

Angler Use and Sport Fishing Harvest Survey On
Lakes Francis Case, Sharpe, and Oahe, South Dakota
1992 and 1993

Statewide Fisheries Management Surveys

Annual Report

by
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PREFACE

Information collected during 1992 and 1993 is summarized in this report. Copies of this report and references to the data can be made with permission from the authors or Director of the Division of Wildlife, South Dakota Department of Game, Fish and Parks, 523 E. Capitol, Pierre, South Dakota 57501-3182.

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ABSTRACT

Missouri River reservoirs provide a considerable amount of fishing recreation. Anglers fishing the upper three Missouri River reservoirs in South Dakota exerted over two million hours each year during 1992 and 1993. There were 438,117 trips in 1992 and 412,591 trips in 1993 to these three reservoirs. Walleyes were the most sought after species and accounted for 78% of the total fish harvest in 1992 and 82% in 1993. A total of 591,487 walleyes were harvested in 1992 and 447,950 walleye were harvested in 1993. The total fish harvest for 1992 was estimated to be 754,003 and 547,445 in 1993.

Excellent catch rates were observed in all three reservoirs. Walleye harvest rates ranged from 0.2 to 0.4 fish per hour. The high catch rate is attributed to an abundance of walleyes created by enhanced escapement resulting from more conservative harvest regulations implemented in 1990.

Release rates ranged from 0.1 to 0.7 walleye per hour and an estimated 855,333 walleyes were released in 1992 and 429,444 in 1993. The economic impact of the fishery on these reservoirs was estimated to be 17 million dollars in 1992 and 16 million dollars in 1993. The authors recommend continuing the current walleye harvest regulations unchanged for 1995.

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INTRODUCTION

Since the impoundment of the four Missouri River reservoirs, in South Dakota, beginning in the early 1950's, fishing pressure has continued to increase, exceeding over 1.6 million angler hours in 1991 (Fielder et al. 1992a, 1992b; Stone and Wickstrom 1992). The Missouri River provides 40 percent of the state's fishing recreation (McPhillips 1989). The 1991 National Survey of Fishing, Hunting and Wildlife-Associated Recreation (U.S. Dept. of Interior, Fish and Wildlife Service, and U.S. Dept. of Commerce, Bureau of Census 1993) estimated that 170,000 anglers spent 1.7 million days angling in South Dakota and that fishing contributes over 39 million dollars annually to South Dakota's economy. Estimates for 1991, place the economic impact of the upper three South Dakota reservoirs at over 16 million dollars (Fielder et al. 1992a, 1992b; Stone and Wickstrom, 1992).

South Dakota Department of Game, Fish and Parks (SDGFP) recognizing the importance of Missouri River reservoir fisheries undertook a series of major fisheries development programs on these reservoirs during the 1980's (Talsma 1983). The goal of fisheries management programs and reservoir development has been to meet increasing demand for angling opportunity by creating new fisheries, as well as protecting, enhancing and maintaining existing ones. One valuable tool in any fisheries management program is an accurate estimation of angler exploitation and resulting harvest of fish stocks.

Fish population surveys on Lakes Francis Case, Sharpe and Oahe in the late 1980's revealed several alarming walleye population trends (Johnson et al. 1990). A management plan for Lake Francis Case (Stone 1988) described that walleye fishery as "over harvested", while long term trends on Lake Sharpe and Oahe were beginning to display similar characteristics. In response to these population parameter declines, SDGFP initiated a series of walleye sportfishing regulation changes for the 1990 angling year on Lake's Francis Case, Sharpe and Oahe. Changes initiated were a reduction in the daily creel limit from 6 to 4 fish, a reduction in the possession limit from 12 to 8, and a 35.6 cm (14 inch) minimum size limit during the months of April, May and June.

The reservoir fisheries of the Missouri River are significant contributors to over all sportfishing opportunities in South Dakota. Sound management decisions must be made to insure their continued success. Information provided in this report will aid managers in making future decisions that have implications for reservoir fisheries.

OBJECTIVES

The objectives of this study were to:

- 1) Estimate recreational angling pressure.
- 2) Estimate angler fish harvest by species.
- 3) Estimate angler harvest and catch rates by species.
- 4) Provide statistics on mean angler party size, mean length of angler day and residence of the angler.
- 5) Provide estimates of the annual economic impact of these sport fisheries.
- 6) Document the effects of the 1990 change in walleye harvest regulations on the sport fishery.

STUDY AREA

The study area consisted of Lakes Francis Case (Figure 1), Sharpe (Figure 2), and Oahe (Figure 3). Each reservoir was divided into three study zones for data collection and analysis (Figures 1-3). A more detailed physical description of these three reservoirs can be found in Wickstrom et al. (1993).

METHODS

Techniques for estimating fishing pressure in a short period of time on large reservoirs are difficult. This creel survey was patterned after a study designed and conducted on Lake Sharpe, South Dakota (Schmidt 1975). This survey allowed an economically feasible, statistically accurate method of estimating fishing pressure and harvest on South Dakota's Missouri River reservoirs. The technique consists of two independent surveys. First, an aerial count is used to estimate fishing pressure; and second, angler interviews are used to estimate harvest, catch and release rates, mean party size, mean angler day length and obtain information on angler residency. Results of these surveys are combined to estimate harvest. The survey was also designed to provide statistics comparable to those previously determined for Lake Francis Case during 1981-1984 and 1989 (Miller 1984; Unkenholz et al. 1984; Stone 1985; Stone and Wickstrom 1991a, 1991b 1992), for Lake Sharpe (Schmidt 1975, Riis 1986, Fielder et al. 1992), and for Lake Oahe (Riis 1989, Fielder et al. 1992).

Sampling was conducted from 1-May-31-August, 1992 and 1-April-30-September, 1993 on Lake Francis Case; from 1-April-30-September, 1992 and 1993 on Lake Sharpe; and from 1-May-30-September, 1992 and 1-April, 1993 through 31-October, 1993 on Lake Oahe. Results from a previous survey on Lake Sharpe (Schmidt 1975) indicated winter fishing did not contribute significantly to yearly harvest totals. All sampling was conducted from sunrise to sunset.

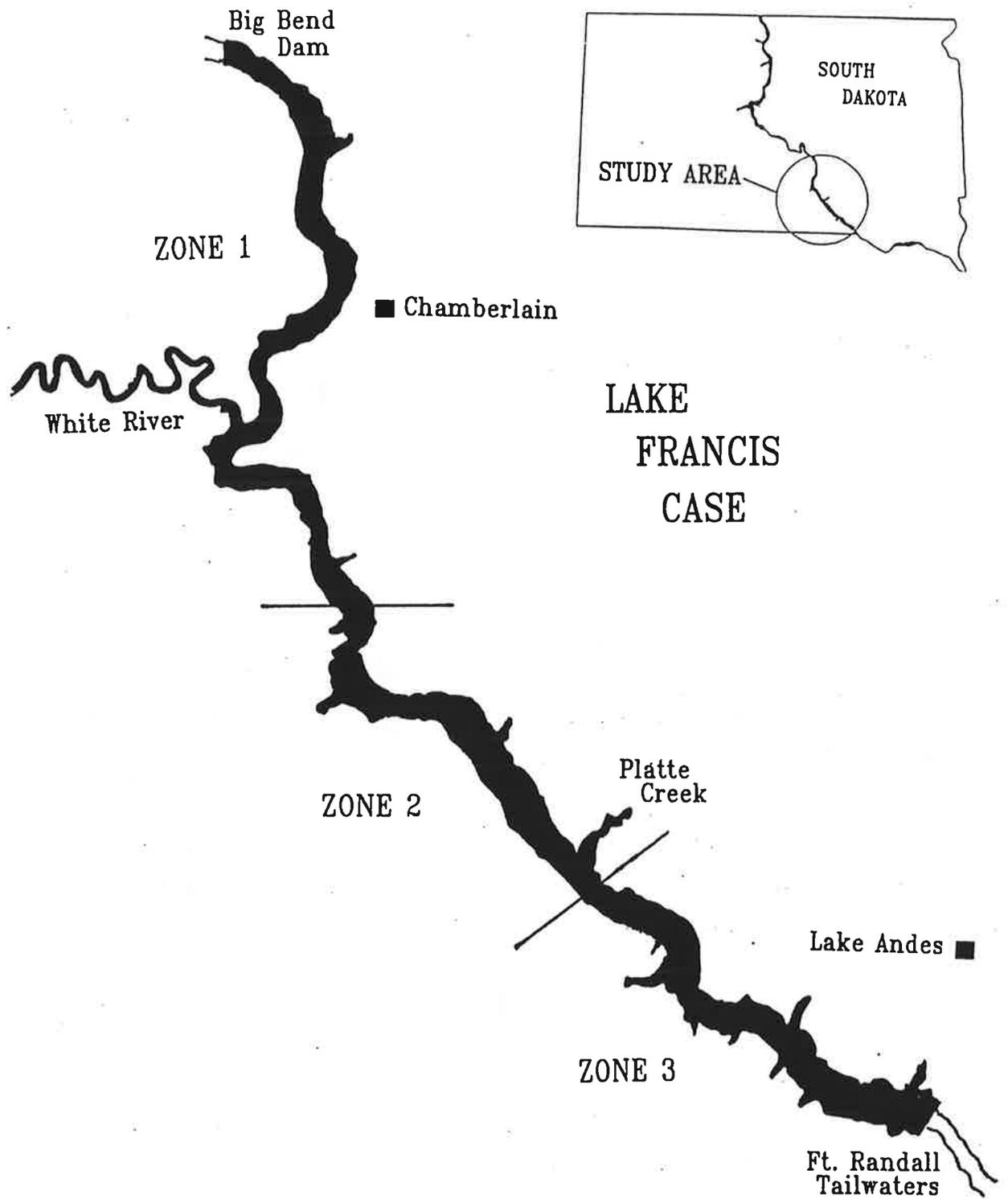
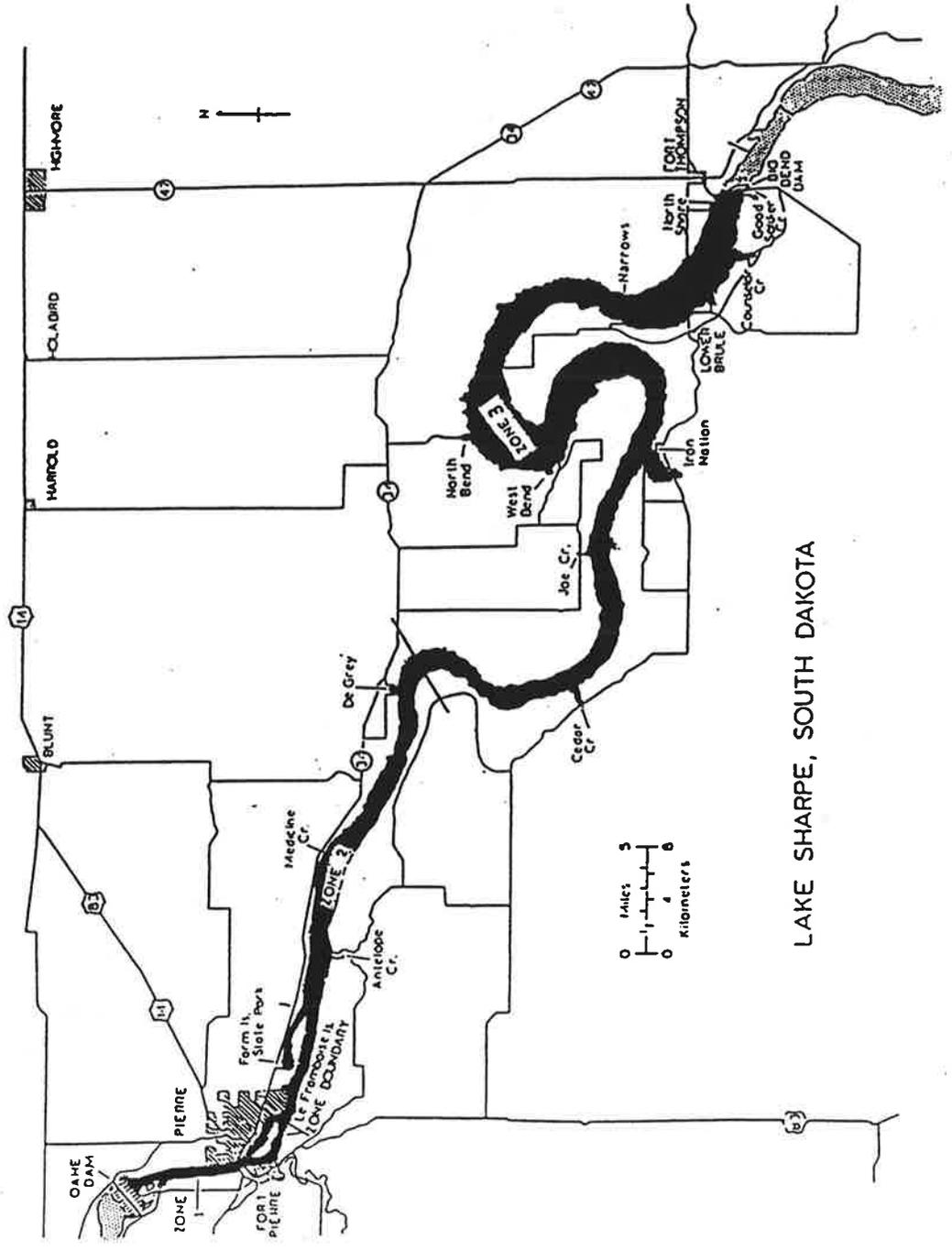


Figure 1. Lake Francis Case study area.



LAKE SHARPE, SOUTH DAKOTA

Figure 2. Lake Sharpe Study Area

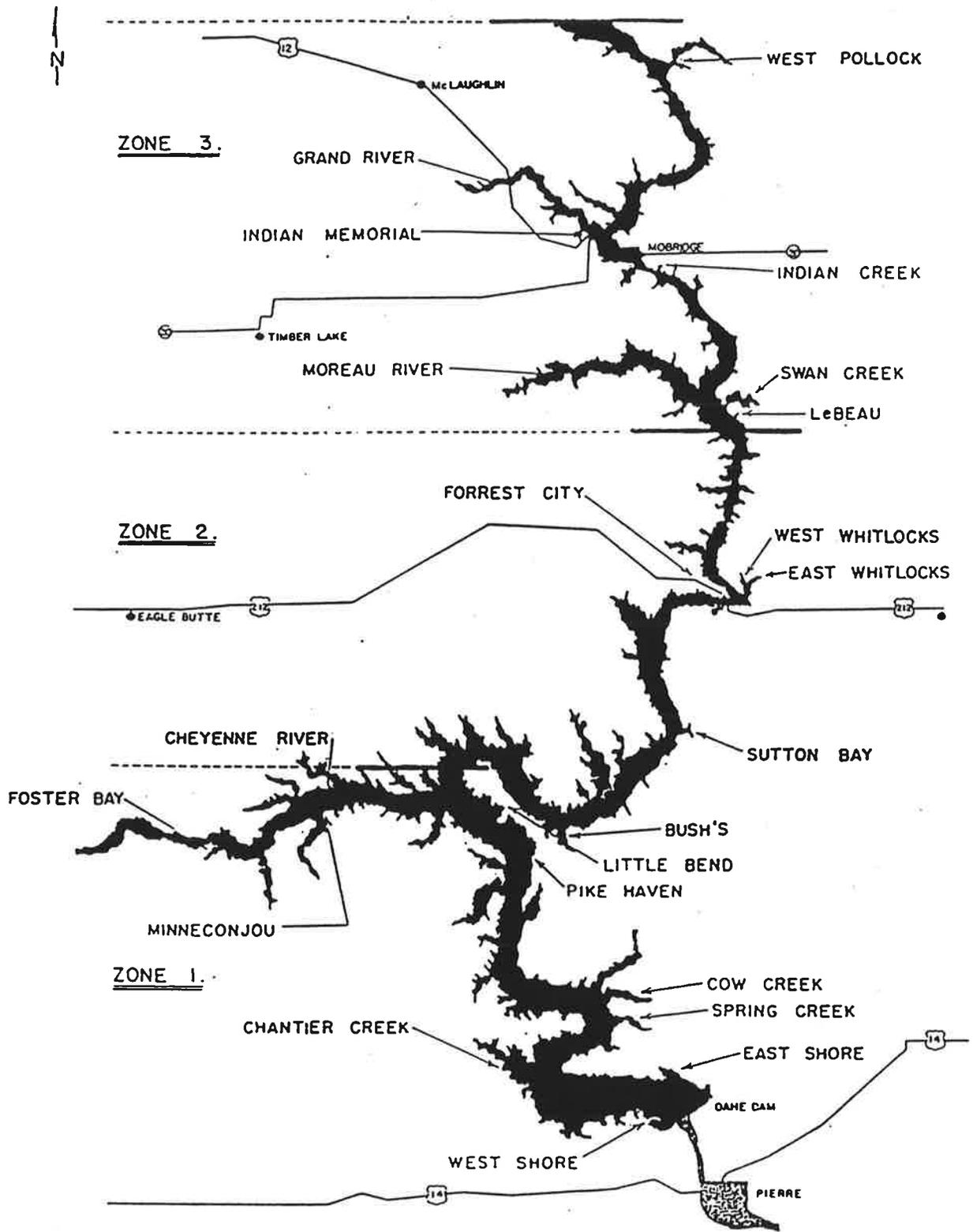


Figure 3. Lake Oahe Study Area

A list of common and scientific names of fish mentioned throughout this report is presented in Appendix 1.

