Lake Newell Fall Walleye Index Netting (FWIN) Survey 2011

Fisheries Management

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Lake Newell Fall Walleye (*Sander vitreus*) Index Netting Survey, 2011

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ABSTRACT

The 2011 FWIN Survey of Lake Newell was conducted from September 26 to 27, 2011. Survey objectives included estimating catch per unit effort, as well as various population demographics (age, growth rate, reproductive status) in order to monitor the effects of management to ensure the stability and sustainability of the Walleye population at this location. In total 109 Walleye were caught in 2011, resulting in a catch per unit effort of 10.4 Walleye/100 m^2/24 h (95% CI: 7.2 – 14.5 Walleye/100 m^2/24 h). Walleye fork length averaged 467 mm (range: 112 – 720 mm). Walleye sampled during the 2011 FWIN reached 500 mm in length by five years of age, and mean age for this species was 5.5 years. While a diversity of ages (ranging from 0 to 14 years) were sampled, fish aged 8 years predominated. Males matured completely by age 3, while females were completely mature after 8 years of age. A gonadosomatic index exceeding 0.5% distinguished mature spawning females from immature and non-spawning individuals. Overall growth for Walleye can be characterized as "normal" in 2011. In response to these metrics, the Walleye population in Lake Newell can be classified as vulnerable in 2011.

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1.0 INTRODUCTION

Walleye (*Sander vitreus*) are considered a highly desirable sport fish in Alberta, and are consequently much sought after. As a result Walleye populations have been subjected to high levels of angling pressure and harvest, particularly in easily accessible locations in proximity to larger population centers. Historically, management of this species was conducted on a provincial basis, which proved ineffective for managing locations with high levels of angling pressure. Walleye populations in a variety of locations declined or collapsed as a result of overharvest. Alberta Sustainable Resource Development formulated *Alberta's Walleye Management and Recovery Plan* (Berry 1995) in response. Under this plan Walleye populations are surveyed to assess a variety of biological criteria and classified as trophy, stable, vulnerable, or collapsed. Management is subsequently modified to prevent decline and/or restore diminishing populations according to the individual requirements at a given location.

The Fall Walleye Index Netting (FWIN) survey conducted at Lake Newell in 2011 continued monitoring at this location to ensure effective management of the local Walleye population. It follows up on similar surveys conducted since 2005.

2.0 METHODS

2.1 Study Area

Situated approximately 200 km southeast of Calgary and 8 km south of Brooks, Lake Newell (TWP16-R14-W4M to TWP18-R15-W4M) is located in the shortgrass prairie region of Alberta (Mitchell and Prepas 1990). Constructed for offstream storage, the reservoir is owned and operated by the Eastern Irrigation District. Lake Newell is one of Alberta's largest reservoirs, with a mean depth of 6.4m, a maximum depth of 16.8 m, and a surface area of 6307 ha. The mean annual drawdown is 1.4m, and water has a residence time of 1.4 years (Mitchell and Prepas 1990).

Water is diverted into the north end of Lake Newell from Bassano Dam via the Main East Branch Canal, and into the Southwest corner from Kitsum Reservoir via the Bow Slope

Canal. Lake Newell has two exits; the Main Bantry Canal in the north east supplies the North and West Bantry Canal systems, while the outlet at the south east end supplies Rolling Hills Reservoir (Mitchell and Prepas 1990).

In addition to irrigation, Lake Newell also provides access to a number of popular recreational activities such as angling, wind surfing, and bird watching. The majority of access to this location occurs via Kinbrook Island Provincial Park, which is situated on the northeastern quadrant of the reservoir. The park has numerous facilities, including 209 campsites, sewage disposal, potable water, playgrounds, picnic areas, a concession and swimming area, and two boat launches (Mitchell and Prepas 1990). A nature reserve (the Sven Bayer Peninsula) located just south of Kinbrook Island offers bird and wildlife viewing opportunities and nature trails. The reservoir can also be accessed via a residential community (Lake Newell Resort) located on the northwest side of the lake.

Fifteen (15) species of fish occur in Lake Newell. These include Walleye, Northern Pike (*Esox lucius*), Lake Whitefish (*Coregonus clupeaformis*), Yellow Perch (*Perca flavescens*), Burbot (*Lota lota*), Rainbow Trout (*Oncorhynchus mykiss*), Brook Trout (*Salvelinus fontinalis*), Brown Trout (*Salmo trutta*), Longnose Sucker (*Catostomus catostomus*), White Sucker (*Catostomus commersoni*), Grass Carp *(Ctenopharyngodon idella*), Spottail Shiner (*Notropis hudsonius*), Emerald Shiner (*Notropis atherinoides*), Fathead Minnow (*Pimephales promelas*) and Trout-Perch (*Percopsis omiscomaycus*)(ASRD, Fisheries Management Information System, species present query 2006).

