
Catfish (6/20/94)	1 Sinker	19.2	No Fish							
	1 Seine		LmB	1	-	(6.1)	-	(0.10)		
			Tiger Salamander	2	-		-			
Holland (6/20/94)	1 Sinker	18.3	No Fish							
Jakes (6/2/94	1 Sinker	14.7	YP	97	5.2- 8.7	(6.0)	0.06-0.27	(0.09)	27.8-48.6	(38.0)
			WSu	2	14.0-16.9	(15.4)	1.16-2.55	(1.85)	42.3-52.8	(47.6)
			FCh	5	8.2- 9.5	(8.9)	0.22-0.35	(0.29)	33.4-43.9	(40.4)
	1 Seine		YP	49	2.9-6.7	(5.3)	-		-	
Fayola (8/18/94)	1 Sinker	19.2	LmB	1	-	(7.9)	-	(0.21)		
			YP	76	5.5-10.9	(9.1)	0.10-0.63	(0.39)	39.6-65.1	(51.3)
			BBh	13	8.5-10.5	(9.9)	0.34-0.64	(0.54)	47.6-62.2	(54.7)
	1 Seine		YP	4	2.3-2.6	(2.4)	-		-	
			LmB	2	7.8-7.9	(7.8)	-		-	

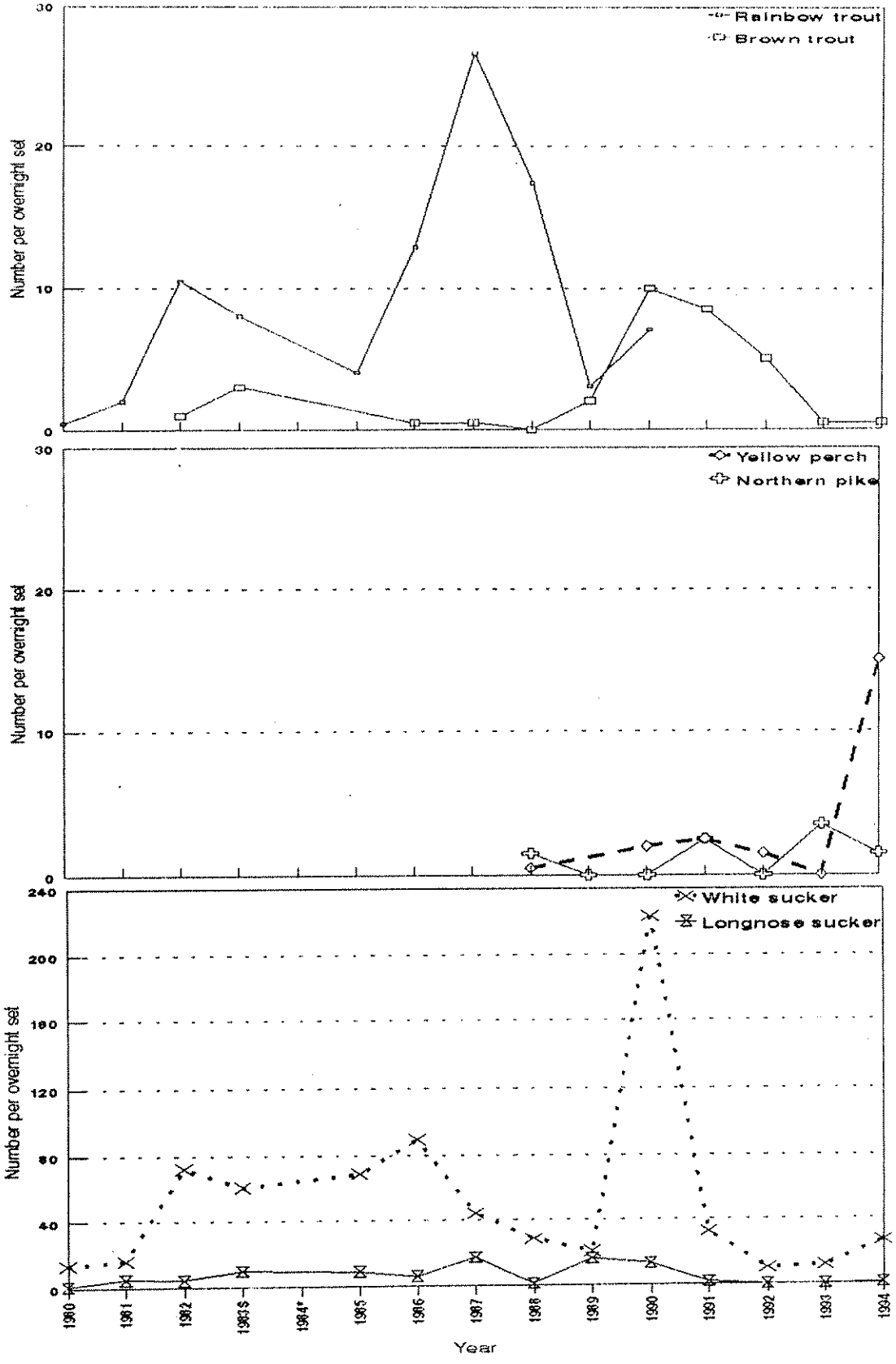

Figure 12. Gill netting trends from East Fork Reservoir from 1981 - 1994. Fall netting with 1 floater and 1 sinker except 1990 was summer netting, and S = sinker only.

