

**Status Assessment of the Northern Pike Sport  
Fishery, Lac Ste. Anne, 2001.**

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**ABSTRACT**

To recover or maintain Alberta's northern pike (*Esox lucius*) fisheries, a provincial management strategy was implemented in 1999. Consequently, the Lac Ste. Anne northern pike fishery was classified as vulnerable (stable-recreational). A 63 cm maximum total length minimum size limit, 3 fish daily possession limit on pike was implemented on the sport fishery.

In order to assess the status of the pike fishery at Lac Ste. Anne, a roving type creel survey was conducted during May to August 2001. During this survey, the number of anglers interviewed was 372. The estimated number of anglers during the survey in 2001 was 4,864. Angling pressure was 2.6 hours/hectare. This was the lowest recorded angling pressure since surveys conducted in 1985, 1995 and 1997.

Twenty-seven pike were observed harvested of which twelve were sublegal size. The estimated harvest of legal-size pike (fish >63 cm TL max) was 292 with a harvest rate of 0.020 fish / hr. The reported release rate on pike >63 cm (total length maximum, TL max) was 0.032 fish / hr and on pike <63 cm TL max (sublegal size) was 0.771 fish / hr. The estimated release rate on sublegal size pike was 0.313 fish / hour. Therefore the estimated total catch rate for pike was 0.336 fish / hr.

Based on Provincial Fisheries Management criteria to classify pike stocks, the pike fishery at Lac Ste. Anne remains vulnerable.

## **ACKNOWLEDGEMENTS**

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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 designed to manage the pike harvest at an average fishery. The previous sport fishing regulation was a 10 fish daily bag limit with no size limit. Fisheries receiving heavier than average exploitation have not been adequately protected with these regulations. Consequently, many have declined or collapsed including Lac Ste. Anne. 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 Lac Ste. Anne was assigned a vulnerable status. A 63 cm maximum total length (TL max) minimum size and a 3 fish daily possession limit on pike was therefore implemented at the fishery.

This report describes the creel survey conducted at Lac Ste. Anne during the summer of 2001. The purpose of the survey was to verify the status of the population and fishery.

## METHODS

### Study Site Description

Lac Ste. Anne (TWP 54-55, RNG 3-4, W5M) is approximately 60 kilometres west of the City of Edmonton. Lac Ste. Anne has a surface area of 5,690 hectares and a maximum depth of approximately 9 metres. Many people consider Lac Ste. Anne a special lake: its long history, spiritual symbolism and its recreational attractiveness (Mitchell and Prepas 1990). Seven Summer Villages, a number of subdivisions, the Alexis Indian Reserve and several agricultural operations surround Lac Ste. Anne. Camping facilities around Lac Ste. Anne include only private campgrounds at Alberta Beach, Gunn and the Lac Ste Anne Mission. Boats may be launched at several day-use areas: Alberta Beach, Gunn, Yellowstone, Ross Haven, West Cove, WarWa Estates, Birchwood Estates and at the eastside of the narrows between the West and East lakes.

The trophic status of Lac Ste. Anne is eutrophic. The lake is in the North Saskatchewan River Basin. The main inlet is the Sturgeon River, which flows from Isle Lake into the western arm of Lac Ste. Anne. The outflow is also the Sturgeon River that leaves the lake along the east shoreline north of Alberta Beach. The Sturgeon River flows into Big Lake and 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 biotechnicians) collected information from both Lake Wabamun and Lac Ste Anne from 19 May - 22 August 2001. For the entire survey, the crew was stationed at the Fish and Wildlife Cabin at Fallis Point on Lake Wabamun. 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 type survey procedure was followed to sample 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 – Thursdays and weekends included Fridays – 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 (the boat launch at Alberta Beach or Warwa Estates) of each roving event 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 (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. Complete trip creel data was collected throughout the survey period to calculate mean complete trip length. 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. The full data set is stored in the Alberta Conservation Association (ACA) Fisheries Section, northeast region office and the Alberta Sustainable Resource Development (ABSRD), Fisheries Management Branch, Fisheries Management Information System (FMIS) database.

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 5). 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. Following Sullivan (in press) it was assumed that the reported release rate of these large fish was exaggerated, but could not quantify the amount of exaggeration. The constant release rate of 10% for legal-length pike was used and added to the total estimated catch rate (Sullivan, in press).

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). Statistical analyses and graphics were completed on a *Compaq* notebook personal computer (Intel Pentium III, 1.2 GHz) using Microsoft Office professional. All data and analyses are stored in spreadsheet format on ACA and Alberta Sustainable Resource Development (ABSRD), Fisheries Management Information System (FMIS) and on recordable compact discs.

#### Data Analysis

Angling hours (Eh) was estimated by multiplying the mean of the instantaneous counts anglers (Ei) by the daily angling period (14.25 hours), then multiplied this value by the total number of angling days during the season. The estimate of anglers (Ea) was calculated by dividing the estimate of angling hours (Eh) by the mean length of a completed angling trip (3.0 hours). Harvest was estimated as the product of Eh and the incomplete trip catch rate (mean of daily ratios) using equation 15.7 (Pollock et al. 1994). Variance for catch rate was calculated using Microsoft Excel spreadsheet function, =VAR(number1, number 2...).

