

**Assessment of the Status of the Sport
Fishery for Walleye at Wolf Lake, 1999.**

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ABSTRACT

To recover or maintain Alberta's walleye fisheries, Alberta Natural Resources Service implemented a new walleye management strategy in 1996. In 1996, the walleye fishery at Wolf Lake was classified as collapsed and a catch and release regulation (0 daily bag limit) for the walleye sport fishery was implemented. In order to assess the status of the walleye fishery at Wolf Lake, a creel survey was conducted during May to August 1999.

Historical information states that "Wolf Lake was possibly the best pickeral (walleye) lake in the north-eastern part of the province and by the mid-1970s the species appears to have been cleaned out by sport fishermen" (Chipeniuk, 1975).

During the late 1980's and the early 1990's, catch rates declined as angling pressure increased as the Wolf Lake walleye fishery collapsed. Angling pressure peaked in 1992 and has decreased 76% to 2.1 hrs / ha in 1999. In 1999, the number of anglers interviewed during the survey was 1,005. The total number of anglers was estimated at 2,476.

Protection of remnant mature walleye is critical to facilitating population recovery. Special attention needs to be given to the effort response of anglers to the improving densities of walleye and the related hooking mortality. Excessive release mortality could prevent any recovery of this fishery. The recovery and monitoring of Alberta's most renowned walleye collapse ought to provide some interesting and useful information.

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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 many 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 aid the recovery of these fisheries, a new walleye management strategy was implemented in 1996. This strategy requires that each walleye population be 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 Wolf Lake was assigned a collapsed status. A catch and release (0 daily bag limit) regulation was therefore implemented at the fishery.

This report describes the creel survey conducted at Wolf Lake during the summer of 1999. The purpose of the survey was to assess the walleye sport fishery and verify the status of the walleye population and fishery.

METHODS

Study Site Description

Wolf Lake (TWP 65, RNG 7, W4M) is approximately 70 kilometres north of the Town of Bonnyville or 310 km northeast of the City of Edmonton. Wolf Lake has a surface area of 3150 hectares and a maximum depth of 38.3 metres. Wolf Lake's shoreline is largely undeveloped. A private contractor maintains a low-density Forest Service campground located on the south shore.

The trophic status of Wolf Lake is mesotrophic. The lake is in the Beaver River basin, and is fed and drained by the Wolf River. Several intermittent streams also feed Wolf Lake. 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 biotechnicians) collected information from both Wolf Lake and Baptiste Lake between 22 May - 22 August 1999. At Wolf Lake, the crew was stationed at the Forest Service campground. They worked from the Fish and Wildlife cabin adjoining the campground. A schedule of 5 survey days at Wolf Lake (Fridays through Tuesdays) was followed

by 5 survey days (Wednesdays through Sundays) at the alternate site (Baptiste Lake) followed by 4 days off. 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 regarding their time spent angling, the numbers of each species caught, target species, their gear types, residence, 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 pelvic fin and 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 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 and in Ryerson (2000).

An angling test-fishery was used to collect additional information regarding the size frequency distribution of walleye in the population. The sport fishery could not provide this information, due to the collapsed status of walleye and the catch and release regulation at this lake. Creel survey technicians, volunteer anglers, and fisheries staff participated in the collection of this data. Test fisheries occurred during creel survey days from 22 May to 22 August 1999. The test fishery catch rate (CUE) was not used in the calculation of angler effort or CUE.