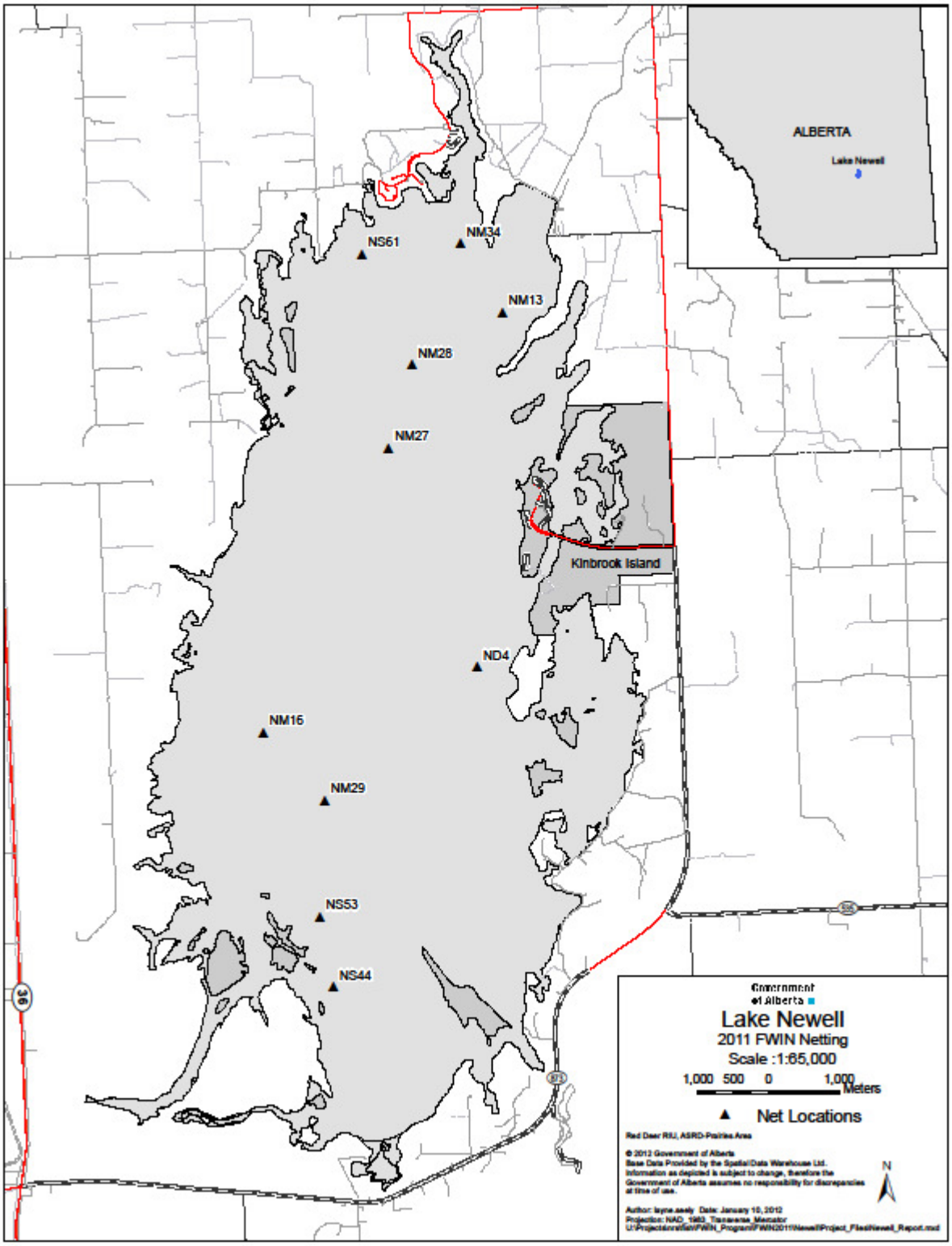

Figure 1. Map of Lake Newell including 2011 netting locations.

2.2 Survey Methods

The FWIN protocol developed by the Ontario Ministry of Natural Resources in 2000 was employed to survey Lake Newell in 2011 (Morgan 2000). According to this method, nets are composed of eight ascending panels of different mesh sizes (25 mm, 38 mm, 51mm, 64mm, 76mm, 102mm, 127mm, and 152mm, respectively) without spacers. As a result, the standard FWIN net measures 61.0m long by 1.8 m deep, spanning an area of 109.8m^2.

Nets were placed by assigning random locations within depth and distance strata according to the methodology described in Morgan (2000). While this methodology allows for the selection of an alternate location if an inappropriate spot is initially chosen (too shallow, heavily vegetated, or a very steep bottom gradient), all of the randomly generated locations were used in 2011. The 2011 survey was designed to set a total of 16 nets in three strata. Severe weather conditions forced the survey to be truncated, such that three nets were set in the shallow stratum, six nets were set in the medium stratum, and a single net was set in the deep stratum (10 nets in total). In accordance with protocol, nets were set perpendicular to shore for approximately 24 hours with the exception of two nets which were removed after approximately 2 hours on the second day of the survey, and were subsequently excluded from data analysis.

The catches for individual panels were bagged separately and identified with grid location numbers and mesh sizes. Four species were collected in 2011, including Walleye, Northern Pike, Lake Whitefish, and White Sucker. Sport species were visually examined to catalogue hooking injuries and illnesses, and subjectively assess general physical condition (normal weight versus exceptionally fat or thin individuals). Fork length (mm), total length (mm), and weight (mm) were measured, and species specific aging structures were collected. Gender and maturity for Walleye were determined by examination of the gonads (including measurement of the weight of female gonads, in grams). If the gonads were considered to be sufficiently developed for spawning during the following spring, fish were classified as mature. Non-spawning females were identified by the absence of developing eggs despite mature gonadal development.

For some of the analysis and comparisons in this report a weighted CUE (catch per unit effort) was used. The weighted CUE is the number of fish caught per net per twenty-four hours. The weighted CUE is calculated using the formula:

$$Weighted\_CUE = \left(\frac{\left(\frac{Number\_of\_fishx24h}{Number\_of\_hours\_net\_was\_set} \right) x100m^2}{109.8m^2} \right)$$

Walleye ages were assigned by a modified methodology from that described in MacKay et al. (1990). The first annulus tightly surrounding the focus (indicating one year of age) was identified using the following formula:

$$1^{st} \text{ annulus} = \frac{\text{rL (age-0 L)}}{\text{L}}$$

where:

rL = radius length (distance from the center of the focus to the furthest edge)

Age-0 L = hypothesized length of age-0 Walleye at time sampled

L = length of the sampled Walleye

The von Bertalanffy growth equation was used to calculate growth parameters. The following equation was used:

$$L_t = L_\infty(1 - e^{-k\,(t-t0)})$$

where:

L_∞ = maximum theoretical length (fork length infinity) that can be obtained;

k = growth coefficient;

t = time of age in years;

t_0 = is the time in years when length would theoretically be equal to zero and;

e = exponent for natural logarithms.

L_∞, t0, and k were calculated using the Fisheries Analysis and Modeling Simulator ver. 1.0 (Slipke 2010). The length-at-age data were fitted to the growth model by applying the equation independently to each sample.

All data were analysed and written using Microsoft Office 2000 Professional (9.0.7616 SP-3) (MSAccess, MSExcel, MSWord). The data set for this study is stored in the Alberta Sustainable Resource Development *Fisheries & Wildlife Management Information System* database (FWMIS).

3.0 RESULTS AND DISCUSSION

3.1 Water Temperatures and Netting Effort

The 2011 Lake Newell FWIN was conducted between September 26, 2011 and September 27, 2011. Water temperature ranged from 14.1℃ to 15.8℃. Eight (8) nets were set for an average of 22.5 hours (95%CI: 21.9 – 23.2 hours) (Appendix 1). Six (6) nets were set in the medium stratum, 3 nets were set in the shallow stratum, and one net was set in the deep stratum. Originally sixteen (16) nets were to be set, but severe weather conditions forced truncation of the 2011 FWIN survey after the first set. Two of the ten nets pulled on the first day had been set that morning, and were subsequently removed from consideration in the survey since they had only been set for two and 3.5 hours, respectively.

3.2 Catch Results

The 2011 FWIN catch totalled 212 fish representing four species, with a mean catch of 21.5 fish/100m^2/24h (95%CI: 16.7 – 27.8 fish/100m^2/24h) (Appendix 1). The medium sets caught an average of 22.1 fish/100m^2/24h (95%CI: 15.1 – 32.5 fish/100m^2/24h)

while shallow sets caught an average of 19.9 fish/100m^2/24h (no confidence intervals as data was only available for three nets), and the single deep set caught 14.6 fish/100m^2/24h. Walleye were the most common species captured (n=109, 51.4%) in 2011, followed by Lake Whitefish (n=85, 40.1%), Northern Pike (n=9, 4.2%), and White Sucker (n=9, 4.2%).