#### 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 equation 15.8 (Pollock et al. 1994).



## RESULTS

### Angler Survey

Anglers were distributed mostly along the shoreline (Figure 1). During the roving survey period, 372 anglers were interviewed (Table 1 and Appendix 1.3). The total number of anglers was estimated at 4,864. The estimated effort was 14,592 hours resulting in an estimated angling pressure of 2.56 angler-hours / ha. The estimated harvest of legal-size pike was 292 fish (Table 2). The harvest of pike and angling pressure has decreased since the 1980's (Figure 2). Anglers reported releasing an estimated 11,250 sublegal-size pike and 467 legal-size pike. Based on test angling and the sampled proportion of sublegal / legal pike caught, it is estimated that anglers actually released 4,563 sublegal-size pike.

The yield of harvested legal-size pike was estimated at 694.3 kg (0.122 kg / ha). Assuming 10% release mortality, the yield of released, but dead pike was 546.6 kg (4,563 pike\*0.1 mortality\*1.198 kg mean weight) or 0.096 kg / ha. The sport yield of harvested pike during the period of this survey was therefore 0.218 kg / ha, of which 44% 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 210 pike (27 angler harvest, 183 test fishery sample) (Appendix 2 and 3), 29 walleye (0 angler harvest, 29 test fishery sample) (Appendix 4), and 0 perch.

### Test Angling

Test fisheries were conducted on 21 days, from 20 May to 15 August for a total of 135.0 hours. A total of 183 pike and 29 walleye were caught and sampled of which eleven pike were legal-size and 172 were sublegal-size.

### Compliance

Anglers both exaggerate their catch and harvest illegal size fish (Table 3). These compliance parameters are taken from Jordan Walker's (Alberta Sustainable Resource Development) unpublished graduate work.

### Historical

Sport is very popular (at Lac Ste Anne), largely because the lake is so close to Edmonton (Mitchell and Prepas, 1990). It was estimated that approximately 9900 anglers visited the lake (Lac Ste Anne) during the 1984 creel survey. Of this number, 45% (4,500 anglers) visited the lake during the Canadian Progress Clubs' "Fish at Large" weekend fishing derby. Derby participants harvested, in two days, approximately 43% (1,440) and 54% (3,600) of all the walleye and pike, respectively, harvested that summer (Sullivan 1986). Although 10 pike were tagged and a monetary prize attached to the harvest of those pike, the annual production, approximately, of walleye was also harvested that weekend (Daryl Watters, Fisheries Biologist, pers. comm.).

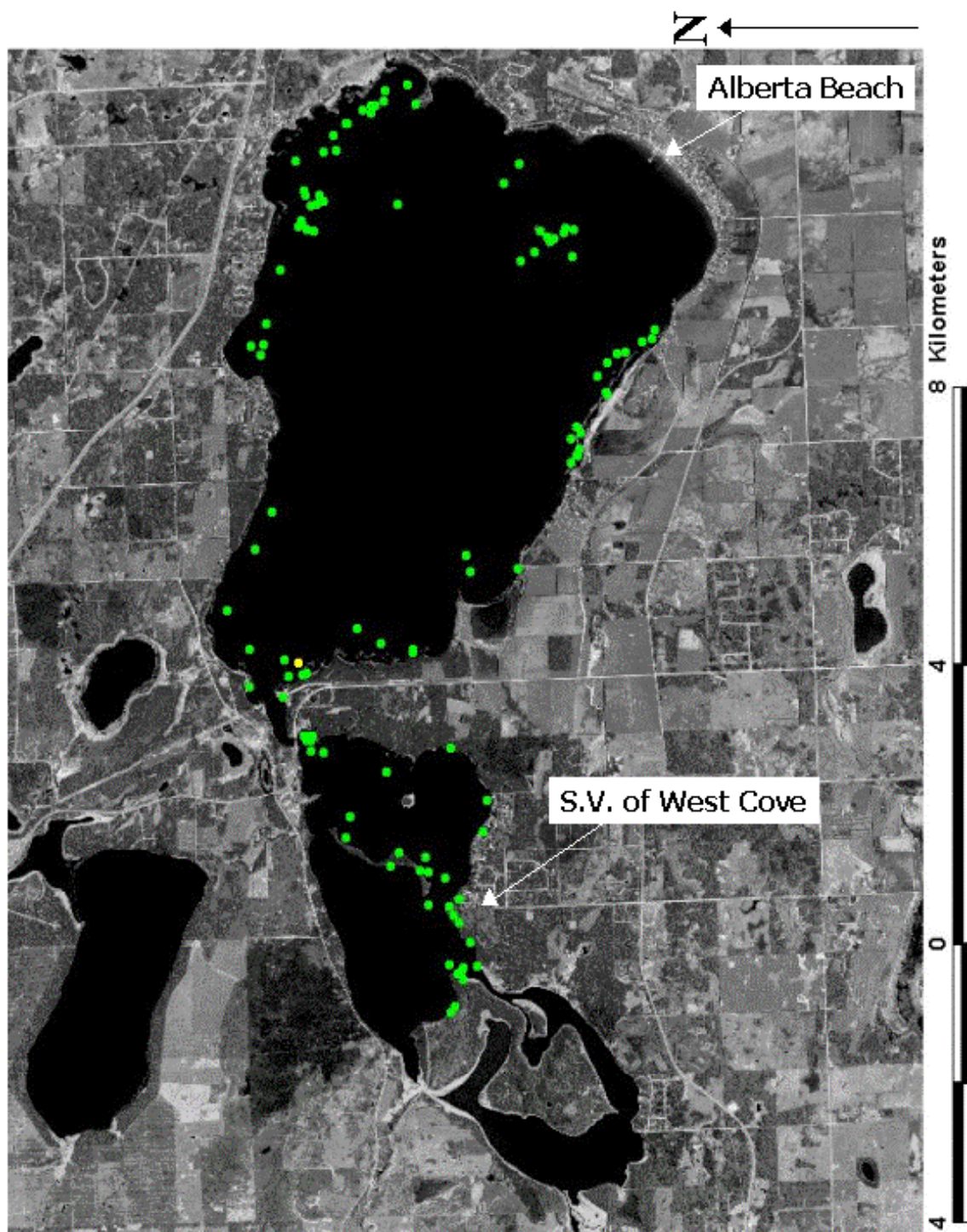


Figure 1. Location of roving creel interviews, Lac Ste. Anne, 2001.