All field data were recorded in pencil on field data forms (Appendix 4). These data were transcribed into computer files (Microsoft Excel format) by a commercial keypunch service 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 equations were modified from Sullivan, 1984:

Equation (1)

$$H_p = (H_{we}) + (H_{wd}) + (\# \text{weekend days missed (mean } H_{we})) + (\# \text{weekdays missed (mean } H_{wd}))$$

$$H_p (se) = \text{SQRT } (((H_{we}, se^2) \times (\# \text{weekend days missed}^2)) + ((H_{wd}, se^2) \times (\# \text{weekday missed}^2)))$$

H_p = estimated primary site harvest

$H_p (se)$ = standard error of estimated harvest

H_{we} = observed weekend day harvest

H_{wd} = observed weekday harvest

(H_{we}, se) = standard error of mean daily harvest on weekends

(H_{wd}, se) = standard error of mean daily harvest on weekdays

Equation (2)

The 95% confidence intervals for the total harvest were calculated as follows:

$$H_e \pm 95\% \text{ CI} = H_e \pm T_{0.05} (df) \times (H_e, se)$$

$$df = (n - 1)$$

n = number of days surveyed

All statistical analyses and graphics were done on an IBM - type personal computer (Intel Pentium-II, 300 MHz) using Microsoft Office Professional. All data and analyses are stored in spreadsheet format on the ACA and NRS Edmonton Metropolitan office, Fisheries computers, on recordable compact discs (650 MB), and in Ryerson (2000).

RESULTS

Angler Survey

During 22 May - 22 August 1999, 1,005 anglers were interviewed (Table 1 and Appendix 1). The total number of anglers was estimated at 2,476 with an estimated effort of 2.1 angler-hours / ha (Table 2). There was no observed illegal harvest of walleye. The distribution of walleye caught is shown in Appendices 1.2. Biological samples were collected from 77 sport-harvested pike (Appendix 3). There was no observed sport harvest of perch.

Table 1. Observed catch rates of anglers; Wolf Lake, 1999.

CREEL DATA	1992	1993	1994	1999
# days surveyed	61	22	36	32
# anglers interviewed	7,734	2,153	2,124	1,005
# angling hours reported	21,068.8	5,747.5	5,554.7	2,734.75
WALLEYE DATA				
Walleye kept / angler-hour	0.037	0.029	0.01	N/A
Walleye released / angler-hour	0.014	0.019	0.008	0.09
NORTHERN PIKE DATA				
Pike kept / angler-hour	0.27	0.28	0.31	0.035
Pike released / angler-hour	0.39	0.37	0.39	0.80
YELLOW PERCH DATA				
Perch kept / angler-hour	0.003	0.002	0.001	0.000
Perch released / angler-hour	0.007	0.001	0.001	0.004

Table 2. Angler survey summary; Wolf Lake, 1999.

	1991 WHOLE LAKE ESTIMATE (95% CI)	1992 WHOLE LAKE ESTIMATE (95% CI)	1993 WHOLE LAKE ESTIMATE (95% CI)	1994 WHOLE LAKE ESTIMATE (95% CI)	1999 WHOLE LAKE ESTIMATE (95% CI)
# Anglers	10,405 (+8.3%)	10,534 (+6.4%)	5,464 (+11%)	4,952 (+11%)	2475.6 (+16.5%)
# Hours	27,428 (+8.8%)	28,661 (+6.6%)	14,057 (+11.6%)	12,770.5 (+10%)	6684 (+16.5%)
Hours / hectare	8.71 (+8.8%)	9.1 (+6.6%)	4.46 (+11.6%)	4.05 (+10%)	2.12 (+16.5%)
# Walleye Harvested (CIs not available)	982	1050	758	119	N/A

Test Angling

Test fisheries were conducted on 25 days, from 22 May to 22 August. A total of 282.75 hours were spent test angling. Sixty-eight walleye were caught and measured (Appendix 2).

