Keeyask Generation Project

Aquatic Effects Monitoring Plan

Adult Lake Sturgeon Population Monitoring Report

(Future Keeyask Reservoir and Stephens Lake)

AEMP-2017-05

KEEYASK

Manitoba Sustainable Development Client File 5550.00 Manitoba Environment Act Licence No. 3107

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KEEYASK GENERATION PROJECT

AQUATIC EFFECTS MONITORING PLAN

REPORT #AEMP-2017-05

ADULT LAKE STURGEON POPULATION MONITORING IN THE FUTURE KEEYASK RESERVOIR AND STEPHENS LAKE, 2016

Prepared for

Manitoba Hydro

By

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SUMMARY

Background

The Keeyask Hydropower Limited Partnership (KHLP) was tasked with creating a plan to monitor what possible effects construction and operation of the Keeyask Generating Station (GS) could have on the environment. Aside from measuring the accuracy of the predictions made and actual effects of the GS on the environment, monitoring results will provide information on how construction and operation of the GS will affect the environment and if more needs to be done to reduce harmful effects.

Construction of the Keeyask GS began in mid-July 2014. During 2014 and 2015, cofferdams were constructed that blocked the north and central channels and a portion of the south channel of Gull Rapids (see map below). In 2016 there was little in-stream construction prior to the completion of field studies in fall: the central portion of the Central Dam Cofferdam was widened in April/May and work on the Tailrace Summer Level Cofferdam was started on August 4 and 5 and then stopped until October. With so little in-stream construction activity prior to completing field work in the fall, possible construction-related impacts to the aquatic environment during this period were limited to indirect effects (*e.g.*, potential impacts to water quality from discharge at the cofferdam, runoff from disturbed terrestrial areas).

Lake Sturgeon were identified as one of the key species for monitoring because they are culturally important to local people, the local populations have been previously impacted, and construction and operation of the GS could change or negatively impact important habitat. The plan to monitor the impacts of GS construction and operation on Lake Sturgeon includes several areas of study:

- Estimating the number of adults;
- Estimating the number and growth of juveniles (less than 800mm);
- Identifying spawning locations and numbers of spawning fish; and
- Movement studies to record seasonal habitat use, long distance movements, and movements past barriers (*i.e.,* over GSs or Gull Rapids).

This report presents results from adult Lake Sturgeon population monitoring in spring 2016 in the river reach that will form the future reservoir of the Keeyask GS (*i.e.*, the Nelson River between Clark Lake and Gull Rapids) and in Stephens Lake.

KEEYASK

DATA SOURCE:
Orthophoto: Manitoba Hydro - Sep 2016

CREATED BY:
North/South Consultants

COORDINATE SYSTEM:	DATE CREATED:	REVISION DATE:
UTM NAD 1983 Z15N	17-MAR-17	17-MAR-17
0 0.15 0.3 Kilometres / 0 0.15 0.3 Miles	VERSION NO: 2.0	QA/QC: PMC/FSV/MWZ

Construction Site

Map of instream structures at the Keeyask generating station site, September 2016.

Why is the study being done?

This study is being done to answer four main questions:

Is there a change in how many Lake Sturgeon are in the future Keeyask reservoir?

Population estimates allow us to determine how the number of adults is changing as we try to increase the number of sturgeon by stocking young fish. Lake Sturgeon are different from other fish in Manitoba, in that they do not begin to reproduce until they are at least 15 years old, and can live a very long time (more than 60 years and even up to 100 years). If the remaining adult fish disappear before enough young fish are born or stocked, then the population will not recover.

Is there a change in the mortality rate of Lake Sturgeon in the future Keeyask reservoir?

The rate at which Lake Sturgeon are dying is important to know if we want the population of sturgeon to increase. If the mortality rate increases, then we would need to try and find a cause and possibly a way to reduce it.

Is there a change in the number of Lake Sturgeon captured in Stephens Lake each year the monitoring occurs?

This question is important because not enough fish have been caught in Stephens Lake to produce an estimate of population size. Changes in the number of fish captured will tell us if the population is increasing or decreasing.

Is there a significant change in the condition (how fat they are) of Lake Sturgeon in the future Keeyask reservoir and in Stephens Lake?

This question is important because if Lake Sturgeon become fatter or thinner than they used to be, something is changing in their environment. In the long-term (more than 10 or 15 years), it might also mean that stocking has increased population levels to the point that there is not enough food and stocking should be reduced or stopped.

What was done?

For this study, we classified sturgeon that were over 800 mm in length as adults and those smaller than 800 mm in length as juveniles. Although the size at which Lake Sturgeon mature and become ready to reproduce varies among individual fish, we needed a standard length for the purpose of the study. Gill nets were used to catch adult sturgeon. Nets were set in the spring at locations where adults are known to occur at this time of year. Some nets were set at spawning areas, to estimate how many sturgeon were spawning that year. When a fish was caught it was measured and weighed and examined to see if it would, or already had, spawned. If the fish was not already tagged, then two different tags were applied, an external (Floy®) tag and a small internal (PIT) tag. If the captured fish had already been tagged, then the tag number was recorded before the fish was released. Tagging and recapturing fish makes it possible to

estimate how many Lake Sturgeon are in the population. Populations are estimated using a model. Each year as more data are collected and added to the model, the population estimates get more precise and accurate. Therefore, these estimates are recalculated each sampling year, so they might differ between reports.

Measuring (left) and PIT tagging (right) an adult Lake Sturgeon.

What was found?

In the future Keeyask reservoir, 190 Lake Sturgeon were caught, 118 of which were longer than 800 mm and were considered adults. Twenty-three of these adults were classified as 2016 spawners (adult Lake Sturgeon do not spawn every year). Seventy-six fish had been caught in a previous year including two fish that had been tagged in Stephens Lake (in 2003 and 2011) and one that had been tagged downstream of the Kelsey GS in 2011, about 75 km upstream. Overall, the condition factor (a measure of how fat a sturgeon is at a given size) of captured fish was similar to other years. The 2016 population was estimated at 708 individuals, which is similar to the 2012 and 2014 estimates. These results indicate that the status of the Lake Sturgeon population in the future Keeyask reservoir has improved since the early years of monitoring (2001–2004), when the estimated number of fish ranged from 395–565. Survival was estimated at 91%, which was higher than in other years.

In Stephens Lake, 71 Lake Sturgeon were captured, 58 of which were large enough to be considered adults. Eight of these fish were classified as 2016 spawners. Sixteen Lake Sturgeon were caught and tagged in previous years, one of which was tagged in Gull Lake in 2008, about 14 km upstream. Overall, the condition factor of captured fish was similar to other years. The overall catch of adult Lake Sturgeon was higher than in previous years.

What does it mean?

The population of Lake Sturgeon in the future Keeyask reservoir has remained relatively stable over the last 6 years. Although the population is small, a significant change in numbers has not been observed. In Stephens Lake, the 2016 catch is far greater relative to other years, with the

catch being comprised mainly of small adult Lake Sturgeon. Although there are a few older, larger fish in the catch, the increased abundance of small adult fish suggests that the population is gradually increasing. Condition factor of adult Lake Sturgeon has not changed much since studies began.

What will be done next?

This was the first year that this adult Lake Sturgeon population was monitored after the start of Keeyask GS construction in July 2014. Monitoring will continue in the future Keeyask reservoir and Stephens Lake every other year until 2044. Changes in the numbers of adult sturgeon generally occur slowly, unless a large number of sturgeon move to a different area. Therefore, it may take a few years to identify if construction is having an impact on adult Lake Sturgeon. Effects of stocking will not be seen in the adult population for 15–20 years, as the stocked fish grow to adult size.

ACKNOWLEDGEMENTS

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The collection of biological samples described in this report was authorized by Manitoba Sustainable Development, Fisheries Branch, under terms of the Scientific Collection Permit #08-16.

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1.0 INTRODUCTION

The Keeyask Generation Project (the Project) is a 695-megawatt (MW) hydroelectric generating station at Gull Rapids on the lower Nelson River in northern Manitoba. The Project is approximately 725 kilometres (km) northeast of Winnipeg, 35 km upstream of the existing Kettle Generating Station, where Gull Lake flows into Stephens Lake, 60 km east of the community of Split Lake, 180 km east-northeast of Thompson and 30 km west of Gillam (Map 1). Construction of the Project began in July 2014.

The *Keeyask Generation Project: Response to EIS Guidelines*, completed in June 2012, provides a summary of predicted effects and planned mitigation for the Project. Technical supporting information for the aquatic environment, including a description of the environmental setting, effects and mitigation, and a summary of proposed monitoring and follow-up programs, is provided in the *Keeyask Generation Project Environmental Impact Statement: Aquatic Environment Supporting Volume* (AE SV). As part of the licensing process for the Project, an Aquatic Effects Monitoring Plan (AEMP) was developed detailing the monitoring activities during the construction and operational phases of the Project regarding various components of the aquatic environment, including the fish community, and in particular, Lake Sturgeon. The study area included in the Lake Sturgeon component of the AEMP encompasses the reach of the Nelson River from the Kelsey GS to the Kettle GS, as well as waterbodies immediately adjacent to the Nelson River (Map 1).

The Lake Sturgeon section in the AEMP lists four programs:

- Adult population monitoring – includes estimation of adult population size, condition factor and growth;
- Juvenile population monitoring – includes growth, condition factor and year-class-strength;
- Spawn monitoring – includes number and sex of spawning fish; and
- Movement monitoring – includes local movements (habitat use) and coarse scale movements between waterbodies.

For the purposes of this monitoring program, adult Lake Sturgeon are those equal to or greater than 800 mm in fork length and juvenile Lake Sturgeon are smaller than 800 mm. Although fish greater than 800 mm length may not reach maturity for some years, the smallest mature fish captured to date has been 803 mm (captured in 2016 in Stephens Lake).

Adult population studies were initiated in 2001. Two areas were considered:

- The area that would be directly affected by the Project, that is the reach of the Nelson River from Clark Lake to Gull Rapids, and Stephens Lake; and
- Rivers flowing into the upstream portion of Split Lake (referred to as the Upper Split Lake Area).

When studies were initiated in 2001, it was known that Lake Sturgeon habitat in the Upper Split Lake Area would not be affected by the Project, but the degree of interaction between Lake Sturgeon in the Upper Split Lake Area and Gull and Stephens Lakes was not known. Genetic studies completed since that time have demonstrated that sturgeon in Gull Lake are a separate population from sturgeon in the Upper Split Lake Area (Gosselin *et al*. 2016). However, some movements of adult Lake Sturgeon between Gull Lake and the Nelson River downstream of the Kelsey GS have been recorded. Studies have continued in the Upper Split Lake area because this area was selected as a location where the KHLP could support the recovery of a Lake Sturgeon population outside the direct influence of the Project, as an offsetting measure[1].

Multiple years of data have been collected in the Upper Split Lake, Clark Lake to Gull Rapids, and Stephens Lake areas since 2001 (Barth and Mochnacz 2004; Barth 2005; Barth and Murray 2005; Barth and Ambrose 2006; Barth and MacDonald 2008; MacDonald 2008; MacDonald 2009; Michaluk and MacDonald 2010; MacDonald and Barth 2011; Hrenchuk and McDougall 2012; Hrenchuk 2013; Groening *et al*. 2014). Studies that focused on adults were conducted during alternate years among locations: in the Upper Split Lake Area during odd-numbered years, and in the Nelson River between Clark Lake and Gull Rapids and Stephens Lake in even-numbered years. Given that rapid changes to the adult population are not expected, this sampling frequency is considered adequate to track long-term change. These studies were conducted during spring and have identified sturgeon spawning areas, determined the relative importance of spawning sites, and contributed to the understanding of sturgeon movements. Mark-recapture data have been used to develop adult abundance estimates for populations in the Upper Split Lake Area and in the Nelson River between Clark Lake and Gull Rapids. To date, it has not been possible to develop an estimate for Stephens Lake because too few fish are captured. The last population estimate for the Upper Split Lake Area and Gull Lake was derived in 2014 (Hrenchuk *et. al.* 2015).

This report presents the results of the adult Lake Sturgeon population monitoring conducted in Clark Lake, the future Keeyask reservoir (*i.e.*, the Nelson River between Clark Lake and Gull Rapids [Map 2]) and in Stephens Lake (Map 3) in spring 2016, and compares these results to previous years. This is the first monitoring study conducted on adult Lake Sturgeon in the future Keeyask reservoir and in Stephens Lake since construction of the Project began in July 2014. Data collected during the field program address the adult population monitoring activity as well as provide information relevant to movement monitoring. The key questions set out in the AEMP for adult population monitoring were:

- Is there a biologically relevant (and statistically significant) change in the rate of population growth for the future Keeyask reservoir and Stephens Lake populations?
- Is there a biologically relevant (and statistically significant) change in survival for the future Keeyask reservoir and Stephens Lake populations?

[1] See the Fisheries Offsetting and Mitigation Plan for more information on the selection of stocking locations and the stocking plan.

- Is there a biologically relevant (and statistically significant) change in the condition factor of Lake Sturgeon?
- Is the relative abundance/CPUE of adult Lake Sturgeon in Stephens Lake changing?
- Over the long-term, is there a measureable effect on population growth due to stocking?
- Over the long-term, is the Lake Sturgeon population considered sustainable based on the size of the adult population and the population viability analysis?

Movement monitoring, as described in the AEMP, is based on both mark/recapture methods (this report) and acoustic telemetry (see adult movement report).

2.0 STUDY SETTING

Adult population monitoring in 2016 was conducted at three locations: 1) Clark Lake, 2) the future Keeyask reservoir, and 3) Stephens Lake.

Clark Lake is located immediately downstream of Split Lake, and approximately 42 km upstream of Gull Rapids (Map 1). Current is restricted to the main section of the lake, with off-current bays outside the main channel. The Assean River is the only major tributary to Clark Lake, and flows into the north side. Downstream from the outlet of Clark Lake, the Nelson River narrows and water velocity increases for a 3 km stretch, known as Long Rapids. For the next 7 km, the river widens, and water velocity decreases.

Birthday Rapids is located approximately 10 km downstream of Clark Lake and 30 km upstream of Gull Rapids (Maps 1 and 2). The drop in elevation from the upstream to downstream side of Birthday Rapids is approximately 2 m. The 14 km reach of the Nelson River between Birthday Rapids and Gull Lake is characterized as a large, somewhat uniform channel with medium to high water velocities. There are a few large bays with reduced water velocity and a number of small tributaries that drain into the Nelson River.

Gull Lake is a section of the Nelson River where the river widens, with moderate to low water velocity. Gull Lake is herein defined as the reach of the Nelson River beginning approximately 17 km upstream of Gull Rapids and 14 km downstream of Birthday Rapids, where the river widens to the north into a bay around a large point of land (Maps 1 and 2), and extending to the downstream end of Caribou Island, approximately 3 km upstream of Gull Rapids. Gull Lake has three distinct basins, the first extending from the upstream end of the lake downstream approximately 6 km to a large island; the second extending from the large island to Morris Point (a constriction in the river immediately upstream of Caribou Island); and the third extending from Morris Point to the downstream end of Caribou Island (Map 2).

Gull Rapids is located approximately 3 km downstream of Caribou Island on the Nelson River (Map 1). Two large islands and several small islands occur within the rapids, prior to the river narrowing. The rapids are approximately 2 km in length, and the river elevation drops approximately 11 m over this distance. Gull Rapids is the site of the Keeyask Generation Project. A summary of 2015/2016 construction activities is provided in Section 2.1.

Just below Gull Rapids, the Nelson River enters Stephens Lake. Stephens Lake was formed in 1971 by construction of the Kettle GS. Between Gull Rapids and Stephens Lake there is an approximately 6 km long reach of the Nelson River that, although affected by water regulation at the Kettle GS, remains riverine habitat with moderate velocity. Construction of the Kettle GS flooded Moose Nose Lake (north arm) and several other small lakes that previously drained into the Nelson River, as well as the old channels of the Nelson River that now lie within the southern portion of the lake. Major tributaries of Stephens Lake include the North and South Moswakot rivers that enter the north arm of the lake. Looking Back Creek is a second order

stream that drains into the north arm of Stephens Lake (Maps 1 and 3). Kettle GS is located approximately 40 km downstream of Gull Rapids.

2.1 CONSTRUCTION SUMMARY

Construction of the Keeyask GS began in mid-July 2014 with the construction of cofferdams in the north and central channels of Gull Rapids. These cofferdams resulted in the dewatering of the north and central channels and the diversion of all flow to the south channel. Construction of the spillway cofferdam, which extends into the south channel of Gull Rapids, was completed in 2015.

Work began to construct the Tailrace Summer Level Cofferdam on August 4 and 5, 2016 and then was suspended until October. Work also took place to widen the central portion of the Central Dam Cofferdam (Map 4) in late April and early May. With so little in-stream construction activity prior to completing field work in the fall, possible construction-related impacts to the aquatic environment during this period were limited to indirect effects (*e.g.*, potential impacts to water quality from discharge at the cofferdam, runoff from disturbed terrestrial areas).

Split Lake outflows from late 2015 to the end of June 2016 were relatively high, generally ranging between 3500-4000 m^3/s. The 75th percentile flow for Split Lake outflow is approximately 3,500 m^3/s. Flow increased sharply in July 2016, reaching a peak of 4,700 m^3/s in August, before declining. Water levels varied in conjunction with flow, however, some winter staging was apparent from December to May. During the winter of 2015/2016, water levels rose to approximately 155.5 m ASL. Water level on Gull Lake ranged from 154 – 155 m ASL for most of the open-water season.

3.0 METHODS

3.1 GILLNETTING

Large mesh gill nets were used to capture Lake Sturgeon in areas along the Nelson River: Clark Lake, the future Keeyask reservoir and in Stephens Lake. Gillnetting occurred from May 21 to June 29, 2016 upstream of Gull Rapids, and from May 25 to June 29, 2016, in Stephens Lake.

Gillnet gangs consisted of a combination of four 25 yd (22.9 m) long, 2.7 yd (2.5 m) deep panels of 8, 9, 10, and 12" (203, 229, 254, and 305 mm) twisted nylon stretched mesh. Each four-panel gang included one panel of each mesh size. Gill nets were checked approximately every 24 hours, weather permitting. At each gillnetting site, UTM coordinates were taken using a hand-held GPS unit (Garmin Limited, Olathe, Kansas).

Water temperature was measured daily in each area using a hand-held thermometer (±0.5°C). HOBO Water Temperature Pro data loggers (±0.2°C), set approximately 1 m off the substrate, were also used to log water temperature at 6-hour intervals in each of the study areas.

Captured Lake Sturgeon were measured for fork length (FL) and total length (TL; ±1 mm), weighed (with a hand-held or pan scale ±1 lb; converted to g for data analysis), and externally marked with an individually numbered plastic Floy-GD-94 T-bar anchor tag (Floy tag). Floy tags were inserted between the basal pterygiophores of the dorsal fin using a Dennison Mark II tagging gun. Each Lake Sturgeon was also tagged with an individually numbered Passive Integrated Transponder (PIT) tag (Oregon RFID Ltd., Portland Oregon). PIT tags were injected under the third dorsal scute using Oregon RFID tag injector needles, coated in Polysporin® to minimize the risk of infection. Tags were injected into muscle tissue (not the body cavity), parallel to the horizontal axis of the fish. Following implantation, the fish was scanned using an Agrident APR 350 Reader (Agrident Ltd., Steinkippenstrasse, Germany).

Sex and maturity were determined for individual adult Lake Sturgeon by applying pressure to the ventral surface of the fish to express gametes. If no gametes were expelled, sex and maturity codes were not assigned. The following sexual maturity codes were used:

Females (F)		Males (M)	
2 –	maturing to spawn (pre-spawn)	7 –	maturing to spawn (pre-spawn)
3 –	ripe	8 –	ripe
4 –	spent (post-spawn)	9 –	spent (post-spawn)
11 –	unknown	12 –	unknown

Species other than Lake Sturgeon caught inadvertently were measured for FL (TL for Burbot and Freshwater Drum) and released.

