Fall Walleye Index Netting at North and South Wabasca Lakes, Alberta, 2010

Fisheries Management
Lesser Slave Area

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Fisheries Biologist(s): Myles Brown, Kristy Wakeling

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Abstract

North Wabasca Lake was surveyed most recently during September 19th – 21st,2010, using the Fall Walleye Index Netting (FWIN) protocol to assess the stock status, relative abundance, structure and reproduction (recruitment) of the Walleye (*Sander vitreus*) population as well as the northern pike (*Esox lucius*), yellow perch (*Perca flavescens*) and lake whitefish (*Coregonus clupeaformis*) (ACA 2007). This information was used to evaluate the status of the current Sport Fishing Regulations for North Wabasca Lake to ensure they are in alignment with the stock status of the fish populations. North Wabasca Lake was last surveyed in 2006 using the FWIN proptocol, the data from the 2010 survey will be compared to the previous survey completed by the Alberta Conservation Association (ACA 2007) to identify any changes to the population since the original survey in 2006. In total 674 fish were captured in 12 full FWIN nets comprised of 112 Walleye, 117 Northern Pike, 100 Lake Whitefish, 19 Yellow Perch, 297 Cisco (*Coregonus artedi*), 1 Cisco x Whitefish hybrid, 12 Spottail Shinners (*Notropis hudsonius*), 30 White Suckers (*Catostomus commersoni*) and 1 Longnose Sucker (*Catostomus catostomus*). As a result of the wildfire the struck Slave Lake in May 2011 and destroyed the Alberta Government building, the aging samples from the 2010 index netting that were present in the ASRD office were destroyed. There is no age or length-at-age data for North Wabasca Lake 2010 index netting.

The Walleye catch per unit effort (maximum likelihood estimate) was 5.4 fish/100m^2/24hr (95% C.I. 3.7 - 7.1) 6.6 fish/100m^2/24hr (95% C.I. 3.8 -9.3) and the mean catch per unit effort estimated at 6.6 fish/100m^2/24hr (95% C.I. 3.8 -9.3). This catch rate is considered low and indicates a stock status of 'vulnerable' to 'collapsed' (Sullivan 2003). Female Walleye (n=54) ranged in length from 184mm to 667mm total length and Male Walleye (n=53) ranged in size from 170mm – 570mm total length with maturity being reached at approximately 400mm total length. Walleye population in North Wabasca Lake has historically been categorized as a vulnerable population (ACA 2007). The remaining biological indicators from the 2010 FWIN signify that this population continues to exhibit many characteristics of a vulnerable Walleye population, however low densities, low levels of natural recruitment and multiple full year class failures indicate and may result in this status shifting to 'vulnerable' to 'collapsed' in future assessments.

The northern pike catch per unit effort (maximum likelihood estimate) was 7.4 fish/100m^2/24hr (95% C.I. 6.2 – 8.6) and the mean catch per unit effort was estimated at 6.8 fish/100m^2/24hr (95% C.I. 6.2 -8.6). Female northern pike (n=97) ranged in length from 449mm – 1020mm total length and were mature at approximately 580mm total length. Male northern pike (n=19) ranged in length from 415mm to 771mm total length and were mature at approximately 440mm total length. Due to the low sample size of immature pike, not accurate maturation schedule could be determined. The catch rate and biological indicators from the 2010 FWIN are indicative of a 'vulnerable' northern pike population experiencing growth overfishing (Sullivan 2003).

The lake whitefish catch per unit effort (maximum likelihood estimate) was 5.4 fish/100m^2/24hr (95% C.I. 3.0 – 8.0) and the mean catch per unit effort was estimated at 4.7 fish/100m^2/24hr (95% C.I. 3.0 – 8.0). Female lake whitefish (n=35) ranged in size from 295mm – 545mm total length. Male lake whitefish (n=46) ranged in size from 351mm – 605mm total length. Compared to FWIN catch rates provincially, the low sample size detected in the 2013 index netting is indicative of a collapsed lake whitefish population.

The 2010 sampling event was the first survey of South Wabasca Lake using the Fall Walleye Index Netting (FWIN) protocol to assess the status, relative abundance, structure and reproduction (recruitment) of the Walleye (*Sander vitreus*) population as well as the northern pike (*Esox lucius*), yellow perch (*Perca flavescens*) and lake whitefish (Coregonus clupeaformis). This information was used to evaluate the status of the current Sport Fishing

Regulations for South Wabasca Lake to ensure they are in alignment with the stock status of the fish populations. In total 482 fish were captured in 8 full FWIN nets comprised of 19 Walleye, 215 Northern Pike, 3 Lake Whitefish, 3 Yellow Perch, and 172 Cisco (*Coregonus artedi*).

The Walleye catch per unit effort (maximum likelihood estimate) was 2.2 fish/100m^2/24hr (95% C.I. 1.4 - 2.9) and the mean catch per unit effort estimated at 2.1 fish/100m²/24hr (95% CI 1.1 – 3.3). This catch rate is considered low and indicates a stock status of 'collapsed' (Sullivan 2003). Female Walleye (n=8) ranged in age from 2 to 7 years-old (several full year class failures evident) reaching sexual maturity between approximately 3 and 6 years-of-age and ranged in size from 339mm – 571mm total length. Male Walleye ranged in age from 0 to 7 years-old (several full year class failures evident) reaching sexual maturity sometime before age 3 and ranged in size from 269mm – 576mm total length. Due to the low sample size growth rates could not be calculated for the 2010 data. The biological indicators (low densities, unbalanced catch curve, low levels of natural recruitment and multiple full year class failures indicate) from the 2010 FWIN signify that this population continues to exhibit many characteristics of a 'collapsed' Walleye population.

The northern pike catch per unit effort (maximum likelihood estimate) was 24fish/100m^2/24hr (95% C.I. 21 – 27.3) and the mean catch per unit effort was estimated at 24.1 fish/100m^2/24hr (95% C.I. 20 – 28). Female northern pike (n=138) ranged in age from 2 to 10 years-old, due to the nature of the sample no maturation maturation schedule could not be derived as nearly all (n=136) were mature and ranged in size from 451mm – 925mm total length. Male northern pike (n=76) ranged in age from 2 to 8 years-old, due to the nature of the sample collected no maturation schedule could be derived as all male northern pike were mature and ranged in size from 397mm – 776mm total length. The catch rate and biological indicators from the 2010 FWIN are indicative of a 'stable' northern pike population.

The lake whitefish catch per unit effort (maximum likelihood estimate) could not be generated due to the extremely low catch numbers. Only two (n=2) total individuals were captured in the 2010 FWIN at South Wabasca Lake. Due to the low sample size no accurate maturation schedule could be derived, for male or female lake whitefish. Low population numbers are reflective of a population that has been routinely overfished in past years and represents a collapses population. Additional information will be required to confirm 2010 FWIN results.

Introduction

Alberta Environment and Sustainable Resource Development implements strategies to manage sport fisheries for long-term sustainable harvest. Monitoring is required to evaluate the effectiveness of these strategies and to recommend alternate strategies where evidence supports change. The objective of Fall Walleye Index Netting is to estimate relative abundance, population structure and growth of Walleye, but data is also collected for northern pike, yellow perch and lake whitefish. These data are essential to provide sustainable harvest allocations for sport fish and to ensure the current management strategies in place for the sportfish species monitored are in alignment with the current status and structure of the populations. North and South Wabasca Lakes are located approximately 122 km northeast of Slave Lake Alberta. North Wabasca is located to the north of the town of Wabasca Alberta (318756E 6216702N 12 NAD83) and has a surface areas of approximately 12 200 hectares and a mean depth of 5.8 meters (ACA, 2006). South Wabasca Lake is located to the south of the town of Wabasca and is connected to North Wabasca Lake by the Wabasca River. South Wabsaca Lake has a surface area of approximately 5059 hectares and a mean depth of 1.5 meters (FWMIS, 2010). Access to both North and South Wabasca Lakes is located in various locations including public boat launches and various cottage and private launches around both lakes on private, public or reserve land.

North and South Wabasca Lakes are used by the local First Nations communities located on the southwest and the north of North Wabasca Lake and on the northwest and south east of South Wabasca Lake respectively including the Bigstone Cree First Nation 166, 166A and 116D including approximately 6000 members. The majority of use and harvest takes place in the open water months; however there is a strong Domestic netting presence and a recreational fishery on both North and South Wabasca Lakes. With additional development in the area, resource exploration, it is expected that recreational pressure will grow significantly in the coming years. North and South Wabasca Lakes have both been commercially fished in the past however due to unsustainable fishing practices

both lakes commercial use has been suspended (2012) for conservation purposes to allow the lake whitefish populations to recover (M. Brown personal comm).