3.3 Walleye Catch Per Unit Effort

Walleye were caught in all mesh sizes in 2011 (Appendix 1). The highest catch occurred in the 127 mm mesh, which averaged 2.8 Walleye/100m^2/24h (95%CI: 1.6 – 3.8 Walleye/100m^2/24h). An average of 10.2 Walleye/100m^2/24h (95%CI: 6.3 – 16.6 Walleye/100m^2/24h) were caught in the medium sets, while 14.6 Walleye/100m^2/24h were caught in the single deep set, and the two shallow sets averaged 8.0 Walleye/100m^2/24h (no 95% CI).

The weighted catch per unit effort for Walleye was 10.4 Walleye/100m^2/24h (95%CI: 7.2 – 14.5 Walleye/100m^2/24h) in 2011, and the catch was normally distributed (Figure 2). This catch rate is comparatively low for Alberta, but within the historical range seen for Lake Newell, and also within the range normally seen for locations in southeastern Alberta (Figure 3). Given the truncated nature of the FWIN, it is not possible to conclusively state that the CUE was actually lower than those observed previously because historically catches have been higher in either the deeper or shallower sets, which were underrepresented in 2011. Walleye of 500mm or greater total length had a CUE of 6.1 Walleye/100m^2/24h (95% CI: 4.2 – 8.5 Walleye/100m^2/24h).

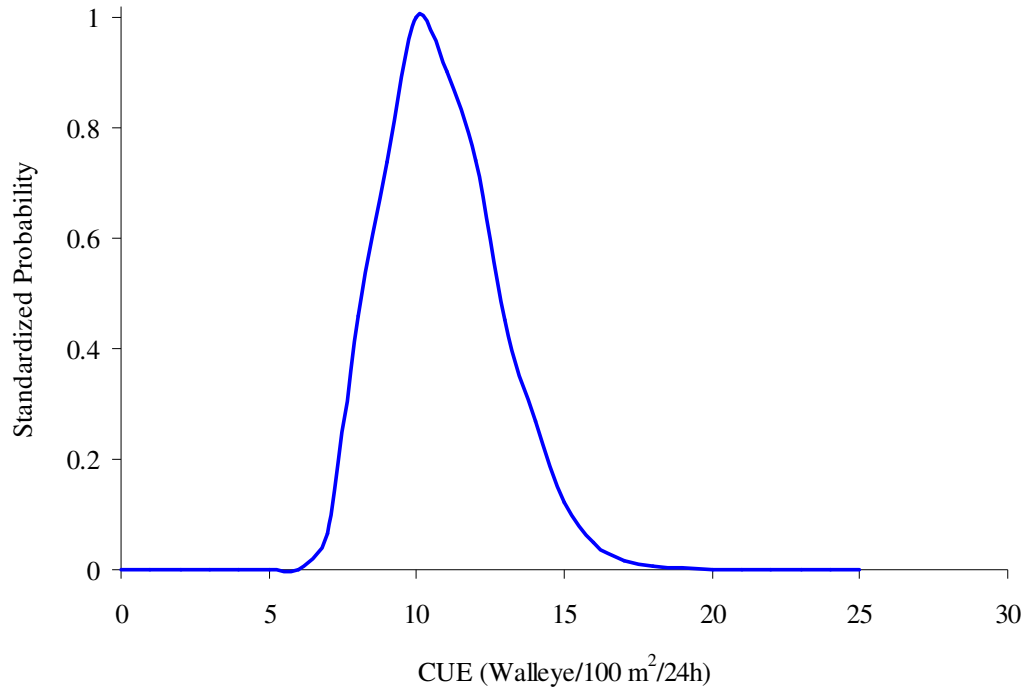

Figure 2. Walleye catch frequency distribution, Lake Newell 2011 (CUE = 10.4 Walleye/100m^2/24h (95% CI: 7.2 – 14.5 Walleye/100m^2/24h)).

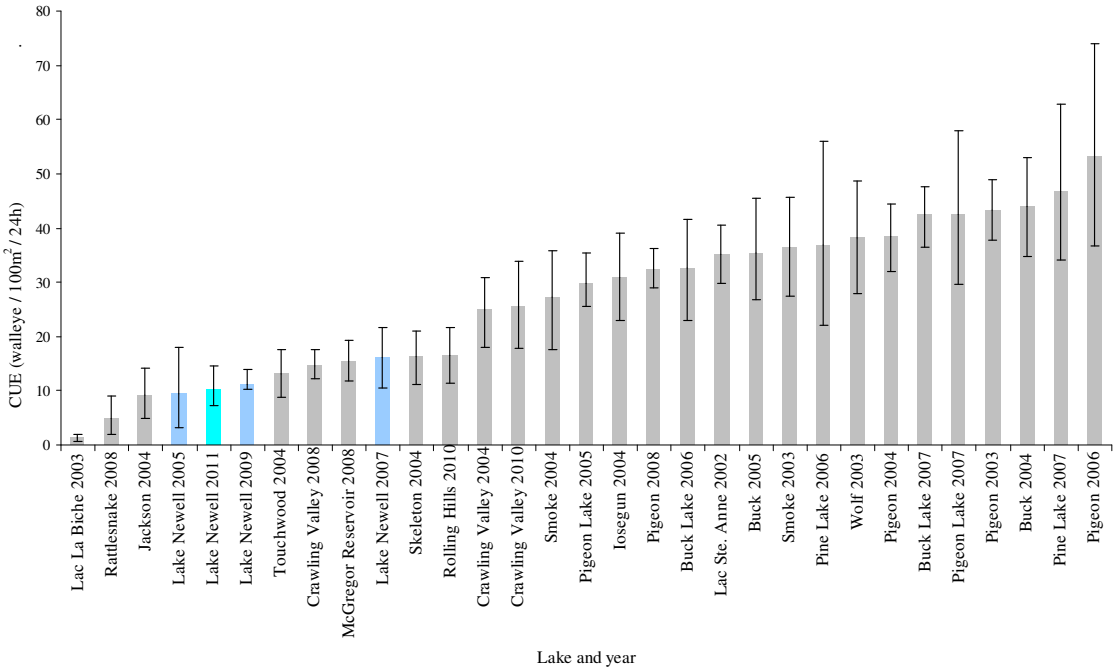

Figure 3. FWIN catches from 35 Alberta lakes from 2002-2011. Error bars depict 95% confidence intervals.

3.4 Fork Length Frequency Distribution

The fork length of Walleye sampled in 2011 ranged from 112 – 720 mm (Figure 4). Walleye between 520 and 630 mm predominated in the sample, though 170 mm fish and Walleye between 350 and 390 mm were also relatively common.