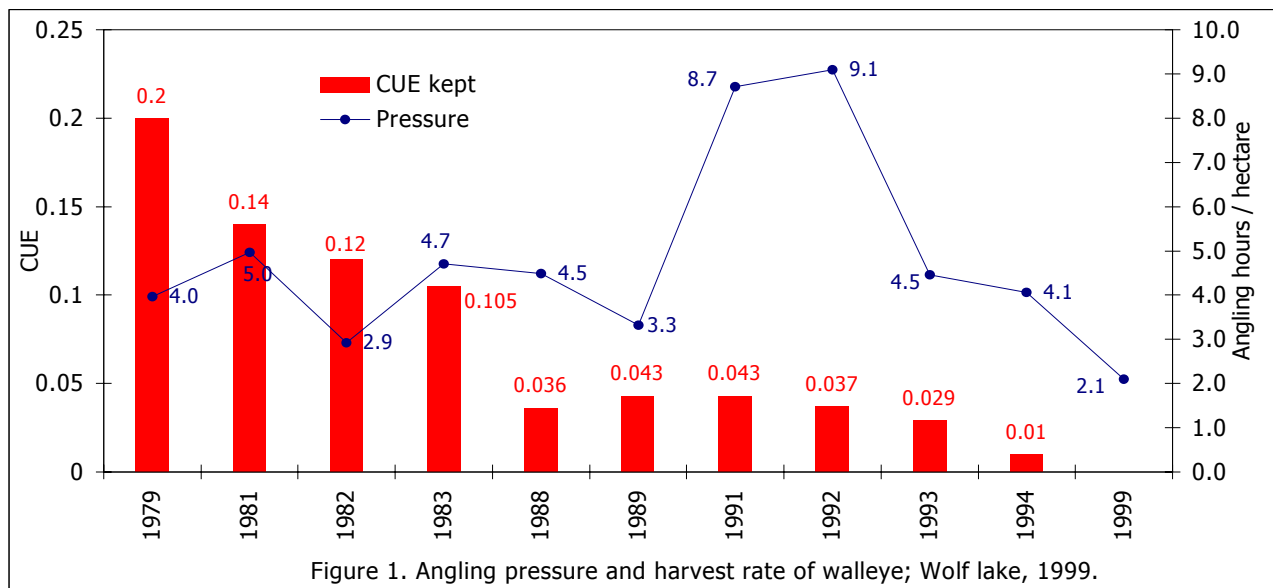
Status of the Walleye Fishery

Two hundred and forty-four walleye were reported released by the sport fishery in 2,734.75 hours of angling (0.09 fish released / hour). There was no observed (illegal) harvest of