The current sportfishing regulations on North Wabasca Lake and tributaries are*: The portion south of a line drawn from the northern boundary of Wabasca Reserve 166b in NW 35-80-26 W4 to the point of land in the east half of NE 31-80-25 W4M, which includes the mouth of the Willow River and channel of the Wabasca River – June 1 to March 1 – Walleye limit 2 over 50cm; pike limit 2 over 63cm; perch limit 15; lake whitefish limit 10; burbot limit 10 - Mach 2 to May 31- CLOSED.

The current sportfishing regulation on South Wabasca Lake and tributaries are (Governement of Albert 2013): *The portion north of a line drawn from the southern most point of the land in E1/2 13-80-25-W4M to the point of land in the SW 15-80-25-W4M, which includes the channel of the Wabasca River – June 1 to March 1- Walleye limit 2; pike limit 2 over 63cm; perch limit 15; lake whitefish limit 10; burbot limit 10 – March 2 to May 31 – CLOSED.**The portion south and west of a line drawn from the easternmost point of lan in SE 31-79-24-W4 to poin of land in NW 27-79-24-W4: June 1 to Mar. 1 – Walleye limit 0; Pike 2 over 63c,; Perch limit 15; lake whitefish limit 0; Burbot limit 10, Closed Mar. 2 to May 31 – CLOSED. Remainder of the lake May 15 – Mar. 31 - Walleye limit 0; Pike 2 over 63c; Perch limit 15; lake whitefish limit 0; Burbot limit 10

Sportfishing regulations on the connecting Wabasca River are (Government of Alberta 2013): the portion between South and North Wabasca lakes – June 1 to Mach 1 – Walleye limit 2 over 50cm; pike limit 2 over 63cm; lake whitefish limit 10; burbot limit 10; arctic grayling limit 2 over 35 cm (arctic grayling limit 0 from September 1 to October 31); bait is allowed in the Wabasca River only.

Methods

A comprehensive description of equipment and methodology may be found in the Manual of Instructions Fall Walleye Index Netting (FWIN) (Morgan 2002) and the FWIN protocol used at Fawcett Lake was in accordance with the Standards for Index Netting of Walleye in Alberta. Sites were selected randomly and were weighted by depth stratum. The number of nets set was by conducting power analyses of net catches to achieve a predetermined level of precision measured by a coefficient of variation of less than 0.2 (Haddon 2001, Morgan 2002). In total 14 nets were set, three nets were set in shallow depth stratum < 5m water, four nets were set in 5 – 15 meter medium depth stratum, and five nets were set in the > 15 m depth stratum, unique to lakes in this geographic area of Alberta. The FWIN nets consisted of eight panels, 1.83 m deep x 7.62 m in length with stretched mesh sizes of 25, 38, 51, 64, 76, 102, 127, and 152 mm.

Nets were set for approximately 24 hrs before being cleared of fish and reset at a new location. The date and time the nets were set and pulled were recorded. Nets were set perpendicular to depth contours, and minimum and maximum depths were recorded. The net location was recorded in Universal Transverse Mercator (UTM) projection coordinates using the North American Datum 1983 (NAD 83) using handheld GPS units. Surface water temperature was also recorded for most net locations. The FWIN protocol requires that sampling occur at surface temperatures of 10 to 15 C.

All fish species were kept for biological sampling. Catch was recorded by net location and mesh size. A net ID, date, mesh size, and count of each species of fish caught were recorded for each panel for catch-per-unit-effort (CPUE) calculations. All fish were measured for fork length (FL), and total length (TL) to the nearest millimetre, and weighed in grams, with individual data recorded on a sample envelope for each fish. Walleye, northern pike, yellow perch, and lake whitefish were also examined for gender and maturity, and a bony structure was removed for ageing.

Otoliths were collected and prepared following Watkins and Spencer (2009). Aging structures for the remaining species were collected and prepared following Mackay et al (1990). Walleye and northern pike ages were determined and verified by a second technician. Gonad weight was also collected for mature female Walleye.

Walleye catch rates were calculated as walleye·100m-2·24hrs-1 and empirical confidence intervals to 95% were determined by bootstrapping net catches to 50,000 replications (Haddon 2001). Size and age distributions, von Bertanlanffy growth curves, and maturity rates were calculated to assess the stock status according to modified guidelines of the Walleye Management and Recovery Plan (Berry 1995). von Bertalanffy parameters were calculated using FAMS 1.0 software (Slipke and Maceina 2010). The raw data can be found in Fish and Wildlife Management Information System (FWMIS).

Walleye densities were estimated from the FWIN catch rate based on the regression y = 1.8359x + 0.1235 (where y = density (#/ha) and x = FWIN CUE) from unpublished Alberta Conservation Association and Fish and Wildlife data.

Although not designed specifically for managing northern pike or other species captured, FWIN surveys may also be useful as a tool for assessing those populations as well. Fisheries Management Branch (FMB) is currently calibrating FWIN catch rates and structures of northern pike populations to other sampling methods currently used for this species. Biological data for northern pike, yellow perch and lake whitefish can be found in the Appendices.

Results

Index netting was conducted from September 19 to September 21, 2010 on North Wabasca Lake and from September 21 to September 22, 2010 on South Wabasca Lake. Nets were set for a mean time of 25 hours on North Wabasca Lake and a mean time of 24.5 hours on South Wabasca Lake, with total soak times varying between 23 hours and 27.25 hours for both lakes. A total of 675 fish representing 10 species were caught during the survey on North Wabasca Lake and a total of 482 fish representing 6 species were caught during the survey of South Wabasca Lake.

Walleye

The Walleye catch per unit effort (maximum likelihood estimate) at North Wabasca Lake, was 5.4 fish/100m²/24hr (95% CI 3.7 – 7.1) (table 1) and the mean catch per unity effort estimated at 6.6 fish/100m²/24hr. This catch rate is considered low and indicates a stock status of collapsed (Sullivan 2003). Female walleye ranged in size from 184mm to 593mm total length and male Walleye ranged in size from 170mm to 520mm total length; age range and age at sexual maturity could not be determined due to lack of data for this sampling event (raw samples were lost in the Slave Lake fire 2011). A Gonadosomatic Index (GSI) is a ratio of gonad weight over whole body weight and is used to indicate the potential for an adult female to successfully spawn the following spring or the maturity of the gonads at the relative whole body weight of the fish. Of the female walleye sampled 22 of 54 fish (41%) were mature and possessed a GSI of above 2.0% suggesting that these individuals would potentially spawn the following spring.

The Walleye catch per unit effort (maximum likelihood estimate) at South Wabasca Lake, was 2.6 fish/100m²/24hr (95% CI 1.4 – 3.0) (table 1) and the mean catch per unity effort estimated at 2.1 fish/100m²/24hr (95% CI 1.8 – 5.0). This catch rate is considered low and indicates a stock status of 'collapsed' (Sullivan 2003). Overall the Walleye in Sandy Lake display a narrow size and age-class distributions (figure 5 and 6) with the female Walleye (n=8) ranging in age from 2 to 7 years-old (several full year class failures evident) reaching sexual maturity at approximately age 6 and ranged in size from 339.4mm – 573.9mm total length. Male Walleye (n=10) ranged in age from 0 to 7 years-old (several full year class failures evident) reaching sexual maturity at age 2 and ranged in size from 269.4mm – 576mm total length. Due to the low sample an accurate maturity schedule and growth parameters could not be estimated. A Gonadosomatic Index (GSI) is a ratio of gonad weight over whole body weight and is used to indicate the potential for an adult female to successfully spawn the following spring or the maturity of the gonads at the relative whole body weight of the fish. Of the female walleye sampled 3 of 3 fish (100%) were mature and possessed a GSI of above 2.0% suggesting that these individuals would potentially spawn the following spring.

Northern Pike

The northern pike catch per unit effort (maximum likelihood estimate) in North Wabasca Lake was 7.4 fish/100m²/24hr (95% CI 6.2 – 8.6) and the mean catch per unit effort was estimated at 6.8 fish/100m²/24hr. Female northern pike (n= 97) range in length from 449 mm to 1020 mm with all but three individuals mature and all individuals over 620 mm at maturity. Male northern pike (n= 19) range in length from 415 mm to 771 mm

with maturity reached by all but one individual sampled; age range and age at sexual maturity could not be determined due to lack of data for this sampling event (raw samples were lost in the Slave Lake fire 2011).