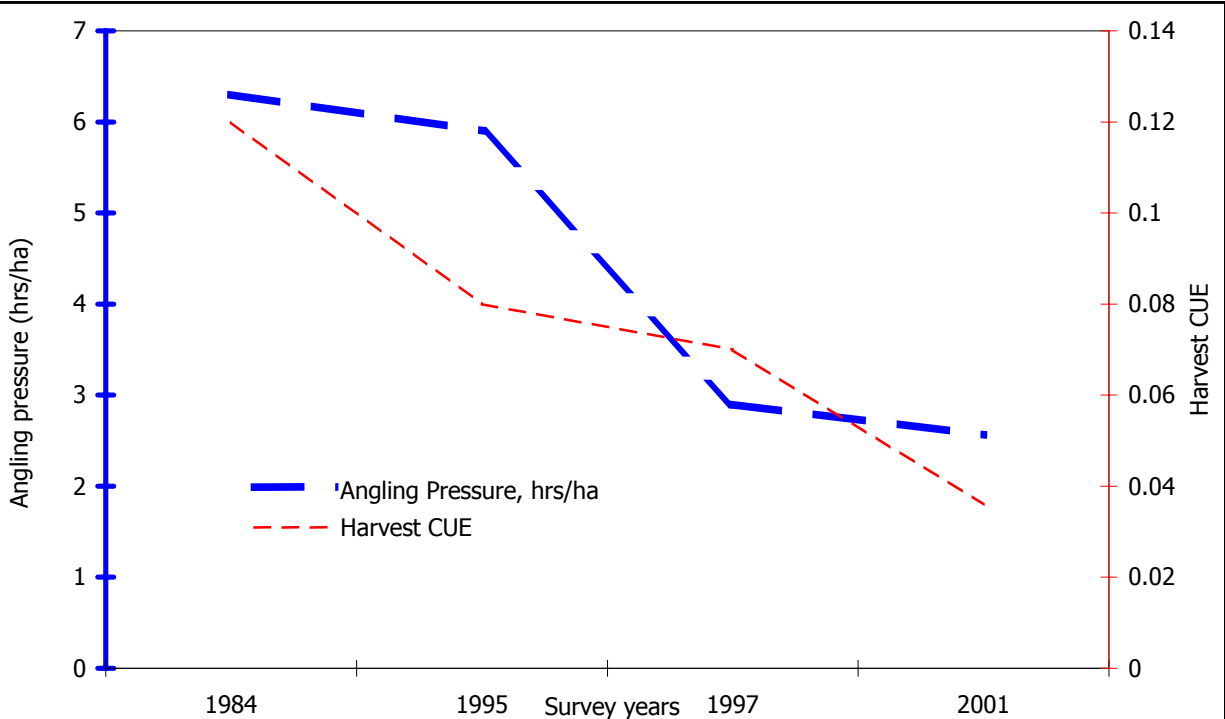


Figure 2. Angling pressure and harvest observed over 4 creel surveys from 1984 to 2001 conducted at Lac Ste Anne.

Table 1. Observed and reported catch rates of anglers; Lac Ste. Anne, 2001.

<b>Creel Data</b>	<b>1984</b>	<b>1995</b>	<b>1997</b>	<b>2001</b>
# days surveyed	63	32	30	33
# anglers interviewed	878	837	537	372
# angling hours reported	2,664	3,025	1,225	720
<b>NORTHERN PIKE DATA</b>				
Kept / angler-hour	0.121 <sup>^</sup>	0.080 <sup>^</sup>	0.070 <sup>^</sup>	0.036 <sup>^^</sup>
Released legal-size / angler-hour				0.032
Released sublegal / angler-hour				0.771
Total released / angler-hour	0.185	0.275	0.260	0.800
Total catch rate	0.306	0.355	0.330	0.839
<b>WALLEYE DATA</b>				
Kept / angler-hour	0.120	0.090*	<0.001**	0.000***
Released legal-size / angler-hour		0.036	0.002	
Released sublegal / angler-hour		0.019	0.006	
Total released / angler-hour	0.010	0.054	0.008	0.083***
Total catch rate	0.130	0.145	<0.009	0.083
<b>YELLOW PERCH DATA</b>				
Kept / angler-hour	0.002	<0.001	<0.001	0.001
Released / angler-hour	No data	0.000	0.001	0.003

<sup>^</sup> Regulation was 10 pike no size limit / 10 pike daily possession.

<sup>^^</sup> Regulation was modified in 1999 to 3 pike / 63 cm minimum size limit.

\* Regulation was 38 cm minimum size / 3 fish daily possession.

\*\* Regulation modified in 1996 to 50 cm minimum size / 3 fish daily possession.

