

**Assessment of the Status
of the Sport Fishery for Walleye
at Lac Ste. Anne, 1997.**

Conducted as part of the
Walleye Monitoring Program
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ABSTRACT

To recover or maintain Alberta's walleye fisheries, a new walleye management strategy was implemented in 1996. In 1996, the walleye fishery at Lac Ste. Anne was classified as vulnerable and a 50 cm (total length, TL) size limit for walleye was implemented in the sport fishery. In order to monitor the status of the walleye fishery at Lac Ste. Anne, a creel survey was conducted during May to August 1997. Creel surveys were also conducted in 1984 and 1995. The estimated number of anglers in 1997 was 6 902, compared to 5423 and 9052 in 1984 and 1995 respectively. The estimated angler effort in 1997 was 2.9 angler-hours / hectare, compared to 3.02 in 1984 and 5.9 in 1995. No walleye were observed harvested in 1224.5 hours during the 1997 survey, compared to 1922 and 3052 in 1984 and 1995, respectively. The catch rate on legal-sized walleye (>50 cm TL) had decreased from 0.014 walleye kept / hour in 1995 to < 0.001 walleye kept / hour in 1997. The reported release rate for walleye in 1997 was 0.007 fish / hr, 0.054 in 1995 and 0.008 in 1984.

Based on the criteria used to classify walleye stocks in Alberta, the walleye population in Lac Ste Anne was collapsed. The regulation recommended in Alberta's walleye management strategy for a walleye fishery with a collapsed status is a catch and release regulation (0 daily bag limit). According to the survey results, this regulation would effect very few anglers and protect the remnant population of walleye in Lac Ste. Anne.

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TABLE OF CONTENTS

	Page
ABSTRACT	i
ACKNOWLEDGEMENTS	ii
LIST OF TABLES	iv
LIST OF FIGURES	iv
LIST OF APPENDICES	iv
INTRODUCTION	1
METHODS	1
Study Site Description	1
Methods of Study	1
RESULTS	4
Angler Survey	4
Status of the Walleye Fishery	5
DISCUSSION	6
LITERATURE CITED	7
APPENDICES	8

LIST OF TABLES

Table	Page
1. Observed catch rates of anglers; Lac Ste. Anne 1984, 1995, and 1997.	4
2. Angler survey summary; Lac Ste. Anne, 1984, 1995 and 1997.	5

LIST OF APPENDICES

Appendix	Page
1. Angler survey data; Lac Ste. Anne, 1997.	
1.1. Daily summary of angler survey data.	8
1.2. Catch frequency distribution of released walleye.	9
1.3. Methods of angling and catch statistics for walleye.	10
1.4. Skill levels of anglers and catch statistics for walleye.	10
1.5. Target species of anglers and catch statistics for walleye.	10
1.6. Angler use of electronic gear and catch statistics for walleye.	10
1.7. Summary of entire lake surveys, Lac Ste. Anne, 1984.	11
2. Biological data from sport-caught pike; Lac Ste. Anne, 1997.	12
3. Creel survey form; Lac Ste. Anne, 1997.	13

INTRODUCTION

Walleye (*Stizostedion vitreum*) populations in Alberta have been subjected to heavy fishing pressure for many years. Most populations show signs of over-harvest, with some experiencing significant declines. Previous management strategies have focused on province-wide regulations designed to manage the walleye harvest at an average fishery. Fisheries receiving heavier than average exploitation have not been adequately protected with these regulations and consequently many have declined or collapsed. To recover these fisheries and to maintain the stable fisheries, a new walleye management strategy was implemented in 1996 (Berry 1995). This strategy requires that each walleye population is evaluated as to its degree of exploitation and is then placed in one of these categories: collapsed, vulnerable, or stable. The fishery is assigned a standard sport fishing regulation based on this status (Sullivan 1994). In early 1996, the walleye fishery at Lac Ste. Anne was assigned a vulnerable status. A 50 cm total length (TL) minimum size and a 3 fish daily bag limit on walleye was therefore implemented at the fishery.

This report describes the creel survey conducted at Lac Ste. Anne during the summer of 1997. The purpose of the survey was to monitor the walleye sport fishery and verify the status of the population and fishery.