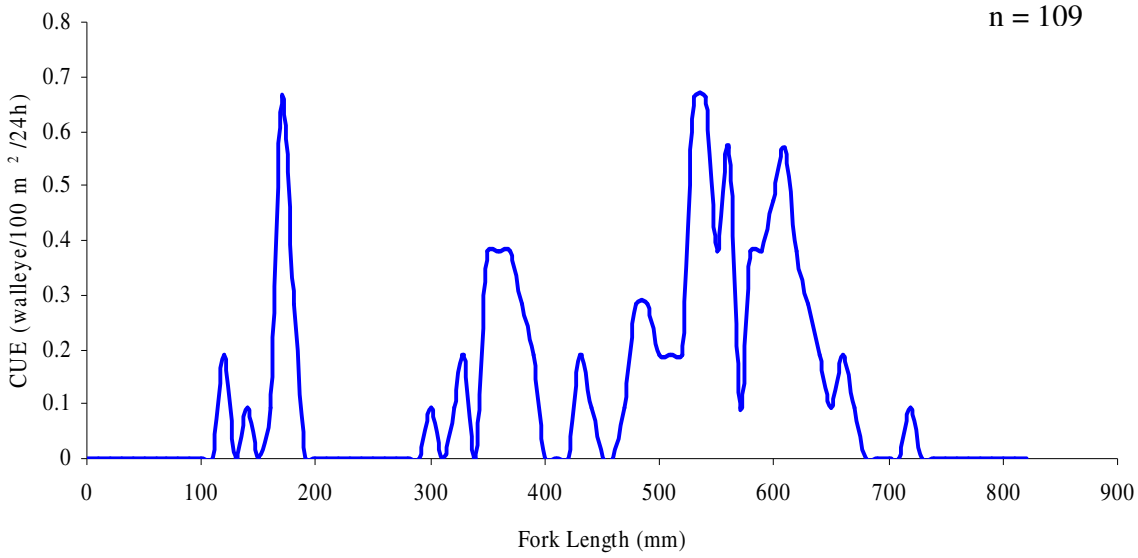

Figure 4. Walleye fork length frequency distribution, Lake Newell 2011 (mean fork length = 468 mm, n = 109).

3.5 Age Class Frequency Distribution

The year-class distribution for Walleye from Lake Newell ranged from fish aged 0 to 14 years in 2011 (Figure 5). Eight (8) year old fish predominated in the sample, with a CUE of 5.3 Walleye/100m^2/24h, comprising 51.5% of the Walleye caught. The average age for Walleye was 5.5 years. Given the relatively low average age, and the fact that the population is predominantly supported by a single year class, it is categorized as a vulnerable population under the Stock Classification Matrix (Table 1).

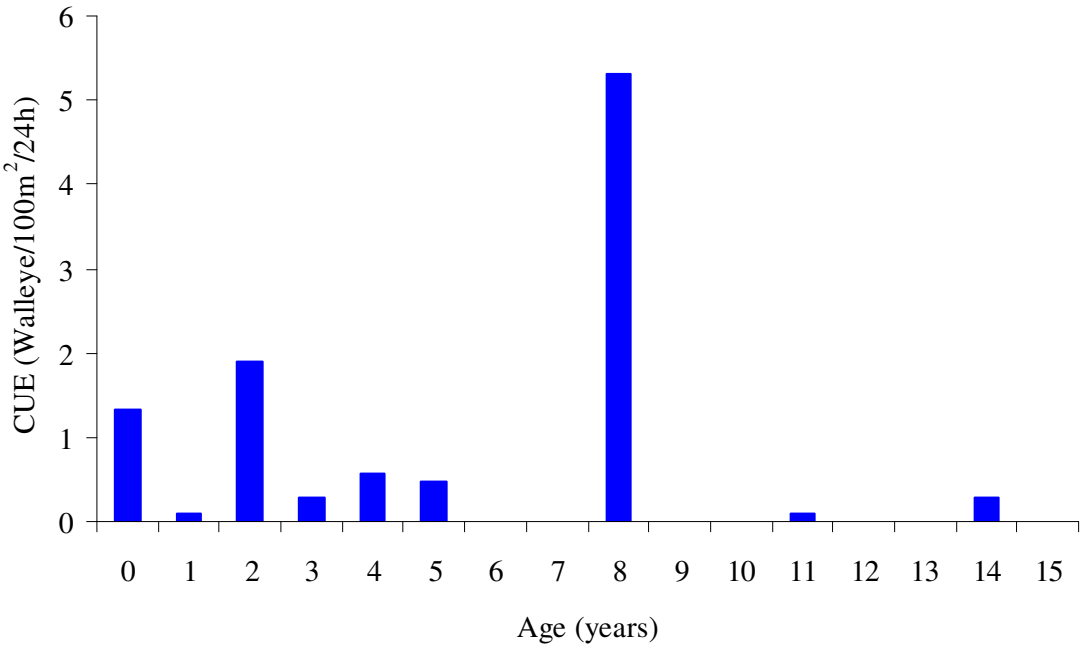

Figure 5. Age frequency distribution, Lake Newell 2011 (mean age = 5.5 years).

Table 1. Criteria for classifying status of Walleye fisheries, modified for FWIN analysis (from Sullivan 2003).

STATUS OF STOCK	TROPHY	STABLE	VULNERABLE	COLLAPSED
Age-class Distribution	Wide 8 or more age classes mean age >9	Wide 8 or more age classes mean age = 6-9	Narrow 1-3 age classes mean age = 4 - 6 few old (>10 years) fish	Wide or Narrow Mean age = 6 - 10
Lake Newell 2011			**mean age 5.5**	**9 age-classes**
Age-class Stability	Very Stable 1 - 2 age classes out of smooth catch curve	Relatively Stable 2 - 3 age classes out of smooth catch curve	Unstable 1 - 3 age classes support fishery	Stable or Unstable Recruitment failures
Lake Newell 2011			**1 age-class**	
Age-At-Maturity	Females 10 - 20 Males 10 - 16	Females 8 - 10 Males 7 - 9	Females 7 - 8 Males 5 - 7	Females 4 - 7 Males 3 - 6 Ages will vary with age class distribution
Lake Newell 2011				**Females at 5.9** **Males at 6.9**
Length-at-age	Very slow 50 cm (FL) in 12 - 15 years	Slow 50 cm (FL) in 9 - 12 years	Moderate 50 cm (FL) in 7 - 9 years	Fast 50 cm (FL) in 4 - 7 years
Lake Newell 2011				**50 cm FL in 5 years**
Catch Rate FWIN		High >30 walleye / net	Moderate 5 - 25 walleye / net	Low <5 walleye / net
Lake Newell 2011			**10.4 walleye/net**	

3.6 Age Class Stability

The age class structure observed for Walleye in 2011 is indicative of a vulnerable population (Table 1). Only one age class (the eight year old fish) was strongly represented, though a range of older and younger fish were observed (Figure 5). Since fish ranging from young of the year (i.e. age 0) to age five were present in the sample, recruitment is occurring at Lake Newell. This means that the population could stabilize over time, as progressively more fish mature and attain reproductive status.