The northern pike catch per unit effort (maximum likelihood estimate) in South Wabasca Lake was 24.1 fish/100m²/24hr (95% CI 21 – 27.3) and the mean catch per unit effort was estimated at 24 fish/100m²/24hr. Female northern pike (n= 138) range in age from 2 years-of-age to 10 years-of-age and in length between 451mm and 925mm . Male northern pike (n= 76) range in age between 2 years-of-age and 8 years-of-age and in length from 397 mm to 776 mm . Maturity was reached by all but three individuals sampled; no accurate age length at maturity could be determined as all samples were mature at the time of capture. Pike in South Wabasca have slow growth rates reaching 630mm TL 5 to 6 years with females (K= 0.124) growing slightly slower than males (K= 0.149) but females reaching slightly larger $L\infty$ (958.132mm TL) than males (800 mm TL) (figure 9). As a result of the low sample size of male pike, $L\infty$ was held constant to try and force t_0 closer to zero while producing reasonable estimates for the remaining growth parameters. An $L\infty$ of 800mm was consistent with historical data for male pike reviewed from FWMIS as well as other life history parameters from pike in similar lake environments with comparable species composition and use (Fisheries management, unpublished data).

Lake Whitefish

The lake whitefish catch per unit effort (maximum likelihood estimate) in North Wabasca Lake was 5.4 fish/100m²/24hr (95% CI 3 – 8) and the mean catch per unit effort was estimated at 4.7 fish/100m²/24hr (95% CI 3.5 – 5.8). Female lake whitefish (n= 35) range in length from 295 mm to 545 mm total length; age data could not be calculated for these samples; female lake whitefish mature at approximately 420 mm in total length. Male lake whitefish (n= 46) ranged in size from 351 mm to 605 mm total length; male lake whitefish mature at approximately 440 mm to 460mm total length. This is comparable with the data collected by the ACA (2006) showing lake whitefish maturation at age 5 and 420 mm total length for female and age 6 and 400 mm for males, noting that the sample lacked the robustness to determine an accurate 50% at age of maturity. Based on ACA findings in 2006 FWIN surveys and the most recent 2010 FWIN, it would suggest that the whitefish population is likely venerable.

A lake whitefish catch per unit effort (maximum likelihood estimate) in South Wabasca Lake was not generated due to the extremely low catch results (n=2). In total, for all nets set, two individual lake whitefish were captured (n=2). Graphs were not provided for interpretation of this data. This extremely low catch would suggest that there are significant challenges with maintaining the integrity of the South Wabasca Lake, lake whitefish population. Additional surveys will be required in order to establish the status of the population of lake whitefish within South Wabasca Lake. Management changes may be required in order to recover the lake whitefish population to a sustainable level. Data could not be properly analyzed due to the low sample size and has been omitted from the Tables and Figures.

Yellow Perch

The yellow perch catch per unit effort (maximum likelihood estimate) in North Wabasca Lake was 1.1 fish/100m²/24hr (95% could not be established due to the nature of the sample size). Three individuals (n=3) were identified as immature, all of which were female and under 161mm total length. All male yellow perch captured (n=8) were found to be mature and ranged in size between 157mm and 195mm total length.

The yellow perch catch per unit effort (maximum likelihood estimate) in South Wabasca Lake could not be calculated due to the extremely low sample size of three individuals. Of the three individuals captured one male was immature and two mature, one male and one female, yellow perch were captured. Data could not be properly analyzed due to the low sample size and has been omitted from the Tables and Figures.

Tables and Figures

North Wabasca Lake

Table 1. Species catch rates from 2010 North Wabasca Lake FWIN survey. Additional species observed not included in data analysis include: spottail shiner, white sucker, longnose sucker, trout perch, hybrid lake whitefish- cisco and cisco.

Species	Year	CPUE	95%
WALL	2006	5.74	(4.07 - 7.41)
	2010	6.6	(3.8 - 9.3)
NRPK	2006	9.1	(6.65 - 11.55)
	2010	6.8	(6.2 - 8.6)
LKWH	2006	5.58	(2.45 - 8.71)
	2010	4.7	(3.0 -8.0)
YLPR	2006	2.44	(0 - 4.92)
	2010	1.1	~

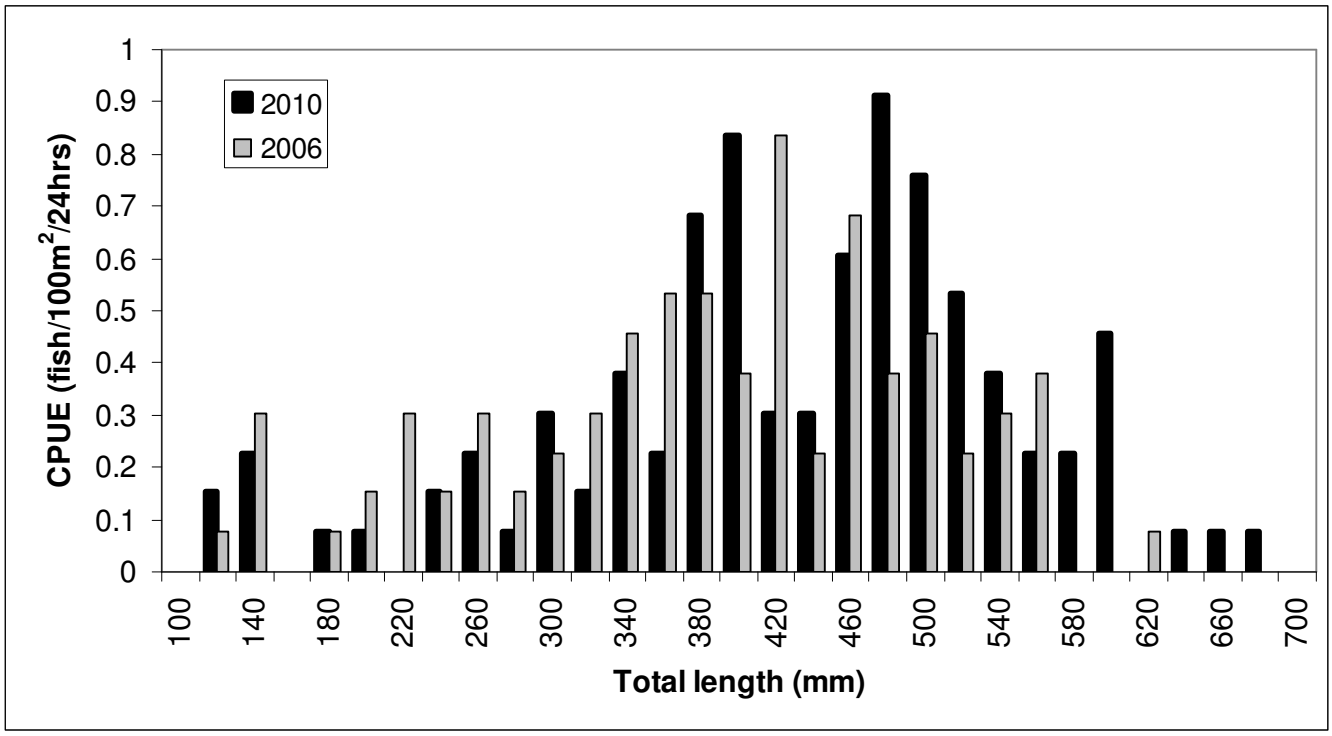

Figure 1. North Wabasca Lake total length distributions of Walleye from Fall Walleye Index, Alberta, 2006 (n=99), 2010 (n=112). Y-axis is catch per unit effort (fish/100m^2/24hrs), X-axis is total length of Walleye in millimetres.

Table 2. Walleye length composition (sample number, percent) of sexes combined, for males and female; number and maturing (percent) for North Wabasca Lake 2010 FWIN survey; several Walleye (n=7) were not included below due to unconfirmed sex.