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

Table 2. Whole lake estimates; Lac Ste. Anne, 2001.

	<b>1984 Whole Lake Estimate (95% CI)</b>	<b>1995 Whole Lake Estimate (95% CI)</b>	<b>1997 Whole Lake Estimate (95% CI)</b>	<b>2001 Whole Lake Estimate (95% CI)</b>
# Anglers	9,923 (+9.6%)	9,052 (+20.0%)	6,904 (+27.5%)	4,864 (3,417 – 6,311)
# Hours	34,452 (+8.4%)	31,942 (+22.7%)	15,836 (+24.8%)	14,592 (10,251 – 18,932)
Hours / hectare	6.0 (+8.4%)	8.8 (+22.7%)	2.9 (+24.8%)	2.6 (2.1 – 3.0)
# pike harvested	6,700 (+8.8%)	2,702 (+30.2%)	1108 (+25.0%)	530 (83 – 977)

Table 3. Non-compliance with size limits; Lac Ste. Anne, 2001.

<b>PARAMETER</b>	<b>Using number of legal-size pike estimated harvested + 10% of legal-size pike estimated harvested</b>  (LCI – UCI, 95%)
Illegal harvest (%)	5.1% (2.43% – 9.13%)
Exaggeration (1X)	2.4X

## Status of the Pike Fishery

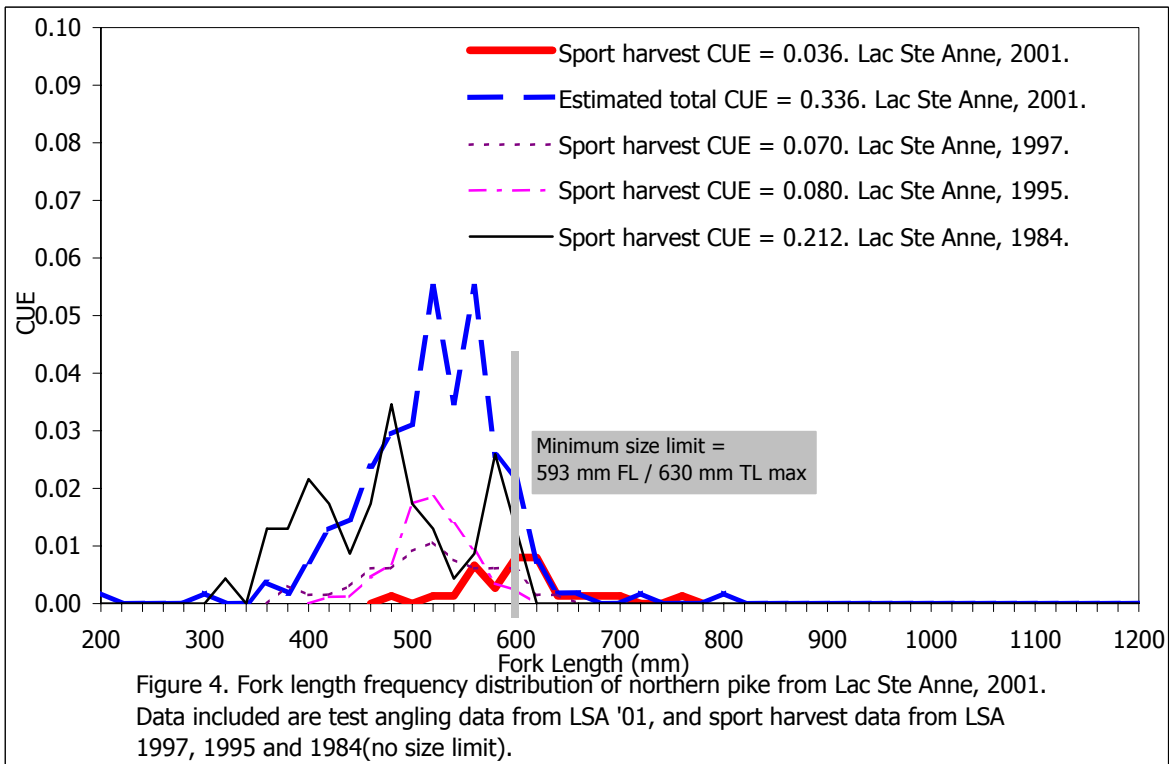
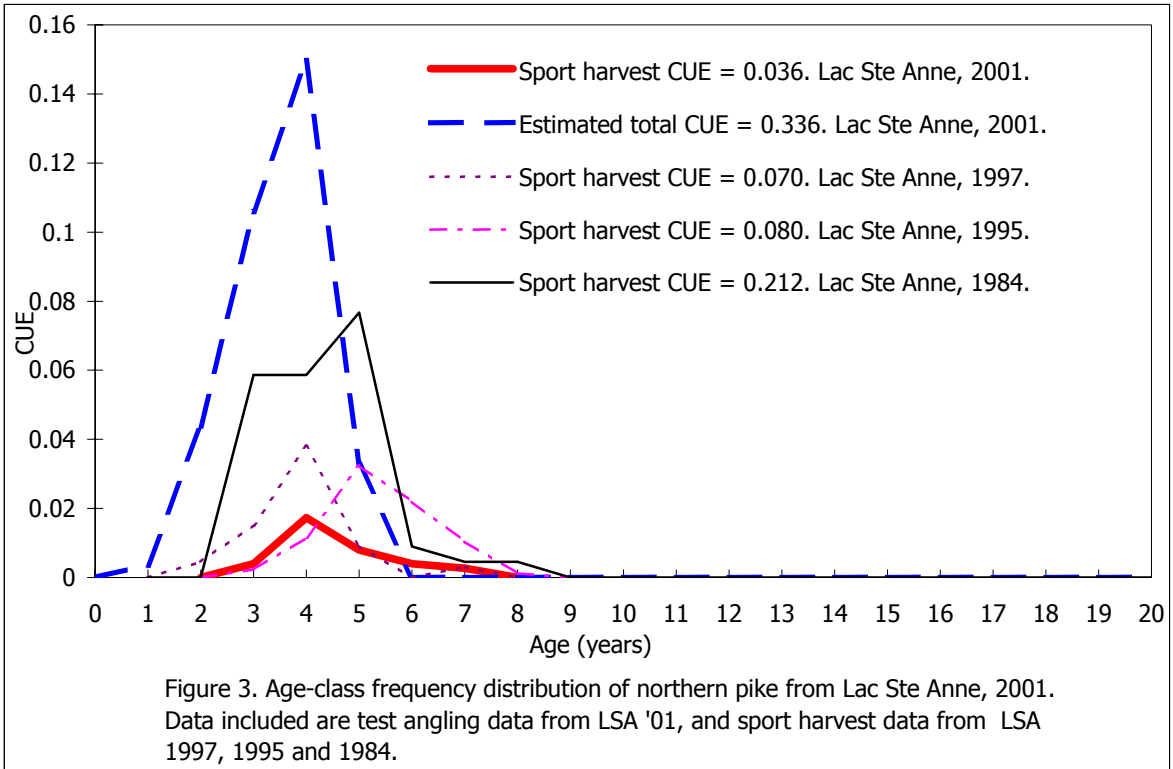
### 1. Biological Metrics