3.7 Age at Maturity

The sex ratio observed for Walleye in 2011 was 1.18 females : 1.0 male. Males started to mature at age 2 and were completely mature by 3 (Figure 6). Females started to mature at age 4, and were mostly mature by age 8 (Figure 7). Precise age at full maturity could not be established from data in 2011, since no female fish were captured between the ages of 8 and 14, at which point all were mature. The early onset of maturation observed is characteristic of a collapsed population according to the criteria laid out in the Stock Classification Matrix (Table 1).

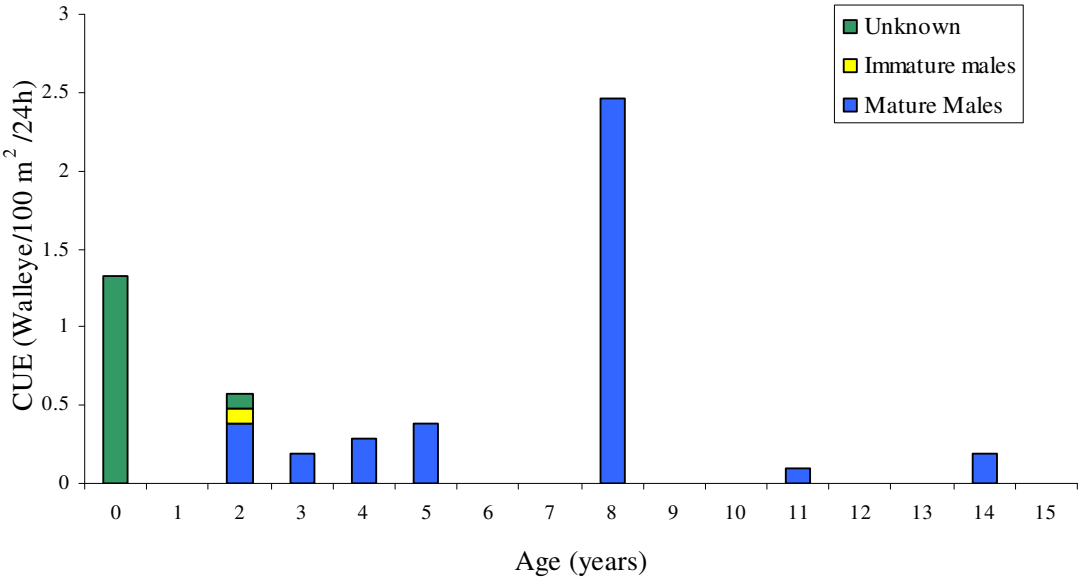

Figure 6. Age-at-maturity of male Walleye, Lake Newell 2011.

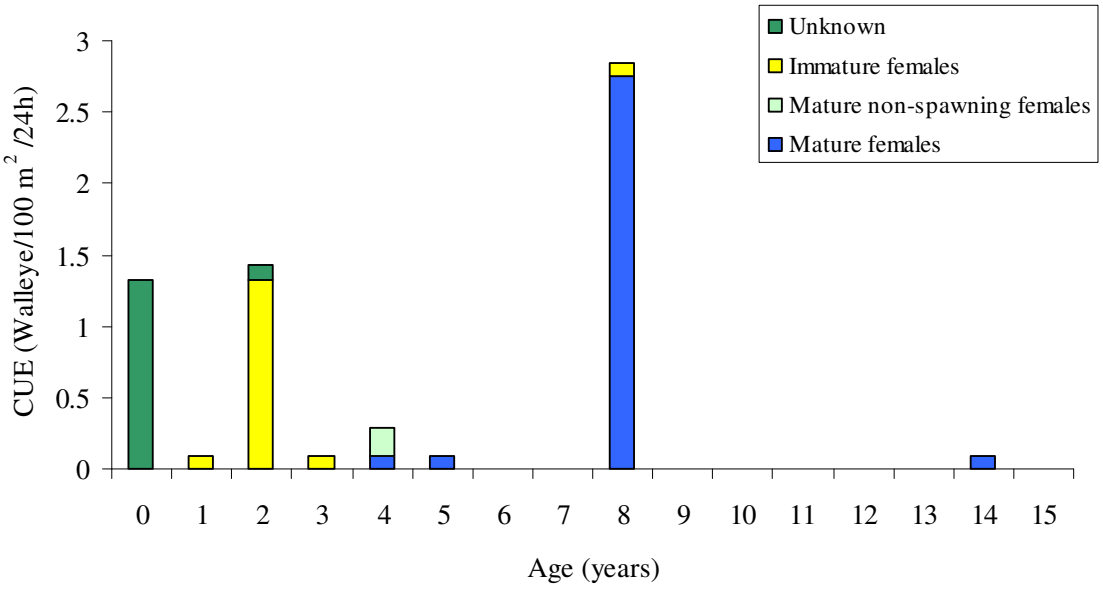

Figure 7. Age-at-maturity of female Walleye, Lake Newell 2011.

3.8 Length at Age

Female Walleye grew more rapidly than males after four years of age, which is characteristic for the species (Figure 8). Both genders exhibited normal asymptotic growth, and reached 50 cm in total length by age 5 (Figure 9). This relatively rapid growth rate falls within the parameters for a collapsed population under the Stock Classification Matrix (Table 1).

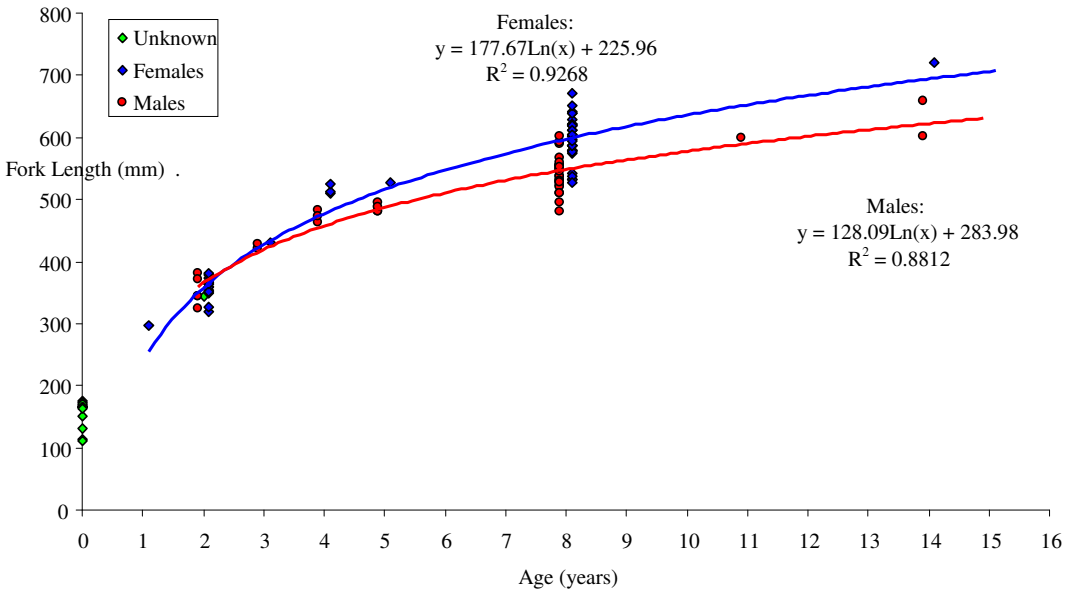

Figure 8. Length-at-age (logarithmic line of best fit) of Walleye, Lake Newell 2011.