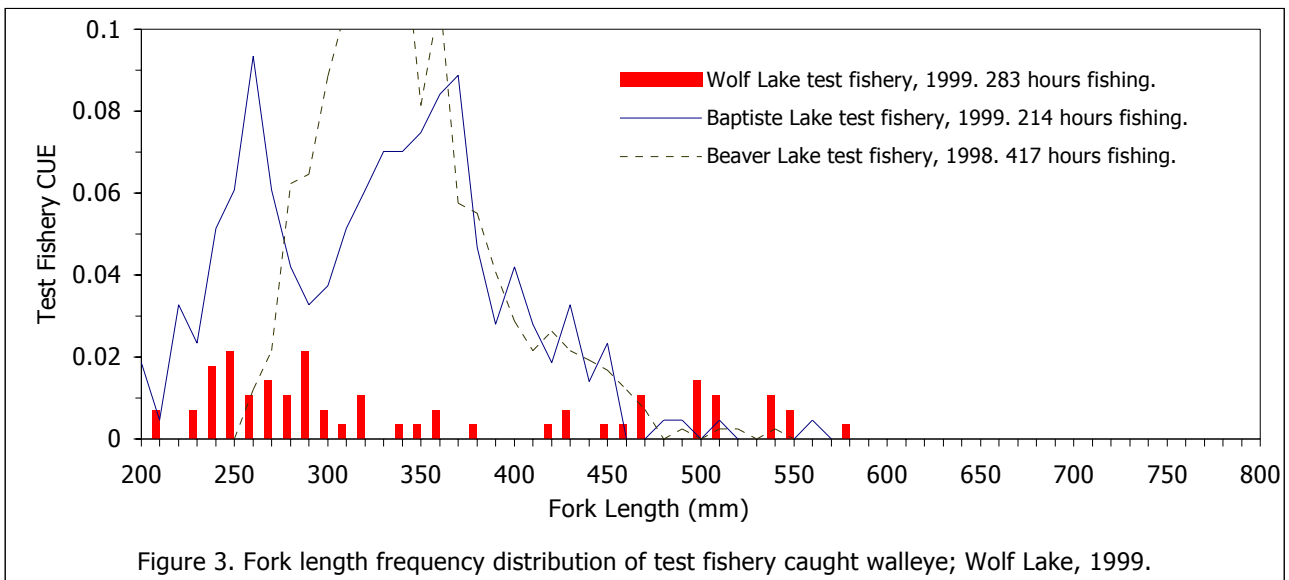
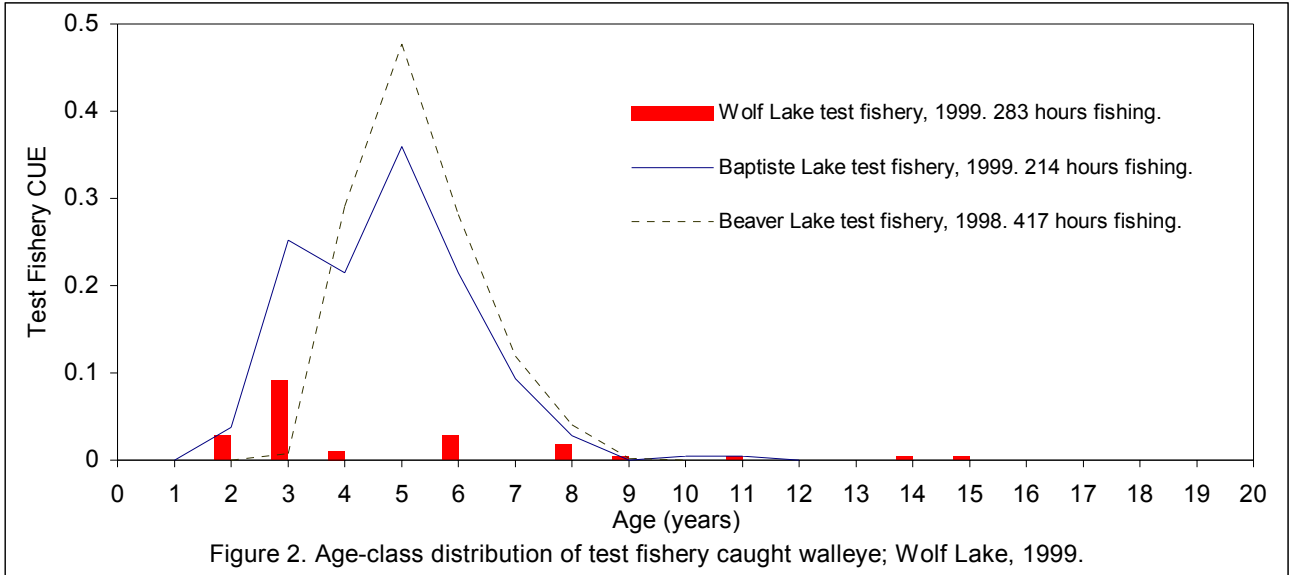
walleye during the survey. The observed sport-catch rates are indicative of a walleye stock with a collapsed status.