3.2 DATA ANALYSIS

As was done in previous years, data were analysed for all sizes of Lake Sturgeon captured (as opposed to only those measuring more than 800 mm FL). Mesh sizes used select for large Lake Sturgeon, and including all fish in the summary statistics ensures comparability among years.

Mean FL (mm), weight (g), and condition factor (K) were calculated for all first-time captures and recaptured Lake Sturgeon tagged in a previous year. Condition factor was calculated for individual fish based on the following equation (after Fulton 1911, in Ricker 1975):

$$K = W / (L^3 / 10^5)$$

Where:

W = round weight (g); and

L = fork length (mm)

Mean condition factor was calculated by 50 mm FL interval for adult Lake Sturgeon. Condition factor for pre-Project data (*i.e.*, 2001–2014 pooled) was then compared to the first year of monitoring data, by FL interval, using Mann-Whitney U-tests in XLSTAT® (Addinsoft 2006). Significance was determined using a *p*-value of 0.05.

A length-frequency distribution for Lake Sturgeon was plotted in 50 mm length intervals (*e.g.*, 1,000–1,049 mm).

A length-weight relationship was calculated using least squares regression analysis on logarithmic transformations of fork lengths and round weights according to the following relationship:

$$Log_{10}(W) = Log_{10}(a) + b*Log_{10}(L)$$

Where:

W = round weight (g);

L = fork length (mm);

a = Y-intercept; and

b = slope of the regression line.

Catch-per-unit-effort (CPUE) was calculated and expressed as the number of Lake Sturgeon captured in 45.7 m (50 yd) of net per 24-h period using the following formula:

CPUE = Σ # Lake Sturgeon / Σ gillnetting hours x 24 h / length of gill net used x 45.7 m

Where:

Σ = sum of the number of fish or gillnetting hours at all sites.

Set durations of all nets were standardized to 45.7 m net sets.

Lake Sturgeon tagged in previous years and recaptured in 2016 were included in all analyses; however, current-year recaptures (*i.e.,* those captured multiple times in the same sampling year) were excluded.

3.3 POPULATION ESTIMATION

Mark-recapture population estimates have been calculated for the future Keeyask reservoir during the spring of 11 different years (1995, 2001-2004, 2006, 2008, 2010, 2012, 2014, and 2016). Lake Sturgeon were tagged in 1995 in Gull Lake by Manitoba Fisheries Branch and the Split Lake Resource Management Board. All data for the period 2001–2012 were collected annually as part of environmental studies related to the pre-Project environment, while data from 2014 until 2044 will be collected biennially as part of monitoring studies related to the Keeyask Project.

The Jolly-Seber model (POPAN formulation; Arnason and Schwarz 2002), as implemented within MARK, was used to estimate the annual abundance of adult Lake Sturgeon upstream of Gull Rapids. Insufficient adult fish have been captured in Stephens Lake to date to permit calculation of a population estimate.

Detailed methods can be found in Appendix 3.

4.0 RESULTS

In total, 446 fish, comprised of seven species, were captured in large mesh gill nets set in Clark Lake and the future Keeyask reservoir, and in Stephens Lake during spring 2016 (Table 1). Of these, 261 were Lake Sturgeon. Tag and biological data for first-time Lake Sturgeon captures are presented in Appendix 1. Data from recaptured Lake Sturgeon are presented in Appendix 2.

4.1 UPSTREAM OF GULL RAPIDS

4.1.1 RELATIVE ABUNDANCE/CPUE

Sixty-five sites were fished between Clark Lake and Gull Rapids from May 21 to June 29, 2016 (Map 2). Water temperature increased from 8.5 to 16.5°C during the study (Figure 1). The catch (n=221) was comprised of four species, the majority of which (86%) were Lake Sturgeon (Table 1). A total of 190 Lake Sturgeon were captured in 16,736 gillnetting hours, resulting in an overall CPUE of 0.27 LKST/45.7 m net/24 h, ranging from 0.0-3.0 LKST/45.7 m net/24 h by site (Table 2).

Gillnetting effort was highest in the upper basin of Gull Lake (zone GL-A), at 4,839 hours (Table 3; Map 2). Lake Sturgeon CPUE was similar in all Gull Lake zones (Table 3; Map 2) and lowest in the reach of the Nelson River between Clark Lake and Birthday Rapids (zone BR-U). Overall CPUE by zone was:

- BR-U = 0.02 LKST/45.7 m net/24 h;
- BR-D = 0.11 LKST/45.7 m net/24 h;
- GL-A = 0.36 LKST/45.7 m net/24 h;
- GL-B = 0.35 LKST/45.7 m net/24 h; and
- GL-C = 0.37 LKST/45.7 m net/24 h (Table 3).

The first Lake Sturgeon was captured on May 22, 2016 (the first day nets were checked), when the water temperature measured 9.1°C, and the last Lake Sturgeon was captured on the final day of sampling on June 29, 2016, when the water temperature measured 16.5°C (Figure 1; Appendix 1). The catch peaked on May 22, 2016 (n = 18).

4.1.2 BIOLOGICAL METRICS

Captured Lake Sturgeon had a mean FL of 872 mm (range: 301–1,439 mm), a mean weight of 7,569 g (range: 227-33,566 g), and a mean condition factor of 0.90 (range: 0.49-1.46; Table 4).

Of the 190 Lake Sturgeon caught, 119 were considered adults and 71 juveniles. Lake Sturgeon in the 850-899 mm FL interval were the most abundant. This interval made up 15% (n = 28) of the total catch and 24% of the adult catch (Figure 2).

Statistical comparison indicated that the mean condition factor was significantly higher for adult Lake Sturgeon captured in 2016 relative to those captured prior to the onset of construction (*i.e.*, 2001–2014 data pooled) for the 800 – 849 mm FL interval only (Mann-Whitney U test, $p < 0.05$; Figure 3). The length-weight relationship is presented in Figure 4.

Sex and maturity were determined for 22 individuals, 16 pre-spawn and two ripe males, as well as two ripe females and two pre-spawn females (Table 5). These fish were captured between May 22 and June 1, when water temperature ranged from 9.0 to 10.6˚C. The two pre-spawn females (Floy tag #80375 and #94083) were used as broodstock for a stocking program along with two males (Floy tag #48926 and #107245). Details on gamete collection, egg fertilization, egg transport, hatch, larval rearing, and stocking can be found in Klassen *et al*., 2017. Sexually mature Lake Sturgeon were captured immediately downstream of Birthday Rapids (zone BR-D; n=4), in the upper reach of Gull Lake (zone GL-A; n=17), and in the lower reach of Gull Lake (GL-C; n=1).

4.1.3 MOVEMENTS

Floy tags were applied to all 114 newly captured Lake Sturgeon (Appendix 1). The remaining 76 fish (40% of the total catch) were tagged in a previous year (Appendix 2), as follows:

- 71 were originally tagged in the future Keeyask reservoir between 2001 and 2014.
    - Thirty-four have been captured multiple times since the original date of tagging.
        - Thirty-three were recaptured only within the future Keeyask reservoir.
        - One (Floy tag #76414) was originally tagged immediately downstream of Birthday rapids in 2006. It was recaptured twice in the Kelsey GS area in 2013.
    - Four (Floy tag #76484, #77507, #77508, and #77510) were implanted with acoustic transmitters in Gull Lake in 2011. Details on their movements since this time can be found in Hrenchuk and Barth (2017).
- Two were originally tagged in Stephens Lake.
    - Floy tag #56202/80420 was originally captured in zone STL-B in 2003, and was recaptured in 2016 in zone BR-D, approximately 45 km upstream of its original capture location (Maps 2 and 3).
        - This fish was implanted with an acoustic transmitter (ID #16029) in Stephens Lake in June 2011. It moved upstream into Gull Lake between July and

August 2011. Details of its movements can be found in Hrenchuk and Barth (2017).

- Floy tag #74415 was originally captured in zone GR-A of Stephens Lake in 2011 and was recaptured in 2016 in zone GL-C, approximately 11 km upstream.
  - This fish was implanted with an acoustic transmitter (ID #16038) in Stephens Lake in June 2011. It moved upstream into Gull Lake on September 13, 2012. Details of its movements can be found in Hrenchuk and Barth (2017).

- One was originally tagged in the Kelsey GS area.
  - Floy tag #94458 was originally marked in 2011 and was recaptured in 2016 in Gull Lake (zone GL-A), approximately 75 km downstream from its original capture location.
- Two Lake Sturgeon could not be traced back to their initial date of tagging due to sampling error (*i.e.*, the wrong tag numbers were recorded at the time of initial capture or upon recapture).

4.1.4 POPULATION ESTIMATION

The population estimate for the future Keeyask reservoir in 2016 was 709 individuals (range 588–853), which was greater than the 95% confidence limits estimated between 2002 and 2004, but within the 95% confidence limits of the estimates made for 1995, 2001, and 2006–2014 (Figure 5; Appendix 3, Table A3-1).

The population lambda (growth rate) in 2016 was less than one (0.96) which may indicate a decline from the preceding period, but the 95% confidence interval extends to an upper limit of 1.08, indicating that the population may be stable (Figure 5, Appendix 3, Table A3-2). Inclusion of the 2016 data resulted in an annual survival rate estimate for the period 2004–2016 of 0.91 (91%) (Appendix 3, Table A3-2).

4.2 STEPHENS LAKE

4.2.1 RELATIVE ABUNDANCE/CPUE

Large mesh gill nets were set in 90 locations in Stephens Lake from May 25 to June 29, 2016, during which time water temperatures ranged from 8.7 to 16.2°C (Figure 6; Map 3). A total of 225 fish were captured, comprised of seven species (Table 1). A total of 71 Lake Sturgeon were captured, representing 32% of the total catch (Table 1). The 71 Lake Sturgeon were captured in 17,037 gillnetting hours, resulting in an overall CPUE of 0.10 LKST/45.7 m net/24 h, ranging from 0.0–1.1 LKST/45.7 m net/24 h by site (Table 2).

Overall CPUE by zone (Table 3) was:

- GR-A = 0.11 LKST/45.7 m net/24 h;
- STL-A = 0.12 LKST/45.7 m net/24 h; and
- STL-B = 0.03 LKST/45.7 m net/24 h.

The first Lake Sturgeon was captured on May 26 at a water temperature of 9.4°C, and the last on June 27 at a water temperature of 15.7°C (Figure 6; Appendix 1). The catch was the highest on May 28, 2016 (n = 10) when water temperature measured 9.7°C (Figure 6; Appendices 1 and 2).

4.2.2 BIOLOGICAL METRICS

Captured Lake Sturgeon had a mean FL of 902 mm (range: 343–1,425 mm), a mean weight of 6,740 g (range: 253–22,680 g), and a mean condition factor of 0.85 (range: 0.63–1.20) (Table 4). Thirteen of the 71 captured Lake Sturgeon (18%) were classified as juveniles. Lake Sturgeon in the 850–899mm FL interval were the most abundant, representing 28% (n = 20) of the total catch and 34% of the adult catch (Figure 7). Mean condition factor did not differ significantly between baseline studies for any of the eight FL intervals compared (Mann-Whitney U test, $p > 0.05$) (Figure 8). The length-weight relationship is presented in Figure 9.

Sex and maturity were determined for eight fish, including four pre-spawn and four ripe males (Table 5). Two pre-spawn males were captured immediately downstream of Gull Rapids (zone GR-A), and the remainder were caught in upper Stephens Lake (zone STL-A) (Map 3). The ripe males were captured on May 28 and 29, as well as June 16, 2016, when water temperature measured 9.7, 10.0, and 13.2ºC, respectively (Figure 6).

4.2.3 MOVEMENTS

Floy tags and PIT tags were applied to all 55 newly captured Lake Sturgeon. The remaining 16 fish (23% of the total catch) were recaptures tagged in a previous year (Appendix 2), as follows:

- Fifteen were originally tagged in Stephens Lake between 2001 and 2014.
    - Eight have been captured multiple times since the original date of tagging
        - Seven were captured only in Stephens Lake
        - One (Floy tag #46827) was originally tagged immediately downstream of Gull Rapids in 2001. It was recaptured downstream of Birthday Rapids in 2003.
    - Three (Floy tag #69868, #88788, and #93924) were implanted with acoustic transmitters in Stephens Lake in 2011. Details on their movements since this time can be found in Hrenchuk and Barth (2017).

  - The remaining four fish were captured a single time in Stephens Lake.

- One was originally captured in Gull Lake (Floy tag #75317) in 2008 and was recaptured in the same area in 2012. In 2016, it was recaptured in Stephens Lake (zone STL-A) approximately 14 km downstream from its original capture site.

5.0 DISCUSSION

The main objective of the long-term adult Lake Sturgeon population monitoring program in the future Keeyask reservoir and Stephens Lake is to identify potential changes in abundance and condition factor during construction and operation of the Project. Adult Lake Sturgeon population monitoring is planned to continue until 2044.

5.1 EVALUATION OF METHODOLOGY

Keeyask adult Lake Sturgeon population monitoring data are currently being collected by location (Upper Split Lake and future Keeyask reservoir/Stephens Lake) every two years. Given that rapid changes to the adult population are not expected, this sampling frequency is expected to be adequate to track long-term change. Analysis suggests that estimates have remained largely in line with previous years estimates; there have not been years where estimates differ significantly or considerable numbers of outliers (*i.e.*, large increases in untagged fish) have become evident. This suggests the methodology to estimate adult Lake Sturgeon abundance in this study area is performing well.

The Keeyask population estimate methodology has employed double tagging (Floy and PIT) since 2014, which is expected to improve confidence in the data set by minimizing the probability of misidentifying marked fish as unmarked. Population estimates are based on the recapture rate in relation to the total number of fish tagged, with lower recapture rates yielding higher population estimates (and vice versa). An over-estimate of the population occurs when the recapture rate is artificially low, for example when tags are lost or tagged fish are harvested and not reported. While double tagging is expected to reduce the number of tags lost, the lack of tag returns from domestic harvesters is a confounding factor.

5.2 ADULT LAKE STURGEON ABUNDANCE

Abundance estimates derived in 2012, 2014, and 2016 from the future Keeyask reservoir are relatively similar with actual abundance estimates differing by 102 individuals; confidence intervals around the estimates have overlapped for these years (Figure 5). In 2016, the population estimate was 709 adults (95% CI 599–854), the 2014 estimate was 758 (95% CI 608–945), while the 2012 estimate was 811 (95% CI 613–2075). Similarly, the estimated rate of population growth (lambda) has varied slightly around one since 2010, with the 95% confidence interval generally including one (Figure 5, Appendix 3, Table 3A-2). Based on these results, the adult Lake Sturgeon population in the future Keeyask reservoir is considered stable. The current status represents an improvement in the population's status when compared to results from the

early years of monitoring (2001–2004; Figure 5) when the estimated number of fish ranged from 395–565 and was lower (significantly so in 2002–2004) than in 2016 (Table A3-1).

Addition of data collected in 2016 to the population model did not indicate a substantial change in the survival rate, so a single rate for the 2004–2016 period continued to be used in the population model. The calculated survival rate remains high, at 91%, which is greater than the estimate determined for the 2001–2004 period (78%, Table A3-2). It is also higher than annual survival rates calculated both for the Burntwood (87%) and Kelsey GS area (75%) populations in 2015 (Henderson *et al*., 2016).

In Stephens Lake, the number of Lake Sturgeon captured in 2016 (n=71) was the highest ever recorded from this location. Although effort was also higher, the CPUE was greater than noted during similar programs since 2001 (Table 2). The catch was comprised primarily of younger fish (measuring less than 1000 mm) recently recruited to the adult population (Figure 7). Although qualitative, these data suggest the Stephens Lake adult population may be increasing. Up until 2016, the number of Lake Sturgeon captured in Stephens Lake has been considered too low to facilitate calculation of a meaningful population estimate. Given the numbers observed in 2016 and assuming similar numbers are captured in 2018 and 2020, it is expected that a meaningful population estimate can be calculated after three iterations of data collection (*i.e.*, 2020).

5.3 SPAWNING

In 2016, 22 Lake Sturgeon in spawning condition were captured upstream of Gull Rapids. The majority of spawning individuals (n=17 or 77%) were captured where the Nelson River enters Gull Lake (zone GL-A), with other spawning individuals captured downstream of Birthday Rapids (zone BR-D; n= 4; 18%) and in the lower basin of Gull Lake (zone GL-C; n=1; 5%) (Maps 2 and 3). These locations are similar to capture locations in previous years (Hrenchuk *et al.* 2015).

As previously discussed, adult abundance in Stephens Lake is lower than in the future Keeyask reservoir; therefore, the number of adults spawning each year is also expected to be lower. Twenty-two adult Lake Sturgeon were captured in spawning condition in Stephens Lake during all years of pre-construction sampling (2001–2014) combined. In 2016, eight adult males in spawning condition were captured downstream of Gull Rapids (the only suitable spawning habitat for Lake Sturgeon in Stephens Lake), suggesting that (along with the observed increased abundance of adult Lake Sturgeon) a higher number of Lake Sturgeon may also be spawning at Gull Rapids. In an attempt to confirm that Lake Sturgeon spawned at Gull Rapids in 2016, two drift nets were set to capture eggs and/or larvae; none were captured (NSC unpublished data).

5.4 SIZE DISTRIBUTION AND CONDITION FACTOR

Based on the size distribution of Lake Sturgeon captured in the future Keeyask reservoir, there will likely be an increase in the number of spawning fish in the near future. Of the 190 Lake Sturgeon captured, 119 (63%) were large enough to be considered adults, while 71 (37%) were considered juveniles. Of the 71 juveniles captured, 57 (80%) measured over 600 mm FL and 20 (28%) measured over 700 mm FL. Soon these fish will be recruited to the adult population. A similar trend was observed in Stephens Lake. Of the 13 juvenile fish captured, 12 (92%) measured over 600 mm FL and nine (69%) measured over 700 mm FL.

Condition factor of adult Lake Sturgeon captured during baseline studies and in 2016 were similar for the majority of size classes in both the future Keeyask reservoir and Stephens Lake. Mean condition factor in 2016 was significantly higher than baseline for only the 800–849 mm size class in the future Keeyask reservoir. Future monitoring will indicate whether this difference persists and is biologically significant or just reflects natural variability within the catch. Mean condition factor in 2016 did not differ from baseline for any of the eight size classes within Stephens Lake. Overall, average condition factors from both areas (0.90 in the future Keeyask reservoir and 0.85 in Stephens Lake) continue to fall within typical ranges seen for adult Lake Sturgeon in Manitoba.

5.5 MOVEMENT

Lake Sturgeon in the future Keeyask reservoir and Stephens Lake have mostly been recaptured within the same waterbody as their initial capture; however, movement between zones within a waterbody are common. Only a small proportion of sturgeon have moved long distances. Of the 76 recaptures in the future Keeyask reservoir in 2016, only four (5%) are known to have moved outside the waterbody in which they were initially captured: two (Floy Tag #76414 and #94458) were previously captured in the Kelsey GS area; and two (#56202/80420 and #74415) were originally captured in Stephens Lake as part of an acoustic tagging study. Similarly, only a small proportion (n=2, 3%) of the fish captured in Stephens Lake in 2016 have been recaptured in other waterbodies: two fish (#75317 and #46827) were originally captured in the future Keeyask reservoir.

Since 2011, an acoustic telemetry study carried out from Clark Lake to the Limestone reservoir (Map 1) has tracked 9 movements of sturgeon through Gull Rapids (6 upstream and 5 downstream) (Hrenchuk and Barth 2017). This number includes two fish that were recaptured in the current study. Both studies show that large-scale movements of these fish are generally rare and unless they are moving to a spawning area, adult Lake Sturgeon tend to remain within a general area (*e.g.*, the upper basin of Gull Lake).