Angler Aerial Count

Aerial counts were stratified according to four criteria which were considered to potentially affect the count. Strata were months, type of day (weekend-holiday or weekday), type of fishing (boat or shore) and location on the reservoir (zone).

Six flight times were selected by a stratified random procedure to guarantee that scheduled flights would be evenly divided between weekend-holidays and weekdays. To select the flight times, average day-length period for the month was divided into two hour intervals (approximate flight time) and the starting time for each flight was randomly selected from these intervals. Length-of-day was assumed to be one half hour before sunrise to one half hour after sunset. Flights were treated as if they were instantaneous. All estimates were for daylight hours; night fishing was not surveyed.

Counts were made from a low flying airplane, flying a zig-zag pattern up or down and along the reservoir. Data forms (Appendix 2) provided space for recording individual flight count data.

Angler Interview Survey

The angler interview survey was designed to obtain estimates of:

- 1) Harvest rates: number of fish caught and kept per angler per hour of fishing, by species
- 2) Release rates: number of fish caught and released per angler per hour of fishing, by species
- 3) Catch rates: total number of fish caught per angler per hour of fishing (i.e. harvest rate and release rate), by species.

Additionally, statistics on fish size (TL), angler residence, party size and trip length were also collected. Strata for the angler interview survey were the same as those for the aerial portion of the survey, except for type of day. Since Schmidt (1975) found no consistent difference between the catch rates for weekend-holiday versus weekdays, angler interviews were not stratified according to type of day. Creel clerks were randomly scheduled to interview three to five days per week at selected access points (Appendix 3) within the three zones on each reservoir. A random sampling design with one modification was used to select interview locations. To assure an adequate number of interviews during periods of low use, access points that traditionally received high use due primarily to factors such as quality of facilities present, were given a greater chance of being selected as interview sites. Sampling was not, however, distributed according to the expected time of high angling success at each of the access points.

Interviewing at access points provided an easy method of contact with boat anglers, who exert a majority of the fishing pressure on these reservoirs (Stone 1985). Contact with shore anglers was difficult due to the inability to find them concentrated at easily accessible locations. Angler interviews were conducted from mid-morning until dark. Anglers were contacted at the end of their trip, when possible. Interviews from uncompleted trips were updated, when possible. Interview data was recorded on the form shown in Appendix 4. This form allowed the creel clerk to quickly record the information necessary to accomplish the objectives of this portion of the survey.

Calculations

A personal computer utilizing a database program to catalog the data and program equations (Schmidt 1975) necessary to calculate the desired statistics and associated standard error terms was used. Confidence intervals are calculated at the $P < 0.05$ level.

RESULTS & DISCUSSION

LAKE FRANCIS CASE

Fishing Pressure

Lake Francis Case (LFC) anglers fished 640,215 hours (+/-125,531 hours, 95% CI) (Table 1) fishing during May through August 1992 and 589,153 (+/- 73,106) hours during a 1993 creel period of April through September. The 1992 value represents the highest amount of fishing pressure ever measured for LFC and is a dramatic increase over that observed in 1991, despite a two month shorter creel period than past surveys (Table 2). Total fishing pressure, in 1992, would have exceeded 700,000 angler hours, if average (as measured through the three previous surveys) April and September pressure (72,000 angler hours-months combined) had occurred.

Fishing pressure averaged 16.7 angler hours/hectare (Table 3) during 1992, up from the previously measured high of 15.7 in 1989 (Stone and Wickstrom 1991a). The 1993 pressure per hectare was 15.3 angler hours. Zone 3 received the heaviest pressure, 24.3 and 18.3 hours/hectare, for 1992 and 1993 respectively, continuing a trend reversal from the early 1980's when Zone 1 consistently received the heaviest pressure on a per hectare basis (Unkenholz et al 1984, Stone 1985). Zone 2 ranked second in pressure/hectare both years at 16.6 and 14.3 hours/hectare followed by Zone 1 at 10.6 and 13.6 hours/hectare, (Table 3). Peak fishing pressure during both years occurred in June, unlike 1989-1991 when peak pressure occurred in May (Figure 4). Estimated July, 1992 pressure was the highest ever documented for that month on LFC (Figure 4).

Table 1. Total fishing pressure (angler hours), by month and zone, on Lake Francis Case. (+/- 95% confidence interval)

1992

ZONE	MAY	JUNE	JULY	AUGUST	TOTAL
1	60,020	58,597	36,988	13,935	169,540
2	55,751	63,110	35,991	11,692	166,544
3	86,309	118,235	80,409	19,178	304,131
TOTAL	202,080	239,942	153,388	44,805	640,215
	(111,581)	(93,381)	(49,556)	(17,627)	(125,531)

1993

ZONE	APR	MAY	JUNE	JULY	AUGUST	SEPT	TOTAL
1	44,938	63,198	55,355	32,629	10,671	10,357	217,148
2	19,946	24,637	49,148	14,282	25,149	9,998	143,160
3	19,350	30,800	78,427	40,029	29,588	30,651	228,845
TOTAL	84,234	118,635	182,930	86,940	65,408	51,006	589,153
	(42,995)	(55,840)	(30,531)	(15,076)	(31,875)	(36,470)	(73,106)

Table 2. Angler use and harvest statistics from creel surveys conducted on Lake Francis Case since 1954.

Year	Fishing Pressure (Hours)	Angler Days	Mean Trip Length (Hours)	Total Fish Harvest (No.)	Walleye Harvest (No.)	Total Harvest Rate (Fish/Hour)	Walleye Harvest Rate (Fish/Hour)	Reference
1954	84,000	35,000	2.4	115,000	0	1.369	0.000	Shields (1955)
1955	119,000	41,000	2.9	105,000	190	0.882	0.002	Sheilds (1956)
1956	159,000	47,500	3.4	89,500	177	0.563	0.001	Sheilds (1957)
1960	425,000	78,500	5.3	114,310	1,386	0.269	0.003	Nelson (1961)
1981*	565,890	99,280	5.7	173,730	145,412	0.307	0.257	Miller (1984)
1982	557,570	101,375	5.5	136,150	110,554	0.244	0.198	Miller (1984)
1983	425,060	74,570	5.7	102,070	70,434	0.240	0.166	Unkenholz et al. (1984)
1984	433,640	86,730	5.0	259,070	242,431	0.597	0.559	Stone (1985)
1989	604,100	115,290	5.2	289,854	222,008	0.480	0.368	Stone and Wickstrom (1991a)
1990	383,711	81,641	4.7	117,155	64,596	0.305	0.169	Stone and Wickstrom (1991b)
1991	409,600	87,521	4.7	139,600	95,298	0.341	0.233	Stone and Wickstrom (1992)
1992**	640,215	127,215	5.0	267,105	217,841	0.417	0.339	(This Study)
1993	589,153	115,520	5.1	126,231	95,425	0.214	0.161	(This Study)

* Estimate projected from a creel survey for approximately 1.3 of reservoir.

** Estimate was for May-August only.

Table 3. Total angler hours, for boat and shore fishing and methods combined, by zone for Lake Francis Case. May-August, 1992 and April-September, 1993.

1992

ZONE	BOAT			SHORE			COMBINED		
	TOTAL ANGLER HOURS	%	NO. HRS/HA	TOTAL ANGLER HOURS	%	NO. HRS/HA	TOTAL ANGLER HOURS	%	NO. HRS/HA
1	143,729	24	9.0	25,811	53	1.6	169,540	26	10.6
2	157,313	27	15.7	9,230	19	0.9	166,543	26	16.6
3	290,539	49	23.2	13,593	28	1.1	304,132	48	24.3
TOT/AVE	591,581	100	15.4	48,634	100	1.3	640,215	100	16.7

1993

ZONE	BOAT			SHORE			COMBINED		
	TOTAL ANGLER HOURS	%	NO. HRS/HA	TOTAL ANGLER HOURS	%	NO. HRS/HA	TOTAL ANGLER HOURS	%	NO. HRS/HA
1	190,527	35	11.9	26,621	61	1.7	217,148	37	13.6
2	136,026	25	13.6	7,134	16	0.7	143,160	24	14.3
3	219,013	40	17.4	9,832	23	0.8	228,845	39	18.3
TOT/AVE	545,566	100	14.2	43,587	100	1.1	589,153	100	15.3

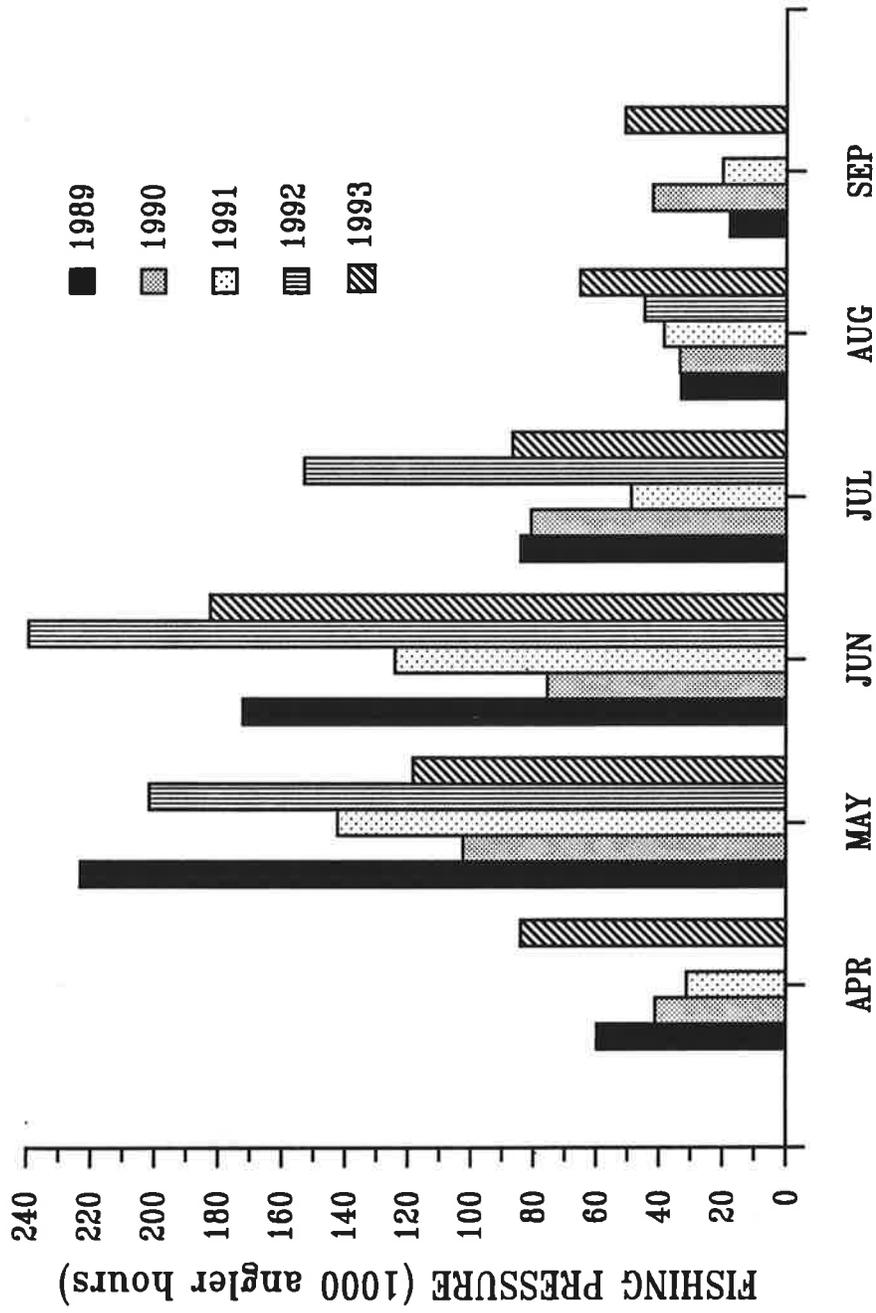


Figure 4. Fishing pressure, by month, on Lake Francis Case, 1989 - 1993.

Fish Harvest

Anglers fishing LFC, May through August 1992, harvested an estimated 267,105 fish (+/- 50,560 fish, 95% CI); species, method of fishing and zones combined (Table 4); while the 1993 estimate was 126,231 (+/- 16,678). These values are within the range observed from previous surveys (Table 1), however, 1992 probably would have been similar to the 1989 total harvest figures had average April and September harvest occurred and been included in the survey period. Sixteen species of fish were observed in the 1992 catch, with walleye accounting for over 81.5 percent of the total harvest (Table 4). The 1993 harvest composition included 15 species with walleye accounting for 75.6 percent of the total harvest (Table 4). White bass, smallmouth bass, and channel catfish accounted for 8.9, 3.4 and 3.3 percent of the total 1992 harvest, respectively. During 1992 smallmouth bass displaced channel catfish, as the third ranked species in the harvest for the first time since their introduction into LFC in 1985. In 1993, white bass, channel catfish, and smallmouth bass accounted for 7.7, 6.1, and 5.0 percent of the harvest, respectively.

Total fish harvest peaked in June during both survey years (Table 4), similar to patterns observed in the 1980's (Stone 1985), Stone and Wickstrom 1991a) but dissimilar to the July peak in harvest observed during 1990 (Stone and Wickstrom 1991b). Changes in walleye harvest regulations, initiated in 1990, reduced the number of walleye that could be legally harvested, in the April through June period of that year, resulting in a shift of peak walleye harvest to July when walleye of any size could legally be kept. Improvements in the walleye size structure provided more legal-sized fish during the period April through June 1991. That same trend continued during 1992 and 1993 (Figure 5). July, 1992 walleye harvest was the highest ever documented for that month on LFC.

Different patterns of harvest were observed during the two survey years. Total fish harvest, during 1992, was highest in Zone 3 which accounted for 39.3 percent of the total, followed by Zones 1 and 2 with 34.7 and 26.0 percent, respectively (Table 5). Anglers fishing Zone 3 contributed 41.5 percent of the total 1992 walleye harvest, dissimilar to most years when the peak walleye harvest came from Zone 1. Harvest during 1993 followed a more typical pattern, with Zone 1 accounting for 42.4 percent, followed by Zones 3 and 2 with 31.4 and 26.2 percent, respectively (Table 5).