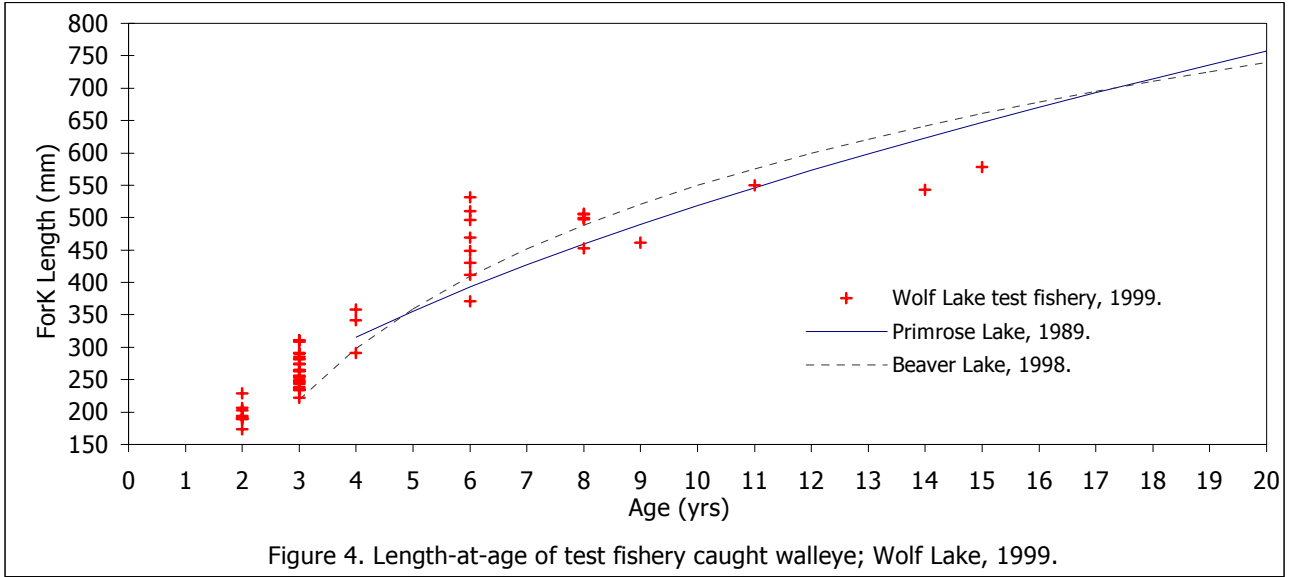
Chipeniuk (1975) mentions, "throughout the 1960's pickeral (walleye) fishing was superb. The walleye bit in the dozens and individuals would fill wash-tubs with their catch, and beg strangers to take the surplus".

Catch rates of walleye declined as angling pressure increased (Figure 1) through the collapse of the walleye fishery in the 1990s. Angling pressure peaked in 1992 at 9.1 hrs/ha. Moderate densities of walleye were recorded in the early 1980s. The walleye harvest rate decreased significantly between 1983 and 1988 (66%) and again from 1993 to 1994 (65%). The walleye fishery was finally considered collapsed in 1996. Angling pressure has continued to decline and measured 2.1 hrs/ha during the 1999 survey.



The test fishery shows a relatively wide age-class distribution (Figure 2). All age-classes were very poorly represented with several failures. Large differences in year-class strengths were observed with most year-classes being strikingly weak or absent. The 1997 and 1996 year-classes represent the majority of the walleye in the fishery and suggest a level of recruitment. All sizes of walleye (Figure 3) are poorly represented. The growth rate of the younger walleye (Figure 4), ages 2, 3 and 4, is extremely fast and is likely due to recruitment into an extremely low density of walleye.





DISCUSSION

As angling pressure peaked in 1992, walleye harvest rates continued to decline. The walleye fishery at Wolf Lake was finally considered collapsed in 1996. In 1999, sport anglers reported a released rate of 0.09 fish / hr. There was no observed (illegal) harvest of walleye during the 1999 survey. Based on the criteria used to classify walleye stocks in Alberta, the Wolf Lake walleye fishery is still in a collapsed state.

Historical information indicates that the walleye fishery at Wolf Lake was exceptional and the fishery by the 1970's was likely collapsed.

The test fishery data shows extremely low densities of older, larger walleye, accelerated growth rates of young walleye, and recruitment of age 2 and 3 walleye into the fishery.

The walleye population in Wolf Lake has apparently responded to the catch and release regulation implemented in 1996. The two youngest age-classes indicate successful recruitment increasing the numbers of walleye in the fishery. The survival of remnant spawners and the 1997 and 1996 year-classes is critical for population recovery. If mature walleye continue to produce young, and the 2 youngest year-classes survive to produce spawning fish; the subsequent generations could potentially increase walleye densities in the lake.