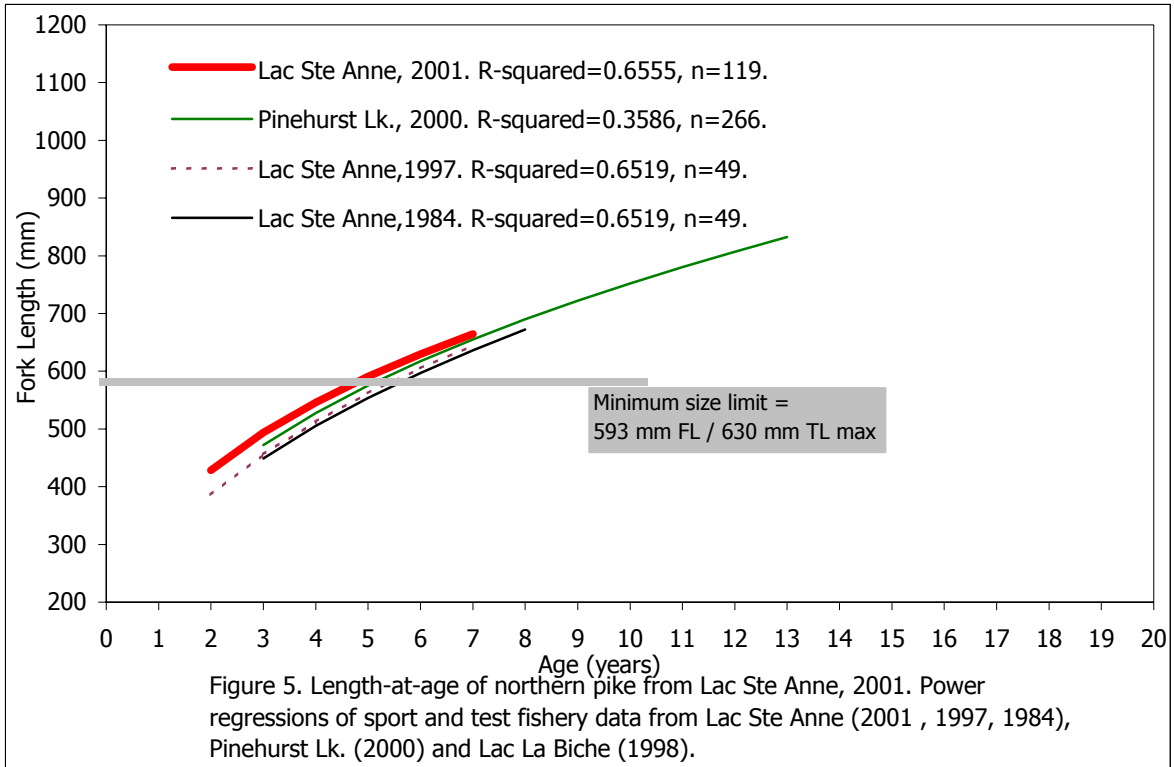
The metrics associated with reference points for classifying pike fisheries are shown in Table 4. From the 2001 survey of Lac Ste. Anne, the observed harvest rate on legal-size pike was 0.020 fish kept / hour. The reported release rate on sublegal-size pike was 0.771 fish released / hour. It is interesting that the total reported release rate has increased practically 3 times since 1997 from 0.259 to 0.771 pike released / hr. According to Sullivan (2000) the reported release rate is likely exaggerated; exaggeration in catches was not constant, but increased exponentially with decreasing catch rate. Since the legal catch of pike has been reduced (upwards of 80%) due to restrictive size limits, the reported catch rate is most likely exaggerated. Based on the test fishery size frequency distribution, the estimated sublegal size release rate was 0.313 pike released / hour. Therefore, the estimated total CUE on all sizes of pike was 0.336 fish / hour (0.020 + 0.313 + (0.032 X 10%)).