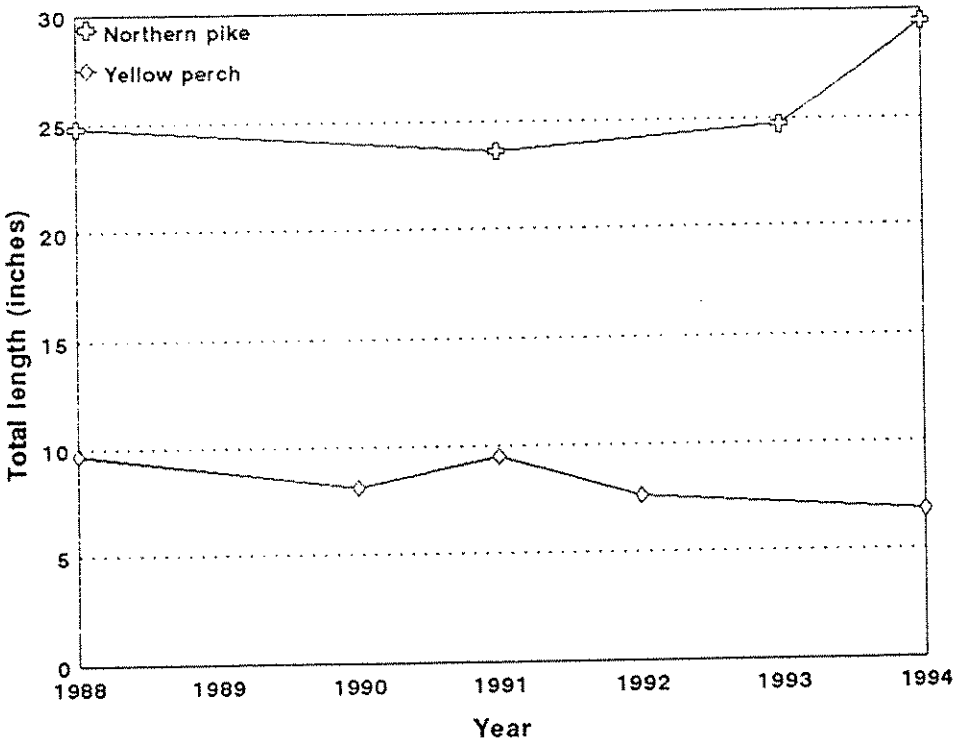

Figure 13.Average total length of northern pike and yellow perch in East Fork Spring Creek Reservoir from 1988 - 1994.

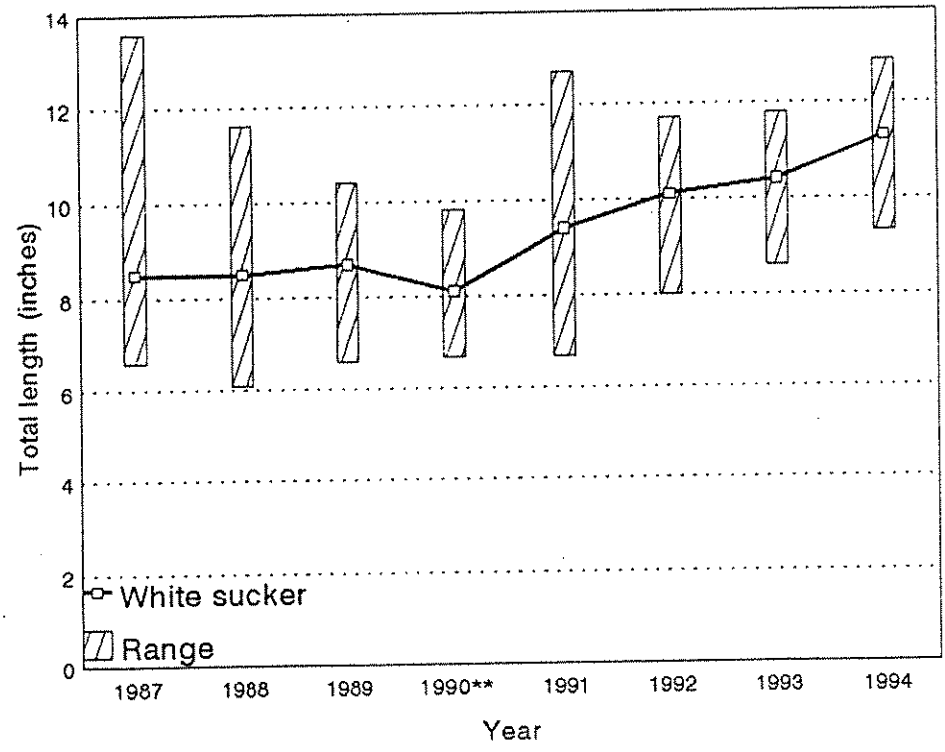

Figure 14.Average total length and total length range of white sucker in East Fork Reservoir from fall gill netting 1987 - 1994. ** summer netting and subsampled.

