

**Status Assessment of the Northern Pike Sport
Fishery, Lake Wabamun, 2001.**

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ABSTRACT

To recover or maintain Alberta's northern pike (*Esox lucius*) fisheries, a management strategy was implemented provincially in 1999. Consequently, the Lake Wabamun northern pike fishery was classified as vulnerable. A maximum total length (TL max) minimum size limit of 63 cm with a 3 fish daily possession limit was implemented on the northern pike fishery.

In order to assess the status of the northern pike fishery at Lake Wabamun, a roving type creel survey was conducted during May to August 2001. During this survey, the number of anglers interviewed was 432. The estimated number of anglers during the survey period was 9,464. Angling pressure was 3.4 angler-hours / hectare (hrs/ha).

In total Twenty-six pike were observed harvested of which twelve were sub-legal size. The harvest rate was 0.018 fish / hr. The estimated harvest of legal-size pike (fish >63 cm TL max) was 494. The estimated total harvest of pike (including illegal-size fish) was 712 pike.

The reported release rate on pike >63 cm (TL max) was 0.049 fish / hr and on sub-legal size northern pike (<63 cm TL max) was 0.832 fish / hr. The estimated release rate on sub-legal size pike was 0.259 fish / hour. Therefore the estimated total catch rate for pike including fish harvested, released and an angler exaggeration factor of 10% for legal-size released pike was 0.282 fish / hr.

Based on Provincial Fisheries Management criteria to classify northern pike stocks, the fishery at Lake Wabamun remains vulnerable.

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INTRODUCTION

Northern pike (*Esox lucius*) 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 with a 10 fish daily bag limit with no size limit. Fisheries receiving heavier than average exploitation were not adequately protected with these regulations. Consequently, many have declined or collapsed including Lake Wabamun. To recover these fisheries, a pike management strategy was implemented in 1999. This strategy requires that each pike population be evaluated as to its degree of exploitation and then placed in one of three categories: collapsed, vulnerable, or stable. These categories are based on the classification system used during the walleye management review (Sullivan 1994). The fishery is assigned a standard sport fishing regulation based on this status (Berry 1999). In early 1999, the pike fishery at Lake Wabamun was assigned a vulnerable status. Therefore, a 63 cm maximum total length (TL max) minimum size and a 3 fish daily possession limit on pike was implemented at the fishery.

This report describes the summer of 2001 creel survey conducted at Lake Wabamun . The purpose of the survey was to document the status of the population and fishery.

METHODS

Study Site Description

Lake Wabamun (Townships 52 – 53, Ranges 4 - 5, West of the 5th Meridian) is approximately 80 kilometres west of the City of Edmonton. Lake Wabamun has a surface area of 8,180 hectares and a maximum depth of approximately 11 metres. The Lake Wabamun watershed has considerable development including; the Village of Wabamun many other Summer Villages, seasonal and permanent residences, TransAlta Utilities' 3 coal-fired power plants, 3 sailing clubs, Wabamun Indian Reserve (#133A) and Wabamun Lake Provincial Park surround the lake. Boats can be launched at access points including Seba Beach, Village of Wabamun, Wabamun Lake Provincial Park and the Sundance power plant. The Provincial Park provides 318 campsites and a day-use area.

The trophic status of Lake Wabamun is mesotrophic. The lake is in the North Saskatchewan River Basin. Beaver and Jackpine creeks are the main inlet streams. Several intermittent streams also flow into the lake. The outflow is Wabamun Creek that leaves the lake along the northeast shoreline. A more complete description of the physical, chemical and biological characteristics may be found in Mitchell and Prepas (1990).

Study Methods

One creel survey crew (two biotechnicians) collected information from both Lake Wabamun and Lac Ste Anne from 19 May - 22 August 2001. A schedule of 5 survey days on Lake Wabamun (Fridays through Tuesdays) was followed by 5 survey days on Lac Ste. Anne (Wednesdays through Sundays). Each shift was followed by 4 days off. This cycle was repeated 7 times during the study.

A roving-roving survey procedure was followed to assess the sport fishery (Pollock et al. 1994). The survey was stratified according to day type (weekdays or weekend days) and time of day. Weekdays included Mondays through Thursdays and weekends included Fridays through Sundays. Statutory holidays were included as weekend-type days. The angling day was assumed to be 14.25 hours long. The angling day was stratified into 3 equal length periods (0800 – 1245, 1245 – 1730 and 1730 – 2215).

The daily roving event, the direction of each roving event (clockwise or counter clockwise), the starting point of each roving event (Fish and Wildlife cabin at Fallis Point or in front of Sundance Power Plant) and the time of each instantaneous count were randomly selected (without replacement). The survey technicians collected incomplete trip creel data from all fishers including those angling from shore. Angler locations were recorded using a Garmin GPS unit (+- 5m, 1983 North American Datum). Both boat and shore anglers were included in the instantaneous counts (Appendix 1.2). The technicians used binoculars during the roving creel survey and instantaneous counts to identify distant anglers. The complete trip creel data was collected throughout the survey period for completed trip length data. The survey schedule is Appendix 1.1.

During each roving event, 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.

If permitted, the sport fish retained by anglers were sampled for biological information. The fork length and maximum total 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 cleithrum of pike, the left pelvic fin and operculum of walleye (*Stizostedion vitreum*), 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.

An angling test-fishery collected size frequency distribution of pike in the population. Data from sport-harvested pike could not provide this information, due to the large minimum size limit for pike at this lake. Creel survey technicians, volunteer anglers, and fisheries staff participated in the collection of these data. 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.

Because anglers may release legal-length pike, the number of legal-length pike that were seen to be harvested will not represent the actual number of legal-length pike that were caught by anglers. The reported release rate of large fish was exaggerated, but the amount of exaggeration could not be quantified (Sullivan, in press). Therefore, the constant release rate of 10% for legal-length pike was used and added to the total estimated catch rate. Exaggeration and illegal harvest were calculated (J. Walker 2002, unpublished).

Gini coefficients and associated Lorenz curves were calculated using an Excel macro based on Baccante (1995). All Proportional Stock Density (PSD %) and Relative Stock Density (RSD stock - quality) classifications were calculated using fork lengths and the size categories suggested by Gablehouse (1984). All statistical analyses and graphics were completed not necessary using Microsoft Office Professional.