The sport and the test fishery sampled relatively few older, large pike (Figures 3 and 4). The estimated sublegal release catch rate suggests a moderate level of recruitment. Cushing (1981) refers to a growth overfished population 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. The 1998 and 1997 year-classes are of considerable strength. The length-at-age of young pike has increased since 1997 survey (Figure 5). 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 Lac Ste. Anne were protected by the minimum size limit. The percentage of pike larger than 63 cm TL in the sport harvest sampled during creel surveys conducted at Lac Ste. Anne in 1984, 1995 and 1997 were 0%, 3% and 4%, respectively. The mean weight of a legal-size pike was 1,310 g.

Table 4. Assessment of the status of the pike fishery; Lac Ste. Anne, 2001.

METRIC	STABLE	VULNERABLE (No Risk)	VULNERABLE (Low Risk)	COLLAPSED
<b>CUE kept</b> (>63 cm TL max)	> 0.1	> 0.02	> 0.01 <b>0.020</b>	< 0.01
<b>CUE estimated total</b> (observed legal size CUE + estimated release CUE) INCLUDES TEST FISHERY DATA	1 – 2	0.5 - 1	0.2 - 0.5 <b>0.336</b>	< 0.2
<b># MEASURABLE AGE-CLASSES</b> (> 0.02 / h) INCLUDES TEST FISHERY DATA	7 – 12	3 – 7 <b>4</b>	1 – 2	Almost none
<b>GROWTH RATE</b> INCLUDES TEST FISHERY DATA	Slow	Increasing	Increasing <b>Increased since 1997, legal-size at age 5</b>	Fast
<b>MEAN WT</b> (kg) (legal-size) INCLUDES TEST FISHERY DATA	1 – 2	< 1	0.5 – 1.5	0.5 – 3.5 <b>1.310 kg</b>
<b>PSD</b> (% pike >53 cm TL max) INCLUDES TEST FISHERY DATA	> 40	< 40	Variable (> 0.1 pike / h) <b>48.6</b>	Variable (< 0.1 pike / h)
<b>RSD</b> (% pike 35 – 52 cm TL max, stock – quality size) INCLUDES TEST FISHERY DATA	< 50	> 50 <b>50.5</b>	Variable (> 0.1 / h)	Variable (< 0.1 / h)
<b>SUCCESS</b> (% anglers catching 1 or more legal-size pike)	> 70	< 70	< 40	< 20 <b>10.5%</b>
<b>GINI</b> (total CUE) (catch inequality)	0.3	0.5 – 0.7	0.7 – 0.9 <b>0.738</b>	> 0.9





## 2. Social Metrics

Only 11% 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 0.738 (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 Lac Ste. Anne is vulnerable, based on the criteria used to classify pike stocks in Alberta. The harvest rate on legal-size pike was moderately low (0.020 fish / hr). The estimated total catch rate was moderate (0.336 pike / hr). Reported catch rates are likely exaggerated. The test fishery confirms a moderate level of recruitment and relatively strong 1998 and 1997 year-classes. At a modest rate of hooking mortality, 45% of the sport harvest is released, dead pike. The length-at-age of young pike has increased since the 1997 creel survey. Most anglers did not catch a legal-size pike. The level of inequality in the pike catch was a moderately high.

The pike management strategy was only recently implemented (1999). It is too early 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 young pike mature and 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 special attention given to changes in angling pressure and to the response of pike to the protective minimum size limit and the effects of hooking mortality.

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## APPENDICES

Appendix 1. Angler survey data. [Lac Ste. Anne, 2001]

Appendix 1.1 Survey schedule. [Lac Ste. Anne, 2001]

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. [Lac Ste. Anne, 2001]

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				

Appendix 1.1 Survey schedule, con't. [Lac Ste. Anne, 2001]

Date	Day	Day code	Work / Off	Lake	Shifts (800-2215)	Survey origin/finish point	Instantaneous counts
10-Aug	fri	5	O				
11-Aug	sat	6	W	LSA	3	6	1
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. [Lac Ste. Anne, 2001]

Date	1 = Weekday 2 = Weekend	Anglers / boat	# Boats	# Boat Anglers	# Shore Anglers	# Anglers
15			55	124	36	160
May-20	1	2,2,4	3	8	0	8
May-21	1	0	0	0	0	0
May-22	2	1	1	1	0	1
Jun-03	1	2,2,2,2,1,2,2,4,4	9	21	0	21
Jun-05	2	3,1,1,3,2	5	10	0	10
Jun-15	1	3,1,2	3	6	0	6
Jun-18	2	0	0	0	0	0
Jun-30	1	6,2,4,3,2,1,1,2,2	9	23	11	34
Jul-02	1	2,3,1,1	4	7	10	17
Jul-03	2	1,3,2,1,2,2	6	11	0	11
Jul-28	1				7	7
Jul-30	2	2,5,2,1	4	10	6	16
Jul-31	2	2,4	2	6	2	8
Aug-19	1	2,3,1,2,2,4	6	14	0	14
Aug-20	2	3,3,1	3	7	0	7

Appendix 1.3. Daily summary of angler survey data. [Lac Ste. Anne, 2001]