			Males		Females	
TL (mm)	**Number (N)**	**Comp. (%)**	**No. (N)**	**Mature. (%)**	**No. (N)**	**Mature. (%)**
0	0	0	0	--	0	--
50	0	0	0	**--**	0	**--**
100	0	0	0	**--**	0	**--**
150	2	1.90	1	0	1	0
200	2	1.90	2	0	0	**--**
250	6	5.71	3	0	3	0
300	9	8.57	2	0	7	0
350	20	19.05	15	73	5	0
400	14	13.33	10	100	4	0
450	23	21.90	13	100	10	40
500	15	14.29	7	100	8	100
550	11	10.48	0	**--**	11	100
600	1	0.95	0	**--**	1	100
650	2	1.90	0	**--**	2	100
700	0	0	0	**--**	0	--
750	0	0	0	**--**	0	--
800	0	0	0	**--**	0	--
SUM	**105**	**100**	**53**		**52**	

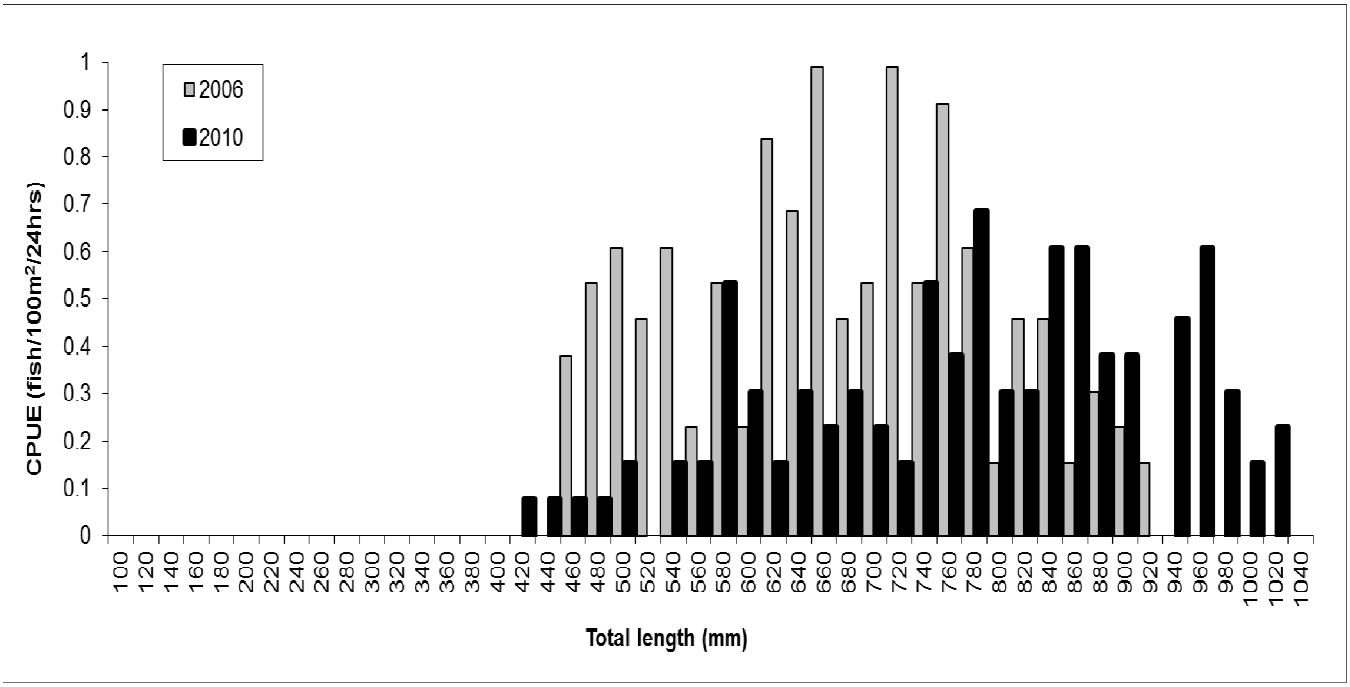

Figure 2. Total length distributions of northern pike from Fall Walleye Index netting at North Wabasca Lake, Alberta, 2006 (n=158), 2010 (n=117). Y-axis is catch per unit effort (fish/100m^2/24hrs); X-axis is total length of pike in millimetres.

Table 3. Northern pike length composition (sample number, percent) of sexes combined, for males and female; number and maturing (percent) for North Wabasca Lake 2010 FWIN survey.

			Males		Females	
TL (mm)	**Number (N)**	**Comp. (%)**	**No. (N)**	**Mature. (%)**	**No. (N)**	**Mature. (%)**
0	0	0	0	~	0	~
50	0	0	0	~	0	~
100	0	0	0	~	0	~
150	0	0	0	~	0	~
200	0	0	0	~	0	~
250	0	0	0	~	0	~
300	0	0	0	~	0	~
350	0	0	0	~	0	~
400	3	2.56	2	50	1	0
450	3	2.56	1	100	2	50
500	3	2.56	0	0	3	100
550	13	11.11	9	100	4	75
600	7	5.98	2	100	5	20
650	9	7.69	2	100	7	100
700	10	8.55	1	100	9	100
750	17	14.53	2	100	15	100
800	13	11.11	0	0	13	100
850	16	13.68	0	0	16	100
900	7	5.98	0	0	7	100
950	12	10.26	0	0	12	100
1000	4	3.42	0	0	4	100
1050	0	0	0	0	0	~
1100	0	0	0	0	0	~
SUM	**117**	**100**	**19**	**~**	**98**	**~**

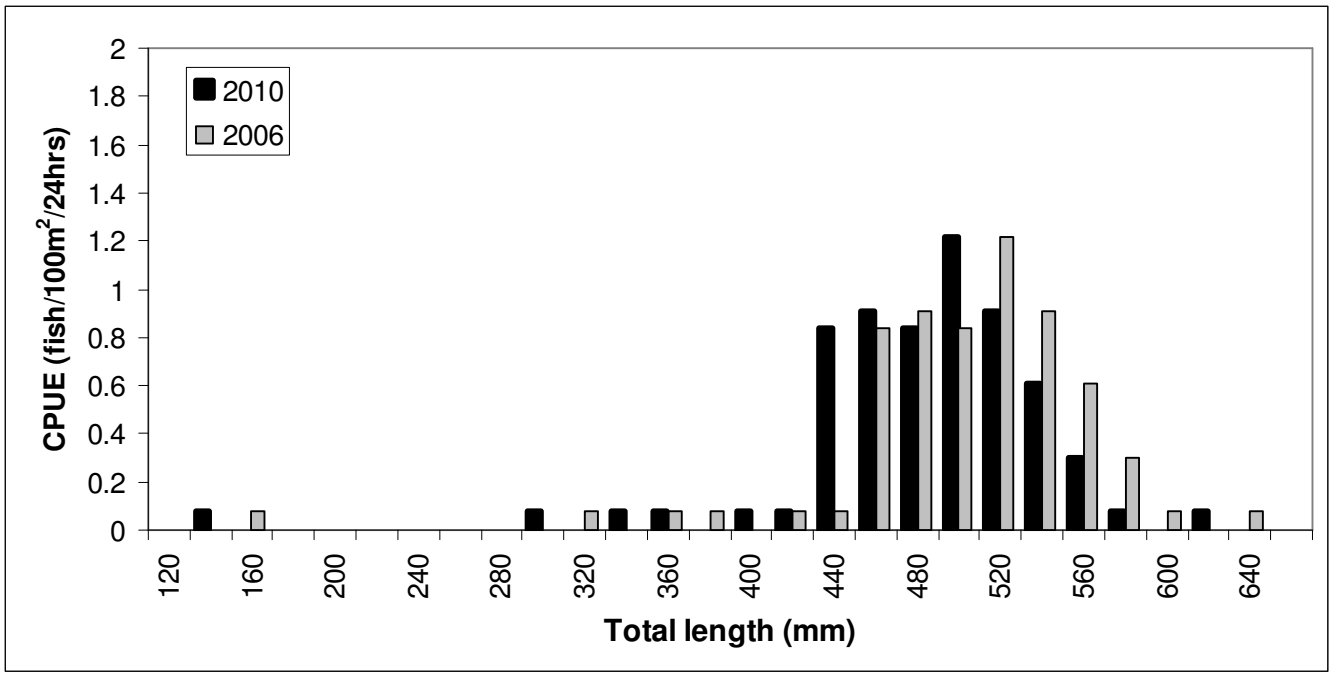

Figure 3. Total length distributions of lake whitefish from Fall Walleye Index netting at North Wabasca Lake, Alberta, 2010 (n=100). Y-axis is catch per unit effort (fish/100m^2/24hrs); X-axis is total length of lake whitefish in millimetres.

Table 4. Lake whitefish length composition (sample number, percent) of sexes combined, for males and female; number and maturing (percent) for North Wabasca Lake 2010 FWIN survey.