Jakes Reservoir has over-wintered successfully for several years. This reservoir was stocked with yellow perch in 1975 (MT FWP field notes) and yellow perch have been captured during all 9 years when subsequent sampling was conducted. There is currently a large but stunted perch population (Table 9). In 1994, flathead chubs and longnose suckers were also captured and were probably present due to illegal introductions. Figure 15 compares data from overnight gill netting sets for several years and indicates that yellow perch have gotten smaller and more numerous during the last 10 years.

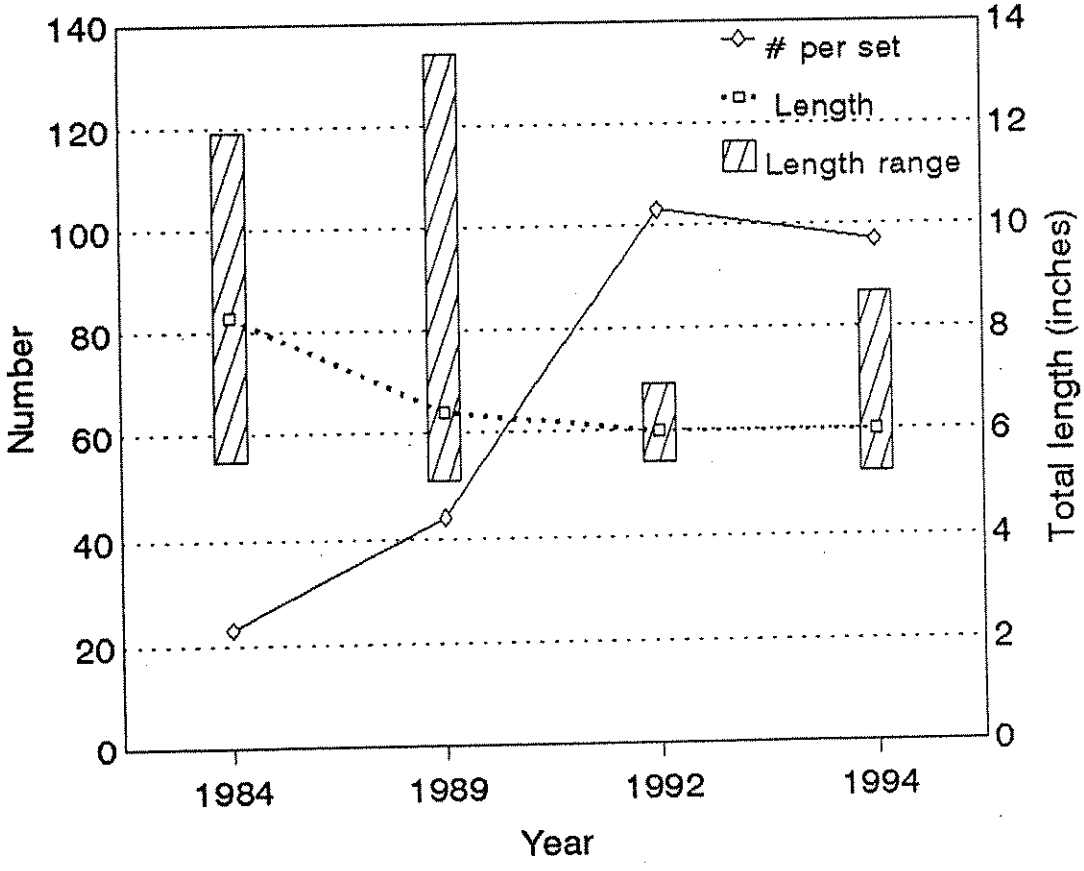

Figure 15. Number and total length of yellow perch captured in overnight sinking gill nets in Jakes Reservoir.

In 1994, Payola Reservoir exhibited a diversified warmwater fishery with largemouth bass, black bullheads and yellow perch (Table 9). This reservoir has over-wintered yellow perch successfully for several years and black bullheads were captured in 1994 for the first time in 16 years (Figure 16). These bullheads are large and will provide a good fishery. Largemouth bass catch in Payola is usually low and they probably winter-killed in 1988 (Ibid). During 1994 the largest bass captured were about 8 inches long (Table 9) but approximately 10 inch largemouth bass skeletons were observed. Gill netting of Holland and Catfish Reservoirs resulted in no fish