All data and analyses are stored in spreadsheet format on the ACA and Alberta Sustainable Resource Development (ABSRD), Fisheries Management Information System (FMIS) and on recordable compact discs (650 MB).

Data Analysis

Angling hours (Eh) was estimated by multiplying instantaneous anglers (Ei) by the daily angling period of 14.25 hours then multiplying this value to the total number of angling days during the survey period. The estimate of anglers (Ea) was then calculated by dividing the estimate of angling hours (Eh) by the mean length of a completed angling trip (2.9 hours). Harvest was estimated as the product of Eh and the incomplete trip catch rate (mean of daily ratios) (Pollock et al. 1994).

Confidence Intervals

Confidence intervals for Eh and harvest were calculated as:

$$\text{Variance (Eh)} = \text{Variance (Ei)} \times 14.25 \times N^2$$

Where N = the number of days in the angling season

$$\text{Confidence limits on Eh} = 1.96 \times (n \times \text{SQRT (Variance Eh)}) / (\text{SQRT (n)})$$

Where n = number of instantaneous angler counts

Variance for harvest estimate was calculated following Pollock et al. (1994).

RESULTS

Angler Survey

Anglers were mostly distributed along the northeast shore of the lake (Figure 1). During the roving survey period, 432 anglers were interviewed (Table 1 and Appendix 1.3). The total number of anglers was estimated at 9,464. The estimated effort was 27,445.5 hours resulting in an estimated angling pressure of 3.4 angler-hours / ha. The estimated harvest of legal-size pike was 494 fish (Table 2). Anglers reported releasing an estimated 22,835 sub-legal size pike and 1,345 legal-size pike. Based on test angling and the sampled proportion of sublegal / legal pike caught, it is estimated that anglers actually released 7,108 sublegal-size pike.

The yield of harvested legal-size pike was estimated at 1,182.0 kg (0.144 kg / ha). Assuming 10% release mortality, the yield of released pike was 921 kg (7,108 pike*0.1 mortality*1.296 kg mean weight) or 0.113 kg / ha. The sport yield of harvested pike during the period of this survey was therefore 0.227 kg / ha, of which 50% was released, dead pike.

The distributions of harvests and catches for pike are shown in Appendices 1.4 and 1.5. Biological samples were collected from 369 pike (26 angler harvest, 343 test fishery sample) (Appendix 2 and 3), 0 walleye (0 angler harvest, 0 test fishery sample) and 2 perch (0 angler harvest, 2 test fishery sample).

Test Angling

Test fisheries were conducted on 21 days, from 20 May to 15 August for a total 112.25 hours. A total of 343 pike were caught and sampled of which 22 of the pike were legal-size and 321 were sub-legal size.

Compliance

Anglers both exaggerate their catch and harvested illegal size fish (Table 3). Exaggeration and illegal harvest values were calculated following J. Walker 2002 (unpublished).

Historical

Angling is an important recreational pursuit in Wabamun Lake and the winter fishery for whitefish is more popular than the summer fishery for northern pike and walleye (Mitchell and Prepas 1990).

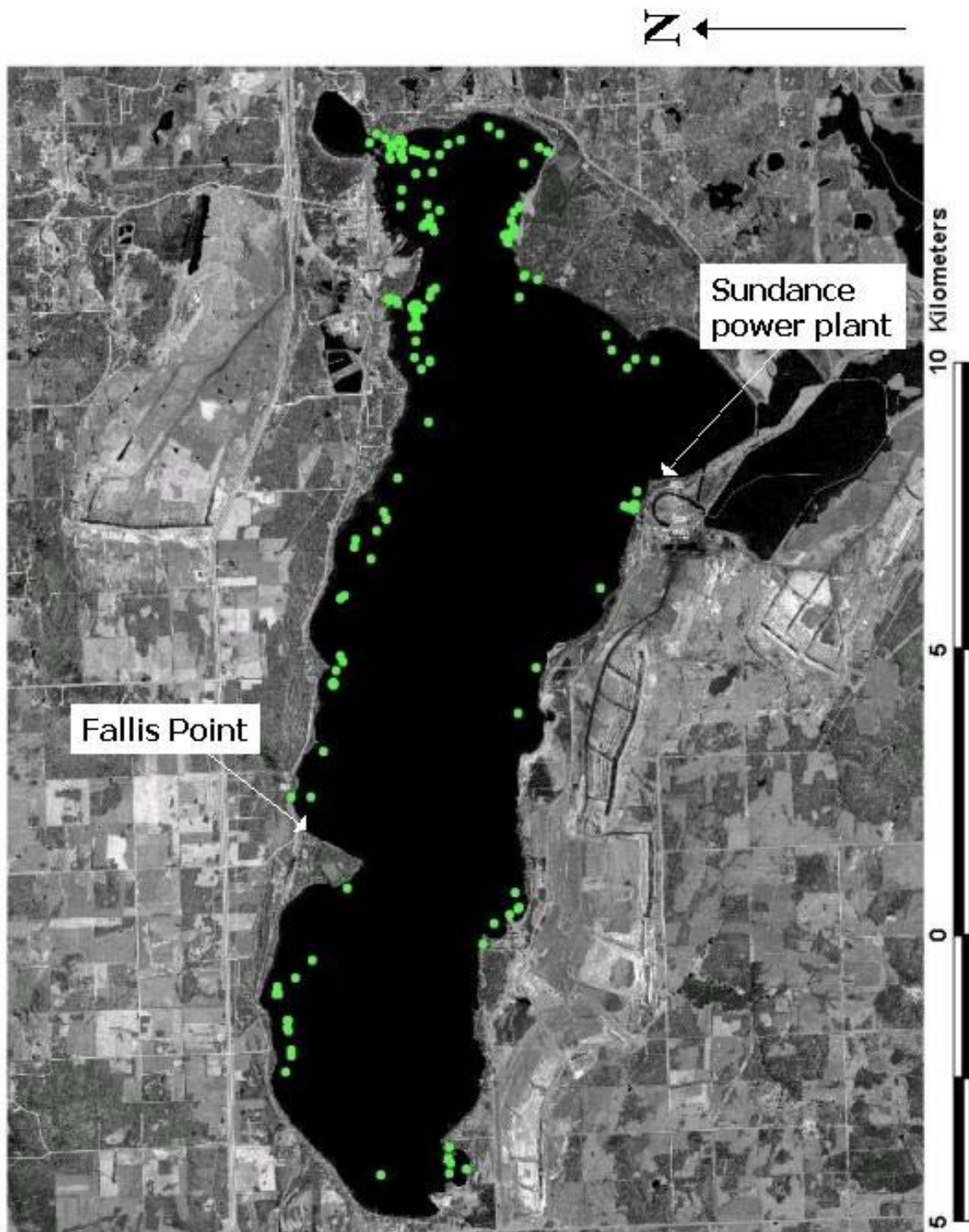


Figure 1. Location of roving creel interviews, Lake Wabamun, 2001.