5.6 KEY QUESTIONS

Information pertinent to the key questions provided in the AEMP for adult Lake Sturgeon monitoring are addressed below.

Is there a biologically relevant (and statistically significant) change in the rate of population growth for the future Keeyask reservoir population?

The rate of population growth for the Keeyask adult Lake Sturgeon population has remained relatively stable since studies began. The population is currently considered stable (neither increasing nor decreasing).

Is there a biologically relevant (and statistically significant) change in survival for the future Keeyask reservoir population?

Inclusion of the 2016 data into the calculated survival rate for the 2004–2016 period indicates that survival remains high (91%).

Is there a biologically relevant (and statistically observable) change in the condition factor of Lake Sturgeon?

Condition factor of adult Lake Sturgeon captured during baseline studies and in 2016 were similar for the majority of size classes in both the future Keeyask reservoir and Stephens Lake. Mean condition factor in 2016 was significantly higher than baseline for a single size class (*i.e.*, 800–849 mm) in the future Keeyask reservoir, and did not differ significantly for any size class within Stephens Lake.

Is the relative abundance/CPUE of adult Lake Sturgeon in Stephens Lake changing?

The CPUE of adult Lake Sturgeon in 2016 in Stephens Lake (0.10 LKST/45.7 m net/24 h) was higher than reported in previous years with comparable sampling effort (0.01 – 0.09 LKST/45.7 m net/24 h). The majority of the adults captured in 2016 measured less than 1,000 mm FL, indicating the increased number of fish is due to recruitment of juveniles to the adult segment of the population. Assuming similar numbers of fish are captured during monitoring in 2018 and 2020, it should be possible to derive a population estimate for this area.

6.0 SUMMARY AND CONCLUSIONS

- Spring 2016 adult population monitoring was conducted in Clark Lake, the future Keeyask reservoir, and Stephens Lake, to provide information on Lake Sturgeon abundance, size and condition. The number of spawning fish was also recorded.
- A total of 261 Lake Sturgeon were captured: 190 upstream of Gull Rapids and 71 in Stephens Lake. Of these, 119 upstream of Gull Rapids and 58 in Stephens Lake were considered adults (>800 mm fork length).
- Of the 190 Lake Sturgeon captured upstream of Gull Rapids, 22 were in spawning condition: 18 pre-spawn or spawning males and 4 spawning condition females.
- Of the 71 Lake Sturgeon captured in Stephens Lake, 8 were pre-spawn or spawning males. No females were identified.
- Mark-recapture data indicate that long-range movements are rare and that fish tend to remain in the area in which they were tagged. Monitoring will reveal if long-range movements become more common as construction of the GS progresses (emigration of Lake Sturgeon in response to water level changes in Gull Lake was identified as a potential effect of the construction of the Keeyask GS).
- Key questions in the AEMP related to Lake Sturgeon monitoring in the future Keeyask reservoir and Stephens Lake are addressed below:
    - *Is there a biologically relevant (and statistically significant) change in the rate of population growth for the future Keeyask reservoir?*

      Abundance estimates derived in 2012, 2014, and 2016 from the future Keeyask reservoir are relatively similar. In 2016, the population estimate was 709 adults (95% CI 599–854), the 2014 estimate was 758 (95% CI 608–945), while the 2012 estimate was 811 (95% CI 613–2075). Although there is a slight downward trend, analysis suggests that there is not a statistically significant difference in the population estimates for these three years. Similarly, the estimate for the rate of population growth (lambda) has been similar since 2010 and is not significantly different from one (*i.e.*, a stable population).
    - *Is there a biologically relevant (and statistically significant) change in survival for the future Keeyask reservoir population?*

      The survival rate estimate is defined as the percentage of the population of adult Lake Sturgeon within a given area that survives until the next year (*i.e.*, a survival rate of 75% would mean that 75 out of 100 fish survive). It is affected by natural mortality and fishing mortality through harvest. The population model was used to estimate a constant survival rate (*i.e.*, the proportion of the population that survives each year) for the future Keeyask reservoir population (Appendix 3).

Inclusion of the 2016 data into the calculated survival rate for the 2004–2016 period indicates that survival remains high (91%). This is higher than the 2015 survival rates for the Burntwood (87%) and Kelsey (75%) populations.

- *Is there a biologically relevant (and statistically observable) change in the condition factor of Lake Sturgeon?*

  Condition factor of adult Lake Sturgeon captured during baseline studies and in 2016 were similar for the majority of size classes in both the future Keeyask reservoir and Stephens Lake. Mean condition factor in 2016 was significantly higher than baseline for a single size class (*i.e.,* 800–849 mm) in the future Keeyask reservoir, and did not differ significantly for any size class within Stephens Lake.

- Is the relative abundance/CPUE of adult Lake Sturgeon in Stephens Lake changing?

  The CPUE of adult Lake Sturgeon in 2016 (0.10 LKST/45.7 m net/24 h) was higher than those reported in previous years with comparable sampling programs (0.01 – 0.09 LKST/45.7 m net/24 h), indicating the population is likely increasing.

- Results of the 2016 monitoring do not indicate any need to modify the monitoring planned for 2018.
- Continued monitoring will identify long-term trends in adult size, condition, survival, spawning, and whether coarse scale movement patterns have been altered.

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TABLES

Table 1: Number of fish, by species, captured during adult Lake Sturgeon population monitoring upstream of Gull Rapids (CL-GR) and Stephens Lake, 2016

Common Name	Scientific Name	Abbreviation	Upstream (CL-GR)	Stephens Lake	Total
Freshwater Drum	*Aplodinotus grunniens*	FRDR	-	3	3
Lake Sturgeon	*Acipenser fulvescens*	LKST	190	71	261
Longnose Sucker	*Catostomus catostomus*	LNSC	-	1	1
Northern Pike	*Esox lucius*	NRPK	20	60	80
Sauger	*Sander canadensis*	SAUG	2	52	54
Walleye	*Sander vitreus*	WALL	9	34	43
White Sucker	*Catostomus commersonii*	WHSC	-	4	4

Table 2: Adult Lake Sturgeon catch-per-unit-effort (CPUE; # LKST/45.7 m net/24 h) values observed during mark/recapture studies upstream of Gull Rapids and Stephens Lake from 2001–2016.

Location	Year	# Sites	Total Lake Sturgeon[a]	Total Gillnet hours	Total CPUE
Nelson River (CL-GR)[b]	2001	37	60	4538	0.32
	2002	19	59	4918	0.29
	2003	30	85	7565	0.27
	2004	17	51	6907	0.18
	2006	22	150	12587	0.29
	2008	16	52	9960	0.13
	2010	18	65	9128	0.17
	2011	38	34	5895	0.12
	2012	42	116	11332	0.25
	2014	62	239	17897	0.32
	2016	**65**	**190**	**16736**	**0.27**
Stephens Lake[c]	2001*	18	24	6254	0.09
	2002*	15	4	3250	0.03
	2003	29	24	9638	0.06
	2004*	8	5	4638	0.03
	2005	72	7	12303	0.01
	2006	40	14	8926	0.04
	2010*	37	17	4898	0.08
	2011*	49	18	4410	0.06
	2012*	23	15	3555	0.10[d]
	2014	5	9	473	0.45[d]
	2016	**90**	**71**	**17037**	**0.10**

a. Does not include fish recaptured in the same waterbody in the season/year in which they were tagged.

b. Nelson River from Clark Lake (CL) to Gull Rapids (GR).

c. * Indicates studies where gillnetting was conducted primarily in the reach of Stephens Lake extending 6 km downstream of Gull Rapids.

d. CPUE value reflects study objective (fish captured for acoustic tagging) and may not be comparable to studies conducted during previous years.

Table 3: Number and catch-per-unit-effort (CPUE; # LKST/45.7 m net/24h) values, by zone, observed during adult Lake Sturgeon population monitoring upstream of Gull Rapids and in Stephens Lake, spring, 2016.

Location	Zone	# Sites	Total # Lake Sturgeon[a]	Total Gillnet Hours	Total CPUE
Nelson River (CL-GR)	BR-U	10	1	1233	0.02
	BR-D	23	19	4160	0.11
	GL-A	15	72	4839	0.36
	GL-B	7	47	3238	0.35
	GL-C	10	51	3266	0.37
Stephens Lake	GR-A	31	19	4023	0.11
	STL-A	44	48	9404	0.12
	STL-B	15	4	3609	0.03

a. Does not include fish recaptured in the same waterbody in the season/year in which they were tagged.

Table 4: Mean fork length (mm), weight (g), and relative condition factor (K) of Lake Sturgeon captured during adult Lake Sturgeon population monitoring upstream of Gull Rapids and in Stephens Lake, from 2001–2016.

Location	Year	Fork Length (mm)				Weight (g)				K		
		n[c]	Mean	Std[d]	Range	n[c]	Mean	Std[d]	Range	n[c]	Mean	Range
Nelson River (CL-GR)[a]	2001	79	1022	148	739–1355	78	9984	5059	3500–24000	78	0.88	0.64–1.26
	2002	67	1055	149	680–1415	66	12198	6367	2722–34020	66	0.97	0.73–1.44
	2003	92	1067	148	700–1540	87	11949	6681	3000–54431	87	0.94	0.67–1.49
	2004	51	1149	152	870–1468	51	14115	6747	5443–31298	51	0.87	0.67–1.10
	2006	150	1003	217	300–1550	146	10343	7071	1134–43091	146	0.86	0.61–1.44
	2008	92	1057	223	648–1551	50	12186	8207	2268–40823	50	0.87	0.66–1.09
	2010	65	901	267	443–1390	65	8056	6977	500–29937	65	0.83	0.57–1.11
	2011	34	1090	219	664–1610	34	13209	9052	2268–43092	34	0.89	0.61–1.19
	2012	116	844	284	330–1620	116	7536	8214	200–37648	116	0.85	0.51–1.23
	2014	239	838	229	449–1640	238	6111	5873	650–29710	238	0.82	0.38–1.39
	2016	**189**	**872**	**229**	**301–1439**	**184**	**7569**	**6531**	**227–33566**	**184**	**0.90**	**0.49–1.46**
Stephens Lake[b]	2001*	24	1077	181	792–1447	24	13148	9499	4400–40000	24	0.94	0.71–1.56
	2002*	4	1045	51	1001–1100	4	10888	2995	8050–15000	4	0.94	0.80–1.13
	2003	24	1018	206	555–1340	23	11212	7205	1700–26000	23	0.90	0.61–1.20
	2004*	5	1180	112	1025–1324	4	15347	4577	9450–20412	4	0.97	0.72–1.32
	2005	7	922	130	763–1100	7	8701	4989	3636–15455	7	1.00	0.82–1.44
	2006	14	1144	162	902–1421	13	13224	6071	5897–24948	13	0.86	0.73–1.03
	2010*	17	1028	162	730–1349	16	9993	5272	3200–24040	16	0.83	0.65–0.98
	2011	18	890	255	362–1208	12	9053	3984	1082–16556	12	0.87	0.76–0.99
	2012	15	896	144	645–1176	11	7468	3113	3901–14969	11	0.92	0.74–1.07
	2014	9	941	115	810–1150	9	6854	3374	4082–13608	9	0.77	0.66–1.01
	2016	**71**	**902**	**152**	**343–1425**	**69**	**6740**	**3540**	**253–22680**	**69**	**0.85**	**0.63–1.20**

a. Nelson River from Clark Lake (CL) to Gull Rapids (GR).

b. *Indicates studies where gillnetting was conducted primarily in the reach of Stephens Lake extending 6 km downstream of Gull Rapids.

c. Number of fish measured.

d. Standard deviation.

Table 5: Sex and maturity data for Lake Sturgeon captured upstream of Gull Rapids and in Stephens Lake during adult Lake Sturgeon population monitoring, spring, 2001–2016.

Location	Year	Sex and Maturity[b]							# of Spawners	Unknown Maturity	Total
		Male			Female						
		7	8	9	2	3	4	11			
Nelson River (CL-GR)[a]	2001	5	10	1	3	-	-	-	19	41	60
	2002	8	1	5	-	-	-	-	14	46	60
	2003	3	-	-	1	-	-	-	4	89	93
	2004	3	2	-	-	-	-	-	5	46	51
	2006	13	3	-	-	-	-	-	16	134	150
	2008	1	1	1	-	-	-	-	3	49	52
	2010	5	3	-	-	-	-	-	8	57	65
	2011	6	4	1	1	1	2	-	15	19	34
	2012	1	4	2	-	-	-	-	7	109	116
	2014	8	7	2	4	-	3	-	24(21)*	227	248
	2016	**16**	**2**	**-**	**-**	**2**	**-**	**2**	**22**	**168**	**190**
Stephens Lake	2001	5	-	-	3	-	-	-	8	16	24
	2002	3	-	-	-	-	-	-	3	1	4
	2003	2	-	-	1	-	-	-	3	21	24
	2004	-	-	-	-	-	-	-	-	5	5
	2005	-	-	-	-	-	-	-	-	7	7
	2006	-	1	-	-	-	-	-	1	15	16
	2010	-	-	-	-	-	-	-	-	17	17
	2011	1	-	-	-	-	-	-	1	29	30
	2012	3	1	-	-	-	-	-	4	11	15
	2014	-	2	-	-	-	-	-	2	7	9
	2016	**4**	**4**	**-**	**-**	**-**	**-**	**-**	**8**	**63**	**71**

a. Nelson River from Clark Lake (CL) to Gull Rapids (GR).

b. Refer to Section 3.2 for maturity codes.

* Maturity status columns include recaptures of fish whose maturity status progressed between captures (*e.g.*, would include recaptures of fish initially captured in maturing condition and recaptured in ripe or spent condition). Number in brackets indicates the total number of individual spawners captured.

FIGURES

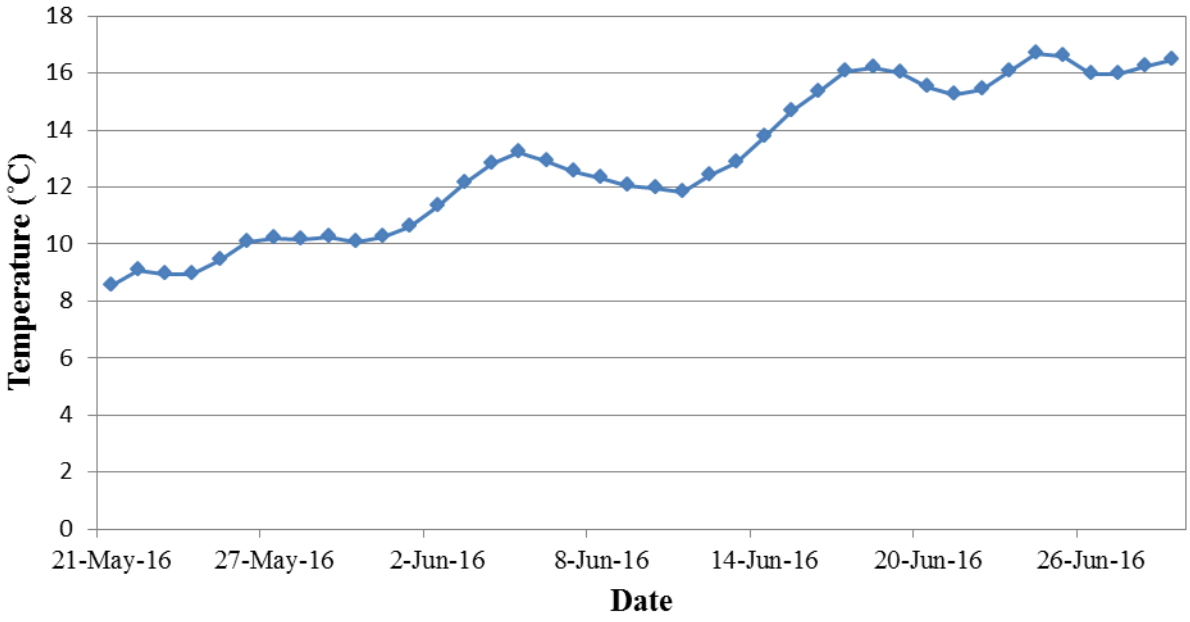


Figure 1: **Mean daily water temperature in the Nelson River mainstem, as measured in Gull Lake, May 21 to June 29, 2016.**

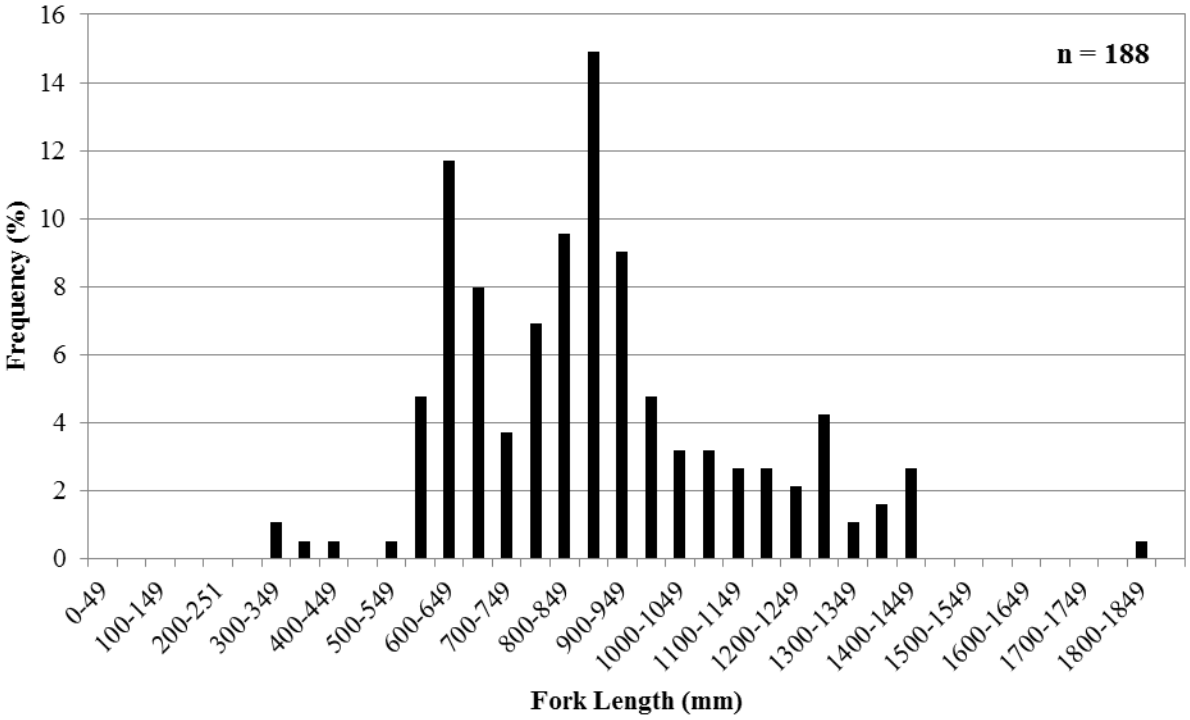


Figure 2: **Length-frequency distribution for Lake Sturgeon captured in large mesh gill nets set upstream of Gull Rapids during spring, 2016.**