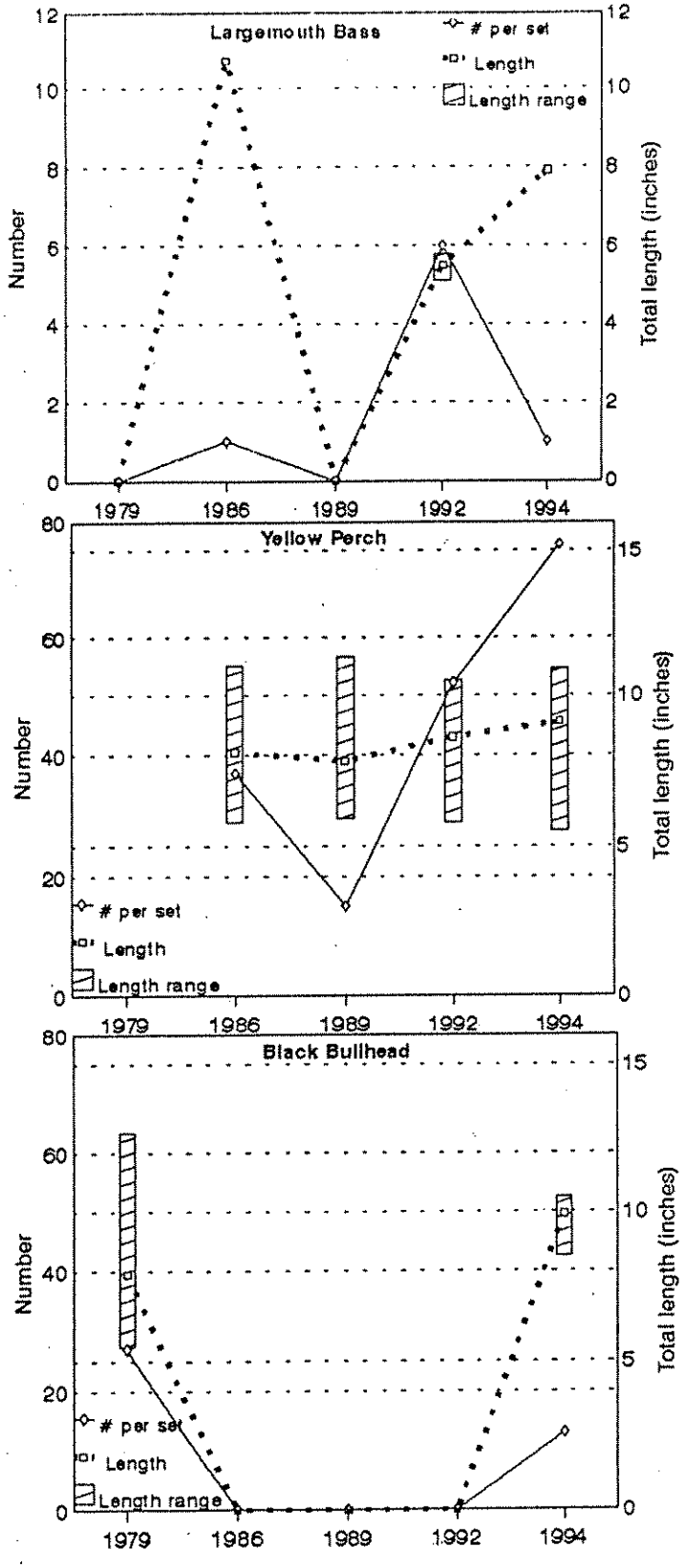

Figure 16. Number and total length of three fish species captured by overnight sinking gill nets in Payola Reservoir. 1979 was a 2 night set.

captured. Apparently these reservoirs winter-killed in 1992. One six inch bass was captured in Catfish Reservoir during seining. Drag Reservoir has not been stocked recently due to siltation and low depth. Maximum water depth was measured at 11 - 12 feet when at completely full pool which makes this reservoir a likely candidate for frequent winter kill.

GREAT FALLS AREA WATERS

Missouri River between Morony Dam and the Marias River

The Portage Coulee section was sampled on 1-2 September during the reporting period. Water temperatures ranged from 61-66° F. Thirteen species were collected for length and weight measurements (Table 10). Other species including carp, smallmouth buffalo, river carpsucker, longnose dace and mottled sculpins were observed but not captured. Up to thirty specimens for each species of all other non-game fish were collected. Relative abundance is shown for game species and those non-game species where less than 30 were captured (Table 10). Observations made during the electrofishing operation suggested that shorthead redhorse and goldeye were the most common non-game species.

The total number of rainbow trout (34) and mountain whitefish (24) captured was the highest on record since sampling began in 1988 (Table 11). Although a record 20 brown trout were sampled, the catch per unit effort (CPUE) declined from a high of 3.8 per hour in 1993 to 2.8 per hour in 1994. The good water year in 1993 may have contributed to better spawning conditions and survival of these colder water species.

Only one sauger was netted in 1994, resulting in the lowest CPUE, 0.1 per hour, for any of the five years sampled. The highest catch rate of sauger occurred in 1988 when 94 were collected and the CPUE was 13.8 per hour. Walleye catch declined from a high of 2.3 per hour in 1993 to 0.4 fish per hour in 1994. One smallmouth bass was collected in 1993 for a CPUE of 0.4/hour. Electrofishing also produced two smallmouth bass in 1994. However, one escaped before length-weight measurements were obtained. Twenty thousand 1.5 inch smallmouth bass were planted in the Missouri River, Section 7, in 1994 to enhance the existing low population of bass.

Habitat Protection

No projects in Cascade County were reviewed under the Natural Streambed and Land Preservation Act of 1975. One Stream Protection Act permit application for a project in Cascade County was processed.

Table 10. Catch statistics from electrofishing surveys of the Portage Coulee Section on the Missouri River, Montana, 1-2 September 1994.