Table 1. Observed and reported catch rates of anglers; Lake Wabamun, 2001.

Creel Data	2001
# days surveyed	34
# anglers interviewed	432
# angling hours reported	872.5
NORTHERN PIKE DATA	
Kept / angler-hour	0.033 [^]
Released legal-size / angler-hour	0.050
Released sublegal / angler-hour	0.832
Total released / angler-hour	0.882
Total catch rate	0.092
WALLEYE DATA	
Kept / angler-hour	0.000*
Released / angler-hour	0.001
Total catch rate	0.001
YELLOW PERCH DATA	
Kept / angler-hour	0.000
Released / angler-hour	0.029
Total catch rate	0.029

[^] Regulation was modified in 1999 to 3 pike / 63 cm minimum size limit.

* Regulation modified in 1997 to a collapsed status and a catch and release regulation.

Table 2. Whole lake estimates; Lake Wabamun, 2001.

	2001 Whole Lake Estimate (95% CI)
# Anglers	9,464 (6,428 – 12,499)
# Hours	27,446 (22,276 – 32,615)
Hours / hectare	3.4 (2.7 – 4.0)
# pike harvested (Including illegal-size)	712 (135 – 1288)

Table 3. Non-compliance with size limits; Lake Wabamun, 2001.

PARAMETER	Number of legal-size pike estimated harvested + 10% of legal-size pike estimated harvested (LCI – UCI, 95%)
Illegal harvest (%)	8.7% (6.5% - 13.4%)
Exaggeration (1X)	4.3X

Status of the Pike Fishery

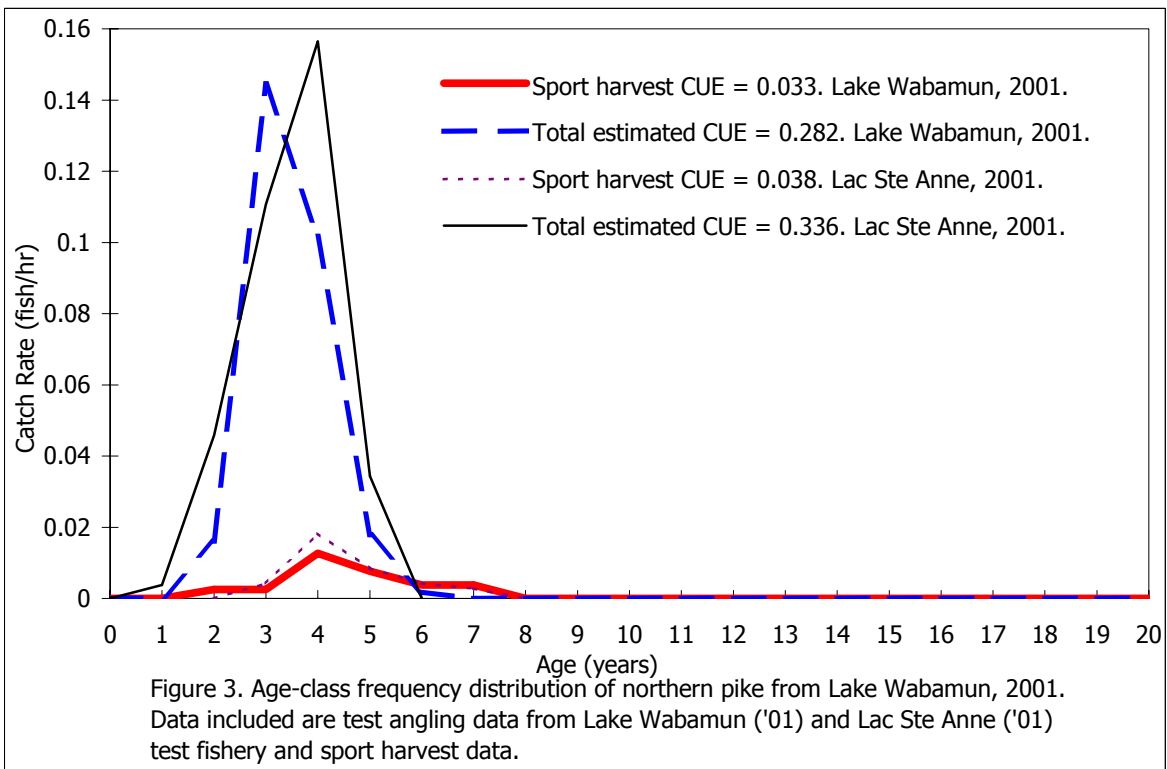
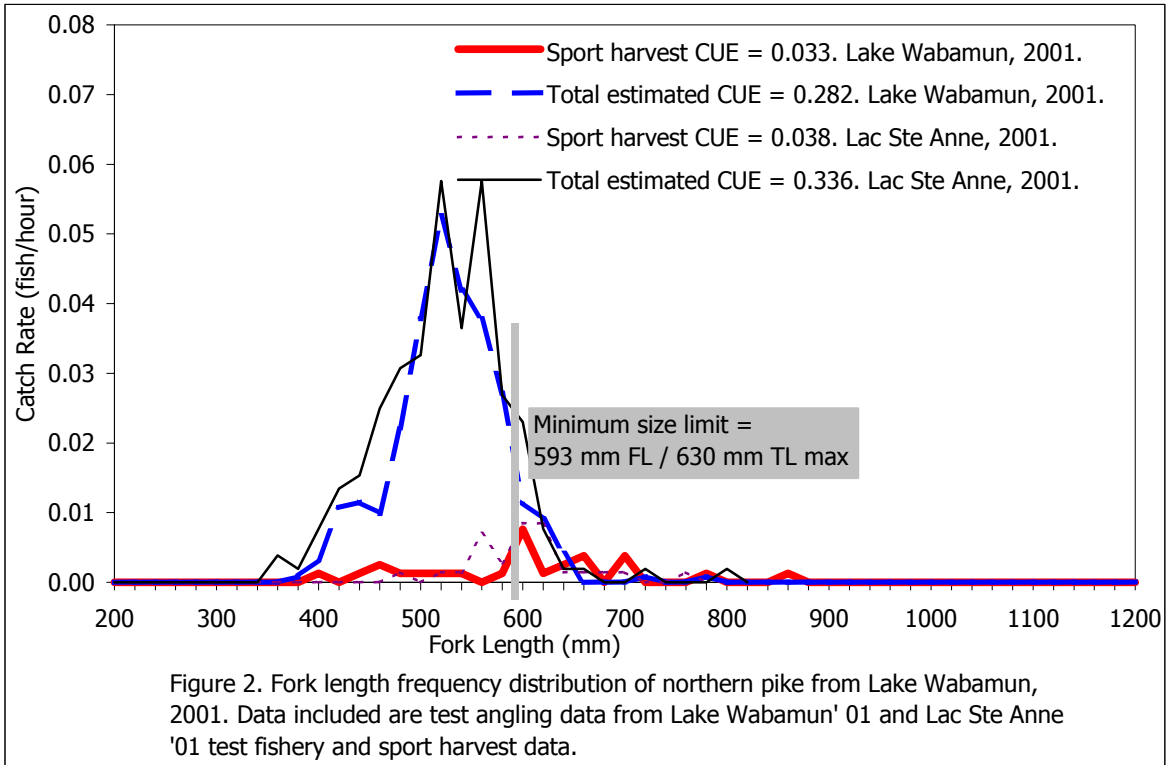
1. Biological Metrics