Monthly length frequencies, from angler caught walleye (Figures 6 and 7), reflect the impact of the April-June 35.6 cm (14 inch) minimum size limit. During May and June very few walleye under 35 cm were harvested (illegal), while in July and August fish under 35 cm were common in the walleye harvest. However, the mean size of walleye harvested, by month, remained above the minimum length limit for the first time since the regulation change took place in 1990. Table 6 provides statistics on the

Table 4. Total fish harvest, by month, for anglers fishing Lake Francis Case.
(+/- 95% confidence interval)

1992

MONTH	WAE	SAR	SMB	CCF	WHB	NOP	OTH*	TOTAL
May	78,940	484	3,915	1,459	7,100	417	771	93,086 (39,820)
June	76,994	664	2,685	3,454	8,279	58	2,207	94,321 (28,637)
July	45,374	186	2,363	2,715	7,008	0	2,156	59,802 (16,330)
August	16,533	47	240	1,102	1,441	23	510	9,896 (6,348)
TOTAL	217,841 (41,395)	1,361 (613)	9,203 (2,221)	8,730 (3,256)	23,828 (6,887)	498 (216)	5,644 (1,528)	267,105 (50,560)

1993

MONTH	WAE	SAR	SMB	CCF	WHB	NOP	FCS	OTH*	TOTAL
April	11,530	0	102	91	318	0	0	102	12,143 (5,203)
May	23,087	117	2,446	345	1,249	0	250	514	28,008 (10,342)
June	26,512	284	1,542	1,248	4,777	0	34	1,332	35,729 (6,409)
July	15,736	162	991	2,231	1,482	15	0	723	21,340 (3,773)
August	14,450	48	876	2,917	1,419	0	0	1,372	21,082 (8,049)
September	4,110	15	397	886	498	0	0	2,023	7,929 (4,930)
TOTAL	95,425 (13,418)	626 (226)	6,354 (1,625)	7,718 (2,134)	9,743 (3,762)	15 (32)	284 (411)	6,066 (2,415)	126,231 (16,678)

* OTH includes: black crappie, bluegill, common carp, flathead catfish, freshwater drum, goldeye, largemouth bass, white crappie, yellow perch.

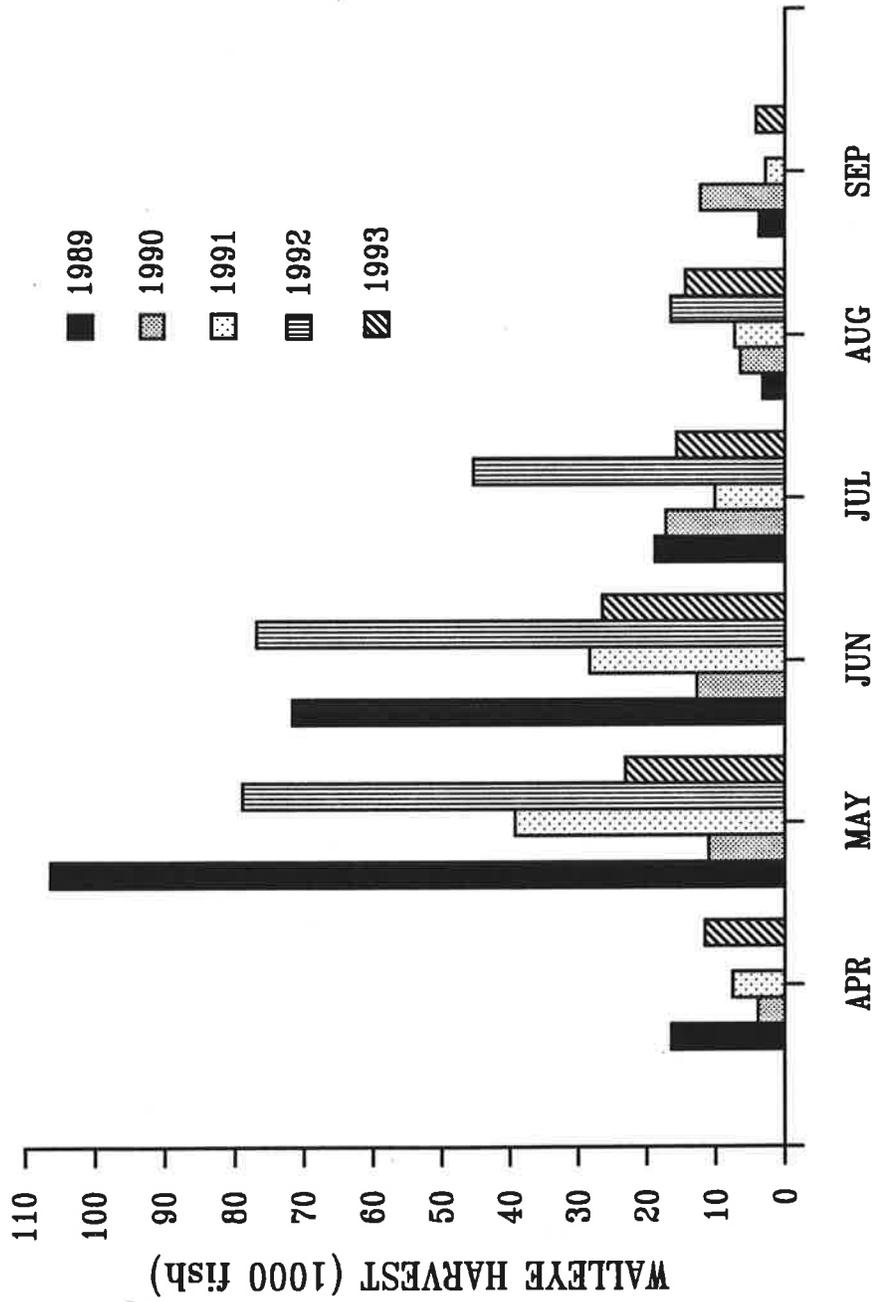


Figure 5. Total walleye harvest, by month, for anglers fishing Lake Francis Case, 1989 - 1993.

Table 5. Total fish harvest, by zone, from Lake Francis Case during May-August, 1992 and April-September, 1993.

1992

ZONE	WAE	SAR	SMB	CCF	WHB	NOP	OTH*	TOTAL
1	68,274	818	2,316	3,519	15,493	455	1,824	92,699
2	59,174	229	1,839	3,297	3,795	0	1,053	69,387
3	90,393	314	5,048	1,914	4,540	43	2,767	105,019
TOTAL	217,841	1,361	9,203	8,730	23,828	498	5,644	267,10

1993

ZONE	WAE	SAR	SMB	CCF	WHB	NOP	FCS	OTH*	TOTAL
1	43,892	442	541	2,328	4,896	15	268	1,131	53,513
2	23,167	37	3,336	2,294	3,223	0	0	1,035	33,092
3	28,366	147	2,477	3,096	1,624	0	16	3,900	39,626
TOTAL	95,425	626	6,354	7,718	9,743	15	284	6,066	126,231

* OTH includes: black crappie, bluegill, common carp, flathead catfish, freshwater drum, goldeye, largemouth bass, white crappie, and yellow perch.

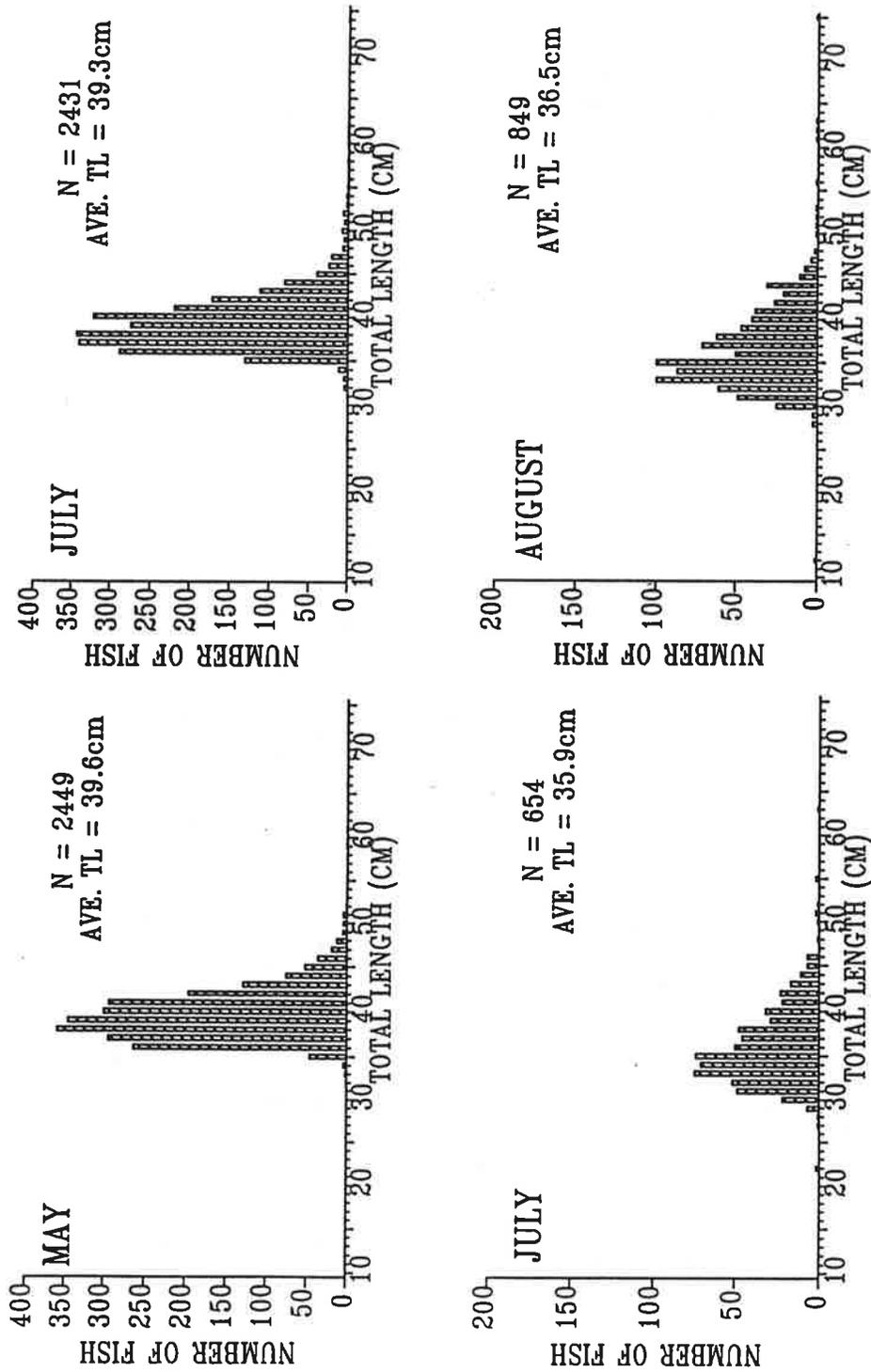


Figure 6. Monthly length frequencies of angler caught walleye from Lake Francis Case, 1992.

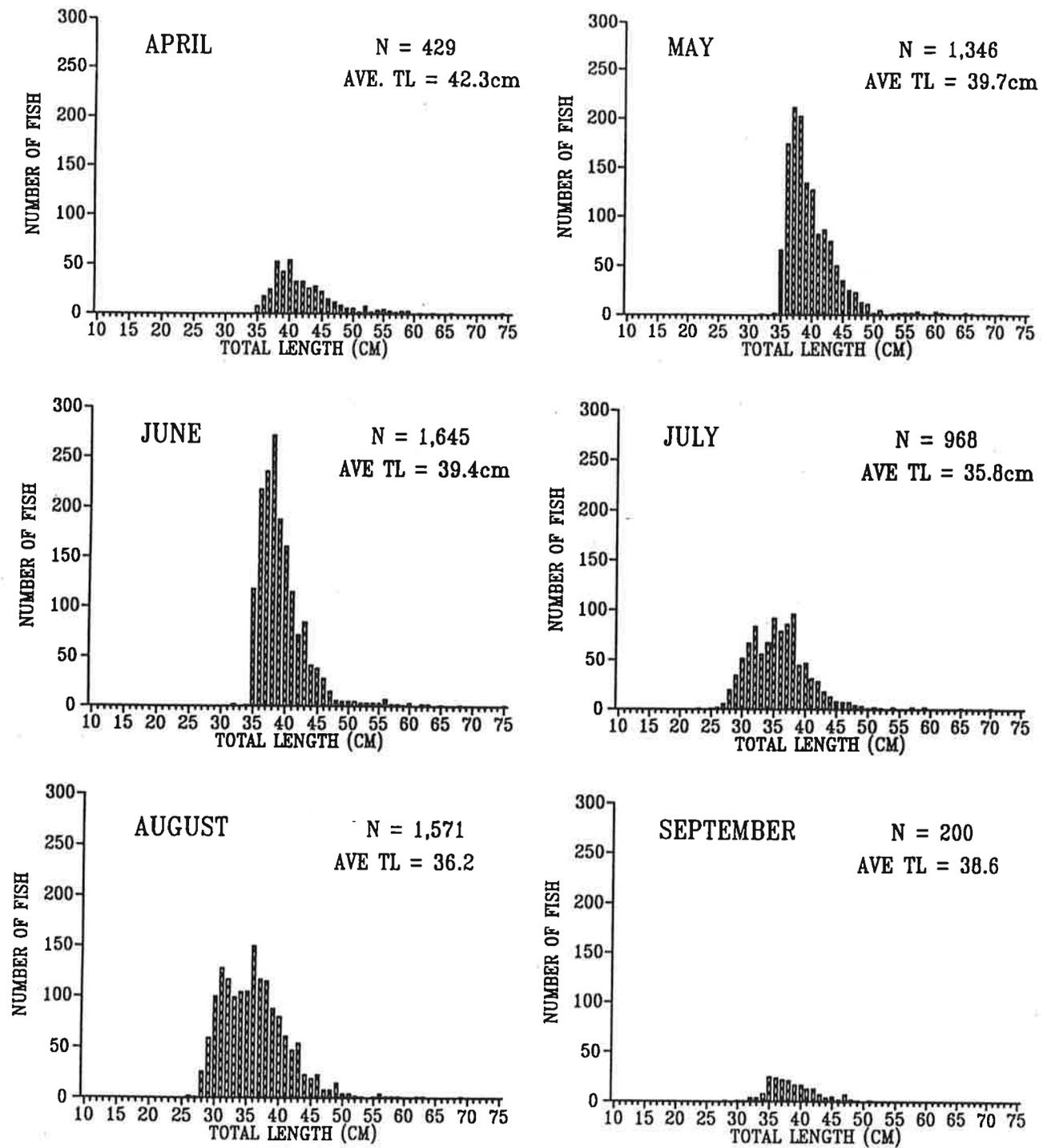


Figure 7. Monthly length frequencies of angler caught walleye from Lake Francis Case, 1993.

Table 6. Percent of angling parties that harvested a limit of walleye, at least three walleye/angler, at least two walleye/angler, etc. from Lake Francis Case.

1992

PARTY SUCCESS WALLEYE/ANGLER	PERCENT
Limit (4)	19
3.0 - 3.9	11
2.0 - 2.9	14
1.0 - 1.9	21
0.1 - 0.9	15
0	20

1993

PARTY SUCCESS WALLEYE/ANGLER	PERCENT
Limit (4)	7
3.0 - 3.9	4
2.0 - 2.9	9
1.0 - 1.9	18
0.1 - 0.9	20
0	43

percentage of angling parties that caught a limit of walleye. From this, it is apparent that as the walleye population continues to expand in both abundance and in improved size structure, that an increasing proportion of anglers are achieving the daily creel limit of four walleyes. In this regard, the daily creel limit is now becoming an important factor in the regulation of the fishery.