			Males		Females	
TL (mm)	**Number (N)**	**Comp. (%)**	**No. (N)**	**Mature. (%)**	**No. (N)**	**Mature. (%)**
0	0	0	0	~	0	~
50	0	0	0	~	0	~
100	0	0	0	~	0	~
150	0	0	0	~	0	~
200	0	0	0	~	0	~
250	1	1	0	~	1	0
300	1	1	0	~	1	100
350	2	3	2	100	0	~
400	16	20	6	84	10	80
450	34	43	20	96	14	100
500	24	30	15	100	9	100
550	1	1	1	100	0	~
600	1	1	1	100	0	~
650	0	0	0	~	0	~
700	0	0	0	~	0	~
750	0	0	0	~	0	~
800	0	0	0	~	0	~
SUM	**80**	**100**	**45**	**~**	**35**	**~**

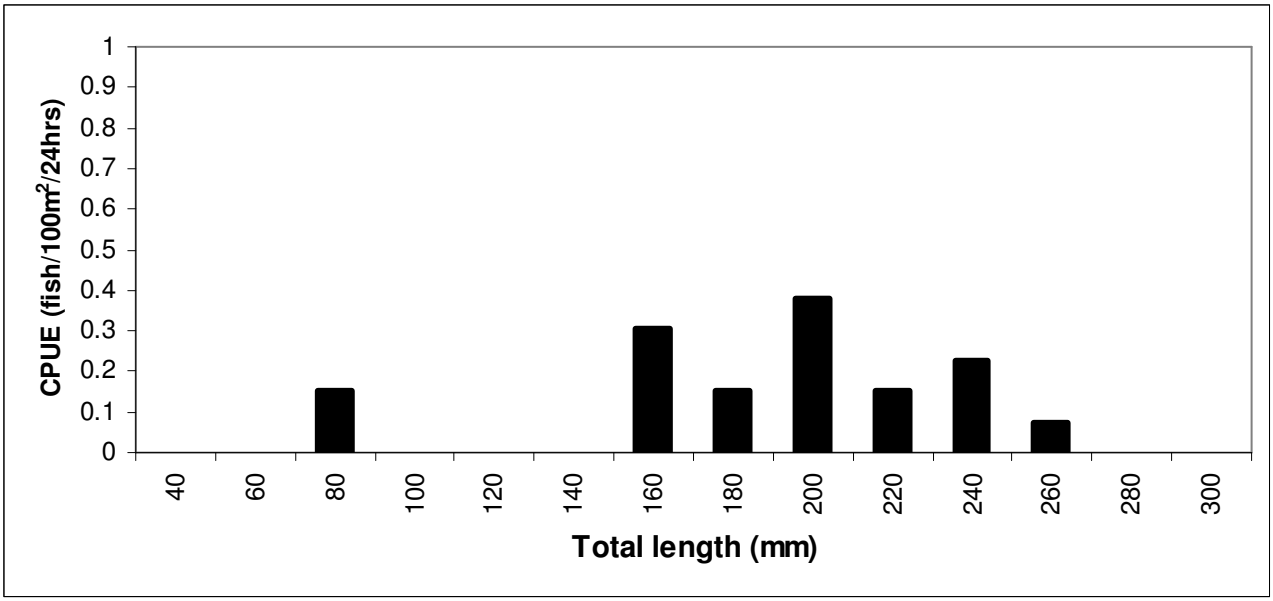

Figure 4. Total length distributions of yellow perch from Fall Walleye Index netting at North Wabasca Lake, Alberta, 2010 (n= 19). Y-axis is catch per unit effort (fish/100m^2/24hrs); X-axis is total length of yellow perch in millimetres.

Table 5. Yellow perch length composition (sample number, percent) of sexes combined, for males and female; number and maturing (percent) for North Wabasca Lake 2010 FWIN survey.

			Males		Females	
TL (mm)	**Number (N)**	**Comp. (%)**	**No. (N)**	**Mature. (%)**	**No. (N)**	**Mature. (%)**
0	0	0	0	~	0	~
50	0	0	0	~	0	~
100	1	6	0	~	1	0
150	10	59	8	100	2	0
200	6	35	0	~	6	100
250	0	0	0		0	~
300	0	0	0	~	0	~
350	0	0	0	~	0	~
SUM	**17**	**100**	**8**	~	**9**	~

South Wabasca Lake

Table 6. Species catch rates from 2010 South Wabasca Lake FWIN survey. Cisco and spottail shiner were also observed but were only enumerated, aging samples were not. CPUE could not be calculated for LKWH (n=2) or YLPR (n=3) due to the low sample size.

Species	Year	CPUE	95%
WALL	2010	2.6	(1.4 -3.0)
NRPK	2010	24	(21 - 27.3)
LKWH	2010	~	~
YLPR	2010	~	~

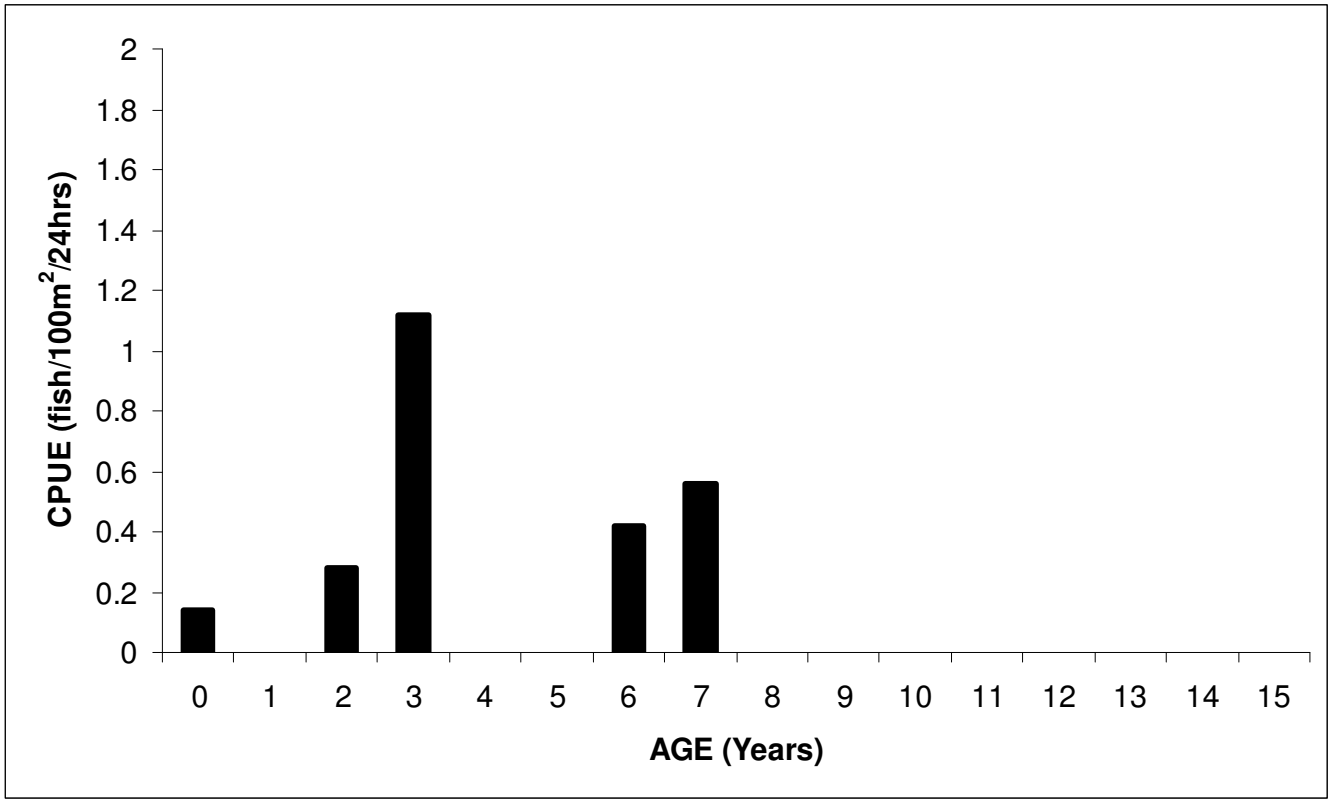

Figure 5. Age distribution of Walleye captured and sampled from Fall Walleye Index netting at South Wabasca Lake, Alberta, 2010 (n=18). Y-axis is catch per unit effort (fish/100m^2/24hrs); the X-axis is age of Walleye in years.