Species	Number of fish	Length (inches) mean	Length (inches) range	Weight (pounds) mean	Weight (pounds) range	Mean condition factor
Freshwater drum	13	15.0	(10.4-20.7)	2.09	(0.50-4.88)	52.80
Goldeye	56	12.2	(11.0-13.7)	0.70	(0.48-1.04)	38.07
Rainbow trout	34	10.6	(8.0-21.1)	0.57	(0.22-3.04)	40.99
Brown trout	20	12.2	(4.0-18.4)	0.96	(0.02-2.52)	38.91
Mountain whitefish	24	8.2	(4.9-13.6)	0.29	(0.04-1.20)	39.22
Walleye	3	18.3	(10.9-26.5)	3.83	(0.47-8.90)	41.22
Sauger	1	16.7	-	1.60	-	34.35
Smallmouth bass	1	7.3	-	0.22	-	56.55
Stonecat	7	6.9	(5.1-8.2)	0.12	(0.05-0.20)	34.46
Shorthead redhorse	38	17.9	(13.6-22.0)	2.80	(1.06-4.96)	47.50
Longnose sucker	42	9.1	(5.4-19.1)	0.50	(0.06-3.10)	45.81
White sucker	7	14.4	(10.4-18.3)	1.54	(0.55-2.59)	46.79
Emerald shiner	13	3.1	(3.0-3.4)	-	-	-

Table 11. Comparison of catch per unit effort (CPUE) of game species from electrofishing surveys of the Portage Coulee section on the Missouri River, Montana, 1988-1994.

	Date				
	9/8-9/88	8/23-24/89	8/23&28/91	9/14/93	9/1-2/94
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)
Walleye	2.1(14)	0.2 (1)	0.1(1)	2.3 (6)	0.4 (3)
Rainbow trout	1.2 (8)	0.5 (3)	0.3(2)	2.7 (7)	4.8(34)
Brown trout	2.4(16)	0.5 (3)	0.1(1)	3.8(10)	2.9(20)
M. whitefish	0.3 (2)	0.2 (1)	- (0)	0.4 (1)	3.4(24)
Smallmouth bass	- (0)	- (0)	- (0)	0.4 (1)	0.3 (2)
Total effort(hours)	6.8	6.5	7.2	2.6	7.0

DISCUSSION AND RECOMMENDATIONS

Natural reproduction of walleye occurred in Bynum Reservoir for the second year in a row. It is recommended to not plant in 1995 to allow detection of additional natural reproduction. If successful natural reproduction occurs in 1995, walleye stocking in Bynum Reservoir should be eliminated. Walleye numbers in Bynum decreased slightly during 1994. Exploitation should be monitored closely and if a downward trend continues, consideration should be given to changing regulations.

The walleye population in Lake Frances continues to increase from a low observed in 1992. This is the result of excellent reproduction that occurred from 1990-1992. A fairly large population of northern pike is also present in Lake Frances at the present time. Spottail shiner numbers appear adequate, however, yellow perch numbers are considered below optimum. To improve yellow perch numbers, spawning structures could be installed.

Anglers complained during 1994, about small, poor conditioned walleye in Tiber Reservoir. There has been a steady decrease in walleye condition since 1990. However, in 1994, forage fish increases were documented for both yellow perch and spottail shiner populations. If forage approaches unacceptable levels or if walleye condition deteriorates, consideration should be given to the introduction of cisco to enhance walleye forage. It is suggested to continue participation in the Marias Management Committee to work with the Bureau of Reclamation towards improved water level management. Artificial structures should continue to be placed in Tiber to enhance yellow perch spawning and also to serve as cover for small fishes.

In the Lewistown area, warmwater fishery investigations were continued on Petrolia Reservoir. To diversify the forage fish population it is important to introduce spottail shiners in 1995 as planned. If the introduction is not done in 1995, spottail shiners should be introduced as soon as possible. This is the first year seining was done with the 10 x 100 seine so it difficult to determine if the artificial structures placed in 1994 helped yellow perch reproduction. Yellow perch were also the most abundant species captured during 1989 on Petrolia with a smaller seine (Hill et al. 1990). Yellow perch numbers captured during Petrolia seining were similar to yellow perch catch from 1991 - 1993 in Tiber Reservoir (Hill and Liknes, 1994). Seining surveys should be continued to monitor forage fish trends. Aging of spines taken from Petrolia fish should be done to monitor growth rates and if natural reproduction is occurring.

The primary sport fish in East Fork of Spring Creek Reservoir have changed from trout to northern pike and yellow perch, so this reservoir has been included in the warm-water report for the first time this year. Due to poor success, brown trout will no longer be stocked in East Fork Reservoir. MT FWP will continue to monitor the illegally stocked northern pike and yellow perch that were first found during 1988 gill netting in East Fork. Seining surveys should be continued but done in late August to allow YOY (young-of-the-year) yellow perch to be captured more efficiently.