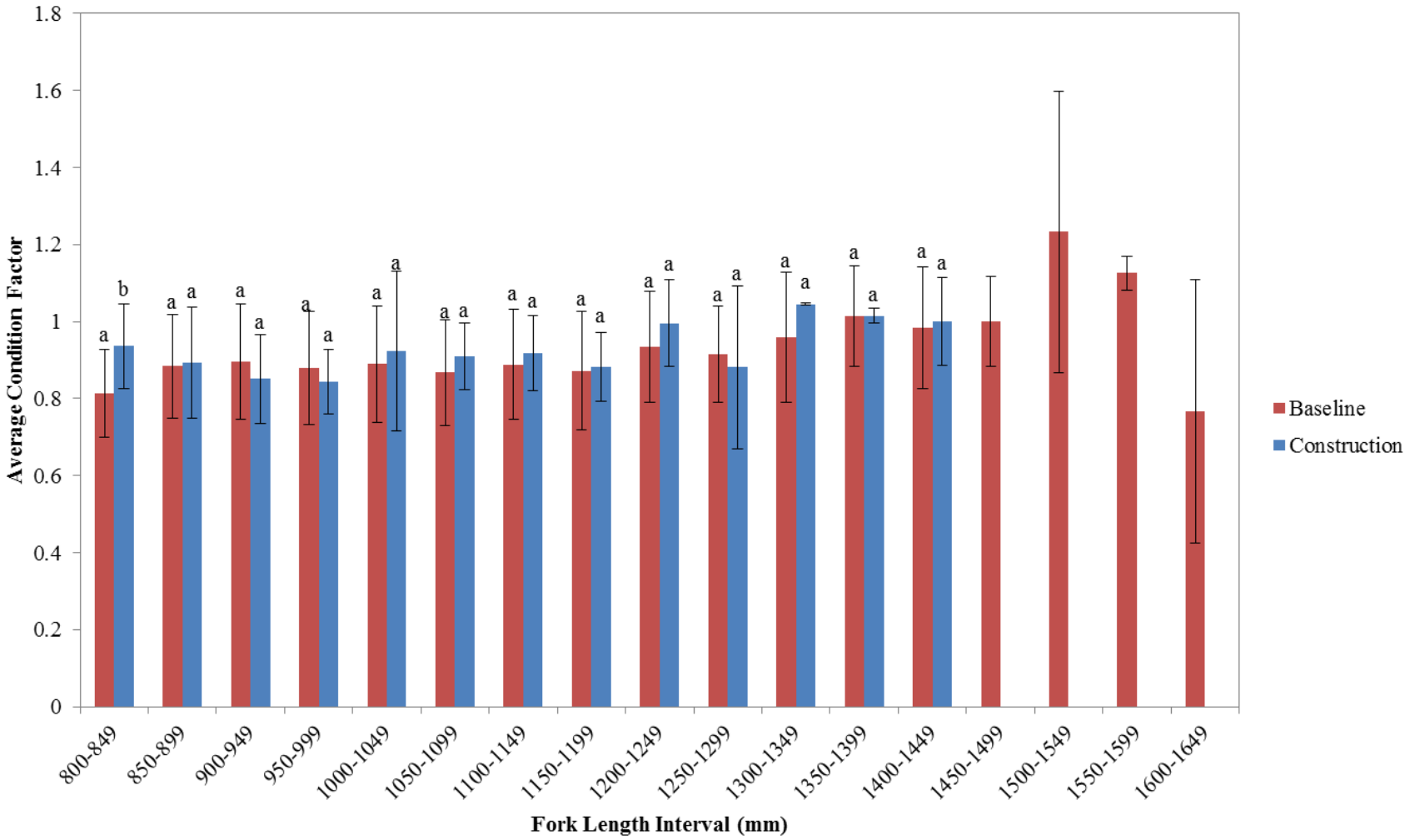


Figure 3: **Mean condition factor by 50 mm length intervals for adult (> 800 mm) Lake Sturgeon captured upstream of Gull Rapids during baseline studies (red bars) and 2016 (blue bars). Letters denote significant differences between groups (Mann Whitney U test, P < 0.05). Error bars represent standard deviations.**

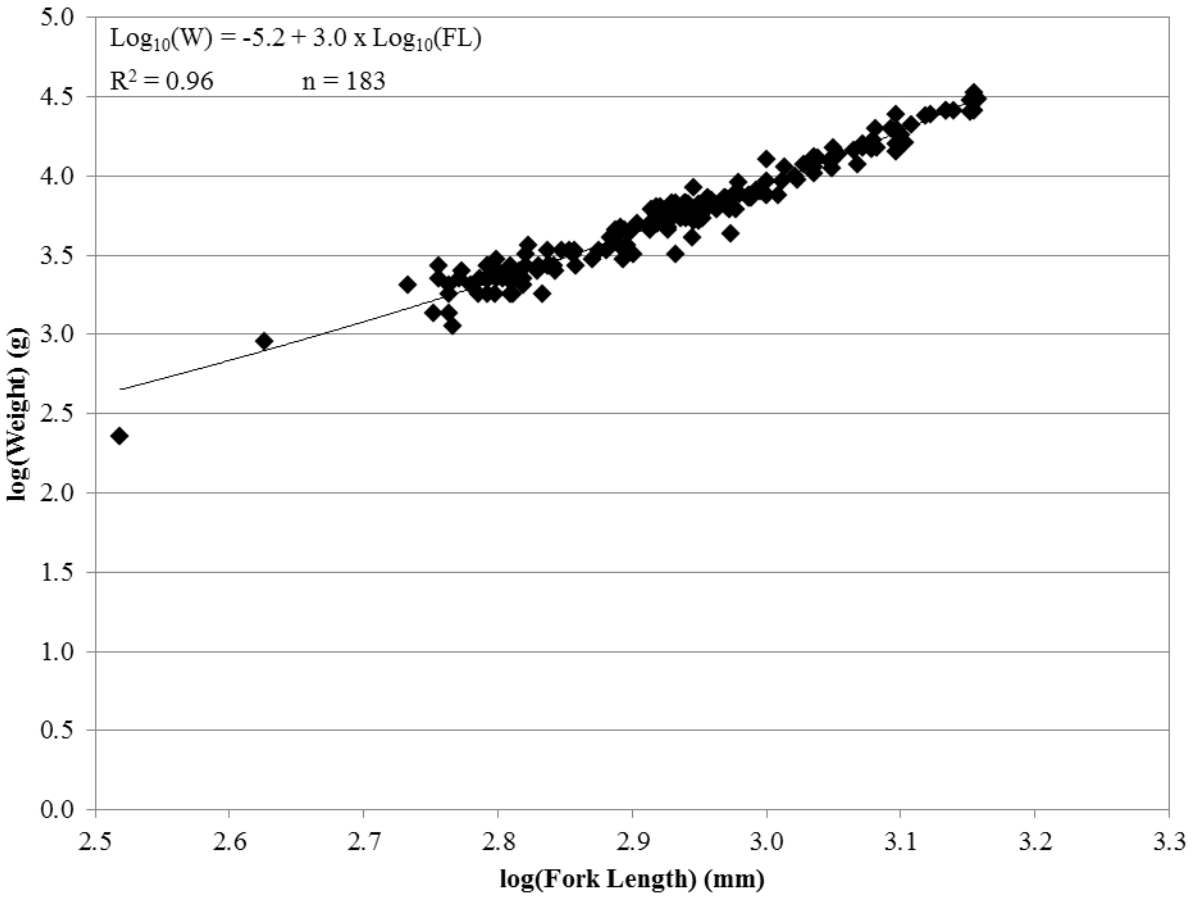


Figure 4: Length-weight regression for Lake Sturgeon captured in large mesh gill nets set upstream of Gull Rapids during spring, 2016.

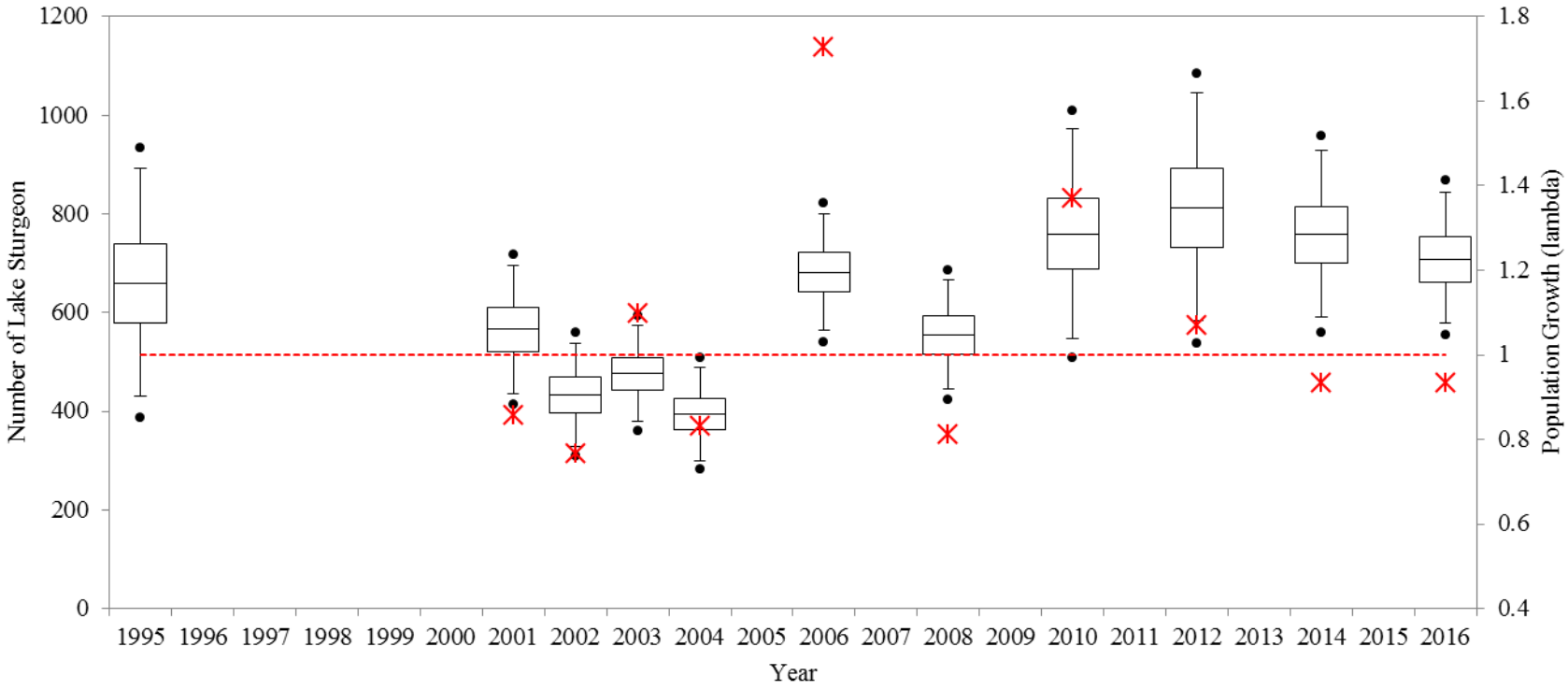


Figure 5: **Adult Lake Sturgeon abundance estimates based on POPAN best model (left y-axis) and population growth estimates based on the Pradel Lambda model (right y-axis) for upstream of Gull Rapids (1995–2016). Results of the POPAN abundance estimate are presented in black. Horizontal line inside the box represents the estimated abundance (*i.e.*, the number of adult Lake Sturgeon in the area during the time of capture), the dots represent the min and max estimates, and the vertical bar lines represent the upper and lower 95% confidence intervals. Results of the Pradel Lambda population growth analysis are presented in red. The population lambda (*i.e.*, growth rate) is represented by an asterisk. The dotted line represents zero population growth (equilibrium), therefore lambda values above this line represent population growth, and those below represent population decline.**

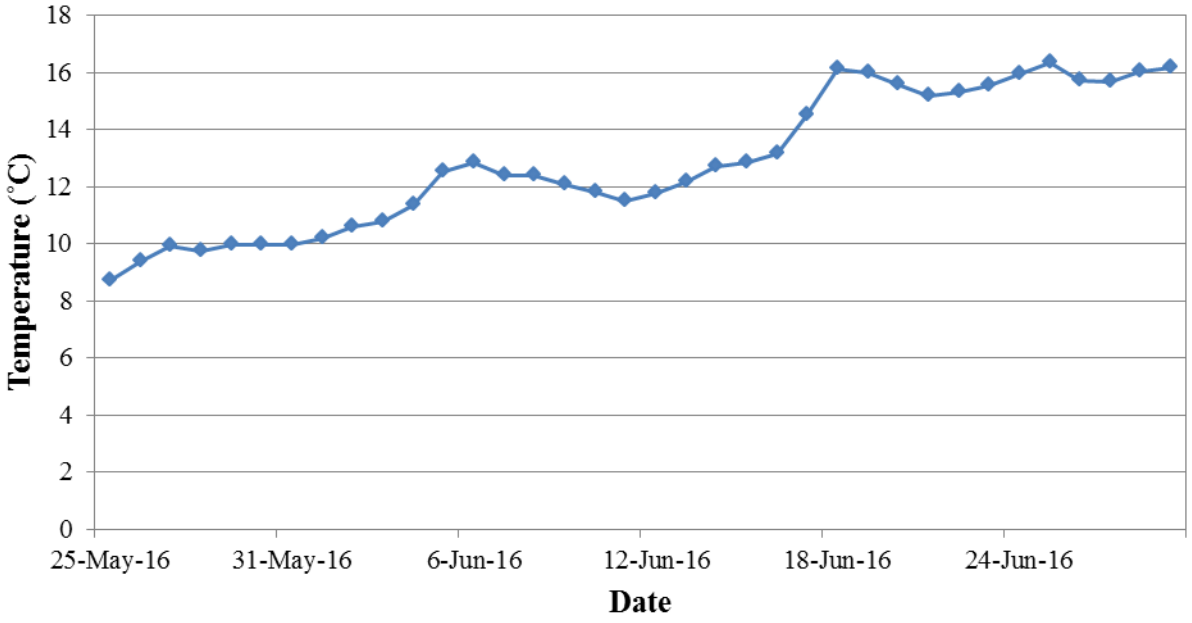


Figure 6: Mean daily water temperature in Stephens Lake.

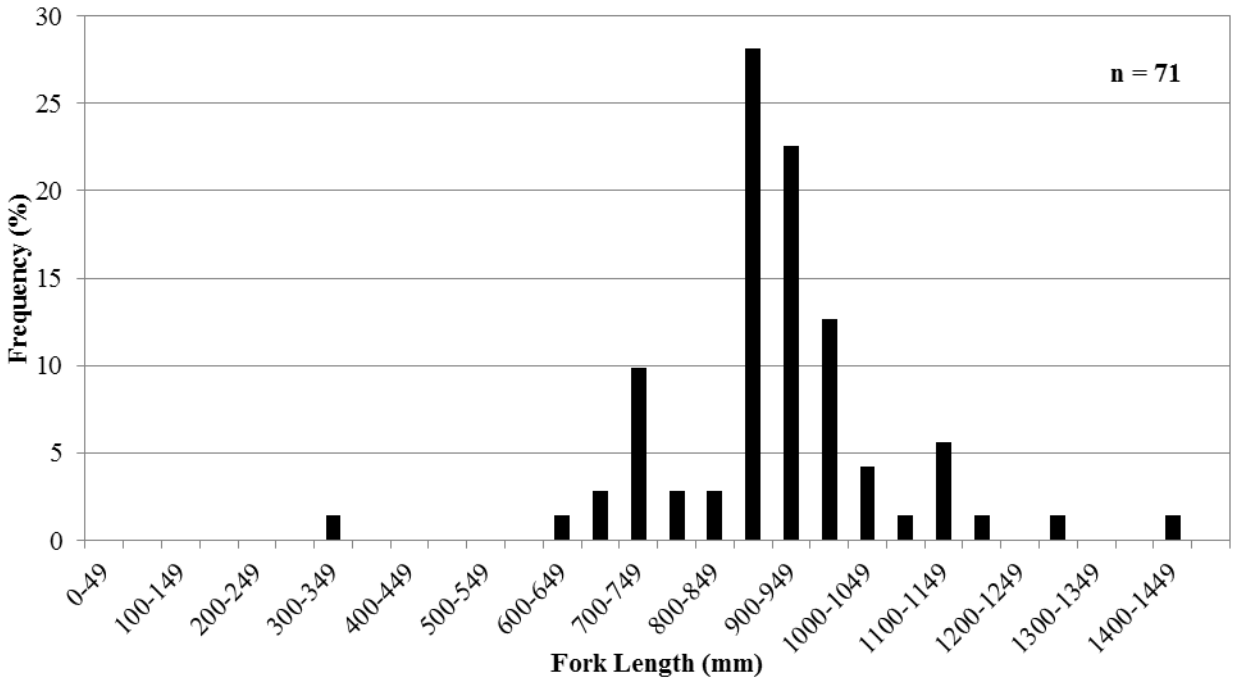


Figure 7: Length-frequency distribution for Lake Sturgeon captured in large mesh gill nets set in Stephens Lake during spring, 2016.

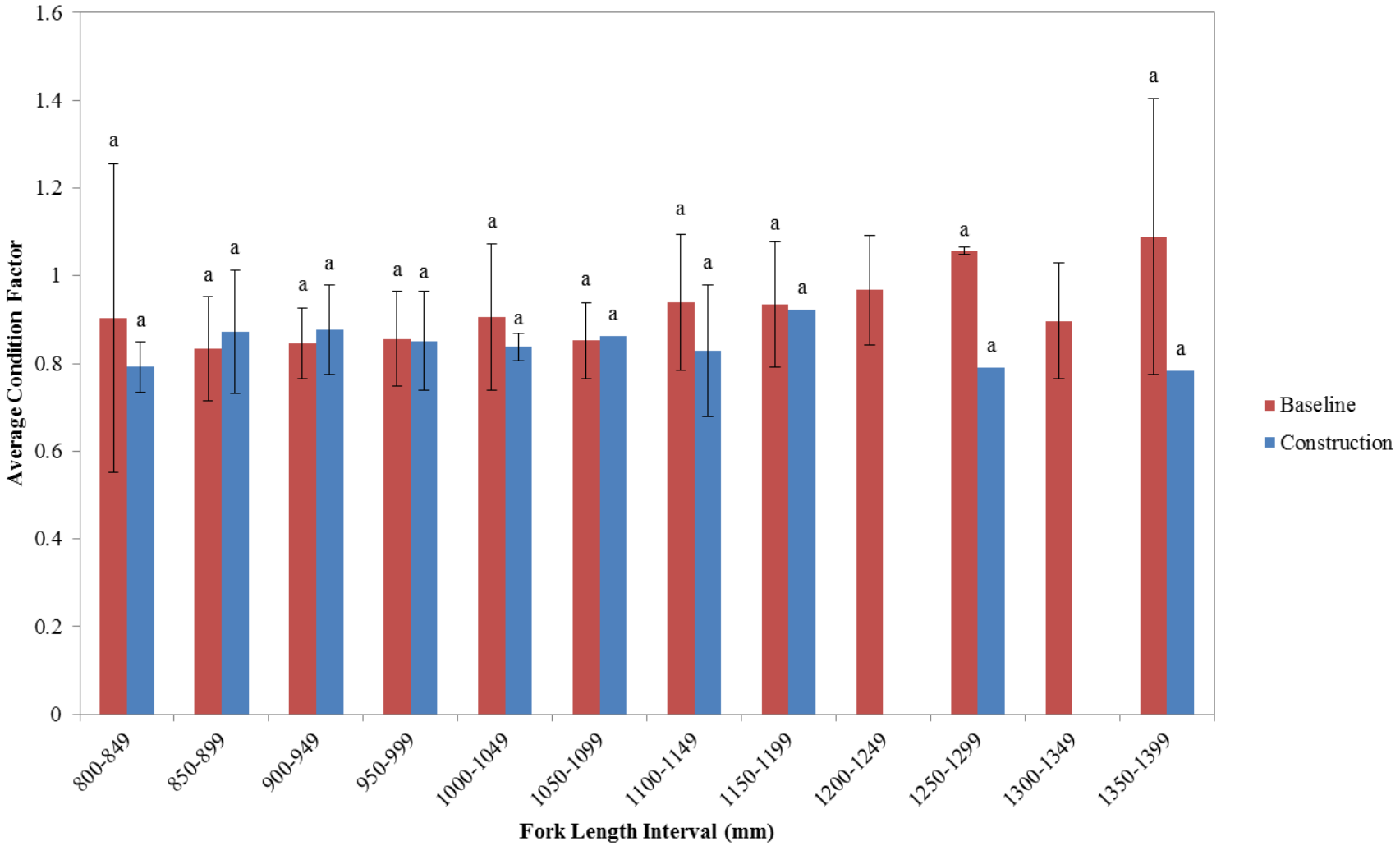


Figure 8: **Mean condition factor by 50 mm length intervals for adult (> 800 mm) Lake Sturgeon captured in Stephens Lake during baseline studies (red bars) and 2016 (blue bars). Letters denote significant differences between groups (Mann Whitney U test, *P* < 0.05). Error bars represent standard deviations.**