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
			372	719.50	60	27	555	23	1	2	0	0
5	19	6	0	0	0	0	0.00	0	0	0	0	0
5	20	7	2	1	0	0	1.00	0	0	0	0	0
5	21	8	0	0	0	0	0.00	0	0	0	0	0
5	22	2	0	0	0	0	0.00	0	0	0	0	0
6	2	6	0	0	0	0	0.00	0	0	0	0	0
6	3	7	21	40.5	0	3	81.00	0	0	0	0	0
6	4	1	0	0	0	0	0.00	0	0	0	0	0
6	5	2	5	5.25	0	1	7.00	0	0	0	0	0
6	8	5	20	22.25	2	2	13.00	6	0	0	0	0
6	15	5	3	0.75	0	0	0.00	0	0	0	0	0
6	16	6	57	153.75	2	9	153.00	2	0	1	0	0
6	17	7	30	33.25	1	0	27.00	5	0	0	0	0
6	18	1	0	0	0	0	0.00	0	0	0	0	0
6	19	2	8	24.5	2	0	12.00	0	0	0	0	0
6	29	5	6	14	0	0	14.00	2	0	0	0	0
6	30	6	22	39.25	1	0	22.00	0	0	0	0	0
7	1	7	45	75.25	1	5	15.00	0	1	0	0	0
7	2	8	15	28.5	1	0	25.00	1	0	0	0	0
7	3	2	9	17.5	0	1	19.00	0	0	0	0	0
7	7	6	41	82	0	1	88.00	1	0	0	0	0
7	14	6	0	0	0	0	0.00	0	0	0	0	0
7	15	7	0	0	0	0	0.00	0	0	0	0	0
7	16	1	0	0	0	0	0.00	0	0	0	0	0
7	17	2	0	0	0	0	0.00	0	0	0	0	0
7	28	6	2	12	0	0	7.00	0	0	0	0	0
7	29	7	0	0	0	0	0.00	0	0	0	0	0
7	30	1	7	12	0	0	0.00	0	0	0	0	0
7	31	2	3	1.5	0	0	1.00	0	0	0	0	0
8	11	6	19	36.75	11	2	22.00	4	0	0	0	0
8	12	7	18	39.5	38	0	1.00	2	0	1	0	0
8	14	2	2	2	0	0	4.00	0	0	0	0	0
8	15	3	3	4	0	1	1.00	0	0	0	0	0
8	19	7	12	7.5	0	0	0.00	0	0	0	0	0
8	20	1	7	36.5	0	2	30.00	0	0	0	0	0
8	21	2	7	6	0	0	10.00	0	0	0	0	0
8	22	3	8	24	1	0	2.00	0	0	0	0	0

Appendix 1.4. Catch frequency distribution of harvested pike. [Lac Ste. Anne, 2001]

# Pike	# Anglers	% Anglers	Pike Harvest	% NP Harvested	Cumulative % Pike Harvest
0	350	94.1	0	0.0	0.0
1	17	4.6	17	63.0	63.0
2	5	1.3	10	37.0	100.0
3	0	0.0	0	0.0	
4	0	0.0	0	0.0	
5	0	0.0	0	0.0	
>5	0	0.0	0	0.0	
Totals	372	100.0	27	100.0	

Appendix 1.5. Catch frequency distribution of released pike. [Lac Ste. Anne, 2001]

# Pike	# Anglers	% Anglers	Pike Released	% NP Released
0	194	52.2	0	0.0
1	62	16.7	62	10.7
2	45	12.1	90	15.6
3	18	4.8	54	9.3
4	21	5.6	84	14.5
5	6	1.6	30	5.2
6	9	2.4	54	9.3
7	5	1.3	35	6.1
8	3	0.8	24	4.2
9	1	0.3	9	1.6
10	1	0.3	10	1.7
>10	7	1.9	126	21.8
Totals	372	100.0	578	100.0

Appendix 2. Summary of biological data from sport-caught pike. [Lac Ste. Anne, 2001]

Sample #	Month	Date	Fork Length (mm) Mean = 594 mm n = 27	Age (years) Mean = 4.6 n = 27	Sex
1	6	3	579	3	F
2	6	3	587	4	F
3	6	3	643	5	F
4	6	5	597	4	F
5	6	8	673	5	F
6	6	8	602	5	
7	6	15	614	5	
8	6	15	603	5	
9	6	15	611	4	
10	6	15	593	6	
11	6	15	600	7	M
12	6	15	615	4	
13	6	15	577	5	
14	6	15	552	4	
15	6	15	545	4	M
16	7	1	479	3	M
17	7	1	560	4	
18	7	1	590	4	F
19	7	1	545	4	M
20	7	1	548	4	
21	7	3	746	6	F
22	8	11	610	4	F
23	8	14	535	4	
24	8	14	520	3	
25	8	15	631	6	
26	8	20	600	4	
27	8	20	695	7	



Appendix 3. Summary of biological data from test-caught pike. [Lac Ste. Anne, 2001]