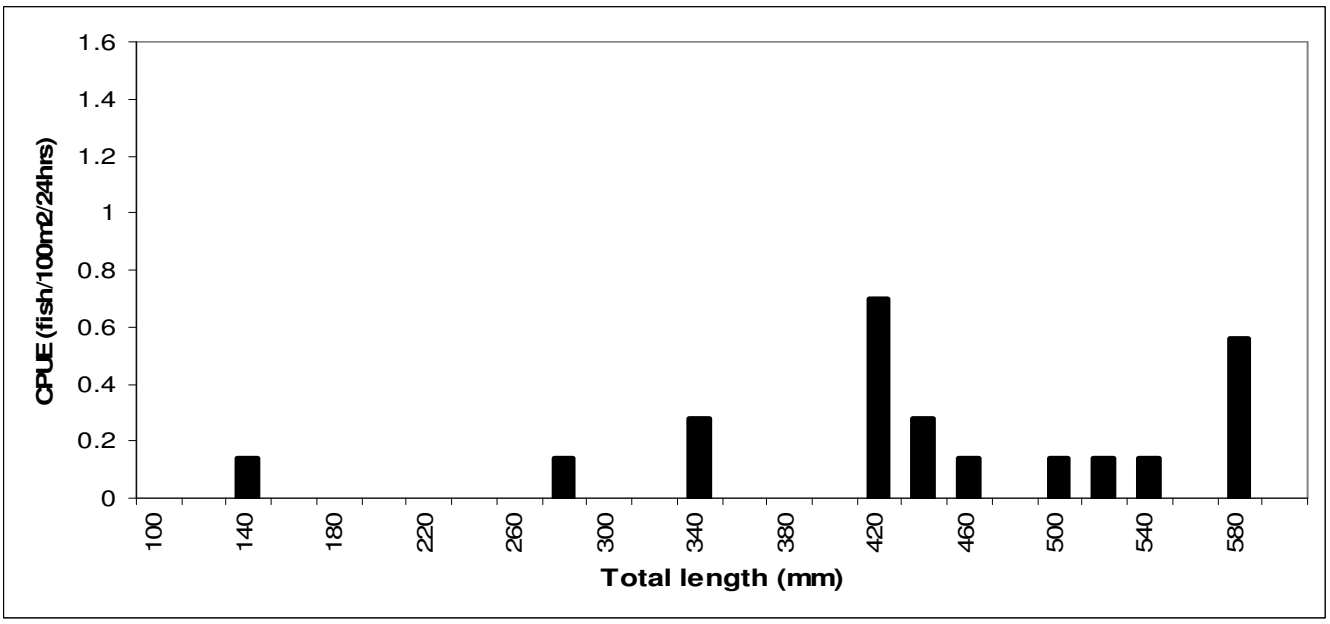

Figure 6. South Wabasca Lake total length distributions of Walleye from Fall Walleye Index, Alberta, 2010 (n=19). Y-axis is catch per unit effort (fish/100m^2/24hrs), X-axis is total length of Walleye in millimetres.

Table 7. Walleye length composition (sample number, percent) of sexes combined, for males and female; number and maturing (percent) for South Wabasca Lake 2010 FWIN survey; (n=1) Walleye were not included below due to unconfirmed sex.

			Males		Females	
TL (mm)	**Number (N)**	**Comp. (%)**	**No. (N)**	**Mature (%)**	**No. (N)**	**Mature (%)**
0	0	0	0	~	0	~
50	0	0	0	~	0	~
100	0	0	0	~	0	~
150	0	0	0	~	0	~
200	0	0	0	~	0	~
250	1	6	1	0	0	~
300	2	11	1	~	1	0
350	0	0	0	~	0	~
400	8	44	4	100	4	0
450	1	6	1	100	0	~
500	2	11	2	100	0	~
550	4	22	1	100	3	100
600	0	0	0	~	0	~
650	0	0	0	~	0	~
700	0	0	0	~	0	~
750	0	0	0	~	0	~
800	0	0	0	~	0	~
SUM	18	100	10		8	

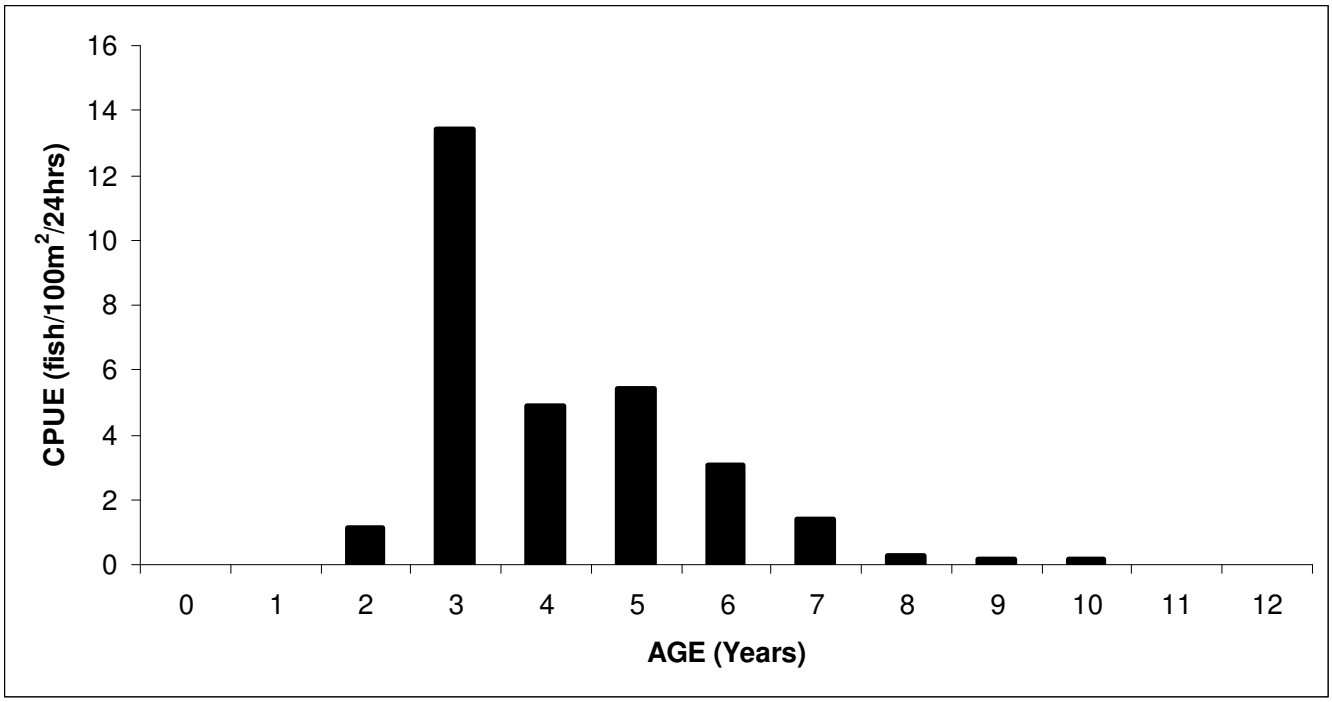

Figure 7. Age distribution of northern pike captured and sampled from Fall Walleye Index netting at South Wabasca Lake, Alberta, 2010 (n=214). Y-axis is catch per unit effort (fish/100m^2/24hrs); the X-axis is age of northern pike in years.

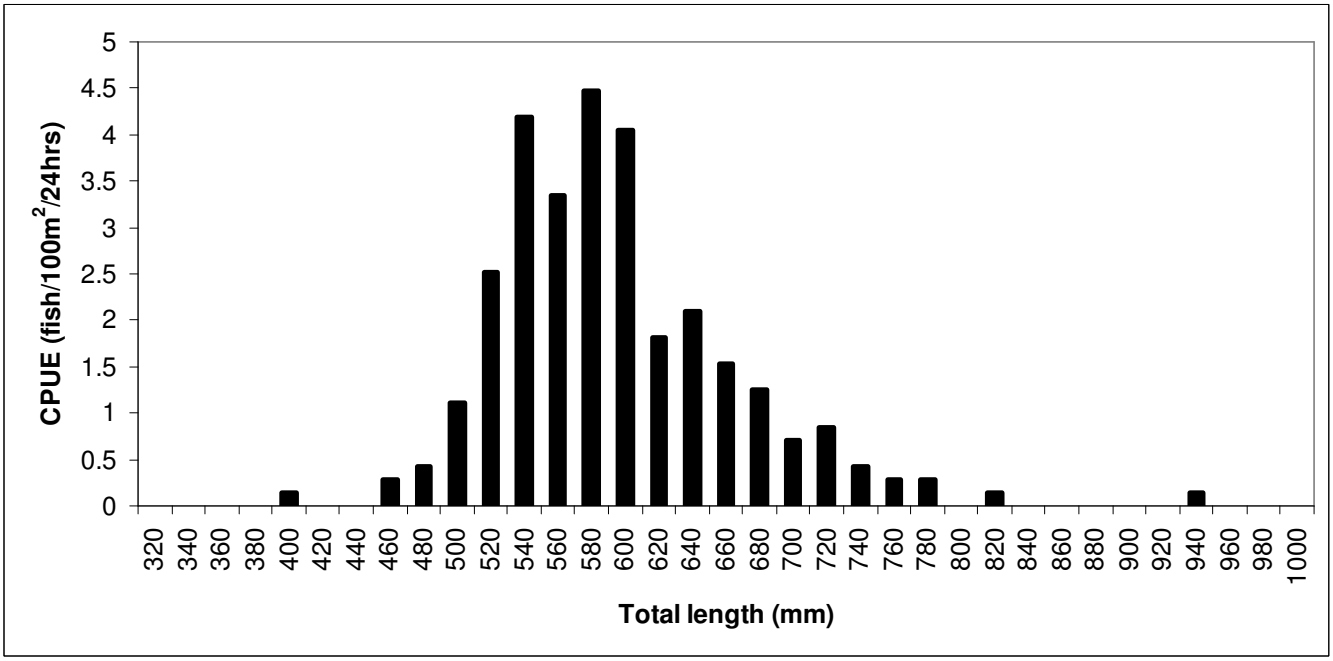

Figure 8. Total length distributions of northern pike from Fall Walleye Index netting at South Wabasca Lake, Alberta, 2010 (n=215). Y-axis is catch per unit effort (fish/100m^2/24hrs); X-axis is total length of northern pike in millimetres.