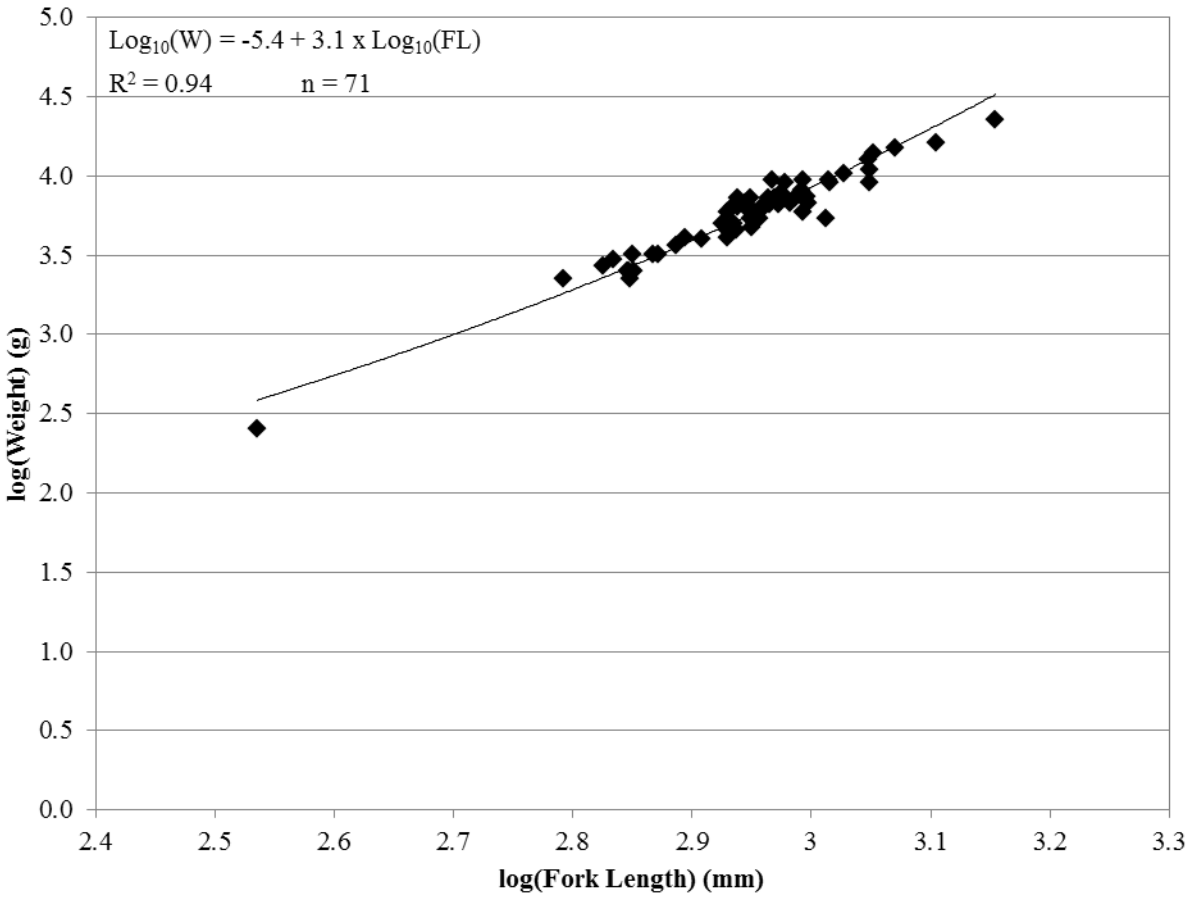


Figure 9: Length-weight regression for Lake Sturgeon captured in large mesh gill nets set in Stephens Lake during spring, 2016.

MAPS

N

Fox Lake Cree Nation
Fox Lake (Bird)

Limestone G.S.

Nelson River

290

280

North Moswakot River

South Moswakot R.

North Access Road

Looking Back Creek

Kettle G.S.

Long Spruce G.S.

Stephens Lake

Keeyask G.S.
(Under Construction)

Morris Point

Caribou Island

Hydro Island

Gull Lake

Gull Rapids

Fox Lake Cree Nation
A Kwis Ki Mahka Reserve

Gillam

Boots Ck.

Assean R.

Clark Lake

Nelson R.

Birthday Rapids

Tataskweyak Cree Nation
Tataskweyak (Split Lake)

Assean Lake

River

Butnau Lake

Kettle River

Split Lake

Anipitapiskow Rapids

Sakitowak Rapids

York Factory First Nation
York Landing (Kawechiwasik)

Burntwood River

First Rapids

Grass Witchai Lake Falls

Kelsey G.S.

Aiken River

Moose Nose Lake

War Lake First Nation
Ilford (Mooseocoot)

Kettle Lake

Witchai Lake

Nelson River

Fox (Atkinson) Lake

DATA SOURCE:
Government of Manitoba, Province of Manitoba, Manitoba Hydro

CREATED BY:
North/South Consultants

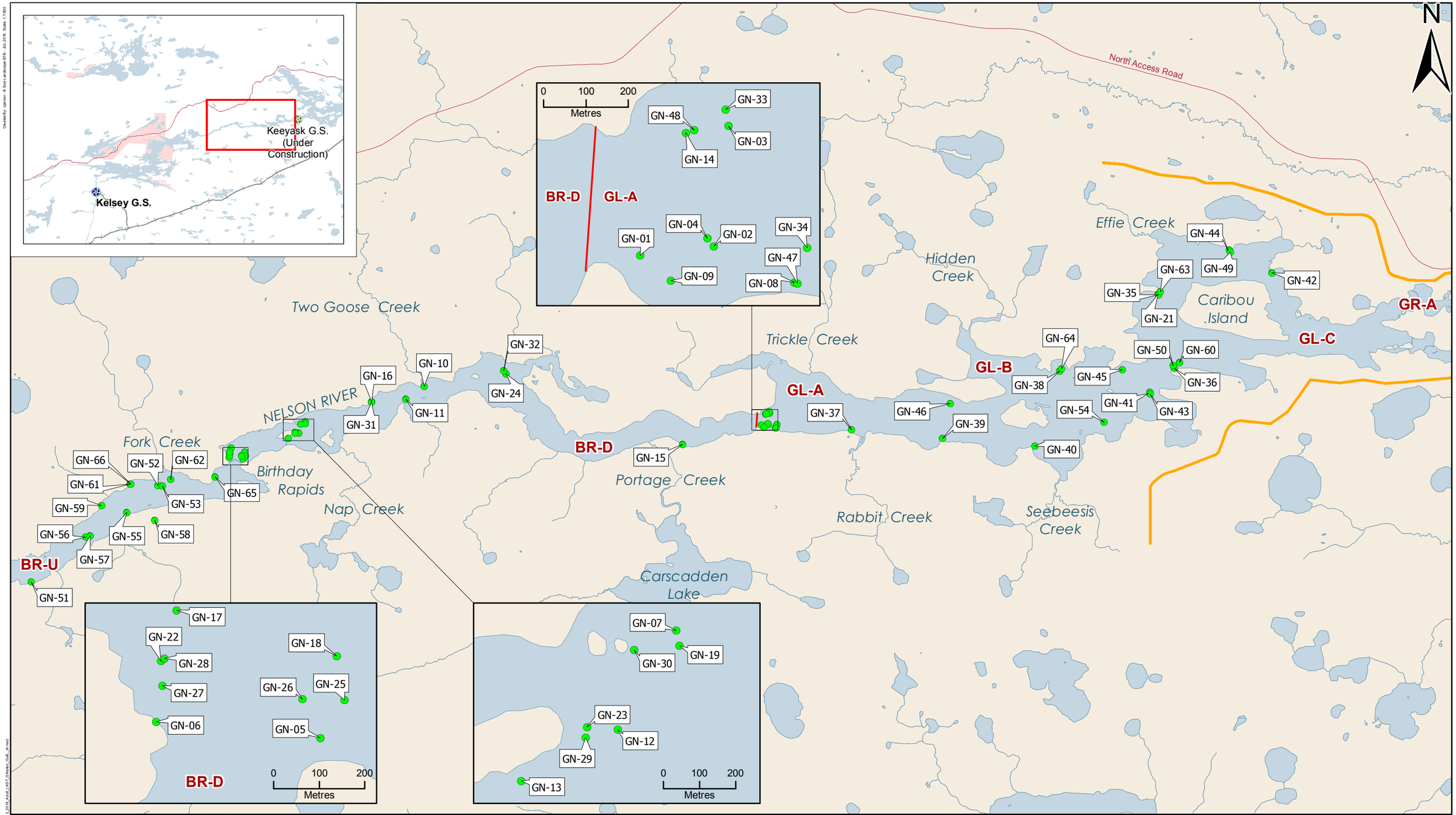
COORDINATE SYSTEM:	DATE CREATED:	REVISION DATE:
UTM NAD 1983 Z15N	09-FEB-15	30-MAY-17
0 6 12 Kilometres / 0 5 10 Miles	VERSION NO: 1.0	QA/QC: CMP/YYY/ZZZ

Legend

- Town
- Community
- Generating Station (Existing)
- Generating Station (Under Construction)
- Highway
- Rail
- First Nation Reserve

Keeyask G.S. Site and Adult Lake Sturgeon Population Monitoring Study Setting

Map 1: Map of the Nelson River showing the site of the Keeyask Generating Station and the adult Lake Sturgeon population monitoring study setting.



DATA SOURCE:
Government of Manitoba, Province of Manitoba, Manitoba Hydro

CREATED BY:
North/South Consultants

COORDINATE SYSTEM:	DATE CREATED:	REVISION DATE:
UTM NAD 1983 Z14N	09-FEB-15	21-SEP-16
0 0.45 0.9 Kilometres / 0 0.35 0.7 Miles	VERSION NO: 1.0	QA/QC: CMP/YYY/ZZZ

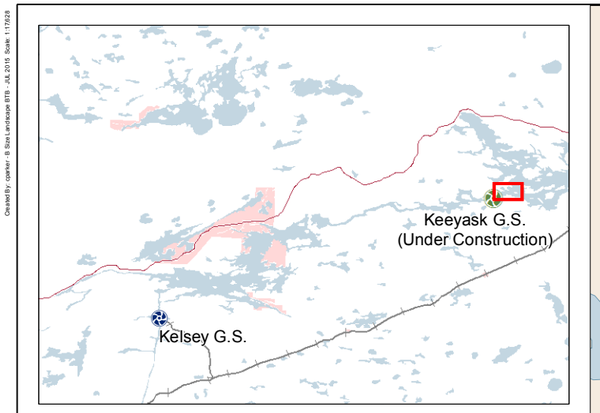
Legend

- Gillnetting Site
- Generating Station (Existing)
- Generating Station (Under Construction)
- Zones
- Keeyask Principal Structures
- Highway
- First Nation Reserve

2016 Adult Lake Sturgeon Gillnetting Sites

Gull Lake

Map 2: Sites fished with large mesh gillnet gangs in the Nelson River between Clarke Lake and Gull Rapids during spring, 2016.



DATA SOURCE:
Government of Manitoba, Province of Manitoba, Manitoba Hydro

CREATED BY:
North/South Consultants

COORDINATE SYSTEM:
UTM NAD 1983 Z14N

0 0.45 0.9 Kilometres
0 0.35 0.7 Miles

DATE CREATED: 09-FEB-15
REVISION DATE: 29-SEP-16
VERSION NO: 1.0
QA/QC: CMP/YYY/ZZZ

Legend

- Gillnetting Site
- Generating Station (Existing)
- Generating Station (Under Construction)
- Zones
- Highway
- Rail
- First Nation Reserve

2016 Adult Lake Sturgeon Gillnetting Sites

Stephens Lake Area

Map 3: Sites fished with large mesh gillnet gangs in Stephens Lake during spring, 2016.

KEEYASK

DATA SOURCE:
Orthophoto: Manitoba Hydro - Sep 2016

CREATED BY:
North/South Consultants

COORDINATE SYSTEM:	DATE CREATED:	REVISION DATE:
UTM NAD 1983 Z15N	17-MAR-17	17-MAR-17
0 0.15 0.3 Kilometres / 0 0.15 0.3 Miles	VERSION NO: 2.0	QA/QC: PMC/FSV/MWZ

Construction Site

Map 4: **Map of intream structures at the Keeyask Generating Station site, September 2016.**

APPENDICES

APPENDIX 1:
TAGGING AND BIOLOGICAL INFORMATION FOR LAKE STURGEON CAPTURED UPSTREAM OF GULL RAPIDS AND IN STEPHENS LAKE IN SPRING, 2016

Table A1-1: Tagging and biological information, by waterbody, for Lake Sturgeon marked with Floy tags and PIT tags upstream of Gull Rapids and in Stephens Lake during spring, 2016.

Location[a]	Zone	Date	Floy Tag Prefix	Floy Tag #1	Floy Tag #2	PIT Tag	Fork Length (mm)	Total Length (mm)	Weight (g)	Sex[b]	Maturity[c]
Nelson River (CL-GR)	GL-A	23/06/2016	NSC	106976	-	900 226000153823	695	765	2722	-	-
Nelson River (CL-GR)	GL-A	23/06/2016	NSC	106977	-	900 226000153824	636	711	2268	-	-
Nelson River (CL-GR)	GL-A	23/06/2016	NSC	106978	-	900 226000153862	612	704	2268	-	-
Nelson River (CL-GR)	GL-C	24/06/2016	NSC	106980	-	900 226000153874	675	764	2495	-	-
Nelson River (CL-GR)	GL-C	24/06/2016	NSC	106981	-	900 226000768582	621	703	2268	-	-
Nelson River (CL-GR)	GL-B	24/06/2016	NSC	106982	-	900 226000153833	885	983	5443	-	-
Nelson River (CL-GR)	GL-B	24/06/2016	NSC	106983	-	900 226000768409	662	745	2722	-	-
Nelson River (CL-GR)	GL-A	24/06/2016	NSC	106984	-	900 226000768434	876	980	6577	-	-
Nelson River (CL-GR)	GL-B	27/06/2016	NSC	106985	-	900 226000153869	802	865	4990	-	-
Nelson River (CL-GR)	GL-B	27/06/2016	NSC	106986	-	900 226000768532	765	836	4082	-	-
Nelson River (CL-GR)	GL-B	27/06/2016	NSC	106987	-	900 226000153888	794	926	4536	-	-
Nelson River (CL-GR)	GL-B	27/06/2016	NSC	106988	-	900 226000768464	718	811	3175	-	-
Nelson River (CL-GR)	GL-B	27/06/2016	NSC	106989	-	900 226000768472	835	940	6350	-	-
Nelson River (CL-GR)	GL-C	28/06/2016	NSC	106990	-	900 226000768456	856	939	6804	-	-
Nelson River (CL-GR)	GL-B	28/06/2016	NSC	106991	-	900 226000768403	828	925	4990	-	-
Nelson River (CL-GR)	GL-C	29/06/2016	NSC	106992	-	900 226000768474	777	880	3629	-	-
Nelson River (CL-GR)	GL-C	19/06/2016	NSC	107101	-	900 226000153809	822	933	6123	-	-
Nelson River (CL-GR)	GL-C	19/06/2016	NSC	107102	-	900 226000153845	890	995	6577	-	-
Nelson River (CL-GR)	GL-C	19/06/2016	NSC	107103	-	900 226000768495	872	973	6804	-	-
Nelson River (CL-GR)	GL-C	16/06/2016	NSC	107104	-	900 226000153885	581	650	1361	-	-
Nelson River (CL-GR)	GL-C	16/06/2016	NSC	107105	-	900 226000153871	660	732	2041	-	-
Nelson River (CL-GR)	GL-C	16/06/2016	NSC	107106	-	900 226000768490	954	1065	9072	-	-
Nelson River (CL-GR)	GL-C	16/06/2016	NSC	107107	-	900 226000768402	820	931	-	-	-
Nelson River (CL-GR)	GL-C	16/06/2016	NSC	107108	-	900 226000153860	773	860	4536	-	-
Nelson River (CL-GR)	GL-C	16/06/2016	NSC	107109	-	900 226000153893	-	-	6350	-	-
Nelson River (CL-GR)	GL-C	16/06/2016	NSC	107110	-	900 226000153838	940	1050	6123	-	-

Table A1-1: Tagging and biological information, by waterbody, for Lake Sturgeon marked with Floy tags and PIT tags upstream of Gull Rapids and in Stephens Lake during spring, 2016 (continued).

Location[a]	Zone	Date	Floy Tag Prefix	Floy Tag #1	Floy Tag #2	PIT Tag	Fork Length (mm)	Total Length (mm)	Weight (g)	Sex[b]	Maturity[c]
Nelson River (CL-GR)	GL-B	16/06/2016	NSC	107111	-	900 226000153856	602	676	2041	-	-
Nelson River (CL-GR)	GL-A	16/06/2016	NSC	107112	-	900 226000153828	705	810	3402	-	-
Nelson River (CL-GR)	GL-A	15/06/2016	NSC	107113	-	900 226000768407	970	-	7257	-	-
Nelson River (CL-GR)	GL-A	15/06/2016	NSC	107114	-	900 226000153889	871	990	5443	-	-
Nelson River (CL-GR)	GL-A	15/06/2016	NSC	107115	-	900 226000153800	900	1100	6350	-	-
Nelson River (CL-GR)	GL-C	15/06/2016	NSC	107116	-	900 226000768482	687	772	3402	-	-
Nelson River (CL-GR)	GL-B	15/06/2016	NSC	107117	-	900 226000153898	571	743	2268	-	-
Nelson River (CL-GR)	GL-B	15/06/2016	NSC	107118	-	900 226000153858	630	721	2268	-	-
Nelson River (CL-GR)	GL-C	15/06/2016	NSC	107119	-	900 226000153851	620	701	2722	-	-
Nelson River (CL-GR)	GL-A	14/06/2016	NSC	107120	-	900 226000153818	896	947	5443	-	-
Nelson River (CL-GR)	GL-B	14/06/2016	NSC	107121	-	900 226000768405	720	825	3402	-	-
Nelson River (CL-GR)	GL-C	14/06/2016	NSC	107122	-	900 226000153830	820	923	4763	-	-
Nelson River (CL-GR)	GL-C	14/06/2016	NSC	107123	-	900 226000153855	947	1063	7711	-	-
Nelson River (CL-GR)	GL-C	14/06/2016	NSC	107124	-	900 226000153825	983	1090	8165	-	-
Nelson River (CL-GR)	GL-C	14/06/2016	NSC	107125	-	900 226000153848	423	478	907	-	-
Nelson River (CL-GR)	GL-C	07/06/2016	NSC	107127	-	900 226000768442	619	706	2268	-	-
Nelson River (CL-GR)	GL-A	08/06/2016	NSC	107128	-	900 226000153892	820	910	4536	-	-
Nelson River (CL-GR)	GL-C	11/06/2016	NSC	107129	-	900 226000153846	750	860	3402	-	-
Nelson River (CL-GR)	GL-A	11/06/2016	NSC	107130	-	900 226000153831	697	785	2495	-	-
Nelson River (CL-GR)	GL-A	11/06/2016	NSC	107131	-	900 226000153834	820	910	4990	-	-
Nelson River (CL-GR)	GL-A	12/06/2016	NSC	107132	-	900 226000768485	620	703	1814	-	-
Nelson River (CL-GR)	GL-A	12/06/2016	NSC	107133	-	900 226000153843	580	681	1814	-	-
Nelson River (CL-GR)	GL-A	12/06/2016	NSC	107134	-	900 226000768444	681	682	1814	-	-
Nelson River (CL-GR)	GL-C	13/06/2016	NSC	107135	-	900 226000153865	857	892	3175	-	-
Nelson River (CL-GR)	GL-B	13/06/2016	NSC	107136	-	900 226000768499	581	776	2041	-	-
Nelson River (CL-GR)	GL-A	13/06/2016	NSC	107139	-	900 226000153839	301	342	-	-	-

Table A1-1: Tagging and biological information, by waterbody, for Lake Sturgeon marked with Floy tags and PIT tags upstream of Gull Rapids and in Stephens Lake during spring, 2016 (continued).