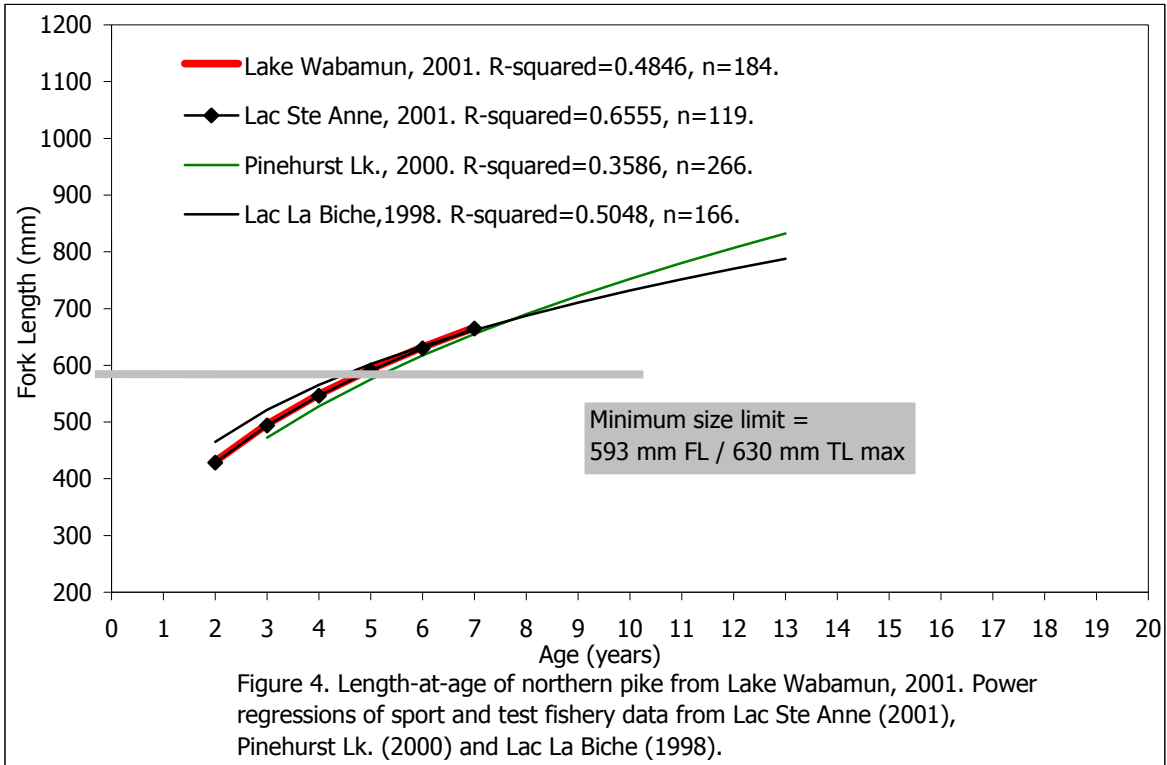
The metrics associated with reference points for classifying pike fisheries are shown in Table 4. From the 2001 survey of Lake Wabamun, the observed harvest rate on legal-size pike was 0.018 fish kept / hour. The reported release rate on sublegal-size pike was 0.832 fish released / hour. Reported release rate is likely exaggerated; exaggeration in catches was not constant, but increased exponentially with decreasing catch (Sullivan, in press). Since the legal catch of pike has been reduced (upwards of 95%) recently due to restrictive size limits, the reported catch rate is likely exaggerated. Based on the test fishery size frequency distribution, the estimated sublegal size release rate was 0.259 pike released / hour. Therefore, the estimated total CUE on all sizes of pike was 0.282 fish / hour (0.018 + 0.259 + (0.050 X 10%)).

The sport and the test fishery sampled relatively few large, older pike (Figures 2 and 3). The estimated sublegal release catch rate suggests a moderately low level of recruitment. A growth overfished population is defined as both the catch and the stock density of large fish having been reduced while remaining adult population has maintained or increased recruitment of pike (Cushing 1981). The 1998 and 1997 year-classes, compared to the moderate 1999 and 1996 year-classes, are considerable. The index-of-growth of Lake Wabamun pike is not unlike the index-of-growth of Lac Ste Anne pike (Figure 3). Pike are first reaching the 630 cm TL max (593 mm FL) size limit by ages 4 and 5 and are fully recruited to the sport fishery by age 6. Ninety-four percent (94%) of the pike in Lake Wabamun were protected by the minimum size limit. The mean weight of a legal-size pike was 2.4 kg.