Sample #	Month	Date	Fork Length (mm) Mean = 510 mm n = 183	Age (years) Mean = 3.5 years n = 92
1	5	20	575	5
2	5	20	443	
3	5	20	460	3
4	5	20	550	
5	5	21	507	3
6	5	21	475	
7	5	21	500	3
8	5	21	496	
9	5	21	384	2
10	5	22	300	
11	5	22	547	4
12	5	22	555	
13	5	22	516	4
14	5	22	515	
15	5	22	507	4
16	5	22	563	
17	6	4	467	3
18	6	4	472	
19	6	4	547	4
20	6	4	399	
21	6	4	487	3
22	6	4	475	
23	6	4	420	2
24	6	4	457	
25	6	4	501	4
26	6	4	555	
27	6	4	510	3
28	6	4	542	
29	6	4	550	4
30	6	4	492	
31	6	4	415	2
32	6	4	480	
33	6	4	570	4
34	6	4	58	
35	6	4	495	4
36	6	4	452	
37	6	4	566	4
38	6	4	584	
39	6	4	418	3
40	6	4	532	
41	6	4	556	4
42	6	4	532	
43	6	4	558	3
44	6	4	416	
45	6	5	543	3
46	6	5	465	
47	6	5	517	4
48	6	5	573	
49	6	5	485	3

Appendix 3. Summary of biological data from test-caught pike, con't. [Lac Ste. Anne, 2001]

Sample #	Month	Date	Fork Length (mm)	Age (years)
50	6	5	477	
51	6	5	587	5
52	6	5	529	
53	6	5	438	2
54	6	5	499	
55	6	5	501	5
56	6	5	442	
57	6	5	600	4
58	6	5	544	
59	6	5	501	3
60	6	5	540	
61	6	5	499	3
62	6	5	488	
63	6	5	476	4
64	6	5	501	
65	6	5	544	3
66	6	5	465	
67	6	5	535	4
68	6	5	590	
69	6	15	495	3
70	6	15	435	
71	6	15	457	3
72	6	15	563	
73	6	15	501	4
74	6	15	535	
75	6	15	466	2
76	6	15	421	
77	6	15	381	1
78	6	15	351	
79	6	15	423	2
80	6	15	519	
81	6	17	560	4
82	6	17	585	
83	6	17	535	4
84	6	17	500	
85	6	17	552	3
86	6	17	440	
87	6	17	358	2
88	6	17	445	
89	6	17	452	3
90	6	17	518	
91	6	17	509	4
92	6	17	589	
93	6	17	598	4
94	6	17	604	
95	6	17	550	4
96	6	17	504	
97	6	19	503	3
98	6	19	565	
99	6	19	560	3
100	6	19	648	

Appendix 3. Summary of biological data from test-caught pike, con't. [Lac Ste. Anne, 2001]

Sample #	Month	Date	Fork Length (mm)	Age (years)
101	6	19	555	3
102	6	19	551	
103	6	19	510	3
104	6	19	497	
105	6	19	593	4
106	6	29	570	
107	6	29	543	4
108	6	29	603	
109	6	29	570	5
110	6	29	455	
111	6	29	475	4
112	6	29	566	
113	6	29	530	5
114	6	29	508	
115	6	30	589	4
116	6	30	540	
117	6	30	512	4
118	6	30	607	
119	6	30	466	3
120	7	2	513	
121	7	2	570	4
122	7	2	505	
123	7	2	544	4
124	7	2	580	
125	7	2	585	4
126	7	2	554	
127	7	2	510	4
128	7	2	546	
129	7	2	507	4
130	7	2	525	
131	7	2	521	3
132	7	2	553	
133	7	2	537	4
134	7	2	584	
135	7	2	490	3
136	7	2	449	
137	7	2	548	3
138	7	2	524	
139	7	2	540	3
140	7	2	501	
141	7	3	433	2
142	7	3	520	
143	7	3	552	4
144	7	3	535	
145	7	3	462	3
146	7	3	550	
147	7	3	519	4
148	7	3	515	
149	7	3	546	4
150	7	3	511	
151	7	3	496	3

Appendix 3. Summary of biological data from test-caught pike, con't. [Lac Ste. Anne, 2001]

Sample #	Month	Date	Fork Length (mm)	Age (years)
152	7	3	487	
153	7	3	535	4
154	7	3	446	
155	7	3	565	4
156	7	3	437	
157	7	3	411	2
158	7	3	451	
159	7	3	403	2
160	7	3	434	
161	7	5	591	4
162	7	5	505	
163	7	20	462	4
164	7	20	453	
165	7	21	525	4
166	7	21	549	
167	7	21	386	2
168	7	21	490	
169	7	21	363	2
170	7	21	522	
171	7	21	514	4
172	7	21	473	
173	8	12	535	5
174	8	12	420	
175	8	12	556	5
176	8	14	784	
177	8	14	541	3
178	8	14	466	
179	8	15	630	5
180	8	15	605	
181	8	15	570	5
182	8	15	712	
183	8	15	500	4

Appendix 4. Summary of biological data from test-caught walleye. [Lac Ste. Anne, 2001]

Sample #	Month	Date	Fork Length (mm) mean = 404 mm n = 29	Age (years) mean = 4.2 n = 29
1	6	4	463	5
2	6	4	480	5
3	6	4	428	4
4	6	4	485	5
5	6	5	645	10
6	6	5	428	3
7	6	15	462	5
8	6	15	451	4
9	6	29	515	6
10	6	29	523	5
11	7	3	461	5
12	7	12	252	3
13	7	12	390	4
14	7	12	254	3
15	7	12	370	3
16	7	12	372	3
17	7	12	365	5
18	7	12	367	3
19	7	12	290	3
20	7	12	396	4
21	7	12	280	3
22	7	12	400	4
23	7	12	337	4
24	7	12	380	3
25	7	12	399	4
26	7	12	497	4
27	8	14	265	
28	8	14	380	4
29	8	15	386	4

Appendix 5. Creel survey form. [Lac Ste. Anne, 2001]