METHODS

Study Site Description

Lac Ste. Anne TWP 54-55, RNG 3-4, W5M) is approximately 100 km west of the city of Edmonton. Lac Ste. Anne has a surface area of 5450 hectares and a maximum depth of 9.0 metres. The shoreline is heavily developed with numerous cottage sub-divisions, day-use areas and private campgrounds. The trophic status of Lac Ste. Anne is hypereutrophic. Lac Ste. Anne is fed and drained by the Sturgeon River, which eventually flows into the North Saskatchewan River. A more complete description of the physical, chemical and biological characteristics may be found in Mitchell and Prepas (1990).

Methods of Study

One creel survey crew (two technicians) collected information from both Lac Ste. Anne and Lac La Nonne between 17 May - 17 August 1997. At Lac Ste. Anne, the crew was stationed at the boat launch and day-use area within the hamlet of Gunn, on the northeast shore

of the lake. A schedule of 5 survey days at Lac Ste. Anne (Fridays through Tuesdays) was followed by 5 survey days (Wednesday through Sundays) at the alternate site (Lac La Nonne). This cycle was repeated 7 times during the study.

The survey technicians interviewed each angler returning to the survey site during all survey days (24 h survey). Anglers were approached and asked a series of questions concerning their time spent angling, the numbers of each species caught or released, species sought, their gear types, and their use of electronic equipment. A subjective evaluation of their skill level was also made. Children and anglers with little equipment, knowledge or seriousness were considered to be novice anglers. Professional anglers demonstrated clear superiority in equipment and knowledge (and usually had their sponsors emblazoned on their hats, coats and boats). All other anglers were classified as having a moderate skill.

As time permitted during the survey period, sport fish retained by anglers were sampled for biological information. The fork length of each fish was recorded to the nearest millimetre; the weight was recorded to the nearest ten grams; and one or more skeletal structures were removed to determine the age of the fish. For this purpose, the left pelvic fin and operculum of walleye, the left cleithrum of northern pike (*Esox lucius*), and the operculum and or anal fin of yellow perch (*Perca flavescens*) were collected. Ages were determined following Mackay *et al.* (1990). Sex and state of maturity of each fish was determined following Olynyk (1980). Stomach contents were removed and classified as to number and species of vertebrates, and approximate number and order of invertebrates. The complete biological data set for walleye is reported in this study. Biological data sets for other species are partially reported in the Appendices, with the full data set stored in the Alberta Conservation Association (ACA) Fisheries Section and the Alberta Natural Resources Service (NRS), Fisheries Management Branch files, Edmonton Metropolitan office.

All field data were recorded in pencil on field data forms (Appendix 3). This data was transcribed into computer files (Lotus 1-2-3 format) by commercial keypunch services using double entry verification. Prior to analysis, all data were again subjected to verification procedures. These involved calculating frequency distributions of all creel survey parameters and using field diaries and notes to verify outlying values. Biological samples were verified by plotting weight measurements against the dependent variable of length, and length measurements against the dependent variable of age. Outlying values were investigated and eliminated if measurement error was suspected.

To determine sport fishery parameters specific to the creel survey site, the following procedure was used:

- creel data categories (i.e. # anglers, # hours fishing, # walleye harvested) were separated into daily weekday totals. Weekdays included Monday (day 1) through Thursday (day 4). Weekends included Friday (day 5) through Sunday (day 7) and long weekends (day 8) either on a Monday or a Friday.
- totals, means and standard deviations of # anglers / weekdays, # hours / weekdays and # walleye harvested / weekdays were calculated using Lotus 123 @functions: total (@SUM), mean (@AVG), and standard deviation (@STD). Standard error (SE) for each category was calculated by ($\text{@STD of each category} / (\text{@SQRT (n days surveyed)})$).
- to estimate parameters for days NOT surveyed, the above means and SE of those categories were multiplied by the # weekdays not surveyed and added to the observed parameters.
- the same procedure was used for weekend days.
- estimated # anglers, # hours fishing and # walleye harvested for weekdays and weekend days were added for total estimates.
- variances of these estimates were combined following Pollock et al. (1994) for stratified sampling, by adding the separate estimates of variances.
- 95% confidence intervals for estimated # anglers, # angling hours and # walleye harvested were calculated using $t_{0.05(df)} \times \text{SE}$.

At many surveyed lakes, anglers could access the lake from sites other than the creel survey site. In these instances, an estimate of the total use of the fishery was extrapolated from the proportion of angler numbers using the creel survey site compared to those observed during entire-lake surveys. These entire-lake surveys were conducted over several time periods and consisted of driving a boat over the entire lake and interviewing all anglers encountered. Angler use estimates for this survey were based on entire-lake surveys conducted in 1984. Total use estimators of the fishery were then calculated by simple extrapolation. Variances of these combined estimates were calculated following Pollock et al. (1994).