Location[a]	Zone	Date	Floy Tag Prefix	Floy Tag #1	Floy Tag #2	PIT Tag	Fork Length (mm)	Total Length (mm)	Weight (g)	Sex[b]	Maturity[c]
Nelson River (CL-GR)	GL-C	06/06/2016	NSC	107143	-	900 226000768492	665	760	3629	-	-
Nelson River (CL-GR)	GL-C	06/06/2016	NSC	107144	-	900 226000768413	620	695	2268	-	-
Nelson River (CL-GR)	BR-D	31/05/2016	NSC	107209	-	900 226000768408	824	935	4990	-	-
Nelson River (CL-GR)	BR-D	01/06/2016	NSC	107210	-	900 226000768530	650	740	2268	-	-
Nelson River (CL-GR)	GL-C	03/06/2016	NSC	107211	-	900 226000153821	1000	1182	12701	-	-
Nelson River (CL-GR)	GL-B	03/06/2016	NSC	107212	-	900 226000768568	677	754	2722	-	-
Nelson River (CL-GR)	BR-D	03/06/2016	NSC	107213	-	900 226000768460	639	731	-	-	-
Nelson River (CL-GR)	BR-D	03/06/2016	NSC	107214	-	900 226000768410	900	1000	6804	-	-
Nelson River (CL-GR)	GL-B	04/06/2016	NSC	107215	-	900 226000768481	610	704	1814	-	-
Nelson River (CL-GR)	GL-B	04/06/2016	NSC	107216	-	900 226000768445	644	723	2268	-	-
Nelson River (CL-GR)	GL-B	04/06/2016	NSC	107217	-	900 226000768427	893	995	6350	-	-
Nelson River (CL-GR)	GL-A	04/06/2016	NSC	107218	-	900 226000768447	690	780	2722	-	-
Nelson River (CL-GR)	GL-A	04/06/2016	NSC	107219	-	900 226000153849	840	943	4990	-	-
Nelson River (CL-GR)	GL-C	05/06/2016	NSC	107220	-	900 226000153802	565	654	1361	-	-
Nelson River (CL-GR)	GL-B	05/06/2016	NSC	107221	-	900 226000153886	660	751	2268	-	-
Nelson River (CL-GR)	GL-B	05/06/2016	NSC	107222	-	900 226000153819	628	709	1814	-	-
Nelson River (CL-GR)	GL-B	05/06/2016	NSC	107223	-	900 226000153896	688	762	2722	-	-
Nelson River (CL-GR)	GL-B	05/06/2016	NSC	107224	-	900 226000153827	840	945	5897	-	-
Nelson River (CL-GR)	BR-U	16/06/2016	NSC	107226	-	900 226000629204	648	731	1814	-	-
Nelson River (CL-GR)	GL-A	13/06/2016	NSC	107227	-	900 226000153859	1162	1290	14515	-	-
Nelson River (CL-GR)	GL-A	09/06/2016	NSC	107228	-	900 043000103472	645	731	1814	-	-
Nelson River (CL-GR)	GL-A	09/06/2016	NSC	107229	-	900 226000153887	845	950	4536	-	-
Nelson River (CL-GR)	BR-D	01/06/2016	NSC	107230	-	900 226000768503	930	1009	7257	M	8
Nelson River (CL-GR)	BR-D	30/05/2016	NSC	107238	-	900 226000768581	797	884	3175	-	-
Nelson River (CL-GR)	BR-D	29/05/2016	NSC	107239	-	900 226000768498	788	865	3629	-	-

Table A1-1: Tagging and biological information, by waterbody, for Lake Sturgeon marked with Floy tags and PIT tags upstream of Gull Rapids and in Stephens Lake during spring, 2016 (continued).

Location[a]	Zone	Date	Floy Tag Prefix	Floy Tag #1	Floy Tag #2	PIT Tag	Fork Length (mm)	Total Length (mm)	Weight (g)	Sex[b]	Maturity[c]
Nelson River (CL-GR)	BR-D	29/05/2016	NSC	107243	-	900 226000768424	395	450	-	-	-
Nelson River (CL-GR)	BR-D	29/05/2016	NSC	107244	-	900 226000768420	905	1021	7257	M	-
Nelson River (CL-GR)	BR-D	28/05/2016	NSC	107245	-	900 226000629081	1050	1135	9979	M	7
Nelson River (CL-GR)	BR-D	27/05/2016	NSC	107247	-	900 226000768469	706	785	-	-	-
Nelson River (CL-GR)	BR-D	26/05/2016	NSC	107248	-	900 226000767831	976	1074	7257	-	-
Nelson River (CL-GR)	BR-D	26/05/2016	NSC	107249	-	900 226000768401	1430	1486	33566	-	-
Nelson River (CL-GR)	BR-D	26/05/2016	NSC	107250	-	900 226000768489	845	950	4763	-	-
Nelson River (CL-GR)	GL-C	22/06/2016	NSC	107704	-	900 226000153805	845	936	6123	-	-
Nelson River (CL-GR)	GL-B	22/06/2016	NSC	107705	-	900 226000153876	620	700	-	-	-
Nelson River (CL-GR)	GL-B	22/06/2016	NSC	107706	-	900 226000153803	901	1025	6577	-	-
Nelson River (CL-GR)	GL-B	22/06/2016	NSC	107707	-	900 226000153844	905	1030	7257	-	-
Nelson River (CL-GR)	GL-A	22/06/2016	NSC	107708	-	900 226000153880	783	881	2948	-	-
Nelson River (CL-GR)	GL-C	23/06/2016	NSC	107709	-	900 226000153850	1181	1344	15876	-	-
Nelson River (CL-GR)	GL-B	23/06/2016	NSC	107710	-	900 226000153806	772	870	4082	-	-
Nelson River (CL-GR)	GL-B	23/06/2016	NSC	107711	-	900 226000153894	642	724	2268	-	-
Nelson River (CL-GR)	GL-B	23/06/2016	NSC	107712	-	900 226000153853	907	940	6804	-	-
Nelson River (CL-GR)	GL-B	23/06/2016	NSC	107713	-	900 226000153873	865	961	6123	-	-
Nelson River (CL-GR)	GL-C	21/06/2016	NSC	107715	-	900 226000768592	850	-	6804	-	-
Nelson River (CL-GR)	GL-B	21/06/2016	NSC	107716	-	900 226000153864	645	725	2722	-	-
Nelson River (CL-GR)	GL-B	21/06/2016	NSC	107717	-	900 226000153837	591	677	2268	-	-
Nelson River (CL-GR)	GL-B	21/06/2016	NSC	107718	-	900 226000153861	760	854	3402	-	-
Nelson River (CL-GR)	GL-B	21/06/2016	NSC	107719	-	900 226000768561	541	626	2041	-	-
Nelson River (CL-GR)	GL-A	19/06/2016	NSC	107720	-	900 226000153842	873	980	6577	-	-
Nelson River (CL-GR)	GL-A	19/06/2016	NSC	107721	-	900 226000153866	893	992	6123	-	-
Nelson River (CL-GR)	GL-B	19/06/2016	NSC	107722	-	900 226000153804	571	761	2722	-	-

Table A1-1: Tagging and biological information, by waterbody, for Lake Sturgeon marked with Floy tags and PIT tags upstream of Gull Rapids and in Stephens Lake during spring, 2016 (continued).

Location[a]	Zone	Date	Floy Tag Prefix	Floy Tag #1	Floy Tag #2	PIT Tag	Fork Length (mm)	Total Length (mm)	Weight (g)	Sex[b]	Maturity[c]
Nelson River (CL-GR)	GL-B	19/06/2016	NSC	107723	-	900 226000153882	593	681	2495	-	-
Nelson River (CL-GR)	GL-B	19/06/2016	NSC	107724	-	900 226000768540	785	860	4536	-	-
Nelson River (CL-GR)	GL-C	19/06/2016	NSC	107725	-	900 226000768432	790	882	4309	-	-
Nelson River (CL-GR)	BR-D	23/05/2016	NSC	110526	-	-	949	1050	6123	M	7
Nelson River (CL-GR)	BR-D	23/05/2016	NSC	110527	-	-	884	988	5216	M	7
Nelson River (CL-GR)	BR-D	23/05/2016	NSC	110528	110529	-	1000	1121	9299	M	7
Nelson River (CL-GR)	BR-D	23/05/2016	NSC	110545	-	-	890	1010	6123	-	-
Nelson River (CL-GR)	BR-D	23/05/2016	NSC	110546	-	-	1380	1535	26082	-	-
Nelson River (CL-GR)	BR-D	22/05/2016	NSC	110547	-	-	1207	1330	19731	M	7
Nelson River (CL-GR)	BR-D	22/05/2016	NSC	110548	-	-	1120	1259	11113	-	-
Nelson River (CL-GR)	BR-D	22/05/2016	NSC	110549	-	-	1119	1215	12474	-	-
Nelson River (CL-GR)	BR-D	22/05/2016	NSC	110550	-	-	1430	1549	26082	-	-
Stephens Lake	GR-A	26/06/2016	NSC	101001	-	900 226000628187	985	1092	9525	-	-
Stephens Lake	STL-A	27/06/2016	NSC	101002	-	900 226000548853	669	721	2722	-	-
Stephens Lake	STL-A	26/05/2016	NSC	110401	-	900 226000548793	880	1010	6804	M	7
Stephens Lake	GR-A	26/05/2016	NSC	110402	-	900 226000548810	850	941	5897	-	-
Stephens Lake	GR-A	26/05/2016	NSC	110403	-	900 226000548843	922	1046	6577	M	7
Stephens Lake	GR-A	27/05/2016	NSC	110404	-	900 226000548774	1120	1122	10886	-	-
Stephens Lake	STL-A	27/05/2016	NSC	110405	-	900 226000548930	809	918	3975	M	7
Stephens Lake	STL-A	28/05/2016	NSC	110406	-	900 226000548948	952	1058	7257	-	-
Stephens Lake	STL-A	28/05/2016	NSC	110407	-	900 226000548970	865	980	4536	-	-
Stephens Lake	STL-A	28/05/2016	NSC	110408	-	900 226000548954	891	992	4763	-	-
Stephens Lake	STL-A	28/05/2016	NSC	110409	-	900 226000548770	909	1033	6350	-	-
Stephens Lake	STL-A	28/05/2016	NSC	110410	-	900 226000548997	702	804	2500	-	-
Stephens Lake	STL-A	28/05/2016	NSC	110411	-	900 226000548987	703	791	2525	-	-

Table A1-1: Tagging and biological information, by waterbody, for Lake Sturgeon marked with Floy tags and PIT tags upstream of Gull Rapids and in Stephens Lake during spring, 2016 (continued).

Location[a]	Zone	Date	Floy Tag Prefix	Floy Tag #1	Floy Tag #2	PIT Tag	Fork Length (mm)	Total Length (mm)	Weight (g)	Sex[b]	Maturity[c]
Stephens Lake	STL-A	28/05/2016	NSC	110412	-	900 226000628428	710	804	2500	-	-
Stephens Lake	GR-A	28/05/2016	NSC	110413	-	900 226000548902	940	1051	6804	-	-
Stephens Lake	STL-A	29/05/2016	NSC	110414	-	900 226000548755	851	954	4763	-	-
Stephens Lake	STL-A	29/05/2016	NSC	110415	-	900 226000548750	1127	1234	14061	M	8
Stephens Lake	GR-A	30/05/2016	NSC	110416	-	900 226000548891	861	962	4990	-	-
Stephens Lake	STL-A	23/06/2016	NSC	110461	-	900 226000548858	950	1070	9072	-	-
Stephens Lake	GR-A	22/06/2016	NSC	110462	-	900 226000548881	1065	1178	10433	-	-
Stephens Lake	STL-B	21/06/2016	NSC	110463	-	900 226000548889	620	712	2268	-	-
Stephens Lake	GR-A	19/06/2016	NSC	110464	-	900 226000628725	770	853	3629	-	-
Stephens Lake	STL-A	19/06/2016	NSC	110465	-	900 226000548782	918	1015	6804	-	-
Stephens Lake	STL-A	19/06/2016	NSC	110466	-	900 226000548872	942	1050	7257	-	-
Stephens Lake	STL-A	19/06/2016	NSC	110467	-	900 226000548867	705	788	2268	-	-
Stephens Lake	STL-B	19/06/2016	NSC	110468	-	900 226000548899	708	804	3175	-	-
Stephens Lake	STL-A	16/06/2016	NSC	110469	-	-	745	840	3175	-	-
Stephens Lake	STL-A	16/06/2016	NSC	110470	-	-	1035	1140	9525	-	-
Stephens Lake	STL-A	16/06/2016	NSC	110471	-	-	994	1077	6804	M	8
Stephens Lake	STL-A	14/06/2016	NSC	110472	-	900 226000548914	880	976	6350	-	-
Stephens Lake	GR-A	02/06/2016	NSC	110473	-	900 226000548866	890	1000	5443	M	7
Stephens Lake	GR-A	02/06/2016	NSC	110475	-	900 226000548816	1425	1509	22680	-	-
Stephens Lake	STL-A	01/06/2016	NSC	110956	-	900 226000548941	1273	1406	16329	-	-
Stephens Lake	STL-A	04/06/2016	NSC	110976	-	900 226000548981	868	955	7257	-	-
Stephens Lake	GR-A	05/06/2016	NSC	110977	-	900 226000548882	895	1000	5897	-	-
Stephens Lake	GR-A	05/06/2016	NSC	110978	-	900 226000548962	904	1012	5897	-	-
Stephens Lake	GR-A	05/06/2016	NSC	110979	-	900 226000548018	905	996	5443	-	-
Stephens Lake	STL-A	07/06/2016	NSC	110980	-	900 226000548908	932	1037	7257	-	-

Table A1-1: Tagging and biological information, by waterbody, for Lake Sturgeon marked with Floy tags and PIT tags upstream of Gull Rapids and in Stephens Lake during spring, 2016 (continued).

Location[a]	Zone	Date	Floy Tag Prefix	Floy Tag #1	Floy Tag #2	PIT Tag	Fork Length (mm)	Total Length (mm)	Weight (g)	Sex[b]	Maturity[c]
Stephens Lake	STL-A	07/06/2016	NSC	110981	-	900 226000548751	942	1058	7711	-	-
Stephens Lake	STL-A	08/06/2016	NSC	110983	-	900 226000548951	933	1046	7257	-	-
Stephens Lake	STL-A	10/06/2016	NSC	110984	-	900 226000548821	880	1004	6804	-	-
Stephens Lake	STL-A	10/06/2016	NSC	110985	-	900 226000628618	737	839	3175	-	-
Stephens Lake	STL-A	10/06/2016	NSC	110986	-	900 226000548912	886	998	6350	-	-
Stephens Lake	STL-A	10/06/2016	NSC	110987	-	900 226000548762	890	1000	7257	-	-
Stephens Lake	STL-A	10/06/2016	NSC	110988	-	900 226000548990	920	1022	7257	-	-
Stephens Lake	STL-A	10/06/2016	NSC	110989	-	900 226000548946	868	985	6350	-	-
Stephens Lake	GR-A	10/06/2016	NSC	110990	-	900 226000548740	1175	-	14969	-	-
Stephens Lake	GR-A	10/06/2016	NSC	110991	-	900 226000548883	935	1055	7257	-	-
Stephens Lake	STL-A	11/06/2016	NSC	110992	-	900 226000548796	843	954	4990	-	-
Stephens Lake	STL-A	11/06/2016	NSC	110993	-	900 226000548802	945	1060	7257	-	-
Stephens Lake	STL-A	12/06/2016	NSC	110994	-	900 226000548945	343	387	253	-	-
Stephens Lake	STL-A	12/06/2016	NSC	110995	-	900 226000548564	970	1068	7257	-	-
Stephens Lake	GR-A	13/06/2016	NSC	110996	-	900 226000548965	850	958	4536	-	-
Stephens Lake	STL-A	03/06/2016	NSC	110998	-	900 226000548967	850	945	4082	-	-
Stephens Lake	STL-A	03/06/2016	NSC	110999	-	900 226000548752	1030	1125	-	-	-

a. Nelson River from Clark Lake to Gull Rapids.

b. Refer to section 3.1 for sex and maturity codes.

c. Refer to section 3.1 for sex and maturity codes.

APPENDIX 2:
TAGGING AND BIOLOGICAL INFORMATION FOR LAKE STURGEON RECAPTURED UPSTREAM OF GULL RAPIDS AND IN STEPHENS LAKE DURING SPRING, 2016

Table A2-1: Tagging and biological information for Lake Sturgeon recaptured upstream of Gull Rapids and in Stephens Lake during spring, 2016.

Location[a]	Zone	Date	Floy Tag Prefix	Floy Tag 1 Number	Floy Tag 2 Number	PIT Tag	Fork Length (mm)	Total Length (mm)	Weight (g)	Sex[b]	Maturity[c]
Nelson River (CL-GR)	GL-A	23-Jun-16	NSC	10825*	10826	900 226000153880	1068	1184	11793	-	-
Nelson River (CL-GR)	GL-C	24-Jun-01	NSC	47154	-	-	995	1097	7500	-	-
Nelson River (CL-GR)	BR-D	29-Jun-06	NSC	47154	-	-	1127	1240	11340	-	-
Nelson River (CL-GR)	GL-A	22-May-16	NSC	47154	-	-	1251	1365	14288	M	7
Nelson River (CL-GR)	BR-D	28-Jun-02	NSC	48806	-	-	1021	1123	8618	-	-
Nelson River (CL-GR)	BR-D	18-Jun-03	NSC	48806	-	-	1013	1125	8845	-	-
Nelson River (CL-GR)	BR-D	14-Jun-06	NSC	48806	-	-	1066	1147	10433	-	-
Nelson River (CL-GR)	BR-D	27-Jun-08	NSC	48806	-	-	1075	1185	-	-	-
Nelson River (CL-GR)	BR-D	14-Jun-14	NSC	48806	-	900 226000629218	1123	1235	11793	M	8
Nelson River (CL-GR)	GL-A	22-May-16	NSC	48806	-	900 226000629218	1131	1227	13835	-	-
Nelson River (CL-GR)	GL-A	2-Jun-16	NSC	48806	-	900 226000629218	-	-	-	-	-
Nelson River (CL-GR)	GL-B	23-Jun-16	NSC	48806	-	900 226000629218	-	-	-	-	-
Nelson River (CL-GR)	BR-D	28-Jun-02	NSC	48807	-	-	1161	1279	11794	M	7
Nelson River (CL-GR)	GL-A	29-Jun-02	NSC	48807	-	-	-	-	-	-	-
Nelson River (CL-GR)	BR-D	28-Jun-04	NSC	48807	-	-	1187	1312	11340	M	7
Nelson River (CL-GR)	BR-D	4-Jun-06	NSC	48807	-	-	1190	1313	12701	M	7
Nelson River (CL-GR)	BR-D	9-Jun-14	NSC	48807	-	-	1242	1337	16783	M	7
Nelson River (CL-GR)	GL-A	22-May-16	NSC	48807	-	900 226000629224	1270	1400	16103	M	7
Nelson River (CL-GR)	BR-D	11-Jun-02	NSC	48926	-	-	1299	1420	21092	M	7
Nelson River (CL-GR)	BR-D	14-Jun-04	NSC	48926	-	-	1318	1435	17237	-	-
Nelson River (CL-GR)	BR-D	5-Jun-06	NSC	48926	-	-	1321	1440	21772	-	-
Nelson River (CL-GR)	GL-A	29-May-16	NSC	48926	-	900 226000768497	1362	1491	25855	M	7
Nelson River (CL-GR)	GL-C	9-Jun-16	NSC	48926	-	900 226000768497	-	-	-	-	-

Table A2-1: Tagging and biological information for Lake Sturgeon recaptured upstream of Gull Rapids and in Stephens Lake during spring, 2016 (continued).