Harvest, Release and Catch Rates

Mean harvest rate (species, type of fishing, and zone combined) for LFC, during 1992, was 0.417 fish/angler hour (Table 7), representing a continued increase since 1990 (Table 2) and within the range observed from previous surveys. An excellent overall catch rate (combining the 1992 harvest rate with the estimated release rate of 0.752 fish/angler hour) of 1.169 fish/angler hour was estimated (Table 7). The walleye harvest rate, for the four month 1992 creel period, was 0.339 walleye/angler hour (Table 8), the highest value measured since 1989 (Table 1). When harvest rate for walleye was combined with release rate, an excellent overall catch rate of over one walleye per angler hour was estimated (Table 9). This value exceeds the rate of 0.30 fish/angler hour that is considered by most biologists to be indicative of an excellent walleye fishery (Colby et al. 1979). Shore anglers, during 1992, experienced an overall harvest rate of 0.598 fish/angler hour versus boat anglers who harvested 0.402 fish/angler hour. However, when the release rate is factored in for each group, boat anglers had an overall catch rate of 1.153 fish/angler hour versus shore anglers catch rate of 1.072 fish/angler hour. Boat anglers also had much higher harvest and catch rates for walleye than shore anglers; 0.347 and 1.043 walleye/angler hour, versus 0.261 and 0.551 walleye/angler hour, respectively.

Both harvest and catch rates declined considerably in 1993 in comparison to the highs measured during 1992. The total 1993 fish harvest rate of 0.214 fish/angler hour (Table 7) was the lowest measured of any year surveyed (Table 1). The overall walleye harvest rate of 0.161 walleye/angler hour (Table 9) was the lowest recorded since the 1960's (Table 1). However, with the release rates factored in, the total catch rate was 0.541 fish/angler hour (Table 7) and the walleye catch rate was 0.432 fish/angler hour (Table 9). While the walleye catch rate was low, when compared with the previous years on LFC, it remained above the target of 0.30 walleye/angler hour indicative of a good fishery (Colby et. al. 1979). Boat anglers generally had higher harvest rates than shore anglers. The total harvest rate and walleye harvest rate for boat anglers was 0.218 and 0.169 fish/angler hour, respectively, versus 0.169 and 0.068 fish/angler hour for shore anglers.

Total catch rate (Table 8) peaked in June during both years. The value of over 1.5 fish/angler hour, measured in June of 1992, resulted in part due to the release of a substantial number of

Table 7. Harvest rate, release rate and catch rate, by species, for anglers fishing Lake Francis Case. (T=<0.001) (+/- 95% confidence interval)

1992

SPECIES	HARVEST RATE (FISH/ANGLER HR.)	RELEASE RATE (FISH/ANGLER HR.)	CATCH RATE (FISH/ANGLER HR.)
Walleye	0.339 (0.016)	0.693	1.033
Sauger	0.002 (0.001)	T	0.002
Smallmouth Bass	0.014 (0.002)	0.022	0.036
Channel Catfish	0.014 (0.004)	0.004	0.018
White Bass	0.037 (0.008)	0.014	0.051
Northern Pike	0.001 (0.000)	T	0.001
Other*	0.009 (0.002)	0.018	0.027
Species Combined	0.417 (0.018)	0.752	1.169

1993

SPECIES	HARVEST RATE (FISH/ANGLER HR.)	RELEASE RATE (FISH/ANGLER HR.)	CATCH RATE (FISH/ANGLER HR.)
Walleye	0.161 (0.012)	0.271	0.432
Sauger	0.001 (0.000)	0.001	0.002
Smallmouth Bass	0.011 (0.002)	0.023	0.034
Channel Catfish	0.013 (0.003)	0.007	0.020
White Bass	0.016 (0.006)	0.010	0.026
Chinook Salmon	0.001 (0.001)	T	0.001
Northern Pike	T (-)	T	T
Other*	0.010 (0.002)	0.015	0.025
Species Combined	0.214 (0.012)	0.327	0.541

* Other includes: Bluegill, common carp, freshwater drum, goldeye, largemouth bass, rock bass, yellow perch, trout, buffalo, sturgeon.

Table 8. Harvest rate, release rate and catch rate for all species, by month, for anglers fishing Lake Francis Case. (+/- 95% confidence interval)

1992

MONTH	HARVEST RATE (FISH/ANGLER HR.)	RELEASE RATE (FISH/ANGLER HR.)	CATCH RATE (FISH/ANGLER HR.)
May	0.461 (0.035)	0.644	1.105
June	0.393 (0.025)	1.125	1.518
July	0.390 (0.046)	0.440	0.790
August	0.444 (0.048)	0.321	0.765
Combined	0.417 (0.018)	0.752	1.169

1993

MONTH	HARVEST RATE (FISH/ANGLER HR.)	RELEASE RATE (FISH/ANGLER HR.)	CATCH RATE (FISH/ANGLER HR.)
April	0.144 (0.026)	0.070	0.214
May	0.236 (0.021)	0.417	0.653
June	0.195 (0.025)	0.468	0.663
July	0.245 (0.029)	0.250	0.495
August	0.322 (0.029)	0.331	0.653
September	0.155 (0.047)	0.165	0.320
Combined	0.214 (0.012)	0.327	0.541

Table 9. Harvest rate, release rate and catch rate of walleye, by month, for anglers fishing Lake Francis Case. (+/- 95% confidence interval)

1992

MONTH	HARVEST RATE (FISH/ANGLER HR.)	RELEASE RATE (FISH/ANGLER HR.)	CATCH RATE (FISH/ANGLER HR.)
May	0.391 (0.031)	0.596	0.987
June	0.321 (0.023)	1.069	1.390
July	0.296 (0.039)	0.314	0.610
August	0.369 (0.041)	0.253	0.622
Combined	0.339 (0.016)	0.693	1.032

1993

MONTH	HARVEST RATE (FISH/ANGLER HR.)	RELEASE RATE (FISH/ANGLER HR.)	CATCH RATE (FISH/ANGLER HR.)
April	0.137 (0.025)	0.058	0.195
May	0.195 (0.020)	0.363	0.558
June	0.145 (0.022)	0.410	0.555
July	0.181 (0.022)	0.184	0.365
August	0.221 (0.021)	0.259	0.480
September	0.081 (0.032)	0.074	0.155
Combined	0.161 (0.012)	0.271	0.432

sub-legal walleye (Table 9). Harvest rate peaked in May, 1992 at 0.461 fish/angler hour and in August, 1993 at 0.322 fish/angler hour (Table 8). Walleye harvest rate peaked in May, 1992, while catch rate was highest in June (Table 9). During 1993 the walleye harvest rate was highest in August, while the catch rate peaked in May (Table 9).

Smallmouth bass, introduced into the reservoir in 1985, are also a species that are routinely released (voluntarily) by anglers (Table 10). Overall harvest and release rates for 1992 and 1993 were similar (Table 10). While harvest, during both years, was similar to that measured in 1991 (Stone and Wickstrom 1992), total catch rate declined slightly. Annual fish population surveys conducted in 1992 (Wickstrom et al. 1993) also indicated a slight decline in overall smallmouth bass abundance.

Angler Demographics and Economics

Thirty-eight percent of the angler contacts on LFC during both years of this survey were non-residents, similar to values measured in previous surveys (Stone 1985, Stone and Wickstrom 1992). Anglers from 23 states were contacted (Table 11) with Nebraska, Iowa and Minnesota anglers accounting for a majority of the non-resident contacts each year. Mean angler trip length (boat and shore combined) on LFC was similar both years at 5.0 hours during 1992 and 5.1 hours for 1993 (Table 1). The average angling party consisted of approximately 2.5 individuals each year. Anglers traveling over 100 miles (one-way) accounted for over 60 percent of all trips on LFC during both 1992 and 1993 (Table 12).

The 1992 LFC fishery had an economic impact of 5 million dollars to local economies, based on over 127,000 angling trips, at an estimated expenditure of \$39 per trip on South Dakota's Missouri River reservoirs (U.S. Dept. of Interior, Fish and Wildlife Service, and U.S. Dept. of Commerce, Bureau of Census 1993). The 1993 estimate was 4.5 million dollars.

Table 10. Harvest rate, release rate and catch rate of smallmouth bass, by month, zones combined, for anglers fishing Lake Francis Case. (+/- 95% confidence interval)

1992

MONTH	HARVEST RATE (FISH/ANGLER HR.)	RELEASE RATE (FISH/ANGLER HR.)	CATCH RATE (FISH/ANGLER HR.)
May	0.019 (0.005)	0.023	0.042
June	0.011 (0.003)	0.020	0.031
July	0.015 (0.009)	0.037	0.052
August	0.005 (0.003)	0.015	0.020
Combined	0.014 (0.002)	0.022	0.036

1993

MONTH	HARVEST RATE (FISH/ANGLER HR.)	RELEASE RATE (FISH/ANGLER HR.)	CATCH RATE (FISH/ANGLER HR.)
April	0.001 (0.002)	0.002	0.003
May	0.021 (0.002)	0.027	0.048
June	0.008 (0.006)	0.029	0.037
July	0.011 (0.003)	0.024	0.035
August	0.013 (0.003)	0.021	0.034
September	0.008 (0.004)	0.031	0.039
Combined	0.011 (0.002)	0.023	0.034

Table 11. Percent of angler contacts from non-resident anglers who fished Lake Francis Case, South Dakota.

STATE	1992 PERCENT	1993 PERCENT
Nebraska	54.6	51.4
Iowa	37.3	39.1
Minnesota	3.7	6.1
Colorado	1.1	0.6
Wyoming	0.5	0.2
North Dakota	0.4	0.4
Missouri	0.4	0.1
Michigan	0.4	0.1
Idaho	0.4	0.2
Kansas	0.4	0.3
Hawaii	0.2	-
Nevada	0.2	-
Texas	0.2	-
Arizona	0.2	0.1
Oklahoma	0.2	0.1
Wisconsin	-	0.4
North Carolina	-	0.2
Florida	-	0.2
Indiana	-	0.2
Illinois	-	0.2
California	-	0.2
Montana	-	0.1
Arkansas	-	0.1

Table 12. Distance anglers traveled, one way, to fish Lake Francis Case during 1992 and 1993.

Distance (miles)	1992 Percent	1993 Percent
<25	9.2	10.7
25-50	8.2	8.0
51-100	19.5	19.6
101-200	49.1	46.4
200+	14.0	15.3

LAKE SHARPE

Fishing Pressure

Lake Sharpe anglers fished 402,543 angler hours (+/- 81,323 angler hours, 95% CI) (Tables 13 and 14) during April through September 1992 and 291,970 (+/- 54,858 angler hours, 95% CI) hours during April through September 1993. The 1992 value represents the highest fishing pressure ever measured on Lake Sharpe and constitutes a 56% increase over the average for the same months in 1984 and 1985 (ave. = 258,181 angler hours; Riis 1986) (Table 13).

Fishing pressure averaged 16.3 angler hours/hectare in 1992, up from the previously measured high of 12.3 in 1991 (Fielder et al., 1992). The 1993 pressure per hectare averaged 11.8 angler hours (Table 15). Zone 3 received the heaviest pressure both years with 207,366 angler hours in 1992 and 155,743 angler hours in 1993. Zone 2 received little fishing pressure during July and August in 1992 and April through August in 1993 because of heavy rains and the influence of Bad River runoff (Table 14). Peak fishing pressure occurred in June during both years, unlike 1991 when peak pressure occurred in May (Figure 8). Estimated June, 1992 pressure was the highest ever documented for that month on Sharpe.

Fish Harvest

Anglers fishing Lake Sharpe, April through September 1992 harvested an estimated 219,152 fish (+/- 44,093 fish, 95% CI) while the 1993 estimate was 102,833 fish (+/- 19,675 fish, 95% CI). The total harvest in 1992 was the most ever estimated for Lake Sharpe. Walleye harvest constituted 72% (157,220) of the total fish harvest in 1992, which falls in the range reported for previous years (54% in 1985; Riis 1986 to 82% in 1974; Schmidt 1975). As in previous years, white bass were the second most harvested species with 38,072 caught in Lake Sharpe during 1992 and 9,493 caught during 1993. Most white bass were caught during the month of May in Zone 1. Walleye and total fish harvest in 1992 peaked in May (Figure 9) while walleye and total fish harvest in 1993 peaked in June. Walleye harvest in 1993 was estimated to be 83,133 fish and is similar to previous years estimates.

The 1993 harvest included 15 species and walleye accounted for 81% (Table 16). White bass, channel catfish, smallmouth bass and sauger accounted for 9.2, 2.0, 1.6, and 1.6 percent of the total 1993 harvest, respectively. Despite a 35.6 cm minimum length limit on walleye during April through June about half the harvest occurred during those months (56% in 1992 and 50% in 1993).

Total harvest, both years, was highest in Zone 3 (56% of the total in 1992 and 55% in 1993) (Table 17). Different patterns of

Table 13. Angler use and harvest statistics from creel surveys conducted on Lake Sharpe.

YEAR	FISHING PRESSURE (HOURS)	ANGLER TRIPS	TRIP LENGTH (HOURS)	FISH HARVEST (NO.)	WALLEYE HARVEST (NO.)	TOTAL HARVEST RATE (FISH/HOUR)	WALLEYE HARVEST RATE (FISH/HOUR)	REFERENCE
1973-1974 (May-May)	208,800	46,400	4.5	76,813	67,579	0.37	0.32	Schmidt (1975)
1984 (April-Sept)	241,986	52,605	4.6	87,020	64,784	0.36	0.27	Riis (1986)
1985 (April-Sept)	274,376	62,358	4.4	123,942	66,584	0.45	0.24	Riis (1986)
1990 (June-Aug)*	133,893	32,657	4.1	-	-	-	-	Fielder (1992)
1991 (April-Sept)	303,381	70,554	4.3	143,307	93,027	0.47	0.31	Fielder (1992)
1992 (April-Sept)	402,543	100,636	4.0	219,152	157,220	0.54	0.39	This Study
1993 (April-Sept)	291,970	60,827	4.8	102,833	83,133	0.35	0.29	This Study

* Only pressure was surveyed in 1990.

Table 14. Total fishing pressure (angler hours), by month and zone, on Lake Sharpe during April-September (+/- 95% confidence interval)

1992

ZONE	APRIL	MAY	JUNE	JULY	AUGUST	SEPT	TOTAL
1	15,411	28,225	28,555	20,908	6,998	4,464	104,561
2	12,204	29,845	15,640	5,525	4,398	23,003	90,615
3	7,245	42,791	84,642	50,762	13,526	8,400	207,366
TOTAL	34,860 (12,423)	100,862 (40,974)	128,837 (82,850)	77,194 (34,071)	24,922 (8,926)	35,868 (23,360)	402,543 (81,323)

1993

ZONE	APRIL	MAY	JUNE	JULY	AUGUST	SEPT	TOTAL
1	15,485	28,593	31,704	23,354	5,952	9,810	114,898
2	2,403	3,030	3,444	2,081	745	9,626	21,329
3	11,871	22,898	56,691	26,024	23,663	14,596	155,743
TOTAL	29,759 (17,377)	54,521 (23,597)	91,838 (52,808)	51,459 (12,773)	30,360 (12,554)	34,032 (28,325)	291,969 (54,858)

Table 15. Total angler hours, for boat and shore fishing and methods combined for Lake Sharpe, April-September.