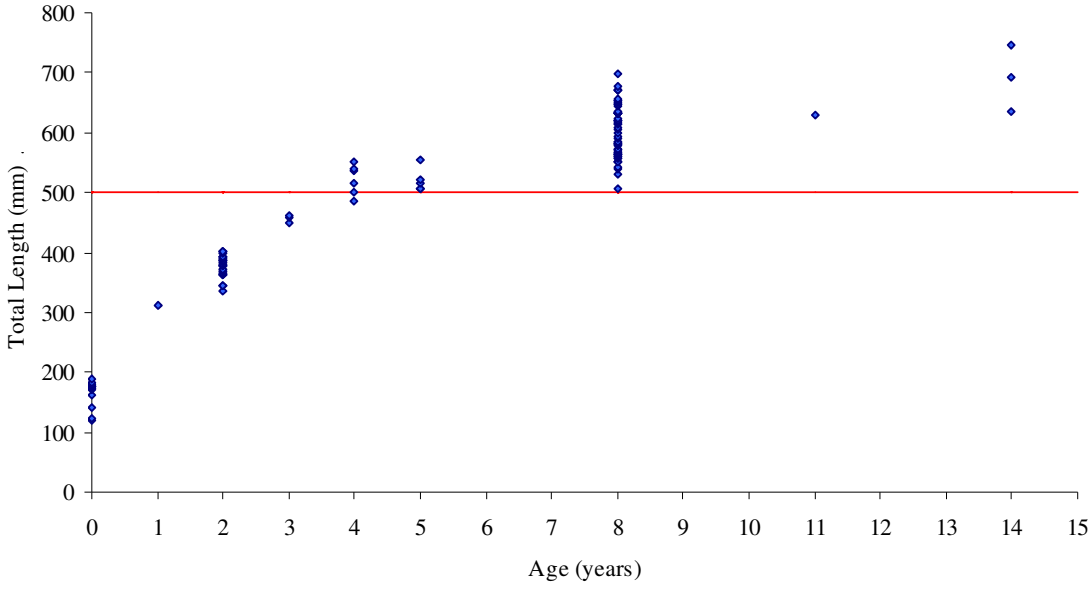

Figure 9. Walleye length-at-age compared to 50 cm total length for Lake Newell, 2011.

3.9 Length at Weight

The growth pattern observed for Walleye from Lake Newell is normal for the species, with weight increasing in proportion to length (Figure 10). None of the fish observed in 2011 were exceptionally fat or thin, which is indicative of the presence of abundant forage and the absence of disease at this location.

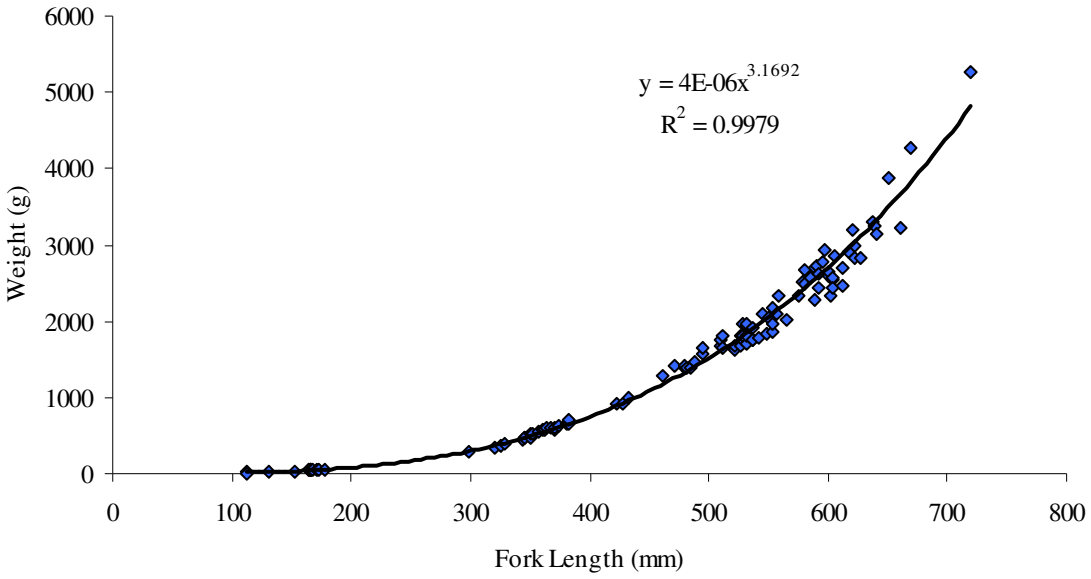

Figure 10. Growth of Walleye (expressed as Length vs. Weight) from Lake Newell, 2011.

3.10 Gonadosomatic Index

The Gonadosomatic Index (or GSI) is the ratio of the gonad weight to total body weight for female Walleye. This metric is a clear indicator of reproductive status, as spawning females exhibit far higher gonad weights in proportion to their body weight than non-spawning or immature fish. In 2011 mature females were differentiated from immature females by a wide margin, with immature fish having GSI values under 0.5%, whereas the values for mature spawning females were 2.5% or greater (Figure 11).