Location[a]	Zone	Date	Floy Tag Prefix	Floy Tag 1 Number	Floy Tag 2 Number	PIT Tag	Fork Length (mm)	Total Length (mm)	Weight (g)	Sex[b]	Maturity[c]
Nelson River (CL-GR)	BR-D	6-Jun-03	NSC	50836	-	-	1159	1260	10500	-	-
Nelson River (CL-GR)	BR-D	26-May-06	NSC	50836	-	-	1120	1190	11793	M	7
Nelson River (CL-GR)	GL-A	22-May-16	NSC	50836	-	-	1198	1295	14742	-	-
Nelson River (CL-GR)	GL-C	31-May-03	NSC	50916	-	-	908	1037	-	-	-
Nelson River (CL-GR)	GL-A	23-May-16	NSC	50916	-	-	1250	1385	18824	-	-
Stephens Lake	STL-B	25-Jun-03	NSC	56202	-	-	1002	1097	8500	-	-
Stephens Lake	STL-A	10-Jun-06	NSC	56202	80420	-	1070	-	9525	-	-
Stephens Lake	STL-A	21-Jun-11	NSC	56202	80420	-	1208	1316	16556	-	-
Nelson River (CL-GR)	BR-D	25-May-16	NSC	56202	80420	900 226000768458	1251	1363	15876	-	-
Stephens Lake	GR-A	12-Jun-11	NSC	74415	-	-	1116	1239	11793	-	-
Nelson River (CL-GR)	GL-C	14-Jun-16	NSC	74415	-	900 226000153870	1262	1500	18144	-	-
Nelson River (CL-GR)	BR-D	29-Jun-08	NSC	75282	-	-	1035	1155	11793	-	-
Nelson River (CL-GR)	BR-D	11-Jun-16	NSC	75282	-	900 226000153810	1250	1371	24267	-	-
Nelson River (CL-GR)	GL-B	21-Sep-08	NSC	75302	-	-	632	715	2050	-	-
Nelson River (CL-GR)	BR-D	30-May-16	NSC	75302	-	900 226000768585	830	926	4990	-	-
Nelson River (CL-GR)	GL-B	18-Sep-08	NSC	75319	-	-	649	740	-	-	-
Nelson River (CL-GR)	GL-C	21-Jun-16	NSC	75319	-	900 226000153817	849	954	6123	-	-
Nelson River (CL-GR)	GL-C	18-Sep-08	NSC	75321	-	-	710	799	-	-	-
Nelson River (CL-GR)	GL-C	17-Jun-14	NSC	75321	-	900 226000629248	838	933	4990	-	-
Nelson River (CL-GR)	GL-C	18-Sep-15	NSC	75321	-	900 226000629248	880	960	7257	-	-
Nelson River (CL-GR)	GL-C	27-Jun-16	NSC	75321	-	900 226000629248	884	952	8391	-	-
Nelson River (CL-GR)	GL-C	18-Sep-08	NSC	75323	-	-	672	755	-	-	-
Nelson River (CL-GR)	GL-C	21-Jun-16	NSC	75323	-	900 226000153812	850	951	6123	-	-

Table A2-1: Tagging and biological information for Lake Sturgeon recaptured upstream of Gull Rapids and in Stephens Lake during spring, 2016 (continued).

Location[a]	Zone	Date	Floy Tag Prefix	Floy Tag 1 Number	Floy Tag 2 Number	PIT Tag	Fork Length (mm)	Total Length (mm)	Weight (g)	Sex[b]	Maturity[c]
Nelson River (CL-GR)	GL-B	16-Sep-08	NSC	75328	-	-	832	940	-	-	-
Nelson River (CL-GR)	GL-B	30-Jun-14	NSC	75328	-	900 226000629150	950	1050	7711	-	-
Nelson River (CL-GR)	GL-A	22-May-16	NSC	75328	-	900 226000629150	990	1104	7938	-	-
Nelson River (CL-GR)	GL-A	15-Sep-08	NSC	75334	-	-	645	750	1950	-	-
Nelson River (CL-GR)	BR-D	9-Jun-14	NSC	75334	-	-	865	993	5897	-	-
Nelson River (CL-GR)	GL-A	22-May-16	NSC	75334	-	-	911	1041	7031	-	-
Nelson River (CL-GR)	GL-B	15-Sep-08	NSC	75337	-	-	816	918	-	-	-
Nelson River (CL-GR)	BR-D	10-Jun-10	NSC	75337	-	-	857	945	5000	M	8
Nelson River (CL-GR)	BR-D	9-Jun-12	NSC	75337	-	-	893	980	6350	-	-
Nelson River (CL-GR)	BR-D	2-Jun-16	NSC	75337	-	900 226000768505	955	1065	7711	M	7
Nelson River (CL-GR)	GL-C	24-Sep-11	NSC	75878	-	-	404	465	475	-	-
Nelson River (CL-GR)	GL-B	27-Jun-16	NSC	75878	-	900 226000153895	631	716	2495	-	-
Nelson River (CL-GR)	GL-C	24-Jun-06	NSC	76330	76331	-	830	905	4536	-	-
Nelson River (CL-GR)	GL-B	11-Jun-12	NSC	76330	76331	-	1008	1118	10206	-	-
Nelson River (CL-GR)	GL-C	15-Jun-16	NSC	76330	76331	900 226000153875	1123	1241	14969	-	-
Nelson River (CL-GR)	GL-C	25-Jun-06	NSC	76334	76333	-	862	942	5670	-	-
Nelson River (CL-GR)	GL-C	15-Jun-10	NSC	76334	76333	-	955	1060	6350	-	-
Nelson River (CL-GR)	GL-A	23-Jun-16	NSC	76334	76333	900 226000153808	1085	1160	11340	-	-
Nelson River (CL-GR)	GL-B	1-Jul-06	NSC	76377	76376	-	706	796	2722	-	-
Nelson River (CL-GR)	GL-B	26-Aug-06	NSC	76377	76376	-	703	806	2495	-	-
Nelson River (CL-GR)	GL-C	14-Jun-16	NSC	76377	76376	900 226000153883	945	1060	7484	-	-
Nelson River (CL-GR)	GL-C	2-Jul-06	NSC	76389	-	-	1055	1165	8618	-	-
Nelson River (CL-GR)	BR-D	15-Jun-14	NSC	76389	-	900 226000629249	1165	1275	9752	M	9
Nelson River (CL-GR)	GL-C	6-Jun-16	NSC	76389	-	900 226000629249	1170	1288	11793	-	-

Table A2-1: Tagging and biological information for Lake Sturgeon recaptured upstream of Gull Rapids and in Stephens Lake during spring, 2016 (continued).

Location[a]	Zone	Date	Floy Tag Prefix	Floy Tag 1 Number	Floy Tag 2 Number	PIT Tag	Fork Length (mm)	Total Length (mm)	Weight (g)	Sex[b]	Maturity[c]
Nelson River (CL-GR)	GL-C	17-Jun-06	NSC	76406	76320	-	1085	1194	11340	-	-
Nelson River (CL-GR)	GL-C	24-Jun-16	NSC	76406	76320	900 226000768440	1284	1404	20865	-	-
Nelson River (CL-GR)	BR-D	18-Jun-06	NSC	76414	-	-	768	848	4309	-	-
Kelsey GS (NR-SPL)	KGS-A	16-Jun-13	NSC	76414	-	900 226000548093	982	1090	9299	M	7
Kelsey GS (NR-SPL)	KGS-B	25-Jun-13	NSC	76414	-	900 226000548093	-	-	-	-	-
Nelson River (CL-GR)	GL-A	27-Jun-16	NSC	76414	-	900 226000548093	1033	1141	11340	-	-
Nelson River (CL-GR)	BR-D	24-Jun-06	NSC	76447	76448	-	965	1066	8165	-	-
Nelson River (CL-GR)	GL-A	14-Jun-16	NSC	76447	76448	900 226000153836	1180	1312	15195	-	-
Nelson River (CL-GR)	BR-D	15-Jun-06	NSC	76484	76485	-	960	1046	7257	-	-
Nelson River (CL-GR)	BR-D	16-Jun-11	NSC	76484	76485	-	1026	1133	7711	M	8
Nelson River (CL-GR)	GL-C	16-Jun-16	NSC	76484	76485	900 226000153811	1050	1072	9525	-	-
Nelson River (CL-GR)	GL-C	15-Jun-06	NSC	76497	76499	-	619	675	2155	-	-
Nelson River (CL-GR)	GL-A	23-May-16	NSC	76497	76499	900 226000629228	828	930	5670	M	7
Nelson River (CL-GR)	GL-B	21-Jun-11	NSC	77504	-	-	805	901	3175	-	-
Nelson River (CL-GR)	GL-A	22-May-16	NSC	77504	-	900 226000768411	884	980	6123	-	-
Nelson River (CL-GR)	GL-A	28-May-16	NSC	77504	-	900 226000768411	-	-	-	-	-
Nelson River (CL-GR)	GL-A	20-Jun-11	NSC	77507	-	-	1310	1405	25855	F	4
Nelson River (CL-GR)	BR-D	11-Jun-14	NSC	77507	-	900 226000629028	1330	1410	29710	F	2
Nelson River (CL-GR)	GL-C	1-Jun-16	NSC	77507	-	900 226000629028	1360	1414	25855	F	3
Nelson River (CL-GR)	GL-A	16-Jun-11	NSC	77508	-	-	1072	1195	10886	M	7
Nelson River (CL-GR)	GL-A	22-May-16	NSC	77508	-	-	1093	1226	12927	M	7
Nelson River (CL-GR)	BR-D	12-Jun-11	NSC	77510	-	-	1176	1284	12247	-	-
Nelson River (CL-GR)	GL-A	11-Jun-16	NSC	77510	-	900 226000153897	1210	1322	15195	-	-
Nelson River (CL-GR)	GL-B	22-Sep-11	NSC	79653	-	-	835	944	4950	-	-
Nelson River (CL-GR)	BR-D	4-Jun-16	NSC	79653	-	900 226000768471	935	1036	6350	-	-

Table A2-1: Tagging and biological information for Lake Sturgeon recaptured upstream of Gull Rapids and in Stephens Lake during spring, 2016 (continued).

Location[a]	Zone	Date	Floy Tag Prefix	Floy Tag 1 Number	Floy Tag 2 Number	PIT Tag	Fork Length (mm)	Total Length (mm)	Weight (g)	Sex[b]	Maturity[c]
Nelson River (CL-GR)	BR-D	3-Jun-06	NSC	80217	-	-	970	1071	7450	-	-
Nelson River (CL-GR)	BR-D	8-Jun-06	NSC	80217	-	-	-	-	-	-	-
Nelson River (CL-GR)	BR-D	21-Jun-06	NSC	80217	-	-	-	-	-	-	-
Nelson River (CL-GR)	BR-D	22-Jun-06	NSC	80217	-	-	-	-	-	-	-
Nelson River (CL-GR)	BR-D	7-Jun-14	NSC	80217	-	900 226000629135	1070	-	9525	M	7
Nelson River (CL-GR)	GL-A	19-Jun-16	NSC	80217	-	900 226000629135	1085	1200	10433	-	-
Nelson River (CL-GR)	BR-D	4-Jun-06	NSC	80224	80225	-	1310	1444	22680	-	-
Nelson River (CL-GR)	GL-A	22-May-16	NSC	80224	80225	-	1315	1459	23814	-	-
Nelson River (CL-GR)	BR-D	4-Jun-06	NSC	80227	80228	-	1180	1285	12020	M	7
Nelson River (CL-GR)	BR-D	6-Jun-06	NSC	80227	80228	-	-	-	-	-	-
Nelson River (CL-GR)	BR-D	14-Jun-14	NSC	80227	80228	900 226000629176	1230	1330	14969	M	8
Nelson River (CL-GR)	GL-B	21-Jun-16	NSC	80227	80228	900 226000629176	1240	1365	19731	-	-
Nelson River (CL-GR)	BR-D	30-May-06	NSC	80277	80278	-	812	914	3969	-	-
Nelson River (CL-GR)	BR-D	29-Jun-08	NSC	80277	-	-	-	-	-	-	-
Nelson River (CL-GR)	BR-D	2-Jun-12	NSC	80277	-	-	882	972	4990	M	8
Nelson River (CL-GR)	GL-A	22-May-16	NSC	80277	-	-	919	1011	6123	-	-
Nelson River (CL-GR)	BR-D	10-Jun-08	NSC	80366	-	-	856	925	4763	-	-
Nelson River (CL-GR)	GL-B	24-Jun-16	NSC	80366	-	900 226000153822	1028	1132	9299	-	-
Nelson River (CL-GR)	BR-D	22-Jun-08	NSC	80375	-	-	1143	1242	14742	-	-
Nelson River (CL-GR)	GL-A	24-May-16	NSC	80375	-	-	1253	1397	19504	F	-
Nelson River (CL-GR)	GL-B	20-Aug-06	NSC	82609	82612	-	530	606	1089	-	-
Nelson River (CL-GR)	GL-C	23-Jun-16	NSC	82609	82612	900 226000153840	855	946	5670	-	-
Nelson River (CL-GR)	GL-B	21-Aug-06	NSC	82619	82620	-	1300	1461	19731	-	-
Nelson River (CL-GR)	BR-D	15-Jun-12	NSC	82619	82620	-	1375	1540	23587	-	-
Nelson River (CL-GR)	GL-B	12-Jun-16	NSC	82619	82620	900 226000153857	1420	1620	25174	-	-

Table A2-1: Tagging and biological information for Lake Sturgeon recaptured upstream of Gull Rapids and in Stephens Lake during spring, 2016 (continued).

Location[a]	Zone	Date	Floy Tag Prefix	Floy Tag 1 Number	Floy Tag 2 Number	PIT Tag	Fork Length (mm)	Total Length (mm)	Weight (g)	Sex[b]	Maturity[c]
Nelson River (CL-GR)	GL-B	26-Aug-06	NSC	82640	82641	-	653	741	2495	-	-
Nelson River (CL-GR)	GL-A	23-May-16	NSC	82640	82641	-	974	1092	7484	M	7
Nelson River (CL-GR)	GL-A	22-May-16	NSC	83721*	-		1115	1228	12474	M	7
Nelson River (CL-GR)	GL-B	22-Sep-08	NSC	87233	-	-	743	835	-	-	-
Nelson River (CL-GR)	GL-B	6-Sep-12	NSC	87233	-	-	842	945	-	-	-
Nelson River (CL-GR)	GL-A	22-May-16	NSC	87233	-	-	907	1003	6350	-	-
Nelson River (CL-GR)	GL-B	23-Sep-08	NSC	87245	-	-	729	821	-	-	-
Nelson River (CL-GR)	GL-A	23-May-16	NSC	87245	-	-	880	982	5670	M	7
Nelson River (CL-GR)	GL-B	24-Sep-10	NSC	87851	-	-	315	345	150	-	-
Nelson River (CL-GR)	GL-B	16-Jun-16	NSC	87851	-	900 226000153815	584	652	1134	-	-
Nelson River (CL-GR)	GL-C	25-Sep-10	NSC	87862	-	-	550	625	1300	-	-
Nelson River (CL-GR)	GL-C	11-Jun-12	NSC	87862	-	-	605	683	1600	-	-
Nelson River (CL-GR)	GL-B	15-Jun-16	NSC	87862	-	900 226000768480	721	810	2722	-	-
Nelson River (CL-GR)	GL-A	25-Jun-14	NSC	91377	-	900 226000629155	849	956	4536	-	-
Nelson River (CL-GR)	GL-A	11-Jun-16	NSC	91377	-	900 226000629155	890	1000	5216	-	-
Nelson River (CL-GR)	GL-B	7-Jun-10	NSC	94027	-	-	727	812	3450	-	-
Nelson River (CL-GR)	GL-A	17-Jun-14	NSC	94027	-	900 226000629049	839	923	4082	-	-
Nelson River (CL-GR)	GL-A	23-May-16	NSC	94027	-	900 226000629049	855	951	5670	M	7
Nelson River (CL-GR)	BR-D	30-May-10	NSC	94083	-	-	1390	1540	29937	-	-
Nelson River (CL-GR)	BR-D	25-May-16	NSC	94083	-	900 226000768428	1420	1680	29937	F	-
Nelson River (CL-GR)	GL-B	22-Sep-11	NSC	94123	-	-	590	685	1500	-	-
Nelson River (CL-GR)	GL-B	14-Jun-16	NSC	94123	-	900 226000153801	743	852	2948	-	-
Kelsey GS Area	KGS-C	16-Jun-11	NSC	94458	-	-	925	1007	9165	-	-
Nelson River (CL-GR)	GL-A	22-May-16	NSC	94458	-	-	970	1087	7484	-	-

Table A2-1: Tagging and biological information for Lake Sturgeon recaptured upstream of Gull Rapids and in Stephens Lake during spring, 2016 (continued).

Location[a]	Zone	Date	Floy Tag Prefix	Floy Tag 1 Number	Floy Tag 2 Number	PIT Tag	Fork Length (mm)	Total Length (mm)	Weight (g)	Sex[b]	Maturity[c]
Nelson River (CL-GR)	GL-C	22-Sep-11	NSC	94864	-	-	650	741	2000	-	-
Nelson River (CL-GR)	GL-B	3-Jul-14	NSC	94864	-	900 226000629142	724	809	3550	-	-
Nelson River (CL-GR)	GL-C	14-Jun-16	NSC	94864	-	900 226000629142	780	886	4763	-	-
Nelson River (CL-GR)	BR-D	2-Jun-12	NSC	100406	-	-	900	1010	6804	M	8
Nelson River (CL-GR)	BR-D	5-Jun-14	NSC	100406	-	-	960	1100	10433	-	-
Nelson River (CL-GR)	GL-A	25-May-16	NSC	100406	-	900 226000629066	1000	1175	7484	M	7
Nelson River (CL-GR)	BR-D	1-Jun-16	NSC	100406	-	900 226000629066	-	-	-	M	7
Nelson River (CL-GR)	GL-C	3-Jun-12	NSC	100410	-	-	712	804	2800	-	-
Nelson River (CL-GR)	GL-C	14-Sep-14	NSC	100410	-	900 226000629483	795	917	4250	-	-
Nelson River (CL-GR)	GL-C	15-Jun-16	NSC	100410	-	900 226000629483	851	973	5443	-	-
Nelson River (CL-GR)	GL-B	11-Jun-12	NSC	100425	-	-	831	938	4536	-	-
Nelson River (CL-GR)	GL-B	26-Jun-14	NSC	100425	-	900 226000629108	884	991	5443	-	-
Nelson River (CL-GR)	GL-B	27-Jun-16	NSC	100425	-	900 226000629108	934	1042	7257	-	-
Nelson River (CL-GR)	GL-B	15-Jun-12	NSC	100446	-	-	705	795	3175	-	-
Nelson River (CL-GR)	GL-C	7-Jun-16	NSC	100446	-	900 226000768468	828	925	6350	-	-
Nelson River (CL-GR)	GL-B	27-Jun-12	NSC	100454	-	-	1320	1440	23587	-	-
Nelson River (CL-GR)	GL-A	22-May-16	NSC	100454	-	-	1325	1460	24267	M	8
Nelson River (CL-GR)	GL-C	6-Sep-12	NSC	100680	-	-	450	508	600	-	-
Nelson River (CL-GR)	GL-C	13-Jun-16	NSC	100680	-	900 226000153884	655	733	2495	-	-
Nelson River (CL-GR)	GL-B	21-Jun-14	NSC	101382	-	900 226000629132	801	908	4082	-	-
Nelson River (CL-GR)	GL-C	19-Jun-16	NSC	101382	-	900 226000629132	855	970	5670	-	-
Nelson River (CL-GR)	BR-D	22-Jun-14	NSC	101390	-	900 226000629092	1176	1291	12247	-	-
Nelson River (CL-GR)	GL-C	15-Jun-16	NSC	101390	-	900 226000629092	1201	1320	16783	-	-
Nelson River (CL-GR)	GL-C	25-Jun-14	NSC	101437	-	900 226000629247	605	688	1750	-	-
Nelson River (CL-GR)	GL-B	27-Jun-16	NSC	101437	-	900 226000629247	663	751	3175	-	-

Table A2-1: Tagging and biological information for Lake Sturgeon recaptured upstream of Gull Rapids and in Stephens Lake during spring, 2016 (continued).