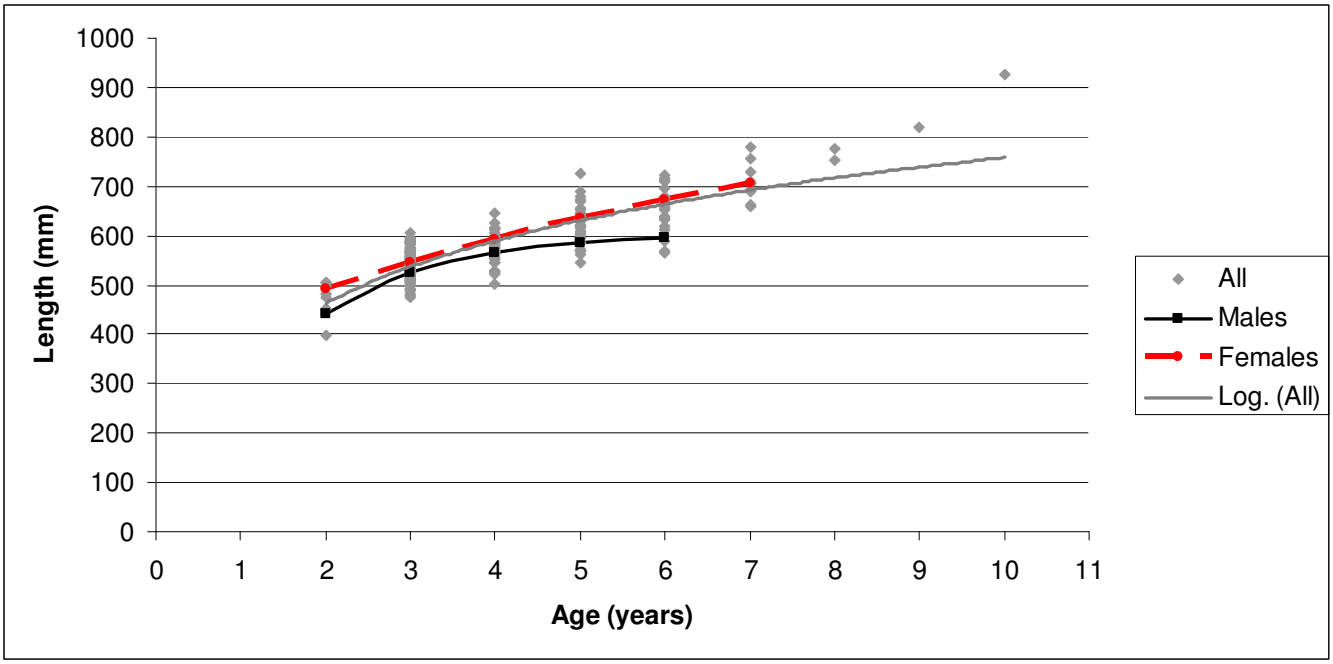

Figure 9. Length-at-Age scatter plot with von Bertalanffy growth equations for all northern pike sampled 2010; all northern pike (n=209; K=-0.127, L∞=950mm TL, t0= -3.459), females (n=135; K=-0.124, L∞=958.132mm TL, t0= -3.775), and males (n=75, K=-0.149, L∞=-800 mm TL, t0= -3.754). Due to low sample size, pike from ages 8-10 (n=4) were removed from analysis and L∞ was held constant for all pike and male pike in order to generate functional growth pararmeters.

Table 8. Northern pike length composition (sample number, percent) of sexes combined, for males and female; number and maturing (percent) for South Wabasca Lake 2010 FWIN survey.

			Males		Females	
TL (mm)	**Number (N)**	**Comp. (%)**	**No. (N)**	**Mature (%)**	**No. (N)**	**Mature (%)**
0	0	0	0	~	0	~
50	0	0	0	~	0	~
100	0	0	0	~	0	~
150	0	0	0	~	0	~
200	0	0	0	~	0	~
250	0	0	0	~	0	~
300	0	0	0	~	0	~
350	1	0	1	100	0	~
400	0	0	0	~	0	~
450	12	6	8	100	4	100
500	61	28	31	100	30	100
550	71	33	28	100	43	98
600	33	15	6	100	27	100
650	20	9	1	100	19	100
700	9	4	0	~	9	100
750	4	2	1	100	3	100
800	3	1	0	~	3	100
850	0	0	0	~	0	~
900	1	0	0	~	1	100
950	0	0	0	~	0	~
1000	0	0	0	~	0	~
SUM	215	100	76		139	

Interpretation

The data and results from the FWIN surveys on North and South Wabasca lakes has been packaged and presented together in this report due to the connectivity between the two lakes and the evidence that there is movement at least one fish species (Walleye) actively between the two lakes seasonally. Based on information provided by the ACA (James et al 2011), it was confirmed through telemetry and genetic analysis that populations of walleye from North and South Wabasca Lakes are not genetically distinct between the two lakes but rather show some fidelity to spawning locations. The Walleye populations mix between the two lakes following the spawning season and that the two populations are heavily linked (James 2011). It is probable this same activity occurs with other species in the lakes as well but has not been investigated so far, given these linkages it was deemed appropriate to combine the reporting of information on these two lakes into a single report.

North Wabasca

North Wabasca Lake was last sampled under the FWIN protocol in 2006 by the Alberta Conservation Association (ACA) under the direction of Alberta Environment and Sustainable Resource Development (ESRD). Information collected in the 2010 FWIN of North Wabasca Lake conducted by ESRD staff is directly comparable to the information collected by ACA (2007).

The walleye CPUE identified by the ACA (2007) was 3.73 fish/100m^2/24hr (95% C.I. 2.22 - 4.88) with the total of 99 individuals captured (n=99) and accounting for 12% of the overall catch (n=822) for the 2006 survey.

Comparatively, the 2010 survey of North Wabasca Lake was 5.4 fish/100m²/24hr (95% CI 3.7 – 7.1), showing minor improvements in the over all catch rate of walleye in four years since the most recent FWIN, yet still below the provincial average for Walleye of 18 fish/100m^2/24hr and remaining classified as a collapses Walleye CPUE. In the 2006 ACA survey Age-at-maturity for walleye was assumed to be reached at an age less than 8 years and before the individuals reached an overall size of 430 mm TL. Due to the loss of aging data in the 2011 fire in Slave Lake, aging samples could not be used to determine changes in age at maturity. Although age distribution, age-at-maturity and growth parameters could not be determined from the 2010 FWIN, 50% length-at- maturity for female Walleye was reached at approximately 500 mm TL and by males at some length between 340-360mm TL. Females were 100% mature at 520mm and larger and males at 420mm TL and larger. These results are congruent with the results presented in ACA (2007) report. Similarly, small sample sizes in the 2010 survey reduce the confidence in these estimates but they reflect what was represented in the sample. Based on the information collected in 2010, lacking aging data, the North Wabasca Walleye population is characterized as 'collapsed' (Sullivan 2003); the allocation and management objectives associated with Walleye in North Wabasca lake should be reviewed and necessary changes recommended in order to align allocation and use with the current stock status.