The presence of a biologist in the Lewistown area should allow opportunity to fine-tune management of Lewistown area warmwater ponds. In 1995, MT FWP plans to stock northern pike in Jakes Reservoir to increase yellow perch size. This technique has worked well at Jakes in the past (Michiel Poore, MTFWP file notes). Possibilities of game fish should be investigated for Drag Reservoir. Pond sampling methods should also be improved. The lack of largemouth bass captured by gill netting in Catfish Reservoir and the lack of 10 inch largemouth bass found by netting Payola indicates a better method is needed for largemouth bass surveys. Electrofishing is a standard method for capturing bass but in many Lewistown area reservoirs this method may be marginal to impossible due to high conductivities (Table 8). Of the reservoirs tested in 1994 only Jakes would be excellent for electrofishing. Drag, East Fork, and Payola also may be suitable. Holland and Petrolia would be marginal and Catfish would be impossible to successfully electrofish. Other sampling possibilities include trammel nets, monofilament gill nets or early spring fishing with hook and line.

Although no discharge permit applications or pollution complaints were received during the report period, these will be handled on a case by case basis as they arise. We will continue to process permits for stream alteration projects as they occur. We will continue to monitor the fishery resource below Morony Dam.

ACKNOWLEDGEMENTS

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DATE: September 1995

PRINCIPAL FISH SPECIES INVOLVED: Walleye, northern pike, yellow perch, spottail shiner, largemouth bass, black bullhead, sauger, freshwater drum, goldeye, smallmouth bass, longnose sucker, white sucker, shorthead redhorse, river carpsucker, smallmouth buffalo, carp, emerald shiner, longnose dace, rainbow trout, brown trout, mountain whitefish, and mottled sculpin.

CODE NUMBERS OF WATERS REFERRED TO IN REPORT:

14-3280	Marias River Sec. 02
14-7080	Bynum Reservoir
14-7440	Lake Frances
14-9240	Tiber Reservoir
16-4950	East Fork Spring Creek Reservoir
16-6070	Jakes Reservoir
17-4864	Missouri River Sec. 07
18-7395	Catfish Reservoir
18-7560	Drag Reservoir
18-7840	Hollands Reservoir
18-8700	Payola Reservoir
18-8720	Petrolia Reservoir
20-7950	Pishkun Reservoir

Appendix I. Forage fish/reproduction surveys, 1994 (beach seining).

Water		Date	Water temp(°F)	No. of pulls	Number of fish/pull YP	SS	WSu	Cray	WE	NP	MSc	ES	Ling	LND	LC	FHC	Carp	SB
Bynum Res.		8/17	69°	17	125.7	20.9	9.5	3.4	1.6		0.1							
Lake Frances		8/16	70°	16	18.0	99.8	2.1	3.9	3.9	0.5			0.1					
Pishkun Res.		8/15	67°	15	39.5	0.9	48.2	3.1		0.8								
Tiber Res:	Dam	8/22	70°	17	26.0	139.2	0.4	1.0	0.9	0.7	0.2		0.3				2.6	
	WCA	8/23	68°	17	66.2	169.3	0.4	1.7	0.2	1.2			0.2				5.2	0.3
	BT	8/24	67°	17	80.2	37.9	0.1	1.0	0.3	0.6	0.1				0.8	0.2	0.8	
	Devon	8/25	66°	16	13.6	205.6			0.8		0.1	0.6		0.1	3.1	0.3		
	Tiber Combined			66	46.5	138.5	0.2	1.0	0.6	0.6	0.1	0.2	0.1	Tr.	1.0	0.1	2.2	Tr.

Appendix II. Gill net summaries by area, in Tiber Reservoir, 1994.