Table 4. Assessment of the status of the pike fishery; Lake Wabamun, 2001.

METRIC	STABLE	VULNERABLE (No Risk)	VULNERABLE (Low Risk)	COLLAPSED
CUE kept (>63 cm TL max)	> 0.1	> 0.02 0.033	> 0.01	< 0.01
CUE estimated total (observed legal size CUE + estimated release CUE + 10% legal size released pike) UTILIZES TEST FISHERY DATA	1 – 2	0.5 - 1	0.2 - 0.5 0.282	< 0.2
# MEASURABLE AGE-CLASSES (> 0.02 / h) UTILIZES TEST FISHERY DATA	7 – 12	3 – 7 4	1 – 2	Almost none
GROWTH RATE UTILIZES TEST FISHERY DATA	Slow	Increasing	Increasing legal size at age 5	Fast
MEAN WT (kg) (legal size) UTILIZES TEST FISHERY DATA	1 – 2	< 1	0.5 – 1.5	0.5 – 3.5 2.4 kg
PSD (% pike >53 cm TL max) UTILIZES TEST FISHERY DATA	> 40	< 40	Variable (> 0.1 pike / h) 43.9	Variable (< 0.1 pike / h)
RSD (% pike 35 – 52 cm TL max, stock – quality size) UTILIZES TEST FISHERY DATA	< 50	> 50 56.1	Variable (> 0.1 / h)	Variable (< 0.1 / h)
SUCCESS (% anglers catching 1 or more legal size pike)	> 70	< 70	< 40	< 20 10.0%
GINI (total CUE) (Catch inequality)	0.3	0.5 – 0.7	0.7 – 0.9 0.798	> 0.9





2. Social Metrics

Only 10% of all anglers were successful in catching 1 or more legal-size pike. There was a moderately high level of inequality in the catch of pike with a GINI coefficient of 0.798 (Baccante 1995). A GINI coefficient of 0 indicates all anglers caught equal numbers of fish and a coefficient of 1 indicates that a single angler caught the entire catch. Both success rate and GINI coefficient are likely inflated due to exaggeration found in reported catch rates.

DISCUSSION

The pike fishery at Lake Wabamun is vulnerable based on the criteria used to classify pike stocks in Alberta. The harvest rate on legal-size pike was moderately low (0.021 fish / hr). The total estimated catch rate was moderate (0.282 pike / hr). Based on Sullivan (2002 in press), reported catch rates are likely exaggerated. The test fishery confirms a significant level of recruitment represented in the 1999 to 1996 year-classes. At a modest rate of hooking mortality, 50% of the sport harvest is in released, dead pike. Lake Wabamun northern pike are vulnerable to the sport fishery by age 5. Most anglers (90%) did not catch a legal-size pike. The level of inequality in the pike catch was a moderately high.

In 1999, the pike management strategy was implemented. It is almost to soon to observe any response to the restrictive regulation. However, the steep catch curve indicates high mortality from either commercial or domestic harvests or harvest and release mortality by the sport fishery. Angling pressure may increase as pike densities and catch rate increase. A likely result will be an increase in release mortality, and therefore, a larger proportion of the sport harvest occurring as released, dead pike. As pike recruit into the fishery, their excessive harvest (both legal and release mortality) may prevent any future recovery of the fishery. It is necessary to continue to monitor this fishery with attention given to the response of pike to the protective regulations and to changes angling pressure and the related effects of hooking mortality.

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APPENDICES

Appendix 1. Angler survey data. [Lake Wabamun, 2001]

Appendix 1.1 Survey schedule.

Date	Day	Day code	Work / Off	Lake	Shifts (800-2215)	Survey origin/finish point	Instantaneous counts
					1 = early = 800 - 1245 2 = mid = 1245 - 1730 3 = late = 1730 - 2215	1=from fallis clockwise 2=from fallis counter clockwise 3=from Sundance clockwise 4=from Sundance counter clockwise 5=from Westcove clockwise 6=from Westcove counter clockwise 7=from Alberta beach clockwise 8=from Alberta beach counter clockwise	1 = LSA b/c before or after rove 17 2 = WAB b/c before or after rove 17
19-May	sat	6	W	LSA	1	6	1
20-May	sun	7	W	LSA	2	7	
21-May	mon	8	W	LSA	2	8	1
22-May	tue	2	W	LSA	1	5	
23-May	wed	3	W	WAB	1	4	2
24-May	thur	4	W	WAB	2	3	
25-May	fri	5	W	WAB	2	1	2
26-May	sat	6	W	WAB	1	2	
27-May	sun	7	W	WAB	2	3	
28-May	mon	1	O				
29-May	tue	2	O				
30-May	wed	3	O				
31-May	thur	4	O				
1-Jun	fri	5	TOIL				
2-Jun	sat	6	W	LSA	2	8	
3-Jun	sun	7	W	LSA	1	6	1
4-Jun	mon	1	W	LSA	3	5	
5-Jun	tue	2	W	LSA	3	7	1
6-Jun	wed	3	W	WAB	1	3	
7-Jun	thur	4	W	WAB	2	4	2
8-Jun	fri	5	W	LSA	3	5	
9-Jun	sat	6	W	WAB	2	1	2
10-Jun	sun	7	W	WAB	1	3	
11-Jun	mon	1	O				
12-Jun	tue	2	O				
13-Jun	wed	3	O				
14-Jun	thur	4	O				
15-Jun	fri	5	W	LSA	2	6	1
16-Jun	sat	6	W	LSA	1	7	
17-Jun	sun	7	W	LSA	3	8	
18-Jun	mon	1	W	LSA	1	5	1
19-Jun	tue	2	W	LSA	3	5	
20-Jun	wed	3	W	WAB	2	1	2
21-Jun	thur	4	W	WAB	1	2	
22-Jun	fri	5	W	WAB	2	4	
23-Jun	sat	6	W	WAB	3	2	

Appendix 1.1 Survey schedule, con't.