These increasing densities of walleye may attract larger numbers of anglers. Excessive release mortality of these young walleye could prevent the recovery of the fishery. It is extremely important to continue to monitor this fishery with special attention given to the effort response of anglers to the improving densities of walleye and the related hooking mortality. If the positive response of Wolf Lake's walleye population to the restrictive regulation continues, the recovery of one of Alberta's most renowned walleye collapses ought to provide some interesting information.

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APPENDICES

Appendix 1.1. Daily summary of angler survey data. [Wolf Lake, 1999]

Month	Date	# Anglers	# Hours	# Walleye Kept	# Walleye Released	# Pike Kept	# Pike Released < 63 cm TL max	# Pike Released > 63 cm TL max	# Perch Kept	# Perch Released
Survey Days 32	Totals	1005	2734.75	0	244	96	2154	44	1	12
5	22	52	113	0	0	2	11	3	0	0
5	23	42	112	0	1	2	86	0	0	0
5	24	23	75	0	0	2	17	0	1	1
5	25	3	13	0	0	0	4	2	0	1
6	5	15	33	0	0	2	5	0	0	0
6	6	17	66.5	0	2	4	97	0	0	0
6	7	0	0	0	0	0	0	0	0	0
6	8	12	35	0	0	2	47	1	0	0
6	18	11	19.5	0	1	3	29	0	0	0
6	19	50	133	0	6	4	88	7	0	0
6	20	44	129.5	0	2	4	198	1	0	0
6	21	4	14	0	1	4	19	0	0	0
6	22	0	0	0	0	0	0	0	0	0
7	1	29	98.5	0	17	2	112	0	0	0
7	2	83	269.5	0	112	14	265	6	0	0
7	3	25	44	0	4	4	48	1	0	0
7	4	10	23	0	3	0	20	0	0	0
7	5	4	9	0	1	0	10	2	0	0
7	6	18	57.5	0	1	1	44	1	0	0
7	17	44	131.5	0	10	1	101	5	0	0
7	18	58	161.75	0	2	6	151	2	0	0
7	19	48	94	0	4	3	101	0	0	0
7	20	24	48	0	2	4	33	0	0	0
7	31	76	176.5	0	0	6	135	0	0	3
8	1	96	288.75	0	4	8	198	1	0	0
8	2	43	119.5	0	7	2	67	8	0	3
8	3	25	53.75	0	22	1	32	0	0	0
8	13	19	56	0	5	3	56	0	0	0
8	14	23	60.5	0	3	2	35	3	0	0
8	15	32	71	0	4	2	14	1	0	0
8	16	33	98.5	0	9	2	47	0	0	0
8	17	42	130	0	21	6	84	0	0	4

Appendix 1.2. Catch frequency distribution of released walleye. [Wolf Lake, 1999]

# WALL Released	# Anglers	% Anglers	# WALL Released	% WALL Released
0	921	91.6	0	0.0
1	50	5.0	50	20.5
2	15	1.5	30	12.3
3	4	0.4	12	4.9
4	2	0.2	8	3.3
5	1	0.1	5	2.0
6	0	0.0	0	0.0
7	2	0.2	14	5.7
8	2	0.2	16	6.6
9	1	0.1	9	3.7
10	2	0.2	20	8.2
>10	5	0.5	80	32.8
Totals	1005	100.0	244	100.0

Appendix 1.3. Methods of anglers and catch statistics for walleye. [Wolf Lake, 1999]

METHOD	# Anglers	% Anglers	# Hours	WALL Rel.	Rel. CUE
Artificial	933	92.8	2507.00	206	0.082
Commercial Baitfish	39	3.9	142.25	28	0.197
Seined Baitfish	0	0.0	0.00	0	
Leeches	18	1.8	43.00	2	0.047
Dewworms	4	0.4	14.00	0	0.000
Scent baits	6	0.6	12.50	0	0.000
Miscellaneous	5	0.5	16.00	8	0.500
Totals	1005	100	2734.75	244	