All statistical analyses and graphics were done on an IBM - type personal computer (Intel Pentium, 133 MHz) using Lotus 1-2-3 Release 5 and Microsoft Office '97. All frequency analysis was conducted using Microsoft Office '97 (Excel spreadsheet). All data and analyses are stored in spreadsheet format on the ACA / NRS Edmonton Metropolitan office Fisheries computers and on Iomega Zip 100 MB disk cartridges.

RESULTS

Angler Survey

During 17 May - 17 August 1997, 537 anglers were interviewed (Table 1 and Appendix 1). Based on data from the 1984 survey (Appendix 1.7), the creel site was estimated to receive 23% of the total angler effort at Lac Ste. Anne. The total number of anglers was estimated at 6 902, with an estimated effort of 2.9 angler-hours / ha (Table 2). No harvest of walleye was observed in 1224.5 hours of sport-angling, suggesting a catch rate of < 0.001 walleye kept / hr. The catch frequency distribution of released walleye is shown in Appendices 1.2. Biological samples were collected from 46 pike (Appendix 2). No perch were observed.

Table 1. Observed catch rates of anglers; Lac Ste. Anne, 1984, 1995, and 1997.

CREEL DATA	1984	1995	1997
# days surveyed	63	32	30
# anglers interviewed	878	837	537
# angling hours reported	2 664	3 025	1 224.5
# angling hours estimated	16 452	31 942	15 836
WALLEYE DATA			
Walleye kept / angler-hour (HCUE)	0.122	0.090	<0.001
Walleye rel. (<38 cm TL) / angler-hour	N/A	0.019	0.002
Walleye rel. (>38 cm TL) / angler-hour	N/A	0.036	N/A
Walleye rel. (38 - 50 cm TL) / angler-hour	N/A	N/A	0.004
Walleye rel. (>50 cm TL) / angler-hour	N/A	N/A	0.002
Total walleye rel. / angler-hour	0.008	0.054	0.008
NORTHERN PIKE DATA			
Pike kept / angler-hour	0.212	0.08	0.070
Pike rel. (<50 cm TL) / angler-hour	N/A	N/A	0.187
Pike rel. (>50 cm TL) / angler-hour	N/A	N/A	0.072
Total pike rel. / angler-hour	0.185	0.275	0.259
YELLOW PERCH DATA			
Perch kept / angler-hour	0.011	0.0007	< 0.001
Perch rel. (<20 cm TL) / angler-hour	N/A	N/A	< 0.001
Perch rel. (>20 cm TL) / angler-hour	N/A	N/A	0.001
Total perch rel. / angler-hour	0.004	< 0.0003	0.001

Table 2. Angler survey summary; Lac Ste. Anne, 1984, 1995 and 1997.

PARAMETER	1984 EST.	1995 EST.	REPORTED (1997)	ESTIMATED (1997)
# Anglers	5 423	9 052	537	6 902 (+-26.6%)
# Hours	16 452	31 942	1 224.5	15 836 (+-24.8%)
Hours / hectare	3.02	5.9	0.22	2.9 (+-24.8%)
# walleye harvested	1922	3 052	0	N/A

Status of the Walleye Fishery

The total reported release rate for walleye was 0.007 fish / hr (8 walleye released / 1224.5 hours). The size range of released walleye was reported to have been from < 38 cm to > 50 cm TL. Five comparative test fisheries conducted during the 1996 walleye stock classification surveys at other lakes indicate that release rates reported by anglers were exaggerated and that there was possibly a negative correlation between the reported release rates and the observed catch rate (Sullivan 1996). The observed catch rates on walleye are indicative of a walleye stock with a collapsed status.

DISCUSSION

Based on the criteria used to classify walleye stocks in Alberta, the walleye in Lac Ste. Anne are collapsed. The catch rate on harvested walleye was < 0.001 fish / hr. The reported CUE for released walleye of 0.007 fish / hr was extremely low, and may be exaggerated.

Between 1984 and 1995, both angling effort and walleye harvest increased 49% and 37%, respectively. This level of harvest was clearly excessive, and furthered the collapse of walleye in Lac Ste. Anne. From 1995 to 1997, angling effort declined (51%), to approximately the 1984 effort, and no walleye were reported harvested.