Date	Day	Day code	Work / Off	Lake	Shifts (800-2215)	Survey origin/finish point	Instantaneous counts
24-Jun	sun	7	W	WAB	3	4	2
25-Jun	mon	1	O				count if = 1
26-Jun	tue	2	O				13
27-Jun	wed	3	O				count if = 2
28-Jun	thur	4	O				11
29-Jun	fri	5	W	LSA	1	6	
30-Jun	sat	6	W	LSA	2	7	1
1-Jul	sun	7	W	LSA	3	8	
2-Jul	mon	8	W	LSA	1	7	1
3-Jul	tue	2	W	LSA	2	5	1
4-Jul	wed	3	W	WAB	2	1	
5-Jul	thur	4	W	WAB	3	3	2
6-Jul	fri	5	W	WAB	1	4	2
7-Jul	sat	6	W	LSA	2	6	
8-Jul	sun	7	W	WAB	3	1	2
9-Jul	mon	1	O				
10-Jul	tue	2	O				
11-Jul	wed	3	O				
12-Jul	thur	4	O				
13-Jul	fri	5	TOIL				
14-Jul	sat	6	W	LSA	2	6	1
15-Jul	sun	7	W	LSA	1	8	1
16-Jul	mon	1	W	LSA	3	5	
17-Jul	tue	2	W	LSA	2	7	1
18-Jul	wed	3	W	WAB	3	3	2
19-Jul	thur	4	W	WAB	1	2	2
20-Jul	fri	5	W	WAB	3	4	
21-Jul	sat	6	W	WAB	2	3	2
22-Jul	sun	7	W	WAB	1	1	
23-Jul	mon	1	O				
24-Jul	tue	2	O				
25-Jul	wed	3	O				
26-Jul	thur	4	O				
27-Jul	fri	5	TOIL				
28-Jul	sat	6	W	LSA	1	8	1
29-Jul	sun	7	W	LSA	3	6	
30-Jul	mon	1	W	LSA	2	7	1
31-Jul	tue	2	W	LSA	3	8	
1-Aug	wed	3	W	WAB	1	1	
2-Aug	thur	4	W	WAB	2	3	2
3-Aug	fri	5	W	WAB	3	4	
4-Aug	sat	6	W	WAB	2	2	
5-Aug	sun	7	W	WAB	1	3	2
6-Aug	mon	8	W	WAB	1	1	2
7-Aug	tue	2	O				
8-Aug	wed	3	O				
9-Aug	thur	4	O				
10-Aug	fri	5	O				
11-Aug	sat	6	W	LSA	3	6	1

Appendix 1.1 Survey schedule, con't.

Date	Day	Day code	Work / Off	Lake	Shifts (800-2215)	Survey origin/finish point	Instantaneous counts
12-Aug	sun	7	W	LSA	2	5	
13-Aug	mon	1	W	LSA	1	6	
14-Aug	tue	2	W	LSA	2	7	1
15-Aug	wed	3	W	WAB	3	2	2
16-Aug	thur	4	W	WAB	2	4	
17-Aug	fri	5	W	WAB	3	3	2
18-Aug	sat	6	W	WAB	1	1	
19-Aug	sun	7	W	LSA	3	8	1
20-Aug	mon	1	O	LSA	2	5	1
21-Aug	tue	2	O	LSA	3	7	
22-Aug	wed	3	O	LSA	1	8	1

Appendix 1.2. Instantaneous counts summary.

Date	1 = Weekday 2 = Weekend	Anglers / boat	# Boats	# Boat Anglers	# Shore Anglers	# Anglers
16			123	272	49	321
May-23	1	0	0	0	0	0
May-23	1	2	1	2	0	2
May-25	2	2,1,2,2,2,1,2,1,2,2,4,3,2	13	26	1	27
Jun-07	1	2,3	2	5	0	5
Jun-09	2	2,3,3,3,2,4,3,4,3,3,2	11	32	11	43
Jun-20	1	2,3,2,2	4	9	7	16
Jun-24	2	2,3,2,2,2,3	6	14	2	16
Jul-05	1	2,1,2	3	5	0	5
Jul-06	2	1,1,2,2,4	5	10	0	10
Aug-01	1	1,1,2,2,2,3,2,2,3	9	16	4	20
Aug-02	1	2,2,3,1,4,3,4,2	8	21	7	28
Aug-03	2	3,1,3,4,1,2,3,2,3	9	22	0	22
Aug-05	2	2,2	2	4	1	5
Aug-06	2	1,3,2,2,2,3,2,1,3,2,4,2,2,3,2,3,1,2	18	40	3	43
Aug-16	1	1,2,2,3,1,1,1	7	11	3	14
Aug-17	2	2,2,2,3,2,2,2,2,2,3,2,2,2,2,2,2,2,2,2,2,3,2,3,2,2,3	25	55	10	65

Appendix 1.3. Daily summary of angler survey data.

Month	Date	Day Code	# Angler	# Hours	Walleye Released	Pike Kept	Pike <63 Rel.	Pike >63 Rel.	Perch Kept	Perch Released	Lake Whitefish Kept	Lake Whitefish Released
	34		432	872.5	1	29	726	43	0	25	34	0
5	23	3	1	0.75	0	0	0	0	0	0	0	0
6	6	3	4	18.00	0	0	1	0	0	0	5	0
6	20	3	10	18.25	0	2	4	0	0	0	0	0
7	4	3	4	2.50	0	0	0	0	0	0	0	0
8	1	3	17	40.75	0	7	35	0	0	0	0	0
5	24	4	9	27.25	0	0	32	1	0	0	3	0
6	7	4	5	10.50	0	0	0	0	0	0	0	0
6	21	4	0	0.00	0	0	0	0	0	0	0	0
7	5	4	2	2.00	0	0	0	0	0	0	0	0
7	19	4	0	0.00	0	0	0	0	0	0	0	0
8	2	4	26	31.50	0	0	30	0	0	0	0	0
8	16	4	8	26.00	0	2	3	3	0	0	0	0
5	25	5	17	42.00	0	0	7	0	0	0	10	0
6	22	5	1	0.25	0	0	0	0	0	0	0	0
7	6	5	5	6.00	0	0	5	0	0	0	0	0
7	20	5	0	0.00	0	0	0	0	0	0	0	0
8	3	5	8	9.00	0	0	10	0	0	0	0	0
8	17	5	5	17.75	0	0	15	0	0	0	0	0
5	26	6	36	79.50	0	0	51	2	0	0	13	0
6	9	6	31	37.25	0	1	63	7	0	0	0	0
6	23	6	25	59.50	0	5	95	1	0	0	0	0
7	14	6	16	55.00	0	0	61	2	0	0	0	0
7	21	6	0	0.00	0	0	0	0	0	0	0	0
8	4	6	53	95.00	1	2	106	5	0	4	0	0
8	18	6	11	12.00	0	0	19	1	0	0	0	0
5	27	7	8	9.50	0	0	3	1	0	0	0	0
6	8	7	16	34.25	0	0	7	0	0	0	0	0
6	10	7	34	104.00	0	5	69	20	0	0	3	0
6	24	7	4	10.00	0	1	19	0	0	0	0	0
7	8	7	0	0.00	0	0	0	0	0	0	0	0
7	15	7	17	52.50	0	1	26	0	0	0	0	0
7	22	7	0	0.00	0	0	0	0	0	0	0	0
8	5	7	26	35.25	0	0	7	0	0	21	0	0
8	6	8	33	36.25	0	3	58	0	0	0	0	0