Appendix 1.4. Skill levels of anglers and catch statistics for walleye. [Wolf Lake, 1999]

SKILL	# Anglers	% Anglers	# Hours	WALL Rel.	Rel. CUE
Novice	64	6.4	158.00	0	0.000
Average	940	93.5	2571.75	243	0.094
Professional	1	0.1	5.00	1	0.200
Totals	1005	100	2734.75	244	

Appendix 1.5. Target species of anglers and catch statistics for walleye. [Wolf Lake, 1999]

TARGET	# Anglers	% Anglers	# Hours	WALL Rel.	Rel. CUE
Walleye	15	1.5	43.00	146	3.395
Northern Pike	934	92.9	2547.75	75	0.029
Yellow Perch	2	0.2	5.00	0	0.000
Any species	54	5.4	139.00	23	0.165
Totals	1005	100	2734.75	244	

Appendix 1.6. Angler's use of electronic gear and catch statistics for walleye. [Wolf Lake, 1999]

ELECTRONICS	# Anglers	% Anglers	# Hours	WALL Rel.	Rel. CUE
None	456	45.4	1200.50	139	0.116
Depth Sounder	533	53.1	1484.75	97	0.065
G.P.S.	3	0.3	6.00	0	0.000
Depth Sounder + G.P.S.	12	1.2	39.00	8	0.205
Other	0	0.0	0.00	0	
Totals	1004	100	2730.25	244	

Appendix 1.7. Residence of anglers and catch statistics for walleye. [Wolf Lake, 1999]

RESIDENCE	# Anglers	% Anglers	# Hours	WALL Rel.	Rel. CUE
Local (50 km radius)	91	9.1	209.00	19	0.091
Edmonton	228	22.7	615.25	121	0.197
Ft. McMurray	9	0.9	17.00	1	0.059
Lac La Biche	0	0.0	0.00	0	
Peace River	13	1.3	56.00	6	0.107
St. Paul / Bonnyville	242	24.1	680.75	40	0.059
Edson / Hinton	4	0.4	8.50	0	0.000
Vegreville / Lloydminster	325	32.3	869.25	56	0.064
Red Deer and west	25	2.5	81.00	1	0.012
Rocky Mtn. House / Nordegg	1	0.1	6.00	0	0.000
South east slopes	0	0.0	0.00	0	
Calgary and west	44	4.4	142.50	0	0.000
Southern Alberta	7	0.7	23.00	0	0.000
Out of province	16	1.6	26.50	0	0.000
Totals	1005	100	2734.75	244	

Appendix 2. Biological data from test fishery caught walleye. [Wolf Lake, 1999]

Sample #	Fork Length (mm)	Age (yrs)	Month	Day
mean =	334.47	4.50		
n =	68	54		
1	506	8	6	5
2	578	15	6	5
3	550	11	6	5
4	371	6	6	5
5	461	9	6	5
6	291	4	6	6
7	496	6	6	8
8	412	6	6	18
9	543	14	6	18
10	499	8	6	19
11	234	3	6	19
12	510	6	6	19
13	449	6	6	19
14	469	6	6	19
15	497	8	6	19
16	235	3	6	19
17	505	8	6	19
18	249	3	6	19
19	342	4	6	19
20	453	8	6	19
21	430	6	6	19
22	285	3	6	20
23	239	3	6	20
24	311	3	6	20
25	281	3	6	20
26	358	4	6	21
27	253	3	7	4
28	311	3	7	4
29	243	3	8	3
30	236	3	8	3
31	173	2	8	3
32	256	3	8	3
33	189	2	8	3
34	229	2	8	3
35	265	3	8	3
36	203	2	8	3
37	265	3	8	3
38	247	3	8	3
39	190	2	8	3
40	274	3	8	3
41	263	3	8	3
42	206	2	8	3