Area (date)	No. of nets	Hours fished	Species	No. of fish	Length range (avg.)	Weight range (avg.)
WCA	8-S	17.8	WE	9	7.0 - 12.5 (10.3)	0.10 - 0.61 (0.37)
(9/20)				11	13.0 - 15.4 (13.8)	0.64 - 1.20 (0.85)
				3	18.5 - 19.7 (19.0)	2.04 - 2.95 (2.54)
				1	(21.9)	(3.71)
			NP	4	10.1 - 15.9 (12.0)	0.20 - 0.76 (0.38)
				8	16.3 - 19.2 (17.9)	0.79 - 1.43 (1.17)
				4	24.3 - 28.7 (26.8)	3.50 - 6.30 (4.91)
			YP	71	5.1 - 8.9 (6.8)	0.05 - 0.35 (0.15)
				3	9.0 - 11.3 (9.8)	0.38 - 0.73 (0.50)
			Rb	3	16.2 - 21.6 (18.9)	1.46 - 3.24 (2.35)
			WSu	15	8.0 - 14.6 (12.4)	0.17 - 0.56 (0.78)
				15	15.1 - 19.0 (16.7)	1.49 - 2.84 (2.05)
			LnSu	2	19.2 - 19.3 (19.3)	2.57 - 2.67 (2.62)
			Carp	1	(5.4)	(0.08)
Dam	6-S	19.5	WE	7	9.8 - 12.7 (11.3)	0.28 - 0.64 (0.45)
(9/21)				8	13.0 - 15.5 (13.9)	0.64 - 1.23 (0.82)
				4	18.7 - 19.2 (19.0)	2.17 - 2.28 (2.24)
				1	(20.2)	(3.12)
			NP	3	10.1 - 11.4 (10.7)	0.23 - 0.38 (0.30)
				5	16.9 - 19.7 (18.4)	1.11 - 1.54 (1.34)
				5	20.2 - 30.5 (25.3)	2.06 - 8.50 (4.54)
			YP	14	5.4 - 8.1 (6.9)	0.07 - 0.24 (0.15)
				1	(11.0)	(0.69)
			WSu	2	12.9 - 14.4 (13.7)	1.07 - 1.43 (1.22)
				2	15.8 - 16.3 (16.0)	1.81 - 2.04 (1.92)
			LnSu	2	12.7 - 18.8 (15.8)	0.88 - 2.72 (1.80)
			Rb	4	13.7 - 20.8 (17.3)	1.01 - 2.89 (1.97)
			Carp	1	(23.3)	(7.50)
BT	6-S	18.6	WE	17	8.1 - 12.6 (11.0)	0.14 - 0.61 (0.40)
(9/21-22)				4	13.0 - 13.9 (13.5)	0.58 - 0.86 (0.72)
			NP	2	16.7 - 16.9 (16.8)	0.88 - 1.02 (0.95)
				4	25.3 - 30.6 (27.5)	4.50 - 9.00 (5.32)
			YP	50	5.3 - 8.5 (7.4)	0.07 - 0.27 (0.19)
				5	9.3 - 9.6 (9.5)	0.39 - 0.43 (0.41)
			Rb	3	13.9 - 14.5 (14.3)	1.06 - 1.16 (1.13)
			WSu	3	8.3 - 13.8 (11.4)	0.21 - 1.21 (0.72)
				1	(19.2)	(3.08)
			LnSu	3	10.2 - 20.4 (15.5)	0.40 - 3.44 (1.91)
			Ling		(21.0)	(1.42)
Devon	5-S	18.0	WE	4	8.7 - 12.0 (10.3)	0.16 - 0.47 (0.31)
(9/22)				3	13.0 - 14.1 (13.5)	0.55 - 0.79 (0.65)
				1	(17.1)	(1.44)
			NP	2	15.2 - 15.8 (15.5)	0.69 - 0.84 (0.77)
				1	(17.3)	(0.90)
			YP	6	5.5 - 8.5 (7.5)	0.08 - 0.28 (0.20)
				4	9.1 - 11.2 (10.0)	0.38 - 0.67 (0.52)
			SNS	1	(41.0)	(13.7)
			WSu	4	7.0 - 14.7 (11.3)	0.12 - 1.23 (0.69)
				1	(15.6)	(1.55)
			LnSu	3	6.9 - 16.9 (11.5)	0.12 - 2.07 (0.85)

Appendix III. Age composition of walleye from three reservoirs, 1991-94 (Spring).

Lake	Year	Total nos. Caught	Aged	% composition by age 2	3	4	5	6	7	8	9	10	11	12+ *
Bynum Res.	1991	258	81	0.4	0.0	53.2	4.8	41.6						
	1992	301	90	0.7	4.7	6.2	51.0	7.6	29.8					
	1993	322	131	0.0	12.0	21.8	13.2	28.2	18.4	6.4				
	1994	550	85	0.0	0.8	81.0	13.6	2.7	1.5	0.4				
L.Frances	1992	262	93	0.0	0.4	3.1	12.6	27.6	21.3	14.1	6.4	9.5	1.6	3.6
	1993	308	107	0.0	1.3	8.8	21.8	10.9	22.9	12.2	2.8	7.9	10.3	1.0
	1994	253	85	0.0	3.2	17.2	22.1	5.2	27.4	15.2	1.7	5.7	2.0	0.5
Tiber Res.	1991	746	193	0.4	3.3	20.6	29.6	29.5	9.3	4.0	1.8	0.1	0.5	0.9
	1992	299	81	0.0	0.7	3.3	10.5	34.8	40.6	5.3	3.3	0.0	1.3	0.3
	1993	442	92	0.0	0.2	9.0	9.7	24.7	34.2	19.1	2.2	0.2	0.2	0.5
	1994	479	114	0.0	1.1	12.2	19.6	22.7	16.8	19.2	5.1	0.7	2.1	0.4

* Ages 12 and older grouped together.

Appendix IV. Average length of walleye by age from three reservoirs, 1991-1994 (Spring).

Lake	Year	Average length by age 2	3	4	5	6	7	8	9	10	11	12+ *
Bynum Res.	1991	9.8	-	14.9	18.1	19.1						
	1992	10.0	12.6	14.9	16.7	20.2	20.1					
	1993	-	11.0	14.5	16.3	18.2	21.1	21.8				
	1994	-	11.6	14.1	16.6	19.1	20.0	21.5				
L. Frances	1992	-	10.6	13.0	14.4	15.3	16.9	17.5	20.0	20.5	20.6	23.1
	1993	-	11.6	13.2	14.7	16.1	16.7	18.6	19.8	20.0	21.4	25.8
	1994	-	-	12.8	14.9	16.1	16.9	18.3	19.8	20.6	20.3	21.0
Tiber Res.	1991	9.0	12.6	13.8	15.6	16.1	18.6	19.6	20.7	21.3	24.0	26.5
	1992	-	11.5	12.5	15.1	16.7	17.1	19.4	19.7	-	22.9	23.3
	1993	-	10.6	13.4	14.5	16.1	16.8	18.8	19.8	22.5	21.5	25.4
	1994	-	11.7	12.9	14.6	16.1	16.6	18.5	19.6	19.6	20.5	25.8

* Ages 12 and older grouped together.