1992

BOAT		SHORE		COMBINED	
TOTAL ANGLER HOURS	NO. HRS./HA	TOTAL ANGLER HOURS	NO. HRS./HA	TOTAL ANGLER HOURS	NO. HRS./HA
348,156	14.1	54,387	2.2	402,543	16.3

1993

BOAT		SHORE		COMBINED	
TOTAL ANGLER HOURS	NO. HRS./HA	TOTAL ANGLER HOURS	NO. HRS./HA	TOTAL ANGLER HOURS	NO. HRS./HA
257,500	10.4	34,470	1.4	291,970	11.8

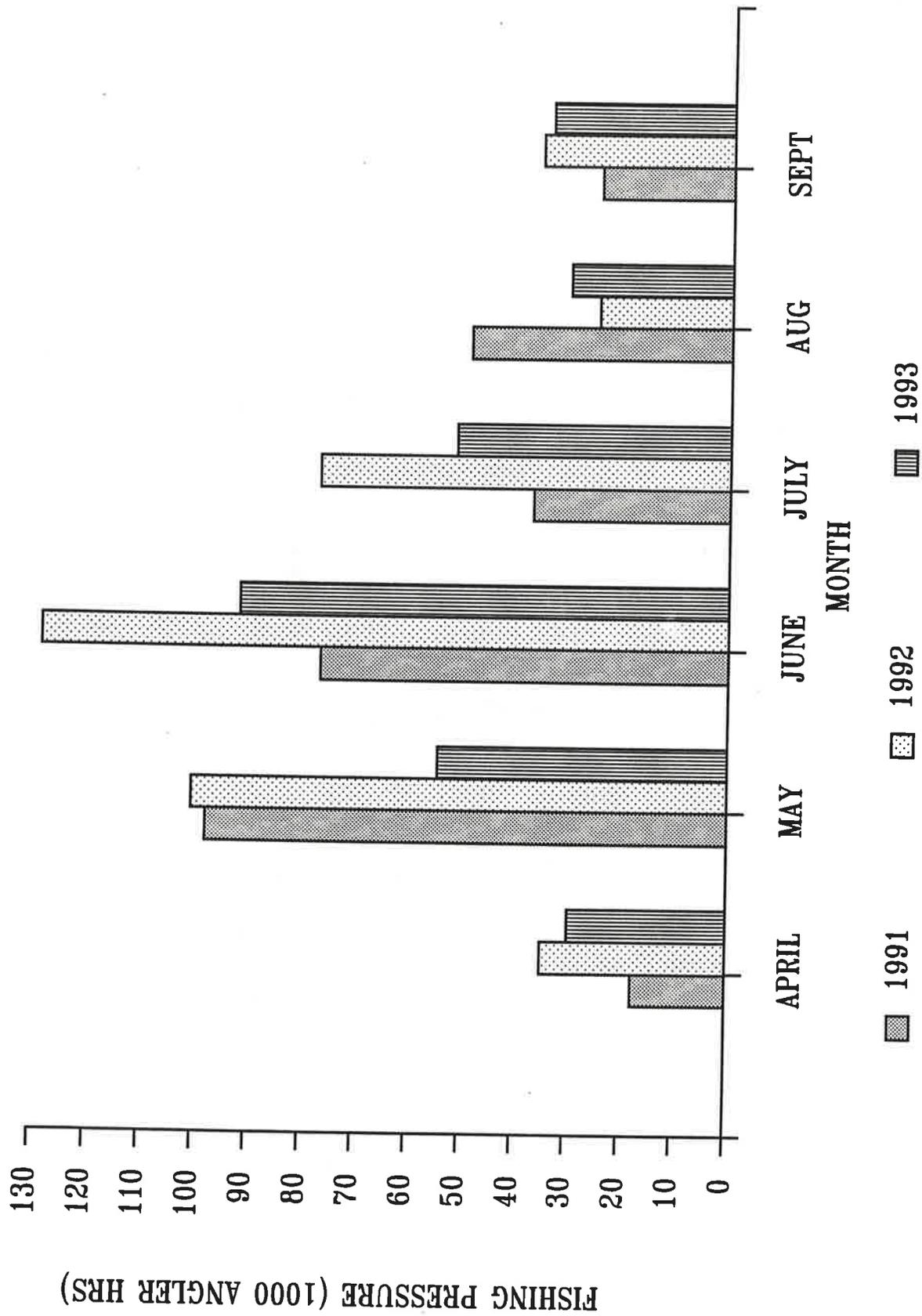


Figure 8. Fishing pressure by month, on Lake Sharpe, 1991-1993.

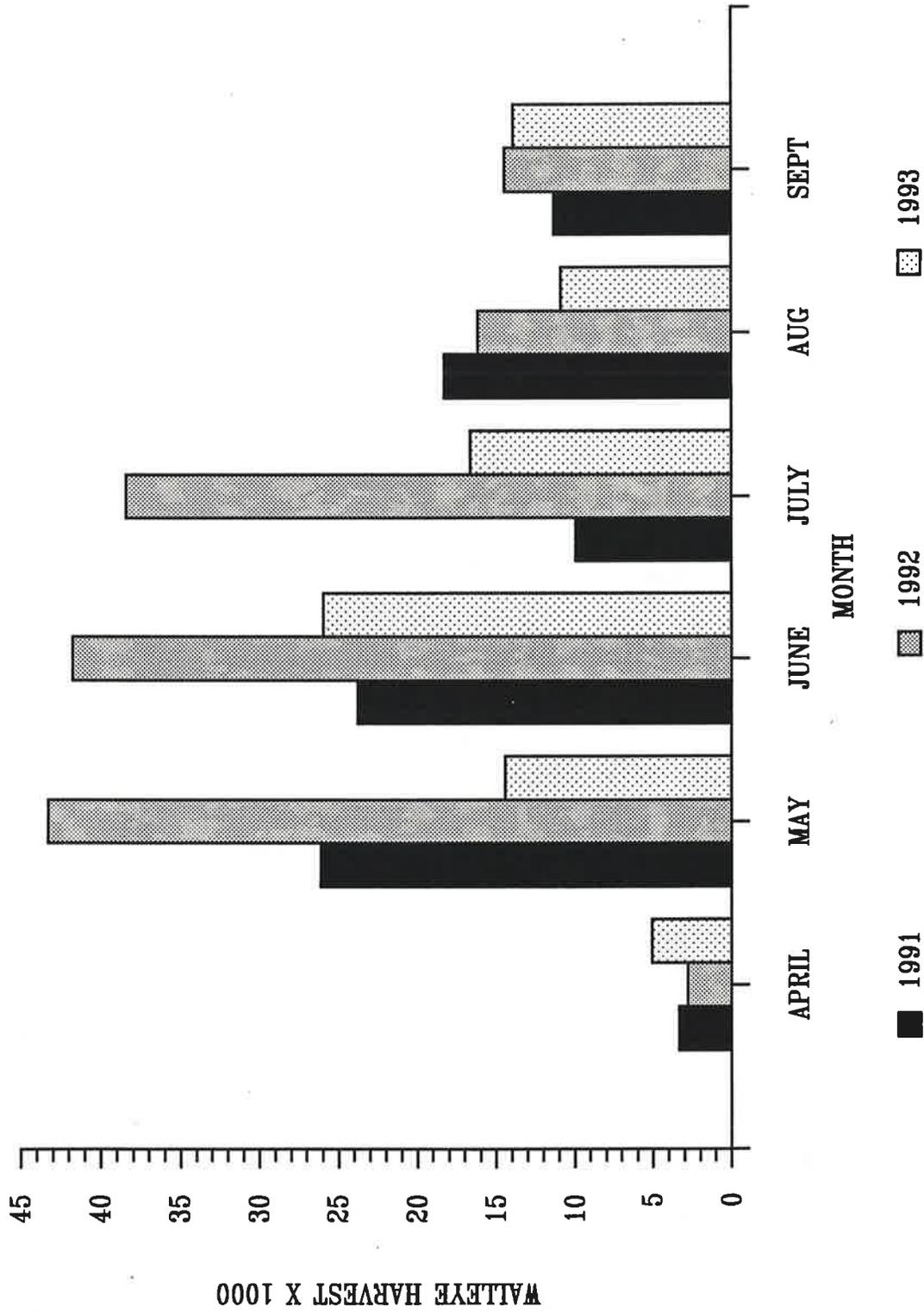


Figure 9. Total walleye harvest, by month, for anglers fishing Lake Sharpe, 1991-1993.

Table 16. Total fish harvest, by month, for anglers fishing Lake Sharpe April-September.
(+/- 95% confidence interval)

1992

MONTH	WAE	SAR	SMB	CCF	WHB	NOP	FCS	OTH*	TOTAL
April	2,809	317	52	258	3,435	63	0	242	7,176 (2,882)
May	43,366	734	2,283	748	29,076	0	0	3,985	80,192 (29,721)
June	41,867	489	1,291	3,601	3,421	127	0	3,020	53,816 (27,324)
July	38,523	105	798	4,208	1,941	0	0	826	46,401 (16,260)
August	16,184	0	261	0	144	0	0	287	16,876 (6,836)
September	14,471	0	110	0	55	0	0	55	14,691 (8,064)
Total	157,220 (32,821)	1,645 (1,488)	4,795 (1,801)	8,815 (4,480)	38,072 (14,854)	190 (252)	0 (-)	8,415 (2,302)	219,152 (44,093)

1993

MONTH	WAE	SAR	SMB	CCF	WHB	NOP	FCS	OTH*	TOTAL
April	5,064	622	0	13	424	7	0	2,038	8,168 (4,535)
May	15,081	695	87	276	6,303	13	0	401	22,856 (7,978)
June	21,479	0	1,006	686	1,047	131	33	817	25,199 (11,468)
July	16,669	33	212	774	1,317	57	24	1,100	20,186 (4,440)
August	10,906	0	120	271	0	0	0	120	11,417 (4,570)
September	13,934	273	208	62	402	0	22	106	15,007 (9,954)
Total	83,133 (16,087)	1,623 (516)	1,633 (628)	2,082 (792)	9,493 (3,547)	208 (188)	79 (100)	4,582 (1,921)	102,833 (19,675)

* OTH includes: black crappie, common carp, freshwater drum, goldeye, largemouth bass, white crappie, yellow perch, and Lepomis spp.

Table 17. Total fish harvest, by zone, from Lake Sharpe during April-September.

1992

ZONE	WAE	SAR	SMB	CCF	WHB	NOP	OTH*	TOTAL
1	25,710	316	2,390	4,034	9,136	0	391	41,977
2	19,874	920	958	3,937	26,902	63	1,782	54,436
3	111,636	409	1,447	844	2,034	127	6,242	122,739
TOTAL	157,220	1,645	4,795	8,815	38,072	190	8,415	219,152

1993

ZONE	WAE	SAR	SMB	CCF	WHB	NOP	FCS	OTH*	TOTAL
1	23,954	1,027	181	1,039	6,303	58	46	3,025	35,633
2	7,417	282	57	332	2,297	11	0	272	10,668
3	51,762	314	1,395	711	893	139	33	1,285	56,532
TOTAL	83,133	1,623	1,633	2,082	9,493	208	79	4,582	102,833

harvest were observed for Zone 2 during the two survey years. Zone 2 accounted for 24.8% of the total in 1992 and only 10.4% in 1993. Zone 1 accounted for 19.2% of the total in 1992 and 34.6% in 1993. The increase in Zone 1 during 1993 was most likely due to a shift from Zone 2 which was influenced by heavy rains and Bad River runoff.

Monthly length-frequencies, from angler caught walleye (Figure 10), reflect the impact of the April-June 35.6 cm (14 inch) minimum length limit. During May and June very few walleye under 35 cm were harvested, similar to the pattern in Lake Francis Case. When walleyes under 35 cm became legal after July 1st, they were more common in the harvest. Table 18 provides statistics on the percent of angling parties that caught a limit of walleye. From this, it is evident that an increasing proportion of anglers are being limited in their walleye harvest by the daily creel limit. As the walleye population on Lake Sharpe expands in abundance, the daily creel limit regulation has become an important component in the protection of the fishery.

Harvest, Release and Catch Rates

Mean harvest rate (species, type of fishing, and zone combined) for Lake Sharpe, during 1992, was 0.544 fish/angler hour (Table 19). An excellent overall catch rate (combining the 1992 harvest rate with the estimated release rate of 0.632 fish/angler hour) of 1.148 fish/angler hour was estimated (Table 19). The walleye harvest rate, for the six month 1992 creel period, was 0.395 walleye/angler hour, the highest ever estimated for Lake Sharpe. When harvest rate for walleye was combined with release rate in 1992 an excellent overall catch rate of nearly one walleye per angler hour was estimated (Table 21). A walleye catch rate of 0.30 fish/hour is considered excellent by North American standards (Colby et al. 1979). Boat anglers generally had higher harvest and catch rates for walleye than shore anglers.

Harvest and catch rates were lower in 1993 than during 1992. The total 1993 harvest rate of 0.352 fish/hour was similar to the lowest years previously surveyed (Table 13). Walleye harvest rate was 0.298 walleye/angler hour. The total catch rate for all species was 0.834 (Table 20) fish/angler hour and the walleye catch rate was 0.728 fish/angler hour (Table 21). While the walleye catch rate was down from 1992, it still compares with previous years on Lake Sharpe and remains above the target of 0.30 walleye/angler hour indicative of a good fishery.

Total catch rate (Table 20) peaked in August during 1992 and in June during 1993. Harvest rate peaked in August, 1992 at 0.872 fish/angler hour and in September, 1993 at 0.441 fish/angler hour. Walleye harvest rate and catch rate peaked in August, 1992.

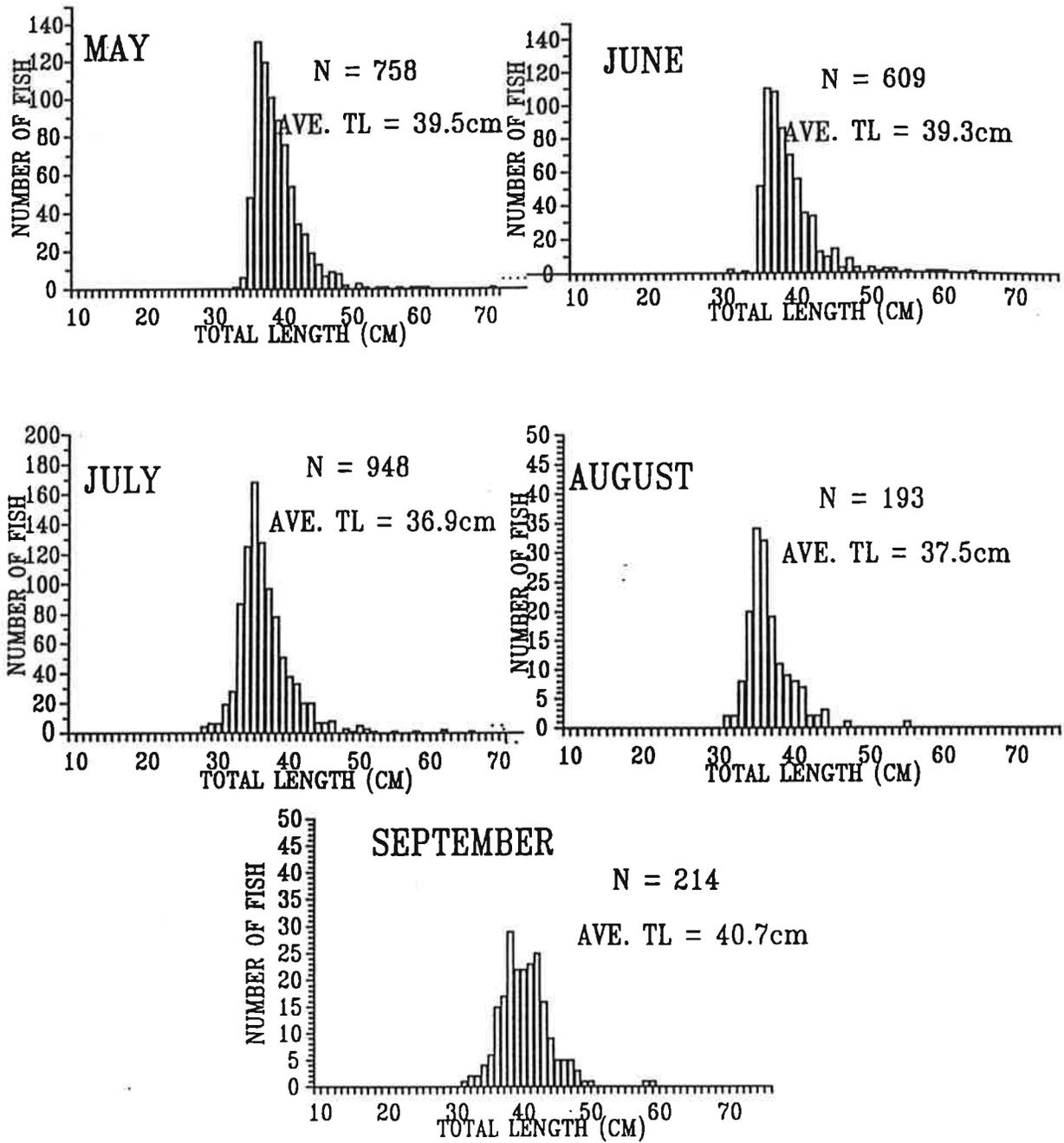


Figure 10. Monthly length frequencies of angler caught walleye from Lake Sharpe, 1993

Table 18. Percent of angling parties that harvested a limit of walleye, at least three walleye/angler, at least two walleye/angler, etc. from Lake Sharpe.