Appendix 1.4. Catch frequency distribution of harvested pike.

# Pike	# Anglers	% Anglers	Pike Harvest	% NP Harvested	Cumulative % Pike Harvest
0	408	94.4	0	0.0	0.0
1	18	4.2	18	62.1	62.1
2	4	0.9	8	27.6	89.7
3	1	0.2	3	10.3	100.0
4	0	0.0	0	0.0	
5	0	0.0	0	0.0	
>5	0	0.0	0	0.0	
Totals	432	100	29	100	

Appendix 1.5. Catch frequency distribution of released pike.

# Pike	# Anglers	% Anglers	Pike Released	% NP Released
0	251	58.2	0	0.0
1	69	16.0	69	9.0
2	30	7.0	61	7.9
3	17	4.0	52	6.8
4	17	4.0	69	9.0
5	10	2.3	49	6.3
6	5	1.3	32	4.2
7	4	1.0	30	3.9
8	4	1.0	35	4.5
9	2	0.5	19	2.5
10	6	1.5	65	8.4
>10	14	3.2	287	37.3
Totals	432	100	769	100

Appendix 2. Summary of biological data from sport-caught pike. [Lake Wabamun, 2001]

Sample #	Month	Date	Fork Length (mm) Mean = 592 mm n = 26	Age (years) Mean = 4.6 n = 26	Sex
1	6	9	566	4	M
2	6	10	855	6	M
3	6	10	590	4	M
4	6	10	600	6	M
5	6	10	584	5	
6	6	10	699	7	M
7	6	20	398	2	M
8	6	23	610	4	
9	6	23	650	5	
10	6	23	622	5	
11	6	24	600	4	
12	8	1	700	6	M
13	8	1	425	3	I
14	8	1	765	7	
15	8	1	596	4	
16	8	1	531	4	M
17	8	1	456	5	I
18	8	1	581	5	M
19	8	1	471	5	M
20	8	4	449	2	M
21	8	4	695	7	M
22	8	6	640	4	M
23	8	6	656	4	M
24	8	6	657	4	M
25	8	16	519	4	M
26	8	16	486	3	F

Appendix 3. Summary of biological data from test-caught pike. [Lake Wabamun, 2001]

Sample #	Month	Date	Fork Length (mm) Mean = 518 mm n = 342	Age (years) Mean = 3.4 years n = 158
1	5	23	460	
2	5	23	503	3
3	5	23	549	
4	5	23	539	5
5	5	23	558	
6	5	23	518	4
7	5	23	585	
8	5	23	562	5
9	5	23	521	
10	5	23	540	4
11	5	23	480	
12	5	23	400	3
13	5	23	560	
14	5	23	480	4
15	5	23	545	
16	5	23	579	4
17	5	23	471	
18	5	23	554	3
19	5	23	609	
20	5	23	450	3
21	5	23	560	
22	5	23	557	3
23	5	23	544	
24	5	23	600	4
25	5	23	526	
26	5	23	409	3
27	5	23	559	
28	5	23	475	3
29	5	24	506	
30	5	24	541	4
31	5	24	415	
32	5	24	522	5
33	5	24	585	
34	5	25	458	3
35	5	25	535	
36	5	25	618	3
37	5	25	466	
38	5	25	505	3
39	5	25	558	
40	5	25	520	3
41	5	25	500	
42	5	25	582	4
43	5	25	566	
44	5	25	574	4
45	5	25	538	
46	5	25	501	3
47	5	25	550	
48	5	25	511	3
49	5	25	562	

Appendix 3. Summary of biological data from test-caught pike, con't. [Lake Wabamun, 2001]

Sample #	Month	Date	Fork Length (mm)	Age (years)
50	5	25	490	4
51	5	25	563	
52	5	25	497	3
53	5	25	407	
54	5	25	538	3
55	5	25	422	
56	5	25	578	3
57	5	25	497	
58	5	25	528	3
59	6	6	465	
60	6	6	544	3
61	6	6	429	
62	6	6	503	3
63	6	6	425	
64	6	6	570	4
65	6	6	500	
66	6	6	475	3
67	6	6	486	
68	6	6	590	4
69	6	6	595	
70	6	6	418	2
71	6	6	438	
72	6	6	523	4
73	6	6	385	
74	6	6	466	
75	6	6	498	
76	6	6	475	4
77	6	6	413	
78	6	6	531	3
79	6	6	442	
80	6	6	564	4
81	6	6	487	
82	6	7	497	3
83	6	7	500	
84	6	7	466	2
85	6	7	476	
86	6	7	499	3
87	6	7	556	
88	6	7	564	4
89	6	7	563	
90	6	7	505	3
91	6	7	412	
92	6	7	555	3
93	6	7	544	
94	6	7	582	4
95	6	7	765	
96	6	7	490	3
97	6	7	479	
98	6	7	507	3
99	6	7	497	
100	6	7	555	5

Appendix 3. Summary of biological data from test-caught pike, con't. [Lake Wabamun, 2001]