Appendix V. Age composition of walleye from three reservoirs, 1991-94 (Fall).

Lake	Year	Total nos. Caught	Aged	% composition by age 1	2	3	4	5	6	7	8	9	10	11	12+
Bynum Res.	1991	18	14	22.2	0.0	11.1	38.9	0.0	27.8						
	1992	27	23	0.0	23.1	53.8	7.7	7.7	7.7						
	1993	55	45	4.3	31.9	46.8	4.3	8.5	0.0	2.1	2.1				
	1994	27	26	0.0	7.4	20.4	61.1	3.7	3.7	0.0	0.0	3.7			
L. Frances	1991	41	41	9.8	12.2	29.3	22.0	12.2	7.3	0.0	4.9	2.4			
	1992	26	24	0.0	15.4	43.6	17.9	0.0	19.2	3.8					
	1993	47	45	0.0	14.9	27.7	14.9	17.0	2.1	6.4	6.4	4.3	6.4		
	1994	59	54	0.0	3.4	11.6	24.8	18.8	7.1	5.2	10.6	13.4	0.0	1.7	3.4
Tiber Res.	1991	260	105	8.5	38.8	19.7	13.4	9.7	3.9	3.4	1.4	0.5	0.4	0.0	0.4
	1992	210	102	0.0	20.4	38.7	13.7	11.2	8.3	7.2	0.0	0.5			
	1993	149	92	4.7	9.9	46.9	12.1	11.4	7.3	5.6	2.2				
	1994	73	66	0.0	13.0	56.5	12.6	4.1	4.6	0.0	3.2	1.8	1.4	1.4	1.4

* Ages 12 and older grouped together.

Appendix VI. Average length of walleye by age from three reservoirs, 1991-94 (Fall).

Lake	Year	Average length by age											
		1	2	3	4	5	6	7	8	9	10	11	12+ *
Bynum Res.	1991	10.2	-	14.3	16.5	-	20.0						
	1992	-	9.1	13.5	17.8	18.1	20.3						
	1993	9.8	11.5	14.0	16.5	18.4	-	19.7	21.6				
	1994	-	9.3	14.3	15.8	16.3	16.6	-	-	23.6			
L. Frances	1991	8.2	11.0	13.1	14.4	15.9	17.9	-	19.5	18.6			
	1992	-	10.4	13.0	14.6	-	16.3	18.9					
	1993	-	10.3	12.6	14.6	16.3	15.9	17.9	18.3	19.7	24.3		
	1994	-	8.2	12.7	14.5	16.7	18.5	18.0	19.1	19.7	-	23.6	23.6
Tiber Res.	1991	8.7	12.0	14.5	16.1	16.5	18.5	18.2	19.5	19.5	24.6		
	1992	-	8.8	13.0	14.5	17.2	18.2	18.8	-	20.1			
	1993	7.5	10.0	12.3	15.2	16.7	18.0	17.9	19.1	-	-		
	1994	-	8.6	12.2	14.0	14.7	18.4	-	18.9	18.5	20.2	19.7	21.9

* Ages 12 and older grouped together.

Appendix VII. Age composition of northern pike from three reservoirs, 1991-94 (Spring).

Lake	Year	Total nos.		% composition by age								
		Caught	Aged	2	3	4	5	6	7	8	9	10
L. Frances	1992	94	79	26.6	47.7	21.4	3.2	1.1				
	1993	85	65	0.0	55.8	28.7	10.7	2.4	2.4			
	1994	345	100	0.9	29.8	32.1	36.6	0.0	0.6			
Pishkun Res.	1992	84	78	2.4	34.5	31.3	20.8	8.5	2.5			
	1993	159	91	1.2	63.3	26.7	5.9	2.1	9.0	0.6		
Tiber Res.	1991	332	184	23.1	50.6	15.5	9.2	0.4	0.6	0.3	0.3	
	1992	126	65	0.0	34.5	40.7	14.5	6.3	2.4	0.0	0.8	0.8
	1993	244	104	0.0	7.4	46.1	42.3	3.8	0.4			
	1994	204	87	10.4	3.9	41.4	38.8	2.7	2.8			

Appendix VIII. Average length of northern pike by age from three reservoirs, 1991-94 (Spring).

Lake	Year	Average length by age								
		2	3	4	5	6	7	8	9	10
L. Frances	1992	11.7	18.3	24.7	24.2					
	1993	-	17.1	20.8	24.8	35.1	37.3			
	1994	11.3	16.3	18.6	21.5	-	36.9			
Pishkun Res.	1992	14.5	19.9	24.0	26.0	27.9	27.7			
	1993	14.1	18.5	22.2	24.9	30.5	-	38.5		
Tiber Res.	1991	17.8	20.1	22.3	24.9	28.9	26.8	40.5	45.0	
	1992	-	20.7	23.5	23.9	28.7	34.8	-	45.7	43.0
	1993	-	19.3	23.4	24.9	26.1	30.8			
	1994	13.2	18.5	23.3	25.4	26.2	28.6			

Reviewed
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