1992

PARTY SUCCESS WALLEYE/ANGLER	PERCENT
Limit (4)	16
3.0 - 3.9	7
2.0 - 2.9	12
1.0 - 1.9	17
0.1 - 0.9	12
0	36

1993

PARTY SUCCESS WALLEYE/ANGLER	PERCENT
Limit (4)	13
3.0 - 3.9	8
1.0 - 2.9	13
1.0 - 1.9	20
0.1 - 0.9	12
0	34

Table 19. Harvest rate, release rate and catch rate, by species, for anglers fishing Lake Sharpe. (T=<0.001) (+/- 95% confidence interval)

1992

SPECIES	HARVEST RATE (FISH/ANGLER HR.)	RELEASE RATE (FISH/ANGLER HR.)	CATCH RATE (FISH/ANGLER HR.)
Walleye	0.391 (0.030)	0.563	0.954
Sauger	0.004 (0.004)	0.004	0.008
Smallmouth Bass	0.012 (0.004)	0.010	0.022
Channel Catfish	0.022 (0.010)	0.003	0.025
White Bass	0.095 (0.032)	0.022	0.117
Northern Pike	T	T	0.001
Chinook Salmon	0	0	0
Other*	0.021	0.016	0.037
Species Combined	0.544 (0.041)	0.632	1.176

1993

SPECIES	HARVEST RATE (FISH/ANGLER HR.)	RELEASE RATE (FISH/ANGLER HR.)	CATCH RATE (FISH/ANGLER HR.)
Walleye	0.285 (0.020)	0.431	0.716
Sauger	0.006 (0.002)	0.005	0.011
Smallmouth Bass	0.006 (0.002)	0.004	0.009
Channel Catfish	0.007 (0.002)	0.003	0.010
White Bass	0.033 (0.011)	0.008	0.040
Northern Pike	0.001 (0.001)	0.000	0.001
Chinook Salmon	T (0.0004)	0.000	0.000
Other*	0.016 (0.006)	0.026	0.041
Species Combined	0.357 (0.020)	0.482	0.840

* Other includes: freshwater drum, goldeye, largemouth bass, yellow perch, Lepomis spp., Poxomis spp.

Table 20. Harvest rate, release rate and catch rate for all species, by month, for anglers fishing Lake Sharpe. (+/- 95% confidence interval)

1992

MONTH	HARVEST RATE (FISH/ANGLER HR.)	RELEASE RATE (FISH/ANGLER HR.)	CATCH RATE (FISH/ANGLER HR.)
APRIL	0.205 (0.061)	0.099	0.304
MAY	0.795 (0.162)	0.458	1.253
JUNE	0.418 (0.055)	0.873	1.291
JULY	0.601 (0.059)	0.723	1.324
AUGUST	0.872 (0.203)	1.130	2.003
SEPTEMBER	0.487 (0.094)	0.145	0.632
COMBINED	0.544 (0.041)	0.632	1.176

1993

MONTH	HARVEST RATE (FISH/ANGLER HR.)	RELEASE RATE (FISH/ANGLER HR.)	CATCH RATE (FISH/ANGLER HR.)
APRIL	0.274 (0.091)	0.218	0.492
MAY	0.418 (0.048)	0.546	0.965
JUNE	0.274 (0.034)	0.741	1.015
JULY	0.392 (0.044)	0.348	0.740
AUGUST	0.376 (0.093)	0.431	0.807
SEPTEMBER	0.441 (0.085)	0.163	0.604
COMBINED	0.352 (0.023)	0.482	0.834

Table 21. Harvest rate, release rate and catch rate of walleye, by month, for anglers fishing Lake Sharpe. (+/- 95% confidence interval)

1992

MONTH	HARVEST RATE (FISH/ANGLER HR.)	RELEASE RATE (FISH/ANGLER HR.)	CATCH RATE (FISH/ANGLER HR.)
APRIL	0.107 (0.038)	0.049	0.156
MAY	0.320 (0.072)	0.328	0.648
JUNE	0.340 (0.044)	0.836	1.176
JULY	0.545 (0.057)	0.693	1.238
AUGUST	0.677 (0.203)	1.309	1.986
SEPTEMBER	0.410 (0.095)	0.164	0.574
COMBINED	0.395 (0.030)	0.563	0.958

1993

MONTH	HARVEST RATE (FISH/ANGLER HR.)	RELEASE RATE (FISH/ANGLER HR.)	CATCH RATE (FISH/ANGLER HR.)
APRIL	0.170 (0.054)	0.138	0.308
MAY	0.265 (0.036)	0.488	0.753
JUNE	0.282 (0.032)	0.691	0.973
JULY	0.324 (0.043)	0.318	0.641
AUGUST	0.359 (0.093)	0.339	0.699
SEPTEMBER	0.409 (0.083)	0.141	0.550
COMBINED	0.298 (0.020)	0.430	0.728

During 1993 the walleye harvest rate was highest in September, while the catch rate peaked in June (Table 21). The high release rate (0.691) measured in June of 1993 was apparently the result of the release of a substantial number of sub-legal walleye.

Angler Demographics and Economics

Non-residents comprised 29% of angler contacts on Lake Sharpe in 1992 and 21% in 1993. Only 12.5% of angler contacts were nonresidents in 1991 on Lake Sharpe (Fielder, 1992). Anglers from 13 states were contacted in 1992 and 17 states in 1993 (Table 22). Iowa, Minnesota and Nebraska anglers accounted for a majority of the non-resident contacts each year. Mean angler trip length (boat and shore combined) on Lake Sharpe was 4.0 hours during 1992 and 4.8 hours during 1993 (Table 13).

The average angling party consisted of 2.5 individuals both years. Anglers traveling over 100 miles (one-way) accounted for over 50% of all trips on Lake Sharpe during both 1992 and 1993 (Table 23). The 1992 Lake Sharpe fishery had an economic impact of 3.9 million dollars to local economies, based on 100,636 angling trips, at an estimated expenditure of \$39 per trip on South Dakota's Missouri River reservoirs (U.S. Dept. of Interior, Fish and Wildlife Service, and U.S. Dept. of Commerce, Bureau of the Census 1993). The 1993 estimate was 2.4 million dollars.

Table 22. Percent of angler contacts from non-resident anglers who fished Lake Sharpe, South Dakota.

STATE	1992 PERCENT	1993 PERCENT
Iowa	37.0	44.8
Minnesota	21.8	15.6
Nebraska	21.8	21.4
Wisconsin	5.9	2.6
Colorado	3.4	2.6
Illinois	2.5	1.6
North Dakota	2.5	0.5
Arizona	0.8	-
California	0.8	-
Kansas	0.8	2.6
Mississippi	0.8	-
Missouri	0.8	-
Wyoming	0.8	4.2
Utah	-	0.5
Oregon	-	0.5
Texas	-	1.0
Montana	-	2.1

Table 23. Distance anglers traveled, one way, to fish Lake Sharpe during 1993.

DISTANCE (miles)	1992 PERCENT	1993 PERCENT
<25	40	28
25-50	1	5
51-100	8	15
101-200	15	19
200+	36	33

LAKE OAHE

Fishing Pressure

Lake Oahe anglers fished 1,051,330 angler hours (+/- 138,753 angler hours, 95% CI) (Table 24) fishing during May through October 1992 and 1,299,344 angler hours (+/- 150,508 angler hours, 95% CI) during a creel period of April through October. The 1993 value represents the highest fishing pressure ever estimated for Lake Oahe (Table 25). Perhaps Bad River flows kept anglers off Lake Sharpe in 1993 and they shifted their angling efforts to Lake Oahe resulting in the high estimate.

Anglers fishing Oahe averaged 12.3 angler hours/hectare during 1992 and 15.2 angler hours/hectare in 1993 (Table 26). Zone 2 received the heaviest pressure at 15.8 hours/hectare in 1992 and in 1993 Zone 3 was highest at 18.4 hours/hectare. Zone 1 consistently received the lowest pressure on a per hectare basis (Table 27). Peak fishing pressure occurred in July (Figure 11) during 1991, 1992 and 1993.

Fishing Harvest

Anglers fishing Lake Oahe, May through October 1992, harvested an estimated 267,746 fish (+/- 36,071 fish, 95% CI) while the 1993 estimate was 318,381 fish (+/- 39,110 fish, 95% CI) (Tables 28 & 29). Both values are within the range observed from previous surveys, (Table 24). Eighteen species of fish were observed in the catch, with walleye accounting for 80.8% of the total harvest in 1992 and 84.6% in 1993 (Table 28). Channel catfish, smallmouth bass, chinook salmon and white bass accounted for 6.3, 3.0, 2.6 and 1.5 percent of the total 1992 harvest, respectively. In 1993, channel catfish, white bass, chinook salmon, and smallmouth bass accounted for 2.8, 2.7, 1.9 and 1.8 percent of the harvest, respectively.

Total fish harvest peaked in July during both survey years (Table 28). Changes in walleye harvest regulations, initiated in 1990 included a 35.6 cm minimum length limit for the months of April through June which reduced the number of walleye that could be legally harvested during those months resulting in a shift of peak walleye harvest to July when walleye of any size could legally be kept. Walleye harvest continued strong in August of 1992 and 1993. In some prior surveys, walleye harvest decreased dramatically in August (Riis 1989). Over 40,000 walleye were harvested during September and October in both 1992 and 1993. The fall fishery has become more popular on Lake Oahe in recent years. Figure 12 shows the walleye harvest by month for anglers fishing Lake Oahe, 1991-1993.

Different patterns of harvest were observed during the two survey years. Total fish harvest in Zone 2 accounted for 44.7% of the total, followed by Zones 3 and 1 with 36.8 and 18.5 percent,

Table 24. Total fishing pressure (angler hours), by month and zone, on Lake Oahe.
 (+/- 95% confidence interval)

1992

ZONE	MAY	JUN	JULY	AUGUST	SEPTEMBER	OCTOBER	TOTAL
1	49,605	37,320	123,883	51,234	24,703	5,533	292,278
2	63,306	53,470	147,054	87,340	35,775	6,934	393,878
3	126,786	39,547	90,389	30,404	29,766	48,281	365,173
TOTAL	239,697 (96,353)	130,337 (72,325)	361,326 (89,903)	168,978 (76,757)	90,244 (42,769)	60,748 (15,153)	1,051,330 (138,753)

1993

ZONE	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	TOTAL
1	4,191	62,714	96,383	106,014	72,566	53,332	4,012	399,212
2	1,980	26,146	59,396	128,383	76,551	61,531	810	354,797
3	2,507	114,977	130,140	117,815	80,580	65,720	33,596	545,335
TOTAL	8,678 (5,119)	203,837 (61,154)	285,919 (122,650)	352,211 (94,536)	229,697 (54,665)	180,418 (73,340)	38,418 (14,909)	1,299,344 (150,508)

Table 25. Angler use and harvest statistics from creel surveys conducted on Lake Oahe.

YEAR	FISHING PRESSURE (HOURS)	ANGLER TRIPS	TRIP LENGTH (HOURS)	FISH HARVEST (NO.)	WALLEYE HARVEST (NO.)	TOTAL HARVEST RATE (FISH/HOUR)	WALLEYE HARVEST RATE (FISH/HOUR)	REFERENCE
1981 (July-Sept)	671,393	124,332	5.4	278,127	221,594	0.41	0.33	Riis (1982)
1982 (April-Sept)	1,276,990	228,034	5.6	342,682	286,633	0.23	0.22	Riis (1983)
1983 (April-Sept)	784,658	142,665	5.5	141,475	95,797	0.18	0.12	Riis (1985)
1986 (April-Oct)	1,031,176	190,958	5.4	313,199	256,737	0.30	0.25	Riis (1989)
1990 (June-Aug)*	892,022	193,918	4.6	-	-	-	-	Fielder (1992)
1991 (May-Oct)	903,777	238,795	3.7	193,593	178,492	0.22	0.20	Fielder (1992)
1992 (May-Oct)	1,051,330	210,266	5.0	267,746	216,426	0.30	0.20	This Study
1993 (April-Oct)	1,299,344	236,244	5.5	318,381	269,392	0.25	0.21	This Study

* Only pressure was surveyed in 1990.

Table 26. Total angler hours, for boat and shore fishing and methods combined, by zone, for Lake Oahe.

1992

ZONE	BOAT			SHORE			COMBINED		
	TOTAL ANGLER HOURS	%	NO. HRS/HA	TOTAL ANGLER HOURS	%	NO. HRS/HA	TOTAL ANGLER HOURS	%	NO. HRS/HA
1	281,618	28	9.0	7,661	13	0.3	289,273	28	9.3
2	371,762	37	15.0	22,117	38	0.9	393,879	38	15.8
3	337,452	34	11.4	27,720	49	0.9	365,172	35	12.3
TOT/AVE	993,832	100	11.6	57,498	100	0.7	1,051,330	100	12.3

1993

ZONE	BOAT			SHORE			COMBINED		
	TOTAL ANGLER HOURS	%	NO. HRS/HA	TOTAL ANGLER HOURS	%	NO. HRS/HA	TOTAL ANGLER HOURS	%	NO. HRS/HA
1	351,315	29	11.2	7,898	22	0.3	399,212	31	12.8
2	342,339	28	13.8	12,458	34	0.5	453,797	27	14.2
3	529,562	43	17.7	15,772	44	0.5	545,335	42	18.4
TOT/AVE	1,223,216	100	14.3	36,128	100	0.4	1,299,344	100	15.2

Table 27. Percent use by zone as measured in angler hours.