Location[a]	Zone	Date	Floy Tag Prefix	Floy Tag 1 Number	Floy Tag 2 Number	PIT Tag	Fork Length (mm)	Total Length (mm)	Weight (g)	Sex[b]	Maturity[c]
Nelson River (CL-GR)	GL-A	24-Jun-14	NSC	101440	-	900 226000629037	1040	1140	9525	-	-
Nelson River (CL-GR)	GL-A	27-Jun-16	NSC	101440	-	900 226000629037	1086	1169	13154	-	-
Nelson River (CL-GR)	GL-B	23-Jun-14	NSC	101448	-	900 226000629042	558	637	1450	-	-
Nelson River (CL-GR)	GL-B	14-Jun-16	NSC	101448	-	900 226000629042	646	725	2495	-	-
Nelson River (CL-GR)	GL-B	23-Jun-14	NSC	101449	-	900 226000629088	830	940	4990	-	-
Nelson River (CL-GR)	GL-A	13-Jun-16	NSC	101449	-	900 226000629088	882	990	6123	-	-
Nelson River (CL-GR)	GL-C	28-Aug-13	NSC	103116	-	-	483	555	700	-	-
Nelson River (CL-GR)	GL-C	6-Jun-16	NSC	103116	-	-	620	711	2722	-	-
Nelson River (CL-GR)	GL-C	6-Jul-14	NSC	103643	-	900 2260000629040	1399	1530	28576	-	-
Nelson River (CL-GR)	GL-A	29-May-16	NSC	103643	-	900 2260000629040	1439	1610	30844	F	3
Nelson River (CL-GR)	GL-A	7-Sep-12	NSC	103550	-	-	803	910	-	-	-
Nelson River (CL-GR)	GL-B	13-Jun-16	NSC	103550	-	900 226000768419	881	990	4082	-	-
Nelson River (CL-GR)	GL-C	5-Jul-14	NSC	103648	-	900 043000103868	609	667	1700	-	-
Nelson River (CL-GR)	GL-C	19-Jun-16	NSC	103648	-	900 043000103868	713	800	3402	-	-
Nelson River (CL-GR)	GL-A	15-Sep-15	NSC	105041**	-	900 043000119437	330	370	225	-	-
Nelson River (CL-GR)	GL-A	8-Jun-16	NSC	105041**	-	900 043000119437	330	361	227	-	-
Nelson River (CL-GR)	GL-C	3-Jul-14	NSC	105106	-	900 043000103823	617	676	1900	-	-
Nelson River (CL-GR)	GL-B	16-Jun-16	NSC	105106	-	900 043000103823	629	783	2948	-	-
Nelson River (CL-GR)	GL-B	17-Jun-14	NSC	105401	-	900 226000629062	842	939	4082	-	-
Nelson River (CL-GR)	BR-D	27-May-16	NSC	105401	-	900 226000629062	864	965	5443	-	-
Nelson River (CL-GR)	GL-C	17-Jun-14	NSC	105403	-	900 226000629181	992	1104	6350	-	-
Nelson River (CL-GR)	GL-A	23-May-16	NSC	105403	-	900 226000629181	1021	1140	7484	-	-
Nelson River (CL-GR)	GL-C	14-Jun-14	NSC	105413	-	900 226000629204	830	926	5443	-	-
Nelson River (CL-GR)	GL-A	15-Jun-16	NSC	105413	-	900 226000768436	850	962	5670	-	-

Table A2-1: Tagging and biological information for Lake Sturgeon recaptured upstream of Gull Rapids and in Stephens Lake during spring, 2016 (continued).

Location[a]	Zone	Date	Floy Tag Prefix	Floy Tag 1 Number	Floy Tag 2 Number	PIT Tag	Fork Length (mm)	Total Length (mm)	Weight (g)	Sex[b]	Maturity[c]
Nelson River (CL-GR)	BR-D	10-Jun-14	NSC	105419	-	900 226000629237	955	990	8165	M	7
Nelson River (CL-GR)	BR-D	5-Jun-16	NSC	105419	-	900 226000629237	998	1040	7711	-	-
Nelson River (CL-GR)	BR-D	9-Jun-14	NSC	105422	-	900 226000629059	912	1020	8391	M	7
Nelson River (CL-GR)	GL-A	23-May-16	NSC	105422	-	900 226000629059	941	1055	4309	-	-
Nelson River (CL-GR)	GL-B	3-Jul-14	NSC	105679	-	900 226000629030	830	908	4990	-	-
Nelson River (CL-GR)	GL-C	27-Jun-16	NSC	105679	-	900 226000629030	870	962	6804	-	-
Stephens Lake	GR-A	28-May-01	NSC	46827	-	-	945	1040	7500	M	7
Stephens Lake	GR-A	30-May-01	NSC	46827	-	-	-	-	-	-	-
Stephens Lake	GR-A	2-Jun-01	NSC	46827	-	-	-	-	-	-	-
Gull Lake	BR-D	24-Jun-03	NSC	46827	-	-	964	-	8166	-	-
Stephens Lake	GR-A	5-Jun-16	NSC	46827	-	900 226000548789	1120	1100	9072	-	-
Stephens Lake	GR-A	25-Jun-03	NSC	56205	-	-	771	877	4000	-	-
Stephens Lake	GR-A	26-Jun-03	NSC	56205	-	-	-	-	-	-	-
Stephens Lake	GR-A	29-May-16	NSC	56205	-	900 226000548766	1115	1246	12701	-	-
Stephens Lake	STL-A	25-Sep-11	NSC	69864	-	-	735	820	3590	-	-
Stephens Lake	STL-A	4-Jun-16	NSC	69864	-	900 226000548931	927	1040	9525	-	-
Stephens Lake	GR-A	8-Jun-16	NSC	69864	-	900 226000548931	-	-	-	-	-
Stephens Lake	GR-A	9-Jun-16	NSC	69864	-	900 226000548931	-	-	-	-	-
Stephens Lake	STL-A	26-Sep-11	NSC	69868	-	-	941	1040	8165	-	-
Stephens Lake	STL-A	28-May-16	NSC	69868	-	900 226000548760	1036	1150	9072	M	8
Stephens Lake	STL-A	10-Jun-16	NSC	69868	-	900 226000548760	-	-	-	-	-
Stephens Lake	STL-B	11-Jun-16	NSC	69868	-	900 226000548760	-	-	-	-	-
Stephens Lake	STL-A	16-Jun-16	NSC	69868	-	900 226000548760	-	-	-	-	-

Table A2-1: Tagging and biological information for Lake Sturgeon recaptured upstream of Gull Rapids and in Stephens Lake during spring, 2016 (continued).

Location[a]	Zone	Date	Floy Tag Prefix	Floy Tag 1 Number	Floy Tag 2 Number	PIT Tag	Fork Length (mm)	Total Length (mm)	Weight (g)	Sex[b]	Maturity[c]
Nelson River (CL-GR)	GL-B	18-Sep-08	NSC	75317	-	-	730	841	-	-	-
Nelson River (CL-GR)	GL-B	15-Jun-12	NSC	75317	-	-	860	990	7711	-	-
Stephens Lake	STL-A	10-Jun-16	NSC	75317	-	900 226000548932	930	1065	-	-	-
Stephens Lake	STL-A	26-Sep-14	NSC	79251	-	900 226000629493	910	1010	7050	-	-
Stephens Lake	STL-A	28-May-16	NSC	79251	-	900 226000629493	938	1053	6577	-	-
Stephens Lake	STL-A	15-Sep-08	NSC	81627	-	-	450	510	575	-	-
Stephens Lake	STL-A	29-May-16	NSC	81627	-	900 226000548865	850	961	4775	-	-
Stephens Lake	STL-A	24-Aug-06	NSC	81829	81830	-	428	483	600	-	-
Stephens Lake	STL-A	6-Jun-16	NSC	81829	81830	900 226000548756	893	996	5443	-	-
Stephens Lake	GR-A	11-Jun-10	NSC	88788	-	-	730	823	3200	-	-
Stephens Lake	GR-A	10-Jun-11	NSC	88788	-	-	790	885	4536	-	-
Stephens Lake	STL-A	11-Jun-16	NSC	88788	-	900 226000548905	981	1093	8165	-	-
Stephens Lake	STL-A	1-Oct-11	NSC	89481	-	-	597	689	1950	-	-
Stephens Lake	STL-A	16-Jun-16	NSC	89481	-	-	784	890	4082	-	-
Stephens Lake	STL-A	13-Jun-12	NSC	93924	-	-	884	976	5216	-	-
Stephens Lake	STL-B	17-Sep-12	NSC	93924	-	-	864	985	5525	-	-
Stephens Lake	STL-B	8-Jun-16	NSC	93924	-	900 226000577243	985	1090	7711	-	-
Stephens Lake	STL-B	29-Sep-10	NSC	94239	-	-	679	970	2300	-	-
Stephens Lake	STL-A	4-Jun-16	NSC	94239	-	900 226000548916	858	968	6350	-	-
Stephens Lake	STL-B	22-Sep-12	NSC	100138	-	-	760	865	4050	-	-
Stephens Lake	GR-A	13-Jun-16	NSC	100138	-	900 226000548979	860	973	6804	-	-
Stephens Lake	STL-B	22-Sep-12	NSC	100139	-	-	852	955	5225	-	-
Stephens Lake	STL-A	13-Jun-16	NSC	100139	-	900 226000548863	950	1056	7257	-	-

Table A2-1: Tagging and biological information for Lake Sturgeon recaptured upstream of Gull Rapids and in Stephens Lake during spring, 2016 (continued).

Location[a]	Zone	Date	Floy Tag Prefix	Floy Tag 1 Number	Floy Tag 2 Number	PIT Tag	Fork Length (mm)	Total Length (mm)	Weight (g)	Sex[b]	Maturity[c]
Stephens Lake	STL-A	19-Sep-14	NSC	101039	-	900 226000629372	971	1052	8700		
Stephens Lake	STL-A	29-May-16	NSC	101039	-	900 226000629372	991	1100	7400	M	8
Stephens Lake	GR-A	3-Jun-16	NSC	101039	-	900 226000629372	-	-	-	-	-
Stephens Lake	GR-A	4-Jun-16	NSC	101039	-	900 226000629372	-	-	-	M	8
Stephens Lake	STL-B	15-Sep-12	NSC	103612	-	-	490	560	850	-	-
Stephens Lake	-	17-Sep-12	NSC	103612	-	-	-	-	-	-	-
Stephens Lake	STL-B	22-Jun-16	NSC	103612	-	900 226000548839	683	772	2948	-	-

a. Nelson River from Clark Lake to Gull Rapids.

b. Refer to section 3.1 for sex and maturity codes.

c. Refer to section 3.1 for sex and maturity codes.

* Lake Sturgeon mislabelled. Tag number does not match with any tagged Lake Sturgeon.

** Measurement discrepancies due to errors in measurement during release or recapture.

APPENDIX 3:
POPULATION ESTIMATE INFORMATION

Mark-recapture population estimates have been calculated for the future Keeyask reservoir during the spring of 11 different years (1995, 2001–2004, 2006, 2008, 2010, 2012, 2014, and 2016). Lake Sturgeon were tagged in 1995 in Gull Lake by Manitoba Fisheries Branch and the Split Lake Resource Management Board. All data for the period 2001–2012 were collected annually as part of environmental studies related to the pre-Project environment, while data from 2014 until 2044 will be collected biennially as part of monitoring studies related to the Keeyask Project.

Only Lake Sturgeon classified as adults (*i.e.*, fork length equal to or greater than 800 mm) were included in the population estimate. Floy tag returns from local fishers were also included in the dataset to provide information on harvested Lake Sturgeon and to ensure that individuals harvested were removed from the tagged population. Between 2001 and 2012, 29 tags from Lake Sturgeon harvested in the Clark Lake to Gull Rapids reach were returned to North/South Consultants (Nelson and Barth 2012). Since 2012, there have been no reported tag returns from this section of the Nelson River, although field crews have observed resource harvesters in this reach.

Data were analysed using the program MARK (White and Burnham 1999), which is an industry standard for the analysis of data from marked populations. Program MARK uses binary numbers to represent the encounter history of individuals, and then uses the cumulative pattern of 0's (not-encountered) and 1's (re-encountered live capture) to generate a probability distribution of tag recaptures which form the basis of population estimation. Re-encounters can also be from dead recoveries (*e.g.*, the animal is harvested) in which case the model uses a value of -1. For example, the history "10-1" indicates than an animal was captured for the first time at sampling occasion 1, not encountered at sampling occasion 2, and recovered dead at sampling occasion 3.

Several different population model variants exist, most of which can be classified as either closed or open models. Closed models assume there are no births, deaths, immigration, or emigration between sample periods, while open models assume these processes occur. Prior to 2014, a Robust Design (Kendall 2001) model was used to estimate the annual abundance of adult Lake Sturgeon (outlined in the AEMP). This model incorporates both open (*i.e.,* between sampling years) and closed (*i.e.*, pre- and post-spawning periods within a single year) population models. However, this model requires numerous assumptions, for example that the population is closed between the pre- and post- spawn sampling periods. Estimates may be confounded by variables such as spawning periodicity, inter-annual variation in environmental conditions and the timing of spawning (which was estimated based on water temperature), and harvest during the spawning period. Thus, after 2014, the Jolly-Seber model (POPAN formulation; Arnason and Schwarz 2002), as implemented within MARK, was used to estimate the annual abundance of adult Lake Sturgeon. This is an open model that requires fewer assumptions and modeled variables, and thus likely provides a more reliable estimate of abundance.

Using first-time capture and recapture information, POPAN estimates the survival (*i.e.,* the probability that a fish will survive from one capture to the next), the probability of recapture (p; *i.e.,* the probability that a fish will be recaptured given that the animal is alive and in the study area), and abundance (N; *i.e.,* the number of adult Lake Sturgeon in the area during each capture period) (Appendix 3, Table A3-1).

- Model fit for survival was best using three time periods of fish capture corresponding to i) 1995 to 2001 (93% survival); (ii) 2001 to 2004 (77% survival); and iii) 2004–2016 (90% survival). Survival rate within each time period was constant.
    - The model recommends how best to split the data for survival estimates.
    - In the current study, time periods were split, not into pre- and post-construction periods, but into groups based on tag type and sampling periodicity to best fit the model. In 1995, the Manitoba Fisheries Branch and the Split Lake Resource Management Board tagged Lake Sturgeon capture in Gull Lake with Carlin tags, as opposed to Floy tags used in future studies. These were the only fish tagged in the area until 2001. Between 2001 and 2004, fish were sampled annually, while biennial studies were conducted between 2004 and 2016.
    - As more data is added to the model, the best fit for survival may change, and additional time periods may be added (even if sampling methods remain consistent). For example, should survival be very different in one year, the model may recommend that the data be divided. It is also possible to divide the data to compare survival between set time periods (*e.g.*, into pre- and post-impoundment periods).
- The probability of recapture varied among years and was split into three groups: i) p_1 (1995, 2008, 2010, and 2012) had low recapture rates (0.094); ii) p_2 (2001, 2002, 2004, and 2014) had moderate recapture rates (0.181); iii) and p_3 (2003, 2006, and 2016) had high recapture rates (0.268).
- An abundance estimate is provided for each year sampling was conducted.
- As sampling continues (*i.e*., year to year) and data is added to the model, the parameters are recalculated. Thus, although survival rates and abundance estimates are calculated for the same time periods, they may differ among reporting periods. This allows the estimates to become more refined and precise over time.

To assess the long term trends in abundance, a Pradel Lambda variant of the Jolly-Seber model was run to estimate population growth (Pradel 1996). This model used the same inputs and parameters as the POPAN model but uses a different mathematical formulation; therefore estimates such as survival and recapture may differ slightly but not significantly from the POPAN model. The Lambda parameter provides a measure of population growth between years, with values less than one indicating population decline between the current and preceding year, values of one indicating equilibrium, and values greater than one indicating population growth.

Table A3-1: Results of POPAN analysis of adult Lake Sturgeon from the future Keeyask reservoir. Best model was constant survival and variable recapture. Confidence intervals are rounded.

Parameter	Estimate	SE[a]	95 % Confidence Interval	
			Lower	Upper
1995–2001 Survival	0.93	0.03	0.84	0.97
2001–2004 Survival	0.77	0.04	0.69	0.83
2004–2016 Survival	0.90	0.01	0.88	0.93
1995, 2008, 2010, 2012 Recapture (p_1)	0.09	0.01	0.07	0.12
2001, 2002, 2004, 2014 Recapture (p_2)	0.18	0.02	0.15	0.22
2003, 2006, 2016 Recapture (p_3)	0.27	0.02	0.23	0.32
1995 Abundance	661	119	466	936
2001 Abundance	565	67	450	711
2002 Abundance	432	55	339	552
2003 Abundance	475	50	387	583
2004 Abundance	395	48	312	500
2006 abundance	682	61	573	812
2008 Abundance	554	57	453	677
2010 Abundance	758	109	574	1003
2012 Abundance	812	118	613	1075
2014 Abundance	759	86	609	945
2016 Abundance	709	68	588	854

a. Standard error.

Table A3-2: Results of PRADEL Lambda Jolly-Seber analysis of adult Lake Sturgeon from the future Keeyask reservoir. Best model was constant survival for the periods indicated and variable recapture for the years indicated. Confidence intervals are rounded.

Parameter	Estimate	SE[a]	95% Confidence Interval	
			Lower	Upper
1995–2001 Survival	0.92	0.03	0.84	0.97
2001–2004 Survival	0.78	0.04	0.70	0.84
2004–2016 Survival	0.91	0.01	0.88	0.93
1995, 2008, 2010, 2012 Recapture (p_1)	0.09	0.01	0.07	0.12
2001, 2002, 2004, 2014 Recapture (p_2)	0.18	0.02	0.14	0.22
2003, 2006, 2016 Recapture (p_3)	0.26	0.03	0.22	0.32
1995 to 2001 Lambda	0.99	0.04	0.92	1.06
2001 to 2002 Lambda	0.69	0.09	0.53	0.88
2002 to 2003 Lambda	1.19	0.18	0.89	1.59
2003 to 2004 Lambda	0.85	0.11	0.65	1.10
2004 to 2006 Lambda	1.33	0.09	1.16	1.51
2006 to 2008 Lambda	0.90	0.06	0.78	1.04
2008 to 2010 Lambda	1.18	0.08	1.03	1.36
2010 to 2012 Lambda	1.04	0.07	0.91	1.18
2012 to 2014 Lambda	0.97	0.08	0.83	1.14
2014 to 2016 Lambda	0.96	0.06	0.86	1.08

a. Standard error.