Appendix 2. Biological data from test fishery caught walleye, con't. [Wolf Lake, 1999]

Sample #	Fork Length (mm)	Age (yrs)	Month	Day
43	264	3	8	3
44	222	3	8	16
45	194	2	8	17
46	531	6	8	17
47	282	3	8	17
48	275	3	8	17
49	255	3	8	17
50	246	3	8	17
51	192	2	8	17
52	309	3	8	17
53	290	3	8	17
54	291	3	8	18
55	358			
56	281			
57	537			
58	495			
59	337			
60	532			
61	469			
62	285			
63	311			
64	239			
65	245			
66	426			
67	246			
68	275			

Appendix 3. Biological data from sport-caught pike. [Wolf Lake, 1999]

Sample #	Weight (g)	Fork Length (mm)	Age (yrs)	Sex 1 = immature 5 = mature female 10 = mature male	Month	Day
mean =	2666.67	702.28	8.45			
n =	60	77	77			
1	2050	654	9	10	5	22
2	2500	668	8	5	5	22
3	1950	665	9	5	5	23
4	2500	685	9	10	5	24
5	2800		14	10	5	24
6	1250	588	7	5	6	5
7	2250	685	8	10	6	6
8	5600	915	10	5	6	7
9	2600	690	9	10	6	7
10	4500	880	10	5	6	7
11	2700	700	8	5	7	7
12	1700	630	8	5	6	8
13	1900	686	8	10	6	18
14	1000	620	7	5	6	19
15	1350	635	6	5	6	19
16	1600	635	7	5	6	19
17	1700	614	8	5	6	20
18	1450	580	6	5	6	20
19	5500	940	13	5	6	20
20	1650	629	7	5	6	20
21	3400	795	9	10	6	21
22	2950	735	9	5	6	21
23	5850	975	16	5	6	21
24	4000	835	11	5	6	21
25	1750	633	7	10	7	1
26	2500	715	8	5	7	1
27		789	11	10	7	2
28		694	10	10	7	2
29		597	6	10	7	2
30		559	6	10	7	2
31		682	9	10	7	2
32		654	8	5	7	2
33	3900	817	11	5	7	2
34	3200	815	9	5	7	2
35	2900	770	8	5	7	3
36	3300	789	10	5	3	7
37		781	9		3	7
38	1800	615	7	5	7	17
39	1850	640	7	5	7	17
40	1450	805	9	5	7	18
41		731	9	5	7	18
42	2950	755	8	5	7	18
43	3500	785	9	5	7	18

Appendix 3. Biological data from sport-caught pike, con't. [Wolf Lake, 1999]

Sample #	Weight (g)	Fork Length (mm)	Age (yrs)	Sex	Month	Day
44	3750		7	5	7	18
45	2000	654	7	5	7	19
46	1350	602	6	5	7	19
47	4900	917	11	5	7	20
48	1600	595	6	5	7	20
49	1850	613	7	5	7	20
50	4650	867	12	5	7	20
51		589	7	5	7	31
52	2600	722	11	5	7	31
53		621	7	10	7	31
54	1600	615	7	5	7	31
55	2850	721	9	10	8	1
56		585	7	10	8	1
57	2600	633	8	5	8	1
58		599	7	5	8	1
59		685	8	10	8	1
60	2100	633	7	5	8	1
61	5200	874	12	5	8	1
62		592	6	5	8	1
63	5850	932	14	5	8	2
64	2200	628	6	5	8	3
65	4400	861	10	5	8	13
66	1250	645	7	5	8	13
67	1500	654	8	5	8	13
68	3100	743	10	10	8	14
69		653	7		8	14
70		847	11	5	8	16
71		725	8	5	8	16
72	1900	624	6	5	8	16
73	1650	614	7	10	8	16
74	1700	645	8	5	8	17
75	2450	676	7	5	8	17
76	1400	622	7	5	8	17
77	1700	620	6	5	8	17

Appendix 4. Creel survey form. [Wolf Lake, 1999]