YEAR	ZONE 1 (LOWER OAHE)	ZONE 2 (MIDDLE OAHE)	ZONE 3 (UPPER OAHE)
1993	31	27	42
1992	28	38	35
1991	27	38	35
1990	22	45	33
1986	26	34	40
1983	19	26	54
1982	27	30	43

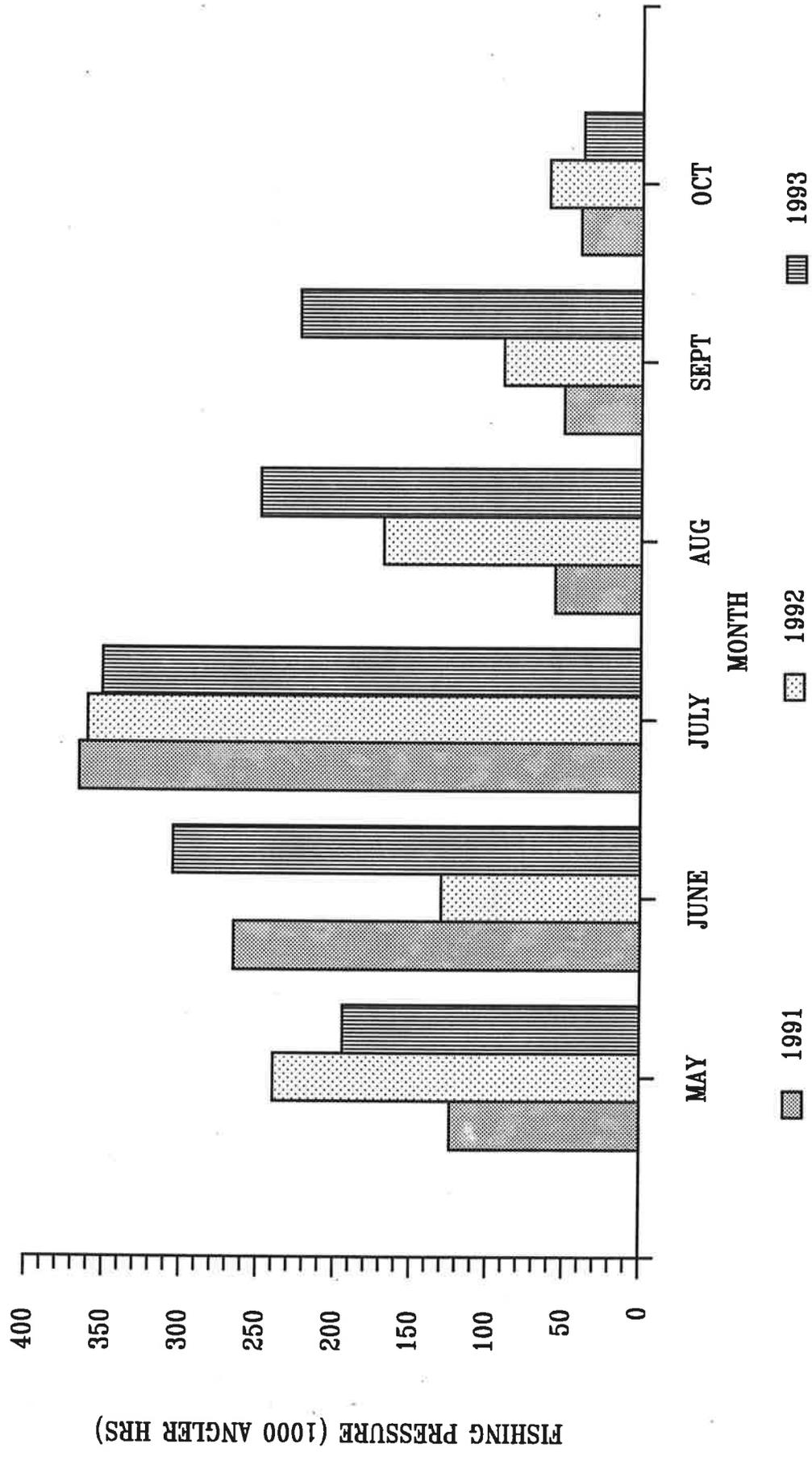


Figure 11. Fishing pressure, by month, on Lake Oahe, 1991-1993.

Table 28. Total fish harvest, by month, for anglers fishing Lake Oahe May-September.
(+/- 95% confidence interval)

1992

MONTH	WAE	SAR	SMB	CCF	WHB	NOP	FCS	OTH*	TOTAL
May	22,781	382	1,503	2,621	2,300	856	0	3,361	33,804 (12,551)
June	26,040	133	733	874	774	212	1,358	889	31,013 (13,358)
July	68,837	314	1,656	11,568	1,015	75	1,658	5,642	90,765 (90,765)
August	58,647	34	1,226	616	171	346	2,409	698	64,147 (23,073)
September	19,505	354	996	1062	0	0	656	1,179	23,752 (17,360)
October	20,616	38	1,952	115	0	342	982	220	24,265 (6,135)
TOTAL	216,426 (72,532)	1,254 (2,034)	8,066 (6,646)	16,857 (9,645)	4,260 (6,615)	1,831 (6,456)	7,063 (6,724)	11,989 (7,049)	267,746 (36,071)

1993

MONTH	WAE	SAR	SMB	CCF	WHB	NOP	FCS	OTH*	TOTAL
April	81	9	0	0	0	5	160	24	279 (249)
May	26,806	386	355	1,917	4,541	53	254	1,237	35,549 (9,505)
June	36,598	755	1,265	898	1,560	359	1,907	2,848	46,190 (16,706)
July	80,302	236	1,589	3,595	1,336	409	220	4,797	92,484 (20,776)
August	80,829	0	1,852	1,262	526	212	843	1,384	86,908 (17,042)
September	36,436	0	563	1,262	432	64	2,539	5,257	46,553 (16,226)
October	8,340	0	54	72	144	54	132	1,622	10,418 (3,490)
TOTAL	269,392 (33,547)	1,386 (641)	5,678 (1,511)	9,006 (3,655)	8,539 (2,766)	1,156 (588)	6,055 (1,767)	17,169 (4,488)	318,381 (39,110)

* OTH includes: black crappie, bluegill, common carp, freshwater drum, goldeye, largemouth bass, river carpsucker, white crappie, yellow perch, Ictiobus spp., trout spp. and Lepomis spp.

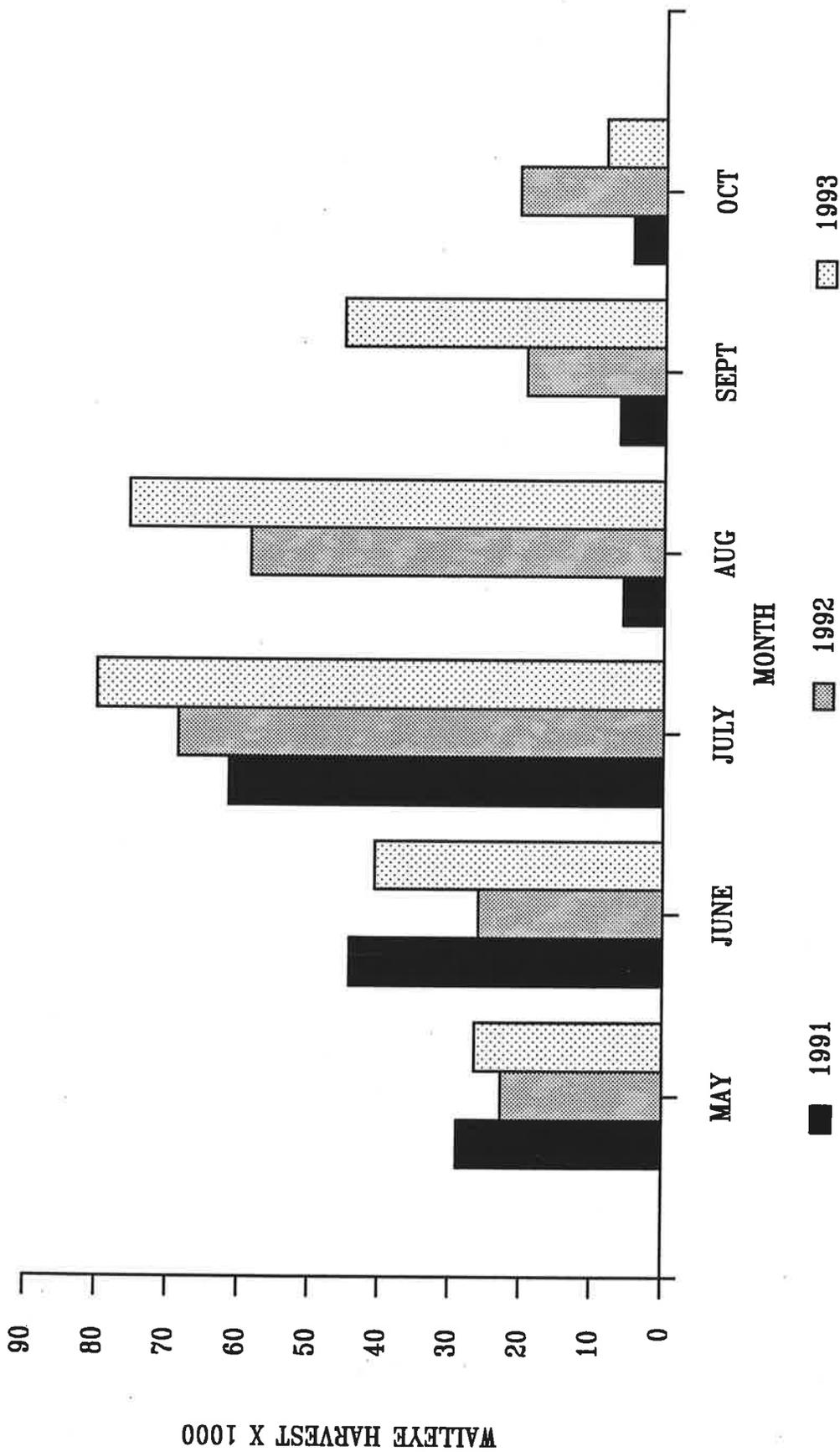


Figure 12. Total walleye harvest, by month, for anglers fishing Lake Oahe, 1991-1993.

respectively (Table 29). Anglers fishing Zone 2 contributed 47.0 percent of the total 1992 walleye harvest, dissimilar to most years when the peak walleye harvest came from Zone 3. Walleye harvest during 1993 followed a more typical pattern, with Zone 3 accounting for 48.7% followed by Zones 2 and 1 with 27.9 and 23.3 percent, respectively (Table 29).

Monthly length-frequencies, from angler caught walleye (Figure 13) reflect the impact of the April-June 35.6 cm, (14 inch) minimum length limit. During May and June walleye under 35.6 cm are illegal to keep and very few are harvested, while from July through October fish under 35 cm were common in the walleye harvest. Table 30 provides statistics on the percent of angling parties that caught a limit of walleye. From this, it is evident that an increasing proportion of anglers on Lake Oahe are being limited in their walleye harvest by the daily creel limit. As the walleye population on Lake Oahe continues to expand in both abundance and through improved size structure, the daily creel limit has become an important factor in the protection of the fishery. Additional creel information for the coldwater salmon fishery was collected in 1992 and 1993 (Appendix 5).

Harvest, Release and Catch Rates

Mean harvest rate (species, type of fishing, and zone combined) for Lake Oahe, during 1992, was 0.246 fish/angler hour (Table 31). An overall catch rate for 1992 of 0.460 was estimated (Table 32) by combining the harvest rate with the estimated released rate of 0.214 fish/angler hour. The walleye harvest rate, for the six month 1992 creel period, was 0.198 walleye/angler hour. The overall catch rate of 0.374 walleye per angler hour was estimated (Table 33). This value exceeds the rate of 0.30 fish angler hour that is considered to be indicative of an excellent walleye fishery (Colby et al. 1979). Boat anglers generally had higher harvest and catch rates for walleye than shore anglers.

Both total fish harvest and catch rates declined slightly in 1993. The total 1993 fish harvest rate of 0.245 falls within the range of past years (Table 24). With release rates factored in, the total catch rate was 0.439 fish/angler hour. The overall walleye harvest rate of 0.207 combined with the release rate of 0.111 equals a catch rate of 0.318 walleye/angler hour, still indicative of a good fishery.

Total catch rate (Table 32) peaked in August during 1992 and in September during 1993 at of 0.6 fish/angler hour. Harvest rate peaked in August during both years. Walleye harvest rate and catch rate peaked in August during both years (Table 33).

Angler Demographics and Economics

Twenty-two percent of the angler contacts on Lake Oahe during 1992 were non-residents while 24% were non-residents in 1993,

Table 29. Total fish harvest, by zone, from Lake Oahe.

1992

ZONE	WAE	SAR	SMB	CCF	WHB	NOP	FCS	OTH*	TOTAL
1	37,567	115	1,451	630	1,414	745	5,535	1,956	49,413
2	101,784	753	2,898	3,440	1,609	400	1,358	7,435	119,677
3	77,075	386	3,717	12,787	1,237	686	170	2,598	98,656
TOTAL	216,426	1,254	8,066	16,857	4,260	1,831	7,063	11,989	267,746

1993

ZONE	WAE	SAR	SMB	CCF	WHB	NOP	FCS	OTH*	TOTAL
1	62,828	625	1,712	4,134	4,863	432	3,290	2,320	79,641
2	75,253	557	1,681	1,177	1,100	456	2,643	4,610	87,477
3	131,311	767	2,285	3,695	2,576	268	122	10239	151,263
TOTAL	269,392	1,386	5,678	9,006	8,539	1,156	6,055	17,169	318,381

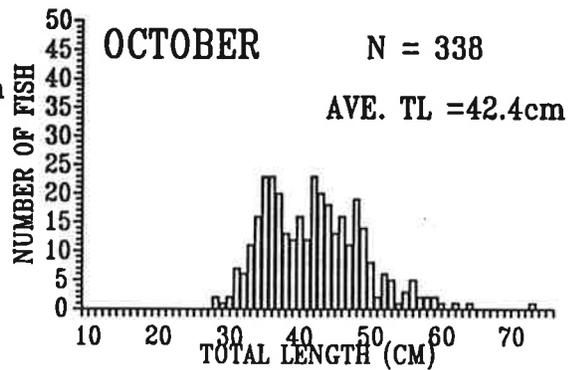
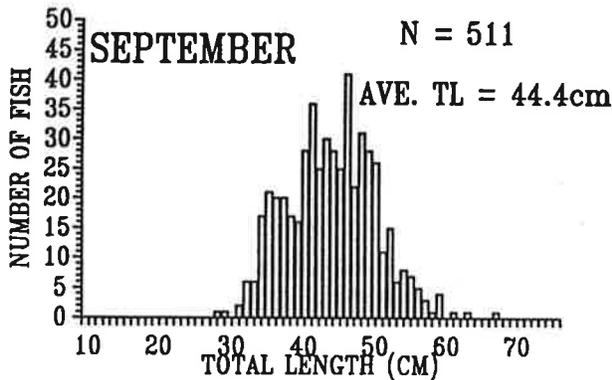
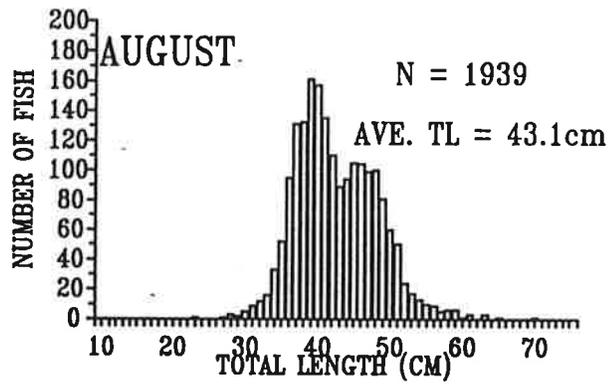
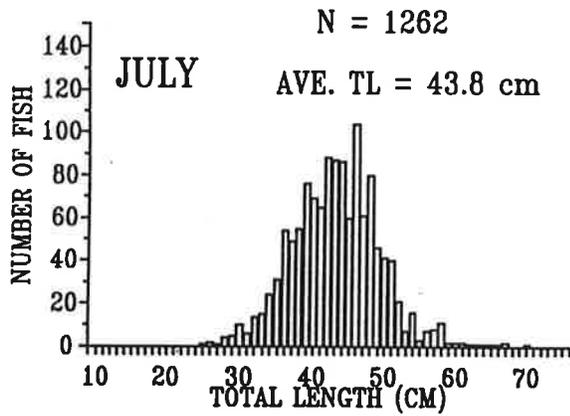
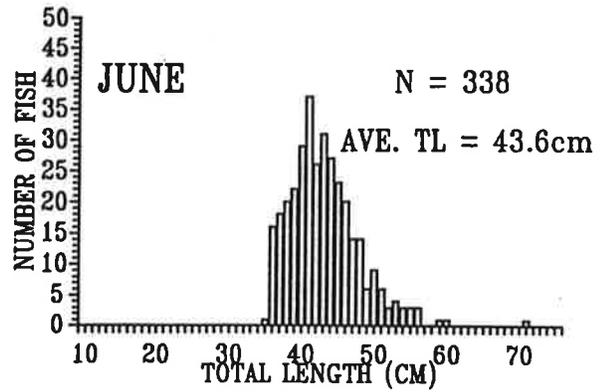
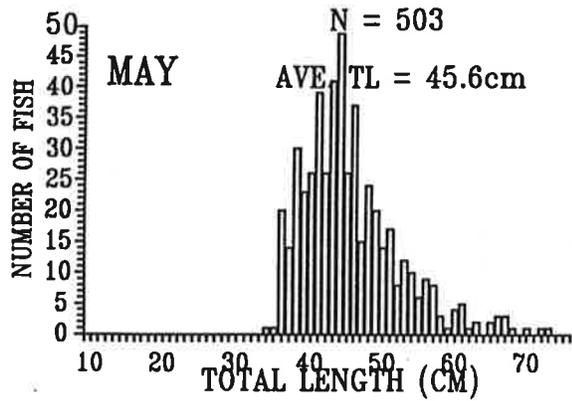


Figure 13. Monthly length frequencies of angler caught walleye from Lake Oahe, 1993.