In 1984, a 2-day fishing derby, sponsored by Uncles at Large, brought about the harvest of half of the annual production of walleye from Lac Ste. Anne. Such derbies could essentially destroy a stock and the subsequent years of fishing (Norris 1986).

In 1989, a province-wide regulation modification reduced bag limits from 5 to 3 walleye per day and a 38 cm TL size limit was imposed. This regulation was ineffective in preventing the continued collapse of walleye at Lac Ste. Anne. The 50 cm (total length) minimum size limit imposed in 1996 was not appropriate to the actual status of the walleye population. The regulation recommended in Alberta's walleye management strategy (Berry 1995) for a walleye fishery with a collapsed status is a zero (0) daily bag limit (catch and release for walleye).

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APPENDICES

Appendix 1.1. Daily summary of angler survey data. [Lac Ste. Anne, 1997]

Date	# Anglers	# Hours	# WALL Kept	# WALL Released < 38 cm	# WALL Released 38 - 50 cm	# WALL Released > 50 cm	# NRPK Kept	# NRPK Released < 50 cm	# NRPK Released > 50 cm	# YLPR Kept	# YLPR Released < 20 cm	# YLPR Released > 20 cm
30 Totals	537	1224.5	0	2	5	3	86	229	88	0	0	1
17-May-97	5	6.0	0	0	0	0	0	0	0	0	0	0
18-May-97	22	54.0	0	0	3	2	5	22	18	0	0	0
19-May-97	9	17.0	0	2	2	1	0	0	2	0	0	0
20-May-97	0	0.0	0	0	0	0	0	0	0	0	0	0
31-May-97	34	94.5	0	0	0	0	12	16	4	0	0	0
1-Jun-97	22	64.0	0	0	0	0	7	5	8	0	0	0
2-Jun-97	8	16.0	0	0	0	0	0	4	1	0	0	0
3-Jun-97	13	27.0	0	0	0	0	1	15	1	0	0	0
13-Jun-97	13	35.5	0	0	0	0	2	15	12	0	0	0
14-Jun-97	18	69.0	0	0	0	0	11	21	20	0	0	0
15-Jun-97	46	127.5	0	0	0	0	19	34	8	0	0	0
16-Jun-97	8	26.5	0	0	0	0	1	3	0	0	0	0
17-Jun-97	27	86.5	0	0	0	0	18	34	2	0	0	0
27-Jun-97	1	0.5	0	0	0	0	0	0	0	0	0	0
28-Jun-97	77	135.0	0	0	0	0	4	24	3	0	0	1
29-Jun-97	90	160.0	0	0	0	0	5	23	3	0	0	0
30-Jun-97	33	68.5	0	0	0	0	0	9	0	0	0	0
1-Jul-97	25	58.0	0	0	0	0	0	2	0	0	0	0
12-Jul-97	10	13.5	0	0	0	0	0	0	1	0	0	0
13-Jul-97	19	30.0	0	0	0	0	1	1	0	0	0	0
14-Jul-97	11	18.0	0	0	0	0	0	0	0	0	0	0
15-Jul-97	3	5.0	0	0	0	0	0	1	0	0	0	0
26-Jul-97	2	1.0	0	0	0	0	0	0	0	0	0	0
27-Jul-97	14	34.0	0	0	0	0	0	0	0	0	0	0
28-Jul-97	2	7.0	0	0	0	0	0	0	3	0	0	0
29-Jul-97	5	19.0	0	0	0	0	0	0	0	0	0	0
9-Aug-97	7	28.0	0	0	0	0	0	0	2	0	0	0
10-Aug-97	5	9.5	0	0	0	0	0	0	0	0	0	0
11-Aug-97	6	12.0	0	0	0	0	0	0	0	0	0	0
12-Aug-97	2	2.0	0	0	0	0	0	0	0	0	0	0

Appendix 1.2. Catch frequency distribution of released walleye. [Lac Ste. Anne, 1997]

# WALL Released	# Anglers	% Anglers	# WALL Released	% WALL Released
0	532	99.1	0	0.0
1	2	0.4	2	20.0
2	1	0.2	2	20.0
3	2	0.4	6	60.0
4	0	0.0	0	
5	0	0.0	0	
6	0	0.0	0	
7	0	0.0	0	
8	0	0.0	0	
9	0	0.0	0	
10	0	0.0	0	
>10	0	0.0	0	
Totals	537	100	10	100

Appendix 1.3. Methods of anglers and catch statistics for walleye. [Lac Ste. Anne, 1997]