The catch per unit effort (CPUE) for northern pike as recorded by the ACA (2006) was 9.1 fish/100m^2/24hr (95% C.I. 6.65 – 11.55) with a total of 158 northern pike sampled (n=158). In the 2006 analysis (ACA) it was found that northern pike were the most abundant species captured, accounting for 19.2 % of the total catch (ACA 2006). This remains consistent with the 2010 FWIN with the most abundant species captured being northern pike with a total of 117 individuals captured, slightly higher than walleye (n=112). The CPUE for northern pike in 2010 was 6.8 fish/100m^2/24hr (95 % C.I. 6.2 – 8.6) with a total of 117 individuals sampled (n=117) which is consistant with the provincial average catch rate of 6 fish/100m^2/24hr (95 % C.I. 5.3 – 7.5) . While densities of northern pike have dropped between the 2006 assessment and the 2010 FWIN assessment at North Wabasca Lake the northern pike population would continue to be characterized as 'vulnerable' and at low to moderate risk of collapse. The size distribution of pike is fairly broad, ranging from 420 – 1020 mm TL with the majority of the sample (n=80, 68%) between 740 and 1020 mm total length (TL). Few individuals were captured in the 300 mm to 500 mm length ranges in the 2010 FWIN, which may partially be attributed to gear selection, but may also be indicative of low recruitment. Further investigation into gear selectivity, sampling methodology and continued monitoring of the population will determine if there is a recruitment concern or if this is sampling bias. There does not appear to be signs of truncation in the northern pike population vulnerable to the 63cm regulation on North Wabasca Lake. The current relative abundance and biological metrics that were measurable are indicative of a population experiencing growth overfishing from harvest pressure which combined with the vulnerable classification of the population increases the risk of collapse for pike in North Wabasca Lake. Continued monitoring is required to ensure the allocation and use of pike remains appropriate for the stock status. If the pike population continues to show signs of decline, the allocation and management objectives associated with northern pike on North Wabasca Lake should be reviewed and necessary changes recommended in order to align the allocation and use of the fishery with the current stock status.

The lake whitefish population showed little change between the 2006 and 2010 surveys, the catch per unit effort (CPUE) in the 2010 survey was 4.7.1 fish/100m^2/24hr (95% C.I. 3 – 8), this is indicative of a low relative abundance when compared to the provincial FWIN catch rates of lake whitefish and is considered to be a collapsed population CPUE. There is still a broad size distribution of lake whitefish but weak indications of recruitment coming into the population. The allocation and management objectives associated with lake whitefish on North Wabasca Lake should be reviewed and necessary changes recommended in order to align allocation and use with the current stock status.

The size class structure of the yellow perch population is fairly narrow, with few large fish being detected in the sample. The catch rate of Yellow Perch is low relative to other lakes in the area and is indicative of a low density population and is likely representative of a vulnerable population.

South Wabasca

Prior to 2010, South Wabasca Lake had not been surveyed using the Fall Walleye Index Netting protocol. The Walleye CPUE for South Wabasca Lake was 2.6 fish/100m^2/24hr which is significantly lower than the provincial average of 18 fish/100m^2/24hr and is indicative of a collapsed populations (Sullivan 2003).

All of the Walleye captured in the 2010 FWIN were under the age of 7 years-of-age, with maturity reached by males (n=10) in the sample at approximately 3 years-of-age and by females (n=8) at approximately 6 years-of-age. Despite the low sample size which prevents the accurate determination of 50% age at maturity or a maturation schedule, this pattern of early maturity can also be attributed to a 'collapsed' population with individuals maturing at a faster rate to encourage recruitment in the population. Significant deficits in age cohorts (1, 4, 5, and any above 7 years-of-age) (figure 5), suggest that there have been multiple recruitment failures. There were young-of-the-year captured in the survey, showing that recruitment is likely still occurring but at a lower than average rate. There are only two strong mature year classes for females (6 and 7 year-olds) and three strong mature year classes for males (3, 6 and 7 year-olds) supporting the recruitment for the South Wabasca Lake population. Few Walleye were captured with total lengths of less than 420 mm (TL) or greater than 580 mm (TL) suggesting that there may have been recruitment failures in the younger age classes and possible mortality related effects in the larger age classes. The largest Walleye captured in 2010 was measured at 580 mm total length suggesting that the regulation of two Walleye over 50 cm may be having an impact on the population; only 4 of the individuals captured (n=19) were legal fish eligible for harvest suggesting that harvest may have a more significant impact on the population than originally assumed. Based on the catch rate and biological information collected in 2010, the Walleye population is characterized as 'collapsed' (Sullivan 2003); the allocation and management objectives associated with Walleye in South Wabasca Lake should be reviewed and necessary changes recommended in order to align the allocation and use of the fishery with the current stock status.

The northern pike population in South Wabasca Lake can be classified as 'stable' (Fisheries Management, unpublished data), with a catch rate (CPUE) of 24 fish/100m^2/24hr (95% C.I. 21 – 27.3) which is significantly higher than the provincial average catch rate of 6 fish/100m^2/24hr (95 % C.I. 5.3 – 7.5). The pike have a moderate age and size class distribution, with the majority of the sampled individuals falling between 2 and 8 years-of-age and ranging from 397 mm – 925mm total length. Only three individuals of the total sample (n=215) were immature; an accurate 50 percent age-at-maturity could not be determined due to the lack of immature individuals captured in the population sample. Although the northern pike relative abundance and biological metrics are indicative of a stable population at low risk of collapse, the majority of the sample (n=160, 74%) are strongest in categories of less than 620 mm which coincides with the regulation on South Wabasca Lake of two northern pike over 63 cm TL during open seasons suggesting that harvest may be affecting the population densities of northern pike over this restriction. If the pike population begins to show signs of decline and truncation at the current minimum size restriction, the allocation and management objectives associated with northern pike on South Wabasca Lake should be reviewed and necessary changes recommended in order to align the allocation and use of the fishery with the current stock status.

The catch rate of lake whitefish in South Wabasca was extremely low with only two (n=2) individuals being detected. This is very low relative to other lakes that have been assessed using FWIN in Alberta corresponding to a low relative abundance and is likely representative of a collapsed population. The allocation and management objectives associated with northern pike on South Wabasca Lake should be reviewed and necessary changes recommended in order to align the allocation and use of the fishery with the current stock status.

The yellow perch catch per unit effort (maximum likelihood estimate) in South Wabasca Lake could not be calculated due to the extremely low sample size of three individuals. Of the three individuals captured one male was immature and two mature, one male and one female, yellow perch were captured.

Citations

Berry, D.K. 1995. *Alberta's Walleye management and recovery plan*. Alberta Environmental Protection, Natural Resources Services. Number T/310. 32pp.

Berry, D.K. 1999. *Alberta's Northern Pike management and recovery plan*. Alberta Environmental Protection, Natural Resources Service. Number T/459. 22pp.

Carruthers, N., and T. Johns. 2007. Status of sport fish in North Wabasca Lake, Alberta, 2006. Data Report, D-2007-012, produced by the Alberta Conservation Association, Peace River, Alberta, Canada. 26 pp + App.

Government of Alberta. 2013. Alberta Guide to Sportfishing Regulations. Publication. 2013

Government of Alberta. 2010. *Standards For Index Netting of Walleye in Albert.* Technical Report. Prepared by Alberta Sustainable Resource Development, Fish and Wildlife Division, Fisheries Management Branch, Edmonton, Alberta, Canada. 20pp.

Haddon, M. 2001. *Modeling and quantitative methods in fisheries*. Chapman and Hall/CRC, Boca Raton, Florida, USA. 406 pp.

James, C., and P. Hvenegaard. 2011. Verification of effectiveness of spring conservation closure zones on North and South Wabasca lakes, Alberta, 2008 -2010. Data Report, D-2011-003, produced by the Alberta Conservation Association, Peace River, Alberta, Canada. 12 pp + App.

Mackay, W.C., G.R. Ash, and H.J. Norris (eds.). 1990. Fish ageing methods for Alberta. R.L. & L. Environmental Services Ltd. in assoc. with Alberta Fish and Wildl. Div. And Univ. of Alberta, Edmonton. 113 p.

Morgan, G.E. 2002. Manual of instructions – Fall Walleye Index Netting (FWIN). Percid Community Synthesis, Diagnostics and Sampling Standards Working Group. Ontario Ministry of Natural Resources. 34 p.

Slipke, J., and Maceina, M. Fisheries Analyses and Simulations Tools- v2.1 (FAST). Department of Fisheries and Allied Aquaculture, Auburn University, AL, USA.

Sullivan, M. G. 2003. Active Management of Walleye Fisheries in Alberta: Dilemmas of Managing Recovering Fisheries. North American Journal of Fisheries Management 23: 1343-1358,2003.

Watkins, Owen B. and Stephen C. Spencer 2009. Collection, preparation and ageing of walleye otoliths. Fish and Wildlife Division, Alberta Sustainable Resource Development. 14pp.

Von Bertalanffy, L. 1938. A quantitative theory of organic growth. Human Biology 10: 181-213.