Sample #	Month	Date	Fork Length (mm)	Age (years)
101	6	7	479	
102	6	7	537	4
103	6	7	503	
104	6	7	454	3
105	6	7	510	
106	6	7	546	4
107	6	7	608	
108	6	7	416	3
109	6	7	445	
110	6	7	507	3
111	6	7	530	
112	6	7	554	4
113	6	7	479	
114	6	7	445	3
115	6	7	420	
116	6	7	538	4
117	6	7	561	
118	6	7	606	4
119	6	7	533	
120	6	7	424	3
121	6	7	437	
122	6	7	544	3
123	6	7	428	
124	6	7	503	3
125	6	7	578	
126	6	7	548	3
127	6	7	504	
128	6	7	508	3
129	6	7	495	
130	6	7	593	3
131	6	7	463	
132	6	7	458	3
133	6	7	486	
134	6	7	492	3
135	6	7	519	
136	6	7	440	3
137	6	7	500	
138	6	7	554	4
139	6	7	538	
140	6	8	438	4
141	6	8	466	
142	6	8	440	3
143	6	8	611	
144	6	8	421	2
145	6	8	499	
146	6	8	496	4
147	6	8	566	
148	6	8	615	4
149	6	8	526	
150	6	8	535	3
151	6	8	408	

Appendix 3. Summary of biological data from test-caught pike, con't. [Lake Wabamun, 2001]

Sample #	Month	Date	Fork Length (mm)	Age (years)
152	6	8	517	3
153	6	8	465	
154	6	8	575	5
155	6	8	542	
156	6	10	570	4
157	6	10	535	
158	6	10	414	2
159	6	10	529	
160	6	10	508	3
161	6	20	522	
162	6	20	495	3
163	6	20	528	
164	6	20	548	5
165	6	20	485	
166	6	20	491	3
167	6	20	520	
168	6	20	506	4
169	6	20	480	
170	6	20	544	3
171	6	20	500	
172	6	20	520	4
173	6	20	520	
174	6	20	550	5
175	6	20	490	
176	6	20	539	5
177	6	20	514	
178	6	20	387	2
179	6	20	540	
180	6	20	590	4
181	6	20	635	
182	6	20	493	3
183	6	20	463	
184	6	20	508	3
185	6	20	417	
186	6	20	431	2
187	6	20	514	
188	6	20	518	4
189	6	20	510	
190	6	20	482	4
191	6	20	558	
192	6	20	515	3
193	6	20	517	
194	6	20	532	3
195	6	20	442	
196	6	20	573	4
197	6	20	464	
198	6	20	630	4
199	6	20	613	
200	6	20	610	6
201	6	20	632	
202	6	21	505	4

Appendix 3. Summary of biological data from test-caught pike, con't. [Lake Wabamun, 2001]

Sample #	Month	Date	Fork Length (mm)	Age (years)
203	6	21	561	
204	6	21	531	4
205	6	21	516	
206	6	21	543	3
207	6	21	511	
208	6	21	519	4
209	6	21	498	
210	6	21	537	4
211	6	21	531	
212	6	21	548	4
213	6	21	568	
214	6	21	531	4
215	6	21	492	
216	6	21	529	3
217	6	21	534	
218	6	21	496	3
219	6	21	421	
220	6	21	531	4
221	6	21	586	
222	6	21	496	4
223	6	21	616	
224	6	21	413	2
225	6	21	493	
226	6	21	550	3
227	6	21	517	
228	6	21	530	3
229	6	21	546	
230	6	21	455	3
231	6	21	494	
232	6	21	528	3
233	6	21	550	
234	6	21	471	3
235	6	21	503	
236	6	21	574	4
237	6	21	630	
238	6	21	585	3
239	6	21	503	
240	6	21	555	3
241	6	21	475	
242	6	21	565	5
243	6	21	535	
244	6	21	460	3
245	6	21	522	
246	6	21	593	4
247	6	21	510	
248	6	21	488	3
249	6	21	525	
250	6	21	401	2
251	6	21	530	
252	6	21	523	4
253	6	21	580	

Appendix 3. Summary of biological data from test-caught pike, con't. [Lake Wabamun, 2001]

Sample #	Month	Date	Fork Length (mm)	Age (years)
254	6	21	634	3
255	6	21	440	
256	6	21	526	4
257	6	21	585	
258	6	21	480	3
259	6	21	556	
260	6	21	519	4
261	6	21	500	
262	6	21	470	3
263	6	21	500	
264	6	21	487	4
265	6	21	505	
266	6	21	513	4
267	6	21	487	
268	6	21	520	3
269	6	21	491	
270	6	21	503	4
271	6	21	506	
272	6	21	554	4
273	6	21	515	
274	6	21	580	4
275	6	21	534	
276	6	21	520	4
277	6	21	510	
278	6	21	503	3
279	6	21	505	
280	6	21	383	2
281	6	23	498	
282	6	23	515	3
283	6	23	484	
284	6	23	607	4
285	6	23	517	
286	6	23	579	
287	6	23	580	
288	6	23	563	4
289	6	23	552	
290	6	23	462	3
291	6	23	498	
292	6	23	505	3
293	6	23	575	
294	6	23	520	3
295	6	23	511	
296	6	23		3
297	6	23	503	
298	6	23	530	3
299	6	23	494	
300	6	23	492	3
301	6	23	563	
302	6	23	459	3
303	6	23	534	
304	6	23	534	4

Appendix 3. Summary of biological data from test-caught pike, con't. [Lake Wabamun, 2001]

Sample #	Month	Date	Fork Length (mm)	Age (years)
305	6	23	556	
306	6	23	484	3
307	6	23	543	
308	6	23	508	3
309	6	23	534	
310	6	24	528	5
311	6	24	517	
312	6	24	552	4
313	6	24	529	
314	6	24	529	3
315	6	24	551	
316	6	24	477	3
317	6	24	370	
318	6	24	500	3
319	6	24	535	
320	6	24	575	4
321	6	24	509	
322	7	5	478	
323	7	5	511	
324	7	5	603	
325	7	5	589	
326	7	5	565	
327	7	5	569	
328	7	5	503	
329	7	5	514	
330	7	5	557	
331	7	5	518	
332	8	1	549	
333	8	1	538	
334	8	1	560	
335	8	1	553	
336	8	1	570	
337	8	1	490	
338	8	1	512	
339	8	1	550	
340	8	1	568	
341	8	1	524	
342	8	3	510	
343	8	3	720	

Appendix 4. Creel survey form. [Lake Wabamun, 2001]