METHOD	# Anglers	% Anglers	# Hours	WALL Kept	WALL Released	Harvest CUE	Released CUE
Artificial	398	74.1	798.5	0	0	0.000	0.000
Commercial Baitfish	51	9.5	139	0	8	0.000	0.058
Seined Baitfish	0	0.0	0	0	0		
Leeches	67	12.5	218	0	2	0.000	0.009
Dewworms	12	2.2	33.5	0	0	0.000	0.000
Scent baits	1	0.2	2	0	0	0.000	0.000
Miscellaneous	8	1.5	33.5	0	0	0.000	0.000
TOTALS	537	100.0	1224.5	0	10		

Appendix 1.4. Skill level of anglers and catch statistics for walleye. [Lac Ste. Anne, 1997]

SKILL	# Anglers	% Anglers	# Hours	WALL Kept	WALL Released	Harvest CUE	Released CUE
Novice	27	5.0	40	0	0	0.000	0.000
Average	504	93.9	1164.5	0	4	0.000	0.003
Professional	6	1.1	20	0	6	0.000	0.300
TOTALS	537	100	1224.5	0	10		

Appendix 1.5. Target species of anglers and catch statistics for walleye. [Lac Ste. Anne, 1997]

TARGET	# Anglers	% Anglers	# Hours	WALL Kept	WALL Released	Harvest CUE	Released CUE
Walleye	158	29.4	491	0	10	0.000	0.020
Northern Pike	263	49.0	491.5	0	0	0.000	0.000
Yellow Perch	1	0.2	2	0	0	0.000	0.000
Any species	115	21.4	240	0	0	0.000	0.000
TOTALS	537	100	1224.5	0	10		

Appendix 1.6. Angler use of electronic gear and catch statistics for walleye. [Lac Ste. Anne, 1997]

ELECTRONICS	# Anglers	% Anglers	# Hours	WALL Kept	WALL Released	Harvest CUE	Released CUE
None	393	73.2	759.5	0	0	0.000	0.000
Depth Sounder	136	25.3	417	0	5	0.000	0.012
G.P.S.	0	0.0	0	0	0	0.000	
Depth Sounder + G.P.S.	8	1.5	48	0	5	0.000	0.104
Other	0	0.0	27	0	0	0.000	0.000
TOTALS	537	100	1251.5	0	10		

Appendix 1.7. Summary of entire lake surveys; Lac Ste. Anne, 1984.

Date	# Surveyed	# Anglers using survey site	Ratio of use
03 June	209	54	3.87
22 July	25	5	5.00
10 August	63	17	3.71
10 August	82	18	4.56
Mean ratio =	4.28	SE = 0.26	n = 4

Appendix 2. Summary of biological data from sport-caught pike. [Lac Ste. Anne, 1997]

Sample #	Fork Length (mm)	Weight (g)	Age (years)	Sex 1 = immature 3 = mature females 8 = mature males	Month	Day
mean =	507.6	1046.6	3.9			
1	460		3	3	5	18
2	520		4	3	5	18
3	610		7		5	18
4	485	800	4	8	5	31
5	550	1300	5	3	5	31
6	540	1000	4	3	5	31
7	490	900	3	3	5	31
8	401	620	3	8	6	1
9	530	1200	4	3	6	1
10	463	1100	4		6	1
11	427	765	2		6	1
12	470		4		6	1
13	432	800	3		6	1
14	452	950	4		6	1
15	470		5		6	2
16	510	900	4	3	6	3
17	450		4		6	13
18	450		3		6	13
19	400		2		6	13
20	470		4		6	13
21	630	1800	5		6	14
22	575	990	4		6	16
23	487	1000	3		6	17
24	505	825	4		6	17
25	510	900	3		6	17
26	585	1300	4		6	17
27	532	1300	4	3	6	17
28	580	1500	5		6	17
29	520	900	3		6	17
30	522		4	8	6	17
31	487	800	3		6	17
32	485	800	4		6	17
33	519		4	8	6	17
34	558	1500	5		6	17
35	552		4	3	6	17
36	510		4	8	6	17
37	549	1000	5		6	17
38	587		4	3	6	28
39	572		4	3	6	28
40	370		3		6	28
41	587	1800	7		6	29
42	487	600	4		6	29
43	372		2		6	29
44	527	800	4		6	29
45	592	1000	4		6	29
46	569	1200	4		7	13

Appendix 3. Creel survey form. [Lac Ste. Anne, 1997]