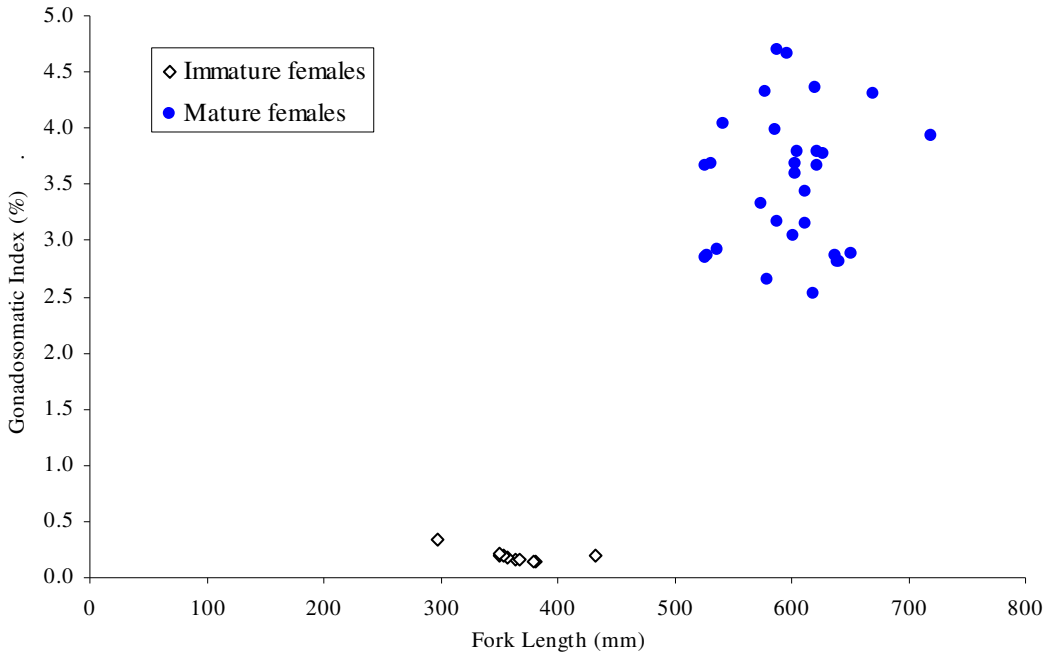

Figure 11. Walleye Gonadosomatic Index, Lake Newell 2011.

3.11 Von Bertalanffy Growth Equation

Fish generally exhibit asymptotic growth, with length increasing proportionately more in early life, and growth decreasing over time as age and size maxima are reached. The von Bertalanffy growth curve for Walleye from Lake Newell in 2011 exhibited the anticipated pattern, with grown parameters resembling those previously calculated for this population (Figure 12).

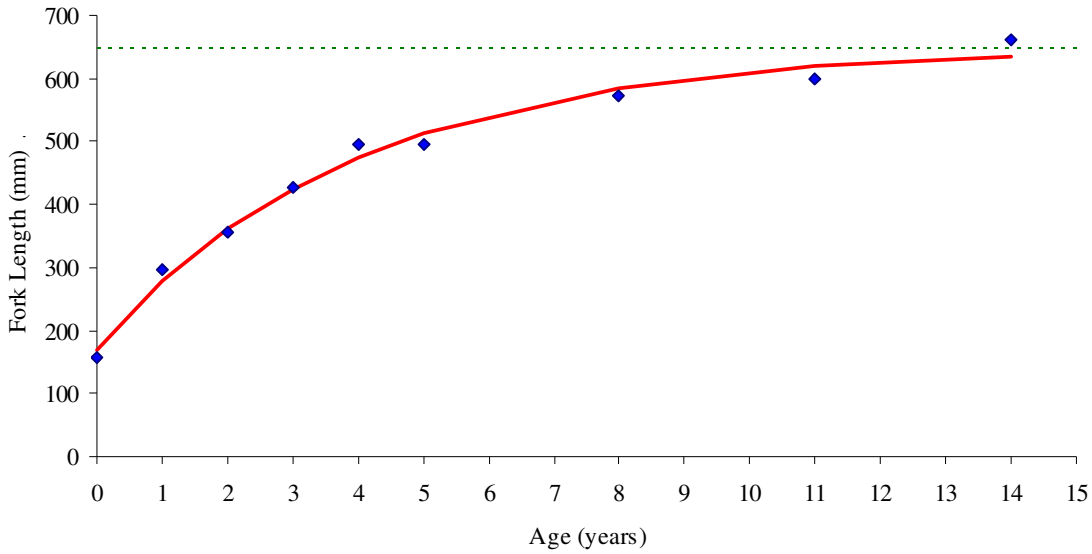

Figure 12. Von Bertalanffy growth curve and parameters fitted to observed fork-length-to-age data for Lake Newell, 2011 ($k = 0.254$, $t_0 = -1.203$, $L_\infty = 648$ mm).

4.0 SUMMARY

The management status of the Walleye population in Lake Newell is vulnerable in 2011 according to the criteria laid out in the ASRD *Walleye Management and Recovery Plan* (Berry 1995). Three out of the total five biological characteristics were categorized as vulnerable, while two were collapsed (Table 1). This represents a continuation of the status assigned previously, including the distribution of various criteria between the collapsed and vulnerable categories (Winkel, 2008; Winkel, 2010).

The presence of Walleye in all age categories from young of the year (age 0) to five years of age indicates the absence of year class failures, and therefore recruitment is occurring at Lake Newell (though this may be low, and subject to periodic peaks). The overall age class distribution is broad, with fish ranging from 0 to 14 years present in the survey. However, only a single age class was well represented, consisting of 8 year old fish, which comprised 51.5% of sample. This type of distribution is characteristic of a vulnerable population under the stock assessment matrix.

The CUE for Walleye from Lake Newell in 2011 is typical for populations in southern Alberta reservoirs. While the 2011 CUE was lower than that observed in 2009 (11.8 Walleye/100m^2/24h (Winkel, 2010)) and 2007 (CUE: 16.1 Walleye/100m^2/24h (Winkel, 2008)), it is still higher than the catch rate observed in 2006 (which was 9.5 Walleye/100m^2/24h (Fitzpatrick 2007)). In addition, the truncated nature of the 2011 FWIN means that the CUE for this year is not definitive, since the deep and shallow strata were data deficient.

The classification for the Walleye population in Lake Newell remains vulnerable in 2011. The normal growth rate observed, coupled with the absence of recruitment failures, indicates that the population could stabilize over time. Ongoing monitoring and management is therefore vital to the continued the preservation of this population.

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6.0 APPENDICES

6.1 Catch Composition for FWIN nets, Lake Newell 2011. **Sets in italics were omitted from analysis due to insufficient soak time.**

Set	Depth stratum	Depth (m)	Temp. (°C)	Soak Time (h)	Species				
					WALL	LKWH	NRPK	WHSC	Total
ND4	deep	(15.2 - 15.3)	15.4	23.9	16	7	1	0	24
NM13	*medium*	*(27.1 - 29.7)*	*14.1*	*3.5*	*21*	*1*	*0*	*3*	*25*
NM16	medium	(8.5 - 9.9)	15.2	23.5	9	14	2	0	25
NM27	medium	(10.1 - 10.2)	15.8	22.3	9	4	0	0	13
NM28	medium	(8.8 -10.0)	15.4	22.7	24	17	2	0	43
NM29	medium	(9 - 9.3)	15.1	23.3	6	15	0	0	21
NM34	medium	(7.3 - 7.7)	15.2	21.6	6	2	2	5	15
NS44	*shallow*	*(1.2 - 4.8)*	*14.6*	*2.0*	*2*	*4*	*0*	*0*	*6*
NS53	shallow	(3.6 - 5.0)	14.8	21.9	9	14	1	0	24
NS61	shallow	(3.5 - 4.0)	15.1	21.1	7	7	1	1	16
Total					109	85	9	9	212
Average				22.5	10.8	10	1.1	0.8	22.6