Table 30. Percent of angling parties that harvested a limit of walleye, at least three walleye/angler, at least two walleye/angler, etc. from Lake Oahe.

1992

PARTY SUCCESS WALLEYE/ANGLER	PERCENT
Limit (4)	17
3.0 - 3.9	9
2.0 - 2.9	12
1.0 - 1.9	20
0.1 - 0.9	18
0	24

1993

PARTY SUCCESS WALLEYE/ANGLER	PERCENT
Limit (4)	14
3.0 - 3.9	7
2.0 - 2.9	10
1.0 - 1.9	17
0.1 - 0.9	14
0	37

Table 31. Harvest rate, release rate and catch rate, by species, for anglers fishing Lake Oahe. (T=<0.001) (+/- 95% confidence interval)

1992

SPECIES	HARVEST RATE (FISH/ANGLER HR.)	RELEASE RATE (FISH/ANGLER HR.)	CATCH RATE (FISH/ANGLER HR.)
Walleye	0.198 (0.013)	0.176	0.374
Sauger	0.001 (0.000)	0.001	0.002
Smallmouth Bass	0.007 (0.002)	0.008	0.015
Channel Catfish	0.017 (0.007)	0.005	0.022
White Bass	0.005 (0.001)	0.004	0.009
Northern Pike	0.002 (0.001)	T	0.002
Chinook Salmon	0.006 (0.002)	T	0.006
Other*	0.012 (0.002)	0.019	0.031
Species Combined	0.246 (0.015)	0.214	0.460

1993

SPECIES	HARVEST RATE (FISH/ANGLER HR.)	RELEASE RATE (FISH/ANGLER HR.)	CATCH RATE (FISH/ANGLER HR.)
Walleye	0.207 (0.207)	0.111	0.318
Sauger	0.001 (0.0004)	0.0001	0.001
Smallmouth Bass	0.004 (0.001)	0.013	0.017
Channel Catfish	0.007 (0.003)	0.004	0.011
White Bass	0.007 (0.002)	0.015	0.020
Northern Pike	0.001 (0.0004)	0.001	0.002
Chinook Salmon	0.005 (0.001)	0.001	0.005
Other*	0.013 (0.003)	0.007	0.020
Species Combined	0.245 (0.013)	0.194	0.439

* Other includes: freshwater drum, goldeye, largemouth bass, common carp, rainbow trout, yellow perch, *Scaphirhynchus* spp., *Lepomis* spp., *Ictiobus* spp., and *Poxomis* spp.

Table 32. Harvest rate, release rate and catch rate, for all species, by month, for anglers fishing Lake Oahe. (+/- 95% confidence interval)

1992

MONTH	HARVEST RATE (FISH/ANGLER HR.)	RELEASE RATE (FISH/ANGLER HR.)	CATCH RATE (FISH/ANGLER HR.)
May	0.141 (0.030)	0.182	0.323
June	0.238 (0.019)	0.307	0.545
July	0.251 (0.034)	0.189	0.440
August	0.380 (0.036)	0.222	0.602
September	0.263 (0.086)	0.243	0.506
October	0.399 (0.067)	0.124	0.523
Combined	0.246 (0.014)	0.214	0.460

1993

MONTH	HARVEST RATE (FISH/ANGLER HR.)	RELEASE RATE (FISH/ANGLER HR.)	CATCH RATE (FISH/ANGLER HR.)
April	0.032 (0.025)	0.010	0.042
May	0.174 (0.024)	0.134	0.309
June	0.162 (0.025)	0.123	0.285
July	0.263 (0.024)	0.205	0.467
August	0.378 (0.028)	0.189	0.567
September	0.258 (0.041)	0.352	0.609
October	0.271 (0.043)	0.203	0.474
Combined	0.245 (0.013)	0.194	0.439

Table 33. Harvest rate, release rate and catch rate of walleye by month, zones combined, for anglers fishing Lake Oahe. (+/- 95% confidence interval)

1992

MONTH	HARVEST RATE (FISH/ANGLER HR.)	RELEASE RATE (FISH/ANGLER HR.)	CATCH RATE (FISH/ANGLER HR.)
May	0.095 (0.023)	0.130	0.225
June	0.200 (0.019)	0.260	0.460
July	0.190 (0.022)	0.172	0.362
August	0.347 (0.036)	0.213	0.560
September	0.216 (0.075)	0.063	0.279
October	0.339 (0.064)	0.114	0.454
Combined	0.198 (0.015)	0.176	0.374

1993

MONTH	HARVEST RATE (FISH/ANGLER HR.)	RELEASE RATE (FISH/ANGLER HR.)	CATCH RATE (FISH/ANGLER HR.)
April	0.009 (0.018)	0.008	0.017
May	0.132 (0.021)	0.072	0.204
June	0.128 (0.023)	0.083	0.211
July	0.228 (0.022)	0.108	0.336
August	0.352 (0.027)	0.126	0.478
September	0.202 (0.039)	0.197	0.399
October	0.219 (0.034)	0.108	0.325
Combined	0.207 (0.011)	0.111	0.318

similar to values measured in the late 1980's (Riis 1989), but still not as high as the early 1980's when half of all Lake Oahe anglers were non-residents (Riis 1985). Anglers from 18 states were contacted in 1992 and 20 in 1993 (Table 34) with Minnesota, Iowa, Nebraska and North Dakota accounting for a majority of the non-resident contacts each year. Mean angler trip length (boat and shore combined) on Lake Oahe was similar both years at 5.0 hours in 1992 and 5.5 hours in 1993 (Table 24). The average angling party consisted of 2.5 individuals. Anglers traveling over 100 miles (one-way) accounted for over 55% of all trips on Lake Oahe during both 1992 and 1993 (Table 35).

The 1992 Lake Oahe fishery had an economic impact of 8.2 million dollars to local economies, based on over 210,266 angling trips, at an estimated expenditure of \$39.00 per trip on South Dakota's Missouri River reservoirs (U.S. Dept. of Interior, Fish and Wildlife Service, and U.S. Dept. of Commerce, Bureau of Census 1993). The 1993 estimate was 9.2 million dollars. The economic value of Missouri River sport fishing cannot be over emphasized.

Table 34. Percent of angler contacts from non-resident anglers who fished Lake Oahe, South Dakota.

STATE	1992 PERCENT	1993 PERCENT
Iowa	22.9	18.5
Minnesota	29.7	21.8
Nebraska	19.2	27.3
North Dakota	14.3	16.5
Wyoming	3.4	3.5
Wisconsin	2.6	3.1
Colorado	2.3	2.9
California	1.1	0.2
Ohio	0.8	0.4
Arizona	0.4	0.2
Florida	0.4	-
Illinois	0.4	0.9
Kansas	0.4	1.5
Louisiana	0.4	-
Michigan	0.4	0.9
Oklahoma	0.4	-
Texas	0.4	-
Virginia	0.4	-
Idaho		0.2
Missouri		0.7
Montana		0.4
Maryland		0.2
Ontario		0.2
Washington		0.2
Oregon		0.2

Table 35. Distance anglers traveled one way to fish Lake Oahe.

DISTANCE (miles)	1992 PERCENT	1993 PERCENT
<25	16	21
25-50	12	10
51-100	16	14
101-200	24	17
200+	32	38

CONCLUSIONS AND MANAGEMENT IMPLICATIONS

Creel survey results document the continued initial success of the 1990 changes in walleye sport fishing regulations on the upper three Missouri River reservoirs in South Dakota. On Lake Francis Case, the regulations have functioned as an effective management tool for restructuring the walleye population away from conditions indicative of overharvest. On Lakes Sharpe and Oahe, the regulation has maintained and enhanced these walleye populations in spite of increasing fishing pressure. Catch rates on all three reservoirs remain excellent.

During the 1992 creel survey periods an angler preference and attitude survey (Stone et. al. 1993) was also conducted on the reservoirs. Several questions in this survey were designed to evaluate angler attitudes toward the 1990 regulation changes. Results from this survey indicate, that at least in 1992, a majority of anglers fishing these reservoirs were positive about the effects these changes were having on the walleye populations and their associated fishing activity. Survey responses showed 84% of the anglers felt the length limit regulation had improved the quality of the walleye fishery and 90% indicated that reduced daily creel had no effect on their enjoyment or enhanced their fishing enjoyment. Seventy-seven percent of anglers surveyed were satisfied with that days fishing trip.

Annual fish population surveys (Lott et al. 1994, in press) indicate that walleye growth rates have remained good, and that population indices continue to show improvements toward management goals and objectives for these populations (SDGF&P, unpublished data). Continued monitoring of the fish populations through annual population surveys and the sport fishery through routine creel and preference surveys will allow managers to work towards maintaining healthy fish populations, while allowing for maximum recreational benefits.

Overall, when evaluating the results of this survey in combination with recent population survey (Lott et. al. 1994, in press) and angler attitude and preference data (Stone et. al. 1993) it can be concluded that current management practices are providing for most angler's needs while maintaining healthy fish populations.

RECOMMENDATIONS

1. Maintain current walleye harvest regulations.
2. Continue annual creel surveys on the Missouri River reservoirs.
3. Investigate alternatives to estimating fishing pressure, other than by an aerial survey.
4. Continue public relations/public education efforts to encourage catch and release of species such as walleye and smallmouth bass.
5. Continue angler education efforts to draw attention to underutilized species such as channel catfish, white bass and freshwater drum.
6. Evaluate the results of the Statewide Angler Use and Preference survey as they pertain to management of the Missouri River reservoir fisheries.
7. Continue lake access improvement and maintenance programs to meet angling access demands. Special emphasis should be placed on development of shore fishing access for elderly and handicapped anglers.

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Appendix 1. A list of common and scientific names of fishes mentioned in this report.

Common Name	Scientific Name
Common carp	<i>Cyprinus carpio</i>
Channel catfish	<i>Ictalurus punctatus</i>
Chinook salmon	<i>Oncorhynchus tshawytscha</i>
Flathead catfish	<i>Pylodictis olivaris</i>
Freshwater drum	<i>Aplodinotus grunniens</i>
Largemouth bass	<i>Micropterus salmoides</i>
Northern pike	<i>Esox lucius</i>
Sauger	<i>Stizostedion canadense</i>
Shortnose gar	<i>Lepisosteus platostomus</i>
Smallmouth bass	<i>Micropterus dolomieu</i>
Walleye	<i>Stizostedion vitreum vitreum</i>
White bass	<i>Morone chrysops</i>
White crappie	<i>Pomoxis annularis</i>

Appendix 2. Flight data form.

LAKE _____ START _____
 DATE _____ DAY _____ STOP _____
 WEATHER _____

ZONE	# FISHING BOATS	# SHORE ANGLERS	# TRANSIT BOATS	TOTAL

Appendix 3. Access sites.

Lake Francis Case

Big Bend Dam
American Creek
Dude Ranch
Boyer Area
Elm Creek
Bjryanek Area
West Bridge
Platte Creek
North Wheeler

Pease Creek
White Swan
St. Francis Bay
North Point
Joe Day Bay
South Scalp Creee
South Wheeler
Whetstone Bay

Lake Sharpe

Oahe Marina
Ft. Pierre
LaFramboise Causeway
Down's Marina
Polo Field
Farm Island
Ft. George

DeGrey
Joe Creek
West Bend
North Bend
North Shore
Good Soldier

Lake Oahe

West Shore
East Shore
Chantier Creek
Peoria Flats
Spring Creek
Cow Creek
Pike Haven
Little Bend
Minneconjou
Bush's
Sutton Bay
Forest City
Bob's

South Whitlock
East Whitlock
West Whitlock
Dodge Draw
Swan Creek
Walth Bay
Thomas Bay
Indian Creek
Indian Memorial
Shaw Creek
West Pollock

Appendix 4. Angler interview form.

Date _____ Page _____ of _____
 Day of Week _____ Officer/Clerk _____
 Water Temp _____ Location _____
 Weather _____

No. in Party	Boat or Shore		Walleye # Kept: # Released	SM Bass #Kept: # Released	Species: Salmon W. Bass C. Catfish Sauger N. Pike Other	#Kept	#Rel.
	State of Residence:	Completed: Y N					
Distance Traveled:	T.Start:						
Zip Code:	T.Stop:						
	T.Not Fish:						
	Time of Interview:						

What are you fishing for? Anything; Walleye; N.Pike; SM Bass; Salmon; W. Bass; Other
 Comments:

No. in Party	Boat or Shore		Walleye # Kept: # Released	SM Bass #Kept: # Released	Species: Salmon W. Bass C. Catfish Sauger N. Pike Other	#Kept	#Rel.
	State of Residence:	Completed: Y N					
Distance Traveled:	T.Start:						
Zip Code:	T.Stop:						
	T.Not Fish:						
	Time of Interview:						

What are you fishing for? Anything; Walleye; N.Pike; SM Bass; Salmon; W. Bass; Other
 Comments:

No. in Party	Boat or Shore		Walleye # Kept: # Released	SM Bass #Kept: # Released	Species: Salmon W. Bass C. Catfish Sauger N. Pike Other	#Kept	#Rel.
	State of Residence:	Completed: Y N					
Distance Traveled:	T.Start:						
Zip Code:	T.Stop:						
	T.Not Fish:						
	Time of Interview:						

What are you fishing for? Anything; Walleye N.Pike; SM Bass; Salmon; W. Bass; Other
 Comments:

Appendix 5. Comparison of chinook salmon creel statistics for the month of July on the Dam face in Lake Oahe from 1985 through 1993.

CHINOOK SALMON CREEL/OAHE DAM FACE						
JULY						
	1985	1987	1988	1991	1992	1993
Number of hours fished	13,643	43,231	37,009	-----	11,062	16,617
Number of salmon caught	973	6,448	8,509	-----	732	1,078
Mean trip length (hrs.)	4.40	5.20	5.02	4.90	4.78	4.68
Average size caught (lbs.)	2.60	4.38	3.82	4.00	4.19	5.77
Total pounds harvested	2,529	28,470	32,470	-----	3,067	6,220
Harvest rate (fish/hr.)	0.07	0.15	0.23	0.13	0.07	0.07
Harvest rate (fish/trip)	0.31	0.78	1.15	0.64	0.32	0.30
Harvest rate (lbs./trip)	0.81	3.42	4.39	2.56	1.32	1.75
Party size	-----	-----	-----	-----	-----	2.5
Reference	Riis 1986	Riis 1989	G. Marrone, SDGF&P Communication 1994			

Appendix 5 continued. Chinook salmon creel stastics for June through August 1993 from the Dam face on Lake Oahe (G. Marrone, SDGF&P Personal Communication, 1994).

CHINOOK SALMON CREEL/OAHE DAM FACE			
1993	JUNE	JULY	AUGUST
Number of hours fished	11,062	16,617	9,515
Number of salmon caught	985	1,078	715
Mean trip length (hrs.)	5.07	4.68	4.09
Average size caught (lbs.)	6.30	5.77	8.39
Total pounds harvested	6,206	6,220	5,999
Harvest rate (fish/hr.)	0.09	0.07	0.08
Harvest rate (fish/trip)	0.90	0.30	0.31
Harvest rate (lbs./trip)	5.70	1.75	2.60
Party size	2.5	2.5	2.2