6.1.1 Catch composition from shallow sets, Lake Newell 2011.

Set	Depth stratum	Depth (m)	Temp. (°C)	Soak Time (h)	Species				
					WALL	LKWH	NRPK	WHSC	Total
NS44	*shallow*	*(1.2 - 4.8)*	*14.6*	*2.0*	*2*	*4*	*0*	*0*	*6*
NS53	shallow	(3.6 - 5.0)	14.8	21.9	9	14	1	0	24
NS61	shallow	(3.5 - 4.0)	15.1	21.1	7	7	1	1	16
Total					16	21	2	1	40
Average			14.9	21.5	8.0	10.5	1.0	0.5	20.0

6.1.2 Catch composition from medium sets, Lake Newell 2011

Set	Depth stratum	Depth (m)	Temp. (°C)	Soak Time (h)	Species				
					WALL	LKWH	NRPK	WHSC	Total
NM13	*medium*	*(27.1 - 29.7)*	*14.1*	*3.5*	*21*	*1*	*0*	*3*	*25*
NM16	medium	(8.5 - 9.9)	15.2	23.5	9	14	2	0	25
NM27	medium	(10.1 - 10.2)	15.8	22.3333	9	4	0	0	13
NM28	medium	(8.8 -10.0)	15.4	22.7333	24	17	2	0	43
NM29	medium	(9 - 9.3)	15.1	23.2833	6	15	0	0	21
NM34	medium	(7.3 - 7.7)	15.2	21.5833	6	2	2	5	15
Total					54	52	6	5	117
Average				22.7	10.8	10.4	1.2	1.0	23.4

6.2 Walleye catches by mesh size, Lake Newell 2011.

Set	Depth Stratum	Soak Time (h)	Mesh Size 25	38	51	64	76	102	127	152	Total
ND4	deep	23.9	0	1	2	3	2	3	2	3	16
NM13	*medium*	*3.5*	*0*	*5*	*4*	*2*	*4*	*2*	*4*	*0*	*21*
NM16	medium	23.5	0	0	0	0	2	2	4	1	9
NM27	medium	22.3	0	1	0	1	1	1	4	1	9
NM28	medium	22.7	4	6	1	2	0	6	4	1	24
NM29	medium	23.3	0	0	0	1	2	0	3	0	6
NM34	medium	21.6	0	0	0	1	0	0	5	0	6
NS44	*shallow*	*2.0*	*0*	*0*	*0*	*0*	*0*	*0*	*1*	*1*	*2*
NS53	shallow	21.9	0	0	1	0	3	2	1	2	9
NS61	shallow	21.1	0	0	0	1	4	0	0	2	7
Total			4	13	8	11	18	16	28	11	109

6.3 Lake Whitefish catches by mesh size, Lake Newell 2011.

Set	Depth Stratum	Soak Time (h)	Mesh Size 25	38	51	64	76	102	127	152	Total
ND4	deep	23.9	4	0	0	1	1	1	0	0	7
NM13	*medium*	*3.5*	*0*	*0*	*0*	*1*	*0*	*0*	*0*	*0*	*1*
NM16	medium	23.5	1	1	1	0	4	4	2	1	14
NM27	medium	22.3	0	0	0	0	0	4	0	0	4
NM28	medium	22.7	2	0	1	5	0	8	1	0	17
NM29	medium	23.3	0	2	0	4	3	5	1	0	15
NM34	medium	21.6	0	0	0	1	0	1	0	0	2
NS44	*shallow*	*2.0*	*0*	*1*	*0*	*0*	*0*	*2*	*1*	*0*	*4*
NS53	shallow	21.9	3	0	2	3	0	4	0	2	14
NS61	shallow	21.1	0	0	0	0	0	3	4	0	7
Total			10	4	4	15	8	32	9	3	85

6.4 Northern Pike catches by mesh size, Lake Newell 2011.

Set	Depth Stratum	Soak Time (h)	Mesh Size 25	38	51	64	76	102	127	152	Total
ND4	deep	23.9	0	0	1	0	0	0	0	0	1
NM13	*medium*	*3.5*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
NM16	medium	23.5	0	1	0	0	0	1	0	0	2
NM27	medium	22.3	0	0	0	0	0	0	0	0	0
NM28	medium	22.7	0	1	0	1	0	0	0	0	2
NM29	medium	23.3	0	0	0	0	0	0	0	0	0
NM34	medium	21.6	1	0	0	0	1	0	0	0	2
NS44	*shallow*	*2.0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
NS53	shallow	21.9	0	0	0	0	1	0	0	0	1
NS61	shallow	21.1	0	0	0	0	0	0	1	0	1
Total			1	2	1	1	2	1	1	0	9

6.5 White Sucker catches by mesh size, Lake Newell 2011.

Set	Depth Stratum	Soak Time (h)	Mesh Size 25	38	51	64	76	102	127	152	Total
ND4	deep	23.9	0	0	0	0	0	0	0	0	0
NM13	*medium*	*3.5*	*0*	*0*	*0*	*0*	*0*	*3*	*0*	*0*	*3*
NM16	medium	23.5	0	0	0	0	0	0	0	0	0
NM27	medium	22.3	0	0	0	0	0	0	0	0	0
NM28	medium	22.7	0	0	0	0	0	0	0	0	0
NM29	medium	23.3	0	0	0	0	0	0	0	0	0
NM34	medium	21.6	0	0	0	0	1	2	2	0	5
NS44	*shallow*	*2.0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
NS53	shallow	21.9	0	0	0	0	0	0	0	0	0
NS61	shallow	21.1	0	0	0	0	1	0	0	0	1
Total			0	0	0	0	2	5	2	0	9

6.6 Statistics of the catch distribution for game fish catches, Lake Newell 2011. This data is for presentation of the statistical nature of the catch distribution and are based on the geometric mean values (unweighted).

	Walleye	Lake Whitefish	Northern Pike	White Sucker
Mean (CUE)	10.8	10.0	1.1	0.8
Standard Error	2.2	2.0	0.3	0.6
Median	9.0	10.5	1.0	0.0
Mode	9.0	7.0	1.0	0.0
Standard Deviation	6.2	5.7	0.8	1.8
Sample Variance	38.8	32.0	0.7	3.1
Kurtosis	2.6	-1.9	-1.4	7.0
Skewness	1.7	-0.2	-0.3	2.6
Range	19.0	16.0	3.0	6.0
Minimum	6.0	2.0	0.0	0.0
Maximum	24.0	17.0	2.0	5.0
Sum	86.0	80.0	9.0	6.0
Count	8	8	8	8
Confidence Interval (95%)	4.3	3.9	0.6	1.2